Mach3 USB Motion Card (BSMCEO4U-PP) Installation Manual

V2.4





Installation requires the operator to have the relevant knowledge of how it is used! If used improperly, damage to the equipment or personal injury may result. Please follow the

instructions and warnings when using this product. If you are not sure, consult a professional for help. First time users, that are not familiar with the product, and the software features of Mach3 should get professional training.

When testing or using this product, make sure the machine's power switch is at hand, and that you can quickly turn off the power. We strongly recommend that users install the emergency stop button and make sure the button is functioning properly. Please strictly follow the instructions and warnings using this product. Any direct / indirect personal injury, our company does not assume any responsibility.

Note: This document is the culmination of researching any document that could found concerning the BSBCEO4U CNC Controller board. Some of the documents were in English and the others in Chinese. With the aid of Google translate and my skills as an Electronics Engineer, I endeavored to translate and Americanize the document text for relatively easy understanding. Pictures that appeared to be useful were borrowed from wherever I found them.

Any errors found in this document are most likely my doing. And I would appreciate notification of any errors you find, and contributions you offer.

Thanks, Bill Vancura cnc@vancura.biz March 16, 2022

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Features:

Support for 4-axis linkage, you can connect four stepper motor drives or servo drives;

Maximum step-pulse frequency is 100KHz, which is suitable for the servo or stepping motor;

General-purpose opto-couplers isolation input: for connecting limit switches, emergency stop switch, auto tool zero, home switch, and etc.

Support for connecting an electronic hand-wheel;

Has 0-10V signal output, you can use mach3 software to control the spindle motor speed.

General-purpose isolated relay drive output interface can drive four relays for controlling spindle start, forward and reverse rotation, pumps, or other devices.

On-board status LED, indicate connection status and operation.

Basic connection diagram (an Overview):





Mechanical dimensions diagram:

1. Prepare:

Installation the Mach3:

Open the CD, find mach3 software. Run the installation file :

新建文件夹				
名称	修改日期	类型	大小	
🛃 Mach3VersionR3.041	2014/1/10 13:23	应用程序	25,733 KB	

Follow the prompts to install, until the last step.

For the last step, do not to select "LoadMach3 Driver". This controller uses USB not the parallel port.

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Software license application:

Note: If you already have a full license for Mach3, Use that license. The supplied license on the CD is a DEMO license and is good for 500 Lines of G-Code only.

Get the demo license from "mach3 software folder"

Copy your registered license file "Mach1Lic.dat" to C:\Mach3 replacing the original free trial file, then reset the Compute (you must reset the computer, please don't open the software without first resetting the computer!)

Installation the software of the USB motion card:

This USB motion card does not require installation of a USB driver,Windows2000/XP/Windows7, will detect it automatically.

Connecting the USB cable to the PC and the motion card:

The first installation of motion control card, may take about 10s, when the green led lights on motion control card, indicating that the connection is successful, try the following tips when you install on your computer:



Installing the motion card plug-in.

Unzip the **USB Driver RnRMotion.dll**, and copy or drag RnRMotion.dll into your Mach3\PlugIns folder.

	名称		修改日期	类型	大小	1
	El Elach		2009/2/5 12:20	DU 17/#	1.050 KP	
	lovStick		2008/3/3 13:20	のロ文件	1,009 KB	
	Probing		2007/3/3 17:33	DII 文件	272 KB	
	usbMove		2015/3/19 17:03	DU 文件	266 KB	
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(4) usb mo (4) 编 添加 • 名称 • (上层	ve.zip - 2345好压 - 中国用, 塌① 查看(V) 工具(O) 炎 解压到 测试 删除 ▼ 診 Ⅲ ▼ ↓ usb r = <u>33</u>) ption.dll	中量最大的免费 5% 症项(Z) 帮助(d) 電力 信 move.sp\usb move 大小 265.50 KB	2007/9/21 0:57 软件 意 修复 注释 压缩后大小 类型 128.25 KB DLL 文·		304 KB 使改时间 2015-03-19 17:03:	CRC32 9E361D41
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Run Mach3 for setup.

Start the Mach3 software, a dialogue of "Motion Control Hardware PlugIn sensed!" is shown. Please select the "RnRMotionControllerECO-V2.0". You can also check" Don't ask me this again".

Mach3 CNC Controller		
File Config Function Cfg's View Wizards Opera	tor Plugin Control Help	
Program Run Alt-1 MDI Alt2 ToolPath Alt4 Offse	ts Alt5 Settings Alt6 Diagnostics Alt-7 Mill->G15 G80	0 G17 G40 G21 G90 G94 G54 G49 G99 G64 G97
	Ê F +0.0000	Scale +1.0000
	A <u>Y</u> +0.0000	+1.0000
	H Z +0.0000	+1.0000
0	E Zero +0.0000	Correct
	Your system is showing more than one control d	evice
File: No File Loaded.	Please pick the one you would like this profile to C Normal Printer port Operation.	use. Toolpath Display Jog Follow
Cycle Start <alt-r> Edit G-Code Rev Recent File Sing</alt-r>	RnRMotionControllerECO-V2.0 No Device	Spindle Speed
Close G-Code Re Feed Hold Load G-Code	 No Device No Device 	Spindle CW F5 100
Stop Line 0 Fit	To Dont ask me this again	ОК РРМ О
Run From Here Dw		S-ov 0
Reset Emergency Mo	Con/Off C Z inhibit +0.000 Elapsed):U0:00:00 Units/Min Jog ON/OFF Ctrl-AitJ Units/Rev	0.00 Spindle Speed
History Clear Status:	Profile:	Mach3Mill

2. Config for mach3:

For Mach3 X, Y, Z & A Axis configuration, use the settings as shown below: Config => Ports and Pins):

End Port Setu	coder/MPG's p and Axis Sel	lection	Motor 0	tive	Input S	ignals	Options Output Signals
Signal	Enabled	Step Pin#	Dir Pin#	D	Ac Step Lo	Step Port	Dir Port
X Axis	4	0	0	4	4	0	0
Y Axis	4	0	0	4	4	0	0
Z Axis	4	0	0	4	4	0	0
A Axis	4	0	0	4	4	0	0
tick "\"	2	0	0	2	×	0	0
	*	0	0	×	*	0	0
Spindle	4	1	1	2	×.	0	0
				Aft	er setting, ave the set	click "Apply ting results	" to

A **check** enables, an **X** disables the Port, Direction selection, and Step mode. These allow the steppers to move in the appropriate direction.

Enable only the individual axis as needed and select the step and direction modes to be compatible with your driver requirements.

Pulse output:

Connection of (step/servo) motor driver:

The RNR universal motion control card can control 4 motors, named

X axis,

Y axis,

Z axis,

A axis motors.

There are two motor control signals for each axis:

command pulse signal P (four The signals corresponding to the axis are "X P", "Y P", "Z P", "A P"), and the

Direction signal D (four-axis The corresponding signals are "X D", "Y D", "Z D", "A D").

Signal connection of motor driver

There are usually two types of interfaces: differential or single-ended. The following are the motors of these two methods. The wiring of the driver is explained.

Differential method

For the differential motor driver, the wiring with the RNR all-round motion control card is as follows: As shown below:



Single-ended

There are usually two types of motor drives with a single-ended interface. The most common one, One end of the internal signal isolation optocoupler is connected to the internal 5V power supply. This kind of drive The wiring diagram of the input interface with







Motor tuning setup as shown below: (Config => Motor Tuning)

The Mach3 Menu => Config => Homing/ Limits dialog :

			Entries ar	e in setup un	its.			
Axis	Reversed	Soft Max	Soft Min	Slow Z	Home	Home	Auto Z	Speed %
х	1	100.00	-100.00	1.00	0.0000	4	4	20
Y		100.00	-100.00	1.00	0.0000	4	4	20
z		100.00	-100.00	1.00	0.0000	4	4	20
A	X	100.00	-100.00	1.00	0.0000	4	4	20
В	X	> 00	-100.00	1.00	0.0000	X	4	20
С	8	Axis dir	ection [.]	00	0.0000	*	4	20
G28 hom X 0 Y 0 Z 0	e location coo	Depends or "X"	s on "√	"				OK

Axis direction, depends on the "Reversed"

4 Setup the input signal :

There are 4 general-purpose input channels. The channels number is from I1 to I4.

Example of input signal settings: 11 (input 1) is connected to emergency stop switch, l2 (input 2) is connected to the 4 axis limit switches, l3 (input 3) is connected to the 4 axis home switches, l4 (input 4) is connected to auto tool zero, set as shown.

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	-
X ++	4	3	2	×	×	0	
X	4	3	2	*	×	0	
X Home	4	3	3	×	×	0	
Y ++	4	3	2	X	×	0	
Y	4	3	2	×	*	0	
Y Home	4	3	3	×	×	0	
Z ++	4	3	2	×	*	0	
Z	4	3	2	×	×	0	
Z Home	4	3	3	×	20	0	
A ++	4	3	2	×	*	0	
A	4	3	2	×	*	0	
A Home	4	3	3	×	*	0	
B ++	*	0	0	×	×	0	
в	*	0	0	×	×	0	
B Home	8	0	0	×	*	0	
C ++	×	0	0	×	×	0	
c	*	0	0	×	×	0	
C Home	*	0	0	×	×	0	
Input #1	×	0	0	×	×	0	
Input #2	×	0	0	×	×	0	
Input #3	*	0	0	×	*	0	
Input #4	×	0	0	×	×	0	
Probe	4	3	4	*	×	0	
Index	×	0	0	×	*	0	
Limit Ovrd	2	0	0	×	×	0	
EStop	4	3	1	×	*	0	
	Pins 10-13 a	nd 15 are inp	outs. Only these S	5 pin numbers	may be Automated	Setup of In	

below: Note: All Digital inputs are on port 3.

Setup the Output signals:

There are 4 general-purpose (open-drain) output channels, the channels number from O1 to O4, Mach3 setup as shown below: Note: All Digital outputs are on port 3.





Note: Only **OUT** and **COM-** are used to activate most types of VFD spindle motor drives.

Slave axis setting:

Some mechanical devices use a gantry structure, which requires dual motors to drive it. The A-axis of the motion control card can be set as a slave axis, so that it can operate in sync with the designated master Axis to move the gantry.

The method of setting the A axis as a slave axis:

- 1) select the menu in Mach3 [Settings (Config)],
- 2) select [Slave Axis],
- in the [Slave Axis] Select (Slave Axis Selection)] page to set the slave axis. As shown below:



M3 code (Start Clockwise) turns output 1 ON, M4 code (Counter clockwise) turns output 2 ON, and M5 code (Spindle Stop) turns OFF both output 1 and output2.

my m Encoder/MPG's Spindle Setup Mill Options lay Control Isable Spindle Rel Vse Spindle Motor Outri Vse Spindle Fooduri Vse Spindle Fooduri COW (M4) Output 2 Vse Spindle Motor Outri Vse Spindle Motor Outri Vse Spindle Fooduri Vse Spindle Fooduri Pioed Mist Control Vse Spindle Motor Outri Vse Spindle Motor Outri Vse Spindle Spindle Cont Pioed Mist Control Vse Step/Dir Moto Ninimum PHM Vse Spindle Speed Averagi Pioed Mist Control Vse Step/Dir as weil/Delay Spin UP Seconds Special Options, Usually Off CW Delay Spin UP Seconds CW Delay Spin UP Laser Mode. fr Dutput Signal #'s CW Delay Spin DOWN Seconds Torch Volts Contu Max ADC Count 16380 CW Delay Spin DOWN Seconds Torch Volts Contu	Remove	rt Setup and Axis Selection	Motor Outputs	Inpu	it Signals	Output Signal:
		Encoder/MPG's ay Control Disable Spindle Rel Dockwise Output 1 Output Signal #'s od Mist Control Disable Flood/Mist repelay t Output 3 0 od Output 4 0 Output Signal #'s Bus Spindle - Use Step/Dir as Enabled Reg 64 64 - Max ADC Count 16380	Spindle Set	up Special Fu Use Spin Closed 1 P [0.25 Spindle Seconds Seconds Seconds Seconds Seconds Seconds Seconds Seconds Seconds Seconds	nctions ndle Feedback i Loop Spindle Co I I D Speed Averagi Special Opti HotWire H Laser Mod Torch Vol	Mill Options in Sync M ont 0.3 ons, Usually Off leat for J le. fr ts Conts

M7 code controls output 3 to ON, M8 code control output port 4 to ON, M9 turns both output 1 and output2 OFF.

Spindle speed control (0-10V) Setup:

There is 0-10v signal output on the control card (AVI), Can be used to control the spindle speed of a connected Inverter.

The maximum spindle speed is defined in the pulley setup:

(For example, 24000 RPM). As shown below: The Mach3 Menu => Config => Spindle pulleys:

Completion of the setting, there are two ways to control the output value of 0 \sim 10V.

Using the S command. Such as S20000 (the speed to 20000RPM)

Using the Mach3 interface control (input Spindle Speed, and adjust Percentage SRO's). Figure: 2.6

l obi	snow
Spir	ndle CW F5
	Reset)
	\smile
RPM	0
S-ov 📃	10000
Spindle Sp	peed
	10000

Setup Spindle PWM parameters: as shown in the red box

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Port Setup and Axis Selection Encoder/MPG's	Motor Outputs Spindle Setu	Input Signals Output Signals P Mill Options
Relay Control Disable Spindle Rel Clockwise Output 1 CCW (M4) Output 2 Output Signal #'s Flood Mist Control	Motor Control Vise Spindle Motor Outj PMM Control Step/Dir Moto PWMBase Freq. 1000	Special Functions Vse Spindle Feedback in Sync M Closed Loop Spindle Cont P 0.25 I I D 0.3 V Spindle Speed Averagi
Disable Flood/Mist rep _{elay} Mist Output 3 0 Flood Output 4 0 Output Signal #'s ModBus Spindle - Use Step/Dir as Flaabled Reg 64 64 - Max ADC Count 16380	Minimum PWM 0 % General Parameters CW Delay Spin UP 1 CCW Delay Spin UP 1 s well Delay Spin DOWN 1 CCW Delay Spin DOWN 1 Immediate Relay off 1	Seconds Seconds Seconds Seconds Seconds Seconds Seconds Seconds Seconds

Enable spindle output as shown below:

Encoder/MPG's Port Setup and Axis Selection			Spindle Setup Mill Opti Motor Outputs Input Signals Out)ptions Output Signals	
Signal	Enabled	Step Pin#	Dir Pin#	Dir LowAc	Step Low	Step Port	Dir Port
X Axis	4	0	0	4	4	0	0
Y Axis	4	0	0	4	4	0	0
Z Axis	4	0	0	4	4	0	0
A Axis	4	0	0	4	4	0	0
B Axis	*	0	0	X	X	0	0
C Axis	*	0	0	X	×	Q	0
Spindle	4	1	1	X	X	0	0

2.6 Mach3 MPG Setup:

Note: The electronic hand-wheel is supplied 5V voltage. The output must not exceed 5V or damage to the board may result. Refer to the following wiring diagram:

The RNR universal motion control card provides a handwheel interface to connect the handwheel provided by the user. It is the 10 pin connector.



Mach3 MPG Setup:

The Mach3 Menu => Config =>Ports and Pins=>Encoder/MPG 'S

Port Setup and Axis Selection Encoder/MPG's			Motor Outputs Spindle Setup		Input Signals ap		Output Signal Will Options	
Signal	Enabled	A -Port #	A -Pin #	B -Port #	B -Pin #	Counts/	Velocity	
Encoder1	*	0	0	0	0	1.000000	100.0000	
Encoder2	×	0	0	0	0	1.000000	100.0000	
Encoder3	×	0	0	0	0	1.000000	100.0000	
Encoder4	X	0	0	0	0	1.000000	100.0000	
MPG #1	4	0	0	0	0	1.000000	100.0000	
MPG #2	X	0	0	0	0	1.000000	100.0000	
MPG #3		0	0	8				
Enable with				Afte sav	After setting, click "Apply" to save the setting results			

Press the "Tab" key on your keyboard, to bring up the "MPG MODE" in mach3:



Click the "Jog mode" and select MPGmode, You can use the electronic hand-wheel to control the stepper motors manually.



The inputs are all rated for a maximum of 5Volts. 3.3 Volts is preferred. The interface is as follows

- 1) 5 Volt source to run hand-wheel
- 2) Ground
- 3) X select (Pull low)
- 4) Y select (Pull low)
- 5) Encoder A (Zero phase)
- 6) Encoder B (90 degree phase)
- 7) Z Select (Pull low)
- 8) A select (Pull low)
- 9) Multiply Speed by 100
- 10) Multiply Speed by 10

These pins can be used as general purpose inputs if a hand-wheel is not installed.

The ten pin header is on Port3 and the pins are mapped as follows:

Header Pin / Input number

- 3) IN 5
- 4) IN6
- 5) IN7
- 6) IN8
- 7) IN9
- 8) IN10
- 9) IN11
- 10)IN12

Note: The input terminals IN5 through IN12 corresponding to the hand-wheel interface cannot be used for limit switches, homing, tool settings, or other critical functions. They can only be used as a general switch input terminals (usually used as a connection to control panel). Consider X axis input as an example. An additional input can be connected to the X axis select input IN5. The following schematic diagram shows the correct method:



Example Mach3 settings for Input on Hand-Wheel pins:

Handwheel X select input is on Port3 pin 5 and in the example, and is associated to input #1.



On the Diagnostic Screen, the indicator marked Input #1 will illuminate whenever the switch on Port3-IN5 is closed.

Port 1 Pins current State										
Pulse										
Input Signals current State external										
EJogY+	EJogZ+	EJogA+								
EJogY-	EJogZ-	EJogA-								
M1++Lim	M1Limit	M1Home								
M2 ++Lin	M2Limit	M2Home								
M3++Lim	M3Limit	M3Home								
M4++Lim	M4Limit	M4Home								
M5++Lim	M5Limit	M5Home								
M6++Lim	M6Limit	M6Home								
Torch On	Torch UP	Torch Dn								
y										
Output Signals current State										
Enable 2	Enable 3	Enable 4								
Enable 6										
Output 2	Output 3	Output 4								
Output 6	Digitize									
	current Star	current State Pulse Fr B current State EXT EJogY+ EJogZ+ EJogY- EJogZ- M1++Lim M1Limit M2++Lir M2Limit M3++Lim M3Limit M4++Lim M4Limit M5++Lim M5Limit M6++Lim M6Limit M6++Lim M6Limit M6++Lim M6Limit M6++Lim M6Limit M6+Lim M6Limit M8 M6Limit M8 M6Limit M8 M6Limit M8 M6Limit M8 M6Limit M8 M8 M8 M8 <td< td=""></td<>								