RP 16-1993
Revision of RP 16-1988

SMPTE RECOMMENDED PRACTICE

Specifications of Tracking-Control Record for 2-in Quadruplex Video Magnetic Tape Recordings

1 Scope

This practice specifies the recorded dimensional relationships among (a) tracking-control signal, (b) frame pulse signal, and (c) vertical synchronizing signal for 2-in (50.8 mm) quadruplex video magnetic tape recordings.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this practice are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below.

ANSI/SMPTE 6-1993, Video Recording — 2-in Quadruplex Tape — Video, Audio and Tracking-Control Records

3 Dimensions

3.1 The dimensional relationships among the tracking-control record, frame pulse record, and video record, not specified elsewhere in this practice, shall be as specified in figures 1a and 1b and table 1.

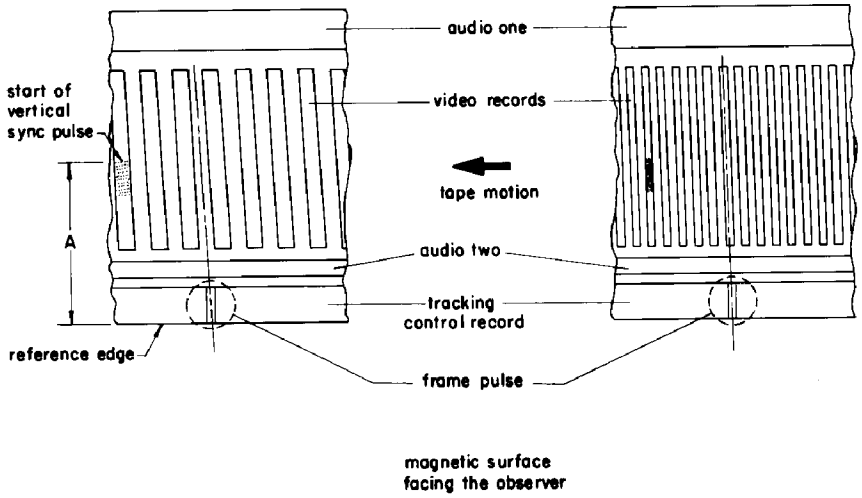

Figure 1a – 15 in/s recording

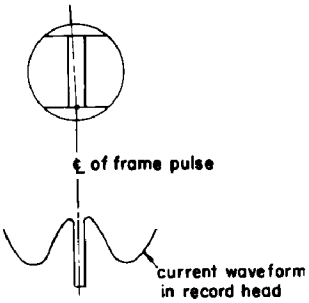

Figure 1c – Enlargement of frame pulse area

Figure 1b – 7.5 in/s recording

Table 1 -- Dimension

	Inch		Millimeter	
Dimension	Minimum	Maximum	Minimum	Maximum
A	1.135	1.165	28.83	29.59

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3.2 Dimensions pertaining to the video, audio, and control records on 2-in magnetic tape shall be as specified in ANSI/SMPTE 6.

4 Magnetic coating

With the direction of tape motion shown, the magnetic coating is on the surface facing the observer.

5 Frame pulse

5.1 A pulse to identify the position of the vertical synchronizing pulse shall be superimposed on the tracking-control signal.

5.2 One pulse shall be recorded per television frame to identify the vertical blanking interval that is preceded by a full horizontal line when the tape is recorded at 15 in/s (381 mm/s) and to identify the vertical blanking interval that is preceded by a half horizontal line when the tape is recorded at 7.5 in/s (190.5 mm/s) (see annex A.1).

To assist in certain restricted types of color editing, alternate frame pulses may be omitted. Since omission of alternate frame pulses may result in slightly lengthened lock-up time in tape replay, users may wish to obtain prior agreement before distributing such tapes.

5.3 The pulse shall be positioned so that the centerline of the recorded pulse and the extended centerline of the area between the second and third video tracks after the track containing the vertical synchronizing pulse shall intersect within ± 0.002 in (± 0.05 mm) at the reference edge of the tape when the recording is made at 15 in/s tape speed (figure 1a). The pulse shall be positioned so that the centerline of the recorded pulse and the extended centerline of the fifth video track after the track containing the vertical synchronizing pulse shall intersect within ± 0.002 in at the reference edge of the tape when the recording is made at 7.5 in/s tape speed (figure 1b).

5.4 The amplitude of the frame pulse shall be (150 ± 25)% of the peak-to-peak value of the sinusoidal tracking-control signal current in the record head.

5.5 The polarity of the pulse with respect to the tracking-control signal shall be as shown in figure 1c.

5.6 The pulse shall be 150 µs ± 30 µs wide at the 50% amplitude points of the current waveform in the record head. The rise and fall times of the pulse shall be 15 µs ± 10 µs measured between the 10% and 90% points on the waveform.

Width observable and measurable on developed tape will vary with recording level and properties of the developing solution (see annex A.2).

6 Tracking-control signal

6.1 The frequency of the tracking-control signal shall be four times the field frequency of the television video signal.

6.2 The amplitude of the tracking-control signal current in the recording head shall be such that the tape is driven to the verge of saturation. This amplitude can be established by the method described in annex A.3.

6.3 The tracking-control signal shall be positioned so that a point of maximum record current and the extended centerline of the area between the second and third video tracks after the track containing the vertical synchronizing pulse shall coincide within ± 0.001 in (± 0.03 mm) at the reference edge of the tape when the recording is made at 15 in/s tape speed.

The tracking control signal shall be positioned so that a point of maximum record current and the extended centerline of the fifth video track after the track containing the vertical synchronizing pulse shall coincide within ± 0.001 in (± 0.03 mm) at the reference edge of the tape when the recording is made at 7.5 in/s tape speed.

6.4 The point of maximum record current coinciding with the frame pulse shall be one that immediately follows an area on the control record to which a south-seeking pole of a compass will be attracted.

6.5 The wave shape of the tracking-control signal current in the record head should be sinusoidal.

Annex A (informative)
Additional data

A.1 In present practice, this pulse is derived from the vertical sync signal that is preceded by a half horizontal line for both the 15 in/s case and the 7.5 in/s case. The placement on the tape specified by 5.2 is a consequence of the displacement between the video head wheel and the control track head which records this pulse.

A.2 Recordings made in accordance with this frame pulse specification will reproduce satisfactorily on equipment presently in use without requiring equipment modification. However, modification of existing recording equipment to meet this specification may be made by users or manufacturers in order to increase the overall reliability of the frame pulse recovery. Recordings made according to earlier versions of this practice contain less energy in the recorded frame pulse and this fact should be taken into account in the design of new equipment.

A.3 The transfer characteristic of magnetic tape is nonlinear. The B_r, I_r curve of the tape as recorded has a shape indicated in figure A.1a. When a sinusoidal record current (figure A.1c) is applied to the record head, the resulting recorded flux density is as shown in figure A.1b. The playback voltage waveform (figure A.1d) is the first derivative of the recorded flux. Thus, the zero axis crossing region of the reproducing signal corresponds to the maximum recorded flux region. The verge of saturation is considered to be the condition where the recorded flux waveform is just noticeably flattened on its peaks. This flattening of the flux peaks results in an inflection in the reproducing signal waveform in the zero axis crossing region. The verge of saturation can thus be determined by increasing the record current until a barely perceptible inflection occurs in the zero axis crossing region of the reproducing signal.

A.4 Areas to which a compass is attracted (see 6.4) do not coincide with point of maximum record current. The compass will be attracted to two areas (X, as shown in figure A.1) adjacent to the point where the record current crosses the zero axis. The two areas will appear as bars when the track is developed with carbonly iron or an equivalent material.

A.5 The location of vertical sync and the frame pulse, as specified herein, will apply only if the recorder video head and capstan servos are referenced to a synchronizing signal that is in time coincidence with the video at the recorder.

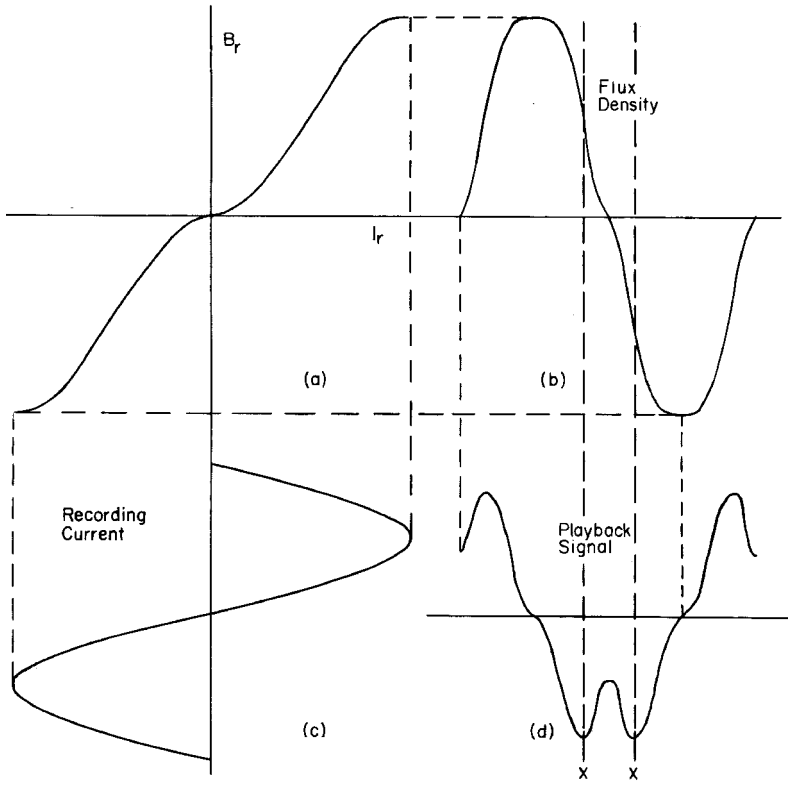

Figure A.1 – B_r, I_r curve