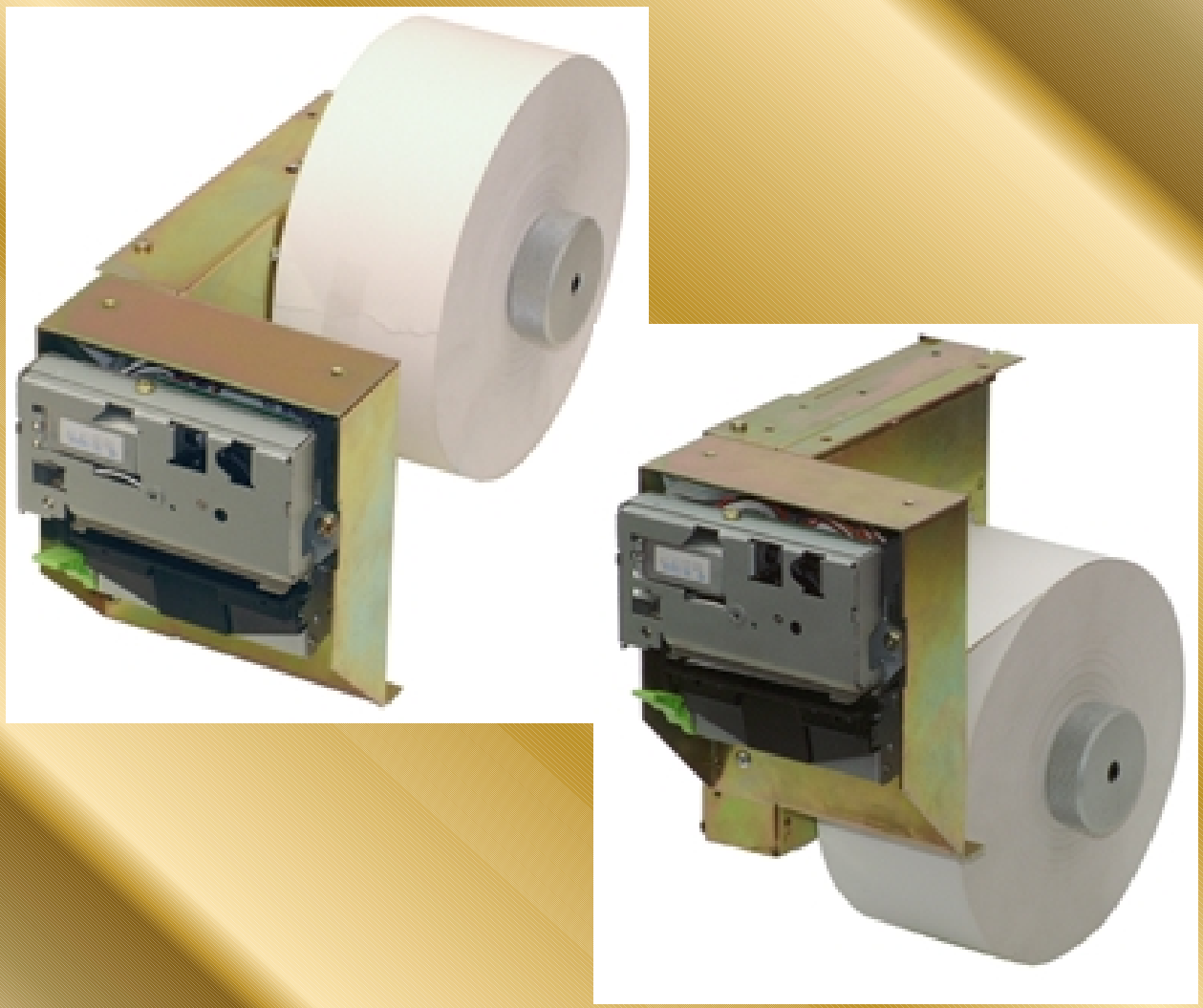
TK41 THERMAL PRINTER

Operation Manual - Version 2.0

February 2003



Revision list for the TK41 thermal printer operation manual.

V1.0 Date: 15-10-2001

Page	Type of revision	Before change	After change

V1.1 Date: 20-02-2002

Page	Type of revision	Before change	After change
8	change	9ª, 14ª,0,1ª	**9A, 14A, 0.1A**
49	change	Fig.3.6.1 - Optical Mark Characteristics	**Fig.3.6 – Optical Mark Characteristics**
68	addition		**ITF bar code**
73	change	Fig. C.1- TK4160T/TK4180B external dimensions	**Fig. C.1 – TK4160T/TK4180T external dimensions**
74	change	Fig. C.2- TK4160B/TK4180B external dimensions	**Fig. C.2 – TK4160B/TK4180B external dimensions**

V1.2 Date: 4-12-2002

Page	Type of revision	Before change	After change
	addition		**Code128 bar code**

V2.0 Date: 13-2-2003

Page	Type of revision	Before change	After change
all	general		

I N D E X

IMPORTANT NOTES ON TK41 HANDLING ---------- 6

0- INTRODUCTION ---------- 8
1- GENERAL SPECIFICATIONS ---------- 9
1.1- PRINTING SPECIFICATIONS ---------- 9
1.2- CHARACTER SPECIFICATIONS ---------- 9
1.3- ELECTRICAL CHARACTERISTICS ---------- 10
1.4- PAPER REQUIREMENTS ---------- 10
1.5- OVERALL DIMENSIONS ---------- 10
1.6- ENVIRONMENTAL CONDITIONS ---------- 11
2- INSTALLATION ---------- 12
2.1- FIXING THE TK41 PRINTER ---------- 12
2.1.1- TK41T (Top fixing model) INSTALLATION ---------- 12
2.1.2- TK41B (Bottom fixing model) INSTALLATION ---------- 13
2.2- TK41 INSTALLATION CONSIDERATIONS ---------- 14
2.2.1- EXTERNAL CHUTE SYSTEM ---------- 16
2.2.2- PAPER GUIDE SYSTEM ---------- 17
2.3- TK41 CONNECTORS ---------- 18
2.3.1- POWER SUPPLY CONNECTOR ---------- 19
2.3.2- SERIAL RS-232 CONNECTOR ---------- 21
2.3.2.1- Specifications ---------- 21
2.3.2.2- Serial interface connection example ---------- 22
2.3.3- CENTRONICS PARALLEL CONNECTOR ---------- 23
2.3.3.1- Specifications ---------- 23
2.3.3.2- Parallel interface connection example ---------- 25
3- BASIC OPERATIONS ---------- 28
3.1- LOADING PAPER ---------- 28
3.1.1- AUTOMATIC PAPER LOAD ---------- 29
3.1.2- MANUAL PAPER LOAD ---------- 30
3.2- CHARACTER CODE TABLE ---------- 31
3.3- BUTTONS & LEDS ---------- 33
3.3.1- BUTTONS FUNCTIONS ---------- 34
3.3.2- LED INDICATORS ---------- 35
3.4- SPECIAL MODES ---------- 36
3.4.1- SELF-TEST MODE ---------- 36
3.4.2- PROGRAMMING MODE ---------- 38
3.4.3- HEXADECIMAL DUMP MODE ---------- 40
3.5- ERROR PROCESSING ---------- 41
3.5.1- NO PAPER / HEAD-UP ERROR ---------- 42
3.5.2- PAPER-NEAR-END SENSOR ---------- 43
3.5.3- THERMAL HEAD TEMPERATURE ERROR ---------- 44
3.5.4- AUTOCUTTER ERROR ---------- 45
3.5.5- THERMAL HEAD VOLTAGE (Vp) ERROR ---------- 46
3.5.6- HARDWARE ERROR ---------- 47
3.5.7- OPTICAL MARK ERROR ---------- 48
3.5.8- SERIAL PORT ERROR DETECTION FLOW CHART ---------- 49
3.5.9- PARALLEL PORT ERROR DETECTION FLOW CHART ------- 50
3.6- OPTICAL MARK ---------- 51
3.6.1- EXAMPLE ON USING THE OPTICAL MARK ---------- 52

4- CONTROL COMMANDS ---------- 54
4.1- COMMAND NOTATION ---------- 54
4.2- EXPLANATION OF TERMS ---------- 54
4.3- CONTROL COMMANDS DESCRIPTION ---------- 55

APPENDIX A- CHARACTERS x LINE ---------- 74
APPENDIX B- RECOVERY FROM AUTOCUTTER ERROR ---------- 75
APPENDIX C- EXTERNAL APPEARANCE ---------- 76
APPENDIX D- SPECIFICATIONS ---------- 78
APPENDIX E- HOW TO ORDER ---------- 79
APPENDIX F- FREQUENTLY ASKED QUESTIONS ---------- 80
APPENDIX G- CODE 128 BAR CODE ---------- 81
APPENDIX H- TESTING SOFTWARE ---------- 85

FIGURES AND TABLES

Fig a. Head cleaning procedure---------- 7
Fig. 1.1- Operating Temperature and Humidity Range ---------- 11
Fig. 2.1- Fixing the TK41T ---------- 12
Fig. 2.2- Fixing the TK41B ---------- 13
Fig. 2.3- Accessible parts of the TK41T ---------- 14
Fig. 2.4- Accessible parts of the TK41B ---------- 15
Fig. 2.5- Paper-near-end sensor positions ---------- 15
Fig. 2.6- External chute system ---------- 16
Fig. 2.7- Paper guide system ---------- 17
Fig. 2.8- Fixing holes of the TK41---------- 17
Fig. 2.9- TK41 connectors location ---------- 18
Fig. 2.10- Power supply connector as seen from outside the TK41 ---------- 19
Fig. 2.11- RS-232 connector as seen from outside the TK41 ---------- 21
Fig. 2.12- CENTRONICS connector as seen from outside the TK41 ---------- 24
Fig. 2.13- Parallel input / output signal timing chart --- ---------- 27
Fig. 3.1- Place the paper roll ---------- 28
Fig. 3.2- Paper roll positioning ---------- 28
Fig. 3.3- (1) Automatic paper load ---------- 29
Fig. 3.4- (2) Automatic paper load ---------- 29
Fig. 3.5- (1) Manual paper load ---------- 30
Fig. 3.6- (2) Manual paper load ---------- 30
Fig. 3.7- (3) Manual paper load ---------- 30
Fig. 3.8- TK41 Buttons & Leds identification ---------- 33
Fig. 3.9- SELF-TEST MODE sample ---------- 37
Fig. 3.10- PROGRAMMING MODE sample ---------- 39
Fig. 3.11- HEXADECIMAL DUMP MODE sample ---------- 40
Fig. 3.12- Serial port error detection flow chart ----------49
Fig. 3.13- Parallel port error detection flow chart---------- 50
Fig. 3.14- Optical Mark Characteristics ---------- 51
Fig. 3.15- Optical Mark recommended use sequence ---------- 53
Fig. 4.1- Code128 code example---------- 71
Fig. B.1- Printer mechanism. Front view ---------- 75
Fig. C.1- TK4160T/TK4180T external dimensions---------- 76
Fig. C.2- TK4160B/TK4180B external dimensions---------- 77

Table 2.1- Serial port pin-out ---------- 21
Table 2.2- Serial interface connection example---------- 22
Table 2.3- Parallel port pin-out ---------- 23
Table 2.4- Standard parallel connection example---------- 25
Table 2.5- Special parallel connection example---------- 26
Table 3.1- (1) PC437 character code table---------- 31
Table 3.2- (2) PC437 character code table---------- 32
Table 3.3- Errors explanation ---------- 41
Table 3.4- Parallel Port Signals VS Type of error ---------- 41
Table 3.5- Parallel Port pins status at “NO PAPER / HEAD-UP” error ---------- 42
Table 3.6- Parallel Port pins status at “PAPER NEAR END” error ---------- 43
Table 3.7- Parallel Port pins status at “HEAD TEMPERATURE” error ---------- 44
Table 3.8- Parallel Port pins status at “AUTOCUTTER” error ---------- 45
Table 3.9- Parallel Port pins status at “HEAD VOLTAGE” error ---------- 46
Table 3.10- Parallel Port pins status at “HARDWARE” error ---------- 47
Table 3.11- Parallel Port pins status at “OPTICAL MARK” error ---------- 48
Table 4.1- Command List ---------- 55
Table C.1- TK4160T / TK4180T different dimensions ---------- 76
Table C.2- TK4160B / TK4180B different dimensions ---------- 77

IMPORTANT NOTES ON TK41 HANDLING

In order to guarantee a long life of the printer, it is necessary to keep some precautions on the TK41 handling. Please read carefully next lines to make a good use of the printer.

SAFETY PRECAUTIONS

Before using the printer, please carefully read point *2- INSTALLATION*.
BEWARE not to invert power supply polarity. This may irremediably damage the printer.
Use power supply voltage within specified range. Overvoltage may irremediably damage the printer. Voltage under the specified range may cause incorrect operations.
Keep TK41 away from water or any other liquid.
Do not use in locations subject to high humidity or dust levels.
DO NOT put any objects into the printer. It could cause severe damage like shortcircuits, broken thermal head or general printer failure.
DO NOT blow the TK41.

- **NEVER modify the TK41.**
- **DO NOT try to repair the TK41 by yourself. If some failure is detected contact with your usual dealer technical service.**
- **Since the printer contains permanent magnets (in the motor) as well as elctromagnets, it should not be used in areas containing excessive dirt, dust and metallic particles.**
- **Never print without paper installed or the head away from the platen, because the life of the thermal head may be shortened.**
- **Never pull the paper out (forward or backward) with the head down against the platen.**
- **Since the head heating elements and the driver IC are very delicate, avoid touching them with any metal objects, such as tweezers or screwdrivers.**
- **Since the head area and the motor surface reaches high temperatures right after printing, never touch it with your bare hands; wait about 15 min. For it to cool.**
- **Never touch the surface of the head heating elements and the driver IC, as dirt may stick to them, affecting the head heating elements or causing damage by static electricity.**

- **<u>HEAD CLEANING PROCEDURE AND PRECAUTIONS</u>**.
  Do not clean the thermal head immediately after printing because thermal head and its periphery are hot during and after printing.
  Do not use sandpaper, cutter knives etc. when cleaning. They will damage the heat elements.

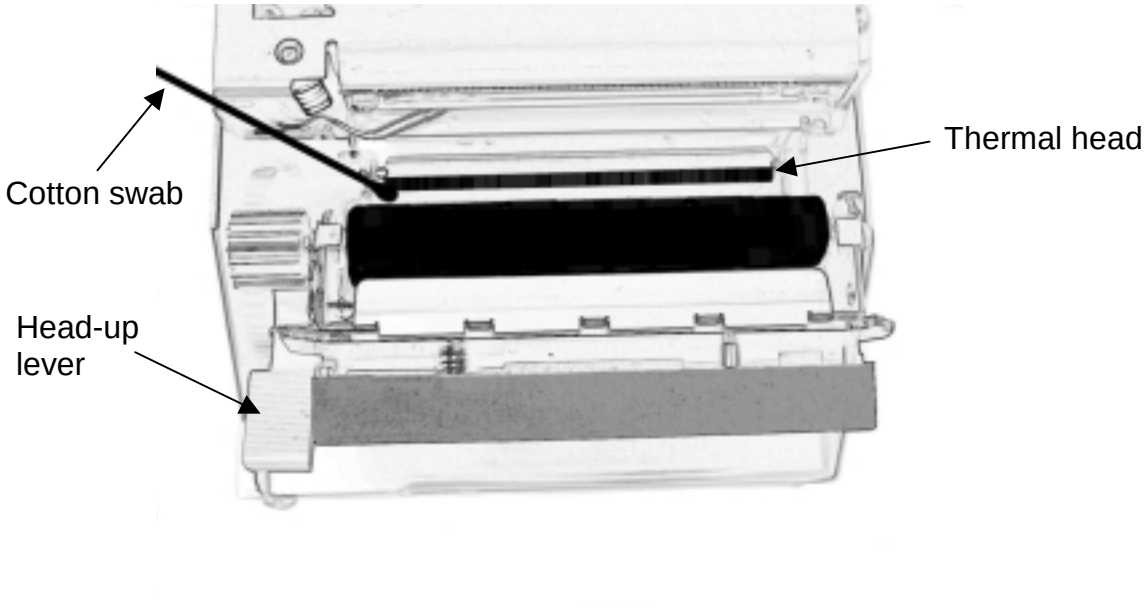


Fig a. Head cleaning procedure

Turn off the printer. Turn the release lever in the direction of the arrow. Clean the heat elements using alcohol (ethanol, methanol, or IPA) and a cotton swab. Wait until the alcohol dries and close the platen block. Fenix recommends cleaning the thermal head periodically (generally every 3 months) to maintain receipt print quality.

<u>RECOMMENDATIONS</u>

- **Before connecting any input interface, verify the correct operation of the TK-41 printer with self test feature.**
- **Place the TK41 in such a way that connection wires are not crushed or twisted**.

0 – INTRODUCTION

The TK41 is a very high-performance embedded thermal line printer. Its compact and functional design covers many professional applications. It has graphics capabilities and bar code representation.
The TK41is intended to be integrated into the user's final system. Its structure allows an easy access either to the interface or the critical parts of the mechanism. So, special care must be taken at choosing the TK-41 location, access and protection from external damage. It can be used in industrial, professional or laboratory environments.

Main features of the TK41 printer are:

- Easy maintenance structure.
- Easy installation procedure.
- Compact and lightweight.
- Three paper widths available (60mm, 80 mm or 82 mm) depending on the printing mechanism used.
- Upper or lower paper roll location.
- High speed printing: up to 150mm/s.
- Line printing method: Printing is performed every time a text line is filled.
- High reliability: 15 million lines.
- Single 24V DC power supply (150W).
- No-paper and paper-near-end sensors.
- High resolution printing (8 dots/mm).
- Both parallel (CENTRONICS) and serial (RS-232) data input interface.
- Scalable font (independent scale in X / Y axis).
- Programmable character and line space.
- Printing adjustments (speed, density and consumption).
- Graphic bitmap printing capabilities.
- Several formats Bar Code.
- Two different font sizes (Font A = 12x24dots. Font B = 8x16dots).
- Control code based on ESC / POS commands(*).
- Hexadecimal mode for easy software debugging.
- Scissors type autocutter.
- Self test feature.
- Windows 95, 98, NT & 2000 drivers and demo/configuration program.

This manual is a guide of the printer operations and is addressed to the application's designer. In following chapters there is a detailed description of hardware and software configuration to take advantage of the features of the TK41 printer.

(*) ESC/POS are registered trademarks of Seiko Epson Corporation.

1 – GENERAL SPECIFICATIONS

1.1-PRINTING SPECIFICATIONS

1) Printing method: Thermal line printing.

2) Print Head:

Total number of dots:

Printing mechanism model type	Number of dots
M-522AF (59.5mm paper-width model)	448 dots (= 56mm)
M-532AF (79.5mm paper-width model)	576 dots (= 72mm)
M-542AF (82.5mm paper-width model)	640 dots (= 80mm)

Printing width:

Printing mechanism model type	Maximum printing width
M-522AF (59.5mm paper-width model)	56mm (448-dot positions)
M-532AF (79.5mm paper-width model)	72mm (576-dot positions)
M-542AF (82.5mm paper-width model)	80mm (640-dot positions)

3) Dot density: 203 dpi x 203 dpi (dpi: dots per inch (25.4mm)).
(8 dots/mm)

4) Printing speed:
High speed mode: 150mm/s (5,9”/s) max.
Normal mode: 100mm/s (3,9”/s)
Low speed mode: 80mm/s (3,1”/s)
Very low speed mode: 50mm/s (2”/s)
Printing speed may be slower, depending on the data transmission speed and combination of control commands, environmental conditions, or selection of the print density.

5) Paper feeding:
Feeding method: unidirectional with friction feed.
Feeding pitch: 0,125mm (0,0049”)
Feeding speed: 150mm/s (5,9”/s) maximum.

1.2- CHARACTER SPECIFICATIONS

1) Number of characters: Alphanumeric characters: 95
(Refer to point *3.2- CHARACTER CODE TABLE*).

2) Character structure: Font A: 12 x 24 dots (1,5 x 3 mm).
Font B: 8 x 16 dots (1 x 2 mm).
Font B is selected as the default.

1.3- ELECTRICAL CHARACTERISTICS

1) Supply voltage: +24V DC ± 2.4V (± 10%)

2) Current consumption (at 24V):

		80mm paper-width model	60mm paper-width model
High speed mode	Mean current	Approx. 9 A	Approx. 6.5 A
	Peak current	Approx. 14 A	Approx. 10 A
Standby mode	Mean current	Approx. 0.1 A	Approx. 0.1 A

1.4- PAPER REQUIREMENTS

1) Paper type: Single-ply thermal paper roll

2) Specified thermal paper: Original paper No. P350 KSP
Original paper No. TF50KS-E NIPPON PAPER INDUSTRIES CO., LTD.
Original paper No. AF50KS-E JUJO THERMAL
Original paper No. PD160R OJI
Original paper No. TF11KS-ET NIPPON PAPER INDUSTRIES CO., LTD.

A different paper type may give a different print quality.
The paper thickness must be 56 – 180 μm.

1) Size:

Paper width:

M-532AF printing mechanism	M-522AF printing mechanism
79.5 +/- 0.5mm (3.13” +/- 0.02”)	59.5 +/- 0.5mm (2.34” +/- 0.02”)

Paper roll outer diameter: 150mm (Max.)

1.5- OVERALL DIMENSIONS

1) External dimensions (with a 150mm-diameter paper roll):

	M-532AF/M-542AF mechanism	M-522AF mechanism
Lower paper- roll location	130x225x210 (WxDxH)	110x225x210 (WxDxH)
Upper paper-roll location	130x265x170 (WxDxH)	110x265x170 (WxDxH)

2) Weight (with a 150mm-diameter paper roll):
For the M-532AF/M-542AF mechanism: 1500gr. Approx.
For the M-522AF mechanism: 1300gr. Approx.

1.6- ENVIRONMENTAL CONDITIONS

1) Operating Temperature: 0 to 55ºC (32 to 131ºF)
Reliable printing: 5 to 50ºC (41 to 122ºF)

2) Operating humidity: 10 to 80% (34ºC (93.2ºF) at 80%, non-condensing)

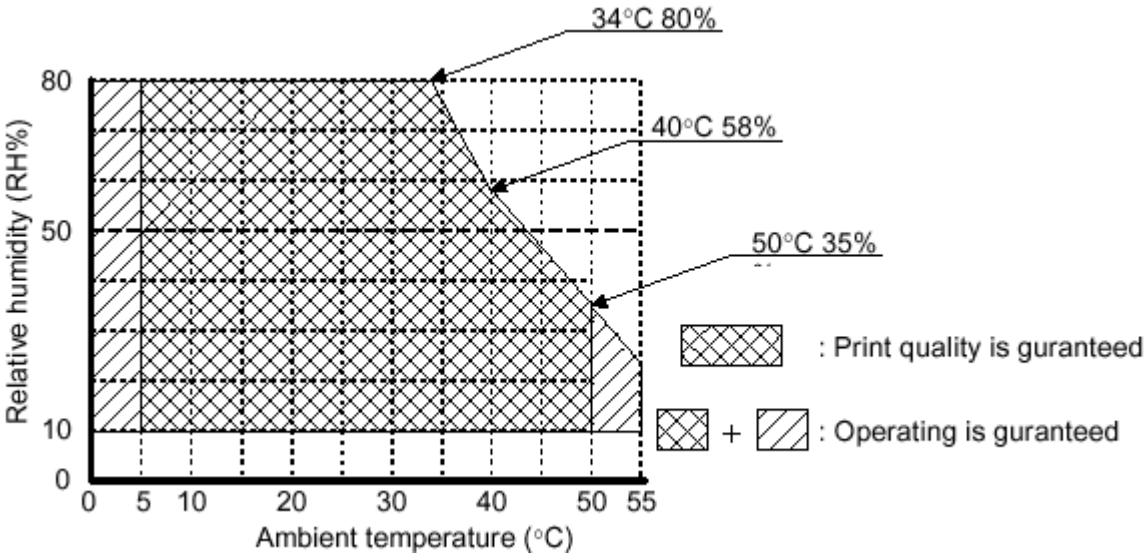


Fig. 1.1- Operating Temperature and Humidity Range

2 – INSTALLATION

2.1- FIXING THE TK41 PRINTER

The TK41 is an industrial printer thought to be fixed in a bigger case or structure, or another kind of appropriate chassis. There are two models for the TK41 printer with 4 different fixing points each.

2.1.1- TK41T (Top fixing model) INSTALLATION

- Fix the TK41T to the chassis by screwing putting four metric screws (M4 / L10 mm) through the holes marked with A in ***fig. 2.1-*** *Fixing the TK41T*.
- Place all the four screws in the same direction, from up to down.
- Use two metric nuts (M4) to secure the screws marked with B in the same figure.
- It is hardly recommended that the fixing holes of your chassis have an oval shape so as the TK41 can move backward and forward for an easy manipulation (See point ***2.2- TK41 INSTALLATION CONSIDERATIONS***)

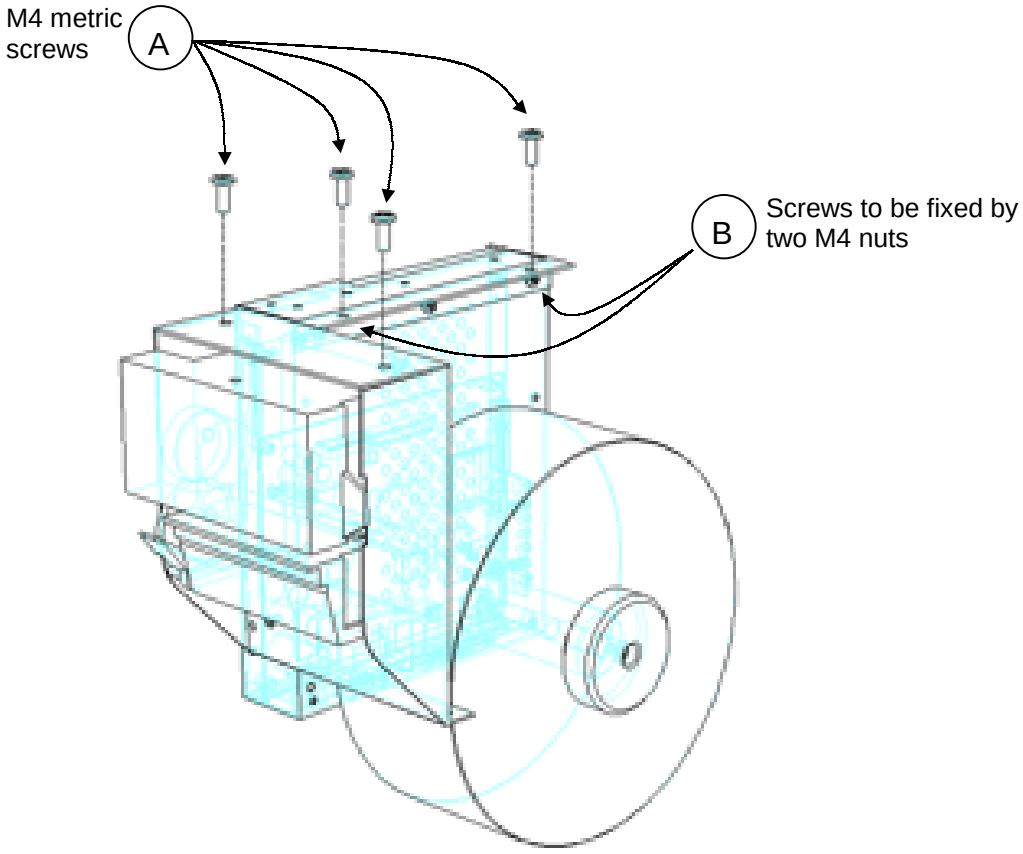


Fig. 2.1- Fixing the TK41T.

2.1.2- TK41B (Bottom fixing model) INSTALLATION

- Fix the TK41B to the chassis by screwing putting four screws (M4 / L10 mm) through the holes marked with A in ***Fig. 2.2-*** *Fixing the TK41B*.
- Place all the four screws in the same direction, from down to up.
- Use two metric nuts (M4) to secure the screws marked with B in the same figure.
- It is hardly recommended that the fixing holes of your chassis have an oval shape so as the TK41 can move backward and forward for an easy manipulation (See point ***2.2- TK41 INSTALLATION CONSIDERATIONS***)

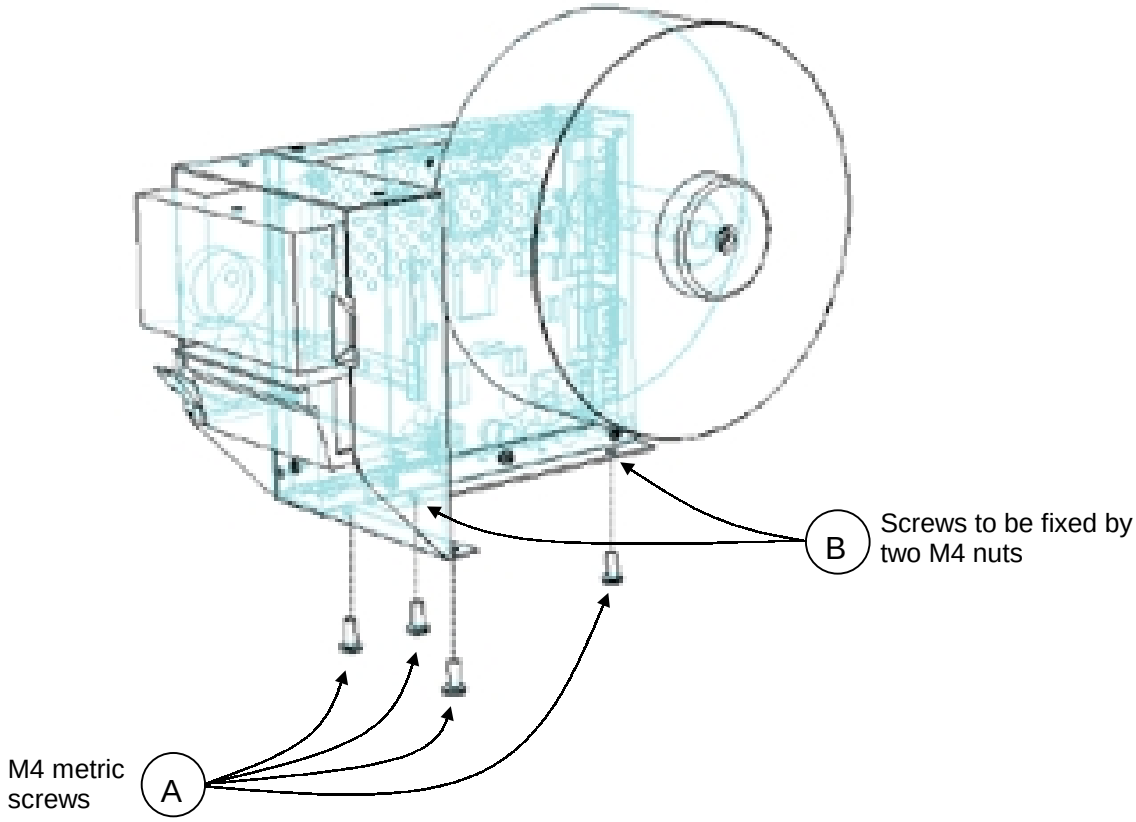


Fig. 2.2- Fixing the TK41B.

2.2- TK41 INSTALLATION CONSIDERATIONS

Despite of the model, there are some general considerations to take into account when installing the TK41.
A wrong installation can cause many serious problems like paper jam, difficult maintenance of the printer, impossible to change the paper roll, etc.

Moreover, a correct installation can prevent the printer of being damaged by external agents, like weather or vandalism.

The basic points that a correct installation must follow are:

- Smooth exit of the ticket. Prevent problems with static electricity due to the nature of the used materials.
- Avoid the final user's access to the printer outlet.
- Allow enough space and accessibility to reach the maintenance procedure points in case it is needed. These points are:
    - Printing Head.
    - Paper roll.
    - Interface.
    - Connectors.
    - Leds and Push-buttons.

(See ***fig. 2.3-*** *Accessible parts of the TK41T* and ***fig. 2.4-*** *Accessible parts of the TK41B*)

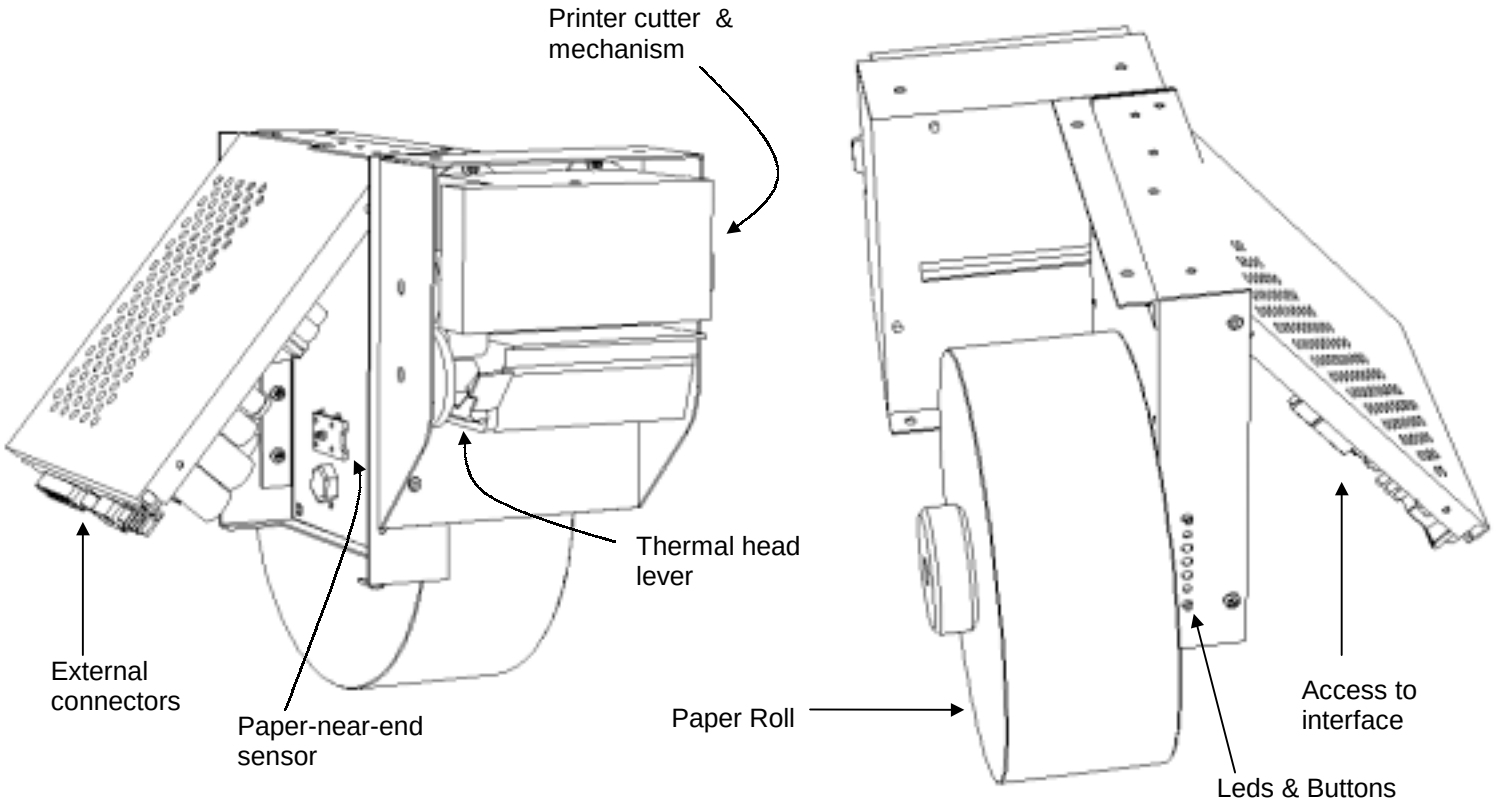


Fig. 2.3- Accessible parts of the TK41T.

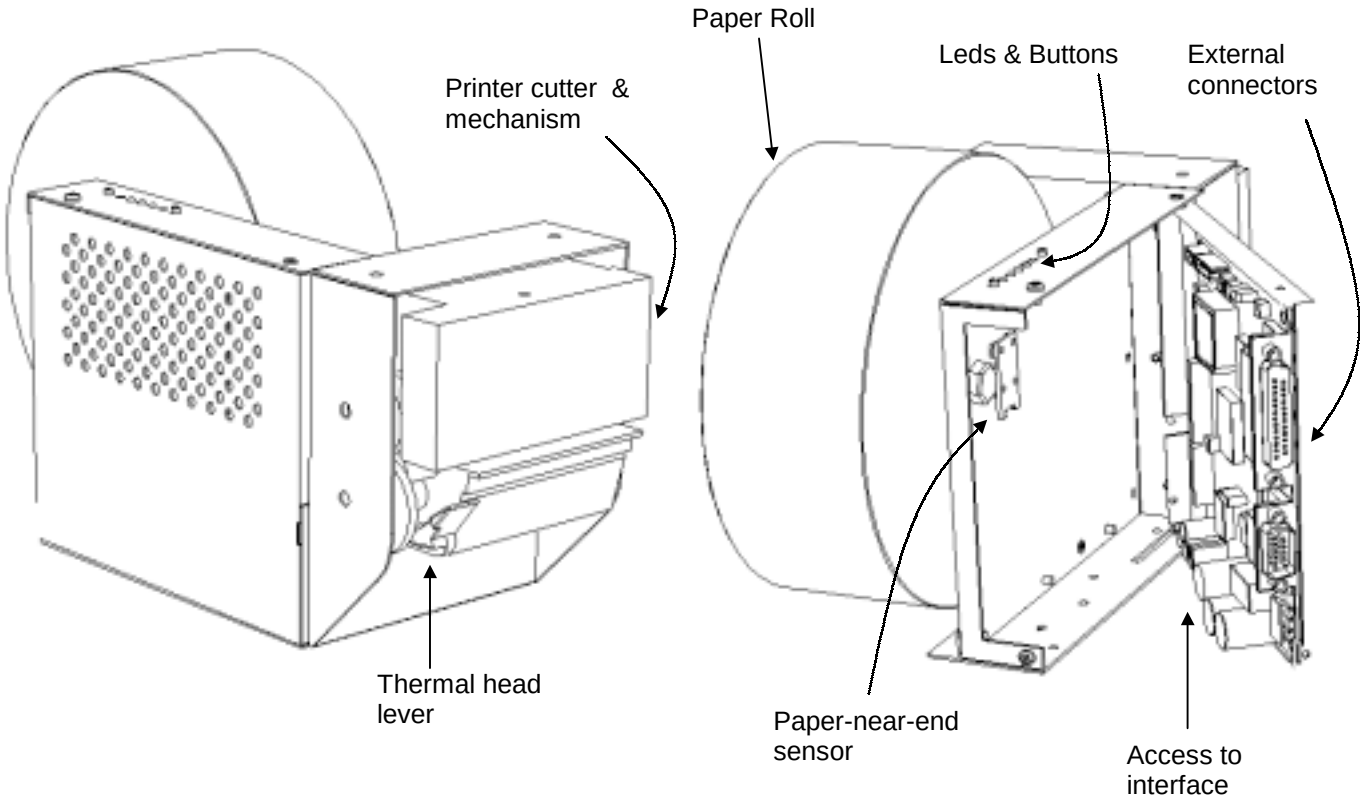


Fig. 2.4- Accessible parts of the TK41B.

The paper-near-end sensor can be fixed in two positions:

A) Detects paper-near-end when remaining paper is about 7m long.
B) Detects paper-near-end when remaining paper is about 30m long.

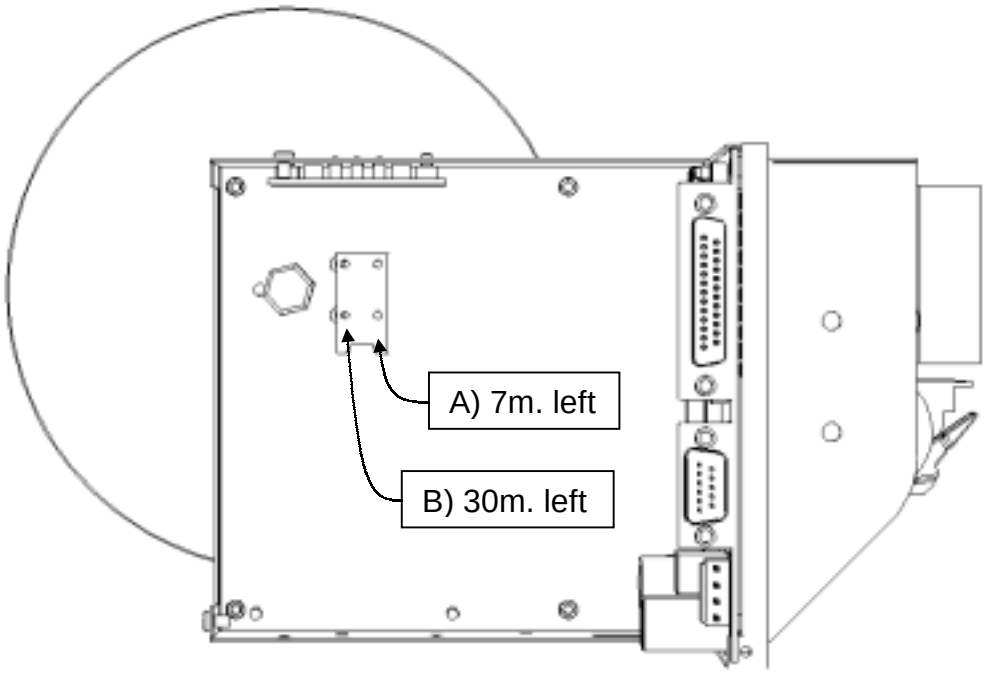


Fig. 2.5- Paper-near-end sensor positions.

For these reasons, FENIX suggests the following systems as solutions to a correct installation:

2.2.1- EXTERNAL CHUTE SYSTEM

The idea of this system is to internally print and cut the ticket inside the machine, and then make it fall into a receptacle where the user can have external access. Therefore, there must exist some distance between the printer and the front side of the user's chassis in order to build a useful chute for the ticket, and to be able to open the printer thermal head.
Two points must be assured to make this system work right:

- The construction of the receptacle must avoid the user to reach any internal parts of the machine.
- The way of the ticket from the printer outlet to the receptacle must be smooth, clean and free of obstacles to allow the ticket to actually fall into it and avoid paper jams or tickets that do not fall. Depending on the construction materials, care must be taken with static electricity; otherwise tickets may get stuck inside the machine and never reach the receptacle.

Next figure shows a scheme of this system:

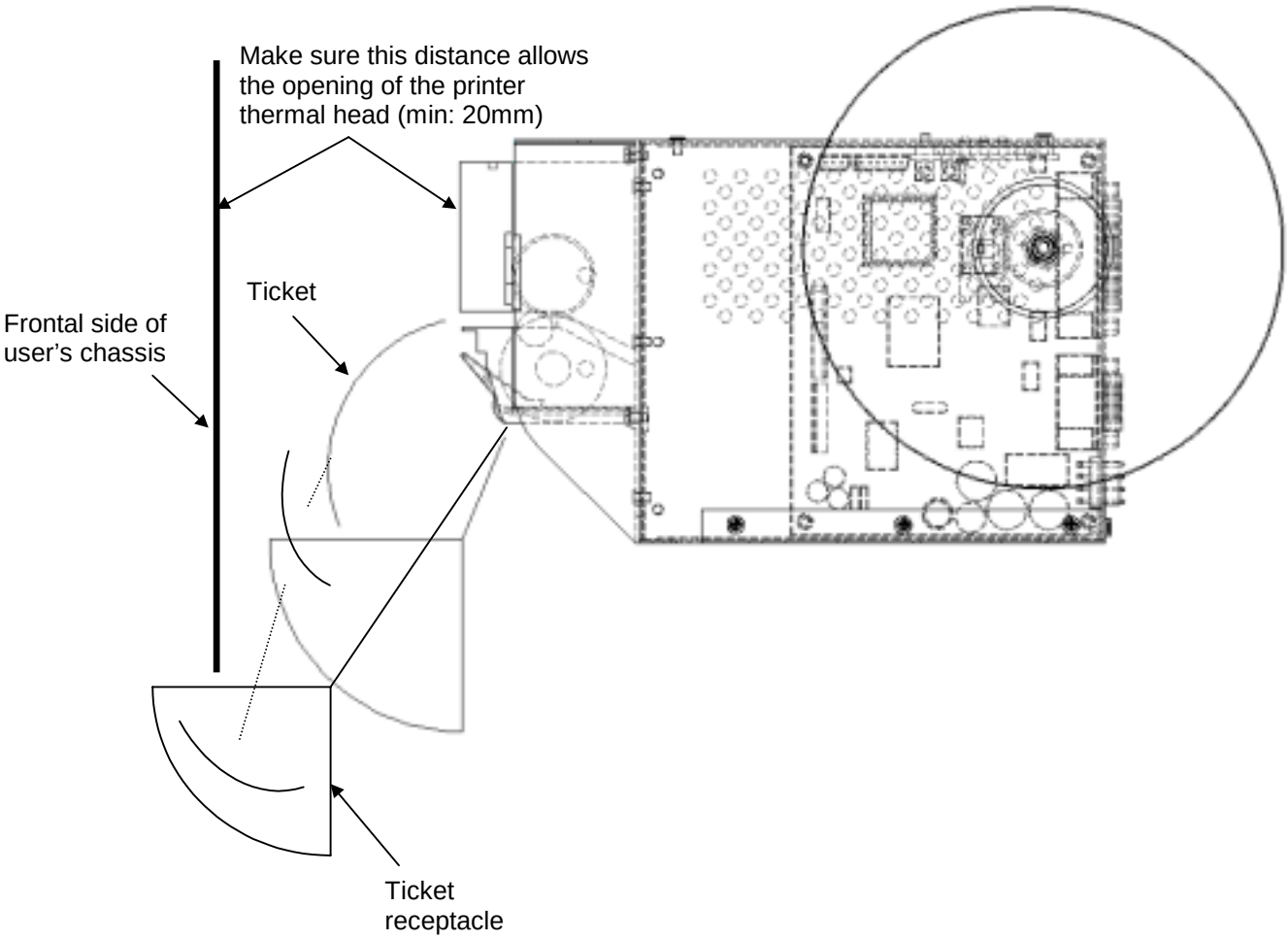


Fig. 2.6- External chute system.

2.2.2- PAPER GUIDE SYSTEM

When using this system, the printer must be set quite near the front side of the user's chassis. The paper guide is to avoid external handling of the printer outlet.
Two points must be assured to make this system work right:

- Special care in the design of the part which goes from the printer outlet to the paper guide (Paper jams can a occur due to an inappropriate design). Depending on the construction materials, care must be taken with static electricity; otherwise tickets may get stuck in the paper guide and never reach the receptacle.
- As the printer is placed very near the user's chassis, some system must be implemented in order to move the printer when accessing the printing head (i.e. giving the fixing holes of the chassis an oval shape to allow the printer moving forward and backward). Otherwise there will be no access to the printing head.

Next figure shows an scheme of this system:

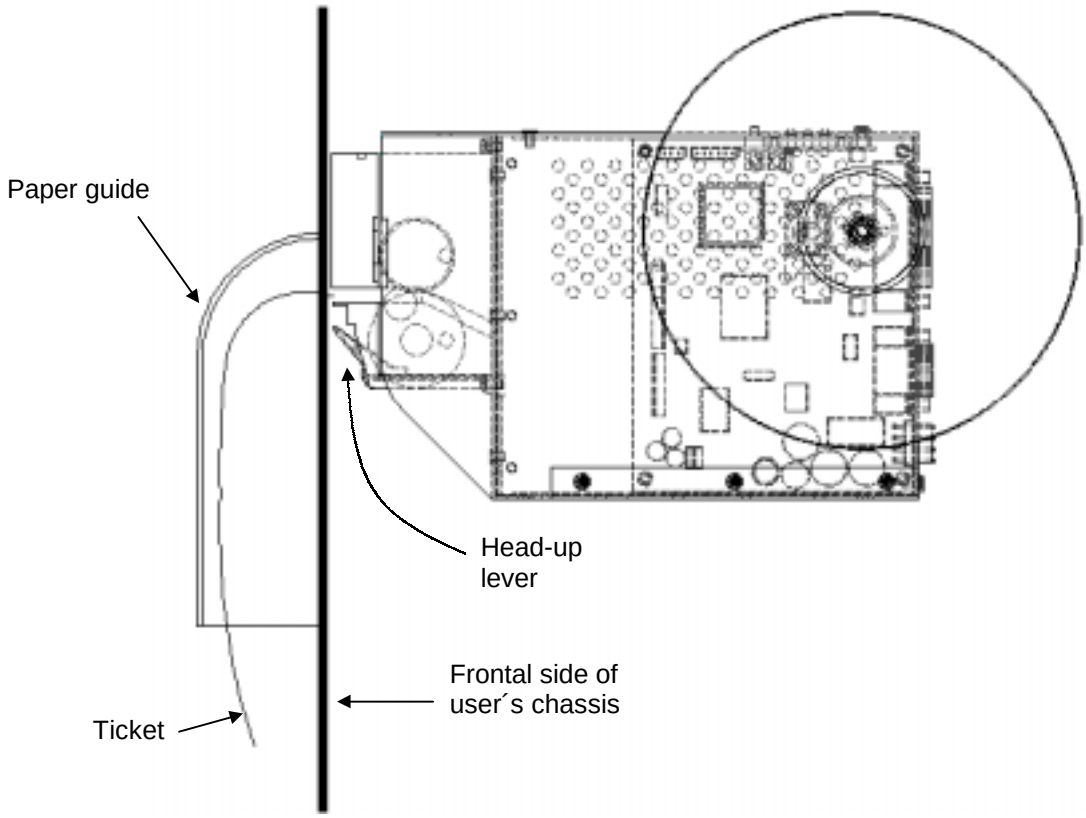


Fig. 2.7- Paper guide system.

The distance between the mechanism and the frontal side of the user's chassis may not allow the opening of the printer thermal head. To avoid this, one solution is to design the fixing holes of the TK41 with an oval shape, so as the machine can move backward and forward to access to its head-up lever.

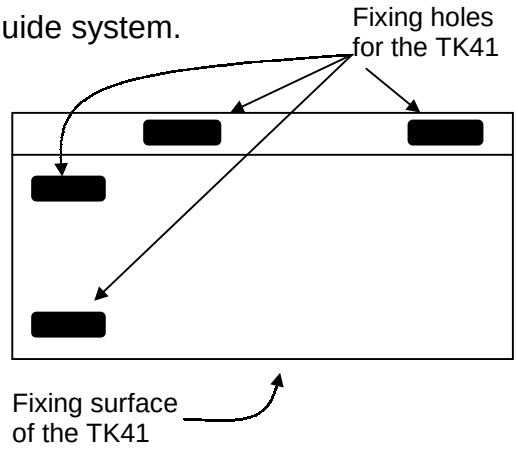


Fig. 2.8- Fixing holes for TK41

2.3- TK41 CONNECTORS

When using the TK41T, the external connectors are placed in the bottom side of the printer.
When using the TK41B, the external connectors are placed in the back side of the printer.
User can find the next connectors:

- Power supply connector.
- Serial RS-232 communications connector.
- Parallel CENTRONICS communications connector.

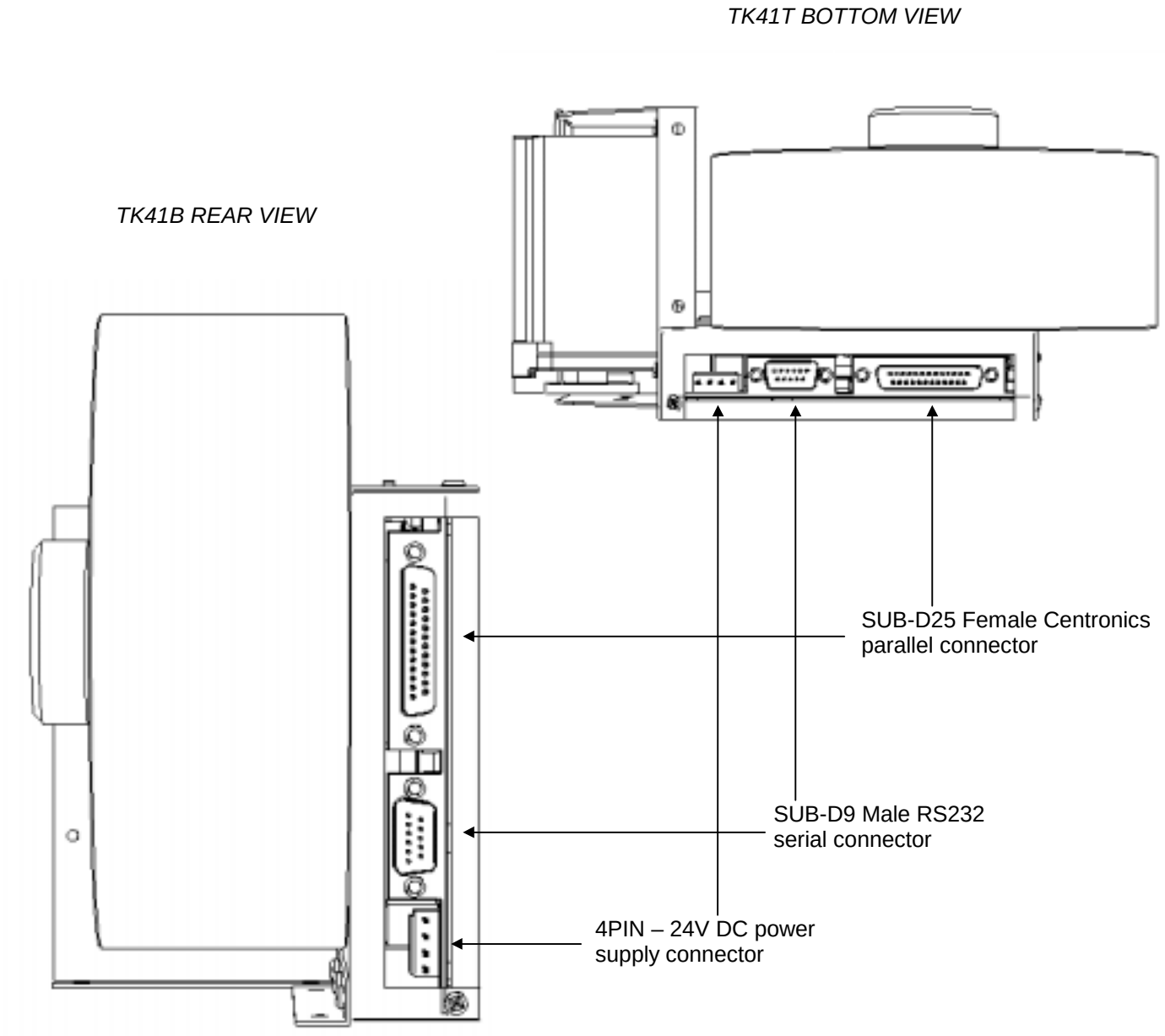


Fig. 2.9- TK41connectors location.

2.3.1- POWER SUPPLY CONNECTOR

Attach power supply cable to the 4-pin micro connector. Verify power supply voltage before making the connection.

NOTE: All the 4 pins must be connected.
The minimum section for the supply wires is 1mm^2.
Cables more than 50cm long are not recommended.

Terminal nº	Signal Name	Function
1	GND	Ground
2	VCC	Printer power (24v DC)
3	VCC	Printer power (24v DC)
4	GND	Ground

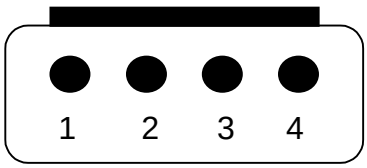


Fig.2.10- Power supply connector as seen from outside the TK41.

User side connector model: Housing: VHR-4N (JST or compatible)
Contacts: SVH-21T-P1.1 (JST or compatible)

The TK-41 requires one power source: VCC (24v DC) for driving the thermal head and motor. This voltage is internally regulated to 5V to control the electronics. The power supply must satisfy the following conditions:

VCC: **24v DC +/- 2,4v**

Example of current consumption (for the 79.5mm-wide mechanism):
Print head current consumption at a printing ratio of 25%:
(Printing ratio is defined as the number of dots/dot line (576 dots)).

1) Peak current: Approx. 6.7 A (the moment all 160 dots are energized).
NOTE: The peak current is measured at the minimum resistive value and at the maximum voltage.
Conditions:
VH max: Head connector terminal voltage max. 26.4V
Rmin: Head resistance value min. 626.8 Ohm.

2) Mean current Approx. 1.75 A
(Head terminal voltage= 24V, head resistive value R=657Ohm, print duty of 25%, mean energizing pulse width of 248 μs (assumed that 50% of printed dots are energized just before), synchronizing with 833μs).

The following formula is used to obtain the head drive current:

Imean = [V(volts)/R(Ohms)] x 576dots x printing ratio x [energizing pulse width/cycle]

NOTES:

- If the number of dots that are energized at the same time is increased, a higher current will flow; therefore, the user should use a power supply with a current capacity adequate for the corresponding print duty.
- When designing lines and bit images, take the printing ratio and print duty into account.
- Print quality may be poor if the printing ratio or print duty is high.
- Definitions:
    - Printing ratio: the number of printing dots (energizing pulses)/dot line.
    - Print duty: the number of printing dots (energizing pulses)/ elements/ paper feed amount (two steps, including non-printing area)
- Average energizing pulse width is defined as 107 of 160 dots per dot line that are continuously energized.

WARNING : Beware not to invert the polarity of power supply. This may irremediably damage the printer.

IMPORTANT NOTE ABOUTTK42 POWER SUPPLY:

The necessary power supply depends on content printed in the ticket. A 150w power supply covers all adversed possibility (printing ratio of 100% black at any temperature). However, if the print ratio is not over 60%, a 60w power supply can be used. Any way, power supply must satisfy the peaks current that mechanism requires, which are determined by the following formula:

$$I_{peak} = [24/657] \times \text{number of printing dots}$$

2.3.2- SERIAL RS-232 CONNECTOR

2.3.2.1- Specifications

- Data transmission: Serial
- Synchronization: Asynchronous
- Handshaking: CTS/RTS control
- Signal levels (RS232): Logic "1" = -3 to –15 V
  Logic "0" = +3 to +15 V
  (See *APPENDIX E- HOW TO ORDER* for TTL signal levels).
- Baud rate: 4800, 9600, 19200, 38400 bps (bps: bits per second)
- Data word length: 8 bits (fixed)
- Parity Settings: None, even, odd
- Stop bits: Fixed to 1.
- Connector (printer side): Male D-SUB9 pin connector

NOTES:

- The baud rate, and parity settings can be changed in *PROGRAMMING MODE*. (Refer to point ***3.4.2***.).
- The stop bit for the printer side is fixed to 1.
- The data word length is fixed to 8 bits.

Pin	Signal name	Signal direction(from the printer side)	Function
2	RXD	Input	Receive data
3	TXD	Output	Transmit data
4	/DTR	Output	Logic "0" indicates that the printer is connected and ready to receive data, and logic "1" indicates that the printer is busy. If this signal stays logic "1" for more than 4 seconds this indicates an error in the printer (see point *3.5- ERROR PROCESSING*).
5	GND	-	Ground
6	-	-	Not connected
7	/RTS	Output	When this signal is logic "0" the printer is ready to receive data, and logic "1" indicates that the printer is busy.

Table 2.1- Serial port pin-out.

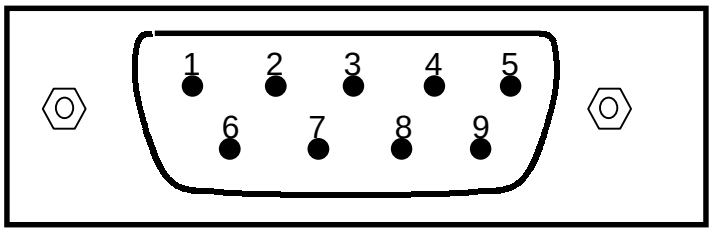


Fig. 2.11– RS-232 connector as seen from outside the TK41.

2.3.2.2- Serial interface connection example

The cable which has the signal connection as shown below must be used.

PRINTER SIDE			***USER SIDE (PC)***	
D-SUB9 Pin Num.	Signal Name		Signal Name	D-SUB9 Pin Num.
1	(NC)		DCD	1
2	RxD	◄	RxD	2
3	TxD	►	TxD	3
4	/DTR		/DTR	4
5	SG	◄►	SG	5
6	/DSR	◄	/DSR	6
7	/RTS		/RTS	7
8	/CTS	►	/CTS	8
9	(NC)		RI	9

NC: Not Connected

Table 2.2- Serial interface connection example.

NOTE: Transmit data to the printer after turning on the power and initializing the printer.

The TK41 receives data continuously, even while performing printing operation.
The TK41 serial input/output signals (RXD, /RTS and TXD) can be RS232C level or TTL level (see ***APPENDIX E- HOW TO ORDER***).
The TK41 receives and checks serial data according to the transmission baud rate programmed.
If the input data is not printed correctly, the transmission conditions between the host device and the TK41 do not probably match. If this happens, the character ***"?"*** is continuously printed and user must adjust the transmission conditions so that they match.

Serial data output (TXD): output pin, SUB-D9-3

- Data is output according to the programmed transmission conditions.

Serial data input (RXD): input pin, SUB-D9-2

- Data input port
- Data is input from the host device according to the programmed transmission conditions.

Serial busy (/RTS): output pin, SUB-D9-7

- Indicates whether or not the printer is ready to receive data.
- When the /RTS signal is "LOW", data can be input.

NOTE:
For more information on serial data reception see point *3.5.8- SERIAL PORT ERROR DETECTION FLOW CHART*.
Connect the communications cable before turning ON the TK-41.

2.3.3- CENTRONICS PARALLEL CONNECTOR

2.3.3.1- Specifications

- Data transmission: 8-bit parallel
- Synchronization: External supplied /STB signals
- Handshaking: /ACK and BUSY signals
- Signal levels: TTL compatible
- Connector (printer side): Female D-SUB25 pin connector

Pin Number	Signal Name	Signal direction (from the printer side)	Function
1	/STB	Input	Strobe signal
2	Data0 (LSB)	Input	Data Bus
3	Data1	Input	
4	Data2	Input	
5	Data3	Input	
6	Data4	Input	
7	Data5	Input	
8	Data6	Input	
9	Data7 (MSB)	Input	
10	/ACK	Output	Acknowledge signal
11	BUSY	Output	Busy signal
12	Perror	Output	Paper error
13	Select	Output	Printer Selected
14	NC	-	NOT CONNECTED
15	/ERR	Output	Error signal
16	ST1	Output	Status signal 1
17	ST2	Output	Status signal 2
18	GND	-	Ground
19	GND	-	Ground
20	GND	-	Ground
21	GND	-	Ground
22	GND	-	Ground
23	GND	-	Ground
24	GND	-	Ground
25	GND	-	Ground

Table 2.3- Parallel port pin-out.

NOTES:

1.If the host is not provided with all of the signal lines listed above, communication may fail.
2.For interfacing, if the communications cables are longer than 2m, signal lines shall use twisted pair cables with the return sides connected to signal ground level.
3.Interfacing conditions shall all be based on the TTL level to meet the characteristics described below. In addition, both rise time and fall time of each signal shall be 0.5 μs or less.
4.Data transmissions shall not ignore the /ACK or BUSY signals. An attempt to transmit data with either /ACK or BUSY, signal, ignored can cause lost data. (Data transmissions to the printer shall be made after verifying the /ACK signal or while the BUSY signal is at the “LOW” level.)
5.Interface cables shall be the minimum length required.

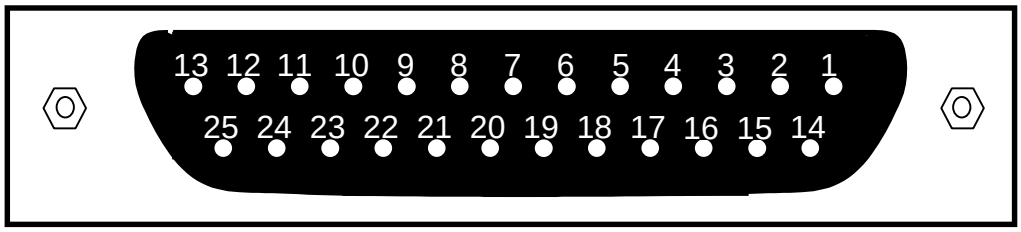


Fig. 2.12 – CENTRONICS connector as seen from outside the TK-41.

2.3.3.2- Parallel interface connection example

The cable which has the signal connection as shown below must be used:

PRINTER SIDE			***USER SIDE (PC)***	
D-SUB25 Pin Num.	Signal Name		Signal Name	D-SUB25 Pin Num.
1	/STB	←	/STB	1
2	Data0(LSB)	←	Data0(LSB)	2
3	Data1	←	Data1	3
4	Data2	←	Data2	4
5	Data3	←	Data3	5
6	Data4	←	Data4	6
7	Data5	←	Data5	7
8	Data6	←	Data6	8
9	Data7(MSB)	←	Data7(MSB)	9
10	/ACK	→	/ACK	10
11	BUSY	→	BUSY	11
12	PE	→	PE	12
13	Select	→	Select	13
14	NC		/AutoFeed	14
15	/ERR	→	/ERR	15
16	NC		/INIT	16
17	NC		/SelectIn	17
18 to 25	GND	↔	GND	18 to 25

NC: Not Connected

Table 2.4- Standard parallel connection example.

With this connection, user can check the follow errors:

- NO PAPER ERROR/ HEAD UP
- NEAR END PAPER ERROR *(**see command ESC c 3**)* → by **PE** signal

- GENERIC ERROR
  (*Temperature, cutter, voltage, hardware or optical mark*) → by **/ERR** signal

If user can know exactly the kind of error, the cable as shown below must be used:

PRINTER SIDE			***USER SIDE (PC)***	
D-SUB25 Pin Num.	Signal Name		Signal Name	D-SUB25 Pin Num.
1	/STB	←	/STB	1
2	Data0(LSB)	←	Data0(LSB)	2
3	Data1	←	Data1	3
4	Data2	←	Data2	4
5	Data3	←	Data3	5
6	Data4	←	Data4	6
7	Data5	←	Data5	7
8	Data6	←	Data6	8
9	Data7(MSB)	←	Data7(MSB)	9
10	/ACK	→	/ACK	10
11	BUSY	→	BUSY	11
12	PE	→	PE	12
13	Select	→	Select	13
14	NC		/AutoFeed	14
15	/ERR	→	/ERR	15
16	ST1	→	/INIT	16
17	ST2	→	/SelectIn	17
18 to 25	GND	↔	GND	18 to 25

NC: Not Connected

Table 2.5- Special parallel connection example.

NOTE:
For more information on check errors see point <u>3.5- ERROR PROCESSING</u>

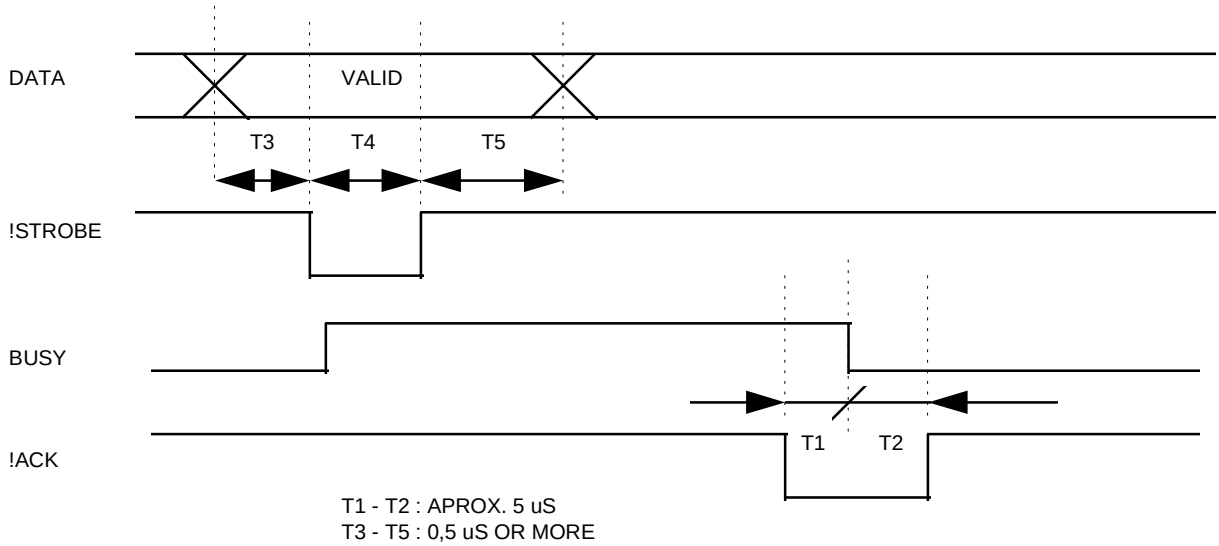


Fig. 2.13- Parallel input / output signal timing chart

Strobe (/STROBE) : input pin, SUB-D25-1

- Triggers reading of 8-bit parallel data (DATA0~DATA7).
- This signal is ignored when the BUSY signal is high.
- The /STROBE signal is normally “HIGH”. The data on the data lines (DATA0~DATA7) is placed into the buffer at the transition of this signal to “LOW”.

Data (DATA0~DATA7): input pin, SUB-D25-2 through 9

- Carries 8-bit parallel signals from the host device.
- “HIGH” is 1 and “LOW” is 0. The data on these lines are placed by the /STROBE signal.

Busy (BUSY): output pin, SUB-D25-11

- The BUSY signal indicates that the printer is ready to receive data.
- When the BUSY signal is “LOW”, data can be input. This signal remains “HIGH” from the transition of the /STROBE signal to “LOW” until the time when the data input processing is complete to indicate that the printer is unable to receive data.

Acknowledge (/ACK): output pin, SUB-D25-10

- The /ACK signal indicates that data reception is complete.
- The /ACK signal is normally “HIGH”. A pulse approximately 5 µS wide is generated when one-byte of data has been input.
- The printer generates this signal to indicate to the host device that it can receive further input data.

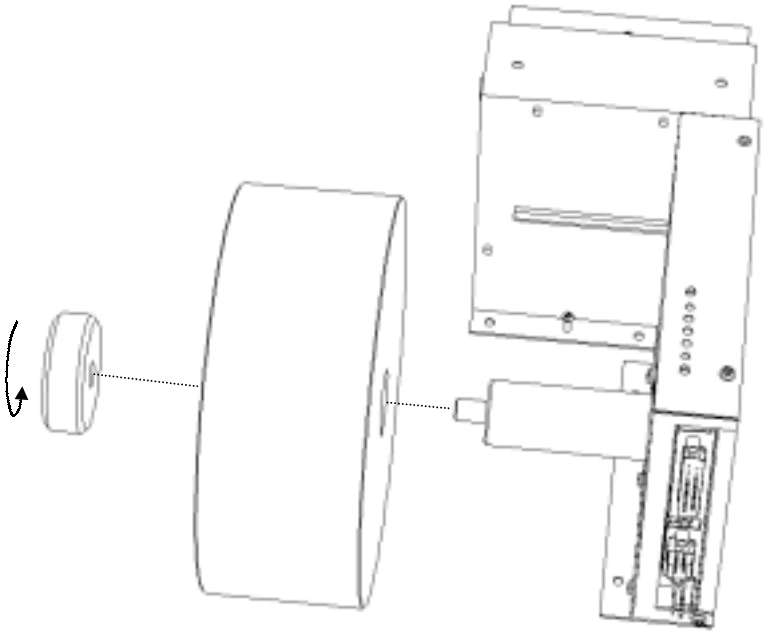
NOTE:
For more information on serial data reception see point *3.5.9- PARALLEL PORT ERROR DETECTION FLOW CHART*.
Connect communications connector before turning ON the TK-41.

3 – BASIC OPERATIONS

3.1- LOADING PAPER

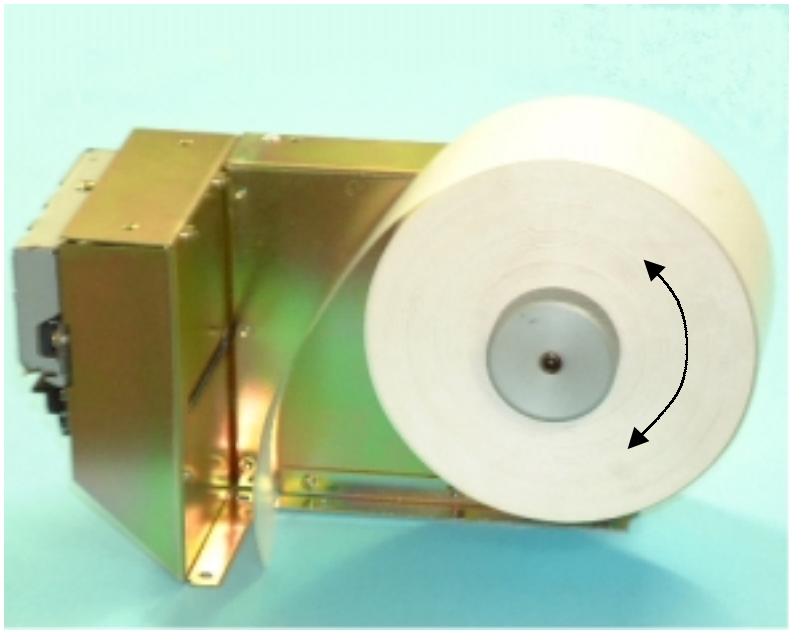
When the printer runs out of paper, there are two ways of loading paper in the TK41: automatic and manual.

Before starting the paper load sequence, please make sure the paper roll has been placed in the right way:



1) Place the paper roll in the subjection cylinder.
2) Place the paper roll in the right direction.
3) Place the fixing button to assure the good positioning of the paper roll.

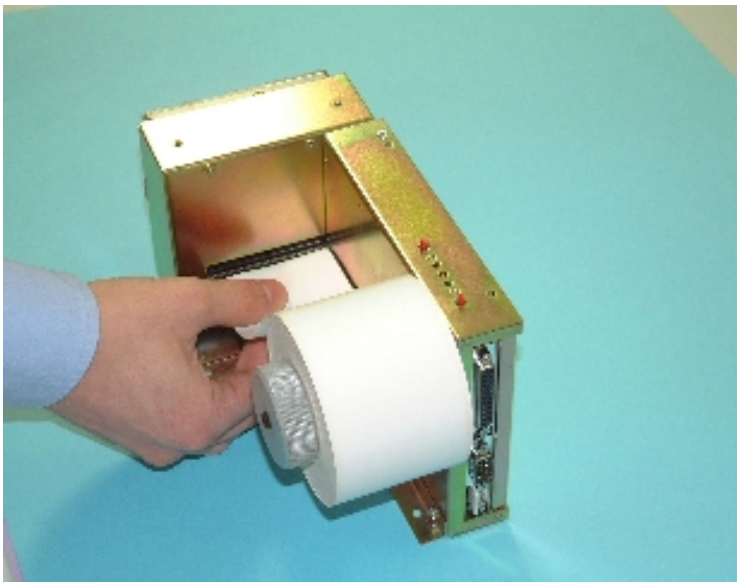
Fig. 3.1- Place the paper roll.



4) Once in its place, the paper roll must be able to turn around the subjection cylinder smoothly, with very little friction.

Fig.3.2-Paper roll positioning

3.1.1- AUTOMATIC PAPER LOAD



5) Make sure the TK41 is power supplied.

6) Open the printing head and remove paper from inside the TK41 (if there is any).

7) Make sure that the printing head is closed.

8) Make sure the paper end is cut in a straight way as shown in the figure.

Fig.3.3- (1) Automatic paper load.

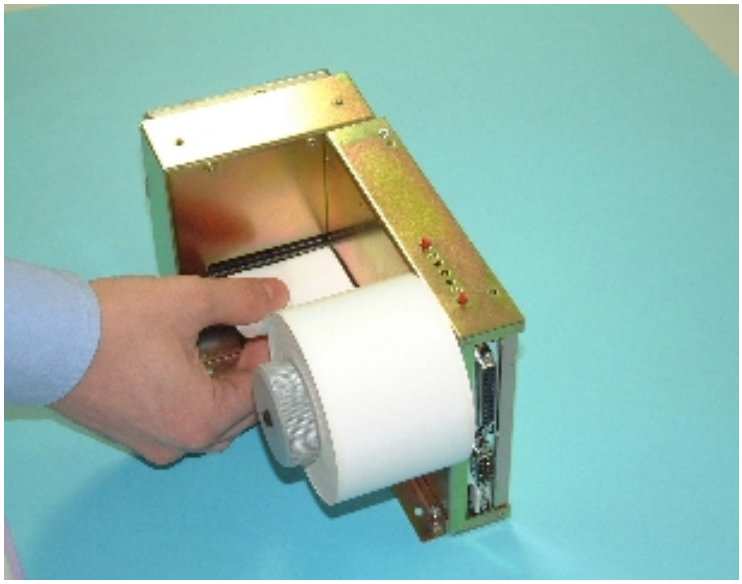
9) Put the paper end in the TK41 inlet.

10) Push the paper in until the TK41detects it and starts the auto-load sequence.

11) Wait until the auto-load sequence extracts the paper from the printer outlet.

Fig.3.4- (2) Automatic paper load.

3.1.2- MANUAL PAPER LOAD



1) Open the printing head and remove the paper (if there is any).

2) Keep the printing head open.

3) Place the paper roll in the right direction.

4) Make sure the paper end is cut in a straight way as shown in the figure.

Fig.3.5- (1) Manual paper load.

5) Put the paper end in the TK41 inlet.

6) Push the paper in until it reaches the TK41 outlet.

Fig. 3.6- (2) Manual paper load.

7) Close the printer head.

Fig. 3.7- (3) Manual paper load.

3.2- CHARACTER CODE TABLE

The TK41 uses next table:
PC437: USA, Standard Europe (International Character Set: USA) .

	HEX	0	1	2	3	4	5	6	7
HEX	BIN	0000	0001	0010	0011	0100	0101	0110	0111
0	0000	NUL 00	DLE 16	SP 32	0 48	@ 64	P 80	` 96	p 112
1	0001	01	XON 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	0010	02	18	" 34	2 50	B 66	R 82	b 98	r 114
3	0011	03	XOFF 19	# 35	3 51	C 67	S 83	c 99	s 115
4	0100	EOT 04	20	$ 36	4 52	D 68	T 84	d 100	t 116
5	0101	ENQ 05	21	% 37	5 53	E 69	U 85	e 101	u 117
6	0110	06	22	& 38	6 54	F 70	V 86	f 102	v 118
7	0111	07	23	' 39	7 55	G 71	W 87	g 103	w 119
8	1000	08	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
9	1001	HT 09	25	) 41	9 57	I 73	Y 89	i 105	y 121
A	1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122
B	1011	11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	1100	FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	¦ 124
D	1101	CR 13	GS 29	- 45	= 61	M 77	] 93	m 109	} 125
E	1110	14	30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	1111	15	31	/ 47	? 63	O 79	_ 95	o 111	SP 127

Table 3.1- (1) PC437 character code table.

(Continued): 80H to FFH

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	¢ 155	½ 171	╗ 187	╦ 203	■ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	1101	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Å 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

Table 3.2- (2) PC437 character code table.

3.3.- BUTTONS & LEDS

When using the TK41T model, the Buttons & Leds are placed in the back side of the printer.
When using the TK41B model, the Buttons & Leds are placed in the top side of the printer.
There are three leds and two buttons, which are identified as follows:

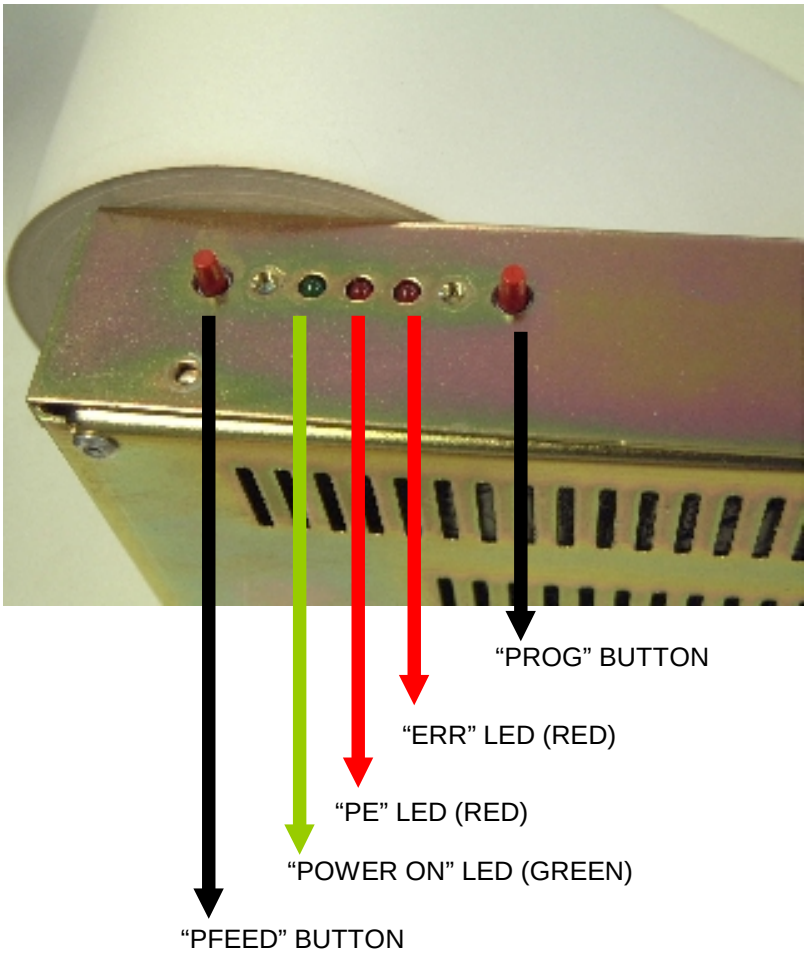


Fig. 3.8- TK41 Buttons & Leds identification.

3.3.1.- BUTTONS FUNCTIONS

1) PFEED Button.

Functions:

- If pressed on start-up, it activates the *SELF-TEST MODE.*
- If pressed together with PROG button on start-up, they activate the *HEXADECIMAL MODE*.
- During *PROGRAMMING MODE* this is the ***"YES"*** button.
- If pressed when the printer is already started, its function depends on whether the OM (Optical Mark) sensor is enabled or not.
    - When the OM (Optical Mark) sensor is disabled, the printer feeds paper continuously while pressing the PFEED button.
    - When the OM sensor is enabled, the printer will feed paper by mark paper unit.
- Paper feeding using the paper FEED button cannot be performed under the following conditions:
    - The paper roll end sensor detects a paper end.
    - When the printer thermal head is open.

2) PROG Button.

Functions:

- If pressed on start-up, it activates the *PROGRAMMING MODE*.
- If pressed together with PFEED button on start-up, they activate the *HEXADECIMAL DUMP MODE*.
- During *PROGRAMMING MODE* this is the ***"NO"*** button.
- If pressed when the printer is already started, this button does nothing.

NOTE: See ***3.4- SPECIAL MODES*** for explanations on *SELF-TEST MODE*, *PROGRAMMING MODE* and *HEXADECIMAL DUMP MODE*.

3.3.2- LED INDICATORS

1) Power (POWER) LED: GREEN
   ON: Power is stable.
   OFF: Power failure.

2) Paper roll end (PAPER OUT) LED: RED
   ON: Paper-end and/or thermal head-up detected.
   OFF: Paper is loaded and thermal head closed.(normal condition)

NOTE:

When this LED is ON indicates one of this three situations:

- There is no paper at the printer inlet.
- The thermal head is open.
- Both previous situations.

Any of these situations is critical enough so as to stop the printing. For this reason they are indicated in the same way, without making distinctions between them.

2) Error (ERROR) LED: RED
   ON: ERROR state (See point ***3.5- ERROR PROCESSING***).
   OFF: Normal condition

3.4- SPECIAL MODES

Apart from the normal printing mode, where all the data received by the printer is printed according to the adjustments or conditions set by the commands also received and processed, the TK41 allows three *SPECIAL MODES* which must be set at the moment of turning on the printer.

3.4.1- SELF-TEST MODE

The printer has a self-test function that checks the following:

- Interface version.
- Printer mechanism which is connected to the printer interface.
- Serial interface operating conditions.
- Printing speed.
- Print density.
- Selected font.
- Character scale.
- Character spacing.
- Line Spacing.
- Status of the Black Mark sensor.
- Status of the CR command function (See point ***4.CONTROL COMMANDS***).

Starting the self-test mode:
To start the self-test on a paper roll, turn off the printer, and hold down the PFEED button then turn on the printer. Then the current printer status is printed.

After printing the current printer status, the printer continuously prints a sample text of different sizes until the PFEED button is released.
While printing this sample text, two features of the TK41 can be checked:

- Idea of its printing speed.
- Comparison of different character sizes.

When the PFEED button is released, the printer stops printing and cuts the ticket.

Next figure shows an example of SELF-TEST MODE:

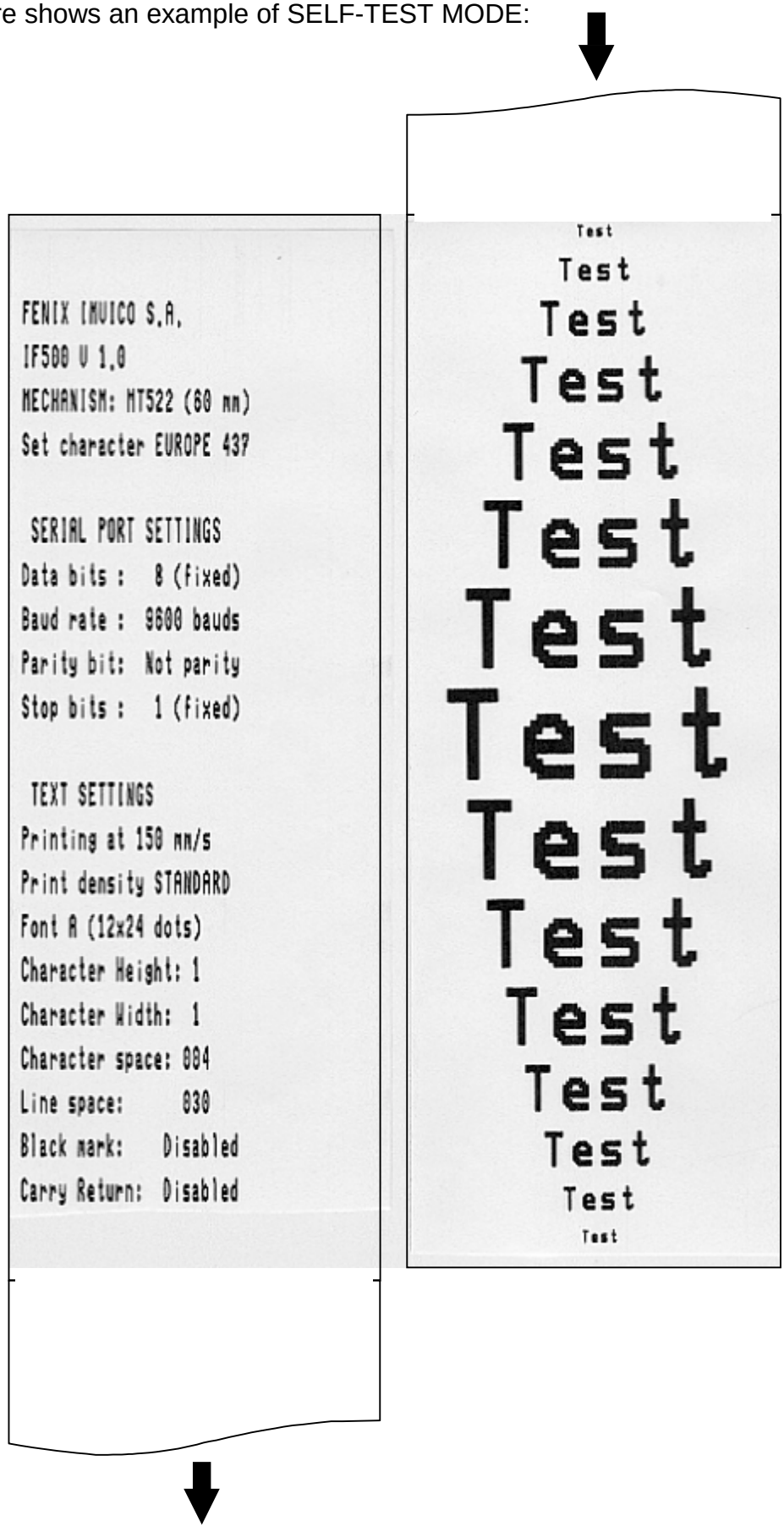


Fig. 3.9- SELF-TEST MODE sample.

3.4.2- PROGRAMMING MODE

The TK41 has a PROGRAMMING MODE in order to set up some parameters of the printer.
In this mode, the printer makes some questions to the user. These questions must be answered by pressing one of the two push-buttons.
PFEED button means “YES” and “PROG” button means “NO”.

Starting the programming mode:
To start the programming mode on a paper roll, turn off the printer, and hold down the PROG button then turn on the printer. Then the printer asks for the configurable parameters.

These are the configurable parameters during PROGRAMMING MODE:

- Mechanism: MT522-AF at 59.5mm or MT532-AF at 79.5mm.
- Baudrate: 4800, 9600, 19200 or 38400 baud.
- Parity for serial transmission: ODD, EVEN, NO PARITY.
- Printing speed: 150mm/s or 100mm/s or 80mm/s or 50mm/s.
- Print density: Light (-50%), Normal or Dark (+50%).
- Black Mark: Enable / Disable marked paper.
- Carry Return: Enable / Disable CR command.

Next figure shows how the printer asks for the configurable parameters:

Fig. 3.10- PROGRAMMING MODE sample.

3.4.3- HEXADECIMAL DUMP MODE

The hexadecimal dump prints the data transmitted from the host computer as hexadecimal numbers and their corresponding ASCII characters.

In this mode, no commands are processed. All the received data is printed as it is in Hexadecimal mode. This is very useful for the user can debug the software implementation during the initial period of his application. He can check whether the communication is correct and the commands are well defined.
If a set of commands and data does not act as it was expected, the error can be easily detected using this mode, for the user can compare what he is supposedly sending to the printer and what the printer is actually receiving.

Starting the hexadecimal dump:
To start the hexadecimal dumping, turn off the printer, and hold down the PFEED button and the PROG button then turn on the printer. Then the printer first prints “Hexadecimal Dump” on the paper roll and prints the received print data in hexadecimal numbers and in its corresponding ASCII characters.

NOTES:

1. If no characters correspond to the data received, the printer prints “.”
2. During the hexadecimal dump, no commands are processed.

Ending the hexadecimal dump
You can end the hexadecimal dump by turning the power off.

Next figure shows an example of the HEXADECIMAL DUMP MODE:

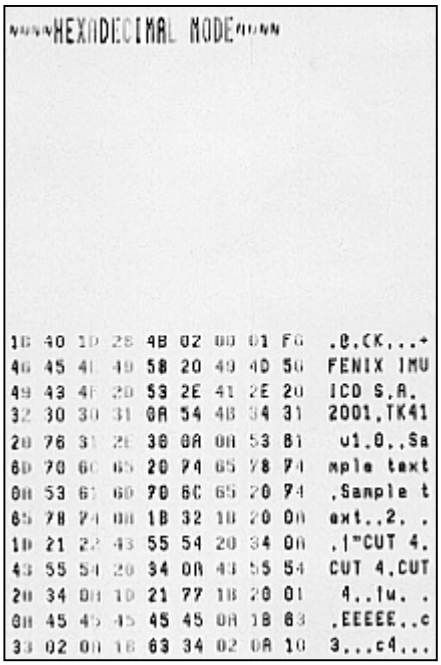


Fig. 3.11- HEXADECIMAL DUMP MODE sample.

3.5.- ERROR PROCESSING

IMPORTANT NOTE:
For detect all errors with parallel interface, user must connect the TK41 as show in the Table 2.5- Special parallel connection example.

The TK41 can detect several errors. These errors are indicated in different ways depending on their relevancy and on the communications interface used (serial or parallel).
There are three ways of indicating these errors:

- **LEDS:** The PE led and the ERROR led can indicate some of these errors. When an error occurs, one or both of the two leds automatically turn ON.

- **SERIAL PORT:** When an error occurs, the DTR signal goes to active level (logical “HIGH” level). If the user detects that this signal is “high” for more than 4 seconds that means that an error has occurred. The TK41 can send the STATUS BYTES by the serial port to communicate some of these errors.

- **PARALLEL PORT:** When an error occurs, it is indicated in the port pins. Pins named PE (pin 12), /ERR (pin 15), ST1 (pin 16) and ST2 (pin 17) of the D-SUB25 CENTRONICS connector are used to communicate some of these errors by the parallel port.

NOTE: For more information on how each error is indicated see points 3.5.1 to 3.5.9, where every error is explained in detail.

Name	Description
NO PAPER	There is no paper in the printer inlet
HEAD-UP	The thermal head is open
PAPER-NEAR-END	The paper roll is near its end
HEAD TEMPERATURE	The thermal head temperature is above 70ºC
CUTTER	The autocutter can not cut
VOLTAGE	The thermal head voltage is out of range (Vp = 24V ± 10%)
HARDWARE	There is an error in the control board interface
OPTICAL MARK	The optical mark is not detected
NO ERROR	There is no error

Table 3.3- Errors explanation.

	PE	/ERR	ST2	ST1
Paper-End/Head-up or Paper-near-end (1)	1	1	X(5)	X(5)
Paper-Near-End	0	1	1	0
Recoverable Error (2)	0	0	0	1
Non recoverable Error (3)	0	0	1	0
Mechanical Error (4)	0	0	1	1
Optical Mark Error	0	0	0	0

Table 3.4- Parallel Port signals VS Type of error.

(1) A “Paper near end error” can also be detected in pin PE depending on the condition set by the command *“ESC c 3”*.
(2) Recoverable error means a “Thermal Head Temperature” error, which automatically recovers when the temperature drops below 60ºC.
(3) A non-recoverable error is a “Hardware error” or a “Thermal Head Voltage error”, and the printer can not recover from those errors.
(4) A mechanical error means an error in the Autocutter.
(5) An X means the value of that signal is not significant.

3.5.1- NO PAPER / HEAD-UP ERROR

Although these two errors have different causes, they are indicated in the same way because the action to recover from these errors is actually the same. This error is quite significant, so when it arises the motor stops and no printing is allowed.

- ERROR ORIGIN: There is no paper in the printer inlet or the thermal head is open.

- LEDS INDICATION: The PE led turns ON.

- SERIAL PORT INDICATION: When the user detects an error (DTR signal “HIGH” for more than 4 seconds) he must send to the printer the “Real-time status transmission” command *“DEL EOT n”*, and then the printer answers with the corresponding STATUS BYTE which identifies the type of error (See point ***4. CONTROL COMMANDS*** for details).
- PARALLEL PORT INDICATION: When the user detects an error (PE signal “HIGH”) he must read the next pins in the D-SUB25 connector to identify the error:

Pin number	Pin Name	Status
12	PE	1
15	/ERR	1
16	ST1	0
17	ST2	0

Table 3.5- Parallel port pins status at “NO PAPER / HEAD-UP” error.

NOTE: This error is indicated in the parallel port depending on the conditions set by the *”ESC c 3”* command (See point ***4. CONTROL COMMANDS***).

- RECOVERY: To recover from this error, user must do a paper load (See point ***3.1- LOADING PAPER***).

3.5.2- PAPER-NEAR-END ERROR

This error is not as significant as the “NO PAPER/ HEAD-UP” error. So, the user must decide what to do when this error comes. Depending on the settings of command *“ESC c 4”* this error stops the printing or not (See point ***4. CONTROL COMMANDS***). If this error is set to stop the printing, it will be detected as any other error. If this error is not set to stop the printing, user must detect it by polling the status bytes in the serial port or the error pins in the parallel port.

- ERROR ORIGIN: The paper-near-end sensor does not detect the paper roll. That means there are approximately 7m or 30m of paper left, depending on the paper-near-end position (See ***Fig. 2.5***- *Paper-near-end positions*).

- LEDS INDICATION: No leds are turned ON.

- SERIAL PORT INDICATION:

    - If this error is set to stop the printing by using the *“ESC c 4”* command, the DTR signal will be “HIGH” for more than 4 seconds. Then, the user must send to the printer the “Real-time status transmission” command *“DEL EOT n”*, and then the printer answers with the corresponding STATUS BYTE which identifies the type of error (See point ***4. CONTROL COMMANDS*** for details).
    - If this error is not set to stop the printing by using the *“ESC c 4”* command, the DTR signal will not be “HIGH” and so, the error can not be detected by reading this signal. Therefore, the way to detect this error is by polling the STATUS BYTE sending the “Real-time status transmission” command *“DEL EOT n”* cyclically.

- PARALLEL PORT INDICATION:

    - The way to detect this error is by polling the parallel port pins PE, /ERR, ST1 and ST2 cyclically.
    - Next pins must be read in the D-SUB25 connector to identify the error:
    - This error can also be detected at the PE signal by setting the *“ESC c 3”* command.

Pin number	Pin Name	Status
12	PE	0
15	/ERR	1
16	ST1	0
17	ST2	1

Table 3.6- Parallel port pins status at “PAPER NEAR END” error.

NOTE: If the *“ESC c 3”* command (See point ***4. CONTROL COMMANDS***) is used to indicate this error, then the error can not be detected as shown in the ***Table 3.6***.

- RECOVERY: To recover from this error, user must change the paper roll.

3.5.3- THERMAL HEAD TEMPERATURE ERROR

Due to very continuous use of the printer, or due to environmental conditions, the temperature in the thermal head may reach levels which can damage the printer itself. When this situation occurs, an error must be indicated in order to protect the printer from abrasion. This error recovers automatically and the printer returns to normal status when the thermal head temperature drops to an acceptable level (below 60 ºC).

- ERROR ORIGIN: The thermal head temperature raises over 70 ºC.

- LEDS INDICATION: The “ERR” led turns ON.

- SERIAL PORT INDICATION: When the user detects an error (DTR signal “HIGH” for more than 4 seconds) he must send to the printer the “Real-time status transmission” command *“DEL EOT n”*, and then the printer answers with the corresponding STATUS BYTE which identifies the type of error (See point ***4. CONTROL COMMANDS*** for details).

- PARALLEL PORT INDICATION: When the user detects an error (/ERR signal “LOW”) he must read the next pins in the D-SUB25 connector to identify the error:

Pin number	Pin Name	Status
12	PE	0
15	/ERR	0
16	ST1	1
17	ST2	0

Table 3.7- Parallel port pins status at “HEAD TEMPERATURE” error.

- RECOVERY: The printer automatically recovers from this error when the thermal head temperature drops below 60 ºC.

3.5.4- AUTOCUTTER ERROR

In some cases, after cutting a ticket, the cutter blade can be out of its home position (See ***APPENDIX B- RECOVERY FROM AUTOCUTTER ERROR***). In other cases, an object may be obstructing the cutter blade, making it impossible to cut the ticket. After cutting a ticket, the printer checks the right position of the cutter blade, and if it has not returned to its home position, the printer indicates an error.

- ERROR ORIGIN: For some mechanical reason, the cutter blade can not return to its home position after trying to cut.

- LEDS INDICATION: The ERR led turns ON.

- SERIAL PORT INDICATION: When the user detects an error (DTR signal “HIGH” for more than 4 seconds) he must send to the printer the “Real-time status transmission” command *“DEL EOT n”*, and then the printer answers with the corresponding STATUS BYTE which identifies the type of error (See point ***4. CONTROL COMMANDS*** for details).

- PARALLEL PORT INDICATION: When the user detects an error (/ERR signal “LOW”) he must read the next pins in the D-SUB25 connector to identify the error:

Pin number	Pin Name	Status
12	PE	0
15	/ERR	0
16	ST1	1
17	ST2	1

Table 3.5.4- Parallel port pins status at “AUTOCUTTER” error.

- RECOVERY: The printer tries to automatically recover from this error at printer initialization (turn the printer OFF / ON). Previously, objects must be removed from inside the cutter. User can manually make the cutter blade return to its home position (See ***APPENDIX B- RECOVERY FROM AUTOCUTTER ERROR***).

3.5.5- THERMAL HEAD VOLTAGE (Vp) ERROR

The thermal head needs a stable voltage to produce a correct printing. This voltage is in the range of 21,6V to 26,4V.
When the thermal head voltage (Vp) goes out of this range, correct printing can not be assured, so an error occurs.

- ERROR ORIGIN: The thermal head voltage (Vp) is out of range (24V ± 10%).

- LEDS INDICATION: The ERR led turns ON.

- SERIAL PORT INDICATION: When the user detects an error (DTR signal "HIGH" for more than 4 seconds) he must send to the printer the "Real-time status transmission" command *"DEL EOT n"*, and then the printer answers with the corresponding STATUS BYTE which identifies the type of error (See point ***4. CONTROL COMMANDS*** for details).

- PARALLEL PORT INDICATION: When the user detects an error (/ERR signal "LOW") he must read the next pins in the D-SUB25 connector to identify the error:

Pin number	Pin Name	Status
12	PE	0
15	/ERR	0
16	ST1	0
17	ST2	1

Table 3.9- Parallel port pins status at "HEAD VOLTAGE" error.

- RECOVERY: This is a Non-recoverable error. The only way to return the printer to a normal status is to turn it OFF / ON and make sure that this time, the thermal head voltage (Vp) is in the specified range.

  When this error occurs, some parts of the printer may be damaged. If this happens, the printer will be unable to recover itself and some of its components are likely to be replaced.

3.5.6- HARDWARE ERROR

At initialization, the printer internally checks its hardware devices. If they do not function properly, an error occurs.

- ERROR ORIGIN: Some of the printer hardware devices do not function properly.
- LEDS INDICATION: The ERR led turns ON.
- SERIAL PORT INDICATION: When the user detects an error (DTR signal "HIGH" for more than 4 seconds) he must send to the printer the "Real-time status transmission" command *"DEL EOT n"*, and then the printer answers with the corresponding STATUS BYTE which identifies the type of error (See point ***4. CONTROL COMMANDS*** for details).
- PARALLEL PORT INDICATION: When the user detects an error (/ERR signal "LOW") he must read the next pins in the D-SUB25 connector to identify the error:

Pin number	Pin Name	Status
12	PE	0
15	/ERR	0
16	ST1	0
17	ST2	1

Table 3.5.6- Parallel port pins status at "HARDWARE" error.

- RECOVERY: This is a Non-recoverable error. One of the control board components may be damaged and it is quite sure that the control board needs to be changed or repaired.

3.5.7- OPTICAL MARK ERROR

The printer can use marked paper. The use of the optical mark must be enabled via hardware on printer start-up (See point ***3.4.2- PROGRAMMING MODE***). An error can occur if:

- The paper does not have optical mark.
- The optical mark is not in the right position.
- The optical mark does not have the right size or intensity.

NOTE: See point ***3.6- OPTICAL MARK*** for details on using marked paper.

- ERROR ORIGIN: The optical mark sensor does not detect the optical mark.

- LEDS INDICATION: The ERR led turns ON.

- SERIAL PORT INDICATION: When the user detects an error (DTR signal “HIGH” for more than 4 seconds) he must send to the printer the “Real-time status transmission” command *“DEL EOT n”*, and then the printer answers with the corresponding STATUS BYTE which identifies the type of error (See point ***4. CONTROL COMMANDS*** for details).

- PARALLEL PORT INDICATION: When the user detects an error (/ERR signal “LOW”) he must read the next pins in the D-SUB25 connector to identify the error:

Pin number	Pin Name	Status
12	PE	0
15	/ERR	0
16	ST1	0
17	ST2	0

Table 3.11- Parallel port pins status at “OPTICAL MARK” error.

- RECOVERY: This is a Non-recoverable error. User must turn OFF the printer, and check the paper and optical mark characteristics .

3.5.8- SERIAL PORT ERROR DETECTION FLOW CHART

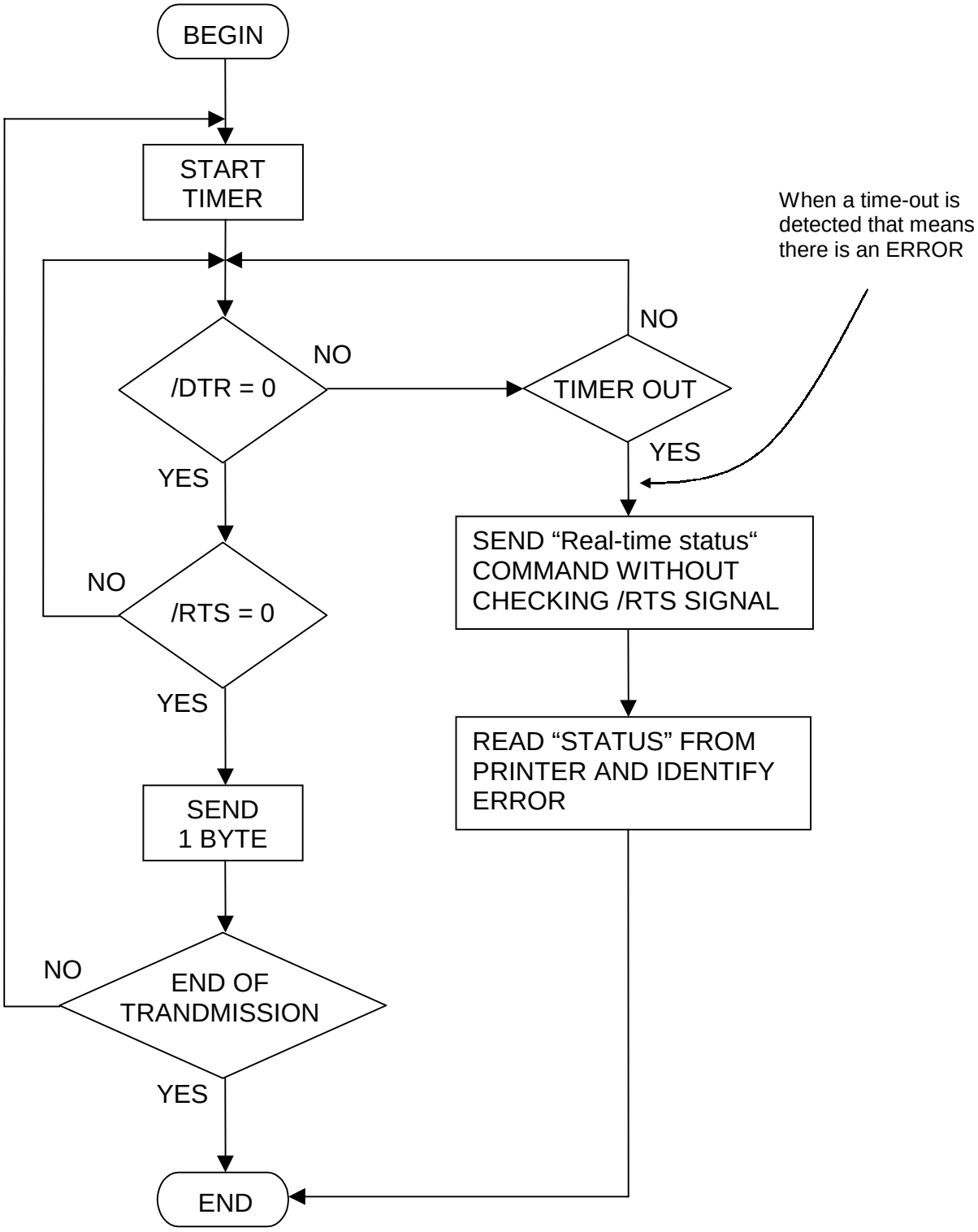


Fig.3.12- Serial port error detection flow chart.

3.5.9- PARALLEL PORT ERROR DETECTION FLOW CHART

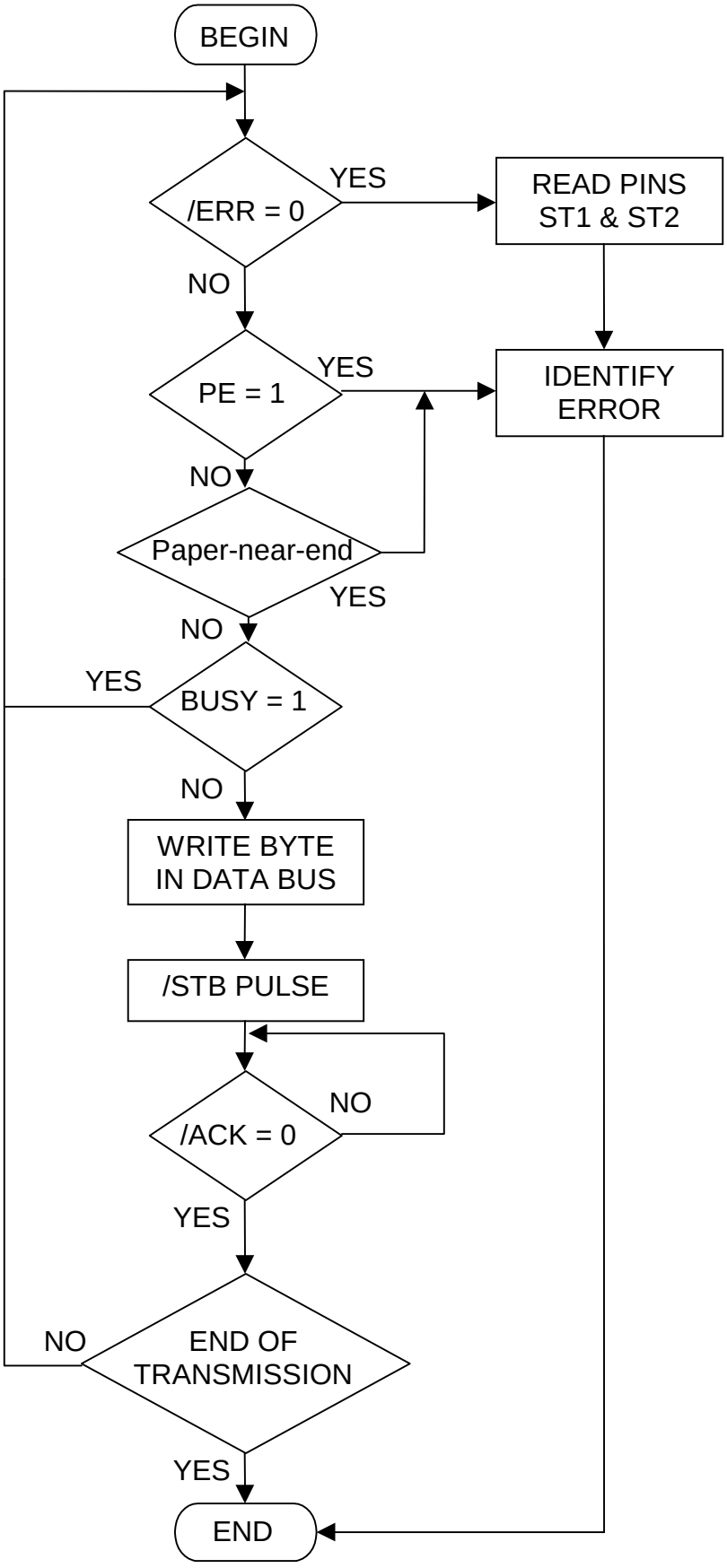


Fig.3.13- Serial port error detection flow chart.

3.6- OPTICAL MARK

The TK41 printer has the capability of using an Optical Mark Sensor to work with paper which is pre-printed with an Optical Mark. To make use of this feature, the Optical Mark Sensor must be enabled via hardware (See point ***3.4.2- PROGRAMMING MODE***).

The optical mark must be placed in the back of the paper, and in its right side as seen in ***Fig. 3.14.-*** *Optical mark characteristics*.

The optical mark must satisfy the dimensions shown in ***Fig. 3.14.-*** *Optical Mark Characteristics*.

The Optical Mark is detected at the position which the top edge of the Optical Mark comes into approximately 2mm from the center of the Optical Mark sensor. After detecting the Optical Mark, it is not detected for approximately 2cm.

The reflecting rate of the Optical Mark must be 10% or less, and the reflecting rate of the white must be 75% or more. The reflecting rate means the value which is measured with Macbeth density meter (PCMII) D filter.

At the factory the print starting position and the cutting position are set to the head position and the cutter position respectively when the Optical Mark sensor detects the Optical Mark.
The print starting position and the cutting position can be changed with the ***GS (F*** command (See point ***4- CONTROL COMMANDS***)

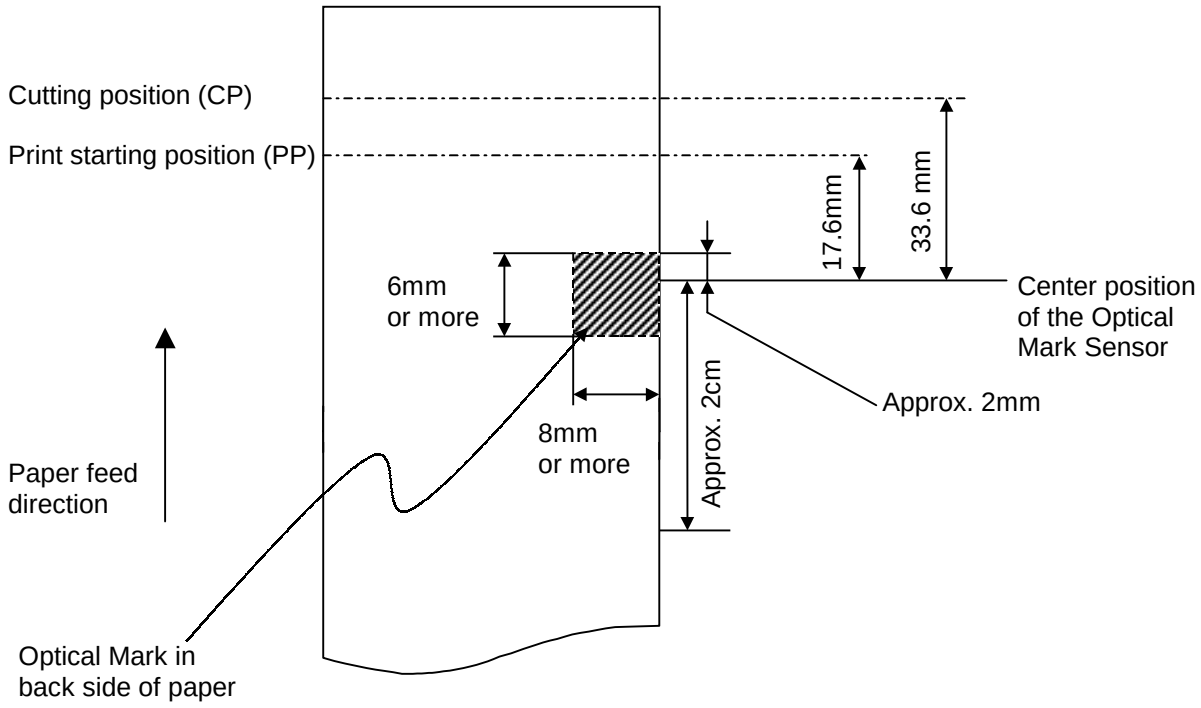


Fig. 3.14- Optical Mark Characteristics.

3.6.1- EXAMPLE ON USING THE OPTICAL MARK

Some very concrete points must be observed when using the Optical Mark.

There are three commands for handling marked paper:

GS (F → Set adjustment values. This command allows setting the distances between the optical mark and the cutting position & printing position. These distances can be positive or negative starting from the optical mark.
GS FF → Feed marked paper until printing position. This commands feeds paper until finding an optical mark. Then it moves the ticket backward or forward until placing it at the printing position.
GS V m n →Cut paper. This command feeds paper until optical mark, then moves the ticket to its cutting position and cuts, then it moves the ticket to the printing position.

Other considerations:

Paper can only be fed backward by using these previous commands.
The total amount that paper can be backward fed is 118 steps (approx. 14,75mm).
Pressing the PFEED button when the Optical Mark is enabled is the same as sending the GS V m n command.

Recommendations for the use of marked paper:

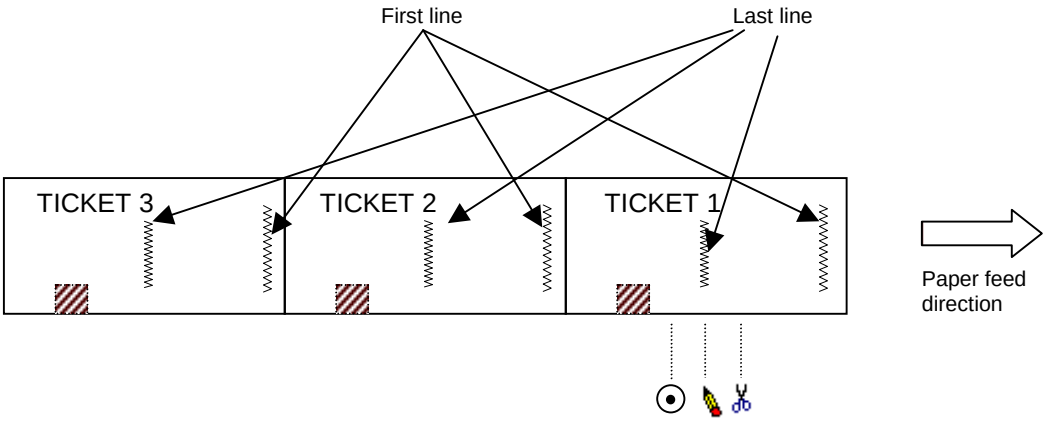
The optimum use of the marked paper follows this logical sequence:
Place the current ticket at its printing position (PP):
Print current ticket
Use optical mark in current ticket to place current ticket at its cutting position (CP)
Cut current ticket
Place next ticket at its printing position (PP).

Marked paper normally uses tickets of the same length. Therefore the printing position (PP) and cutting position (CP) are the same for every ticket. Consequently, the Optical Mark handling sequence is the same for every ticket.

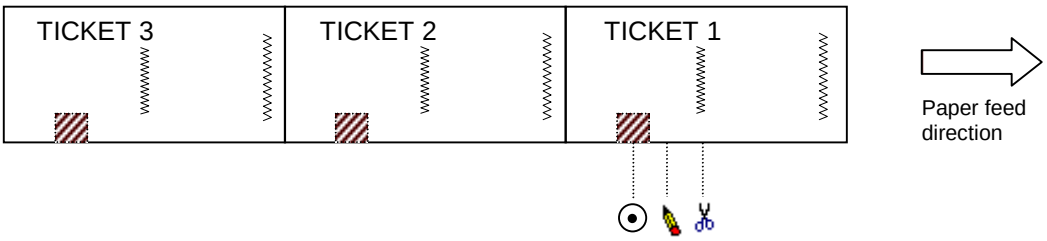
By default the distances for CP and PP are:

Printing position: 17,6mm before Optical Mark.
Cutting position: 33,6mm before Optical Mark.

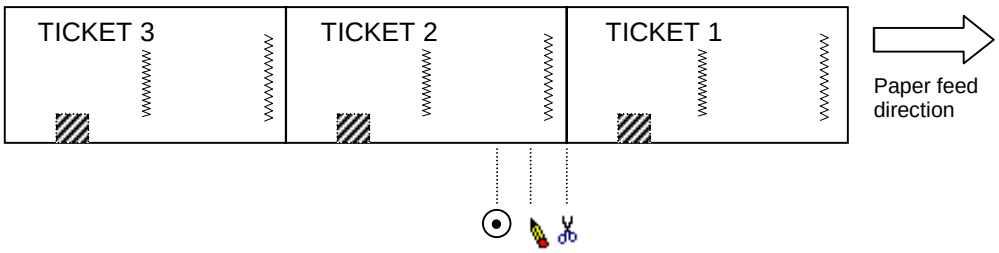
Next figures illustrate an example on how to handle the marked paper.



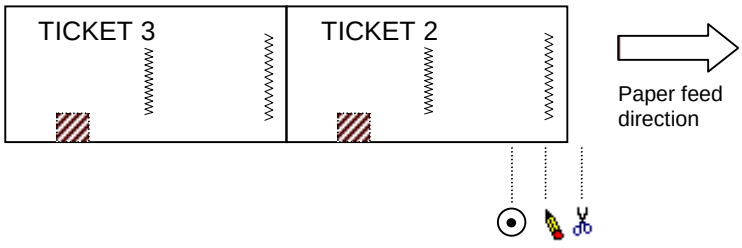
Last line of TICKET 1 has been printed.



Feed paper until finding Optical Mark of TICKET1.



Place TICKET 1 at its cutting position (CP) and cut it.



Move paper backwards until finding the printing position (PP) of TICKET 2. Now TICKET 2 is ready to start printing.

Fig. 3.15- Optical Mark recommended use sequence.

4 – CONTROL COMMANDS

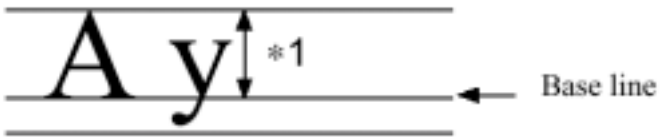
4.1.- COMMAND NOTATION

[Name] The name of the command.
[Format] The code sequence.
[ ]*k* indicates the contents of [ ] should be repeated *k* times.
[Range] Gives the allowable ranges for the arguments.
[Description] Describes the function of the command.
[Notes] Provides important information on setting and using the printer command, if necessary.
[Default] Gives the default values, if any, for the command parameters.
[Reference] Lists related commands.

All the numbers are in HEXADECIMAL.

4.2.- EXPLANATION OF TERMS

3) Receive buffer
The receive buffer is a buffer that stores, as it is, the data received from the host (the reception data). The receive data is stored in the receive buffer temporarily, and is then processed sequentially.
4) Print buffer
The print buffer is a buffer that stores the image data to be printed.
5) Ignore
The state in which all codes, including parameters, are read in and discarded, and nothing happens.
6) Inch
A unit of length. One inch is 25.4 mm.
7) MSB
Most Significant Bit
8) LSB
Least Significant Bit
9) Baseline
The standard position for character data stored in the print buffer.
The illustration below shows normal character positions:



*1. When Font A (12x24 dots) is selected, this height is 18 dots.
When Font B (8x16 dots) is selected, this height is 14 dots.

4.3.- CONTROL COMMANDS DESCRIPTION

Command List

Command	Name	Command classification		Page
		Executing	Setting	
LF	Print and line feed	X		56
CR	Print and carriage return	X		56
DEL EOT	Real-time status transmission	X		56
ESC SP	Set right-side character spacing		X	58
ESC !	Select print mode(s)		X	59
ESC 2	Select default line spacing		X	59
ESC 3	Set line spacing		X	60
ESC @	Initialize printer	X	X	60
ESC J	Print and feed paper	X		60
ESC M	Select character font		X	61
ESC c 3	Select paper sensors to output paper-end signals		X	61
ESC c 4	Select paper-near-end sensor to stop printing		X	62
ESC d	Print and feed ***n*** lines	X		62
GS FF	Feed marked paper to print starting position	X		62
GS !	Select character size		X	63
GS (F	Set adjustment value(s)		X	64
GS (K 2 0 0 m	Select print control mode		X	65
GS (K 2 0 1 m	Select print density		X	65
GS E	Select Head Control Method		X	66
GS H	Select printing position of HRI characters		X	66
GS L	Set left margin		X	67
GS T	Set print position to the beginning of print line	X		67
GS V	Select cut mode and cut paper		X	68
GS f	Select font for HRI characters		X	69
GS h	Set bar code height		X	69
GS k	Print bar code	X		70
GS v 0	Print raster bit image	X		72
GS w	Set bar code width		X	73

Table 4.1- Command List

LF

[Name] Print and line feed
[Format] ASCII LF
Hex 0A
[Description] Prints the data in the print buffer and feeds one line, based on the current line spacing.
[Note] This command sets the print position to the beginning of the line.
[Reference] **ESC 2**, **ESC 3**.

CR

[Name] Print and carriage return
[Format] ASCII CR
Hex 0D
[Description] When automatic line feed is enabled, this command functions the same as **LF**; when automatic line feed is disabled, this command is ignored.
[Notes]

- This command is set at the start-up, via the PROGRAMMING MODE (see point ***3.4.2- PROGRAMMING MODE***).
- Sets the print starting position to the beginning of the line.

[Reference] **LF**

DEL EOT *n*

[Name] Real-time status transmission
[Format] ASCII DEL EOT *n*
Hex 10 04 *n*
[Range] <01>H ≤ *n* ≤ <04>H
[Description] Transmits the selected printer status specified by *n* in real-time, according to the following parameters:

n = <01>H: Transmit printer status
n = <02>H: Transmit offline status
n = <03>H: Transmit error status
n = <04>H: Transmit paper roll sensor status

[Notes]

- The status is transmitted whenever the data sequence <10>H<04>H<n> (<01>H ≤ *n* ≤ <04>H) is received.
- The printer transmits the current status. Each status item is represented by one-byte of data.
- The printer transmits the status without confirming whether the host computer can receive data.
- The printer executes this command upon receiving it.
- This command is executed even when the printer is offline, the receive buffer is full, or there is an error status with a serial interface model.
- This command is effective only when using the serial RS-232 interface.

n = <01>H: Printer status

Bit	OFF/ON	Hex	Function
0	OFF	00	Not used. Fixed to OFF
1	ON	02	Not used. Fixed to ON
2	ON	04	Not used. Fixed to ON
3	OFF	00	Online
	ON	08	Offline
4	ON	10	Not used. Fixed to ON
5	X	-	Not used. Undefined value
6	X	-	Not used. Undefined value
7	OFF	00	Not used. Fixed to OFF

n = <02>H: Offline status

Bit	OFF/ON	Hex	Function
0	OFF	00	Not used. Fixed to OFF
1	ON	02	Not used. Fixed to ON
2	OFF	00	Platen is open (Thermal head is open)
	ON	04	Platen is closed (Thermal head is closed)
3	OFF	00	Hardware OK
	ON	08	Hardware error occurred
4	ON	10	Not used. Fixed to ON
5	X	-	Not used. Undefined value
6	OFF	00	No error
	ON	40	Error occurred
7	OFF	00	Not used. Fixed to OFF

n = <03>H: Error status

Bit	OFF/ON	Hex	Function
0	OFF	00	Not used. Fixed to OFF
1	ON	02	Not used. Fixed to ON
2	OFF	00	Optical Mark OK.
	ON	04	Optical Mark error
3	OFF	00	No autocutter error
	ON	08	Autocutter error occurred
4	ON	10	Not used. Fixed to ON
5	OFF	00	No unrecoverable error
	ON	20	Unrecoverable error occurred
6	OFF	00	No auto-recoverable error
	ON	40	Auto-recoverable error occurred
7	OFF	00	Not used. Fixed to OFF

Bit 6: Bit 6 is ON when printing is stopped due to high print head temperature until the print head temperature drops sufficiently.

n = <04>H: Continuous paper sensor status

Bit	OFF/ON	Hex	Function
0	OFF	00	Not used. Fixed to OFF
1	ON	02	Not used. Fixed to ON
2,3	OFF	00	Paper roll near-end sensor: paper adequate
	ON	0C	Paper near-end is detected by the paper roll near-end sensor.
4	ON	10	Not used. Fixed to ON
5,6	OFF	00	Paper roll sensor: Paper present
	ON	60	Paper roll end detected by paper roll sensor
7	OFF	00	Not used. Fixed to OFF

ESC SP *n*

[Name] Set right-side character spacing

[Format] ASCII ESC SP *n*

Hex 1B 20 *n*

[Range] <00>H ≤*n*≤ <FF>H

[Description] Sets the character spacing for the right side of the character to *[n x* 0.125 mm *(n x* 0.0049")].

[Notes]

- The right-side character spacing for double-width mode is twice the normal value. When characters are enlarged, the right-side character spacing is *n* times normal value.

This command is effective only when sent at the beginning of a line.

[Default] *n* = <04>H

[Reference] **APPENDIX A**

ESC ! *n*

[Name] Select print mode(s)
[Format] ASCII ESC ! *n*
Hex 1B 21 *n*
[Range] <00>H ≤ *n* ≤ <FF>H
[Description] Selects print mode(s) using *n* as follows:

Bit	OFF/ON	Hex	Function
0	OFF	00	Character Font A (12 x24).
	ON	01	Character Font B (9 x 17).
1	--	--	Undefined
2	--	--	Undefined
3	--	--	Undefined
4	OFF	00	Double-height mode not selected
	ON	10	Double-height mode selected
5	OFF	00	Double-width mode not selected
	ON	20	Double-width mode selected
6	--	--	Undefined
7	--	--	Undefined

[Notes]

- When both double-height and double-width modes are selected, quadruple-size characters are printed.
- When some characters in a line are double or more height, all the characters in the line are aligned at the baseline.
- **ESC M** can also select character font type. However, the setting of the last received command is effective.
- **GS !** can also select character size. However, the setting of the last received command is effective.
- If this command is not received at the beginning of a line, and the character font is to be changed, all previous data in the print buffer is printed and the ticket is placed at the beginning of the next line..

[Default] *n* = <00>H
[Reference] **ESC M, GS !, APPENDIX A**

ESC 2

[Name] Select default line spacing
[Format] ASCII ESC 2
Hex 1B 32
[Description] Selects 3.75 mm (30 x 0.125 mm) line spacing.
[Reference] **ESC 3.**

ESC 3 *n*

[Name] Set line spacing
[Format] ASCII ESC 3 *n*
Hex 1B 33 *n*
[Range] <00>H ≤ *n* ≤ <FF>H
[Description] Sets the line spacing to *[n* x 0.125 mm].
[Default] *n* = <1E>H
[Reference] **ESC 2**

ESC @

[Name] Initialize printer
[Format] ASCII ESC @
Hex 1B 40
[Description] Clears the data in the print buffer and resets the printer settings to the settings that were in effect when the power was turned on.
[Notes]

- The data in the receive buffer is not cleared.

ESC J *n*

[Name] Print and feed paper
[Format] ASCII ESC J *n*
Hex 1B 4ª *n*
[Range] <00>H ≤ *n* ≤ <FF>H
[Description] Prints the data in the print buffer and feeds the paper *[n* x 0.125 mm (0.0049")].
[Notes]

- After printing is completed, this command sets the print starting position to the beginning of the line.
- The paper feed amount set by this command does not affect the values set by **ESC 2** or **ESC 3**.
- The printer uses the vertical motion unit *(*y).

ESC M *n*

[Name] Select character font
[Format] ASCII ESC M *n*
Hex 1B 4D *n*
[Range] *n* = <00>H, <01>H
[Description] Selects the character font.

n	**Function**
<00>H	Character Font A (12 x 24) selected
<01>H	Character Font B (8 x 16) selected

[Notes]

- **ESC !** can also select character font types. However the setting of the last received command is effective.
- This command must be sent at the beginning of a line. If it is sent in the middle of a line, all previous data in the print buffer is printed and the ticket is placed at the beginning of the next line.

[Reference] **ESC !, APPENDIX A**

ESC c 3 *n*

[Name] Select paper sensor(s) to output paper-end signal in the parallel port.
[Format] ASCII ESC c 3 *n*
Hex 1B 63 33 *n*
[Range] <00>H ≤ *n* ≤ <01>H
[Description] Selects the paper sensor(s) to output paper-end signal, using *n* as follows:

Bit	**OFF / ON**	**Hex**	**Function**
0	OFF	00	Undefined.
1	OFF	00	Paper roll near-end sensor disabled.
	ON	02	Paper roll near-end sensor enabled.
2	-	-	Undefined.
3	OFF	00	Paper roll end sensor disabled
	ON	08	Paper roll end sensor enabled
4-7	-	-	Undefined.

[Notes]

- It is possible to select both sensors to output the signal. Then, if any of the sensors detects a paper-end, the paper-end signal at the parallel port is output.
- **Normally, the paper-near-end error is detected by directly reading the parallel port (*see point 3.5.2- PAPER-NEAR-END ERROR*). When setting the paper-near-end sensor to activate the PE signal in the parallel port, the distinction between "paper-near-end" and "no paper / head-up" errors must be very accurate, for they are indicated in a very similar way.**

[Default] *n* = <08>H

ESC c 4 *n*

[Name] Select paper-near-end sensor to stop printing
[Format] ASCII ESC c 4 *n*
Hex 1B 63 34 *n*
Decimal 27 99 52 *n*
[Range] $0 \le n \le 255$
[Description] Selects the paper-near-end sensor to stop printing when a paper-near-end is detected, using *n* as follows:

Bit	OFF / ON	Hex	Decimal	Function
0	OFF	00	0	Undefined.
1	OFF	00	0	Paper roll near-end sensor disabled.
	ON	02	2	Paper roll near-end sensor enabled.
2-7	-	-	-	Undefined.

[Notes]

- When a paper sensor is enabled with this command (n = 2), printing is stopped.

[Default] *n* = 0

ESC d *n*

[Name] Print and feed *n* lines
[Format] ASCII ESC d *n*
Hex 1B 64 *n*
[Range] <00>H ≤ *n* ≤ <FF>H
[Description] Prints the data in the print buffer and feeds *n* character lines.
[Notes]

- This command sets the print starting position to the beginning of the line.
- This command does not affect the line spacing set by **ESC 2** or **ESC 3**.
- The maximum paper feed amount is 1016 mm {40”}. If the paper feed amount *(n x* line spacing) of more than 1016 mm {40”} is specified, the printer feeds the paper only 1016 mm {40”}.
- Every line feed corresponds to the current selected font height (24 dots for Font A and 16 dots for Font B).

[Reference] **ESC 2, ESC 3.**

GS FF

[Name] Feed marked paper to print starting position
[Format] ASCII GS FF
Hex 1D 0C
[Description] Feeds the marked paper to the print starting position.
[Notes]

- This command is enabled only when the Optical Mark sensor is set to be effective using PROGRAMMING MODE.
- This command sets the next print position to the beginning of the line.
- Even if this command is executed at the print starting position of the marked paper, the printer does not feed the marked paper to the next print starting position.

[Reference] **GS (F**

GS ! *n*

[Name] Select character size

[Format] ASCII GS ! *n*

Hex 1D 21 *n*

[Range] <00> ≤ *n* ≤ <FF>H

(1 ≤ vertical number of times ≤ 8, 1 ≤ horizontal number of times ≤ 8)

[Description] Selects the character height using bits 0 to 3 and selects the character width using bits 4 to 7, as follows:

Bit	OFF / ON	Hex	Function
0	Character height selection. See Table 2.		
1			
2			
3			
4	Character width selection. See Table 1		
5			
6			
7			

Table 1
Character Width Selection

Hex	Width
00	1 (normal)
10	2 (double-width)
20	3
30	4
40	5
50	6
60	7
70	8

Table 2
Character Height Selection

Hex	Height
00	1 (normal)
01	2 (double-height)
02	3
03	4
04	5
05	6
06	7
07	8

[Notes]

- This command is effective for all characters, except for HRI characters.
- The vertical direction is the paper feed direction, and the horizontal direction is perpendicular to the paper feed direction.
- When characters are enlarged with different sizes on one line, all the characters on the line are aligned at the baseline.
- The **ESC !** command can also turn double-width and double-height modes on or off. However, the setting of the last received command is effective.

[Default] *n* = <00>H

[Reference] **ESC !, APPENDIX A**

GS (F pL pH a m nL nH

[Name] Set adjustment value(s)

[Format] ASCII GS (F *pL pH a m nL nH*

Hex 1D 28 46 *pL pH a m nL nH*

[Range] (*pL* + (*pH* x 256)) = 4 (where *pL* = <04>H, *pH* = <00>H)

<01>H ≤ *a* ≤ <02>H

m = <00>H,<01>H

0 ≤ (*nL* + *nH* x 256) ≤ 65535

(where <00>H ≤ *nL* ≤ <FF>H, <00>H ≤ *nH* ≤ <FF>H)

[Description] This command is effective only when the Optical Mark sensor is enabled. Set adjustment value(s) for the printer operations specified by *a*.

- *pL* and *pH* specifies the number of the parameter such as a to (*pL* + (*pH* x 256)) bytes.
- *a* specifies setting values for the positions to start printing and cutting.

a	Function
<01>H	Setting value for the positions to start the printing
<02>H	Setting value for the positions to start the cutting

- *m* specifies the direction of the adjustment.

m	Function
<00>H	Specifies a forward paper feeding direction
<01>H	Specifies a backward paper feeding direction

- *nL* and *nH* specifies the setting value to [(*nL* + *nH* x 256) x 0.125 mm].
- The adjustment value for the print starting position (*a* = <01>H) is affected with the following commands:
  GS FF
- The adjustment value for the paper cutting position (*a* = <02>H) is affected with the following commands:
  GS V *m n*

[Default] All adjustment values are set to “0”.
(At the factory setting, the print starting position and the cutting position are set to the head position and the cutter position respectively when the Optical Mark sensor detects the Optical Mark). See point ***3.6- OPTICAL MARK***.

[Reference] **GS FF, GS V**

GS (K 2 *0 0 m*

[Name] Select the energized mode.
[Format] ASCII GS (K *2 0 0 m*
Hex 1D 28 4B 02 00 00 *m*
[Range] <01>H ≤ *m* ≤ <02>H
[Description]

- *m* specifies the print control mode.

m	Function
<01>H	Specifies the non-divided print head energizing mode.
<02>H	Specifies the two-part print head energizing mode.

[Notes]
When this command sets the two part energized mode (*m* = <02>H), the maximum printing speed (150mm/s) is automatically prohibited.
[Default] *m* = <01>H
[Reference] **GS E, PROGRAMMING MODE**

GS (K 2 *0 1 m*

[Name] Select the print density.
[Format] ASCII GS (K 2 *0 1 m*
Hex 1D 28 4B 02 00 01 *m*
[Range] <F6>H ≤ *m* ≤ <FF>H and <00>H ≤ m ≤ <0A>H (corresponds to the print density -50 to +150%)
[Description]

- *m* specifies the print density.
- If <F6>H ≤ *m* ≤ <FF>H, the print density set to be lighter ("<F6>" is the lightest) than the standard density.
- If *m* = <00>H, the print density is set as the standard.
- If <01> ≤ *m* ≤ <0A>H, the print density is set to be darker ("<0A>" is the darkest) than the standard density.
- The print density in one line is always the same even if different density is set. In this case, the last specified data for the print density is effective.

M		Print Density
Dec	Hex	
10	0A	+50%
9	09	+45%
8	08	+40%
7	07	+35%
6	06	+30%
5	05	+25%
4	04	+20%
3	03	+15%
2	02	+10%
1	01	+5%
0	00	Standard
-1	FF	-5%
-2	FE	-10%
-3	FD	-15%
-4	FC	-20%
-5	FB	-25%
-6	FA	-30%
-7	F9	-35%
-8	F8	-40%
-9	F7	-45%
-10	F6	-50%

[Default] *m* = <00>H
[Reference] **PROGRAMMING MODE**

GS E *n*

[Name] Select head control method.
[Format] ASCII GS E *n*
Hex 1D 45 *n*
[Range] <00>H ≤ *n* ≤ <FF>H
[Description] Selects the head control method.

Bit	Off/On	Hex	Function
0-3	Off	00	Undefined
4 5	Specifies the print speed		
6	Off	00	Undefined
7	Off	00	Undefined

Speed Level	Bit 5	Bit 4	
Speed 1 (150mm/s MAX)	0	0	High speed
Speed 2 (100mm/s MAX)	0	1	
Speed 3 (80mm/s MAX)	1	0	
Speed 4 (50mm/s MAX)	1	1	Low speed

[Notes]

- This command is effective only at the starting position of the line.
- When the head elements are energized being divided into two, the maximum printing speed in speed level 1 becomes 100mm/s.
- When the print speed is set to 150mm/s the energizing mode is automatically set to non-divided print head energizing mode.

[Default] Speed level 1
[Reference] **GS (K 2 0 0 m, PROGRAMMING MODE**

GS H *n*

[Name] Select print position for HRI characters.
[Format] ASCII GS H *n*
Hex 1D 48 *n*
[Range] *n* = <00>H or *n* = <02>H
[Description] Selects the print position of HRI characters when printing a bar code.
n selects the print position as follows:

n	***Printing position***
<00>H	Not printed
<02>H	Below the bar code

[Notes]

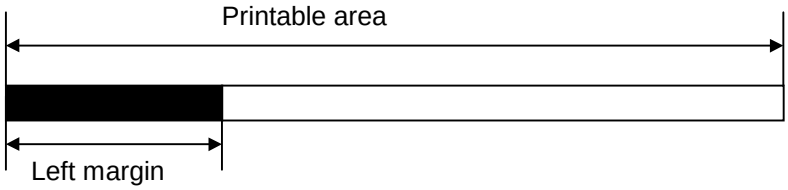
- HRI indicates Human Readable Interpretation
- HRI characters are printed using X-scale = 1, Y-scale = 1 and the font specified by **GS f.**

[Default] *n* = <02>H
[Reference] **GS f, GS k**

GS L *nL nH*

[Name] Set left margin
[Format] ASCII GS L *nL nH*
Hex 1D 4C *nL nH*
[Range] <00>H ≤ *nL* ≤ <FF>H
<00>H ≤ *nH* ≤ <FF>H
[Description] Sets the left margin using *nL* and *n*H.

- The left margin is set to [(*nL* + *nH* x 256) x 0.125 mm].



[Notes]

- This command is effective only when processed at the beginning of the line.
- This commands affects text, graphic and bar code printing.

[Default] *nL* = <00>H, *nH* = <00>H
[Reference] **APPENDIX A**

GS T *n*

[Name] Set print position to the beginning of print line
[Format] ASCII GS T *n*
Hex 1D 54 *n*
[Range] *n* = <00>H or *n* = <01>H
[Description] Sets the print position to the beginning of print line.

- *n* specifies the data processing in the print buffer.

N	**Printing position**
<00>H	Sets the print position to the beginning of print line after deleting all data in the print buffer.
<01>H	Sets the print position to the beginning of print line after printing all data in the print buffer.

1)GS V m 2) GS V m n

[Name] Select cut mode and cut paper

[Format] 1) ASCII GS V *m*
Hex 1D 56 *m*
2) ASCII GS V *m n*
Hex 1D 56 *m n*

[Range] 1) *m* = <01>H
10)*m* = <42>H; <00>H ≤ *n* ≤ <FF>H

[Description] Selects a mode for cutting paper and executes paper cutting. The value of m selects the mode as follows:

m	**Print Mode**
<01>H	Cuts paper in the current position
<42>H	Feeds paper (cutting position + [n x 0,125mm]), and cuts the paper.

[Notes for 1) and 2)]

Cutting position is the distance between the thermal head and the cutter (16mm).

- This command is effective only when processed at the beginning of a line.
- After cutting the ticket, the printer always feeds the paper back to the printing position.

[Notes for 1)]

The printer cuts paper at the current position, even when the Optical Mark is enabled.

[Notes for 2)]

Without optical mark:

- When *n* = <00>H, the printer feeds paper to the cutting position and cuts it.
- When *n* ≠ <00>H, the printer feeds paper to (cutting position + [*n* x 0.125 mm (0.0049")]) and cuts it.

With optical mark:

- When the Optical Mark sensor is set to be effective, the printer feeds paper to (Optical Mark ± [(Value which is set by **GS (F**) x 0.125mm]) and cuts it. After cutting, it feeds paper to the position specified by the command **GS (F**. See point ***3.6- OPTICAL MARK***.

[Default] *n* = <00>H

[Reference] **GS (F**

GS f *n*

[Name] Select font for Human Readable Interpretation (HRI) characters
[Format] ASCII GS f *n*
Hex 1D 66 *n*
[Range] *n* = <00>H or <01>H
[Description] Selects a font for the HRI characters used when printing a bar code.
n selects a font from the following table:

n	**Font**
<00>H	Font A (12x24)
<01>H	Font B (8x16)

[Notes]

- HRI indicates Human Readable Interpretation
- HRI characters are printed at the position specified by **GS H**.
- HRI characters are always printed at X-Scale = 1 and Y-Scale = 1

[Default] *n* = <01>H
[Reference] **GS H, GS k**

GS h *n*

[Name] Select bar code height
[Format] ASCII GS h *n*
Hex 1D 68 *n*
[Range] <01>H ≤ *n* ≤ <FF>H
[Description] Selects the height of the bar code.
n specifies the number of dots in the vertical direction.
[Default] *n* = <A2>H (162 dots)
[Reference] **GS k**

GS k *m n d1...dn*

[Name] Print bar code

[Format] ASCII GS k *m n d*1...*dn*

Hex 1D 6B *m n d*1...*dn*

[Range] m= <43>H , m = <45>H, m= <46>H or m= <49>H

(*n* and *d* depend on the bar code system used).

[Description] Selects a bar code system and prints the bar code.

m selects a bar code system as follows:

m	Bar Code System	Number of Characters	Remarks
<43>H	EAN13	<0C>H ≤ *n* ≤ <0D>H	<30>H ≤ *d* ≤ <39>H
<45>H	CODE39	<01>H ≤ *n* ≤ <FF>H	<30>H ≤ *d* ≤ <39>H, <41>H ≤ *d* ≤ <5ª>H, <20>H, <24>H, <25>H, <2B>H, <2D>H, <2E>H, <2F>H
<46>H	ITF	<01>H ≤ n ≤ <FF>H (even number)	<30>H ≤ *d* ≤ <39>H
<49>H	Code128	<02>H ≤ n ≤ <FF>H	<00>H ≤ d ≤ <7F>H

[Notes]

- *n* indicates the number of bar code data bytes, and the printer processes *n* bytes from the next character data as bar code data.
- If *n* is outside the specified range, the printer stops command processing and processes the following data as normal data.
- If *d* is outside the specified range, the printer only feeds paper and processes the following data as normal data.
- If the horizontal size exceeds printing area, the printer only feeds the paper.
- This command feeds as much paper as is required to print the bar code, regardless of the line spacing specified by **ESC 2** or **ESC 3**.
- This command is enabled only when no data exists in the print buffer. When data exists in the print buffer, the printer processes the data following *m* as normal data.
- After printing the bar code, this command sets the print position to the beginning of the line.
- This command is not affected by print modes.
- The number of data for the ITF bar code must be even numbers. When an odd number of bytes of data is input, the printer ignores the last received data.

- When Code128 (m=49h) is used:

1. Refer to Appendix G – CODE 128 BAR CODE for the information for the Code128 bar code and its code table.
2. When using Code128 in this printer, take the following points into account for data transmission:
   → The top of the bar code data string must be the code set selection character (CODE A, CODE B or CODE C), which selects the first code set.

→ Special characters are defined by combining two characters "**{**" and one character. The ASCII character "**{**" is defined by transmitting "**{**" twice consecutively.

Specific character	Transmit data		
	ASCII	Hex	Decimal
SHIFT	{S	7B, 53	123, 83
CODE A	{A	7B, 41	123, 65
CODE B	{B	7B, 42	123, 66
CODE C	{C	7B, 43	123,67
FNC1	{1	7B, 31	123, 49
FNC2	{2	7B,32	123, 50
FNC3	{3	7B, 33	123,51
FNC4	{4	7B,34	123, 52
"{"	{{	7B, 7B	123, 123

[Example] Example data for printing "No. 123456"
In this example, the printer first prints "No." Using CODE B, then prints the following numbers using CODE C.

GS k 73 11 123 66 82 101 102 46 123 67 25 87 10

Fig. 4.1- Code128 code example.

3. If the top of the bar code data is not the code set selection character, the printer stops command processing and processes the following data as normal data.
4. If the combination of "{" and the following character does not apply any special character, the printer stop command processing and processes the following data as normal data.
5. If the printer receives characters that cannot be used in the special code set, the printer stop command processing and processes the following data as normal data.
6. The printer does not print HRI characters that correspond to the shift characters or code set selection characters.
7. HRI character for the function character is space.
8. HRI characters for the control character (<00>H to <1F>H and <7F>H) are space.

<Others> Be sure to keep spaces on both right and left sides of a bar code. (Spaces are different depending on the types of the bar code.)

[Reference] **GS h**, **GS w**

GS v 0 m *xL xH yL yH d1 ... dk*

[Name] Print raster bit image

[Format] ASCII GS v 0 *m xL xH yL yH d1...dk*

Hex 1D 76 30 *m xL xH yL yH d1...dk*

[Range] <00>H ≤ *m* ≤ <03>H

<00>H ≤ *xL* ≤ <FF>H

<00>H ≤ *xH* ≤ <FF>H where 1 ≤ *(xL + xH* x 256) ≤ 128

<00>H ≤ *yL* ≤ <FF>H

<00>H ≤ *yH* ≤ <08>H where 1 ≤ *(yL + yH* x 256) ≤ 4095

<00>H ≤ *d* ≤ <FF>H

k = (xL + xH x 256) x *(yL + yH* x 256) *(k* ≠ 0)

[Description] Selects raster bit-image mode. The value of *m* selects the mode, as follows:

m	**Mode**	**Vertical Dot Density**	**Horizontal Dot Density**
<00>H	Normal	203.2 dpi	203.2 dpi
<01>H	Double-width	203.2 dpi	101.6 dpi
<02>H	Double-height	101.6 dpi	203.2 dpi
<03>H	Quadruple	101.6 dpi	101.6 dpi

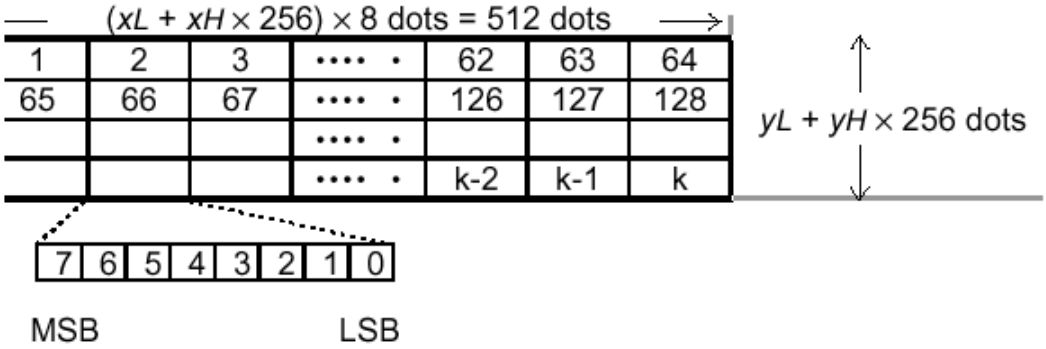
(dpi: dots per 25.4 mm {1"})

- *x*L, *x*H, select the number of data bytes *(x*L+*xH x* 256) in the horizontal direction for the bit image.
- *y*L, *y*H, select the number of data bits *(y*L+*yH x* 256) in the vertical direction for the bit image.

[Notes]

- This command is effective only when there is no data in the print buffer.
- Data outside the printing area is read in and discarded on a byte-by-byte basis.
- The position at which subsequent characters are to be printed for raster bit image is specified by **GS L** (Set left margin).
- *d* indicates the bit-image data. Setting a bit to 1 prints a dot and setting it to 0 does not print a dot.

[Example] When *xL + xH* x 256 = 64



GS w *n*

[Name] Set bar code width

[Format] ASCII GS w *n*

Hex 1D 77 *n*

[Range] <02>H ≤ *n* ≤ <06>H

[Description] Sets the horizontal size of the bar code.

n specifies the bar code width as follows:

n	Module Width (mm) for Multi-level Bar Code
<02>H	0.250
<03>H	0.375
<04>H	0.500
<05>H	0.625
<06>H	0.750

- Multi-level bar codes are as follows:
  EAN13, CODE93, ITF.

[Default] *n* = <03>H

[Reference] **GS k**

APPENDIX A – CHARACTERS x LINE

The maximum number of printable characters in one line is determined by the next formula:

$$\text{Max. Of char / line} = \left| \frac{\text{Mechanism - LeftMargin}}{\text{(Right-side + Font) x CharWidth}} \right|$$

The parameters of the formula are:

Mechanism :

640 dots (for M-T542)
576 dots (for M-T532)
448 dots (for M-T522)

LeftMargin: 0 to 65535 ---------- Use GS L nH nL **command**

Right-side: 0 to 255 ---------- Use ESC SP n **command**

Font: 12 (for Font A)
8 (for Font B) ---------- Use **ESC M n** command

CharWidth: 1 to 8 ---------- Use GS ! n **command**

APPENDIX B – RECOVERY FROM AUTOCUTTER ERROR

- If a foreign object, such as a push pin or paper clip, drops in the autocutter and causes the autocutter to lock up, the printer enters an error state and begins the recovery operation automatically.

  If the problem is not serious, the autocutter returns to its normal position without any intervention by the user.

  If the autocutter does not return to its normal position by itself, manually rotate the cutter motor gear to return the cutter to its original position (see figure **B.1**).

- If you cannot rotate the motor gear, rotate it in the reverse direction to loosen it; then press the paper feed button. Open the platen unit, remove the jammed paper, and reinstall the paper roll. Then close the platen unit..

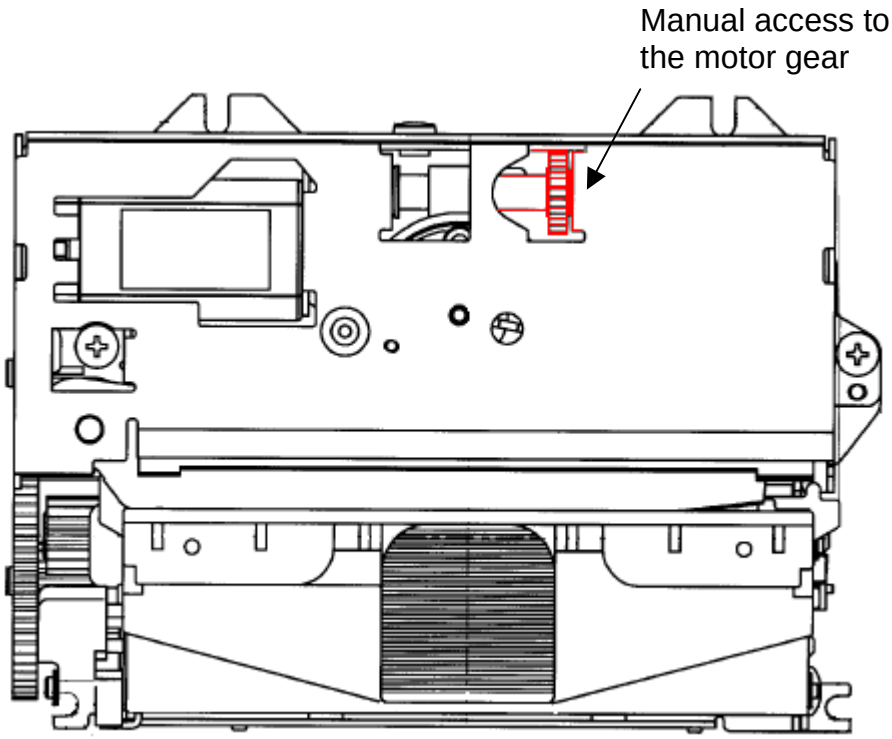


Figure B.1- Printer mechanism. Front view.

APPENDIX C – EXTERNAL APPEARANCE

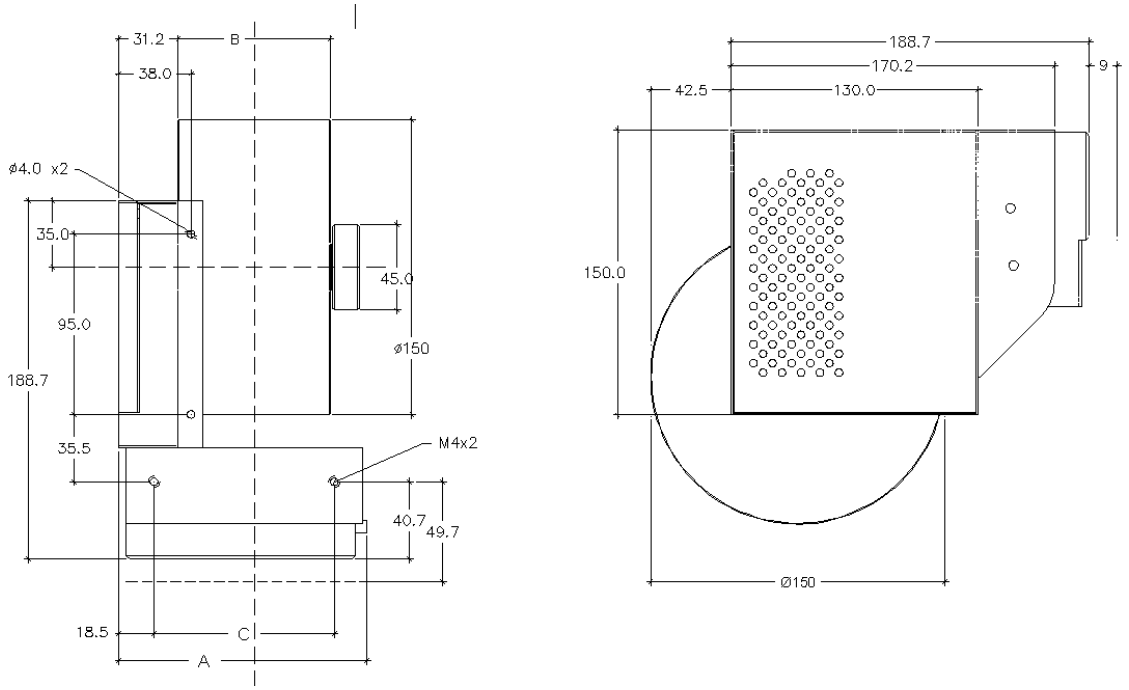


Fig C.1- TK4160T / TK4180T external dimensions.

	A	B	C
TK41T60	110mm	60mm	80mm
TK41T80	130mm	80mm	95mm

Table C.1- TK4160T / TK4180T different dimensions.

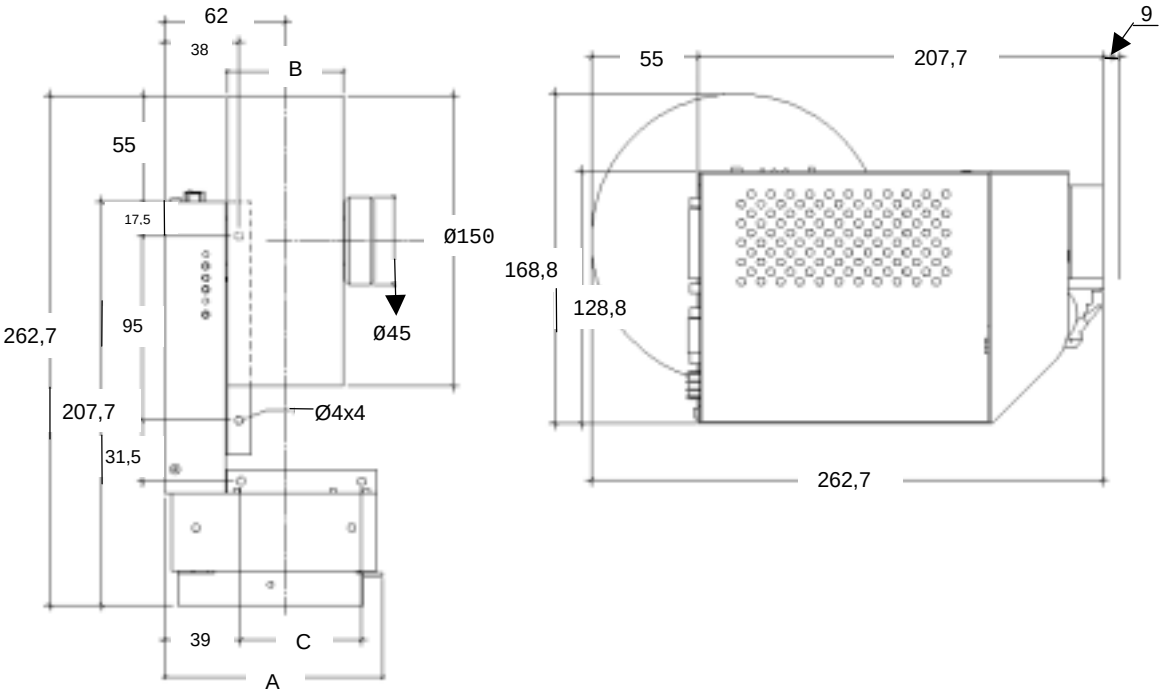


Fig C.2- TK4160B / TK4180B external dimensions.

	A	B	C
TK41B60	110mm	60mm	62mm
TK41B80	130mm	80mm	70mm

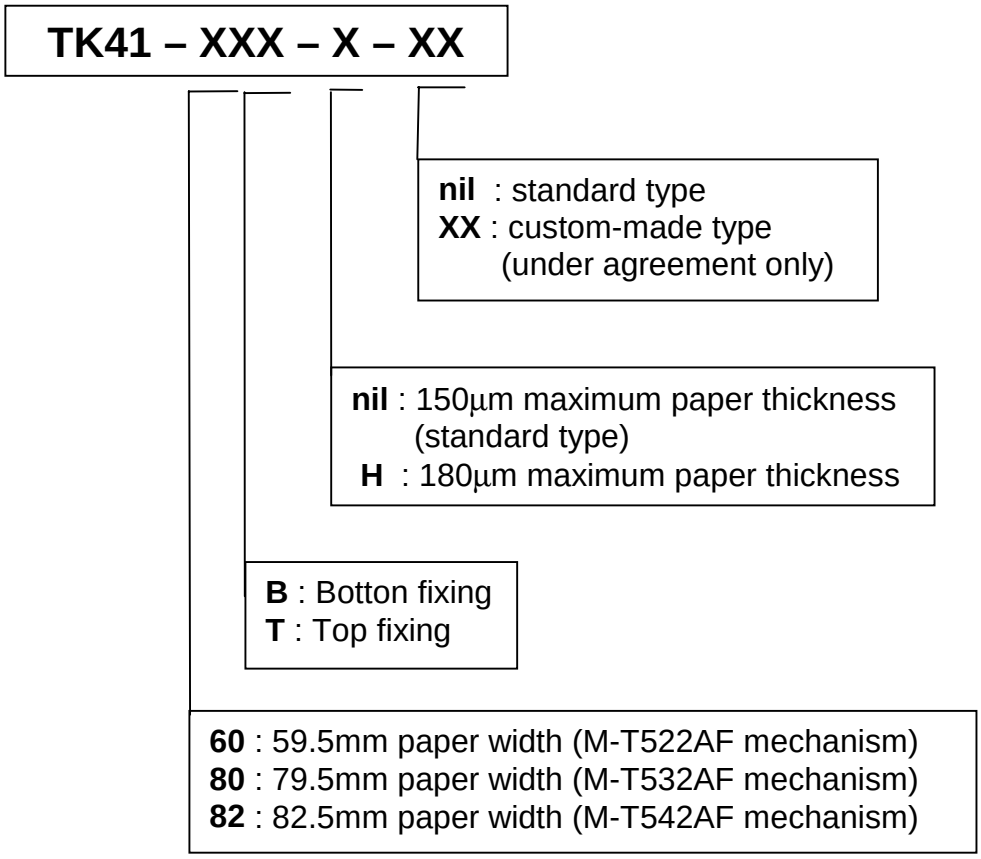
Table C.2- TK41B60 / TK41B80 different dimensions.

APPENDIX D – SPECIFICATIONS

TK-41			
Printing method	Thermal dot line		
Printing mechanism	EPSON M-T532AF	EPSON M-T522AF	EPSON M-T542AF
Data interface	CENTRONICS parallel RS232 Serial		
Dot composition/line	576 dots	448 dots	640 dots
Resolution	8 dots/mm		
Printing speed (mm/sec)(1)	150 High speed mode 100 Normal mode 80 Low speed mode 50 Very low speed mode		
Paper width (mm)	79.5 ± 0.5	59.5 ± 0.5	82.5 ± 0.5
Paper roll diameter	150mm MAX.		
Printing width (mm)	72 Max.	56 Max.	80 Max.
Character/line (Interchar = 1 Font Scale = 1x1)	Font A 44 Font B 64	Font A 34 Font B 49	Font A 49 FontB 71
Operating voltage range	Vcc --> 24V DC +/-10%		
Current consumption (see 2.3.1.Power supply connector).	High speed mode: Mean: Approx 9 A Peak: Approx 14 A Two-part energizing mode: Mean: Approx 7 A Peak: Approx 11.5 A Standby: Mean: Approx 0.1 A		
Dimensions WxDxH (mm) (including a 150mm-diameter paper roll)			
Operating ambient Temp.	0ºC to 55ºC (noncondensing)		
Long Term Storage Temp.	5ºC to 30ºC (noncondensing)		
Weight	2100 gr. Approx. (with paper roll)	1800 gr. Approx. (with paper roll)	2100 gr. Approx. (with paper roll)
Recommended thermal Paper	TF50KS-E From Nippon Paper Industries P350 KSP AF50KS-E Jujo Thermal PD160R From Oji Paper Industries		
Thermal head life Activation pulse resistance Abrasion resistance	 100 million pulses 100 Km		
Autocutter life	1.000.000 cuts (when above 30ºC and above 60% HR, 750.000 cuts)		

(1) Printing speed may be slower, depending on the data transmission speed, control commands, environmental conditions or selection of the print density.

APPENDIX E – HOW TO ORDER



AVAILABLE ACCESORIES

PARTNUMBER	Description
RS232- 5	Standard serial cable 1,5m
CENTRONIC- 5	Standard parallel cable 1,5m
T60X150X25	Standard 150 mm diameter paper roll for 60
T80X150X25	Standard 150 mm diameter paper roll for 80
T60X130X25	Standard 130 mm diameter paper roll for 60
T80X130X25	Standard 130 mm diameter paper roll for 80
MTG- 01	Metal outlet ticket guide

APPENDIX F – FREQUENTLY ASKED QUESTIONS

The printer is connected and the power is ON but it does not print and the paper does not come out.

- ✓ Check your power supply and make sure it is giving the specified values.
- ✓ Remove any foreign objects from the paper inlet.
- ✓ If using the serial port, check the port configuration.

The paper comes out but no characters are printed.

- ✓ Make sure you are using the correct paper.
- ✓ Make sure you are using the correct side of the thermal paper.
- ✓ Check your program.
- ✓ If the paper is correct, try to execute a self-test.

The printing is too light (or too dark).

- ✓ Check that the environmental temperature is within the specified range.
- ✓ Make sure you are using the correct paper.
- ✓ Check the print density status (*"GS (K 0 2 1 m"* command)

APPENDIX G – CODE128 BAR CODE

In Code128 bar code system, it is possible to represent 128 ASCII characters and 2-digit numerals using one bar code character that is defined by combining one the 103 bar code characters and 3 code sets. Each code set is used for representing the following characters:

G.1 Description of the CODE128 Bar Code

- **Code set A**: ASCII characters 00H to 5FH
- **Code set B**: ASCII characters 20H to 7FH
- **Code set C**: 2-digit numeral characters using one character (100 numerals from 00 to 99)

The following special characters are also available in Code128:

- **SHIFT** characters

  In code set A, the character just after SHIFT is processed as a character for code set B. In code set B, the character just after SHIFT is processed as the character for code set A.
  SHIFT character cannot be used in code set C.

- Code set selection character (**CODE A**, **CODE B** or **CODE C**)

  This character switches the following code set to code set A, B or C.

- Function character (**FNC1**, **FNC2**, **FNC3** or **FNC4**)

  The usage of function characters depends on the application software. In code set C, only FNC1 is available.

G.2 Printable characters in CODE SET A

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
NUL	00	0	(	28	40	P	50	80
SOH	01	1	)	29	41	Q	51	81
STX	02	2	*	2A	42	R	52	82
ETX	03	3	+	2B	43	S	53	83
EOT	04	4	,	2C	44	T	54	84
ENQ	05	5	-	2D	45	U	55	85
ACK	06	6	.	2E	46	V	56	86
BEL	07	7	/	2F	47	W	57	87
BS	08	8	0	30	48	X	58	88
HT	09	9	1	31	49	Y	59	89
LF	0A	10	2	32	50	Z	5A	90
VT	0B	11	3	33	51	[	5B	91
FF	0C	12	4	34	52	\	5C	92
CR	0D	13	5	35	53	]	5D	93
SO	0E	14	6	36	54	^	5E	94
SI	0F	15	7	37	55	-	5F	95
DLE	10	16	8	38	56	FNC1	7B,31	123,49
DC1	11	17	9	39	57	FNC2	7B,32	123,50
DC2	12	18	:	3A	58	FNC3	7B,33	123,51
DC3	13	19	;	3B	59	FNC4	7B,34	123,52
DC4	14	20	<	3C	60	SHIFT	7B,53	123,83
NAK	15	21	=	3D	61	CODEB	7B,42	123,66
SYN	16	22	>	3E	62	CODEC	7B,43	123,67
ETB	17	23	?	3F	63			
CAN	18	24	@	40	64			
EM	19	25	A	41	65			
SUB	1A	26	B	42	66			
ESC	1B	27	C	43	67			
FS	1C	28	D	44	68			
GS	1D	29	E	45	69			
RS	1E	30	F	46	70			
US	1F	31	G	47	71			
SP	20	32	H	48	72			
!	21	33	I	49	73			
“	22	34	J	4A	74			
#	23	35	K	4B	75			
$	24	36	L	4C	76			
%	25	37	M	4D	77			
&	26	38	N	4E	78			
`	27	39	O	4F	79			

G.3 Printable characters in CODE SET B

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
SP	20	32	H	48	72	P	70	112
!	21	33	I	49	73	Q	71	113
“	22	34	J	4A	74	R	72	114
#	23	35	K	4B	75	S	73	115
$	24	36	L	4C	76	T	74	116
%	25	37	M	4D	77	U	75	117
&	26	38	N	4E	78	V	76	118
´	27	39	O	4F	79	W	77	119
(	28	40	P	50	80	X	78	120
)	29	41	Q	51	81	Y	79	121
*	2A	42	R	52	82	Z	7A	122
+	2B	43	S	53	83	{	7B,7B	123,123
,	2C	44	T	54	84	|	7C	124
-	2D	45	U	55	85	}	7D	125
.	2E	46	V	56	86	-	7E	126
/	2F	47	W	57	87	DEL	7F	127
0	30	48	X	58	88	FNC1	7B,31	123,49
1	31	49	Y	59	89	FNC2	7B,32	123,50
2	32	50	Z	5A	90	FNC3	7B,33	123,51
3	33	51	[	5B	91	FNC4	7B,34	123,52
4	34	52	\	5C	92	SHIFT	7B,53	123,83
5	35	53	]	5D	93	CODEA	7B,41	123,65
6	36	54	^	5E	94	CODEC	7B,43	123,67
7	37	55	-	5F	95			
8	38	56	`	60	96			
9	39	57	a	61	97			
:	3A	58	b	62	98			
;	3B	59	c	63	99			
<	3C	60	d	64	100			
=	3D	61	e	65	101			
>	3E	62	f	66	102			
?	3F	63	g	67	103			
@	40	64	h	68	104			
A	41	65	i	69	105			
B	42	66	j	6A	106			
C	43	67	k	6B	107			
D	44	68	l	6C	108			
E	45	69	m	6D	109			
F	46	70	n	6E	110			
G	47	71	o	6F	111			

G.4 Printable characters in CODE SET C

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
00	00	0	40	28	40	80	50	80
01	01	1	41	29	41	81	51	81
02	02	2	42	2A	42	82	52	82
03	03	3	43	2B	43	83	53	83
04	04	4	44	2C	44	84	54	84
05	05	5	45	2D	45	85	55	85
06	06	6	46	2E	46	86	56	86
07	07	7	47	2F	47	87	57	87
08	08	8	48	30	48	88	58	88
09	09	9	49	31	49	89	59	89
10	0A	10	50	32	50	90	5A	90
11	0B	11	51	33	51	91	5B	91
12	0C	12	52	34	52	92	5C	92
13	0D	13	53	35	53	93	5D	93
14	0E	14	54	36	54	94	5E	94
15	0F	15	55	37	55	95	5F	95
16	10	16	56	38	56	96	60	96
17	11	17	57	39	57	97	61	97
18	12	18	58	3A	58	98	62	98
19	13	19	59	3B	59	99	63	99
20	14	20	60	3C	60	FNC1	7B,31	123,49
21	15	21	61	3D	61	CODEA	7B,41	123,65
22	16	22	62	3E	62	CODEB	7B,42	123,66
23	17	23	63	3F	63			
24	18	24	64	40	64			
25	19	25	65	41	65			
26	1A	26	66	42	66			
27	1B	27	67	43	67			
28	1C	28	68	44	68			
29	1D	29	69	45	69			
30	1E	30	70	46	70			
31	1F	31	71	47	71			
32	20	32	72	48	72			
33	21	33	73	49	73			
34	22	34	74	4A	74			
35	23	35	75	4B	75			
36	24	36	76	4C	76			
37	25	37	77	4D	77			
38	26	38	78	4E	78			
39	27	39	79	4F	79			

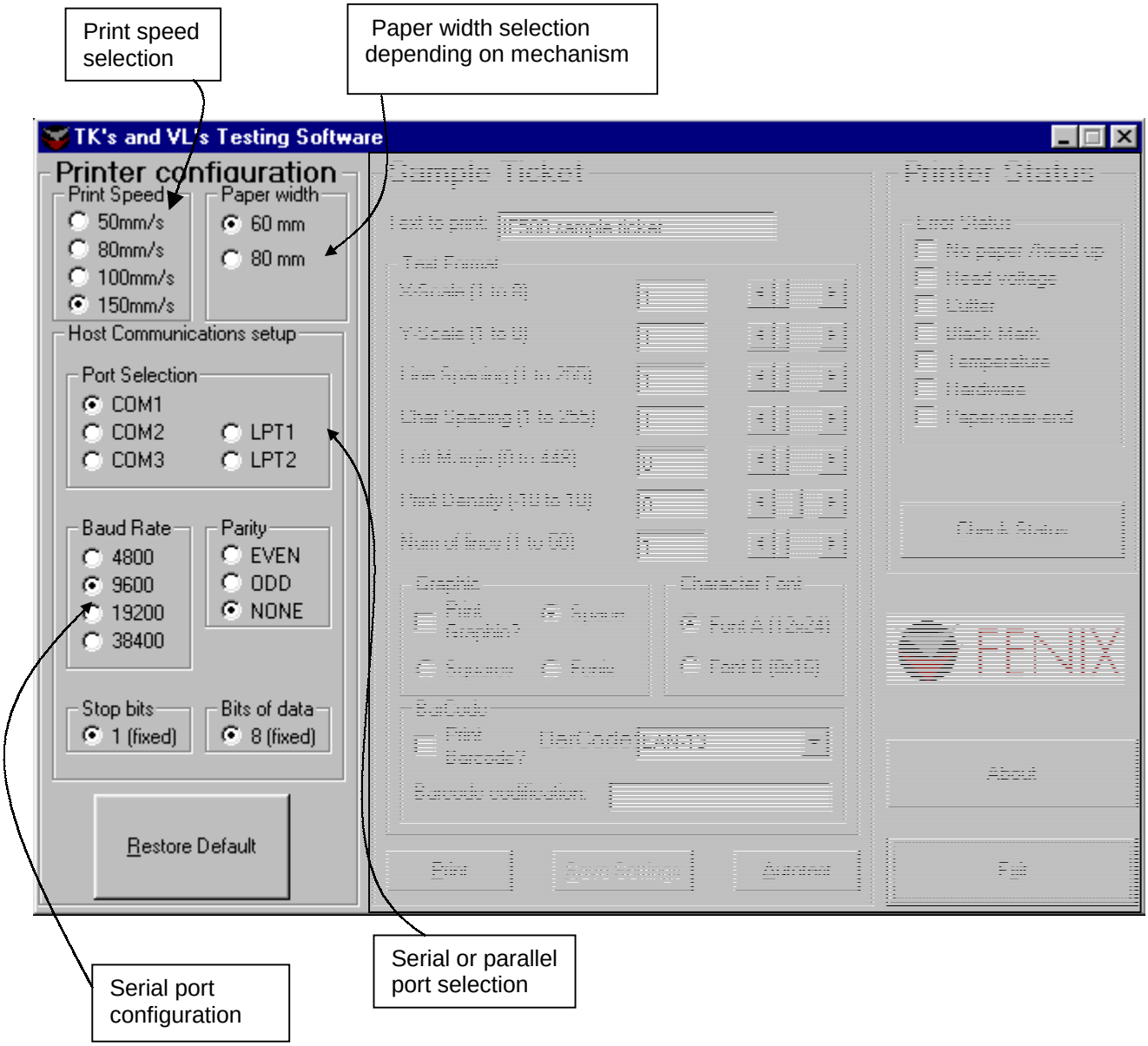
APPENDIX H – TESTING SOFTWARE

The TK41 printer is delivered together with a Windows-based, testing & configuring program. This program is an easy way to explore the TK41's main features.
To install the program, run the ***"SETUP.EXE"*** file and follow the instructions on the screen.
The program is intended for three purposes:

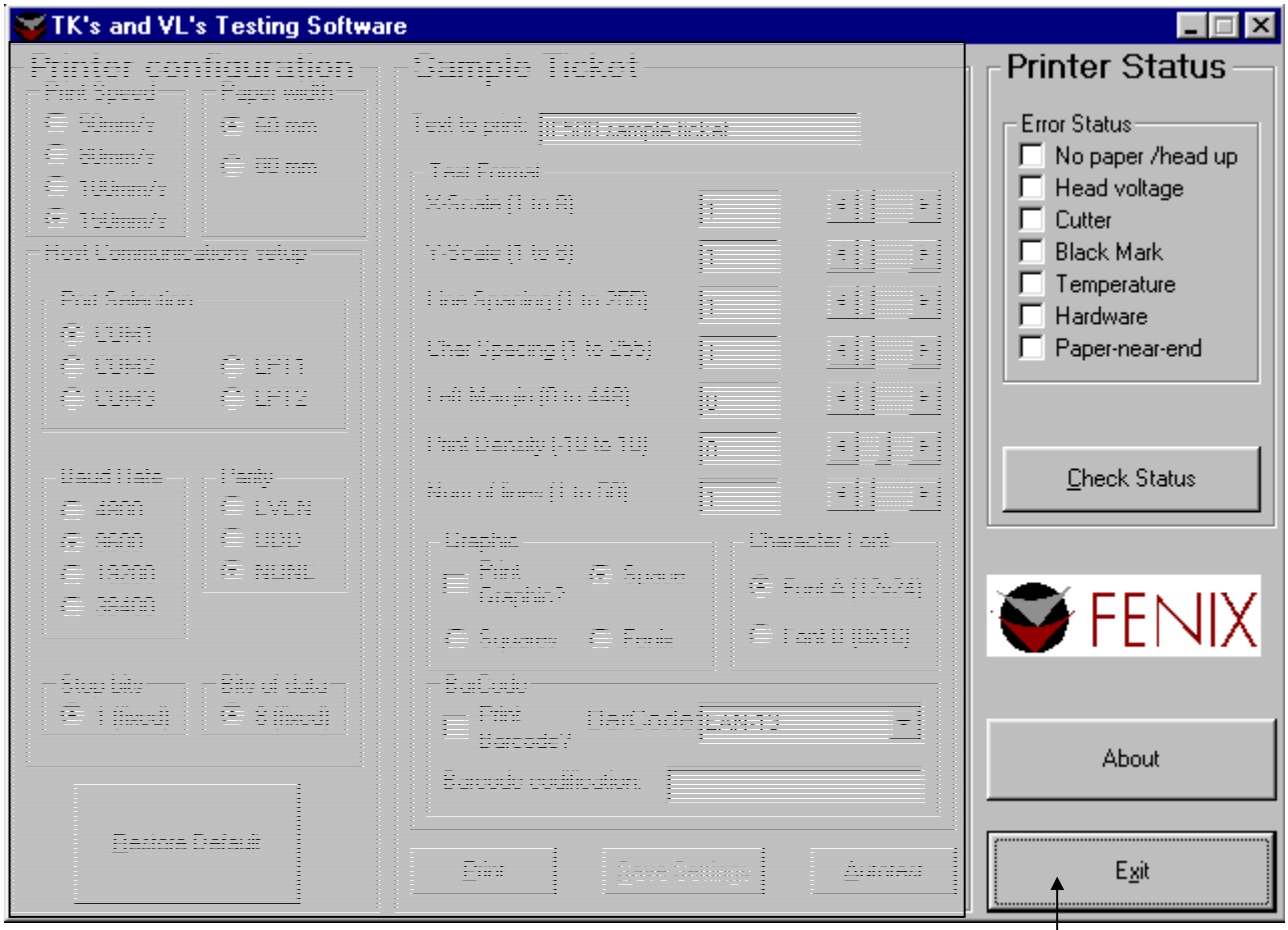
- Printer Configuration.
- Printer Status.
- Sample ticket.

These three parts are distinguished in the program main window. And they are explained next.

PRINTER CONFIGURATION



PRINTER STATUS

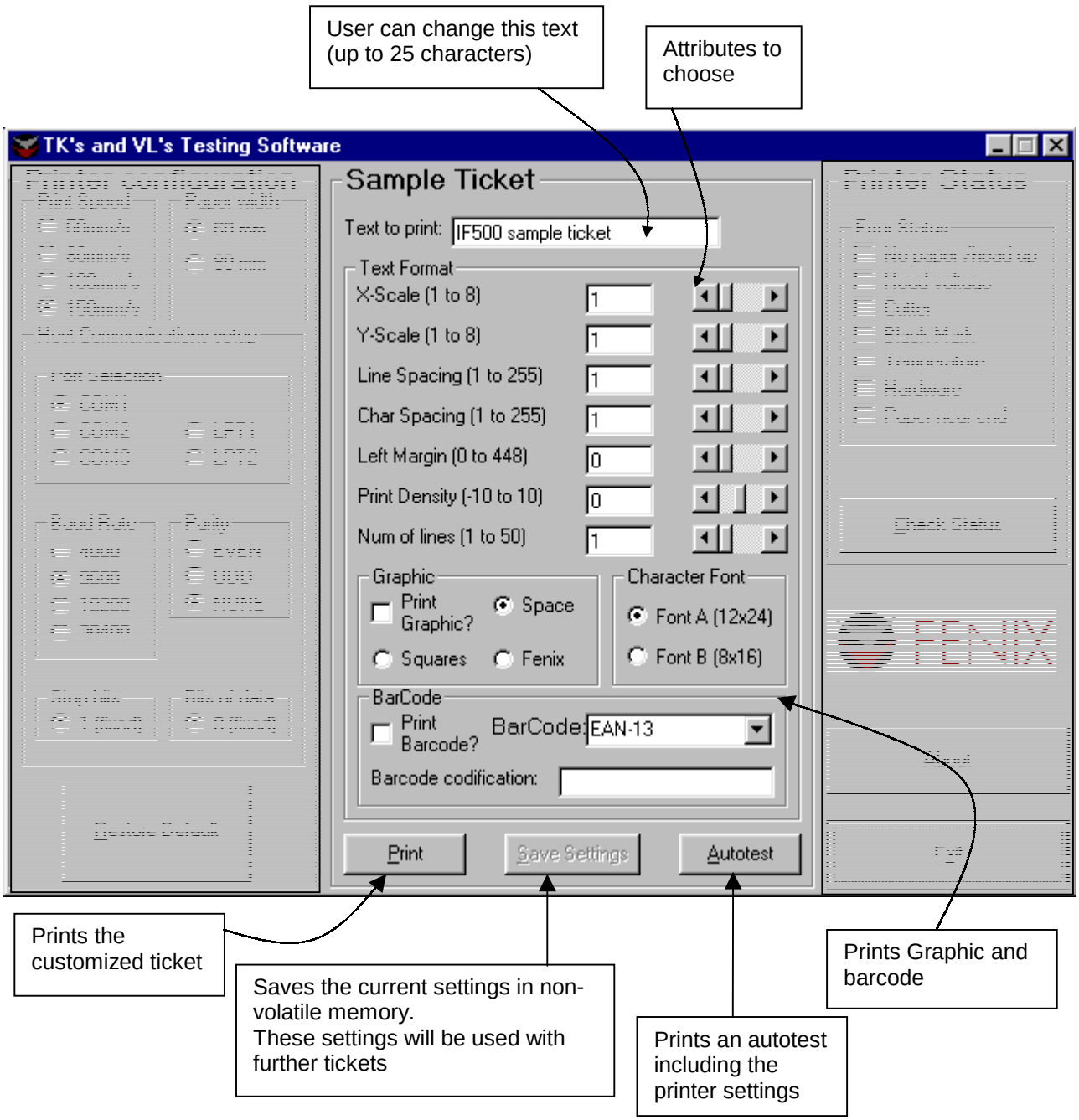


When enabling the printer status, the program tests the printer's sensors and notifies every significant error or printing status.

The program tests the printer's status once. In some errors, there may be a little time delay from the moment when the error is produced until the printer notifies it.

SAMPLE TICKET

With this feature, user can appreciate different formats of text by choosing the attributes of the desired text.



To save the current settings in non-volatile memory, user must take next steps:

Select the text parameters
Print a ticket with the selected parameters
Press the "Save settings" button to save these parameters.
Press the "Autotest" button to check the parameters have been saved.

NOTE: The "Left Margin" and the "Number of lines" parameters are NEVER saved into memory.

SPAIN Avda. Meridiana, 507-509 – 08016 BARCELONA
Phone Num: 34 – 93 353 92 22
Fax Num: 34 – 93 353 97 21
e-mail: fenixim@retemail.es
http: www.feniximvico.com