MC-1
Laser Marking Controller

User Manual

Version 2.5

2012/06/19

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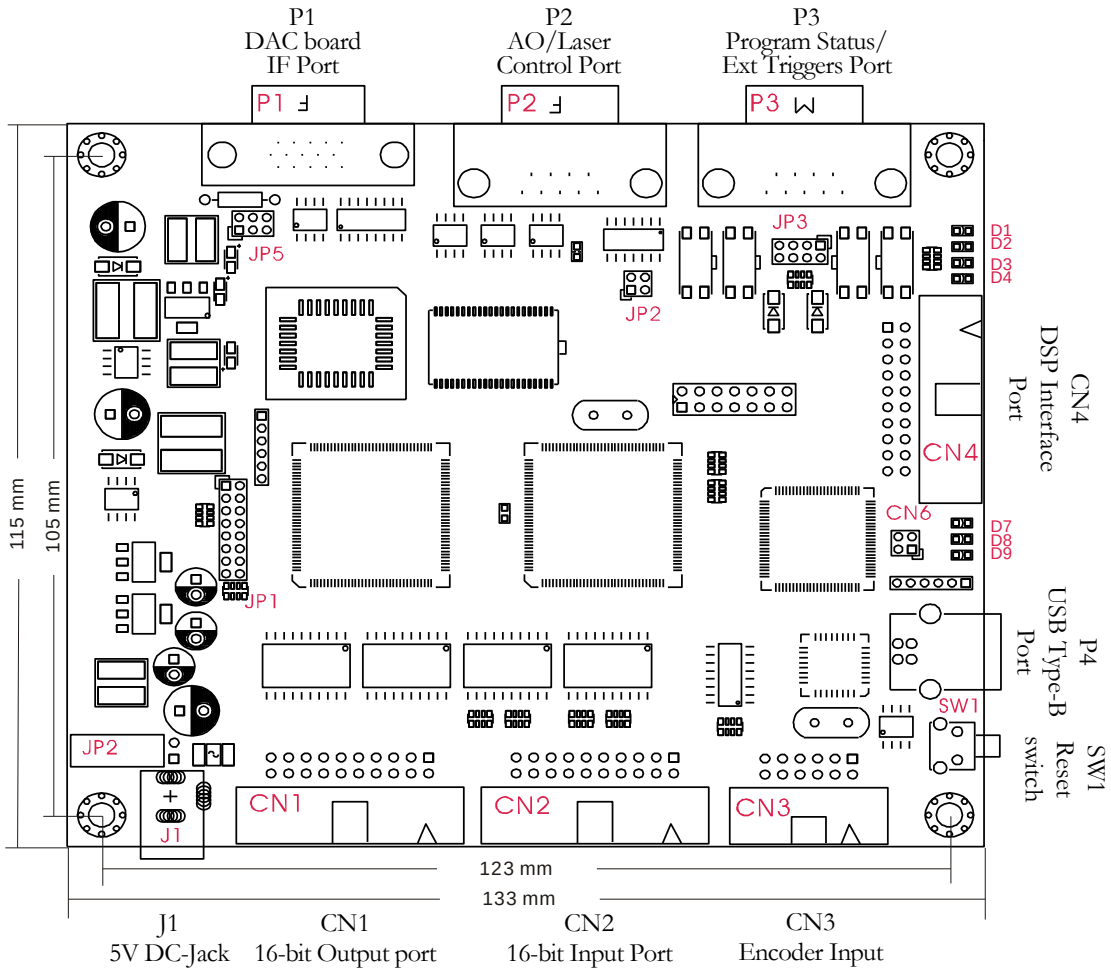
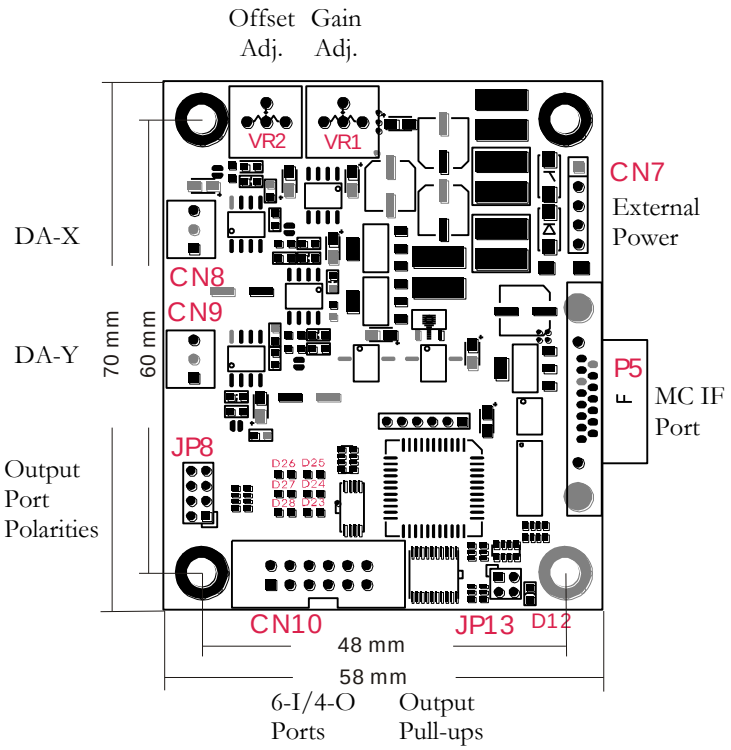


D/A Receiver Connectors Layout



MC-1 Connector Pin Assignments and Signal Descriptions

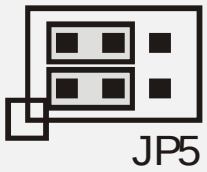
P1---D/A Board Interface Port

D/A board interface are a high-density D-SUB connector providing digital control signals to DAC board.

Pin No.	I/O Type	Signal Name	Description	Comment
1	Power	+12V	+12V power to D/A	
2	I	DSTATUS+	Status input from D/A	
3	O	DATA_X+	Channel 1 data stream to D/A	
4	O	DSYNC+	Synchronization signal to D/A	
5	O	DCLK+	Clock signal to D/A	
6	Power/O	-12V	-12V power to D/A	
7	I	DSTATUS-	Status input from D/A	
8	O	DATA_X-	Channel 1 data stream to D/A	
9	O	DSYNC-	Synchronization signal to D/A	
10	O	DCLK-	Clock signal to D/A	
11	Power	GND	Ground	
12	Power	GND	Ground	
13	Power	5V	+5V power to D/A	
14	Power	GND	Ground	Short JP5.1 to JP5.3①
	O	DATA_Y+	Channel 2 data stream to D/A	Short JP5.5 to JP5.3①
15	Power	GND	Ground	Short JP5.2 to JP5.4①
	O	DATA_Y-	Channel 2 data stream to D/A	Short JP5.6 to JP5.4①

Caution

① **The default settings are JP5.1 to JP5.3 and JP5.2 to JP5.4, i.e. Pin 14 and pin 15 serve as ground connections. When the controller is used to drive a XY2-100 interface DA board, connect JP5.5 to JP5.3 and JP5.6 to JP5.4, i.e. P14 and pin 15 serve as Y channel connection. Under such case, P3 and pin 9 serve as X channel, and firmware setting should be adjusted accordingly.**



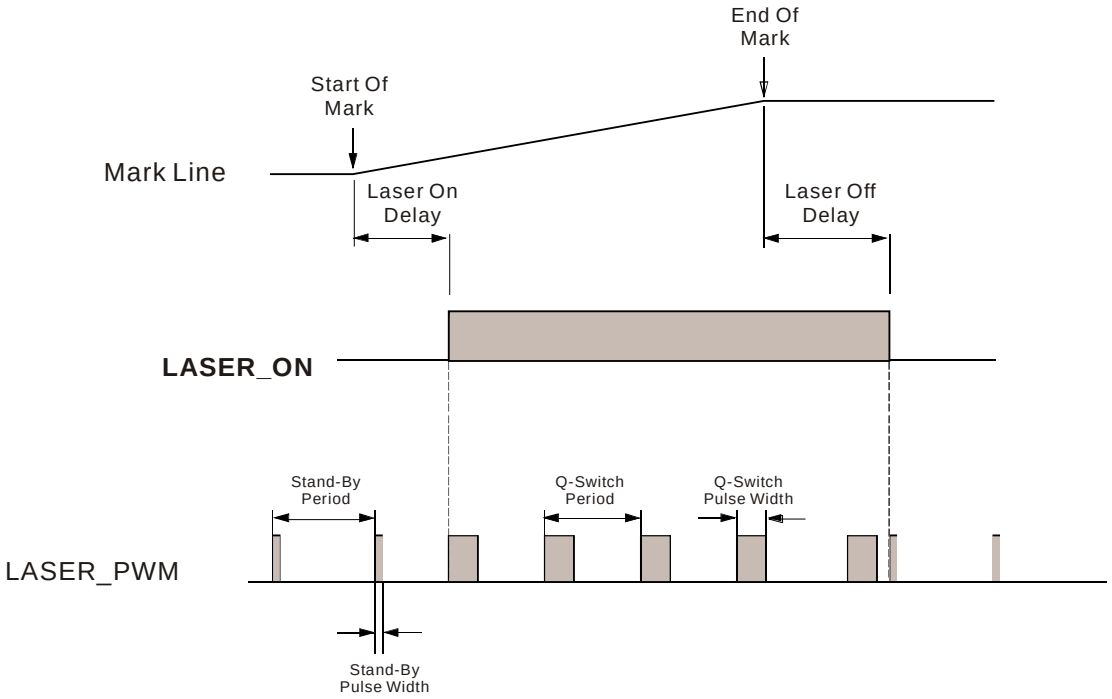
pin 2 , 4 close
pin 1 , 3 close

P2---Analog Output/Laser Control Port

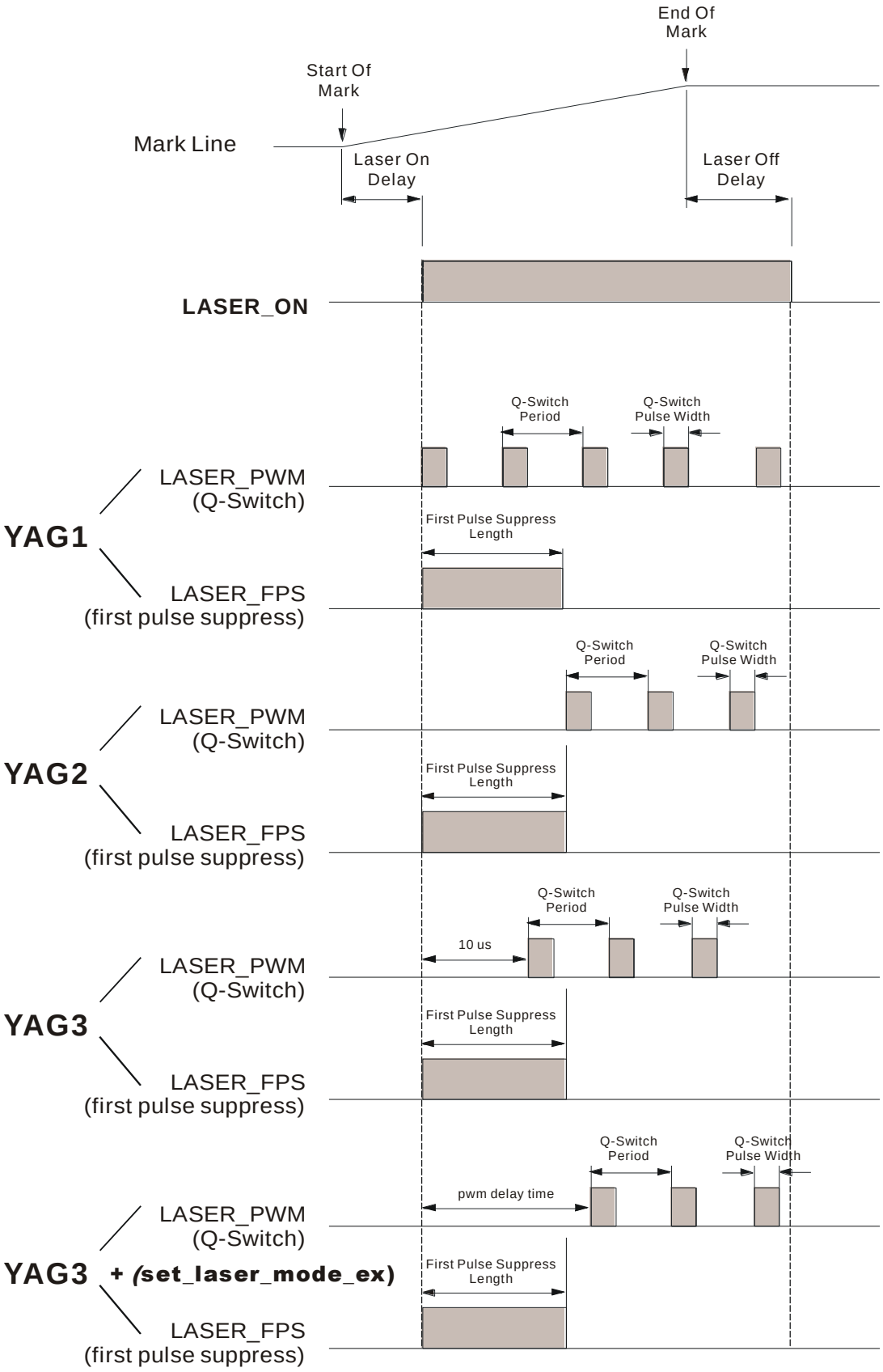
Analog Output/Laser Control port is a D-SUB female connector providing 2 analog outputs and 3 digital outputs to control laser power and frequency.

Pin No.	I/O Type	Signal Name	Description	Comment
1	O	AO1	DAC 1 output, 10 bit resolution	0 ~ 10 V
2	Power	GND	Analog ground of AO1/AO2 signals	
3	Power	GND	Ground of LASER_ON,LASER_PWM, LASER_FPS and +5V supply	
4	O	LASER_PWM	Programmable pulse width signal	±24mA driving capability
5	O	LASER_ON	Laser on/off gate signal	±24mA driving capability
6	O	AO2	DAC 2 output, 10 bit resolution	0 ~ 10 V
7	Power	GND	Analog ground of AO1/AO2 signals	
8	Power	5V	+5V supply	Limited under 500mA
9	O	LASER_FPS	First pulse suppression signal	±24mA driving capability

Laser control timing diagram (CO2)



Laser control timing diagram (YAG1, YAG2,YAG3)



P3---Program Status/External Triggers Port

Program Status/External Triggers port is a D-SUB male connector providing 2 digital outputs and 2 digital inputs to control program execution.

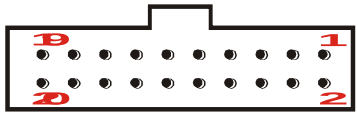
Pin No.	I/O Type	Signal Name	Description	Comment	LED light
1	O	PGM_RDY+	Collector of PGM_RDY signal	See JP3.(1 – 2)	D1
2	O	PGM_RDY-	Emitter of PGM_RDY signal		
3	O	MARK_RDY+	Collector of MARK_RDY signal	See JP3 (3 – 4)	D2
4	O	MARK_RDY-	Emitter of MARK_RDY signal		
5	Power	GND	Ground		
6	I	EI_START_A	Input of EI_START signal	See JP3 (5 – 6)	D3
7	I	EI_START_B	Input of EI_START signal		
8	I	EI_STOP_A	Input of EI_STOP signal	See JP3 (7 – 8)	D4
9	I	EI_STOP_B	Input of EI_STOP signal		

The **PGM_RDY signal** is updated with commands **set_pgm_state** , and **set_pgm_state_list**.

P4---USB Port

P4 is a USB device port of USB-B type connector providing connection to USB host.

CN1---16-bit Digital Output Port



CN1 is a 16-bit digital port of 20-pin connector providing 16 bits outputs.

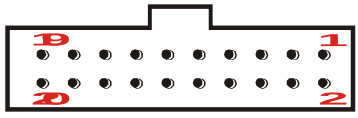
The output value is updated with commands **write_io_port**, **write_io_port_list**, **set_io_cond_list**, and **clear_io_cond_list**.

Pin No.	I/O Type	Signal Name	Description	Comment
1	O	PO0	Bit 0 of output value	
2	O	PO1	Bit 1 of output value	
3	O	PO2	Bit 2 of output value	
4	O	PO3	Bit 3 of output value	
5	O	PO4	Bit 4 of output value	
6	O	PO5	Bit 5 of output value	
7	O	PO6	Bit 6 of output value	
8	O	PO7	Bit 7 of output value	
9	O	PO8	Bit 8 of output value	
10	O	PO9	Bit 9 of output value	
11	O	PO10	Bit 10 of output value	
12	O	PO11	Bit 11 of output value	
13	O	PO12	Bit 12 of output value	
14	O	PO13	Bit 13 of output value	
15	O	PO14	Bit 14 of output value	
16	O	PO15	Bit 15 of output value	
17	Power	GND	Ground	
18	Power	GND	Ground	
19	Power	F_5V	5V supply protected by fuse	Max. 100mA output current
20	N/C		Not connected	

CN1 and CN2 provide 16 bit output and 16 bit input. Each output is able to source/sink up to 24mA.

All output ports are initialized to low after power-up reset.

CN2---16-bit Digital Input Port



CN1 is a 16-bit digital port of 20-pin connector providing 16 bits inputs.

The input value is sampled with commands **read_io_port**, **get_io_status, list_jump_cond,** and **list_call_cond.**

Pin No.	I/O Type	Signal Name	Description	Comment
1	I	PI0	Bit 0 of input value	
2	I	PI1	Bit 1 of input value	
3	I	PI2	Bit 2 of input value	
4	I	PI3	Bit 3 of input value	
5	I	PI4	Bit 4 of input value	
6	I	PI5	Bit 5 of input value	
7	I	PI6	Bit 6 of input value	
8	I	PI7	Bit 7 of input value	

9	I	PI8	Bit 8 of input value	
10	I	PI9	Bit 9 of input value	
11	I	PI10	Bit 10 of input value	
12	I	PI11	Bit 11 of input value	
13	I	PI12	Bit 12 of input value	
14	I	PI13	Bit 13 of input value	
15	I	PI14	Bit 14 of input value	
16	I	PI15	Bit 15 of input value	
17	Power	GND	Ground	
18	Power	GND	Ground	
19	Power	F_5V	5V supply protected by fuse	Max. 100mA output current
20	N/C		Not connected	

*Pins 1 to 16 are internally pulled-low with 47K resistors.

CN3---X/Y Position Encoder Port

Support for mark_on_fly feature.

Pin No.	I/O Type	Signal Name	Description	Comment
1	Power	GND	Ground	
2	Power	GND	Ground	
3	I	X A+	Encoder X A+	
4	I	X A-	Encoder X A-	
5	I	X B+	Encoder X B+	
6	I	X B-	Encoder X B-	
7	I	Y A+	Encoder Y A+	
8	I	Y A-	Encoder Y A-	
9	I	Y B+	Encoder Y B+	
10	I	Y B-	Encoder Y B-	
11	Power	GND	Ground	
12	Power	GND	Ground	

*The encoder inputs EncoderX and EncoderY are designed for a pair of standardized differential signals (RS-422) each.

CN4---DSP Interface Port

Interface port to on-board DSP, reserved for future expansion.

Jumper Settings

The first pin of each pin header is marked with symbol

Laser Signal Polarity Settings

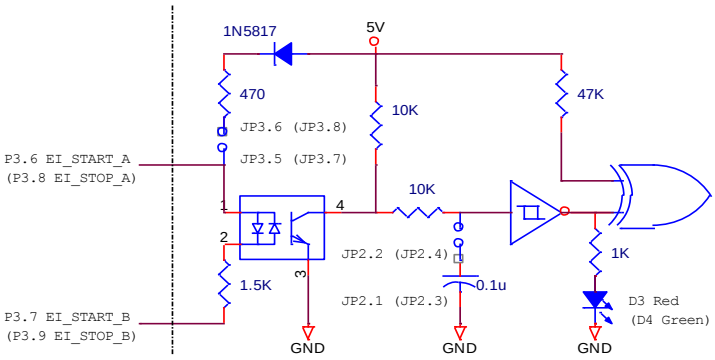
Jumper	Pin No.	Status		Description
JP1	1 2	Open		LASER_ON is active HIGH (default)
		Close		LASER_ON is active LOW
JP1	3 4	Open		LASER_PWM is active HIGH (default)
		Close		LASER_PWM is active LOW
JP1	5 6	Open		LASER_FPS is active HIGH (default)
		Close		LASER_FPS is active LOW

External Trigger Inputs and LEDs

External triggers signals can be programmed with following jumper pins.

Jumper	Pin No.	Status		Description
JP2	1 2	Open		EI_START is not filtered. (default)
		Close		EI_START is filtered.
JP2	3 4	Open		EI_STOP is not filtered. (default)
		Close		EI_STOP is filtered.
JP3	5 6	Open		EI_START is an isolated input.
		Close		EI_START_B is pulled up. (default)
JP3	7 8	Open		EI_STOP is an isolated input.
		Close		EI_STOP_B is pulled up. (default)

Two LEDs, D3 and D4, give visual indication of EI_START and EI_STOP signals to facilitate program/wiring debugging.

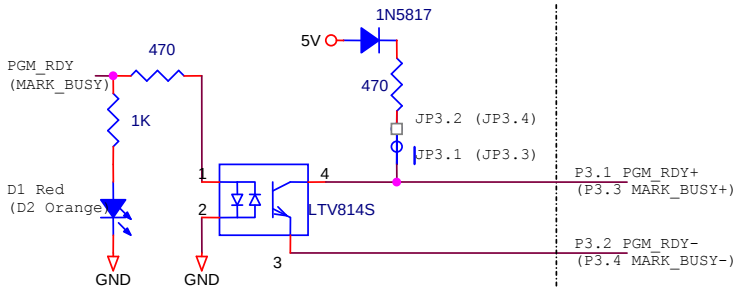


Program Status Outputs and LEDs

Program Status output signals can be programmed with following jumper pins.

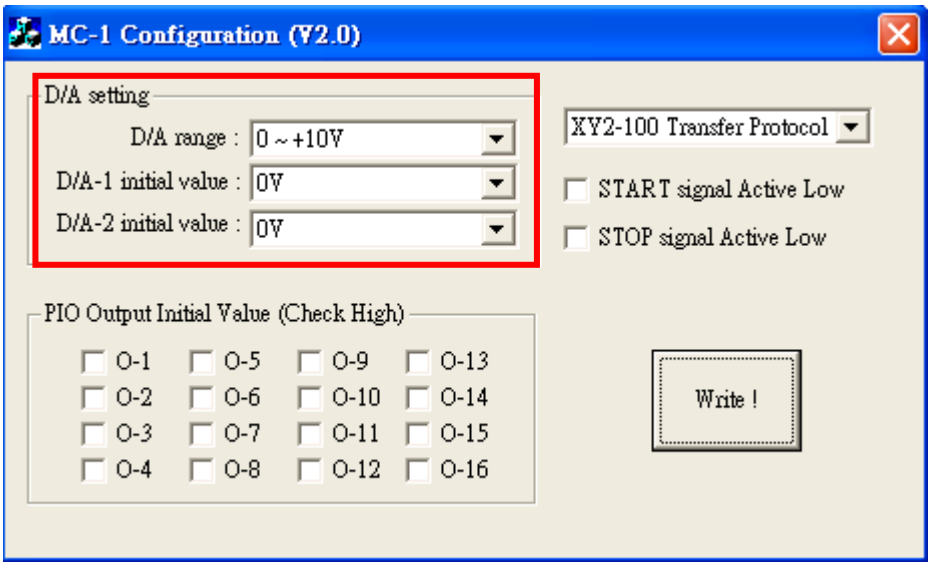
Jumper	Pin No.	Status		Description
JP1	9 10	Open	■ ■	PGM_RDY and MARK_RDY are active HIGH (default)
		Close	▬	PGM_RDY and MARK_RDY are active LOW
JP3	1 2	Open	■ ■	PGM_RDY is an isolated input. (default)
		Close	▬	PGM_RDY+ is pulled up.
JP3	3 4	Open	■ ■	MARK_RDY is an isolated input. (default)
		Close	▬	MARK_RDY+ is pulled up.

Two LEDs, D1 and D2, give visual indication of PGM_RDY and MARK_RDY signals to facilitate program debugging.



10-bit DAC Output

The output range is also determined by software HWConfig.exe (under the directory of C:\Program Files\MarkingMate\Drivers\MC1, the output swing is set to 0~+5V or 0~+10V.

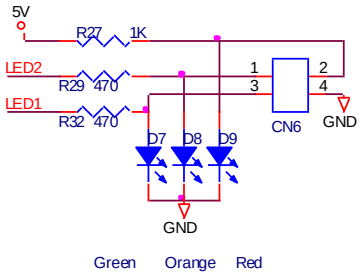


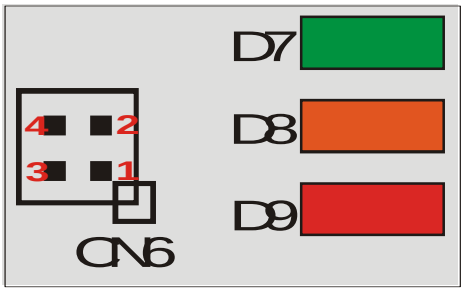
Note, AO1 and AO2 can't be set to different ranges.

System Status LED Outputs

The System Status LEDs give visual indications of various system health status.

Connector	Pin No.	Status		Description
CN6	1	Orange (D8)	twinkling	USB cable is not connected to PC.
			blinking	Data transfer is occurring on USB, faster blinking speed means more data.
			steady on or steady off	MC-1 out of control.
CN6	2	Red (D9)	steady off	5V power is not applied, or not high enough.
			steady on	5V power is applied.
CN6	3	Green (D7)	slow blinking	DSP load is low
			fast blinking	DSP load is high
			steady on or steady off	MC-1 out of control.
CN6	4			Ground





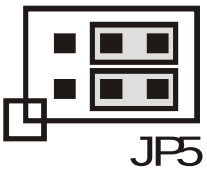
Caution

The LEDs used here present around 2V voltage drops when turned on.

Interfacing to XY2-100 D/A Board

When MC2 is used to drive XY2-100 interface, the following steps are necessary.

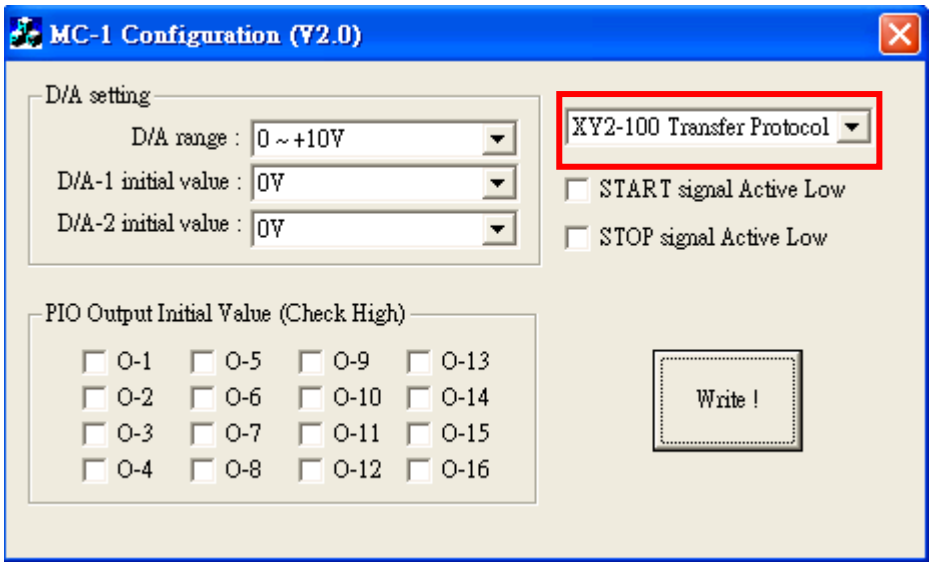
1. On **JP5**, short pin 3 to pin 5, and short pin 4 to pin 6.



Pin 4, 6 close

Pin 3. 5 close

2. Go to the directory of C:\Program Files\MarkingMate\Drivers\MC1, run the HWConfig.exe program to select XY2-100 transfer protocol type as below.



3. Assembly the cable of High-Density DB-15 connector to DB-25 connector as the following table by yourself or purchase this cable from us (the order no: MC1-L-XY2-100). Please refer to page 18 for the pin assignments.

D/A Receiver Settings

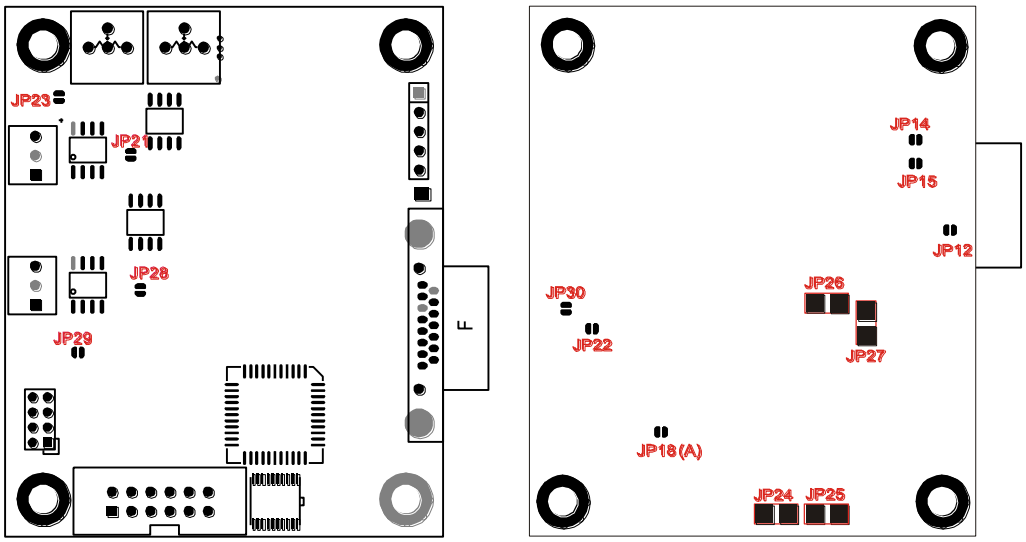
1. Select output range

Output ranges	JP18	JP21	JP22	JP23	JP28	JP29	JP30	JP24	JP25	JP26	JP27
±3V		●	●	●	●	●	●	●		●	
±5V	●		●	●		●	●	●		●	
±10V	●								●		●

2. Interface to XY2-100 controller

Interface type	JP14	JP15
Default, use proprietary interface	●	●
Use XY2-100 interface. (Need special order for different CPLD programming. Cable should not be wired for pin 1,6,11,12,13 of P5)		

● : Close



D/A Receiver Connector Pin Assignments and Signal Descriptions

P5---Controller Interface Port

MC1 interface is a slim high-density D-SUB connector providing digital control signals to Marking Controller board. D/A receiver board may work in either XY2-100 mode or proprietary mode according to factory settings. When D/A receiver is configured to XY2-100 mode, any controllers with XY2-100 interface nay drive D/A receiver board as long as the cable is properly assembled.

Pin No.	I/O Type	Signal Name	Description	Comment
1	Power	+12V	+12V power from Controller	③
2	O	DSTATUS+	Status output to Controller	
3	I	DATA_X+	Channel 1 data stream from Controller	
4	I	DSYNC+	Synchronization signal from Controller	
5	I	DCLK+	Clock signal from Controller	
6	Power	-12V	-12V power from Controller	③
7	O	DSTATUS-	Status output to Controller	
8	I	DATA_X-	Channel 1 data stream from Controller	
9	I	DSYNC-	Synchronization signal from Controller	
10	I	DCLK-	Clock signal from Controller	
11	Power	GND	Ground	
12	Power	GND	Ground	
13	Power	5V	+5V power from Controller	③
14	Power	GND	Ground	Default factory setting
	I	DATA_Y+	Channel 2 data stream from Controller	XY2-100 mode ④
15	Power	GND	Ground	Default factory setting
	I	DATA_Y-	Channel 2 data stream from Controller	XY2-100 mode ④

Caution

③ **These pins are wired with corresponding power pins of CN7. If external powers are used to power D/A receiver board, DO NOT wire these pins in the cable to Controller, otherwise permanent damages may occur in the D/A board and Controller board. Also refer to Cable Diagrams for details.**

Caution

④ **These pins are wired to ground during factory time by default. If XY2-100 mode is required, contact your dealer for special configuration. Also refer to Cable Diagrams for details.**

CN7---External Power Connector

If the data cable connecting Marking Controller and D/A receiver board is longer then 3m, you may need to use external power for D/A receiver, instead of using Controller's internal power, for better performance. +5V,+12V and -12V are required on the D/A receiver board.

Pin No.	I/O Type	Signal Name	Description	Limits	Comment
1	Power	GND	Ground		
2	Power	+12V	+12V power to D/A	+12.0V ~ +13.2V	⑤
3	Power	-12V	-12V power to D/A	-12.0V ~ -13.2V	⑤
4	Power	GND	Ground		
5	Power	+5V	+5V power to D/A	+4.5V ~ +7V	⑤

Caution

⑤ **Performance impairment may occur when voltages are lower than the limits, or permanent damages may occur when voltages are higher than the limits.**

CN8---DA-X

This is X-axis DA output port. The output voltage range can be ±3V, ±5V and ±10V depending on factory setting. Differential output is provided for better noise immunity.

Pin No.	I/O Type	Signal Name	Description	Comment
1	O	CMD+	Positive output to driver board	
2	Power	GND	Ground	
3	O	CMD-	Negative output to driver board	

CN9---DA-Y

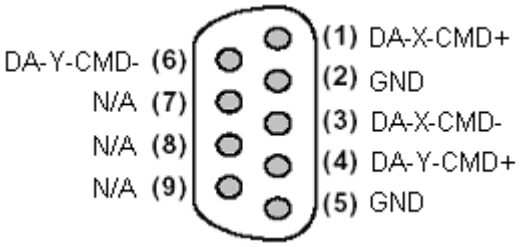
This is Y-axis DA output port. The output voltage range can be ±3V, ±5V and ±10V depending on factory setting. Differential output is provided for better noise immunity.

Pin No.	I/O Type	Signal Name	Description	Comment
1	O	CMD+	Positive output to driver board	

2	Power	GND	Ground	
3	O	CMD-	Negative output to driver board	

DA-XY

As the DA receiver is integrated into a system box. The DA-X & DA-Y terminals will be connected to a D-Type male 9 PIN connector. The pin assignment is as following:



Pin No.	I/O Type	Signal Name	Description	Comment
1	Output	DA-X-CMD+	DA-X Positive output to driver board	
2	Power	GND	Ground	
3	Output	DA-X-CMD-	DA-X Negative output to driver board	
4	Output	DA-Y-CMD+	DA-Y Positive output to driver board	
5	Power	GND	Ground	
6	Output	DA-Y-CMD-	DA-Y Negative output to driver board	
7	N/A			
8	N/A			
9	N/A			

VR1---Gain Adjustment

This is a trimmer for adjusting maximum voltage swing on both X-axis and Y-axis DA outputs.

VR2---Offset Adjustment

This is an offset null trimmer for both X-axis and Y-axis DA outputs.

CN10---6-I/4-O Ports

These ports are reserved to control galvometer drivers. Details will be defined.

JP8---Output Port Polarity Settings

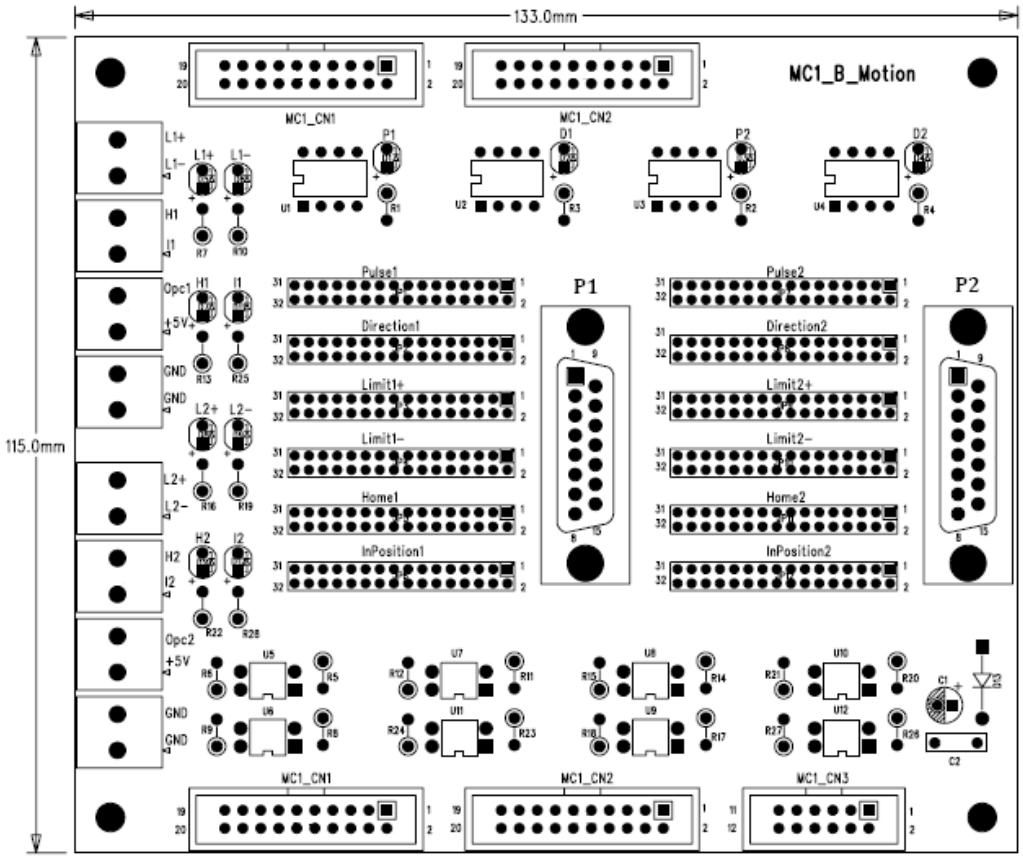
TBD

JP13---Output Port Pull-ups

TBD

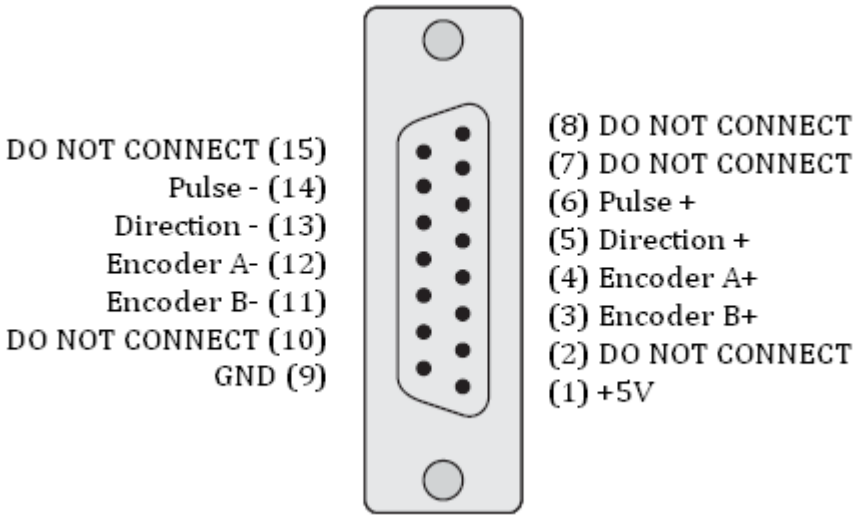
MC1_B_Motion Board

LAYOUT



MC1_B_MOTION

P1 & P2 Pin Assignments



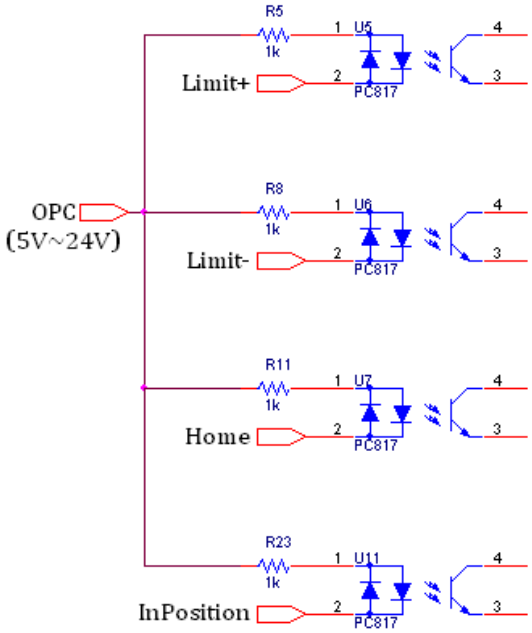
Jumper Settings

Jumper	Description
1, 2 Close	MC1 Input 1 or Output 1
3, 4 Close	MC1 Input 2 or Output 2
5, 6 Close	MC1 Input 3 or Output 3
7, 8 Close	MC1 Input 4 or Output 4
9, 10 Close	MC1 Input 5 or Output 5
11, 12 Close	MC1 Input 6 or Output 6
13, 14 Close	MC1 Input 7 or Output 7
15, 16 Close	MC1 Input 8 or Output 8
17, 18 Close	MC1 Input 9 or Output 9
19, 20 Close	MC1 Input 10 or Output 10
21, 22 Close	MC1 Input 11 or Output 11
23, 24 Close	MC1 Input 12 or Output 12
25, 26 Close	MC1 Input 13 or Output 13
27, 28 Close	MC1 Input 14 or Output 14
29, 30 Close	MC1 Input 15 or Output 15
31, 32 Close	MC1 Input 16 or Output 16

Default Settings

P1：Pulse	=> MC1 Output 16	P2：Pulse	=> MC1 Output 14
P1：Direction	=> MC1 Output 15	P2：Direction	=> MC1 Output 13
Limit1+	=> MC1 Input 16	Limit2+	=> MC1 Input 12
Limit1-	=> MC1 Input 15	Limit2-	=> MC1 Input 11
Home1	=> MC1 Input 14	Home2	=> MC1 Input 10
InPosition1	=> MC1 Input 13	InPosition2	=> MC1 Input 9

Input Circuit Diagram



Cable Wirings

Proprietary Mode---Internal Power

In this mode, D/A receiver consumes powers from Marking Controller. No external power is required. A 1-to-1 wiring is in this case.

Controller Side P1		Description	DA Side P5	
Pin	Signal Name		Signal Name	Pin
1	+12V	+12V power to D/A	+12V	1
2	DSTATUS+	Status input from D/A	DSTATUS+	2
3	DATA_X+	Channel 1 data stream to D/A	DATA_X+	3
4	DSYNC+	Synchronization signal to D/A	DSYNC+	4
5	DCLK+	Clock signal to D/A	DCLK+	5
6	-12V	-12V power to D/A	-12V	6
7	DSTATUS-	Status input from D/A	DSTATUS-	7
8	DATA_X-	Channel 1 data stream to D/A	DATA_X-	8
9	DSYNC-	Synchronization signal to D/A	DSYNC-	9
10	DCLK-	Clock signal to D/A	DCLK-	10
11	GND	Ground	GND	11
12	GND	Ground	GND	12
13	5V	+5V power to D/A	5V	13
14	GND	Ground	GND	14
15	GND	Ground	GND	15

Proprietary Mode---External Power

In this mode, D/A receiver consumes powers from external power supplies. No common ground is needed. CN7 is used to supply powers.

Controller Side P1		Description	DA Side P5	
Pin	Signal Name		Signal Name	Pin
1	+12V	Not Connected		
2	DSTATUS+	Status input from D/A	DSTATUS+	2
3	DATA_X+	Channel 1 data stream to D/A	DATA_X+	3
4	DSYNC+	Synchronization signal to D/A	DSYNC+	4
5	DCLK+	Clock signal to D/A	DCLK+	5
6	-12V	Not Connected		
7	DSTATUS-	Status input from D/A	DSTATUS-	7
8	DATA_X-	Channel 1 data stream to D/A	DATA_X-	8
9	DSYNC-	Synchronization signal to D/A	DSYNC-	9
10	DCLK-	Clock signal to D/A	DCLK-	10
11	GND	Ground	GND	11
12	GND	Ground	GND	12
13	5V	Not Connected		
14	GND	Not Connected		
15	GND	Not Connected		

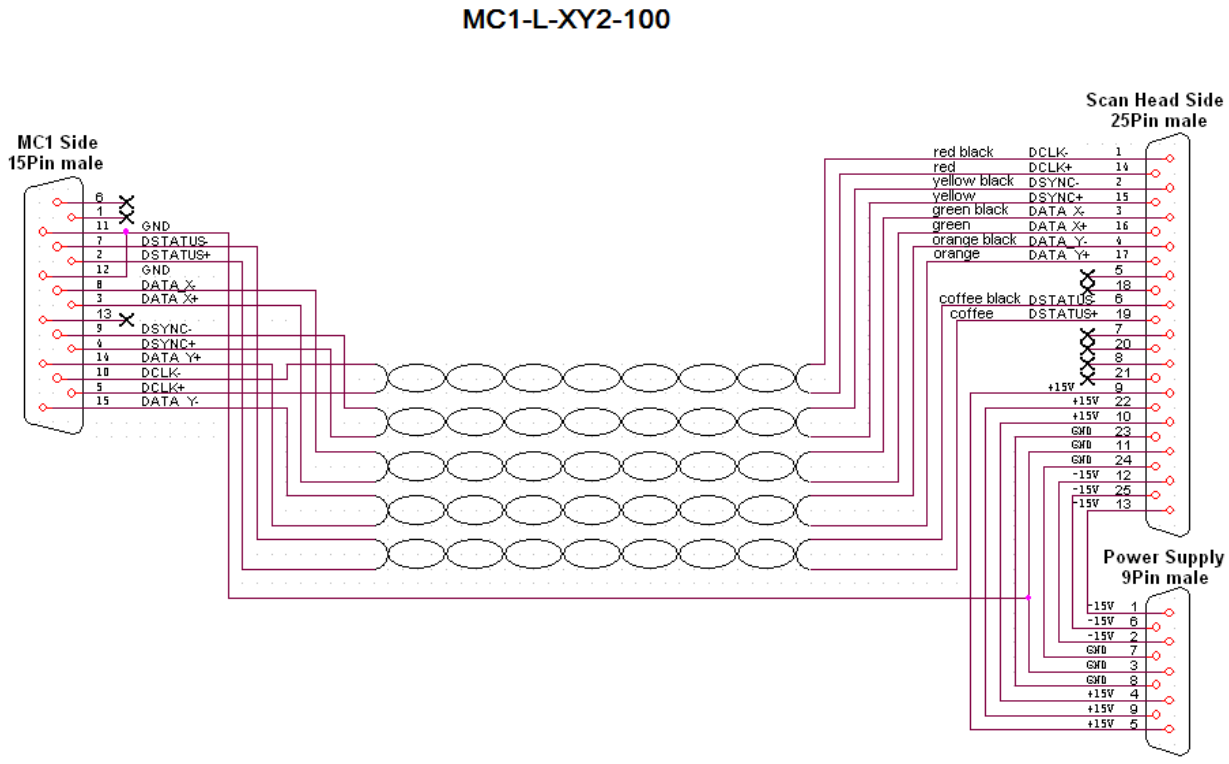
XY2-100 Mode---MC-1 Controller Side

In this mode, D/A receiver is configured to driver a XY2-100 compliant D/A board, which can be a foreign D/A board or a D/A receiver board in XY2-100 Mode with proper DB25 converter.

Controller Side P1		Description	DA Side DB25	
Pin	Signal Name		Signal Name	Pin
1	+12V	Not Connected		
2	DSTATUS+	Status input from D/A	DSTATUS+	19
3	DATA_X+	Channel 1 data stream to D/A	CHANNEL1+	16
4	DSYNC+	Synchronization signal to D/A	DSYNC+	15
5	DCLK+	Clock signal to D/A	DCLK+	14
6	-12V	Not Connected		
7	DSTATUS-	Status input from D/A	DSTATUS-	6
8	DATA_X-	Channel 1 data stream to D/A	CHANNEL1-	3
9	DSYNC-	Synchronization signal to D/A	DSYNC-	2
10	DCLK-	Clock signal to D/A	DCLK-	1
11	GND	Ground	GND	11, 23, 24
12	GND	Ground	GND	11, 23, 24
13	5V	Not Connected		
14	DATA_Y+	Channel 1 data stream to Controller	CHANNEL2+	17
15	DATA_Y-	Channel 1 data stream to Controller	CHANNEL2-	4

MC1-L-XY2-100 Cable

The diagram of MC1-L-XY2-100 cable:

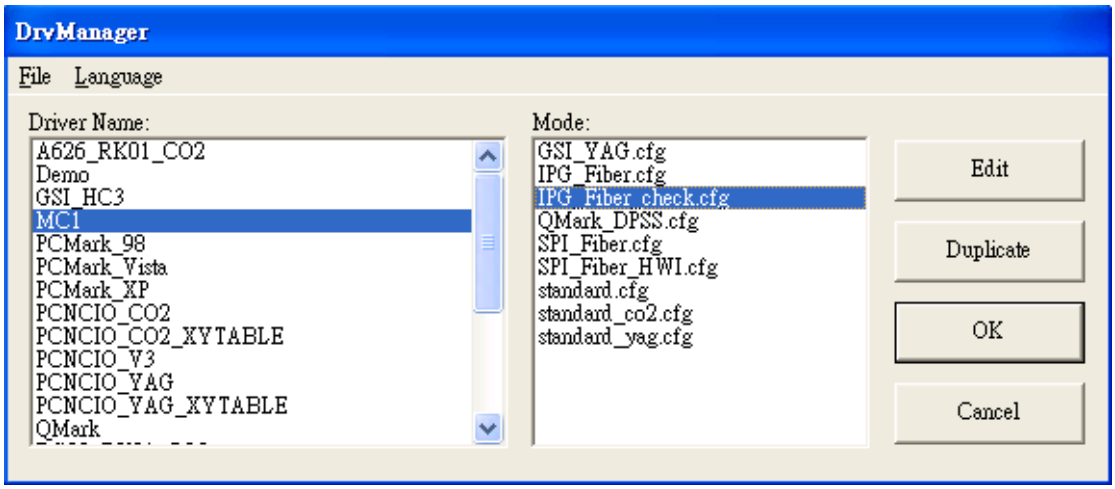


IPG Laser

IPG Laser---Program Settings

If you want to use MarkingMate software to control IPG Laser, you have to the right program settings first, please follow the below steps.

Execute the program DM.exe under the directory of C:\Program Files\MarkingMate, a dialogue box will be displayed as below. Choose the MC1 of Driver Name and choose the Mode of IPG_Fiber.cfg or IPG_Fiber_check.cfg, and then click "OK" button. The differences between these two modes are that IPG_Fiber_check.cfg will check the machine status, while the other one will not.



MC1---IPG Laser Pin Assignments

- IPG_Fiber.cfg

The pin assignments of MC1 and IPG Laser will be different according to the drivers you selected. When you choose the driver of "IPG_Fiber.cfg", the pin assignments of MC1 and IPG Laser are as below:

MC1 – CN1 (20 pins)			IPG Laser (25 pins)	
Pin No.	I/O Type	Signal Name	Description	Pin No.
1	O	PO0	Laser Power (bit1)	pin – 1
2	O	PO1	Laser Power (bit2)	pin – 2
3	O	PO2	Laser Power (bit3)	pin – 3
4	O	PO3	Laser Power (bit4)	pin – 4
5	O	PO4	Laser Power (bit5)	pin – 5
6	O	PO5	Laser Power (bit6)	pin – 6
7	O	PO6	Laser Power (bit7)	pin – 7
8	O	PO7	Laser Power(bit8)	pin – 8
9	O	PO8	Latches power setting	pin – 9
10	O	PO9	Master Oscillator	pin - 18
11	O	PO10	Guide Laser	pin - 22
12	O	PO11		
13	O	PO12		
14	O	PO13		
15	O	PO14		
16	O	PO15		
17	POWER	GND	Ground	pin – 14
18	POWER	GND		
19	POWER	5V	EMStop	pin - 23
20	N/C			
MC1 – P2 (9 pins)			IPG Laser (25 pins)	
Pin No.	I/O Type	Signal Name	Description	Pin No.
1	O	AO1		
2	POWER	GND	Ground	pin – 14 / pin - 10
3	POWER	GND		
4	O	LASER_PWM	Pulse Repetition Rate	pin - 20
5	O	LASER_ON	Laser Modulation input	pin - 19
6	O	AO2		
7	POWER	GND		
8	POWER	5V	EMStop	pin - 23
9	O	LASER_FPS		

- IPG_Fiber_check.cfg

When you select the IPG_Fiber_check.cfg, the system will check the status of IPG laser. Therefore, in addition to the above connections, you need more connections as listed as below:

MC1 – CN2 (20 pins)			IPG Laser (25 pins)	
Pin No.	I/O Type	Signal Name	Description	Pin No.
1	I	PI0		
2	I	PI1		
3	I	PI2		
4	I	PI3		
5	I	PI4		
6	I	PI5		
7	I	PI6		
8	I	PI7		
9	I	PI8		
10	I	PI9		
11	I	PI10		
12	I	PI11	Alarm Status	pin - 16
13	I	PI12	Alarm Status	pin – 21
14	I	PI13	Alarm Status	pin – 11 (Only for Type D)
15	I	PI14		
16	I	PI15		
17	POWER	GND		
18	POWER	GND		
19	POWER	F_5V		
20	N/C			

- IPG_Fiber_XYTable.cfg & IPG_Fiber_XYTable(CHK).cfg

The pin assignments of MC1 and IPG laser please refer to the above descriptions. While the connections between MC1 and XY Table is as below:

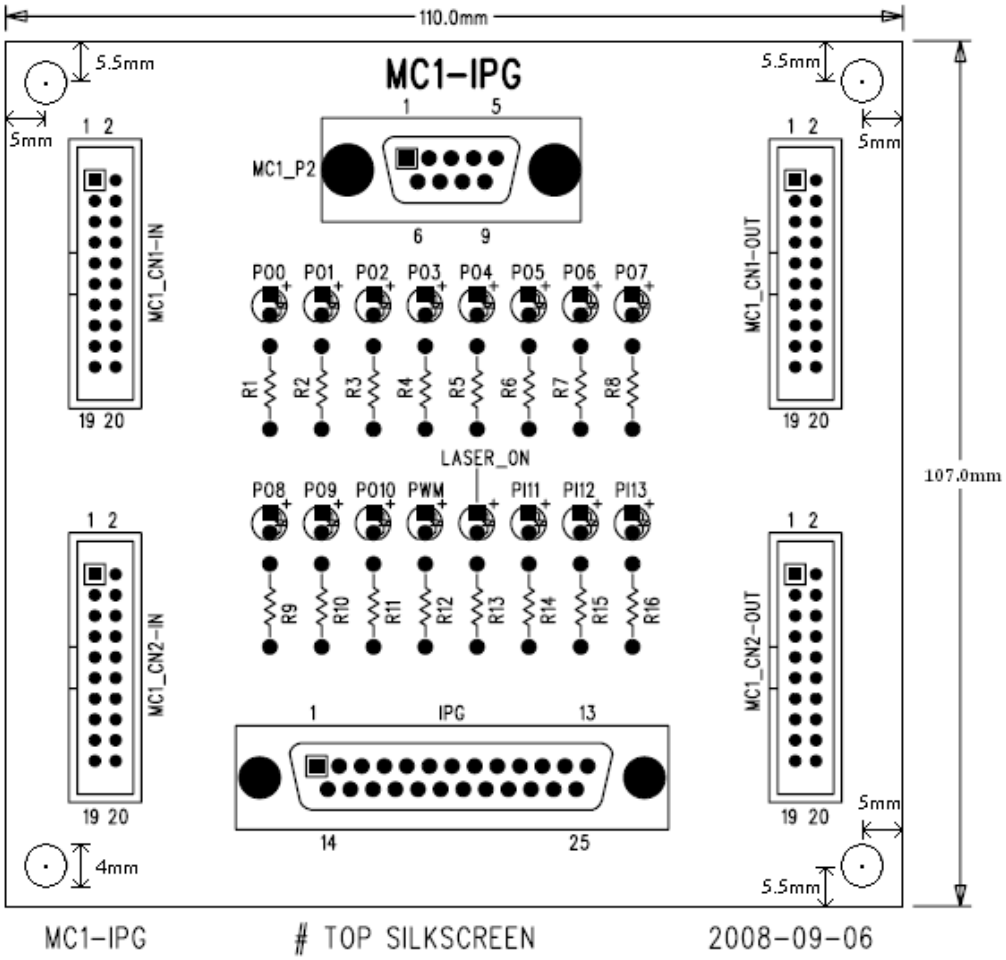
MC1-CN1 (20 pins)			XY-Table	
Pin No.	I/O type	Signal Name	Description	Pin No
1	O	PO0		
2	O	PO1		
3	O	PO2		
4	O	PO3		
5	O	PO4		
6	O	PO5		
7	O	PO6		
8	O	PO7		
9	O	PO8		
10	O	PO9		
11	O	PO10		
12	O	PO11		
13	**O**	**PO12**	**X-Axis PULSE+**	
14	**O**	**PO13**	**X-Axis DIRECTION+**	
15	**O**	**PO14**	**Y-Axis PULSE+**	
16	**O**	**PO15**	**Y-Axis DIRECTION+**	
17	**Power**	**GND**	**GROUND**	

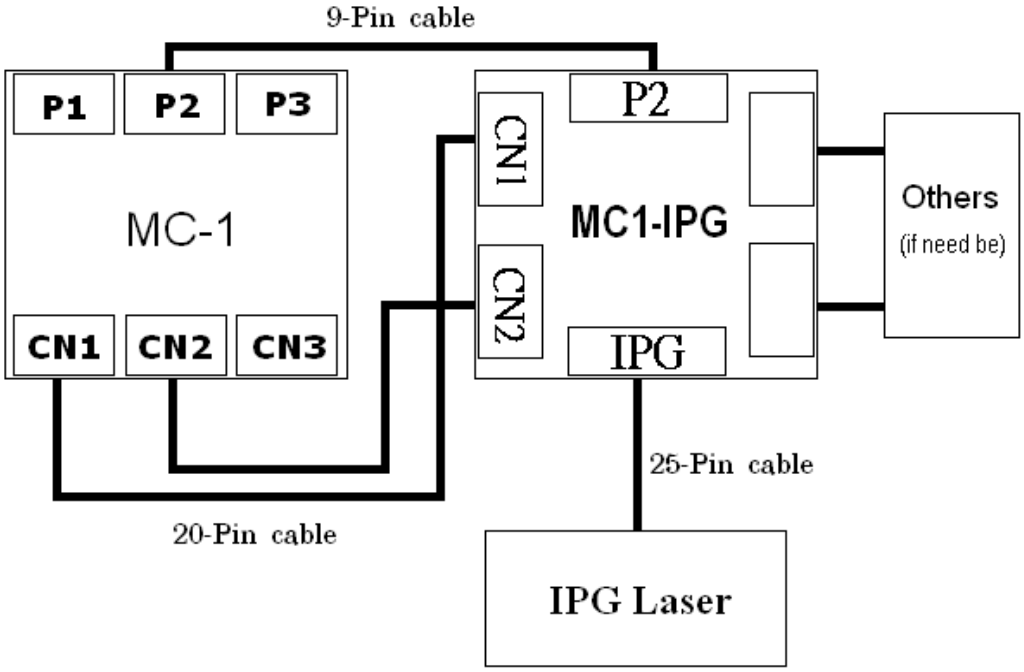
			(PULSE- &DIRECTION-)	
18	**Power**	**GND**	**GROUND (PULSE- &DIRECTION-)**	
19	Power	5V		
20	N/C			

MC1-CN2 (20 pins)			**XY-Table**	
Pin No.	I/O type	Signal Name	Description	Pin No.
1	**I**	**PI0**	**X-Axis Limit (-)**	
2	**I**	**PI1**	**X-Axis Limit (+)**	
3	**I**	**PI2**	**Y-Axis Limit (-)**	
4	**I**	**PI3**	**Y-Axis Limit (+)**	
5	**I**	**PI4**	**X-Axis In Position**	
6	**I**	**PI5**	**X-Axis In Home**	
7	**I**	**PI6**	**Y-Axis In Position**	
8	**I**	**PI7**	**Y-Axis In Home**	
9	I	PI8		
10	I	PI9		
11	I	PI10		
12	I	PI11		
13	I	PI12		
14	I	PI13		
15	I	PI14		
16	I	PI15		
17	**Power**	**GND**	**GROUND (In Position, In Home, Limit)**	
18	**Power**	**GND**	**GROUND (In Position, In Home, Limit)**	
19	Power	F_5V		
20	N/C			

MC1---IPG Board

The MC1 –IPG Board (order number: MC1-B-IPG) is used to connect MC1 and IPG laser easily. Its layout and connecting diagram are as below:


110.0mm
MC1-IPG
5.5mm
5mm
MC1_P2
MC1_CN1-IN
MC1_CN1-OUT
P00 P01 P02 P03 P04 P05 P06 P07
R1 R2 R3 R4 R5 R6 R7 R8
LASER_ON
P08 P09 P010 PWM PI11 PI12 PI13
R9 R10 R11 R12 R13 R14 R15 R16
MC1_CN2-IN
MC1_CN2-OUT
IPG
4mm
107.0mm
MC1-IPG
TOP SILKSCREEN
2008-09-06

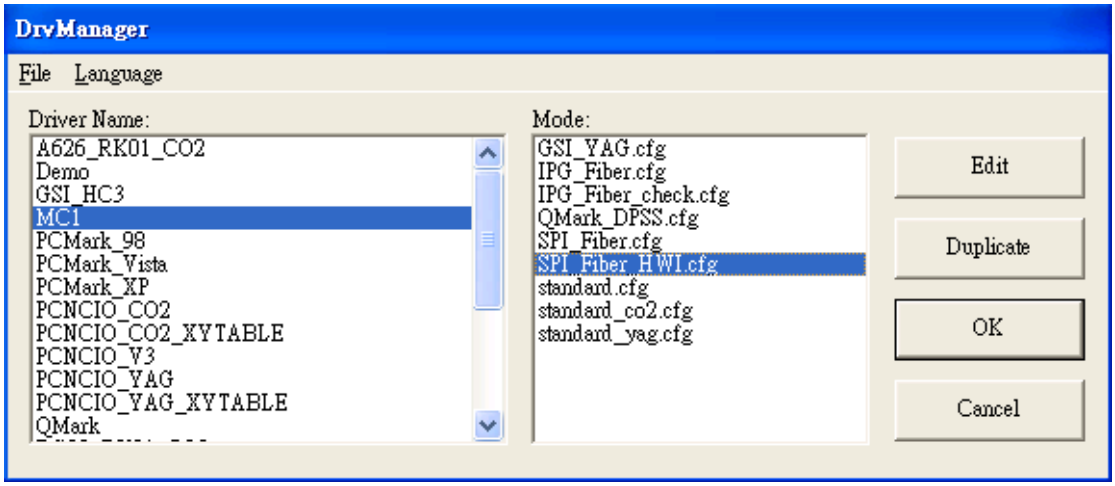

9-Pin cable
P1
P2
P3
MC-1
CN1
CN2
CN3
CN1
CN2
P2
MC1-IPG
IPG
Others
(if need be)
25-Pin cable
20-Pin cable
IPG Laser

SPI Laser

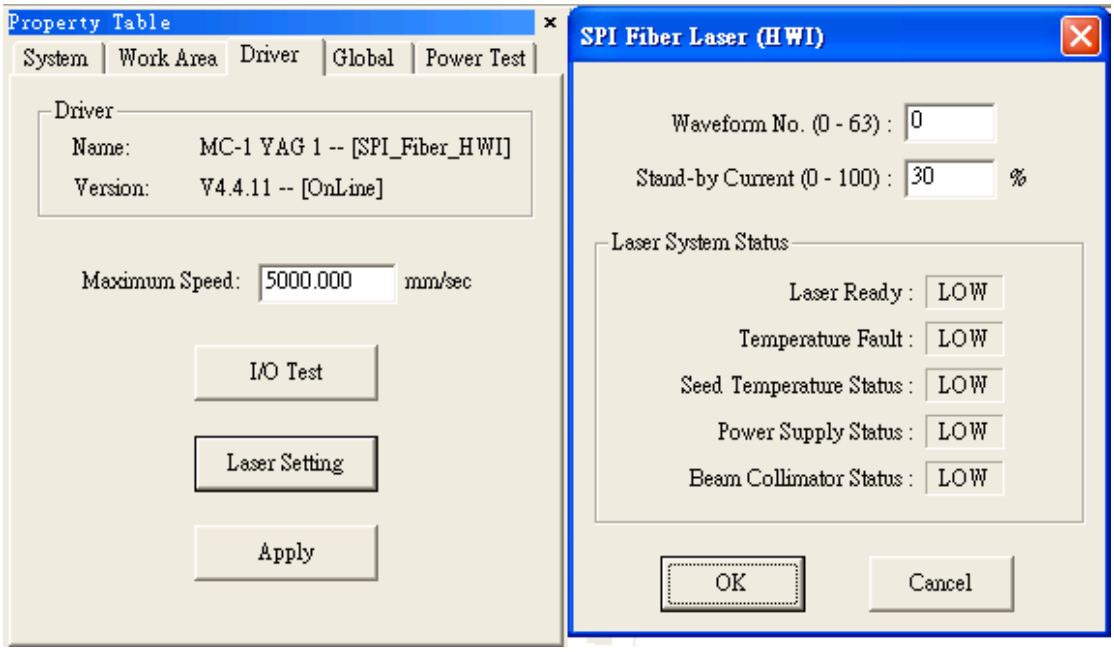
SPI Laser---Program Settings

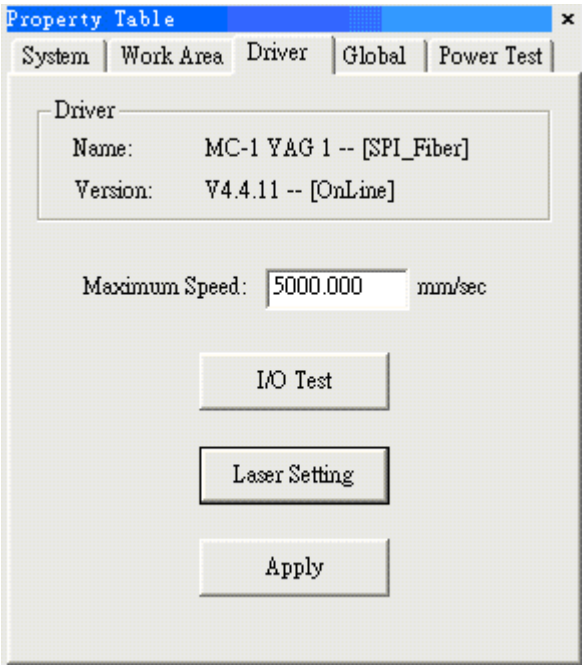
If you want to use MarkingMate software to control SPI Laser, you have to the right program settings first, please follow the below steps.

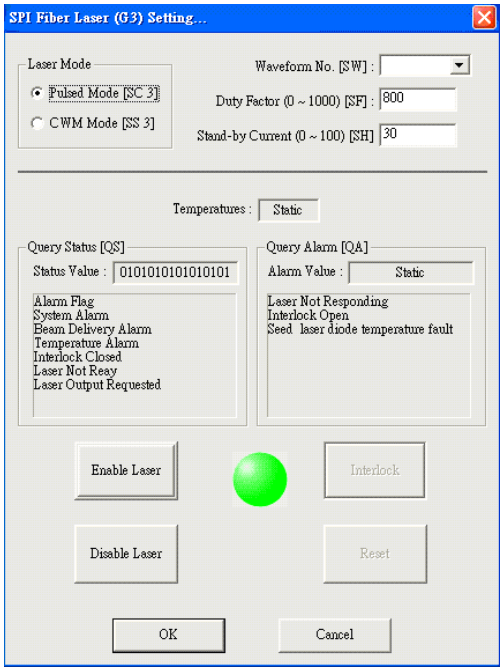
1. Execute the program DM.exe under the directory of C:\Program Files\MarkingMate, a dialogue box will be displayed as below. Choose the MC1 of Driver Name and choose the Mode of SPI_Fiber.cfg or SPI_Fiber_HWI.cfg, and then click "OK" button. The differences between these two modes are that SPI_Fiber_.cfg will use RS-232 port to control the I/Os, while the SPI_Fiber_HWI.cfg will control the I/Os through the hardware pin connections.



2. Enter the MarkingMate software, go to the "Driver" page of the Property Table, and click the "Laser Setting" button, then you will see a dialogue box as below for SPI laser setting.







MC1---SPI Laser Pin Assignments

- SPI_Fiber.cfg

When you choose the driver of "SPI_Fiber.cfg", the pin assignments of MC1 and SPI G3 Laser are as below:

MC1- P2 (9 pins)			**SPI G3 Laser (68 pins)**	
Pin No.	I/O Type	Signal Name	Description	Pin No.
1	O	AO1		
2	**Power**	**GND**	**Ground**	**pin - 31**
3	**Power**	**GND**	**Laser Emission Gate Low**	**pin - 39, 47**
4	O	LASER_PWM		
5	**O**	**LASER_ON**	**Laser Emission Gate High**	**pin - 5**
6	O	AO2		
7	Power	GND		
8	Power	5V		
9	O	LASER_FPS		

PC- RS232 port (9 pins)			**SPI G3 Laser (68 pins)**	
Pin No.	I/O Type	Signal Name	Description	Pin No.
1				
2		**TX**	**RS-232_TX**	**pin - 25**
3		**RX**	**RS-232_RX**	**pin - 26**
4				
5		**GND**	**Ground**	**pin - 31**
6				
7				
8				
9				

- SPI_Fiber_HWI.cfg

When you choose the driver of "SPI_Fiber_HWI.cfg", the pin assignments of MC1 and SPI G3 Laser are as below:

MC1-CN1 (20 pins)			SPI G3 Laser (68 pins)		SPI break-out board	
Pin No.	I/O Type	Signal Name	Description	Pin No.	Description	Pin No.
1	O	PO0				
2	O	PO1				
3	O	PO2				
4	O	PO3				
5	O	PO4				
6	**O**	**PO5**	**Pulsed/CW Mode Select_High**	**pin – 21**	**User_Pulse_N_CW_H**	**J7 pin-11**
7	**O**	**PO6**	**Global Enable_High**	**pin – 7**	**User_Global_EN_H**	**J7 pin-5**
8	**O**	**PO7**	**Alignment Laser Enable_High**	**pin – 6**	**User_PU_Laser_EN_H**	**J7 pin-3**
9	**O**	**PO8**	**State Select Bit 0**	**pin – 17**	**User_CFG_0**	**J2 pin-1**
10	**O**	**PO9**	**State Select Bit 1**	**pin - 18**	**User_CFG_1**	**J2 pin-2**
11	**O**	**PO10**	**State Select Bit 2**	**pin - 19**	**User_CFG_2**	**J2 pin-3**
12	**O**	**PO11**	**State Select Bit 3**	**pin - 20**	**User_CFG_3**	**J2 pin-4**
13	**O**	**PO12**	**State Select Bit 4**	**pin - 51**	**User_CFG_4**	**J2 pin-5**
14	**O**	**PO13**	**State Select Bit 5**	**pin - 52**	**User_CFG_5**	**J2 pin-6**
15	**O**	**PO14**	**State Select Bit 6**	**pin - 53**		
16	**O**	**PO15**	**State Select Bit 7**	**pin - 54**		
17	**Power**	**GND**	**Ground**	**pin – 40, 41, 55, 56**		**N/C**
18	**Power**	**GND**	**Ground**	**pin – 40, 41, 55, 56**		**N/C**
19	Power	5V				
20	N/C					

MC1-CN2 (20 pins)			SPI G3 Laser (68 pins)		SPI break-out board	
Pin No.	I/O Type	Signal Name	Description	Pin No.	Description	Pin No.
1	I	PI0				
2	I	PI1				
3	I	PI2				
4	I	PI3				
5	I	PI4				
6	I	PI5				
7	I	PI6				
8	I	PI7				
9	I	PI8				
10	I	PI9				
11	I	PI10				
12	**I**	**PI11**	**Beam Collimator Fault**	**pin - 11**	**User_BDO_Fault_N**	**J11 pin-7**
13	**I**	**PI12**	**Power Supply Fault**	**pin - 16**	**User_DRV_PWR_MON_N**	**J11 pin-10**
14	**I**	**PI13**	**Seed Laser Temperature Fault**	**pin - 3**	**User_Seed_Temp_Fault_N**	**J11 pin-3**
15	**I**	**PI14**	**Base Plate Temperature Fault**	**pin - 8**	**User_Base_Temp_Fault_N**	**J11 pin-4**
16	**I**	**PI15**	**Laser Ready**	**pin - 14**	**User_Laser_Ready**	**J11 pin-9**
17	Power	GND				
18	**Power**	**GND**	**GND_ISOD**	**pin - 48**	**0V_ISO_D**	**J11 pin-1**
19	**Power**	**F_5V**	**Pull-up resistors on inputs**	**4.7kR**	**5V_ISO**	**J11 pin-12**
20	N/C					

MC1- P2 (9 pins)			SPI G3 Laser (68 pins)		SPI break-out board	
Pin No.	I/O Type	Signal Name	Description	Pin No.	Description	Pin No.
1	**O**	**AO1**	**Power-Amp Active-State Current Set Point**	**pin - 65**	**User_PWR_MOD_IN**	**J6 pin-7**
2	**Power**	**GND**	**Ground**	**pin - 31**	**0V_Analogue**	**J6 pin-1**
3	**Power**	**GND**	**Laser Emission Gate_Low**	**pin - 39, 47**		**N/C**
4	**O**	**LASER_PWM**	**External Pulse Trigger_High**	**pin - 13**	**User_EXT_TRIG_H**	**J7 pin-7**
5	**O**	**LASER_ON**	**Laser Emission Gate_High**	**pin - 5**	**User_Laser_Out_EN_H**	**J7 pin-1**
6	**O**	**AO2**	**Power_Amp Simmer State Current Set Point**	**pin - 64**	**User_PWR_BIAS_IN**	**J6 pin-6**
7	Power	GND				
8	Power	5V				
9	Power	LASER_FPS				

When you choose the driver of "SPI_Fiber_HWI_G4.cfg", the pin assignments of MC1 and SPI G4 Laser are as below:

MC1-CN1 (20 pins)			**SPI G4 Laser (68 pins)**		**SPI break-out board**	
Pin No.	I/O Type	Signal Name	Description	Pin No.	Description	Pin No.
1	O	PO0				
2	O	PO1				
3	O	PO2				
4	O	PO3				
5	O	PO4				
6	**O**	**PO5**	**Pulsed/CW Mode Select-High**	**pin - 21**	**Laser_Pulse_CW_H**	**J2 pin-7**
7	**O**	**PO6**	**Global Enable-High**	**pin - 7**	**Laser_Enable_H**	**J2 pin-1**
8	**O**	**PO7**	**Alignment Laser Enable-High**	**pin - 6**	**Pilot_Laser_Enable_H**	**J2 pin-5**
9	**O**	**PO8**	**State Select Bit 0**	**pin - 17**	**DI_0**	**J6 pin-2**
10	**O**	**PO9**	**State Select Bit 1**	**pin - 18**	**DI_1**	**J6 pin-3**
11	**O**	**PO10**	**State Select Bit 2**	**pin - 19**	**DI_2**	**J6 pin-4**
12	**O**	**PO11**	**State Select Bit 3**	**pin - 20**	**DI_3**	**J6 pin-5**
13	**O**	**PO12**	**State Select Bit 4**	**pin - 51**	**DI_4**	**J6 pin-6**
14	**O**	**PO13**	**State Select Bit 5**	**pin - 52**	**DI_5**	**J6 pin-7**
15	**O**	**PO14**	**State Select Bit 6**	**pin - 53**		
16	**O**	**PO15**	**State Select Bit 7**	**pin - 54**		
17	**Power**	**GND**	**Ground**	**pin – 40, 41, 55, 56**		**N/C**
18	**Power**	**GND**	**Ground**	**pin – 40, 41, 55, 56**		**N/C**
19	Power	5V				
20	N/C					

MC1-CN2 (20 pins)			SPI G4 Laser (68 pins)		SPI break-out board	
Pin No.	I/O Type	Signal Name	Description	Pin No.	Description	Pin No.
1	I	PI0				
2	I	PI1				
3	I	PI2				
4	I	PI3				
5	I	PI4				
6	I	PI5				
7	I	PI6				
8	I	PI7				
9	I	PI8				
10	I	PI9				
11	I	PI10				
12	**I**	**PI11**	**Beam Delivery**	**pin - 11**	**Beam Delivery**	**J1 pin-5**
13	**I**	**PI12**	**Laser Emission Warming**	**pin - 16**	**Laser Emission Warming**	**J1 pin-8**
14	**I**	**PI13**	**Monitor**	**pin - 3**	**Monitor**	**J1 pin-2**
15	**I**	**PI14**	**Laser Temperature**	**pin - 8**	**Laser Temperature**	**J1 pin-4**
16	**I**	**PI15**	**Laser Is On**	**pin - 14**	**Laser Is On**	**J1 pin-9**
17	Power	GND				
18	**Power**	**GND**	**GND_D**	**pin - 48**	**GND_D**	**J3 pin-1**
19	Power	F_5V				
20	N/C					

MC1- P2 (9 pins)			SPI G4 Laser (68 pins)		SPI break-out board	
Pin No.	I/O Type	Signal Name	Description	Pin No.	Description	Pin No.
1	**O**	**AO1**	**AI_1 – ext power control**	**pin - 65**	**AI_1**	**J3 pin-7**
2	**Power**	**GND**	**GND_A**	**pin - 31**	**GND_A**	**J3 pin-6**
3	**Power**	**GND**	**Laser Emission Gate Low**	**pin - 39, 47**		**N/C**
4	**O**	**LASER_PWM**	**Pulse_trigger_h**	**pin - 13**	**Pulse_Trigger_H**	**J3 pin-3**
5	**O**	**LASER_ON**	**Laser_emission_ gate_h**	**pin - 5**	**Laser_emission_ gate_h**	**J3 pin-2**
6	**O**	**AO2**	**AI_2 – ext simmer control**	**pin - 64**	**AI_2**	**J3 pin-8**
7	Power	GND				
8	Power	5V				
9	Power	LASER_FPS				

CFG Descriptions

[ENV]

```
LaserMode=1              // 1:CO2, 2:YAG1,3:YAG2,4:YAG3,

PWM Delay=0              // Unit :us, YAG Mode


MaxPower=100             // range: 0 ~ 100, default: 100%
                         // Percentage of the power output, default: 100%

MinFrequency=0.1         // range: >= 0, default: 0.1
                         // Minimum frequency set by UI

MaxFrequency=60          // range: > 0, default: 60
                         // Maximum frequency set by UI

MarkEnd_Out=0            // range: 0 ~ 17, default: 0
                         // Port no. of MarkEnd signal,
                         // 0: no output signal
                         // 1 ~ 16: port no. of CN1 (OUT1 ~ OUT16)
                         // 17: means equal to the RGM_RDY port

EndDelay=0               // range: >= 0, default: 0
                         // Lasting time of the MarkEnd signal
                         // Unit: ms

Shutter_Out=0            // range: 0 ~ 16, default: 0
                         // Port no. of Shutter ON/OFF signal
                         // 0: Disable Shutter Out
                         // 1 ~ 16: port no. of CN1 (OUT1 ~ OUT16)

Lamp_Out=0               // range: 0 ~ 16, default: 0
                         // Port no. of Lamp ON/OFF signal
                         // 0: Disable Lamp Out
                         // 1 ~ 16: port no. of CN1 (OUT1 ~ OUT16)

Align_Out=0              // range: 0 ~ 16, default: 0
                         // Port no. of Align light (pilot light) ON/OFF signal
                         // 0: Disable Align light Out
                         // 1 ~ 16: CN1 (OUT1 ~ OUT16) port

Variable Polygon=1       // range: 0 / 1, default: 1
                         // Enable polygon delay depending on included
                         // angle
                         // 0: disable, 1: enable

Get Object Info=0        // range: 0 / 1, default: 0
                         // Support (Get Object Information) mechanism
                         // the mechanism is now controlled by AP, ignore it
```

```
Enable SoftStart=0          // range: 0 / 1, default: 0
                            // Enable SoftStart for CO2 mode
                            // 0: disable, 1: enable

Lock Start Signal=0         // range: 0 / 1, default: 0
                            // (get_start_signal) command can Query the Start
                            // Signal after MarkEnd and lock the signal
                            // only special-made AP support it
                            // Disabled when Mark On Fly=1

FPS=10                      // FPS signal value for YAG Laser
                            // Unit: 1 us

Mark On Fly=0               // range: 0 / 1, default: 0
                            // Enable off-line marking
                            // 0: disable, 1: enable
                            // When enabled, the Lock Start Signal will be
                            // ignored

HT I/O Config=0             // range: 0 / 1, default: 0
                            // Planning as PGM RDY or Rdy for Start Signal
                            // 0: planning as PGM RDY signal
                            // 1: planning as Rdy for Start signal

PGM RDY Signal Reverse=0    // range: 0 / 1, default: 0
                            // Enable PGM RDY signal reverse
                            // 0: PGM RDY signal is active high
                            // 1: PGM RDY signal is active low

[STAND-BY]
Period Time=2000            // range : 0 ~ 65535，default : 2000
                            // Period time of CO2 Laser's PWM signal on
                            // Stand-by
                            // Unit: 0.1 us

Pulse Width=10              // range : 0 ~ 65535，default : 10
                            // Pulse width of CO2 Laser's PWM signal on
                            // Stand-by
                            // Unit: 0.1 us

[SOFTSTART]
Level-1=0                   // range : 0% ~ 100%，percentage value of the 16
Level-2=0                   // points before Laser ON.
Level-3=0
Level-4=0
Level-5=0
Level-6=0
Level-7=0
Level-8=0
```

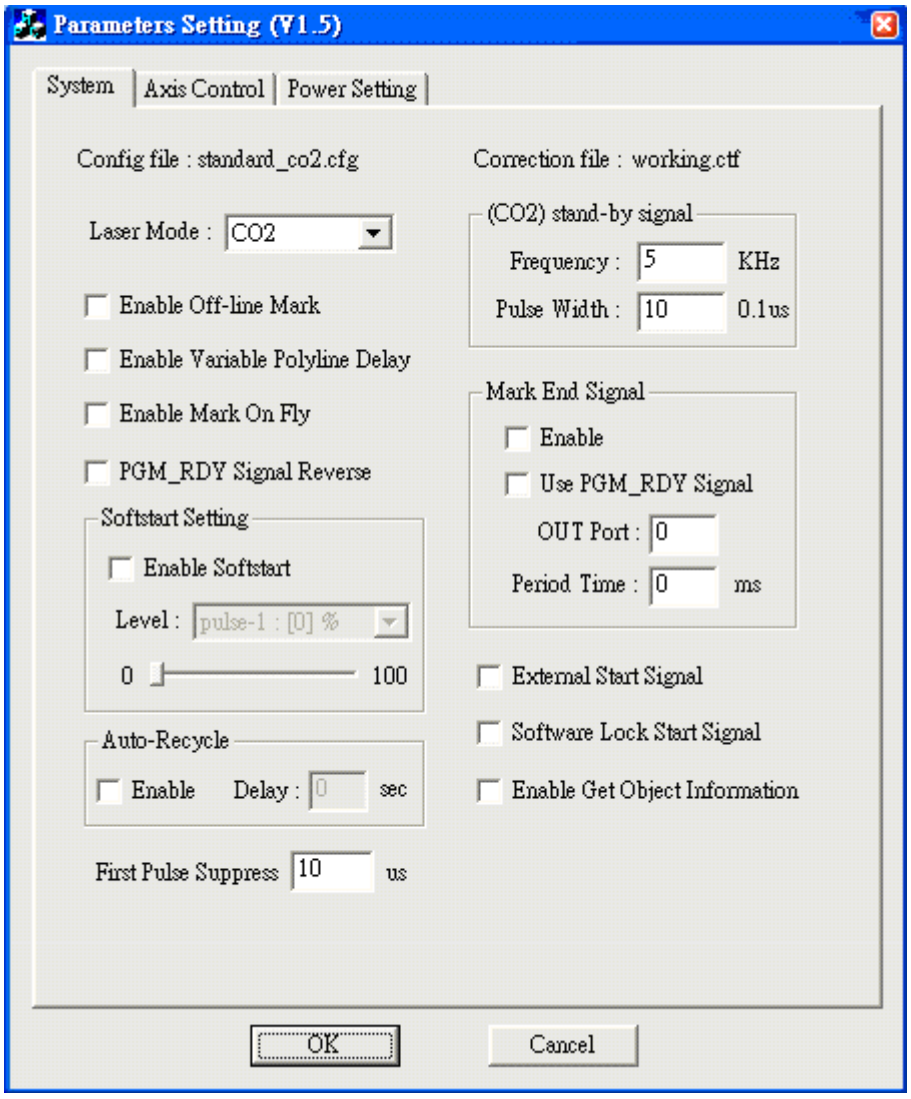
```
Level-9=0
Level-10=0
Level-11=0
Level-12=0
Level-13=0
Level-14=0
Level-15=0
Level-16=0

[IPG]
MO Job Start=0          // range: 0 / 1, default: 0
                        // Enable the MO signal of IPG Laser before
                        // marking
                        // 0: disable, 1: enable

[IFL]                   // IPG Laser pin no. description
Bit0=1                  // range: 1 ~ 16
Bit1=2                  // IPG Power Setting (0 ~ FFH), DO (LSB) ~ D7
                        // signal
Bit2=3                  // port
Bit3=4
Bit4=5
Bit5=6
Bit6=7
Bit7=8
Latch=9                 // range: 1 ~ 16
                        // power data latch signal port
Laser Status=10         // Master Oscillator signal port
Aim Laser=11            // Align light (pilot light) signal port
Duty Cycle=5            // 0.5 us, IPG duty cycle (0.1 us ~ 0.9 us)
```

Config.exe Descriptions

Config.exe is a driver program installed in the directory of C:\Program Files\MarkingMate\Drivers\MC1. This program is used to do more settings of MC-1 controller. Please see the descriptions below to learn how to do the settings.

System Settings

Double click the Config.exe program will see the dialogue box as below:



Laser Mode: Select CO2, Yag1, Yag2, or Yag3 from the pull down menu

Enable Off-line Mark: Enable the off-line mark function

Enable Variable Polyline Delay: Enable polyline delay function

Enable Mark On Fly: Enable mark on fly function

PGM_RDY Signal Reverse: Reverse the Program Ready signal

Softstart Setting

Enable Softstart: Enable software control function

Level: Adjust the power level (from 0% to 100%) from pulse-1 to pulse-16 separately.

Auto-Recycle

Enable: Enable auto-recycle function

Delay: The delay time between each cycle [sec]

First Pulse Suppress: The suppress time of the first pulse [us]

(CO2) stand-by signal

Frequency: The frequency of CO2 laser [KHz]

Pulse Width: The pulse width of CO2 laser [0.1us]

Mark End Signal

Enable: Enable Mark End signal

Use PGM_RDY Signal: Use the Program Ready signal

OUT Port: The port number of the signal

Period Time: The remain time of the signal [ms]

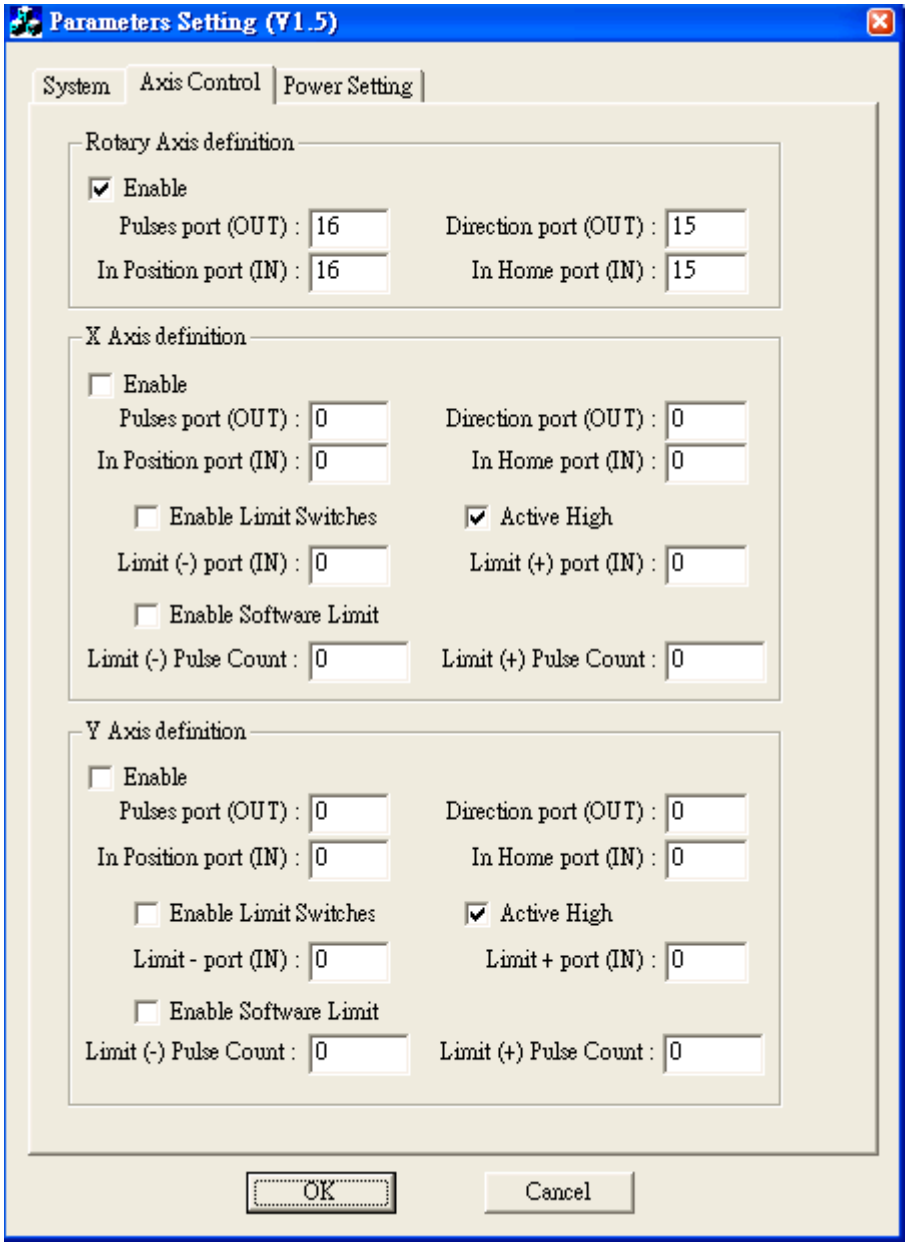
External Start Signal: Enable external start signal

Software Lock Start Signal: Enable software lock start signal

Enable Get Object Information: Enable get object information

Axis Control Settings

Click the label of “Axis Control” will see the dialogue box as below:



Rotary Axis Definition

Enable: Enable Rotary Axis settings

Pulse port (OUT): Port number of Pulse signal

Direction port (OUT): Port number of Direction signal

In Position port (IN): Port number of In Position signal

In Home port (IN): Port number of In Home signal

X Axis Definition

Enable: Enable X Axis settings

Pulse port (OUT): Port number of Pulse signal

Direction port (OUT): Port number of Direction signal

In Position port (IN): Port number of In Position signal

In Home port (IN): Port number of In Home signal

Enable Limit Switches: Enable Limit Switches

Active High: Set active high

Limit (-) port (IN): Port number of Limit (-) signal

Limit (+) port (IN): Port number of Limit (+) signal

Enable Software Limit: Enable software control limit switch

Limit (-) Pulse Count: Count number of Limit (-) signal

Limit (+) Pulse Count: Count number of Limit (+) signal

Y Axis Definition

Enable: Enable Y Axis settings

Pulse port (OUT): Port number of Pulse signal

Direction port (OUT): Port number of Direction signal

In Position port (IN): Port number of In Position signal

In Home port (IN): Port number of In Home signal

Enable Limit Switches: Enable Limit Switches

Active High: Set active high

Limit (-) port (IN): Port number of Limit (-) signal

Limit (+) port (IN): Port number of Limit (+) signal

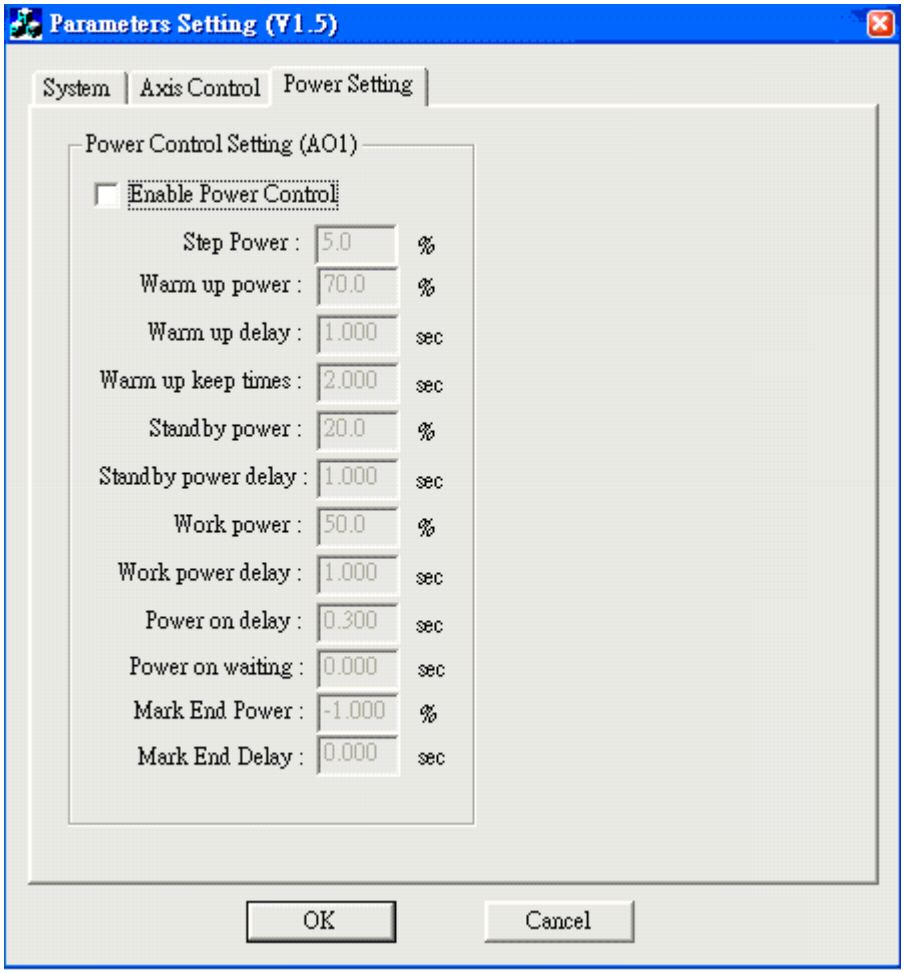
Enable Software Limit: Enable software control limit switch

Limit (-) Pulse Count: Count number of Limit (-) signal

Limit (+) Pulse Count: Count number of Limit (+) signal

Power Settings

Click the label of “Power Setting” will see the dialogue box as below:



Enable Power Control: Enable power control settings

Step Power: Step power change ratio [%]

Warm up power: Warm up power [%]

Warm up delay: Warm up delay time [sec]

Warm up keep time: Warm up keep time [sec]

Standby power: Standby power [%]

Standby power delay: Standby power delay time [sec]

Work power: Work power initial value [%]

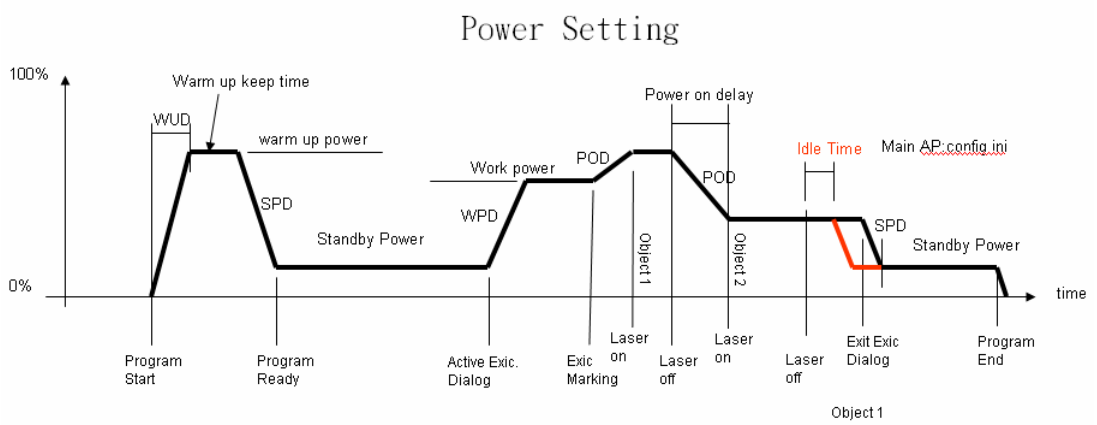
Work power delay: Work power initial value delay time [sec]

Power on delay: Power on delay time [sec]

Power on waiting: Time period from power on to stable [sec]

Mark End Power: Mark end power [%]

Mark End Delay: Mark end power delay time [sec]



WUD : Warm Up Delay
POD : Power On Delay
WPD : Work Power Delay
SPD : Standby Power Delay

Drives : Config.ini

```
[POWER]
WarmUpKeepTime=2     : [sec]
WarmUpPower=100      : [%]
WarmUpDelay=10       : [sec]
StandbyPower=30      : [%]
StandbyPowerDelay=0  : [sec]
PowerOnDelay=0       : [sec]
WorkPowerDelay=0     : [sec]
WorkPower=0          : [%]
```

HWConfig.exe Descriptions

HWConfig.exe is another driver program installed in the directory of C:\Program Files\MarkingMate\Drivers\MC1. This program is used for setting laser signal transferring protocol and the D/A output signals. Please see the descriptions below to learn how to do the settings.

1. Transfer Protocol setting. The default setting of MC-1 is using standard protocol (analog signal). If users want to use XY2-100 transfer protocol, you have to set the JP5 jumper as the description on page 14 first, and then execute this program to change the protocol to “XY2-100 Transfer Protocol”.

2. D/A setting. The output range of D/A signals (i.e. AO1 and AO2 of P2 connector) can be set as 0 ~ +10V or 0 ~ +5V. The default setting is 0 ~ +10V. And the initial values of D/A-1 and D/A-2 are 0V; users can select different values they want.

3. PIO Output Initial Value setting. The initial value of PIO output signal (i.e. 16-bit output of CN1) can be set as high or low separately. Checked means high.

4. START and STOP signal setting. The START and STOP signals can be set as active high or active low separately. Checked means active low.

5. When all settings are done, you have to click the “Write” button for finishing the setting. And more important is to restart the MC-1 controller to make all setting to go into effect.