The Manual of Mach3, EMC2 Interface Board CM106

1. Outline

This is a Mach3, EMC2 Interface Board. It is linked with Parallel Port attached in PC It was made that each signal of parallel port to be connected motor driver.

Each input/output port in breakout board is connected with the driver or can be joined limit & home sensor and it offers Relay contact signal for speed control of spindle & exterior device.



Unit mm



2. Detailed function

• Switch or Sensor Input Port.

24V P1.15 P2.15 GND
P1.15 P2.15 GND
P2.15 GND
GND
24V
P1.10
P1.11
P1.12
P1.13
GND
24V
P2.10
P2.11
P2.12
°2.13
GND
2 ⁴ P P P P P P P P P C I

There are total 10 connectors (5 for port1 / 5 for port2) as above picture, It has each 4 or 6 pins. 24V Pin here provides power of exterior sensor and can be joined to the sensor to be input by +24V

If the sensor is the contact by type of switch, you can do not to use 24V Pin.

Input signal here can connect "High" "Low" & "Switch Contact" The operation for each inputting can modify setting in port & pins in menu after checking it in Diagnostics(Alt-7)

It can link with emergency stop button to halt the system in this port when the emergency and can connect other input button too.



• Speed Control of spindle & Relay Port for controlling exterior device.

This port outputs $0\sim5V$ or $0\sim10V$ DC voltage for speed control of spindle. In Mach3, it is outputted after the PWM signal is converted to DC voltage when speed control of spindle by PWM mode.

For DC voltage can change speed of motor by connecting to servo driver or inverter. You use No. 1 Pin in Port2



The output voltage is selected $0 \sim 5V$ or $0 \sim 10V$ range.

Relay Port is comprised of COM & NO.

"NO" is normal open so, it is open usually and if the relay works,

it means that it is connected.

No.1, 14, 16, 17 in Port 1 and No.14, 16, 17 in Port 2 are allocated.

To extend exterior output, you should need an output control code.

For an example, the 14 in Relay port P2 above is allotted by Pin No.14 in port2 and it is set Output #3.

This output can use after assigning to M3, M7, or M8 but I show you another example to use making other M Code.

M code is saved in Mach3-macros-Mach3Mill.

Open an note pad to create a new M code

ActivateSignal(output3) Put down above and save as M12.m1s

DeActivateSignal(output3)

Put down above again and save as M13.m1s

And if you spell M12 in MDI screen, the relay3 should be "On" If you spell M13, you can check it out that it should be "Off"

MDI input window is in MDI(Alt-2)



• Port connecting to driver



This is the port to join the driver in each axis and is made by Pins above. This port can link with revolving axis as well as moving straightly in each axis and can do also speed control for by connecting to motor driver for spindle. For linking with driver, It applies +/- line driver and

is the output 1pulse as DIR / PLS

It is allotted 2~9 in port1 and 2~5 in port2

EX) Samsung servo



"DIR" & "SIGN" as direction signal are same.

"PLS", "PULS", "CLOCK", & "CLK" as pulse signal are same.

• Open Collector / Output Port

0	VOC
0	P2.6
0	P2.7
0	P2.8
0	P2.9
ම	GND
	00000

It is assigned 6,7,8,9 in Port2 and can join motor driver & can link with the relay for exterior control too.

Power VOC using here can select below pins.

If you connect with motor driver, use 5V and if the relay, use 24V



Power Input Port



It is the port accepting +24V power for Board-driven.

If you don't use Power for driver in exterior, it has about 80mA current consumption.

3. Mach3 / Run Screen

Program Run Alts MD ANZ ToolPath Alti Others Altis Numerica Altis MD -C15 G1 G1 G4 G0 G21 G9D G44 G54 G49 G99 G64 G97 Image: State of the	🖗 Mach3 CNC Licensed To: JI Robotics File Config Function Cfg's View Wizards Operator Plugin Control Help	_6>
File: No File Loaded Rewind Cut!W File: Start Rewind Cut!W Gene G.Code No platent Start Block Delete Dia: +0.00000 Hold OF Rate Dia: +0.00000 Frood Califier Dia: +0.00000 JOG Rate Dia: 00000 JOG Rate Dia: 00000 Jog OKOFF Cut.Alk Dia: 00000 Jog OkoFF Cut.Alk <th>Program Run Alt-1 MDI Alt2 ToolPath Alt4 Offsets Alt5 Settings Alt6 Diagnostics Alt-7</th> <th>MilL>G15 G1 G17 G40 G21 G90 G94 G54 G49 G99 G64 G97</th>	Program Run Alt-1 MDI Alt2 ToolPath Alt4 Offsets Alt5 Settings Alt6 Diagnostics Alt-7	MilL>G15 G1 G17 G40 G21 G90 G94 G54 G49 G99 G64 G97
File: No File Loaded. Cycle Start Edit G-Code Rewind Ctrl.W Single BLK Alt.N Tool Information Cocce Start Recent File Single BLK Alt.N Cocce Start Reverse Run On OF Doad G-Code Reverse Run On OF Block Delete M1 Optional Step Tool Concern Stop Fieod Ctrl.F Num From Here Outor Tool Curl for Concern Reverse Run On OF JOG Rate 50.0 Outor Tool Curl for Curl for Tool Curl for	R Zero + A L Zero -2 H Zero -2 H Zero -2 H Zero -2 CFLNE COTC TO C	15.0000 scale +1.0000 scale +1.0000 +1.0000 +0.0000 scale +1.0000 scale +0.0000 scale +0.0000 scale Correct scale Go Machine Soft Limits
Edit G.Code Rewind Ctrl.W Recent File Single BLK Alt.N Close G.Code Reverse Run Tool Information Feed Hold Set Next Line M1 Optional Stop Stop Set Next Line M1 Optional Stop Line: O On/Off JOG Rate 50.0 On/Off JOG Rate 50.0 On/Off Jog ON/OFF Cut.Alt.J Class Revent File Spindle Speed M:Codes M:Codes +0.0000 History Clear Status: Initialization Macro Called on reset. Profile: Mach3Mill	File: No File Loaded.	Load Wizards Last Wizard Regen. Display Jog Conversational Conversion
	Edit G-Code Rewind Cttl-W Cycle Start Recent File Close G-Code Single BLK Alt.N Code N Gecent File Block Delte Load G-Code N Stop Set Next Line Line: O Run From Here Dwell CV/Mode H History Clear Status: Initialization Macro Called on reset.	Feed Rate Spindle Speed OverRidden FRO % 100 Fred Reset FRO 2000.00 Feedrate 2000.00 Feedrate 2000.00 Spindle Speed Units/Rev 0.00 Profile: Mach3Mill

4. Mach3, Set-Up

"Set Value" made here, is just an example.

It can possible to set it variously and can do detailed modification.

Menu / Config \rightarrow Select Native Units \rightarrow Choose " MM's "



Menu / Config \rightarrow Set up in Port and Pins as below.



Confirm Pin No. & Port No. exactly.

**** Make sure to press "Apply" button before going on to each tap. If it is not, it isn't saved. ****

signal	Enabled	Step Pin#	Dir Pin#	Dir LowActive	Step Low A	Step Port	Dir Port
< Axis	-	2	3	4	4	1	1
Y Axis	4	4	5	×	4	1	1
Z Axis	4	6	7	20	4	1	1
A Axis	4	8	9	X	4	1	1
3 Axis	4	2	3	X	4	2	2
C Axis	4	4	5	X	4	2	2
Spindle	4	1	0	*	X	2	0
pindle		- PC	U			2	U

If you use A,B,C axis, Set up them and if you don't want to, Remove "Enabled" For both "Dir Low Active" and "Step Low Active"

You should set after judging the direction well in each axis in CNC in view of surroundings your driver is working.

And Voltage Output Pin for speed control of spindle is set No.17

This process can be differ depending on users and it has to be followed some efforts experiencing a few trial & error experiments.



Set up X Home, Y Home & Z Home.

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	
A ++	X	1	13	4	X	0	
Å	66	1.00	13	-	66	0	
A Home	4	1	13	4	X	0	
B ++	X	2	10	4	X	0	
B	X	2	10	4	X	0	
B Home	4	2	10	4	X	0	
C ++	X	2	11	4	X	0	
с	X	2	11	4	X	0	
C Home	4	2	11	4	X	0	
Input #1	N N		U	8	N.	U	-
	1 1 1 1 1 1 1 1 1 1			l bee	ha	0	
	Pins 10-13 an	d 15 are inputs, (Only these 5 pin nur	nbers may be us	ed on this		
					Autoro	stad Catus of las	uuto
					Automa	ated Setup of Inp	outs

If use A,B,C axis, set it and if it is not, remove "Enable"

"Set Value" can be much different because users could do "Home" or 'Limit"

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	
nput #2	X	1	0	X	X	0	
nput #3	X	1	0	X	X	0	
Innut #4	*	1	n	22	37	0	
Probe	4	2	12	4	X	0	
ndex	X	1	0	X	X	0	
Limit Ovrd	X	1	0	X	X	0	
EStop	4	1	15	4	X	0	
THC On	X	1	0	X	X	0	
гнс бр	65	l.	Ū	8	a l	Ū	
THC Down	X	1	0	X	X	0	T
OF14 T 14	Pins 10-13 an	d 15 are inputs, (Only these 5 pin nur	nbers may be us	sed on this Autom	ated Setup of Inp	iuts

Set up "EStop Pin" as above.

In "ActiveLow" case here, should apply after checking out whether your emergency stop button is "Active Low" or "Active High"

For probe, it is allotted for Tool Zero Sensor in Z axis.

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	
THC Down	X	1	0	X	X	0	
DEM Trig #1	4	2	13	4	X	0	
DEM Trig #2	4	2	15	4	X	0	
DEM Trig #3	X	1	0	X	X	0	
DEM Trig #4	X	1	0	X	X	0	
DEM Trig #5	*	1	0	8	X	0	
DEM Trig #6	X	0	0	8	X	0	
DEM Trig #7	X	0	0	8	X	0	
DEM Trig #8	X	0	0	8	X	0	
DEM Trig #9	8	0	0	8	X	0	
		•	and the same of			0	
	Pins 10-13 an	d 15 are inputs, (Only these 5 pin nur	nbers may be us	sed on this Autom:	ated Setup of Inp	outs

For OEM Trigger #1 & #2 are assigned for Cycle Start and Feed Hold button.

The 1000 inputted in OEM Trigger #1 is Cycle Start OEM Code.

1001 of #2 is OEM Code in Feed Hold.

For more detailed thing, hope to refer to MACH3 manual.

	External Buttons - OEM	Codes
ScanCode ScanCode X++ 39 X Y++ 38 Y Z++ 33 Z A/U++ 80 A/U B/V++ 999 B/V Q99 C/W++ 999	Trigger DEM Code 1 1000 2 1001 3 -1 4 -1 5 -1 6 -1 7 -1	8 -1 9 -1 10 -1 11 -1 12 -1 13 -1 14 -1 15 -1
Jostem Hotkeys ScanCode DRO Select 999 Code List MDI Select 999 Load G-Code 999	ScanCode	

Signal	Enabled	Port #	Pin Number	Active Low	A 1	
Digit Trig	X	1	0	X		
Enable1	X	1	1	2		
Enable2	4	2	6	2		
Enable3	4	2	7	*		
Enable4	4	2	8	*		
Enable5	4	2	9	X		
Enable6	X	1	0	*		
Output #1	4	1	14	X		
Output #2	4	1	1	X		
Output #3	4	1	17	X		
Output #4	4	1	16	X	-	
ne Configuration	n Ports & Pins		Outsut Sizzala J.c.		Cancel	Apply
ne Configuration Setup and Axis S	n Ports & Pins Selection Motor Ou	Itputs Input Signals	Output Signals Encoder,	OK	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal	n Ports & Pins Selection Motor OL Enabled	utputs Input Signals	Output Signals Encoder, Pin Number	OK	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal Enable3	n Ports & Pins Selection Motor Ou Enabled	utputs Input Signals Port # 2	Output Signals Encoder, Pin Number 7	OK	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal Enable3 Enable4	n Ports & Pins Selection Motor Ou Enabled	utputs Input Signals Port # 2 2	Output Signals Encoder, Pin Number 7 8	OK	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal Enable3 Enable4 Enable5	n Ports & Pins Selection Motor Ou Enabled 4 4	utputs Input Signals Port # 2 2 2 2 -	Output Signals Encoder, Pin Number 7 8 9	/MPG's Spindle Setu Active Low	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal Enable3 Enable4 Enable5 Enable6	n Ports & Pins Selection Motor OL Enabled 4 4 4 4	utputs Input Signals Port # 2 2 2 2 0	Output Signals Encoder, Pin Number 7 8 9 0	/MPG's Spindle Setu Active Low	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal Enable3 Enable4 Enable5 Enable6 Output #1	n Ports & Pins Selection Motor OL Enabled 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Itputs Input Signals Port # 2 2 2 2 0 1	Output Signals Encoder, Pin Number 7 8 9 0 14	/MPG's Spindle Setu Active Low	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal Enable3 Enable4 Enable5 Enable6 Output #1 Output #2	n Ports & Pins Selection Motor OL Enabled 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Itputs Input Signals Port # 2 2 2 2 0 1 1	Output Signals Encoder, Pin Number 7 8 9 0 14 16	/MPG's Spindle Setu Active Low	Cancel	Apply ions
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ne Configuration t Setup and Axis S Signal Enable3 Enable4 Enable5 Enable6 Output #1 Output #2 Output #3 Output #4	n Ports & Pins Selection Motor OL Enabled 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Itputs Input Signals Port # 2 2 2 2 0 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2	Output Signals Encoder, Pin Number 7 8 9 0 14 16 14 16 14 16	/MPG's Spindle Setu Active Low	Cancel	Apply ions
ne Configuration t Setup and Axis S Signal Enable3 Enable4 Enable5 Enable6 Output #1 Output #2 Output #3 Output #4 Output #5	n Ports & Pins Selection Motor OL Enabled 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Itputs Input Signals Port # 2 2 2 2 0 1 1 1 2 2 2 2 2 1 1 1 2 2 2 2	Output Signals Encoder, Pin Number 7 8 9 0 14 16 14 16 14 16 17 2	/MPG's Spindle Setu Active Low	Cancel	Apply
ne Configuration t Setup and Axis S Signal Enable3 Enable5 Enable6 Output #1 Output #2 Output #3 Output #4 Output #5 Output #6	n Ports & Pins Selection Motor Ou Enabled 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	utputs Input Signals Port # 2 2 2 0 1 1 1 2 2 2 0 1 1 1 2 2 1 1 1 2 1 1 2 1 1 1 2 1 1 1 1 2 1	Output Signals Encoder, Pin Number 7 8 9 0 14 16 14 16 14 16 17 0 1	/MPG's Spindle Setu Active Low	Cancel	Apply
te Configuration t Setup and Axis S Signal Enable3 Enable5 Enable6 Output #1 Output #2 Output #3 Output #4 Output #5 Output #6 Charge Pump	n Ports & Pins Selection Motor Ou Enabled 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	utputs Input Signals Port # 2 2 2 2 0 1 1 2 2 2 2 1 1 1 2 2 1 1 1 2 2 1 1 1 2 2 2 2 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	Output Signals Encoder, Pin Number 7 8 9 0 14 16 14 16 17 0 1	/MPG's Spindle Setu Active Low	Cancel	Apply

Enable 2~5 is the pin assigned by Open Collector Output.

For Output #1, #2, #3, #4, & #5Pin are relay output port and set as above.

In ActiveLow, should apply after thinking according to exterior device connected your CNC.

If you want to use spindle & pump for cutting oil, remove "checking" above picture. If it is checked, it means that it does not use.

To set speed control of spindle is as follows..

Relay Control Disable Spindle Relays Clockwise Output # 1 CCW (M4) Output # 1 Output Signal #'s 1-6 Flood Mist Control Disable Flood/Mist relays Delay Mist Output # 3 0 Flood M8 Output # 2 0 Output Signal #'s 1-6 ModBus Spindle - Use Step/Dir as well Enabled Reg 64 64 - 127	Motor Control Use Spindle Motor Output PWM Control Step/Dir Motor PWMBase Freq. 100 Minimum General Parameters CW Delay Spin UP CCW Delay Spin UP CW Delay Spin UP CW Delay Spin DOWN CCW Delay Spin DOWN	Special Fund Use Spin Closed L P 0,25 Spindle S Seconds Seconds Seconds Seconds	ctions dle Feedback in Sync Mode oop Spindle Control I I D 0.3 peed Averaging Special Options, Usually Off HotWire Heat for Jog Laser Mode, freq Torch Volts Control Torch Auto Off	
Max ADC Count 16380	Immediate Relay off befo	re delay		

5. Motor Tuning

Menu / Config → choose "Motor Tuning"
Select "X axis" and set to be fit user's equipment.
For Velocity or Acceleration, it can alter adequately.

***** Make sure to press "Save Axis Setting" after inputting.

Motor Tuning and Setup	×
X - AXIS MOTOR MOVEMENT PROFILE	city
⊕ 2764.8 = 2457.6 ≥ 2150.4	Y Axis
⊕ 1843.2 · · · · · · · · · · · · · · · · · · ·	Z Axis
27 921.6 0 614.4 ≥ 307.2	B Axis
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5	C Axis
Accel -	
Velocicy Acceleration Step Pulse Dir Pulse Steps per In's or mm's per min. in's or mm's/sec/sec G's 1 - 5 us 0 - 5	SAVE AXIS SETTINGS
160 1999.8 500 0.050988 1 1 1	Cancel OK

Motor Tuning a	nd Setup				×
3072	Y - AXIS MOTO	OR MOVEMENT	PROFILE	Velocity	Axis Selection
e 2764.8 provident 2457.6 U 2150.4 d. 1843.2 Se 1536					Z Axis
E 1228.8 Áti 921.6 	/				A Axis B Axis
Accel -	0.05 0.1 0.15	0.2 0.25 0.3 Time in Seconds	0.35 0.4 0.45	0.5	C Axis Spindle
Steps per	Velocity In's or mm's per min.	Acceleration in's or mm's/sec/sec	Step Pulse D G's 1 - 5 us	ir Pulse SA 0 - 5	VE AXIS SETTINGS
160	1999.8	500 0.0	50988	1 Can	cel OK











Menu / Config \rightarrow Choose "Motor Homing" and set as below.

For more detailed explanation as for each functions, refer to mach3 program manual.

	1		Entries	are in setup u	nits.	1.22	1	1
Axis	s Reversed	Soft Max	Soft Min	Slow Z	Home	Home	Auto Z	Speed %
Х	*	100,00	-100,00	1,00	0,0000	X	4	20
Y	*	100,00	-100,00	1,00	0,0000	X	4	20
Z	*	100,00	-100,00	1,00	0,0000	8	4	20
A	*	100,00	-100,00	1,00	0,0000	X	4	20
В	*	100,00	-100,00	1,00	0,0000	*	4	20
С	8	100,00	-100,00	1,00	0,0000	*	4	20

6. How to adjust spindle speed

Set up as follows after you finish setting above. Config \rightarrow Click "Spindle Pulleys"

	Fixtures	
4	ToolTable,,,,,	
•	Config Plugins	
	Spindle Pivleys,,	
	Safe_Z Settep.,	

Input "Max Speed" of spindle as below. If Max Speed is 20,000RPM , input 20000

Ratio
<u> </u>
ОК

If so, can do speed control of spindle in mach program.



If it is S1000 on G code, It means the spindle RPM is 1000 and if it is S5000 It means the RPM is 5000

7. Further Information

Allotted pin for Home & Limit Sensor is available in many ways.

You can connect one pin together to Home & Limit sensor in each axis in CNC and the rest of pins can be allocated by switch input too setting up Probe Sensor or OEM Trigger.

For more detailed, refer to MACH3 manual.

** If you have any questions or concerns, feel free to contact us anytime via facebook below.



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