

# National Bureau of Standards Certificate Standard Reference Material 3216 Secondary Standard Magnetic Tape Cartridge (Computer Amplitude Reference)

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This Standard Reference Material is intended for use in the calibration of the output signal amplitude from computer magnetic tape cartridge recording and reproducing systems. It is defined as an NBS Secondary Standard Magnetic Tape Cartridge (Computer Amplitude Reference). This SRM consists of approximately 91.4 m (300 ft) of 6.35 mm (0.250 in) wide unrecorded magnetic tape wound on two coplanar hubs. The material consists of oriented ferromagnetic oxide particles dispersed in a suitable polymeric binder material, which has been uniformly coated over the surface of a flexible polyester, or equivalent, base material.

The National Bureau of Standards maintains a Master Standard Magnetic Tape Cartridge (Computer Amplitude Reference) in repository that is used periodically to calibrate selected "Working" Standard Magnetic Tape Cartridges. These selected tapes, in turn, are used to calibrate the instrumentation for measuring and documenting the performance of the NBS Secondary Standard Magnetic Tape Cartridges (Computer Amplitude Reference), SRM 3216's.

The signal output from the NBS Master Standard Magnetic Tape Cartridge is taken as the 100 percent reference level. Each SRM 3216 is calibrated with respect to the Master Cartridge on both their read-while-write and first read-after-write passes after the system has been calibrated by the Master Cartridge on the read-while-write pass.

To qualify as a Standard Reference Material 3216, the magnetic tape cartridge candidate must meet the following criteria: the average peak-to-peak output signal amplitude from the candidate as measured at the test recording current level  $I_M$  must be:

- (a) Within 15 percent of the NBS Master Cartridge's read-while-write signal amplitude on the candidate's read-while-write pass, and
- (b) Within 20 percent of the NBS Master Cartridge's read-while-write signal amplitude on the candidate's first read-after-write pass.

**NOTE:** The test recording current  $I_M$  is equal to 1.5 times the current  $I_R$  where  $I_R$  is the standard reference current and is the minimum value that produces an average peak-to-peak output signal amplitude from the tape which is equal to 95 percent of its maximum output signal.

The percentage relationships between the signal amplitude of Standard Reference Material 3216, Serial No. \_\_\_\_\_, and the NBS Master Cartridge are measured with an accuracy of 2 percent.

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

(over)

The following documents accompany each SRM 3216:

Four saturation curves showing the average peak-to-peak signal output voltage versus the record head current, all made at a recording density of 63 bpmm (1600 bpi) phase encoded:

- (a) Two of the curves are produced from the NBS Master Standard Magnetic Tape Cartridge; one on the read-while-write pass and the other on the first read-after-write pass.
- (b) Two of the curves are produced from the SRM 3216, Serial No. \_\_\_\_\_; one on the read-while-write pass and the other on the first read-after-write pass.

The data provided with each NBS Secondary Standard Magnetic Tape Cartridge (Computer Amplitude Reference) 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 under conditions similar to those described in the accompanying documentation.

The enclosed calibrations for SRM 3216, Serial No. \_\_\_\_\_ were completed on \_\_\_\_\_

Application Notes:

- (1) SRM 3216 should always be given one full forward and one rewind pass before it is used for calibration purposes.
- (2) A complete forward and rewind pass should always be made over the entire surface of SRM 3216 whenever it is used.
- (3) Always run SRM 3216 at normal operating speeds and avoid high speed rewinds whenever possible.
- (4) During its application, the SRM 3216 tape surface must move in the forward direction (i.e., from left to right with read/write head access port at the bottom left hand side of the cartridge and the plastic window facing the viewer).
- (5) SRM 3216 is received by the user in an unrecorded ac bulk-erased condition and must be recorded by the user at 63 bpmm (1600 bpi) PE on their in-house measurement system. All measurements are made on either the read-while-write pass or on the first read-after-write pass and are referred to the proper calibration chart that accompanies the SRM.
- (6) SRM 3216 should be bulk erased before each use if possible and should be used sparingly. It is suggested that "working" reference cartridges should be calibrated and used for everyday operations.
- (7) The reference read/write transducer should be used sparingly. It is suggested that a group of "working" transducers should be calibrated to be used for everyday operations and replaced as necessary.
- (8) There are LOAD POINT, BOT, and EOT marker holes in the tape. SRM 3216 is shipped with the tape wound to the LOAD POINT.

Calibration Charts [ $e_o$  (%) versus Write Current  $I_w$  Saturation Curves]:

1. The average peak-to-peak amplitude charts for SRM 3216 are in the form of  $e_o$  (%) versus  $I_w$  saturation curves. These curves have been produced using the automatic current changing system and the automatic write-current valued marker system. The automatic write-current marker system has twelve preset write-current points at which the write current  $I_E$  is rapidly switched to zero value.
2. The average peak-to-peak saturation curves for SRM 3216 are charted on both the read-while-write pass and the first read-after-write pass after the NBS system has been calibrated with the Master Cartridge on the read-while-write pass only.
3. In keeping with the standards proposed by both the American National Standards Institute (ANSI X3.55-1982) and International Standards Organization (ISO 4057-1979) the saturation curves have been marked at the  $1.5 I_R$  signal amplitude reference points (noted as  $I_M$ ) where  $I_R$  is the minimum

write-current which produces an average peak-to-peak output signal amplitude from the tape which is equal to 95 percent of the maximum output signal. The  $e_o$  (%) relationship between each SRM 3216 and the NBS Master at this  $1.5 I_R (=I_M)$  reference current point is the principal signal amplitude descriptor for each SRM 3216 reference cartridge and is read directly from the secondary chart at that point. The Master chart will be calibrated so that the Master curve will be at the 100 percent chart level at the  $I_M$  current point during the read-while-write pass.

System Components:

1. The calibration of this Secondary Standard Magnetic Tape Cartridge (Computer Amplitude Reference) SRM 3216 has been performed on a Mincom Data DCD-3 Cartridge Drive Model No. DCD-3-DXC-30/90-1/2-RWO-DX. The read/write head is a 4-track Nortronics Head Type DQ42D (4-track)-(3M Catalog No. 81-2716-1680-7).
2. The write-current circuit shown in Figure 1 has been added to the normal cartridge write-drive electronics for the purpose of varying and marking the write-current levels on the Mincom Data DCD-3 cartridge drive.
3. The signal-reproduce system which is used for calibrating SRM 3216 is similar to the reference cassette calibration system which is described in Section 4 of the accompanying NBS Technical Note 731.

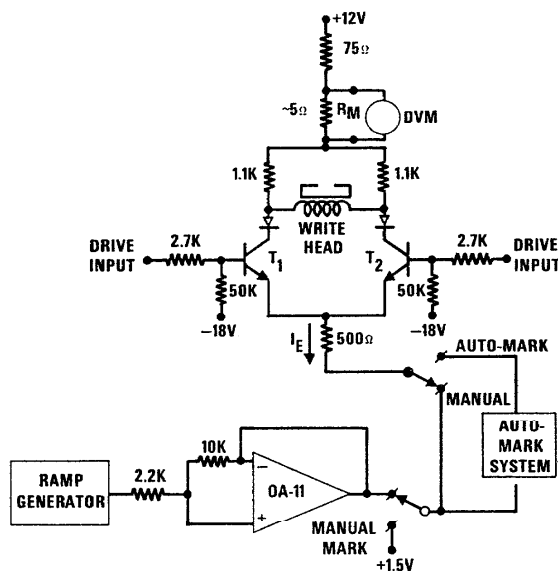


FIGURE 1. WRITE CURRENT CIRCUIT