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SECTION I

INTRODUCTION

1.1. SCOPE OF DOCUMENT

This document describes the Engineering Product Specs of the 1200 bps teleprinter (ROSY 26.1).

1.2. SCOPE OF PRODUCT

The basic product is a Receive Only Teleprinter which provides the capability of printing in monodirectional mode at 160 CPS with a 7x7 Matrix scheme. The interface is a serial EIA RS232/C compatible interface which operates in asynchronous mode at 1200 BPS with TTY like procedures.

The teleprinter provides :

- UP to 132 print columns
- Paper handling of the Tractor Type
- Upper case ASCII character set.

1.3. REFERENCE DOCUMENTS

- 1.3.1 A 78116572 EPS MIMA Mechanism
- 1.3.2 EIA RS232/C Standard
- 1.3.3 A 78120093 EPS Connectability list
- 1.3.4 ECMA Standard on "Continuous sprocket punched stationary"
- 1.3.5 A 78120407 EPS Character Set Option
- 1.3.6 A 78120406 EPS Keyboard Option.

- END OF SECTION -

SECTION II

ARCHITECTURE

2.1. OVERVIEW OF THE UNIT

The 1200 BPS Teleprinter (ROSY 26.1) is composed of the following parts

- Mechanism (MINA) comprehensive of electromechanical parts
- Logic and analysis electronics
- Firmware
- Power supply
- Operator panel
- Desk top enclosure with antinoise cover.

Several options can be added to the basic product, such as keyboard, single sheet movement, etc : they are separately described.

In the printer, a base carries the mechanical parts (basic paper movement by tractor, carriage and its guides, printing head) with their electromechanical elements (motors, transducers).

On the back of the mechanism are carried the power supply and capacitors.

Two electronic boards are positioned above the power supply, providing the power commands for the electromechanical parts (DRIVE board) and the logic for the management of interface signals and of the printer itself (CPU board); this board contains also RAM memory and ROM memory.

Space is provided for the connection of two other half size boards, for the management of some options.

A certain number of switches are provided on the CPU board in order to allow the choice at field level among some functionalities or to provide the management of options which require also the addition of mechanical or electronic parts.

A connector is provided for a modem interface.

An operator panel is provided in front of the printer with push buttons and lights able to allow the basic operations on the printer in any condition.

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Space is also provided in front of the printer to carry a keyboard, which can be optionally added.

Printing is accomplished by means of a 7 needles impact printing head. Characters are obtained by dots chosen among those of a 7x7 matrix: the nominal distance between the dots on a vertical line is 0.37 mm and on a horizontal line is 0.5 mm. The same needle cannot be operated more than 4 times per character.

Printing is performed only during forward movement of the carriage carrying the printing head.

2.2. OPTIONS

The list of options supported on ROSY 26.1 is given on the document at paragraph 1.3.3.

- END OF SECTION -

SECTION III

FUNCTIONAL REQUIREMENTS

3.1. HARDWARE AND FIRMWARE FUNCTIONS

The unit provides the following functions.

Basic functions

- printing character by character or continuously
- character set printing
- horizontal tabulation
- paper motion control
- character visibility
- three unit status LOCAL - STAND BY - ON LINE

Field selectable functions

- Ready or Stand by status at Power ON
- print of a diamond on parity error detected in modem interface
- half or full duplex
- types of keyboard
- Local print of data when echoplex function is not performed on the system
- management of AFF, SFU, VFU options
- vertical tabulation enabling
- buffer overflow signal
- management of upper and lower case character set
- 132 or 80 columns

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3.1.1 PRINTABLE CHARACTER SET

The basic unit can provide national and international upper and upper plus lower case character sets according to what specified in the document at ref. 1.3.5.

The DEL code is always ignored.

3.1.2 MODE OF OPERATION

The device provides a buffer of 1000 characters to eliminate in some case the need of fill characters; in fact the characters coming from the interface will be loaded into the buffer every time the mechanism could not accept a print command.

All characters coming from the line with buffer overflow will be lost.

Two modes of operation will be provided :

- LOCAL mode
- ON LINE mode

- .. LOCAL : The "Data terminal ready signal" on the interface is in mode OFF condition.
- .. ON LINE : The "Data terminal ready" signal is held up on the interface. Data are accepted and printed if no transmission errors are detected.

See para 4.2.2 for detailed description.

3.1.3 HORIZONTAL TABS HANDLING

The sequence to load TABS for horizontal tabulation is :

- o the device must be in ON LINE or LOCAL status
- o send the clear horizontal TAB command (ESC-2)
- o send a message with the CR command at the beginning and then a sequence of SPACE (BLANK) characters with tab set commands (ESC-1) inside.

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Up to 16 tabs are available.

A CR command causes the print head to move :

- to the left most tab if tabs are present
- to the left most printable position of the fanfold if no tab is present.

3.1.4 VERTICAL TABS HANDLING

1. the device must be in ON LINE or LOCAL status.
2. send the clear vertical tab command (ESC-4).
3. send the FF (Form Feed) command to reset the line counter.
4. align the first line of fanfold paper under the print head.
5. set the tab sending a sequence of LF commands with inside tab set command (ESC-3); after the last tab set command insert a FF (Form Feed) command for the fanfold.
6. up to 10 tabs are available.

3.1.5 PAGE LENGTH HANDLING

The sequence to load the page length is :

- the device must be in ON LINE or LOCAL status.
- send the FF (Form feed) command to reset the line counter.
- align the first line of fanfold paper under the print head.
- send the page length command. (ESC 0 + X) or (ESC t + Y).

The binary value of X or Y character determines the number of lines according to the table of para 4.4.4.

3.2. ACCEPTED CONTROL CODES

The following table resumes the ASCII codes that are accepted by the unit.

6	5	4	3	2	1	0		
0	0	0	0	0	0	0		
0	0	0	0	0	1			
0	0	0	0	0	0		NUL	DLE
0	0	0	0	0	1		SOH	DC1
0	0	0	1	0			STX	DC2
0	0	0	1	1			ETX	DC3
0	1	0	0				EOT	DC4
0	1	0	1				ENQ	NAK
0	1	1	0				ACK	SYN
0	1	1	1				BEL	ETB
1	0	0	0				BS	CAN
1	0	0	1				HT	EM
1	0	1	0				LF	SUB
1	0	1	1				VT	ESC
1	1	0	0				FF	FS
1	1	0	1				CR	GS
1	1	1	0				SO	RS
1	1	1	1				SI	US



ignored in reception



accepted according special sequence

For signal definitions, see para. 4.3.2

All the codes, except NUL, are usable for Form Length setting with the sequence ESC 0 + X.

- END OF SECTION -

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SECTION IV

INTERFACE PROCEDURE

4.1. USER INTERFACES

4.1.1. OPERATOR PANEL

4.1.1.1 CONTROLS

Referring to figure 4.1.1.1. the following push buttons are available :

I ON LINE/STAND BY/STAND BY/ \overline{P}

- its pressing causes the printer to :
 - .. go to STAND-BY being in ON-LINE
 - .. go to ON-LINE being in STAND-BY
 - .. go to STAND-BY being in LOCAL not during test
 - .. start the printing during local test operation if pressed after IV push button.

II LOCAL/FORM FEED/FORM FEED/ \overline{C}

- its pressing causes the printer to :
 - .. go to LOCAL being in STAND-BY
 - .. execute a form feed if the printer is in ON-LINE and after carriage is entered in visibility status
 - .. execute a form feed being in LOCAL not during test and after carriage is entered in visibility status
 - .. start the carriage movement without printing during local test operation if pressed after IV push button.

III/LINE FEED/LINE FEED

- its pressing causes the printer to :
 - .. execute a line feed being in ON-LINE and after carriage is entered in visibility status

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- execute a line feed being in LOCAL not during test and after carriage is entered in visibility status.

This push button is meaningless in STAND-BY.

IV/ BREAK/TEST

- its pressing causes the printer to :
 - send a BREAK on the external interface (> 200 ms)
 - enter TEST condition being in LOCAL (see fig. 4.1.1.3).
The start of tests operation is given by pressing I or II push button.
 - stop the test if printer is in LOCAL and test is running.

This push button is meaningless in STAND-BY.

The following figure 4.1.1.1 shows the operator panel.

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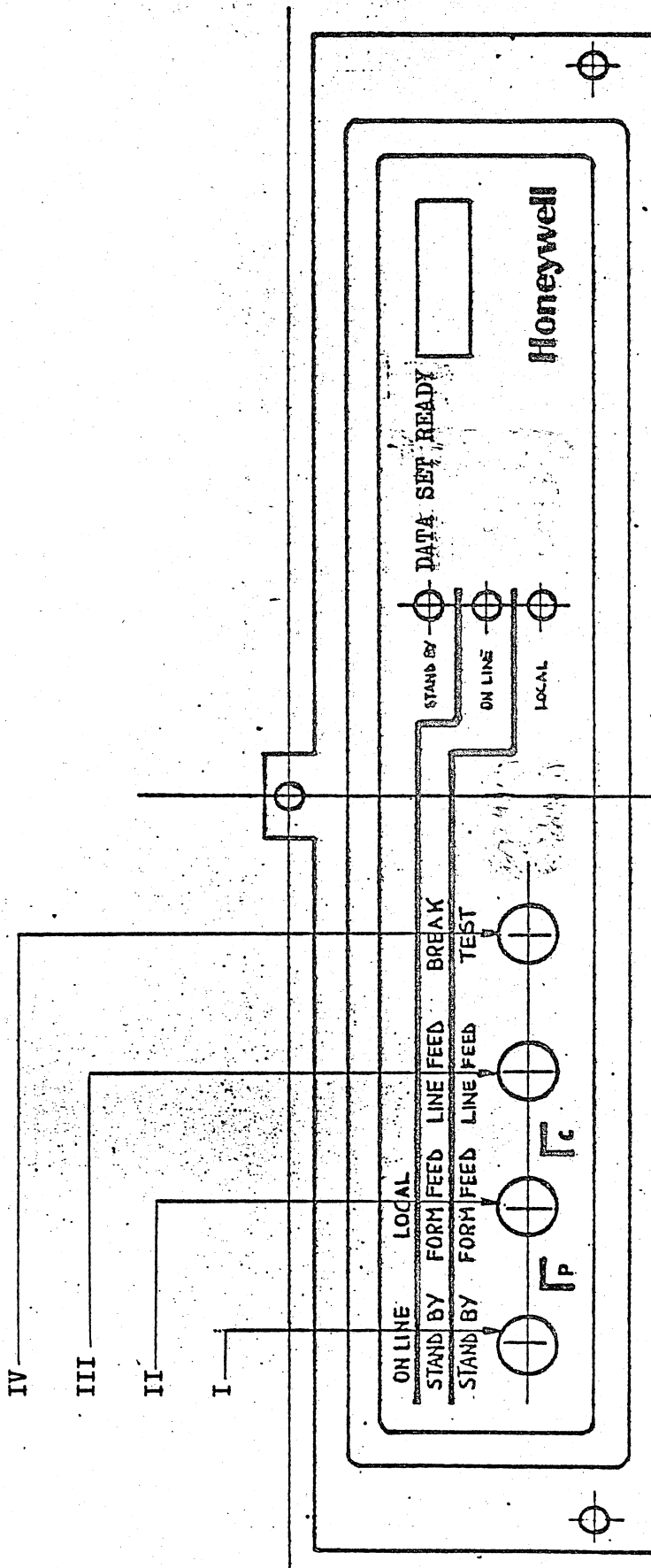
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ROSY 26 OPERATOR PANEL

Fig. 4.1.1.1

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4.1.1.2 INDICATORS

Front panel provides the following lights :

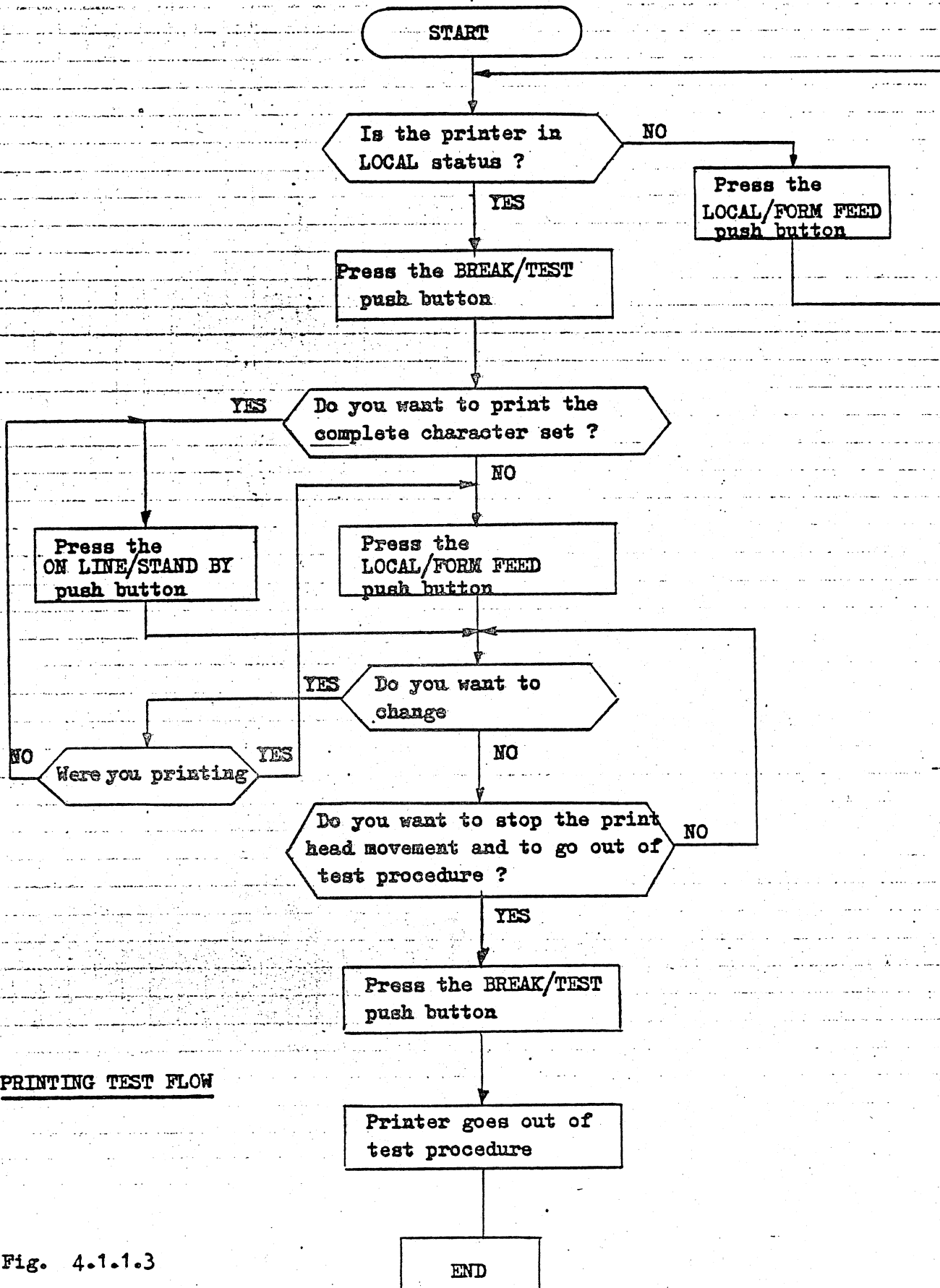
- STAND-BY/DSR (DATA SET READY) : indicates that the terminal is in :
 - .. STAND-BY status if ON LINE lamp is OFF
 - .. DSR (DATA SET READY) interface signal ON if ON LINE lamp is ON

- ON LINE : indicates that the terminal is able to correctly operate.
 If at the same time the STAND-BY/DSR (Data Set Ready) lamp lits this means that DSR is ON and the terminal is connected to the communication line.

- LOCAL : indicates that the terminal is powered-up and not connected to the line (Data Terminal Ready OFF)

4.1.1.3 TEST FLOW

The steps to be followed to perform a local test (with the unit in LOCAL status), is shown in the following flow (Fig. 4.1.1.3).

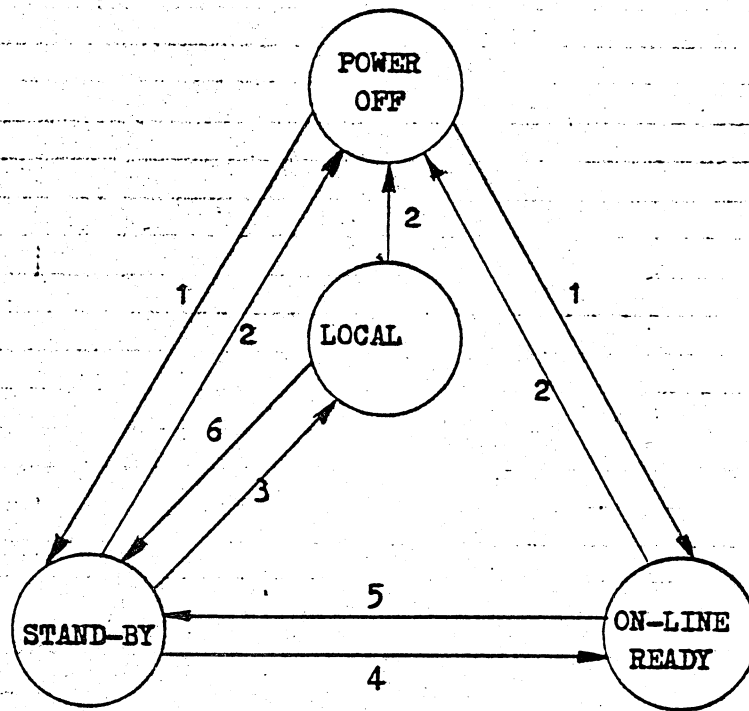


PRINTING TEST FLOW

Fig. 4.1.1.3

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4.1.2: STATI E TRANSIZIONI STATI



- 1 Power ON switch (resulting status depending upon a switch position).
- 2 Power OFF switch + Printing Fault + Carriage driver voltage fault.
- 3 LOCAL/FORM FEED push button.
- 4 Calling indicator signal + ON LINE/STAND BY push button and DSR + ESC H.
- 5 DSR OFF + Paper End + Carriage Error + ON LINE/STAND BY push button + ESC J + DLE EOT.
- 6 ON LINE/STAND BY push button + Paper End + Carriage Error.

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4.1.3 ADDITIONAL OPERATOR PANEL CONTROLS

The following additional controls are provided :

- Lever to accomodate various forms thickness according to the table in para 6.3.6
- Paper Movement Knob which allows to manually position the fanfold paper. This operation possible only in STAND-BY or Power off status.
- Unlock to allow the adjustement of the right tractor position.

4.1.4 FIELD SELECTABLE OPTIONS

Switches mounted on the printed circuit CPU board are provided to select the options, as reported in the following table.

ROSY 26.1

S-01 01	ON	MUST BE OFF
	OFF	
S-01 02	ON	MUST BE ON
	OFF	
S-01 03	ON	MUST BE OFF
	OFF	
S-01 04	ON	MUST BE OFF
	OFF	
S-01 05	ON	MUST BE OFF
	OFF	
S-01 06	ON	MUST BE ON
	OFF	
S-01 07	ON	MUST BE OFF
	OFF	
S-01 08	ON	INDIFFERENT
	OFF	
S-01 09	ON	READY STATUS AT POW. ON STAND-BY STATUS AT POW. ON
	OFF	
S-01 10	ON	132 COLUMNS 80 COLUMNS
	OFF	
S-01 11	ON	PRINT DIAMON IF PARITY ERR. NO CHECK PARITY
	OFF	
S-01 12	ON	WITHOUT KEYB. TRANSC. WITH KEYB. TRANSCODIF.
	OFF	
S-01 13	ON	MUST BE ON
	OFF	
S-01 14	ON	NORMAL CONNECTION VIP HARD COPY CONN.
	OFF	
S-01 15	ON	FULL DUPLEX MODE HALF DUPLEX MODE
	OFF	
S-01 16	ON	ENABLE V.T. OPTION DISABLE V.T. OPTION
	OFF	
S-01 17	ON	QWERTZ KBD AZERTY KBD
	OFF	
S-01 18	ON	LOCAL PRINT
	OFF	
S-01 19	ON	BUFFER OVERFLOW SIGNAL PRINT UPPER & LOWER CASE
	OFF	
S-01 20	ON	PRINT UPPER CASE ONLY
	OFF	
S-01 21	ON	INDIFFERENT
	OFF	
S-01 22	ON	INDIFFERENT
	OFF	
S-01 23	ON	INDIFFERENT
	OFF	
S-01 24	ON	INDIFFERENT
	OFF	
S-01 25	ON	WITHOUT AFF OPTION WITH AFF OPTION
	OFF	
S-01 26	ON	MUST BE OFF
	OFF	
S-01 27	ON	MUST BE ON
	OFF	
S-01 28	ON	MUST BE ON
	OFF	
S-01 29	ON	MUST BE OFF
	OFF	
S-01 30	ON	VFU WITH LOOP OR NOVFU SEV OPTION
	OFF	
S-01 31	ON	MUST BE ON
	OFF	
S-01 32	ON	MUST BE OFF
	OFF	

TABLE 4.1.4

DIP SWITCH OPTIONS

AVAILABLE ON

ROSY 26.1

4.2. EXTERNAL INTERFACES

4.2.1 GENERAL

The interface is serial asynchronous and transmission code follows the ASCII standard (TABLE 4.2.1) with Teletype like control procedure. The character structure is the following :

- 1 Start bit
- 7 Information bits
- 1 Parity bit (even)
- 1 Stop bit

Transmission speeds is 1200 BPS.

A 25 pin, female connector in accordance with EIA RS-232C Standard is provided on the rear of the printer.

Optional cables terminating with a female connector in accordance with the same standard are provided. Maximum standard cable length is 50 feet.

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4.2.2 INTERFACE SIGNALS

Pins are defined on a 25 pin CANNON female connector (MODEM interface)

Pin 1 . Frame Ground

Frame ground and signal ground will be separated.

Pin 2 . Transmitted Data (from printer): this lead carries the serial data generated by the printer as soon as they are generated. Break signal is sent as spacing lasting more than 200 ms.

Pin 3 . Received Data (to printer): the terminal accepts on this lead data in asynchronous mode.

Interpretation of received characters is inhibited if Carrier Detector is OFF or if the printer is in LOCAL mode.

Pin 4 . Request to Send (from printer): this signal goes ON or OFF as soon as the device is initialized after a power ON sequence, according to S01-09 switch position. The following table summarizes the RTS and DTR conditions.

A - For printer predisposed to go READY at POWER ON.

STATUS	ON LINE	LOCAL	STAND-BY	POWER
	READY		(a)	OFF
DTR	ON	OFF	ON	OFF
RTS	ON	ON	OFF	OFF

(a) error condition (Paper out/carriage motion error) procures Stand By plus a Break (200 msec) on Transmitted data.

B - For printer predisposed to go STAND BY at POWER ON.

same as case A, Modem, but - DTR OFF in Stand By status

- no Break sent on Ready → Stand BY transition.

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Pin 5 . Clear to Send (to printer): this signal when ON enables to transmit data.

Pin 6 . Data set Ready (to printer): means that the modem is ready.

Pin 7 . Signal Ground : this lead is the common ground reference for all interchange circuits, except Frame Ground.

Pin 8 . Carrier Detector (to printer): it enables interpretation of the received characters.

Pin 18 . - 12 Useful to force the signal in false level when they are not used in the connection.

Pin 20 . Data Terminal Ready (from printer): according to switch (S01-09) position on CPU board is possible to have :

1 - : Switch position causes READY status at Power-ON.

DTR ON

- . At power-ON
- . When ON LINE/ST.BY push button is pressed with printer in Stand-By
- . When Calling indicator signal is received
- . ESC H, (ESC h) sequences on interface

DTR OFF

- . LOCAL status

2 - : Switch position causes STAND-BY status at power ON

DTR ON

- . When ON LINE/ST.BY push button is pressed
- . When Calling indicator signal is received and DSR goes ON before a 250 msec min time out.
- . ESC H (ESC h) sequences on interface

DTR OFF

- . End of paper signal is present
- . Carriage motion error is present
- . ON LINE/ST.BY push button is pressed
- . DLE EOT sequence is received
- . ESC J (ESC j) sequences on interface
- . When DSR goes low.

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Pin 21 . + 12 Useful to force the signals in true level when they are not used in the connection.

Pin 22 . Calling Indicator (to printer): this signal goes ON when a remote call is received.

Pin 11 . Secondary Transmitted Data (from printer). This signal is used only when teleprinter is connected to a Bell 202C Data Set. It is used to send a Break signal lasting more than 200 msec while Request to Send (RTS) is OFF. This brake is obtained by operation on Operator Panel or via keyboard while the printer is receiving.

Pin 14 . Secondary Transmitted Data (from printer). This signal is used only when teleprinter is connected to Data Sets following CCITT and EIA RS232C standards. It is used to send a Break signal lasting more than 200 msec while Request to Send (RTS) is OFF. This brake is obtained by operation on Operator Panel or via keyboard while the printer is receiving.

Pin 13 . Secondary Clear to Send (to printer). This signal when ON enables to transmit the break on the "Secondary Transmitted Data" signal.

Pin 19 . Secondary Request to Send (from printer): this signal is ON every time the "Request to Send" is OFF and viceversa when RTS is ON.

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4.3. INTERFACE SIGNAL HANDLING

4.3.1 AUTOMATIC ANSWER

On switched lines with modems wired for automatic answer, receiving "Calling indicator" the printer will automatically connect the modem on the line so that it will be ready to receive data.

4.3.2 CODES HANDLING

Reference is made to paragraph 3.2.

Control codes and code combinations are defined in the following :

- BEL : recognition of this code activates an audible alarm for about 0,5 seconds.
- FS : recognition of this code causes the single sheet ejection when the Automatic Front Feed option is present.
- GS : recognition of this code causes the single sheet positioning when the Automatic Front Feed option is present or a line feed when the second paper handler option is present.
- BS : recognition of this code causes the printing head to move one position to the left.
- HT : recognition of this code causes the printing head to move forward to the next tab position. If no TABS have been set, the head moves to the end of the line (80 or 132 position).
- LF : this code causes the paper to advance one line.
- VT : this code causes the paper to advance up to the next vertical tab or to the first line of next form when no tab are inserted (when enabled by S01-16 switch) (see para 4.3.4).
- FF : this code causes the paper to advance at the first line of the next form (when enabled by S01-16 switch otherwise it causes a LF) (see para 4.3.4).
- CR : recognition of this code causes the printing head to move to first tab or to the first print position when no tab are inserted.

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- DLE : is ignored if not followed by EOT.

In this case it causes the Data Terminal Ready to be turned OFF to cause modem disconnection on switched lines according to switch position (see para. 4.1.4 and 4.2.2).

- ESC : the following escape sequences are interpreted :

- 1) ESC1 : sets a tab at the horizontal position where it is recognized.
- 2) ESC2 : clears all horizontal tabs. (At power-on all tabs are cleared).
- 3) ESC3 : sets a vertical tab position at line count.
- 4) ESC4 : clear all vertical tabs.
- 5) ESCO : plus X character to determine the page length, max page length is 126 lines. The Teleprinter is initially set for 66 lines (see table para 4.4.4.1 and Appendix A).
- 6) ESCh : (ESC h): causes the printer go to ON LINE status from the STAND-BY status. Correspondingly DTR and RTS will go ON.
- 7) ESCj : (or ESCj): causes the printer go to STAND-BY status from the ON LINE status. Correspondingly RTS or RTS + DTR will go OFF.
- 8) ESCbY : (ESC + space + Y) (see table 4.4.4). The binary value of Y minus 32 defines the number of lines of the page.
E.g. a page length of 66 lines can be set in the following ways :

by line

ESC + b + 62Hex note 62Hex ASCII code
or (with other se corresponds to
quence) "b" character.

ESC + 0 + 42Hex note 42Hex ASCII code
corresponds to
"B" character.

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by keyboard

ESC + b + (key number 51)
or (with other sequence)

note key number 51 corresponds to
b con 60SD11 keyboards (NML)

ESC + 0 + LOCK + (key number 51)

note key number 51 corresponds to
B on 60SD11 keyboards (NML)

(see Appendix A and B for further information)

Note : This sequence was introduced in order to avoid problems in setting some form lengths under 32 columns due to the use as VIP hard copy in transparent mode (OFF position).

Code sequences ESC0 + CRT, ESC3, ESC4 and ESCf + CRT + CRT can be ignored according to switch S01-14 on CPU board.

- ENQ : this code, valid in full duplex causes the answer of an ACK code if the printer is in READY status; a NACK code is sent if the printer is in STAND-BY status.

Note : A break signal is sent on the "Transmitted data" signal interface (at least 200 ms) every time the break key is depressed on the keyboard or on the operator panel, or for paper out/carriage motion error if the switch S01-09 is positioned for READY status at Power-ON.

- ETX : recognition of this code causes the Line turn-around when the printer is setted for half-duplex operation.

- EOT : same as ETX.

- ACK : same as ETX.

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4.3.3 BUFFER OVERFLOW

When the Dip switch S01-19 is in OFF position, the Request To Send (RTS) signal goes low when characters in the buffer exceed 3/4 K (buffer full); the RTS signal returns high when characters in the buffer are less than 512 (buffer empty).

4.3.4 VERTICAL FORM MANAGEMENT CODING

The printer will provide the capability to set tabs to perform vertical tabulation and form length for top of form skip. This information can be given by remote or local (from keyboard if the option is present).

Execution of VT code can be enabled or disabled at field engineer level by switch (see para 4.1.4).

When VT code is disabled the reception of FF code will cause the execution of LF movement.

The skip is performed by receiving remotely or locally a VT or FF command. If the VT code is entered after the page has been advanced beyond the highest tab set, the paper will advance to the top of next page. Paper synchronization is performed by operator, adjusting the paper by means of a knob.

4.4. PROGRAMMING CONSIDERATIONS

4.4.1 HORIZONTAL TAB PROGRAMMING

4.4.1.1 CR PLUS LF SEQUENCE

The following are the formulas to compute the worst case fill characters after CR/LF :

a - columns from 20 to 132

$$X = \frac{(N-2) 6.88 + (N-16) 2.5 + 180}{8.33} - N$$

b - columns from 2 to 20

$$X = \frac{(N-2) 13.76 + 80}{8.33} - N$$

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where : X = number of fill characters

N = number of columns to be printed

The number of fill characters required are the following :

- with 132 columns 32 fill characters
- with 120 columns 31 fill characters
- with 80 columns 26 fill characters
- with 60 columns 23 fill characters
- with 36 columns 20 fill characters

4.4.2 CHARACTER VISIBILITY

Due to the buffer no fill characters are required after print head movement is performed to permit the visibility of the last printed character.

4.4.3 VERTICAL TABULATION

The number of fill characters required after a LF command received from the line is 7.

The formula to compute the worst case fill characters after a VT or FF or GS commands in the following :

$$X = 5 + 2.85 \text{ number of line performed.}$$

4.4.4.1 PAGE LENGTH PROGRAMMING

Two ways are provided : ESC \bar{B} Y described in para. 4.3.2 item 8 or ESC 0 X (see para 4.3.2).

The binary values of character X or Y to set the page length are :

Number of lines	Hexadecimal character		Number of lines	Hexadecimal character		Number of lines	Hexadecimal character	
	X	Y		X	Y		X	Y
1	01	21	43	2B	4B	85	55	75
2	*	22	44	2C	4C	86	56	76
3	*	23	45	2D	4D	87	57	77
4	*	24	46	2E	4E	88	58	78
5	*	25	47	2F	4F	89	59	79
6	06	26	48	30	50	90	5A	7A
7	07	27	49	31	51	91	5B	7B
8	08	28	50	32	52	92	5C	7C
9	09	29	51	33	53	93	5D	7D
10	0A	2A	52	34	54	94	5E	7E
11	0B	2B	53	35	55	95	5F	7F
12	0C	2C	54	36	56	96	60	80
13	0D	2D	55	37	57	97	61	81
14	0E	2E	56	38	58	98	62	82
15	0F	2F	57	39	59	99	63	83
16	*	30	58	3A	5A	100	64	84
17	11	31	59	3B	5B	101	65	85
18	12	32	60	3C	5C	102	66	86
19	13	33	61	3D	5D	103	67	87
20	14	34	62	3E	5E	104	68	88
21	15	35	63	3F	5F	105	69	89
22	*	36	64	40	60	106	6A	8A
23	*	37	65	41	61	107	6B	8B
24	*	38	66	42	62	108	6C	8C
25	*	39	67	43	63	109	6D	8D
26	1A	3A	68	44	64	110	6E	8E
27	*	3B	69	45	65	111	6F	8F
28	1C	3C	70	46	66	112	70	90
29	1D	3D	71	47	67	113	71	91
30	1E	3E	72	48	68	114	72	92
31	1F	3F	73	49	69	115	73	93
32	20	40	74	4A	6A	116	74	94
33	21	41	75	4B	6B	117	75	95
34	22	42	76	4C	6C	118	76	96
35	23	43	77	4D	6D	119	77	97
36	24	44	78	4E	6E	120	78	98
37	25	45	79	4F	6F	121	79	99
38	26	46	80	50	70	122	7A	9A
39	27	47	81	51	71	123	7B	9B
40	28	48	82	52	72	124	7C	9C
41	29	49	83	53	73	125	7D	9D
42	2A	4A	84	54	74	126	7E	9E

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The page length can also be introduced through keyboard or VFU options etc :

the related programming considerations are reported in the documents describing the options and in attachments A and B.

(*) - Not usable in VIP hard copy transparent mode connection.

- END OF SECTION -

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SECTION V

PHYSICAL AND LOGICAL STRUCTURE

5.1. PHYSICAL STRUCTURE5.1.1 MECHANICAL SPECS

Height	7,5" (190 mm)	} Desk top cabinet, including mechanism, electronics, power supply.
Width	23" (590 mm)	
Depth	20,5" (520 mm)	
Weight	64 Lbs (28,5 Kg)	

5.1.2 ENVIRONMENTAL CONDITIONS

The operating environment is :

- Temperature range 10°C to 38°C (Dry Buld)
- Humidity range 10% RH to 90% RH

Media restrictions (see ECMA standard para 1.3.4) are :

- Temperature range 16°C to 24°C
- Humidity range 40% RH to 60% RH

Outside of these restrictions, some degradation can be expected.

5.1.3 ELECTRICAL SPECS5.1.3.1 PRIMARY POWER

The unit will operate as specified when connected to any of following source of primary power

- . 208 Vac; 60 Hz; monophasic: three wires (1 phase, 1 ground, 1 neutral)

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. 220 Vac; 50 Hz; monophasic: three wires (1 phase, 1 ground, 1 neutral)

. 240 Vac; 50 Hz; monophasic: three wires (1 phase, 1 ground, 1 neutral)

. 120 Vac; 60 Hz; monophasic: three wires (1 phase, 1 ground, 1 neutral)

A.C. power consumption is 230 VAm_{ax}

All the voltages have tolerances + 10%, - 15%.

Selection of the mains is at field engineering level.

The mains is sectionable in order to meet U.L. requirements.

5.1.3.2 SIGNALS ELECTRICAL CHARACTERISTICS

The device interface signals are compatible with EIA RS232C and with CCITT V24, standards and are described in para 4.2.2.

The signals electrical value is :

Positive = + 10V

Negative = - 10V.

The accepted signal electrical value is:

Positive : + 3V to + 25V

Negative : - 3V to - 25V.

- END OF SECTION -

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SECTION VI

PERFORMANCE

6.1. PRINTER PERFORMANCES

<u>Character size</u>	- 1,9 mm x 2,67 mm (.075"x.105") (outside dimen.)
<u>Character pitch</u>	- 1/10"
<u>Line Spacing</u>	- 1/6"
<u>Print Positions</u>	- up to 132
<u>Carriage Return Time</u>	- nominal 380 ms - max 430 ms for 132 col. nominal 280 ms - max 310 ms for 80 col.
<u>Paper feeding</u>	- tractors type.
<u>Paper width</u>	- fanfold paper minimum 4", maximum 15" wide
<u>Line feed time</u>	- max 70 ms
<u>Print color</u>	- one print color
<u>Print rate</u>	- continuous 160 CPS \pm 5% average character by } character } 38 CPS \pm 15%
<u>Number of copies</u>	- original plus up to 4 copies
<u>Ribbon</u>	- ribbon is of the cartridge type and can be replaced by the operator
<u>Vertical tabulation and form feed</u>	- performed at 7 inches/sec (42 lines/sec)
<u>Horizontal tabulation</u>	- performed at the following speed : <ul style="list-style-type: none"> . 160. CPS for displacement up to 20 columns . slew speed for displacement over 20 col. (max slew speed 500 cps nominal)

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6.2. LINE CHARACTERISTICS

The Teleprinter will be connected to a host system through the EIA RS232C serial interface in two way :

- directly without Modem
- remotely by means of Modem

The connection capabilities are :

- Transmission speed - 1200 BPS
- Data synchronization - asynchronous mode
- Communication channels - point-to-point either Full Duplex or Half Duplex either with or without secondary channel (see para 4.3.2)
- switched or leased
- Communication code and control Procedures - TTY-like, intended as follows :
ASCII, 7 information bit plus 1 parity bit plus 1 START bit plus 1 STOP bit.

6.3. CAPACITIES

6.3.1 PRINT VISIBILITY

The printing head automatically moves 3 position beyond the current print position after about 0.8 seconds time-out of no printing activity.

At the end of the carriage return movement the printing head will be 3 positions on the left of the first print position to permit the complete line visibility even if no line feed is performed.

6.3.2 END OF PAPER SENSOR

A sensor, is provided to detect that the forms supply is depleted. Upon detection of end of paper condition the device will stop printing, the STAND-BY indicator will be lighted and the signals "Data Terminal ready" and "Request to send" will be set as described in para 4.2.2.

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6.3.3 AUTOMATIC NEW LINE

To protect the print head, every time it is received a new character to be printed (instead of CR + LF) being the print head on column 133 or 81 (depending from the line length selected), the printer will perform automatically a CR plus LF and then will print the received character on first column of the new line.

The line counter is correspondingly increased.

6.3.4 AUDIBLE ALARM

An audible alarm is activated for about 0.5 seconds when it has been received a BELL command from the line.

6.3.5 MEDIA CHARACTERISTICS

The LCSP handles the standard continuous fanfold paper forms. The continuous fanfolds commonly used in the European and USA countries, have marginal sprocket holes (Carrol type) as specified below :

- Sprocket holes diameters : $5/32'' = 3.97 \text{ mm} \pm 0.1$
- Sprocket holes pitch : $0.5'' = 12.7 \text{ mm} \pm 0.1$
- Distance of any hole from the corresponding one, placed 20 pitches farther, must be equal to $254 \text{ mm} \pm 0.6$.

Fanfold dimensions :

- Form height : from 3 to 21 inches
- Form width : from 4 to 15 inches

Table 6.3.5.1 shows the media weights and the number of copies.

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Number of copies	Type of media	Weight	Carrying method
1 copy	Fanfold form	min 55 gr/mq max 80 gr/mq	tractors
2 to 4 (1 original + 1 to 3 copies)	Fanfold form (carbon not considered carbon	min 45 gr/mq max 75 gr/mq max 35 gr/mq	tractors
5 (1 original + 4 copies)	Fanfold form (carbon not considered) carbon	max 45 gr/mq max 35 gr/mq	tractors

Tab. 6.3.5.1 Media characteristics

6.3.6 PAPER THICKNESS ADJUSTEMENT

A lever is provided to accomodate various form thickness according to the following table.

MEDIA THICKNESS	LEVER POSITION
.07 ± 0.12 mm (.003" to .0047")	1
0.13 ± 0.22 mm (.0051" to .0087")	2
0.23 ± 0.32 mm (.0091" to .0126")	3
0.33 ± 0.42 mm (.0130" to .0165")	4
0.43 ± 0.52 mm (.0169" to 0.0204")	5

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6.3.7 PRINT ALIGNMENTS**• Line straightness**

The maximum deviation between any individual characters of the same line is 0.15 mm (0.006 inch).

• Column straightness

The maximum deviation between any individual characters of the same column is 0.3 mm (0.012 inch).

• Character pitch tolerance

Tolerances are :

± 0.15 mm (0.006 inch) between adjacent characters
 ± 1 mm (0.040 inch)
 $- 0.3$ mm (0.012 inch) between characters spaced 100 columns.

• Line spacing tolerance

Tolerances are :

± 0.25 mm (0.010 inch) on original copy, not cumulative
 ± 1.2 mm (0.050 inch) from original copy to fourth copy.

- END OF SECTION -

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SECTION VII

AVAILABILITY

7.1. RELIABILITY

With the duty cycle specified in the MINA Product Design Spec. § 1.3.1 (Appendix B) the MTBF goal is 1000 power-on hours starting from the second manufacturing year.

The above MTBF figure does not include the replacements of the printing head.

Early failures occurring during the first 50 hours are not to be computed in the MTBF calculation.

MTBF calculation and demonstration are to be done as specified in the above mentioned MINA specs., appendix B.

7.2. MAINTAINABILITY

Maintainability figures

.. MTRR : 0,8 hours

.. Print head life : 50 Million Chars.

.. Inked ribbon replacement will be performed by operator.

7.3. SAFETY

The unit will conform with U.L. and C.S.A. standards.

7.4. DATA, MEDIA, DEVICE INTEGRITY

The following conditions and malfunctions which can damage Data, and Device Integrity are detected and cause the unit to enter Stand-by state

- Paper End (for details see various operating conditions)

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- Print Carriage out of limits
- Print Carriage synchronization error.

The following conditions are detected and cause the device power-off:

- Power supply failure
- Printing needle driving circuit fault
- Carriage Driver Fault.

7.5. USEFUL LIFE

This product will have an useful life of 10 calendar years, or 20.000 power-on hours, whichever comes first.

- END OF SECTION -

SECTION VIII

CONNECTABILITY

The connectability is reported on document No. A 78120093 "Connectability List".

- END OF SECTION -

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SECTION IX

THEORY OF OPERATIONS

9.1. INTRODUCTION

This section describes the functional operations of the serial printer.

The major functional blocks are splitted in :

- . Power supply
- . Power and analog circuits
- . Logic circuits with 8080 microprocessor
- . Fault protections

For each section the functional blocks are shown.

9.2. POWER SUPPLY

The power supply includes the "controlled voltage transformer" (C.V.T.) the rectifiers and capacitors, the breaker and the voltage regulators.

When the breaker is in ON condition, the line voltage is applied to the primary of the transformer, so the following DC., unregulated voltages are generated :

- + 8,5 V, 12 A
- + 19 V, 4,3 A
- 19 V, 0,6 A

from which are obtained the regulated voltages :

- + 5 V \pm 5%, 5 A max
- + 12 V \pm 5%, 0,4 A max
- 15 V \pm 5%, 0,05 A max
- 12 V \pm 5%, 0,1 A max
- 5 V \pm 5%, 0,3 A max

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Each voltage has an internal current limiter, and a low voltage protection (except for - 15V) while + 5V has also an overvoltage protection which strips off the line breaker by means of the auxiliary coil.

To allow the device trouble shooting this coil can be disconnected, so no protection is active.

9.3. POWER AND ANALOG CIRCUITS

Only one analog circuit is present on the device: the magnetic sensor amplifier that amplifies the sinusoidal signal coming from the "mistor".

The adjustments, "balance and amplitude", are necessary to obtain a correct output signal.

The power circuits consists of:

- . carriage driver : these circuits drive a four phase stepping motor and a transistor for "enhancement mode" to allow fast carriage acceleration.
- . paper drive : these circuits drive a four phase stepping motor identical to carriage motor and a transistor for enhancement mode to allow fast paper acceleration.
- . hammer drivers : these circuits drive seven printing head solenoids according to the commands coming from the characters generator.
- . ribbon driver : these circuit supplies a constant voltage to the cartridge ribbon motor.

9.4. LOGIC CIRCUITS

The logic consists of the following main parts :

- . Microprocessor and associated kit of LSI circuits
- . Random logic for DOE signals generation.

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9.4.1 MICROPROCESSOR CIRCUITS

The microprocessor part of the logic design is implemented by an 8080-A μ P, five 1KX8 bits 8708 EPROMS for storing control programs, two 256X4 bits 8111-2 RAMS used like process working area and data buffer of 64 characters.

Interrupt levels are handled by a priority interrupt circuit unit 8214 and additional masking gates to get individual masking function capabilities. Masking involves only the four highest priority levels.

The EIA RS-232/C communication interface is implemented by a 8251 universal synchronous and asynchronous transmitter and receiver circuit connected to the 8080 system data and address bus.

Bit rate generation circuits providing line timing clock for 110 BPS 200 and 300 BPS and drivers and receivers are also included.

Several 8212 I/O ports are used to interface the operator panel, keyboard and all the available straps.

These circuits are physically located on the CPU BOARD.

9.4.2. RANDOM LOGICS

The signals to drive the DOE power circuits for the carriage and paper motors, print head, etc., are generated by the random logic located on the DRIVE board.

It consists mainly of

- paper and print delay counter to generate the correct timing for print head commands and paper motor signals
- carriage motor delay counter for timing of the carriage motions
- paper and carriage motor phases generation
- position sensor sampling to draw data for carriage motion speed control.

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9.5. FAULT PROTECTIONS

Provisions are made in order to protect the printer against faults. Protections include basically both analogic circuitry and firmware. A fault protection on both carriage and paper "enhancement mode" is activated when the transistors are in conduction and no commands are present. This is due to the fact the stepping motors and drivers can not stay indefinitely in this condition without damage.

The same protection is activated when hammer current limits are surpassed or the firmware stored into memory stops for any reason, so avoiding the device to stay in indefinite condition.

9.5.1. FIRMWARE FAULT PROTECTION

Fault routines allow to detect mainly :

- carriage motion faults and errors
- firmware out of sequence conditions.

9.5.1.1. CARRIAGE FAULT

Carriage fault can happen because of detecting an out of the allowed position range limits condition. In that case carriage is protected against possible mechanical damages by disabling the stepping motor phases so that carriage will get idle.

One additional protection is carried out by a firmware error counter able to detect motion command and no motion conditions due to unexpected obstacles to the carriage motion or to excessive oscillations on carriage stop.

Detection of these Faults cause ON LINE to STAND-BY state transition allowing to advise the operator about the anomalous conditions.

9.5.1.2. FIRMWARE FAULT

Firmware out of sequence conditions can be mainly due to uncorrect positioning of the straps at installation level or to faults which prevent the correct micro-processor program counter operation.

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Under out of control operations damages to power circuitry or mechanical parts like print head are possible.

Protection consists of special sequence exercised by the main firmware.

Where these sequences are not branched within a certain expected time the protection will be activated.

9.6. FAULT DIAGNOSYS

The local T & D system for serial printer is based on the following routines:

- Printing of a test pattern and/or carriage movement without print (standard)
- CPU board test (optional).

The standard routine is described at para 4.1.1.3

The purpose of the optional diagnostic routine is to test the CPU board only and display to symptoms automatically. It allows the complete comprehensiveness of the line circuitry after the connection of the line connector in turn around mode with a diagnostic connector and the branch of the diagnostic routine in line mode. The flow chart of the optional T&D is shown in fig. 9.6.1.1. and 9.6.1.2.

The EPROM's test is made by calculating the CRC. Each EPROM contains two bytes coded in such a way that the result of CRC is zero.

In the same way the RAM are tested after having written them with the contents of some EPROM's. The possible intermediate or Final symptom display are some combinations of three operator panel lamps in the following states: OFF, Blinking, ON.

The use of an additional half size board equipped with the diagnostic EPROM is needed. (AFF. D board).

For more detailed description refer to T&D EPS document A 78120079.

9.6.1. OPERABILITY

The jump to the T&D is allocated at the end of initialization.

The branch to these routine requires :

- . Power off starting state
- . Switching of the breaker AC and at the same time, pushing of the TEST button.
- . Connect the line connector with the diagnostic connector when the Serial Printer is in power off state if it is required the branch to line mode.

OPTIONAL FLOW ROUTINE T8D

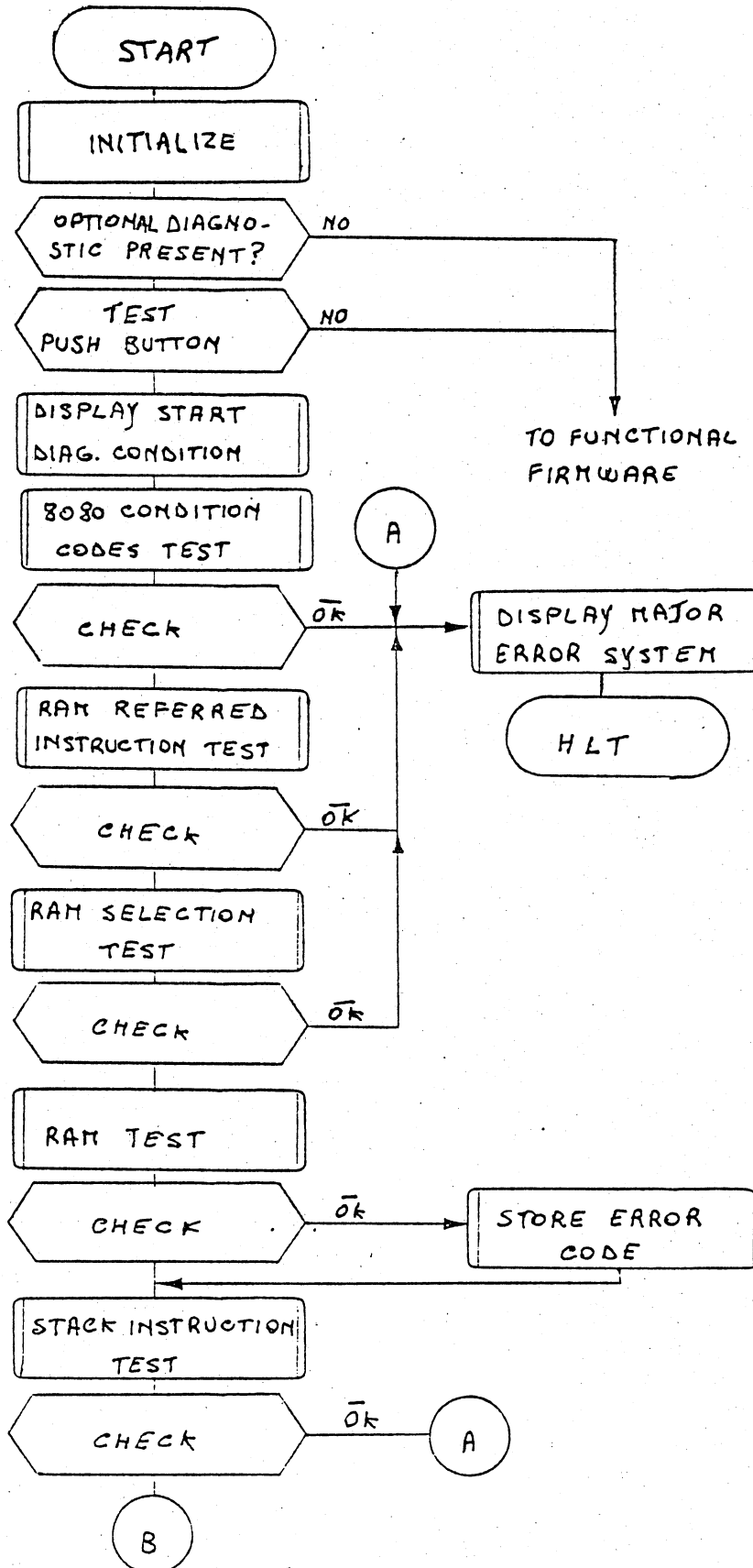


FIG. 9.6.1.1.

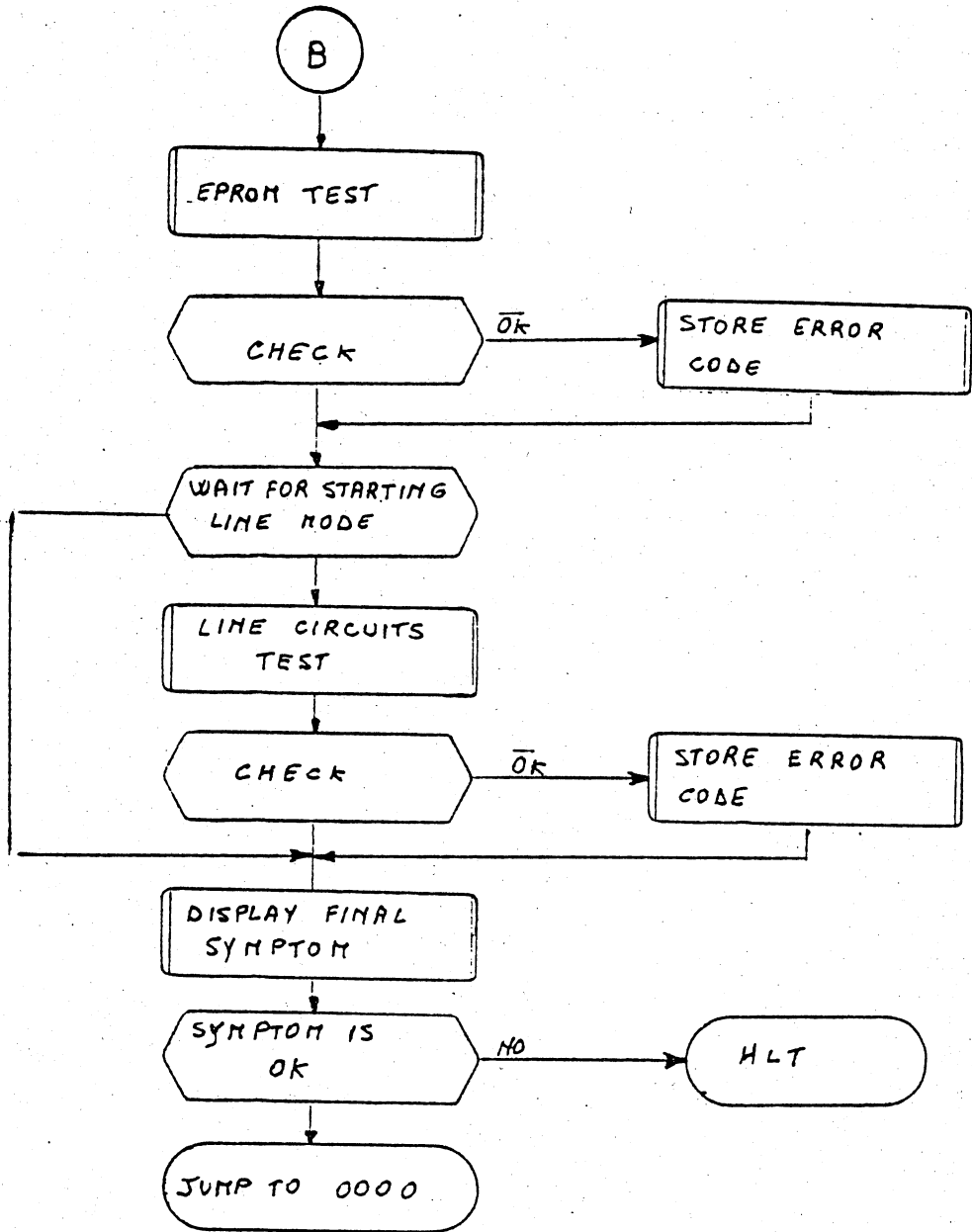


FIG. 9.6.1.2.

- END OF SECTION -

- END OF DOCUMENT -

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APPENDIX A

VERTICAL FORM MANAGEMENT USING OPTIONS

Synchronized Form Unit (SFU) and Vertical Form Unit (VFU) available
 - in case of NOT PRESENT SFU nor VFU a default value of page length (66 lines) is considered.

1. SFU

- provides the user of two couples switches giving
 - . form length (max 99 lines)
 - . one vertical tabulation

- note the SFU is supported by standard firmware.

- operation

setting values from SFU

- . when switch pairs are positioned on 0, the former value are maintained (and can be modified in other way)
- . when switches are positioned on a number $\neq 0$, the related values are set in the following moments :

- .. Power ON
- .. Stand By to Ready transition
- .. Stand By to Local transition

setting values from Software

- . values of SFU switches must be zero, otherwise the values introduced via Software are LOST on the next status transition.

setting values from Keyboard

- . same conditions as for software setting (reset is given by ESC 4).

2. VFU

- parameters : page length and up to 10 vertical tabs

- operation

- . at Power ON a default value of page length (66 lines) is introduced

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ced. During transitions the charged values are maintained.

setting parameters from VFU

- requires printer in LOCAL; modifications or re-setting of same values are possible only in LOCAL mode.

setting parameters from SOFTWARE or KEYBOARD

- no limitations.

3. Neither SFU nor VFU

- parameters : page length and up to 10 vertical tabs

- operation

- at Power ON a default value of page length (66 lines) is introduced. During transitions the charged values are maintained.

setting parameters from SOFTWARE or KEYBOARD

- no limitations.

4. Protections

When a VT larger than module dimensions is received the command is transformed in Form Feed.

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APPENDIX BPAGE LENGTH HANDLING BY KEYBOARD

The sequence to load the page length is :

- the device can be either in LOCAL or in ON LINE status.
- give the FF (form feed) command to reset the line counter.
- align the first line of fanfold paper under the print head.
- give the page length command (ESC 0 + X), the binary value of X character determines the number of lines according to the following table :

Number of lines	Key to press	Number of lines	Key to press
1	CTL + Key N° 3	36	SHIFT + KEY N° 4
6	" " " 35	37	" " " 5
7	" " " 36	38	" " " 6
8	" " " 37	39	" " " 7
9	" " " 24	40	" " " 8
10	Key N° 44	41	" " " 9
11	CTL + Key N° 39	42	" " " 42
12	" " " 40	43	" " " 41
13	Key N° 30	44	Key N° 54
14	CTL + Key N° 52	45	" " 11
15	" " " 25	46	" " 55
		47	" " 56
17	" " " 17	48	" " 10
18	" " " 20	49	" " 1
19	" " " 33	50	" " 2
20	" " " 21	51	" " 3
21	" " " 23	52	" " 4
26	" " " 47	53	" " 5
28	" " " 13	54	" " 6
29	" " " 43	55	" " 7
30	" " " 12	56	" " 8
31	" " " 29	57	" " 9
32	Key N° 60	58	" " 42
33	SHIFT + Key N° 1	59	" " 41
34	" " " 2	60	SHIFT + KEY N° 54
35	" " " 3	61	" " " 11

Honeywell Honeywell Information Systems Italia Loc. Pregnana Milanese Italia	SPEC. NO.	SHEET	REV
	A 78120758	53/F	AB

Number of lines	Key to press	Number of lines	Key to press
62	SHIFT + Key N° 55	101	Key N° 19
63	" " " 56	102	" " 35
64	" " " 27	103	" " 36
65	LOCK + Key N° 32	104	" " 37
66	" " " 54	105	" " 24
67	" " " 49	106	" " 38
68	" " " 34	107	" " 39
69	" " " 19	108	" " 40
70	" " " 35	109	" " 53
71	" " " 36	110	" " 52
72	" " " 3	111	" " 25
73	" " " 24	112	" " 26
74	" " " 38	113	" " 17
75	" " " 39	114	" " 20
76	" " " 40	115	" " 33
77	" " " 5	116	" " 21
78	" " " 52	117	" " 23
79	" " " 25	118	" " 50
80	" " " 26	119	" " 18
81	" " " 17	120	" " 48
82	" " " 20	121	" " 22
83	" " " 33	122	" " 47
84	" " " 21	123	" " 28
85	" " " 23	124	" " 13
86	" " " 50	125	" " 43
87	" " " 18	126	" " 12
88	" " " 48		
89	" " " 22		
90	" " " 47		
91	SHIFT + Key N° 28		
92	" " " 1		
93	" " " 4		
94	" " " 12		
95	Key N° 29		
96	" " 27		
97	" " 32		
98	" " 51		
99	" " 49		
100	" " 34		

