

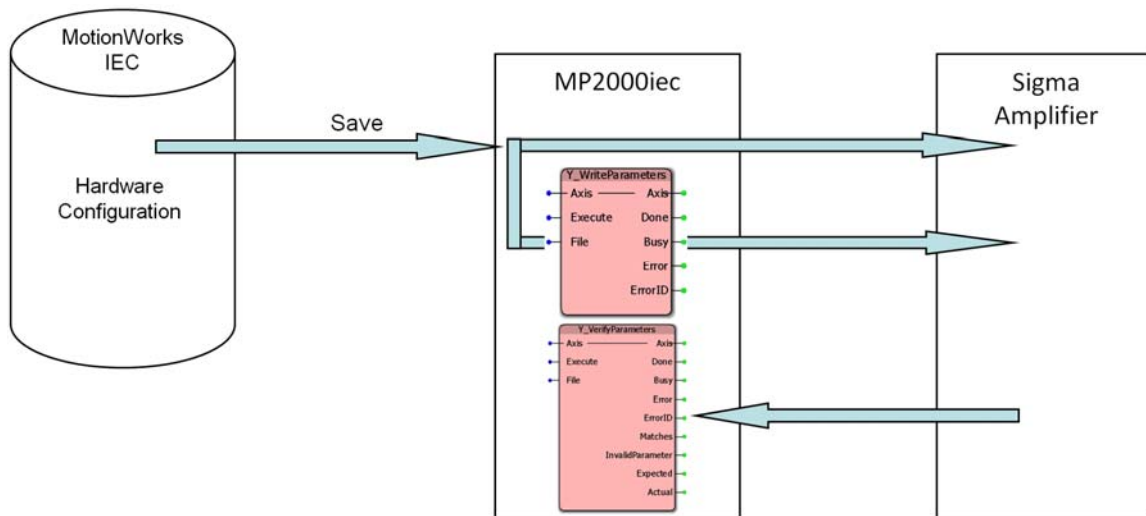


Programming IEC Applications for Simple Amplifier Replacement

Introduction

Yaskawa recommends that all applications be programmed for easy amplifier replacement. Industrial machines have a long life and it makes sense to include pre programmed maintenance routines to help maintenance personnel restore the machine to production after an issue causes downtime.

The following diagram represents how parameters are managed during program or configuration operations.



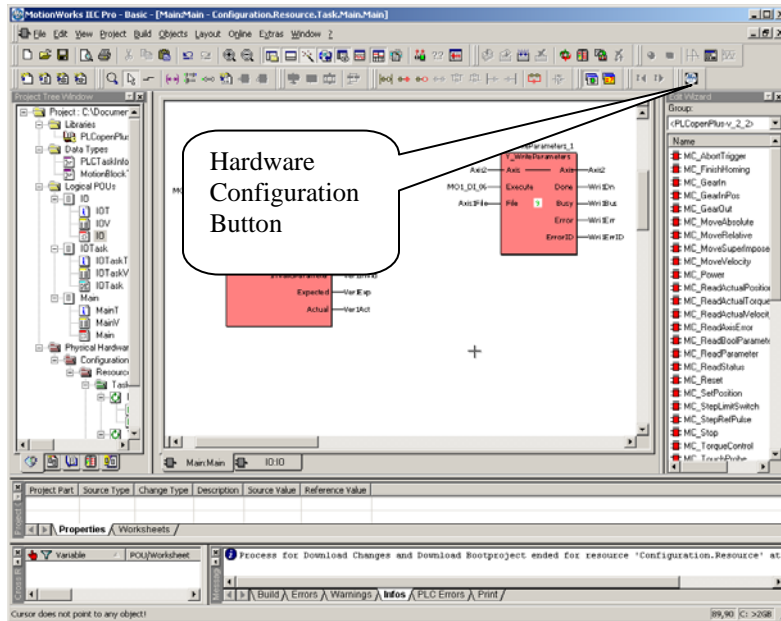
Amplifier parameters are stored in three places:

- The computer's hard drive (IEC Project subdirectory)
- The MP2000iec controller (As an XML file as seen in the Project Archive)
- Amplifier

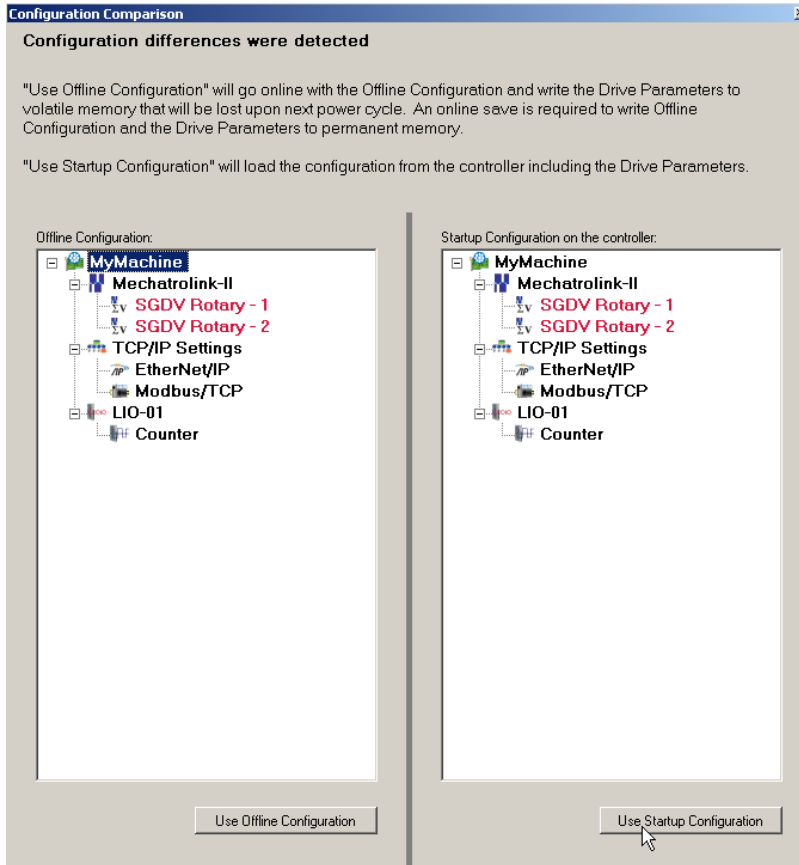
When the programmer is online and saves the Hardware Configuration, parameter files are saved to the hard drive, written to the controller, and the individual parameters are sent to the amplifier, so that all three locations contain the same data. The Y_WriteParameters function block sends the data from the parameter file stored on the controller to the amplifier. The Y_VerifyParameters function block reads the parameters from the drive and then compares them with the parameter file stored on the controller.

Procedure

The success of this procedure is prefaced upon the fact that the controller must contain an identical copy of the parameters used in the amplifier. If SigmaWin was used to tune the servos, be sure to connect with the Hardware Configuration and select the StartUp configuration, which will read all the amplifier parameters. Press 'save' which will then write the XML files into the controller project archive.

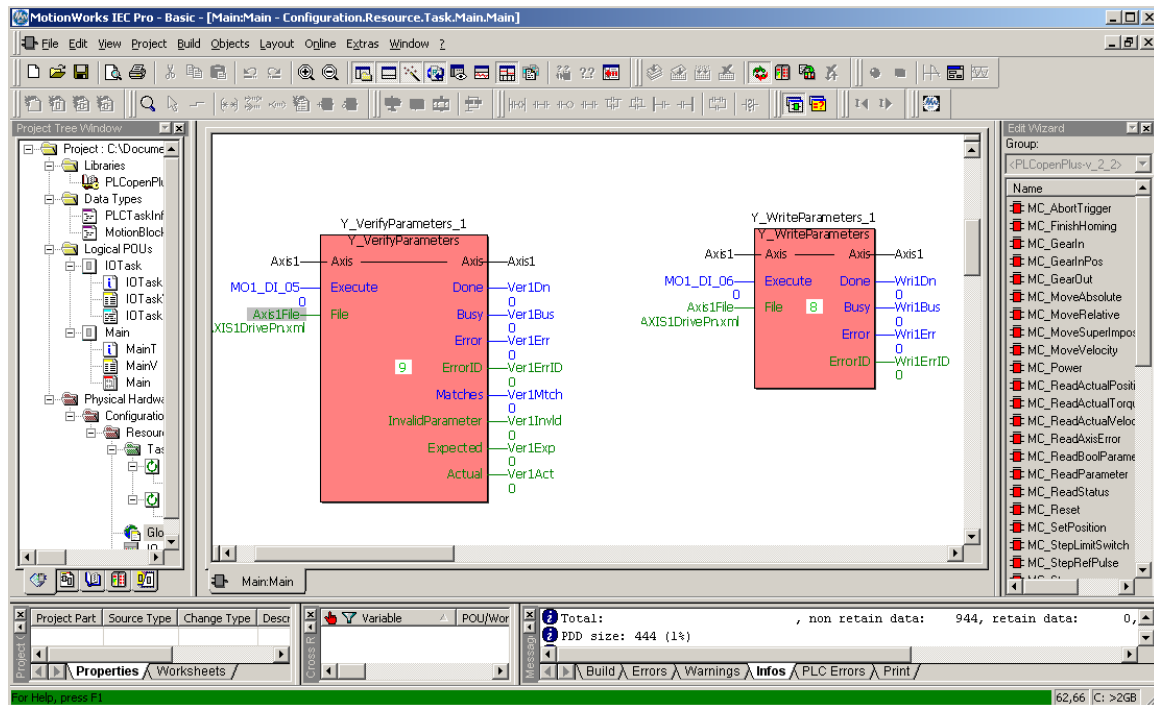


If there are parameter differences detected choose to use the startup configuration.



Save the application by selecting File-> Save from the menu or by using the save button on the toolbar.

The next step is to program the file replacement in the application by using the Y_WriteParameters function block.

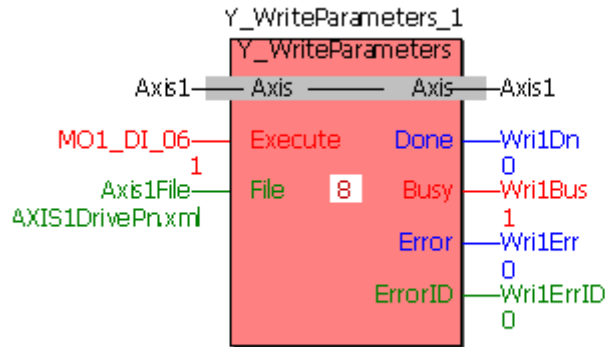


The screenshot above shows a Y_VerifyParameters and a Y_WriteParameters function block. The Y_VerifyParameters function block could be used to automatically detect when an amplifier has been replaced in the field and trigger a Y_WriteParameters function block to run without user intervention. However, this automatic parameter write should be considered carefully. The Y_VerifyParameters function block will show differences under the following conditions:

1. If a parameter is changed using the Y_WriteDriveParameter function block.
2. If a parameter is changed using SigmaWin +.
3. If other motion functions change parameters.

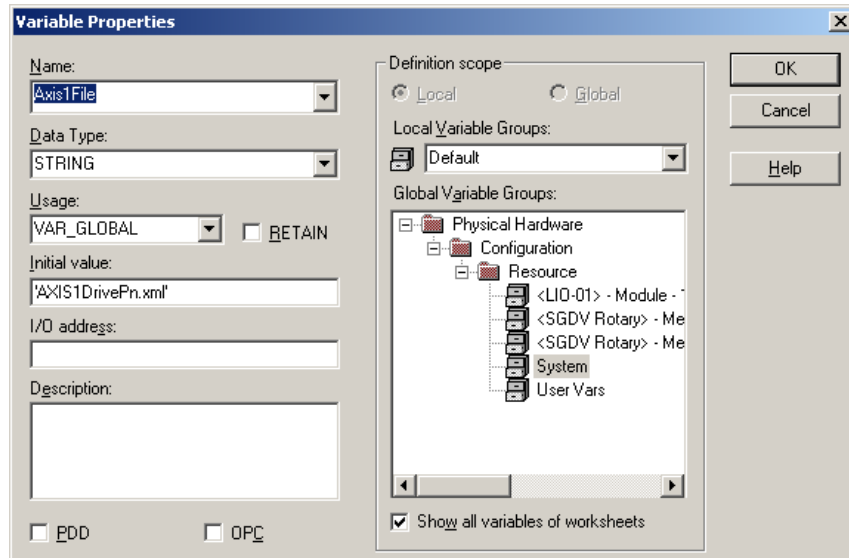
So it is not recommended to simply write drive parameters every time a difference is detected.

The designer must insert a Y_WriteParameters function block for each amplifier, and determine how the operator or maintenance person will trigger the functions. In the example shown below, digital input 6 was used to trigger the write function block but we could have just as easily implemented an HMI variable available on a maintenance screen.



The file name string type variable must be set to 'AXIS*DrivePn.xml' with the * replaced with the axis number. This is the name of the file that the MotionWorks IEC Hardware Configuration application writes during the save operation.

The variable definition of Axis1File is shown below:



Alternatively, a string literal may be defined as STRING#'AXIS1DrivePn.xml', with the string value after STRING# enclosed in single quotes.

Note About Absolute Encoder Motors

There are two methods to supply battery backup power to the absolute encoder:

1. Use an encoder cable with an inline battery.
2. Connect a battery to the CN1 connector of the amplifier.

If the absolute encoder is powered from a battery through the CN1 connector, the battery will be disconnected from the motor when replacing the amplifier. An amplifier alarm (A.810) will be generated, and must be cleared using the Y_ResetAbsoluteEncoder function block, the toolbar function in the Hardware Configuration or the web server. Next, the axis must be homed and the position must be defined using the MC_SetPosition block.

Sequence of operations

Before the machine is put into production:

1. Open the Hardware Configuration and save while online.
2. Program the application to allow a maintenance person to trigger a MC_WriteParameters block for the axis (axes) that must have the parameters re-written.
3. If the absolute encoder battery power will be disconnected from the motor create a method to run a Y_ResetAbsoluteEncoder function block and perform a homing routine after a amplifier has been replaced.
4. Interlock the machine operation with a MC_VerifyParameters block to insure that the machine is not run with an amplifier that has default parameters. Make sure to test for a subset of parameters as the application may change some parameters during machine operation.

Conclusion

Resuming production after replacing an amplifier can be very easy if the machine designer incorporates a maintenance function into the program which will allow an amplifier to be replaced in the field without using any software.