INSTRUCTION MANUAL
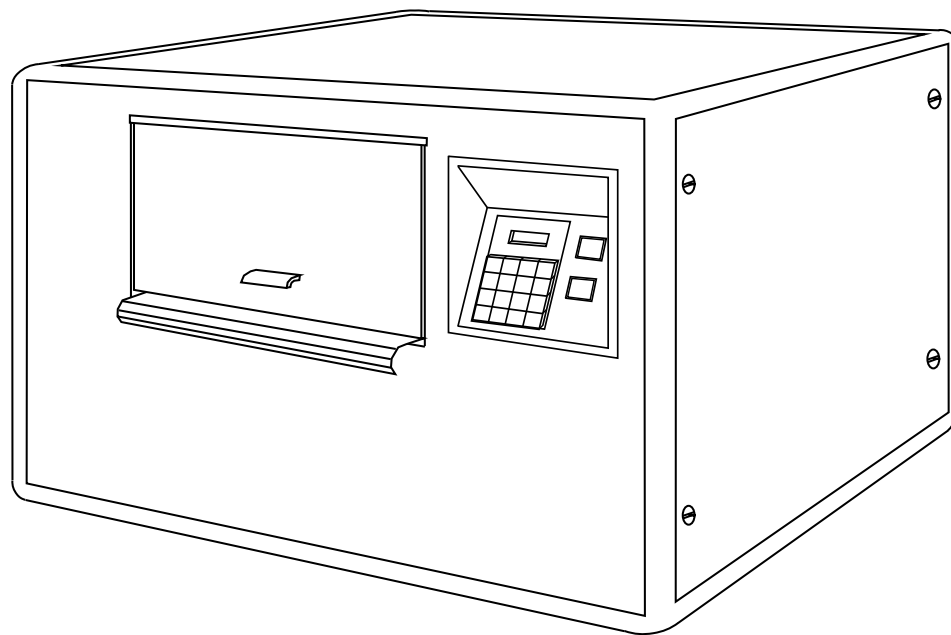

BRAILLO 200

BRAILLO ● NORWAY

FOR BETTER BRAILLE - AND MORE

TABLE OF CONTENTS

1.   INSTALLATION

1.1   Requirements of Installation Site

Table:
The Printer should be placed on a sturdy table. Note: this printer weighs 145 Kg.

Space:
The space requirement for the Braillo 200 is approximately 1.25m x 1.5m (4 x 5 feet).

Distance to the computer:
Serial communication: Up to 25 metres (cable distance) from the computer without special transmission precautions.
Parallel communication: Up to 7 metres (cable distance) from the computer without special transmission precautions.

Environment:
Braillo Printers are made to operate continuously and to be reliable for many years. However, sensitive electronic and mechanical parts require a suitable installation environment to ensure long and trouble-free operation.

Failure to meet the installation requirements may relieve the supplier of any warranty responsibilities.

The Printer requires normal office environmental conditions: Temperatures between 15 - 30°C (60 - 86°F), and relative humidity between 40 and 60%.

Maintain a clean environment because dust may clog the Printer - especially with high humidity. Too low humidity should also be avoided to prevent electrostatic problems.

Some paper qualities may generate excessive paper dust. This should be removed with a vacuum cleaner and a damp cloth. (About every 50,000 Sheets).

Be sure to consult your distributor/supplier for further details concerning the installation site.

1.2   Unpacking

Unpacking and installation can be done by the user.
After unpacking the Printer, the cover must be removed before lifting the Printer. See chapter 1.3 "Removal of Cover".
Any kind of lifting of the Printer must always be done from the baseboard at the bottom of the printer, and with extreme care.

Make sure that your Braillo 200 has not been damaged in transport. Check if the packing is damaged; If so, it is possible that the Printer has also been damaged or scratched. If any damages are found, please contact your distributor or Braillo Norway AS immediately.

Also check that the Printer is accompanied with the following items:

1	Power cable for the Printer
2	Data cables (serial and parallel)
1	Serial adapter (9-25 pin)
1	A small stack of paper
1	Instruction manual
1	Toolkit for service and maintenance
1	Test and packing list

If any of these items are missing, please contact your distributor or Braillo Norway AS.

Important !

It is very important that the Printer's specified voltage value corresponds with the local main power supply available.

If the plug on the mains power cable is to be replaced, note that the yellow/green wire is the ground (earth) wire.

Please read this manual carefully before starting the Printer!

1.3   Removal of Cover

See figures on the next page.

The side-panel (A) is removed by turning the four screws (B) 1/4 of a revolution - use a coin or a screwdriver. Pull out the side-panel. Place it aside.

Disconnect the cables for the Operating Panel (C) (at the operating panel end), On/Off Switch (D) and the Fan (E) (at the electric unit end).

The cover can now be carefully removed by lifting it upwards.

The Printer can now be moved to the desired location. Afterwards, replace the cover (in reverse order of above) and reconnect (C), (D) and (E).

Connect now the power and the data communication cable like described in chapter 1.4 "Interfacing to Computer".
The side-panel (A) is mounted by placing the lower edge in first, and then pushing it against the cover. Make sure that the slot on each screw's head is vertical and that the screws are aligned with the holes, then just push the screws in until a "click" is heard. Now the side-panel is secured.

Removal of Cover, Figures
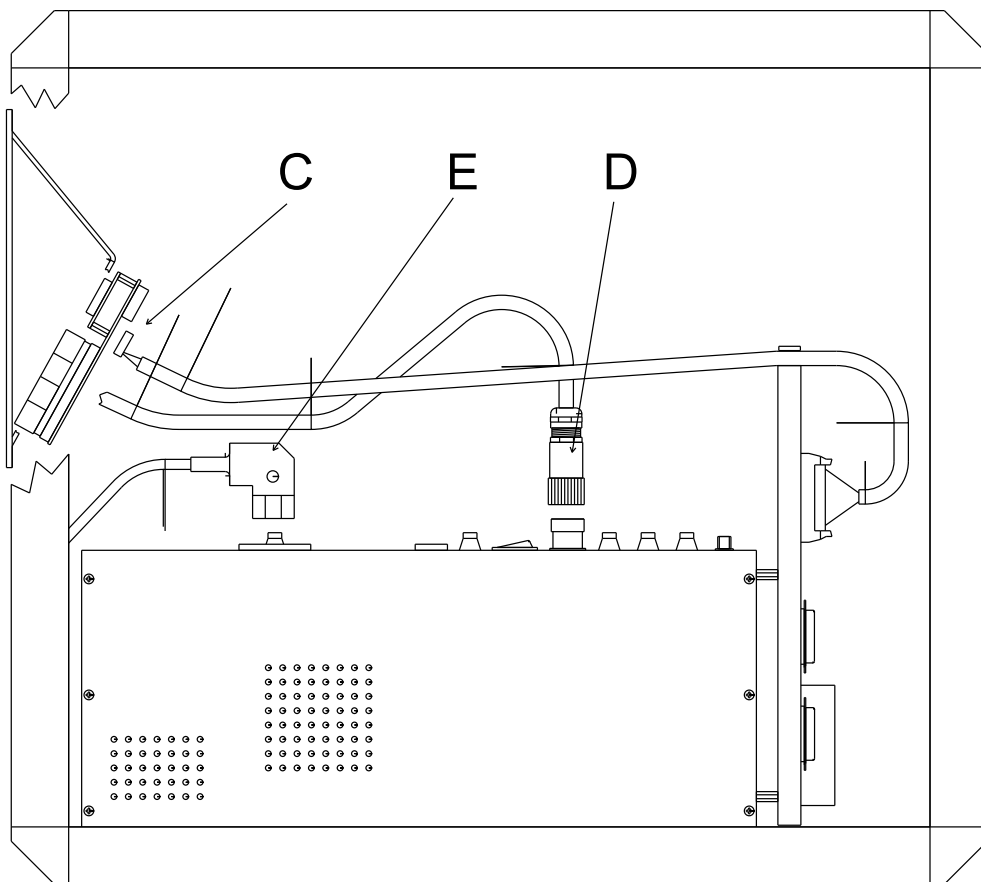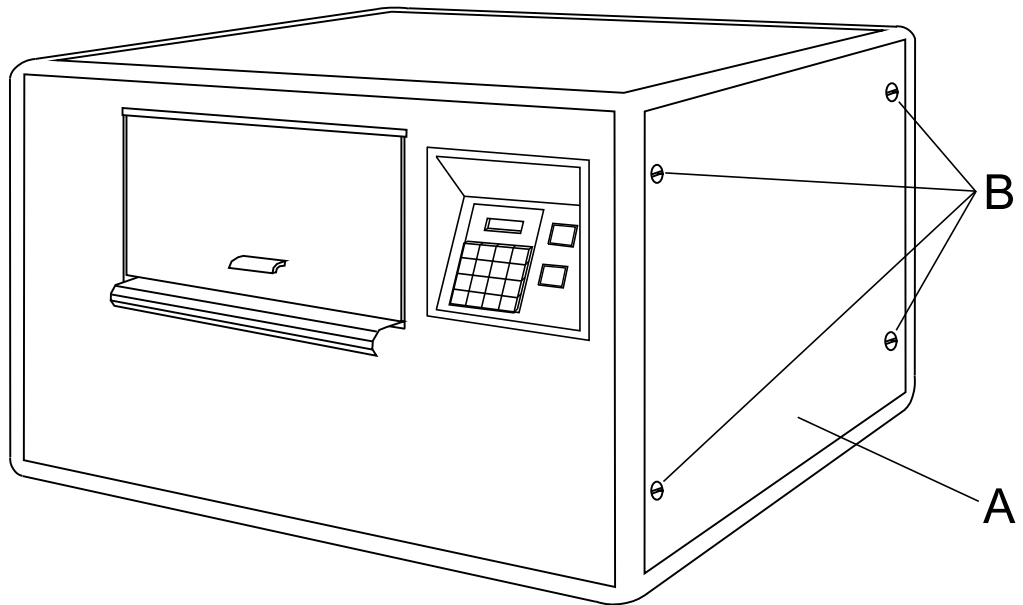
1.4   Interfacing to Computer

Data can be transmitted from the computer to the Printer in two ways, either via the serial or the parallel port. Serial transmission goes through an RS 232 C interface. Parallel transmission uses a Centronics compatible interface.
Both connectors are of the 25 pin D-sub types, and are electrically isolated from the computer.

Serial communication:
Connect the enclosed cable, ensure that the computer and the Printer have exactly the same transmission settings. If not, they can be changed either on the computer or the Printer. Braillo Norway recommends a baud rate of 9600 Baud for quick and reliable communication.

When the Printer is delivered from Braillo Norway, the serial port has the following transmission settings:

Baud rate: 9600
Parity: NO
Data bit: 8
Stop bit: 1

To change these settings on the Printer, see chapter 2.1 "Operating Panel". To make changes on your computer, consult the user manual.
If changes in the transmission settings are to be done on the computer, we recommend that these changes are added in the start-up file, e.g. AUTOEXEC.BAT, so that they occur automatically with each startup. The command for this might be: MODE COM1:96,N,8,1,P.

Parallel communication:
Connect the enclosed cable, ensure that the Printer is set for parallel communication, and start printing.

The Printer recognizes the following control codes:
CR: New line (fills the rest of the line with space).
LF: New line (fills the rest of the line with space).
If both CR and LF, in any order, immediately follow each other, only one new line command is executed by the Printer.
FF: New page (fills the rest of the page with space).
(After 2 x FF the paper is fed one sheet forward, filling the rest of the page plus the next page with blank space).

If the lines are not terminated with CR or LF, the text which follows will be printed on the same line, until the line length set in the Printer is filled. Remaining characters will be wrapped to the next line. The same situation will occur if FF is missing in the text, the text which follows will appear on the same page, because there is no internal text formatting.
The Printer can also be controlled by ESC-sequences to change its settings and modes. Please see chapter 2.7 "Escape-sequences".

> Note! If text of less than two pages, or text with an odd number of pages, is received without being followed by FF on the last page, the Printer will wait for more text or FF. This is due to the double-sided operation of the printer. It waits for a signal that its buffer contains a full two page print job before it begins printing.

To have one sheet (two pages) printed, one of the following sequences must be executed:

Double-sided printing:
A)   Two pages full of text.
B)   More than one page of text and one FF.
C)   Less than one page of text and two FF.
D)   Two FF-commands.
E)   Less than one/two pages and depress Dump Buffer.

Single-sided printing:
A)   One page full of text.
B)   Less than one page of text and one FF.
C)   Less than one page of text and depress Dump Buffer.

Note! When using more than one FF command, make sure to have a space between them to keep them separated. E.g. FF FF FF.

Connecting the Printer to the Mains and Computer.

See the figure below.
Connect the enclosed mains power cable to the inlet (C). If the plug on the mains power cable is to be replaced, observe that the yellow/green wire is the ground (earth) wire.
With parallel communication, use connector (P). With serial communication, use connector (Q).

A: Fan Outlet
B: Fan Fuse 3.15 AT
C: Mains Inlet
D: Main Fuses 10 AT
E: Main Switch
F: Hour Counter
G: On/Off Switch Connector
H: Fuse, Magnetrack C 3.15 AT
I: Fuse, Magnetrack A 3.15 AT

J: Fuse, Magnetrack D 3.15 AT
K: Fuse, Magnetrack B 3.15 AT
L: Relay Fuse 1.25 AF
M: Motherboard Fuse 2.5 AF
N: External Connector
O: Motherboard
P: Parallel port
Q: Serial port

2.   OPERATING

2.1   Operating Panel
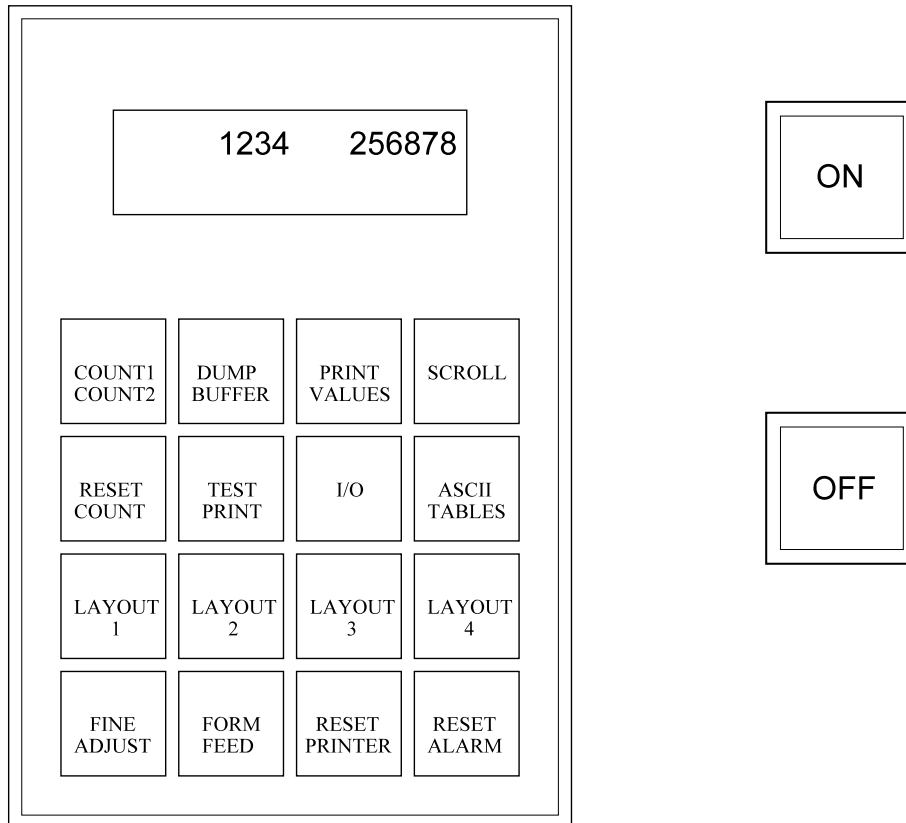
The green switch marked "ON" will turn the printer on, and the red switch marked "OFF" will turn the printer off.

There is an audio alarm which sounds if a problem has occurred, and the display will show what has happened.

There are three sheet counters. The one at the right-hand side of the display shows the total number of printed sheets and cannot be reset.

The remaining two counters - Count1 and Count2, are displayed one-at-a-time on the left-hand side of the display and can be reset.

Description of Functions of Operating Panel

COUNT1 / COUNT2
Selects between sheet counter (not pages!) 1 and 2. When this button is in the outer (released) position, counter 1 is displayed on the left-hand side of the display, and when the button is in (depressed), counter 2 is displayed.

DUMP BUFFER
During normal double sided printing, a volume of text of less than two pages will not be printed. This is because the Printer is waiting for a full two page print job. By pushing DUMP BUFFER, the text remaining in the buffer will be printed. See chapter 1.4, "Interfacing to Computer".

PRINT VALUES
Prints the current values of the LAYOUT, I/O and ASCII-TABLES.
See chapter 2.3, "Print Values".

SCROLL
Scrolls through the menus activated by:
I/O, ASCII-TABLES, LAYOUT 1, LAYOUT 2, LAYOUT 3 or LAYOUT 4 buttons.

RESET COUNT
Resets the sheet counter selected by COUNT1/COUNT2.

TEST PRINT
This button has two functions: Test Print and Ready/Continue.

Test Print:
1st push down:
>   Prints a X-pattern on both sides of the sheet which shows each pin from each magnet rack printing on a separate line. Useful when searching for missing dots.

2nd push down:
>   Prints full cells and empty lines, together with the ASCII-table on both sides of the sheet. Useful for testing the printing pressure adjustments, and to see how the paper tolerates tightly grouped dots.

3rd push down:
>   Prints full cells and empty lines, together with the ASCII-table single-sided. Useful for testing the printing pressure adjustments.

4th push down:
>   Prints a test pattern made of dot 1,3,5 and 2,4,6, single-sided. Useful when searching for extra dots.

5th push down:
>   As 1st push down etc.

Ready/Continue:
>   When the Printer runs out of paper, the message PAPER OUT is shown on the display. Insert new paper, and push TEST PRINT in and out, and the printer will continue printing the last print job.

>   Do not use RESET PRINTER as this will clear the print job from the Printer's memory!

I/O - Input/Output
Selects between serial and parallel port, and sets the data transmission values for the serial port.

1st push down: Displays which port is active.
To select serial or parallel port, the button must be depressed and then released. Now, while the display still shows the active port, press SCROLL to select the other port.

If the serial port is active, a 2nd push down will make it possible to use SCROLL to adjust the settings for the serial port.

ASCII-TABLES
This button has two functions:
It selects which 6 and 8 dot ASCII-table to be active for braille conversion and it displays the 6 and 8 dot ASCII-tables currently active.
1st push down:
    Displays the active ASCII-table, number and country for the 6 dot mode.
2nd push down:
    Displays the active ASCII-table, number and country for the 8 dot mode.

Note! This button will not change between the 6 and 8 dot print mode, it just displays which ASCII-tables that will be used in these modes.

To select from the 8 resident ASCII-tables in the Printer, the following procedure should be used:

Push the ASCII-tables button, release it, then push it once again and hold. Now it is possible to change the active ASCII-tables with the SCROLL button. ASCII-table pair number one will be displayed first. (If there has been a pair of ASCII-tables loaded from the computer, these will be displayed first). If SCROLL is released, and pressed again, ASCII-table pair no. two will be displayed. This continues until pair no. eight is reached, whereafter it will start at pair number one again.

Note! Scrolling trough the resident ASCII-tables will clear any user table that has been downloaded from the computer. If this table is to be activated again, it must be reloaded from the computer.

LAYOUT 1
Selects sheet length, line length or Single/Double -sided printing.
Use SCROLL to choose each setting.

LAYOUT 2
Selects normal or Z-fold printing, if page 1 is to be up or down, and to choose between 6 and 8 dot braille.
Use SCROLL to choose new settings.

LAYOUT 3
Selects the line spacing.
The line spacing is adjustable in steps from 0 to 16. In millimetres this will be from 0 to 5.08 mm. (One step equals 0.3175 mm). The setting 16 is the standard line spacing, 5.08 mm (0.2"). 8 is the setting for graphic, 2.54 mm (0.1"), and so on.

The function "Single or Double line spacing" will double the given line spacing. If, e.g. the current line spacing is 13 steps (4.1275 mm), selecting Double line spacing will increase it to 26 steps (8.255 mm). Use SCROLL to choose new settings.

LAYOUT 4
Selects Page Adjust and Page Margin.

Note! Please keep in mind that there is a difference in the terms "page length" and "sheet length". By page length we mean the number of lines of text to be printed on a page, and by sheet length we mean the physical size of a sheet of paper in inches.
The number of lines which can be printed on a page, is dependent on whether 6 or 8 dot braille is used, the selected line spacing, and the page length settings.

The "Page Adjust" can have one of the following values:

NoFFed: No form feed. This setting will cause the printer to print continuously. There are no pagebreaks, and it is possible to print an "infinity long sheet".

Max: Maximum. This is the standard setting, and will give a maximum number of lines per page. How many lines that will fit on a page will depend on, e.g. the sheet length, if it's 6 or 8 dot braille, the line spacing, and margins.

Max-1 to -9: Maximum, -1 to -9. This setting will decrease the number of lines on each page with 1 to 9, (depending on the selected number). If, e.g. the maximum number of lines would be 29, and the setting "Max-4" is selected, the resulting number of lines will be 25.
              This function will centre the text vertically on the page, to keep the top and bottom margin approx. equal.

The "Page Margin" function will adjust the page margin in steps from 0 to 20. The standard setting is 8, (8 = normal). The page margin will give different effect when used on single-sided, compared with double-sided. On double-sided printing, one step is equal to 0.6350 mm, and the text will be centred vertically on the page. If, e.g. a page margin on 6 steps is selected, the printer will print closer to the edges of the paper, and if a page margin on 20 steps is selected, it will give a larger page margin. This will affect both top and bottom margins, i.e. page margin.
On single-sided printing, however, the page margin will actually work as a top margin. (Note! The page lay out must be set to normal to be able to do the following). One step is equal to 0.6350 mm. It will "push" the text downwards the sheet. When the text reaches the bottom, (meaning that there will not be enough space on this page for the last line), this line will wrap over to the next page.
Use SCROLL to choose new settings.

FINE ADJUST
Positions the paper.
Each push down moves the paper a distance equal to 0.5".

FORM FEED
Advances the paper to the next sheet.

RESET PRINTER
Resets the CPU unit and clears the buffer.
Must always be used if an error occurs (Printer Error in the display).

RESET ALARM
For alarms, the audio alarm can be reset (e.g. Printer Alarm, Out of Paper).
For errors (Printer Error in the display), however, the RESET PRINTER must be used.

Using the Menu Buttons

With help of the menu buttons (LAYOUT 1, LAYOUT 2, LAYOUT 3 and LAYOUT 4) the current values can be changed.

The first push of a menu button shows which setting is currently active - its current value.
If these settings are correct, wait a few seconds for the timeout to expire, or press the RESET PRINTER button and the setting will remain.

If you would like to change one of the settings, push the button several times, until the desired function is shown on the display, then hold it down. By using SCROLL, the complete menu for the function can be reviewed in the display. When the correct value is shown, release the button and either wait for the timeout, or use RESET PRINTER.

The I/O and ASCII-table buttons differ slightly from this routine. Please see their button descriptions previously in this chapter.

Note! The Current Values are saved in the battery-backup memory, and they will remain even if the power is turned off.

2.2   Current Values and Options

```
┌─────────────────────────┐
│ Parallel Interf.        │
├─────────────────────────┤

┌─────────────────────────┐
│ Serial RS 232 C:        │
│ 9600 NP 8DB 1SB         │
└─────────────────────────┘
```

Baudrate =   150
                300
                600
                1200
                2400
                4800
                9600
                19200

Parity =   **No**
                Odd
                Even

Data Bit =   **8**
                7

Stop Bit =   **1**
                2

```
┌───────────────────┐
│  1234    256878   │
└───────────────────┘

 COUNT1  DUMP    PRINT   SCROLL
 COUNT2  BUFFER  VALUES

 RESET   TEST    I/O     ASCII
 COUNT   PRINT           TABLES

 LAYOUT  LAYOUT  LAYOUT  LAYOUT
   1       2       3       4

 FINE    FORM    RESET   RESET
 ADJUST  FEED    PRINTER ALARM
```

```
┌─────────────────────────┐
│ 1 Denmark               │
│ 6 dot 045.00            │
└─────────────────────────┘
```

1 Denmark
   6 dot 045.00
   8 dot 045.00
2 England
   6 dot 044.00
   8 dot 044.00
3 Germany
   6 dot 049.03
   8 dot 049.03
4 Germany
   6 dot 049.04
   8 dot 049.04
5 Iceland
   6 dot 354.00
   8 dot 354.00
6 Italy
   6 dot 039.02
   8 dot 039.02
7 Norway
   6 dot 047.03
   8 dot 047.03
8 Sweden
   6 dot 046.01
   8 dot 046.01

```
┌─────────────────────────┐
│ Sheet Line Print        │
│  12    42 Double        │
└─────────────────────────┘
```

SheetLength = 4-14"

LineLength = 10-42

Print =   Single
            Double

```
┌─────────────────────────┐
│ Layout Page1 Dot        │
│ Normal   Up    6        │
└─────────────────────────┘
```

Layout = **Normal**
          Z-fold

Page 1 = **Up**
          Down

Dot =   **6**
            8

```
┌─────────────────────────┐
│ LineSpac LineSiDo       │
│ Normal    Double        │
└─────────────────────────┘
```

LineSpac = **Normal**
            0 - 16

LineSiDo = **Single**
            Double

```
┌─────────────────────────┐
│ PageAdj PageM           │
│ Max      Normal         │
└─────────────────────────┘
```

PageAdj = **Max**
           Max-1 to 9
           NoFFed

PageMar = **Normal**
           0 - 20
       (16 = Normal)

2.3   Print Values

This function gives a printout of the settings which are currently active in the Printer; It also gives information about the 8 ASCII-tables in the Printer.

When Print Values is used, the Line Length setting must be at least 36 characters. If not, this message will appear in the display:

> NB! Line Length
> Minimum 36 Char.

To be able to print the current values, change the line length to min. 36 characters.

Print Values might look like this:

```
 BRAILLO NORWAY
 VERSION 000.19 D
 CURRENT VALUES

COMMUNICATION           = SERIAL
BAUD RATE               = 9600
PARITY                  = NO
DATA BIT                = 8
STOP BIT                = 1

SHEET LENGTH            = 12
LINE LENGTH             = 42
PRINT                   = DOUBLE

LAYOUT                  = NORMAL
PAGE 1                  = UP
DOT                     = 6

LINE SPACING            = NORMAL
LINE SING/DOUB          = SINGLE

PAGE ADJUST             = MAX
PAGE MARGIN             = NORMAL

SHEET COUNTER          1= 87654321

ASCII TABLE
NO 2 =       ENGLAND       6 DOT 044.00
             ENGLAND       8 DOT 044.00
```

"Sheet counter" shows the number of printed sheets (Not pages!). This is the same counter as on the right-hand side of the display. "ASCII table" shows which ASCII-table is active.

The remaining information in the Print Values printout tells which ASCII-tables are available in the EPROM, and might look like the list below.

BRAILLO NORWAY

ASCII TABLES IN PROM

NO 1 =	DENMARK	6 DOT 045.00
	DENMARK	8 DOT 045.00
NO 2 =	ENGLAND	6 DOT 044.00
	ENGLAND	8 DOT 044.00
NO 3 =	GERMANY	6 DOT 049.03
	GERMANY	8 DOT 049.03
NO 4 =	GERMANY	6 DOT 049.04
	GERMANY	8 DOT 049.04
NO 5 =	ICELAND	6 DOT 354.00
	ICELAND	8 DOT 354.00
NO 6 =	ITALY	6 DOT 036.02
	ITALY	8 DOT 036.02
NO 7 =	NORWAY	6 DOT 047.03
	NORWAY	8 DOT 047.03
NO 8 =	SWEDEN	6 DOT 046.01
	SWEDEN	8 DOT 046.01

All the 8 tables are resident in the Printer. The table which is active is shown under the "ASCII table" section of the printout. To select another table (among the 8), refer to chapter 2.1, "Operating Panel". Note: This is just an example. The ASCII-tables listed will be dependent upon the combinations which are included in the printer. Some common combinations are listed below:

EURO 1 931203

1	045.00	Denmark
2	044.00	England
3	049.03	Germany
4	049.04	Germany
5	354.00	Island
6	039.02	Italy
7	047.03	Norway
8	046.01	Sweden

EURO 2 931203

1	032.00	Belgium
2	044.00	England
3	033.00	France
4	049.03	Germany
5	049.04	Germany
6	039.02	Italy
7	047.03	Norway
8	041.00	Switzerland

EURO 3 930106

1	043.00	Austria
2	042.00	Czech/Slovakia
3	044.00	England
4	049.03	Germany
5	049.04	Germany
6	030.00	Greece
7	036.00	Hungary
8	047.03	Norway

AMERICA 931203

1	055.00	Brazil
2	033.01	France
3	049.04	Germany
4	039.02	Italy
5	047.03	Norway
6	351.10	Portugal
7	034.00	Spain
8	001.00	USA

ASIA1 930118

1	033.01	France
2	049.04	Germany
3	081.00	Japan
4	965.01	Kuwait
5	060.01	Malaysia
6	047.03	Norway
7	966.00	Saudi Arabia
8	001.00	USA

ASIA2 941025

1	033.01	France
2	049.04	Germany
3	098.00	Iran
4	965.01	Kuwait
5	060.01	Malaysia
6	047.03	Norway
7	966.00	Saudi Arabia
8	001.00	USA

2.4   Messages/Error Messages

The text in the display can be divided into three groups; Messages, Alarms and Error Messages. With Messages, the Printer operates normally. With some Alarms, the Printer can be operated to a certain degree, while other Alarms are like Error Messages, in that the Printer cannot be operated, and RESET PRINTER must be used.

The audio alarm (BEEP) is sounded for both alarms and error messages.

Messages:

1
```
Printer
BUFFER empty
```
When DUMP BUFFER is used, and the input buffer is empty, the message "BUFFER empty" is shown on the display. The Printer is then ready to begin a new print job. Note: If there is text remaining in the buffer and "Dump Buffer" is not used, the text will appear at the beginning of the next print job.

2
```
NB! Line Length
Minimum 36 Char.
```
When PRINT VALUES is used, and the line length is set to less than 36 characters, this message will appear on the display. To print the current values, first set the line length to 36 characters or more.

Alarms

1
```
Printer
Out of Paper
```
When the Printer runs out of paper, the audio alarm is sounded, and the Printer stops at the end of the next page. To continue printing, press RESET ALARM and then TEST PRINT after the paper has been replaced. For information, see TEST PRINT - Ready/Continue, in chapter 2.1 "Operating Panel".

If the alarm is sounded when there still is paper in the machine, this may have been caused by one of the following:

A.   Paper dust in the paper out sensor.
B.   The paper guide which the paper out sensor is attached to might be bent or damaged, so the distance from the sensor to the paper is too big to detect the paper.
C.   The sensor is not connected.
D.   Defect sensor.

If one of these problems occurs, clean the sensor, make sure that it's connected to the motherboard, and check that the sensor is not more that 2 mm from the paper surface.

The following alarms are usually caused by a problem with the handshake in the data communication between the computer and the Printer, and it will be necessary to press RESET printer.

The text which remains in the buffer during these alarms can be printed by using DUMP BUFFER.

However, during these alarms one must check the transmission parameters for both the Printer and the computer, and also possibly the software in use. If any changes are made on the Printer, one will have to RESET PRINTER to register these changes.

4	Printer Buffer Overflow	This alarm indicates that the computer has not registered that the input buffer in the Printer is full, and continues to send data which causes the buffer to overflow. The text which remains in the buffer can be printed by using DUMP BUFFER. If this alarm occurs, check the transmission parameters for both the Printer and the computer, and also possibly the software in use.
5	Printer Alarm Overrun/Framing	Error in at least one of the following transmission parameters: Baud rate, no. of data bits and / or no. of stop bits. If this alarm occurs, check the transmission parameters for both the Printer and the computer, and also possibly the software in use.
6	Printer Alarm Parity	Error in the parity check in serial communication. If this alarm occurs, check the transmission parameters for both the Printer and the computer, and also possibly the software in use.
7	Printer Alarm ESC-Sequences	Some irregularities have been detected when receiving escape-sequences. If this alarm occurs, check the transmission parameters for both the Printer and the computer, and also possibly the software in use. If the escape-sequences are sent by a batch-file or are integrated in the text-file, be sure that the correct ASCII-value combinations are used.

On error messages, the Printer cannot be operated, and RESET PRINTER must be used.

1
Printer Error
General Failure

The reason might be:
A.   If the main motor starts, but for some reason stops, this message appears in the display, together with the audio alarm. The reason for this might be a bad connection in the motor wires or a problem inside the electrical unit.
B.   The belt on the Printer breaks during printing. Check the belt, and replace if needed.

2
Printer Error
Start Motor

If the main motor does not start, this error message is shown in the display. The reason might be:
A.   The motor is not connected. Check that the cable to the motor is connected.
B.   The belt is broken or out of place.
C.   System error.

3
Printer Error
Stop Motor

The main motor does not stop. The reason might be:
A.   Defect electrical unit.
B.   System error.

4
Printer Error
Paper Feed

Disagreement between the paper feed assembly (the paper) and the program system.
The reason might be:
A.   The paper is stuck, and the paper feed motor has slipped. Free the paper jam, push RESET PRINTER.
B.   System error.

2.5   Inserting Paper

Paper should be inserted into the Printer in the following manner:

1. Turn on the main switch, if the printer is not already switched on. (Green power lamp lights up.)

2. Place a box of paper at the back of the Printer. (Opposite from the operating panel.)

3. Insert the paper between the two knobs, and then through the slit in the paper guide. Insert about the length of one sheet. Go to the front of the Printer. Lock the paper into the tractor-feed. By using the FINE ADJUST button, adjust the paper with respect to the starting mark (notch) corresponding to the chosen sheet length. (See figure below.)

4. Push RESET PRINTER.

5. Push RESET COUNTER, if desired.

6. The Printer is now ready to start printing.

Note! If the Printer has run out of paper, perform step 2 and 3, without resetting the Printer. Press the TEST PRINT button in and out to restart the printing, and the Printer will continue from the place where it ran out of paper without losing any text.

Starting mark 12"
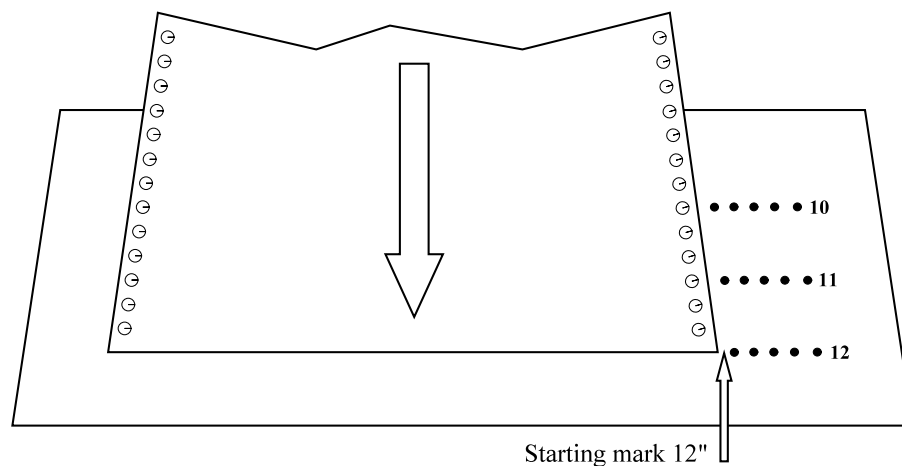
2.6   Test Print

This Braillo Printer has both single-sided and double-sided (interpoint) test print patterns. See also TEST PRINT in chapter 2.1 "Operating Panel".
The test print consists of a X-pattern, some full cell lines, empty cell lines, the complete ASCII-table and a pattern consisting of a character with dot 1,3,5 combined with a character with dot 2,4,6.

The test print program is designed to ensure that the 168 printing mechanisms functions properly.

It is recommended to print a few pages of test print before beginning the day's production.

How to use the Test Print:

1st push down:	Prints an X-pattern on both sides of the sheet which shows each pin from each magnet rack printing on a separate line. Useful when searching for missing dots.
2nd push down:	Prints full cells and empty lines, together with the ASCII-table on both sides of the sheet. Useful for testing the printing pressure adjustments, and to see how the paper can take heavy printing.
3rd push down:	Prints full cells and empty lines, together with the ASCII-table single-sided. Useful for testing the printing pressure adjustments.
4th push down:	Prints a test pattern made of dot 1,3,5 and 2,4,6, single-sided. Useful when searching for extra dots.
5th push down:	As 1st push down etc.

> Note! To get the single-sided test print to alternate sides, LAYOUT 2 must be used to set the layout to Z-fold.

The chapter 3.2 "Principal Design of Printing Procedure" illustrates how the printing mechanisms are placed. This illustration combined with the printing page sequences, chapter 3.3 "Table of Page Sequences", makes it possible to locate the faulty printing mechanism.

Instruction for troubleshooting will be illustrated by examples in chapter 3.1 "Troubleshooting".

2.7   Escape-Sequences

What is an escape-sequence?

An escape-sequence is just a name for a code which is sent from the computer to the Printer to change the parameters which control the way the Printer works. All parameters that can be set via the operator panel, can also be changed with the help of escape-sequences, (except those for the data communication, i.e. active port, Baud rate, Data bit, Stop bit, and Parity).

This makes it possible to have different codes (read; escape-sequences) stored in a document. For example, when the document is sent to the Printer, these codes are sent automatically first (so that the Printer sets itself in the correct mode and format automatically).

When the Printer receives ASCII 27, it knows that this code and one or more of the following codes are not text, but commands. This makes the Printer stop writing characters, and begins performing the commands.

> Note! When the Printer receives an escape-sequence, <u>it</u> will have first priority. This means that, regardless of the setting made before and regardless what the operator panel dictates, the most recent escape-sequence will take precedence.

How to make escape-sequences?

How to make an escape-sequence depends on the computer and the software being used. To make an escape-sequence the ASCII value 27 (hexadecimal 1B) is needed. This is the escape command.

Under MS.DOS 5.0 (or newer) this can be done in the DOS-text editor "Edit". At the DOS prompt, type "edit", press Enter, and the editor appears. Now, to create the ASCII value for escape press Ctrl-P, and then press the ESC-key. A left arrow will appear on the monitor. This indicate the escape character ASCII 27.

E.g. to make an escape-sequence to set the Printer to 6 dot mode, the command is ESC J0, and in "Edit", it is done as follows; Press Ctrl-P, then press the ESC-key to create the left arrow. Then type J0, and the command is completed. Save the file, exit the editor, and copy this file to the Printer. This will set the Printer to 6 dot mode.

The same thing can be done in Word Perfect 5.1: Press Ctrl-V, then press the ESC-key. The characters will appear on the monitor indicating the escape character ASCII 27. To achieve the same command as in the previous example, press J0. Now this must be saved as a DOS-text file. This is done by pressing Ctrl-F5, then 1 for DOS-text and 1 for Save. Give the file a name, exit WP, and copy the file to the Printer. This will set the Printer to 6 dot mode.

In order to use some of these commands correctly, the ASCII values must sometimes be combined. (For example the number of characters per line and the length of the sheet).

> Note! Escape-sequences should be placed at the very beginning of the first page on the sheet, (e.g page 1, 3, 5, 7 ...). However, a software form feed can be placed wherever needed. (If there is a command on the other pages, it will be skipped).
> All page formatting which is done on the front page will also format the back of the same sheet. It is e.g. not possible to have 8 dot braille on the front page and 6 dot on the back page. It is possible to mix 6 and 8 dot braille however, as long as it is done on two different sheets.

Overview of the escape-sequences:

ESC A nn   - Sheet length.   nn can be from 08 to 28 (4 to 14 inch).
ESC B nn   - Line length.   nn can be from 10 to 42 characters.
ESC C n   - Print Format.   n can be 0 or 1, single-sided (0) or interpoint (1).

ESC H n   - Page Layout.   n can be 0 or 1, Normal (0) or Z-fold printing (1).
ESC I n   - Page 1 up/down.   n can be 0 or 1, up (0) or down (1).
ESC J n   - 6 / 8 dot braille.   n can be 0 or 1, 6 (0) or 8 (1) dot braille.

ESC M nn   - Line Spacing.   nn can be from 0 to 16 step.
ESC N n   - Line Single/Double.   n can be 0 or 1, single (0) or double line spacing (1).

ESC R n   - Page adjust.   n can be from 0 to 9 lines.
ESC S n   - Form Feed Mode.   n can be 0 or 1, no form feed (0) or normal form feed (1).
ESC T nn   - Page margin.   nn can be from 0 to 20 step.

ESC 0   - Soft Reset
ESC 1   - Soft Form Feed
ESC 3   - ASCII-Table from PC

Note! The escape-sequences will be executed immediately if the printer is not running. However, if the printer is running, the escape-sequences will keep their place in the document, and will be executed when this particular page is printed.
Also keep in mind that any page formatting command must be kept on the front page of a sheet. Then the command will affect both the front and back page, i.e. one sheet.
If there are page formatting commands on the back page of a sheet, these comands will be skipped.

Please see the following explanations on how to combine different values to get the different escape-sequences.

Sheet length:

ESC A nn   - Sheet length.   nn can be from 4 to14 inches.

nn can be a number from 8 to 28, corresponding to the length of the sheet in inches times two. (A 12 inch sheet will have the number 24).

Sheet Length					
Inches	ASCII	HEX	Inches	ASCII	HEX
04.0	027 065 048 056	1B 41 30 38	09.5	027 065 049 057	1B 41 31 39
04.5	027 065 048 057	1B 41 30 39	10.0	027 065 050 048	1B 41 32 30
05.0	027 065 049 048	1B 41 31 30	10.5	027 065 050 049	1B 41 32 31
05.5	027 065 049 049	1B 41 31 31	11.0	027 065 050 050	1B 41 32 32
06.0	027 065 049 050	1B 41 31 32	11.5	027 065 050 051	1B 41 32 33
06.5	027 065 049 051	1B 41 31 33	12.0	027 065 050 052	1B 41 32 34
07.0	027 065 049 052	1B 41 31 34	12.5	027 065 050 053	1B 41 32 35
07.5	027 065 049 053	1B 41 31 35	13.0	027 065 050 054	1B 41 32 36
08.0	027 065 049 054	1B 41 31 36	13.5	027 065 050 055	1B 41 32 37
08.5	027 065 049 055	1B 41 31 37	14.0	027 065 050 056	1B 41 32 38
09.0	027 065 049 056	1B 41 31 38			

Default is 12 inches.

Setting the line length:

ESC B nn   - Line length.   nn can be from 10 to 42 characters.

Line Length					
Char	ASCII	HEX	Char	ASCII	HEX
10	027 066 049 048	1B 42 31 30	20	027 066 050 048	1B 42 32 30
11	027 066 049 049	1B 42 31 31	21	027 066 050 049	1B 42 32 31
12	027 066 049 050	1B 42 31 32	22	027 066 050 050	1B 42 32 32
13	027 066 049 051	1B 42 31 33	23	027 066 050 051	1B 42 32 33
14	027 066 049 052	1B 42 31 34	24	027 066 050 052	1B 42 32 34
15	027 066 049 053	1B 42 31 35	25	027 066 050 053	1B 42 32 35
16	027 066 049 054	1B 42 31 36	26	027 066 050 054	1B 42 32 36
17	027 066 049 055	1B 42 31 37	27	027 066 050 055	1B 42 32 37
18	027 066 049 056	1B 42 31 38	28	027 066 050 056	1B 42 32 38
19	027 066 049 057	1B 42 31 39	29	027 066 050 057	1B 42 32 39

Line Length					
30	027 066 051 048	1B 42 33 30	37	027 066 051 055	1B 42 33 37
31	027 066 051 049	1B 42 33 31	38	027 066 051 056	1B 42 33 38
32	027 066 051 050	1B 42 33 32	39	027 066 051 057	1B 42 33 39
33	027 066 051 051	1B 42 33 33	40	027 066 052 048	1B 42 34 30
34	027 066 051 052	1B 42 33 34	41	027 066 052 049	1B 42 34 31
35	027 066 051 053	1B 42 33 35	42	027 066 052 050	1B 42 34 32
36	027 066 051 054	1B 42 33 36			

Default is 42 characters pr. line.

Print Format:

ESC C n   - Print Format.   n can be 0 or 1, single-sided (0) or interpoint (1).

Print Format		
Print Format	ASCII	HEX
Single-sided	027 067 048	1B 43 30
Double-sided	027 067 049	1B 43 31

Default is Double-sided.

Page layout:

ESC H n   - Page Layout.   n can be 0 or 1, Normal (0) or Z-fold printing (1).

Page Layout		
Page Layout	ASCII	HEX
Normal	027 072 048	1B 48 30
Z-fold	027 072 049	1B 48 31

Default is Normal Page Layout.

Page 1 up or down:

ESC I n   - Page 1 up/down.   n can be 0 or 1, up (0) or down (1).

Page 1 Up or Down		
Page 1 Up or Down	ASCII	HEX
Up	027 073 048	1B 49 30
Down	027 073 049	1B 49 31

Default is Page 1 Up.

6 / 8 dot braille:

ESC J n   - 6 / 8 dot braille.   n can be 0 or 1, 6 (0) or 8 (1) dot braille.

6 / 8 dot braille		
6 / 8 dot braille	ASCII	HEX
6	027 074 048	1B 4A 30
8	027 074 049	1B 4A 31

Default is 6 dot braille.

Line spacing:

ESC M nn   - Line Spacing.   nn can be from 0 to 16 step.

Line Spacing							
Step	mm	ASCII	HEX	Step	mm	ASCII	HEX
0	0	027 077 048 048	1B 4D 30 30	9	2.8575	027 077 048 057	1B 4D 30 39
1	0.3175	027 077 048 049	1B 4D 30 31	10	3.1750	027 077 049 048	1B 4D 31 30
2	0.6350	027 077 048 050	1B 4D 30 32	11	3.4925	027 077 049 049	1B 4D 31 31
3	0.9525	027 077 048 051	1B 4D 30 33	12	3.8100	027 077 049 050	1B 4D 31 32
4	1.2700	027 077 048 052	1B 4D 30 34	13	4.1275	027 077 049 051	1B 4D 31 33
5	1.5875	027 077 048 053	1B 4D 30 35	14	4.4450	027 077 049 052	1B 4D 31 34
6	1.9050	027 077 048 054	1B 4D 30 36	15	4.7625	027 077 049 053	1B 4D 31 35
7	2.2225	027 077 048 055	1B 4D 30 37	16	5.0800	027 077 049 054	1B 4D 31 36
8	2.5400	027 077 048 056	1B 4D 30 38				

Default is 16 steps. 16 steps are the standard line spacing (5.08 mm or 0.2"), 8 is the setting for "graphic" (2.54 mm or 0.1"). Note that if the setting is less than 7, and there is text on each line, the dots might get damaged in the printing process.

Single / Double Line Spacing:

ESC N n   - Line Single/Double. N can be 0 or 1, single (0) or double line spacing (1).

Single / Double Line Spacing		
Line Spacing	ASCII	HEX
Single	027 078 048	1B 4E 30
Double	027 078 049	1B 4E 31

Note! The function "Single or Double line spacing" will double the given line spacing. If, e.g. the current line spacing is 13 steps (4.1275 mm), selecting Double line spacing will increase it to 26 steps (8.255 mm).

Default is Single Line Spacing.

Page Adjust:

ESC R n   - Page adjust.   n can be from 0 to 9 lines.

> Note! Please keep in mind that there is a difference in the terms "page length" and "sheet length". By page length we mean the number of lines of text to be printed on a page, and by sheet length we mean the physical size of a sheet of paper in inches.
>
> The number of lines which can be printed on a page, is dependent on whether 6 or 8 dot braille is used, whether what kind of line spacing is in use, and whether page length is set for Maximum, Maximum-1 or upto -9.

Page Adjust					
Omitted Lines	ASCII	HEX	Omitted Lines	ASCII	HEX
0	027 082 048	1B 52 30	5	027 082 053	1B 52 35
1	027 082 049	1B 52 31	6	027 082 054	1B 52 36
2	027 082 050	1B 52 32	7	027 082 055	1B 52 37
3	027 082 051	1B 52 33	8	027 082 056	1B 52 38
4	027 082 052	1B 52 34	9	027 082 057	1B 52 39

Maximum, -1 to -9. This setting will decrease the number of lines on each page with 1 to 9, (depending on the selected number). If, e.g. the maximum number of lines would be 29, and the setting "Max-4" is selected, the resulting number of lines will be 25.

This function will centre the text vertically on the page and keep the top and bottom margin approx. equal.

Default is Maximum number of lines per page.

Form Feed Mode:

ESC S n   - Form Feed Mode.   n can be 0 or 1, no form feed (0) or normal form feed (1).

Form Feed Mode		
Form Feed Mode	ASCII	HEX
No Form Feed	027 083 048	1B 53 30
Normal Form Feed	027 083 049	1B 53 31

Default is Normal Form Feed.

Page Margin:
ESC T nn   - Page margin.   nn can be from 0 to 20 step.

	Page Margin						
Step	mm	ASCII	HEX	Step	mm	ASCII	HEX
0	0	027 084 048 048	1B 54 30 30	11	6.9850	027 084 049 049	1B 54 31 31
1	0.6350	027 084 048 049	1B 54 30 31	12	7.6200	027 084 049 050	1B 54 31 32
2	1.2700	027 084 048 050	1B 54 30 32	13	8.2550	027 084 049 051	1B 54 31 33
3	1.9050	027 084 048 051	1B 54 30 33	14	8.8900	027 084 049 052	1B 54 31 34
4	2.5400	027 084 048 052	1B 54 30 34	15	9.5250	027 084 049 053	1B 54 31 35
5	3.1750	027 084 048 053	1B 54 30 35	16	10.1600	027 084 049 054	1B 54 31 36
6	3.8100	027 084 048 054	1B 54 30 36	17	10.7950	027 084 049 055	1B 54 31 37
7	4.4450	027 084 048 055	1B 54 30 37	18	11.4300	027 084 049 056	1B 54 31 38
8	5.0800	027 084 048 056	1B 54 30 38	19	12.0650	027 084 049 057	1B 54 31 39
9	5.7150	027 084 048 057	1B 54 30 39	20	12.7000	027 084 050 048	1B 54 32 30
10	6.3500	027 084 049 048	1B 54 31 30				

The "Page Margin" function will adjust the page margin in steps from 0 to 20. The standard setting is 8, (8 = normal). The page margin will give different effect when used on single-sided, compared with double-sided. On double-sided printing, one step is equal to 0.6350 mm, and the text will be centred vertically on the page. If, e.g. a page margin on 6 steps is selected, the printer will print closer to the edges of the paper, and if a page margin on 20 steps is selected, it will give a larger page margin. This will affect both top and bottom margins, i.e. page margin.

On single-sided printing, however, the page margin will actually work as a top margin. (Note! The page layout must be set to normal). One step is equal to 0.6350 mm. It will "push" the text downwards the sheet. If the text reaches the bottom, (meaning that there will not be enough space on this page for the last line), this line will wrap over to the next page.

Default is 8 steps.

Software Reset:
ESC 0   - Soft Reset

Note! This command is used to reset the Printer. It is used from the computer and has the same effect as pushing the key RESET PRINTER. Software Reset should be used with care: If the printer has not finished printing, the rest of the text in the buffer will be lost, and a new paper position will be assumed by the Printer. Because of this, the command is only to be used after a software form feed has been executed, and the Printer has stopped completely.

	Software Reset	
	ASCII	HEX
Software Reset	027 048	1B 30

Software Form Feed:

ESC 1   - Soft Form Feed

> Note! This command is to be used after all text in one volume has been transmitted to the Printer. If text corresponding to less than two pages, or text with an odd number of pages is received, and not followed by FF on the last page, the Printer will wait for more text or FF. This means that the last page may be stuck in the Printer. This is due to the double-sided printing of the Printer. This command makes the Printer to start printing the rest of the text. After this the paper position will be the same as it had when this volume of text was started. Then page no. 1 on the next volume will start out correctly. There will always be at least one blank sheet of paper between the volumes of text when finishing each volume with a Software Form Feed.

Software Form Feed		
	ASCII	HEX
Software Form Feed	027 049	1B 31

2.8   Lines per Page, Example:

Lines per Page, Example.				
Sheet Length, Inches	Normal LineSpac 6 dot	Normal LineSpac 8 dot	Double LineSpac 6 dot	Double LineSpac 8 dot
4	9	7	6	5
5	12	9	8	6
6	14	11	9	8
7	17	13	11	9
8	19	15	13	11
9	22	17	14	12
10	24	19	16	14
11	27	21	18	15
12	29	23	19	16
13	32	25	21	18
14	34	27	23	19

3.   SERVICE AND MAINTENANCE

3.1   Troubleshooting

Through proofreading, errors have been found in some of the characters in the text.
The first thing to do is:
Check the characters in the text-file in your computer to find out if the error could come from the text-file and not from the Braillo Printer. However, if your text-file is OK, a problem has occurred in the Braillo Printer.

Inside the Printer there are four identical magnet racks, named from A to D. Each magnet rack contains 42 printing mechanisms. There are totally 168 printing mechanisms to choose among when the error search begins. See figure in chapter 3.2, "Principal Design of Printing Procedure".

As a start, you should run the built-in Test Print. Depending on what kind of errors you have, you should use different tests.
The essential thing at this stage is to find which magnet rack(s) is causing the trouble.

If there is missing dot(s), use the X-pattern to detect which magnet rack(s) is missing the dot(s).

If there are too many dots, use the full cell lines, or the test pattern on test print no. 4, and the extra dot(s) will appear in the space between the lines.

However, the best test is ordinary text, if a proofreader is available. To locate the faulty magnet rack(s), use the Table of Page Sequences.
See figure in chapter 3.3, "Table of Page Sequences".

Note! The table is made for Page 1 up.

An example how to use the table:

1   Find the page with the error. (Use the pagination on the printed page). Let us assume that the error has occurred on page 10. Find the braille cell with the error. The braille cell contains 2 columns of each 3 (or 4) dots. See figure below.
Here, it is assumed that the error is found in the column with dot 1, 2, 3 (and 7).

2   The Table of Page Sequences shows that page 10 is printed from the top and downwards. From the same table you can see that this column with dot 1, 2, 3 (and 7) in the braille cell is printed by a mechanism in magnet rack A.

Braille cell

```
1 ● ● 4
2 ● ● 5
3 ● ● 6
7 ● ● 8
```

Possible reasons for errors

See figures on page 36.

If a dot from a certain printing pin is missing regularly, the reason might be one of the following:

1 -   Defect magnet (7).
2 -   Broken short pivot arm (9).
3 -   The long pivot arm (3) cannot move because of dirt.
4 -   The printing pin is stuck because of dirt, causing the short pivot arm (9) to miss the long pivot arm (3).
5 -   Errors on the Magnet Rack Driver Board.

If dots from several printing pins are missing now and then, the reason might be one of the following:

1 -   The sponge list (5) is pushing too hard on the long pivot arm (3).
2 -   The gap (11) is too large.
3 -   The support list (1) has become sticky on the side against the long pivot arms (3), and the long pivot arm does not move properly.

If there are too many dots on the paper, the reason might be one of the following:

1 -   The sponge list (5) is not pressing enough against the long pivot arm (3).
2 -   The gap (11) is too small.
3 -   The magnet poles have become sticky, and this causes the pivot arms (3) to stick to the magnet.
4 -   The long pivot arm (3) does not move properly.

Control:
To ensure yourself that you have found the right mechanism after a search, you can do the following test:
Pull the suspected long pivot arm against the magnet with your finger. (Like the lowest figure on page 37).
At the same time, run a test print. The mechanism with the finger on, will make a column of dots downwards the paper until you take the finger away. By doing this you can see if this column of dots is situated on the same place on the sheet as the error is.

3.2   Principal Design of Printing Procedure
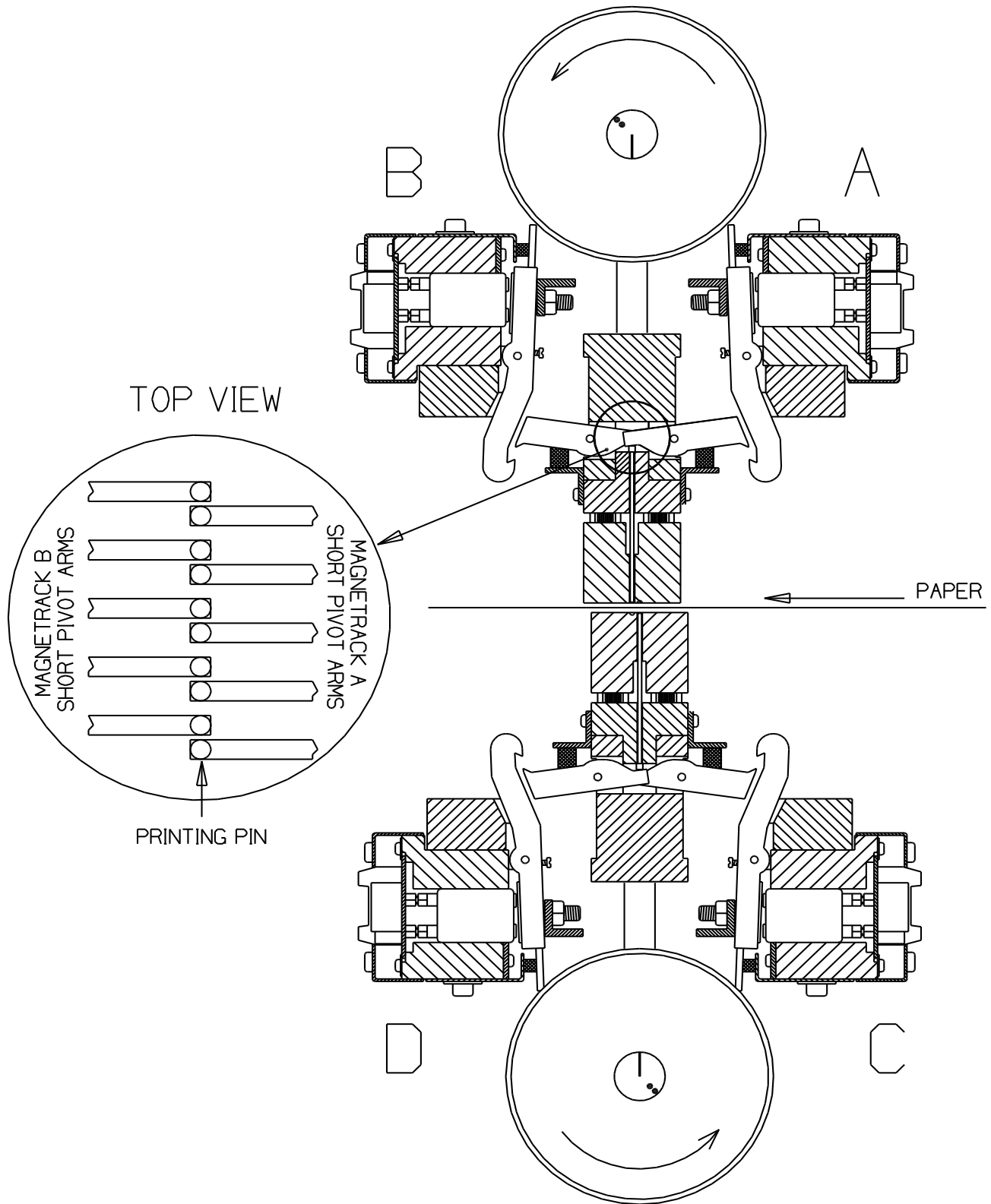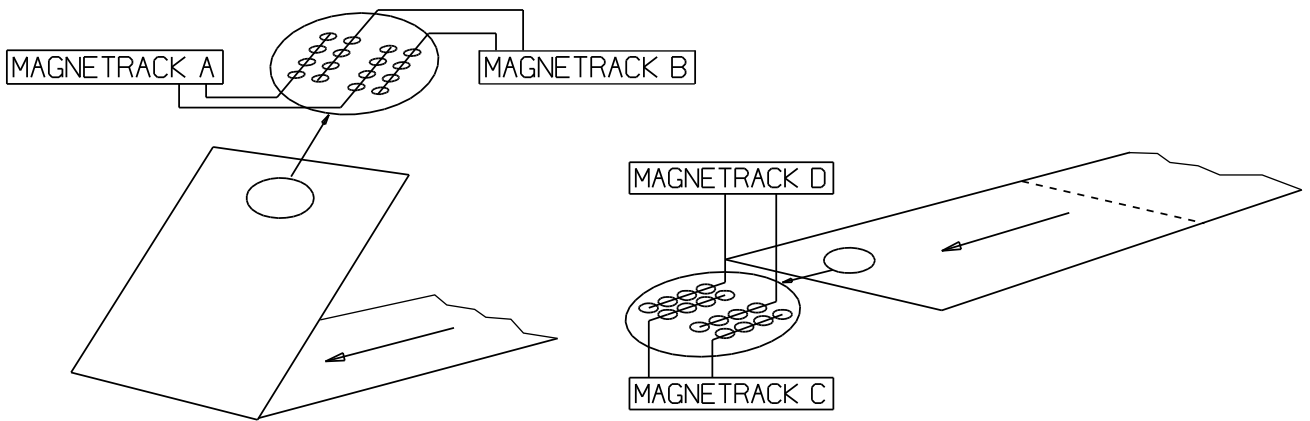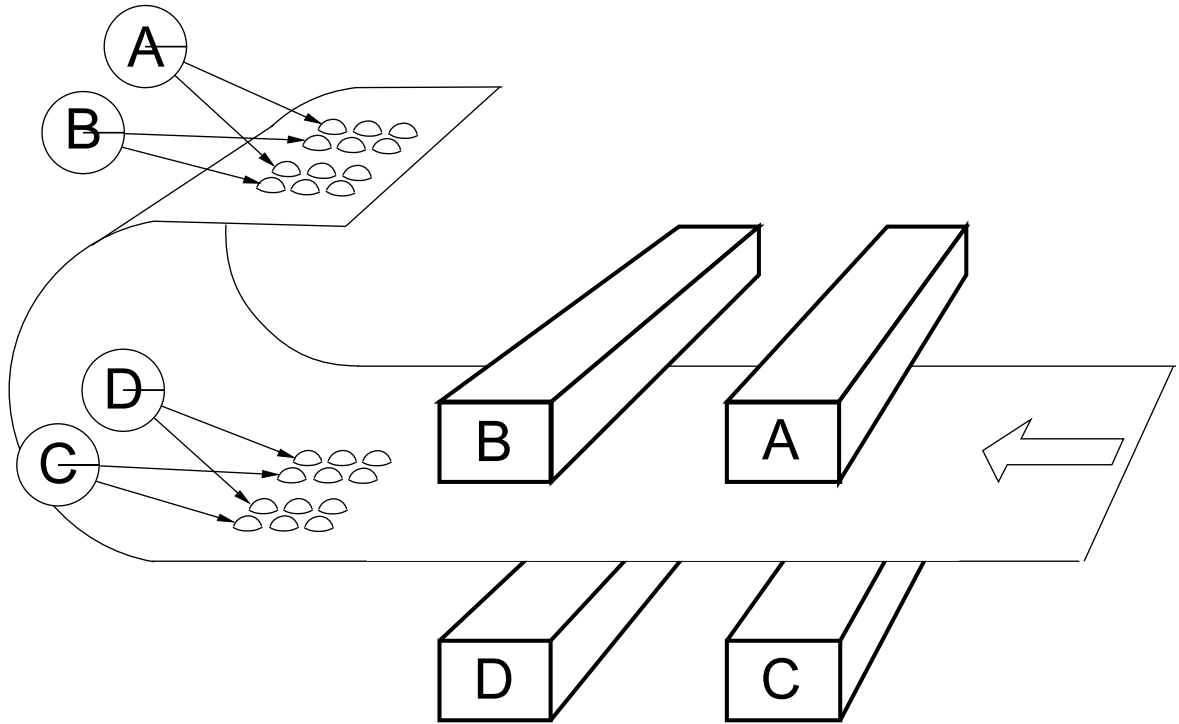
Observe that the same printing mechanism (magnet, long pivot arm, short pivot arm and printing pin) makes all the dots in a column downwards the page.
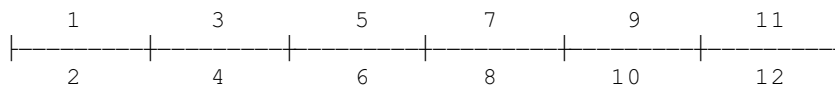
3.3   Table of Page Sequences

Page layout:

> Note! The table is made for Page 1 up.

Normal:

```
Page:   2-4-6-8-10-12-14-16-18-20-22-24-26-28-30   Dot 1-2-3-7   Magnet Rack A
        32-34-36-38-40-42-44-46-48-50-52-54-56      Dot 4-5-6-8   Magnet Rack B

            1           3           5           7           9           11
        +---------+---------+---------+---------+---------+---------+
            2           4           6           8           10          12

Page:   1-3-5-7-9-11-13-15-17-19-21-23-25-27-29   Dot 1-2-3-7   Magnet Rack C
        31-33-35-37-39-41-43-45-47-49-51-53-55      Dot 4-5-6-8   Magnet Rack D
```
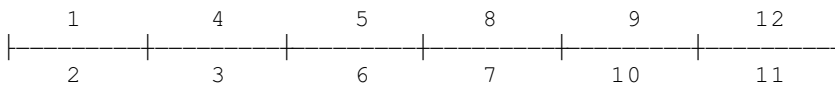
Z-fold

```
Page:   1-5-9-13-17-21-25-29-33-37-41-45-49-53    Dot 1-2-3-7   Magnet Rack C
        57-61-65-69-73-77-81-85-89-93-97-101        Dot 4-5-6-8   Magnet Rack D

Page:   4-8-12-16-20-24-28-32-36-40-44-48-52-56    Dot 1-2-3-7   Magnet Rack D
        60-64-68-72-76-80-84-88-92-96-100-104       Dot 4-5-6-8   Magnet Rack C

            1           4           5           8           9           12
        +---------+---------+---------+---------+---------+---------+
            2           3           6           7           10          11

Page:   2-6-10-14-18-22-26-30-34-38-42-46-50      Dot 1-2-3-7   Magnet Rack A
        54-58-62-66-70-74-78-82-86-90-94-98-102     Dot 4-5-6-8   Magnet Rack B

Page:   3-7-11-15-19-23-27-31-35-39-43-47-51-55    Dot 1-2-3-7   Magnet Rack B
        59-63-67-71-75-79-83-87-91-95-99-103        Dot 4-5-6-8   Magnet Rack A
```

Braille cell

```
1 o o 4
2 o o 5
3 o o 6
7 o o 8
```

3.4 Magnet Rack, Removal and Refitting

See figures on page 35 and 36.

To remove the magnet rack, unscrew two pairs of screws (13), lift out the assembly.

Refitting is the reverse of removal, but observe:

The Printer is adjusted for optimal dot quality when delivered, but different paper quality could make it necessary to make some adjustments. Our service personnel will adjust the Printer when they are on site. However, if the Printer should need adjustment and Braillo Norway service personnel is not available, it should be done like this:

Turn the belt, so the marking at the end of the shafts is pointing in the opposite direction of each other (see figure below), and lock the shaft, e.g. with a locking wrench.

The magnet rack assembly is fastened on the Printer. The gap (11) should be about 0.2 mm, and should be adjusted using screw (16). Make sure that the gap (11) is the same at both ends of the magnet rack.

The distance (10) should be about 1.0 mm, but if the braille dots are too weak, you may adjust the magnet rack tighter in small steps (increase the distance (10)). This is done by loosening the screws (12), and use the two nuts (17) on the outside of pillar (14) to move the magnet rack up or down. Do this at both ends of the magnet rack.
Test the Printer for each step of 1/4 rev. of the nuts (17). This will move the magnet rack about 0.3 mm up or down..

Note! Do not adjust too tight, the pivot arms may be overstrained and break.

The magnet rack assembly may be moved sideways using two eccentric adjusters at the ends. This is done at the factory, and should never need to be changed.
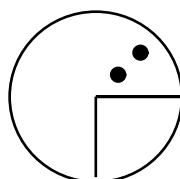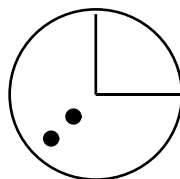
3.5   Magnet Rack, Disassembly, Assembly and Adjusting

See figures on page 36.

Remove the magnet rack as described on page 33.

This is what to do if a magnet (7) is to be replaced, or a complete cleaning is to be done.

Remove the support list (1) and the sponge list (5). Remove the two screws which were hidden under the sponge list (5). This will make the guide list (8) for the long pivot arm come loose. This, with all the pivot arms, should be placed aside.

To replace a magnet (7), unscrew the five screws holding the locking list (6), remove the locking list (6), and pull out the magnet (7) with a narrow pair of pliers.

The magnet can be measured with a multimeter, and if the magnet is OK, the internal resistance should be between 185 and 220 ohm.

When inserting a new magnet, the magnet should be inserted exactly the same way as the rest of the magnets. (Observe the small spikes which come out of the soldering on the magnets). If two magnets are placed with these spikes against each other, the Printer will probably make two dots instead of one when one of these magnets is engaged. Also make sure that the connectors on the new magnet are placed exactly in the connectors in the printed circuit board.

The assembly is done in reverse order.

Mount the guide list (8) with the pivot arms on the magnet rack.

Observe the following:

The support list (1) must be adjusted and fastened so the gap between the support list (1) and the long pivot arms (3) is 0.8 mm, when the long pivot arm is against the magnet. Use a feeler gauge to check this adjustment.

The sponge list (5) must be adjusted and fastened so the sponges (4) barely touches the top of the long pivot arms (3) when the magnets are released.
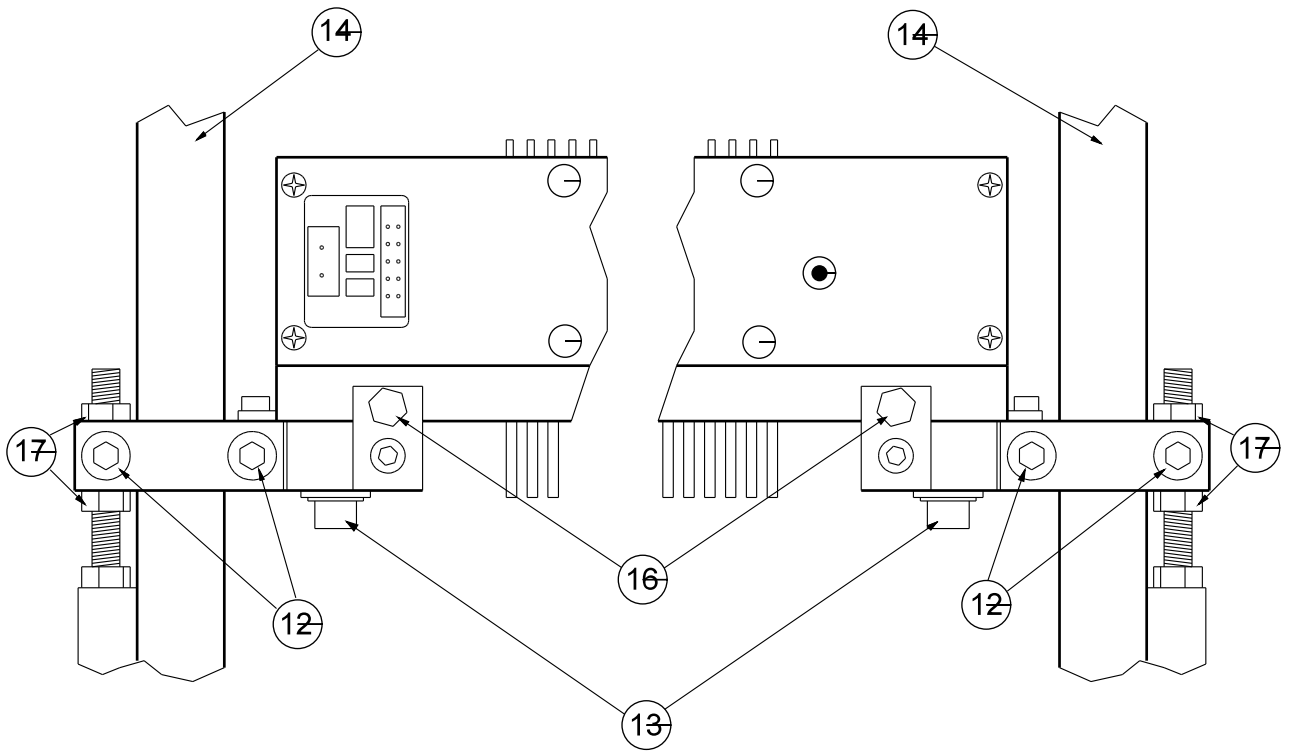
How to replace a long pivot arm:
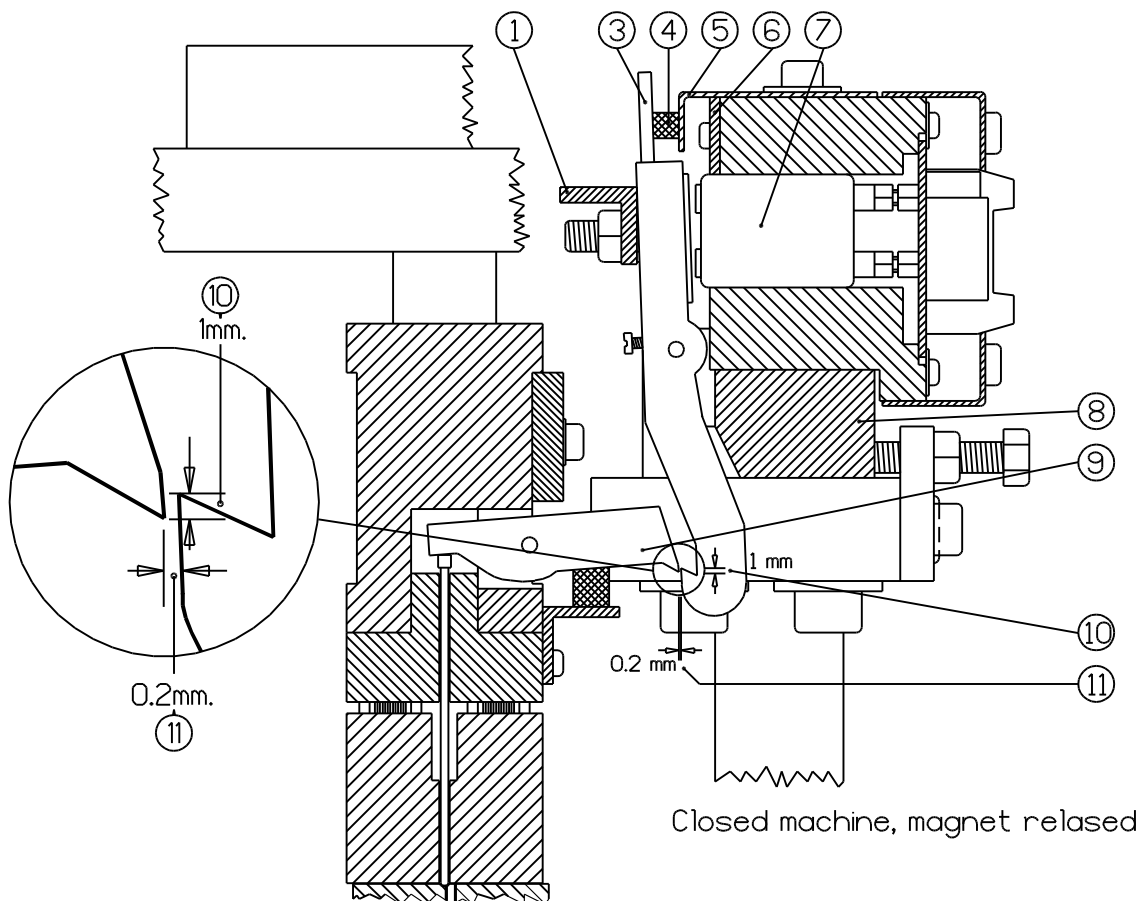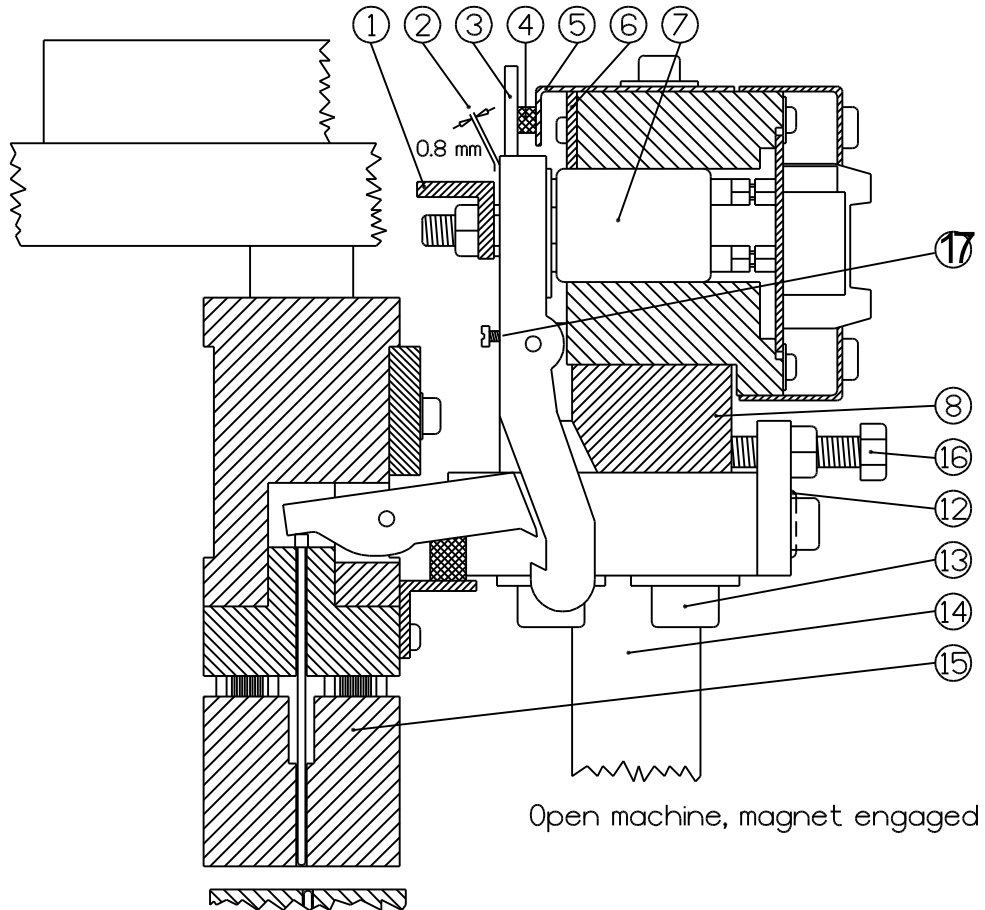
See figures on page 36.

Remove the magnet rack as described on page 33. Remove the support list (1) and the sponge list (5). Now, loosen the screws (17). Note! Do not try to unscrew the screws (17) completely. They should only be loosened about one revolution. Use, e.g. a small screwdriver to slide the pivot arm shaft sideways until the defect pivot arm is loose. Take it out and replace it with a new one. Put the pivot arm in the position so that you can slide the shaft back in place. Repeat this for each loose pivot arm until the shaft is approx. in the centre on the magnet rack. When tightening the small screws (17), pull at the same time the pivot arm shaft into its slot. And do not over tighten, these screws are fragile!
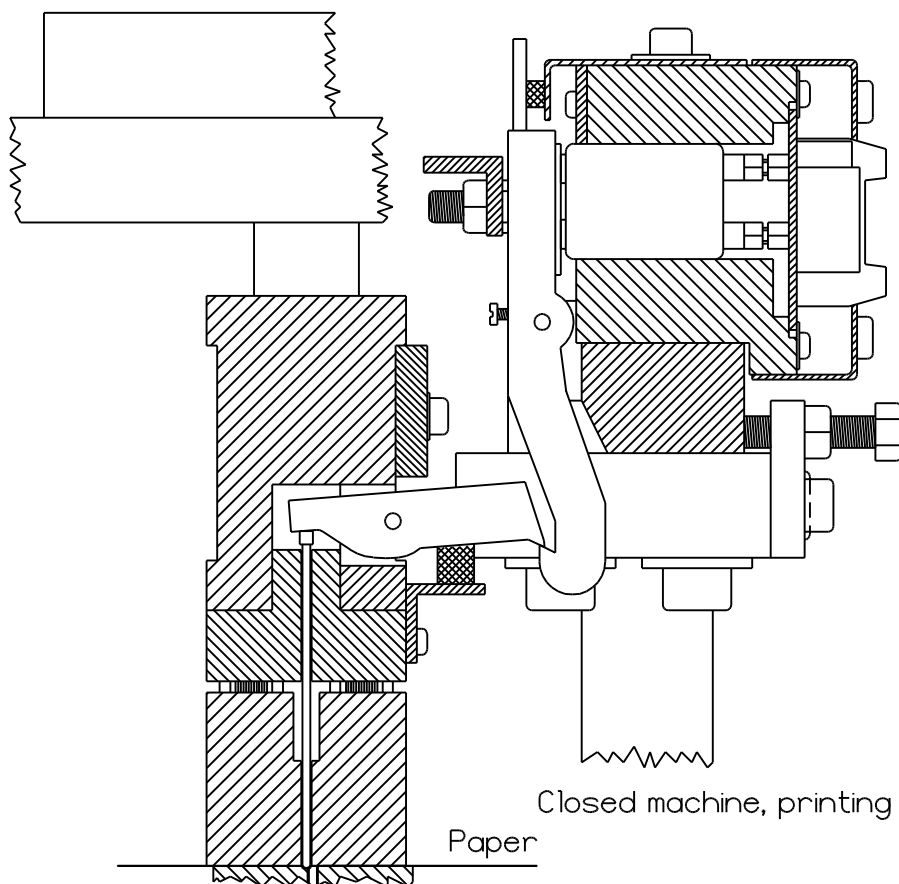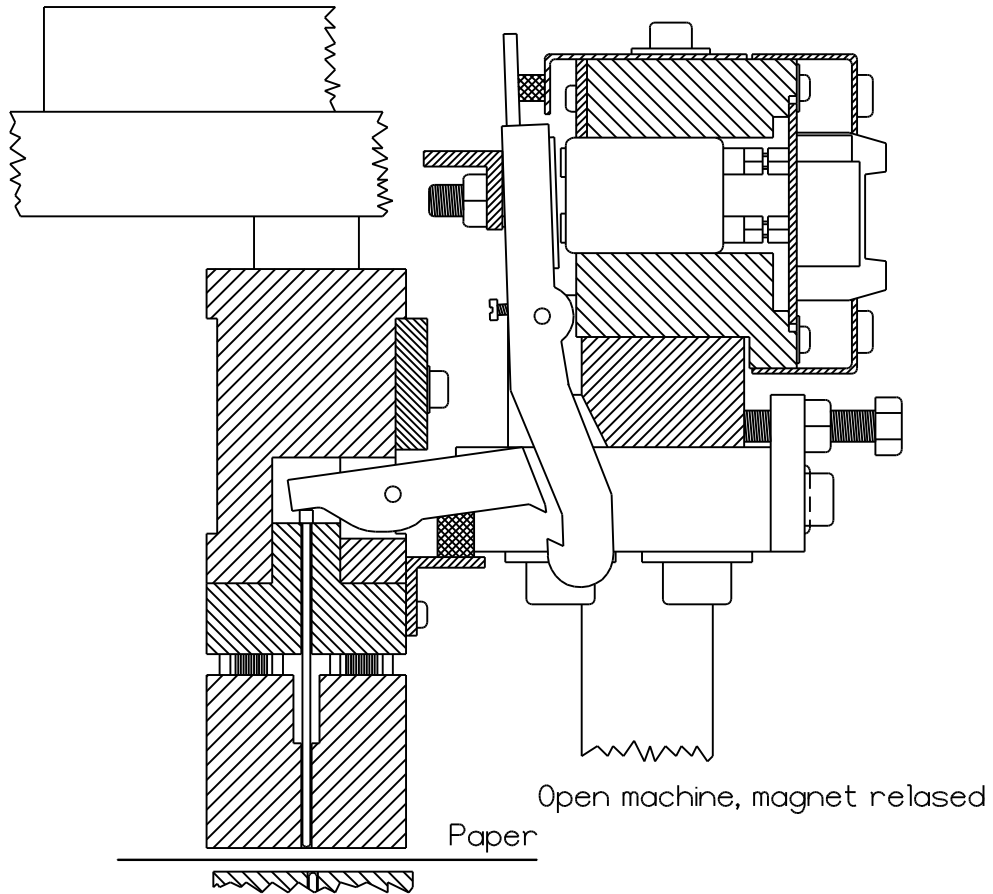Assemble the magnet rack as described above.

3.6   Magnet Rack, Figures

Magnet Rack, Figures

Open machine, magnet engaged

Closed machine, magnet relased

3.7   Magnet Rack, Printing Process

Open machine, magnet relased

Paper

Closed machine, printing

Paper

3.8   How to Replace Short Pivot Arms

See figures on page 39.

If for some reason the short pivot arms need replacement, (worn or broken) this is the procedure to follow:
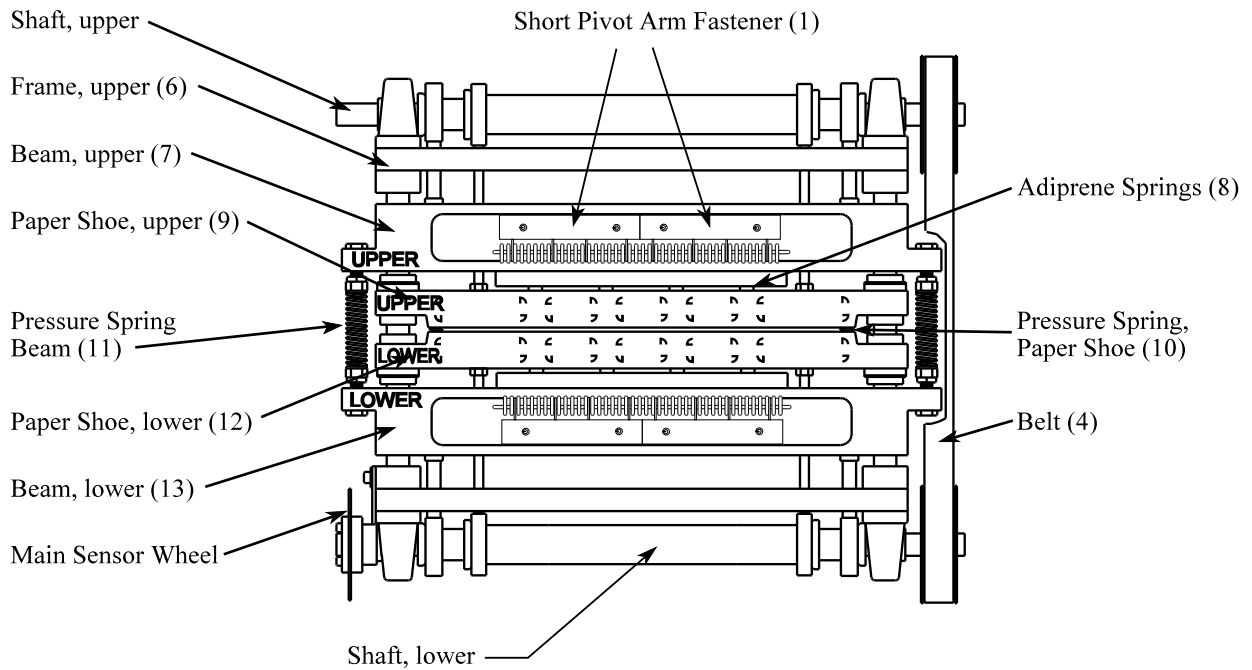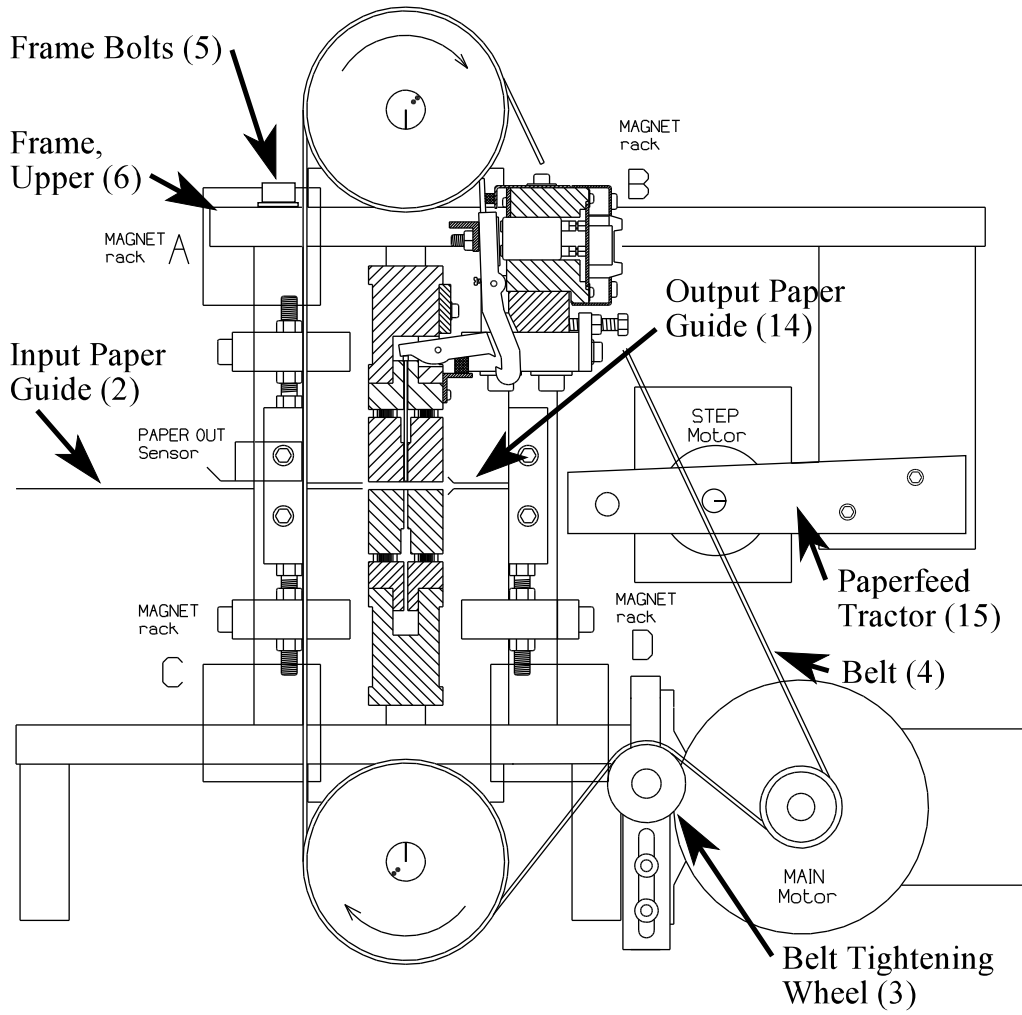
Short pivot arm situated on the upper unit:
1.   Remove the magnet rack (the one in front of the defect short pivot arms) as described on page 33.
2.   Take off the short pivot arm fastener (1). Pull the short pivot arms straight out of its slot, and the shaft will come out as well. The short pivot arms shaft consists of two parts, each containing 21 short pivot arms.
3.   Put the new short pivot arms back in place, be sure to have the shafts all the way into its slot.
4.   Fasten the magnet rack back on place.

**Short pivot arm situated on the lower unit:**
This procedure will take some more effort to do. This is due to the fact that the printing pin will fall down if the lower short pivot arms are taken out, and then you cannot get the new short pivot arm back in place. The procedure here is to take the beam with the short pivot arms out of the Printer before replacing the short pivot arm. Do as described below:

1.   Remove the two upper magnet racks (A and B).
2.   Remove the paperfeed tractor assembly (15). Leave the unit on the printer's frame without disconnecting the cables.
3.   Remove the input paper guide (2).
4.   Remove the output paper guide (14).
5.   Loosen the belt tightening wheel (3), and remove the belt (4).
6.   Loosen the four big bolts (5) on top of the frame (6). Take this bolts all the way out.
7.   Now the top part of the frame (6) with the upper shaft must be lifted upwards and placed aside. Note that the top part of the frame (6) is precisely aligned with the two columns, and could be a little tricky to lift upwards. The best way is to pull it all the way in one "snap". If this cannot be done, it should be wriggled carefully upwards, one side at the time, repeatedly until the unit can be lifted off.
8.   Then, lift the upper beam (7) carefully upwards and place aside. Note that the adiprene pressure springs (8) are now loose and may fall out. There are eight adiprene springs on the upper unit. Also take care if there are some steel shims under the adiprene springs, they can easily fall out and disappear.
9.   Lift out the upper paper shoe (9), take out the two blue springs (10), and the two green springs (11).
10.   Lift out the lower paper shoe (12), again take care of the adiprene springs, and eventually the steel shims.
11.   Lift the lower beam (13) out, and the short pivot arm can be replaced like described for the upper unit above.
12.   Assemble in reverse order. To be able to get the belt on correct, see chapter 3.10 "Eccentrics, Adjustment".

Frame Bolts (5)

Frame, Upper (6)

MAGNET rack A

Input Paper Guide (2)

PAPER OUT Sensor

MAGNET rack

C

MAGNET rack B

Output Paper Guide (14)

STEP Motor

Paperfeed Tractor (15)

MAGNET rack D

Belt (4)

MAIN Motor

Belt Tightening Wheel (3)

Shaft, upper

Frame, upper (6)

Beam, upper (7)

Paper Shoe, upper (9)

Pressure Spring Beam (11)

Paper Shoe, lower (12)

Beam, lower (13)

Main Sensor Wheel

Short Pivot Arm Fastener (1)

UPPER

UPPER

LOWER

LOWER

Adiprene Springs (8)

Pressure Spring, Paper Shoe (10)

Belt (4)

Shaft, lower

3.9   Return Springs, Adjustment

The adjustment has to be done when the shafts are in this position. See the marks at the end of the shafts on the figure below.

70 mm   70 mm
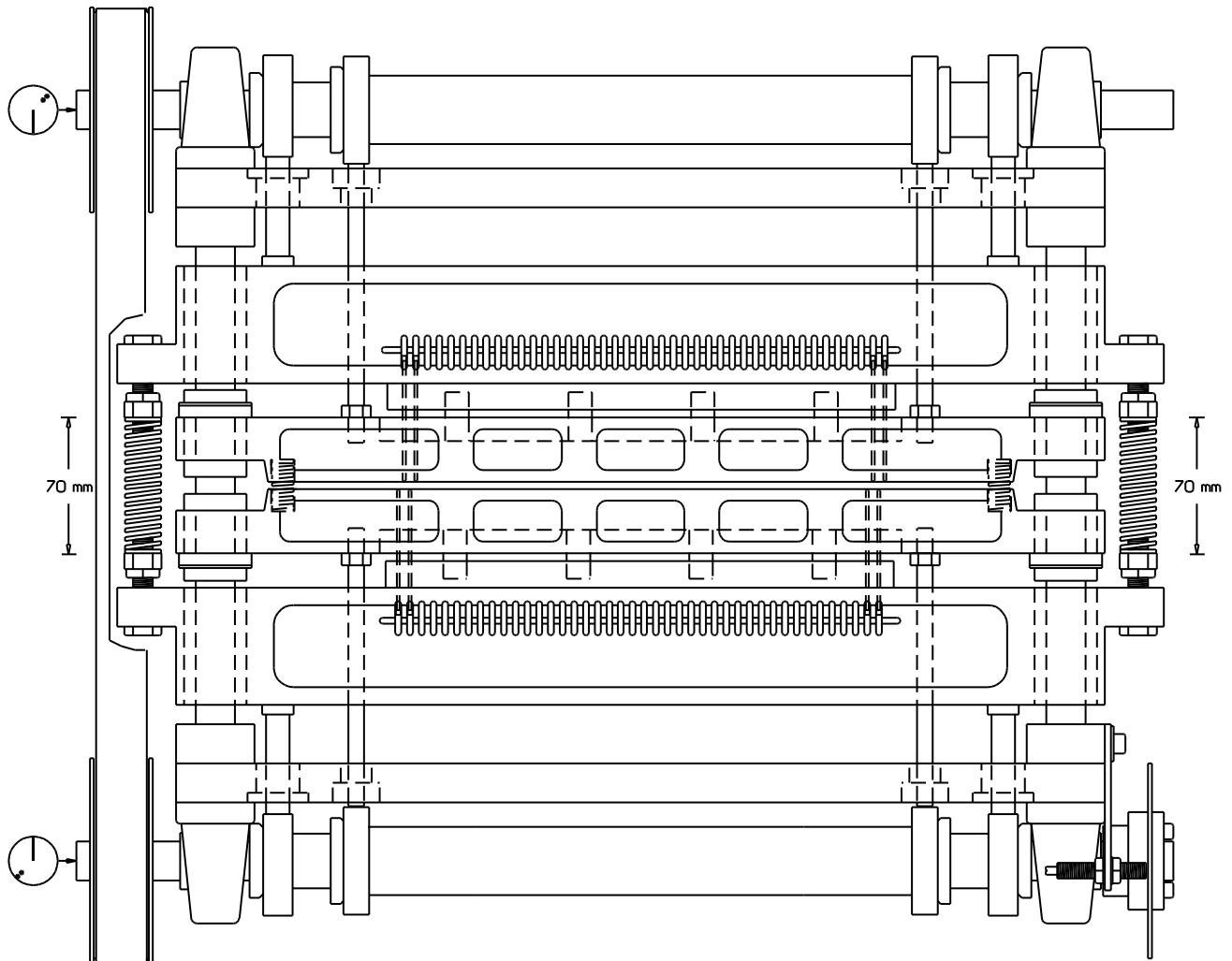
3.10   Eccentrics, Adjustment

After taking off the belt, it is necessary to align the eccentrics.

Put the belt back on, tighten it with the belt tightening wheel (2), and check that the marks at the end of the shafts (1) are pointing towards each other. See figure below.

If the marks are not aligned like on the figure, it might be necessary to move the belt a notch or two on one of the wheels.
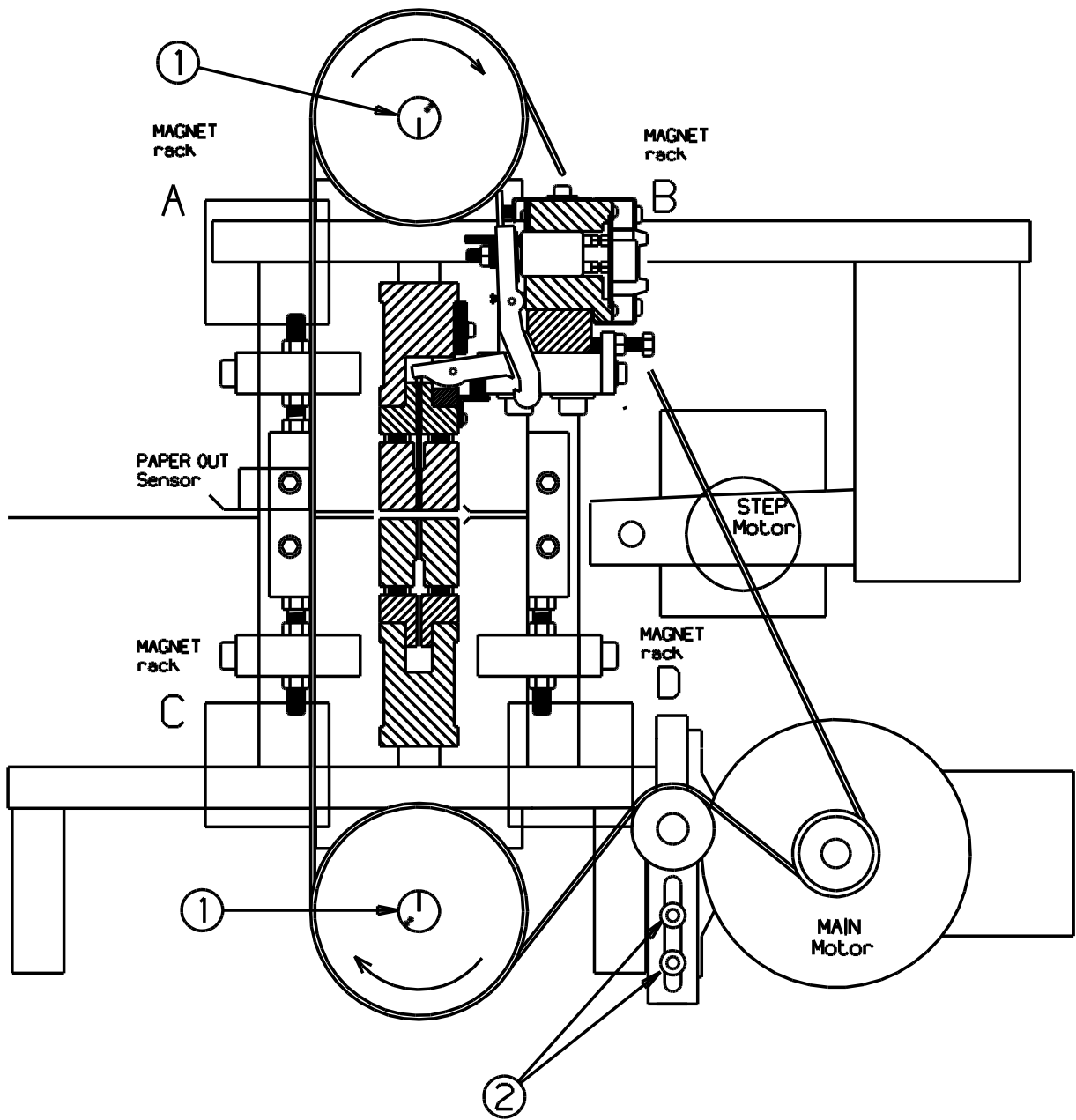
3.11 Paper Shoes, Adjustment

Place a sheet of paper between the paper shoes (P).
Turn the belt so the two points (6) at the end of the shafts (2) is pointing towards each other as shown on the figure below.

Lock the shafts in this position with a wrench, e.g. at the end of the shaft (2).
Loosen the locking nuts (1), adjust the push rods (3) by turning them. Adjust it against the inner eccentric bearing (4) until the paper shoes (P) have a light pressure on the paper.
Check that the gap (5) between the press plates and the beam above, is equal on both upper and lower units.
Secure the push rods (3) with the locking nuts (1).
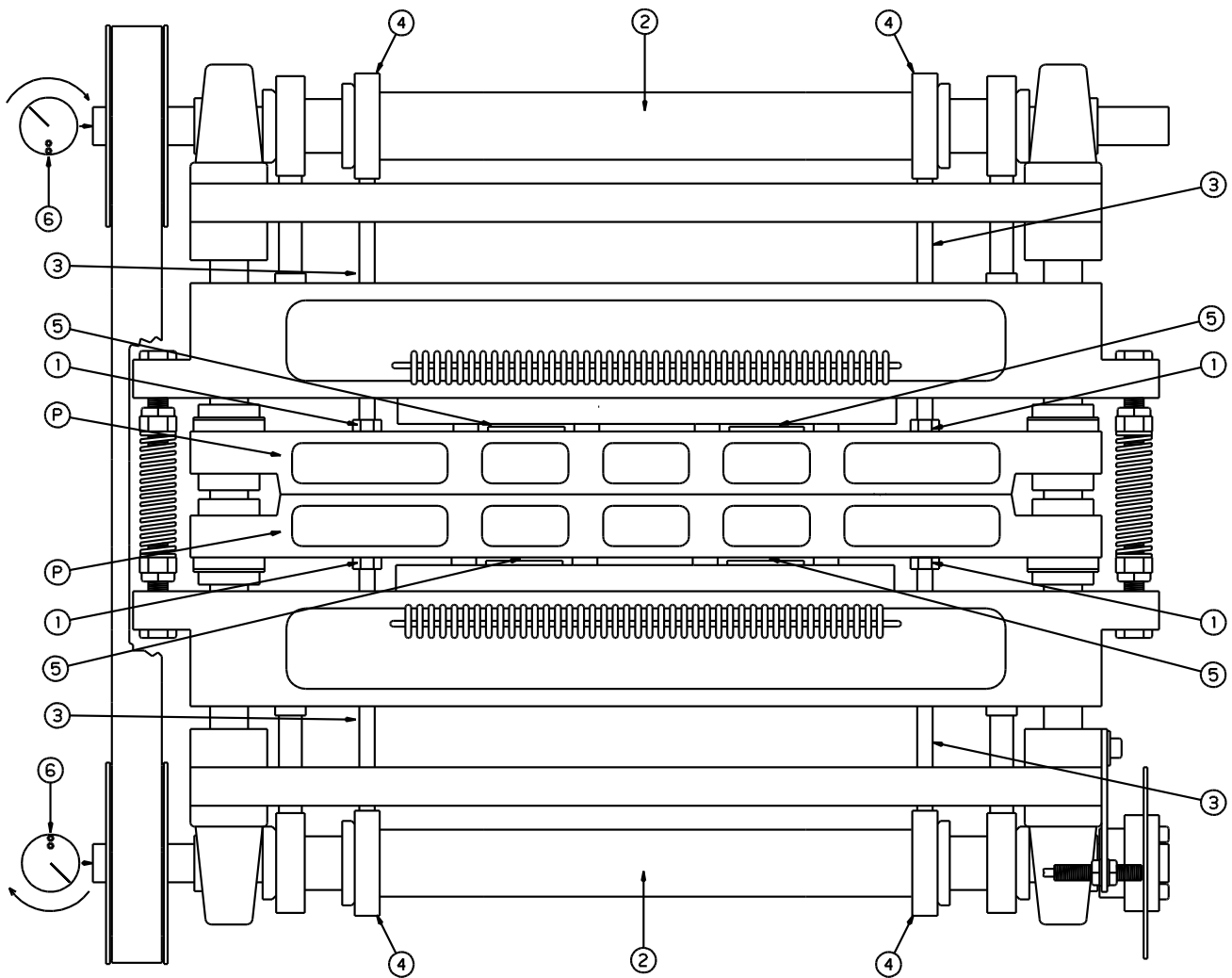
3.12 Main Sensor Wheel, Adjustment

Turn the belt, so the marks at the end of the shafts (D), is pointing towards each other, as shown on the figure below.
Loosen the screws (A), turn the sensor wheel (C), until the sensor (B) is situated in the middle of the open part of the sensor wheel. See figure below.

Shaft, Upper (D)

Shaft, Lower (D)
Sensor (B)
Main Sensor Wheel (C)
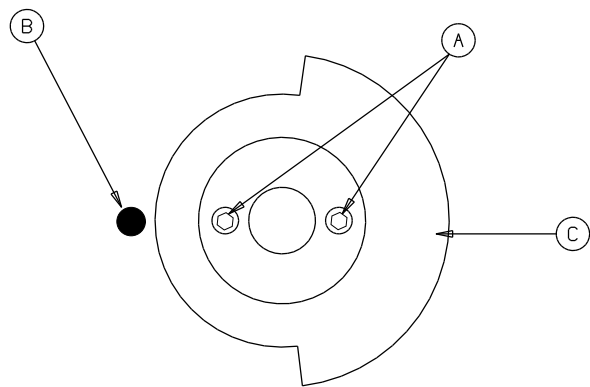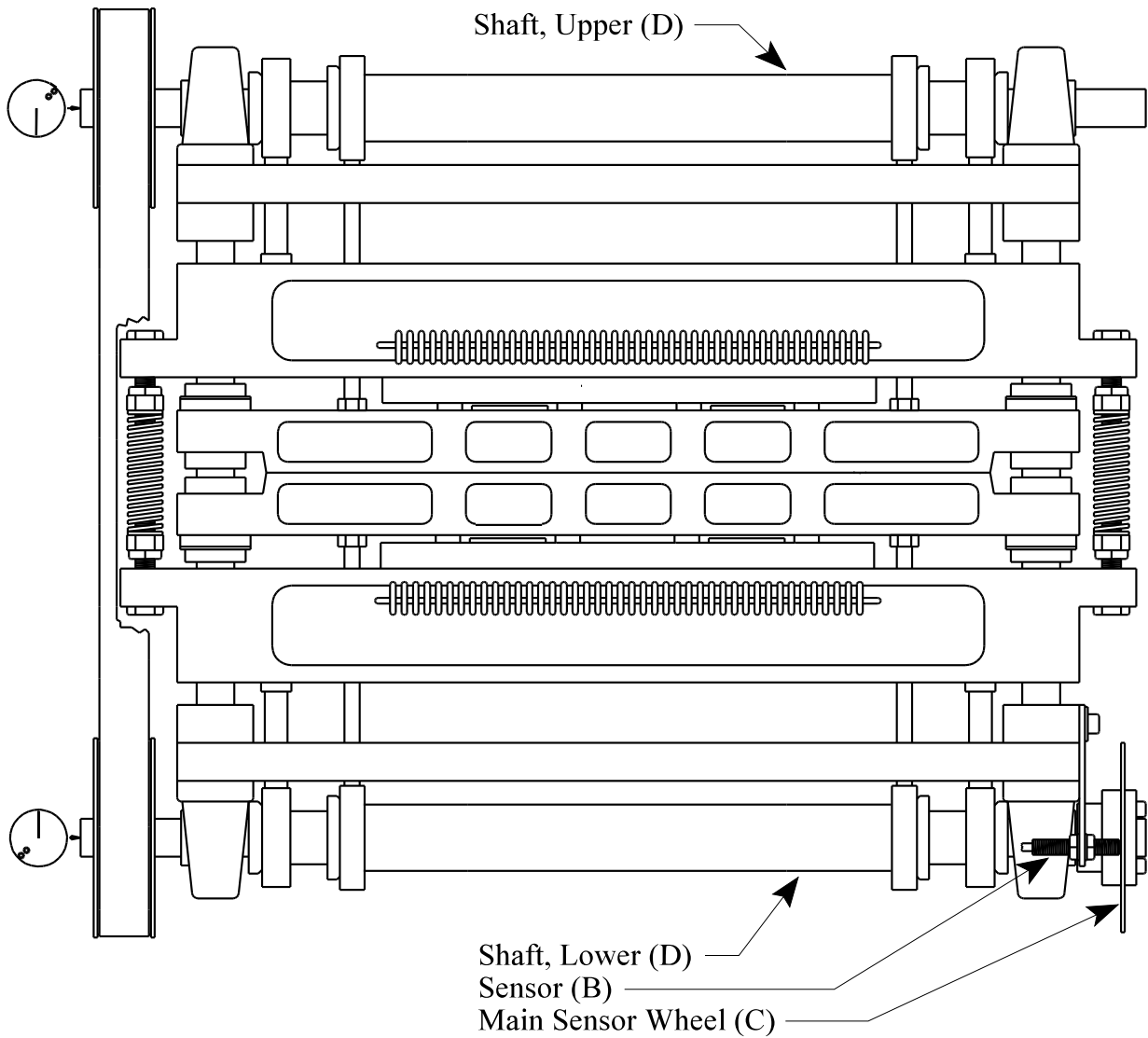
3.13 Paper Feed Mechanism, Adjustment

An adjustment on the relation between the top margin and the bottom margin on a page which is full of text, could be done like this:

Loosen the tractor feed shaft by unscrewing the two left-hand screws (B) on the sensor wheel.

Note ! Do not loosen the screws for the stepping motor shaft.

Now the tractor feed shaft can be turned forward or backward until the paper is in the wanted position.

Note ! The marks to indicate the positioning of the paper on the paper guide, will not be accurate after this adjustment.
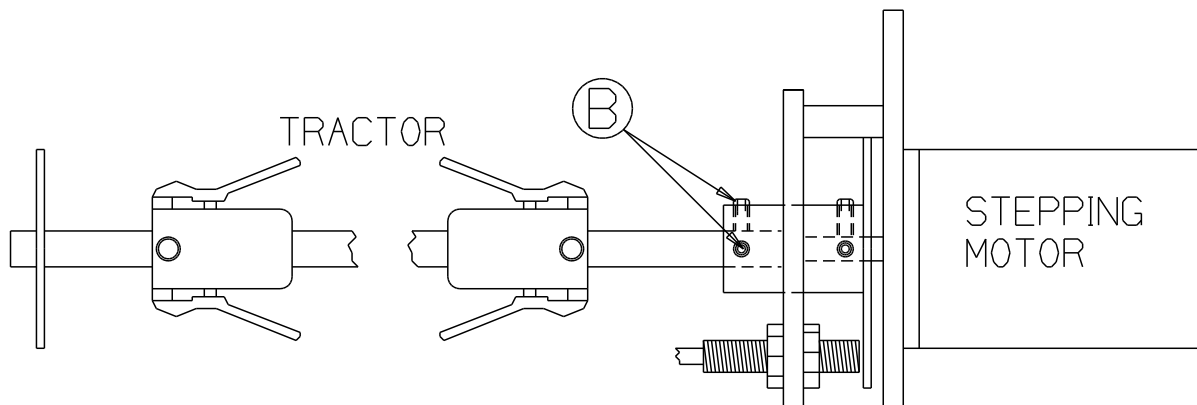
3.14 Inductive Sensors, Replacing and Adjusting

When replacing the sensors, the gap between the sensor wheel and the sensors can be maximum 0.6 mm.
See figure below.

Stepping Motor

Sensors

Max Gap 0.6 mm

Main Sensor Wheel
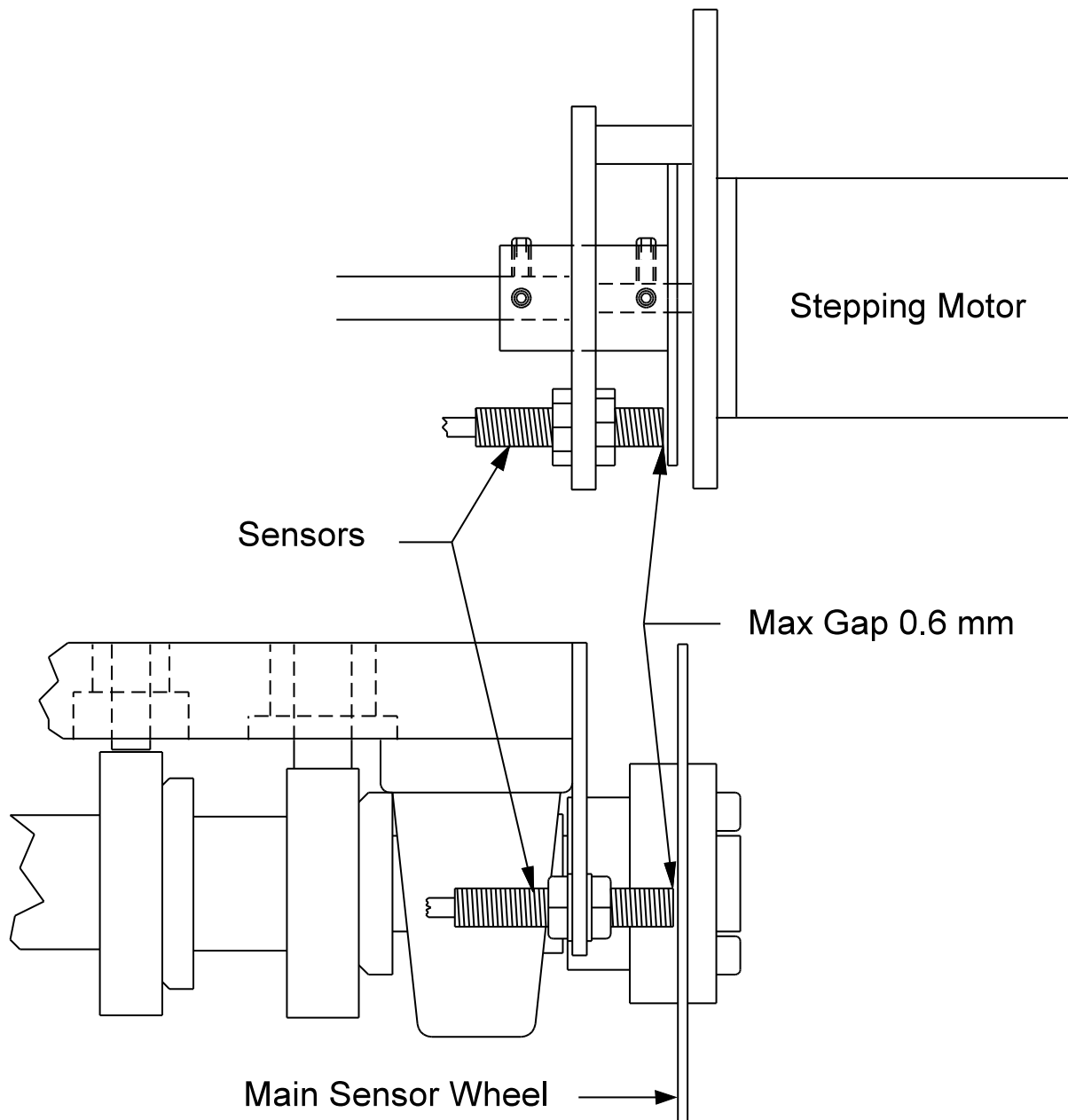
3.15 Paper Sensor, Replacing

The paper out sensor can be replaced like this: Take the paper guide with the sensor out of the Printer. To open the box, press the two fastening clips (G) simultaneously, and pull the box a little bit open at this end. Do the same at the other end, and pull the box open.

Replace the sensor.
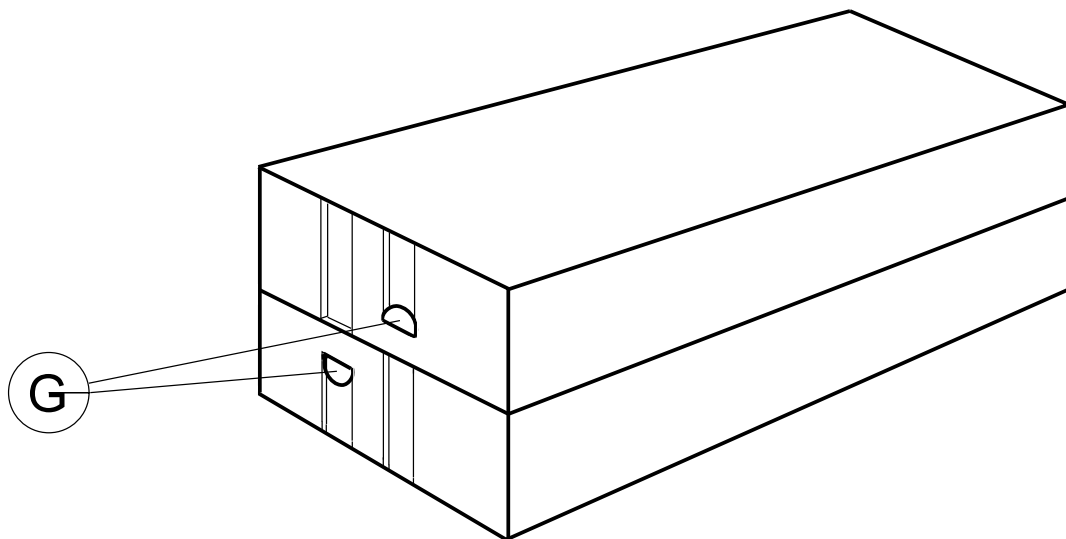
3.16 Maintenance

The printing of paper produces paper dust which stick to the mechanical parts of the printing mechanisms and to the paper guides. Depending on the paper type used, it is necessary to clean the Printer regularly with a vacuum cleaner, e.g. every 50.000 sheets.

Further, we recommend that at least once every year, the magnet racks are taken apart for more thoroughly cleaning. Disassembly the magnet racks as described on page 34, and the different parts should be wiped off with a cloth moisturized with alcohol. The most important areas: The surface on the piece of iron in the long pivot arm, the magnet poles, the surface on the long pivot arm which lay against the support list and the support list itself.

Lubrication of Printer.

Bearings   (1):   Lubricate (grease) after approx. 2000 hours, but: Lubricate if the Printer for some other reason is disassembled.
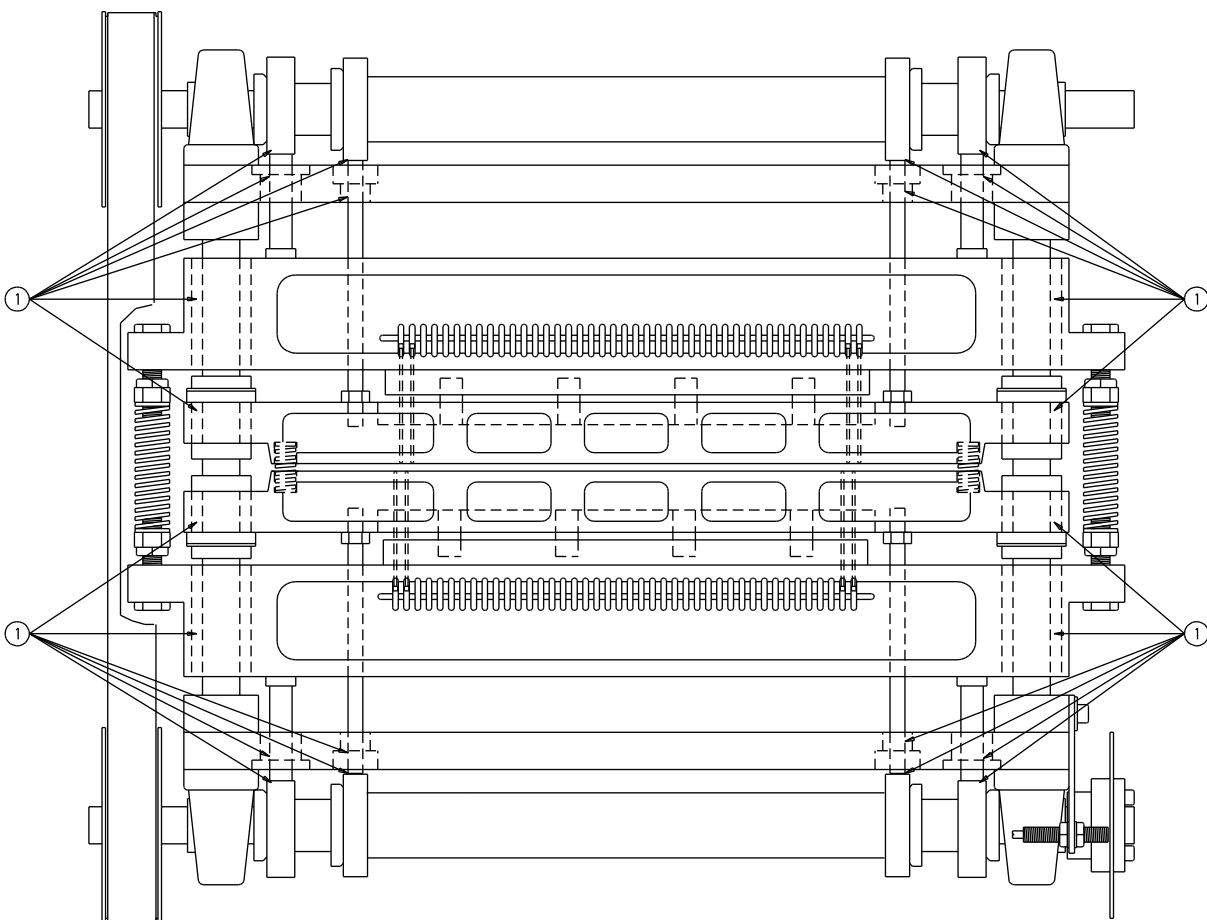
4.   SPAREPARTS

## 4.1   Sparepart List

See the figures on the next pages.

Pos. No	Name	Quantity
1	Frame, Upper	1
2	Beam, Upper	1
3	Short Pivot Arm Fastener	8
4	Shaft, Short Pivot Arm	8
5	Printing Pin	168
6	Rack, Printing Pins	2
7	Paper Shoe, Upper	1
8	Paper Out Sensor	1
9	Paper Guide In/Out	2
10	Paper Shoe, Lower	1
11	Pillar	4
12	Fastener, Magnet Rack	8
13	Beam, Lower	1
14	Columns	2
15	Frame, Lower	1
16	Pulley, Shaft	2
17	Support List, Magnet Rack	4
18	Sponge List, Magnet Rack	4
19	Magnet Rack	4
20	Magnet	168
21	Board, Magnet Rack	4
22	Shaft, Long Pivot Arm Magnet Rack	4
23	Guide List, Magnet Rack	4
24	Pivot Arm, Short, Beams	168
25	Pivot Arm, Long, Magnet Rack	168
26	Sponge List, Beam	4

27	Paper Guide Inner	1
28	Stepping Motor, Paper Feed	1
29	Paper Feed Tractor	1
30	Belt, Main 540L100	1
31	Belt Tightening Wheel	1
32	Pulley, Main Motor	1
33	Main Motor	1
34	Shaft, Upper/Lower	2
35	Bearing, Inner Eccentric	4
36	Pressure Spring, Paper Shoe	2
37	Bearing, Outer Eccentric	4
38	Bearing, Main, with housing	4
39	Push Rod, Paper Shoe	4
40	Piston	4
41	Stroke Ball Bearing, Paper Shoe	4
42	Pressure Spring, Adiprene	16
43	Stroke Ball Bearing, Beam	4
44	Return Spring	2
45	Stroke Ball Bearing, Push Rod	4
46	Stroke Ball Bearing, Piston	4
47	Main Sensor Wheel	1
48	Inductive Sensor	3
	Vibration Absorbers	9
	Belt, for Paper Feed Tractor	2
	Fan, Cover	2
	Motherboard	1
	Operating Panel	1
	Cable, Data Magnet Rack, set of four	1
	Cable, Power Magnet Rack, set of four	1

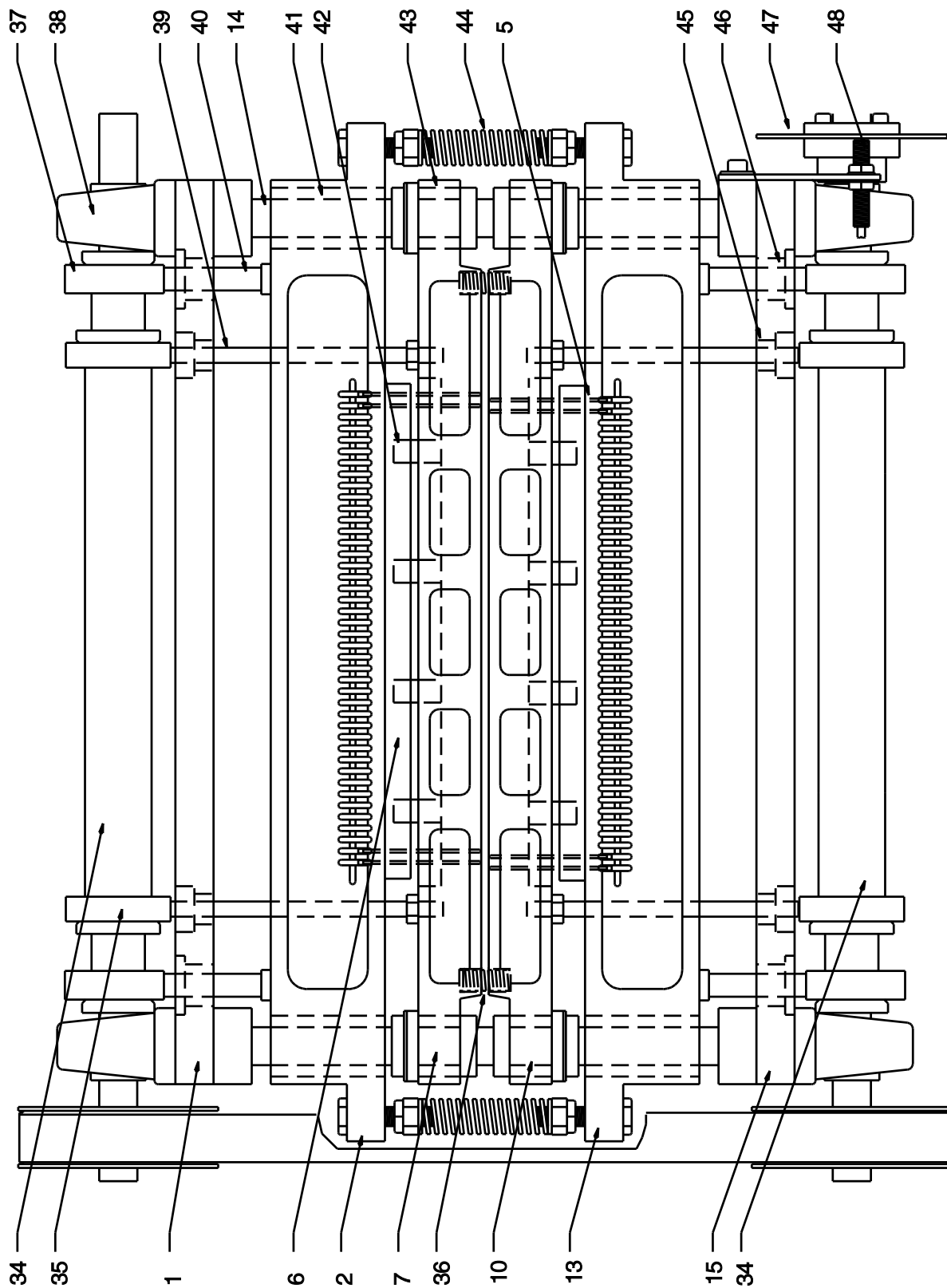|		
	Cable Mains	1
	Power Unit, Complete	1
	Fuse 10 AT 5 x 20 mm (Main fuses)	2
50	Fuse 3.15 AT 5 x 20 mm (Magnet Racks and Fan fuses)	5
	Fuse 2.5 AF 5 x 20 mm (Motherboard fuse)	1
	Fuse 1.25 AF 5 x 20 mm (Relay fuse)	1

4.2 Overview Spareparts, Side

See the list on the previous pages.
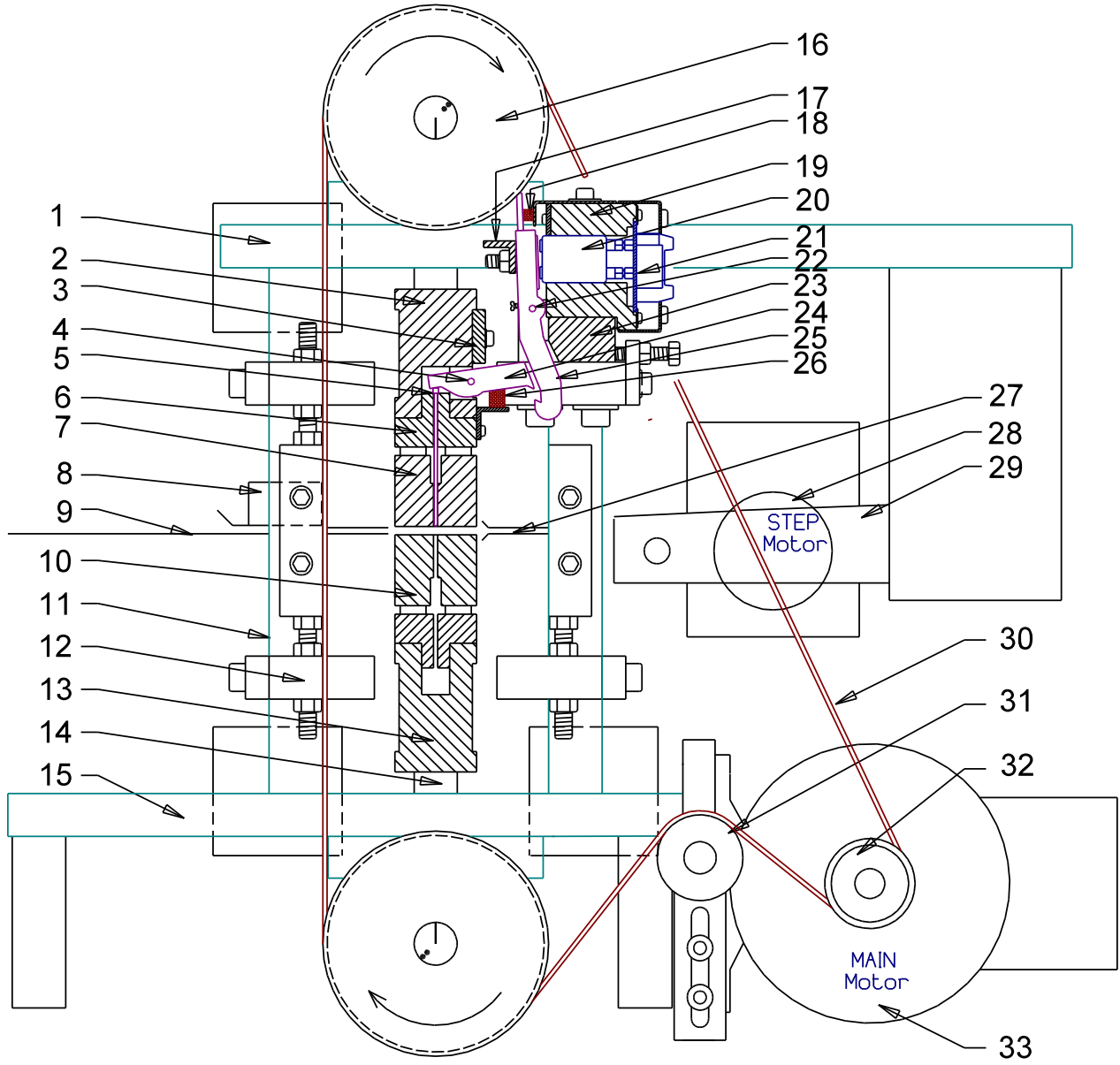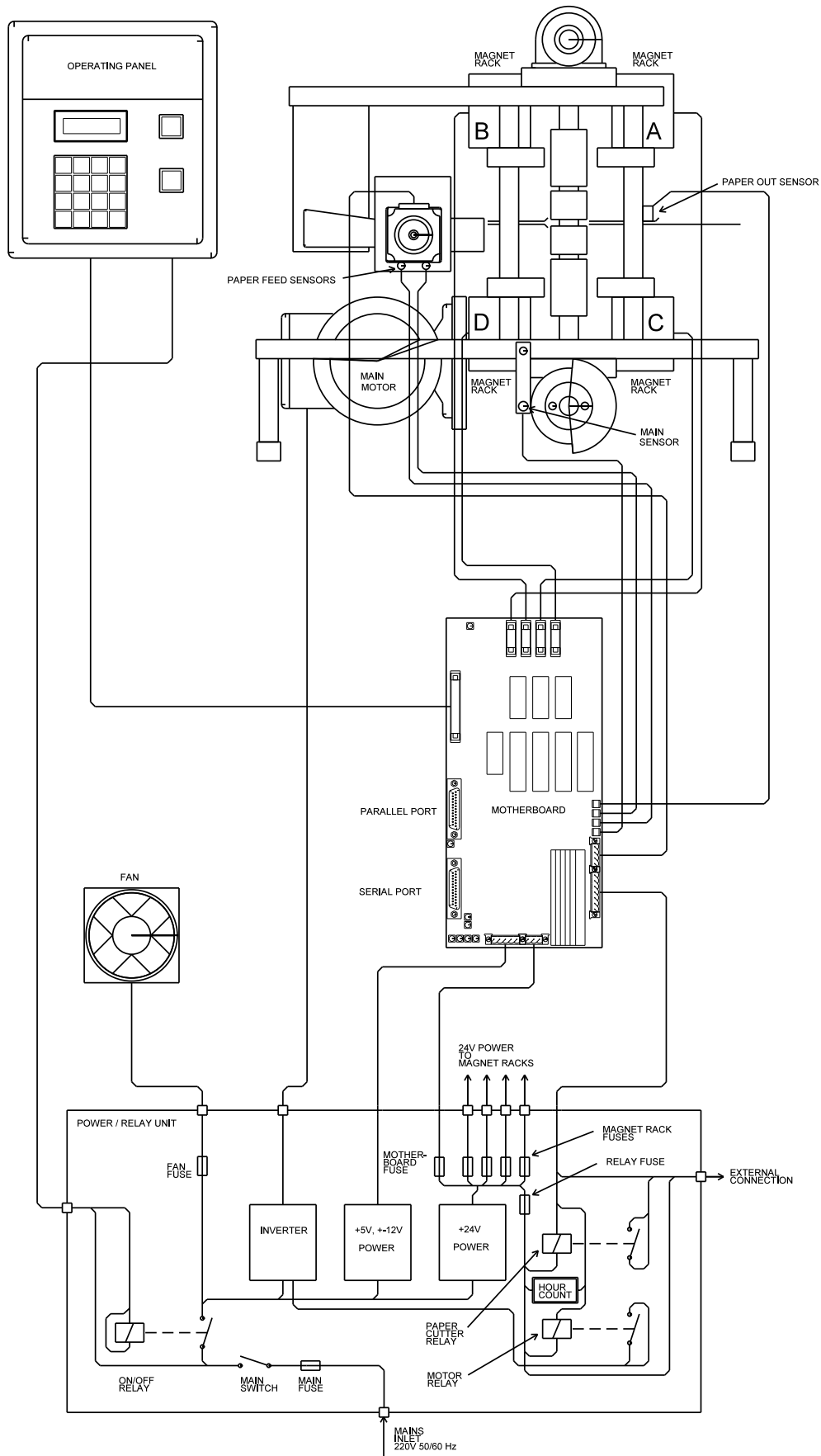
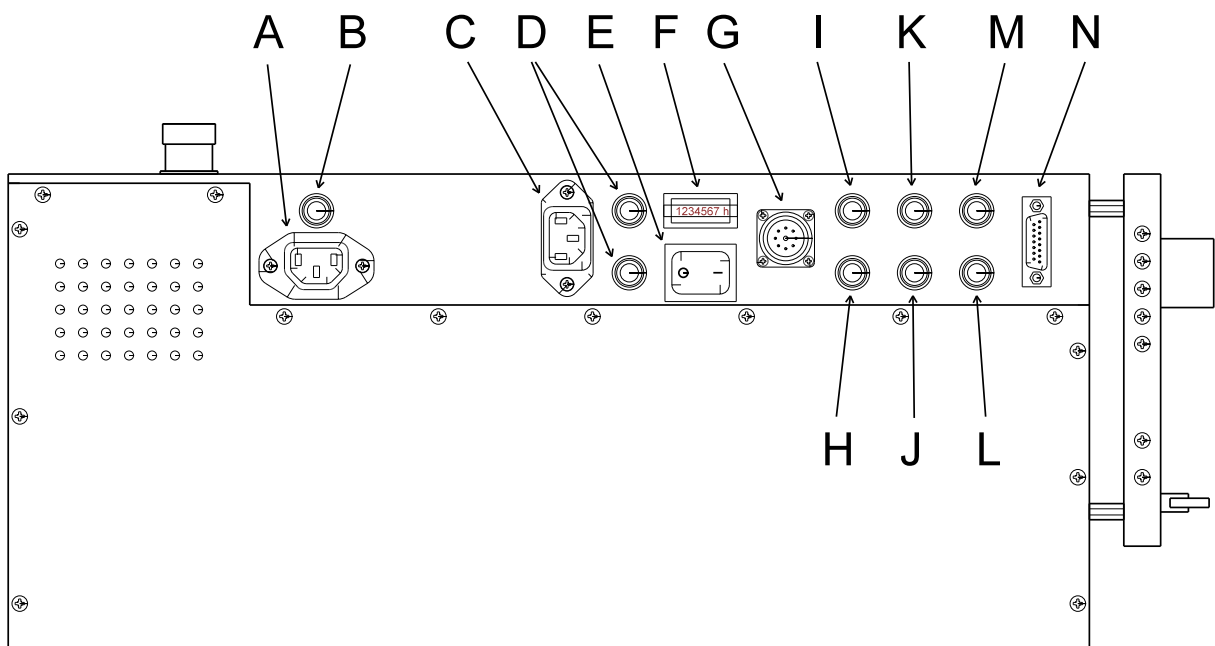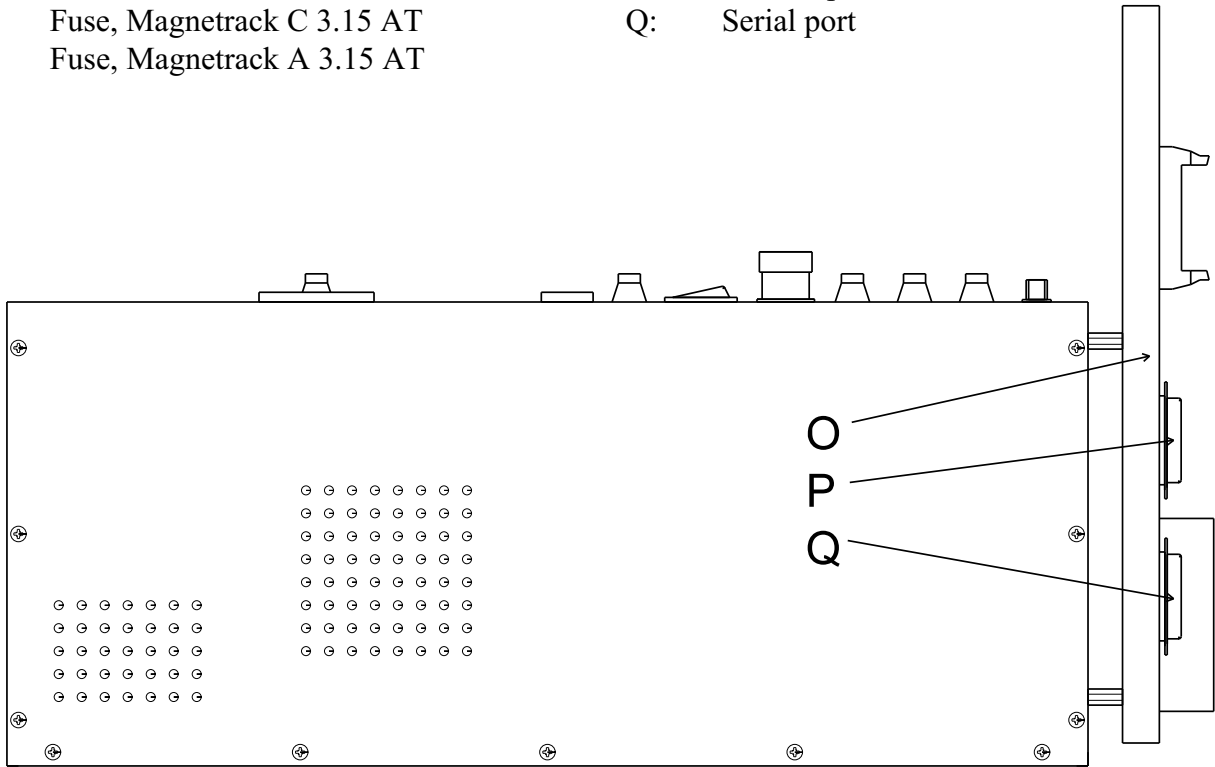## 4.3   Overview Spareparts, Front

See the list on the previous pages.

5.   TECHNICAL SPECIFICATIONS

5.1   Cable Connections, Fuses

5.2   Electric Unit

A: Fan Outlet
B: Fan Fuse 3.15 AT
C: Mains Inlet
D: Main Fuses 10 AT
E: Main Switch
F: Hour Counter
G: On/Off Switch Connector
H: Fuse, Magnetrack C 3.15 AT
I: Fuse, Magnetrack A 3.15 AT

J: Fuse, Magnetrack D 3.15 AT
K: Fuse, Magnetrack B 3.15 AT
L: Relay Fuse 1.25 AF
M: Motherboard Fuse 2.5 AF
N: External Connector
O: Motherboard
P: Parallel port
Q: Serial port

5.3   Motherboard

A: LED, 24 V
B: LED,   5 V
C: LED, -12 V
D: LED, +12 V
E: LED, -12 V Serial port
F: LED, +12 V Serial port
G: Serial port
H: LED, 5 V Parallel port
I: Parallel port
J: Connector, Operator Panel

K: LED, 5 V Magnet racks
L: Connectors, Magnet racks
M: EPROM socket
N: Connector, Paper Out sensor
O: Connector, Paper Feed sensors
P: Connector, Main sensor
Q: Connector, Stepping Motor
R: Connector, Relays
S: Power supply input
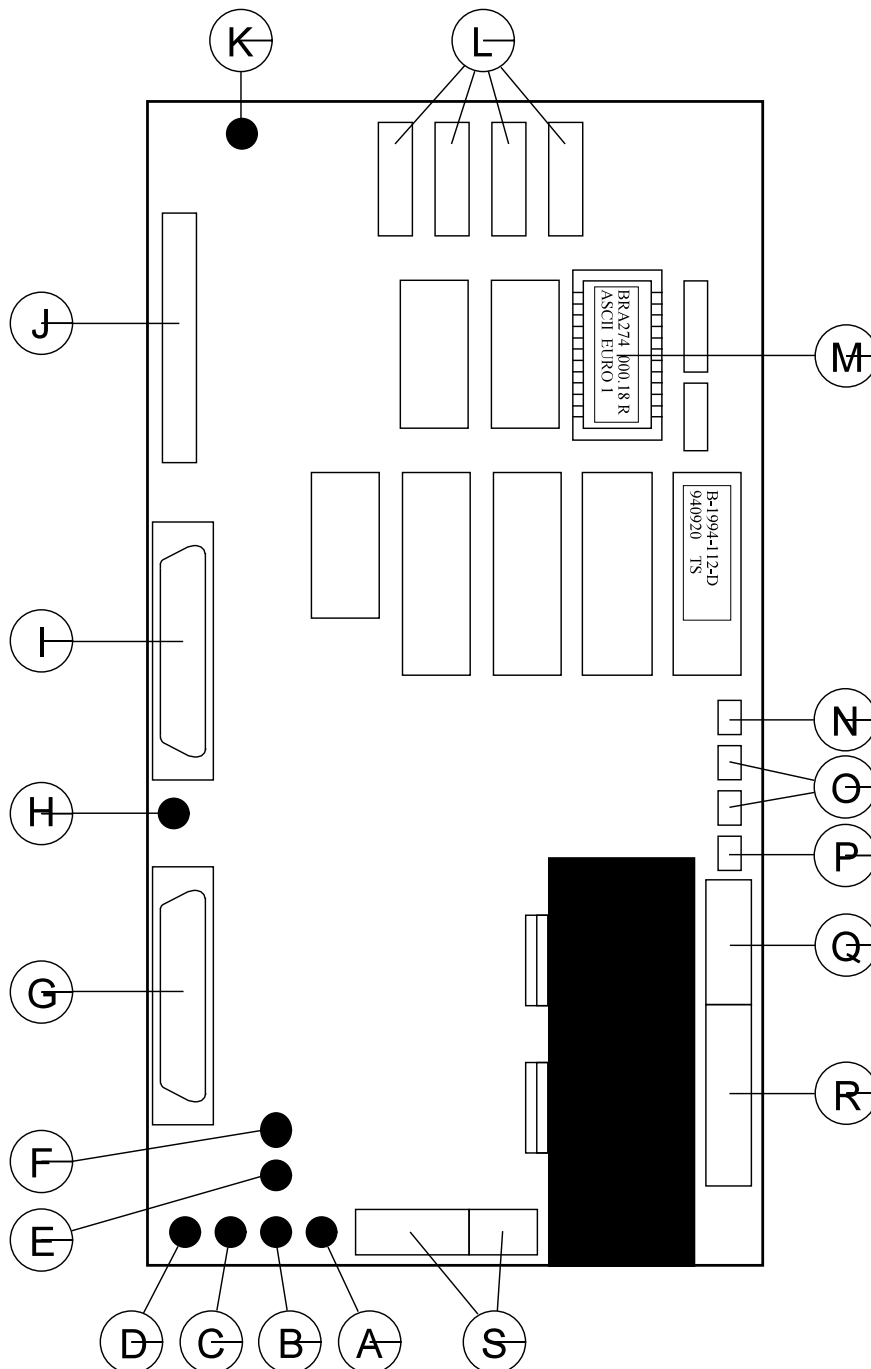
5.4   Pin Configuration Serial and Parallel Port

Data transmission from the computer to the Printer can be done in two ways, either serial or parallel. The serial goes through an RS 232 C interface, and the parallel is using a Centronics compatible interface. Both connectors are of the 25 pin D-sub type.

Pin configuration 25 pin male D-sub contact RS 232 C (serial port):

Pin no. 1	FG	Frame Ground	
Pin no. 2	Tx	Transmit data	Output
Pin no. 3	Rx	Receive data	Input
Pin no. 4	RTS	Request to send	Output
Pin no. 5	CTS	Clear to send	Input
Pin no. 6	DSR	Data set ready	Input
Pin no. 7	GND	Signal Ground	
Pin no. 8	DCD	Data carrier detect	Input
Pin no. 9	PU	+ 12V (Logic high)	Output
Pin no. 20	DTR	Data terminal ready	Output

The Printer is only using pin no. 4 (RTS) as a control signal. When this is set to logic low (from the Printer), the computer must stop sending text immediately. Pin no. 2 (Tx) is used to transmit XON/XOFF control signals to the computer. The text sent to the Printer is received through pin no. 3 (Rx). All other outputs from the Printer are set to logic high.

Pin configuration 25 pin female D-sub contact (parallel port):

Pin no. 1	Strobe	Input	Active low
Pin no. 2	Data 0	Input	
Pin no. 3	Data 1	Input	
Pin no. 4	Data 2	Input	
Pin no. 5	Data 3	Input	
Pin no. 6	Data 4	Input	
Pin no. 7	Data 5	Input	
Pin no. 8	Data 6	Input	
Pin no. 9	Data 7	Input	
Pin no. 10	Acknowledge	Output	Active low
Pin no. 11	Busy	Output	
Pin no. 12	Paper out	Output	
Pin no. 13	Select	Output	
Pin no. 14	Not in use		
Pin no. 15	Error	Output	
Pin no. 16	Not in use		
Pin no. 17	Frame Ground		
Pin no. 18	Signal Ground		
Pin no. 19	Signal Ground		
Pin no. 20	Signal Ground		
Pin no. 21	Signal Ground		
Pin no. 22	Signal Ground		
Pin no. 23	Signal Ground		
Pin no. 24	Signal Ground		
Pin no. 25	Signal Ground		

Wiring diagram for the enclosed serial cable

Standard RS 232 C cable, 25-25 pin:

25 pin female		25 pin female	
1	FG	FG	1
2	TD	RD	3
3	RD	TD	2
4	RTS	CTS, DSR	5,6
5,6	CTS, DSR	RTS	4
7	SG	SG	7
8	DCD	DTR	20
20	DTR	DCD	8

Wiring diagram for the serial cable with 9 pins adaptor:

Standard RS 232 C cable, 9-25 pin:

9 pin female		25 pin female	
1	DCD	DTR	20
2	RD	TD	2
3	TD	RD	3
4	DTR	DCD	8
5	SG	SG	7
6,8	CTS, DSR	RTS	4
7	RTS	CTS, DSR	5,6

5.5   Pin Configuration External Connection

Pin no. 1	Ground 24 V (for Braillo Paper Stacker only)
Pin no. 2	24 V (for Braillo Paper Stacker only)
Pin no. 3	Not in use
Pin no. 4	Relay contact for syncronisation to paper cutter
Pin no. 5	Relay contact for syncronisation to paper cutter
Pin no. 6	Opto coupler output for paper cutter, Base
Pin no. 7	Opto coupler output for paper cutter, Collector
Pin no. 8	Opto coupler output for paper cutter, Emitter
Pin no. 9	Not in use
Pin no. 10	Not in use
Pin no. 11	Not in use
Pin no. 12	Not in use
Pin no. 13	Not in use
Pin no. 14	Ground 5 V
Pin no. 15	Alarm input (for Braillo Paper Stacker only)

5.6 Technical Specifications

Format:

Chars per line:	10-42 chars.
Sheet length:	4-14 inches
Paper width:	140-330 mm
Page layout:	Normal/Z-Fold
Page 1:	Up/Down
Printing Type:	Single/Double
Line Spacing:	Adjustable, Single/Double
Dot:	6/8
Page Length:	No Form Feed/Normal/Normal-1 to -9
Braille cell:	Standard medium 6 or 8 dot.
Paper Weight:	120 - 180 g/m², Recommended 150 g/m²

Printing Speed: 200 characters per second, Approx. 600 printed pages per hour.

Electrical:

Voltage:	Single phase 220V (+/- 10 %), 50/60Hz
Current:	Approx. 5 A max
Main Fuse:	10 AT
Power:	Approx. 1000 W max

Communication with the computer:
Parallel on Centronics (25 pin D-sub female), or
Serial on RS 232 C (25 pin D-sub male).
Both are electrical isolated with opto-couplers to prevent noise and ground loops.

Parameters for the serial port:

Baud rate:	150-19200
Parity:	No/Odd/Even
Data bit:	7/8
Stop bit:	1/2

Environment:

Temperatures:	15-30°C (60-86°F)
Rel. Humidity:	40-60%

Measurements: **Patents:**

Measurements:		Patents:	
Height:	580 mm	Norway	no. 140335
Width:	670 mm	Great Britain	no. 2040231
Length:	875 mm	USA	no. 4261663
Weight:	145 Kg	Germany	no. DE 2850780 C22

5.7   Addresses and Phone Numbers

Administration/Sales department Braillo Norway AS:

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