PoKeys plugin for Mach4

Version: 23/3/2015

Pendant functionality

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PoKeys plugin for Mach4 and pendant functionality

PoKeys plugin for Mach4 integrates a very powerful and versatile support for various pendants. Key-based and MPG-based pendants are supported, as well as a combination of those.

The concept behind the pendant functionality is based on a set of pendant functions that can be enabled for each pendant (usually pendant will contain only a subset of all possible functions). These functions can be activated by a push-button switch (labelled as 'Button' later on) and/or toggle switch (labelled as 'Switch' later on). The difference between the two is in the way the specific pendant functions is activated - in case of push-buttons, the action of pressing the button triggers the command (e.g. toggling different settings, Cycle start, Stop, etc.), while in case of toggle switches, the current state of the switch is processed (e.g. enable jog, select axis, jog x in + direction, etc.). The state of most pendant functions can also be signalized on pendant's LEDs.

PoKeys plugin for Mach4 supports multiple pendants on multiple PoKeys devices. The plugin joins information from all pendants and executes the commanded jogging or control commands.

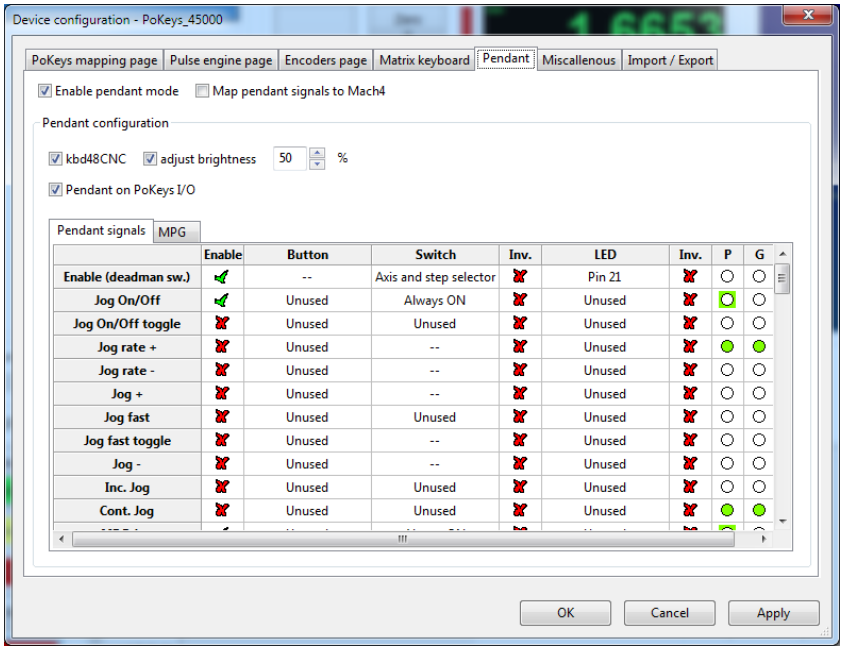
Pendant setup

In order to setup the pendant, the following options are to be considered:

- Enable pendant mode: tells the plugin that the pendant is going to be used (this option must be activated for any pendant to work)
- kbd48CNC: enable the pre-configured support for kbd48CNC keyboard pendant
- Pendant on PoKeys I/O: enable the support for various pendants (both keyboard- and MPG-based), connected to PoKeys I/O pins

Configuring Pendant on PoKeys I/O

The pendant configuration is divided into Pendant signals and MPG sections. The Pendant signals contains the list of all possible pendant functions and configuration section, where each pendant function can be assigned to a specific PoKeys I/O pin.



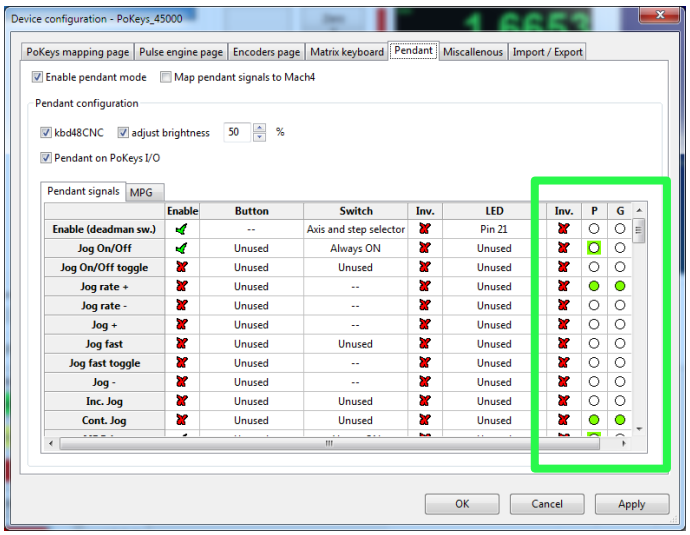
Pendant functions

- **Enable (deadman sw.)**: since PoKeys supports multiple pendants, each pendant can independently be enabled or disabled - this is done using this function. When disabled, the jogging motion is stopped and all LEDs are turned off. Pendants that contain the dead man's switch (also named Operator Presence Control, enabling switch) can use the signal from this switch to automatically enable or disable the pendant. This function should not be mixed with emergency (or Reset) switch. None of the pendant functions is taken into account while the pendant is disabled.
- **Jog On/Off:** pendants can support both the control (starting, stopping, pausing the job in execution, etc.) and jogging functionality. The jogging functionality must be enabled and this pendant function takes care of that. Since the keyboard-based pendants use push-button switches, the 'Jog On/Off toggle' function should be used instead since the jogging functionality is toggled on or off on each input signal activation.
- **Jog On/Off toggle:** similar as above, but is for use with pushbuttons (toggle switches). The jogging state is changed on each button press
- **Jog rate+/Jog rate-:** change jog rate (the value is displayed in Mach4 under jogging tab)
- **Jog fast:** toggle full-speed jogging
- **Jog +/-**: jog the current axis
- **Inc./Cont./MPG jog:** switching between incremental, continuous and MPG jogging.
- **Jog X/Y/Z/A/B/C +/-**: jog the corresponding axis
- **Axis X/Y/Z/A/B/C:** axis selection
- **MPG 1/2/3 - X/Y/Z/A/B/C:** assign the axis to the appropriate MPG
- **Step x0.001/x0.01/x0.1/x1:** select step size (0.001, 0.01, 0.1, 1.0 of the unit)
- **Cycle start/Feed hold/Stop/Reset:** start, hold, stop or reset job
- **Single step:** execute single step ***(not supported)***
- **Reverse:** reverse jog execution ***(not supported)***
- **Optional stop:** toggle optional stop
- **Edit:** open G-code editor ***(not supported)***
- **Load:** open G-code open dialog ***(not supported)***
- **Close:** close current G-code
- **Recent:** open list of recent G-code files ***(not supported)***
- **Set next line:** set next line to execute ***(not supported)***
- **Rewind:** rewind current G-code file
- **Run from here:** run G-code from current line ***(not supported)***
- **Block delete:** Block delete option
- **Ref:** take reference measurement ***(not supported)***
- **Goto 0's:** goto home command - the button must be pressed for more than 1 second for the function to activate
- **Spindle CW/Stop/CCW:** turn on or off the spindle and set the direction
- **Spindle speed +/-/reset:** set the spindle speed
- **Feedrate +/-/reset:** set the federate
- **Teach/Stop teach:** start or stop teach mode ***(not supported)***
- **Shuttle mode:** shuttle mode ***(not supported)***

- **Emergency switch:** emergency switch that disables the Mach4 motion engine. Make sure to use proper hardwire-wiring of emergency switch to the machine power supply. This signal can only be used to notify Mach4 of the event that emergency switch has been activated.

Pendant function status display

The two rightmost columns of the Pendant configuration screen display the actual pendant and global (aggregated) pendant states. The actual pendant (column P) displays the information on the state of the pendant that the configuration is being edited for. It will display the information even if the pendant is not enabled ('Enable (deadman sw.)' function active). The last column 'G' displays the aggregated function states of all pendants - this state is being used to trigger the jogging or command events.



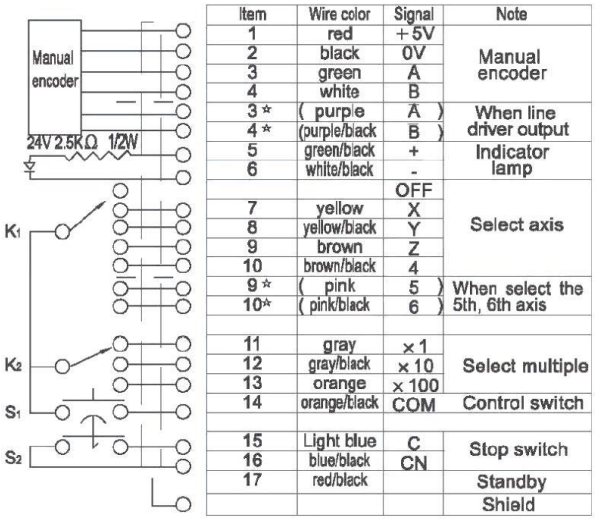
Each cell displays one of the following states:

- inactive
- function is triggered by the input, but has inactive display (LED) state
- function is not triggered by the input, but has an active display (LED) state
- function is both triggered by the input and has an active display (LED) state

Example: configuring PoPendant1

Note: the following table only gives an example on how to connect the PoPendant to PoKeys device. To ease the setup process, the configuration file for this example is provided on PoPendant homepage. Wiring can be rearranged by the user, but the plugin configuration must be adjusted accordingly.

Wire	PoPendant "wire colour"	Function	PoKeys pin number	Mach4 Mapping
1	red	MPG +5V	5V	/
2	black	MPG GND	GND	/
5	green	MPG A	1	Encoder 1B
7	white	MPG B	2	Encoder 1A
	purple	N.C.	*N.C.*	/
	purple/black	N.C.	*N.C.*	/
9	green/black	Lamp +	+3.3V	/
11	white/black	Lamp -	14	Pendant enable
13	yellow	X axis	19	Axis X
15	yellow/black	Y axis	20	Axis Y
17	brown	Z axis	21	Axis Z
19	brown/black	A axis	22	Axis A
10	pink*	B axis	24	Axis B
12	pink/black*	C axis	27	Axis C
21	gray	x1	3	Step 0.001
23	gray/black	x10	4	Step 0.01
25	orange	x100	7	Step 0.1
	orange/black	Ctrl Switch	GND	/
4	Light blue	Estop	52	IO Estop
6	blue/black	Estop GND	GND	/
	red/black	N.C	*N.C.*	/
	shield	shield	GND	/
	N.C.= not connected - wire it to GND			



Item	Wire color	Signal	Note
1	red	+5V	Manual encoder
2	black	0V	
3	green	A	
4	white	B	
3*	(purple	A)	When line driver output
4*	(purple/black	B)	
5	green/black	+	Indicator lamp
6	white/black	-	
		OFF	Select axis
7	yellow	X	
8	yellow/black	Y	
9	brown	Z	
10	brown/black	4	
9*	(pink	5)	When select the 5th, 6th axis
10*	(pink/black	6)	
11	gray	×1	Select multiple
12	gray/black	×10	
13	orange	×100	
14	orange/black	COM	Control switch
15	Light blue	C	Stop switch
16	blue/black	CN	
17	red/black		Standby
			Shield

Figure 1: PoPendant internal wiring

PoPendant1 is an MPG-based pendant with MPG, axis and step selection switches, emergency stop button and dead-man switch on the side of the device.

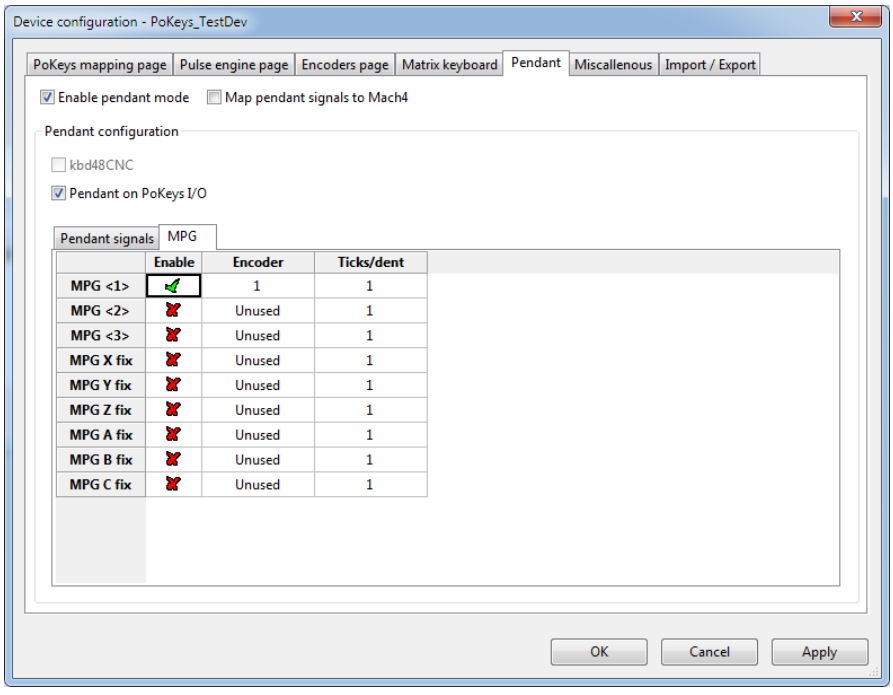
In order to make it work in Mach4 plugin, the following settings must be selected:

- Enable pendant mode: 'master' enable mode for pendants
- Pendant on PoKeys I/O: Pendant1 is connected to PoKeys I/O pins
- Enable (deadman sw.): select 'Axis and step selector' signal under 'Switch' column. Since dead-man switch in PoPendant1 is wired in series with axis and step selector, signal of those must be used to enable the pendant
- Jog On/Off: since no switch for turning the jogging functionality on or off is present on PoPendant1, select 'Always ON' under 'Switch' column.
- MPG jog: this pendant is using MPG to jog - select 'Always ON' under 'Switch' column
- MPG 1 - X,Y,Z,A,B,C: select which pins the axis selection switch on the PoPendant1 is wired to

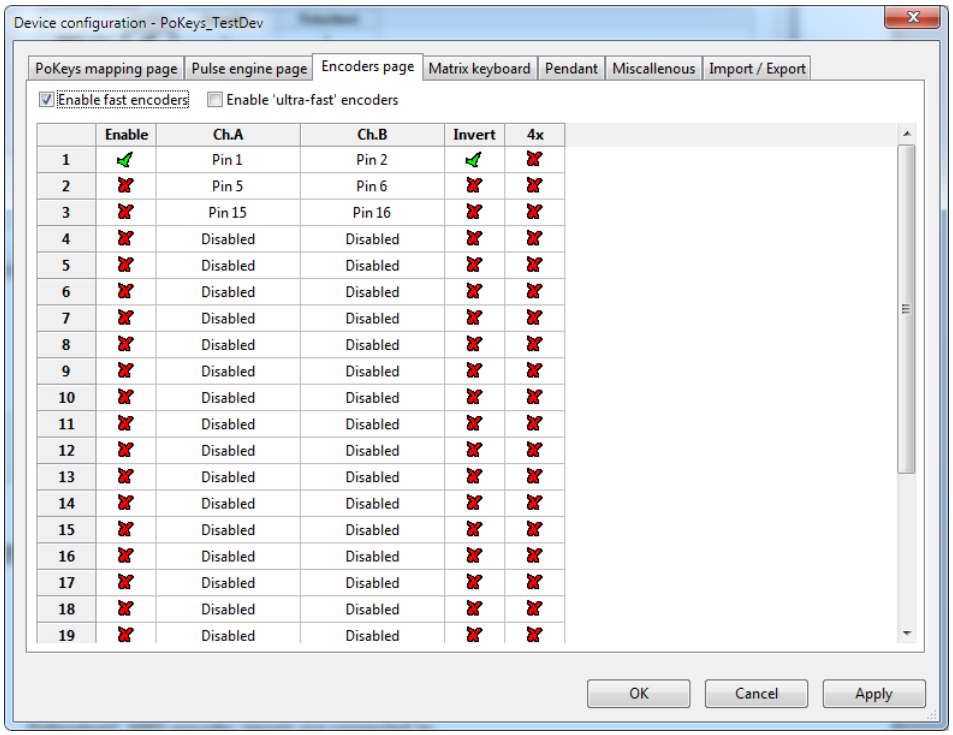
- Step x0.001, x0.01, x0.1: select which pins the step selection switch on the PoPendant1 is wired to

Enable (deadman sw.)	✓	--	Axis and step selector	✗	Pin 21	✗
Jog On/Off	✓	Unused	Always ON	✗	Unused	✗
Jog On/Off toggle	✗	Unused	Unused	✗	Unused	✗
Jog rate +	✗	Unused	--	✗	Unused	✗
Jog rate -	✗	Unused	--	✗	Unused	✗
Jog +	✗	Unused	--	✗	Unused	✗
Jog fast	✗	Unused	Unused	✗	Unused	✗
Jog fast toggle	✗	Unused	--	✗	Unused	✗
Jog -	✗	Unused	--	✗	Unused	✗
Inc. Jog	✗	Unused	Unused	✗	Unused	✗
Cont. Jog	✗	Unused	Unused	✗	Unused	✗
MPG Jog	✓	Unused	Always ON	✗	Unused	✗
MPG 1 - X	✓	Pin 9	Unused	✗	Unused	✗
MPG 1 - Y	✓	Pin 10	Unused	✗	Unused	✗
MPG 1 - Z	✓	Pin 11	Unused	✗	Unused	✗
MPG 1 - A	✓	Pin 5	Unused	✗	Unused	✗
MPG 1 - B	✓	Pin 3	Unused	✗	Unused	✗
MPG 1 - C	✓	Pin 4	Unused	✗	Unused	✗
Step x0.001	✓	Pin 6	Unused	✗	Unused	✗
Step x0.01	✓	Pin 15	Unused	✗	Unused	✗
Step x0.1	✓	Pin 16	Unused	✗	Unused	✗
Step x1	✗	Unused	Unused	✗	Unused	✗
Cycle start	✗	Unused	--	✗	Unused	✗
Feed Hold	✗	Unused	Unused	✗	Unused	✗
Stop	✗	Unused	--	✗	Unused	✗
Reset	✗	--	Unused	✗	Unused	✗

- Select encoder 1 in the MPG section as shown below. Set the Ticks/detent to a correct number (the default value is 1).



- Switch to Encoders configuration and configure encoder 1 to use the pins, where PoPendant1 MPG encoder signals are connected to.



	Enable	Ch.A	Ch.B	Invert	4x
1	✓	Pin 1	Pin 2	✓	✗
2	✗	Pin 5	Pin 6	✗	✗
3	✗	Pin 15	Pin 16	✗	✗
4	✗	Disabled	Disabled	✗	✗
5	✗	Disabled	Disabled	✗	✗
6	✗	Disabled	Disabled	✗	✗
7	✗	Disabled	Disabled	✗	✗
8	✗	Disabled	Disabled	✗	✗
9	✗	Disabled	Disabled	✗	✗
10	✗	Disabled	Disabled	✗	✗
11	✗	Disabled	Disabled	✗	✗
12	✗	Disabled	Disabled	✗	✗
13	✗	Disabled	Disabled	✗	✗
14	✗	Disabled	Disabled	✗	✗
15	✗	Disabled	Disabled	✗	✗
16	✗	Disabled	Disabled	✗	✗
17	✗	Disabled	Disabled	✗	✗
18	✗	Disabled	Disabled	✗	✗
19	✗	Disabled	Disabled	✗	✗

Pendant function configuration checklist

If pendant function is not reacting to the switch or button input, check that the following conditions are met:

- Is 'Enable pendant mode' option checked?
- Is 'Pendant on PoKeys I/O' option checked?
- Is 'Enable (deadman sw.)' function properly configured and is activated by the input signal?
- Is pendant function enabled (checkbox in the first column)?

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