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Using the Kinetix 300 Drive

Using the Kinetix 300 Drive: Hands-On Lab

Training Lab Manual

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Using the Kinetix 300 Drive

About This Hands-On Lab

The versatile Kinetix 300 drive can be used in many ways; the most simplistic of these being as a stand-alone drive. This lab shows the initial setup and configuration of the drive, as well as its use as an analog velocity drive and an indexing drive.

The following sections explain what you'll be doing in this lab session, and what you will need to do to complete the hands-on exercises.

What You Will Accomplish In This Lab

As you complete the exercises in this hands-on session, you will:

- Configure and tune the Kinetix 300 drive for various modes of operation
- Command the drive in analog velocity and indexing modes

Who Should Complete This Lab

This hands-on lab is intended for individuals who:

- Have a base knowledge of servo drive systems
- Would like to explore the web-based configuration software for the Kinetix 300 drive

Lab Materials

For this Hands-On lab, we have provided you with the following materials that will allow you to complete the labs in this workbook.

Hardware

This hands-on lab uses the following hardware:

- Kinetix 300 drive demo unit including drive TLY series motor

Software

This hands-on lab uses the following software:

- The embedded web-based configuration tool included in the drive
- Internet Explorer

Document Conventions

Throughout this workbook, we have used the following conventions to help guide you through the lab materials.

This style or symbol:	Indicates:
Words shown in bold italics (e.g., ***RSLogix 5000*** or ***OK***)	Any item or button that you must click on, or a menu name from which you must choose an option or command. This will be an actual name of an item that you see on your screen or in an example.
Words shown in bold italics, enclosed in single quotes (e.g., ***'Controller1'***)	An item that you must type in the specified field. This is information that you must supply based on your application (e.g., a variable). **Note:** When you type the text in the field, remember that you do not need to type the quotes; simply type the words that are contained within them (e.g., Controller1).
	The text that appears inside of this gray box is supplemental information regarding the lab materials, but not information that is required reading in order for you to complete the lab exercises. The text that follows this symbol may provide you with helpful hints that can make it easier for you to use this product. Most often, authors use this "Tip Text" style for important information they want their students to see.

Note: If the mouse button is not specified in the text, you should click on the left mouse button.

Before You Begin

The following steps must be completed before starting the lab exercise:

1. Verify that you have an **Ethernet connection** between the Kinetix 300 drive and your workstation.

Typical Ethernet Layout (a switch is shown, but is *not* required)

Note you can directly connect via an Ethernet cable from the computer to the drive without an Ethernet switch.'

Lab 1: Basic Drive Configuration (15 minutes)

This section assumes that you have previously connected to the Kinetix 300 drive, which automatically installs the Java application MotionView Onboard. Note that you must have a *live internet connection* when installing this application because the drive's embedded installation tool simply points to the Java website for the complete program installation. Once installed, you no longer need an internet connection and the MotionView Onboard program will run automatically upon connecting to the drive.

About This Lab

This lab allows the user to become familiar with the web-based configuration tool included in the Kinetix 300 drive.

In this lab, you will:

- Open the drive configuration software and observe its features
- Restore the drive to it's default settings
- Configure the motor and I/O
- Auto tune the drive for first usage

Follow the steps below to complete Lab Section 1.

Open the MotionView OnBoard Software

The embedded web-based configuration tool eliminates the need to maintain software support in the field. The current software revision is already available – directly from the drive.

In this section of the lab, you will simply attach to the drive using Internet Explorer software and reset the drive to its factory configuration. The Java application has been pre-installed on the workstation.

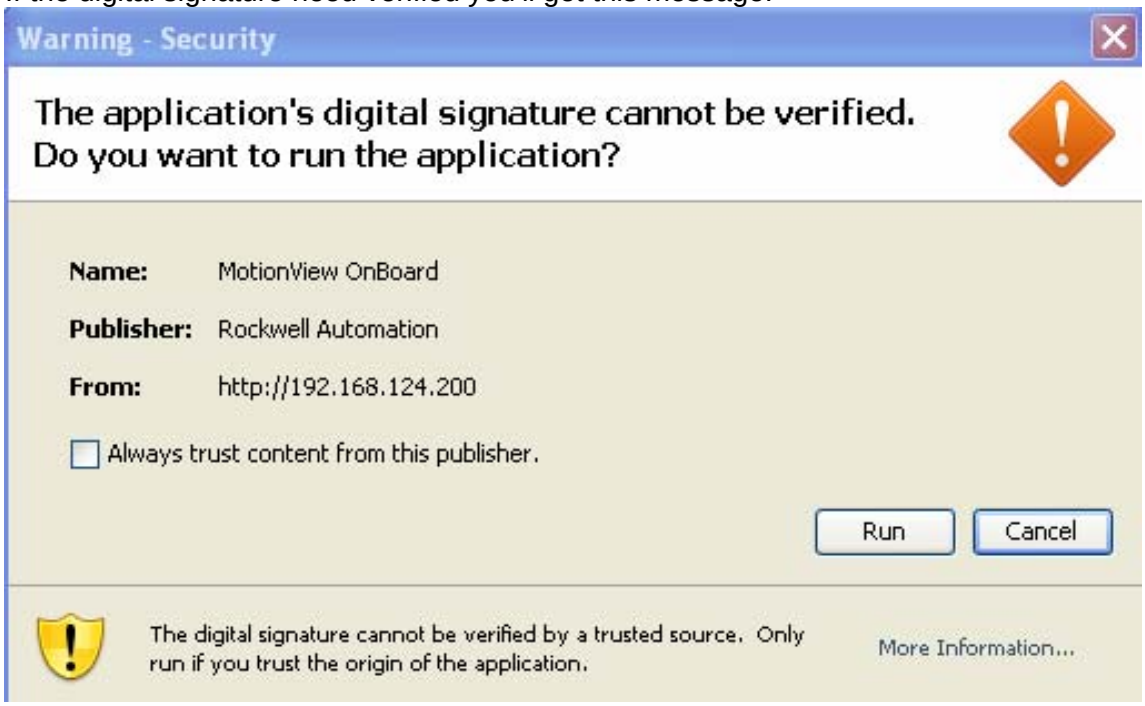
1. Follow the steps in the ***Before You Begin*** section of this document before proceeding.

2. Open ***Internet Explorer*** by double-clicking on the desktop shortcut.

3. Using the spreadsheet posted at your workstation, enter the ***IP Address*** of *your* Kinetix 300 drive and press ***Enter***. Be sure not auto-fill HTTP is in the address window.

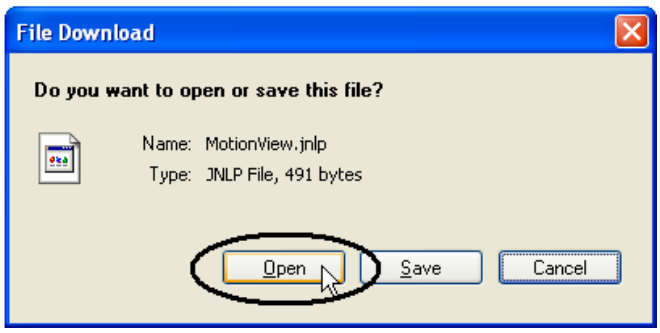
4. Select ***Open*** when the popup window appears.

   If the digital signature need verified you'll get this message:

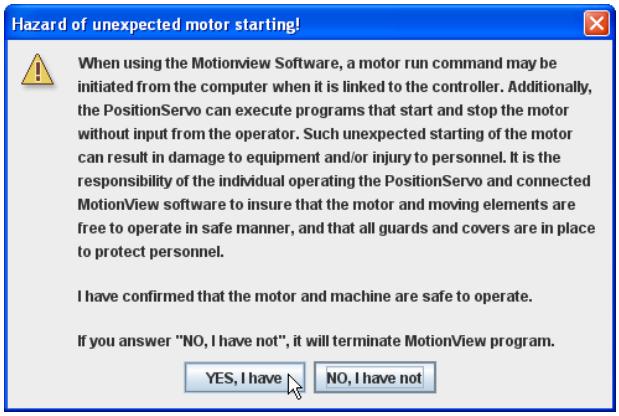


   Click on the Run.

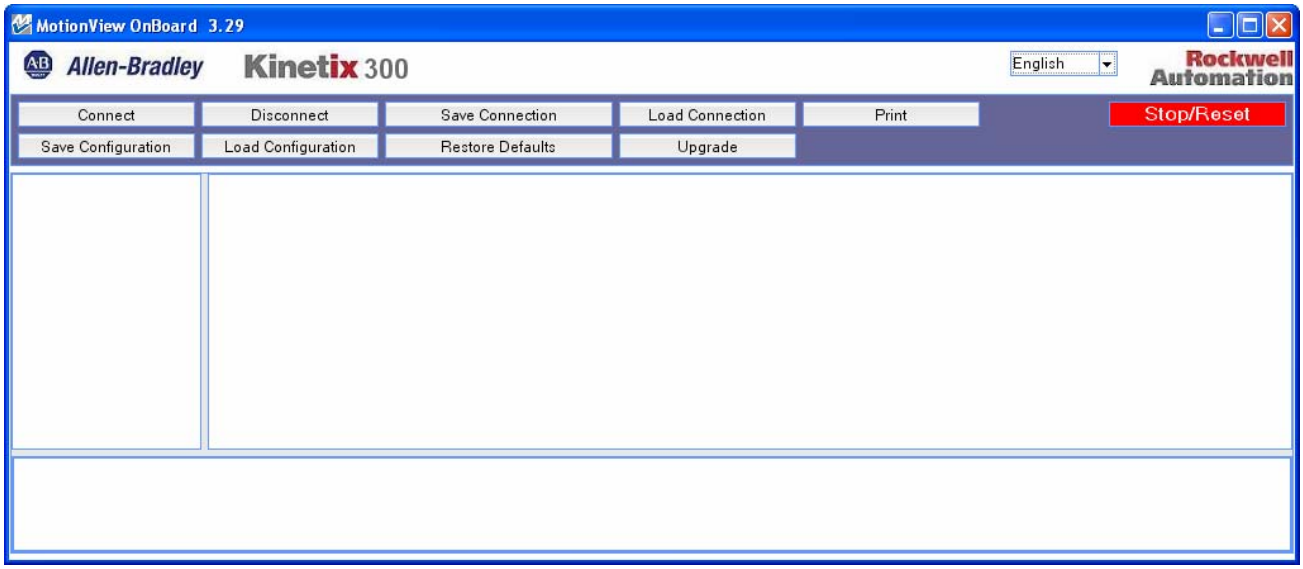
Now the actual Java application will run. Click on open.



5. Read the warning and answer ***YES, I have*** to the prompt.

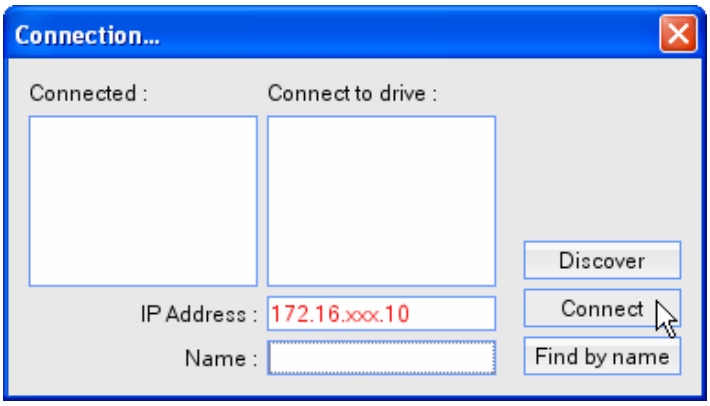


The MotionView OnBoard window opens.



6. To attach to your drive, click ***Connect***.

7. Enter your ***IP Address*** from the spreadsheet again and click ***Connect***.



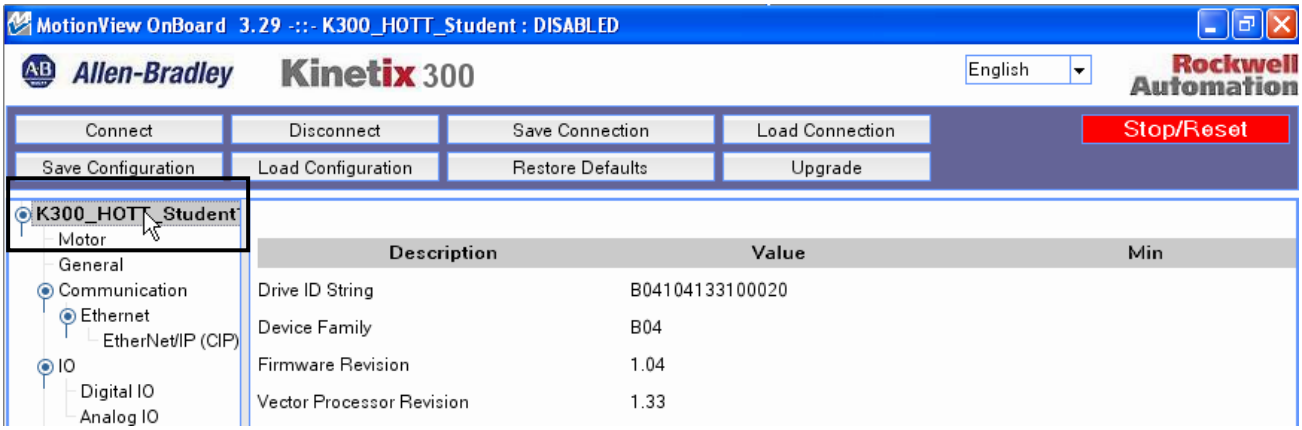
TIP: You could also use the *Discover* option to locate drives on your subnet.

The software uploads the drive information.

8. When your software is ready, click on the ***root drive*** in the tree to see a system summary. There may several drives available, so be careful to choose *your* Kinetix 300 drive in the tree.

   Note the Toolbar buttons:

   Connect/Disconnect is communications between the drive and computer Java Motion View.



Save and Load Connection for known communication paths saved as an XML file. Note that any portion or the entire program can be saved as an XML file. Simply high what you want to save, title it well so you know what it is and save it. To save the entire program go to the top of the tree.

Print if the top of the tree is highlighted will print an entire copy of the drive information and settings. This can be printed to a file or send to a printer.

Save and Load Configuration is for drive set up, nice for using the same drive/motor combinations.

Restore Defaults is just that. You do get 1 warning before it happens.

Upgrade is for firmware changes. You will need the firmware file on your computer.

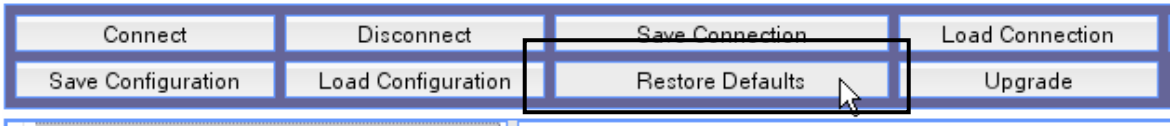
Most important is **stop reset**.

Note this page content when the top of the tree is highlighted displays all the drive information.

The buttons availability state will change depending what topic or state (such as faulted) you are in.

9. To be sure what state the drive is in click on the Stop/Reset button

10. Reset the drive to its default configuration by selecting ***Restore Defaults***. Answer ***Yes*** to confirm your action.



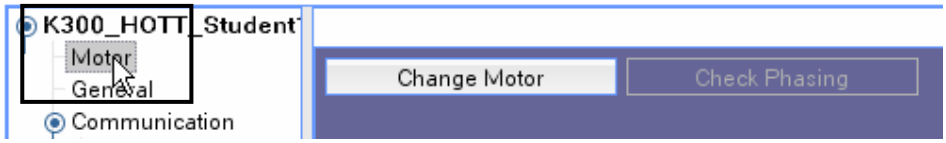
11. Wait for the process to complete and press ***OK*** to confirm the reset.

> **NOTE:** The IP Address is not affected by the reset whether it is set for DHCP or statically assigned

Select the Servo Motor

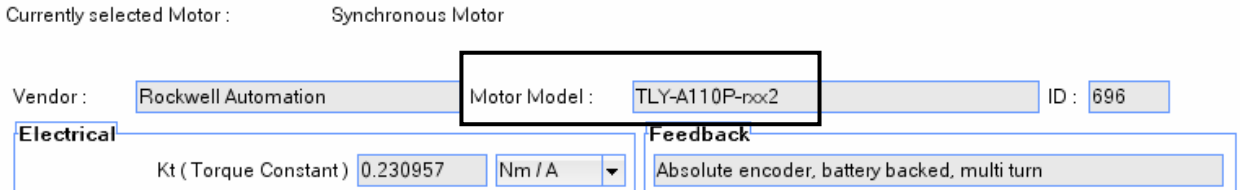
If you are using one of Rockwell Automation's high performance servo motors which employ a self-identifying high resolution encoder, your motor selection should be automatically made. If your system includes an *incremental* encoder option, you will need to manually select the motor.

12. Move to the ***Motor*** branch.

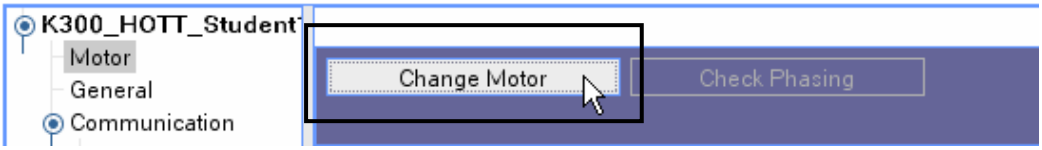


For our demo unit best to verify the correct motor is selected. In this class the motor model is

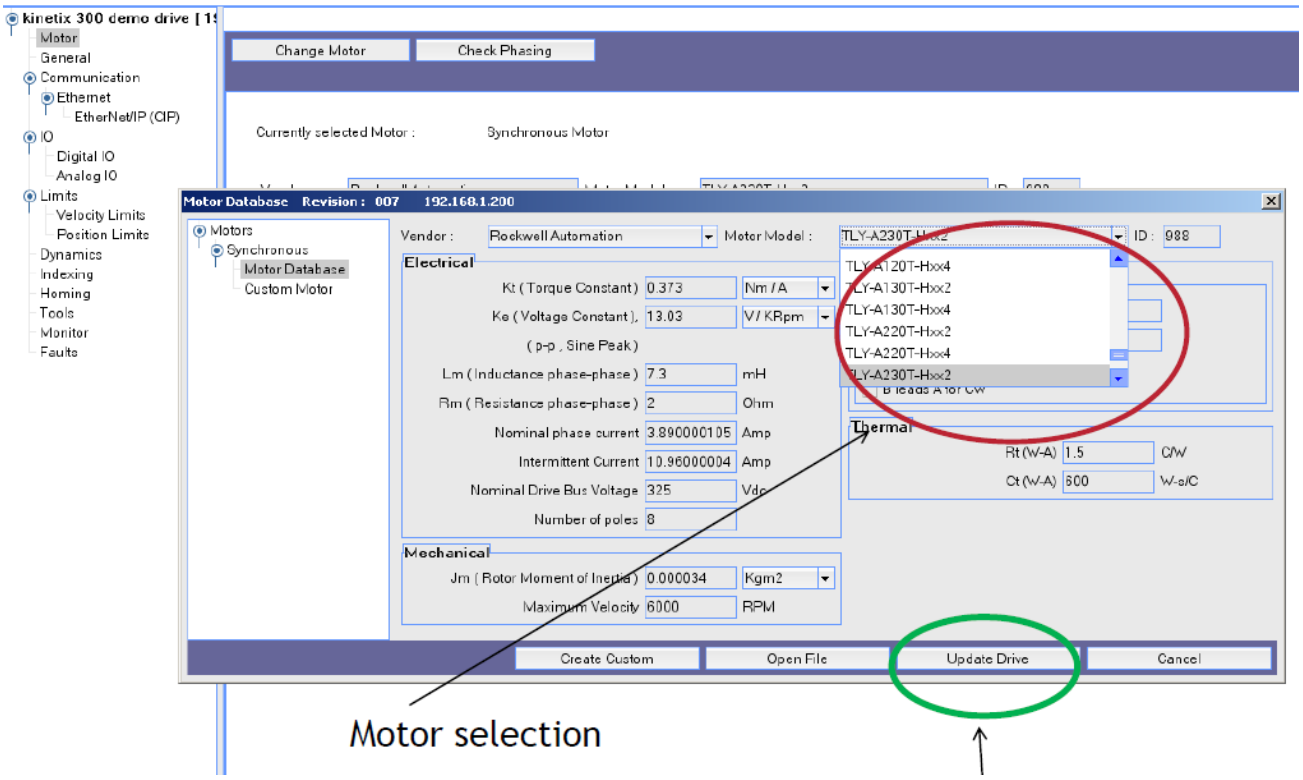
TLY-A230T-Hxx2. Motor does has the model number on the label if you're in doubt.



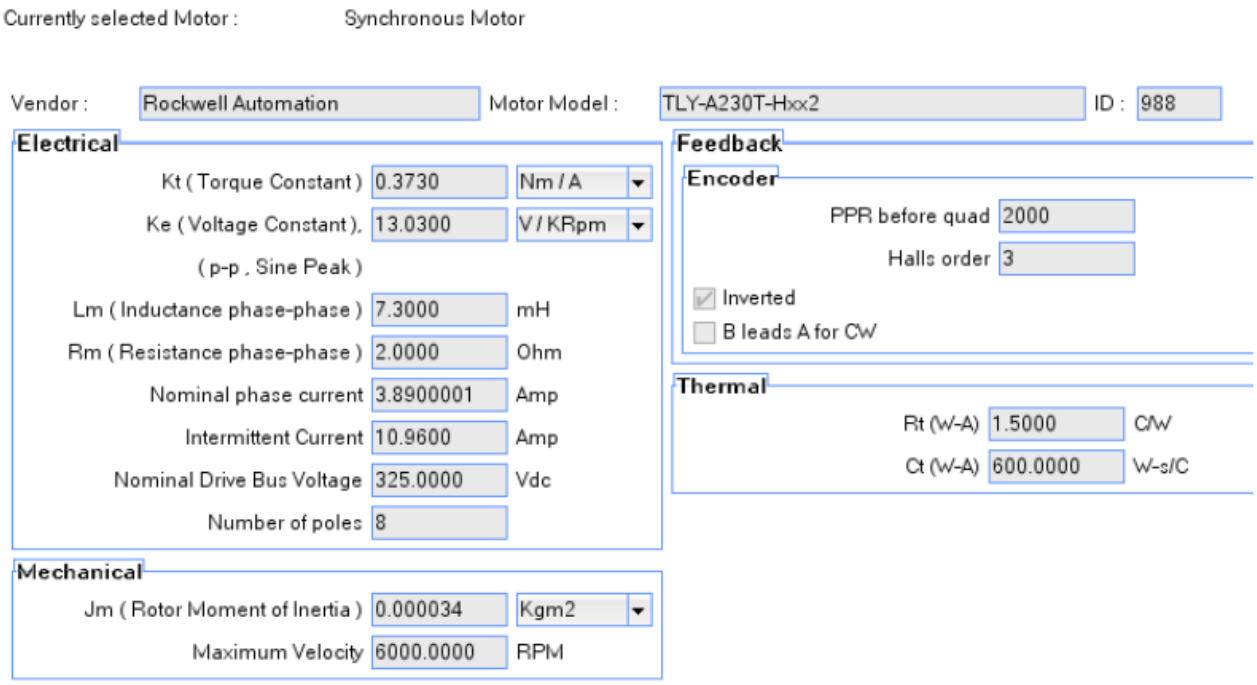
13. In the window on the right, click ***Change Motor***.



This opens the motor configuration screen,

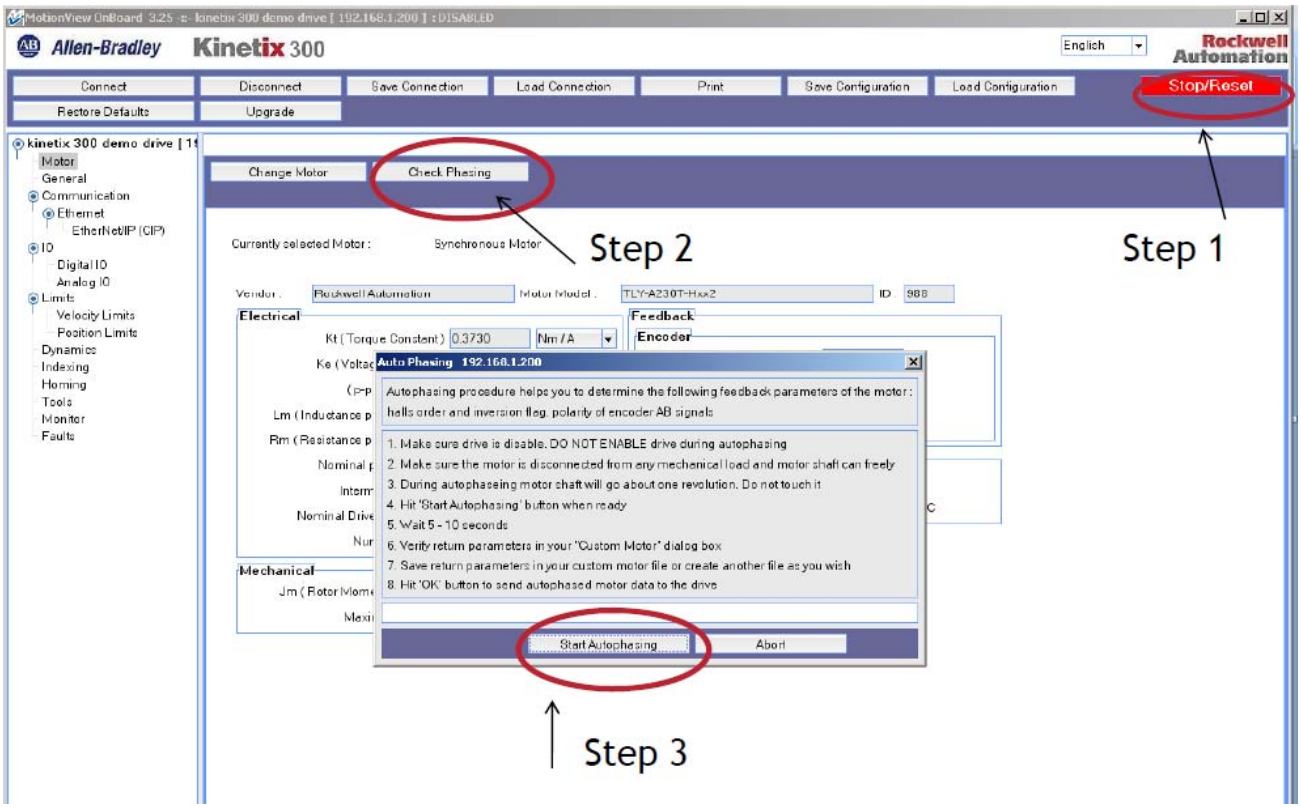


14. Open the drop down window and select the TLY-A230T-Hxx2 motor. Confirm this choice by Update Drive. Note this page would allow for custom motor entry or saved motor files. When finished close the box (x) or Cancel to exit. (Note: Both TL and TLY series motors are selectable. We are using a TLY for this lab.)



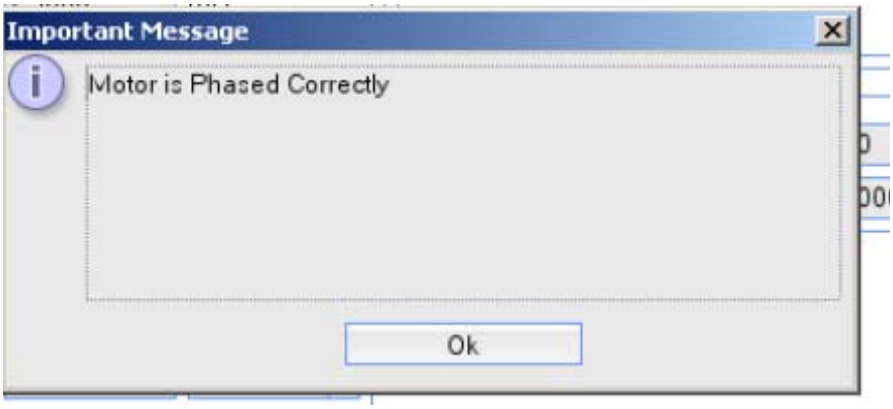
NOTE: We will tune the drive for our needs shortly.

- The motor is capable of 6000 RPM max (we will need this shortly). Let's Continue on.
- Now that we have selected a motor let's check our wiring to be sure it's correct.



First be sure to Stop/Reset.

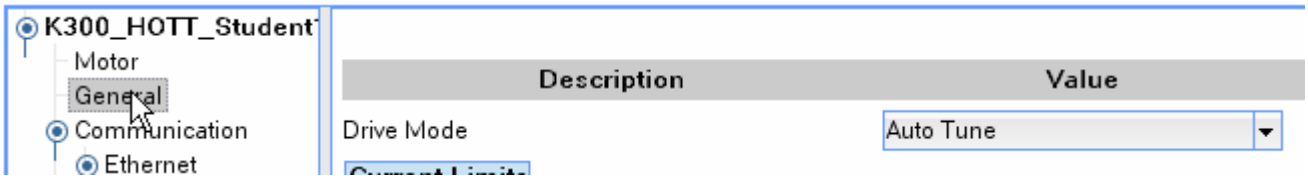
Now click on Check Phasing. The Start Autophasing. You here a very short bump with no motor motion. The following message should come up.



Choose the Operating Mode

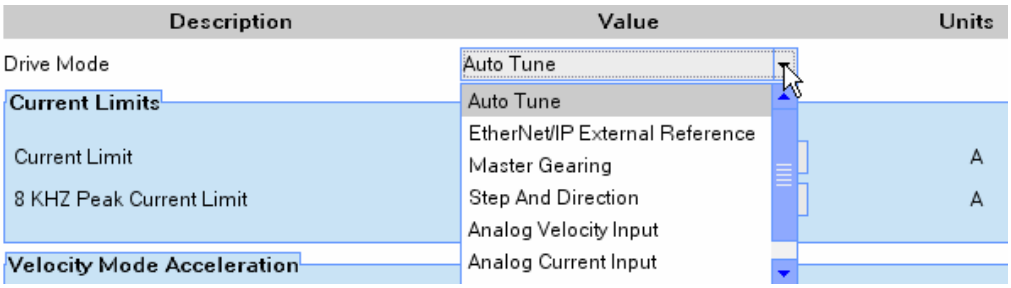
The Kinetix 300 drive can operate in one of several modes which were discussed in the kickoff presentation. In this section of the lab, we will leave the drive in the Auto Tune mode, which we will perform in Lab 2.

15. Move to the ***General*** branch.



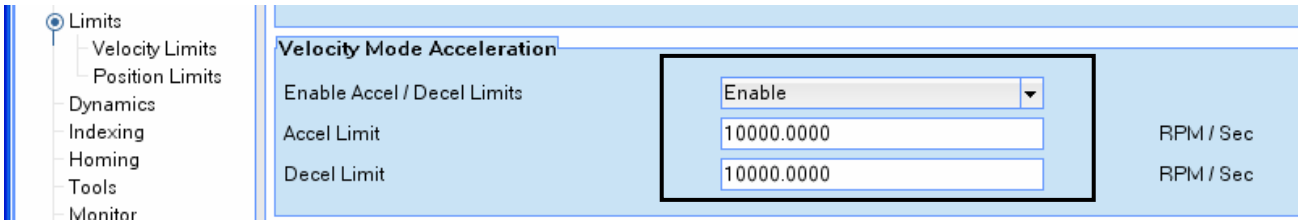
You can see that the Drive Mode is currently set to Auto Tune. This is indeed the first operation that we will need to complete; however, we will need to set up a few more options in order to do so. We will keep most of these entries at their default values in order to prevent damage to the drive or motor.

16. Use the drop-down menu to view the available Drive Mode selections, but be sure to leave it set to ***Auto Tune***. Note: If your Auto Tune is grayed out hit the Stop/Reset.



17. Locate the ***Velocity Mode Acceleration*** section within this same window.

18. Change the ***Enable Accel / Decel Limits*** setting to ***Enable***. Set the ***Accel*** and ***Decel Limit*** to a smooth ***'10,000'*** for our needs.



We will initially be running the drive in indexing mode, but we'll use these limits in later labs to avoid step changes in the command signal (such as upon enabling the drive).

19. Leave all other settings in this section at their ***default values***.

> **NOTE:** You may notice the User Units value at the bottom of the General screen. You cannot change the *name* of the user units, only the scale.

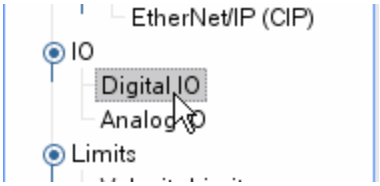
Configure the Drive Inputs and Outputs

The Kinetix 300 drive includes 12 digital inputs and 4 digital outputs plus a relay output. The drive also includes an analog input and an analog output. Many of these I/O points are user configurable, but some are pre-assigned. Here is a list of the pre-assigned inputs:

Digital Input	Function
Input A1	Negative travel limit switch
Input A2	Positive travel limit switch
Input A3	Inhibit/enable input
Input A4	N/A
Input B1	N/A
Input B2	N/A
Input B3	N/A
Input B4	N/A
Input C1	N/A
Input C2	N/A
Input C3	N/A
Input C3	Homing and registration input sensor
Input C4	N/A

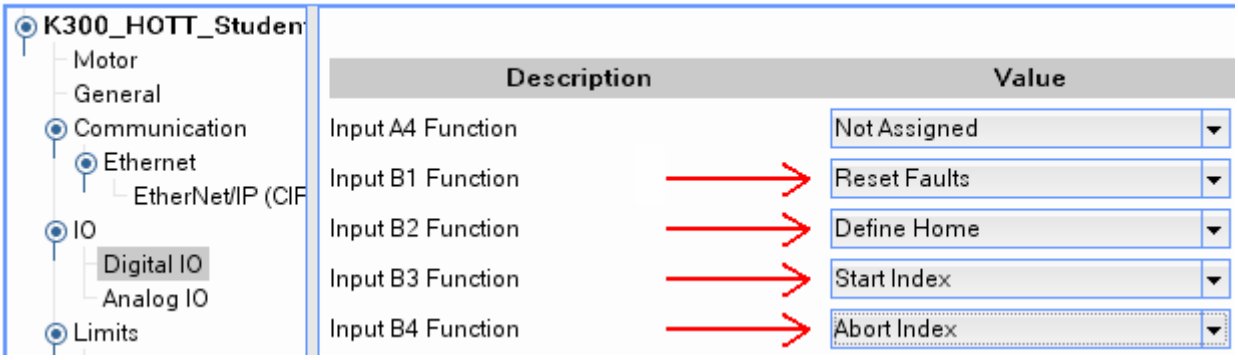
The pre-assigned inputs will not appear in the configuration sections below.

20. Move to the ***IO > Digital IO*** branch.



NOTE: Only Inputs B1 – B4 and Outputs 1 - 2 are provided on this demo unit.

21. Configure the ***inputs*** as shown below. Note that one input at the bottom of the selection tree is always configured as an enable.

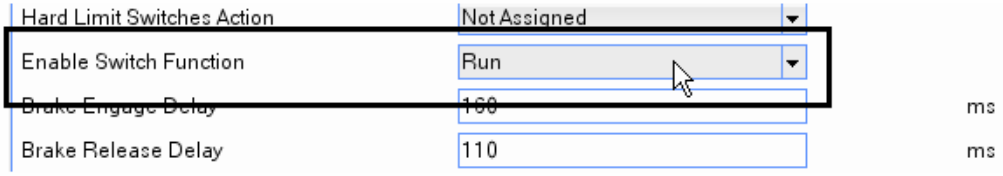


22. ***Scroll*** down until you can see the ***Output*** functions.

23. Set ***Output 1 and 2*** as shown below. These are likely important for an indexing application.

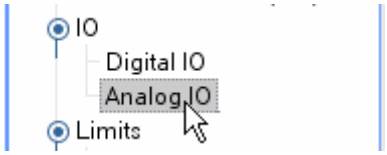
IMPORTANT: Verify once again that your inputs are all turned OFF.

24. Scroll down to the bottom of this window and set the ***Enable Switch Function*** to ***Run***.



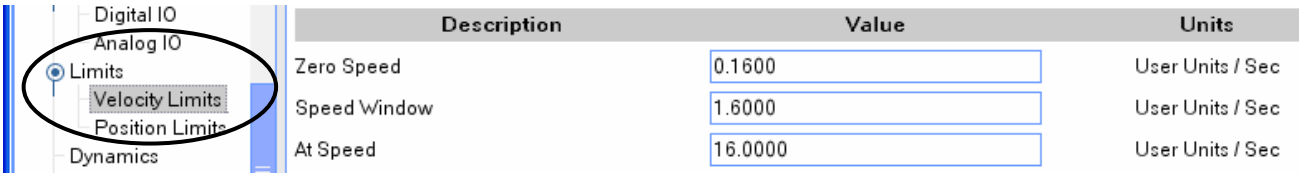
Note: Remember this step. In our demo the enable switch is always made, there is no controller Ethernet IP tag toggle or physical switch in use. This is on purpose to discover when the enable has to be made or released to permit an action. In cases where you need to toggle the enable simply change the state from Run to Inhibit and back to run.

25. Next, move to the ***IO > Analog IO*** branch.



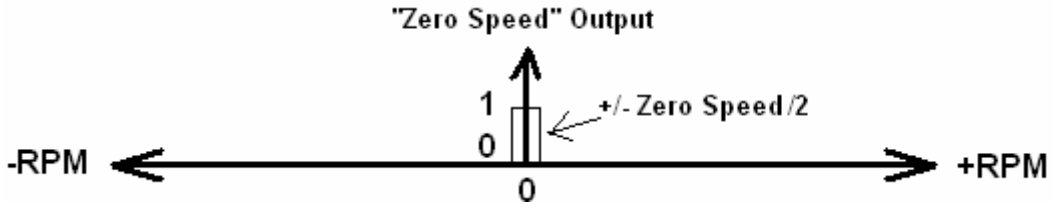
If we were using some sort of an analog meter or display, we might assign and scale the analog output to annunciate the speed of the drive. We have no display at our workstations, so we'll leave that one blank. Also, if we were running in analog velocity mode, we would scale our input here.

26. Move to the ***Limits > Velocity Limits*** branch. Here, we'll be setting the range for the In Speed Window output that we configured above.

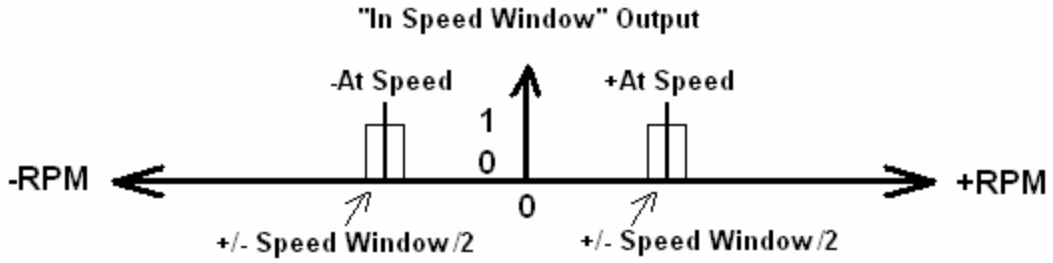


Here is a general overview of how the settings affect the digital output signals:

- The **Zero Speed** setting is actually a *window* centered around an actual velocity of 0.0. If the actual velocity is between +/- (Zero Speed)/2, the Zero Speed output would be turned ON.



- The **Speed Window** setting is actually a *window* centered around the **At Speed** set point. If the actual velocity is equal to the At Speed value +/- (Speed Window)/2, the In Speed Window output configured above will be turned ON.

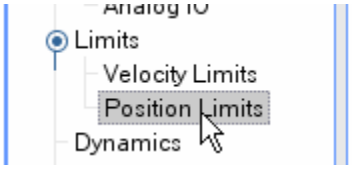


27. Set the ***Velocity Limits*** as shown below. This will make them easier to work with throughout the lab.

Description	Value	Units
Zero Speed	1.0000	User Units / Sec
Speed Window	2.0000	User Units / Sec
At Speed	10.0000	User Units / Sec

NOTE: We are only using the Speed Window and At Speed values in this lab. So this means that the In Speed Window output should be on for actual velocities between 9 and 11 Rev/s (and negative equivalents) for our drive.

28. Move to the ***Limits > Position Limits*** branch. Here, we'll be setting the range for the In Position output we configured above.



29. We'll leave the ***"In Position" Limit*** setting as it is.

Description	Value	Units
Position Error	32767	Counts
Max Error Time	100.0000	ms
Abort Decel	100.0000	User Units / Sec²
"In Position" Limit	0.1000	User Units

Remember that this value simply turns on the digital output (another +/- window, as above) and does not set any functional tolerances. The **Position Error** value, however, would create drive faults if exceeded. We'll also leave it at the default setting for now. Keep in mind that this value is affected by tuning and the machine's dynamics, so don't forget where it is located within the software.

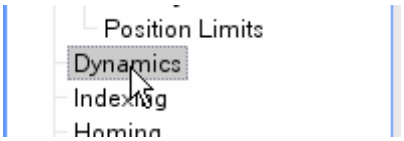
Next, let's tune the drive.

Auto Tune the Drive for Indexing Mode

In this section of the lab, we will tune the *position* loop of the drive. We will be running in indexing mode, so we care more about the position loop gains that the velocity loop gains.

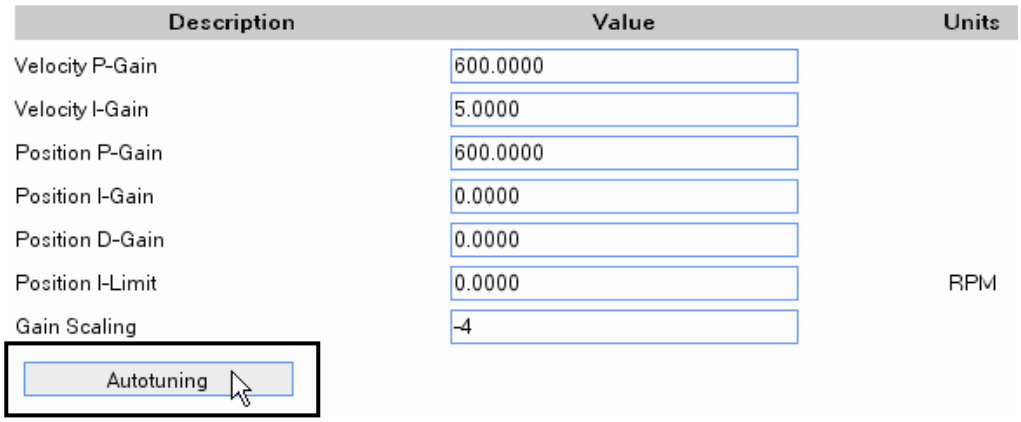
> **TIP:** Use common sense here. If you are only concerned with speed, tune only the Velocity loop. In Indexing mode where the end points are critical and not the path getting there, tune only the Position loop. Gearing, however, may require tuning both the Velocity and the Position loop, depending on the allowable tolerances.

30. Move to the ***Dynamics*** branch.



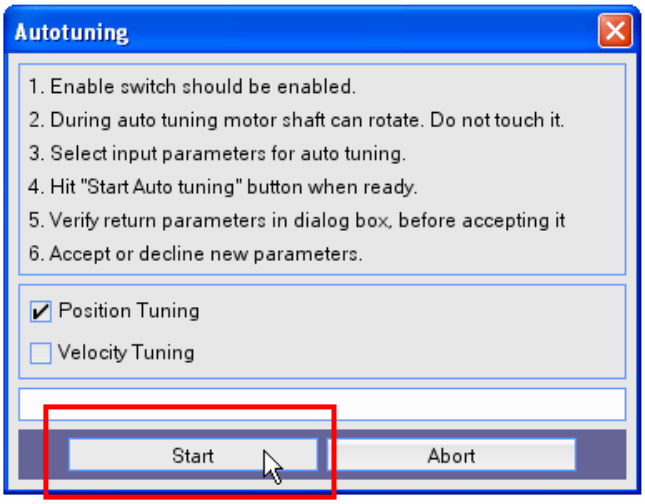
We will test the Auto Tune feature for the Kinetix 300 product.

31. Press ***Autotuning*** in the window on the right.



32. ***Change*** the selections as shown.

33. Follow the instructions in the popup window and press ***Start*** to complete the tuning procedure.

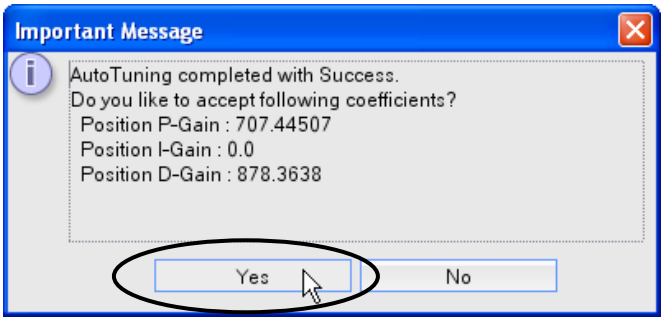


TIP: If you get an error read the message. One of two things could be happening.

1. Our demo drives have the enable hard wired so it never disabled. There are software methods to clear this be either clicking on the Stop/Reset or change the I/O state of the enable contact by clicking on the input, change the state, then change it back. Note no save has to be done.

2. Make sure under the General tab you are in Autotune mode.

34. Accept the tuning parameters by answering ***Yes***.



TIP: You may be tempted to grab hold of the motor shaft and "feel" the results of the tuning; however it will feel quite spongy. Remember, we are still in Auto Tune mode and the stiffness of the system will change when we go into our indexing mode.

Don't worry! We'll play with the manual tuning later in the lab. Your Kinetix 300 drive is now tuned and ready to run.

Lab 2: Indexing Mode (20 Minutes)

About This Lab

Looking to lower your overall system costs? If your application involves simple point to point moves or *recipes* of moves, the stand-alone Indexing feature of the Kinetix 300 may be what you need.

- Configure and command the drive to run in Indexing (position) mode
- Explore the content included in the software's Monitor feature
- Explore the content included in the software's Oscilloscope feature

Follow the steps below to complete Lab Section 2.

Configure the Drive for Indexing Mode

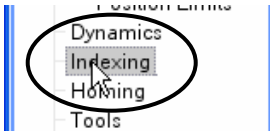
Although we have tuned the drive for positioning, the Drive Mode is still set for Auto Tune. In this section of the lab, you will change modes.

1. Turn OFF the ***ENABLE*** input, so as to *disable* the drive. The shaft should turn freely by hand.

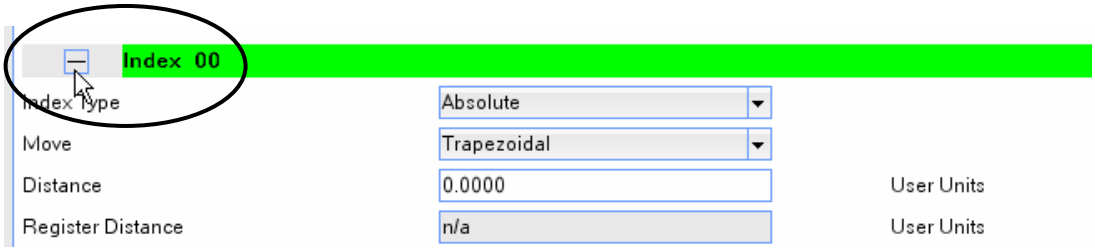
2. Return to the ***General*** branch and use the drop-down to change the ***Drive Mode*** to ***Indexing***.

   If you selection is grayed out hit the Stop/Reset button.

3. Finally, move to the ***Indexing*** branch in order to enter the move profiles.

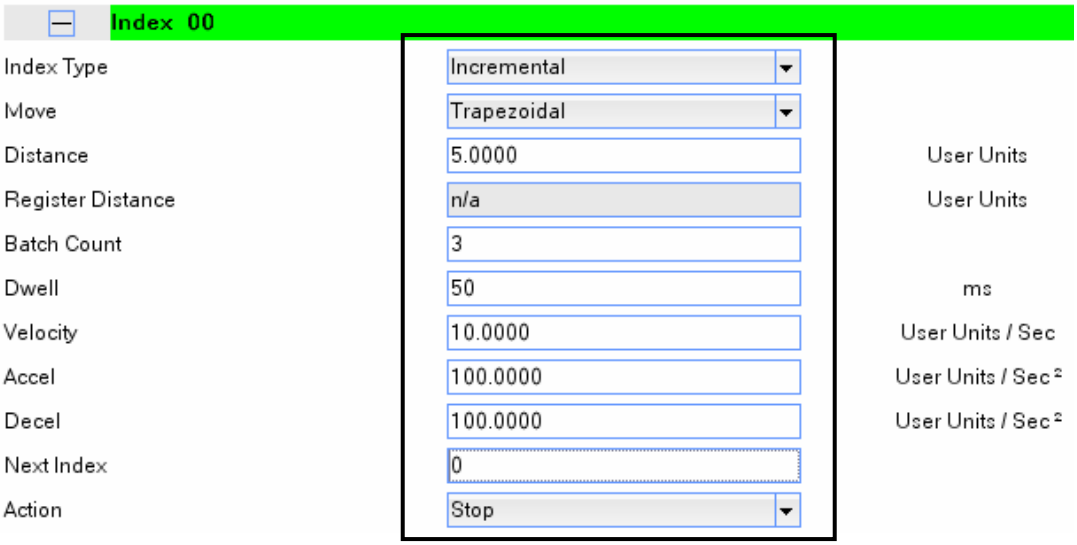


4. Expand ***Index 00*** and take a look at the parameters provided for index moves.



NOTE: It looks a lot like the move profile of an index in Ultraware!

5. Set ***Index 00*** to make (3) sets of incremental moves, ***5 revs*** each at the dynamics shown. Don't forget the brief Dwell.



Now let's have some fun.

Note: Stick with these settings. If you choose an out of range velocity it will fault.

Command the Drive in Indexing Mode

> **WARNING:** You are about to command motion.

6. The ***ENABLE*** input is already on.

7. Grab hold of the ***motor shaft*** again and notice that the tuning is really quite stiff.

8. ***Toggle*** the ***Start Index*** radio button in Motion View. If you think a value is incorrect you can always hit the about index. If you do abort an index or Stop/Reset in the middle of a move you will have to re-enable the drive. Once the index completes by hitting reset index will repeat the same index number.

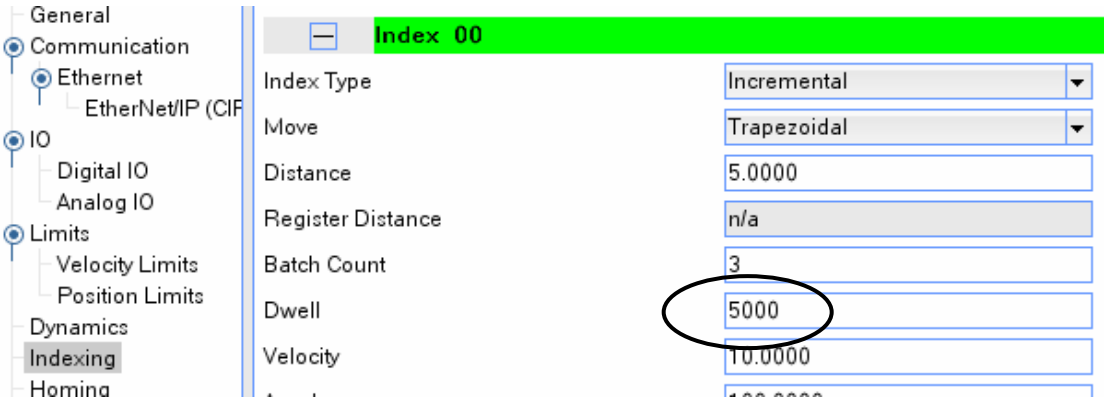
The motor *should* quickly make 3 sets of 5 revolutions.

9. Toggle the ***Start Index*** one more time, this time making note of the *dwell* between moves.

   NOTE: For our demo we are using the Motion View radio button on the indexing page. This would normally be accomplished by a PLC over Ethernet or a switch closure.

Are you sure that there was a 50ms Dwell between the Index move batches? Hard to tell.

10. Return to the ***Indexing*** branch in the main window and set the ***Dwell*** for ***Index 00*** to '***5000***' ms (5 seconds).



11. Issue the ***Start Index*** one last time.

That was definitely not 5 seconds. What's going on?

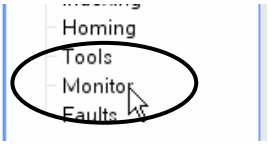
> **NOTE:** The **Dwell** variable is not active between batches of index moves; only between linked (but not blended) index moves. This is different than the Ultra3000i drive.

Spend some time playing with the Index settings, including the S-Curve type Move. Next, we'll explore one of the troubleshooting tools provided in the drive software.

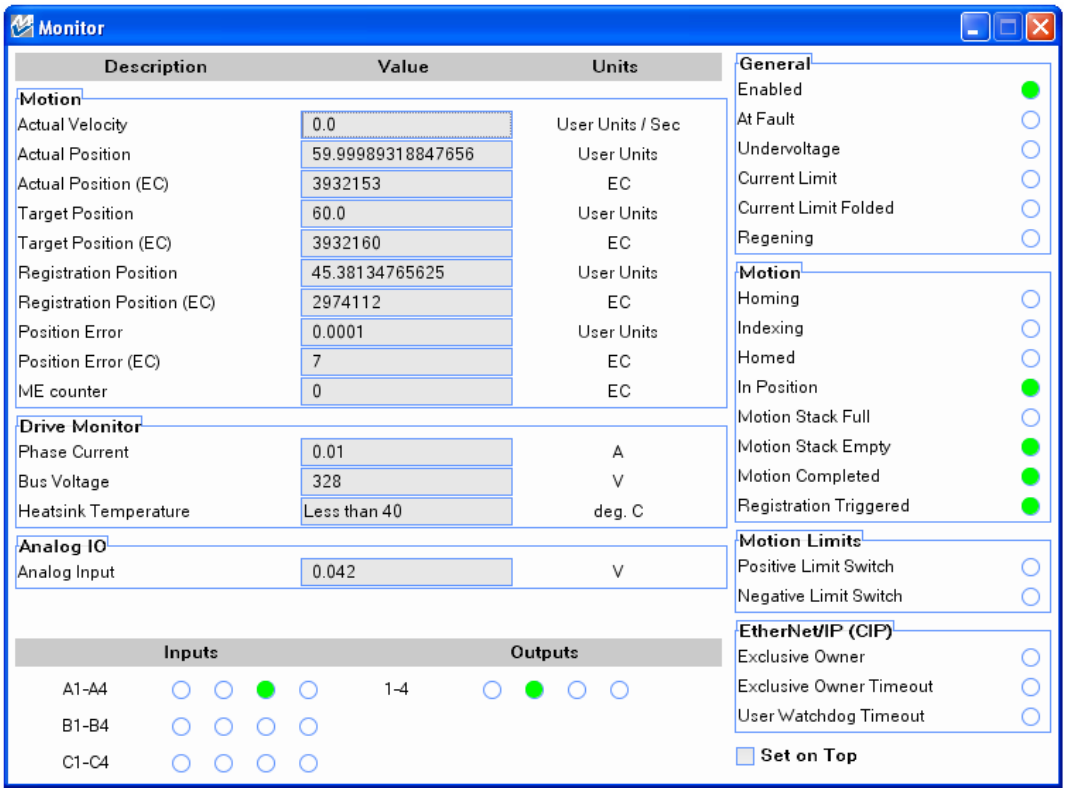
Explore the Monitor Feature

This tool allows you to access the most commonly needed information about the drive. There are other tools included within the software, but let's first take a look at what this one provides.

12. Click on the ***Monitor*** branch and a new window should open.



The Monitor window opens:

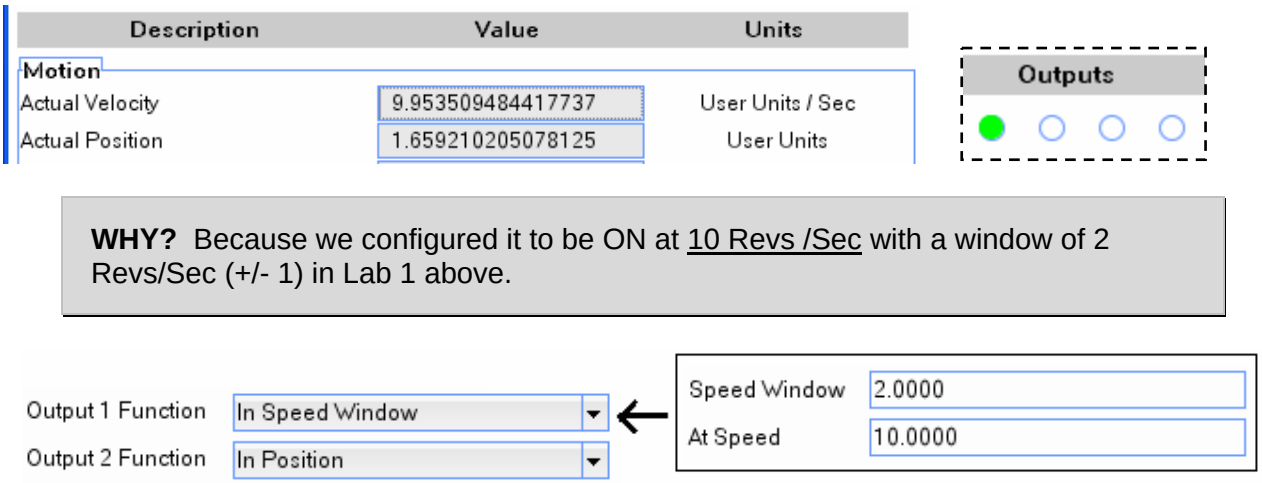


The Monitor is showing *analog* values for position, velocity and current, as well as the command input. It is also providing *digital* values for motion status and I/O.

13. Toggle the ***Start Index*** input again and carefully watch as the ***Actual Velocity*** reaches about 10 Revs / Sec.

    Hint: You can open the monitor and Indexing window at the same time. For easier use you could increase the move distance to watch it longer.

Output #1 (In Speed Window) should briefly turn ON and OFF three times during the move.



Output #2 (In Position) should only be on when the index has completely finished.

14. Return the ***MotionView OnBoard*** window by closing or minimizing the monitor.

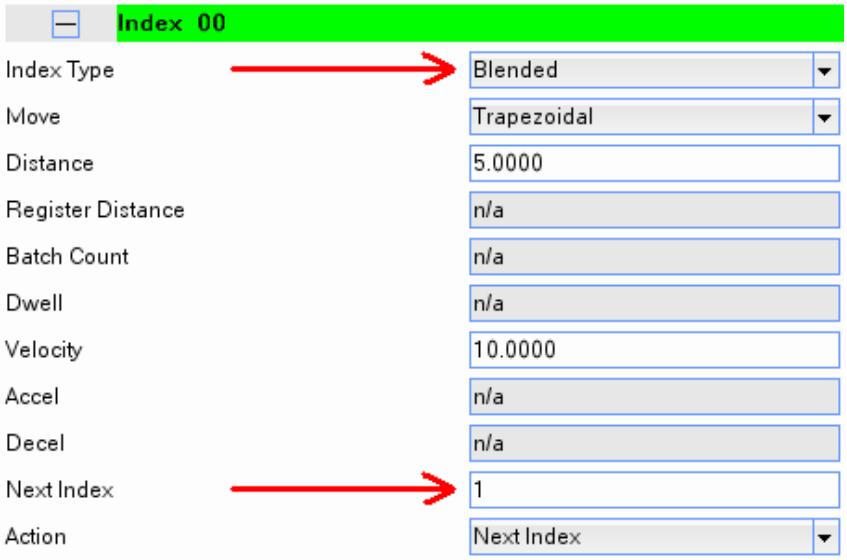
Blend a Series of Index Moves

In this section, you'll program a blended set of index moves. We'll open up the Oscilloscope feature in the drive to see what is actually happening.

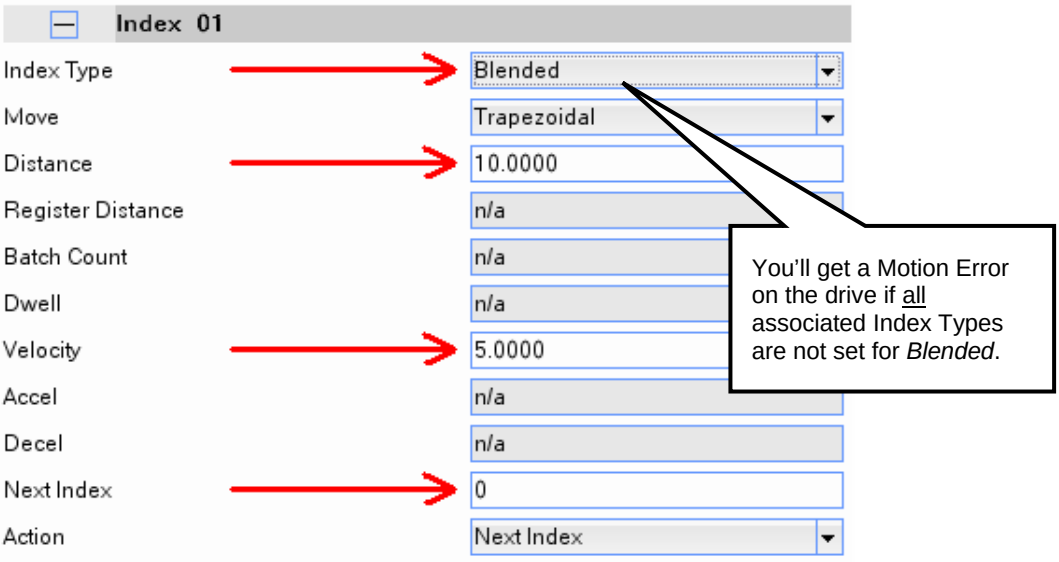
15. Return to the ***Indexing*** branch.

> **IMPORTANT:** Remember that the Kinetix 300 drive does not support the calling of indexes using a BCD (binary coded decimal) masking on the digital inputs. Issuing the Start Index command will trigger Index 00 every time. This is different than the Ultra3000i drive.

16. Configure ***Index 00*** to blend into next index as shown below.



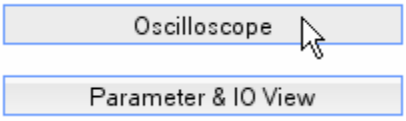
17. Configure ***Index 01*** as shown below. Be sure to loop it back to Index 00.



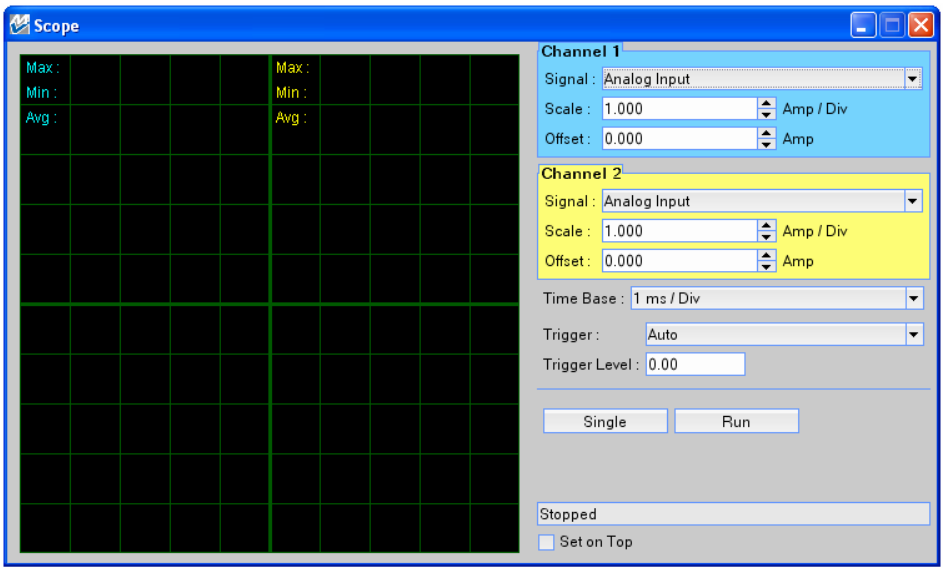
18. Toggle the ***Start Index*** again.

The drive should appear to run briefly at a higher speed and then a lower speed, repeating over and over. To see the actual velocities, let's use the Oscilloscope feature.

19. Move to the ***Tools*** branch and click ***Oscilloscope***.



The Scope window opens.



Let's look at the Velocity Command, which we programmed to be between 5 and 10 revs/sec, as well as the Current Command, which shouldn't be much with no load.

20. For ***Channel 1***:

    a. Set the ***Signal*** to ***Velocity Command***.

    b. Set the ***Scale*** to ***5*** (User Units / Div).

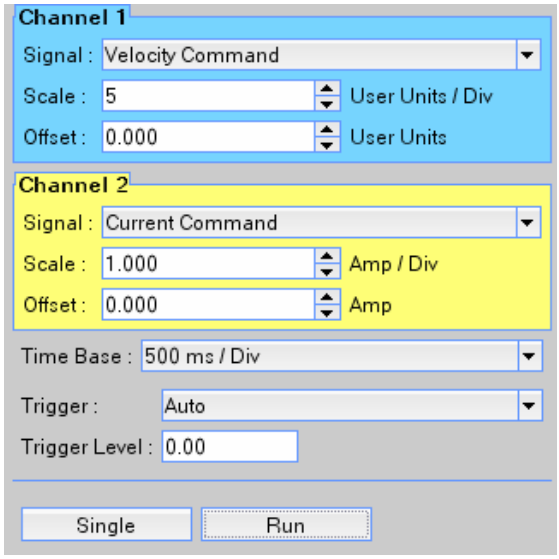
21. For ***Channel 2***:

    c. Set the ***Signal*** to ***Current Command***.

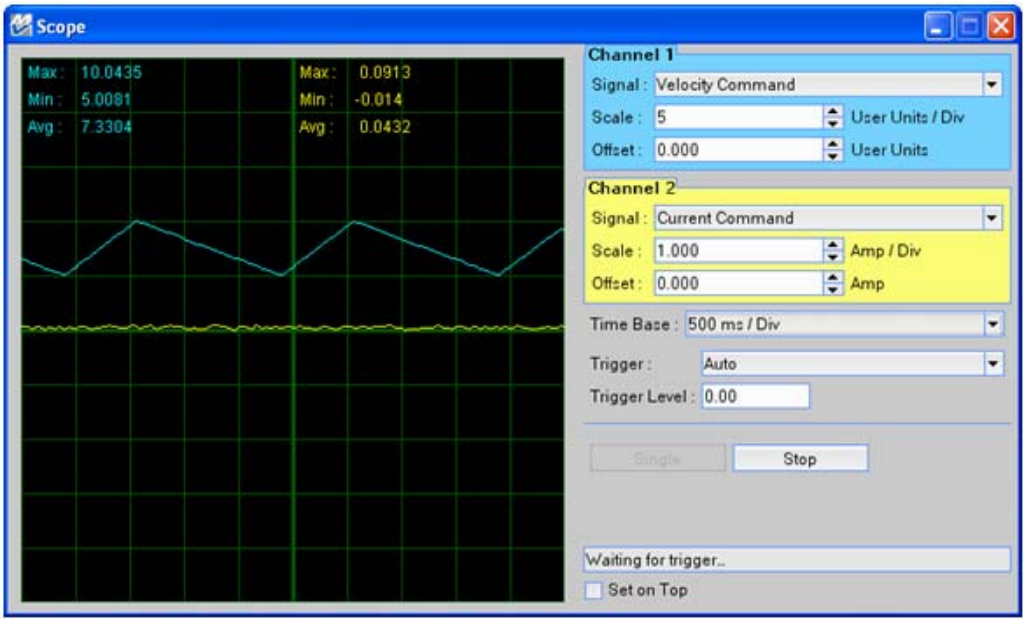
    d. Set the ***Scale*** to ***1*** (Amp / Div).

22. Set the ***Time Base*** to ***500 ms / Div***.

23. Click ***Run*** to start the scope.



The scope shows the blended velocities between the indexes.

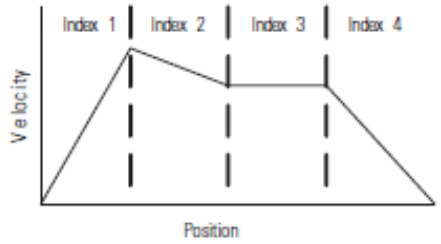


IMPORTANT: Notice that you do not have the ability to control the accel and decel rates used during blended moves. The planner within the Kinetix 300 drive spaces out the velocity change over the entire index.

Blended

If the indexing configuration Type is set to Blended, the acceleration and deceleration parameters are not programmable, but calculated internally by the drive based upon distance and velocity between the two points of the move. The full profile is assembled by 'stitching' together a sequence of positions and velocities rather than complete move operations. The index table simply contains the position and velocities necessary to assemble the profile.

Example of Blended Indexing

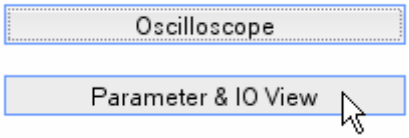


Reference: Publication #2097-UM001A-EN-P

24. Click ***Stop*** to stop the scope.

25. You can ***Close*** the ***Scope*** window at this time; feel free to play around with the tool if time permits.

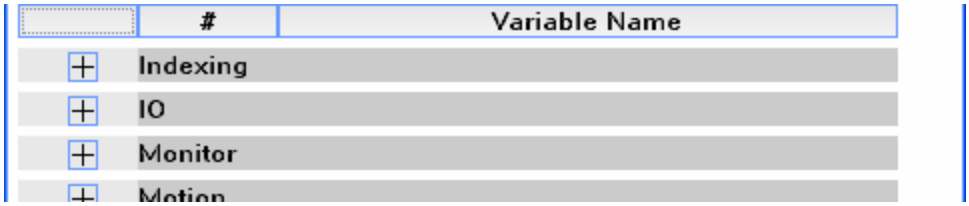
26. Still on the ***Tools*** branch, open the ***Parameter & IO View***.



The Diagnostic window opens.

27. Click ***Add*** to choose the desired signals.

28. Use the tool to add the signals <u>of your choice</u>. Expand the entries and place a check beside the desired signal. Click ***Add*** to complete.



Here is a screen showing some random signals:

You can even Save and Load the signals to create a familiar troubleshooting environment.

29. You may play around or ***Close*** the ***Diagnostic*** window as time permits.

30. Toggle the ***Abort Index*** to stop the motion (or Stop/Reset).

Note: The Parameter I/O view is the only place in Motion View where you actually see the parameter number/description.

Lab 3: Additional Features (15 Minutes)

About This Lab

In this last lab section, we will explore some additional functions and features of the Kinetix 300 drive. We will:

- Explore the content included in the software's Fault History feature
- Configure and command a homing routine
- Explore the manual tuning ability of the drive

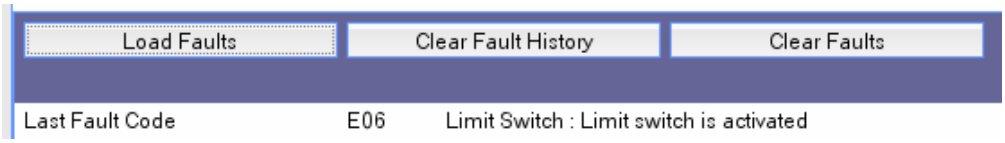
Follow the steps below to complete Lab Section 3.

Use the Fault History Feature

Of course no drive software is complete without the ability to display and log faults. In our haste to get the drive running again, we forgot to look at the fault code or display in order to see what had happened during the over travel event above.

1. Click on the ***Faults*** branch at the bottom of the tree.

The Fault Code is displayed.



Need more information? Looking for a more complete history in order to understand what has been happening on the customer's machine?

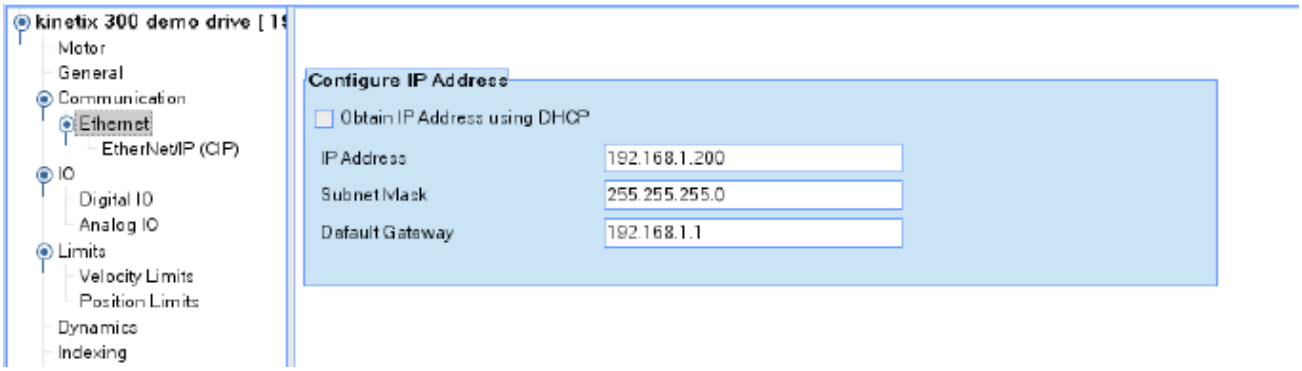
2. Click ***Load Faults*** and the fault history is displayed, complete with ***Device Time*** stamps.

> **NOTE:** The Device Time stamps are currently the time since the drive was last powered up. Future firmware releases will allow the fault history to perform more like the Ultra3000i drive and track faults over hours of usage.

You can create additional faults by enabling the drive with the Drive Power switch in the OFF position. We will explore more of the troubleshooting tools in the final section of this lab.

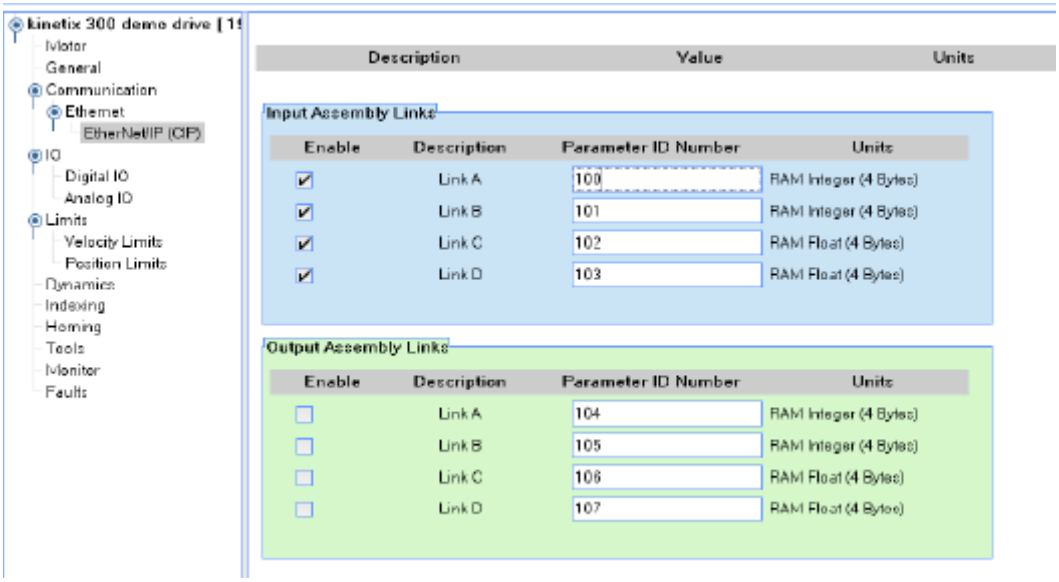
Ethernet settings

1. From the main tree view selection Ethernet.



2. This is where you can quickly change the address. You also change the last 3 numbers of the IP address from the face mounted programmer.

3. Next select the CIP tab below.



This provide preset datalinks to the Logix based controller. These act more like standard AC drive datalinks. One thing to remember is the actual function of these is the opposite of the description. An “input” as actually an output to the PLC.

Where to find the actual parameter description is in the Tools tab.

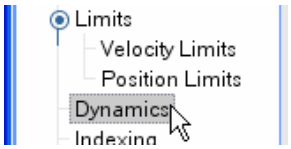
Click Tools – Parameter I/O – Add- open each topic for the parameter number.

The manual has all these listed as well.

Manually Tune the Drive (Optional)

There is not much of a challenge in manually tuning the drive and motor in the demo unit, since the load is small and tightly coupled. Follow the steps below to at least become familiar with the process.

3. Move to the ***Dynamics*** branch in the software.



4. Start the blended move routine by toggling the ***Start Index*** as before.

> **IMPORTANT:** Please read ALL of the bullet points below thoroughly before changing the tuning values. Notice the part about disabling the drive, especially.

Feel free to play around with the tuning values manually:

- Note that values don't take effect until you press ***Enter*** or leave the entry window (use ***Tab***)
- Add some **Position I-Gain**, for instance. Keep it below 25% of the Position P-Gain for stability
- Change the **Gain Scaling** value mentioned below, using the range shown
- The **Filters** section will be difficult to explore with our tightly coupled load
- **Start** and **stop** the blended move profile to check your position holding capability
- **Increase** the **dynamics** of the blended move profile (add/dec and speed) for fun
- If you run into any trouble, simply **Disable** the drive

You can always Autotune again or return to these functional settings:

Description	Value
Velocity P-Gain	600.0000
Velocity I-Gain	5.0000
Position P-Gain	661.3013
Position I-Gain	0.0000
Position D-Gain	842.2333
Position I-Limit	0.0000
Gain Scaling	-4

This **Gain Scaling** value is your "one touch" handle for tuning. Use it like Position BW in Logix to change performance but keep stability between the loops.

NOTE: The range is -16 to +4.

> **Summary:** The Kinetix 300 is a perfect low-cost solution for stand-alone indexing applications. The MotionView OnBoard software is simple, yet powerful.

Extra Credit: Maximizing your control with Compactlogix

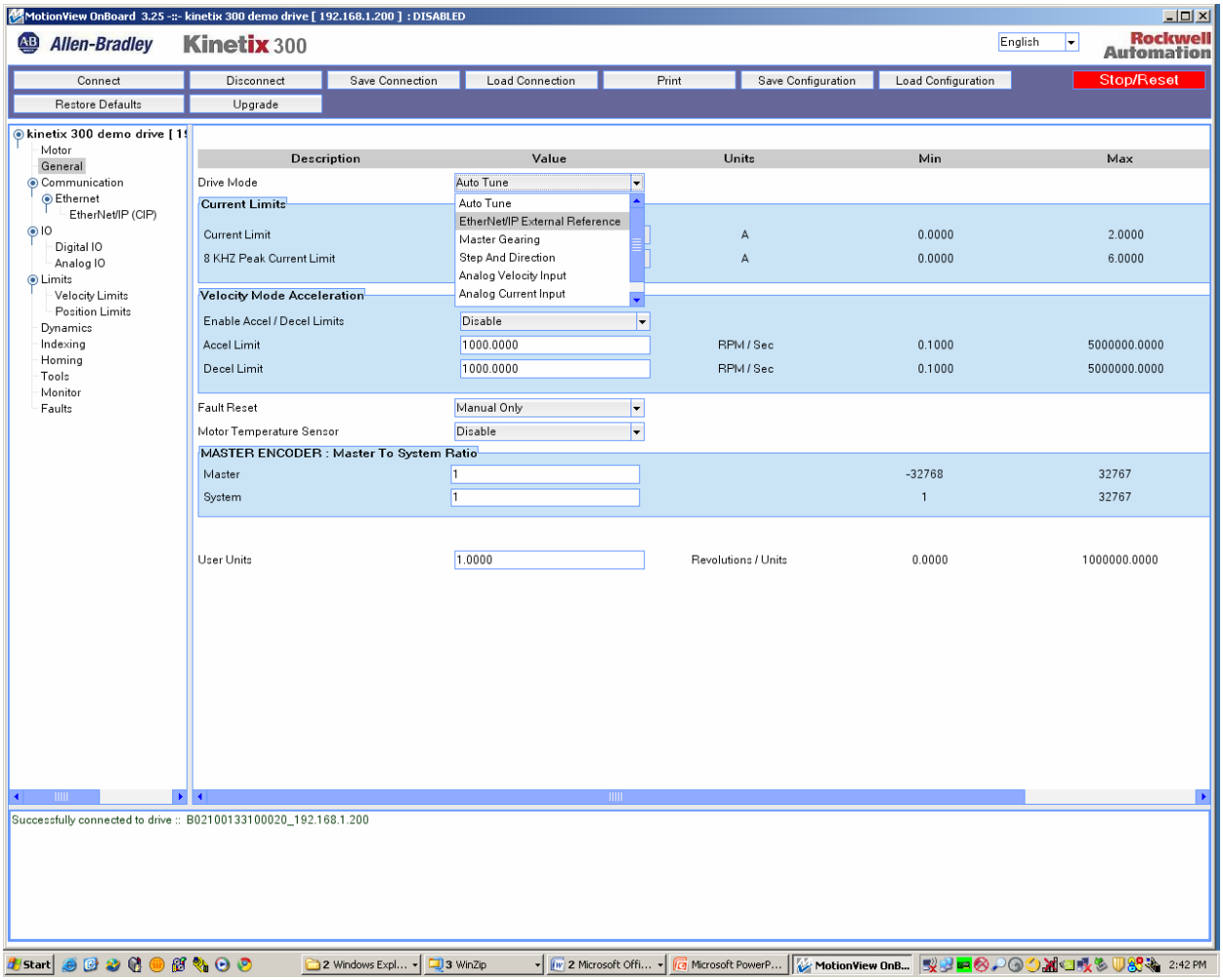
Now that you have scrolled through most of the set up features you may have noticed the only digital control to run the drive is via the index profiles or analog velocity both controlled by the enable switch. The Enable is either set for run or inhibit for selection.

To control the start/stop, selected a particular index or change to a fixed velocity control we need to accomplish this through a PAC or PLC. In the Compactlogix (or Controllogix) we have some definite advantages:

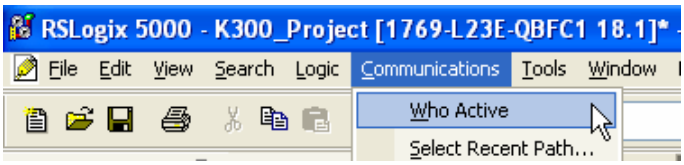
*Add On Profile that has this as a resident part of the RSLogix5000 program. This has the entire tag base already in place for use.

*Status, control and fault handling is now all done from the controller.

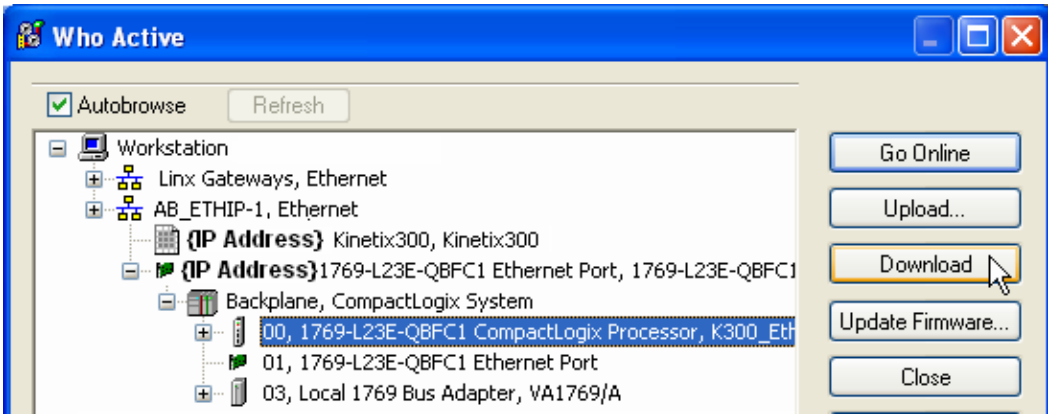
1. In Motion View from the General tab set the Drive Mode to Ethernet IP external reference.



2. Next from the desktop open the SampleK300.ACD file in the Kinetix 300 folder. This will open RSLogix5000. When this opens select **Commuications > Who Active.**

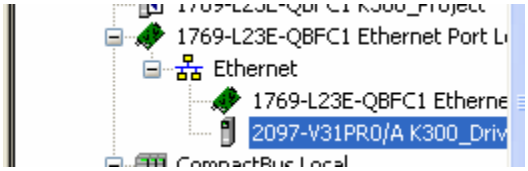


3. Browse to the 1769-L23E controller, highlight it and download the project. Be sure to drill through the Backplane to the 1769 Processor as shown below.



Confirm the ***Download*** and be sure to place the controller in ***Run*** mode.

1. Scroll down to the ***Kinetix 300*** entry in the ***I/O Configuration*** tree and verify that you have no errors (the little yellow triangles of death). Contact your instructor if you do.



2. On the Kinetix 300 demo unit, turn ON the ***Enable*** input.

The drive will not be enabled until we toggle the appropriate bit in the program.

Lab 3: Commanding the Drive (20 minutes)

About This Lab

There are many ways to issue commands the Kinetix 300 drive. In this section of the lab, we will investigate several of them, including:

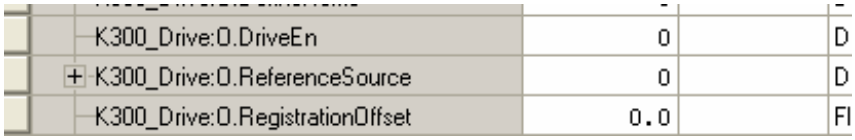
- Toggling bits and changing tag values to become familiar with the add-on profile
- Importing ladder rungs from a sample code project

Follow the steps below to complete Lab Section 3.

Command the Drive in Velocity Mode

We'll use the brute force method of toggling bits to command our drive for now. You are welcome to program your own ladder rungs, if you have enough time.

3. Return to the ***Controller Tags*** section with the ***K300_Drive:O*** (commands) entry expanded and locate the ***ReferenceSource*** tag.



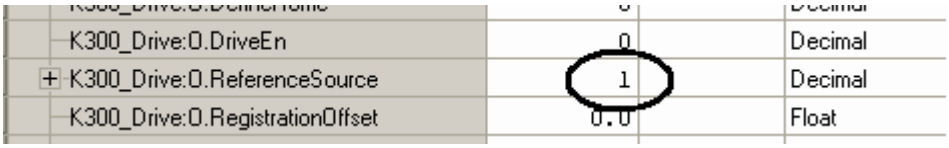
We'll need to consult the Kinetix 300 user manual again in order to understand the available settings for this tag.

Output Assembly

RSLogix 5000 Field	Description
AbortIndex	Upon transition from 0 to 1 of this field the drive aborts the current index or position based move the drive is executing and decel to zero velocity.
StartMotion	Upon transition from 0 to 1 of this field the drive begins moving towards the position in the CommandPosition field below assuming the drive is enabled.
DefineHome	Upon transition from 0 to 1 of this field the drive defines the current position of the motor to be home.
AbortHoming	Upon transition from 0 to 1 of this field the drive aborts (decel to zero velocity) the homing operation.
StartHoming	Upon transition from 0 to 1 of this field the drive begins homing as configured by the Homing section of the MotionView software assuming the drive is enabled.
DriveEn	Upon transition from 0 to 1 of this field the drive enables, it turns on power structure, closes servo loops, tracks commands.
StartingIndex	This field defines the first index the drive should execute if the drive is operating in Indexing mode.
ReferenceSource	This field defines the type of control being exerted over EtherNet/IP network (0 = current, 1 = velocity, 2 = incremental position, 3 = absolute position, 4 = incremental registration, 5 = absolute registration).

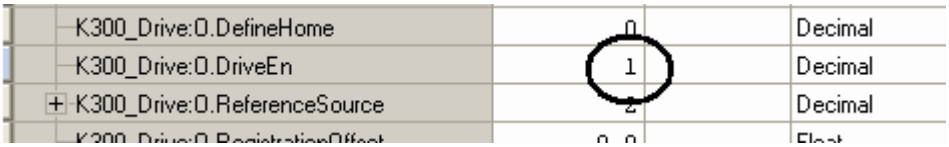
We'll start by commanding some simple *velocity* profiles, so it looks like we need a ReferenceSource of 1 for our needs.

4. Enter a '***1***' in the ***ReferenceSource*** tag to set the drive to velocity mode.



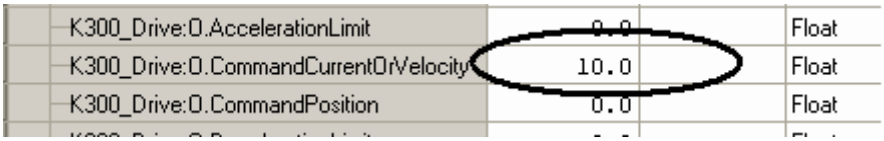
> **TIP:** Make sure that you are on the **Monitor Tags** tab at the bottom of the screen.

5. Enter a '***1***' in the ***DriveEn*** tag to enable the drive.



The drive should be *enabled*, but <u>not</u> *spinning* at this point. We have not provided a speed!

6. Enter a '***10***' in the ***CommandCurrentOrVelocity*** tag to command a velocity, in our case.



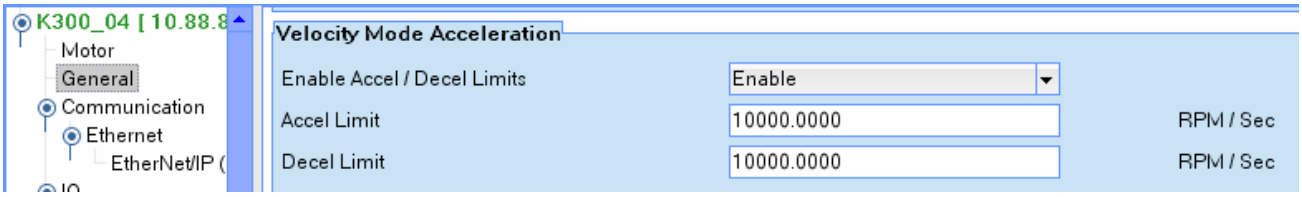
> **TIP:** This same tag is used for the Command Current in the Current mode.

The motor begins to spin at 10 motor revs per second (recall that our units are Revs).

> **WARNING:** If you decide to run the drive in Current mode, consider a CommandCurrent of around 0.02A or less. The drive will run away wildly with little to no load attached. It's also fairly safe to grab the motor shaft at this reduced current.

7. Feel free to enter more velocity values, including ***REAL*** values as well as ***negative*** values for reverse direction.

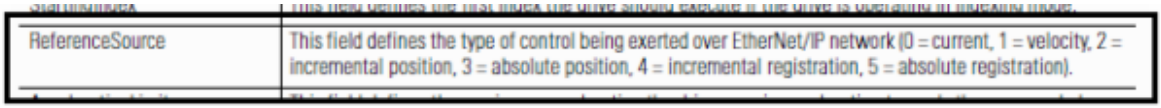
> **TIP:** The acceleration and deceleration rates used in this mode are only found back in the MotionView OnBoard software. You would have to use MSG Instructions to Parameter ID #76 and #77, respectively, to change them programmatically.



Next, we'll look at how to command position changes in position mode.

Command the Drive in Position Mode

We'll need to refer to the user manual again to find out what the reference source value is for positioning.



ReferenceSource	This field defines the type of control being exerted over EtherNet/IP network (0 = current, 1 = velocity, 2 = incremental position, 3 = absolute position, 4 = incremental registration, 5 = absolute registration).

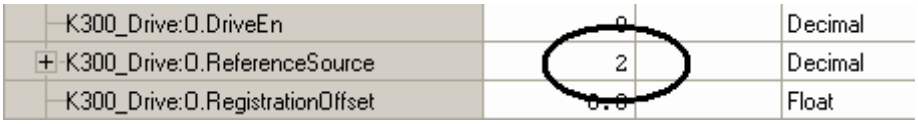
It looks like a 2 = incremental positioning mode, which is what we'll use.

8. Enter a '***0***' in the ***CommandCurrentOrVelocity*** tag to bring the drive to a stop.

9. Enter a '***0***' in the ***DriveEn*** tag to disable the drive.

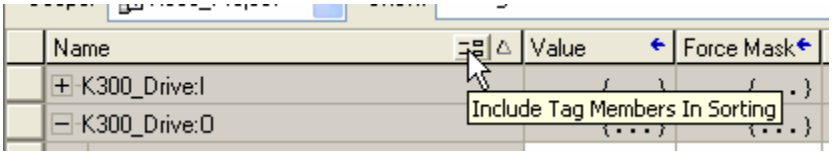
> **TIP:** You must disable and re-enable the drive to recognize changes in modes.

10. Enter a '***2***' in the ***ReferenceSource*** tag to set the drive to our positioning mode.

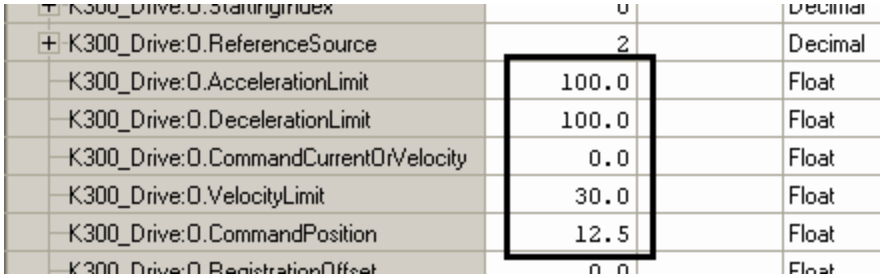


11. You can enter a '***1***' in the ***DriveEn*** tag to enable the drive at this point.

12. It's a little easier to enter the position mode data with the tag member sorting feature turned off, so click on the ***sort*** button again to disable it.

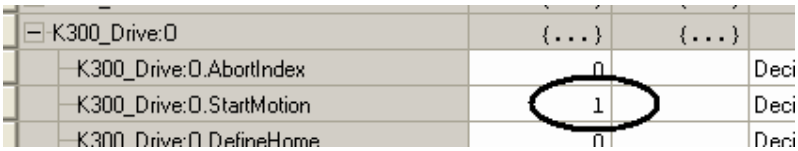


13. Enter the ***AccelerationLimit***, ***DecelerationLimit***, ***VelocityLimit*** and ***CommandPosition*** shown below. The VelocityLimit is actually the speed of the move in positioning mode.



The drive does *not* make the move yet, however.

14. Finally, enter a '***1***' in the ***StartMotion*** tag to command the move.



The drive executes the move profile.

15. Be sure to *reset* the ***StartMotion*** tag to a '***0***' after the move is complete.

16. Spend some time playing around with other ***position*** and ***move dynamic*** value, as time permits.

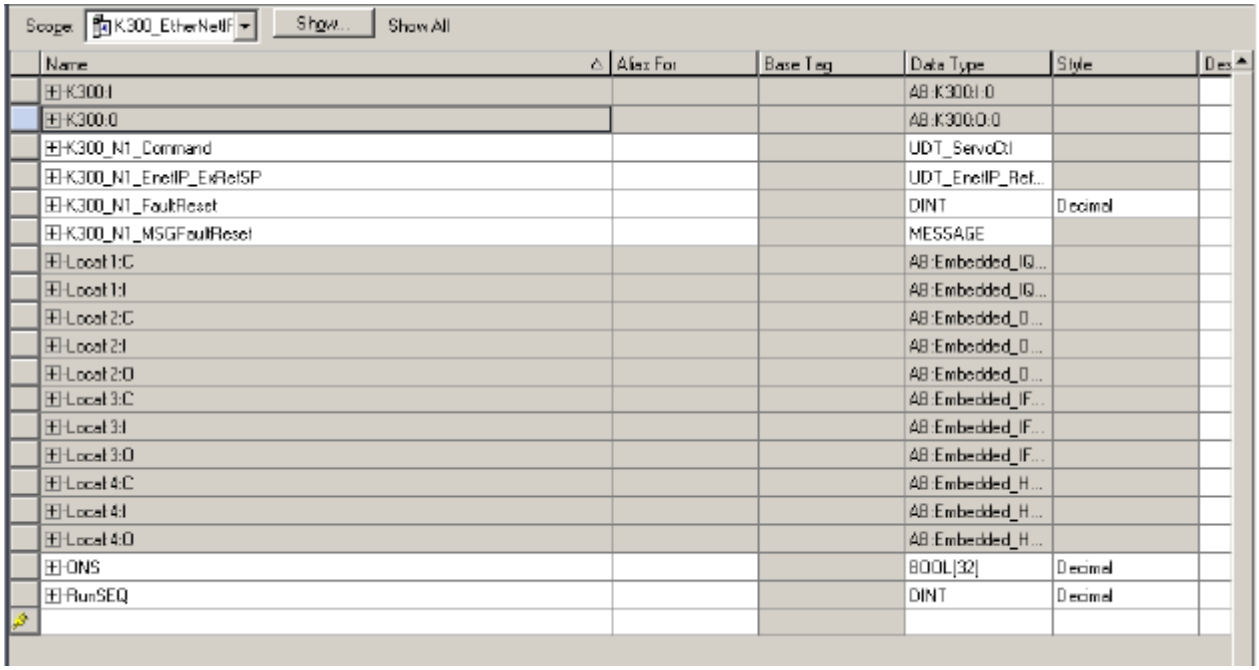
17. See if you can get the drive to work in ***Absolute Positioning*** mode, using the knowledge gained so far.

> **TIP:** Here is a quick checklist of the steps required:
>
> - Set the ReferenceSource to the proper mode value
> - Be sure to cycle the DriveEn output so the drive recognizes the change in mode.
> - Use the DefineHome output to reset the drive's position to 0.0.

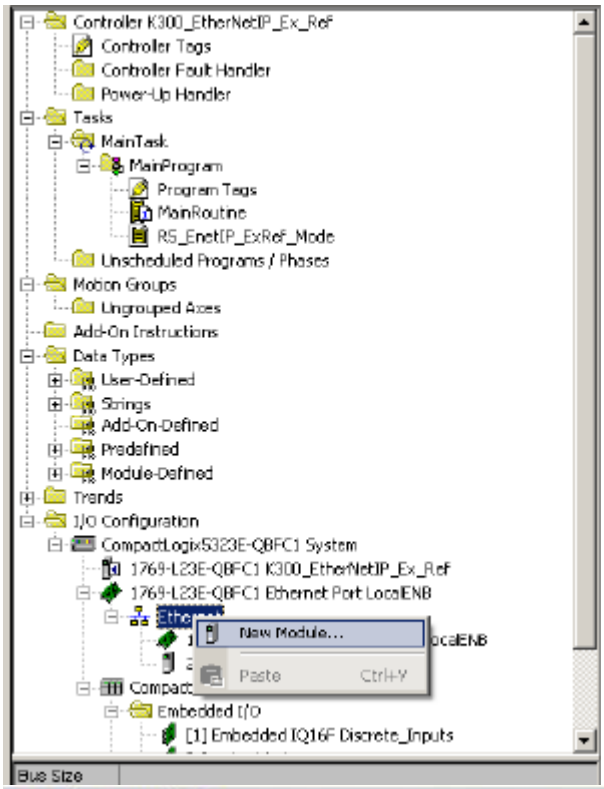
Explore the sample file program

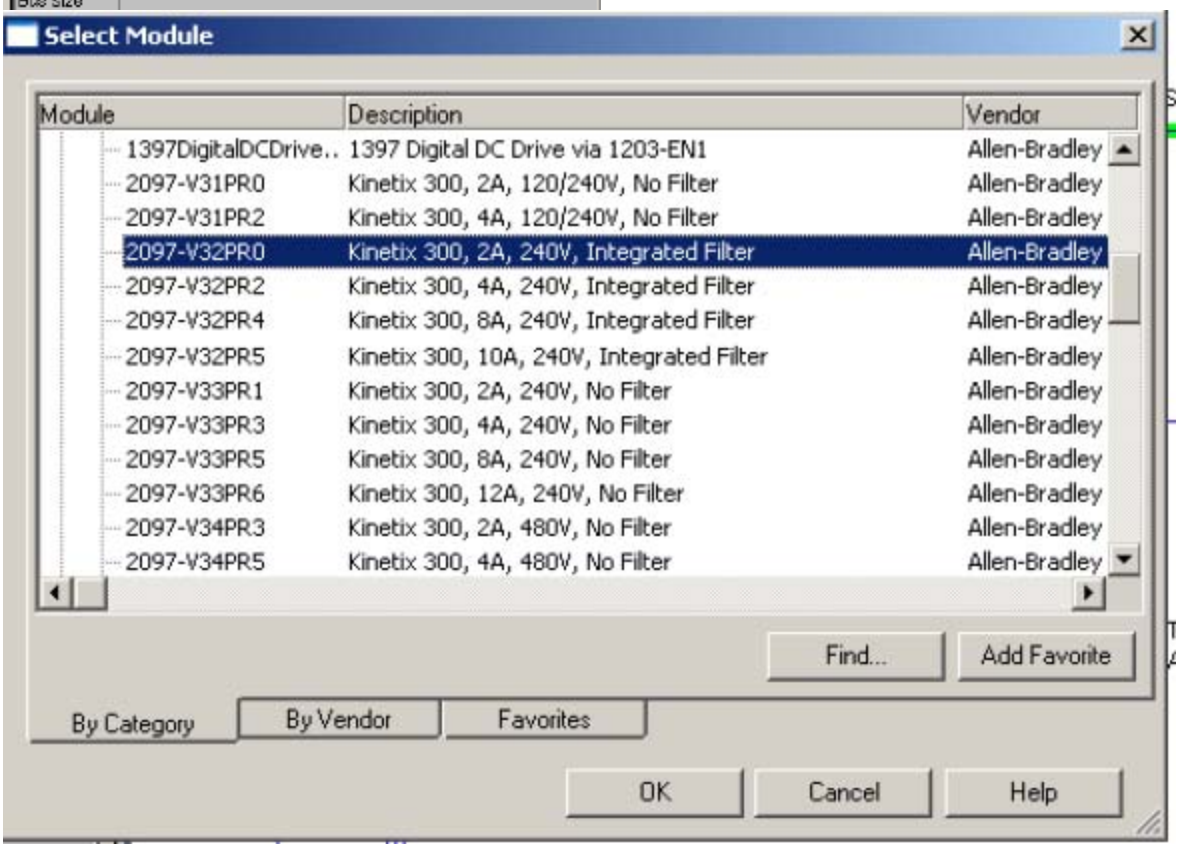
The sample file has text indicating how each action is accomplished. In addition to this the Allen Bradley sample code web site has demo programs for Micrologix, Controlligix and Logix controllers with Add On Instructions.

Click on the 2097 drive in the tree and right click for cross reference. Chose TAGS from the pop up and explore all the available tags that are preloaded from the profile.



In this program look for how to add a Kinetix 300 drive. Click on the Ethernet and right click to add module. Then choose from Drives (not motion) and select from the 2097 models.





End of lab.