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# **Modbus Setup**

This article is designed to introduce the reader to the myCNC Modbus setup, as well as serve as the main reference point for all myCNC Modbus documentation.

### I/O expand cards mapping

The transparent mapping of Modbus inputs/outputs can be done through the **I/O Expand cards mapping** window in Settings > Config > Inputs/Outputs/Sensors. In this part, the focus will be on expanding the number of inputs/outputs in a standard myCNC controller using a WELLPRO Modbus device. This process provides the user with a way to easily add 8 more inputs and 8 more outputs per Modbus device connected, allowing to connect more peripherals to the myCNC controller.

NOTE: In order for the Modbus device to connect properly, the "RS485/Modbus communication" checkbox should be UNCHECKED in the Config > Technology > Mill/Lathe > Spindle configuration dialog

Info Support Camera Config C	SAVE CE
CNC Settings	Spindle Speed from 1/Min_Max_Step) 100 - 100 -
Motion	
▼ PLC	Spindle Overspeed, [%] (Min, Max, Step) 1 1
Hardware PLC	Encoder channel Not used
Hardware PLC Templates	
Hardware PLC: XML configs	Encoder pulses per revolution 1
PLC Configuration	Voltage offset units
Software PLC	
DVE import settings	Voltage ratio, units 1
Macro List	RS485/Modbus communication
Macro Wizard	
Probing Wizard	
▼ Preferences	R5485 speed 9600 V
Common	
Start/Stop	
Shape Library Settings	Inverter Address 🙀 7 🔶 🙀 -1 🔶 🙀 -1 🔶
▼ Screen	Inverter Modbus address should be 16 or more. Addresses 015 reserved
Colors	for Non-Modbus devices.
Popup Messages	Messages: 💑 Exceptions: 💑
3D Visualisation	Write registers
Work Offsets	
Tachnalam	WR/Operate 🔀 8192 😴 Send
<ul> <li>Rechnology</li> <li>Blasma Cutting</li> </ul>	WR/Frequency 🔀 8193 🔶 Send
Gas/Oxyfuel	Bood sovietser
Cutcharts	
тнс	RD/Drive Status 🔀 8448 🚖
▼ Mill/Lathe	RD/Fault Content 😿 8449 📥
Spindle	
Tools	RD/Frequency reference 🔀 8450 🚖
ATC Pots	RD/Output frequency 18451
Lathe	
Multi Head	RD/Output current 🔀 🛿 🛃 🔄

Upon opening the I/O settings, the following window is presented to the user:

Info Support Camera Config							
CNC Settings		Device	e Id	<b>.</b>	. 1	Destination	
Axes/Motors	Mapping device	(Modb	us)	Source port		port	
<ul> <li>Inputs/Outputs/Sensors</li> </ul>	Modbus/Coil Input expansion	34	÷	0 4		2 🔺	×
X-Alarms							
Limits	Modbus/Coll Output expansion	34	▼	2 _		• –	~
Triggers/Timers							
MPG through binary inputs							
Jog through ADC inputs	0 0 0 0 0 0 0 0 0 0 8 0 0 0	000	0001	5			
I/O Expand cards mapping	16 0 0 0 0 0 0 0 24 0 0	00	9 🛛 🔿 3	1			
ADC Mapping	32 0 0 0 0 0 0 0 0 40 0 0			7			
Network	48 0 0 0 0 0 0 0 56 0 0 0	000	0006	3			
Motion	64 0 0 0 0 0 0 0 72 0 0 0	000	0007	- 0			
▼ PLC		000		5			
Hardware PLC	8000000000 88000	000	0009	5			
Hardware PLC Templates	96	000	0001	11			
Hardware PLC: XML configs	112 120	000	0001	27			
PLC Configuration	128 🔍 🔍 🔍 🔍 🔍 🔍 🔍 🔍 136 🔍 🗬	000	0001	43			
G-codes settings	144 🛛 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓		001	59			
DXF import settings	0000000000 8000	000		5			
Macro List	16 0 0 0 0 0 0 0 24 0 0	000	0003	1			
Macro Wizard	32 0 0 0 0 0 0 0 0 0 0 0 0	000	0004	7			
Probing Wizard		0.00	000	2			
Preferences	48 0 0 0 0 0 0 0 0 0 0 0 0 0			3			
Work Offsets							
Parking Coordinates							
<ul> <li>Technology</li> </ul>							
Plasma Cutting							
Gas/Oxyfuel							
Cutcharts							
THC							

In this window, the following settings can be edited:

#### Mapping device

For now, the focus will be on coil input/output expansion, which can be seen selected in the screenshot above. Therefore, Modbus/Coil Input expansion and Modbus/Coil Output expansion will be chosen in the Mapping Device selection.

#### **Device ID**

Device ID can be changed using PLC procedures using gvarset (60010,DEVICE ID); as described in PLC/Modbus API. If the device ID is unknown, the user can either switch it using the PLC procedure, or try to go through the possible Device IDs (0 through 255). The device ID has been previously assigned to be 34 in case of this example.

#### Source Port

Source port is usually chosen to be 0 for Input, as the count typically starts from zero on the Modbus device. This will signify the port from which the inputs are "carried into" the system. The way the ports are organized in the software is as follows:

Imputs/Outputs/Sensors   Axes/Motors   inputs/Outputs/Sensors   Alarms   Limits   Triggers/Timers   M6dbus/Coil Unput expansion   Jg through ADC inputs   Jog through ADC inputs   Jog through ADC inputs   Jog through ADC inputs   Connections   Network   Hardware PLC   <	Info Support Camera Config		
Modbus/Coil Juts/Sensors   Alarms   X-Alarms   Limits   Triggers/Timers   MP6 through binary inputs   Jog through ADC inputs   I/O Expand cards mapping   ADC Mapping   Connections   Network   Motion   * PLC   Hardware PLC   Hardware PLC Templates   Hardware PLC Templates   Hardware PLC Templates   Hardware PLC Settings   Out List   112   0   128   0   128   0   128   0   128   0   128   0   128   0   128    136   144   128   128   136   144   136   128   128   136   136   136   137   138   139   130   131   132   133   134   134   144   136   136   136   136   137   138   139   130   131   132   133   134   134   135   136   137   138   139   131   131 <td< th=""><th>CNC Settings</th><th>Mapping device Device Id (Modbus) Source port Destination port</th><th>-</th></td<>	CNC Settings	Mapping device Device Id (Modbus) Source port Destination port	-
Avairns   Limits   Triggers/Timers   MP6 through binary inputs   jog through ADC inputs   Toto Repring   ADC Mapping   BOD Go	<ul> <li>Inputs/Outputs/Sensors</li> </ul>	Modbus/Coil Input expansion 💎 34 🔶 0 🔶 2 🔶 🗶	
Limits   Limits   Triggers/Timers   MG0Duls/Coll Output expansion   Jack Mapping   Connections   Network   Motion   * PLC   Hardware PLC   Hardware PLC   Hardware PLC   Biology   PLC Configuration   Hardware PLC   Biology   PLC Configuration   Hardware PLC   Biology   Proteinguration   Screen   Work Offsets   Parking Coordinates   * Technology   + Plasma Cutting   Gover function	Alarms X-Alarms		
Triggers/Timers MPC through binary inputs jog through ADC inputs <ul> <li>Image: Connections</li> <li>Image: Connections</li></ul>	Limits		
MFG through binary inputs jog through ADC inputs       0	Triggers/Timers		
Jog through ADC inputs       0 <th>MPG through binary inputs</th> <th></th> <th></th>	MPG through binary inputs		
VO Expand cards mapping         ADC Mapping Connections         Network         Motion         * PLC         Hardware PLC         Hardware PLC         Hardware PLC         Hardware PLC         B0       0         96       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         120       0         121       0         122       0         123       0         0       0         0       0         128       0         128       0         129       140         120       0         120       0         <	Jog through ADC inputs		
ADC Mapping Connections       32       40       47         Network       48       56       63         Motion       64       72       63         + PLC       80       88       95         Hardware PLC       80       88       95         Hardware PLC Configuration       120       121       111         Hardware PLC Configuration       128       136       120       143         Software PLC       128       88       152       143         Macro Wizard       16       24       159       159         DXF import settings       0       24       31         Macro Wizard       16       24       31         Preferences       48       56       63         Screen       48       56       63         Work Offsets       Parking Coordinates       56       63         * Technology       + Plasma Cutting       56       56       63	I/O Expand cards mapping		
Connections       0.2       2.6       0.4       0.4         Network       48       0.4       56       0.4       63         Motion       64       0.4       72       0.4       79         PLC       80       0.4       88       0.4       95         Hardware PLC       80       0.4       104       0.4       111         Hardware PLC: XML configs       96       0.4       120       0.4       111         Hardware PLC       96       0.4       120       0.4       111         Hardware PLC       112       0.4       120       0.4       114         Software PLC       112       0.4       0.4       144       114         Software PLC       144       0.4       0.4       159       159         DXF import settings       0.4       0.4       0.4       154       16       0.4       154         Macro Vizard       32       0.4       0.4       0.4       0.4       154       16         Probing Wizard       32       0.4       0.4       0.4       0.4       154       16         Vork Offsets       9       16       0.4       0.4	ADC Mapping	37	
Network       48       30       50       50       50         Motion       64       72       60       79         PLC       80       88       95         Hardware PLC       96       96       104       95         Hardware PLC       96       96       104       95         Hardware PLC       96       96       104       96       95         Hardware PLC       96       96       104       96       111         Hardware PLC       96       96       120       96       127         PLC Configuration       128       96       136       96       143         Software PLC       144       96       152       96       159         DXF import settings       0       9       88       9       9       31         Macro Uizard       32       9       40       9       9       31         Macro Wizard       32       9       9       6       63         Screen       48       9       9       6       63         Work Offsets       9       9       9       9       9         Paking Coordinates <td< th=""><th>Connections</th><th></th><th></th></td<>	Connections		
witchin       64       64       72       72       79         PLC       80       80       88       95         Hardware PLC       96       96       96       95         Hardware PLC Templates       96       96       104       95         Hardware PLC Templates       96       96       104       95         Hardware PLC Templates       96       96       104       96       111         Hardware PLC Templates       96       96       120       96       127         PLC Configuration       128       96       126       96       143         Software PLC       144       96       152       96       143         Macro Vizard       128       96       124       96       143         Macro Vizard       32       96       40       96       31         Macro Vizard       32       96       40       96       63         Screen       48       96       96       63         Work Offsets       9       96       96       96       96         Parking Coordinates       7       7       7       7         * Technology <t< th=""><th>Network</th><th>48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</th><th></th></t<>	Network	48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Hardware PLC       80       88       88       95         Hardware PLC Templates       96       96       104       95       111         Hardware PLC Templates       96       96       104       96       111         Hardware PLC SML configuration       112       96       120       96       127         Software PLC       128       96       136       96       143         G-codes settings       144       96       152       96       159         DXF import settings       0       96       24       96       31         Macro List       16       96       40       97       47         Preferences       48       96       63       63         Screen       Work Offsets       9       63       63         V Technology       Plasma Cutting       65       63       63		64 • • • • • • • • • • • • • • • • • • •	
Hardware PLC Templates       96       <	Hardware PLC	80 @ @ @ @ @ @ @ 88 @ @ @ @ @ @ @ 95	
Hardware PLC: XML configs       112       120       120       127         PLC Configuration       128       136       143         Software PLC       128       144       159         DXF import settings       0       8       159         DXF import settings       16       24       15         Macro Uizard       32       24       16       31         Probing Wizard       32       40       40       47         Preferences       48       56       63         Screen       Work Offsets       63         Parking Coordinates       7       7         Parking Coordinates       65       63         Parking Coordinates       65       63	Hardware PLC Templates	96 😡 🛛 🖉 🖉 🖉 🖉 104 🗠 🖓 🖓 🖓 🖓 🖓 🖉 111	
PLC Configuration       128       136       143         Software PLC       144       152       143         G-codes settings       144       152       159         DXF import settings       0       8       15         Macro List       16       24       31         > Macro Wizard       32       40       31         > Probing Wizard       32       40       47         > Preferences       48       56       63         > Screen       Work Offsets       56       63         Parking Coordinates       7       7         > Plasma Cutting       6       63	Hardware PLC: XML configs	112	
Software PLC       120       120       150         G-codes settings       144       152       159         DXF import settings       0       24       159         Macro List       16       24       31         Macro Wizard       32       40       31         Probing Wizard       32       56       63         Screen       48       56       63         Work Offsets       9       65       63         Parking Coordinates       7       7         * Technology       >       >       >         > Plasma Cutting       6       6       6	PLC Configuration	128	
G-codes settings       144       152       159         DXF import settings       0       8       15         Macro List       16       24       31         Macro Wizard       32       40       47         Proferences       48       56       63         Screen       Work Offsets       8       63         Parking Coordinates       7       7         * Technology       +       8       6         > Plasma Cutting       6       6	Software PLC		
DX import settings       0       8       6       15         Macro List       16       24       31         Macro Wizard       32       40       47         Probing Wizard       32       66       63         Screen       Work Offsets       63         Parking Coordinates       7       7         Parking Coordinates       65       63         Vertice       65       63	G-codes settings	144	
Macro Wizard       16       24       31         Probing Wizard       32       40       47         Preferences       48       56       63         Screen       Work Offsets       63         Parking Coordinates       7       7         Plasma Cutting       65/0004/001       63	DXF import settings	0 8 15	
Probing Wizard     32     32     40     47       Preferences     48     56     63       Screen     Work Offsets       Parking Coordinates       * Technology       > Plasma Cutting       6 or Cowrdinal	Macro List	16 • • • • • • • • • 24 • • • • • • • • •	
<ul> <li>&gt; Preferences</li> <li>&gt; Screen</li> <li>&gt; Work Offsets</li> <li>&gt; Parking Coordinates</li> <li>&gt; Technology</li> <li>&gt; Plasma Cutting</li> <li>Gord/Ownfuel</li> </ul>	Probing Wizard	32 • • • • • • • • • 40 • • • • • • • • •	
<ul> <li>&gt; Screen Work Offsets</li> <li>Parking Coordinates</li> <li>▼ Technology</li> <li>&gt; Plasma Cutting</li> <li>Cord Control</li> </ul>	<ul> <li>Preferences</li> </ul>	48 • • • • • • • 56 • • • • • • 63	
Work Offsets Parking Coordinates	▶ Screen		
Parking Coordinates	Work Offsets		
✓ Technology	Parking Coordinates		
Plasma Cutting     Gasciowing	<ul> <li>Technology</li> </ul>		
	Plasma Cutting Gas (Onvirtual)		
Gas/OAyuet	Gas/Oxyruei		
THC	THC		

As can be seen in the screenshot above, each port consists of 8 inputs, which are grouped together. These groups are numbered from 0 up.

#### **Destination port**

Destination port is the port to which the inputs are sent to. There is a number of assigned "virtual" ports in myCNC software which do not typically correspond to any physical ports on the controller itself. These virtual ports can therefore be assigned to the Modbus device for it to send its inputs to. In such a way, for m Inputs expansion, the Source port can be set to 0 to correspond to the Modbus configuration, and the Destination port can be set to 2, 3, 4, etc in order to "fill" one of the virtual ports in myCNC software.

#### Input/Output behaviour switch

NOTE: The above description for the source/destination Input ports setup is reversed for the Outputs expansion. In the Modbus/Coil Output expansion, the Source port is the myCNC software virtual port, and the Destination port is the Modbus device. Therefore, the Source port for and Output expansion can be set to 2, 3, 4, etc, while the Destination port would be set to 0 to correspond to the numbering on the Modbus device (the source is the host/controller, while the destination is the Modbus rather than the other way around here).

Info Support Camera Config		
CNC Settings	A Device Id Source port Destination	
AXes/Motors	(Modbus) (Modbus) port	
Alarms	Modbus/Coil Input expansion 👻 34 🔶 0 🔶 2 🔶 🗶	
X-Alarms		
Limits		
Triggers/Timers		
MPG through binary inputs		
Jog through ADC inputs	0 0 0 0 0 0 0 0 0 8 0 0 0 0 0 0 0 15	
I/O Expand cards mapping	16 • • • • • • 24 • • • • • • 31	
ADC Mapping	32 0 0 0 0 0 40 0 0 0 0 0 47	
Connections		
Network	48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Notion	64 • • • • • • • 72 • • • • • 79	
Hardware PLC	80 0 0 0 0 0 0 0 0 88 0 0 0 0 0 0 0 0 95	
Hardware PLC Templates	96	
Hardware PLC: XML configs	112 0 0 0 0 0 0 120 0 0 0 0 0 0 0 0 127	
PLC Configuration		
Software PLC	128 0 0 0 130 0 0 0 143	
G-codes settings	144 🗢 🗢 🗢 🗢 🗢 🗢 152 👄 🗢 🗢 👄 👄 👄 单 159	
DXF import settings	0 0 0 0 0 0 0 0 0 0 8 0 0 0 0 0 0 0 0 15	
Macro List	16 0 0 0 0 24 0 0 0 0 31	
Macro Wizard	32 0 0 0 0 0 40 0 0 0 0 0 0 0 47	
Probing Wizard		
Preferences	48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Screen Work Offsets		
Parking Coordinates		
Technology		
<ul> <li>Plasma Cutting</li> </ul>		
Gas/Oxyfuel		
Cutcharts		
тнс	-	

This inversion results from the Source and Destination being effectively flipped when using input/output ports via a Modbus. With inputs, the source is the Modbus device, while with Outputs, the source is the host computer/controller.

Using the I/O Expand cards mapping window allows for a guaranteed signal delivery even if the Modbus device was turned off when the initial signal was sent (for example, when changing the Binary Outputs status from OFF to ON in the System Diagnostics window). However, a certain amount of latency (up to 100-200 ms) is introduced, as the system has to regularly loop through and check for the inputs/outputs on the Modbus device. Therefore, using I/O expansions via a Modbus device is recommended on systems which are less time-critical.

**NOTE:** The latency becomes larger when more mapping devices are introduced, as the system loops through each such device one at a time.

### Using Modbus through PLC commands

The instructions for using PLC commands for a Modbus device can be found in the PLC/Modbus API article. As compared to the I/O expansion procedure through the Config settings, PLC commands eliminate the latency. However, the PLC method of using a Modbus device does not allow for device downtime, as is the case with the I/O method.

### Using Modbus through Software PLC

The Host Modbus API is designed to be used with Software PLC. This allows to connect the Modbus device directly to the host computer through a USB port. This is a slower process than the Hardware PLC described above, however it is well-suited for repeated tasks which have to be constantly running, as it allows to offload the task from the controller onto the host computer.

## Modbus Devices available

The detailed description of the available Modbus devices is located at the Modbus Devices page.

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