ADVANCE INFORMATION

ALL INFORMATION IN THIS USER MANUAL IS PRELIMINARY AND SUBJECT TO CHANGE.

LCD & Keypad - RS232 Terminal

(R1.1 Feb 2005)

Introduction

This device should be attached and tuned by specialized personnel **ONLY** !

This manual is intended for firmware release **1.1**. The validity of information contained in this manual is subordinated to the firmware release number, so the user must always verify the marking of firmware release number. The firmware release number is written on the label stick on the CPU inside the device, or firmware release number can be obtained by a proper command sent through the serial line (Terminal Type Request).

General Description

The LCD & Keypad - RS232 Terminal (further - "Terminal") is an RS232 terminal that allows you to use the 16-keys film keypad and 16x2 LCD (16-symbol x 2-lines) to communicate with control computer through COM-port, to switch the control computer on/off using key-coded power switch and also to monitor temperature and voltage using analog inputs. It can also be configured to work with your software, and customized as much as you like.

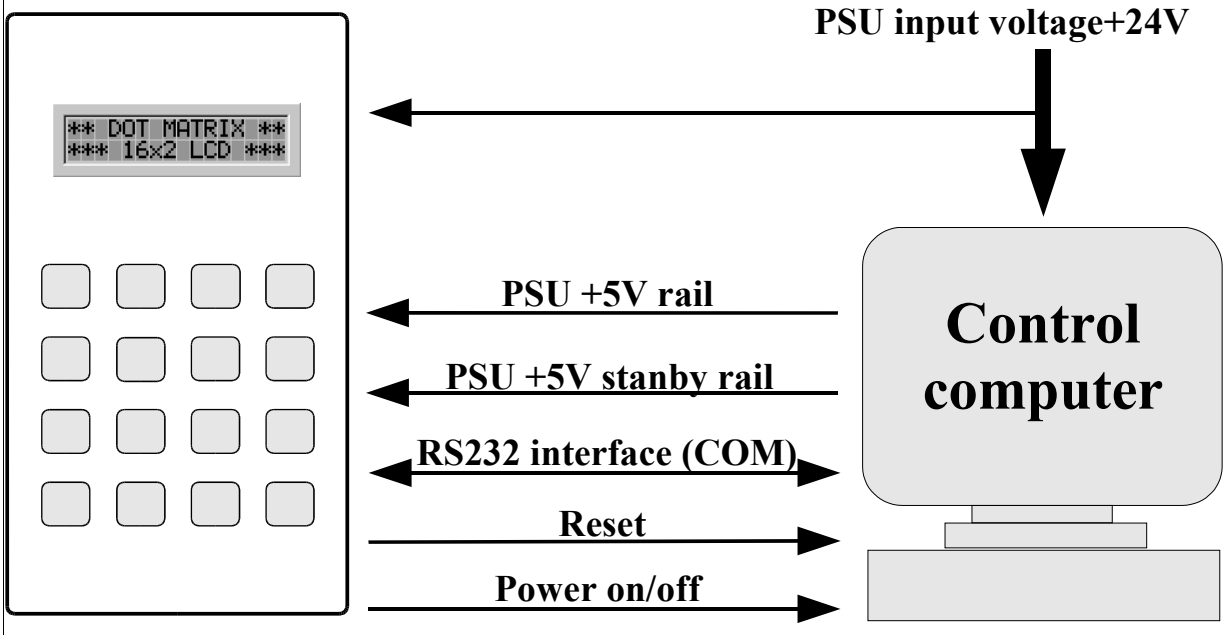
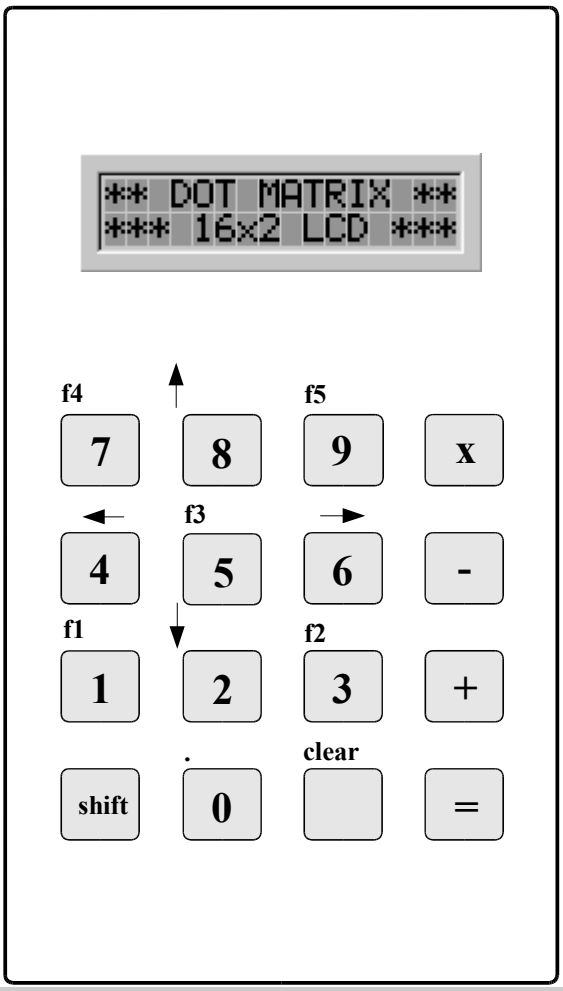


Figure 1. LCD & Keypad - RS232 Terminal

Features include:

- 16x2 LCD (2-lines x 16-symbol)
- 16-key film keypad
- VT100 subset
- Fixed 9600, 8 bit, no parity, 1 stop bit operation
- RTS/CTS hardware handshaking
- EEPROM to store character codes and configuration
- key-coded power switch
- controllable counter that is acting as a WatchDog timer for the (connected) control computer
- 2 channels of voltage measuring
- 2 channels of temperature remote sensing (using remote thermistors)
- Chime and warning light (buzzer and "alarm" LED)

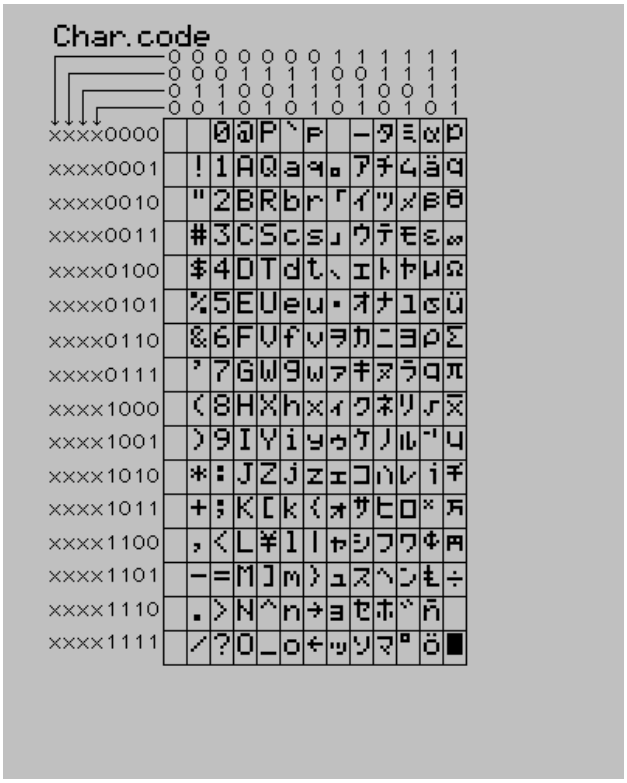
The Terminal uses 16-keys film keypad as an input device (see picture below).



In a normal mode the Terminal scans keys and transmits them to the RS-232 output. The configuration program allows to assign a random ASCII character to each key. The keypad can operate in standard mode or with auto-repeat function on all keys (ver.1.0 does not support this function).

Input from the RS-232 is parsed, decoded and displayed on the LCD or executed if it is ANSI/VT100 ESCape sequence. The Terminal latches the codes to its display data RAM, transforms each character code into a 5x7 dot-matrix character pattern, and displays the characters on the LCD.

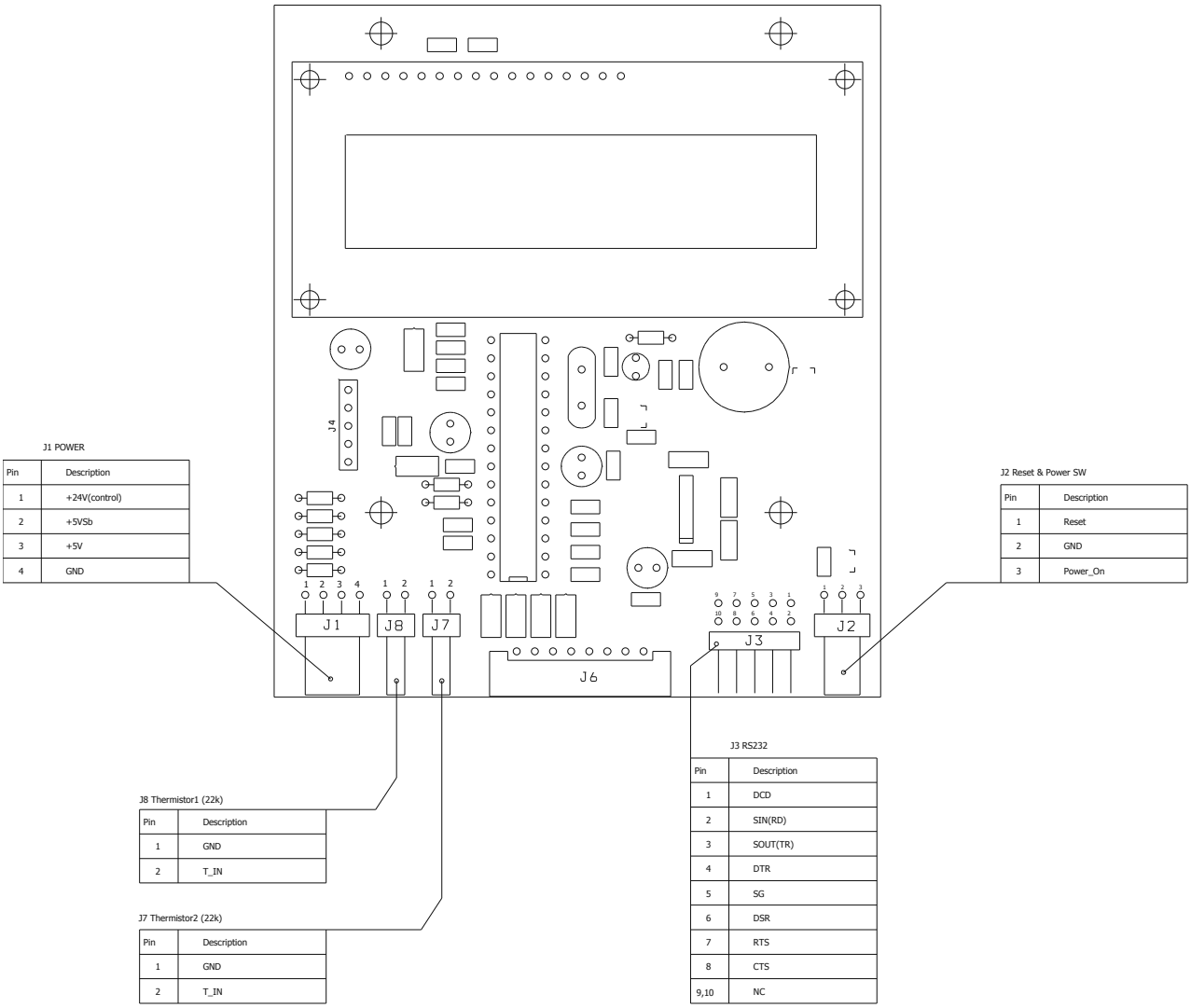
The LCD unit incorporates a character generator ROM which produces 160 different 5x7 dot-matrix character patterns (see table below).



The unit also provides a character generator RAM (64 bytes) through which the user may define up to eight additional 5x7 dot-matrix character patterns, as required by the application.

Connecting

Figure 2 shows pinouts and profiles for the Terminal connectors.



WARNING! The Terminal does not have its own DC/DC converter to operate on any DC voltage between 12 and 30V (including the common 24V industrial supply). +24V line is used for voltage measuring by Terminal ONLY.

J1 (a 4-pin polarized connector) should be connected to power supply unit of control computer. The Terminal takes +5VDC 0,1A from +5Vsb (standby) rail of ATX PSU of control computer.

J2 (a 3-pin polarized connector) should be connected to "Power Button" and "Reset" pins of "Front Panel" connector located on motherboard of control computer. Pin J2-1 should connected to "RESET+" while pin J2-2 to "PW_BN-" or "GND" (ground) and J2-3 to "PW_BN+" signal, i.e. J2 should be connected instead of 2-pin push buttons of regular computer. Pressing this buttons will either switch the control computer on/off or reset. In order to connect the Terminal, someone should find two wires that go to the "reset" button and the two wires that go to the "power" button of control computer. The relays of the Terminal should be connected in parallel to these reset and power buttons.

J3 is a 10-pin polarized header for RS-232. The Terminal uses RTS/CTS handshaking. If you don't want handshaking, you can cut the trace from pin 8 of J3 and short pin 7 of J3 to ground.

For normal operation, do not connect anything to J4. In any event, do not disconnect J5 and J6. J4 is used for manufacturing while J5 and J6 are used by LCD and keypad.

J7 and J8 (2-pin connectors) are used to connect remote temperature sensors (thermistors). If you don't intend to connect thermistors, you can leave J3 and J8 free.

Example of connecting EPIA-M motherboard to the Terminal see in Appendix A.

Operation

The Terminal acts as a standard terminal that uses 9600 baud rate, 8 bits, no parity, and 1 stop bit. It uses RTS/CTS handshaking. The terminal implements a very small subset of the ANSI/VT100 terminal emulation of escape sequences. Added features are:

- key-coded power on/off switch
- WatchDog timer
- 2 channels of voltage measuring
- 2 channels of temperature remote sensing (using remote thermistors)
- Banner string replacement/appending
- Chime and warning light (buzzer and “alarm” LED)

Additional notes:

- Terminal starts parsing of input string after receiving the CR(0x0d) character or when a full number of characters (23) for a line have been received.
- Input buffer is 23 bytes length. String with 24 and more bytes length is truncated.
- Parameters, such as the cursor positions, are in ASCII digits, so 12 represents the character "1" and the character "2", not a single byte with the value of 12.
- Characters are case sensitive, so Esc[@W and Esc[@w are two different commands.

Switching on/off:
The Terminal offers a power on/off switch for the control computer over the connector POWER SWITCH. ***To enter “Power on/off menu” mode the user must press the "shift" and "=" keys simultaneously.*** The Terminal displays one of two prompt strings depending on computer status:

The correct PIN code should be typed in instead of 1234. The PIN code is provided by manufacturer.
If entered PIN code is correct, then the Terminal closes contacts on POWER SW connector (pin J2-3 and J2-2) for half of second. This causes startup or shutdown ATX PSU of control computer.

Using of WatchDog:
The WatchDog is off by default. To switch it on the command Esc[W<u>W</u> should be sent and timeout should be set by indicating required <u>W</u>, which is a value between 0 and 255. E.g <u>W</u>=10 will set the WatchDog timeout at 10*1sec=10sec. To switch it off, the timeout=0 should be set (send the command Esc[W0 and WatchDog timeout will be set at 0*1sec=0sec). The driver program needs to set the timeout periodically to avoid the WatchDog hits. If your control computer locks up, then the driver program will no longer set the timeout and the WatchDog will hit. As a rule, control computers almost never hang up. However, if they hang up and get stuck, usually there is nobody at place to press the reset, or nobody knows where the control computer is because usually there is no problem with it.

The WatchDog is designed in such a way that it

will hit only once. This is to avoid it hitting again during the file system check which will probably follow after the reset. When the control computer comes up again, the driver program should re-enable itself.

How to use the WatchDog:
The WatchDog guarantees that the system is always able to execute programs. It does not guarantee that a application is still running and responding. To check such things you should use a crontab entry for Linux/UNIX or other programs. Someone may be confident that the crontab will be
working because the WatchDog ensures that software in general is still executing.

For example, there may be designed a script that is triggered by a cronjob and downloads a webpage from some webserver every 15 minutes, but you have to be careful with that: A webserver can get heavily loaded by a lot of requests and then it is normal that it does not answer all of them. Therefore you should count how often the webserver did not answer. If it did not answer at all in the last 10 checks, then you can restart the webserver or trigger a normal reboot (not a hard reset via WatchDog).

Reference

The Terminal uses a subset of the VT100 command codes. Commands are case sensitive and consist of ASCII characters.

Many commands require numeric arguments. These are indicated below by an underline so, "Esc [L ; C H" is telling you to replace the L with a decimal number (for example, " Esc [6 ; 1 H").

Input Codes

Set Cursor Position –
Esc[L;CH or Esc[L;Cf
Use any of these Escape sequences to set the current cursor position. The first number indicates the line number (lines start at 0) and the second number is the column number (also starting at 0). So to move the cursor to the top left corner of the screen, send "Esc[0;0H". Note that sending invalid cursor numbers will have unpredictable results.

Set Cursor and Display –
Esc[@XD
You can use this command to control the cursor appearance. The following numbers are supported: 0 – no cursor; 1 – blinking cursor.

Erase screen –
Esc[2J
This command clears the screen, it does not move the cursor to the home position.

Reset –
Escc
This completely resets the Terminal. Note that this causes the parameters to be read from EEPROM.

Terminal Type Request –
Esc[c
The Terminal responds to this code with "Esc [?1;1c" to indicate its terminal firmware release.

Temperature Request –
Esc[CT
You can use this command to get temperature value. The following numbers are supported: 0 – channel 0; 1 – channel 1. The Terminal responds to this code with "Esc@XY" to indicate temperature value. X represents first digit (tens) in double-digited value of temperature in degree Celsius, while Y represents the second digit (ones). For example the temperature of 25ºC will cause the Terminal to respond with "Esc@25". If value of temperature is less than 0, the Terminal will respond with "Esc@--". If value of temperature is more than 70ºC, the Terminal will respond with "Esc@++".

Main Voltage Request –
Esc[MV
You can use this command to get main voltage

value (+24,000mV nominal). The Terminal responds to this code with "Esc@VWXYZ" where VWXYZ are 5 digits of five-digited value in mV. For example the +24,5 Volts will cause the Terminal to respond with "Esc@24500". If measured value is less than +15V, the Terminal will respond with "Esc@<15000". If measured value is more than +36V, the Terminal will respond with "Esc@>36000".

Vcc Voltage Request –
Esc[VV
You can use this command to get Vcc voltage value (+5,000mV nominal). The Terminal responds to this code with "Esc@WXYZ" where WXYZ are 4 digits of four-digited value in mV. For example the +5,12 Volts will cause the Terminal to respond with "Esc@5120". If measured value is less than +4V, the Terminal will respond with "Esc@<4000". If measured value is more than +6V, the Terminal will respond with "Esc@>6000".

Replace banner string –
Esc[Ss{banner string text}
Use this command to replace banner string. The Terminal will scroll banner string printed in braces.

Concatenate banner string with new string –
Esc[ss{banner string text}
Use this command to append concatenate present banner string with new string. The Terminal appends the string in braces to present banner string. If the length of new concatenated banner is more than 40 characters, then truncation occurs.

WatchDog Timeout Setting –
Esc[WW
Use this command to set the timeout of WatchDog and get the current value of WatchDog timeout counter. The WatchDog is off by default. To switch it on the command where W is a timeout value. should be sent. E.g W=10 will set the WatchDog timeout at 10*1sec=10sec. To switch WatchDog off the timeout=0 should be set (send the command with W=0). Value W=0 will set the WatchDog timeout at 0*1sec=0sec and therefore the WatchDog timeout counter will be stopped. The Terminal responds to this code with "Esc@XYZ" to indicate current (old) WatchDog timeout counter value. X represents first digit (hundreds) in tri-digited value, while Y represents the second digit (tens) and Z represents the third digit (ones). For example, the current value of WatchDog timeout counter of 125 will cause the Terminal to respond with "Esc@125". If the WatchDog timeout counter has been either stopped or hit, the Terminal responds with "Esc@0".

WatchDog Timeout Getting –
Esc[w
Use this command to get the current value of WatchDog timeout counter. The Terminal responds to this code with "Esc@XYZ" to indicate current WatchDog timeout counter value. For example, the current value of WatchDog timeout counter of 234 will cause the Terminal to respond with "Esc@234". If the WatchDog timeout counter has been either stopped or hit, the Terminal responds with "Esc@0".

Output Codes

Function keys
The Function keys output:
F1 – Esc[O
F2 – Esc[P
F3 – Esc[Q
F4 – Esc[R
F5 - Esc[S

Cursor keys
The cursor arrows output:
Cursor arrow up - Esc[A
Cursor arrow down - Esc[B
Cursor arrow right - Esc[C
Cursor arrow left - Esc[D

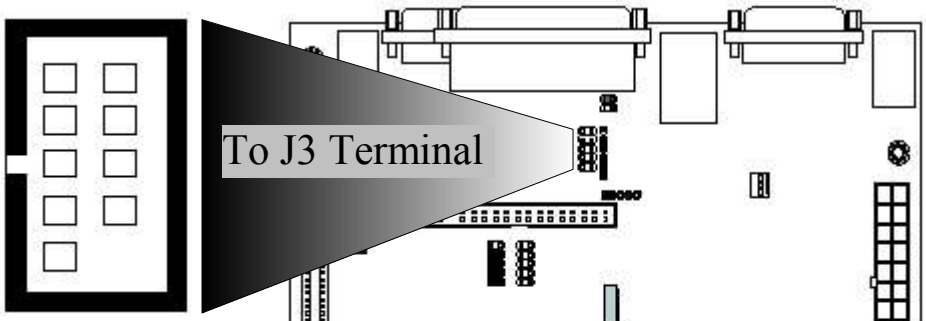
Clear key

The Clear key output – Esc[%KX

Appendix A

Connecting EPIA-M motherboard to the Terminal.

PIN	SIGNAL	PIN	SIGNAL
1	RIN12	2	RIN32
3	DOUT22	4	DOUT32
5	GND	6	RIN22
7	DOUT12	8	RIN42
9	-XR12		



PIN	SIGNAL	PIN	SIGNAL
1	PW_LED+	2	HD_LED+
3	PW_LED+	4	HD_LED-
5	PW_LED-	6	PW_BN+
7	SPEAKER+	8	PW_BN-
9	NC	10	RST_SW+
11	NC	12	RST_SW-
13	SPEAKER-	14	SLP_LED+
15	NC	16	SLP_LED-