USER MANUAL

Longo programmable controller
LPC-2.U01
Universal Peripheral module

Version 3

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User Manual

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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 100 .. 240 V AC 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, warranty of 24 months is valid from the date of sale to the end buyer, but not more than 36 months after delivery from Smarteh. 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 61000-6-3:2007 + A1:2011, EN 61000-6-1:2007, EN 61000-3-2:2006 + A1:2009 + A2: 2009, EN 61000-3-3:2013
- LVD: IEC 61010-1:2010 (3rd Ed.), IEC 61010-2-201:2013 (1st Ed.)

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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Index

Longo programmable controller LPC-2.U01

1 ABBREVIATIONS

LED	Light emitting diode
UART	Universal asyncronous receiver/transmitter
TTL	Transistor-transistor logic
PWR	Power
ERR	Error
TX	Transmit
RX	Receive
DIP	Dual in-line package

2 DESCRIPTION

LPC-2.U01 universal periheral module is used for interface to dedicated devices such as switches and switch boards, signal LEDs or/and simple UART communication. Module is on one side connected to the main module which provides power supply and on the other side to the dedicated device. Parameters can be viewed and set with Smarteh IDE.

LPC-2.U01 universal periheral module supports up to 8 TTL digital outputs or inputs, additional 8 TTL digital inputs, UART TTL receive input and UART TTL transmit output.

3 FEATURES

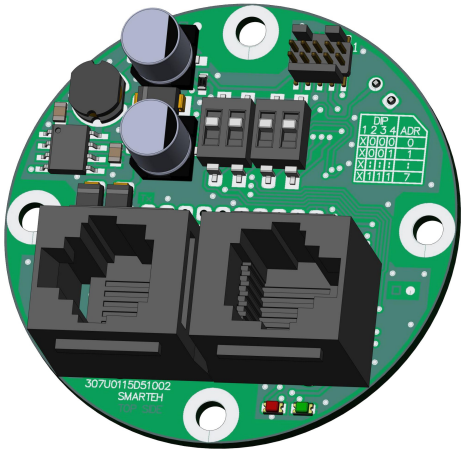


Figure 1: LPC-2.U01 module.

Table 1: Features
8 TTL digital inputs or outputs, pull-down configuration
8 additional TTL digital inputs, pull-down configuration
UART TTL receive and UART TTL transmit communication
Over voltage, under voltage and short current protection
Small overall dimensions
2 diagnose LED

4 OPERATION

Module inputs can be read and outputs can be written via Smarteh IDE software. In addition, UART receive frame can be received to the module from the dedicated device and UART transmit frame can be transmitted from the module to the dedicated device.

4.1 Operational modes

Normal
Communication with the main module is working. Only green "PWR" LED is turned on.

Error
In case of communication fault, red "ERR" LED will turn on.

4.2 Parameters

If parameter is set to logical "1", is considered to be active, enabled, set or TTL voltage high. If parameter has logical value "0" is considered to be inactive, disabled, cleared or TTL voltage low.

Parameter can be command or feedback, status. When parameter is marked as feedback, status it means that LPC-2.U01 is sending information to the main module. On the other hand, command represents request from main module to the LPC-2.U01.

Command:

U0x_1_DO_1 .. U0x_1_DO_8: Controls TTL digital voltage on pin UIO1 .. UIO8.

U0x_1_DO_9 .. U0x_1_DO_16*:* Enables fade effect on pins UIO1 .. UIO8, e.g. setting U0x_1_DO_9 .. U0x_1_DO_16 to logical "1" enables fade-in and fade-out effect on pin UIO1 .. UIO8. Both fade-in and fade-out effect has a duration of 500 ms.

U0x_1_OutWord_1 .. U0x_1_OutWord_10: Used for TTL digital output Tx data to the dedicated device.

Feedback, status[1]*:*

U0x_1_DI_1 .. U0x_1_DI_8: Reads TTL digital voltage on pin *UIO1 .. UIO8*.

U0x_1_DI_9 .. U0x_1_DI_16: Reads TTL digital voltage on pin DI9 .. DI16.

U0x_1_InWord_1 .. U0x_1_InWord_10: Used for TTL digital input Rx data from the dedicated device.

1 TTL digital voltage on pins UIO1 .. UIO8 and DI9 .. DI16 is sampled approximately every 50 ms, but will forward the data to the main module every 200 .. 500 ms.

4.3 UART communication with dedicated devices

UART specification:

19200 bps / 8 data bits / 1 stop bit / no parity bit

Tx frame: Tx frame is sent from LPC-2.U01 to the dedicated device approximately every 200 .. 500 ms. LPC-2.U01 repacks data U0x_1_OutWord_1 .. U0x_1_OutWord_10 that it receives from the main module and adds ASCII character 'S' to the beginning and ASCII character 'E' to the end of data. The following data frame is than transmitted to the dedicated device:

Smarteh IDE name		U0x_1_OutWord_1 .. U0x_1_OutWord_10																				
Word		W_1		W_2		W_3		W_4		W_5		W_6		W_7		W_8		W_9		W_{10}		
Byte	'S'	B_0	B_1	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9	B_{10}	B_{11}	B_{12}	B_{13}	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	'E'
Offset	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

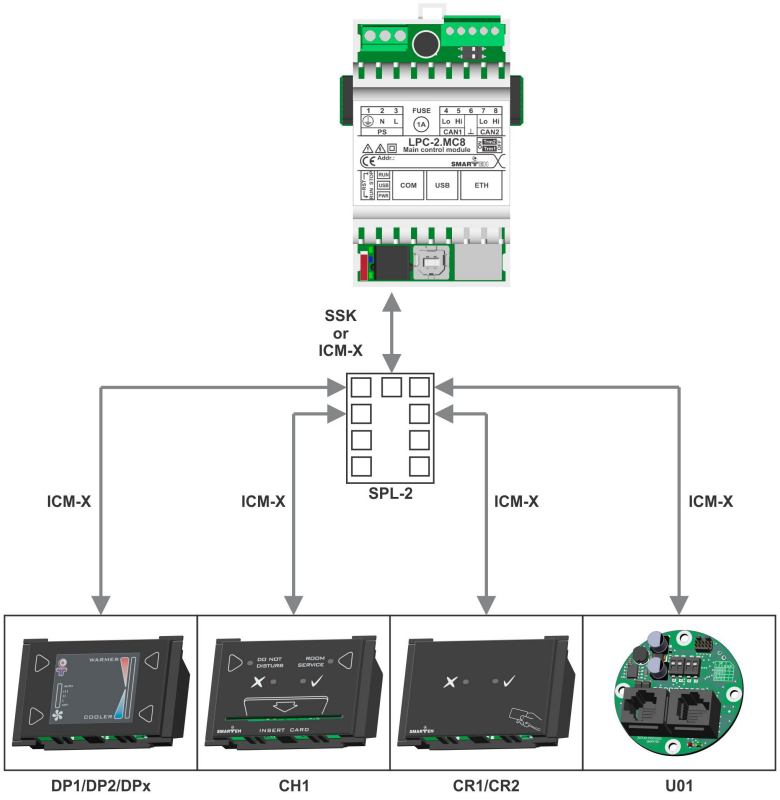
Rx frame: RX frame is sent from LPC-2.U01 to the dedicated device. LPC-2.U01 is capable of receiving the data from the external device with minimum period of 50 ms, but will forward the data to the main module approximately every 200 .. 500 ms. LPC-2.U01 will recognize valid data only, if the following data frame is received inside 20 ms:

Smarteh IDE name		U0x_1_InWord_1 .. U0x_1_InWord_10																				
Word		W_1		W_2		W_3		W_4		W_5		W_6		W_7		W_8		W_9		W_{10}		
Byte	'S'	B_0	B_1	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9	B_{10}	B_{11}	B_{12}	B_{13}	B_{14}	B_{15}	B_{16}	B_{17}	B_{18}	B_{19}	'E'
Offset	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

5 INSTALLATION

5.1 Connection scheme

Figure 2: Connection scheme to main module



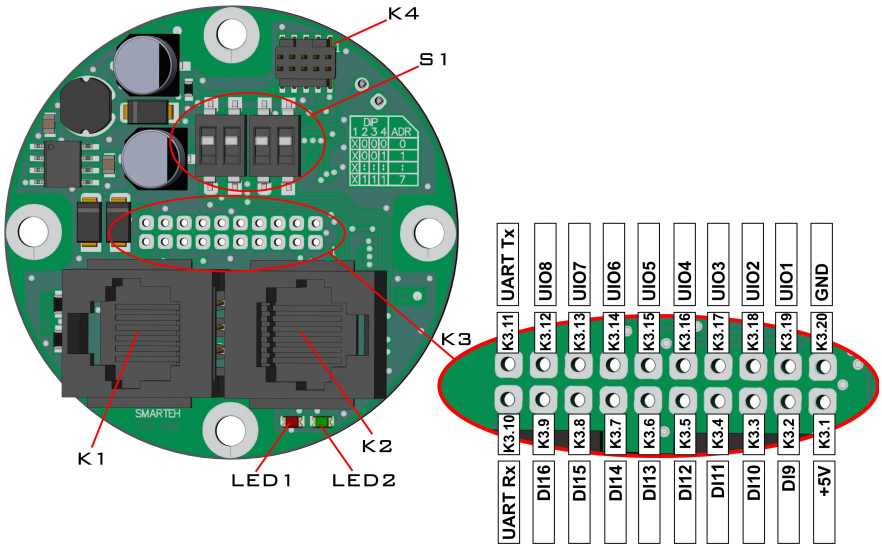


Figure 3: Block diagram

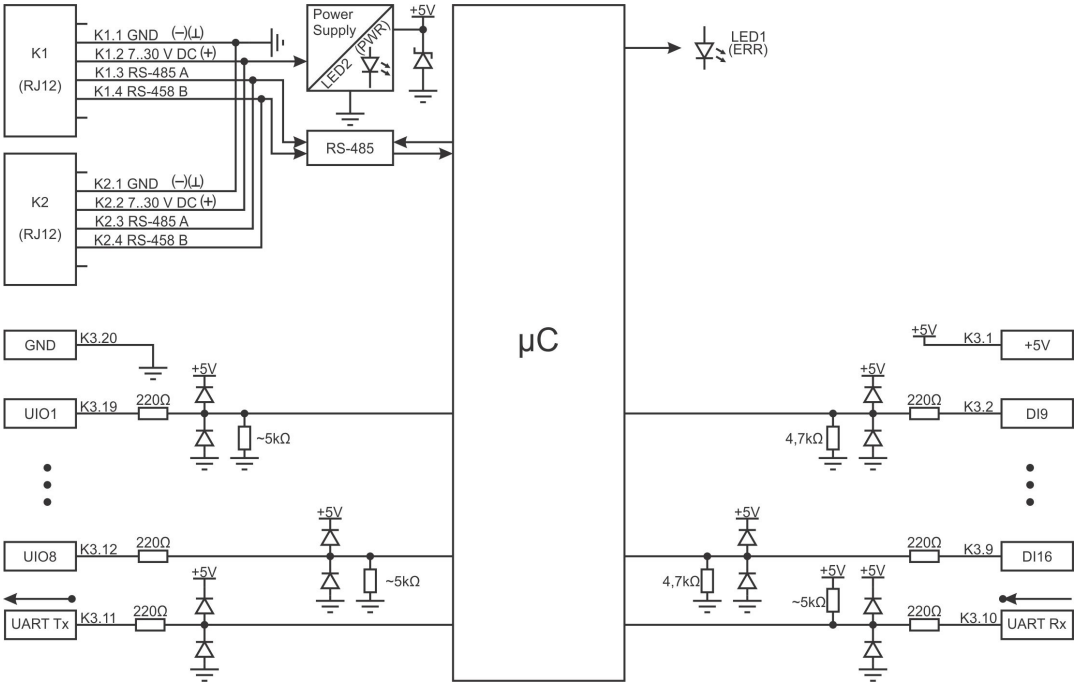


Figure 4: Connection scheme for switches & loads

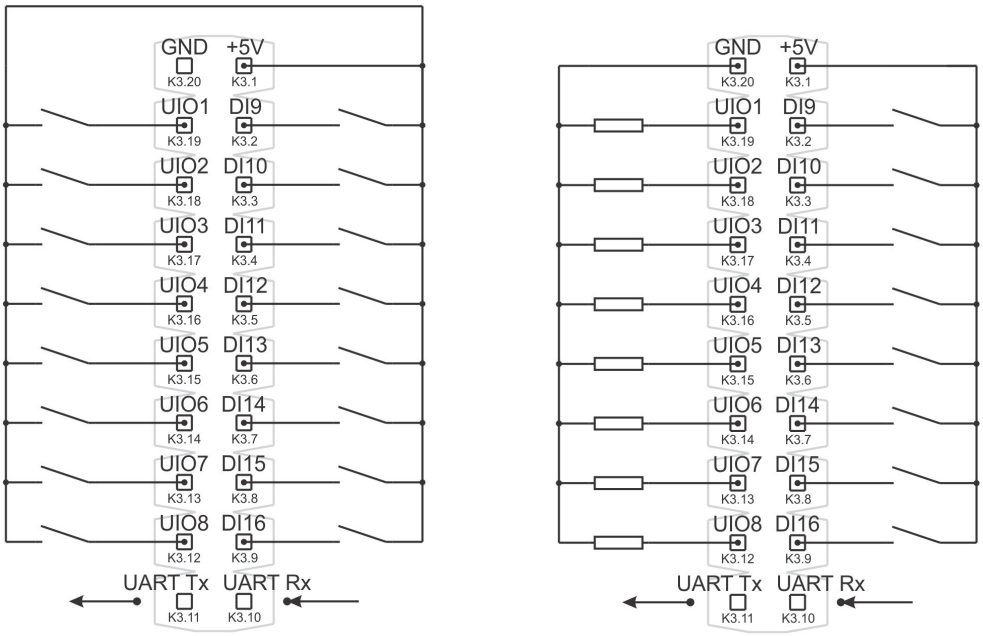


Figure 4 shows 2 examples how switches and/or loads should be connected to the K3 connector on LPC-2.U01 module. On each UIOx pin can be connected either switch or load. Be advised that supply is provided from the LPC-2.U01.

Table 2: K1 & K2		
K1.1	GND	Ground
K1.2	7 .. 30 V DC	Power supply input
K1.3	Standard RS-485 A	Data receive/send line A
K1.4	Standard RS-485 B	Data receive/send line B
K2.1	GND	Ground
K2.2	7 .. 30 V DC	Power supply input
K2.3	Standard RS-485 A	Data receive/send line A
K2.4	Standard RS-485 B	Data receive/send line B

Table 3: K3		
K3.1	+5 V	Power supply output
K3.2	DI9	TTL digital input, pull-down
K3.3	DI10	TTL digital input, pull-down
K3.4	DI11	TTL digital input, pull-down
K3.5	DI12	TTL digital input, pull-down
K3.6	DI13	TTL digital input, pull-down
K3.7	DI14	TTL digital input, pull-down
K3.8	DI15	TTL digital input, pull-down
K3.9	DI16	TTL digital input, pull-down
K3.10	UART Rx	UART TTL input, pull-up
K3.11	UART Tx	UART TTL output, push-pull
K3.12	UIO8	TTL digital input/output, pull-down
K3.13	UIO7	TTL digital input/output, pull-down
K3.14	UIO6	TTL digital input/output, pull-down
K3.15	UIO5	TTL digital input/output, pull-down
K3.16	UIO4	TTL digital input/output, pull-down
K3.17	UIO3	TTL digital input/output, pull-down
K3.18	UIO2	TTL digital input/output, pull-down
K3.19	UIO1	TTL digital input/output, pull-down
K3.20	GND	Ground

Table 4: K4		
K4	Programming connector	Factory use only

Table 5: LEDs		
LED1: red	Communication	On: RS-485 communication fault Off: RS-485 communication OK
LED2: green	Power supply	On: power supply OK Off: power supply missing or power off

One main module is capable of communicating with 8 LPC-2.U01 modules, where every module must have different address. Addresses are defined with DIP switches on-board LPC-2.U01, as shown in Table 6. For reference about DIP switch position see S1 on Figure 2, where all switches are set to ON.

Table 6: S1				
RS-485 ADDRESS	**Switch 1**	**Switch 2**	**Switch 3**	**Switch 4**
0	NOT USED	OFF	OFF	OFF
1		OFF	OFF	ON
2		OFF	ON	OFF
3		OFF	ON	ON
4		ON	OFF	OFF
5		ON	OFF	ON
6		ON	ON	OFF
7		ON	ON	ON

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

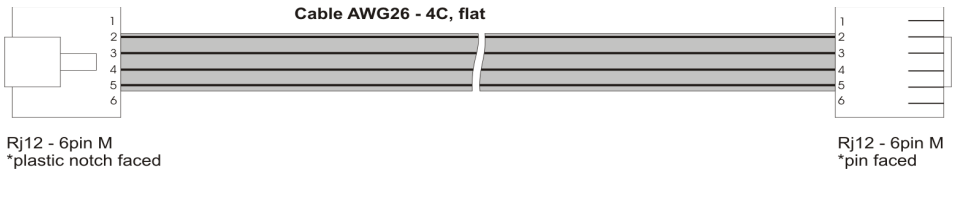
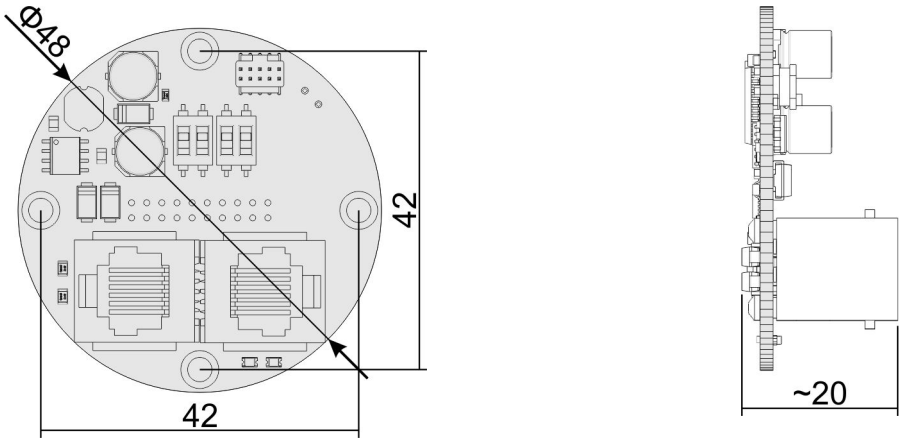


Figure 5: Interconnection cable ICM-x.

5.2 Mounting instructions

Figure 6: Housing dimensions



Dimensions in milimeters.

All connections, module attachments and assembling must be done while module is not connected to the power supply.

1. Set the correct RS-485 address (S1 switches) for LPC-2.U01 (refer to the Table 6).
2. Connect interconnection cable to the connector K1. Max. allowed tensile force is 30 N.
3. LPC-2.U01 module must be installed properly, isolating any potential connection with electrical sources other than power supply from main module. Improperly installed module may cause failure of the module itself, other devices on the same wiring, main module or may lead to fire or personal injury.

LPC-2.U01 is connected to the main module with interconnection cable (e.g. SSK, ICM-7) which must be ordered together with LPC-2.U01 module. When more modules are connected to the main module, splitter (e.g. SPL-2) is also required (Figure 2).

Module address on RS-485 network is set with DIP switch S1 on the module (Table 6).

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

5.3 Module labeling

Figure 7: Labels

Label 1:

LPC-2.U01
P/N:225U0115001001
D/C: 01/15

Label 2:

S/N: U01-S9-1500000003

Label 1 description:

- **LPC-2.U01** is the full product name
- P/N: 225U0115001001 is the part number
  - 225 – general code for LPC-2 product family,
  - U01 – short product name,
  - 15 – year of code opening
  - 001 – derivation code
  - 001 – version code (reserved for future HW and/or SW firmware upgrades).
- D/C: 01/10 is the date code.
  - 01 – week and
  - 15 – year of production

Label 2 description:

- S/N: U01-S9-1500000003 is the serial number.
  - U01 – short product name,
  - S9 – user code (test procedure, e.g. Smart
  - 15 – year (last two cyphers)
  - 00000003 – current stack number; previous module would have the stack number 00000002 and the next one 00000004.

6 TECHNICAL SPECIFICATIONS

Table 7: Technical specifications	
Power supply	from main module
Interconnection connector type	RJ-12 6/6
Power consumption	1 W
Max. source/sink current per individual UIOx output pin	20 mA
Max. total source current from +5 V supply pin	150 mA
Total source current from LPC-2.U01 module	160 mA
Dimensions (W x H x D)	48 x 48 x 20 mm
Weight	15 g
Maximum altitude	2000 m
Mounting position	any
Ambient temperature	0 to 50 °C
Ambient humidity	max. 95 %, no condensation
Transport and storage temperature	-20 to 60 °C
Protection class	IP 20

7 CHANGES

The following table describes all the changes to the document.

Date	V.	Description
23.12.2015	001	The initial version, issued as *LPC-2.U01 module UserManual*.
22.1.2016	002	Added footnote to feedback, status.
14.3.2016	003	Chapter 4.2: ..duration of 500 ms.

8 NOTES