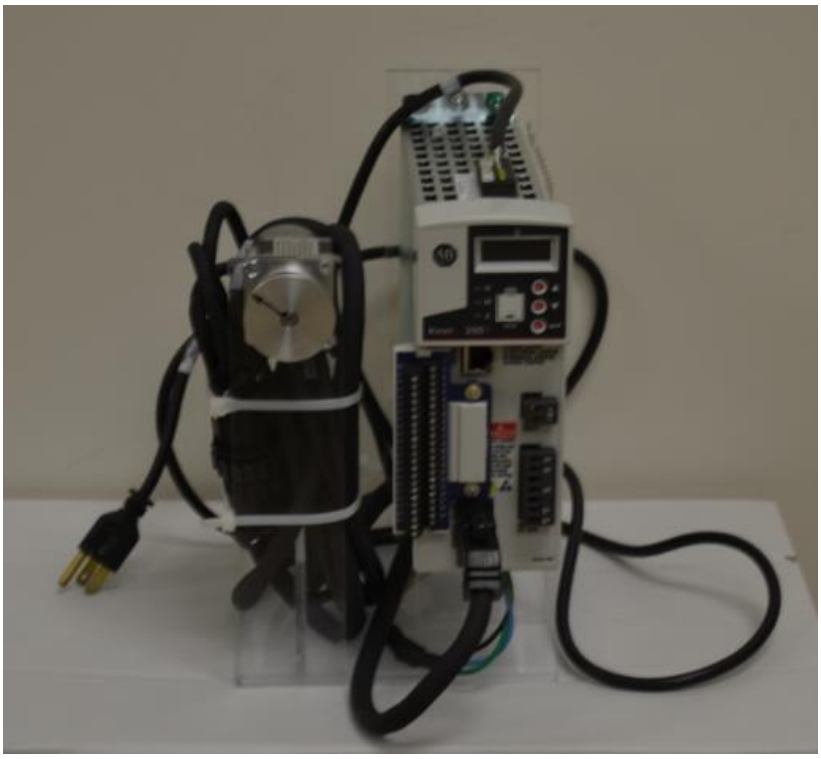
Chapter 20 Single Axis Servo Control

Servo Lab

The Servo Lab gives the student an experience with single axis motion control. Automation uses for single axis motion include indexing machines and grinders. The lab is provided to a point with students expected to expand the base program to include advanced concepts. Developing a useful HMI is a part of this lab. The student is required to provide a motion action with the capability of automatic and manual control.



Servo Motor and
Motor Controller
Allen-Bradley

While the servo shown is Allen- Bradley, several servos from Siemens are also in the final stages of being purchased. The cost of these servos is approximately $1000/each. The servo communicates with the PLC via Ethernet. The goal is eight Allen-Bradley stations and four Siemens stations. These units can be stored on a shelf between labs.

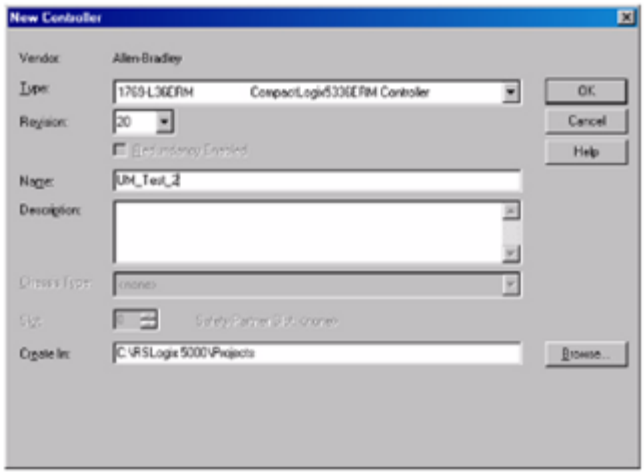
From A-B, "The IP address of the Kinetix 350 drive is composed of four sub-octets that are separated by three dots to conform to the Class C Subnet structure. Each sub-octet can be configured with number between 1 and 254. As shipped from the factory, the default IP address of a drive is 192.168.124.200."

The present IP address can be obtained from the drive's display using the up-down keys and reading the address one sub-octet at a time.

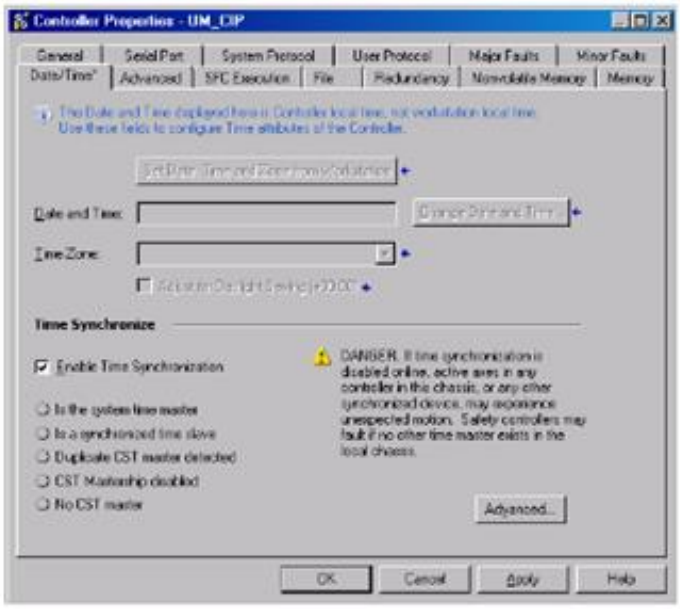
A-B states that the drive can be assigned either using DHCP (dynamic IP address) or statically. The drive must be configured statically for our application. You must check that the IP address is already set or ping the address to check if it is operating. There should be an address label on the drive. If checking the drive, use the up-down arrow keys to locate the DHCP parameter and verify that it is set to 0. If not, set to 0 and cycle power.

When using the file given for the course, the controller is configured and ready to run except for the drive's IP address. Configuration of the drive has been accomplished. The next few pages lead one through the process of defining the drive during the configuration process in preparation for the move command programming to follow.

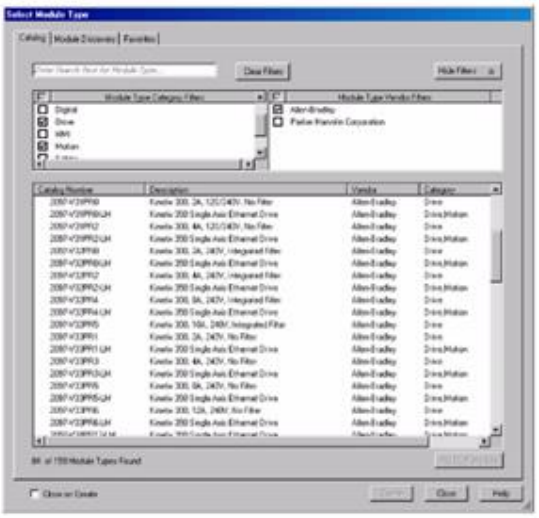
If the controller is not configured, first follow the procedure below:



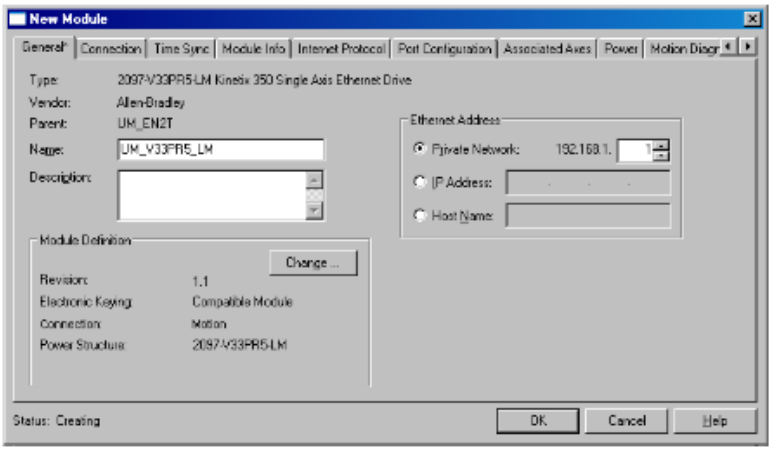
Notice that the controller must be at revision 20 or higher. Under the controller properties dialog box, click the Date/Time tab and enable Time Synchronization.



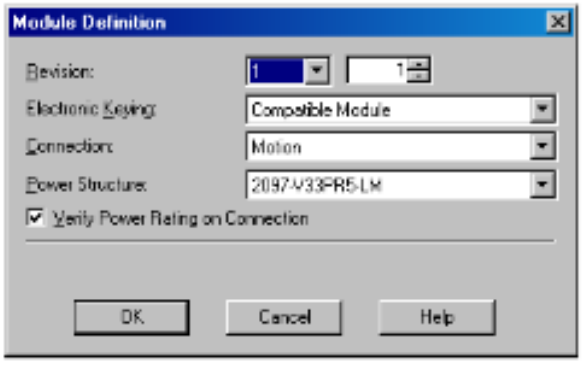
Configure the Kinetix 350 Drive. Right click to create a New Module. Clear the module type filters and check the Drive and Motion categories. Select the appropriate drive.



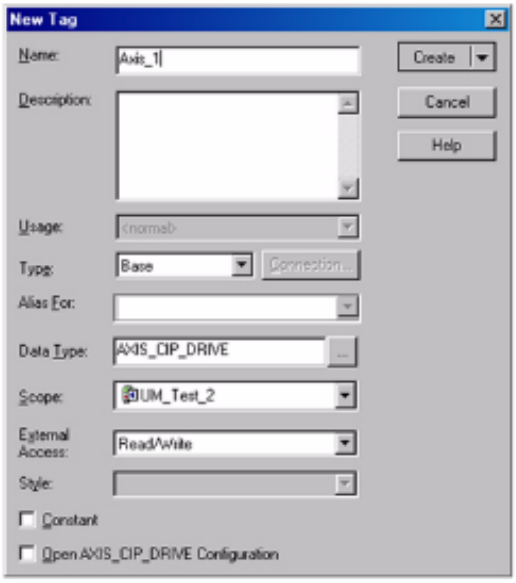
Configure the New Module using the following dialog box. The etnernet address must match the address set for the drive.



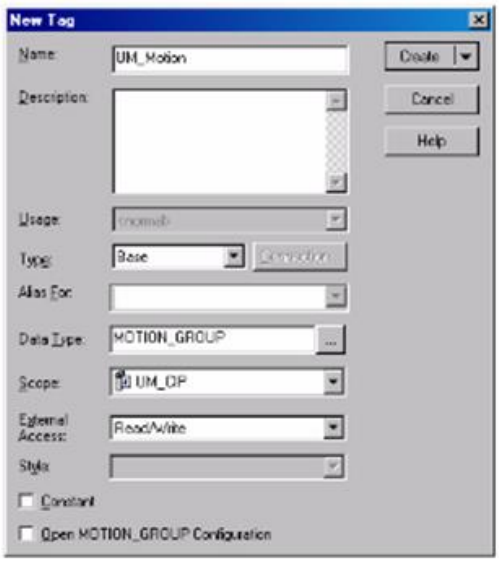
Under Change Module Definition, change the following:

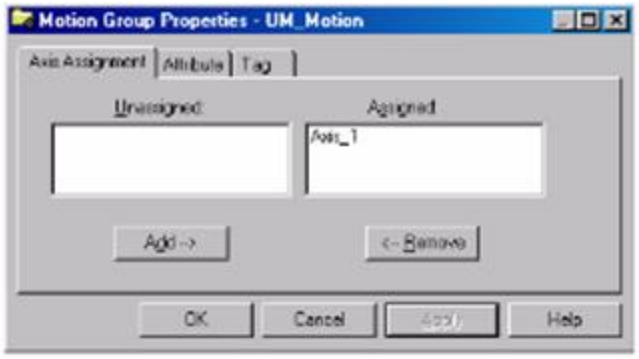


Under the Associated Axes tab, click ‘new axis’ and add information:

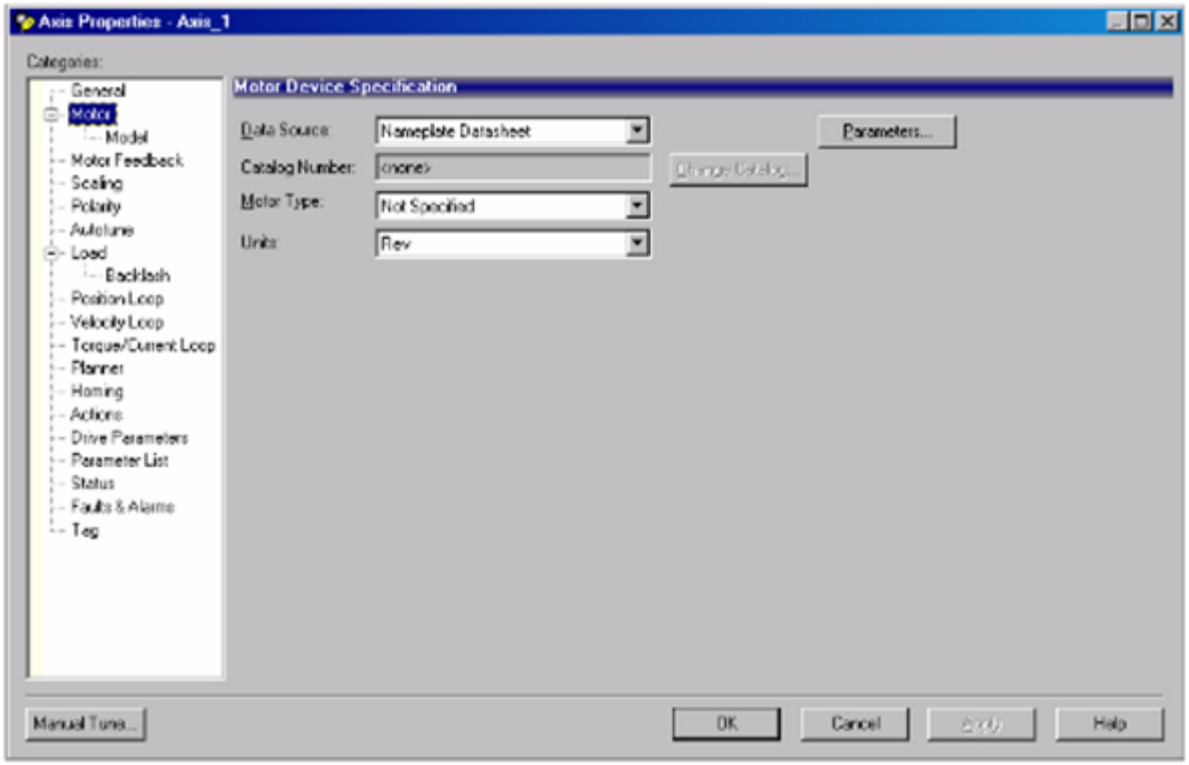


Finish by checking ‘create’. Next configure the Motion Group. In the Controller Organizer, right click Motion Groups and choose New Motion Group. Assign the axis just created to this motion group.



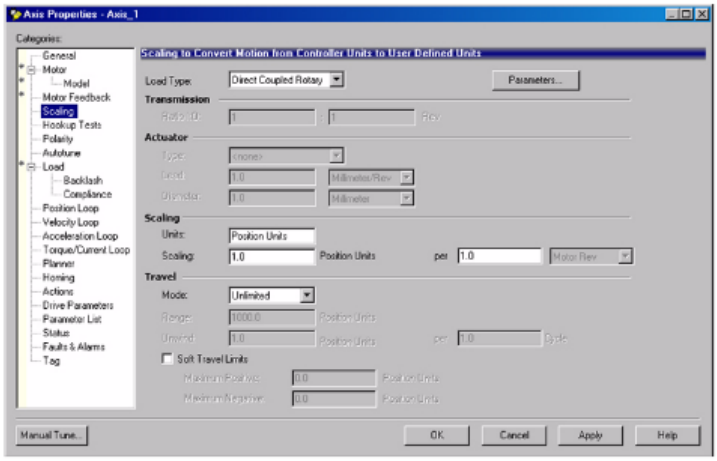


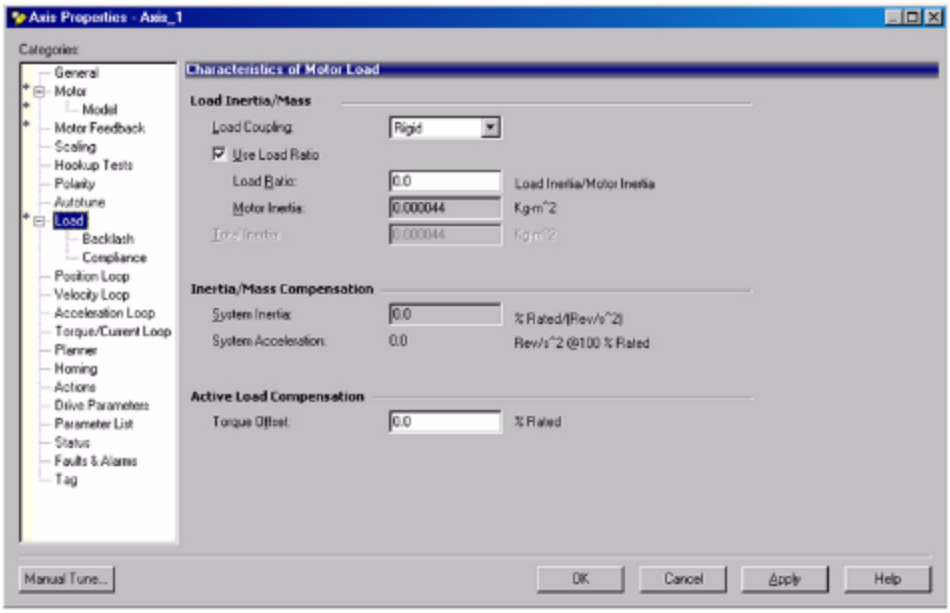
Right click on the axis in the Controller Organizer to change properties of the drive. For the motor:



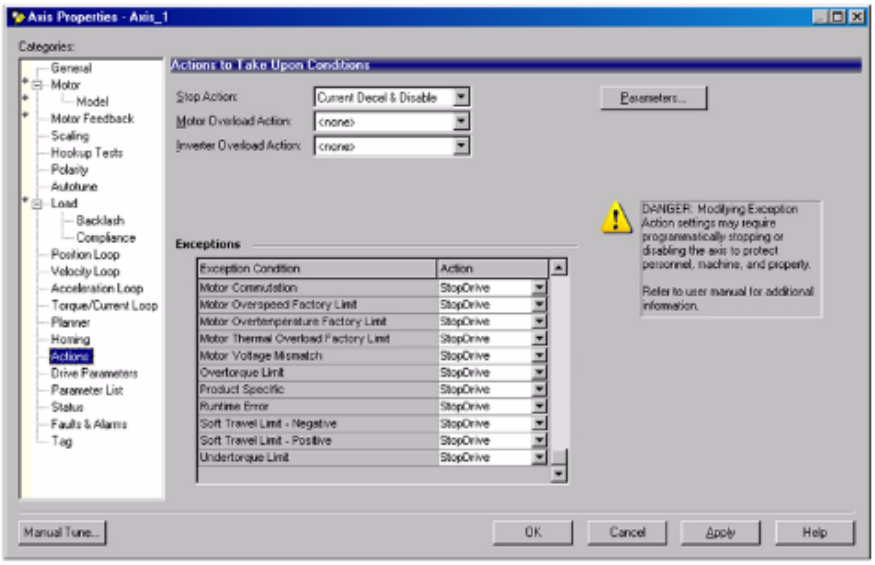
To Configure the Motor

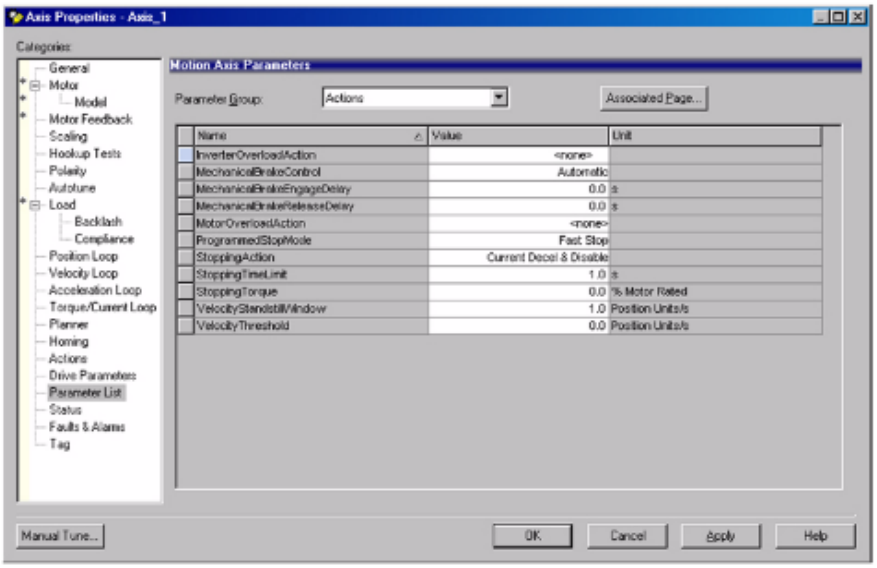
Use the scaling and loads appropriate for the application:



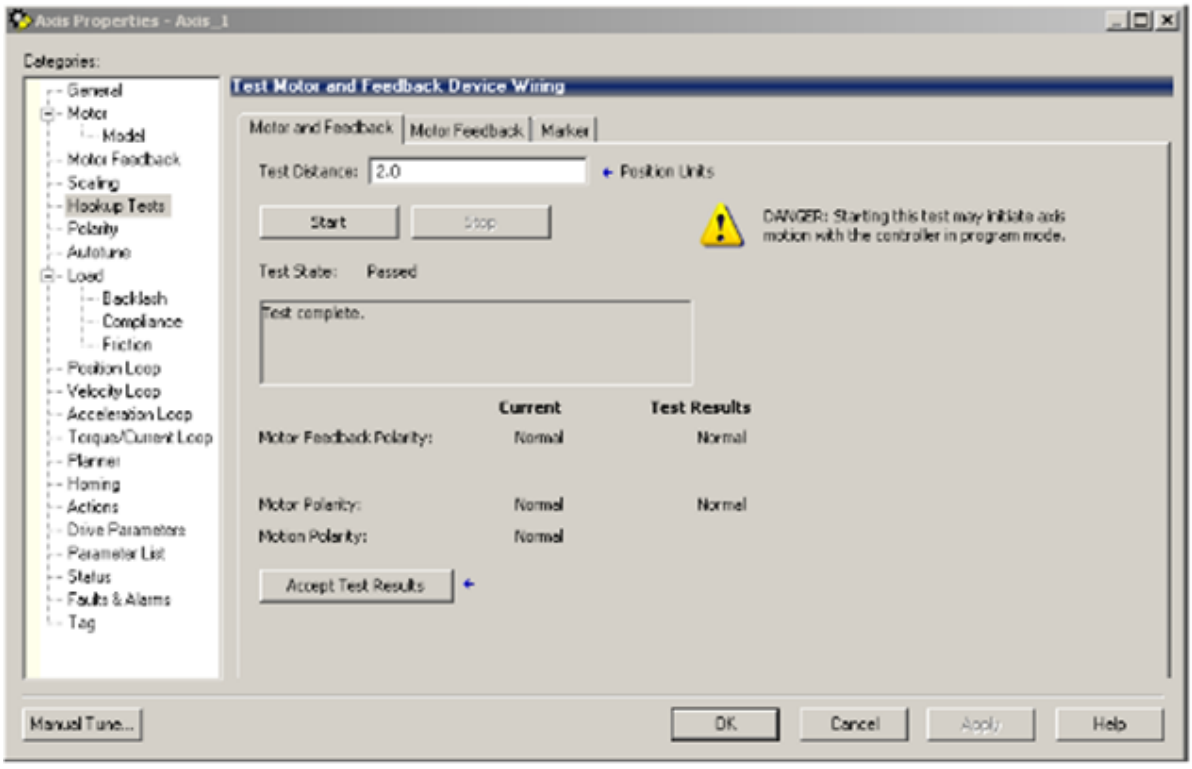


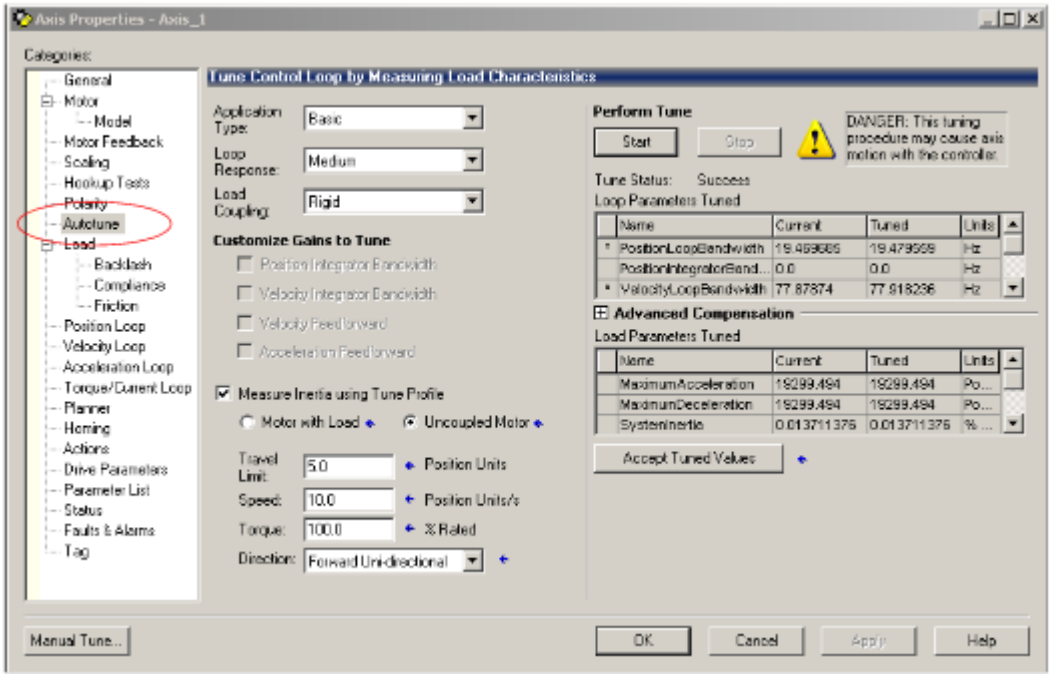
Actions and Parameters:



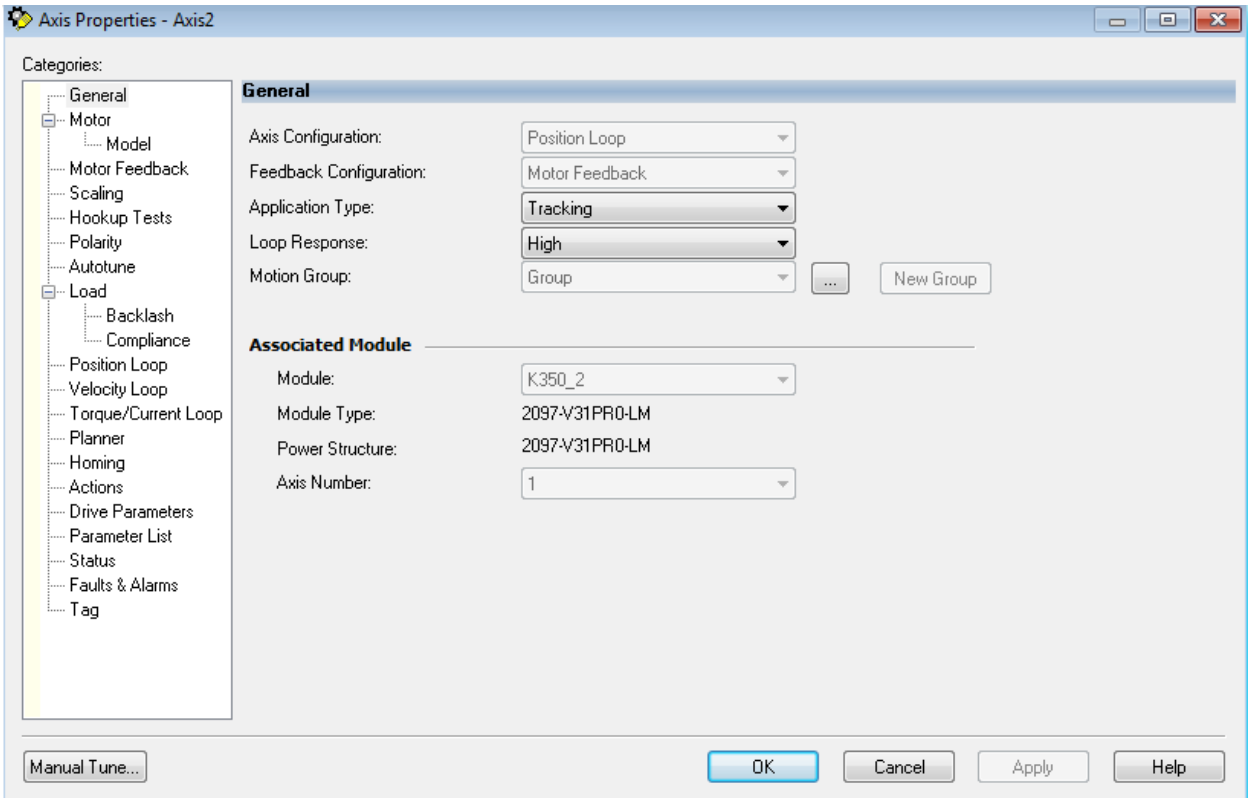


Download the application and test and tune the axes.

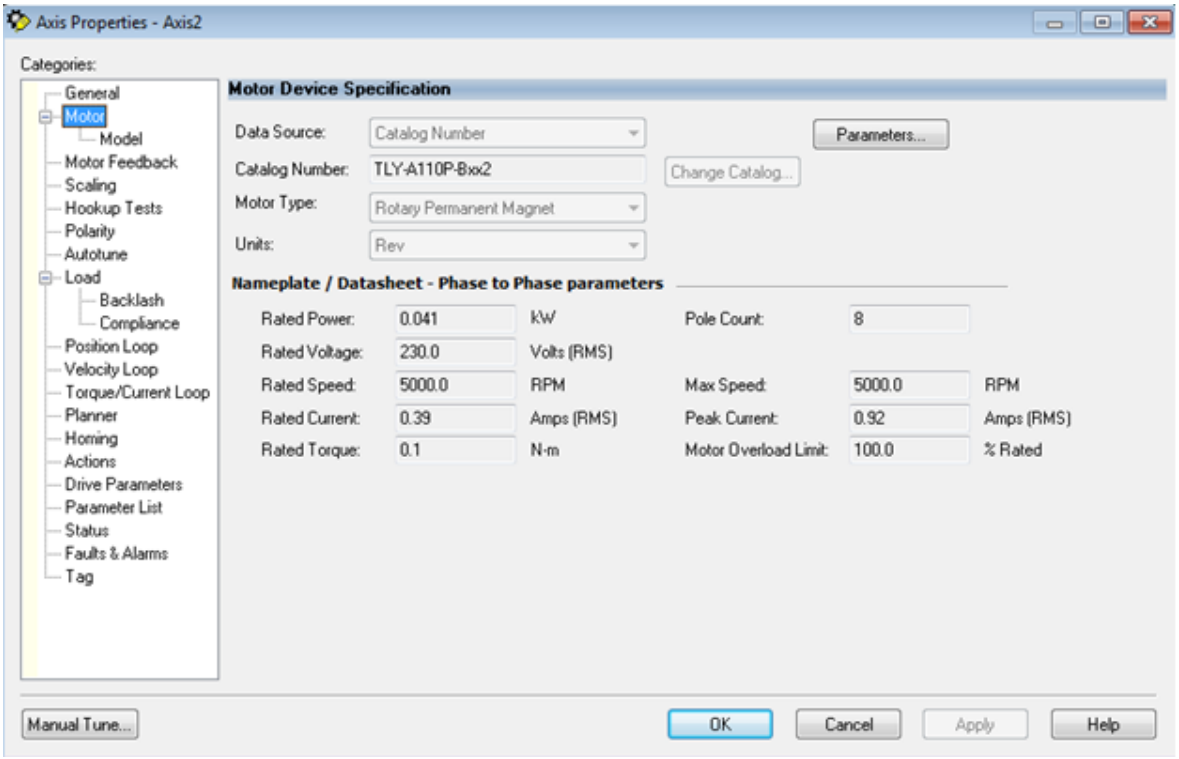




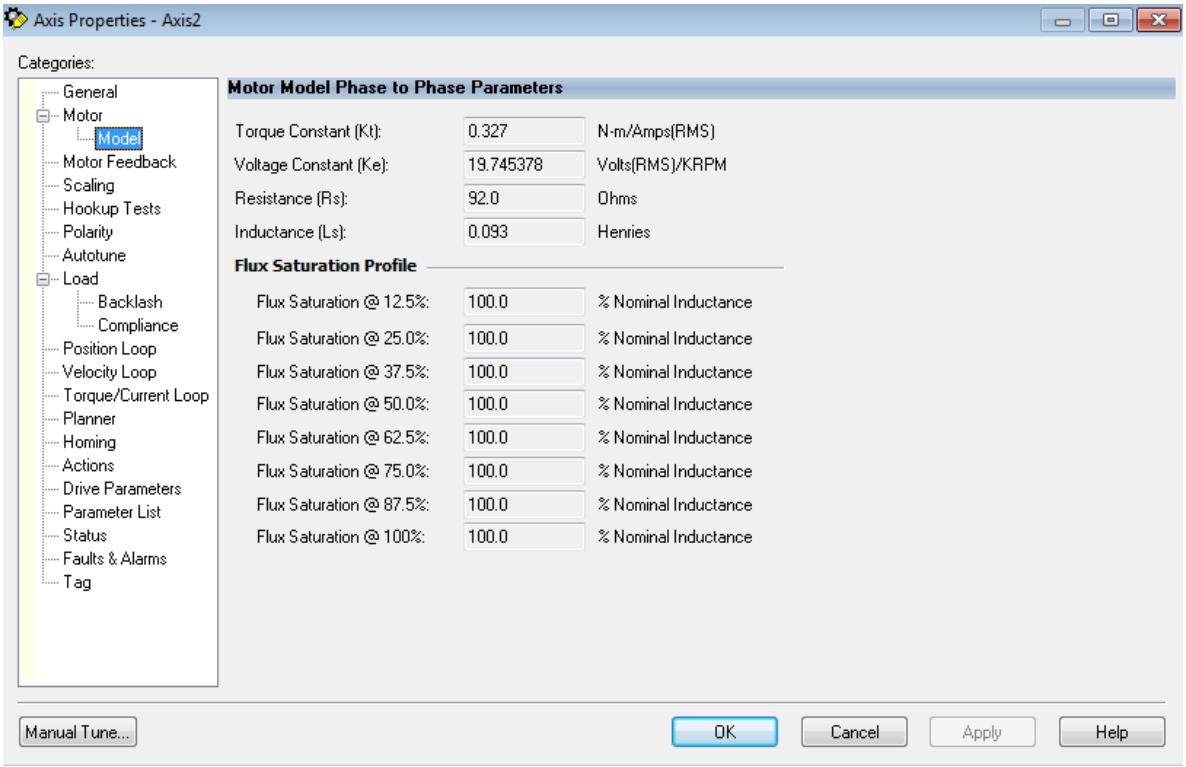
Auto-tune the Drive



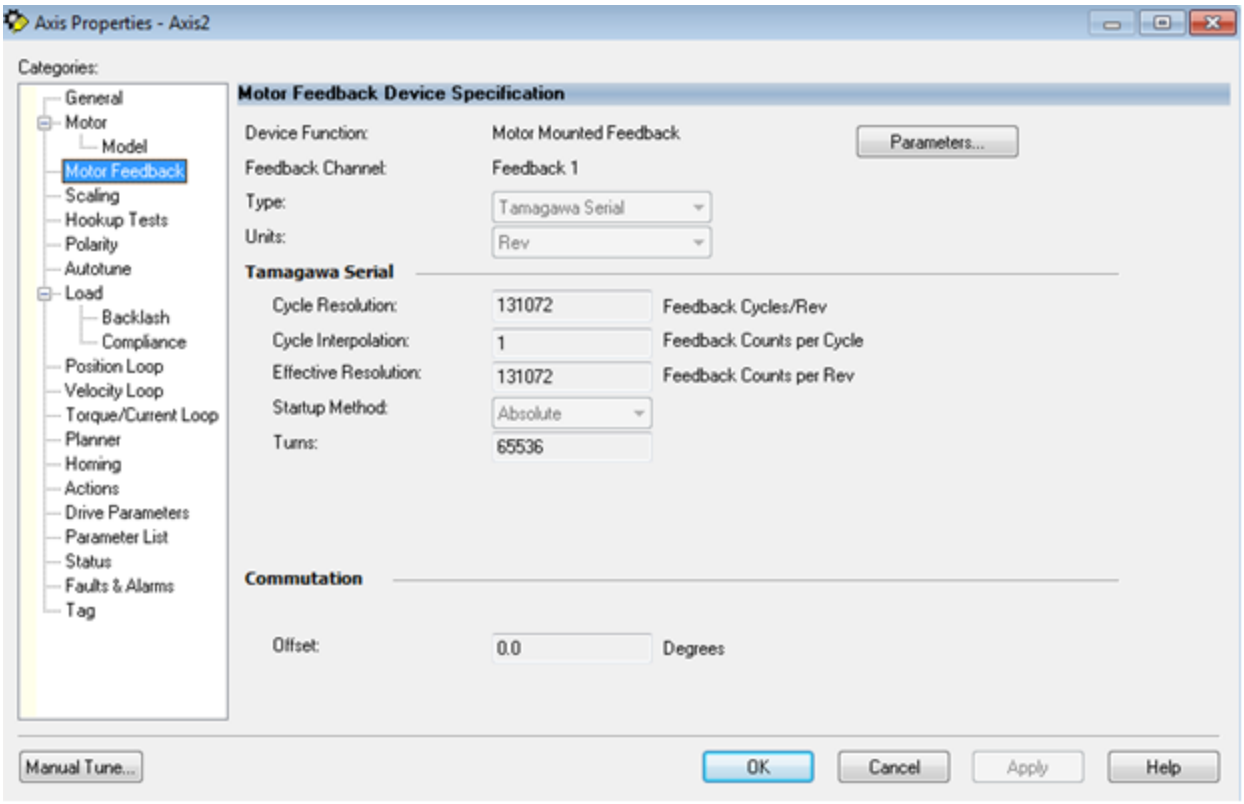
Axis Properties for our application:

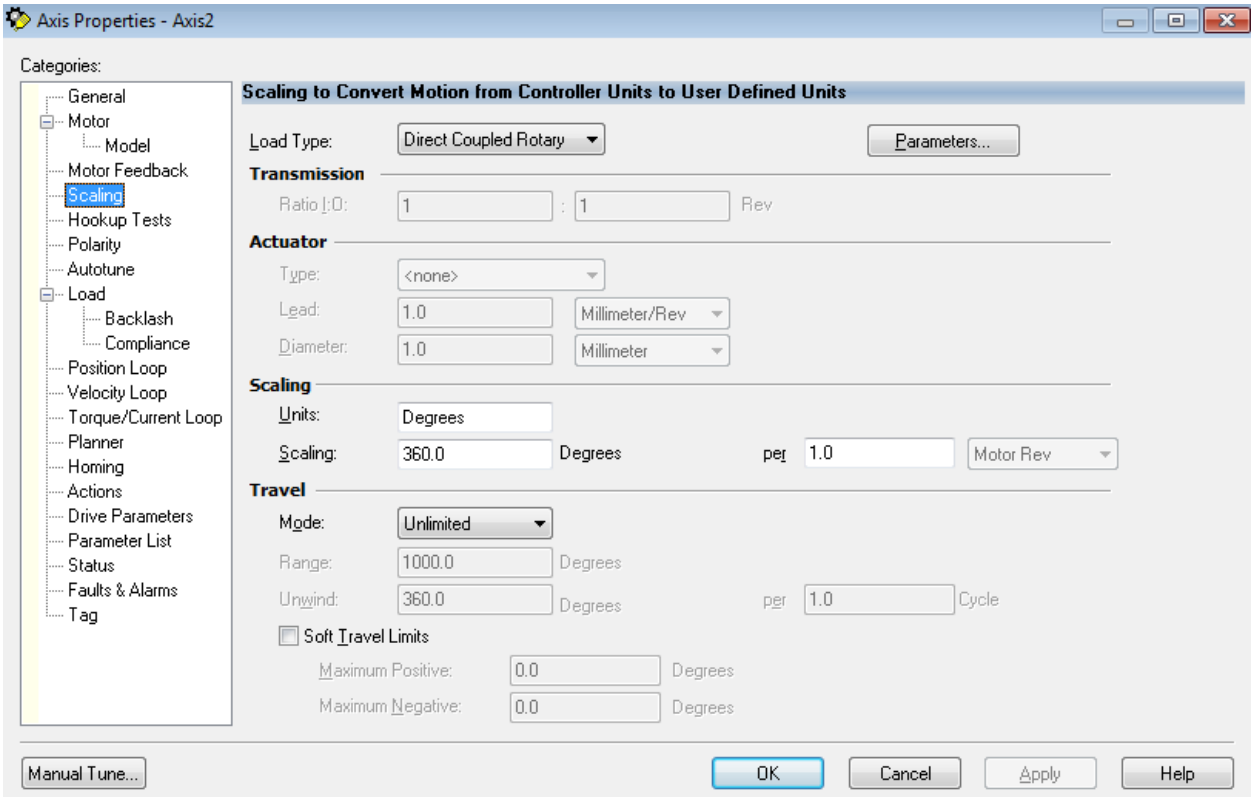


Motor Device Specification Properties

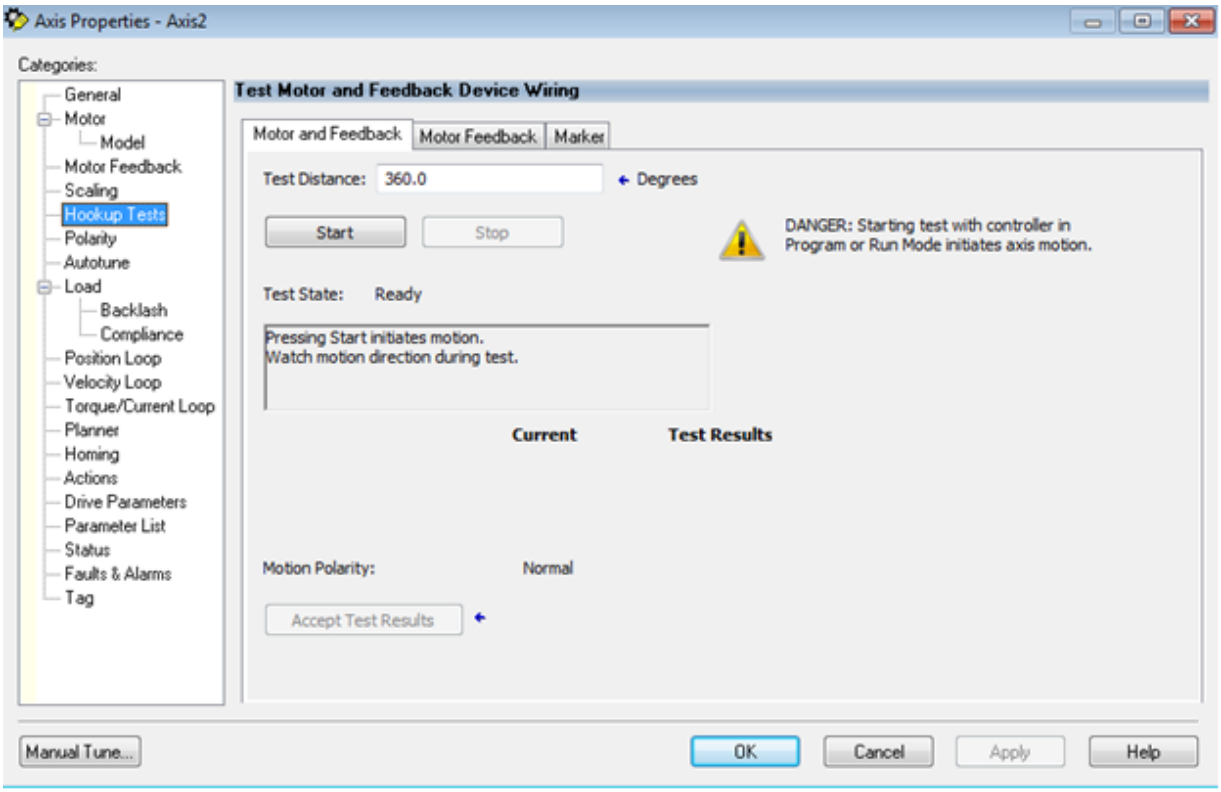


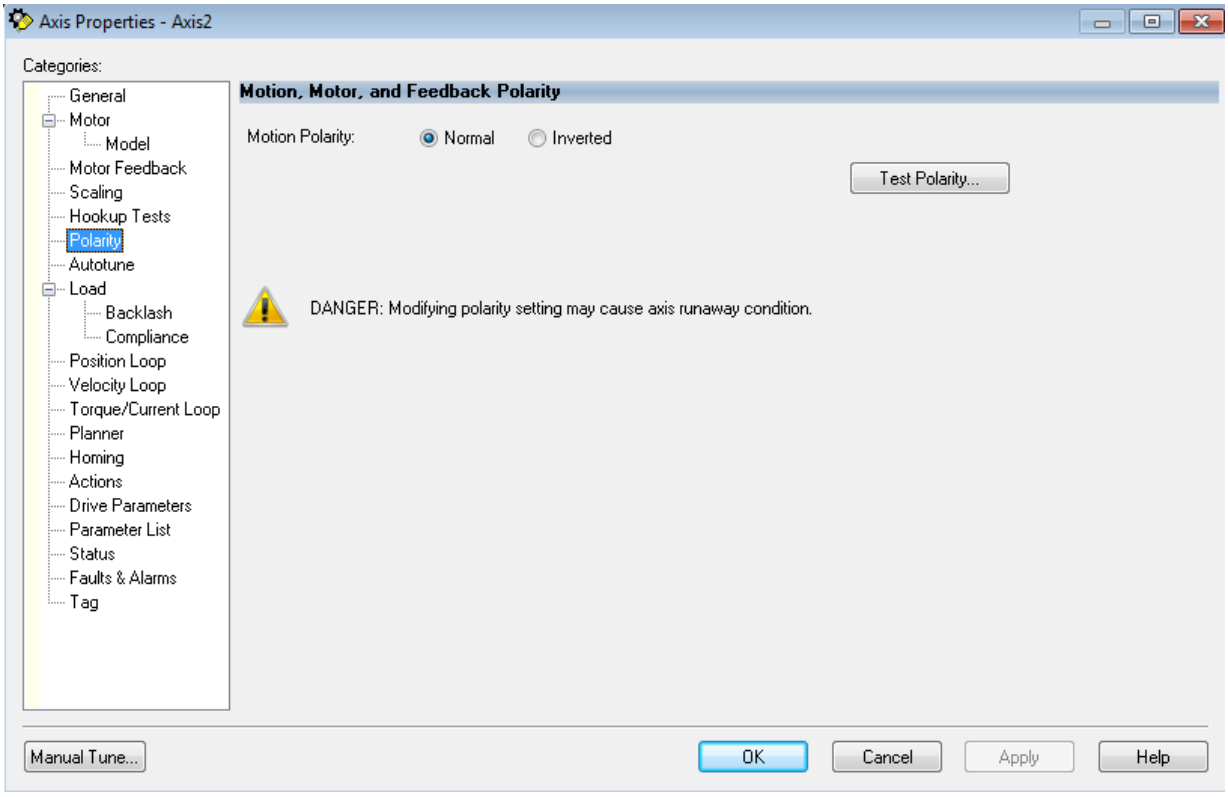
Motor Model Phase to Phase Properties



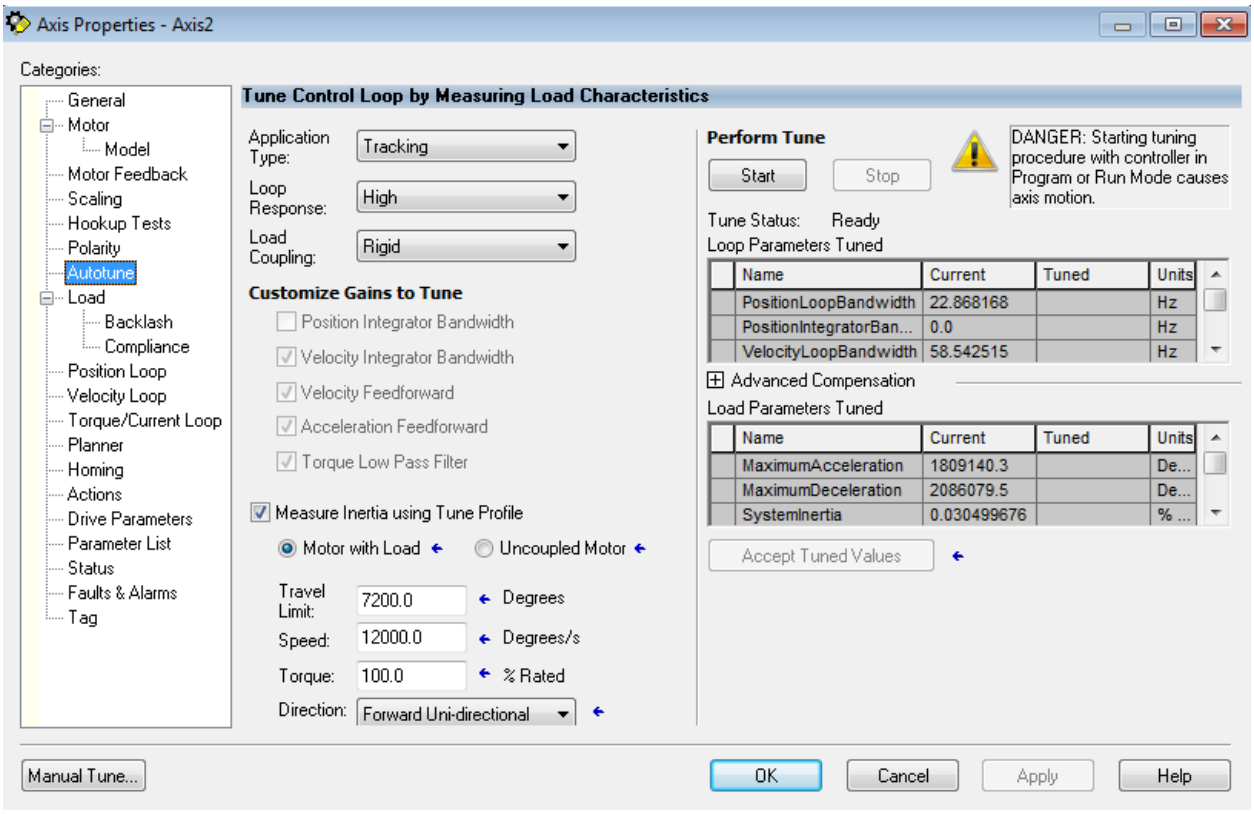


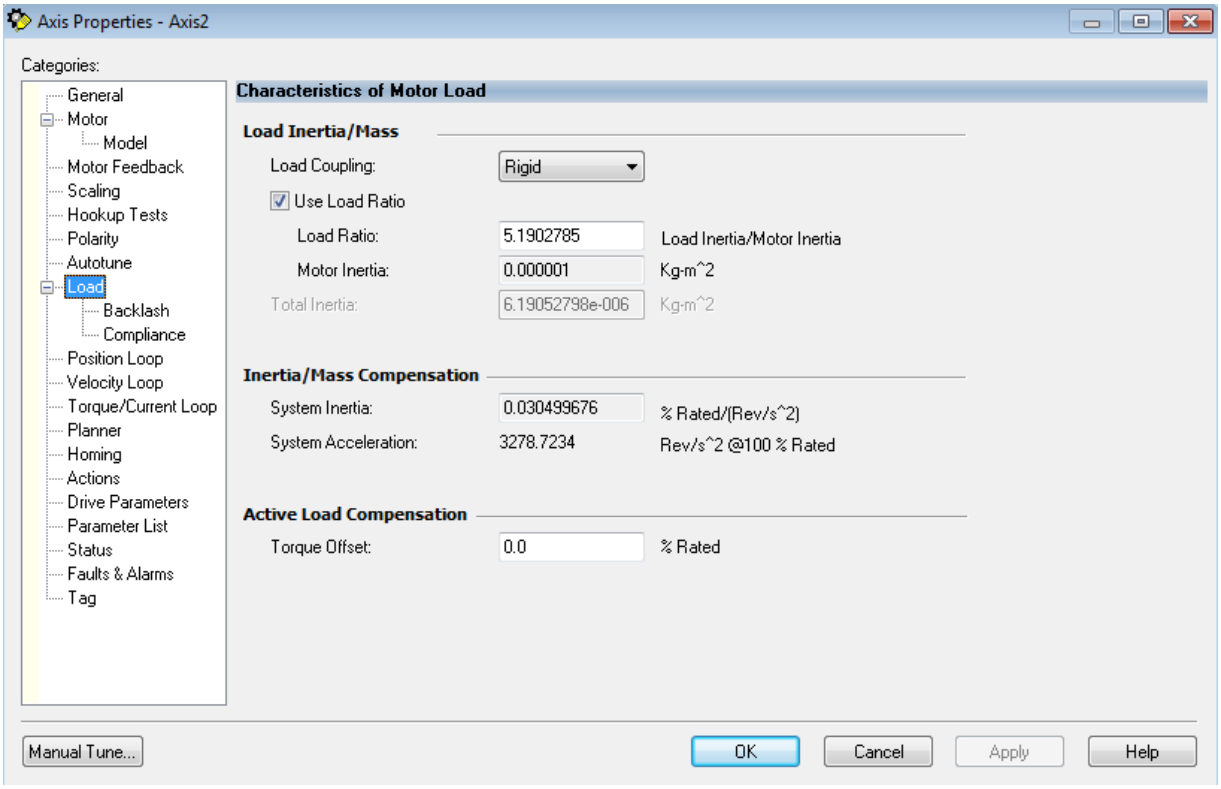
Scaling Parameters



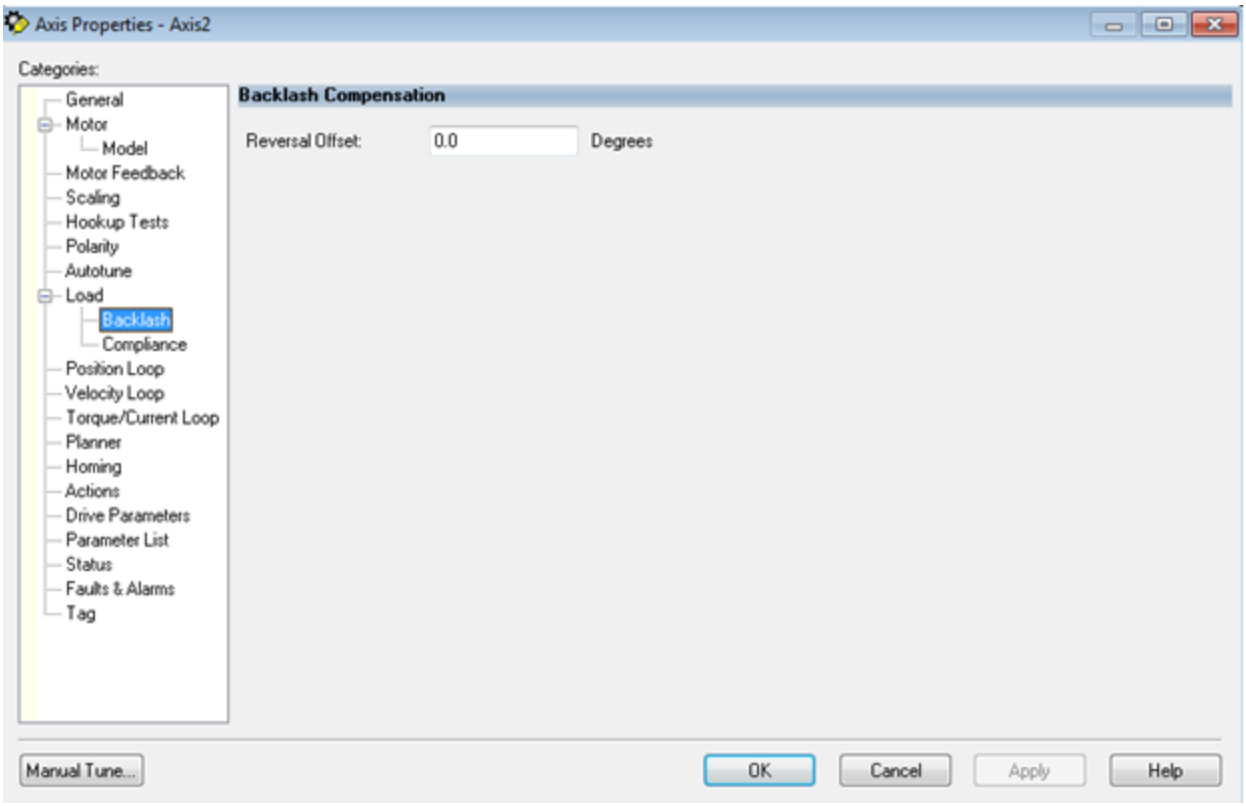


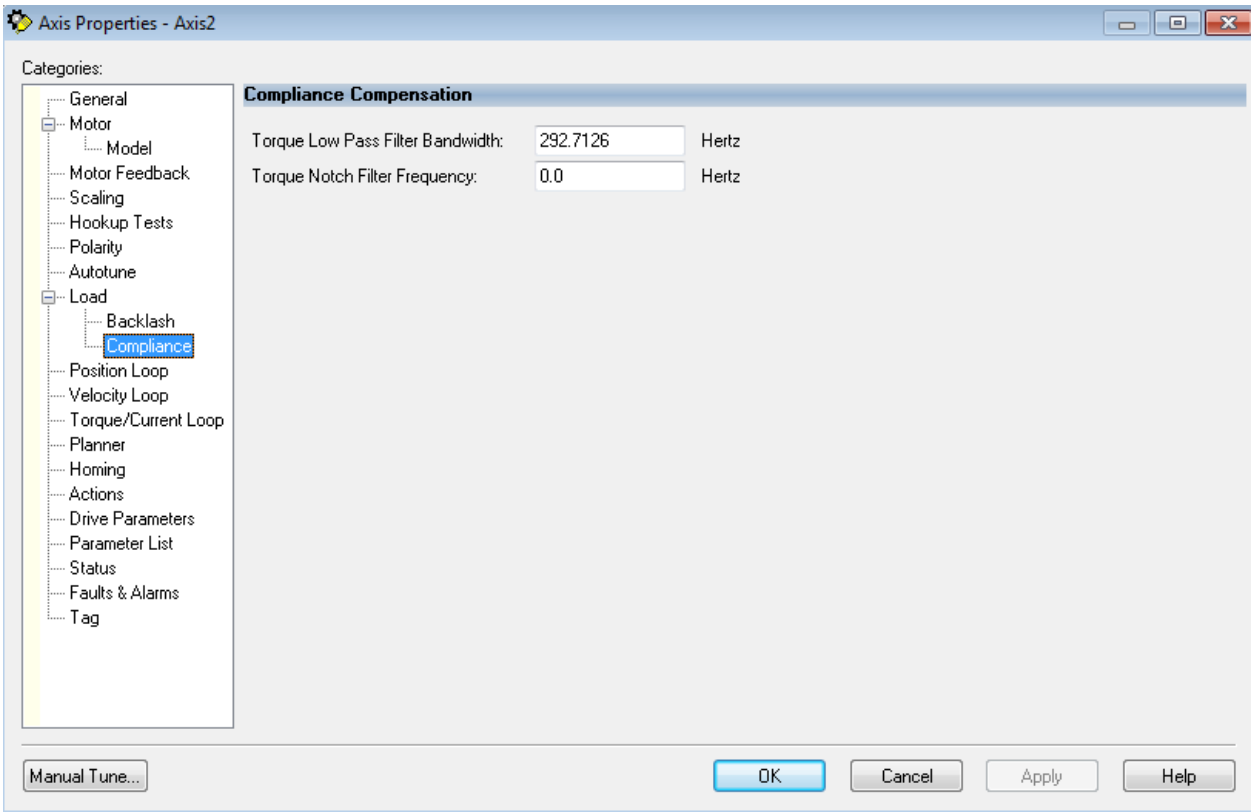
Test Polarity Screen



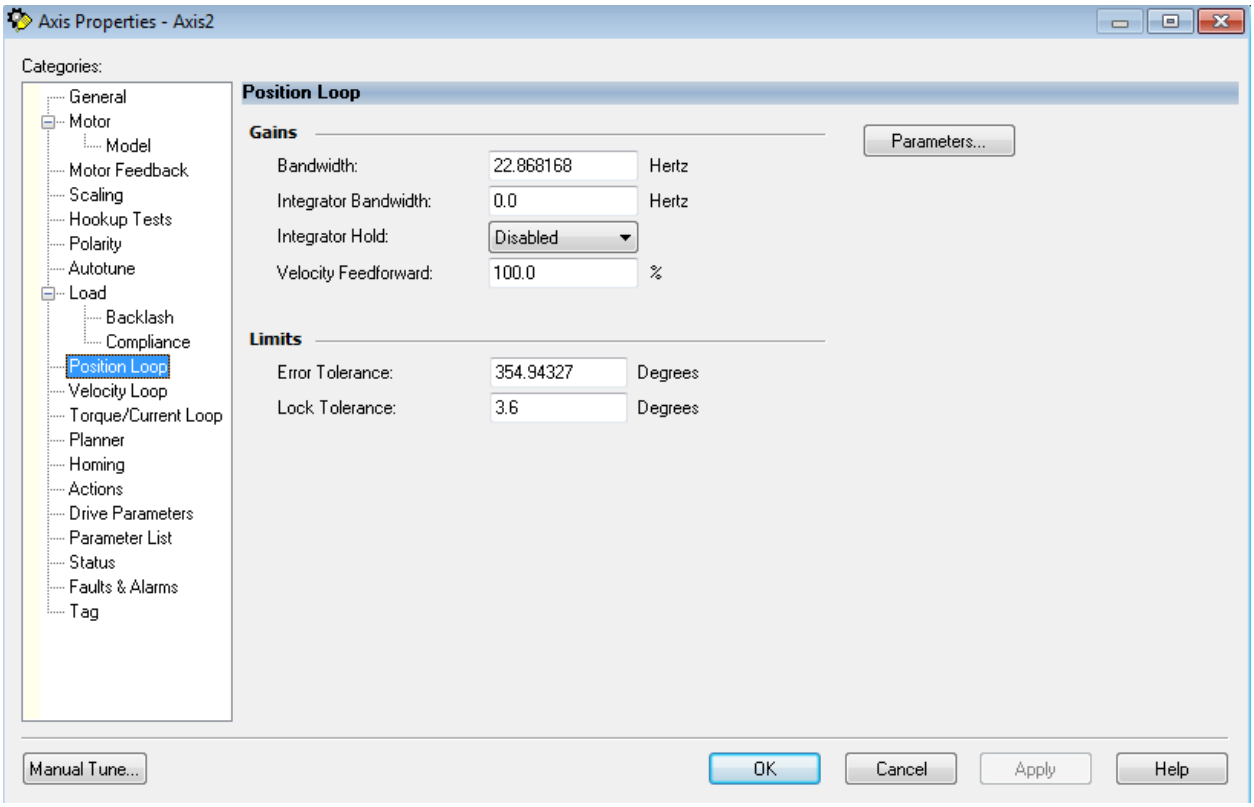


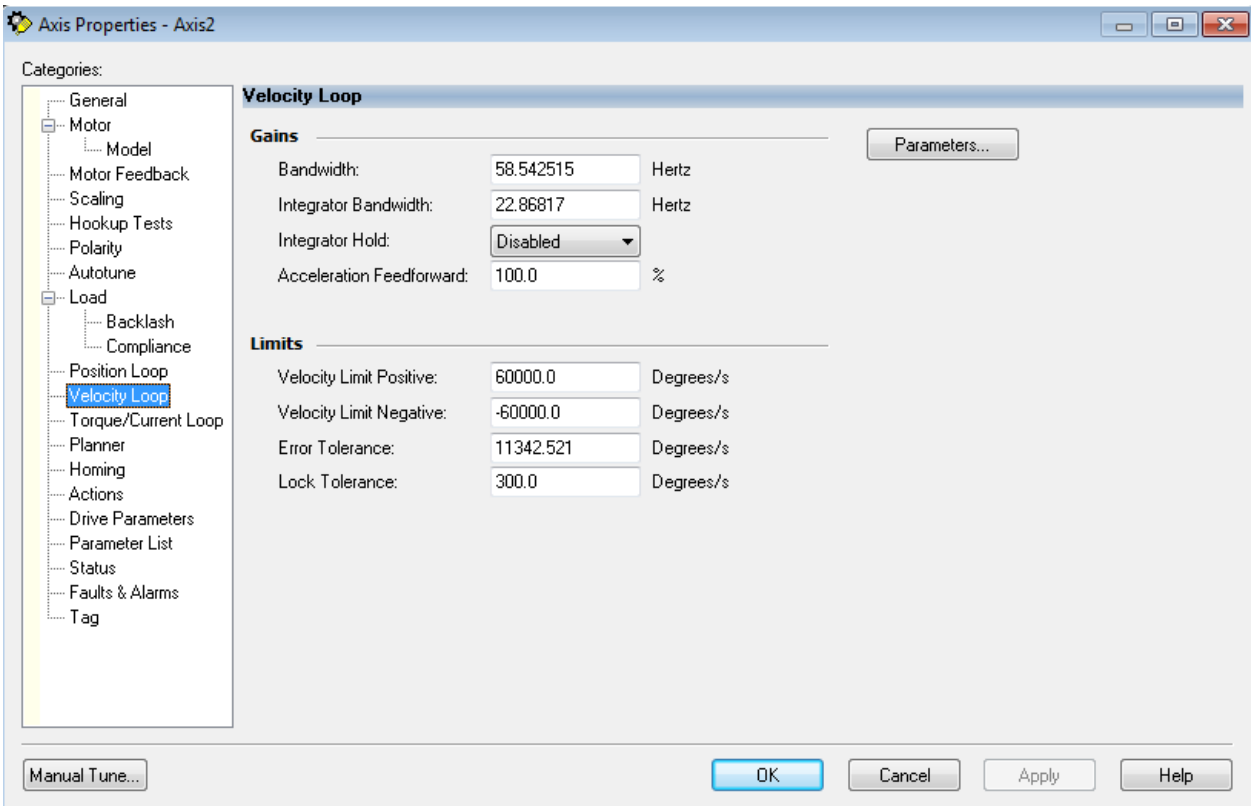
Motor Load Characteristics



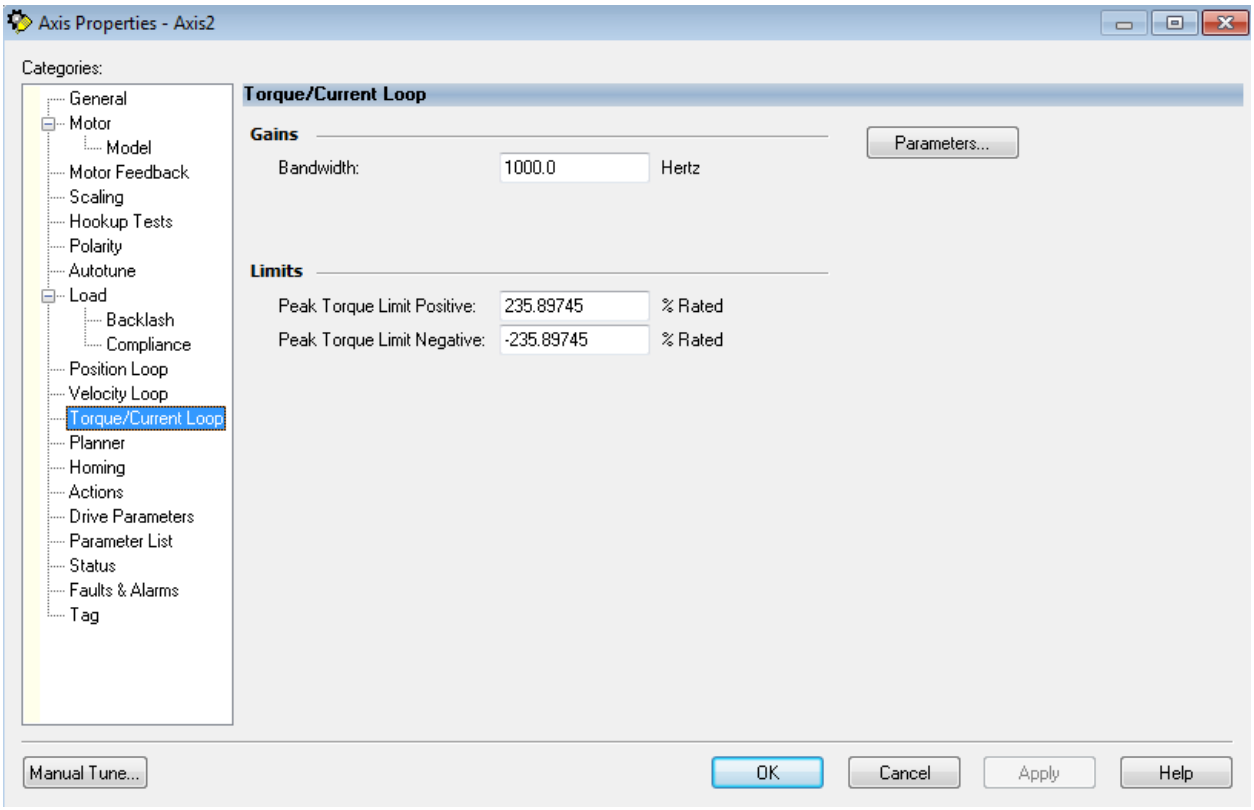


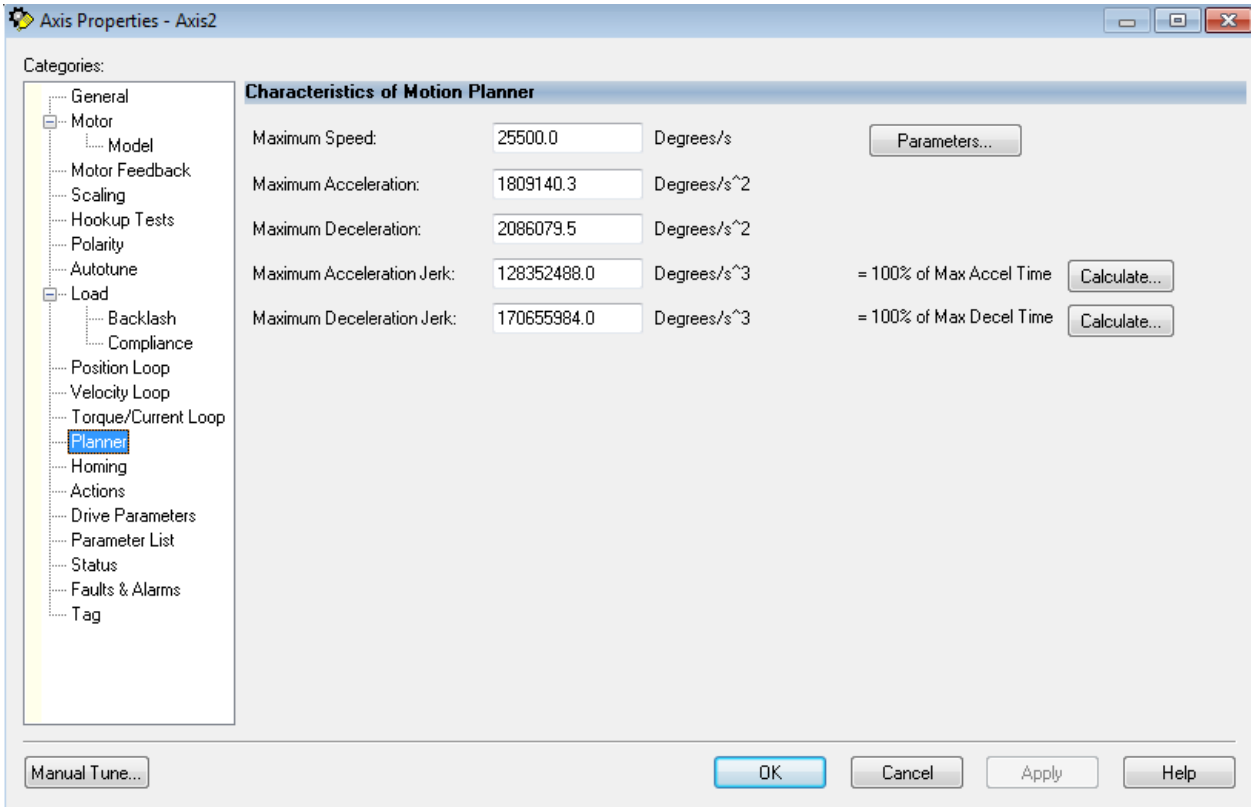
Compliance Compensation



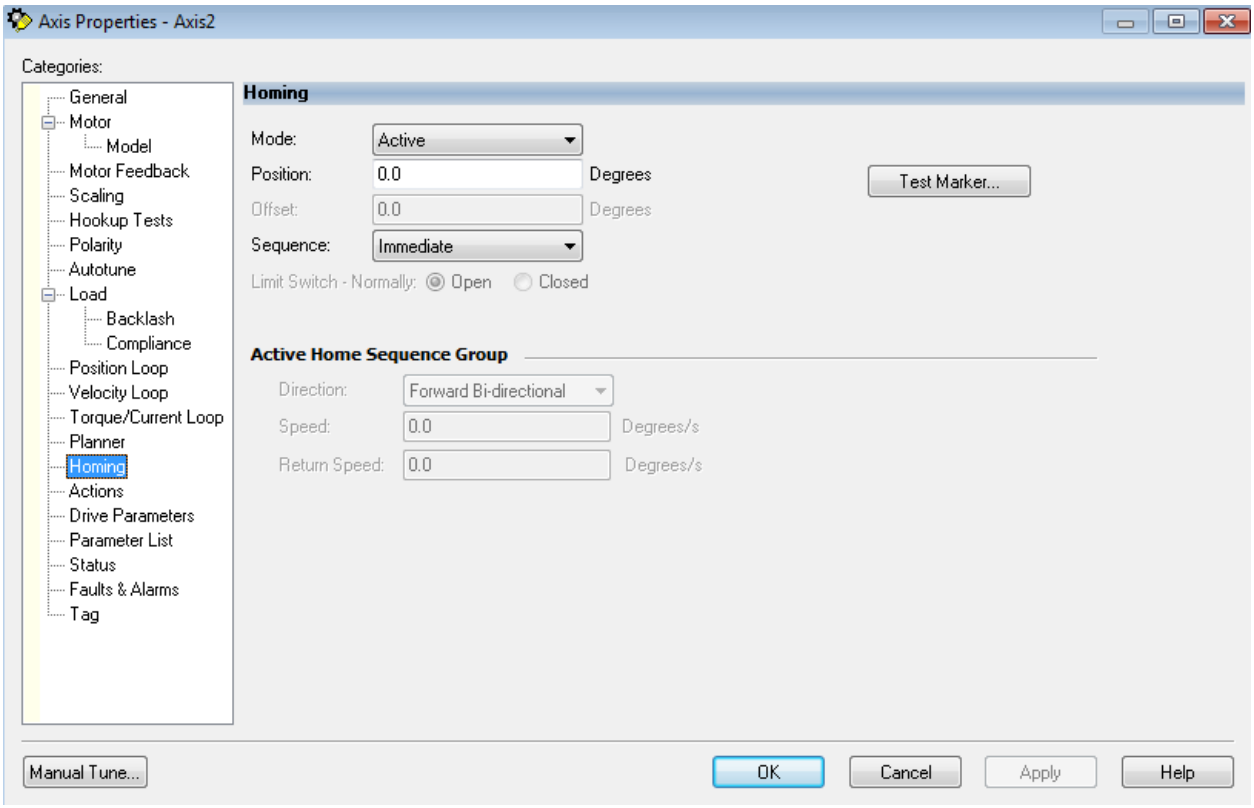


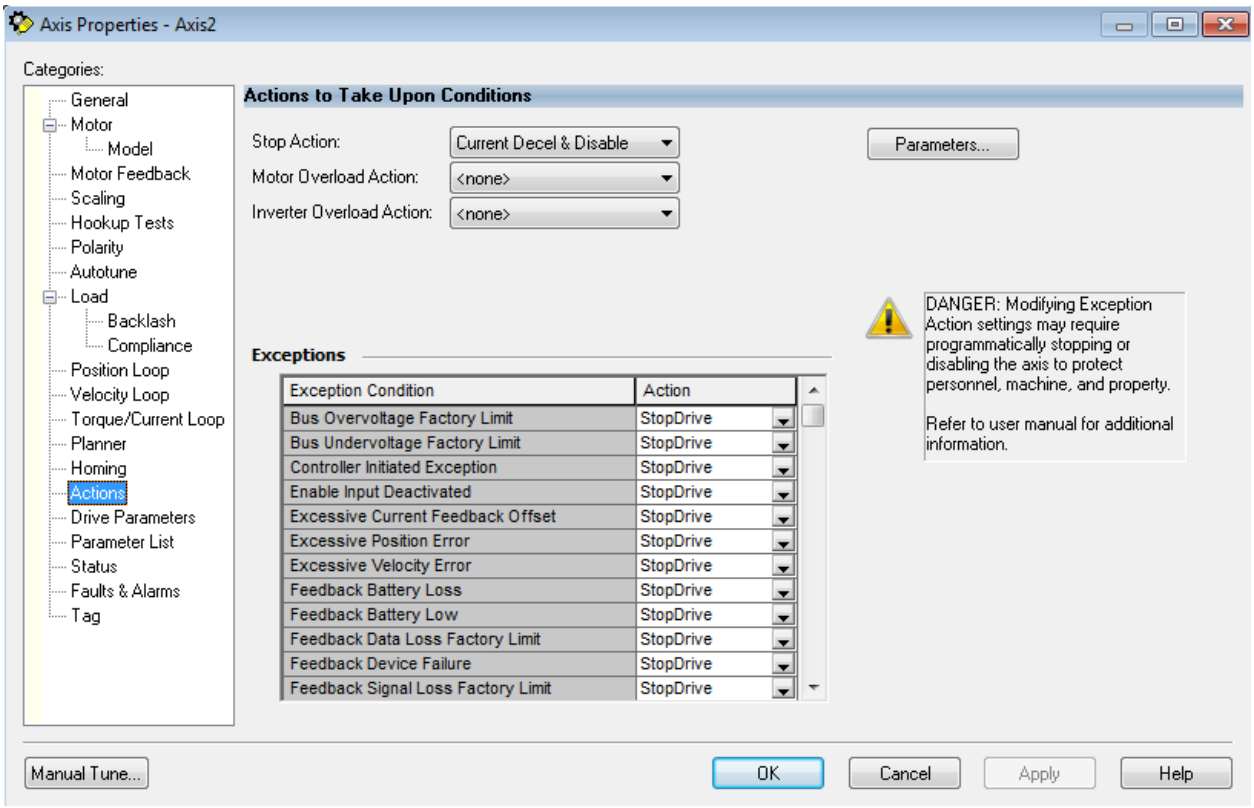
Velocity Loop Properties



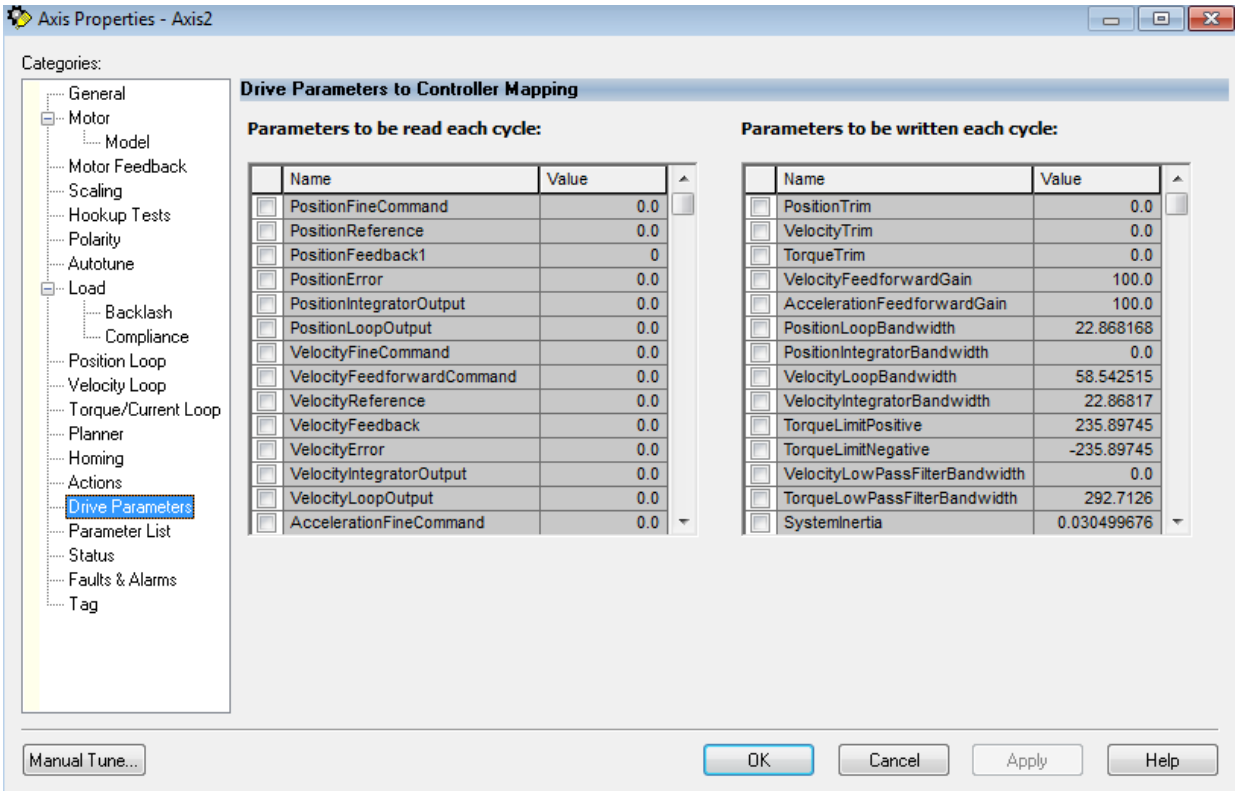


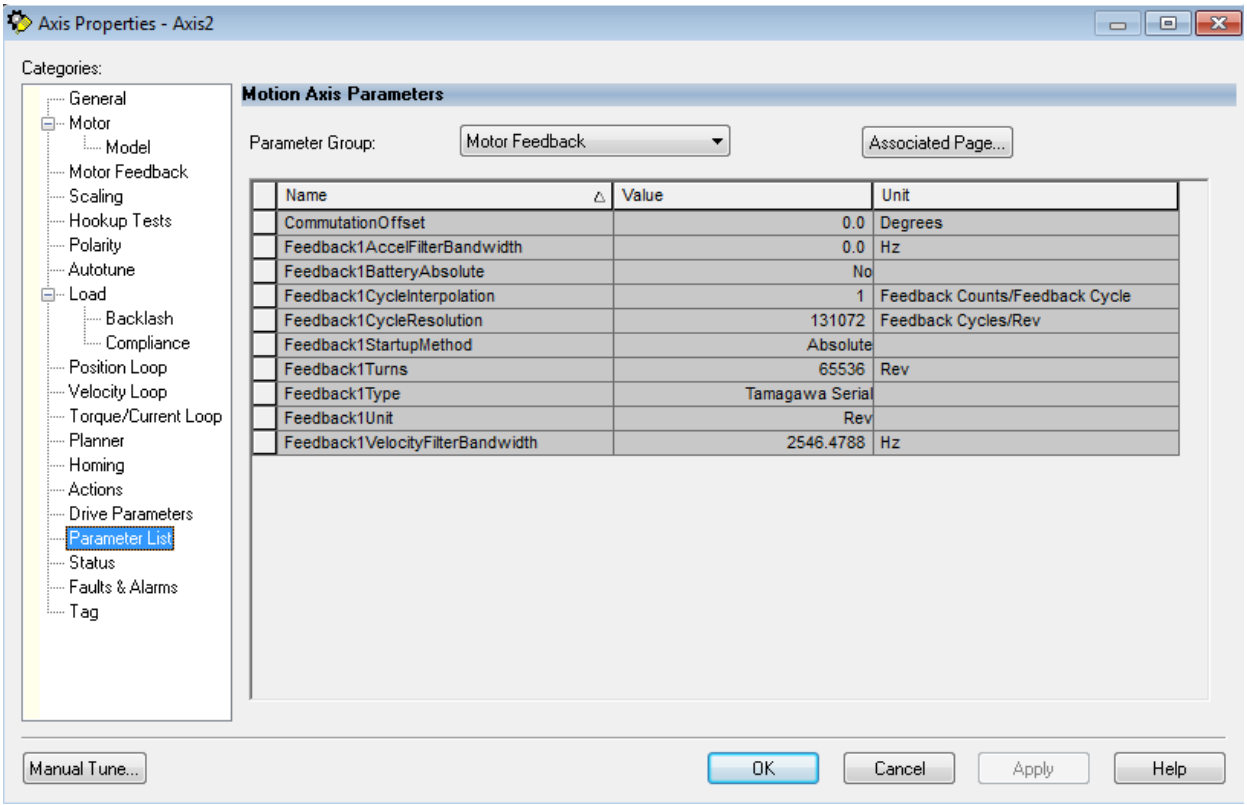
Motion Planner



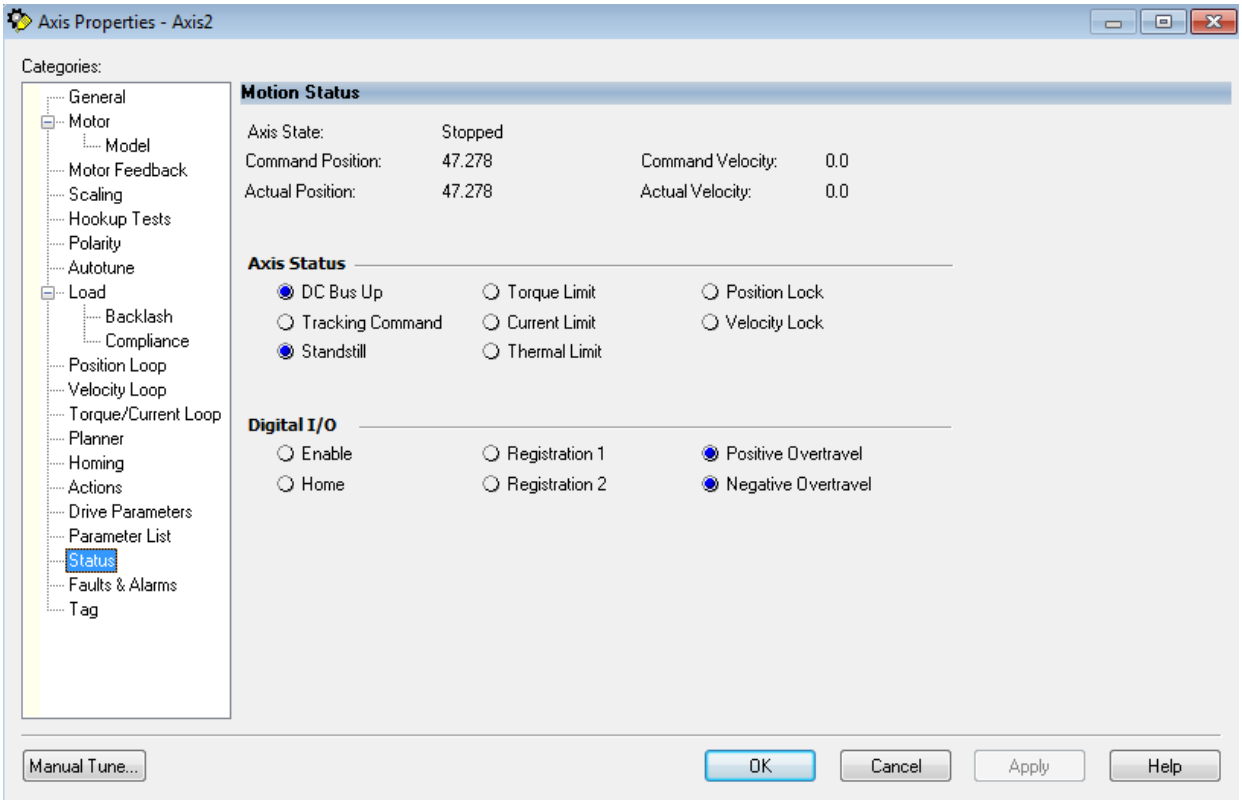


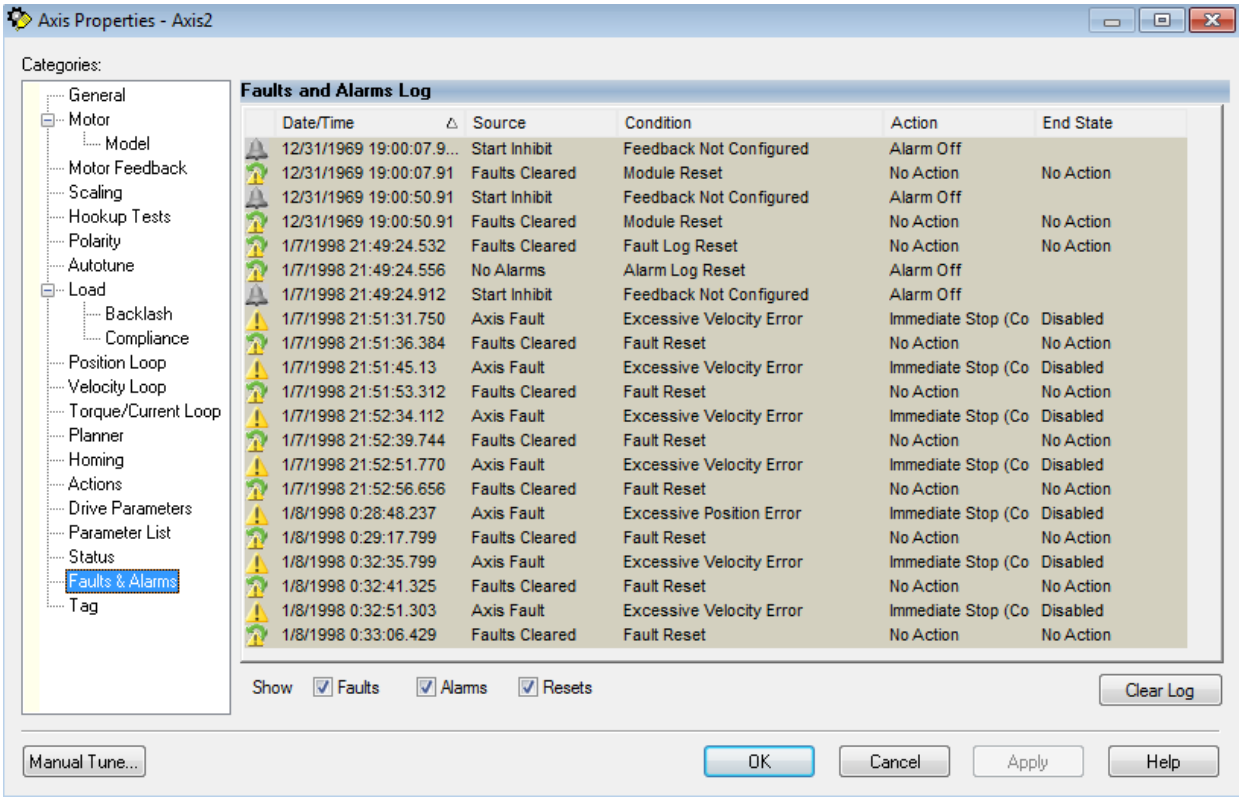
Actions to Take Upon Conditions



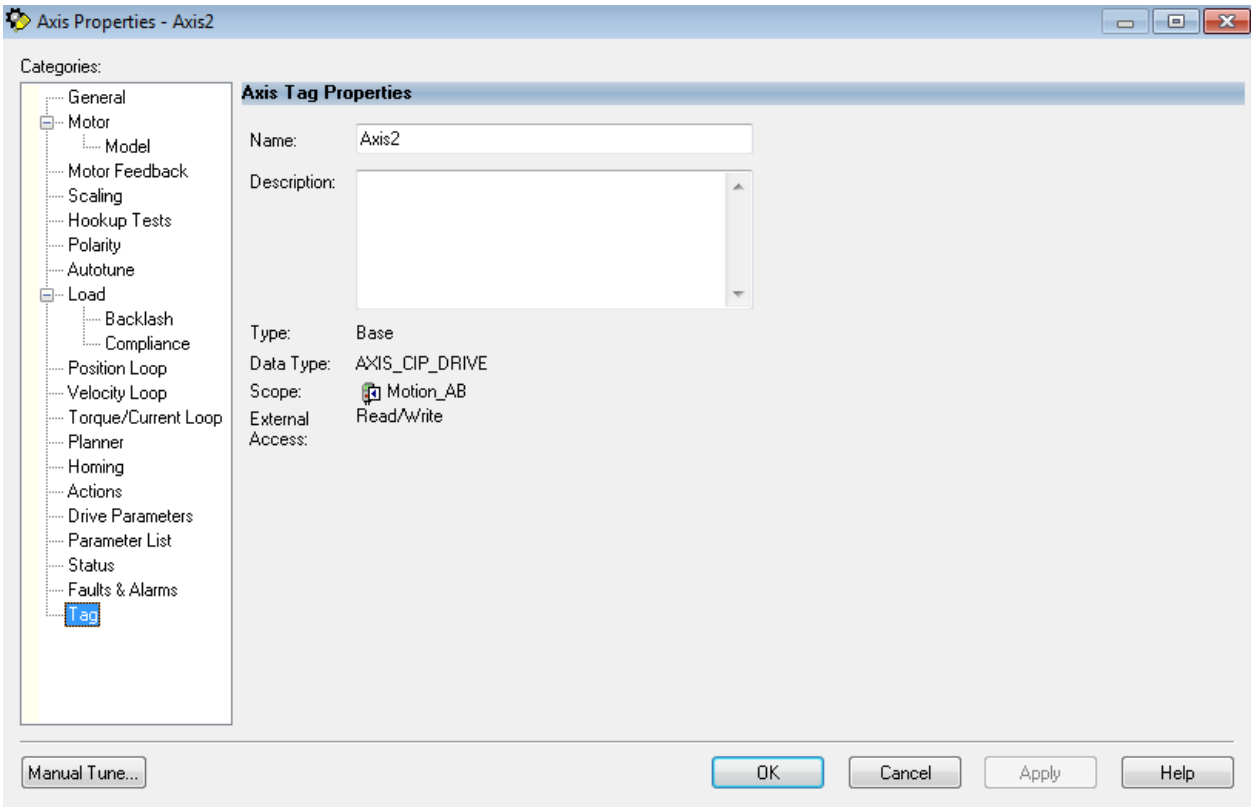


More Drive Parameters





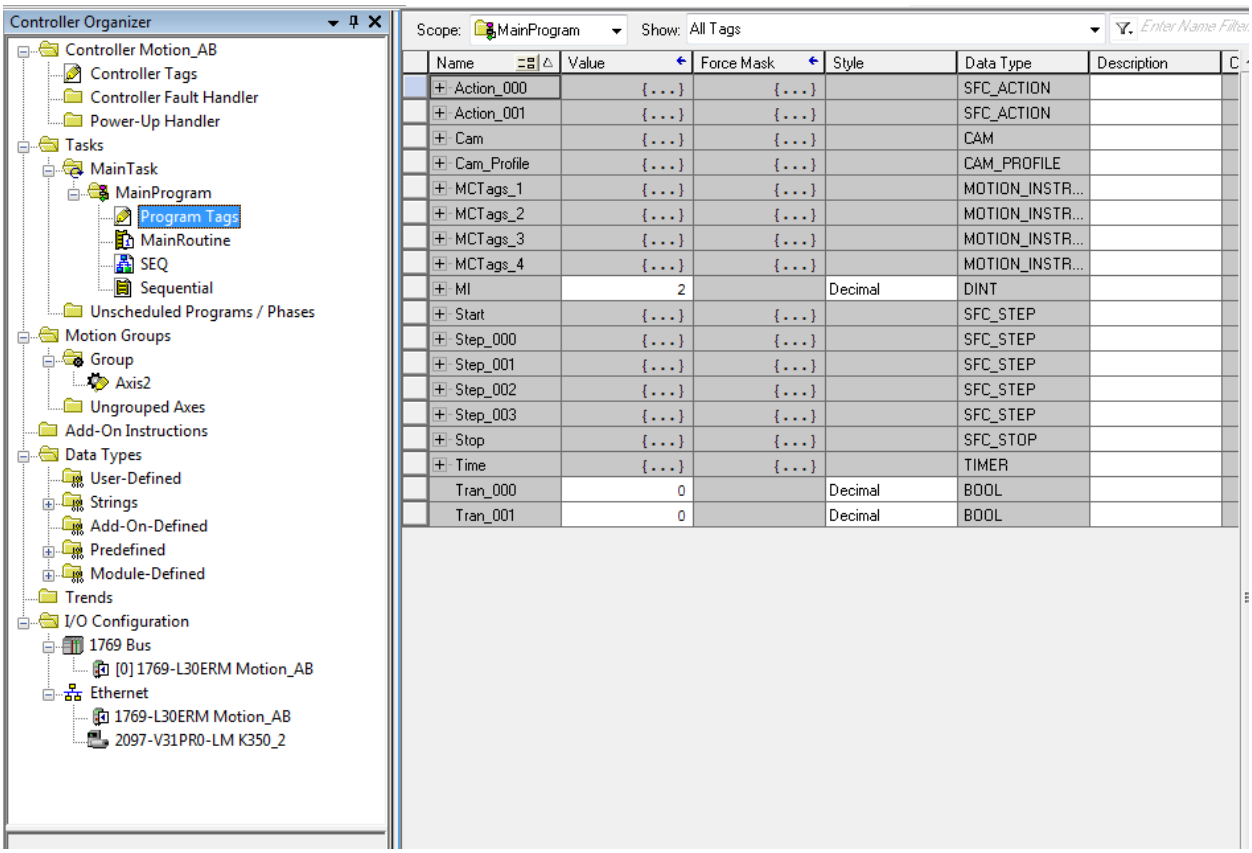
Faults and Alarm Log Screen



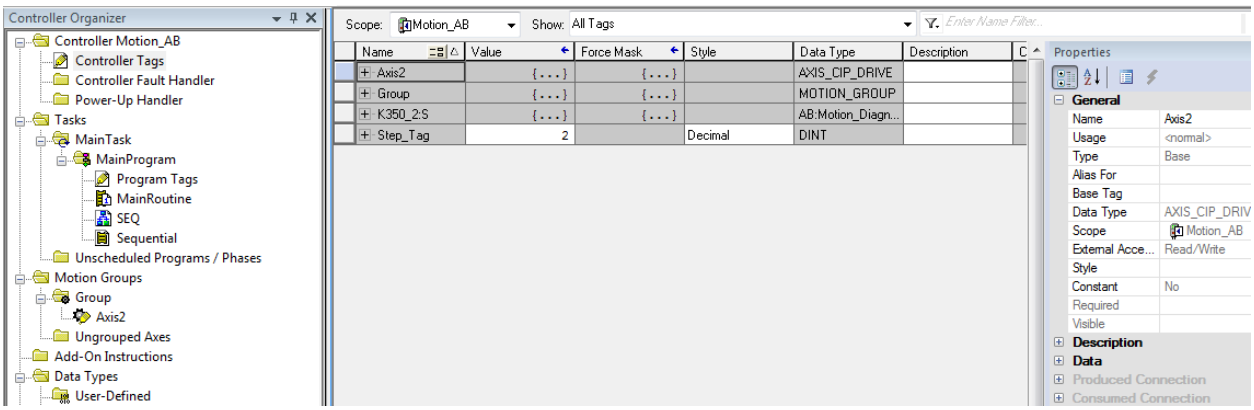
Note:

Under Drive Parameters, Feedback1BatteryAbsolute, set to ‘No’ or 0. Otherwise, the hardware will generate a fault and you will not be able to run the axis.

Sample Commands for the A-B Application



Setting Up a Sequence



More Examples of Sequences

Kinetix 350 Drive Ethernet Port Configuration

The IP address of the Kinetix 350 drive is composed of four sub-octets that are separated by three dots to conform to the Class C Subnet structure. Each sub-octet can be configured with number between 1 and 254. As shipped from the factory the default IP address of a drive is 192.168.124.200.

There are two methods of changing the current IP address. An address can be assigned to the drive automatically (dynamic IP address) when the drive is connected to a DHCP (Dynamic Host Configuration Protocol) enabled server, or you can manually assign an IP address to the drive (static IP address). Both methods of configuring the drive's IP address are shown here.

Obtain the Kinetix 350 Drives' Current Ethernet Settings

The current Ethernet setting and IP address of the Kinetix 350 drive can be obtained from the drive display and keypad. Press  on the display and use  to access parameters IP_1, IP_2, IP_3, and IP_4. Each of these parameters contain one sub-octet of the full IP address, for example in the case of the drive default (factory set) address parameters:

IP_1 = 192
IP_2 = 168
IP_3 = 124
IP_4 = 200

By accessing these four parameters the full IP address on the drive can be obtained.

If parameters IP_1, IP_2, IP_3, and IP_4 all contain '----' rather than a numerical values it means that the drive has DHCP enabled and the DHCP server is yet to assign the drive its dynamic IP address. As soon as an IP address is assigned by the server the address assigned is displayed by the drive in the above parameters. See Configure the IP Address Automatically (dynamic address) on page 83.

Configure the IP Address Manually (static address)

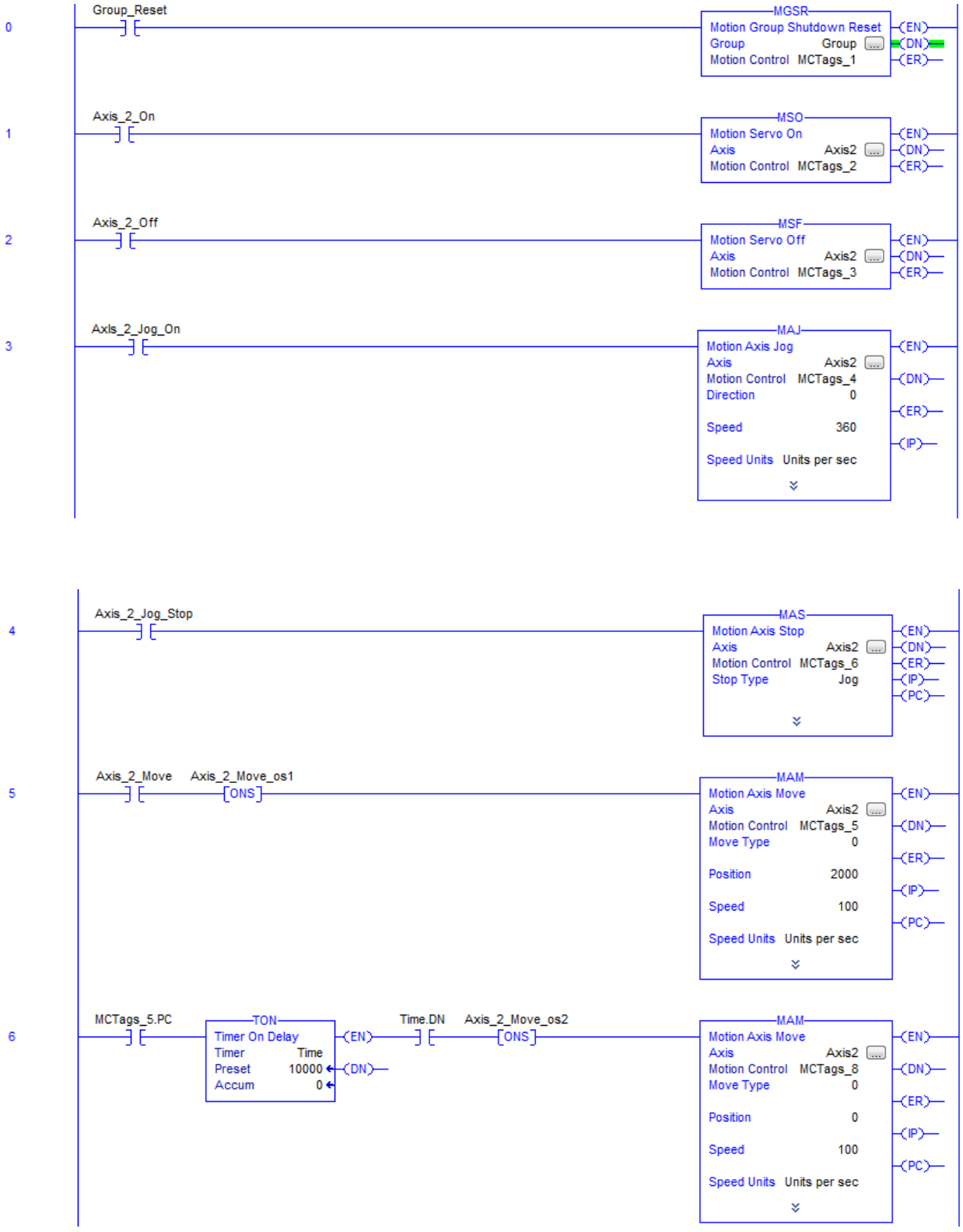
When connecting directly from the Kinetix 350 drive to the personal computer without a server or when connecting to a private network, where all devices have static IP addresses, assign the IP address of the Kinetix 350 drive manually.

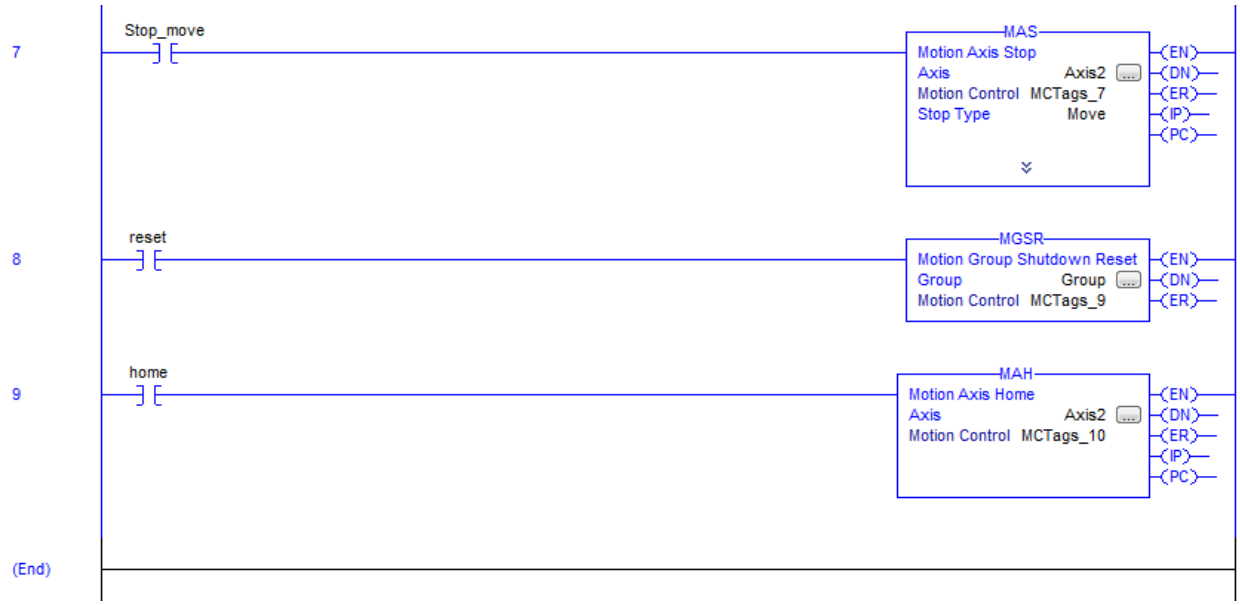
To assign the address manually, disable the DHCP mode. Do this by using the drive keypad and following these steps.

1. Press .
2. Use to access parameter DHCP.
3. Check this parameter is set to a value of 0.
4. If the DHCP parameter is set to 1 then use and to set to 0.
5. Cycle power to the drive.

   The change takes effect.

Do not forget step 5 – Cycle Power!


0
Group_Reset
MGSR
Motion Group Shutdown Reset
Group Group
Motion Control MCTags_1
EN
DN
ER
1
Axis_2_On
MSO
Motion Servo On
Axis Axis2
Motion Control MCTags_2
EN
DN
ER
2
Axis_2_Off
MSF
Motion Servo Off
Axis Axis2
Motion Control MCTags_3
EN
DN
ER
3
Axis_2_Jog_On
MAJ
Motion Axis Jog
Axis Axis2
Motion Control MCTags_4
Direction 0
Speed 360
Speed Units Units per sec
EN
DN
ER
IP
4
Axis_2_Jog_Stop
MAS
Motion Axis Stop
Axis Axis2
Motion Control MCTags_6
Stop Type Jog
EN
DN
ER
IP
PC
5
Axis_2_Move
Axis_2_Move_os1
ONS
MAM
Motion Axis Move
Axis Axis2
Motion Control MCTags_5
Move Type 0
Position 2000
Speed 100
Speed Units Units per sec
EN
DN
ER
IP
PC
6
MCTags_5.PC
TON
Timer On Delay
Timer Time
Preset 10000
Accum 0
EN
DN
Time.DN
Axis_2_Move_os2
ONS
MAM
Motion Axis Move
Axis Axis2
Motion Control MCTags_8
Move Type 0
Position 0
Speed 100
Speed Units Units per sec
EN
DN
ER
IP
PC


7
Stop_move
MAS
Motion Axis Stop
Axis Axis2
Motion Control MCTags_7
Stop Type Move
EN
DN
ER
IP
PC
8
reset
MGSR
Motion Group Shutdown Reset
Group Group
Motion Control MCTags_9
EN
DN
ER
9
home
MAH
Motion Axis Home
Axis Axis2
Motion Control MCTags_10
EN
DN
ER
IP
PC
(End)


Allen-Bradley
QUALITY
KINETIX 350 DRIVE
BUL. 2097
Input Voltage: 120/240 VAC
Input Phase: 1/N/PE
Output Current: 2,0 A
Ethernet
FW REV: 2.02
HW/SW Rev: 3.03 / 20
SN:
0344921805
KCC-REM-RAA-2097
Product of USA
Material: PN-102707
CAT
2097-V31PR0-LM
SER
A
00884951255937


CAT
PRODUCT OF CHINA
SER
TLY-A110P-BJ62AA
B
00820919821721

The following manual describes the setup of the drive:

https://literature.rockwellautomation.com/idc/groups/literature/documents/um/2097-um002_-en-p.pdf

Chapter 6 describes the Drive Safe Torque-off set-up. On pg. 107 the jumpers are shown that bypass the feature. In another chapter, the safety of a system is discussed. This chapter discusses the safe use of this drive and controller.