

JIS

JAPANESE INDUSTRIAL STANDARD

**9-Track, 12.7 mm Wide
Magnetic Tape for Information
Interchange-Format and Recording,
Using Phase Encoding at 63 cpmm**

JIS X 6104—1988

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In the event of any doubt arising,
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for Information Interchange - Format and Recording,
Using Phase Encoding at 63 cpmm

1. Scope

This Japanese Industrial Standard specifies the format and recording standard for 9-track, 12.7 mm wide and data density 63 cpmm magnetic tape, hereafter referred to as the "tape", using phase encoding system, hereafter referred to as the "PE (Phase Encoding) system", to be used for information interchange between the digital computers and similar machines.

2. Definitions

For the purposes of this Standard, the following definitions apply:

- (1) PE system In the case where a series of binary codes are recorded successively on the track of a tape in positive travel direction, the recording system in which the polarity of saturated magnetization is reversed respectively from the polarity opposite to the block gap portion to the same polarity when recording code "1", and from the same polarity as the block gap portion to the opposite polarity when recording code "0", and also the polarity is reversed again at the mid-point when the adjacent 2 codes are identical.
- (2) reference tape A tape which is to be used for the reference of the electromagnetic transducing characteristics of the tapes, and the characteristic values of which are specified by the International Organization for Standardization (ISO).
- (3) secondary reference tape This is a tape to be described as follows. It is to be used for comparing the electromagnetic transducing characteristics of a tape with those of the reference tape, and the deviations of its characteristics from those of the reference tape are clearly indicated, and by correcting the deviations of the actually measured values, it is made possible to carry out an indirect comparison between the characteristics of the tape to be tested and those of the reference tape.
- (4) reference magnetic field The minimum magnetic field applied to the reference tape which causes an output signal equal to 95 % of the maximum (saturated) output, when consecutive flux transitions recorded at the specified packing density of 126 ftpmm on the reference tape are reproduced.
- (5) reference peak output voltage The average peak (P-P) output voltage obtained when the reference tape is reproduced on which consecutive flux transitions are recorded with the recording current 1.8 times the current sufficient to generate the reference magnetic field at the packing density of 126 ftpmm.

Applicable Standards, Corresponding International Standard and Reference Standards: See page 14.

- (6) reference edge The edge further from an observer, when a tape is lying flat with the magnetic surface uppermost and the direction of movement of the tape at time of recording is from left to right.
- (7) track A linear portion on the surface of the magnetic tape which is capable of storing a series of information and being read or written with one head.
- (8) row A portion of a tape in which nine bits of a set are recorded across the width.
- (9) recording density The number of recorded flux transitions per unit length of a track (ftpmm).
- (10) data density The number of data characters recorded per unit length of a tape (cpmm).
- (11) skew Within the bits in a row, the maximum displacement of any location from any location in the longitudinal direction.

3. Operating Conditions of Tapes

3.1 Operating Environmental Conditions The operating environmental conditions of the tapes during recording and reproducing shall be as follows.

Temperature	16 to 32° C
Relative humidity	20 to 80 %
Wet-bulb temperature	not higher than 25° C

If a tape has been exposed during storage or transportation to conditions outside the above values, it should be conditioned before use for a period of 2 to 12 h depending on the extent of exposure.

3.2 Storage Environmental Conditions for Recorded Tapes The storage environmental conditions for the recorded tapes to be used for information interchange shall be as follows:

Temperature	5 to 32° C
Relative humidity	20 to 80 %
Wet-bulb temperature	not higher than 26° C

3.3 Transportation Conditions for Recorded Tapes The sender shall take appropriate measures against matters specified in Appendix 1 for protecting the tapes from damage during transportation.

3.4 Winding Tension The winding tension of the recorded tape shall be 2 to 3.6 N.

3.5 Tapes to Be Used The tapes to be used for information interchange shall be those conforming to the designation of record density 126 ftpmm specified in JIS X 6101.

4. General Requirements of Recording

4.1 Recording System The recording system shall be PE system, and the recording magnetization shall be carried out in the longitudinal direction of the tape.

4.2 Recording Density The nominal recording density shall be 126 ftpmm, and the flux transition spacing shall be $7.935 \mu\text{m}$. A density of 63 ftpmm may also be used as the nominal recording density for a special measurement.

4.3 Average Flux Transition Spacing The average flux transition spacing shall satisfy the following conditions when measurement is made of a tape which has been recorded at the recording density of 63 ftpmm.

- (1) The static flux transition spacing shall be $15.87 \mu\text{m} \pm 4 \%$, averaging the flux transition spacings of continuous 5×10^5 pieces or over.
- (2) The dynamic flux transition spacing, with respect to a certain specific flux transition spacing, shall be the average of that flux transition spacing and the flux transition spacing immediately preceding it, and be within $\pm 10 \%$ of the static flux transition spacing. However, the variation of the dynamic flux transition spacing shall not exceed 0.5% per one flux transition.

4.4 Instantaneous Flux Transition Spacing The instantaneous flux transition spacing may vary according to the reproducing process, recording process, recorded pattern (pulse crowding effects) and other factors. Under the test conditions of Appendix 2, the instantaneous flux transition spacing shall conform to the following conditions.

- (1) In the case where no intervening phase flux transition exists, the data bits spacing shall be 85 to 108 % of the dynamic flux transition spacing.
- (2) In the case where an intervening phase flux transition exists, the data bits spacing shall be 93 to 112 % of the dynamic flux transition spacing.
- (3) The spacing between the data bit and any adjacent phase flux transition shall be 44 to 62 % the dynamic flux transition spacing.
- (4) In the case where the flux transition of 126 ftpmm exists before or after the flux transition of 63 ftpmm, the average value of distance between the anticipated location where a data bit exists when the flux transition of 126 ftpmm has been assumed to continue, and the location of the actual data bit of 63 ftpmm corresponding to that shall be less than $\pm 6 \%$ the dynamic flux transition spacing.

4.5 Skew In the same row, the displacement of any flux transition from any other flux transition shall not exceed $15.87 \mu\text{m}$.

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4.6 Signal Amplitude

4.6.1 Average Signal Amplitude The average signal amplitude shall satisfy the following conditions.

- (1) The average signal amplitude at a recording density of 126 ftpmm shall be 65 to 150 % of the reference peak output voltage.
- (2) The average signal amplitude at a recording density of 63 ftpmm shall be less than 300 % of the reference peak output voltage.
- (3) The average signal amplitude shall be the average value of the reproduced output over 4000 or more consecutive flux transitions.
Measurement shall be carried out at the first reproduction after recording.

4.6.2 Minimum Signal Amplitude The minimum signal amplitude (peak value) at the first reproduction after recording shall not be less than 20 % of the reference peak output voltage.

4.7 Erase The erasure shall be as given in the following:

- (1) Polarity of Erase The magnetization at the erasing part of the tape shall be such that the beginning end of the tape is the direction indicating the north pole and the end of the tape is the direction indicating the south pole.
- (2) Width of Erase The width of erasure at the erasing part of the tape shall be the full width of the tape.
- (3) Erasing Effect When the tape has been erased, the reproducing output of the remaining signals less than 4 % of the reference peak output voltage at 126 ftpmm whether the remaining signals are 32 ftpmm under NRZ-1 system, 126 ftpmm under PE system or 356 ftpmm under GCR system.

5. Tracks

5.1 Number of Tracks and Track Number The number of tracks for recording information on the tape shall be nine. The tracks shall be numbered consecutively beginning from 1 to 9 on the side closer to the reference edge (see Figure).

5.2 Positions and Dimensions of Tracks The width of the track having recorded information shall be not less than 1.09 mm. The distance from the center line of each track to the reference edge shall be as given in Table.