TB297 - Yaskawa Sigma5 Step and Direction Setup for Acorn CNC Controller

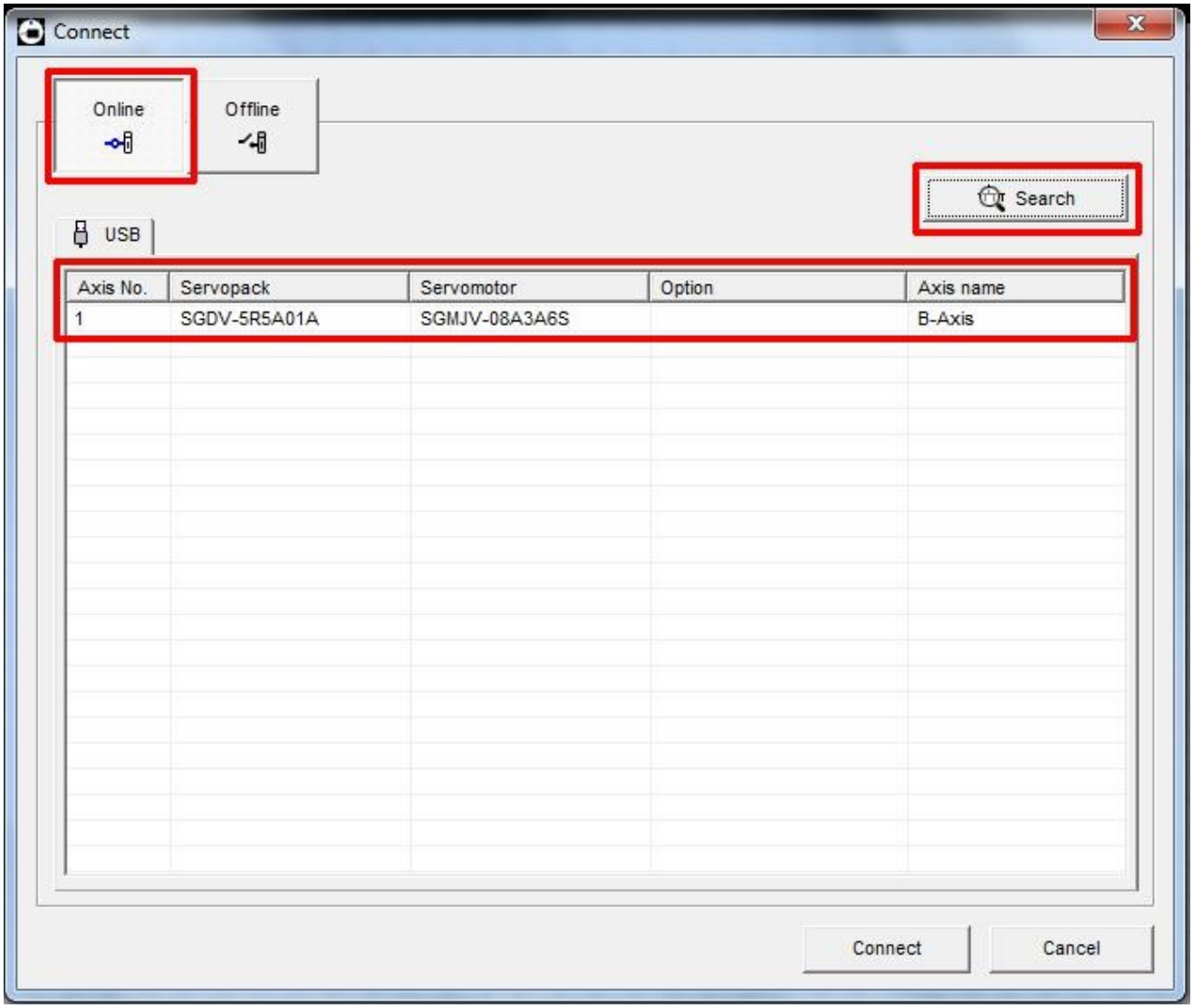
Overview:
This document will walk you through the process of configuring and tuning a Yaskawa Sigma V Servopack and Servomotor with a Centroid Acorn based control.

The following items are needed:

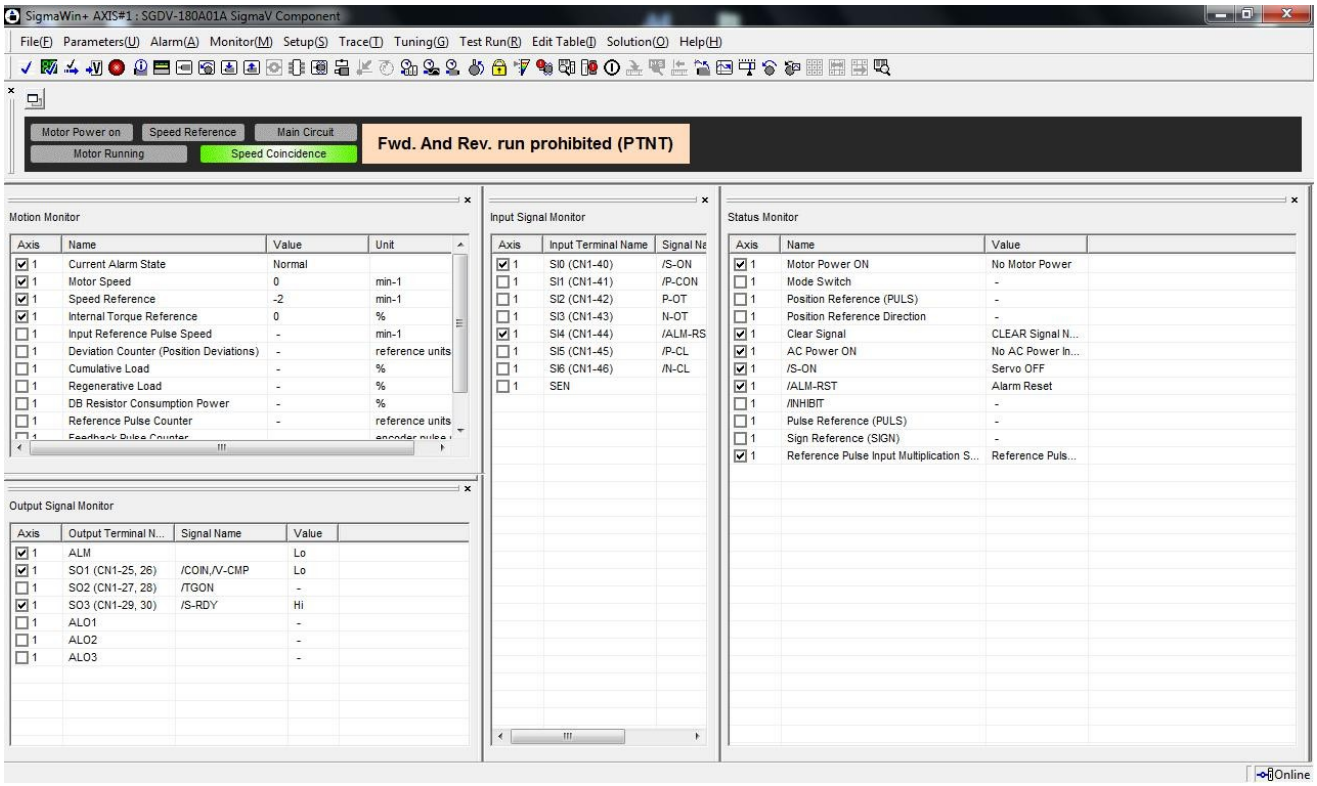
- Computer with the Yaskawa SigmaWin+ software installed.
- A to Mini-B type USB cable (Yaskawa part number JZSP-CVS06-02-E) – connected between the laptop and the Yaskawa drive you wish to setup.

Servopack Configuration Process:

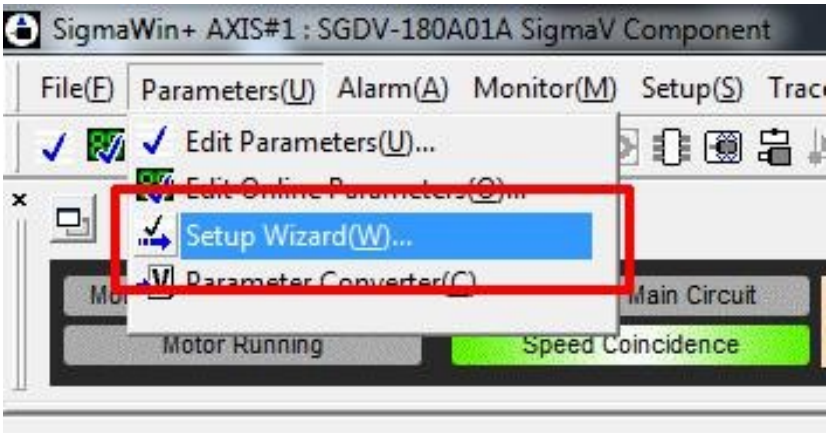
- Launch the Yaskawa SigmaWin+ software.
- You will see the following screen:



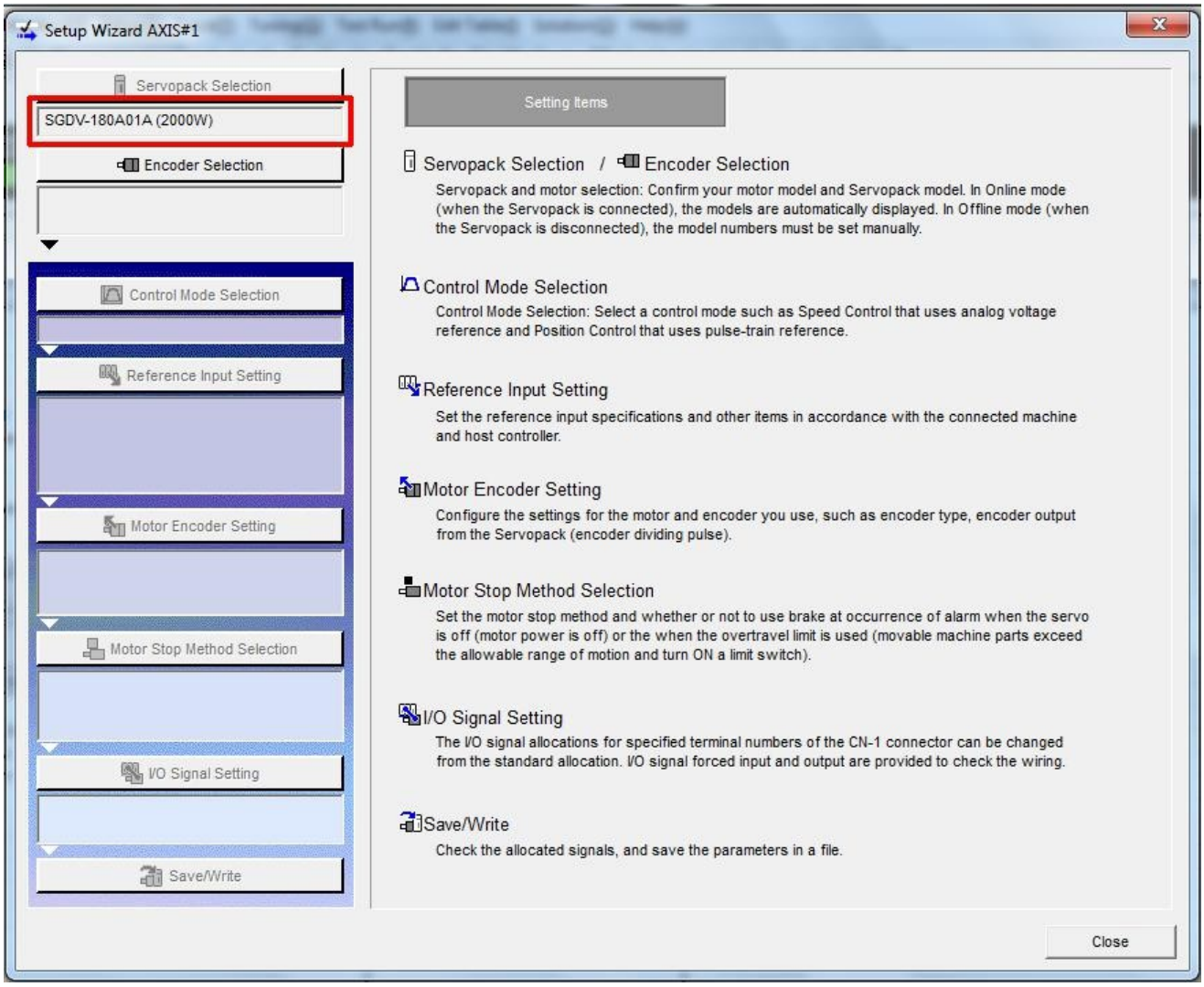
- Ensure "Online" is selected as shown above
- Select "**Search**" and make sure "Σ5 drives" are selected. This search must be done every time you power up the software or connect to a different Servopack because the SigmaWin+ software remembers the last drive that was connected to it and displays that rather than what is currently connected.
- Select the drive that appears and click "**Connect**".
- SigmaWin+ will then open to the main screen as shown below:



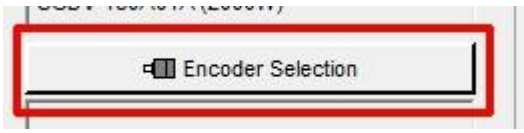
- The best way to configure the Servopack is by using the Setup Wizard which is located under the Parameters menu option as shown below:



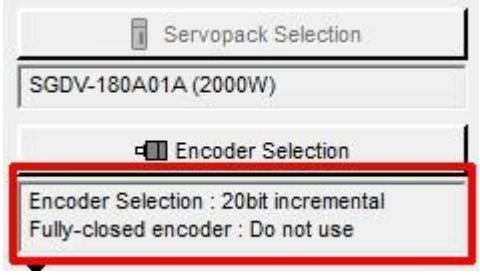
- Select "**Parameters(U)**" then click "**Setup Wizard(W)**" to start the wizard. The "**Setup Wizard(W)**" window is shown below:



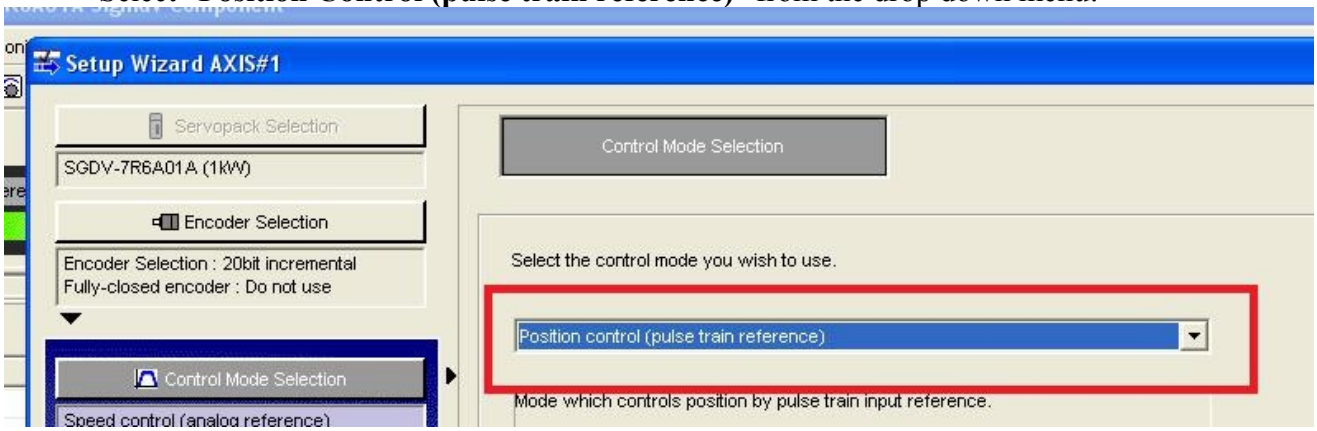
- To run the setup wizard you will click on the buttons at the left of the window. Starting at the top and working down the list.
- Start by clicking the "**Encoder Selection**" button.



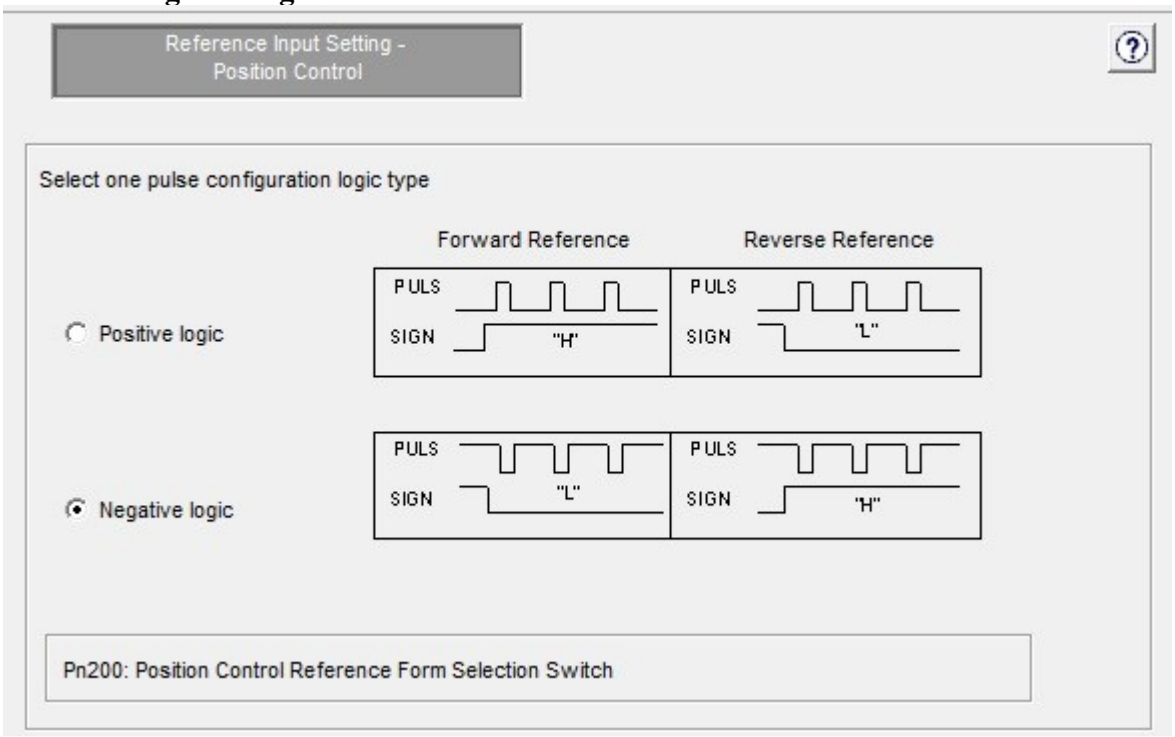
- Nothing is displayed in the window under "**Encoder Selection**" until you click on "**Apply**" at the lower right corner.
- The encoder type will then be shown under the Encoder Selection button.



- Click "**Control Mode Selection**".
- Select "**Position Control (pulse train reference)**" from the drop down menu:

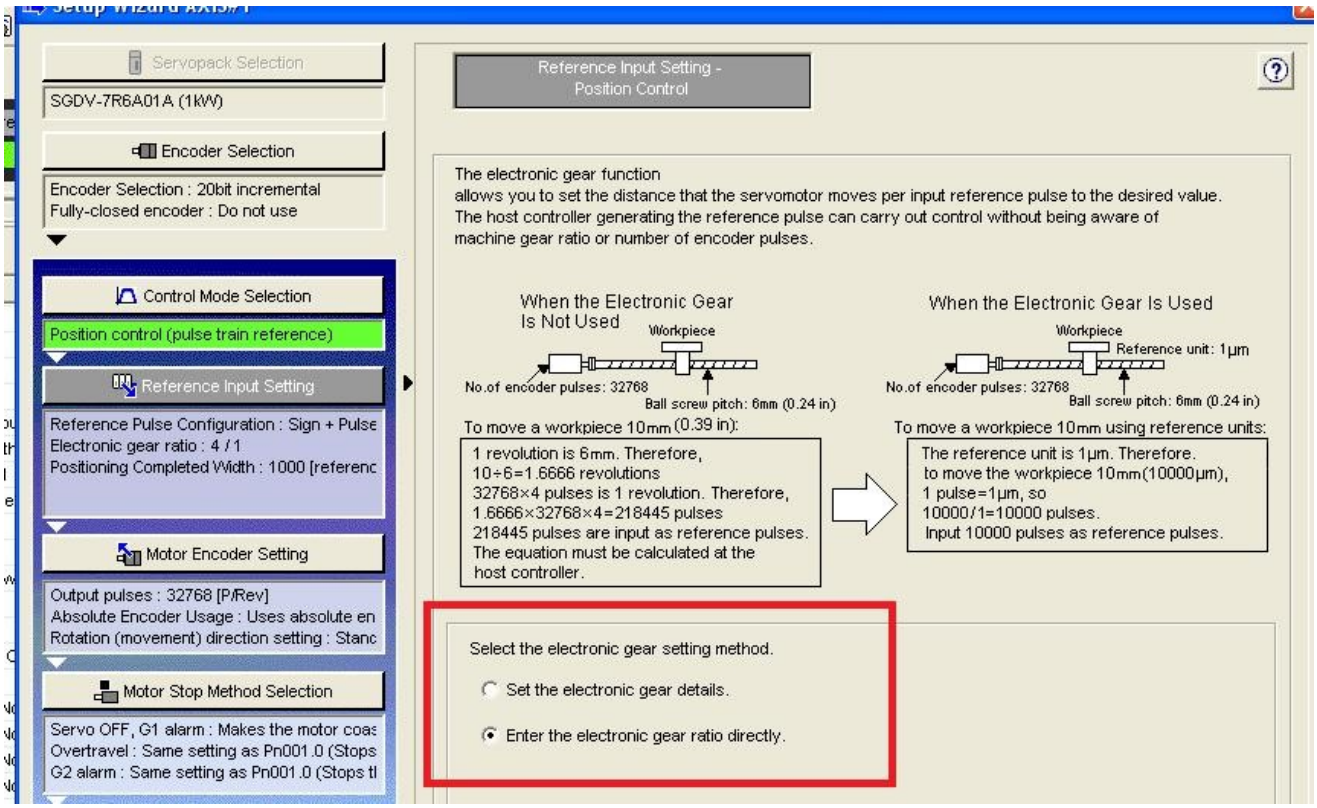


- Click "**Apply**".
- Click "**Reference Input Setting**".
  Note: the "**Control Mode Selection**" setting is now highlighted in green, signifying that it has been completed.
- Select "**SIGN + PULSE**" and click "**Next**".
- You will then need to select pulse configuration logic type.
- Select "**Negative logic**" as shown below:



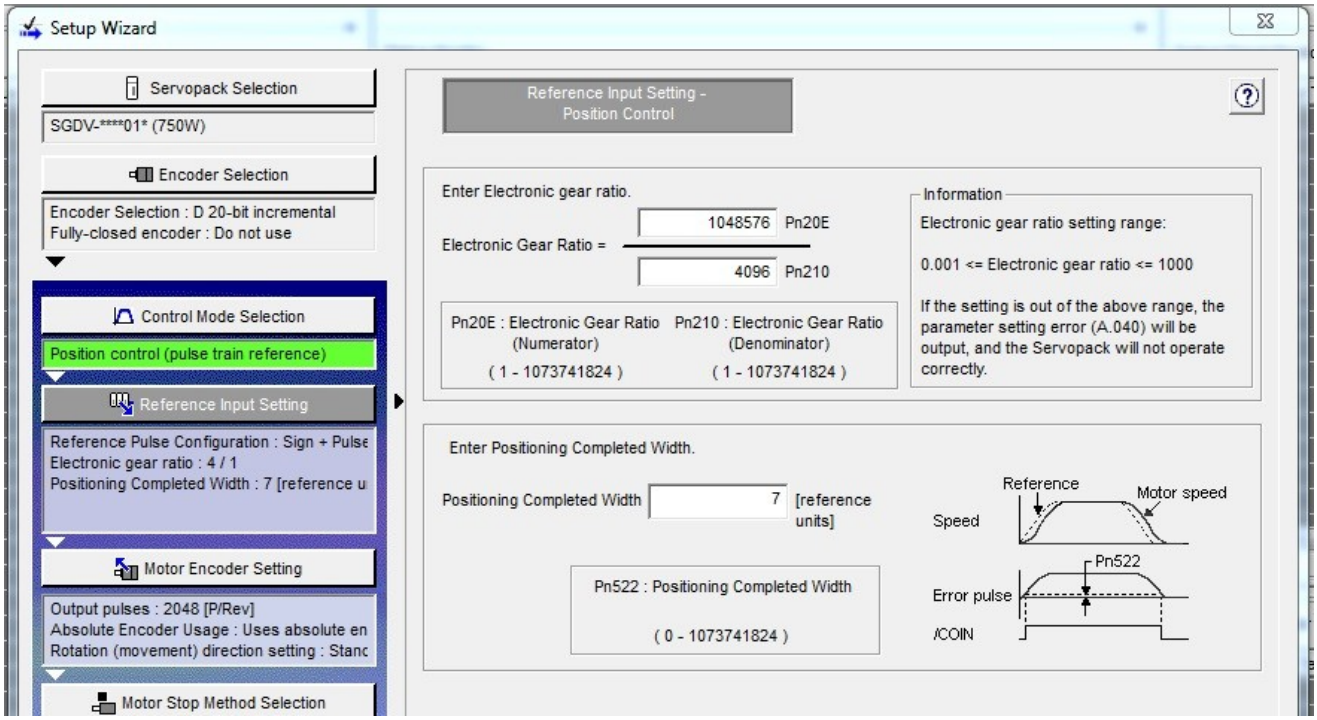
- Click "**Next**".

- You will then be asked to Select the electronic gear setting method. Select "Enter the electronic gear ratio directly" as shown below:

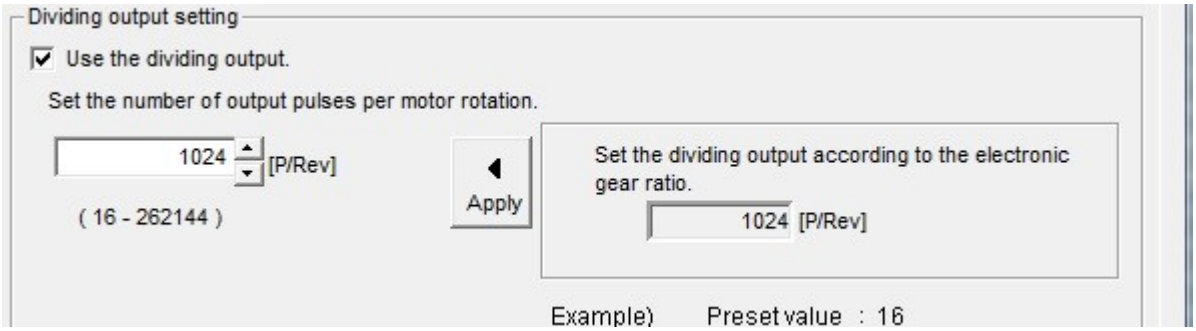


- Click "**Next**".
- You will then need to enter the gear ratio. Enter **1048576** on top and **4096** on bottom as shown in the image below:

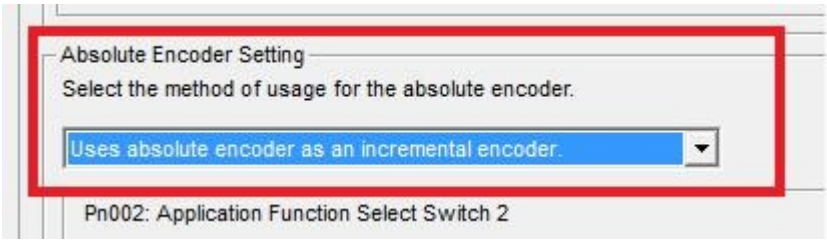
- Verify the "Positioning Completed Width" is set to **7** and click "**Apply**".
- The "Reference Input Setting" will now be green.
- Click "**Motor Encoder Settings**".



- On the right side of the screen you will see the option “Set the dividing output according to the electronic gear ratio” as shown below. Click “**Apply**” to set the number of output pulses per motor rotation to **1024**.

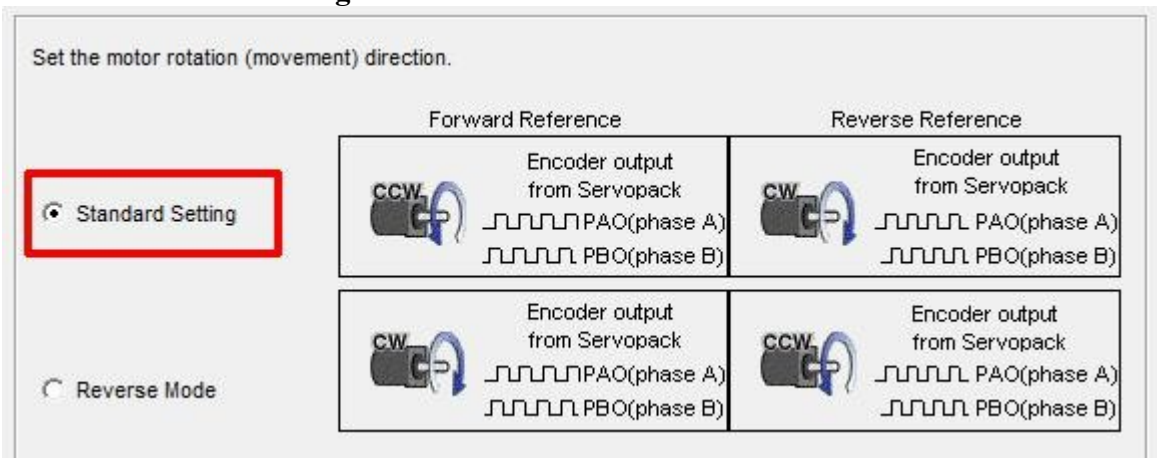


- Sometimes due to availability, you may receive a servomotor with an absolute encoder instead of an incremental encoder. The wizard will detect this and allows you to set the following option. If the servomotor does have an absolute encoder installed the “Absolute Encoder Setting” must be changed to “**Uses absolute encoder as an incremental encoder.**” as shown below:



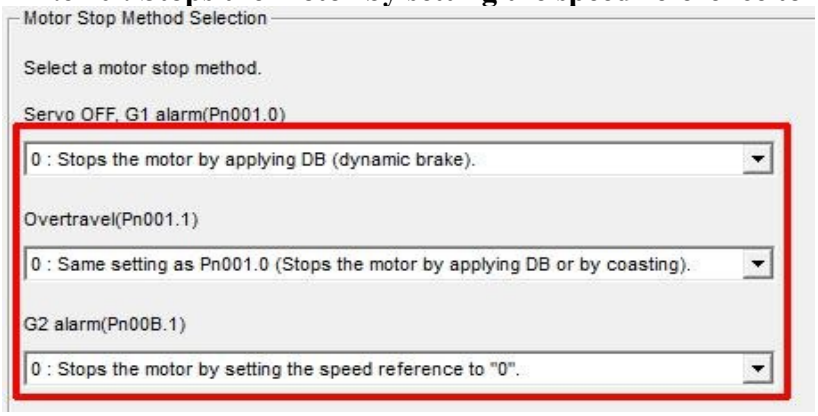
Note: The "Absolute Encoder Setting" option is grayed out if you have an incremental encoder.

- Click "**Next**".
- Select "**Standard Setting**".



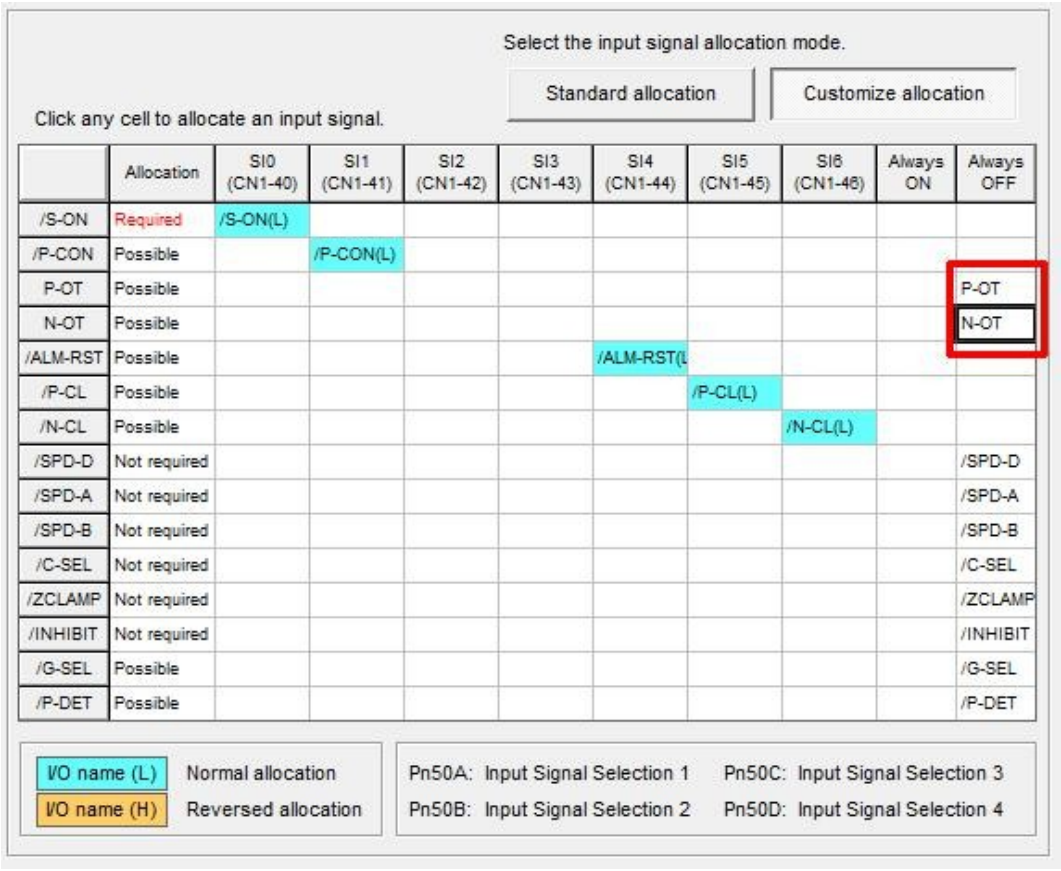
- Click "**Apply**".

- The "Motor Encoder Settings" will now also be green.
- Click "**Motor Stop Method**".
- Pn001.0 should be set by default to the settings in the picture below. If not, make sure they are set accordingly.
- Set "Servo OFF" to "**0 : Stops the motor by applying DB (dynamic brake).**".
- Set "Overtravel" to "**0 : Same setting as Pn001.0 (Stops the motor by applying DB or by coasting).**".
- Set "G2 alarm" to "**0 : Stops the motor by setting the speed reference to "0".**".



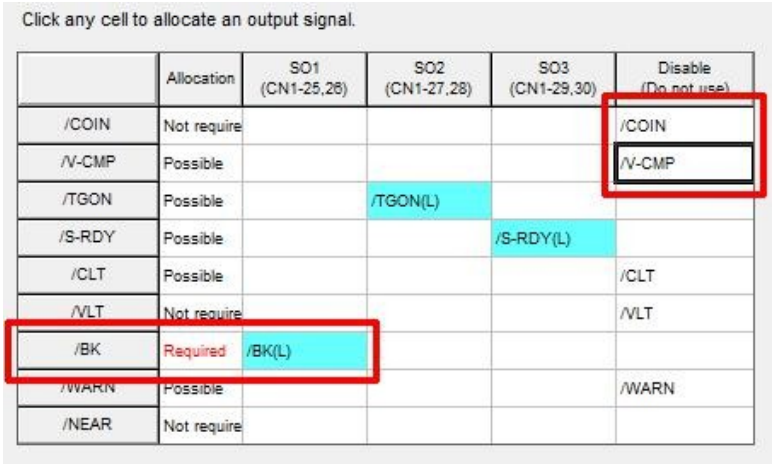
- If the Servomotor you are setting up has a brake, you will need to check the "**Use the Holding brake**" option as shown below:

- Click "**Apply**".
- Click "**IO Signal Settings**" then click "**Input Signal Settings**".
- Disable "N-OT" by clicking in the "**Always OFF**" column as shown below.
- Disable "P-OT" by clicking in the "**Always OFF**" column as shown below.



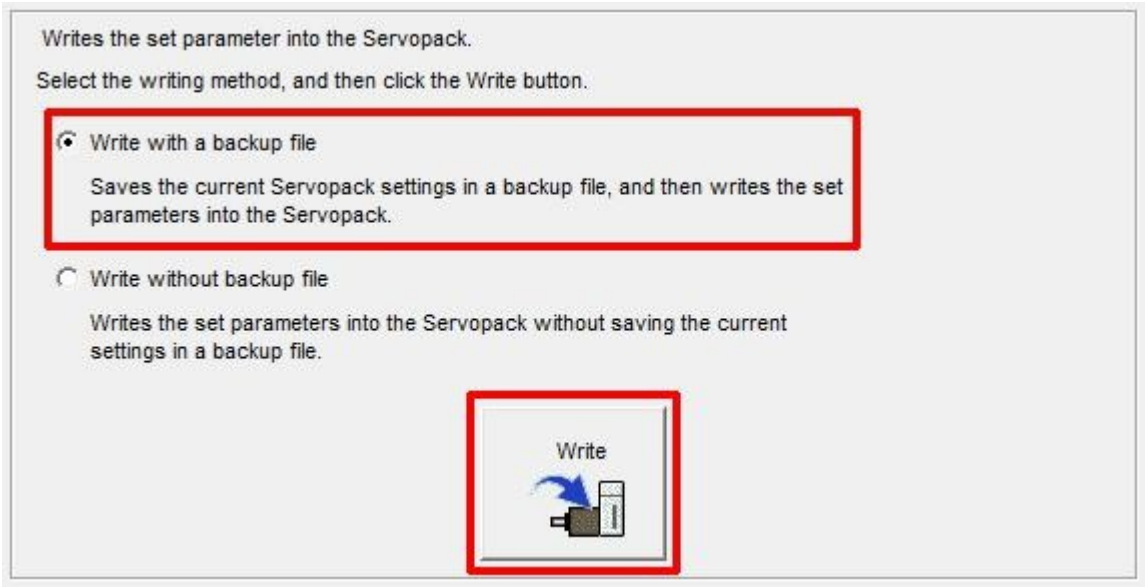
	Allocation	SI0 (CN1-40)	SI1 (CN1-41)	SI2 (CN1-42)	SI3 (CN1-43)	SI4 (CN1-44)	SI5 (CN1-45)	SI6 (CN1-46)	Always ON	Always OFF
/S-ON	Required	/S-ON(L)								
/P-CON	Possible		/P-CON(L)							
P-OT	Possible									P-OT
N-OT	Possible									N-OT
/ALM-RST	Possible					/ALM-RST(L				
/P-CL	Possible						/P-CL(L)			
/N-CL	Possible							/N-CL(L)		
/SPD-D	Not required									/SPD-D
/SPD-A	Not required									/SPD-A
/SPD-B	Not required									/SPD-B
/C-SEL	Not required									/C-SEL
/ZCLAMP	Not required									/ZCLAMP
/INHIBIT	Not required									/INHIBIT
/G-SEL	Possible									/G-SEL
/P-DET	Possible									/P-DET

- Click "**OK**".
- Click "**Output Signal Settings**".
- You must set "/COIN" and "/V-CMP" to "**Disable (Do not use)**" as shown below:
- For motors with a brake you must also set "/BK" to "**SO1 (CN1-25,26)**" as shown below:

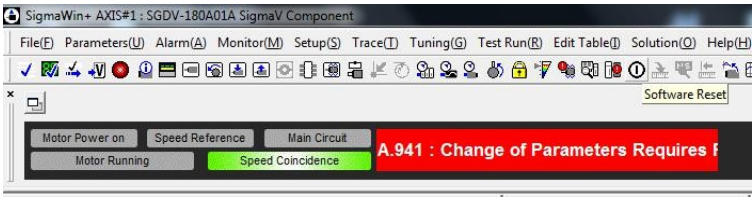


	Allocation	SO1 (CN1-25,26)	SO2 (CN1-27,28)	SO3 (CN1-29,30)	Disable (Do not use)
/COIN	Not require				/COIN
/V-CMP	Possible				/V-CMP
/TGON	Possible		/TGON(L)		
/S-RDY	Possible			/S-RDY(L)	
/CLT	Possible				/CLT
/VLT	Not require				/VLT
/BK	Required	/BK(L)			
/WARN	Possible				/WARN
/NEAR	Not require				

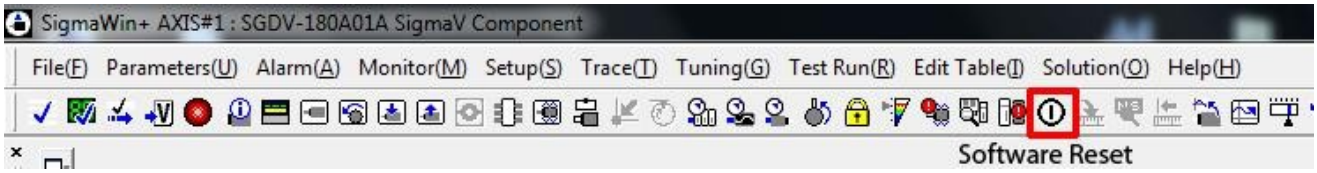
- Click "**OK**".
- You will then be returned to the IO Signal Settings screen. Hit "**Apply**" to save the settings and then click "**Save/Write**".
- Select "**Write with a backup file**" then press "**Write**". This will save the current configuration and then write the current configuration to the Servopack:



- Click "**Finish**".
- Click "**Yes**" when prompted to complete the Setup Wizard.
- The ServoPack will now have an A941 error as shown below. This indicates that a reset is required to apply the configuration changes.



- To reset the Servopack you must click the "**Software Reset**" button in SigmaWin or remove power from the Servopack. Before clicking the "**Software Reset**" button push in the E-stop button on the control. This avoids putting the control into an error state when the drive and motor go offline. The Software Reset button is shown below:



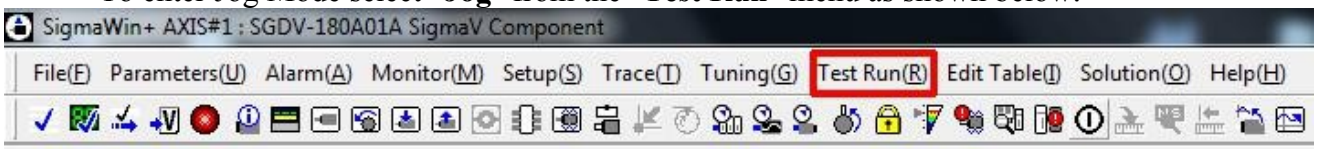
- After pressing the "**Software Reset**" button you will receive a warning. Simply click "**Execute**" to continue as shown below:

- Click "**Execute**" at the next screen that pops up to confirm reset of the Servopack.
- Every time the Yaskawa Servopack is reset, you will normally get an error on the Centroid control. Having the E-stop button pressed will avoid getting that error message.
- Once the Servopack is reset, you will have a "Motor Base Blocked - bb" message displayed on the Servopack. This message means that everything is OK.

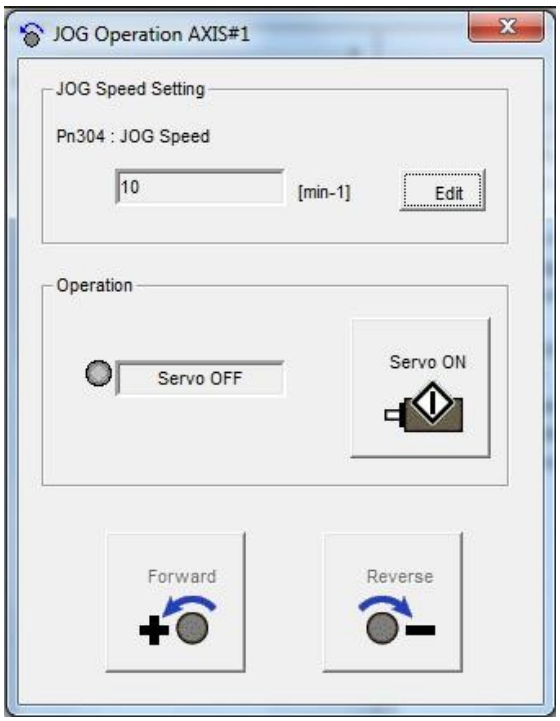
Test Run:

We are now ready to perform a test run of the Servopack and Servomotor. This test run will be performed from the SigmaWin+ software using the Jog Mode.

- To enter Jog Mode select "**Jog**" from the "**Test Run**" menu as shown below:



- You will then see the Jog Operation window as shown below:



- Click "**Edit**" to change the "JOG Speed" setting. 50rpm is a good safe starting point.
- Verify that the E-stop button is released.
- Click "**Servo ON**" to enable the Servopack Motor Power.

The screen should then show "Servo ON" as shown below:

- You can now jog the motor by pressing and holding either the Forward or Reverse buttons.
- If everything is working correctly you should have smooth motion of the Servomotor. Simply close the Jog Operation window to exit Jog Mode. Cycle the E-stop button.

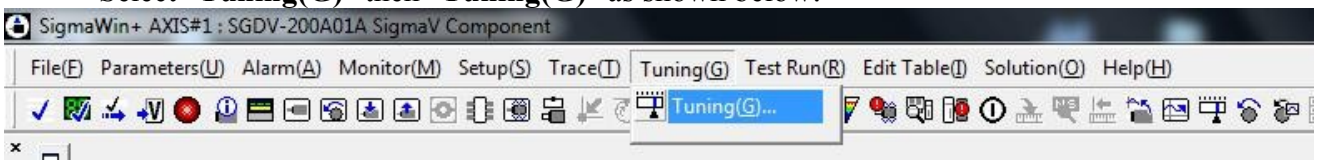
Servopack Tuning:

We are now ready to tune the Yaskawa Servopack. There are two main options for doing this:

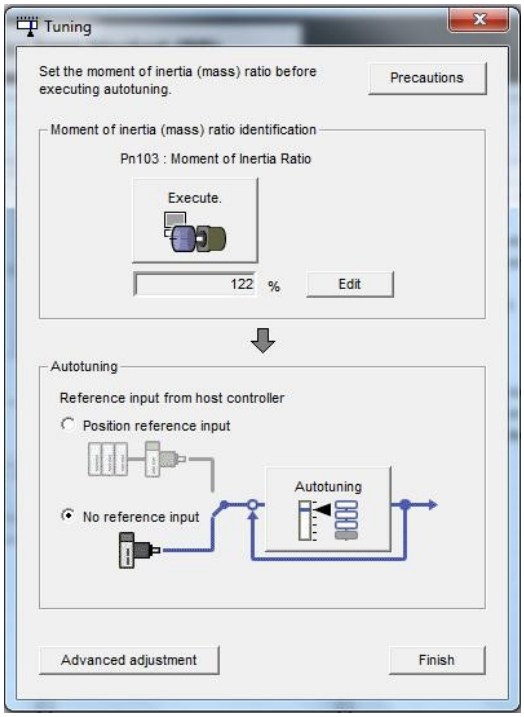
1. "Tune Less Mode" – This is the default mode for the Servopack. It obtains a stable response without adjustment.
2. "Autotuning" – In this mode the Servopack will attmept to tune itself to the dynamics of the system, saving the parameters for use after that.

Note: Most Servopack/Servomotor combinations seem to perform better once they have been Autotuned, so that is the option in which we will proceed.

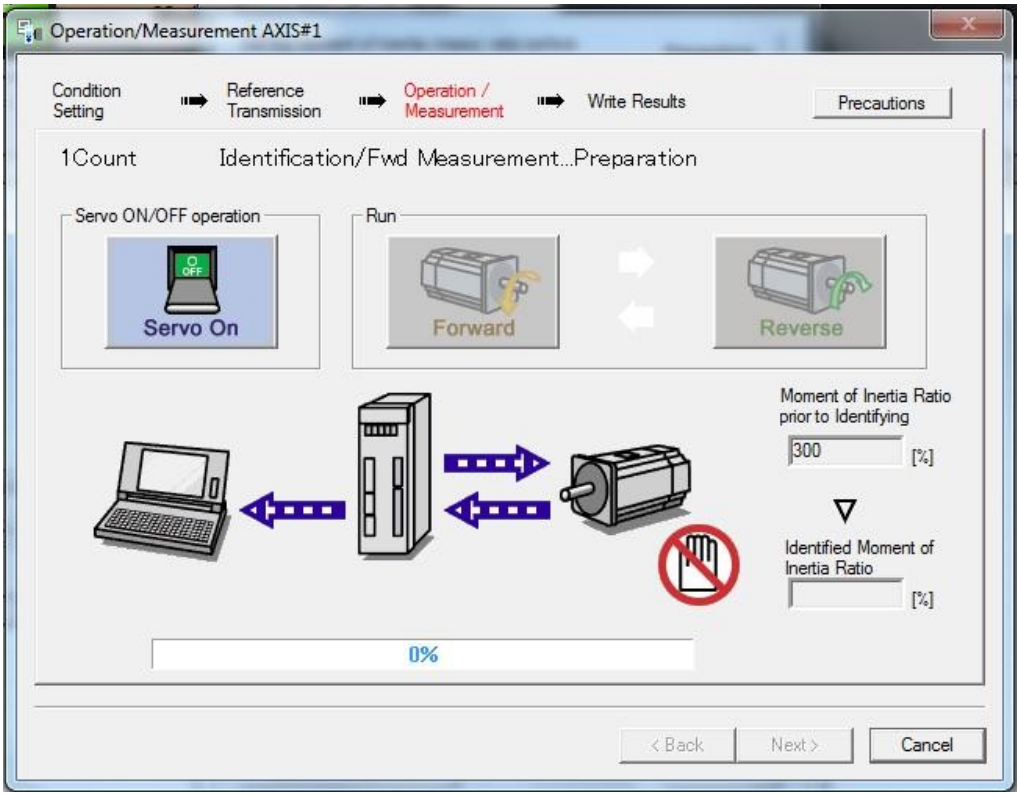
- Select "**Tuning(G)**" then "**Tuning(G)**" as shown below:



- You will then see a safety warning about the use of Tuning. Simply press "**Execute**" to continue.
- You will then see the following Tuning window:

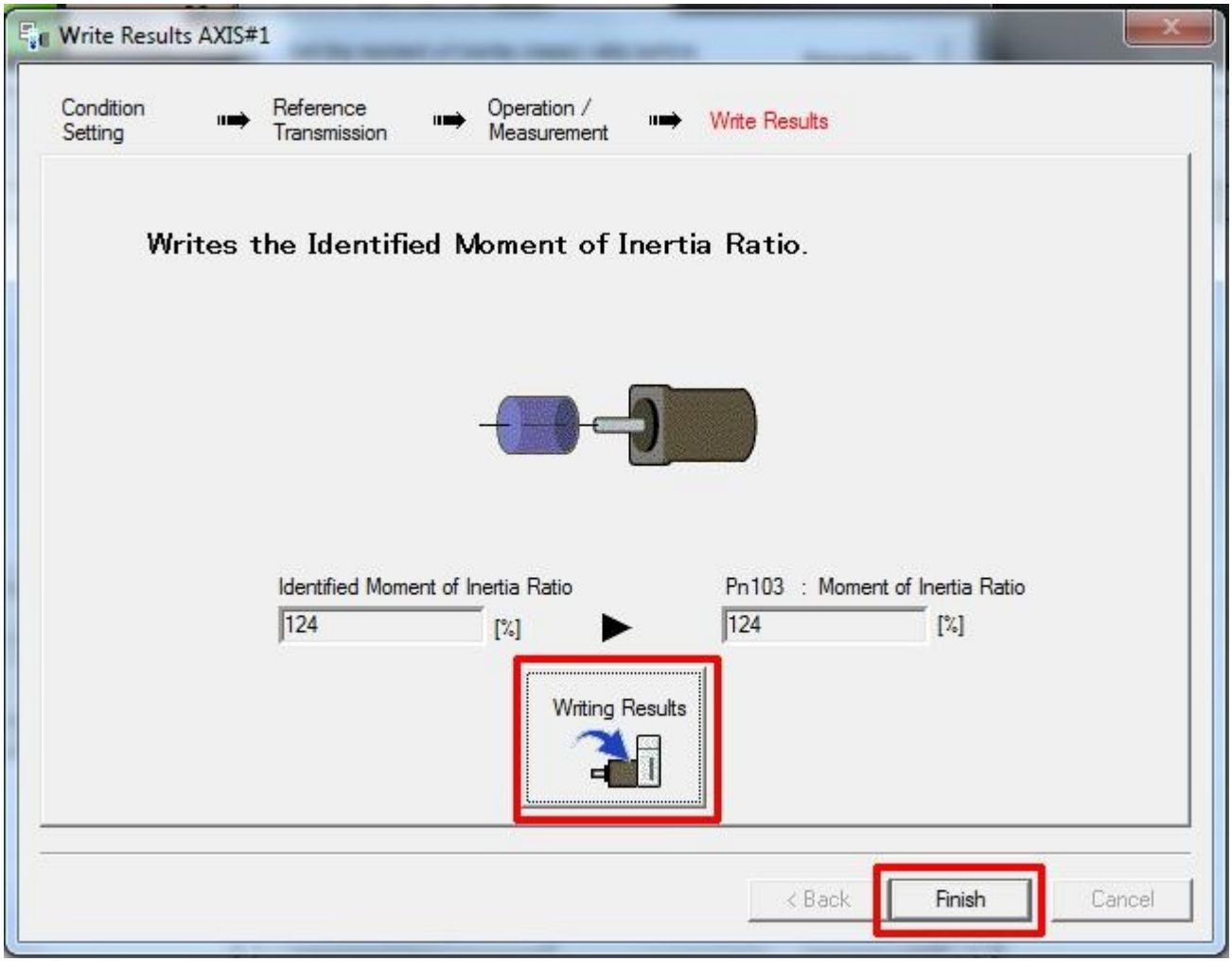


- Click "**Execute**". This will begin the process to calculate the Moment of Inertia for the Servomotor.
- You will then see the Condition Setting window as shown below. Click "**Next**".
- Click "**Start**" to transfer reference conditions to the Servopack and then click "**Next**".
- You will then see the Moment of Inertia calculation as shown below:

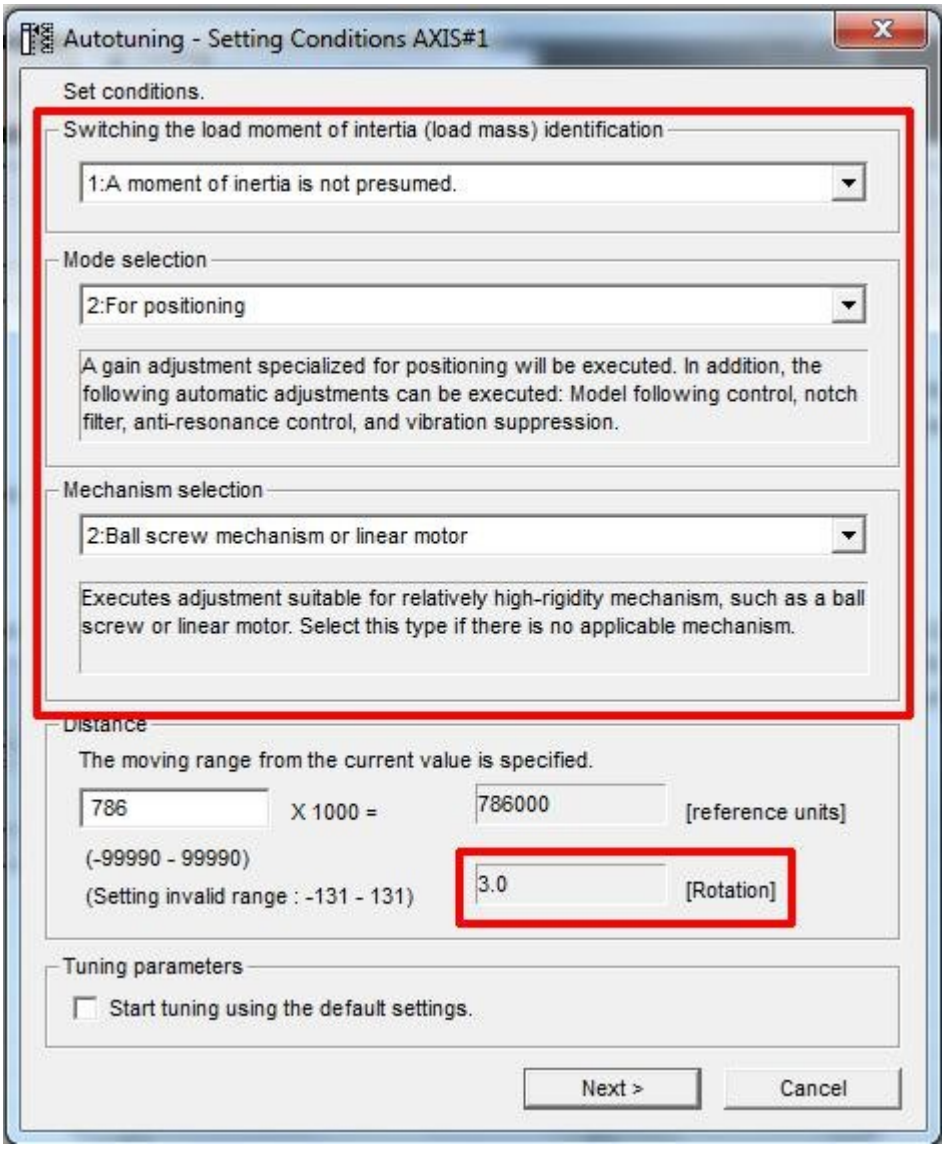


- Verify that the E-stop button is released.
- Click "**Servo On**" to apply power to the Servomotor.
- Alternatingly, click "**Forward**" then "**Reverse**" until the SigmaWin software will no longer allow you to press either one, signifying that the process is complete.
- Push in the E-stop button and click "**Next**".

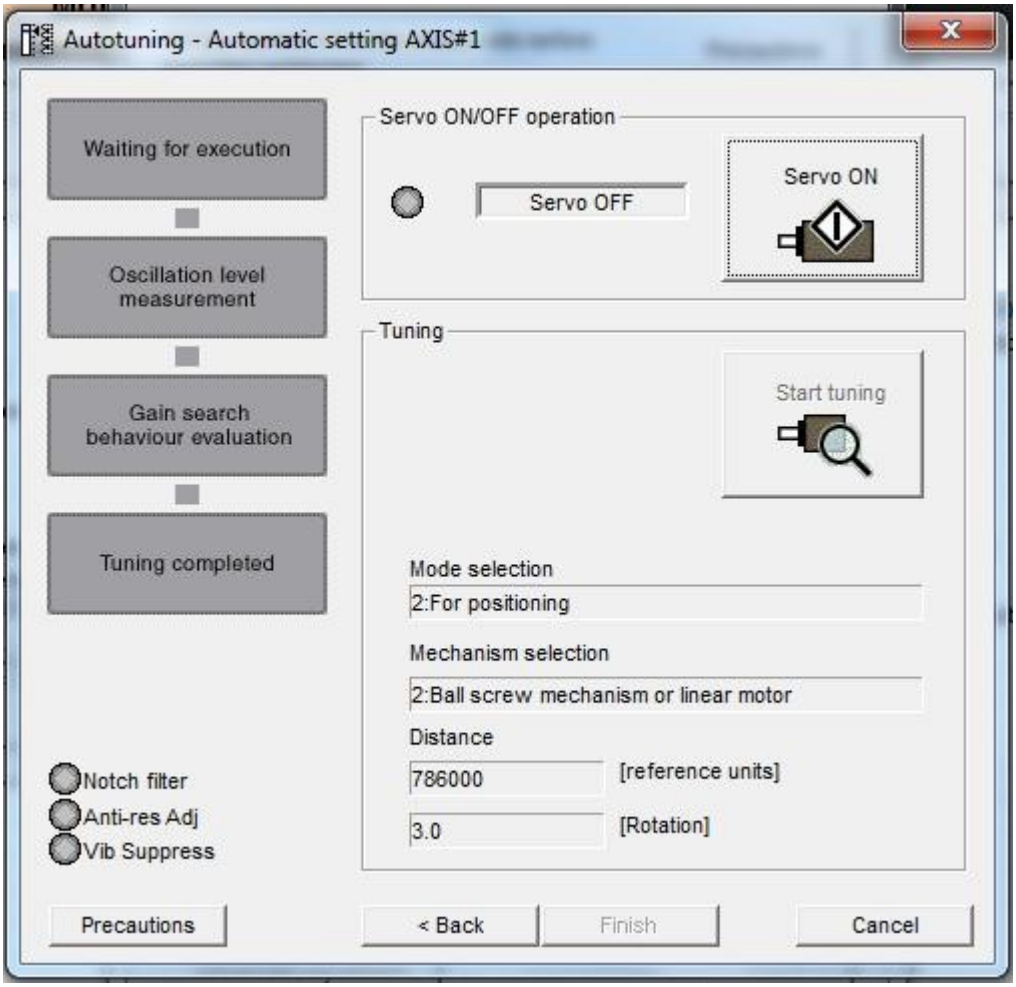
- You will then see the window as shown below:



- Click "**Writing Results**" to send the results to the Servopack.
- Click "**Finish**".
- You will be prompted to execute a **Software Reset** on the Servopack.
- You will then be returned to the Tuning window.
- Under the "**Autotuning**" section, click "**No Reference Input**" to ensure the correct mode during tuning. Click "**Autotuning**".
- You will then see the following Autotuning - Set Conditions window:



- The following settings should be set by default, verify that they match the following settings:
  - Set "Switching the load moment of inertia (load mass identification)" to "**1: A moment of inertia is not presumed.**".
  - Set "Mode selection" to "**2: For positioning**".
  - Set "Mechanism selection" to "**2:Ball screw mechanism or linear motor**".
  - Ensure the "Moving Range" is set to "**3.0**" rotations.
- Click "**Next**".
- You will receive another warning. Click "**Yes**" to send the parameters to the Servopack.
- You will then see the Autotuning – Automatic setting window as shown below:



- Verify that the E-stop button is released.
- Click "**Servo ON**".
- Click "**Start tuning**". The Servopack will then tune itself. Sometimes the autotune will fault. This can usually be fixed by performing a **Software Reset** and re-starting the Autotune.
- Click "**Finish**" when tuning is complete.
- At this point the Servopack and servomotor are tuned. Exectue a **Software Reset** to be sure everything is back in good operation.
- Run **Acorn Setup Wizard** and set Steps/Rev to **4096**