

CONFIGURATION ESS + C11G + MACH4

Configure/Plugins/ESS XXX
Motors

Motor	Mode	Reported Feed Rate Smoothing (Seconds)
Motor 0	Step/Dir	0.100
Motor 1	Step/Dir	0.100
Motor 2	Step/Dir	0.100
Motor 3	Step/Dir	0.100
Motor 4	Step/Dir	0.100
Motor 5	Step/Dir	0.100

☐ Enable AntiClunk Mode for Servo Motors

1) In the 'Output Signals' Tab, assign Aliases or Pins for each Motor used.

2) In Mach Config -> Motors, set up the parameters for each Motor used.

3) In Mach Config -> Axis Mapping, Enable your axes and assign Motors as Masters and/or slaves.

OK Cancel

Spindle

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) Spindle Settings:

Spindle Type: **PWM** Frequency, Hz: **300** ☐ Duty Cycle Zero at Min RPM

RPM: **Spindle Index Input** Averaging **1.00** Sec ☒ Report Spindle RPM

Encoder Prescaler **1** * Effective PPR **1** = **1** Total Encoder Pulses/Rev

2) Spindle PID Settings (Only for PWM Drive Mode)

☐ Use PID ☐ Use PID For Threading ☐ SS_PID_LOG.csv

Kp **0.0000100** Ki **0.0000000** Kd **0.0000000**

☐ Use PID Ceiling **120.00** % of commanded RPM ☐ Use PID Floor **95.00** %

1) Choose a Spindle Type of:

- * Relay or none - The spindle/router is controlled by relays or there is none
- * PWM - Pulse Width Modulation Spindle Speed control
- * SS Motor - The ESS will directly control Motor #5 (Step/Dir, CW/CCW or Quadrature)
- * OB - Out of Band, use Motor #5 (Step/Dir, CW/CCW or Quadrature)

The 'Output Signals' tab has dedicated Spindle pins for your system's relays:

- * Spindle Dir - Retains the current spindle direction even when the spindle stops. The state changes only with a direction change (prevents direction glitching)
- * Spindle On - Active when the spindle is active
- * Spindle Fwd - Only active when the spindle is running forwards/CW
- * Spindle Rev - Only active when the spindle is running in reverse/CCW

2) Spindle PID will adjust the PWM output, to try and hold the commanded RPM.

- * Kp is the constant proportional gain that corrects for the error amount.
- * Ki corrects for the error amount summed over time.
- * Kd corrects based upon the rate of change of the error amount.
- * Recommended initial values are Kp = 0.0000100 Ki = 0.0000000 Kd = 0.0000000
- * Index Pulses per Rev is '1' unless a slotted disk or encoder channel is used.

3) In the 'Output Signals' Tab, assign Aliases or Pins as needed for:

- * Spindle Motor PWM (Required)
- * Spindle Motor Dir (Optional)
- * Spindle On (Optional)
- * Spindle Fwd (Optional)
- * Spindle Rev (Optional)

OK Cancel

Pins Config

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) Set the pins Active High (Red Arrow Up) or Active Low (Green Arrow Down).

2) Give the Pins you are using an Alias: (P#=#) DESCRIPTION (This is the (Port#-Pin#) for the pin and a description of it). This makes it MUCH EASIER to identify which pins do what in the Input and Output signal tabs.

3) Assign Noise Filtering, in us, for each input pin, if needed (see the 'Info' tab for more details).

4) A Feed Hold or Stop (Stop, EStop, Disabled or Limit) event can set the Output state to 'Force ON', 'Force OFF', or 'No Change'. 'No Change' means that the output is controlled by Mach4. With 'Force ON' and 'Force OFF' the ESS will force that desired state.

5) Pins are always enabled, only Signals can be enabled or disabled. Connect pins as needed on the Input and Output signal tabs.

Port 2 Pins 2-9 Direction Port 3 Pins 2-9 Direction

☒ Inputs ☐ Outputs ☒ Inputs ☐ Outputs

	DIR	Active High/Low	Alias or Name	Noise Filtering	Stop State	Feed Hold State
Port1-Pin1	Out	↑	Coolant	-----	No Change	No Change
Port1-Pin2	Out	↑	Step X	-----	No Change	No Change
Port1-Pin3	Out	↑	Dir X	-----	No Change	No Change
Port1-Pin4	Out	↑	Step Y	-----	No Change	No Change
Port1-Pin5	Out	↑	Dir Y	-----	No Change	No Change
Port1-Pin6	Out	↑	Step Z	-----	No Change	No Change
Port1-Pin7	Out	↑	Dir Z	-----	No Change	No Change
Port1-Pin8	Out	↑	Step A	-----	No Change	No Change
Port1-Pin9	Out	↑	Dir A	-----	No Change	No Change
Port1-Pin10	In	↓	E-Stop	0.00	-----	-----
Port1-Pin11	In	↓	Home X	0.00	-----	-----
Port1-Pin12	In	↓	Home Y	0.00	-----	-----
Port1-Pin13	In	↓	Home Z	0.00	-----	-----
Port1-Pin14	Out	↑	PWM Spindle	-----	No Change	No Change
Port1-Pin15	In	↑	Probe	0.00	-----	-----
Port1-Pin16	Out	↑	Rev Spindle	-----	No Change	No Change
Port1-Pin17	Out	↑	SCHP	-----	No Change	No Change

OK Cancel

Input Signal

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) When you enable an input signal here, it will automatically be enabled and mapped into Mach.
 2) An Input Pin (or Alias) may be assigned to multiple Input Signals.

	Enable	Mach Mapping	Mapped Pin
E-Stop			
Motor 0 Home		ESS	Home X
Motor 1 Home		ESS	Home Y
Motor 2 Home		ESS	Home Z
Motor 3 Home			
Motor 4 Home			

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) When you enable an input signal here, it will automatically be enabled and mapped into Mach.
 2) An Input Pin (or Alias) may be assigned to multiple Input Signals.

	Enable	Mach Mapping	Mapped Pin
Encoder 5 Phase B		ESS-only	
Encoder Aux 0 Phase A (MPG or other)		ESS-only	
Encoder Aux 0 Phase B (MPG or other)		ESS-only	
Encoder Aux 1 Phase A (MPG or other)		ESS-only	
Encoder Aux 1 Phase B (MPG or other)		ESS-only	
Encoder Aux 2 Phase A (MPG or other)		ESS-only	
Encoder Aux 2 Phase B (MPG or other)		ESS-only	
Encoder Spindle Phase A		ESS-only	
Encoder Spindle Phase B		ESS-only	
Spindle Index (RPM Input)			
Spindle At Speed			
Spindle At Zero			
Probe (G31 or G31.0)		ESS	Probe
Probe 1 (G31.1)			
Probe 2 (G31.2)			
Probe 3 (G31.3)			
THC On (Arc Okay)			
THC Up			
THC Down			
Inhibit Jog			
Inhibit Motion			

OK Cancel

Output Signal

Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) An Output Pin (or Alias) may only be assigned to a single Output Signal.
 2) An Output Signal may have up to 3 Output Pins (or Aliases) assigned to it:
 * When enabled in this window, only 'Mapped Pin1' will be enabled and mapped into Mach.
 * 'Mapped Pin2' and 'Mapped Pin3' will still receive the same Output Signal as 'Mapped Pin1', but will not be referenced in Mach.

	Enable	Mach Mapping	Pin1 Mapping	Pin2 Mapping	Pin3 Mapping
Motor 0 Step		ESS-only	Step X		
Motor 0 Dir		ESS-only	Dir X		
Motor 1 Step		ESS-only	Step Y		
Motor 1 Dir		ESS-only	Dir Y		
Motor 2 Step		ESS-only	Step Z		
Motor 2 Dir		ESS-only	Dir Z		
Motor 3 Step		ESS-only	Step A		
Motor 3 Dir		ESS-only	Dir A		

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 * When enabled in this window, only 'Mapped Pin1' will be enabled and mapped into Mach.
 * 'Mapped Pin2' and 'Mapped Pin3' will still receive the same Output Signal as 'Mapped Pin1', but will not be referenced in Mach.

	Enable	Mach Mapping	Pin1 Mapping	Pin2 Mapping	Pin3 Mapping
Laser PWM/XY Vel PWM		ESS-only			
Spindle Motor PWM		ESS-only	PWM Spindle		
Spindle Motor Dir		ESS-only			
Spindle On		ESS			
Spindle Fwd		ESS			
Spindle Rev		ESS	Rev Spindle		
Alarm		ESS			
Charge Pump		ESS-only	SCHP		
Coolant, Flood (M08, M09)		ESS	Coolant		
Coolant, Mist (M07, M09)		ESS			
Current Hi/Low		ESS			
Cut Recovery		ESS			
Digitize Trigger		ESS			
Dist To Go		ESS			
Dwell		ESS			
Feed Hold		ESS			
Feed Hold Disabled		ESS			
Feed Rate Override		ESS			
Feed Rate Override Disabled		ESS			

OK Cancel

Homing

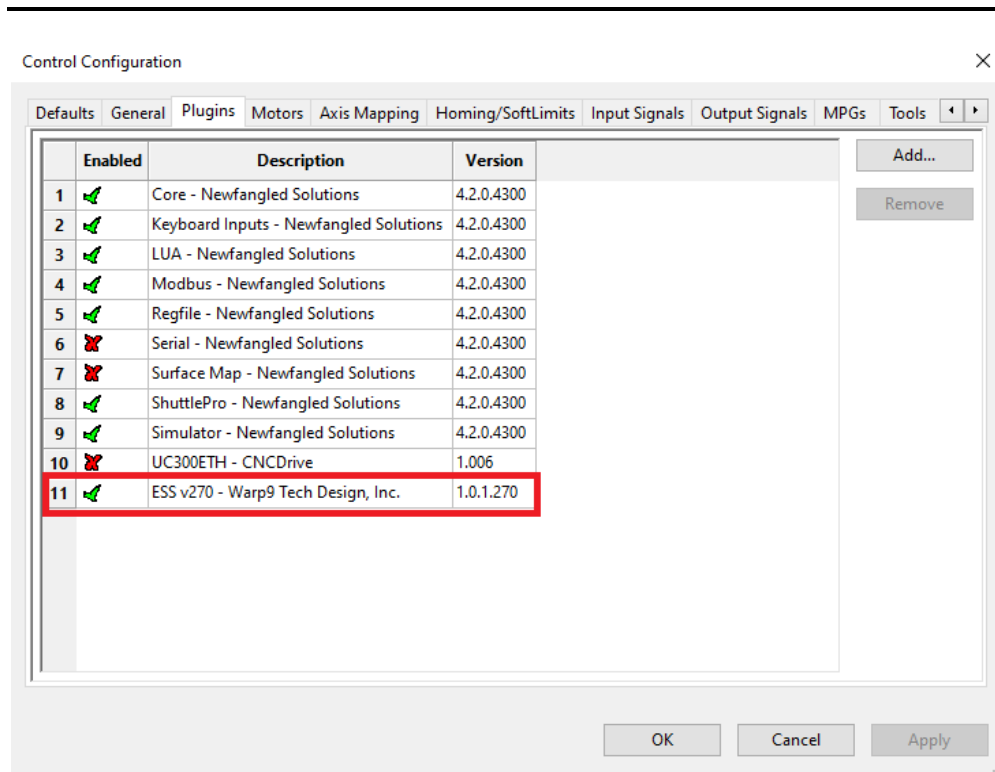
Info General Motors Spindle Laser Pins Config Input Signals Output Signals Homing Probing Backlash HC

1) Homing is enabled for a Motor 'N', when the 'Input Signals' tab has:
 * 'Motor N Home' Enabled with a green check.
 * 'Motor N Home' has an assigned 'Mapped Pin'.
 2) If you have encoders with an index pulse, you may enable homing to a motor's index pin by:
 * Place a green check in 'Home to Motor's Index Pin'.
 * Make sure that the index signal is enabled for that Motor.

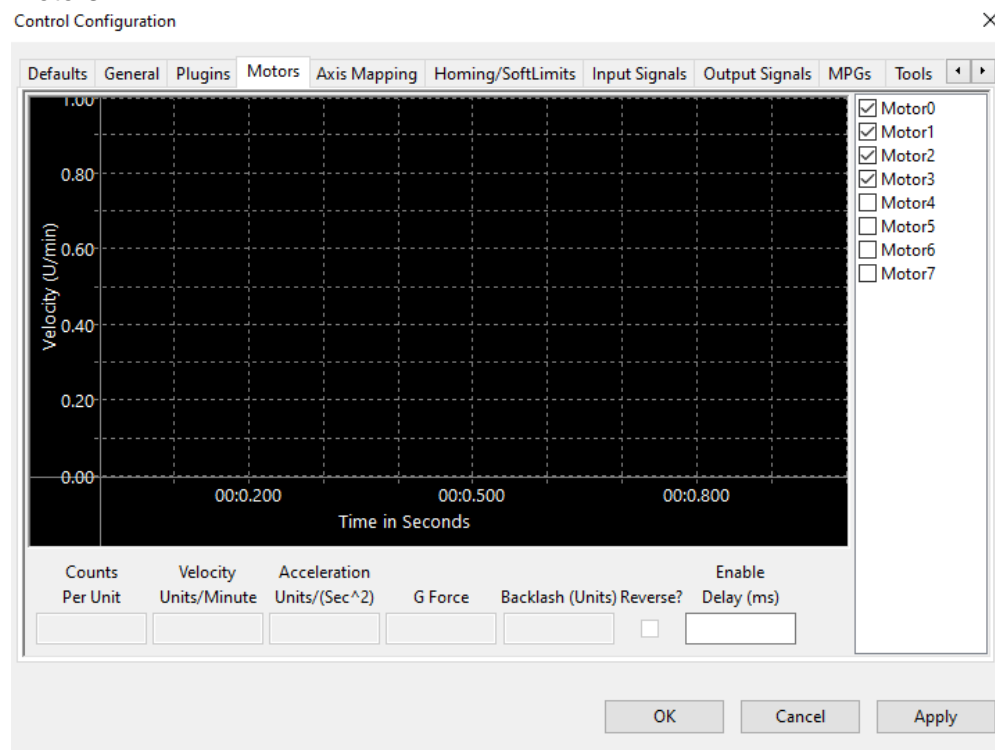
	Home Pin (Automatically Populated from 'Input Signals' tab)	Approach Velocity (Units/Min)	Backoff Velocity (Units/Min)	Home To Motor's Index Pin	Index Pin (Automatically Populated from 'Input Signals' tab)
Motor 0	Home X	1.0	1.0		
Motor 1	Home Y	1.0	1.0		
Motor 2	Home Z	1.0	1.0		
Motor 3		1.0	1.0		
Motor 4		1.0	1.0		
Motor 5		1.0	1.0		

OK Cancel

Configure/Control Plugins



Motors



Axis Mapping

Control Configuration



	Enabled	Master	Slave 1	Slave 2	Slave 3	Slave 4	Slave 5
X (0)		Motor0					
Y (1)		Motor1					
Z (2)		Motor2					
A (3)		Motor3					
B (4)							
C (5)							
OB1 (6)							
OB2 (7)							
OB3 (8)							
OB4 (9)							
OB5 (10)							
OB6 (11)							

OK Cancel Apply

Input Signals

Control Configuration



	Mapping Enabled	Device	Input Name	Active Low	User Description
Input #63					
Motor 0 Home		ESS	Home X		
Motor 1 Home		ESS	Home Y		
Motor 2 Home		ESS	Home Z		
Motor 3 Home					
Motor 4 Home					

Control Configuration ✕

Defaults
 General
 Plugins
 Motors
 Axis Mapping
 Homing/SoftLimits
 Input Signals
 Output Signals
 MPGs
 Tools

	Mapping Enabled	Device	Input Name	Active Low	User Description
Motor 27 --	✖			✖	
Motor 28 --	✖			✖	
Motor 29 --	✖			✖	
Motor 30 --	✖			✖	
Motor 31 --	✖			✖	
Probe	✔	ESS	Probe	✖	
Index	✖			✖	
Limit Override	✖			✖	
E-Stop	✖			✖	
THC On	✖			✖	
THC Up	✖			✖	
THC Down	✖			✖	
Timing	✖			✖	
Jog X+	✔			✖	
Jog X-	✔			✖	

OK
 Cancel
 Apply

Output Signal

Control Configuration ✕

Defaults
 General
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	Mapping Enabled	Device	Output Name	Active Low	User Description
Limit Override	✖			✖	
Charge Pump #1	✖			✖	
Charge Pump #2	✖			✖	
Current Hi/Low	✖			✖	
Spindle On	✖			✖	
Spindle Fwd	✖			✖	
Spindle Rev	✔	ESS	Rev Spindle	✖	
Coolant On	✔	ESS	Coolant	✖	
Mist On	✖			✖	
Digitize Trigger	✖			✖	
Alarm	✖			✖	
Parts Finished	✖			✖	
TLM Tool Change	✖			✖	
Waiting	✖			✖	
Retract	✖			✖	

OK
 Cancel
 Apply

Spindle

Control Configuration



Plugins Motors Axis Mapping Homing/SoftLimits Input Signals Output Signals MPGs Tools Spindle Tool Patl

	MinRPM	MaxRPM	Accel Time	Decel Time	FeedBack Ratio	Reversed
0	0.00	25000	0.00	0.00	1.00000	✗
1	0.00	0.00	0.00	0.00	1.00000	✗
2	0.00	0.00	0.00	0.00	1.00000	✗
3	0.00	0.00	0.00	0.00	1.00000	✗
4	0.00	0.00	0.00	0.00	1.00000	✗
5	0.00	0.00	0.00	0.00	1.00000	✗
6	0.00	0.00	0.00	0.00	1.00000	✗
7	0.00	0.00	0.00	0.00	1.00000	✗
8	0.00	0.00	0.00	0.00	1.00000	✗
9	0.00	0.00	0.00	0.00	1.00000	✗
10	0.00	0.00	0.00	0.00	1.00000	✗
11	0.00	0.00	0.00	0.00	1.00000	✗

Max Spindle Motor RPM: 25000 ☐ Wait on spindle to stabilize to 90 percent.

Spindle Override Delay: 25 (ms)

Step/Dir Spindle Axis: None (Axis must be enabled and mapped.) ☐ Enable Step/Dir Spindle rigid tapping.

OK

Cancel

Apply