



 **ADVANCED**  
MOTION CONTROLS



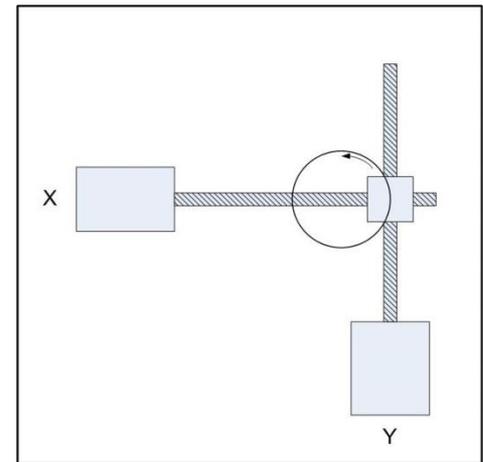
Click & Move<sup>®</sup>

Two Axis Coordinated

## Project Description

In this lesson we will construct a two axis coordinated motion project. We will build from our Two Axis project and configure the system to drive real axes.

Our project will use two axes and operate on an X-Y plane using 1mm per Rev. ball screws. We will move and end point in a circle and we will construct an HMI to control the motion. In addition to a start button, the HMI will provide controls to set the diameter of the circle and the speed of the motion.



The zero position of our axes will be the center of the travel and shall also be the center of our circle. We will not use home or limit switches and we will assume the position to be  $X=0$ ,  $Y=0$  at power on time. After completing the circle motions the axes will return to the starting position.

# Coordinated Motion

Two or more axes acting as a group to move a tool center point (TCP) along a path in a coordinate system.

Examples are 3D printers and CNC Milling Machines and our two axis circle project.

Some typical coordinate systems:

MCS: Machine Coordinate System, origin is a fixed position relative to the machine.

PCS: Product Coordinate System, can have a rotation or shift to the MCS coordinate system.

ACS: Axes Coordinate System, actual position of the physical axis (after homing).

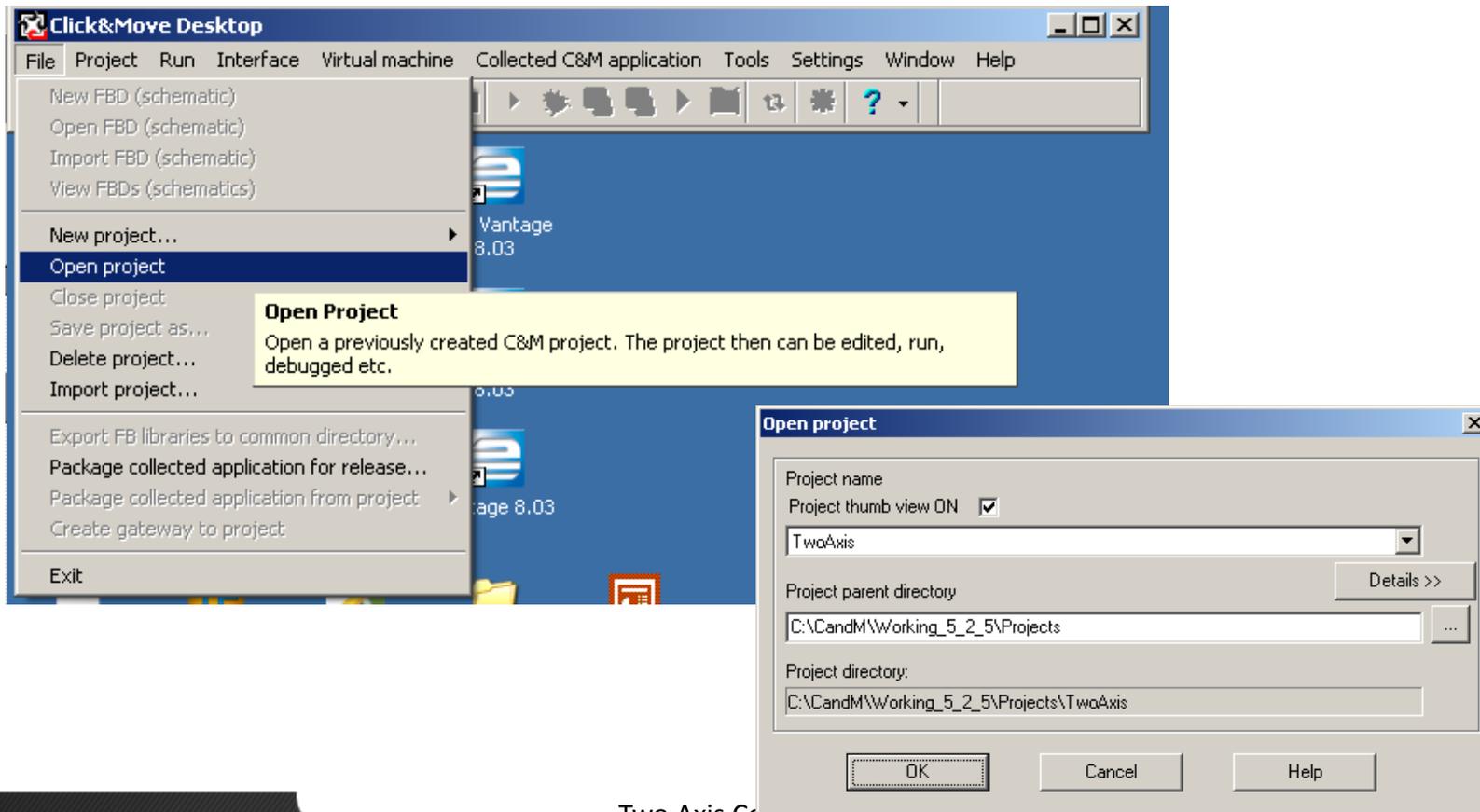
For additional information about coordinate systems, please see the document named “part4\_coordinatedmotion\_v10.pdf” that can be found in the Program Files directory where C&M is installed. For Win XP the path is

“C:\Program Files\A-M-C\CandM\_5\_2\_5\Documents\Supplementary”.

For the purpose of this lesson, all the coordinate systems are identical. PCS = MCS = ACS

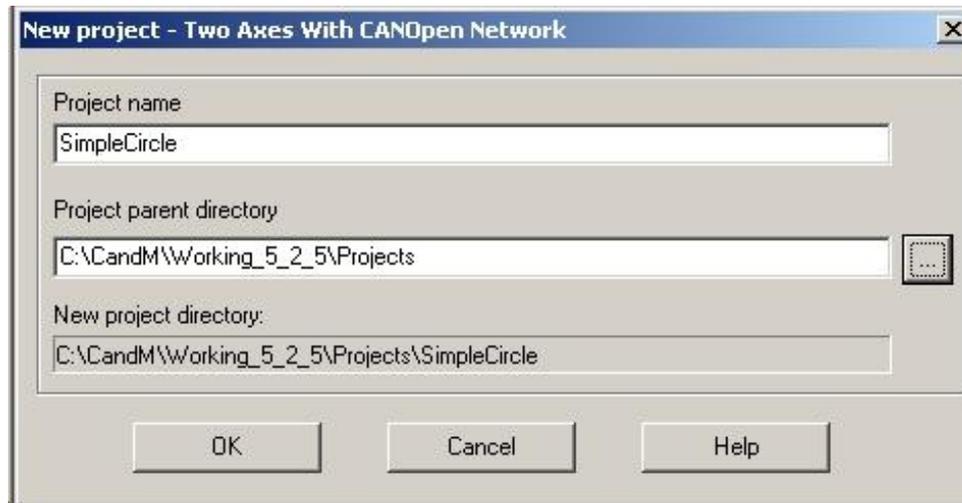
## Packaged Two Axis Project

Start C&M, close the currently open project (if any) then click File, Open project. Select the TwoAxis project and click 'OK'.



## Name the new Project and view the parts of the project

Change the project Parent directory to the projects directory. Give the project a name and click 'OK'.



Click the Open Edit icon,  to see list of schematics in the project.

*C\_M\_MAIN.sch*

*TWO\_CAN\_AXIS\_SET\_UP.sch*

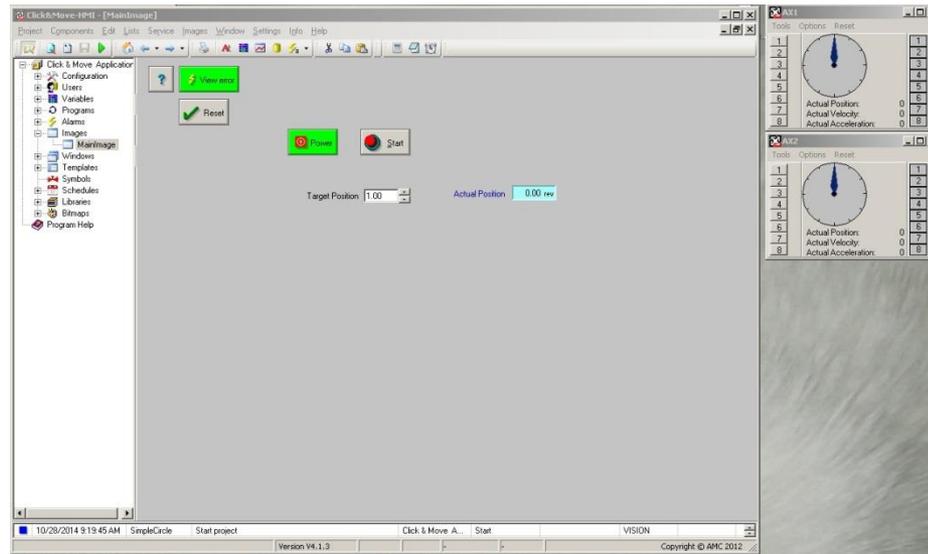
*AXIS\_SET\_UP.sch*

Close the Open Edit window for now.

The project also has a simple HMI, click the C&M HMI icon,  to open the HMI. The HMI has controls to run the project, set a target position and start the move to the target position. The View Error button provides a way to view error status and the Reset button a way to reset error conditions. Close the HMI for now. Click the Project Description button,  to open the project description file. We can use this file to describe the project and provide help to the operator. Close the project file.

## Build and test New Project in Virtual Mode

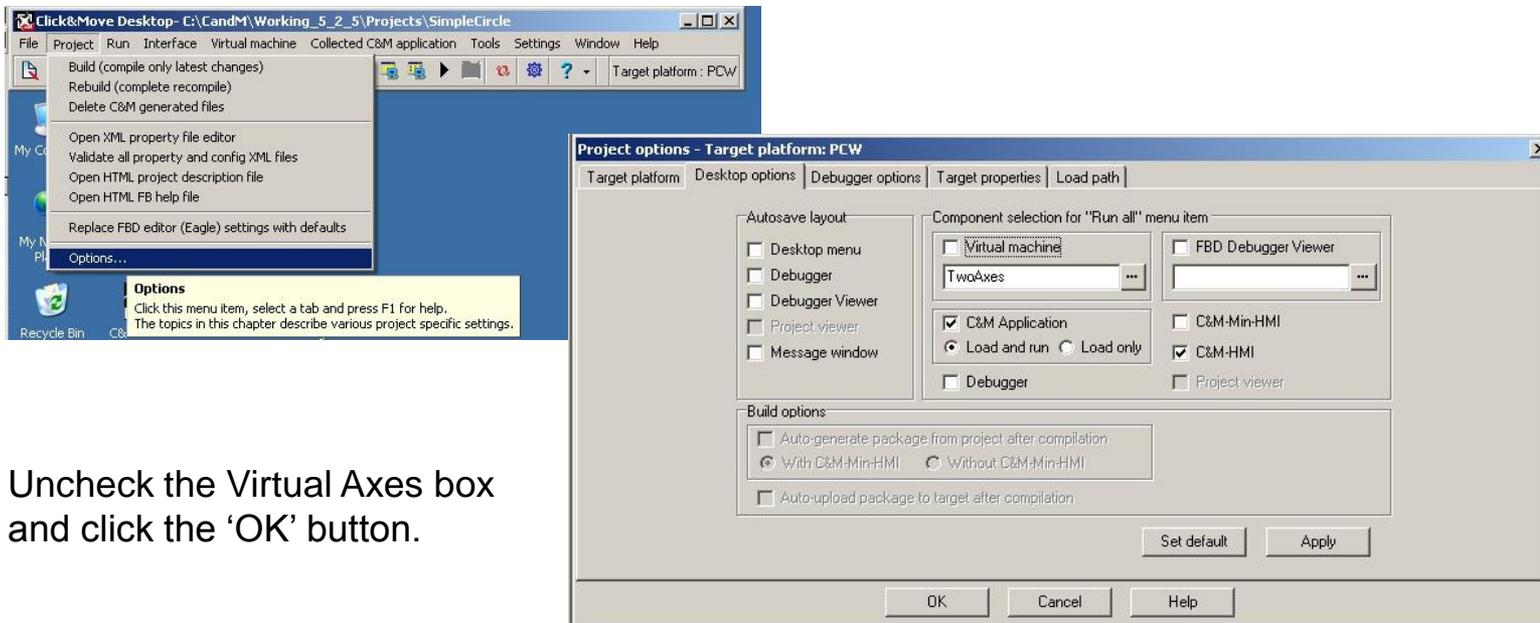
Click the rebuild button,  to build the project. Do not interrupt Click and Move while the build is in progress. Upon completion the message “Project is successfully built” is displayed at the bottom of the Message Window. After the build completes, click the Run All button,  (the large triangle) to launch all components of the project at the same time.



Click the Power button to start the application and establish CAN communication to the virtual axes. Enter a target position into the Target Position window and click the Start button. The pointers on the virtual axes will spin to represent motion and stop when the Actual Position matches the Target Position.

## Convert the Project to Real Axes

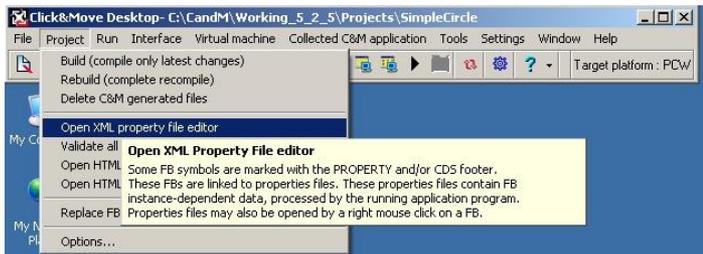
Close the HMI window and the two virtual axes windows. Click the Close C&M Application button, to stop the application. Click Project and Options to open the options tab box and click the Desktop options tab.



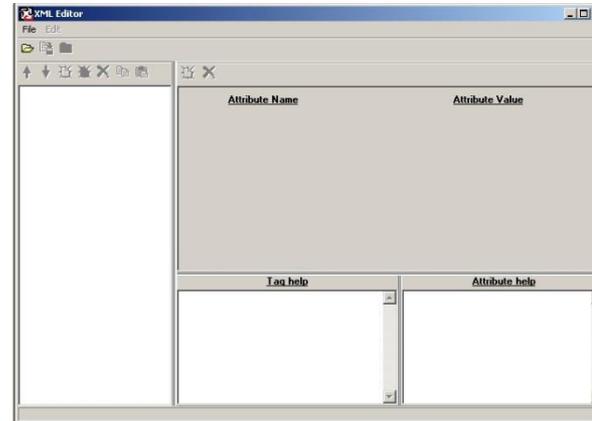
Uncheck the Virtual Axes box and click the 'OK' button.

## Convert the Project to Real Axes continued

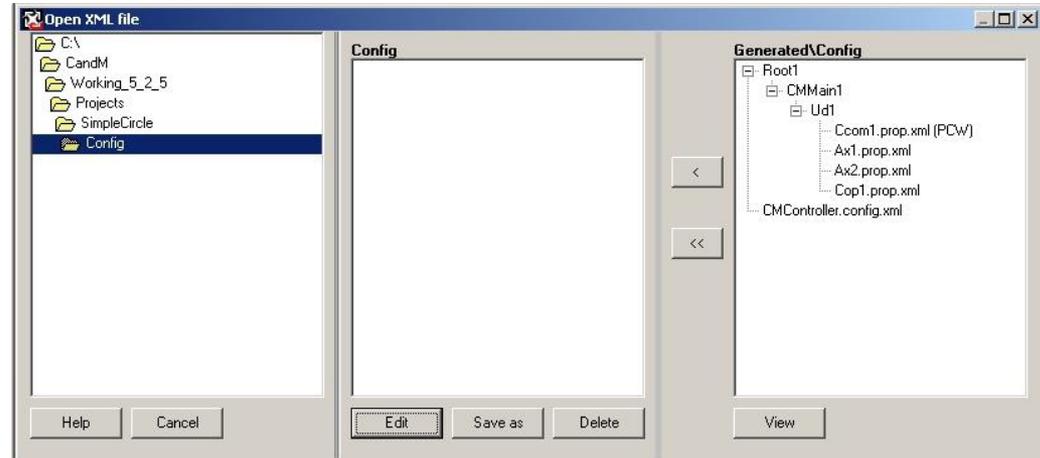
Click Project, Open XML property file editor.



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.

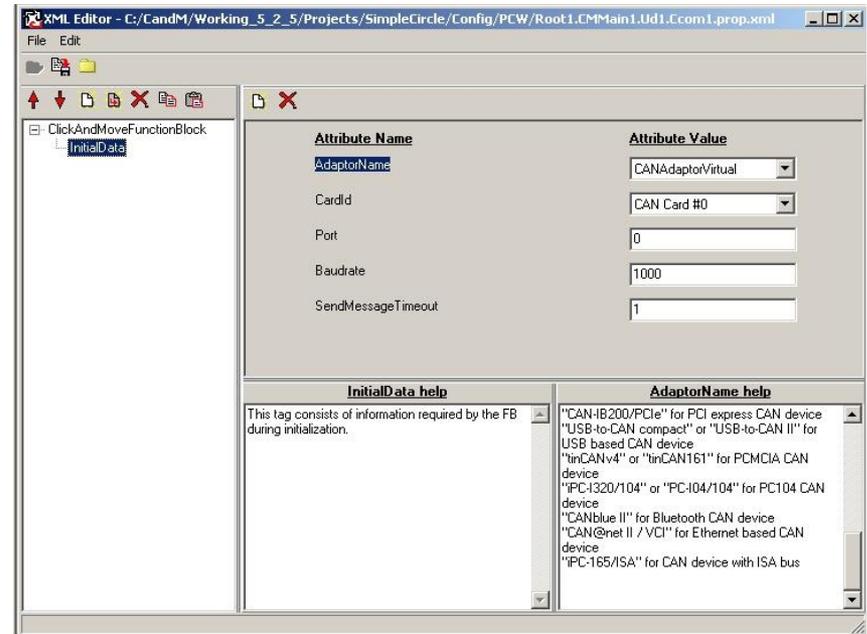


## Convert the Project to Real Axes continued

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.

## Convert the Project to Real Axes continued

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

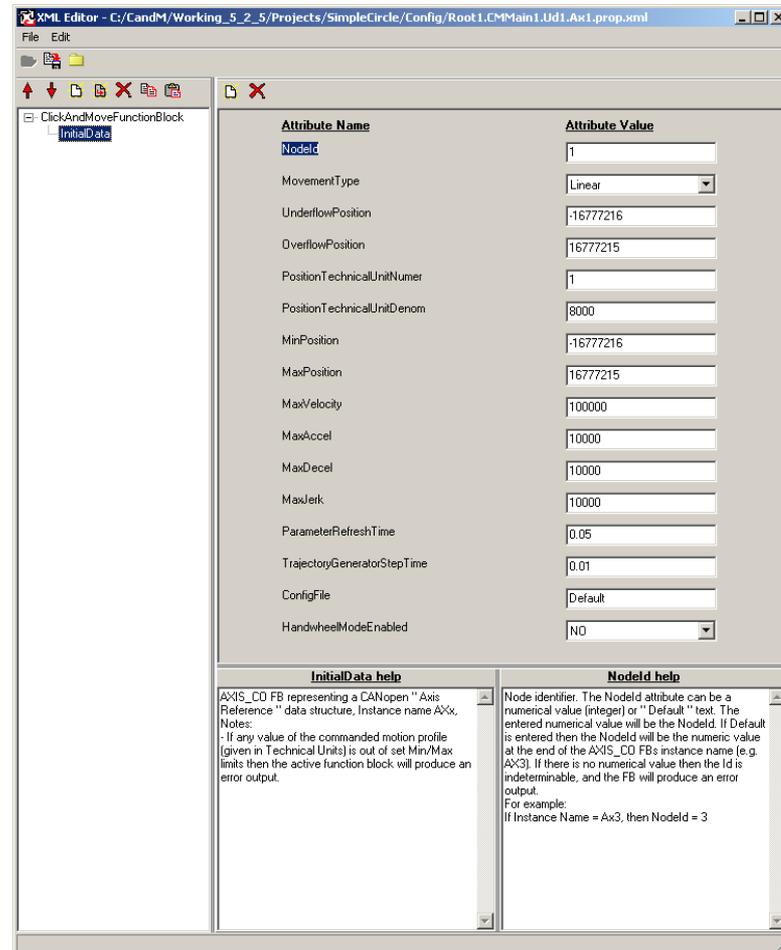
HandwheelModeEnabled - NO

**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.



## Convert the Project to Real Axes continued

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)**

