Purpose:

This document is a Click&Move® tutorial for the operation of a TWO-AXIS EtherCAT MACC project.

Document Notation:

This document references various buttons and tabs on the C&M desktop. Many actions may be accomplished in multiple ways. This document highlights just one way to use the tool.

Hardware:

- You will need a Windows PC (Win-Xp, Win7, Win10) with an ethernet adaptor.
- Two *ADVANCED* Motion Controls' EtherCAT drives with attached motors.
- MACC02c controller. (MACC02b also works but requires additional USB-Ethernet adaptor)

(The MACC02 Demo kit with EtherCAT contains everything needed except a CAT5 cable for the PC)

NOTE ON MACC02b Ethernet Ports

The MACC02b does not include a second ethernet port. Use a USB to Ethernet adapter connected to the USB port P3 of the MACC02b as the second adapter. When connected the USB device is normally assigned to Eth1: and you can proceed with the configuration.

NOTE

The USB-Ethernet adapter must be connected before power on to initialize correctly. You must use an adaptor with compatible chip set, see the MACC02 data sheet.

Software:

- Windows XP or Win7 or Win10.
- Click&Move Version 5.4.3d and the CandM-5.4.3d-GAX_ARM.exe compiler extension.
- The Project folder is TwoAxisEtherCatMacc.

NOTE ON THE DEMO BOX

The drives and MACC in the AMC DEMO BOX were tuned and configured at AMC

No additional drive or MACC configuration is required

Demo Kit MACC02 Ethernet port IP addresses were changed from the default configuration.

Eth0: on connector P2 is assigned IP address 192.168.101.50

Eth1: on connector P10 is assigned IP address 192.168.100.50

(For MACC02b The USB-Adaptor is Eth1)

Preparing the Hardware:

*** If you use a Demo Box, all components have been prepared and you can skip this section ***

Motor Tuning –

The EtherCAT drives need to be configured and tuned to operate with the connected motors. Use the latest version of DriveWare from *ADVANCED* Motion Controls to configure and tune the drives as needed.

Drive Addressing –

The drive address switches must be set to 01 and 02. The actual axis assignment is determined by the position of the drive in the physical connection.

MACC Eth0: and Eth1: IP Addresses -

For maximum performance we need to reserve Eth0: for the EtherCAT field bus. The default configuration of the MACC assigns Eth0: IP address 192.168.100.50. That is the IP address used in all the example projects and documents. To prevent confusion later in this project the MACC Eth0: and Eth1: assignments are swapped.
Please modify the Linux interfaces configuration file to assign Eth0: and Eth1: as follows:

Eth0 = 192.168.101.50
Eth1 = 192.168.100.50

Connecting the Field Bus:

Connect a network cable from the MACC02c connector P2 to the first drive's input connector P3. And another cable from the first drive's output connector P4, to the second drive's input connector P3.

Copy the project:

Copy the C&M project into the Click and Move Projects folder.

C:\CandM\Working_5_4_3d\Projects\TwoAxisEtherCatMacc

If your installed version of Click&Move differs from the version that created the project you will need to import and build before you can open or run the project.

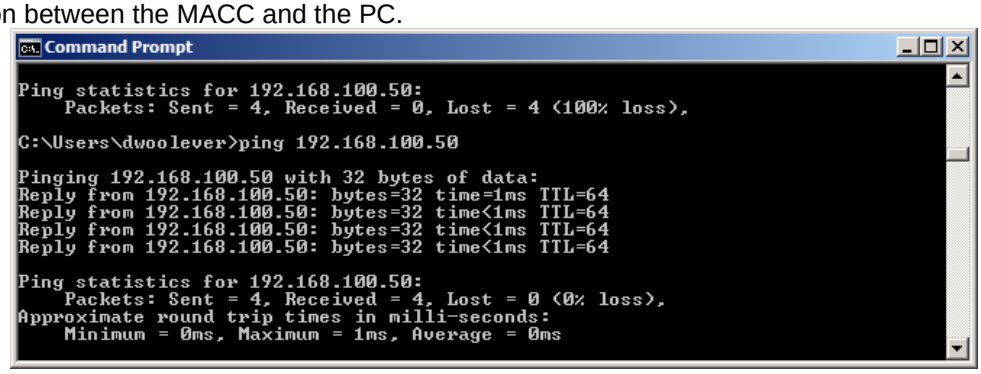
Note: The supplied project was created using C&M version 5.4.3d

Ethernet Adaptor Settings:

Use the Windows Control Panel to configure the Ipv4 IP address of your adaptor to communicate with the MACC. The MACC listens on IP address 192.168.100.50 and we need an address for the PC that differs only for the last number. As an example, you can set your adaptor to 192.168.100.33.
Open a command prompt and ping the MACC with the command:

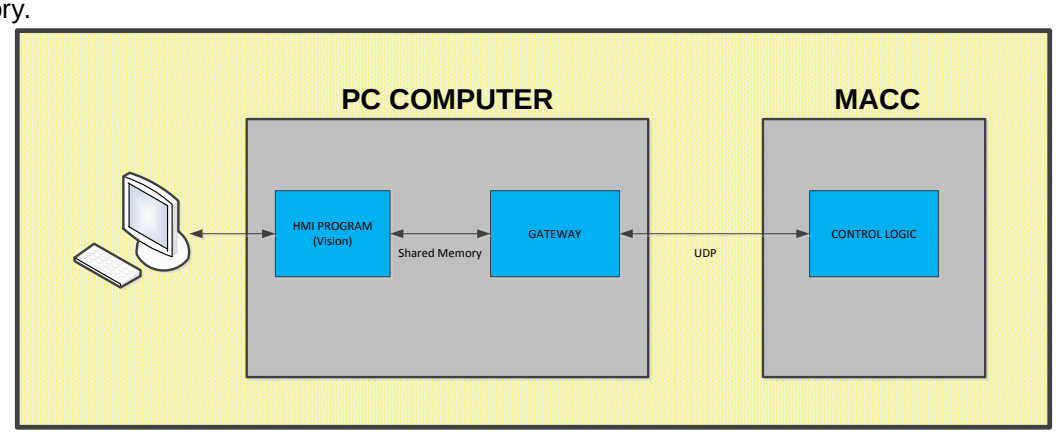
C:>ping 192.168.100.50

You get a response from the MACC shown below. If the ping fails, check the configurations and the connection between the MACC and the PC.



Project Organization:

When finished our project will have control code running on the MACC and HMI code running on the PC, and a third program called the GATEWAY linking the HMI to the MACC. The MACC and gateway communicate over ethernet using UDP. The gateway and the HMI communicate with a shared memory.



Running Multiple Programs:

The Click&Move IDE can only run and trace one program at a time. Our project necessitates running three programs at the same time. We accomplish this by creating a packaged project that contains the HMI and gateway. We can run the package stand-alone while we use the C&M IDE to debug and trace the control logic.

Overview of Steps to Build and Run the MACC project:

1 – Build the Control Logic

2 – Download Control Logic to the MACC

3 – Create the Gateway

4 – Build the Gateway

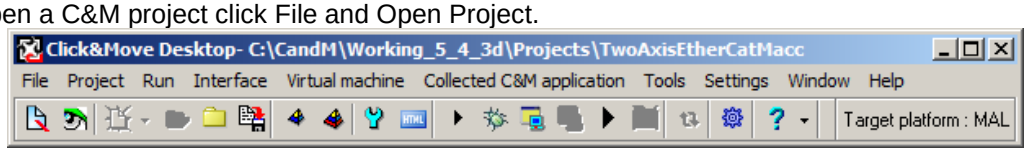
5 – Package the HMI and Gateway

6 – Run the packaged project

7 – Run the Control Logic

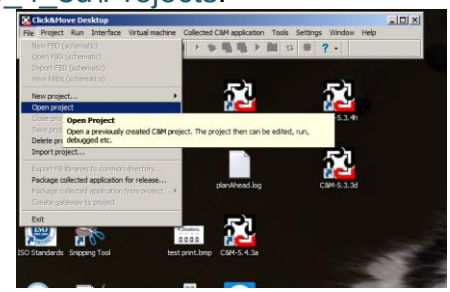
Open the Project:

Only one project may be open at a time. Use File and Close Project to close any open project.
To open a C&M project click File and Open Project.

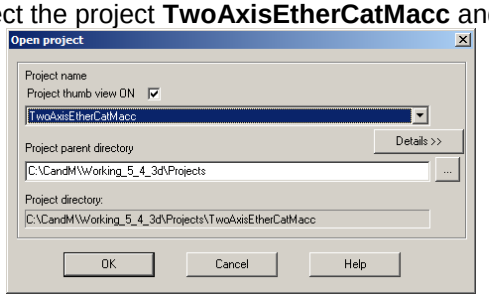


The Open Project window appears.
Click the ellipse button (3 dots) and set the PARENT DIRECTORY to

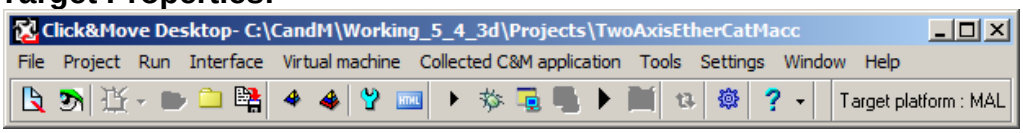
C:\CandM\Working_5_4_3d\Projects.



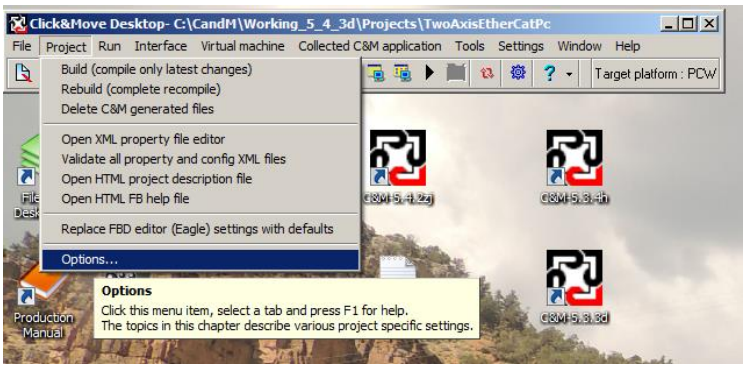
In the dropdown window select the project **TwoAxisEtherCatMacc** and click OK.



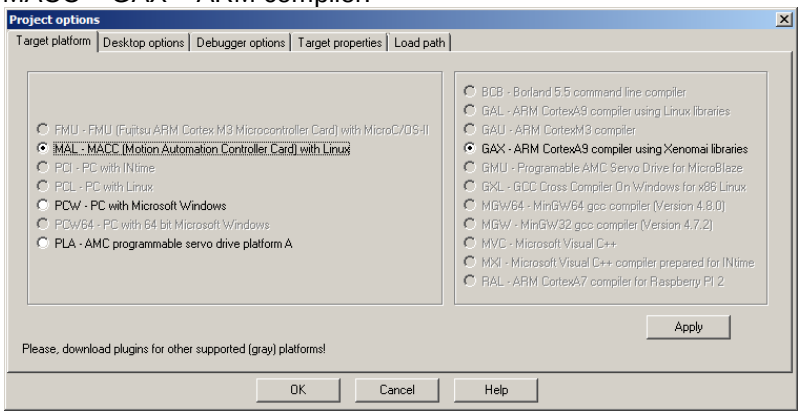
Setting Target Properties:



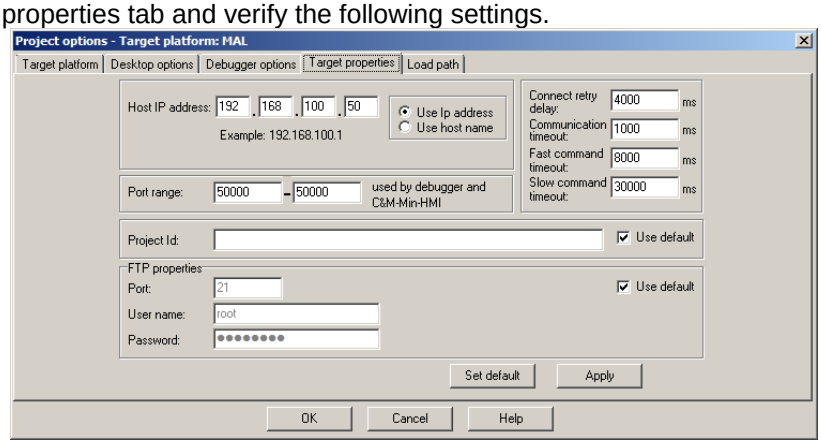
Open the Project Options from the Project tab on the desktop.
Select the target platform tab.



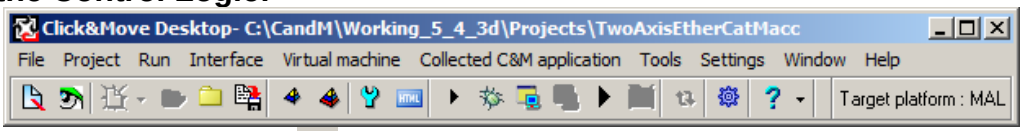
Choose the MAL-MACC – GAX – ARM compiler.



Click the Target properties tab and verify the following settings.



Building the Control Logic:



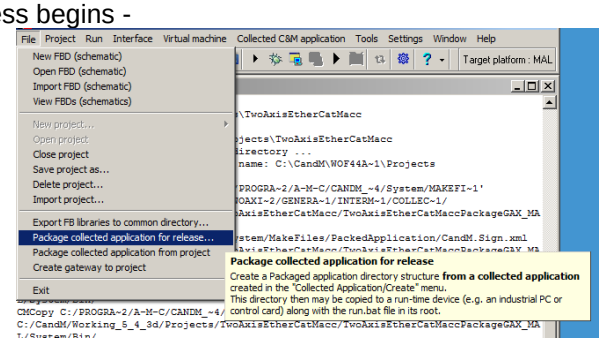
Click the LARGE pyramid button  to run a complete build or the smaller one to just build changes. After build completes, review the Message Window for the build results.

Package the Project:

Create a package to download to the MACC.

Click File, and then Package_Collected_Application_From_Project.

The package process begins -



And the package process ends -

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What's next?
1. Set the IP address of the remote device and the host PC
2. Connect your MACC to your PC with an Ethernet cable and Power it up
3. Download your Packaged application to your MACC by Tools/.. menu
4. Start your remote application by Run/Load C&M Package and run
5. The Debugger and MIN-HMI is now functional
6. Generate a C&M-HMI interface for your PC by File/Create gateway to project menu
See also: C&M-MC help/Download application to remote device/
Download Packaged application to a MACC
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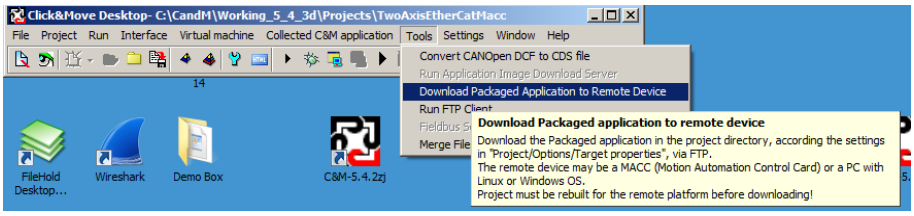
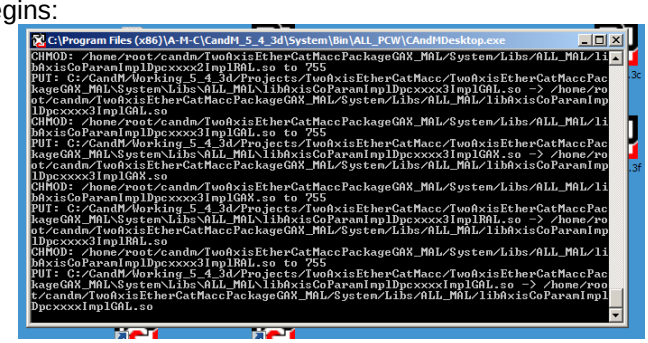
Down Load the Control Program to the MACC:

Click the Tools tab on the C&M Desktop and then click –

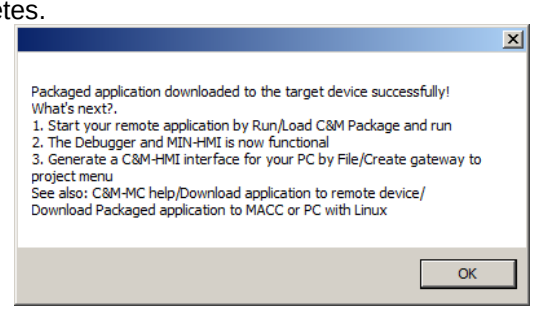
Download_Packaged_Application_to_Remote_Target



The download begins:



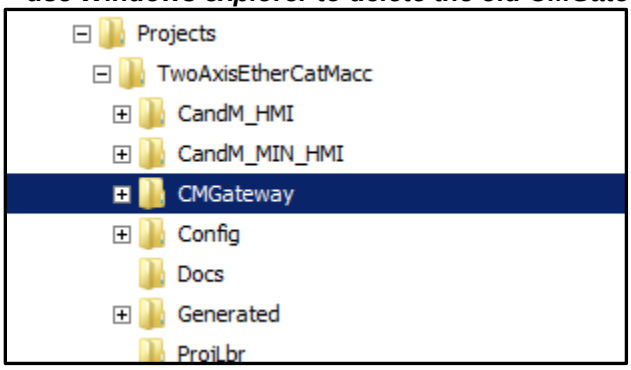
The Download completes.



Create the Gateway Project:

On the C&M Desktop Click File and create gateway project. The gateway project is created and stored in the project folder, see below.

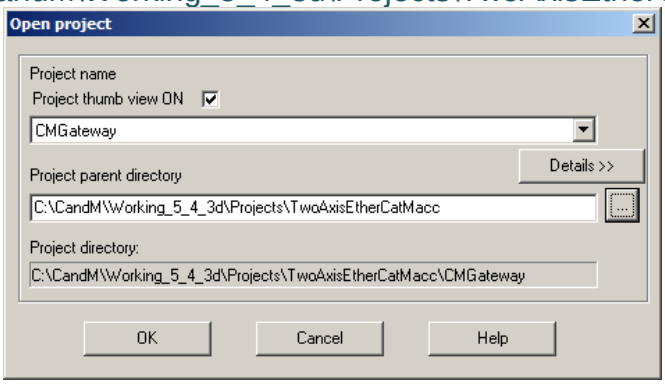
NOTE: You cannot overwrite an existing Gateway. If you need to regenerate the gateway first use Windows explorer to delete the old CMGateway folder.



Open the Gateway Project:

First close the TwoAxisEtherCatMacc project then click File and Open Project. Use the Ellipse button in the open project window to set the parent folder –

C:\CandM\Working_5_4_3d\Projects\TwoAxisEtherCatMacc

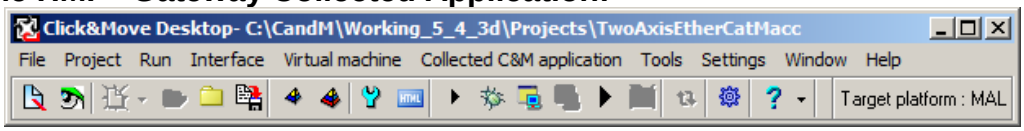


From the dropdown selection choose the CMGateway project and click OK.

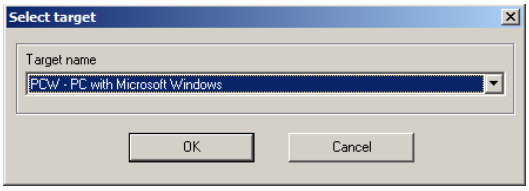
Build the Gateway Project:

Click the LARGE pyramid button  to build the Gateway project. After build completes, review the Message Window for the build results.

Create the HMI + Gateway Collected Application:

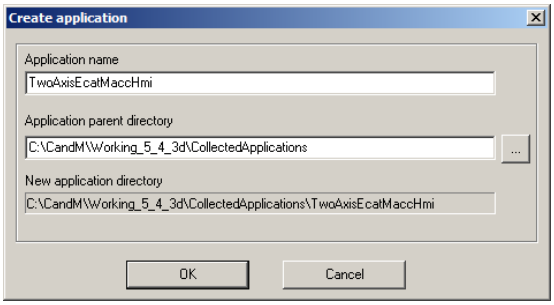


Click on the Collected C&M application tab and then on Create. Accept PCW as the selected target. (The HMI+Gateway collected app runs on PC windows)

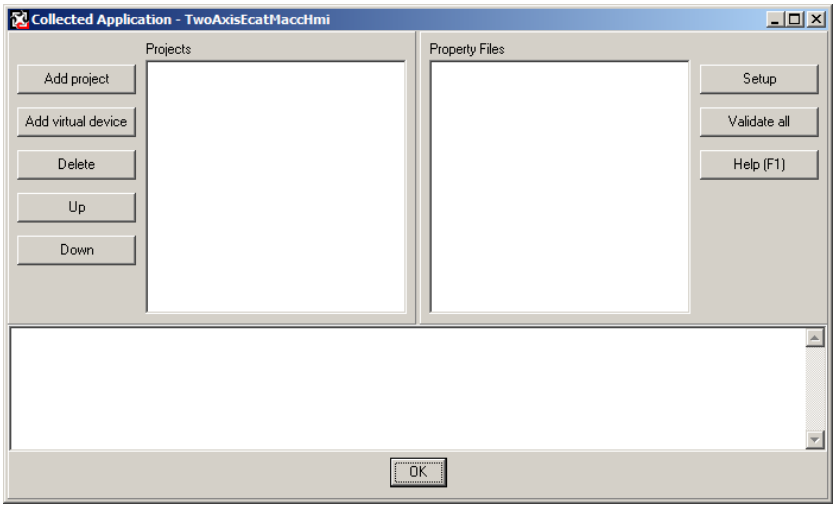


Enter a name for the collected application, for example – TwoAxisEcatMaccHmi

Click OK when ready.

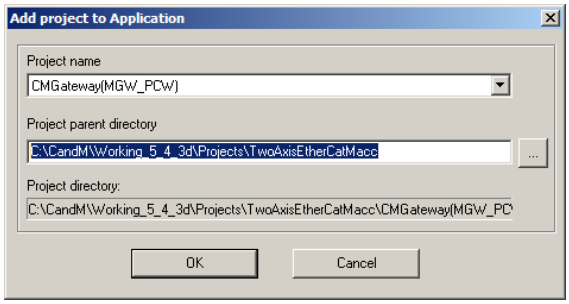


The collected application window appears. We add the programs to be packaged into the left pane. We need to add the Gateway and the HMI programs to the collection.



Adding the Gateway:

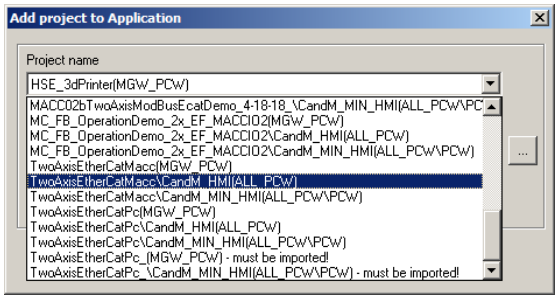
Click the Add project button, and the Add project to Application window pops up.
Click the ellipse button (3 dots) and browse for folder opens.
Browse to select the C:\CandM\Working_5_4_3d\Projects\TwoAxisEtherCatMacc folder



Select CMGateway(MGW_PCW) From the dropdown selection and click OK.

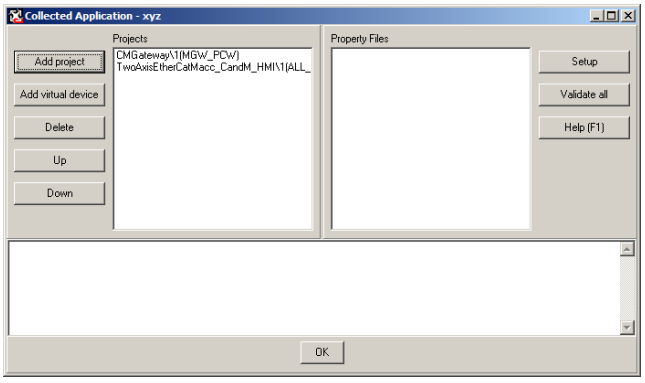
Adding the HMI:

Click the Add project button, and the Add project to Application window pops up.
Click the ellipse button (3 dots) and the browse for folder opens.
Browse to select the C:\CandM\Working_5_4_3d\Projects folder.

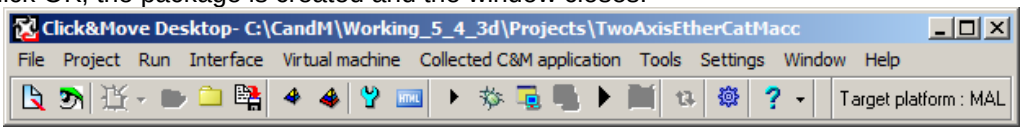


Select TwoAxisEtherCatMacc\CandM_HMI(ALL_PC) from the dropdown selection.

You will see:

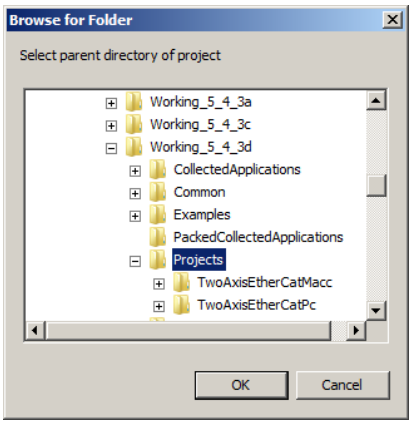


Click OK, the package is created and the window closes.

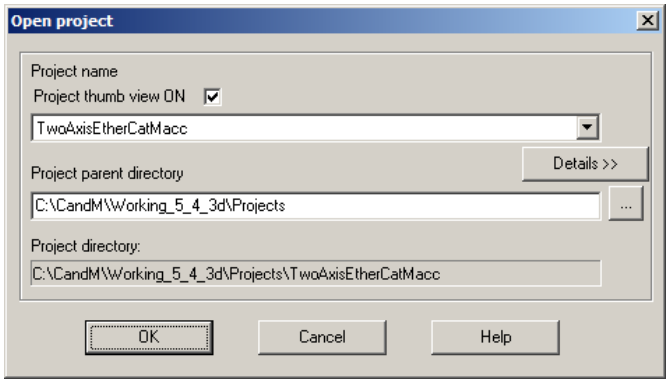


Open the Control Logic:

Before we can run the MACC we need to close the Gateway and re-open the Control Logic. Click File, Close project (and the Gateway Closes). Click File, Open project and the Open Project window pops up. Click the ellipse button (3 dots) and browse to select the C:\CandM\Working_5_4_3d\Projects folder and click OK.



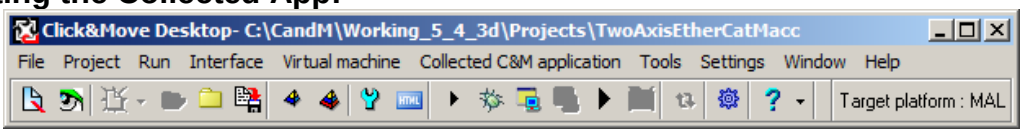
Select the TwoAxisEtherCatMacc project from the dropdown list and click OK.



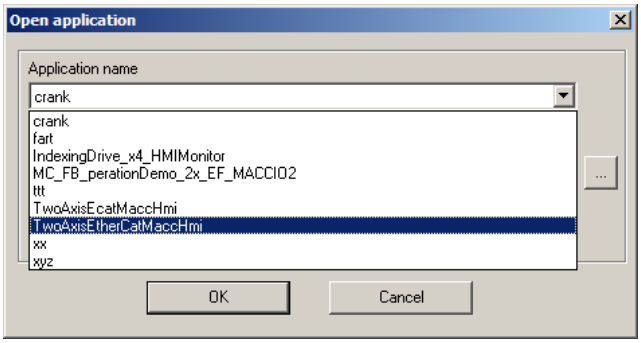
Starting the Application:

We start the TwoAxisEtherCatMacc application in two steps. First start the Collected Application and second start the application downloaded to the MACC.

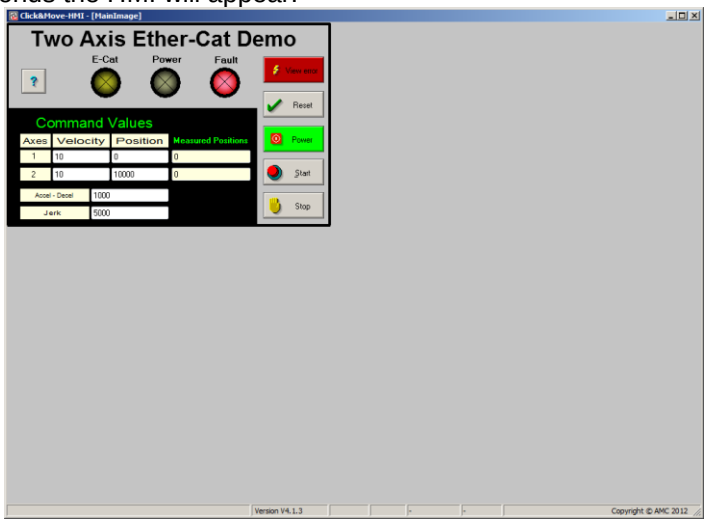
Starting the Collected App:



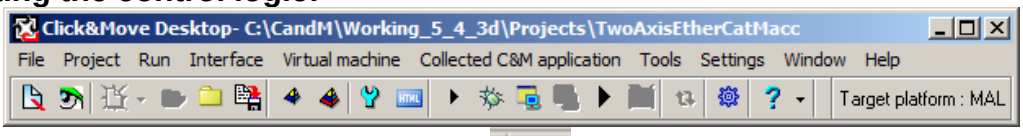
Click the Collectd_C&M_application tab on the desk top and choose Run and the Open Application window pops up. From the dropdown selection choose TwoAxisEtherCatMaccHmi and click OK.



After some seconds the HMI will appear.



Starting the control logic:

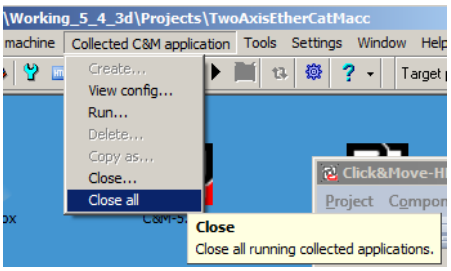


To start the MACC application click the run  button.

If everything is working, after some seconds the Ether-Cat indicator on the HMI will turn Green. Click the Power button to enable the drives set your target positions and speeds and start a move.

Stopping the Application:

You can stop the control logic for this project at any time, click the stop  button. All motion will stop.
You can stop the Hmi+Gateway, just click Collected_C&M_Application and Close All.



Additional Notes About MACC Projects

1 You must re-package and then download the package to the target (MACC) if you make changes to the control logic. (Else the project file and downloaded app are out of sync)

2 You must re-create the gateway each time you make changes to the type or number of variables shared between the control logic and the HMI.

3 You need to change the compiler selection to PCW before making changes to the HMI and back to the MACC compiler for everything else.