USBLMC_CUH_DIGIT_V2(1)

USBLMC Client Use Handbook

Digital Board

Version recorder

version	Date	Comment
V1.0	2007-1	
V1.1	2007-6	
V1.2	2008-5-21	Assort all the material and make it a document.
V1.3	2010.7	"Start" change to "Remark"
V2.0	2010-11-19	Usb digital board is upgraded with more digital I/Os. The pin definition has changed.

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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℃ ± 10℃.
   - The storage temperature should be between –20℃ and +60℃.
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 scan 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.

. Common Digital Module

LMC2010 laser marking board is specially for laser, connecting with PC by USB.

1.1 Definition of Output Socket

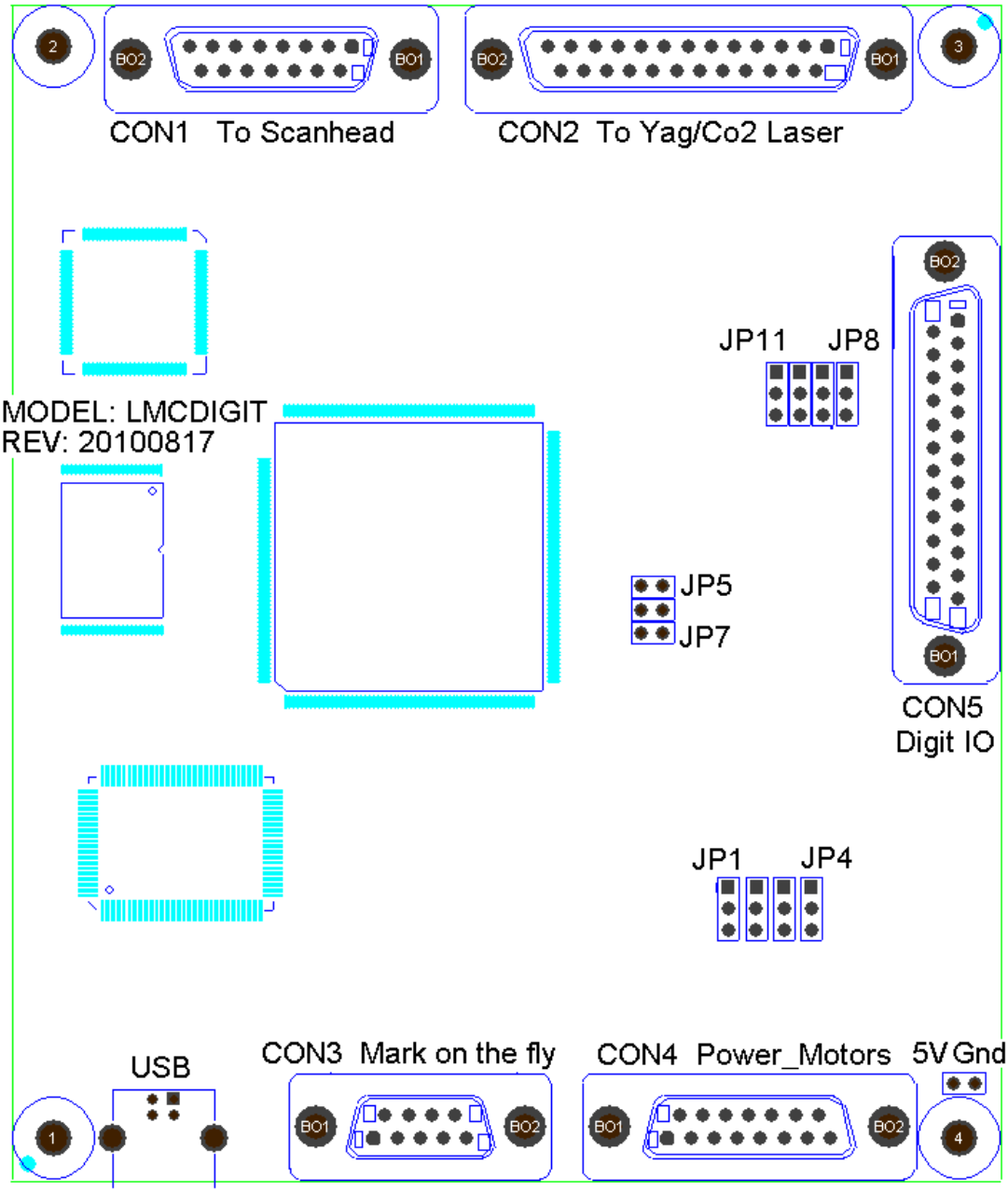


Fig 1 1 USBLMC digital card illustration

In this picture,

CON1：scanhead control socket, DB15

CON2：laser control socket, DB25

CON3：on-the-fly marking interface to encoder, DB9
CON4：power supply and i/o, DB15
CON5：general i/os, DB25

1.2 main feature

- Galvo control signal is digital, which can be connect to most scanhead directly.
- on-the-fly marking feature. A encoder can be used to surveillance the pipeline speed real-timely.
- Multiple system function. One computer can control up to 8 control board to mark different pattern simultaneously
- Extension axis(step motor or sever motor): two set of direction/pulse signal can be used to control 2 step(server) motors.
- 16 general input signals(TTL campatible): In0-In13, XORG0(IN14), YORG0(IN15).
- 14 general input signals(TTL campatible): Out0-7 coming out of Con5. Out8-13 coming out of CON2. Out0 - 3 ,out8 and out13 are TTL outputs. Out4-7 can be configured as OC output or TTL output by jumpers. Out 9-12 are OC outputs.
- ReMark(REpeat MARKing signal): in the case of high speed marking of a same pattern, a foot pedal can be connected to this pin. If some variables are in the pattern or the pattern is too big for the cache in board, the foot pedal can be only connect to general input pins.
- Laser signal: we provide both high level effective and low level effective signals.
- PWM signal: both differential and TTL signal is provided.
- A specified red light pointer signal is now added.
- Two analog signal that control power/frequency is now added.
- Using USB2.0 specifications.

2 electrical wiring

2.1 pin definition

2.1.1 power supply

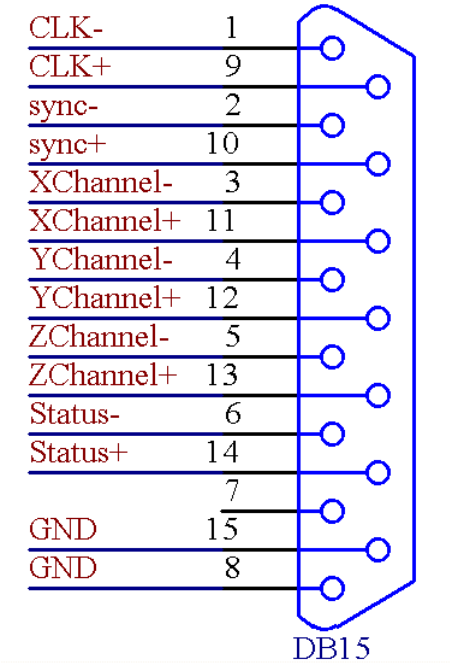
The control board need a 5V DC power supply. We recommend a 5V/3A DC supply. The Vcc and Gnd pin are 4/5 and 12/13 of CON4 respectively. You may find in other connectors some Vcc/Gnd pins, but we strongly suggest you use the ones in CON4.

CON4 pins	Name	function

4， 5	VCC	+5V power supply.
12，13	GND	Reference ground of the power supply.

2.1.2 CON1 ： DB15 scanhead control

The signals that control scanhead are digital, therefore can be connected to the digital scanhead directly. Because the protocols that every manufacturer used are not always the same, you need to conform which protocol is used. We also provide a D/A converter in the package. The digital signal converted by which can be connected to a analog scanhead.

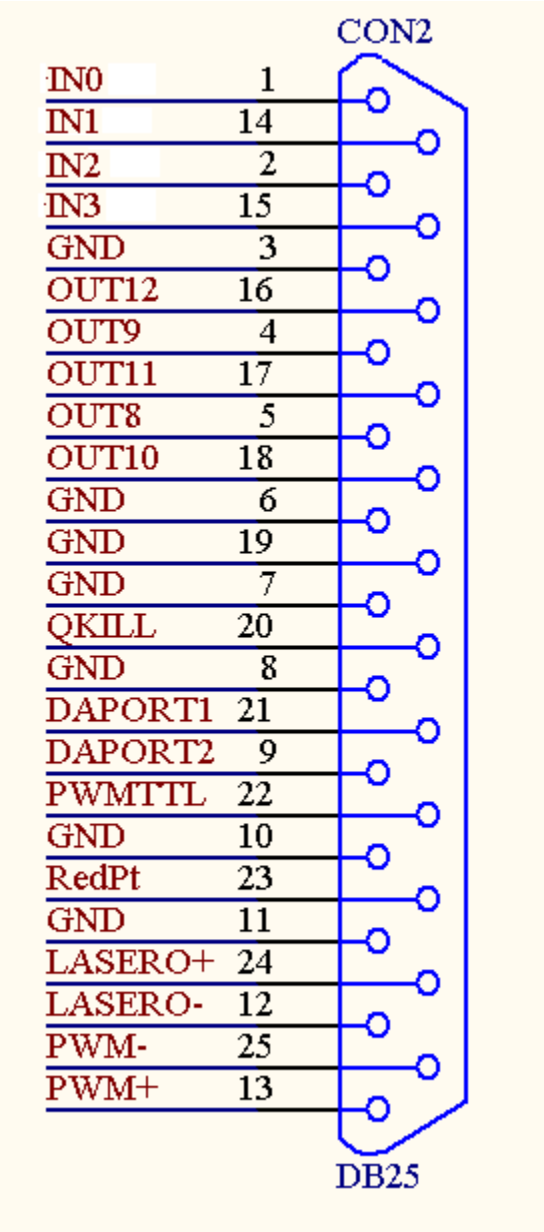


Pic 2 1 CON1 pin definition

Pin	Name	Function
1，9	CLK－ / CLK＋	Clock signal－ / Clock signal＋
2，10	SYNC－ / SYNC＋	Synchronization signal － / Synchronization signal＋
3，11	X Channel－ / X Channel＋	Scanhead signal X－ / Scanhead signal X＋
4，12	Y Channel－ / Y Channel＋	Scanhead signal Y－ / Scanhead signal Y＋
5，13	Z Channel－ / Z Channel＋	Scanhead signal Z－ / Scanhead signal Z＋
6，14，	Status-/Status+	Reserved
7	NULL	Reserved
8，15	GND	GND

To a commonly used two dimension scanhead, connecting CLK, SYNC, four wires for XChannel and Ychanne and the GND would be enough. We recommend a shielded twisted pair for all digital signal.

2.1.3 CON2 ： DB25 laser control/ I/O



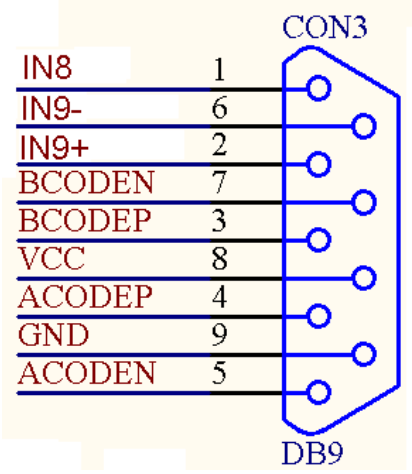
Pic 2-2 CON2 pin definition

Pin	Name	Function
1，2，14，15	IN0——3	General input 0-3 whose reference ground is pin GND. To use these signals connect this pin and GND to a switch. This is the In0-3 in the software.
3，6，7 8，10，11，19	GND	The reference ground of the control board. Use as a return pin(reference ground) of all the signals of CON2.
4，5，	OUT9，13	General output 9 and 13. TTL compatible.

16， 17， 18	OUT10，11，12	General output 10-12. Open chain output.
20	QKILL	First pulse kill signal. TTL compatible.
9	DAPORT2	Frequency control/ first pulse kill. This is a analog signal between 0-5V. the maxim drive current is 5mA. To switch between these 2 signals use the settings in software.
21	DAPORT1	Laser power signal. This is a analog signal between 0-10V. the maxim drive current is 5mA.
23	RedPt/OUT8	Red light pointer signal. TTL compatible.
12	LaserO-	Laser on signal. TTL compatible. Low level effective.
24	LaserO+	Laser on signal. TTL compatible. High level effective
13，25	PWM-/PWM+	PWM signal. Differential output.
22	PWMTTL	PWM signal. TTL compatible. For CO2 laser this signal is used as power control signal as well as the tickle signal. For YAG laser it's used as a repeat frequency signal of Q driver.

Remark: CON2 is mother socket connector.

2.1.4 CON3 ： DB9 On-the-fly interface

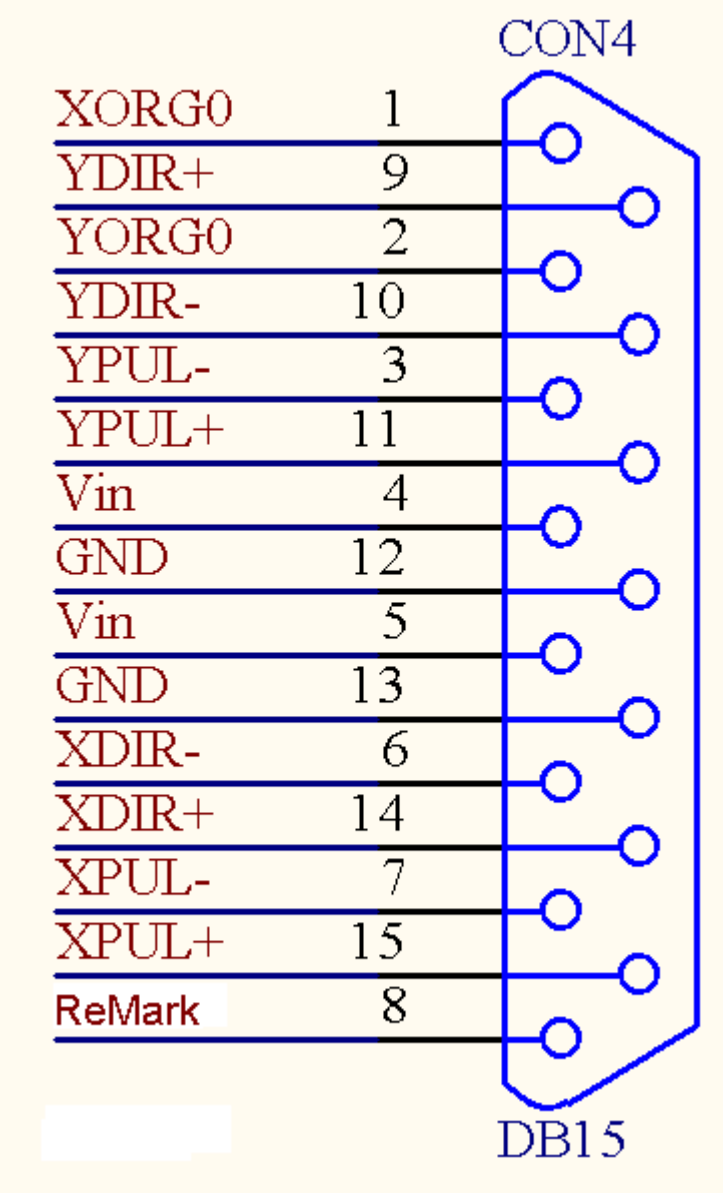


Pic 2-3 CON3 pin definition

Pin	Name	function	
1	IN8	Input port 8	Form a closed circuit with GND
2，6	IN9＋，IN9－	Input port 9	With a 1K resistor built in. if the input signal is over 12V, an external resister is recommended.
3，7	BCODEP/ BCODEN	Encoder input B＋/B-	
4，5	ACODEP/ACODEN	Encoder inputA＋/A-	

8	VCC	+5V output	This is a power supply for external device. DO NOT CONNECT POWER SUPPLY HERE OR SHORT IT WITH GND. OTHERWISE IT WILL CAUSE DAMANGE OF THE BOARD.
9	GND	Reference ground	

2.1.5 CON4 ： DB15 power supply and extension axis control.

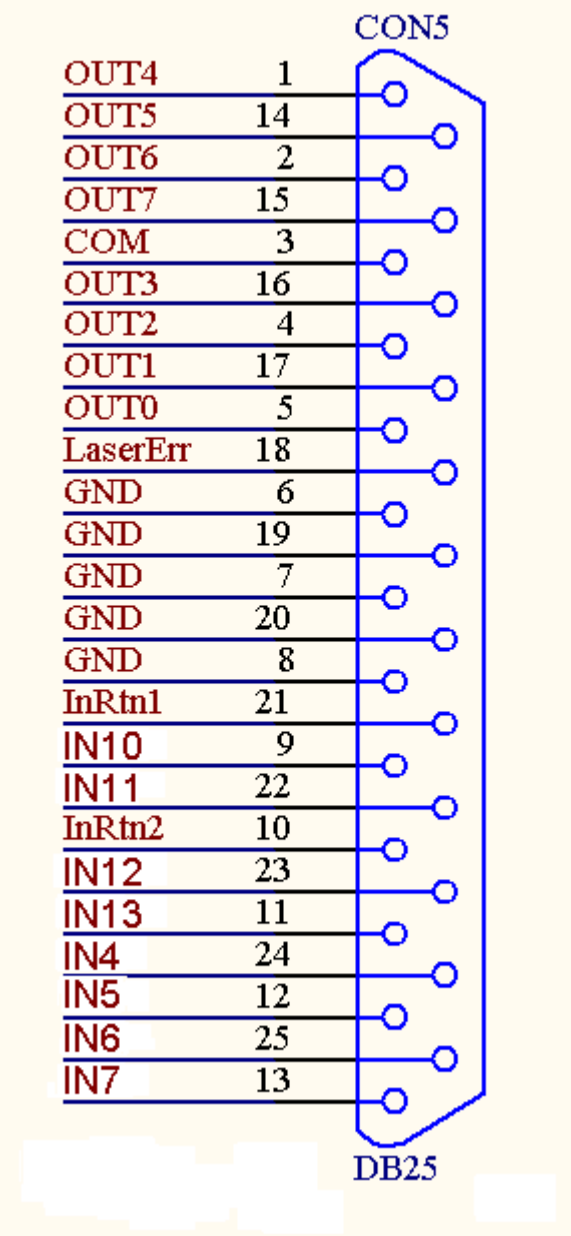


Pic 2-4 CON4 pin definition

Pin	NAME	Function
1	XORG0	The home signal of extension axis X. To use this pin just connect it and GND to a switch. In software In14 represents this pin.
2	YORG0	The home signal of extension axis Y. To use this pin just connect it and GND to a switch. In software In15 represents this pin.
9，10	YDIR+/YDIR-	Direction signal of extension axis Y (step motor or sever

		motor). It can be either a differential output or a TTL output.
3，11	YPUL+/YPUL-	Pulse signal of extension axis Y (step motor or sever motor). It can be either a differential output or a TTL output.
4，5	Vin	Input pin for 5V power supply.
12，13	Gnd	Reference ground of 5V power supply
6，14	XDIR+/XDIR-	Direction signal of extension axis X (step motor or sever motor). It can be either a differential output or a TTL output.
7，15	XPUL+/XPUL-	Pulse signal of extension axis X (step motor or sever motor). It can be either a differential output or a TTL output.
8	ReMark	Repeat marking signal. Use GND as a reference ground, to use this signal just connect a switch between this pin and GND. When it is activated the control will mark the content in the cache.

2.1.6 CON5 ： DB25 general I/O



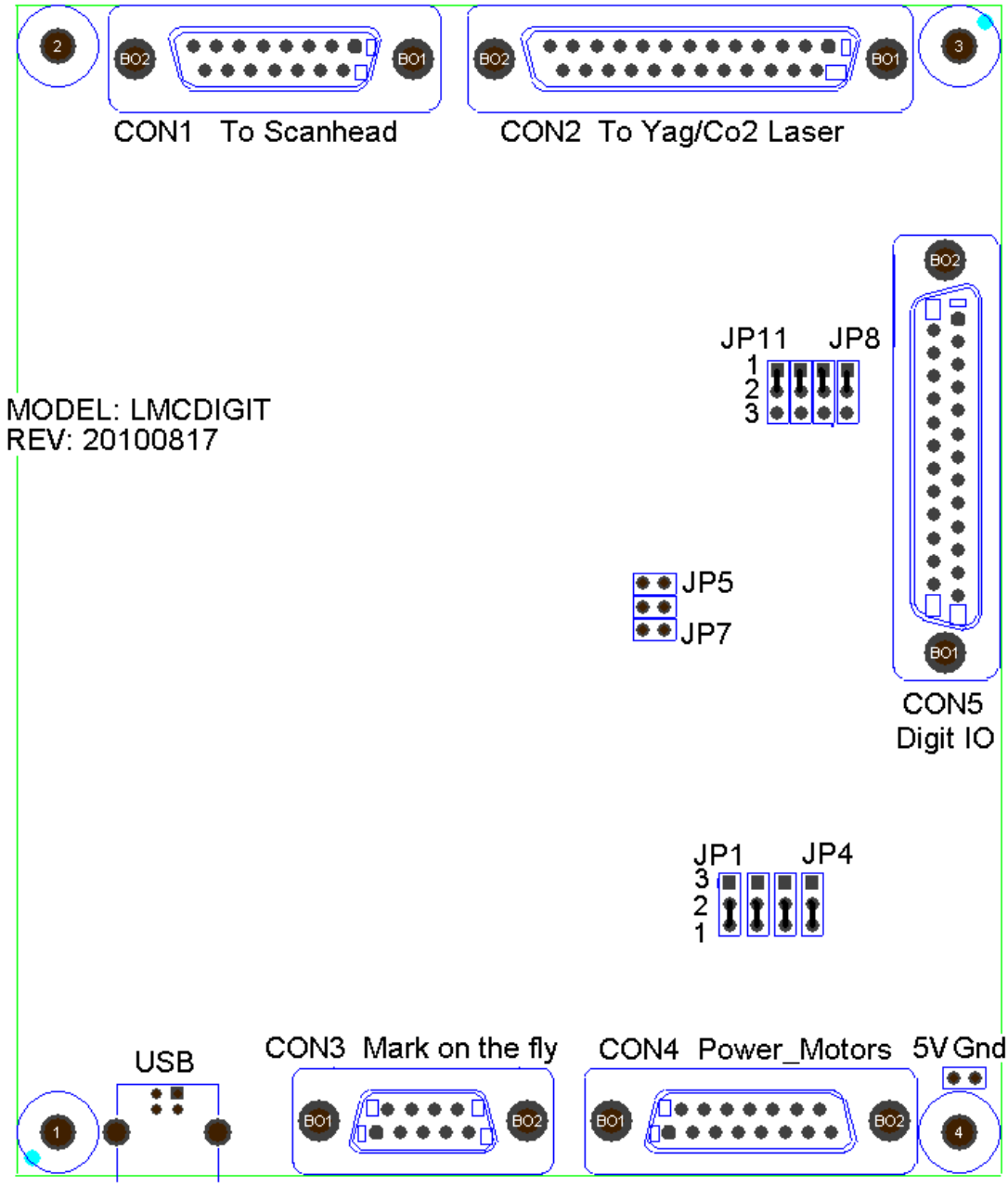
Pic 2-5 CON5 pin definition

pin	name	function
1，2，4，5，14，15，16，17	Out0——7	General Output Out 0—Out 7, using GND as reference ground. They are all TTL output by default. Out 4-Out 7 can be configured to perform as a OC out put by jumper JP8-11.
3	COM	When out4 – out 7 are set to be oc outputs, connect this pin the the external power supply which provides voltage and current for these OC outputs.
18	LaserErr	Reserved。

6，7，8，19，20	GND	Reference ground of control board. Used by out0-out7 and in0-in3.
21	InRtn1	return pins for in10/in11
9，22	In10，In11	Input signal in10/in11, using InRtn1 as a return pin, with a 1k build in resistor.
10	InRtn2	return pin for in7/in8
11，23	In12，In13	Input signal in12/in13, using InRtn1 as a return pin, with a 1k build in resistor.
12，13，24，25	In4——7	General input in4-in7, using GND as a reference ground. To use these signal connect a switch between each pin and GND.

Remark: CON5 is father socket connector.

2.2 jumpers



Pic 2-6 jumpers in board

See jumper illustrations as followed:

No.	Qty of Pin	Illustrations
JP1，JP2 JP3，JP4	3	Direction/pulse signal setting of extend axes. JP1 and JP3 set direction signals; JP2 and JP4 set pulse signals. JP1 and JP2 correspond to extend axis Y; JP3 and JP 4 correspond to extend axis X. Short connecting JUMPER pin1&2 will make direction/pulse signals differential outputs. Respectively connect

		control card's DIR-、DIR+、PUL-、PUL+ to step driver's DIR-、DIR+、PUL-、PUL+；Short connecting JUMPER pin2-3 will make direction/pulse signals level outputs. In this case, respectively connect control card's VCC、DIR+、PUL+ to step driver's VCC、DIR、PUL。
JP5,JP6 ，JP7	2	Index numbers 0~7. Differentiate various cards when muti-cards are used at a time. JP7 –JP6- JP5 respectively correspond to binary b2 b1 b0. Short connecting JUMPER means 0, and not short connecting it means 1.
JP8, JP9, JP10，JP11	2	Set output signal out4-7 as Open drain(OC). Short connecting JP1&2 make TTL output; short connecting JP2&3 make OC output.

Default Settings:

JP1——JP4：Short connecting pin 2-3. Level output.

JP5——JP7：Not connected.

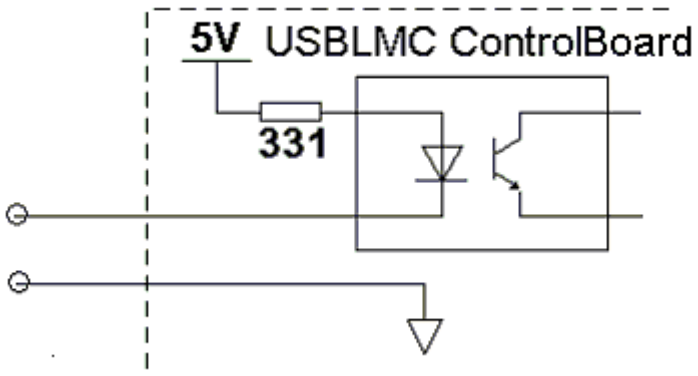
JP8——JP11：Short connecting pin 1-2. TTL output.

2.3 wiring for digital I/O.

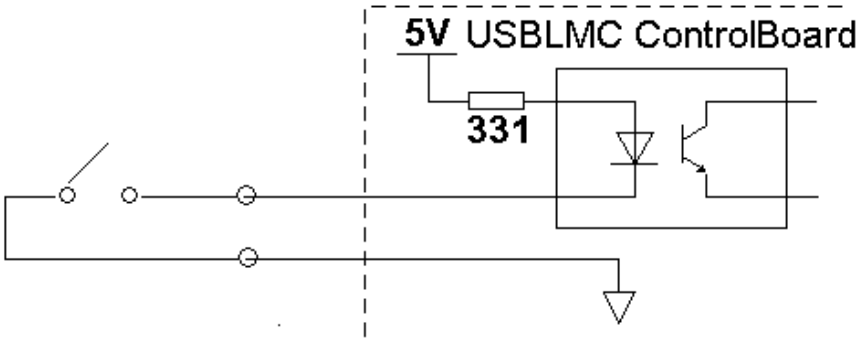
2.3.1 I/O that can be connect to GND

As name suggested these kind of I/O can be connected to switch and then to the ground. **In0-7，In8, ReMark，XORG0,YORG0 is of this kind.**

The following schematics are typical wiring diagrams for these kind of signal.



Pic 2-7 wiring for general input pins

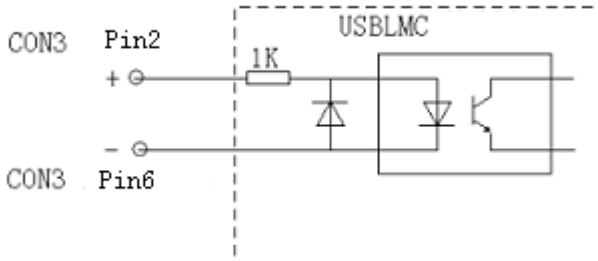


Pic 2-8 recommended wiring for general input pins

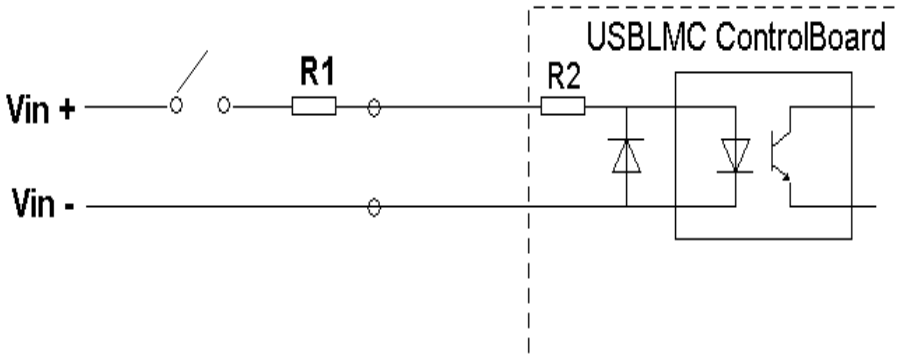
For these pins the resistor of the switch should be below 100ohm.

2.3.2 input signal In9-13

The typical and recommend wiring of general input signals In4-7/ In9 are shown in pic 2-9 and 2-10.



Pic 2-9 typical wiring for general



Pic 2-10 recommended wiring for general input pin in9

Wether to introduce R1 depends on the voltage. The goal here is to ensure that the input current is between 10mA and 15mA. If the voltage is over 12V, we recommend a current-limiting resistor. Assume that the current you choose is 12mA, then the resistor is calculated as follow:

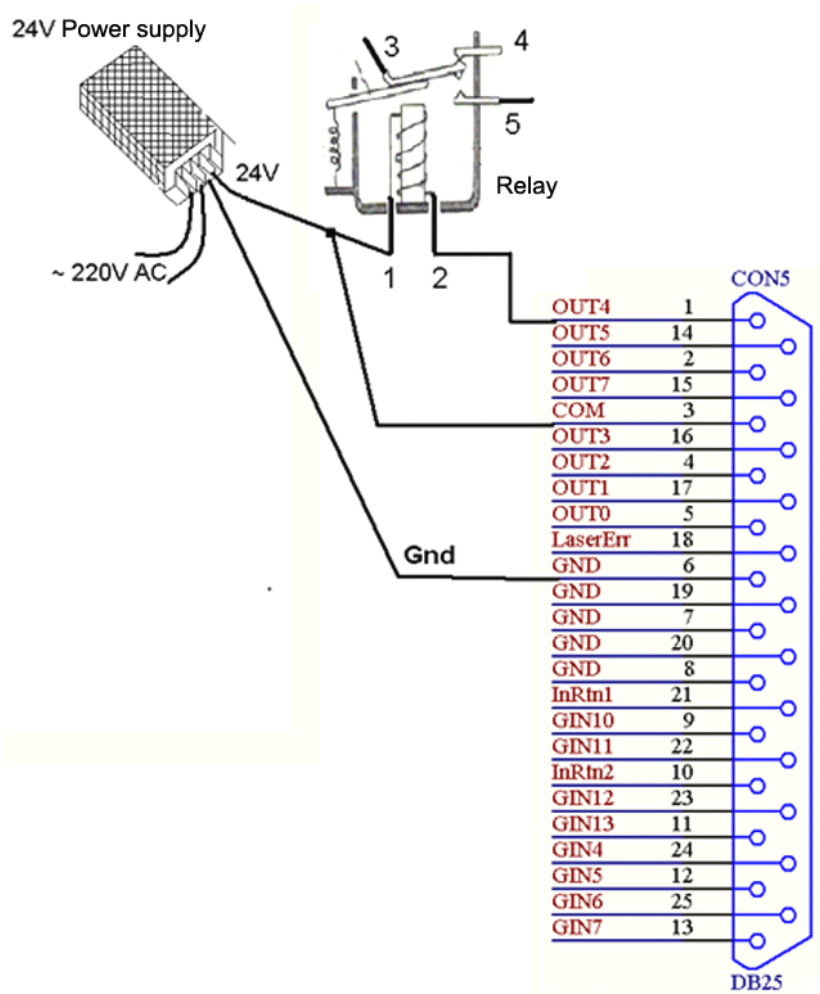
$$R1 = \left(\frac{Vin}{12} - 1\right) \times 1000 \quad \Omega$$

2.3.3 输出信号

Out0/1/2/3/13 is TTL singal, with JP8/9/10/11 to set out4/5/6/7 as OC or TTL output.Out9/10/11/12 is OC output.

When TTL output, need to in case of short connection ot connect ground, or the card will be ruined.

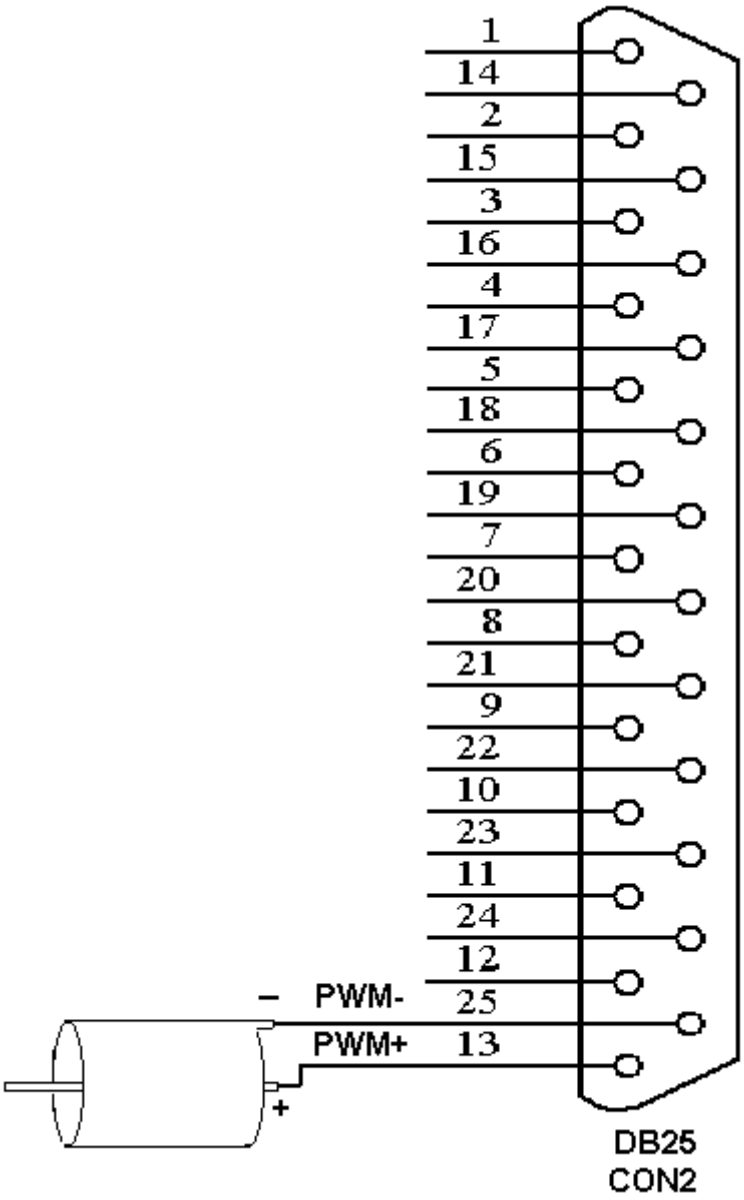
When OC output, please reference to fig 2-11. especially when connecting inductiveload, for example:inductive relay, need to connect COM to anode of power supply. When OC output, the promised current is 250mA, voltage is 40V.



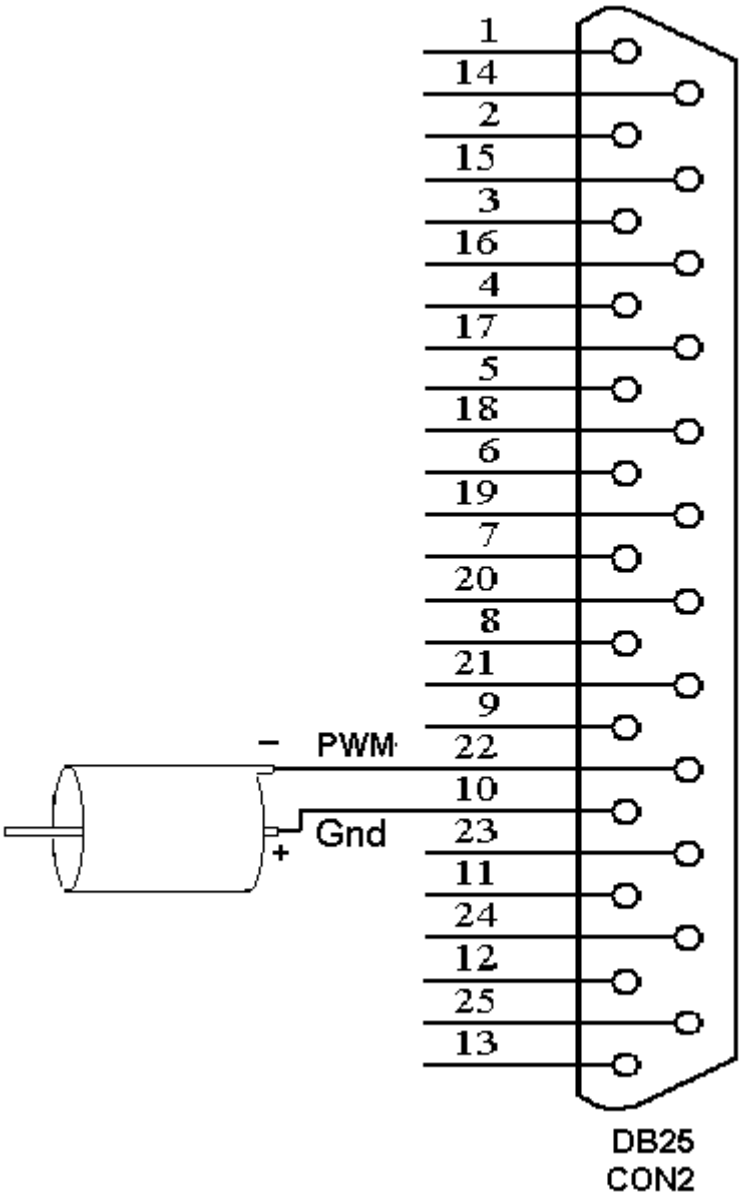
Pic 2-11 Connetion of OC and relay

2.3.4 wiring for PWM signal

PWM signal can output as a differential signal or a TTL signal.



Pic 2-11 differential output：PWM+/PWM-



Pic 2-12 single ended output(TTl): PWM/GND

2.3.5 FPK signal

FPK Signals

USBLMC1 control card can output two types of FPK signal, one being the TTL signal and the other analog signal. TTL FPK signal is output from CON2 socket pin2 – QKILL. This signal's chronological relation with laser switch signal and PWM signal can be set via software. Particular way of restraint can be set according to practical situations. To YAG equipments, PWM signal is the repeat frequency signal for the drive Q. See fig. 1-13 for the chronological relation.

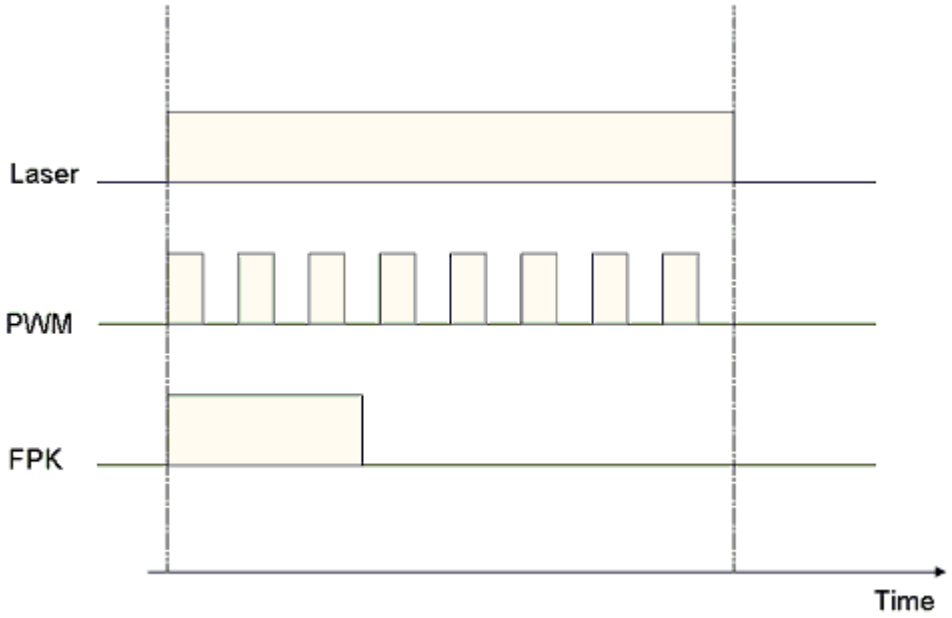


Fig.1-13-1 FPK Signals forming at the same time as PWM Signals

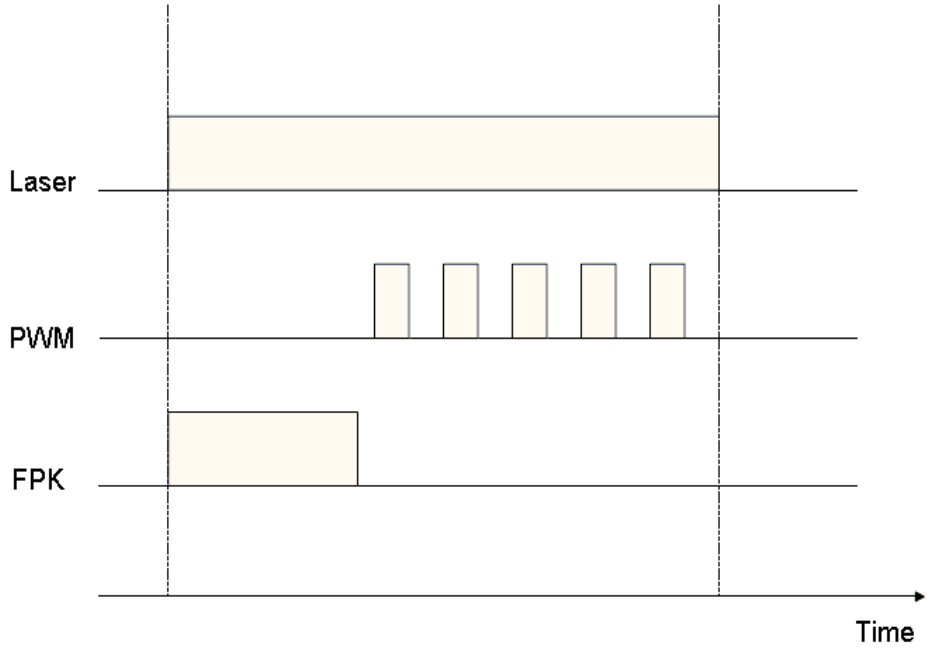


Fig.1-13-2 FPK Output PWM signal after finishing

The FPK signal as analog signal is output from CON2 socket pin9 – DA2PORT, and shares the same pin with analog (frequency) output port. This pin can be set in software as FPK signal or as repeat frequency setting signal. Analog pulse restraint signal is output as shown in the following fig. 1-13-3.

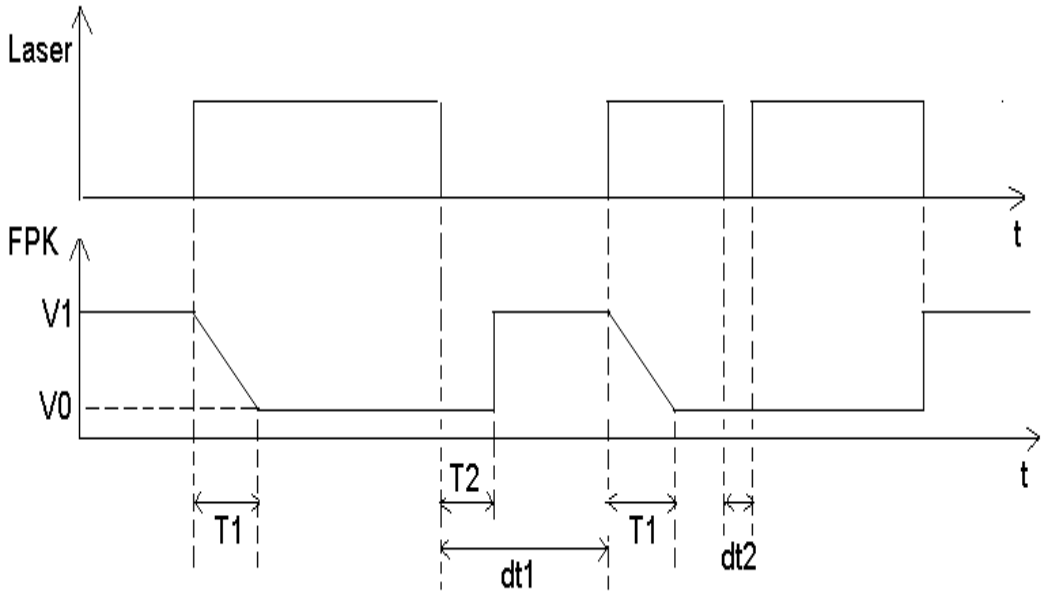


Fig.1-13-3 Analog FPK

Four parameters V1, V0, T1, and T2 must be set in the software for analog FPK. Their meanings are as followed:

V1: Maximum voltage of analog FPK signal.

V0: Minimum voltage of analog FPK.

T1: Time taken for analog FPK to change from maximum voltage to minimum voltage.

T2: Minimum intervals between analog FPK outputs.

As per fig.1-13-3, when laser cut-off time dt1 >T2, the next time when laser outputs, the analog FPK become effective. When the laser cut-off time dt2 < T2, there is no FPK.

The FPK signals in fig.1-13-3 are descending, and the signals can be set via software to be ascending.

2.4 Typical Connection of Digital Module

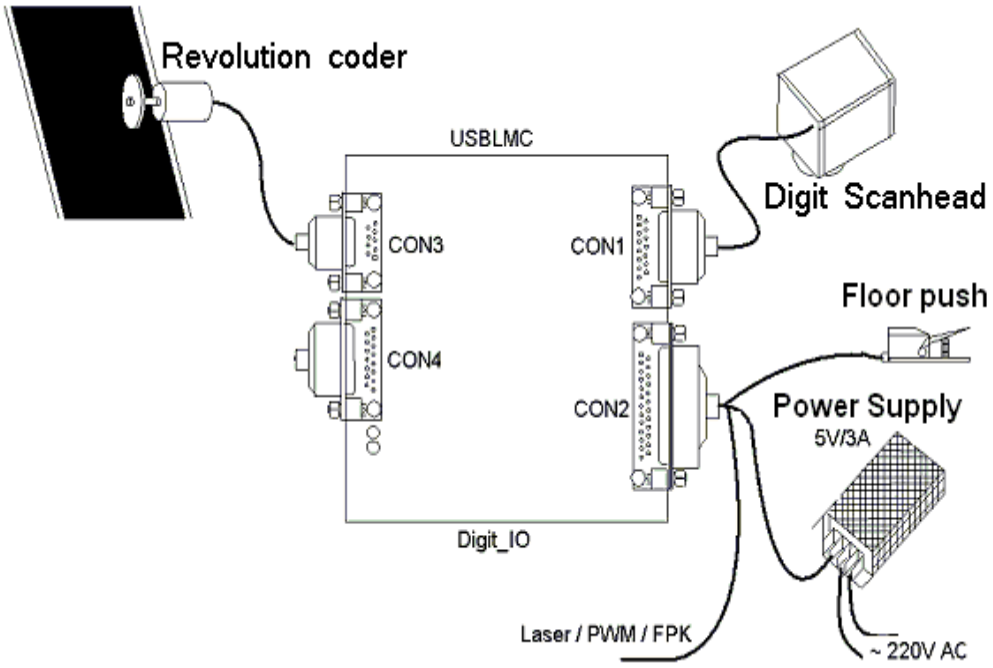


Fig. 1-15 Typical Connection of Digital Module

For the Floor push, it depends whether the rotary encoder needs connected. If the marking-on-fly function is not used, then there is no need to connect the rotary encoder.