二维总线系统装机说明文档版本更新记录

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1. Product Overview

LBC40 is a precision machining motion control system for sheet metal fiber laser cutting machine.

This product is suitable for low-power laser cutting, EtherCAT bus servo control machine tools, equipped with self-developed software CDCUT, can realize flat cutting of arbitrary graphics. It has rich functions such as drawing processing, path planning, trajectory technology, processing technology, speed planning, etc. It has special functions such as flying cutting, nesting, disc centering, five-level perforation, perforation and slag removal, automatic PLC, etc., which can be applied to the scene of rapid cutting and cyclic processing. Widely used in sheet metal, kitchenware, lamps and other industries, this installation manual is only for installation guidance.

2. Wiring instructions

2.1. API overview



(LBC40 Interface Description)

2. 2. API description

- 1. Servo control interface: This system includes 1 servo control interface, and the F-AXIS axis is connected to the automatic focus axis;
- Network 1 interface: the expansion interface of the IO board, which can be connected to the expansion IO module provided by the company through this network port to expand the number of IOs;
- 3. Network 2 interface: connected to the PC through network port 0, used for software communication and control;
- 4. Network port 3 interface: debugging interface (do not operate and use without technical

personnel guidance);

- 5. EtherCAT interface: This product is an EtherCAT host, which contains a bus protocol stack, which can be connected to a slave of a bus-type servo;
- 6. USB interface: it can be used for data import and export, and can also be used for system firmware upgrade;
- 7. RS232 interface: special interface, which can be used to connect lasers and RS232 communication;
- 8. RS485 interface: it can be connected to RS485 equipment for monitoring and measuring the parameters of the equipment;
- 9. Power input: 24V power supply, it is recommended to supply power separately, do not share the same switching power supply with other equipment;
- 10. PWM output interface: the PWM signal is used to control the output modulation signal of the laser;
- 11. Analog DA1-DA4: used to control the power of the laser, proportional valve, analog focusing axis and other modules;
- 12. Transistor output signal: 12 transistor outputs, the specific corresponding functions can be set by the configuration tool software;
- 13. Relay output interface: 6 relay normally open contact output, 4 relay normally open and normally closed output, the specific corresponding function can be set by the configuration tool software;
- 14. Switching input interface: This terminal contains 24 universal input interfaces, and the specific corresponding functions can be set by the configuration tool software;
- 15. Limit switch interface: The terminal inputs 4 limit switch signals, including the positive limit and negative limit of the Z-axis and the focusing axis respectively.

note

1 The servo connected to the focusing shaft should be configured for position loop digital pulse control; The output of the servo enable signal in the shaft port is active low by default;

The servo alarm input signal output is active low by default; (Normally open and normally closed options can be set by the machining software)

 $2\;$ The switching input is active low by default; (Configurable functions through processing software);

3 PWM output factory default high level is 24V (if you need 5V level, please contact the manufacturer);

4 The default input of the limit switch input is valid at a low level, where Z+ indicates a positive limit and Z- indicates a negative limit. And so on.

2. 3. Wiring instructions



3. Installation instructions

3. 1. Preparation before installation

3. 1. 1. Recommended host configurations

CPU	Inter i5 1.6GHz (4 cores) and above
memory	8GB and above
hard disk	120GB and above
network card	2X10/2X100/2x1000 Gigabit LAN
USB	4XUSB2.0/4XUSB3.0
display	HDMI/VGA is supported
system	Genuine Windows 7 (64-bit Ultimate) / Genuine Windows
	10 (64-bit Professional)

3. 1. 2. Change the host IP address

1. Find the "Network" shortcut on the desktop, right-click and select "Properties", and select "Change Adapter Settings" in the pop-up interface, as shown in the following figure.



fig 3.1.1Change the adapter

2. In the pop-up window, the unidentified network identifies the network port of the connected network cable, which is the network port where we need to change the IP address, as shown in the following figure.

	1977. A. 198	S. 44/6	111
	Vetwork Connections		
	$\leftrightarrow \rightarrow = \uparrow$	~ O	Search Network Con
10	Organize •		
	No.5		
-	Seallek PCIe GEE Family Controller		
0			
0			
1			

fig 3.1.2Select a network adapter

3.Right-click on this network port, select "Properties", select "Internet Protocol Version 4 (TCP/IPv4)" in the pop-up interface, then click "Properties", select "Use the following IP address" in the properties interface, fill in the IP address and subnet mask in the table, and click "OK" to complete the change.

4.

IP address	192.168.2.110

Subnet mask

Research the second time of this connection. Channel Hings of this con- Internet (NGBE# 4 (ICP/IPv4) Properties X
General
You can get IP settings assigned automotically if your network supports the capability. Otherwise, your need to ask your network administrator for the appropriate IP autompt.
Ogktain an IP address automatically
O Use the following IP address
P address: [192.268.2.1.10] Subret mask: 256.255.355.0
gefault gateways 1 1 1
Cigture Dhill server address automatically
Q Use the following CMS service addresses:
Breferred DNS server: + + +
Alternate DNG servers
Vejdate settings upon exit Adjanced

fig 3.1.3 Change the IP address

3.2. Install the software

1. Download the latest version of the software installation package from the official website.

2. Double-click the installation package and follow the prompts to complete the installation step by step.

3. Contact the manufacturer to authorize the software.

3.3.Connect slaves

Connect the slave station with CAT5E and above standard network cables, and the wiring diagram is shown in Section 1.2.

3. 4. Scan slaves

Open the CDCut software and wait for the prompt "Controller is online".
Click "Configure Tool", the default password is empty, and click "Start Scan" of "Bus Scan" after opening.

3. After the scanning is completed, the corresponding function axes are set according to the slave connection sequence, as shown in the figure below.

only used	🖋 Drawing	: 🖬 Swapling	€ Cratt	I Sumerical contro	1						
begins 🔸	et 10-	Configuratio		🔤 Noná tor*	$\div \pi_{\mathrm{ack}}$	to origin 👻	TLC operation -	Process	ing craft	🗍 Find edge	e#
		Beight adjus	ter parameters	A. Demarcate	Cloba	l parameters	PLC editing -	17 One-c15	ch cut-off -	n Debugeine	÷
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		D024-06- Slava per Scan comp Operation Pauber o Slave st Slave st Slave st	15 14:11:22 (work link OK jote al status f slaves: 4 stjond:31ave_100 stjond:31ave_100 stjond:31ave_100 stjond:31ave_100	1 (3075-жилый)а Се 1 (3077-жилый)а Се 1 (3077-жилый)а Се 1 (3077-жилый)а Се 1 (3077-жилый)а Се 1 (30775-жилый)а Се 1 (30775-жилый)а	E Drivel Drivel Drivel	Bus Perri L Bus Gerri 2 Bus Gerri 3 Bus Perri 4		axis Z axis Y axis Y axis Y2 axis Y2			
varning									_		

fig 3.4 .1 Bus scanning

4. Commissioning of the machine

4. 1. Configure parameters

4. 1. 1. Configure axis parameters

Set the basic parameters of the axis and the parameters of the return to the origin according to the actual situation of the machine tool.

4. 1. 2. Configure laser parameters

Set according to the brand and control method of the laser actually used.

4. 1. 3. Configure I/O parameters

IO input signal

1. Configure "Emergency Stop", "Laser Alarm", "Chiller Alarm", if there are other alarm signals, configure "General Input Alarm", and then fill in the name in the custom name column.

2. Configure the "E-STOP" signal.

3. Configure the common axis positive and negative limit signals.

4. If there is a focus axis, it is necessary to configure the corresponding limit, origin, and alarm signal

IO output signal

1. Configure the output ports of "laser" and "shutter".

2. Configure "Oxygen", "Nitrogen", or "Nitrogen" if you are using air.

3. Configure the alarm lights "red", "green", and "yellow".

4. Configure the brake signal, if the servo brake is externally controlled, then configure the brake signal of the corresponding axis.

4.1.4. Configure the height adjuster parameters

1.Set the basic parameters of the axis

2."Maximum speed" is calculated according to the maximum speed of the servo and the corresponding screw pitch per revolution, and "Maximum acceleration" is filled in according to the actual machine performance.

3.Back to Origin Direction, set the positive direction.

4."Servo direction", the default is forward, after configuration, if the Z-axis jogs upwards and the actual cutting head moves downward, the "servo direction" is reversed.

5."Encoder Reverse" is not set by default, if the Z-axis mechanical coordinate value increases and the cutting head moves downward when the Z-axis jogs downward, then "Encoder Reverse" is set.

4.1.5.Configure the focus parameters

1.Set the focus axis control mode

2.Set the basic parameters

3. If it is a shaft port control, it is recommended to set 100 for "jog speed" and "positioning speed", and 1000-3000 for "maximum acceleration".

4. If it is a shaft port control, the default negative direction of "Return to Origin Direction", 2 is recommended for "Coarse Positioning Speed of Return to Origin", 0.5 is recommended for "Precise Positioning Speed of Return to Origin", and "Retreat Distance": the distance of the focusing axis from the origin position to the 0 position.

4.1.6.Global parameters configuration

Open Global Parameters in the CDCut menu bar and use the default parameters, as shown in the following figure.

Global parameters			
Motion control parameters			
	х		Y
Maximum airspeed	50.000 *	n/ain	50.000 * n/min
Max Travel acceleration	1000.000 -	nn/s^2	1000.000 - nn/s^2
Max Cutting speed	10.000 *	n/min	10.000 * n/min
Maximum machining acceleration	800.000 *	nn/s^2	800.000 * nn/s^2
Small circle speed limit constant	0.4000 *	Ĩ	
Quick parameter settings		Cutting Paramete	r Settings
🗌 Use frog-leap lift		Gas.on	del av 20.000 * se
the height of the jump 0.0	000 📼	Cas switch	delay 20,000 xs
Lifting height 0.0	000 💌	Continue ster	back so coop T
iaua frog-leap distance 0.0	0000 💌	Continue, step	Dack 50.0000 * MR
Short distances do n		Cooling	delay 1000.000 * ms
hen travel shorter than 0.0	0000	Gas down	delay 20.000 * ms
sitioning coordinates:	inates	Light response	e time 0.0000 * us
Gas-free machining		Light off response	e tine 0.0000 - us
Unit selection	Cutti	ing Settings	
	🕑 Proc	cess Selected Only	
Time Unit: nas *	🕑 Proc	cess end, go to Berth	point - Mark Editing
Speed Unit: n/min -			
Acceleration units: na/s^2 -	Speed	d settings	
Air pressure unit: BAR 👻			
: forces all parameters to change!		Frame speed 10.	000 - a/nin
			Save Cancel

Figure 4.1.1 Global parameters

4.1.7. Jog parameters configuration

Open the jog parameter setting interface and use the default parameters, as shown in the following figure. If you have already set the correct stroke for each axis, you can set "Enable Soft Limit Protection".

Bridging -	🕇 Extend 📧 Globa	l parameters	_
175 Craft	Step Jos	5.00m/min Y+ LOW HIGH Y- D0mm C	
	ar Settings		×
Jog Paramete	a settings		~
	х	ч	
Jog high speed	15.000 🔻 m/min	15.000 🔻	m/min
Jog low speed	5.000 🔻 m/min	5.000 🔻	m/min
Step distance	15.00 🔻 mm	15.00 🔻	mm
Enable soft	t limits		
		Save	Cancel

fig4.1.3 Jog Parameters

$4.\ 1.\ 8.\ \text{Increase the parameters } \ \text{configuration}$

In the TDCut menu bar, turn up parameters.

1. The other parameters of the height adjuster can use the default value, as shown in the figure below.

 $2.\ {\rm If}$ you are using a bus servo, ignore the following.

3. Servo brands are set according to the actual setting, Schneider, Inovance, Delixi, HCFA and other settings are set up "Yaskawa/Delta", and Fujifilm and other settings are set up

"Panasonic/Mitsubishi".

4. To automatically calibrate the zero point voltage, first jog the Z-axis, let the cutting head move to the middle position of the Z-axis stroke, click "Automatic Calibration of the Zero Point Voltage", and wait for the calibration to be completed.

5. Automatically adjust the gain, Z-axis jog down or up at low speed, if the speed is not 20mm/s, and the difference is large, move the cutting head to the middle of the Z-axis stroke, check "Auto Gain", and click "Auto Adjust Speed Gain".

D Follower				>
Other parameters of the	aligner		Servo branding	
Following error ±:	0.010 👻	nm) Panasonic / Mitsubishi	
Follow the error delay	20.000 🔻	n s	🔿 Yaskawa/Delta	
Perforated touchpad delay	200.000 🔻	ns	O 0ther	
Cutting bumper delay	20.000 🔻	n s		
Idle shift bumper delay	20.000 🔻	ns		
Automatic calibration	of the zero volt	age		
			OK Cance	1

fig 4.1.4 Heightener settings

4. 1. 9. Configuring the parameters of the shootout

On the right side of the main interface, you can set the default value on the point emission parameter configuration interface, if the laser power is small, it can be appropriately increased.

				_	
Shutter	Re	dLight	*	' Lase:	r
Se Daal	🕌 ВІ	.ow		air	•
Peak poi	nt power	5	0.00	- *	δ
PWM du	ty cycle	3	0.00	- %	6
Point pulse f	requency		1000	- н	{z
Button blow air	pressure	20	0.00	- E	BAR
- Bamro	Fi Fi	····es		Empt	y go
Wa er	📮 Fo	llow	Pı	review	
				ţ	<u>}=</u>

fig 4.1.5 Burst Parameters

4. 2. Shaft commissioning

4.2.1. Limit debugging (Note: The motor should be in the non-enabled state

at this step!)

1. Trigger the limit switch of each axis in turn, and observe whether the alarm bar has the limit alarm prompt.

2.Check other input signals such as emergency stop in turn, and turn on "I/O Monitoring" in the menu bar "Monitoring" for observation.

4.2.2.Back to square one

1.Enabled on the motor.

2.Set the "step speed" and "step distance" of each axis in the jog parameter setting interface, and it is recommended to use a small parameter test first to observe whether the direction and distance of each axis are consistent with the setting.

3.Turn on the "Back to Origin" function after the step test is complete.

4.Test the back-to-origin function of each axis in turn.



fig 4.2.1 Back to square one

4. 3. IO commissioning

After completing the IO input debugging through limit debugging, open "IO Monitoring" in "Monitoring" in the menu bar and continue to test the IO output function in turn.

4.4. demarcate

1. Click "Back to Origin" in the menu bar, "Return to Origin".

2. Wait for the return to the origin action to complete, and lay the sheet under the cutting head.

3. First, click "Z-axis jog down", let the cutting head stop within 1cm of the board surface, click "Calibrate Z-axis capacity value", and wait for the calibration to be completed. If no change in the capacitance value is detected, the Z-axis position can be appropriately lowered and the pipe surface can be calibrated again by about 5mm.

Calibration capacitance	×		
Calibrate the capacit	tance		
On the Z-axis point trend			
Calibrate the capacitance			
One-button	calibration		

Figure 4.4.1 demarcate

4.5. incision

1. After completing all the above steps, you can use the functions under the drawing bar to plot, see Figure 4.5.1 for details. Drawing is done by the red area functon, if you are not satisfied, you can optimize it with the green area function, or click "File" in the upper left corner of the figure to import the existing DXF file.

2. After drawing the graph, open the "Processing Technology" in the CNC bar under the menu bar to set the process parameters.

3. Once the setup is complete, the cutting can be made.



fig 4.5.1 Drawing function



Figure 4.5.2 Machining technology

5. Precautions

5.1. Wiring precautions

5. 1. 1. Specification for the cabling of the drag chain line

- 1. Twisting of the cable is not allowed when it is installed in an enclosed space, which can lead to premature damage to the stranding of the core. This effect is gradually strengthened during the operation of the cable, resulting in a de-twisting phenomenon that eventually leads to a breakage of the core and a failure.
- 2. In the case of vertically suspended e-chains[®], more free space must be left in the vertical support, as the cables will be elongated during operation. After a short period of operation, it is necessary to check whether the cables are running along the central area and, if necessary, adjust them.
- 3. For sliding chains[®], we recommend simply fixing the cable to the moving point. A small cable protection zone is required at the fixed point. (refer to the assembly instructions of the e-chain[®] supplier)

- 4. Make sure that the cable moves along the center area at the desired bend radius. Do not apply tension to the cable (do not pull it too tightly), otherwise the friction inside the e-chain® will cause the cable sheath to wear; Do not let the cable become too loose in the e-chain®, as this may also cause wear and tear on the inner wall of the e-chain® or become entangled with other cables.
- 5. If the cable is not running smoothly, check whether it has been twisted along the longitudinal axis during operation, and the cable should slowly rotate at a fixed point until it runs freely.
- 6. Given the absolute size of the cables and e-chains®, their length variation characteristics vary considerably. Within a few hours of initial operation, the cable naturally elongated. In the case of energy chains, this phenomenon takes many hours of operation. Such a big difference can be resolved by regularly checking where the cable is installed. We recommend regular inspections, every three months for the first year of operation, and then at every maintenance session. This includes checking that the cable is moving completely freely within the desired bend radius and adjusting it if necessary.

5. 1. 2. Machine tool wiring specifications

5.1.2.1. Power Wiring Specifications

1. Strong and weak electricity are strictly separated. The power cord selects the appropriate wire diameter according to the power size, and the attached table is the cable diameter and power comparison table

Wire/cable	Cable	25°C copper	Single-phase	Three-phase
specificatio	cross-	wire ampacity	220v	380v load
n (mm^2).	section	(A)	negative	power (W)
	(mm^2)		load power	
			(W).	
1.5	1.38	15	3300	9476.8
2.5	1.38	25	5500	13163.2
4	2.25	32	7040	16848.8
6	2.85	45	9900	23693.6
10	7*1.35	60	13200	31591.2
16	7*1.7	80	17600	42121.6

25	7*2. 14	110	24200	57917.6

2. Strong current plus short-circuit protectors, filters and other auxiliary devices.

3. Weak current: The color of the positive and negative wires of the power supply is distinguished, for example: the red wire is connected to the positive pole, and the blue wire is connected to the negative pole

4. Loads with large interference (such as servos and solenoid valves) are supplied separately from the controller.

5. 1. 2. 2. Signal wire wiring specifications

1. Signal cable wiring color: such as black.

2. The signal cable is matched according to the power level.

3. DC 24V solenoid value is recommended. Absorption circuits are added at both ends of the solenoid value, that is, a freewheeling diode is connected in parallel at both ends of the solenoid value (pay attention to the direction, current resistance value, and withstand voltage value).

4. It is recommended that the digital signal (PWM) shield be grounded at both ends and the analog signal (DA) shield should be grounded at one end. Singleended grounding avoids low-frequency current noise on the shield; Doubleended grounding effectively eliminates high-frequency interference, and if the transmission cable is very long, it is recommended to ground at multiple points to ensure the equipotential of the shield.

5. The resistance of the cutting head connected to the amplifier to the machine housing is not more than 1 Ω , and the resistance to the grounding point of the electrical cabinet is not more than 6 Ω .

5. 1. 2. 3. Ground wire wiring specification

1. The ground wire adopts a standard yellow and green two-color wire.

2. There are some high-frequency signals (PWM, pulse, encoder, capacitive signal, etc.) in the laser cutting machine, and it is recommended to use multi-point grounding.

3.Galvanized grounding screws are used for machine tools and grounded with special grounding wires. The resistance between the grounded metal body and the main grounding point cannot be greater than 0.1Ω .

5. 1. 2. 4. Other wiring specifications

1. Clear and accurate identification and marking of each wire. n

2. The lines are arranged in parallel with each other, and they are not allowed to cross, and the arrangement of the wiring harness and conduit should be

straight. n

3. When choosing our wiring, select the appropriate type of wire according to the layout space, and do not pile up and circle. n All wiring must be firm and not loose to prevent ignition. n

4. Cabling avoids the formation of loops and prevents antenna effects. A current loop consisting of a signal source--- transmission line, --- load, which is equivalent to a magnetic field antenna.