6. The M- Drive Utility

6.1 Installing The M - Drive Utility Software

The M - Drive Utility software is designed to operated under the Windows '95 operating system only. Before commencing the installation, ensure that the older versions of this software are not already installed on your system. If any such older versions exist, first delete it and, then perform a fresh installation of this software.

Kindly use the [Add/Remove Programs] icon inside the Windows '95 Control Panel to install this software. Clicking on this icon will bring up the property dialog box for the [Add/Remove Programs]. Then, proceed to click on the [Setup] icon and follow the instructions in the dialog box to run the Setup program for the M Drive Utility software.

Read the instructions carefully and after confirmation of the contents displayed, click on the [Next] button. This will lead to the menu for due selection of the destination for the software installation (refer to the **Fig. 6.1.1**).
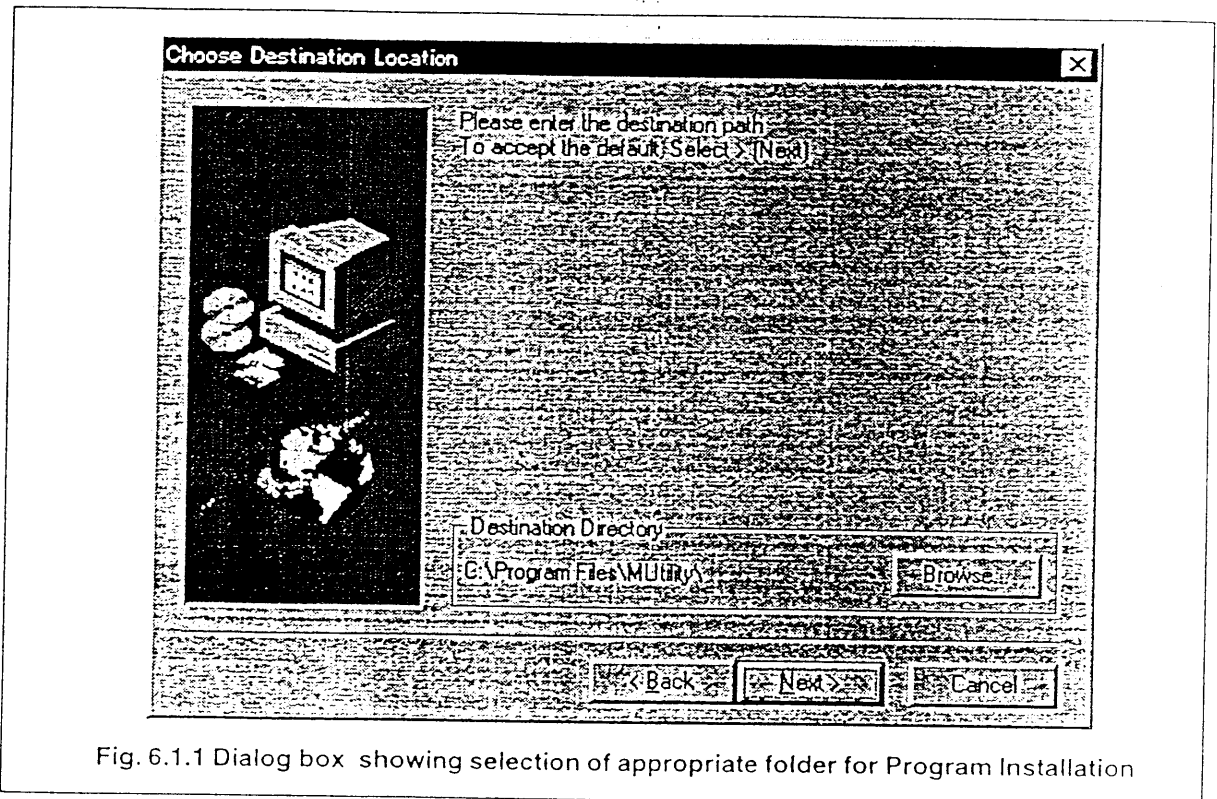

Fig. 6.1.1 Dialog box showing selection of appropriate folder for Program Installation

1. Click on the [Browse] button and the [Directory selection] dialog will appear, and select the drive and the target directory.

2. By default, the program will install the software using the following path: C: Program File\M utility\ You may also click on the [Browse] button to select some other folder as a suitable choice for software installation. If this choice of folder does not exist on the hard disk, the Operating system shall automatically create it.

Then, click on the [Next] button to start the installation.

You may interrupt the installation at anytime by simply clicking on the [Cancel] button.

After copying the contents of the installation Disk#1 to the hard disk, you shall be promted to insert the Disk#2 and follow the instructions on the screen for inserting the installation Disk#2 and, then click on the [OK] button to proceed further with the installation.

The dialog box will pop up indicating the completion of installation and a final click on the [OK] button will end the successful installation of the program.

6.2 How To Use The M - Drive Utility Software:

Clicking on the M Drive Utility software in the "Program" menu of the Windows "Start" button. After the opening screen, the [Main menu] dialog box similar to **Fig. 6.2.1** will be displayed, and then click on the button in accordance to the menu. For a description of the various menu options, refer to the appropriate explanations.

Fig 6.2.1 Main menu
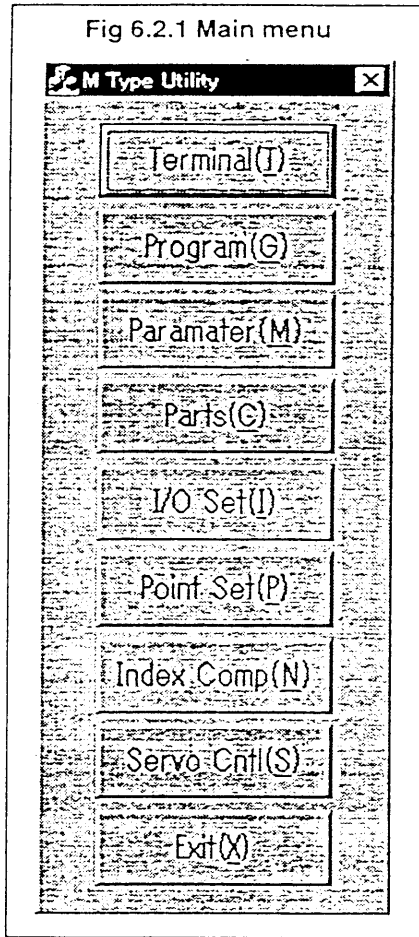
[Terminal Mode]	The terminal mode can be used for direct interaction with the M Driver using the PC and it enables both the parameter inputs as well as the monitoring capability.
[Program Menu]	This sub-menu combines the functionality of uploading and downloading of the various programs from/to the M Driver.
[Parameter Menu]	This sub-menu combines the functionality of uploading and downloading of the parameters from/to the M Driver.
[Cam Curve Menu]	This is used to create, edit, view and download cam curves to the M Driver controller.
[I/O setting menu]	This is used to set the I/O related setting in the Driver
[Point setting menu]	This is used to edit the point setting table.
[Index compensation]	This is used to edit the process for the compensation table and also the index compensation file.
[Servo adjustment]	This is used to adjust the servo parameter of the motor.
[Exit]	Terminating this utility program.

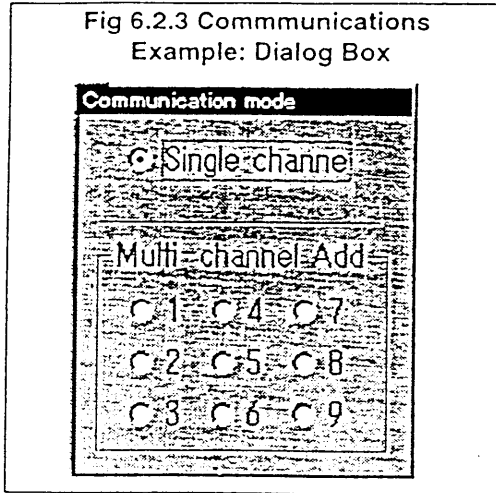Fig 6.2.2 Communications Example: Dialog Box
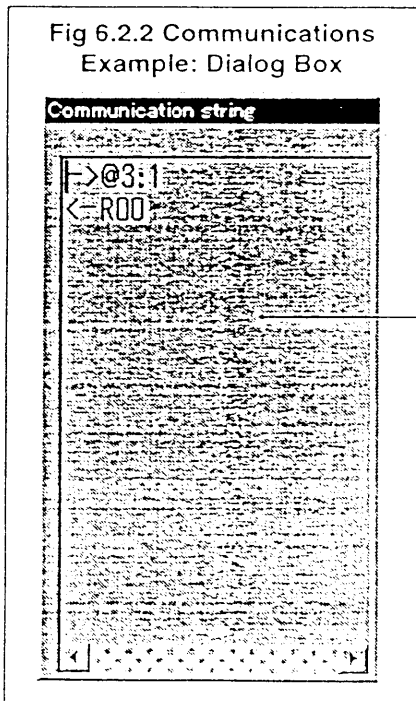
The [Parameter Inputs] dialog box is displayed during the operation of the Utility software(**Fig. 6.2.2**). The commands sent to the driver and the messages (response) received from the driver is displayed regardless of the menu selection.

Alpha-numeric edit tool box.
Headers:

$\longrightarrow$ Characters sent

$\longleftarrow$ Characters received

Fig 6.2.3 Commmunications Example: Dialog Box

Communication mode

○ Single channel

Multi-channel Add

○ 1   ○ 4   ○ 7
○ 2   ○ 5   ○ 8
○ 3   ○ 6   ○ 9

Starting the Utility software will bring up the [Communication mode] dialog box (Fig. 6.2.3). For the single axis of operation, select the single axis address and for multiple axis, select the multiple axis address.

6.3 How To Use The Terminal Mode:

Clicking on the [Terminal Mode] button will display the Terminal mode dialog window as shown in the example below. It is possible to monitor the driver status and to display the list of all commands and parameters.

Click on the Terminal mode inside the Main menu to display the "Terminal Mode" dialog box. (Refer to the Fig. 6.3.1).
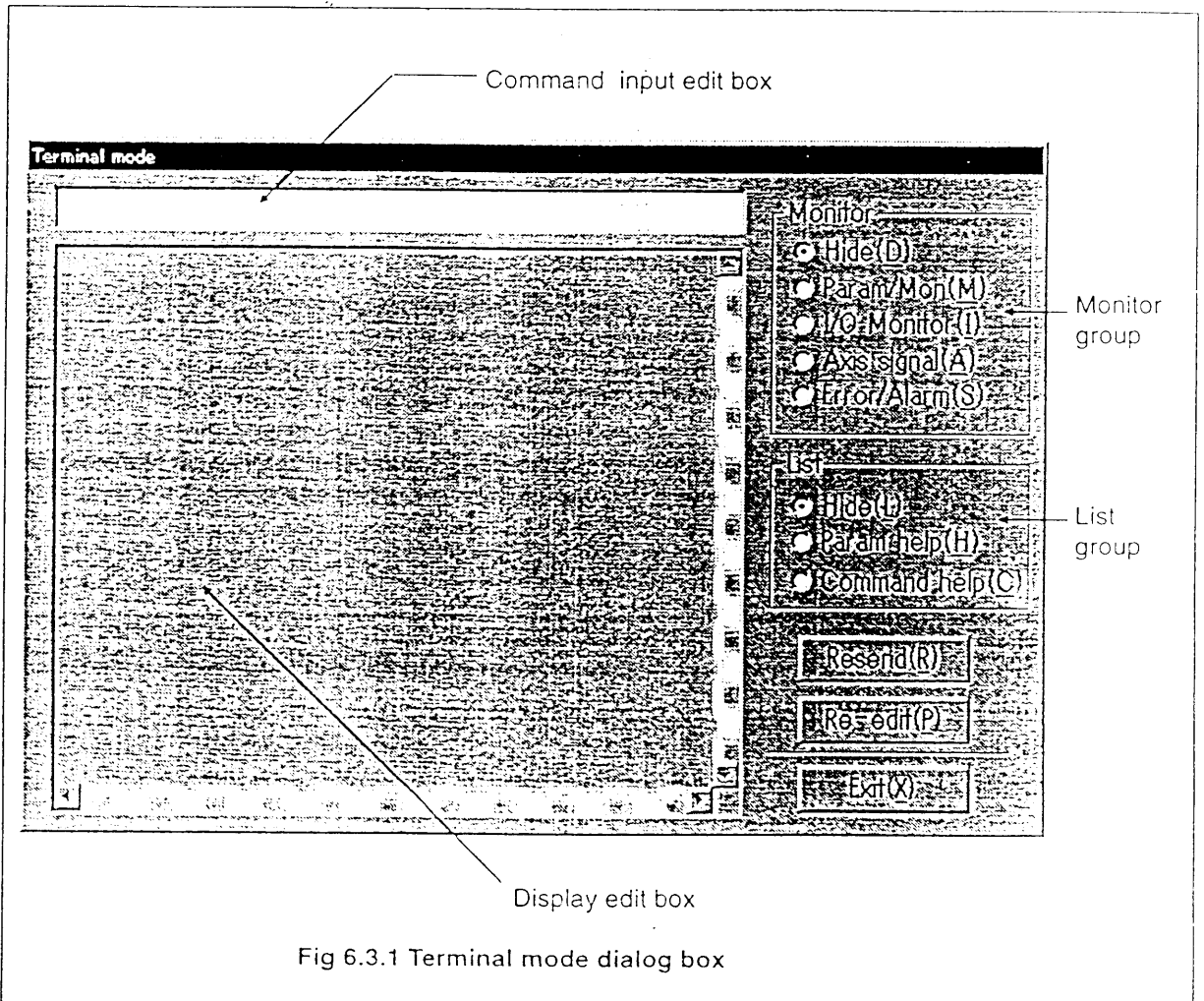
Command input edit box

Terminal mode

Monitor
● Hide(D)
○ Param/Mon(M)
○ I/O Monitor(I)
○ Axis signal(A)
○ Error/Alarm(S)

— Monitor group

List
● Hide(L)
○ Param help(H)
○ Command help(C)

— List group

Resend(R)

Re-edit(P)

Exit(X)

Display edit box

Fig 6.3.1 Terminal mode dialog box

6.3.1 Sending & Receiving Commands

1. Use the keyboard to input the relevant commands in the [Command Input] box and then press the Return key (enter key) to transmit the commands to the M Drive. While these commands are transmitted to the M Drive, the same are also displayed in the [Display edit] box.

2. When the M Drive transmits information to the PC, the same will also be displayed in this [Display edit] box.

3. Clicking on the [Re-Transmit] button will retransmit the last command sent to the M Drive.

4. Clicking on the [Paste] button will paste the last transmitted command in the [Command Input] box. Note: This will not be transmitted unless the Return (enter) key is pressed.
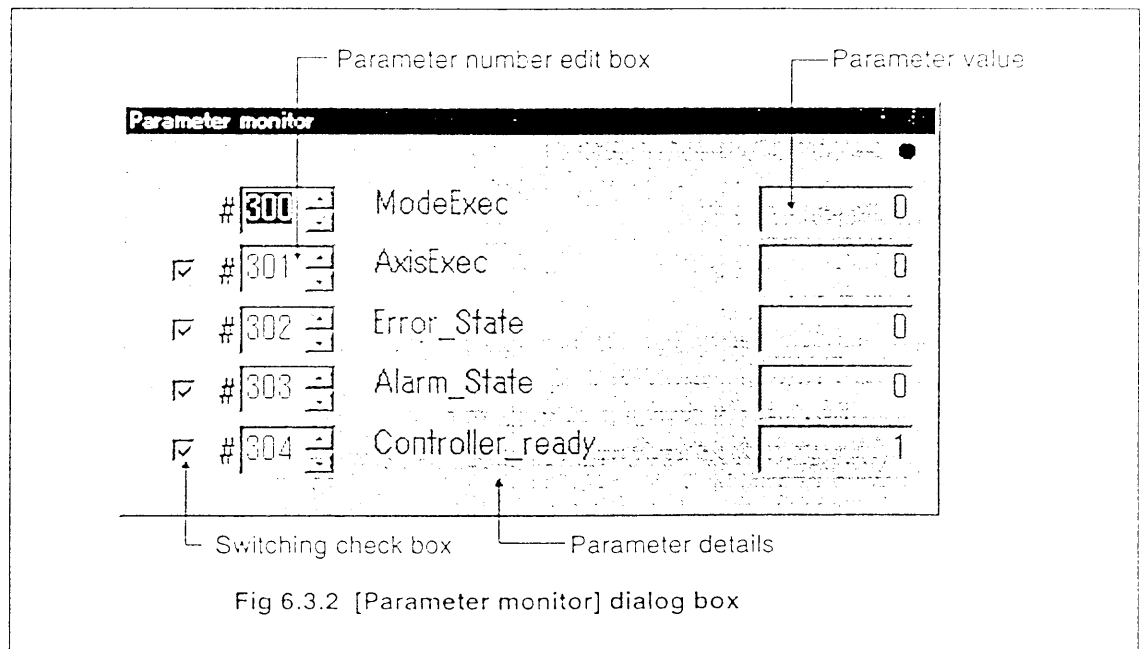
6.3.2 Monitoring The Driver Status

Clicking on any of the items within the [Monitor] group button will display the driver status monitor dialog box. The command transmission can be carried out during the monitoring through this [Terminal Mark]box.

	Description
Parameter	Monitors up to a maximum of five (5) parameter values from the driver.
I/O	Monitors the I/O status of the drives.
Axis signal status	Monitors the Axis DI status.
Error/Alarm	Check for an error or an alarm status and displays it's record.

Parameter Monitor

Clicking on the [Parameter monitor] of the [Terminal mode] will bring up the [Parameter monitor] dialog box (Fig. 6.3.2).

When the desired parameter number is input into the parameter number edit box, the contents of the parameter and value shall be displayed. By selection of the Switch check box , the number of parameters intended for monitoring can be changed from 1 to 5.

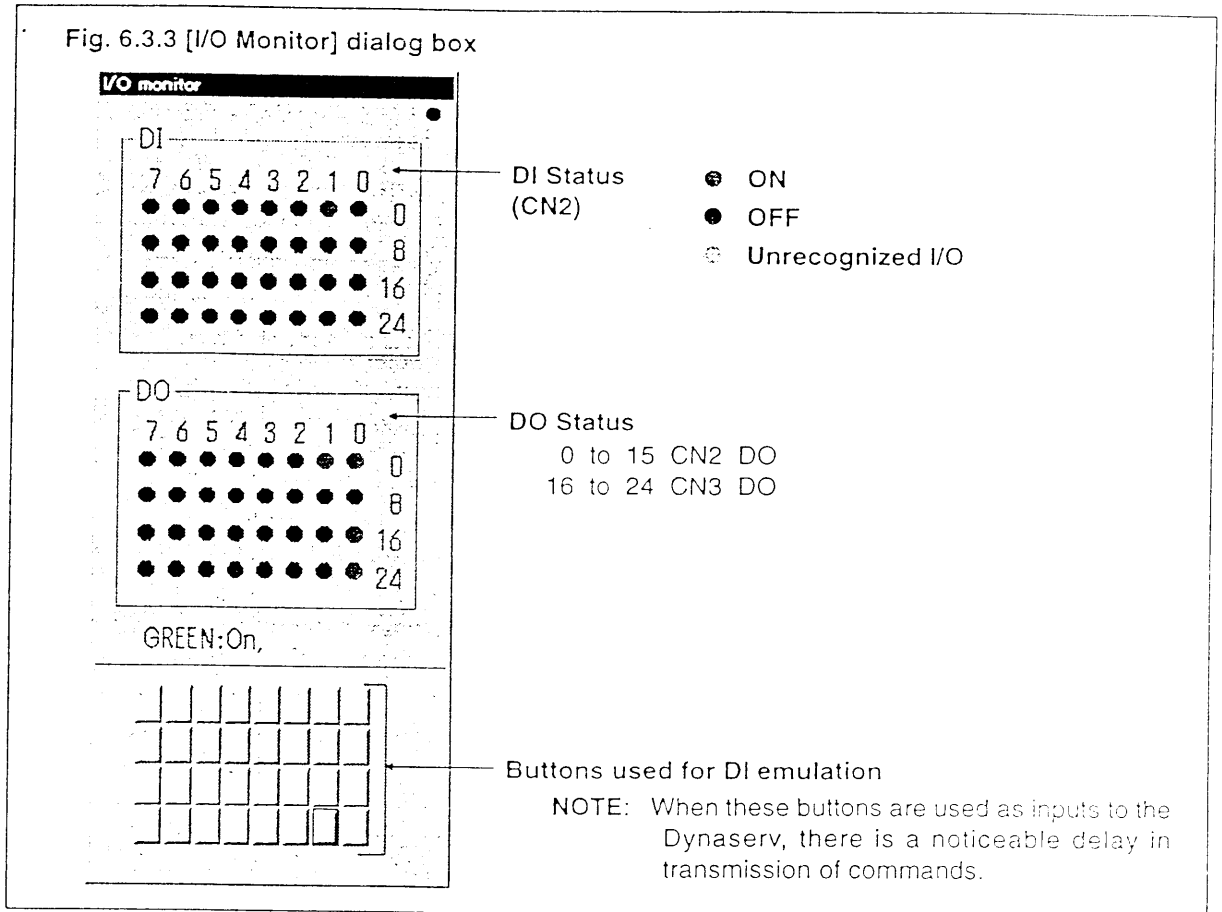Fig 6.3.2 [Parameter monitor] dialog box

I/O Monitor

Clicking on the [I/O monitor] in the [Terminal mode] will display the [I/O monitor] box (Fig 6.3.3).

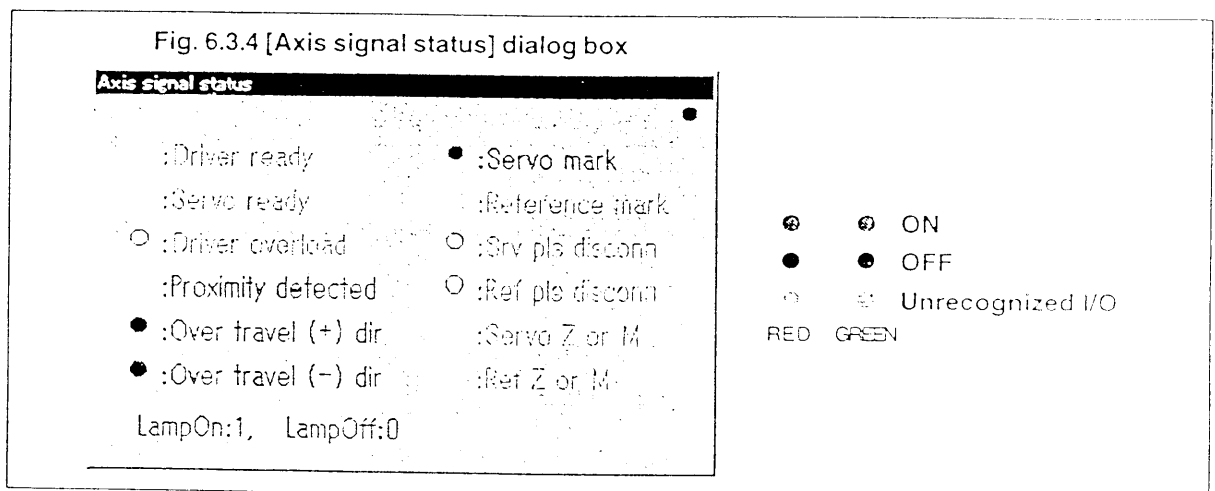The status of the DI and DO can be monitored using the [I/O monitor].

In addition, if the drive is powered ON in the DI emulation mode, the DI on the CN2 can be turned either ON/OFF directly by using the button located just below the dialog box.

Fig. 6.3.3 [I/O Monitor] dialog box

DI Status (CN2)

⦿ ON
● OFF
○ Unrecognized I/O

DO Status
0 to 15 CN2 DO
16 to 24 CN3 DO

GREEN:On.

Buttons used for DI emulation

NOTE: When these buttons are used as inputs to the Dynaserv, there is a noticeable delay in transmission of commands.

Axis Signal Status

Clicking on the [Axis signal status] button in the [Terminal mode] will display the [Axis signal status] dialog box (Fig.6.3.4).

[Axis signal status] can be used to monitor the driver axis DI status.

Fig. 6.3.4 [Axis signal status] dialog box

:Driver ready   ● :Servo mark
:Servo ready   :Reference mark
○ :Driver overload   ○ :Srv pls disconn
:Proximity detected ○ :Ref pls disconn
● :Over travel (+) dir :Servo Z or M
● :Over travel (−) dir :Ref Z or M

LampOn:1, LampOff:0

⦿ ⦿ ON
● ● OFF
○ ○ Unrecognized I/O
RED GREEN

Error / Alarm Monitor

Clicking on the [Error/alarm] button in the [Terminal mode] will display the [Error/alarm] dialog box (Fig.6.3.5).

When an error occurs, [Error] warning is displayed and the error messages will be displayed in the display edit box. The same holds true for the alarm warnings. The error/alarm contents are displayed in sequence in the Display edit box but the maximum number of error messages is restricted to 16 only.

Fig.6.3.5 [Error/alarm] dialog box

Error occurence message

Alarm occurence message

Display edit box
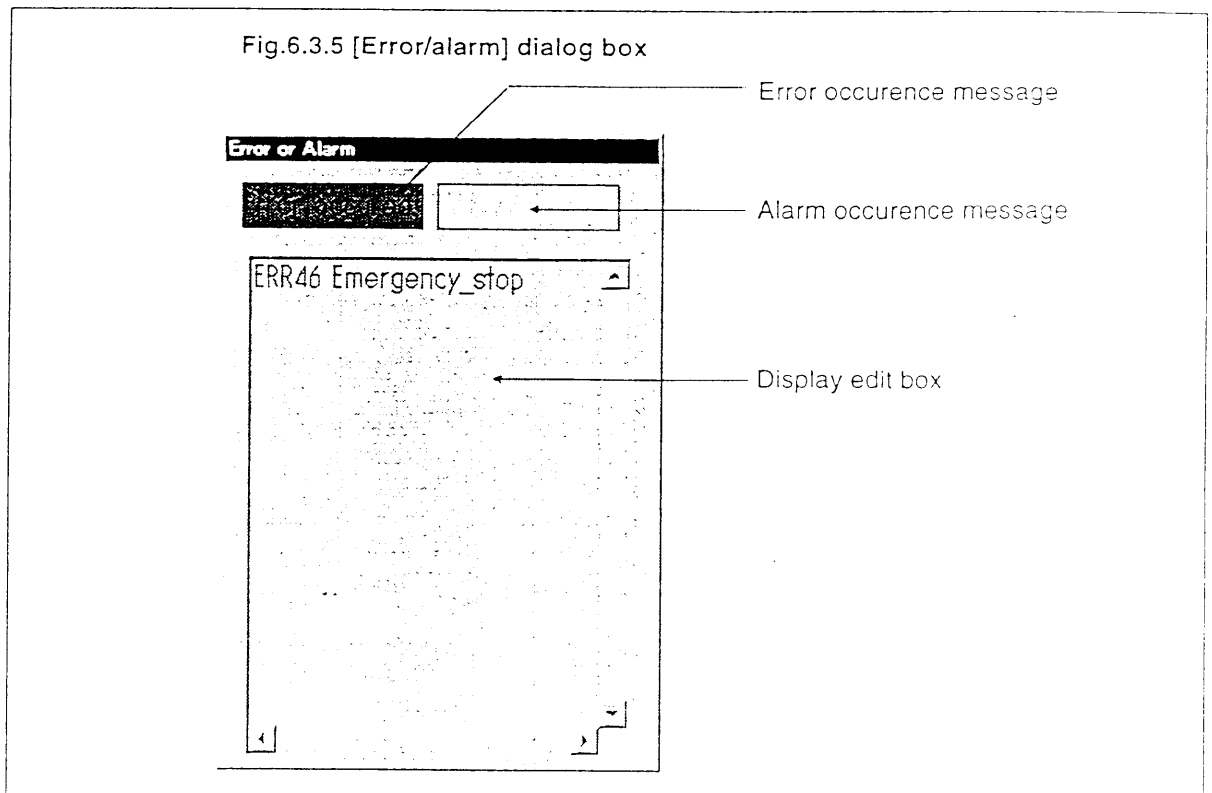
Help List

Clicking on the [List] button of the group in the [Terminal mode] will display the dialog box which displays the driver parameter help or the command help list. Fig. 6.3.6 shows the [Parameter help] dialog box.

Commands can be sent to the drive using the input edit box in the [Terminal mode] while also displaying the help list. However, commands cannot be sent to the drive while receiving the help messages into the help dialog box.

Fig. 6.3.6 [Parameter Help] dialog box

-61-
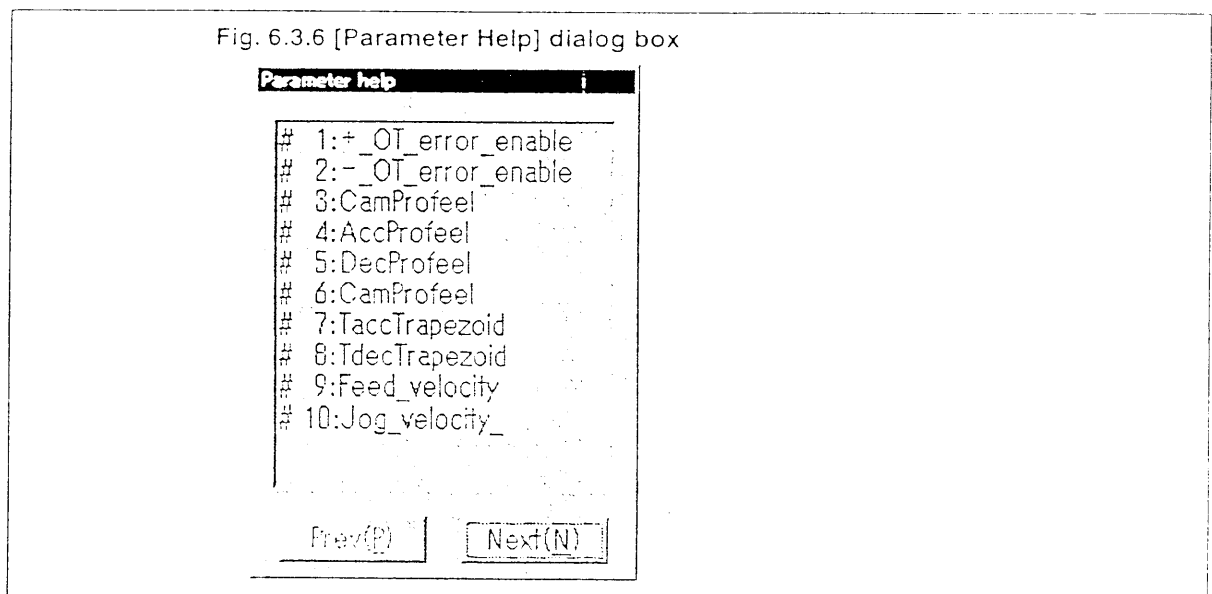
6.4 The Program Manager

The Program manager is used to upload registered files from the drive to the computer, for downloading file contents from the computer to the drive, for editing the file contents and for printing the files for hard copy purposes. Further, inside the program monitor feature it is possible to monitor the program execution and the data.

Clicking on the [Program Manager] button inside the [Main Menu] will display the [Program Manager] dialog box. Refer to **Fig. 6.4.1** for details. Clicking on the individual buttons inside this box will execute various features as required.

Fig. 6.4.1 [Program Manager] dialog box
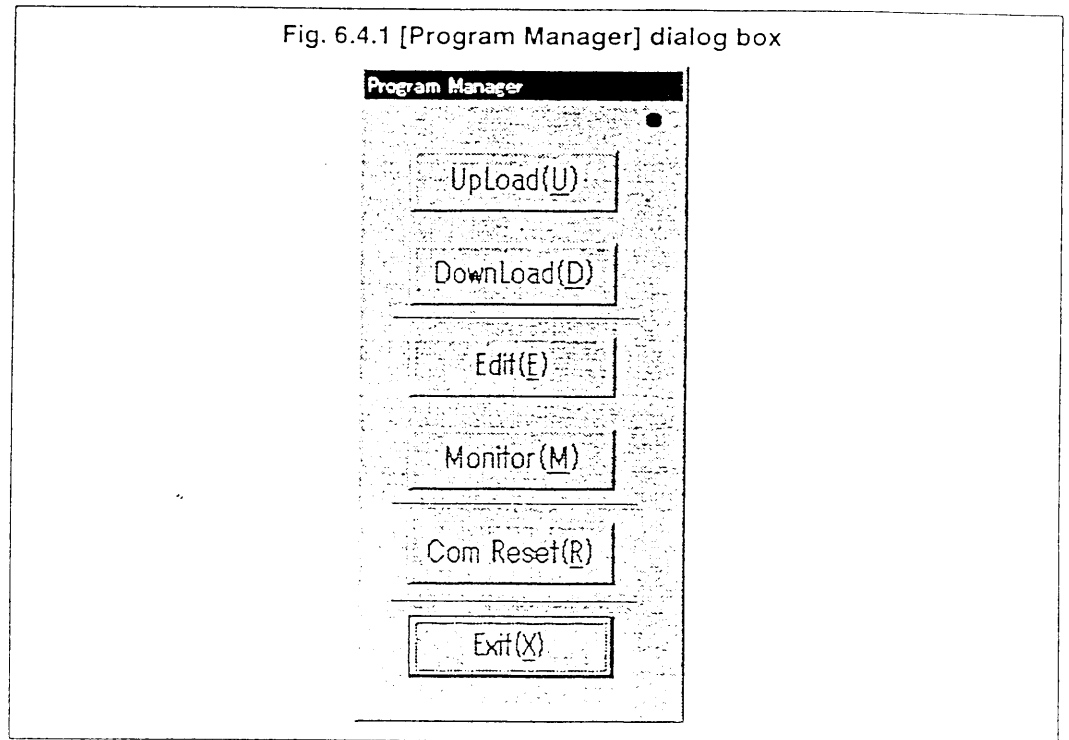
6.4.1 Uploading Programs

Clicking on the[Upload] button inside the [Program Manager] will bring up the [Type Selection] dialog box.

Standard Uploads

1. Click on the [Standard] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. The [Property] dialog box will be displayed and at this point, input the Program number to upload and then click on the [OK] button.

   NOTE: The user definable programs may be stored in program numbers ranging from 0 to 89 and the program numbers 90 to 99 are reserved for the system programs.

3. Input the name for storing the program file. The file extension (.prg) shall be automatically registered so kindly do not enter any file extensions.

4. Click on the [Save] button and this will commence the upload of information to the computer. You may stop this procedure at any point of time by simply clicking on the [Cancel] button.

Multiple Uploads

All the programs registered in the driver can be uploaded with a single command.

1. Click on the [All] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. Input a program name to retrieve the information into. The file extension (.whp) shall be automatically registered so kindly do not enter any file extensions.

3. Click on the [Save] button to start the upload process. You may stop this procedure at any point of time by simply clicking on the [Cancel] button.

6.4.2 Downloading Programs

Clicking on the [Download] button inside the [Program Manager] (Refer to the **Fig. 6.4.1**), shall bring up the Type Selection] dialog box.

Standard Downloads

1. Click on the [Standard] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. The [Property] dialog box will be displayed and at this point, input the Program number to download and then click on the [OK] button.

NOTE: The user definable programs may be stored in program numbers ranging from 0 to 89 only (the program numbers 90 to 99 are reserved for the system programs).

3. Input the program file name for downloading. The file extension (.prg) shall be automatically recognized, so kindly do not enter any file extensions.

4. Click on the [Open] button and this will commence the downloading of information to the drive. You may stop this downloading procedure at any point of time by simply clicking on the [Cancel] button.

Multiple Downloads

Based upon the program numbers specified in the program file, the programs file can be downloaded to the drive with a single command.

1. Click on the [All] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. Input the desired program name into the field specified. The file extension (.whp) shall be automatically recognized, so kindly do not enter any file extensions.

3. Click on the [Open] button to start the download process. You may stop this procedure at any point of time by simply clicking on the [Cancel] button.

6.4.3 Reset Communications

If the driver experiences communication problems, use this feature to reset the communication system between the computer and the drive. In the [Program Manager] (**Fig. 6.4.1**), click on the [Communications Reset] button to reset the communication system and return the drive to normal status.

6.4.4 Editing Programs

The programs registered in the drive or those programs stored in a file on the computer can be easily edited using this feature. In addition, this feature may be used to store the programs on file after editing the same or even to register them on the drive.

In the [Program Manager] (**Fig. 6.4.1**), click on the [Edit] button to display the [Program Edit] display box as shown in Fig. 6.4.4:

Fig. 6.4.4 [Program Edit] dialog box
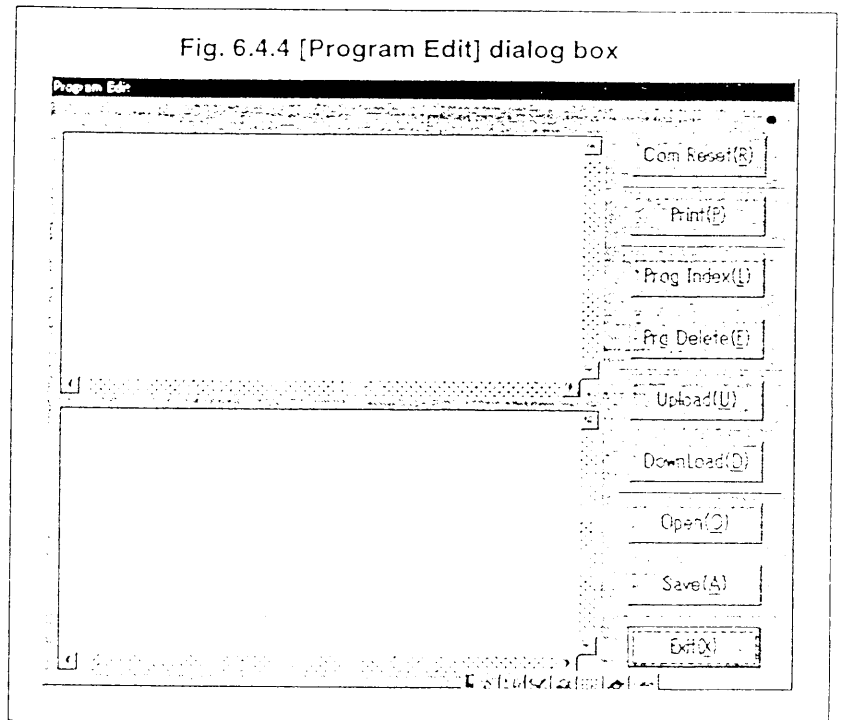
Editing Previously Stored Or Registered Programs

All the programs registered in the drive or, those programs stored on the computer can be edited easily.

Driver Programs

1. Click on the [Upload] button.
2. The [Property] dialog box will be displayed, then select the display window and enter the Program number here.
3. Click on the [OK] button and the Program contents shall be displayed.

Program Files

1. Click on the [Open] button.
2. The [Property] dialog box will be displayed, then select the display window and click on the [OK] button.
3. Enter the program number, click on the [Open] button and the Program contents shall be displayed. As the file extension (.prg) is automatically recognized, do not enter the file extension.

Registration Of Programs Into The Driver

1. Click on the [Download] button and the [Property] dialog box will be displayed.
2. Then select the display window enter the desired program number.
3. Check the required optional parameters and then click on the [Open] button. If the program has any built-in inherent errors, it cannot be downloaded into the driver and the relevant error line in the program shall be highlighted in RED.

The optional parameters during downloading are listed as follows:

	Meanings (When the appropriate box is checked)
Servo ON settings	At the time of downloading, it is necessary that the driver is in Servo ON status, or else the download shall not be carried out.
Motion coordinates compatibility	At the time of downloading, if the coordinate system is incompatible the downloading process cannot be carried out.

Saving Programs In A File

1. Click on the [Save] button and the [Property] dialog box will be displayed.
2. Then select the display window which lists the desired program number and check the required optional parameters and then click on the [OK] button. The optinal parameters for saving are the same as those for downloading programs into the driver (see above).
3. Input the desired program name into the field specified and then click on the [Save] button. The file extension (.whp) shall be automatically registered, so kindly do not enter any file extensions.

Deleting Programs From The Driver

Click on the [Program delete] button and the [Property] dialog box will be displayed. Then enter the program number meant for deletion and click on the [OK] button.

Listing Programs Registered In The Driver

Clicking on the [Program Index] button will bring up a display of the programs registered in the driver along with the details about the programs such as the number of program blocks, loop blocks etc.

Printing The Programs

Clicking on the [Print] button will display the [Property] dialog box. Subsequently, select the display window containing the desired program file and then click on the [OK] button.

Communications Reset

If the driver to computer communications become abnormal due to any reason, use this button to reset the communication channels and thereby restore proper operations.

When a program is under execution, the program number, the contents of a program, the block number under execution etc. can be monitored. In addition, the display of alarm/ error messages can be viewed too. It is also possible to view the sent and received messages etc.

NOTE: Based upon the operation mode of the driver, the function of the program monitor or the type of the buttons enabled in the program monitor window differ and, hence it is necessary to confirm the operation mode of the driver before carrying out monitoring.

Clicking on the [Program monitor] button inside the [Program Edit] window, will bring up the [Program Monitor Initialization] window (Refer to Fig. 6.4.5).

Enter the desired program number, the contents of which you wish to record into the relevant selection box. If you select the [ALL] feature, this will record the entire contents of all the registered programs in the driver. The program contents of a program number which has not been previously registered in the driver shall not be recorded or displayed.

Click on the [O-] button to begin the recording of the program contents. To return to the [Program Edit] window, click on the [Cancel] button.

When the recording of the program contents is complete, the [Program Monitor] dialog box window shall be displayed and another dialog box for the [Optional Settings] shall also be displayed on top of the above window (See Fig. 6.4.6).

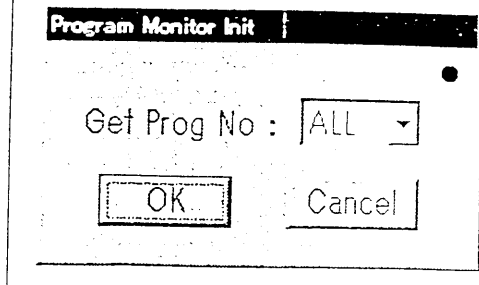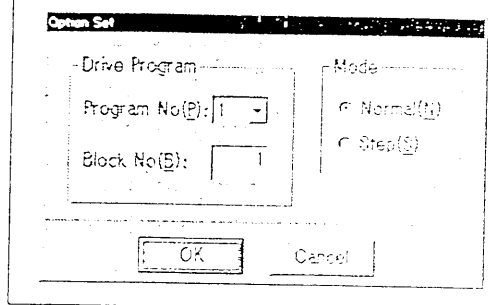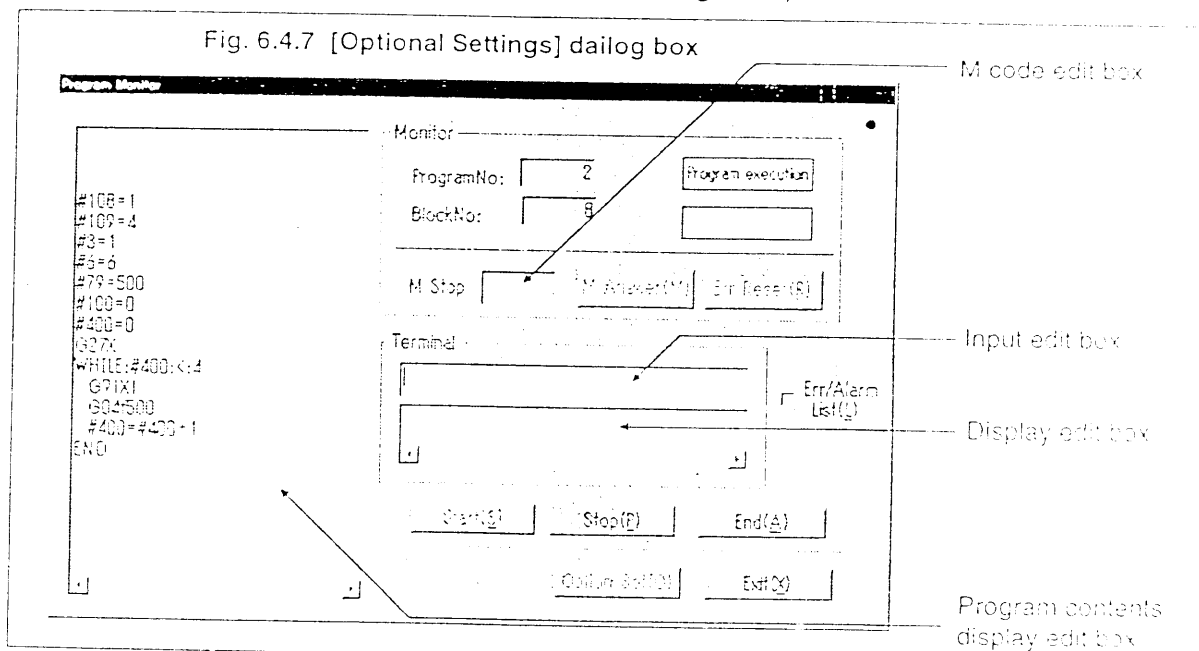Fig. 6.4.5 [Initialization Settings] dialog box

Fig. 6.4.6 [Optional Settings] dialog box

Optional Settings

1. Select the program desired for execution.
2. Input the block number desired for execution.
3. Select the move mode of operation. In the step mode of execution, the program shall stop after each step in the block.
4. Click on the [OK] button to set this selection or click on the [Cancel] button to exit from this mode and then return to the [Program Monitor] window (refer to Fig. 6.4.7)

Fig. 6.4.7 [Optional Settings] dailog box

Run Program

Clicking on the [Run] button will commence running the program and the button [Terminate Program Execution] button will be displayed. After completion of all the programs, the system will automatically move to the Stop mode.

If the move operations mode is [Standard], then the system will execute the program number selected in the [Optional Settings] in sequential mode. In order to make changes, click on the [Optional Settings] and make relevant changes. Refer to the section on [Optional Settings] for further information regarding these settings.

While the program is under execution, the program number, block number etc. are displayed in the [Monitor] group. Further, the program statements and contents of the program under execution are displayed in the window in Yellow color.

Program Stop

Clicking on the [Stop] button will wait until the block under execution is complete and then stop the execution. Clicking on the [Abort] button will immediately abort the operation and stop.

Receiving & Sending Alphabetical Characters (Commands)

In the Input edit box, enter the commands or alphabetical characters and then press the Return Key. This will transmit the commands to the driver. After the receipt of these commands into the driver, the driver's response (if any) shall be transmitted to the computer and the responses are displayed in the Display edit box.

M Answer

Set the M function interface communication settings to serial communications. If the M -code outputs are enabled during the program execution, the M code edit box shall be displayed and it will display the M-code display. Clicking on the [M answer] will transmit the M answer to the driver.

Processing Error/ Alarm Warnings

When an error occurs, the [Error] messages are displayed. To reset this error, click on the [Error Reset] button.

In order to view the Error/ Alarm history, click on the [Error or Alarm] button (see **Fig. 6.4.8**). The errors or alarm history is displayed in the Display edit box of the [Error or Alarm] window, but however, the number of errors that can be displayed is restricted to 16 numbers only. Click on the [Update] button to refresh the data on the error/ alarm history details.

Fig. 6.4.8 [Error or Alarm] dialog box

Display edit box
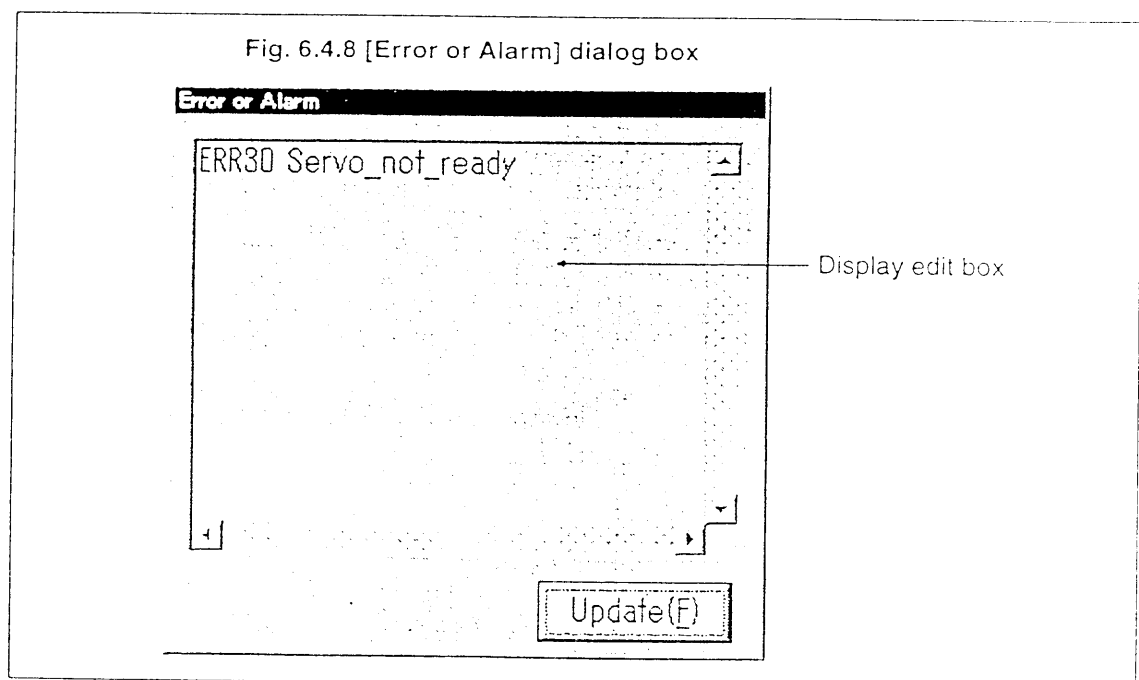
6.5 The Parameter Menu

The parameter menu may be used to upload the parameter values already registered in the drive onto a file on the computer; the contents of the parameters file created on the computer can be downloaded into the driver; the parameter values can be displayed on screen and the contents of the parameter file can also be printed.

Click on the [Parameter Menu] in the [Main menu] to display the [Parameter Menu] dialog box (Refer to **Fig. 6.5.1**). Clicking on the various buttons will execute the various function accordingly.

Fig. 6.5.1 [Parameter Menu] dialog box

Parameter maintenance

Upload(U)

Download(D)

View file(V)

Reset Com(R)

Exit(X)
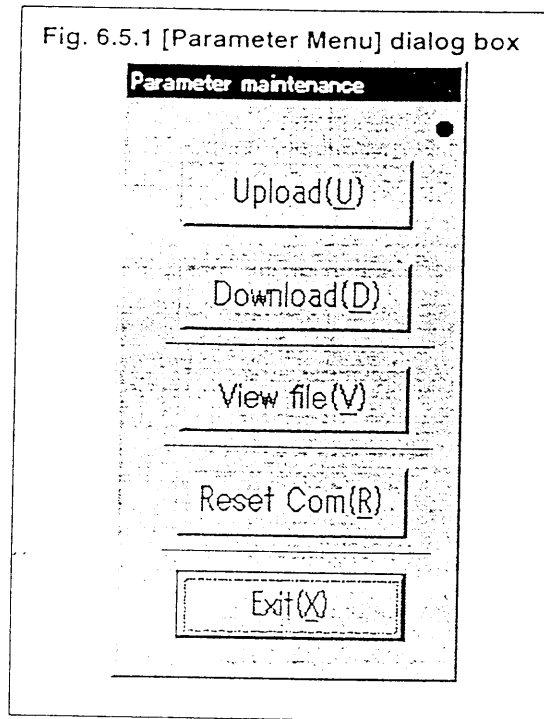
6.5.1 Uploading The Parameters

1. Click on the [Upload] button
2. Input the file name of the parameter to be saved. The file type (.prm) will be added automatically, thus do not add any file extensions.
3. Clicking the [Save] will start the upload. To stop the upload, click on the [Cancel] button.

6.5.2 Downloading The Parameters

1. Click on the [Download] button.
2. Input the file name of the parameter to be downloaded to the driver. The file type (.prm) will be added automatically, thus do not put add any extensions.
3. Clicking the [Save] will commence the download. To stop the downloading process, click on the [Cancel] button.
4. To update the downloaded parameters, reset the driver after completing the download process.

6.5.3 Display The Contents Of The Parameter File

1. Click on the [View] button.
2. Input the name of the parameter file to be viewed. The file type (.prm) will be added automatically, thus do not add any file extensions.
3. Clicking on the [Open] button will display the contents of the file in the [Parameter file display] dialog box.
4. Click on the [File print] button to print the file.

6.5.4 Communications Reset

If communication malfunction occurs during the driver-computer communications, clicking on the [Reset Com] will bring back the driver back to the normal status.
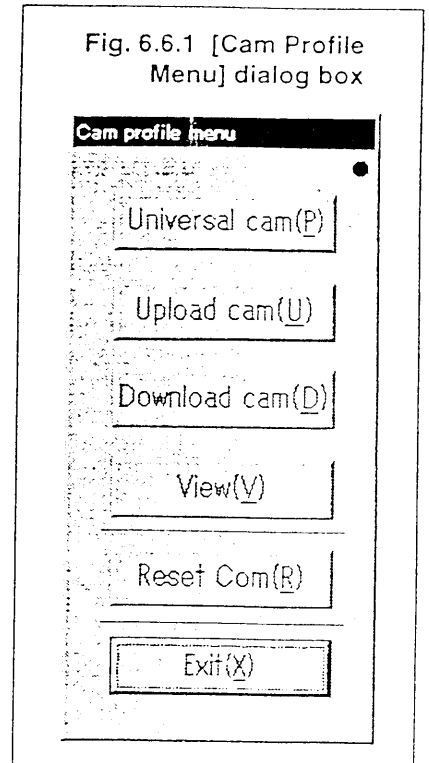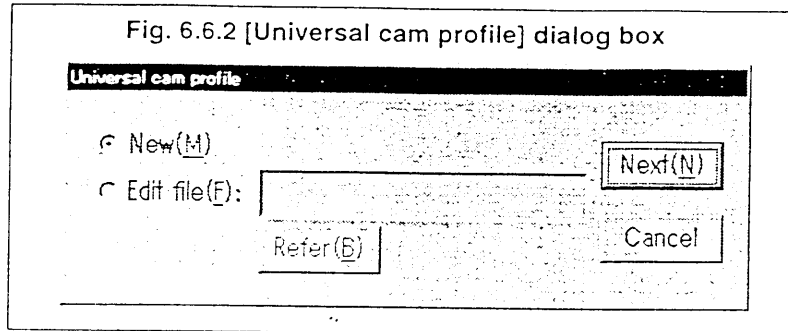
6.6 The Cam Profile Menu

The cam profile menu may be used to create an universal cam profile; upload the cam profile values from the drive into the computer; download the cam profile values already created inside the computer into the drive and further, the cam profile can be displayed on screen and the same can also be printed out.

Click on the [Cam Profile Menu] in the [Main menu] to display the [Cam Profile Menu] dialog box (See Fig. 6.6.1). Clicking on the various buttons will execute the various functions accordingly.
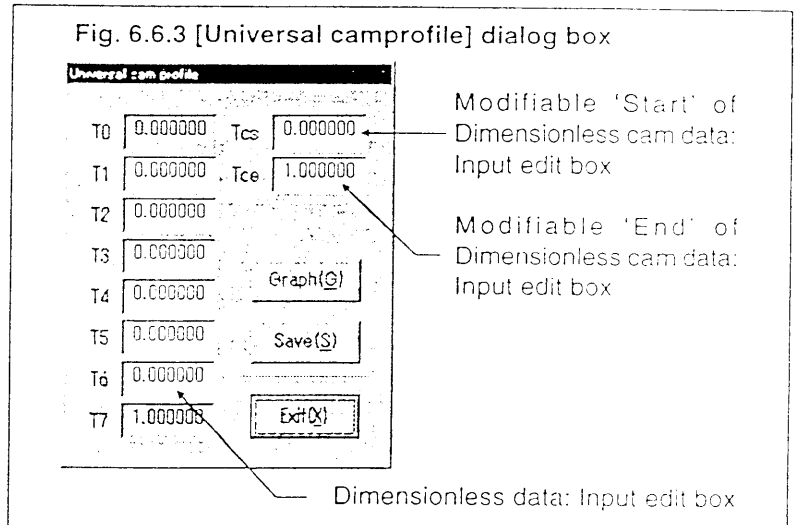
6.6.1 Creating An Universal Cam Profile

Clicking on the [Universal Cam] button inside the [Cam Profile Menu] dialog box shall display the [Universal cam profile] dialog box (see Fig. 6.6.2).

Fig. 6.6.1 [Cam Profile Menu] dialog box

Cam profile menu
- Universal cam(P)
- Upload cam(U)
- Download cam(D)
- View(V)
- Reset Com(R)
- Exit(X)

Fig. 6.6.2 [Universal cam profile] dialog box

Universal cam profile
- ⊙ New(M)
- ○ Edit file(F):
- Refer(B)
- Next(N)
- Cancel

New Universal Cam Profile Creation

1. Click on the [New] button inside rthe [Universal cam] dailog box and then click on the [Next] button to display the [Universal cam profile] dialog box (see the Fig. 6.6.3).

2. Enter the dimension less data inputs for the parameters <T1> to <T6>. The valid data range is any value between 0 and 1. Press the carriage return (or the enter key) after making each of the entries so as to register the value correctly.
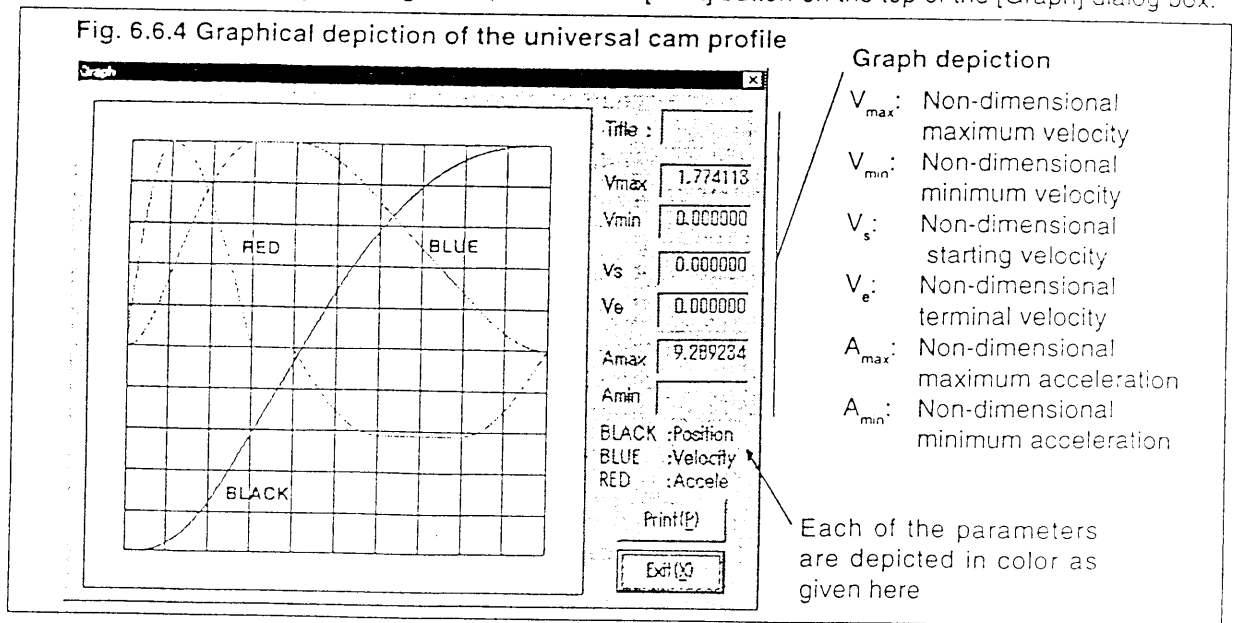
Note:

Fig. 6.6.3 [Universal camprofile] dialog box

Universal cam profile

T0	0.000000	Tcs	0.000000
T1	0.000000	Tce	1.000000
T2	0.000000		
T3	0.000000		
T4	0.000000	Graph(G)	
T5	0.000000	Save(S)	
T6	0.000000		
T7	1.000000	Exit(X)	

Modifiable 'Start' of Dimensionless cam data: Input edit box

Modifiable 'End' of Dimensionless cam data: Input edit box

Dimensionless data: Input edit box

Click on each of the input areas from <T1> to <T6> and enter any value between 0 & 1 by using the Numeric pad on the computer keyboard and press the return (enter) key to register each of the <T1> to <T6>. Kindly note however, that the values from <T1> to <T6> must be in strict ascending order. For example if a value of 0.3 is entered for <T3> then it is necessary that you must enter a value equal to 0.3 (or greater) for <T4> ; if, however, you do enter a value less than 0.3 for <T4> , the Program will automatically register it as 0.3.

3. After creating the cam curve profile like above, it is possible to select only a part of the curve if necessary. In the above window (Fig. 6.6.3), input the values of T_{cs} and T_{ce} and ensure that these values lie in the range of 0 to 1 . Further, remember to enter a carriage return after inputting the values. Note that it is absolutely essential to ensure that the value of T_{cs} does not exceed the value of T_{ce} and also ensure that the value of T_{ce} is not smaller than the value input for T_{cs}.

4. Click on the [Graph] button to immediately view the results of the selection (see **Fig. 6.6.4**). In order to print the graph displayed in **Fig. 6.6.4**, click on the [Print] button on the top of the [Graph] dialog box.

Fig. 6.6.4 Graphical depiction of the universal cam profile

Graph depiction

V_{max}: Non-dimensional maximum velocity

V_{min}: Non-dimensional minimum velocity

V_s: Non-dimensional starting velocity

V_e: Non-dimensional terminal velocity

A_{max}: Non-dimensional maximum acceleration

A_{min}: Non-dimensional minimum acceleration

Title :
Vmax 1.774113
Vmin 0.000000
Vs   0.000000
Ve   0.000000
Amax 9.289234
Amin
BLACK :Position
BLUE :Velocity
RED   :Accele
Print(P)
Exit(X)

Each of the parameters are depicted in color as given here

Graph Depiction:

The horizontal and vertical axes depicted on this graph are both non-dimensional. The curve in Black is the non-dimensional Position representation. The Blue curve represents non-dimensional velocity values and the Red curve represents the non-dimensional acceleration values. The left of the horizontal axis has a values of 0 and the right end is taken to be 1.

Similarly, the vertical axis depicting Position starts with a non-dimensional value of 0 at the bottom of the graph on the left and equals 1 at the top right end of the graph. The Velocity curve starts with a value of 0 at origin and ends with a value of 0 and has a maximum non-dimensional value of 1 in the middle. The non-dimensional acceleration curve has a value of 0 in the middle of the graph where it crosses over from a positive value to a negative value. The maximum value of this acceleration in the positive direction is depicted as A_{max} and the minimum value is in the negative direction and referred to as A_{min}.

Saving The 'universal cam profile' In A File

1. Click on the [Save] button in the [Universal cam profile] box.
2. Input a file name to store the universal cam profile. The file type (.unv) will be added automatically, thus do not add any file extensions.
3. Clicking on the [Save] button will store the file. To stop the save process, click on the [Cancel] button.

NOTE: Whenever a universal cam profile is stored in a file, simultaneously yet another file is also created on the computer drive with an identical name but a different file extension (file extension is .cdt).

Close The [Universal cam profile] Dialog Box After Saving The Data In A File

1. Click on the [Exit] button in the [Universal cam profile] box. This will bring the display of a message box which will prompt for saving the data in a file.
2. Click on the [Save] button if you need to save the file. The process is the same as in the section above. Refer to 'Saving the universal cam profile in a file' for more details.
3. Clicking on the [No] button will abort the save process and exit from the menu. To return to the [Universal cam profile] dialog box, click on the [Cancel] button.

Editing The Universal Cam Profile file

1. Click on the [File edit] button in the [Universal cam Menu] dialog box (Refer to Fig. 6.6.2).
2. Input the correct file name of the stored universal cam profile in the Input edit box window [the file type (.unv) must be used]. If the file name or the path to the file location is unknown, click on the [Browse] button to seek for it.
3. Clicking on the [Next] button will bring up the [Universal cam profile] dialog box (refer to Fig. 6.6.3).
4. Then follow the same procedure as described in 'New Universal Cam Profile Creation'.

6.6.2 Uploading The Cam Profiles

Clicking on the [Cam Profile Upload] button in the [Cam profile menu] dialog box (see Fig. 6.6.1), will bring up the display of the [Type selection] dialog box.

Standard Uploads

1. Click on the [Standard] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input the cam profile number to read the universal cam profile data from and then click on the [OK] button.

   The driver has the capability of storing 16 cam profiles. However, the cam profiles numbering 1 to 8 are standard cams and the cam profiles 9 to 16 are available for user defined cams.

3. Input a file name to store the universal cam profile. The file extension (.cdt) will be added automatically, thus do not add any file extensions.
4. Click on the [Save] button to commence uploading of the data. To stop the save process, click on the [Cancel] button.

Multiple Uploads

All the cam profiles stored in the driver can be uploaded with a single command.

1. Click on the [Multiple] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input a file name to store the data from multiple universal cam profiles. The file extension (.whc) will be added automatically, thus do not add any file extensions.
3. Click on the [Save] button to commence uploading of the data. To stop the save process, click on the [Cancel] button.

NOTE: Whenever the multiple universal cam profiles are stored in a single file, simultaneously yet another file is also created on the computer drive with an identical name but a different file extension (file extension is .cdt). The registered cam profile numbers are also appended to the cam profile data file.

6.6.3 Downloading The Cam Profiles

Clicking on the [Cam Profile Download] button in the [Cam profile menu] dialog box (see Fig. 6.6.1), will bring up the display of the [Type selection] dialog box.

Standard Downloads

1. Click on the [Standard] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input the cam profile number to download the universal cam profile data to and then click on the [OK] button.

   Note that the cam profiles numbering 9 to 16 are alone available for user downloads.

3. Input a file name with the universal cam profile meant for downloading. The file extension (.cdt) will be added automatically, thus do not add any file extensions.
4. Click on the [Open] button to commence downloading of the data. To stop the downloading process, click on the [Cancel] button.

Multiple Downloads

All the cam profiles stored in single file can be downloaded at once.

1. Click on the [Multiple] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input a file name with the multiple universal cam profiles data. The file extension (.whc) will be added automatically, thus do not add any file extensions.
3. Click on the [Open button to commence the downloading of the data. To stop the downloading process, click on the [Cancel] button.

6.6.4 Viewing The Cam Profiles

The cams registered in the driver or the various cam profiles stored in data files on the computer are easily viewed on screen with graphical representation.

Clicking on the [Cam View] button in the [Cam profile menu] dialog box (see **Fig. 6.6.1**), will bring up the display of the [Cam profile view] dialog box as shown in **Fig. 6.6.5**.

Fig. 6.6.5 [View cam profile] dialog box

File name input edit box
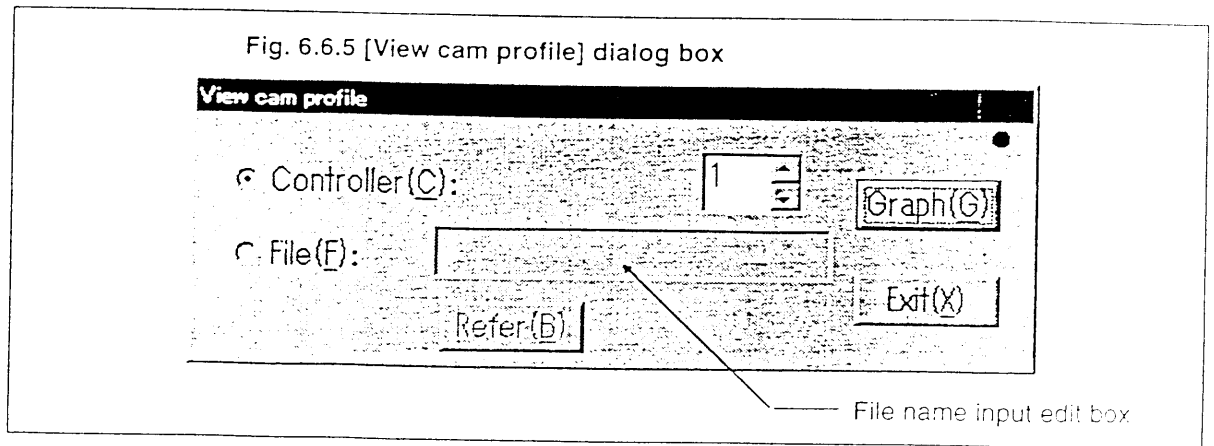
Viewing The Cam Profiles Registered In The Driver

1. Click on the [Controller] button inside the [Cam View] dialog box.
2. Input the desired cam profile number for viewing.
3. Click on the [Graph] button to display the graphical depiction of the cam profile on screen.
4. For details on the graph refer to the section on **New Universal Cam Profile Creation** and also see **Fig. 6.6.4 (Graphical depiction of the universal cam profile)** for explanations.

Viewing The Cam Profiles Stored In Cam Profile Data Files On The Computer

1. Click on the [Filer] button inside the [Cam View] dialog box.
2. Input a file name for the universal cam profiles data in the file name input edit box. The file extension (.cdt) must also be added. If the file name or the path to the file location is unknown, click on the [Browse] button to seek for it.
3. Click on the [Graph] button to display the graphical depiction of the cam profile on screen.
4. For details on the graph refer to the section on **New Universal Cam Profile Creation** and also see **Fig. 6.6.4 (Graphical depiction of the universal cam profile)** for explanations.

6.6.5 Communications Reset

If communication malfunction occurs during the driver-computer communications, clicking on the [Reset Com] button in the [Cam profile menu] dialog box (see **Fig. 6.6.1**) will bring back the driver back to the normal operations status.

6.7 Point Settings

The 'Point setting' menu is used to edit the tables used in point location moves.

Clicking on the [Point setting] in the [Main menu] will display the [Point setting table] dialog box (see the Fig. 6.7.1). The coordinates of points specified in the driver will be displayed in the point value display edit box. To change the point coordinate values, use the 'Point n number' parameter in the Terminal mode.

Fig. 6.7.1 [Point Settings Table] dialog box
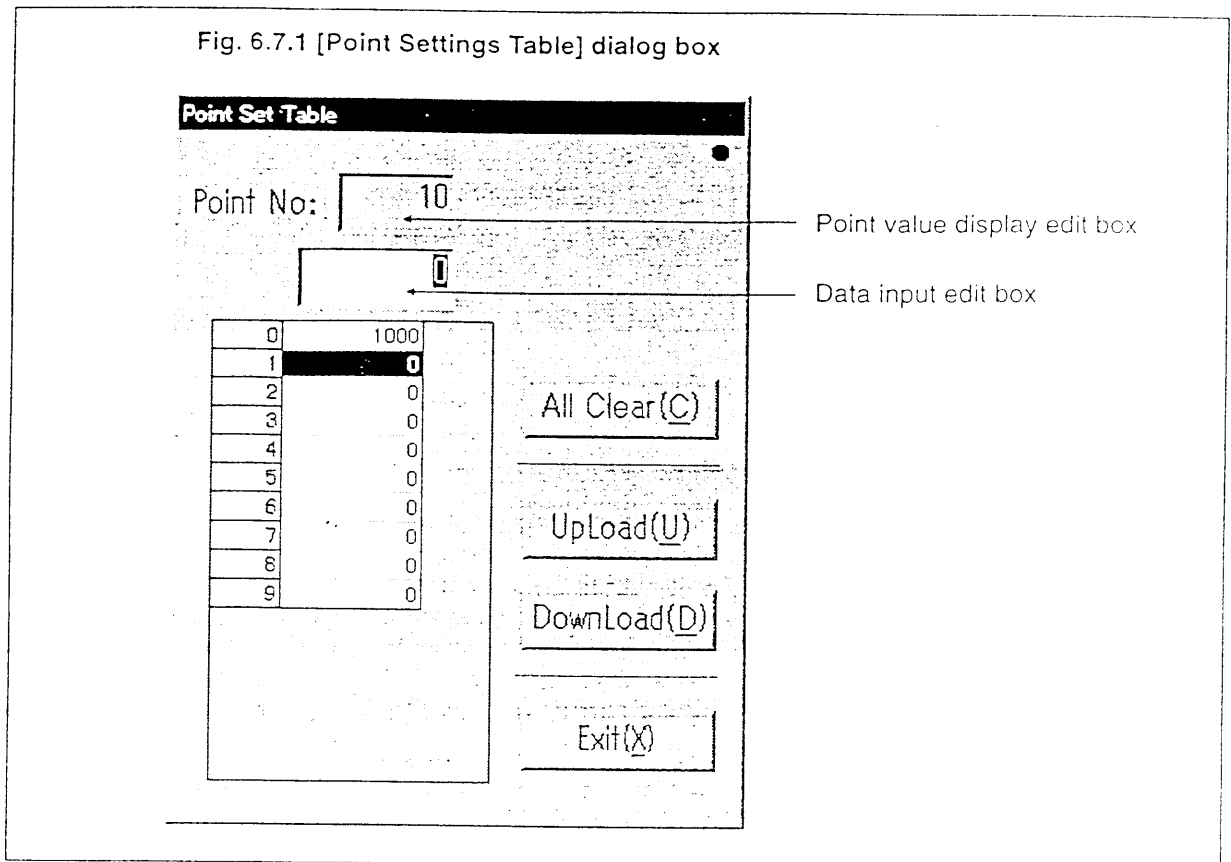
6.7.1 Point Data Inputs

1. Input the point data into the data input edit box.
2. Pressing the ENTER key (the carriage return key) will confirm the input, and the cursor will automatically move to the next point data input setting.
3. Click on the [All clear] button to initialize all the data fields to default settings (data is reset to 0).

### 6.7.2 Data Uploads & Downloads

Clicking the [Recall] will read and display the point data registered in the drive.
Clicking the [Register] will register the point data in the display table onto the drive.

6.8 Indexing Compensation

Indexing compensation uses the compensation table during the index moves. It is possible to download the index compensation values registered in the driver onto a file on the computer or to upload a compensation table created on thje computer ont othe driver. Further, this mode also enables the editing of the compensation table values.

Click on the [Index compensation] button in the [Main menu] to bring up the display of the [Index compensation menu] dialog box (Fig. 6.8.1).

Fig. 6.8.1 [Index compensation menu] dialog box

Index compensate menu

UpLoad(U)

DownLoad(D)

Table Edit(E)

Comm Reset(R)

Exit(X)
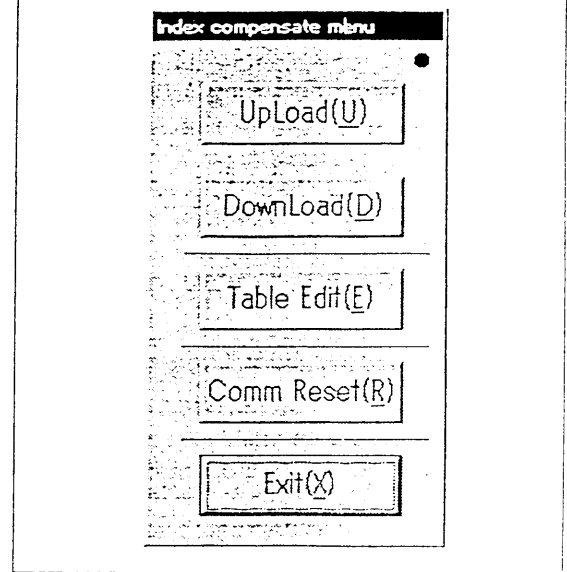
6.8.1 Uploading The Compensation Table

Click on the [Upload] button in the [Index compensation menu] box to display the [Typel selection] dialog box.

Standard Uploads

1. Click on the [Standard] button in the [Model selection] dialog box and then click on the [OK] button.
2. Select the table for uploading and then click on the [OK] button.
   There are two types of indexing compensation tables namely, Table A & Table B.
3. Input the file name for the compensation table to be saved to. The file extension (.idx) will be added automatically, thus do not add any file extensions.
4. Click on the [Save] button to commence the upload process. To stop or abort the upload process, click on the [Cancel] button.

Multiple Uploads

Uploading all the compensation tables registered in the drive.

1. Click on the [All] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input a file name to save the data from all the index compensation tables. The file extension (.whi), will be added automatically, thus do not append a file extension.
3. Click on the [Save] to commence the multiple upload process. To stop or abort the upload, click on the [Cancel] button.

Note: Executing the multiple upload process, will create the single compensdation table file along with the individual compensation table with the extension as (.idx). The registered table number will be also be added to the name of the indexing compensation file.

6.8.2 Downloading The Compensation Table

Click on the [Download] button in the [Index compensation menu] dialog box to bring up the [Type selection] display (see Fig. 6.8.1).

Standard Downloads

1. Click on the [Standard] button in the [Type selection] dialog box and then click on the [OK] button.
2. Select a table for downloading and then click on the [OK] button.
3. Input the file name of the Index compensation file for due downloading. The file extension (.idx) will be recognized automatically, thus do not add any file extensions.
4. Click on the [Open] button to commence the download process. To stop or abort the download process, click on the [Cancel] button.

Multiple Downloads

This process enables the download of the compensation tables in accordance with the contents of the Multiple Index Compensation file.

1. Click on the [All] button in the [Type selection]dialog box band then click on the [OK] button.
2. Input the file name of the Multiple Index Compensation file for due downloading. The file extension (.whi) will be appended automatically, thus do not add any file extensions.
3. Click on the [Open] button to commence the multiple download process. To stop or abort the multiple download process, click on the [Cancel] button.

6.8.3 Editing The Compensation Table

It is possible to edit the compensation table registered in the drive or, to edit the table saved as a file on the computer also. Further, it is also possible to register the edited table file into the driver and to save it on a disk file.

Click on the [Table edit] button in the [Index compensation menu] (see Fig. 6.8.1) to bring up the display of the [Index compensation table] dialog box (see Fig. 6.8.2).

Fig. 6.8.2 [Index compensation table] dialog box

Point value display edit box
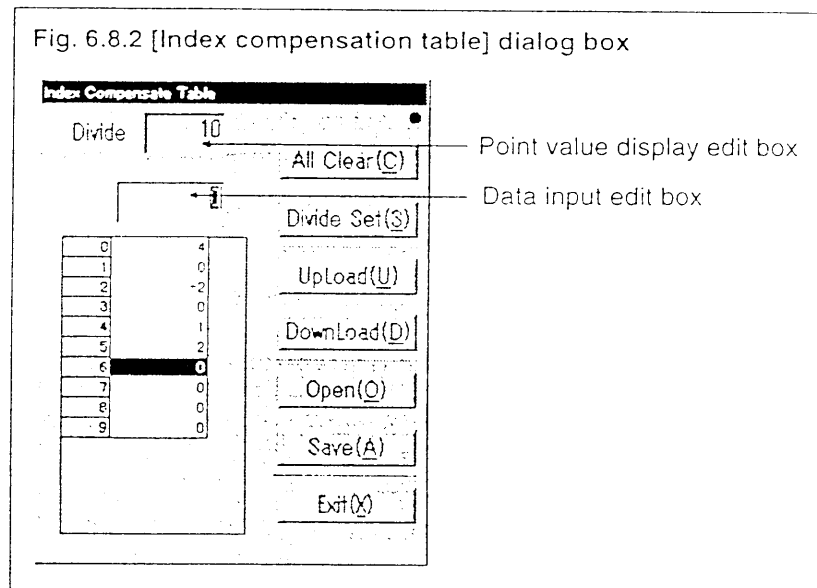
Data input edit box

Compensation Data Input

1. Input the compensation data into the data input edit box.
2. Press the Enter key (the carriage return key) to confirm the data input and the cursor will automatically move to the next data field.
3. Click on the [All clear] button to initialize all the data to default values (reset to data 0).

Modifying The Index Table Point Values

Click on the [Change Indexing number] button to change the indexing values. Once the [Change Indexing number] dialog box is displayed, input the indexing values and then click on the [OK] button.

Editing The Existing Index Table Point Values

The table registered in the drive or the index compensation file stored on the computer can easily be edited.

Driver Table

1. Click on the [Call] button.
2. Select the desired table you wish to bring up and then click on the [OK] button.

Index Compensation File

1. Click on the [Open] button..
2. Input the name of the indexing compensation file and then click on the [Open] button.

Registration Of The Table In The Drive

1. Click on the [Register] button.
2. Select the registered table, then click on the [Open] button.

Saving The Table Values In A File

1. Click on the [Save] button.
2. Input the name of the index compensation file to save the data onto and then click on the [Save] button. The file extension (.idx) is appended automatically, thus do not add any file extensions.

6.8.4 Communications Reset

If communication malfunction occurs during the driver-computer communications, clicking on the [Reset Com] button in the [Index compensation menu] dialog box (see Fig. 6.8.1) will bring the driver back to the normal operation status.

6.9 I/O Settings

It is possible to make various settings regarding the driver's I/O by using the [I/O settings menu]

Click on the [I/O configuration menu] button in the [Main menu] dialog box to display the [I/O settings menu] dialog box (refer to Fig. 6.9.1)

Fig. 6.9.1 [I/O configuration menu] dialog box

I/O configuration menu

I/O config(L)

Exit(X)
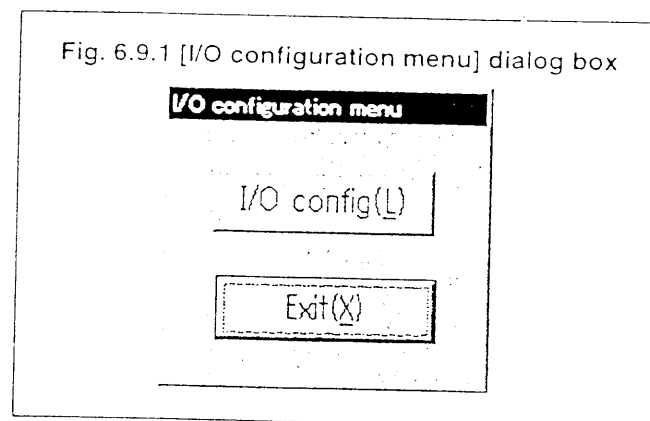
6.9.1 Changing The Operation Logic Settings

The operations logic for the driver's CN2 connection can be changed as desired.

Click on the [Logic settings] button in the [I/O settings menu] to bring up the display of [Logic Settings] dialog box (see Fig. 6.9.2).

1. Each of the I/O terminals have a check box designator. Use the computer's mouse to click on the check box to mark them or unmark them as needed.

   The checked box indicates a Type A logic (positive pull up) and the unchecked box indicates the Type B logic (positive sink).

2. Click on the [Configure] button to set the type.

3. These settings shall become valid after resetting the driver once.

NOTE: The setting made here can be copied into the Flash ROM and also restored from there. However, the PC utility software cannot upload these values or download the same either.

Fig. 6.9.2 [Logic setting] dialog box
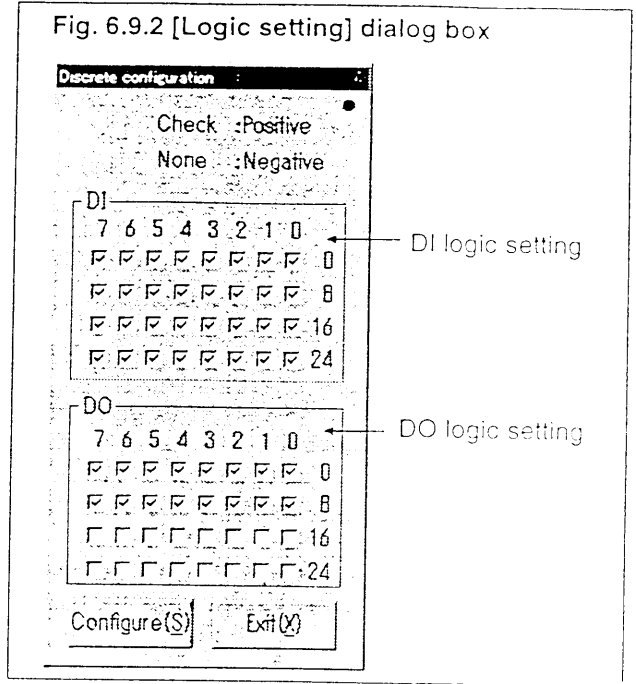
6.10 Servo Settings

The execution of Auto-tuning mode, execution of the test mode, monitoring of the servo parameters etc., can be undertaken in this [Servo settings menu] dialog box. It is also possible to make adjustments to the control loop filter values to avoid mechanical resonance in the Servo system configuration.

Fig. 6.10.1 [Servo settings] dialog box
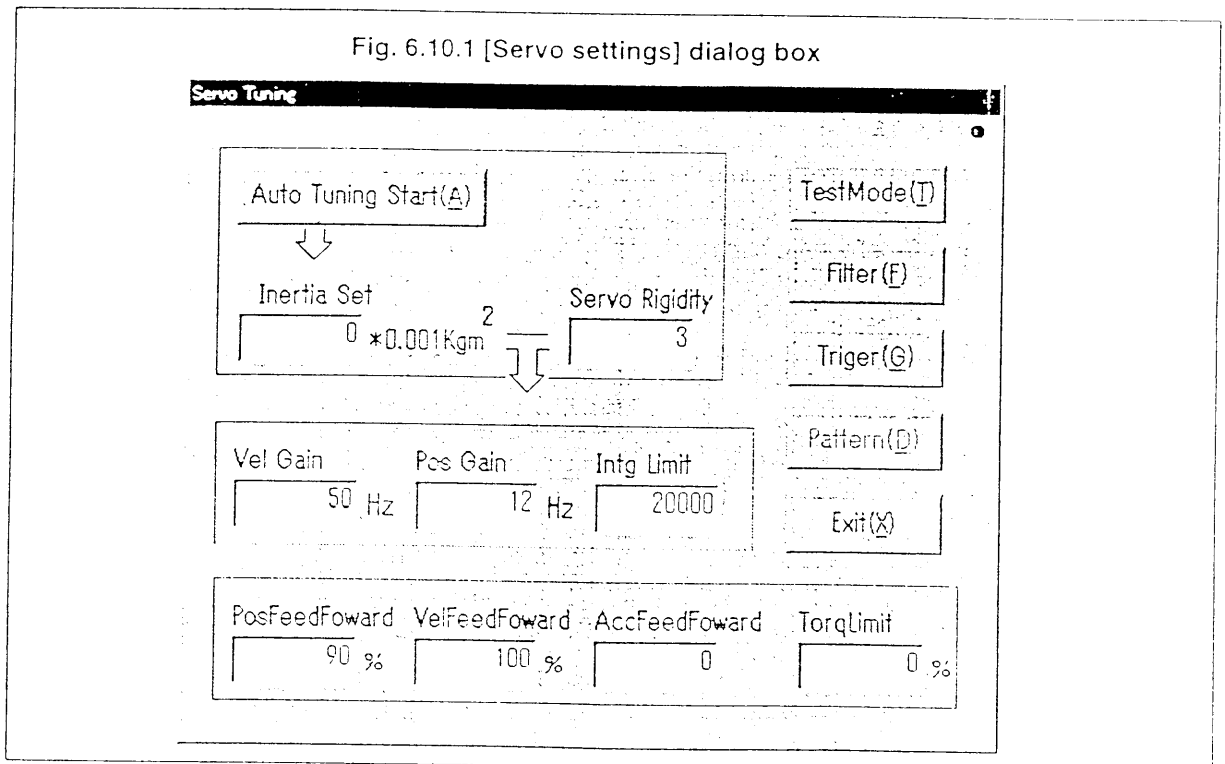
6.10.1 Execute Auto-tuning

The driver carries out the Auto-tuning of the motor and load inertia by making small oscillating movements and estimating the servo parameters and using these for it's servo settings.

NOTE:　The motor is subjected to a maximum of 45° rotation back and forth in order to estimate the inertia. However, the maximum rotation angle is subject to change.

Before carrying out the auto-tuning, it is necessary to set the servo stiffness for the system.
The value of servo stiffness range from a low of 1 to a maximum of 5 and the default setting is 3.

After the execution of auto-tuning, the values of velocity control loop bandwidth, the position control loop band width and the position loop integral limiter values change accordingly.

NOTE:　It is necessary that the driver be set in the RS232C control mode see <Section 3.4.2> for the mode settings or else, clicking on the Auto-tuning feature **will not** have any effect on the driver.

6.10.2 Execute The Test-mode Run

The driver is subject to small oscillating movements and estimating the servo parameters and the response of the driver-motor system is monitored on an oscilloscope and the results are used for setting the various servo parameter settings. (The default value for these oscillations are 1800 pulses).

The test mode is used to set the values of the velocity control loop bandwidth, the position control loop band width and for the position loop integral limiter.
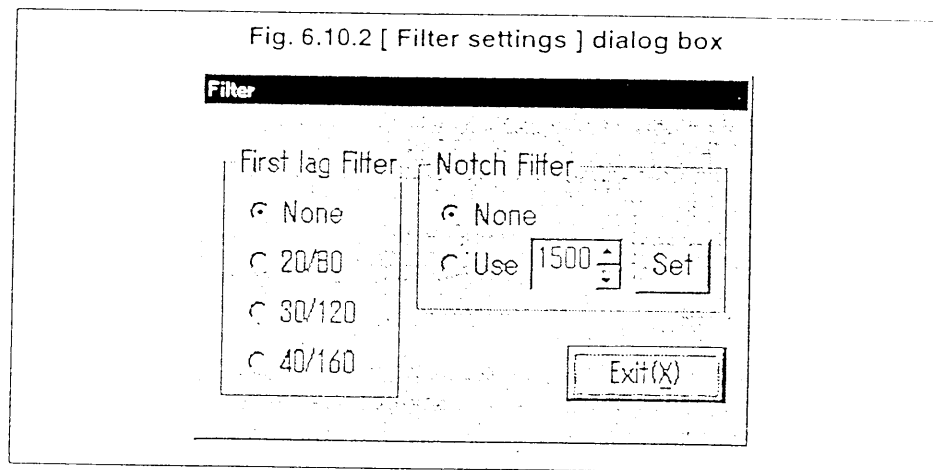
NOTE:　If the auto-tuning feature is used for setting the servo parameters and the system behaves in a stable manner, it is not necessary to carry out this test-mode run.

NOTE:　It is necessary that the driver be set in the RS232C control mode see <Section 3.4.2> for the mode settings or else, clicking on the Auto-tuning feature **will not** have any effect on the driver.

6.10.3 Filter Settings

If the motor shows resonance even after the completion of tuning, it may be necessary to change the filter settings The menu displayed below is used for making changes to the 1st Order delay filter settings. Run through the settings from 40/160, 30/120, 20/80 in that sequence to locate the best response.

If the servo system response does not show satisfactory response despite running through the various filter changes, then it may be necessary to make changes to the control loop by incorporating the Notch filter in it (Optional). To use the notch filter, check the [None] box in the 1st order delay filter dialog box, then select an appropriate cutoff frequency from the notch filter settings and click on the [Set] button. Run through the frequency selections to locate the best settings. (For more details on the notch filter, consult **Yokogawa Precision Corporation** or it's authorized dealers.

Fig. 6.10.2 [Filter settings] dialog box

Filter

First lag Filter

- None
- 20/80
- 30/120
- 40/160

Notch Filter

- None
- Use 1500 Set

Exit(X)

6.10.4 Display The Motor Response Curves

In the absence of an oscilloscope, it is possible to view the position variation, velocity, position error, the COIN signal etc. as a graphical representation on the computer screen itself. The process is described briefly herewith: 2. Start moves (Operate the motor system).

1. Set the Trigger value

Input the Trigger type, time and the trigger point values in the Trigger condition] dialog box and then click on the [Start] button.

Fig. 6.10.3 [Trigger Condition] dialog box
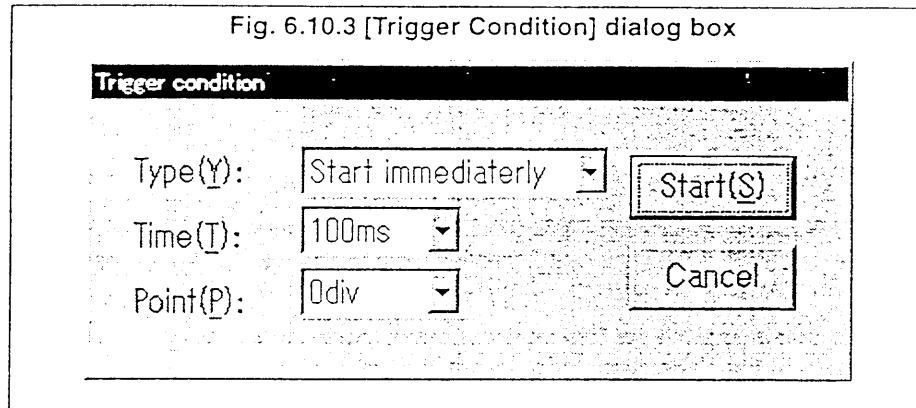
2. Start moves (Operate the motor system).

3. Graphical viewing of the response and command signals.

Click on the [View curves] button. The data shall be displayed on screen. However, the data transmission may not be immediate and it takes a littile time (few seconds) to plot the curves on screen.
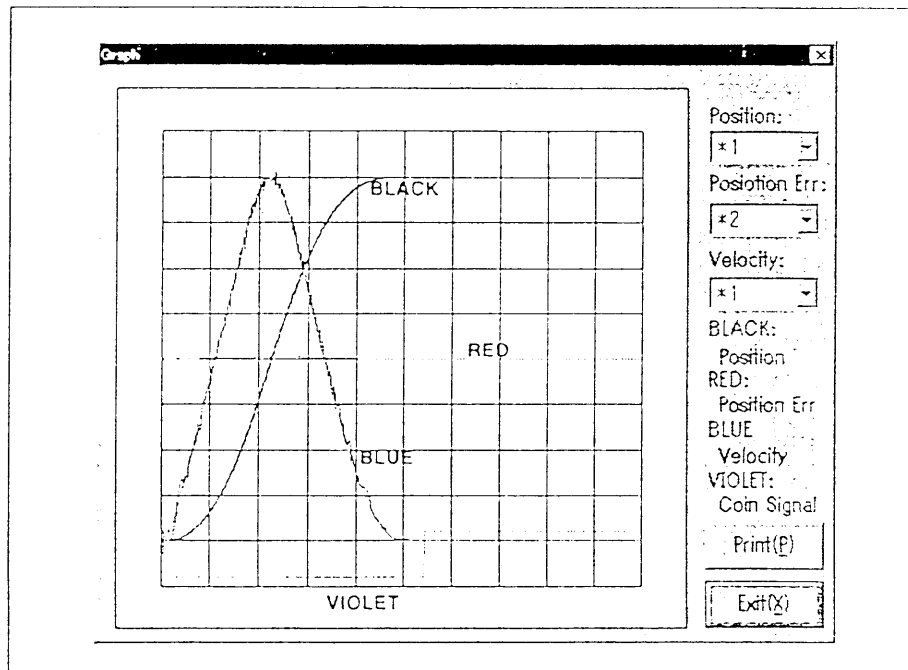
NOTE: It is possible to change the scaling for the display of the position, position error and the velocity of the move as desired for a clear and understandable display. The horizontal axis is the time value and the Vertical axis is automatically adjusted for the dsplay height.