IFS-6560T4-N MANUAL OF 2.5A FOUR AXIS OF STEPPER MOTOR



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I. Summary

The computer engraving machine is a new set of engraving and milling. The machine is mainly suitable for processing a variety of colorful patterns mould, such as,matrixes for embossing,sole mould,button mould,Zipper model,Stamping die design and die text,Instrument Mould,glass mold,etc.Also applies to advertising, such as logo of firms,scutcheon,module of building,badge,name-plate,panel,association's, emblem,door-plate,destination,board,decoration,upholster,etc. And applies for graphic engraving,Yin wen and Yang wen profile, and relief sculpture,such as portrait,scenery,Calligraphy Lettering,seal,etc.

The company's 4-axis Engraving machine drive will composed minimum control system, using high-performance special micro-step control of TB6560 chip , open micro-computer control according to user requirements to functional design to the driver board. The control panel suitable for driving any small or four-phase or two-phase hybrid stepping motor. And have 4 files adjustable features of current 0.6A, 1.2A, 1.8A, 2.5A, support MACH2, MACH3 ,KCAM4 Series software,Widely used in mold processing, graphic sculpture. As a result of new bipolar constant-current chopping technique, high precision, the motor running,with small vibration, low noise, smooth operation, safe and convenient, it is welcomed by the vast number of DIYers and engraving machine manufacturers.

II、The advantages of TB6560AHQ

1. The advantages at low speed

Low-speed operation system means clock frequency is not high, a small current drive based, such as several to 100 rpm, under the conditions of the user, in such applications will increase in costs such as using the traditional driver, either due to integrated chip subdivision is too low, leaving the low-speed vibration is too large;

either had to choose a high drive segments.

The advantages of TB6560AHQ

- low vibration and noise.Because the chip comes with an optional sub-2,4,16, enough to meet speed nearly a few to high speed.
- Less heat:Large enough to heat the chip comes with a separate support the cooling requirements of small current drive
- Supports a variety of stepper motor: Customers can choose slightly larger moment of a hybrid or permanent magnet stepper motor, the motor work in the allowed peak torque between 30-50 percent, the motor costs almost the same; the chip set to provide more current file and current decay model, support various parameters under thethe same power index.

2. The advantages at high speed

High-speed operation system means clock frequency is higher, and a large current drive-based. Such as speed close to thousand rpm, under this application,compare with traditional driven program,Either due to integrated chip segment is too low, leaving the system is too small speed range,Either due to excessive breakdown and increase high costs, may also caused by high torque decrease vibration and noise.

The advantages of TB6560AHQ

- Low vibration and noise.As the chip TB6560AHQ comes with 16 segments, meeting nearly from a few to thousand rpm. and generates automatically a pure sine wave control current, compare with another highly integrated chip, the high torque at the same speed will not only not decreased, but increased..As TB6560AHQ can withstand the peak driving voltage 40V, 3.5A peak current, it provides continuous technical support.when the motor torque in a large, high-speed operation.
- Supports a variety of stepper motor. Customers can choose a hybrid moment slightly larger or permanent magnet stepper motor, in the maximum torque of between 30-50%, the motorthe costs is almost the same. The chip provide high

current set and multi-profile current decay mode, support the same power index of the various parameters under the stepper motor.

Less heat. The embedded drive compact, easy to heat. When it drive in high current, the chip surface to facilitate the external cooling radiator, the user can be also directly connected to the metal shell of the original controller,

In short, because TB6560AHQ is highly integrated, the external circuit is very simple, it is high reliability, and support 57 and some 86 per minute stepper motor from a few dozen to thousand rpm.in the wide speed application development and enable the both costs down of numerical control equipment and production

III、Brief performance of IFS-6560T4-N

We have accumulated many years of design experience in 4-axis engraving machine drive. And developed this type of TB6560T3V1.In addition to its main features a little bit above 6560, it also has:

- Driving four 2.5A stepper motor simultaneously, With 5-axis expansion, if you need to extend it
- Isolated completely high-speed DCDC optocouplers and protect your Pc.
- Spindle relay output, if you use the mach3 to control spindle start and stop
- Semi-flow control ,when the motor stop, current is reduced to the minimum stop effectively.
- The interface with the fans, you can add any fans
- With 4-way 0.8-3.5A (peak) adjustable current, rated output two-phase bipolar stepper motor driver
- Interface with Standard parallel port, support MACH2, KCAM4 series software.
- Limit interface with 4-ways, Plug connector designed fby connecting limit switches as you like
- Support four running mode, such as mixture, fast, low, normal mode.
- Support the choice of four segments 1,1 / 2,1 / 4,1 / 16

 Stability,and small heat,24-36V single power supply input with switching power chip supply 5V power

IV, GENERAL DIAGRAM



Fig 1

V. Definition on pins of parallel port



25-pin parallel port control is defined as follows:

DB25(PIN)	The role of the pin on driver	Notes
	board	
1	EN	Enable all axis
2	STEPX	X pulse signal
3	DIRX	X direction signal
4	STEPY	Y pulse signal
5	DIRY	Y direction signal
6	STEPZ	Z pulse signal
7	DIRZ	Z direction signal
8	STEPA	A pulse signal
9	DIRA	A direction signal
10	LIMIT-1	Limit input1
11	LIMIT-2	Limit input2
12	LIMIT-3	Limit input3
13	LIMIT-4	Limit input4
14	Relay control	
15	blank	
16	STEPB-	B pulse signal
17	DIRB-	B direction signal

|--|

VI.Adjusting current decay, subdivision, current output



6.1、Adjusting current decay

The specific role of the current decay of stepper motor driver board:

Subdivision is now a way of the current subdivision of stepping motor, phase current according to sine wave is about to get the current point as the tangent point of breakdown. Subdivision in the phase current reaches the point of control is necessary to control current decay, otherwise there will overshoot the angle will not stay in the exact breakdown point. Motor at different speeds, selected for different decay modes. fast decay ad high speed, slow decay at low speed. Slow decay occurs when high-speed vibration, noise, Low speed at fast decay will lead motor weakness, severe

cases are not allowed to locate. Motor Control IC for the current decay of the H bridge switches is the control mode. The high side of the tube when the slow decay off, fast decay tube are closed when the high and low side. Mixed decay is the fast decay first and then a slow decay, mixing ratio of decay time and power for the chip also will be different.

Marked on board D1/D2 ,the value of the current decay is set DIP switch D1/D2 correspondence between the location and decay mode, following table

DIP D1	DIP D2	Running mode
ON	ON	Fast decay
OF	ON	50% decay
ON	OF	25%decay
OFF	OFF	Slow decay

6.2、Adjusting subdivision

You may adjust the subdivision mode of board, DIP switches on the two on the M1/M2 adjust DIP switch, DIP switch location and subdivision mapping table below

DIP M1	DIP M2	Subdivision mode
OFF	ON	1/16
OFF	OFF	1/4
ON	OFF	1/2
ON	ON	1

To make the motor run smoothly, please try to choose high segments, such as 1 / 16 segments

6.3、Adjusting current output



电流调节拨码开 关T1/T2

Fig 4

Current standard T1/T2 by two board DIP switch to adjust,T1/T2 location and value of current output, correspondence as follows:

DIP T1	DIP T2	Value current
OFF	ON	25%*2.5A
ON	ON	50%*2.5A
ON	OFF	75%*2.5A
OFF	OFF	100%*2.5A

We proposed the current value closed to rated of stepper motor

VII、 Connection of stepper motor

Electrical connection diagram refer to the overall wiring diagram IV:





Four-wire stepper motor connection





Six -wire stepper motor connection



Fig 7

Eight -wire stepper motor connection

Notes:Motor A,-A, B,-B, connected respectively, connected driver board AP, AM, BP, BM

VIII、 Limit switch connection



Fig 8

IX, The 4th axis extended connection



X. Match with the and driver board

The panel of IFS-6560T4-N four-axis match with two and four-phase motor drive of domestic and foreign manufacturers. In order to obtain the most satisfactory results, need to set a reasonable supply voltage and current. The high-speed performance depends on the degree of the motor supply voltage.but the current set value determines the output torque of the motor.

1. Select supply voltage

In general, when the higher the supply voltage, more great torque at the motor high speed, and avoid the motor out of step at high speed. On the other hand, the voltage too high may damage the drive, and work in high-voltage, vibratory at low speed Reference value of power between 12-36VDC 8A

2. Set value of output current

The larger of setting current, the greater of output torque in the same motor. But the problem is the larger current the more heat of motor and driver. So in general,we

set the value at when it warm but not too hot on running at long-term.

- At high speed mode of 4 and 6-wire: the output current equal or less rated value
- Larger torque mode of 6-wire: output current is 70% of rated value.
- Ttandem-type connection of 8-wire:output current is 70% of rated value
- Parallel connection of 8-wire:output current is 1.4times of rated value.





Notes: please operating motor 15-30 minutes when you finished the setting of current.If the motor temperature is too high, you should reduce the value. If reducing the current value, the motor output torque is not enough to improve the cooling conditions, are invited to ensure motor and drive are not hot.

XI、Usage of MACH3

11.1、Startup Mach3



Fig 11 open mach3

When you have installed the software, here are 3 icons on the desk,let's click the march3Mill, as fig 11.



Fig 12 the main interface of march3

The main interface of MACH3 as fig 12, some basic buttons on it, Here, we first configure MACH3.

🛃 Mach3 CNC Controller	
Eile Config Function Cfg's View Wizards Operator PlugIn Control Help	
Pro Select Mative Units Ports and Pins Alt2 ToolPath Alt4 Offsets Alt5 Settings Alt6 Diag Motor Tuning	mostics Alt-7 Mill->G15 G80 G17 G40 G20 G90 G94 G54 G49 G99 G64 G97
General Config System Hotkeys Homing/Limits	+0.0000 Scale +1.0000 Tool:0
I ooliPath Slave Axis Backlash	+0.0000 +1.0000
Fixtures ToolTable Config Plugins	+0.0000 Scale +1.0000
Spindle Pulleys Safe_Z Setup Zero	+0.0000 Radius Correct
	COTO Z To GO Machine Soft Coord's Limits
File: No File Loaded.	Load Wizards Last Wizard Regen. Display Jog Conversational Charters many Mode Follow
Edit G-Code Rewind Ctrl-W Cycle Start Recent File Alt-R> Close G-Code	Feed Rate Spindle Speed O Change OverRidden FRO % Total Spindle CW F5 SRO %
Feed Hold <spc> Load G-Code Block Delete H + H +</spc>	0.0000 🗣 🏦 Reset 🗣 🔂 Reset
Stop Line Flood Ctrl.F Auto Run From Here Dwell CV Mode Remen	Tool Zero Feedrate S-ov 0
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11.2, The basic set of mach3

Fig 13 set menu of mach3

Open the config menu, ports and pins menu, marked with red circlet

Mach3 CNC Controller
Program Run Alt-1 MDI Alt2 ToolPath Alt4 Offsets Alt5 Settings Alt6 Diagnostics Alt-7 Mill->G15 G80 G17 G40 G20 G90 G94 G54 G49 G99 G64 G97
Engine Configuration Ports & Pins
Encoder/MFC's Spindle Setup Mill Options Port Setup and Axis Selection Motor Datputs Input Signals Output Signals Port #1 Import #2 Imput Signals Output Signals Port #1 Imput Signals Output Signals Imput Signals Port #1 Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals
Feed Hold Lo See Stop Run From Here Dwell CV Mode Remember Return 6.00 Generation S-ov Image: Comparison of the second seco
G.Codes M.Codes +0.000 Units/Rev 0.00 0 0 History Clear Status: Profile: Mach3Mill // start 20 20 第 # # # 0

Fig 14 The basic frequency setting

Circlet1, where you can set the fundamental frequency, this parameter is the speed of motor rotation. After setting the place chosen circlet 2, there shown in Figure 15, the following us direction and pulse settings:

12	ToolPath Alt	4 Offsets /	Alt5 Setting:	s Alt6 Dia	ognostics Alt-7	ļļ.	Mill->(G15 G80 G17 C	340 C
			9	R Zero E X		+0.0	0000	+1.0000	[ool:
				F Zero		+0.0		Scale I	
ngir	ne Configurat	ion Ports &	Pins		- 7 - C +	,		11. 0. 4	
	Port Setup	and Axis Sel	lection	Sp) Notor	Outputs	Input	Signals	Output Signe	ls
F	Signal	Enabled	Step Pin#	Dir Pin#	Dir LowActive	Step Low	Ac Step Port	Dir Port	T
	X Axis	4	2	3	X	×	1	1	1
	Y Axis	4	4	5	2	* 1	1	1	
	Z Axis	4	6	7	×	×	1	1	
	A Axis	4	8	9	×	8	1	1	1
1	B Axis	A	16	17	X	×	1	1	イ
	C Axis	8	0	0	*	×	0		
	Spindle	2	0	0	2	×	0	0	
1									
						1.5	确定 [取消しの	Πa

Fig 15 basic setting of direction and pulse pins

When you finished the setting, click output signals then set ENABLE and Relay

			A DESCRIPTION OF A DESC				
		1	E X	+0	0.0000.	\$cale +1.0000	Tool:
			A Zero Y	+C	0.0000.0	Scale	
Engine C	onfiguration	Ports & Pins					
P	Encoder, ort Setup an	/MPG's d Axis Selection	Spi Metor	indle Setup Outputs In	put Signals	Will Options Output S	lignals
Signa	ľ	Enabled	Fort #	Pin Number	Active Low	e	
Digit	Trig	4	1	14	*		
Enabl	e1	4	1	1	*	<u> </u>	
Enab	eZ 🛛	8			-		
Enabl	e3	2	0	0	2	1.1	
Enab	e4	2	0	0	×		
Enab	e5	2 X	0	0	X		
Enabl	e6	8	0	0	X		
Outp	£#1		0	0	X		
Outp	£#2	X	0	0	N N N N N N N N N N N N N N N N N N N		
Outp	£#3	8	0	0		6	
	Fin	s 2 - 9 , 1, 14,	15, and 17 are out	tput pinu. No other	pin .	-	-
					确定	取消	应用(4)
					The second second second		

Fig 16 setting the ENABLE and Relay's pin

11.3、Adjusting limits witch of mach3

rogram Run Alt-1 MD1 Alt2 ToolPath Alt4 Offsets Alt5 Settings Alt6 maine Configuration . Forts & Pins Image: Configuration . Forts & Pins Image: Configuration . Forts & Pins Encoder/MPG's Spindle Setup Imput Signals Mill Options Port Setup and Axis Selection Motor Outputs Imput Signals Output S Signal Enabled Port # Pin Number Active Low Emulated HotKey X ++ 1 10 Imput Signals 0 Imput Signals Output S Y ++ 1 11 Imput Signals 0 Imput Signals Output S Y ++ 1 11 Imput Signals 0 Imput Signals Output S Y ++ 1 11 Imput Signals 0 Imput Signals Output S Y ++ 1 11 Imput Signals 0 Imput Signals Output S Y 0 0 Imput Signals 0 Imput Signals Imput Signals Y 0 0 Imput Signals 0 Imput Signals Imput Signals <		<u></u>				p.	erator Hel	w Wizards Oj	Config Vi
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gine Configuration Forts & Pins Encoder/MPG's Spindle Setup Mill Options Port Setup and Axis Selection Motor Outputs Input Signals Output S Signal Enabled Port # Pin Number Active Low Emulated HotKey X ++ 1 10 0 0 0 0 0 X ++ 0 0 0 0 0 0 0 0 X Home 0 <	CAL		Mode	R					
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Signal Inform Inform	5)/	latKarr .	Hatka	au Havita	r Aatimo	Pin Number	Port #	Rashlat	Simel
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X Home 0 0 0 X Home 0 0 0 Y ++ 1 11 0 Y 0 0 0 Y Home 0 0 0 Z ++ 1 12 0 Z 0 0 0 Z Home 0 0 0 Z Home 0 0 0 Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be m M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 0 M 0 <		H	0	2	×	0	0	-	x
Y ++ 1 11 0 Y 0 0 0 2 Y Home 0 0 0 2 Y Home 0 0 0 0 Z ++ 1 12 0 0 Z 0 0 0 0 Z Home 0 0 0 0 A ++ 1 13 0 0 Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be m m			0	- 2	_	0	ů.		X Home
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Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be		/ ·	0	X	4	13	1	4	A ++
	_ 应用 (4)	取消	确定 [ers m ay be	s <u>e 5 pin nu</u> m	p <u>uts. O</u> nly thes	id 15 are in	Pins 10-13 a	
Stop Stop DI Slow Jog Rate Stop Stop 90.0 % 90.0 %	ite	low Jog Rate 90.0 %	Slow	DI	elete 📕	Block De M1 Optional	Coue t Line	Set Nex	eed Hold <spc></spc>
<alt-s> Run From Here Dwell CV Mode F Button Jog</alt-s>		Button Jog	Bu	F	CV Mode	Flood Ct	n Here	Run Fror	<alt-s></alt-s>

Click *input signal*, the parameter as fig17

Fig 17

11.4、Running of G code

G is the numerical instructions control program code , mach3 for customers to test software comes with the G code, you can easily test machine.click the File, as fig 18

Mach3 CNC Controller			
Load G-Code MDI Alt2 ToolPath Alt4 Offsets Alt5 Settings	s Alt6 Diagnostics Alt-7 Mil	I->G15 G80 G17 G40 G20 G90	G94 G54 G49 G99 G64 G97
Close File(s) Ext F60.000000 G0 X0.000000 Y0.000000 Z0.200000 M3 S60.000000 G43H5 G0 X0.000000 Y0.000000 Z0.200000 G0 X1 179950 Y4.004260 Z-0.100000 G1 X1 179950 Y4.004260 Z-0.100000 G1 X1 179950 Y4.004260 Z-0.100000	R Zero A Y +0 H Zero H Zero Zero H Zero H Zero H C Zero H	.0000 Scale .0000 Scale .1.0000 +1.0000 .0000 Scale .1.0000 Scale .0000 Radius .0000 Radius .0000 Soft Limits Soft	
File: D. Mach3\GCode\roadrunner.tap	Load	Wizards Last Wizard sational	legen. Display Jog Jolpath Mode Follow
Cycle Start Edit G-Code Rewind Ctrl-W Kalt-R> Close G-Code Single BLK Alt-N Close G-Code Load G-Code Block Delete Stop Set Next Line H optional Stop Stop Line Flood Ctrl-F Quick Start Dwell CV Mode	Tool Information Tool O Change Tool O Tool Dia. +0.0000 H +0.0000 Auto Tool Zero Remember Return Elapsed 00:00:01 Jag ONOFF CH-At-J	Feed Rate OverRidden FRO % 100 FRO 6.00 Feedrate 6.00 Units/Min 0.00	Spindle Speed
G-Codes M-Codes +0.000		Units/Rev 0.00	
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🧦 start 👌 🖉 💿 🧔 🕼 🌾 🛸 并发工具 🛛 🛃 Mach3 C	201 🦉 9- 面間	🧼 38动板 🕮 TA38动 🥻	20 Macrome < 📀 13:42

Fig 18 Open G

Click the red circlet Load G-code and open the icon \square^{Mach3} and click \square^{GCode} , and choice a G code, the interface as follows as fig 19

Mach3 CNC Controller File Config Function Cfg's Yew Wizards	Operator PlugIn Control	i Help		
	和AR4 Offsets AR5 打开 查找范围 (L): Coo	Settings Alt6 Diagnostics Alt.7	MIL>C15 C80 C17 C40 C20 C 0.0000 Scate +1.0000 Scate = C ■ C ■ C ■ C ■ C ■ C ■ C ■ C ■	Tool:0
File: No File Loaded.		all.tap oross.tap estCircle.tap oadrunner.tap hapes.tap		Regen. Display Jog Toolpath Mode Follow Spindle Speed
Feed Hold Close G-Code <spc> Load G-Code Stop Set Next Line Stop Line <alt-s> Run From Here Reset s Rese G-Code G-Code</alt-s></spc>	文件4 文件4 文件3 Dwell CV t Emergen Z1 s M-Codes +(名 (g): roadrunner 类型 (g): (k, tap) 「以只读方式打开 (g) * Mode Remember Return Elapsed 00:00:00 Jog OH/OFF Ctrl-Alt-J	ゴ 田田 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	0 Spindle CW15 100 ↓ ↑ ↑ Reset RPM 0 S-ov 0 Spindle Speed 0
History Clear Status: ReCo	onfiguration Estop.	Mach3 C) 🦝 1 🦉 7 - 画图	Profile: Mach3Mill	🧆 Macrome < 🚯 13:42

Fig 19 Open the testing procedures of G

Program Rus AH-1 MDE AU2 ToolPath AH4 Offsets AH5 Sett	ings Alt6 Diagnostics Alt.7	MIL>G15 G1 G17 G	40 G20 G90 G94 G54 G49 G9
G0 Z1.0000 S333 M5 G0 Z-0.1 G0 X0.0845 Y0.0341 F5000M3 F5000G1 X0.0936 Y-0.0037 G1 X0.1031 Y-0.0416 G1 X0.1130 Y-0.0795 G1 X0.1232 Y-0.1175	R Zero +(F Zero +(H Zero +(H Zero -(ME Zero +(QRLME COTD2 To Go	0.0845 State +1.0000 (0.0340 State +1.0000 (0.1000 State +1.0000 (0.0000 State +1.0000 (0.0000 State (0.0000 State (0.0000 State (0.0000 State (0.0000 State (0.0000 State) (0.0000 State)	Tool:0 Job Display
File: C Wach3/GC ode/Cross tap Cycle Start Alt: R- Close G Code Load G Code Stap Stap Alt:S- Stap Close From Here Close C Code Code Code Code Code Code Code Code	Load Correct Tool Information Tool O Charge Dia: +0.0000 H +0.0000 Auto Tool Zere Remember Return Elacsed 00:00:01 Jog ONOFF CtriAR.J	Wizards Last Wizard reational Feed Rate FRO 9 FRO 5000.00 100 F 5000.00 100 F 5000.00 100 F 0.00 Units/Nev 0.00 Units/Rev 0.00 Decom MultiPass From Last Wizard Autor 2 Info	Regent Display Jog rollow Spindle Speed Spindle CMFS RPM 0 S 333 Increment 10 (Loop) + 0 Times on M30 (Lloop) + 0 Times on M30
History Clear Status:	Profile: Mach3Mill		



When you open the G code, you may watch on a flashing red button **RESET**, click it to stop, and click the **CYCLESTART**.

If you want to run your own G code for processing.find your location of G code, and leading it in.,

11.5 Wow to use the manual control interface of MACH3

If you want manual control, press the TAB as follows as :



图 11