MyCNC Plasma Configuration Example based on profile 1024P-V2

NOTE: The myCNC team recommends utilizing the examples provided in this manual (as well as other manuals in this documentation) as a starting point for your machine setup. When possible (and applicable), it is recommended to keep changes to a mininum. In general, using these examples as the basis for your PLCs/macro commands allows for an easier setup process.

500

In this article, we will show an ET7 control board connection example and the software configuration to build a Middle-class Plasma/Gas cutting table. The Cutting table supposed to have

- Torch Height control (THC) width Z height control through standard Z axis (no matter stepper or servo),
- Initial Height Control (IHC) Probe sensor and ability to find material by lowering a Torch and searching material sheet by probing.
- (Optional) Oxyfuel gas cutting torch control (Oxy Heat low/high pressure valves, Oxy Cutting high/low pressure valves, Gas valve, Ignition valve/relay)
- (Optional) Drill head Lowering Drill valve, Drill ON relay
- (Optional) Mechanical (or Pneumatic) Scriber to perform marking operations.

Configuration process might be quite complicated, Software programming skills needed to do all this stuff. However, customers able to skip all this process and use configuration defined in the profile by default.



Power supply connection

Connect 24V DC power supply to contacts +24V and GND

Pulse-Dir connection and configuration

Connect pulse-dir outputs according to the first picture. Connection configured to use dual motors for X and Y axes. Leave motor output unconnected if you have only 1 motor for X or Y axes.

Axes configuration is shown below

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Q	SYS O CFG			SUPPORT		C .							rest of the second seco
	Preferences Pr	rofile	Macros PLC B	uilder Axe	s/Motors	Inputs/Sensors	Technolo	gy Network	Camera	5 axes RTCP	Panel/Pendant	Hardware	Advanced
	Enable	ed	Pulses per Unit	Max Speed	Backlash	Axes map	oing	Speed p	rofile				
	х	v	2000	10000	0	x	•						
	Y	V	2000	10000	0	Y	-						
Π.	z	V	5000	10000	0	z	-						
	А		82.3723229	0	0	A1 - rotation arc	ound X 👻	Slave of XYZ	-				
6	В		82.3723229	0	0	B1 - rotation arc	ound Y 👻	Slave of XYZ	-				
	С		82.3723229	0	0	C1 - rotation arc	ound Z 👻	Slave of XYZ	*				
NO	U]	0	0	x	-	Slave of XYZ	-				
Xa	v			0	0	x	-	Slave of XYZ	-				
	Scan along rotatio	onal avi	ic.										
	Motor outputs o	configu Avis	ration	Smooth									
.ell∞fitt.	Motor #0 X	-		9 🗘									
	Motor #1 X	•	V	9 🗘									
	Motor #2 Y	*		9 🗘									
	Motor #3 Y	*	V	9 🗘									
	Motor #4 Z	*		9 \$									
	Motor #5 A	•		9 🗘									
	Motor #6 X			9 🗘									
	Motor #7 X	*		8 \$									
	Servo ON output		Output 48 👻		b								

Inputs connection

Arc ON, IHC sensors

INO - Arc ON Sensor from plasma power source. IN1 - Initial Height Control (IHC) Sensor or Probe Sensor - a sensor which triggered when the torch touches the material sheet.

Both inputs should be configured in PLC Builder, include file **pins.h**

#define	INPUT_ARC	0
#define	INPUT_IHC	1

To see the state of both inputs on the main screen **led** screen items should be configured in **cncscreen-xml**

```
<gitem type="led" where="led1-toolbar" orientation="horizontal"
labelFontStyle="bold"
labelAlignment="right;vcenter" labelFontFamily="Arial" labelWidth="90"
labelFontSize="12" inversion="no" ledColor="green" width="15" height="15"
address="inputs" number="0" >
    <message>Arc Sensor</message>
    <message_ru>Ayra</message_ru>
</gitem>
<gitem type="led" where="led1-toolbar" labelFontFamily="Arial"
```

SE1 SET 34.74 SE1 0.00 \mathbb{Z}_{+} 0.1 SET 0 5 Ŀ 4 G54 G54 G54 G55 G56 Cmd: 0 / 0 (0) Jog over speed PLC: 0 I: 0 lib-shape-017.nc MCC: Idle C: 100 14-26-05: Ethernet/UDP interface opened. IP:192.168.0.78 14-26-06: Init cutcharts database:C.sqlite 14-26-11: Program file "lib-shape-025.nc" loaded (0.00 sec. 35 lines) 15-30-18: Cannot run. Need to return to Toolpath:(299.2040, 161.2320, -0.3576, 0.00000, 0.00000) Speed, mm/mi Over 1: 617 690 691.1 2: 617 3: 60 X93.025050 Y65.292628 4: M3 5: 63 X103.000000 Y56.000000 19.974950 J0.707372 K0.000000 50% Arc Ref, V 137.8

address="inputs" number="0" - for Arc Sensor (IN0)
address="inputs" number="1" - for IHC Probe Sensor (IN1)

Υ1

Х

Input Number Home Sensor Limit Switch

-Y

-Х

6: G3 X103.000000 Y150.000000 I0.000000 J47.000000 K0.000000 7: G3 X103.000000 Y56.000000 I0.000000 J-47.000000 K0.000000

X43.000000 Y26.000000 I9.974950 J0.707372 K0.000000

Plasma Power

Arc Sensor IHC On IHC Sensor 000 K0.000000

THC Low Speed

Drill Down

The inputs should be configured in "Inputs/Sensors" - "Limits" settings dialog if **Home sensors** are used as **Limit Switches** as well If Home sensors are used as Limit switches like on the table below

8: G3 X112.974950 Y65.292628 I0.000000 J10.000000 K0.000000

Home Y1 Home Y2 Home X Home Z

9. M5

11: M3 12: G3

Home Sensors

IN4 - Home Z IN5 - Home X IN6 - Home Y1 IN7 - Home Y2

IN6

IN5

10: G0 X33.025050 Y35.292628

13: G3 X43.000000 Y60.00000

. XYZ Arc Refere

Arc Voltage, V

THC Speed

Adjustn

-6.0

0.0

Input Number	Home Sensor	Limit Switch
IN4	Z	+Z

then setting up limit switches will be as following

Q	SYS Q	PLC CFG					SU	PPO	RT			CFG	A														res (
	Preferenc	es	Profile	Mac	ros	PLC	Builde	r	Axe	s/Mo	tors	Inp	outs/s	Sensors	Т	echno	logy		Netwo	'k	Came	ra	5 axes RTCF	>	Panel/Pendant	Hardware	Advanced
	Alarms	Lim	its T	riggers	MP	G thro	ough b	ina	ry inp	outs	J	og thro	bugh	ADC in	puts	I/O	Expa	nd	cards	mapp	bing	ADC	Mapping				
	Soft Lim	its E	nablec S	l Soft Lin	nits			V			Lim	it Swi	itch ·				L	.imi	it Swi	tch +	ŀ						
			,	4in Limit	t	Max	Limit																				
	x		0		301	.0			₹.	5	\$	Norma	ally cl	osed	•	8		¢ [Norma	lly cl	osed	-					
5	Y		0		151	.0			v e	۶.	\$	Norma	ally cl	osed			0	¢ [Norma	lly op	pened	-					
	z		0		150)				ļ.	•	Norma	ally cl	osed	-	₹ 4		\$ [Norma	lly cl	osed	•					
NO	А									,		Norma	ally o	pened	×			2	Norma	lly of	pened	×.	·				
Xa	В)		Norma	ally o	pened	-				Norma	lly op	pened	-					
	С)		Norma	ally o	pened	-			<u>e</u> li	Norma	lly op	pened	-					
and a street	U)		Norma	ally o	pened	-) (Norma	lly op	pened	-					
	v)	Ð	Norma	ally o	pened	•			Ì	Norma	lly op	pened	-					
	log slow	dow	'n					√																			
	Slow dow	n dis	tance					x	50		Y	50		Z 50	D		4 5			B 5			5				
	Slow dow	n val	ue, %					x	20		\$Y	20		‡ Z 2	0	\$	4 20)	\$	B 2	0	\$	20	•			
U																											

If Limit switchers configured and any of it is activated, job running will be stopped and Error message showed in the centre of the main screen

Q,						×××	0.000 -29.656 SET
		$\left(\begin{array}{c} \\ \\ \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \\ \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \end{array} \right) \left(\begin{array}{c} \\ \\ \end{array} \right) \left(\begin{array}{c} \\ \end{array} \right) \left(\end{array}) \left(\begin{array}{c} \\ \end{array} \right) \left(\end{array}) \left(\begin{array}{c} \\ \end{array} \right) \left(\left(\begin{array}{c} \\ \end{array} \right) \left(\end{array}) \left(\left(\end{array}) \left(\end{array}) \left(\left(\end{array}) \right) \left(\left(\end{array}) \left$	\sim			Y	0.000 34.744 SET
						zz	0.000 SET
U _l		End switch + End switch +	+z -x				₹
S,						88.88	>
X							🕥 Z-
	III 🔊 🖑 🔛	G54		く 54 55	654 G54	1.0	
	lib-shape-017.nc MCC: Idle	C:	PLC: 0	1: 0	Cmd: 0 / 0 (0) Jog ov speed	er	100%
	17-22-56: Ethernet/ODP Interface opened. IP:19. 17-22-56: Init cutcharts database:C.sqlite 17-23-01: Program file "lib-shape-017.nc" loaded	d (0.00 sec, 199 lines)			Speed	n	0
					- Over		50%
	1: G17 G90 G91.1 2: G17 3: G0 Y93 025050 Y65 202628				Speed		
	4: M3 5: G3 X103.000000 Y56.000000 I9.974950 J0.70	7372 K0.000000			Arc Re	f, V 🧲	137.8
	6: G3 X103.000000 Y150.000000 I0.000000 J47 7: G3 X103.000000 Y56.000000 I0.000000 J-47. 8: G3 X112 974950 Y65 292628 I0 000000 J10 (000000 K0.000000 000000 K0.000000			Arc Re Adjust	ference ment. V	-6.0
	9: M5 10: G0 X33.025050 Y35.292628				Arc Vo	ltage, V	0,0
	11: M3 12: G3 X43.000000 Y26.000000 I9.974950 J0.70 13: G3 X43.000000 Y60.000000 I0.000000 J17.0	7372 K0.000000 00000 K0.000000			THC S	peed	0.0
٢	Home Y1 Plasma Power Home Y2 Arc Sensor Home X2 HC On Home Z IHC Sensor	THC Low Speed Drill D Drill P	Down lower				STOP >

Homing Macro

Home sensor numbers should be configured in Macro Wizard accordingly and **Homing procedures** for X, Y, Z axes generated.

Axis X - Homing X - M131

Q,		
	references Profile Macros PLC Builder Axes/Motors Inputs/Sensors Technology Network Camera 5 axes RTCP Panel/Pendant Hardware Advanced	
	Aacro List Macro Wizard Probing Wizard	
	Homing Homing XY Gantry Alignment Back to Path Surface Measure Tool Length Measure Tool Change	_
	Axis X Axis Y Axis Z Axis A Axis B Axis C Axis U Axis V	-
	Homing direction - 👻 Macro preview	
	Sensor Number/Type 5 🗘 Normally closed 🔹 (M131 Homing X)	
	Encoder-Z home detection 99 Normally opened Korological States when several triangrad	
	More Out from Home sensor, then G91 G0 X -1000.0000 F 1000.00	
20	Distance to Encoder Z Sensor M89 L1 P5(Quick stop when sensor triggered)	
Xa	Ignore Limits V G04 P0.1	
	Soft stop Image: G91 G0 X 5.0000 F 500.00 G90 G10L70 P0 X #5451 G90 G10L70 P0 X #5451	
	Distance to Home Sensor 1000 G90 G10L70 P#5220 X #5451 G10 L80 P5521 Q0	
.14. ftt.	Gap 5 Gap Speed 500 G10 L80 P5525 Q0 G10 L80 P7391 Q0 (Homing Flag)	
	Speed, Slow Speed 1000 60	
	Position After Homing 0	
	Reset Work position	
	Macro filename M131 v (*) default is: M131	
	Macro header (MI31 Homing X)	
	Generate / Save macro	
(也)		

- Change setings in macro Wizard for Axis X
- Press Generate to generate Homing X macro to "macro preview" window, check the code
- Press Save Macro to save the Homing X macro to M131 file on the disk

Q		
	Preferences Profile Macros PLC Builder Axes/Motors Inputs/Sensors Technology Network Camera 5 axes RTCP Panel/Pendant Hardware Advanced	
	Macro List Macro Wizard Probing Wizard	
	Homing Homing XY Gantry Alignment Back to Path Surface Measure Tool Length Measure Tool Change	-
\sim	Axis X Axis Y Axis Z Axis A Axis B Axis C Axis U Axis V	
U.	Homing direction Macro preview	
	Sensor Number/Type 6 C Normally closed V (M132 Homing Y) G10 L80 P5521 O1	
5	Encoder-Z home detection 99 C Normally opened C G10 L80 P5525 Q1 M88 L0 P6(Soft stop when sensor triggered)	
~	Move Out from Home sensor, then G91 G0 Y -2000.0000 F 1000.00 find Z G94 P0.1	
20	Distance to Encoder Z Sensor M89 L1 P6(Quick stop when sensor triggered) G91 G9 Y 2000 0000 F 60.00	
Xa	Ignore Limits V G04 P0.1 G91 G9 X 5 0000 E 500 00	
	Soft stop G90 G10L70 P0 Y #5452 G90 G10L70 P1 Y #5452	
The particular	Distance to Home Sensor 2000 G10 L80 P5521 Q0 G10 L80 P5525 Q0	
	Gap 5 Gap Speed 500 G10 L80 P7392 Q0 (Homing Flag)	
	Speed, Slow Speed 1000 60	
	Position After Homing 0	
	Macro filename M132 v (*)default is: M132	
	Macro header (M132 Homing Y)	
	Macro footer	
	Generate Save macro	
U		

Axis Y - Homing Y - M132

- Change setings in macro Wizard for Axis Y
- Press Generate to generate Homing Y macro to "macro preview" window, check the code
- Press Save Macro to save the Homing Y macro to M132 file on the disk

Axis Z - Homing Z - M133

Q		
	Preferences Profile Macros PLC Builder Axes/Motors Inputs/Sensors Technology Network Camera 5 axes RTCP Panel/Pendant Hardware Advanced	
	Macro List Macro Wizard Probing Wizard	
	Avis X Axis Z Axis Z Axis A Axis B Axis C Axis I Axis V	
	Axis X Axis Z Axis A Axis B Axis C Axis V Homing direction + • Sensor Number/Type 4 • Normally closed • Encoder-Z home detection 99 • Normally opened • Move Out from Home sensor, then find Z - Distance to Encoder Z Sensor - Ignore Limits V Soft stop - Distance to Home Sensor 200 Gap 1 Gap Speed 500 Speed, Slow Speed 500 Soft stop - Macro filename M133 Macro filename M133 Macro filename M133 Macro folename M133 Homing Z	
٢		

- Change setings in macro Wizard for Axis Z
- Press Generate to generate Homing Z macro to "macro preview" window, check the code
- Press Save Macro to save the Homing Z macro to M133 file on the disk

Led items on the main screen should be configured in **cnc-screen.xml** configuration file of the profile to see a current state of Home Sensors.

```
<gitem type="led" where="led0-toolbar"</pre>
   orientation="horizontal" labelAlignment="right;vcenter"
labelFontFamily="Arial" labelWidth="80"
   labelFontSize="12" labelFontStyle="bold" width="15" height="15"
   address="inputs" number="7" inversion="1" ledColor="green" >
<message>Home Y1</message>
<message_tr>REF Y1</message_tr>
<message ru>Хоум Y1</message ru>
</gitem>
<gitem type="led" where="led0-toolbar"</pre>
   orientation="horizontal" labelAlignment="right;vcenter"
labelFontFamily="Arial"
   labelWidth="80" labelFontSize="12" labelFontStyle="bold" width="15"
height="15"
   address="inputs" number="6" inversion="1" ledColor="green" >
<message>Home Y2</message>
```

```
<message_tr>REF Y2</message_tr>
<message_ru>Xoyм Y2</message_ru>
</gitem>
<gitem type="led" where="led0-toolbar"</pre>
   orientation="horizontal" labelAlignment="right;vcenter"
labelFontFamily="Arial" labelWidth="80"
   labelFontSize="12" labelFontStyle="bold" width="15" height="15"
   address="inputs" number="5" inversion="1" ledColor="green" >
<message>Home X</message>
<message tr>REF X</message tr>
<message ru>Хоум X</message ru>
</gitem>
<gitem type="led" where="led0-toolbar"</pre>
   orientation="horizontal" labelAlignment="right;vcenter"
labelFontFamily="Arial" labelWidth="80"
   labelFontSize="12" labelFontStyle="bold" width="15" height="15"
   address="inputs" number="4" inversion="1" ledColor="green" >
<message>Home Z</message>
<message tr>REF Z</message tr>
<message ru>Xoyм Z</message ru>
<message kr>Xoyм Z</message kr>
        </gitem>
```

Input Number	Home Sensor	led attributes
IN7	Y2	address="inputs" number="7" inversion="1" ledColor="green"
IN6	Y1	address="inputs" number="6" inversion="1" ledColor="green"
IN5	X1	address="inputs" number="5" inversion="1" ledColor="green"
IN4	Z	address="inputs" number="4" inversion="1" ledColor="green"

Q						2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	⊕ _x x	0.000 -29.656 SET
			$\neg ?$	-9			<mark>⊕</mark> γ	0.000 34.744 SET
\geq			End switch -X End switch -Y				$\bigoplus_{z} z$	0.000 SET
			End switch +Z					
3							88.88	
	#N			<u> </u>		e te	0.1 1.0	SET ∞
	lib-shape-017.nc	MCC: Idle	G54	PLC: 0	G54 G5	Cmd: 0 / 0 (0)	Jog over	100%
	17-22-56: Ethernet/UDP inte 17-22-56: Init cutcharts dat 17-23-01: Program file "lib-s	erface opened. IP:192.168.0.78 abase:C.sqlite shape-017.nc" loaded (0.00 sec	:, 199 lines)				Speed, mm/min	0
	1: G17 G90 G91.1 2: G17 3: G0 X93 025050 X65 2926	528				Î 📢	Over Speed	50%
	4: M3 5: G3 X103.000000 Y56.000 6: G3 X103.000000 Y150.00 7: G3 X103.000000 Y56.000	0000 19.974950 J0.707372 K0.0 00000 10.000000 J47.000000 K0 0000 10.000000 J-47.000000 K0	000000 0.000000 0.000000				Arc Ref, V	137.8
	8: G3 X112.974950 Y65.292 9: M5 10: G0 X33.025050 Y35.292 11: M3	2628 10.000000 j10.000000 K0. 2628	.000000				Adjustment, V Arc Voltage, V	0.0
	12: G3 X43.000000 Y26.000 13: G3 X43.000000 Home Home	0000 19.974950 J0.707372 K0.0 000000 J17.000000 K0. Y1 lasma Power THC Low	000000 000000 w Speed Drill Down Drill Powe	n				
0	XYZ Home Home	e X IHC On IHC On IHC Sensor	Dial Fore					

Emergency Stop button

IN15 configured as (Emergency Stop)

An emergency stop should be set up in "Inputs/Sensors" – "Alarms" setting dialog. Emergency setup is shown below

Q	SYS PLC CFG		PORT I	CFG Q							P
	Preferences Profile N	Aacros PLC Builder	Axes/Motors	Inputs/Sensors	Technology	Network	Camera	5 axes RTCP	Panel/Pendant	Hardware	Advanced
	Alarms Limits Trigge	ers MPG through bi	nary inputs Jog	g through ADC inputs	I/O Expand	d cards mapp	oing AD	C Mapping			
\gg	Emergency Button 🗸	15 🗘 Norn	nally closed 👻	N							
8 h	X:Servo driver ready	11 🗘 Norn	nally closed 👻								
	X2:Servo driver ready	12 🗘 Norn	nally closed 👻								
mane	Y:Servo driver ready	13 🗘 Norn	nally closed 📼								
	Z:Servo driver ready	0 🗘 Norn	nally opened 👻								
3/0	A:Servo driver ready	0 🗘 Norn	nally opened 👻								
2	B:Servo driver ready	0 🗘 Norn	nally opened 👻								
	C:Servo driver ready	0 🗘 Norn	nally opened 👻								
and the second	Air Pressure	0 🗘 Norn	nally opened 👻								
	Gas Pressure	0 🗘 Norn	nally opened 👻								
	Oxygen Pressure	0 🗘 Norn	nally opened 👻								
	Coolant	0 🗘 Norn	nally opened 👻								
	Safety Switch	0 🗘 Norn	nally closed 👻								
	Motor Short Circuit	0 🗘 Norn	nally opened 👻								
	Spindle Driver Ready	0 🗘 Norn	nally opened 👻								
	Servo driver(s) Alarm	0 🗘 Norn	nally opened 👻								
(し											

If button is pressed Job running will be stopped, new run will be blocked, Alarm message displayed on the main screen



Job Start/Stop buttons

Inputs can be used as Hot Keys. Binary inputs IN14 and IN13 can be configured as "Start" and "Stop" keys in "Panel/Pendant" "Hardkeys" settings dialog. See inputs configuration o a picture below. To configure buttons press "+" button, select input number (13 or 14), select "Pressed" checkbox and choose Slots:

- "Job: Start running" for Start button
- "Job: Stop running" for Stop button



Outputs

Plasma ON

Plasma On signal used to turn ON plasma power source. Relay output or Open Collector output can be used as Plasma ON output. In this profile, We have reserved 2 outputs (open collector **OUTO** and relay output **(relay P4)** to generate Power ON signal to plasma power source.

Led to show PlasmaPower current state should be configured in cnc-screen.xml

```
<gitem type="led" where="led1-toolbar" orientation="horizontal"
    labelAlignment="right;vcenter" labelFontFamily="Arial" labelWidth="90"
    labelFontSize="12" labelFontStyle="bold" width="15" height="15"
    address="outputs" number="0" ledColor="red" inversion="no" >
    <message>Plasma Power</message>
```

<message_ru>AПP</message_ru> </gitem>

Output Number led attributes

OUT0

address="outputs" number="0" inversion="no" ledColor="red"



Output numbers for Plasma power source should be defined in PLC Builder, pins.h include file

pins.h

#define	OUTPUT_	PLASMA1	0
#define	OUTPUT	PLASMA2	15

External THC ON

In case built-in THC does not meet customer's requirements, output pin can be used to turn ON external THC. This pin can be used for ET6 control board which does not have built-in THC. In this example, we use an output **OUT14 (relay P3)** to turn ON/OFF external Torch Height Control (THC)

Led to show External THC state should be configured in cnc-screen.xml

```
<gitem type="led" where="led2-toolbar" orientation="horizontal"
    labelAlignment="right;vcenter" labelFontFamily="Arial" labelWidth="80"
    labelFontSize="12" labelFontStyle="bold" width="15" height="15"
    address="outputs" number="14" inversion="0" ledColor="blue" >
```

```
<message>THC</message>
<message_ru>Слежение</message_ru>
</gitem>
```

 Output Number
 Ied attributes

 OUT14
 address="outputs" number="14" inversion="no" ledColor="blue"



Output numbers for external THC should be defined in PLC Builder, pins.h include file

pins.h

#define OUTPUT_THC_EXT 14

Scriber

Optional Scriber can be used for marking operations. Scriber turned on by code M72 and turned off by M73. PLC procedures **M72.plc**, **M73.plc** should handle scriber turning ON-OFF. We use output **OUT13** (relay P2) to control a scriber.

Led to show Scriber state is configured in cnc-screen.xml

```
<gitem type="led" where="led3-toolbar" orientation="horizontal"
    labelAlignment="right;vcenter" labelFontFamily="Arial" labelWidth="110"
    labelFontSize="12" labelFontStyle="bold" width="15" height="15"
    address="outputs" number="13" inversion="0" ledColor="yellow" >
```

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```
<message>Scriber</message>
<message_ru>Маркировка</message_ru>
</gitem>
```

Output Number led attributes

OUT13 address="outputs" number="13" inversion="no" ledColor="yellow"

×

Output numbers for external THC should be defined in PLC Builder, pins.h include file

pins.h

#define OUTPUT_SCRIBER 13

PLC procedures for Scriber Marking On - M72.plc

M72.plc

```
#include pins.h
#include vars.h
main()
{
   timer=0;
   portset (OUTPUT_SCRIBER);
   //Wait 0.5sec till scriber ready to marking
   timer=500;do{timer--;}while(timer>0);
   exit(99);
};
```



PLC procedures for Scriber Marking Off - M73.plc

```
M73.plc
```

```
#include pins.h
#include vars.h
main()
{
    timer=0;
    portclr(OUTPUT_SCRIBER);
    //Wait 0.5sec till scriber move to parking position
    timer=500;do{timer--;}while(timer>0);
    exit(99);
};
```

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THC

Arc Voltage

Arc Voltage from Arc voltage divider is connected to ADC1 galvanic isolated input according to the first picture.

ADC1 channel should be configured as THC#1 feedback channel (THC#2...THC4 are reserved for Multi-Head Gas cutting machines).

Q	SYS PLC CFG		SUPPO	RT D	CFG								rest of the second seco
	Preferences Profile	Macros PL	C Builder	Axes/Moto	rs Inputs	s/Sensor	s Technology	Network	Camera	5 axes RTCP	Panel/Pendant	Hardware	Advanced
	PWM PIDs Plasma Cut	ting Cutch	arts THC	Lathe	Tools S	pindle	Gas/Oxyfuel	Multi Head	3D Printer	Multi-Device	MaxLaser	Laser control	Circular 🜗
	THC enabled THC feedback channel	V N	ADC0	AD	C0	▼ AE	DC0 -	ADC0	-				
	Arc Voltage Ref		ADC2	0		0		0					
	ADC/Voltage ratio		ADC3										
			ADC4										
1 mart	Alarm Move Up (if differe more than given value, a	ence between alarm detected	d (DC)	renc	e voltage	80	00						
20	THC Maximum Speed		(PULSE-DI	R)		Acc	eleration Ratio (2	20 by default)	50				
	THC Low Speed (Height control is suspended, when current speed lower value) 300												
	Alarm Arc Voltage Difference,V (If Differentce between Measured Arc Voltage and Reference is more than given value, THC is suspended for "THC delay") 300												
	Alarm Arc Voltage Rise, V (If Measured Arc Voltage Rise per 8ms is more than given value, THC is suspended for "THC delay" THC delay.s					30	0						
						0	0						
	Hi/Lo event output port 63 🗘 (*)Default port value is 63												
	THC PI-control P ratio				-8	10	-820						
	THC PI-control I ratio			-10	0	-10							
	THC pre-off,s	0.3		Cutt	ing pre-off,	s 0							
	Accept jog while THC activated			✓									
	Turn On THC Debug on U	JSB											
٢													

There are 4 parameters to monitor THC on the main screen:

- Arc Ref Reference Voltage for THC. THC measures actual Arc Voltage and controls torch height up and down to keep Arc Voltage equal to Reference Voltage. Reference voltage can be setup
 - Manually on the main screen by operator
 - From G-code
 - loaded from Cutcharts
 - THC can **measure actual Arc voltage** just after pierce finished and use it as a Reference.
- Arc Reference Adjustment variable is used to tune cutting height on the fly by changing Arc Reference value in a small range. Global Variable #7012 is used as Reference Voltage Adjustment. The sum of Arc Reference and Arc Reference Adjustment is used as THC reference. Potentiometer or rotary encoder can be connected to Adjustment variable #7012 for convenient Torch Height tuning while plasma cutting.
- Arc Voltage actual measured arc voltage display item should be attached to ADC channel used as THC Feedback (that's ADC#1 in out example).

THC parameters are shown in screenshot below



Reference Voltage display

A number of Global variables represent Voltage Reference for THC

- #7011 Reference Voltage
- #7012 Reference Voltage Adjustment
- #7013 A sum of #7011 and #7012 which is used as a complete THC Voltage Reference

Reference Voltage value can be changed either throgh

- Global Variable #7011 (button actions like cnc-gvariable-inc-7011, cnc-gvariabledec-7011) or
- CNC variable **0xa3** (button actions like **cnc-variable-inc-0xa3**, **cnc-variable-dec-0xa3**).

Display Item with Increment/Decrement buttons (**kspinbox**) setup for Reference Voltage is shown below

```
<gitem type="kspinbox" where="w-operate" K="#VARC" format="%3.1f"
action="cnc-variable-dec-0xa3;cnc-variable-inc-0xa3" name="display-
cnc-gvariable-7013"
bgColor="black" labelWidth="60" displayWidth="60" fontStyle="bold"
labelFontFamily="Arial"
fgColor="cyan" labelFontStyle="bold" format="%3.1f" height="60"
labelFontSize="12" orientation="horizontal">
<message>Arc Ref, V</message>
<message_ru>Onopa дуги, B</message_ru>
```

</gitem>

- Action action="cnc-variable-dec-0xa3;cnc-variable-inc-0xa3" to change raw Reference Voltage value
- Name name="display-cnc-gvariable-7013" to display the sum of Voltage Reference and Adjustment value
- **Ratio** K="#VARC" myCNC uses Reference Voltage in ADC units. Ratio "K" with named parameter "#VARC" is used to convert ADC units and display the value in **Volts**
- Format format="%3.1f" defines display format in C-like style

Reference Voltage Adjustment display

Simple display of Global Variable #7012 is used to show Reference Voltage Adjustment on the main screen

```
<gitem type="display" where="w-operate"
name="display-cnc-gvariable-7012" K="#VARC" format="%3.1f" height="30"
fontSize="20" fgColor="cyan" labelFontFamily="Arial" labelFontSize="12"
labelFontStyle="bold"
bgColor="black" labelWidth="120" displayWidth="120" fontStyle="bold"
orientation="horizontal">
<message>Arc Reference Adjustment, V</message>
<message_pl>Korekta napięcia, V</message_pl>
<message_ru>Подстройка опоры дуги, B</message_ru>
</gitem>
```

- Name name="display-cnc-gvariable-7012" to display Voltage Reference Adjustment value
- **Ratio** K="#VARC" myCNC uses Reference Voltage Adjustment in ADC units. Ratio "K" with named parameter "#VARC" is used to convert ADC units and display the value in **Volts**
- Format format="%3.1f" defines display format in C-like style

Arc Voltage display

Simple display of ADC input which is used as THC Feedback channel (ADC#1 in our example).

```
<gitem where="w-operate" type="display"
address="adc-inputs" number="1" K="#VARC" format="%5.1f"
bgColor="#202020" labelFontFamily="Arial" fgColor="red"
labelFontStyle="bold"
height="30" displayWidth="120" labelWidth="120" fontStyle="bold"
fontSize="20"
labelFontSize="12" orientation="horizontal">
<message>Arc Voltage, V</message>
<message_ru>Haпpяжение дуги, B</message_ru>
</gitem>
```

- **Type** type="display" defines "display" item.
- Address address="adc-inputs" set up the display to show one of ADC inputs value

- Number number="1" set up the display to show ADC1 value
- Ratio K="#VARC" convert ADC units to Volts
- Format format="%3.1f" defines display format in C-like style

Plasma Cutting Start/Stop Procedures

We offer to use M71 code as **Start Cutting** and M74 code as **Stop Cutting**. Codes M03/M05 are widely used to Cutting on and off also. We recommend to use this codes however any other codes can be selected and PLC procedures created and compiled in PLC Builder.

Plasma Cutting Start

A procedure for start plasma cutting is

- Probe material sheet (move Torch down till probe sensor pressed)
- Move Torch up to **Ignition Height**
- Turn Plasma Power ON, wait Arc ON sensor ready
- Move up to Pierce Height
- Wait Pierce Time
- Move down to Cutting Height
- Start Torch Height Control (THC)
- Start XY motion

M71/M03 procedure handles all this sequence, no extra programming needed in g-code



Code for Plasma Cutting start shown below

M71.plc

```
#include pins.h
#include func ihc.h
#include vars.h
main()
{
   timeout_plasma_ready=10000;
   timer=0;
   do plasma probe();
   do_move_ignition_height();
   portset(OUTPUT_PLASMA1);
   portset(OUTPUT PLASMA2);
   timer=5000; //wait up to 5secs till plasma arc ready
   do{
    timer--;
    a=portget(INPUT ARC);
    if (a!=0) { timer=0; };
   }while(timer>0); //pause
//doublecheck arc sensor
   a=portget(INPUT ARC);
   if (a==0)
   {
   message=PLCCMD TRIGGER2 ON;
   texit=timer+10;do{timer++;}while(timer<texit);</pre>
   exit(plc exit plasma fail);
   };
   do move pierce height();
   timer=ihc pierce time;
   do{timer--;}while(timer>0);
   do move cutting height();
   //start thc();
   if (thc enabled!=0)
   {
    //start THC control
    gvarset(7570, thc avc start); //THC #0 ON
    };
   //set OK message and exit
   proc=plc_proc_plasma;
   message=PLCCMD TRIGGER1 ON;
   timer=2;do{timer--;}while(timer>0);
```

```
message=PLCCMD_TRIGGER2_ON;
timer=2;do{timer--;}while(timer>0);
//set OK message and exit
message=PLC_MESSAGE_PLASMA_OK;
exit(99);
};
```

Functions do_plasma_probe, do_move_ignition_height, do_move_pierce_height, do_move_cutting_height are defined in "func_ihc.h" include file

func_ihc.h

```
/ start motion //flags
// bit 0 - absolute programming
// bit 1 - machine coordinates
// bit 7 - delayed start.
//axes mask
// bit 0 - X axis
// bit 1 - Y axis
// bit 2 - Z axis
// bit 3 - A axis
// bit 4 - B axis
// bit 5 - C axis
do_plasma_probe()
  gvarset(7080, ihc move down speed);//seet speed;
  if (ihc_enabled!=0)
  {
    message=PLCCMD TRIGGER2 OFF;
    texit=timer+5;do{timer++;}while(timer<texit);</pre>
    portset(OUTPUT PROBE);
    timer=200; do{ timer--; }while (timer>0);
    sens=portget(INPUT IHC);
    if (sens==0)
    {
    gOmoveA(0x0,0x4,0-30000);//Z axis,
    timer=200; do{timer--;}while(timer>0);//wait till motion started
    do
    Ł
      code=gvarget(6060);
      sens=portget(INPUT_IHC);
      if (sens!=0)
      {
       code=1;
```

```
message=PLCCMD LINE STOP;//skip line
      };
      }while (code==0);
      do { code=gvarget(6060); }while(code!=0x4d);//wait till motion
finished
   };
  }:
  portclr(OUTPUT_PROBE);
};
do move ignition height()
{
  gvarset(7080,3000);//seet speed;
  if (ihc enabled!=0)
  {
    ihc current height=ihc correction height+ihc ignition height;
    if (ihc current height>5)
    {
      gOmoveA(0x0,0x4,ihc current height);//Z axis, ignition height
      timer=200;do{timer--;}while(timer>0);//wait till motion started
      do { code=gvarget(6060); }while(code!=0x4d);//wait till motion
finished
   };
 };
};
do move pierce height()
  ihc current height=ihc pierce height-ihc ignition height;
  if (ihc current height>5)
  {
    gOmoveA(0x0,0x4,ihc current height);//Z axis, pierce height
    timer=200;do{timer--;}while(timer>0);//wait till motion started
    do { code=gvarget(6060); }while(code!=0x4d);//wait till motion
finished
};
};
do move cutting height()
  ihc current height=ihc cutting height-ihc pierce height;
  if (ihc current height<(0-5))
  {
    gOmoveA(0x0,0x4,ihc current height);//Z axis, cutting height
    timer=200;do{timer--;}while(timer>0);//wait till motion started
    do { code=qvarget(6060); }while(code!=0x4d);//wait till motion
finished
 };
};
```

How to disable Arc ON input

It is highly recommended to use Arc ON signal from Plasma power source and connect it to ET7 controller Arc ON input to get correct feedback about current plasma state. Cutting will be started just after Arc Plasma ready and stopped in case of plasma fail.

However Arc ON signal can be disabled in case you don't want to use it.

There is 3 simple methods how to do it. You can use any of it.

- (Method 1) Just short Arc ON input on ET7 control board. To do it you need
 - 1. Short J1 to power up binary inputs IN0...IN3
 - 2. Connect INO pin to GND (any of GND pins can be used, please see photo as an example)
 - 3. Check on-board LED correspondant to INO is ON



4. check if software LED on Diagnose widget is activated



• (Method 2) Invert Binary input #0 in **Common Hardware Settings** dialog, then check it on Diagnose widget or in the main screen

Q	SYS CFG	SUPPORT E										rest of the second seco
	Preferences Profile Macros PL	C Builder Axes/Motors Inputs/Sensors	Technology	Networ	rk Cam	era 5 a	axes RTCF	Pane	l/Pendant	Hardwa	ire A	dvanced
<u> </u>	Common Hardware Settings Encoders Analogue Closed Loop Pulse-Dir Closed Loop ET2/ET4											
	Output bits inversion	0-15 0 1 2 3 4 5 6 7 8 9 10 1 32-47 32 33 34 35 36 37 38 39 40 41 42 4	.1 12 13 14 3 44 45 46	15 16 1 47 48 4	7 18 19 9 50 51	20 21 22 52 53 54	23 24 2	5 26 27 0 0 0 7 58 59	28 29 30 60 61 62	31 15-31 63 48-63		
H	Input bits inversion	0-15 0 2 3 4 5 6 7 8 9 10 1			7 18 19	20 21 22	23 24 2	5 26 27	28 29 30	31 16-31		
		32-47		4/ 48 4						48-63		
3	ADC inputs inversion			0	1	2	3	4	5	6	7	
SK	Pulse width	3 * 0 *	ET1	0.32 us	0.64 us	2 0.96 us	1.28 us	4 1.60 us	1.92 us 2	2.24 us 5	.0 us	
<u>~~</u> C	Pulse format	PULSE/DIR -	ET3	0.16 us	0.32 us	0.48 us	0.64 us	0.8 us	0.96 us	1.12 us 2	.5 us	
	UART2 setup	External myTHC -	ET6, ET7	0.13 us	0.25 us	0.50 us	1.0 us	2.0 us	4.0 us	8.0 us	12 us	
The particular	Command Buffer Size	8k (firmware before 2015-11)	EIIO	0.13 us	0.25 US	0.50 US	1.0 US	2.0 us	4.0 US	8.0 us	to us	
	ET7/ET10 Overspeed bugfix											
C												



• (Method 3) Remove the following pieces of code for the M71.plc source, then save, rebuild and send the binary files (press 3 buttons on the right of **PLC Builder** screen.

```
timer=5000; //wait up to 5secs till plasma arc ready
do{
   timer--;
   a=portget(INPUT_ARC);
   if (a!=0) { timer=0; };
}while(timer>0); //pause
//doublecheck arc sensor
a=portget(INPUT_ARC);
if (a==0)
{
   message=PLCCMD_TRIGGER2_ON;
   texit=timer+10;do{timer++;}while(timer<texit);
   exit(plc_exit_plasma_fail);
};</pre>
```

and

message=PLCCMD_TRIGGER1_ON; timer=2;do{timer--;}while(timer>0);

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Permanent link: http://docs.pv-automation.com/examples/plasma-1024p

Last update: 2022/03/29 15:54

