TLK10232 Dual-Channel XAUI/10GBASE-KR Transceiver with Crosspoint Evaluation Module (EVM) Graphical Users Interface User's Guide

This user's guide describes the usage and construction of the TLK10232 evaluation module (EVM) GUI. This document provides a basic overview of the different portions of the program.

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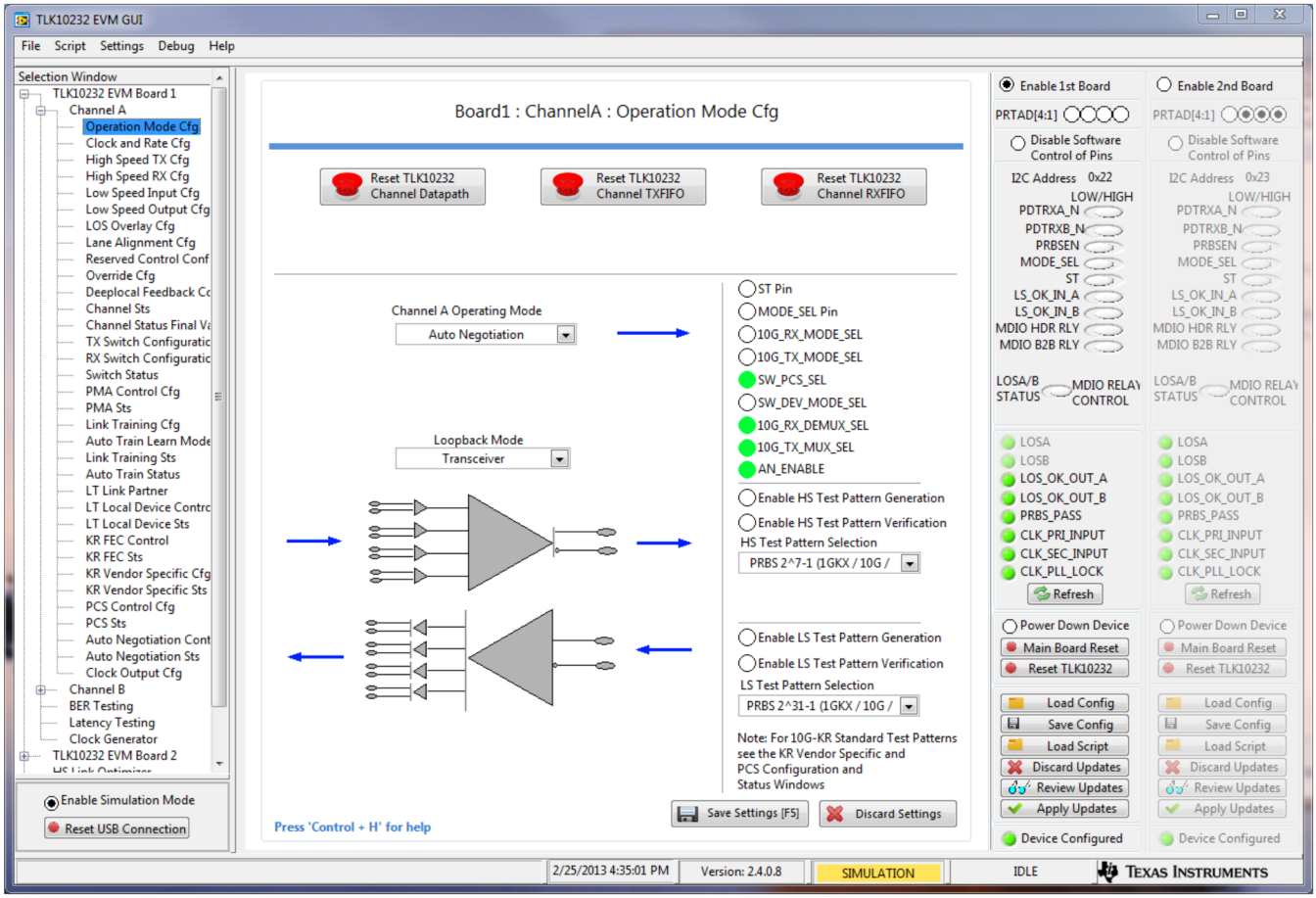


WARNING

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user, at their own expense, is required to correct this interference.

1 Introduction

The Texas Instruments TLK10232 SERDES evaluation module (EVM) boards are controlled and configured with a custom developed graphical user interface (GUI) developed using National Instrument's LabVIEW™ 2010 programming language.

High- and low-level manipulation of the registers is possible through this GUI as well as a variety of built-in test modes. Both channels of the TLK10232 and every low-speed input/output lane in each channel is handled independently allowing maximum configurability of the TLK10232 device. Global write register bits exist, allowing the register read/write commands to be applied to every channel, and lane, simultaneously to shorten the configuration time. However, these bits are not implemented in the GUI and the user should be aware that the configuration sequences in the GUI could be optimized for both time and redundancy for the particular use case when implementing the system.

The high speed transmit and receive parameters can be swept through a nested loop of parameter combinations in the *HS Link Optimizer* portion of the GUI. The test results can be reviewed both visually and empirically through a saved test report with the results. Running the *Link Optimizer* saves time when determining the optimal combination of settings for the particular system or test setup.

Advanced functionality and debug capabilities are built into the GUI through the implementation of the Python scripting language. A recording of register read/write transactions can be recorded in real-time while manually using the GUI in order to create a reusable and easily modified script for future work. These scripts can be modified to include any supported Python 2.7 features including loops, file I/O, and command prompt user input.

2 Getting Started

Configure the EVM hardware and connect the USB dongle to the PC before starting the TLK10232 EVM GUI. The first time the GUI is started, default settings and configuration files are created and saved into the working directory of the PC causing the GUI to take longer than normal to open.

The TLK10232 EVM implements TI's TCA6424 I^2C™-to-GPIO device to provide software control and status monitoring of the TLK10232 device's I/O pins. When the board is powered up and the GUI is run, the GUI first initializes the registers of the TCA6424 for their default values and issues a *Main Board Reset*, resetting the TLK10232. This ensures that the GUI and TLK10232 register values are synchronized to their default values prior to configuration. When this reset occurs, the red reset LED on the EVM blinks momentarily and then the green LED relights when the reset operation is complete.

The GUI is designed to control up to two TLK10232 EVMs when one is configured to accept the MDIO and I^2C control signals from the first board that is connected to the USB port of the PC. Currently, this feature is not fully implemented and tested in both hardware and software. See future revisions of this document for additional information. Use Board 1 settings and registers when only one board is connected to the PC.

Both channels can be configured simultaneously using Channel A's settings as a reference. Selecting the TLK10232 EVM board window from the *Selection Window* menu (Figure 1) allows selection whether or not to simultaneously configure both channels. After making a selection, click the **Save Settings [F5]** button at the bottom of the screen.

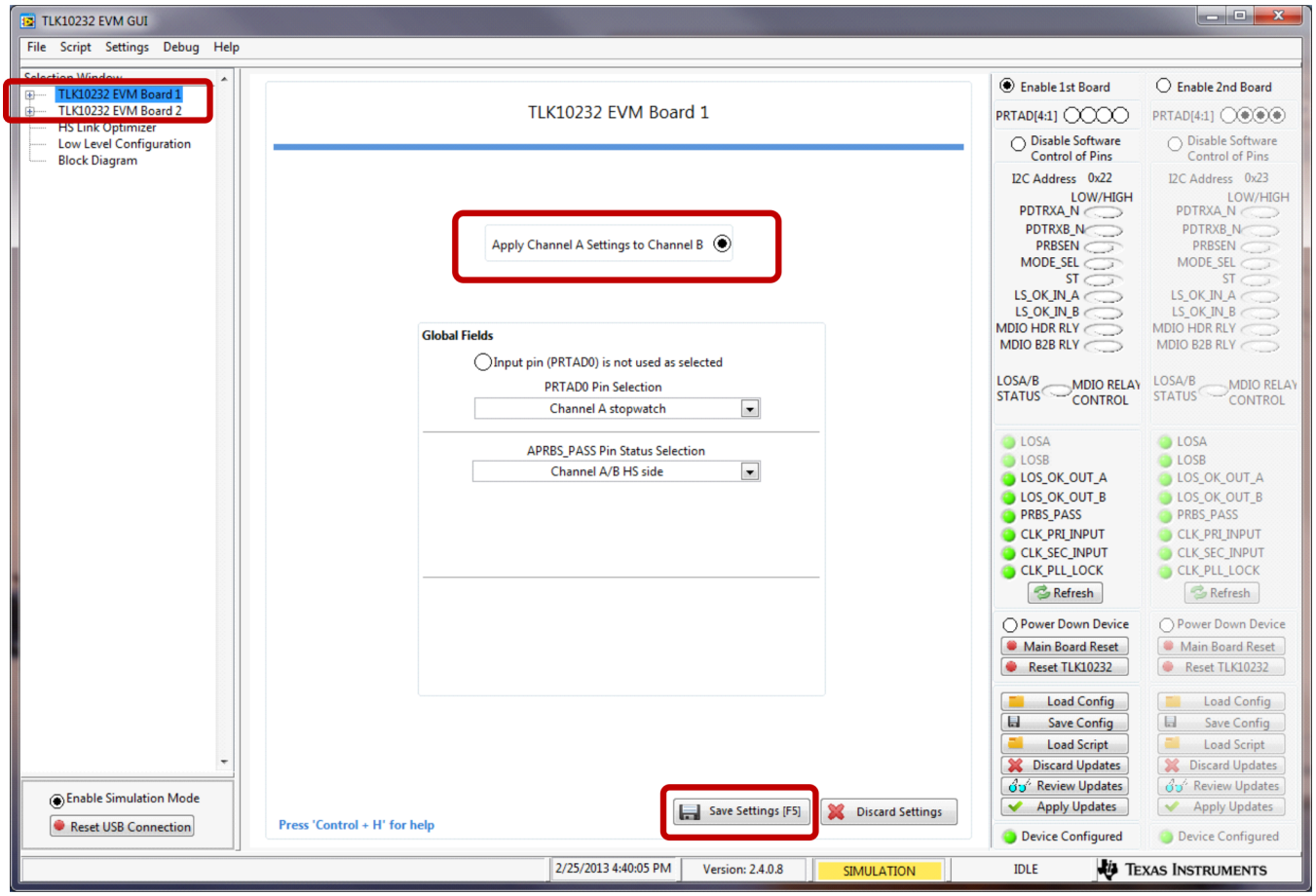


Figure 1. TLK10232 EVM GUI Board 1 Window

3 High-Level TLK10232 Device Configuration

All of the TLK10232 control and status register fields have been grouped together based upon function and are accessed on an individual basis through the use of a *high-level* control. Expanding the board hierarchy in the GUI's *Selection Window* tree (Figure 2) displays the various channel and window windows. If both channels are chosen for simultaneous configuration, the GUI disables the selection windows for Channel B. The registers are written to the device individually, but the GUI saves time and adopts Channel A's settings into the GUI's register configuration array.

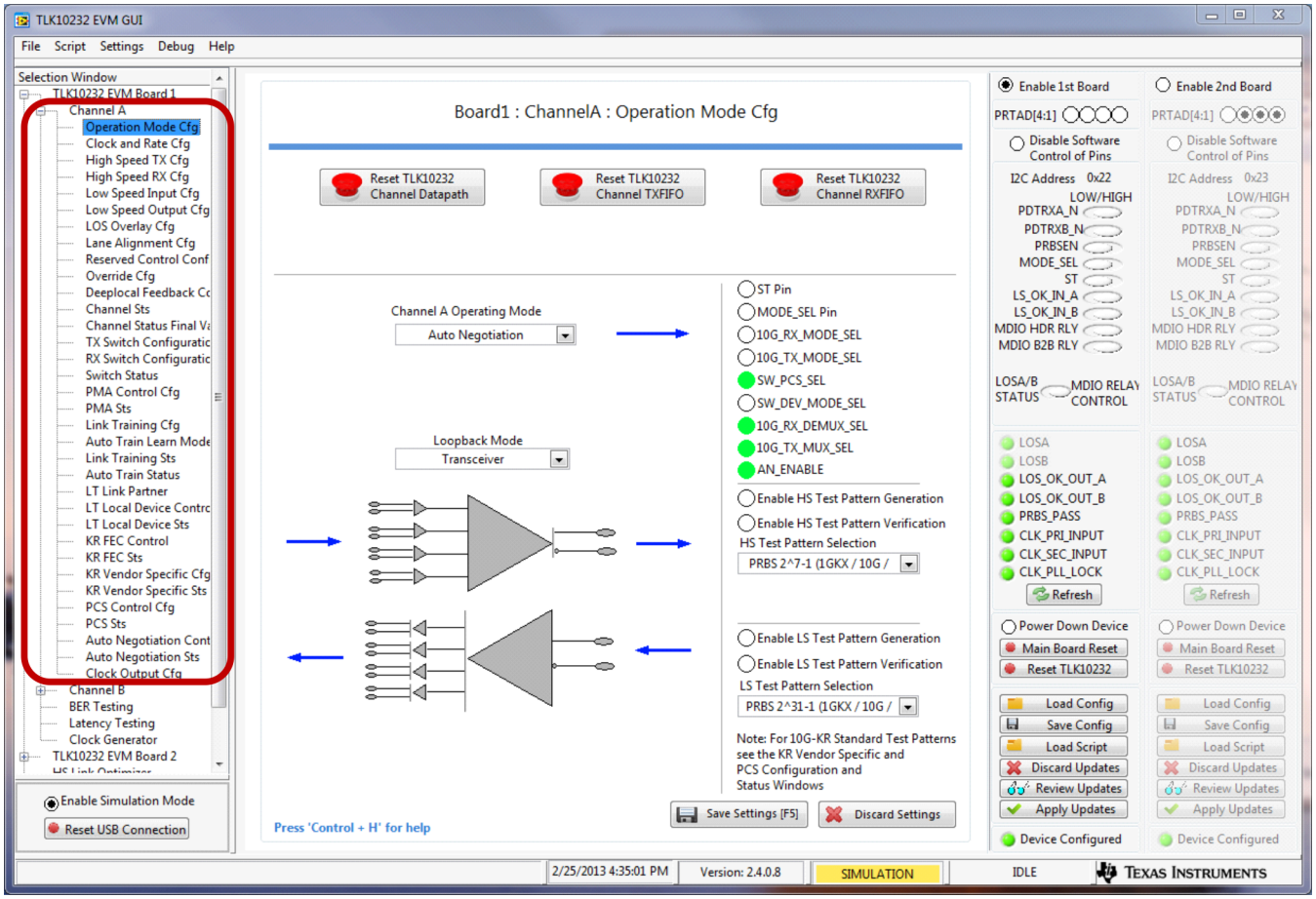


Figure 2. TLK10232 EVM GUI Hierarchical Selection Window Tree

Configuration of the external control pins of the TLK10232 device through the GUI is performed through TI's TCA6424 onboard I^2C-to-GPIO device. The TCA6424 is configured to control the high and low settings of the device from USB data sent to the board from the GUI. It is also possible to disable the software control and rely on manual settings of these signals. Monitoring external status pins is also possible through this method.

The GUI and the device settings on the board can be synchronized by initiating all reset signals from the GUI through the various buttons. If the reset button on the board itself was pressed, the GUI would not realize that the registers were reset and continue to display the previous register values. Pressing the **Main Board Reset** button (Figure 3) in the GUI is equivalent to pressing the reset pushbutton on the EVM board and has the added benefit of resetting the GUI's register settings to match the hardware default values applied to the TLK10232 device following a main board reset.method. The

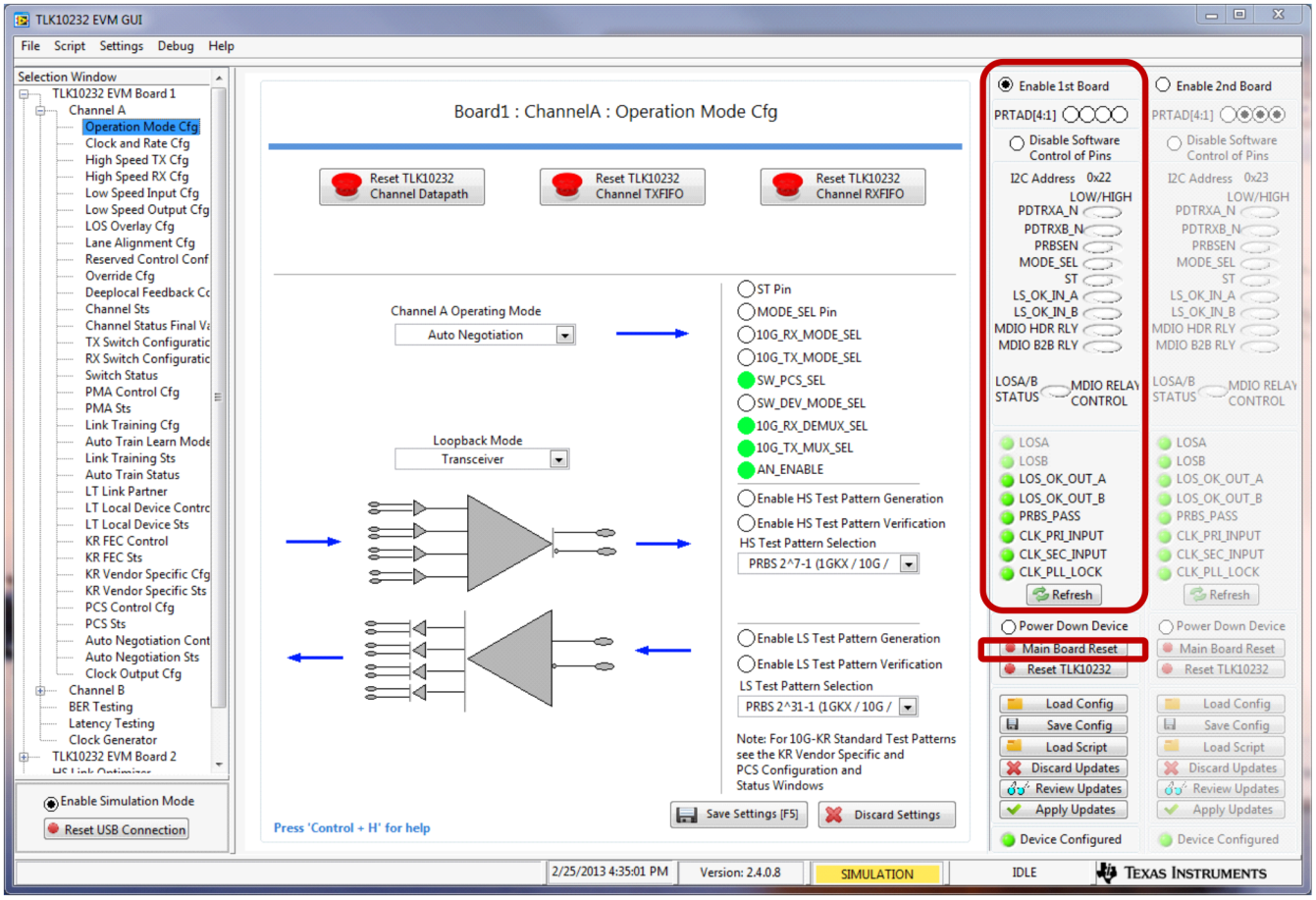


Figure 3. TLK10232 EVM GUI Software Control of TLK10232 I/O Pins and Main Reset

The TLK10232 register settings are configured from the high-level device configuration windows of the GUI. All of the settings of the TLK10232 can be modified from various portions of this tab broken out and grouped into individual windows according to their function.

It is recommended to configure the TLK10232 device by starting at the first window in the GUI's *Selection Window* and work down the tree selecting and saving any settings changed to something other than default.

By default, the TLK10232 device and GUI are configured to run in *Auto Negotiation 10G-KR* mode. The first window (Figure 4) has a selection box that allows easy configuration for all of the various operational modes of the TLK10232 device. This is a hybrid control and will set all of the various control register bits required for proper operation in that mode. Located to the right of this selection box is an LED indicator panel displaying the value of the various controls bits set in that particular mode.

The default PRTAD[4:1] setting for TLK10232 EVM board and GUI is 4b'0000. If the PRTAD[4:1] value is changed on the TLK10232 EVM board using the dip switch settings, the value must also be entered into the GUI on the Front Panel above the Control pin settings. If there is a hardware/software mismatch, then register read/write operations will fail. The same is true for the I^2C Address on the TCA6424. Clicking the 0x22 allows the selection of address 0x23.

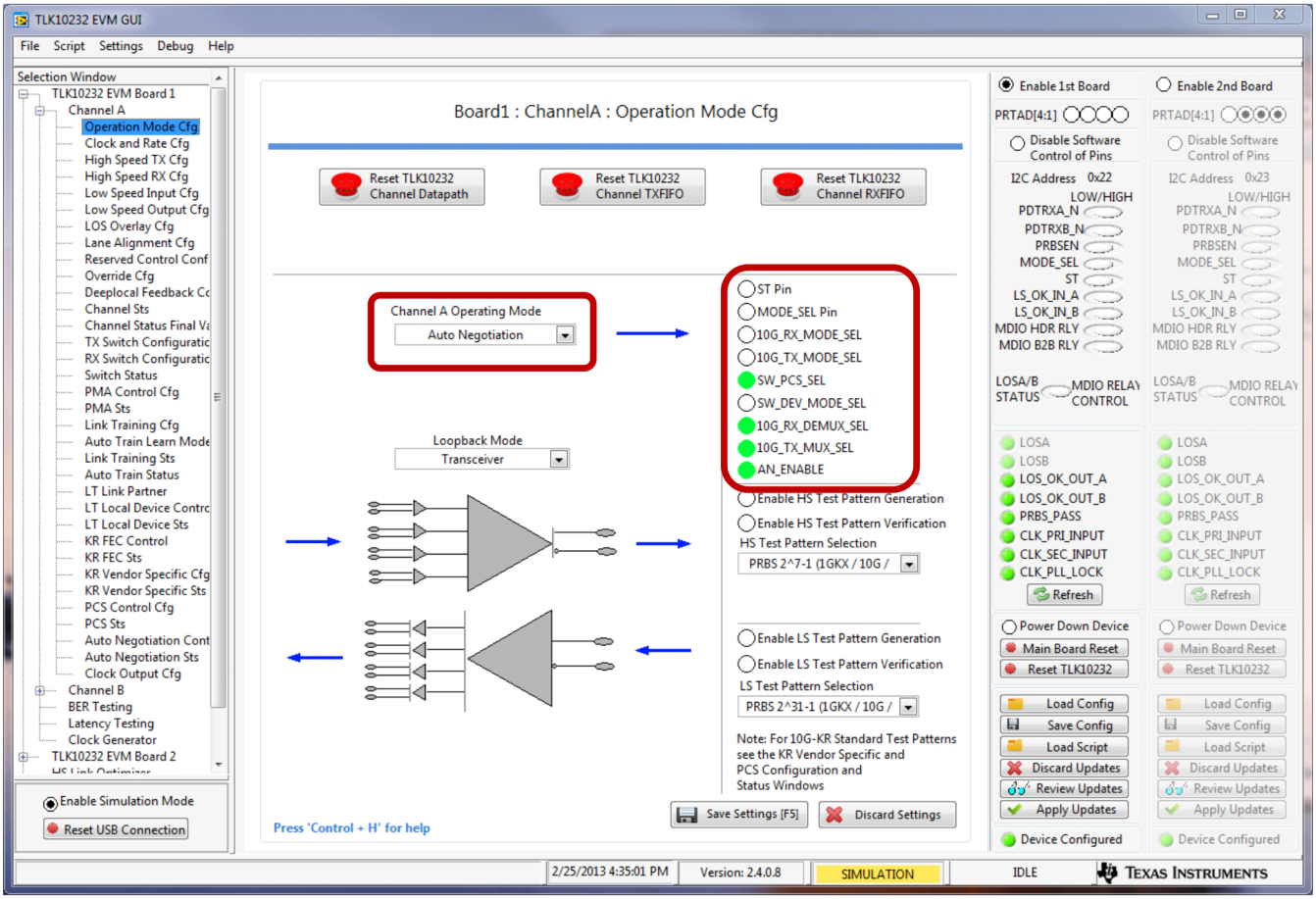


Figure 4. TLK10232 EVM GUI Operating Mode Configuration

When making changes to a particular control field in any of the high-level control windows, the value is stored into the GUI's register configuration array but is not immediately written to the device. When the settings have changed and the settings of the GUI do not match the actual register settings of the EVM device, the **Require Update?** light glows red, indicating that some setting has changed in the GUI memory and needs to be sent to the device. When the device settings match the GUI's memory the **Device Configured** light glows green indicating that the board is configured as displayed in the GUI.

To change the various register settings in the GUI memory to a new value, simply find the particular parameter field in the various windows, select the new value, and click the **Save Settings** button. The change is discarded if the **Save** button is not clicked and the **Current Value** of the register is kept.

Saving all the values for the register fields in memory allows selection of the values for the device in any sequence chosen. The TLK10232 device settings and the newly selected register values can be reviewed at any time by clicking the **Review Updates** button on the front panel of the GUI. This will bring up a window that shows the register configuration array (Figure 5) and shows the current and new value for every register field. If the field has a new value, the status box for that array is shaded orange highlighting the changes to be applied to the TLK10232 device. To discard the changes in memory and keep the current settings, click the **Discard Updates** button to reset the new value fields with the current values.

Register values in other windows that are not relevant in the particular operation mode are disabled and become grayed out. This allows easy determination as to which register control fields are relevant for their mode and need to be configured.

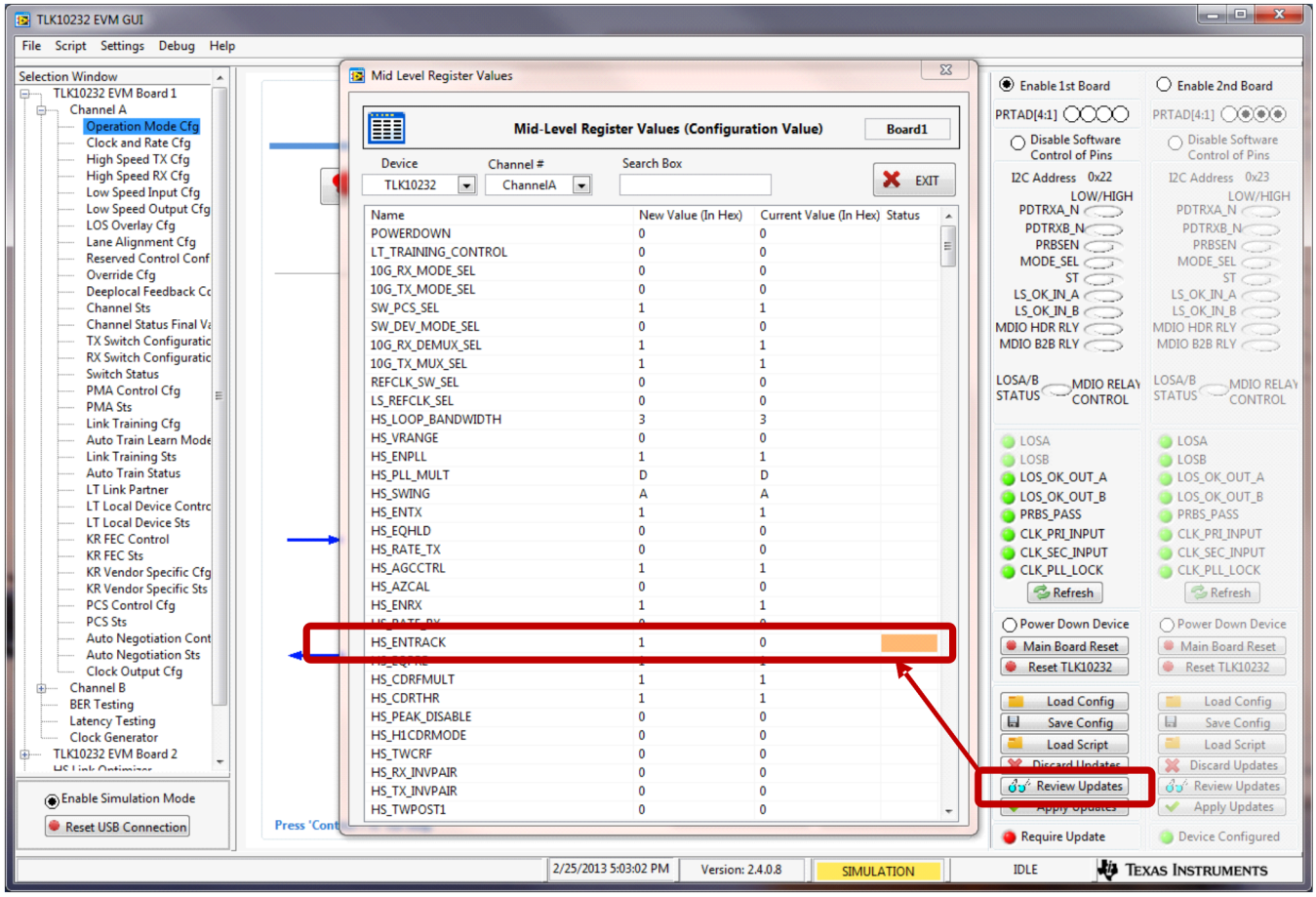


Figure 5. TLK10232 EVM GUI High-Level Review Updates

After selecting the *Operating Mode* settings, select the *Clock and Rate Configuration* window (Figure 6) from the *Selection Window* tree. All of the standard clock and rate controls listed in the TLK10232 datasheet are implemented using a quick reference lookup table. The *Clock and HS Serial Data Rate* options are operating-mode specific, requiring configuration of the operating mode before configuring the clock so the correct options are presented. Only the *Reference Clock Frequency* and *HS Serial Data Rate* selections are required. All other HS and LS PLL multipliers and rate settings are configured in the TLK10232 register to support that mode.

The selection of which reference clock is used to how to configure the HS Recovered Byte Clock for the selected channel can also be made from this window.

Selecting the **Others** button allows direct control the HS/LS PLL multiplier and rate registers. Entering the *Ref Clock Frequency* and *HS/LS Serial Data Rates* displays the *Output Clock Frequency* calculations for reference, even though they do not have any direct register configuration value.

Save any changes to the **Clock and Rate Configuration** window.

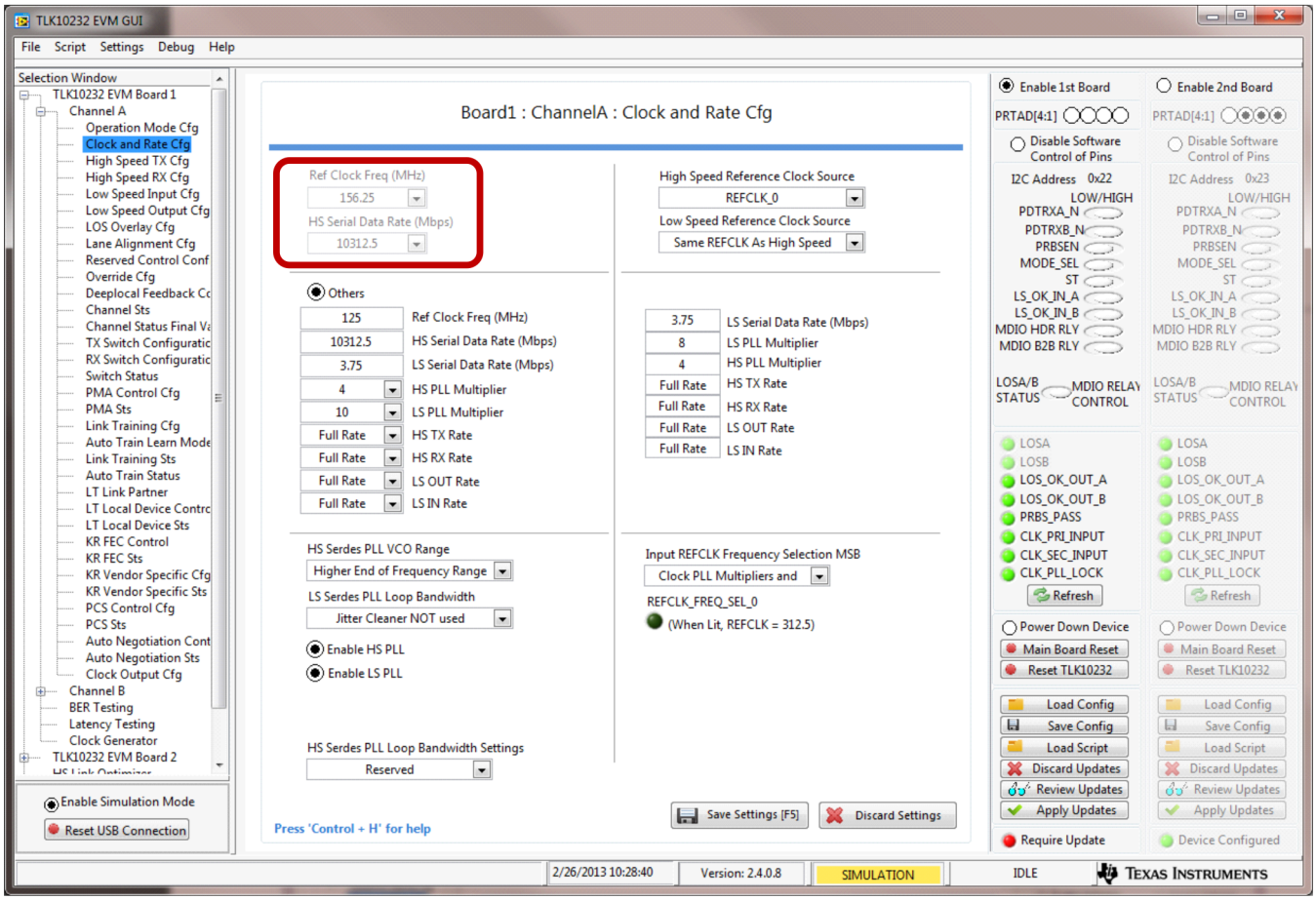


Figure 6. TLK10232 EVM GUI High-Level Device Clock and Rate Configuration

Not all configuration windows will be displayed in this document. Work through the various windows making other necessary configuration settings.

Status registers can be read at anytime from the various *Status* windows (Figure 7). Clicking the **Refresh** button located in the top right corner of the *Status* window causes all of the registers associated with that particular window to be read and the results to be displayed.

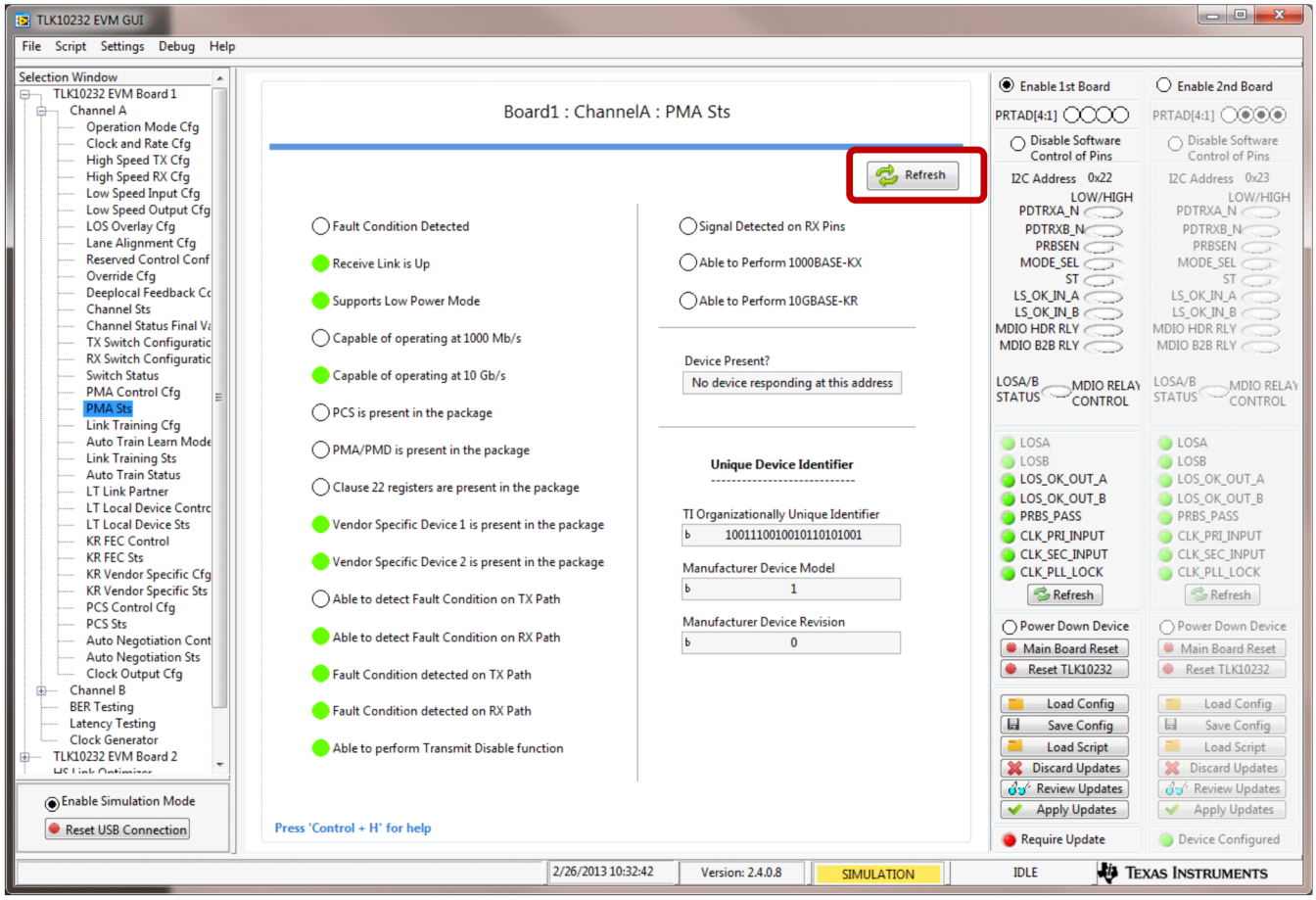


Figure 7. TLK10232 EVM GUI High-Level Device Status Windows

The red pushbutton controls located on the various windows, such as the **Reset TLK10232 Channel Datapath** button on the *Operation Mode* window, cause an immediate write of that register. Other modes such as the *10G* modes allow for a reset of the Channel TXFIFO and RXFIFOs, and the *10G-KR*, *1G-KX*, and *Auto Negotiation* modes have a pushbutton to restart the *Auto Negotiation* procedure immediately (Figure 8). Depending on which button is pressed, the saved register values may or may not be affected and reset. The GUI only resets the saved values if the register values are reset in hardware based upon the action committed by that particular pushbutton.

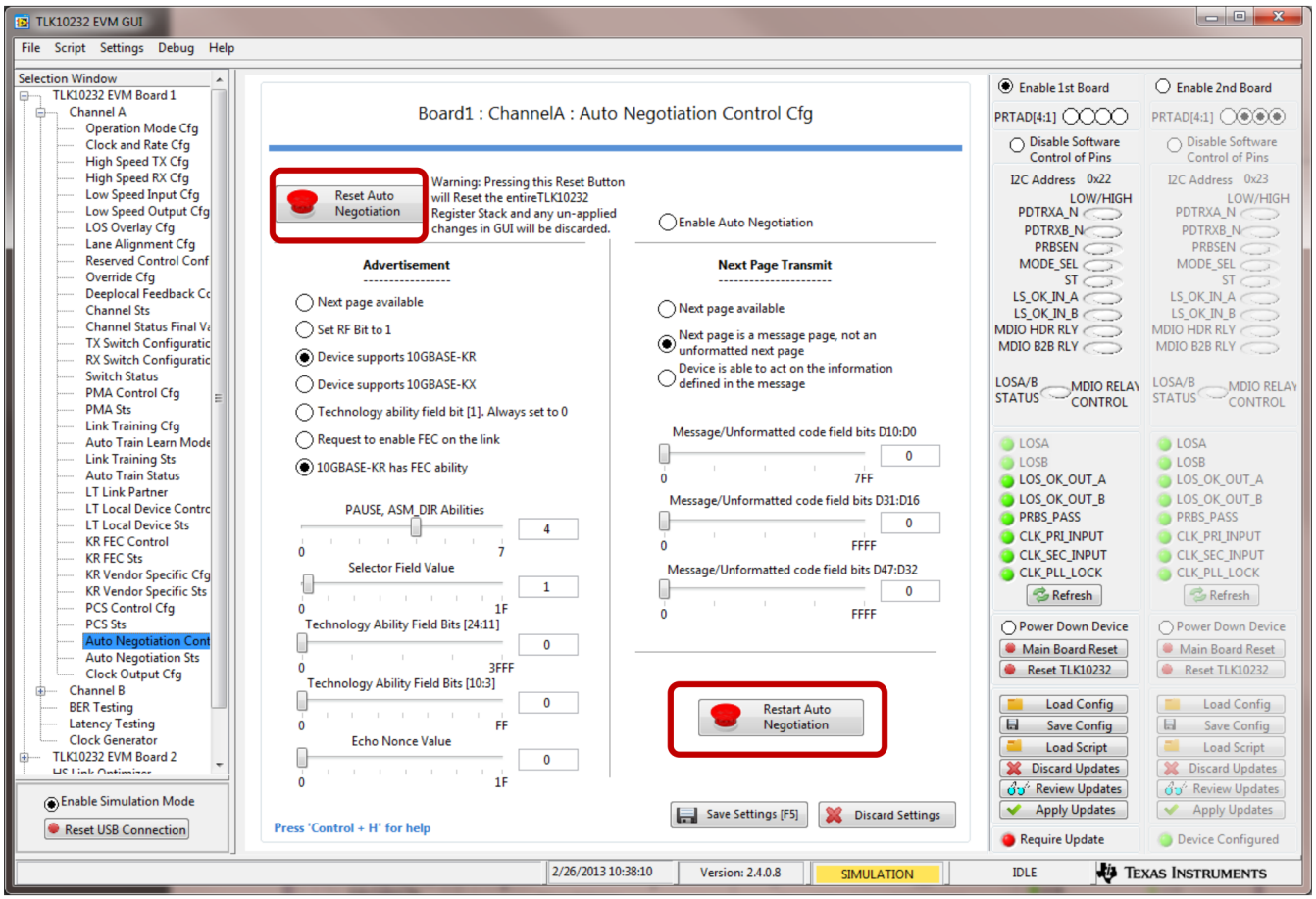


Figure 8. TLK10232 EVM GUI High-Level Device Immediate Action Pushbuttons

After changing the various control fields and all settings are saved into the GUI's memory, apply the updated settings to the TLK10232. The TLK10232 EVM GUI configures the device based upon a text file script. This script can be modified and loaded for any various specific or optimized use case and prevents the GUI from having a single hard-coded provisioning sequence. By implementing the use of this script, the provisioning sequence can be easily modified and adjusted without requiring the creation and deployment of a full software revision. A general provisioning file has been created and loaded by default that configures all writable registers of the TLK10232 device when executed. Also provided in the installation are several mode-specific scripts that only write to the registers valid in the particular operating mode. Selecting one of these scripts may reduce the configuration time slightly because fewer registers are being written every time the script is executed.

Any script can be set as the default script by first selecting the script in the **Load Script** button on the front panel of the GUI and then right-clicking the button and selecting the **Set as Default** option. From this point forward, this script is the default script loaded and executed by the GUI. The default script can be reset or changed at any time, as desired. The *Choose Script File* dialog boxes are shown in Figure 9.

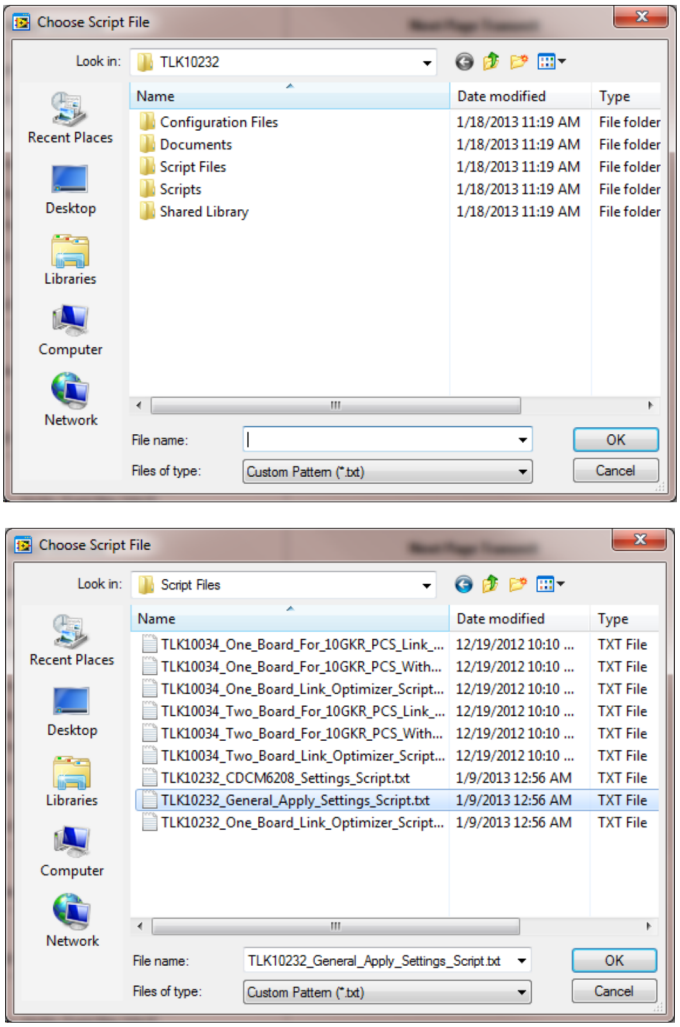


Figure 9. TLK10232 EVM GUI High-Level Device Load Script Selection Window

Once the script is selected (no change is required if the default script is desired), click the **Apply Updates** button to execute the script. A popup window opens and displays the register read/writes in real time as they are applied to the TLK10232 device. The current executed command is displayed at the bottom of the window and the value of each register read and write is displayed in the window. The script can be stopped by pressing the **Abort** button.

A text file report of the *Apply Settings* script can be created to log all of the register read/write values that occurred during the script execution. This report can be useful when determining the values needed to be implemented in an FPGA or other system controller.

4 Low-Level TLK10232 Device Configuration

Any register can be either read or written at any time through the use of the *Low Level Configuration* window (Figure 10). There are three device types containing register stacks that may need modification. Similar to the GUI *Selection Window* tree, the various registers are grouped in an easily-expanded hierarchal tree, allowing quick navigation to the registers of interest.

The primary device needed to read/write registers is the TLK10232. Expanding the TLK10232 in the tree shows *Board1* and *Board2* options. Select the appropriate board number that the TLK10232 is located and expand that to show the global and channel specific registers. All registers are handled individually for maximum configurability.

Navigate to the desired register and click the register name in the tree. This loads the bit-specific register information into the *Register Data* window and shows the last read/write value of the register in both hex and bit format. The names of the bits are also displayed for easier reference. The *Register Description* box displays the description information from the TLK10232 datasheet for the chosen register, helping to understand the significance of a particular register bit value without having a copy of the datasheet.

To read a register value, simply click the register to read and then click the **Read Reg** button. The new value is returned.

To write a register with a new value, click the register name to load the register information into the *Register Data* window. Click the individual bit fields to change the new values from 1 to 0 or vice versa. A check mark indicates a 1 value and an open box indicates a 0 value. The HEX value of the register is automatically updated. Click the **Write Reg** button to write the new value to the TLK10232 register. Retyping the HEX value directly into the *Write Data* field also writes the value to the register when the **Write Reg** button is pressed and the individual bit fields are updated for the specific HEX value.

If a chosen register has the *Write Reg* information disabled and grayed out, then that register is read only.

The GUI knows the register communication protocol of all the different registers and writes to the register in the required mode. If a TCA6424 register is read or written, the GUI executes that transaction using the I^2C protocol. The TLK10232 registers are MDIO Clause 45 Protocol, and the Spartan-6 registers (if using the legacy TLK10002 EVM FPGA daughterboard) are MDIO Clause 22 protocol.

Also, the PHY and Device Address information is used from the various input fields associated with the various board address controls. It is important to ensure that the PRTAD[4:1] address is set appropriately for the boards, and the I^2C address also matches the addresses set in hardware. The EVM board ships with PRTAD[4:1] = 4'b0000 and the I^2C Address for the TCA6424 = 0x22.

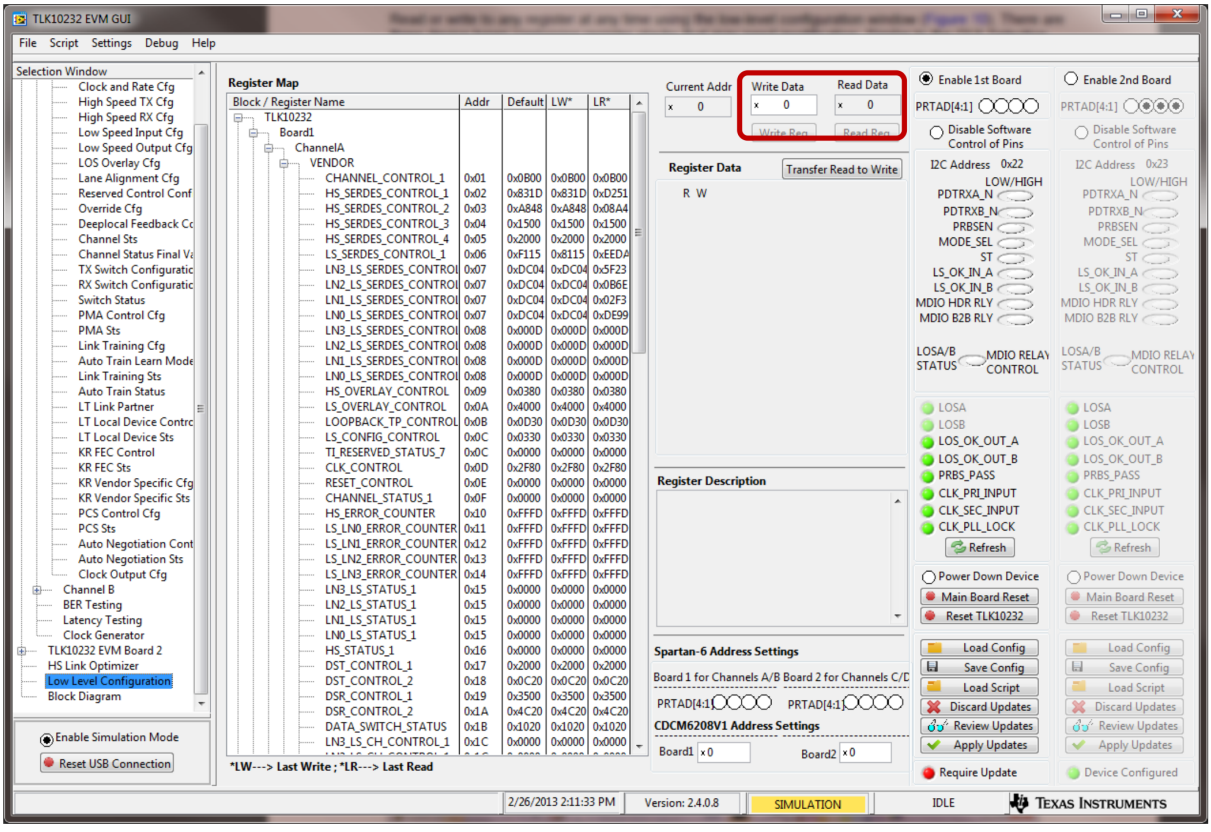


Figure 10. TLK10232 EVM GUI Low-Level Device Configuration

5 BER Testing

The *BER Testing* portion of the GUI can be used after configuring the desired TLK10232 settings and applying them to the device. When selecting the *BER Testing* window from the *Selection Window* tree (Figure 11), a page is displayed for running BER tests with any of the supported internal test patterns. The generation and verification enables bits as well as the test patterns must be configured during the initial device configuration and this window only reads and displays the error counter results. Pressing the **Read Counter** button under the *SINGLE READ* title performs a single read of all the error counters. Note that the error counters are cleared on read and the first read should be discarded because it contains a value set prior to the start of the test. Reading an error counter twice initially is always recommended.

A cumulative BER test can be performed by pressing the **Run Test** button under the *AUTO READ* title. This reads all error counters in sequence and continues to read the error counters in a loop until the **Stop** button is pressed. Note that the error counters stop being read at the end of the loop when the **Stop** button is pressed. If the test does not stop immediately when the **Stop** button is pressed, wait a short time to allow for the current loop to complete before the test is allowed to stop.

During the *AUTO READ* test, the *Current Count* of error values are displayed for the current read, and any errors are added to the *Cumulative Count*. Reset the *Cumulative Count* at any time by pressing the **Reset Cumulative** button under the *AUTO READ* title.

If bit errors are present, or the user would like to observe how different TX or RX settings affect the bit error rate, the left portion of the window allows access to all TX and RX parametric settings such as TX Swing, Pre-emphasis, and RX Equalization. Any adjustment of these controls will cause the GUI to apply the updated value in almost real time to the device. At the end of every error count read loop the GUI checks to see if any of the register control settings have been changed and the GUI applies writes the new values to the TLK10232 device before returning to the error count loop. All low- and high-speed TX and RX channels and lanes can be selected for control by using the *Transmitter Configuration* and *Receiver Configuration* selection boxes.

The results of the BER tests can be output to the *PRBS_PASS* LED on the TLK10232 EVM board by use of the *Pin Selection* box located at the top right corner of this window.

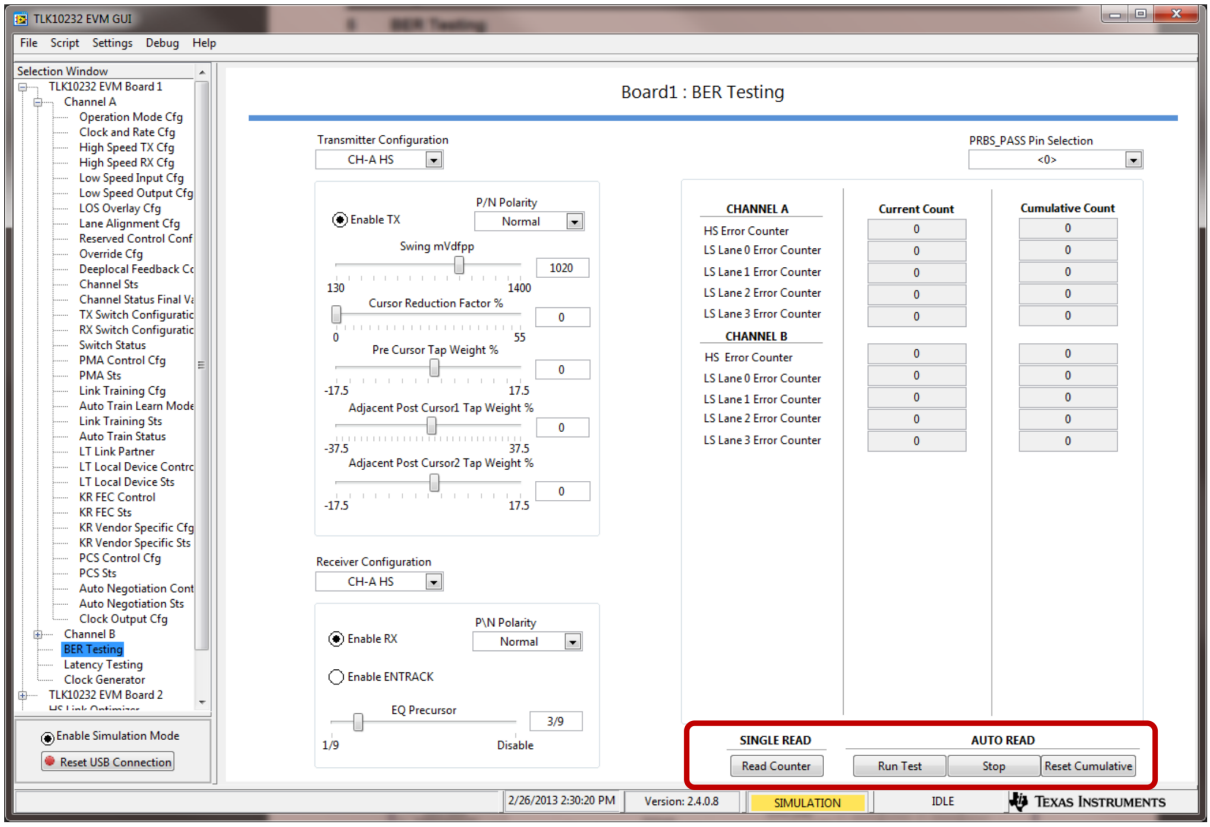


Figure 11. TLK10232 EVM GUI High-Level BER Testing

6 Latency Testing

In a similar fashion to the *BER Testing* window, a *Latency Testing* window (Figure 12) is also supplied in the GUI for easier operation of the internal latency counters in the TLK10232 devices. Once the TLK10232 board is configured for proper latency testing and data is passing, select the *Latency Testing* window to configure the test settings and run the test. Each channel of the TLK10232 has a latency counter, but only one channel can be configured and tested at a time. Once the test settings are selected, pressing the **Run Test** button writes the test configuration settings to the TLK10232 and reads the latency status register to determine if the test is complete. If the test is complete, the *Latency Measurement Ready* LED glows green and the *Latency Measurement Count* is displayed. If the *Latency Measurement Ready* status bit fails to indicate the measurement is ready and the test is complete, then the test will time out after the set timeout is achieved. Rereading the counters is performed by pressing the **Re-Read Counter** button.

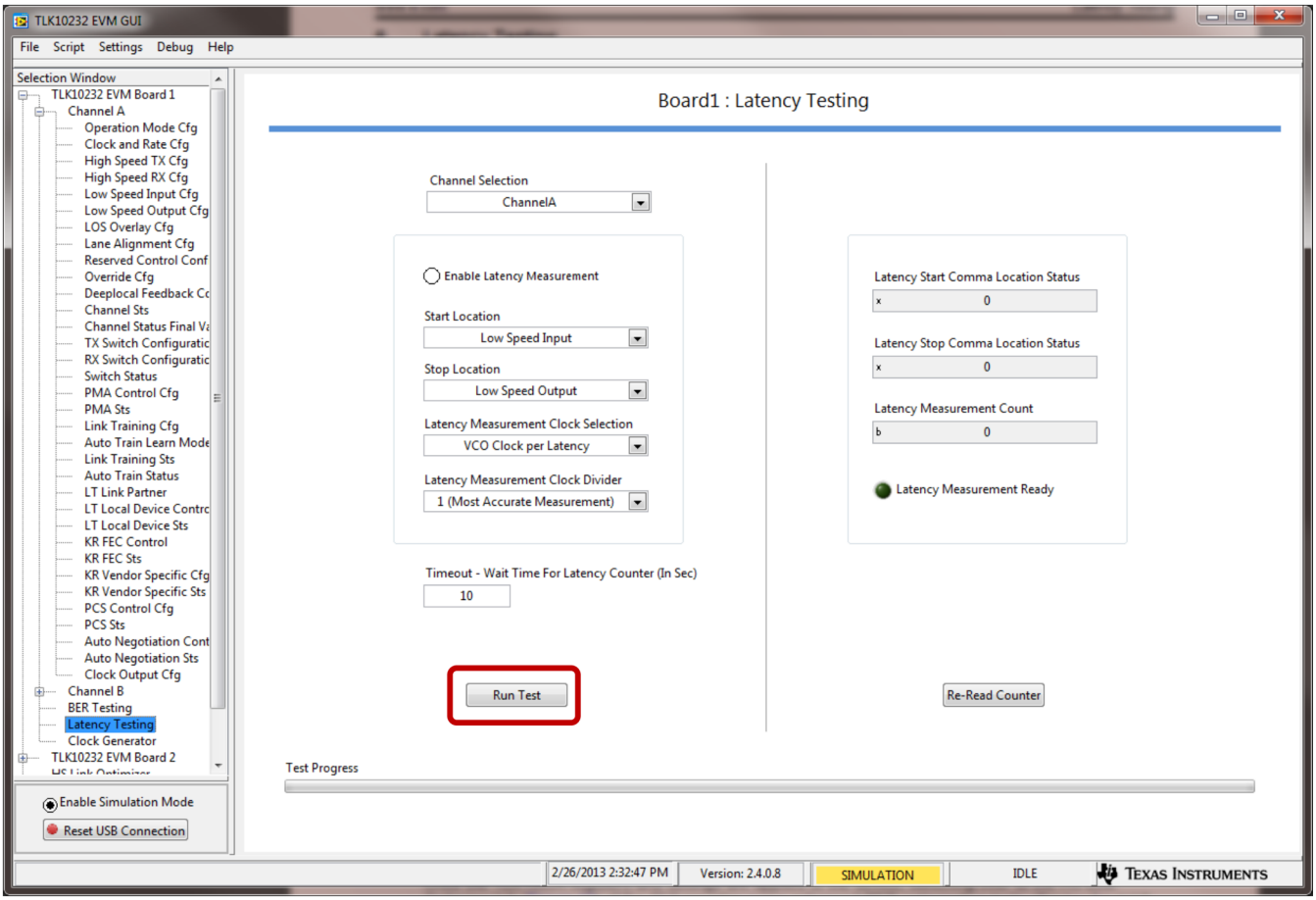


Figure 12. TLK10232 EVM GUI High-Level Device Latency Testing

7 High-Speed Link Optimizer Tests

Once the TLK10232 device registers and settings are applied to the device, switching over to the *High Speed Link Optimizer* tab of the GUI provides some enhanced BER optimization tests allowing for quick evaluation of the health of the channel and what combination of parameter values yields the lowest bit error rate. This portion of the GUI is more applicable when operating modes that do not implement link training as part of their initialization sequence.

It is possible to optimize a link that contains two different devices on two different boards as in a real system and not serial loop back test normally found in a lab test environment. Currently additional testing and verification of the TLK10232 EVM board and GUI is needed to support the two-board solution for this feature of the GUI. Look for future revisions of this document for additional information on how to configure the hardware and software for a two-board setup.

Up to four individual sweeps can be run simultaneously allowing for the entire device to be optimized concurrently. Each of the four sweep setups has an enable check box in the *Set Up* tab to enable that sweep for testing. Not selecting irrelevant sweeps uses fewer PC resources.

Select the *No. of Parameters* from the selection box; up to 6. Notice that if less than 6 parameters are selected, the extra parameters are disabled and grayed out. The board number and channel number are required to ensure the proper board and device's parameters are swept in the two-board test setup. Once a parameter is used by a sweep, it is grayed out as an option for additional sweeps.

For each parameter swept, select the board number, channel, and parameter name. The start and stop values for those parameters are chosen with an associated step size. A step size of 1 sweeps every value; a step size of 2 sweeps every other value, and so forth. If a non-linear step or alternate order of the parameter values is desired, the sequence of values can be input in the form of a comma-separated list in any particular order. Match the syntax of the selected parameter fields in order to ensure the parameter is set properly. Do not include spaces in the comma-separated list. If a comma-separated list is used, the *Start*, *Stop*, and *Step* fields are ignored.

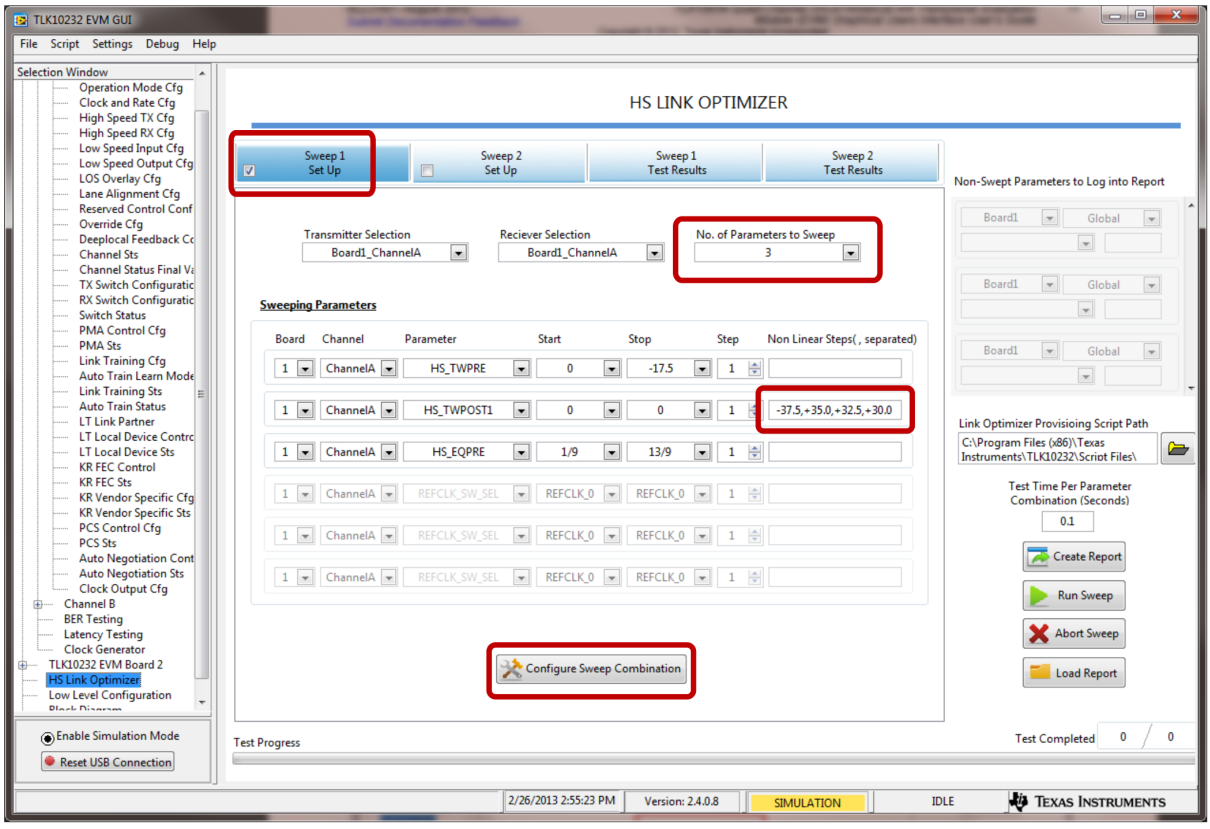


Figure 13. TLK10232 EVM GUI High-Speed Link Optimizer Setup

Once all the sweeping parameters are configured, press the **Configure Sweep Combination** button to create the parameter sweep sequence. Pressing this button opens a new window (Figure 14) that displays the sweep sequence with each combination having its own checkbox. Determine if any of the particular combinations are unnecessary and uncheck the individual fields to exclude them from the sweep. Once those final selections are made, pressing the **Save** button saves the test sweep array to memory and the test is ready to begin.

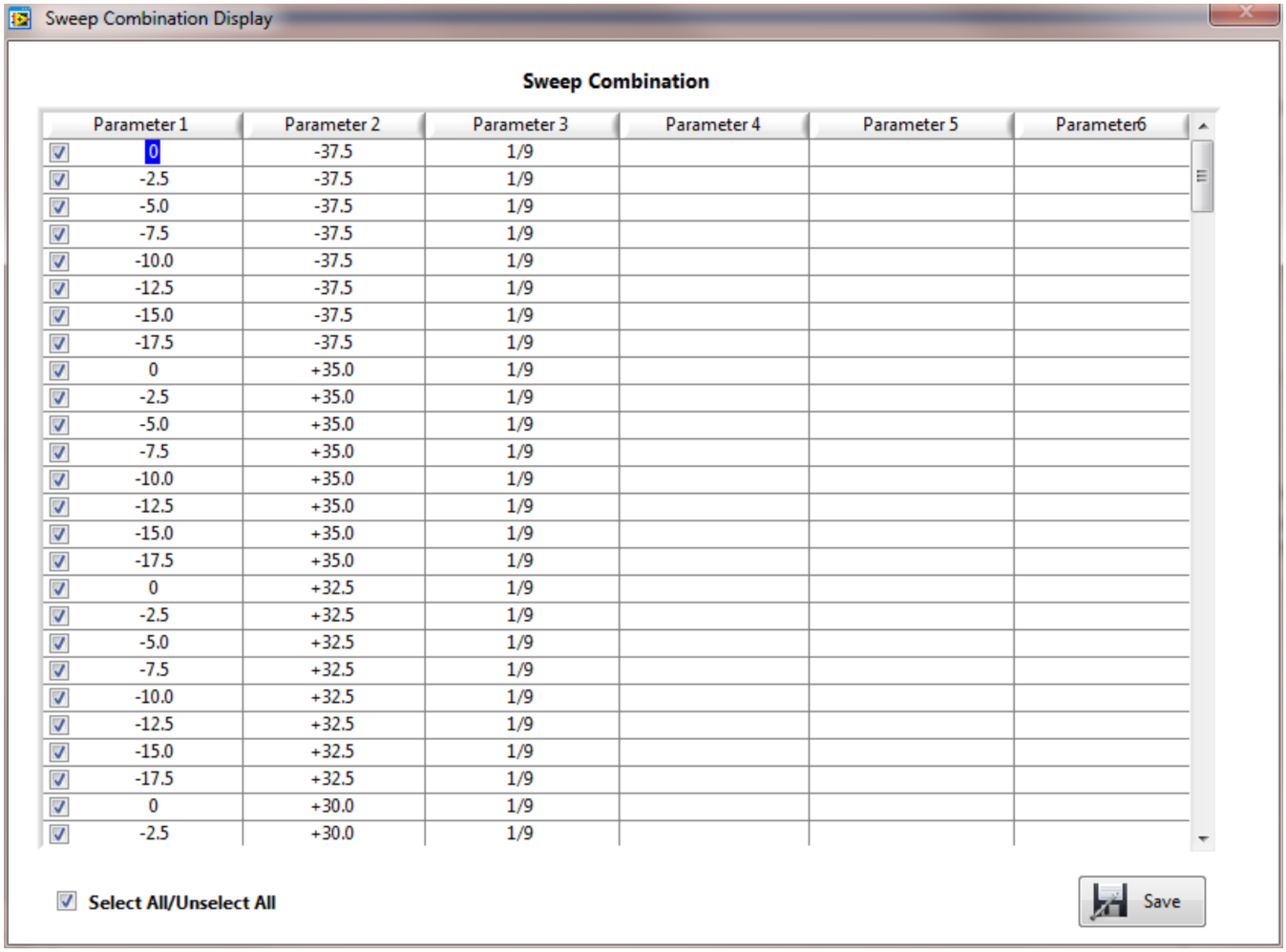


Figure 14. TLK10232 EVM GUI High-Speed Link Optimizer Setup

The *Link Optimizer* is similar to the *Apply Settings* portion of the GUI and is executed with a script. There are two versions of the *Link Optimizer* script provided with the GUI; one for a single-board setup, and the other for a two-board setup. The two-board script is loaded by default and while it can be used in a single board setup, the test time takes twice as long because the GUI is trying to configure an entire second board when the second board does not exist. To change the script, click the folder button next to the *Link Optimizer Provisioning Script Path* box and select the single-board script (Figure 15). To set this as the default script, right click the folder button and select the **Set Current File as Default Script**. It should also be noted that the scripts configure every channel of the device independently no matter what channels are implemented. If the channels to be optimized are known, a version of the script can be created that only configures the channels of concern to further reduce and optimize test time.

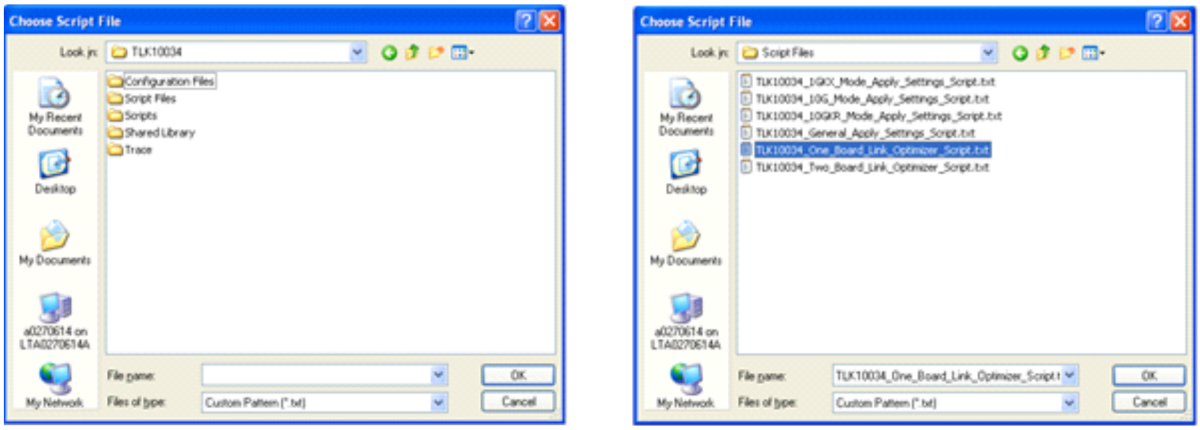


Figure 15. TLK10232 EVM GUI High-Speed Link Optimizer Setup

After loading the desired script, press the **Run Sweep** button to start the test. When this button is pressed, the GUI takes the first set of parameter values in the configuration array and changes those values in the GUI's register configuration memory. The GUI then executes the script responsible for provisioning the TLK10232 device, reading the error counters to clear them, waiting for the amount of test time entered for the BER test, and then rereading the error counters to obtain the BER count. Next the GUI stores the BER values into memory and processes the results. In the *Sweep Test Results* tab, there is an individual square pixel generated for each parameter combination in a matrix-of-matrix's configuration (Figure 16). The square is colored green if there are zero bit errors, yellow if there are bit errors but the maximum value of the error counter was not exceeded, and red if the maximum error count was achieved in the counter. Clicking on a square displays the parameter information for that test as well as the number of bit errors.

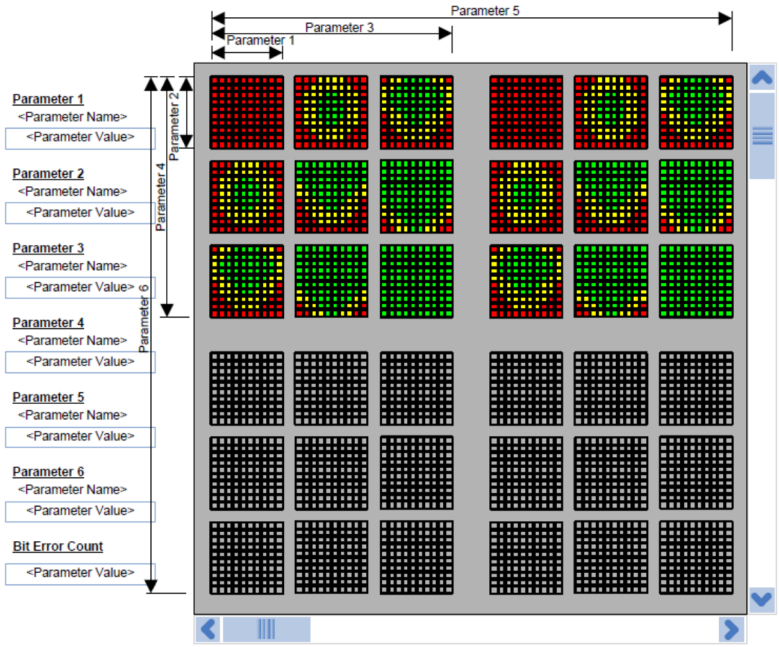


Figure 16. TLK10232 EVM GUI High-Speed Link Optimizer Sweep Results Matrix

The sweep can be aborted at any time by pressing the **Abort Sweep** button. This does not discard any test data already collected, but stops the remaining portion of the test configurations from running.

At the completion of the test, the test results can be written to a data file for further analysis or archiving. Pressing the **Create Report** button writes the data to a .csv file. Additional parameters that were not swept as part of the test can be included in the report by entering those values in the top right corner of the *Link Optimizer* window (Figure 17). This information is for manual entry only and not linked to the memory array.

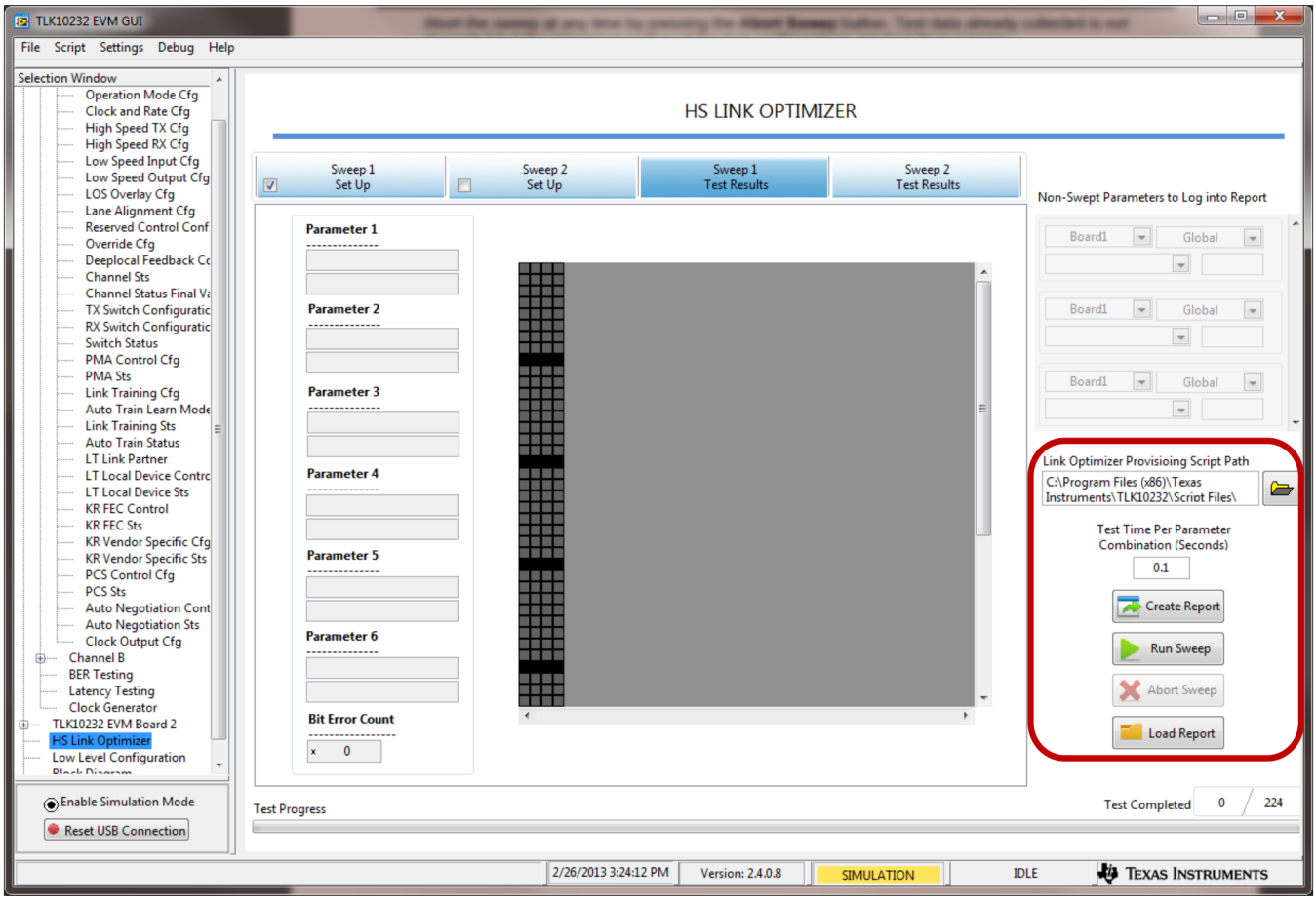


Figure 17. TLK10232 EVM GUI High-Speed Link Optimizer Test Control Buttons

8 Python Scripting

Advanced operation and control of the TLK10232 device can be performed by using the linked Python Scripting Editor. Register read/writes can be logged into a script while registers are read and written either manually through the low level, or through other areas of the GUI where registers are read or written. These scripts can be modified, written by the user, or enhanced with loops, file I/O and command-prompt entry if the advanced register control not found in the GUI is needed. All aspects of the Python programming language supported in Version 2.7 can be implemented to the Python scripts. Specifics aspects of the Python programming language are not discussed in this document.

To open a Python Script Editor to record a macro script, click the *Script* menu option and select the *Launch Window* option (Figure 18).

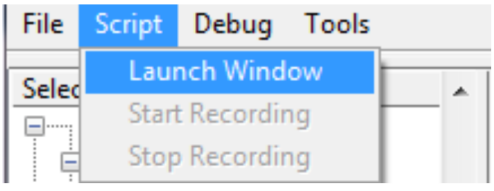


Figure 18. TLK10232 EVM GUI Launching Python Scripting Editor

A blank Python editor window opens (Figure 19).

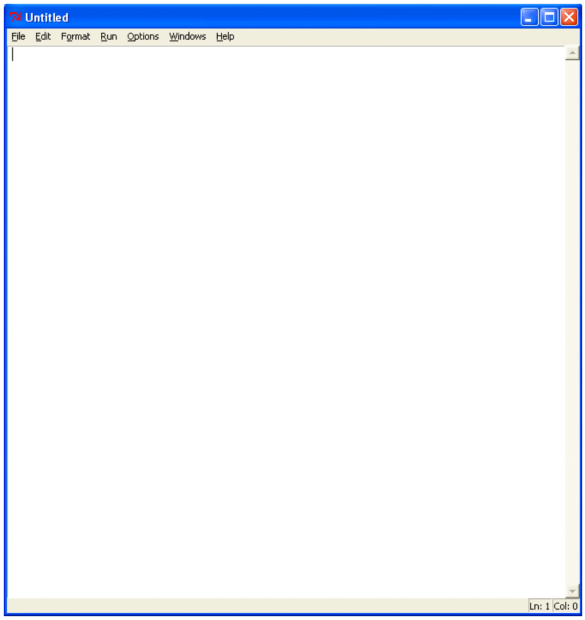


Figure 19. TLK10232 EVM GUI Blank Python Scripting Editor

On the TLK10232 GUI, click the *Script* menu option again and select *Start Recording*. The header information will be added to the Python Editor window and the color of the window starts to blink between white and green to indicate that it is in a recording mode (Figure 20). All register read and write transactions from this point forward are logged in the Python Editor window.

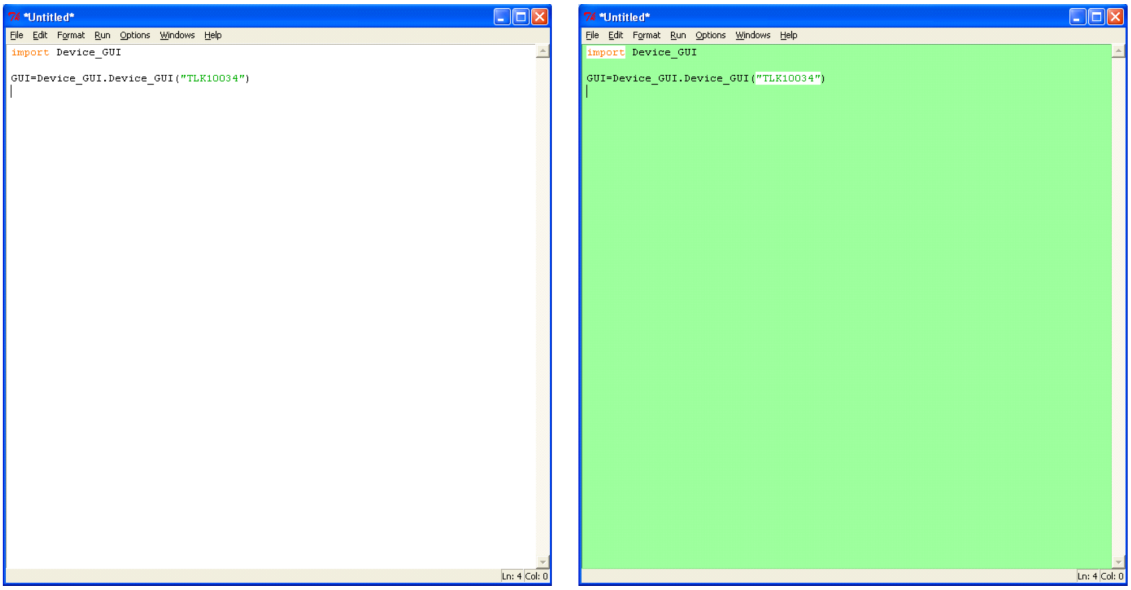


Figure 20. TLK10232 EVM GUI Python Scripting Editor in Record Mode (Toggles Color)

To stop a recording click the *Script* menu option and select *Stop Recording* to stop the recording feature and close out the script. Restart the recording at any time and additional read/write transactions are added to the same script.

The script can be rerun as-is by saving the python script with the .py extension and selecting *Run Module* from the *Run* Menu in the Python Editor. The output of the script run is open in the shell window. It displays *Script completed successfully* indicating that the execution is complete. The user can add variables to assign and display read values, or write values directly from the script, or add looping structures, by saving those settings and rerunning the module.

It is recommended that advanced users create small python scripts of commonly used tasks to create a library of macros to enhance their evaluation of the TLK10232 device and reduce their test time.

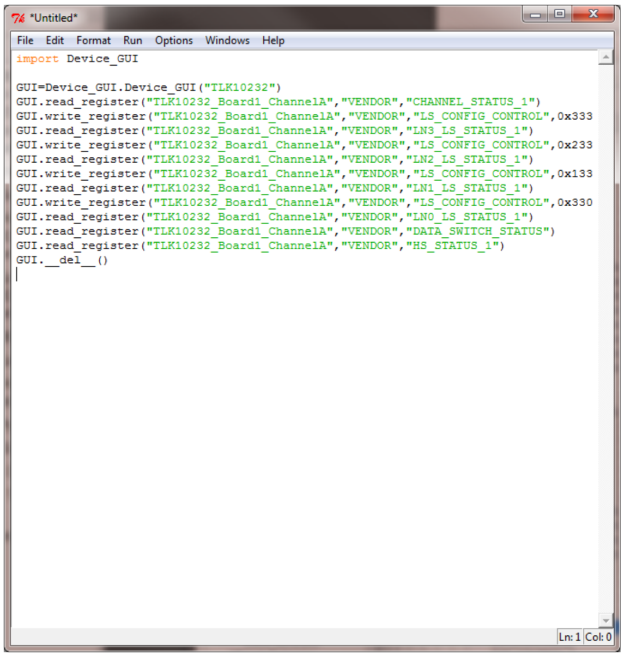


Figure 21. TLK10232 EVM GUI Recorded Script in Python Scripting Editor

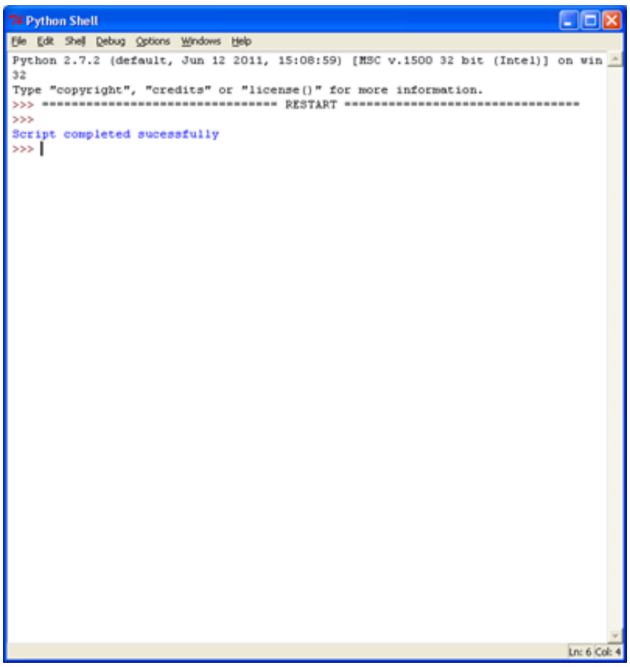


Figure 22. TLK10232 EVM GUI Python Shell

9 GUI Status

Check the status of the GUI by double-clicking the status bar at any time. A *Status Log* window opens showing recent operations performed on the GUI. This window is useful for testing or debug.

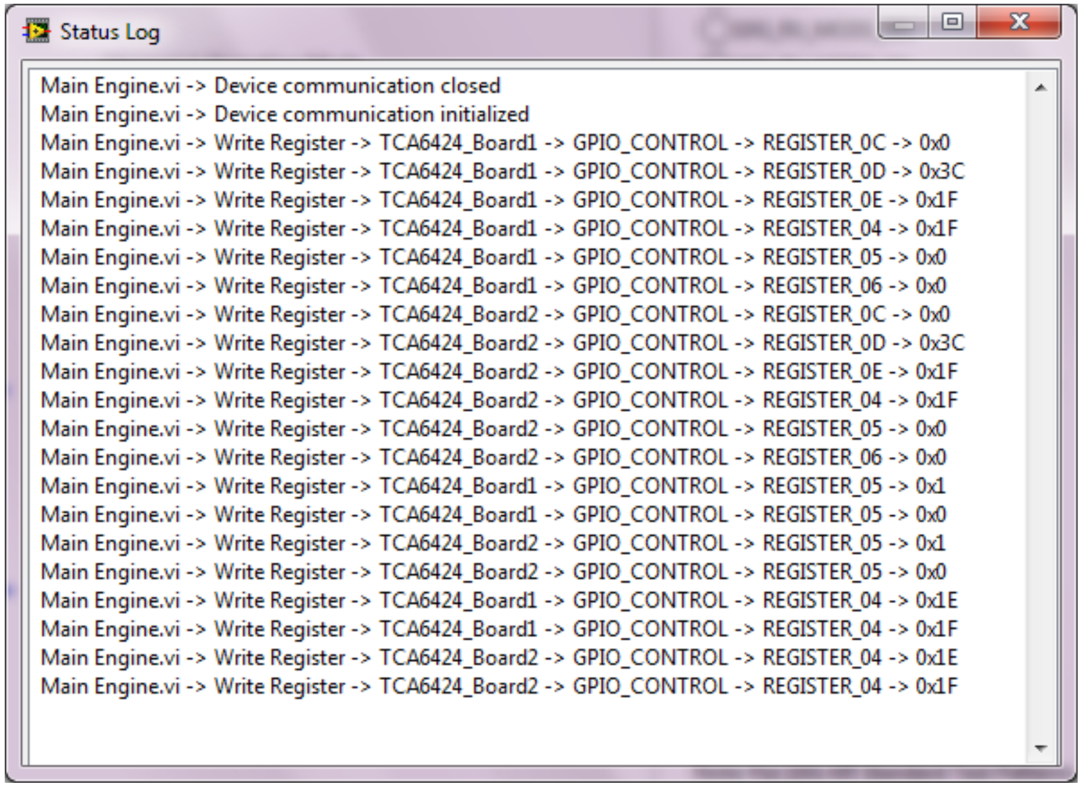
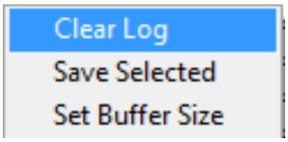


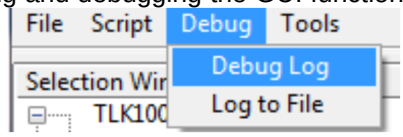
Figure 23. TLK10232 EVM GUI Status Log Window

This window has menu options for clearing the status log, saving the status log to a file, or setting the buffer limit which holds recent actions and operations done on the GUI. Use this option by right-clicking the window.



10 Debug Options

There are a few debug options available that will help in testing and debugging the GUI functionality. These options are available through menu options in the GUI.

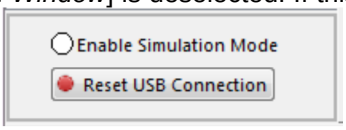


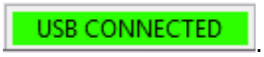
Debug Log: On selecting this option, the *Status Log* window will log all the necessary operations that are needed for testing or debugging the device. It will list all the functionalities and actions done while performing a specific operation. Deselecting this option will log only the general operation done by GUI.

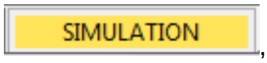
Log to File: On selecting this option, the GUI starts logging the operations into a file. (It logs all the data that is recorded in the *Status Log* window). The maximum file size is 10kB. If the file size reaches the maximum, a new file is created. These files can be found inside the *Trace* folder under the *Application* folder.

11 Troubleshooting

1. Pressing *Control + h* opens a help window. Hover the mouse over the target control and find the description on the help window.
2. If the GUI doesn't properly read or write a register,

   (a) Check if the *Enable Simulation Mode* [below *Selection Window*] is deselected. If this control is enabled, the GUI will be running on simulation values. 

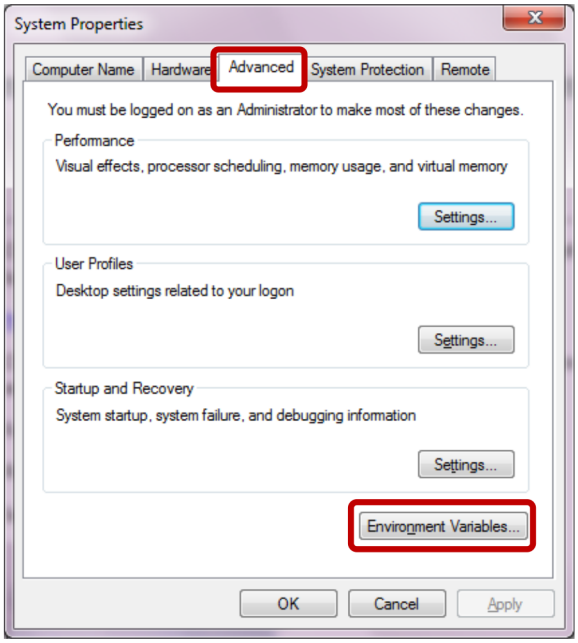
   (b) Check if the GUI status shows 

. If it shows 

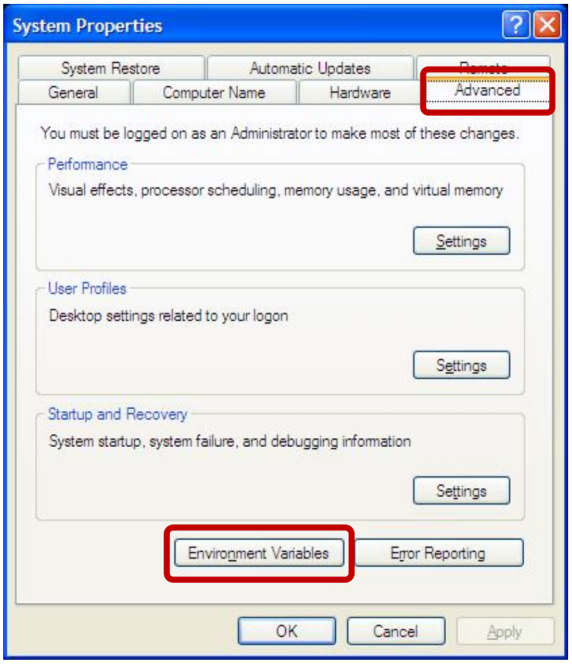
, follow the above procedure. If it shows 

, plug-in the USB device properly and press *Reset USB Connection* or restart the GUI.
3. Error with Python Scripting. If the Python window is not launched on pressing menu option *Launch Window*:
   - Check if Python 2.7 is installed on working PC. If not, download python 2.7 from the following location and install it.
     http://www.python.org/download/releases/2.7/
   - Check if Python is added to environment variable. If not, follow the procedure below to add Python to the environment variable
     – Right-click *My Computer* and select *Properties*.
     – For the Windows® 7 Operating System, select *Advanced system settings* from the options available.

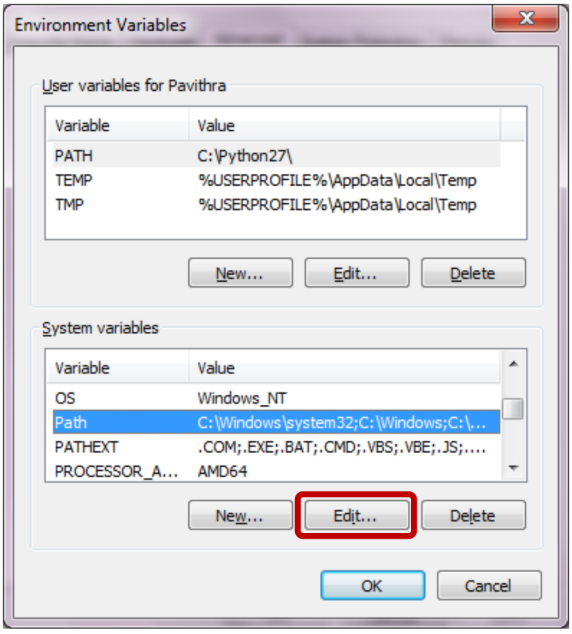
This opens a window as shown below. Press *Environment Variables*.



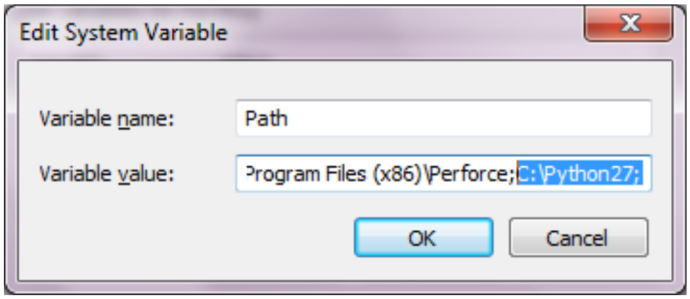
For the Windows XP Operating System, select the *Advanced* tab and press *Environment Variables*.



- Select *Path* from *System variables* and press the **Edit…** button.



- Add 'C:\Python27;' at the end of *Variable value* and Press the **OK** button



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User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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