

PROTEUS IPE Software Manual

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1. Introduction

Proteus IPE (**Interactive Programming Environment**) is a Windows program for programming, configuring and debugging Proteus XES controller. Main features of the Proteus IPE are:

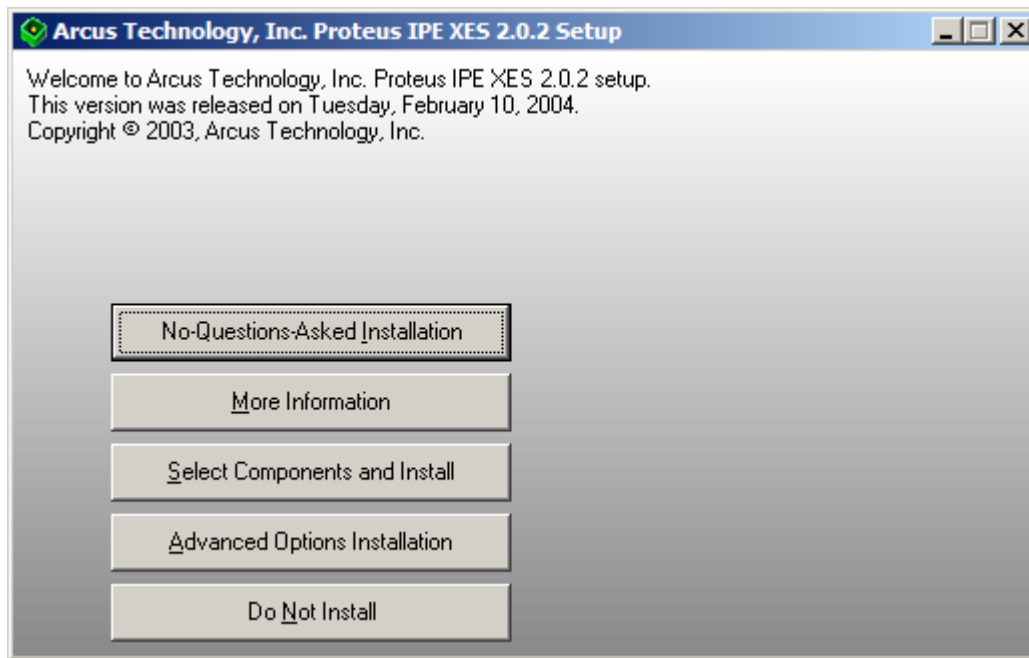
- Windows 2000, XP compatible
- USB/Ethernet/RS-232 communication
- Multiple Document Interface for managing multiple programs simultaneously
- Graphical Controller Setup and Configuration Management
- On-line Language Help

2. Installation

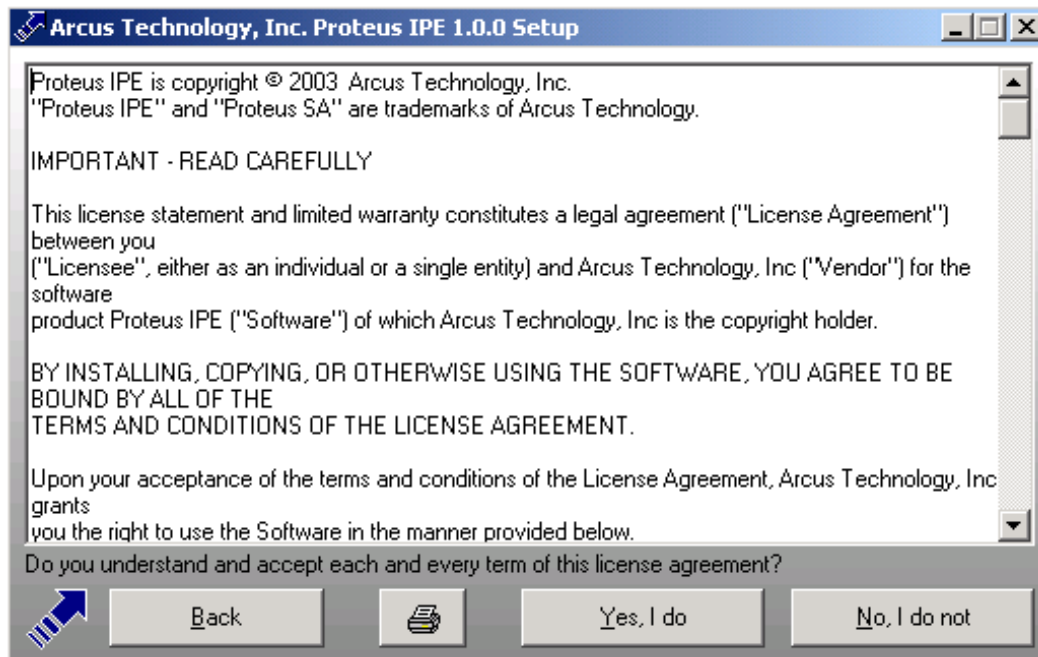
Run the Proteus IPE Setup program:



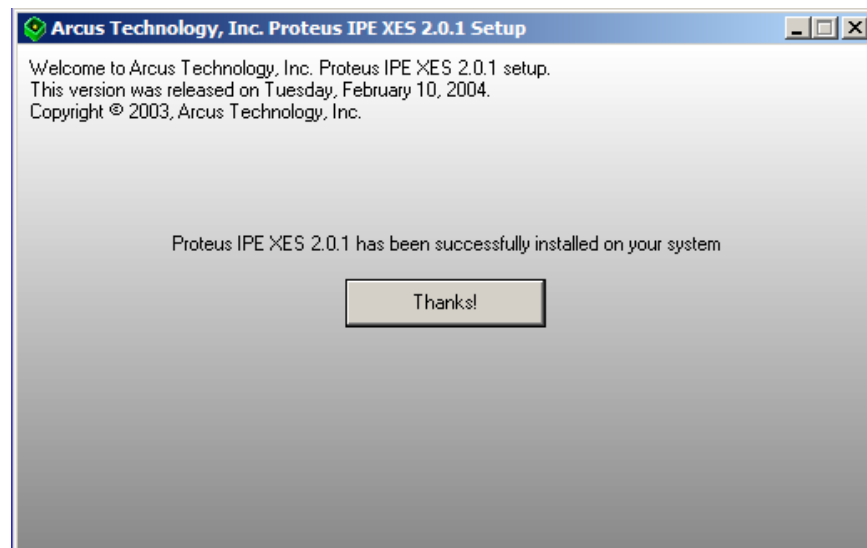
From the opening screen click the button for **No-Questions-Asked Installation**



Read the License Agreement and click **Yes, I do button**.



All necessary files and programs will be installed and you should see the following screen indicating successful installation:



After successful installation, following files are installed:

- Proteus IPE
- Proteus XE Hardware Manual
- Proteus XE Software Manual
- Proteus XE IPE Manual
- Sample Communication Program in VC++, VB, LabVIEW

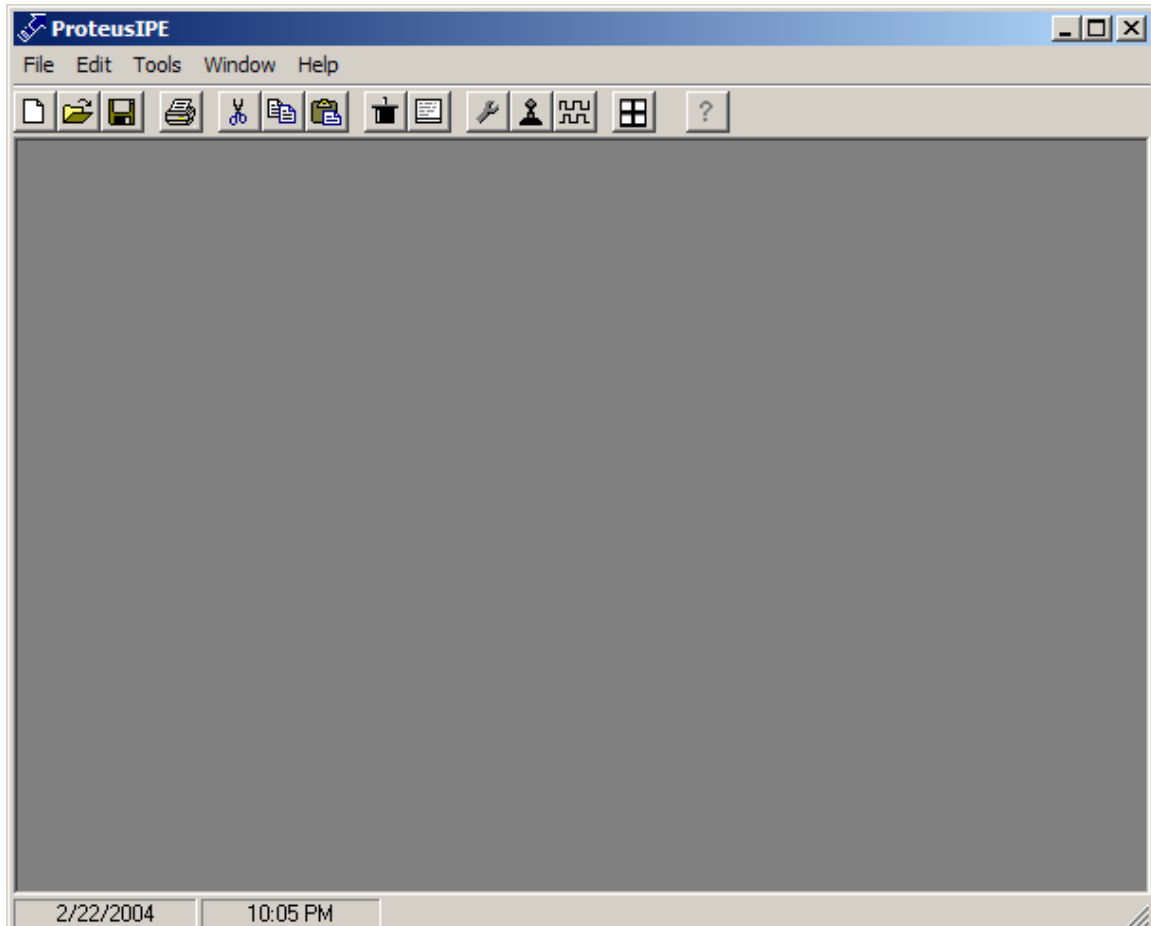
3. Using Proteus IPE

3.1 Starting Proteus IPE

Run the Proteus IPE program by selecting the following icon:



Following main screen will open:

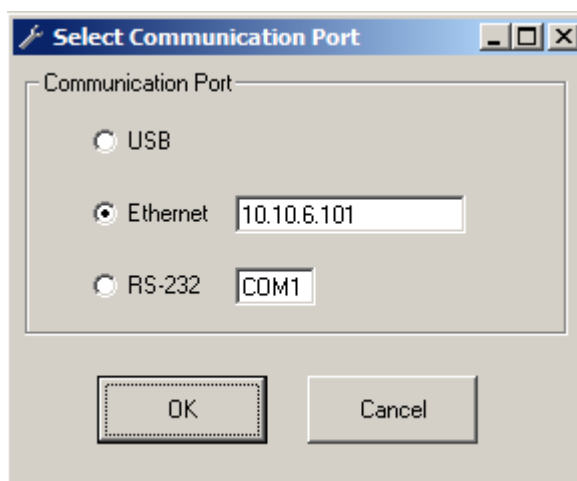


3.2 Communication Setup

Proteus IPE uses one of following communication methods to communicate with Proteus XES:

- 1) USB
- 2) Ethernet
- 3) RS-232

To select the communication method, select **Tools/Setup Communication** from the menu. Following dialog will show.



Select the desired communication port and click OK button.

Notes for Ethernet Communication:

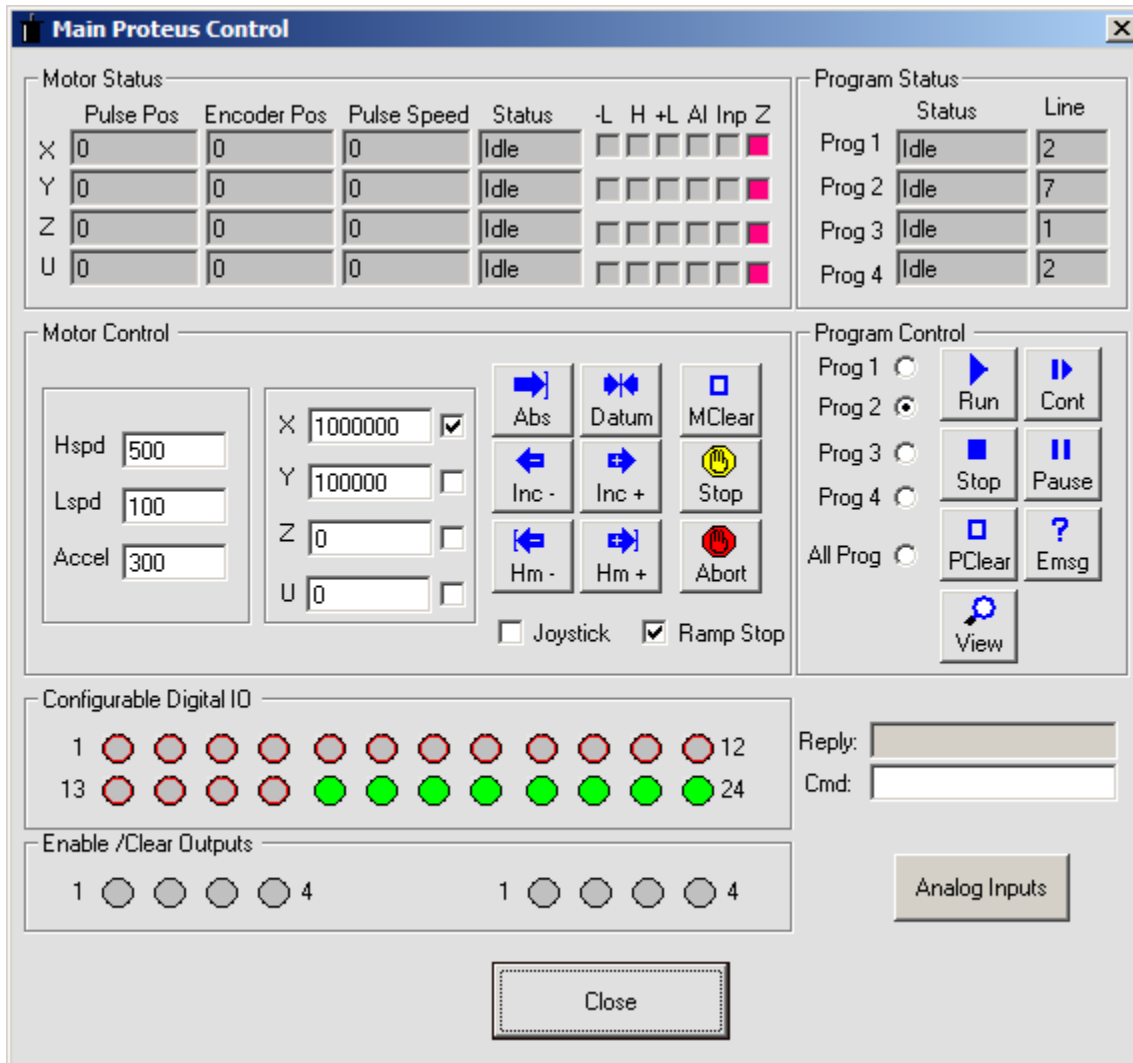
- When selecting Ethernet, make sure that the Proteus XES controller's IP address matches with the IP address in the communication setup.
- Default IP Address when the Proteus XES unit is shipped is **10.10.6.101**.
- See the setup screen to set the IP Address of Proteus XES controller.
- Interactive command IPA can be used to find out the IP Address of Proteus XES controller.

3.2 Main Control Screen

Open the main control screen by selecting **Tools/Control** from the menu or clicking the following button:



Following control screen will open:



There are five main sections:

- Motor Status Section – All the motor positions/speed and switch status are shown.
- Motor Control Section – Move motions can be controlled here.
- Digital IO Control Section – Digital Inputs and Outputs are shown here.
- Program Status Section – Status of four motion programs are shown here.
- Program Control Section – Program control is done here. Programs also can be viewed.

3.2.1 Motor Status Section

Motor Status						
	Pulse Pos	Encoder Pos	Pulse Speed	Status	-L	H +L Al Inp Z
X	0	0	0	Idle	<input type="checkbox"/>	<input type="checkbox"/>
Y	0	0	0	Idle	<input type="checkbox"/>	<input type="checkbox"/>
Z	0	0	0	Idle	<input type="checkbox"/>	<input type="checkbox"/>
U	0	0	0	Idle	<input type="checkbox"/>	<input type="checkbox"/>

In this section, Pulse Positions, Encoder Positions, Pulse Speed, Motor Status, and Limit/Home/Alarm/In Position/Z index encoder channel input status are shown.

The Pulse Speed unit is in pulses/second.

Motor status can be one of the following:

Idle – motor is not moving.

Accelerating – motor is ramping up

Constant – motor is running at constant speed or in joystick mode

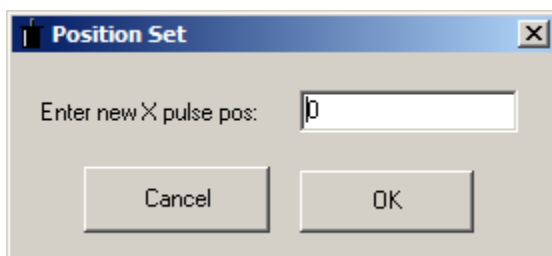
Decelerating – motor is ramping down

Error Alarm – Alarm switch was triggered

Error Limit – Limit switch was triggered.

The limit/home/alarm switch polarity can be set from the Setup screen as described later.

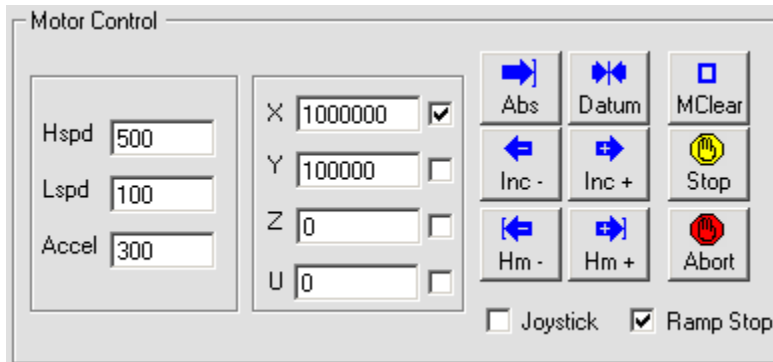
You can change the current pulse position or encoder position by double clicking the position text box, which will show the following dialog box:



The dialog box is titled "Position Set" and has a close button (X) in the top right corner. It contains a label "Enter new X pulse pos:" followed by a text input field containing the value "0". At the bottom, there are two buttons: "Cancel" and "OK".

Here you can enter the new position and hit OK to set the new position.

3.2.2 Motor Control Section



In the motor control section, you can move the motor individually or in linear interpolation.

Move parameters are:

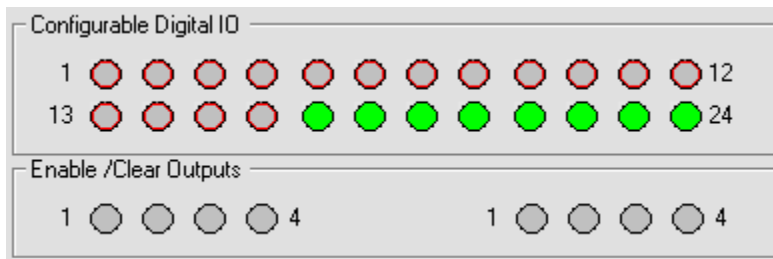
- Hspd – High target speed. Unit is in pulses/second.
- Lspd – Low start and end speed. Unit is in pulses/second.
- Accel – Acceleration and deceleration time in milliseconds.
- X, Y, Z, U – target positions

You can select which motors to move by checking the checkboxes. For multiple motors selected, linear interpolation is used to move the selected motors. Linear interpolation ensures simultaneous starting and stop of the selected motors.

There are several move controls:

- Abs** – absolute move. Selected motors will move the absolute target position
- Datum** – datum move. Selected motors will move to absolute 0 position.
- Inc-** and **Inc+** - incremental move. Selected motors will move incrementally from the current position.
- Home-** and **Home+** - Perform home search action. Home search is done using the limit switches and home switch. See HOME command in the Proteus SA language manual for details of the home search operation.
- McClear** – clear motor error. When the motor hits the alarm or limit, the motor goes into error state. Use this button to clear any motor error. Once motor is in error, no moves can be performed until this error is cleared.
- Stop** – stops the motors. Depending on whether the ramp checkbox is checked, Stop will either immediately stop the selected motor or ramp stop the selected motor.
- Abort** – stops all the motors and programs. This will immediately stop any motors in motion as well as stop any motion programs running.
- Joystick** – When this is checked, selected axes go into joystick control mode. See Joystick setup for details.
- Ramp Stop** – When this is checked, **Stop** will decelerate the motor. If this is not checked, the motor will stop immediately without deceleration.

3.2.3 Digital IO Control Section



This section shows the status of the 24 configurable digital IO, 4 enable outputs, and 4 clear outputs.

For the 24 configurable digital IO, the red shade as shown below indicates that the IO is configured as output.



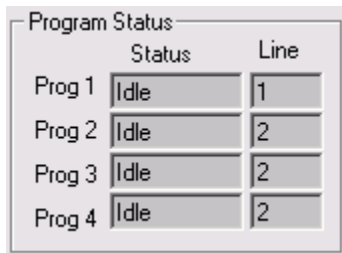
The green shade as shown below indicates that the IO is an input.



You can toggle the digital outputs/enable outputs/clear outputs by clicking on the individual pictures.

See Setup section for configuration of digital IO as inputs or outputs.

3.2.4 Program Status Section



Program status section shows the current status of the 4 motion programs as well as the current line number of the motion programs.

Program Status can be one of following:

Idle – program is idle and not running

Paused – program is paused

Running – program is running

Error – program is in error. PEMSG is used to see the program error message.

3.2.5 Program Control Section



In this section, you can control the motion program:

Run – run the selected motion program from the beginning

Stop – stop the selected motion program from running

Pause – pause the selected motion program.

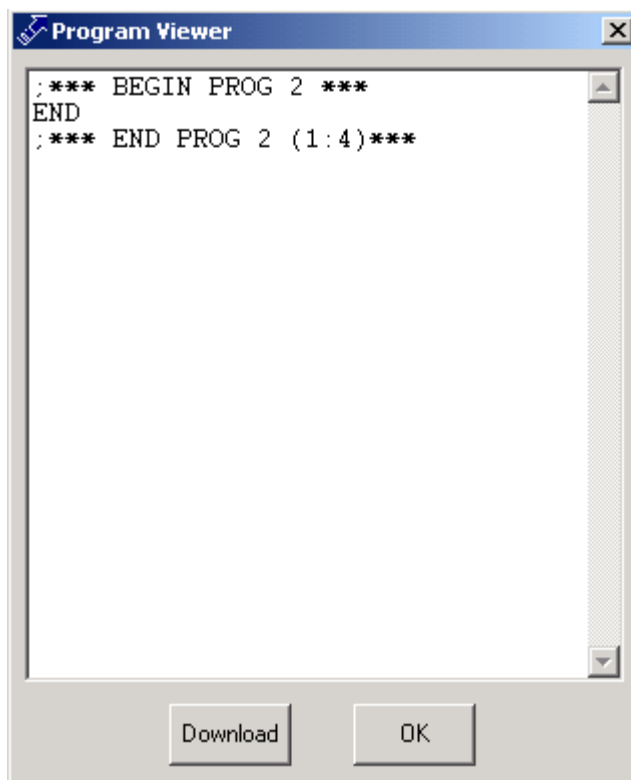
Continue – continue the paused motion program.

Pclear – Clears the motion program in error, Once motion program is in error, you cannot run until the error is cleared.

Emsg – See the program error message.

View – View/Edit/Download selected motion program.

When you hit View button following dialog box pops up with the content of motion program:



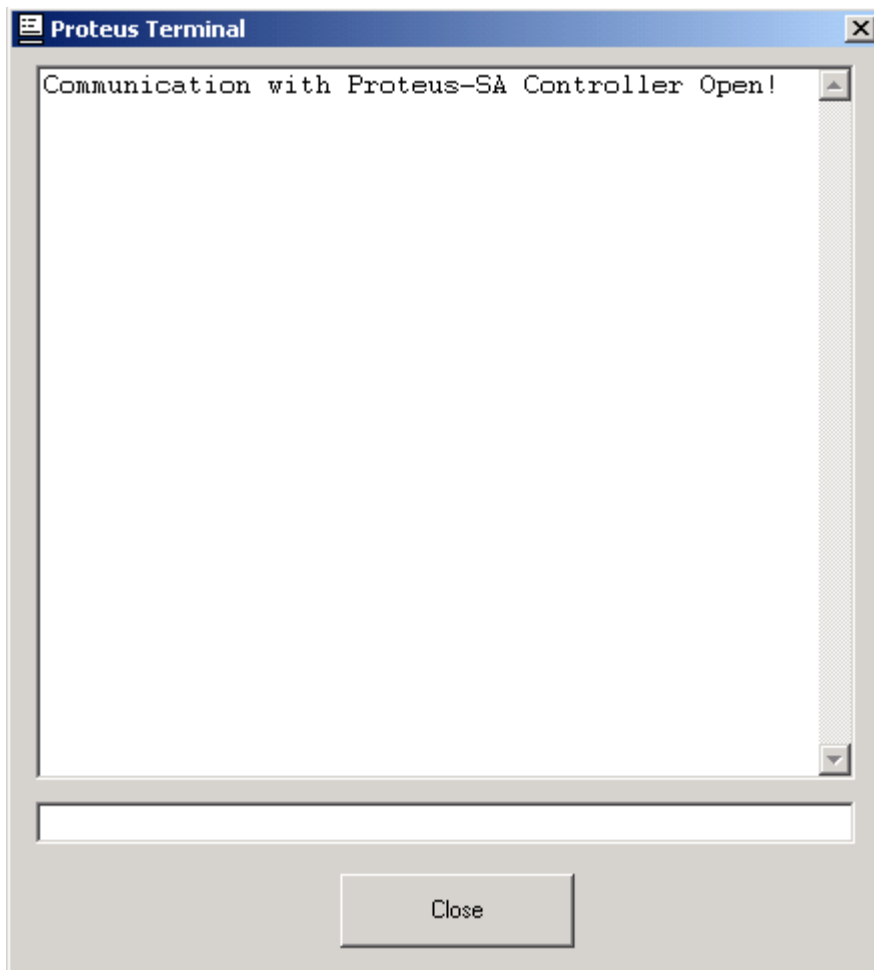
Here you can edit and download the motion program. Download is allowed only if the program is idle.

3.3 Terminal Screen

Open the terminal screen by selecting **Tools/Terminal** from the menu or clicking the following button:



Following screen will display:



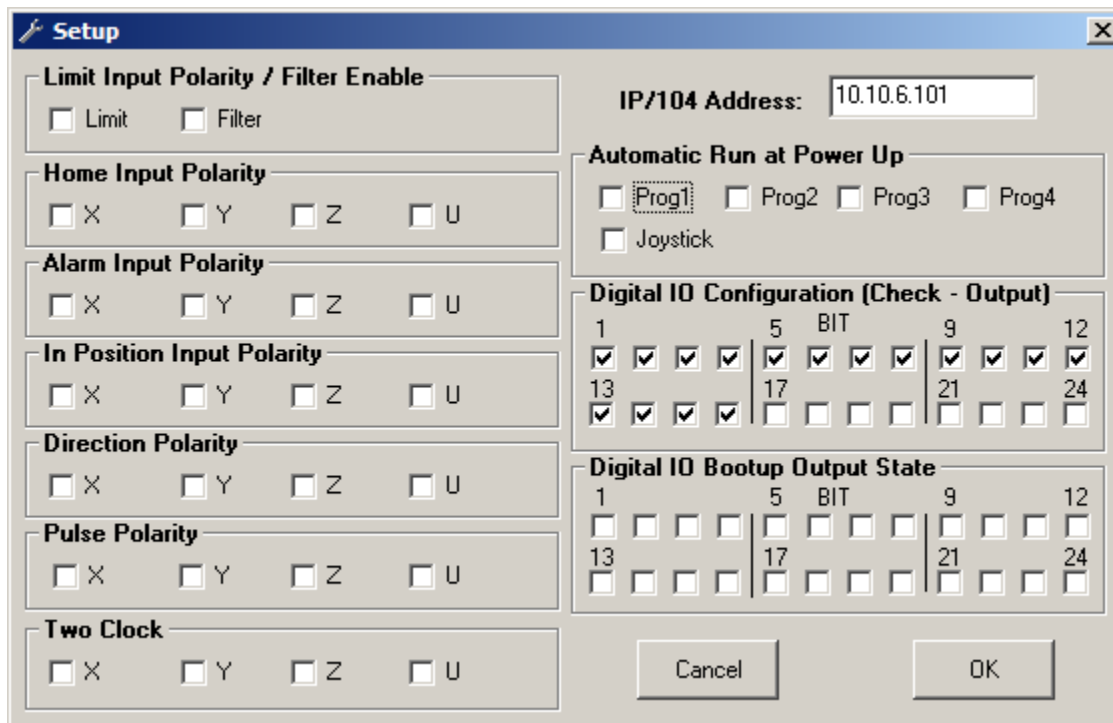
On the bottom text line, you can manually enter Interactive Commands and see the reply on the text box above. (See Proteus XE Software Manual for details on Interactive commands)

3.4 Setup Screen

Open the setup screen by selecting **Tools/Setup** from the menu or clicking the following button:



Following dialog box will show:



The Setup dialog box contains the following sections:

- Limit Input Polarity / Filter Enable:**
 - ☐ Limit
 - ☐ Filter
- Home Input Polarity:**
 - ☐ X
 - ☐ Y
 - ☐ Z
 - ☐ U
- Alarm Input Polarity:**
 - ☐ X
 - ☐ Y
 - ☐ Z
 - ☐ U
- In Position Input Polarity:**
 - ☐ X
 - ☐ Y
 - ☐ Z
 - ☐ U
- Direction Polarity:**
 - ☐ X
 - ☐ Y
 - ☐ Z
 - ☐ U
- Pulse Polarity:**
 - ☐ X
 - ☐ Y
 - ☐ Z
 - ☐ U
- Two Clock:**
 - ☐ X
 - ☐ Y
 - ☐ Z
 - ☐ U
- IP/104 Address:** 10.10.6.101
- Automatic Run at Power Up:**
 - ☐ Prog1
 - ☐ Prog2
 - ☐ Prog3
 - ☐ Prog4
 - ☐ Joystick
- Digital IO Configuration (Check - Output):**

1	5	BIT	9	12
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
- Digital IO Bootup Output State:**

1	5	BIT	9	12
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Buttons: Cancel, OK

From this setup screen, you can setup the polarity of input switches, such as home/alarm/in pos as well as polarity of outputs, such as direction/pulse polarity and one/two clock pulse output mode.

IP Address or PC104 address can be set. If the address setting is changed, you need to save the new setup values in the EEPROM and the controller needs to be powered cycled for the new address to take effect.

Automatic Run at Power Up setup is used so that the controller automatically starts the program after power up.

Each of 24 bits of digital IO can be configured as input or output. By checking the checkbox, the DIO is configured as an output.

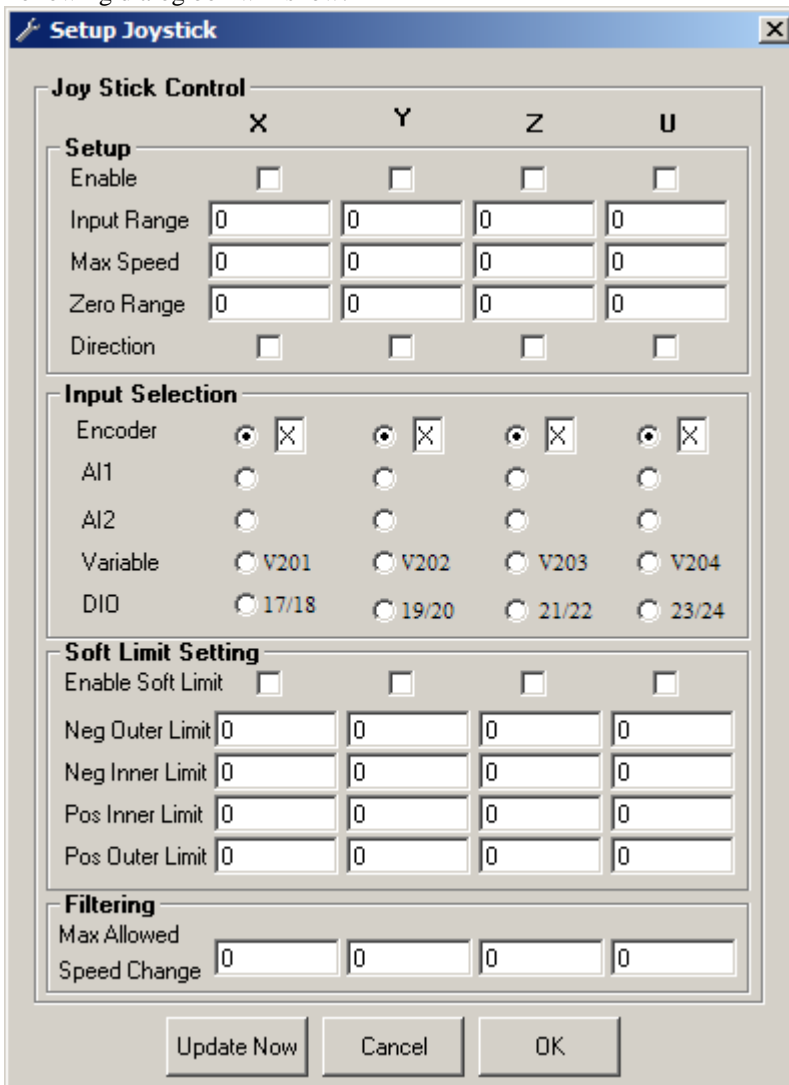
Remember that once the setup is changed, it is stored in the memory. To make the new setup permanent, store the values in EEPROM using STORE command or from **Tools/Store from Memory to EEPROM**.

3.5 Joystick Setup Screen

Open the joystick setup screen by selecting **Tools/Setup** from the menu or clicking the following button:



Following dialog box will show:



The **Setup Joystick** dialog box is divided into several sections for configuring joystick control across four motors (X, Y, Z, U).

	X	Y	Z	U
Setup				
Enable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input Range	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Max Speed	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Zero Range	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Direction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input Selection				
Encoder	<input checked="" type="radio"/> X	<input checked="" type="radio"/> X	<input checked="" type="radio"/> X	<input checked="" type="radio"/> X
AI1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
AI2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Variable	<input type="radio"/> V201	<input type="radio"/> V202	<input type="radio"/> V203	<input type="radio"/> V204
DIO	<input type="radio"/> 17/18	<input type="radio"/> 19/20	<input type="radio"/> 21/22	<input type="radio"/> 23/24
Soft Limit Setting				
Enable Soft Limit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neg Outer Limit	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Neg Inner Limit	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Pos Inner Limit	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Pos Outer Limit	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Filtering				
Max Allowed Speed Change	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>

Buttons at the bottom: **Update Now**, **Cancel**, **OK**

Joystick control can be done on any of the 4 motors.

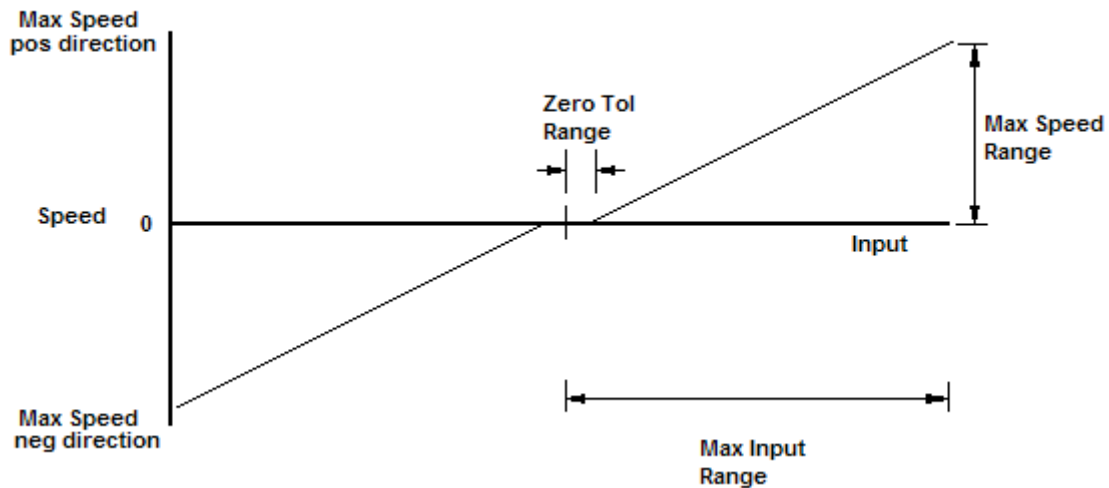
Joystick input can be any of the following:

- Analog Input
- Digital Encoder Input
- Variable
- Digital IO

Input Setup

Setup				
Enable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Input Range	0	0	0	0
Max Speed	0	0	0	0
Zero Range	0	0	0	0
Direction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Enable - The enable button on top enables joystick control on any of the 4 motors. Note that once the motor is in joystick control manual move commands cannot be performed.



Input Range – The input range sets the maximum amount for the input that corresponds to maximum speed. When analog input is selected, the unit is in mV. When analog input is selected for joystick, input range is 2500 mV which corresponds to half of 5V or 5000 mV. When digital encoder position is selected, Input Range corresponds to maximum encoder position range from zero.

Max Speed – this value is the maximum motor speed when the input is at its maximum.

Zero Range – this value is the tolerance range for zero speed. Zero tolerance range is used so that when the joystick is in the middle, the motor does not move when there is any slight change in the zero value.

Input Selection

Input Selection				
Encoder	<input checked="" type="radio"/> X	<input checked="" type="radio"/> X	<input checked="" type="radio"/> X	<input checked="" type="radio"/> X
AI1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
AI2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Variable	<input type="radio"/> V201	<input type="radio"/> V202	<input type="radio"/> V203	<input type="radio"/> V204
DIO	<input type="radio"/> 17/18	<input type="radio"/> 19/20	<input type="radio"/> 21/22	<input type="radio"/> 23/24

For joystick input, any of the following can be selected: Encoder, Analog input, Variable, and DIO

Encoder – when encoder position is selected as joystick input, enter which encoder motor is to be used: X, Y, Z, and U.

AI1/AI2 – when analog input is used, input range is 0 to 2500 mV.

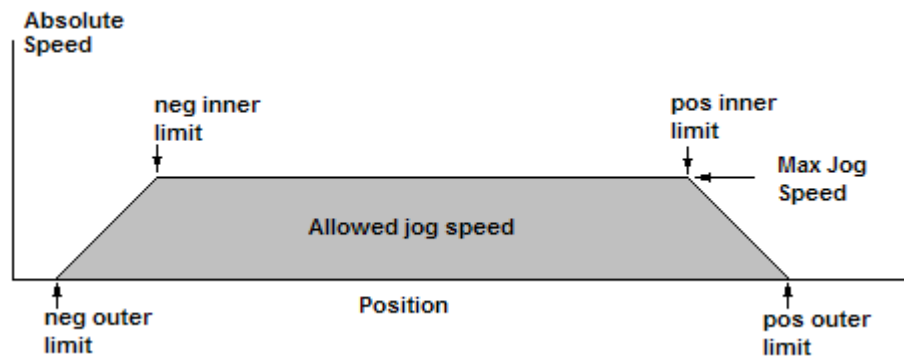
Variable – when variable is used, preset variable 201/202/203/204 is used for X/Y/Z/U axis respectively.

DIO – when DIO is used, preset digital IO 17/18 is used for X, 19/20 is used for Y, 21/22 is used for Z, and 23/24 is used for U axis.

Soft Limit

Soft Limit Setting				
Enable Soft Limit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neg Outer Limit	0	0	0	0
Neg Inner Limit	0	0	0	0
Pos Inner Limit	0	0	0	0
Pos Outer Limit	0	0	0	0

Following chart describes the soft limit control for joystick operation:



Filtering

Filtering				
Max Allowed				
Speed Change	0	0	0	0

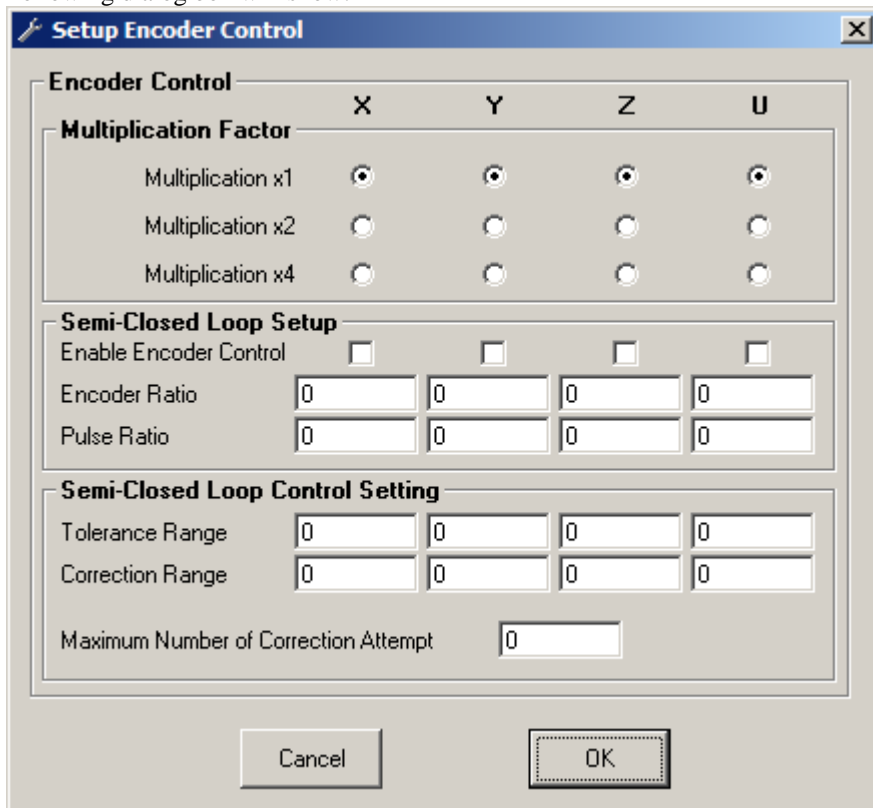
Maximum allowed speed change is used to control maximum acceleration. For example, when the encoder input range changes from zero to maximum input value suddenly, filtering ensures that the motor does not move from 0 to maximum speed suddenly.

3.6 Encoder Setup Screen

Open the encoder setup screen by selecting **Tools/Setup Encoder** from the menu or clicking the following button from the toolbar:



Following dialog box will show:



Encoder Control	X	Y	Z	U
Multiplication Factor				
Multiplication x1	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Multiplication x2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multiplication x4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Semi-Closed Loop Setup				
Enable Encoder Control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Encoder Ratio	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Pulse Ratio	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Semi-Closed Loop Control Setting				
Tolerance Range	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Correction Range	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Maximum Number of Correction Attempt	<input type="text" value="0"/>			

Cancel
OK

Multiplication Factor - For the encoder setup select the desired multiplication factor for each axis. Multiplication factor uses combination of rising and falling edges of the quadrature encoder signals to determine the encoder feedback position.

Semi-Closed Loop Setup – Proteus XES Controller can perform end of the move closed loop control also known as semi-closed loop control. Semi-closed loop control only performs position correction at the end of the move if the encoder error range is less than maximum allowed and greater than tolerance. To enable semi-closed loop control, check the **Enable Encoder Control** checkbox and the appropriate Encoder Ratio and Pulse Ratio. For example, if you have 2 phase stepper motor with 10 micro step driver, enter 2000 for pulse ratio. If you have 400 pulse encoder and using x4 multiplication, enter 1600 for encoder ratio. Once encoder correction is enabled, all the position will be respect to encoder position. This means that when you enter move target as 100, this mean 100 encoder position which Proteus XES controller will try to generate appropriate pulses using the encoder and pulse ratio.

Tolerance Range – If the final position is less than the tolerance range, there will be no correction done.

Correction Range – If the final position is greater than tolerance range and less than correction range, correction will be done. If the position is greater than correction range, no correction will be done and the motor will be in error state.

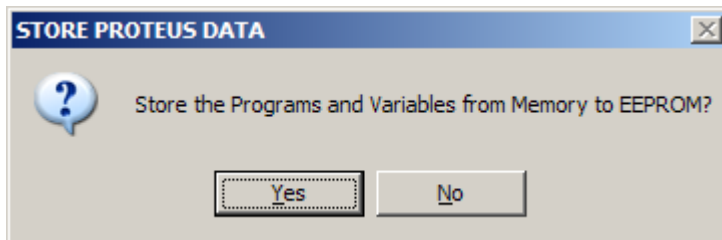
3.7 Storing and Loading the programs and variables

Newly downloaded motion programs or setup information are store in the controller memory. If you want to permanently store them to the controller so that they are loaded after power cycle, you can use the **Tools/Store from Memory to EEPROM** from the menu. Following items are stored in the memory:

- 4 motion programs
- V variables
- I variables
- IP Address
- Project name

Storing to EEPROM

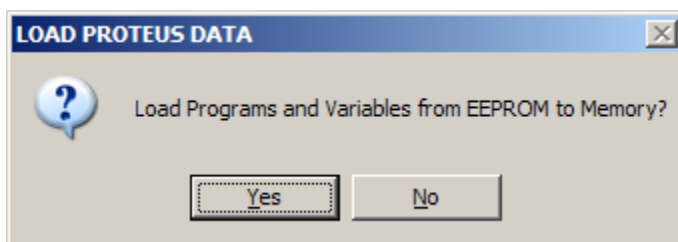
Programs and variables and setup information in the memory can be stored to EEPROM by selecting **Tools/Store from Memory to EEPROM** from the menu.



Answer **Yes** to store to the permanent storage. Remember that all motion and variables in the EEPROM will be overwritten.

Loading from EEPROM

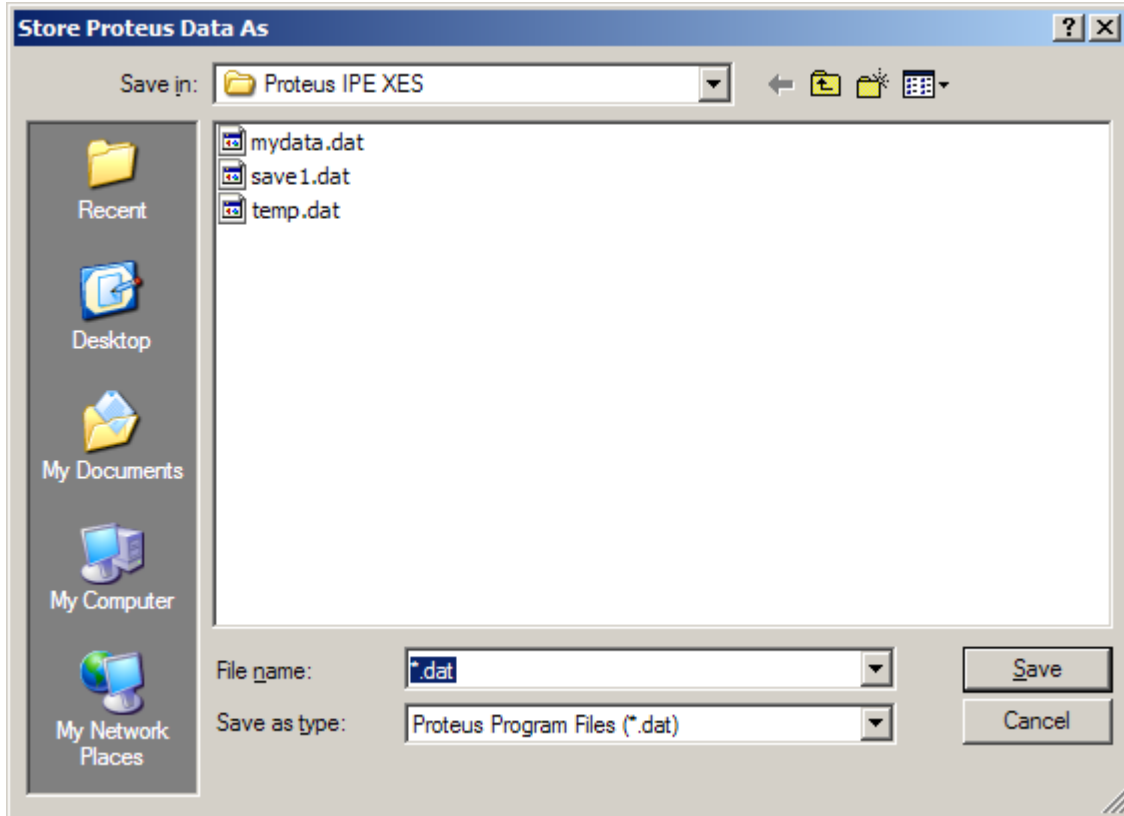
Programs and variables and setup information from the EEPROM can be loaded to memory by selecting **Tools/Load from EEPROM to Memory** from the menu.



Answer **Yes** to load the programs and variables and setup information. Remember that any current motion programs and variables and setup information in the controller memory will be overwritten with the ones loaded from the EEPROM.

Storing to File and Loading from File

Programs and variables and setup information in the memory can be stored to a file on the computer by selecting **Tools/Store from Memory to File** from the menu. Following dialog box open up. Select existing file or enter new file name to store to a file or load from a file.



3.6 Working with Motion Project and Motion Programs

In Proteus XES controller, a motion project consists of up to 4 motion programs. These four motion programs are in multitasking mode.

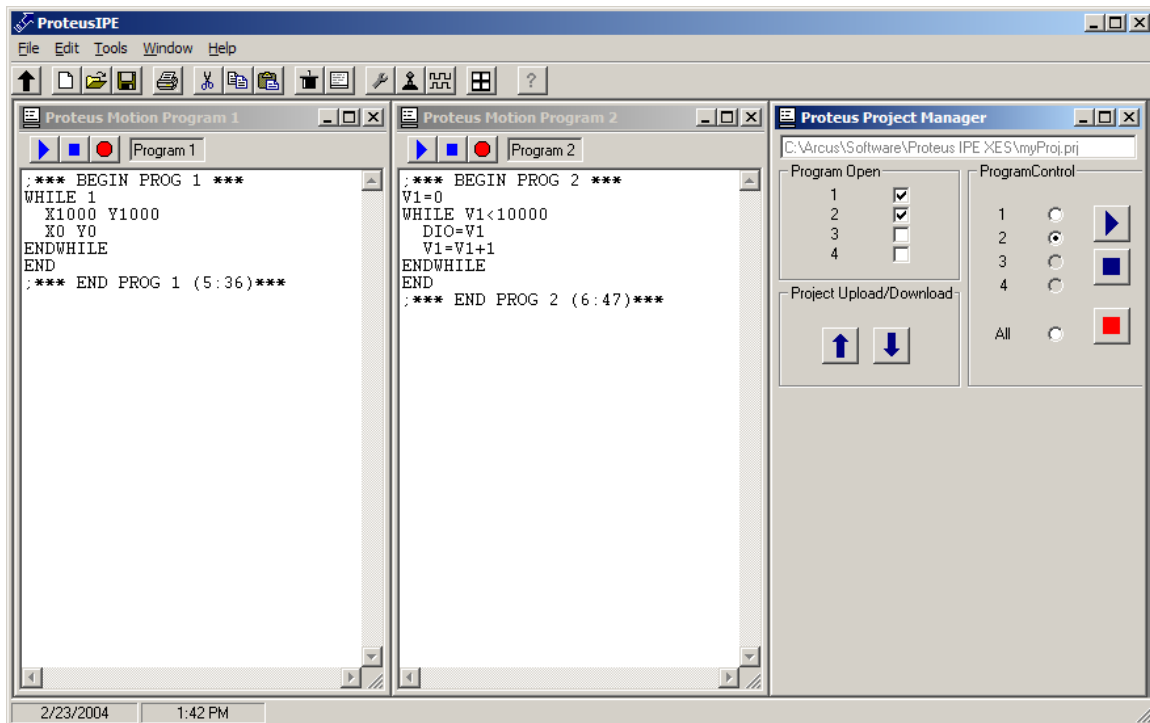
Using Proteus IPE, you can easily work with motion projects and motion program by opening, editing, downloading, and uploading.

3.6.1 Uploading Motion Project

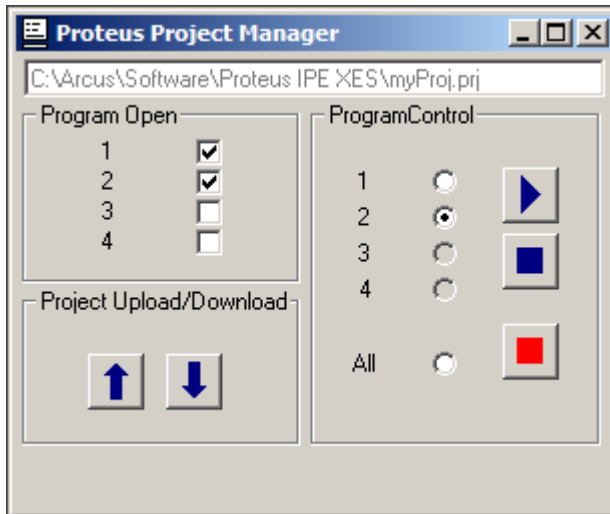
To upload a motion program from Proteus controller by clicking the following button from the toolbar:



If the communication with Proteus XES is connected, project and motion programs will be uploaded.



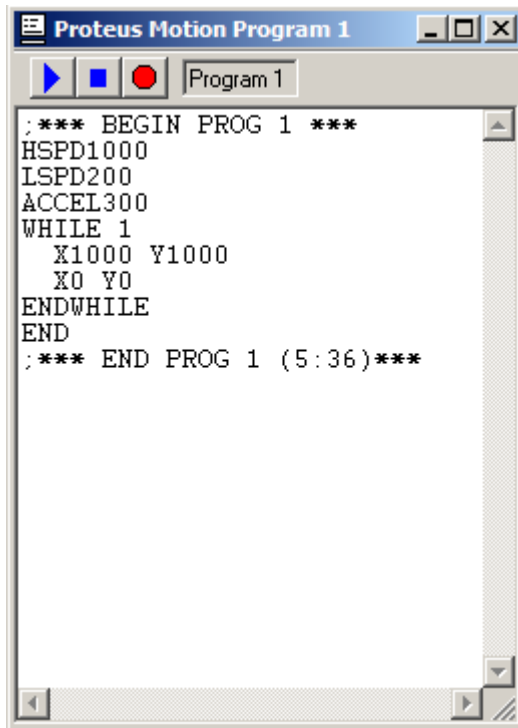
Project Manager



The project manager shows the motion project name, motion programs that are open for the project.

From motion project manager, you can download and upload projects as well as performing motion program control.

Motion Program



Within each motion project, up to 4 motion programs are available.



From the motion program toolbar, you can run, stop, or abort the program.

For details of motion programming language, please refer to **Proteus XES Software Manual**.

3.6.4 Editing and Printing Motion Program

Motion editor is a common text editor which supports Windows text edit functions: Copy, Cut, Paste:



You can print the currently open motion program using the print button:



3.6.5 Saving and Opening Motion Project

Proteus IPE uses common Windows File Save and Open functions to save and open motion projects. All the motion projects have *.prj file format.

To open an existing motion project:



To save currently opened motion program:



3.7 Online Help

Proteus IPE has online language help file. To open the online language help file, select the following button:



Following Windows Help will open



This help file contains all the Proteus XES language that is currently supported.