Reverse engineering of HPC laser system
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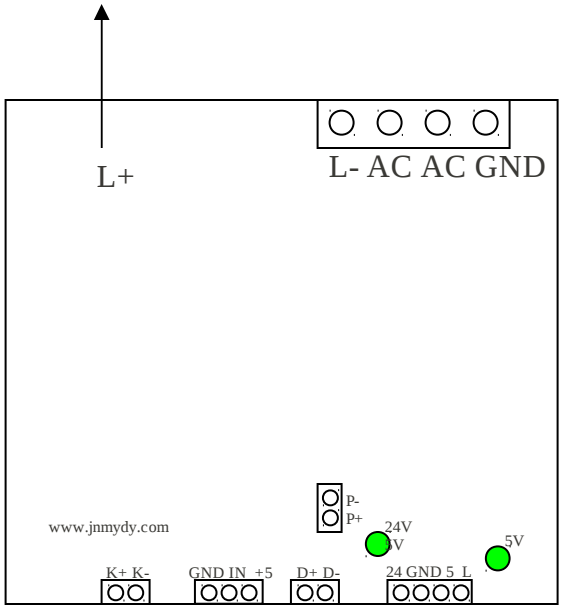
System has 2 parts: Controller card and power supply.
Power supply combines Laser power and +5V/+24V. 220..230VAC in 50/60Hz. 300 to 1000W.

Power supply connections (top view)

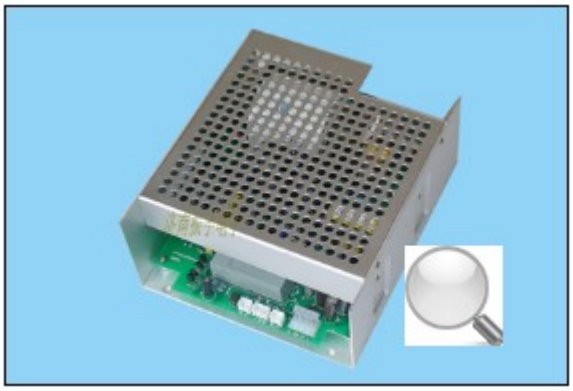


K+ K-

L+ / L-	Laser tube. Note: current measurement is done in L- line with panel meter. L+ is high voltage line.
AC	AC input
GND	PE
K+ K-	Key (connect K+ to K1 to turn laser on via manual key)
GND IN +5V	Power setpoint Potentiometer. 0V is low current 5V is max current
P+ P-	Protection input (connect P+ to P– to enable laser)
D+ D-	Digital PWM in? Jumpered from D+ to D-

24 GND 5 L 24V and 5V, digital Laser input. Connect “L” to GND to enable laser. Two green leds indicate 5VOK and 24VOK.

Technical information, According to web site (http://www.jnmydy.com/)



Power Supply for Laser Engraving Machines

The power supply adopts zero-current half-bridge soft switching circuit, featuring high efficiency, fast response and easy matching for laser tubes produced by various manufacturers. Its ports can be controlled simply, easy to be equipped with machines and match the board signals. Meanwhile, it has an additional abnormal prevention switch for testing external water supply, ventilation, etc.

The laser power can be adjusted by entering either 0 to 5V analog signals or PWM signals.

The power supply has open circuit protection function: under the well-grounding circumstances, it can work under open circuit state within short term to avoid laser power supply damages caused by laser tube burst.

Meanwhile, it can output 24V and 25V, convenient for facility installation and commissioning

Ex-factory Aging Test:

Each power supply should go through 12-hour, 60℃ high temperature aging test under full load with 500 times power supply switches in 7 seconds.

Main Technical Parameters:

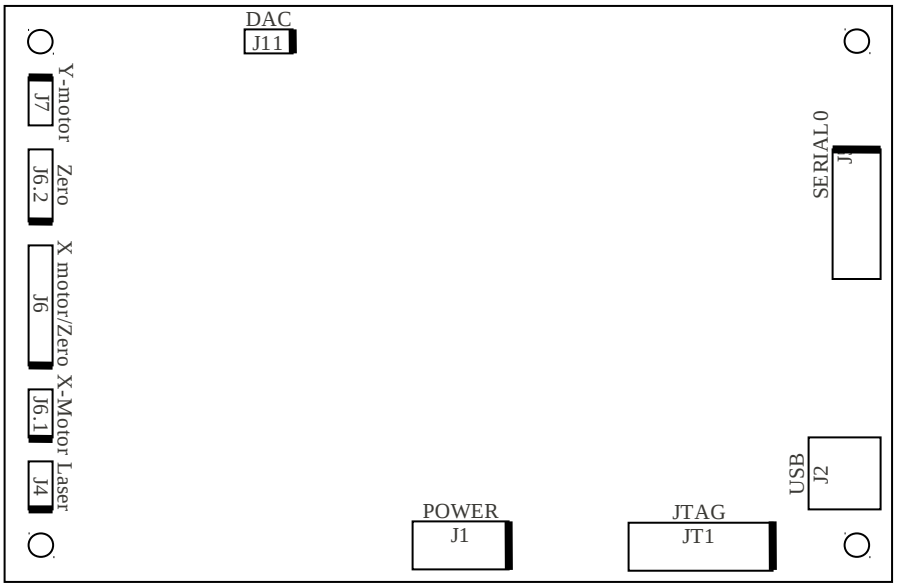
AC Input Voltage		AC220V or AC110V
DC Input Voltage		DC300V or DC150V
AC Input Frequency		47~440Hz
Maximum Voltage Output		30KV
Voltage Output 1		24V 1A
Voltage Output 2		5V 1A
Maximum Current		20mA (depending on the laser tubes of different manufacturers)
Efficiency		91%
Overcurrent Protection		130% of maximum current
Open Circuit Protection		Yes (short term)
Structure		Fan cooling
High Electric Level Control Voltage Range		≥3V
Low Electric Level Control Voltage Range		≤0.6V
Working Temperature		-30℃~+60℃
Relative Humidity		20~85%RH (no condensation)
Voltage Resistance	Input—Output	AC1500V1minutes≤10mA
	Input—Shell	AC1500V1 minutes≤10mA
	Output—Shell	Connection
Insulation Resistance		≥50MΩ(DC500V)
Earth Leakage Current		≤1mA(AC220V)≤0.5 mA(AC110V)
Vibration Resistance		Amplitude: 0.5mm frequency 10~55Hz 3D direction 2 hours
MTBF		≥30,000 hours
Test Time at Full Load and 60℃		12 hours
Power Supply Switches Test within 7 Seconds		500 times
Maximum Dimensions (L*W*H)		165mm*145mm*90mm

Control board

Mounting hole locations:

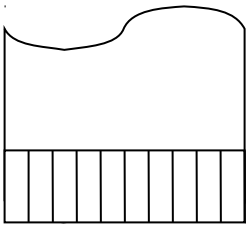
150 mm center to center between holes horizontally
105 mm center to center between holes vertically

Connector locations (note black bar is pen-1)



Control board connections

J6: X motor + limits (on flex foil, as seen from contact side)



Pin	Name	Function
12	A-	Motor windings (X motor)
11	A+	
10	B-	
9	B+	
8		
7		
6	GND	Ground
5	XHOME	X Home sensor. 5V if on sensor (head is at right side) 10 K ohm pull up on board
4	YHOME	Y Home sensor. 5V if on limit sensor (head is at top side) 10 k pull up on board
3	+5V	5V supply
2		
1	GND	Ground

J6.1: X Motor connections

PIN	Name	Function
1	A+	Motor windings (Y motor)
2	A-	
3	B+	
4	B-	

J6.2: zero/home sensor connections

PIN	Name	Function
1	+5V	5V supply
2	GND	Ground
3	YHOME	Y Home sensor. 5V if on limit sensor (head is at top side) 10 k pull up on board
4	XHOME	X Home sensor. 5V if on sensor (head is at right side) 10 K ohm pull up on board
5	?	

J7: Y Motor connections

PIN	Name	Function
1 (RED)	A+	Motor windings (Y motor)
2 (BLUE)	A-	
3 (YELLOW)	B+	
4 (WHITE)	B-	

J4: Laser OUT

PIN	Name	Function
1	+5	
2 (YELLOW)	GND	
3 (GREEN)	LASER	Pulled to GND to disable laser. Pulled to +5V to enable laser (or floating, as laser has internal pull-up?)
4	PWM?	PWM output?

J11: DAC OUT

PIN	Name	Function
1		
2		22Kohm between 2 and 3
3		

Note: seems to be completely isolated from input power

J1: POWER

PIN	Name	Function
1 (BLUE)	+5V	Controller voltage
2 (GRN/YEL)	GND	GND
3 (RED)	+24V	Motor voltage

Firmware / Software

The board has a LPC214x chip. At least it uses a Philips LPC214x USB driver.
The board can store upto 9 files on the (128MB) SD card.

When the board is powered up, it immediately starts homing the axis. X axis first (to the right) then Y axis (moves to the top).

The motor speed is max 1200 mm/sec. The motion is acceleration limited (but the acceleration seems to be progressive, not a linear increase in speed). It takes a few 100 msec to reach max speed. At higher speeds the axis (at least the Y axis) stalls.

It is possible to enable and disable the motor via the software. It does not seem to check the limit switches or maximum travel. You can engrave a drawing larger than the physical work area. The motors will crash at the physical limits.

Scale
X and Y = 40.74 mm/rev

Note: Some of the lasers have 400steps/rev motors, and some have 200 steps/rev steppermotors. So the overall micrometer/step value differs (6400 v.s. 3200 steps/rev)

At 16x microstep, the resultion is:

- **3200 steps/rev: 12.7 um/step**
- **6400 steps/rev: 6.37 um/step**