Human Interface Devices for Microcontroller Modules
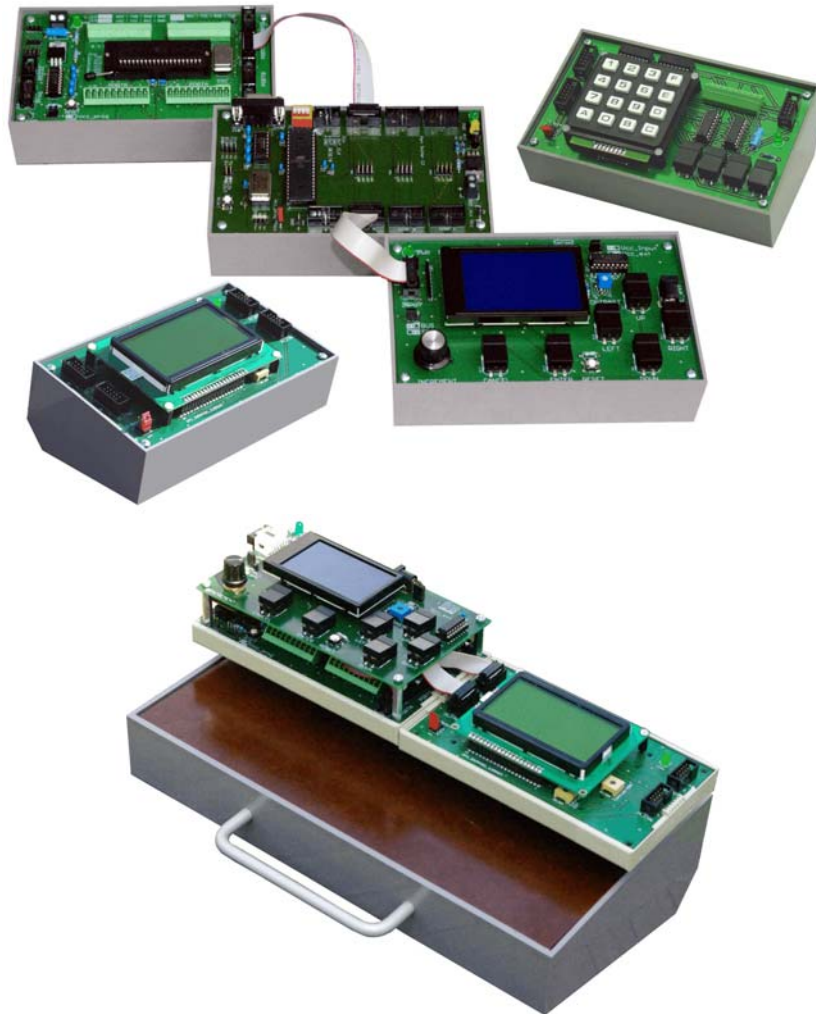## – Overview –
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The Human Interface Module 02/10

This module features a dot-matrix LCD display with four rows of 20 characters, 6 keys and an incremental encoder (Fig. 1). It requires only one 8-bit-port. A strong motivation for developing this module was the desire to conduct multitasking experiments (Fig. 2) and to have a simple debugging and troubleshooting console (Fig. 3). The idea behind is to employ the 4-bit mode of the dot-matrix module and to use a multiplexer with three-state outputs for attaching the keys and the incremental encoder. The 8-bit interface comprises a bidirectional 4-bit bus and four control and strobe signals. A microcontroller module and a human interface module constitute a basic embedded system platform with three freely available 8-bit ports.
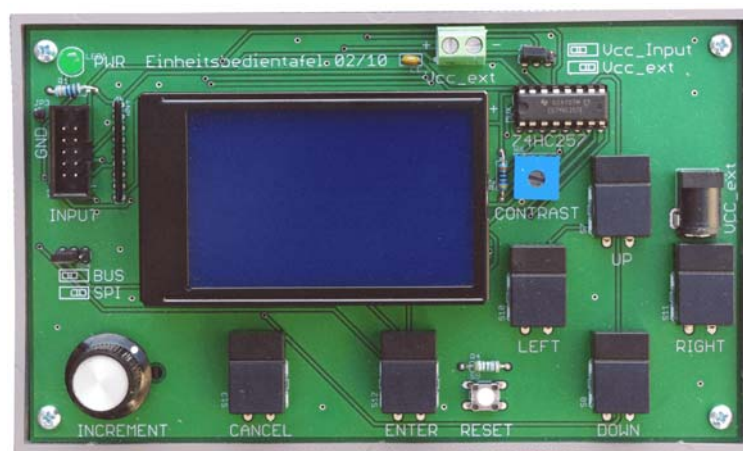

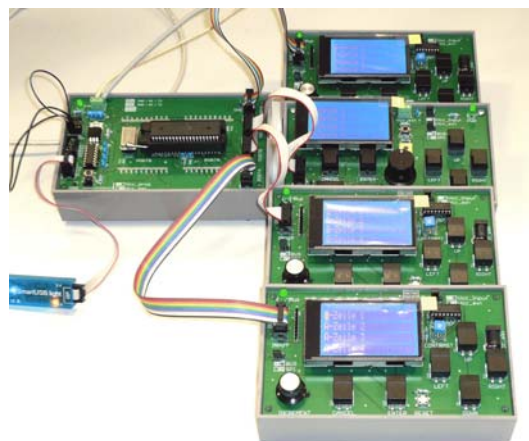**Fig. 1** The Human Interface Module 02/10.

Fig. 2 To demonstrate multitasking principles, four human interface modules are attached to a microcontroller module.

Fig. 3 To facilitate the bring-up of a complicated experimental multimicrocontroller system, each of the microcontrollers is connected to its own debugging console.

The LCD Module 10a

The pc board is only the carrier for the LCD display (Fig. 4). Nevertheless, the device shows some details, which are a little more sophisticated. Three types of LCD displays can be inserted: a dot-matrix module of 2 rows and 16 characters per row, a dot-matrix modules of 4 rows and 20 characters per row, or a graphical module of 128 by 64 pixels (Fig. 5). When a particular LCD display is inserted, only the corresponding contrast trim pot is accessible. The interface comprises a 8 bit data bus and 8 control and strobe signals. Pin headers are mounted at both sides, so that additional modules can be attached by daisy-chained cable 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.
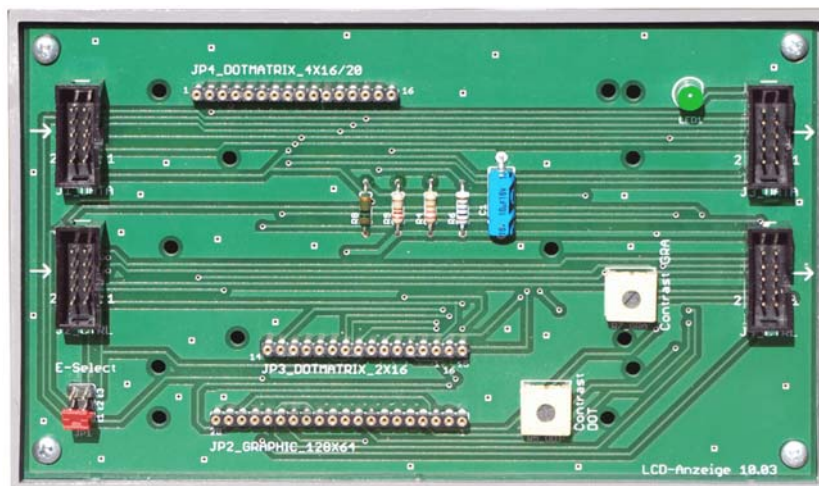

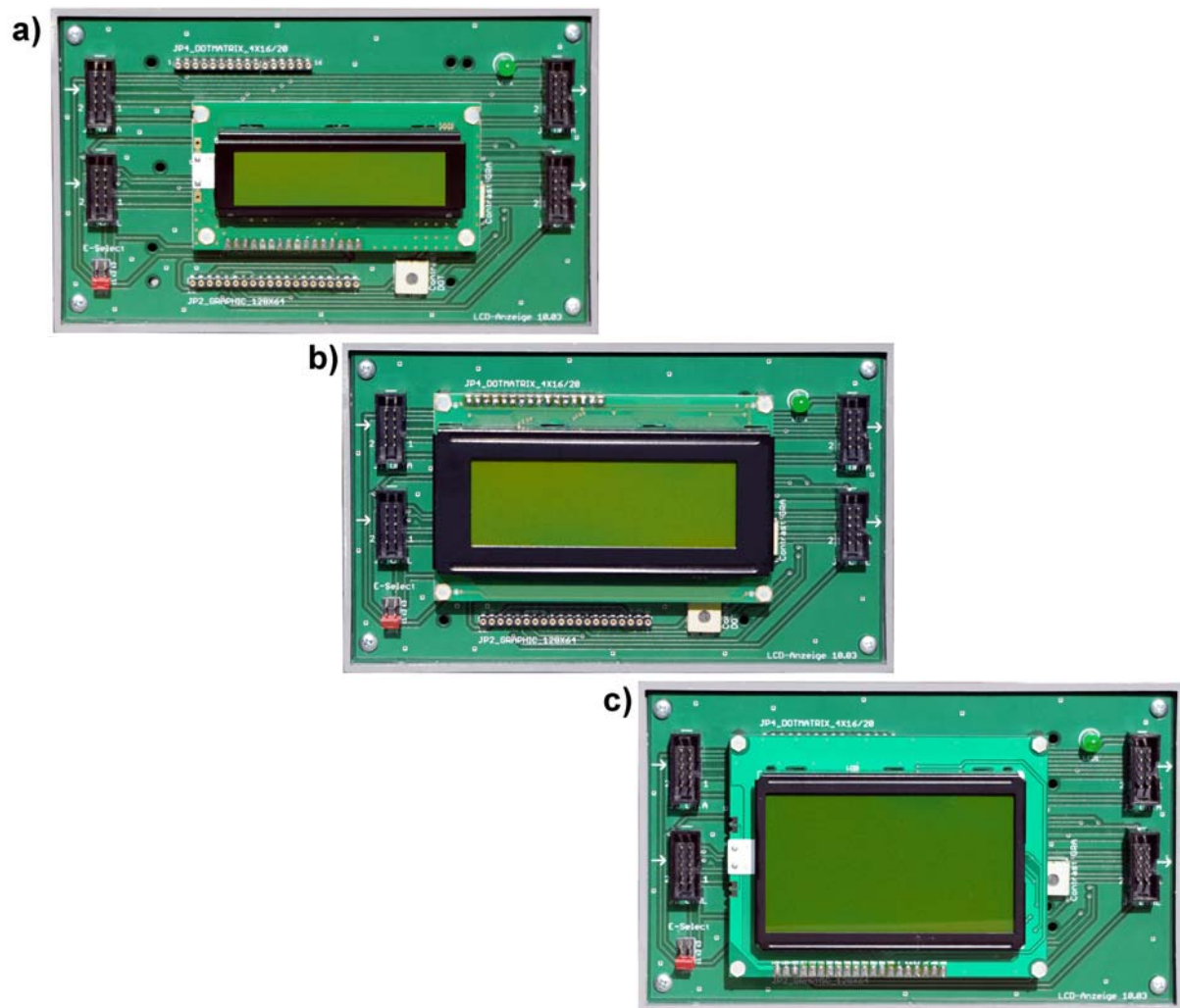***Fig. 4*** The LCD module 10a.

Fig. 5 The LCD module 10a with different LCD displays. a) dot-matrix 2 • 16 characters. b) dot-matrix 4 • 20 characters. c) graphical 128 • 64 pixels.

The Keypad/Input Module 10b

This module carries a keypad and four additional keys (Fig. 6). Additionally, 8 input signals from outside can be attached via terminals or a pin header. The interface comprises a 8-bit data bus, five selection and three enable signals. Input signal selection is done via two multiplexers with three-state outputs. The interfaces of the keypad/input module and the LCD module fit well together. Each of these modules allows for selecting one of the enable signals via jumper setting. A typical configuration comprises two LCD modules (one with a dot matrix, one with a graphic LCD) and one Keypad/Input module.
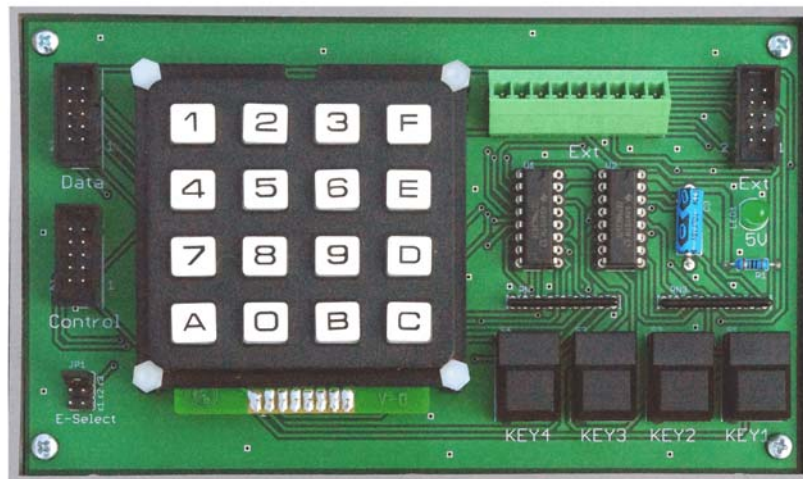
Fig. 6 The Keypad/Input Module 10b.