AUTOMATIONDIRECT.com

ever
e-MOTION SOLUTIONS

LW4D Quick Start Guide with Ever Studio

1st Edition, January 16, 2025

Ever Studio

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EVER STUDIO WITH LW4D OVERVIEW

This quick start guide is intended to provide users of the Ever Stepper LW4D series drive an overview of using Ever Studio software. The vendor-created software manual that is included as part of Ever Studio is not applicable to the LW4D drive. This non-applicable manual is located under the Help menu → Contents. The "CANopen & EtherCAT DS402 Specification" is for Titanio-Platino-Vanadio Ever Drives, **not** the LW4D drive series Automation Direct sells.

For detailed documentation of the LW4D drive, please see the following:
- *Ever_Studio_Quick_Start_Guide.pdf*
- *Manual_e3PLC_Studio_EN.PDF*
- *LW4D Installation instructions*
- *LW4D Datasheet*

The Rotary switch on the LW4D drive needs to be set for the motor you plan to use. For SureStep motors sold by Automation Direct, see section "Preconfigured Motor and Drive Settings." For any other motor selection see section "Software Configurable Motor and Drive Settings."

LW4D Switch Settings per Motor			
SureStep Motor Part Number	*Encoder*	*Default PPR**	*Rotary Switch Selection*
STP-MTRL-14026E	AMT112Q-V is premounted on the motor	400	0
STP-MTRL-14034E			1
STP-MTR-17040E			2
STP-MTR-17048E			3
STP-MTR-17060E			4
STP-MTR-23055E			5
STP-MTR-23079E			6
STP-MTRH-23079E			7
STP-MTR-34066D	AMT132Q-V	2048	8
STP-MTRH-34066D			9
STP-MTRH-34097D			A
STP-MTRH-34127D			B
STP-MTRAC-42100D	AMT132Q-V + STP-MTRA-42ENC		C
STP-MTRAC-42151D			D
STP-MTRAC-42202D			E
Software configurable			F

* The drive PPR cannot be changed when using 0-E. The encoders ship with this default PPR (no configuration necessary).

⚠️ *FOR ROTARY SWITCH POSITIONS 0–E, THE DRIVE MUST RUN IN CLOSED LOOP MODE (AN ENCODER MUST BE USED).*

4-lead motors are the easiest to connect, and 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.

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 line driver type. Use programming cable AMT-PGRM-17C to change the PPR of this encoder if needed. When selecting preconfigured motor setting in the drive, rotary switch set to 0 through 7, the encoder must remain at the default 400 ppr (x4 = 1600). For selections 8 through E, the encoder must remain at the default 2048 ppr (x4 = 8192).

Connect the encoder cable, STP-CBL-EBx (or AMT-17C-1-036), to the drive's encoder cable (CN4 cable) using the following diagram:
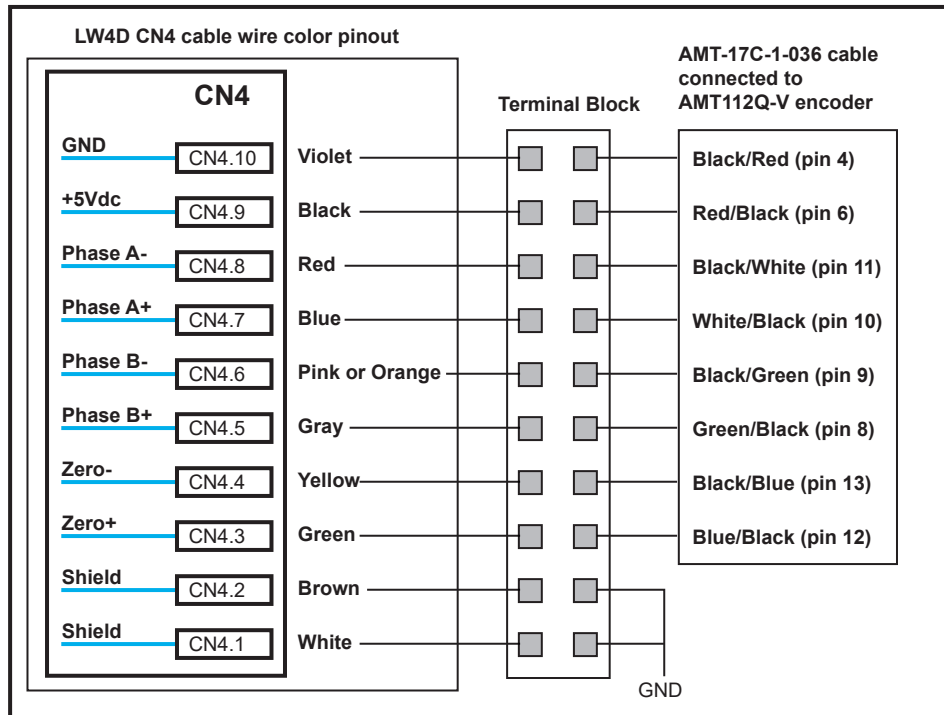
LW4D CN4 cable wire color pinout

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:

LW4D CN2 Cable		Terminal Block		STP-EXT(x)-0xx cable	
CN2.2	Black		Red	**Pin 1**	Motor phase A+
CN2.4	Red		White	**Pin 2**	Motor phase A-
CN2.3	Green		Green	**Pin 3**	Motor phase B+
CN2.1	White		Black	**Pin 4**	Motor phase B-
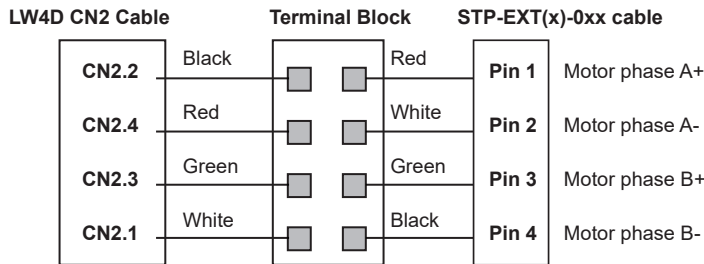
NOTE: The LW4D cable and STP-EXT cable hav ethe same wire colors but signals of the colors do not match.

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

EXT & EXTH CABLES

PIN#	COLOR
1	RED
2	WHITE
3	GREEN
4	BLACK

EXTL CABLES

PIN#	COLOR
1	RED
2	WHITE
3	GREEN
4	BLACK

PIN #4
PIN #2
PIN #3
PIN #1

PIN #1

2.00"
1.00"

1.0" ref

L

CONNECTORS:
EXT: Molex #43020-0401
EXTH: Molex #39-01-2041
EXTL: TE #103653-3

HEAT SHRINK

UNSHIELDED CABLE:
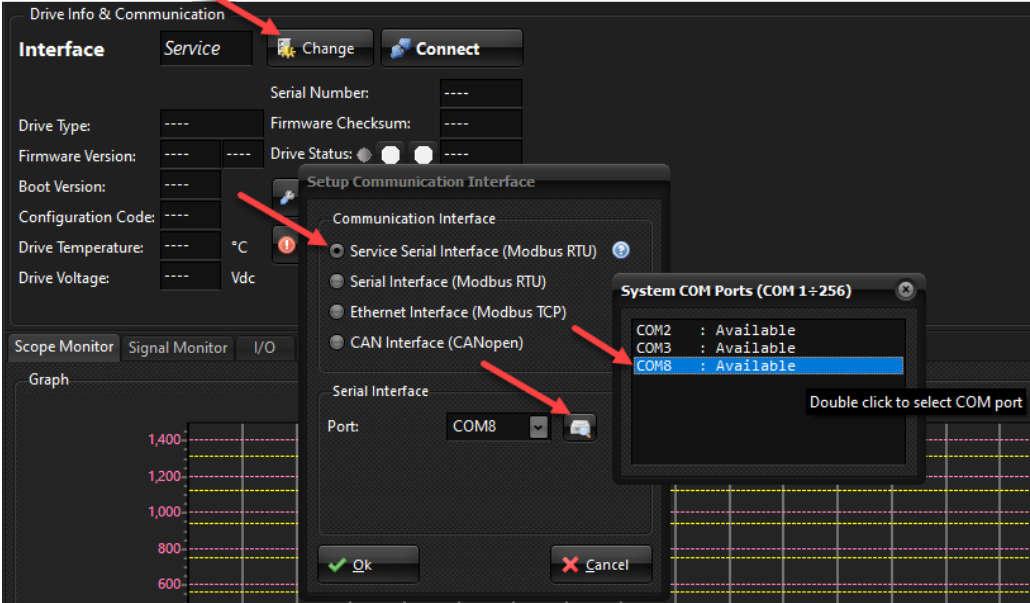(4) 20 AWG cond
(4) 18 AWG cond
(4) 24 AWG cond
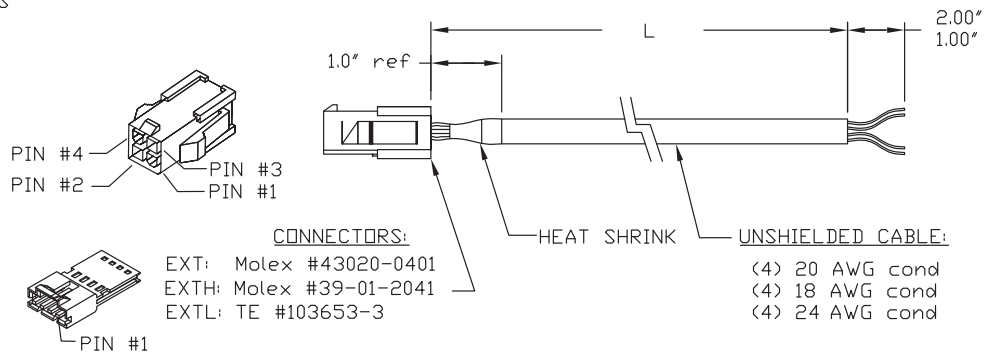
WIRING PULSE AND DIRECTION INPUTS

The diagram below provides an example for wiring a Producitivity series high speed output card (P2-HSO) pulse and direction connection to the LW4D drive. See the "LW4D Installation instructions. pdf" for more wiring details for Line Driver, NPN, and PNP connections.
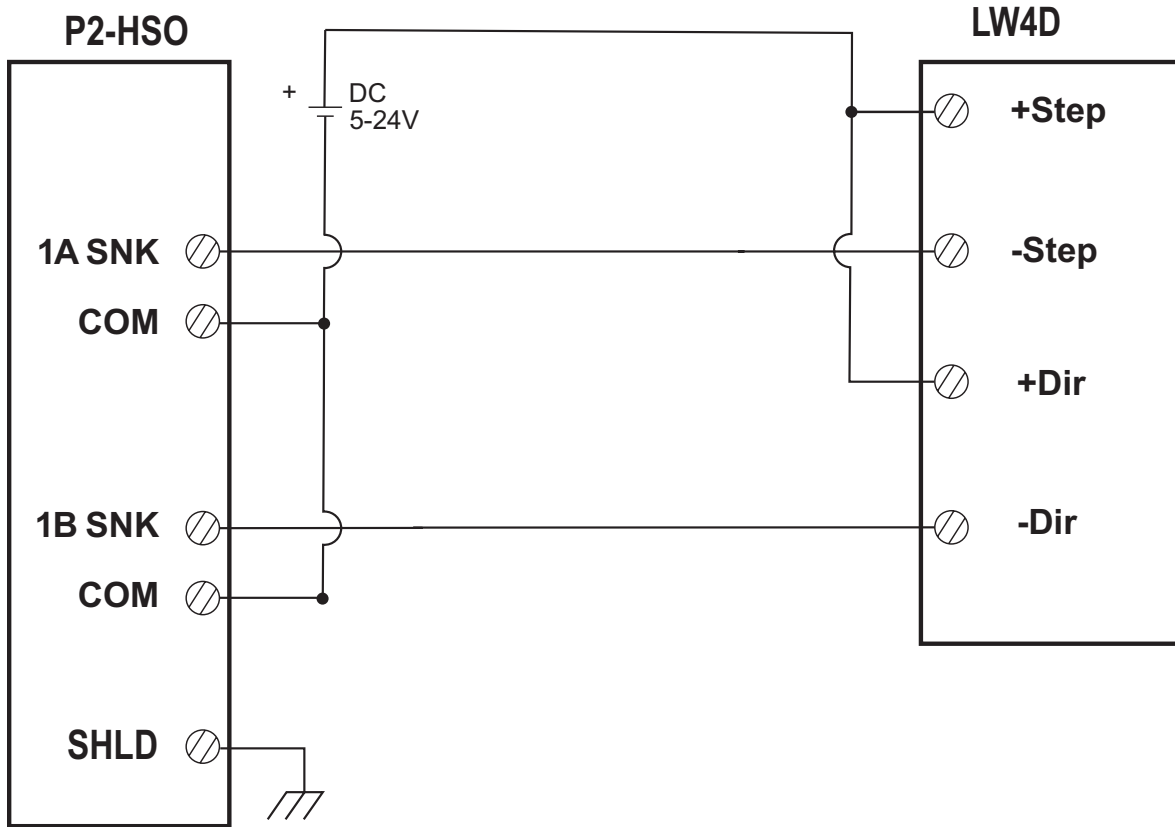
CONNECTING EVER STUDIO

This section covers getting connected to your Ever Stepper drive with Ever Studio configuration software. If using AutomationDirect SureStep motors (rotary DIP switch position 0-E), it is not necessary to connect Ever Studio. All motor configuration is preset with the rotary DIP switch.

| Step	Action
1	To begin, connect the computer with Ever Studio installed to the LW4D drive using an EVER-PGM-1 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 configuration cable kit.
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 LW4D. Click **Ok**.
6	Click **Connect**. The upper left of the Ever Studio window should now report part number LW4D3070N2I1-00.

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 will get the following warning:
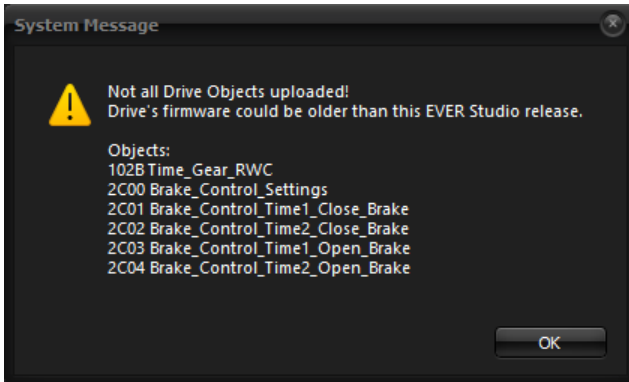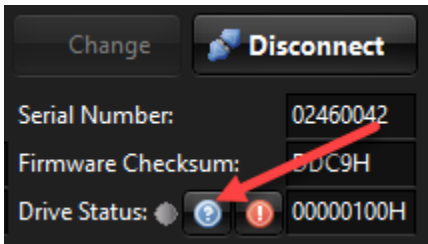

To stop receiving pop-up System Messages stating this, you will need to uncheck the **Warning on Unavailable Objects** menu item in the **Options** menu.
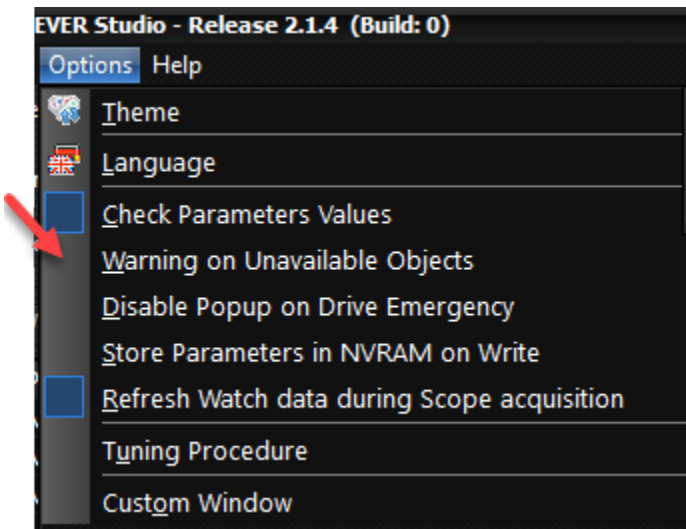
ALARMS AND DRIVE STATUS LEDS

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

The Application Execution green LED will always be on. If the rotary switch is selected for 0 through E, then the drive is running a preconfigured setting application for the applicable motor in a pulse mode. If the rotary switch is set to F then the application that is running is the user's defined settings in the software and the drive is in pulse mode. Another Application that is valid is when the **Disable CKDIR Functionality** check box is selected in the **Direct Commands** window.

The Drive Watchdog LED should always be active.

Be sure to check the Automation Direct website if a new Application Update is available. The application file is similar to a firmware file but is specific to the LW4D drive and contains all the settings for each rotary switch position. There is also a firmware file download if a new version is available on the Automation Direct website.
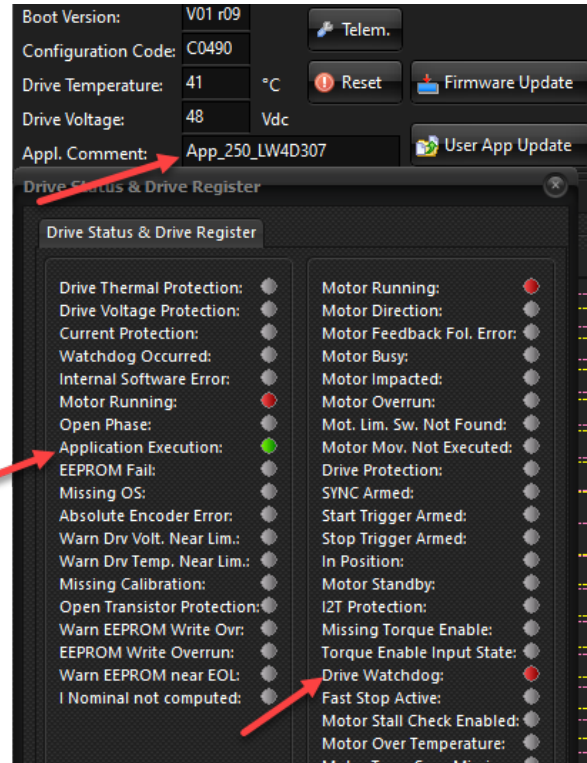
## Preconfigured Motor and Drive Settings (Rotary Switch = 0–E)

When selecting a SureStep motor that is sold by Automation Direct, use the preconfigured motor settings via the rotary switch on the drive (positions 0–E). A power cycle of the drive is required for the new switch position to take affect. The Ever Studio software is not needed when selecting rotary positions 0–E. **No motor or drive parameters can be configured with Ever Studio when the rotary switch is in position 0–E**. This includes the Working tab, Motor tab, and Feedback tab settings. When selection 0-E are used the drive is in closed loop mode. You must have the encoder connected to the drive.

The DIP switches on the drive are also used for configuring the micro-stepping settings along with the forward/rEverse direction of the motor and the ability to select Step/Direction or CW/CCW input signals only when rotary positions 0 through E are active. AB Quadrature pulse input (Electric Gear) is only available when the rotary switch is set to F. Switch settings 0–E do not use the software settings.

In any rotary switch position the software is still beneficial for troubleshooting and monitoring. Encoder configuration, scope, and I/O monitoring features are always available.

### Using Ever Studio Software with Rotary Switch = 0–E

In rotary switch position 0–E the following settings are hard coded in the drive and cannot be changed via software. These parameters can be read from the drive in any rotary position by clicking the **Read** button in the **Settings** window.

- **Modality:** *This follows the setting of dip switch 6 on the drive. Pulse/Direction or CW/CCW are the only two options. AB Quadrature following (Electric Gear) is available with rotary selection F only*
- **Motor Feedback:** *This box is always checked and cannot be changed. The motor must be the E model of the stepper motor and have the encoder properly wired up to the drive. The encoder must be configured for 400 ppr if the rotary switch is set for 0 through 7. For selections 8 through E, the encoder must be configured for 2048 ppr The drive will use the 4x method for these AB channel pulses, resulting in 1600 (or 8192) state changes per revolution. 400ppr is the default value for the encoders mounted on the rear of the E model motors. The recommended encoders to mount to the rear of the 'D' model motors (NEMA 34 and 42) will have a default of 2048. If the encoders have been changed from their default 400 or 2048 ppr then they can be reprogrammed with a configuration cable.*
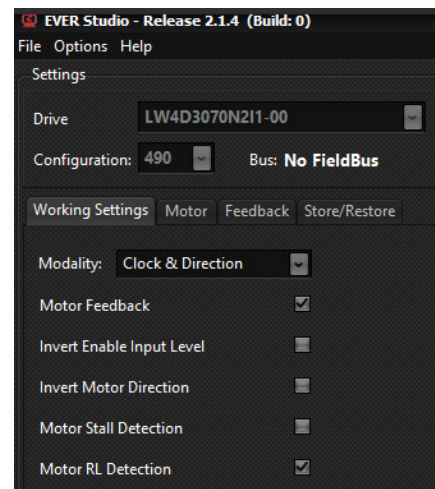
> NOTE: NEMA 34 and 42 motors use the "D" version (dual shaft), and a separate encoder must be purchased.

- **Invert Enable Input Level:** *This box is always unchecked and cannot be changed. When this box is not checked, then the drive is enabled when no current is flowing across terminals EN-/EN+. Applying voltage to this terminal will disable the drive. Disabling the drive also causes the status to change to "Drive is in Emergency Condition" and the following warnings to activate in the Drive Status window.*
  - *Open Transistor Protection: Drive is not enabled and the output transistors are off.*
  - *Drive Protection: General message for all drive disable alarms.*
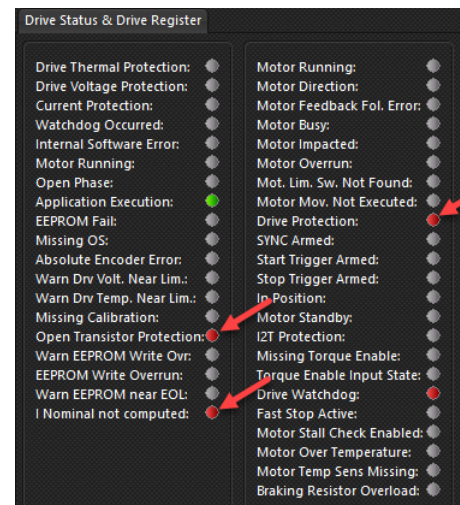
- ***Warning "I Nominal not computed:"*** *This alarm is normal at the power up of the drive if the drive is not enabled. It indicates that the drive has not yet sent current to the motor and has not been able to calculate the motor's R and L values. At the first Enable, the alarm will disappear and at the next disable it will not show again.*
- ***Invert Motor Direction:*** *The check box follows the setting of DIP switch 5 on the drive.*
- ***Motor Stall Detection:*** *This box is always unchecked and cannot be changed.*
- ***Motor RL Detection:*** *This box is always checked and cannot be changed. On power up of the drive, the motor will auto-check the detected resistance and inductance of the motor windings.*

After the drive is properly enabled you can manually move the motor with the Direct Commands window. See "Direct Commands Window" on page 23.

SOFTWARE CONFIGURATION WHEN ROTARY SWITCH = F

When selecting rotary switch position F, the drive is configured in the software. A power cycle of the drive is required for the new switch position to take affect. The Ever Studio software gives access to the Working tab, Motor tab, and Feedback tab settings. The DIP switches on the drive are not active when setting F is chosen. If F is chosen, then inserting the parameters directly into the Motor parameters tab is easiest (if you know all the parameters) instead of going through the motor wizard.

In any rotary switch position the software is still beneficial for troubleshooting and monitoring. Encoder configuration, scope, and I/O monitoring features are always available.
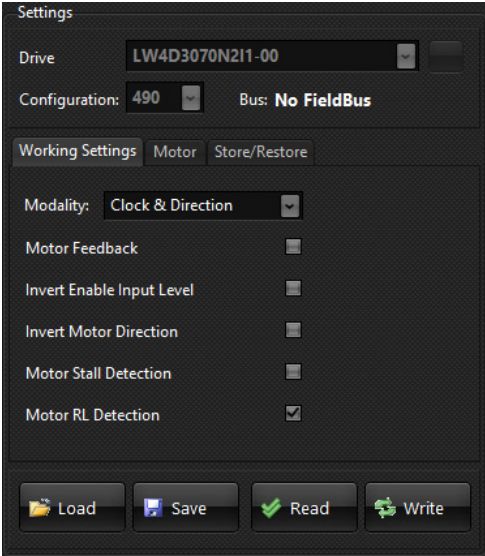
See sections 8.1 Open Loop mode and section 8.2 Close loop mode in the e3PLC Studio Software Manual for more information.
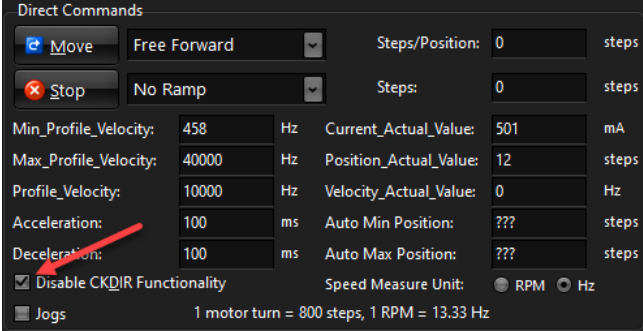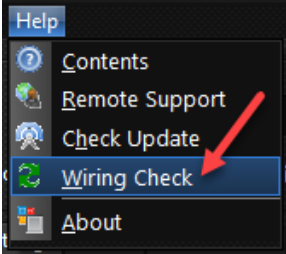
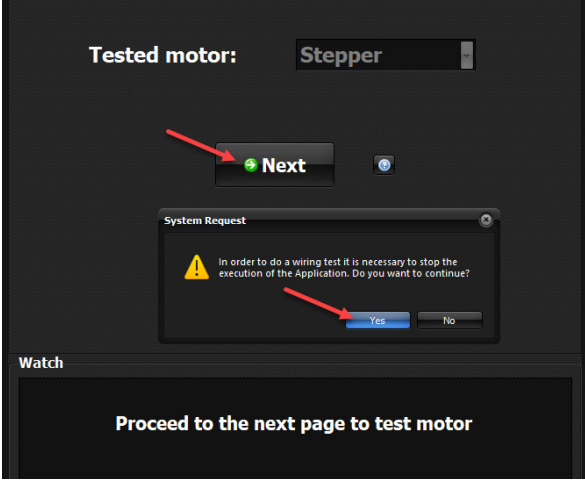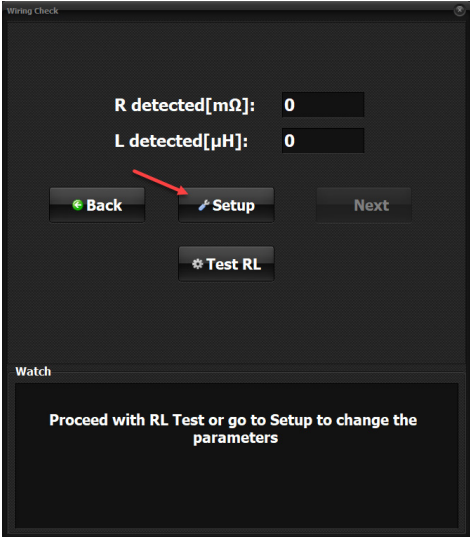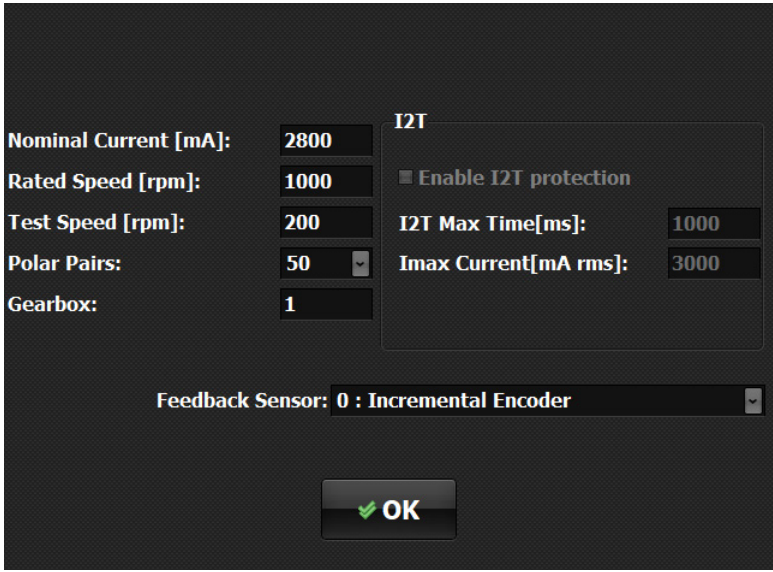> NOTE: If you are using a SureStep motor from Automation Direct you can use the pre-configured open loop .tscfg files available for download in the Support Resources section of the LW4D item page.
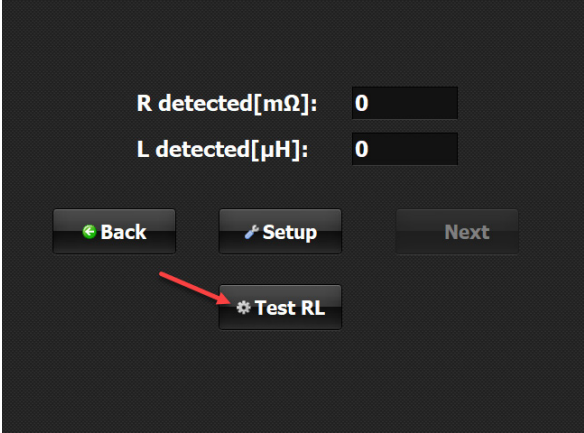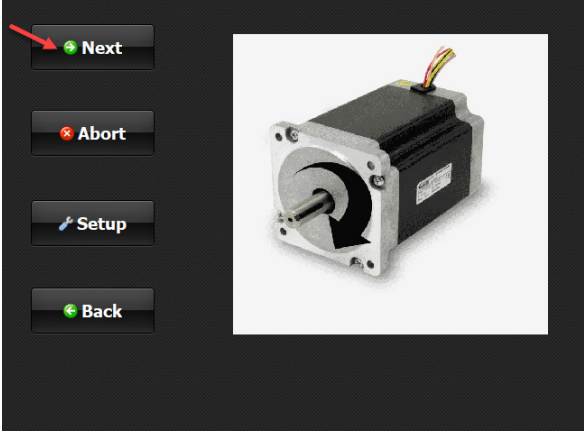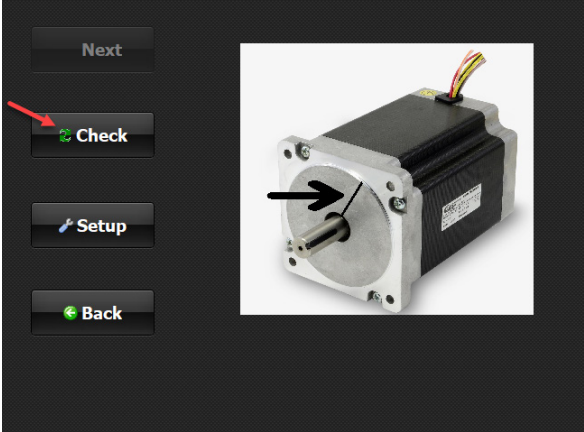
USING EVER STUDIO SOFTWARE WITH ROTARY SWITCH = F
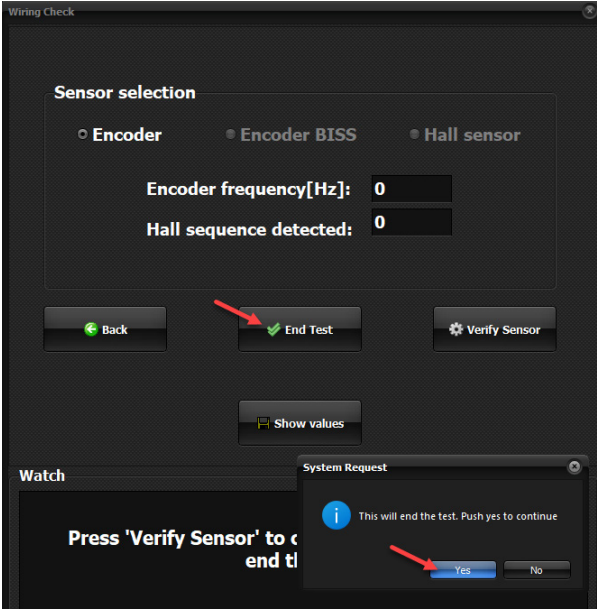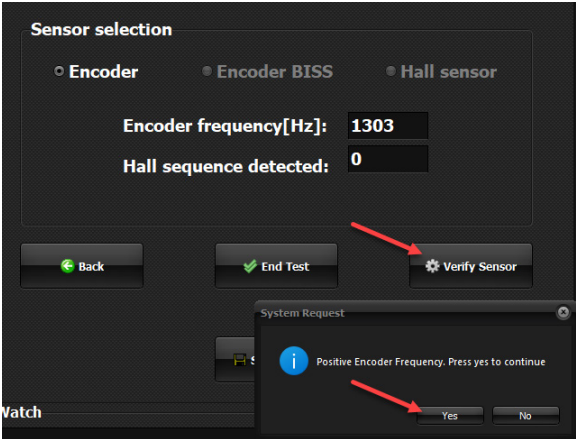
Follow the steps below to configure your LW4D drive using the Ever Studio software.

Step	Action
1	With your computer connected to the drive (see "Connecting Ever Studio" on page 7) open Ever Studio and select **Settings**, then the **Working Settings** tab. 1) Choose the pulse signal Modality. Pulse/Direction, CW/CCW, or AB Quadrature following (Electric Gear). 2) Deselect **Motor Feedback**. This will allow the drive to run the motor in open loop for initial motion testing. 3) Deselect check box **Invert Enable Input Level** if you do not have any I/O connected and just want to test the motor movements through Ever Studio. 4) Select check box **Motor RL Detection**. This will automatically detect the resistance and inductance of the motor. 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. 5) Click **Write** to write the setting to the drive. Ever Studio can write the LW4D when it is enabled and disabled.
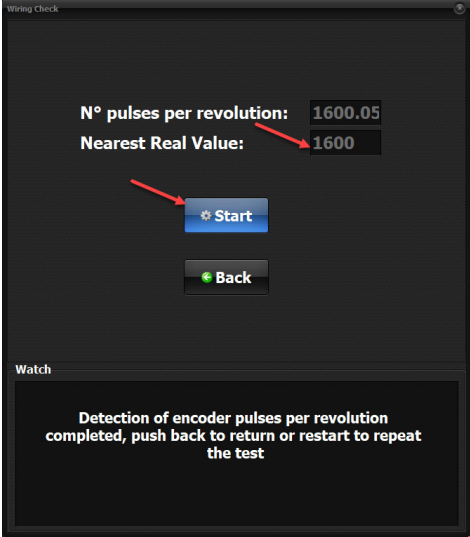
Step	Action
2	When performing any motor checks or direct movements from the software, be sure to disable the clock and direction terminal inputs in the **Direct Commands** window. This can be used if the pulse and direction signals are not connected yet.
3	Open the **Wiring Check** window from the **Help** menu. 1) Ensure **Stepper** is selected and click **Next**. 2) Click **Yes**. **Note:** In the **System Request** window, the software needs to stop the Application that is running. In this drive there is always an application running. Each rotary dip switch position is considered a different application.

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**. These encoders include a Z pulse but this drive cannot use this Z pulse for any feature or function. 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. **N° pulses per revolution:** 1600.05 **Nearest Real Value:** 1600 ⚙ Start 🔘 Back **Watch** Detection of encoder pulses per revolution completed, push back to return or restart to repeat the test 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 with Clock & Direction, and you can set the resolutions of the motor by changing the Motor_Step_Angle. 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. Applicable settings that are supported for the LW4D include:

- *Motor Type "Stepper 2P" (only)*
- *Motors with 50 pole pairs (only)*
- *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 andwhen 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.*

The braking settings do not apply to the LW4D.

Parameter	Value
Motor_Step_Angle	8 - 1/8
Motor_Pole_Pairs	50
Min_Current (mA)	500
Max_Current (mA)	2800
Boost_Current (mA)	2900
Nominal_Current (mA)	2800
Min_Profile_Velocity (Hz)	0
Max_Profile_Velocity (Hz)	1092000
Profile_Velocity (Hz)	65520
Profile_Acceleration (ms)	500
Profile_Deceleration (ms)	500
Motor_Start_Delay	0
Motor_Start_Delay_Pulses	0
Motor_R (mΩ)	750
Motor_L (µH)	2501
I2T_Peak_Current (mA)	3000
I2T_TMax_Peak_Current (ms)	1000
Position_Window (steps)	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)	0

Feedback Settings

The Feedback tab is a way to configure parameter address 2820H and is only available in closed loop mode. The value next to the Feedback Settings text, (0082H) in the below image, is the value of address (2820H) 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.
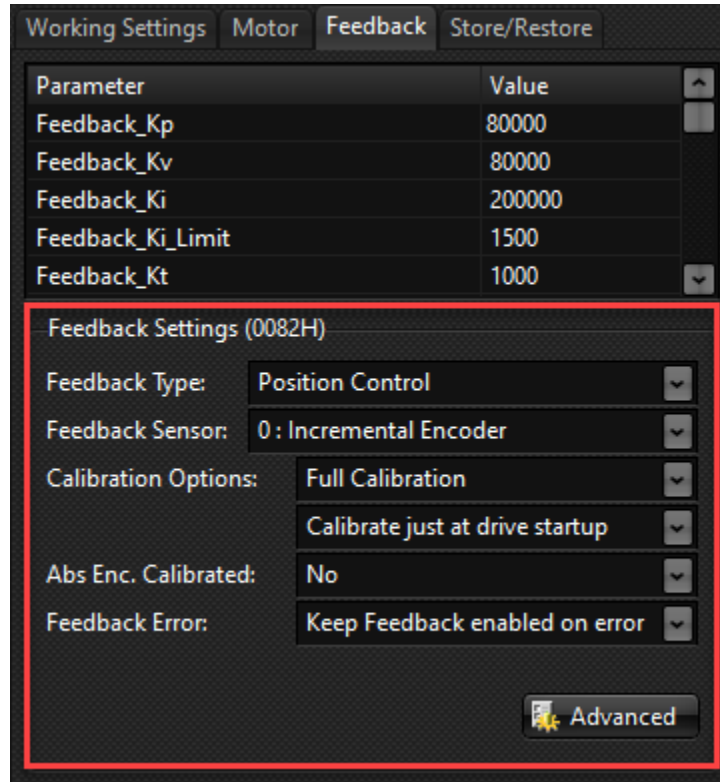
- *Feedback Type (bits 0-3) can be set to 0-5 and 7 only when the rotary switch is set to F. In Rotary switch setting 0-E the Feedback type is Mode 1 and cannot be changed.*
- *Feedback Sensor (bits 8-11) can only be set to 0 for the LW4D.*
- *Calibration Options (bit 12) is the level of feedback calibration 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 does not apply to the LW4D (bit 14)*
- *Feedback Error works with the first field Feedback Settings*

Note on Feedback Mode 7:

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	
	Motor_L	
	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
	Drive_Working_Settings	This Object permit the settings of some working features and also to enable the Close Loop.
	Drive_Working_Settings_Extended	This Object permit the settings of some working features

### 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 error. For mode 2 and 4 the feedback stays enabled on position 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. Parameter 2820H shows 008**1**H. See below.
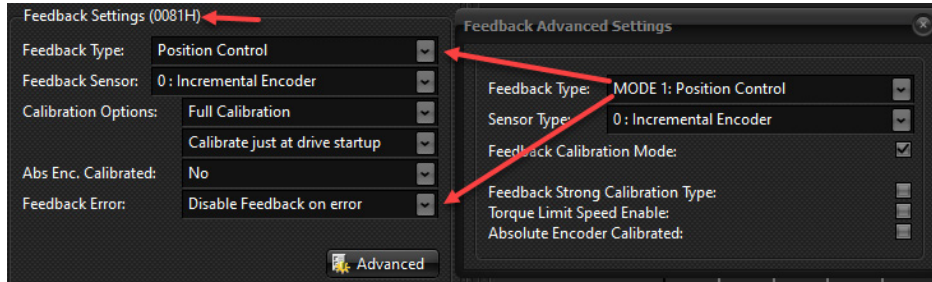

For Position Control mode 2, the feedback stays enabled on position error. Parameter 2820H shows 008**2**H. The motor stops but closed loop remains active. See below.
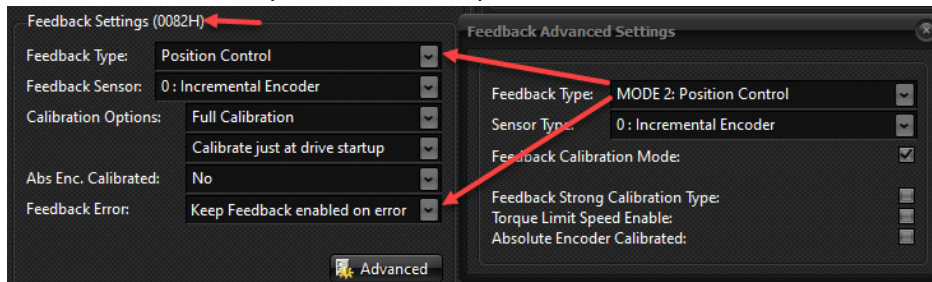
For Velocity Control mode 3, the feedback stays enabled on position error. Parameter 2820H shows 008**3**H. The motor stops and an alarm is issued.
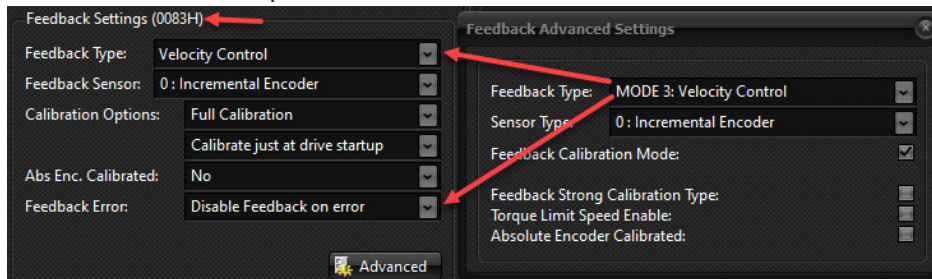

For Velocity Control mode 4, the feedback stays enabled on position error. Parameter 2820H shows 008**4**H. The motor stops but closed loop remains active. See below.
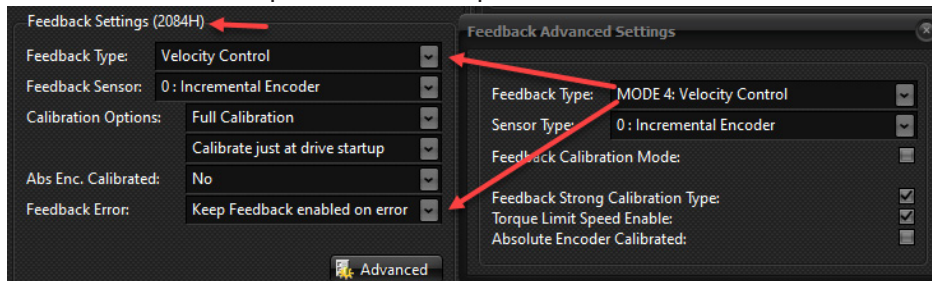
SETTINGS PRIORITY

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.
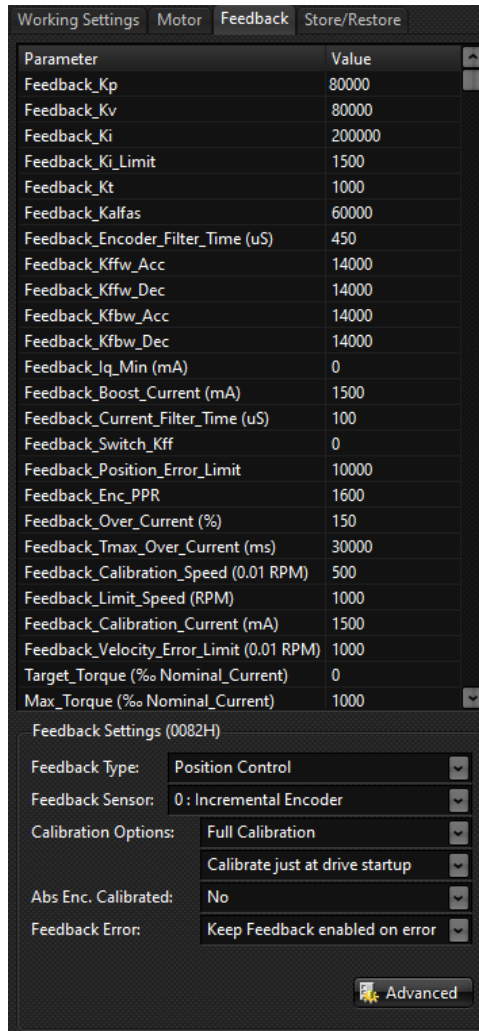
FEEDBACK STATUS REGISTER

The Feedback status register (Address 2822H) 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 9 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 LW4D drive.
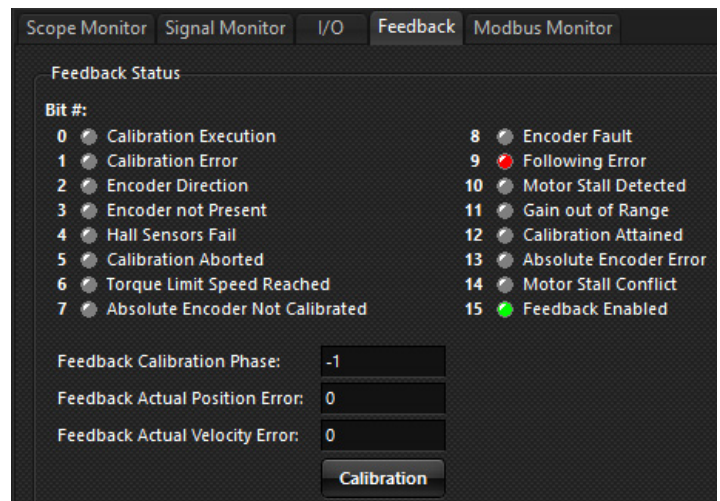
Direct Commands Window

To control the drive's motion directly from the software, you must Disable the pulse and direction inputs.

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

Free Forward

For a continuous velocity jog, select **Free Forward** and input the desired velocity. Units can be selected as RPM or Hz. Click **Move** and the motor will spin at the desired profile velocity until the **Stop** button is pressed.
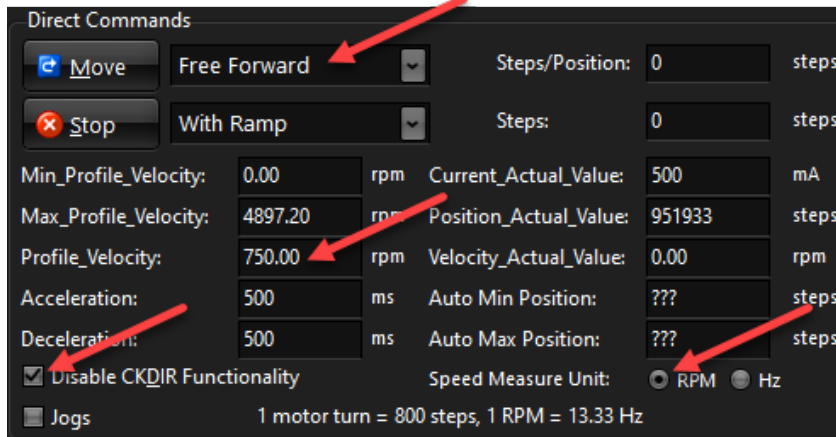

Steps Forward or Backwards

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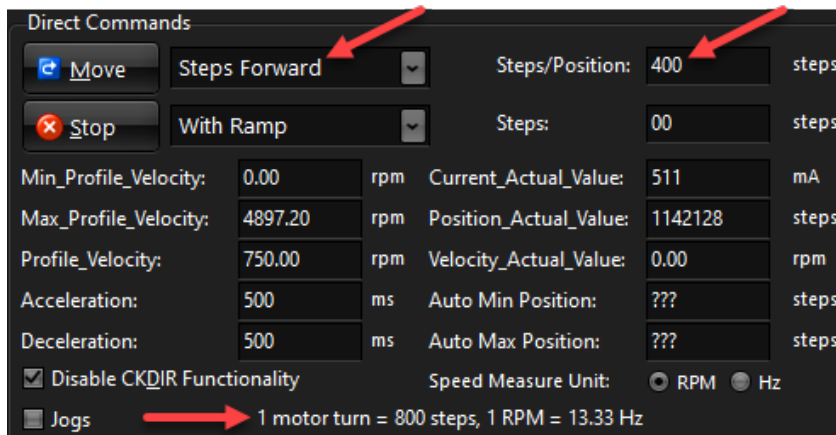
TARGET MOVE

For a Target move enter the position <u>location</u> 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 36000 steps to move to the target position of 1000000. The shaft will rotate CW or CCW to reach the target position.
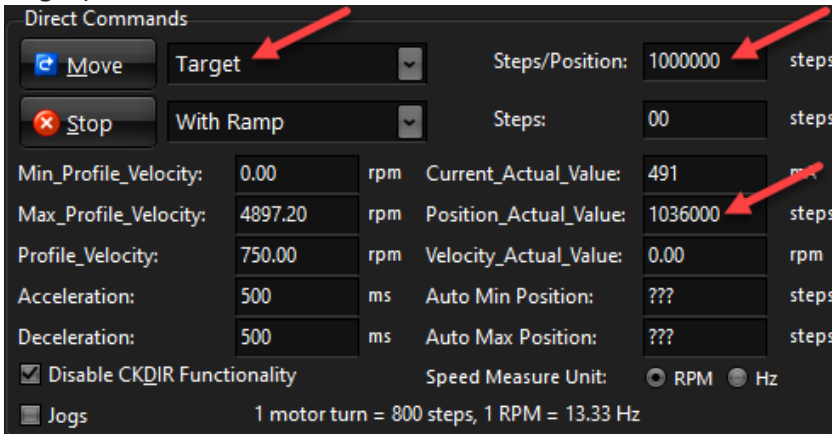

STEPS ABSOLUTE

For a **Steps Absolute** move enter the position <u>distance</u> 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 30000 steps resulting in the Position_Actual_Value increasing by 30000 (new value will be 1130000). You can enter a negative value here as well, and the motor will move backwards instead of forwards.
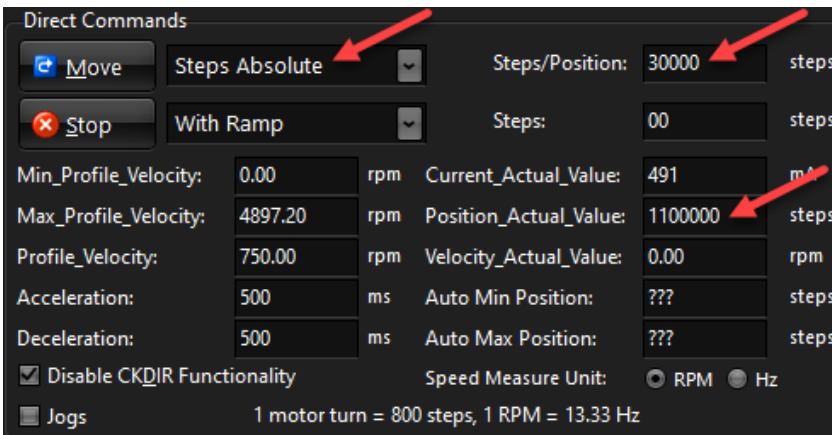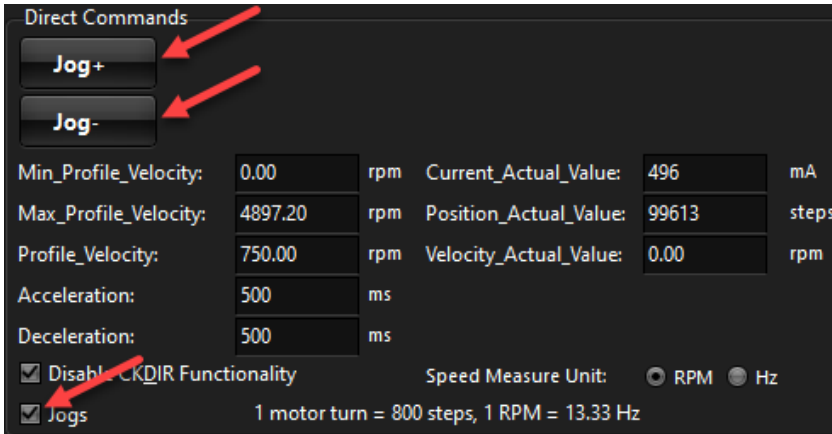

AUTO MOVE

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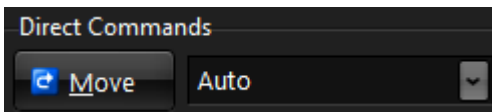
Jog

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	This input does not exist on the LW4D drive (not used)
B0_In1	Enable input
B0_In2	Direction input
B0_In3	Pulse input
B0_In4	This input does not exist on the LW4D drive (not used)
B0_In5 (ENC0_Z)	Z pulse input (not used on the LW4D)
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
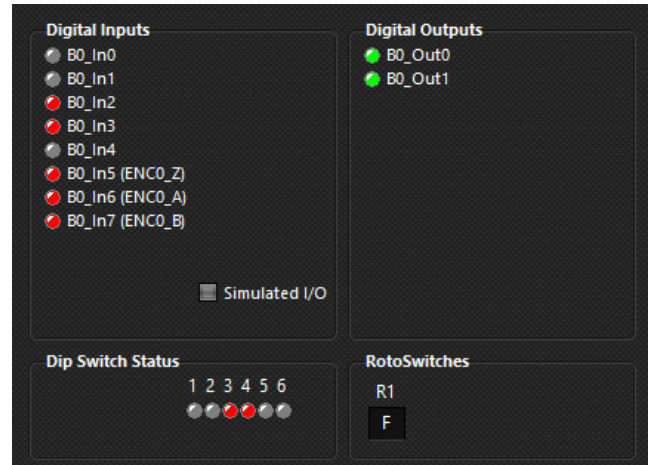
WATCH WINDOW

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 LW4D, 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.*
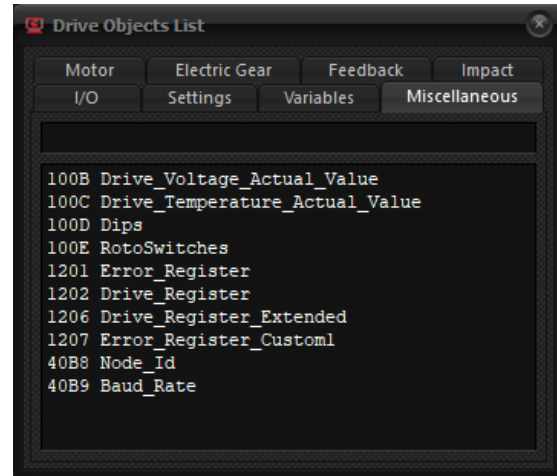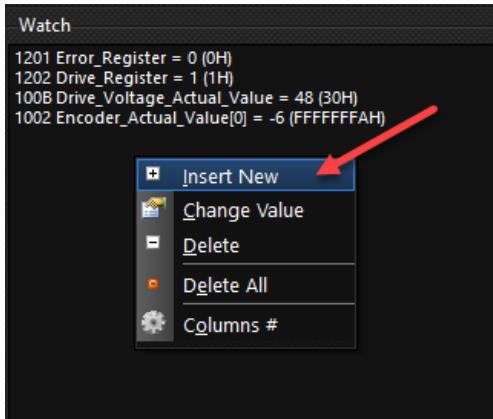

- *To change a value of an object in the watch window, double-click on the object to open the Update Value window. Enter the new value and click OK. This will immediately update the object in the drive and in all fields in Ever Studio. The "Feedback Settings" below are the same as Address 2820 hex. The value shown in the window (0081H) is the current parameter value of address 2820H.*
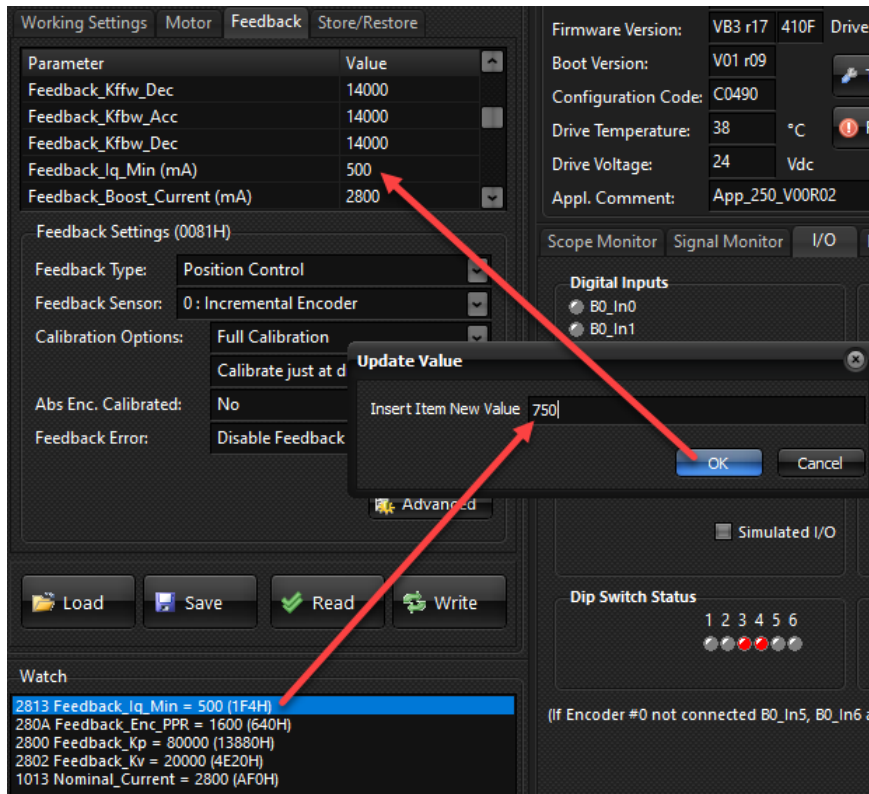
Scope Monitor

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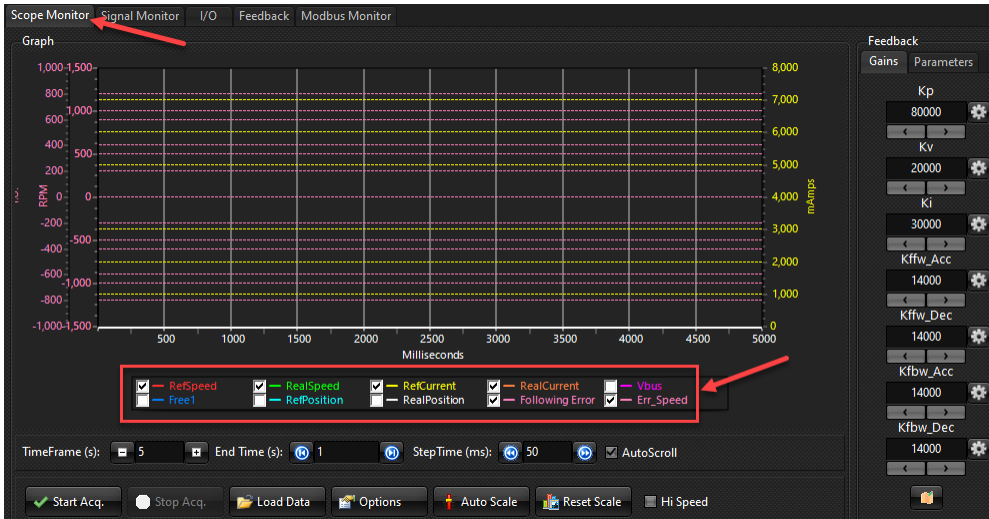
To adjust each trace, select the option button, choose which trace you want to change, and adjust accordingly.
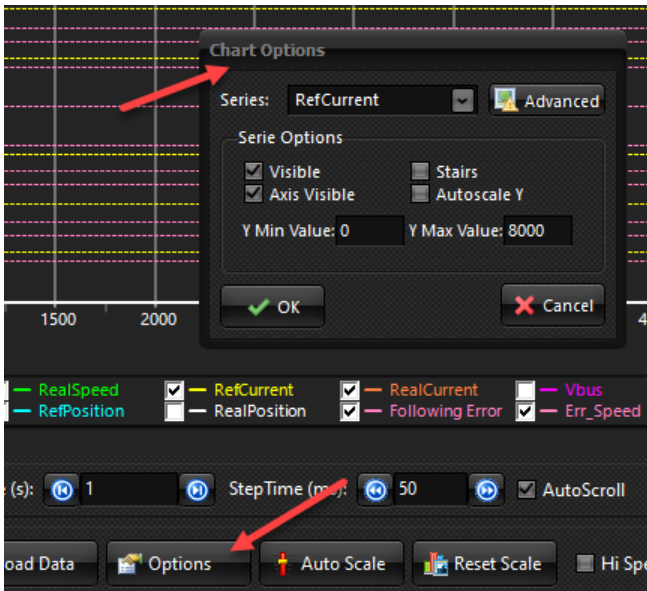
CLOSED LOOP TUNING

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 LW4D 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 with the LW4D 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 with the LW4D?	Although there are Z and /Z inputs on the LW4D 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, but there is no functionality. The LW4D will only use the AB encoder channels.
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
Clock input	Same as pulse input.
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 with the LW4D).
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.
Modality	This is the pulse input mode (Clk/Dir, CW/CCW, AB Quad)
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 AND APPLICATION DOWNLOAD

The LW4D has two layers of Firmware. An Application file (.e3plcobj extension) and a firmware file (.EBI extension). The firmware controls the basic functions of the drive. The application file determines the behavior of the DIP switches, rotary switches, pulse input implementation, etc. Check the Automation Direct software downloads page for the latest firmware and application file.

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.
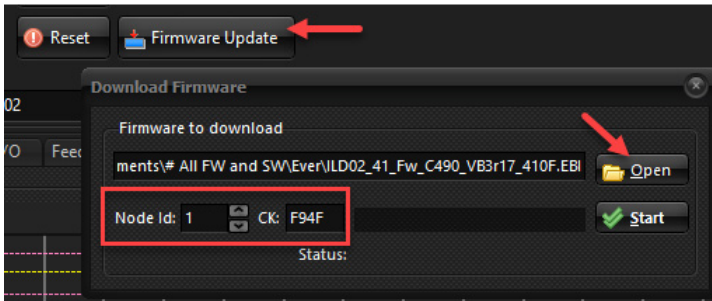
APPLICATION UPDATE

In Ever Studio click User App Update, open the appropriate .e3plcobj file and click update. The only way to "Restore to factory defaults" is to rewrite the application file and have both "Initialize User Variables" and "Initialize Global Parameters" check boxes checked. Rotary switch selections 0-E cannot have their settings changed, only position F can. After the User App Update has installed completely, power cycle the drive.

Note: Instead of a power cycle you can use the "Reset" button in Ever Studio. This resets the CPU in the drive.