

## **EyeScan Tool User's Guide**

### Contents

1	Introduction .....	3
2	Installing the EyeScan Tool .....	4
3	Using the EyeScan Tool .....	7

### List of Figures

1	EyeScan Tool Setup Wizard .....	4
2	EyeScan Tool License Agreement .....	4
3	EyeScan Tool Destination Folder.....	5
4	.NET Framework 4.0 Prerequisite .....	5
5	.NET Framework 4.0 Installation .....	6
6	Software Installation Completed .....	6
7	USB Interface Instances .....	7
8	USB Interface Hardware IDs .....	8
9	EyeScan Tool Locations .....	8
10	Configure USB Adapter Window .....	9
11	USB Adapter Info.....	10
12	USB Adapter Configuration .....	10
13	Configure USB Adapter Button.....	10
14	Configure USB Adapter Menu Option .....	10
15	EyeScan Tool Tabs .....	11
16	EyeScan Tool Version .....	11
17	EyeScan Settings .....	12
18	Equalizer Settings.....	12
19	Swap Input Lanes .....	12
20	Individual Bit Selection .....	12
21	Quick Bit Selection .....	13
22	Enable Lanes .....	13
23	Scanning Process .....	13
24	Persistence option .....	14
25	Repeat Delay .....	14
26	Scanning Process Completed .....	14
27	Zoom In and Out Buttons .....	15
28	Save EyeScan Window.....	15
29	EyeScan Tool Register Access .....	16
30	Basic Registers Control .....	16
31	Pattern Tab.....	17
32	Advanced Register Access .....	17
33	Script Mode .....	18
34	Script Help .....	19

35	Dialog Box That Appears to Confirm User's Action.....	20
36	Syntax Error.....	21
37	Add Command Manually .....	21

### List of Tables

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## 1 Introduction

This user's guide provides instructions on how to use features provided by the EyeScan Tool.

EyeScan Tool is a Windows™ based application that allows users to review general eye quality per lane at the receiver. Furthermore, it provides a way to read all status registers and make common modifications with minimal user effort.

### 1.1 System Requirements

The following list shows the minimum recommended system requirements for the EyeScan software:

- PC running Windows XP™ or above (32-bit or 64-bit OS)
- Microsoft's .NET framework 4.0
- USB host
- USB interface connected to a supported TI device

### 1.2 Supported TI Devices

- SNx5DP149
- SNx5DP159
- TMDS171
- TMDS181

### 1.3 Definitions

**GUI**— Graphical User Interface

**PC**— Personal Computer

**USB**— Universal Serial Bus

**CSV**— Comma-Separated Values

**HID**— Human Interface Device

**VID**— Vendor ID

**PID**— Product ID

## 2 Installing the EyeScan Tool

### 2.1 Running the Setup Program

Extract the setup program on the desired folder in the PC. Execute the "EyeScan\_Tool.exe" file and follow the instructions for software installation.

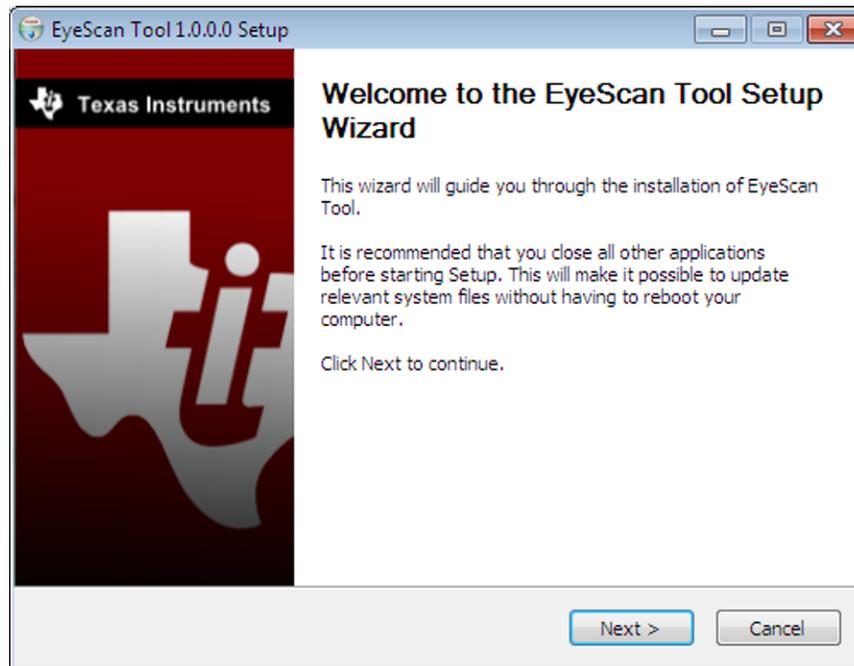


Figure 1. EyeScan Tool Setup Wizard

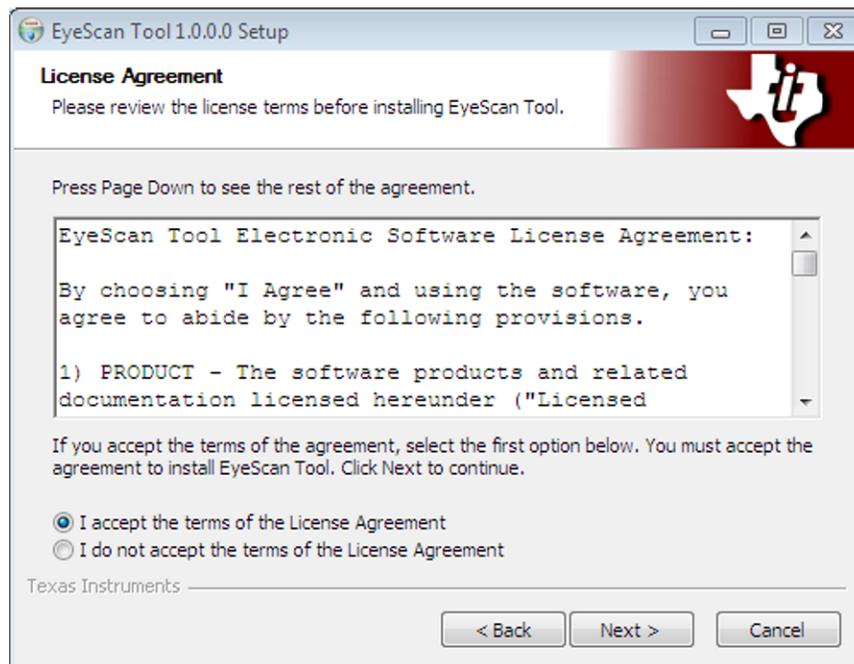
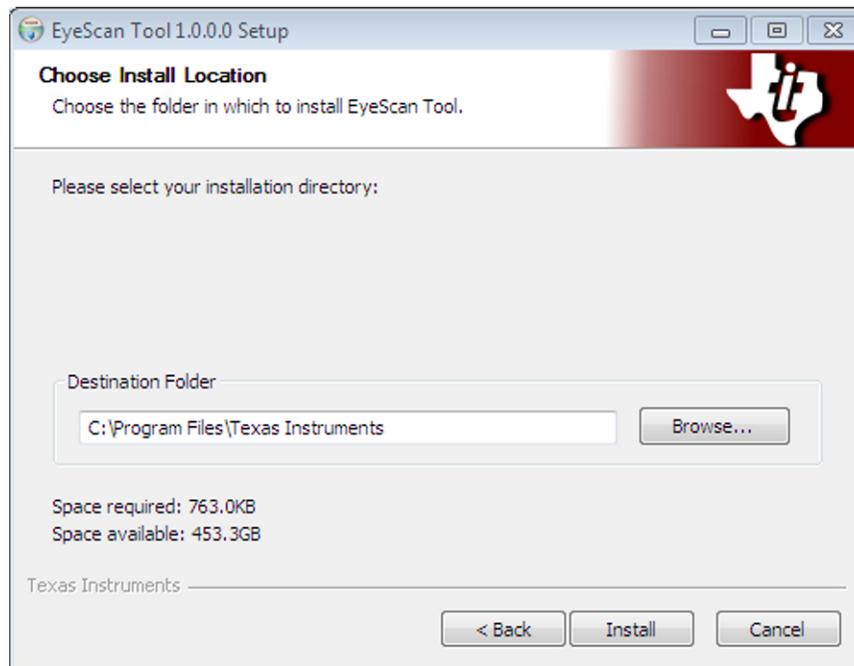
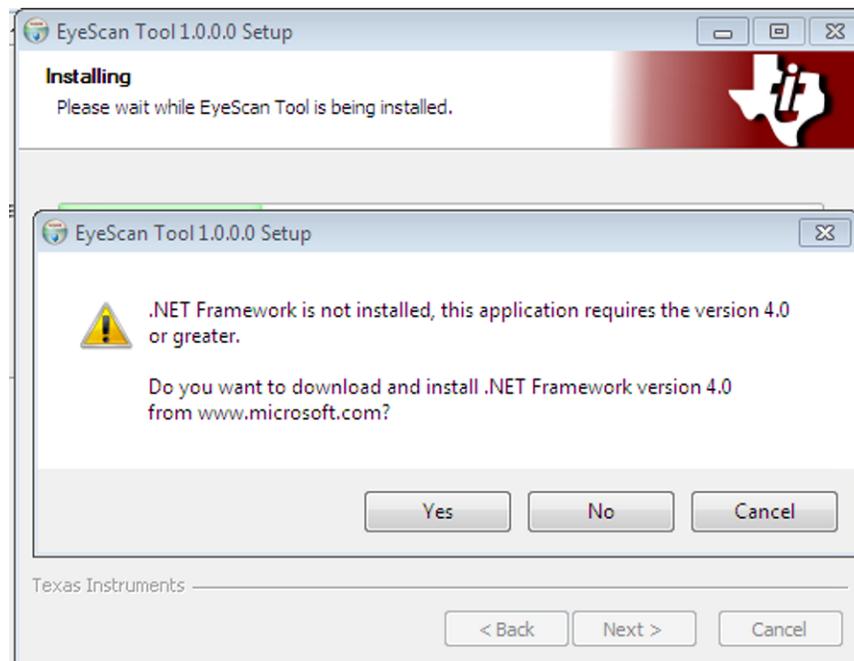


Figure 2. EyeScan Tool License Agreement

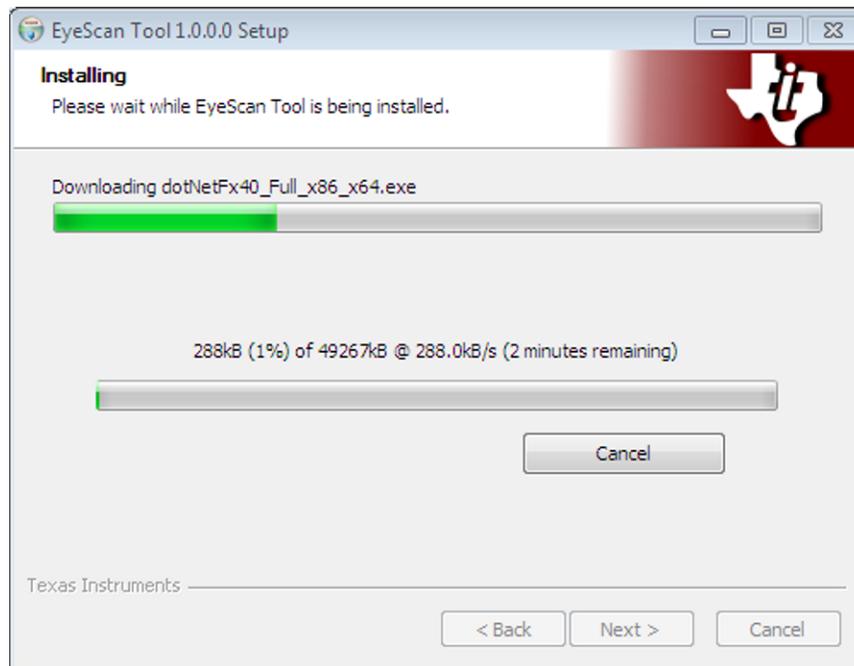


**Figure 3. EyeScan Tool Destination Folder**

The EyeScan Tool requires Microsoft's .NET Framework 4.0; the installer guides the user through this prerequisite installation in case such .NET framework version is not present on the system. Ensure the PC has a proper internet connection to download the framework directly from Microsoft's website.

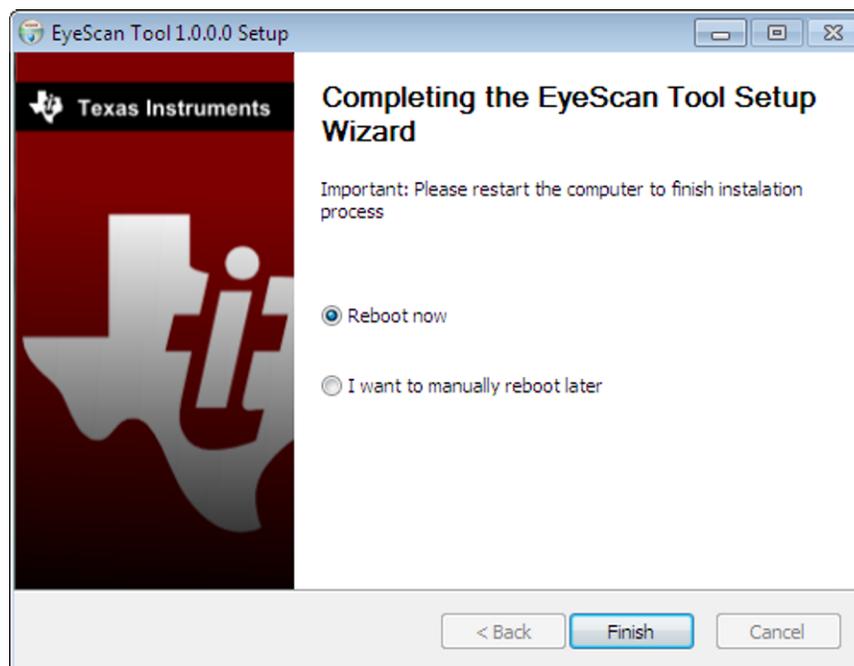


**Figure 4. .NET Framework 4.0 Prerequisite**



**Figure 5. .NET Framework 4.0 Installation**

Click "Finish" when the wizard indicates that the EyeScan Tool installation has been completed.

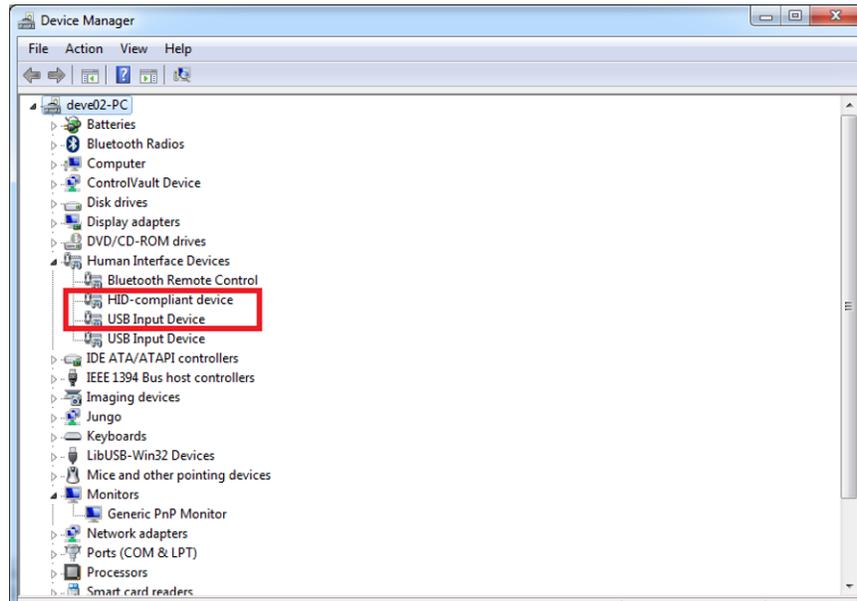


**Figure 6. Software Installation Completed**

### 3 Using the EyeScan Tool

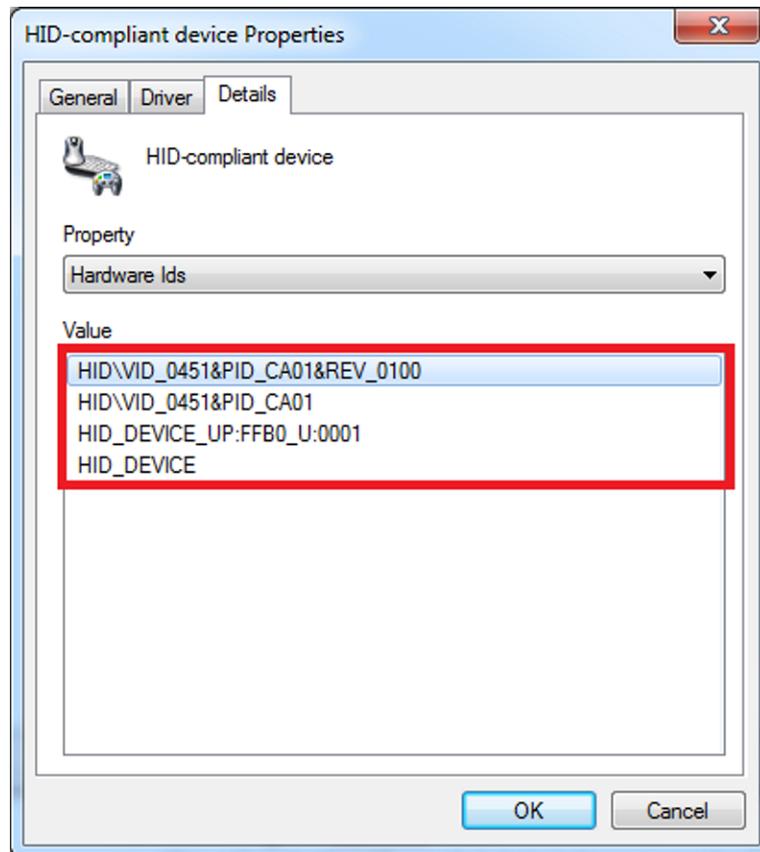
#### 3.1 TI's USB Interface

After connecting the USB interface to any available port on the PC, it will be enumerated both as an HID compliant device and USB input device (both requiring no special drivers) upon USB device connection. Locate both instances of this solution on the Device Manager by looking into the hardware IDs on the device properties, where the VID is 0x0451 and the PID is 0xCA01.



**Figure 7. USB Interface Instances**

If the device is not recognized as an HID, as shown in [Figure 7](#), the user will have to program the correct firmware. For more information about this process, please refer to the [TUSB3x10 EEPROM Burner User's Guide](#) (SLLU205).

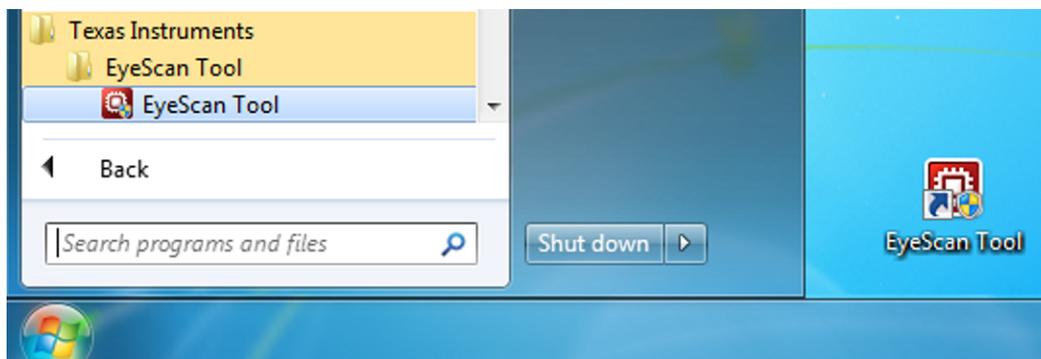


**Figure 8. USB Interface Hardware IDs**

### 3.2 Launching the EyeScan Tool

After verifying that the HID-compliant device instance is shown in the Device Manager, the user can access the EyeScan utility by clicking on the "EyeScan Tool" shortcut added on your desktop or by going to "Start" → "Texas Instruments" → "EyeScan Tool" → "EyeScan Tool".

Administrator rights are required to execute this application.



**Figure 9. EyeScan Tool Locations**

### 3.3 Configuring the USB Adapter

The USB Interface must be configured before the EyeScan Tool can generate an eye representation or have access to the I<sup>2</sup>C register of the target device. The configuration window (Figure 10) is organized into three sections: the list of available USB adapters, the I<sup>2</sup>C bus speed, and the I<sup>2</sup>C slave address.

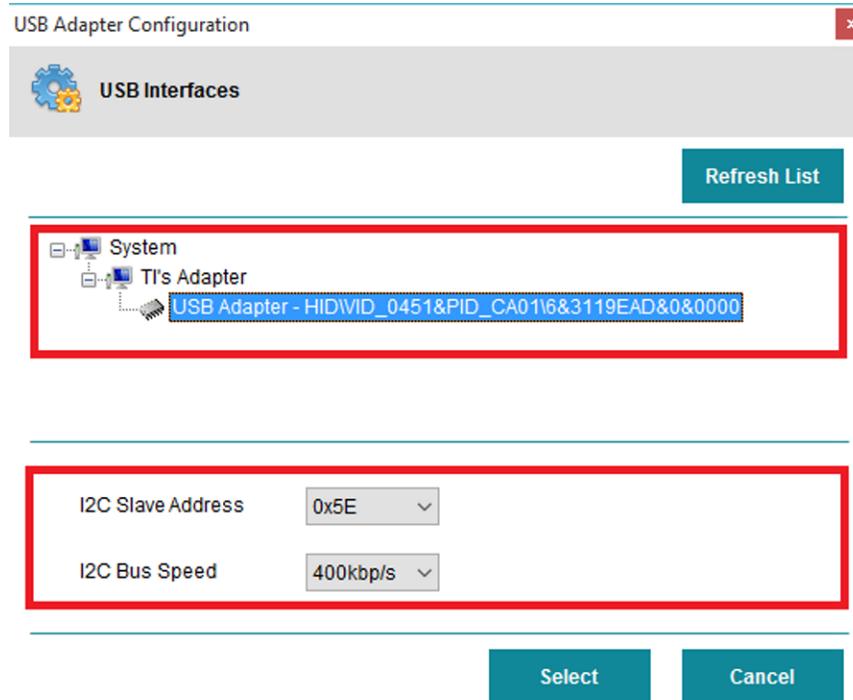


Figure 10. Configure USB Adapter Window

- List of Available USB Adapters:** This list depicts all the USB TI's Interfaces that are connected to the system. If no USB Interfaces are shown in the list, then there are no available units connected to the computer. The list provides the unique device path or a serial number to identify each USB device connected.

To see an updated list of USB adapters attached to the computer, simply click on the "Refresh List" button to rescan the USB connections.
- I<sup>2</sup>C Bus Speed:** The bus speed is the bit rate of communications between the USB interface and the target device. The user can select between an I<sup>2</sup>C bit rate of 100 kbps or 400 kbps.
- I<sup>2</sup>C Slave Address:** This field allows the user to select the address of the target I<sup>2</sup>C slave device. Once any USB adapter has been selected and the I<sup>2</sup>C bus speed and slave address have been configured, the user will be able to click on the "Select" button, and the local I<sup>2</sup>C access will be enabled in the USB Interface.

### 3.4 Operating the EyeScan Tool

The user will be able to display the current adapter configuration through the item "USB Adapter Info" under the File Menu.

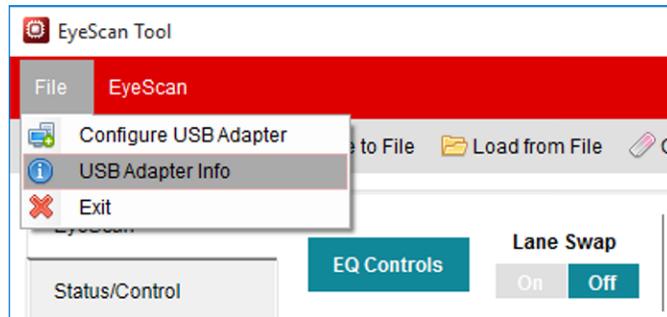


Figure 11. USB Adapter Info

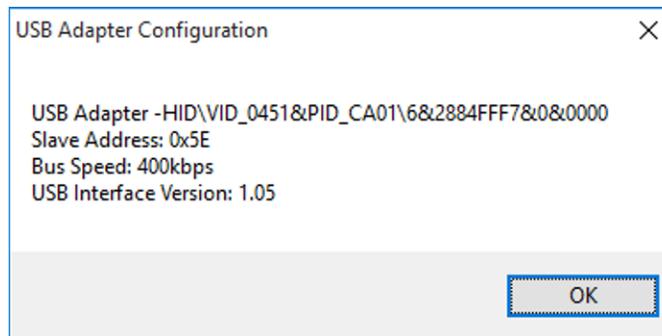


Figure 12. USB Adapter Configuration

In order to change the USB adapter settings or select another available interface the user could click on the "Configure USB Adapter" button or alternatively through "File" → "Configure Adapter" in the Menu Bar.

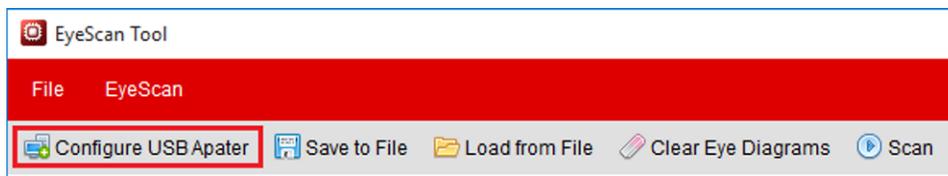


Figure 13. Configure USB Adapter Button

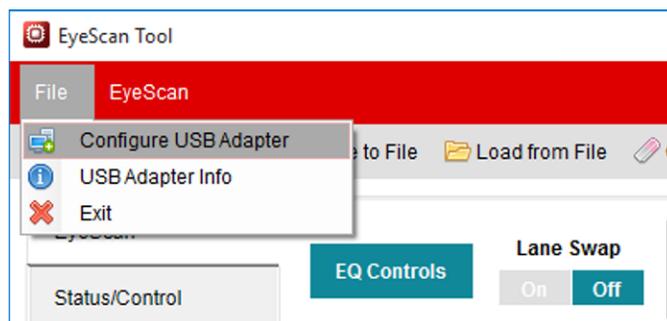
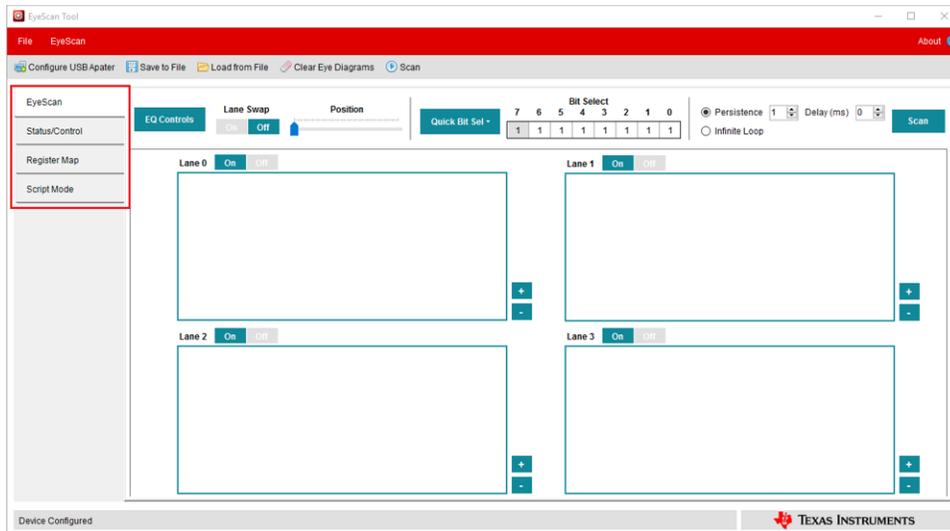


Figure 14. Configure USB Adapter Menu Option

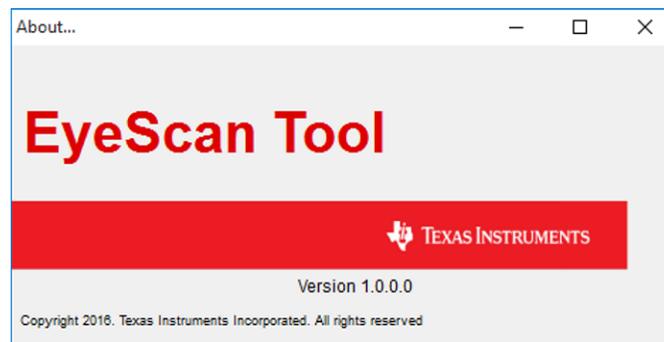
The EyeScan Tool is divided into four sections that can be accessed by means of the tabs located on the bottom the window:

- The EyeScan tab contains the controls for generating the eye diagrams.
- The Status/Control tab enables the user to read and write the status and control registers of the device.
- The Register Map section allows the user to access all the register of the device.
- By accessing the Script Mode section, the user will be able to specify an arbitrary set of instructions for the adapter to execute in sequence.



**Figure 15. EyeScan Tool Tabs**

To check for the GUI version currently in use, click the "About" button in order to display the application information.



**Figure 16. EyeScan Tool Version**

### 3.5 EyeScan Settings

The "EyeScan Settings" group box menu enables the user to change different aspects of the scanning process.

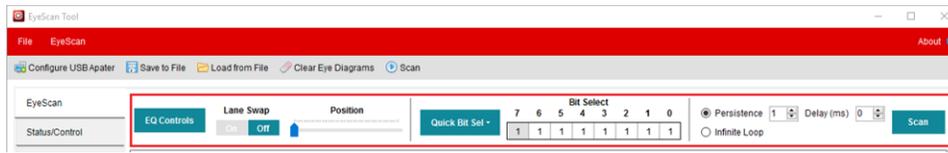


Figure 17. EyeScan Settings

The following configuration parameters can be customized from the "EyeScan Settings" menu:

- **Equalization Control Button:** By clicking on this button (EQ Controls), the utility will show up the Equalization Tab, which allows the user to enable the device equalizer and select either Adaptive or Fixed EQ mode.

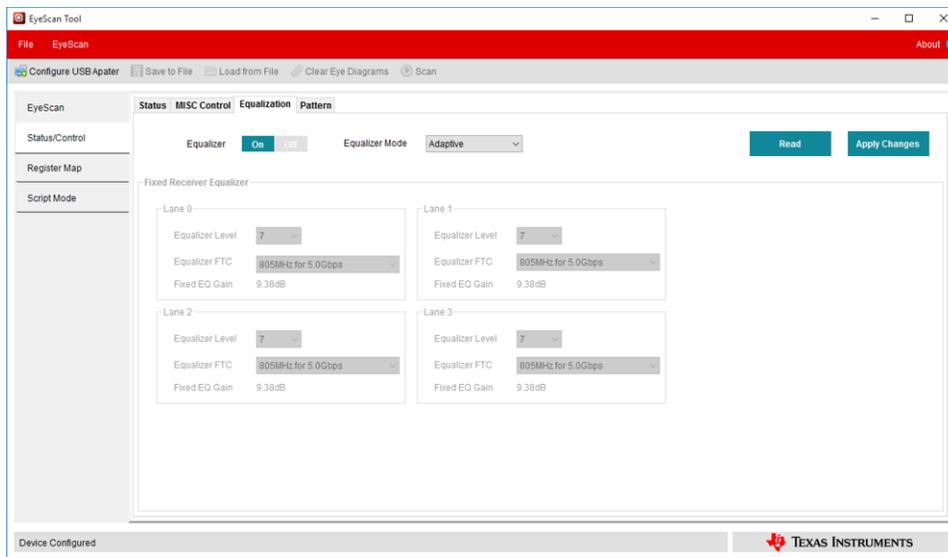


Figure 18. Equalizer Settings

- **Lane Swap:** This option allows the user to set the input lanes in swap mode.



Figure 19. Swap Input Lanes

- **Bit Select:** Configure a particular bitmask for the Eye Scanning resolution. In order to enable or disable each bit, the user can click on the individual bit value just below its corresponding index, or clicking the desired option through the Edit button and selecting the Quick Bit Selection option.

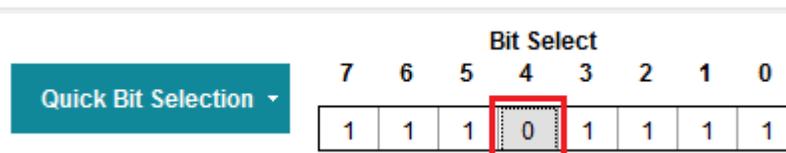


Figure 20. Individual Bit Selection

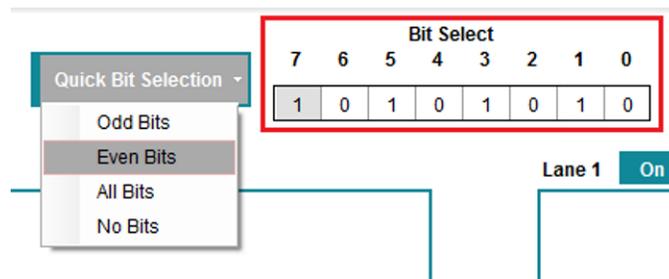


Figure 21. Quick Bit Selection

- *Enable Lane:* Clicking on the individual buttons will enable the scanning and plotting of the selected lane.

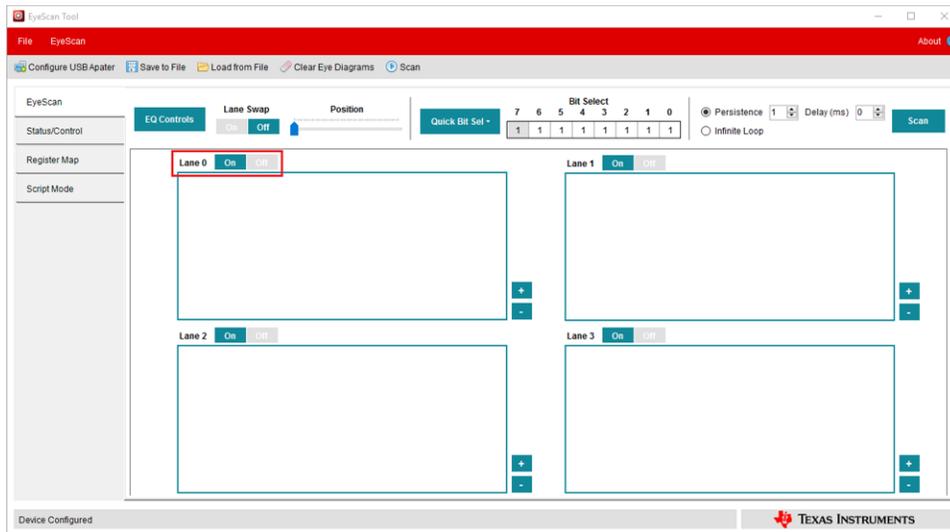


Figure 22. Enable Lanes

### 3.6 Scanning Process

After selecting all the desired options and the video output on sink device is observed, the user can click on the "Scan" (**Scan**) button to start the scanning process.

When the process is running, the utility will disable all of the controls on the main window and also a message ("Scanning") will be displayed in the Status Bar (bottom of the window). The time that it takes to plot the Eye Diagrams depends on the number of selected lanes, the bit select mask and the desired persistence.

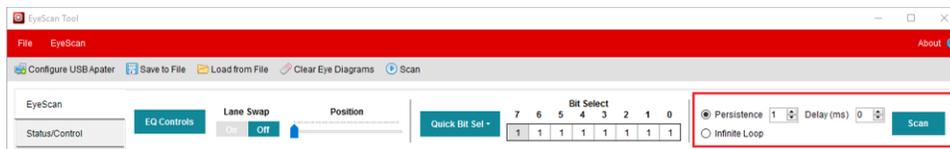


Figure 23. Scanning Process

The customer can choose between Persistence and Infinite Loop to configure the amount of diagrams that the utility will generate.

- *Persistence*: When this option selected the tool will repeat the scanning and plotting process based on the numeric menu, which is just after the Persistence check-box.

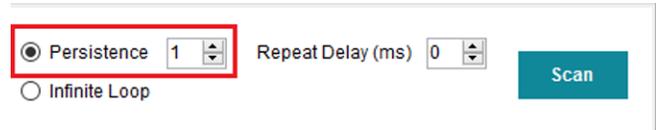


Figure 24. Persistence option

- *Infinite Loop*: By setting this option ( Infinite Loop), the EyeScan Tool will automatically repeat the scanning and plotting process until manually interrupted by the user. When this feature is in progress, the utility will add a "Stop" () button and the rest of the controls will be disabled; therefore, the user has to click on such button to exit the programming loop when required.
- *Repeat Delay (ms)*: This option adds a delay when the Scanning process is performed more than once.

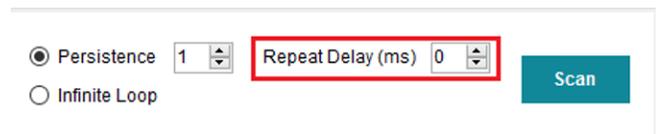


Figure 25. Repeat Delay

Figure 26 shows a completed scanning and plotting process.

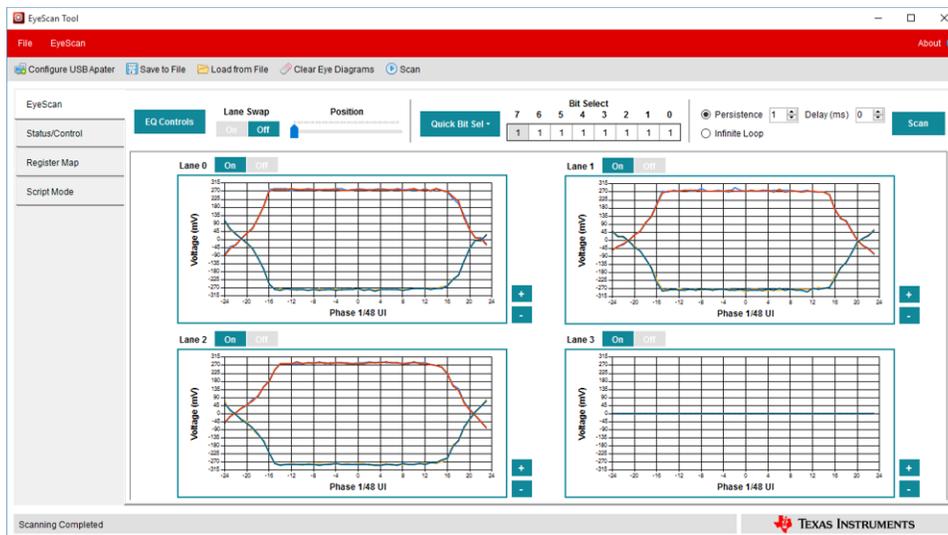


Figure 26. Scanning Process Completed

### 3.7 Zoom In and Out of an Eye Diagram

By clicking the "Zoom In" button () , the user can proportionally enlarge the current graph and redraw it in the new ranges of coordinates.

The user can also decrease the graph size (in the same increments) using the "Zoom Out" () button.

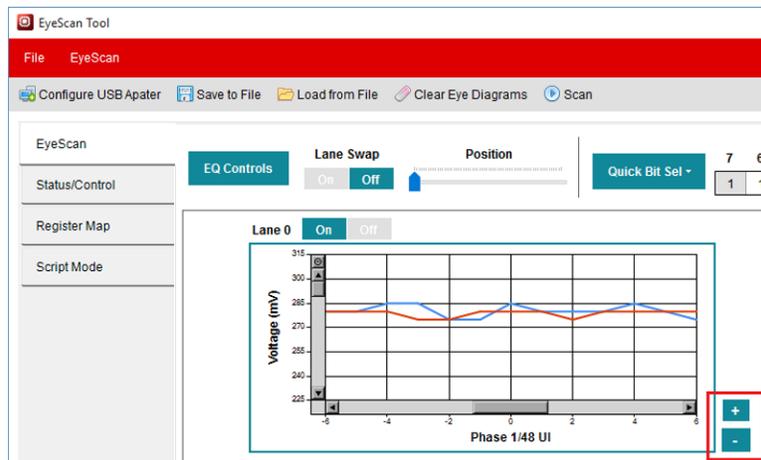


Figure 27. Zoom In and Out Buttons

### 3.8 Clear, Save, and Load Eye Diagrams

It is just a matter of clicking on the "Clear Eye Diagrams" (  ) button in case the user wants to clear all the Eye Diagrams that are plotted.

By clicking the "Save to File" button (  ), an onscreen box will appear asking the user to enter a Project Name, and, if desired, change the directory that is set by default.

The utility will create .CSV files with all the data generated in the scanning process in separated subfolders for each supported lane where the user is able to find out the mentioned folders in the selected path plus the Project Name.

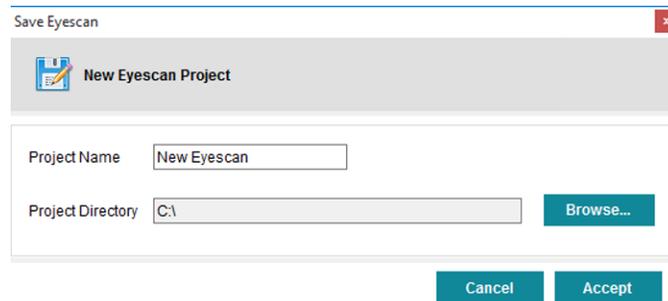


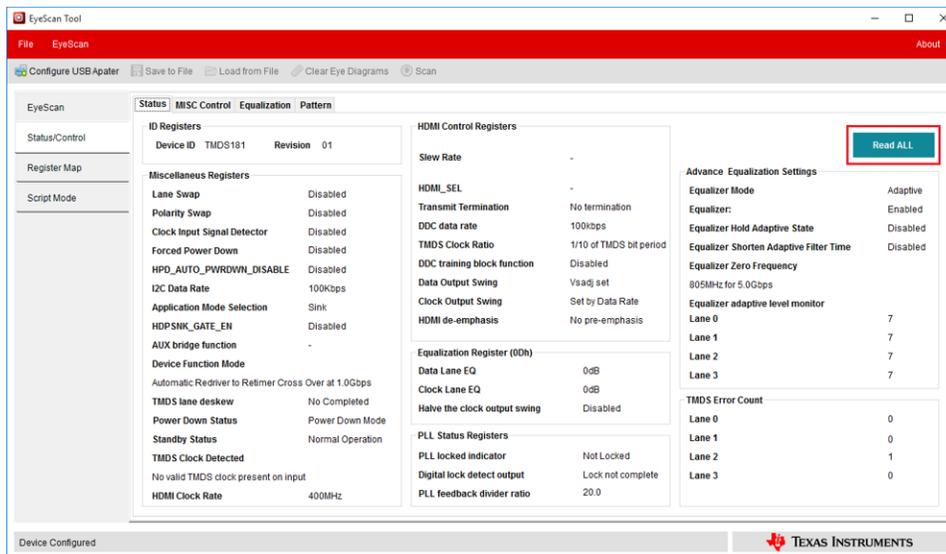
Figure 28. Save EyeScan Window

By clicking the "Load from File" button (  ), the user is prompted to provide a previous saved data file, and its content will be automatically plotted by the tool.

### 3.9 Basic Register Access

The Register Status/Control tab provides a way to read all status registers at once with minimal user effort. All the control and status register fields have been grouped together based upon function.

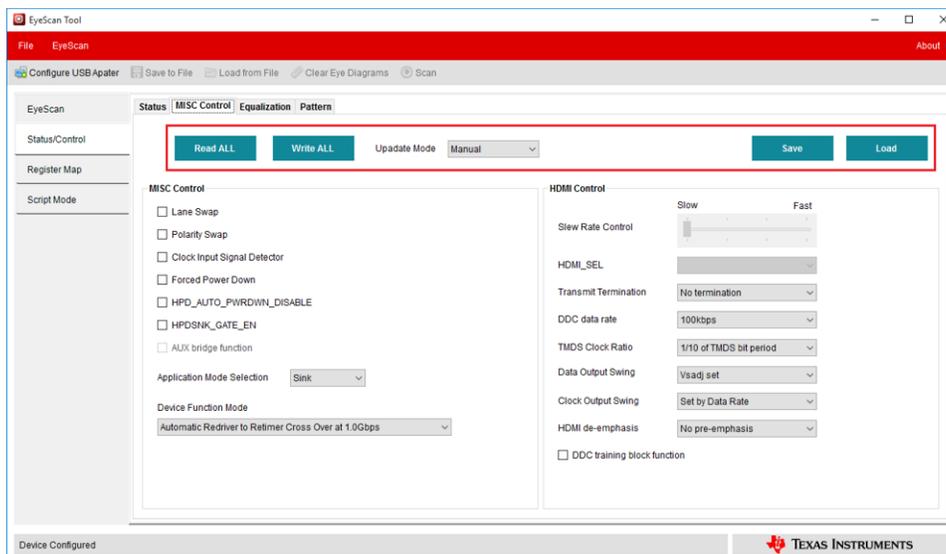
Clicking the "Read Registers" button causes a read of all of the status/control registers; the results will be automatically displayed.



**Figure 29. EyeScan Tool Register Access**

Click on the tabs located just below the Read Registers button to access the Status/Control registers.

When making changes to a particular control field, the value is stored into the GUI's register configuration array but is not immediately written to the device. In order to update all the changes, the user will have to press the "Apply Updates" button.



**Figure 30. Basic Registers Control**

The user also can save the current device configuration into a file by means of the "Save" button (); this file can be useful to back up the existing data before performing any changes to the existing device configuration as well as a template to program multiple devices with custom data.

The "Load" () button is intended to automatically load into the device the control registers from a formatted data file.

### 3.10 Pattern Generator and Verifier

This tab allows the user to program the device TX Pattern Generator and RX Pattern Verifier.

In order to update the selected settings, the user will have to press the "Load Generator" or "Verifier" buttons.

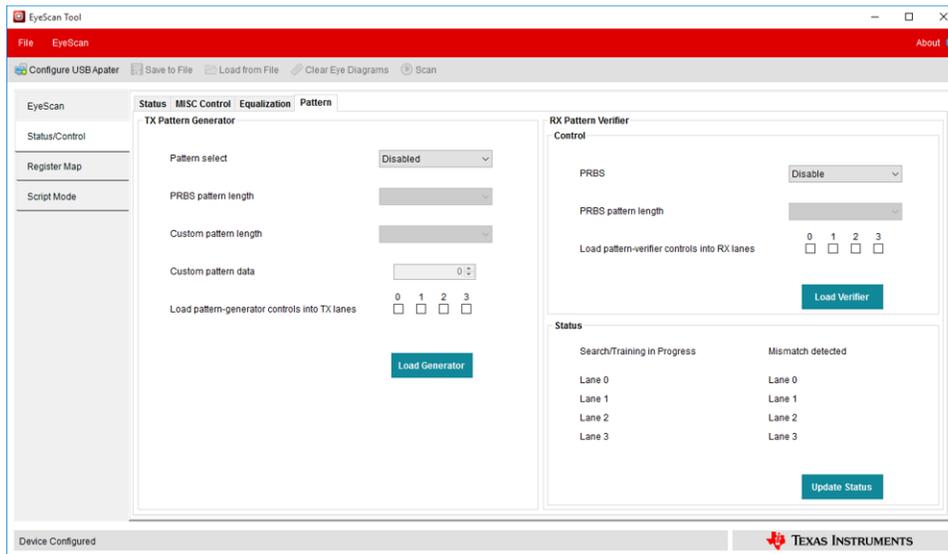


Figure 31. Pattern Tab

### 3.11 Register Map View

This section covers the register map view and the available operations and features.

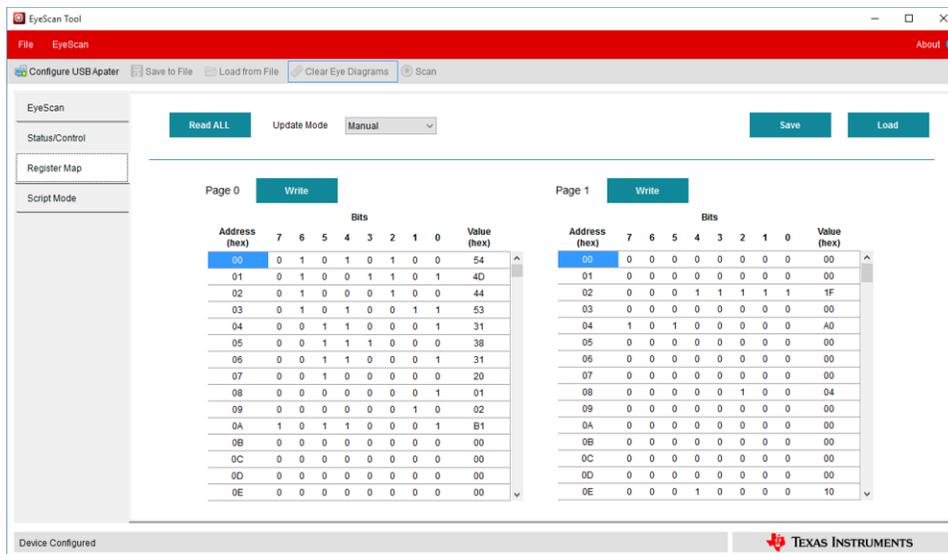


Figure 32. Advanced Register Access

#### 3.11.1 Read/Write Registers

The following controls are available for reading and writing registers:

- **Read all Registers:** Clicking the "Read ALL" button located at the top of the register map view will read the entire register map. This can be useful if you wish to ensure that a previously written value is still present on the device.
- **Write:** These buttons located beside the Page 0/1 label will write only that single page registers.

### 3.11.2 Changing Register Values

Register values can be changed using any of the following methods:

- *Clicking a Bit:* By clicking on any bit in the register map, the following action will occur. Clicking on a bit in a register that has already been read and initialized will change the bit value.
- *Using the Value Field:* The value field can be used to enter the hex value for the register. This is useful when setting all the bits in the register to a specific value rather than having to modify each bit individually. If the hex value entered attempts to overwrite reserved or read-only bits, it will be modified accordingly to preserve the settings in those bits and only change the writeable bits. For read-only registers, the value field will not allow for user input.

### 3.11.3 Update Mode

The Update Mode control found at the top of the register map view can be used to configure when write operations are performed. There are two settings available:

- *Manual:* This is the default mode and means that a write will only occur when the user clicks one of the write buttons as detailed in the previous sections.
- *Immediate:* In this mode, a write will be performed any time a register value is changed using any of the methods detailed in the previous sections. This is not the default mode as it should be used with caution. Because the write occurs any time the register value is changed, it is possible to put the register in to an undesired state when clicking on bits to change their value. It is recommended in this mode that the user use the control groups or the value field to set the entire value of the register or register bit groups if interim values are not desired.

### 3.11.4 Save a Load Register Configuration

- *Save data to a file:* By clicking the "Save" button, EyeScan Tool will generate a file containing the current contents of the device registers.
- *Loading data from a file:* Clicking the "Load" button will prompt the user to provide a formatted data file, which content will be automatically loaded into the device.

## 3.12 Script Mode

In Script mode, the user can specify an arbitrary set of commands through the Instructions text-box in order to read or write the device registers in a specific sequence.

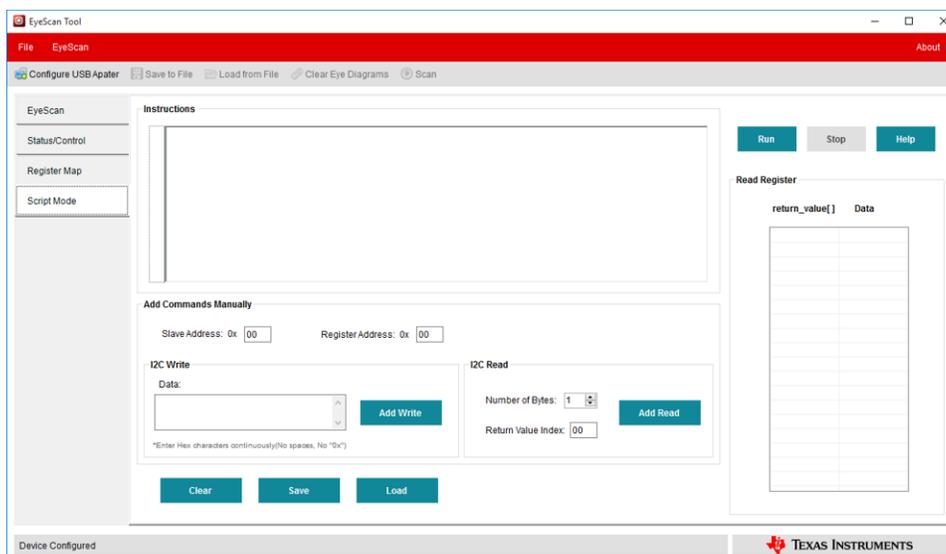
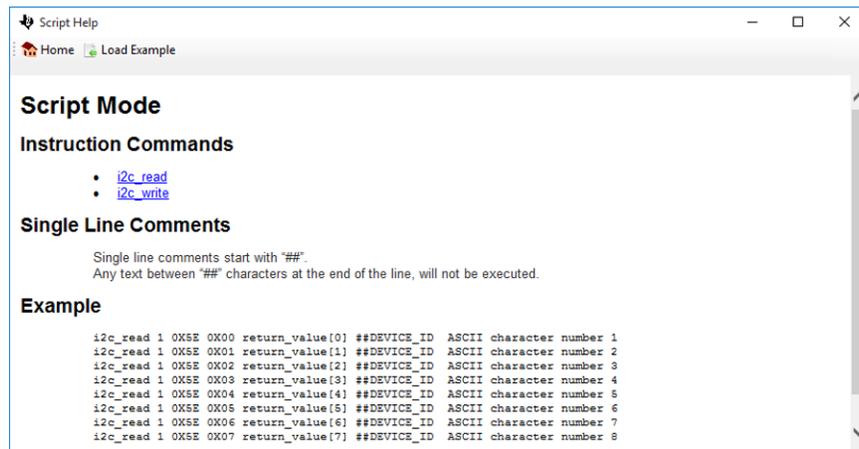


Figure 33. Script Mode

### 3.13 Script Instructions

Script commands are executed in the order that they appear in the instructions block. A set of instructions must contain only capital letters.

Help for the script commands is available in the Script Help, which explains all the available commands. On the Help window, click the "Load Example" button to copy and paste automatically the example script into the Instructions box.



**Figure 34. Script Help**

#### 3.13.1 i2c\_read Command

This command reads data from the I<sup>2</sup>C slave device.

##### Syntax

- `i2c_read count slave_addr device_addr return_value[index]`

##### Parameters

- count**  
The number of bytes to write (maximum 255)
- slave\_addr**  
The slave address from which to read. The value must be specified in hexadecimal notation (for example, 0X5E). This address must be seven bits long.
- device\_addr**  
The device addresses from which to read. The value must be specified in hexadecimal notation (for example, 0xFF).
- index**  
The array index in which the result data is stored. The value must be a decimal character (for example, 99).

##### Details

- `return_value[ ]` is a 255 bytes length array.

### 3.13.2 i2c\_write Command

This command writes the selected data in the I<sup>2</sup>C bus.

#### Syntax

- `i2c_write slave_addr device_addr data`

#### Parameters

- `slave_addr`  
Address for the I<sup>2</sup>C slave device. The value *must* be specified in hexadecimal notation (for example, 0X5E). This address must be seven bits long.
- `device_addr`  
The device addresses from which to read. The value must be specified in hexadecimal notation (for example, 0XFF).
- `data`  
Data to be transmitted. Space separated list of values, which must be specified in hexadecimal notation (for example, 0XFF). Maximum bytes allowed = 254.

### 3.13.3 Script Comments

Single line comments start with "##". Any text between "##" and end of the line will not be executed.

### 3.13.4 Editing Script Instructions

The instructions are entered in this text field. Script instructions can be saved and loaded as .txt files using the "Save" () and "Load" () buttons, respectively. The "Clear" () button will clear all contents out of the text field. The following dialog box will appear to confirm that the user wants to clear all data out of the text field.

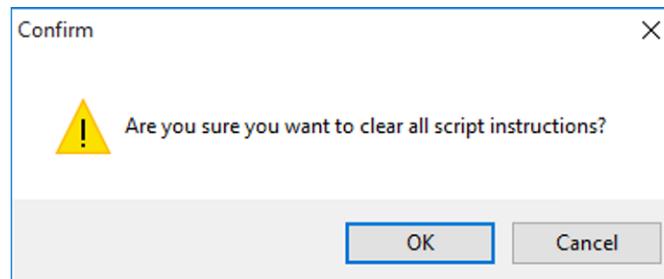


Figure 35. Dialog Box That Appears to Confirm User's Action

### 3.13.5 Executing Batch Instruction

To execute a set of batch instructions, click on the "Run" button (). The results from the commands will appear in the Register Chart. While a script is running, it is not possible to edit the batch instructions.

### 3.13.6 Batch Instruction Error

When the "Execute" button is clicked, the instruction set is parsed and validated. In the event of an error, a dialog box will open indicating the line in which the error appears. Click "OK" to close the dialog.

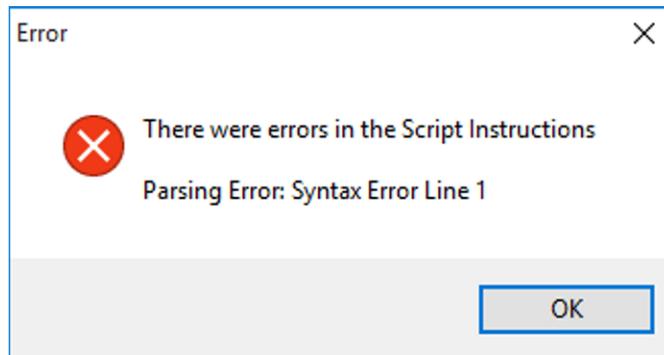


Figure 36. Syntax Error

### 3.14 Add Commands Manually

On scripting tab, the "Add Read" and "Add Write" buttons allow the user to insert read or write command, with dummy values to be filled in by the user.

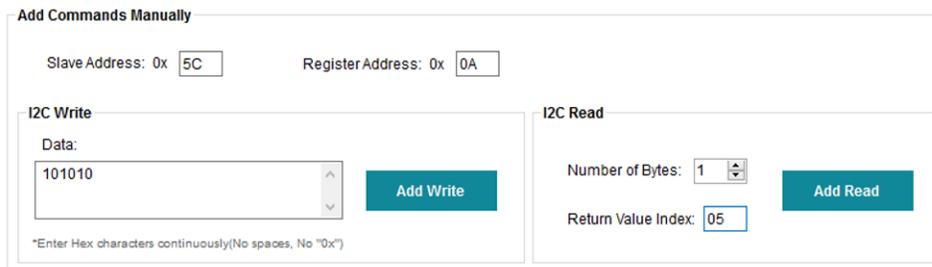


Figure 37. Add Command Manually

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