NASA Technical Memorandum 104558

Goddard Space Flight Center Specification for Helical-Scan 8-Millimeter (mm) Magnetic Digital Data Tape Cartridge

Jimmy L. Perry

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Jimmy L. Perry
NASA-Goddard Space Flight Center
Greenbelt, Maryland

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, MD

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

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SPECIFICATION FOR HELICAL-SCAN 8 MILLIMETER (MM) MAGNETIC DIGITAL DATA TAPE CARTRIDGE

This specification was developed by the GSFC Magnetic Tape Certification Facility (MTCF), Code 562.2, Greenbelt, MD 20771, and generally reflects available state-of-the-art products. Copies may be obtained from GSFC, Code 562.2.

1. SCOPE AND CLASSIFICATION

1.1 SCOPE

This specification covers the requirements for a Helical-Scan 8mm magnetic digital data tape cartridge. The 8mm cartridges covered by this specification are intended for use on 8mm Cartridge Tape Systems using the Non-Return-To-Zero-Change-On-One (NRZI) method for maximum linear recording densities of 43,200 bits per inch (bpi).

1.2 CLASSIFICATION

1.2.1 General

Each individual 8mm cartridge configuration covered by this specification shall be identified by an item identifying part number consisting of the specification number with revision indicator (if any), and the indicators compiled from the part number code as follows:

TM-	8MM	36	TC
Specification Number	Application Indicator	Tape Length Indicator	Tape Container

1.2.2 Part Number Code

Indicator Code	Application
8mm	8mm Recording
36	360-foot minimum
TC	Cartridge 8mm

2. APPLICABLE DOCUMENTS

2.1 SPECIFICATIONS AND STANDARDS

The following documents, of the issue in effect on the date of the Invitation For Bids (IFB) or Request For Proposal (RFP), form a part of this specification to the extent specified herein:

2.1.1 Federal Specifications.

PPP-B-636 - Boxes, Shipping, Fiberboard.

2.1.2 Federal Standards.

Federal Standard Number 123 - Marking for Domestic Shipment (Civil Agencies).

Federal Test Method Number 406/GEN - Plastics: Method of Testing.

Federal Test Method Number 406/1013 - Tensile Properties of Thin Plastic Sheets and Films.

Federal Test Method Number 406/4041 - Electrical Resistance.

2.1.3 Military Standards.

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

MIL-STD-129 - Marking for Shipping and Storage.

2.1.4 NASA Standard.

NHB5300.4(1C) - NASA Quality Publication - Inspection Provisions for Suppliers of Space Materials, Parts, Components, and Service.

2.1.5 American Society for Testing and Material (ASTM) Standard.

D 638 - Test for Tensile Properties of Plastics.

2.1.6 American National Standards Institute (ANSI) Standard.

X3.202-199X - American National Standard - Helical-Scan Digital Computer Tape Cartridge 8mm (0.315 in) for Information Interchange.

2.2 PUBLICATION COPIES

2.2.1 Organizations Outside the Federal Government. Organizations outside the Federal Government may obtain copies of federal specifications, standards, and handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

2.2.1.1 Copies for Bidding. Single copies of federal specifications required by organizations outside the Federal Government for bidding purposes are available without charge from the Business Service Center at the General Services Administration Regional Offices in Boston, New York, Washington, Atlanta, Chicago, Kansas City, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle.

2.2.2 Organizations Within the Federal Government. Organizations within the Federal Government may obtain copies of federal specifications, standards, handbooks, and the Index of Federal Specifications and Standards from established distribution points in their agencies.

2.2.3 Military Standards. Copies of military specifications and standards required by suppliers in connection with specific procurement functions should be obtained from the procuring organization or as directed by the contracting officer.

2.2.4 ASTM Standard. Applications for copies of the ASTM Standard should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia, PA 19103.

2.2.5 ANSI Standard. Applications for copies of the ANSI Standard should be addressed to Global Engineering Documentation Inc., 2805 McGaw Avenue, Irvine, CA 92714.

3. DEFINITIONS

3.1 Acceptable Quality Level (AQL). The maximum percent defective (or the maximum number of defects per hundred units) that, for purposes of sampling inspection, can be considered satisfactory.

3.2 Anhysteresis. The process whereby a material is magnetized by subjecting it to a unidirectional magnetic field that is superimposed on an alternating field of gradually decreasing amplitude.

3.3 Anhysteretic Erase. A process of erasure utilizing alternating fields of decaying levels.

3.4 Average Signal Amplitude. The average peak-to-peak value of the read head at 2126 flux transitions per millimeter (54,000 flux transitions per inch) exclusive of dropouts.

3.5 Bit. A single digit in the binary number system.

3.6 Bit-Cell. A distance along the track between the initial flux transition of adjacent bits.

3.7 Bit-Error-Rate (BER). This term, used in high-density digital recording, refers to the number of errors a specific magnetic tape may contain. It is expressed in errors per data bits such as 1 in 10^6 or one error in one million bits.

3.8 Block. A group of contiguously recorded bytes considered and transported as a unit. Blocks are separated by a preamble and postamble.

3.9 Byte. A contiguous set of eight data bits that are acted on as a unit and recorded as a 10-bit pattern.

3.10 Cartridge. A container holding an 8mm (0.315 inch) wide magnetic tape on twin hubs, with coplanar type reels. The tape is transported between the reels and across a rotating head for digital recording.

3.11 Certifying Agency. The Certifying agency will be NASA-GSFC.

3.12 Character. A unit of information constituted as one or more bytes.

3.13 Cyclic Redundancy Check (CRC) Character. A two-byte code derived from information contained in the data bytes, pad bytes, and other bytes.

3.14 Data Density. The number of single-byte characters stored per unit length of tape; usually expressed as byte per millimeter (bpmm), bytes per inch (bpi), characters per millimeter (cpmm) or characters per inch (cpi).

3.15 Dropout. A dropout is a loss of read-back signal amplitude. A drop-out exists when the base-to-peak read-back signal amplitude is 25 percent or less of half of the average signal amplitude for the preceding 4000 flux transitions on tape, exclusive of dropouts.

3.16 Error-Correcting-Code (ECC). A coding scheme incorporated into the recording before it is transmitted (or stored) so that errors can be detected and corrected.

3.17 Gap Azimuth. The angular deviation, in degrees and minutes of arc, of the recorded flux transitions on a track from the line normal to the track center line.

3.18 Helical-Scan. A method of recording on magnetic tape using rotating magnetic heads which create a helical track across the width of the tape. The recording heads are mounted on a rotating drum tilted from the vertical axis (4.5° for 8mm). The drum rotates at a high rpm, while the tape moves slowly in the same direction, creating a high effective speed which is necessary for these frequencies. Typically, two heads are mounted opposite each other on the drum to create an array of alternating tracks diagonally across the tape.

3.19 Logical Beginning of Tape (LBOT). The LBOT is indicated by the start of analog tape mark tracks followed by a series of format ID tracks.

3.20 Logical End of Tape (LEOT). The last point on a tape for any recording.

3.21 Master Standard Reference Tape. A tape selected as the standard for reference field, signal amplitude, and resolution.

3.22 Physical Beginning of Tape (PBOT). The PBOT is indicated by the transition from the tape leader to the opaque area of the splice where the leader tape is joined to the magnetic tape.

3.23 Physical End of Tape (PEOT). The PEOT is indicated by the transition from the opaque area of the splice to where the trailer tape is joined to the magnetic tape.

3.24 Physical Recording Density. The number of recorded flux transitions per unit length of track usually expressed as flux transitions per millimeter (ftpmm) or flux transitions per inch (ftpi).

3.25 Postamble. A sequence of binary characters recorded at the end of each block area on a magnetic tape to provide electronic synchronization when reading.

3.26 Preamble. A sequence of binary characters recorded at the beginning of each information block area on a magnetic tape to provide electronic synchronization when reading.

3.27 Reference Field. The minimum recording field which, when applied to the master reference tape, causes an average signal amplitude equal to 60 percent of the maximum average signal amplitude at the physical recording density of 2126 ftpmm (54,000 ftpi).

3.28 Resolution. The ratio of the average signal amplitude at the physical recording density of F=2126 ftpmm (54,000 ftpi) to that of the physical recording density of (1/3)F.

3.29 Secondary Standard Reference Tape. A tape the performance of which is known and stated in relation to that of the master standard reference tape.

3.30 Standard Measurement Current (Im). The write current used to determine the standard reference amplitude form the master standard reference tape. The standard measurement current is expressed as 1.5 times the standard reference current (Im = 1.5Ir).

3.31 Standard Reference Amplitude. The average signal amplitude from the master standard reference tape when it is recorded with the standard measurement current on the National Institute of Standards and Technology (NIST) measurement system at 2126 ftpmm (54,000 ftpi). Traceability to the standard reference amplitude is provided by the calibration factors supplied with each secondary standard reference tape.

3.32 Standard Reference Current (Ir). The write current that produces the reference field.

3.33 Tape-Reference Edge. The reference edge of the tape is the bottom edge when viewing the recording side of the tape with the hub end (PEOT) of the tape to the observer's right.

3.34 Track. A diagonally positioned area on the tape along which a series of magnetic transitions is recorded.

3.35 Track Angle. The angular deviation, in degrees and minutes of arc, of the center line of the recorded track from the tape reference edge.

3.36 Zero Crossing. The point at which the read signal passes through zero.

4. TEST EQUIPMENT

The qualification tests and acceptance tests specified herein which require recording data on the tape will be performed using the following listed systems:

MediaLogic Model ML4500 8mm Tape Evaluator

Exabyte Model EXB-8200 8mm Cartridge Tape Drives

IBM Personal Computer Model PC AT

(NOTE: SEE FIGURE 1)

5. REQUIREMENTS

5.1 GENERAL REQUIREMENTS

5.1.1 Product Type. The 8mm cartridges supplied under this specification shall be new and shall have been tested for conformance to the requirements specified herein. Additionally, the supplier must have met the requirements of NASA Quality Publication NHB 5300.4(1C).

5.1.2 Product Qualification. Qualification testing shall be conducted at the NASA GSFC MTCF and shall consist of all tests listed in this section. All samples subjected to these tests must also conform to the requirements listed in this specification, unless otherwise specified. Qualification of a particular tape type of a given base material, thickness, width, oxide, and performance characteristics shall constitute qualification of all tapes of identical characteristics regardless of length.

5.1.2.1 Qualified Products List. The 8mm cartridges supplied under this specification shall be products which have been tested and have passed the qualification tests specified herein, and that are listed or approved for listing on the NASA GSFC Qualified Products List (QPL).

5.1.2.2 Qualification Product Testing. Products may be submitted by prospective suppliers of 8mm Magnetic Digital Data Tape Cartridges on dates to be announced by the certifying agency. A prospective supplier may submit only the type of 8mm cartridge requested for testing on these submission dates. Qualifying cartridges being submitted must be identified by a manufacturer's designator. Should the submitted product fail to meet the specifications as defined herein, the certifying agency reserves the right to refuse to accept such a product for additional qualification tests until satisfactory data and test results have been submitted indicating correction of the product deficiencies. The certifying agency shall accept only one type of 8mm cartridge for qualification testing from each prospective supplier within any 1-year period. Two copies of the manufacturer's printed commercial specifications and technical data shall be submitted with the tape samples. The certifying agency reserves the right to levy a charge to cover the cost of product qualification testing; however, such charges shall only be made when so specified in the procurement documents.

The certifying agency reserves the right to limit the access and distribution of the qualification test results to the specific manufacturer of the 8mm cartridge submitted for qualification.

5.1.2.3 Samples for Qualification Tests. The sample size shall consists of thirty (30) tapes for the type of base material, thickness, oxide, and performance characteristics for which qualification is desired. All samples shall be submitted in cartridges which conform to the requirements of this specification unless otherwise specified. The manufacturer shall also submit test data showing that the 8mm cartridge type for which qualification is desired has successfully met all of the

requirements of this specification. The manufacturer's test data shall be classified by the certifying agency as proprietary and restricted.

5.1.2.3.1 Sample Disposition. Samples submitted for qualification which pass the QPL tests shall be retained by the certifying agency. Samples submitted for qualification which failed the QPL tests shall be returned to the manufacturer.

5.1.2.4 Qualification Withdrawal. A supplier's product shall be withdrawn from the QPL for any of the following reasons:

(1) The product offered under contract does not meet the requirements of this specification.

(2) The manufacturer is delivering a product differing in material and/or manufacturing process from the one originally qualified.

(3) If a manufacturer submits three successive deliveries containing a lot which fails to meet the requirements of this specification or have three consecutive lots fail to meet the requirements of this specification, it shall then become necessary to withdraw the product from the QPL.

(4) A manufacturer's product may be withdrawn from the QPL for reasons considered to be sufficient by the certifying agency.

5.1.2.5 Requalification. A supplier's product, once withdrawn from the QPL, shall not be accepted for requalification within 1 year from the date of the QPL withdrawal notice and until satisfactory data and test results have been submitted to the certifying agency by the supplier indicating a correction of the product's fault(s).

5.1.2.6 Process Change. Qualification and certification of a supplier's product under this specification, once established, applies only to those 8mm cartridges manufactured by the specific process in use at the time of qualification. All process changes shall be reported to the certifying agency indicating the extent and probable effect of such changes on the delivered product. The certifying agency reserves the right to require a minimum of 6-weeks' notice and sufficient samples of the new product for quality assurance tests. The supplier must provide the test samples prior to the delivery of products manufactured under any such change in process. The foregoing requirements do not in any way relieve the manufacturer of delivery requirements, quality control, and testing necessary to ensure that all products delivered under this specification are equal to or better than those products originally submitted for qualification.

5.1.3 Product Acceptance Testing. Acceptance testing shall be conducted at the NASA GSFC MTCF. Normal acceptance testing will be those tests indicated in Test Groups A, B, and C (Table II) with the appropriate Acceptable Quality Level (AQL). Groups A, B, C and D tests shall be required at the time of qualification and as often thereafter as deemed necessary to ensure continued compliance with the specified requirements. Failure to conform to any of the requirements of the Group Tests or inspections shall be cause for the rejection of the lot represented by the defective samples.

5.1.3.1 Samples for Acceptance Testing. Samples shall be drawn from lots delivered to the MTCF unless otherwise indicated in the procurement. The number of samples required for acceptance testing is governed by the lot size and shall be in accordance with MIL-STD-105D, Normal Inspection, Level 1, Single Sampling Plan, at an AQL of 2.5 unless stated otherwise in this specification.

5.1.4 Lot Size and Definition.

5.1.4.1 Lot Size. On orders exceeding 1000 8mm cartridges, the minimum lot size shall be 1000 8mm cartridges; the maximum lot size shall be 3200 8mm cartridges. For orders of less than 1000 8mm cartridges, the lot size shall be the order size.

5.1.4.2 Definition of a Lot. A lot shall consist of 8mm cartridges of the same type that have been manufactured and processed from the same batch or mix of the basic coating materials used in the production of the cartridges. This batch or mix shall be sufficient to ensure compliance with lot size requirements. In the case of a continuous batching or production process, a lot shall consist of cartridges selected from concurrent production runs to meet lot size requirements.

5.1.5 Compatibility with other 8mm Cartridges. 8mm cartridges supplied under this specification shall not act as an inhibitor. The performance of other 8mm cartridges shall not be degraded by the use of any other QPL 8mm cartridges when operated on the same 8mm cartridge drives.

5.1.6 Materials.

5.1.6.1 Tape. The magnetic tape shall consist of a backing or base of polyethylene teraphthalate, polyester film (or equivalent), coated on one side with a layer of ferromagnetic material suspended in a suitable binder. The back surface of the tape may be coated.

5.1.6.2 Toxic Compounds. Materials which may cause bodily harm through contact, inhalation, or ingestion during normal use of the cartridges shall not be used.

5.1.6.3 Flammable Materials. Materials which will ignite from a match flame and continue to burn in a still carbon dioxide atmosphere shall not be used.

5.1.7 Discontinuities. There shall be no discontinuities in the tape between the PBOT and the PEOT, such as those produced by splicing or perforations.

5.1.8 Environment.

5.1.8.1 Operating Environment. Operating temperatures shall range from 10° C to 32° C (50° F to 90° F). The operating relative humidity shall range from 20 to 80 percent.

5.1.8.2 Storage Environment. The storage environment for the cartridges shall range form 5° C to 30° C (41° F to 86° F). The storage relative humidity shall range from 30 to 70 percent.

5.1.9 Workmanship and General Examination.

5.1.9.1 Workmanship. The magnetic tapes and cartridges shall be manufactured and processed in a careful and workmanlike manner in accordance with good practice. All surfaces of the tapes shall be free from raised edges, dust, flakes, powder, holes, scratches, creases, or any other defects which would render the tape unsuitable for its intended use.

5.1.9.2 General Examination. The tape as initially received from the supplier shall be examined to determine that cartridges and tapes are free from the defects listed in Table III.

5.1.10 Physical Damage. All tapes and cartridges shall be free from physical damage. Any tape or cartridge that is found to be physically damaged during any quality assurance testing shall be considered a failure.

5.2 INSPECTION

5.2.1 Responsibility for Inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any other commercial laboratory acceptable to the certifying agency. The certifying agency reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure that supplies and services conform to the prescribed requirements.

5.2.2 Quality Conformance Inspection. The supplier shall be responsible for the performance of quality conformance inspections. The supplier shall select a sample number of cartridges from each lot offered for delivery and shall subject the samples to the examinations and tests necessary to ensure compliance with the specification requirements.

5.2.3 Reporting of Quality Conformance Inspection. Unless otherwise directed by the contracting officer, the supplier shall maintain a complete record of all production tests results for the duration of the contract. The production test records shall be available to the certifying agency at all reasonable times. The records shall include the information necessary to identify the lot, the tapes, the inspection, and the dates of the tests.

5.3 TEST SAMPLES ENVIRONMENTAL CONDITIONING

5.3.1 Standard Environmental Conditioning. The standard conditioning temperature shall be 24° C ± 3° C (75° F ± 5° F), and the standard conditioning relative humidity shall be 50 ± 3 percent. This is the temperature and humidity used for conditioning and/or making tests and measurements unless otherwise specified. The samples will be conditioned in this environment for a minimum of 24 hours prior to any tests.

5.3.2 QPL Environmental Conditioning. Preliminary conditioning of each cartridge will be required prior to qualification testing, unless otherwise specified, to relieve stresses and establish uniformity. The cartridges shall be conditioned at 52° C ± 3° C (125° F ± 3° F), 80 to 90 percent relative humidity for 3 hours. The cartridges shall then be conditioned at 21° C ± 3° C (70° F ± 5° F) 45 to 55 percent relative humidity for a minimum of 3 hours. This temperature-humidity cycle shall be repeated with the transition times between temperature extremes not to exceed 60 minutes, until the cartridges have been subjected to a total conditioning time, including transitions, of 24 hours. Upon removal from the last cycle, the cartridges shall be conditioned at 21° C ± 3° C (70° F ± 5° F) 45 to 55 percent relative humidity for a minimum of 24 hours before any tests are made. Preliminary conditioning shall not be required for supplier quality conformance or acceptance testing.

5.4 PRODUCT PHYSICAL REQUIREMENTS

5.4.1 Cartridge.

5.4.1.1 General. The Helical-Scan cartridge assembly shall consist of the following: (1) a case to facilitate the loading and unloading of the cartridge by a drive and to provide protection from contaminants and human handling; (2) a magnetic tape of 8.00 mm (0.315 in) nominal width held inside the case on twin hub coplanar type reels; (3) file-protect; (4) cartridge lid; and (5) other features to facilitate its use for information interchange (See Figures 2 and 3).

5.4.1.2 Dimensions. The overall dimensions of the cartridge shall be as shown in Figures 4 through 8.

5.4.1.3 Cartridge Insertion. The cartridge shall be designed to mount in 8mm drives in one position only. The cartridge shall have asymmetrical features that can be utilized to prevent engaging the cartridge improperly. The cartridge shall be provided with a channel recess as shown in Figure 4 to protect it from being improperly inserted.

5.4.1.4 Cartridge Datum Areas. The cartridge shall be referenced to the 8mm drive only in the crosshatched areas shown in Figure 12. Datum plane Z shall be decided by datum areas A, B, and C. Datum plane X shall be orthogonal to datum plane Z and shall run through the center of datum hole A and datum hole B as shown in Figure 12.

5.4.1.5 Cartridge Support Areas. The case support areas are illustrated as crosshatched areas shown in Figure 12. Support areas A, B, C, and D shall be coplanar with datum areas A, B, and C, respectively, within $\pm$ 0.1mm ($\pm$0.004 in). Support area D shall be coplanar with datum plane Z within $\pm$ 0.15mm ($\pm$0.006 in). Support areas that are 0.5mm (0.02 in) from the edge of the cartridge shall be removed.

5.4.1.6 Case Dimensions. The footprint dimensions of the case shall be as shown in Figure 13.

5.4.1.7 Cartridge-in-Position Sense. The cartridge shall have an area which shall be held to the dimensions as shown to be used for sensing that the cartridge is in position writing and reading data.

5.4.1.8 Cartridge Lid. The cartridge shall contain a lid for protection of the tape during handling, storage and transport. The dimensional requirements for opening the lid are shown in Figures 21 through 24. The lid lock and release requirements are shown in Figures 26 and 27.

5.4.1.9 Cartridge Opening and Unlocking Force. The force needed to unlock the reel lock as shown in Figure 28 shall not exceed 0.25 Newtons (N) (0.0562 pound-foot [lbf]). The force needed to unlock the lid, when applied in the direction as shown in Figure 30, shall not exceed 1 N (0.255 lbf).

5.4.1.10 Cartridge File-Protect. The cartridge shall contain a mechanism to prevent the accidental writing or erasing of the tape. The mechanism shall allow the user to open and close the file-protect hole as desired. When the file-protect hole is open, it shall be impossible to write or erase the tape. The mechanism shall be constructed such that it can withstand a force of 0.5 N (0.112 lbf). Devices using the cartridge shall be designed to prevent writing or erasing the tape when the switch is in the appropriate position.

5.4.1.11 Cartridge Drop-Test. The cartridge shall be able to withstand the shock incurred from falling 1 m (39.37 in) onto a concrete floor covered with asphalt tile. The cartridge shall meet the requirements of

this specification after being dropped once on a corner and once on a face.

5.4.2 Tape.

5.4.2.1 Dimensions.

5.4.2.1.1 Width. The width of the tape shall be 8.00 mm ± 0.010 mm (0.315 in ± 0.0004 in). The width of the tape shall be measured across the tape from edge to edge. This measurement shall be made using a tool maker's microscope or equivalent.

5.4.2.1.2 Total Thickness. The total thickness of the tape at any point shall be between 10 micro-meters (409.5 micro-inches) and 11.4 micro-meters (448.8 micro-inches).

5.4.2.1.3 Length. The minimum tape length between the PBOT and the PEOT shall be 110 m (360.89 ft).

5.4.2.2 Slitting.

5.4.2.2.1 Requirement. The tape edges shall be cut cleanly with no ragged coating or backing. No torn particles shall be clinging to the edges of the tape. The coating shall not be mashed, scratched, or fractured along the edges.

5.4.2.2.2 Test Equipment. A microscope with 100X magnification.

5.4.2.2.3 Test Sample Environmental Conditioning. Standard.

5.4.2.2.4 Test Procedure. A minimum of five feet of tape shall be inspected on both edges for evidence of poor slitting. The tape shall be examined for compliance with this specification.

5.4.2.3 Magnetic Properties.

5.4.2.3.1 Requirement. The intrinsic coercive force of the recording surface shall be at least 1500 oersteds ± 100 oersteds.

5.4.2.3.2 Test Equipment. LDJ Model 7600A BH Meter.

5.4.2.3.3 Test Sample Environmental Conditioning. QPL or Standard.

5.4.2.3.4 Test Procedure. The LDJ Model 7600A BH Meter shall be calibrated using the manufacturer's procedures. Samples shall then be cut, measured, and the results examined for compliance with this specification.

5.4.2.4 Tensile Strength.

5.4.2.4.1 Requirement. The yield strength shall be greater than 4.9 N (1.1 lbf) and the breaking shall be equal to or greater than 17.6 N (3.9 lbf).

5.4.2.4.2 Test Equipment. Amthor Testing Instrument Company Vertical Tensile Tester Type 272 or equivalent.

5.4.2.4.3 Test Sample Environmental Conditioning. QPL.

5.4.2.4.3.1 Test Sample Preparation. An environmentally conditioned strip of tape 200 mm (7.87 in) in length shall be unwound and placed in a 21° C ± 3° C (70° F ± 5° F) 50 ± 5 percent relative humidity environment for at least 24 hours prior to testing. The tape shall be free of bends and kinks.

5.4.2.4.4 Test Procedure. The test specimen shall be clamped in the Tensile Tester taking care to align the long axis of the specimen with the imaginary line joining the points of attachment to the grips of the Tester. The grips shall be tightened evenly and firmly to the degree necessary to prevent any slippage of the specimen during the test. The rate of grip separation shall be 100 mm/min (3.937 in/min). The force necessary to produce a 5-percent elongation of the tape shall be considered the yield strength, and the force necessary to reach the breaking point shall be considered the breaking strength.

5.4.2.5 Residual Elongation.

5.4.2.5.1 Requirement. The residual elongation shall be less than 0.03 percent.

5.4.2.5.2 Test Equipment. A suitable fixture with positive nonslipping tape clamps from which to hang at least four samples; a scale for measuring length; a scribe with which to mark the tape; and a 7X magnifier through which to measure results.

5.4.2.5.3 Test Sample Environmental Conditioning. QPL.

5.4.2.5.3.1 Test Sample Preparation. Samples at least 1 m (39.37 in) long shall be clamped so as to hang in the test area at 21° C ± 3° C (70° F ± 5° F) 50 ± 5 percent relative humidity for at least 24 hours under no externally applied force before any tests are started.

5.4.2.5.4 Test Procedure. The test sample is measured and then subjected to a tension of 20.5 N/mm^2 (2973 lbf/in^2) total cross-sectional area for a period of 10 minutes. After 10 minutes, the tension shall be removed and the sample allowed to hang freely for 10 minutes. The residual elongation shall be stated as a percentage of the original tape length.

5.4.2.6 Longitudinal Curvature.

5.4.2.6.1 Requirement. The deviation of the tape from straight line shall not exceed 3.8 mm (0.150 in).

5.4.2.6.2 Test Equipment. No special apparatus other than a straight-edge that is at least 1 m (39.37 in) in length.

5.4.2.6.3 Test Sample Environmental Conditioning. QPL.

5.4.2.6.4 Test Procedure. Allow a tape sample of 1 m (39.37 in) to unroll and assume its natural curvature on a flat surface. The tape shall be under no tension and free from bends, kinks, or other visible distortions. The straight-edge shall be placed along either edge of the tape, and any deviation from a straight line shall be measured. The maximum deviation of the edge of the tape from a straight line shall be defined as the longitudinal curvature.

5.4.2.7 Magnetic Coating Electrical Resistance.

5.4.2.7.1 Requirement.

5.4.2.7.1.1 Recording Surface. The electrical resistance of any square area of the recording surface of the tape shall be within the range of:

10^5 ohms to 5 x 10^{12} ohms

5.4.2.7.1.2 Backcoating. The electrical resistance of the backcoating of the tape, if present, shall be less than 9 x 10^8 ohms.

5.4.2.7.2 Test Equipment. The apparatus for this test shall consist of that required by Method 4041, Insulation Resistance for Flexible Tapes, of Federal Test Method Standard Number 406; and a Freed Transformer Company Model 1620 Meghohmeter (or equivalent).

5.4.2.7.3 Test Sample Environmental Conditioning. QPL or Standard.

5.4.2.7.3.1 Test Sample Preparation. Lengths of tapes sufficient for this test shall be unwound from the reels and placed in a 21° C ± 3° C (70° F ± 5° F) 50 ± 5 percent relative humidity environment. The samples shall be free from distortions and allowed to hang for at least 24 hours before conducting the test.

5.4.2.7.4 Test Procedure. The surface electrical resistance of the oxide and backcoating (if present) shall be determined in accordance with Method 4041, Insulation Resistance for Flexible Tapes, of Federal Test Method Number 406 to determine conformance with this specification. Two layers of the test sample shall be placed in the strip electrodes, backing material to backing material, so that only the oxide (or backcoated) surfaces of the tape are in contact with the electrodes. The method of clamping shall be similar to that specified. The measurement potential shall be 500 ± 10 volts dc.

5.4.2.8 Layer-to-Layer Adhesion.

5.4.2.8.1 Requirement. The tape shall show no sticking or layer-to-layer adhesion when tested as specified.

5.4.2.8.2 Test Equipment. A Blue M Company Model CFR 7652C humidity controlled chamber with an attached Blue M Model WP 4800 Crystal-Clear Water Purification System; a special winding apparatus; and hollow metal tubes on which tape samples are wound. The tubes shall be made of non-oxidizing metal such as brass or corrosion-resisting steel 12.5 cm (0.5 in) in diameter and 1 dm (3.94 in) in length, and shall weigh no less than 15 grams (0.525 ounce) nor more than 30 grams (1.05 ounce). The tubes shall be capable of being mounted in bearings so that they may be rotated freely on their axes and easily removed from the bearings.

5.4.2.8.3 Test Sample Environmental Conditioning. QPL or Standard.

5.4.2.8.4 Test Procedure. A 1 m (39.37 in) sample length of tape shall be affixed to the tube with the magnetic oxide surface down with a nonflowing adhesive material. The tube shall then be mounted on the bearings and the tape wound at a tension of 5 N/mm^2 (725.2 lbf/in^2). The tube shall then be slowly and uniformly rotated so that the tape winds uniformly around the tube into a compact and even roll.

The tube supporting the rolled tape shall be removed from the winding setup and subjected to a 24-hour heat and humidity cycle in which the first 16 hours shall be at 54° C (129.2° F), 85 ± 5 percent relative humidity; 4 hours shall be at 54° C (129.2° F) dry heat (less than 5 percent relative humidity); and the final 4 hours shall be at 21° C ± 3° C (70° F ± 5° F) 50 ± 5 percent relative humidity.

The tape shall then be unwound slowly and any tendency of the tape sticking and delamination of the magnetic coating shall be observed and noted.

5.5 PRODUCT PERFORMANCE

5.5.1 Dropouts.

5.5.1.1 Definition. A dropout is a loss of read-back amplitude. A dropout exists when the read-back signal amplitude is 25 percent or less of the average signal amplitude. When a dropout is detected, a second dropout should not be counted until 28 consecutive dropout free flux transitions are read.

5.5.1.2 Requirement. The total dropout count shall not exceed a bit-error-rate (BER) of 2×10^{-6} without an error correcting code; therefore, the total number of dropout blocks shall be limited to 5000.

5.5.1.3 Test Equipment. Media Logic Model ML4500 8mm Tape Cartridge Evaluator.

5.5.1.4 Test Sample Environmental Conditioning. QPL or Standard.

5.5.1.5 Test Procedure. The tape is written with an "all ones" bit pattern using the NRZI recording method and read back at a threshold of 25 percent. The ML4500 dropout detection circuits locate and count dropout blocks using three counters. The three counters are designated as the "bad bits" counter, the "good bits" counter and the "block length" counter. The "bad bits" counter is set to define the minimum number of error bits (8) required to count one dropout block; the "good bits" counter is set to define the number of good bits (28) that must occur before a new dropout block can be initiated; and the "block length" counter is set to define the maximum duration (in bits) of a dropout block (80) before the dropout block count is incremented again. The results of the test is the total number of dropout blocks detected divided by the storage capacity (2.5 gigabytes).

5.5.2 Resolution.

5.5.2.1 Requirement. The resolution of the tape shall be between 80 percent and 120 percent of that for the secondary standard reference tape.

5.5.2.2 Test Equipment. Media Logic Model ML4500 Tape Cartridge Evaluator.

5.5.2.3 Test Sample Environmental Conditioning. QPL or Standard.

5.5.2.4 Test Procedure. The tape is positioned to the desired location for the test. A Tape Average Amplitude (TAA) measurement is made for a low frequency and a high frequency. Each TAA measurement is made over the number of tracks specified in the tracks to test parameter. The resolution is the ratio between the high frequency and low frequency TAA measurements (in percent).

5.5.3 Signal to Noise.

5.5.3.1 Requirement. The narrow band signal-to-noise-ratio shall be equal to or greater than 34 decibels (dB).

5.5.3.2 Test Equipment. Media Logic Model ML4500 Tape Cartridge Evaluator.

5.5.3.3 Test Sample Environmental Conditioning. QPL or Standard.

5.5.3.4 Test Procedure. The tape is positioned to the desired location for the test. An RMS amplitude measurement is made on the blank media over the the number of tracks specified in the tracks to test parameter. The media is anhysteretic erased, and an RMS amplitude measurement is made for the frequency specified over the number of tracks specified in the tracks to test parameter. The signal to noise result is the ratio of the two RMS measurements displayed in dB.

6. PREPARATION FOR DELIVERY

Unless otherwise specified in the contract or purchase order, 8mm cartridges supplied under this specification shall be marked, packaged, and packed in accordance with paragraphs 6.1 through 6.3.

6.1 PACKAGING

Each 8mm cartridge along with a set of blank user labels shall be packaged in a clear plastic case. The case shall then be packaged in a heat-sealed, airtight, plastic bag of sufficient gauge to ensure the integrity of the cartridge until received by the users.

6.2 PACKING

Ten (10) 8mm cartridges packaged as defined in paragraph 6.1 shall be packed in a closefitting, fiberboard box conforming to the requirements of PPP-B-636, type CF, class domestic, grade 275.

6.3 SPECIAL MARKING

In addition to the markings required by Federal Standard Number 123, the cartridges and shipping boxes shall contain the following identification:

6.3.1 Cartridge. Unique and easily read identification of the 8mm cartridges supplied under this specification shall be provided by assigning a manufacturer's type number, lot number, unique serial number*, and tape length to the cartridge.

*NOTE: THE SERIAL NUMBER FOR EACH 8MM CARTRIDGE MUST BE A UNIQUE NUMBER FOR EACH CARTRIDGE IN THE LOT AND SHALL BE LOCATED ON THE CARTRIDGE SO THAT IT WILL BE VISIBLE THROUGH THE CASE WHEN HANGING ON 8MM CARTRIDGE RACKS. THE NUMBERS MUST BE EASILY DISCERNIBLE AND MUST CONTRAST WITH THE BACKGROUND.

6.3.2 Master Carton. Each master carton of cartridges packed as defined in paragraph 6.2 shall be marked as follows:

a. Manufacturer's type number.

b. Number of 8mm cartridges in the carton.

c. Manufacturer's lot number.

d. Date of manufacturer (month and year).

e. Contract number.

f. NASA order number.

g. NASA federal stock number.

7. CONTRACT INFORMATION

7.1 ORDERING DATA

Purchasers should select the preferred options permitted in this specification and include the following information in the procurement documents:

a. Title, symbol, and date of this specification.

b. Quantity of 8mm cartridges required.

c. Inspection responsibility if other than specified.

d. Specify when packaging and packing, other than specified herein, is required.

e. Specify whether the special marking described in this specification is required.

7.2 CONTRACT AWARDS

With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for the opening of bids, been tested according to NASA TM 104558 and approved for inclusion in the NASA GSFC QPL whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement and manufacturers are urged to arrange to have the products they propose to offer to the certifying agency tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The organization responsible for the NASA QPL is the GSFC MTCF (Code 562.2), Greenbelt, Maryland 20771. Information pertaining to product qualification and scheduling can be obtained from this facility.

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
AA	2.4	-0.1	0.0945	-0.0039
AB	7.5	±0.1	0.2953	±0.0039
AC	0.55	±0.1	0.0217	±0.0039
AD	39.35	±0.2	1.5492	±0.0079
AE	12.0	+0.1	0.4724	±0.0039
AF	1.5	±0.1	0.591	±0.0039
AG	15.0	±0.2	0.5906	±0.0079
AH	12.0	MAX	0.4724	MAX
AI	10.0	±0.1	0.3937	±0.0039
AJ	15.15	REF	0.5965	REF
AK	47.35	±0.15	1.8642	±0.0059
AL	62.5	±0.3	2.461	±0.012
AM	7.5	±0.1	0.2953	±0.0039
AN	11.0	±0.2	0.4331	±0.0079
AP	13.5	±0.1	0.5315	±0.0039
AQ	3.0	MIN	0.1181	MIN
AR	95.0	±0.2	3.7402	±0.0079
AS	R2.3	±0.1	R0.0906	±0.0039
AT	Ø0.65	+0.3	Ø0.2559	+0.0118
AU	R2.0	MIN	R0.0787	MIN

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
AV	0.5	REF	0.0197	REF
AW	14.65	±0.10	0.5768	±0.0039
AX	13.15	±0.10	0.5177	±0.0039
AY	3.85	±0.10	0.1516	±0.0039
AZ	1.5	±0.10	0.0591	±0.0039
BA	34.5	±0.1	1.3583	±0.0039
BB	68.0	±0.1	2.6772	±0.0039
BC	1.0	±0.1	0.0394	±0.0039
BD	69.0	±0.2	2.7165	±0.0079
BE	3.5	±0.1	0.1378	±0.0039
BF	79.7	±0.2	3.1378	±0.0079
BG	3.0	±0.05	0.1181	±0.0020
BH	8.35	±0.1	0.3287	±0.0039
BI	23.0	±0.05	±0.9055	±0.0020
BJ	6.5	MIN	0.2559	MIN
BK	36.35	±0.08	1.4311	±0.0031
BL	39.65	REF	1.5610	REF
BM	43.35	±0.15	1.7067	±0.0059
BN	3.7	±0.1	0.1457	±0.0039
BP	4.0	±0.1	0.1575	±0.0039

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
BQ	11.4	±0.05	0.4488	±0.0020
BR	46.2	±0.1	1.8189	±0.0039
BS	6.4	±0.1	0.2520	±0.0039
BT	13.0	±0.1	0.5118	±0.0039
BU	72.6	REF	2.8583	REF
BV	2.3	±0.1	0.0906	±0.0039
BW	1.5	±0.1	0.0591	±0.0039
BX	76.7	REF	3.0197	REF
BY	10.0	±0.1	0.3937	±0.0039
BZ	79.0	±0.2	3.1102	±0.0079
CA	10.2	±0.05	0.4016	±0.0020
CB	79.2	±0.2	3.1181	±0.0079
CC	89.4	±0.1	3.5197	±0.0039
CD	13.0	±0.1	0.5118	±0.0039
CE	82.0	REF	3.2283	REF
CF	1.2	+0.3 -0.1	0.0472	+0.0118 -0.0039
CG	Ø3.0	+0.05	Ø0.1181	+0.0020
CH	58.0	±0.1	2.2835	±0.0039
CI	10.0	±0.1	0.3937	±0.0039
CJ	11.0	±0.1	0.4331	±0.0039

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
CK	0.5	MAX	0.0197	MAX
CL	7.0	±0.1	0.2756	±0.0039
CM	30.0	±0.1	1.1811	±0.0039
CN	R24.15	±0.10	R0.9508	±0.0039
CP	5.5	±0.1	0.2165	±0.0039
CQ	54.5	±0.2	2.1457	±0.0079
CR	Ø5.0	±0.1	Ø0.1969	±0.0039
CS	2.0	±0.2	0.0787	±0.0079
CT	5.0	±0.3	0.197	±0.0118
CU	35.85	±0.15	1.4114	±0.0059
CV	Ø18.8	±0.05	Ø0.7402	±0.0020
CW	8.4	MAX	0.3307	MAX
CX	12.5	MIN	0.4921	MIN
CY	Ø3.5	±0.1	Ø0.1378	±0.0039
CZ	4.0	MIN	0.1575	MIN
DA	1.5	MIN	0.0591	MIN
DB	1.2	±0.1	0.0472	±0.0039
DC	Ø2.6	MIN	Ø0.1024	MIN
DD	5.0	MIN	0.1969	MIN
DE	0.3	MAX	0.118	MAX

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
DF	0.5	MAX	0.0197	MAX
DG	□ 2.5	±0.4	□ 0.0985	±0.0157
DH	6.05	±0.1	0.2382	±0.0039
DI	2.4	-0.1	0.0945	-0.0039
DJ	76.28	*	3.0031	*
DK	12.46	*	0.4906	*
DL	5.11	*	0.2012	*
DM	27.25	*	2.0689	*
DN	23.0	*	0.9055	*
DP	12.0	REF	0.4724	REF
DQ	0.5	MIN	0.0197	MIN
DR	1.61	±0.1	0.0634	±0.0039
DS	16.0	REF	0.6299	REF
DT	11.65	±0.1	0.4587	±0.0039
DU	31.15	*	1.2264	*
DV	11.4	*	0.4488	*
DW	46.2	*	1.8189	*
DX	3.5	±0.1	0.1378	±0.0039
DY	1.0	±0.1	0.0394	±0.0039
DZ	Ø1.4	MIN	Ø0.0551	MIN

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
EA	Ø16.0	*	Ø0.6299	*
EB	Ø46.3	+0.2	Ø1.8228	+0.0079
EC	Ø43.2	MAX	Ø1.7008	MAX
ED	9.67	*	0.3807	*
EE	Ø45.1	-0.5	Ø1.7768	-0.020
EF	Ø16.05	-0.1	Ø0.6299	-0.0039
EG	5.4	±0.1	0.2126	±0.0039
EH	4.4	±0.1	0.1732	±0.0039
EI	9.4	MIN	0.3701	MIN
EJ	Ø6.5	+0.08	Ø0.2559	+0.0031
EK	Ø10.0	+0.08	Ø0.3937	+0.0031
EL	Ø16.0	MAX	Ø0.6299	MAX
EM	Ø18.0	-0.1	Ø0.7087	-0.0039
EN	Ø3.0	±0.1	Ø0.1181	±0.0039
EP	2.4	±0.1	0.0945	±0.0039
ER	0.6	MAX	0.0236	MAX
ET	0.2X	MAX	0.0079	MAX
EU	1.1	±0.05	0.0433	±0.0020
EV	0.6	±0.1	0.0236	±0.0039
EW	2.3	±0.05	0.0906	±0.0020

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
EX	8.3	±0.5	0.3268	±0.0020
EY	11.75	±0.15	0.4626	±0.0059
EZ	R0.2	MAX	R0.0079	MAX
FB	1.4	±0.05	0.0551	±0.0020
FC	0.7	REF	0.0276	REF
FD	12.4	REF	0.4882	REF
FE	0.6	±0.2	0.0236	±0.0079
FF	7.05	±0.10	0.2776	±0.0039
FG	1.2	±0.5	0.0472	±0.0020
FH	0.2X	MAX	0.0079	MAX
FI	7.5	MAX	0.2953	MAX
FJ	8.0	MAX	0.3150	MAX
FM	3.2		0.126	
FN	39.0	MIN	1.5354	MIN
FP	0.5	MIN	0.0197	MIN
FQ	0.3	MIN	0.0118	MIN
FR	4.0	±0.1	0.1575	±0.0039
FS	Ø46.3	±0.1	1.8228	±0.0039
FT	R0.3	MAX	R0.0118	MAX
FU	4.0	±0.1	0.1575	±0.0039

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
FV	1.0	MIN	0.0394	MIN
FW	7.8	MAX	0.3071	MAX
FX	41.75	MIN	1.6437	MIN
FZ	0.7	±0.1	0.0276	±0.0039
GA	1.2	±0.1	0.0472	±0.0039
GB	0.8	±0.1	0.0315	±0.0039
GC	1.0	±0.1	0.0394	±0.0039
GD	1.5	±0.1	0.591	±0.0039
GE	0.5	±0.1	0.0197	±0.0039
GF	3.8	±0.1	0.1496	±0.0039
GG	0.2	±0.2	0.0079	±0.0079
GH	2.3	MAX	0.0906	MAX
GI	2.5	±0.2	0.0984	±0.0079
GJ	7.0	±0.2	0.2756	±0.0079
GK	0.3	±0.1	0.0118	±0.0039
GL	1.7	REF	0.0669	REF
GM	0.6	REF	0.0236	REF
GQ	1.0	±0.1	0.0394	±0.0039
GR	0.7	REF	0.0276	REF
GS	8.2	REF	0.3228	REF

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
GU	1.2	±0.1	0.0472	±0.0039
GV	6.3	REF	0.2480	REF
GX	2.0	±0.1	0.0787	±0.0039
HA	7.7	MAX	0.3031	MAX
HB	0.55	REF	0.0217	REF
HD	R14.7	MAX	R0.5787	MAX
HE	15.2	MAX	0.5984	MAX
HF	7.5	REF	0.2953	REF
HG	15.3	MAX	0.6024	MAX
HH	7.0	±0.1	0.2756	±0.0039
HI	7.5	±0.1	0.2953	±0.0039
HJ	10.1	±0.1	0.3976	±0.0039
HK	0.55	±0.1	0.0217	±0.0039
HL	13.15	±0.1	0.5177	±0.0039
HM	R14.9	MAX	R0.5866	MAX
HN	22.5	MAX	0.8858	MAX
HP	1.0	MIN	0.0394	MIN
HQ	14.8	MIN	0.5827	MIN
HR	11.5	±0.2	0.4528	±0.0079
HS	11.05	±0.1	0.4350	±0.0039

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
HT	3.05	±0.1	0.1201	±0.0039
HU	1.2	±0.1	0.0472	±0.0039
HV	22.3	MAX	0.878	MAX
HW	66.8	MIN	2.6299	MIN
HX	1.2	MAX	0.0472	MAX
HY	1.15	REF	0.0453	REF
HZ	14.0	REF	0.5512	REF
IB	10.0	MIN	0.3937	MIN
IC	69.0	±0.2	2.7165	±0.0079
ID	1.0	±0.1	0.0394	±0.039
IF	13.15	±0.1	0.51773	±0.0039
IG	3.85	±0.1	0.1516	±0.0039
IH	13.8	±0.3	0.543	±0.012
II	1.15	±0.15	0.0453	±0.0059
IK	3.8	±0.1	0.1496	±0.0039
IL	2.5	±0.4	0.0984	±0.0157
IM	6.05	±0.10	0.2382	±0.0039
IN	13.0	MAX	0.5118	MAX
IP	80.0	±0.10	3.15	±0.39
IQ	10.15	*	0.3996	*

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

	METRIC (MM)		ENGLISH (IN)	
SYMBOL	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
IR	10.15	±0.10	0.3996	±0.0039
IS	R3.0	±0.1	R0.1181	±0.0039
IT	0.6	MAX	0.0236	MAX
IU	0.3	±0.1	0.0118	±0.0039
IV	2.4	±0.2	0.0945	±0.0079
IW	1.0	±0.1	0.0394	±0.0039
IX	1.2	±0.1	0.0472	±0.0039
IY	2.0	-0.2	0.0787	-0.0079
IZ	1.9	REF	0.0748	REF

Ø–DIAMETER DIMENSION

□ SQUARE DIMENSION

R–RADIUS DIMENSION

* – NOMINAL VALUES SPECIFYING TAPE PATH

TABLE I

CARTRIDGE DIMENSIONS AND TOLERANCES

SYMBOL	DIMENSION	TOLERANCE
a	90°	±1°
b	45°	±1°
c	45°	±1°
d	20°	REF
e	30°	°1°
f	45°	±1°
g	30°	±1°
h	15°	±1°
j	45°	±1°
k	15°	±1°
m	30°	±1°
n	5°	MAX
p	5.5°	±0.25°
q	45°	±1°
r	15°	±1°
s	60°	±1°
t	60°	±1°
u	45°	±1°
w	49°	MAX
x	45°	±1°
y	45°	±1°

TABLE II. TEST AND EXAMINATION ACCEPTANCE CRITERIA

NORMAL INSPECTION LEVEL 1 AQL 2.5	
Group A	Required Paragraph
Workmanship and General Examination	5.1.10
Total Thickness	5.4.2.1.2
Length	5.4.2.1.3
Dropouts	5.5.1
SPECIAL INSPECTION LEVEL S-1 AQL 4.0	
Group B	
Cartridge Physical Requirements	5.4.1
Width	5.4.2.1.1
Slitting	5.4.2.2
Magnetic Properties	5.4.2.3
Magnetic Coating Electrical Resistance	5.4.2.7
Layer-to-Layer Adhesion	5.4.2.8
NORMAL INSPECTION LEVEL 1 AQL 0.40	
Group C	
Discontinuities	5.1.7
Physical Damage	5.1.11
OTHER TESTS AND EXAMINATIONS SPECIAL INSPECTION LEVEL S-1 AQL 4.0	
Group D	
Toxic Compounds	5.1.6.2
Flammable Materials	5.1.6.3
Tensile Strength	5.4.2.4
Residual Elongation	5.4.2.5
Longitudinal Curvature	5.4.2.6

TABLE III. GENERAL EXAMINATION DEFECTS

EXAMINE	DEFECTS
Cartridges: Appearance	Voids, nicks and other surface imperfections.
Dimensions	Not as specified.
File-Protect	Not as specified.
Marking	Not as specified.
Packaging	Not as specified.
Packing	Not as specified.
Tape:	Tape surface not clean; presence of dirt, dust, lint, fuzz, or other foreign matter; presence of blemishes, holes, tears, creases, or wrinkles; split or ragged edges.
Condition as Received:	Improper markings on carton. Damaged contents.

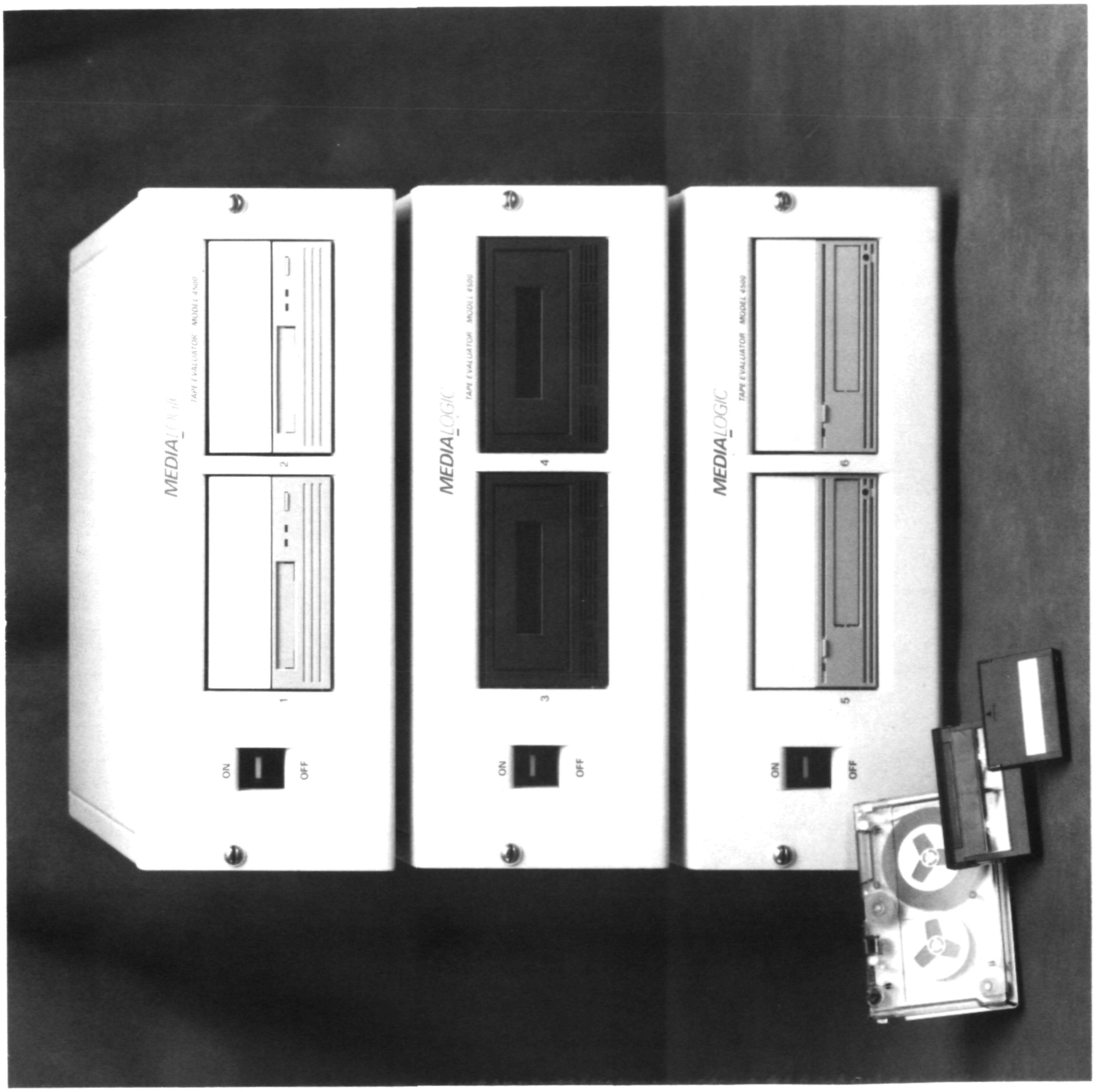


Figure 1a. 4mm, 8mm, QIC ML4500 Tape Evaluator.

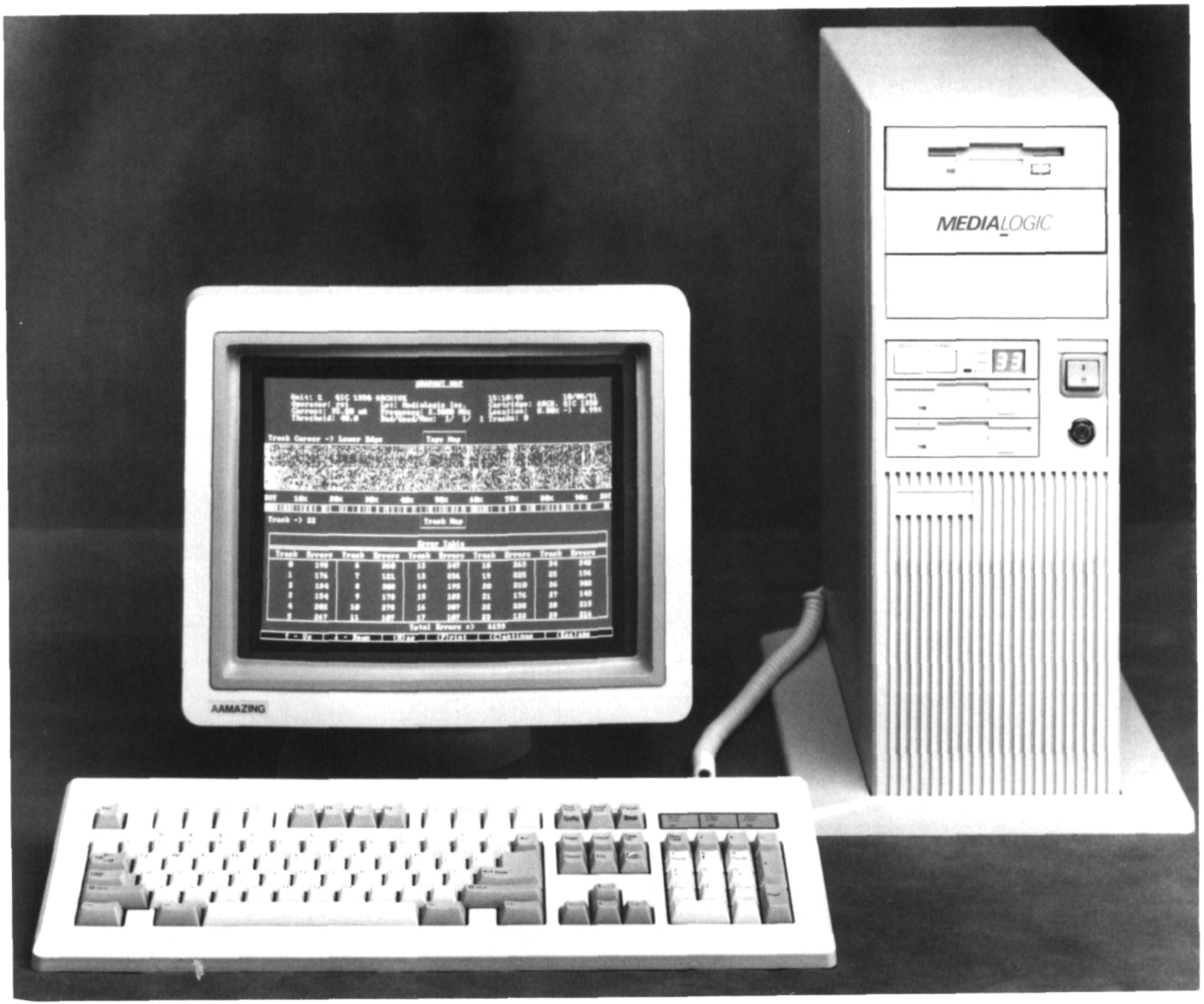


Figure 1b. 4mm, 8mm, QIC MC4500 Tape Evaluator.

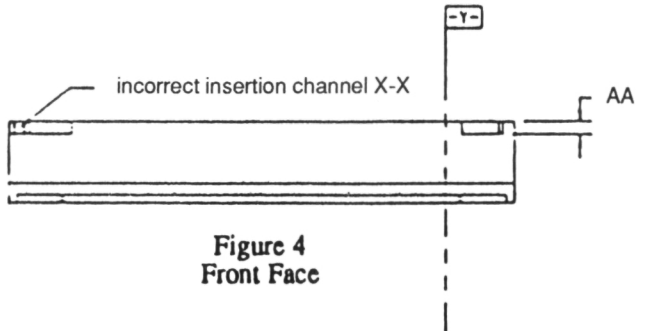


Figure 4
Front Face

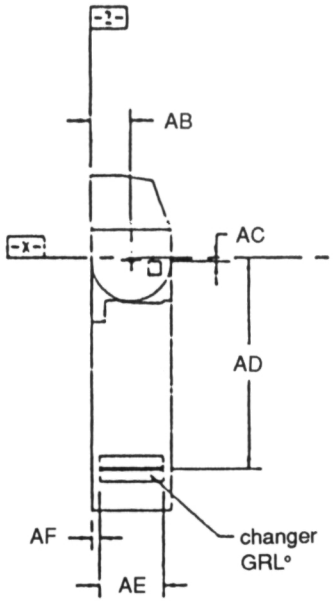


Figure 5
End Face

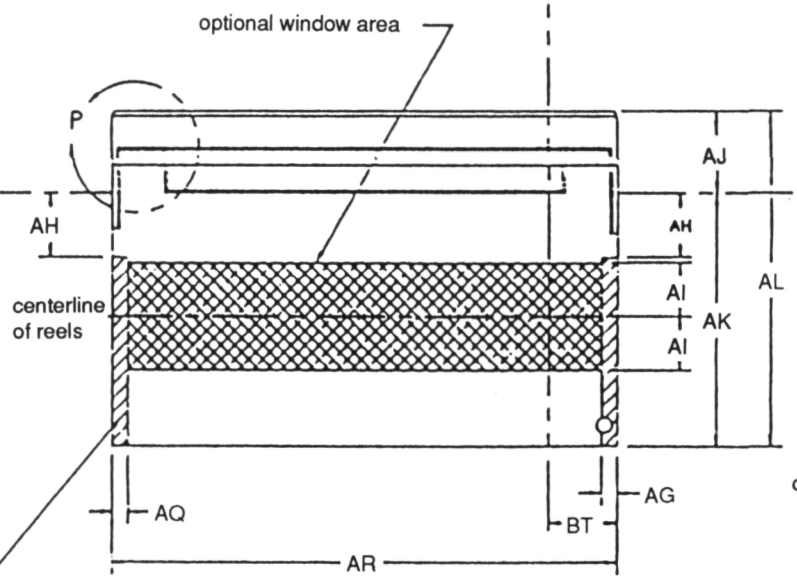


Figure 6
Top Face

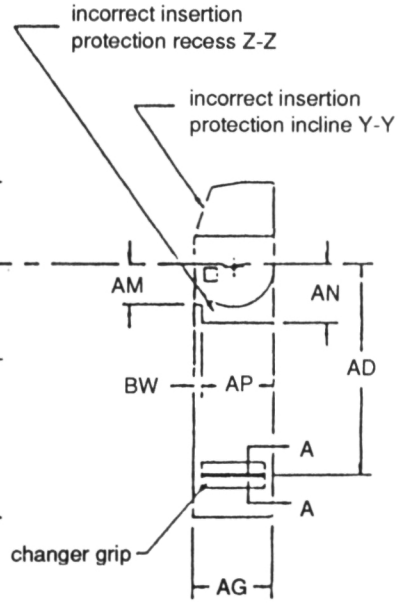


Figure 7
End Face

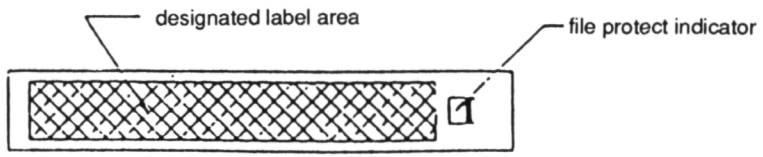


Figure 8
Back Face

support area
note 1.

Note 1. The cartridge shall be supported by the tape transport unit in the hatched area.

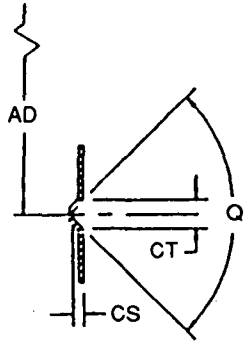


Figure 9
Section A-A

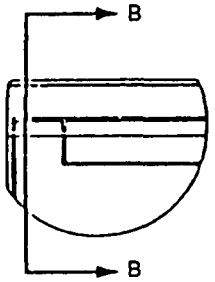


Figure 10
View P

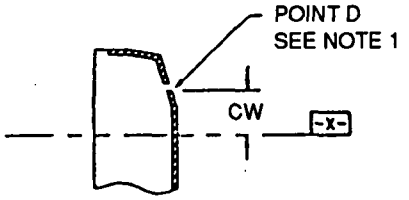


Figure 11
Section B-B/

NOTE 1. POINT D SHALL BE NO MORE THAN CW FROM DATUM PLANE X TO ENSURE THAT LID OPENER DOES NOT TOUCH POINT D WHEN LID IS OPEN.

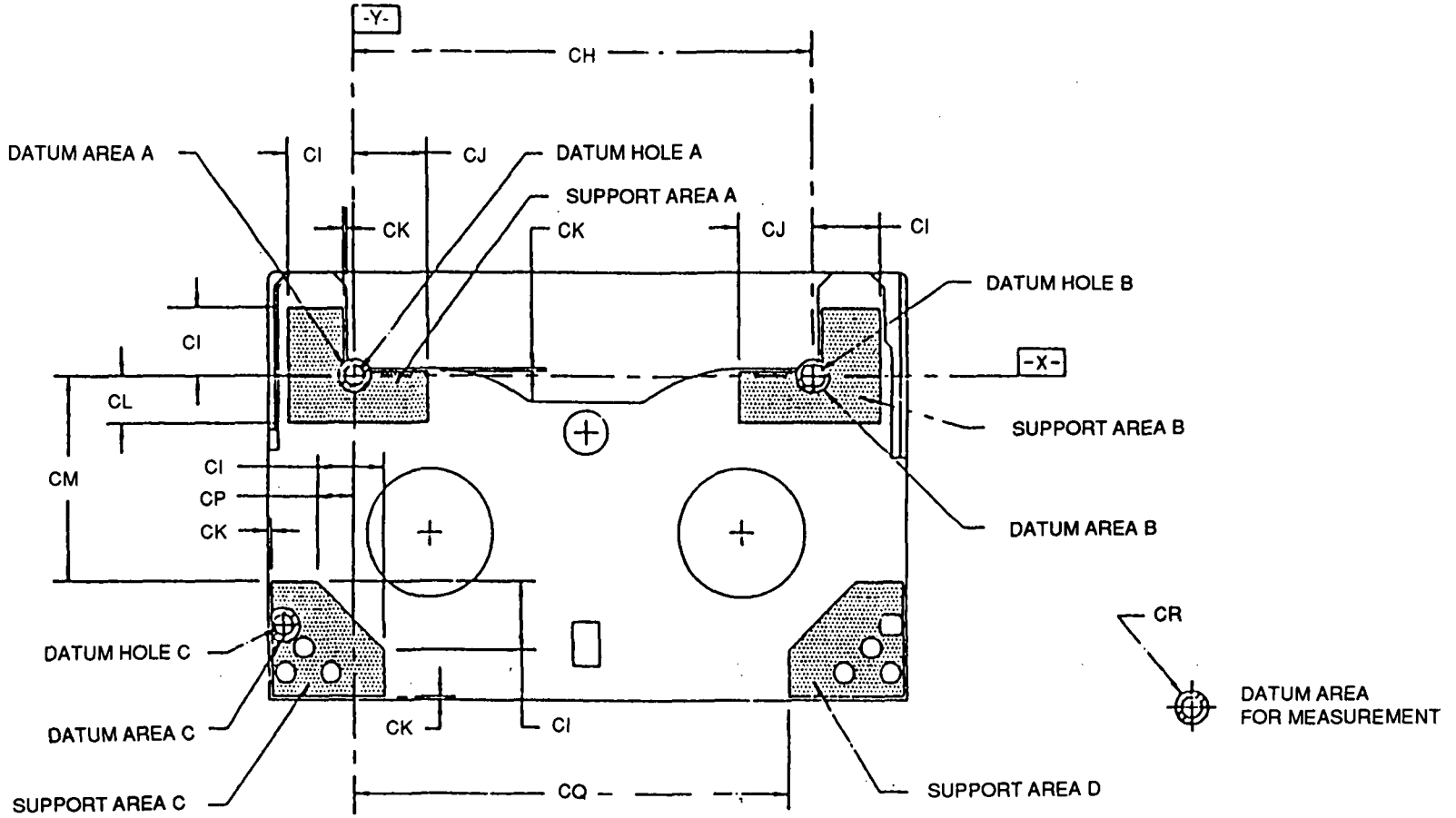
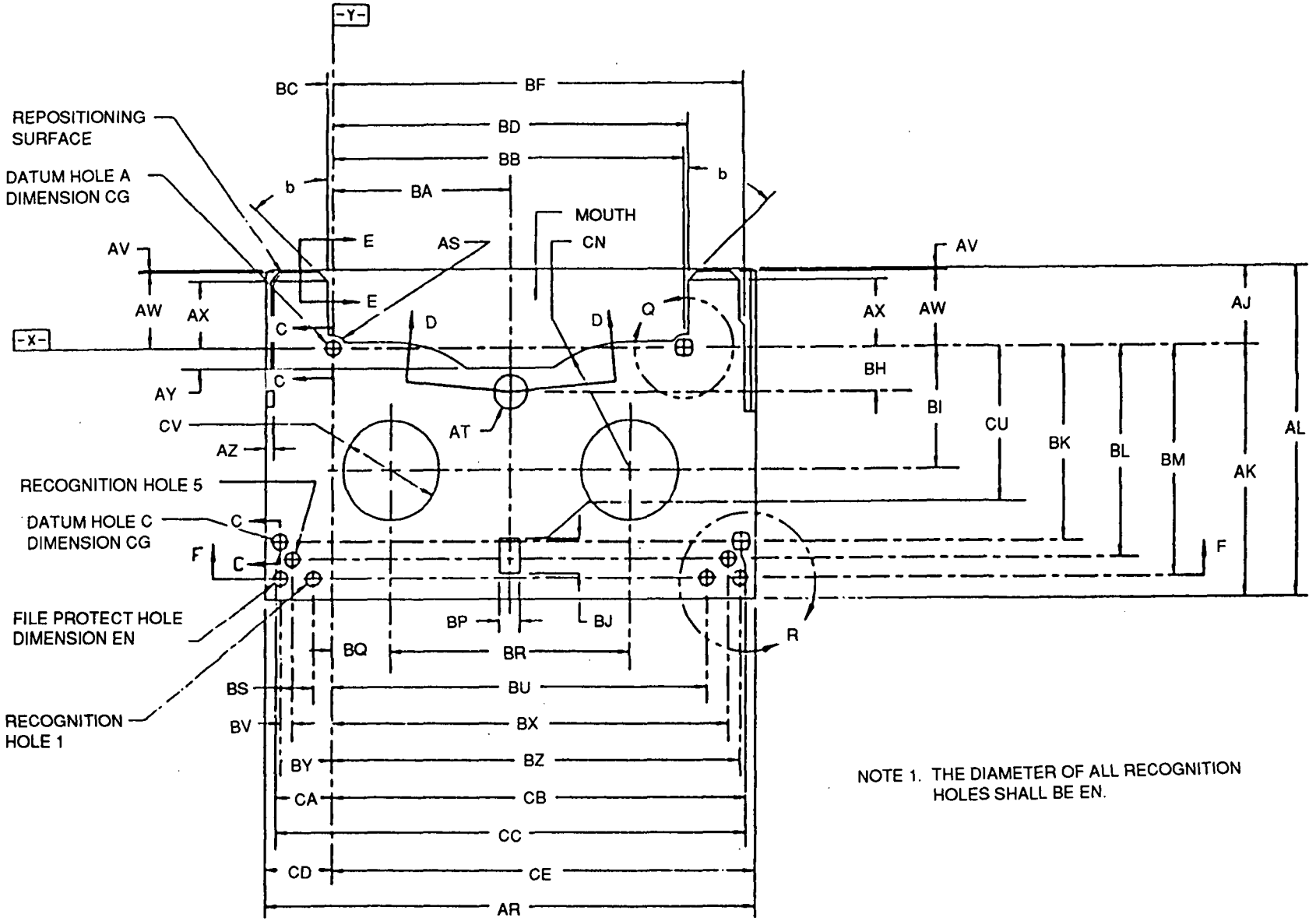


Figure 12
Cartridge Datum Areas and Support Areas



NOTE 1. THE DIAMETER OF ALL RECOGNITION HOLES SHALL BE EN.

Figure 13
Case Dimensions

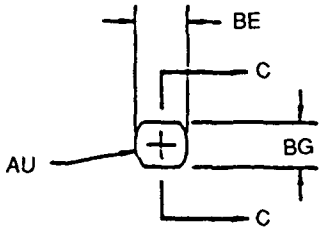


Figure 14
View Q

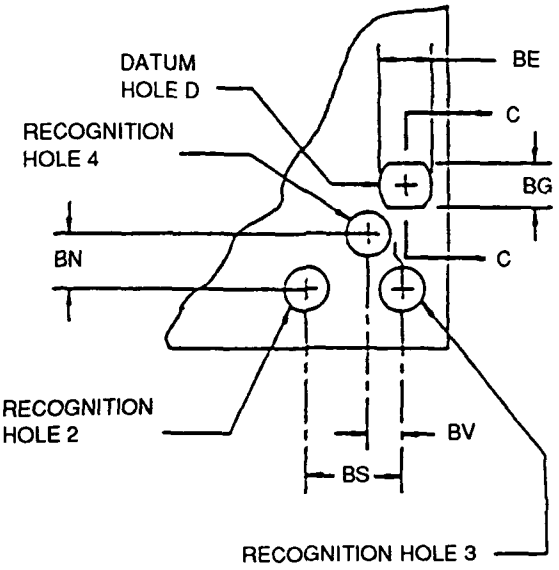


Figure 15
View R

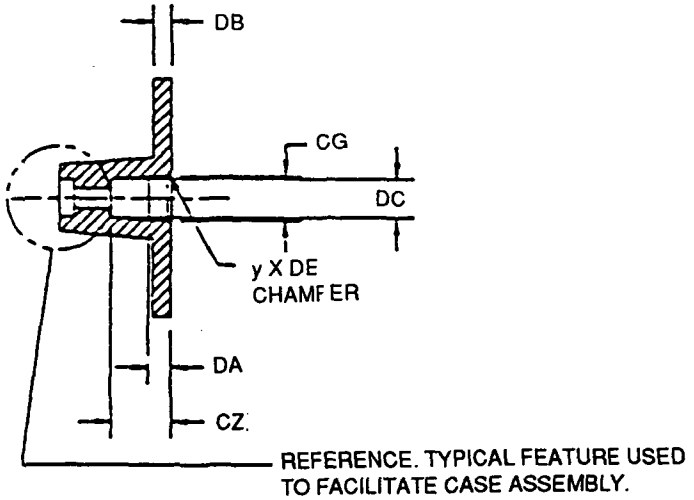
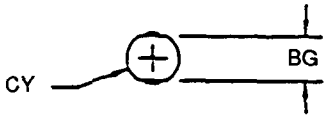


Figure 16
Section C-C



THIS CONFIGURATION IS ACCEPTABLE
FOR DATUM HOLES B AND D.

Figure 17
Datum Holes B And D

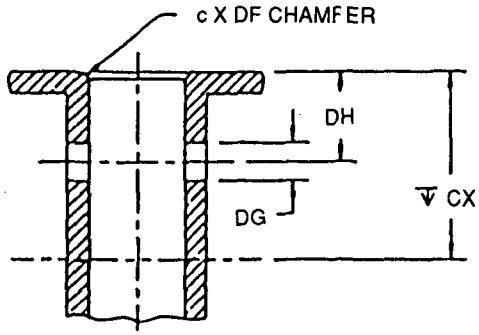


Figure 18
Section D-D

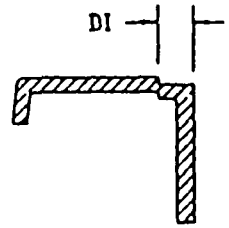


Figure 19
Section E-E

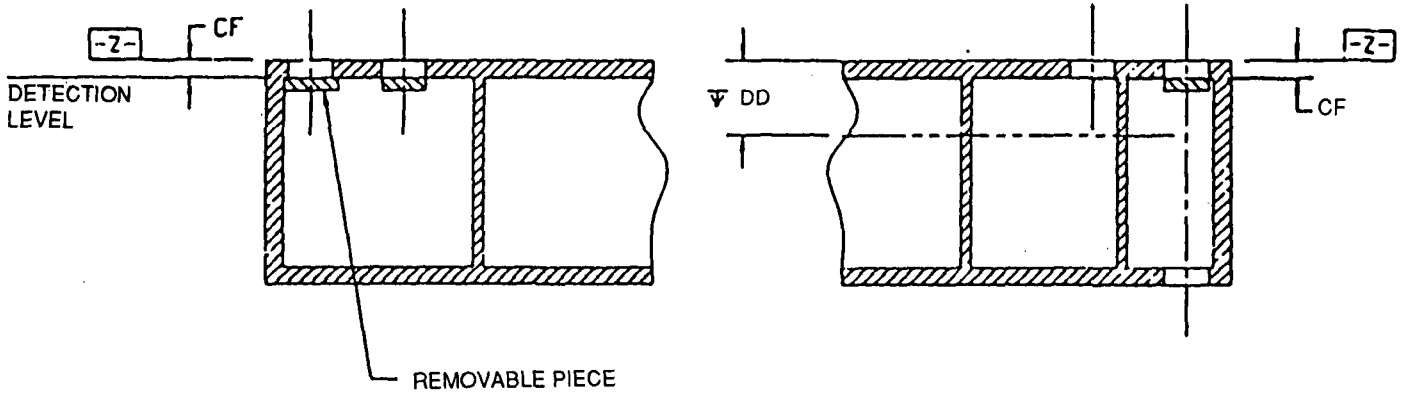


Figure 20
Section F-F

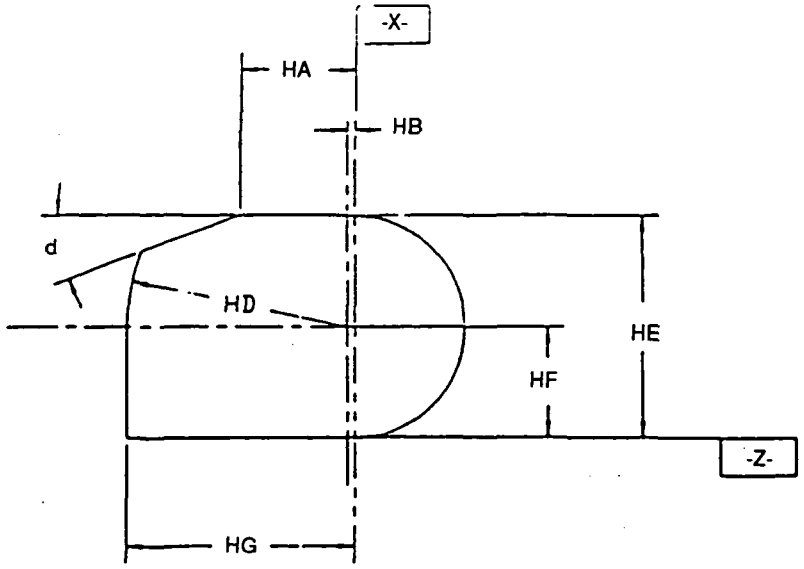


Figure 21
Size of Lid (Side View)

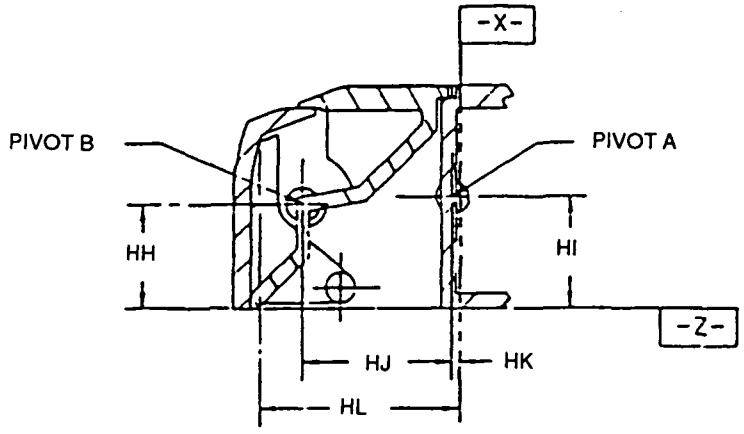


Figure 22
Lid Structure

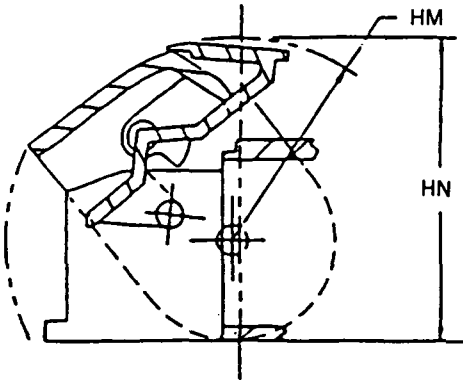


Figure 23
Lid Configuration When Rotating

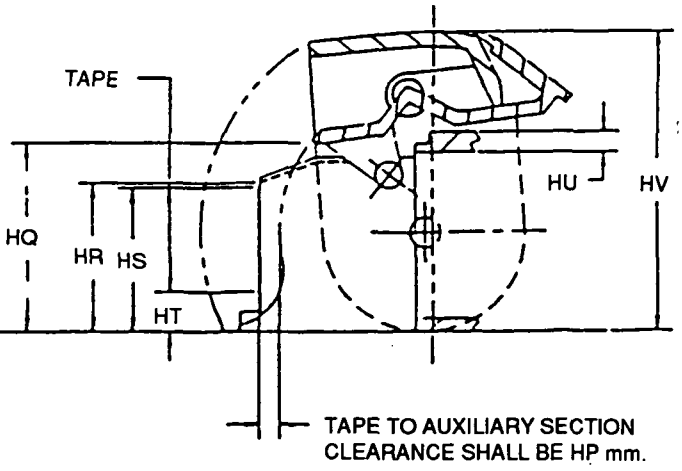


Figure 24
Lid Configuration When Lid is Open

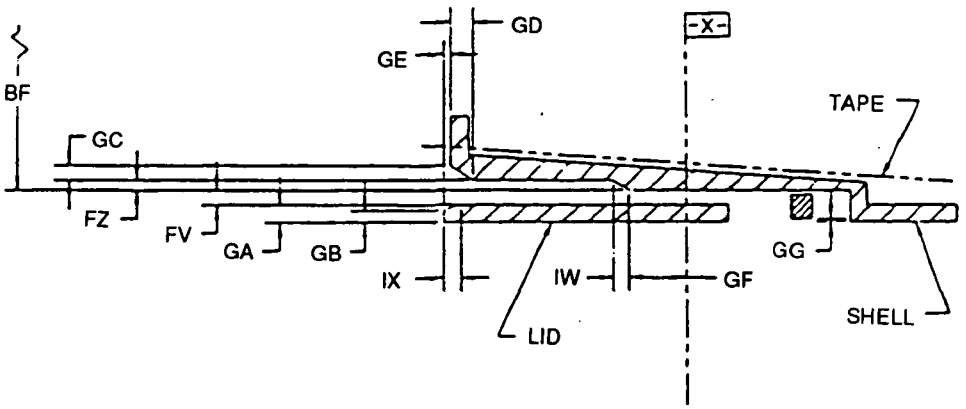
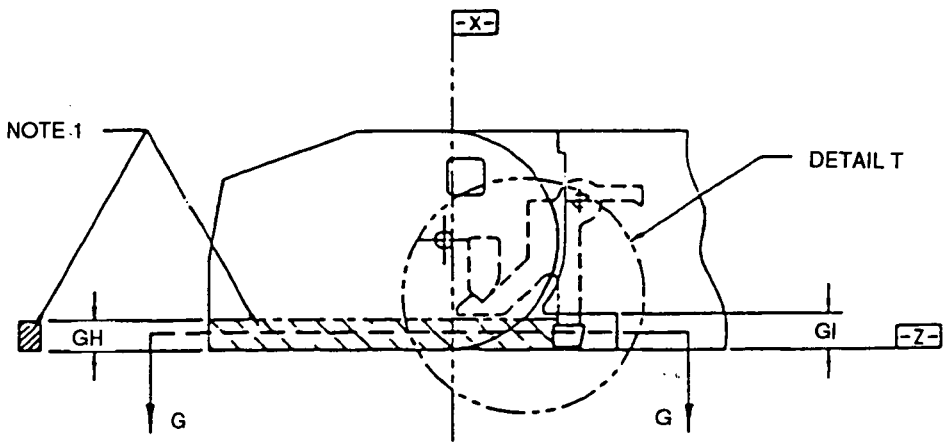
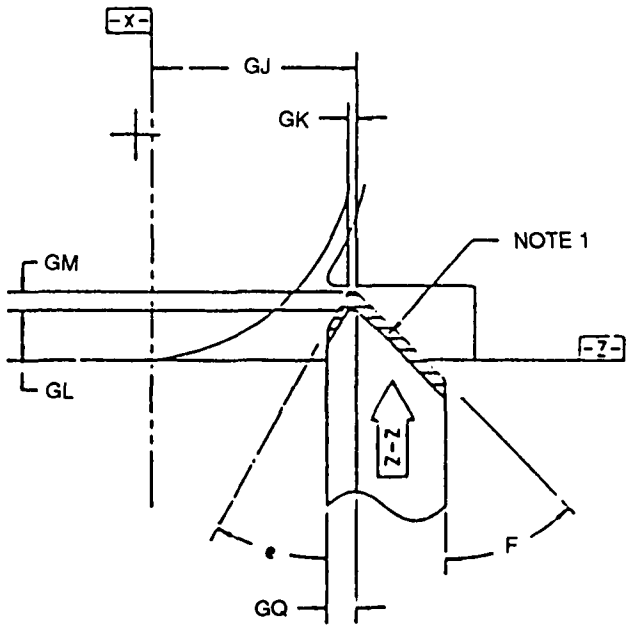


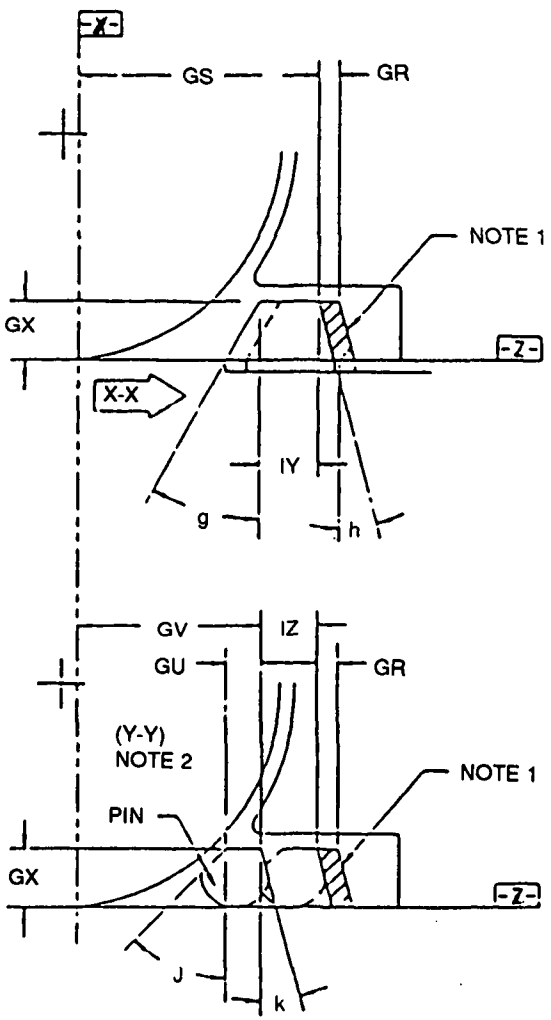
Figure 25
Section G-G



NOTE 1. LID LOCK AND RELEASE AND INSERTION AREA.

Figure 26
Lid Lock and Release





NOTE 1. WHEN PIN IS IN CROSS-HATCHED AREA, LID LOCK CAN BE RELEASED.

NOTE 2. LID LOCK CAN BE RELEASED IN Y-Y DIRECTION BY INSERTING RELEASE PIN FROM THE SIDE OF THE CARTRIDGE AND THEN MOVING IN THE X-X DIRECTION.

Figure 27
Detail T (Release Pin)

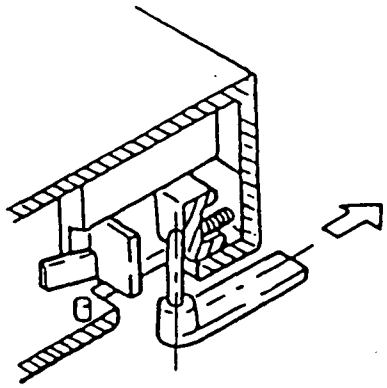


Figure 28
Force Needed to Unlock the Reel Lock

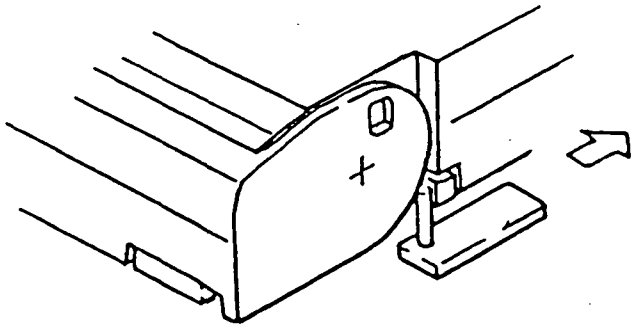


Figure 29
Force Needed to Unlock the Lid Lock

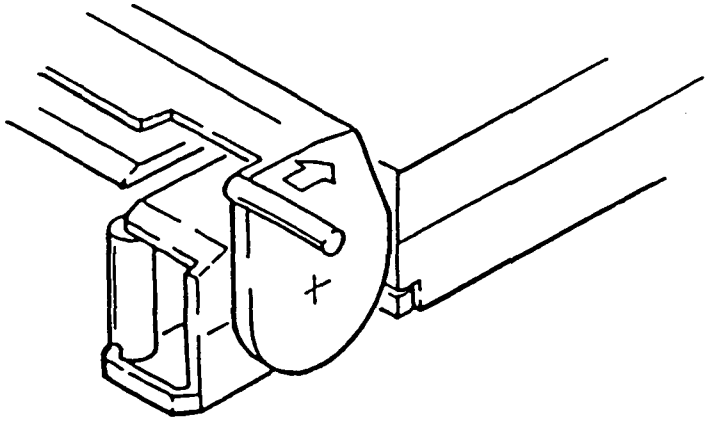


Figure 30
Force Needed to Open the Lid

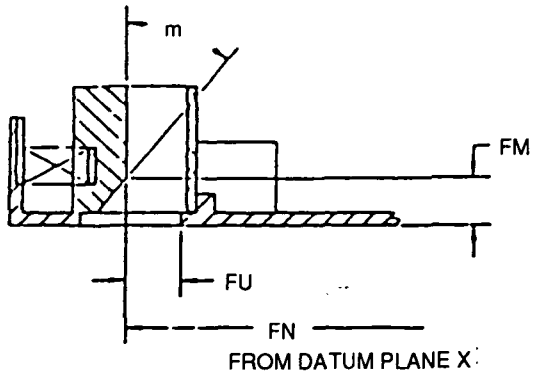


Figure 31
Reel Lock in Locked Position

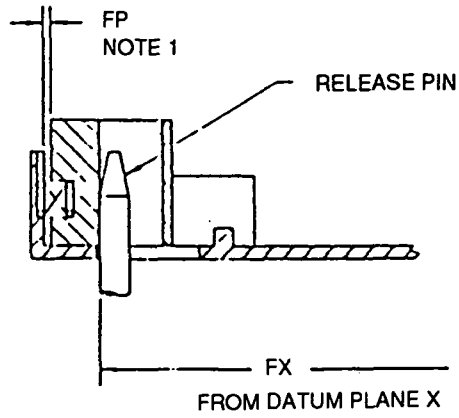


Figure 32
Reel Lock in Released Position 1

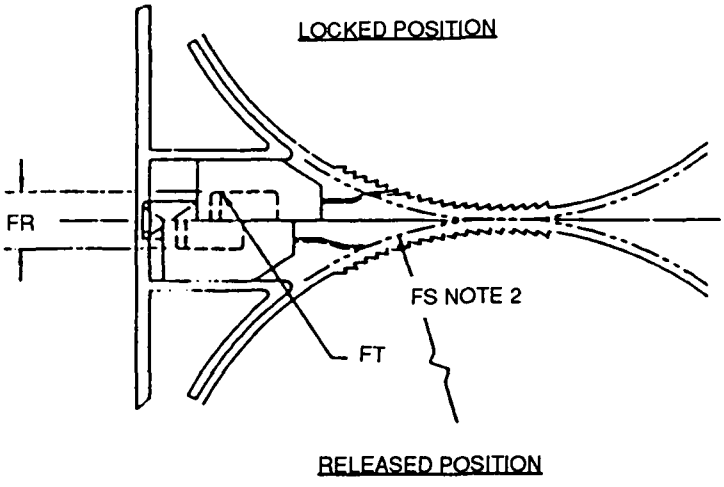


Figure 33
Reel Lock and Release

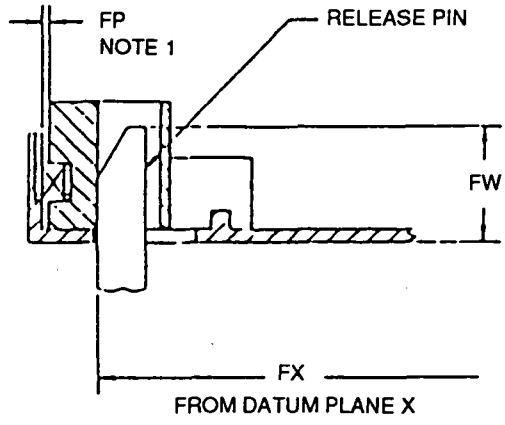


Figure 34
Reel Lock and Release in Position 2

NOTE 1. CLEARANCE BETWEEN REEL LOCK AND INSIDE OF SHELL SHALL BE FP mm WHEN THE RELEASE PIN IS LOCATED FX mm FROM DATUM PLANE X.

NOTE 2. THE END OF THE REEL LOCK SHALL REMAIL OUTSIDE THE FS mm DIAMETER REEL AREA WHEN THE RELEASE PIN IS LOCATED FX mm FROM DATUM PLANE X.

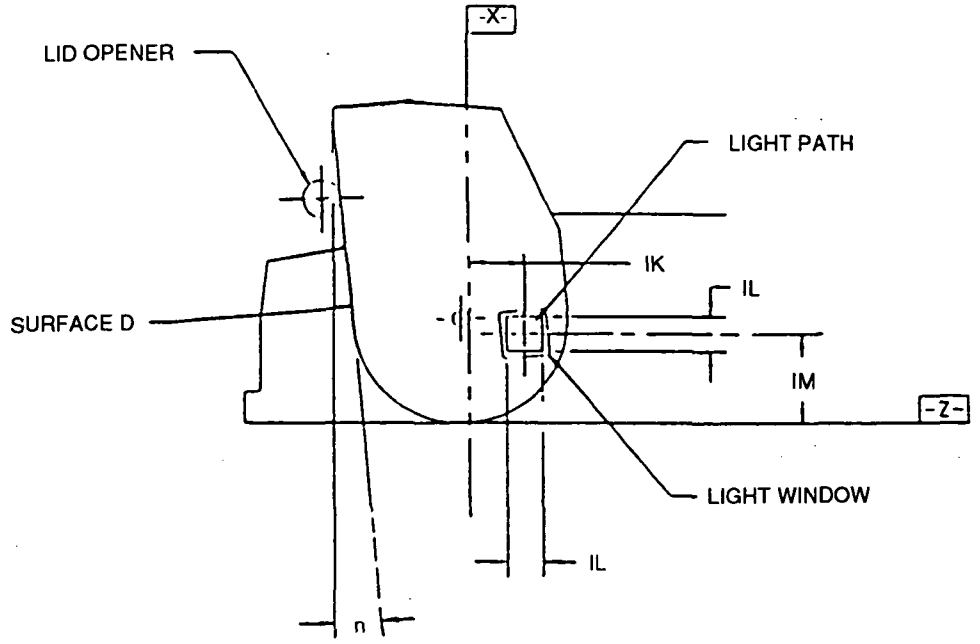


Figure 35
Light Path and Light Window

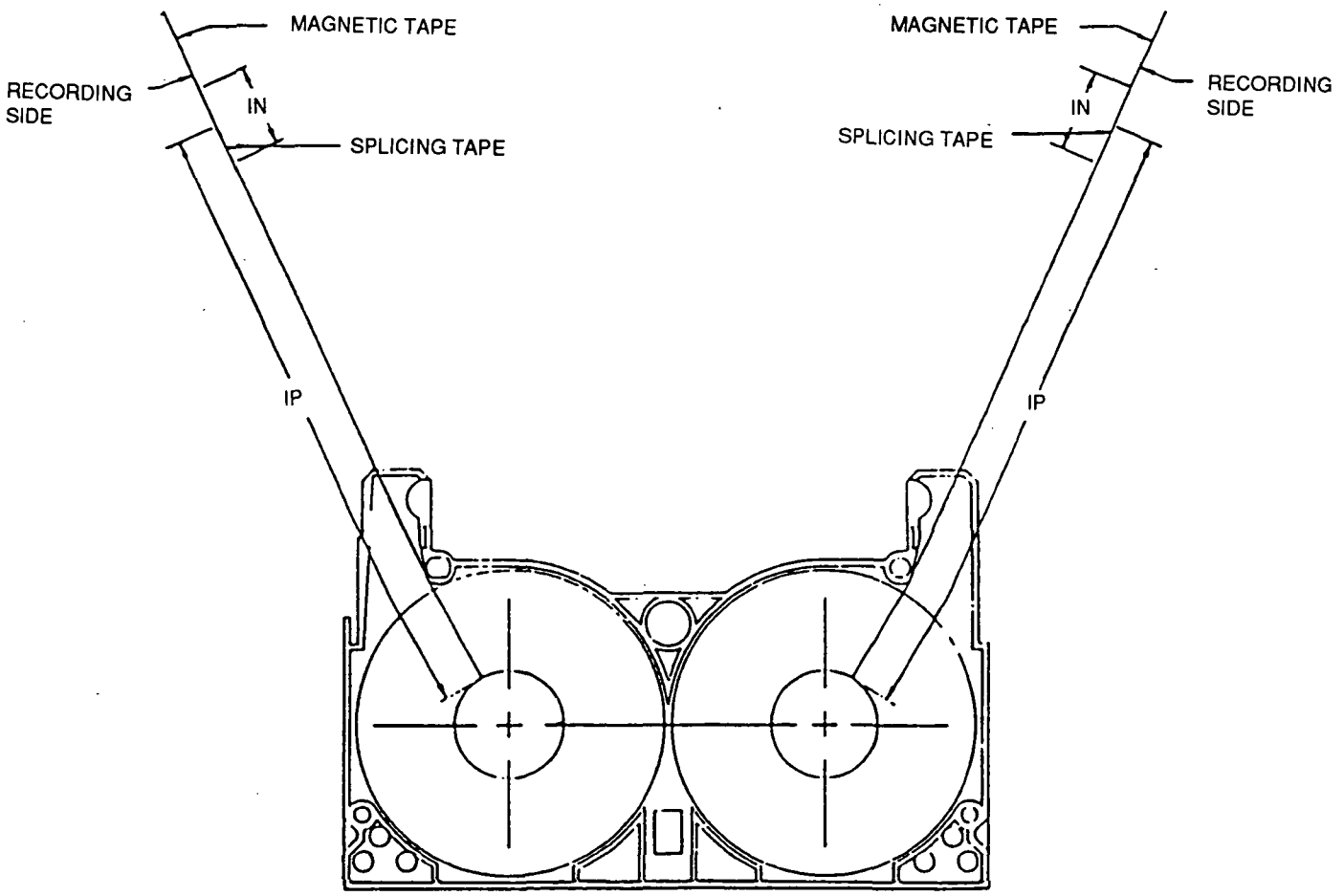


Figure 36
Leader and Trailer Tape

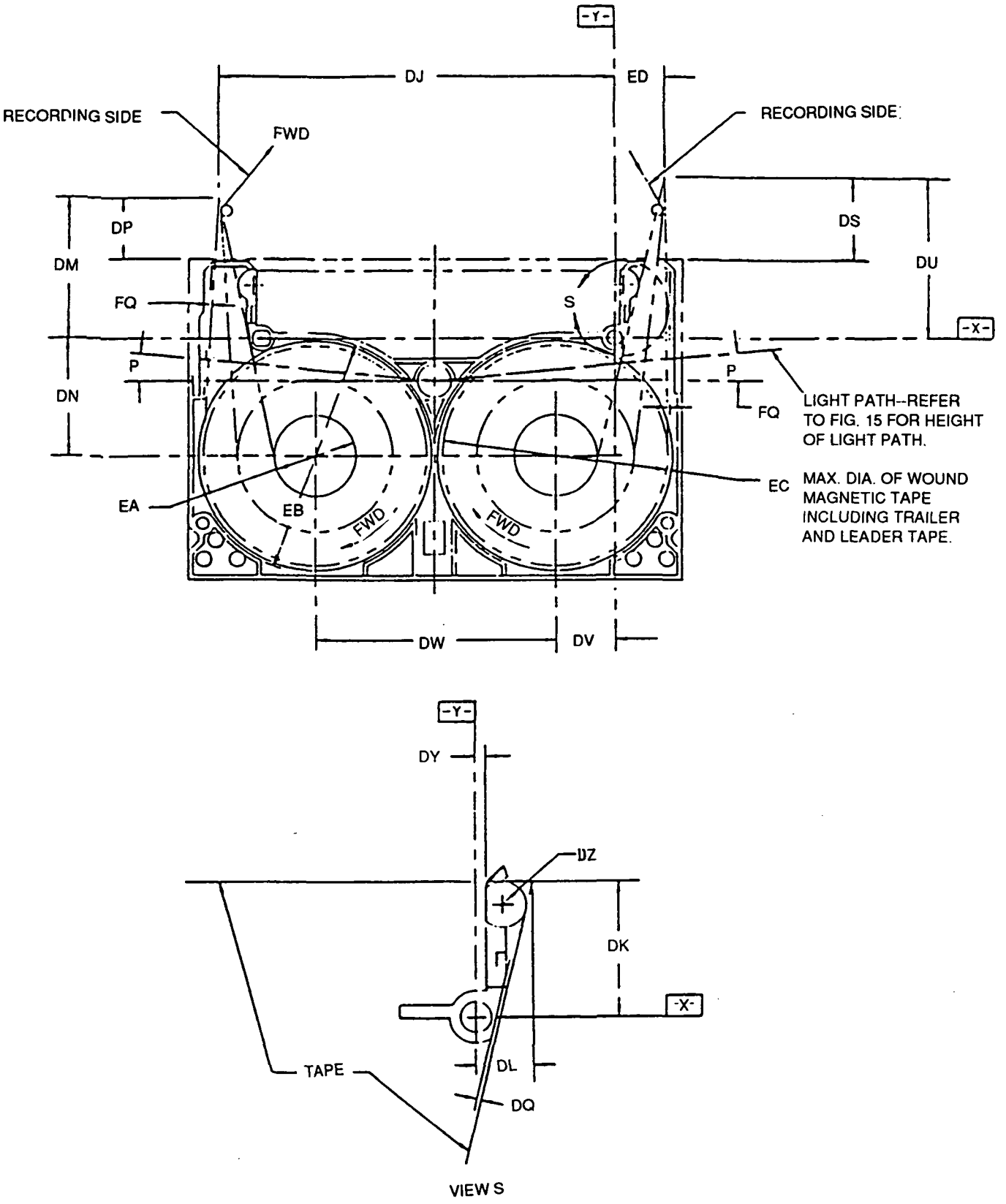


Figure 37
Iternal Structure, Tape Path and Light Path

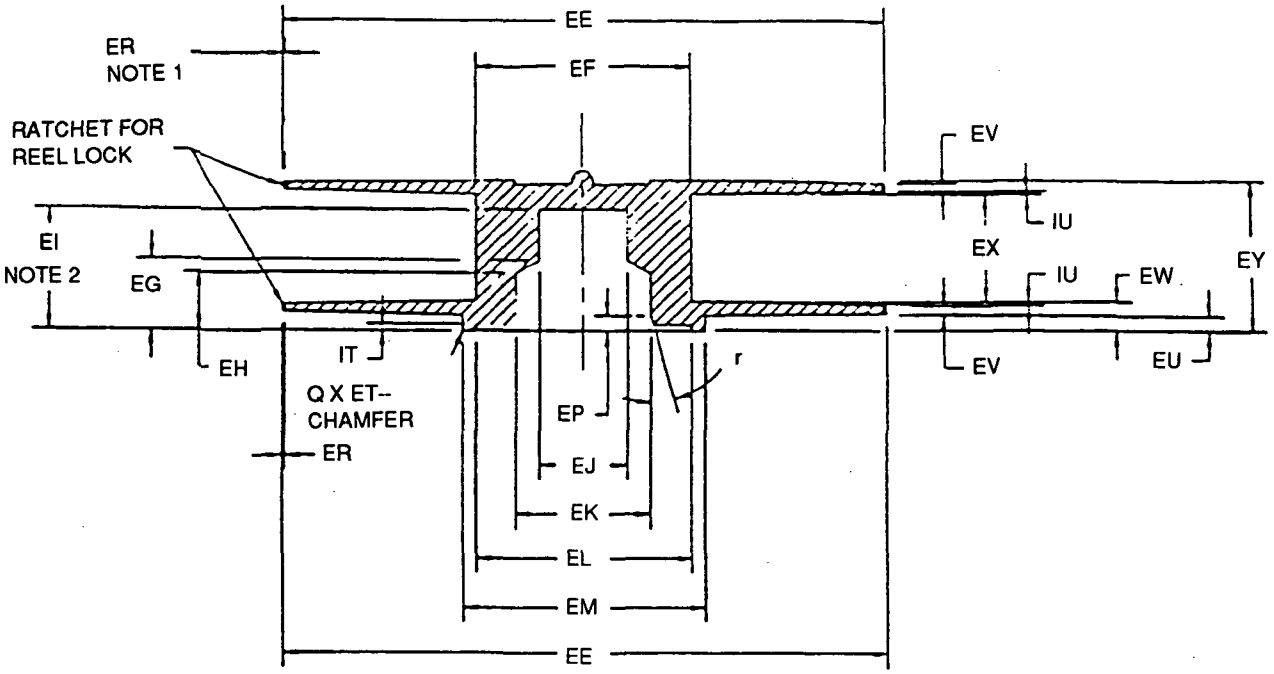


Figure 38
Section H-H

NOTE 1. RATCHET FOR REEL LOCK OF THE UPPER PART OF THE REEL IS AT THE MANUFACTURER'S OPTION.

NOTE 2. DEPTH EI OF REEL DRIVING HOLE SHALL BE EFFECTIVE TO THE DIAMETER EJ.

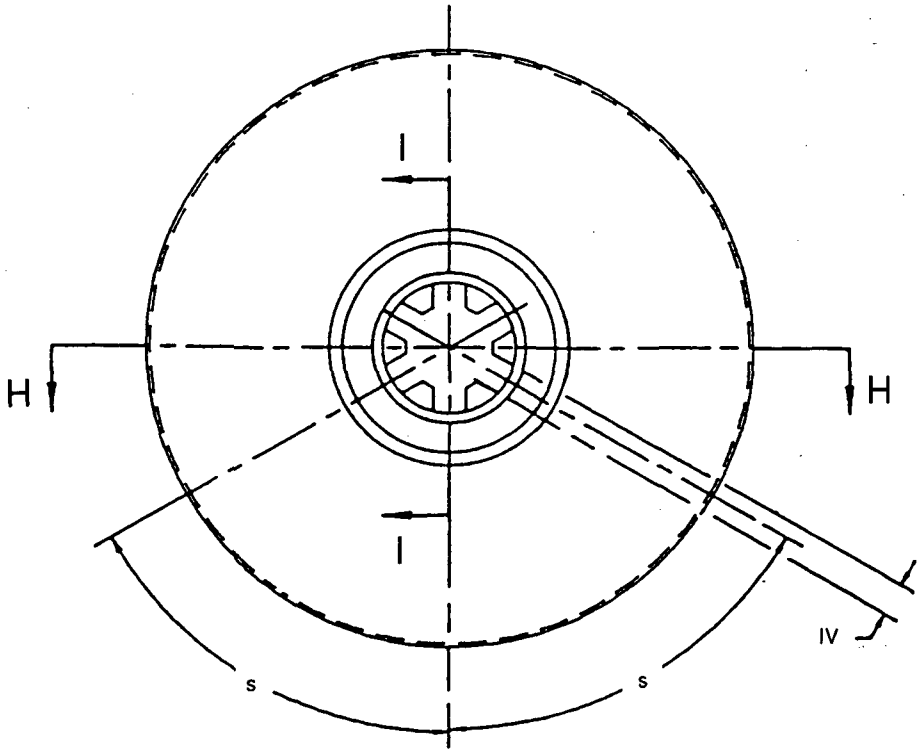


Figure 39
Cartridge Reels

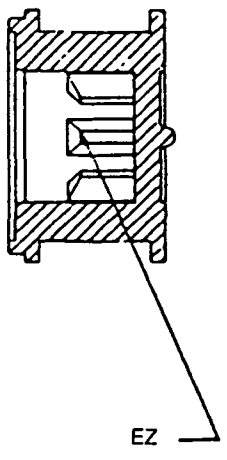
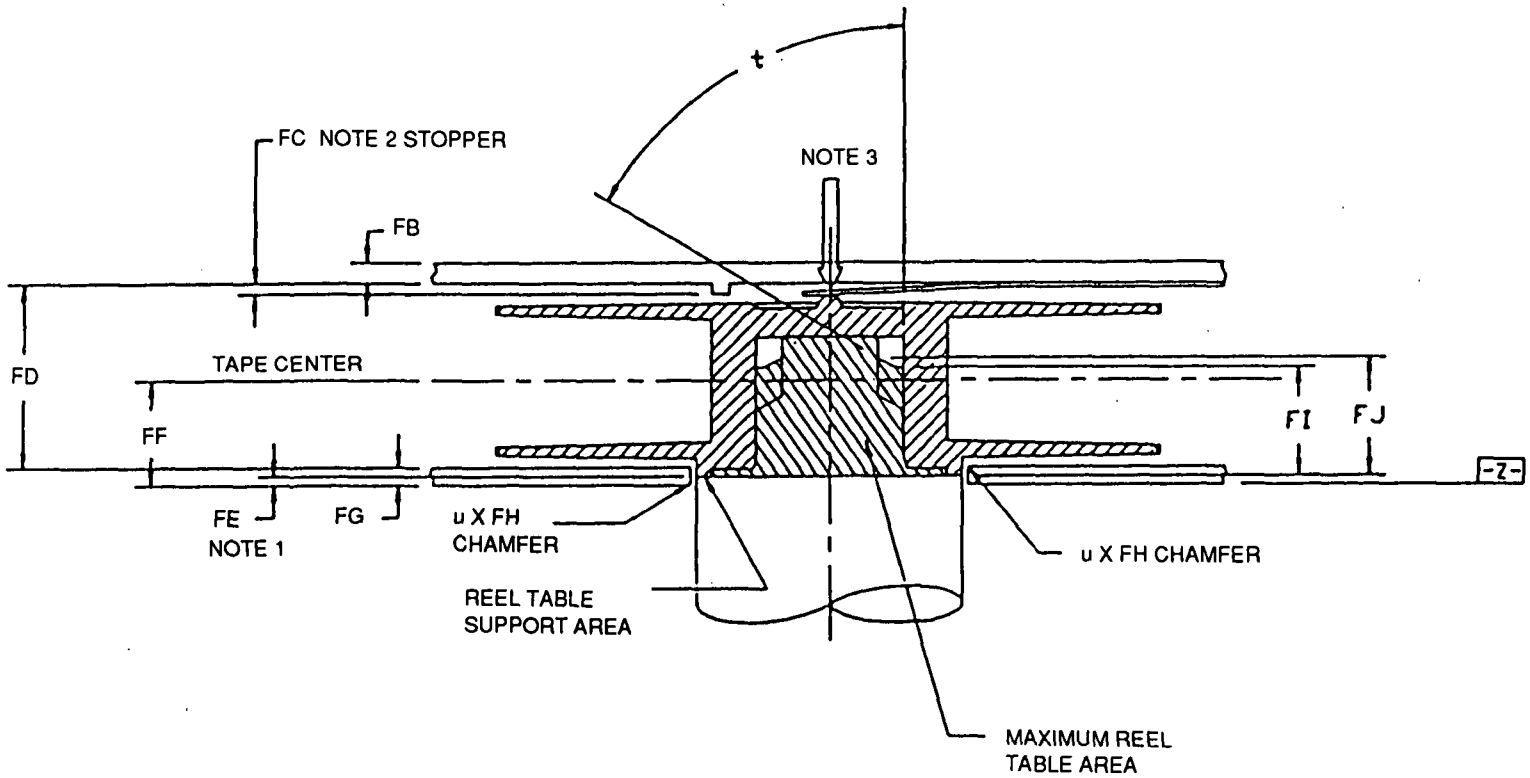


Figure 40
Section I-I



NOTE 1. HEIGHT OF REEL TABLE.

NOTE 2. STOPPER TO PREVENT REEL FROM SLIPPING INTO SHELL.

NOTE 3. REEL SPRING PRESSURE SHALL BE WITHIN 0.4 TO 0.8N WHEN HEIGHT OF REEL TABLE SUPPORT AREA IS FE mm FROM DATUM PLANE Z.

Figure 41
Cartridge Reel(s) Mounted in Drive

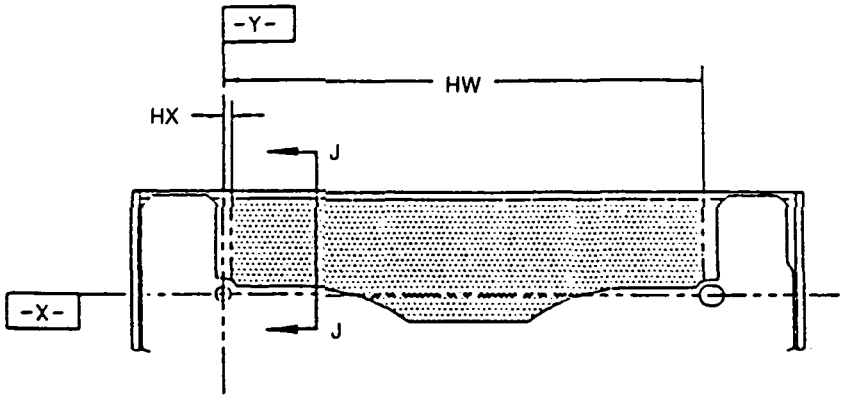


Figure 42
Clearance Requirements Between Cartridge and Drive -Bottom View

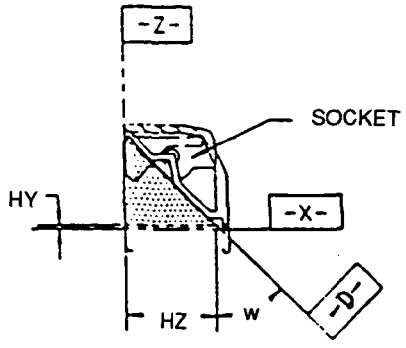


Figure 43
Section J-J

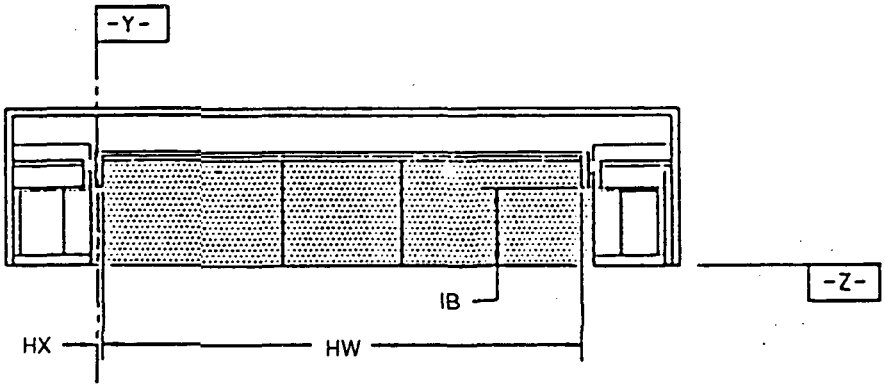


Figure 44
Clearance Requirements Between Cartridge and Drive - Front View

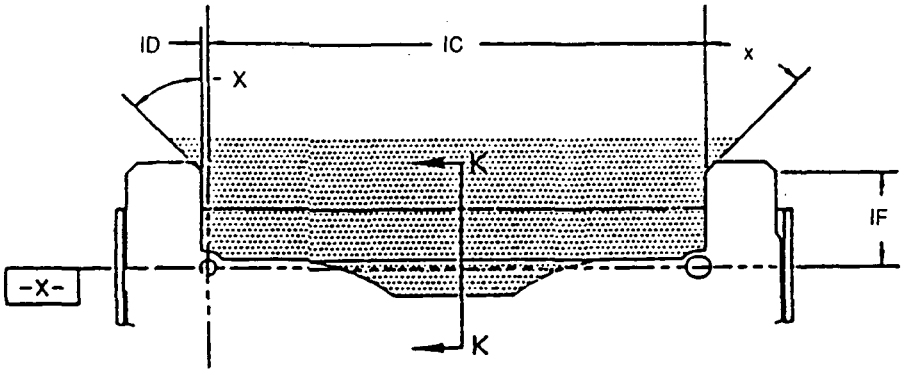


Figure 45
Clearance Requirements Between Cartridge and Drive - Bottom View

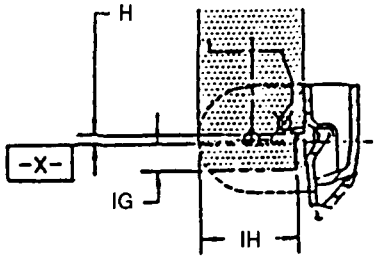
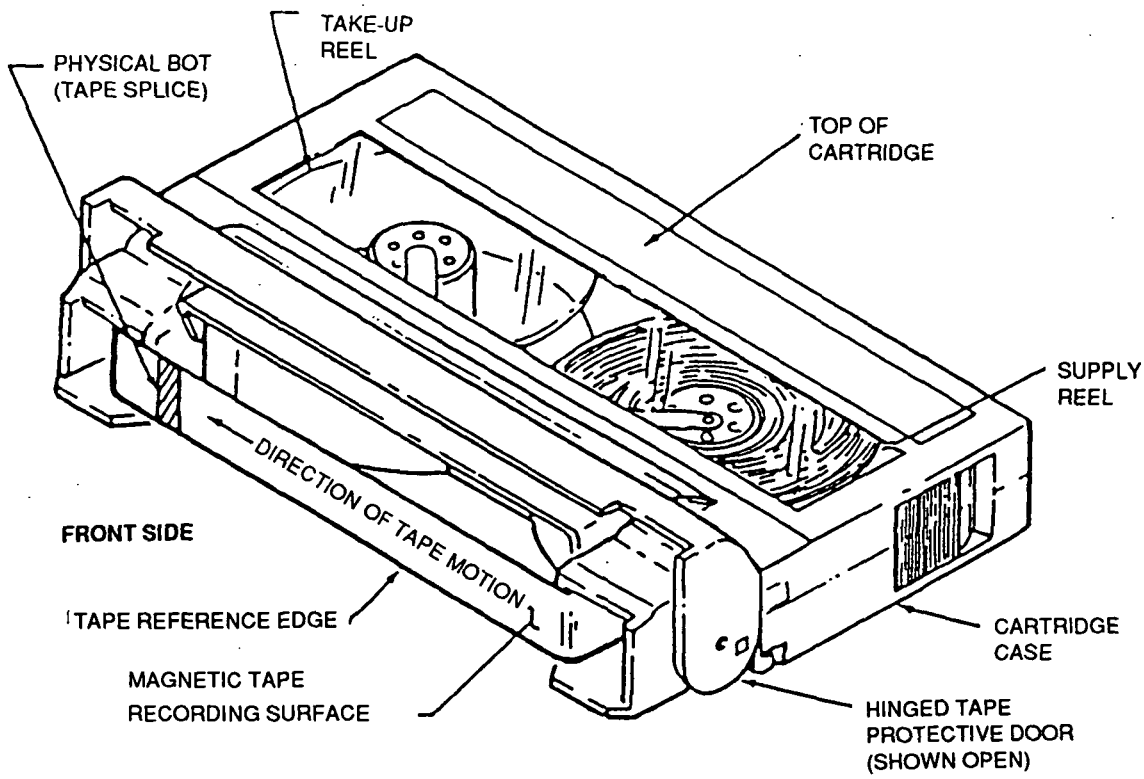
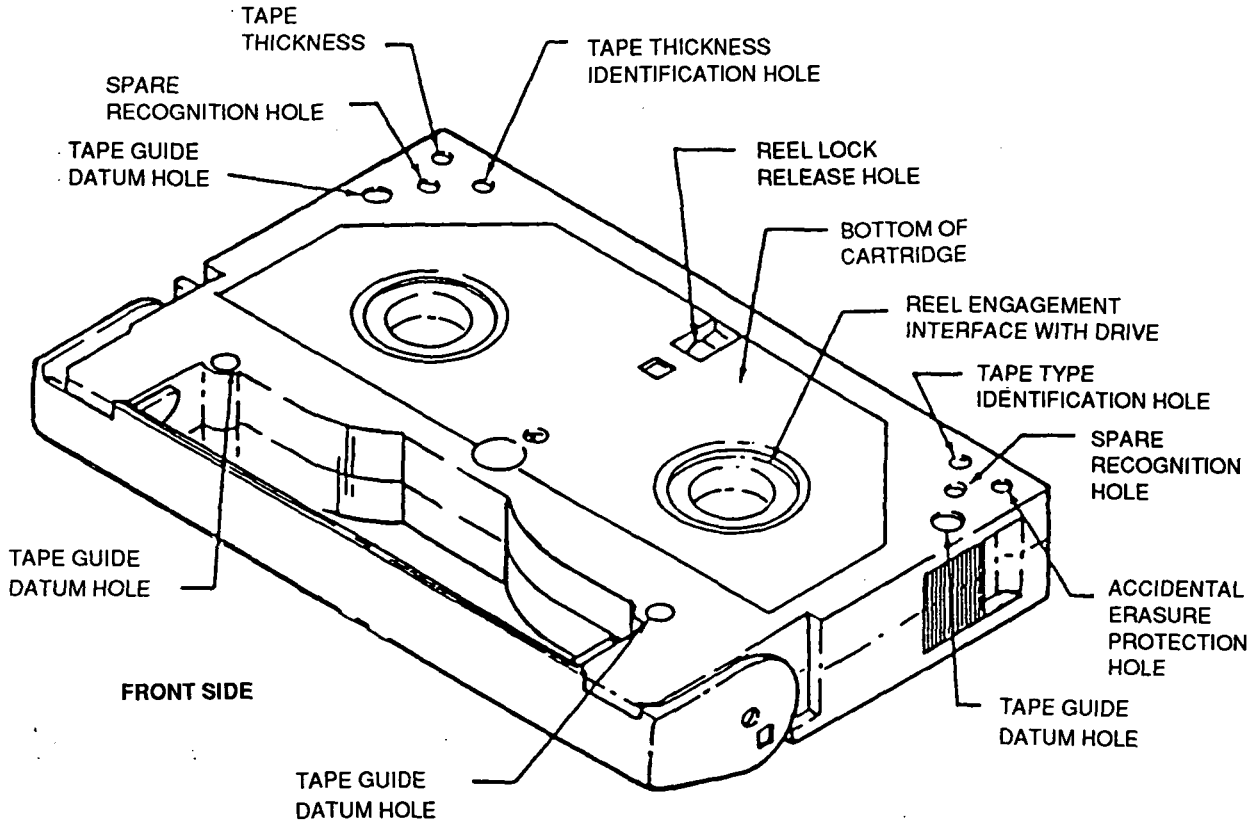


Figure 46
Section K-K



TOP VIEW



BOTTOM VIEW

Figure 47
Tape Cartridge Assembly

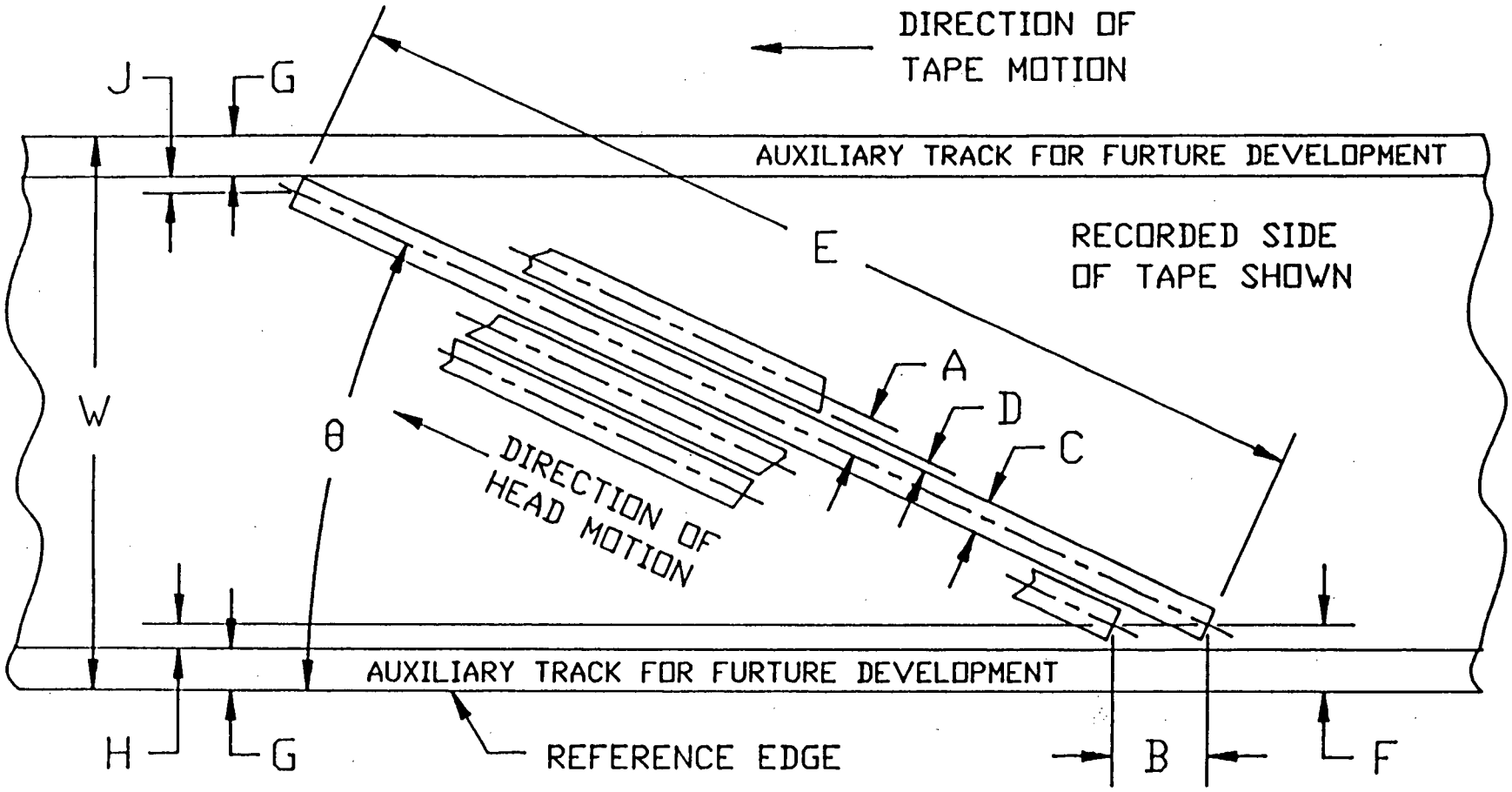


Figure 48
Layout of Tracks and Track Location

(View looking into recorded side of tape)

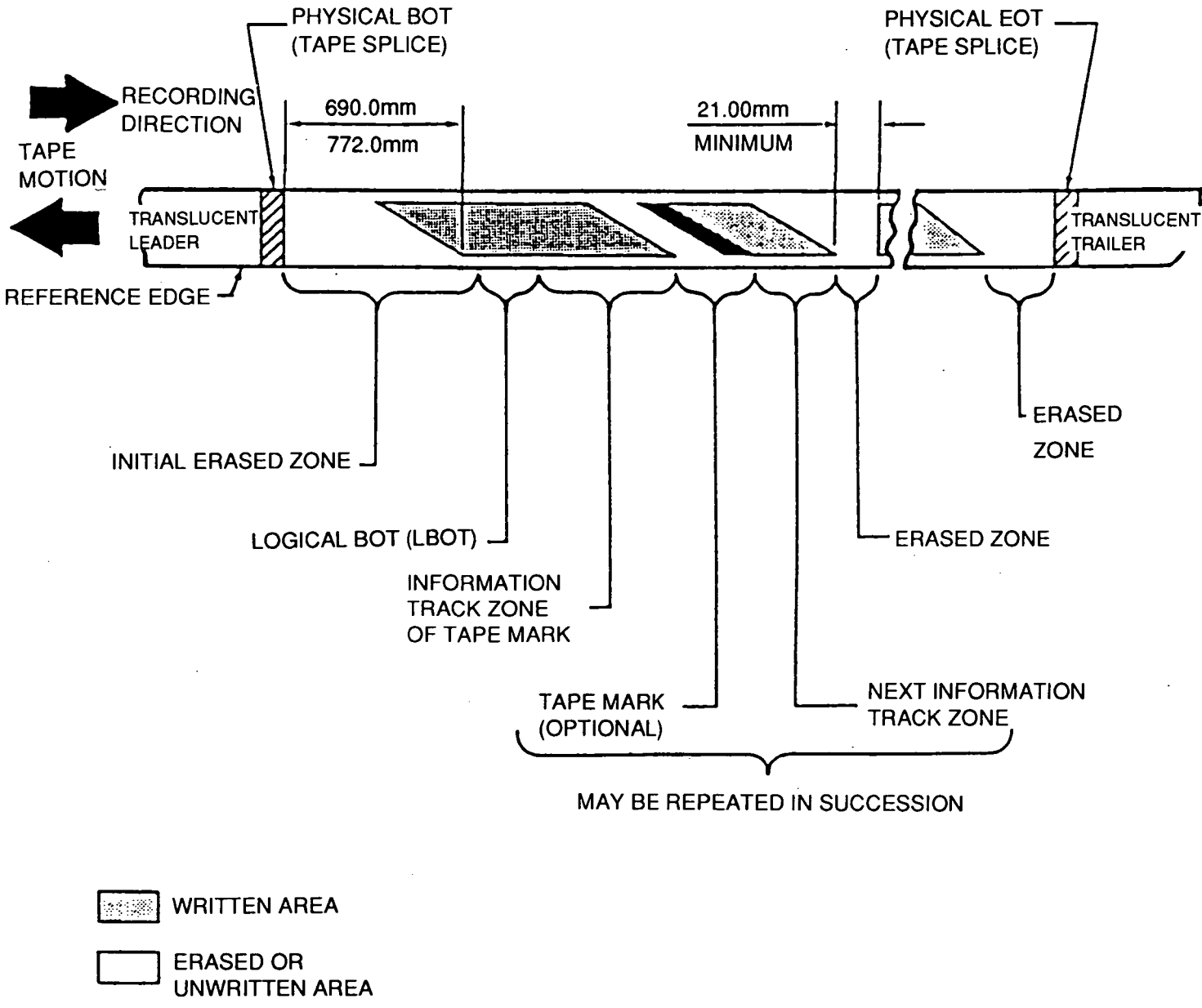


Figure 49
Arrangement of Recording Along the Length of Tape

(View looking into recorded side of tape)

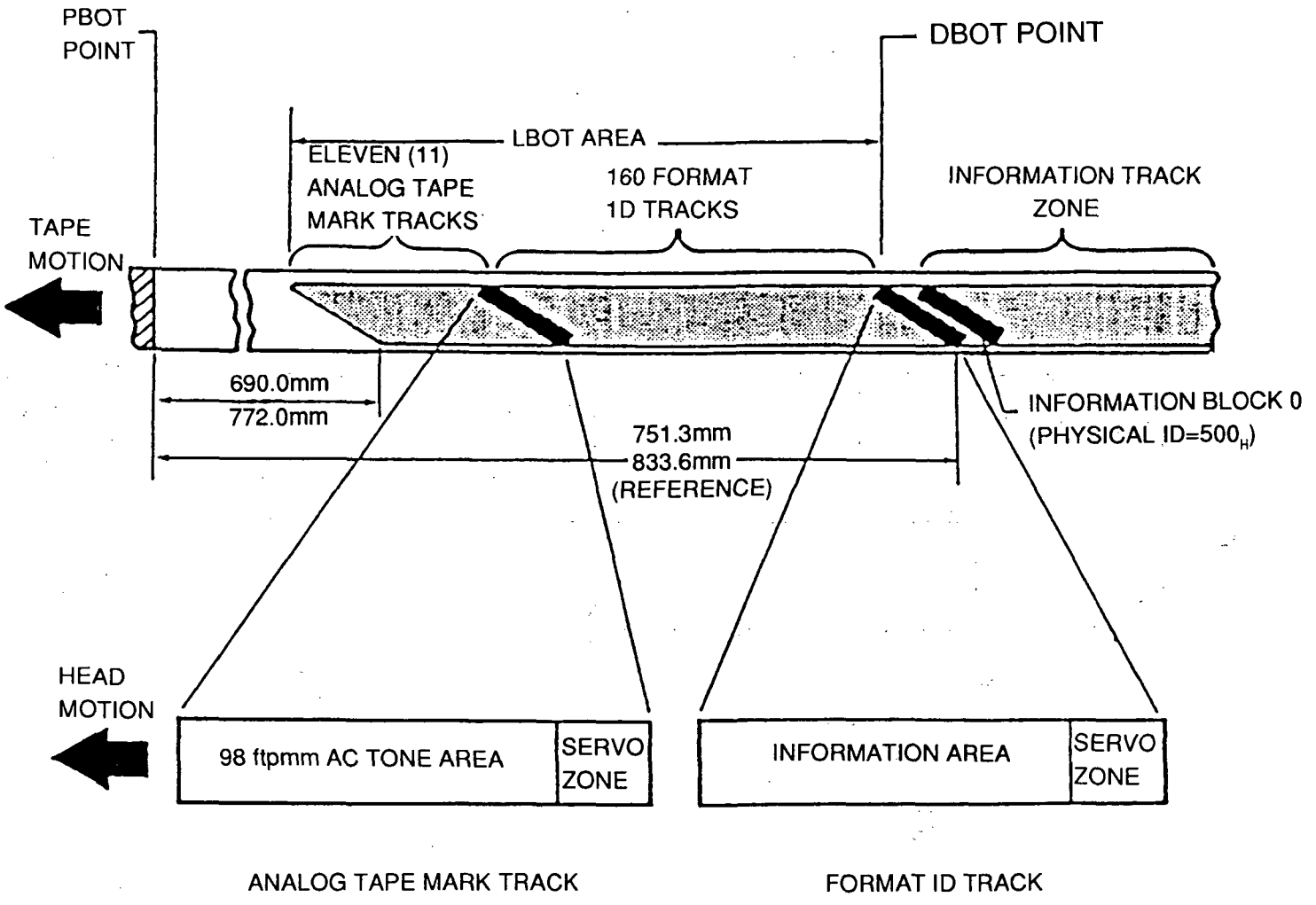


Figure 50
Beginning of Tape Layout

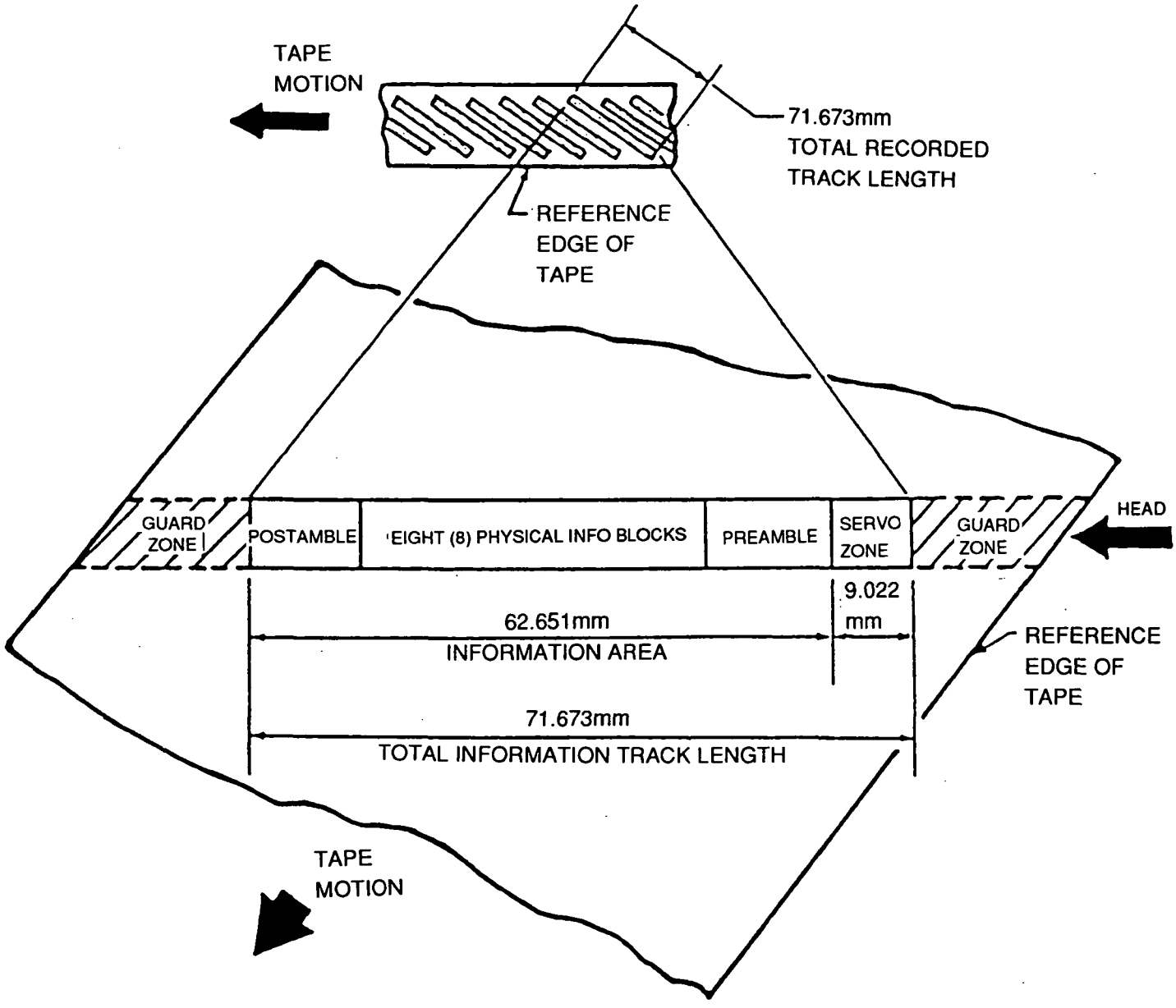


Figure 51
Organization of Information on a Typical Information Track

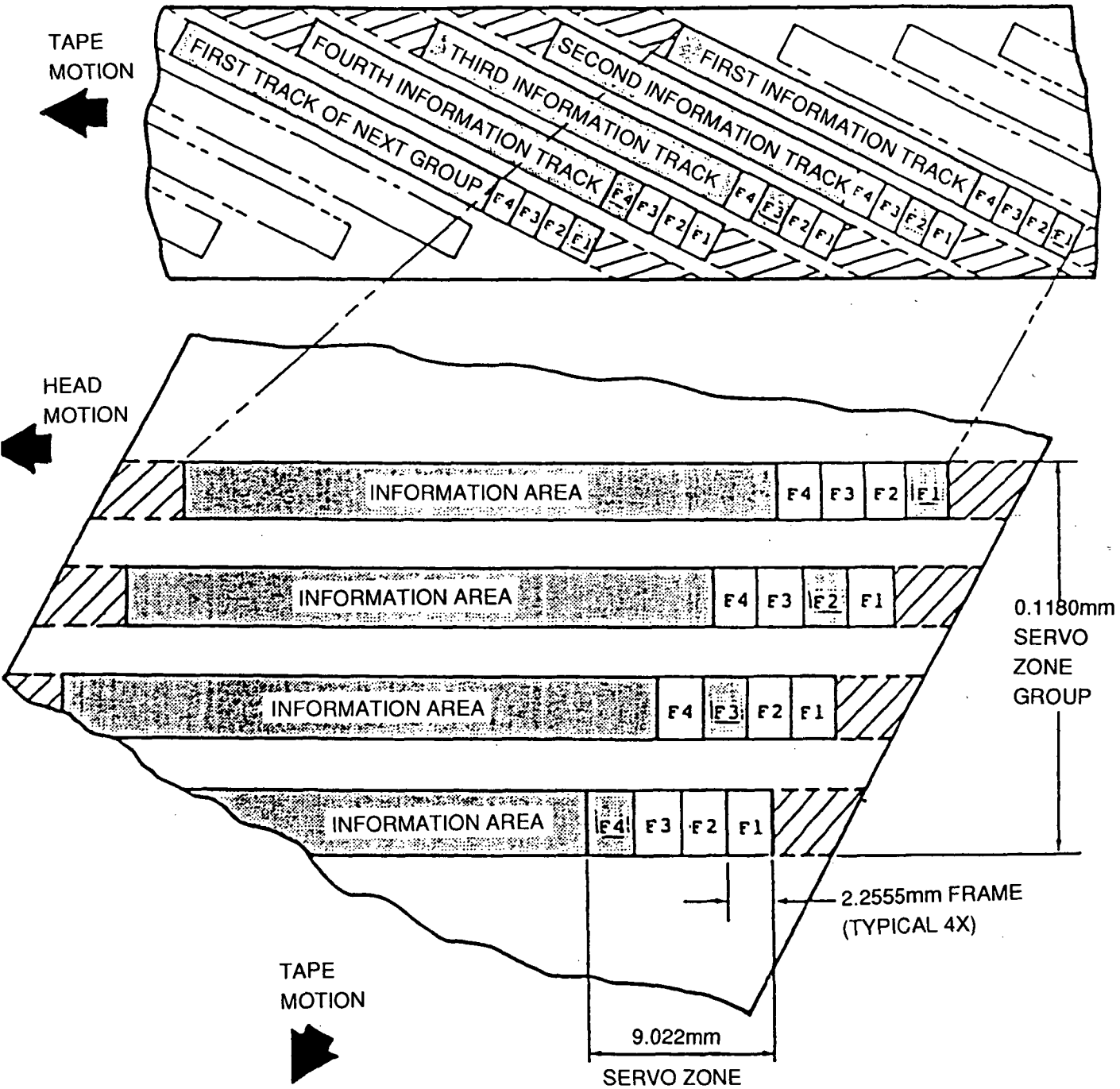


Figure 52
Servo Zone Layout

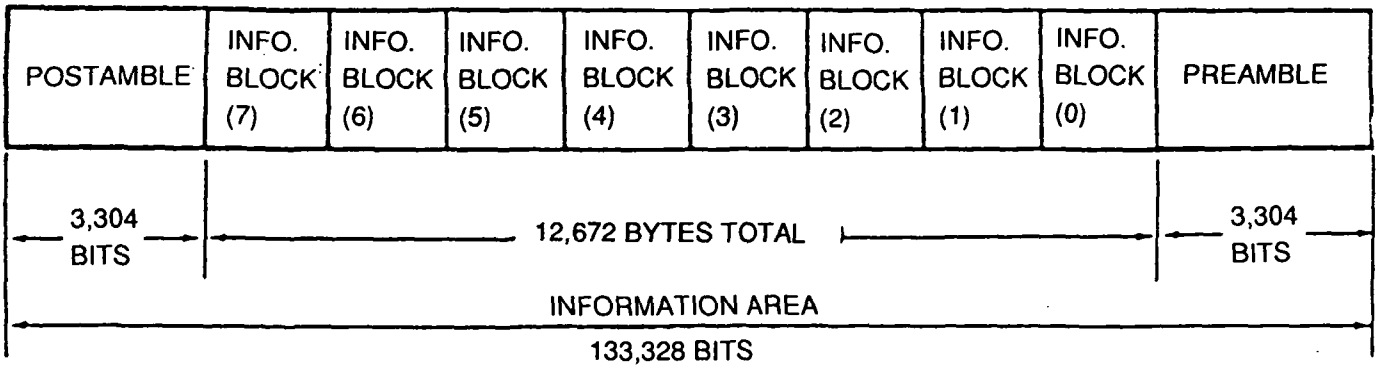


Figure 53
Information Area Layout

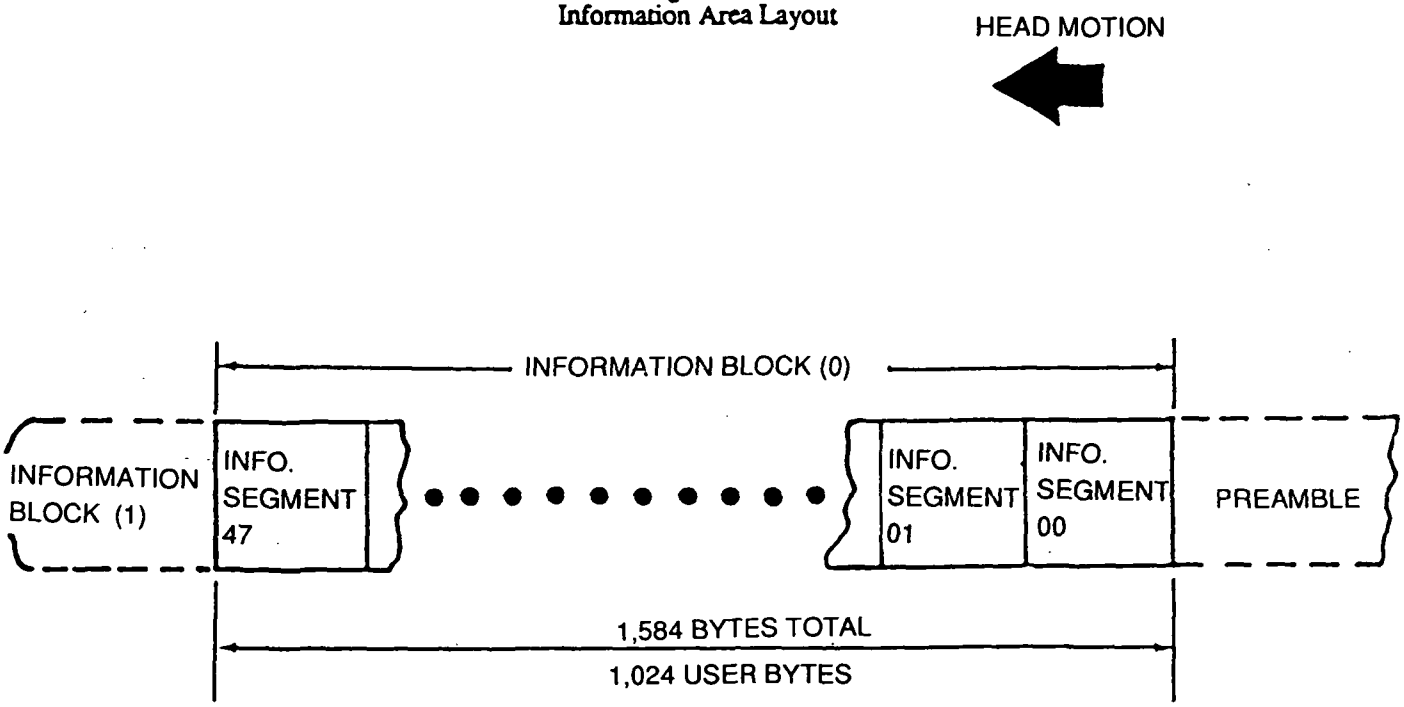


Figure 54
Information Block Layout

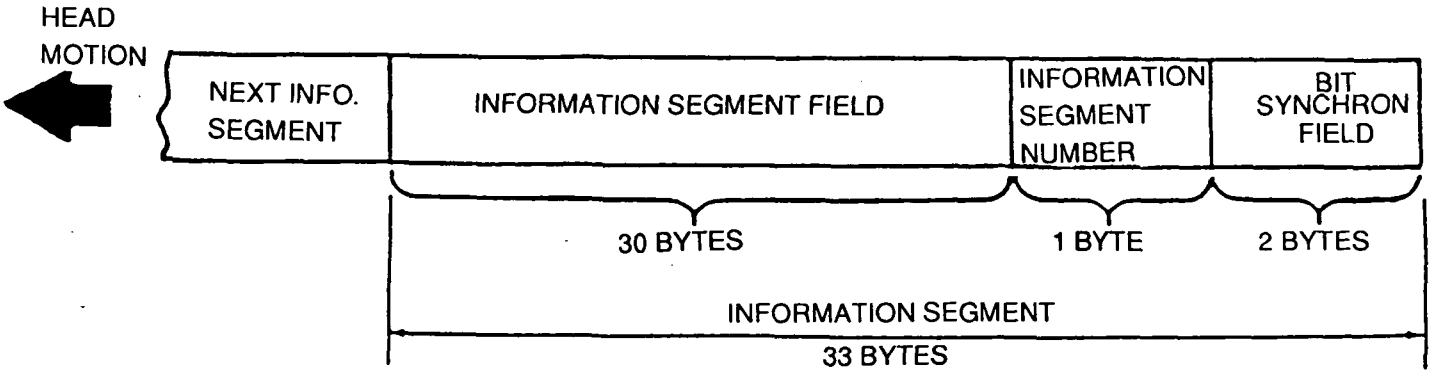


Figure 55
Information Segment Layout

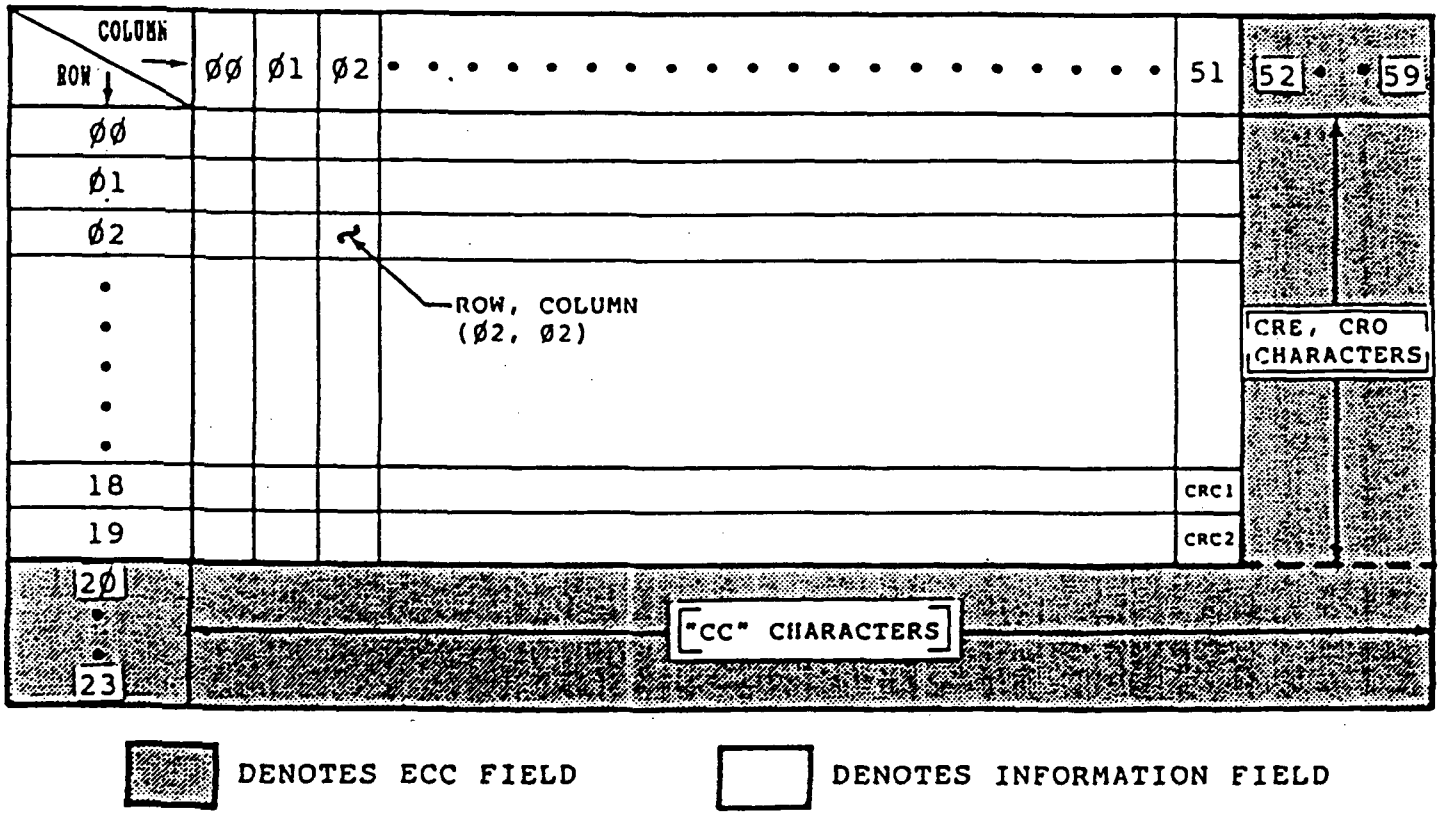


Figure 56
Information Matrix

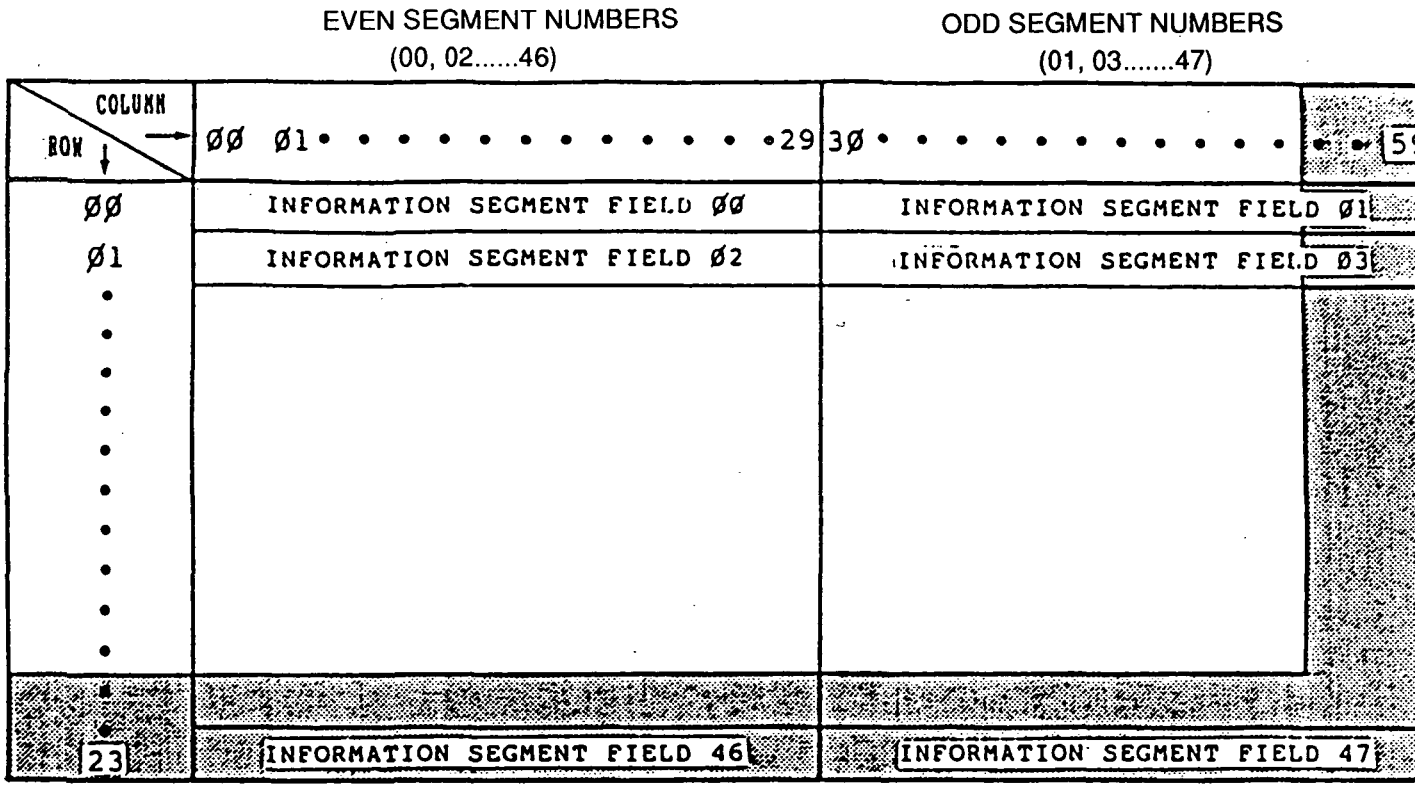


Figure 57
Segment Field Partitioning of the Information Matrix

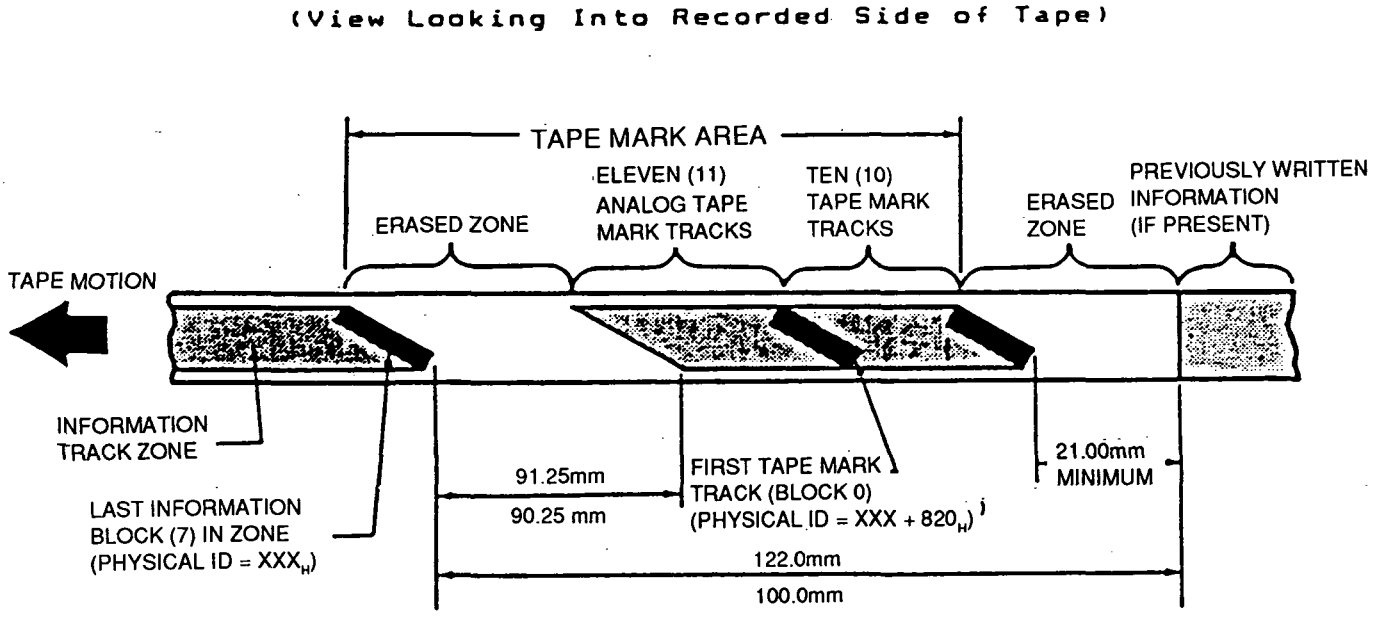


Figure 58
Tape Mark Layout

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13. ABSTRACT *(Maximum 200 words)*

This document establishes the same kind of standards and controls that are currently in use for the procurement of new analog, digital, and IBM/IBM-compatible 3480 tape cartridges, and 1-inch-wide channel video magnetic tapes. The Magnetic Tape Certification Facility (MTCF) maintains a Qualified Products List (QPL) for the procurement of new magnetic media and uses the following specifications for the QPL and Acceptance Tests: (1) NASA TM-79724 is used for the QPL and Acceptance Testing of new analog magnetic tapes; (2) NASA TM-80599 is used for the QPL and Acceptance Testing of new digital magnetic tapes; (3) NASA TM-100702 is used for the QPL and Acceptance Testing of new IBM/IBM-compatible 3480 magnetic tape cartridges; and (4) NASA TM-100712 is used for the QPL and Acceptance Testing of new 1-inch-wide channel video magnetic tapes. This document will be used for the QPL and Acceptance Testing of new Helical-Scan 8mm digital data tape cartridges.

14. SUBJECT TERMS
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