USER MANUAL

Longo programmable controller
LPC-2.DU1 LCD control panel

Version 2

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User Manual

Document Version: 002
July 1, 2012

STANDARDS AND PROVISIONS: Standards, recommendations, regulations and provisions of the country in which the devices will operate, must be considered while planning and setting up electrical devices. Work on 230 VAC network is allowed for authorized personnel only.
DANGER WARNINGS: Devices or modules must be protected from moisture, dirt and damage during transport, storing and operation.
WARRANTY CONDITIONS: For all modules LONGO LPC-2 – if no modifications are performed upon and are correctly connected by authorized personnel – in consideration of maximum allowed connecting power, we offer warranty for 24 months from date of sale to end buyer. In case of claims within warranty time, which are based on material malfunctions the producer offers free replacement. The method of return of malfunctioned module, together with description, can be arranged with our authorized representative. Warranty does not include damage due to transport or because of unconsidered corresponding regulations of the country, where the module is installed.

This device must be connected properly by the provided connection scheme in this manual. Misconnections may result in device damage, fire or personal injury.
Hazardous voltage in the device can cause electric shock and may result in personal injury or death.
NEVER SERVICE THIS PRODUCT YOURSELF!
This device must not be installed in the systems critical for life (e.g. medical devices, aircrafts, etc.).
If the device is used in a manner not specified by the manufacturer, the degree of protection provided by the equipment may be impaired.

Waste electrical and electronic equipment (WEEE) must be collected separately!

LONGO LPC-2 complies to the following standards:

- EMC:EN 61000-6-2 (EN 50082), EN 61000-6-4 (EN 50081)
- LVD: IEC 61131-2
- Vibrations and climatic-mechanical: EN 60068-2-6, EN 60068-2-27, EN 60068-2-29

Smarteh d.o.o. operates a policy of continuous development. Therefore we reserve the right to make changes and improvements to any of the products described in this manual without any prior notice.

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LPC-2.DU1 LCD control panel

1 DESCRIPTION

LPC-2.DU1 control panel (CP) is general purpose operation terminal, capable of displaying 4 lines of text at 17 characters per line. CP is equipped with four touch buttons (TB) for navigating and changing settings. Additionally, CP has built in temperature measurement and light intensity sensor, both available for further processing on MCU. Light intensity measurement is also internally used to adjust LCD intensity (dimming brightness).

Display is built from graphic color LCD display 220 times 176 pixels. Background picture, which contains button descriptions and company logo can be freely customized (e.g. putting in your LOGO). Text color is static and is also freely customizable, each line can be in different color.

LPC-2.DU1 supports menus and scrolling, which needs to be programmed in MCU where control panel is connected.

CP supports displaying custom alphanumeric strings and certain preformatted line outputs for displaying values:

- numeric values (description + value + unit), where value can be up to 5 characters[1] plus sign,
- discrete (description + state) state 0/1 with 5 character alphanumeric state description,
- day time (hh:mm),
- scheduler with 12 steps, with up to 4 values (0/1/2/3) per step.

Using preformatted outputs it is possible to display up to four values (states, settings) per single page.

Security, disabling controls and set points limitations can be programmed on MCU, where LPC-2.DU1 control panel display is driven from.

PC-2.DU1 control panel communicates using Smarteh proprietary protocol and is compatible with Smarteh MCUs marked LPC-2.MCx.

1 Panel displays signed integer (16 bit register), that is ±32767

2 FEATURES

Figure 1: LPC-2.DU1 module

Table 1: Features
4 touch buttons
4 lines for displaying strings, values and settings
Temperature measurement
Light intensity measurement
LCD intensity control
Color LCD with custom selection of line colors and background picture

3 OPERATION

LPC-2.DU1 control panel receives data from MCU line by line and, according to received line number and format selector, displays properly formatted data on certain line of the display.

Some format selectors are used also to allow setting values. Changed values are sent from CP to MCU as input values, allowing programmer to define what to do with the received values. Programer has to decide to write changed value over the old one or just to ignore changed value.

Screen updates are stopped, while operator is changing set points (while CP is in EDIT mode).

Page navigating is only possible when CP is not in EDIT mode. Navigating screens and changing settings can be done with four panel Touch Buttons (TB).

It is advised to press touch-buttons respectively with finger not much faster than 1 press per second.

Press (touch) must be done with whole finger tip. Brief pressing can not activate the action, because of protection against unwanted action, caused by touching CP accidentally.

3.1 Operational modes

Display mode

When CP is connected to MCU and receives data, displayed page is constantly refreshing, showing current states and values. In display mode, touch button sensitivity is low. Display illumination can be dimmed, depending on ambient light.

***Error* mode**

If powered up CP is not communicating to MCU,“ERR” fault sign appear on LCD. When communication is restored, ERR sign disappears.

Set mode

When any of four touch buttons is pressed for a while (approximately for a second), CP switches to SET mode. “SET” sign is displayed at the bottom of the screen. In SET mode touch button sensitivity is high and LCD illumination goes to 100%. CP beeps every time the touch button is pressed. Navigating through pages and changing to EDIT mode is possible. CP will exit SET mode when no button is pressed for approximately 3 seconds.

Edit mode

EDIT mode is used for setting values (set points) and to issue commands. Pressing edit (🔧) button while in SET mode changes mode to EDIT. When CP is in EDIT mode, pointer (◀) appears on the right edge of the display, marking currently selected text line. Using up (Δ) or down (∇) buttons wanted line can be selected. Pressing edit (🔧) button again, pointer becomes empty (◁) and cursor appears (_), allowing editing value using up (Δ) or down (∇) buttons. Cursor (_) can be further moved to the right by repeatedly pressing edit (🔧) button. Editing value using up (Δ) or down (∇) buttons is possible. Displayed data is not refreshing during EDIT mode, and also navigating through screens is not possible. To exit EDIT mode (◀) press OK (✔) button. Press OK (✔) button twice if pointer is empty (◁). On exiting EDIT mode, new value is sent to MCU.

3.2 Communication principles

Communication between CP and MCU is based on exchanging series of words (16 bit). In this manual communication is treated from the point of view of the MCU. The OUT (output) variables in the MCU contains output data to be displayed on the CP. The IN (input) variables in the MCU contains data that is received from CP (e.g. new setting for set-point).

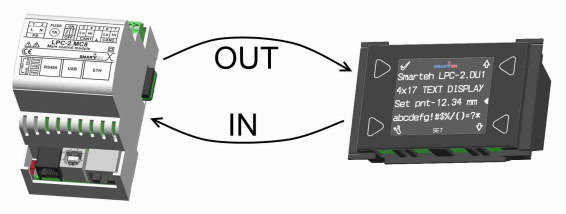


Figure 2: Communication principle

3.3 Communication specification

Note: For driving the display function block is provided in LPC Manager software. Please refer to LPC Manager documentation for further information.

Following description is provided to explain principle of driving CP and to allow programming of custom functionality of the CP.

Data exchange between MCU and CP is realized through data strings interchange. Data format is defined as follows.

3.3.1 OUT string format tables

OUT string sent from MCU to CP is always 22 bytes long, consisting of 17 ASCII characters to display, followed by 1 additional byte (for internal use of CP), format selector byte, line selector byte and 2 bytes containing value (16 bit) to be displayed.

Table 4: OUT string

Consecutive byte #	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Output to CP	**W**	**R**	**I**	**T**	**E**	**-**	**T**	**O**	**-**	**D**	**I**	**S**	**P**	**L**	**A**	**Y**	**!**	**x**	**FS**	**LS**	**H**	**L**
Content of the byte							message.	alphanumeric	displayed as	text to be	ASCII codes of	bytes contain	This range of					Internally used	Format Selector	Line Selector	Variable HIGH	Variable LOW

Table 5: OUT string control parameter description

Parameter	Description	Allowed range
FS - format selector	Defines format of displayed text and variable, if any. See below.	0 .. 8 & 102 .. 108
LS – line selector	Line on the LCD, where current string is to be displayed.	0 .. 3
H - variable high byte L - variable low byte	These two bytes represent 16 bit word, containing variable value to be displayed in signed integer format.	-9999 .. 9999 (for FS=2 and 102: -32767 .. 32767)

Variable (H & L) is in signed integer format (16 bits); high byte “H” and low byte “L” together behaves as a word. Regardless of decimal places displayed, variable is always integer. For displaying temperature 20,6°C with one decimal place using FS=3, integer value of 206 needs to be sent to CP.

Table 6: OUT string format sselector definition

FS - Format selector definition			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FS	DISPLAY SAMPLE	Edit[2]	-	A	S	C	I	I	-	S	T	R	I	N	G	-	-	-	-	x	FS	LS	H	L
0	**Empty string** - displays spaces only in selected line, ASCII string* and values* are neglected																							
	[null output]	no	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	***0***	***0***	***0***	*	*
1	**String only** - displays 17 characters of alphanumeric text, value is not displayed, beep[3]																							
	[ABCDEFGHIJKLMNOPQ]	no	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	***0***	***1***	***0***	***0***	***1***
2	**String & value** (±32767) & **unit** - 7 characters of text, 6 characters for value, 4 characters for unit																							
	[ABCDEFG-32767HIJK]	no	A	B	C	D	E	F	G	-	0	0	0	0	0	H	I	J	K	***0***	***2***	***0***	***128***	***1***
3	**String & value** (±9999) with **one decimal place** & **unit** - 7 char. of text, 6 char. for value, 4 char. for unit																							
	[ABCDEFG-999.9HIJK]	no	A	B	C	D	E	F	G	-	0	0	0	.	0	H	I	J	K	***0***	***3***	***0***	***216***	***241***
4	**String & value** (±9999) with **two decimal places** & **unit** - 7 char. of text, 6 char. for value, 4 char. for unit																							
	[ABCDEFG-99.99HIJK]	no	A	B	C	D	E	F	G	-	0	0	.	0	0	H	I	J	K	***0***	***4***	***0***	***216***	***241***
5	**String & value** (±9999) with **three decimal places** & **unit** - 7 char.of text, 6 char.for value,4 char.for unit																							
	[ABCDEFG-9.999HIJK]	no	A	B	C	D	E	F	G	-	0	.	0	0	0	H	I	J	K	***0***	***5***	***0***	***216***	***241***
6	**String & value** (±9999) in **time format** - 7 char. of text, 1 space, 5 char. for value, 4 char. for units																							
	[ABCDEFG 99:99HIJK]	no	A	B	C	D	E	F	G		0	0	:	0	0	H	I	J	K	***0***	***6***	***0***	***39***	***15***
7	**Schedule (12 steps) with 4 levels (0 .. 3)** - 5 characters of text, 12 schedule settings (0 .. 3)																							
	[ABCDE_▄▀▀▄_▀_▄_▄]	no	A	B	C	D	E	***0***	***1***	***2***	***3***	***2***	***1***	***0***	***3***	***0***	***2***	***0***	***1***	***0***	***7***	***0***	*	*
8	**String & state (0 .. 1)** - 7 char. of text, 5 char. for “0” description, 5 char. for “1” descript., 2 bytes state																							
	[ABCDEFG ... ON]	no	A	B	C	D	E	F	G	O	F	F				O	N			***0***	***8***	***0***	***0***	***1***
102	**String & value** 0	yes	Same as FS = 2																					
103	**String & value** 0.0	yes	Same as FS = 3																					
104	**String & value** 0.00	yes	Same as FS = 4																					
105	**String &value** 0.000	yes	Same as FS = 5																					
106	**String & time** 00:00	yes	Same as FS = 6																					
107	**Schedule**_▄▀▀▄_▀_▄_▄	yes	Same as FS = 7																					
108	**String & state** 1/0	yes	Same as FS = 8																					
208	**String & state & beep**	no	Same as FS = 8, beep[3]																					

Please note for byte(s) content: large letters and numbers represents ASCII characters of byte value, while small italic numbers represents byte value in decimal format (0-255).

2 Editing of displayed value is possible if “yes”, with selected FS (format selector), using CP touch buttons.
3 To control sound use variable value 1 to enable beep and value 0 to disable beep.

3.3.2 IN string format tables

Input string is received from CP, by the MCU. When values are just displayed (no currently editing values by the user), input string contains measured values and copy of output data, previously sent from MCU. When user changes the value, input string contains new (edited) value(s) of data. Editing values is only allowed for lines, where selected FS (format selector) is 102 .. 108.

IN string is 22 bytes long, consisting of: two bytes for CP state (bit) values, two bytes for measured temperature value in 1/100 °C, two bytes for light intensity value in scale 1 ..100, 12 bytes schedule data (if schedule format is selected), 2 bytes for FS (format selector) & LS (line selector) and last 2 bytes containing value. Last two bytes will contain copy of the value or new, edited value, if value is changed using CP.

Table 7: IN string

Consecutive byte #	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Input from CP	D1	D2	TH	TL	0	LI	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	FS	LS	H	L
Content of the byte (s)	Communication status	Touch buttons pressed	Temperature high byte	Temperature low byte	Light intensity (always 0)	Light intensity measured	range.	schedule are in this	also edited values for	selected FS is 7 or 107,	schedule values, when	OR	writing to display.	codes as reply to	contain part of ASCII	This range of bytes			Format Selector	Line Selector	Variable HIGH	Variable LOW

Table 8: IN string control parameter description

Parameter	Description	Range
D1 – communication status	bit 2,3,4,5,6,7 – not used bit 0 - Communication active – internally used LSB	0/1
D2 – Touch buttons pressed	Bit 7 – Display in EDIT MODE (no button feedback on bit 0 to bit 3) bit 4, 5, 6 – not used bit 3 – EDIT (🔧) button pressed (pulse for 0,5 s, when pressed) bit 2 – OK (✔) button pressed (pulse for 0,5 s, when pressed) bit 1 – DOWN (∇) button pressed (pulse for 0,5 s, when pressed) bit 0 – UP (Δ) button pressed (pulse for 0,5 s, when pressed)	0/1
TH - Temperature TL - measurement	Ambient temperature measurement range is limited to 0 .. 40°C	0 .. 4000 (1/100°C)
0 - Light intensity LI - measurement	Light sensor gives proportional output, 0 = dark, 100 = well illuminated room (not to be placed under direct sunlight)	0 .. 100
I1 to I12 – text copied or schedule data	When schedule data is changed (FS=107), these 12 bytes contain 12 consecutive schedule settings. *Please note, that schedule IN data is shifted, comparing to OUT*	0 .. 3
FS – format selector	Copy of FS from OUT string (written to CP). FS>100 allows edit.	0 .. 8 & 102 .. 108
LS – line selector	Copy of LS from OUT string – defines current line activity on CP	0 .. 3
H - variable high byte L - variable low byte	Returns value copied from OUT string, if not edited or edited (new) value in case of editing (changing) values.	-9999 .. 9999 (for FS=2 and 102: -32767 .. 32767)

Part of IN string content is always the same, regardless to the LS and FS used: statuses (D1, D2), measured temperature (TH, TL) and light intensity measurement (0, LI) are always transferred to MCU.

Variables and measurements are in integer format (word: 16 bits) contained in “H” high byte and “L” low byte. When changing data, IN string contains data string of changed (edited) line, which is NOT necessary same as currently written (OUT) line from MCU.

Table 6: IN string format selector definition

INPUT string description			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FS	Editable from CP	Edit[4]	D1	D2	TH	TL	0	LI	I1	I2	I3	I4	I5	I6	I7	I8	I9	10	11	12	FS	LS	H	L
0	**Empty string** - displays spaces only – returns buttons pressed and measured temperature and light																							
	No settings allowed	no	***1***	***0***	***8***	***152***	***0***	***91***	*	*	*	*	*	*	*	*	*	*	*	***0***	***0***	***0***	***0***	***0***
1	**String only** - displays 17 characters of text – returns buttons pressed and measured temperature and light																							
	No settings allowed	no	***1***	***0***	***8***	***152***	***0***	***91***	G	H	I	J	K	L	M	N	O	P	Q	***0***	***1***	***0***	***0***	***0***
2 to 6	**String & value** (±32767) – returns buttons pressed, temperature, light and value (H, L)																							
	No settings allowed	no	***1***	***0***	***8***	***152***	***0***	***91***	G	-	0	0	.	0	0	H	I	J	K	***0***	***4***	***0***	***216***	***241***
7	**Schedule -** returns buttons pressed, temperature, light and schedule values																							
	No settings allowed	no	***1***	***0***	***8***	***152***	***0***	***91***	***0***	***1***	***2***	***3***	***2***	***1***	***0***	***3***	***0***	***2***	***0***	***1***	***7***	***0***	*	*
8 and 208	**String & state -** returns buttons pressed, temperature, light and state 0 .. 1																							
	No settings allowed	no	***1***	***0***	***8***	***152***	***0***	***91***	G		O	F	F			O	N			*0*	***8***	***0***	***0***	***1***
102 to 106	**String & value** (±32767) – returns buttons pressed, temperature, light and edited value (H, L)																							
	[ABCDEFG-99.98HIJK]	yes	***1***	***0***	***8***	***152***	***0***	***91***	G	-	0	0	.	0	0	H	I	J	K	*0*	***104***	***0***	***216***	***240***
107	**Schedule -** returns buttons pressed, temperature, light and edited schedule settings (12 bytes)																							
	[ABCDE]	yes	***1***	***0***	***8***	***152***	***0***	***91***	***0***	***1***	***2***	***3***	***2***	***1***	***0***	***3***	***0***	***2***	***0***	***1***	***107***	***0***	*	*
108	**String & state -** returns buttons pressed, temperature, light and edited state 0/1																							
	[ABCDEFG ... ON]	yes	***1***	***0***	***8***	***152***	***0***	***91***	G		O	F	F			O	N			*0*	***108***	***0***	***0***	***1***

Please note for byte(s) content: large letters and numbers represents ASCII characters of byte value, while small italic numbers represents byte value in decimal format (0-255). Shown underlined on the left is line display sample, which can be EDITed, on the right side (also underlined) are marked, also underlined, changed values sent back to MCU as IN string.

3.3.3 Communication example

MCU is sending (OUT) string to CP - one single line per single communication data exchange and receives “reply” from CP as input (IN) string – also single line input per communication exchange. In this example we want to display following page:

1st line: Temper. regulation

2nd line: T_actua 30.7°C (actual temperature)

3rd line: T_setpt 30.0°C (current temperature setpoint)

4th line: OUTpump 69.4 % (regulator output – cooling pump power)

MCU program application needs to prepare OUT string for (i.e. first) line and send it to CP. When replied (IN) string confirms that line is processed by CP, next line can be sent.

4 Editing of displayed value is possible using CP touch buttons, when selected FS (format selector) is 102 .. 108.

In case, when operator changes a value using CP, CP returns status “EDIT mode” D1:bit0=1. When setting on CP is done and EDIT mode exited, EXIT status bit is reset to 0 and CP returns new (edited) value, along with line and format selector of changed (edited) line.

It is programer's job to correctly handle changed settings, using LS and FS bytes, being contained in IN string.

Display driving and setpoint control flow chart

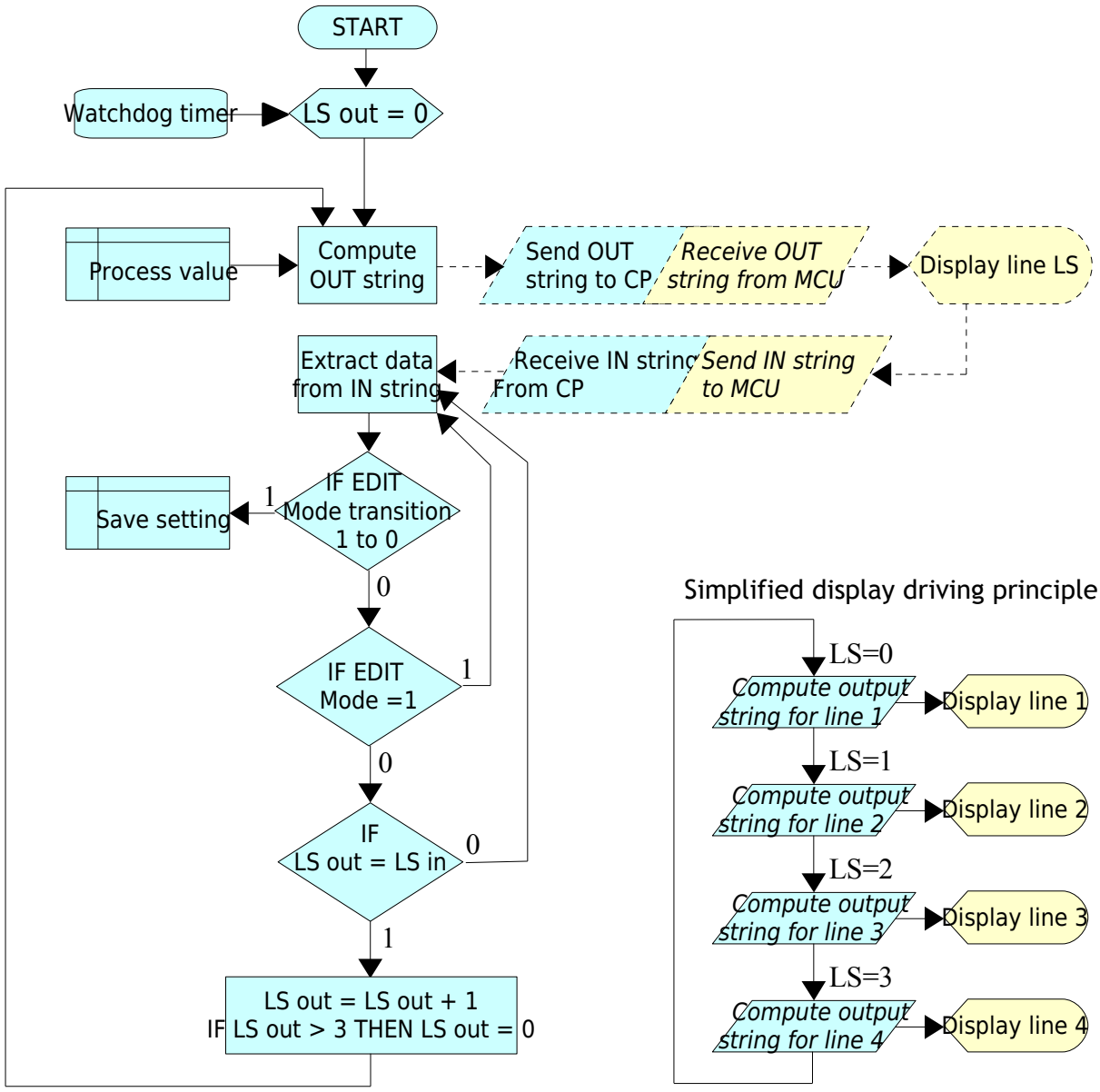


Figure 3: Display driving principle

Detailed content of OUT and IN strings for displaying example page follows.

Table 7: strings for displaying example page

Step	OUT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	OUT spec.
		-	A	S	C	I	I	-	S	T	R	I	N	G	-	-	-	-	x	FS	LS	H	L	
1	OUT string		L	E	V	E	L		R	E	G	U	L	A	T	I	O	N						ASCII char.
MCU →CP	for line 1	32	76	69	86	69	76	32	82	69	71	85	76	65	84	73	79	78	0	1	0	0	0	Byte value
2	IN string								R	E	G	U	L	A	T	I	O	N						ASCII char.
MCU← CP	for line 1	1	0	8	172	0	93	32	82	69	71	85	76	65	84	73	79	78	0	1	0	0	0	Byte value
3	OUT string	H		a	c	t	u	a		0	0	0	.	0		m	m							ASCII char.
MCU →CP	for line 2	72	95	97	99	116	117	97	32	48	48	48	46	48	32	109	109	32	0	3	1	1	51	Byte value
4	IN string							a		0	0	0	.	0		m	m							ASCII char.
MCU← CP	for line 2	1	0	8	172	0	93	97	32	48	48	48	46	48	32	109	109	32	0	3	1	1	51	Byte value
5	OUT string	H		s	e	t	ɒ	t		0	0	0	.	0		m	m							ASCII char.
MCU →CP	for line 3	72	95	115	101	116	112	116	32	48	48	48	46	48	32	109	109	32	0	103	2	1	45	Byte value
6	IN string							t		0	0	0	.	0		m	m							ASCII char.
MCU← CP	for line 3	1	0	8	172	0	93	116	32	48	48	48	46	48	32	109	109	32	0	103	2	1	45	Byte value
7	OUT string	O	U	T	ɒ	u	m	ɒ		0	0	0	.	0		%								ASCII char.
MCU →CP	for line 4	79	85	84	112	117	109	112	32	48	48	48	46	48	32	37	32	32	0	3	3	2	182	Byte value
8	IN string							ɒ		0	0	0	.	0		%								ASCII char.
MCU← CP	for line 4	1	0	8	172	0	93	112	32	48	48	48	46	48	32	37	32	32	0	3	3	2	182	Byte value
Step	IN	D1	D2	TH	TL	0	LI	I1	I2	I3	I4	I5	I6	I7	I8	I9	10	11	12	FS	LS	H	L	IN spec.

Note: IN string contains: D1=1 (comm. OK), D2=0 (no touch-buttons pressed), TH=8, TL=172 (measured temperature in 16 bit integer format contains 2220, meaning 22,2 °C), LI =93 (light intensity 93%).

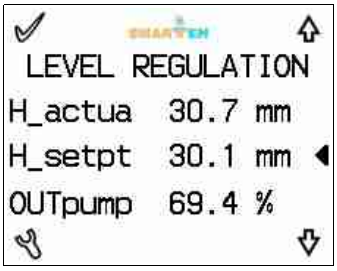


Figure 4: Example page layout on the LPC-1.DU1 screen.

3.3.4 Navigating through pages on CP

Navigating pages on the CP is realized on the MCU, by changing content of the OUT strings. It is advised to program internal up/down counter, which is increased/decreased based on detection of up (Δ) and down (∇) buttons (using byte D2: bits 0 and 1). Content of the OUT strings should be based on the counter value then.

To navigate through screens, cursor (◀,◁) on the right side of the lines must be absent. Cursor (◀,◁) can be switched off by pressing OK (✔) button. When panel is in SET mode, navigating through screens can be realized by pressing right up (Δ) or right down (∇) button respectively.

3.4 CP parameters description

3.4.1 Character table

On the LPC-2.DU1 supported ASCII characters are from 32 to 126, from 128 to 138 there are some nonstandard characters, which can be also used on the CP.

Figure 5: Supported characters on the LPC-1.DU1 screen.

3.4.2 Customization of the display

For customization of the LPC-2.DU1 display PC software tool is provided, called “LCD Composer”. We advise to use Smarteh's “USB to serial adapter“ LSA-2.USB, which has needed RS-485 port and built in power supply to power up the CP, while transferring customization.

Background picture, which contains button descriptions and company logo can be freely customized. Graphic color LCD display resolution is 220 times 176 pixels, as is the size of the background picture in BMP format. Text color is also customizable, each line can be in different color.

It is advisable to use same background color over all areas of the display. To have good looking background, color of background needs to match the color of text background, which is defined in LPC Composer.

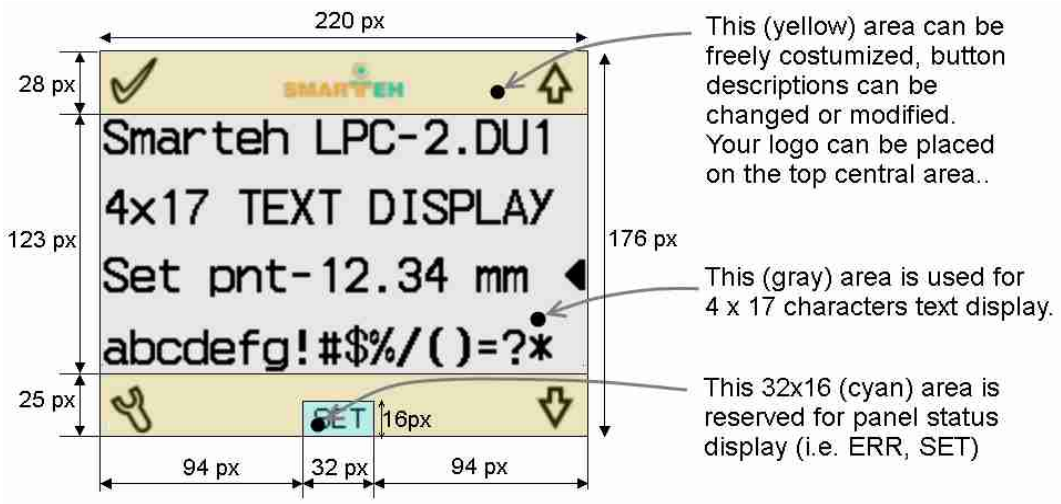


Figure 6: Customization area of LPC-1.DU1 background picture.

Background picture can be customized using any picture editing software (e.g. Paint) supporting BMP format.

It is good practice to open original LCD composer file *.lcddata and immediately save it under new name. Custom background picture can be imported using LCD Composer, colors for text needs to be defined for each line (4). Representation of colors is 15 bits, having 5 bits per single (R,G,B) color. For converting colors, defined in LCD Composer from RGB use following table:

Table 8: strings for displaying example page

color	R (red)	G (green)	B (blue)
Color components range for LCD Composer	0 .. 31	0 .. 31	0 .. 31
24 bit RGB color components range	**R: 0 .. 255**	**G: 0 .. 255**	**B: 0 .. 255**
Conversion of color components from RGB 24bit to LCD composer 15bit	R / 8	G / 8	B / 8
Calculating color value for LCD composer based on RGB 24 bit (Fore color and Back color)	Color code = 1024 * R/8 + 32 * G/8 + B/8		

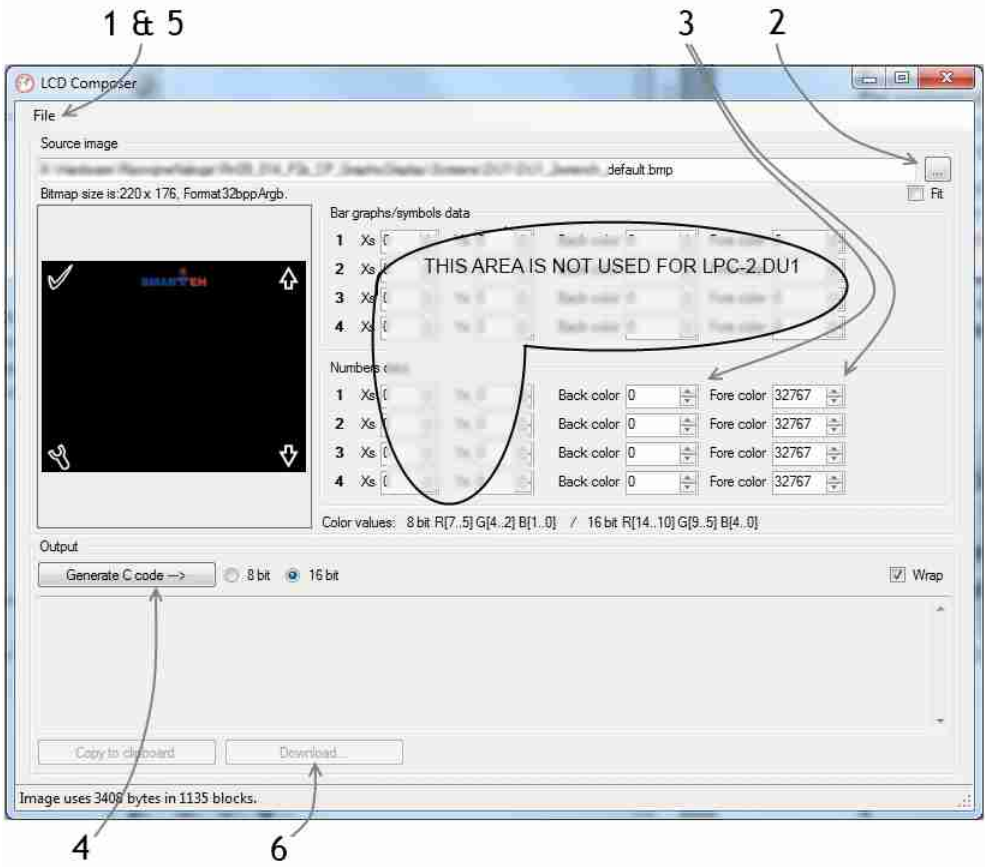


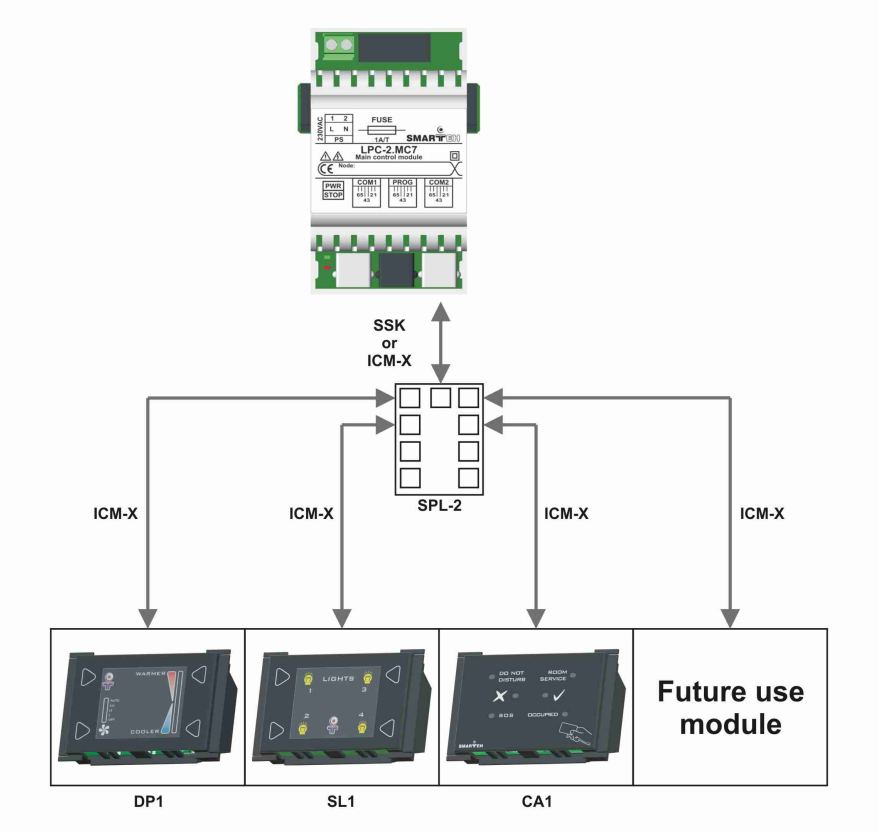
Figure 7: LCD Composer screen

1 Open original LCD composer file *.lcddata and save it under new name.
2 Import custom background bitmap.
3 Set colors of text and text background for each line, based on previous table.
4 Generate code.
5 Save result.
6 Download customization (first disconnect CP, then click “Download”, after clicking download, reconnect it in 5 seconds to start download).

4 INSTALLATION

4.1 Connection scheme

Figure 8: Connection scheme



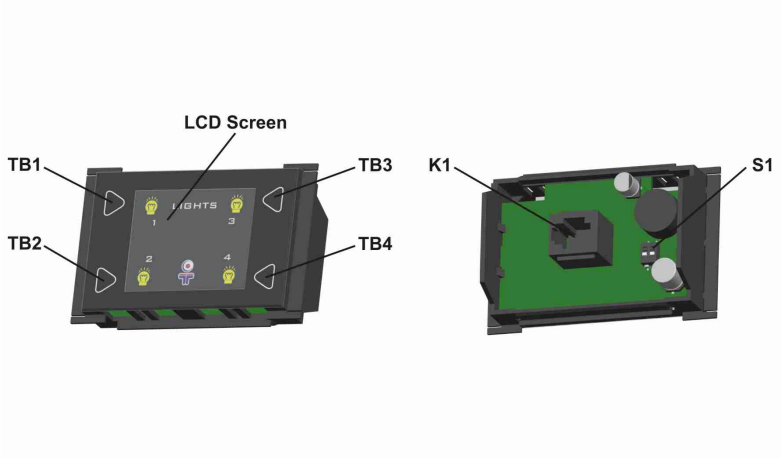
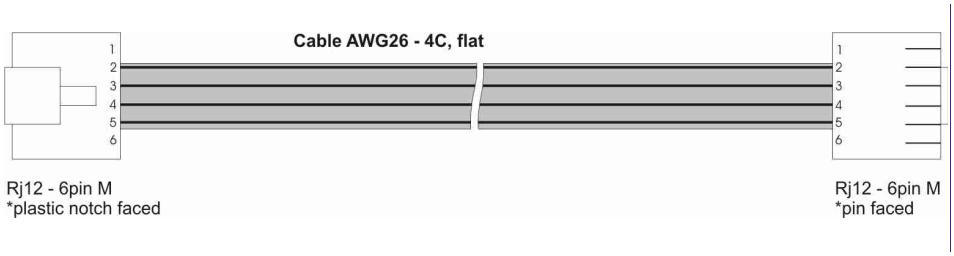


Table 9: K1		
K1.1	GND	Ground
K1.2	7- 30 VDC	Power supply input
K1.3	Standard RS485 A	Data receive/send line A
K1.4	Standard RS485 B	Data receive/send line B

Table 10: LCD Buttons		
TB1 (Up-left)	✔	OK touch button
TB2 (Down-left)		EDIT touch button
TB3 (Up-right)	Δ	Up touch button
TB4 (Down-right)	∇	Down touch button

Table 11: S1		
RS485 ADDRESS	**Switch 1**	**Switch 2**
0	OFF	OFF
1	OFF	ON
2	ON	OFF
3	ON	ON

Interconnection cable can ordered from Smarteh or terminated on site, considering wiring scheme bellow:



Interconnection cable ICM-X

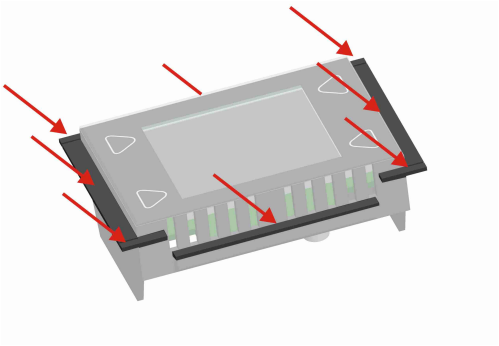
4.2 Mounting frame selection

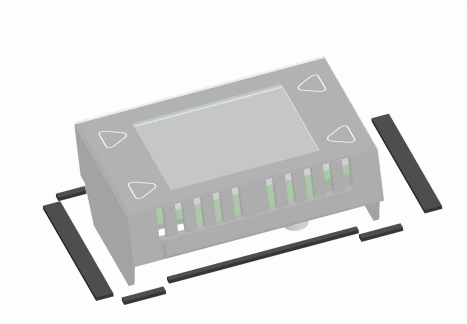
Smarteh has verified following lines to be compatible with LPC-2.DU1 module:

- Bticino – Living, Light
- Gewiss – Playbus, System
- Vimar – Plana, Idea
- Tem – Modul Soft, Modul Line
- Ave
- Master

Frames of other vendors most probably suits as well, but they were not verified by Smarteh. Before installation verify compatibility of non listed frames.

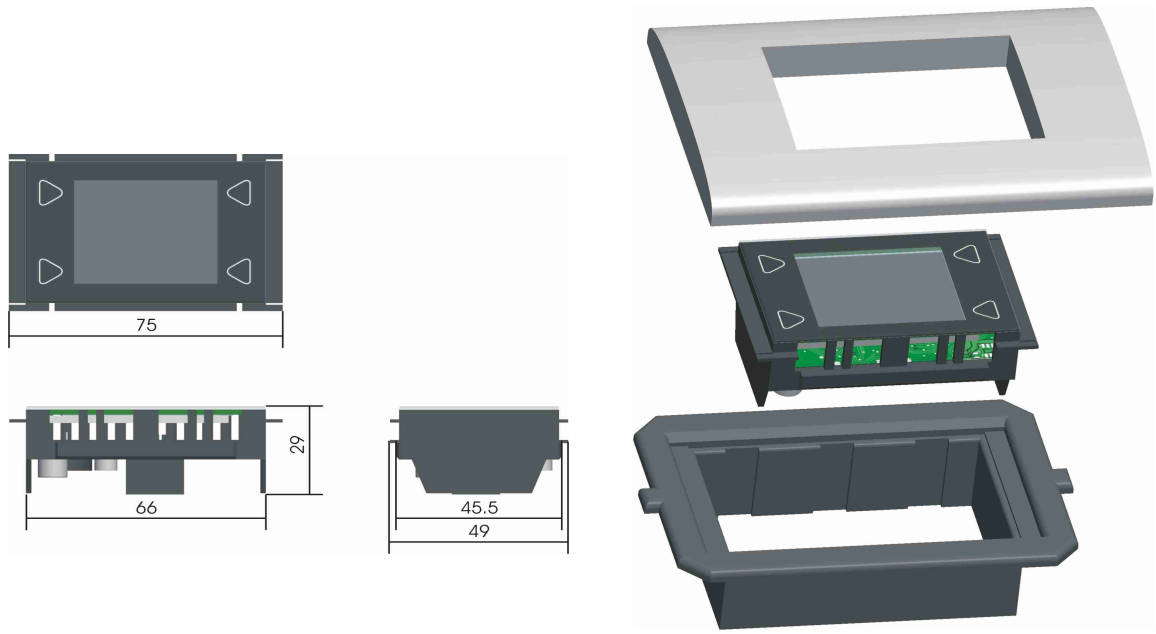
Module housing has a fin on each side, which can be easily removed with knife cutter or pliers. This adaptation enables housing to be build in various frame formats with two different depths. With regard to frame used you may remove fin for housing to fit in.





4.3 Mounting instructions

Figure 9: Housing dimensions



- Dimensions in millimeters.

All connections, module attachments and assembling must be done while module is not connected to the main power supply.
Module should be positioned in the wall inside of the room. Avoid direct sunlight or positioning near heating/cooling source object.
Usage of cover frames and holders made of metal, could cause the decreased performance of touch buttons
Recommended installation height is 1,5 m above floor level.

1. Set the correct RS485 address (S1 switch) for LPC-2.DU1 (refer to the Table 4).
2. Connect interconnection cable to the connector K1. Max. allowed tensile force is 30 N.
3. Put the LPC-2.DU1 in mounting frames
4. Cover LPC-2.DU1 with cover plate

LPC-2.DU1 is connected to the main control unit with interconnection cable (e.g., SSK, ICM-7) which must be ordered together with LPC-2.DU1 module. When more modules (e.g., LPC-2.CR1, LPC-2.CH1, LPC-2.DP2 or up to four LPC-2.DU1) are connected to main control unit, splitter (e.g., SPL-2) is also required (Figure 2).

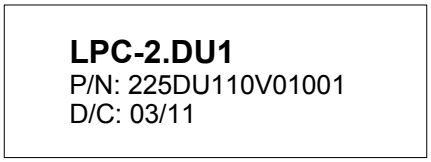
Module address on RS485 network is set with DIP switch on the back of the module (Table 4).

NOTE: Signal wires must be installed separately from power and high voltage wires in accordance with general industry electrical installation standard.

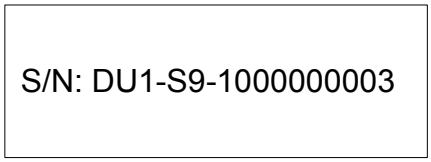
4.4 Module labeling

Figure 10: Labels

Label 1:



Label 2:



Label 1 description:

- **LPC-2.DU1** is the full product name
- P/N: 225DU110V01001 is the part number
  - 225 – general code for LPC-2 product family,
  - DU1 – short product name,
  - 11 – year of code opening
  - V - denotes flush frame mounting module
  - 01 – derivation code
  - 001 – version code (reserved for future HW and/or SW firmware upgrades).
- D/C: 03/11 is the date code.
  - 03 – week and
  - 11 – year of production

Label 2 description:

- S/N: DU1-S9-0900000003 is the serial number.
  - DU1 – short product name,
  - S9 – user code (test procedure, e.g. Smarteh person xxx),
  - 11 – year (last two cyphers)
  - 00000003 – current stack number; previous module would have the stack number 00000002 and the next one 00000004

5 TECHNICAL SPECIFICATIONS

Table 5: Technical specifications	
Power supply	from MCU
Interconnection connector type	RJ12 6/6
Power consumption	1 W
Dimensions (W x H x D)	75 x 49 x 29 mm
Weight	50 g
Maximum altitude	2000 m
Mounting position	horizontal
Ambient temperature	0 to 50 °C
Ambient humidity	max. 95 %, no condensation
Transport and storage temperature	-20 to 60 °C
Protection class	IP 20

6 CHANGES

The following table describes all the changes to the document.

Date	V.	Description
1.7.2012	002	CGP General Update.
2.4.2011	001	The initial version, issued as *LPC-2.DU1 module UserManual*.

7 NOTES