





Two Axis Real

# **Project Description**

In this lesson we will convert a two axis virtual motion project to work with real motors. The best way to use this lesson is as a follow-up to the Virtual Two Axis motion lesson.

Please create a virtual two axis project as shown in the Virtual Two Axis motion lesson.

We begin with an open and tested virtual two axis project.

# **Convert the Project to Real Axes**

Close the HMI window and the two virtual axes windows. Click the Close C&M Application button, to stop the application. Click Project and Options to open the options tab box and click the Desktop options tab.

Click&Move Desktop- C:\CandM\Working_5_2_5\Projects\SimpleCircle	
File Project Run Interface Virtual machine Collected C&M application Tools Settings	Window Help
Build (compile only latest changes)         Rebuild (compilete recompile)         Delete C&M generated files	Target platform : PCW
Open XML property file editor Validate all property and config XML files Open HTML project description file Open HTML FB help file	Project options - Target platform: PCW         X           Target platform         Desktop options         Debugger options         Target properties         Load path
Replace FBD editor (Eagle) settings with defaults My N PV Options Options	Autosave layout     Component selection for Hun all menu item       Desktop menu     Vittual machine       Debugger     TwoAxes
Click this menu item, select a tab and press F1 for help. Recycle Bin Co. The topics in this chapter describe various project specific settings.	Debugger viewer     Image: C&M Application     Image: C&M-Min-HMI       Image: Mindow     Image: C&M Application     Image: C&M-Min-HMI       Image: Mindow     Image: C&M Application     Image: C&M-HMI
	🗖 Debugger 🗖 Project viewer
	Build options
	Auto-generate package from project after compilation     With C&M-Min-HMI C Without C&M-Min-HMI
Uncheck the virtual Axes box	Auto-upload package to target after compilation
and click the 'OK' button.	Set default Apply
	OK Cancel Help

Click Project, Open XML property file editor.



The XML file window opens with 3 panes. The right side pane lists files automatically generated by C&M. Files in the right side pane are overwritten each time the project is rebuilt. The middle pane lists XML files manually configured for the project. We need to move three configuration files to the middle pane and edit them. To move a file, click on it and then use the < button. Move the "Ccom1.prop.xml, Ax1.prop.xml and the Ax2.prop.xml files to the middle pane.



Click the file open icon, to open the XML file window.

C:\	Canfia	Generated\Config
CandM Working_5_2_5 Projects SimpleCircle Config		Image: Control of the second control of the secon
Help Cancel	Edit Save as De	lete View

#### Two Axis Motion ProjectADVANCED Motion Controls

Open the Ccom1.prop.xml with a double click. When the editor opens click on Initial Data in the left side pane. The computer used to create this lesson has PCI CAN, your selections may differ due to installed hardware.

Change the attribute values as follows:

AdaptorName	· CANAdaptorKavaser
CardId	PCICan #0(channel0)
Port	0
Baudrate	1000
SendTimeoutMessage	1



Click the close file icon,



and save the changes.

File

Double click on Ax1.prop.xml to open the axis 1 property xml file, then click on Initial Values.

Change the following attributes:

- Node Id ----- 1
- Movement Type ----- Linear
- Pos.Tech.UnitsNumer ----- 1
- Pos.Tech.UnitsDenom ---- 8000
- HandwheelModeEnabled NO

NOTE: Position Technical Units Numerator is 1mm linear travel for one revolution of the motor. Position Technical units Denominator is 8000 encoder counts per revolution of the motor.

Close and save the file.

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ndMoveFunctionBlock	Attribute Name	Attribute Value
	Nodeld	1
	MovementType	Linear
	UnderflowPosition	·16777216
	OverflowPosition	16777215
	PositionTechnicalUnitNumer	1
	PositionTechnicalUnitDenom	8000
	MinPosition	.16777216
	MaxPosition	16777215
	MaxVelocity	100000
	MaxAccel	10000
	MaxDecel	10000
	MaxJerk	10000
	ParameterRefreshTime	0.05
	TrajectoryGeneratorStepTime	0.01
	ConfidEile	Default
	HanduhaalMadaEnablad	
	Tranuwi icelimi uucunauleu	INU 🗾
	InitialData help	Nodeld help
AXIS Refer - If ar (given limits error	_CO FB representing a CANopen "Axis rence" data structure, Instance name AXx, sy value of the commanded motion profile nin Technical Units is out of set Mir/Max then the active function block will produce an output.	Node identifier. The Nodeld attribute can be a numerical value (integer) or "Default" text. The entered numerical value will be the Nodeld. If Default is entered then the Nodeld will be the numeric value at the end of the XVS_CD FBs instance name (e.g. AX3). If there is no numerical value then the Id is indeterminable, and the FB will produce an error output. For example: If Instance Name = Ax3, then Nodeld = 3
	V	

Double click on Ax2.prop.xml to open the axis 2 property xml file, then click on Initial Values. Change the following attributes: Node Id ------ 2 Movement Type ------ Linear Pos.Tech.UnitsNumer ----- 1 Pos.Tech.UnitsDenom ---- 8000 HandwheelModeEnabled - NO Close and save the file.

NOTE: Position Technical Units Numerator is 1mm linear travel for 1 revolution of the motor. Position Technical units Denominator is 8000 encoder counts for 1 revolution of the motor.

(8000 counts / mm)

XML Editor - C:/CandM/Workin	a 5 2 5/Projects/SimpleFircle/Config/Doot1 FN	4Main1 IId1 Av2 nron ym
le Edit	g_a_z_a/Projects/simplecificle/coning/Root1.ch	
y 📴 🗀		
• 🕴 🖸 📓 🗙 🖻 🛍	<b>B</b> X	
<ul> <li>ClickAndMoveFunctionBlock</li> <li>InitiaData</li> </ul>	Attribute Name	Attribute Value
	Nodeld	2
	MovementType	Linear
	UnderflowPosition	·16777216
	OverflowPosition	16777215
	PositionTechnicalUnitNumer	1
	PositionTechnicalUnitDenom	8000
	MinPosition	-16777216
	MaxPosition	16777215
	MaxVelocity	100000
	MaxAccel	10000
	MaxDecel	10000
	MaxJerk	10000
	ParameterRefreshTime	0.05
	TrajectoryGeneratorStepTime	0.01
	ConfigFile	Default
	HandwheelModeEnabled	NO
	InitialData help	Nodeld help
	AXIS_CUT BF representing a CANopen "Axis Reference" data structure, Instance name AXx, Notes: -1f any value of the commanded motion profile (given in Technical Units) is out of set Min/Max limits then the active function block will produce an error output.	Node identitier. The Nodeld attribute can be a numerical value (intege) or "Default" (text. The entered numerical value will be the Nodeld. If Default is entered then the Nodeld will be the numeric value at the end of the AVIS_COT PBs instance name (e.g. AV3). If there is no numerical value then the Id is indeterminable, and the FB will produce an error output. For example: If Instance Name = Ax3, then Nodeld = 3
		<u> </u>
		1.

# **Test the Project using Real Axes**

Rebuilding the project is not required after changing the content of the xml files. Click the Run All button, (the large triangle) to launch all components of the project at the same time. Upon starting the project CAN communication is established with the drives, wait for the flashing text under the reset button. Once communication is established, we can power up the drives.



Click the Power button to power up the drives and bring them to ready standby condition. Enter a target position into the Target Position window and click the Start button. The the motors will spin and stop when the Actual Position matches the Target Position.

# Add Controls to the Project

Let's add controls to set the position and velocity of each axis. Click the Open Edit icon and select the main schematic. Click the Add Library Element button and select INPUT from the list of Basic Elements. Click the 'OK' button to add inputs to the schematic.

CAUTION: Do Not Click the DROP button, it will remove the selected item from the library!!





With each click of the mouse an input is placed on the schematic, I added 3 inputs at the top center of the drawing. Click the ESCAPE key twice to exit the add mode.

Now lets make some room to add our new connections, Set the editor to move mode with the MOVE button  $\checkmark$ . Use the left mouse button to drag objects one at a time. To move multiple objects click the GROUP button in and draw a rectangle around the group of objects. Use a right click of the mouse to display options and select 'Move Group'. The group will follow your mouse pointer, just left click the mouse to place them. I moved the MC1 and MC2 blocks to the right.





Use the delete objects tool  $\times$  to put the editor in delete mode and delete the connection to POSITION on MC2. Click the add connection tool  $\bigcirc$  and connect the inputs we added to the position and acceleration inputs of the MC1 and MC2 blocks. Left click the mouse to start the line and additional left clicks to anchor corners. When you click on the end of a pin to make the connection, the line is done.



Click the info button i to display information about selected objects. Click on one of the inputs we added and set the name to match the connection to the motion blocks. Enter the names in the VALUE field. Do not use spaces in the names, we use all upper case letters and under scores to separate the words. Rename the original POSITION input to AXIS1\_POSITION.



Close the schematic and save the changes. Click the build changes icon, it will save some time building only the changes we made to the project. After the build completes, click the load and run C&M HMI button, to load and run the HMI. Expand the HMI to full screen size. The screen should appear as shown below. If parts of the screen are missing use the indicated function keys to toggle the display.



Click the edit component icon, a to put the HMI into edit mode. The screen should appear as shown below. If parts of the screen are missing use the indicated function keys to toggle the display.



We will move and add some controls to the display. To select an object on the screen use a single left mouse click. A selected object can be moved with a left press of the mouse button, dragging to the new location and releasing the mouse button. Some objects can be resized, you can display the size controls with a right click of the mouse on a PREVIOUSLY SELECTED object. Move the compile image warning text block down to make some room for our new controls.



Draw a rectangle around the position controls by pressing the left mouse button and dragging.	Setting up axes	Power Start	Actual Position 0.00 rev
When the mouse button is released, the controls will be high- lighted. Note that 3 items are highlighted	Setting up axes	Power       Start         Target Position       1.00	Actual Position 0.00 rev



Click on the Edit tab located on the inner edit window and choose 'Duplicate'.

Setting up axes	Power Start	
	Target Position 1.00	Actual Position 0.00 rev

New highlighted controls are added to the HMI. Move the mouse over the highlighted controls and use the left mouse button to drag them to a new location. Click a blank space on the screen to deselect the controls.



	Target Position 100			Actual Position 0.00	rev
1	Target Tositon 1.00	Y			_
	Target Position 1.00	×		Actual Position 0.00	rev
i					
Properties Events	►	<b>1</b> 2	5 <b>F</b>	UD1:UD "Target P	ositi
□ Identification		2	:6	BEGIN	
Name UD1		2	8	Position= NumberFormet=	29.5 Deck
🗆 Assian		2	9	Hint=	"Ent
Variable • M.POSITION		3	0	END	
		3	1 🗗	BM2:BM 4002,4.25	,-4.5
E Position 29,5,66	A	3	12	BEGIN	
Prompt I Target Position		3	3	Position=	2,89
		3	4	TxBkgndColor=	Menu
		3	6	Hint=	"Vie
		3	7	Click	exed
Prompt color = Black	· · · · · · · · · · · · · · · · · · ·	3	8	END	
	· · · · · · · · · · · · · · · · · · ·	3	9 Ē	TX1:TX "Actual P	ositi
E Font MS Sans Serir ,8,0,0		4	10	BEGIN	
Justification Left,Bottom,False		4	1	Position=	54.5
Step up-dov = 1				END DME.DM 4210 0 E .	4 5
Style csDefaults	· · · · · · · · · · · · · · · · · · ·		13 Er 14	BEGIN	-1.5,
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Border - 🗹 True		4	16	TxBkgndColor=	M.PC
Shadow - 🗹 True	· · ·	4	17	Cursor=	crPo
Visible • 🗹 True	· · ·	4	18	Hint=	"Tur
DefaultMin - 0	\$	4	19	Click	M.EN
DefaultMax - 100	*		10 -	END	
Dumber format Packpad,2,16			12 E	NH1:NH M.AXIS1 A	ст ро
		5	33	BEGIN	~ ĭ
Enable • 🗹 True	· · ·	5	54	Position=	65,6
🗆 Audit Trail		5	5	TxBkgndColor=	56
		5	56	NumberFormat=	Righ
UD1.Prompt		-1		FND	

Left mouse click the upper left control box to select the control. The property window in the lower left side of the screen will display the properties of the control. Find the 'Prompt' property and click on the value field. Highlight just the text portion of the field and change the text to "Axis 1 Target Position" and press enter. The control on the HMI will update to the new value.

	Axis 1 Target Position 1.0	0	Actual P
:	Target Position 1.00	<b>A</b>	Actual P
09			
Properties	Events	25 🗗	UD1:UD
E Identific	ation	26	BEGIN
		27	Posi
🔲 🗆 Name	UD1	28	Numb
🗆 Assign		29	Hint
🗆 Variable	- M.POSITION	30 -	END
	Ince	31 🗗	BM2:BM
		32	BEGIN
E Fosition	• 23.3,00 💡	33	Posi
Prompt	Axis 1 Target Position	34	TxBk

NOTE: The spaces between the single quotes set the size of the control's display area.

Next we need to connect the control the the input we named (AXIS1\_POSITION) in our CNC project. Click the button with the DOT for the 'Variable' setting in the property window.

🗆 Name	UD1	21
🗆 Assign		2:
🗆 Variable	M.POSITION	31
🗆 Appeara	e	3
🗉 Position	- 29.5,66	3.
D Promot	- Avia 1 Target Position 1	

🔞 Variable list and select - Al	🔞 Yariable list and select - All				
🗐 Total var 📃	翻	🛛 🛅 🔤 M.AXIS1_PO	SITION		
🖃 📻 Variables (var)	Тр	Name	Mean	Connection	
-123 Direct		M.START	Autocreated C&M discrete variable		
- (F) Real	6	M.AXIS1_POSITION	Autocreated C&M numeric variable		
Discrete	0	M.ENABLE	Autocreated C&M discrete variable		
AC Message		M.RESET	Autocreated C&M discrete variable		
Functions	F	M.VELOCITY	Autocreated C&M numeric variable		
P Formal variables	F	M.ACCELERATION	Autocreated C&M numeric variable		
	F	M.AXIS2_POSITION	Autocreated C&M numeric variable		
		M.FB_ERROR	Autocreated C&M discrete variable		
	123	M.FB_ERROR_ID	Autocreated C&M numeric variable		
-	AC	M.FB_ERROR_LOCATI	Autocreated C&M string-variable		
-	F	M.AXIS1_ACT_POS	Autocreated C&M numeric variable		
		M.SETTING_UP_AXES	Autocreated C&M discrete variable		
-		M.POWER_ON	Autocreated C&M discrete variable		
-					
G Default 0 (alua)					
C Delauk (Value)					
CAttr CDim Value					
C Min C Mean C D					
CMax Olnfo O1					
CI Ciden C 2					
OH Olech O3					
010 OLo OHi					
Show all variables					
Select variable(s):	СM	AXIS1_POSITION			
✓ Apply					

Click on the line with 'M.AXIS1\_POSITION variable and click the 'Apply' button. The property window will show the new variable selection.

Identification				
🗆 Name	UD1			
🗆 Assign				
U Variable	M.AXIS1_POSITION			
Appearance				
	29.5,66			
Prompt	Axis 1 Target Position 1			
Color	Black			

Repeat the process for the second Target Position control and use the AXIS2 settings. And change the text for the actual position controls too.



Now let's add two more input controls for the acceleration and velocity control.

.70 1 .		Power Power	<u>Start</u>	
		Axis 1 T	Farget Position 0.00 🏝	Axis
-		Axis 2 T	Farget Position 0.00	Axis
.09			Velocity 0.00	
: :			Acceleration	
•				
Properties	Eve	nts	▶ ▲ 83	
□ Identification			84 -	E
🗆 Name		UD5	86	В
🗆 Assign			87	
🗆 Variable		M.ACCELERATION	88	
Appearance				T.
		35,54.375	\$ 90 ₽	Е Т
Prompt		Acceleration 1 1	92	B
Color		Black	→ 93	_

You can use the keyboard arrow keys to make fine position adjustments.

You may wonder about the 'M.' prefixed to the variable name. The prefix identifies variables that originate from the motion side of the project.

# Add Controls to the Project End

To exit the HMI edit mode click the Edit Component Item button . You can also use the keyboard shortcut <CTRL><ALT> e to toggle the edit mode.

Test the project, keep in mind depending on the motor/amplifier configuration there are limits that will generate errors should they be exceeded.

