TK31 THERMAL PRINTER Operation Manual - Version 1.1 April 2003



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INDEX

IMPORTANT NOTES ON TK31 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	10
2- INSTALLATION	11
2.1- FIXING THE TK31 PRINTER	11
2.1.1- TK31 INSTALLATION	12
2.2- TK31 INSTALLATION CONSIDERATIONS	13
2.2.1- EXTERNAL CHUTE SYSTEM	13
2.2.2- PAPER GUIDE SYSTEM	14
2.3- TK31 CONNECTORS	16
2.3.1- POWER SUPPLY CONNECTOR	16
2.3.2- PRINTER CURRENT CONSUMPTIONS	17
2.3.3- SERIAL RS-232 CONNECTOR	19
2.3.3.1- Specifications	19
2.3.3.2- Serial interface connection example	20
2.3.4- CENTRONICS PARALLEL CONNECTOR	21
2.3.4.1- Specifications	21
2.3.4.2- Parallel interface connection example	22
3- BASIC OPERATIONS	25
3.1- LOADING PAPER	26
3.1.1- AUTOMATIC PAPER LOAD	26
3.1.2- MANUAL PAPER LOAD	27
3.2- CHARACTER CODE TABLE	29
3.3- BUTTONS & LEDS	31
3.3.1- BUTTONS FUNCTIONS	31
3.3.2- LED INDICATORS	32
3.4- SPECIAL MODES	33
3.4.1- SELF-TEST MODE	33
3.4.2- PROGRAMMING MODE	35
3.4.3- HEXADECIMAL DUMP MODE	37
3.5- ERROR PROCESSING	38
3.5.1- NO PAPER / HEAD-UP ERROR	39
3.5.2- PAPER-NEAR-END SENSOR	40
3.5.3- THERMAL HEAD TEMPERATURE ERROR	41
3.5.4- AUTOCUTTER ERROR	42
3.5.5- THERMAL HEAD VOLTAGE (Vp) ERROR	43
3.5.6- HARDWARE ERROR	44
3.5.7- OPTICAL MARK ERROR	45
3.5.8- SERIAL PORT ERROR DETECTION FLOW CHART	46
3.5.9- PARALLEL PORT ERROR DETECTION FLOW CHART	47

3.6- OPTICAL MARK	48
3.6.1- EXAMPLE ON USING THE OPTICAL MARK	49
4- CONTROL COMMANDS	51
	51
	51
4.2- EXPLANATION OF TERMS	51
4.3- CONTROL COMMANDS DESCRIPTION	52
APPENDIX A- CHARACTERS x LINE	70
APPENDIX B- RECOVERY FROM AUTOCUTTER ERROR	71
APPENDIX C- EXTERNAL APPEARANCE	72
APPENDIX D- SPECIFICATIONS	73
APPENDIX E- HOW TO ORDER	74
APPENDIX F- FREQUENTLY ASKED QUESTIONS	75
APPENDIX G- CODE 128 BAR CODE	76
APPENDIX H- TESTING SOFTWARE	80
APPENDIX I - TERMAL HEAD OPERATION	83

FIGURES AND TABLES

Fig. a - Head cleaning procedure	7
Fig. 2.1.1- Fixing the TK31	11
Fig. 2.2.0.A- Accessible parts of the TK31	12
Fig. 2.2.0.B- Paper-near-end sensor positions	13
Fig. 2.2.1- External chute system	14
Fig. 2.2.2.A- Paper guide system	- 15
Fig. 2.2.2.B- Distances between fixing holes	· 15
Fig. 2.3- TK31 connectors location	16
Fig. 2.3.1- Power supply connector as seen from outside the TK31	16
Fig. 2.3.3.1- RS-232 connector as seen from outside the TK31	19
Fig. 2.3.4.1- CENTRONICS connector as seen from outside the TK31	22
Fig. 2.3.4.2- Parallel input / output signal timing chart	24
Fig. 3.1.A- Load paper roll process	25
Fig. 3.1.B- Paper roll positioning	26
Fig. 3.1.1- Automatic paper load sequence	27
Fig. 3.1.2- Manual paper load sequence	28
Fig. 3.3.1- TK31 Buttons & Leds identification	31
Fig. 3.4.1- SELF-TEST MODE sample	34
Fig. 3.4.2- PROGRAMMING MODE sample	36
Fig. 3.4.3- HEXADECIMAL DUMP MODE sample	37
Fig. 3.6- Optical Mark Characteristics	48
Fig. 3.6.1- Optical Mark recommended use sequence	50
Fig. B.1- Cutter mechanism. Front view	70
Fig. I.1- Schematic head for the LTP2000 series thermal mechanisms	· 83
Fig. I.2- Sample of line thermal head operation using 3 logical blocks	83
Table 2.3.2.1- Ranking of maximum current consumption	17
Table 2.3.3.1- Serial port pip-out	17

Table 2.3.2.1- Ranking of maximum current consumption	17
Table 2.3.3.1- Serial port pin-out	17
Table 2.3.4.1- Parallel port pin-out	21
Table 2.4- Standard parallel connection example	22
Table 2.5- Special parallel connection example	23
Table 3.5.A- Errors explanation	38
Table 3.5.B- Parallel Port Signals VS Type of error	39
Table 3.5.1- Parallel Port pins status at "NO PAPER / HEAD-UP" error	39
Table 3.5.2- Parallel Port pins status at "PAPER NEAR END" error	38
Table 3.5.3- Parallel Port pins status at "HEAD TEMPERATURE" error	41
Table 3.5.4- Parallel Port pins status at "AUTOCUTTER" error	42
Table 3.5.5- Parallel Port pins status at "HEAD VOLTAGE" error	43
Table 3.5.6- Parallel Port pins status at "HARDWARE" error	44
Table 3.5.7- Parallel Port pins status at "OPTICAL MARK" error	45
Table 4.3.1- Command List	52
Table I.1- Speeds relation depending on strobes selected	· 84

IMPORTANT NOTES ON TK31 HANDLING

In order to guarantee a long life of the printer, it is necessary to keep some precautions on the TK31 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.
- Use power supply voltage within specified range. Overvoltage may irremediably damage the printer. Voltage under the specified range may cause incorrect operations.
- Keep TK31 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 short-circuits, broken thermal head or general printer failure.
- DO NOT blow the TK31.
- NEVER modify the TK31.
- DO NOT try to repair the TK31 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 electromagnets, 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.
- To ensure safety, unplug the TK31 before leaving it unused for an extended period.

 <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.

RECOMMENDATIONS

Before connecting any input interface, verify the correct operation of the TK-31 printer with self test feature.

Place the TK31 in such a way that connection wires are not crushed or twisted.

0 – INTRODUCTION

The TK31 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 TK31 is 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-31 location, access and protection from external damage. It can be used in industrial, professional or laboratory environments.

Main features of the TK31 printer are:

- Easy maintenance structure.
- Easy installation procedure.
- Compact and lightweight.
- 112 mm paper width.
- High speed printing: up to 75 mm/s.
- Line printing method: Printing is performed every time a text line is filled.
- High reliability: 15 million lines.
- Single 24V DC power supply.
- 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 auto cutter.
- Configurable auto-cutter sort: Total or Partial
- Self test feature.
- Windows 95, 98, 2000 and XP 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 TK31 printer. NOTICE: The contents of this manual are subject to change without notice.

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

1 – GENERAL SPECIFICATIONS

1) PRINTING SPECIFICATIONS

- 1) Printing method: Thermal line printing.
- 2) Print Head:

Total number of dots:

Printing mechanism model type	Number of dots
LTP2442 (112 mm paper-width model)	864 dots (= 108 mm)

Printing width:

Drinting meschanism medal type Maximum prim	
Printing mechanism model type Maximum prin	ting width
LTP2442 (112 mm paper-width model) 832 dots (= 104	mm)

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

Printing speed:	up to 75 mm/s (2,95"/s)

Printing speed may be slower, depending on the data transmission speed and combination of control commands, environmental conditions, the print density or the print method selected.

4) Paper feeding: Feeding method: unidirectional with friction feed. Feeding pitch: 0,125mm (0,0049")
Feeding speed: 75 mm/s (2,95"/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 \pm 2.4V (\pm 10%)
- 2) Current consumption (at 24V):

Printing mode	Max. current	See section 2.3.2 PRINTER CURRENT CONSUMPTIONS
Standby mode	Mean current	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 $56 - 90 \ \mu m$.

3) Size:

Paper width:112 ±0.5mmPaper roll outer diameter:150 mm (Max.)

1.5- OVERALL DIMENSIONS

1) External dimensions (without paper roll):

WxDxH (mm) 162x197.5x140

2) Weight (without paper roll): For the LTP2442 mechanisms: 1500gr. Approx.

1.6- ENVIRONMENTAL CONDITIONS

- 1) Operating Temperature:0 to 55°C (32 to 131°F)Reliable printing:5 to 50°C (41 to 122°F)
- 2) Operating humidity: 10 to 80% (34°C (93.2°F) at 80%, non-condensing)

2 – INSTALLATION

2.1- FIXING THE TK31 PRINTER

The TK31 is an industrial printer thought to be fixed in a bigger case or structure, or another kind of appropriate chassis. The TK31 printer has 4 fixing points.

2.1.1- TK31 INSTALLATION

- Fix the TK31 to the chassis by screwing putting four metric screws (M4 / L10 mm) through the holes marked with A in *fig. 2.1.1- Fixing the TK31*.
- Place all the four screws in the same direction, from up to down.
- Use two metric nuts (M4) to secure the screws in the same figure.
- It is hardly recommended that the fixing holes of your chassis have an oval shape so as the TK31 can move backward and forward for an easy manipulation (See point 2.2- TK31 INSTALLATION CONSIDERATIONS)



2.2- TK31 INSTALLATION CONSIDERATIONS

Despite of the model, there are some general considerations to take into account when installing the TK31.

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.



Fig. 2.2.0.A- Accessible parts of TK31.

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

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



Fig. 2.2.0.B- 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. 2.2.1- 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. 2.2.2.A- Paper guide system.

The distance between the mechanism and frontal side of the user's chasis may not allow the opening of the printer thermal head. To avoid this, one solution is to design the fixing holes of the TK31 with an oval shape, so as the machine can move backward and forward to access to its head-up lever.



Fig. 2.2.2.B- Distances between fixing holes.

2.3- TK31 CONNECTORS

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 communications connector.



Fig. 2.3- TK31 connectors 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 1mm². 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.2.3.1- Power supply connector as seen from outside the TK31.

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

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

2.3.2- PRINTER CURRENT CONSUMPTIONS

The TK-31 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 has to satisfy the following condition:

Vcc 24 V DC ±2.4 V

The **maximum current consumption** varies according to the used print method. This can be chosen between six possibilities; 1, 2, 3, 4, 5 or 6 strobes per line. *For more details about Thermal Head Operation see appendix I*.

Print Method	Max. consumption
1 Strobe (Fixed Division)	11,1 A max.
2 Strobes (Dynamic Division)	6,6 A max.
3 Strobes (Dynamic Division)	4,5 A max.
4 Strobes (Dynamic Division)	3,5 A max.
5 Strobes (Dynamic Division)	2,9 A max.
6 Strobes (Dynamic Division)	2,5 A max.

 Table 2.3.2.1 Ranking of maximum current consumption

NOTES:

- To know how select the Print Method, see section 3.4.2 PROGRAMMING MODE.
- All these values of maximum current consumption are recommended from the mechanism manufacture (Seiko) to make sure a correct operation in every print situation. The most critical print situation (about current consumption) is done when the printer need print indefinitely a black ticket. In this case, the power supply must provide the maximum current indicated on the previous table (Fig. 2.3.2.1).
- If the customer print application needn't print a complete black ticket (the most general case), then it's possible use a power supply (ps) with less output current. To decide how many amperes need provide the ps to the interface for print a standard's user ticket, first it's necessary perform a visual inspection on the ticket and reckon what average of dots are activated (black points) per line on all the user ticket (a millimeter line is performed by 8 dots and a millimeter long is performed by 8 lines).
- With the dots per line average is possible <u>estimate</u> the Printer Mechanism Current Consumption (PMCC) using the following equation:

$$PMCC = Navg \times Idot + Im$$

where: Navg is the average of dots per line

Idot is the maximum activated current for one dot

Im is the maximum activated current for motor

Maximum activated	Maximum activated current for
current for motor (Im)	one dot (Idot)
500 mA	13 mA

- The PMCC value offer an approximated estimation of how much current need provide the User Power Supply (UPS) using the 1 strobe print method. Otherwise, if the PMCC exceed the maximum current than the UPS can supply and the PMCC is higher than the maximum current consumption for the 6 strobes print method, then it's possible use the UPS whether at least the print method is configured with 6 strobes.
- Since the experience teaches us that sometimes it's possibly increase the print speed using the same UPS. This is possible do reducing the print method and trying to reconfigurate this parameter printing the user ticket.
- The **print speed** and **print quality** are very related with the Print Method (PM) selected. When the PM increase, the print speed is reduced and the print quality is improved on. Otherwise whether the PM decrease, the print speed is higher and the print quality is a little worse.

2.3.3- SERIAL RS-232 CONNECTOR

2.3.3.1- 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

- 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
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 2.3.3.1- Serial port pin-out.



Fig. 2.3.3.1 – RS-232 connector as seen from outside the TK31.

2.3.3.2- Serial interface connection example

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

PRINTI	ER SIDE		USER S	IDE (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	$\longleftarrow \longrightarrow$	SG	5
6	/DSR		/DSR	6
7	/RTS		/RTS	7
8	/CTS		/CTS	8
9	(NC)		RI	9

NC: Not Connected

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

The TK31 receives data continuously, even while performing printing operation.

The TK31 serial input/output signals (RXD, /RTS and TXD) can be RS232C level or TTL level (see *APPENDIX E- HOW TO ORDER*).

The TK31 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 TK31 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-31.

2.3.4- CENTRONICS PARALLEL CONNECTOR

2.3.4.1- 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							
3	Data1	Input							
4	Data2	Input							
5	Data3	Input	Data Bus						
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 to 25	GND	-	Ground						

Table 2.3.4.1- 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 $0.5 \ \mu s$ 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. 2.3.4.1 – CENTRONICS connector as seen from outside the TK-31.

2.3.4.2- Parallel interface connection example

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

PRINT	ER SIDE		USER SIL	DE (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)	4	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	Ì►	/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

22/85

PRINT	ER SIDE		USER SIL	DE (PC)
D-SUB25 Pin Num.	Signal Name		Signal Name	D-SUB25 Pin Num.
1	/STB	₄	/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

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

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. 2.3.4.2- 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-31.

3 – BASIC OPERATIONS

3.1- LOADING PAPER

When the printer runs out of paper, there are two ways of loading paper in the TK31: 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.A- Load paper roll process.

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



Fig. 3.1.B- Paper roll positioning.

3.1.1- AUTOMATIC PAPER LOAD

5) Make sure the TK31 is power supplied.

- 6) Open the printing head and remove paper from inside the TK31 (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.
- 9) Put the paper end in the TK31 inlet.

10)Push the paper in until the TK31detects it and starts the auto-load sequence.

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



Fig.3.1.1- Automatic paper load sequence.

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.
- 5) Put the paper end in the TK31 inlet.
- 6) Push the paper in until it reaches the TK31 outlet.
- 7) Close the printer head.



Fig. 3.1.2- Manual paper load sequence.

3.2- CHARACTER CODE TABLE

The TK31 uses next table:

PC437: USA, Standard Europe (International Character Set: USA) .

	HEX	0)	1			2		3		4		5		6		7
HEX	BIN	000	00	000)1	00	010	- 00	011	01	00	01	01	01	10	0	11
	0000	NUL		DLE		SP		0		@		Ρ		`.		\mathbf{p}	
Ľ	0000		00		16		32		48		64		80		96	_	112
1	0001			XON		1		1		А		Q		a		q	
	0001		01		17		33		49		65		81		97	_	113
2	0010		_			"		2		в		R		ь		r	
-	0010		02		18		34		50		66		82		98		114
3	0011			XOF	F	#		3		С		s		С		s	
Ľ	0011		03		19		35		51	_	67	-	83		- 99		115
4	0100	EOT				\$		4		D		Т		a	100	t	140
Ľ			04	Į	20		36	-	52	-	68		84		100		116
5	0101	ENC	2	1	-	%		5	50	E		U	07	e	101	u	1117
Ľ.		<u> </u>	05		21	<u> </u>	37	_	53	T	69	1.7	85	P	101		117
6	0110		0.0	ł	00	1 St	00	6	64	F	70	ľ	0.0	I	102	v	110
		<u> </u>	06	<u> </u>	22	ļ.,-	38	7	54		70	TAT	80	0	102		110
7	0111	ļ	07		00		20	1	55	G	71	w	87	в	103	1~	110
	<u> </u>		07	CAN	23	1	39		00	ш	11	v	01	h	100	v	1110
8	1000		00	CAU	24	{``	40	°	56	n.	72	ſ^.	88	1	104	ſ^	120
<u> </u>	<u> </u>	UT	100	<u> </u>	24	5	40	a	, 50	T	12	v	00	i	104	v	120
9	1001	111	00	1	25	Ľ	41	ľ	57	11	73	1	89	1	105	1	121
\vdash		LF	100	<u> </u>	120	*	.11	1.		J		Z	00	i		z	1
A	1010	Ľ	10	1	26	1.	42	1	58	ľ.	74	1-	90	1	106	-	122
	<u>+</u>	t—	110	ESC	100	+		:		к		t r		k		1	1
В	1011		11	1	27	1	43	ľ	59	1	75	1 -	91		107	1 '	123
	1	FF	1	FS		1.	1	<		L		$\overline{\}$		1		T	-
C	1100	· ·	12	1	28	Ľ	44	1	60	1	76	1	92	1	108	1	124
		CR		GS				1=	1	М]		m	•	F	1
0	1101		13	1	29	1	45	1	61	1	77	1	93	1	109	1	125
			-			1.		>		N		1°		n		~	
R	1110		14	1	30		46	1	62	1	78	1	94	1	110		126
P			-	1		1		?		0				0		SP	
I.K.	hm		15	1	31		47	1	63	1	79	1	95	1	111	ļ	127

(Continued): 80H to FFH

	HEX		8	9			A		В		С		D]	E		F
HEX	BIN	10	000	10	001	1(010	1	011	1	100	1	101	11	110	11	111
0	0000	Ç		É		á		000X 2322		Ľ		Т		a		\equiv	
0	0000		128		144		160		176		192		208		224		240
1	0001	ü		æ		í		<u>.</u>		Т		т		β		\pm	
1	0001		129		145		161		177		193		209		225		241
2	0010	é		Æ		ó		***		т		т		Г		≥	
"	0010		130		146		162		178		194		210		226		242
3	0011	â		ô		ú		1		ŀ		L		π		≤	
Š	0011		131		147		163		179		195		211		227		243
A	0100	ä		ö		ñ		-		—		-		Σ		ſ	
7	0100		132		148		164		180		196		212		228		244
5	0101	à		ò		Ñ		4		+		г		σ		1	
Ű.,	0101		133		149		165		181		197		213		229		245
6	0110	å		û		<u>a</u>		Н		-		Г		μ		÷	
Ŭ	0110		134		150		166		182		198	Ļ	214		230		246
7	0111	ç		ù		0		٦		ŀ		H		τ		≈	
	· · · ·		135		151		167		183	Ļ	199	Ļ	215		231		247
8	1000	ê		ÿ	150	占	100	٦		Ŀ	-	+	210	Φ	200	Ŭ	Co in
	1000	L	136	L.,	152		168	Ļ	184		200	Ļ	216	-	232		248
9	1001	ë		0	150	-	4.00	1	Lor	٢	204	-	1010	θ		•	
-		Ļ	137	1.	153		169	L	185	-	201		217	_	233	_	249
A	1010	e	100	U	151	-	100	1	100	-	000	ſ	010	Ω	004	1.	050
			138	-	154	-	170	-	180		202		218	-	Z34	-	250
В	1011	1	120	¢	155	Ż	171	٦	107	Т	000		010	P	095	1	951
		-	139	-	199	1	m	-	101		205		219	-	235	n	201
С	1100	1	140	æ	150	4	170	-	100	Г	204	-	220	~	226		252
<u> </u>		-	140	3.2	150		172	-	100	_	204		220		230	2	202
D	1101	1	141	Ŧ	167	•	172	-	190	-	205		221	P	237	-	253
—		x	141	Dł	101	77	110	╘	109	T	200		221	E	231	-	200
Е	1110	A	142	r	158		174	-	100	т	206		222	15	238	- 1	254
			142	f	100	155	In	_	100	┶	200	-	666	10	200	SP	20-1
F	1111	ſ~	143	J	159	ſ″	175	1	191		207	ł	223	1.	239		255

3.3.- BUTTONS & LEDS

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. 3.3.1- TK31 Buttons & Leds identification.

3.3.1.- BUTTONS FUNCTIONS

4) 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.

5) 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.

6) 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 TK31 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 TK31 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:

FENIX IMUICO S.A. IF-2100 U 1.0 MECHANISM:LTP2442(112mm) HEAD ACTIVATION MODE Fixed Division: 1 Strobe SERIAL PORT SETTINGS Data bits : 8 (fixed) Baud rate : 38400 bauds Parity bit: Odd parity Stop bits : 1 (fixed) TEXT SETTINGS Set character EUROPE 437 Printing at 75 mm/s Print density STANDARD Font B (8x16 dots) Character Width: -Character Height: 1 Character space: 004 030 Line space: Black mark: Disabled Carry Return: Disabled



Fig. 3.4.1- SELF-TEST MODE sample.

3.4.2- PROGRAMMING MODE

The TK31 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: LTP2242 (60mm), LTP2342 (80mm) or LTP2442 (112mm)
 (If you use the TK31 printer, you have to chose LTP2442)
- Baudrate: 4800, 9600, 19200 or 38400 baud.
- Head Activation Mode: 1, 2, 3, 4, 5 or 6 Strobes
- Parity for serial transmission: ODD, EVEN, NO PARITY.
- Print density: Light (-50%), Normal or Dark (+50%).
- Black Mark: Enable / Disable marked paper.
- Carry Return: Enable / Disable CR command.



NOTES:

- The Head Activation Mode parameter is also possible make the configuration using a software command. See command GS (K 2 0 0 m to know how do it.
- For more details about *Head Activation Mode,* see section 2.3.2 PRINTER CURRENT CONSUMPTIONS.

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

Pressing PFEED button is 'YES' Pressing PROG button is 'NOT' NNNPRINTER MECHANISM SETUPNNNN SEIKO LTP2242 60mm?..... SEIKO LTP2342 80mm?..... SEIKO LTP2442 112mm?..... ..LTP2442 SET (112mm - 75mm/s) Head activated with 1 Strobe? Head activated with 2 Strobes? Head activated with 3 Strobes? ... DYNAMIC DIVISION - 3 STROBES NNNNNSERIAL PORT SETUPNNNNNNNDATA BITS AT 8 (fixed)STOP BITS AT 1 (fixed) Baudrate at 38400 baud?..... Baudrate at 19200 baud?..... Baudrate at 9600 baud?.....BAUDRATE SET AT 9600 BAUD.

	S	e	t		p	a	r	i	t	y		¢	h	e	c	k	?		•		•	•						•	•
•				•					N	0	Ī		C	H	E	C	K		P	A	R	1	Ī	Y		S	E	Ī	
N	NL	Ni	N g	N h	Pt	R	1	Nr	Ī	n	Dt	E	N	Se	I	T	Y	t	Su	E	T (U -	P 5	NO	N %	N)	14 ?	N	Ņ
	N	0	r	M	a	1		p	r	i	n	t	-	d	e	n	5	i	t	y	?								
	D	a	r	k		p	r	i	n	t		d	e	n	5	i	t	y		(+	5	0	%)	?			
				P	R	1	N	Ī		D	E	N	S	I	Ī	Y		S	E	Ī		A	Ī		D	A	R	K	
Ņ	NF	N	N	Nh	N 1	N	B	L	A	Ca	K	k	M	A	R	K	k	So	E	Ī	V	P	N	Ņ	N	Ŋ	N	Ņ	N
										B	L	A	C	K		M	A	R	·	•	0		·	A	B		Ē		•
N	N	N	N	Ņ	Ņ	N	N	N	N	N	C	R		S	F	T	U	P	Ŋ	N	N	N	N	N	N	N	N	N	Ŋ
	E	n	a	b	1	e		C	a	r	r	y		R	9	t	u	r	n		C	R	?				•	•	
														•				C	R		0	1	S	A	B	L	E	D	

Fig. 3.4.2- 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:

N-14-74	~HE	XAD	ECI	MAL	M	DE	11.14	•	
16	40	10	28	4B	02	00	01	FG	.8.CK+
46	45	41	49	58	20	49	40	50	FENIX IMU
49	43	4F	30	53	2E	41	2E	20	ICD S.A.
32	30	30	31	0 A	54	4B	34	31	2001,TK41
20	76	31	2E	38	θA	08	53	81	u1.8,.Sa
6D	70	60	65	20	94	65	78	74	mple text
0H	53	61	60	70	6C	65	20	94	,Sample t
65	78	24	0.0	18	32	18	20	0n	ext2
10	21	22	43	55	54	20	34	00	.1"CUT 4.
43	55	54	20	34	OR	43	55	54	CUT 4.CUT
211	34	011	10	21	77	18	20	01	414
BII	45	45	45	45	45	DR	18	63	EEEEEc
33	02	011	18	63	34	02	0A	10	3

Fig. 3.4.3- HEXADECIMAL DUMP MODE sample.

3.5.- ERROR PROCESSING

IMPORTANT NOTE:

For detect all errors with parallel interface, user must connect the TK31 as show in the Table 2.5- Special parallel connection example.

The TK31 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 TK31 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.

where every error is expla	ained in detail.		
NOTE: For more information on how each error is indicated see points 3.5.1 to 3.5			

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 70°C
CUTTER	The auto-cutter can not cut
VOLTAGE	The thermal head voltage is out of range (Vp = $24V \pm 10\%$)
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 3.5.A Errors explanation.

	PE	/ERR	ST2	ST1
Paper-End/Head-up or	1	1	Y(5)	Y(5)
Paper-near-end (1)	I	I	X(3)	Λ(3)
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 3.5.B 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 60°C.
- (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 Auto cutter.
- (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 Name	Status
Pin number		
12	PE	1
15	/ERR	1
16	ST1	0
17	ST2	0

Table 3.5.1- 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. 2.2.0.C- 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:

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

• This error can also be detected at the PE signal by setting the "ESC c 3" command.

 Table 3.5.2 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 3.5.2*.

• 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 °C).

- ERROR ORIGIN: The thermal head temperature raises over 70 °C.
- 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 Name	Status
Pin number		
12	PE	0
15	/ERR	0
16	ST1	1
17	ST2	0

 Table 3.5.3- Parallel port pins status at "HEAD TEMPERATURE" error.

• RECOVERY: The printer automatically recovers from this error when the thermal head temperature drops below 60 °C.

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 ($24V \pm 10\%$).
- 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 3.5.5- 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 3.5.7- 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



3.5.9- PARALLEL PORT ERROR DETECTION FLOW CHART



3.6- OPTICAL MARK

The TK31 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 LTP2000 series mechanism shares the optical sensor for the Optical Mark and the No-Paper functions. For this reason, when it's selected the Optical Mark function and the printer detects a black mark on the paper, the led PE is turned ON.

The optical mark must be placed in the back of the paper, and in its right side as seen in *Fig. 3.6.- Optical mark characteristics*.

The optical mark must satisfy the dimensions shown in *Fig. 3.6.-* 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. 3.6- 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 ($F \rightarrow$ 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 \rightarrow 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 \rightarrow 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. 3.6.1- 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

7) 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.

8) Print buffer

The print buffer is a buffer that stores the image data to be printed.

9) Ignore

The state in which all codes, including parameters, are read in and discarded, and nothing happens.

10)Inch

A unit of length. One inch is 25.4 mm.

11)MSB

Most Significant Bit

12)LSB

Least Significant Bit

13)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

		Comn	Command		
Command	Name	classifi	cation	Page	
		Executing	Setting		
LF	Print and line feed	Х		52	
CR	Print and carriage return	Х		52	
DEL EOT	Real-time status transmission	Х		52	
ESC SP	Set right-side character spacing		Х	54	
ESC !	Select print mode(s)		Х	55	
ESC 2	Select default line spacing		Х	55	
ESC 3	Set line spacing		Х	56	
ESC @	Initialize printer	Х	Х	56	
ESC J	Print and feed paper	Х		56	
ESC M	Select character font		Х	57	
ESC c 3	Select paper sensors to output paper-end		Х	57	
	signals				
ESC c 4	Select paper-near-end sensor to stop printing		Х	58	
ESC d	Print and feed <i>n</i> lines	Х		58	
GS FF	Feed marked paper to print starting position	Х		58	
GS !	Select character size		Х	59	
GS (F	Set adjustment value(s)		Х	60	
GS (K 2 0 0 m	Select thermal head operation		Х	61	
GS (K 2 0 1 m	Select print density		Х	62	
GS H	Select printing position of HRI characters		Х	62	
GS L	Set left margin		Х	63	
GS T	Set print position to the beginning of print line	Х		63	
GS V	Select cut mode and cut paper		Х	63	
GS f	Select font for HRI characters		Х	64	
GS h	Set bar code height		Х	64	
GS k	Print bar code	Х		65	
GS v 0	Print raster bit image	Х		67	
GS w	Set bar code width		Х	68	

Table 4.3.1- Command List

[Name]	Print and	l line feed								-	
[Format]	ASCII	LF									
	Hex	0A									
[Description]	Prints t current li	he data in ne spacing.	the print	buffer	and	feeds	one	line,	based	on	the
[Note] [Reference]	This com ESC 2, E	mand sets	the print	position	to the	e begii	nning	of th	e line.		

~	
C	к
_	

[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 sta	atus transmission
[Format]	ASCII	DEL EOT n
	Hex	10 04 <i>n</i>
[Range]	<01>H ≤ <i>n</i> ≤	<04>H
[Description]] Transmits th	e selected printer status specified by <i>n</i> 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]		
• Th	e status is tra	nsmitted whenever the data sequence <10>H<04>H <n></n>
(<	01>H ≤ <i>n ≤ <</i> (D4>H) is received.
• Th on	e printer trans e-byte of data	smits the current status. Each status item is represented by
• Th	a nrintar trans	mits the status without confirming whether the host

- 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	Х	-	Not used. Undefined value
6	Х	-	Not used. Undefined value
7	OFF	00	Not used. Fixed to OFF

$n = \langle 02 \rangle$ 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	Х	-	Not used. Undefined value
6	OFF	00	No error
	ON	40	Error occurred
7	OFF	00	Not used. Fixed to OFF

$n = \langle 03 \rangle$ H: Error status

		0.0.0	
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.

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

 $N = \langle 04 \rangle$ H: Continuous paper sensor status

ESC SP n

[Name]	Set right-side character spacing				
[Format]	ASCII	ESC SP n			
	Hex	1B 20 <i>n</i>			

[Range] <00> $H \le n \le <$ FF>H

[Description] Sets the character spacing for the right side of the character to $[n \times 0.125 \text{ mm } (n \times 0.0049^{\circ})]$.

[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 = -c04

[Default] *n* = <04>H

[Reference] APPENDIX A

<u>ESC ! n</u>

[Name]	Select print mode(s)			
[Format]	ASCII	ESC ! n		
	Hex	1B 21 <i>n</i>		
[Range]	<00>H < <i>n</i> < <ff>H</ff>			

[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, quadruplesize 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] $n = \langle 00 \rangle H$

[Reference] ESC M, GS !, APPENDIX A

ESC 2			
[Name]	Select de	fault line spacir	ים וס
[Format]	ASCII	ESC 2	
	Hex	1B 32	
[Descriptio	n] Selects 3	.75 mm (30 x 0	.125 mm) line spacing.
[Reference	e] ESC 3.	-	

<u>ESC 3 n</u>

[Name]	Set line spac	ing
[Format]	ASCII	ESC 3 n
	Hex	1B 33 <i>n</i>
[Range]	$<00>H \le n \le$	<ff>H</ff>
[Description]	Sets the line	spacing to [n x 0.125 mm].
[Default] n =	<1E>H	
[Reference]	ESC 2	

ESC @

[Name] Initializ		printer
[Format]	ASCII	ESC @
	Hex	1B 40
ID		a .

[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 4 ^a <i>n</i>	
[Range]	<00>H ≤	<i>n</i> ≤ <ff>H</ff>	

[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 c	Select character font		
[Format]	ASCII	ESC M n		
-	Hex	1B 4D <i>n</i>		
[Range]	<i>n</i> = <00:	<i>n</i> = <00>H, <01>H		
[Descripti	on] Selects	the character font.		
Ν	Function			
<00>H	Character F	ont 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

ES	Сc	3	n

[Name]	Select pape	r sensor(s) to output paper-end signal in the parallel port.
[Format]	ASCII	ESC c 3 n
	Hex	1B 63 33 <i>n</i>
[Dongo]	-005 U < n <	

[Range] $<00>H \le n \le <01>H$

[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] $n = \langle 08 \rangle H$

ESC c 4 *n*

[Name]	Select pap	er-near-end sensor to stop printing
[Format]	ASCII	ESC c 4 n
	Hex	1B 63 34 <i>n</i>
	Decimal	27 99 52 n

[Range] $0 \le n \le 255$

[Description] Selects the paper-near-end sensor to stop printing when a paper-nearend 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

<u>ESC d *n*</u>

[Name]	Print and feed <i>n</i> lines		
[Format]	ASCII	ESC d <i>n</i>	
	Hex	1B 64 <i>n</i>	

[Range] <00> $H \le n \le <FF>H$

[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.

<u>GS FF</u> [Name] Feed marked paper to print starting position

[Format]	ASCII	ĠSFF	
	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

<u>GS !</u>	n				
[Nam	ne]	Sele	Select character size		
[Form	nat]	ASC	CII	GS!n	
		Hex		1D 21 <i>n</i>	
[Ran	nge]	$<00> \le n \le H$			
		(1 ≤	vertical	number of times ≤ 8 , $1 \leq$ 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	

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

Table 1			
Characte	er 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			
Characte	er 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 (FpLpHamnLnH

[Name]	Set adjustment value(s)			
[Format]	ASCIL	GS(FpLpH a m nL nH)		
	Hex	1D 28 46 pL pH a m nL nH		
[Range]	(pL + (pH	(<i>pL</i> + (<i>pH</i> x 256)) = 4 (where <i>pL</i> = <04>H, <i>pH</i> = <00>H)		
	<01>H ≤	 <01>H ≤ a ≤ <02>H 		
	<i>m</i> = <00>	H,<01>H		
	0 ≤ (<i>nL</i> +	0 ≤ (<i>nL</i> + <i>nH</i> x 256) ≤ 65535		
	(where <0	$00>H \le nL \le \langle FF>H, \langle 00>H \le nH \le \langle FF>H \rangle$		
	n) Ìthia aamu	mand is offective only when the Ontion Mark on		

[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 + (pHx 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.

М	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 $[(nL + nH \times 256) \times 0.125 \text{ mm}]$.
- 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**

<u>GS (K200m</u>

Format]	ASCII	GS (K 2 0 0 m
	Hex	1D 28 4B 02 00 00 <i>m</i>

[Range] $< 01>H \le m \le < 06>H$

[Description]

• *m* specifies the thermal head operation.

т	Function
<01>H	Specifies the head operation with 1 strobe (Fixed Division)
<02>H	Specifies the head operation with 2 strobes (Dynamic Division)
<03>H	Specifies the head operation with 3 strobes (Dynamic Division)
<04>H	Specifies the head operation with 4 strobes (Dynamic Division)
<05>H	Specifies the head operation with 5 strobes (Dynamic Division)
<06>H	Specifies the head operation with 6 strobes (Dynamic Division)

[Notes]

For more details about the Thermal Head Operation see the appendix I.



The **print speed** and **print quality** are very related with the Thermal Head Operation (THO) selected. When the THO increase, the print speed is reduced and the print quality is improved on. Otherwise whether the THO decrease, the print speed is higher and the print quality is a little worse.

[Default] $m = \langle 01 \rangle H$

[Reference] PROGRAMMING MODE, THERMAL HEAD OPERATION

<u>GS (K 2 0 1 m</u>

[Format]	ASCII	GS (K 2 0 1 m
	Hex	1D 28 4B 02 00 01 <i>m</i>
[Range]	<f6>H ≤ <i>m</i> ≤</f6>	$<$ <ff>H and <00>H \leq m \leq <0A>H (corresponds to the print</ff>
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 $m = \langle 00 \rangle$ 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 same even though the different density is set. In this case, the last specified data for the print density is effective.

Ν	Λ	Print Density
Dec	Hex	,
10	0A	+50%
9	09	+45%
8	08	+40%
7	07	+35%
6	O6	+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] $m = \langle 00 \rangle H$

[Reference] **PROGRAMMING MODE**

<u>GS H n</u>

[Name] Select print position for HRI characte	ers.
---	------

[Format]	ASCII	GS H <i>n</i>
----------	-------	---------------

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	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] $n = \langle 02 \rangle H$

[Reference] **GS f, GS k**

<u>GS L nL nH</u>

[Name]	Set left m	argin
[Format]	ASCII	GS L nL nH
	Hex	1D 4C <i>nL nH</i>
[Range]	<00>H ≤	nL≤ <ff>H</ff>

 $<00>H \le nH \le <FF>H$ [Description] Sets the left margin using *nL* and *n*H.

• The left margin is set to $[(nL + nH \times 256) \times 0.125 \text{ mm}].$



[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

<u>GS T n</u>

[Name]	Set print p	position to the beginning of print line	
[Format]	ASCII	GS T n	
	Hex	1D 54 <i>n</i>	
[Range]	<i>n</i> = <00>ł	H or <i>n</i> = <01>H	

[Description] Sets the print position to the beginning of print line.

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

Ν	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

<u>GSVm2)GSVmn</u>

[Name]	Sele	ct cut mode	and cut paper
[Format]	1)	ASCII	GS V m
	-	Hex	1D 56 <i>m</i>
	2)	ASCII	GS V <i>m n</i>
		Hex	1D 56 <i>m n</i>
10 1	43		

[Range] 1) *m* = <01>H

14) $m = \langle 42 \rangle H; \langle 00 \rangle H \le n \le \langle FF \rangle H$

[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 (118mm).

[Notes for 1)]

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

[Notes for 2)]

- When $n = \langle 00 \rangle$ 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.
- 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] $n = \langle 00 \rangle H$

[Reference] GS(F

<u>GS f *n*</u>

[Name]	Select for	nt for Human Readable Interpretation (HRI) characters
[Format]	ASCII	GS f n
	Hex	1D 66 <i>n</i>
[Dongo]	m .00.1	

[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:

Ν	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 <i>n</i>		
[Name]	Select bar co	ode height
[Format]	ASCII	GS h n
	Hex	1D 68 <i>n</i>
[Range]	<01>H ≤ <i>n</i> ≤	<ff>H</ff>
[Description]	Selects the h	neight of the bar code.
	N specifies t	he number of dots in the vertical direction.
[Default]	<i>n</i> = <a2>H (</a2>	162 dots)
[Reference]	GS k	

<u>GS k m n d1...dn</u>

[Name]	Print bar coo	le
[Format]	ASCII	GS k <i>m n d</i> 1d <i>n</i>
	Hex	1D 6B <i>m n d</i> 1 <i>dn</i>
[Range]	m= <43>H , <i>(n</i> and <i>d</i> dep	$m = \langle 45 \rangle H$, $m = \langle 46 \rangle H$ or $m = \langle 49 \rangle H$ bend 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 ≤ <i>n</i> ≤ <0D>H	<30>H ≤ d ≤ <39>H
<45>H	CODE39	<01>H ≤ <i>n</i> ≤ <ff>H</ff>	<30>H ≤ <i>d</i> ≤ <39>H, <41>H ≤
			<i>d</i> ≤ <5 ^a >H, <20>H, <24>H,
			<25>H, <2B>H, <2D>H,
			<2E>H, <2F>H
<46>H	ITF	<01>H ≤ n ≤ <ff>H</ff>	<30>H ≤ <i>d</i> ≤ <39>H
		(even number)	
<49>H	Code128	<02>H ≤ n ≤ <ff>H</ff>	<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:
 - 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	Transmit data		
character	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



- 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 d1dk
	Hex	1D 76 30 <i>m xL xH yL yH d1dk</i>
[Range]	<00>H ≤ <i>m</i>	≤ <03>H
	<00>H ≤ <i>xL</i>	.≤ <ff>H</ff>
	<00>H ≤ <i>x</i> F	$1 \le \langle FF \rangle$ H where $1 \le (xL + xH \times 256) \le 128$
	<00>H ≤ <i>yL</i>	.≤ <ff>H</ff>
	<00>H ≤ yF	$1 \le <08>H$ where $1 \le (yL + yH \times 256) \le 4095$
	$<00>H \le d \le$	≤ <ff>H</ff>
	k = (xL + xF)	Η 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
(dn), $data nar QE (1, name (1, 1))$			

(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 $xL + xH \times 256 = 64$



<u>GS w n</u>

[Name]	Set bar co	ode width	
[Format]	ASCII	GS w <i>n</i>	
	Hex	1D 77 <i>n</i>	
[Range]	<02>H <	n < <06>H	

[Range] $<02>H \le n \le <06>H$ [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.

 $[Default] \quad n = <03>H$

[Reference] **GS k**

APPENDIX A – CHARACTERS x LINE

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

Max. Of char / line =

Mechanism - LeftMargin

(Right-side + Font) x CharWidth

The parameters of the formula are:

Mechanism : 832 dots (for LTP-2442 mechanism)

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, turn the printer off. 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- Cutter mechanism. Front view.

APPENDIX C – EXTERNAL APPEARANCE






APPENDIX D – SPECIFICATIONS

	TK-31				
Printing method	Thermal dot line				
Printing mechanism	SEIKO LTP2442				
Data interface	CENTRONICS parallel				
	RS232 Serial				
Dot composition/line	832 dots				
Resolution	8 dots/mm				
Printing speed(mm/sec)(1)	75 mm/sec				
Paper width (mm)	$112 \pm 0,5$				
Paper roll diameter	150mm MAX.				
Printing width (mm)	104 Max.				
Character/line	Font A 92				
(Interchar = 1	Font B 64				
Font Scale = 1x1)					
Operating voltage range	Vcc> 24V DC +/-10%				
Current consumption	(see section 2.3.2 Printer Current				
	Consumption)				
Dimensions WxDxH (mm)	162 x 197,5 x 140				
Operating ambient Temp.	0°C to 55°C (noncondensing)				
Long Term Storage Temp.	5°C to 30°C (noncondensing)				
Weight (gr)	1500				
Recommended thermal	TF50KS-E From Nippon Paper Industries				
Paper	P350 KSP				
	AF50KS-E Jujo Thermal				
	PD160R From Oji Paper Industries				
Thermal head life	100 million pulses				
Activation pulse	400 16				
resistance	100 Km				
Abrasion resistance					
Auto cutter life	1.000.000 cuts (when above 30°C 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			
T112X150X25	Standard 150 mm diameter paper roll for 112 mm			

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.
- \checkmark 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 (K201m" command)

APPENDIX G – CODE128 BAR CODE

G.1 Description of the CODE128 Bar Code

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

- 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	Transr	nit Data
Character	Hex	Decimal	Character	Hex	Decimal	Character	Hex	Decimal
NUL	00	0	(28	40	Р	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	Т	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	Х	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	:	ЗA	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	В	42	66			
ESC	1B	27	С	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	Н	48	72			
!	21	33	I	49	73			
"	22	34	J	4A	74			
#	23	35	K	4B	75			
\$	24	36	L	4C	76			
%	25	37	М	4D	77			
&	26	38	Ν	4E	78			
``	27	39	0	4F	79			

G.3 Printable characters in CODE SET B

Character	Transmit Data		Character Trai		mit Data	Character	Transr	nit Data
Character	Hex	Decimal	Character	Hex	Decimal	Character	Hex	Decimal
SP	20	32	Н	48	72	Р	70	112
!	21	33		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	Т	74	116
%	25	37	М	4D	77	U	75	117
&	26	38	N	4E	78	V	76	118
,	27	39	0	4F	79	W	77	119
(28	40	Р	50	80	Х	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	Т	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	Х	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	١	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	а	61	97			
:	ЗA	58	b	62	98			
	3B	59	С	63	99			
<	3C	60	d	64	100			
=	3D	61	е	65	101			
>	3E	62	f	66	102			
?	3F	63	g	67	103			
@	40	64	h	68	104			
Α	41	65	i	69	105			
В	42	66	j	6A	106			
С	43	67	k	6B	107			
D	44	68		6C	108			
E	45	69	m	6D	109			
F	46	70	n	6E	110			
G	47	71	0	6F	111			

G.4 Printable characters in CODE SET C

Character	Transmit Data		Character	Transmit Data		Character	Transr	nit Data
Character	Hex	Decimal	Character	Hex	Decimal	Character	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	ЗA	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 TK31 printer is delivered together with a Windows-based, testing & configuring program. This program is an easy way to explore the TK31'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

Select the Thermal Head Operation (Print Method)

STK-31 Testing Software		
-Printer confiduration	Sample Ticket	Printer Status
Strobes	Text to print: TK-31 sample ticket	Firor Status
Y	Text Format	F Head voltage
1	X-Scale (1 to 8)	Cutter
	Y-Scale (1 to 8)	
- Host Communications setup	Line Spacing (1 to 255)	Hardware
Port Selection	Char Spacing (1 to 255)	Paper-near-end
	Left Margin (0 to 832) 0	
C COM3 C LPT2	Print Density (-10 to 10)	
	Num of lines (1 to 50)	Check Status
Baud Rate Parity		
@ 9600 C ODD	Graphic Character Font	
C 19200	Graphic?	
	Picture C Fenix C Font B (8x16)	
Stop bits Bits of data	BarCode ■ Print BarCode EAN-13 ▼	About
	Barcode?	
	Barcode codification.	Evit
<u>R</u> estore Default	Print Save Settings Autobest	
Sorial part	Sorial or parallel	
	port selection	
<u>-</u>		

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.

🚭 TK-31 Testing Software		
Printer confiduration Strobes I I Host Communications setup Port Selection C COM1 C COM2 O LPT1	Sample Ticket Text to print: TK-31 sample ticket Text Format X-Scale (1 to 8) Y-Scale (1 to 8) Line Spacing (1 to 255) Char Spacing (1 to 255) Left Margin (0 to 832) 0	Printer Status Error Status No paper /head up Head voltage Cutter Black Mark Temperature Hardware Paper-near-end
Baud Rate Parity 4800 C EVEN 9600 ODD 19200 NONE	Print Density (-10 to 10) Num of lines (1 to 50) Graphic Fint Graphic? Graphic? Character Font Font A (12x24) Graphic? Font B (8v16)	<u>Check Status</u>
Stop bits G 1 (fixed) Bits of data G 8 (fixed)	BarCode Print BarCode EAN-13	About
<u>R</u> estore Default	Print Save Settings Autotest	Exit Exits the program

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.

	User can	change this text	Attributes to ch	oose
STK-31 Testing	Software			
- Printer confid Strobes - I - I - I - I - I - I - I - I - I - I	IURATION	Sample Ticket Text to print: Text Format X-Scale (1 to 8) Y-Scale (1 to 8) Line Spacing (1 to 255) Char Spacing (1 to 255) Left Margin (0 to 832) Print Density (-10 to 10) Num of lines (1 to 50)	ket	Printer Status Error Status No paper /head up Head voltage Cutter Black Mark Temperature Hardware Paper-near-end
Baud Rate C 4800 C 9600 C 19200 C 38400 Stop bits Bi C 1 (fixed)	arity EVEN ODD NONE	Graphic Print C Clock Graphic? Clock Graphic? Picture C Fenix BarCode □ Print BarCode	Character Font Font A (12x24) Font B (8x16)	FENIX About
<u>R</u> estore Defa	nult	Barcode? Barcode codification:		Egit
Prints the customized ticket	Saves to non-vol These with fur	the current settings in atile memory. settings will be used ther tickets	Prints an autotest including the printer setting	Prints Graphic & barcode

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.

APPENDIX I – THERMAL HEAD OPERATION

For the LTP2000 series thermal mechanism, the line head is divided into 2 blocks called physical blocks. Each one of these blocks are made up by a collection of dots than when all are activated on the same time, it produces a high increase of energy consumption.



Fig. I.1.- Schematic head for the LTP2000 series thermal mechanisms

To avoid the necessity of use a great power supply when it's needed to print a completely black line, the physical blocks are divided in logical blocks. Generally, when the line thermal head is operating, the line is divided into several logical blocks which are activated one after another in succession.



Fig. I.2.- Sample of line thermal head operation using 3 logical blocks

These blocks allow divide the consumption between two and six, depending on requirements of consumption and speed. For more details about current consumption see section 2.3.2 **PRINTER CURRENT CONSUMPTION**.

The TK31 printer use the IF-2100 printer interface to manage the thermal mechanism. The IF-2100 can be configured to drive between 1 and 6 strobes (logical blocks), which each one is called Virtual Strobe. This selection is made through a function switch or a command.

For the selection by the commands, see command GS (K 200 on page 61.

For the selection by the function switches, see section **3.4.2 PROGRAMMING MODE**.

This facility allow to fix the maximum simultaneous active dots to be printed and therefore the maximum consume done for the printer (for more details about consumes see **PRINTER CURRENT CONSUMPTION** on section 2.3.2). Also, this feature affect indirectly the print speed, varying it automatically between the maximum speed for the selected mechanism and a minimum depending on the logical blocks selected. Next it's showed a table with the least speed depending on the logical blocks selected with an environment temperature of 25°C.

Strobes	Minimum Speed	Maximum Speed
1	75 mm / sec	75 mm / sec
2	54 mm / sec	75 mm / sec
3	21 mm / sec	75 mm / sec
4	13 mm / sec	75 mm / sec
5	13 mm / sec	75 mm / sec
6	13 mm / sec	75 mm / sec

Tab. I.1.- Speeds relation depending on strobes selected

When it's selected one strobe print method, the printer can print any text or graphic at the maximum speed, but this requires a great power supply. Otherwise, if it's used other print method, the printer adapts itself automatically the print speed to the print information to be written and also the energy requirements decrease. So, the print speed can vary between the minimum fixed by the print method selected and the maximum speed characteristic of the mechanism.



SPAIN

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