

USBLMC_CUH_SPI_V2(0)

**USBLMC Client Use Handbook
For SPI G3**

Version	Date	Author	Comment
V1.0	2008-6-11		
V2.0	2009-9-22	Jack	Add RS232 connector; Add Global Enable connector

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Safety During Installation And Operation

Please read these operating instruction completely before you proceed with installing and operating this product. If there are any questions regarding the contents of this manual, please contact BJJCZ.

1. Steps For Safe Operation

- Carefully check your application program before running it. Programming errors can cause a break down of the system. In this case neither the laser nor the scan head can be controlled.
- Protect the board from humidity, dust, corrosive vapors and mechanical stress.
- For storage and operation, avoid electromagnetic fields and static electricity. These can damage the electronics on the product. For storage, always use the antistatic bag.
- The allowed operating temperature range is $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$.
- The storage temperature should be between -10°C and $+60^{\circ}\text{C}$.

2. Laser Safety

- This product is intended for controlling a laser scan system. Therefore all relevant laser safety directives must be known and applied before installation and operation. The customer is solely responsible for ensuring the laser safety of the entire system.
- All applicable laser safety directives must be adhered to. Safety regulation may differ from country to country. It is the responsibility of the customer to comply with all local regulations.
- Please observe all laser safety instructions as described in you scan head or laser module manual, and this manual.
- **Always turn on the power of this product and the power supply for the scan head first before turning on the laser. Otherwise there is the danger of uncontrolled deflection of the laser beam.**

We recommend the use of a shutter to prevent uncontrolled emission of laser radiation.

1. Introduction

USBLMC marking control board is developed specially for laser marking machine, which exchange data with PC through USB interface. According to the different laser modules, several model of the USBLMC have been designed. This model is intended for the SPI G3 fiber laser module. To control the board, please use EzCad software released after Mar 3, 2008.

1.1 Identification

There is a text "To SPI G30 Laser Module" in the middle of board. And text "Model: SPI G3 IO" in the left-bottom of the board. Shown as figure 1-1.

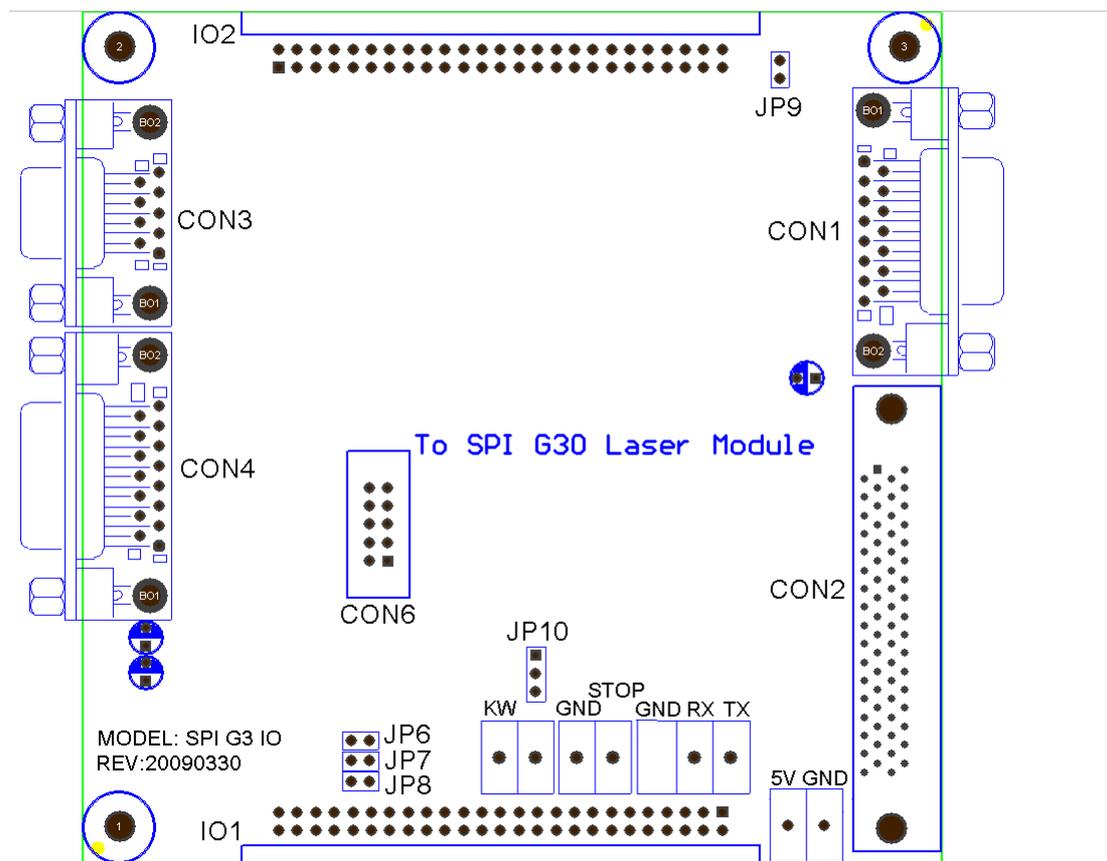


Fig. 1-1 USBLMC for SPI G3

On the board:

CON1: Connector for Scan head, in the form of DB15.

CON2: Connector for SPI G3 fiber laser module, in the form of SCSI 3 socket with 68 pins.

CON3: Connector for mark-on-fly, in the form of DB9. It is used to connect the encoder.

CON4: Connector for IO, in the form of DB15.

CON6: Connector for IO, in the form of IDC 10.

1.2 Features

- Use 68-pins SCSI 3 socket, connect SPI G3 laser module via 68-pin cable directly.
- RS232 interface to SPI laser module.
- Key Switch connector to Global Enable of SPI Laser Module.
- Output digital signals for digital scanhead.
- Supports Mark-on-fly function with an encoder connected.
- Support multi-board mode. Up to 8 boards can be controlled by one computer. The 8 boards can process different jobs (The function needs special software).
- Two axes for step/servo motor are available.
- Nine general input signal: IN0 ~ IN6 / IN8 / IN9. IN0 and IN1 are connected to CON6; IN2 ~ IN6 are connected to CON4, IN8 and IN9 are connected to CON3. All these input signal are TTL compatible.
- One general output signal OUT8. TTL compatible.
- Hardware start signal: using under the case that the marking graph will not changed and high efficiency is required. The data is saved on the board and this signal is handled directly by hardware without inform software. So it is not suitable to marking the variable text when using this mode. Also, the data size is restricted. **Caution: We must start the job by the software at the first time to transfer the data to the board.**
- USB 2.0 compliant.

2. Electric connection

2.1 Connector

2.1.1 Power Supply

A 5V/3A DC power supply is recommended. Power socket is located at the right-bottom corner of the board, as figure 2-1.

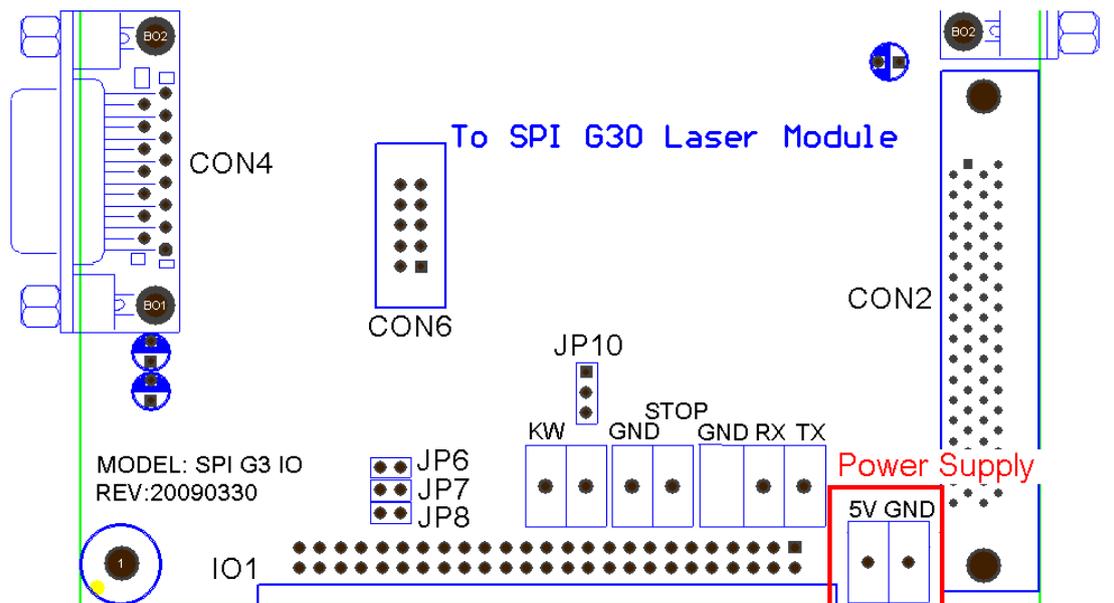


Fig 2-1 Power interface

	Name	Comment
	VCC	+5V。 Anode of power supply
	GND	Cathode of power supply

2.1.2 CON1: DB15, Galvo output

Galvo signal is digital signal, which can be directly connected to digital scanhead. Please confirmed that the transfer protocols is matched when using digital scanhead for there are different protocols. In order to connect analog scanhead, the transfer board is required to convert the digital signal to analog signal.

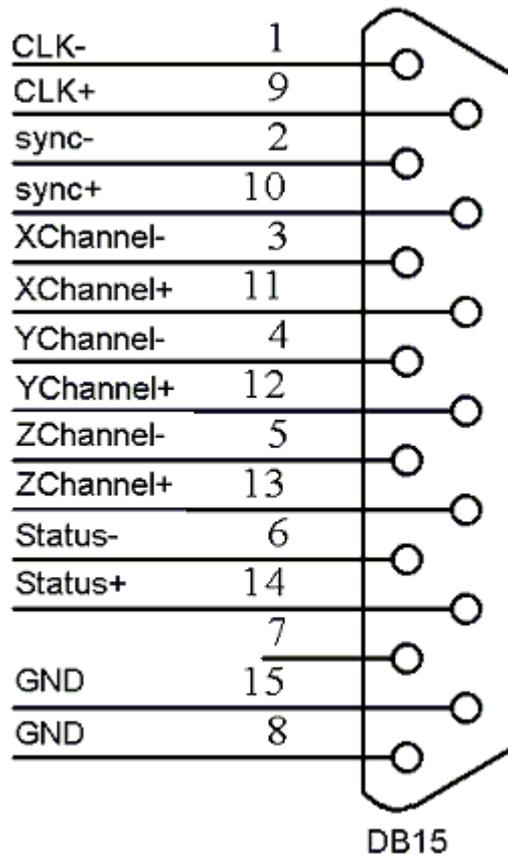


Fig. 2-2 Pin out of the CON1

Pin No.	Name	Comments
1, 9	CLK-/CLK+	Clock signal. Differential output
2, 10	SYNC-/ SYNC+	Synchronized signal. Differential output
3, 11	XChannel-/ XChannel+	Digital signal of axis X. Differential output
4, 12	YChannel-/ YChannel+	Digital signal of axis Y. Differential output
5, 13	ZChannel-/ ZChannel+	Digital signal of axis Z. Differential output
6, 14	Status-/ Status+	Reserved
8, 15	Gnd	The reference ground of control card.

For the two-axes scanhead, the signal pair CLK/SYNC/Xchannel/Ychannel are required to connect. The shielded twisted-pair cable is recommended to wire these signal.

2.1.3 CON2: 68 PINS SCSI 3, Laser control

Socket CON2 can be directly connected to the 68 pins socket on SPI G3 fiber laser module via a 68 pins cable.

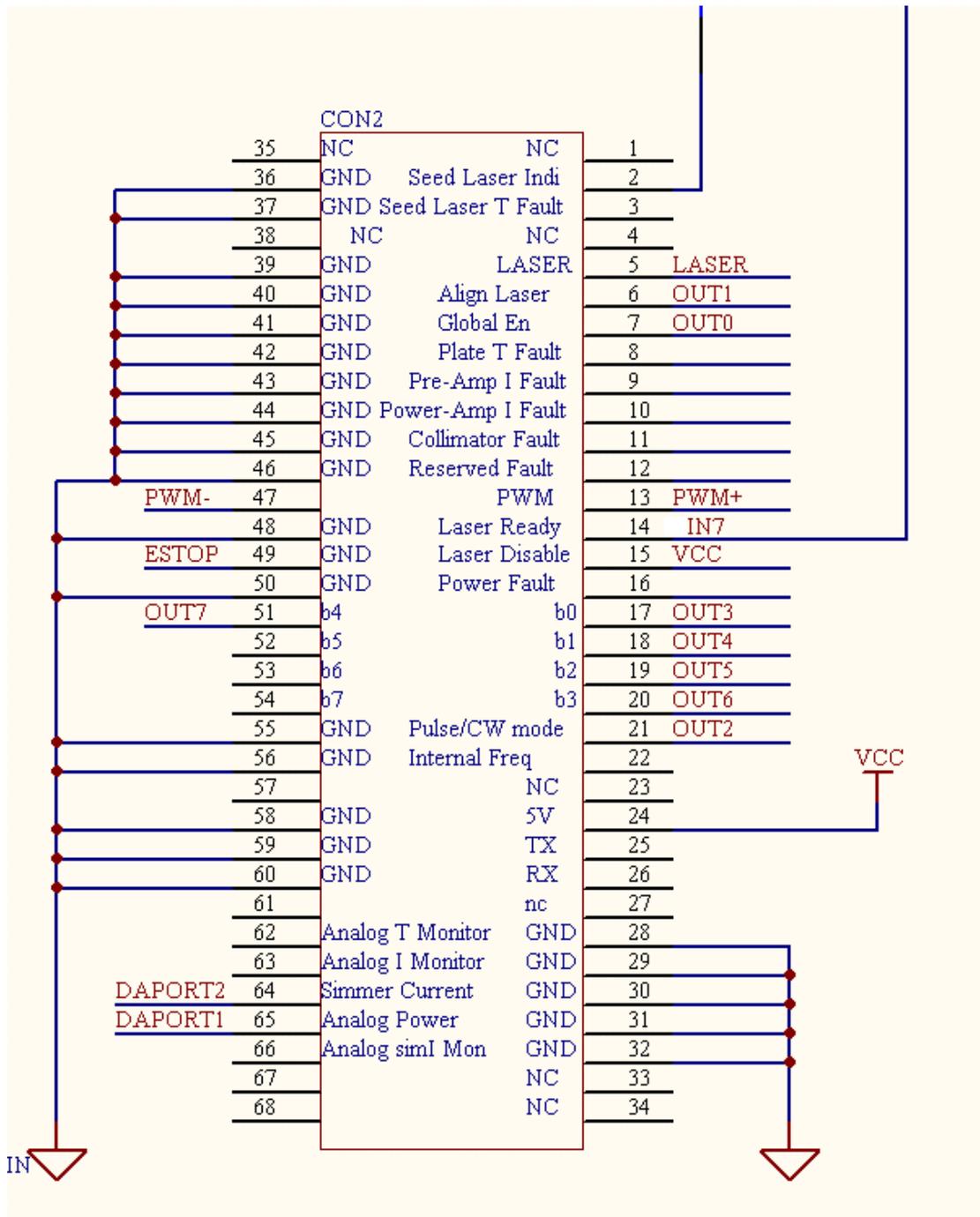


Fig. 2-3 Pin out of the CON2

PIN NO.	Name	Comments
5	Laser	Laser gate signal.
6	OUT1	Output, to align laser
7	OUT0	Output, to 'Global enable' of laser.
13	PWM+	Positive differential output of PWM signal
47	PWM-	Negative differential output of PWM signal

14	IN7	Input, 'Laser ready' signal from laser module
49	ESTOP	Input, Emergency stop signal
17	OUT3	Output, Wave select b0
18	OUT4	Output, Wave select b1
19	OUT5	Output, Wave select b2
20	OUT6	Output, Wave select b3
51	OUT7	Output, Wave select b4
21	OUT2	Output, switch between pulse mode and CW mode
15,24	VCC	+5V
64	DAPORT2	Analog voltage output, used to setup the simmer current
30,31,39,40, 41,48,55,58	GND	Ground
65	DAPORT1	Analog voltage output, used to setup the power of laser

2.1.4 CON3: DB9, Mark-on-fly

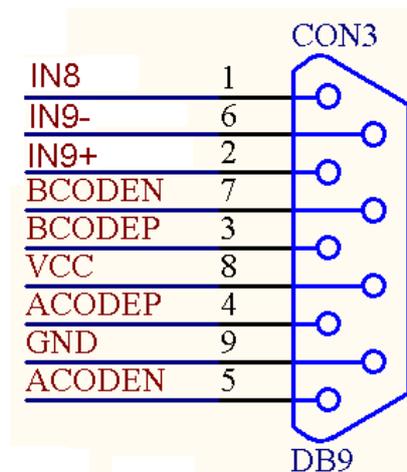


Fig. 2-4 Pin out of the CON3

PIN No.	Name	Comments
1	IN8	General input signal 8. TTL compatible. A 330 Ω current-limited resistor is used Internally. This signal should be connect to GND(Pin9) through a Normal-Opened switch. Please refer to Figure 2-8 and 2-9.
2, 6	IN 9+ / IN 9-	A 330 Ω current-limited resistor is used Internally. External current-limited resistor is recommended when the voltage between IN9-/IN9+ is over 5V. Please refer to Figure 2-10 and 2-11.
3, 7	BCODEP /BCODEN	Encoder's phase B input signal. Differential input.

4, 5	ACODEP /ACODEN	Encoder's phase A input signal. Differential input.
8	Vcc	+5V
9	Gnd	Ground. The return signal of pin 8 & 1.

2.1.5 CON4: DB15, IO

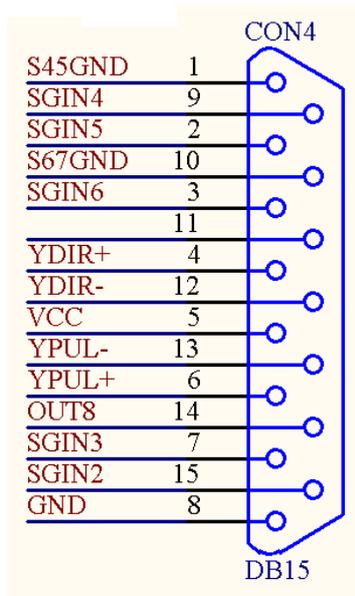


Fig. 2-5 Pin out of the CON4

PIN No.	Name	Comments
1	S45GND	The return signal of general input IN4 and IN5.
2, 9	SGIN5, SGIN4	General input IN4 and IN5. A 330 Ω current-limited resistor is used internally. If the voltage between SGIN4/S45GND or SGIN5/S45GND is greater than 5V, please use external current-limited resistor.
3	SGIN6	General input IN6. There is a 330 Ω current-limited resistor internally. If the voltage between SGIN6/S67GND is greater than 5V, please use external current-limited resistor.
10	S67GND	The return signal of general input IN6.
4, 12	YDIR+/YDIR-	Direction signal of extend axis Y.
5	VCC	+5V
6, 13	YPUL+/YPUL-	Pulse signal of extend axis Y.
7, 15	SGIN3, SGIN2	General input signals 2 & 3, reference to GND.
8	GND	Ground
11	NC	
14	OUT8	General output signal 8, TTL compatible

2.1.6 CON6: IDC10, IO

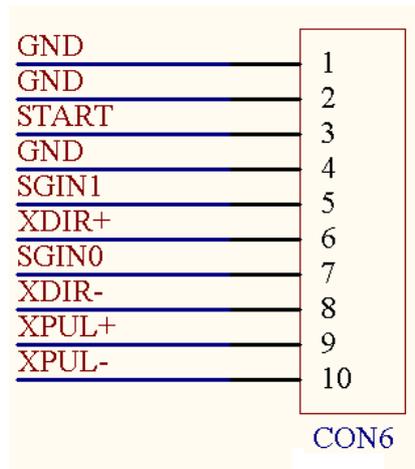


Fig. 2-6 Pin out of the CON6

PIN No.	Name	Comments
1,2,4	GND	Ground
3	START	Start signal. Please refer to Figure 2-8 and 2-9.
7	SGIN0	General input 0. Please refer to Figure 2-8 and 2-9.
5	SGIN1	General input 1. Please refer to Figure 2-8 and 2-9.
6, 8	XDIR+/XDIR-	Direction signals of extend axis X.
9, 10	XPUL+/XPUL-	Pulse signals of extend axis X.

2.1.7 RS232 / Key Switch / Emergency Stop

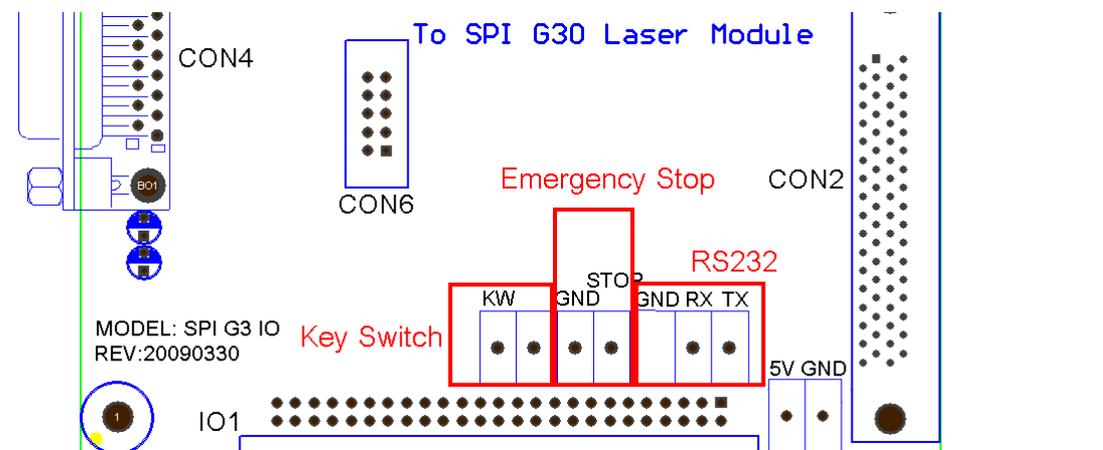


Fig. 2-7 Connector for RS232/Emergency Stop/Key Switch

- RS232 is directly wired to the Con2 which connected to the SPI G3 Laser Module. We may wire to PC com port and send commands to Laser Module.
- When Pin2-3 of Jumper10 is short, Key Switch is wired to Global Enable signal of laser module. While Pin1-2 is of Jumper10 is short, the control board generate the Global Enable signal internally. Just wire the two terminal of the connector to the two end of key switch.
- Just wire the two terminal of the connector to the switch used for Emergency Stop.

2.2 Jumpers

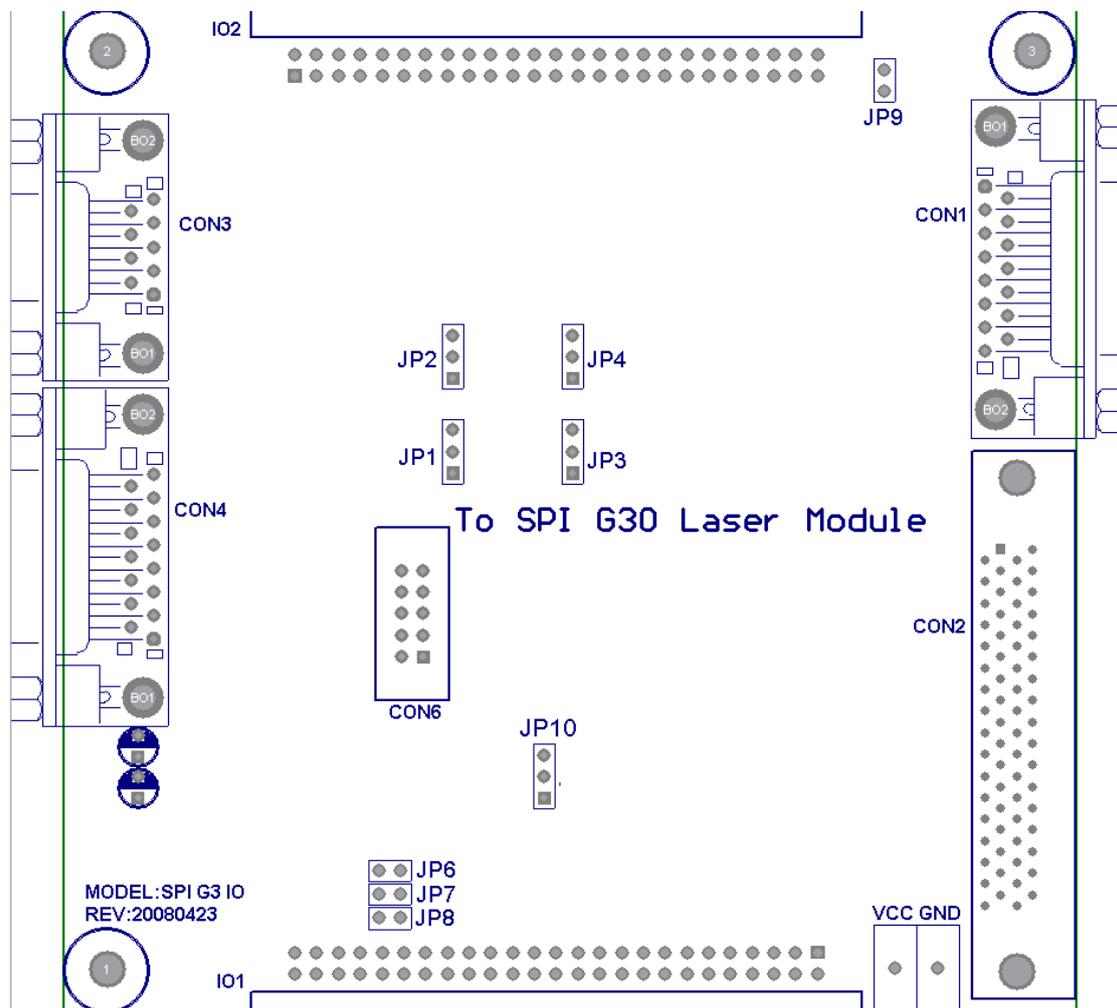


Fig. 2-8 Jumpers of the board

Name	Pin NO.	Comments
JP1, JP2, JP3,	3	Setup the direction/pulse signal. JP1 and JP3 setup the direction signal, while JP2 and JP4 setup the pulse signal. JP1 and JP2 correspond to axis Y, while JP3 and JP4 correspond to axis X. Short

JP4		pin1-2 of jumper will generate differential output. DIR-/DIR+/PUL-/PUL+ should be respectively connected to DIR-/DIR+/PUL-/PUL+ of step driver. Short pin2-3 will generate level output. In this case, VCC/DIR+/PUL+ should be respectively connected to VCC/DIR/PUL of step driver.
JP6, JP7, JP8	2	Index numbers 0~7, used to identify various cards when multiple cards are working on the same PC at a time. JP8/JP7/JP6 stand for bit b2/b1/b0 respectively. Short the JUMPER stands for that the bit is equal 0, otherwise is 1.
JP9	2	Short the JUMPER always. Unless the earlier version of DA-transfer board is used.
JP10	3	When Pin1-2 is short, the Global Enable signal is generated internally. While Pin2-3 is short, Key Switch should be used to generate the Global Enable signal. Leave the jumper open the Laser module will not work for no Global Enable signal is generate.

2.3 Interface circuit of digital IO

2.3.1 In0-In3, In8, Start

The detailed interface circuit of input signals In0 / In1 / In2 / In3 / In8 / Start are shown as figure 2-9 and 2-10.

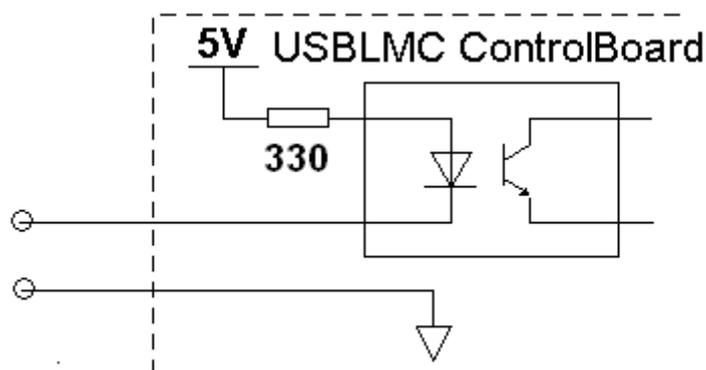


Fig. 2-9 interface circuit

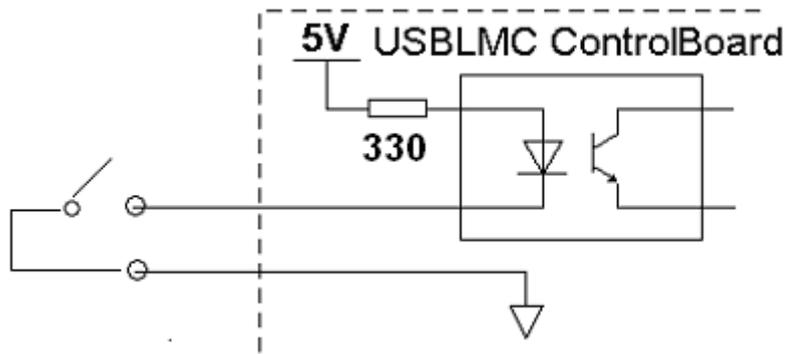


Fig. 2-10 wiring example: Normal-Opened switch is used

For these input signals, only a normal-opened switch is required. The contact resistance of the switch should be less than 100 Oh.

2.3.1 In4-In6, In9

The detailed interface circuit of input signal In4 / In5 / In6 / In9 are shown as figure 2-11 and 2-12.

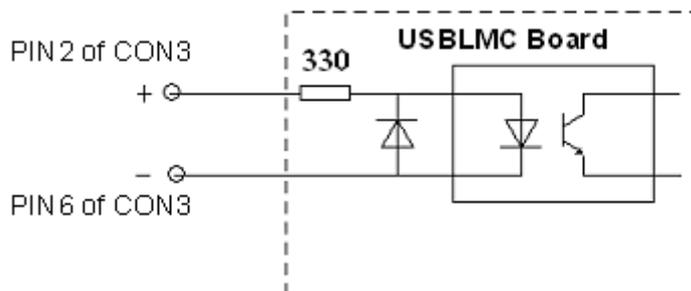


Fig. 2-11 Interface circuit

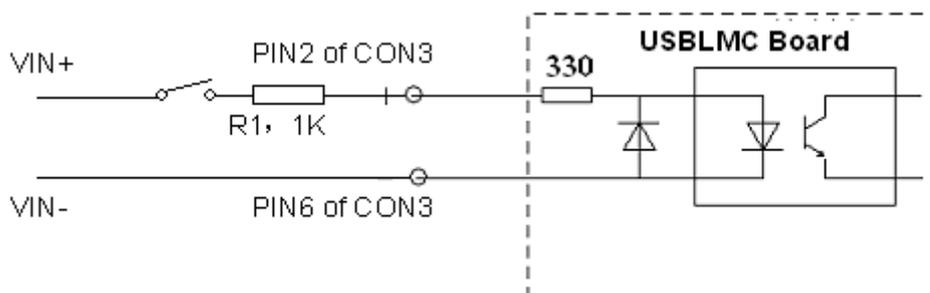


Fig. 2-12 wiring example: Normal-Opened switch is used

Resistor R1 is used to limit the input current between 10mA and 15mA. Assume that the

input voltage of VIN is larger than 5V, and input current is 12mA, then the resistance of R1 is calculated by the formula:

$$R1 = \left(\frac{V_{in}}{12} - 0.33 \right) \times 1000 \ \Omega$$

2.4 Emergency Stop / Key Switch

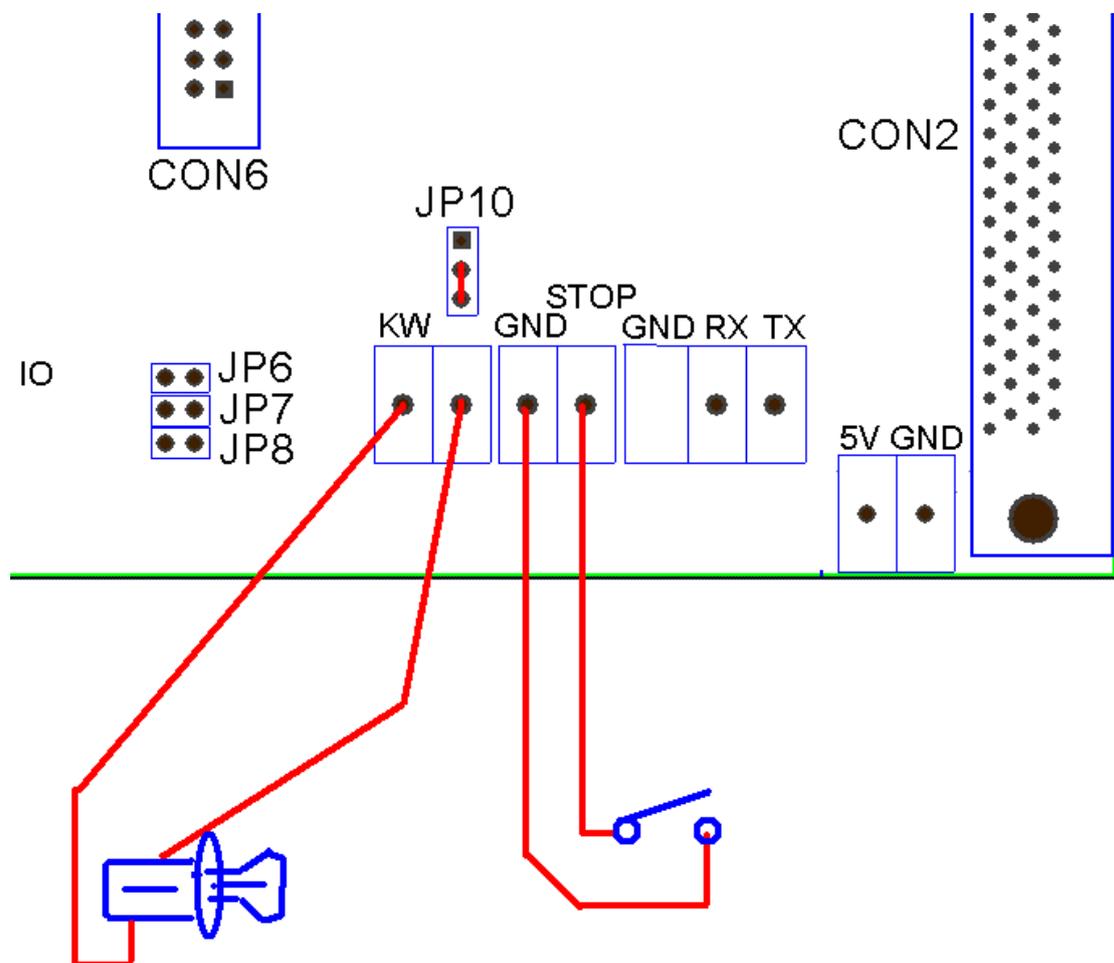


Fig. 2-13 Wiring of Emergency-STOP (Normal-Opened switch is used)

2.5 Typical connection

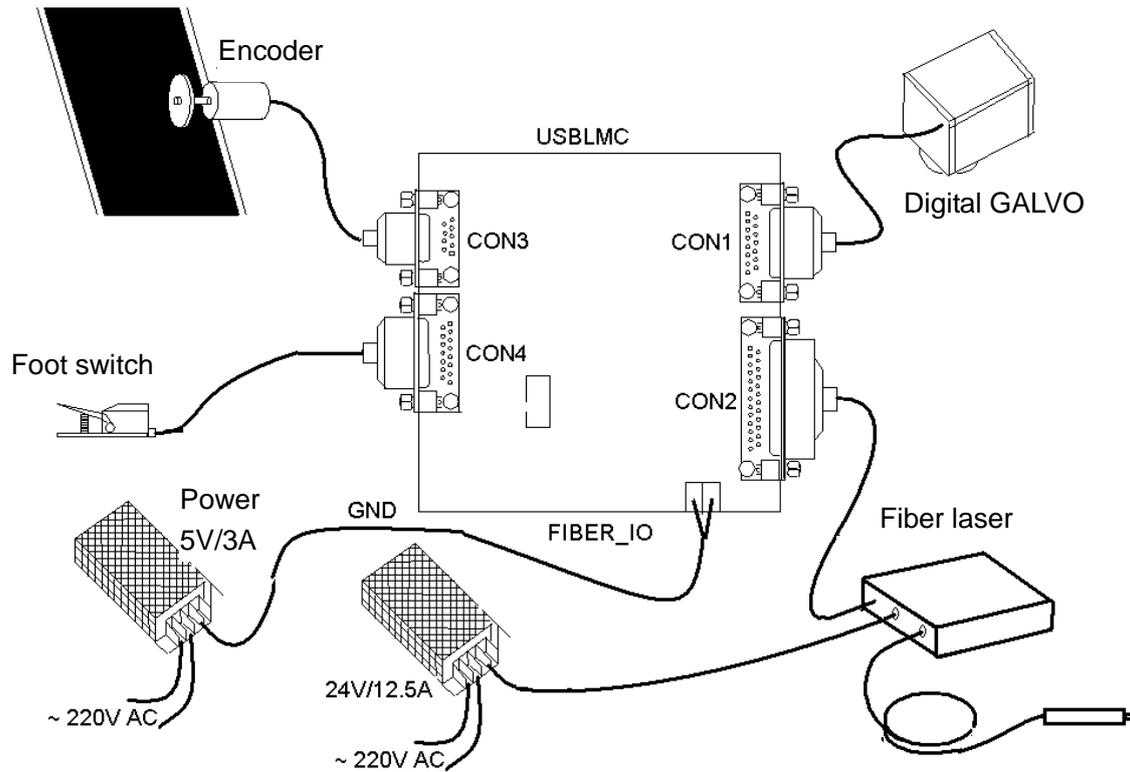


Fig. 2-14 Typical wiring illustration

Caution:

- In Fig. 2-14, only Power supply, fiber laser and GALVO is requisite
- The encoder is used only for Mark-on-fly.
- The foot switch is optional.