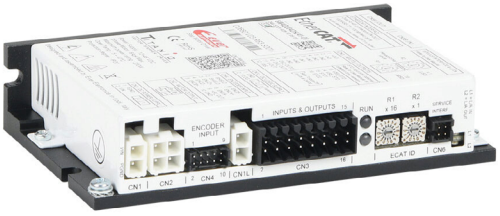
AUTOMATIONDIRECT.com

EtherCAT Drives
Quick Start Guide
with Ever Studio

1st Edition, September 22, 2025



Ever Studio

Table of Contents

Ever Studio with EtherCAT Series Drives Overview

This quick start guide is intended to provide users of the Ever Stepper EtherCAT drives an overview of using Ever Studio software.

For detailed documentation on each drive, please see the following:

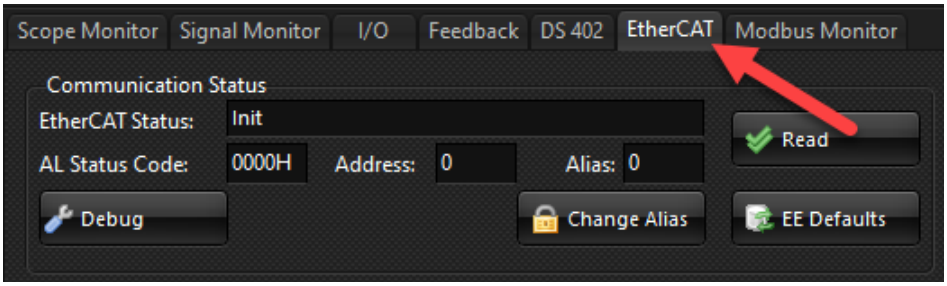
- *Ever_Studio_Quick_Start_Guide*
- *Manual_e3PLC_Studio_EN*
- *Manual_TitanioPlatinoVanadio_DS402_EN*
- *SW4D Installation Instructions*
- *SW4A Installation Instructions*
- *SW4x Datasheet*
- *SW3A Installation Instructions*
- *SW3A Datasheet*
- *SW3D Installation Instructions*
- *SW3D Datasheet*
- *SW5A Installation Instructions*
- *SW5A Datasheet*

Four-lead motors are the easiest to connect. The speed–torque of the motor depends on winding inductance. To determine the peak output current of the drive, multiply the nameplate motor phase current by 1.4. If the motor runs too hot, then multiply by 1.2 instead. A motor running in closed loop with encoder feedback will run cooler. For 6-lead and 8-lead motor wiring information, please refer to the drive User Manual.

The drives are designed to operate within a specific voltage input (see specifications table). When selecting a power supply, choose a power supply with an output range within the minimum and maximum of the drive, and be sure to leave room for power supply fluctuation and motor back-EMF.

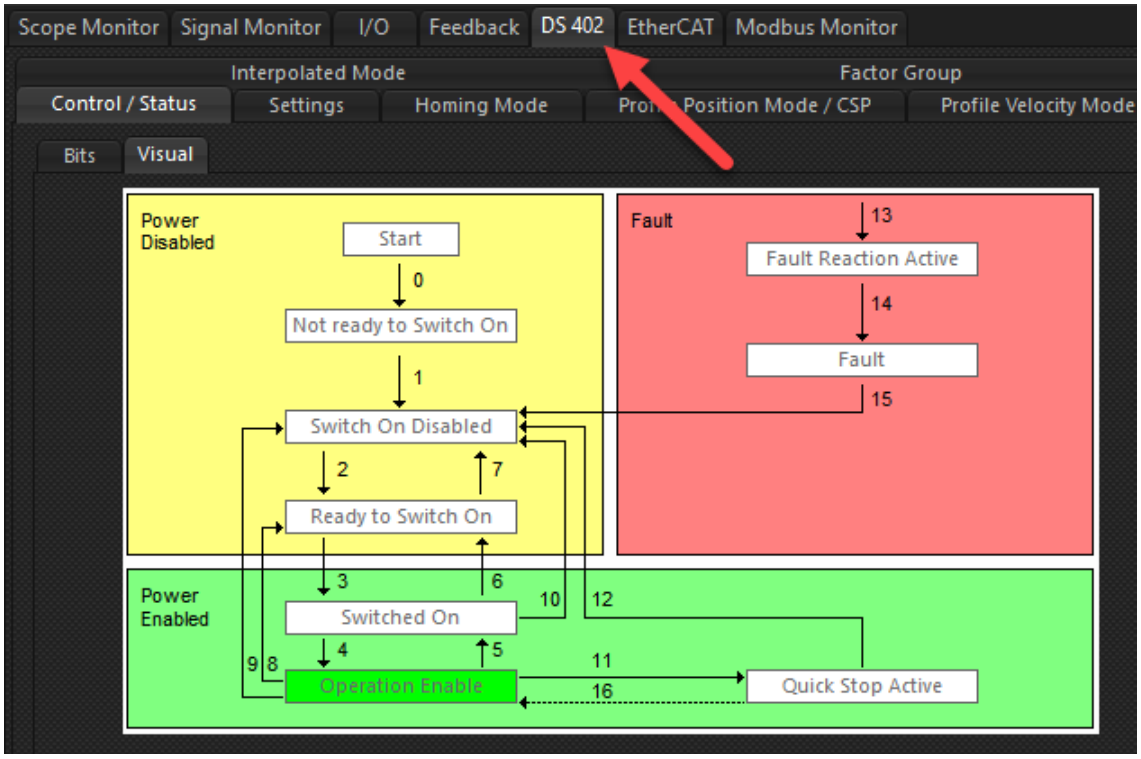
EtherCAT addressing and troubleshooting

The Ever drives use the term Alias as the EtherCAT node. This node can be set in the EtherCAT tab in Ever Studio. The EtherCAT Status field is for the actual EtherCAT communication chip.



The SW4D drive uses two rotary switches to set the EtherCAT Alias. All other drives need to have the Alias set through this window. The new Alias will only take affect after a power cycle.

You can control and monitor the state machine in the DS 402 tab. While the EtherCAT master is controlling the drive you can monitor the state machine here. You can also control the state machine by clicking on the states. Be sure the “Disable PLC Master RX PDO” box is checked. Note that you can only move through the states in the intended order. For example from the “Ready to Switch On” state you can only move to the “Switch On Disabled” or “Switched On” states.

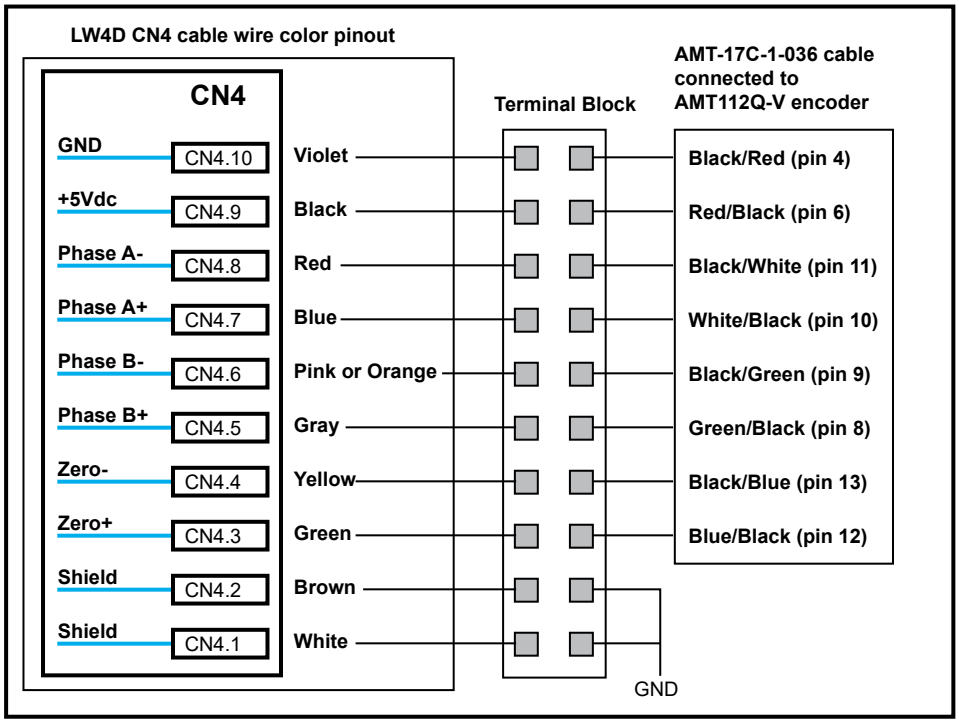


Wiring

Wiring the Encoder

The wiring example below uses a SureStep motor from AutomationDirect (STP-MTR-23055E). This motor includes an encoder, AMT112Q-V, premounted on the rear shaft of the motor. By default, the encoder is set to 400ppr and is a line driver type. Use programming cable AMT-PGRM-17C to change the PPR of this encoder if needed.

Connect the encoder cable, STP-CBL-EBx (or AMT-17C-1-036), to the drive's encoder cable (CN4 cable) using the following diagram:



CN4 cable wire color pinout (CBL/0341-050)

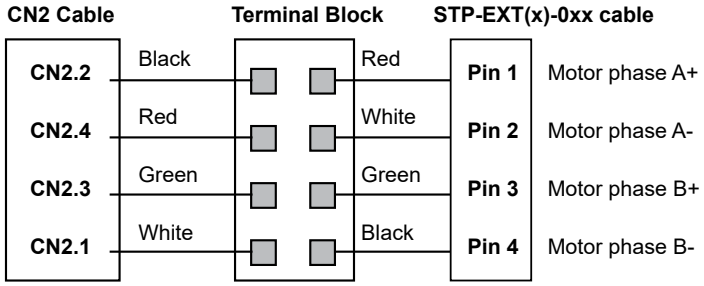
Item Pin	*Wire Color*
1	WHITE
2	BROWN
3	GREEN
4	YELLOW
5	GRAY
6	PINK or ORANGE
7	BLUE
8	RED
9	BLACK
10	VIOLET

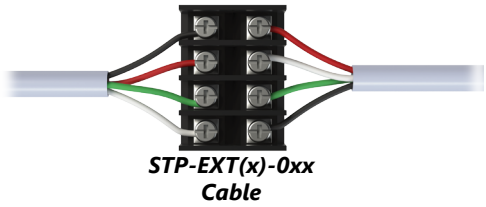
AMT-17C-1-036 wire color pinout

Connector Pinout			
#	*Function*	*Color*	
		Primary	*Stripe*
4	GND	Black	Red
6	+5V	Red	Black
8	B+	Green	Black
9	B-	Black	Green
10	A+	White	Black
11	A-	Black	White
12	Z+	Blue	Black
13	Z-	Black	Blue

Wiring the Motor

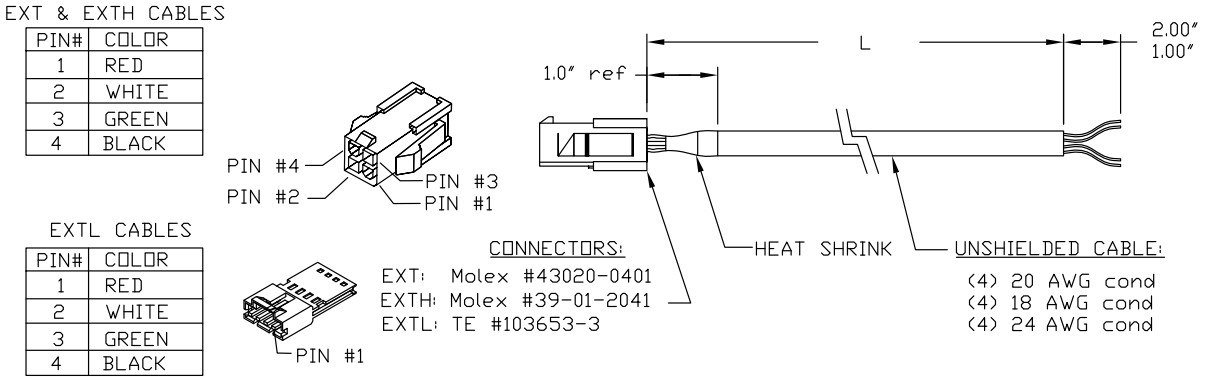
Wire the motor according to the diagram below:





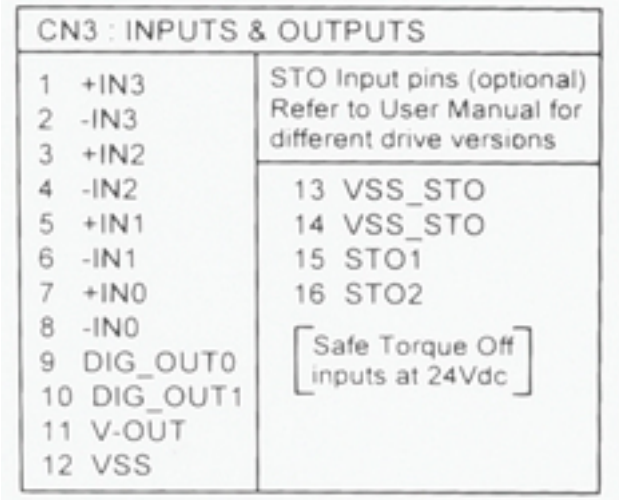
NOTE: The CN2 cable and STP-EXT cable have the same wire colors, but signals of the colors do not match. Use CBL/0191-100 or CBL/0191-050 to connect to CN2.

STP-EXT(x)-0xx Extension Cable Wiring Diagram



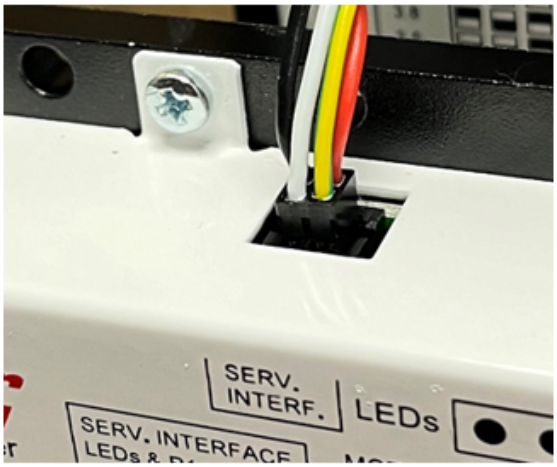
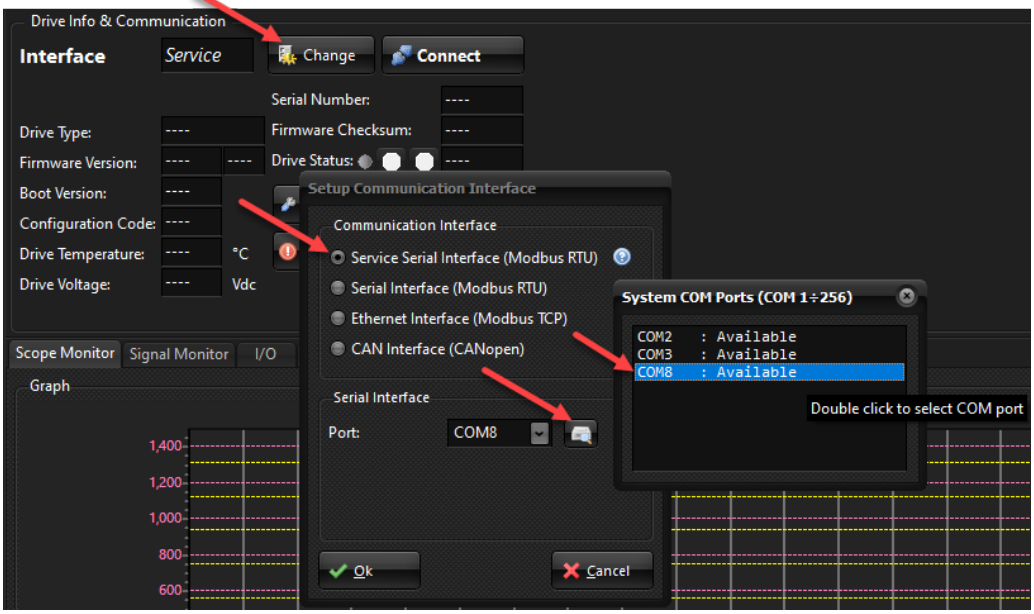
Incorrect STO Labeling

The SW4D2042H241-00 silk sceen label on the drive is used for multiple drive models. This drive does not have STO and pins 13-16 are not used.



Connecting Ever Studio

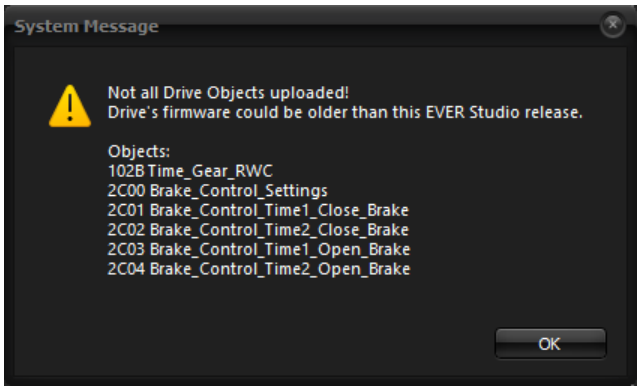
This section covers getting connected to your Ever Stepper drive with Ever Studio configuration software. The drive can also be configured over EtherCAT from a master.

Step	Action
1	To begin, connect the computer with Ever Studio installed to the drive using an EVER-PGM-1 or EVER-PGM-2 cable. Ensure the 4-pin square connector of the EVER-PGM-1 is plugged in as shown below: 
2	Open the Ever Studio software on the connected computer.
3	Click **Change** to open the **Setup Communication Interface** window. 
4	Select **Service Serial Interface (Modbus RTU)**. This is used with EVER-PGM-1 and EVER PGM-2 configuration cable kits.
5	Click the **Show System COM Ports** icon to open the **System COM Ports** window. Double-click on the com port that connects to the drive. Click **Ok**.
6	Click **Connect**. The upper left of the Ever Studio window should now the connected drive model number.

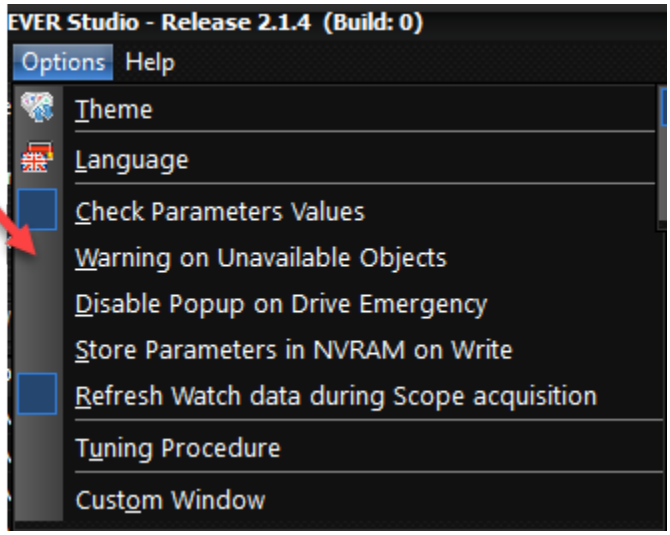
Initial Software Setting Changes

Unavailable Object Warning

Not all parameters and objects in Ever Studio are supported in every drive. If you have a non-supported parameter or object, you may get a warning similar to the message below:

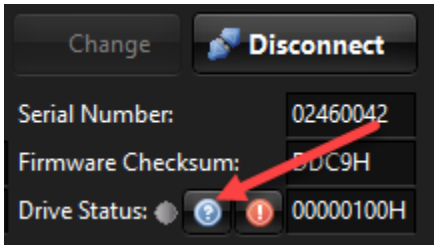


To stop receiving pop-up System Messages stating this, you will need to uncheck the **Warning on Unavailable Objects** menu item in the **Options** menu.

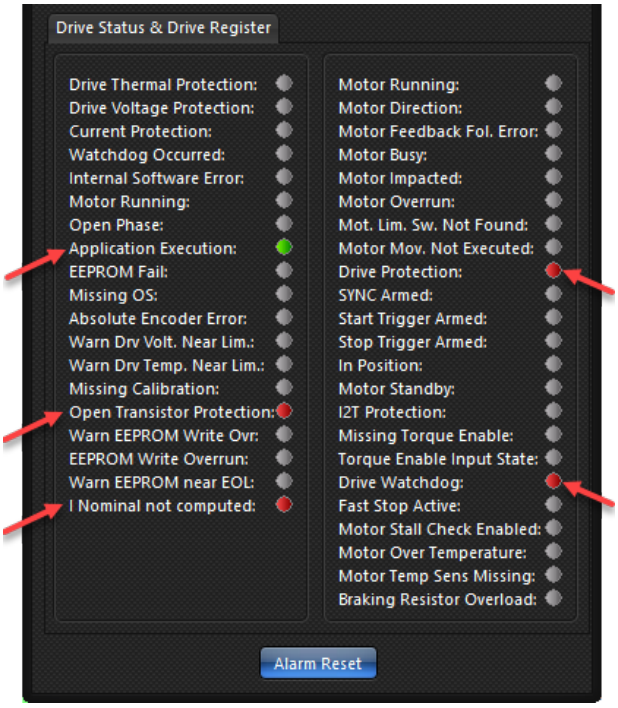


Alarms and Drive Status LEDs

If any Alarms need to be reset, do so in the **Drive Status** window.



When first connecting to the drive you may see drive status and alarms as shown to the right.



- *The Application Execution green LED should always be on. It indicates the drive's firmware/ software is running properly.*
- *Open Transistor protection: Drive is not enabled and the motor output transistors are off. Once the drive is enabled and torque is applied to the motor, this alarm will clear.*
- *I Nominal Not Computed: This alarm is normal at the power up of the drive if the drive is not enabled. It indicates that the drive has not yet sent current to the motor and has not been able to calculate the motor's R and L values. At the first Enable, the alarm will clear and at the next disable it will not show again. If "Motor RL Detection" is not checked in the Working Settings Tab then this alarm will not appear.*
- *Drive Protection: General message for all drive disable alarms.*
- *The Drive Watchdog LED should always be active.*

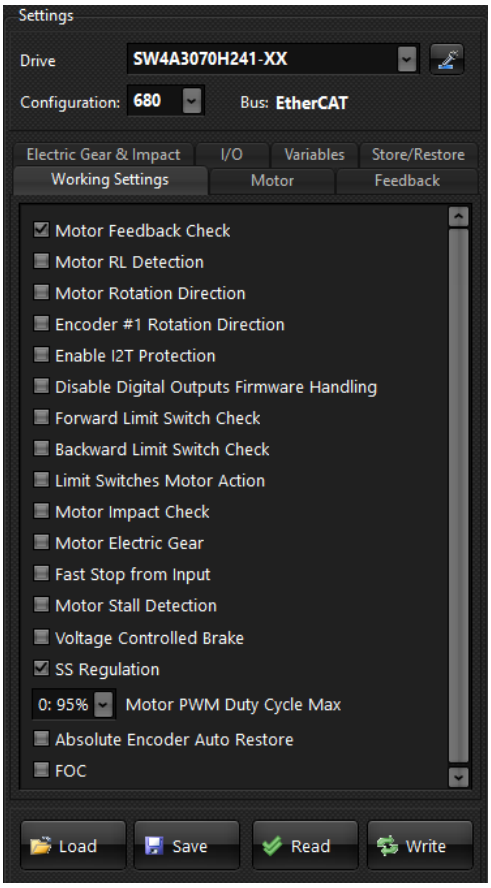
Disabling the drive also causes the status to change to "Drive is in Emergency Condition" and the Drive Protection and the Open Transistor Protection warnings to activate in the Drive Status window.

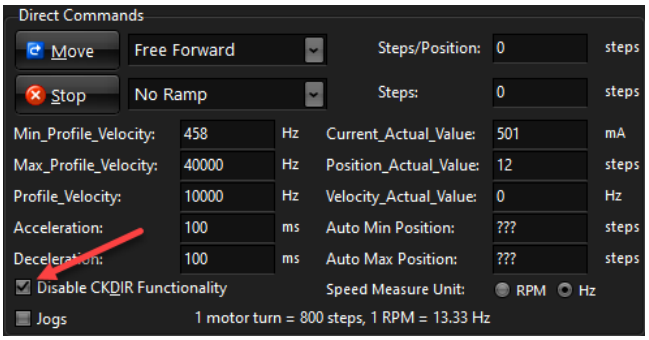
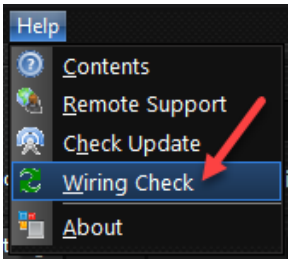
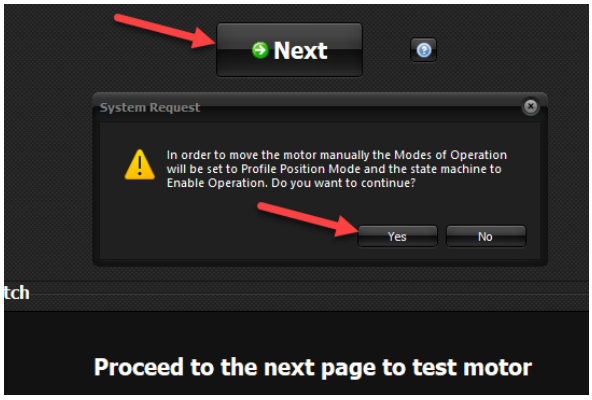
Be sure to check the Automation Direct website if a new firmware file is available.

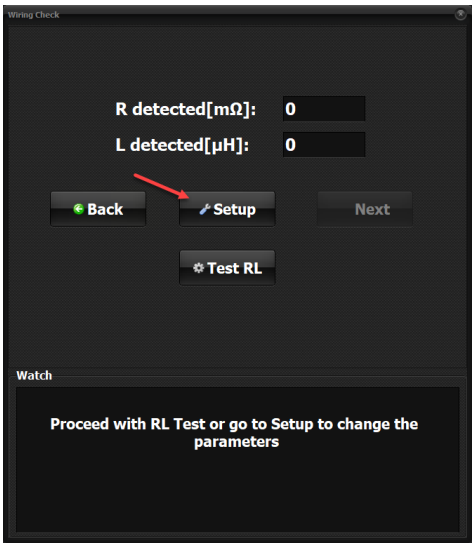
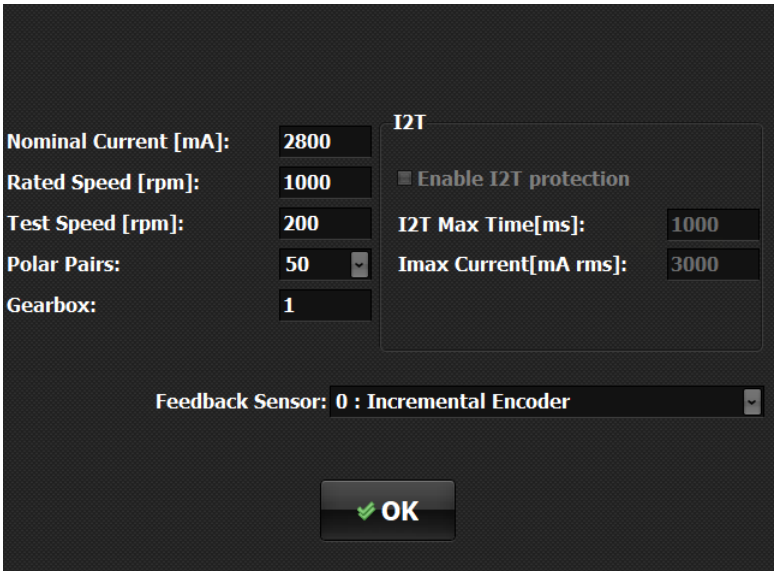
Configure the Drive with Ever Studio

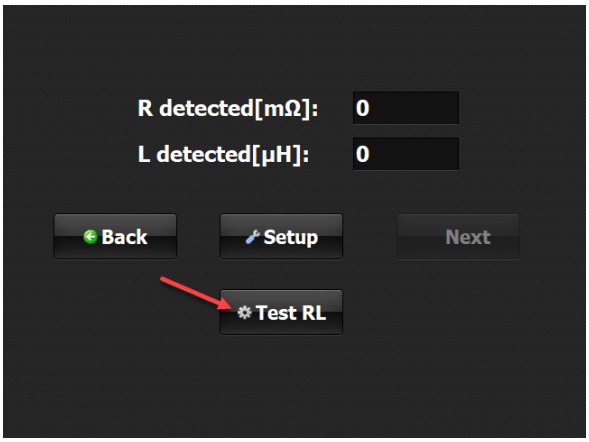
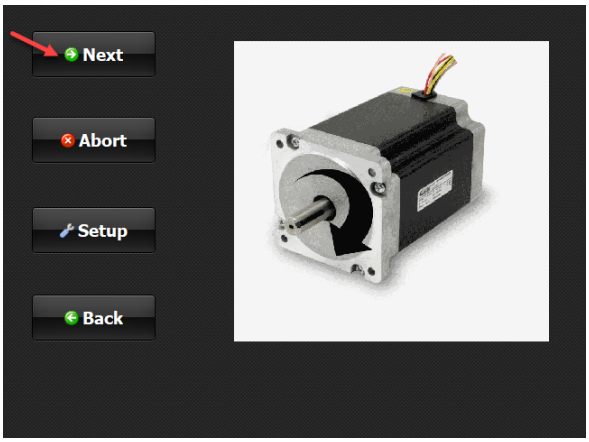
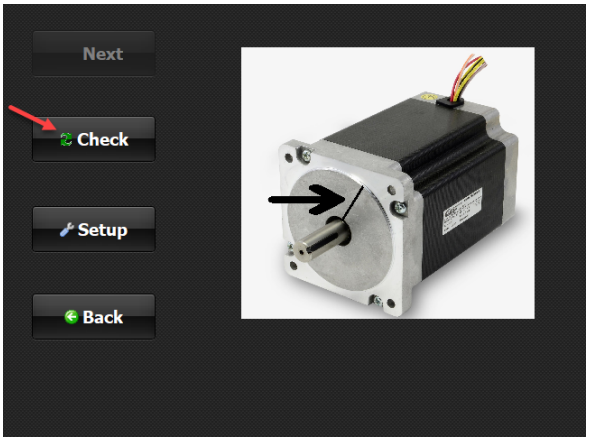
These drives should be configured in the Ever Studio software. The steps below show how to configure them using Ever Studio. Ever Studio software gives access to the Working, Motor, Feedback, I/O, Variables, and Electric Gear & Impact tabs. Inserting the parameters directly into the Motor parameters tab is easiest (if you know all the parameters) instead of going through the motor wizard.

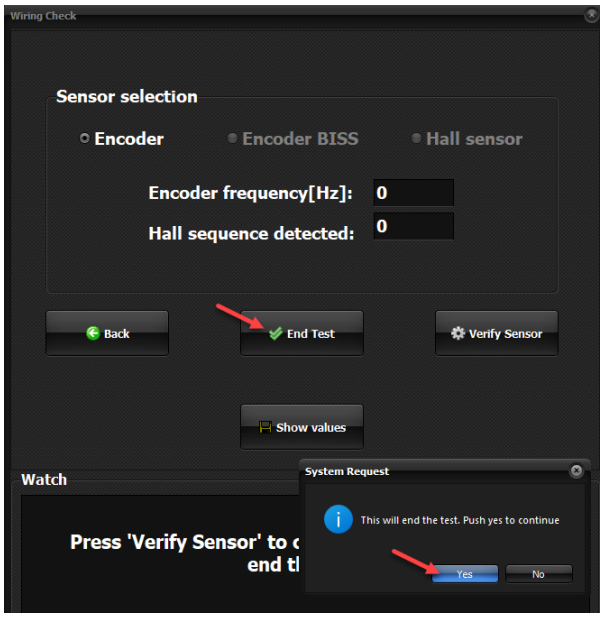
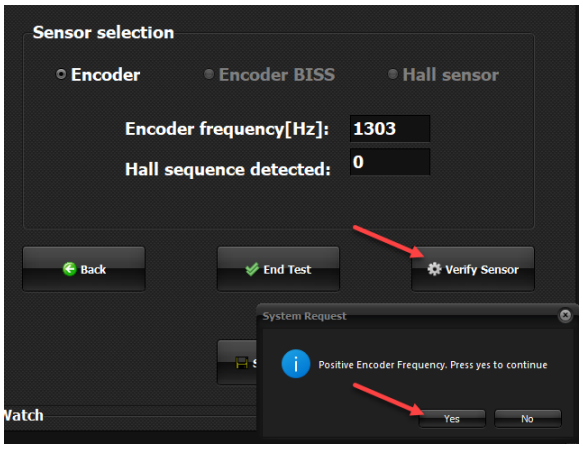
See sections 8.1 Open Loop mode and section 8.2 Close loop mode in the e3PLC Studio Software Manual for more information.

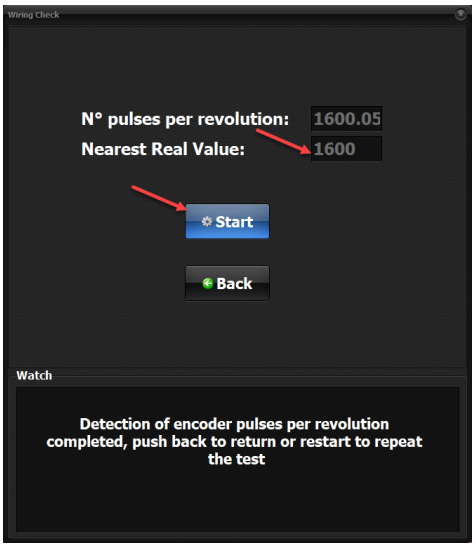
Step	*Action*
1	With your computer connected to the drive (see "Connecting Ever Studio" on page 8) open Ever Studio and select **Settings**, then the **Working Settings** tab.  1) Deselect **Motor Feedback Check**. This will allow the drive to run the motor in open loop for initial motion testing. 2) Select check box **Motor RL Detection**. This will automatically detect the resistance and inductance of the motor. Once determined later you can save the values to the drive and .tscfg file and deselect Motor RL Detection. Using **Wiring Check** you can also manually interrogate the drive for the resistance and inductance values if you do not want to use automatic RL detection. 3) Click **Write** to write the setting to the drive. The drive should be disabled when writing parameters as some parameters will not write when enabled. Next, click **Store in NVRAM** in the **Store/Restore** tab for the settings to stay in the drive after a power cycle.

Step	Action
2	When performing any motor checks or direct movements from the software, be sure to disable the PLC master RX PDO in the **Direct Commands** window. This can be used to test the motor if the EtherCAT master is not yet set up. 
3	Open the **Wiring Check** window from the **Help** menu.  1) Ensure **Stepper** is selected and click **Next**. 2) Click **Yes**.  **Note:** In the **System Request** window, the software needs to put the drive into Profile Position mode, put the DS 402 State machine in to Operation Enable, and disconnect external EtherCAT control. This is achieved by the software enabling the "Disable PLC Master RX PDO" in the Direct Commands window.

Step	Action
4	Click **Setup**. 
5	The **Setup** window should open.  1) Enter the **Nominal Current** of the motor. This is the Amps per phase of the motor. 2) Enter the **Rated Speed**. This should be near the speed you plan to run the motor during use or at least 60 RPM. 3) Keep **Test Speed** to a low value. 4) **Pole Pairs** are the number of teeth on the rotor. For a 1.8 degree per step motor this would be 50 pole pairs. 5) Chose the type of encoder you plan to use if using the drive as a closed loop stepper. 6) For US Digital or CUI Encoders sold by Automation Direct, choose **0: Incremental Encoder**. 7) Click **OK**.

Step	Action
6	Proceed with testing the resistance and inductance of the motor by pressing **Test RL**. The drive will determine the motor's winding resistance and inductance. The new R and L values will get pushed down to the drive but are not stored in EEPROM yet. 
7	Then click **Next**. **Note:** After clicking **Next** the motor will begin to rotate.  Click **Next** again if the motor is rotating correctly. Clicking **Next** will also move these parameters into the drive and into the **Motor Parameters** in the **Settings** Window.
8	Click **Check** to verify the shaft made one revolution.  Click **Next**.

Step	Action
9	You can click **Show Values** to see all the configured values.  For open loop control click **End Test**. For closed loop control proceed to step #10. Now is a good time to save your configuration file and write to the drive again.
10	Click **Verify Sensor**. The motor will rotate and the next pop-up window will ask you if the Encoder Frequency is a positive value. If it is, then the encoder A/B phases are wired correctly. Click **Yes**. 

Step	Action
11	Click **Start** on the next screen for the drive to run the motor to determine the encoder's PPR. The drive will determine the nearest PPR that is divisible by 4. In the example image below, the drive determined that a 1600 PPR encoder was attached to the motor. The encoder defaults to 400 ppr, but the drive will use the x4 method for feedback functions.  Click **OK** on the next window if you agree with the results. Click **Back** to go back to the previous screen. You may click **Show Values** to see all the calculated and related values or click **End Test**.
12	Ensure the **Working Settings** are still configured as desired. Determine whether you will be using encoder feedback.

For closed loop, these are the most important values to adjust for performance:

- *Feedback_Boost_Current*
- *Feedback_Calibration_Current*
- *Feedback_Iq_min*
- *Motor_R and Motor_L if not set for auto-detection*
- *Feedback_encoder_PPR (Encoder resolution multiplied by 4)*

The gains of a closed loop application can only be tuned when installed in the machine application.

For open loop, these are the most important values to adjust for performance:

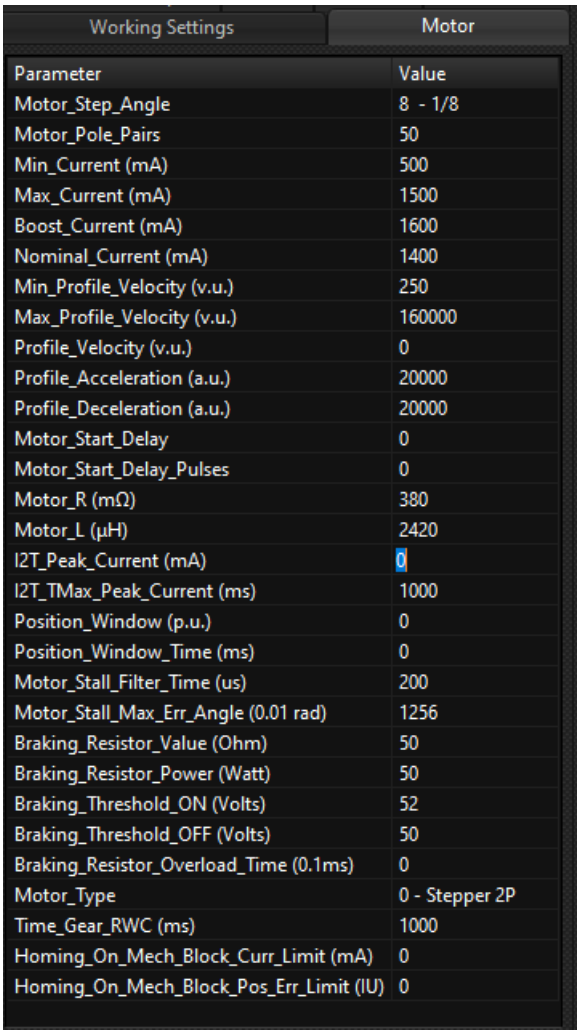
- *Min_Current*
- *Max_Current*
- *Boost_Current*
- *Nominal_Current*
- *Motor_R and Motor_L if not set for auto-detection*

The velocities objects are not used when communicating over EtherCAT. For other objects use the default values.

Motor Settings

The Motor tab can be used to configure all the motor parameters directly without using the Wizard.

- *Motor Step Angle (2012.4h) and Motor Pole Pairs (2012.2h) are both used to define the Motor Resolution (60EF.0h). For 1.8 degree motors use 50 pole pairs and set Motor Type to '0-Stepper 2P'.*
- *Min_Current is the same as Idle current reduction and is used when the motor is stopped in open loop mode. It will also be used in closed loop mode only during an error and when closed loop mode control is disabled by the drive.*
- *Nominal Current is the rated phase current of the motor and is usually the same as the Max Current setting.*
- *Boost Current can be set slightly higher that Nominal current and is used mainly for acceleration ramps. Do not set too high or excessive motor heating can occur.*
- *All the Velocity, Accel, and Decel setting will only apply when the Direct Commands are used in the upper right of EVER Studio.*
- *I2T time and current should only be used if absolutely needed and should not be set too high or excess heating can occur. If this setting is needed at a high value, then the motor chosen for the application could be undersized.*



Parameter	Value
Motor_Step_Angle	8 - 1/8
Motor_Pole_Pairs	50
Min_Current (mA)	500
Max_Current (mA)	1500
Boost_Current (mA)	1600
Nominal_Current (mA)	1400
Min_Profile_Velocity (v.u.)	250
Max_Profile_Velocity (v.u.)	160000
Profile_Velocity (v.u.)	0
Profile_Acceleration (a.u.)	20000
Profile_Deceleration (a.u.)	20000
Motor_Start_Delay	0
Motor_Start_Delay_Pulses	0
Motor_R (mΩ)	380
Motor_L (µH)	2420
I2T_Peak_Current (mA)	0
I2T_TMax_Peak_Current (ms)	1000
Position_Window (p.u.)	0
Position_Window_Time (ms)	0
Motor_Stall_Filter_Time (us)	200
Motor_Stall_Max_Err_Angle (0.01 rad)	1256
Braking_Resistor_Value (Ohm)	50
Braking_Resistor_Power (Watt)	50
Braking_Threshold_ON (Volts)	52
Braking_Threshold_OFF (Volts)	50
Braking_Resistor_Overload_Time (0.1ms)	0
Motor_Type	0 - Stepper 2P
Time_Gear_RWC (ms)	1000
Homing_On_Mech_Block_Curr_Limit (mA)	0
Homing_On_Mech_Block_Pos_Err_Limit (IU)	0

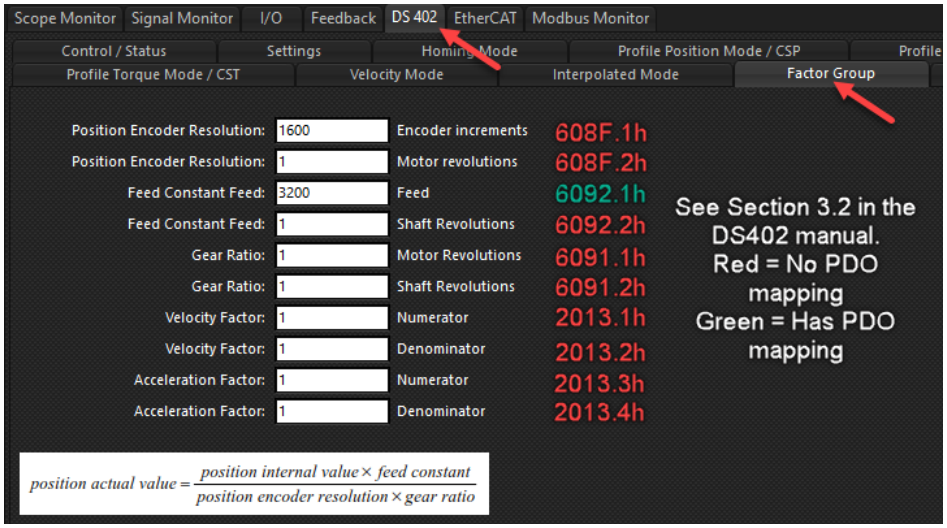
Factor Group

The Factor Group defines the relationship for position and velocity units from the EtherCAT master to the stepper drive (see Section 3.2 in the EtherCAT DS402 manual for details). The Factor Group section is in the DS 402 tab in EVER Studio.

- *The factor group defines the relationship between 'device internal units' and 'user-defined units'.*
- *'User-defined units' are used to represent position, velocity and acceleration values.*
- *'Device internal units' are related to Motor Resolution (shown in red) and defined as:*
  - *'Position Internal unit' → Increments*
  - *'Velocity Internal unit' → Increments/sec*
  - *'Acceleration Internal unit' → Increments/sec²*

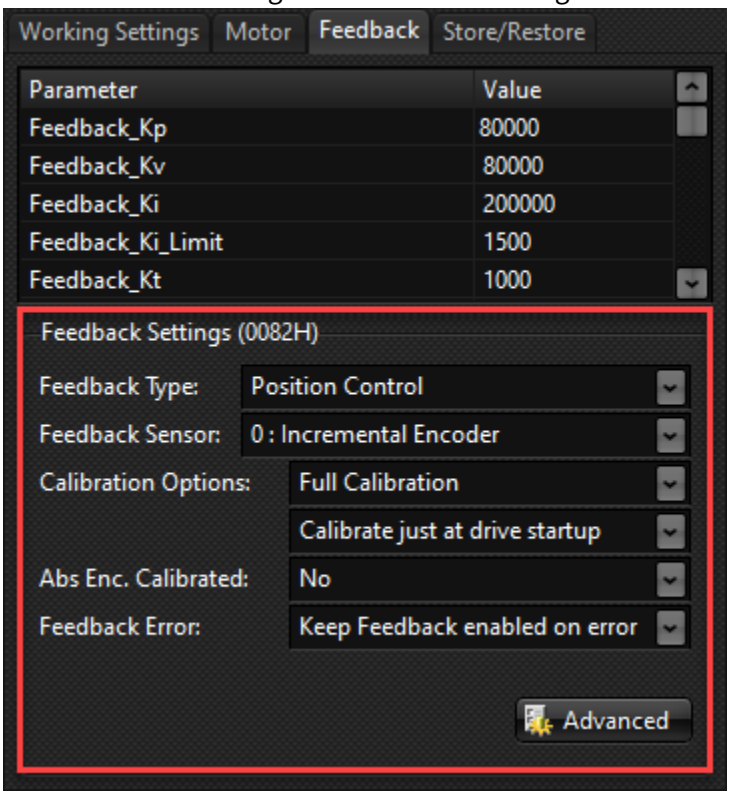
The table below contains the formulas for the unit conversions:

Value	Formula
Position actual value [user defined unit]	$\frac{\text{Position internal value [incremments]} \times \text{Feed constant}}{65536 \frac{Inc}{rev} \times \text{Gear Ratio}}$
Velocity value [user defined unit]	$\frac{\text{Velocity value } [\frac{increments}{sec}]}{\text{Velocity Factor}}$
Acceleration value [user defined unit]	$\frac{\text{Acceleration value } [\frac{increments}{sec^2}]}{\text{Acceleration Factor}}$
Motor Resolution $\frac{incr}{rev}$ [60EF.0h]	$\frac{\text{Motor Pole Pairs [2012.2h]} \times 4}{\text{Motor Step Angle [2012.4h]}}$
Feed Constant [6092.0h]	$\frac{\text{Feed Constant Feed [6092.1h]}}{\text{Driving Shaft Revolutions [6092.2h]}}$
Gear Ratio [6091.0h]	$\frac{\text{Motor Shaft Revolution [6091.1h]}}{\text{Driving Shaft Revolutions [6091.2h]}}$
Motor Velocity Factor	$\frac{\text{Velocity Factor Numerator [2013.1h]}}{\text{Velocity Factor Denominator [2013.2h]}}$
Motor Acceleration Factor	$\frac{\text{Acceleration Factor Numerator [2013.3h]}}{\text{Acceleration Factor Denominator [2013.4h]}}$



Feedback Settings

The Feedback tab is a way to configure EtherCAT Index: 2230.17H and is only available in closed loop mode. Drives that do not have encoder feedback do not have these settings available. The value next to the Feedback Settings text, (0082H) in the below image, is the value of Index 2230.17H for object Feedback_Settings. More detail about these settings can be found in section "8.2.5 Feedback_Type Modality" of the e3PLC manual. More settings can be accessed using the Advanced button.



- *Feedback Type (bits 0-3) can be set to 0-5 and 7 only.*
- *Feedback Sensor (bits 8-11) can only be set to 0 for the EtherCAT drives.*
- *Calibration Options (bit 12) is the level of feedback calibration you want.*
  - *Full calibration is a complete calibration of the encoder with slight backward and forward movement of the motor during the calibration.*
  - *Light calibration is a simple rephasing of the encoder. Light calibration is used when Full calibration will not work correctly on application.*
  - *AutomationDirect suggests using Full calibration when the mechanics permit it.*
- *Bit 7 is to have the calibration performed at startup or on enable.*
- *Absolute Enc. Calibrated only applies to legacy drives, it does not apply to the current EtherCAT drives (bit 14)*
- *Feedback Error works with the first field Feedback Settings*

Note on Feedback Mode 7:

Mode 7 is only available in the SW4D2042H241-00, SW4A3070H241-00, and SW5A5080H221-30 EtherCAT drives with encoder feedback.

Hybrid Position Control is a hybrid of Closed and Open Loop. It uses the encoder to control the position but without PID control of torque.

The Hybrid closed loop is for difficult to tune mechanical load conditions or applications. Hybrid is used without needing to tune the closed loop gains. Applications that have a drastic variable load may need this mode. Hybrid position control works as in open loop, so tuning the Gains (Ex: Feedback_Kp, Feedback_Kv, Feedback_Ki, and others) is not necessary.

The 'Current' parameters applied to the motor are the same parameters as Open_Loop:

- *Min_Current*
- *Max_Current*
- *Boost_Current*

Min_Current is used while the motor is at standstill. While the motor is running, Max_Current and Boost_Current are used.

Parameter usage in the Stepper HYBRID Modality is listed below:

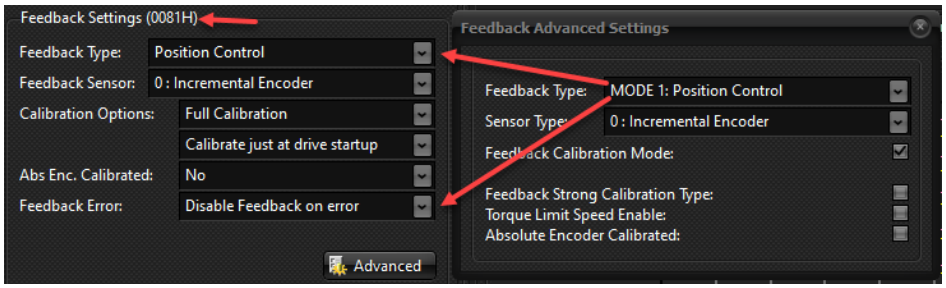
Location	***Object Name***	***Note***
Motor Tab	Motor Poles	Mandatory
	Motor_Step_Angle or Motor_Resolution	Mandatory
	Min_Current	Mandatory: Torque when the motor is Standstill
	Max_Current	Mandatory: Torque when the motor is running
	Boost_Current	Mandatory: Torque during acceleration and deceleration ramp
	Nominal_Current	Mandatory: Rated amps of the motor
	Min_Profile_Velocity	Mandatory
	Max_Profile_Velocity	Mandatory
	Motor_R	Only needed if Motor RL Detection is disabled
	Motor_L	Only needed if Motor RL Detection is disabled
	Feedback_Source_PPR	Mandatory
	Feedback_Calibration_Current	Mandatory.
	Feedback_Calibration_Speed	Mandatory. Generally a default value of 5 rpm works well
Feedback Tab	Feedback_Settings	Mandatory
	Feedback_Limit_Speed	Not used in Stepper HYBRID Modality
	Feedback_Boost_Curren	Not used in Stepper HYBRID Modality
	Feedback_Position_Error_Limit	Mandatory: Define the maximum motor deviation
	Feedback_Velocity_Error_Limit	Not used in Stepper HYBRID Modality
	Feedback_Encoder_Filter_Time	Mandatory
	Feedback_Current_Filter_Time	Mandatory
	Feedback_Iq_min	Not used in Stepper HYBRID Modality
	Feedback_Kp	Not used in Stepper HYBRID Modality
	Feedback_Kv	Not used in Stepper HYBRID Modality
	Feedback_Ki	Not used in Stepper HYBRID Modality
	Feedback_Ki_Limit	Not used in Stepper HYBRID Modality
	Feedback_Kalfas	Mandatory
	Feedback_Kffw_Acc	Not used in Stepper HYBRID Modality
	Feedback_Kffw_Dec	Not used in Stepper HYBRID Modality
	Feedback_Kfbw_Acc	Not used in Stepper HYBRID Modality
	Feedback_Kfbw_Dec	Not used in Stepper HYBRID Modality

Feedback Type and Feedback Error

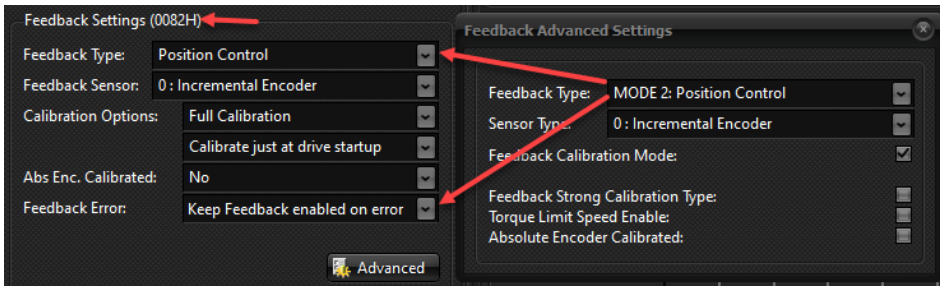
Feedback Type and Feedback Error work together in bits 0-3. Example, Position Control is mode 1 and 2, Velocity Control is mode 3 and 4. For mode 1 and 3 the feedback is disabled on position/velocity error. For mode 2 and 4 the feedback stays enabled on position/velocity error. With mode 1, closed loop is disabled when the Feedback_Actual_Position_Error is out of limits (following error). With mode 2, closed loop is disabled when at least one of the bits (1,3,5,8) of the Feedback_Status object is on. The following error alone doesn't disable closed loop.

Examples:

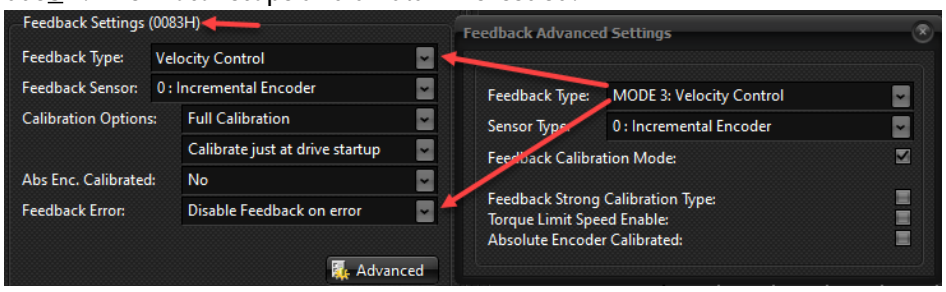
For Position Control mode 1, the feedback is disabled on position error. The motor stops and an alarm is issued. Index 2230.17H shows 0081H. See below.



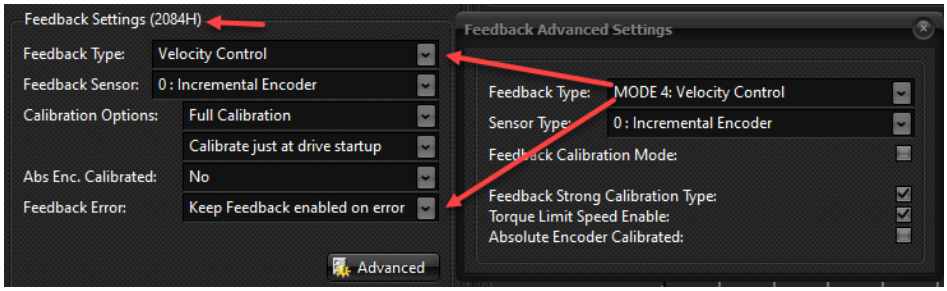
For Position Control mode 2, the feedback stays enabled on position error. Index 2230.17H shows 0082H. The motor stops but closed loop remains active. See below.



For Velocity Control mode 3, the feedback stays enabled on velocity error. Index 2230.17H shows 0083H. The motor stops and an alarm is issued.

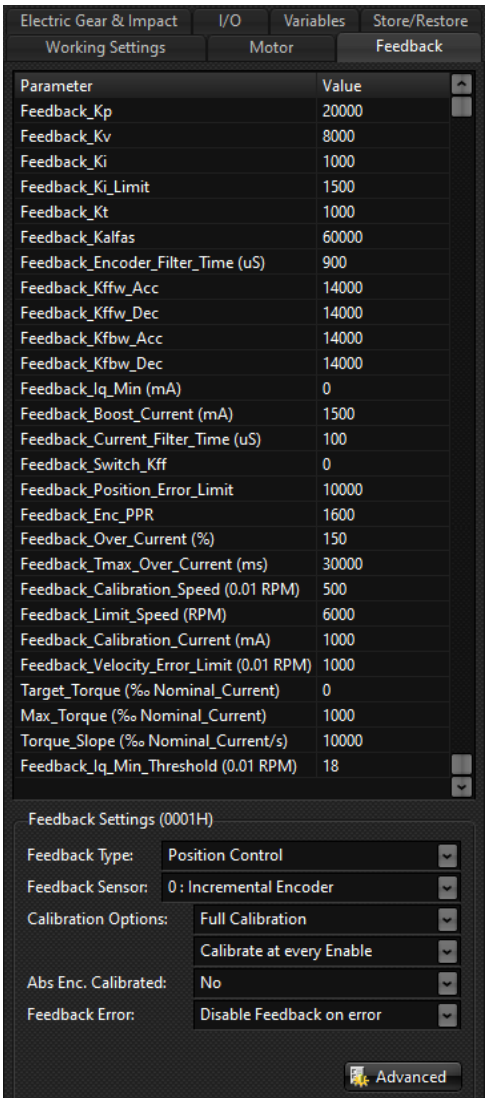


For Velocity Control mode 4, the feedback stays enabled on velocity error. Index 2230.17H shows 0084H. The motor stops but closed loop remains active. See below.



Settings Priority

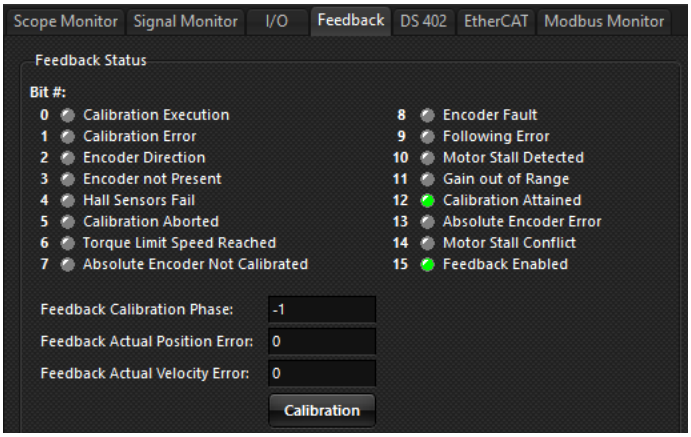
In closed loop the settings in the Feedback tab take priority over the same settings in the motor tab. For example, the Feedback_Iq_Min current is used as the idle reduction current in stead of the Min_ Current in the Motor tab. Same with Feedback_Boost_Current. In Open loop control the Feedback tab is not shown.



Feedback Status Register

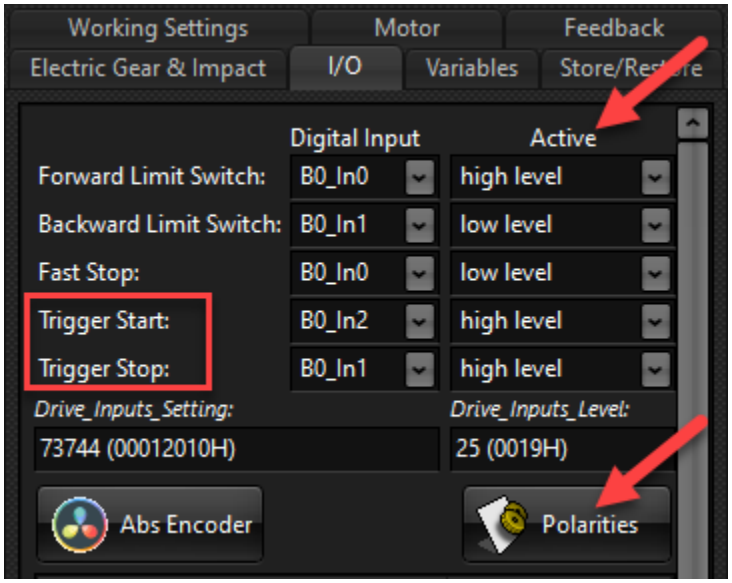
The Feedback status register (EtherCAT Index 2230.18H) can be monitored in the monitoring section of EVER Studio at the bit level with description. The bits directly correspond to the Feedback Status register. The example image to the right shows bits 12 and 15 active. This would be a value of 8200H. The values can also be monitored in the Watch window.

The **Calibration** option to enter a calibration code is not applicable to the EtherCAT drives.



I/O Settings Tab

In the I/O tab there are options for active high/low and positive/negative polarity settings for each input. Changing the active high/low level will determine how the input is turned on from the digital input terminal, either Normally Open (NO) or Normally Closed (NC) behavior. If an input is set to high level it will turn on when the switch is closed.

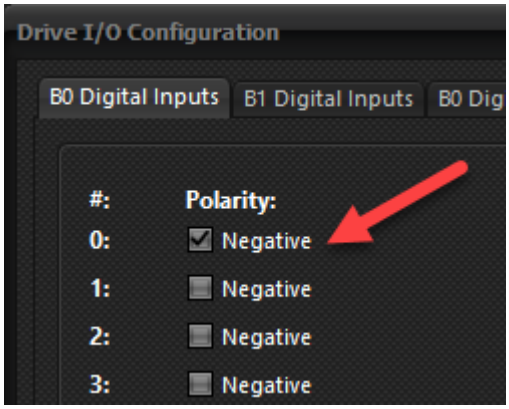


Example:

B0_In0 = High level

- *On =* 
- *Off =* 

Changing the polarity to negative or positive will determine how the firmware reacts to the input. If the input is ON and polarity is set to negative, then the firmware will detect that the input is OFF.



The two functionally achieve the same behavior. We suggest using the Active high/low selection unless your application requires something different.

These input functions need to be activated for use in the Working Settings tab. Functions Trigger Start and Trigger Stop do not apply to the EtherCAT drives. Tabs B1 Digital Inputs and B1 Digital Outputs do not apply to these drives.

Direct Commands Window

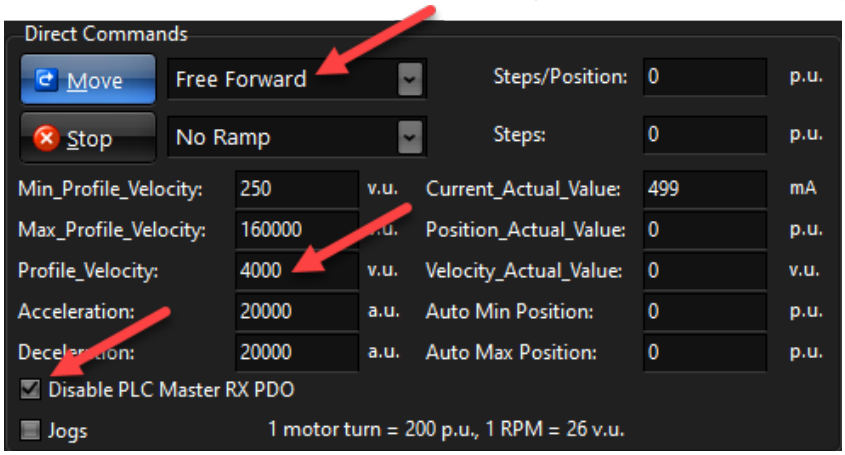
To control the drive's motion directly from the software, you must Disable the PLC Master RX PDO.

Here you can manually create precise position test moves and jog the motor.

- *v.u. = velocity units*
- *p.u. = position units*
- *a.u. = acceleration units*

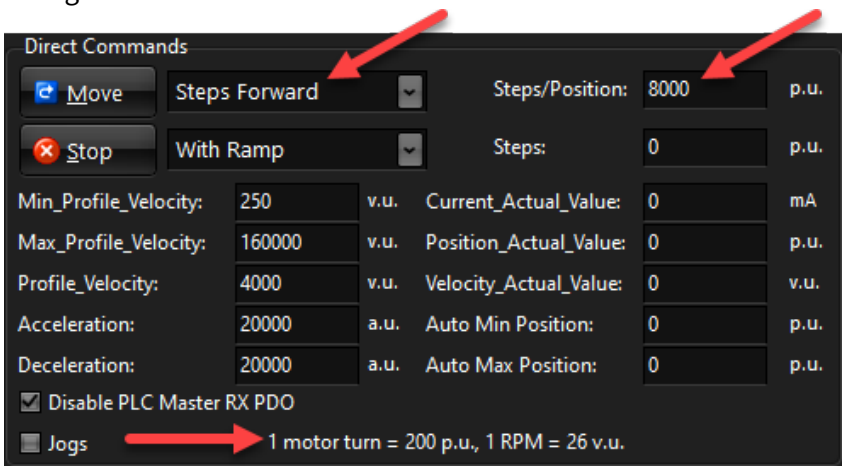
Free Forward or Backwards

For a continuous velocity jog, select **Free Forward** and input the desired velocity. Click **Move** and the motor will spin at the desired profile velocity until the **Stop** button is pressed.



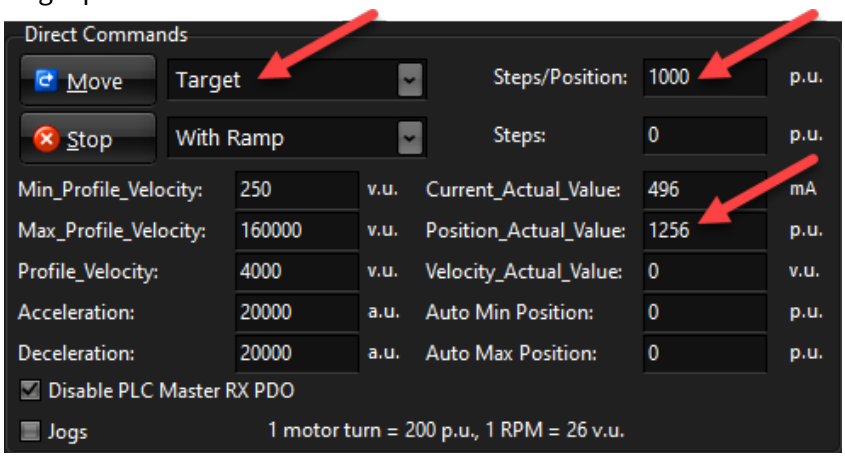
Steps Forward or Backwards

To move the motor a specific amount, choose **Steps Forward** or **Steps Backwards**. Enter the number of steps desired in p.u. At the bottom of the window, you can see how many position units are configured for one shaft revolution.



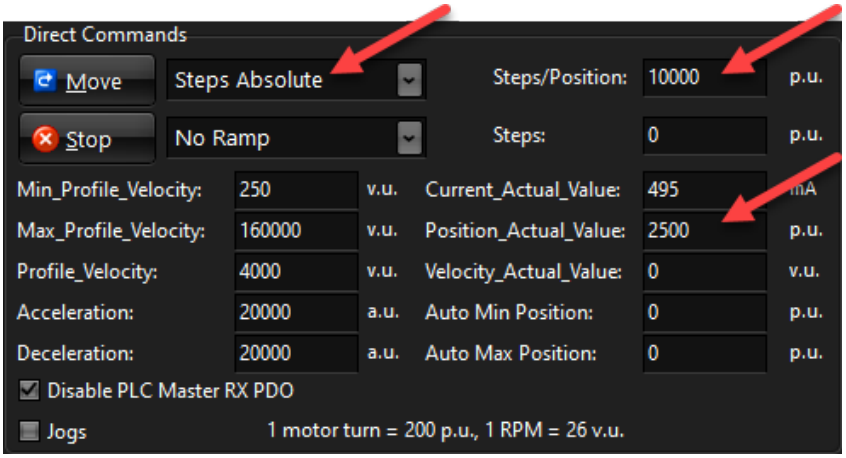
Target Move

For a Target move enter the position location you want to move to in **Steps/Position**. The current position is shown in **Position_Actual_Value**. In the example below the motor will move backwards 256 position units to move to the target position of 1000. The shaft will rotate CW or CCW to reach the target position.



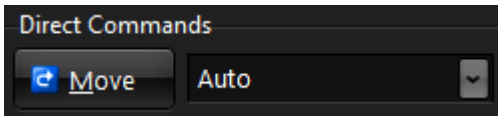
Steps Absolute

For a **Steps Absolute** move enter the position distance you want to move to in **Steps/Position**. The current position is shown in **Position_Actual_Value**. In the example below the motor will move forward 10000 position units resulting in the Position_Actual_Value increasing by 10000 (new value will be 12500). You can enter a negative value here as well, and the motor will move backwards instead of forwards.



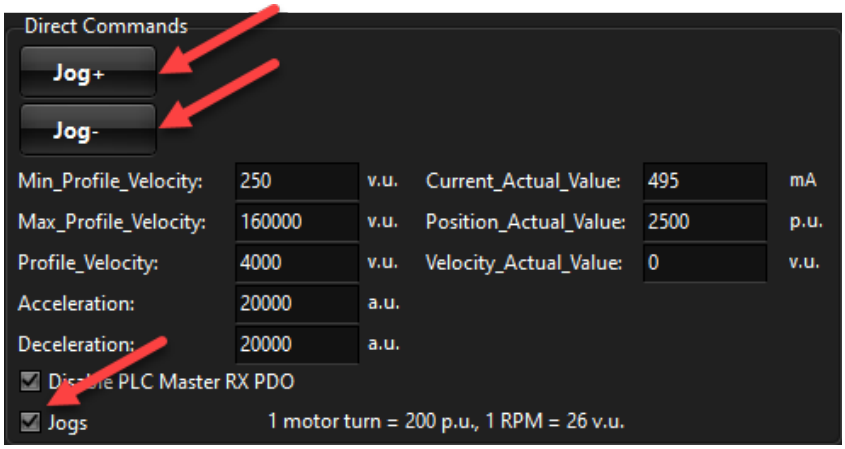
Auto Move

An **Auto** move command will move the motor back to a position of 0.



Jog

To jog the motor forward or rEverse enable the check box **Jogs**. Enter the speed you wish to jog in the **Profile_Velocity** field by double-clicking in the field. Motion of the motor will occur as long as Jog+ or Jog- is held down.

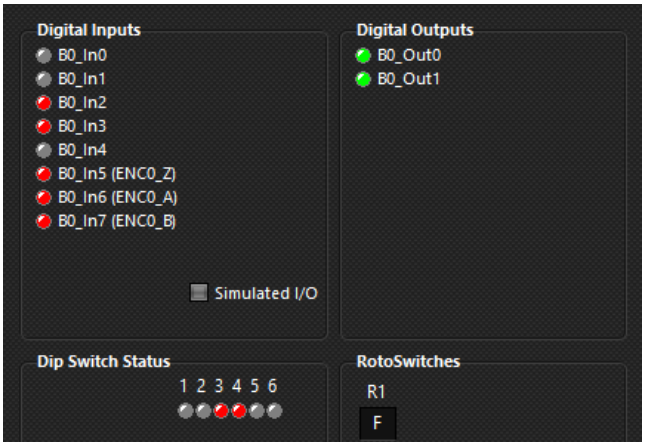


I/O Monitoring Tab

The I/O tab has several useful tools for monitoring and troubleshooting. The I/O and function assignments are shown in the table below.

- *If the Simulate I/O box is checked, you can double-click on each input to turn it on.*
- *Current DIP switch and Rotary switch position can be read.*

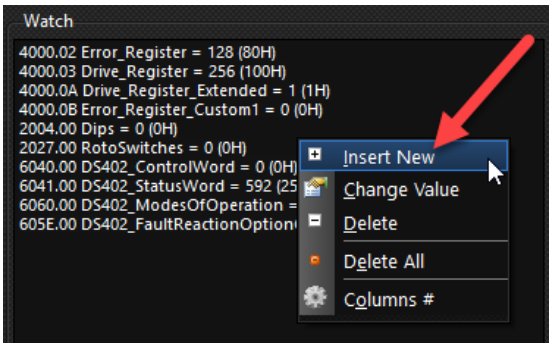
I/O	*Function*
B0_In0	Digital Input 1
B0_In1	Digital Input 2
B0_In2	Digital Input 3
B0_In3	Digital Input 4
B0_In4	This input does not exist on the EtherCAT drive (not used)
B0_In5 (ENC0_Z)	Z pulse input (not used on the EtherCAT drives)
B0_In6 (ENC0_A)	A Channel encoder input
B0_In7 (ENC0_B)	B Channel encoder input
B0_Out0	In position output
B0_Out1	Alarm output

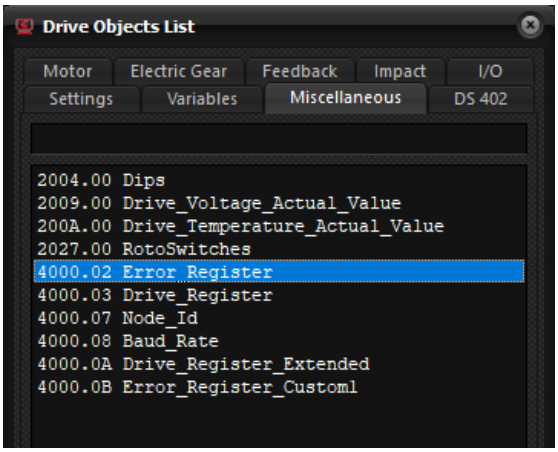


Watch Window

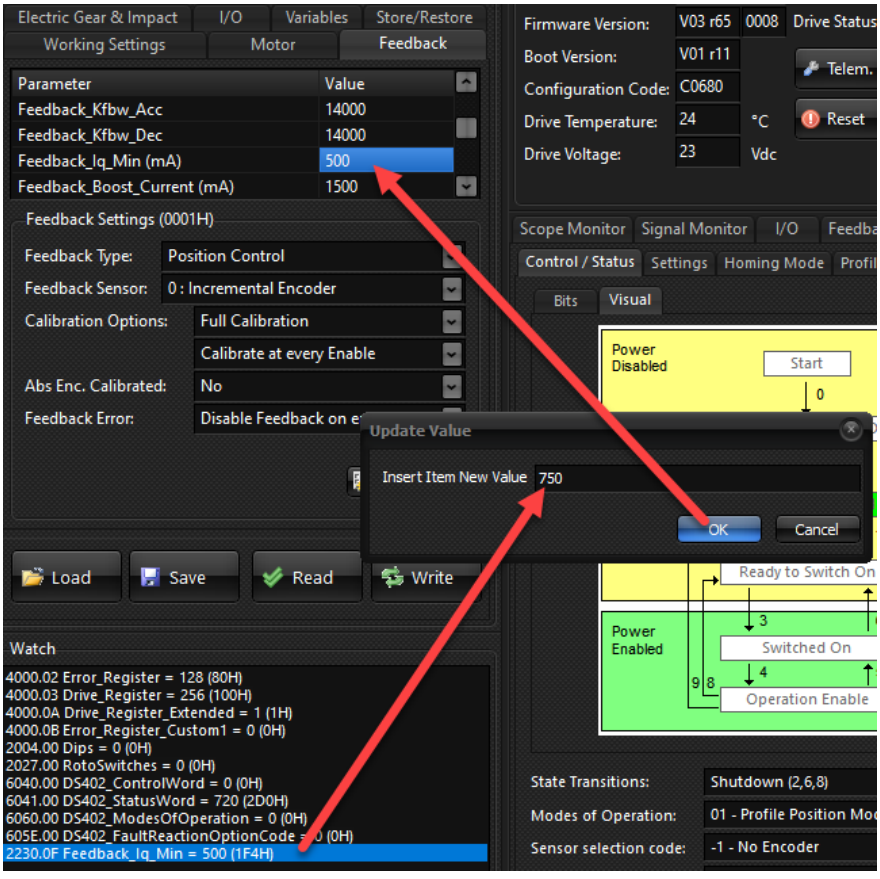
The Watch window in Ever Studio is extremely useful for monitoring any and all parameters associated with the drive. Not all objects and parameters shown are applicable to the EtherCAT drives, however. If a parameter is not "read only" then it can also have its value changed in the Watch window.

- *To insert a new parameter to monitor, simply right-click in the window and select "Insert New." The Drive Object List window will open. Double-click on any object you wish to monitor or change. Once the Drive Object List is closed, the object in the watch window will show a continuously updated value.*



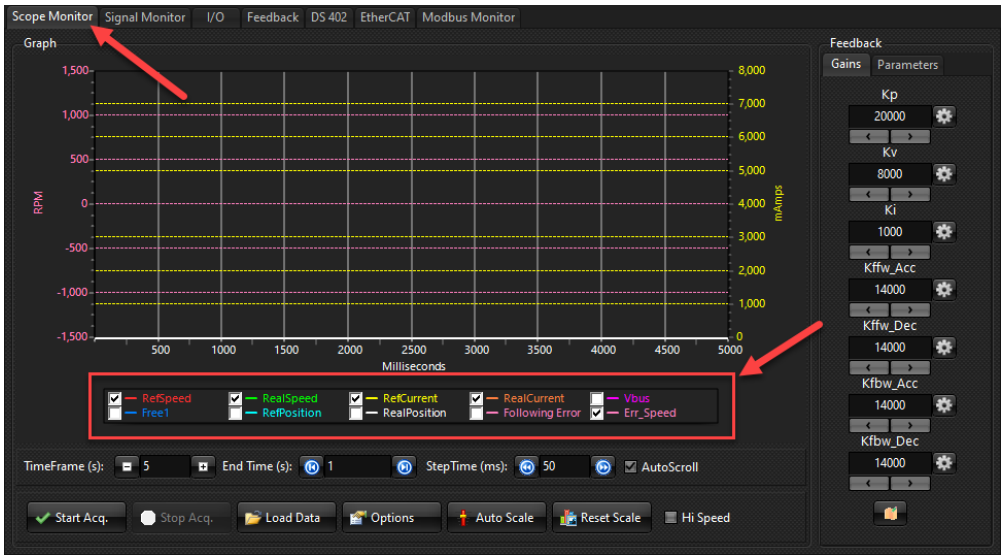


- *To change a value of an object in the watch window, double-click on the object to open the Update Value window. Enter the new value and click OK. This will immediately update the object in the drive and in all fields in Ever Studio. The "Feedback Settings" below are the same as Index 2230.17H hex. The value shown in the window (0001) is the current parameter value of Index 2230.17H.*

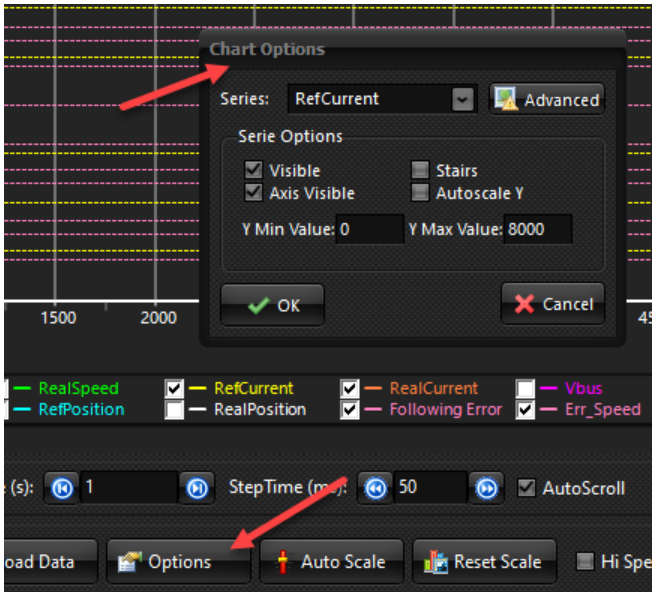


Scope Monitor

The Scope Monitor can be used to trace 9 different values for troubleshooting motor performance. This window is also used for fine tuning the gains for the application. This tuning is only useful for closed loop applications. See the Ever Studio Quick Start Guide for more details.



To adjust each trace, select the option button, choose which trace you want to change, and adjust accordingly.



Closed loop tuning

More details on tuning are located on page 172 of the e3PLC manual. Before tuning be sure the settings for the motor are accurate. When operating the drive in closed loop, it's important to reduce the Following Error until the system performs as desired. Tuning should be performed while the motor is running in the final application/machine. To do this, move the motor back and forth and adjust Kp, Kv (Kd), Ki, and Ki_Limit (anti-windup clamping).

- *Kp (proportional gain) determines how fast the motor will try to correct position in relation to the feedback error. A low Kp value can lead to sluggish or slower reduction in the position error. A higher Kp value will close the position error faster. Too high of a Kp value can lead to overshoot of the target position. If oscillations occur in the system, then the Kp value is likely very high. Proportional gain has the greatest influence on the stiffness of the tuning.*
- *Ki (integral gain) determines how much the following error increases over time. If accurate position or commanded speed is never attained or takes a long time to settle into the commanded position or speed, then the Ki term may be too low.*
- *Kv (velocity gain) is the same as Derivative gain (Kd). A high value could cause motor resonance. This gain determines how much the output changes in response to the rate of change of an error. In other words, it dampens the rate of change and the response to error correction. It can also reduce overshoot.*

Frequently Asked Questions (FAQ)

Question	*Answer*
What is impact detection?	Impact detection is used with closed loop only. Using the motor's commanded position and the encoder's feedback position, the drive can detect impacts. See section 9.1 in the e3PLC Studio Software Manual. In open loop, stall detection is used to detect if the motor stalls without using an encoder. Motor Feedback and Motor Stall Detection cannot both be active at the same time.
What is the Custom window for?	The Custom window under the Option menu is used for specific customers or for specific functions. This window is not used for any drive Automation Direct sells.
Which tab is used for currents?	When in open loop, the Motor tab is used for currents. When in closed loop, the Feedback tab is used for current settings.
What is Open Transistor Protection?	Open Transistor Protection shows that the transistors are open and there isn't torque on the motor–the drive is not enabled.
What does Motor Move Not Executed mean?	The last movement command was not executed (the application tried to activate the movement in Clock & Direction, but the drive was not enabled).
What is a Motor Feedback Fol. Error?	This error could mean any of the following: • That pulse signals are being sent to the drive during the power on cycle. • Encoder not connected. • Motor Feedback and Motor Stall Detection both active at the same time.
How do I use Z pulse?	Although there are Z and /Z inputs on the drive, the drive cannot use the Z pulse for anything. If the encoder has a Z signal you can connect it to the drive so there are no loose wires. This input (B0_In5) can be used by the EtherCAT master though.
What are the I2T currents for?	I2T Peak Current (mA) and I2T TMax Peak Current (mA) must be used if you want to use a current higher than Nominal Current, such as during acceleration.

Glossary

Term	*Definition*
Counter	Use when referring to the encoder input pulses.
Electric Gear	This is the same as encoder following or A/B Quadrature pulse commands. See section 9.2 in the e3PLC Studio Software Manual.
Encoder Zero	Encoder zero pulse or index pulse (not used)
Min Current (mA)	Same as idle current reduction. Used when the motor is at a standstill in open loop. In closed loop use “Feedback_Iq_Min (mA)” for idle current reduction.
Motor Pole Pairs	Number of motor poles. For SureStep motors this will be 50 poles, 1.8 degrees per full step.
Motor Step Angle	This is the microstep setting

Firmware Update

In Ever Studio click Firmware Update –> open the appropriate .EBI file and click start. There is no need to change the Node ID: or CK: values. After the firmware has installed completely, power cycle the drive.