

**National Library Service
for the Blind and
Physically Handicapped**

The Library of Congress

Approved by Director, NLS/BPH

~~Frank Kent Gilke~~

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Technical Certification

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BACKGROUND

The National Library Service for the Blind and Physically Handicapped (NLS) of the Library of Congress administers a free library service to eligible residents of the United States and citizens living abroad who cannot hold, handle, or read traditional print media because of visual or physical handicaps.

Using federal funds, NLS annually publishes approximately 2,000 books and 70 magazines on cassettes, on discs, and in braille. Titles are selected to appeal to a wide variety of interests, and copyright permission is obtained from authors and publishers. Books and magazines are narrated and duplicated at a high-quality professional standard. The quantity produced of any title is dependent on anticipated reader demand.

Playback machines and their accessories are designed to facilitate convenient use by handicapped people and to provide maximum reliability under environmental conditions that are sometimes harsh and handling that may be technically unsophisticated or inadvertently abusive. The equipment plays program materials at noncommercial speeds: 8-1/3 rpm for discs and 15/16 ips, 4-track for cassettes. All materials and equipment in the program can be sent to users and returned to libraries postage free.

A cooperating network of 56 regional libraries and more than 100 subregional libraries circulates recorded and braille books to some 700,000 adults and children out of a potential three million eligible population. Magazine subscriptions are provided on a direct-mail basis from the manufacturers. Users must generally deal with service centers in distant cities with communication by mail or phone and little or no personal contact. Everything comes and goes through a mail-order system. Fifty percent of the users are over sixty-four years old, and many depend on the NLS program for their major source of entertainment and connection with the world; 95 percent read recorded materials, 5 percent read braille.

Users are informed about new books, magazines, and services through bimonthly publications, annual catalogs, and subject bibliographies produced by NLS, and through various publications produced and circulated by the regional and subregional libraries.

USER MATERIALS

Contractors who consider submission of a bid to produce books, equipment, or other program products should be cognizant of the consumer-responsive nature of the program, and that the specifications for these products have been developed to meet the special reader needs in the program. Materials are produced with those reader needs foremost in mind, and improved through constant monitoring and consumer input. Contractors are expected to familiarize themselves with the equipment-handling practices of blind and physically handicapped clientele and ensure that the equipment they produce will stand up under this type of use. A high degree of quality workmanship and product reliability is mandated by the product specification.

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1. SCOPE

This specification defines the requirements for C-0, twin-hub, coplanar tape cassettes, suitable for use in the Library of Congress, National Library Service for the Blind and Physically Handicapped (NLS), cassette magazine program. To promote standardization and interchangeability of various makes of cassettes and to establish an acceptable level of quality for our users.

2. APPLICABLE DOCUMENTS

The following documents and publications, of the issue in effect on the date of the invitation for bids, form a part of this specification. In the event of conflict between the documents and publications referenced herein and the content of this specification, the content of this specification shall be considered a superseding requirement.

International Tape Association (ITA) ITA-A-101 - Audio Cassette Specification

International Electro-Technical Commission (IEC) Recommendations:
IEC 94-7, Parts 1 through 5: Magnetic Tape Recording and Reproducing Systems;
Dimensions and Characteristics. Part-7 (1986): Cassette for commercial tape recording
and domestic use

Electronic Industries Association (EIA) Standards: RS-399-A, Dimensional Standard
Coplanar Magnetic Tape Cartridge Type CP II

MIL-STD 105 - Sampling Procedures and Tables for Inspection by Attributes

National Library Services for the Blind and Physically Handicapped:
specification 101, Cassette machine C-1

3. REQUIREMENTS

3.1 General

The C-0 cassette shall be new and designed in accordance with the requirements given in ITA-A-101, IEC 94-7, and EIA RS-399-A.

3.2 Qualification

The items furnished under this specification shall be products that have been tested and passed the qualification tests specified herein. Items that pass the

qualification tests shall be under engineering change control and are considered qualified by NLS for the remainder of the Library of Congress contracting period.

3.2.1 Product or process change

Qualification, once established, applies only to those cassettes manufactured by the same process used to make the cassettes that passed the qualification tests. Qualification inspection shall be performed on new products and on previously qualified products that have undergone any changes in design, materials, component parts, or manufacturing process.

3.2.2 Qualification by contractor (cassette supplier)

The contractor shall perform qualification inspection on eight samples. Complete inspection data and twenty untested samples consisting of eight C-60 and twelve C-0 cassettes shall be submitted to NLS. Upon completion of the qualification inspection, NLS will return one C-0 production control sample to the contractor for reference.

3.2.3 Qualification by purchaser (duplicator)

NLS will also send a C-0 production control sample of each qualified cassette to each current purchaser. The purchaser shall obtain from the contractor sixteen untested C-0 samples, a copy of the contractor's qualification inspection data, and certification that no changes in manufacturing or material have occurred. The purchaser shall load the samples, perform the qualification inspection on eight of the samples, and compare that data with the contractor's data and with the production control sample to confirm that no changes have occurred. Upon completion of purchaser's qualification inspection, eight untested C-60 samples, eight tested C-60 samples with complete data, and a copy of the contractor's data shall be submitted to NLS.

3.3 Materials

The cassettes shall be constructed of nonmagnetic materials and shall conform to the physical, dimensional, and other requirements specified herein. The contractor shall certify that no changes in materials have taken place for each lot.

3.3.1 Cassettes

The C-0 cassette shells shall be black in color. The plastic parts used in the C-0 cassettes are limited to products that meet or exceed the ITA-A-101, section 9 (Environmental and physical test conditions) and section 10 (Evaluation procedure) requirements.

3.3.2 Flammable materials

Cassette components that ignite from a match flame, and when so ignited continue to burn in a still carbon dioxide atmosphere, shall not be used. Certificate of compliance shall accompany qualification samples.

3.3.3 Toxicity

Cassette components that may cause bodily harm by contact, inhalation, or ingestion shall not be used. Certificate of compliance shall accompany qualification samples.

3.4 Cassette dimensional measurements

The cassette dimensions shall conform to the measurements given in EIA RS-399-A.

3.5 Cassette physical requirements

3.5.1 Cassette assembly

Cassette halves shall be bound together by five screws or sonic welding. The cassettes shall be supplied with their record-protect tabs removed.

3.5.1.1 Cassette drop resistance

The cassette shall remain bound together with no dislocation or breakage of parts and shall perform satisfactorily in the NLS cassette player after being subjected to the drop tests of section 4.7.6.

3.5.2 Corner tape guides

Rotating idler-roller corner tape guides shall be provided. These tape guides shall be flanged and shall have a minimum hub diameter of 0.280

in. (7.11 mm) and be secured to the cassette shell using an inserted stainless steel pin (lubricated) or a molded plastic support post.

3.5.3 Windows

Windows are not required in the cassette C-0 assembly. If a window is present, it shall be capable of withstanding a force of 3.5 lbs. (1.59 kg.) distributed over the total window area.

3.5.4 Anti-Friction liners

Cassettes shall be provided with anti-friction liners. Liner configuration, material, coating, and impregnation are subject to the approval of NLS. Liners shall be evenly coated or impregnated with solid lubricant and shall be of uniform workmanship free from manufacturing defects; shall not fray, tear, or wrinkle; and shall exhibit no shredding or shedding of debris. The tape contact surface of the liner shall be electrically conductive to reduce build-up of static charge to the tape. The maximum resistance, when measured from end to end on the longest dimension, shall not exceed 2 megohms.

3.5.5 Hubs

The hubs shall be constructed in such a way that no hub breakage shall occur as a result of the drop test (see section 4.7.6). Bulges or depression of the tape, occurring when the tape is wound around the hub, and hubs that become dislodged under normal conditions of cassette operation are not acceptable.

3.5.6 Pressure pad assembly

The pressure pad assembly shall consist of a device to apply a uniform contact pressure between the tape and the record/reproduce head and shall meet the requirements of section 3.7.3 and 3.7.4.

3.5.7 Magnetic shield

Cassettes may be provided without a hum-reducing shield.

3.5.8 Label area

Each cassette shall be provided with two label areas in conformance with EIA RS-399-A

3.6 Tape leader

The C-0 cassette shell shall be provided with a polyester or equivalent leader attached to both hubs.

3.6.1 Dimensions

The leader shall be 26 in. (66.04 cm) minimum, 30 in. (76.20 cm) maximum long; 0.145 in. (3.68 mm) minimum, 0.150 in. (3.81 mm) maximum wide; with a thickness of 0.002 in. (0.0508 mm) maximum.

3.6.2 Leader-to-hub connections

Leader-to-hub connections shall be capable of withstanding a minimum force of 2.2 lbs. (1 kg.) for 10 seconds. This measurement shall be made at least 72 hours after the cassette has been assembled.

3.7 Mechanical requirements

3.7.1 Maximum friction torque of both hubs (with C-60 load)

The friction torque of both hubs, measured in the cassette itself at the nearly full hub, shall not exceed 0.38 oz./in. (2.7×10^{-3} Newton-meters) when measured in accordance with section 4.7.5.2.

3.7.2 Maximum friction torque of both hubs with hold-back torque (with C-60 load)

With a hold-back torque of 0.113 oz./in. (0.8×10^{-3} Newton-meters) applied to the nearly empty hub, the required torque to be applied to the nearly full hub, when moving tape, shall not exceed 0.74 oz./in. (5.5×10^{-3} Newton-meters) when measured in accordance with section 4.7.5.2.

3.7.3 Pressure pad area and leaf spring

The pressure pad size shall be 0.145 in. (3.68 mm) minimum in width

(parallel to the direction of tape travel) by 0.220 in. (5.58 mm) minimum in length (perpendicular to the direction of tape travel). The pad shall be centered to within 0.010 in. (.254 mm), referenced to the tape width, in the cassette. The spring shall be manufactured of phosphor-bronze or similar nonferrous metal.

3.7.4 Pressure pad pressure

When the playback head is inserted into the cassette in accordance with the maximum dimension given in EIA RS-399-A, fig. B-2, the pressure of the pad on the magnetic head over the head to pad contact area shall be 0.005 to 0.015 N/mm² (0.73 to 2.18 psi).

3.8 Mechanical operation (with C-60 load)

When tested in accordance with section 4.7.7 in a quiet room, the loaded cassettes shall not emit noises in the play mode that are above the acceptable noise level of the NLS cassette player.

3.9 Environmental extremes

When tested in accordance with section 4.7.11, cassettes shall not warp and shall conform to the mechanical requirement specified in section 3.8, after being subjected to the following:

- a. A high temperature soak at 149 degrees Fahrenheit, +0,-9 degrees (65 degrees Celsius, +0,-5 degrees) and a relative humidity of 0 to 30% for 24 hours.
- b. A low temperature soak at -22 degrees F, +9,-0 degrees (-30 degrees C, +5,-0 degrees) for 24 hours.
- c. A high humidity soak at 113 degrees F, ± 9 degrees (45 degrees C, ± 5 degrees) at a relative humidity of 95 percent ± 5 percent for 24 hours.

3.10 Workmanship and general examination

The cassette shall be manufactured and processed in a careful and workmanlike manner in accordance with good commercial practice.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection

The contractor is responsible for the performance of all inspection requirements as specified herein. NLS reserves the right to implement any of the inspections set forth in this specification where such inspections are deemed necessary and in the best interest of NLS to assure that supplies and services conform to these requirements.

4.1.1 Responsibility for compliance

All items must meet all requirements of this specification. The inspections set forth in this specification shall become a part of the contractor's overall inspection system and quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the purchaser for acceptance comply with all requirements of the contract. Meeting the quality acceptance level of the quality assurance plan does not authorize the submission of known defective material, nor does it commit the purchaser to the acceptance of defective material. Should the purchaser determine that a significant fault or faults be found in production units, then correction of the fault or faults in previously produced units and production inspections or controls for prevention shall be instituted without additional charge to the purchaser.

4.1.2 Test equipment and inspection facilities

The contractor shall insure that test and inspection facilities of sufficient accuracy, quality, and quantity are established and maintained to permit performance of required inspections.

4.1.3 Reporting of test results

The contractor shall maintain a complete record of all inspection results for the duration of the contract. Copies of lot inspection records (in English) shall be provided with each shipment. The records shall include the information necessary to identify the lot, the lot sample, the testing equipment, the inspector, and the date of the test.

4.2 Classification of inspections

The inspection requirements specified herein are classified as follows:

- a. Qualification Inspection
- b. Incoming Inspection
- c. Contractor's Lot Acceptance Inspection
- d. Purchaser's Lot Acceptance Inspection

4.3 Inspection conditions

Sampling for inspections shall be performed in accordance with MIL-STD 105.

4.4 Qualification inspection

Qualification inspection, in accordance with section 3.2 and Table 1, shall be performed on new products and on previously qualified products that have undergone any changes in design, materials, component parts, or manufacturing process.

4.4.1 Sample size

The qualification sample shall consist of eight C-60 loaded cassettes. The sample shall be taken at random from a production run and shall be produced with equipment and procedures normally used in production.

4.4.2 Inspection routine

Sample units shall be subjected to the qualification inspection specified in table 1 in the order shown.

4.4.3 Failures

Any failures shall be cause for refusal to grant qualification.

4.4.4 Qualification inspection data

Qualification inspection data shall include data for all dimensions or other measurements required by the inspections of table 1 for all samples. Use of go/no-go gauges shall not be acceptable.

TABLE 1. QUALIFICATION INSPECTION

Examinations, Measurements, and Tests	Requirement Section	Test Method Paragraph
General examination	3.5.1, 3.5.3, 3.5.6, 3.5.8, 3.6, 3.10	4.7.3
Dimensions	3.4	4.7.4
Pressure pad pressure	3.7.4	4.7.5.1
Friction torque	3.7.1 & 3.7.2	4.7.5.2
Cassette drop test	3.5.1.1	4.7.6
Friction torque	3.7.2	4.7.5.2
Corner tape guides	3.5.2	4.7.8
Leader dimensions	3.6.1	4.7.10.1
Leader-to-hub connection	3.6.2	4.7.10.2
Cassette assembly	3.5.1	4.7.12
Pressure pad area	3.7.3	3.7.3
Mechanical operation	3.8	4.7.7
Flammable material	3.3.2	3.3.2
Toxicity	3.3.3	3.3.3
Pressure pad pressure	3.7.4	4.7.5.1
Windows (if present)	3.5.3	4.7.9
Anti-friction liners	3.5.4	3.5.4

4.5 Incoming inspection

Incoming inspection shall be performed by the contractor on any and all component parts not manufactured by the contractor.

4.5.1 Sample size

The incoming inspection sample shall be chosen at random in accordance with MIL-STD 105 inspection level 1 for an Acceptable Quality Level (AQL) of 0.65 percent.

4.5.2 Inspection

All component parts not manufactured by the contractor shall be examined visually and, if applicable, measured dimensionally or electrically for conformance to the requirements of this specification.

4.6 Lot acceptance inspection

Lot acceptance inspection shall be performed by the contractor and the purchaser on each lot of cassettes.

4.6.1 Inspection lot

4.6.1.1 Contractor's inspection lot

A contractor's inspection lot shall consist of all cassettes produced under essentially the same conditions for shipment to a single purchaser.

4.6.1.2 Purchaser's inspection lot

A purchaser's inspection lot shall be as defined in MIL-STD 105 and shall consist of all cassettes received from the contractor in a single shipment.

4.6.2 Inspection routine

Lot acceptance inspection shall consist of the inspections specified in table 2, and shall be made on the same set of sample units, in the order shown.

4.6.3 Sampling plan

The lot sample shall be chosen at random in accordance with MIL-STD 105 inspection level 1 for an AQL of 0.65 percent. Group A inspections shall be performed on the entire sample. Samples for group A shall not be loaded. Group B inspections shall be performed on 10 percent of the lot sample. Samples for group B shall be loaded with a C-60 load of tape. The contractor may select samples periodically (e.g., hourly) during production provided the total number of samples equals the lot sample specified above.

4.6.4 Rejects

4.6.4.1 Group A

The allowable number of rejects for group A shall be as specified by the MIL-STD 105 sampling plan.

4.6.4.2 Group B

Any reject in any inspection of group B shall cause the lot to be rejected.

4.6.5 Rejected lots

Rejected contractor's or purchaser's inspection lots may be resubmitted for acceptance only if the contractor performs 100 percent inspection on cassettes of the lot for those characteristics that were defective and resulted in rejection of the lot, and removes all defective units and resubmits the lot for lot acceptance inspection.

TABLE 2. LOT ACCEPTANCE INSPECTION

Examinations, Measurements, and Tests	Requirement Section	Test Method Paragraph
GROUP A:		
General examination	3.5.1, 3.5.3, 3.5.6, 3.5.8, 3.6, & 3.10	4.7.3
GROUP B:		
Dimensions	3.4	4.7.4 (e,f,g,h)
Cassette drop test	3.5.1.1	4.7.6

4.6.6 Acceptance inspection data

The purchaser and/or contractor shall provide NLS lot acceptance inspection records upon request. For each periodic inspection, these records shall identify the lot and include time and date, number of samples, inspector identification, accept or reject, and details of any corrective action taken. Go/no-go gauges may be used for lot inspection.

4.7 Methods of inspection

4.7.1 Test environment

Unless otherwise specified, all measurements and tests shall be performed at an ambient temperature of 23 degrees C \pm 5 degrees C (73.4 degrees F, \pm 9 degrees F) and a relative humidity of between 40 and 70 percent.

4.7.2 Preliminary conditioning

Test units shall be subjected to the test environment of section 4.7.1 for a period of not less than 24 hours prior to performance of any measurement or test specified herein.

4.7.3 General examination

Cassettes under test shall be visually examined for conformance to the applicable requirements of sections 3.5.1, 3.5.3, 3.5.6, 3.5.8, 3.6, and 3.10.

4.7.4 Cassette dimensions

The following listed dimensions shall be measured for conformance to EIA RS-399-A.

- (a) Length
- (b) Width
- (c) Height at front
- (d) Height at rear
- (e) Locating holes width and height
- (f) Reference line to front edge
- (g) Locating holes location left to right
- (h) Capstan holes diameter and location
- (i) Head and pressure roller openings
- (j) Hub holes diameter and location
- (k) Spindle hole diameter inside spokes
- (l) Label area length and width

4.7.5 Cassette mechanical measurements

4.7.5.1 Pressure pad pressure

The pressure pad force shall be measured with head insertion of 0.132 in. (3.35mm) from the reference line (EIA RS-399-A, Fig. B2). This force shall be divided by the area of the pressure pad for conformance to the requirement of section 3.7.4.

4.7.5.2 Friction Torque

With no hold-back torque applied to the supply reel and with the nearly full reel on the take-up side, note the average torque reading for conformance to requirement 3.7.1. Repeat the foregoing test with a hold-back torque of 0.113 oz./in. (0.0008 Newton-meters). Note the average torque reading for conformance to the requirements of section 3.7.2.

4.7.6 Cassette Drop test

Each C-60 cassette shall be dropped four times from a height of 30 inches onto a concrete floor. The tape shall be fully wound onto one hub. The first two drops shall be on alternate ends and the second two drops shall be on alternate faces. Upon completion of the drops, test for conformance to the requirement of sections 3.5.1.1, 3.5.5, and 3.7.2.

4.7.7 Short-term operation test

The cassette to be tested shall be subjected to one fast cycle to determine conformance to section 3.8. A fast cycle shall consist of fast rewinding the tape from end-to-end in one direction then turning the cassette over and fast rewinding the tape from end-to-end in the other direction. Upon completion of the fast cycle, the cassette shall be placed in an NLS cassette player that has met the requirements of NLS specification 101, section 3.12. (Mechanically generated noise emitted while the cassette book machine is in the play mode with the volume control at minimum setting and the cassette tray empty.) The mechanically generated noise of this player shall not exceed 22 dBA at one meter. The cassette inserted in the player shall not emit mechanical noise above the acceptable limit of the machine.

4.7.8 Corner tape guides

The cassette corner tape guide hub diameter shall be measured for conformance to the requirements of section 3.5.2.

4.7.9 Windows

Windows are not required in the cassette C-0 assembly. If a window is present, it shall be capable of withstanding a force of 3.5 lbs. (1.59 kgs.) distributed over the total window area.

4.7.10 Leader

4.7.10.1 Leader dimensions

The tape leader length, width, and thickness shall be measured for conformance to the requirement of section 3.6.1.

4.7.10.2 Leader to hub connection

The leader-to-hub connection shall be subjected to the force specified in section 3.6.2 and inspected for conformance to the requirement of section 3.6.2.

4.7.11 Environmental tests

Two samples shall be subjected to the high temperature, two to the low temperature, and two to the humidity conditions of 4.7.11.1, 4.7.11.2, and 4.7.11.3, and shall then be retested for conformance to the mechanical requirements of sections 3.7.2 and 3.8.

4.7.11.1 High temperature

The cassettes under test shall be subjected to a high temperature soak at 65 degrees Celsius, +0,-5 degrees (149 degrees Fahrenheit, +0,-9 degrees) and a relative humidity of 0 to 30 percent for 24 hours. The cassettes shall be brought back to the test environment of section 4.7.1 at a temperature gradient of no greater than 25 degrees C (77 degrees F) per hour and shall remain at test environment at least 2 hours before further tests.

4.7.11.2 Low temperature

The cassettes under test shall be subjected to -30 degrees +5,-0 degrees C (-22 degrees, +9,-0 degrees F) for a period of 24 hours. The cassettes shall be brought back to the test environment of section 4.7.1 at a temperature gradient of no greater than 25.0 degrees C (77 degrees F) per hour and shall remain at test environment at least 2 hours before further tests.

4.7.11.3 Humidity

The cassettes under test shall be subjected to 45 degrees ± 5 degrees C (113 degrees, ± 9 degrees F) and a relative humidity of 95 percent, ± 5 percent for a period of 24 hours. The cassette temperature shall be returned to the test environment of section 4.7.1 by opening the test chamber

door and allowing the cassette temperature to stabilize to the test environment for at least 2 hours before further tests.

4.7.12 Cassette assembly

The magazine C-0 shall be assembled by sonic welding or five screws. The finish of the cassette halves shall be smooth and clean. There shall be no flash, cracks, gaps, bumps, lips, or teats on the front of the cassette housing, where the two cassette halves come together or on any parting line.

5. PREPARATION FOR DELIVERY

5.1 Marking

In addition to any special or other identification marking required by the contract, each container of lot samples shall be marked with the contractor's inspection lot number.

6. NOTES

6.1 Definitions

6.1.1 Contractor

The contractor shall be defined as the supplier of the C-0 cassette shells specified herein.

6.1.2 Purchaser

The purchaser shall be defined as the duplicator who procures C-0 cassette shells that comply with this specification for the purpose of producing recorded NLS cassette magazines.