DspHost2 Operation Manual

2004.9.

This manual is applicable for LMDX driver with interface firmware version 2004/07/30

1. Introduction

DspHost2 is the user interface of LMDX driver. It is for users to observe and set parameters, display servo statuses, motion profiles (position, speed, current). It has menu for setting parameters. Users can set common parameters through the interface. It is also possible to use a traditional terminal interface to observe and set parameters.

Caution

The program is only running under Windows 98, Windows XP (not including Windows NT, 2000 and Me).

Setting motor parameters and driving motor involve many technical issues. Before using this program, it is advised to read also “LMDX Command and Parameter Manual.pdf”.

2. How to install

The following describes how to install DspHost2 user interface.

1. Please close all other application programs. Execute Lm_Driver\Terminal program \DspHost2 in the CD with shipment and Fig. 1 appears.

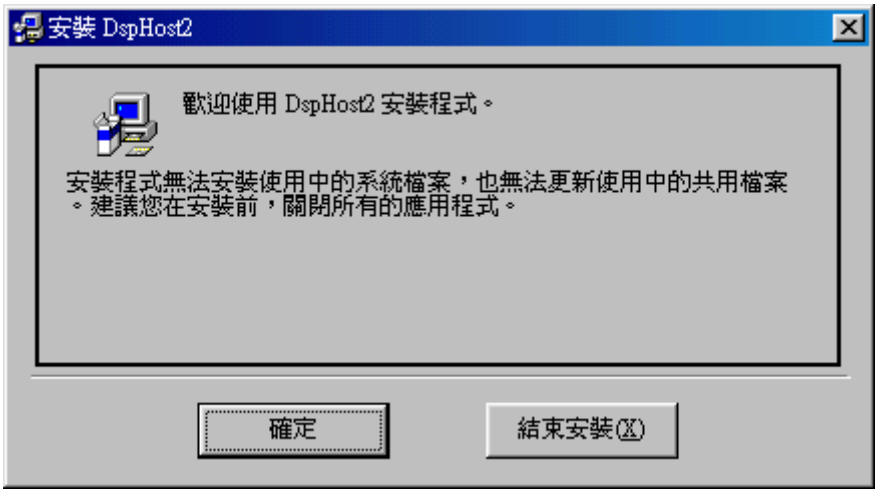


Fig. 1

2. Click OK to confirm and Fig. 2 shows up.

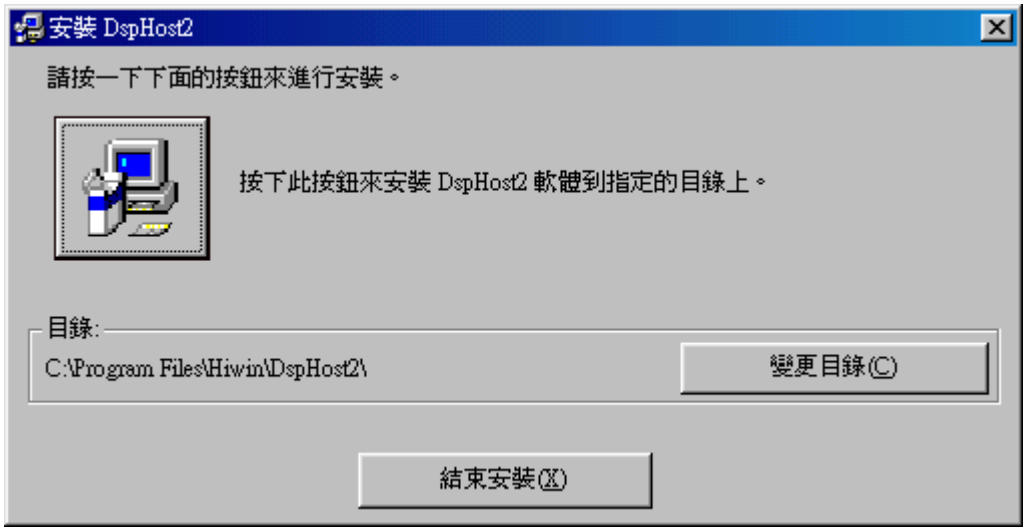


Fig. 2

3. As shown in Fig. 2, the default directory for installation is C:\Program File\Hiwin\DspHost2\, it is also possible to change the directory. Clicking the install icon, it will start installing DspHost2 and Fig. 3 shows up.

Fig. 3

4. Click Continue in Fig. 3. Then Fig. 4 shows starting installation of DspHost2

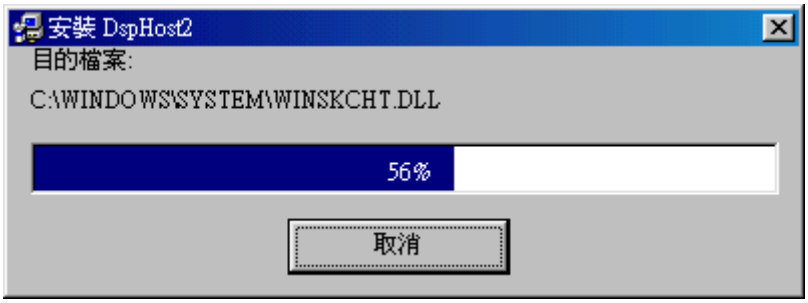


Fig. 4

5. When installation finishes, Fig. 5 is shown. This means installation is done. Click OK.

Fig. 5

3. Operation Explanation

Refer to Fig. 6 and choose DspHost2 to execute it.

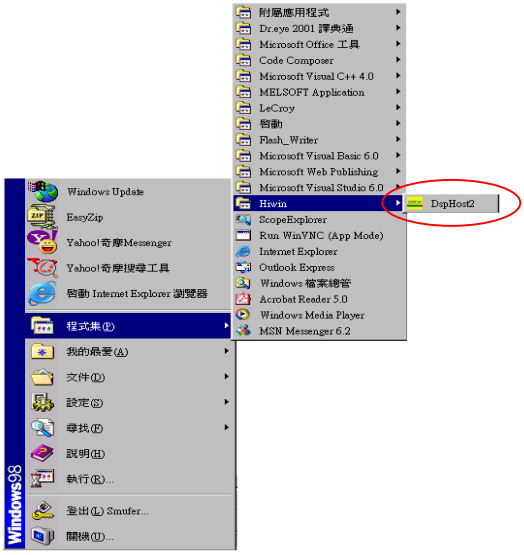


Fig. 6

When this program is executed, it will appear like Fig. 7 and detect connection between PC and LMDX. After detecting the communication if it shows like Fig. 8(up), please click 'yes' to load parameters from driver and it shows like Fig. 8(down). Then it shows user interface like Fig. 10. Otherwise, it shows warning message like Fig. 9. The communication is not correct.

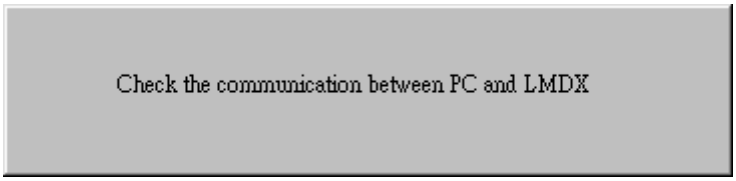


Fig. 7

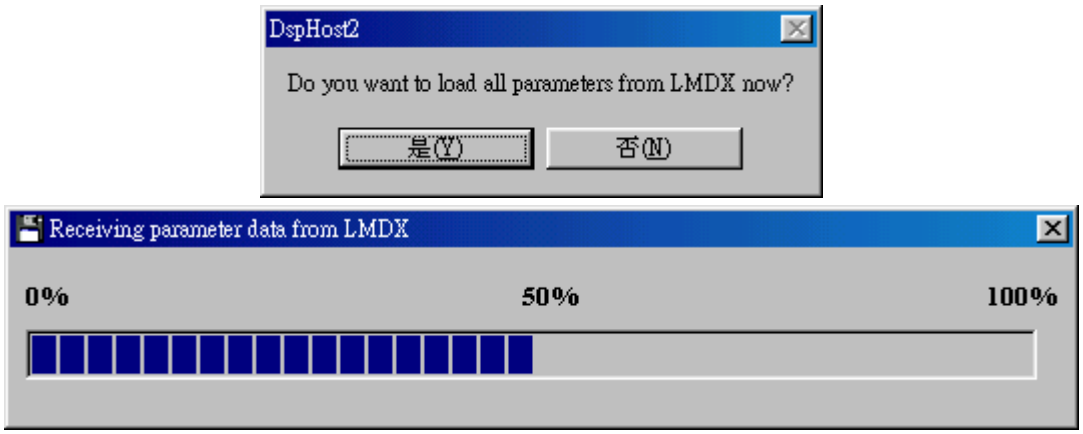


Fig. 8

Fig. 9

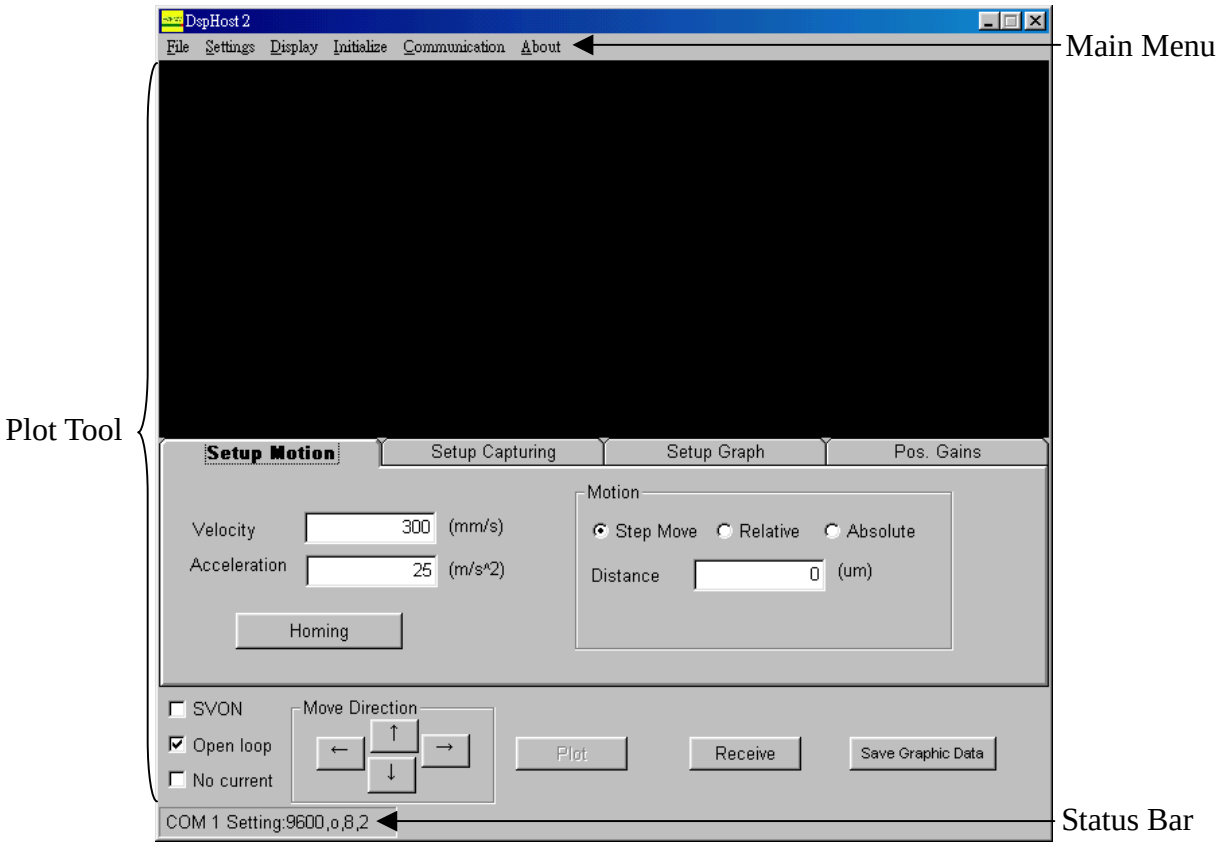


Fig. 10

3.1 Main menu

The DspHost2 main menu choices are described below.

Menu	Selection	Description	
File	Load parameters from LMDX	Load parameters from driver	
	Save parameters to LMDX	Save parameters to driver	
	Load parameters from file	Load parameters from file (Fig. 11)	
	Save parameters to file	Save parameters to file (Fig. 12)	
	Exit	Exit DspHost2	
Settings	Common	PID gains	Refer to section 4.1
		Pulse/Stand-alone	Refer to section 4.2
		In-Position	Refer to section 4.3
		Tracking error window	Refer to section 4.4

		Software limits	Refer to section 4.5
	Advanced	Field weakening	Refer to section 4.6
		Homing	Refer to section 4.7
		Power on	Refer to section 4.8
		Error Compensation	Refer to section 4.9
		Axis directions	Refer to section 4.10
		Filter	Refer to section 4.11
	Save parameters to flash ROM	Before closing this program, if there was any parameter changed, users must execute this to save parameters to flash ROM. To Avoid parameters disappearing after turning off LMDX.	
Display	Position and Status	Display position and status of motor, refer to section 4.12.1	
	Position sensor signals	Display sensor position of motor, refer to section 4.12.2	
Initialize	Motor type	Refer to section 4.13.1	
	Quick initialize	Motor quick initialize, refer to section 4.13.2	
	Advanced initialize	Motor advanced initialize, refer to section 4.13.3	
Communication	Terminal	Terminal program	
	Rs232 setting	Set RS232 communication parameters, refer to section 4.14	
About	About	DspHost2 information (Fig. 13)	

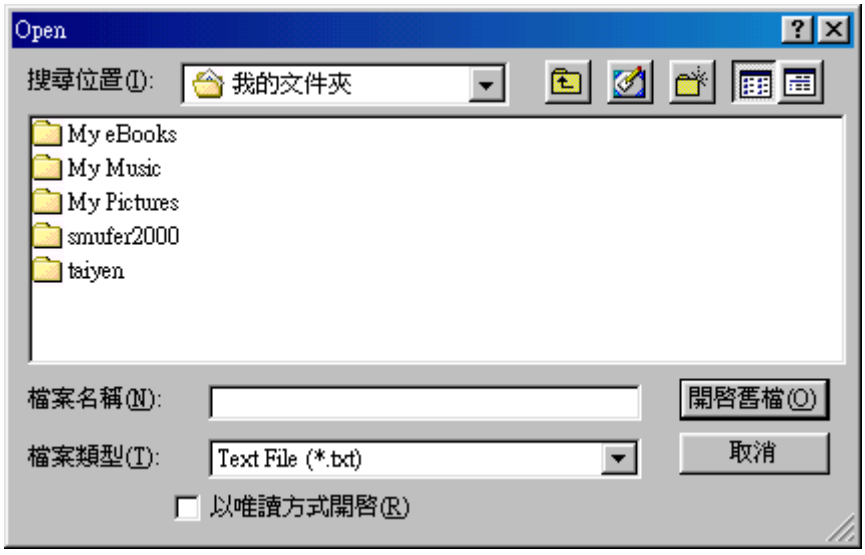


Fig. 11

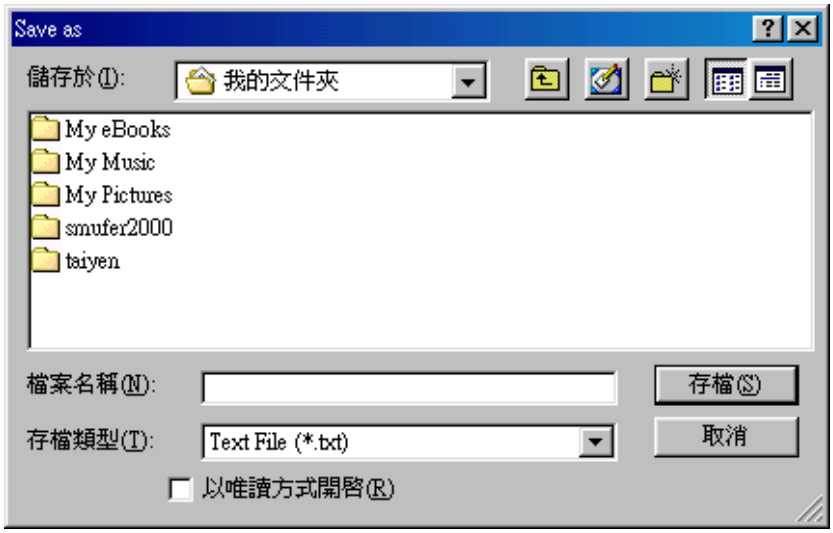


Fig. 12

Fig . 13

3.2 Plot Tool

DspHost2 has a plot function. Users can observe motion response and trajectory planning command so that PID gains could be adjusted easily.

How to use it:

- **Stand-alone mode**:
  1. In **Setup Capturing**, set the physical quantities to capture.
  2. In **Set Motion**, set velocity and acceleration.
  3. Set **Distance** to move.
  4. Click (←) or (→) or (↑) or (↓) to move and start capturing.
  5. Click (Plot) to transfer all captured data from LMDX and plot. If clicking Plot too early so that capturing is still under process, it shows waiting message.
- **Pulse mode**:
  1. In **Setup Capturing**, set the physical quantities to capture.
  2. Click (Receive) to start capturing.
  3. Send pulses to make movement.
  4. Click (Plot) to transfer all captured data from LMDX and plot.

3.2.1 Setup Motion

The Setup Motion tab shown in Fig. 14 is to set basic parameters for movements under stand-alone mode.

- **Velocity** : trajectory maximum velocity, unit is mm/s.
- **Acceleration** : trajectory acceleration, unit is m/s^2
- **Homing** : searching the wall, related parameters refer to section 4.7
- **Motion** : there are three types
  1. Step Move : Single step move. Please click (↑)or(↓)or(←)or (→) to move. The moving distance is set in the field of Distance.
  2. Relative : Relative coordinate move, Fig. 15(left) is shown. Please click (←)or(→) to move.
  3. Absolute : Absolute coordinate move, Fig. 15(right) is shown. Please click (→) to move. Before using this function, make sure homing is performed.

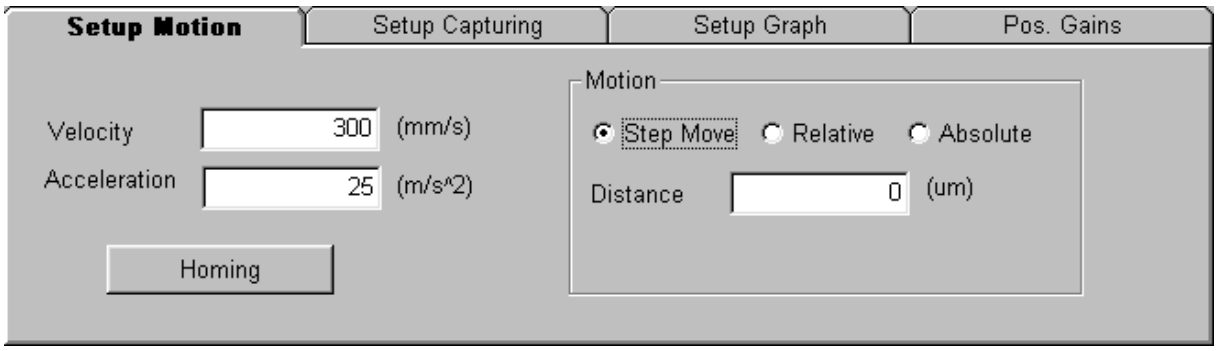


Fig. 14 Setup Motion

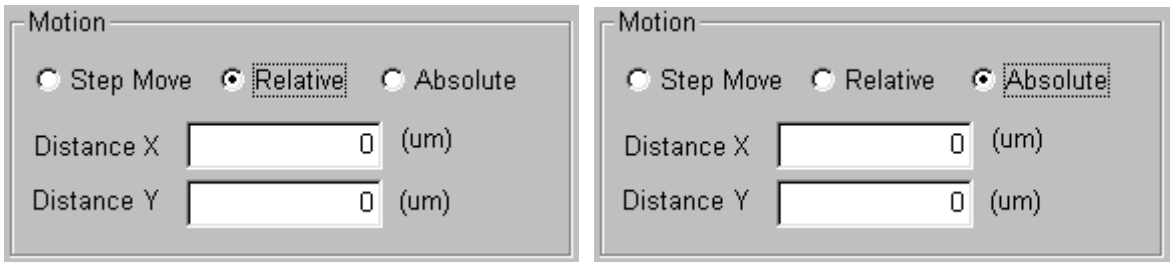


Fig. 15 Relative and Absolute motion settings

3.2.2 Setup Capturing

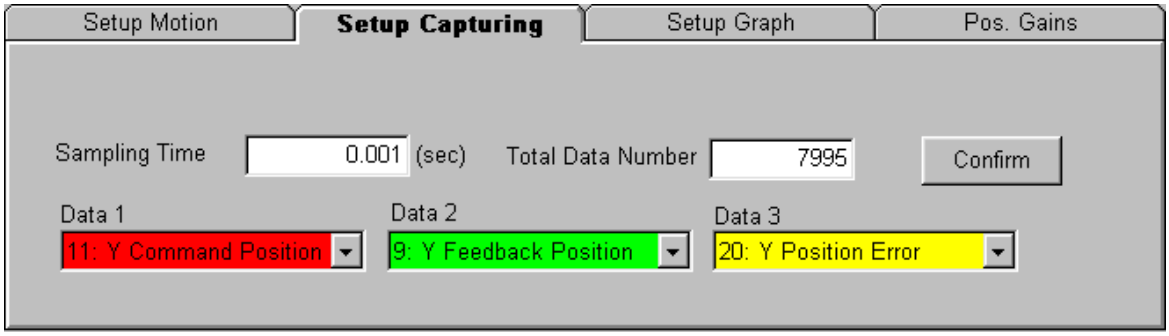


Fig. 16 Setup Capturing

There are five fields to set including **Data1**, **Data2**, **Data3**, **Sampling Time** and **Total Data Number**. **Data1** to **Data3** are physical quantities to capture; please see Table 1 for definitions. **Sampling Time** is the time interval for each capturing. **Total Data Number** is the whole number of captured physical quantities. It is free to choose repeated physical quantities. However, **Data1** could not be 0. When **Data1** and **Data3** were not 0, **Data2** could also not be 0. After setting, please click (Confirm) to finish settings.

The maximum value to input for **Total Data Number** is 8000. If input value was more than 8000 and less than 0, after clicking (Confirm), they would be adjusted. This number does not mean for each physical quantity, but the whole selected quantities. For example, if it is set to be 900 and only one physical quantity is chosen, the same quantity would be captured 900 times. But if 3 physical quantities were selected, there would be 300 values captured for each. Furthermore, the **Total Data Number** should normally be multiple of number of physical quantities to capture. If strange combination of number were input, DspHost2 adjusts it automatically after clicking (Confirm).

Number	Explanation
1	Sensor signal, X1 A
2	Sensor signal, X1 B
3	Sensor signal, X2 A
4	Sensor signal, X2 B
5	Sensor signal, Y A
6	Sensor signal, Y B
7	Feedback X1-position
8	Feedback X2-position
9	Feedback Y-position
10	Command X-position
11	Command Y-position
12	Error rotational, (n-1)
13	Error X, (n-1)
14	Error Y, (n-1)
15	Force rotational
16	Force X
17	Force Y
18	Error rotational
19	Error X
20	Error Y
21	Feed-forward X

22	Feed-forward Y
23	Feed-forward Y

Table 1

3.2.3 Setup Graph

Setup Graph tab shown in Fig. 17 is to set parameters for graph tool.

- Ratio : The captured data is multiplied by this ratio, then displayed.
- Offset : The captured data is added by this value, then displayed
- Differentiate : Check this to differentiate the captured data. For example, in order to observe velocity for Y-axis, please choose physical quantity 9(Feedback Y-position). Then please check this, the captured data is differentiated when plotted.
- **Time - Min** : Set the minimum value in time axis.
- **Time - Max** : Set the maximum value in time axis.
- **Y - Min** : Set the minimum value in vertical axis.
- **Y - Max** : Set the maximum value in vertical axis.
- **X Grid** : Check this to display horizontal lines.
- **Y Grid** : Check this to display vertical lines.

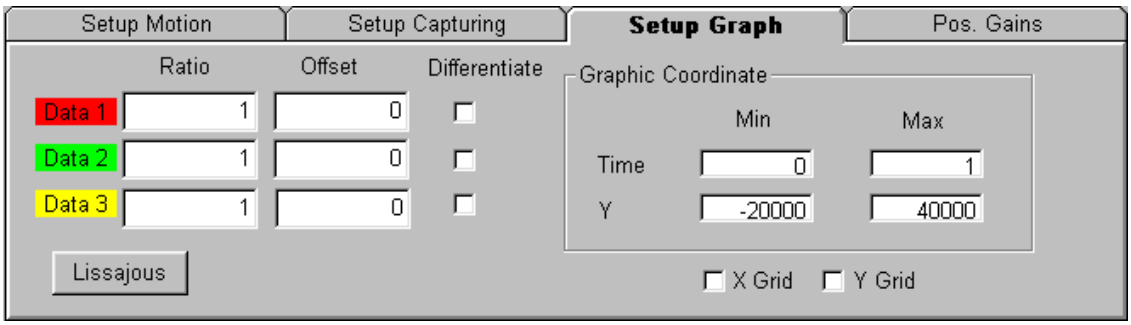


Fig. 17 Setup Graph

- **Lissajous** : Lissajous Circle is for displaying the phase A and B sensor signals. Phase A is taken as horizontal axis, while phase B vertical. In Setup Capturing, Data1 and Data2 must be set as physical quantities between 1 to 6. So it is possible to check whether sensor signals are OK. Click Lissajous to show the circle. Fig. 18 is an example of A, B phases for X1 sensor. At the right side of Fig.18:
  1. **Sensor signals offset** : This is to show the offset for sensors. These values are correct only after finishing initialize of motor.
  2. **X offset** : It is offset for horizontal axis. In the example, X-axis is Sensor X1_A. User can input the X1-A offset with reverted sign in sensor signals offset.
  3. **Y offset** : It is offset for vertical axis. In the example, Y-axis is Sensor X1_B. User can input the X1-B offset with reverted sign in sensor signals offset.
  4. **X, Y Grid** : This is to set the value for each grid in both X and Y direction.
  5. **Plot** : Plot Lissajous Circle

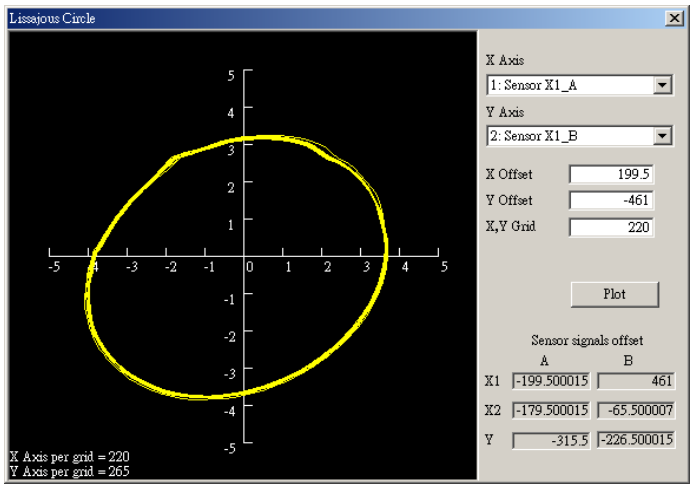


Fig. 18 Lissajous Circle

3.2.4 Pos. Gains

This is to adjust the closed loop PID gains. User can adjust these gains to increase stiffness of motor according to actual movement with help of the captured data and graph.

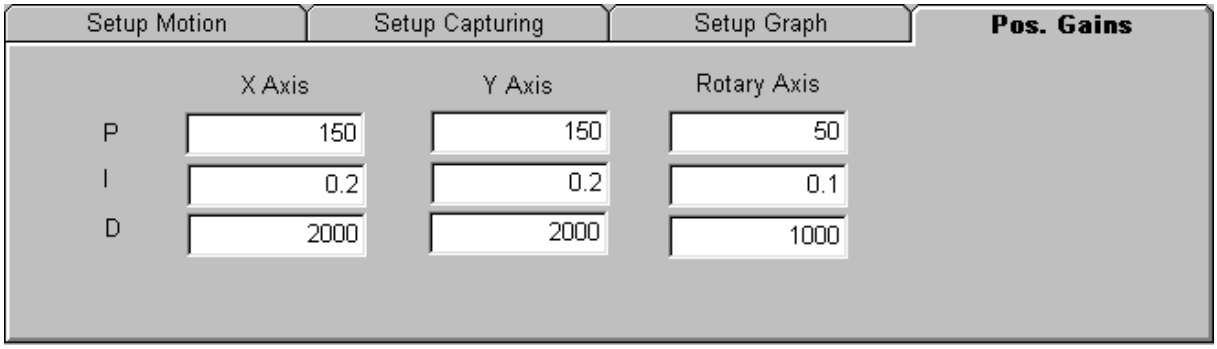


Fig. 19 Pos. Gains

- **P** : Proportional gain
- **I** : Integral gain
- **D**: Differential gain

3.2.5 Function operation

Fig. 20 is shown for operation like SVON, start motion, data capturing, plot data and save captured data to files.

Fig. 20 Function operation

- **SVON** : Check this to make motor SVON, then Fig. 21 is shown. And motor performs alignment. If motor alignment is not successful, it means the motor was not initialized correctly. Please refer to section 4.14 about setting parameters for initialize.

- **Open loop** : Open loop mode
- **No current** : Servo off mode

Fig. 21

- **Move Direction** : (←)or(→) move in X direction ; (↓)or(↑) move in Y direction. This is only for stand-alone mode.
- **Receive** : At pulse mode, click this button to start data capturing.
- **Plot** : Click this to plot, please refer to section 3.2
- **Save Graphic Data** : This will save captured data into a file. File type is *. csv.

3.3 Status Bar

This shows communication status and data capturing status.

Fig. 22 Status Bar

4. Function Explanation

4.1 PID gains

There are three axes in LMDX, X-axis, Y-axis and rotary axis. Each axis has their PID gains. Please see Fig. 23. This setting is the same as Fig.19.

- **P gain** : Proportional gain
- **I gain** : Integral gain
- **D gain** : Differential gain

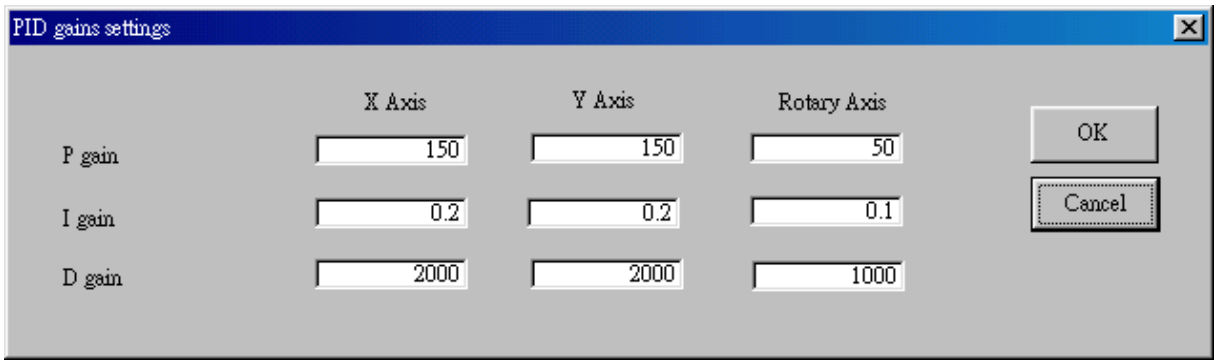


Fig. 23 PID gains

4.2 Pulse / Stand-alone

User can chooses between stand-alone mode and pulse mode.

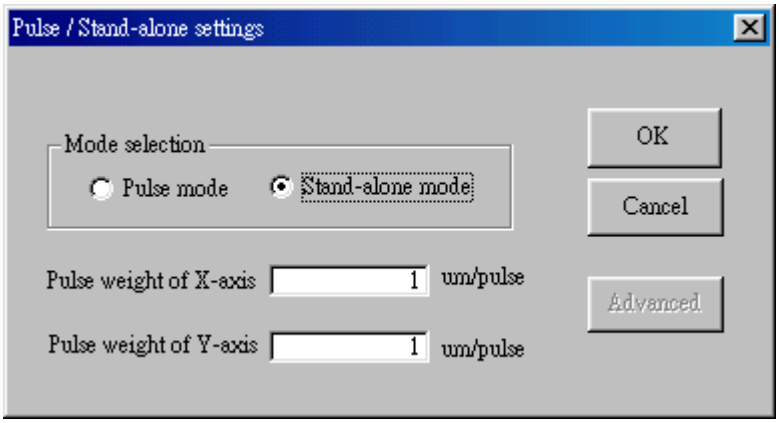


Fig.24 operation setting

At pulse mode, the following parameters need to be set.

- **Pulse weight of X-axis** : The distance to move in X-axis for each pulse.
- **Pulse weight of Y-axis** : The distance to move in Y-axis for each pulse.

User can click Advanced shown in Fig.25 at pulse mode. Please refer to command SD.2 and SD.3 in “LMDX command and parameter manual.pdf”.

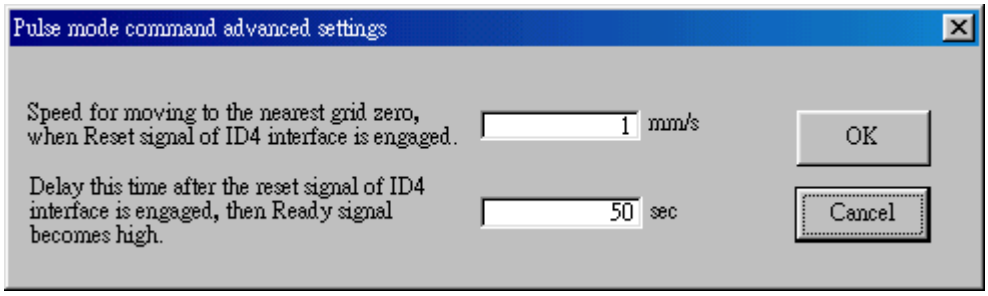


Fig. 25 Advanced setting at pulse mode

4.3 In-Position

In-Position settings :

- **In-Position window** : After tracking error becomes within this window, In-Position becomes active.
- **In-Position delay time** : This is to stablize In-Position signal.

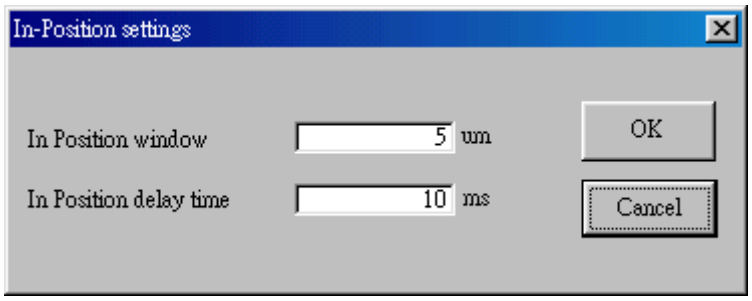


Fig. 26 In-Position settings

4.4 Tracking error window

In closed loop mode :

- **Permissible error for close loop in XY direction** : If tracking error of X or Y axis is over this, there is a alarm ”Tracking error too big”.
- **Permissible rotational error** : If tracking error for rotary axis is over this, there is a alarm “Tracking error too big”.
- **Fatal rotational error** : If tracking error in rotary axis is over this, it means that the motor can’t keep SVON and will change to Servo off mode immediately.

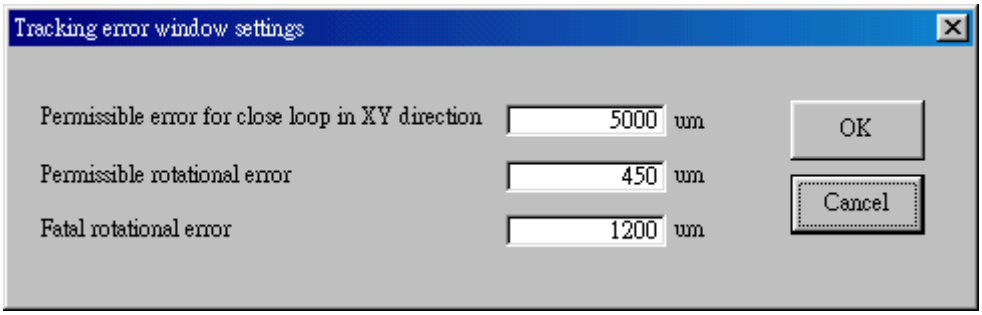


Fig. 27 tracking error settings

4.5 Software limits

This is to set software limits for X and Y axis to prevent inadeguate position commands.

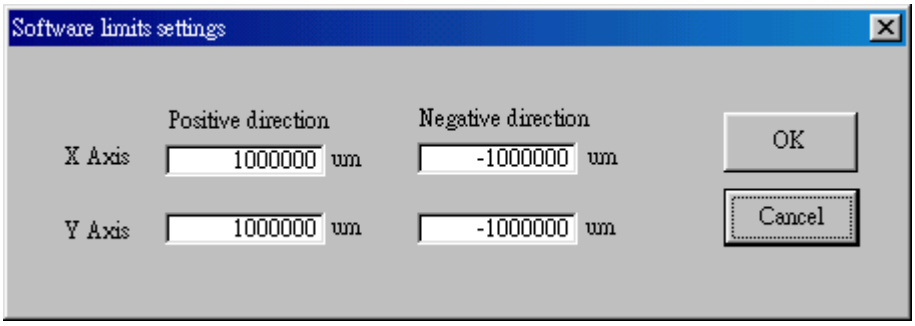


Fig.28 Software limits settings

4.6 Field weakening

It is to set parameters for field weakening.

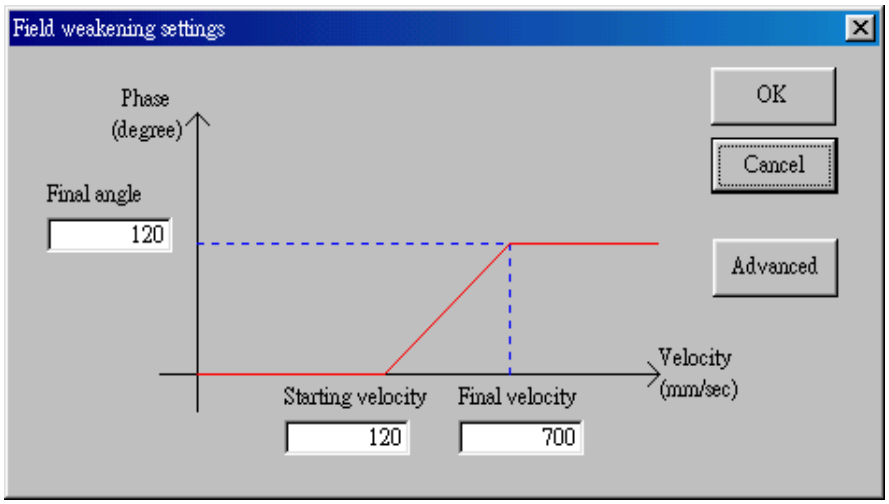


Fig. 29 Field weakening settings

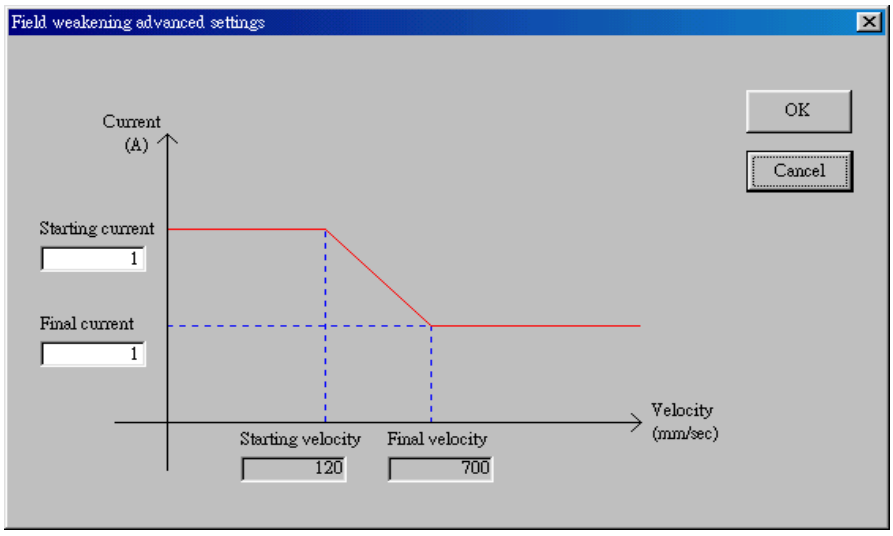


Fig. 30 Field weakening advanced settings

4.7 Homing

It is to set Homing velocity. Regarding other advanced settings refer to command 'GSS' and 'GP' in "LMDX command and parameter manual.pdf".

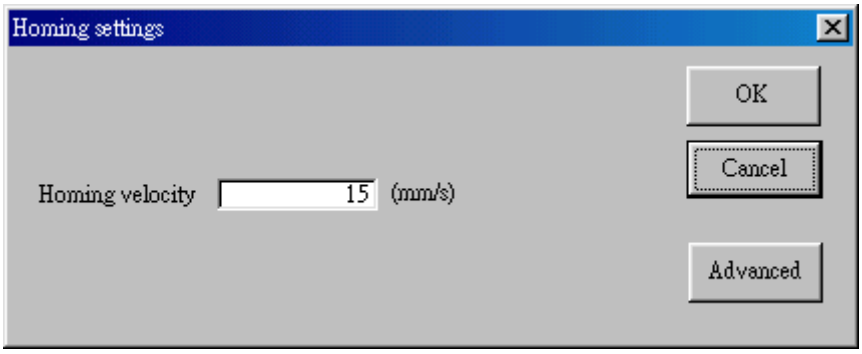


Fig. 31 Homing settings

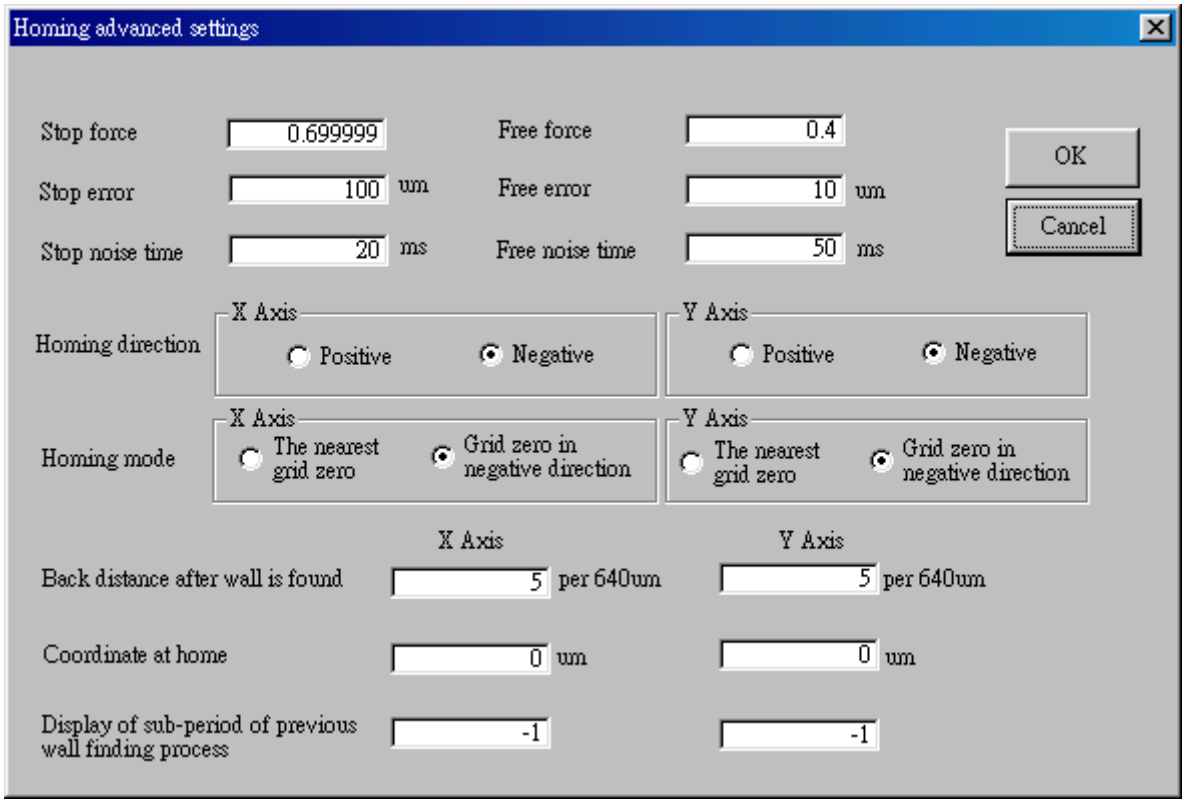


Fig. 32 Homing advanced settings

4.8 Power on

Clicking Power on, Fig.33 is shown. Close loop mode and open loop mode can't be clicked at the same time. If open loop mode is chosen, Automatic homing and Automatic alignment can not be set.

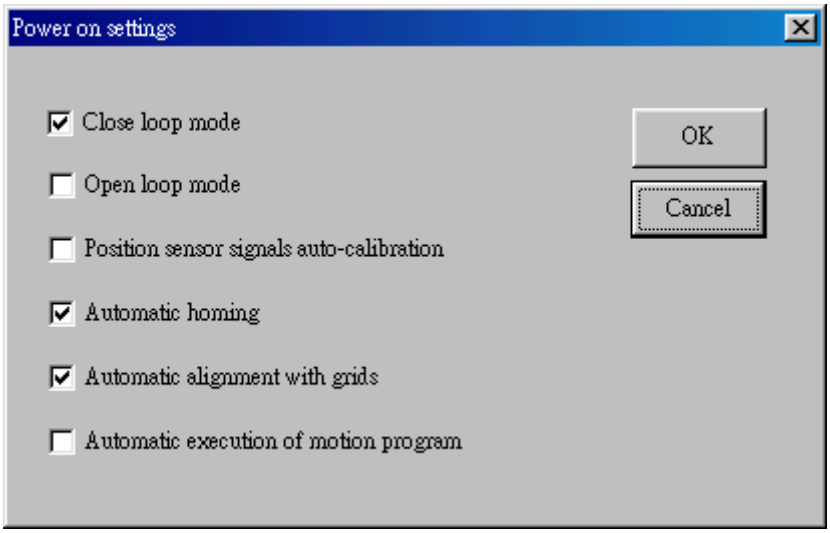


Fig. 33 Power on settings

4.9 Error compensation

For error compensation, there are X-axis and Y-axis. Each axis has forward and backward values. An example for Forward of X-axis, explain how to compensate error with laser result.

1. Prepare error data in *.txt file according to file format in Appendix 2
2. Click **Load…**
3. Choose “from Text file” and “X Axis forward”
4. Click OK
5. Choose the prepared file
6. Click open to load data and it shows like Fig.34
7. Click **Save…**
8. Choose “to LMDX” and “X Axis forward”
9. Click OK
10. It will ask whether data should be saved to ROM, click ‘Yes’

Procedure for the other three error compensate table is similar to the above. Furthermore, there are the following points to notice.

- Maximum number of each compensate table is 599.
- pitch : Measurement pitch.
- dat# : Sequential number for data.
- Data : The data for the above dat#
- Graph Limits :

  Number of data : This is the number of data to display.

  Y-max : Set the maximum value in vertical axis.

  Y-min : Set the minimum value in vertical axis.

If the compensate value need to be modified, click **Load…** and select “from LMDX” to load data from LMDX. After modification, click **Save…** to save it to LMDX or file.

There is a skill in Fig.34. When clicking and draging with mouse in the graphic filed, in the above area of window, the data# changes according to mouse movement.

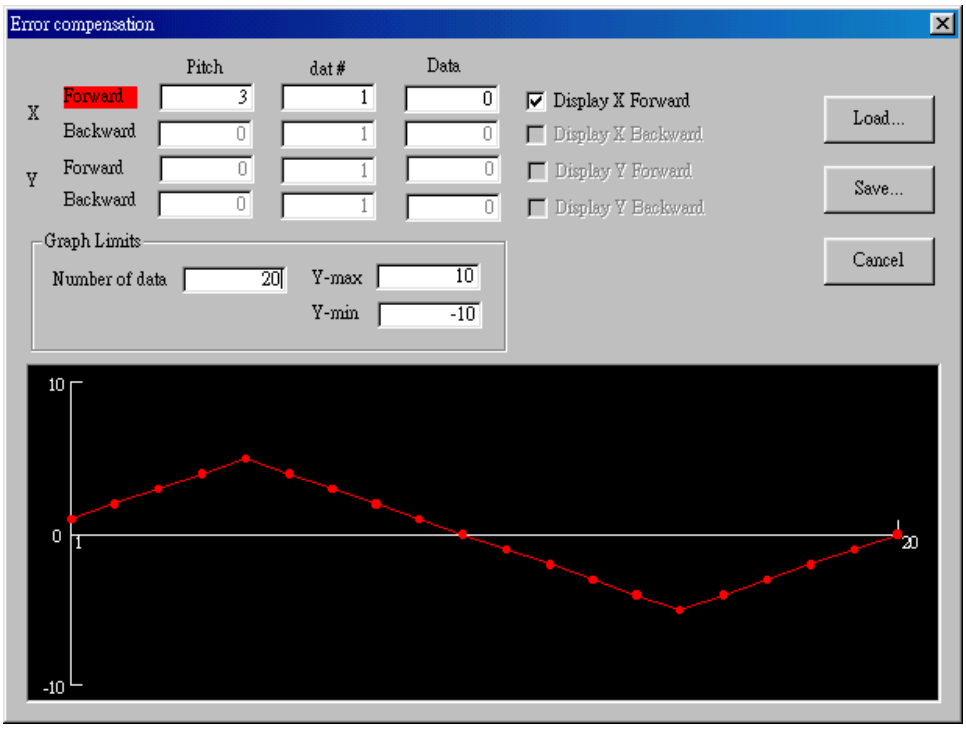


Fig. 34 Error compensated table

4.10 Axis directions

This is to set definition of direction for XY axes. To swap direction definition, please change from Positive to Negative or from Negative to Positive.

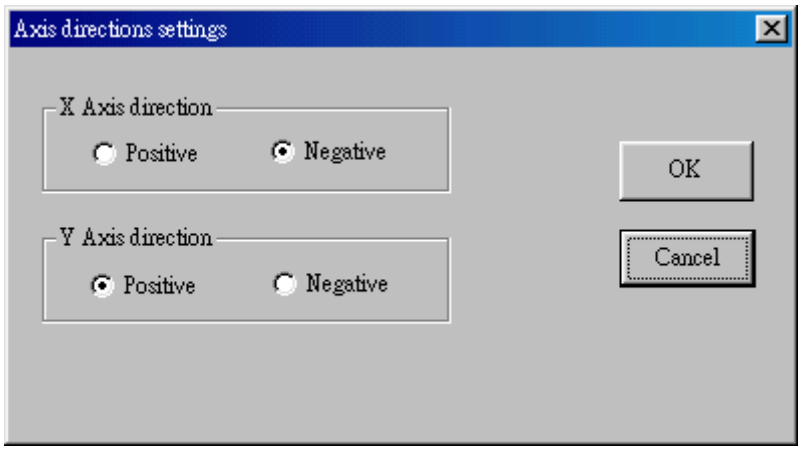


Fig.35 Axis direction settings

4.11 Filter

There are three closed loops, X-axis, Y-axis and rotary axis. This is to set their filter parameter. The range of this parameter is 0 to 1.0. Smaller value means stronger filtering.

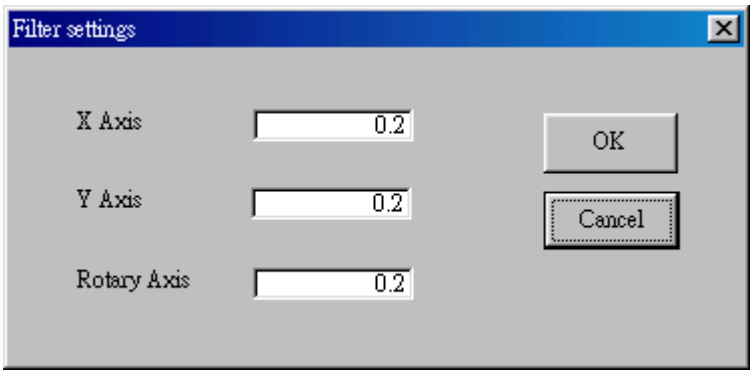


Fig. 36 filter settings

4.12 Display

This shows internal information like status, current position and help user to debug. Two sections below explain this.

4.12.1 Position and status

Status is described below in each axis:

Item	Description	Remark
Command position	Command position in LMDX	Only for closed loop
Real position	Feedback position from sensor	Only for closed loop
Homing result	Status for homing (True or False)	Only for closed loop
Error code	0000-No error 0400-Out of the range of software limits 0800-Tracking error too big	

Reset error : Clear all alarms

Renew : Refresh all statuses

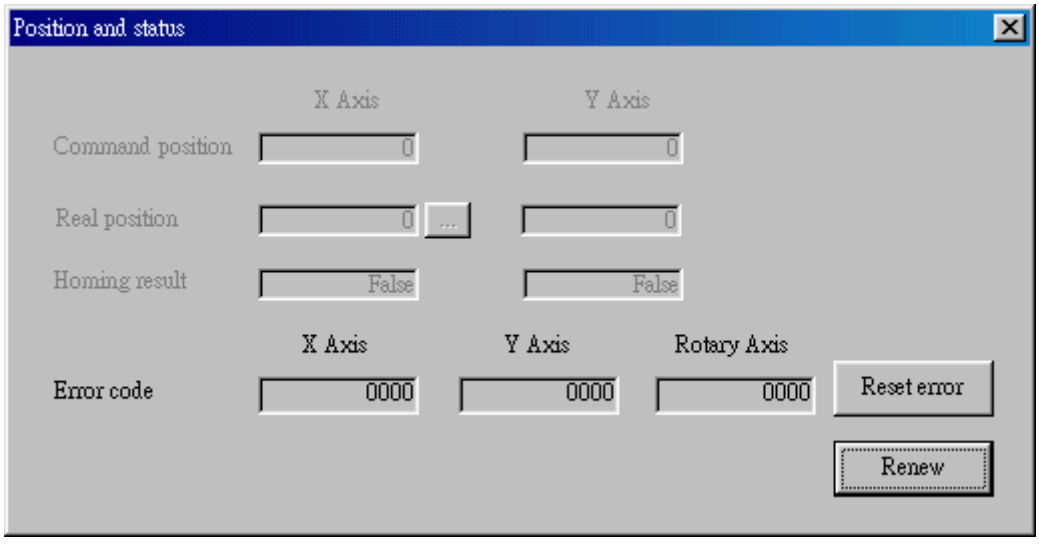


Fig. 37 Display driver status

4.12.2 Position sensor signals

Show the values of sensor:

- **Display** : Begin display continuously.
- **Stop** : Stop display.

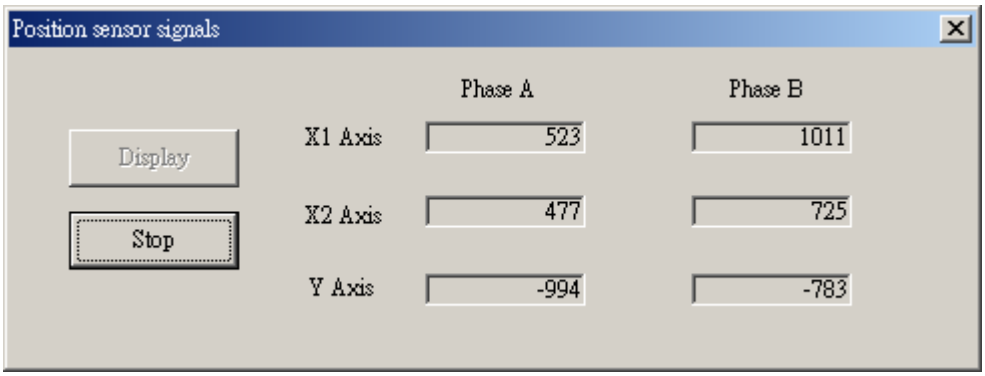


Fig. 38 Display status for sensor

4.13 Initialize

It is important to initialize motor before closed loop control. This has only to be done once. Parameters are saved to Flash ROM. Use this tool to help user to make motor initialized.

4.13.1 LMSP Motor Type

Choose motor types. There are three types, LMSPX1, LMSPX2 and LMSPX3.

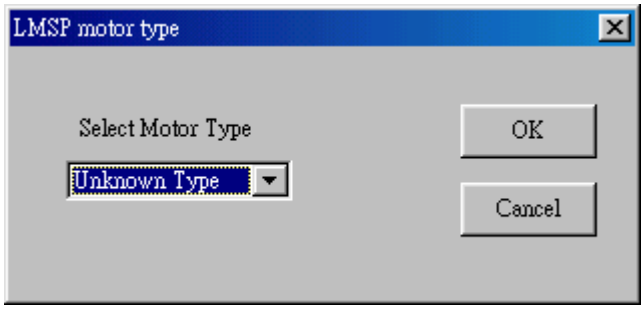


Fig. 39 Motor type settings

4.13.2 Quick initialize

Before the motor could be driven in closed loop, driver has to be initialized once. It is a quick initialize tool. User only has to follow the steps described here. Fig. 40 shows the procedure for initialization.

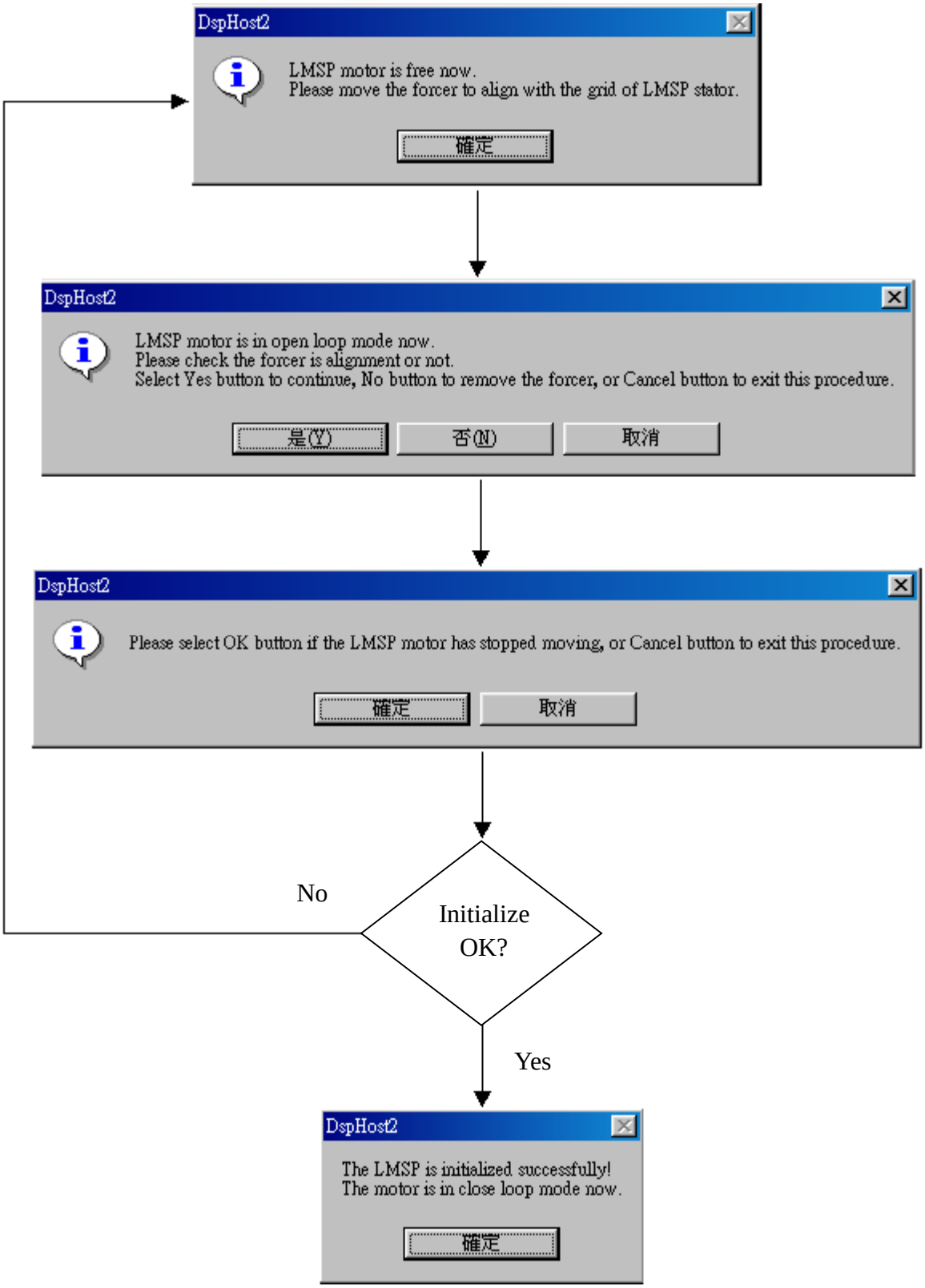
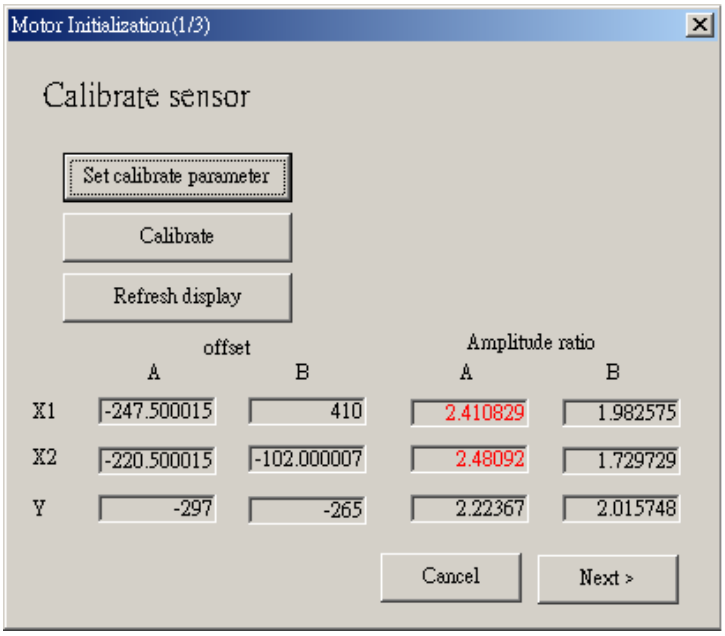


Fig. 40 Quick initialize steps

4.13.3 Advanced initialize

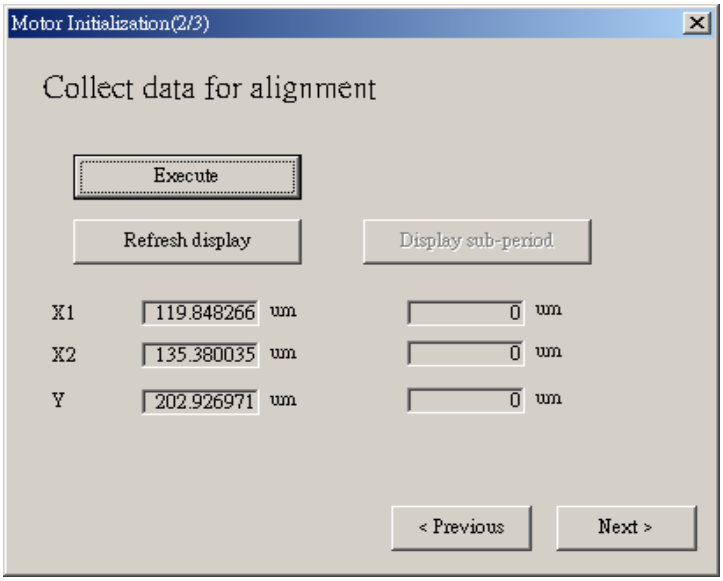
Advanced initialize is more complicated. User also can make this to initialize. Because it is more complicated than quick initialize, it is suggested that user choose quick initialize. There are three steps in Advanced initialize.

1. Calibrate Sensor



- Set calibrate parameter : To set related parameters. Please refer to commands 'CLS' in "LMDX command and parameter menual.pdf".
- Calibrate : To execute calibration for sensor. In the bottom half of window, offset and Amplitude ratio for sensor X1, X2 and Y are shown. If Amplitude ratio is out of the range : 2±0.3 the value becomes red.

2. Collect data for alignment



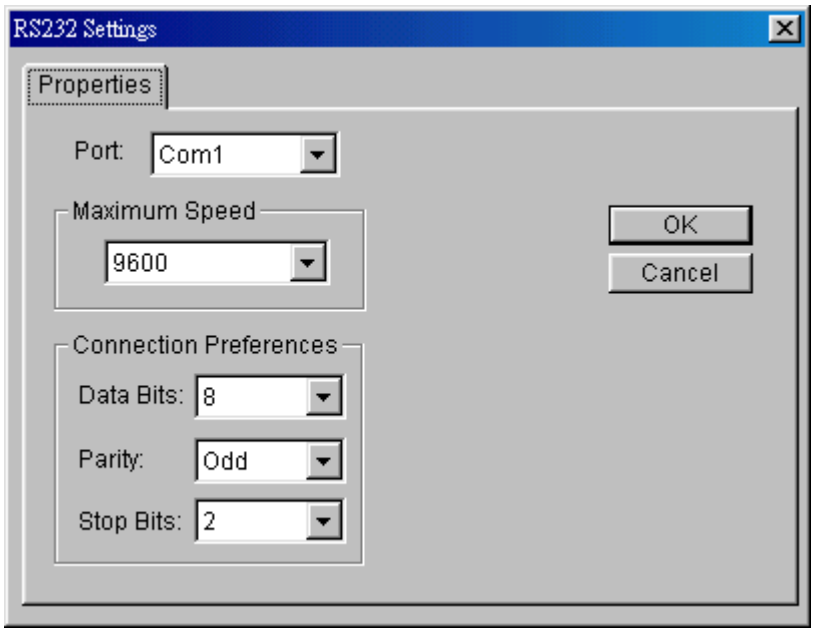
Execute () and collect related information for alignment. Results are shown on the left in the window. After the above execution is finished, the button Display sub-period can be clicked to show the real position for sensor on the right side. Compare left and right to see whether their difference is more than 18. If yes, please execute again.

3. Save parameters

Saving parameters above to LMDX.

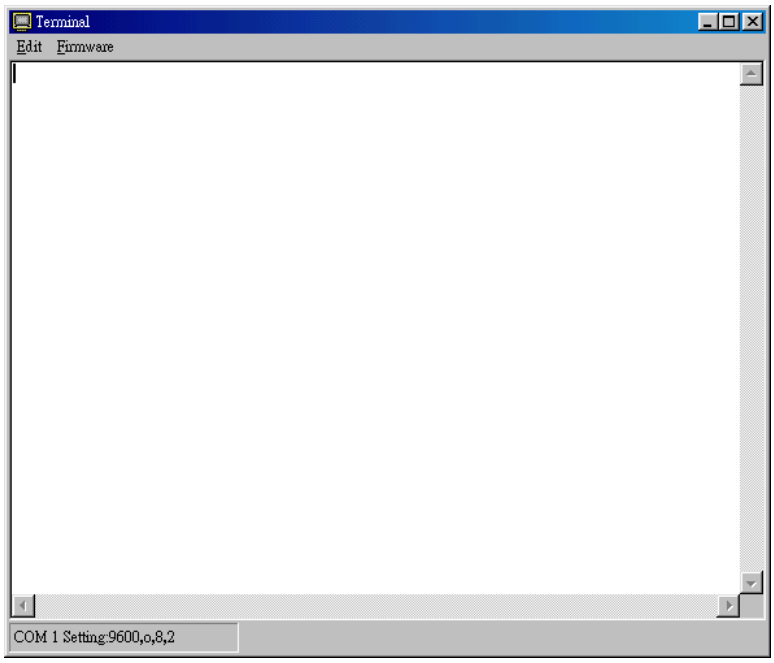
4.14 Communication

This is used for setting the RS-232 serial port. It should be set as 9600 baud, 8 data bit, odd parity, 2 stop bit.

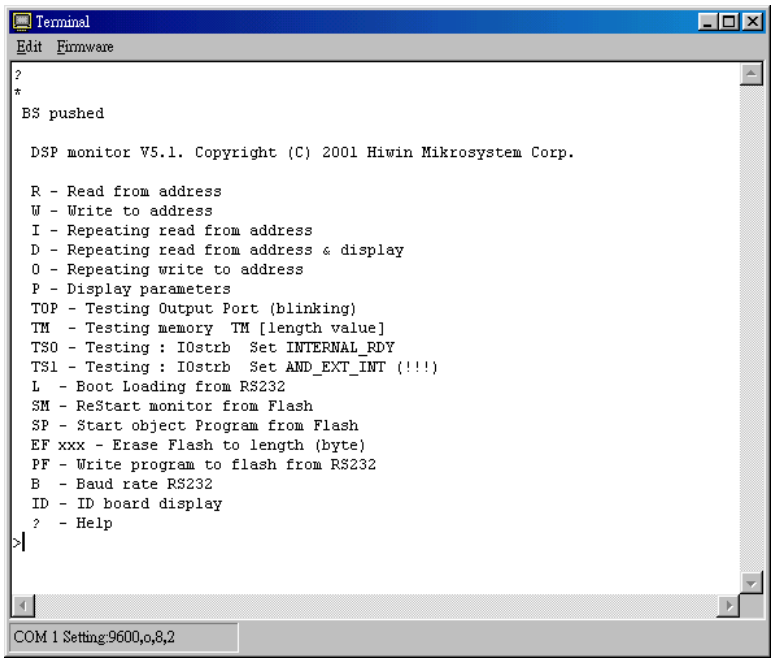


Appendix 1. How to update firmware of LMDX

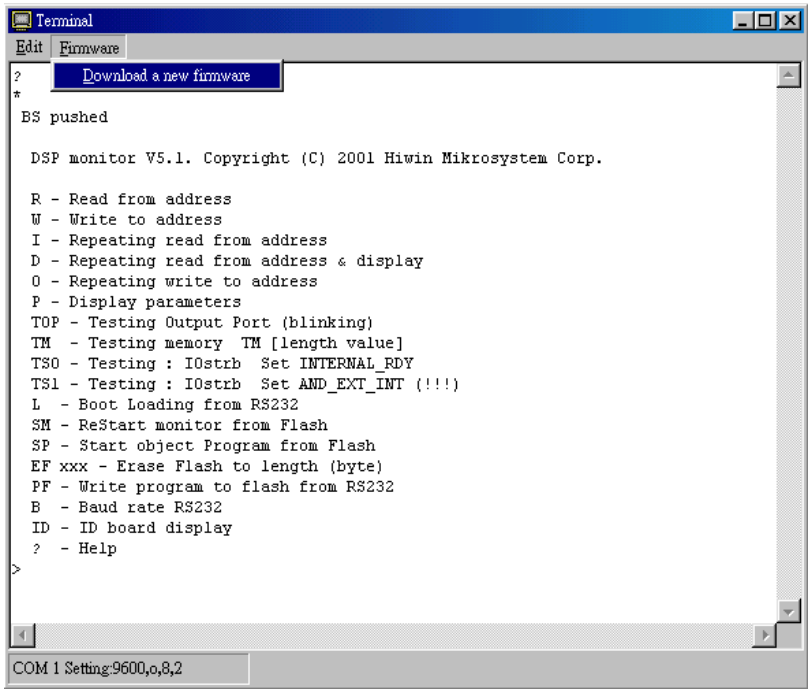
Step1: Click menu bar Communication → Terminal



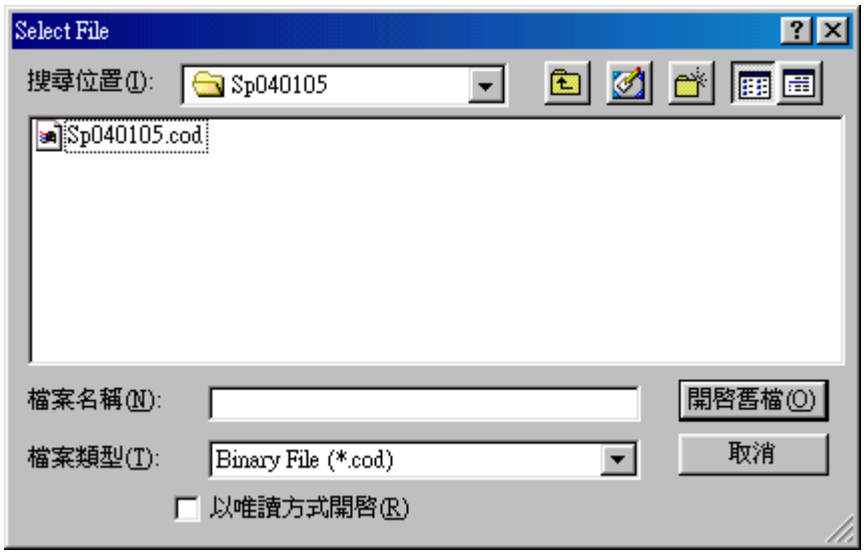
Step2: Keep pressing ”Back Space” on keyboard, and turn on power of LMDX driver, then it enters “Monitor” mode. Now the orange and red LED will blink twice to show that it is under “Monitor” mode. Now terminal may look like this.



Step3: Click Firmware in the menu →Download a new firmware



Step4: Choose the firmware code file: (*.cod).



Step5: After choosing the code file, click open to start the programming procedure.

Step6: After programming is finished, type “SP” command to start the newly programmed firmware. Normally it shows the version of the firmware on terminal window.

Appendix 2. File format for error compensation

The format of compensation data is defined like below. Please also refer to the related section in “LMDX Command and Parameter Manual.pdf”.

Format of the file:

1. It is a text file. (*.txt)
2. The first line contains “START” in capital letter.
3. From the second line on, it is compensation data.
4. 1st data is the period of compensation and they are given in motor mechanical pitches. This is also the measurement pitch.
5. 2nd data is error compensation data at period*0
6. 3rd data is error compensation data at period*1, and so on.
7. There should be only one data in a line. No space or other characters between each line
8. The last line contains “END” in capital letter.
9. Between START and END it is limited to 600 lines.

Example:

Assumed the measurement period is 3 motor mechanical pitches as and the compensation values are 0, -1, 2, 5, 4, and -3. The file would look like this:

START
3
0
-1
2
5
4
-3
END