

**MAGNETIC TAPE MANAGEMENT FOR
STORED PROGRAM CONTROL, AUTOMATIC MESSAGE
ACCOUNTING, AND AUTOMATIC MESSAGE ACCOUNTING
RECORDING CENTER APPLICATIONS**

DESCRIPTION

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1. GENERAL	
1.01 This practice covers management of digital magnetic tapes used for SPC (stored program control). It also includes AMA (automatic message accounting) procedures associated with telephone system COs (central offices) or AMARCs (Recording Centers).	
1.02 This practice is being reissued to add paragraph 5.02 covering AMA procedures. Revision arrows are used to emphasize the more significant changes.	
2. TAPE HANDLING	
2.01 Tape damage of any degree may result in mutilated data; therefore, the following preventative measures should be observed.	
(a) Do not place any type of external label on the surface of a magnetic tape. Do not store labels or notes inside the tape reel canister. (See paragraph 5.01.)	
(b) Do not permit smoking or eating in the tape recorder area or tape storage area. Cigarette ashes can contaminate the tape oxide surface.	
(c) Do not allow the magnetic tape surface or edges to contact clothing or the floor.	
(d) Exercise care to prevent specified recorder cleaning fluid from contacting the magnetic tape surfaces.	
(e) Do not expose an unprocessed magnetic tape to strong magnetic fields which result from ac or dc currents in relays, motors, generators, magnetic detection devices, or other magnetic apparatus (paragraphs 7.01 and 8.04).	
(f) Maintain the tape transport; keep the tape and magnetic heads clean. The heads should be inspected after each period of tape operation and cleaned during the tape change procedure.	

(g) Visually check the inside surfaces of the take-up reel flanges for burrs or other surface defects which may interfere with smooth tape winding (Fig. 1).

(h) After removing a tape from the recorder, immediately place the tape in the tape canister. Always position the foam rubber pad (provided with each new reel) between the flanges over the tape end. (See paragraphs 7.02 and 7.03.)

(i) Always store spare reels of tape in the tape reel canister (or equivalent). Always store the canister vertically to minimize damage to the edge of the tape. (See paragraph 7.04.)

(j) Control the tape pack temperatures as near as possible to (+) 70°F (Fig. 2).

(k) Magnetic tape and tape reels that have been dropped should be retired from service until they have been inspected, tested, and proven serviceable.

(l) Do not splice a magnetic tape. When a tape breaks, forward both sections of the tape to the EDP (Electronic Data Processing) Center with the transmittal form (E-5233). Adhesive labels (Form 6050) should be placed on each section of the tape. Retire the two sections from service after data retrieval. The sections of tape should not be used in critical applications, particularly at a distance of 3 feet on each side of the tape break.

(m) Each tape reel should be checked visually at least once weekly for warpage and alignment. This is necessary to insure that the reel does not wobble when it is seated on the reel turntable and secured by the reel hold-down knob. The warpage and alignment should be gauged by holding an object, such as a pencil, next to the flange edge and rotating the reel. Note any wobble by the change of flange distance up and/or down the gauge.

2.02 Two types of tape are required at AMARC installations where 1AAM3 AMARC and earlier generic AMARC systems are collocated. At these installations, loading a tape on the wrong system may require unusual actions that could result in outages. To prevent system outages, the magnetic tapes are made very distinctive. The distinction is accomplished by applying matching strips of pressure-sensitive color tape to the tape transport equipment

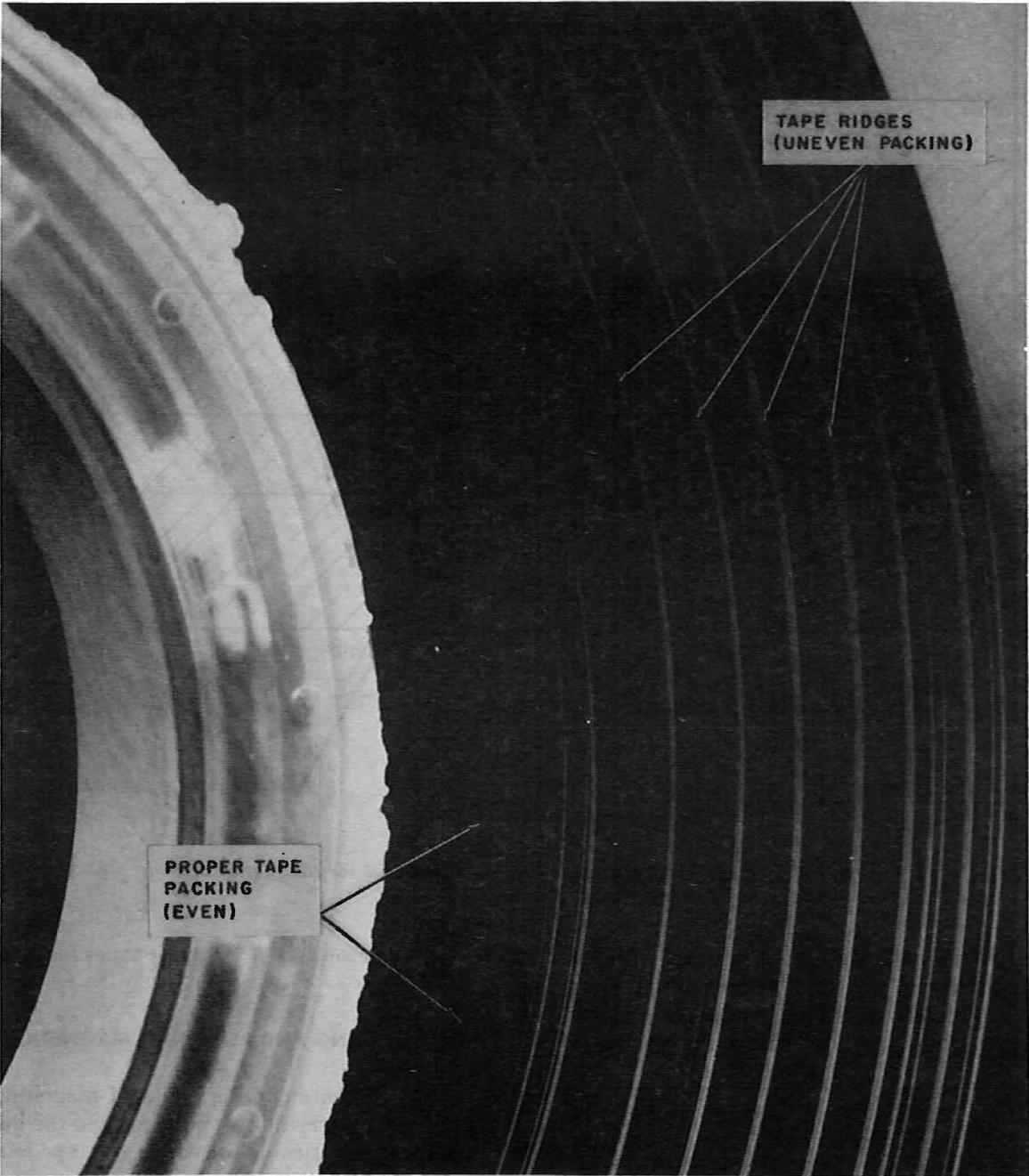


Fig. 1—Uneven Tape Packing on a Reel of Magnetic Tape

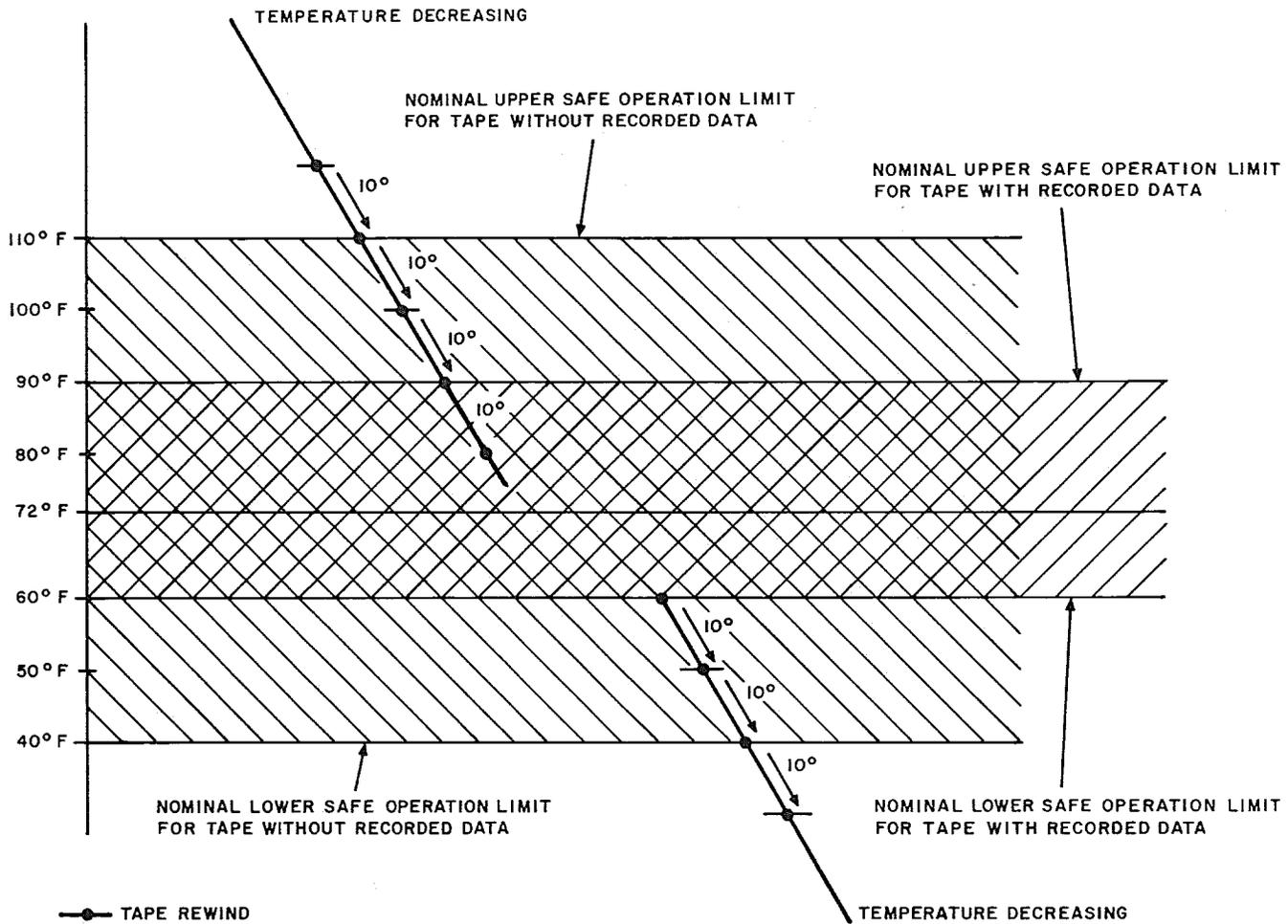


Fig. 2—Safe Operating Temperature Limits for Magnetic Tape

and to the magnetic tape the equipment requires. The tape is applied to the label of the magnetic tape and to the outside surface of the equipment, adjacent to the supply reel.

2.03 The automatic checking procedure that accompanies mounting a tape should also prevent using a tape on the wrong system; however, UCL (unconditional) commands permit bypassing the checking procedure. If there is a shortage of one type of tape, UCL commands may be necessary to keep the system operating.

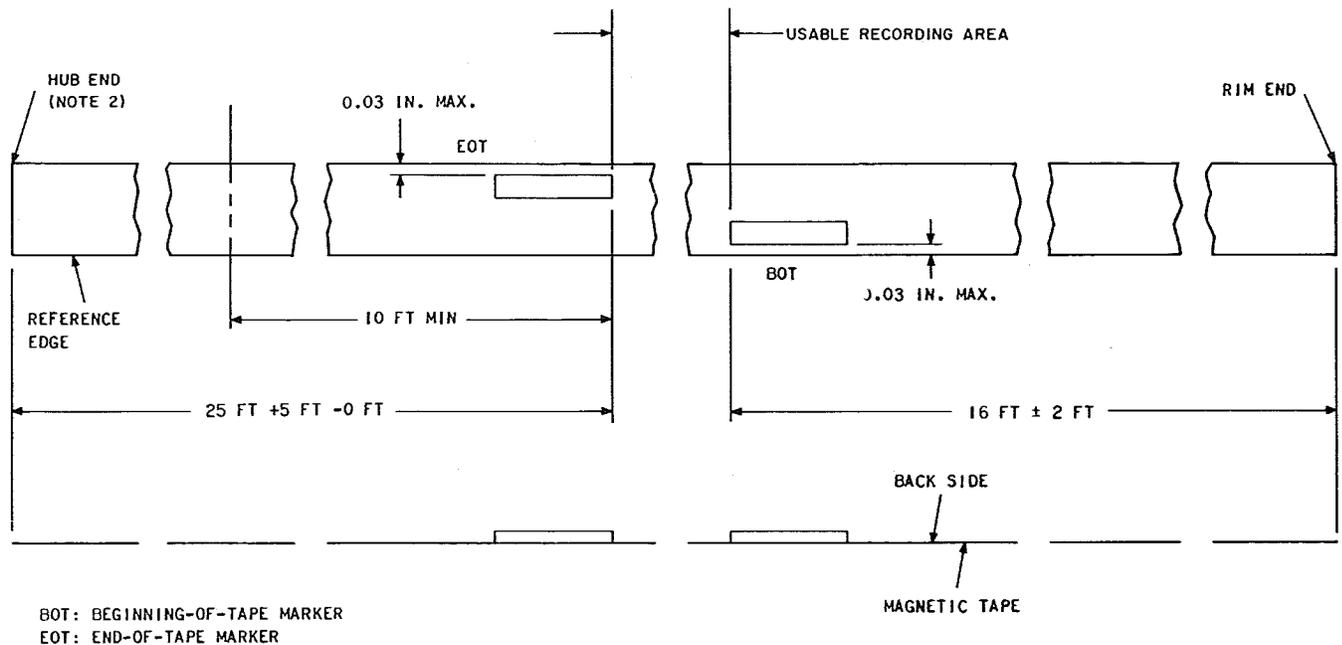
2.04 Tapes that have not been degaussed are mounted and used for recording call data in the 1AAM3 AMARC. Previous systems require

erased or new AMA magnetic tapes for recording call data.

3. LOADING AND REMOVING MAGNETIC TAPES

3.01 When mounting a reel of magnetic tape, the tape should be wound around the hub without securing or sticking the end of the tape to the hub or into a hub slot (if provided). (See Fig. 3.)

3.02 If the ends of a reel of tape are frayed, wrinkled, or otherwise damaged, the damaged portion should be cut off before threading the tape in the recorder. If more than a few inches of the tape leader are removed, a new BOT (beginning of tape) or EOT (end of tape) photo reflective marker should be affixed to the tape in accordance with Fig. 3 or Fig. 4



NOTES:

- PHOTOREFLECTIVE MARKERS SHALL NOT PROTRUDE BEYOND THE EDGE OF THE TAPE AND SHALL BE FREE OF WRINKLES AND EXCESSIVE ADHESIVE.

MARKER DIMENSIONS:

LENGTH	1.1 IN. ± 0.2 IN.
WIDTH	0.19 IN. ± 0.02 IN.
THICKNESS	0.0008 IN. MAX.

- TAPE SHALL NOT BE ATTACHED TO THE HUB.

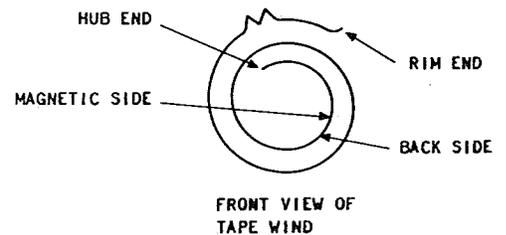


Fig. 3—Photorefective Tape Marker Placement on 1/2-Inch Magnetic Tape

as appropriate. Use replacement markers such as Scotch^{*} Brand Sensing Markers, No. 650, 3M Company.

3.03 For proper loading of a reel of magnetic tape, the BOT marker should be located. The BOT marker is approximately 3 inches on the take-up reel side of the write head (or write-read head). The tape should not be used in the immediate vicinity of the BOT and EOT markers where adhesive may be found (Fig. 3).

3.04 Some tape reels are equipped with write-enable rings. When the rings are provided, the

write-enable ring requirement must be defined for the specific magnetic tape recorder and the ring used accordingly. Most magnetic tape recorders do not deposit data on the tape when the ring is not located in the reel hub; however, some recorders function with or without the ring in position. When dismantling a tape from an AMARC, the write-enable ring should be removed immediately and reinserted by the RAO (Revenue Accounting Office) after the tape has been read.

3.05 Tapes that have not been degaussed are loaded and used for recording call data in No. 1A AMARC, Generic 3 (1AAM3 AMARC). Previous systems require erased or new AMA magnetic tapes for recording call data.

* Registered trademark of the 3M Company.

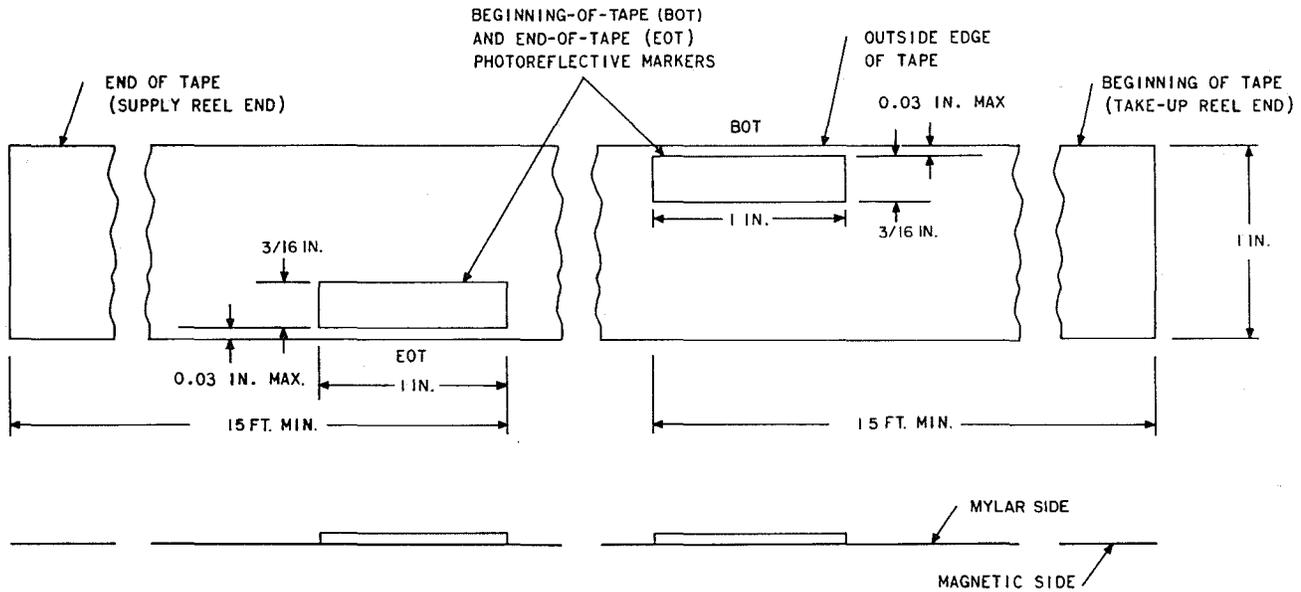


Fig. 4—Photorefective Tape Marker Placement on 1-Inch Magnetic Tape

3.06 Body oils and other foreign matter can contaminate the tape and results in mutilated data; therefore, care should be exercised during the tape threading operation to avoid handling that part of the tape which contains or which will contain data.

3.07 Tape reels should be handled only by the reel hub and reel flange edges. When loading a reel of tape, force should be applied only at the reel hub. When removing a reel of tape, the tape reel should be pulled off only by the outside flange (flange closest to operator). Do not apply force to the flange perpendicular to the tape pack area.

4. MAIN CAUSES OF DATA ERROR

4.01 The main causes of data error are dropout, dirt, and distortion. Dropout is the most common form of data error and is usually the result of a tape imperfection which prevents signal transfer of the proper amplitude. The lack of signal amplitude can prevent adequate erasure of data or cause the data to be misinterpreted, such as a one to be read as a zero, or a zero to be read as a one. The three main causes of dropouts are as follows:

- (a) **Misalignment of the Read or Write Head:**
The head must be positioned exactly over the data track(s) to enable the reading head to pick up

information from the tape. A difference of a few thousandths of an inch in the angular or dimensional tape-to-head relation can produce an error.

- (b) **Insufficient Magnetic Coating:** Due to wear or the manufacturing process, thin or bare spots on the tape may prevent reading or writing data on the tape.

- (c) **Separation Between the Tape and Head:**
This is the most common and most serious tape problem. Positive contact must be maintained between the magnetic tape and the recording head. A gap of only 150 millionths of an inch results in signal loss. The two main sources of signal loss are (1) a distorted tape that does not lie flat against the head and (2) some foreign object intervening between the head and the tape.

4.02 The loss of contact between the recording surface (tape oxide layer) and the head is the primary cause of magnetic tape failure. The loss of contact is created by dirt located on the magnetic surface of the tape and by tape distortion. Dirt is the leading cause of the loss of contact. Dirt is divided into four categories:

- (a) **Foreign Dirt:** Foreign dirt such as dust, lint, and cigarette ashes may cause imperfec-

tions to occur during tape manufacture or in equipment room environments. Equipment rooms of both central offices and EDP centers are especially vulnerable because friction between the magnetic tape and the magnetic tape guide surfaces creates an electrostatic charge which attracts airborne particles. Other dirt traps are oil film and grease due to careless tape handling.

(b) **Self-Dirt:** The largest source of tape imperfection is self-dirt, such as chips and pieces of magnetic oxide or plastic backing. Some common types of self-dirt are as follows:

(1) **Splitting Debris:** During magnetic tape manufacture, the abrasive action of the tape-slitting knives leaves chips of the tape base material loosely attached to the edges. During tape use, some chips are dislodged and fall onto the magnetic oxide surface. Eventually, the chips may be moved to a location between the head and the tape and produce a dropout.

(2) **Burred Edges:** Due to the shearing effect of the tape-slitting knives or tape transport misalignment, magnetic tape edges may become burred. The wearing action of the rollers and tape guides used in the tape manufacturing process may eventually remove burrs and deposit them on the magnetic oxide surface as error causing sources.

(3) **Scratches:** Jagged particles of dirt may adhere to transport heads and tape guides and create scratches on the tape.

(c) **Temporary Flaws:** Dirt that has not been permanently bonded to the magnetic oxide surface is defined as the temporary flaws. Temporary flaws may become permanent as the magnetic tape is used and reused, or as forces are applied by the tape pack pressure. Some temporary flaws are removed by the recorder tape cleaner or corresponding recorder device.

(d) **Permanent Flaws:** Permanent flaws are defined as flaws that have been bonded to the magnetic oxide surface and cause an error (permanent error) each time the tape is passed over a recording head. A magnetic tape that contains one permanent error-producing flaw must be considered for retirement from service, or the flaw must be eliminated by special cleaning processes.

4.03 Tape distortion is the second most common reason for data errors produced by the loss of contact between recording surface area heads. The various types of distortion and the causes are as follows:

(a) **Skewed Tape:** Skewed tape may result from a poorly controlled manufacturing process. The magnetic tape is almost entirely plastic; therefore, it is subject to cold flow. The tape material has the tendency to assume a semipermanent or permanent change in shape due to stress imposed upon the tape. Tape distortion can prevent the tape from flat contact against the reading or writing head and, in turn, cause a dropout.

(b) **Cinched Tape:** Cinched tape is defined as a severe physical tape damage in the form of folds across the tape. This is caused by improper winding of the tension control of the recorder during handling or loading which creates error-producing folds.

(c) **Creased Tape:** A creased tape cannot be repaired. Horizontal creasing results from improper tape handling and from cinching. Longitudinal creases result from (1) extreme cases of misaligned tape guides, (2) rollers on a tape recorder or machine, and (3) loose tape packs that contact the flange surfaces. Both cinched tape and creased tape can be caused by temperature excursions outside of safe operating limits.

(d) **Tape Edge Ripple:** Tape edge ripple is the tendency of one edge of the tape to become stretched or curled. The stretched or curled edge is usually accompanied by excessive head wear and migration of debris from the damaged edge. Magnetic tape that shows edge ripple damage must be removed from service. Edge ripple is caused by poorly aligned tape drives or magnetic tape reels that do not meet requirements for straightness.

(e) **Cupped Tape:** Cupped edges of magnetic tape appear as uneven edges that have a semi-circular pattern cut along the edge. Cupped edges are caused by intense heat, such as from a lighted lamp very close to the tape and/or uneven pressure distribution across the tape that is produced in the tape packing by temperature changes. Cupping can also occur in the middle of the tape instead of on the edges from the effects of sensor lamp heat.

Cupped magnetic tapes must be removed from service.

5. TAPE IDENTIFICATION

A. ESS/TSPS Magnetic Tape External Label

5.01 For automatic message accounting purposes, an external identification label should be affixed to the front flange of the tape reel. The type, size, and information to be shown on the label should be in accordance with local office requirements and procedures. A similar label should be attached to the shipping container before the tape is shipped to an EDP center or placed in extended storage.

5.02 When the magnetic tape is being used for automatic message accounting purposes, it is necessary that it have a volume label and header 1 label. Tapes that are made on the 3B must be labelled tapes. If the tape is made on the 1A, it can be a blank tape. The tape that is created is a new format AMA tape and not a 1A tape. A log sheet should be kept indicating the serial of the tape and the sequence numbers. The sequence numbers are found in the REPT AMA TAPE COMPLETE message and should use the first block and last block. This information is required should it become necessary to rerecord a tape that was lost.

5.03 Form 6050, ESS/TSPS Magnetic Tape External Label (Fig. 5) shall be attached to each reel to provide additional identification to the EDP center.

Each label contains space for six uses of the tape. The spaces should be filled in each time the tape is to be shipped to the EDP center.

5.04 The label will include the following information:

ITEM	DESCRIPTION
IDENT. NO.	The ESS/TSPS office 6-digit identification number assigned to identify magnetic AMA tapes.
FILE NAME	The central office NXX code and town.
TRACK	The number of longitudinal tracks recorded on the magnetic tape.
REEL OF REELS	The number of the reel and the total number of reels, such as REEL 1 of 3 REELS.
CREATED	The date that the magnetic tape was recorded.
ERASED	For EDP center use.

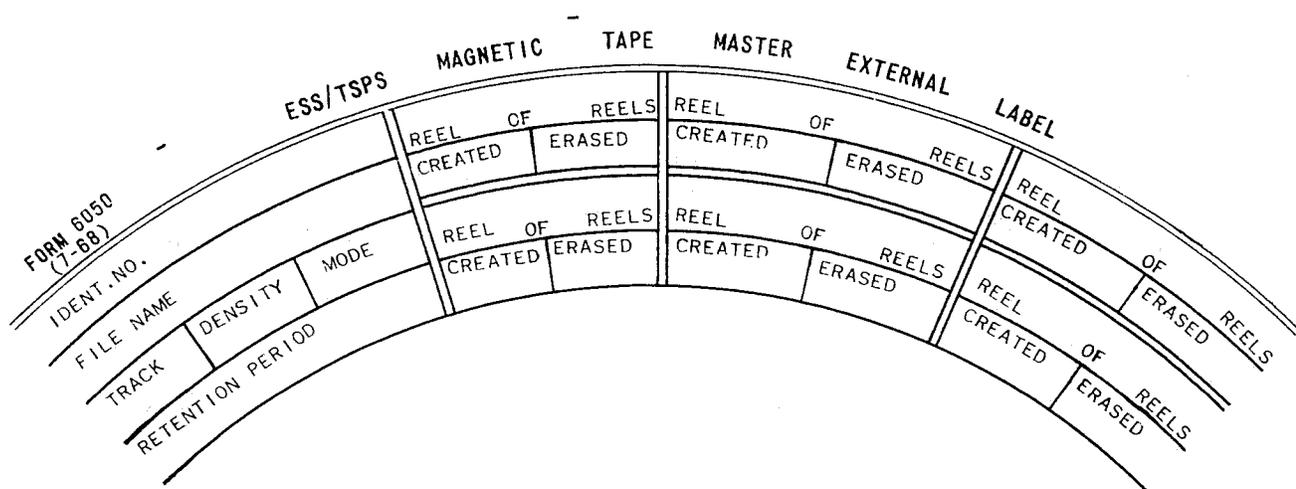


Fig. 5—Sample Form 6050, ESS/TSPS Magnetic Tape Master External Label

B. Magnetic Tape Control Record

5.05 For stored program control purposes, Form E-5851, SPC — Magnetic Tape Control Record (Fig. 6), should be attached to the tape reel after a tape recording has been completed. The form is a 2-by 3-inch self-adhesive paper label and should be completed as follows.

E-5854

SPC-MAGNETIC TAPE CONTROL RECORD

OFFICE IDENTIFICATION _____

DATE _____

ISSUE _____

OFFICE DATA

GENERIC PROGRAM

OTHER _____

Fig. 6—Sample Form E-5854-SPC, Magnetic Tape Control Record

ITEM	DESCRIPTION
OFFICE IDENTIFICATION	The AMA identification of the office.
DATE	The day that the tape was recorded.
ISSUE	The issue number of the generic program.
OFFICE DATA	Check this block if the tape contains office data.
GENERIC PROGRAM	Check this block if the tape contains a copy of the generic program.
OTHER	This is used to indicate if the tape is used for special studies.

C. AMA Magnetic Tape Transmittal Form

5.06 The AMA Magnetic Tape Transmittal, Form E-5233, (Fig. 7), is a 5-copy, carbon-interfold assembly used to report central office trouble or routine activity related to the AMA magnetic tape. For new format tapes, include the sequence numbers and if the tape contains primary or secondary data. The copies are used as follows:

- First copy, White (Originator)
- Second copy, Pink (Tape Container)
- Third copy, Yellow (Transportation)
- Fourth copy, Yellow (Transportation)
- Fifth copy, Green (Accounting)

5.07 The BOCs (Bell Operating Companies) that use common carrier for shipping AMA tapes should receive a bill of lading from the common carrier as a receipt for the tape cases. The BOC personnel should use the Routing Information section of Form E-5233 as a means of tracking tape transport handling. The person receiving the cases will sign the E-5233, and the person delivering the cases will retain the appropriate copy as a receipt. The copies are distributed as follows:

- (a) The originator retains the white copy in the central office for 190 days. This copy must show the transport pick-up signature and time.
- (b) The pink copy is placed inside the shipping container and inside the tape reel canister. Routing initials are not required.

Note: This copy is forwarded to EBAC (Equipment Billing and Accuracy Control) or AMA analysis group if desired.

- (c) The yellow and green copies are forwarded under separate cover. The yellow copies are used by BOC personnel. The copies provide space for the signature by a second driver and/or building person. The retained copy should have the signature of the person who accepted the tape case and the time accepted. The yellow copy is retained by transportation 30 days.

E-5233

AMA MAGNETIC TAPE TRANSMITTAL

Local Serial # _____ (If Required) PG. _____ OF _____

C.O. ENTITY _____ DATE(S) COVERED _____

NO. 1 ESS NO. 2 ESS NO. 4 ESS TSPS CAMA-C

NO. 5 MTR AMARC OTHER _____

ACCTG. R.G. ID# _____ TROUBLE? NO YES

EXPLAIN BELOW

TIME CHANGE? DATE _____ TIME _____

TROUBLE INFORMATION

DATE AND TIME OF TRANSFER TO:

TAPE SERIAL ID #

ACTIVE				
STANDBY				
OTHER				

REPORT ON TROUBLE(S) _____

CALL COUNT CONTROL
(IF REQUIRED)

--	--	--	--	--

ORIGINATOR _____ TEL. NO. _____

ROUTING INFORMATION

CENTRAL OFFICE PREPARED FOR PICK-UP		TRANSPORT PICK-UP DELIVER		RECEIVED BY ACCTG
TIME				
BY				

COPIES: (1) WHITE-ORIGINATOR (3) YELLOW-TRANSPORTATION
(2) PINK-TAPE CONTAINER (4) GREEN-ACCOUNTING

Fig. 7—Sample Form E-5233, AMA Magnetic Tape Transmittal

(d) The green copy is signed and retained by the RAO. This copy must show all the signatures and the times of pick-up and delivery.

5.08 Form E-5233 is packaged in quantities of 100. Requisitions for these forms, in multiples of the 100, should be worded as follows:

(Quantity) Form E-5233

5.09 Form E-5233, the AMA Magnetic Tape Transmittal Form, should be prepared at the beginning of each recording period in accordance with local arrangement with the data processing center. A recording period may be a single day, a number of days, or a weekend. All trouble incidents and the irregular activity and the time of day they occurred are important entries included on the form. These reported incidents alert the data processing center that additional care is needed when these tapes are processed.

5.10 Each tape shipment should include all the magnetic tape containing entries for the completed recording period. Situations may arise when an AMA recorder transfer occurs after the scheduled transfer. If the central office is unattended during a transfer, the magnetic tape on the on-line (active) recorder will contain entries for the current recording period and the completed recording period. If this occurs, an AMA recorder transfer should be made as soon as possible after the trouble has been cleared. The magnetic tape on the standby recorder should then be changed and the removed tape reel should be included in the regular shipment to the data processing center. An entry should be made on Form E-5233 noting the existence of AMA data entries for both the completed and ensuing periods.

5.11 The trouble and activity reports should include the time of the occurrence and a brief explanation, such as broken tape or AMA recorder transfer of testing. A separate line is provided for the time changes.

6. TAPE REWIND

6.01 A reel of magnetic tape should be rewound before use if the tape packing shows severe unevenness as shown in Fig. 1. The rewind procedure is also used to exercise a magnetic tape before use after 6 weeks of storage. Tape exercise is accom-

plished by performing a complete forward and reverse tape wind at continuous speed.

6.02 Severe tape pack unevenness is generally caused by extreme temperature excursions, subsequent handling, machine tape path misalignment, or air turbulence especially associated with high-speed machines.

6.03 Similar tape pack unevenness that is not as severe is a common result of tape operation on many machines. Usually this condition does not affect tape performance.

6.04 The user must evaluate the severity of the tape pack misalignment and estimate the conditions causing the misalignment (such as known temperature exposure or mechanical shock). The user must then determine if the tape should be used directly, first rewound, or retired from service.

6.05 When a magnetic tape is exposed to high or low temperatures beyond safe operating limits (Fig. 2), the tape should be gently rewound at each 10-degree temperature increase or decrease. A tape rewind is usually not necessary unless the anticipated temperature excursions exceed 50°F. The number of rewinds should continue until a minimum temperature is reached.

6.06 Any magnetic tape exposed to temperatures above 110°F for a period of 1/2 hour or more must receive special handling. Tape rewinds are required in this temperature range to prevent high tape pack looseness as the temperature is decreased.

6.07 No magnetic tape should be considered reliable recording media after exposure to 135°F for enough time (approximately 1/2 hour) to bring the entire tape pack (2400 feet) to that temperature. If no check for tape errors has been made to determine further serviceability, such tapes should be retired from service.

6.08 Magnetic tape exposed to low temperature extremes (less than 32°F) during storage or shipment should be allowed time to adjust to ambient conditions before removal from the protective shipping container.

6.09 Low temperature exposure while the tape is in transit is not identified and the proper rewind while the temperature is decreasing cannot be per-

formed. In such cases, high error activity, without apparent cause is the only indication that exposure and damage have occurred. In this case, the tape is retired from service.

6.10 *Rewind Machine Restrictions:* The machine or recorder used to rewind high- or low-temperature exposed magnetic tapes must not provide high angular accelerations to the tape pack, such as during loading on a vacuum column or tension arm magnetic recorder.

6.11 *Unprocessed Data Erasure by Rewind Machine:* Many magnetic tape recorders are designed so that rewind is not electronically possible, thereby protecting stored data on magnetic tape from unintentional erasure. Other recorders provide a tape reversal feature. Typically, magnetic tape recorders should not be used as tape wind and rewind machines since stored data may be accidentally erased. Tape rewind machines, without heads, that provide precision tape packing are commercially available.

7. STORAGE

A. Storage Areas

7.01 Storage areas should be located away from magnetic fields. Very minor magnetic field levels do not provide a harmful effect upon tapes without data. However, very strong and multisourced magnetic fields do produce harmful effects and must always be avoided for tapes containing data. Separate storage is recommended for the two types of AMARC tapes.

B. Storage Containers

7.02 Unprotected tapes should never be left on shelves subjected to environmental dust and foreign matter. Tape reels should be stored in plastic (or metal) dustproof canisters or with flange-edge plastic belts that make the tape reel dustproof. Always store spare reels of tape in the tape reel canister (or equivalent).

C. Storage Position

7.03 The canister and/or tape reel should always be stored vertically to minimize damage to the edge of the tape position. The foam rubber pad is

placed between the flanges over the tape end. Storage bins equipped with partitions are recommended.

D. Temperatures

7.04 Wide ranges in temperature and humidity create dimensional changes in tape base material. This form of tape distortion may render the tape unserviceable or create tape pack movement which increases the chances of tape damage through mishandling.

7.05 Temperature and humidity extremes should be avoided in tape-storage areas. The recommended storage conditions for polyester-base magnetic tapes are as follows:

- For tapes without recorded data, the temperature should be in the range of 40°F to 120°F; and the relative humidity should be 20 to 80 percent.
- For tapes with recorded data, the temperature should be in the range of 40° to 90°F; and the relative humidity should be 20 to 80 percent.

7.06 A magnetic tape exposed to low temperature extremes during storage or shipment should be allowed time to adjust to ambient conditions before removal from the protective shipping container.

7.07 Tapes exposed to extreme high or low temperatures will have loose tape packs and must be handled with great care during recorder loading. The special handling is required to prevent the degree of shock and tape packing movement that causes physical damage to the tape.

7.08 Tapes without data should be exercised before use. Tape exercising is accomplished by performing a complete forward and reverse tape wind at a continuous speed. During the exercising of tapes containing data, they should not be run over write, read, or erase heads. This precaution will reduce the chances of the erasure of data. Normally, a magnetic tape should be exercised every 6 weeks. A tape stored more than 6 weeks should be exercised before use.

8. SHIPPING

8.01 During the shipment of a magnetic tape, the major considerations are the magnetic field

and crush and shock protection of the shipping containers (and, in turn, tape reel canister, tape reel, and physical tape damage protection).

8.02 Shipping containers are usually designed for shock protection in moderate shock environment (Fig. 8 and 9). However, containers that are not equipped with internal insulation materials do not guarantee magnetic tape survival in moderate shock environments. Special handling should always be used in conjunction with the shock protection provided by the container because shock can produce permanent errors on a magnetic tape which renders the tape useless for further service.

8.03 A shock test conducted on selected commercially available 10-1/2 inch tape reel canister shipping containers indicated that a shock, such as a 6-foot drop, typically inflicts serious damage to the tape reels and/or tape reel canister. Other test drop distances, such as 4 and 2 feet, can subject the tape, reel, and canister to dangerous effects. Table A shows test results on three commercially available magnetic tape shipping containers using a 2-foot drop as the shock environment. While the drop effects are indicated in Gs (acceleration due to gravity), the relative capability to damage the shipping container and contents by shock is represented by the G values. The lower G values of container C are explained by the particular container design using a limited amount of internal insulation material, such as shown in Fig. 8 and 9.

8.04 Airport antihijacking metal screening devices generate magnetic fields; therefore, when a magnetic tape is hand-carried through these areas, a typical 6-inch distance should be maintained between the tape and the device. This precaution controls the detrimental effect the magnetic field could produce on a magnetic tape containing data.

8.05 Intercity buses are usually the means of transporting tapes containing data from COs to EPD centers. This type of transportation is economical but magnetic field protection must be considered since assorted freight is transported in the same compartment. A typical 6-inch distance from any ordinary magnetic field generating device (except a magnetron-type device) provides adequate magnetic field protection.

8.06 When CO magnetic tapes have been erased by the EDP center and are ready for release to

the originating CO, the tapes should be packaged in protective shipping containers for return shipment by the most economical means that provide temperature and crush/shock protection. The magnetic field restrictions governing the shipment of CO AMA tapes or other magnetic tapes containing unprocessed data are relaxed during the return shipment of erased tapes. However, the protective shipping container (and, in turn, tape reel canister tape reel, and physical tape damage protection), shock and crush requirements must be maintained.

8.07 The tape shipping method may be a delivery service such as a company courier, bus, airline, or taxi. The method and time of pick-up and delivery of the tape from each recording location to the RAO is documented on the AMA Shipping Schedule, Form BS-636 (Fig. 10). The schedule also provides space for the title and telephone number of the management personnel responsible for the AMA tapes.

8.08 If the personnel responsible for the tape shipment know of any reason the pick-up and delivery cannot be made as scheduled, they should notify the recording and accounting office supervisors as soon as possible so that alternate plans of tape shipment may be arranged.

8.09 If the RAO does not receive a tape on schedule, the RAO supervisor should notify the supervisors of the recording office and the department responsible for the AMA tape transport. The involved department will jointly conduct an investigation to determine the location of the missing tape.

8.10 The AMA Shipping Schedule, Form BS-636 (Fig. 10), enables all personnel responsible for the transport of an AMA tape to know the location of the tape at all times during transport. Copies of the shipping schedule are provided to the appropriate supervisor of all the departments involved in the tape shipment. When a tape does not arrive at a location as expected, the schedule provides a means of determining its present location.

8.11 In BOCs with a centralized staff, the ASD (Administrative Service Department) establishes the route and method of shipping a magnetic tape, and documents this information on an AMA Tape Shipping Schedule. The RAO and recording location personnel assist in determining the best method of tape shipment.

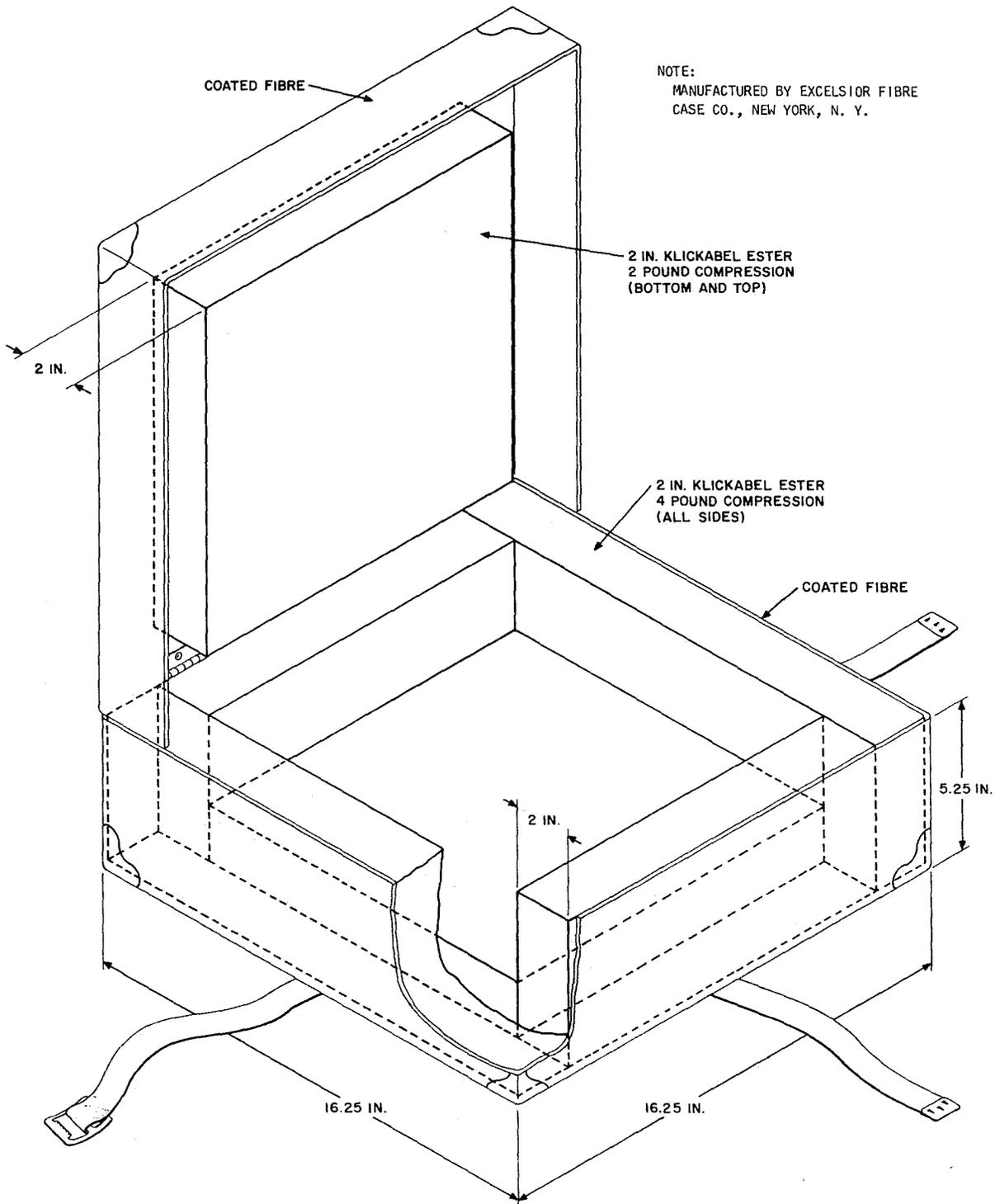


Fig. 8—Recommended Specifications for Shock Protected 10 1/2-Inch Magnetic Tape Reel Shipping Container

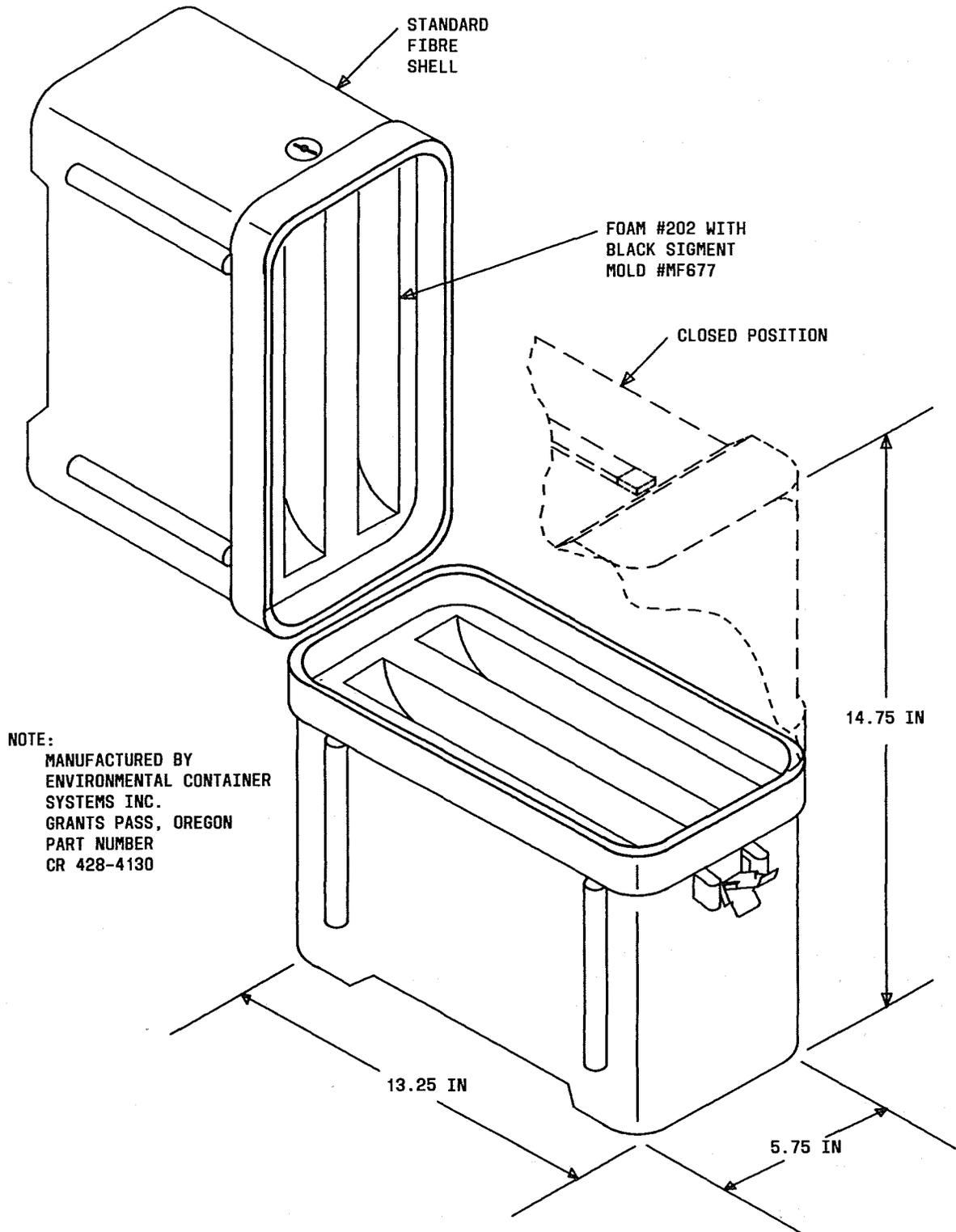


Fig. 9—Recommended Specifications for Shock Protected 10 1/2-Inch Magnetic Tape Reel Shipping Container

TABLE A			
SHOCK ENVIRONMENT — 2-FOOT DROP TEST (NOTES 1 AND 2)			
CONTAINER	SIDE	FLAT SURFACE	CORNER
A	298.3G	129.0G	196.9G
B	187.5G	162.5G	137.5G
C	108.3G	93.8G	46.9G

Notes:

1. All values are averages of three drops per side.
2. G — Acceleration due to gravity.

8.12 In BOCs without a centralized staff, the RAO and network personnel establish the route and method of tape shipment and the shipping schedule.

9. TAPE PROCUREMENT

9.01 Tape quality verification of a particular tape as specified by the purchaser is a function of the magnetic tape manufacturer.

9.02 For magnetic tape applications that require minimal error activity from the first run of a new reel of tape, the user should specify that each reel of tape be full width certified permanent error free at 3200 FCI (100 BPI) with a minimum detection level of 35 percent at final inspection.

9.03 **Full Width Certified:** For the purpose of this practice, full width certified is defined as a function of the tape manufacturing process for a specified quality of magnetic tape where the manufacturer certifies the complete width and the complete length of the reel of tape to be free of permanent error.

9.04 **Permanent Error Free:** A permanent error free tape is defined as one which can be read within the detection level specified in paragraph 9.05. A tape that fails to meet these requirements on

any three consecutive attempts is considered to have permanent error.

9.05 **Detection Level of 35 Percent:** A tape has detection level of 35 percent if the tape output level amplitude provides at least 35 percent of the standard output level with the data recorded at 1.5 times the saturation level of the tape.

10. TAPE LIFE AND RETIREMENT

10.01 The establishment and use of comprehensive records that show for each tape the following minimum information are an economic essential:

- Manufacturer
- Date acquired
- Bit density to which certified
- Number of times used (passes)
- Any difficulty encountered and date
- Any tape maintenance or rehabilitation performed and the date and nature of the processing.

This information provides a basis for statistical data that lead to error-free use and extends life expectancy of the magnetic tape.

10.02 Tape life is defined as the number of passes (cycles) a tape makes over a record head from the initial use to the end of life (Fig. 11).

10.03 End of life is defined as the time in tape usage when the tape develops a number of permanent flaws so as to render the tape useless.

10.04 It is recommended that a magnetic tape be removed from service when (1) the tape has made 5000 recorder head passes (where multihead arrangements are regarded as one pass) or (2) the tape has experienced 1000 hours tape running time whichever occurs first. This criterion provides a margin so as to enhance trouble-free use (Fig. 11).

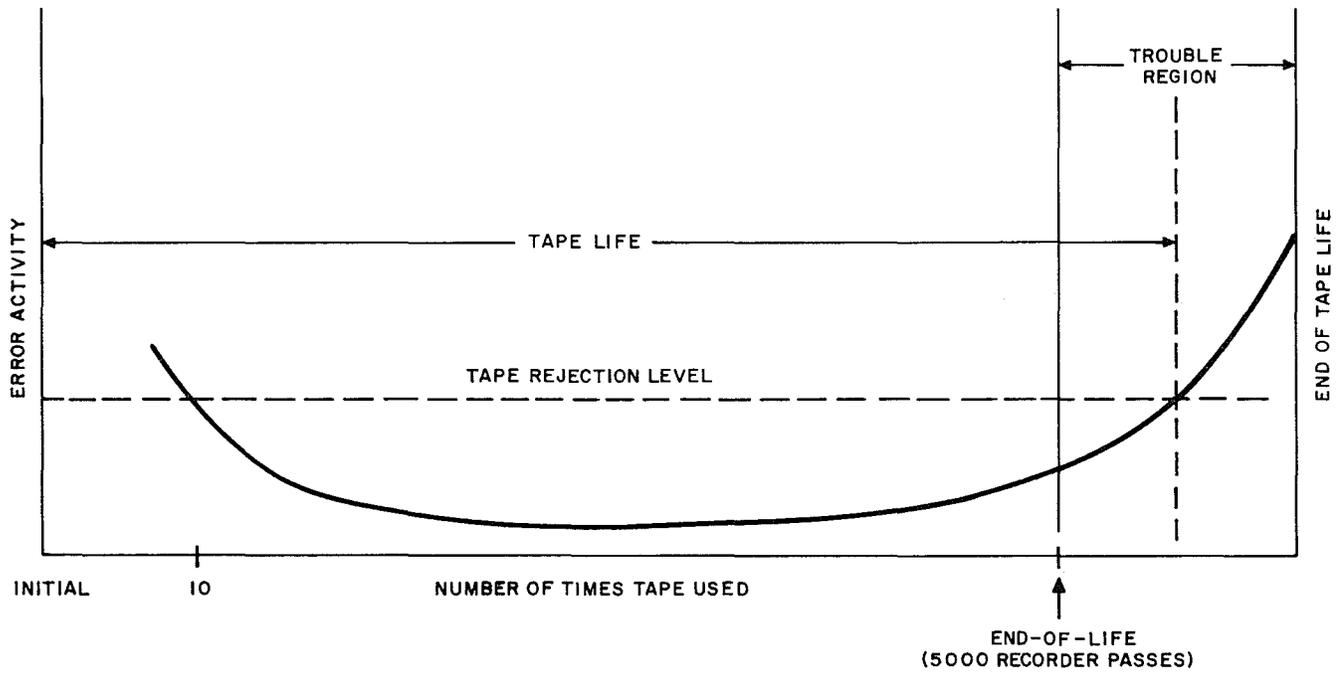


Fig. 11—Typical Error Activity Profile for a Reel of Magnetic Tape