USER MANUAL

Longo programmable controller
LPC-2.ED1 module

Version 2

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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 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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Longo programmable controller LPC-2.ED1 module

1 DESCRIPTION

LPC-2.ED1 is a module that combines two main functions, bipolar stepper motor drive and/or encoder input.

Bipolar stepper motor drive: There are two pairs of outputs(A,B and C,D) to drive bipolar stepper motor coils. The stepper motor power supply source can be set (internal +24 V DC or external
5..36 V DC).

Encoder module: There are three pairs of encoder digital inputs (A,A\ ; B,B\; and Z,Z\) which can be connected to different encoders performing encoding or count function. Type of encoder inputs type can be selected with jumpers. Non inverted input with 4k7 pull up to internal +5 V DC or RS485 input with 120 Ohm termination can be selected.

The encoder power supply source can be set to internal +5 or +12 V DC.
It can be used in a wide range of operation.

Module is powered from internal BUS.

NOTE: Provide quality encoder input signals (without noise) for encoder proper operation.

For proper system configuration and data allocation please refer to LPC Composer software help menu.

2 FEATURES

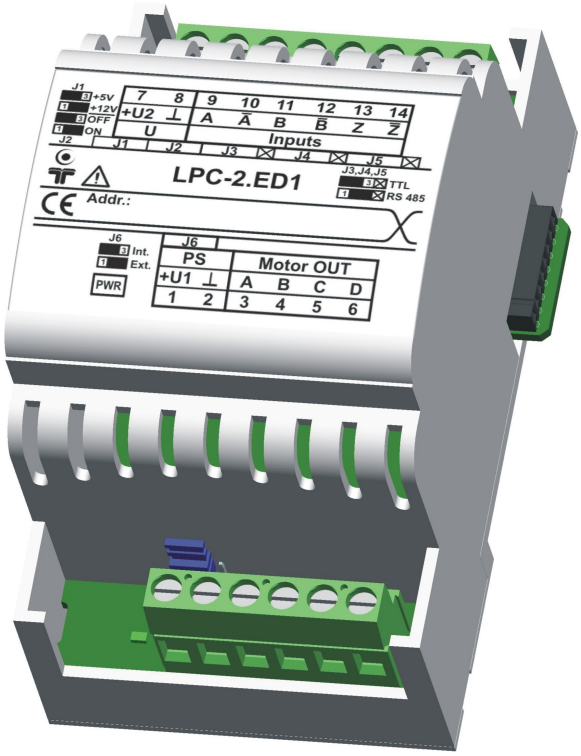


Figure 1: LPC-2.ED1 module

Table 1: Technical data
Bipolar stepper motor drive outputs (A,B,C,D) with 500mA or 330mA drive capability each
Internal +24 V DC or external 5..36 V DC stepper motor power supply selection with jumper J6
Encoder inputs for incremental or count operation (A, A\; B, B\; Z, Z\)
Internal +5 V DC or +12 V DC encoder power supply selection with jumper J1
Encoder inputs type (RS485 or TTL with pull up to +5 V DC) selection with jumpers J3 (A,A\), J4 (B,B\) and J5 (Z,Z\)
Standard DIN EN50022-35 rail mounting

3 OPERATION

LPC-2.ED1 module can be used in different modes of functioning.

With the parameters/commands, various control of the motor drive output can be achieved.

Different encoders and encoder signals can be used.

Functions and possibilities will be described within parameters description.

3.1 Parameters

If parameter is set to logical “1”, is considered to be active, enabled or set. If parameter has logical value “0” is considered to be inactive, disabled, or cleared.

Parameter can be status or command or both. When parameter is marked as status this means that module is sending information to controller. On the other hand command represents request from MCU to module.

Start command: When the command changes from “0” to “1”, start signal and function selected by other command signals will become active. The stepper motor outputs will be activated. To repeat start and/or activate new commands, start command must be first set to “0”. On next rising edge of start command (from “0” to “1”), start and other commands will become active.

Rotation reverse command: When command is “0”, the rotation direction is defined as forward and when this command is “1”, the rotation direction is defined as reverse. Corresponding stepper motor output signals are generated. Command is activated on the rising edge of start command.

Work mode 1 and Work mode 2 commands: This two commands are used to define the working mode of the module.

When Work mode 1 and Work mode 2 command is “0”, continuous mode is selected. Module output will generate corresponding bipolar stepper motor drive signals that motor will continuously rotate/move forward and reverse with defined step time parameter (speed reference) and start command state.

When Work mode 1 is “0” and Work mode 2 command is “1”, step mode is selected. Module output will generate corresponding bipolar stepper motor drive signals that motor will count exact number of bipolar motor steps defined with step value (low and high) parameter. Rotation reverse, speed reference and start command state will be accounted.

Work mode 1 is “1” and Work mode 2 command is “0”. This selection is not allowed and can perform unexpected motor output drive signals.

When Work mode 1 is “1” and Work mode 2 command is “1”, stepper motor is in loop mode with encoder. Encoder must be connected and set properly with encoder select 1 and encoder select 2 commands, to provide this mode of module operation. Module output will generate corresponding bipolar stepper motor drive signals that motor will reach exact number of encoder counts defined with encoder value parameter. Rotation reverse, speed reference and start command state will be accounted.

Holding torque command: When command is set to “0”, stepper motor output will not be active when motor is stopped. When command is set to “1”, motor output will provide holding current to achieve holding torque when motor is stopped.

Current select: When command is set to “0”, output current for stepper motor will be 500mA. When command is set to “1”, output current for stepper motor will be 330mA.

Encoder mode select 1 and select 2 commands: When encoder mode select 1 command is set to “0” and encoder mode select 2 command is set to “0”, encoder reading will be set as incremental. The most common type of incremental encoder uses two output channels (A and B) to read position. Using two code tracks with sectors positioned 90° out of phase, the two output channels of the quadrature encoder indicate both position and direction of rotation/movement.

When encoder mode select 1 command is set to “0” and encoder mode select 2 command is set to “1”, encoder reading will be set as count. Typical example of count encoder is a single inductive switch. Only position by counting switch pulses can be read, without information of rotation/movement direction.

Any other combination of encoder mode select 1 and encoder mode select 2 command is not supported and can cause unexpected functioning of the module.

Encoder reset command: When the command changes from “0” to “1”, actual encoder value will reset to zero.

Motor on status: Indicates stepper motor output state. When “0”, output is not active in sense to generate signals for moving the stepper motor. When “1”, output is active in sense to generate signals for moving the stepper motor. This status do not indicate the holding torque output state, when motor is stopped.

Rotation reverse status: Indicates stepper motor rotation status. “0” indicates forward and “1” indicates reverse rotation.

Count mode status: Indicates module is in count mode of operation, described under “Work mode 1 and Work mode 2 commands description”.

Loop mode status: Indicates module is in loop mode of operation, described under “Work mode 1 and Work mode 2 commands”.

Count end ready status: Indicates module count function end and module ready status (when module is in step or loop mode). It is used to indicate the end of the current module function.

Encoder in zero status: Indicates encoder zero position by reading reset input (Z,Z/).

Step time parameter: This parameter defines time in 1 milliseconds interval between consecutive stepper motor output driving pulses. It can be set from 1 milliseconds up to 30 seconds.

Step value (low and high) parameter: Defines the number of stepper motor steps after motor is started, when module is in step mode of operation. Step value parameter = (step value high parameter * 65536) + step value low parameter.

Encoder value set parameter: Defines the number of incremental or count encoder steps to be counted, after start command changes from “0” to “1”. This parameter takes effect when module is in loop mode of operation, described under “Work mode 1 and Work mode 2 commands”.

Encoder value: Represents actual incremental (observed forward and reverse rotation) or count encoder number of counts. Encoder mode is described under “Encoder mode select 1 and select 2 commands”. Encoder actual value can be reset by reading rising edge on reset input (Z,Z/) or receiving encoder reset command “0” to “1” transition.

3.2 Variables memory list

Table 2: Parameters and commands			
Memory	**Variable description**	**Range**	**Values**
ED1_1_oStepT	Step time parameter	1..30000	0,001..30,000 ms
ED1_1_oStepLo	Step value [low] parameter	0..65535	0..65535
ED1_1_oStepHi	Step value [high] parameter	0..65535	0..65535
ED1_1_oEnc	Encoder value set parameter	0..65535	0..65535
ED1_1_oStart	Start command	0/1	Stop/Start and load
ED1_1_oRotRev	Rotation reverse command	0/1	Forward/Reverse
ED1_1_oMode1	Work mode 1 command	0/1	Off/On *
ED1_1_oMode2	Work mode 2 command	0/1	Off/On *
ED1_1_oHTorq	Holding torque command	0/1	Off/On
ED1_1_oCurSel	Current select	0/1	500mA/330mA
ED1_1_oEncS1	Encoder mode select 1 command	0/1	Off/On **
ED1_1_oEncS2	Encoder mode select 2 command	0/1	Off/On **
ED1_1_oEncRst	Encoder reset command	0/1	Enable/Reset

Table 3: Values and statuses			
Memory	**Variable description**	**Range**	**Values**
ED1_1_iEnc	Encoder value	0..65535	0..65535
ED1_1_iReady	Count end ready status	0/1	Busy/Ready
ED1_1_iMotOn	Motor status on status	0/1	Off/On
ED1_1_iRotRev	Rotation reverse status	0/1	Forward/Reverse
ED1_1_iCount	Count mode status	0/1	Off/Count
ED1_1_iLoop	Loop mode status	0/1	Off/Loop
ED1_1_iEncZero	Encoder in zero status	0/1	Count/Zero

Table 4: * Work modes		
Work mode 1	Work mode 2	**Work mode description**
OFF	OFF	Continuous mode
OFF	ON	Stepping mode
ON	OFF	Not Used
ON	ON	Encoders loop mode

Table 5: ** Encoder modes select		
Enc. mode 1	Enc. mode 2	**Encoder mode description**
OFF	OFF	Incremental mode
OFF	ON	Count mode
ON	OFF	Future use
ON	ON	Future use

4 INSTALLATION

4.1 Connection scheme

Figure 2: Connection scheme

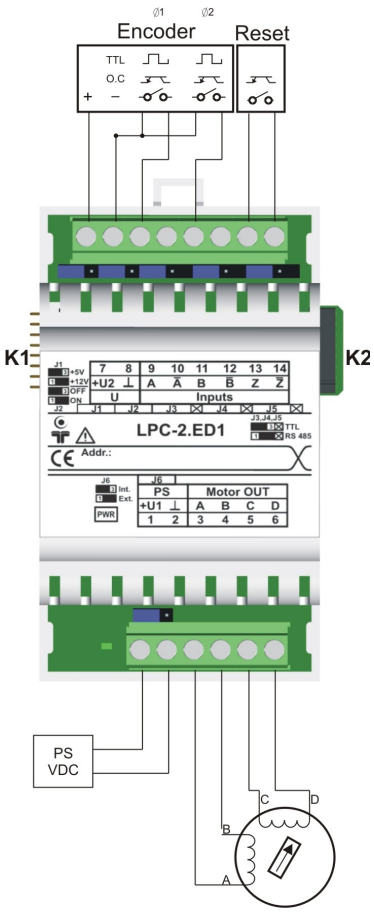


Table 6: Motor power supply selection (PS)

J6	Jumper selector for Motor power supply (PS)	Off = internal +24VDC On = external DC power supply

Table 7: Motor power supply (PS)

PS.1 (+U)	Power supply	External DC power supply
PS.2 (⊥)	GND	GND

Table 8: Motor output (OUT[1])		
Motor OUT.3 (A)	Digital output stepper Motor coil A	Digital output
Motor OUT.4 (B)	Digital output stepper Motor coil B	Digital output
Motor OUT.5 (C)	Digital output stepper Motor coil C	Digital output
Motor OUT.6 (D)	Digital output stepper Motor coil D	Digital output

Table 9: Encoder power supply selection (J1)		
J1	Jumper selector for Encoder power supply (U)	Off = internal +5 V DC On = internal +12 V DC

Table 10: Encoder power supply (U)		
U.7 (+U2)	Power supply	Internal DC power supply
U.8 (⊥)	GND	GND

Table 11: Encoder input type selection (J2,J3,J4,J5)		
J2	Jumper selector not used	not used
J3	Jumper selector for encoder input A, A\	Off = TTL with 4k7 Ohm pull up to +5 V DC On = RS485 with 120 Ohm termination
J4	Jumper selector for encoder input B, B\	Off = TTL with 4k7 Ohm pull up to +5 V DC On = RS485 with 120 Ohm termination
J5	Jumper selector for encoder input Z, Z\	Off = TTL with 4k7 Ohm pull up to +5 V DC On = RS485 with 120 Ohm termination

1 Wires connected to the module must have cross sectional area at least 0.75 mm^2. Minimum temperature rating of wire insulation must be 85 °C.

Table 12: Encoder inputs[2]		
Inputs.9 (A)	Fast digital encoder input A	Fast digital input
Inputs.10 (A\)	Fast digital encoder input A\	Inverted fast digital input
Inputs.11 (B)	Fast digital encoder input B	Fast digital input
Inputs.12 (B\)	Fast digital encoder input B\	Inverted fast digital input
Inputs.13 (Z)	Fast digital encoder input Z	Fast digital input
Inputs.14 (Z\)	Fast digital encoder input Z\	Inverted fast digital input

Table 13: K1		
Internal BUS	Data & DC power supply	Connection to I/O module

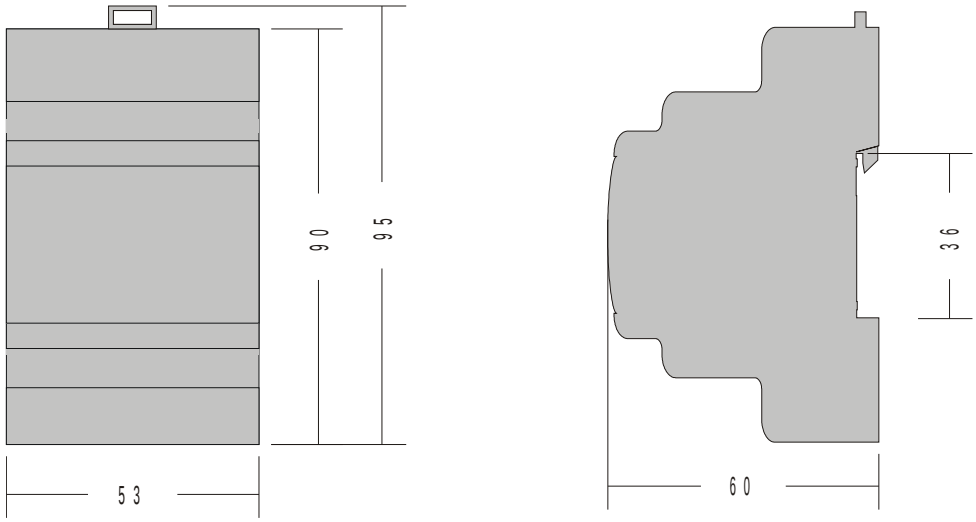
Table 14: K2		
Internal BUS	Data & DC power supply	Connection to I/O module

Table 15: PWR		
PWR	Power LED	On: module is powered ON Off: module has no power supply

2 Wires connected to the module must have cross sectional area at least 0.75 mm^2. Minimum temperature rating of wire insulation must be 85 °C.

4.2 Mounting instructions

Figure 3: Housing dimensions



- Dimensions in millimeters.

EXTERNAL SWITCH OR CIRCUIT-BREAKER AND EXTERNAL OVERCURRENT PROTECTION: The unit is allowed to be connected to installation with over current protection that has nominal value of 16 A or less.

RECOMMENDATION ON SWITCH OR CIRCUIT-BREAKER PROTECTION: There should be two poles main switch in the installation in order to switch off the unit. The switch should meet the requirements of standard IEC60947 and have a nominal value at least 6 A. The switch or circuit-breaker should be within easy reach of the operator. It should be marked as the disconnecting device for the equipment.

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

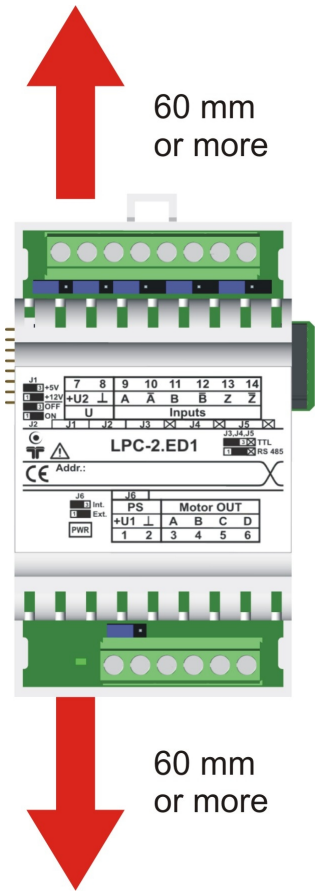
Mounting instructions:

1. Switch OFF main power supply.
2. Mount LPC-2.ED1 module to the provided place inside an electrical panel (DIN EN50022-35 rail mounting).
3. Mount other LPC-2 modules (if required). Mount each module to the DIN rail first, then attach modules together through K1 and K2 connectors.
4. Connect digital output wires according to the connection scheme in Figure 2.
5. Switch ON main power supply.

Dismount in reverse order. For mounting/dismounting modules to/from DIN rail a free space of at least one module must be left on the DIN rail.

NOTE: LPC-2.MCU main control module should be powered separately from other electrical appliance connected to LPC-2 system. Signal wires must be installed separately from power and high voltage wires in accordance with general industry electrical installation standard.

Figure 4: Minimum clearances



The clearances above must be considered before module mounting.

4.3 Module labeling

Figure 6: Labels on housing

Label 1:

Label 2:

Label 1 description:

1. **LPC-2.ED1** is the full product name.
2. **P/N:225ED1070001001** is the part number.
   - **225** – general code for LPC-2 product family,
   - **ED1** – short product name,
   - **07001** – sequence code,
     - 07 – year of code opening
     - 001 – derivation code
   - **001** – version code (reserved for future HW and/or SW firmware upgrades).
3. **D/C:16/07** is the date code.
   - **16** – week and
   - **07** – year of production.

Label 2 description:

1. **S/N:ED1-S9-0700000190** is the serial number.
   - **ED1** – short product name,
   - **S9** – user code (test procedure, e.g. Smarteh person xxx),
   - **0700000190** – year and current stack code,
     - 07 – year (last two cyphers)
     - 00000190 – current stack number; previous module would have the stack number 00000189 and the next one 00000191.

5 TECHNICAL SPECIFICATIONS

Table 7: Technical specifications	
Power supply	from internal BUS
Power consumption	1 W without external load
Rated load voltage +U	5 .. 36 VDC
Number of digital inputs	6 (3 pair) encoder digital inputs (see Table 11)
Max. encoder input frequency	10 kHz
Number of digital outputs	4 (2 pair) bipolar stepper motor digital outputs
Output current per channel	500 mA/330mA
Connection type	screw type connector for stranded wire 0.75 to 2.5 mm^2
Dimensions (L x W x H)	90 x 53 x 60 mm
Weight	85 g
Ambient temperature	0 to 50 °C
Ambient humidity	max. 95 %, no condensation
Maximum altitude	2000 m
Mounting position	vertical
Transport and storage temperature	-20 to 60 °C
Pollution degree	2
Overvoltage category	II
Electrical equipment	Class II (double insulation)
Protection class	IP 30

6 CHANGES

The following table describes all the changes to the document.

Date	V.	Description
1.7.2012	003	CGP General update.
10.11.2011	002	Updated bipolar stepper motor drive capability and “3 Operation” chapter added.
7.8.2007	001	The initial version, issues as *LPC-2.ED1 module UserManual*.