

National Bureau of Standards

Certificate

Standard Reference Material 3200

Secondary Standard Magnetic Tape

(Computer Amplitude Reference)

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This Standard Reference Material is used for calibrating the output signal amplitude from computer tape recording and reproducing systems. It is defined as an NBS Secondary Standard Magnetic Tape (Computer Amplitude Reference). This standard consists of a 183 m (600 ft) length of 12.7 mm (0.50 in) wide unrecorded magnetic tape, preceded and followed by the additional tape needed to minimize end effects, wound on a 216 mm (8.50 in) diameter precision reel. The material consists of oriented ferromagnetic oxide particles dispersed in a suitable polymeric binder material that has been uniformly coated over the surface of a flexible polyester, or equivalent, base material.

The National Bureau of Standards maintains in repository a Master Standard Magnetic Tape (Computer Amplitude Reference) that is used periodically to calibrate selected "Working" Standard Magnetic Tapes. These selected tapes, in turn, are used to calibrate the instrumentation that is used for measuring and documenting the performance of the NBS Secondary Standard Magnetic Tape (Computer Amplitude Reference) SRM 3200.

The output of each secondary tape is calibrated in terms of its percentage of the signal amplitude level of the NBS Master Standard Magnetic Tape which is taken as unity. Each secondary tape is calibrated at three recording densities: 7.9 ftpmm (200 ftpi), 31.5 ftpmm (800 ftpi), and 126 ftpmm (3200 ftpi), where ftpmm and ftpi are flux transitions per millimeter and flux transitions per inch, respectively. The calibration is performed on one of the three center tracks of the reference read/write head; i.e., tracks Nos. 4, 5, or 6 whose locations are designated in ANSI document X3.39-1973. This SRM 3200, No. _____, has been calibrated on Reference Track No. _____.

The criteria for the acceptance of a tape as an NBS Secondary Standard Magnetic Tape (Computer Amplitude Reference) SRM 3200 are based upon the signal amplitude uniformity on the reference track and the proximity of these signal amplitudes to those of the NBS Master Standard Magnetic Tape. These criteria are applied to the calibrated 183 m (600 ft) region of SRM 3200 and are as follows:

1. The maximum variation in average signal peak amplitude along the reference track is limited to 5 percent.
2. The value of the average signal peak amplitude reproduced from the reference track is within 20 percent of that of the NBS Master Standard Magnetic Tape.

The percentage relationship between this SRM 3200 and the NBS Master Standard Magnetic Tape are measured with an accuracy of 2 percent. The calibration of Standard Reference Material 3200 and the associated data collection and analysis were performed by members of the ICST Computer Storage Media Group of the NBS Center for Computer Systems Engineering.

The technical support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R. W. Seward.

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George A. Uriano, Chief
Office of Standard Reference Materials

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The following sets of documents accompany each SRM 3200 for each of the three recorded densities:

- (1) Two saturation curves produced on the aforementioned reference track showing the average signal output voltages in terms of Amplitude Units (A.U.) versus the write head currents I_w :
 - (a) One of the curves is produced from the NBS Master Standard Magnetic Tape on a read-while-write pass.
 - (b) The other curve is produced within the certified 183 m (600 ft) region of SRM 3200, Serial No. _____, on a read-while-write pass.
- (2) A strip chart recording of the signal peak amplitude and the average signal peak amplitude which is produced over the entire length of the SRM 3200 on the aforementioned reference track. The certified 183 m (600 ft) region of the tape is indicated on the strip chart.

A copy of NBS Special Publication 260-29, which describes the measurement system is included with the preceding documentation.

The data provided with each NBS Secondary Standard Magnetic Tape (Computer Amplitude Reference) SRM 3200 are derived using the NBS measurement system. The National Bureau of Standards cannot guarantee the repeatability of the test data unless the signal amplitude measurements are performed on an equivalent system.

Application Notes:

- (1) SRM 3200 should always be given at least two full forward and two rewind passes before it is used for calibration purposes.
- (2) Never make a partial pass on SRM 3200; always run it over its full length.
- (3) Always run SRM 3200 at normal operating speeds and avoid high speed rewinds.
- (4) SRM 3200 is received by the user in an unrecorded ac bulk-erased condition and must be recorded at each density by the user on his measurement system. All measurements are made on the read-while-write pass.
- (5) SRM 3200 should be ac bulk-erased before each use if possible and should be used sparingly. "Working" reference tapes should be calibrated and used for everyday operations.
- (6) The reference read/write transducers should also be used sparingly. It is suggested that a group of "working" transducers be calibrated and used for everyday operations.
- (7) The calibration of this NBS Secondary Standard Magnetic Tape (Computer Amplitude Reference), SRM 3200, has been performed on an IBM 2401, Model IV (112.5 ips) tape transport.
- (8) The reference transducer is a nine-track slotted read/write head; IBM Part No. 5417960. It is recommended that similar or equivalent read/write transducers be used because the transducer is an important system component for assuring tape-to-tape correlation with NBS when operating in the relative measurement mode.

Note: The mention of specific equipment should not be construed as an endorsement of these items by NBS to the exclusion of other equivalent devices.

- (9) Method for using the saturation curves: The percentage relationships between the signal amplitudes of the SRM 3200 and those of the NBS Master Standard Magnetic Tape can be determined directly from their accompanying saturation curves at each density. This is done through the direct calculation of the ratio of their Amplitude Units (A.U.'s) at a selected write current level I_w , and density, as follows:

$$\frac{\text{SRM 3200 (A.U. at } I_w)}{\text{NBS Master Standard Magnetic Tape (A.U. at } I_w)} \times 100 = \text{Percentage value of the SRM 3200 at the selected } I_w \text{ and density.}$$