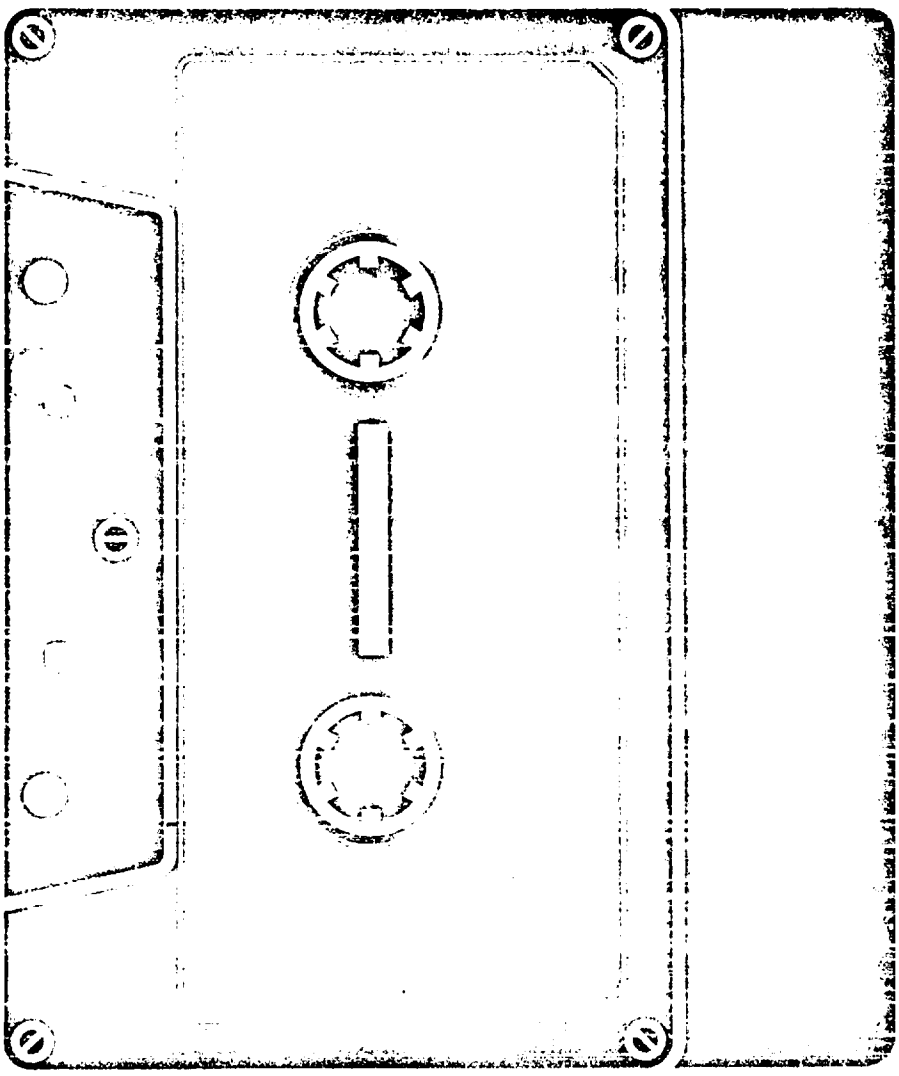
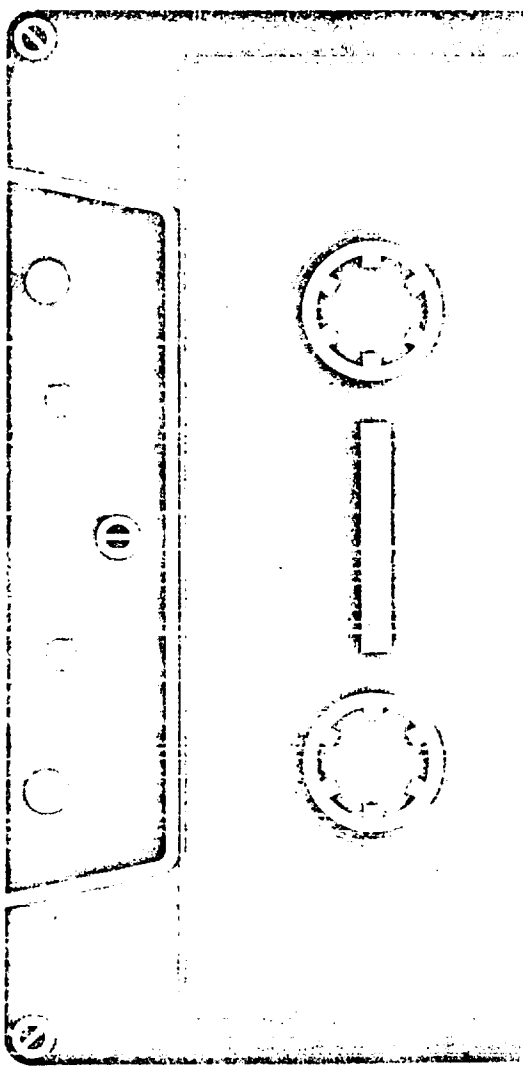
DE 520 SYSTEM
and Magnetic Tapes

olivetti





THE DE 520 SYSTEM AND MAGNETIC TAPES

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PREFACE

This manual explains the functions of the two magnetic tape options on the DE 520 System:

1 Magnetic Tape Cassette Option
2 Computer Compatible Tape Option

The manual is split into two sections. The first section, Cassettes System, details the operations that can apply to both cassette and computer tape options. The second section, Computer Magnetic Tape, details the differences in operation for computer compatible tape applications.

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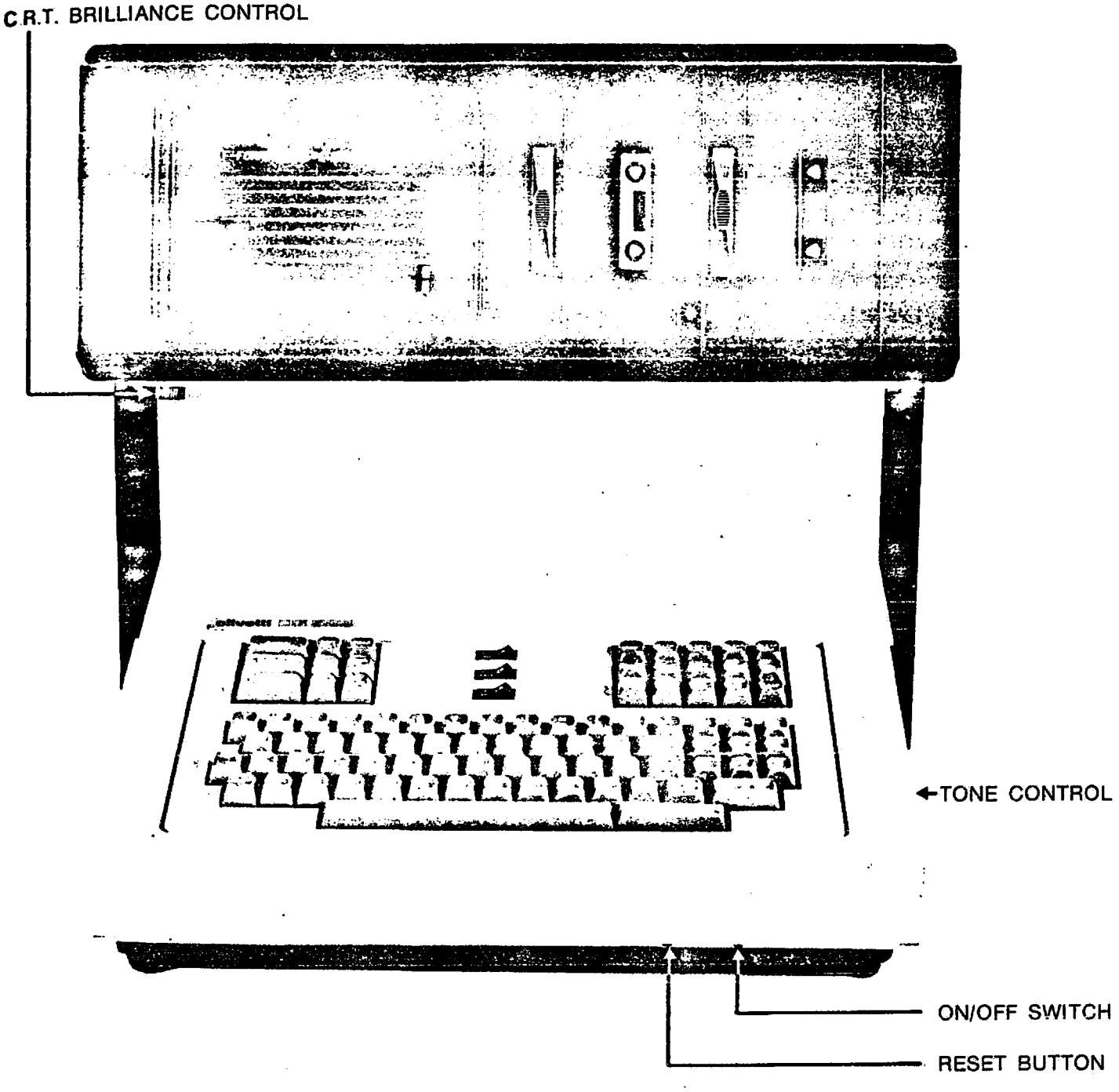
INTRODUCTION

The central unit of the Olivetti DE 520 System is equipped with cassette recorders. The standard DE 521 has one cassette recorder, the DE 523 has two. The DE 521 has the option of a second cassette. Cassette recorders can be assigned for either Input or Output operations.
There are two recording tracks on the cassette magnetic tape, one track for data and the other for a bit parity check. Two possible inter-record gap sizes are available: 0.75 inch and 1.5 inch (CRR-IB compatible). The 0.75 inch inter-record gap is standard on the DE 520 System, the 1.5 inch inter-record gap is optional.

Data is recorded using the extended ISO/USASCII Code (7+1+1 bits).
The recording density is 800 bpi (80 characters). Read/Write speed is 12.5 ips, with a rewind speed of 120 ips.
Each cassette tape is 280 feet (90 metres) in length; the effective capacity being 1,000-2,000 records depending on record size, 216-80 characters respectively and the size of inter-record gaps.


C.R.T. BRILLIANCE CONTROL
←TONE CONTROL
ON/OFF SWITCH
RESET BUTTON

olivetti
FOR DIGITAL APPLICATIONS
AUTO ON
AUTO ON
FIELD
ON

THE DE 523 AND CASSETTES SYSTEM

CASSETTE HANDLING

It should be noted that the correct handling of cassettes is of prime importance.

To insert the cassette into its compartment:

1. Open the compartment door by pressing the catch downwards.
2. Insert the cassette into the compartment by holding the top and bottom of the cassette between the index finger and thumb (see photograph opposite). Special care should be taken not to handle the exposed part of the magnetic tape.
3. Slot the cassette into the compartment by inserting the right edge slightly ahead of the left edge (see photograph opposite).
4. Close the compartment door.

To remove the cassette from its compartment:

1. Open the compartment door by pressing the catch downwards.
2. Hold the top and bottom of the cassette and move it slightly to the right before removal. The left edge of the cassette should be withdrawn first.

NOTE: AT ALL TIMES THE CASSETTES MUST BE REWOUND PRIOR TO THEIR REMOVAL.

SIZE OF CASSETTE TAPE

The cassette tape is 280 feet (90 metres) long with the effective capacity of each cassette consisting of 1,000-2,000 records depending on record size, 216-80 characters respectively, and the size of inter-record gaps.

RECORD HANDLING TECHNIQUES

The cassette recorder feature provides the terminal with the ability to read, write, backspace, insert, write file marks, and rewind cassette tapes. The operations, themselves, can be performed under the control of format programs provided with the cassette system. Since the recorders share the same interface, it is not possible to overlap operations on the first recorder with those of the second recorder. It is, however, possible to overlap cassette input/output operations with other peripheral operations, providing the terminal's overlap rules are satisfied (see DE 520 General Manual, page 14).

READ

The Read operation reads the next available record from the selected cassette into the buffer specified by the terminal control. If the "Clear Leader" is detected prior to the initiation of the read operation the cassette recorder assumes that it is at the beginning-of-tape (BOT), and advances the tape beyond the Clear Leader. If Clear Leader is detected during a read operation the cassette recorder assumes it is at the end-of-tape (EOT), the tape is retarded 0.25 inches from the Clear Leader and the read operation terminates with the message EOT displayed on the screen.

READ ERRORS (PARITY)

When a parity error has occurred there are three further attempts to read the record from the cassette, this is achieved by backspacing over the error record and re-reading it. If the fourth attempt to read the record is unsuccessful the first character in the record is replaced by the @ character and the read error message RD appears on the screen. IT SHOULD BE NOTED THAT THE DATA FROM THE ERROR RECORD IS STORED IN THE SPECIFIED INPUT BUFFER.

READ ERRORS (OVERFLOW)

When a record containing more than 216 characters is read, all the data after the 216th character is "lost". Parity is checked on the entire record and there is no screen message for overflow conditions.

EQUIPMENT ERRORS

If at any time during a read operation the cassette recorder is found to be non-operational, the operation is terminated and an error message displayed on the screen. (See Cassette Recorder Messages, page 11, for appropriate action).

BACKSPACE

The backspace operation moves the selected cassette tape back one record. If the Clear Leader is detected the operation is terminated *without* an error indication. If the cassette recorder is non-operational the operation is terminated *without* an error indication.

WRITE

The Write operation transfers the data in the specified buffer onto the selected cassette tape. The DE backspaces the record, and reads it at reduced sensitivity to check the parity of the record. If the Clear Leader is detected prior to the Write operation the DE assumes that it is at the beginning-of-tape (BOT) and the tape is erased until it is 3.5 inches beyond the Clear Leader. When the Clear Leader is detected during a Write operation the DE assumes that it is at the end-of-tape (EOT); the cassette is backspaced 0.25 inch from the Clear Leader and the operation is terminated with the EOT message displayed on the screen.

WRITE ERRORS (PARITY)

When a parity error is detected the record is backspaced and 3.5 inches of tape erased, the DE then performs the Write operation. This process is repeated until the Write operation is completed successfully.

WRITE ERRORS (EQUIPMENT)

If the cassette is protected from Write operations, by the physical removal of the plastic insert at the edge of a cassette, the Write operation is *not* performed and an error message displayed on the screen. (See Cassette Recorder Messages, page 11, for appropriate action).

WRITE FILE

The Write File operation writes an end-of-file mark consisting of 3.5 inches of tape erased followed by a single character record containing the FS character. The record is written without an LRC. The rules governing Clear Leader, protected cassettes, non-operational recorders and parity error are identical to the Read operation.

REWIND

The Rewind operation rewinds the selected cassette tape until the beginning-of-tape (BOT) Clear Leader is sensed. If the tape is positioned on a Clear Leader at the time the operation is initiated the Rewind function is not performed. It is not possible to rewind a cassette positioned at EOT and on the Clear Leader. This operation is similar to the Read and Write operations in that it follows the convention of backspacing away from EOT thus making the rewind operation possible.

TERMINAL OPERATION

SELECTING AND PROCESSING

When the terminal is provided with the Cassette Recorder feature the cassette recorders may be selected as normal terminal inputs and outputs during I/O assignment. The following device identification codes are reserved to identify the cassette recorder compartment positions.

device code	*function*
1	Select left-hand cassette recorder
2	Select right-hand cassette recorder

Entering these identification codes on the status line results in the specified cassette recorder being selected as a source of, or destination for, data during the terminal's normal course of operation. If the terminal has not been provided with a second cassette recorder compartment (standard DE 521), and it is selected, then the operation results in an EQP error being displayed on the screen. The direction of data transfer is determined by whether the specified recorder has been assigned as an input or an output device. It should be noted that format programs, if used, are usually stored on one of the two cassettes. This cassette is therefore encoded as the format device in the assignment code.

MANUAL CONTROL

Manual control of cassette recorder operations is possible through the use of the Device Operation keys. The functions of these keys are as follows:

key	*function*
Adv Rcd	Loads the input buffer into the output buffer, clears the input buffer and reads the next record from the selected cassette into the input buffer.
Back Rcd	Backspaces the selected cassette tape one record.
Write	Loads the input buffer into the output buffer, clears the input buffer and write the contents of the output buffer onto the selected cassette tape.
Insert	Loads the input buffer into the output buffer, clears the input buffer and inserts the contents of the output buffer onto the selected cassette tape. The insert operation is performed by backspacing the selected cassette and writing the output buffer onto it. CARE MUST BE TAKEN TO ENSURE THAT THE LENGTH OF INSERTED RECORD DOES NOT DIFFER FROM THAT OF THE ORIGINAL RECORD.
Write File	Writes FS onto the selected cassette tape.
Rew	Rewinds the selected cassette tape.

OPERATIONAL MODES USING CASSETTES

FREE-FORM MODE

This is the mode in which assignment codes are set-up via the keyboard. If set-up as follows:

* 1 _ _ _ * (each _ indicating a space)

the cassette recorder in position 1 is assigned as a FMAT device, and format programs and descriptions can be written onto the cassette via the keyboard and the device operation keys; these keys also allow the retrieval of formats or descriptions from the cassette into the buffer where any necessary corrections can be made. The formats or descriptions can then be written back into their relevant record positions on the cassette medium.

For example, to set-up records which have the details:

Date
Name
Address
Invoice No.
Amount

1. Key in the format program (see DE 520 General Manual pages 16 & 19)
   F . . . . ,(, , , , ; , , , , , , , , ,(, , , , , , ,

   , , , , , , , , , , , , D . . . . . P . . . . . .X ■
2. Depress Fmat (Device Control) key
3. Depress Write key
4. Depress Back Rcd key
5. Depress Adv Rcd key

The format program should be displayed on the screen.

6. Depress Free-Form key

It should be possible to key-in a description for each of the fields within the format program written on the cassette and displayed on the screen. Using the cursor as a guide, the following data can be entered, via the keyboard, above the relevant fields displayed:

DATE NAME ADDR

ESS INV. NO. AMOUNT

7. Depress Fmat key
8. Depress Write key
9. Depress Rew key

The field control characters used in the format program are explained in the DE 520 General Manual. Each control character represents one character position of its defined field. The control character plus the number of full stops (.) or commas (,) determines the capacity of each field.

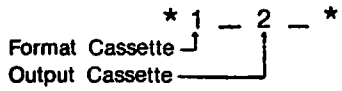
Full stops and commas can be encoded within the same alphanumeric field if such a control is desirable. For example, to record an alphanumeric field whilst specifying the exact location of numeric characters would be obtained in a similar format to the following:

(, , , , , , , , , ,

ENTER MODE

This is a mode in which operator entry is controlled by a format program in either of the two program buffers. For example, to set up records using the format program that had just been written:

1. Insert the second cassette (without altering the position of the first cassette) into the second cassette compartment.
2. Depress the Free-Form key.
3. Depress the I/O Slct key.
4. Key in the assignment code:



5. Depress the Enter key
6. Depress the Next Fmat key.

This loads the program buffers with the format program and the description from cassette 1.

7. Depress Prog. 1 key.

This indicates that the control of entry should be by the format program in program 1 buffer and not by the description in program 2 buffer.

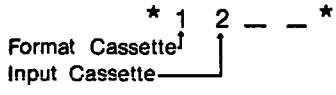
Note: The first line of the format program and the first line of the description are displayed. The current data line determines which format and description lines are displayed.

8. Depress the Skip Bar to advance from one field to another.

At the end of each record the data is automatically written onto the second cassette.

VERIFY MODE

In this mode, using the same example as in the Enter Mode description, the output device assignment code is set-up as:



The second cassette becomes the input device (in the Enter mode example it was assigned as an output device). Records that had been set-up in the Enter mode can be keyed in again, and this mode ensures a sequential character-by-character check according to the format program. The controlling format program might be the same as that used to set up the records or might be a different one which checks only specified fields within the records.

Any corrected records are automatically inserted onto the input device.

SEARCH UNDER BATCH MODE

Before operating in this mode a search format has to be loaded into program 1 buffer. As far as the assignment code is concerned, an input device must be assigned. Depending upon the processing to be carried out, it may be necessary to assign a format device and/or output devices. For example, if the operation is simply to write the records from the second Cassette Recorder onto the first Cassette Recorder the assignment codes should be:

* _ 2 1 _ *

1. Depress the Comp key
2. Depress the Load key
3. Depress the 1 key

This loads the complete character, which acts as a search format, into the program 1 buffer.

4. Depress the Batch key to start the processing.

In Batch mode, it is possible to search for any particular record held on the input device. Upon completion of the search the record can either be held and displayed or written out to an assigned output device. With this type of processing the following points should be noted.

a. A search format should be loaded into program 1 buffer.
b. The search parameter characters, alpha or numeric, must be placed in the same position as they would appear in the required record.
c. Character positions not to be compared are filled with 'SKIP' characters when keying the search format.
d. If searching for a record to be held and displayed, the AUTO REL switch should be OFF.
e. If searching and pooling records onto an output device, the AUTO REL switch should be ON.

Examples of possible search formats are detailed below. Each record on the input device might have the following fields:

Counter field	(5 characters)
Name	(10 characters)
Address	(12 characters)
Date	(6 characters)
Invoice No.	(4 characters)

Example of a typical record:

00006JOE BLOGGS14 High St. 1706721403

A search format – – – – 6■ would find records which have counter fields ending in a six i.e. 6, 16, 26, 36 etc. A search format – – – – – JOE BLOGGS■ would find records (or record) with the name Joe Bloggs on them.

The search format – – – – 6JOE BLOGGS – – – – – – – – – – – – – – 17■ would find a record (or the records) with a six as the last digit of the counter field and the name JOE BLOGGS as well as the first two digits of the date field (being 17) i.e. three conditions to be satisfied by the record (or records).

THE SEARCH FORMAT ■ ALLOWS EVERY RECORD ON THE INPUT CASSETTE TO BE "FOUND"

See above – Search Under Batch mode, for description of how to write this format.

ERROR MESSAGES

Error messages, their meanings, and possible corrective actions, using cassettes, are listed below:

CASSETTE RECORDER MESSAGES

message	*meaning*	*corrective action*
RD	A read error has been encountered in the process of reading the selected cassette.	(1) To accept record depress Error Reset key. (2) To re-read record depress Back Rcd, Adv Rcd, and Error Reset keys. (3) To skip record depress Adv Rcd and Error Reset keys.
WR	A write error has been encountered in the process of inserting on the selected recorder.	ATTEMPT UNDER F-FORM MODE CONTROL. If the error persists create new cassette.
EOT	Clear Leader has been sensed in the process of inputting data from the selected cassette	Depress Rew key, load a new cassette and depress Adv Rcd and Error Reset keys to continue.
EQP	An attempt to input or output has been made and the selected cassette is non-operational.	Make the recorder ready, repeat the operation resulting in the error using the Device Operation keys and depress the Error Reset key.
EQP	An attempt has been made to output to a protected cassette.	If an insert is desired depress the recorder protection override button and then depress Insert and Error Reset keys.
EQP	An attempt has been made to input or output to the second cassette recorder which is not provided on the terminal, e.g. encoding a 2 as an input or output device on the DE 521.	Depress Free-Form and correct I/O assignment codes.

CASSETTE TAPE FORMAT

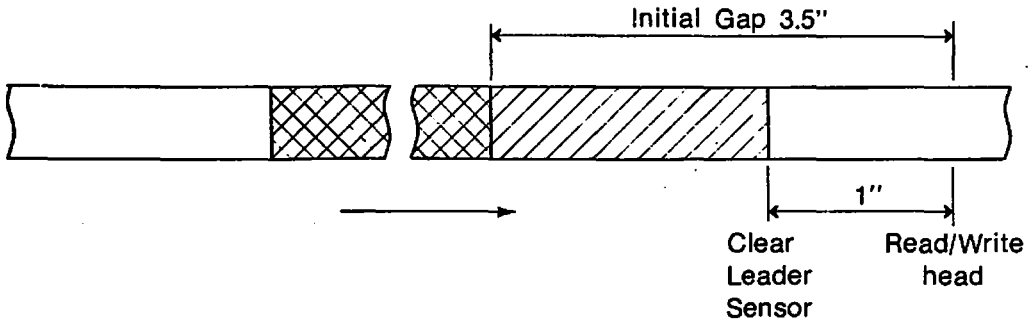


FIG. 1 BEGINNING-OF-TAPE & END-OF-TAPE AREAS

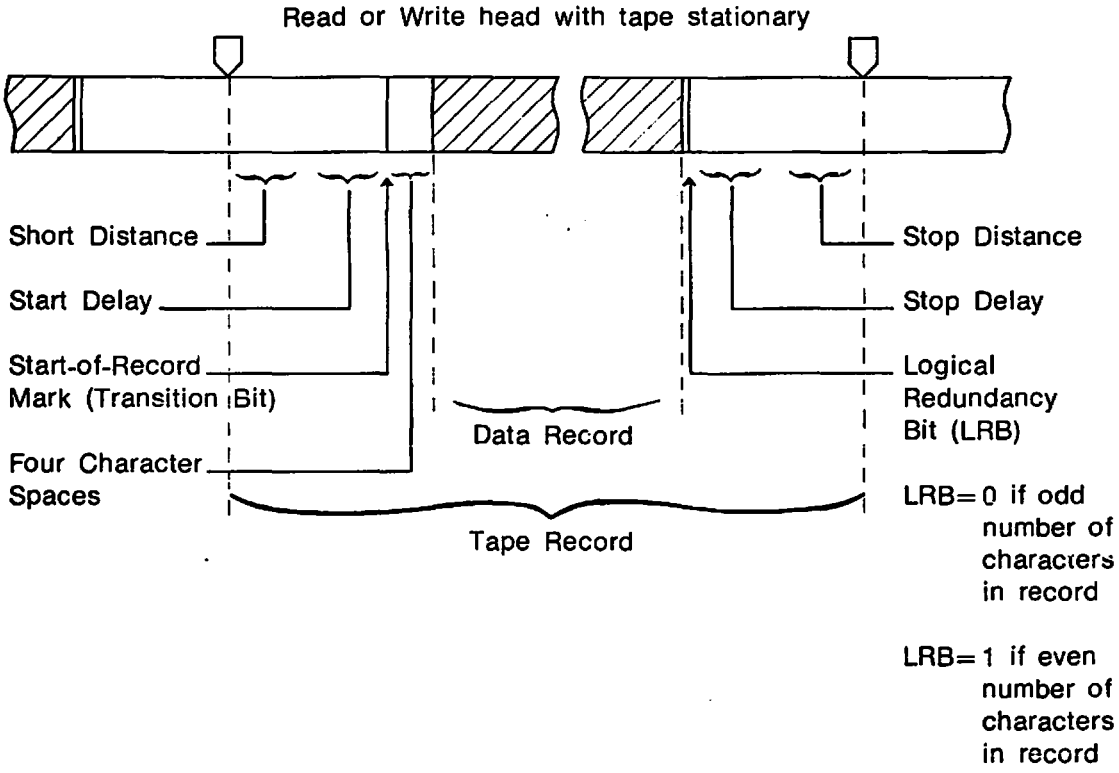
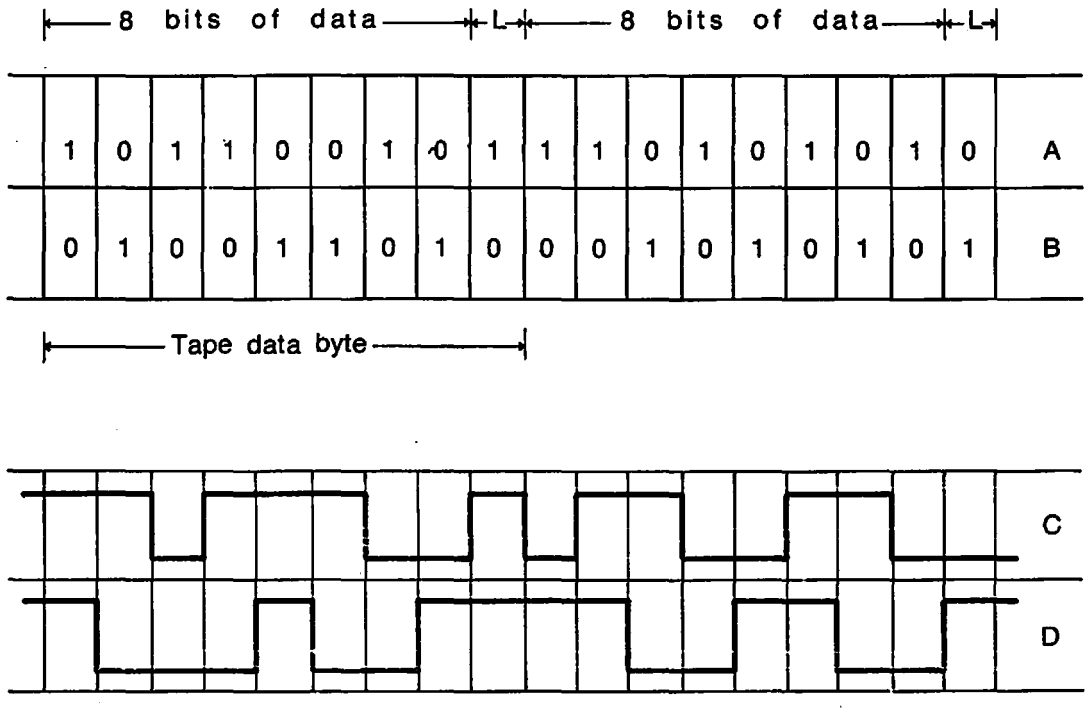


FIG. 2 NOMINAL RECORD

RECORDING ON DE 520 SYSTEM CASSETTE MEDIUM (NRZI 800 bpi)



A. Data Track
B. Parallel Parity Track
C. Data Track Flux
D. Parallel Parity Track Flux
L. Logical Redundancy Bit

FIG. 3 RECORDING BIT PATTERN

THE DE 523 AND COMPUTER MAGNETIC TAPE SYSTEM

INTRODUCTION

The DE 523 Computer Magnetic Tape Option provides the terminal with the ability to read, write, backspace, write file marks and rewind computer tape. The operations are performed under the control of the programs provided with the tape option package and are not overlapped with the terminal's other operations because of the tape transport's high data transfer rate i.e. the terminal is 'locked out' while these operations are being performed.

The tape option interfaces the terminal with a 12.5 ips 0.5 inch computer tape transport for recording and reading nine-track data at 800 bpi or 1600 bpi (EBCDIC) or seven-track BCD data at 556 bpi or 800 bpi. When interfaced to the terminal, via an appropriate interface unit, the computer tape becomes a normally selectable Input/Output device for terminal I/O operations. Provisions are made in the terminal to allow for the installation of this option at field level.

The magnetic tape option consists of a set of programs for controlling the option, a tape interface, a connecting cable and tape transport. The programs for controlling the option and the ASCII/BCD or ASCII/EBCDIC conversion tables are supplied in two MOS, Read-Only-Memory, IC chips. Sockets are reserved on the terminal's memory board to accommodate these chips, plugging in the chips *enables* the programs. The computer tape transport is controlled from the terminal via a two-card interface. The terminal card-file is wired at the time of manufacture to accommodate these cards.

The 'Jumpable' options exist on the interface. On the seven-track unit the first of these options allows the selection of either 800 bpi or 556 bpi recording, and the second allows the selection of odd or even parity.

The same interface is employed for both the seven and nine-track options, when using the nine-track option the jumps select 800 bpi odd parity recording.

7 track tape is written in BCD at 556 bpi or 800 bpi.
9 track tape is written in EBCDIC at 800 bpi or 1600 bpi.

N..B. Particular attention should be paid to the tape loading instructions supplied with the magnetic tape unit.

TAPE OPERATIONS

READ

The Read operation corresponds to that of the cassette read operation except that as the data is read it is converted from BCD or EBCDIC to ASCII code.

BACKSPACE

The Backspace operation backspaces one record on the computer tape. If the tape is positioned at the BOT mark or the transport is non-operational then the operation is terminated without an error indication.

WRITE

The Write operation corresponds to the cassette write operation except that as data is written it is converted from ASCII to BCD or EBCDIC.

If the tape is protected from writing, by the removal of the write enable ring, then the operation is terminated and the EQP error is displayed on the screen.

The clear leader and tail of the cassette correspond to the BOT and EOT markers of the computer magnetic tape.

Write errors correspond to those of the cassette write operation.

WRITE FILE

The Write File operation corresponds to the cassette Write File operation. The rules for handling BOT, EOT, the Write ring and parity are as explained above.

REWIND

The Rewind operation rewinds the computer tape to the BOT position. If the tape is already at the BOT mark no operation is performed. If the tape transport is non-operational when the command is issued then the rewind operation is terminated with the EQP error displayed on the screen. If the tape transport becomes non-operational during a rewind operation then the resetting of the transport is awaited before the operation can be concluded.

INSERT

The Insert operation is NOT possible on the computer magnetic tape unit.

TERMINAL OPERATIONS

SELECTION AND PROCESSING

The tape transport may be selected as the terminal's input or output device during the normal I/O assignment process; the device identification code T is reserved to identify the tape transport. Entering T in the I/O assignment area of the status line, results in the tape transport being selected as a source of or destination for data during the terminal's course of operation. The transport's assignment coding, as either an input or an output device, decides the direction of data transfer.

MANUAL CONTROL

It is possible to manually control the operation of the computer tape through the use of the Device Operation keys listed below:

key	*function*
Adv Rcd	Loads and clears the input buffer into the output buffer and reads the next record on the computer tape into the input buffer.
Back Rcd	Backspaces the computer tape one record.
Write	Loads and clears the input buffer into the output buffer and writes the contents of the output buffer as a record on the computer tape.
Insrt	EQP error (See Insert page 16.)
Write File	Write an end-of-file mark on the computer tape.
Rew	Rewind the computer tape, to the beginning.

OPERATIONAL MODES USING THE COMPUTER TAPE

Computer tape systems usually incorporate cassettes. For example, a cassette as an input device and the computer tape as the output device. A check should be made to ensure that the computer tape produced on the DE 520 System is compatible (as regards code sets and format of records) with the mainframe computer on which it is to be processed. Additional software is available for the mainframe computer (ICL 1900, Honeywell 200 series). This compatibility has been established for existing IBM mainframe computers except for certain special characters. The code sets used in the DE 523 system are shown in appendices B and C.

FREE-FORM MODE

In the Free-Form mode data can be called from the tape and displayed on the screen using the Manual Control keys. With the exception of the Inst key the computer tape can be regarded as having the same facilities as a cassette. See page 8 (F-FORM mode – Cassette Tape section).

ENTER MODE

In the Enter Mode program controlled preparation of tape headers, volume labels and trailers is possible. Data can also be keyed under program control direct to the magnetic tape. See page 12 (Enter mode – Cassette Tape section).

Note: Records can be written onto tape as well as cassette if the assignment code is:

* 1 _ 2 T *

VERIFY MODE

The Verify mode is not normally used with magnetic tape as an input device because the INST function cannot apply. It is, however, possible to have a cassette as an input device when computer tape is used as an output device. The assignment code being:

*1 2 T _ *

See page 9 (Verify mode – Cassette Tape section).

BATCH MODE

This is probably the most used mode of the computer tape system. A typical use is the pooling of records in the cassette onto the computer tape. The assignment code for this operation would be:

* _ 1 T _ *

This indicates that the first cassette recorder is being used as an input device and the computer tape has been assigned as the output device.

A 'search' format is then loaded into the program 1 buffer. To search for a specified alpha or alphanumeric character (or characters), the search format must contain the required character(s) and in the exact positions that they appear within the record.

For example:

(a) To search for a record with a '6' in position four and an 'F' in position eight:

_ _ _ 6 _ _ _ F ■

(b) To transfer all records onto output tape:

■

The COMP (■) character initiates the end of the search format in both instances, and the program is loaded into program 1 buffer.

The Batch key is depressed to start the operation which has the assignment code:

* _ 1 T _ *

Direct printing from the computer tape in Batch mode is possible. Using the example of cassette pooling to computer tape, and a further requirement of printing, a typical sequence of events would be as follows:

1. Key in the assignment code:

   * _ 1 T P *

To pool all cassette records:

2. Load COMP (■) into program 1 buffer.
3. Load print format into program 2 buffer.
   (No print format program is necessary if Q is put into II OUT of the assignment code.)

TAPE ERRORS

Errors, during computer tape operations on the DE 523 System, are detected and indicated to the operator by the terminal programs and error messages. Descriptions and possible corrective actions for these error messages are summarized in appendix A.

APPENDIX A

TAPE ERROR MESSAGES

message	*meaning*	*corrective action*
RD	A read error has been encountered in the process of inputting data from the computer tape.	(1) To accept record – depress the Error Reset key. (2) To re-read record – depress Back Rcd, Adv Rcd and Error Reset keys. (3) To skip record – depress Adv Rcd key.
EOF	An end-of-file mark has been read on the computer tape.	(1) To process EOF mark to outputs – depress the Error Reset key. (2) To skip into the next file – depress the Adv Rcd and Error Reset keys.
EOT	The end-of-tape mark has been read while inputting from the computer tape.	Depress the Rew key, load a new tape, depress Adv Rcd and Error Reset keys to continue.
EOT	The end-of-tape mark has been read while outputting to the computer tape.	Depress the Rew key, load a new tape, depress Write and Error Reset keys to continue.
EQP	An attempt to perform a tape operation has been made and the transport is non-operational.	Make the transport ready, depress the appropriate Device Operation key and the Error Reset key to repeat the tape operation.
EQP	An attempt to insert onto the computer tape has been made.	No corrective action possible.
EQP	An attempt has been made to perform an output operation to a protected tape.	Remove the tape, provide the ring (removed to effect protection) and restart operation from the beginning.

APPENDIX B

INTERNATIONAL: ASCII–BCD CONVERSION TABLE 1

ASCII		BCD		ASCII	
GRAPHIC	OCTAL	GRAPHIC	OCTAL	GRAPHIC	OCTAL
SPACE	040	SPACE	020		
!	041	!	052		
"	042	"	057		
#	043	# =	013	#	043
$	044	$	053		
%	045	% (	034	(	050
&	046	& +	060	+	053
'	047	±	077	–	137
(	050	% (	034	(	050
)	051	)	074		
*	052	*	054		
+	053	& +	060	+	053
,	054	,	033		
-	055	-	040		
.	056	.	073		
/	057	/	021		
0	060	0	012		
1	061	1	001		
2	062	2	002		
3	063	3	003		
4	064	4	004		
5	065	5	005		
6	066	6	006		
7	067	7	007		
8	070	8	010		
9	071	9	011		
:	072	:	015		
;	073	;	056		
<	074	<	076		
=	075	# =	013	#	043
>	076	>	016		
?	077	?	072		

APPENDIX C (continued)

INTERNATIONAL: ASCII–EBCDIC CONVERSION TABLE 1

ASCII CODES			EBCDIC CODES		
GRAPHIC	OCTAL	HEX	GRAPHIC	OCTAL	HEX
BS	010	08	BS	026	16
HT	011	09	HT	005	05
LF	012	0A	LF	045	25
VT	013	0B	VT	013	0B
FF	014	0C	FF	014	0C
CR	015	0D	CR	015	0D
EM	031	19	EM	031	19
ESC	033	1B	ESC	047	27
FS	034	1C	TM	023	13
GS	035	1D	IGS	035	1D
RS	036	1E	IRS	036	1E

INTERNATIONAL: ASCII–EBCDIC CONVERSION TABLE 1

ASCII CODES			EBCDIC CODES		
GRAPHIC	OCTAL	HEX	GRAPHIC	OCTAL	HEX
@	100	40	@	174	7C
A	101	41	A	301	C1
B	102	42	B	302	C2
C	103	43	C	303	C3
D	104	44	D	304	C4
E	105	45	E	305	C5
F	106	46	F	306	C6
G	107	47	G	307	C7
H	110	48	H	310	C8
I	111	49	I	311	C9
J	112	4A	J	321	D1
K	113	4B	K	322	D2
L	114	4C	L	323	D3
M	115	4D	M	324	D4
N	116	4E	N	325	D5
O	117	4F	O	326	D6
P	120	50	P	327	D7
O	121	51	Q	330	D8
R	122	52	R	331	D9
S	123	53	S	342	E2
T	124	54	T	343	E3
U	125	55	U	344	E4
V	126	56	V	345	E5
W	127	57	W	346	E6
X	130	58	X	347	E7
Y	131	59	Y	350	E8
Z	132	5A	Z	351	E9
[	133	5B	¢	112	4A
\	134	5C	\	340	E0
]	135	5D	!	117	4F
†	136	5E	¬	137	5F
—	137	5F	—	155	6D

APPENDIX C

INTERNATIONAL: ASCII–EBCDIC CONVERSION TABLE 1

ASCII CODES			EBCDIC CODES		
GRAPHIC	OCTAL	HEX	GRAPHIC	OCTAL	HEX
SPACE	040	20	SPACE	100	40
!	041	21	!	132	5A
"	042	22	"	177	7F
#	043	23	#	173	7B
$	044	24	$	133	5B
%	045	25	%	154	6C
&	046	26	&	120	50
'	047	27	'	175	7D
(	050	28	(	115	4D
)	051	29	)	135	5D
*	052	2A	*	134	5C
+	053	2B	+	116	4E
,	054	2C	,	153	6B
-	055	2D	-	140	60
.	056	2E	.	113	4B
/	057	2G	/	141	61
0	060	30	0	360	F0
1	061	31	1	361	F1
2	062	32	2	362	F2
3	063	33	3	363	F3
4	064	34	4	364	F4
5	065	35	5	365	F5
6	066	36	6	366	F6
7	067	37	7	367	F7
8	070	38	8	370	F8
9	071	39	9	371	F9
:	072	3A	:	172	7A
;	073	3B	;	136	5E
<	074	3C	<	114	4C
=	075	3D	=	176	7E
>	076	3E	>	156	6E
?	077	3F	?	157	6F

APPENDIX B—(continued)

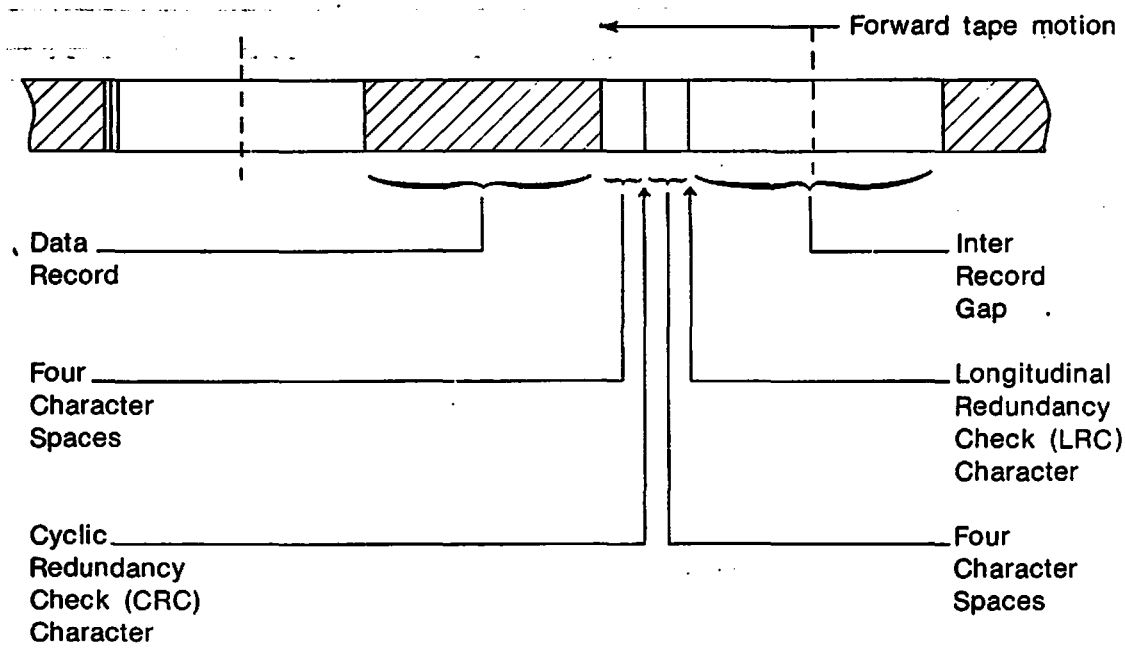
INTERNATIONAL ASCIT – BCD CONVERSION TABLE 1

ASCII		BCD		ASCII	
GRAPHIC	OCTAL	GRAPHIC	OCTAL	GRAPHIC	OCTAL
@	100	@	014		
A	101	A	061		
B	102	B	062		
C	103	C	063		
D	104	D	064		
E	105	E	065		
F	106	F	066		
G	107	G	067		
H	110	H	070		
I	111	I	071		
J	112	J	041		
K	113	K	042		
L	114	L	043		
M	115	M	044		
N	116	N	045		
O	117	O	046		
P	120	P	047		
Q	121	Q	050		
R	122	R	051		
S	123	S	022		
T	124	T	023		
U	125	U	024		
V	126	V	025		
W	127	W	026		
X	130	X	027		
Y	131	Y	030		
Z	132	Z	031		
[	133	[	075		
\	134	\	036		
]	135	]	055		
↑	136	‡	077		137
–	137	‡	077	–	137
EM	031	=	017		
FS	034	=	032		
GS	035	=	035		
RS	036	=	037		

All remaining ASCII codes shall be converted into Octal 77

APPENDIX D

TYPICAL COMPUTER TAPE FORMAT ON THE DE 523 SYSTEM



N.B. (i) For an End-of-Tape Record, no CRC is present.
(ii) With a 7-track tape, no CRC is present.