



Nascom Microcomputers

hardware manual

IMP

impact matrix printer  
for microcomputer  
systems

Serial No.  
9296

NM part number 103-300 issue 4 date 21.2.80

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Chesham, Bucks. HP5 3ED 024-05-75155 Hx 837571

## 1. INTRODUCTION

This manual instructs the user of the IMP printer in its setting up and operation. Information on maintenance and rectification of running problems is also provided.

It is essential that this manual be read in its entirety before the printer is commissioned.

It is strongly recommended that this manual be read in conjunction with the manual(s) for the computer system with which the printer is to be operated; particular attention should be paid to the correct connection of the serial data link and to the programming of the serial I/O devices of the host system.

## 2. CAUTIONS

**Caution:** the printer mechanism operates at high speed and may trap loose objects or fingers. No attempt at adjustment should be made while the printer is operating and care should be taken while examining the operation of the printer to avoid hair or loose jewellery being ingested by the mechanism.

**Caution:** the power supply unit is capable of maintaining 40V on the circuit board for a considerable time after the machine is switched off. This voltage is dangerous and may administer a harmful shock. If it is essential that the printer be serviced immediately after use, the main smoothing capacitor supported above the circuit board should be short-circuited with a 330R resistor. This method should not be used unless it is necessary as it will shorten the capacitor's life.

**Caution:** under no circumstances should the print head be touched while the printer is active; it becomes warm during operation, and any arrest of its motion may cause its motors to stall and overheat, resulting in damage.

## 3. SETTING UP

### 3.1 Mains connection

THE INSTRUCTIONS GIVEN IN THIS SECTION MUST BE FOLLOWED EXACTLY IF OPERATION OF THE PRINTER IS TO BE SAFE. UNDER NO CIRCUMSTANCES MAY THE PRINTER BE OPERATED WITHOUT AN EARTH CONNECTION; SUCH OPERATION COULD PRODUCE A SERIOUS SAFETY HAZARD.

The printer is supplied without a mains plug; the user may select the type of plug most suitable for the application. Any plug used must conform to British Standard. For domestic use in the U.K. the printer must be fitted with a 13A plug to British Standard 1363 fitted with a 2A fuse. For industrial use in connection with filter equipment the use of IEC connectors is permissible provided that the circuit is individually fused 2A or routed through a circuit breaker set at 2A.

13A plugs should be wired as follows:

GREEN/YELLOW	EARTH (top connection)
BROWN	LIVE (fused connection)
BLUE	NEUTRAL

Most plugs are supplied with a diagram showing the exact wiring method for that particular plug; if in any doubt at all consult a qualified electrician or the shop that sold the plug.

### 3.2 Paper selection

Two types of paper may be used; plain paper, either in sheets or rolls, with a maximum width of 8½ inches, or 'pinfeed' paper, whose edges are punched to engage with the tractor drive units, which may be bought in rolls or 'fanfold', which is a continuously folded stack of separable sheets. The maximum width of pinfeed paper is 8½ inches, of which 1 inch is occupied by the punched edges.

Most types of paper may be printed upon; the ideal is the thin, hard paper of the type used by line printers, though telex machine rolls are quite acceptable and may be supported by the printer. Letterheaded sheets may also be printed upon, though there is no means of feeding them automatically. It is recommended that the paper used should not exceed 0.013" (0.33mm); paper is more commonly specified by its density, which should not exceed 120 grams per square metre.

If the printer is required to support rolls of paper the two brackets supplied should be attached to the rear panel to support the paper roll spindle; the flanges by which the brackets are mounted face outwards from the roll area.

3.3 Paper setting

The printer may feed itself with paper either by tractor tension on the edges of pinfeed paper or by roller pressure on plain paper. The two should not be used simultaneously; if pressure feed is selected while pinfeed paper is in use the tractors will probably tear the paper.

Tractor/pressure selection is made by the two small levers located immediately behind the paper path on each side of the spring clip retaining the ribbon cartridge; the right-hand lever is provided with a locking device. The levers lift the pressure roller away from its drive bar; therefore, if pressure feed is NOT required the two levers should be pulled forwards and the locking device moved to the right to engage the right-hand lever. To return to pressure feed simply unlock these levers; the pressure roller will spring back audibly.

The two tractor units may be moved along their rails by locating the small lever that pivots on the uppermost rail, on the outside of each unit, and pulling it forwards and up through about 45 degrees; the tractor will then be unlocked and may slide along the rails. To lock the tractor return the lever to its original position.

When plain paper is in use the tractors should be set so that they do not interfere with the paper's motion. To load pinfeed paper the two ears on the inside of each tractor unit should be lifted to expose the tractor belts; the tractor units should then be moved so that the holes in the paper align as exactly as possible with the pins of the tractor belts; no horizontal force should exist as the paper will tear when fed unless it runs easily. The tractors should then be locked and the paper loaded.

3.4 Paper loading

Rolls of plain paper may be supported on the spindles provided, which rest in the brackets bolted to the rear of the printer. Unroll about 18" of paper and place the roll behind the printer. Lock up the pressure feed levers as if setting up for tractor feed. Push the paper gently into the large aperture at the rear of the printer; it will appear behind the transparent panel immediately below the print head. Continue to push and it will emerge from the mechanism. Pull about a foot through, make sure that the tractors are clear of the paper and that the paper is free to move. Put the spindle through the roll core and hang it on the brackets. Hold the roll and pull its ends; this will ensure that no kinks are present. Unlock the pressure roller. The printer is now loaded.

Pinfeed paper must be fed through the aperture in the base of the printer. Having set the tractor spacing, proceed as for plain paper until the paper emerges from the mechanism. Lift the ears of the tractor and engage the paper on the tractor belts. Lower the ears. It is not possible to run the paper through to align it but any error will be clearly obvious within seconds of commencing operation. If this occurs, switch off and reload or adjust as necessary.

3.5 Preferred operating conditions

- 1 Temperature: 10C to 25C
- 2 Humidity: 5% to 80% (non-condensing)
- 3 Support: adequate and level support should be provided for all four feet, if necessary with an aperture to allow fanfold paper to be fed from below the machine. Purpose-built printer tables with such an aperture are commercially available. The use of rollfed paper does not require the provision of such a facility. Operation of the printer on a hollow and resonant surface may double its noise output.
- 4 Precaution: nothing should be placed on top of the printer or in any position that would obstruct the paper path away from it. Care should be taken to ensure that paper is not allowed to re-enter the rollfed aperture and become caught in the feed rollers; damage could result from this occurrence.

3.6 Standard settings

The printer is set during manufacture as follows; it should be confirmed that these settings are acceptable to the host system before operation proceeds.

data transmission rate	300 baud
automatic linefeed	off
stop bits	two
parity	disabled (even)
word length	8 bits

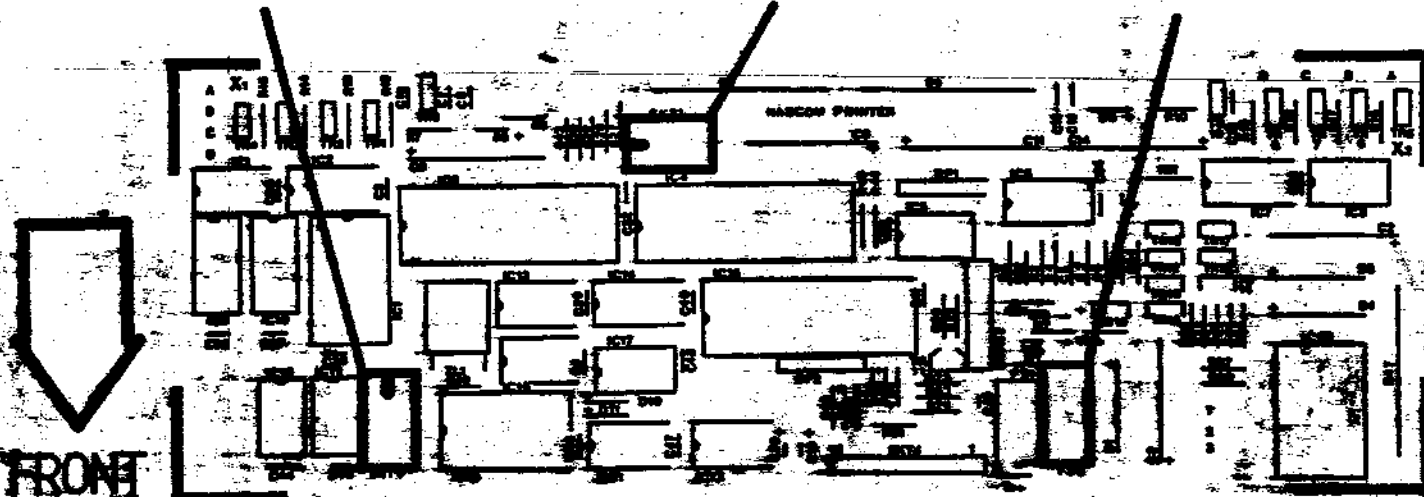
If any of these parameters requires change, please refer to Section 4.

# IMP P.C.B.: user serviceable parts

BAUD RATE socket

OPTIONS socket

HEAD FUSE



### 4.4 Baud rate selection

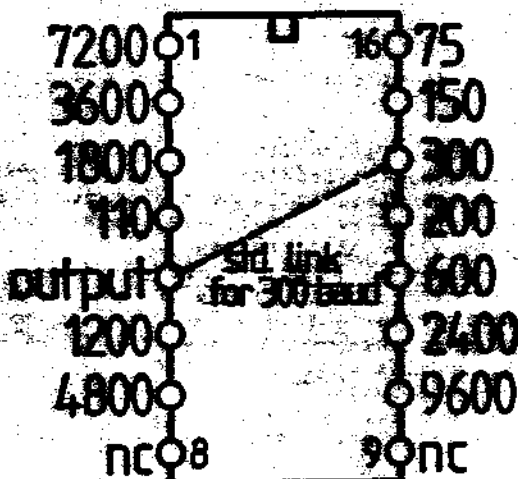
The data transmission rate at which the printer accepts instruction is measured in bits per second (baud); this is normally set at 300. Other rates are available and may be selected by the insertion of a suitable wired 16 pin header plug into the socket.

**N.B.:- BEFORE ANY ATTEMPT IS MADE AT MODIFICATION OF THIS OR OTHER SETTINGS THE SECTION OF THIS MANUAL DEALING WITH MAINTENANCE SHOULD BE READ.**

The socket is fed with all available baud rates and puts out one only to the control circuitry. This output is taken from pin 5; selection is therefore made by wiring one (only) of the other pins to pin 5. Rates available on the socket are as follows; it should be noted that each rate will require its own selection plug as it is not possible to wire a plug to select more than one rate;

pin	baud rate	pin	baud rate
1	7200	9	none
2	3600	10	9600
3	1800	11	2400
4	110	12	800
5	(output)	13	200
6	1200	14	300 (wired as std.)
7	4800	15	150
8	none	16	75

Note: header plugs are best inserted into a separate socket before wiring as this ensures that the pins do not lose their alignment as a result of the soldering temperature. It is not recommended that any form of switch be fitted to the plug.



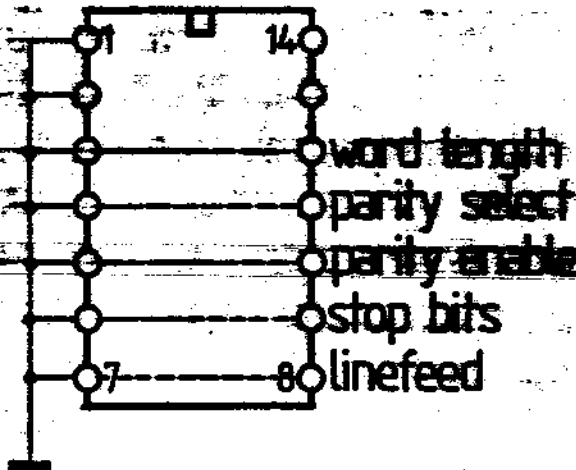
nc = no connection

#### 4.2 Control option selection

The printer may be set up to conform to most common data transmission protocols by the insertion of a suitably wired plug into socket SK71, having first switched off the printer and taken the appropriate precautions to avoid electric shock.

The plug has 14 pins, 7 of which are connected to ground (0V). The connection of otherwise of the remaining 7 pins affects all possible selections. It is therefore possible simply to wire across the plug to select a particular option. Available options are:

pins connected	result of connection	result of non-connection
7-8	a line feed will be performed for each carriage return, and each linefeed character input	linefeed will be performed only on receipt of a linefeed command
6-9	a single stop bit is set	two stop bits are set
5-10	parity is enabled	parity is disabled
4-11	parity set as odd	parity set as even
3-12	word length set as 7 bits	word length set as 8 bits
2-13	none	none
1-14	none	none



## 5 OPERATION

### 5.1 Control panel

The printer control panel is fitted with four controls and three indicators. The indicators are mounted in the control buttons, but are not in all cases related to the button in which they are mounted.

The top left-hand control is the power switch; pressing its lower half will switch the printer on.

The top right-hand control is the line feed button, which contains the power indicator. When lit yellow this indicates printer activity. The button will cause a single line feed every time it is pressed unless it is held down for more than 64ms (just over half a second); if held, it will cause a continuous paper feed that will stop at the next line that becomes available after it is released.

The bottom left-hand control is the online button, containing the online indicator. When pressed, this button will lock down until pressed again. When the button has been pressed the printer is connected to the host system and may receive data. This condition is indicated by the illumination of the button in green. When the printer is offline its host system will be informed by the setting of the BUSY output signal, which, if the host system is able to accept it, will cause data transmission to cease.

The bottom right-hand control is the reset button, containing the error indicator. Should an error in data transmission occur, it will be detected and will cause the

5

print buffer to be loaded with a 'reboot' character ( § ). The error indicator will simultaneously be illuminated in red to inform the operator that such an error has occurred. The ~~ERR~~ mark on the paper enabling the exact location of the error to be determined. The ERROR light will also indicate a buffer overflow; in this condition incoming characters will be ignored until buffer space becomes available. The error indicator may be cancelled only by operation of the reset button, which will also erase the contents of the data buffer. The reset button should therefore not be operated until the printer has emptied the buffer and is at rest. It may, however, be used to curtail the printing of unwanted material.

Note that the operation of the linefeed button is not restricted to times at which the printer is at rest; it may be pressed during the printing of a line, whereupon it will be recognised at the end of the line and the next line will be printed after a line feed has been performed. If held during printing it will cause the machine to complete its line then feed paper until the button is released, whereupon it will resume printing on the next available line.

### 5.2 Automatic selection of unidirectional operation

As a safety feature the printer will, if called upon to print lines containing more than 40 characters (not including spaces), commence printing in one direction only until such requirement ceases to be met, whereupon bidirectional printing will immediately be resumed.

## 6 MAINTENANCE

**WARNING: BEFORE REMOVING THE PRINTER'S COVER THE MAINS PLUG MUST BE DISCONNECTED FROM ITS SOCKET. NO REPAIRMENT OR MODIFICATION MUST BE MADE TO AN ACTIVE MACHINE.**

### 6.1 Access to internal components

A 3/16" Allen key will be required. To access the main board, remove the top cover to the chassis. With a small standard screwdriver remove the single screw retaining the small metal housing over the base of each tractor roll mount, allowing the housings to be removed. Release the left-hand side of the cover first by gently lifting it by about an inch to clear the mechanism, then move it to the right to release the right-hand side. Swing the right-hand side of the cover so that the cover rests upside down to the left of the chassis. The cables connecting the control panel to the chassis should be observed to ensure that they are not under tension. Keep all fittings, screws and other parts removed in a safe place. If a screw is lost do not replace it with a larger one.

### 6.2 Fuse replacement

The printer is fitted with a mains fuse which is located on the rear panel immediately above the mains cable entry point. The fuse holder unscrews to permit replacement of the fuse, which is a 750 milliamp 20mm type. Repeated and frequent failure of this fuse is normally indicative of the existence of an electrical or electronic fault.

A fuse has also been fitted in the circuit operating the print head. In the case of head overload this fuse will rupture. It is located on the circuit board to the right of the print head plug; it is marked F32 (see Fig. 1). In the unlikely event of this fuse's failure replace it with a 3 amp 20mm anti-surge type. Repeated and frequent failure of this fuse will indicate a fault in the head or its driver devices and should be reported to Mascom Microcomputers Ltd.

### 6.3 Ribbon replacement

Ribbon replacement does not require the removal of the cover, though the printer must be switched off. Remove the paper. Unlock the tractors and move them to the ends of their rails. If the printer is being fed from a roll, remove the roll and the spindles.

At the centre of the ribbon cartridge, between the two pressure roller levers, there is a spring clip retaining the ribbon cartridge. Pull the clip forwards and lift the cartridge up and backwards, noting the position of the channel in which the ribbon runs. Wind loose ribbon into the cartridge by turning the small white knob anti-clockwise. Fit a new cartridge by allowing the ribbon into its channel and turning the white knob until the cartridge drops into place against the force of the spring clip. Press the

clip into position, lifting it slightly if necessary; (4). Wind the white knob until the ribbon is under normal tension. If the ribbon will not move, or the cartridge fails to assume the correct position, remove the cartridge and start again. Like most things designed to be easy it is - after the first attempt. Do not attempt to refill a used cartridge and do not re-use old cartridges. Under no circumstances attempt to load the printer with anything except the Two-Day Corporation ribbon cartridges available from Masrow Microcomputers distributors, typewriter cartridges or ribbons will NOT do.

(1) Note that the right-hand side of the cartridge is slightly higher than the left-hand side. This is to ensure that the print head traverses the ribbon at an angle, maximising its usage.

5.4 Lubrication

It is unlikely that the printer will require replacement of its lubricant, however juddering or stalling of the print head normally indicates such requirement. The formation of condensation on the mechanism may aggravate this condition.

Two types of lubricant are needed; IBM GREASE N2, 22 or its equivalent, which may be purchased from typewriter shops and those dealing with IBM office equipment generally, and Singer sewing machine oil, which is normally kept by sewing machine shops.

Grease should be applied very sparingly to the gear trains and their bearings. Care should be taken to avoid contaminating the nylon drive belts with the grease and to avoid unnecessary skin contact as the grease may cause irritation.

Oil should be applied sparingly to the print head and the rollers cylindrical and one which the print head rolls on to no other part. The cross edge of the roller in front of the helical cam which the print head is supported, may be lightly greased if necessary.

5.5 Limit switch adjustment

Serious misalignment of consecutive lines may be due to the limit switches, which are located at each end of the helical cam driving the print head. Each is secured with two screws. The right-hand switch should be adjusted first. The purpose of the adjustment is to ensure that the switch signals the circuitry at the moment at which the head starts and traverses. Switches should never be moved by more than a millimeter at a time; smaller adjustments are normally sufficient. After each adjustment ensure that the lever actuator at top of the switch just touches the chassis above it and is unobstructed. Test the printer after each adjustment and switch off IMMEDIATELY if the machine cannot print normally. The limit switches are set during manufacture and it is most unlikely that any adjustment will become necessary except as the result of pronounced wear of the helical cam.

Appendix 2.3

ASCII character set

Note the substitution for the hash-mark of a f sign (character 35).  
The character set is otherwise to ASCII specification.

LIST

```

10 FOR A=32 TO 127
20 PRINT A, CHR$(A)
30 NEXT

```

Ok

RUN

32	
33	!
34	"
35	#
36	\$
37	%
38	&
39	'
40	(
41	)
42	*
43	+
44	,
45	-
46	.
47	/
48	0
49	1
50	2
51	3
52	4
53	5
54	6
55	7
56	8
57	9
58	:
59	;
60	<
61	=
62	>
63	?
64	@
65	A
66	B
67	C
68	D
69	E
70	F
71	G
72	H
73	I
74	J
75	K
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Ok

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Q  
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Appendix 7.4

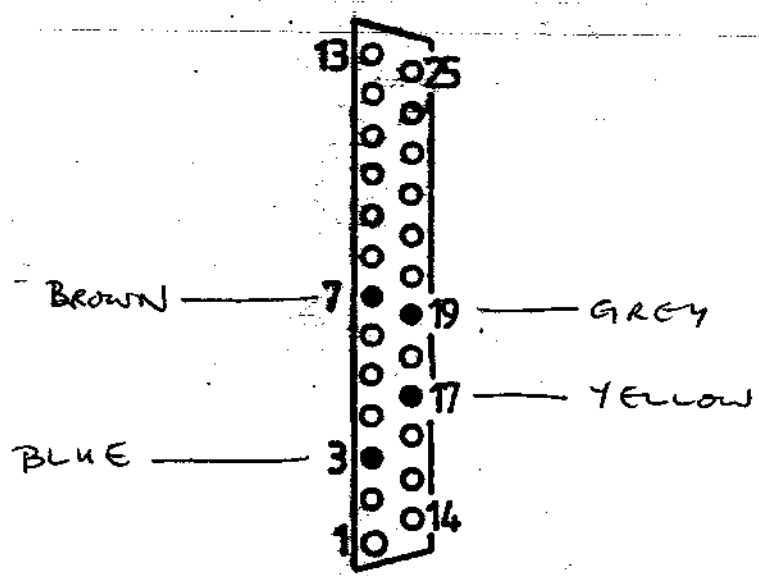
Connection to NASCOM-1

1. Connect the printer clock signal from pin 17 of the DB25 connector to the older post P1, marked EXT SERIAL CLOCK.

2. Connect the BUSY signal from pin 19 of the DB25 connector to pin 8 of the keyboard socket SK1.

3. Connect RS232 ground from pin 7 of the DB25 connector to pin 8 of the serial data socket SK2, not to power supply ground.

4. Connect the RS232 input from pin 14 of the DB25 connector to pin 2 of the DB25 connector.



Appendix 7.5

Connection to NASCOM-2

1. Set LSW2/2 and /3 UP and the remaining switches as is appropriate. The NASCOM-2 will now run at the baud rate selected on the printer. Operation at over 300 baud will require the use of handshaking logic; to set this up connect pin 8 of PL2 to TP3 on the NASCOM-2 board.

2. Wire the serial interface cable supplied with NASCOM-2 as follows:

- core 4: yellow                    DM25P pin 17
- core 8: grey                     "     "     19
- core 6: blue                    "     "     3
- core 11: brown                 "     "     7

Note that yellow, blue and brown wires appear elsewhere in the ribbon; cores should be counted if there is any doubt in identification.

3. If the system appears to be unusually sensitive to noise a 0.1uF capacitor may be connected between TP3 and ground.

4. Note that the BSY signal is active low.

Appendix 7.5

RS232 connections and signal levels

DB25 connector pin	connection	signal level
--------------------	------------	--------------

7 (RS232 ground)	to system ground OR RS232 ground if provided; NOT to -5v or -12v rails present in certain systems	none
------------------	---	------

3 (RS232 input)	to RS232 output of host system, normally pin 2 of the output connector	TL; TL levels are satisfactory
-----------------	--	--------------------------------

17 (clock output)	to 6402 type UART accepting external clocking at 16x baud rate; this output is pulled up to 5v internally	TL
-------------------	---	----

19 (BUFFER FULL)	to RS232 BUSY input	TL active low
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Appendix 7.8

Software interface for NAS-SYS 1

Z8AP Z80 Assembler - Source Listing

```

0030 ; *****
0040 ; *
0050 ; * Program to run the IMP printer *
0060 ; * with full handshake. *
0070 ; * for NAS-SYS *
0080 ; *
0090 ; *****

```

```

0130 ; Execute the program at 0000. This
0140 ; sets up the $UDUT jump, so that whenever
0150 ; the "U" command is activated output will
0160 ; go to the printer, using the handshake
0170 ; facility.

```

```

0190 ; This program assumes that the BUSY
0200 ; line from the IMP is connected to BIT
0210 ; 17 of the keyboard input port (PORT B).

```

```

0C80 0C77 0280 $UDUT EQU 00C77
0C80 006E 0290 XOUT EQU 00E
0C80 005B 0300 MRET EQU 05B
0310 ;
0320 ;
0C80 2180C 0330 LD HL,OUTPUT ;ADDR OF OUTPUT ROUTINE
0C83 22780C 0340 LD ($UDUT+1),HL ;CHANGE $UDUT
0C86 DF5B 0350 SCAL MRET ;RETURN TO MONITOR
0360 ;
0370 ;
0380 ;
0C88 F5 0390 OUTPUT PUSH AF ;SAVE CHAR
0C89 DB00 0400 OUT1 IN A,(B) ;BUSY ?
0C8B E680 0410 AND 80
0C8D 28FA 0420 JR Z,OUT1 ;YES - WAIT TILL NOT BUSY
0C8F F1 0430 POP AF ;GET CHAR BACK
0C90 DF6E 0440 SCAL XOUT ;OUTPUT CHAR
0C92 C9 0450 RET

```

Z8AP Z80 Assembler - Symbol Table

```

0C77H 0280 $UDUT 005BH 0300 MRET
0C89H 0400 OUT1 0C88H 0390 OUTPUT
006EH 0290 XOUT

```

# ERRATA

document

IMP printer manual

issue

4

date

21:3:80

NM number

103-300

page 20: the diagram of the DB25S connector is shown laterally inverted; to illustrate the socket correctly the diagram should be viewed as its mirror image OR regarded as the aspect from the inside of the printer's case.

it is advisable to make the above corrections to your copy now and to keep this sheet.