

LCD Module 10a

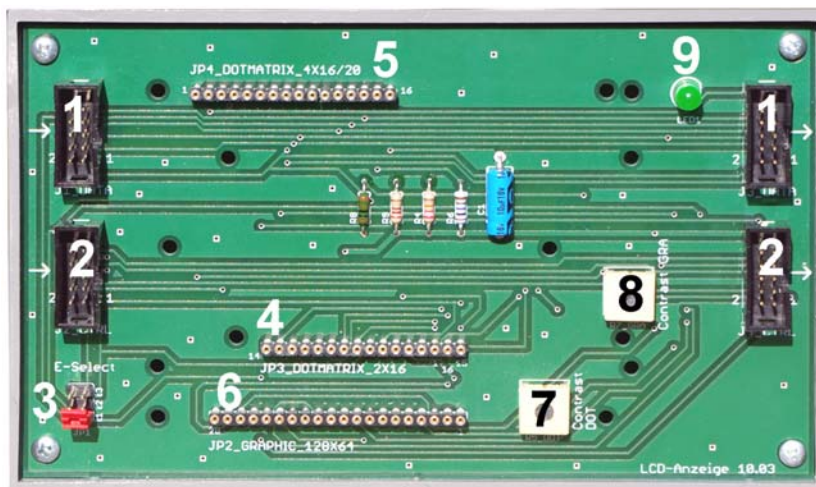
Hardware Reference

Release 1.4 (June 17, 2016)

Purpose:

Platform to carry an LCD display module and to facilitate connection to other modules. Three types of LCD displays can be inserted: a dot-matrix module of 2 rows and 16 characters per row, a dot-matrix module of 4 rows and 20 characters per row, or a graphical module of 128 by 64 pixels. The LCD displays must have an industry-standard Motorola-type interface with control signals E (Enable (the strobe signal)), R/W# (Read/Write) and R/S (Register Select).

- PCB dimensions: approx. 92 by 156 mm (approx. 4" by 6 6,3").
- PCB fits on a sloped enclosure TEKO 362 and on frames for DIN rail mounting.
- PCB can be stacked upon other modules having the same dimensions.
- Microcontroller interface: two 8-bit ports. One port data bus (bidirectional), one port control signals (outputs).
- Supply voltage: according to specifications of the LCD display. Most LCD displays require 5 V.



- | | | | |
|---|-------------------------------------|---|---|
| 1 | Data bus headers | 6 | Connector for graphical LCD 128 • 64 |
| 2 | Control and strobe signal headers | 7 | Contrast adjustment for the dot-matrix LCDs |
| 3 | Enable-signal select jumper | 8 | Contrast adjustment for the graphical LCD |
| 4 | Connector for dot-matrix LCD 2 • 16 | 9 | Power LED |
| 5 | Connector for dot-matrix LCD 4 • 20 | | |

Fig. 1 The LCD module 10a.

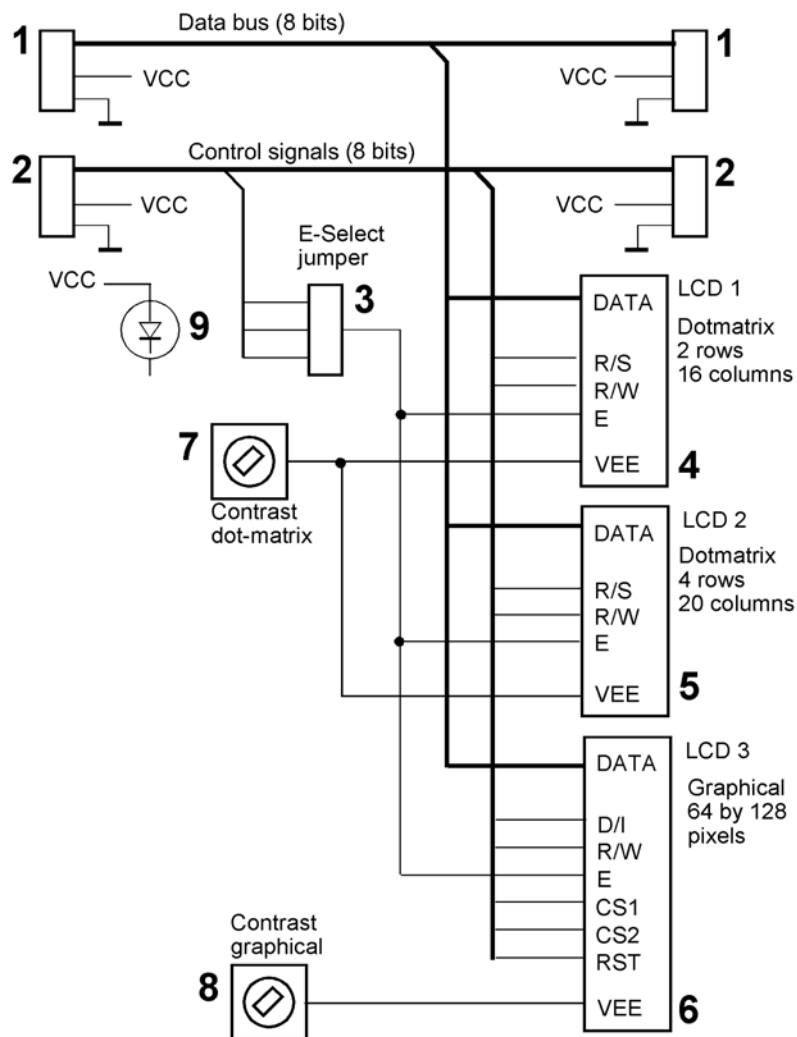


Fig. 2 LCD module 10a block diagram.

Principles of Operation

The interface comprises two 8-bit ports. One port is a bidirectional 8-bit bus, the other comprises eight control and strobe signals. Pin headers are mounted at both sides of the module, so that additional modules can be attached by daisy-chained connections. By appropriately setting a jumper, one of three enable signals can be selected for LCD control. So a maximum of three modules can be operated at one bus attached to two microcontroller ports.

Power Supply

Power must be supplied from outside. The board has no voltage regulator. The supply voltage depends on the LCD display inserted. Most LCD displays require $VCC = 5\text{ V}$. Some LCD displays may require somewhat close tolerances. Power is fed to the module via the I/O port connectors.

I/O port connectors (1), (2)

The I/O connectors are pin headers with 10 pins in two rows and a pin pitch of 2,54 mm (100 mil).

Various types can be inserted (horizontal or vertical, on the component side or on the soldering side, shrouded or not and so on). The assignment of the I/O signals, GND and VCC corresponds to the industry standard of the Atmel starter kits and the like. The GND and VCC contacts are used to supply the module. The upper port (1) is the data bus, the port (2) below comprises the control signals.

Enable-signal select jumper (3)

The E-input of an LCD display is the enable or strobe input, selecting the LCD display as the active slave on the data bus. Three of the eight control signals of the //O port (2) can be used as E-signals. One of these signals is to be selected by appropriately inserting a jumper. A maximum of three modules can be operated at one bus attached to two microcontroller ports. Each module must have its jumper inserted in a different position.

The Keypad / Input Module 10b has the same selection provisions. A keypad / input module can be the last module of a daisy-chain.

Caution:

The LCD module requires the E-signal active Low, the keypad / input module active High.

LCD displays (4), (5), (6)

The module is designed for insertion of the most widespread industry-standard module types (Fig.s 3, 4, 5). The LCD modules can be mounted with spacers.

Contrast Adjustment (7), (8)

There are separate trim pots for dot-matrix and graphics LCDs. When a particular LCD display is inserted, only the corresponding trim pot is accessible.

Power LED (9)

One of the most basic troubleshooting aids is an indication, whether a device is powered or not.

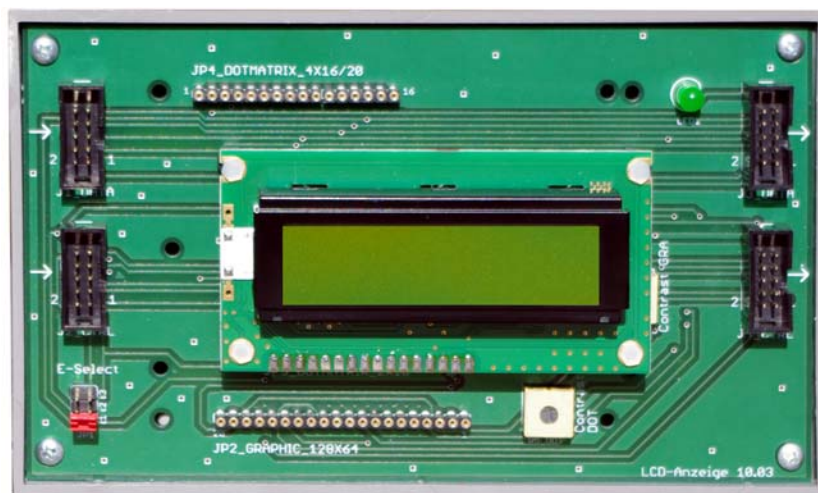


Fig. 3 Dot-matrix display; two rows of 16 characters. 16-pin connector. Footprint approx. 44 • 84 mm. Example: EA P152-NLED with controller HD44780.

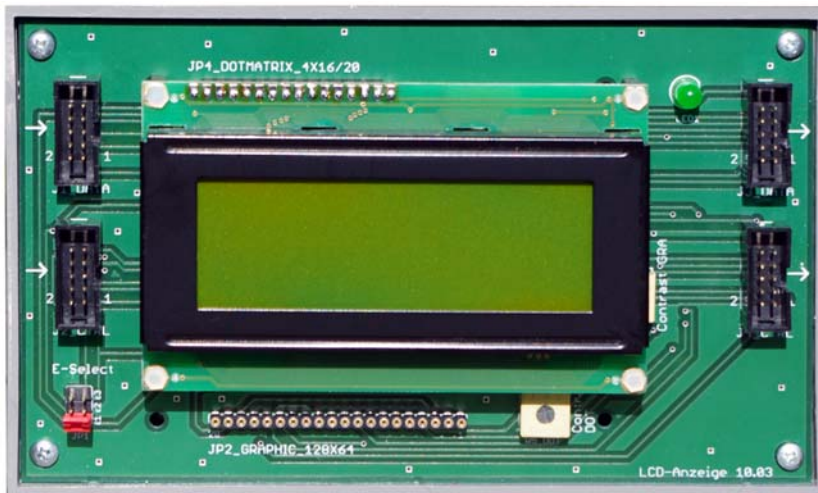


Fig. 4 Dot-matrix display; four rows of 20 characters. 20-pin connector. Footprint approx. 60 • 98 mm. Example EA P204-NLED with controller HD44780.

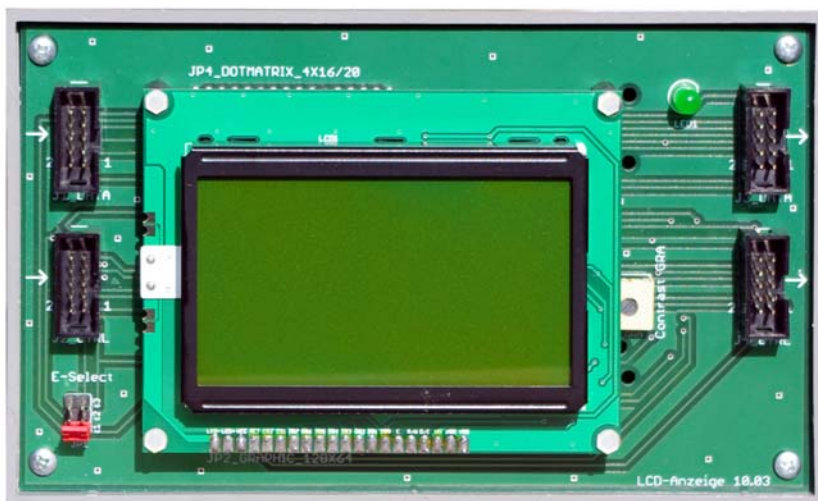


Fig. 5 Graphical display; 128 • 64 Pixel. 20-pin connector. Footprint approx. 70 • 93 mm. Example: EA E128-6N2LW with controller HD 61202.

7	6	5	4	3	2	1	0
D7	D6	D5	D4	D3	D2	D1	D0

Fig. 6 The data bus.

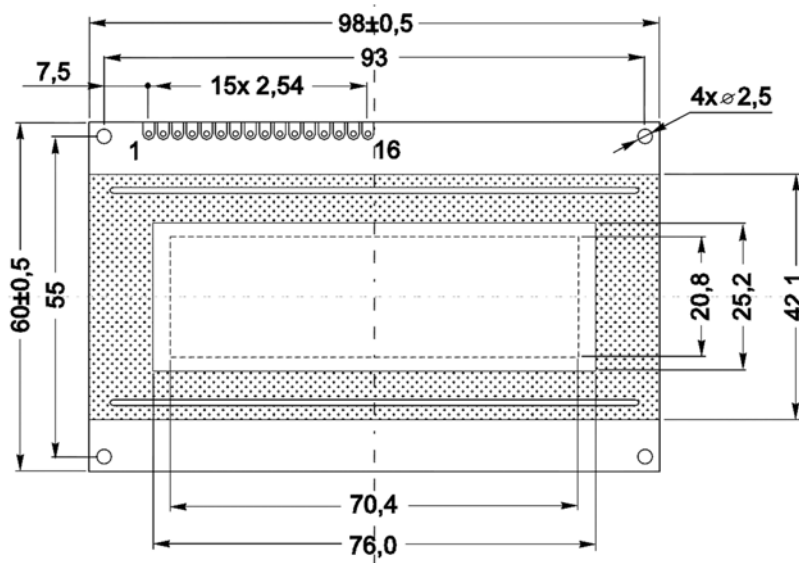


Fig. 10 Dot-matrix 4 • 20.

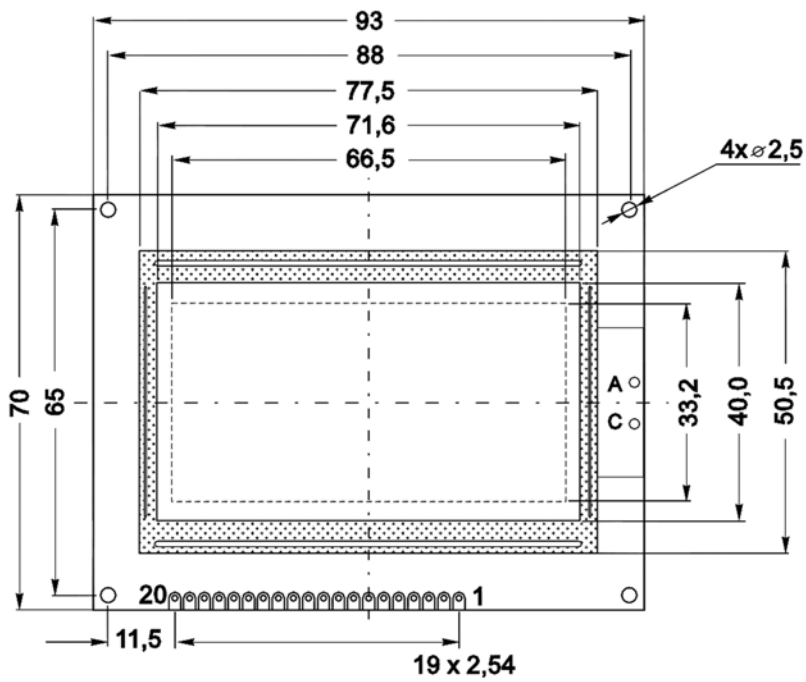
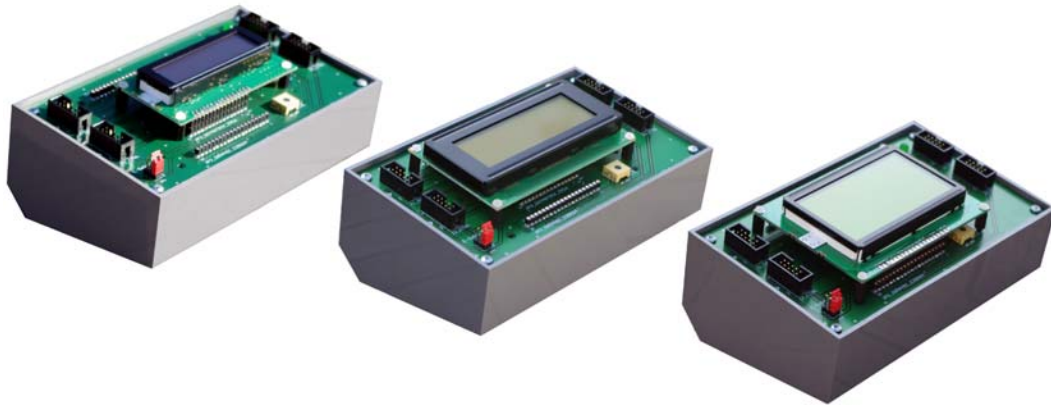
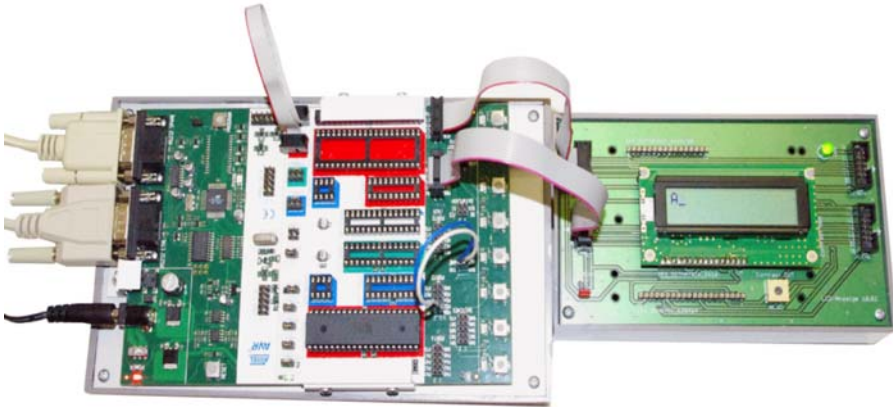


Fig. 11 Graphical 128 • 64.

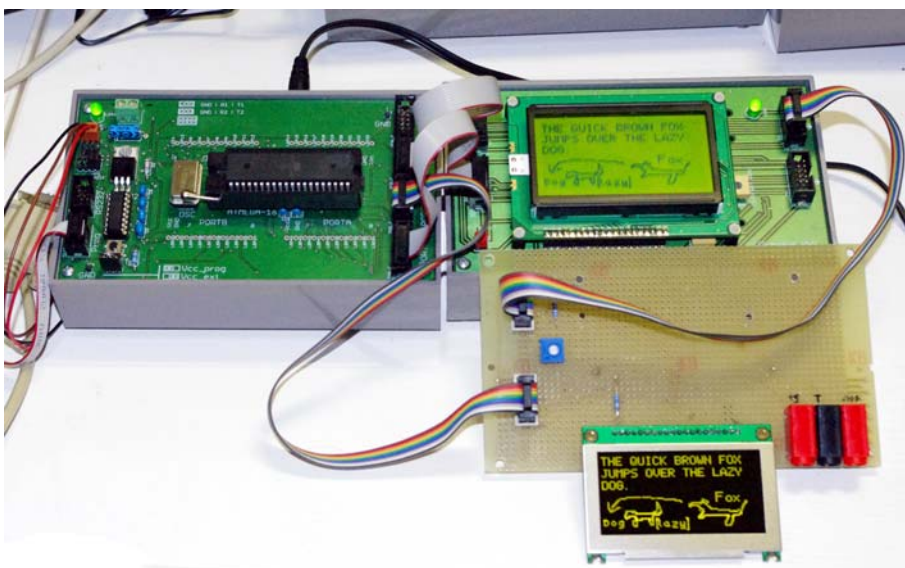
LCD Module 10a in Action – A Photo Gallery –



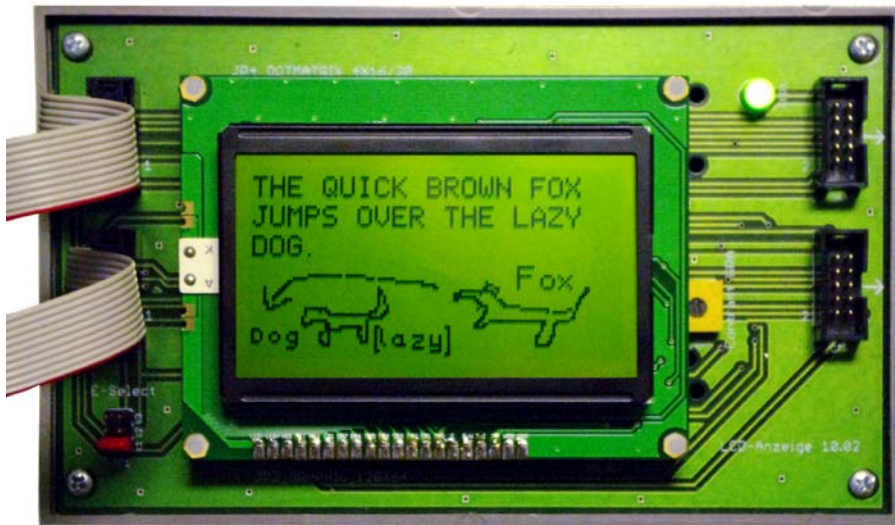
LCD module attached to an Atmel STK 500 starter kit.



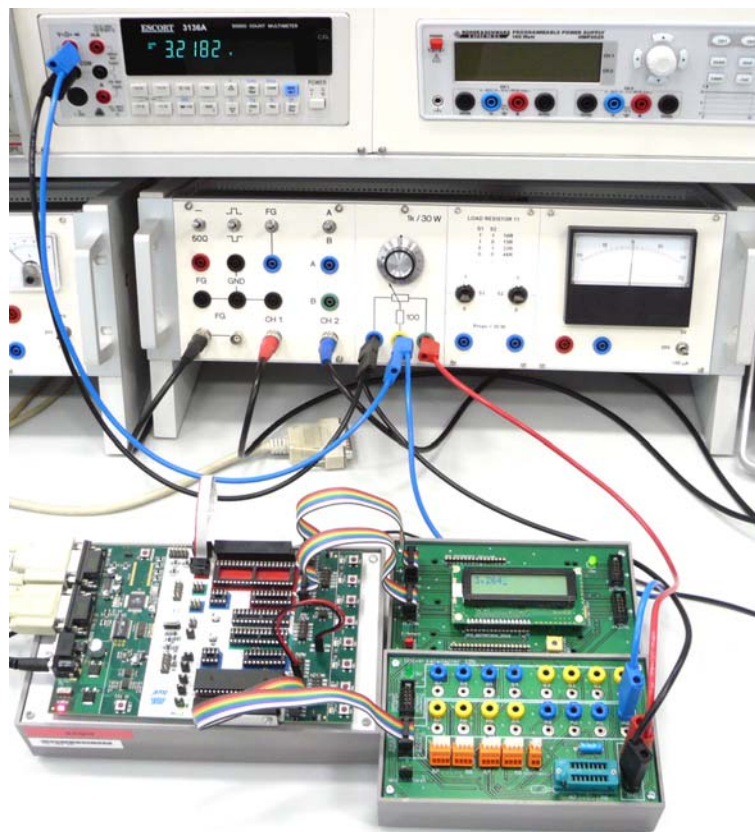
A provisional test setup to compare LCD with OLED displays.



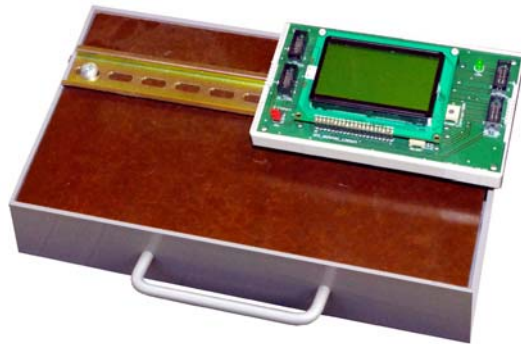
A graphical display example.



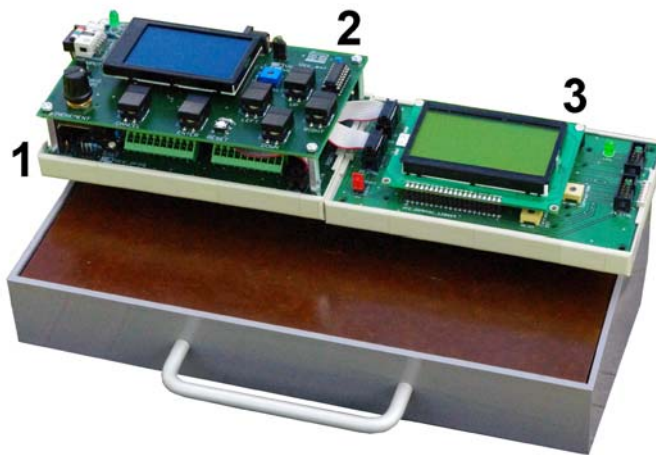
A student's exercise. A digital voltmeter is to be implemented. The general-purpose adapter in front of the LCD module delivers the analog voltage to the microcontroller's analog-to-digital converter.



Mounting the LCD module on a DIN rail.



An educational PLC (Programmable Logic Controller) has been assembled from three modules; a general-purpose microcontroller module (1), a human interface module (2), and an LCD module (3).



This PLC comprises two LCD modules, one with a dot-matrix and the other with a graphical LCD display. On the test rig shown, only the power stages and relays are lacking.

