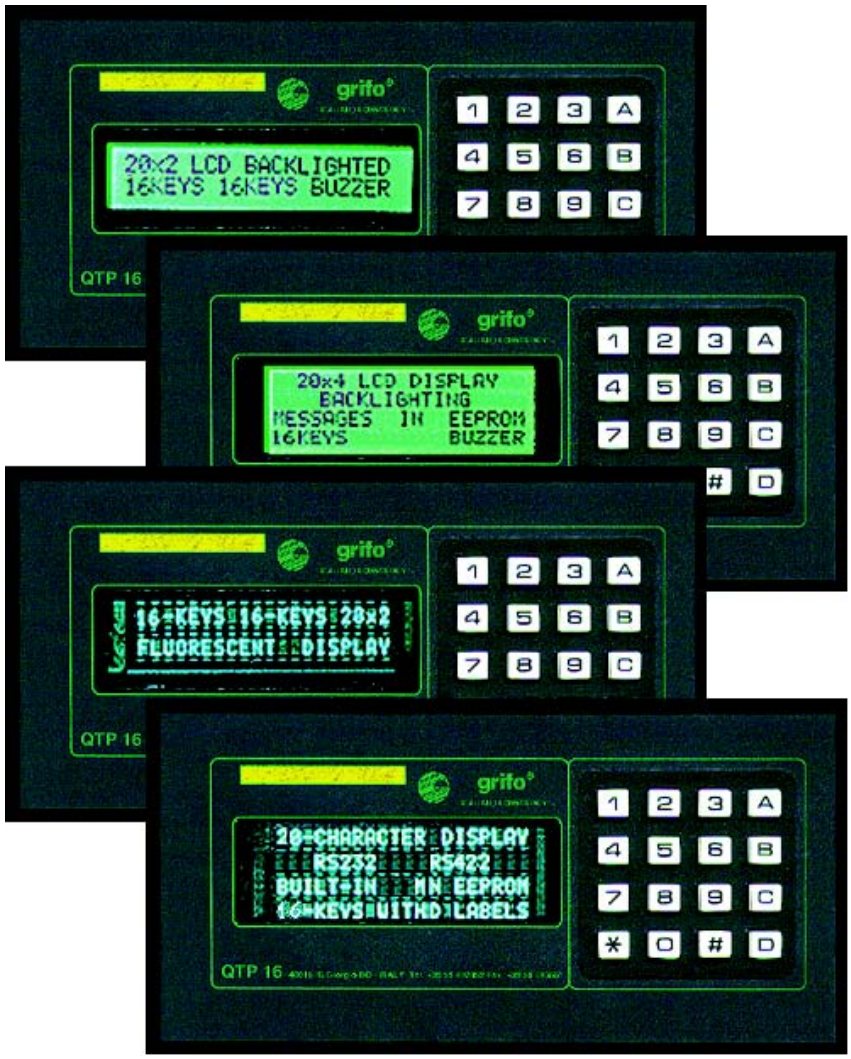
QTP 16

Quick Terminal Panel 16 Keys

USER MANUAL



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QTP 16 Edition 5.20 *Rel. 21 February 2000*

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USER MANUAL

Intelligent user panel equipped with Fluorescent or LCD display, LEDs back lighted, 20x2 or 20x4 characters; RS 232, RS 422 or Current Loop serial line; EEPROM for set-up and messages; 16 keys; Buzzer driven by software; Autorepeat and Keyclick functions; Master-Slave communication available; Built-in switching power supply; Possibility of re-naming the panel name by inserting label with new name or identification code into a proper slot; 4 optocoupled inputs, managed by user software or by on board firmware to select 16 messages that can be shown on the display.

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IMPORTANT

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For specific informations on the components mounted on the card, please refer to the Data Book of the builder or second sources.

SYMBOLS DESCRIPTION

In the manual could appear the following symbols:

Attention: Generic danger

Attention: High voltage

Trade marks

GENERAL INDEX

FIGURE INDEX

INTRODUCTION

The use of these devices has turned - IN EXCLUSIVE WAY - to specialized personnel.

The purpose of this handbook is to give the necessary information to the cognizant and sure use of the products. They are the result of a continual and systematic elaboration of data and technical tests saved and validated from the Builder, related to the inside modes of certainty and quality of the information.

The reported data are destined- IN EXCLUSIVE WAY- to specialized users, that can interact with the devices in safety conditions for the persons, for the machine and for the enviroment, impersonating an elementary diagnostic of breakdowns and of malfunction conditions by performing simple functional verify operations , in the height respect of the actual safety and health norms.

The informations for the installation, the assemblage, the dismantlement, the handling, the adjustment, the reparation and the contingent accessories, devices etc. installation are destined - and then executable - always and in exclusive way from specialized warned and educated personnel, or directly from the TECHNICAL AUTHORIZED ASSISTANCE, in the height respect of the builder recommendations and the actual safety and health norms.

The devices can't be used outside a box. The User must always insert the cards in a container that rispect the actual safety normative. The protection of this container is not threshold to the only atmospheric agents, but specially to mechanic, electric, magnetic, etc. ones.

To be on good terms with the products, is necessary guarantee legibility and conservation of the manual, also for future references. In case of deterioration or more easily for technical updates, consult the AUTHORIZED TECHNICAL ASSISTANCE directly.

To prevent problems during card utilization, it is a good practice to read carefully all the informations of this manual. After this reading, the User can use the general index and the alphabetical index, respectly at the begining and at the end of the manual, to find information in a faster and more easy way.

FIRMWARE RELEASE

This handbook makes reference to firmware release **1.2** and following ones. The validity of the information contained in this manual is subordinated to the firmware release number, so the user must always verify the correct correspondence beetween the notations. Inside the device, the firmware release number is written on the label stuck on the CPU or it can be obtained by a proper command sent through the serial line.

TERMINAL GENERAL FEATURES

QTP 16 (**Quick Terminal Panel 16 Keys**) is a complete **IP-54** operator panel, specifically designed for industrial use and for direct mounting on automatic machinery. It is, in every respect, video terminals suitable to be the direct interface between operator and machinery in any of the control or comand operations which could be necessary during running or diagnostic of the same. **QTP 16** is available with **Alphanumeric Fluorescent** or **LCD** displays, back lighted or not and with 2 or 4 lines of 20 characters. The **QTP 16** affords 16 keys. A label slot can be used to carry a name for the **QTP 16** or the user's own logo. The basic **QTP 16** can be expanded utilizing the various options available, namely **serial EEPROM**, up to 2 Kbyte storage room for message saving; **4 optocoupled input lines** used as user input (readable through serial line) or for direct management of 16 messages; etc. The **QTP 16** is able to execute an entire range of display commands, including Clear Screen, Position cursor, EEPROM reading or writing, etc., with code compatibility to **ADDS ViewPoint** standard video terminal.
Features of **QTP 16**, including options, are as follows:

- Overall dimension: Standard DIN 96x192 mm frontal frame size; 8 mm frontal frame depth; 22 mm rear metallic housing depth
- Tropicalized metallic housing with front plastics frame
- Aluminium front panel with anti-scratch polyester mask
- Case with rear mounting bracket "U" type
- Front panel mounting
- Keypad with **16 keys**
- **IP-54** standard protection for front display panel
- Panel name personalization label slot
- **4 optocoupled input** lines for direct management of 16 messages
- Reading of the 4 optocoupled input lines through serial line
- **Alphanumeric display** options:
  QTP 16-C2: **LCD** display, back lighted or not, with 2 lines of 20 characters
  QTP 16-C4: **LCD** display, back lighted or not, with 4 lines of 20 characters
  QTP 16-F2: **Fluorescent** display with 2 lines of 20 characters
  QTP 16-F4: **Fluorescent** display with 4 lines of 20 characters
- **Buzzer** programmable as **BELL** or to sound with keystroke
- **E²** up to 2 Kbyte for permanent storage of set-up, messages, key codes,etc.
- Memorization on **E²** and visualization, also scrolled, of more than 100 messages
- **RS 232, RS 422, RS 485** or **Current Loop** serial line
- **Communication** configurable as **Point-to-point** or **Master-Slave**
- **Local set up** for **communication** parameters (Baud Rate, Stop bits, Keyclick, etc.)
- **Internal power supply** capable of driving small external loads
- **DC** or **AC** power supply from **5 Vdc** to **24 Vac**

SERIAL COMMUNICATION

The communication with remote units is by standard RS 232 serial line, but it can be optionally changed in RS 422, RS 485 or Current Loop. Communication mode can be point-to-point or Master-Slave, employing the nineth-bit techinque; communication protocol is 8 (point-to-point) or 9 (Master-Slave) Bit, no parity, Baud Rate selectable amongst 1200, 2400, 4800, 9600, 19200, 38400 Baud and Stop bit selectable amongst 1, 2. Baud rate and stop bits are defined through set up mode.

BUZZER

QTP 16 has a circuitery capable to emit a steady sound based on a capacitive buzzer. Such circuitery can be activated by software through a specific comand for generating a sound-beep or it can be linked to a key-pressure just to get the **KeyClick** function.

DISPLAY

QTP 16 is available with **Fluorescent** alphanumeric displays and with **LCD** alphanumeric displays back lighted or not. The displays are available with 20 characters per line, available options are: Fluorescent 20x2, Fluorescent 20x4, LCD 20x2, LCD 20x4.

KEYBOARD

QTP 16 has a 16 keys keyboard. Code output to the serial line by pressing one key is completely software configurable, in addition these keys are equipped with **AutoRepeat** feature and there is the possibility to switch on/off the KeyClick function, i.e the Buzzer function each time a chosen key is pressed.

EEPROM

QTP 16 has the on-board EEPROM (the size varies from 256Bytes to 2 KBytes) for memorizing set-up, communication protocol, messagges, and so on. It is possible to memorize up to 100 messages of 20 characters to be read in any moment or shown on the display, just giving the identifying number of the message to the terminal. **QTP 16** also features the scrolling mode to display a messages: this way it is possible to show on a single display row informations that occupy more space than the amount normally available.
Please remember that the first 16 messages can be recalled on display, simply setting with a proper combination on the 4 optocoupled input lines.

OPTOCOUPLED INPUT LINES

QTP 16 has 4 NPN optocoupled input lines. They can be used as generic inputs from the field through a specific serial line command or they can recall and show on display the first 16 messages.

ON BOARD POWER SUPPLY

QTP 16 has an on board switching power supply so it can be powered with a voltage up to **24 Vac**. Optionally, the **+5Vdc** voltage generated by this power supply, can be used to power small external loads directly from the terminal itself.
Please note that **QTP 16** can also be delivered with a circuitery that allows to power the terminal directly with a **+5Vdc** voltage.

TECHNICAL FEATURES

GENERAL FEATURES

On board resources:

- **16** keys.
- **LCD Display** (2 or 4 lines of 20 characters) back lighted or not, trimmer for contrast regulation; or **Fluorescent Display** (2 or 4 lines of 20 characters).
- **BUZZER** for BELL function, or sound feed back when keys are pressed.
- Full duplex **RS 232** or **RS 422** or **Current Loop** serial line.
- **EEPROM** for set-up, messagges and so on (Max. 2 KBytes).
- **4 NPN Optocoupled** input lines (**Option**).

On board CPU: 89C2051 with 14.7456 MHz Quartz.

Communication protocols: **Master-Slave** or **point-to-point** modes
Baud Rate: 1200, 2400, 4800, 9600, 19200 or 38400 Bauds.
1 or 2 Stop Bit.
No Parity.
8 Bit.

Character size:
Fluorescent 20x2: 5 x 7 dots, 2,40 x 4,70 mm (Horiz., Vertical)
Fluorescent 20x4: 5 x 7 dots, 2,40 x 4,70 mm (Horiz., Vertical)
LCD 20x2: 5 x 7 dots, 3,20 x 4,85 mm (Horiz., Vertical)
LCD 20x4: 5 x 7 dots, 2,95 x 4,75 mm (Horiz., Vertical)

PHYSICAL FEATURES

Size: Please refer to figure 1

Weight: 600 g max

Mounting: On panel as Front-panel.

Temperature range: from 0 to 50 °C.

Relative humidity: 20% up to 90% (without condense)

Connectors:
CN4: 9 pins female D connector for serial connection.
CN5: 2 or 4 pins quick scew connector for power supply.
CN6: 6 pins quick screw connector for OPTOCOUPLED inputs connection (**Option**).

QTP 16 OVERALL SIZE

Here is the **QTP 16** size (in mm.) Rear view and side view where connectors are located. Drawings are not scaled.

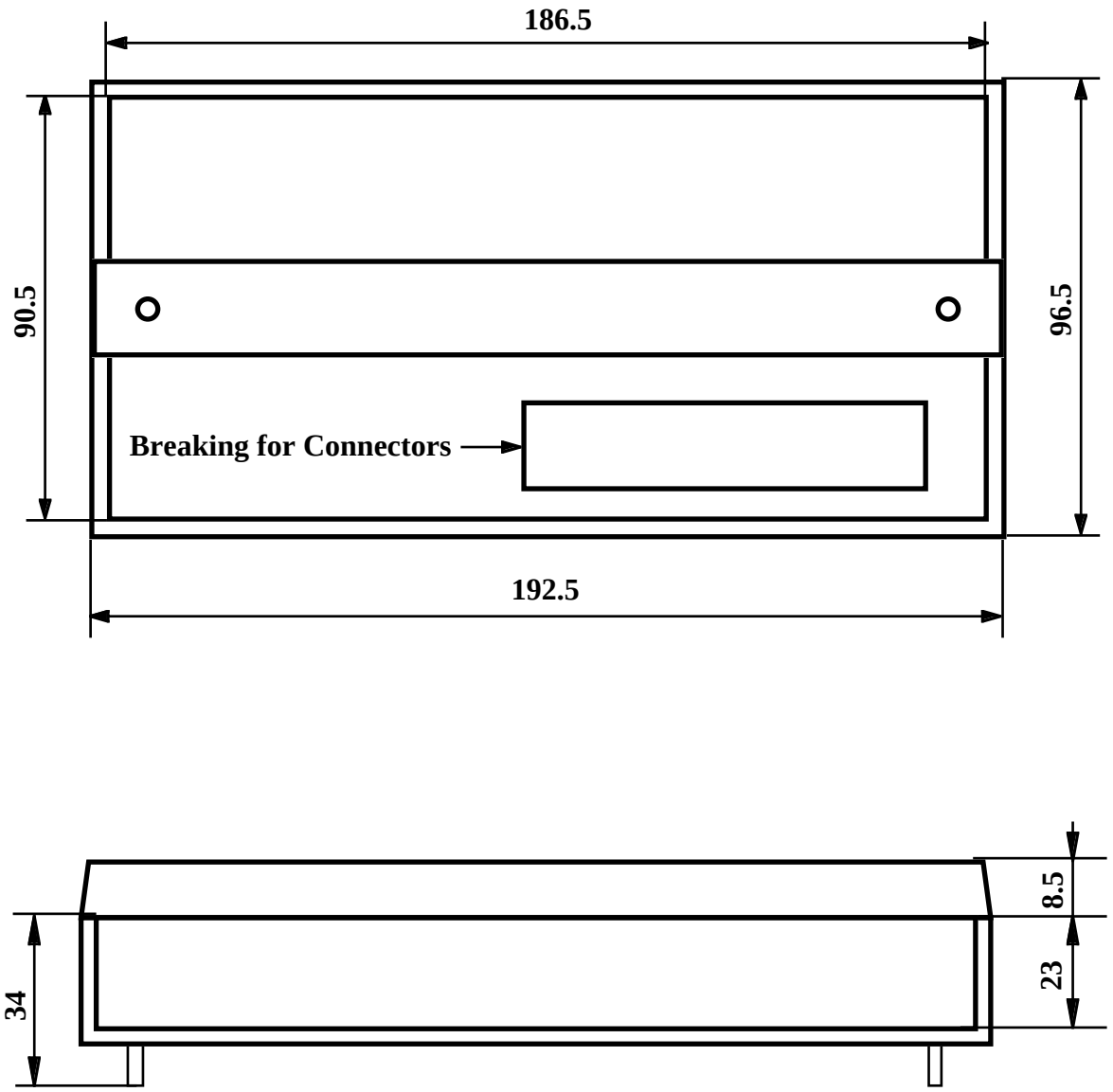

FIGURE 1: QTP 16 SIZE

ELECTRICAL FEATURES

Power supplt voltages:	**5Vdc** or **8÷24Vac**	
External loads power supply:	**5Vdc** (**Option**)	
Power supply power:	**5 W**	
RS 422-485 Termination Network:	pull-up resistor on positive:	**3.3 KΩ**
	pull-down resistor on negative:	**3.3 KΩ**
	line termination resistor:	**120 Ω**
Optocoupler Power supply voltage:	**+12÷24 Vdc**	

Hereunder is listed the **QTP 16** consumptions referred to the different display types. These consumptions are referred to the **QTP 16** basic version with no options.

DISPLAY Model	Consumption
NOT Back lighted LCD	30 mA - 5 Vdc 0.155 W - 8÷24 Vac
Back lighted 20x2 LCD	150 mA - 5 Vdc 0.95 W - 8÷24 Vac
Back lighted 20x4 LCD	150 mA - 5 Vdc 0.95 W - 8÷24 Vac
20x2 Fluorescent	165 mA - 5 Vdc 1.05 W - 8÷24 Vac
20x4 Fluorescent	280 mA - 5 Vdc 1.75 W - 8÷24 Vac

FIGURE 2: QTP 16 CONSUMPTIONS TABLE

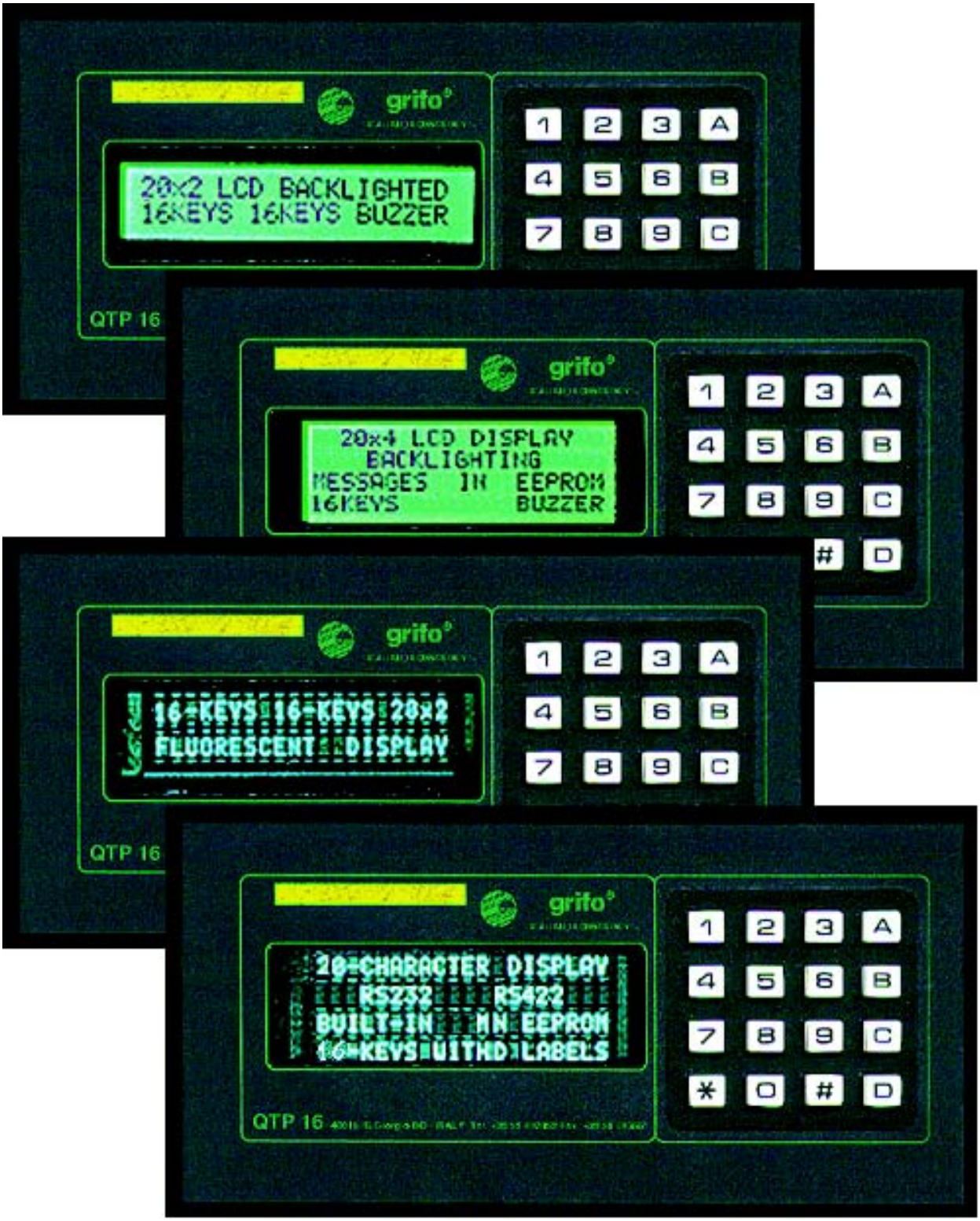

FIGURE 3: QTP 16 PHOTO

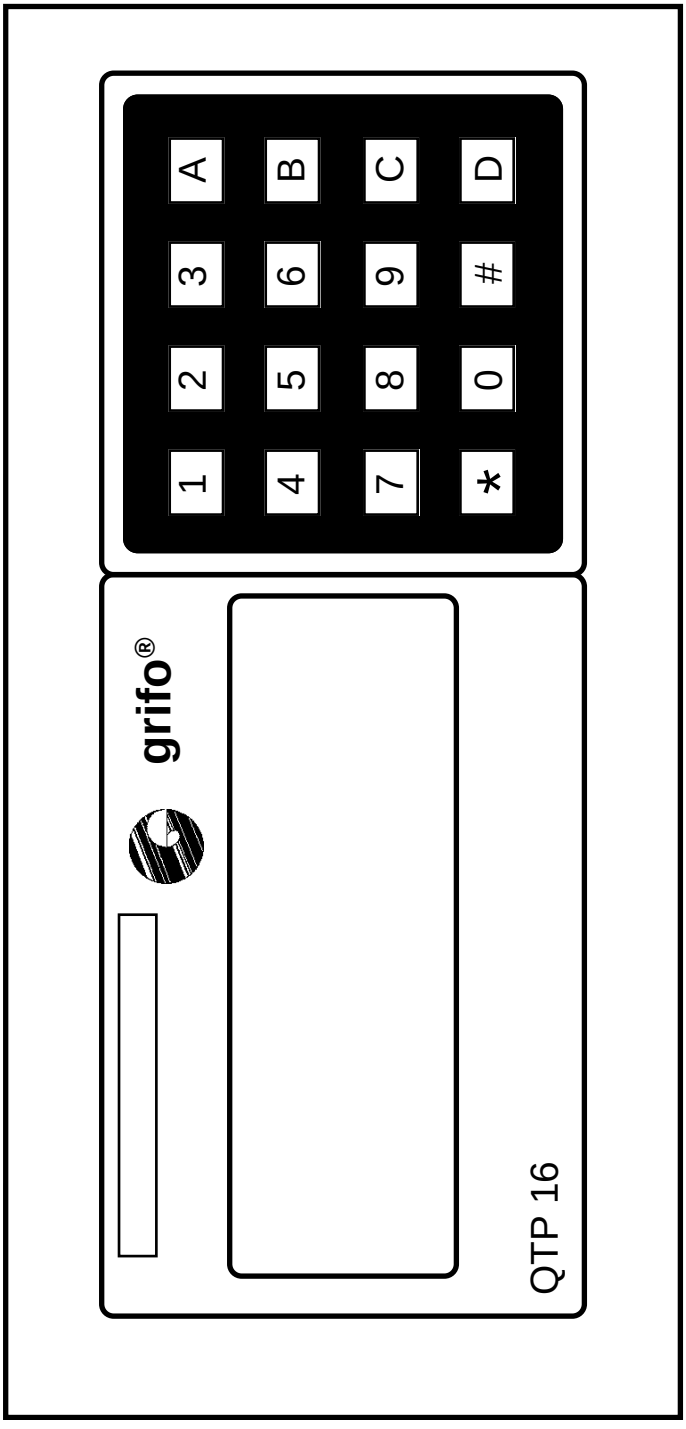

FIGURE 4: QTP 16 PANEL

TERMINAL INSTALLATION

This chapter illustrates all the operations which have to be done for the proper use of **QTP 16** terminal. **QTP 16** is provided with 3 connectors (1 of which is optional) for getting all the connections to the system. Here under please find the list of their Pin-Out and the meaning of the connected signals.

CN5 - POWER SUPPLY CONNECTOR.

CN5 is a quick screw terminal connector having 2 or 4 pins. This connector must be used to supply and/or get the requested and/or generated power supply voltage of the terminal.
The standard **QTP 16** version is supplied with a 2 pins connector for **8÷24Vac** supply (please refer to figure n. 6). All the other configurations are **OPTIONS** and must be requested in order phase.
Here there is the rear view of the terminal where are shown the possible connector configurations.

4 PINS CONNECTOR FOR POWER SUPPLY

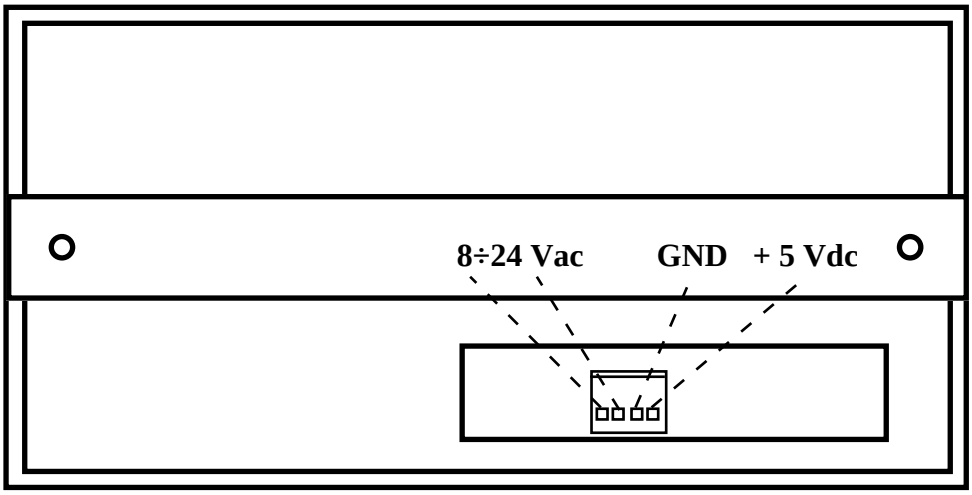

FIGURE 5: CN5 - 4 PINS CONNECTOR FOR POWER SUPPLY

Signals description:

8÷24 Vac	=	**I**	-	Lines for **QTP 16** powering through A.C. voltage connected to the on-board switching section.
+5Vdc	=	**O**	-	Output line to supply an external load through the on-board switching power supply.
GND	=			Ground line for external load supply.

2 PINS CONNECTOR FOR A.C. SUPPLY

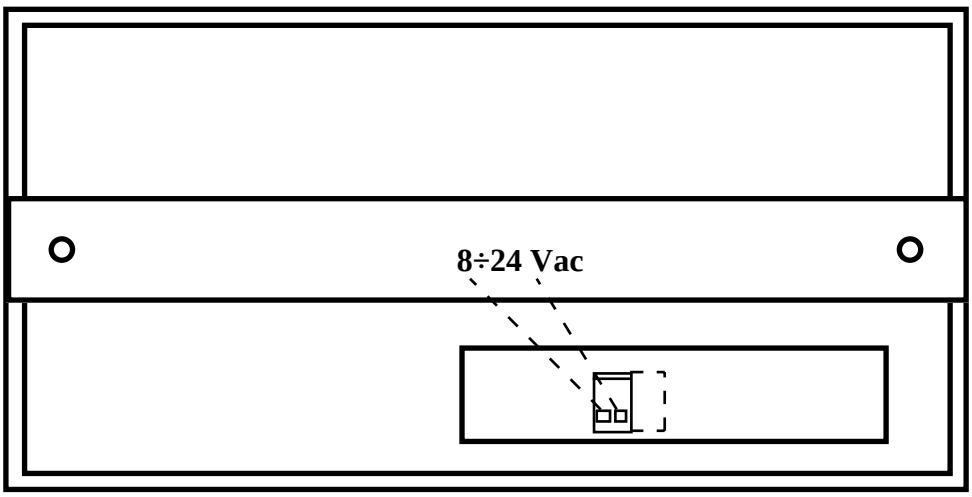

FIGURE 6: CN5 - 2 PINS CONNECTOR FOR A.C. SUPPLY

Signals description:

8÷24 Vac = **I** - Lines for **QTP 16** supply through A.C. voltage connected to on-board switching.

2 PINS CONNECTOR FOR QTP 16 D.C. SUPPLY

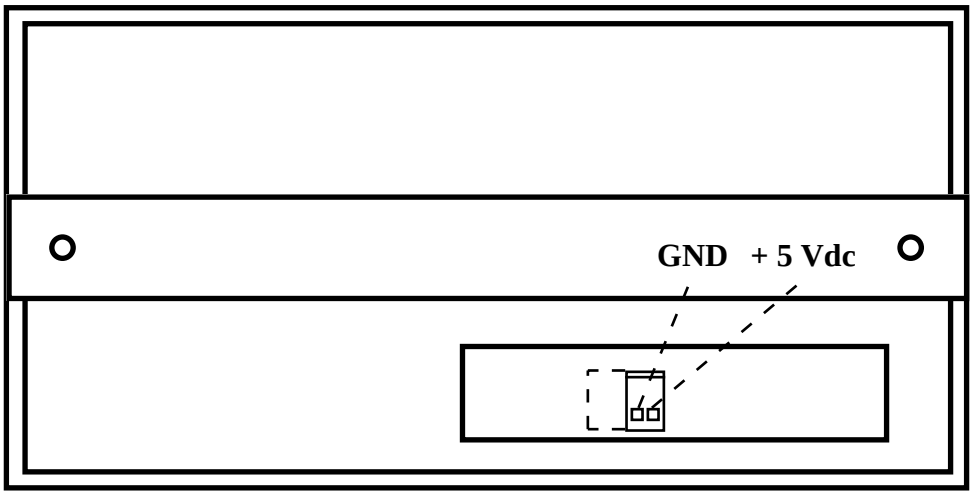

FIGURE 7: CN5 - 2 PINS CONNECTOR FOR D.C. SUPPLY

Signals description:

+5Vdc = **I** - Line for **QTP 16** supply through a D.C. voltage.
GND = Ground line for **QTP 16** supply.

CN6 - OPTOCOUPLED INPUTS CONNECTOR (OPTIONAL)

CN6 is a 5 pins quick screw terminal connector. On this connector the 4 NPN optocoupled input lines and the **+Vopto** signal to power the on-board OPTOCOUPLER components are available.

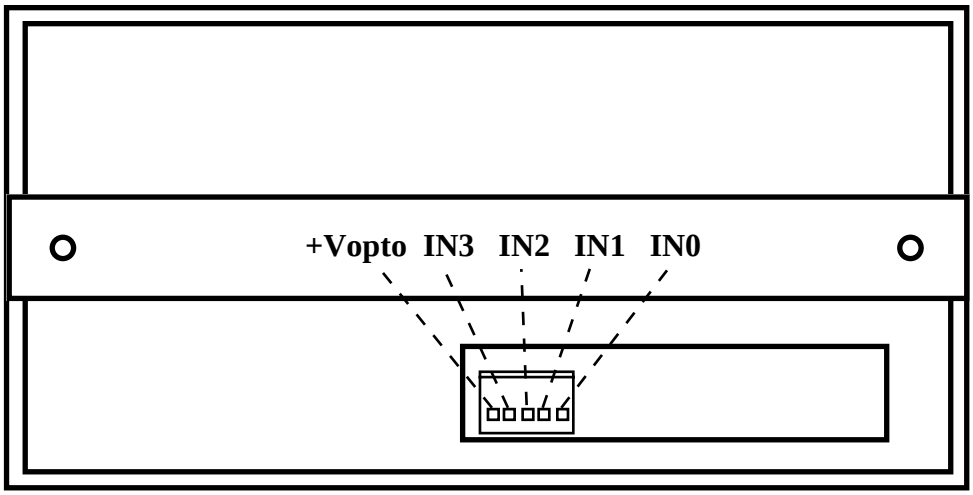

FIGURE 8: CN6 - OPTOCOUPLED INPUTS CONNECTOR

Signals description:

INn	=	**I**	-	NPN input connected to the optocoupled "n" line.
+Vopto	=	**I**	-	Power supply for the Optocoupler (**+12÷+24 Vdc**).

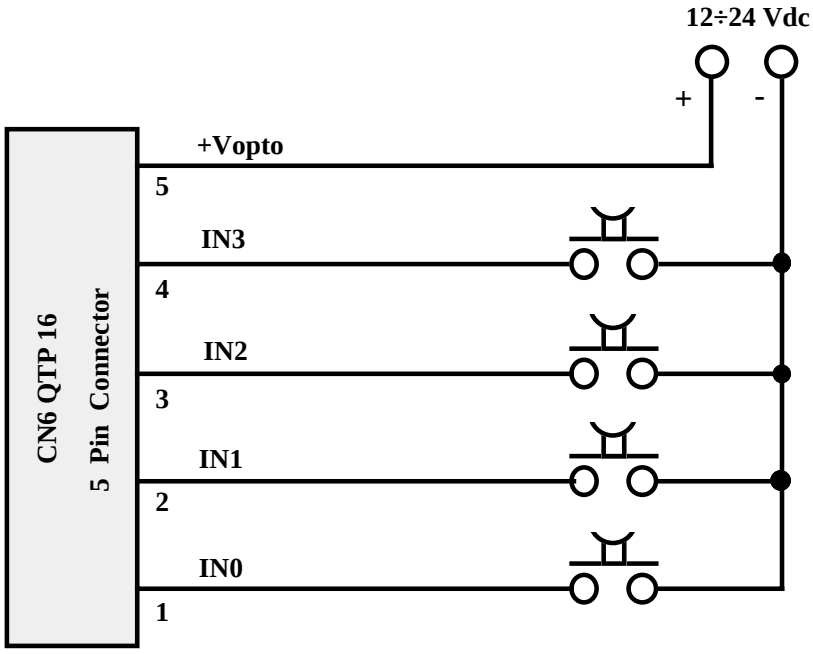

FIGURE 9: OPTOCOUPLED INPUTS CONNECTION EXAMPLE

CN4 - CONNECTOR FOR SERIAL COMMUNICATION

CN4 is a 9 pins D female connector. On **CN4** connector are available the buffered signals for **RS 232**, **RS 422-485** or **Current Loop** serial communication. Only one of the described standards is connected to CN4, but the same connector can be used for any of the listed electric protocols (CCITT normative). Signals location has been carefully studied in order to reduce to the minimum level the interferences and making easier the connection to the field.

RS 232 CONNECTION

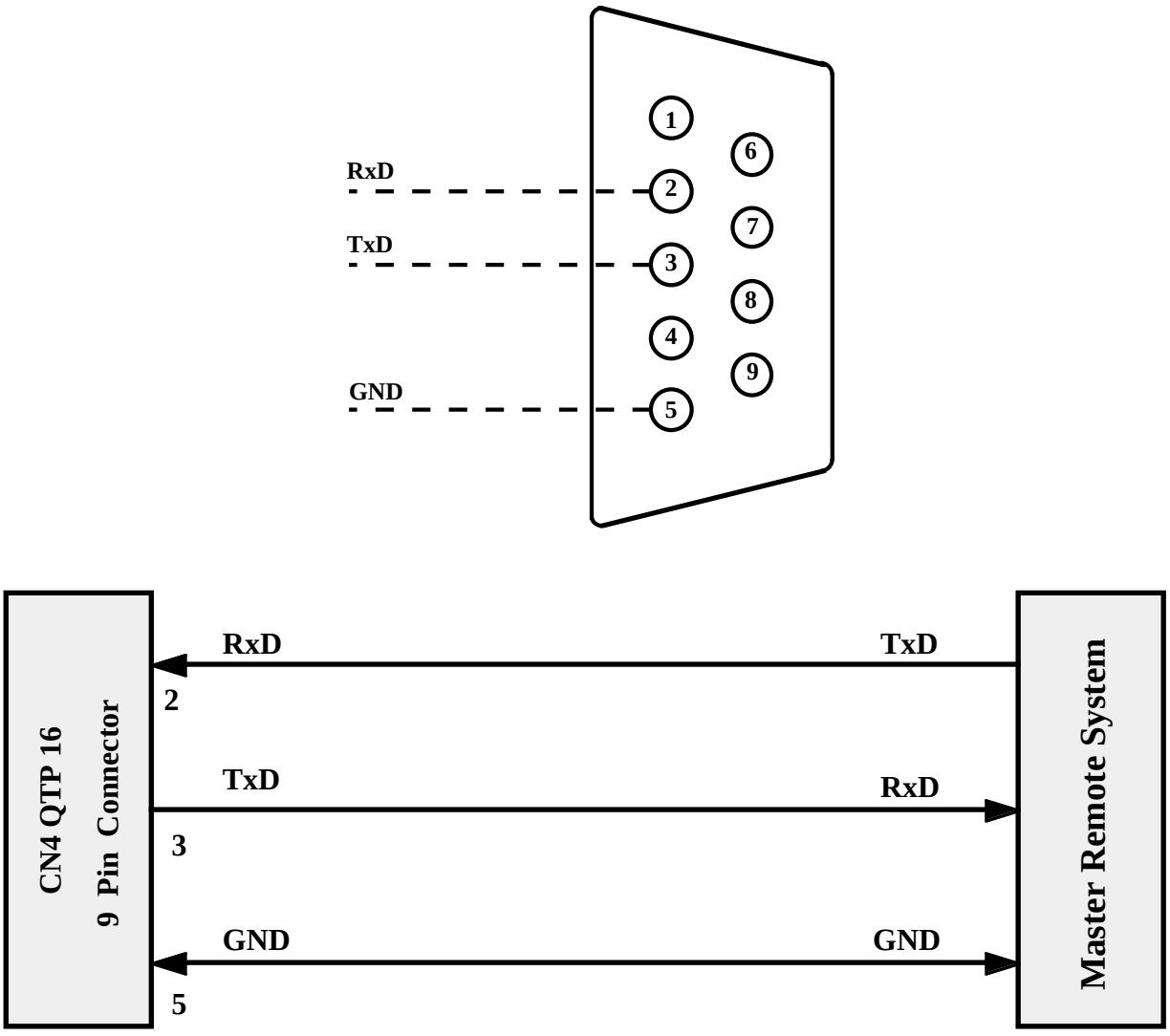

FIGURE 10: CN4 - RS 232 PIN-OUT AND CONNECTION EXAMPLE

Signals description:

RxD	=	**I**	-	Receive Data.
TxD	=	**O**	-	Transmit Data.
GND	=			Ground line.

RS 422 CONNECTION

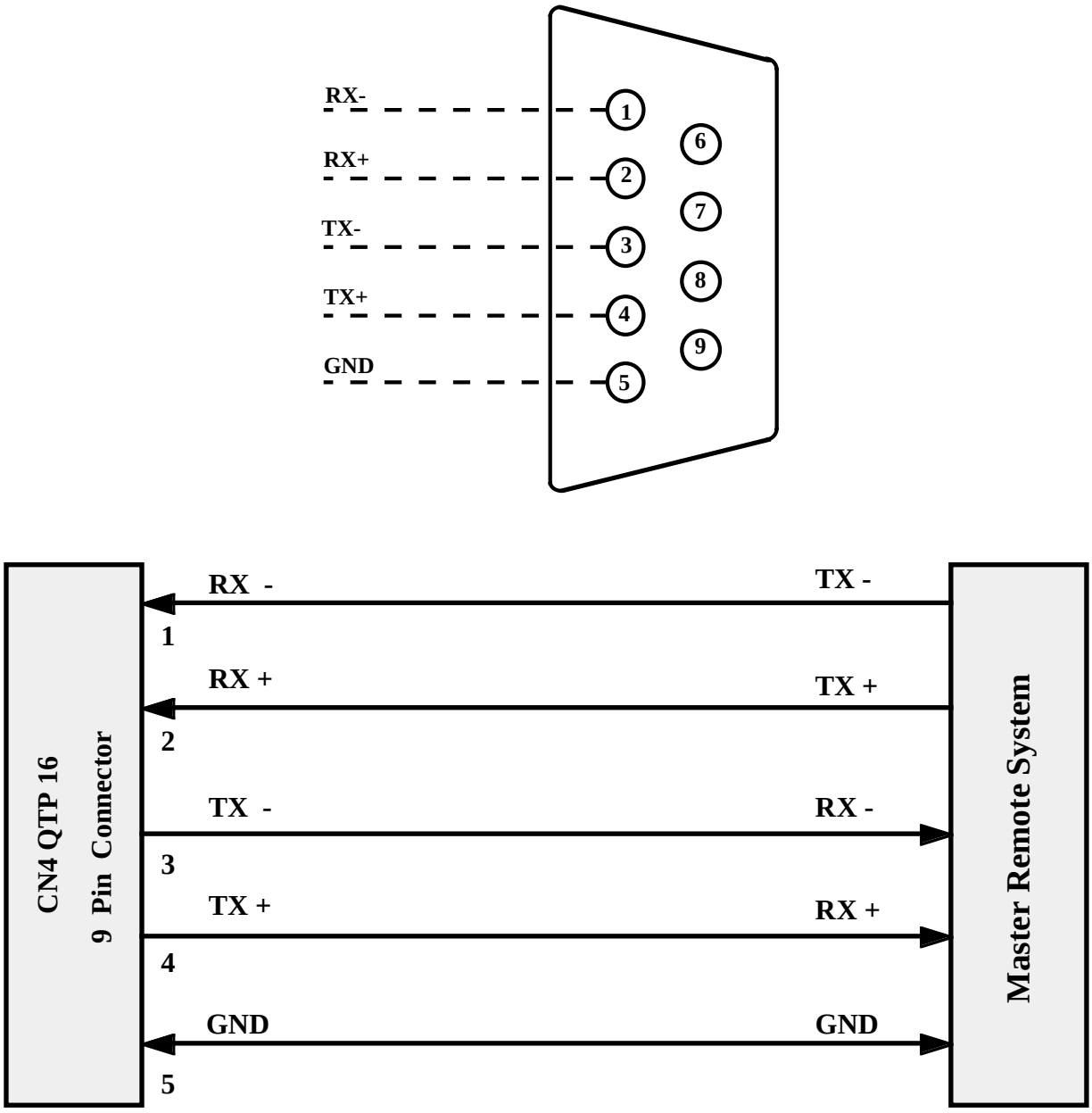

FIGURE 11: CN4 - RS 422 PIN-OUT AND CONNECTION EXAMPLE

Signals description:

RX-	=	**I**	-	Receive Data Negative for 4 wires RS 422.
RX+	=	**I**	-	Receive Data Positive for 4 wires RS 422.
TX-	=	**O**	-	Transmit Data Negative for 4 wires RS 422.
TX+	=	**O**	-	Transmit Data Positive for 4 wires RS 422.
GND	=			Ground line.

RS 485 CONNECTION

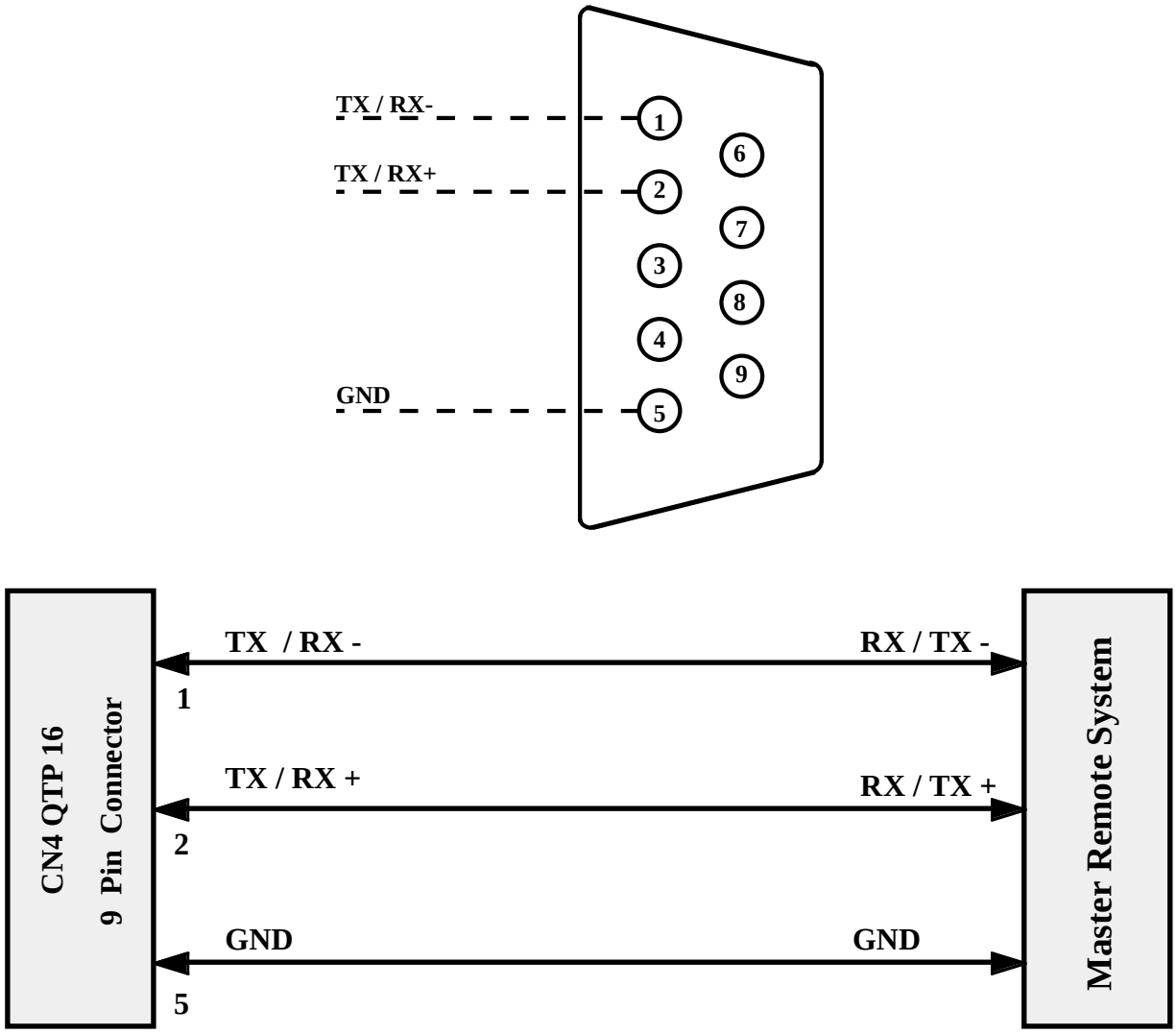

FIGURE 12: RS 485 PIN-OUT AND CONNECTION EXAMPLE

Signals description:

TX / RX - = **I/O** - Receive/Transmit Data Negative: Negative receive or transmit signal for RS 485 differential communication

TX / RX - = **I/O** - Receive/Transmit Data Negative: Negative receive or transmit signal for RS 485 differential communication

GND = - Ground signal

NOTE
Only 9 bits Master-Slave communication is available in RS 485 mode.

RS 485 MASTER-SLAVE COMMUNICATION NETWORK

Here follows an example of RS 485 Master-Slave communication network

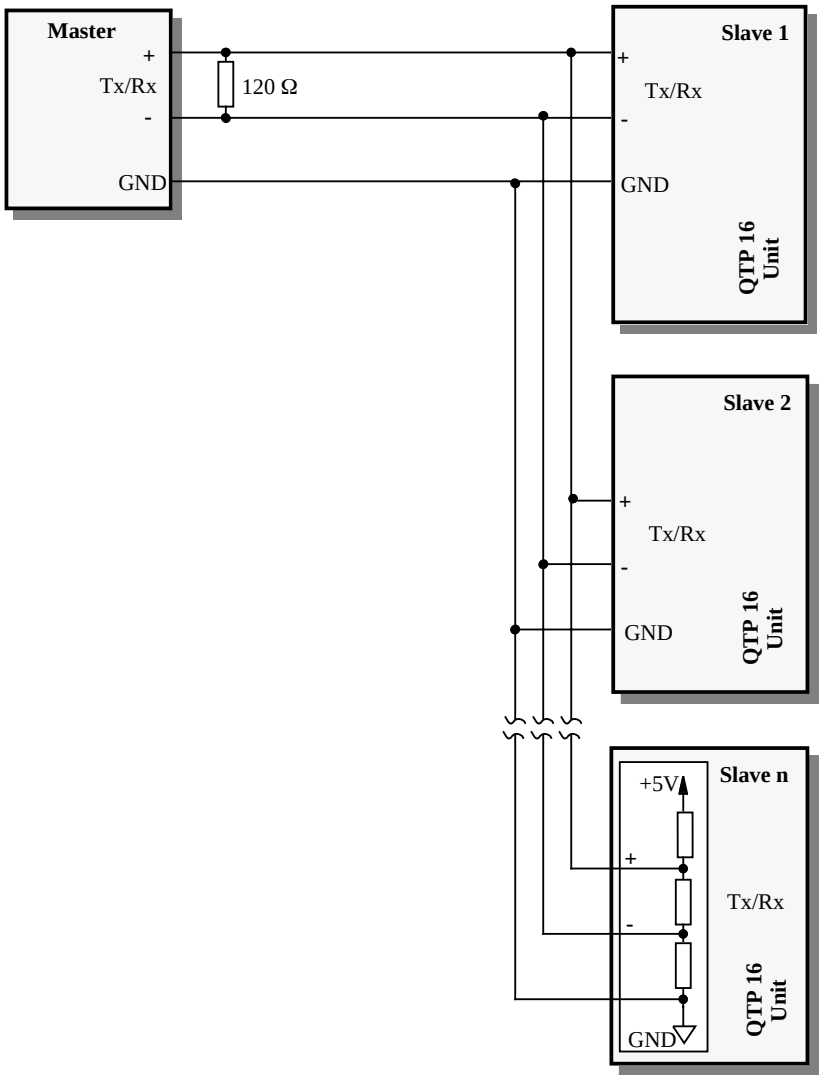

FIGURE 13: RS 485 NETWORK CONNECTION EXAMPLE

Please remark that in a RS 485 network two forcing resistor must be connected across the net and two termination resistors (120 Ω)must be placed at its extrems, respectevely near the Master unit and the Slave unit at the greatest distance from the Master.
Forcing and terminating circuitry is installed on board of **QTP 16** terminal. It can be enabled or disabled through the solder jumers **JS1** and **JS2**; in detail:

JS1 and JS2 -> *Connected*: Connect the termination and forcing circuitry to the RS 485 network

Not Connected (DEFAULT): Disconnect the termination and forcing circuitry from the RS 485 network

For further informations please refer to the TEXAS INSTRUMENTS Data-Book,"*RS 422 and RS 485 Interface Circuits*", in the introduction regarding RS 422-485 networks.

CURRENT LOOP CONNECTION

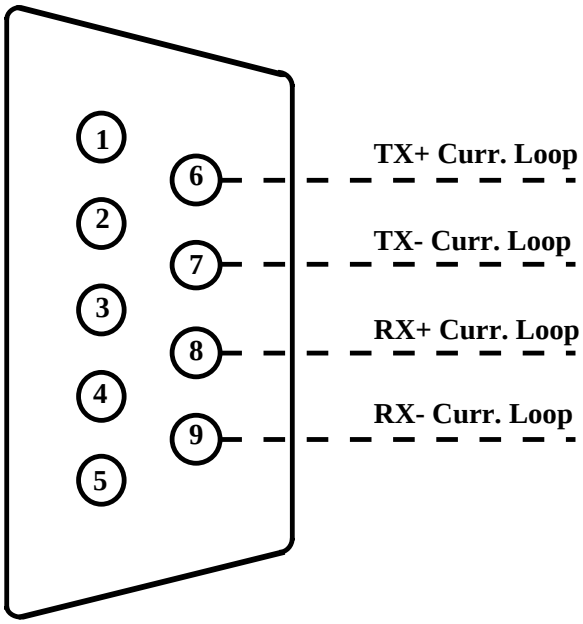

FIGURE 14: CN4 - CURRENT LOOP PIN-OUT

Signals description:

RX- Curr.Loop =	**I**	-	Receive Data Negative for Current Loop.
RX+ Curr.Loop =	**I**	-	Receive Data Positive for Current Loop.
TX- Curr.Loop =	**O**	-	Transmit Data Negative for Current Loop.
TX+ Curr.Loop =	**O**	-	Transmit Data Positive for Current Loop .

Possible Current Loop connections are two: 2 wires and 4 wires.
These connections are shown in the next drawings where it is possible to see the voltage for **VCL** and the resistances for current limitation (**R**).
The supply voltage vary in compliance with the number of connected devices. When the maximum current (**20mA**) runs, it must be guaranted that each device dissipates at maximum **125mW** for transmitter and **90mW** for receiver.
The **R** resistance is needed for limiting the maximum current in case of line short circuit.
Tipically, this is a **220** Ω resistance for a voltage of **VCL=5Vdc**.
For further info please refer to HEWLETT-PACKARD Data Book, (**HCPL 4100** and **4200** devices).

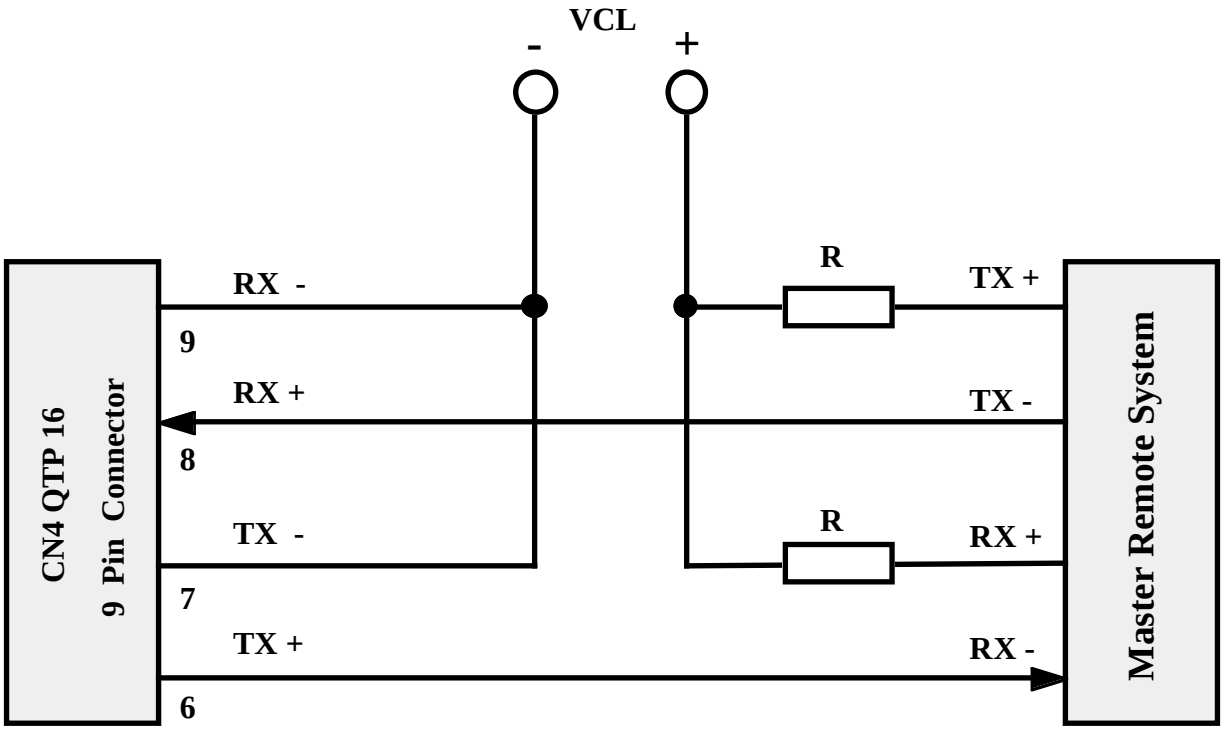

FIGURE 15: 4 WIRES CURRENT LOOP POINT TO POINT CONNECTION EXAMPLE

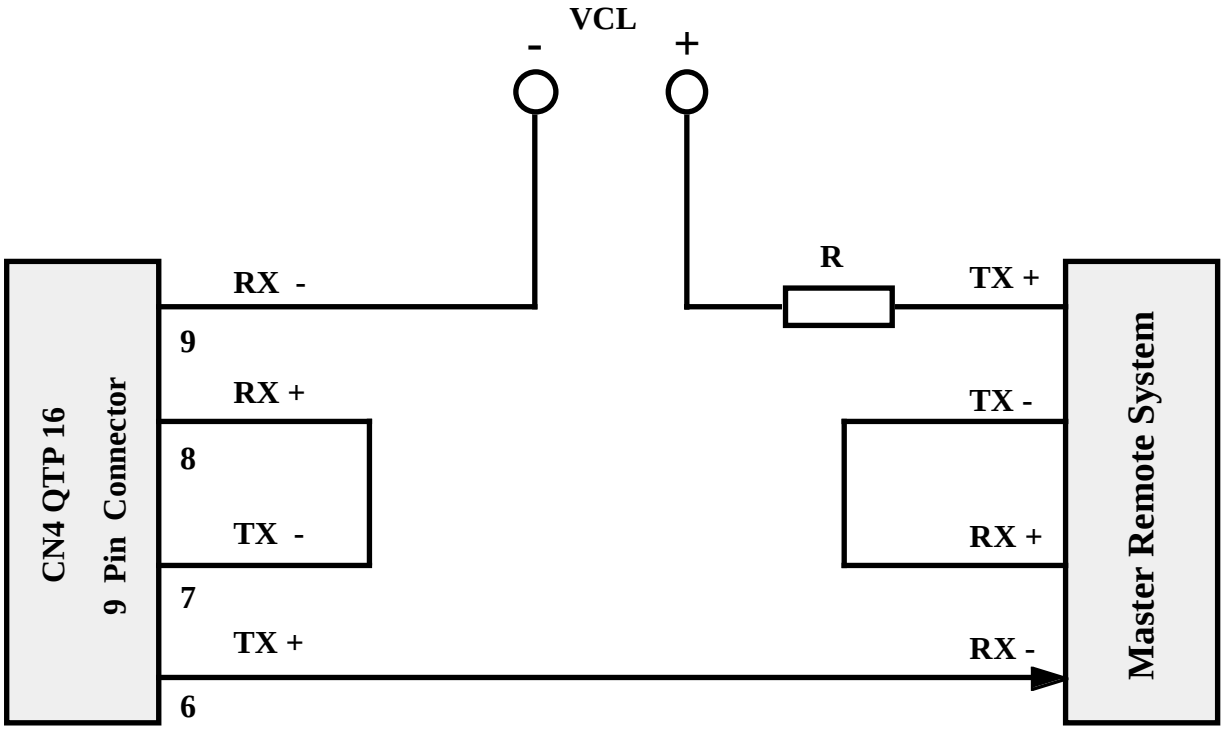

FIGURE 16: 2 WIRES CURRENT LOOP POINT TO POINT CONNECTION EXAMPLE

NOTE
Only 9 bits Master-Slave communication is available in 2 wires Current-Loop mode.

SOFTWARE DESCRIPTION

As already said **QTP 16** terminal is a complete video terminal and for this reason any thing received through serial line, if it is not a command, is shown on the display and codes of any key pressed on the keyboard is transmitted to the control master unit. On board of this terminal panel is also implemented a local set-up program which allows to set the communication protocol by using the **QTP**'s keyboard and display. This manual contains, in addition to the description of the different functions, a complete list of the comand sequences and the recognized combination to be used to benefit of the main features of **QTP 16**. For each code or codes sequence, there is a double description i.e: the mnemonic one through the ASCII characters and the numerical one under decimal and hexdecimal form. The said commands respect the **ADDS View Point** standard so all the sequences begin with **ESC** character corresponding to the **27** decimal code (**1B Hex**).

LOCAL SETUP

To enter in Setup mode the user must press the "1" and "D" keys at the power-on time.
When entered in Setup mode on the display appears the "**-Setup-**" string and the terminal awaits until the user presses one of the following keys:

Key "1" : Allows to select the parameter to set, switching amongst the following menus:

"**COMMUNICATION**" (communication mode), "**BAUD RATE**" (Baud Rate), "**KEYCLICK**" (Key-Click function), "**NAME**" (first figure of NAME), "**NAME**" (second figure of NAME) and "**SAVE and EXIT**" (exit from Setup).

Key "2" : Allows to set the parameter selected by the key "1", in detail:

COMMUNICATION:	***Normal*** *or* ***Master-Slave****.*
BAUD RATE:	***38400****,* ***19200****,* ***9600****,* ***4800****,* ***2400*** *or* ***1200*** *Baud.*
STOP BIT:	***1*** *or* ***2*** *when communication is Normal.*
	1 *when communication is Master-Slave.*
KEYCLIK:	***ON*** *or* ***OFF****.*
NAME:	*Changes the figure indicated by ">" and "<" in the range* ***0÷F*** *Hex.*
SAVE and EXIT:	*Exits from setup and configures* ***QTP 16*** *with the parameters set now.*

Please remark that the code input under the menu "**NAME**" will be the code to be used to identify the **QTP 16** during the Master-Slave communication, as shown in the paragraph dedicated to this subject.

KEYBOARD ACQUISITION

When **QTP 16** recognizes the key pressure, it transmits the pertinent code on serial line.
The **AutoRepeat** function of the pressed key is also implemented so when **QTP 16** recognizes the pressure on a specific key for a period of time over **0.5 sec**. it will start the serial transmission of its code for about **0.1 sec**. and it lasts until that specific key is released.

DEFAULT KEY CODES

Here follows a table reporting the codes sent to the serial line when a key is pressed; the codes are expressed in decimal, hexadecimal and ASCII.

KEY	CODE	HEX CODE	MNEMONIC
1 (number **0**)	49	31	1
2 (number **1**)	50	32	2
3 (number **2**)	51	33	3
A (number **3**)	65	41	A
4 (number **4**)	52	34	4
5 (number **5**)	53	35	5
6 (number **6**)	54	36	6
B (number **7**)	66	42	B
7 (number **8**)	55	37	7
8 (number **9**)	56	38	8
9 (number **10**)	57	39	9
C (number **11**)	67	43	C
***** (number **12**)	27	1B	ESC
0 (number **13**)	48	30	0
# (number **14**)	13	0D	CR
D (number **15**)	68	44	D

FIGURE 17: DEFAULT KEY CODES

CHARACTER VISUALIZATION ON THE DISPLAY

QTP 16 shows on the display all the characters having a code included in the range **32÷255** (**20÷FF Hex**); if it is sent a code not included in this range and this latter is not a command, the code is ignored. The characters in the range: **32÷127 (20÷7F Hex**) correspond to those ones of the standard ASCII table, while characters associated to **128÷255** (**80÷FF Hex**) codes, vary depending on the type of the display installed. This is the reason why the User sholud refer to appendix "A" tables.
The character is visualized in the at the cursor position and this latter will go the the next position; if it is placed in the last position of the last row, it will be moved to Home position.

COMMANDS FOR CURSOR POSITIONING

Here follows the list of the cursor positioning commands.

CURSOR LEFT

Code:	***21***	***(15Hex)***
Mnemonic:	***NACK***	

The cursor is shifted of one position to the left without modifying the display contents. If the cursor is in Home position, it will be placed in the last position of the last row of the display.

CURSOR RIGHT

Code:	***06***
Mnemonic:	***ACK***

The cursor is shifted of one position to the right.
If the cursor is placed in the last position of the last row, il will be moved to the Home position.

CURSOR DOWN

Code:	***10***	***(0A Hex)***
Mnemonic:	***LF***	

The cursor will be moved to the line below but it will remain in the same column.
If the cursor is in the last display line, it will be moved to the first display line.

CURSOR UP

Code:	***26***	***(1A Hex)***
Mnemonic:	***SUB***	

The cursor will be moved to the line above but it will remain in the same column. If the cursor is in the first display line, it will be moved to the last display line.

HOME

Code: ***01***
Mnemonic: ***SOH***

The cursor is moved to Home position i.e first line, first column of the display.

CARRIAGE RETURN

Code: ***13*** ***(0D Hex)***
Mnemonic: ***CR***

The cursor is moved to the beginning of the line where it finds.

CARRIAGE RETURN+LINE FEED

Code: ***29*** ***(1D Hex)***
Mnemonic: ***GS***

The cursor is moved to the beginning of line above the one where it finds.
If the cursor is at the last display line, it will be moved to the beginning of the first line i.e Home position.

CURSOR ABSOLUTE POSITIONING WITH 20H OFFEST

Code: ***27 89 r c (1B 59 r c Hex)***
Mnemonic: ***ESC Y ASCII(r) ASCII(c)***

The cursor is moved to the absolute position indicated by "**r**" and "**c**".
These codes are line and column values of the position plus **32** (**20 Hex**).
If, for example, the User wants to place the cursor at Home position (line 0, column 0), the following byte sequence must be sent to the **QTP 16**: **27 89 32 32**.
If line and/or column values are not compatible to the installed display, the command is ignored.

COMMANDS FOR CHARACTERS ERASURE

In the following paragraphs are described all the commands that deletes one or more characters from the display.

BACKSPACE

Code:	***08***	***(08 Hex)***
Mnemonic:	***BS***	

This command moves the cursor one character position to the left and it erase the contents of the reached cell. If the cursor is in home position, it will be erased the last character of the last row of the display.

CLEAR PAGE

Code:	***12***	***(0C Hex)***
Mnemonic:	***FF***	

This command clears all data on the display and it moves the cursor to home position.

CLEAR LINE

Code:	***25***	***(19 Hex)***
Mnemonic:	***EM***	

This command erases all characters displayed on the current line and it moves the cursor to the first column of the said line.

CLEAR END OF LINE

Code:	***27 75***	***(1B 4B Hex)***
Mnemonic:	***ESC K***	

This command erases all characters displayed from the current cursor position to the end of line inclusive. The cursor doesn't move and at the end of the command execution it mantains the previous current position. If, for example, the cursor is at the beginning of a display line, the complete line will be erased.

CLEAR END OF PAGE

Code:	***27 107***	***(1B 6B Hex)***
Mnemonic:	***ESC k***	

This command erases all characters displayed from the current cursor position to the end of display inclusive. The cursor doesn't move and at the end of the command execution it mantains the previous current position.

COMMANDS FOR CURSOR ATTRIBUTES

In the following paragraphs are described all the commands that change the cursor type.

CURSOR OFF

Code:	***27 80***	***(1B 50Hex)***
Mnemonic:	***ESC P***	

The cursor is disabled and it is not more visible.

STEADY CURSOR ON

Code:	***27 79***	***(1B 4F Hex)***
Mnemonic:	***ESC O***	

The cursor is enabled and it is visible. The selected cursor type is a not blinking line placed under the char.

Note: this command is not available if **fluorescent 20x4** display is installed.

BLINKING BLOCK CURSOR ON

Code:	***27 81***	***(1B 51 Hex)***
Mnemonic:	***ESC Q***	

The cursor is enabled and it is visible. The selected cursor type is a blinking rectangular block that is alternatively visualized with the char displayed on the same position.

COMMANDS FOR EEPROM

In the following paragraphs are described all the commands that manage the data saved on **QTP 16** on board EEPROM.

REQUEST FOR EEPROM WRITING POSSIBILITY

Code:	***27 51***	***(1B 33 Hex)***
Mnemonic:	***ESC 3***	

This command checks if the **QTP 16** is ready for writing data on its on board **EEPROM**. This command must be executed any time there are messages to be memorized or when some EEPROM commands must be sent.
When **QTP 16** receives this command, it answers with the following codes:

6 - 06 Hex	*(ACK)*	***QTP 16** READY*
21 - 15 Hex	*(NACK)*	***QTP 16** NOT READY*

If the **QTP 16** sends back the NACK code, it is not yet possible to memorize a new data on EEPROM.

WRITING OF LIFE BYTE

Code:	***27 33 78 byte***	***(1B 21 4E byte Hex)***
Mnemonic:	***ESC ! N ASCII (byte)***	

This command sets the card "Life Byte" with the value indicated in the **byte** parameter that can be included in **0÷255** range.
This byte has a reserved allocation on the on board EEPROM that, once it is set with the desidered value, it allows for example, to verify that **QTP 16** runs correctly, or if there are some communication problems on the serial line.

NOTE
This command writes data on the on board EEPROM, so before executing it is better to check the EEPROM writing possibility through the proper command; in fact if it is not ready the command is ignored.

READING OF LIFE BYTE

Code:	***27 33 110***	***(1B 21 6E Hex)***
Mnemonic:	***ESC ! n***	

The **QTP 16** sends back on the serial line the value of its "Life Byte".
This command can be useful if you have to verify the presence or the correct running of the card.

COMMANDS FOR KEYBOARD

In the following paragraphs are described all the commands that manage the **QTP 16** external keyboard.

KEY RECONFIGURATION

Code:	***27 55 key no. code (1B 37 key no. code Hex)***
Mnemonic:	***ESC 7 ASCII(key no.) ASCII(code)***

When the selected key is reconfigured, each time it is pressed, the card will send the new specified code on serial line. The value of **key no.** to be reconfigured must be in the range **0÷15** (**0÷F Hex**) and it will replace the codes described in figure 17.

The **code** value can vary in the range **0÷254** (**0÷FE Hex**) as the **255** value (**FF Hex**) indicates that the key is disabled and when it will be pressed the **QTP 16** will not send any code.

NOTE
This command writes data on the on board EEPROM, so before executing it is better to check the EEPROM writing possibility through the proper command; in fact if it is not ready the command is ignored. Furthermore if the **key no.** is not valid, the entire command is ignored.

KEYCLICK ON WITHOUT MEMORIZATION

Code:	**27 53**	**(1B 35 Hex)**
Mnemonic:	***ESC 5***	

This command enables **KeyClick** function, so there is an audible feedback when a key is pressed. This setting is not stored on the on board EEPROM so if the card is turned off and on, it returns to the previous condition.

KEYCLICK OFF WITHOUT MEMORIZATION

Code:	***27 54***	***(1B 36 Hex)***
Mnemonic:	***ESC 6***	

This command disables **KeyClick** function, so there is not audible feedback when a key is pressed. This setting is not stored on the on board EEPROM so if the card is turned off and on, it returns to the previous condition.

KEYCLICK ON WITH MEMORIZATION

Code:	***27 33 53***	***(1B 21 35 Hex)***
Mnemonic:	***ESC ! 5***	

This command enables **KeyClick** function, so there is an audible feedback when a key is pressed. This setting is stored on the on board EEPROM so if the card is turned off and on, it keeps the current condition.

NOTE
This command writes data on the on board EEPROM, so before executing it is better to check the EEPROM writing possibility through the proper command; in fact if it is not ready the command is ignored.

KEYCLICK OFF WITH MEMORIZATION

Code:	***27 33 54***	***(1B 21 36 Hex)***
Mnemonic:	***ESC ! 6***	

This command disables **KeyClick** function, so there is not audible feedback when a key is pressed. This setting is stored on the on board EEPROM so if the card is turned off and on, it keeps the current condition.

NOTE
This command writes data on the on board EEPROM, so before executing it is better to check the EEPROM writing possibility through the proper command; in fact if it is not ready the command is ignored.

COMMANDS FOR GENERAL FUNCTIONS

In the following paragraphs are described all the general purspose commands that manage some of the **QTP 16** functions.

BEEP

Code:	***07***	***(07 Hex)***
Menomonic:	***BEL***	

This command enables the buzzer for 1/10 of second.

READING OF VERSION NUMBER

Code:	***27 86***	***(1B 56 Hex)***
Mnemonic:	***ESC V***	

When **QTP 16** receives this command, it answers with a string of 3 chars containing the version, in the format **x.x**, of the firmware that is saved on, and executed by, its CPU. For example with a **1.2** firmware version the following characters will be transmitted: ***49 46 50 (31 2E 32 Hex)***.

COMMANDS FOR MESSAGES MANAGEMENT

In the following paragraphs are described all the commands that manage messages on **QTP 16**.

READING OF THE LAST STORABLE MESSAGE NUMBER

Code:	***27 110***	***(1B 6E Hex)***
Mnemonic:	***ESC n***	

This comand returns on the serial line the number of the last message that can be saved on EEPROM. It varys in compliace with the size of the EEPROM installed on the card, please refer to the below table:

EEPROM SIZE	MAX N°
256 Bytes	9
512 Bytes	22
1024 Bytes	47
2048 Bytes	99

FIGURE 18: NUMBER OF MESSAGES STORABLE ON EEPROM

MESSAGE STORING

Code:	***27 33 67 mess.no. char. 0... char.19***
	(1B 21 43 mess.no. char. 0... char.13 Hex)
Mnemonic:	***ESC ! C ASCII(mess.no.) ASCII(char.0)...ASCII(char.19)***

This command stores the 20 chars message, with number indicated as **mess.no.**, on the on board EEPROM. The 20 chars which form the message must be visualized on the display so they must be in the range **32÷255** (**20÷FF Hex**) otherwise the command is ignored.
The message number must be included in the range of **0÷max. n**., where max.n. is the number of the last storable message just previously described in figure 18.

NOTE
This command writes data on the on board EEPROM, so before executing it is better to check the EEPROM writing possibility through the proper command; in fact if it is not ready the command is ignored.

MESSAGE READING

Code:	***27 33 69 mess.no. (1B 21 45 mess.no. Hex)***
Mnemonic:	***ESC ! E ASCII(mess.no.)***

This command reads the 20 chars message corresponding to **mess. no.** by the EEPROM and it sends this message on serial line, beginning from the first char of the string.
At the end of the message, the **CR+LF** codes are sent; these codes are not sent if **QTP 16** is set in **Master-Slave** mode.
The message number must be included in the range of **0÷max. no.**, where max.no. is the number of the last storable message previously described in figure 18. If this number is not compatible with the **QTP 16** installed EEPROM size, this command is ignored.

MESSAGES VISUALIZATION

Code:	***27 33 68 mess.no. n (1B 21 44 mess.no. n Hex)***
Mnemonic :	***ESC ! D ASCII(mess.no.) ASCII(n)***

This command visualizes **n** 20 chars messages on the display, beginning from current cursor position. The first of the **n** messages is that one having the number corresponding to **mess.no.** while the remaining messages are those ones immediately subsequents in EEPROM.
The message number must be included in the range **0÷max.no**, where max.no. is the value described in figure 18. If this number is not compatible with the **QTP 16** installed EEPROM size, this command is ignored.
The **n** quantity of messages to be visualized depends only on the model of the display and it is included in these ranges:

20x2 display:	***n** between 1÷2*
20x4 display:	***n** between 1÷4*

If the **n** value is not compatible with the installed display model, the command is ignored.
The cursor is placed in the next position of the last char visualized; if the last char of the message occupies the last position of the display, the cursor will be placed in home position.
For example; if the User wants to visualize the messages no. 20 and 21, it will be necessary to send the following sequence: **27 33 68 20 2**.

SCROLLING MESSAGE VISUALIZATION

Code:	***27 33 83 mess.no. chars (1B 21 45 mess.no. chars Hex)***
Mnemonic:	***ESC ! E ASCII(mess.no.) ASCII(chars)***

This command visualizes, on the first row of the display, a scrolling message **chars** charactes long; in fact the characters that form the message are shifted from the right to the left, making possible to show on an unique row of the display (the first row), an amount of informations greater than the one normally available.
The message, which is **chars** characters long, begins from the first character of the message whose number is **mess.no.** and is composed by the characters that make the **mess.no.** message and the following ones (making the following messages stored on the EEPROM).
The message number must be included in the range of **0÷max. no.**, where max.no. is the number of the last storable message previously described in figure 18. If this number is not compatible with the **QTP 16** installed EEPROM size, this command is ignored.
The value **chars** may have these meanings:

0	Stops the current scrolling (value of **mess.no.** is irrilevant)
20÷200	Starts to scroll the indicated number of characters

If **chars** has a vaule out of these ranges or it extends the scrolling messages beyond the limit of the EEPROM storage space, the command is ignored.

The message will scroll in the first row of the display, without changing position and attributes of the cursor.

This command is ignored if the optocoupled inputs-driven messages management mode is enabled.

If, for example, the User wants to show a scrolling message 23 characters long, made by message 5 (20 characters) and the first 3 characters of message 6,it will be necessary to send the following sequence: **27 33 83 5 23**.

NOTE
Scrolling a message involves a continuous display updating; this operation slows the interpretation of commands coming from the serial port.
So if a great amount of informations must be sent to **QTP 16** and a message is scrolling on the display, it is suggestable to wait for some **msec** between the transmission of a 20÷30 bytes data block and the next one, to assure that the terminal has had the time to interpretate correctly the transmitted data.

COMMANDS FOR OPTOCOUPLED INPUTS MANAGEMENT

Here follow the commands that manage the **QTP 16** four optocoupled inputs.

OPTOCOUPLED INPUTS CONFIGURATION

Code: ***27 33 73 byte*** ***(1B 21 49 byte Hex)***
Mnemonic: ***ESC ! I ASCII(byte)***

The 4 optocoupled inputs configuration byte is stored on EEPROM with the following meaning:

Bit 0 --> **0** The optocoupled inputs are configured as **GENERAL PURPOSE INPUTS**
1 The optocoupled inputs are configured for **MESSAGE SELECTION**

Bit 1÷7 --> **1** Not used (must be to "1" logic state)

Enabling or disabling the optocoupled inputs for message selection involves the stop of an eventual scrolling message.

For example; if the User wants to configure the optocoupled inputs for message selection, it will be necessary to send the following sequence **27 33 73 254** to the card.
While, if the User wants to disable such feature, it will be necessary to send the following sequence **27 33 73 255** to the card.

NOTE
This command needs a data writing in on-board EEPROM so before executing it be sure that the card is ready for the new writing on that device, otherwise the command will be ignored. Please remember that the settings stored in EEPROM are maintained also after the power-off.

OPTOCOUPLED INPUTS-DRIVEN MESSAGES MANAGEMENT MODE

Through this working modality it is possible to show on the display of **QTP 16** up to 16 messages twenty characters long, simply by changing the status of the optocouped input lines. In fact the first 16 messages stored in EEPROM are matched to the combinations obtainable with the possible values of optocoupled inputs.

Whenever the status of any of the inputs is changed, the matching message is shown on the first row on the display. The message will remain on the display until the next change in the optocoupled inputs status occours.

The following table shows the matching between message number and optocoupled input.

IN3	IN2	IN1	IN0	Mess. N°
OFF	OFF	OFF	OFF	**0**
OFF	OFF	OFF	ON	**1**
OFF	OFF	ON	OFF	**2**
OFF	OFF	ON	ON	**3**
OFF	ON	OFF	OFF	**4**
OFF	ON	OFF	ON	**5**
OFF	ON	ON	OFF	**6**
OFF	ON	ON	ON	**7**
ON	OFF	OFF	OFF	**8**
ON	OFF	OFF	ON	**9**
ON	OFF	ON	OFF	**10**
ON	OFF	ON	ON	**11**
ON	ON	OFF	OFF	**12**
ON	ON	OFF	ON	**13**
ON	ON	ON	OFF	**14**
ON	ON	ON	ON	**15**

FIGURE 19: MESSAGES AND RELATIVE OPTOCOUPLED INPUTS COMBINATION

The optocoupled **NPN** input is active (**ON**) when the proper input contact is closed to the **GND opto**. For example if the User wants to show the **n° 8** message then he/she must connect **IN3** to the **GND opto**.
The messages in the 10÷15 range are not available if an EEPROM of 256 bytes size is mounted on **QTP 16**. The message is always visualized on the first display line in HOME position and the cursor status is not changed.
The message is mantained on the display until the optocoupled inputs combination changes.

OPTOCOUPLED INPUTS READING

Code: **27 73 byte (1B 49 byte Hex)**
Mnemonic: **ESC I ASCII(byte)**

A 1 byte value containing the optocoupled inputs status is sent to the serial line:

Bit 7	-->	**0**
Bit 6	-->	**0**
Bit 5	-->	**0**
Bit 4	-->	**0**
Bit 3	-->	**IN3**
Bit 2	-->	**IN2**
Bit 1	-->	**IN1**
Bit 0	-->	**IN0**

where:

Bit n = "**1**" logic status -->	Input **ON** -->	Input contact **CLOSED**
Bit n = "**0**" logic status -->	Input **OFF** -->	Input contact **OPEN**

Remember that an optocoupled **NPN** input is active (**ON**) when the proper input contact is closed to the **GND opto**.

COMMAND CODES SUMMARY TABLES

Here follow the command codes summary tables:

COMMAND	CODE	HEX CODE	MNEMONIC
HOME	01	01	SOH
CURSOR LEFT	21	15	NACK
CURSOR RIGHT	06	06	ACK
CURSOR DOWN	10	0A	LF
CURSOR UP	26	1A	SUB
CARRIAGE RETURN	13	0D	CR
CR+LF	29	1D	GS
Cursor absolute positioning with 20H offset	27 89 r c	1B 59 r c	ESC Y ASCII(r) ASCII(c)
BACKSPACE	08	08	BS
CLEAR PAGE	12	0C	FF
CLEAR LINE	25	19	EM
CLEAR END OF LINE	27 75	1B 4B	ESC K
CLEAR END OF PAGE	27 107	1B 6B	ESC k
Cursore OFF	27 80	1B 50	ESC P
Static Cursor ON	27 79	1B 4F	ESC O
Blinking “Block” cursor	27 81	1B 51	ESC Q
Beep	07	07	BEL
Reading of version number	27 86	1B 56	ESC V

FIGURE 20: COMMAND CODES SUMMARY TABLE 1

COMMAND	CODE	HEX CODE	MNEMONIC
Request for EEPROM writing	27 51	1B 33	ESC 3
Writing of "life" byte	27 33 78 key	1B 21 4E key	ESC ! N ASCII(key)
Reading of "life" byte	27 33 110	1B 21 6E	ESC ! n
Characters show	32÷255	20÷FF	“space”÷ASCII(255)
Key reconfiguration	27 55 key no. code	1B 37 key no. code	ESC 7 ASCII(key no.) ASCII(code)
KeyClick ON without memorization	27 53	1B 35	ESC 5
KeyClick OFF without memorization	27 54	1B 36	ESC 6
KeyClick ON with memorization	27 33 53	1B 21 35	ESC ! 5
KeyClick OFF with memorization	27 33 54	1B 21 36	ESC ! 6
Number reading of the last stored message	27 110	1B 6E	ESC n
Storing message	27 33 67 mess.no. char.0… char.19	1B 21 43 mess.no. char.0…char.13	ESC ! C ASCII(mess.no.) ASCII(char.0)… ASCII(char.19)
Message reading	27 33 69 mess.no.	1B 21 45 mess.no.	ESC ! E ASCII(mess.no.)
Messages visualization	27 33 68 mess.no. 1	1B 21 44 mess.no. 1	ESC ! D ASCII(mess.no.) SOH
SCROLLING MESSAGE VISUALIZATION	27 33 83 mess.no. chars	1B 21 53 mess.no. chars	ESC ! S ASCII(mess.no.) ASCII(chars)
Optocoupled inputs configuration	27 33 73 byte	1B 21 49 byte	ESC ! I ASCII(byte)
Optocoupled inputs reading	27 73	1B 49	ESC I

FIGURE 21: COMMAND CODES SUMMARY TABLE 2

MASTER-SLAVE COMMUNICATION MODE

The Master-Slave mode uses the 9 bits communication technique. In addition to the 8 data bit also a 9th bit is managed as it is needed for recognizing between a call coming from the "**Master**" to any of the "**Slave**" structures and a simple info transmission between Master and the selected device. When 9th bit is placed at 1, the data byte has to contain the name, or identifying code, of the device towards it needs to communicate, while by placing this particular bit at 0 position, it is possible to take out or supply with info at this device.

As far as communications to **QTP 16**, the identifying code must be that one set by the local Set up programm of the terminal itself.
When this byte is sent (with 9th bit set to 1) the **QTP 16** recognizes itself and it waits the string containing chars., data or commands; this string must be at most **25 bytes** wide. In this string there must only be a comand that involves the return of an information sent via serial line on **QTP 16** part; if there is an higher number, the remaining commands of these type are ignored.
Between the transmission of a char. and the next one there must be an interval of time shorter than the **Time-Out**, as elapsed this delay, the **QTP 16** will consider the data string ended and it will begin the answering phase.

Baud Rate		**Time-Out**	
38400	*Baud*	*550*	*µsec*
19200	*Baud*	*990*	*µsec*
9600	*Baud*	*1540*	*µsec*
4800	*Baud*	*3080*	*µsec*
2400	*Baud*	*6105*	*µsec*
1200	*Baud*	*12100*	*µsec*

When the Time-Out is over, the **QTP 16** begins the answering phase which consists in a byte containing the code of the pressed key (**FF Hex**, no key is pressed) or a data string related to a reading command sent in the previous request.
For example if a string containing the command to read the version is transmitted, we will get that for this particular request the pressed key code will be sent back, while in the next one the number of the required version previously asked for, will be transmitted .

After that the last char of the string has been transmitted to the **QTP 16**, it will be necessary to wait a time of:

"char transmission time" + Time-Out

before reaching the first char. of the answering string transmitted by the **QTP 16**.
For example if we are working at 38.4 KBaud, when the transmission of the last char has been completed, it is necessary to wait for about 840 µsec, before completening the reception of the first answering byte on **QTP 16** part.

NOTES

1) Between a call and the next one, it is necessary to wait for a time that is related to the number of commands sent and type of operations these latter ones involve.

2) If the scrolling messages function or the optocoupled inputs-driven messages management mode is enabled, the time between two calls must be the one of point **1)** plus **12 msec**.

3) If the Master unit cannot communicate using 9 bits, it is possible to simulate this communication mode by means of the parity but and programming its value opportunally before any tranmission according to this scheme:

If the byte to transmit has EVEN number of "1" bits

*If 9th bit must be **1*** -> *Set parity to ODD*
*If 9th bit must be **0*** -> *Set parity to EVEN*

If the byte to transmit has ODD number of "1" bits

*If 9th bit must be **1*** -> *Set parity to EVEN*
*If 9th bit must be **0*** -> *Set parity to ODD*

APPENDIX A: DISPLAYS CHARACTERS TABLES

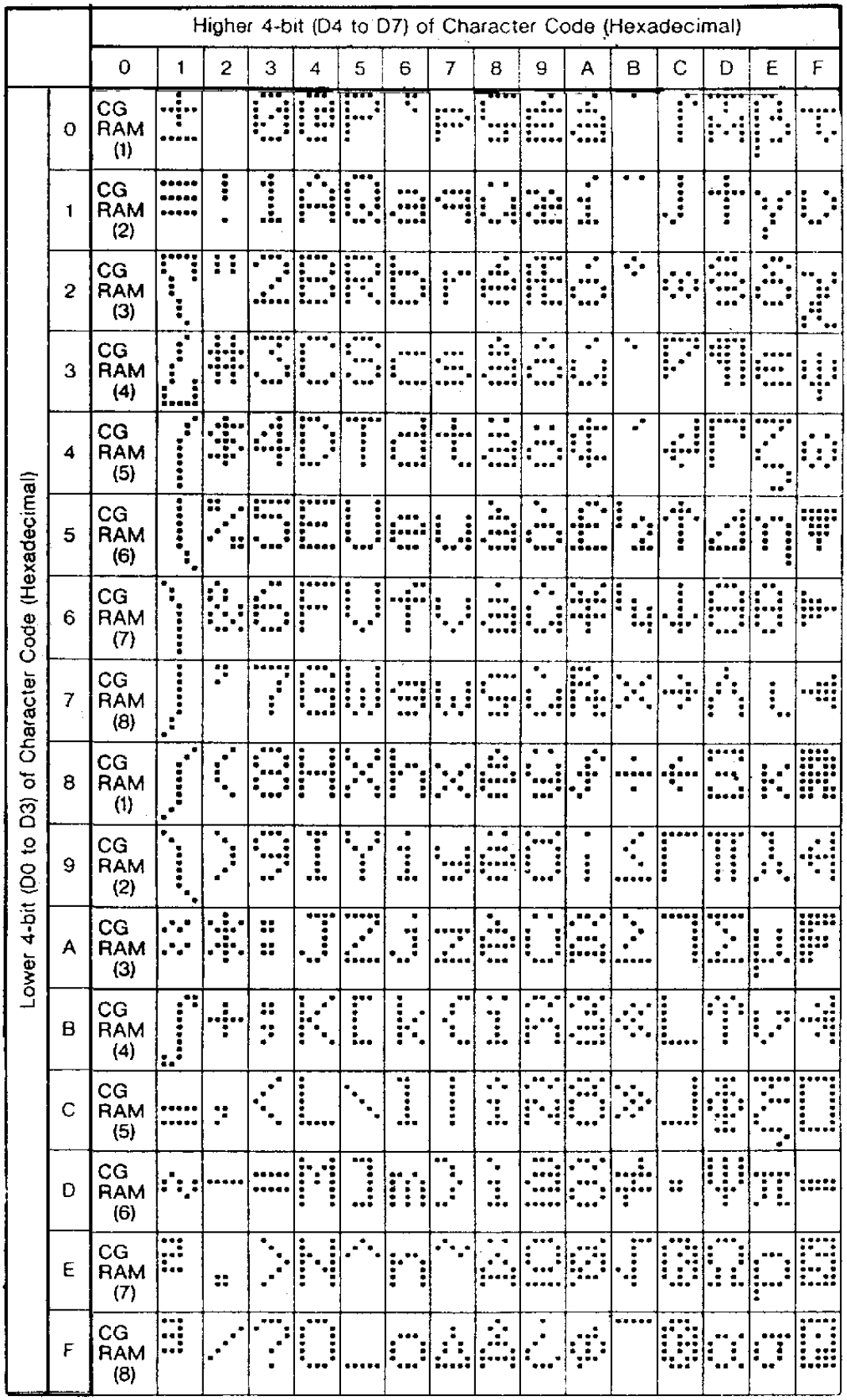

FIGURE A1: LCD 20X2 CHARACTERS TABLE

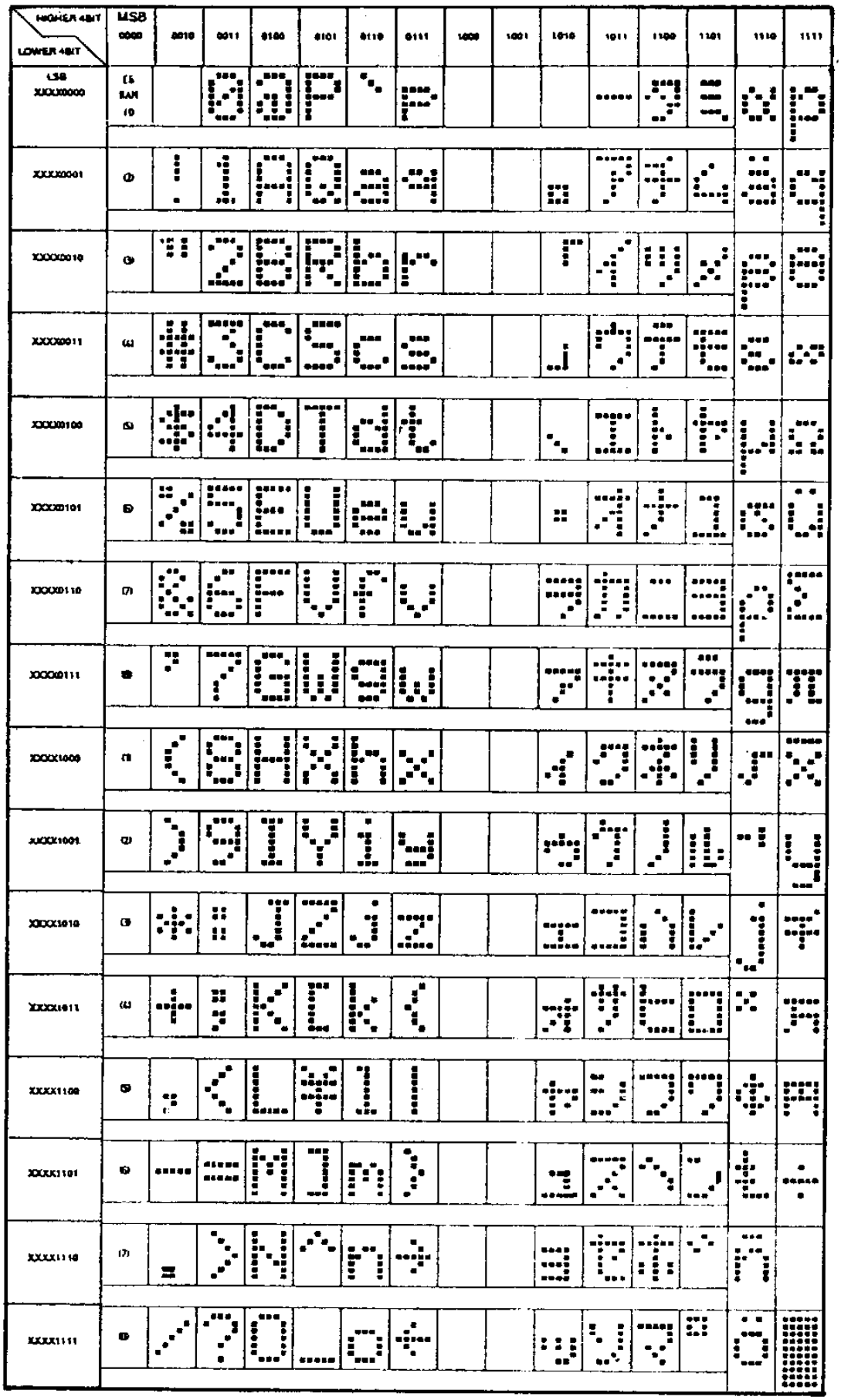

FIGURE A2: LCD 20X4 CHARACTERS TABLE

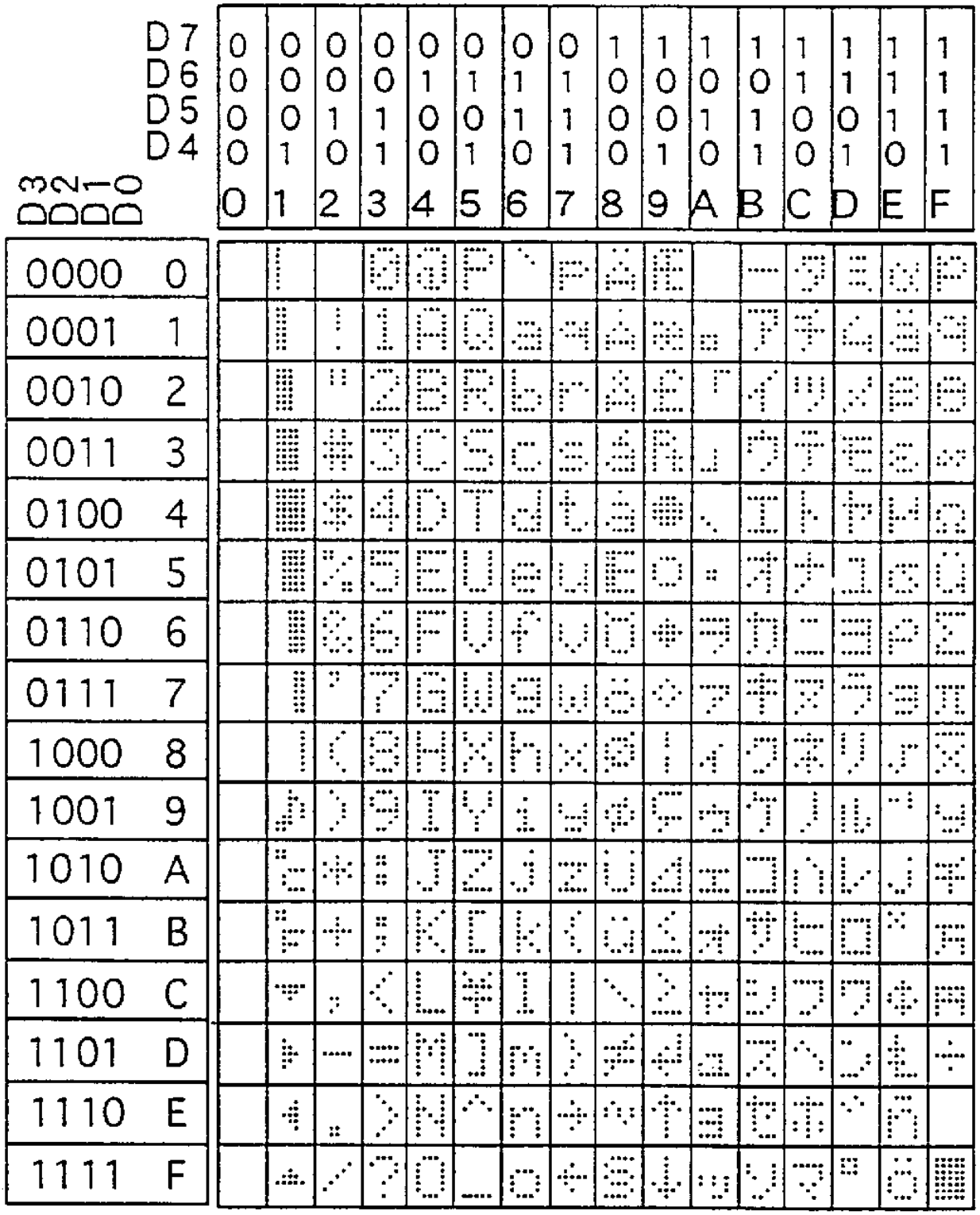

FIGURE A3: FLUORESCENT 20X2 AND 20X4 CHARACTERS TABLE

APPENDIX B: INSTALLATION NOTES

LABEL INSERTION

The **QTP 16** has a personalization label window where the user can put its own logo, identification code or anything else. By using a 80 g/m^2 paper sheet to create this label. In the following picture is shown the personalization label size express in mm.
Note that in this picture the "grey part" is that one that can be read in the **QTP 16** personalization window.

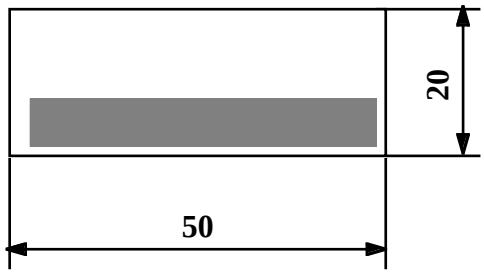

FIGURE B1: PERSONALIZATION LABEL SIZE

Note for inserting the label:

A) Unscrew the 2 black screws from the front panel (if any).

B) Take the panel out separating the back carter - frame group from the printed circuit - keyboard group. The user must press connectors on the **QTP 16** to facilitate this operation.

C) Now the keyboard is ready to accept the personalization label (see figure B2).

D) Remount the panel following the previous instructions but on the back-way.

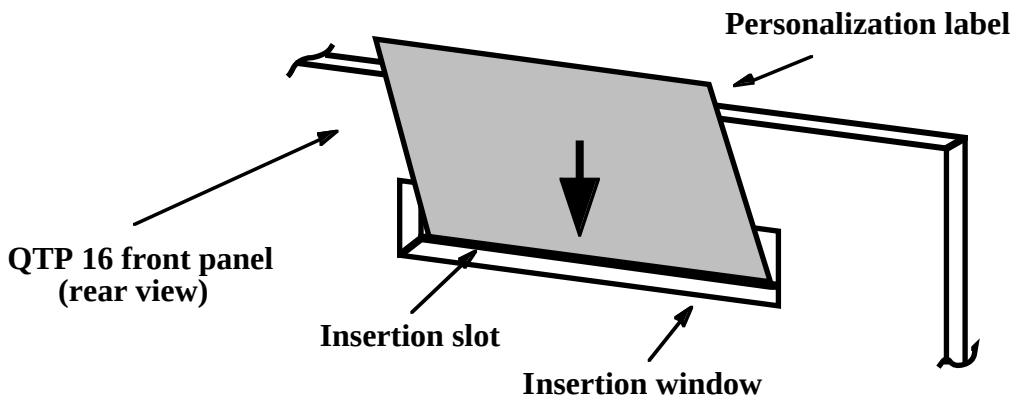

FIGURE B2: PERSONALIZATION LABEL INSERTION

HOW TO FIX THE FRONT PANEL TO THE CARTER

The **QTP 16** is supplied with the front panel (printed circuit - keyboard) fitted to the rear carter. If the User wants to improve the mechanical fixing between the panel and the carter, to avoid an accidental panel out-of-frame, then he/she must follow these instructions point by point:

1) Take the panel out separating the rear carter + frame group from the printed circuit + keyboard group. The User should press connectors on the **QTP 16** to facilitate this operation.

2) Unscrew the 2 central screws to separate the frame from the rear carter.

3) On the front panel, in corrispondance to those 2 central screws, there are 2 countersink holes which are visible only in the rear view. To get these two holes accesible, the user needs to hole the polycarbonate panel covering.

4) Remount the panel by using the two screws of point **"2".** They will be screwed on the front panel instead of the frontal frame.

APPENDIX C: ALPHABETICAL INDEX

SYMBOLS

A

B

C

D

E

R

S

T

W