

Universal Display Simulation

1 Simulation modes

Immediately after the program has been started, the main menu appears on the screen. The mouse pointer is visible in the form of a hand. The operating modes can be selected from the menu bar at the top of the screen by means of the left mouse button. Alternatively, the operating modes can be selected by pressing the corresponding hotkeys on the keyboard.

These keys are shown underlined. The analog section of the universal display is visible in the top half of the screen. The seven-segment display is shown in the bottom half of the screen.

1.1 DEMO mode

The DEMO mode demonstrates how the seven-segment displays are controlled. Different DEMO sequences are run for the two display modes *Direct* and *BCD-code*. The DEMO mode shows a possibility of realizing external control. The automatic process here is to be covered with exercises in the next chapter and replaced by a real control system. None of the control elements can be activated in DEMO mode. The process can only be observed.

Move the mouse pointer to the DEMO button and briefly click the left mouse button.

In the *BCD-code* mode, a counter runs up from 0 to 9999. In the *Direct* mode, the letters LH are formed. The DEMO mode can be quit by activating another mode with the left mouse button or the keyboard.

1.2 MANUAL mode

All functions of the universal display can be tested in the MANUAL mode, without a control unit connected. All switches and control elements are actuated with a mouse click, and the response is observed. The status of the control elements is displayed by LED's. At the same time, the output signals AOO - A 15 and the two analog output signals X and Y are transmitted to the outputs of the PC-adaptor, where they can actually be measured.

The main menu of the program is shown in the menu bar at the top of the screen. Move the mouse pointer to the OPTIONS button and briefly press the left mouse button. A list of options which can be set now appears in a window (see Chapter 2.7). Check whether the parallel interface to which your PC-adaptor is connected is displayed. If required, you can change the entry using the mouse. Also check whether the *Lettering on* option is active, so that consistent conditions apply for the following description.

Click on the MANUAL button in the menu bar at the top. The program is now in the manual mode.

16 switches with LED's now appear on the left and right edges of the screen respectively. To actuate a switch on the left edge, press Shift together with the corresponding number, e.g. [0]

for the lowest switch. The switches can also be actuated with the left mouse button. The switches on the right edge of the screen and, thus, the outputs of the PC-adaptor are either actuated by clicking the mouse or by pressing the corresponding number on the PC keyboard.

These elements are operated as switches with the left mouse button or the keyboard, and as sensors with the right mouse button. Their status is displayed by the LED's on the right side of the screen.

The numbers of the switches co-incide with the numbers of the terminals on the PC-adaptor.

The analog outputs can be set with the mouse or the keyboard. The sliding potentiometers for outputs X and Y can be moved with the left mouse button held down. Alternatively, the buttons to the left and right of the sliding potentiometers can be clicked. When using the keyboard, press the corresponding letter. Press [x] to increase the analog value and Shift [x] to decrease it. The displayed analog values are also present at outputs X and Y of the PC- adaptor.

1.3 EXTERNAL mode

The EXTERNAL mode is similar to the MANUAL mode in terms of screen configuration and operation. Check whether the correct parallel interface has been selected in the OPTIONS menu. The switches on the left edge of the screen in the MANUAL mode are replaced by LED's here. These LED's indicate the statuses of the corresponding PC-adaptor inputs 0-15.

To actuate an LED, connect the corresponding PC-adaptor input to a 1-signal (24 V for PLC and 5 V for TTL mode).

The analog voltages at the PC-adaptor inputs A and B are also displayed. The switches on the right edge of the screen as well as the two sliding potentiometers controlling the PC-adaptor outputs are operated just as in the MANUAL mode.

In the EXTERNAL mode, the seven-segment displays can be controlled by a real PLC unit via the PC-adaptor inputs. If the PC-adaptor outputs are connected with the inputs of a real PLC unit, the inputs can be simulated by means of the switches on the right edge of the screen (input simulation).

Inputs: Key assignment and allocation of the PC-adaptor inputs

BCD display	0				1				2				3			
PIN	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Direct display	0								1							
PIN	a	b	c	d	e	f	g	dp	a	b	c	d	e	f	g	dp
Shift key +.	0	1	2	3	4	5	6	7	8	9	F1	F2	F3	F4	F5	F6
PC-adapter	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Outputs: Key assignment and allocation of the PC-adapter outputs

Switch A..	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Key ...	0	1	2	3	4	5	6	7	8	9	F1	F2	F3	F4	F5	F6
PC-adapter	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

2 Applications

This chapter is meant to treat and realize several typical applications involving the various functions of the universal-display simulation.

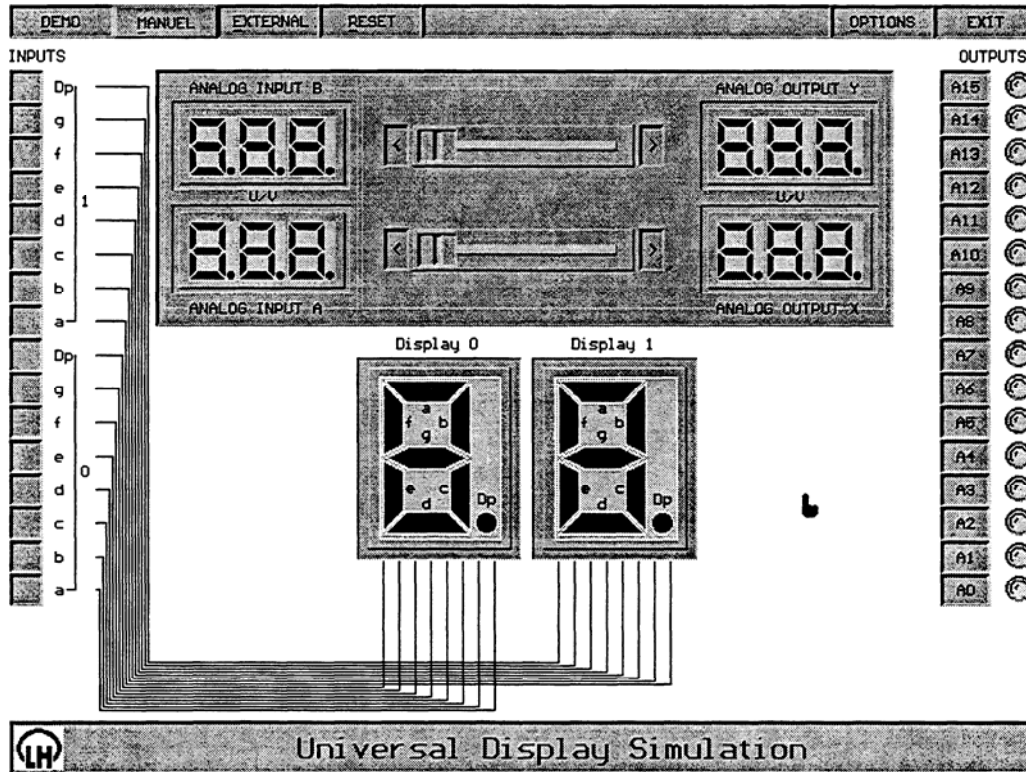
2.1 Display and simulation of digital inputs and outputs

As already mentioned in Section 3.3. "EXTERNAL mode", this program, in conjunction with the PC-adapter, comprises a complete input simulation and status display for a real control system. All PC-adapter outputs are connected with the PLC inputs, all PC-adapter inputs are connected with the PLC outputs.

This provides a universal aid for testing and checking during the development of control systems and programs.

To become familiar with the program now, use your PLC or control unit to design an AND- operator with several inputs, and test it using the method described above.

2.2 Direct control of a seven-segment display



First check whether the *Direct* display mode has been selected in the OPTIONS menu.

The DEMO and MANUEL modes demonstrate how seven-segment displays are controlled.

A logic table for controlling the seven-segment display 0 with a real PLC unit is to be developed in the following.

Exercise:

A PLC unit with 8 digital inputs E0 to E7 is given. At any point in time, only one input supplies a 1-signal. This is to be represented by an appropriate control program on the seven-segment display 0. Inputs a to g of the display are connected via the PC-adapter to the digital outputs of the PLC. When a 1-signal is present at any input a to g of the seven-segment display, the corresponding LED comes on.

The digital inputs of the PLC are connected with the PC-adapter outputs 0 to 7. They can thus be simulated via the program.

Using the DEMO and MANUEL modes, complete the following logic table:

Input	a	b	c	d	e	f	g
E0	0	0	0	0	0	0	0
E1	0	1	1	0	0	0	0
E2	1	1	0	1	1	0	1
E3							
E4							
E5							
E6							
E7							

The switching conditions for LED's a to g can be read from the table. Complete the missing equations..

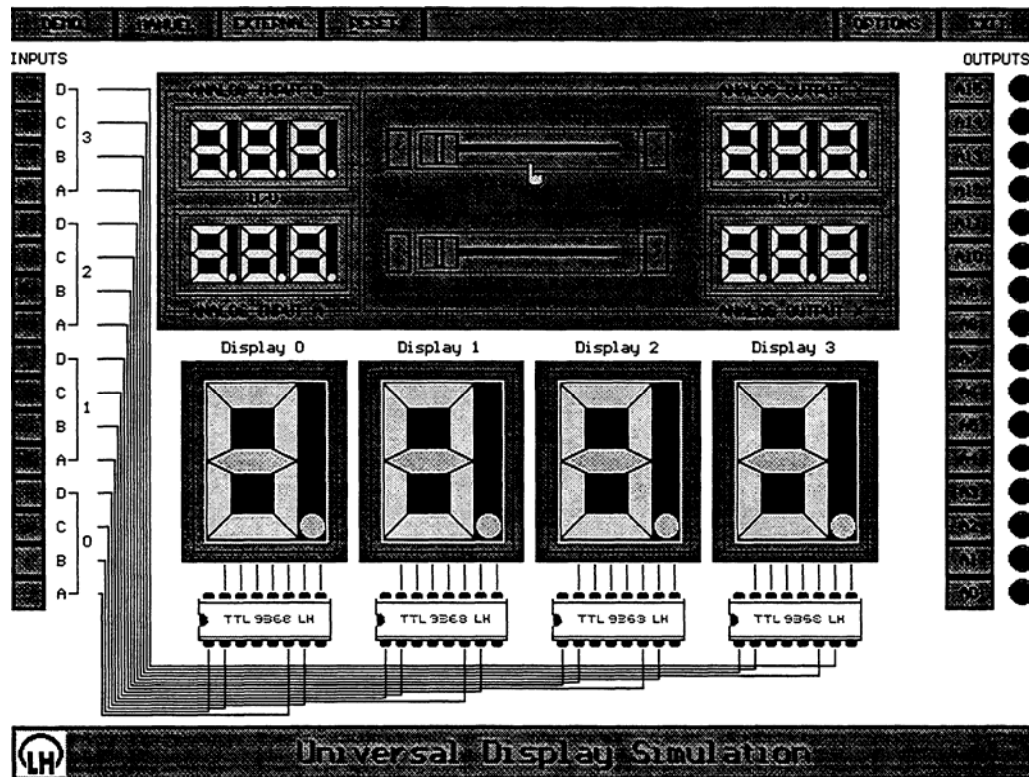
1. $E0 * E1 * E4 = Na$ (* stands for AND, + for OR, Na means: not LED a)
2. $E0 * E5 * E6 = Nb$
3. $E0 * E2 = Nc$
4. $E2 + E3 + E5 + E6 = d$
5. -----
6. -----
7. -----

The statement list or logic chart can be derived directly from these equations.

Now program your PLC or set up a discrete control system with digital modules.

Statement lists for typical control systems and notes on start-up procedures are contained in Chapter 6 of this manual.

2.3 BCD-coded control of a seven-segment display



First check whether the *BCD-code* display mode has been selected in the OPTIONS menu.

The DEMO and MANUAL modes demonstrate how seven-segment displays are controlled.

A logic table for controlling the seven-segment display 0 with a real PLC unit is to be developed in the following.

Exercise:

A PLC unit with 8 digital inputs E0 to E7 is given. At any point in time, only one input supplies a 1-signal. This is to be represented by an appropriate control program on the seven-segment display 0. Inputs A to D of the display are connected via the PC-adaptor to the digital outputs of the PLC. The number coded with the digits A to D appears on the seven-segment display.

The digital inputs of the PLC are connected with the PC-adaptor outputs 0 to 7. They can thus be simulated via switches A00 to A07 on the right edge of the universal display.

Using the DEMO and MANUAL modes, complete the following allocation list:

Input	A	B	C	D
E0	0	0	0	0
E1	1	0	0	0
E2	0	1	0	0
E3	1	1	0	0
E4				
E5				
E6				
E7				

The switching conditions for inputs A to D of the seven-segment display can be read from the table.

Complete the missing equations.

1. $E1 + E3 + E5 + E7 = A$
2. -----
3. -----
4. -----

The statement list or logic chart can be derived directly from these equations.

Now program your PLC or set up a discrete control system with digital modules.

Statement lists for typical control systems and notes on start-up procedures are contained in Chapter 6 of this manual.

2.4 Display and simulation of analog in- and outputs

As already mentioned in Section 1.3. "EXTERNAL mode", this program, in conjunction with the PC-adapter, comprises a complete input simulation and status display for analog voltages between 0 V and 10 V. The analog PC-adapter outputs X and Y are connected with the analog inputs of the PLC, and the analog PC-adapter inputs A and B are connected with the analog outputs of the PLC.

This provides a universal aid for testing and displaying analog voltages during the development of control systems and programs.

The processing of analog values differs from one control program to another and must be referred to in the corresponding manual.