GA21-9170-0

Systems

IBM 3747 Data Converter Operator's Guide

IBM

Preface

This manual, GA21-9170, is for IBM 3747 Data Converter operators. It contains both operating instructions and explanatory information. The message codes that may appear on the 3747 display are shown in Chapter 3 along with their causes and required actions.

The *IBM 3747 Data Converter Reference Manual,* GA21-9153, contains detailed information about the 3747; it should be used in conjunction with this manual.

IBM 3740 Data Entry System Summary and Installation Planning, GA21-9152, should be referred to for environmental and storage information related to the 3747.

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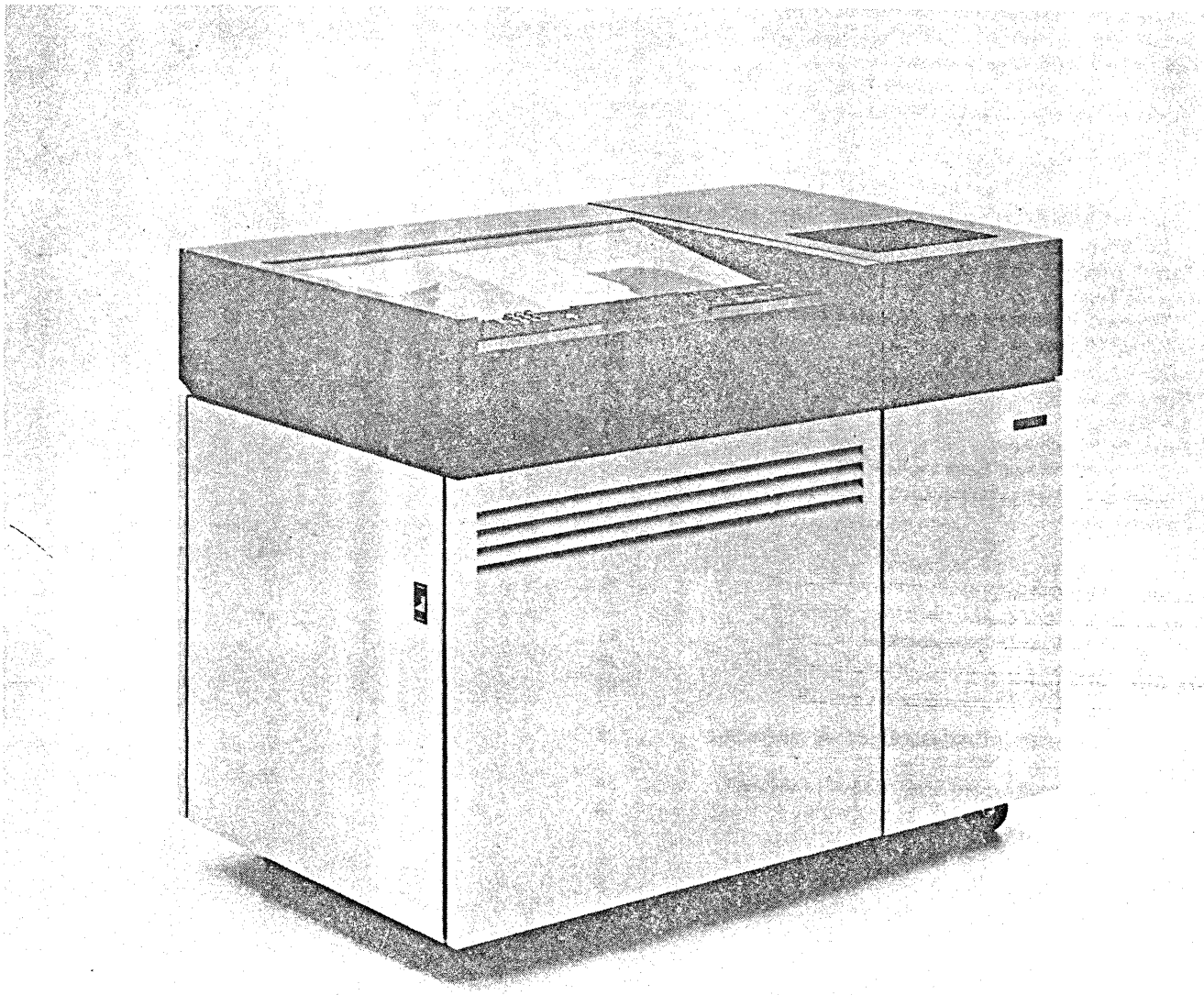
Changes are continually made to the specifications herein; any such changes will be reported in subsequent revisions or Technical Newsletters.

A Reader's Comment Form is at the back of this publication. If the form is missing, address your comments to IBM Corporation, Publications, Department 245, Rochester, Minnesota 55901.



IBM 3747 Data Converter

Chapter 1. Introduction to the IBM 3747 Data Converter

The IBM 3747 Data Converter is a stand-alone device that reads data that is on disks and writes the data on tape. With optional features, the 3747 can also convert data from tape to disk, handle jobs with labeled tapes, and send and receive data over telephone lines through a binary synchronous communications adapter (BSCA).

The basic 3747 can perform these types of jobs:

- Disk to tape, unlabeled (single file on tape)
- Disk to tape, unlabeled (multiple files on tape)

With optional features, the 3747 can also perform these types of jobs:

- Disk to tape, labeled
- Tape to disk, labeled or unlabeled tape
- BSCA to tape, labeled or unlabeled tape
- Tape to BSCA, labeled or unlabeled tape

Operating instructions for each of these job types are given in Chapter 2 of this book. These operating instructions indicate the specific action to be taken and cite references that contain more information on how to take that action. These references are included in Chapter 4; you will need to check these references only if the action to be taken is unfamiliar to you.

Included with the operating instructions are the displays that normally appear on the four-position 3747 display as a result of operator or machine actions. If something other than the expected display appears, see Chapter 3, which contains a listing of message codes, their causes and required actions. The display is normally blank while a job is running on the machine.

Chapter 5 of this manual explains diskette and tape concepts. Chapters 6 and 7 describe the replacement of reflective markers on tape and how to clean the tape transport.

PREPARATION FOR OPERATING THE 3747

As you prepare to run jobs on the 3747, you need to select the correct job, tape, and diskettes. Your supervisor will tell you where to find and how to select the proper job, tape, and diskettes for each job.

To begin operating, you must power up the machine. Power on procedures are given in Chapter 4 for machines with and without the label feature (machines with the label feature have the keylock). If your machine has the label feature, the procedure will ask you to enter today's date. This is keyed in on the keyboard as the last two digits of the year followed by a three-digit day of the year (that is, January 1 is 001, January 31 is 031, December 31 is 365, assuming that this is not a leap year). When the date has been keyed, only the last four digits show on the display. You probably will have a calendar available that shows the three-digit days of the year.

The functions of the 3747 keys, lights, and switches are discussed in Chapter 4 under *Keys, Lights, and Switches.* You communicate with the machine through the keys and switches, and the machine communicates with you through the four-position display and an audible alarm. The alarm sounds to tell you that the machine status has changed and some action must be taken. Taking the required action shuts off the alarm. You can also silence the alarm without changing the machine status by pressing STOP.

When the operating instructions tell you to display job statistics, you can step the display through these statistics (see *Job Statistics*). Your supervisor will tell you which statistics to record.

For some procedures, you must decide if the file or job is complete. If you read the expected number of data sets, your file is complete. When all disks have been read or all files written from tape (the expected number), the job is complete.

MAGNETIC TAPE CARE

These suggestions should help you ensure maximum performance of your magnetic tape and tape unit:

- Do not turn power off until the tape has been rewound and unloaded.
- Do not smoke near tape or tape units because ashes can contaminate or burn tape.
- Handle tape reels carefully; dropping or mishandling can damage the tape or reel.
- Inspect reel containers periodically for dust or dirt.
- Do not expose magnetic tape to magnetism.
- Do not grasp the tape reel at its outer edges, as the tape itself may be pinched and damaged.
- To clean the magnetic tape, wipe it gently with a lint-free cloth.
- If a reel of tape is dropped, inspect it immediately. Thoroughly clean the exposed tape and rewind it on a good reel.
- When a reel of tape is removed from the 3747, always place it in a container immediately.
- Store reel containers where they will not be exposed to dust.
- Clean tape units after every eight hours of use. Pay particular attention to the read/write head and the vacuum columns. This cleaning prevents accumulation of dust and dirt that can interfere with contact between the tape and the read/write head.
- When using tapes that have been stored in other than the operating environment, be sure that the tapes are properly reconditioned by putting them into the operating environment for the same length of time that they were removed from the operating environment (up to a maximum of 24 hours).

DISKETTE CARE

The diskette, like magnetic tape or magnetic cards, performs well when given reasonable care. Some suggestions for protection and user are:

- When the diskette is not in a machine, keep it in the protective cardboard envelope that is provided with each new diskette. Put the diskette in the envelope before writing on the label so that the label is visible through the cut-away front of the envelope.
- Always handle the diskette by the label area to avoid touching the Mylar* recording surface. Fingerprints on the recording surface can cause permanent disk errors.
- Use a file folder or carrier envelope to carry the diskette.
- Keep office utility magnets away from the diskette.
- Never turn machine power off when a diskette is still loaded.

DISKETTE ENVIRONMENT AND STORAGE

Diskettes may be used in normal office environment and in most industrial environments that are not wet or dusty. They are relatively unaffected by climatic variables. If diskettes are mailed, they should be placed in a box or a heavy cardboard mailer to prevent bending or contact with stray magnetic fields that may be encountered in normal shipping and handling.

Diskettes should be stored in their protective envelopes in an upright position. Use a storage rack like those used for magnetic tape reels. The stiff cardboard box (fivepack) in which the diskettes are shipped is excellent for storage. If the storage environment is dusty, or if storage will be lengthy, place the storage rack in a closed cabinet to avoid contamination.

When using diskettes that have been stored in other than the operating environment, be sure that the diskettes are properly reconditioned for a maximum of 5 minutes before they are used.

*Trademark of E.I. duPont deNemours and Co., Inc.

DISK TO TAPE, UNLABELED (SINGLE FILE ON TAPE)

Instructions		Display	See this Section for Reference Information
1.	Select the job, tape, and diskettes.		
2.	Turn the power switch on if it is not already on. (Keylock must be set at NORMAL.)		
3.	Insert write ring in the tape.		
4.	Mount the tape on the machine (with reflective marker on left reel).		*Loading Tape*
5.	Press STOP		
	RESET	8888	
	LOAD/REWIND (tape ready light comes on)	8888	
6.	Place diskettes in hopper (include control disk as first diskette, if used).		*Loading Diskettes*
7.	Perform power on procedure, if needed.		*Power On Procedures*
8.	Press START.		
9.	If 0005 appears, enter control record label number, return to step 8.	0005	
	If 000F appears, go to step 10.	000F	
	If 0111 appears and file is complete, go to step 10.	0111	
	If 0111 appears and file is not complete, add more diskettes and return to step 8.	0111	
	If 011F appears, go to step 10.	011F	
10.	Display and record job statistics as required.		*Job Statistics*
11.	Press EOJ.	000E	
12.	Remove tape and diskettes.		
13.	Complete the job according to your installation procedures.		

DISK TO TAPE, UNLABELED (MULTIPLE FILES ON TAPE)

Instructions	Display	See this Section for Reference Information
1. Select the job, tape, and diskettes.		
2. Turn the power switch on if it is not already on. (Keylock must be set at NORMAL.)		
3. Insert write ring in the tape.		
4. Mount the tape on the machine (with reflective marker on left reel).		*Loading Tape*
5. Press STOP		
RESET	8888	
LOAD/REWIND (tape ready light comes on)	8888	
6. Place diskettes in hopper (include control disk as first diskette if used).		*Loading Diskettes*
7. Perform power on procedure, if needed.		*Power On Procedures*
8. Press START.		
9. If 0005 appears, enter control record label number, return to step 8.	0005	
If 000F appears, go to step 11.	000F	
If 0111 appears and the file is complete, go to step 10.	0111	
If 0111 appears and the file is not complete, add more diskettes and return to step 8.	0111	
If 011F appears, go to step 11.	011F	
10. To change the end of file condition, press END OF FILE and return to step 8.		*Keys, Lights, and Switches*
11. Display and record job statistics as required. If the tape is complete, go to step 12. If the tape is not complete, return to step 6.		*Job Statistics*
12. Press EOJ.	000E	
13. Remove tape and diskettes.		
14. Complete the job according to your installation procedures.		

DISK TO TAPE, LABELED

	Instructions	Display	See this Section for Reference Information
1.	Select the job, tape, and diskettes.		
2.	Turn the power switch on if it is not already on. (Keylock must be set at NORMAL.)		
3.	Insert a write ring in the tape.		
4.	Mount the tape on the machine (with reflective marker on left reel).		*Loading Tape*
5.	Press STOP RESET LOAD/REWIND (tape ready light comes on)	 8888 8888	
6.	Place diskettes in hopper (include control disk as first disk).		*Loading Diskettes*
7.	Perform power on procedure, if needed.		*Power On Procedures*
8.	Press START.		
9.	If 0005 appears, enter control record label number and return to step 8. If 0024 appears, the tape is not expired. Either end the job and return the tape to the supervisor, or return to step 8 (override the date). If 0017 appears, the tape is secure. Match the cipher code and return to step 8. When 0014 appears, a new expiration date is requested. If desired, enter new expiration date (YYDDD) and go to step 10. (If no numbers are entered, the date defaults to all zeros.)	0005 0024 0017 0014 YDDD	 *Cipher Codes*
10.	Press START.		
11.	If 000F appears, go to step 13. If 0111 appears and file is complete, go to step 12. If 0111 appears and file is not complete, add more diskettes and return to step 10. If 011F appears, go to step 13.	000F 0111 0111 011F	
12.	To change the end of file condition, press END OF FILE and return to step 10.	011F	
13.	Display and record job statistics as required.		*Job Statistics*
14.	If job is complete, go to step 15. If job is not complete, add more diskettes if needed and go to step 10.		
15.	Press EOJ.	000E	
16.	Remove tape and diskettes.		
17.	Complete the job according to your installation procedures.		

TAPE TO DISK, LABELED OR UNLABELED TAPE

Instructions	Display	See this Section for Reference Information
1. Select the job, tape, and diskettes.		
2. Turn power switch on if it is not already on. (Keylock must be set at NORMAL.)		
3. Check to ensure that there is no write ring in the tape.		
4. Mount the tape on the machine (with reflective marker on left reel).		*Loading Tape*
5. Press STOP		
RESET	8888	
LOAD/REWIND (tape ready light comes on).	8888	
6. Place diskettes in hopper (include control disk as first diskette).		*Loading Diskettes*
7. Perform power on procedure, if needed.		*Power On Procedures*
8. Press START.		
9. If 0005 appears, enter control record label number and return to step 8.	0005	
If 0017 appears, tape is secure and you must match cipher code and return to step 8.	0017	*Cipher Codes*
If 0111 appears, add more diskettes and return to step 8.	0111	
If 000F appears, go to step 10.	000F	
If 000E appears, go to step 11.	000E	
10. Display and record job statistics as required; return to step 8.		*Job Statistics*
11. Remove tape and diskettes.		
12. Complete the job according to your installation procedures.		

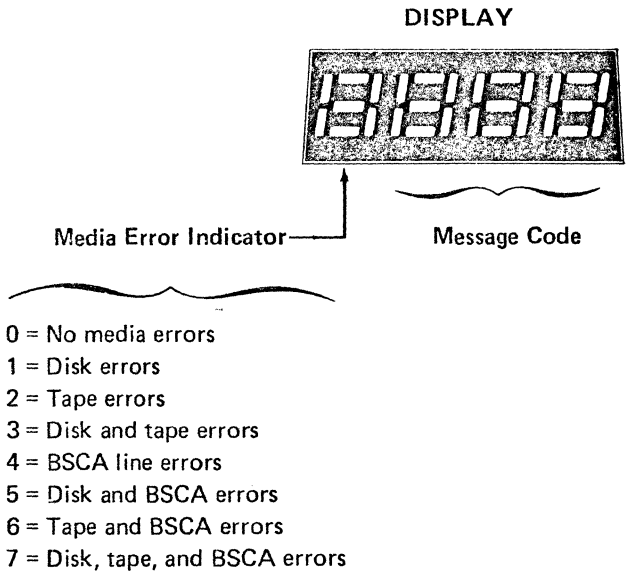
BSCA TO TAPE, LABELED OR UNLABELED TAPE

Instructions	Display	See this Section for Reference Information
1. Select the job, tape, and control disk.		
2. Turn the power switch on if it is not already on. (Keylock must be set at NORMAL.)		
3. Insert write ring in tape.		
4. Mount the tape on the machine (with reflective marker on left reel).		*Loading Tape*
5. Press STOP		
RESET	8888	
LOAD/REWIND (tape ready light comes on).	8888	
6. Place control disk in hopper.		*Loading Diskettes*
7. Perform power on procedure, if needed.		*Power On Procedures*
8. Press START.		
9. If 0005 appears, enter control record label number and return to step 8.	0005	
If 0024 appears, the tape is not expired. Either end the job by pressing EOJ and return the tape to the supervisor, or return to step 8 (override the date).	0024	
If 0017 appears, the tape is secure. Match the cipher code and return to step 8.	0017	*Cipher Codes*
10. If 0401 appears, no action is required; a timing cycle is being taken.	0401	
11. Complete data set (modem) preparation according to your installation procedures.	0404 0406 0407 0408	
12. End of file occurs.	000F	
13. Display and record job statistics as required.		*Job Statistics*
14. Press START.		
If 000F appears, go to step 13.	000F	
If 0405 appears, call is complete.	0405	
If this was the last call, go to step 15.		
If this was not the last call using this control disk, press START and go to step 10.		
15. Press EOJ.	000E	
16. Remove tape and control disk.		
17. Complete the job according to your installation procedures.		

Operating Note: If a call comes in on an unscheduled basis, before the 3747 displays 0406 for the BSC job, the call must be placed on hold while the 3747 job is prepared. When 0406 appears on the display, the C key on the keyboard must be pressed before the data button on the data set (modem) is pressed.

TAPE TO BSCA, LABELED OR UNLABELED TAPE

Instructions	Display	See this Section for Reference Information
1. Select the job, tape, and control disk.		
2. Turn the power switch on if it is not already on.		
3. Check to ensure that there is no write ring in the tape.		
4. Mount the tape on the machine (with reflective marker on left reel).		*Loading Tape*
5. Press STOP		
RESET	8888	
LOAD/REWIND (tape ready light comes on)	8888	
6. Place control disk in hopper.		*Loading Diskettes*
7. Perform power on procedure, if needed.		*Power On Procedures*
8. Press START.		
9. If 0005 appears, enter control record label number, return to step 8.	0005	
If 0017 appears, tape is secure. Match the cipher code and return to step 8.	0017	
10. If 0401 appears, no action is required; a timing cycle is being taken.	0401	
11. Complete data set (modem) preparation according to your installation procedures.	0404 0406 0407 0408	
12. End of file occurs.	000F	
13. Display and record job statistics as required.		*Job Statistics*
14. Press START.		
If 000F appears, go to step 13.	000F	
If 0405 appears, call is complete.	0405	
If this was the last call using this control disk, go to step 15.		
If this was not the last call using this control disk, press START; return to step 10.		
15. Press EOJ.	000E	
16. Remove tape and diskette.		
17. Complete the job according to your installation procedures.		



Note: In this listing, bullet actions (•) are always taken; solid vertical lines indicate optional courses of action.

Code	Meaning		Cause/Action
X00E	End of job		EOJ key has ended the job or double tape mark was sensed on the tape. • Remove the diskette and tape.
X00F	End of file		An end of file condition exists. • Display job statistics as required. OR • Press START to continue with next file. • Press EOJ to end the job.
X005	Enter control record label number		Machine stops to allow control record selection. • Key in control record label number to be used in this job (9 through 26). • Press START.
X006	Enter cipher code		Power on procedure allows cipher code to be entered. • Turn keylock switch to ENTER/LOCK to enter code. OR • Press START to continue without entering cipher code.
X013	Enter today's date		Power on procedure to enter the current date (YYDDD format). • Key in date. • Press START.
X014	Enter expiration date of tape		New tape label being built; expiration date requested. • Key in date (YYDDD), if wanted. • Press START.

Code	Meaning	Cause/Action
X016	Enter a cipher code	Keylock has been turned to ENTER/LOCK. • Key in a 4-digit code (0000 = no change). • Turn keylock to NORMAL. • Press START.
X017	Match cipher code	A secured tape was loaded. • Key in a 4-digit code (must match code entered through X016). • Press START.
X020	Tape and job do not match	Labeled input tape loaded; unlabeled job specified. Press EOJ to terminate job. Restart job after correcting error. OR Press START to accept labels as a data set and continue.
X021	Control record label found	Control record label found where it was not expected. • Use DISPLAY to determine record in error. Press EOJ to terminate the job. Restart job after correcting error. OR Press START to ignore the label and continue with the next label.
X024	Unexpired tape	Labeled output tape is not expired. Press EOJ to terminate the job. Restart job with expired tape. OR Press START to override expiration date and continue.
X026	Keylock in ENTER/ LOCK	Keylock switch is not set to NORMAL. • Turn switch to NORMAL.
X035	Invalid control record label number	A control record label number of other than 9 through 26 was entered through X005, or the label number entered was that of an invalid label. Key in correct sector number of the control record label to be used. Press START. OR Press EOJ to terminate the job; correct control disk.
X037	Match cipher code (second try)	Cipher code entered through X017 did not match that stored. • Key in a 4-digit code (must match code entered through X016). • Press START to match code and continue.
X040	Tape and job do not match	Labeled output tape loaded, unlabeled job specified. • Press EOJ to terminate the job. Restart job after mounting an unlabeled tape or correcting the error. OR Restart job after turning keylock (if installed) to BLP if retention of labeled tape contents is not required.
X041	Tape and job do not match	Unlabeled tape loaded, labeled job specified. • Press EOJ to terminate the job. • Restart job after correcting error.
X042	No data file on tape	Labeled input tape loaded with no data file. • Press EOJ to terminate the job. • Restart job after mounting a labeled tape or correcting the error.

Code	Meaning	Cause/Action
X043	Invalid device in control record	Device specified in control record invalid, not installed, or input and output specified the same. • Use DISPLAY to determine record in error. • Press EOJ to terminate the job. • Restart job after correcting the C1 control record.
X044	Invalid control record	Control record has an invalid entry (first four characters were not C1ØØ or C2ØØ). • Use DISPLAY to determine record in error. • Press EOJ to terminate job. • Restart the job after correcting the control record.
X045	Control record label error	The control record label does not have an L in position 45 or has no control records. • Use DISPLAY to determine the record in error. • Press EOJ to terminate the job. • Restart the job after correcting the error.
X047	Cipher code did not match	Two attempts were made to match the cipher code. • Press EOJ to terminate the job. • Restart the job after obtaining the correct cipher code.
X048	Invalid control record	An invalid BSC control record was found following the completion of a BSC call (X405). • Use DISPLAY to determine record in error. • Press EOJ to terminate the job. • Restart the job after correcting error.
X051	Internal error	Internal read/write error during job. • Press EOJ to terminate job (see *Note* at the end of the message code listing).
X053	Keylock not properly set	Power on procedure was executed with keylock in BLP position. • Press EOJ to terminate the job. • Turn power off. • Turn keylock to NORMAL. • Turn power on and execute power on procedure.
X058	Keylock inoperaple	The keylock has malfunctioned. • Press EOJ to terminate the job (see *Note* at the end of listing).
X059	Internal error	An internal interrupt has occurred which was not expected. • Press EOJ to terminate the job (see *Note* at the end of this message code listing).
X081	Internal error	Internal error occurred during job setup. • Press START. If not other errors occur, the machine is operating correctly (see *Note* at the end of this listing).

Code	Meaning	Cause/Action
X11F	Hopper empty and END OF FILE on	The end of file switch was on and the last data set on the last disk was processed. Load diskettes for the next file on tape. Press START to begin new file. OR Press EOJ to end the job. OR Press END OF FILE to turn it off. Press START to reset the end of file condition so that the current tape file can be continued.
X111	Hopper empty and END OF FILE off	The last data set on the last disk was processed and the end of file switch was off. Load disks to be added to the same tape file. Press START to continue with the same file. OR Press EOJ to end the job. OR Press END OF FILE to turn it on. Press START to set the end of file condition for the current tape file.
X112	Stacker full	Disk stacker capacity is exceeded. • Remove disks from stacker. • Press START.
X113	Hopper jam	A diskette has been misfed or was improperly oriented when fed. • Remove the diskettes from the hopper. • Clean any diskettes from the feed rolls. • Press START to clear machine. Any diskette ejected should be returned to hopper (has not been processed).
X114	Stacker jam	A diskette cannot be ejected. • Remove all diskettes from hopper and stacker. • Press START to clear machine (any disk ejected has been processed).
X115	Unable to clear transport	Object is in the disk unit. • Remove diskettes from hopper and stacker. • Be sure disk unit is clear. • Press START. If disk is ejected and X113 or X114 appeared previously, follow action for previous error. If X113 or X114 were not the previous error message, restart job.
X131	Wrong record length	A disk record does not have the same length as the first record read in the file. • Use DISPLAY to determine the record in error. Press EOJ to end the job. Restart after correcting error. OR Press START to skip the record in error.
X132	Read error	A record cannot be read from disk. • Use DISPLAY to determine the record in error. Press EOJ to terminate the job. Restart after correcting error. OR Press START to skip the record in error.
X133	Write error	A record cannot be written on disk. • Use DISPLAY to determine the record in error. Press EOJ to end the job. Restart the job using a different disk. OR Press START to retry the write.

Code	Meaning	Cause/Action
X139	Invalid location control character	A disk location was marked with an invalid control character. • Use DISPLAY to determine record in error. • Press EOJ to terminate the job. • Restart job after correcting error. OR • Press START to continue (record is bypassed and not counted).
X141	Track address not found	A track cannot be located or the disk is not initialized. • Use DISPLAY to determine track in error. • Press EOJ to terminate the job. • Restart the job after correcting the disk.
X142	Read/Write error	A read/write error has occurred in track 00. • Use DISPLAY to determine the record in error. • Press EOJ to terminate the job. • Restart the job.
X143	Permanent write error	The record cannot be written on the disk. • Press EOJ to terminate the job. • Restart the job with a different disk.
X144	Unit error	The disk unit has malfunctioned. • Press EOJ to terminate the job. • Restart the job.
X145	Write protected data set	The data set label is write protected. • Press EOJ to terminate the job. • Restart job with non-write protected file.
X147	Unverified data	Data set is not verified as required by the control record. • Press EOJ to terminate job. • Restart job after data has been verified.
X148	Label error	Disk label is not correct. • Use DISPLAY to determine record in error. • Press EOJ to terminate the job. • Restart job after label has been corrected.
X149	Invalid location control character	A disk location was marked with an invalid control character. • Use DISPLAY to determine the record in error. • Press EOJ to terminate the job. • Restart job after correcting the error.
X152	Internal error	Disk unit malfunction. • Press EOJ to terminate the job. • Restart job.
X159	Internal error	Disk unit malfunction. • Press EOJ to terminate the job. • Restart job.
X161	Invalid record length	A disk record greater than 128 characters or of zero length was found. • Use DISPLAY to determine the record in error. • Press EOJ to terminate the job. • Restart job after correcting the error.

Code	Meaning	Cause/Action
X202	Tape being erased	Tape is being erased to end-of-tape because of control record request. OR I No action required. I To terminate erase, press STOP, RESET, UNLOAD TAPE.
X221	Write-protected tape	The tape is file protected (no ring). • Press EOJ to terminate job. • Remove tape and insert a write ring, or get correct tape. • Restart the job.
X222	Wrong density tape	The density of the loaded tape does not agree with the specified machine capability. • Press EOJ to terminate job. • Restart job with correct density tape.
X223	Tape not ready	Tape not properly loaded. • Check for proper mounting (left reel latch down, and so on). • Press STOP. • Press LOAD/REWIND. • Press START when TAPE READY is turned on.
X231	Wrong length record	A tape record does not have the same length as the first record read in the file. • Use DISPLAY to determine record in error. OR I Press EOJ to end the job. I Restart after correcting the error. I Press START to skip the record in error.
X232	Read error	A record cannot be read from the tape. • Use DISPLAY to determine record in error. OR I Press EOJ to end the job. I Restart after correcting the error. I Press START to skip the record in error.
X233	Write error	A record cannot be written on tape. • Use DISPLAY to determine the record in error. OR I Press EOJ to end the job. I Restart job using a different tape. I Press START to retry the write.
X241	Tape error	The tape positioning lost or a record was found that was too long for the 3747. OR I Press EOJ to terminate the job. I Restart the job. I Restart the job after turning Keylock (if installed) to BLP if tape is to be unlabeled output and was previously used with long physical records.
X242	End of tape	The end of tape was detected. • Use DISPLAY to determine last record processed. • Press EOJ to end the job. • Restart job with longer reel of tape or less input data, or remaining data (tape is properly closed out).
X243	Read error	A tape read error occurred while reading at BOT (beginning of tape). • Press EOJ to end the job. • Restart the job.

Code	Meaning	Cause/Action
X244	Unit error	The tape unit has malfunctioned. • Press EOJ to end the job. • Restart the job.
X245	Internal error	Read/write error has occurred. • Press EOJ to end the job. • Restart the job.
X246	Unit check	The tape unit has malfunctioned. • Press EOJ to end the job. • Restart the job.
X259	Internal error	Read/write error has occurred. • Press EOJ to end the job. • Restart the job.
X261	Invalid record length	A record was read that was too long for the 3747. • Use DISPLAY to determine record in error. • Press EOJ to terminate the job. OR Restart the job after correcting the error. OR Restart the job after turning Keylock (if installed) to BLP if tape is to be unlabeled output.
X401	Temporary call delay	A 20-second delay between BSC calls or a 3-second modem stabilization delay is in effect. • No action required.
X402	Temporary line delay	Temporary delay caused by far end device. • No action required.
X404	Ready the modem	Job waiting for the data set (modem) to be made ready for leased line operation. OR Make the data set ready. OR Press STOP and EOJ to terminate job.
X405	End of call	A BSC call has been completed. • Display job statistics as required. OR Press START to continue with the next call using control from the next control record label. OR Press EOJ to end the job.
X406	Place call/await call	BSC job is set up and waiting for the line connection. OR Place call according to the installation procedures. OR Press STOP and EOJ to terminate job.
X407	Waiting for call	Auto answer is active and waiting for a call via the data set (modem). OR No action required after placing data set (modem) in auto answer mode. OR Press STOP and EOJ to terminate job.
X408	Line connection being attempted	A connection with the leased line is being attempted. OR No action required. OR Press STOP and EOJ to terminate job.

Code	Meaning	Cause/Action
X409	Call being terminated	Attempting to send a termination status message. • No action required.
X421	SOH record received	A start-of-header record was received but not expected. I Press START to bypass record, record is skipped (and not counted). OR Press EOJ to terminate job. Restart job. If error persists, call for assistance.
X431	Wrong record length	A BSC record does not have the same length as the first record in the file. • Use DISPLAY to determine the record in error. Press EOJ to end the job. Restart job after error is corrected. OR I Press START to skip the record in error.
X440	Invalid ID	Both IDs must be 2 to 15 characters long, and have an asterisk following the last character. The 3747 ID must start with an 'e' (hex 85). • Use DISPLAY to determine the record in error. • Press EOJ to end the job. • Restart the job after finding and correcting the error.
X441	Link-up failure	The initial line link-up failed. • Press EOJ to terminate job. • Restart the job. If error persists, call for assistance.
X442	Read or write error	A non-recoverable read or write error has occurred on the line. • Press EOJ to terminate job. • Restart the job.
X443	Link-up timeout	A timeout has occurred during link-up. • Press EOJ to terminate job. • Restart the job. If the error persists, seek assistance.
X444	Timeout	A timeout occurred while transmitting or receiving data. • Press EOJ to terminate job. • Restart the job. If error persists, call for assistance.
X445	Job canceled	The far-end device has requested that the job be canceled. • Press EOJ to terminate the job. • Contact the operator at the far-end device to see if the job can be restarted. • Restart the job if possible.
X446	Invalid operating mode	Both stations are attempting to transmit data. • Press EOJ to terminate the job. • Determine which station has the wrong job setup. • Correct and restart the job.
X447	Terminal ID error	The terminal ID contains a BSC control character. • Press EOJ to terminate the job. • Correct the terminal ID and restart the job.

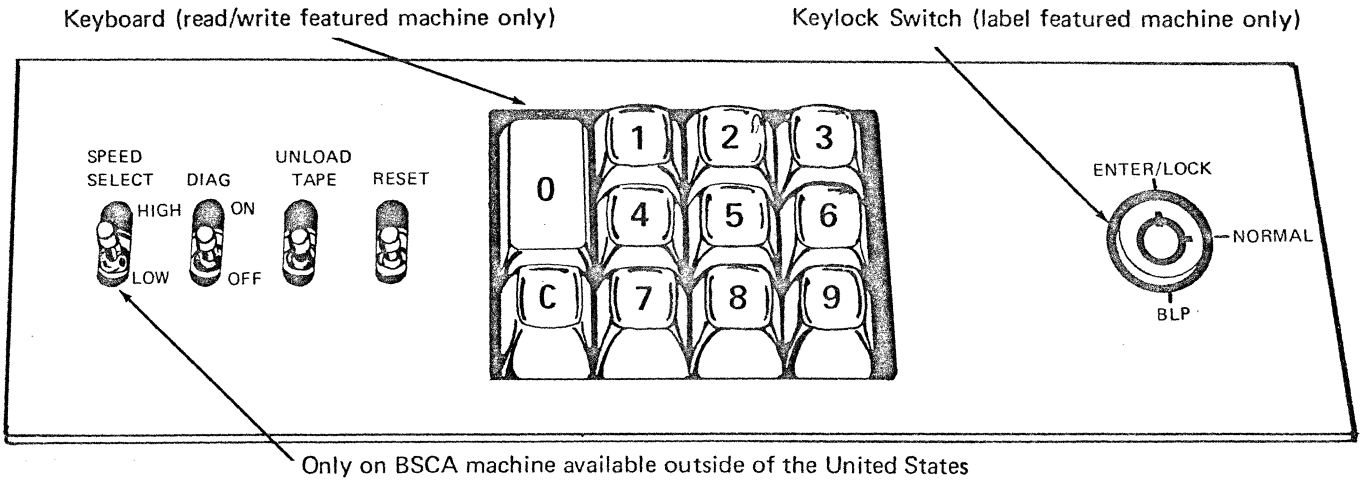
Code	Meaning	Cause/Action
X448	Received ID error	The far-end device ID specified in the control record does not match the ID received. • Press EOJ to terminate the job. • Determine if one station has the wrong ID. • Correct the error and restart the job.
X449	Invalid character	An invalid data character was to be transmitted from tape. • Use DISPLAY to determine the record in error. • Press EOJ to terminate the job. | Correct the data in error. | Restart the job. OR | Change job to transmit in transparent mode. | Restart the job.
X450	Job terminating	The operator has requested termination of this job. • No action required.
X451	Internal error or data set (modem) error	Interrupts are not occurring during transmission. • Press EOJ to terminate the job. • Restart the job.
X452	Internal error data set (modem) error	The data set (modem) has dropped ready after initially being good. • Press EOJ to terminate the job. • Restart the job.
X453	Internal error on data set (modem) error	The data set (modem) did not post the clear to send within the allocated time. • Press EOJ to terminate the job. • Restart the job.
X454	Internal error	A machine failure has occurred. • Press EOJ to terminate the job. • Restart the job.
X456	Internal error or data set (modem) error	The data set (modem) momentarily posted ready, then dropped ready, during initialization on a switched line. Connection may have been temporarily interrupted. • Press EOJ to terminate the job. • Restart the job.
X457	Internal error or data set (modem) error	The data set (modem) will not drop ready for initial connection sequence. • Press EOJ to terminate the job. • Restart the job.
X458	Internal error or data set (modem) error	The data set (modem) will not drop clear to send within allotted time. • Press EOJ to terminate the job. • Restart the job.
X459	Internal error	A machine failure has occurred. • Press EOJ to terminate the job. • Restart the job.

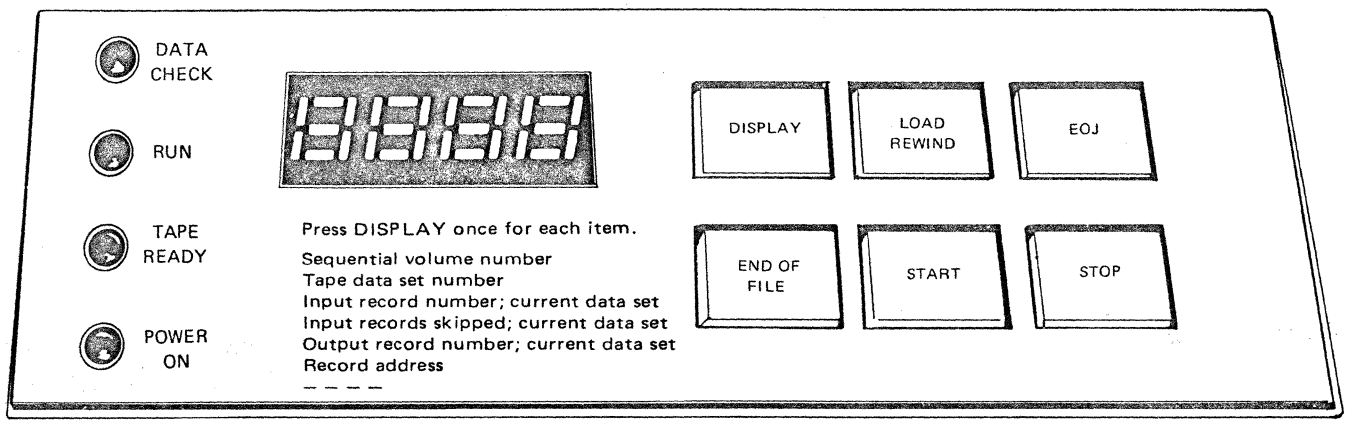
Code	Meaning	Cause/Action
X461	Invalid record length	A record longer than 128 characters was received. • Use DISPLAY to determine the record in error. • Press EOJ to terminate the job. • Restart the job after correcting the error.
X462	Zero length record	A null (empty) record was found. • Use DISPLAY to determine the record in error. • Press EOJ to terminate the job. • Restart the job after correcting the error.
8888	Reset Complete	The RESET switch was used. • Begin the job.
FF42	End of tape (write-only machine)	The end of tape was detected. • Use DISPLAY to determine last record processed. • Press EOJ to end the job. • Restart the job with longer reel of tape, less input data, or remaining data (tape is properly closed out).
XXXX	Undocumented message	A machine failure has occurred. • Check DIAG switch; must be set OFF. • Terminate the job (see *Note* at the end of this listing). • Restart the job. If error persists, call for assistance.

Note: Terminate the job by pressing EOJ. If this does not terminate the job, press STOP, RESET, UNLOAD TAPE, and START. Restart the job. If the error recurs or persists, call for assistance. DO NOT TURN POWER OFF OR PRESS RESET WHEN CALLING FOR ASSISTANCE!

Chapter 4. Reference Material For Operating The 3747

KEYS, LIGHTS AND SWITCHES





POWER Used to turn machine power on or off. Located on the left side of the machine.

START Used to begin operations or to retry or continue after certain stop conditions.

STOP Used to stop operations. Any action in process, such as reading a record, continues to a logical ending point before stopping. Pressing STOP after error stop turns off the audible alarm.

EOJ Used to terminate a job. Pressing EOJ:

- Writes two tape marks for tape output (labeled jobs also get trailer records),
- Rewinds and unloads the tape, and
- Ejects the diskette.

This switch is not active when run light is on.

LOAD/REWIND Used to load the tape and rewind the tape to load point. This is not active when the run light is on.

DISPLAY Used to display additional information in the display lights after an initial error message has been presented, or to display job totals.

After any stop, pressing the display key turns off the alarm and displays the following in succession:

1. Sequential volume number.
2. Tape data set number.
3. Input record number; current data set.
4. Input records skipped; current data set.
5. Output record number; current data set.
6. Record address.
7. – – – –

This switch is not active when the run light is on.

END OF FILE Used to set the end-of-file condition when reading a disk. The switch is effective only when the last data set processed on the last disk in the hopper does not have an L in the multivolume position. When pressed, the

switch lights, which indicate that an end-of-file condition is set if these conditions are met. When 011F is displayed (hopper empty and end-of-file condition set), a tape mark is written after diskettes are placed in the hopper and START is pressed.

The switch can be changed any time before 0111 or 011F appears. After 0111 appears, the end-of-file condition can be changed by pressing END OF FILE and START before loading more diskettes in the hopper. When START is pressed, the display changes to indicate a change in end-of-file. At this time, additional diskettes can be loaded and processing can continue.

DIAG Used for customer engineer diagnostics. Must be off at all other times.

UNLOAD TAPE Used to rewind and unload the tape. The switch is inactive until RESET is pressed.

RESET Used to reset and check the machine logic. Also resets the tape to not ready status and resets the machine when the tape is at other than the beginning of the tape.

This switch is not active when the run light is on.

DATA CHECK Indicates an error was detected while reading the input media; the record is skipped when START is pressed.

RUN Indicates the unit is running — turned on by START and turned off by STOP or an error.

TAPE READY Indicates that the beginning of tape (BOT marker) is detected after LOAD/REWIND is pressed.

POWER ON Indicates that the power is on.

Display Lights A four-position character display used to convey information to the operator.

Media Indicator The leftmost position of the four-character display is used as a media indicator. A digit displayed here indicates that the number of records requiring automatic retries for reading or writing is significant. The machine continues to process records, but at a slower rate. This position is normally blank when the display is blank, and a zero when the display shows a message.

Presence of a digit indicates one or more of the following:

- Worn or contaminated media (if the digit is displayed only on specific volumes).
- Read/write head needs cleaning (if the digit is displayed on many or on all volumes).
- A bad connection has been made in the communication network.

Digits that may be displayed in the media indicator and their meanings are:

0 = No media errors
1 = Disk errors
2 = Tape errors
3 = Disk and tape errors
4 = BSCA errors
5 = Disk and BSCA errors
6 = Tape and BSCA errors
7 = Disk, tape, and BSCA errors

This indicator is turned off when the error rate falls to an acceptable level or when a new volume is started. (A volume is a disk, a tape, or a BSCA call.)

Keyboard The ten-digit keyboard is used for entering control record label numbers, cipher codes, and dates. This keyboard is standard with the read/write tape features. Data may be keyed in through the keyboard only when the message code specifies that input is required. The keyboard is inactive at all other times.

The keyboard has keys 0 through 9 and a C key. The C key is used to clear the entire entry if you detect a keying mistake before pressing START. It is also used to simulate the telephone ring under certain BSC conditions. Each digit entered is displayed in the rightmost position of the four-character display, and is shifted left as additional keys are pressed. Only the requested number of digits are accepted and displayed (when entering a date, only the last 4 of the 5 digits entered are displayed). START must be pressed after keying all data from the keyboard. The entry is stored and disappears from the display. If no digits are keyed, zeros are assumed when START is pressed.

NORMAL Standard operating position for keylock switch.

ENTER/LOCK This position is used by the supervisor to enter a four-digit cipher code. This code remains until changed or until power is turned off (or DIAG switch has been used). When power is turned on, this internal cipher code is set to a number that is impossible to match from the keyboard. When the switch is set at ENTER/LOCK, jobs cannot be run.

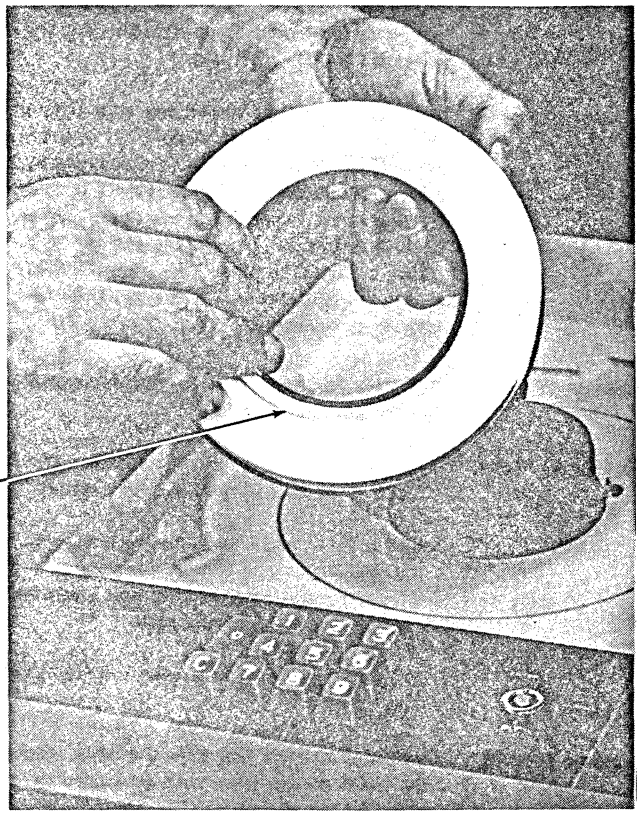
BLP (bypass label processing) This position is used to bypass the label feature functions. When the keylock is in position, the 3747 operates as if the label feature is not installed. This permits jobs to be done that:

- Initialize tapes with new VOL (volume) labels or initial tape marks.
- Reinitialize tapes which have developed permanent errors in the vicinity of BOT.
- Process tapes with records which resemble IBM standard tape labels to the extent that a label check occurs when these records are interpreted as standard labels.

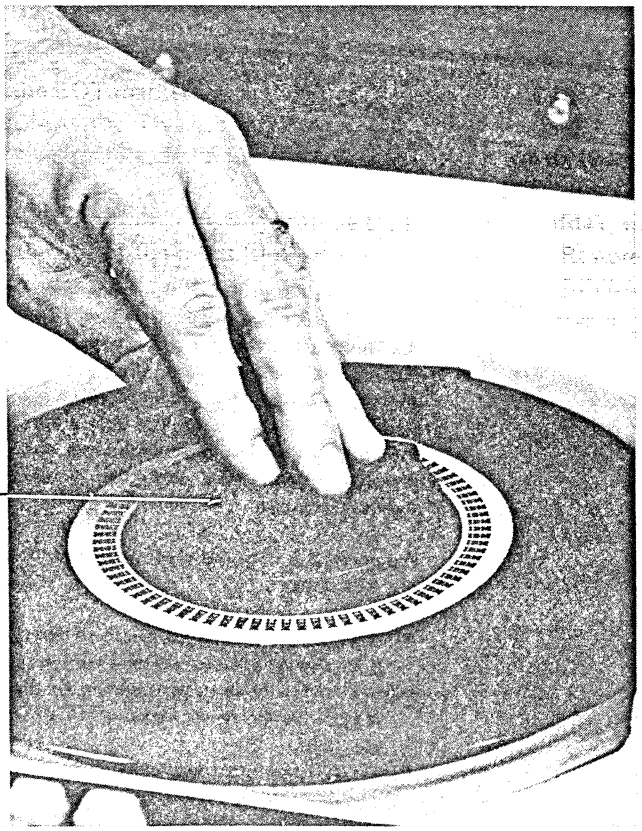
The key cannot be removed while the keylock is in the BLP position.

LOADING TAPE

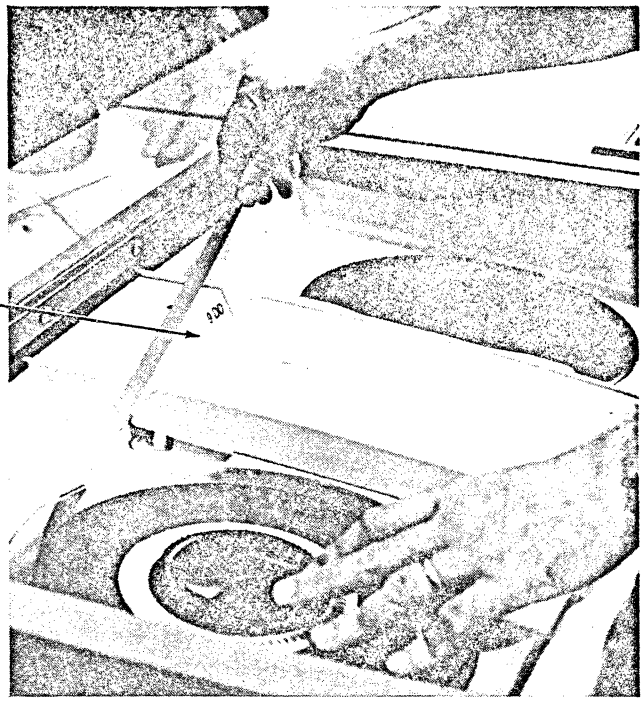
1. Check the back of the tape reel for the write ring. A ring is needed if you are going to write on the tape.



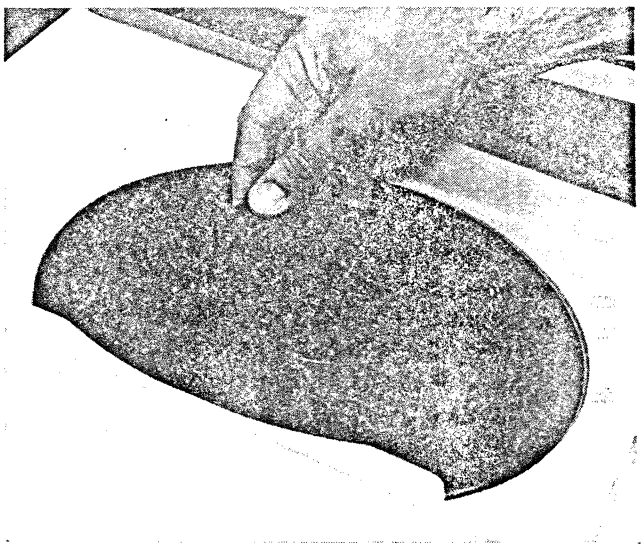
2. Place the tape on the left reel, ring side down. Press the reel latch down.



3. Pull the free end of the tape toward the right reel, pulling it down across and into the slot.

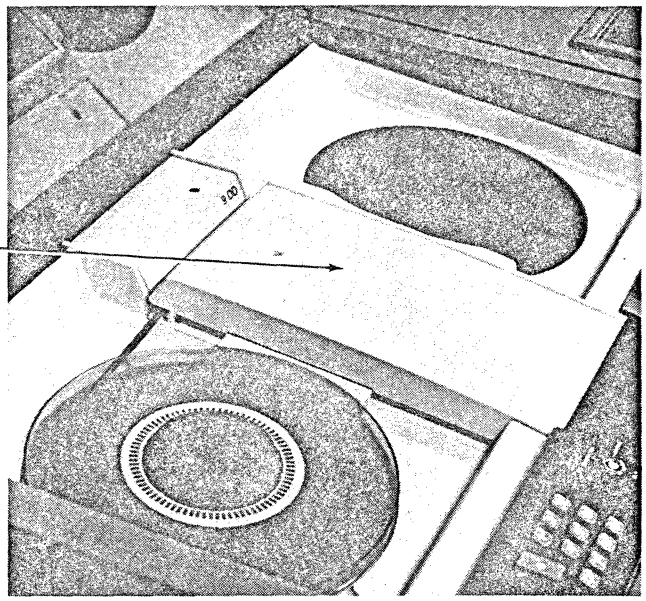


4. Wind the free end of the tape around the right reel 5 or 6 times; be sure that the reflective marker stays on the left side of the slot.



(Continued next page.)

5. The tape is now correctly mounted. When the tape is loaded (by pressing STOP, then LOAD/REWIND), it pulls down into the columns and stops on the BOT reflective marker (tape ready light comes on).



6. If the tape does not stop, but continues to seek BOT marker, press STOP and LOAD/REWIND. The unit then searches for the BOT marker (in reverse direction) until the tape ready light comes on.

Recovery Procedures After Tape Unit Malfunctions

1. If the tape unit does not sense the BOT marker and continues searching forward for it:
   a. Ensure that the BOT marker is properly positioned 14 to 18 feet from the physical beginning of the tape. If it is not, replace the marker (see *Reflective Markers*).
   b. Re-try the load procedure, ensuring that the BOT marker is to the left of the idlers (slot) before pressing LOAD/REWIND.

2. If the tape does not load properly in either column or in both columns, or if it dumps in either column, open the vacuum door and check the door and column edges for contaminants that may have prevented proper sealing. Re-try the load procedure.

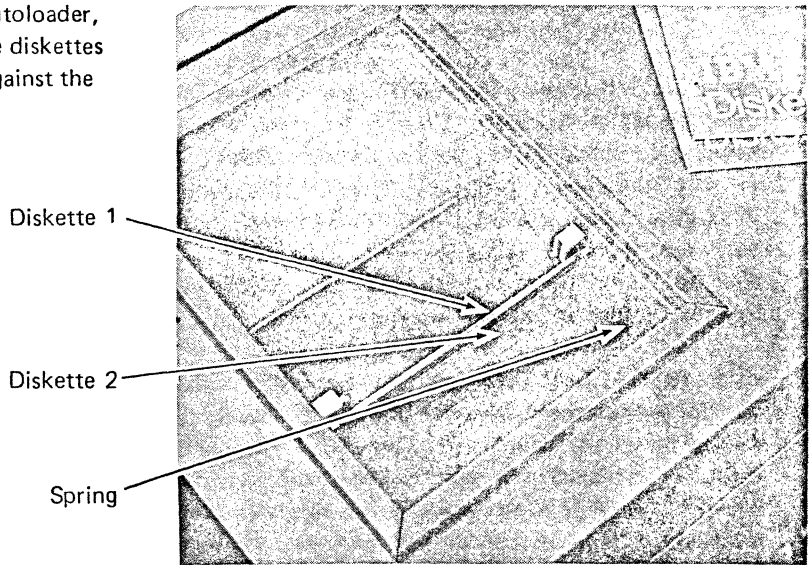
3. If the tape unit does not sense the EOT marker and the tape unwinds completely off the file reel:
   a. Ensure that the EOT marker is properly positioned approximately 25 feet from the physical end of the tape. If not, replace the marker (see *Reflective Markers*). If the marker is properly positioned, the failure could be a machine malfunction.
   b. Thread tape back through slot and onto the file reel. Manually wind 10 to 15 turns counterclockwise on file reel, and remove all slack. Press STOP, RESET, and LOAD/REWIND. As soon as the tape is loaded and starts to move, press STOP and LOAD/REWIND.

4. If power drops while the tape is loaded and not at BOT, manually rewind all slack between reels. Restore power, press STOP, RESET, and LOAD/REWIND. As soon as the tape is loaded and starts to move, press STOP and LOAD/REWIND.

LOADING DISKETTES

1. Order the diskettes in the proper sequence, placing the first diskette on the bottom, label side up, the second diskette on top of the first, and so on.

2. Place the diskettes in the right side of the autoloader, with the labels to the right. Be sure that the diskettes are in place, with the spring holding them against the loading mechanism.



CONTROL RECORDS

Control information must be supplied for all jobs that use any of the special features or user options. This control information is prepared on an IBM 3741 Data Station or an IBM 3742 Dual Data Station (or similar device), and is stored on a disk for use by the 3747.

These control records define the job that the 3747 is to perform; that is, disk to tape, tape to disk, labeled or unlabeled tape, and so on.

The control information can be either on a separate disk or on the same disk as the job data. This disk must be the first disk of the job. If you do not use a control record, the machine defaults to a basic disk-to-tape job.

Control record labels are found in sectors 8 through 26 of track 00. These labels are data set labels with special name fields. A control record label identifies the location of the control record which contains information for the 3747 job. Only one set of control information can be defined per control record label. This information, once read, is used for all files making up a single tape volume; additional control record labels found are ignored.

There are two types of control record labels; QQC and QQS. QQC control record labels identify the location of one or more control records that specify job information.

QQS control record labels are not associated with any specific control records. The QQS control record label causes the 3747 to stop (0005 is displayed) which allows you to select the number (9 through 26) of a QQC control record label. By permitting operator selection of the control record label for a particular job, several different sets of job control information can be included on the same disk, and the operator can select the control information needed for the job.

Thus, if your installation uses QQS control record labels, the machine displays 0005, asking you to enter the number of the control record label you want to use. Not entering any number or entering zeros selects control record label 9.

CIPHER CODES

All labeled tapes are checked for security requirements. Sensitive tapes have an accessibility byte set to prevent access by unauthorized persons. To process a volume with the accessibility byte set, you must match a previously-entered cipher code (display shows 0017). The supervisor normally enters this cipher code at the start of a day's processing. To enter the cipher code, turn the keylock to ENTER/LOCK (display shows 0016) and enter a four-digit code through the keyboard. To store the code, return the keylock to the NORMAL position and press START. If no cipher code is entered during the power on procedure, the 3747 stores a code which is impossible to match from the keyboard. If all zeros are entered, the cipher code is not changed. The cipher code can be changed any time the machine is stopped, except when numeric input is required.

When the 3747 finds a tape with the accessibility byte set, you must match the cipher code that was previously entered before the volume can be processed. To match the code, key the cipher code digits on the keyboard and press START. The 3747 allows you two tries to match this code. If the code matches, the job continues. If you do not match the code in your two tries, the 3747 displays 0047 and you must terminate the job by pressing EOJ. You may restart the job after checking the cipher code with your supervisor.

JOB STATISTICS

Job statistics are available for each job as it is run. These statistics include:

1. Sequential volume number.
2. Tape data set number.
3. Input record number, current data set.
4. Input records skipped, current data set.
5. Output record number, current data set.
6. Record address; last record read off or written on disk.
7. ----

Whenever the machine is stopped, repeatedly pressing the display key causes these statistics to be displayed on the four-position display. If the number of records exceeds 9999 (the largest number that can be displayed at one time), the number is displayed in two parts with a C displayed in the left-most position of the first part of the number. For example, if 26472 records are input, the third time DISPLAY is pressed, the display alternates between C026 and 0472. To stop this alternating display, press START. You can then either continue displaying statistics or resume running in the usual manner.

The output record number equals the input record number minus the input records skipped.

Note: When doing a tape to disk job, when one disk is filled and the next disk is about to be started, one record is stored in the machine. It appears as an input record, but has not yet been output.

The record address of the last record read off or written on disk is the track and sector number of the record (TTSS); the zero that normally separates these numbers (as on a data entry station) is dropped.

The seventh time DISPLAY is pressed, four dashes normally appear. If DIAG is on, the display shows 00--, and with sequential depressions of DISPLAY, diagnostic information is displayed. DIAG must be set to OFF for the machine to operate.

If DISPLAY is pressed on eighth time, the display returns to the original message and subsequent depressions of DISPLAY cycle the display through the job statistics again.

Job statistics can be checked any time during execution of a job by pressing STOP and then DISPLAY. The job can be resumed by pressing START.

These statistics help you to determine if the job was run correctly; for example, the correct number of disks were read, the expected number of records were read and written. When an error occurs, the record address of the last record read or written can be used to help you find and correct the error.

POWER ON PROCEDURES

IBM 3747 Without Label Feature

Instructions	Display	See this Section for Reference Information
1. Turn power switch on (located on left side of machine).		
2. Press STOP RESET	8888	

CAUTION: If power drops, remove tape and diskettes before turning power back on.

IBM 3747 With Label Feature

Instructions	Display	See this Section for Reference Information
1. With the keylock set at NORMAL turn power switch on (located on left side of machine) if it is not on already.		
2. Press STOP RESET	8888	
3. Insert the first diskette in the hopper (control disk or first data disk).		*Loading Diskettes*
4. Press START.	0013	
5. Enter today's date (YYDDD)	YDDD	
6. Press START.	0006	
7. If no cipher code is to be entered, go to step 10. If cipher code is to be entered, turn key to ENTER/LOCK position.	0016	*Cipher Codes*
8. Enter today's cipher code (obtained from supervisor).		
9. Turn key to NORMAL.		
10. Press START (job begins).		
11. If no job is to be run, press EOJ at the first stop (message appears).		
12. Return key to supervisor.		

CAUTION: If power drops, remove tape and diskettes before turning power back on.

CLEARING JAMS

If a diskette jams in the disk unit so that it cannot be ejected by following instructions given with the message codes, try the following procedure:

1. Remove all diskettes from hopper and stacker.

2. Press STOP
   RESET
   START.

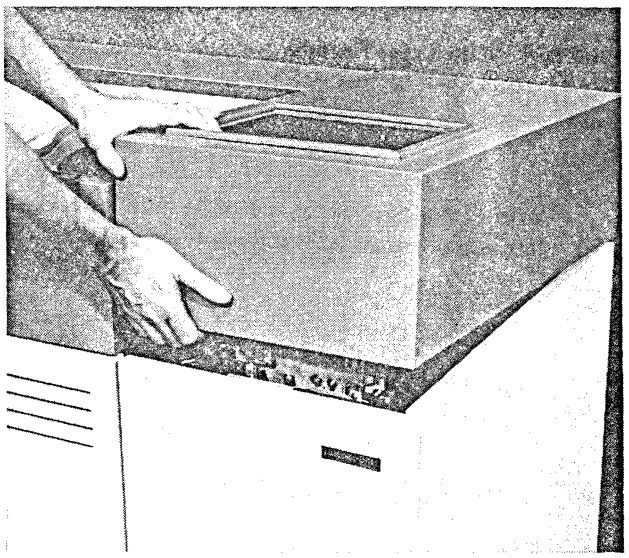
If this fails to eject the diskette, use the following procedure. Use normal safety precautions.

1. Make sure the tape is unloaded by pressing STOP
   EOJ.

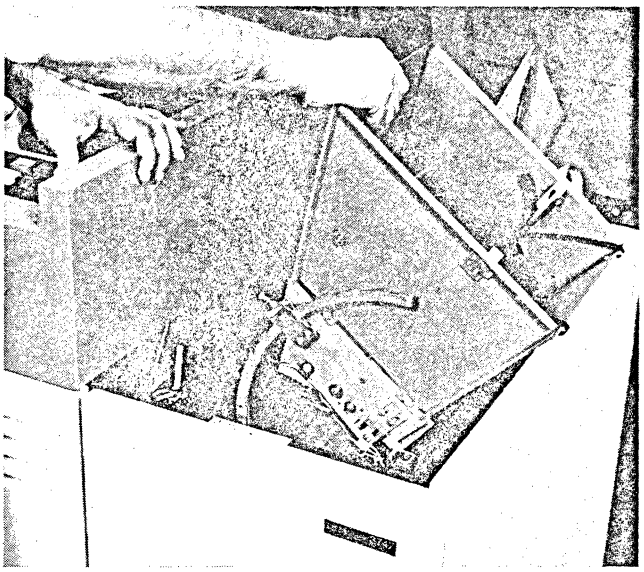
   If this does not unload the tape, press STOP
   RESET
   UNLOAD TAPE.

2. Turn power off.

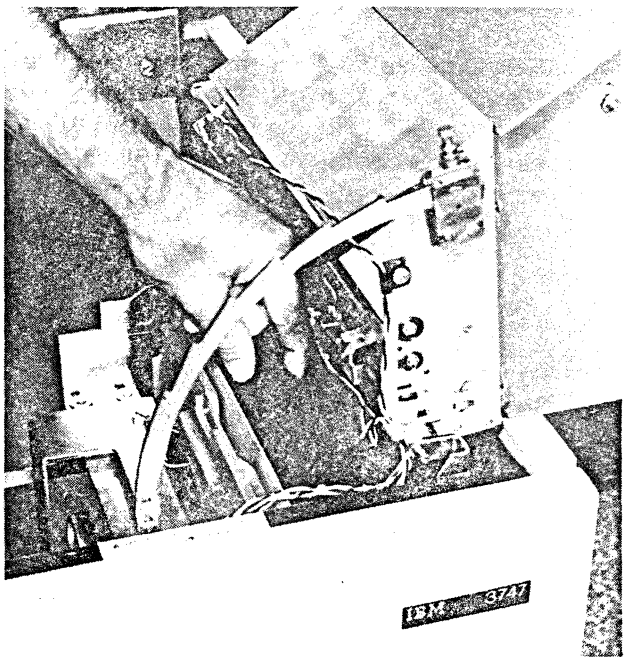
3. Raise the cover over the disk unit. (This cover is counterbalanced and lifts easily.)



4. Tip the autoloader mechanism all the way to the right.



5. The entire top edge of the diskette should now be visible. If the disk reader cover latch is still over the top edge of the diskette, make no further removal attempts but call for assistance.



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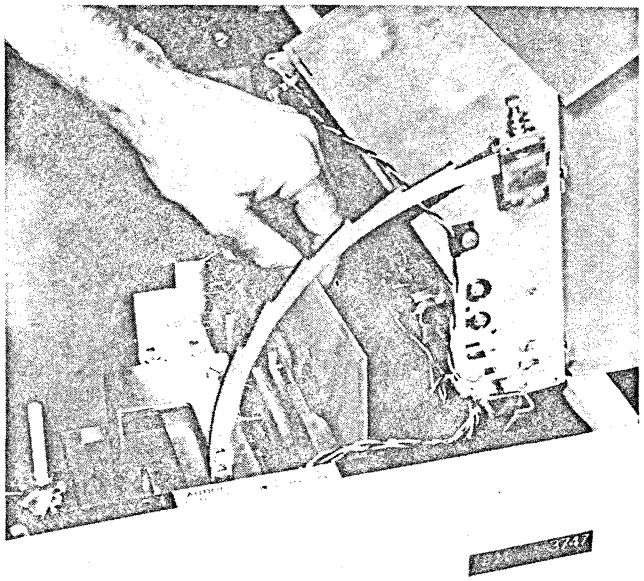
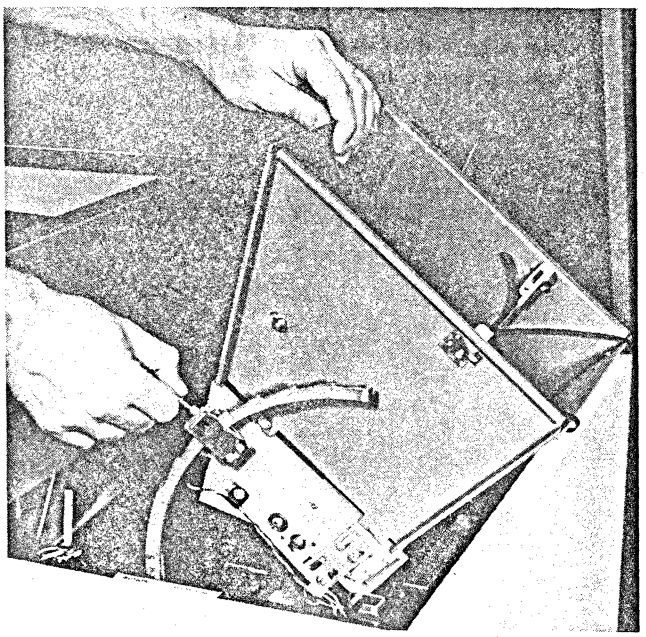
6. Grasp the top edge of the diskette and gently pull the diskette out of the reader, applying a slight pressure to the left for easier clearance of the autoloader mechanism. DO NOT USE ANY TOOLS.



7. Restore the autoloader mechanism to the vertical position. Use both hands. The safety catch must be operated while the autoloader is being moved. Make sure that the autoloader returns all the way to its original position.



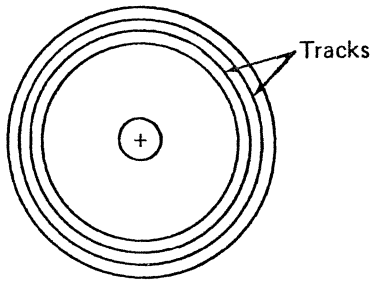
8. Lower the cover over the disk unit.

9. Turn power on and restart the job.

IBM DISKETTE CONCEPTS

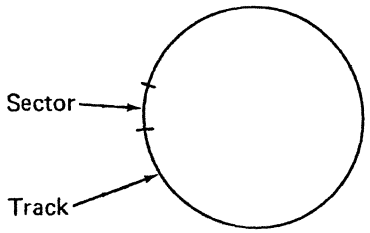
The IBM diskette is a packaged Mylar disk. Information is stored on the disk surface, which is a magnetic recording material very much like that used on standard recording tape for a stereo. If you could remove a disk from its protective package, you would see no grooves or other location markers. In fact, the surface would look just like the surface of stereo recording tape. The machine, however, easily recognizes locations and locates information through the use of a very simple scheme.

Information is arranged on the disk in tracks. A track is a circular section of the disk.



Each disk has 74 tracks, track 00 through track 73.

Tracks are divided into sectors. A sector is a predefined section of the track.



There are 26 sectors, numbered 01 through 26, on each track. One sector holds one record. The sector is 128 positions long; the record may occupy from 1 to 128 of these positions.

To locate information, the machine locates the record address; that is, the track and sector number.

The first track, track 00, is called the index track and is reserved for descriptive information about the data on the disk. This information on the index track is comparable to the table of contents of a book. The index track contains labels, which are names associated with the different data sets, or batches of records, on the disk. The data set is comparable to a chapter in a book, and the label to the chapter title. Associated with these labels are addresses, comparable to the page numbers in a book. Instead of a page number, though, data on a disk has a track and sector number, written TT0SS, where TT stands for the track number and SS stands for the sector number. A zero separates the track and sector number.

Extents are also defined in the index track. Extents tell what addresses (track and sector numbers) mark the beginning and end of each data set on the disk. Beginning of extent (BOE) tells the machine where to find the beginning of the data set, and end of extent (EOE) tells the machine that the data set cannot extend beyond that location. The data set may, however, not fill the space reserved for it, and may end before EOE. A position marker called EOD (end of data) tells the machine where the data set actually ends (the sector following the last sector written).

MAGNETIC TAPE CONCEPTS

IBM magnetic tape is similar to the tape used in home tape recorders. Tape is manufactured by mixing small particles of iron oxide with a bonding agent and uniformly applying the mixture to the surface of long rolls of flexible plastic. The plastic base is about as thick as cigarette paper; the magnetic coating about one-third that thick. Recording occurs in this ferromagnetic coating.

When the magnetic layer hardens, the rolls are slit into one-half inch ribbons, wound on reels, and tested. Tiny flaws, which would not interfere with the recording of music, could prevent accurate recording of data. Therefore, only tape with particularly high quality is used for data processing.

Recording Data On Magnetic Tape

Data is recorded by moving tape across a read/write head. Data is written while the tape is moving forward. Data is written as a series of magnetized bits in parallel tracks along the length of the tape.

Tape Labels

Tape labels are special data records written on tape to provide a machine-readable identification of the tape. These labels contain information that identifies the individual tape and information that prevents accidental misuse of the tape. They also give such information as an expiration data; that is, a date before which the data on the tape should not be destroyed.

Reflective Markers

A reflective marker is a strip of transparent plastic with an aluminum coating covered by a pressure-sensitive adhesive. These markers are fastened to the uncoated (shiny) side of the tape.

A BOT (beginning of tape) marker is located approximately 14 to 18 feet from the beginning of tape, on the top edge of the tape (nearest you) when the reel is mounted. An EOT (end-of-tape) marker is located approximately 25 feet from the end of the tape, on the bottom edge of the tape (nearest the tape unit) when the reel is mounted.

Photosensors on the tape unit detect the BOT and EOT markers to determine the beginning and end of the data area on the tape. New reels of IBM magnetic tape are supplied with BOT and EOT markers.

Occasionally, reflective markers must be replaced. Most often, it is the BOT marker which must be replaced, since the beginning of the tape is most susceptible to wear and damage. If the EOT marker is missing, the tape can completely wind off the reel (the unit then stops). Replace markers while the tape is mounted on the tape unit to keep dust from collecting on the unrolled tape. If you wish to order reflective markers, order IBM P/N 352407 or equivalent magnetic tape markers. Be sure to replace markers carefully, aligning them as described here:

Replace each reflective marker as follows:

1. If the tape is damaged, cut off the end of the tape, including the old reflective marker, if present.

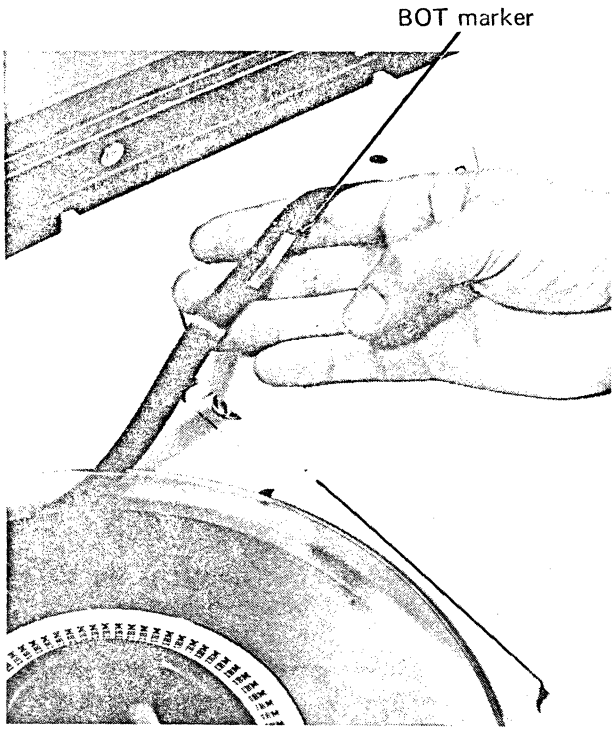
2. *BOT:* Unwind about 14 to 18 feet of tape (10 to 12 turns on the right hand spindle).

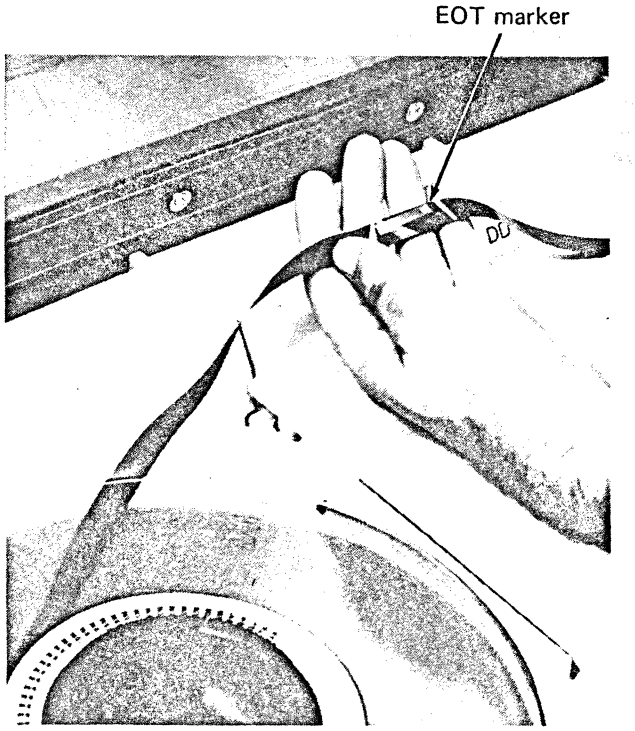
   EOT: Rewind about 25 feet of tape (about 15 turns on the left-hand spindle).

3. *BOT:* Place a reflective marker on the shiny side of the tape on the edge nearest you, parallel to and not more than 1/32 inch from the edge, but not overlapping the edge.

   EOT: Place a reflective marker on the shiny side of the tape on the edge away from you, parallel to and not more than 1/32 inch from the edge, but not overlapping the edge.

4. Be sure to press new markers down firmly.





Chapter 7. Cleaning the Tape Transport

Clean the tape transport and capstan after every eight hours of use. Use cleaning kit, IBM P/N 352456 or equivalent, and tape transport cleaner.

Note: Use IBM transport cleaner, IBM P/N 453511, or equivalent formulations of the same chemical composition. Performance results cannot be guaranteed when other chemical formulations are used, because they have not been tested by IBM, and their use may impair performance or cause damage to the tape unit or tape.

DANGER: Avoid prolonged skin contact with tape cleaner.

CAUTION:

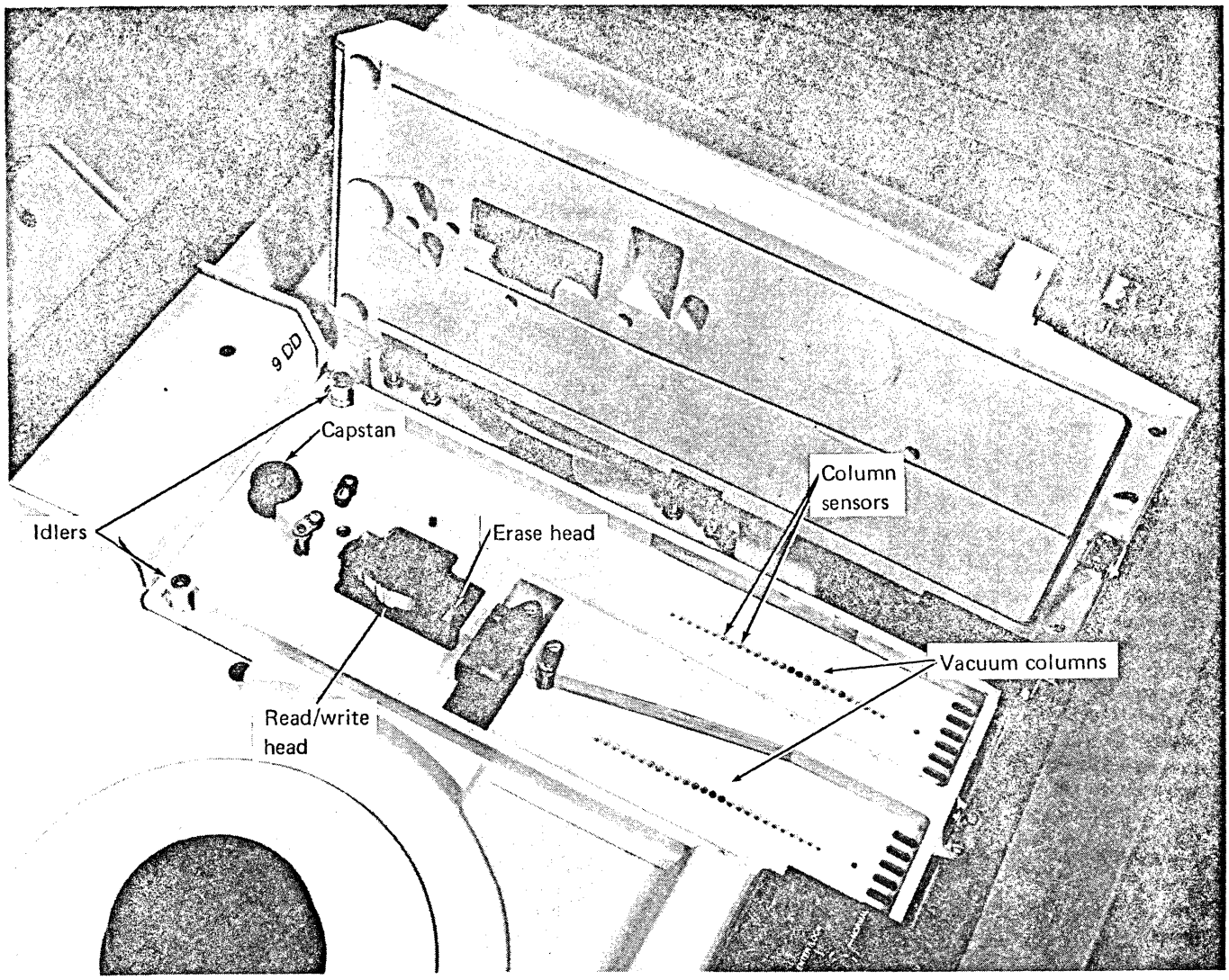
1. Never clean a tape unit with a metal object. Use only the materials specified for each operation.
2. Never touch rubber capstan surface with bare fingers; moisture or oil impairs tape-to-capstan friction.
3. Remove any tape cleaner dropped in the tape path, on the tape guides, or on the idlers during cleaning.
4. Do not use water in the capstan area or the read/write head area.
5. Never get fluids of any kind in or near the column sensors.

To clean the tape transport:

1. Unload the tape and remove it from the tape unit.
2. Clean tape guides, tape path, idlers, vacuum columns, and vacuum column door with a lint-free cloth moistened with tape cleaner. Use a swab moistened with tape cleaner to clean the cleaner blade and corners of tape guides. Water may be used to remove oxide residues only in the vacuum columns. Do not use water on or near the capstan, column sensors, or the read/write head.
3. Clean the read/write head surface with a swab.
4. Wipe the read/write head and the erase head with a lint-free cloth moistened with tape cleaner.

Capstan Cleaning

1. Rotate the capstan with a finger covered with a lint-free cloth. With the other hand, wipe the capstan surface with a lint-free cloth moistened with tape cleaner. Use no water in this area, and avoid excessive pressure.
2. Dry the capstan surface with a lint-free cloth before loading tape, and avoid excessive pressure.


9 DD
Capstan
Idlers
Erase head
Column sensors
Vacuum columns
Read/write head

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