

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

The Library of Congress

Approved by Director, NLS/BPH

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Date *7/25/03*

Specification: 101-3
Title: Performance Specification
Cassette Book Machine
Date: April 2003



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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

The scope of this specification will be described in the accompanying statement of work.

2. APPLICABLE DOCUMENTS

The following documents and publications, of the issue in effect on the date of solicitation, 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.

Specifications:

National Library Service for the Blind and Physically Handicapped:

#202 - Cassette Book Duplication
#603 - Battery Packs (Nickel-Cadmium)

Standards:

ANSI/ASQC Z1.4-1993 - Sampling Procedures and Tables for Inspection by Attributes
(Equivalent to MIL-STD 105)

International Tape Association (ITA):
ITA-A-101 Audio Cassette Specifications

(Copies of ITA Standards may be obtained by writing International Tape Association, 10
West 66th Street, New York, New York 10023)

International Electrotechnical Commission (IEC) Recommendations:

IEC 94 Amendment #1, #2, #3 and #4
Magnetic Tape Recording and Reproducing Systems
Dimensions and Characteristics

IEC 94A - Supplement to Publication 94, Amendment #1 and #2
Cassette for Commercial Tape Records and Domestic Use, Dimensions and
Characteristics

(Copies of IEC Standards may be obtained from the American National Standards
Institute, 1430 Broadway, New York, New York 10018.)

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Electronic Industries Association (EIA) Standard:

RS-399A - Dimensional Standard Coplanar Magnetic Tape Cartridge Type CP II.

UL-94 - Flammability Classification

UL-1492 - Standard for Audio Video Products, and Accessories

Copies of UL-94, and UL-1492 may be obtained from 333 Pfingsten Road, Northbrook, Illinois 60062.

ANSI X3.182 (1990) - Bar Code Print Quality - Guideline

(Copies of ANSI standard may be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018)

Bulletin: Consumer Products Engineering Bulletin #7 (November 1974) Audio Rectification.

3. REQUIREMENTS

3.1 General Design Features

3.1.1 Size

Size - The overall external dimensions shall not exceed the following nominal values:

Length: 11 inches
Width: 9 inches
Height: 3.5 inches

3.1.2 Weight

Weight shall not exceed 7 pounds.

3.1.3 Controls

All controls shall be accessible from the top of the case. Control operation shall be from side to side. Volume, tone, and the continuously variable speed control shall be slide type controls. The arrangement of all other controls shall be such that vertical force is required for operation. Controls shall be easily located and identified.

3.1.4 Push Buttons

Push buttons shall be separated by and identified by raised markings. Functions shall be laid out horizontally. See LC drawings #S10110 through #S10114.

3.1.5 Push Button Color Coding

The function buttons shall be color coded according to Section 3.8.3.

3.1.6 Cassette Loading

The cassette loading area shall be enclosed and provide for retention and release of the cassette. Loading and unloading of the cassette shall be easily accomplished by a handicapped user.

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3.1.7 Jack Bank Protrusion

All jacks shall protrude as little as possible from the case. Raised markings shall indicate each jack function. (See LC drawing 40513)

3.2 Case Design

3.2.1 Material/Color

The case shall be molded from ABS polymer or high impact polystyrene. Material used shall meet the requirements of UL 94V-0 regarding flammability.

Color finishes will be selected after a contract is awarded. The contractor will provide samples of available color chips for selection by NLS. Color selections will be completed within two weeks after contractor submission. The exterior finish shall be non-glossy.

3.2.2 Stability

Case stability shall be such that the unit cannot be tipped when lying on the two longest dimensions.

3.2.3 Rubber Feet

Rubber feet or equivalent shall be provided to prevent machine skidding.

3.2.4 Door Attachment

All compartment doors shall be permanently attached to the case.

3.2.5 Handle

The handle shall be self-storing and shall be permanently attached to the case.

3.2.6 Protuberances

There shall be a minimum protuberance of latching devices, hinges, and other appurtenances.

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3.2.7 Power Cord

Battery and line cord storage shall be built-in. A heavy-duty six (6) foot power cord shall be used.

3.2.8 Appearance

All corners and edges shall be rounded. The case shall be free of burrs, rough spots, and sharp edges.

3.3 Battery and Power Supply

A rechargeable battery and a power supply operating from a nominal 120 volts (105 to 130 volts range), 50/60 Hz is required.

3.3.1 Battery Performance

It is required that the cassette machine shall operate for six (6) hours on battery power, starting with a full charge, at 15/16 ips and meet all of the performance specifications during the entire period. The battery pack supplied shall be physically compatible with the earlier battery product used in the talking-book program, shall conform to NLS specification #603, and provide the characteristics listed below.

3.3.1.1 Battery Voltage

Nominal open circuit voltage of 7.2 volts. (Ranges approximately 6.1 volts to 8.5 volts depending upon charge.)

3.3.1.2 Battery Capacity

Nominal ampere/hour rating of 1.2 Ah. The requirement of paragraph 3.5.1 for six (6) hour operation is the dominant requirement for battery capacity. (See Specification #603)

3.3.1.3 Charge Rate

The power supply shall charge the battery at a c/8 to c/10 rate with the machine turned off; however, the battery shall be capable of sustaining a charge rate of nominal c/5 for 16 hours.

3.3.1.4 Current Drain

The battery shall be capable of operating the cassette-book machine at a nominal 160 mA current drain for 6.0 hours with all parameters within the tolerances of this specification.

3.3.2 Optional Battery Charge Feature [Note: Applicable only if proposed]

3.3.2.1 Battery Charge and Power Supply Regulation

A battery charge regulator is to be incorporated which will provide charging at a c/10 (120 mA) charging rate when the battery is fully discharged and reduce to a c/40 rate (30 mA or less) when the battery is fully charged. The regulated power supply must be capable of operating the machine, meeting all specifications, with or without Nickel-Cadmium battery installed.

3.3.2.2 Current Drain

The battery shall be capable of operating the cassette-book machine at nominal 160 mA current drain for 6.0 hours with all parameters within the tolerances of this specification.

3.3.2.3 Battery Idle Current

The battery idle current, when the machine is turned off and no AC power applied, shall not exceed 130 microAmps.

3.3.2.4 Power Supply Performance

The power supply shall be capable of operating the machine, meeting all electrical and mechanical specifications, under the following conditions:

- a. Using an external power supply attached to the battery contact clips and set to 7.2 (+0.1, -0) volts.
- b. Using an AC line voltage range of 105 to 130 volts, 50/60 Hz, battery not installed.
- c. Using an AC line voltage range of 105 to 130 volts, 50/60 Hz, with a battery that has been discharged to 6.0 volts cut off.

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Design of the power supply shall be such that the battery may be charged over the line voltage range of 105 to 130 volts AC, 50/60 Hz.

3.3.3 Isolation Transformer

The machine shall incorporate a built-in line isolation transformer.

3.3.4 Power Supply Performance

Design of the power supply shall be such that the battery may be charged over the line voltage range of 105 to 130 volts, 50/60 Hz when AC is in use and the machine is off.

3.3.5 Reverse Battery Installation

Provision shall be made to prevent the possibility of reverse battery installation.

3.3.6 Fuse

An in-line fuse shall be used to protect the battery against shorts.

3.3.7 U.L. Approval

U.L. approval is required.

3.4 Tape Head

3.4.1 Number of Tracks

The magnetic playback tape head shall be a two pole head, with poles located at tracks 1 and 3 suitable for monaural reproduction.

3.4.2 Track Switching

Provision shall be made for switching between tracks 1 and 3.

3.4.3 Track Location

The location of tracks 1 and 3 in the head shall conform to IEC Standard #94A.

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3.4.4 Crosstalk

Interchannel crosstalk at 15/16 ips shall be -45 dB or better at 500 Hz and at 1 7/8 ips shall -45 dB or better at 1.0 kHz.

3.5 Speaker

3.5.1 Acoustic Output

The amplifier/speaker/enclosure system shall be capable of producing 80 dB (± 6 dB) SPL (Reference 2×10^{-5} N/m²) when operated over a range of 500 to 4000 Hz. At 250 Hz, 20 dB down is acceptable (reference 80 dB at 1000 Hz).

3.6 Jack Bank

3.6.1 Functions

Five jacks are required in the jack bank. Jack function is as follows:

- a. Remote on-off function
- b. Auxiliary output direct from the preamplifier.
- c. Auxiliary input direct to the amplifier.
- d. Stereophonic Earphone jack
- e. Stereophonic Headphone jack

All jacks, with the exception of e, shall be 1/8-inch mini-jacks. The headphone jack shall be 1/4-inch stereo phone. The earphone and headphone jack connections shall be paralleled, and shall feed an in-phase signal into both earpieces of the stereo headphones, while maintaining compatibility with existing NLS monophonic headphones, and also be capable of switching the speaker off when a pair of headphones is connected to the machine. The layout and marking of the jack bank is shown in LC drawing #40513.

3.6.2 Protection

The amplifier shall be protected from open or short circuit conditions when shorted plugs are inserted into the jacks.

3.6.3 Earphone and Headphone Output

An output of 25 mW minimum (450 mV into 8 ohms) without clipping shall be available at both the earphone and headphone jacks (monaural mode).

3.6.4 Auxiliary Output

An output of 100 millivolts minimum into 50k ohms shall be available at the auxiliary output jack, using the Reference Level Section of the DIN Calibration tape at 1-7/8 ips. See 4.6.7.2 and Notes, Section 6.

3.7 Motor Assembly

3.7.1 Voltage

A DC motor, operated from a nominal 7.5 volts is required.

3.7.2 Two-Speed Operation

The motor shall provide two-speed operation at 1-7/8 ips and 15/16 ips. Speed change shall be electrically switchable. Speed shall be governed electronically.

3.7.3 Speed Tolerance

3.7.3.1 Play Speed

Play speed tolerance shall not exceed $\pm 2.0\%$ measured at both 1-7/8 and 15/16 ips with the variable speed control at the normal detent position.

3.7.3.2 Fast Forward Speed

Voice indexing requires that the fast forward speed of the take up spindle be controlled at 240 rpm $\pm 10\%$, when the variable speed control is at normal and the speed selector switch is at 15/16 ips.

3.7.4 Wow and Flutter

Wow and flutter shall not exceed 0.5% rms at 1-7/8 ips and 0.65% rms at 15/16 ips, NAB weighted.

3.7.5 Motor Electrical Noise

Motor electrical noise shall be a minimum of 50 dB below the Reference Level Section of the DIN Calibration tape at 1-7/8 ips (see 4.6.7.2).

3.7.6 Variable Speed Control

A built-in continuously variable speed control detented at normal speed shall be provided. The control shall provide continuous variation of speed from + 100 percent to -12 percent of normal speed (i.e., 2.0 times to 0.88 times normal speed), at both 1-7/8 ips and 15/16 ips.

3.8 Tape Deck

3.8.1 Tape Head Contact

The tape deck shall be constructed in such a manner that partial tape/head contact is made when the deck is placed in fast-forward or rewind. Activation of these controls shall incorporate full throw locking requiring the stop function to be activated for release of fast-forward or rewind.

3.8.2 Automatic Shut-Off

The tape deck shall incorporate a device that detects take-up reel motion. This device shall provide automatic shut-off of the machine when in play, fast-forward, rewind or variable speed mode within 2.5 seconds maximum, by sensing lack of take-up reel motion.

3.8.3 Push Button Colors

Push button color coding shall be as follows:

- a. Bright red - stop
- b. Bright green - play
- c. Black - fast forward, rewind, and eject

3.8.4 Control Orientation

All reference to positions "normal, horizontal, vertical, up, down, left, right, etc." shall be from the operation viewpoint, with the cassette in the machine in such a position that the relevant label area is in a horizontal plane facing upward, and the tape head recess facing the operator.

3.8.5 Push Button Layout

Push button layout shall be horizontal, requiring vertical force for operation. The functions shall be as follows from left to right:

- a. stop
- b. rewind
- c. play
- d. fast-forward
- e. eject

3.8.6 Cassette Acceptance

The machine shall satisfactorily accept and reproduce the recorded content of a cassette as described in the International Electrotechnical Commission (IEC) standard document #94 (Magnetic tape sound recording and reproducing systems).

3.8.7 Cassette Position

The machine shall be designed so that the cassette is positioned and supported while operating at support planes, prime reference line and reference hole, as defined in IEC Document 94A.

3.8.8 Tape Head Insertion

The tape head insertion shall be in accordance with the data given in the dimensional ITA Standard for a C-0 cassette.

3.8.9 Head Azimuth Position

Deviation of the azimuth position of the head gap shall not exceed 3 dB from maximum output using the 10 kHz azimuth alignment section of the BASF DIN calibration cassette played at 15/16 ips. Deviation of output between tracks 1 and 3 shall not exceed 3 dB.

3.8.10 Perpendicularity

3.8.10.1 Head Perpendicularity

The surface of the head or heads in contact with the tape shall be within 2 degrees perpendicular to the cassette support plane and within 2 degrees of each other.

3.8.10.2 Spindle Perpendicularity

The spindle axes shall be perpendicular to the referenced support plane within 2 degrees.

3.8.10.3 Guide, Capstan, and Pressure Roller Perpendicularity

The guides, capstan, and pressure roller shall be perpendicular to the support plane within 1 degree.

3.8.10.4 Other Member Perpendicularity

Any other member inserted into any part of the tape path shall be within 2 degrees perpendicular to the cassette support plane.

3.8.11 Radial Withdrawal Force

The machine shall not exert forces that result in over 5.0 Newtons (about 500 grams) radial withdrawal force of the tape or leader from the hub attachment at the end of the tape.

3.8.12 Drive Train Layout

Drive train layout shall be according to the limits and dimensions as indicated in Figure A of IEC Document 94A. This figure indicates the required position of the left and right-hand spindles and their relationship to the capstan and prime reference line of the cassette.

3.8.13 Torque Values

- a. Running torque: 35 to 80 gram-centimeters measured at take-up spindle.
- b. Fast-forward mode: 55 gram-centimeters minimum.

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- c. Rewind mode same as (b).
- d. Hold back torque: 1 to 6 gram-centimeters in the play mode.
- e. Rewind Time: @ 1-7/8 ips - 3.25 minutes maximum
@ 15/16 ips - 6.5 minutes maximum

3.8.14 Brake Mechanism

The tape transport shall be provided with a brake mechanism which will prevent both spindles from rotating when the stop key is activated.

3.9 Amplifier

3.9.1 Amplifier Performance

3.9.1.1 Rated Output Power

The amplifier shall be capable of at least 750 milliwatts output into a resistive load equivalent to speaker impedance. (See para. 4.6.7.4.1).

3.9.1.2 Harmonic Distortion

Total harmonic distortion of the amplifier shall not exceed 3% at 600 milliwatts into a resistive load equivalent to speaker impedance.

3.9.1.3 Frequency Response

The equalized amplifier frequency response shall be flat within + 5 to -3 dB from 125 Hz to 8.0 kHz at 1-7/8 ips. Response for 15/16 ips shall be flat within + 5 to -3 dB from 250 Hz to 4.0 kHz. Zero dB reference at 1.0 kHz.

3.9.1.4 Subjective Listening Test

Naturalness of voice reproduction shall be the subjective basis for judging acceptability of the system at 15/16 ips. Over or under accentuation of bass, treble, and/or high frequency response shall not be permitted. Subjective judging of the production approval sample shall be accomplished through the NLS equipment review board. Approval of the system's sound quality is required prior to production.

3.9.1.5 Signal to Noise Ratio

The unweighted signal-to-noise ratio (battery mode, no AC) shall be 45 dB minimum at both 15/16 and 1-7/8 ips.

3.9.1.6 Tone Control

The variable tone control, when adjusted to the left end of its range, shall provide a slope of approximately 6 dB/octave, with 8 ± 3 dB attenuation at 2.0 kHz.

3.9.1.7 Discontinuity

Acceptable amplifiers shall not exhibit discontinuity in a sine wave at the point of zero axis (x coordinate) crossing. 1.0 kHz shall be employed as input to the amplifier. The input signal shall be set to a level sufficient to produce approximately half (300 mW) the maximum undistorted amplifier output into a resistive load equivalent to speaker impedance. Amplifiers showing cross-over distortion on an oscilloscope shall be rejected.

3.9.1.8 Amplifier turn-on delay

The amplifier turn-on delay time shall not exceed 0.5 seconds.

3.9.2 Construction

3.9.2.1 Printed Circuit Board

All Printed Circuit Boards shall be rated UL approved 94V-0 Flammability Requirement.

3.9.2.2 Modularity

A modular plug-in design is required.

3.9.2.3 Accessibility

Placement of the board in the cabinet shall be such that it is easily accessible for repair or replacement.

3.10 Machine Acoustical Noise

Mechanically generated noise emanating from the machine shall not exceed 22 dBA. AC shall be used as power source.

3.11 Maintenance and Technical Data

The contractor shall produce 3000 copies of a technical manual for the machine. The manual shall include a description of circuit operation, signal path flow, component values, and x-ray views. The technical manual shall be similar in scope to those previously provided by NLS for all equipment. A sample of the manual shall be provided by the manufacturer for NLS approval, prior to publication. The manual shall indicate all changes made during production and shall indicate the serial numbers affected.

3.12 Short-Term Operation

The machine shall be tested for proper operation in play mode at 15/16 and 1-7/8 ips. All controls must function normally within the requirements of Section 3 of this specification.

3.13 Operational Life

The contractor shall perform the life test specified in 4.6.9.2 to demonstrate that the mean time between failures (MTBF) of the cassette book machine is at least 1000 hours.

3.14 Workmanship and General Examination

The cassette-book machine shall be manufactured and processed in a careful and workmanlike manner in accordance with good assembly practice.

3.15 Bar Code Label

Each machine shall be affixed with a bar code label as depicted in drawing #570025. The serial number shall be "Smooth" font bold 24 points. The serial number must match the serial number embossed on the bottom information plate. Code 3 of 9 symbology shall be used, with a Mod 43 checksum digit character added for use by the scanner for validating error detection decoding.

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3.15.1 Label material

A pressure sensitive white polyester backed by permanent acrylic adhesive thermal transfer label (ZEBRA Z-Ultimate 5A part number #65587 or equivalent) shall be used. Label shall provide resistance to scratch/smear (oil, grease, and alcohol) and abrasion, when subjected to the environmental test specified in paragraph 4.6.8. Label shall also provide good adhesion and household chemical solvent resistance.

3.15.2 Label Printing

The print quality shall be verified at the beginning, middle and end of each roll.

3.15.3 Label Grade

The ANSI grade of C or better shall be the acceptable minimum to measure the printing accuracy. Scanning shall be done in accordance with the ANSI specification with a bar code verifier/scanner (Photographic Science Corporation model QC600 or equivalent) that checks all parameters of the ANSI specification.

Notes:

1. The Bar Code Verifier model QC600 may be obtained from:
Welch Allyn
Hand Held Products
4619 Jordan Road
Skaneateles Falls, NY 13153

2. The label material and printing system may be obtained from:

Zebra Technologies Corporation
333 Corporate Woods Parkway
Vernon Hills, Illinois 60061.3109

3.16 Warranty Provisions

The contractor shall be required to provide full warranty repair services for the warranty period indicated in the contract. The warranty period for all machines produced in any one annual period starting with the date of contract shall commence on the contract anniversary date, except for those machines produced in the last annual period of production for which the warranty period shall

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commence on the date the last machine produced under the contract is shipped. The warranty repair services must cover the entire cost of all machine failures, including wear, with the only exception being failures determined to be the result of user abuse. The final determination that machine failure is the result of user abuse will be made by an authorized NLS representative. Warranty repair services shall also include, as needed, new battery, new packing, new tags and instruction materials, including instruction cassettes, for each machine repaired. Unless approved by NLS, every machine returned for repair shall be restored to meet Specification 101-3 and packaged as a new machine for issuing to a new patron. In addition, the manufacturer is responsible for performing final inspections for all out-going lots of warranty machines. Warranty reports are to be forwarded to NLS Quality Assurance Section on a weekly basis. These reports are to cover every machine returned to the contractor for repair and list: serial number, agency received from, problem reported, problem diagnosed, repairs performed, and corrective actions taken in the production process to reduce future occurrences. All first time repairs shall be further warranted for the balance of the warranty period, or for an additional one year from repair, whichever period is longer. The government reserves the right to require the re-repair of any already repaired machines that fail during this warranty period.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The supplier is responsible for the performance of all inspection requirements specified herein. The supplier may utilize his own facilities or any reputable commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to assure that supplies and services conform to the prescribed requirements. All test equipment used must have a recent calibration traceable to the National Institute of Standards and Technology.

Acceptability and approval of detailed production and quality control procedures specifically related to the product must be approved prior to beginning production. Any changes during production will require NLS approval in advance.

4.2 Classification of Inspections

The inspections herein specified are classified as follows:

- a. Qualification Inspections 4.3.1
- b. Incoming Materials Inspections 4.3.2

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- c. Quality Conformance Inspections 4.3.3
- d. Final Inspections 4.3.4

4.2.1 Qualification Inspections (4.3.1 and Table I)

Requires testing of a fully assembled machine for every specified parameter. Applies to production control and qualification samples (see contract for sample requirements).

4.2.2 Incoming Materials Inspections (4.3.2 and Table II)

Indicates those parameters which may be measured as sub-assemblies during the production process and therefore need not be measured in the final assembly. Incoming materials must be sampled in accordance with ANSI/ASQC Z1.4-1993 General Inspection Level II and must meet an Acceptable Quality Level (AQL) of 0.65 defects per 100 units.

4.2.3 Quality Conformance Inspections (4.3.3 and Table III)

Indicates tests performed during the machine final assembly process and upon the fully assembled machine prior to packing for shipment. All machines are subjected to 100% of these tests during production.

4.2.4 Final Inspections (4.3.4 and Table IV)

Indicates sample tests to be performed upon randomly selected machines after they have been packed for shipment. Sampling shall be in accordance with ANSI/ASQC Z1.4-1993 General Inspection Level II, and must meet an Acceptable Quality Level (AQL) of 0.65 defects per 100 units.

4.3 Definition of Inspections

4.3.1 Qualification Inspections

Qualification inspection shall consist of each of the examinations, measurements, and tests listed in Table I. All samples subjected to the examinations, measurements and tests specified in Table I must conform to the associated requirements specified in Section 3. Tested prototype samples and complete test data shall accompany the suppliers bid. Two test production control samples and complete test data shall be submitted to NLS for approval prior to the start of production.

4.3.2 Incoming Materials Inspections

Incoming materials inspections shall consist of each of the examinations, measurements, and tests listed in Table II. The contractor shall select the appropriate number of samples from incoming lots or batches. All sampling for examinations, measurements, and tests shall be in accordance with ANSI/ASQC Z1.4-1993, General Inspection Level II, at an Acceptable Quality Level (AQL) of 0.65 defects per hundred units.

4.3.2.1 Lot

A lot shall consist of any and all parts of one type received in one shipment.

4.3.3 Quality Conformance Inspections

Quality conformance inspections upon the assembled machine prior to packing shall consist of each of the examinations, measurements and tests listed in Table III.

All of the machines must be 100% tested for the requirements of Table III. There will be no relaxation of this requirement.

4.3.4 Final Inspections

Contractor's final inspections shall consist of each of the examinations, measurements, and tests listed in Table IV. The contractor shall select the appropriate number of samples from the packed, ready-to-ship machines. All samples subjected to the examinations, measurements, and tests specified in Table IV must conform to the appropriate requirements specified in Section 3. Sampling for Table IV examinations, measurements and tests shall be in accordance with ANSI/ASQC Z1.4-1993, General Inspection Level II, and must meet an Acceptable Quality Level (AQL) of 0.65 defects per hundred units.

4.3.4.1 Lot

A lot shall consist of any and all machines manufactured on one production line during any one given 8-hour time period.

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4.3.5 Acceptance for Shipment

The contractor shall receive notice of government acceptance of each lot following the government final inspection as provided for in section 4.5.2.

TABLE I. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALIFICATION INSPECTIONS

Examinations, Measurements, and tests	Requirement Paragraph Paragraph	Test Method
<u>Basic Design Factors</u>		
Size	3.1.1	4.6.5
Weight	3.1.2	4.6.4
Controls	3.1.3	4.6.4
Push Buttons	3.1.4	4.6.4
Color Coding	3.8.3	4.6.4
Cassette Loading	3.1.6	4.6.4
Jack Bank	3.1.7	4.6.4
Case Material	3.2.1	4.6.4
Case Stability	3.2.2	4.6.4
Rubber Feet	3.2.3	4.6.4
Door Attachment	3.2.4	4.6.4
Handle	3.2.5	4.6.4
Protuberance	3.2.6	4.6.4
Power Cord	3.2.8	4.6.4
Case Appearance	3.2.9	4.6.4
Battery and Power Supply	3.3	4.6.4
Isolation Transformer	3.3.3	4.6.4
Power Supply Performance	3.3.4	4.6.4
Reverse Battery Installation	3.3.5	4.6.4
Fuse	3.3.6	4.6.4
Number of Tracks	3.4.1	4.6.4
Track Switching	3.4.2	4.6.4
Track Location	3.4.3	4.6.4
Jack Bank	3.6.1	4.6.4
Two-Speed Operation	3.7.2	4.6.4
Speed Control	3.7.6	4.6.4
Tape Head Contact	3.8.1	4.6.4
Full Throw Locking	3.8.1	4.6.4

TABLE I. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALIFICATION INSPECTIONS (Continued)

Examinations, Measurements, and tests	Requirement Paragraph Paragraph	Test Method
Automatic Shut Off	3.8.2	4.6.4
Push Button Layout	3.8.5	4.6.4
Amplifier Construction	3.9.2.1	4.6.4
Modular Design	3.9.2.2	4.6.4
Amplifier Accessibility	3.9.2.3	4.6.4
Workmanship	3.14	4.6.4
Bar Code Label	3.15	4.6.10.7
Label Material	3.15.1	4.6.10.7
Label Grade	3.15.3	4.6.10.7
<u>Operational Factors</u>		
Controls	3.1.3	4.6.9.1
Cassette Loading	3.1.6	4.6.9.1
Handle Storage	3.2.5	4.6.9.1
Track Switching	3.4.2	4.6.9.1
Short Protection	3.6.2	4.6.9.1
Two-Speed Operation	3.7.2	4.6.9.1
Variable Speed	3.7.6	4.6.9.1
Tape Head Contact	3.8.1	4.6.9.1
Full Throw Locking	3.8.1	4.6.9.1
Automatic Shut Off	3.8.2	4.6.9.1
Brake Mechanism	3.8.14	4.6.9.1
Subjective Listening Test	3.9.1.4	4.6.10.6
Short-Term Operation	3.12	4.6.9.1
Workmanship	3.14	4.6.9.1
<u>Performance Parameters</u>		
Battery and Power Supply	3.3.1	4.6.7.4.11

TABLE I. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALIFICATION INSPECTIONS (Continued)

Examinations, Measurements, and tests	Requirement Paragraph Paragraph	Test Method
Optional Battery Charge feature	3.3.2	4.6.7.4.11
Crosstalk	3.4.4	4.6.7.4.9
Speaker SPL	3.5.1	4.6.7.4.5
Earphone and Headphone Output	3.6.3	4.6.7.4.7
Auxiliary Output	3.6.4	4.6.10.4
Speed Tolerance (Play Mode)	3.7.3.1	4.6.10.1
Speed Tolerance (Fast Forward Mode)	3.7.3.2	4.6.10.1
Wow and Flutter	3.7.4	4.6.10.2
Motor Noise	3.7.5	4.6.10.3
Variable Speed Control	3.7.6	4.6.10.1
Cassette Acceptance	3.8.6	4.6.5
Cassette Position and Support	3.8.7	4.6.5
Head Insertion	3.8.8	4.6.7.4.10
Head Azimuth	3.8.9	3.8.9
Perpendicularity	3.8.10	4.6.5
Radial Withdrawal	3.8.11	4.6.5
Drive Train Layout	3.8.12	4.6.5
Torque Values	3.8.13	4.6.6
Amplifier Rated Output Power	3.9.1.1	4.6.7.4.1
Harmonic Distortion	3.9.1.2	4.6.7.4.2
Frequency Response	3.9.1.3	4.6.7.4.3
Signal-To-Noise Ratio	3.9.1.5	4.6.7.4.6
Tone Control	3.9.1.6	4.6.7.4.4
Amplifier Zero Crossing Distortion	3.9.1.7	4.6.7.4.1

TABLE I. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALIFICATION INSPECTIONS (Continued)

Examinations, Measurements, and tests	Requirement Paragraph Paragraph	Test Method
Machine Acoustical Noise	3.10	4.6.7.4.8
Short Term Operation	3.12	4.6.9.1
Workmanship	3.14	4.6.4

TABLE II. EXAMINATIONS, MEASUREMENTS, AND TESTS

INCOMING MATERIALS INSPECTIONS

Examinations, Measurements, and tests	Requirement Paragraph	Test Method
<u>BASIC DESIGN</u>		
Color Coding	3.8.3	4.6.4
Cassette Loading	3.1.6	4.6.4
Case Appearance	3.2.9	4.6.4
Tape Head Contact	3.8.1	4.6.4
Automatic Shut Off	3.8.2	4.6.4
Push Button Layout	3.8.5	4.6.4
Workmanship	3.14	4.6.4
Bar Code Label	3.15	4.6.10.7
Label Material	3.15.1	4.6.10.7
Label Grade	3.15.3	4.6.10.7

TABLE II. EXAMINATIONS, MEASUREMENTS, AND TESTS
INCOMING MATERIALS INSPECTIONS (Continued)

Examinations, Measurements, and tests	Requirement Paragraph	Test Method
Performance Parameters		
Battery and Power Supply	3.3.1	4.6.7.4.11
Optional Battery Charge feature	3.3.2	4.6.7.4.11
Crosstalk	3.4.4	4.6.7.4.9
Speed Tolerance (Play Mode)	3.7.3.1	4.6.10.1
Speed Tolerance (Fast Forward Mode)	3.7.3.2	4.6.10.1
Wow and Flutter	3.7.4	4.6.10.2
Motor Electrical Noise	3.7.5	4.6.10.3
Cassette Acceptance	3.8.6	4.6.5
Cassette Position and Support	3.8.7	4.6.5
Head Insertion	3.8.8	4.6.7.4.10
Perpendicularity	3.8.10	4.6.5
Radial Withdrawal	3.8.11	4.6.5
Torque Values	3.8.13	4.6.6
Amplifier Output	3.9.1.1	4.6.7.4.1
Harmonic Distortion	3.9.1.2	4.6.7.4.2
Frequency Response	3.9.1.3	4.6.7.4.3
Signal-to-Noise Ratio	3.9.1.5	4.6.7.4.6
Tone Control	3.9.1.6	4.6.7.4.4
Discontinuity	3.9.1.7	4.6.7.4.1
Workmanship	3.14	4.6.4

TABLE III. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALITY CONFORMANCE INSPECTIONS

Examinations, Measurements, and tests	Requirement Paragraph	Test Method
<u>Operational Features</u>		
Controls	3.1.3	4.6.9.1
Push Buttons	3.1.4	4.6.4
Cassette Loading	3.1.6	4.6.9.1
Handle Storage	3.2.5	4.6.9.1
Track Switching	3.4.2	4.6.9.1
Jack Bank Functions	3.6.1	4.6.9.1
Short Protection	3.6.2	4.6.9.1
Two-Speed Operation	3.7.2	4.6.9.1
Variable Speed	3.7.6	4.6.9.1
Tape Head Contact	3.8.1	4.6.9.1
Full Throw Locking	3.8.1	4.6.9.1
Automatic Shut Off	3.8.2	4.6.9.1
Brake Mechanism	3.8.14	4.6.9.1
Subjective Listening	3.9.1.4	4.6.10.6
Short-Term Operation	3.12	4.6.9.1
Label Grade	3.15.3	4.6.10.7
<u>Performance Parameters</u>		
Battery and Power Supply	3.3.1	4.6.7.4.11
Optional Battery Charge feature	3.3.2	4.6.7.4.11
Earphone and Headphone Output	3.6.3	4.6.7.4.7
Auxiliary Output	3.6.4	4.6.10.4
Variable Speed Control	3.7.6	4.6.10.1
Crosstalk	3.4.4	4.6.7.4.9
Speed Tolerance		

TABLE III. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALITY CONFORMANCE INSPECTIONS (Continued)

Examinations, Measurements, and tests	Requirement Paragraph	Test Method
(Play Mode)	3.7.3.1	4.6.10.1
Speed Tolerance		
(Fast Forward Mode)	3.7.3.2	4.6.10.1
Wow and Flutter	3.7.4	4.6.10.2
Torque Values	3.8.13	4.6.6
Amplifier Output	3.9.1.1	4.6.7.4.1
Harmonic Distortion	3.9.1.2	4.6.7.4.2
Frequency Response	3.9.1.3	4.6.7.4.3
Signal-to-Noise	3.9.1.5	4.6.7.4.6
Tone Control	3.9.1.6	4.6.7.4.4
Head Insertion	3.8.8	4.6.7.4.10
Head Azimuth	3.8.9	3.8.9

TABLE IV. EXAMINATIONS, MEASUREMENTS, AND TESTS

FINAL INSPECTIONS

Examinations, Measurements, and tests	Requirement Paragraph	Test Method
Short-Term Operation	3.12	4.6.9.1
Variable Speed	3.7.6	4.6.9.1
Automatic Shut Off	3.8.2	4.6.9.1
Cassette Loading	3.1.6	4.6.9.1
Controls	3.1.3	4.6.9.1
Handle Storage	3.2.5	4.6.9.1
Track Switching	3.4.2	4.6.9.1
Two-Speed Operation	3.7.2	4.6.9.1
Tape Head Contact	3.8.1	4.6.9.1
Full Throw Locking	3.8.1	4.6.9.1
Workmanship	3.14	4.6.9.1
Jack Bank	3.6.1	4.6.9.1
Labeling and Packaging	5.1 & 5.3	4.6.4
Torque Values	3.8.13	4.6.6
Brake Mechanism	3.8.14	4.6.9.1
Speed Tolerance (Play Mode)	3.7.3.1	4.6.10.1
Speed Tolerance (Fast Forward Mode)	3.7.3.2	4.6.10.1
Wow and Flutter	3.7.4	4.6.10.2
Amplifier Output	3.9.1.1	4.6.7.4.1
Earphone-Headphone Output	3.6.3	4.6.7.4.7
Frequency Response	3.9.1.3	4.6.7.4.3
Harmonic Distortion	3.9.1.2	4.6.7.4.2
Crosstalk	3.4.4	4.6.7.4.9
Subjective Listening	3.9.1.4	4.6.9.1
Workmanship	3.14	4.6.4
Labeling	5.1	4.6.4
Packing	5.3	4.6.4
Label Grade	3.15.3	4.6.10.7

4.4 Reporting of Test Results

4.4.1 Reports

The contractor shall maintain a complete record of all test results for the duration of the contract. The test records shall be available to the Government at all times. The records shall include the information necessary to identify the lot, and the lot sample, the testing equipment, the inspector, and the date of the test. Lot inspection reports should be forwarded to NLS on a weekly basis.

4.4.2 Methods Certification

The contractor is required to provide written certification showing that his methods of quality control incorporate those established by this specification, under Section 4.

4.4.3 Fault Correction

Should NLS determine that 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 with no additional charge to NLS.

4.5 Recalls and NLS Inspections

4.5.1 Recall

Machines produced for the talking-book program are subject to recall or rework, based on the criteria under the Quality Assurance Section. It shall be the prerogative of the contracting officer to institute a recall at his discretion.

4.5.2 NLS Inspection

The right is reserved by the National Library Service for the Blind and Physically Handicapped, Library of Congress, to inspect any process or tests being performed. The Library representative shall have the authority, without advance notice, to select at random a sample machine or machines at any time during the course of the contract for testing to the specified requirements. These may be tested either at the contractor's facility, or the contractor will be required to

express ship the machines to NLS Quality Assurance Section. The right is reserved by the National Library Service for the Blind and Physically Handicapped, Library of Congress, to reject any production lot represented by a tested sample which has been rejected.

4.5.3 Plant Visits

The right is reserved by the National Library Service for the Blind and Physically Handicapped, Library of Congress, to inspect plant facilities or manufacturing processes at any time without advance notice.

4.6 Examinations, Measurements, and Tests

4.6.1 Order of Qualification Inspection

- a. The machine under test shall be subjected to the examinations, measurements, and tests listed in Table I. All electrical measurements are to be performed at the maximum and minimum battery voltage consistent with 3.3.1.1.
- b. The machine shall be subjected to the environmental conditions of 4.6.8. The machine shall then be subjected to the measurement of 4.6.6 for conformance to the frictional torque requirement of 3.8.13. The machine shall then be subjected to the measurements listed in Table I.
- c. The machine shall then be subjected to the operational life test of 3.13 as specified in 4.6.9.2. The frictional torque measurement shall conform to the requirement of 3.8.13.

4.6.2 Preliminary Conditioning

Test units shall be subjected to the test environment of 4.6.3 for a period of not less than 24 hours prior to performance of any measurement or test specified herein.

4.6.3 Test Environment

Except as otherwise specified herein, all measurements and tests shall be performed at an ambient temperature of 70 degrees F \pm 5 degrees F and a relative humidity of between 45 and 55 percent.

4.6.4 General Examinations

Test units shall be visually and aurally examined for proper operation and conformance to the applicable requirements in Tables I, II, III and IV.

4.6.5 Machine Dimensions Measurements

The following listed critical dimensions shall be measured for conformance to paragraph 3.1.1 and to the measurements given in EIA RS-399A. Appropriate "GO" "NO-GO" gauges may be used to determine conformance to dimensional requirements.

Dimensions to be measured:

- (a) Length
- (b) Width
- (c) Height
- (d) Capstan: size and location must enter holes specified in EIA RS-399A
- (e) Locating Pins: size and location must enter holes specified in EIA RS-399A
- (f) Reproduce Head
- (g) Hub spindles: size and location must enter holes specified in EIA RS-399A
- (h) Spindle, capstan, and pinch roller: perpendicularity
- (i) Radial withdrawal force

4.6.6 Torque Measurements

Using a torque cassette, SRK-CT, or an NLS approved cassette type torque indicator, measure the torque at the take-up spindle for conformance with the requirement in paragraph 3.8.13 a and b. Measure the torque at the supply spindle for conformance with the requirement in paragraph 3.8.13 c. Measure the holdback torque using an SRK-CT or an NLS approved cassette type indicator for conformance with 3.8.13 d.

4.6.7 Reference Tape

4.6.7.1 Definition

The reference tape is the standard tape upon which all test tapes and levels are based.

4.6.7.2 Reference Tape and Cassette

The reference tape shall consist of a BASF DIN Calibration Tape 4.76/3.81 (Fe) (PES 12/c 521V) in accordance with DIN 45 513, Sheet 6, in a cassette housing that conforms to IEC 94A. Equalization 120+3180 microseconds.

4.6.7.3 Reference Level

The reference level is the output level obtained from cassette IS 1108 played at 15/16 ips.

4.6.7.4 Test Procedures

With 120 VAC applied, and a fully charged battery or with a fully charged battery only, the machine shall meet all electrical performance requirements listed in Section 3 using test procedures of Section 4.

The following cassette machine performance measurements are applicable to all tracks.

4.6.7.4.1 Amplifier Rated Output Power and Discontinuity

A General Radio Power Meter 1840-A or equivalent shall be set to the speaker impedance and connected across the speaker terminals with the speaker disconnected. The power output of the amplifier shall conform to the requirement in 3.9.1.1. Using cassette IS 1108 played at 15/16 ips, an oscilloscope trace shall not exhibit crossover distortion.

4.6.7.4.2 Amplifier Output and Harmonic Distortion Equipment & Procedures

- (1) General Radio Power Meter 1840-A or equivalent.
- (2) Test Tape - IS 1108
- (3) Flux Loop IS 1170
- (4) Distortion meter

(5) Audio signal generator

Procedure:

- (1) Connect power meter across speaker terminals, disconnect speaker, and set to the speaker impedance.
- (2) Insert the test tape and set machine to "play" mode, set tone control for maximum boost.
- (3) Adjust volume control to provide power reading of 750 milliwatts, minimum. Remove test tape but do not disturb the volume setting.
- (4) Connect leads from the flux loop to an audio signal generator and insert loop securely in front of the playback head. Adjust the generator for a 1.0 kHz signal and raise its output to duplicate the power reading in Step #3.
- (5) Reduce the machine's volume setting to 600 milliwatts.
- (6) Connect distortion meter in parallel with power meter and record THD measurement for conformance with requirement 3.9.1.2.

4.6.7.4.3 Frequency Response

The DIN Calibration Tape, frequency response section, shall be used. A resistive load equal to the speaker impedance shall be substituted at the speaker. Set speed to 1-7/8 ips with tone control set at maximum, set volume control for 600 mW, at 1.0 kHz, 0 dB reference. Frequency response shall be recorded. Readings shall conform to the requirements in 3.9.1.3. Set speed to 15/16 ips, adjust volume control for 200 mW at 1.0 kHz, 0 dB reference. Measure frequency response for conformance with 3.9.1.3 using IS 1083.

4.6.7.4.4 Tone Control

Test conditions stated in 4.6.7.4.2 shall be used with the tone control set at minimum. The difference between the maximum and

minimum settings of the tone control shall be 8 ± 3 dB at 2.0 kHz for conformance with 3.9.1.6.

4.6.7.4.5 Sound Pressure Level

Equipment:

- a. Bruel and Kjaer sound pressure level measuring amplifier model 2610 or equivalent.
- b. Bruel and Kjaer condenser microphone model 4144 or equivalent.
- c. Bruel and Kjaer microphone preamplifier model 2639T or equivalent.

An anechoic chamber shall be used for the following system measurement: Separation between the CBM speaker and the microphone shall be 1.0 meter. The microphone shall be oriented for perpendicular incidence. Test tape IS 1108 shall be used to reference 80 dB minimum SPL at 1.0 kHz. Signal input to the auxiliary input jack shall be substituted for IS 1108 and set to a level referenced to 80 dB SPL at 1.0 kHz without clipping. With this reference and a constant signal generator input, the system shall be capable of producing 80 dB SPL at the test frequencies listed below:

500 Hz	1.0 kHz	2.0 kHz	4.0 kHz
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The SPL at the above test frequencies shall be within the range of 80 ± 6 dB. At 250 Hz the SPL output shall not be more than 20 dB down reference SPL at 1.0 kHz. The system shall not exhibit a clipped waveform at any test frequency. When plotting octave band SPL graphs, accepted point to point practice shall be followed.

4.6.7.4.6 Signal-to-Noise Ratio

Using the reference level section of the BASF DIN calibration tape cassette, set speed to 1 7/8 ips, adjust the amplifier for flat frequency response and the volume control for maximum rated amplifier power (750 mW). Note the voltage reading across a resistive load substituted for the speaker. Refer to this voltage as

V_o . Note the output voltage reading on a blank portion of the tape. Refer to this voltage as V_n . Calculate signal-to-noise ratio from the formula:

$$S/N = (20 \text{ Log}_{10} V_o/V_n) \text{ dB}$$

for conformance with the requirement under paragraph 3.9.1.5. Set speed to 15/16 ips and using test tape IS 1084 repeat above measurement for conformance to requirement 3.9.1.5.

4.6.7.4.7 Earphone and Headphone Output

Power output, using monaural plugs, from the earphone and headphone jacks shall be measured using a GR 1840-A power level meter, or equivalent, set at 8 ohms termination. Power output shall conform to the requirement of paragraph 3.6.3 using IS 1108.

4.6.7.4.8 Machine Acoustic Noise

Place machine in play mode. No signal input shall be used. Volume control shall be set to a minimum. The unit under test shall be checked in four position quadrants maintaining 1.0 meter between the case outer surface and the microphone. Mechanically generated noise emanating from the CBM unit under test shall conform to the requirement in paragraph 3.10. NLS anechoic chamber background level is 18 ± 1.0 dB SPL ("A" weighted, reference 2×10^{-5} N/m²).

4.6.7.4.9 Interchannel Crosstalk

Using crosstalk test tape IS 1110, set speed to 15/16 ips, set tone control to maximum, disconnect speaker, and terminate with the speaker impedance resistive load. Set band pass filter, GR 1952 or equivalent, to 500 Hz. Set output voltage at clip point. Denote output voltage as V_o . Turn cassette over. Denote voltage reading as V_1 . Toggle side selector switch and repeat measurements. Calculate the crosstalk from the formula:

$$\text{Crosstalk dB} = 20 \text{ Log}_{10} (V_o/V_1)$$

Interchannel crosstalk between all sides shall conform to the requirements in paragraph 3.4.4.
Set speed to 1 7/8 ips and filter to 1.0 kHz and repeat above test.

4.6.7.4.10 Head Insertion

Using an appropriate gauge, determine the amount of head insertion and note "GO/NO-GO" acceptance for conformance to the requirement in paragraph 3.8.8.

4.6.7.4.11 Battery Charging System

Battery charge rate shall conform to the requirement in paragraph 3.3.1.3. Battery current drain in play mode shall conform to the requirement in paragraph 3.3.1.4.

4.6.8 Environmental Test

The CBM shall be able to provide satisfactory operation after being subjected to the following humidity test: The CBM shall be placed in an environment which has a minimum 90 percent relative humidity at 104 degrees F and cycled as follows:

Sixteen (16) hours in the high humidity chamber, 8 hours at 40 degrees F and 90 percent relative humidity. Recycle three times. Fifteen minutes after the obvious moisture has been wiped away, the unit will be tested for proper operation.

4.6.9 Operational Tests

4.6.9.1 Short-Term Operational Test

Insert a pre-recorded cassette into the machine. Place the machine in play mode. Check the following controls for proper operation:

1. Speed Control - Check for effectiveness in both speed-up and slow-down operation. Check detent effectiveness.
2. Volume and tone controls - Check for normal operation and intelligible undistorted sound.
3. Handle storage - Determine ease of operation.

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4. Track switching - Switch between tracks for normal operation.
5. Two-speed operation - Switch from 1-7/8 to 15/16 for normal operation.
6. Tape/head contact - Place machine in fast-forward and rewind modes for tape/head contact check.
7. Full throw locking - Confirm requirement for stop operation five times each from fast-forward, rewind, and play, without linkage binding.
8. Short protection - Insert shorted test plugs into earphone and headphone jacks. Check for output after removal, observe no change in output level.
9. Headphone/earphone jack operation - Verify proper operation of headphone and earphone jacks in the monaural and stereophonic modes.
10. Automatic shutoff - Wind test cassette to within a few seconds of end-of-tape. Set variable speed control to minimum, confirm automatic shutoff four times at both 1-7/8 and 15/16 ips.
11. Cassette loading - Confirm ease of loading with insertion/removal four times.
12. Brake mechanism - Set machine to fastforward or rewind mode, confirm requirement of brake mechanism using the stop function key.
13. Workmanship - Visually inspect for burrs, dirt, cracks and general appearance.

4.6.9.2 Life Test

4.6.9.2.1 Life Test Procedure

Twenty (20) machines shall be operated as specified until 12 failures have occurred or until the machines have been operated for 1000 hours. NLS book cassettes or other C-90 cassettes with signal on all four sides shall be played at 15/16 ips with the volume control set between 1/2 and 3/4 of full volume. An 8 ohm load resistor may be attached to the headphone jack.

4.6.9.2.2 Failures

A failure is defined as any condition which would render a machine useless to a patron, including battery failure, no tape movement in play, fast forward, or rewind, obvious flutter or noises, low or intermittent output, or other major malfunction. The serial number, elapsed time to failure, cause of failure, and details of repairs and parts replaced shall be recorded for each failure. Failed machines shall be restored to like new condition and returned to test. The tape path may be cleaned if necessary to continue operation; cleaning shall be recorded but will not be considered a failure. A low battery shall not be considered a failure unless the battery or the charging circuit is found to be defective.

4.6.9.2.3 Periodic Testing

Each machine shall have its tape path cleaned, and shall be tested and data recorded every 100 hours of operation for the following:

1. Torque (Play, fast forward and rewind)
2. Speed (1 7/8 and 15/16 ips)
3. Flutter (1 7/8 and 15/16 ips)
4. Power output
5. Crosstalk
6. Frequency response

(These tests are for information only. A machine which does not meet the specification for these tests is not considered a failure unless the failure criteria of 4.6.9.2.2 are met.)

The time between inspections shall be apportioned as follows:

90 hours in play mode,
5 hours in fast forward mode,
5 hours in rewind mode,

and

80 hours on AC power,
20 hours on battery power.

4.6.9.2.4 Data

The data shall be forwarded to NLS as it is collected. Information on failures shall be forwarded to NLS as they occur. The Weibull distribution or other appropriate distribution shall be used to project the MTBF.

4.6.10 Other Tests

4.6.10.1 Speed

Test cassettes, IS 879 for 1 7/8 ips and IS 1086 for 15/16 ips, shall be counted by a frequency counter at either the headphone or earphone output jack. The counted frequency for each speed shall be noted and the percentage of fast or slow speed calculated. The calculation shall conform to the requirement in 3.7.3 or 3.7.6. Using a tachometer, measure RPM of take-up reel in fast forward mode, (speed set at 15/16 ips) to conform to the requirement in 3.7.3.2.

4.6.10.2 Wow and Flutter

Test cassettes, IS 879 for 1-7/8 ips and IS 1086 for 15/16 ips, shall be used to measure wow and flutter at both 1-7/8 ips and 15/16 ips for conformance to the requirement of 3.7.4.

4.6.10.3 Motor Electrical Noise

The test procedure shall be that stated in 4.6.7.4.6 except that voltage readings shall be taken with the motor connected and disconnected and signal-to-noise ratio calculated for conformance to the requirement in 3.7.5.

4.6.10.4 Auxiliary Output Voltage

Terminate the auxiliary output jack with a 50k ohm resistor typifying load impedance. Using the reference level section of the DIN Reference Cassette as a signal source, speed set at 1-7/8 ips, measure the voltage output across the resistor for conformance with 3.6.4.

4.6.10.5 Battery Capacity

Nominal open circuit voltage - 7.2 volts

Uncycled state of charge - full

Pack condition - new

Cut off voltage - 6.1 volts

Ampere/hour rating - 1.2 Ah

Discharge rate - $c/7.5 = 160$ mA.

Ambient temperature - 70 degrees F.

Load resistance - 45 ohms

Load wattage - 5 watts

Test shall be accomplished through a 45 ohm, 5 watt resistor, a current reading meter and a voltage meter. The circuit shall operate until the cut off voltage of 6.1 volts is reached. Time lapse shall not be less than 6 hours for compliance with the requirement in paragraph 3.3.1.

4.6.10.6 Subjective Listening Test

A subjective listening test shall be performed by a panel convened for judging acceptability of sound quality, consistent with the requirements in paragraph 3.9.1.4.

4.6.10.7 Bar Code Label

A bar code verifier/scanner (Photographic Science Corporation model QC600 or equivalent) shall be used. Calibrate unit. Scanning shall be made parallel to the length of the bar code label. Enable the Code 3 of 9 symbology and check character (Mod 43) to validate if the correct data has been decoded. Set the Extended Accuracy scanning option ON (set to 10 scans). Set unit to report an ANSI scan grade of C or better for conformance with paragraph 3.15. Sample the label at different paths, four in the upper portion, two in the middle and four in the lower portion.

5. PREPARATION FOR DELIVERY

5.1 Machine Labeling

5.1.1 Property U.S. Government

Each individual CBM shall be marked with permanent legible lettering, stating the following:

National Library Service for the Blind and Physically Handicapped, Property of the U.S. Government.

5.1.2 Serial Number/Machine

Each individual CBM shall be serialized externally and internally with a permanently attached serial number label.

5.1.3 Serial Number/Carton

Matching serial number shall be included on the outside of each individual CBM carton. Overpacks shall include serial numbers as reflected in the NLS mailing label area.

5.1.4 Model

Each CBM shall be externally marked with the model designation (e.g., C-1).

5.1.5 Warning

The bottom of the machine case shall bear the following information in conformance with U.L. requirements.

WARNING: To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

CAUTION: To prevent electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

Manufactured by _____ (city) _____ (state) _____ for the National Library Service for the Blind and Physically Handicapped, Library of Congress.

5.1.6 Control Settings

Volume and tone controls are to be set to the midpoint, speed set to 15/16 ips, variable speed to detent, side selector set to sides 1-2. Controls shall be held in place while in the box to prevent their movement during shipment.

5.2 Drop and Vibration Testing

The contractor is required to package the machine in such a manner that the following drop and vibration tests will not cause machine damage.

5.2.1 Drop Testing

The National Safe Transit Association pre-shipment test procedure, project 1A, is the minimum acceptable test for qualifying a CBM. A 30-inch drop test is acceptable as noted under performance limits for packaged products less than 21 pounds. Drop shall be on all sides and one corner. No damage to the machine shall result.

5.2.2 Vibration Testing

The packaged machine must withstand vibration test specified by the National Safe Transit Association pre-shipment test procedure, project 1A, for packaged products weighing under 100 pounds. After the test, the unit will be tested for proper operation per paragraph 4.6.9.1. A report of the verification of the drop and vibration tests must be submitted to NLS within two weeks after the start of but prior to shipment.

5.3 Packing for Shipment

5.3.1 Container

The CBM shall be packed for shipment to NLS, four to an overpack, each CBM packed in a polyfoam cocoon and in its own individual cardboard carton, the carton and the overpack having or exceeding the durability for RSC 275 board. Dimensions shall be determined by the contractor. A minimum requirement for sealing and shipping the overpack shall be that specified by the "two ship" method approved under UFC rule #41 prescribed by the Interstate Commerce Commission, except that no staples shall be used. Each individual carton and the overpack shall be marked on the outside. Lettering must be approved by the NLS.

5.3.2 Instruction

The contractor shall print and include a large-print instruction sheet with each machine. A braille instruction sheet and a 4-track instruction cassette shall be provided by the contractor and packaged with the machine. All instruction text shall be GFE.

5.3.3 Container Labeling

- a. The individual machine container shall be marked per carton drawing #56848. Two bar coded labels, as described in paragraph 3.15, shall also be affixed as shown in CBM carton drawing.
- b. The overpack container shall be marked per carton drawing #56847. Four bar coded labels, as described in paragraph 3.15, shall also be affixed as shown in CBM overpack drawing.

5.3.4 Machine Placement

Placement of the machine inside the container shall agree with the direction of the arrows so that when the container is opened, the machine will be found with the cabinet handle easily accessible, and in its normal operating position.

6. NOTES

All tapes in section 6.2 and used as signal sources in section 4 shall be referenced to paragraph 6.1.

6.1 Reference Cassette

The BASF DIN 45 513/6, IEC 94 Calibration Tape, Part Number #337947A, Equalization 120+3180 microseconds, RMS tape flux 250 nWb/m reference DIN 45 520/3, may be obtained from :

JRF Magnetics
249 Kennedy Road
Greendell, NJ 07839

6.2 Test Tapes

1. Frequency Response

IS 1083, speed 15/16 ips, equalization 120+1590 microseconds. Reference is 333 Hz at 250 nWb/m full track with no high end boost. Test frequencies recorded -10 dB from reference.

Test Frequencies:

333 Hz, 250 Hz, 500 Hz, 1.0 kHz, 2.0 kHz, 3.0 kHz, 4.0 kHz, 5.0 kHz

2. Signal to Noise

IS 1084, speed 15/16 ips, full track, 333 Hz at 250 nWb/m for 11 seconds followed by 10 seconds of blank (no bias) tape, for the entire length of the tape.

3. Crosstalk

IS 1110, speed 1-7/8 ips, equalization 120+1590 microseconds, 1.0 kHz recorded at a reference level of 250 nWb/m on tracks 1 and 3. Tracks 2 and 4 are blank. At 15/16 ips, frequency will be 500 Hz on tracks 1 and 3.

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4. Torque

Twin Torque Test Cassette:
SRK-CT

5. Speed and Flutter at 1-7/8 IPS

IS 879, speed 1-7/8 ips, equalization 120+1590 microseconds, 3.0 kHz recorded on a low flutter 1-7/8 ips test tape reproducer. Full track at -5 to -10 dB below reference level of 250 nWb/m.

6. Speed and Flutter at 15/16 IPS

IS 1086, speed 15/16 ips, equalization 120+1590 microseconds, 6.0 kHz recorded on a low flutter 1-7/8 ips test tape reproducer. Full track at -5 to -10 dB below reference level of 250 nWb/m.

7. Voice Indexing

IS 1134, NLS voice indexing tape recorded at 15/16 ips.

8. Subjective Listening

NLS subjective listening tape recorded at 15/16 ips, NLS track format.

9. Flux Loop

Part Number IS 1170

10. Reference Level Tape

IS 1108, speed 15/16 ips, equalization 120+1590 microseconds. 1.0 kHz recorded 5 dB below reference level of 180 nWb/m. (8.0 dB below 250 nWb/m at 315 Hz).

Performance Test tapes are available from:

Telex Communications, Inc.
12000 Portland Avenue South
Burnsville, MN 55337