![purelogic research & development logo]

User manual

PLCM-B1
Breakout board for PLCM-E3/E3p controller

CONTENTS:

!   Check wiki.purelogic.ru for more detailed information

1. GENERAL INFORMATION

PLCM-B1 is a breakout board for CNC Ethernet/USB PLCM controller. It allows to involve optimal all inputs and outputs. Sockets are mounted on board for connection of 6 step/servo motor drivers, 15 optoisolated inputs, 16 optoisolated outputs, 6 high-current relays and frequency converter for electric spindle control.

PLCM-B1 module allows to control up to 6 step/servo motor drivers (any with STEP/DIR/ENABLE interface). The module can be used for creation of such various X-Y-Z coordinate systems as the CNC machines, the label equipment, engraving, laser cutting, pick and place machines.

The module supports operating with any step motor drivers and servo motor drivers of Purelogic R&D production, drivers of other manufactures.

2. DELIVERY SET

• PLCM-B1 breakout board – 1 pcs.
• PLCM-B1 User manual - 1 pcs.

3. TECHNICAL SPECIFICATIONS

Supply voltage	12V
Maximum consumption current	400 mA
Control interface	Ethernet/USB compatibility with CNC programs (for example MACH3)
Quantity of inputs	15, optoisolated inputs (optocouple, 1 KOhm, 30V MAX)
Quantity of outputs	16, optoisolated outputs (optocouple, 40 mA, 40V MAX)
Quantity of power outputs, relay	6, toggle, 6A/250V relay
PWM → voltage converter	U output = 0...9,5 V (at on-off time ratio change Q=0...1), 10 V supply voltage by frequency converter
Isolation resistance	500 MOhm
Operating temperature	0 ... 50 °C
Net weight	0,3 kg
Overall dimensions (Width x Height x Depth)	188 x 25 x 173 mm

!   **TURN OFF POWER DEVICE BEFORE MAKING ANY CONNECTIONS**

POWER SUPPLY NEGATIVE WIRE CONNECTION WITH GROUND (GND), HOUSING AND ETC. IS FORBIDDEN

4. KEY FEATURES

• Operation with any LPT CNC program (STEP/DIR – MACH, TurboCNC and ETC.).

• Single power supply can be used for power supply of entire circuit, smooth launching system.

• Simultaneous control up to 6 step/servo motors drivers. Drivers are connected via special sockets (terminal sockets or RG-45 type sockets). Control signals states are indicated by LEDs.

• 15 optoisolated inputs for connection of limit switches and E-STOP button. Connection of optoisolated inputs operation external backup LEDs is provided.

• 16 optoisolated outputs (open collector). States of outputs are indicated by LEDs.

• Frequency converter support (adjustment of spindle rotations, PWM voltage converter) from control program (MACH) PWM signal.

• Control of six high-current relays 6A/220V for commutation of supplementary CNC machine devices (spindles, coolant system pump or electric fan). Relay states are indicated by LEDs.
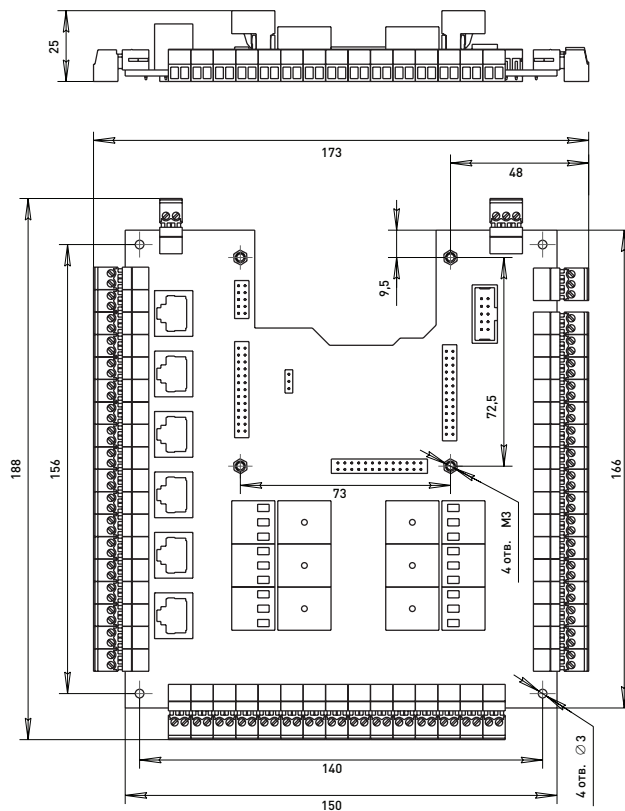

Fig. 1. PLCM-B1 dimensions

5. SOCKETS PURPOSE AND INDICATION

P1/p12

"P" - port notation
"1" - port number
"p" - pin notation
"12" - pin number

XP20 (X)			XP21 (Y)			XP22 (Z)		
XP1	XP2	XP3	XP4	XP5	XP6	XP7	XP8	XP9
ENB	DIR	STEP	ENB	DIR	STEP	ENB	DIR	STEP
P3/p1	P2/p9	P2/p6	P3/p1	P2/p8	P2/p7	P3/p1	P3/p2	P3/p6

XP23 (A)			XP24 (B)			XP25 (C)		
XP10	XP11	XP12	XP13	XP14	XP15	XP16	XP17	XP18
ENB	DIR	STEP	ENB	DIR	STEP	ENB	DIR	STEP
P3/p1	P3/p3	P3/p7	P3/p1	P3/p4	P3/p8	P3/p1	P3/p5	P3/p9

XP1-XP18 (terminal socket) or XP20-XP25 (RG-45 type) – step/servo motor drivers connectors.

XP19 (terminal socket) – module supply voltage connectors.

XP26-XP40 (terminal socket) – external sensors connection and E-STOP button connectors, optoisolated inputs

XP41-XP55 (pin connector) – external LED of optoisolated input operation, connection polarity is specified on the connection diagram («+» anode, «-» cathode).

XP56-XP61 (terminal socket) – K1-K6 relay load connectors.

XP62-XP77 (terminal socket) – optoisolated outputs (open collector).

XP78 (terminal socket) – XP6 socket backup of PLCM-E3/E3p module.

XP79 (terminal socket) – frequency converter connector.

XP80 (terminal socket) – socket backup of PLCM-E3/E3p module Analog-to-Digital convertors (ADC). It isn't used in the current software versions.

XS1-XS5 (pin connector) – sockets for PLCM-E3/E3p module connectors.

LED1, LED3, LED5, LED7, LED9, LED11 – indication LED of 1-6 axes STEP signal.

LED2, LED4, LED6, LED8, LED10, LED12 - indication LED of 1-6 axes DIR signal

LED13 - indication LED of ENABLE signal

LED14-LED28 – indication LEDs of optoisolated inputs operation.

Spindle

Frequency converter

~220

PC with MACH3

Ethernet / USB

Control

Power supply

~220V

48V, 70V

Step/servo motor driver
Up to 4 drivers connection

STEP

DIR

ENABLE

PLCM-E3/E3p BOB

12V

Power supply

~220V

Step/servo motor

Up to 6 devices connection by using relays

Hoover

Vacuum clamping

Ventilator

KRESS spindle

Coolant pump

Limit switch
Up to 5 limit switches connection

Fig. 2. General CNC control system diagram

Fig. 3. Module connection

6. CONNECTION

Connection to PLCM-E3/E3p

It is necessary to close JP3 jumper. PLCM-E3/E3p board is connected with PLCM-B1 module by XS1-XS5 pin connectors. It is necessary to connect two boards same as shown in drawing and to fix PLCM-E3/E3p board by using M3 screws.

Step motor drivers connection

Step motor drivers are connected to the module by XP1-XP18 terminal sockets or XP20-XP25 (RG-45 type) according to fig.3. Drivers are connected to the module according to a circuit with ˝+˝ common. In this case it is +5V.

K1-K6 relay loads connection

PLCM-B1 supports control of six high-current K1-K6 relays for CNC additional devices commutation (spindles, coolant pump or electric fan). Relay states are indicated by LED29-LED34 according to fig.3. Relay loads are connected to XP56...XP61 pins.

Limit switches connection

PLCM-B1 has 15 inputs for XP-26-XP40 switches connection. Physically each input is optocouple with built-in transition resistor (1 KOhm, depending on sensor type and sensor supply voltage the increase in resistance is probably required). This construction of optoisolated inputs allows to connect any sensors to module and provides driver optoisolation from sensors.

Optoisolated inputs states are translated to CNC MACH3 program and are indicated by LED14-LED28 according to fig.3. External LEDs connection is provided by XP41-XP55.

Simple contact switches (buttons) and non-contact sensors (inductive, capacitive) of PLL01 type (inductive non-contact sensor) can be connected to the module. Connection is accomplished
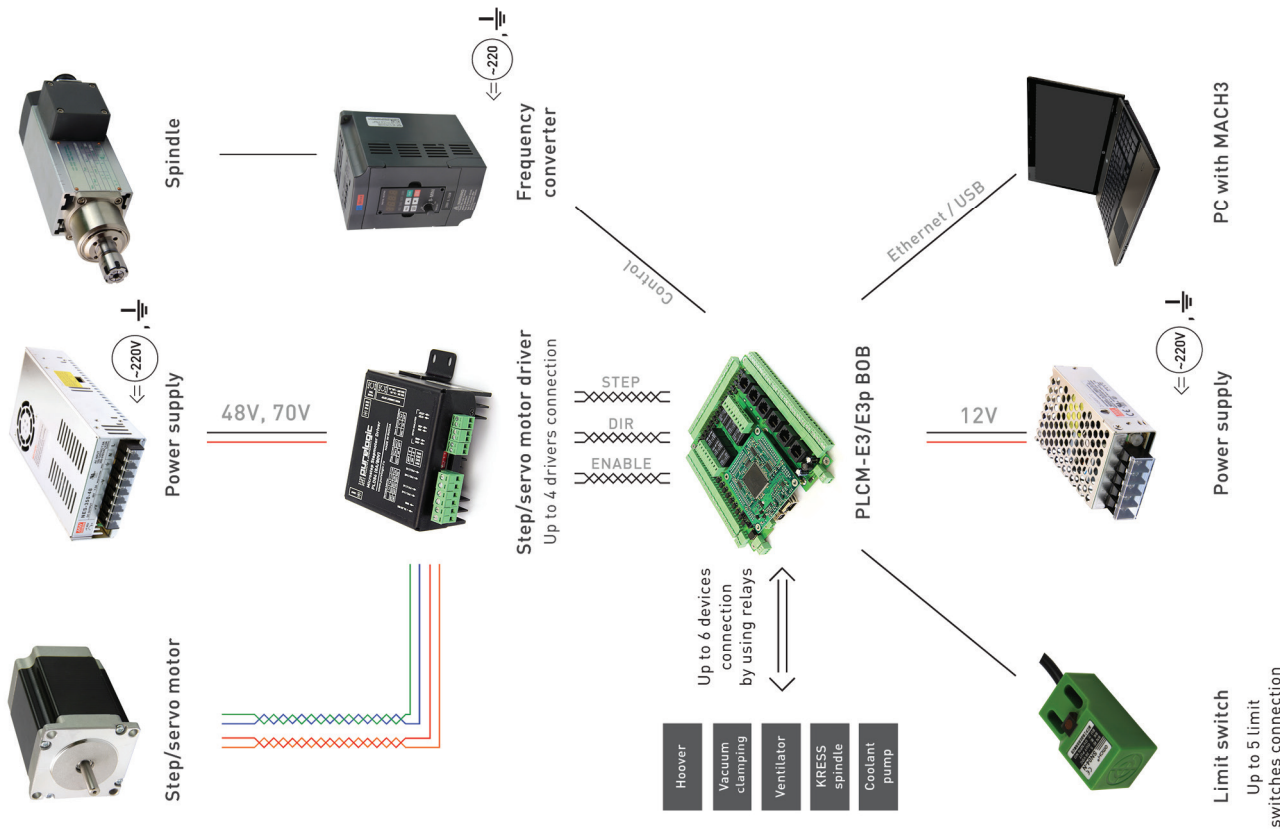
according to fig.2. Separate power supply unit with necessary voltage is strongly recommended to use for sensors supply. 12V module supply can be used in an extreme case (in this case optoisolation will not be).

Optoisolated outputs loads connection

PLCM-B1 has 16 optoisolated outputs, in which loads are connected to XP62-XP77. Physically each output is an optocouple, open collector type output. This optoisolated outputs construction provides module optoisolation from loads circuits.
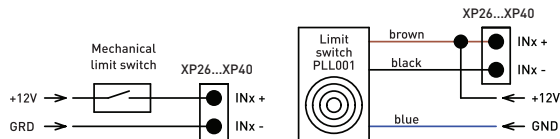

Fig. 4. Limit switches connection

Power supply connection

PLCM-B1 needs to be supplied from separate 12V power supply voltage unit (DC, for example, S-15-12 or power line of 12V PC power supply). Power supply is connected to XP19 socket (according to fig.2). Connection polarity is important.

JP3 jumper can be closed on PLCM-E3/E3p board to join controller power supply and PLCM-B1. In that case it is necessary to apply voltage only to one of devices. Power supply of PLCM-B1 and power supply of PLCM-E3 by USB or PoE is possibly, but in this case relays will not work.
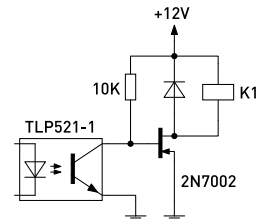

Fig. 5. Relay connection to control output

7. PWM → VOLTAGE CONVERTER

PLCM-B1 has built-in PWM → voltage convertor, which transforms PWM control signal to voltage - on-off time ratio Q=0...1 → voltage U=0...9.5V.

Convertor is used for frequency transformer control (FT, inverter), to which is connected spindle (it allows to change spindle rotations by CNC control program using electronic method).

The convertor is optoisolated from module and is supplied from FT (frequency transformer). In standard FT has 3 pins of convertor connection – 10V supply voltage, GROUND and voltage 0...10V output FIV (in proportion to which spindle rotation frequency is changing). FT PWM control signal is generated by MACH3 CNC control program.

Frequency transformer is connected to XP79 according to fig. 3.

Pay attention that documentation can be changed due to constant technical upgrading of production.
You can download last versions from **www.purelogic.ru**

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