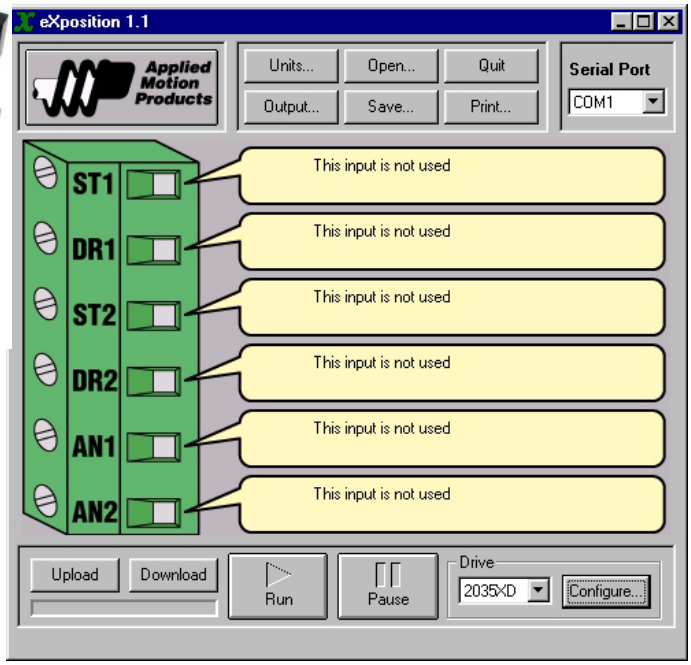
eXposition™

Software Manual



for

BL7080x
BLx7080
2035XD
BLu100S
BLu100Si
BLu200S
BLu200Si

Version
1.30

Applied Motion Products

Corrections/changes

Ver 1.0 ..... Introduced
Ver 1.1 - Sept 2002 ..... Stepper Drive section added, changes to RUN/STOP function.
Ver 1.3 - Jan 2003 ..... Manual re-structured adding BLu drives

NOTE
Please read this manual thoroughly, it covers the *eXposition*™ software used on a number of different drives. There is additional information at the end of the manual for specific products.

Contents

Getting Started

Thank you for purchasing an Applied Motion Products *Xdrive*™ product. We hope you will find that the performance, price and ease of programming make our products the best value for your application.

The *eXposition*™ programming software is used to configure several Applied Motion *Xdrive*™ products, including the BL7080x, BLx7080, 2035XD, BLu100S, BLu100Si, BLu200S and BLu200Si. This manual explains how to install the *eXposition*™ software and how to use it to configure your *Xdrive*™ product.

For information regarding your specific *Xdrive*™ hardware, such as wiring and mounting, please read the hardware manual that came with that product.

To operate your *Xdrive*™ product, you must do the following:
–
- Plug into your personal computer for programming.
- Install our software program on your PC.
- Connect a motor
- Connect power.
- Connect any inputs or outputs that you require.
- Have Fun!

Remember, if you have trouble getting your *Xdrive*™ to meet your expectations, or if you want to suggest improvements to the product or this manual, give us a call at (800) 525-1609. Or, you can fax us at (831) 761-6544. If you are not calling from North America, dial (831) 761-6555. Alternatively , you can email us at techsupport@applied-motion.com

Note: This manual was prepared for firmware versions:
BLx7080
BLu Series
2035XD

And
Windows programming software version 1.30

If your drive contains a previous firmware revision, then some of the features described in this manual may not be available to you. The Windows software will alert you to this fact if you try to download a program that your drive cannot execute.

Using this Manual

This manual is divided into sections depending on the *Xdrive*™ product you have.

Pages 6-9 deal with general aspects of using your *Xdrive*™. Following this there are different sections for each of the drives offered.

Installing the Programming Software

To run the *eXposition*™ software, you must have a computer with the following requirements:

- IBM compatible 486, Pentium or better CPU. Pentium recommended for best performance.
- Microsoft Windows 95, Windows 98, or Windows NT, ME, XP, 2000.
- At least 8 MB memory (16 MB or more will make the software run much faster)
- 10 MB available hard drive space
- VGA monitor, or better. 24 bit color setting (or higher) recommended
- Mouse or other input device
- CD drive
- A 9 pin serial port must be available, preferably COM1 (if your computer does not have a serial port , you will need to purchase a USB to Serial adaptor).

Before you can use the *eXposition*™ software, you must install it on your hard drive.

Installing from the CD

To install the software from the CD , insert the CD into your drive and follow the on screen instructions.

If you encounter errors during installation, it is usually due to lack of memory or conflicts with other programs that are already running on your PC. If you experience an error while installing the programming software, quit all other Windows applications and try again. Holding down the ALT key and pressing TAB will show you all the programs currently running on your PC. Laptop computers generally present the biggest challenge to installation, as they often come preloaded with programs that automatically execute on start-up such as Microsoft Office and battery managers. Furthermore, laptops usually have the least memory.

The programming software will install more easily and run much faster if you have more memory.

Connecting to your PC

- Locate your computer within 6 feet of the *Xdrive*™ hardware.

- Your *Xdrive*™ product was shipped with a black adapter plug. It has a telephone style jack at one end and a larger 9 pin D connector at the other. Plug the 9 pin D connector into the COM1 serial port of your PC. Secure the adapter with the screws on the sides. If the COM1 port on your PC is already used by something else, you may use the COM2 port. On some PCs, COM2 will have a 25 pin D connector that does not fit the black adapter plug. If this is the case you will have to purchase a 25 to 9 pin serial adapter at your local computer store.

- Your *Xdrive*™ was also shipped with a 7 foot telephone line cord. Plug one end into the adapter we just attached to your PC, and the other end into the PC jack on your *Xdrive*™ .

- Start the *eXposition*™ software first, **THEN** apply power to your *Xdrive*™. This is important, the drive will not be “seen” by the software unless you follow this sequence.

Never connect the Xdrive™ to a telephone circuit. It uses the same connectors and cords as telephones and modems, but the voltages are not compatible.

Programming the Xdrive

Introduction

As the name *Xdrive*™ implies, these products are a cross: a blend of several traditional motor drive types. The *Xdrives*™ are as versatile as they are easy to configure. You'll be up and running in minutes.

Each *Xdrive*™ model has a number of "inputs" to which you may connect "signals" (i.e. other electrical components). Some inputs are digital, and can connect to switches, sensors and digital logic. Other inputs are analog, and are suitable for connection to potentiometers and other analog devices. These signals tell the *Xdrive*™ what to do, and when.

The *eXposition*™ software is used to assign functions to the inputs. You can choose from the following kinds of motion.

- Continuous following of pulse and direction or quadrature encoder signals, with electronic gearing
- Point to point (fixed distance) moves
- Moves to a sensor
- Run/stop (jogging) at a continuous speed, selected digitally or proportional to an analog input voltage

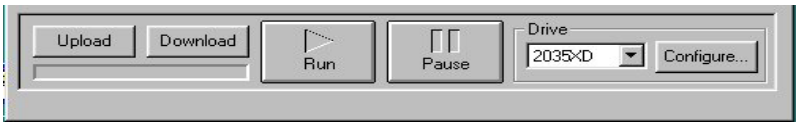
Not all functions are available on all drives, consult the table below to see which functions are available on your particular drive.

FUNCTION	7080X	BL7080X	BLu100S/Si	BLu200S/Si	2035XD
PULSE AND DIRECTION	✔	✔	✔	✔	✔
QUADRATURE ENCODER	✔	✔	✔	✔	
PULSE INPUT	✔	✔	✔	✔	
MOVE	✔	✔	✔	✔	
MOVE TO SENSOR	✔	✔	✔	✔	
RUN/STOP	✔	✔	✔	✔	✔

For example, you may want the *Xdrive*™ to move your load one inch clockwise when you activate input 1, and to run continuously at 10 inches per second while input 2 is active. Just assign a "point to point move" to input 1 and a "run/stop move" to input 2.

The "modular" nature of the *Xdrive*™ makes it flexible and easy to understand. It also provides a great platform for adding new features. If you have an idea or requirement that seems like "something an *Xdrive*™ should be able to do", please contact us. We'd love to hear from you.

Running your Application.



Upload Download
Before you can make the *Xdrive*™ perform your chosen application you will need to download the configuration you have created to the drive. This is done by clicking the Download button on the main screen of the *eXposition*™ software.

As the software downloads you will see a green bar fill the box below the Download button.

It is also possible to upload a program previously stored on your *Xdrive*™, by using the Upload button.

Run, Pause
Once the configuration has been downloaded, you will need to start it, to do this click on the “Run” button. The inputs will now be active and ready to be triggered.

Clicking on “Pause” will stop the motor , even if there is a move in progress.

If you now exit the program and remove the connection to your computer, the *Xdrive*™ will remain with this configuration ready to be triggered once the drive is powered up again.

Open, Save, Print

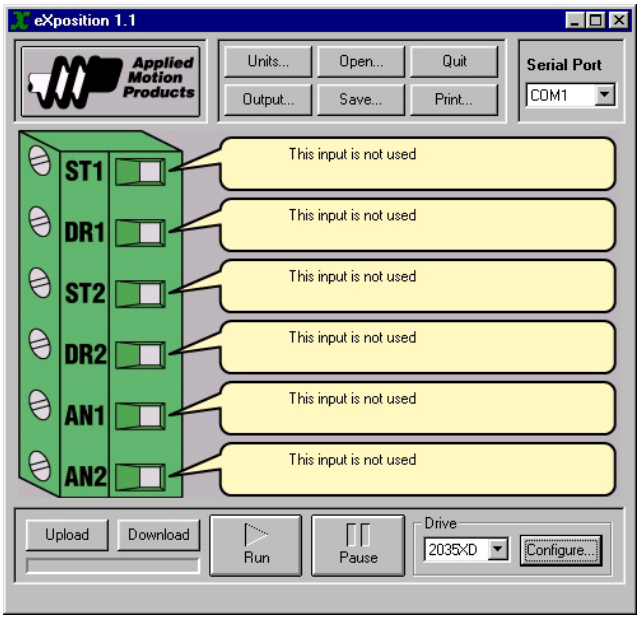
You could also save your work to a disk or your hard drive for use as a backup. Use the “Save” button at the top of this screen.
To retrieve a program you have previously stored on your hard drive or disk, use the Open button and browse to the file.

If you call us for technical support, please save your program first, we may ask that you email it to us.

Using eXposition on the 2035XD

The Main Screen

When the *eXposition*™ software detects that it connected to the 2035XD Stepper Drive it will display a different main screen that only allows a limited set of functions compared to the Servo version of the *eXposition*™.



When the drive connected is the 2035XD the following screen will be displayed.

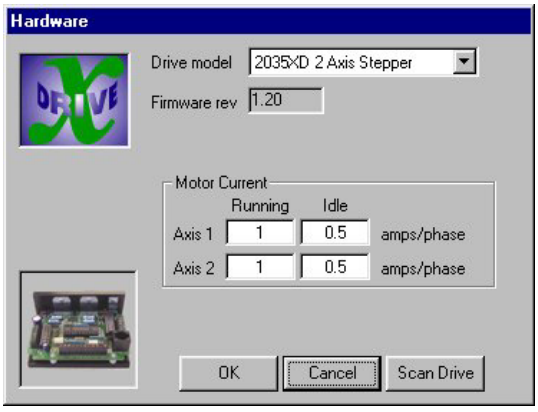
The 2035XD is a dual axis drive capable of driving 2 stepper motors. It has a set of connections for each axis.

- ST1 - Step Input OR Run/Stop Input for axis 1.
- DR1 - Direction Input for axis 1.
- AN1 - Analog input for axis 1.

The same set is repeated for axis 2.

Step 1 - Configure the Hardware

Hardware Configuration

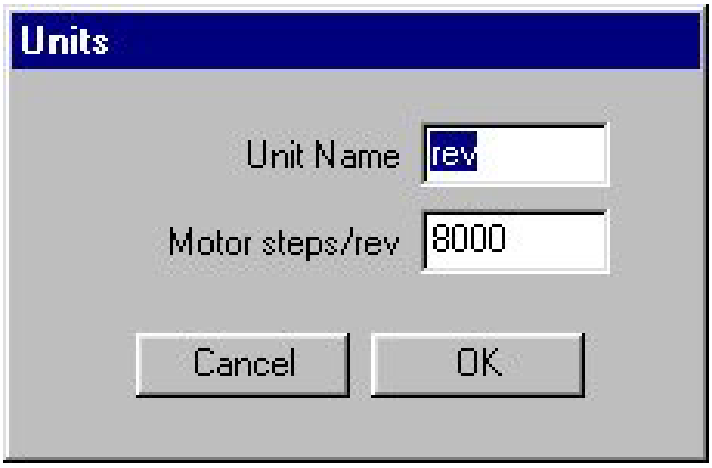


In this screen you will set the current for each axis. The "Running" current you will obtain from your motors documentation, sometimes this is listed on the nameplate. Remember to check your wiring, "Running" current will be different for motors wired in Series than those wired in Parallel.

Idle current is a feature that automatically reduces the motor current when the motor is not moving This reduces the heating in both the motor and the drive.
Remember your motor will need some current to hold a load at zero speed, this should be taken into consideration when using this feature. In most cases setting the Idle current at 50% of the Running current will provide adequate holding torque and cooler operation.

Step 2 - Set the User Units

When using the 2035XD Run/Stop mode it is possible to configure the system to use units that are easier to work with.
This means calculating and entering a scale factor in the Motor steps/rev box.



It is important to note that the 2035XD when in the Run/Stop mode is pre-configured to 12800 steps per rev. This means if you just want to set a speed for the motor in revs (as per the box above) you would have to enter 12800 in the “Motor steps/rev” box.

example

You have a conveyor that is driven by the motor. Between the motor and the load you have a 3.5:1 gear reduction. You want to program the drive in terms of rpm on the conveyor.

The figure you will need to enter is 12800 * 3.5 = 44800

Step 3 - Assign Functions to Inputs

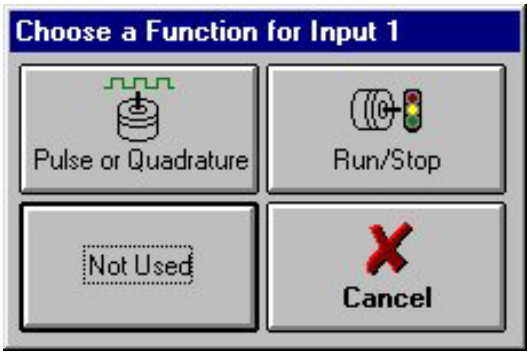
Available Functions

At this point you should have a definition of your machine's operation and the motion you need to create. You may want to create a flow diagram, or at least a list of the functions. Everything becomes easier if you write this out first.
You should also have determined what type of signal will be used to start each task.

You will see from later sections in this manual that different functions use a different number of the 6 inputs available. You may configure the *Xdrive*™ to have a combination of all of these functions, depending on the Input count of each function you choose.

Some functions are only available on certain inputs, so read through the manual carefully, also choosing some functions automatically assigns some inputs, so these are no longer available The best option is to install the software and try the configuration you want before proceeding. Latest software versions can be downloaded from our website www.appliedmotionproducts.com.

Once you have outlined your requirements and have decided to assign a function to a particular input , click on the cartoon bubble next to that input. You will see the following screen.



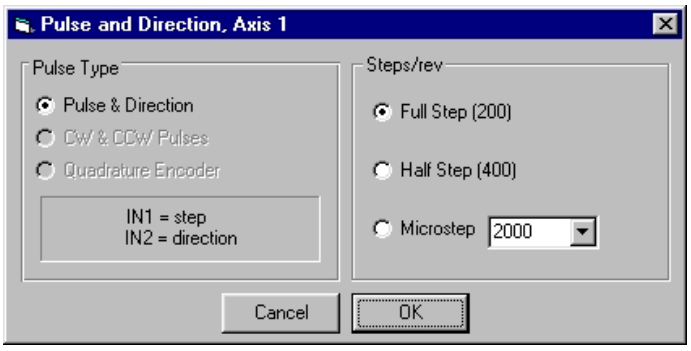
Choosing one of the basic functions will lead you to a specific dialog box .There you can describe the task at hand in terms of motor speed, acceleration rate, trigger condition and more.

The 2035XD stepper drive with firmware level 1.02 offers only two functions

- Pulse or Quadrature Input - accepts a step and direction signal.
- Run/Stop move -this is the oscillator mode, with the drive generating its own command signal.

Step and Direction

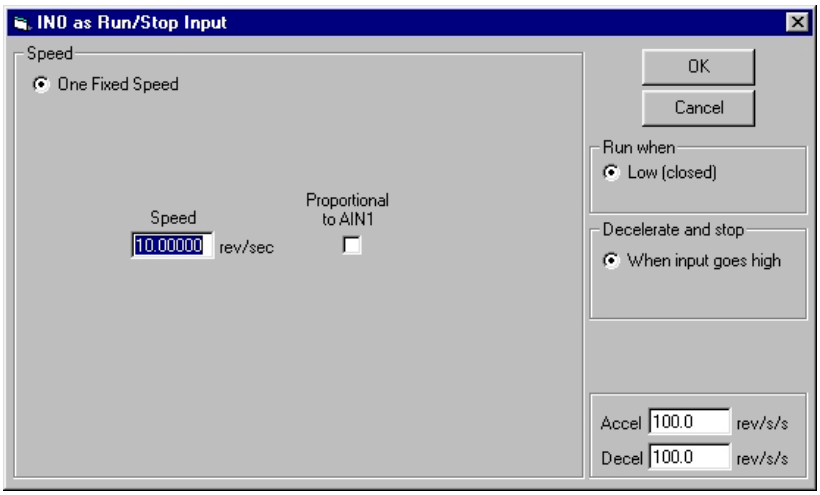
This allows the drive to receive a standard step and direction signal from an external controller such as an indexer or PLC.



The user can choose between Full Step, Half Step or Microstepping. In Microstepping mode, 13 different resolutions are available from the drop down list.
Resolutions available are :- 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400,25600,36000, 50000, 58000.

Run/Stop

The Run/Stop function allows a continuous move to be activated when the ST input is activated. Speed, Acceleration and Deceleration are entered into the following screen.



The drive will run at the set speed until the input is deactivated.

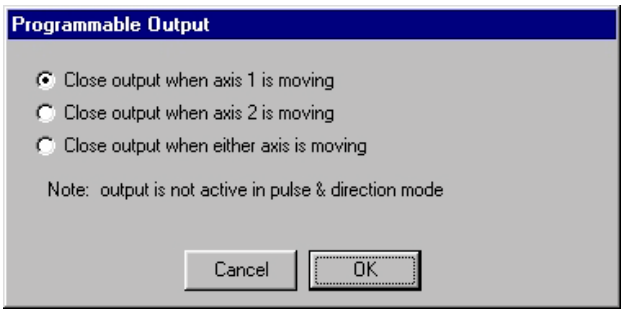
The DR input can be used to select the direction of the move. However the drive will not change direction during the move even if the DR input changes state. The DR input is latched when the ST input is activated.

If required the speed can be varied by the use of the analog input. The speed entered will be the speed achieved when the AIN signal is at its maximum (+5V). Reducing the voltage will reduce the speed proportionally.

When in the RUN/STOP mode the step resolution is preset at 12800 steps/rev.

Setting the Output

The output on the 2035XD can be used to indicate when an axis is in motion. The drive gives you the option to choose if the output indicates status for axis 1 , axis 2 or both.

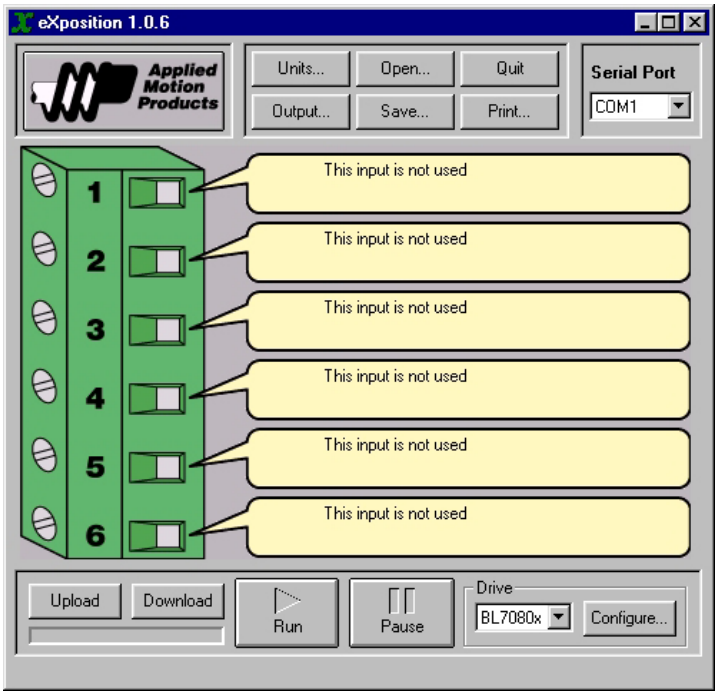


Please note that the output can not be used to indicate status when the drive is being used with a pulse and direction input.

Using eXposition on the 7080 Series Servo Drives

The Main screen

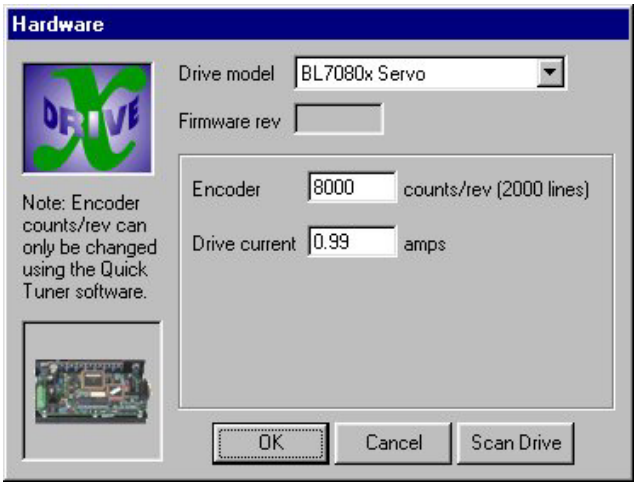
When the *eXposition*™ software detects that it connected to the BL7080x or the BLx7080 Servo Drive it will display the following screen.



These drives have 6 inputs available to trigger functions , a table showing the functions possible for each input is shown below.

	Pulse and Direction	CW/-CCW	Quadrature encoder	Move	Move to Sensor	Run/-Stop	Speed/-Distance Select	Direction change	Sensor
IN1	✔	✔	✔	✔	✔	✔			
IN2	✔	✔	✔	✔	✔	✔		✔	
IN3				✔		✔			✔
IN4				✔	✔	✔	✔		
IN5				✔	✔	✔	✔		
IN6				✔	✔	✔	✔		

Step 1 - Configure the Hardware



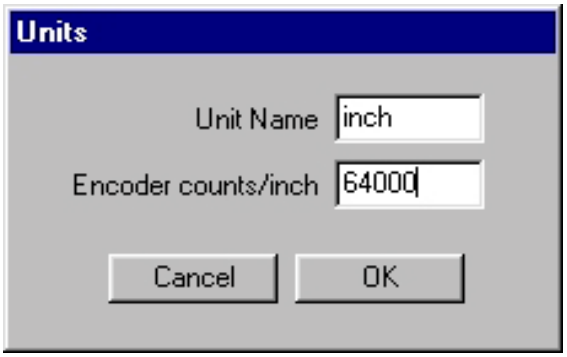
The hardware configuration screen for the BLx7080 and BL7080x is shown below.

In this screen you will set the current for your motor, this will also depend on your application. In some cases you may wish to limit the current to below the motors continuous rated values, for example if you are using a gearhead.

Note - drive current means continuous current. Peak current for the BL7080 series drives is 2 X continuous current, and is available for 2 seconds.

Step 2 - Set the User Units

With many applications it is much easier to get the distances right if you can use units that make sense to you. With the *Xdrive*™ you can define your own units.



Example

You have a leadscrew with 1/8" pitch, meaning that 1 turn of the leadscrew moves the load 1/8". You want to program your application in inches. Enter "inch" into the Unit Name box.

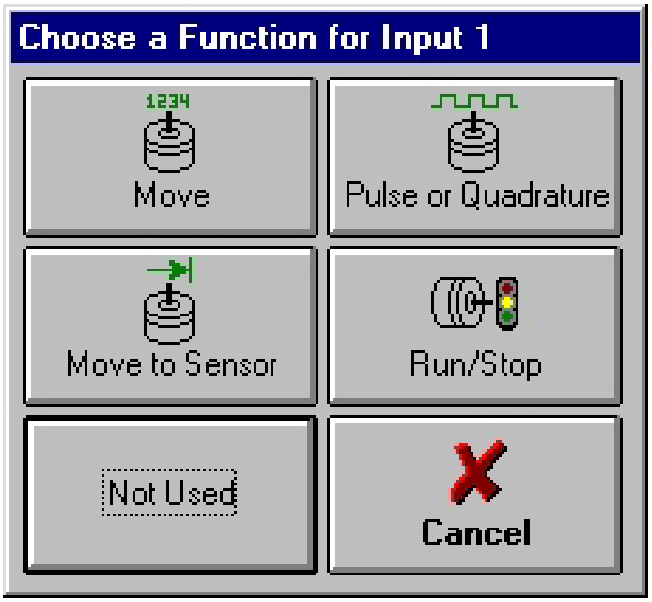
To get 1" of travel you need to turn the leadscrew 8 times.
The motor is fitted with a 2000 line encoder, the drive reads this in quadrature (see page 19), this gives 8000 counts.

8 (turns/inch) x 8000 (counts/turn) = 64000 counts/inch

This is the value you will enter into the Encoder counts/rev box.

Step 3 - Assign Functions to Inputs

At this point you should have a definition of your machine's operation and the motion you need to create. You may want to create a flow diagram, or at least a list of the functions. Everything becomes easier if you write this out first.
You should also have determined what type of signal will be used to start each task.

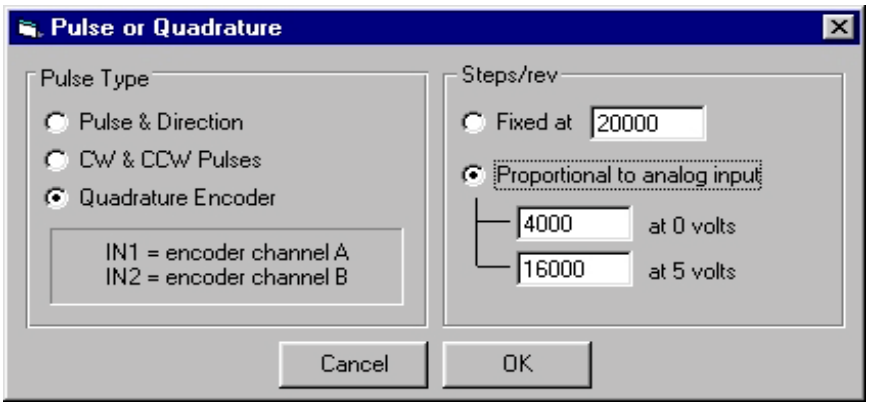


You will see from later sections in this manual that different functions use a different number of the 6 inputs available. You may configure the *Xdrive*™ to have a combination of all of these functions, depending on the Input count of each function you choose.

Some functions are only available on certain inputs, so read through the manual carefully, also choosing some functions automatically assigns some inputs, so these are no longer available The best option is to install the software and try the configuration you want before proceeding. Latest software versions can be downloaded from our website www.appliedmotionproducts.com.

Pulse or Quadrature

This function allows the *Xdrive*™ to be controlled by an external pulse and direction input and has three options, all are essentially the same but use a different external signal source. By selecting any of these options you automatically make IN1 and IN2 unavailable for other functions. The Pulse or Quadrature functions are not available on other inputs.



Pulse and Direction - Usually outputs from a Stepper Motor Controller . These give a train of pulses that determine speed and a direction signal to define a change in direction.
IN1= Step
IN2= Direction

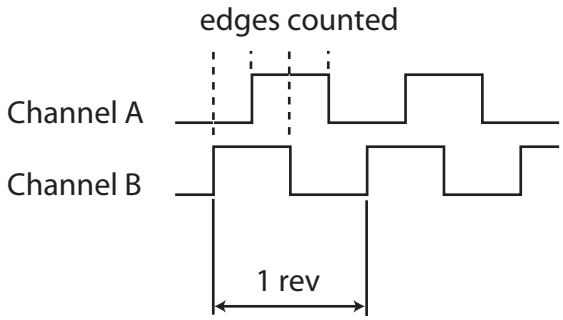
Stepper motor controllers come in many forms, they can be stand-alone units or PC based. Some PLCs have stepper motor control outputs.

CW & CCW Pulses - This option allows the *Xdrive*™ to be driven in either direction by a series of pulses fed into IN 1 **OR** IN2.
IN1= CW Pulse
IN2= CCW Pulse

This means that any pulses fed into IN1 will cause the motor to turn CW, and pulses fed into IN2 will cause the motor to turn CCW.

Quadrature Encoder - Encoders are rotary position/speed sensors that emit a series of pulses according to the speed/direction they turn. Using this type of input to drive a motor is sometimes called Encoder Following or Electronic Gearing. The drive accepts standard 5V encoder signals with a maximum pulse input frequency of 1Mhz.
Most encoders have four channels of signals usually called A and B and /A and /B. Feed these signals into IN1 and IN2 (refer to the hardware manual for connection information). The Encoder can be powered by the 5V auxiliary output available on the drive, 100mA max.

General Statements
Counts/Rev
With each of the functions you will have to enter the number of pulses that will determine one revolution of the motor. This will depend on the encoder that is fitted to the motor driven by the *Xdrive*™, this is called the feedback device. The *Xdrive*™ reads the feedback device in quadrature. Quadrature means reading each rising and falling edge of both channels of the feedback device. So for a motor fitted with a 2000 PPR (Pulses Per Rev) encoder the drive will have a resolution of 8000 counts/Rev.



By varying the Counts/Rev you can force the *Xdrive*™ to turn at a ratio other than 1:1 to the master axis. For example if your master encoder generates 1000 Pulses/Rev i.e 4000 Counts/Rev and you enter 2000 in the Steps/rev box the X Drive will follow at twice the speed of the master axis.

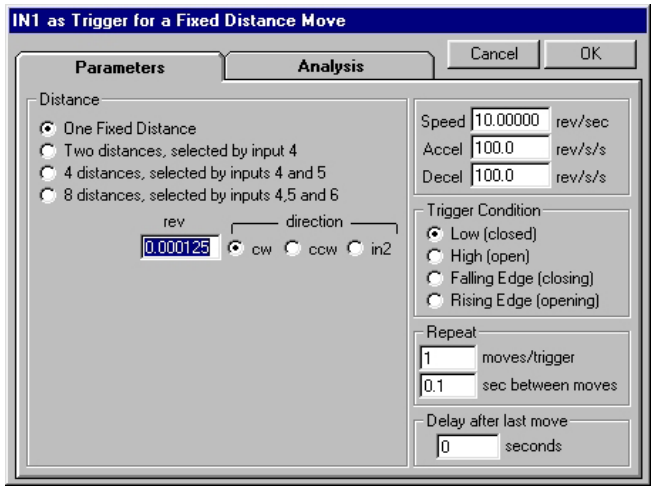
Analog Input
All the functions except the “Move to Sensor” have the option of applying an external “scaling” signal that will modify the speed of the motor according to an analog input. This can be activated by checking the “Proportional to analog input” box.
Then you must enter the maximum and minimum scale factor that will apply by determining the number of steps per rev that will be applied when the analog input (Ain) is at maximum (5V) and minimum (0V).

example : - You want the drive to follow the speed of another axis at a 1:1 ratio (run at the same speed). The other axis is fitted with a 2000 ppr encoder. The motor being driven is also fitted with a 2000 PPR encoder (*this will be determined when you configure the drive using the Quick Tuner software supplied*). To get them to run at the same speed you will enter 8000 in the “counts/rev” box. You also want to vary the ratio externally to be 2:1 to 0.5:1. To do this you will check the box for “proportional to analog input” and enter 16000 in the “at 5 volts” box and “4000” in the “at 0 volts box”.

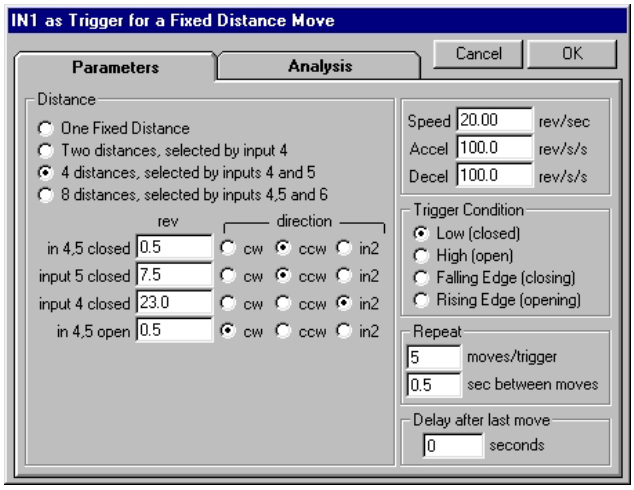
Move

The MOVE function makes the motor move a fixed distance on the trigger of an input. The distance, speed, acceleration and deceleration for the move can be selected. By selecting the move button you get a configuration screen where you enter the parameters for the move.

The screens below show how a different number of moves can be created in the two ways.



The screen above shows how one move distance can be created on each input, using this method up to six different moves can be created. Each move will then have completely different move characteristics. This configuration screen will have to be completed for each of the inputs used.



By assigning just inputs 1, 2 and 3 as MOVES and using a combination of inputs 4, 5 and 6 to select the move distance, up to 24 moves can be created . For each set of distances created on each input the Speed, Acceleration and Deceleration will be the same.

Trigger Condition

You must enter the conditions for the trigger input.
The four input conditions are:

High - move when the specified input reaches a *high* signal state. This is the default state of an input if nothing is connected to it.

Low - move when specified input is at a *low* signal state.

Rising Edge - move when the signal goes from low to high. This is similar to the high condition, but the difference is important. Let's say that you have a sensor wired to the *Xdrive*™ that will go high when you want motion to stop. However, the sensor signal stays high after motion is complete, going low sometime later. This often happens in labeling applications where there isn't much space on the roll between labels. If you choose high as your input condition, the *Xdrive*™ will complete the motion, then refuse to start again because the input signal is still high. If you choose rising edge, the *Xdrive*™ would proceed with the input voltage high and stop when the sensor signal goes from low to high again.

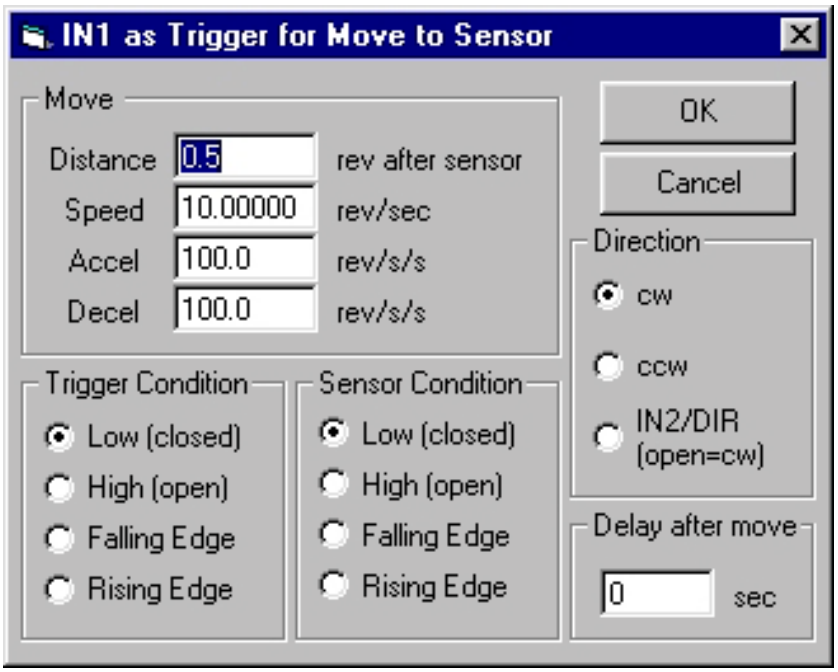
Falling Edge - the opposite of rising edge. The *Xdrive*™ waits for an input voltage to go high, then low.

Repeat Moves

Any of these moves can be repeated up to 65535 times by entering a value in the “moves/trigger” box. There is also the option of entering a delay time between moves . This means, for example, you could use IN1 once to trigger a move and this move could be executed 5 times with a time delay of 1 second between the moves

Move to Sensor

The Move to Sensor command drives the motor at a given speed until a sensor is triggered.



The dialog box allows you to configure parameters for the move such as the Trigger Conditions, the Sensor conditions and the Direction of the move. You must also set the distance after the sensor before the move stops. The software will calculate a minimum value for this distance, based on the speed and deceleration of the move.

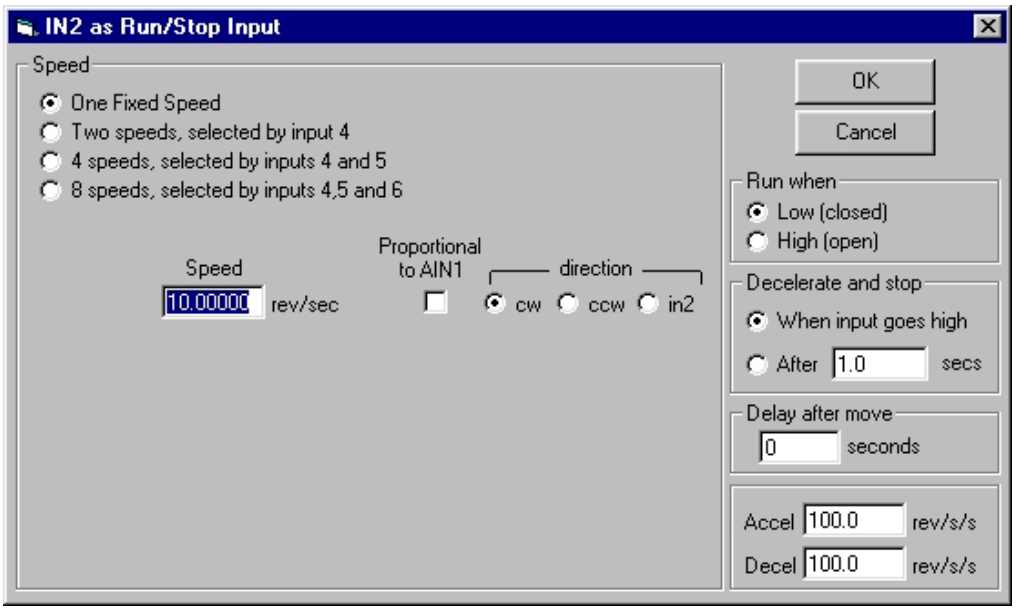
Sensor Input

BL7080x and BLx7080
On BL7080 series servo drives this move can only be triggered by IN1, IN2 , IN4, IN5 or IN6. IN3 is always used as the sensor input. Each drive can support five MOVE TO SENSOR functions, but they will all have to use the same sensor, which will be connected to IN3.

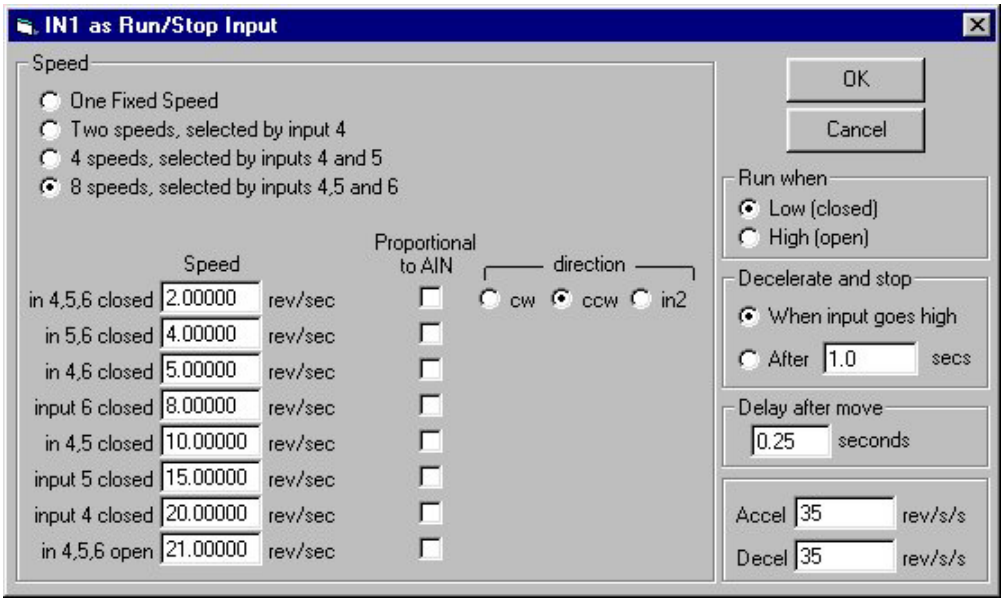
If IN2 is used to command the direction, then IN2 cannot be used to trigger (start) this move or any other move.

Run/Stop Input

Another very simple requirement may be to just run at a pre-configured speed while an input is held in a particular state (i.e. high or low /open or closed) or to run for a given time. You choose which of these options you want by entering values in the “Decelerate and Stop” section of the screen.



Alternatively more than one input can be used, this enables you to select between as many as 8 speeds. IN2 can be used to determine the direction of rotation or the direction of rotation can be fixed, freeing IN2 for other functions. If IN2 is LOW (Closed) the motor will turn in CCW, if it is HIGH (Open) it will turn CW.

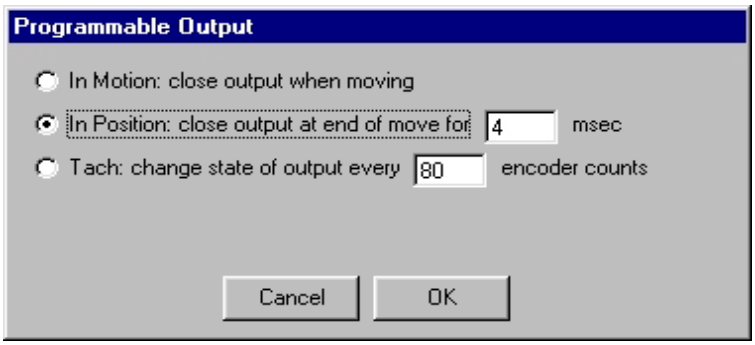


The speed can be varied on the fly by a 0 to 5V external analog signal, by checking the “Proportional to AIN” box. The speed will be proportional to the voltage applied with 5 volts generating the speed entered in the “Speed” box against that particular input.

Setting the Output

The *Xdrive*™ has one output. This output can :

- Close when there is a move in progress.
- Close momentarily when the final position has been reached. You can choose the duration of the closure, from 1 to 250 milliseconds .
- Act as a digital tachometer, by changing state when a given number of encoder pulses have been read. The maximum value that can be entered into this box is 255.



Example 1
You want to signal a PC when each move has been completed. The PLC requires a 4 millisecond pulse, so set the output for "In position: close input at end of move for 4 msec".

example 2

You want to have an output of 100 pulses per rev. The motor is fitted with an 8000 count/turn encoder.
100 pulses is equal to 200 state changes of the output. To find the value of encoder counts on the system to equal your required output, divide the encoder resolution (8000) by the number of changes in state (200).
8000/200 = 40 encoder counts.

Example 3 - Brake

To use the output to signal the operation of a holding brake select "In Motion: close output when moving" to deactivate brake during move.

Note - "In Motion " and "In Position" do not work in pulse/direction and quadrature mode.

Creating Sequences

The *eXposition*™ software can also be used to create a “sequence” of moves or functions.

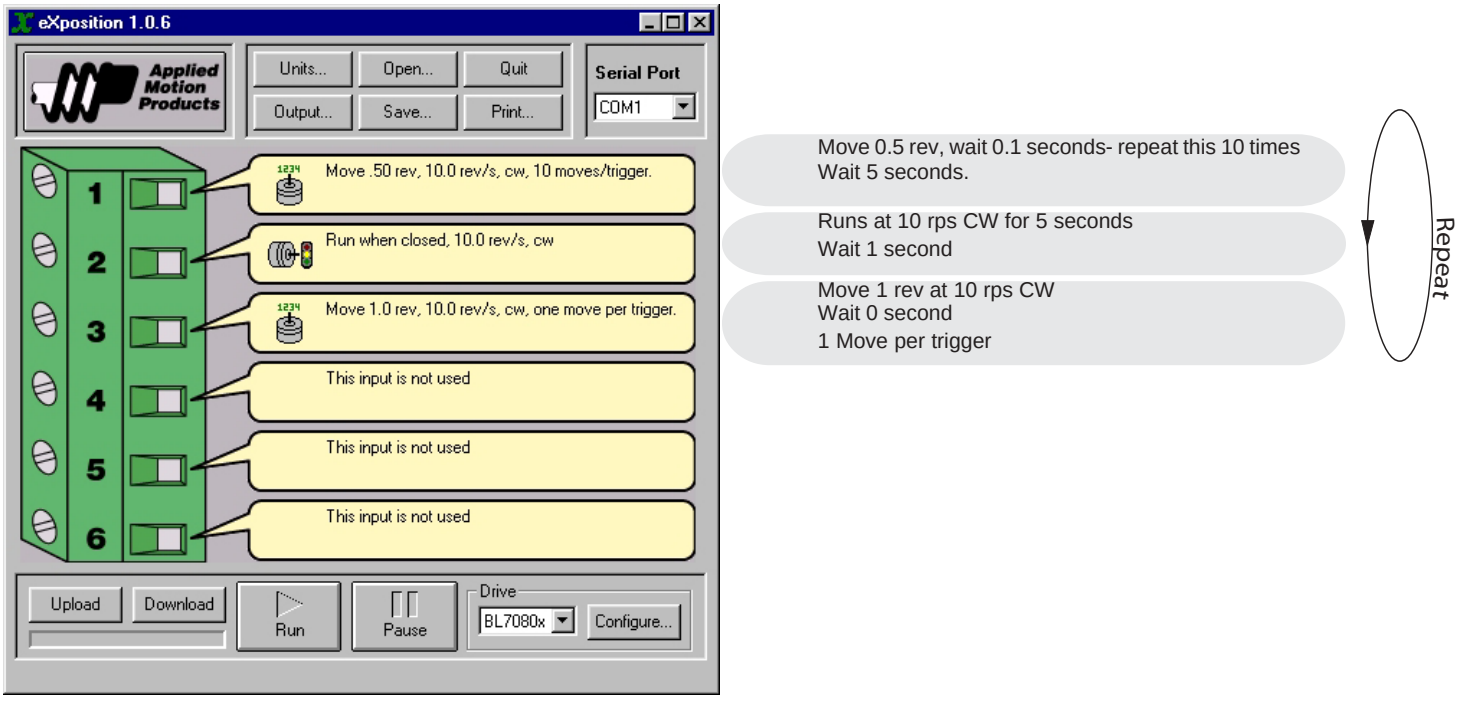
If a number of inputs are activated at power up, the *Xdrive*™ will scan them one by one, in order (from IN1 to IN6) executing each function in turn. After it has executed the last function it will return to the first input and start again.
For any inputs that have repeat moves set on the function assigned to that input , the drive will execute this function the required amount of times , including any time delay, before moving on to the next input.

The “Delay after Move” parameter allows you to control the delay between functions being executed.

NOTE - Any input configured as a RUN/STOP function, with no “Decelerate and Stop” time set, will effectively stop the sequence proceeding as the drive will just continue to run as long as that input is active.

The only way to stop a sequence from being performed is to make the inputs so they are not triggered. This will not halt a move that is in progress.

Example
An *Xdrive*™ with the following screen will cause the following sequence to be executed if IN1, IN2 and IN3 are triggered at power up.

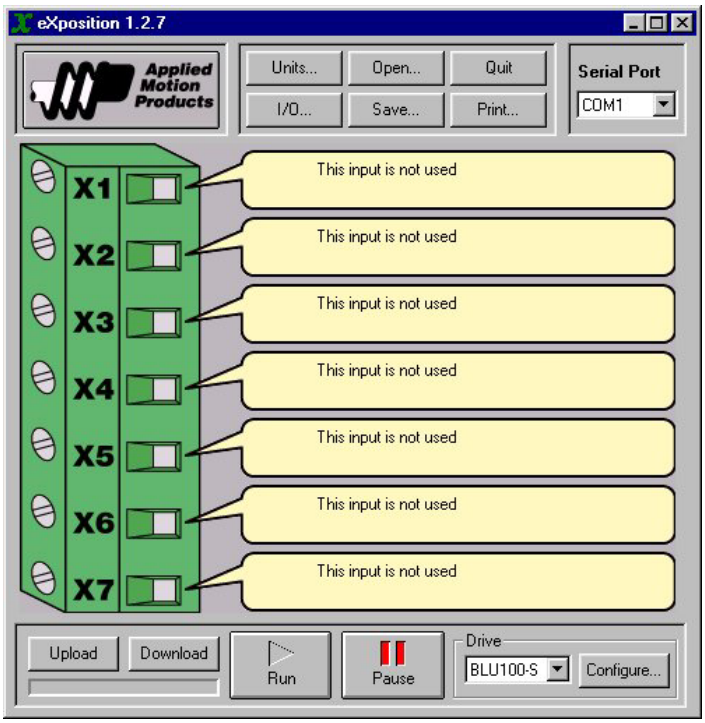


The Si™ system

If the sequence you want to create is more complex than the *Xdrive*™ can handle, please take a look at the Si™ simple indexer drives. These have many more functions and features. Information is available on our website www.appliedmotionproducts.com or through your distributor. The Si™ software and user manuals are also on the CD that you used to install the *eXposition*™ software.

Using eXposition on the BLu S and Si Series Servo Drives

When the *eXposition*™ software detects that it connected to the BLu Series Servo Drives it will display the following screen.



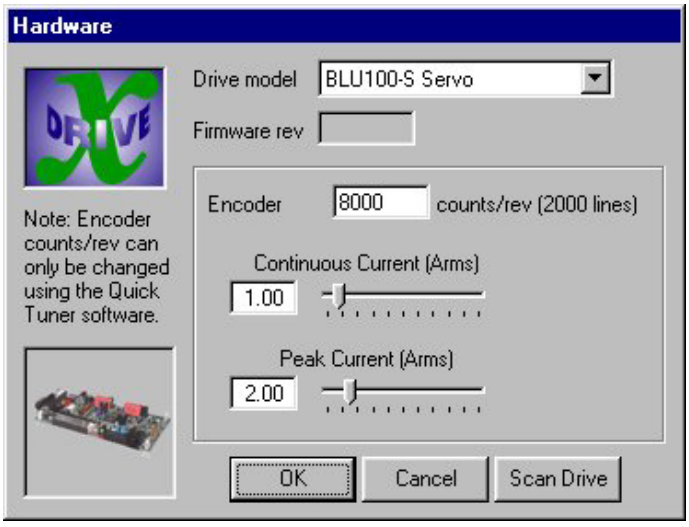
These drives have 7 inputs available to trigger functions , a table showing the functions possible on each input is shown below.

	Pulse and Direction	CW/-CCW	Quadrature encoder	Move	Move to Sensor	Run/-Stop	Speed/-Distance Select	Direction change	Sensor	End of travel limits	Servo Enable-#	Alarm Reset
X1	✔	✔	✔	✔	✔	✔						
X2	✔	✔	✔	✔	✔	✔		✔	✔			
X3				✔		✔			✔		✔	
X4				✔	✔	✔	✔		✔			✔
X5				✔	✔	✔	✔					
X6				✔	✔	✔	✔			✔		
X7				✔	✔	✔			✔	✔		
#also pauses the X program running.												

Step 1 - Configure the Hardware

Before you can use the drive you will need to configure a few parameters and get to know a little of how to use the software. To access “hardware specific” features of your drive, click on the “Configure” button. If your drive is connected to the PC, please apply power now, then click on “Scan Drive”. The “Drive Model” list will automatically select the correct model, and the other boxes will display current information from the drive, such as the firmware revision level.
From here you can change the drive current to suit your motor or application. To change the resolution of the encoder fitted to the motor or other servo tuning parameters you must use the Quick Tuner™ software supplied with your drive. Be sure to note the number of encoder counts per rev. You’ll need this in step 2.

Hardware Configuration

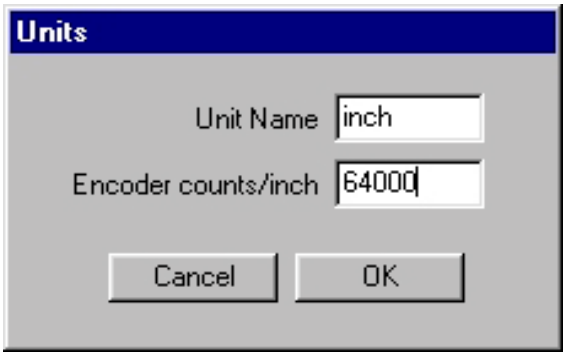


Clicking on the “configure“ button will bring up the hardware configuration box, here you can change the current settings for your motor or application. The BLu series drives allow you to set a value for Continuous Current and Peak Current. The peak current supplied by these drives is available for 1 second only. There may be times when you want to limit the current to your motor to be less than the maximum rated value, for example, when using a gearhead.

This box also displays details of the encoder fitted to the motor. If this value need to be changed please use the Quicktuner™ software.

Step 2 - Set the User Units

With many applications it is much easier to get the distances right if you can use units that make sense to you. With the *Xdrive*™ you can define your own units.



Example

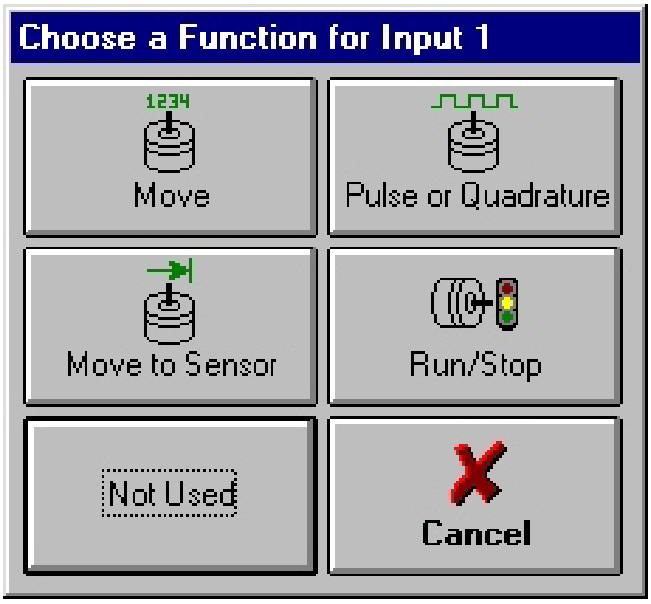
You have a leadscrew with 1/8” pitch, meaning that 1 turn of the leadscrew moves the load 1/8”. You

Step 3 - Assign Functions to Inputs

At this point you should have a definition of your machine's operation and the motion you need to create. You may want to create a flow diagram, or at least a list of the functions. Everything becomes easier if you write this out first.
You should also have determined what type of signal will be used to start each task.

You will see from later sections in this manual that different functions use a different number of the 7 inputs available. You may configure the *Xdrive*™ to have a combination of all of these functions, depending on the Input count of each function you choose.

Some functions are only available on certain inputs, so read through the manual carefully, also choosing some functions automatically assigns some inputs, so these are no longer available The best option is to install the software and try the configuration you want before proceeding. Latest software versions can be downloaded from our website www.appliedmotionproducts.com.

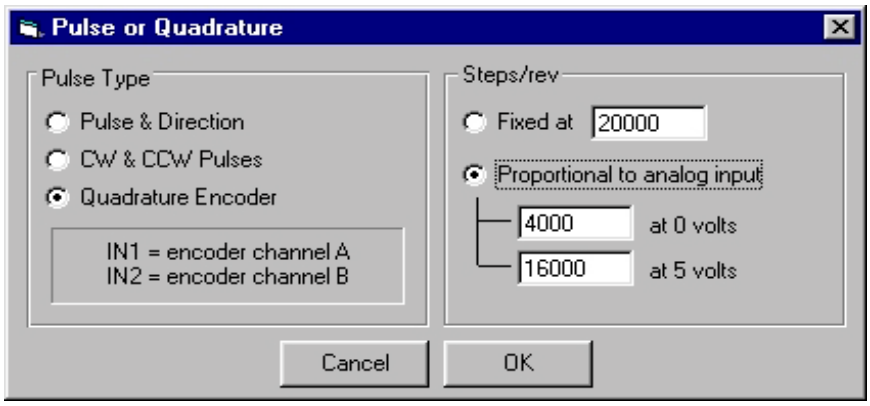


Once you have outlined your requirements and have decided to assign a function to a particular input , click on the cartoon bubble next to that input. You will see the following screen.

Choosing one of the basic functions will lead you to a specific dialog box .There you can describe the task at hand in terms of motor speed, acceleration rate, trigger condition and more.

Pulse or Quadrature

This function allows the *Xdrive*™ to be controlled by an external pulse and direction input and has three options, all are essentially the same but use a different external signal source. By selecting any of these options you automatically make X1 and X2 unavailable for other functions. The Pulse or Quadrature functions are not available on other inputs.



Pulse and Direction - Usually outputs from a Stepper Motor Controller . These give a train of pulses that determine speed and a direction signal to define a change in direction.
IN1= Step
IN2= Direction

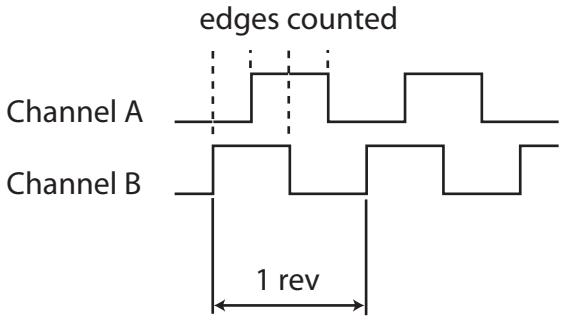
Stepper motor controllers come in many forms, they can be stand-alone units or PC based. Some PLCs have stepper motor control outputs.

CW & CCW Pulses - This option allows the *Xdrive*™ to be driven in either direction by a series of pulses fed into IN 1 **OR** IN2.
IN1= CW Pulse
IN2= CCW Pulse

This means that any pulses fed into IN1 will cause the motor to turn CW, and pulses fed into IN2 will cause the motor to turn CCW.

Quadrature Encoder - Encoders are rotary position/speed sensors that emit a series of pulses according to the speed/direction they turn. Using this type of input to drive a motor is sometimes called Encoder Following or Electronic Gearing. The drive accepts standard 5V encoder signals with a maximum pulse input frequency of 1Mhz.
Most encoders have four channels of signals usually called A and B and /A and /B. Feed these signals into IN1 and IN2 (refer to the hardware manual for connection information). The Encoder can be powered by the 5V auxiliary output available on the drive, 100mA max.

General Statements
Counts/Rev
With each of the functions you will have to enter the number of pulses that will determine one revolution of the motor. This will depend on the encoder that is fitted to the motor driven by the *Xdrive*™, this is called the feedback device. The *Xdrive*™ reads the feedback device in quadrature. Quadrature means reading each rising and falling edge of both channels of the feedback device. So for a motor fitted with a 2000 PPR (Pulses Per Rev) encoder the drive will have a resolution of 8000 Counts/Rev.



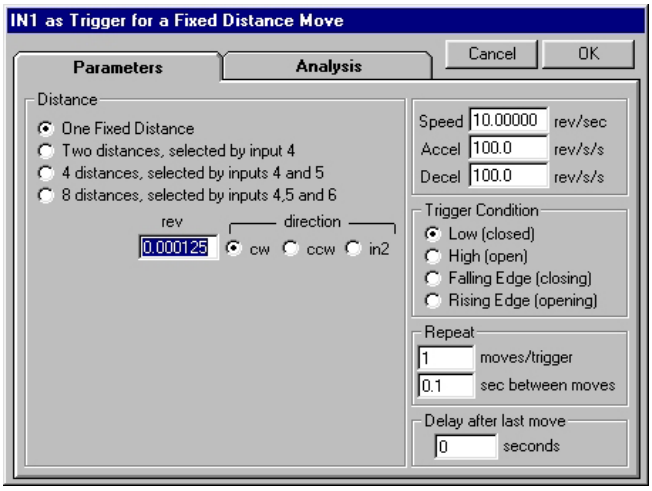
By varying the Counts/Rev you can force the *Xdrive*™ to turn at a ratio other than 1:1 to the master axis. For example if your master encoder generates 1000 pulses and you enter 2000 in the Steps/rev box the X Drive will follow at twice the speed of the master axis.

Analog Input
All the functions have the option of applying an external “scaling” signal that will modify the speed of the motor according to an analog input. This can be activated by checking the “Proportional to analog input” box.
Then you must enter the maximum and minimum scale factor that will apply by determining the number of steps per rev that will be applied when the analog input (Ain) is at maximum and minimum.

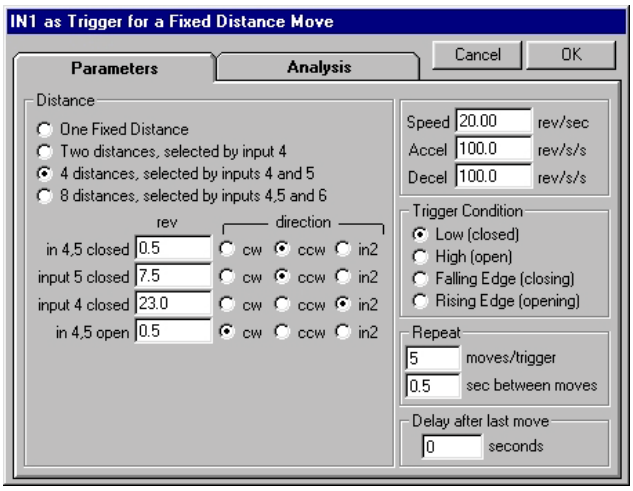
Move

The MOVE function makes the motor move a fixed distance on the trigger of an input. The distance, speed, acceleration and deceleration for the move can be selected. By selecting the move button you get a configuration screen where you enter the parameters for the move.

The screens below show how a different number of moves can be created in the two ways.



The screen above shows how one move distance can be created on each input, using this method up to six different moves can be created. Each move will then have completely different move characteristics. This configuration screen will have to be completed for each of the inputs used.



By assigning just inputs 1, 2 and 3 as MOVES and using a combination of inputs 4, 5 and 6 to select the move distance, up to 24 moves can be created . For each set of distances created on each input the Speed, Acceleration and Deceleration will be the same.

Trigger Condition

You must enter the conditions for the trigger input.
The four input conditions are:

High - when until the specified input reaches a *high* signal state. This is the default state of an input if nothing is connected to it.

Low - move when specified input is at a *low* signal state.

Rising Edge - move whenthe signal goes from low to high. This is similar to the high condition, but the difference is important. Let's say that you have a sensor wired to the *Xdrive*™ that will go high when you want motion to stop. However, the sensor signal stays high after motion is complete, going low sometime later. This often happens in labeling applications where there isn't much space on the roll between labels. If you choose high as your input condition, the *Xdrive*™ will complete the motion, then refuse to start again because the input signal is still high. If you choose rising edge, the *Xdrive*™ would proceed with the input voltage high and stop when the sensor signal goes from low to high again.

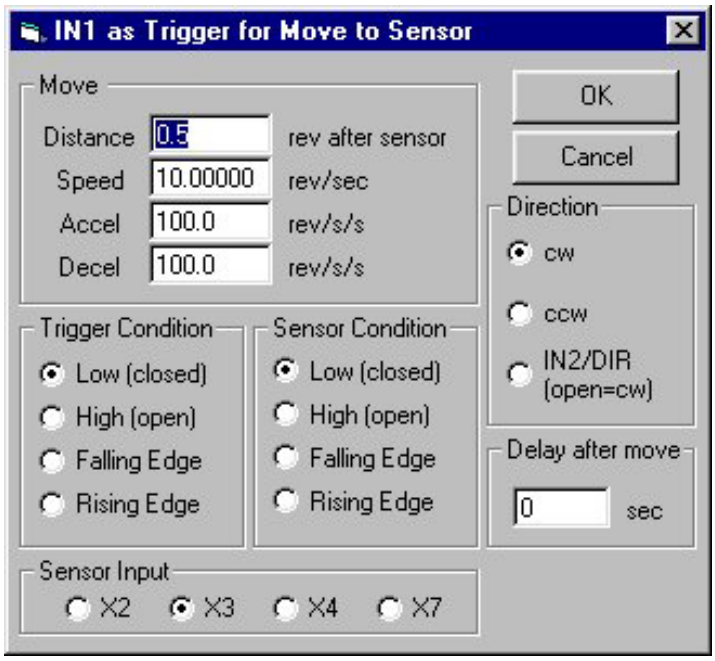
Falling Edge - the opposite of rising edge. The *Xdrive*™ waits for an input voltage to go high, then low.

Repeat Moves

Any of these moves can be repeated up to 65535 times by entering a value in the repeat box. There is also the option of entering a delay time between moves . This means, for example, you could use IN1 once to trigger a move and this move could be executed 5 times with a time delay of 1 second between the moves

Move to Sensor

The Move to Sensor command drives the motor at a given speed until a sensor is triggered.



The dialog box allows you to configure parameters for the move such as the Trigger Conditions, the Sensor parameters and the Direction of the move. You must also set the distance after the sensor before the move stops.

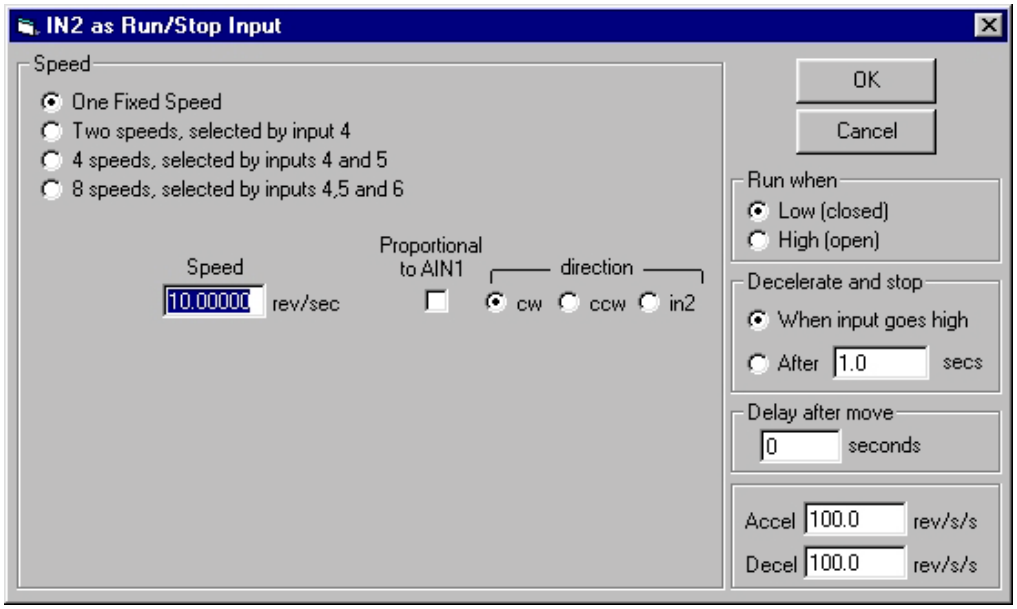
Sensor Input

BLu Drives allow you to use X2, X3, X4 and X7 as sensor inputs, so different trigger conditions can be created by using two or more sensors.

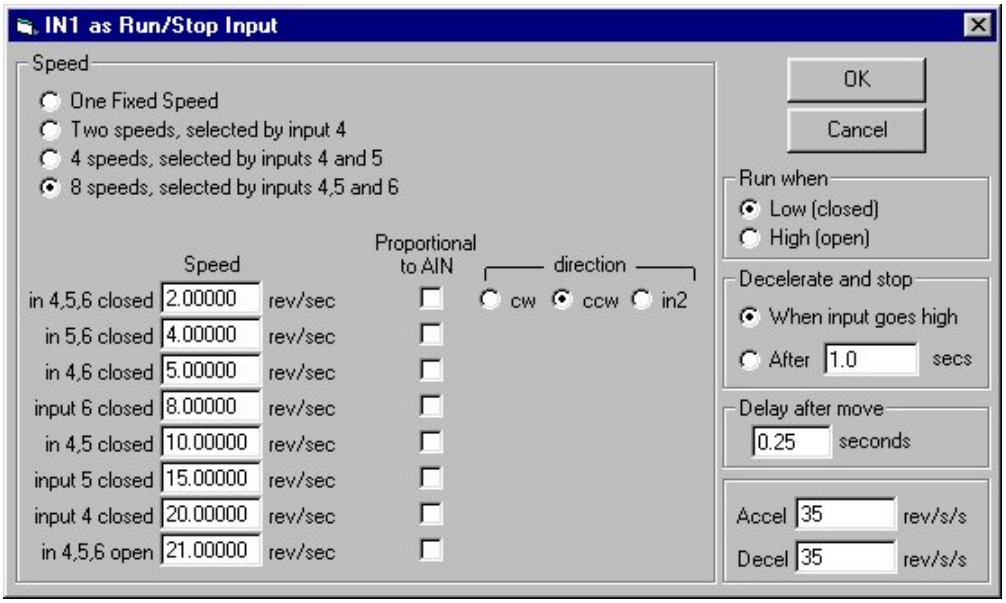
If X2 is used to command the direction, then X2 cannot be used to trigger (start) this move or any other move.

Run/Stop Input

Another very simple requirement may be to just run at a pre-configured speed while an input is held in a particular state (i.e. high or low /open or closed) or to run for a given time. You choose which of these options you want by entering values in the “Decelerate and Stop” section of the screen.



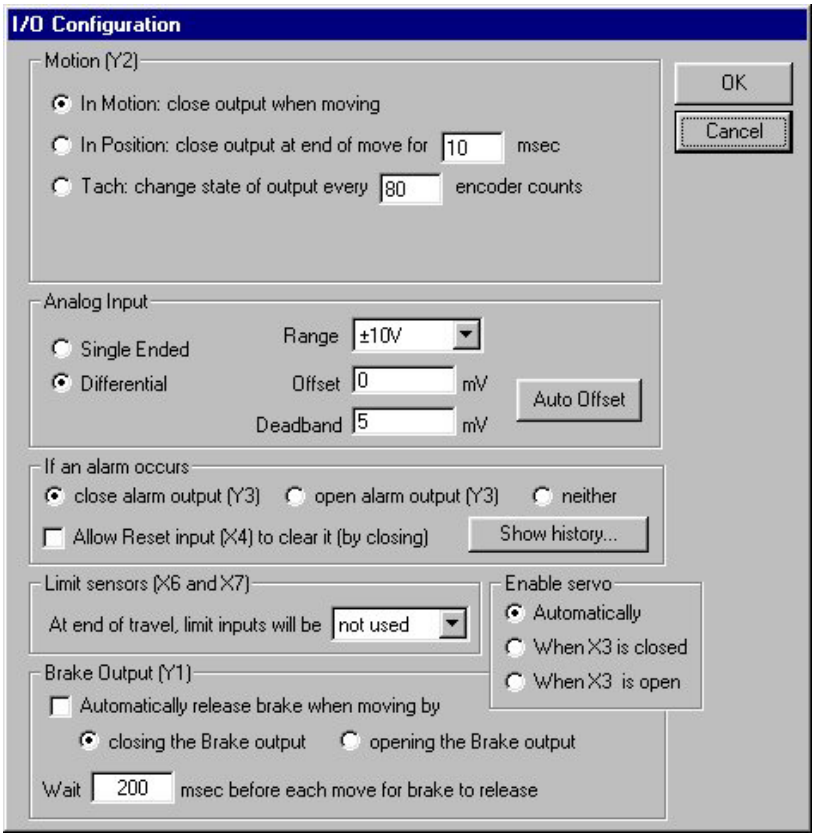
Alternatively more than one input can be used, this enables you to select between as many as 8 speeds. IN2 can be used to determine the direction of rotation or the direction of rotation can be fixed, freeing IN2 for other functions. If IN2 is LOW (Closed) the motor will turn in CCW, if it is HIGH (Open) it will turn CW.



Alternatively the speed could be controlled by an analog input fed into the analog input (AIN). This could come from a potentiometer circuit or the analog output of a PLC. The voltage range that AIN can accept is selected by the I/O configuration window.

I/O Configuration

With the BLu series drives there are a number of hardware features you can use in your application. These are accessed via the I/O button.



Motion Output

The motion output can be used in three different ways.

1. To close the output when there is motion on the motor.

2. To close the output at the end of the move, you can specify how long the output should remain active.

Min time = 1mS
Max time= 250mS

3. To act as a digital tachometer signal. You can specify how often the output will change state in encoder counts.

Min = 1
Max = 255

Analog Input

The Analog Input can be used with the Pulse or Quadrature and the Run/Stop commands to “scale“ the speed or distance.
This input can be either a Single Ended or Differential input, you must select the correct option in the I/O dialog box.
There are also 4 choices of voltage input:

- 0 to +5V
- + / - 5V
- 0 to +10V
- + / - 10V

When the +/- voltages are selected the system can be scaled from full positive to full negative speed.

Example : You have selected Run/Stop on input 1 (X1).The maximum speed entered is 25 revs/sec, you have selected that this speed will be proportional to AIN. Your analog signal has been selected to be +/-10V.
When +10v is applied the speed will be 25 rps CW. When -10V is applied the speed will be 25 rps CCW. If X2 is activated the direction of rotation will be reversed. The change in direction will use the Acceleration and Deceleration parameters set in the Run/Stop configuration screen.

Alarm and Alarm Reset

The drive features an Alarm Output that will be triggered if there is a fault condition. This fault may be a fault within the drive or it may indicate a system fault. Not all these faults will cause the drive to be disabled.

The condition that may trigger a fault are:

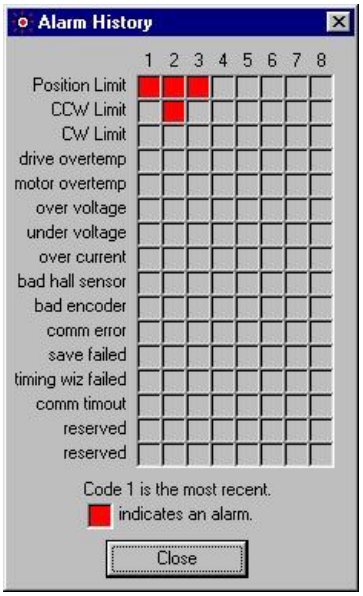
Position Limit	Indicates a Position Error fault
CW or CCW Limit	An end of travel limit input is activated.
Drive Over temperature	The drive becomes hot becuse the motor has continuously drawn a high amount of current.
Over Voltage	The Drive voltage has become too high, this could be due to the power supply voltage, or due to regeneration voltage from the motor. This may occur when a motor with a high inertia load decelerates
Under Voltage	The supply voltage for the drive has fallen under the minimum level required
Over Current	
Bad Hall Sensors	Indicates bad Hall sensor pattern
Bad Encoder	Indicates lost encoder signal
Comm Hardware Error	
Save Failed	
Wizard failed	
Comm Rx Timeout.	

Alarm Reset

The Alarm Reset input (X4) is used to clear the Alarm . This will only clear the Alarm Output and will

not reset the drive unless you choose for it to do so by checking the other box in the Alarm dialog box. If you do not check this box you will have to cycle the power on the drive to clear the fault condition. There is good reason for this. An Alarm condition may indicate a fault on the drive or it may indicate a error on you machine or system. Resetting the drive at this point will make the drive able to respond to any command signal present and could result in damage to your machine or possibly injury.

Alarm History



The BLu Series drives stores a log of previous alarm conditions.

Each time there is an fault, the drive stores the information of which alarms were triggered at this time, as a fault may trigger more than one alarm condition, the drive stores all of them for reference. This information can then be viewed by clicking on the Alarm History button to help with drive and system problem solving. The drive stores up to 8 alarm conditions.

Alarm Codes

Another indication of an error are the LEDs on the main board of the drive. In the event of an error, the green LED on the main board will flash one or two times, followed by a series of red flashes. The pattern repeats until the alarm is cleared.

Please note- a flashing green light indicates the drive is “Enabled” . Also the red LED flashes during communications to the drive. These should not be confused with error conditions.

Code	Error
1 red, 1 green	position error exceeds fault limit
2 red, 1 green	ccw limit
2 red, 2 green	cw limit
3 red, 1 green	drive internal temperature exceeds 85°C
3 red, 2 green	motor over temperature
4 red, 1 green	power supply voltage is more than 55 VDC
4 red, 2 green	power supply voltage is less than 18 VDC
5 red, 1 green	over current / short circuit

6 red, 1 green	bad commutation (Hall) signal
6 red, 2 green	bad encoder signal
7 red, 1 green	serial communication error

Limit Switch Input

The BLu series drives have two inputs that can be configured as end of travel limit switches (X6 and X7). These are useful for linear applications such as actuators.

This dialog box is where you tell the drive whether your input switches or sensors are Open or Closed when they are activated. You can also select the “Not Used” option for when limit sensors are not present.

When a limit switch is activated motion in that direction will stop. While this limit is still active it will be possible to rotate in the opposite direction. When the limit is deacitvated , travel in this direction will be possible again.

Servo Enable

X3 can be configured as a Servo Enable Input and allows you to turn the power stage of the drive on and off. This means that the drive can be on, with power going to it, but the motor will not be active.

WARNING
Care must be taken when using the Servo Enable input.

If you enable a drive when a command input is present, the motor will attempt to perform the move or achieve the speed or torque demanded. So when you enable the drive be sure it is safe to do so.

Alternatively if you disable a drive during a move the motor will no longer have power and it will be allowed to turn freely. If your motor has a large inertia load, or is holding a load against gravity, the motor will no longer have control of the load.

Brake Output

For use when your servo motor is fitted with a fail safe holding brake (Y1). These are normally used to hold the load in position when the motor is at zero speed, often used when the motor is holding a load against gravity.
Most brakes are fail safe, this means it requires a voltage to hold the brake in the OFF position, allowing the motor to move.

The output give you a choice between closing or opening the brake output to release the brake output. Please select this option with care as the wrong choice could damage your system.

The Brake also has a time delay feature. This will create a time delay between the brake being released and the move being started. This could create a time lag in your system as the motor will not respond instantly to any command.

For example; your dwell time for the brake is set at 200mS. In your program you have a “Move” that

will be activated by X5. This move is to be repeated 10 times with NO interval. Because of the delay

time configured for the brake, there will be a 200mS delay between the moves.

Creating Sequences

The *eXposition*™ software can also be used to create a “sequence” of moves or functions.

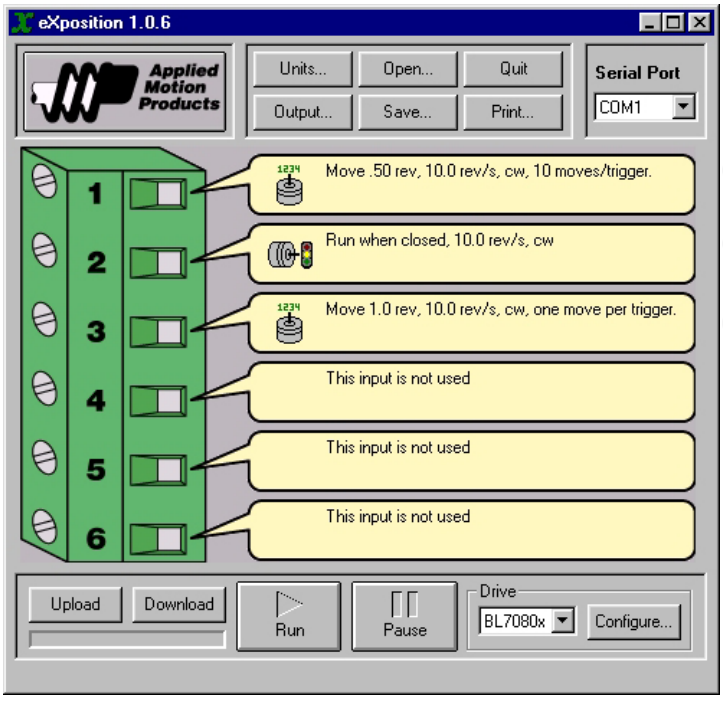
If a number of inputs are activated at power up, the *Xdrive*™ will scan them one by one, in order (from X1 to X7) executing each function in turn. After it has executed the last function it will return to the first input and start again.
For any inputs that have repeat moves set on the function assigned to that input , the drive will execute this function the required amount of times , including any time delay, before moving on to the next input.

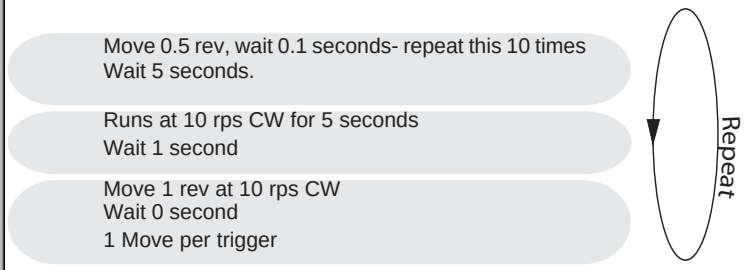
The “Delay after Move” parameter allows you to control the delay between functions being executed.

NOTE - Any input configured as a RUN/STOP function, with no “Decelerate and Stop” time set, will effectively stop the sequence proceeding as the drive will just continue to run as long as that input is active.

The only way to stop a sequence from being performed is to make the inputs so they are not triggered. This will not halt a move that is in progress.

Example
An *Xdrive*™ with the following screen will cause the following sequence to be executed if X1, X2 and X3 are triggered at power up.





The Si™ system

If the sequence you want to create is more complex than the *Xdrive*™ can handle, please take a look at the Si™ simple indexer drives. These have many more functions and features. Information is available on our website www.appliedmotionproducts.com or through your distributor. The Si™ software and user manuals are also on the CD that you used to install the *eXposition*™ software.