LCC-1 User's Handbook

Catalog

Operation of Control Board

LCC-1 control board is a motion control board specially designed for the laser cutting/engraving machine, which adopts PCI interface, supports three axes, offers one TTL output signal 'LASER' to control the output of laser, offers one PWM signal to control the laser power, offers one input signal to connect the *Emergency Stop* signal, offers 11 input signals in general purpose to connect various protection signals, such as limit switch, origin signal, overheat protection, opened protection of front cover, and so on.

That LCC-1 control board and controlling software Ezcad are used together to offers the strongest, most flexible control function to the laser cutting/engraving machine and acquire the best performance of the equipment.
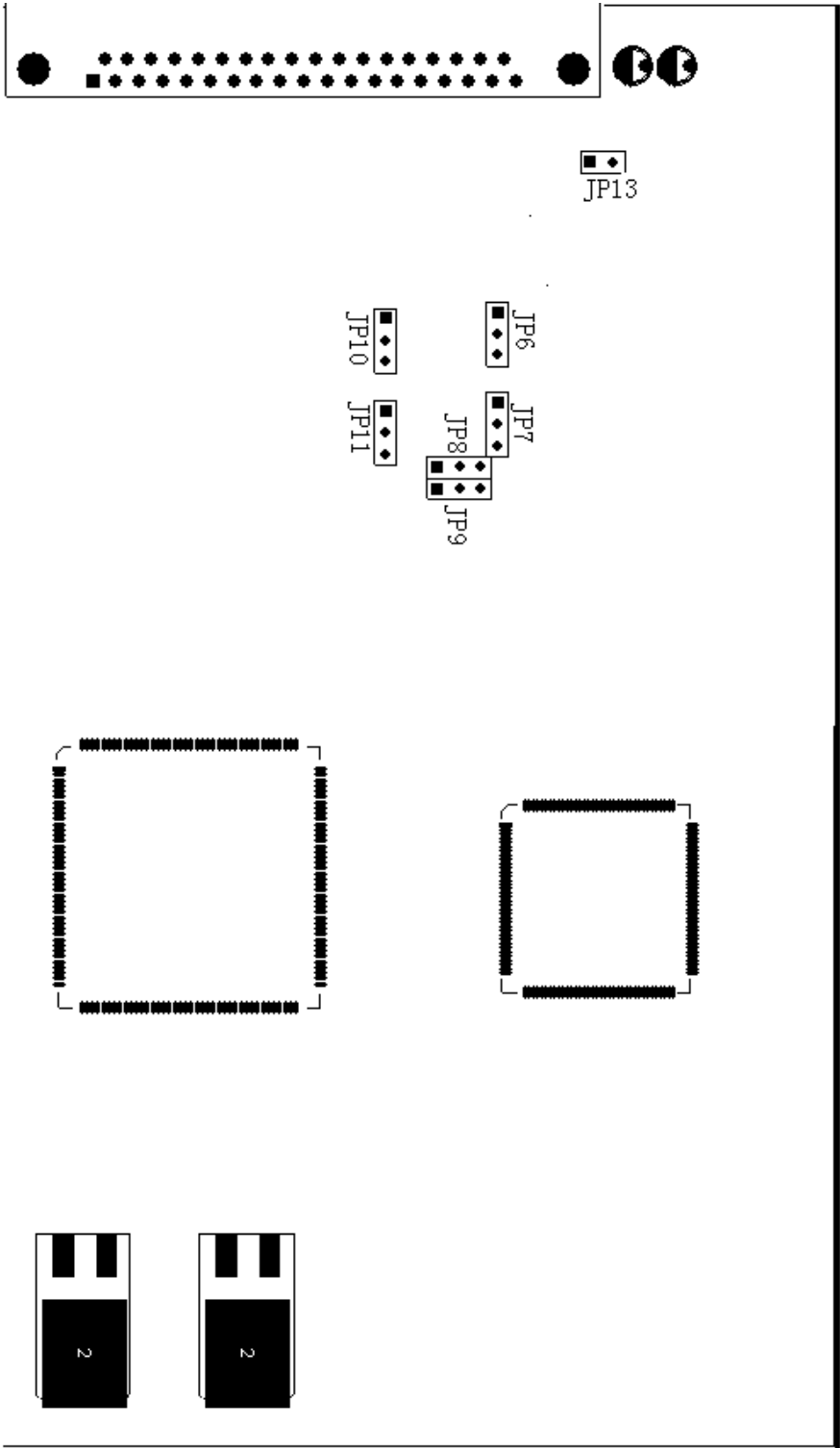
Safe Precaution

While installing LCC-1 control board, you need to pay attention to the following items:

1. In order to prevent the components on the control board from being damaged by the ESD, please confirm that there has no static on hand or already worn protective such as antistatic wrist strap etc. before touching the control board; Please don't touch the chip pins directly with hands, but try one's best to pinch the control board edge to install; Please don't put directly control board on the carpet, etc. where are to be apt to generate static; Please put back the control board in the static shielding bag when not using for a long time.

2. The control board does not support hot plug, so, when the control board is inserted into the PCI slot of the computer motherboard, be sure to confirm the computer power has already been turned off.

3. While installing the control board, be sure to fix the control board firmly on computer case through the screw.

4. Handle with care, and don't beat hard or twist.

Jumpers Setup

For greatest compatibility and flexibility, the motor direction/pulse signals of LCC-1 are output through jumper setup. The jumpers are located on the control card as illustrated below.

JP13

JP10

JP6

JP11

JP8

JP7

JP9

Jumper Setup Instruction

JP13: Emergency stop signal

JP13 is used for setting up whether the *Emergency Stop* signal is effective. If there is no the *Emergency Stop* signal from the outside, being connected shortly by jumper cap is integrant, otherwise the control board cannot send out the pulse to control motion. If the equipment offers the *Emergency Stop* signal, this jumper cap must be disconnecting to enable this signal.

The *Emergency Stop* signal is disable while the control board is dispatched from the factory, and Pin 1-2 of JP13 is connected shortly.

JP6 --JP11: Output mode of direction /pulse signals

JP6 --JP11 controls output mode of the direction/pulse signals of 3 axes respectively.
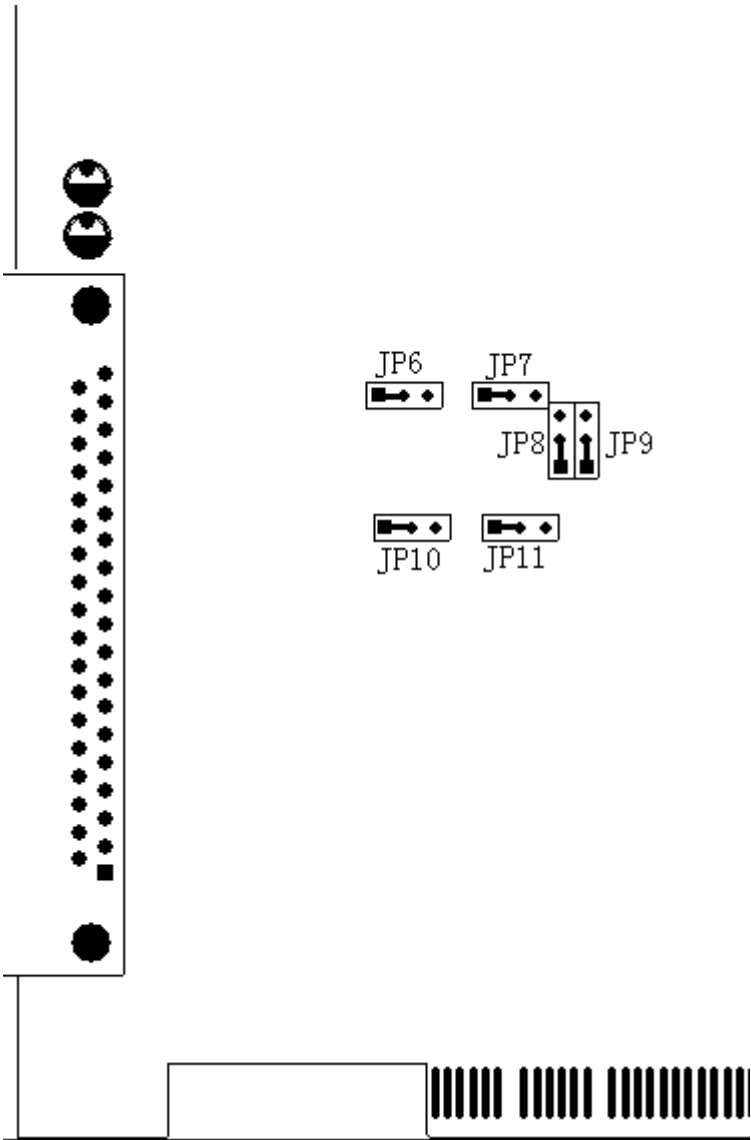
JP6   Pulse signal of the X-axis

JP7   Direction signal of the X-axis

JP8   Pulse signal of the Y-axis

JP9   Direction signal of the Y-axis

JP10   Pulse signal of the Z-axis

JP11   Direction signal of the Z-axis

When being connected shortly with Pin 1-2, output signal adopts the differential output mode. While being connected shortly with Pin 2-3, output signal adopts the level mode. Which kind of output mode is used, please establish according to the input interface type of the step motor driver used actually.

LCC-1 control board is set as the differential output mode while has been dispatched from the factory, and Pin 1-2 of JP6 –JP11 are connected shortly.

Default Jumper Setup

Direction/pulse signal: differentiate output (Pin 1-2 of JP6——JP11 are connected shortly).

JP6　　JP7

JP8　　JP9

JP10　JP11

Definition of Connector Pins

LCC-1 Control Card uses DB37 socket. See below for definition of connector pins:

Pin	Name	Definition	Pin	Name	Definition
1	NC		20	NC	
2	NC		21	PWMO	Pulse Width Modulation.
3	VIN	External Power.	22	NC	
4	OUTP3	Output signal 3	23	OUTP2	Output signal 2
5	OUTP1	Output signal 1	24	GND	Internal Power Ground of LCC.
6	LASER	Signal of laser On/Off.	25	VCC	Internal Power of LCC.
7	ZDN	Negative direction signal: Z	26	ZDP	Positive direction signal: Z
8	ZPN	Negative pulse signal: Z	27	ZPP	Positive pulse signal: Z
9	ZLN	Negative limit of Z	28	ZLP	Positive limit of Z
10	Z0	Z Origin	29	YDN	Negative direction signal: Y
11	YDP	Positive direction signal: Y	30	YPN	Negative pulse signal: Y
12	YPP	Positive pulse signal: Y	31	YLN	Negative limit of Y
13	YLP	Positive limit of Y	32	Y0	Y Origin
14	XDN	Negative direction signal: X	33	XDP	Positive direction signal: X
15	XPN	Negative pulse signal: X	34	XPP	Positive pulse signal: X
16	XLN	Negative limit of X	35	XLP	Positive limit of X
17	X0	X Origin	36	IN11	General purpose input 11
18	IN10	General purpose input 10	37	STOP	Emergency stop signal
19	EXGND	Ground of external Power.			

Signals are divided into 3 parts as following：

1. Laser power supply control part;

2. Axis direction/pulse control part;

3. External signals control part.

Laser power supply control part

These signals include:

1. Laser switch signal (Signal name: LASER), PIN6. Output TTL level. Via JP1 of switch board can be set up as active low level.

2. Laser power supply adjustment signal (Signal name: PWMO), PIN21.

Axis direction/pulse control part

Provides three axes of direction/pulse signals. Default axis is X, Y, and Z. Dual-axes laser cutting machines use X-axis and Y-axis direction/pulse signals.

These signals include:
1. Internal power supply (signal name: VCC), PIN25.
2. Internal power supply ground (signal name- GND), PIN24.
3. X direction signal positive XD+ (Signal name: XDP), PIN33.
4. X direction signal negative XD- (Signal name- XDN), PIN14.
5. X pulse signal positive XP+ (Signal name: XPP), PIN 34.
6. X Pulse signal negative XP- (Signal name: XPN), PIN 15.
7. Y Direction signal positive YD+ (Signal name: YDP), PIN 11.
8. Y Direction signal negative YD- (Signal name: YDN), PIN 29.
9. Y Pulse signal positive YP+ (Signal name: YPP), PIN 12.
10. Y Pulse signal negative YP- (Signal name: YPN), PIN 30.
11. Z Direction signal positive ZD+ (Signal name: ZDP), PIN -26.
12. Z Direction signal negative ZD- (Signal name: ZDN), PIN 7.
13. Z Pulse signal positive ZP+ (Signal name: ZPP), PIN 27.
14. Z Pulse signal negative ZP- (Signal name: ZPN), PIN 8.

The various signals function this way：
1. Jumper JP6 (X-axis pulse), JP7 (X-axis direction), JP8 (Y-axis pulse), JP9 (Y-axis direction), JP10 (Z-axis pulse), JP11 (Z-axis direction) chooses either differential or level control (See Jumper Setup Instruction for details).
2. Under differential control, the X, Y, and Z axis direction/pulse control signals output differential control signals according to signal definitions.
3. Under level control, the X, Y, and Z axis direction/pulse control signals' positive (P) terminals are output control level, and control card internal power supply (VCC) or control card internal power supply ground is reference pressure. For example, under X-axis direction control and common cathode control, X direction signal positive (XDP) is connected to the control unit's positive terminal, and control card internal power supply ground (GND) to the negative terminal. While under common anode control, the control card internal power supply (VCC) is connected to the control unit's positive terminal, and X direction signal positive (XDP) XD+ to the negative terminal.

Below is illustration chart：

Symbol	Signal Name	Pin Type	Pin No.	Function
ZDN	Z axis direction signal V-	Output	7	Z-axis direction signal. Under differential output mode, ZDN is V- , ZDP is V+; Under level output mode, ZDN is NC, ZDP is connected to the direction signal input of the driver. Under common anode mode, it is used with VCC, while with GND under common cathode mode
ZDP	Z axis direction signal V+	Output	26	
ZPN	Z axis pulse signal V-	Output	8	Z-axis direction signal. Under differential output mode, ZPN is V- , ZPP is V+; Under level output mode, ZPN is NC, ZPP is connected to the pulse signal input of the driver. Under common anode mode, it is used with VCC, while with GND under common cathode mode
ZPP	Z axis pulse signal V+	Output	27	
YDN	Y axis direction signal V-	Output	29	Y-axis direction signal. Under differential output mode, YDN is V- , YDP is V+; Under level output mode, YDN is NC, YDP is connected to the direction signal input of the driver. Under common anode mode, it is used with VCC, while with GND under common cathode mode
YDP	Y axis direction signal V+	Output	11	
YPN	Y axis pulse signal V-	Output	30	Y-axis direction signal. Under differential output mode, YPN is V- , YPP is V+; Under level output mode, YPN is NC, YPP is connected to the pulse signal input of the driver. Under common anode mode, it is used with VCC, while with GND under common cathode mode
YPP	Y axis pulse signal V+	Output	12	

XDN	X axis direction signal V-	Output	14	X-axis direction signal. Under differential output mode, XDN is V-，XDP is V+; Under level output mode, XDN is NC, XDP is connected to the direction signal input of the driver. Under common anode mode, it is used with VCC, while with GND under common cathode mode
XDP	X axis direction signal V+	Output	33	
XPN	X axis pulse signal V-	Output	15	X-axis direction signal. Under differential output mode, XPN is V-，XPP is V+; Under level output mode, XPN is NC, XPP is connected to the pulse signal input of the driver. Under common anode mode, it is used with VCC, while with GND under common cathode mode
XPP	X axis pulse signal V+	Output	34	

External Signals control part

The external signals include following:

1. Positive limit signal of X-axis (signal name: XLP), PIN35. It is a level-input signal and the input voltage should be greater than 10V. The default normal state is high-level. And the signal is triggered while low-level or open circuit. This signal can be set by soft to abnormally interrupt the movement and shut down the laser power. It means that once the signal is triggered, the movement must be stopped and the laser must be cut off immediately. If the device does not use positive limit signal, this signal can be used as general input signal NO. 4 and corresponding to the B4 of the port map in the software.

2. Negative limit signal of X-axis (signal name: XLN), PIN16. It is a level-input signal and the input voltage should be greater than 10V. The default normal state is high-level. And the signal is triggered while low-level or open circuit. This signal can be set by soft to abnormally interrupt the movement and shut down the laser power. It means that once the signal is triggered, the movement must be stopped and the laser must be cut off immediately. If the device does not use negative limit signal, this signal can be used as general input signal NO. 5 and corresponding to the B5 of the port map in the software.

3. Origin signal of X-axis (signal name: X0), PIN17. It is a level-input signal and the input voltage should be greater than 10V. The default normal state is high-level. And

the signal is triggered while low-level or open circuit. This signal can be set by soft to abnormally interrupt the movement and shut down the laser power. It means that once the signal is triggered, the movement must be stopped and the laser must be cut off immediately. If the device does not use origin signal, this signal can be used as general input signal NO. 1 and corresponding to the B1 of the port map in the software.

4. Positive limit signal of Y-axis (signal name: YLP), PIN13. Its feature is same as that of X-axis. If the device does not use positive limit signal, this signal can be used as general input signal NO. 6 and corresponding to the B6 of the port map in the software.

5. Negative limit signal of Y-axis (signal name: YLN), PIN31. Its feature is same as that of X-axis. If the device does not use negative limit signal, this signal can be used as general input signal NO. 7 and corresponding to the B7 of the port map in the software.

6. Origin signal of Y-axis (signal name: Y0), PIN32. Its feature is same as that of X-axis. If the device does not use origin signal, this signal can be used as general input signal NO. 2 and corresponding to the B2 of the port map in the software.

7. Positive limit signal of Z-axis (signal name: ZLP), PIN28. Its feature is same as that of X-axis. If the device does not use positive limit signal, this signal can be used as general input signal NO. 8 and corresponding to the B8 of the port map in the software.

8. Negative limit signal of Z-axis (signal name: ZYLN), PIN9. Its feature is same as that of X-axis. If the device does not use negative limit signal, this signal can be used as general input signal NO. 9 and corresponding to the B9 of the port map in the software.

9. Origin signal of Z-axis (signal name: Z0), PIN10. Its feature is same as that of X-axis. If the device does not use origin signal, this signal can be used as general input signal NO. 3 and corresponding to the B3 of the port map in the software.

10. Emergency stop signal (signal name: STOP), PIN37. The signal is un-disabled by the circuit design. Once it is triggered, the movement will be stopped, the laser will be shut down and the general output will be cut off. In normal state, the input voltage should be greater than 10V, and the low-level or open circuit will trigger it. It corresponds to the B0 of the port map in the software.

11. General input signal (signal name: IN10), PIN18. It can be connected to a external signal, and its feature is same as the limit signal.

12. General input signal (signal name: IN11), PIN36. Same to above.

13. External power ground (signal name: EXGND), PIN22.

Note:

1. The input signal is optical-coupling isolation by the board. The input current range

from 10mA to 15mA.

2. When input signals are connected to the control card, the respective input signal positions should be set up accordingly in Ezcad software in order to enable the software to properly deal with the input signals. For the setup of input signal positions in Ezcad software, please refer to Manual for DevDia.exe.