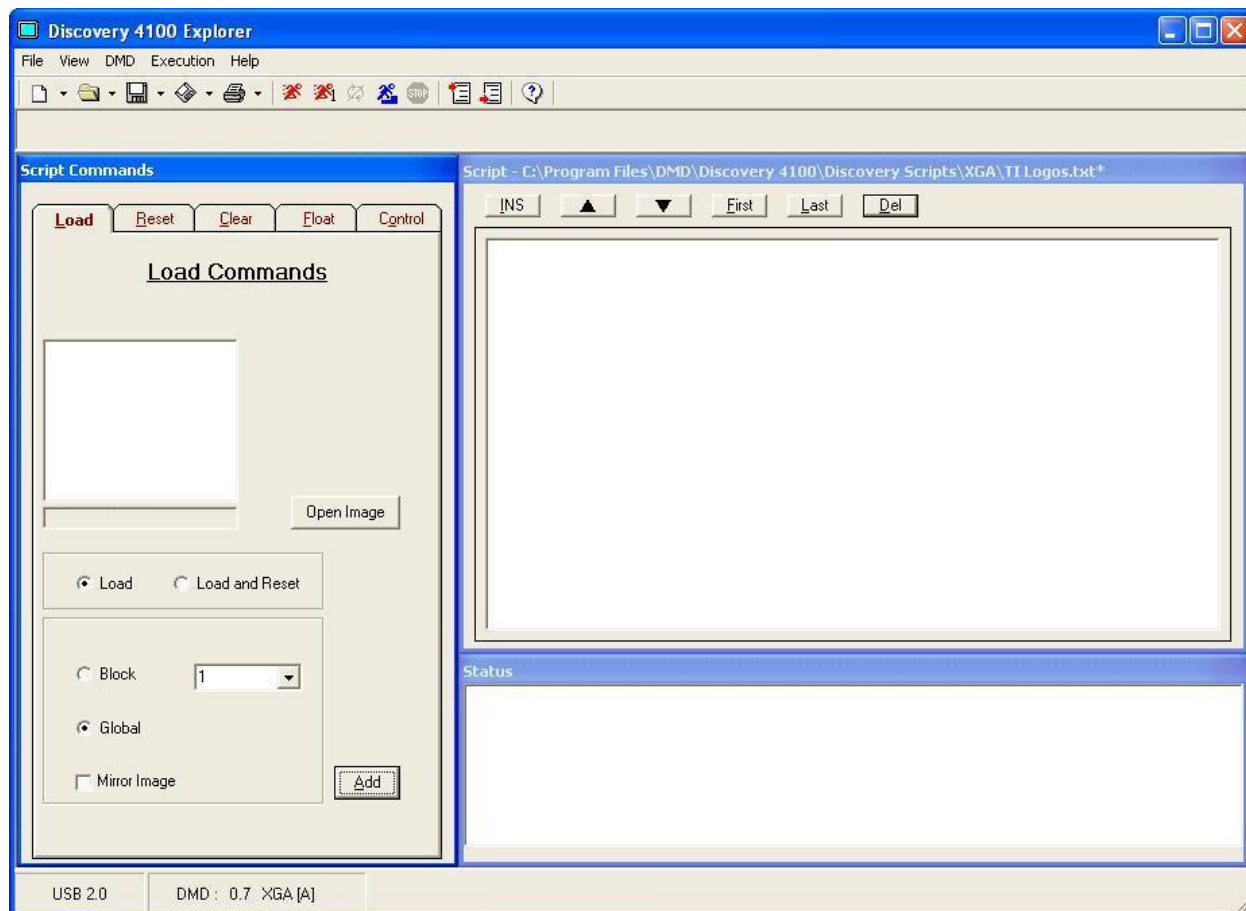


DLP Discovery™ 4100 Explorer Software User's Guide



This manual describes the operation of the DLP Discovery 4100 Explorer software. The Discovery software provides control and display functions via USB 2.0 for the Discovery 4100 hardware.

Revisions		
ECO	Descriptions	Date
	Original release	

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1.0 Overview

This manual provides:

- A general description of the DLP Discovery 4100 Explorer Software
- Descriptions of menus, toolbars and display windows
- Operation instructions

2.0 Terms and Definitions

DMD Digital Micromirror Device

GUI Graphical User Interface

USB Universal Serial Bus

3.0 Software Overview

- The DLP Discovery 4100 Explorer Software allows the user to control the DDC4100 Controller Board hardware via USB 2.0. The software uses the Discovery 4100 ActiveX control API which is documented separately in TI DN 2510142. The software has controls for building and executing a command script.
- The GUI provides you with access to the ActiveX™ control's implementations of the following commands:
 - Load individual blocks or entire DMD from image file.
 - Reset individual blocks or global reset.
 - Clear individual blocks or global clear.
 - Float all DMD mirrors.
 - Wait for external global reset input.
 - Timed delay.
 - Loop iteration control – Loop for N times or until break.
 - General purpose digital output control.

3.1 DMD Image Control

Images are controlled and displayed in blocks on the DMD. The organization of the DMD blocks varies for different DMD types as shown in Table 1. Blocks can be loaded and displayed individually, or as an entire image (all 16 blocks). Section 6.0 will explain the commands to control the different ways an image can be displayed.

Section 7.0 describes how to run a script of commands to control the displaying of an image. There are numerous combinations of display options available and this manual is not designed to cover them all. This user's guide will present an overview of how each command can be used to control an image.

Table 1 DMD Characteristics

TYPE	#COLS	#ROWS	#BLKS	#ROWS/BLK
.9 1080p Type A	1920	1080	15	72
.7 XGA Type A	1024	768	16	48
.55 XGA Type A	1024	768	16	48
.55 XGA Type X	1024	768	16	48

3.2 Image Commands

- **Load** – Loads image blocks into memory.
- **Load and Reset** – Loads image blocks into memory and displays the contents on the DMD.
- **Reset** – Displays the contents of memory on the DMD.
- **Clear** – Clears (zeroes) the contents of memory.
- **Clear and Reset** – Clears (zeroes) the contents memory and displays the contents of memory on the DMD.
- **Float Mirrors** – Sets the mirrors to an unbiased or flat condition.

4.0 Software User Interface

The Explorer Software user interface consists of a multiple display interface containing a menu bar, toolbar and three display windows: Commands Window, Script Window and Status Window. The function of each item is described in the following sections.

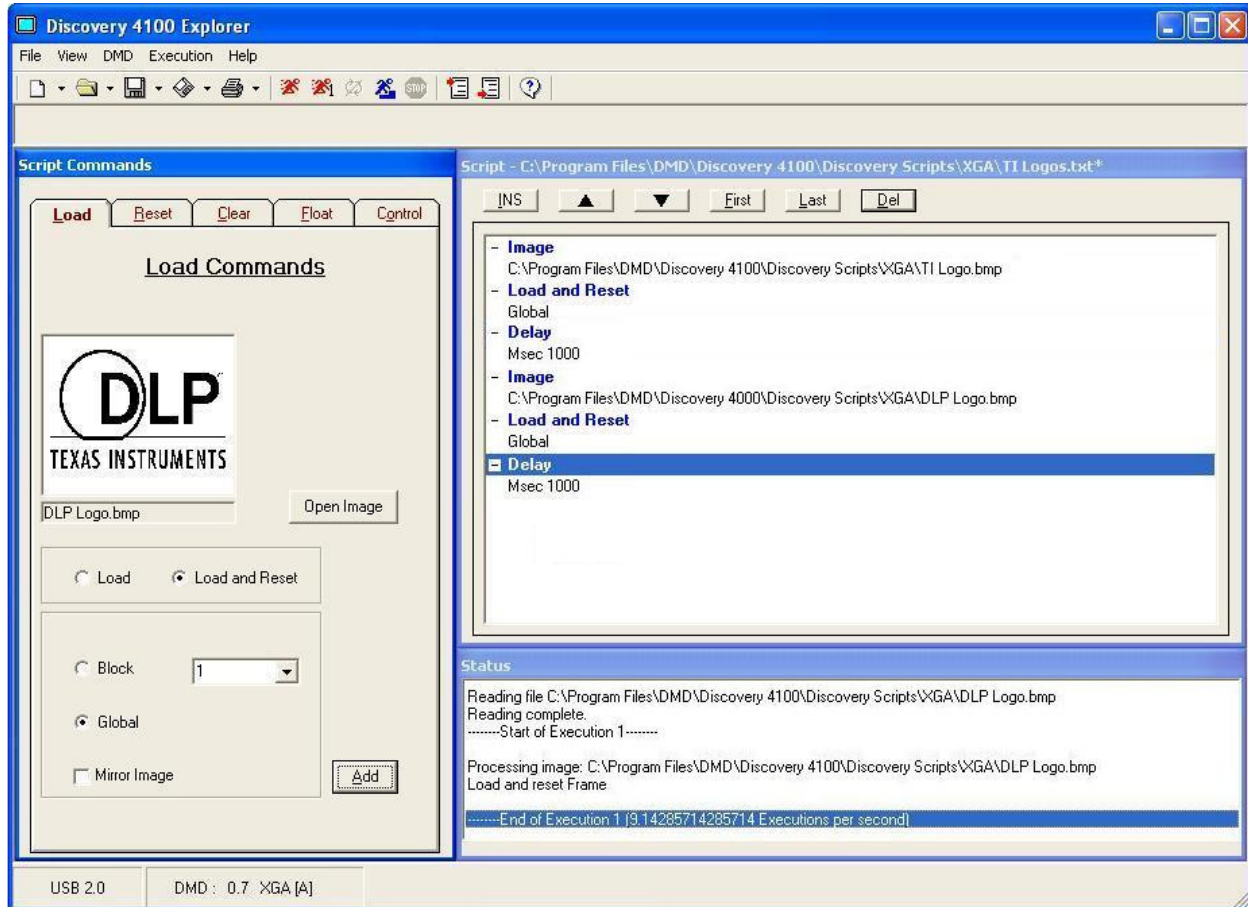


Figure 1 Graphical User Interface Layout

4.1 Menu Bar

The menu bar commands provide standard menu access to software commands as shown in Figure 2 Menu Bar

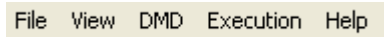


Figure 2 Menu Bar

4.1.1 File Menu

The File menu contains the standard New, Open, Save and Exit menu items with options to open a script or a status, and to save a script or a status.



Figure 3 File Menu

4.1.2 View Menu

The View menu allows you to show or hide any of the display windows.

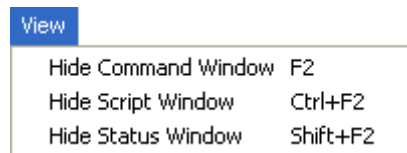


Figure 4 View Menu

4.1.3 DMD Menu

The DMD menu is used to select the DDC4100 Control operation mode.

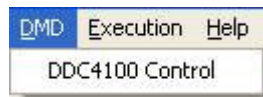


Figure 5 DMD Menu

4.1.4 Execution Menu

The Execution menu contains script commands and configuration options :

- Run - Executes all the commands in the list without interruption, repeating script until Stop selected.
- Run Once- Executes all the commands in the list without interruption for one cycle.
- Loop Break – Exit Loop Until Break command.
- Step - Sets the execution of commands to one step at a time mode.
- Next Step – Executes the next script command.
- Stop – End execution.
- Set Start - Sets the start point of command execution within the script.
- Set End - Sets the end point of command execution within the script.

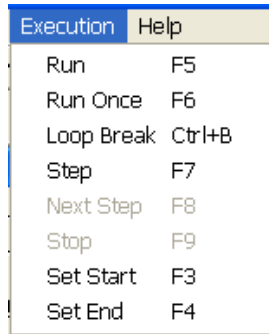


Figure 6 Execution Menu

4.1.5 Help Menu

The Help menu contains the standard link to the help contents and the command to load the About dialog box.

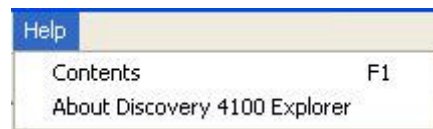


Figure 7 Help Menu

4.2 Toolbar

The Toolbar contains buttons to provide you with shortcuts to perform certain operations.

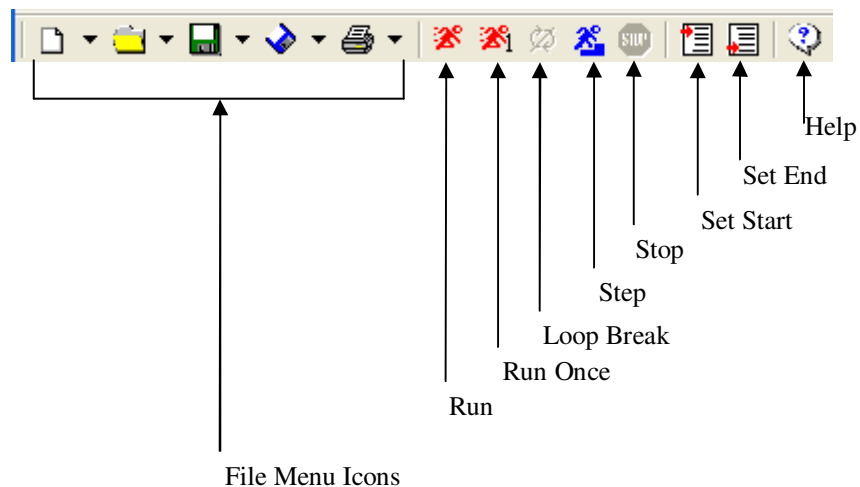


Figure 8 Toolbar

4.2.1 File Menu Buttons

The first five buttons in the toolbar, New, Open, Save, Save As and Print have the same function as the five items in the File menu.

4.2.2 Operational Mode Controls

The next area of the toolbar is a drop down window to select the operational mode for the device. The two buttons immediately to the right of the drop down window are for selecting either the USB or Parallel operation modes. The current revision of the GUI is limited to 'USB Mode' only, therefore the drop down window and the Parallel button are disabled and the USB button will remain depressed.

4.2.3 Run, Run Once, Loop Break, Step and Stop Controls

Run, Run Once, Loop Break, Step and Stop icons control the execution of the list of commands in the script window. Command function is as described in Section 4.1.1.

4.2.4 Set Start and End Buttons

Set Start and Set End icons set the start point and end point of command execution within a script.

4.2.5 Help Button

The Help button displays the help contents for the application.

4.3 The Script Commands Window

The Script Commands Window, Figure 9, contains a series of Command Tabs with command options for building script commands. A script is built by adding commands to execute the desired sequence of operations on the DMD. To view and select the options associated with a command, click on the corresponding command tab. Once you've selected the commands and options, click the **Add** button to add the command options to the script.

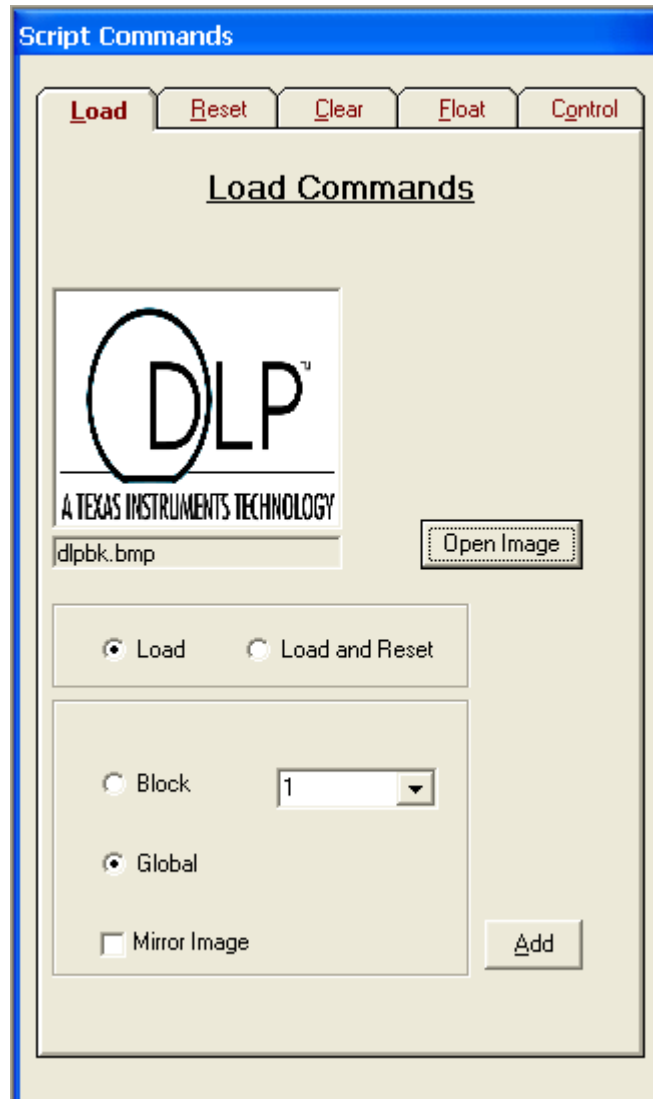


Figure 9 Script Commands Window

4.3.1 Load Tab

Load commands select the image file and specify load operations.

An image file must be selected before the Add button is pressed. To select an image file click the Open Image button and select the image file. Supported image file types are .bmp, .jpg, .gif and .bin. A .bin file is a binary file containing one bit per DMD pixel.

The image data may be loaded to DMD memory by selecting **Load** or the image data may be loaded and the DMD reset to display the image by selecting **Load and Reset**. If **Load and Reset** is not selected the image will not be visible until a separate Reset command is executed.

The entire image may be loaded (**Global**) or individual blocks may be loaded (**Block**). Block numbers may be from 1 to 16. Loading block 16 on the 1080p DMD will be ignored since this DMD has only 15 blocks.

The image may be mirrored in the horizontal direction by selecting **Mirror Image**.

Select the desired options and **Add** button to add the command to the script

The screenshot shows the 'Load Commands' dialog box. At the top, there is a title bar with buttons: **Load**, **Reset**, **Clear**, **Float**, and **Control**. The main area has a title 'Load Commands'. Below the title is a logo for 'DLP' with 'A TEXAS INSTRUMENTS TECHNOLOGY' underneath. A text field contains the filename 'dlpbk.bmp', and an 'Open Image' button is to its right. Below the filename field are two radio buttons: 'Load' (unselected) and 'Load and Reset' (selected). Further down are two more radio buttons: 'Block' (unselected) and 'Global' (selected). Next to the 'Block' radio button is a dropdown menu showing the value '1'. At the bottom left, there is a checked checkbox labeled 'Mirror Image'. At the bottom right, there is an 'Add' button.

Figure 10 Load Tab

4.3.2 Reset Tab

The Reset command causes the mirrors to change from the current state to the state of that in memory. The contents of memory are determined by the Load or Clear commands. You can choose to reset all the blocks (**Global**), or you can choose to reset blocks individually using the **Single Block** and **Multiple Blocks** options. Select the option you want to use and click the **Add** button to add the command to the script.

The screenshot shows the 'Reset Commands' dialog box. At the top, there are five tabs: 'Load', 'Reset' (which is highlighted in red), 'Clear', 'Float', and 'Control'. Below the tabs, the title 'Reset Commands' is centered. The main area contains three radio button options: 'Single Block', 'Multiple Blocks' (which is selected), and 'Global'. To the right of the 'Multiple Blocks' radio button is a dropdown menu. The dropdown menu is open, showing a list of block ranges: '0-1', '2-3', '4-5', '6-7', '8-9', '10-11', '12-13', and '14-15'. The '0-1' range is highlighted in blue. To the right of the dropdown menu is an 'Add' button.

Figure 11 Reset Tab

4.3.3 Clear Tab

The Clear Tab commands clear the memory contents of all the blocks using the **Global** or individually using the **Single Block** option by writing zeroes to the contents of DMD memory. The **Clear** option clears memory only, the **Clear and Reset** option clears memory and performs a reset to change the display. Select the desired option and click on the **Add** button to add to script.

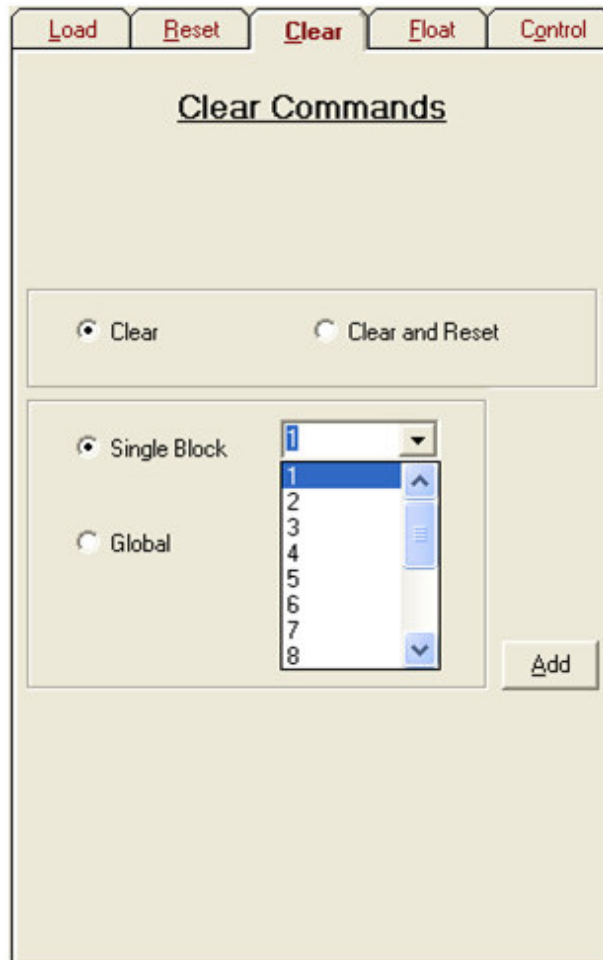


Figure 12 Clear Tab

4.3.4 Float Tab

The Float Tab command places the DMD in safe state with the mirrors in the “floated” or flat condition and no bias applied to the DMD.

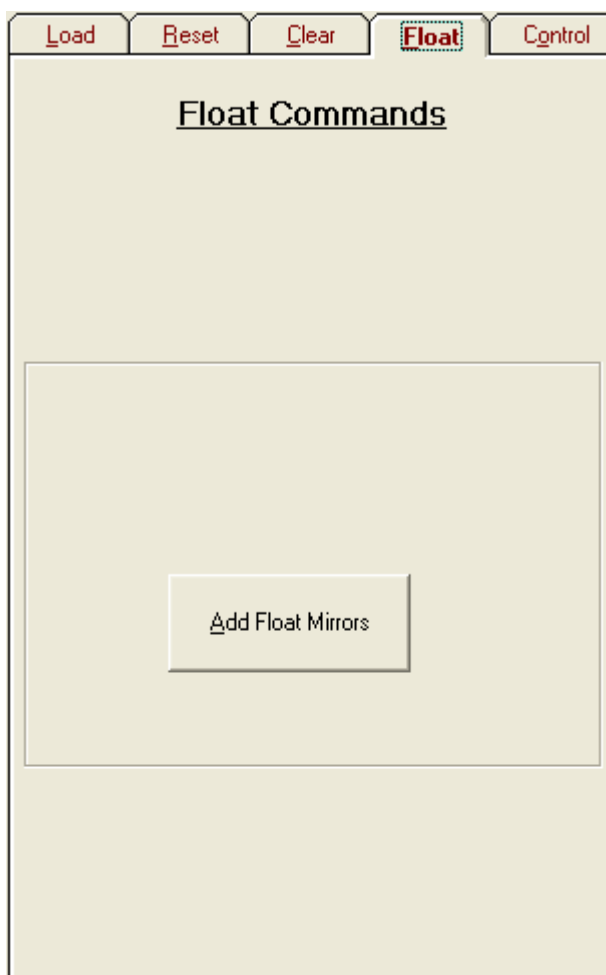


Figure 13 Float Tab

4.3.5 Control Tab

The Control commands tab supports commands for script execution control, external reset and digital output.

The Wait for External Reset command will wait 10 seconds for an external global reset triggered by a rising edge on input GPIOA.0. After ten seconds, execution of the script will resume with the next command in the script. GPIOA.0 is a 2.5V CMOS input. Refer to TI DN 2509510 for signal location.

The Delay command delays for the specified time in msec.

The Loop Until Break command loops until the Break button is clicked.

The Loop command loops for the specified number of iterations.

The Set GP Output command sets the value of general purpose digital outputs GPIOA.2-4. Value is entered in decimal. Bits 4,3,2 of value control the output state. Bits 7,6,5,1,0 of value are not used. GPIOA.2-4 are 2.5V CMOS outputs. Refer to TI DN 2509510 for signal location.

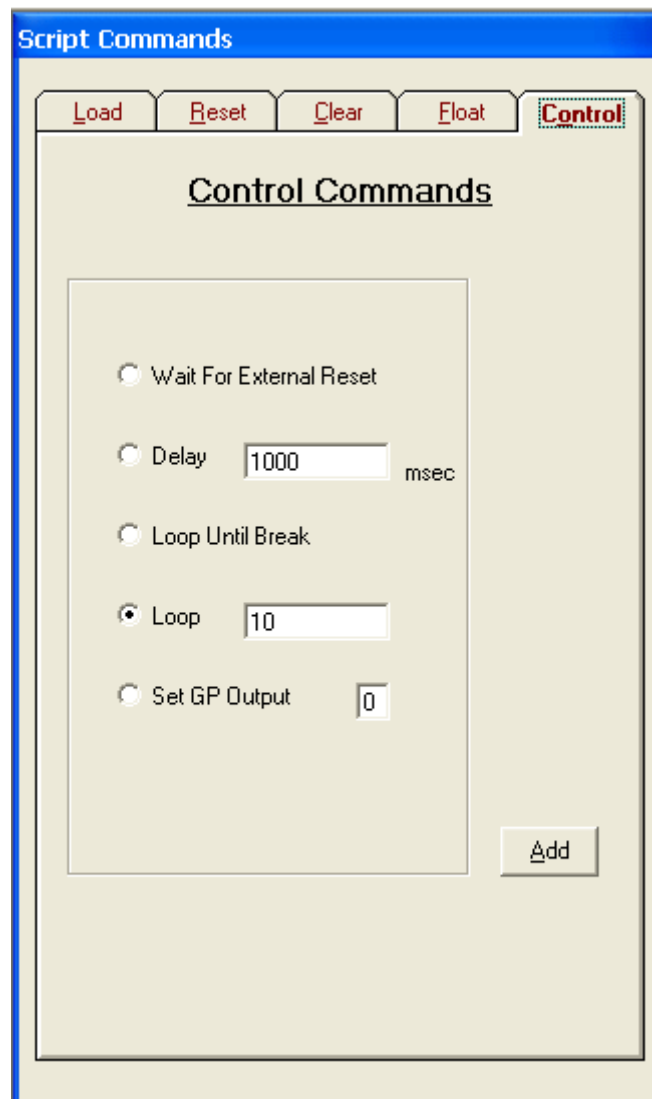


Figure 14 Control Tab

4.2 The Status Window

The Status Windows displays the execution status, retrieved information and any responses sent back to the host from the Discovery 4100 after a command has been executed.

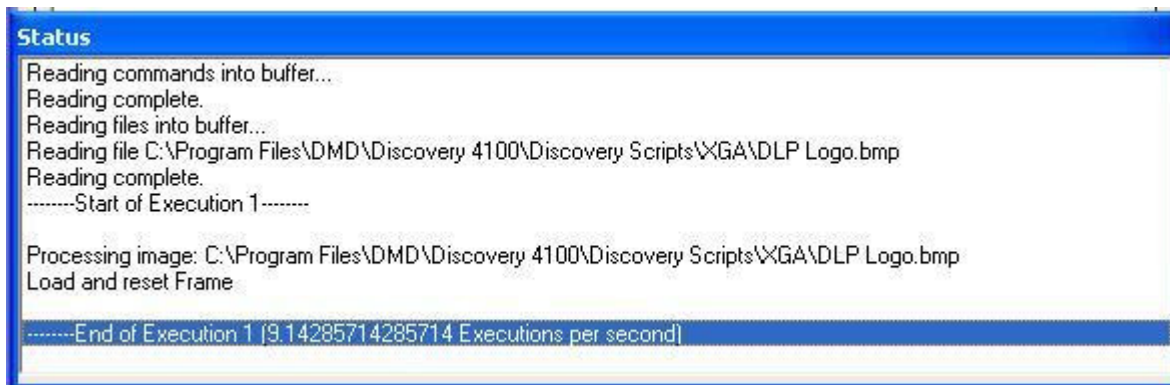


Figure 15 Status Window

4.4 The Script Window

The Controller Board GUI uses a Script window (Figure) to keep track of the images to be loaded and the commands to be executed on the DMD. Once you've added an image and the commands you want to execute to the script, you can change the command order, delete and insert commands at a specified location within the script.

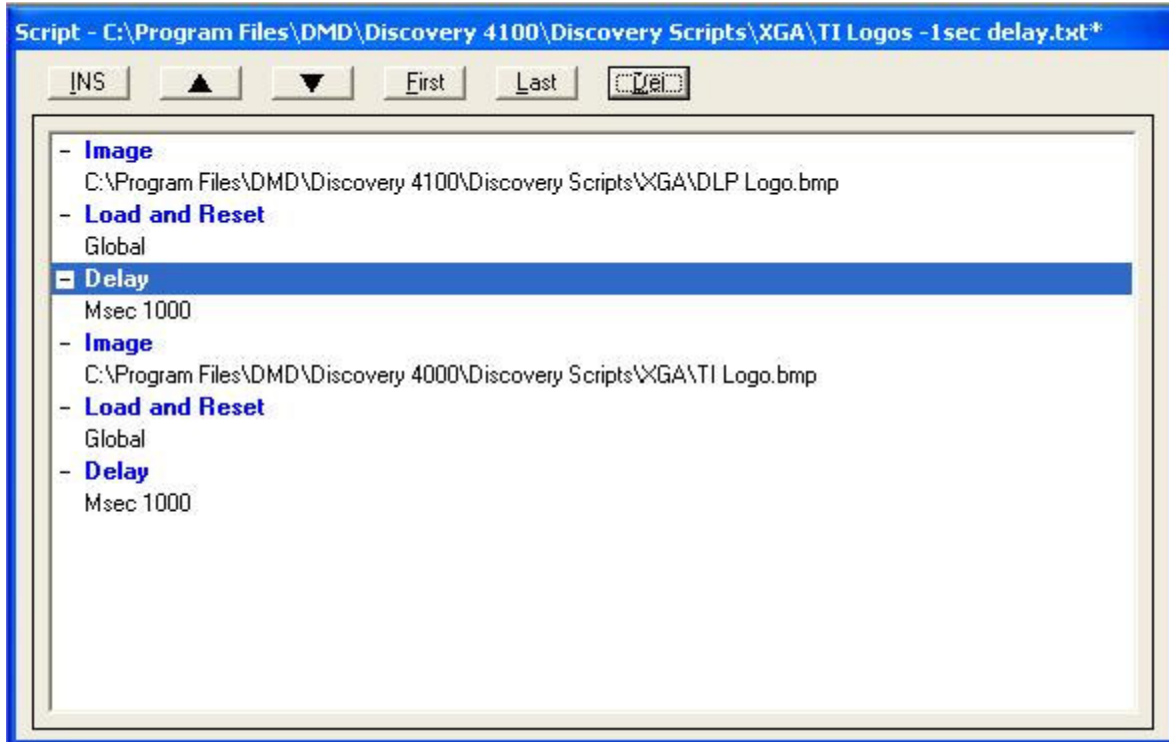


Figure 27. Script Window

The application executes commands in the order in which they are entered in the script. In order for the application to execute commands, the first command in the script must be the **Image** command followed by the correct path and file name for an existing image. See Inserting an Image to learn how to add an image to the script.

4.4.1 Inserting Commands

To insert a command in a specified location on the script, select the command from the Commands window, go to the desired location in the script and click the **INS** button at the top of the Script Window.

4.4.2 Moving Commands

To alter the command order, select the command you want to move by clicking on it, then click the **▲** (up) arrow or the **▼** (down) arrow to move it to the desired location.

You can also move a command to the first position in the script by using the **First** button, or move it the last position with the **Last** button.

4.4.3 Deleting Commands



To delete a command from the script, click on the command you want to delete and click the **Del** button at the top of the Script Window.

5.0 Script and Status Operations

5.1 Saving Scripts and Statuses

5.1.1 Saving a Script

To save a script, proceed as follows:

Step 1: Select the Script option from the  (Save) or  (Save As) icon drop down menu on the tool bar, or select Save Script or Save Script As from the Save option menu on the File menu.



Step 2: Once the selection is made, a common dialog box will appear. Select or type the name of the file you would like to save the script.

Step 3: Click the **OK** button and a message box will appear to notify you that the script has been saved.

NOTE: Scripts are saved with a .txt ending

5.1.2 Saving a Status

To save the contents of the Status Window, proceed as follows:

Step 1: Select the Status option from the  (Save) or  (Save As) icon drop down menu on the tool bar, or select Save Status or Save Status As from the Save option menu on the File menu.

Step 2: Once the selection is made a common dialog box will appear, select or type the name of the file you would like to save the status.

Step 3: Click the **OK** button and a message box will appear to notify you that the script has been saved.


NOTE: Status files are saved with a .sts ending

5.2 Printing Scripts and Statuses


5.2.1 Printing a Script

To print a script, select the Script option from the  (Print) icon drop down menu on the toolbar, or select the Script item from the Print option menu on the File menu.

5.2.2 Printing a Status

To print the contents of the Status Window, select the Status option from the  (Print) icon drop down menu on the toolbar, or select the Status item from the Print option menu on the File menu.

5.3 Opening Scripts and Statuses


You can open scripts [*.txt] or status files [*.sts] that have been previously saved by clicking the  (Open File) icon on the toolbar or by selecting the Script or Status option from the Open File menu on the File menu. Once you've selected the desired file, the file will be opened and the script or status file will be displayed in the Script or Status window.

NOTE: Scripts can be edited with a simple text editor. Therefore, when a script is opened it is checked for consistency. If a command is missing a matching parameter or a parameter is missing a matching command, an error dialog will appear and the script will not be opened. The script must be corrected before it can be opened.

5.4 Creating New Scripts and Statuses


You can create a new script or status file by clicking the New File icon on the toolbar and then selecting the Script or Status option or by selecting the Script or Status option from the New File menu item on the File menu.

5.4.1 Creating a New Script

To open a new script, select the Script option from the  (New) toolbar icon drop down menu, or select the Script item from the New option menu on the File Menu.

Once the selection is made, you will be prompted to save the current script and the blank script will be inserted.

5.4.2 Creating a New Status

To open a new status, select the Status option from the  (New) toolbar icon drop down menu, or select the Status item from the New option menu on the File Menu.

Once the selection is made, you will be prompted to save the current status and the blank script will be inserted.

6.0 6.0 Discovery 4100 Operation

The Discovery 4100 is capable of operating at about 10 XGA frames per second or 7 1080p frames per second when connected to a host system's USB 2.0 port.

6.1 Quick Start Guide to Operation

The following steps must be followed in order to operate the device:

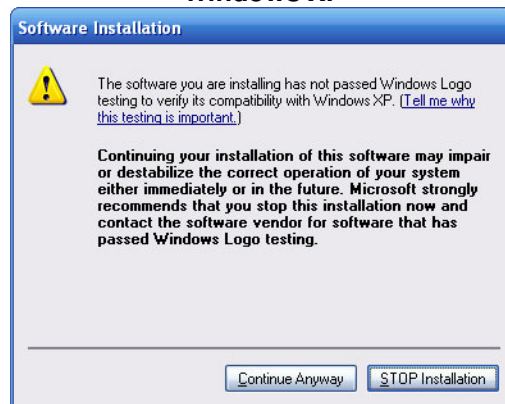
Step 1: Install the software by executing setup.exe. Install the software BEFORE connecting the Discovery 4100 with USB. The setup program will install the software and drivers necessary operation.

Step 2: Connect the Discovery 4100 board with a USB 2.0 mini-B to Type A cable and apply power to the Discovery 4100. The operating system will detect the USB device and prompt to install the driver.

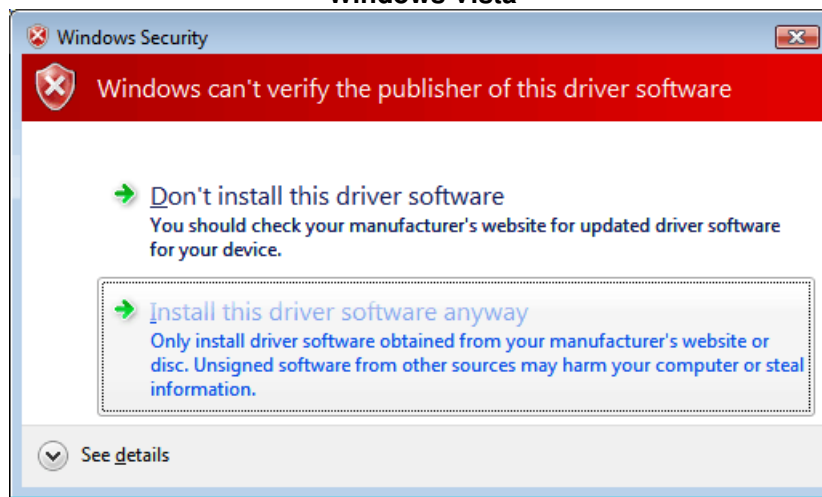
Select **Install from a list or a specific location** and click **Next**. Browse to **c:\Program File\DMD\Discovery 4100\Drivers** and click **Next**. The drivers will automatically load.

If you see any driver logo testing or verification warnings, ignore them and select continue/install anyway:

Windows XP



Windows Vista

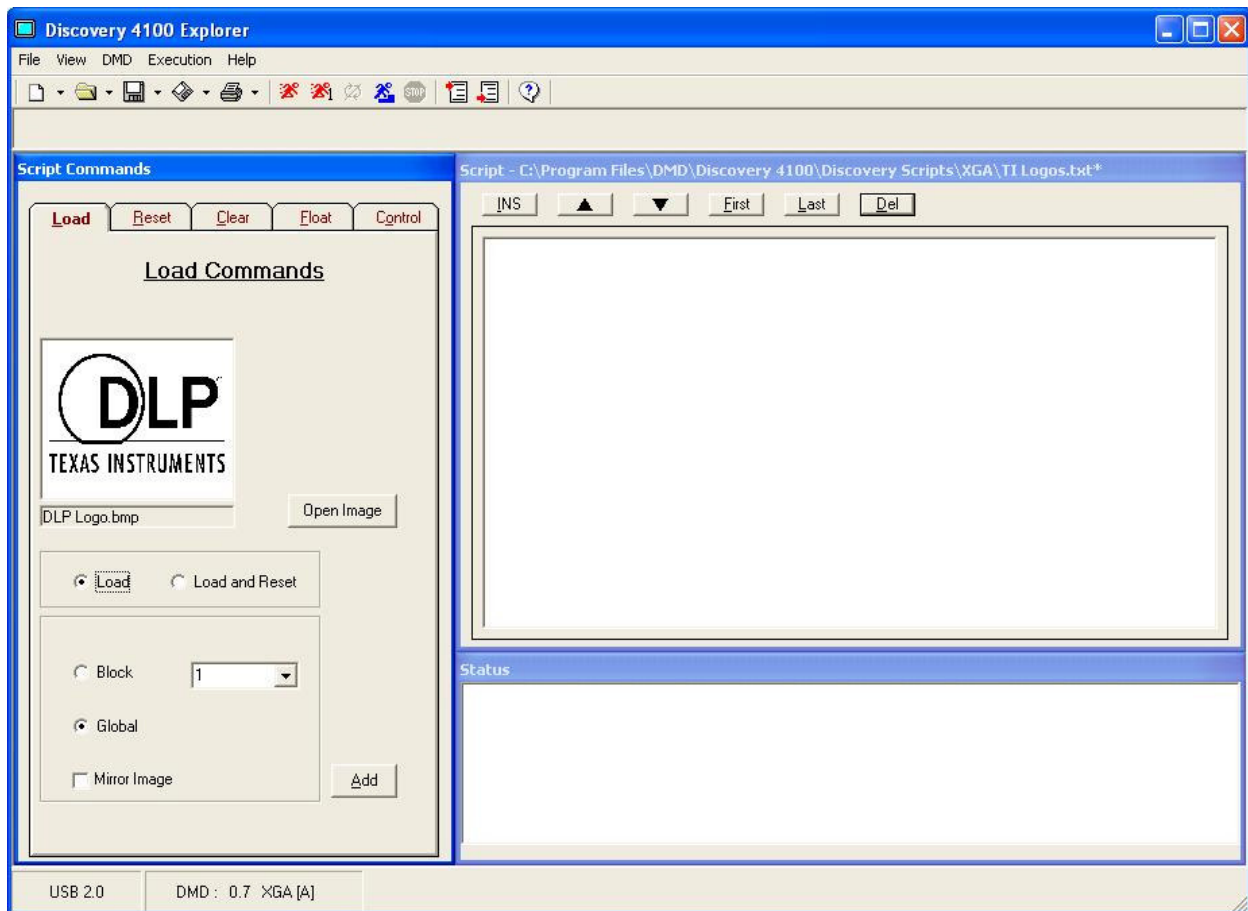


For Windows Vista Driver Installation:

Open up the Device Manager (Control Panel -> System -> Device Manager)
Right click the Unknown or USB device and select Update Driver
Select Browse my computer for driver software
Enter: "**C:\Program Files\DMD\Discovery 4100\Drivers**"
Repeat operation for any new devices that appear




Step 3: Start the DLP Discovery Explorer software from the Program Files / DMD menu.

Step 4: The software will start. The USB connection status and DMD type should be displayed in the lower left status panel :



Step 5: Open an image using the Load Tab / Open Image button.

Step 6: Enter an image command in the script by selecting the desired options in the Load Tab button and clicking **Add**.

- Step 7:** Select and enter commands in the script. You select commands from any one of the command tabs on the Commands Window. Each tab contains a set of related commands and the options assigned to each command. Once you have selected the right combination of commands and options, enter the command into the script by clicking the **Add** button at the bottom of the command tab. Each tab has an **Add** button to enter that command into the script.
- Step 8:** Execute the script. Once the desired list of commands has been entered into the Script Window, click the  (Run) icon on the toolbar to begin executing commands. You can also choose to step through the commands using the  (Step) icon on the toolbar instead of running through them all. You can also use the Execution menu to perform the same functions. Use the  (Stop) icon on the toolbar to stop executing commands.

7.0 DDC4100 Control Window

The DDC4100 Control window is accessed through the DMD / DDC4100 Control menu and provides direct control of the DDC4100 input signals. No script commands are generated, the control is applied immediately to the DDC4100 when a Set button is clicked.

The upper portion of the window supports reading and setting of the DDC4100 signals used in writing data to the DMD. The current value for ROWMD, ROWADDR, BLKMD and BLKADDR is displayed in the Current Value column. When a new value is entered in Hexadecimal in the Hex column and the Set button is clicked the value will be sent to the DDC4100. The Load Row button sends one row with repeating values of the 4 digit hex value entered.

The lower portion of the window supports control of the DDC4100 input signals which are control operational modes. Click a button to toggle the current value of the signal.

Refer to TI DN 2509511 for detailed information on the DDC4100 input signals.

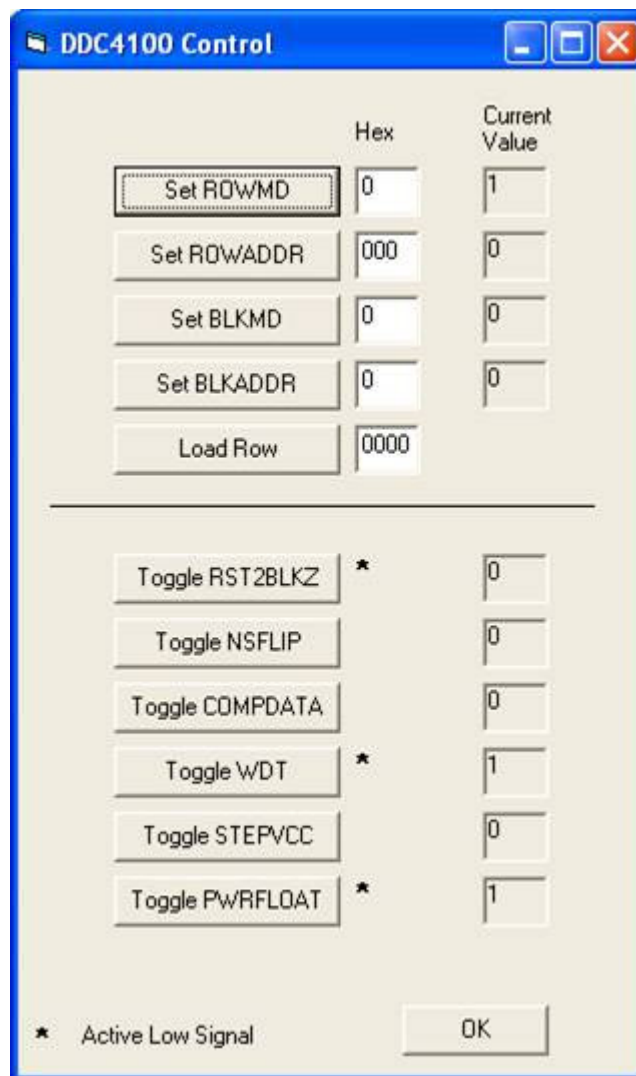


Figure 16 DDC4100 Control Window

8.0 About Box

The About Box provides version information about various software and hardware of the Discovery 4100 system.



Figure 17 The About Box

9.0 Links

For more information about Texas Instruments® DLP® Discovery Systems please visit:

www.dlpdiscovery.com or www.dmddiscovery.com