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TECHNICAL AND FUNCTIONAL SPECIFICATIONS

DE 521

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1. Technical and Functional Specifications:
Model DE 521

1.1 Functional Specifications

This functional specification establishes the performance criteria for a Key-Cassette apparatus which shall be capable of the capture of alpha-numeric source data on magnetic tape. The machine shall perform as a program-controlled data entry device for high-throughput, low-error operation using minimally-trained operators.

1.1.1 System Organization

A block diagram of the system is shown in figure 1. In this block diagram the basic modules of the system, the logical flow of the data and the control functions are particularly shown.

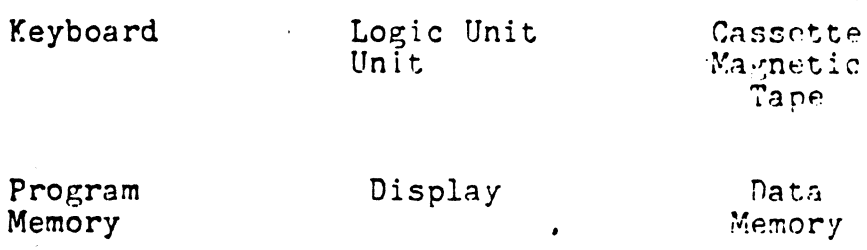

Figure 1

1.1.2 Basic Functions

The major operational functions of the machine are:

- Enter
- Verify
- Free form
- Specific operational functions of the machine are:

Enter

Data enter

Format control

Data display

Tape rewinding

Control of recorded data

Display of the machine status

Overlap of the machine operations

Data correction

Verify

Data verify

Correction

Data display

Display of the machine status

Overlap of the machine operations

Free Form

Program Load

Search

Tape controls

Data display

Display of the machine status

1.1.2.1 Enter

1.1.2.1.1 Data enter

The machine must allow the input of alphanumerical data by means of a keyboard -

The following characters may be introduced in the machine:
Alphabetic characters -
Numeric characters -
Punctuation characters -
Special Symbol characters -
Space -
Multiple characters - (Duplicate function - Skip and fill function - Complete record function)
The record length will be variable from 30 to 200 characters. It will be possible to divide the record into at least 48 fields. The length of each field will be variable from 1 to 200 characters.

The length and partition into fields of the record will be established when starting a particular work by means of an appropriate program.

When a particular work has been defined the same record length will be used, except when a double program is present in the machine. In this case it is possible to have an alternative length.

The same thing occurs for the definition of the fields. However, the fields can be skipped, duplicated or filled in with zeroes. If the operator must work without program control, he can go in Escape condition.

1.1.2.1.2 Format Controls

It will be possible to prevent some operators' errors through format controls. The required controls are the following:

- field length (determined character per character and label)
- type of field: numerical
  alphabetical
  alphanumercal
- field duplication
- field skipping (filling with spaces)
- zero-filling (filling with zeroes at the left hand side)
- blank-filling (filling with spaces at the left-hand side)

All these controls will be given by the program. This means that to operate the machine under control it is necessary to first prepare the program related to the work to be done, load this program into the machine and then operate. The zero and the blank-filling are initiated exclusively from the keyboard.

One key depression only will be necessary to complete the record with spaces. The field duplication and the field skipping will be allowed both through the program and the keyboard. The skipping and the duplicate and the completion of the record can be operated in whatever position.

The duplication function must be such as to allow the memorization of the preceding record. The duplicate function or the duplicate key copies the corresponding characters from the previous record into the current record until a new field is started.

The Skip function or the Skip and Fill key fills the remaining character positions in a field with spaces or shifts the characters to the right end of the field and fills the character positions to the left with zeroes or spaces. The complete key fills the remaining fields of a record with spaces unless the current field is a left fill field, in which case it shifts the characters of that field to the right end of the field and fills the character positions to the left with zeroes or spaces.

It must be possible to "escape" through the keyboard all the format control functions. In this case the complete key causes the record entered to be written on the tape and checked - on the Display in the cursor position appears the end-of-record character ( ) that is not written on the tape.

Alternative format control functions, operated from the keyboard, will be possible with the selection of a second program. Should the operator commit a format error a sound and an alarm on the CRT screen will be given that will cause the locking of the machine, while the data memory will not be affected by the error. The operator can erase this error condition by an error reset key, and re-entering the correct character.

1.1.2.1.3 Data Display

Provision shall be made to display the data being entered as well as program format details, error conditions, and machine status -

The entered data shall be displayed on a high brightness cathode-ray tube -

The unit shall have the capability of displaying data characters and format information, as well as system status and error messages. Thirty-one data characters may be displayed per line, up to the maximum word length of 200 data characters total. The top line of the display is reserved for system status and error messages. The two lines immediately below the line into which data is currently being entered display character mode definition and field labels (or alternate program character mode definition) respectively. These two lines progress down the screen as key entries appear in successive lines.

A cursor, cursor positioning controls, and two additional display controls, shall be provided to facilitate editing of the displayed data. Characters anywhere on the screen may be corrected by positioning the cursor to the desired location and overwriting with the appropriate key. The cursor symbol shall be displayed in the format line as an underline in blank positions and as a blinking character in a character position. Normal cursor position shall be automatic, indicating the position of the next character as determined by the format control codes.

The cursor may also be moved by the operator through use of the positioning keys: , . These keys move the cursor one character position in the direction shown. If the key is held depressed, the cursor shall slew in that direction 10 steps per second. Displayed data is not affected by moving the cursor through it.

Two additional display controls shall be provided. The Clear Screen key, clears the display of all the displayed data characters. The cursor is positioned at the home position. The Clear Line key clears the line into which data is presently being entered, from the present cursor position. to the end of the line. The cursor position is not changed.

Line	1	Terminal Status, Error Messages
	2	Data
	3	Prog One Format Characters
	4	Prog One Label or Prog Two Format Characters
	5	
	6	
	7	
	8	
	9	
	10	

Minimum Display

Line	1	Terminal Status, Error Messages
	2	Data
	3	Data
	4	Data
	5	Data
	6	Data
	7	Data
	8	Data
	9	Prog One Format Characters
	10	Prog One Label or Prog Two Format Characters

Maximum Display

Figure 2

The record will disappear from the display once it has been recorded on the tape or on the intermediate memory.

The display must exactly show the situation of the program pattern and consequently the following must take place:

a) Should the operator enter some data into fields requiring a left-filling, the characters shall appear on the display in the first position of the field and next, after the filling control shall be shifted to the right-hand side of the field preceded by zeroes or spaces according to the control given.

b) In the case of format error the wrong character will not appear on the screen, and the cursor won't advance.

c) In case of duplication, the origin field must appear on the display. In case of skip, the field must appear filled in with spaces. The displayed characters shall be 64 characters of the ISO Graphic set. (See appendix).

1.1.2.1.4 Recording of Data on Tape

The memorized data are recorded on the tape-cassette at the end of the entry-operation. The transfer of data from memory to tape may take place in two ways:

- automatically at the end of the record.
- manually controlled through the keyboard. at the end of the record.

Since the tape cassette which will be used will be the model CRRIB, which provides rather long operation time, and since the possibility of duplicating a complete record is required, the data memory must be able to contain two subsequent records.

Consequently, the transfer from the keyboard to the magnetic tape is performed through an intermediate memory which transfers the data to the tape, accomplishing at the same time, all the checks.

The data entered into the intermediate memory are erased only after the complete transfer on the tape. If the transfer of the first record is not yet completed, the instruction for the output of the second is memorized and the keyboard is locked until a portion of memory is free.

1.1.2.1.5 Control of Recorded Data

After the recording of one record on a tape the unit automatically performs the control of same.

This means that the tape cassette unit, after the recording of a record, automatically goes back and begins to read the last block that has been written.

The program pattern will indicate the length of the various fields; to accomplish this operation, some field separators will appear on the screen at a distance from one another of as many spaces as the field characters. The input characters will fill these spaces.

The field separators can be represented with special symbols.

We give hereunder, as an example, an eventual visualization of pattern and record on the display.

Terminal status and error messages are displayed on the first line of the display as shown in the following figure. Only one line of program one (1) format control characters, and one line of program one (1) label or Program two (2) format characters shall be displayed at one time. This information is displayed immediately below the line of data being entered and is shifted down one line as each line of data is completed.

What is read on the tape is parity controlled. In case of errors, an audible alarm is sounded and a signal is displayed to the operator and the whole record is automatically re-written, with the repetition of the control cycle. The written area of the tape shall then be automatically erased and recording shall be attempted on fresh tape. This procedure shall continue automatically until the whole record is correctly recorded. The audible alarm shall be sounded each time the check fails after erasing a word and re-writing.

The operator can avoid this inconvenience by turning the machine off and by substituting the cartridge.

1.1.2.1.6 Display of the Machine Status

The operator must have, in any operation condition, enough indication of the machine status.

The data entry format as determined by the format program shall be displayed on the two lines immediately below the line into which data is being entered.

A statement of the operational mode the machine is in shall be displayed at the top of the screen as part of the machine status.

The detectable errors displayed following mode status shall be:

Error	Definition
Mode error	Alphabetic or numberic character in field position not programmed
Tape write error	Error during read after write check
End of tape	Indicate presence of clear leader at end of tape is being sensed
Format code error	Appearance of unallowable format code in format program

Moreover, the following indications must be given to the operator:

Machine ON -

Selected program - (includes escape condition)

1.1.2.1.7 Overlap of Operations

When using the cassette recorder/reproducer CRRIB it is necessary to fully overlap data entry operation, display, recording and check on magnetic tape, in such a way that the time elapsed between the end of the record key-entry and the beginning of a new record key-entry does not exceed 200 msecs.

This requirement requires the use of an intermediate memory between the input memory and the tape cassette recorder.

1.1.2.1.8 Data Correction

It shall be possible to correct the operator's errors found in data-entry operation.

In data-entry status the machine detects the format errors by means of a sound signal and an error indication on the display screen.

Actually, the error is prevented because the format error does not alter the memory's contents but causes a lock-out of the machine. The operator may carry on his work by simply depressing the error reset key and re-entering the correct character. During data-entry operation the errors can be detected by the operator himself by means of a control in the display. In this case the operator can move the cursor or clear the screen or the line, and re-enters the correct characters.

1.1.2.2 Verify

1.1.2.2.1 Data Verify

It shall be possible to verify the correct entry of data by re-entering them and comparing the two entries.

It shall be possible to verify both the whole record or some selected fields as specified on the program. The verify operation will take place upon operator's control in the following cases:

a) immediately after a record has been entered

b) at the end of the recording by reading the records by means of a cassette

During the verify operation the data memory shall not be affected by the new data entry operation.

The transfer from a machine status whatsoever to the verify status will take place upon the operator's control by depressing the appropriate key.

This will immediately cause:

- the visualization on the display of verified data superimposed to the verify program pattern. In the case of a selected fields verification, the cursor will skip automatically at the beginning of the next field to be verified.
- the possibility of comparing the contents of the buffer (or only the selected fields) with the data which is being re-entered
- the impossibility of the machine of altering the buffered data with the re-entered data
- once the verify operation has been accomplished, the automatic transfer to the following operation according to the kind of verify operation accomplished.

More precisely in the following cases:

- If the operator immediately verifies a record after having introduced them, being necessary to manually transfer the data from the memory to the tape, he will be obliged, at the end of the verify operation, to return to data entry position and manually transfer data to tape tape

- if the operator verifies data at the end of data-entry operation, after each verify operation, the following record will be automatically introduced in the data memory.
- the duplicate function or key compares the the corresponding characters of the two records.
- a non-compare condition will result in a verify error and will terminate the duplicate operation.
- the Skip function and Skip/Fill key verifies that the remainder of the field contains spaces, or in the case of a left fill field, skips from the left to the first non-zero or non-space character.
- the complete key verifies that the remainder of the record contains spaces, or dup fields and ignores null positions

When the verify operation ends, if the magnetic tape cassette reaches the FS character, the verify operation stops automatically.

1.1.2.2.2 Data Display

In the verify mode data display is as in enter mode.

The only difference happening when a verification error is found:

In this case there appears on the screen the character of the first key entry operation.

The clear screen, clean line, keys are not active in the verify mode.

entered dat

1.1.2.2.3 Data Correction

A keyboard lockout alarm shall be given if re-entered data does not compare with data contained on the cassette. The terminal shall dwell at the erroneous character. Correction shall require depression of the error reset key followed by depression of the correct key. The data displayed to the operator when verifying shall be the original entry, revealed at the character re-entry rate. Correction of the tape is accomplished automatically by rewriting the record. Only records containing verification errors shall be re-written.

The erasing, re-write and control operation is automatically repeated only twice. If errors persist, the machine stops and an error indication is given to the operator. The operator may go from this condition by passing in free-form mode. If a parity (read-error) occurs, while a verify operation is in progress, read error status is displayed on the screen and the verify operation is temporarily halted. The reading operation is automatically repeated twice after that, the machine stops. The operator may go from this condition by passing in free-form mode.

1.1.2.2.4 Display of the Machine Status

The operator must have in any operational condition enough indication of the machine status.

The data entry format as determined by the format program shall be displayed on the two lines immediately below the line at which the data is being entered.

A statement of the operational mode the machine is in shall be displayed at the top of the screen as part of the machine status. The detectable errors displayed following mode status shall be:

Error	Definition
Verify error	A disagreement between original tape contents and keyboard insert
Tape read error	parity error during read
Tape write error	Error during reset-after-write check
End of file	End of file record has been read
End of tape	Indicates presence of clear leader at end of tape is being sensed

Moreover, the following indications must be given to the operator:

Machine ON

Selected program (including Escape)

1.1.2.2.5 Overlap of Operations

When using the cassette recorder/Reproducer CRRIR it is necessary to fully overlap data verify operation, display, reading and check the respective tape in such a way that the time elapsed between the end of a record verify, and the beginning of a new record verify does not exceed 200 ms. This requirement requires the use of an intermediate memory between the input memory and the tape cassette recorder.

1.1.2.3 Free Form

1.1.2.3.1 Search

The key cassette system shall have the capability of searching the recorded contents of a tape cassette for a specific record uniquely identified by a search identifier. The search identifier is a group of from one character to two hundred characters appearing at the start of a record which identifies the record. Prior to actuation of the search operation, the search identifier is entered from the keyboard. Upon depression of the Search Key, the search operation is initiated. The search halts after reaching the first record which contains the search identifier and the record is displayed overlapped to the search identifier entered in the machine.

During the search operation, the machine status shall be displayed on the first row of the screen.

If a parity error occurs while a search operation is in progress, read error status is displayed on the screen and the search operation is temporarily halted. The search operation may then be continued by operator depression of the error reset key followed by depression of the Search key.

If an End of File record is read during a search operation, the operation is halted and End of File is displayed. The operator then has a choice as to whether to continue the search operation into the next file.

1.1.2.3.2 Tape Controls

Six tape control and relative keys shall be provided to initiate data recording functions and allow operator review and editing of recorded data in the free form mode.

a) Write record - this key causes the contents of the display to be recorded starting with the first data line and terminating with the end of record code past the last data character.

b) Backspace record - this key causes the recorder to move tape in the reverse direction by two records and read again one record.

If in the tape there should be an intermediate section not recorded, due to faulty tape, or if there should be an erased record, the backspace key operation shall cause the tape to backspace to the first recorded record.

c) Advance - the advance record key causes the next complete recorded record to be displayed. One record is advanced for each actuation.

d) Insert - the insert key causes the contents of the display to be recorded in a manner similar to that caused by the write record key, except that the error re-write procedure is of limited nature.

e) Rewind - the fast rewind key causes the tape to be rewound until the beginning of tape is reached or till the key remains depressed.

At the end of the rewinding procedure, since the positioning will take place on the clear leader, when the machine's status shall be defined, the tape will conform to it: in Verify condition the tape will automatically position itself at the end of the first record entering it into the memory; in data enter condition the tape will position itself after a tape section sufficiently to guarantee that the head is in the correct position on the section covered with oxide. The forward shifting in this phase will take place in the erasing condition.

f) End of File - the end of file key causes an end of file code (FS) to be recorded to indicate the end of a logical group of data or the end of a useful data on the cassette. Depression of this key shall cause a minimum record containing the FS code to be recorded.

1.1.2.3.3 Program Loading

The format controls are:

- field length and label
- character mode: alphabetic
  numeric
  alphanumeric
- field duplication
- field skipping
- zero filling
- blank filling
- end of record

The form and format of the data to be entered shall be determined by control programs prepared by the user on the key-cassette and provided to the operator in a programmed cassette, or entered by the keyboard. Each program shall specify the mode for each character, the labels of fields, as well as automatic field duplication, field skipping, and fill functions, etc. Two programs may reside in delay line memory at one time, but in such a case no labels are stored or displayed for either program.

The following format constraints shall apply:

a) record length shall be variable between 30 and 200 characters

b) field length is variable between 1 and 200 characters

If the program is loaded through the keyboard it shall consist of the format control characters (Prog. 1), and the names or labels of the fields (Prog. 2), or alternate control characters.

The operating program shall consist of three parts, stored as three records on a magnetic tape:

a) record ID - Part one shall be the record ID and is some unique arrangement of alphabetic or numeric characters to identify the program

b) field identification - Part two of the control program consists of names or labels to identify the fields of a record. The length of labels may vary from 1 to 200 characters, but only 31 at a time will be displayed.

c) format control characters - Part three of the program shall consist of the format control characters. Those characters are identified as defined in the following table.

Programs are generated on the key-cassette in the free-form mode by performing the following steps:

a) the program ID is typed and extended to 31 characters by depressing the space bar and then recorded on the cassette tape by depressing the write record key.

b) the field names are typed and recorded as in previous step.

c) the format control characters are typed and recorded as above.

The control program may be loaded from either the keyboard or the cassette recorder. First the specific program (Program 1 or Program 2) is entered into the display (keyboard or search) and then the appropriate key, Program 1 or Program 2 is depressed.

PROGRAM FUNCTION TABLE

Format Control Character	FUNCTION
Field Modes	
M	Signifies either an alphabetic or numeric (mixed) character shall be entered
A	Signifies an alphabetic character shall be entered
N	Signifies a numeric character shall be entered
X	Generates a one character skip
Auto Duplication Field Start	
"	Signifies automatic duplication of either an alphabetic or numeric character
'	Signifies automatic duplication of an alpha character
-	Signifies automatic duplication of a numeric character
S	Generates a space
Normal Field Start	
	Signifies start of field with an alphabetic or numeric character
(	Signifies start of field with an alphabetic character
	Signifies start of field with numeric character
*	Signifies end of record
Left Fill Field Start	
	Signifies start of a mixed field to be right justified and filled with spaces in the high order positions
)	Signifies start of an alphabetic field to be right justified and filled with spaces in the high order positions
	Signifies start of a numeric field to be right justified and filled with zeroes in the high order positions.

1.1.3 Basic Modules

The system is composed of:

1 alphabetical keyboard

1 numerical keyboard

1 control keyboard

1 cassette recorder/reproducer model CRR1B with tape control

1 magnetic tape cassette

1 cathode ray tube display

1 central control logic unit of the various units

1 read only memory containing the sequences of microinstructions controlling the machine operations

1 data memory

1 program memory

1 power supply unit

1 enclosure

1.1.3.1 Alphabetic Keyboard

The alphabetic keyboard shall be a keyboard with the following groups of keys:

- 26 alphabetic keys
- 8 punctuation keys: . : ' " ! ?
- 18 special symbol keys: $ # % ( ) * + -
  / . = & @
- space bar
- shift key to supply a double quantity of characters
- shift lock key to lock the keyboard in the shift position

A keyboard layout is given hereunder, but different keyboard layouts shall be provided to satisfy the different market requirements. Therefore, the keyboard shall be such as to follow an easy make of the different layouts.

The code used for the keyboard will be the ISO code, in its different national versions. The basic machine will have a keyboard in USASCII code (7 bit + 1 parity bit + 1 of fixed value equal to zero). (See appendix). The keyboard used will be the modified RW Honeywell type. The characteristics of this keyboard are as follows:

- completely electronic keyboard
- contact type: dry reed
- max. no. of keys: 128 plus space bar
- key dimensions: 0.710 square inches
- key layout: as per attached layout
- pressure on keys: about 100 grs.
- key travel: about 5 mms.
- coding: internal
- control: electronic
- life: more than 10 million of cycles per key
- key colour: grey or other to be agreed upon
- maximum speed: 2000/5000 strokes per minute
- average speed: 600/800 strokes per minute

The keyboard will be put out of operation by the following conditons:

- on program control in case of errors

The keyboard will be released by means of the proper key (error reset).

1.1.3.2 Numerical Keyboard

The numerical keyboard is a reduced keyboard with 12 keys disposed on 4 rows. The characteristics of the numerical keyboard are the same as the alphabetical keyboard's.

In cae of lock the same release key as the alphabetical keyboard one is used. The keyboard layout is as follows:

7 8 9

4 5 6

1 2 3

0

Numerical Keyboard

1.1.3.3 Control Keyboard

DUP Key - in the enter mode, the DUP key copies the corresponding characters from the previous record into the current record until a new field is started (Program Control).

In the verify mode, the DUP key compares the corresponding characters of the two records. A non-compare condition will result in a verify error and will terminate the duplicate operation.

If another key is depressed before the time this function is terminated, this key is not active.

Skip and fill key - in the enter mode, the SKIP/fill key fills the remaining character positions in a field with spaces or shifts the characters to the right end of the field and fills the character positions to the left with zeroes or spaces. If the field is programmed for the zero-filling function, the key fill zeroes at the left hand of the field. If the field is programmed for the blank-filling function, the key fill spaces at the left hand of the field. If neither program functions are provided in the field, the field is skipped.

In the verify mode, the SKIP/fill key verifies that the remainder of the field contains spaces. In the case of a left fill field, the program automatically skips from the left of the field to the first non-zero or non-space character. If another key is depressed before that time this function is terminated, this key is not active.

Error reset key - in enter mode, the error reset key is used in the correction of erroneously entered characters. the displayed message is removed from the screen.

In the verify mode, the error reset key is used in the correction of data verification errors. The displayed error message is removed from the screen.

In the free form mode, the error reset key is used in the correction of reading errors, writing errors, overflow data memory, overflow of program memory, etc. The displayed error message is removed from the screen.

Program 1 key - in the enter mode and in the verify mode, this key selects the Program 1. In the free form mode, the Program 1 key loads the format characters appearing on the screen into the format section of program memory.

Program 2 key - in the enter mode and in the verify mode, this key selects the Program 2. In the free form mode, the Program 2 key loads the label characters, (or format characters for an alternate program) appearing on the screen into the labels section of program memory. If the program is contained on a program cassette the cassette must first be read onto the display before the above keys are used.

Enter key - the enter key initializes the terminal for data entry. This key qualifies the machine status in entry: its position nulls the previous status given by the verify or free form keys.

Verify key - the verify key initializes the terminal for verification of previously prepared data. This key qualifies the machine status in entry: its position nulls the previous status given by the enter or free form key.

Free form key - the free form key enables override of the control program and allows the operator total control of data entry, search, and program load operations.

Search key - the search key initiates an automatic search of records contained on cassette tape which are uniquely identified by a record identifier. This key is active only in free form mode.

Display control keys - four display control keys shall be provided, being active in the enter and in the free form mode.

a) Clear screen - the clear screen key clears the display of all data characters. The cursor is positioned at the home position. The data memory is also cleared.

b) Clear line - the clear line key clears the line into which the data is presently being entered, from the present position to the end of the line and clears also the data memory. The cursor position is not changed.

c) Cursor position - the and keys move the cursor one character position in the direction indicated. If the key is held depressed, the cursor slews in that direction 10 steps per second. These keys are active also in verify mode.

Tape Control Keys - six (6) Tape Control keys shall be provided; being used in the free form mode only:

a) Write Record - the write record key causes the contents of the display to be recorded starting with the first data line and terminating with End-of-Record code past the last data character.

b) Backspace Record - the back record causes the record to first move tape in the reverse direction by two records and then to read one record.

c) Advance - the advance record key causes the next complete recorded record to be displayed. One record is advanced for each actuation.

d) Insert - the insert key causes the contents of the display to be recorded in a manner similar to that

caused by the write record key, except that the error re-write procedure is of a limited nature.

e) Rewind - the fast REW key causes tape to be rewound until the key is released or the beginning of tape is reached.

f) End-of-File Code - The End-of-File key causes an End-of-File code to be recorded to indicate the end of a logical group of data or the end of useful data on the cassette. Depression of this key shall cause a minimum record containing the EOF code to be automatically recorded.

Escape Key - this key is active only in enter and verify mode. Its function is to enable the operator to work without program control. The key operates in all the record psoitions.

Power Key - the purpose of the key being the function of switching on or switching off the power supply of the machine.

Record Counter - to be defined.

Complete Record Key - in the enter mode, the COMP key fills the remaining fields of a record with spaces unless the current field is a left fill field, in which case it shifts the characters of that field to the right end of

the field and fills the character positions to the left with zeroes or spaces.

If the machine is in Escape condition this key causes, after this function, the transfer of the record onto the magnetic tape cassette and the display of the end of record character.

In the verify mode, the COMP key verifies that the remainder of the record contains spaces.

In Escape condition at the end of its function, the COMP key causes the transfer of the next record to be verified.

In the free form mode, the COMP key causes the display of end of record code only.

If another key is depressed before the time this function is terminated, this key is not active.

1.1.3.4 Cassette Recorder/Reproducer Model CR11B

The characteristics of this unit are indicated in the relative specifications. The relatives controls are reported in the third group of the control key keyboard.

1.1.3.5 Magnetic Tape Cassette

The characteristics of this unit are indicated in the relative specifications. The data format on the tape is done per records; each record is separated from the others by gaps of a fixed length (less than 1 inch).

The characters are recorded with 9 bits: the first 7 bits are the ISO code bits, starting from b1 to b7, the 9th bit is an even parity bit, the 8th bit is a fixed bit equal to zero. Following the writing of the last data byte, a gap three bytes in length is recorded. The longitudinal parity byte is then written following this gap.

The beginning of the tape is realized erasing the tape for a fixed time, or if enough erasing the tape till when the transparent leader at the beginning of tape, ends. The end of tape is established when the end of tape clear leader is present, and the photo-electric device gives a signal.

When the clear leader appears, the cassette recorder/reproducer stops automatically lighting the error tape indicator.

1.1.3.6 Cathode Ray Tube Display

The CRT display is used to visualize the program pattern, and the data; and to indicate the different status of the machine. The display characteristics are:

Tube size:	9 inches
Display Capacity	310 characters
Characters per row	31
Rows:	10
Visual Area	6¼ x 5½
Scanning Frequency	60 Hz
Character set:	64 ISO graphic set (See appendix)
Nominal character size:	height 0.32" - Large 0.25"

Characters shall be generated from a 5 x 7 dot matrix (5 dots horizontal by 7 dots vertical). Each dot of the 5 x 7 matrix will be either blanked or unblanked to form the selected character. The blanking bits shall be stored in read only memory, and accessed by the character code sequence in display storage.

Focus and brightness shall be regulated by adequate controls in the rear side of the machine.

The CRT screen shall be easily seen by the operator, at a distance between 30 and 40 centimeters from the normal operator position.

The CRT screen shall be bonded for implosion protection. The safety panel shall be etched with an out-reflective coating for improved contrasts.

1.1.3.7 Logic Unit

The different basic units are connected through a central logic unit. This unit interprets the microinstruction sequences of the ROM and the program instructions. In this way the logic unit takes all the logic decisions related to the machine operations. The logic capacities of the logic unit are such to realize all the machine functions previously indicated in these specifications.

1.1.3.8 Read Only Memory

This memory, named ROM (read only memory) must have enough capacity to contain all the microinstructions needed for the machine operations. As a first indication this capacity shall be 16,000 bits.

The programming of ROM is done when the machine is assembled.

Changing this memory unit, another containing different programs, the machine can have different functions.

The access time of this memory must be sufficiently low to permit the accomplishment of all the machine functions: a 100 nesc access time seems to be sufficient.

The memory output shall be 8 bits output: the address memory shall be given with 11 bits.

1.1.3.9 Data Memory

The data memory is the machine unit that receives the input-data and maintains it till at the end of the record, to transfer it on the magnetic tape cassette.

It is also used in verifying to compare the data recorded in the first key entry operation with the data recorded in the second operation. If we consider that the maximum record length is 200 characters of 9 bits, a 1,600 bits memory would be sufficient. Practically, using the

model CRR1B, a dual memory is needed, for full overlap of the different operations. The data memory is also used to display the data on the CRT. We think that for this memory capacity, it is useful to employ a delay line memory.

1.1.3.10 Program Memory

This memory receives from the operator the program instructions and contains it till at the end of the work. The program may be loaded from the keyboard or from the cassette recorder/reproducer. The program memory capacity must be able to contain two program records of 200 characters. It is desirable that the instruction characters shall be 8 bit characters: in this way the program memory capacity shall be about 4,000 bits, and the memory shall be a delay line memory.

1.1.3.11 Power Supply

The machine is equipped with an adequate power supply, to allow the connection with the different networks. The power supply may accept these different input voltages and frequencies:

- 115 V
- 127 V
- 160 V + 10-15% 50 Hz / 60 Hz ± 5%
- 220 V
- 240 V

The power supply output shall give the necessary voltages to drive the rectifier groups, for logical levels.

It gives, also, the two outputs necessary to drive a cassette recorder/reproducer CRR1B: 220 V - 50 Hz; 115 V - 60 Hz.

The power supply shall give, also, the power needed for lamps and signaling devices, and for future options.

1.1.3.12 Enclosure

The machine shall be contained in an adequate enclosure for putting it on a desk or on operator console.

The key and lamp positions shall be adequate for this purpose.

The main conditions are:

a) CRT screen complete and easily visible.

b) Easy module's access, particularly for the magnetic tape cassette.

The operator normally does not have access inside the machine, other than for magnetic tape cassette change, or for magnetic head cleaning.

The major module's access must be easy for technical interventions as indicated in the technical specifications.

The operator must be able to operate the machine in all the different ways, without modification of his work position, and without complex operations.

The machine design shall be in accordance with the Olivetti line products: the machine color shall be defined after prototype arrival.

1.2 Technical Specifications

1.2.1 Electrical Characteristics

1.2.1.1 Power Supply

Refer to what has been already mentioned in the functional specifications.

It must be possible to make a network connection showing the following features.

Voltages	Variations	Frequency	Variations	Phase
115 V	+15% - 10%	60 Hz	± 5%	Single
115 V	+15% - 10%	50 Hz	± 5%	Single
127 V	+15% - 10%	50 Hz	± 5%	Single
160 V	+15% - 10%	50 Hz	± 5%	Single
220 V	+15% - 10%	50 Hz	± 5%	Single
240 V	+15% - 10%	50 Hz	± 5%	Single

The logical levels used in interfacing with Olivetti electronic equipment shall be +20 V (logical 1) and GND (logical 0).

Filtering of network-interference must be such as to guarantee normal functioning of the unit in the event of either a 7 millisecond line dropout or a half-cycle, or less, surge up to 250 volts peak, non-repetitive.

1.2.1.2 Elimination of Radio-Interference

The radio-interferences produced by the machine must be lower than those foreseen by the CISPR and V.D.E. specs. A copy of these specs has already been given to the manufacturer.

1.2.1.3 Safety and Insulation Measures

The machine must satisfy all the conditions imposed by the "Underwriter Laboratories", and by the CEI (Commitee - Electrical International) 10 specs. Copy of specs CEI has already been handed over to the manufacturer.

1.2.1.4 Interface-Characteristics Between the the Various Units

The interface characteristics between the various component units must be indicated in detail by the manufacturer in order to enable the customer to carry out modifications and variations.

1.2.1.5 Sectionings and Protections

The electric parts and circuits must be appropriately sectioned off and the parts most liable to deterioration protected.

1.2.1.6 Absorbed Power

The power absorbed by the machine must not exceed the capacity values allowed by the energy meters normally located in the offices; it must therefore be lower than 3-5 KVA.

1.2.1.7 Cooling

Possible dissipation resistances must be appropriately located with adequate ventilation in order not to disturb the operator and not to spoil the appearance of the machine. If necessary, the use of internal ventilators is allowed, provided that they are silent.

(See 1.2.2.1 Noise).

1.2.2 Environmental Conditions

1.2.2.1 Operating Conditions

Temperature: the machine must operate within a temperature range of 10°C to 40°C. However, the cassette tape is limited to 32°C.*

Humidity: the machine must operate within a humidity range of 0 to 90%.

Pressure: the machine must operate within a pressure range of 522 mm. to 760 mm. That means that it must operate between sea level and an altitude of 3000 meters.

Atmosphere: the machine must operate in places near the sea or close to industrial areas, without deteriorating.

Vibration: the machine must operate on a vibrating floor producing a maximum acceleration of 0.15 g., and with oscillations inside the frequency spectrum ranging from 10 to 55 Hz.

Noise: this machine is required to be particularly noiseless, considering that it can happen that many machines will have to work contemporarily in the same place. The noise

level must not, therefore, exceed that which is considered acceptable in normal offices, in order not to tire or disturb the operator.

As a guide, the total noise produced by the machine working in the worst condition (data transfer on tape - fast rewind) should not exceed 35 db. in tests carried out with the Bruel and Kjaer equipment, scale DIN 1, in a soundproof room, according to the procedures normally used by Olivetti.

1.2.2.2 Non-operating Conditions

Temperature: the machine must be stored, packed or unpacked within a temperature range of -10°C to +60°C.

Humidity: the machine must be stored, packed or unpacked within a pressure range of 522 mm. to 760 mm. That means that it must be stored between sea leval and an altitude of 3000 meters.

The packed machine must be carried up to a maximum height of 15,000 meters.

Vibrations: the packed machine must be able to tolerate a prolonged vibration, within a range of 5 50 55 Hz with a maximum acceleration of 1.5 g. for a period of at least four hours, on each of the three axes. The time for passing from 5 50 55 Hz and coming back to Hz shall be of 20 minutes.

Shocks: the machine must be capable of standing up to four separate shock forces producing accelerations of at least 5g for a duration of 11±1 milliseconds on the packed machine, along the 3 axes.

1.2.3 Physical Characteristics

Packings: two types of packings must be provided: one for transportation by air and the other for transportation by sea. The former is required to satisfy a condition of minimum weight, the latter the condition of minimum volume, both providing a protection for the machine in the surrounding non-working conditions mentioned above.

A re-utilizable packing must be provided for at least 20 of the machines for using the machines in exhibitions, demonstrations and so on.

All packages must contain Olivetti name.

Transportation: the machine must be easily carried by one person. Cables or movable parts must not impede the transportation.

Dimensions and Weight: the fundamental overall dimensions are those of the usual office typewriter. The weight of the machine must be lower than 40 Kg.

Identification Plates: the machine must be equipped with all the plates normally used on Olivetti machines and required by the international rules:

Plate with manufacturer's name and country of of origin.

Plate with electrical characteristics of the network input elements.

Plate or stamping with denomination of the machine.

Plate or stamping with trade-mark.

Plate with serial number.

Denomination: the machine must bear clearly the denomination: Olivetti DE 521.

Serial number: every machine must be registered with a consecutive registration. The serial number must appear on a plate located in a fundamental part of the machine and must be easily accessible without having to use a screw-driver to remove a part.

1.2.4 Operational Characteristics

1.2.4.1 Installation

The installation of DE 521 must not require either attention or measures of any particular kind.

1.2.4.2 Utilization

The use of unit DE 521 is primarily foreseen for key-entry operations, in place of card punching and verify machines.

The average daily use is foreseen as 7 hours corresponding to 1750 hours yearly: during this time the terminal must be considered as switched on and working.

The volume of work actually carried out daily can be estimated in:

- characters operated on keyboard - 40,000 to 60,000
- characters recorded on tape - 80,000 to 100,000

The assistance of the operator to remedy any possible breakdown (dirty tape unit head) must not exceed one intervention every 4 days.

Possible machine failures, which have not been pointed out by the control systems must not exceed the frequency of 1 non-checked failure every 10 million handled characters, with a confidence level higher than 90%.

1.2.4.3 Reliability

Considering the average utilization fixed for the unit DE 521, the periodically and the times foreseen for the intervention on failures should be:

- average time between failures: MTBF - 1000 h, equal to about 1 intervention every 8 months
- average time for repair: MTTR - 1 h.

This time includes the time required to diagnose the failure and to replace the out of service module.

These are data fixed as an objective to be reached in less than one and a half year's production.

With a confidence level higher than 90%.

The minimum value acceptable at the beginning of the average time between failure is MTBF - 750 h.

1.2.4.4 Repair Costs and Spare Parts

The annual total cost for repairs, taking into account the cost of labor and spare parts and the pertinent inactivity, should not exceed 10% of the equipment cost (minimum duration 10 years). The minimum life span of the parts, for which an anticipated replacement is foreseen, should be of at least 1000 h.

1.2.4.5 Maintenance

1.2.4.5.1 Preventive Maintenance

Average time between preventive maintenance: MTBM = 500 h. equal to about 1 intervention every 4 months.

Preventive maintenance operations include all the technical operations which cannot be carried out by the operator.

It will be possible:

- to remove the machine enclosure completely with just the help of a normal screwdriver
- to operate the machine without cover
- to have access to all the necessary electrical signals.
- to remove the component units with the use of normal tools.

The ordinary electrical parts must be easily obtainable and easily interchangeable.

1.2.4.5.2 Repair

To be specified by agreement between Olivetti and Sycor service people.

1.3 Functional Specifications of DE 521 Model with First Option

1.3.1 System Organization

System block diagram is shown in Figure 2. In this diagram are indicated the basic modules of the system, the logic data flow, and control functions.

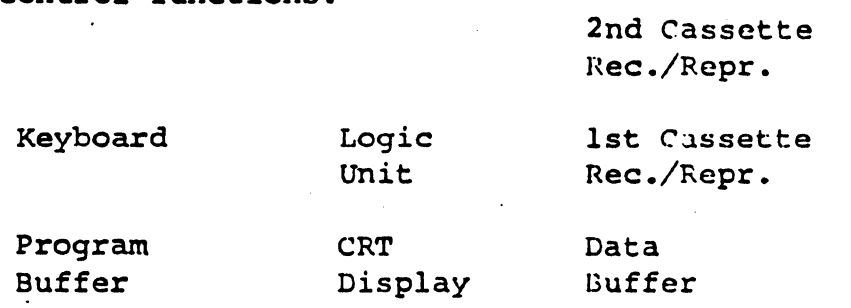

Figure 2

The first option consists of the second cassette recorder/reproducer model CRR1B and associated functions.

1.3.2 Basic Functions

The basic functions of the machine equipped with the first option are:

- DE 521 model functions
- Pooling
- Selecting

- 2nd cassette search
- 2nd cassette rewind
- teaching
- flip-flop operation with the 1st cassette

1.3.2.1 Pooling

The machine permits the full transfer of the recorded data, from the second cassette to the first.

This transfer is independent from the program present in the machine.

The transfer happens through the delay line memory, and under parity control.

If a reading error occurs, automatically the record comes back and is repeated. The record is repeated for a maximum of 1 time and after being stopped, generates an error alarm. (Error Lamp).

The data transfer, from the delay line memory to the 1st cassette recorder/reproducer is done under the read-after-write check, with

the same procedure of the key-entry operation.

The operator may continue the pooling operation by depressing error reset and the Pooling key. Transfer of data between cassettes is in one direction only.

1.3.2.2 Selecting

The machine permits the selective transfer of recorded data, from the second cassette to the first. This transfer depends from the program present in the machine.

The transfer happens through the delay line memory, and under parity control.

If a reading error occurs, automatically the record comes back and is repeated. The record is repeated 1 time, and after being stopped, generates an error alarm.

If, after the reading head is cleaned, the error persists, a technical intervention shall be needed.

The data transfer, from the delay line memory to the 1st cassette recorder/reproducer, is done under read-after-write check, with the same procedure of the key-entry operation.

The transfer may be done only by selected records. On the first cassette are transferred only the record with the same predetermined field.

The selecting program shall be loaded as the procedure is the same as the searching procedure, typing in the delay line memory the characteristic field, and depressing the pool/select key.

Transfer of data between cassettes during selection is in one direction only.

1.3.2.3 2nd Cassette Search

The second cassette search operates as the first cassette search and is used basically for program searching.

All tape controls applicable to the 1st cassette are also operative with the 2nd cassette when the 2nd cassette is selected.

1.3.2.4 Flip-flop Operation with the First Cassette

When with the 2nd cassette, one or more of the other options are present, the 2nd cassette automatically shall operate in flip-flop with the first cassette in the following cases:

- conversion
- transmission
- reception
- printing

1.3.3 Basic Modules

1.3.3.1 Control key Keyboard

The control key keyboard shall be modified by adding the following keys:

Pool/Select

Pooling is accomplished by using a search identifier common to all records. (Clear Screen).

Tape 1/Tape 2 Keys

Depression of either Tape Key selects the respective cassette recorder for all ensuring single operations.

1.3.3.2 Second Cassette Recorder/Reproducer Model CRR1B

It has the same characteristics of the 1st CRR1B cassette recorder/reproducer.

1.3.3.3 Cassette Tape

It has the same characteristics of the cassette tape used on the 1st cassette recorder/reproducer. The cassette tape is interchangeable between the two recorder/reproducers.

Normally the cassette tape used on the 2nd cassette recorder/reproducer contains the recorded programs, when the machine work requires a frequent change of programs.