CX-one

CLEARjet Printer

CX-one Programmers Manual

V1.3

Acknowledgements

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1 Introduction

The CLEARjet printers are controlled using a special command language based on ASCII characters. This command set allows using of all features and options of CLEARjet printers.

The CX-one printer provides an USB- and two RS 232-Interfaces for communication.

A printer driver for Windows Operating Systems is available.

The CLEARjet “ESCAPE” sequences can be used directly to control the CX-one printer from computers with different or no Operating Systems.

You can find descriptions of interface-connectors, settings for interface parameters and instructions for operation in the User Manual and OEM Manual.

1.1 Serial Interfaces

The CX-one printer provides 3 Interfaces for communication:

USB	for printer controlling functions
RS 232 - Host	for printer controlling functions
RS 232 - Chip	for communication with optional chip interfaces

In general USB and RS 232 - Host interfaces can be used arbitrary.
Command execution is identical, independent of the used Interface.

Note: Use only one interface (USB or RS 232 - Host) to send printer-commands or data.
Concurrent use of both interfaces is not allowed (the printer will mix commands received from USB and RS 232 - Host and generate unpredictable results)!

We recommend to use the CLEARjet Active CX SDK for easy generation of customer specific application programs.

CLEARjet Active CX SDK includes all functions for encoding of MAG-stripe cards and smart cards, printing of all Windows fonts, photos and graphics. In addition numerous control functions to perform all other device functionality are included as well.

1.1.1 Operating RS 232 - Interface

A correct serial communication between Host and printer is only granted by using serial interface cables including RTS / CTS Hardware-handshake and a handshake-operating Host computer.

Note: While the printer is processing (printing / erasing) the handshake is active. The printer won't be able to respond to brief status requests.

Communication activity at the USB interface will also cause activation of the RS 232 - Handshake.

1.2 Status Request (Polling)

The minimum delay for a brief status response aggregates to 10 ms. Any further brief status request within this delay is ignored.

Recommended delay between status commands: min. 100 ms

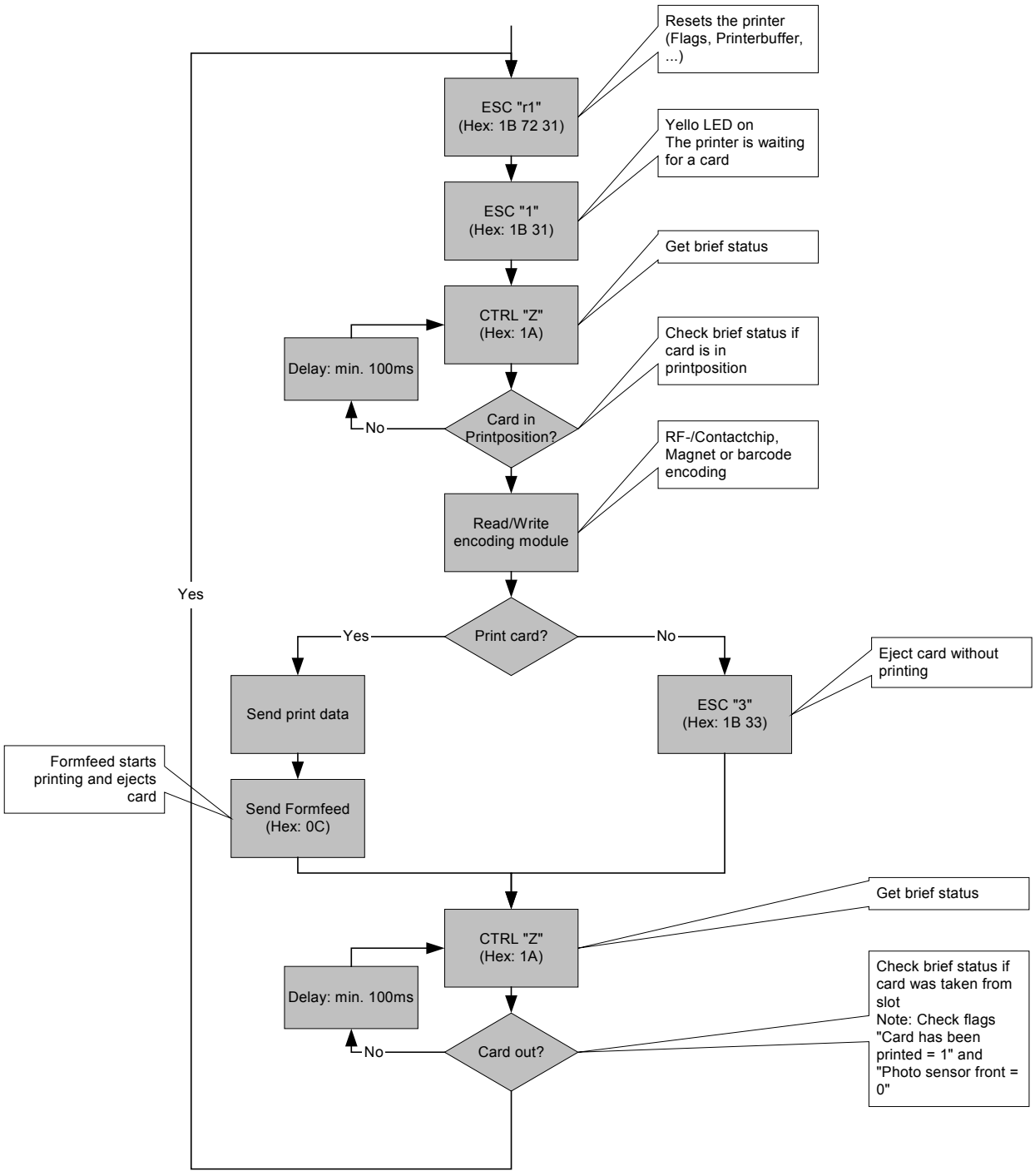
Note: Shorter delays may cause loss of data or malfunction.

1.3 CX-one Operation

The following operations are used for a typical card-cycle:

enable printer command ⇒ the printer is ready to take a card
insert a card ⇒ printer moves card to the chip-reader position
data transaction to the chip
Host transmits print-data to the printer
erase- and print cycle is processed
printer ejects card

This illustration shows a typical command sequence for a print cycle:



The following source code (C++) shows a typical sequence using CLEARjet Active CX SDK:

Print a label to the card:

```
// Define a variable for the status of transport the commands
long lRet = 0;

// Select the font size with wich you want to print
lRet += m_ctrlCXone.SelectFontSize( 3 ); // See printer manual
for fontsize parameter

// Set coordinates of the first textline
lRet += m_ctrlCXone.PrintPosX( 20 );
lRet += m_ctrlCXone.PrintPosY( 850 );

// Print first line
lRet += m_ctrlCXone.PrintText( "Phone", false ); // "false"
indicates that more lines follow

// Set coordinates of the second textline
lRet += m_ctrlCXone.PrintPosX( 40 );
lRet += m_ctrlCXone.PrintPosY( 650 );

// Print second line second part
lRet += m_ctrlCXone.PrintText( "Fax", true ); // "true"
indicates that no more lines follow

// Now the printer starts printing on the card

// Check if any command does not work
if( lRet )
{
    // General transport error of the command
    MessageBox( "Can't send the command", "Error" );
    return;
}
```

1.4 Use of CX-one Printer Driver

Follow the CX-one Setup Instructions for Printer Driver to correctly install the printer driver and/or USB driver.

In general the printer driver is designed to operate as a standard driver for Windows operating systems. The CLEARjet printer driver is a plain printer driver for executing of print-jobs only.
It includes no additional functions like MAG-Encoding, Chip-reading etc.

We recommend to use the CLEARjet Active CX SDK for easy generation of customer specific application programs.

CLEARjet Active CX SDK includes all functions for encoding of magstripe cards and smart cards, printing of all Windows fonts, photos and graphics. In addition numerous control functions to perform all other device functionality are included as well.

Nevertheless, under certain conditions the printer driver can work in combination with additional control software.

1.4.1 General procedure to combine driver and control functions

To allow mixing of control functions and Windows driver and to avoid data mismatch pay attention to the following points:

1. In most applications the first step is encoding of data media (MAG-stripe, Chip, RF-Chip…).
   Please use only tested functions of the appropriate ESC-command set in combination with the Windows driver (see chapter 1.4.3)
2. Make sure that this processes are finished completely before starting the Windows driver job. Be careful: The printer may need different execution time depending on used function-type.
3. Start the Windows printer job
4. The Windows Operating System needs several time to really transmit the data to the printer (via USB or RS 232 - Port).
   To prevent data mismatch the application software must wait after starting the printer driver until the data are really sent to the printer!
5. Execute commands for the next card job or status requests only if the print-job has been finished before.

Note: Use only one interface (USB or RS 232 - Host) to send printer-commands or data.
Concurrent use of both interfaces is not allowed (the printer will mix commands received from USB and RS 232 - Host and generate unpredictable results)!

1.4.2 Sample Program

Use this or a similar program to proceed after printing (if the Windows driver was used).

The following steps must be executed for requesting the printer status:

1. Create a handle of the printer with the function "OpenPrinter".
2. Check existing print jobs for the CLEARjet printer with the function "EnumJobs"
3. This function returns the count of existing print jobs in the queue.
4. If the return value is "0" execution of printer commands (e.g. status requests) is allowed.

```
Sample code:
============
HANDLE hPrinter;
// Open printer
if (OpenPrinter ("CX-one", &hPrinter, NULL))
{
while (true)
{
DWORD dwNeeded = 0;
DWORD dwReturned = 0;
// is there a printjob in the queue
if (EnumJobs (hPrinter, 0, 1, 1, NULL, 0, &dwNeeded,
&dwReturned))
{
// one or more jobs
if (dwNeeded == 0)
break;
else
Sleep (200);
}
}
// close printer
ClosePrinter (hPrinter);
// wait for data send via usb
Sleep (200);
}
************************************************************
```

1.4.3 List of tested functions which can be used prior to Windows driver execution

The correct function of the Windows driver in combination with the ESC-commands listed below is tested carefully.
Use of commands not listed is not recommended and may cause unpredictable results.

Command	Parameter	Description
<ESC>1	-	Enable printer
<ESC>2	-	Disable printer
<ESC>i	[c]	Set printer resolution
<ESC>Q	[n]	Disable eraser roller heating
<ESC>%L	[n]	Disable erase roller heating permanent
<ESC>P	-	Paperticket mode
<ESC>%O	[n]	Read counters and S/N
<SUB>	-	Brief status
<ESC>A	[n]	Printhead status
<ESC>a	-	Firmware code
<ESC>$E	-	ERROR code
<ESC>x	[nn]	Print position x-coordinate
<ESC>y	[nnn]	Print position y-coordinate
<ESC>d	[nnn] [mmm]	Limit print area
<ESC>e	[nnn] [mmm]	Limit erase area
<ESC>%p	-	Get print area
<ESC>%l	-	Get erase area
<ESC>o	[c] [nnn]	Shift print area
<ESC>j	[hh]	Microstep forward
<ESC>k	[hh]	Microstep backward
<ESC>8	-	Auxiliary mode ON
<ESC>7PRINTER	-	Auxiliary mode OFF
<ESC>6	-	Transparent mode ON
<ESC>7PRINTER	-	Transparent mode OFF
<ESC>c	-	Get card from hopper
<ESC>#	-	Read direction detector
<ESC>%b	-	Read barcode
<ESC>$Mr1	[n]	Read magnetcode ISO
<ESC>$Mr2	[n]	Read magnetcode JIS I
<ESC>$Mr31		Read magnetcode JIS II
<ESC>$Mw1	[n][mmm]{DATA}	Write magnetcode ISO
<ESC>$Mw2	[n][mmm]{DATA}	Write magnetcode JIS I
<ESC>$Mw31	[mmm]{DATA}	Write magnetcode JIS II
<ESC>$m	[n]	Auto read

If you need functions not listed in this table please use the CLEARjet Active CX SDK.

CLEARjet Active CX SDK includes all functions for encoding of magstripe cards and smart cards, printing of all Windows fonts, photos and graphics. In addition numerous control functions to perform all other device functionality are included as well.

2 CX-one command description

2.1 Used conventions for command description

To describe functions and commands the following conventions are used in this manual:

CMD	Indicates a printer-command
{DATA}	Indicates data to or from printer device
[n,m,o]	numerical parameters (num. ASCII char.)
[c]	parameter (ASCII char.)
[h]	hexadecimal Parameter
[nn\mm]	selectable parameter. Two or more elements can be selected
< >	Brackets indicates a control character

Example:

<ESC>CMD[nn] [mmm]

This example shows the structure of a command (CMD) with 2 char. parameter [nn] and 3 char. parameter [mmm]

2.2 Command overview

General control commands			
Command	**Parameter**	**Description**	**Page**
<ESC>1	-	Enable printer	15
<ESC>2	-	Disable printer	15
<ESC>3	-	Return card	15
<ESC>$Op	[c] [nnn]	Printenergy offset	16
<ESC>$Ol	[c] [nnn]	Erase temperatur offset	16
<ESC>i	[c]	Set printer resolution	17
<ESC>Q	[n]	Disable eraser roller heating	17
<ESC>%L	[n]	Disable erase roller heating permanent	18
<ESC>P	-	Paperticket mode	18
<ESC>$p	[n]	Move-in erase	19
<ESC>MS	-	Save bitram	19
<ESC>MR	-	Restore bitram	19
<ESC>Ms	-	Save parameter	20
<ESC>Mr	-	Restore parameter	20
<ESC>Ml	[nn]	Read parameter from EEPROM	20
<ESC>Mm	[nn]	Read parameter from RAM	21
<ESC>$Oc	-	Restore factory settings	21
<ESC>r	[n]	Reset	22
<ESC>$R	-	Reboot	22
<ESC>%O	[n]	Read counters and S/N	22

Printer status commands			
Command	**Parameter**	**Description**	**Page**
<SUB>	-	Brief status	23
<ESC>A	[n]	Printhead status	24
<ESC>a	-	Firmware code	24
<ESC>$E	-	ERROR code	25

Character and Font Commands			
Command	**Parameter**	**Description**	**Page**
<ESC>C	-	Select Font 3 (small)	27
<ESC>D	-	Select Font 2 (medium)	27
<ESC>E	-	Select Font 1 (large)	27
<ESC>h	[n] [m]	Get charactersize	27
<ESC>b	[n]	Print double-width character	28
<ESC>w	[n]	Print double-height character	28

Print – and erase Commands			
Command	**Parameter**	**Description**	**Page**
{DATA}<FF>	-	Start printing	29
<ESC>x	[nn]	Print position x-coordinate	29
<ESC>y	[nnn]	Print position y-coordinate	30
<ESC>d	[nnn] [mmm]	Limit print area	30
<ESC>e	[nnn] [mmm]	Limit erase area	31
<ESC>%p	-	Get print area	31
<ESC>$a	[l][mm][nnn][oo][ppp]	Partial erase	32
<ESC>%l	-	Get erase area	33
<ESC>o	[c] [nnn]	Shift print area	33
<ESC>T	-	Rotate print image 180°	33
<ESC>U	-	Reset 180° rotation	34
<ESC>O	-	Rotate print image 90° vertical	34
<ESC>N	-	Reset 90° rotation	35
<ESC>u	[n]{DATA}<CR>	Print format, right aligned	35
<ESC>G	[b] {DATA}	Send graphic data	36
<ESC>$G	[b] {DATA}	Send greyscale graphic data	37
<ESC>J	[h]	Micro line feed	37

Card transport commands			
Command	**Parameter**	**Description**	**Page**
<ESC>F	-	Start motor forward	38
<ESC>B	-	Start motor backward	38
<ESC>S	-	Stop motor	38
<ESC>j	[hh]	Microstep forward	38
<ESC>k	[hh]	Microstep backward	38

Special commands			
Command	**Parameter**	**Description**	**Page**
<ESC>8	-	Auxiliary mode ON	39
<ESC>7PRINTER	-	Auxiliary mode OFF	39
<ESC>6	-	Transparent mode ON	40
<ESC>7PRINTER	-	Transparent mode OFF	40
<ESC>c	-	Get card from hopper	41
<ESC>%h	-	Eject card on backside	41
<ESC>Y	-	Capture card	41
<ESC>#	-	Read direction detector	41

Barcode Encoding			
Command	**Parameter**	**Description**	**Page**
<ESC>z	[n]{DATA}<CR>	Print barcode	42
<ESC>$b	[n]	Mirror barcode	42
<ESC>%b	-	Read Barcode	42
<ESC>%z	[n]	Print barcode with double width	43

Magnet encoding			
Command	**Parameter**	**Description**	**Page**
<ESC>$Mr1	[n]	Read magnetcode ISO	44
<ESC>$Mr2	[n]	Read magnetcode JIS I	44
<ESC>$Mr31		Read magnetcode JIS II	45
<ESC>$Mw1	[n][mmm]{DATA}	Write magnetcode ISO	45
<ESC>$Mw2	[n][mmm]{DATA}	Write magnetcode JIS I	46
<ESC>$Mw31	[mmm]{DATA}	Write magnetcode JIS II	46
<ESC>$m	[n]	Auto read	47
<ESC>$w	[n]	Auto eject after write	47

2.3 Detailed command descriptions

2.3.1 General control commands

Enable printer	<ESC>1

Description	Enables the printer to take a card from front. When inserted the card is moved to the print position (= chipreader position). In this position data transfer to the chipcard is possible. Note: The yellow LED indicates that the printer is ready to insert a card.
ASCII – Code	<ESC>1
HEX – Code	1B 31

Disable printer	<ESC>2

Description	Deactivates the printer after the “Enable Printer” command has been used. The yellow LED goes out. If a card is currently in the printer, it remains in the slot.
ASCII – Code	<ESC>2
HEX – Code	1B 32

Return card	<ESC>3

Description	Returns the card without printing and disables the Printer
ASCII – Code	<ESC>3
HEX – Code	1B 33

Printenergy offset	**<ESC>$Op[c] [nnn]**

Description	This offset is used to adjust the printenergy. The offset value is added to the DIP-switch setting. Use <ESC>Ms command to store the offset-value to the memory for permanent use. [c][nnn].... Offset value -100 to +200 Note: Power down or a printer reset within 5 sec. after using this command may cause unpredictable results.
ASCII – Code	<ESC>$Op[c] [nnn]
HEX – Code	1B 24 4F 70 [c] [nnn]
Example	ESC>$Op–010 decrease print energy by 10 units to check saved parameters use <ESC>MI command: examples: Erase temperature: <ESC> MI 08 Response: +00005 Printenergy: <ESC> MI 09 Response: - 00010

Erase temperature offset	**<ESC>$Ol[c] [nnn]**

Description	This offset is used to adjust the erasing temperature. The offset value is added to the DIP switch setting. Use <ESC>Ms command to store the offset-value to the memory for permanent use. [c][nnn].... Offset value -200 to +200 (10 bit represents approx. 1% variation in temperature) Note: Power down or a printer reset within 5 sec. after using this command may cause unpredictable results.
ASCII – Code	<ESC>$Ol[c] [nnn]
HEX – Code	1B 24 4F 6C [c] [nnn]
Example	<ESC>$Ol+005 increase erasing temperature by 0,5 %

Set printer resolution	**<ESC>i[c]**

Description	This command sets the resolution of your printer in y-direction. [c]=0 200 dpi [c]=1 300 dpi (default) [c]=2 not in use [c]=3 not in use [c]=4 600 dpi Note: All settings other than [c]=1 (300 dpi) are active for one card only. For the next card the printer automatically returns to the default of 300 dpi. The resolution in x-direction is 200 or 300dpi, depending on the printhead actually used.
ASCII – Code	<ESC>i[c]
HEX – Code	1B 69 [c]
Example	<ESC> i4 set resolution 600 dpi in y-direction

Disable eraser roller heating	**<ESC>Q[n]**

Description	Use this command to activate or deactivate the eraser-roller heating. In deactivated state the erase-roller heating is stopped. Use parameter 1 to reactivate erase-roller heating. [n]=0: disable eraser roller heating [n]=1: enable eraser roller heating (default) Note: The erase-roller needs several minutes to cool down! Set parameter is active until next reset or power on/off
ASCII – Code	<ESC>Q[n]
HEX – Code	1B 51 [n]
Example	<ESC>Q0 disable erase-roller heating

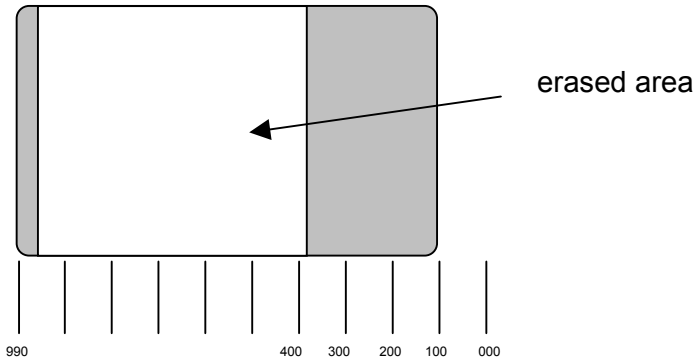
Disable erase roller heating permanent	**<ESC>%L[n]**

Description	Use this command to activate or deactivate the eraser-roller heating permanent. In deactivated state the erase-roller heating is stopped and no heat-up will be done. Use parameter 1 to reactivate erase-roller heating. Parameter is stored to EEPROM. [n]=0: disable eraser roller heating permanent [n]=1: enable eraser roller heating (default) <u>Note:</u> When reactivating erase-roller heating perform a printer reset after using the command! The erase-roller needs several minutes to cool down! Power down or a printer reset within 5 sec. after using this command may cause unpredictable results.
ASCII – Code	<ESC>%L[n]
HEX – Code	1B 25 4C [n]
Example	<ESC>%L0 diable erase-roller heating permanent

Paperticket mode	**<ESC>P**

Description	Print paper ticket (No erase operation) This mode is active only for the following card!
ASCII – Code	<ESC>P
HEX – Code	1B 50

Move-in erase	**<ESC>$p[n]**

Description	Erase operation is done during move-in the card from front. Card cycle time is shortened because of saving one transport cycle. Please note, that the printer can't erase the first 30% of the card. This command is useful only if cards are fetched from front [n] = 0..... disable move in erase [n] = 1..... enable move in erase
ASCII – Code	<ESC>$p[n]
HEX – Code	1B 24 70 [n]
Example	<ESC>$p1 Result: enable move in erase 

Save bitram	**<ESC>MS**

Description	Save the contents of the Bitram to Flash-memory Note: In case of 200x200 dpi and 200x300 dpi printdata, the whole card can be saved to Flash-memory. In case of 200x600 dpi printdata, only the first half of the card can be saved. Saved bitram data can only be reprinted in the same resolution. Note: Power down or a printer reset within 5 sec. after using this command may cause unpredictable results.
ASCII – Code	<ESC>MS
HEX – Code	1B 4D 53

Restore bitram	**<ESC>MR**

Description	Restore the contents of the Bitram from Flash-memory
ASCII – Code	<ESC>MR
HEX – Code	1B 4D 52

Save parameter	**<ESC>Ms**

Description	Save all parameters to EEPROM Note: Power down or a printer reset within 5 sec. after using this command may cause unpredictable results.
ASCII – Code	<ESC>Ms
HEX – Code	1B 4D 73

Restore parameter	**<ESC>Mr**

Description	Restore all parameters from EEPROM
ASCII – Code	<ESC>Mr
HEX – Code	1B 4D 72

Read parameter from EEPROM	**<ESC>Ml [nn]**

Description	Read a specified parameter from EEPROM [nn] parameter-code (See table on next page).
ASCII – Code	<ESC>Ml [nn]
HEX – Code	1B 4D 6C [nn]
Example	<ESC>Ml00 Read printenergy value from EEPROM Response : +00150
Return-Parameter from printer	1 char. sign 5 numerical characters

Read parameter from RAM	<ESC>Mm [nn]

Description	Read presently used parameter from RAM memory. [nn] parameter-code (See table below).
ASCII – Code	<ESC>Mm [nn]
HEX – Code	1B 4D 6D [nn]
Example	<ESC>Mm00 Read presently used printenergy value from RAM Response : +00150
Return-Parameter from printer	1 char. sign 5 numerical characters

Parameter-Code	<ESC>M - Parameter function
00	Printenergy
01	2nd domain printenergy
02	Startposition 2nd domain printenergy
03	Endposition 2nd domain printenergy
04	Start hysteresis
05	End hysteresis
06	Erase temperature
07	Printposition offset
08	Erase temperature offset
09	Printenergy offset

Restore factory settings	<ESC>$Oc

Description	Reset all permanent stored parameters to their default values.
ASCII – Code	<ESC>$Oc
HEX – Code	1B 24 4F 63

Reset	**<ESC>r[n]**

Description	Usage at normal printer mode: [n]=1: Reset all parameters to default values and clear the printer buffer [n]=2: clear the printer buffer _____ Usage at error state: a warm start is executed. Note: Send no parameter [n] in Error state!
ASCII – Code	<ESC>r[n]
HEX – Code	1B 72 [n]
Example	<ESC>r2 Clear Printerbuffer (if no Error)

Reboot	**<ESC>$R**

Description	Initiates a warm start
ASCII – Code	<ESC>$R
HEX – Code	1B 24 52

Read counters and S/N	**<ESC>%O[n]**

Description	Read out the extended status of the printer. Parameters [n]: 1: Cyclecounter Printer Mechanism **Return-Format:** min. 1char + <CR> max. 10char + CR 2: Cyclecounter Printhead **Return-Format:** min. 1char + <CR> max. 10char + CR 8: Serialnummer Printhead **Return-Format:** 14char. + <CR> A: Serialnummer Printer **Return-Format:** 10char. + <CR> D: Printheadtype **Return-Format:** 1char. + <CR> **1**...DK200-1; **2**...DK200-2; **3**…DK300-1	
ASCII – Code	<ESC>%O[n]	
HEX – Code	1B 25 4F [n]	
Example	<ESC>%O1 2226<CR>	Read the number of already printed cards Response from printer

Brief status	**<SUB>**

Description	Read card position and printer status.
ASCII – Code	<SUB>
HEX – Code	1A
Return-Parameter from printer	The response is one binary character. Bit1 (LSB): photo sensor print position Bit2: photo sensor front position Bit3: photo sensor back (Hopper) Bit4: Card in print position (chipreader position) Bit5: Printing in progress Bit6: Card has been printed Bit7: reserved Bit8 (MSB): ERROR **Bit1, 2, 3** are set to “1” if photo sensor is interrupted and cleared to “0” if sensor is free **Bit4** is set to “1” while the card remains in print position (chipreader position) and cleared to “0” as soon as the printhead is removed after successful print procedure. **Bit5** is set to “1” when the card movement starts (from print position) and is cleared to “0” as soon as the printhead is removed after successful print procedure. **Bit6** is set to “1” after a card has been printed. This bit is cleared to “0” after a new card is inserted. **Bit7** reserved for special function (can be ”0” or “1”) **Bit8** is set to “1” when a fatal error has occurred While the printer is in heat-up mode this bit is set too! <u>Note 1:</u> If the printer is in the heat-up mode all bits are set! <u>Note 2:</u> If no hopper is used, BIT3 is set permanently Bits 6 and 8 can be cleared using the reset command <ESC> r1
Example	<SUB> Response (binary char.): 00010100 Printing in progress

Printhead status	**<ESC>A[n]**

Description	Read printhead status. The result string shows number and position of electrical dot-failures. [n]=1 printhead status request
ASCII – Code	<ESC>A1
HEX – Code	1B 41 31
Return-Parameter from printer	Response: [a] [bbb] [ccc] [ddd] [a]=2 Printer head status is OK [a]=1 1 missing dot [a]=0 2 or more missing dots [bbb] Number of missing dots [ccc] Position of the first gap [ddd] Position of the second, or last, gap
Example	<ESC>A1 Response: 0 003 017 275 There are 3 dot-gaps between positions 17 and 275. <u>Barcode-printing (<ESC>Z):</u> In case of [a]=1 or [a]=2 the barcode is shifted to a printable position (x-direction only) In case of [a]=0 no valid barcode can be printed in x-direction

Firmware code	**<ESC>a**

Description	Read the firmware code.
ASCII – Code	<ESC>a
HEX – Code	1B 61
Return-Parameter from printer	{CXxxxxxxx} <CR> (current firmware code) Number of char.: 10 char. ASCII
Example	<ESC>a Response from Printer: CX0000001 <CR>

ERROR code	**<ESC>$E**

Description	Use this command to read the ERROR code if printer is in ERROR mode. The table below will help you to find the fault.
ASCII – Code	<ESC>$E
HEX – Code	1B 24 45
Return-Parameter from printer	Error code: 5 Byte ASCII
Example	<ESC>$E Response: 00921 (Printhead defect)

ERROR code	**List of possible faults**
00000	No ERROR – printer OK
00910	Fault during HW check at boot time • No valid ADC signal • Main board or printhead-controller board defect
00920	Printhead too hot • Printhead too hot ---- wait for cool down • Main board or printhead-controller board defect • Printhead defect
00921/ 00922	Printhead resistance out of range • Printhead resistance out of range (worn-out or damaged) • Too many DOT-failures • Printhead damaged by static stress • Main board or printhead-controller board defect
00923	No or unknown printhead • No printhead connected (cable) • Error at printhead initializing • Defective EEPROM on printhead • Defective Controllerboard
00930	Transport timeout • Card path or motor movement blocked (card got stuck) • Photosensor defective or interrupted (clean sensor path) • Transport motor defective • Main board defective

00931	Printhead position could not be found • Photosensor defective or interrupted (clean sensor path) • Motor for printhead rotation defective • Mainboard defective
00932	Card jam at printing • Photosensor defective or interrupted (clean sensor path) • Motor for printhead rotation defective • Mainboard defective • Card path or motor movement blocked (card got stuck)
00991	Error at preheating: No signal-change during preheating • Temp. Sensor defective • No erase-roller installed • A/D converter defective --- Main board or Printhead-controller board defective
00992	Error at preheating: Out of range signal from temp. Sensor • No or wrong parameters in EEPROM • A/D converter defective • Short circuit at sensor signal • Missing sensor (brocken wire, disconnected cable)
00993	Heating error: Controlling parameter out of range • Wrong parameters in EEPROM • A/D converter defective • Short circuit at sensor signal • Missing sensor (brocken wire, disconnected cable) • Defective erase roller
00940	Magnetencoding write Error • Coding Error: Character not possible (see Chapter "4. Appendix – Characterset for Magnet encoder")
00941	Magnet encoding read Error • Decoding Error

2.3.2 Character and font commands

All internal printer-fonts use proportional character spacing. Charactersize of internal Fonts is different when using 300 dpi printhead.

Select Font3	**<ESC>C**

Description	Select the small typeface, Font3. Print height ca. 1.5 mm at 200 dpi printhead
ASCII – Code	<ESC>C
HEX – Code	1B 43

Select Font2	**<ESC>D**

Description	Select the medium typeface, Font2. Print height ca. 2,0 mm at 200 dpi printhead
ASCII – Code	<ESC>D
HEX – Code	1B 44

Select Font1	**<ESC>E**

Description	Select the large typeface, Font 1. Print height ca. 3.7 mm at 200 dpi printhead
ASCII – Code	<ESC>E
HEX – Code	1B 45

Get Charactersize	**<ESC>h[n][m]**

Description	All internal fonts use proportional character spacing, so the size of a printed string depends on the used characters. This command responds to the size of a specified character from the internal font and helps to calculate the effective string size. [n].... Font number (1, 2 or 3) [m]... specified character
ASCII – Code	<ESC>h[n][m]
HEX – Code	1B 68 [n][m]
Return-Parameter from printer	Size of specified character: {aabb}<CR> aa.... height of character (No. of bytes) bb.... width of char. (No. of Dots)
Example	<ESC>h1a Response: 0410<CR>

Print double-width characters	**<ESC>b[n]**

Description	Print all characters at double width [n]=0 double-width character **OFF** (default) [n]=1 double-width character **ON**
ASCII – Code	<ESC>b[n]
HEX – Code	1B 62 [n]

Print double-height characters	**<ESC>w[n]**

Description	Print all characters at double height [n]=0 double-height character **OFF** (default) [n]=1 double-height character **ON**
ASCII – Code	<ESC>w[n]
HEX – Code	1B 77 [n]

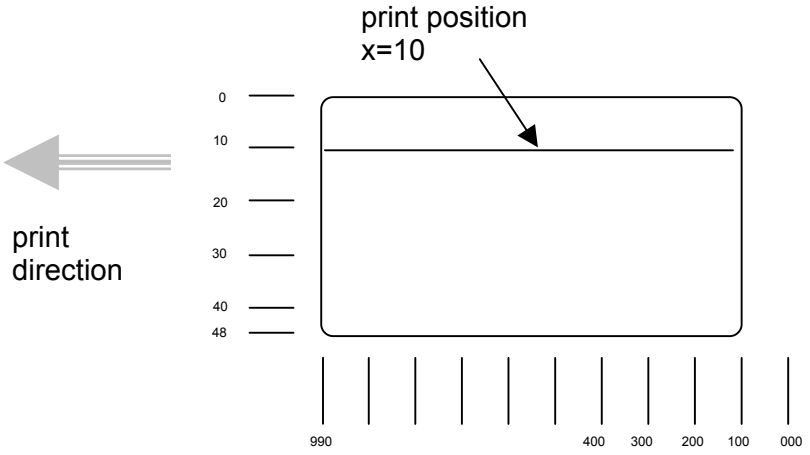
2.3.3 Print- and erase commands

Start printing	**{DATA} <FF>**

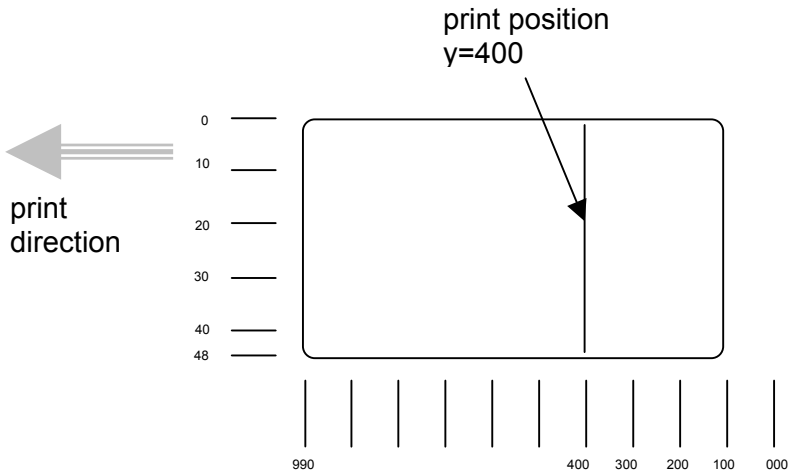
Description	Printing of previous sent data starts after <FF>. (find the character-set table at Appendix of this manual)
ASCII – Code	{DATA} <FF>
HEX – Code	{DATA} 0C

Print position x-coordinate	**<ESC>x[nn]**

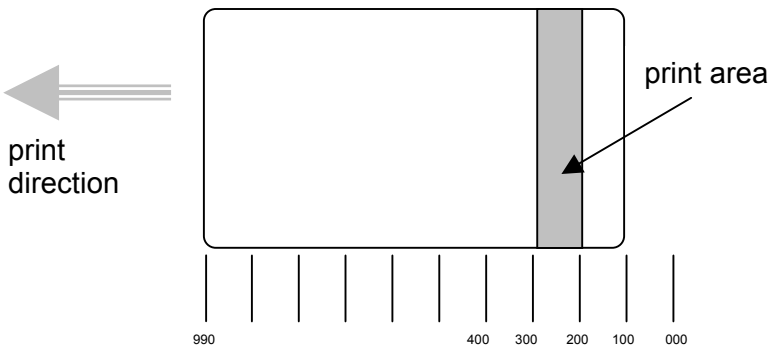
Description	Sets the print position of the following text to position x. The parameter [nn] determines the offset from zero; Possible values for [nn] between 00 and 48.
ASCII – Code	<ESC>x[nn]
HEX – Code	1B 78 [nn]
Example	<ESC>x10



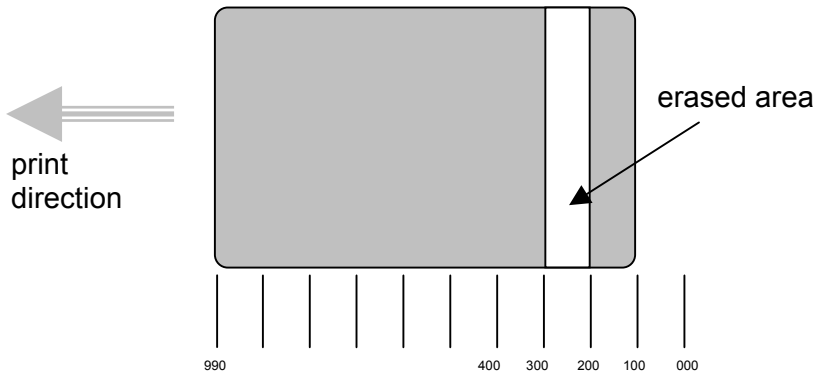
Print position y-coordinate	**<ESC>y[nnn]**

Description	Sets the print position of the following text to position y. The parameter [nnn] determines the offset from zero in micro lines. The printable y area ranges from 100 to 990
ASCII – Code	<ESC>y[nnn]
HEX – Code	1B 79 [nnn]
Example	<ESC>y400 

Limit print area	**<ESC>d[nnn][mmm]**

Description	The print area is limited to the domain [nnn] to [mmm] [nnn] possible values range from 000 to 990 [mmm] possible values range from 000 to 990 <u>Note:</u> Power down or a printer reset within 5 sec. after using this command may cause unpredictable results. The size of the print area ([mmm] – [nnn]) must not exceed 720.
ASCII – Code	<ESC>d[nnn][mmm]
HEX – Code	1B 64 [nnn][mmm]
Example	<ESC>d200300 The print area is limited to the designated area. 

Limit erase area	**<ESC>e[nnn][mmm]**

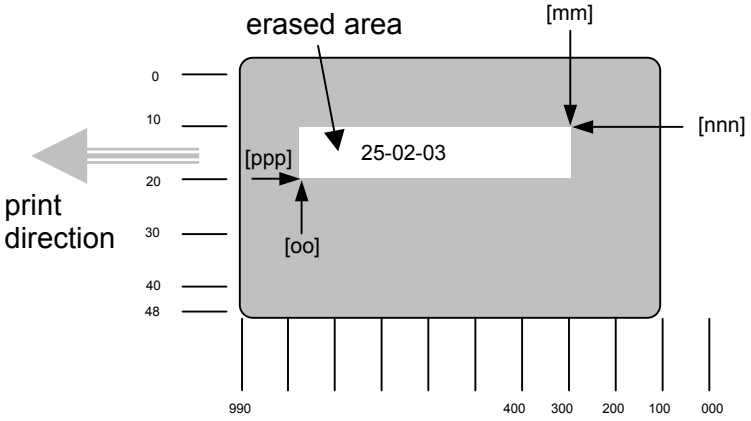
Description	The erase area is limited to the domain [nnn] to [mmm] During the next print procedure this limited area will be erased. The rest of the card will not be affected, the data in those areas retains unchanged. [nnn] possible values range from 000 to 990 [mmm] possible values range from 000 to 990 Note: Power down or a printer reset within 5 sec. after using this command may cause unpredictable results. The size of the erase area ([mmm] – [nnn]) must not exceed 720.
ASCII – Code	<ESC>e[nnn][mmm]
HEX – Code	1B 65 [nnn][mm]
Example	<ESC>e200300 The eraser operation is only performed within the designated area. 

Note: The erase area may extend up to 5 mm depending on card material. Printing area may be shifted up to 2 mm.

Get print area	**<ESC>%p**

Description	This command returns you the actually set print area in y-direction.
ASCII – Code	<ESC>%p
HEX – Code	1B 25 70
Example	<ESC>%p Response: 400700

Partial erase	**<ESC>$a[l][mm][nnn][oo][ppp]**

Description	This command erases and prints a defined rectangle within only one operating-cycle (Maximum width is 15 units in x direction). [l] = 0 disable permanent partial erase, send <u>no</u> additional parameter in this case! [l] = 1 enable permanent partial erase and store x/y positions for repetitive use [l] = 2 enable partial erase for the following printing-cycle only [mm] , [oo] valid values for x-position parameters depend on the used printhead: DK 200-1: x-position 00 - 48 DK 300-1: x-position 00 - 72 [nnn] , [ppp] values for y-position parameters: 100 - 999 <u>Parameter limits:</u> [oo] – [mm] ≤ 15 [mm] < [oo], [nnn] < [ppp] <u>Note:</u> • Send ‘partial erase’ as last command of print-job, directly before start printing command <FF> • In case of parameter [l]=1 the selected x/y positions are stored permanently to the EEPROM. Use parameter [l]=0 for reset. • This command is available at firmware version CX 000804 or later Greyscale modus not possible.
ASCII – Code	<ESC>$a[l][mm][nnn][oo][ppp]
HEX – Code	1B 24 61[l][mm][nnn][oo][ppp]
Example	<ESC>x12 ; text position x <ESC>y750 ; text position y 25-02-03 ; text <ESC>$a11030020900 ; partial erase command <FF> ; start printing 

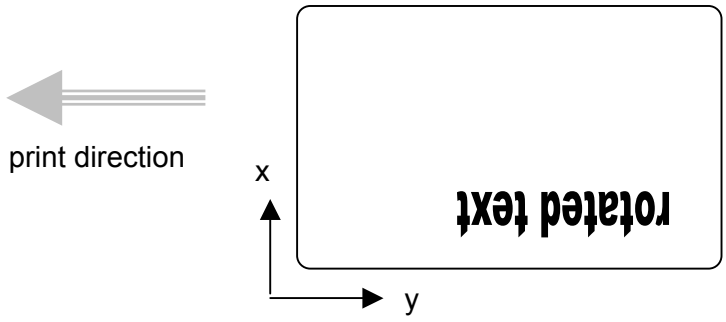
Get erase area	**<ESC>%l**

Description	This command returns you the actually set erase area in y-direction.
ASCII – Code	<ESC>%l
HEX – Code	1B 25 6C
Example	<ESC>%l Response: 400700

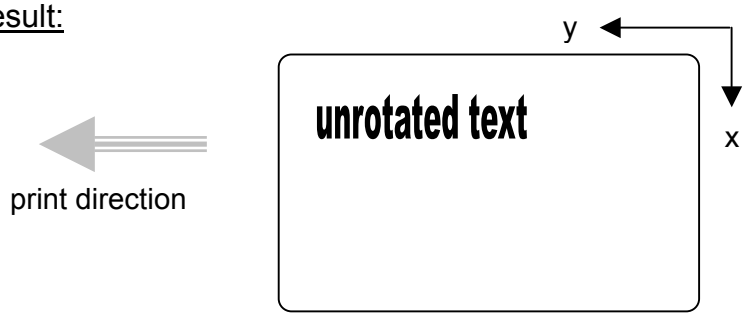
Shift print area	**<ESC>o[c][nnn]**

Description	This command enables you to shift the print area in y-direction. [c]... **+** shift in print-direction [c]... **-** shift against print-direction Note: Power down or a printer reset within 5 sec. after using this command may cause unpredictable results.
ASCII – Code	<ESC>o[c][nnn]
HEX – Code	1B 6F [c][nnn]
Example	<ESC>+070 The print area is shifted 7 mm in print direction

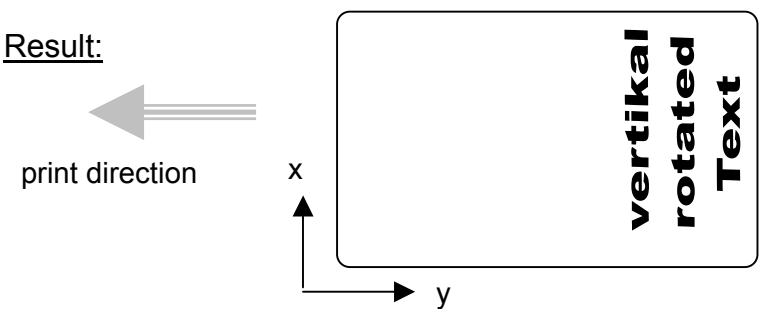
Rotate print image 180°	**<ESC>T**

Description	Rotate whole card (text and graphic) by 180°. Note: The position of origin is rotated too! This command must be used before the print position commands for x- and y-direction.
ASCII – Code	<ESC>T
HEX – Code	1B 54
Example	<ESC>T rotated text<FF> Result: 

Reset 180° rotation	<ESC>U

Description	Reset to default (unrotated) orientation This command resets the <ESC>T function. Note: This command must be used before the print position commands for x- and y-direction.
ASCII – Code	<ESC>U
HEX – Code	1B 55
Example	<ESC>U unrotated text<FF> Result: 

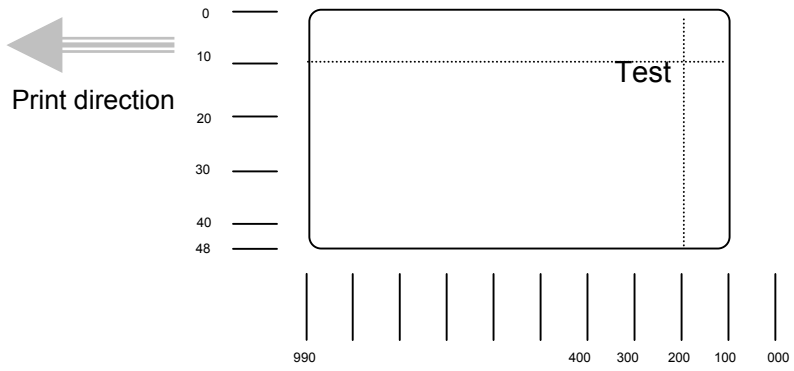
Rotate print image 90° vertical	<ESC>O

Description	Print text in vertical direction (rotate 90°) Note: This command must be used before the print position commands for x- and y-direction.
ASCII – Code	<ESC>O
HEX – Code	1B 4F
Example 1	<ESC>O vertical text<FF> Result: 
Example 2	All commands for print-orientation (<ESC>T, N, U, and O) may be combined. This allows printing in all positions. <ESC>T <ESC>O vertical rotated text<FF> Note: <ESC> T rotates the origin! Result: 

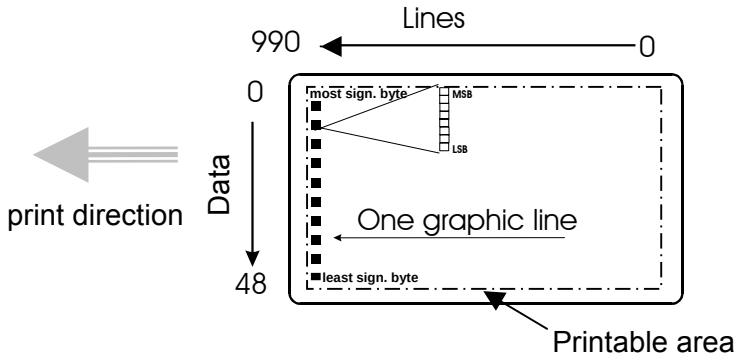
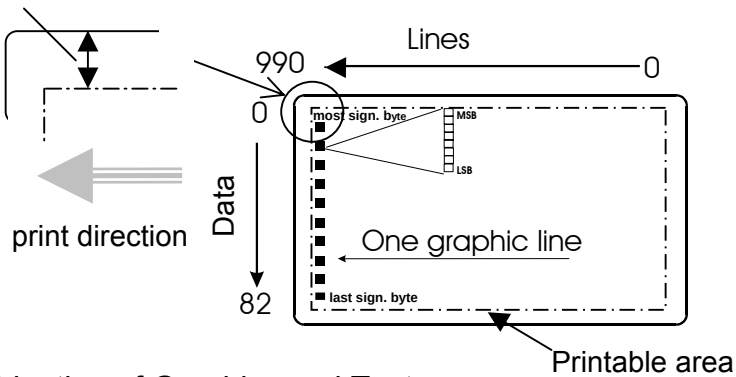
Reset 90° rotation	**<ESC>N**

Description	Print text in horizontal direction (default orientation). This command resets the <ESC>O function. Note: This command must be used before the print position commands for x- and y-direction.
ASCII – Code	<ESC>N
HEX – Code	1B 4E
Example	<ESC>N horizontal text<FF> Result: 

Print format, right aligned	**<ESC> u[n]{DATA}<CR>**

Description	Print text right aligned at current x- and y-coordinates <CR> end character (Hex 0x0D) [n]= 1 right justified
ASCII – Code	<ESC>u1{DATA}<CR>
HEX – Code	1B 75 31 {DATA} 0D
Example	<ESC>x10 <ESC>y200 <ESC>u1 Test <CR> Result: 

Send graphic data	**<ESC>G[b]{DATA}**

Description	This command sends the printer data for one dot line to the printer. A parameter between 0x01 and 0x30 must be entered. The parameter must correspond with the number of data bytes that follow. The maximum print width depends on the printhead type (see table below). A logic '1' in <Data> is the equivalent of one printed pixel.
ASCII – Code	<ESC>G[b]{DATA}
HEX – Code	1B 47 [b] {DATA}
Example	<ESC>G sends the graphical data to the printer line by line. Printing starts in the top right-hand corner of the card when printing from right to left. **Maximum number of bytes:** ***DK200-1:*** max. 48 bytes (printable max. 48 byte) Note: Graphicdata starts at first printable byte. (x-position: 02)  ***DK300-1:*** max. 82 bytes (printable max. 76 byte) Note: Graphic data is located at x-position 00 (edge of card). To reach the printable area use 6 leading <Data> bytes. 6 byte offset  <u>Combination of Graphics and Text:</u> Graphics and text may be combined on the same card. Use the commands <ESC>x and <ESC>y to position both graphics and text. End your data with a form feed to start printing procedure.

Send greyscale graphic data	**<ESC>$G[b]{DATA}**

Description	This command is used to extend the “send graphic data” command, to print dots in greyscale mode. The data of both commands are joined to produce greyscales as shown in the next table:

<ESC>G Data	<ESC>$G Data	Greyscale
0	0	White
0	1	Light grey
1	0	Dark grey
1	1	Black

ASCII – Code	<ESC>$G [b] {DATA}
HEX – Code	1B 24 47 [b] {DATA}
Example	Commandset to print a dark grey dotline of 40 dots: <ESC>J1 <ESC>G 5 0xFF 0xFF 0xFF 0xFF 0xFF <ESC>$G 5 0x00 0x00 0x00 0x00 0x00 <ESC>J1

Micro line feed	**<ESC>J[h]**

Description	This command moves the current print position by [h] micro lines in print direction. Values for [h] from 0x01 to 0xFF. Printable area of ISO cards: 100 to 990 [h] = number of micro lines (hex. char.)
ASCII – Code	<ESC>J[h]
HEX – Code	1B 4A [h]

2.3.4 Card transport commands

Start motor forward	<ESC>F

Description	Start transport motor in forward direction. This procedure can be halted only with the Stop command (<ESC> S)
ASCII – Code	<ESC>F
HEX – Code	1B 46

Start motor backward	<ESC>B

Description	Start transport motor in backward direction. This procedure can be halted only with the Stop command (<ESC> S)
ASCII – Code	<ESC>B
HEX – Code	1B 42

Stop motor	<ESC>S

Description	This command stops the transport motor
ASCII – Code	<ESC>S
HEX – Code	1B 53

Microstep forward	<ESC>j[hh]

Description	This command moves the card forward [hh] number of microsteps (3 hex characters)
ASCII – Code	<ESC>j[hhh]
HEX – Code	1B 6A [hhh]
Example	1B 6A 01 00 00 (all bytes in hex-code) moves the card 100 microsteps forward

Microstep backward	<ESC>k[hh]

Description	This command moves the card backward [hh] number of microsteps (3 hex characters)
ASCII – Code	<ESC>k[hhh]
HEX – Code	1B 6B [hhh]
Example	1B 6B 01 00 00 (all bytes in hex-code) moves the card 100 microsteps backward

2.3.5 Special commands

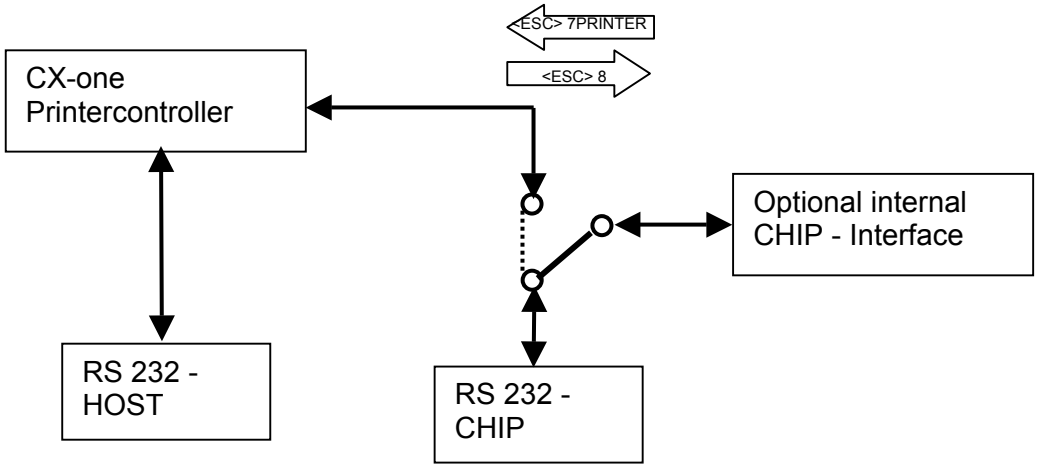
The following special commands are for use with CX-one special models only.
This special models include optional hardware.
Use of this commands at standard CX-one models may cause unpredictable results.

Auxiliary mode ON	**<ESC>8**

Description	Enables the auxiliary mode. A gateway from RS 232 - HOST to RS 232 - CHIP is opened. All following data are copied to the other interface and vice versa. This function works with 9600 Bd for RS 232 - CHIP port. This feature allows communication with external interface-devices by use of only one RS 232 - Port.
ASCII – Code	<ESC>8
HEX – Code	1B 38

Auxiliary mode OFF	**<ESC>7PRINTER**

Description	Disables the auxiliary mode. To leave the auxiliary mode,the host communication must suspend for 50 ms and the command <ESC>7PRINTER must fulfill a intercharacterdelay <50 ms.
ASCII – Code	<ESC>7PRINTER
HEX – Code	1B 375052494E544552



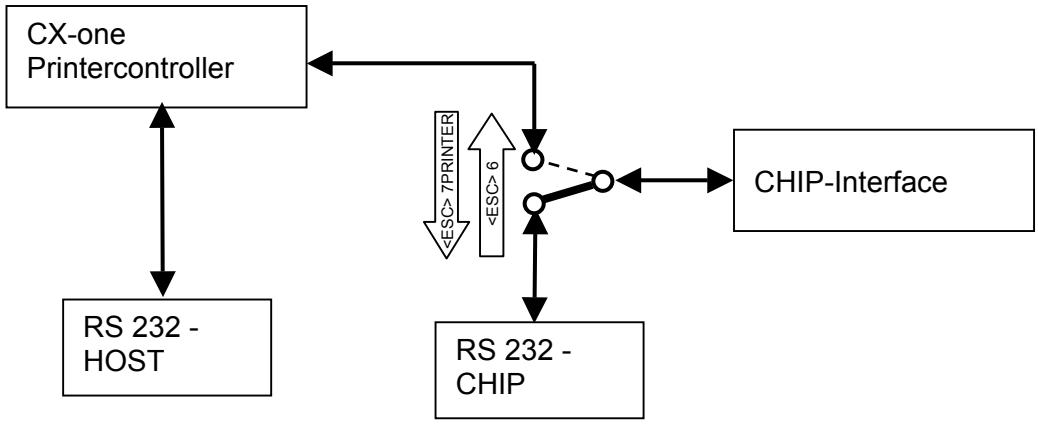
- In normal operating mode the printer-unit is controlled via the interface RS 232 - HOST and the chipreader via RS 232 - CHIP.
- With the command <ESC>8 the "auxiliary mode" is activated.
  The HOST interface path is switched from the RS 232 - Chip Interface to the RS 232 - Host Interface.
- To switch back the interface path to the normal operating mode use the command <ESC>7PRINTER.

Transparent mode ON	**<ESC>6**

Description	Enables the transparent mode. A gateway from RS 232 - HOST to RS 232 - CHIP is opened. All following data are copied to the other interface and vice versa. This function works with 9600 Bd for RS 232 - CHIP port. This feature allows communication with internal interface-devices by use of only one RS 232 -Port.
ASCII – Code	<ESC>6
HEX – Code	1B 36

Transparent mode OFF	**<ESC>7PRINTER**

Description	Disables the transparent mode. To leave the transparent mode,the host communication must suspend for 50 ms and the command <ESC>7PRINTER must fulfill a intercharacterdelay <50 ms.
ASCII – Code	<ESC>7PRINTER
HEX – Code	1B 375052494E544552



- In normal operating mode the printer-unit is controlled via the interface RS 232 - HOST and the chipreader via RS 232 - CHIP.
- With the command <ESC>6 the "transparent mode" is activated. The HOST interface path is switched from the printer to the chipreader.
- To switch back the interface path to the normal operating mode, use the command <ESC>7PRINTER

Note: For hardware-details see CX-one OEM-Manual.

Get card from hopper	<ESC>c

Description	The printer gets a card from the hopper. This command works only on special models with a card hopper module.
ASCII – Code	<ESC>c
HEX – Code	1B 63

Eject card on backside	<ESC>%h

Description	The printer ejects the card after printing at the backside of the printer. This command works only on special models.
ASCII – Code	<ESC>%h
HEX – Code	1B 25 68

Capture card	<ESC>Y

Description	This command ejects the card at the rear side of the printer. This command can be used to capture cards and can only be used in conjunction with specific hardware.
ASCII – Code	<ESC>Y
HEX – Code	1B 59

Read direction detector	<ESC>#

Description	This command reads the position of optical card marks to detect the correct insertion direction. This feature is used especially for contactless cards to check if the card has been inserted correctly for printing. Note: The smallest element has to be at least 0.3 mm thick. For further information please refer to document “CX-one user manual”.
ASCII – Code	<ESC>#
HEX – Code	1B 23
Return-Parameter from printer	Response: [aabbccdd] the position of the marks can be calculated from the response value. Each number divided by 5 gives you the distance in mm to the card edge. aa: 1. mark position bb: 2. mark position cc: 3. mark position dd: 4. mark position
Example	<ESC># Response: 25400000 Result: distance 1st mark 5 mm (25/5) distance 2nd mark 8 mm (40/5) No 3rd and 4th mark were detected

2.3.6 Barcode encoding

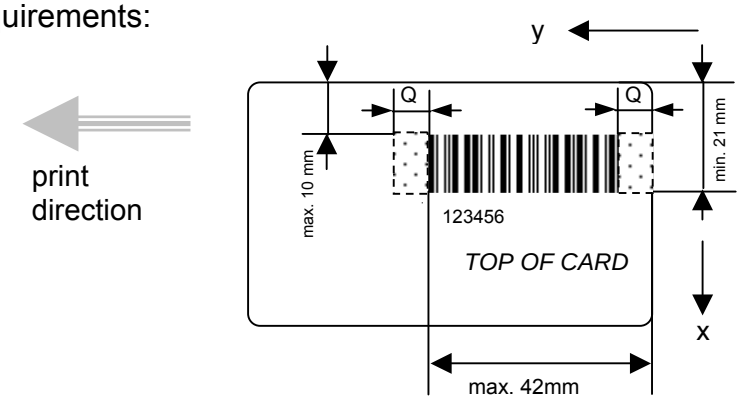
Print barcode	<ESC>z[n]{Data}<CR>

Description	This commands prints {Data} in the form of a barcode. Use parameter [n] to select the barcode type. Currently supported Barcode: [n]=1: Interleaved 2/5 The number of characters has to be even.
ASCII – Code	<ESC>z[n]{Data}<CR>
HEX – Code	1B 7A [n] {Data} 0D

Mirror barcode	<ESC>$b[n]

Description	Rotate barcode 180° (at same printposition). This function is only valid for one following barcodeprint. [n] = 1 rotate barcode 180°
ASCII – Code	<ESC>$b1
HEX – Code	1B 24 62 31
Example	<ESC>$b1

Read barcode	<ESC>%b

Description	Read and decode barcode type Interleaved 2 of 5. Note: The position and size has to fullfill the following requirements:  The smallest element of the barcode has to be at least 0.3 mm. The Quietzones (Q) have to be at least 5mm. Minimum vertical height of barcode: 11 mm
ASCII – Code	<ESC>%b
HEX – Code	1B 25 62
Example	<ESC>%b Response: 123456<CR>

Print barcode with double width	<ESC>%z[n]

Description	Additional command for barcodeprinting. Use this command to print readable barcodes for the CX-one barcodereader.
ASCII – Code	<ESC>%b[n]
HEX – Code	1B 25 62 [n]
Example	<ESC>%z1…enables double width printed barcode <ESC>%z0…disables double width printed barcode

2.3.7 Commands for magnet encoding

Note: See character tables Appendix 4.3

Read magnetcode ISO	**<ESC>$Mr1[n]**

Description	Read magnetcode - ISO 7816. [n] = 1 select ISO Track 1 [n] = 2 select ISO Track 2 [n] = 3 select ISO Track 3 Note: For this command is a special hardware necessary! In case of read error, no retry is done. For an unwritten magnetcard or a card without a magstripe the printer responses 999, for other read errors the printer responses 000.
ASCII – Code	<ESC>$Mr1[n]
HEX – Code	1B 24 4D 72 31 [n]
Response from Printer	[nnn]{Read-Data} [nnn]... Number of read databytes
Example	<ESC>$Mr13 read ISO Track 3 Response: 0100123456789 010..... 10 bytes has been read 0123456789... read data

Read magnetcode JIS I	**<ESC>$Mr2[n]**

Description	Read magnetcode – JIS I Standard. [n] = 1 select JIS I Track 1 [n] = 2 select JIS I Track 2 [n] = 3 select JIS I Track 3 Note: For this command is a special hardware necessary! In case of read error, no retry is done. For an unwritten magnetcard or a card without a magstripe the printer responses 999, for other read errors the printer responses 000.
ASCII – Code	<ESC>$Mr2[n]
HEX – Code	1B 24 4D 72 32 [n]
Response from Printer	[nnn]{Read-Data} [nnn]... number of read-databytes
Example	<ESC>$Mr23 read JIS I Track 3 Response: 0100123456789 010..... 10 bytes has been read 0123456789... read data

Read magnetcode JIS II	**<ESC>$Mr31**

Description	Read magnetcode – JIS II Standard. Note: For this command is a special hardware necessary! In case of read error, no retry is done. For an unwritten magnetcard or a card without a magstripe the printer responses 999, for other read errors the printer responses 000.
ASCII – Code	<ESC>$Mr31
HEX – Code	1B 24 4D 72 33 31
Response from Printer	[nnn]{Read-Data} [nnn]... number of read databytes
Example	<ESC>$Mr31 read JIS II Response: 0100123456789 010..... 10 bytes has been read 0123456789... read data

Write magnetcode ISO	**<ESC>$Mw1[n][mmm]{ DATA}**

Description	Write magnetcode - ISO 7816. [n] = 1 select ISO Track 1 (max. 79 alphanumeric char incl. 3 control characters) [n] = 2 select ISO Track 2 (max. 40 numeric char incl. 3 control characters) [n] = 3 select ISO Track 3 (max. 107 numeric char incl. 3 control characters) [mmm]... number of write databytes Note: For this command is a special hardware necessary! After the writecycle, the printer returns an acknowledge. No verification of written data is done. See appendix for char.table.
ASCII – Code	<ESC>$Mw1[n][mmm]{DATA}
HEX – Code	1B 24 4D 77 31 [n][mmm]{DATA}
Example	<ESC>$Mw130100123456789 Write 10 byte data (0123456789) to ISO Track 3 Response: + Data written

Write magnetcode JIS I	**<ESC>$Mw2[n][mmm]{ DATA}**

Description	Write magnetcode – JIS I Standard. [n] = 1 select JIS I Track 1 (max. 79 alphanumeric char incl. 3 control characters) [n] = 2 select JIS I Track 2 (max. 40 numeric char incl. 3 control characters) [n] = 3 select JIS I Track 3 (max. 107 numeric char incl. 3 control characters) [mmm]... number of write databytes Note: For this command is a special hardware necessary! After the writecycle the printer returns an acknowledge. No verification of written data is done. See appendix for char.table.
ASCII – Code	<ESC>$Mw2[n][mmm]{DATA}
HEX – Code	1B 24 4D 77 32 [n][mmm]{DATA}
Example	<ESC>$Mw210100123456789 Write 10 byte data (0123456789) to JIS I Track 1 Response: + Data written

Write magnetcode JIS II	**<ESC>$Mw31[mmm]{DATA}**

Description	Write magnetcode – JIS II Standard. [mmm]... number of write databytes (max. 72 char incl. 3 control characters) Note: For this command is a special hardware necessary! After the writecycle the printer returns an acknowledge. No verification of written data is done. See appendix for char.table.
ASCII – Code	<ESC>$Mw31[mmm]{DATA}
HEX – Code	1B 24 4D 77 33 31 [mmm]{DATA}
Example	<ESC>$Mw310100123456789 Write 10 byte data (0123456789) to JIS II Response: + Data written

Auto read	**<ESC>$m[n]**

Description	This function allows automatically decoding of the magstripe of inserted cards. Activate or deactivate this function with parameter [n] [n] = 0..... disable auto read [n] = 1..... enable auto read Read data are stored in printer memory. To get the data use the "Read magnetcode" command (<ESC>$Mr.....) Note: For this command is a special hardware necessary! Command is active until reset.
ASCII – Code	<ESC>$m[n]
HEX – Code	1B 24 6D [n]
Example	<ESC>$m1 enable auto read function

Auto eject after write	**<ESC>$w[n]**

Description	This function allows automatically ejecting the card after a writecycle. Activate this function with parameter [n] [n] = 0..... disable auto eject after write [n] = 1..... enable auto eject after write The command must be sent for each write-instruction. The card can not be printed. Note: For this command is a special hardware necessary!
ASCII – Code	<ESC>$w[n]
HEX – Code	1B 24 77 [n]
Example	<ESC>$w1 enable auto eject after write function

3 Special Printer-Modes

The printer detects several error-situations and is automatically switched to the corresponding error mode.
There are 3 different error types:

3.1 Fatal error

All LEDs are flashing periodically and printer stops working.
In this mode the printer accepts and responds to 4 commands only:

<ESC>r1,<ESC>r2	Hardware Reset
<SUB>	Brief Status
<ESC>$E	Read ERROR number

3.2 Non fatal error

Error is not indicated, but the command <ESC>$E returns an error number. This kind of error indicates situations where the printer works well but the last operation was performed incorrectly (magnet-encoding errors, empty hopper ...)
For more details see the command “ERROR Code”.

3.3 Heat-up mode

Green LED is flashing periodically and the response to the brief status (<SUB>) is 0xFF (all bits are set).
This indicates that the printer is in heat-up mode after booting or powering up.

Wait until heat-up is finished!

3.4 Cleaning Mode

After detecting a CLEARjet Cleaning card the printer automatically performs a cleaning procedure and the response to the brief status (<SUB>) is 0xFF (all bits are set).
Wait until heat-up after cleaning procedure is finished.

4 Appendix

4.1 ASCII Character set

The following table shows the printable character set of CX-one.

Note: Characters below hex 20 are not printable control codes!

Hex code	Character	Hex code	Character	Hex code	Character	Hex code	Character	
20	Space	40	@	60	`	80	□	
21	!	41	A	61	a	81	ü	
22	“	42	B	62	b	82	‚	
23	#	43	C	63	c	83	*f*	
24	$	44	D	64	d	84	ä	
25	%	45	E	65	e	85	…	
26	&	46	F	66	f	86	†	
27	‘	47	G	67	g	87	‡	
28	(	48	H	68	h	88	^	
29	)	49	I	69	I	89	‰	
2A	*	4A	J	6A	j	8A	Š	
2B	+	4B	K	6B	k	8B	‹	
2C	,	4C	L	6C	l	8C	Œ	
2D	-	4D	M	6D	m	8D	□	
2E	.	4E	N	6E	n	8E	Ä	
2F	/	4F	O	6F	o	8F	□	
30	0	50	P	70	p	90	□	
31	1	51	Q	71	q	91	‘	
32	2	52	R	72	r	92	’	
33	3	53	S	73	s	93	“	
34	4	54	T	74	t	94	ö	
35	5	55	U	75	u	95	•	
36	6	56	V	76	v	96	–	
37	7	57	W	77	w	97	—	
38	8	58	X	78	x	98	~	
39	9	59	Y	79	y	99	Ö	
3A	:	5A	Z	7A	z	9A	Ü	
3B	;	5B	[	7B	{	9B	›	
3C	<	5C	\	7C	|	9C	œ	
3D	=	5D	]	7D	}	9D	□	*
3E	>	5E	^	7E	~	9E	□	*
3F	?	5F	_	7F	□	9F	Ÿ	*

	Hex code	Character	Hex code	Character	Hex code	Character
*	A0	½ Space	C0	À	E0	à
*	A1	¡	C1	Á	E1	ß
*	A2	¢	C2	Â	E2	â
*	A3	£	C3	Ã	E3	ã
*	A4	¤	C4	Ä	E4	ä
*	A5	¥	C5	Å	E5	å
*	A6	¦	C6	Æ	E6	æ
*	A7	§	C7	Ç	E7	ç
*	A8	¨	C8	È	E8	è
*	A9	©	C9	É	E9	é
*	AA	ª	CA	Ê	EA	ê
*	AB	«	CB	Ë	EB	ë
*	AC	¬	CC	Ì	EC	ì
*	AD	-	CD	Í	ED	í
	AE	®	CE	Î	EE	î
	AF	¯	CF	Ï	EF	ï
	B0	°	D0	Ð	F0	ð
	B1	±	D1	Ñ	F1	ñ
	B2	²	D2	Ò	F2	ò
	B3	³	D3	Ó	F3	ó
	B4	´	D4	Ô	F4	ô
	B5	µ	D5	Õ	F5	õ
	B6	¶	D6	Ö	F6	ö
	B7	·	D7	×	F7	÷
	B8	¸	D8	Ø	F8	ø
	B9	¹	D9	Ù	F9	ù
	BA	º	DA	Ú	FA	ú
	BB	»	DB	Û	FB	û
	BC	¼	DC	Ü	FC	ü
	BD	½	DD	Ý	FD	ý
	BE	¾	DE	Þ	FE	þ
	BF	¿	DF	ß	FF	ÿ

Note: *****..... this characters are different in Font1

4.2 Control codes

Hex code	Printer function	
0A	Linefeed / new line	<LF>
0C	Formfeed, start printing	<FF>
0D	carriage return	<CR>
1A	Brief status	<SUB>
1B	Escape, start of command	<ESC>

4.3 Character set for Magnet Encoding

4.3.1 ISO & JIS I - Track 1

				b_6	0	0	1	1
				b_5	0	1	0	1
b_4	b_3	b_2	b_1	MSB / LSB	0	1	2	3
0	0	0	0	0	SP	0	***a***	P
0	0	0	1	1	***a***	1	A	Q
0	0	1	0	2	***a***	2	B	R
0	0	1	1	3	***c***	3	C	S
0	1	0	0	4	$	4	D	T
0	1	0	1	5	% ***d***	5	E	U
0	1	1	0	6	***a***	6	F	V
0	1	1	1	7	***a***	7	G	W
1	0	0	0	8	(	8	H	X
1	0	0	1	9	)	9	I	Y
1	0	1	0	A	***a***	***a***	J	Z
1	0	1	1	B	***a***	***a***	K	***b***
1	1	0	0	C	***a***	***a***	L	***b***
1	1	0	1	D	**-**	***a***	M	***b***
1	1	1	0	E	**.**	***a***	N	^ ***d***
1	1	1	1	F	/	? ***d***	O	***a***

Function of special characters:

Characters	Function
a	These character positions are available for hardware control purposes only and cannot contain information characters (data content).
b	These character positions are not to be used internationally.
c	This character position is reserved for optional additional graphic.
% ***d***	Start sentinel
? ***d***	Stop sentinel
^ ***d***	Separator

4.3.2 ISO & JIS I - Track 2/3

				b_5	0	1
				MSB / LSB	0	1
b_4	b_3	b_2	b_1			
0	0	0	0	0	-	0
0	0	0	1	1	1	-
0	0	1	0	2	2	-
0	0	1	1	3	-	3
0	1	0	0	4	4	-
0	1	0	1	5	-	5
0	1	1	0	6	-	6
0	1	1	1	7	7	-
1	0	0	0	8	8	-
1	0	0	1	9	-	9
1	0	1	0	A	-	*
1	0	1	1	B	**Start sentinel**	-
1	1	0	0	C	-	*
1	1	0	1	D	**Separator**	-
1	1	1	0	E	*	-
1	1	1	1	F	-	**Stop sentinel**

Note:

- These characters are not available at these tracks.
* These character positions are available for hardware control purposes only and cannot contain information characters (data content).

4.3.3 JIS II

				b_7	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1
				MSB / LSB	0	1	2	3	4	5	6	7
b_4	b_3	b_2	b_1									
0	0	0	0	0	NUL	TC_7 (DEL)	SP	0	@	P	`	p
0	0	0	1	1	TC_1 (SOH)	DC_1	!	1	A	Q	a	q
0	0	1	0	2	TC_2 (STX)	DC_2	"	2	B	R	b	r
0	0	1	1	3	TC_3 (ETX)	DC_3	#	3	C	S	c	s
0	1	0	0	4	TC_4 (EOT)	DC_4	$	4	D	T	d	t
0	1	0	1	5	TC_5 (ENQ)	TC_8 (NAK)	%	5	E	U	e	u
0	1	1	0	6	TC_6 (ACK)	TC_9 (SYN)	&	6	F	V	f	v
0	1	1	1	7	BEL	TC_{10} (ETB)	´	7	G	W	g	w
1	0	0	0	8	FE_0 (BS)	CAN	(	8	H	X	h	x
1	0	0	1	9	FE_1 (HT)	EM	)	9	I	Y	i	y
1	0	1	0	A	FE_2 (LF)	SUB	*	:	J	Z	j	z
1	0	1	1	B	FE_3 (VT)	ESC	+	;	K	[	k	{
1	1	0	0	C	FE_4 (FF)	IS_4 (FS)	,	<	L	\	l	|
1	1	0	1	D	FE_5 (CR)	IS_3 (GS)	-	=	M	]	m	}
1	1	1	0	E	SO	IS_2 (RS)	.	>	N	^	n	~
1	1	1	1	F	SI	IS_1 (US)	/	?	O	_	o	DEL

4.4 DIP-Switch settings

Using the DIP switches you can alter various printer settings. Here is a summary of possible options:

DIP Switch	Function
Baud Rate	
S 1 - OFF S 6 - OFF	9600 baud
S 1 - ON S 6 - OFF	38400 baud
S 1 - OFF S 6 - ON	38400 baud
S 1 - ON S 6 - ON	57600 baud
Print Energy	
S 2 - OFF S 3 - OFF	Material type 1 RICOH TC-stripe
S 2 - ON S 3 - OFF	Material type 2 RICOH TC-full-surface
S 2 - OFF S 3 - ON	Material type 3 MITSUBISHI LEUCO
S 2 - ON S 3 - ON	Material type 4 RICOH LEUCO
Erase Temperature	
S 4 - OFF S 5 - OFF	Material type 1 RICOH TC-stripe
S 4 - ON S 5 - OFF	Material type 2 RICOH TC-full-surface
S 4 - OFF S 5 - ON	Material type 3 MITSUBISHI LEUCO
S 4 - ON S 5 - ON	Material type 4 RICOH LEUCO
Printer Mode	
S 7 - OFF	Standard printer mode
S 7 - ON	Test mode active
Firmware Download	
S 8 - OFF	Standard printer mode
S 8 - ON	Firmware download active (hardware boot mode)

Warning: You should only alter the settings when the printer is switched off.