

USER GUIDE

LabVIEW™ VI Analyzer Toolkit

The LabVIEW VI Analyzer Toolkit allows you to interactively and programmatically test VIs to find areas for improvement. The toolkit contains tests that address a wide range of performance and style issues.

The toolkit organizes the tests into the following main categories:

- **Block Diagram**—Checks block diagram performance and style issues, such as wiring, loop and structure usage, coercion dots, and unnecessary elements on the block diagram.
- **Complexity Metrics**—Checks for VI complexity, such as nesting, code reuse, and modularity.
- **Documentation**—Checks for documentation within a VI for developers and users, such as VI and control descriptions and block diagram comments, and checks the spelling on VIs, front panels, and block diagrams.
- **Front Panel**—Checks front panel design and user interface issues, such as control usage, font selection, and labels.
- **General**—Checks performance and style issues that do not fit into the other categories, such as file properties, icons and connector panes, and VI properties.
- **VI Metrics**—Checks block diagram and front panel metrics, such as the number of connector pane inputs and outputs, controls and indicators, and nodes.
- **Real-Time Module**—Checks best programming practices for real-time applications. These tests are available only if you install and activate the LabVIEW Real-Time Module.
- **User-Specified**—Checks aspects using tests that you design and customize.

This user guide provides a step-by-step introduction to the process of creating, configuring, and running a simple VI Analyzer task and using the VI Analyzer to interpret the results. The user guide also shows you how to export test results, save task configuration settings so you can run and re-run tasks quickly, and create tools for analyzing VIs programmatically.

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About the VI Analyzer Toolkit

You can use the VI Analyzer Toolkit to create and configure VI Analyzer tasks, which provide the settings for the VI Analyzer to run tests that evaluate style and efficiency of VIs.

NI recommends you adhere to the style guidelines the tests promote to achieve maximum performance and reliability. However, you can customize the test criteria to analyze whether VIs comply with standards specific to your needs.

The VI Analyzer Toolkit runs tests on standard VIs, polymorphic VIs, separate components of Express VIs (source VIs and configuration dialog box VIs), VI templates, global variables, and custom controls. You can run tests on all VIs in a specific folder, LLB, project, or on a single VI. You cannot run tests directly on LabVIEW project files or project libraries, but you can run tests on any VIs that are part of a project library or within the project file.

The VIs on which you perform tests do not have to be saved in the latest version of LabVIEW. You can perform tests on any VIs that you can open in the latest version of LabVIEW.

You can specify which tests you want to run on specific VIs. Not all VI Analyzer tests are relevant to every VI you include in a VI Analyzer task. For example, you might not run front panel tests related to fonts on subVIs where users do not see the front panels.

You can save the settings you configure for a VI Analyzer task in a configuration file, which you can apply to subsequent VI Analyzer tasks. The configuration file serves as a template for testing VIs on a regular basis to meet specific criteria.

The VI Analyzer Toolkit provides two options for creating, configuring, and running VI Analyzer tasks. You can use the VI Analyzer by selecting **Tools»VI Analyzer»Analyze VIs** to interactively select the settings you want for a particular analysis. You also can use the VI Analyzer VIs that the toolkit installs on the **Functions** palette, which allow you to write programs to perform VI Analyzer tasks programmatically.

After the VI Analyzer runs a task, you can use the **VI Analyzer Results Window** to highlight objects that caused test failures in specific VIs. You can export the results into an ASCII- or HTML-formatted report that contains all pertinent information about the analysis, including tests that fail and errors that occur during the analysis.

Using the VI Analyzer

The VI Analyzer is a set of dialog boxes you use to create and configure a VI Analyzer task.

Creating and Configuring a VI Analyzer Task

Complete the following steps to examine VIs using the VI Analyzer.

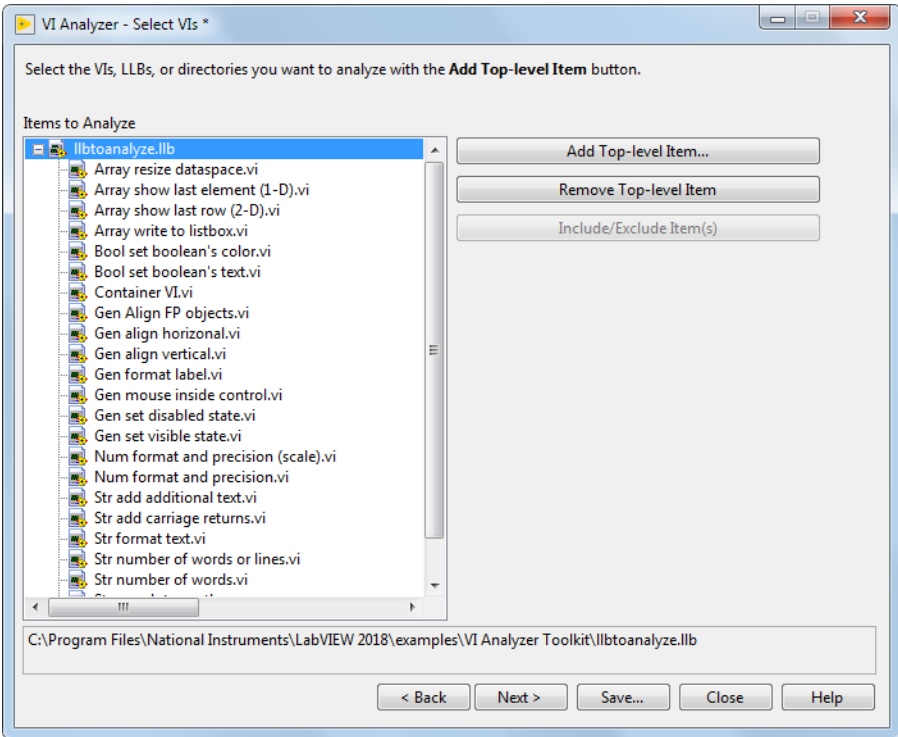
1. From the **Tools** menu, select **VI Analyzer»Analyze VIs**.
2. In the **Select Task** dialog box, select **Start a new VI Analyzer task** and click **Next**.
3. In the **Select VIs** dialog box, click **Add Top-level Item**. Navigate to and select `labview\examples\VI Analyzer Toolkit\llbtoanalyze.llb`.



Tip To select an LLB from a file dialog box, double-click the LLB filename to open it. In the LLB file dialog box, double-click the VI folder icon with a single dot next to it.

After you select the LLB, it appears in the **Items to Analyze** hierarchy.

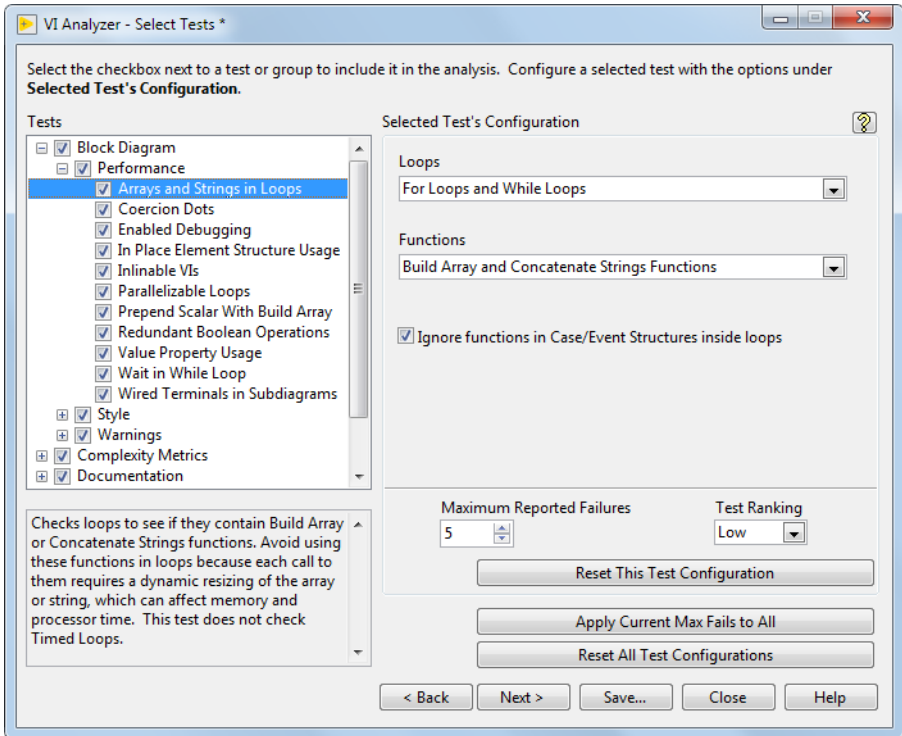
4. Expand the folder in the **Items to Analyze** hierarchy to display a list of all VIs, as shown in the following dialog box.



Notice the **Include/Exclude Item(s)** button, which you can use to select or remove the exact VIs you want in or removed from a VI Analyzer task. Select a VI in the **Items to Analyze** hierarchy to make the button active. Refer to the *Customizing Tests within VI Analyzer Tasks* section for more information about including and excluding VIs from VI Analyzer tasks.

5. Click **Next**. The **Select Tests** dialog box appears.

The **Select Tests** dialog box allows you to select the tests you want to run. The VI Analyzer groups tests by category. For certain tests, you can configure settings to define specific criteria for passing or failing the test. You can expand items in the **Tests** hierarchy to see all available VI Analyzer tests, as shown in the following dialog box.



Tip By default, the VI Analyzer selects all tests in the **Tests** hierarchy to run in a VI Analyzer task. You can right-click in the **Tests** hierarchy and choose **Deselect all tests** or **Select all tests** to deselect or select all tests.

For this exercise, do not change the test selections in the **Tests** hierarchy.

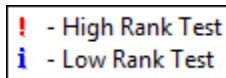
- Click **Next**. The **Exclude Tests from VIs** dialog box appears. The **Exclude Tests from VIs** dialog box allows you to exclude specific tests for specific VIs. Refer to the [Customizing Tests within VI Analyzer Tasks](#) section for more information about including and excluding tests from VI Analyzer tasks.
- Click **Save**. In the file dialog box, select the location where you want to save the configuration file. Name the file `test1.viancfg`.
After you save a configuration file, you can load it into the VI Analyzer to perform the same VI Analyzer task at a later time. Refer to the [Loading VI Analyzer Configuration Files](#) section for more information about using configuration files.
- Click **Analyze**. The **Analyzing VIs** dialog box displays the progress of the VI Analyzer task.

Viewing VI Analyzer Results

The **VI Analyzer Results Window**, which appears after the analysis is complete, displays results in three tabbed pages. The window allows you to view and organize results from the VI Analyzer task.

Complete the following steps to view VI Analyzer results.

- On the **Test Results** page, click **Sort by Test** to view the results by test. The **Results List** hierarchy displays the high-ranking tests first and the low-ranking tests last. The **VI Analyzer Results Window** includes a legend for the test ranking icons, shown in the following figure.



High-ranking tests involve issues that have a significant impact on VI performance or may cause unintended bugs in VI execution. Low-ranking tests involve minor style or cosmetic issues that do not significantly affect VI performance. Tests that do not have a ranking icon next to them fall into a middle-ranking area. The default ranking for each test matches NI recommendations for style and performance issues.

- Expand the **Duplicate Control Labels** item to view a list of VIs that failed the test.



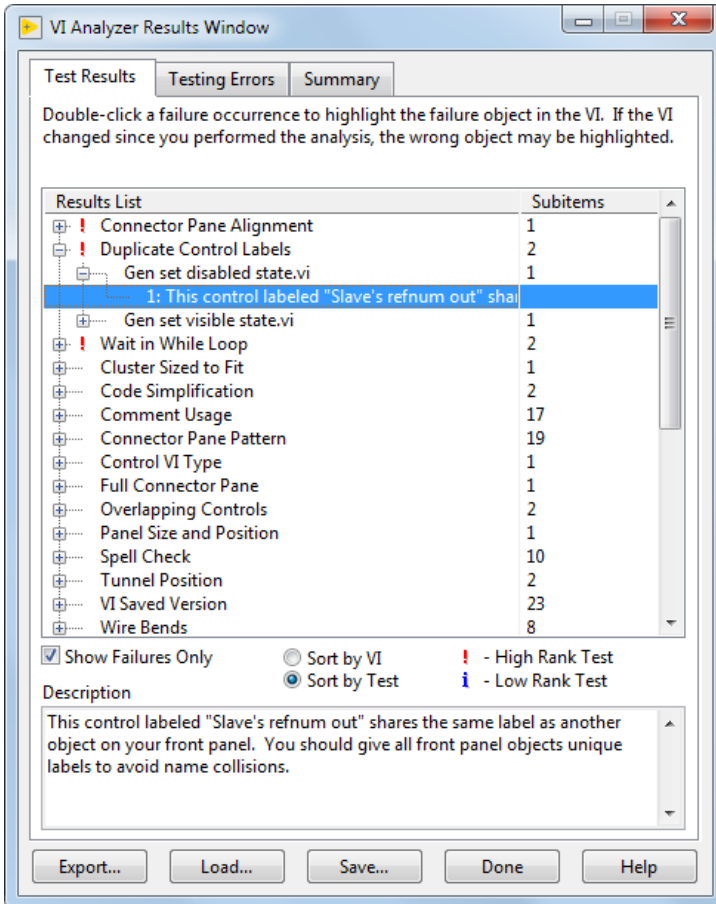
Tip By default, the **Test Results** page lists only the failed tests. Remove the checkmark from the **Show Failures Only** checkbox to view details for all tests in the VI Analyzer task.

- Expand the **Gen set disabled state.vi** item to view a list of test failure occurrences for the VI.



Tip You can see the number of tests that failed in each category in the **Subitems** column of the **Results Window** without expanding the failed VI or failed test node.

- Click the item below the VI name. An info tip for the item and the **Description** text box describe why the VI failed the test, as shown in the following example



The VI failed the test because multiple controls on the front panel have the same label.

- Double-click the item. The front panel of the Gen set disabled state VI opens and the VI Analyzer highlights one of the controls that contains a duplicate label. You can correct the label so the VI passes the test the next time you run the VI Analyzer task.

6. Close the Gen set disabled state VI.
7. Click the **Testing Errors** tab of the **VI Analyzer Results Window**. If errors occur during the analysis, the **Testing Errors** page displays a list of VIs and tests that did not load, tests that did not run, and tests in which errors occurred.
For this exercise, the **Testing Errors** tab does not list any tests because no errors occurred.
8. Click the **Summary** tab of the **VI Analyzer Results Window**. The **Summary** page displays several types of summary results from the analysis, such as the number of tests that ran, the number that passed/failed, and the time it took to complete the VI Analyzer task.

Exporting VI Analyzer Results

From the **VI Analyzer Results Window**, complete the following steps to create a file of the results in a format you can open and manipulate in other applications.

1. Click **Export**. The **Export VI Analyzer Results** dialog box appears.
2. Enter the path and filename for the results file in the **Export File Path** control. The default is a filename consisting of the current date and time.
3. From the **Export Type** list, select the file format you want. You can export the results as a tab-delimited ASCII file, which is useful with spreadsheet applications, or as an HTML file, which is useful for viewing in Web browsers.
4. From the **Sort by** list, select whether you want the results in the file sorted by VI name or by test name.
5. In the **Export Options** section, place checkmarks in the checkboxes next to the results you want to include in the exported file.
6. Click **Export** to generate the file.
7. In the **VI Analyzer Results Window**, click **Done** to close the window.
8. Click **Yes** to save the results in a VI Analyzer results file (.rs1) that you can view later in the **VI Analyzer Results Window**. A file dialog box appears. Select the path and filename you want for the results file.



Note You also can click **Save** in the **VI Analyzer Results Window** to create results files. To view previously saved results files in the **VI Analyzer Results Window**, select **Tools»VI Analyzer»Show Results Window**. If the **VI Analyzer Results Window** is already open, click **Load**. You can view only VI Analyzer results files in the **VI Analyzer Results Window**.

9. Click **No** to close the VI Analyzer.

Loading VI Analyzer Configuration Files

You can create and edit VI Analyzer configuration files that contain the settings you selected for a VI Analyzer task.

Complete the following steps to load a configuration file into the VI Analyzer.

1. Open the VI Analyzer. In the **Select Task** dialog box, select the **Load a previously saved analysis configuration file** option and click **Next**.
2. From the file dialog, select the `test1.viancfg` file you created previously.
3. In the **Select VIs** dialog box, notice that the settings for VIs and folders in the **Items to Analyze** hierarchy are the ones you selected previously.
4. Select the Container VI in the **Items to Analyze** hierarchy and click the **Include/Exclude Item(s)** button. The **X** next to the VI indicates that the VI Analyzer task does not include the VI.
5. Click **Next**. The **Select Tests** dialog box appears. In the next section, you will use the **Select Tests** dialog box to customize tests in the VI Analyzer task.



Tip The VI Analyzer Toolkit includes several example configuration files you can use as models when creating configuration files. The example files are located in the `labview\examples\VI Analyzer Toolkit` directory.

Customizing Tests within VI Analyzer Tasks

Many of the tests included with the VI Analyzer allow you to set certain criteria for passing or failing the tests.

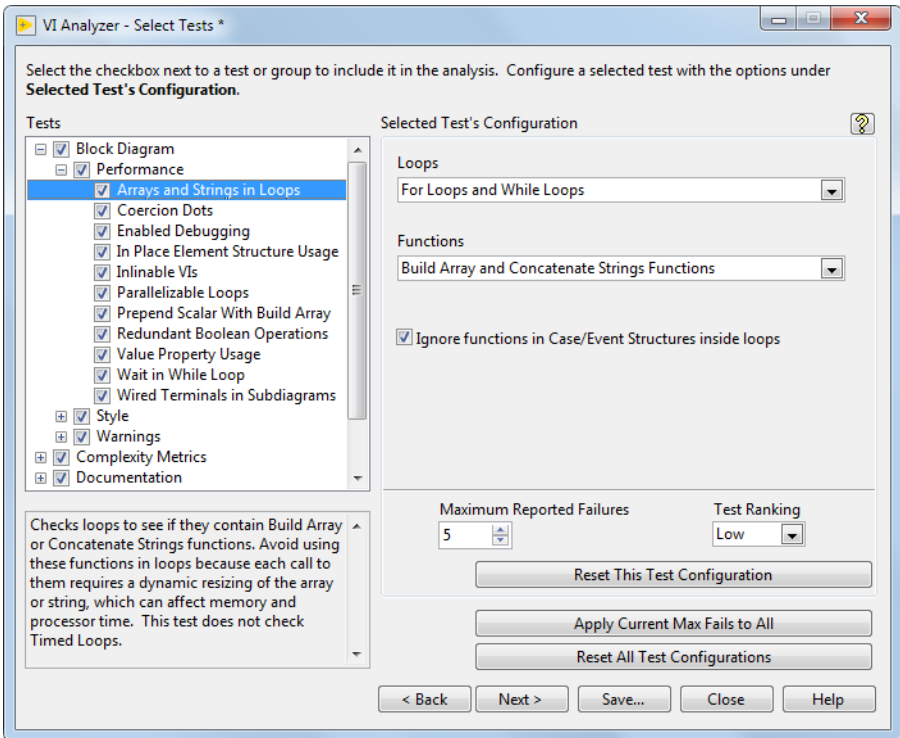


Tip You can set test criteria the way you want, then save the configuration file without specifying VIs in the **Select VIs** dialog box. You can use this configuration file to run the same set of tests on different groups of VIs.

Complete the following steps to configure the test criteria for a VI Analyzer task.

1. From the **Select Tests** dialog box, expand the **Block Diagram** category in the **Tests** hierarchy. Expand the **Performance** category to display the specific tests for the category.

- Click the **Arrays and Strings in Loops** test. The configuration options for the test appear in the **Selected Test's Configuration** frame on the right, as shown in the following dialog box.



- Select **While Loop** from the **Loops** control. The test now searches only for instances containing While Loops.
- Select **High** from the **Test Ranking** control. The test now receives a high rank and will appear at the top of the **Test Results** hierarchy in the **VI Analyzer Results Window**.
- Click **Next**. The **Exclude Tests from VIs** dialog box appears.
The **Exclude Tests from VIs** dialog box allows you to skip specific tests for specific VIs. In some cases, a test might not be necessary for a certain type of VI.
- Select the Gen align horizontal VI and remove the checkmark from the checkbox next to the **Icon Size and Border** test located in the **General>Icon and Connector Pane** category. Select the Gen align vertical VI and remove the same test.



Tip Press the <Ctrl> key and click the VI names to select multiple VIs at once if you want to exclude the same tests for more than one VI.

The Gen align horizontal VI and the Gen align vertical VI are internal subVIs that users do not see, so the icon specifications are not important. Therefore, running the **Icon Size and Border** test on the VIs is not necessary.

7. Click **Save**. Save the file as `test2.viancfg`.
8. Click **Analyze** to run an analysis with the new settings.
9. In the **VI Analyzer Results Window**, review the results of the analysis.

Ignoring Test Failures

By default, the VI Analyzer returns the failures for the VIs and tests you specify in a VI Analyzer task. However, you may want to ignore failures you consider acceptable. When you ignore one or more tests for a particular object or a VI, the VI Analyzer will not return a failure for that object or VI for the specific test(s).



Note You cannot ignore failures for front panel objects or for VIs that do not have block diagrams, such as control VIs and global VIs.

Complete the following steps to ignore specific tests for a VI and object on the block diagram.

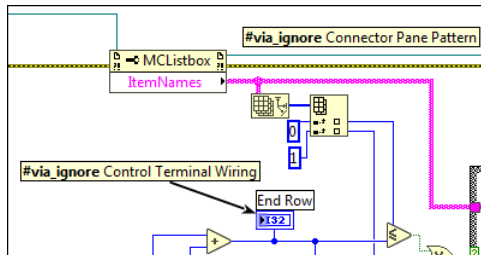
1. Navigate to and select `labview\examples\VI Analyzer Toolkit\11btoanalyze.11b`.
2. Open the Array write to listbox VI and switch to the block diagram.
3. Create a free label anywhere on the block diagram and enter `#via_ignore Connector Pane Pattern`. The VI Analyzer ignores results from the VI Analyzer test name you specify in the free label that also contains the `#via_ignore` bookmark.



Tip You can specify multiple test names in the free label to ignore multiple tests.

4. Create another free label on the block diagram and enter `#via_ignore Control Terminal Wiring`. Attach this free label to the **End Row** indicator. The Control Terminal Wiring test will not return a failure for the **End Row** indicator.

The following block diagram shows the `#via_ignore` bookmarks that will ignore failures in the Array write to listbox VI.



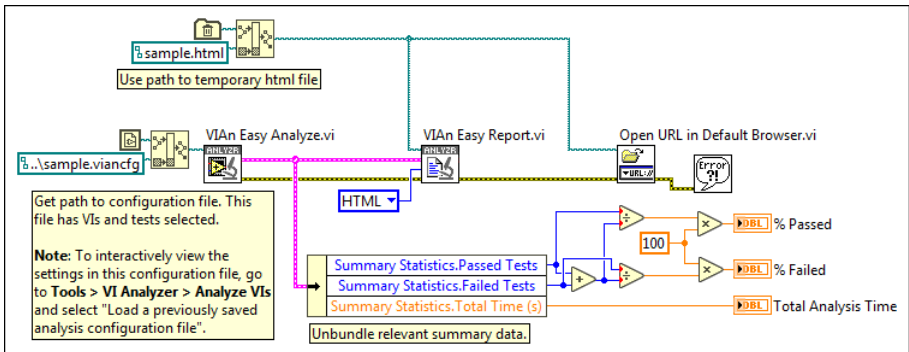
5. Save the Array write to listbox VI.
6. In the VI Analyzer, load the `test1.vi.ncfg` file you created previously and analyze the VI Analyzer task.
7. In the **VI Analyzer Results Window**, review the results of the analysis.

Using the VI Analyzer VIs

The **VI Analyzer** palette, located on the **Programming** palette when you install the LabVIEW VI Analyzer Toolkit, contains VIs that you can use to programmatically create or run VI Analyzer tasks. The programmatic option provides flexibility when you need to check programs frequently or regularly. VI Analyzer VI names begin with **VIAn** to identify them as part of the VI Analyzer Toolkit. Refer to the *LabVIEW Help* for more information about specific VI Analyzer VIs.

Use the NI Example Finder to open the Easy VI Analysis VI. Select **Help»Find Examples** and select the **Directory Structure** view. Open the **VI Analyzer Toolkit** folder to find the Easy VI Analysis VI. This example VI runs a VI Analyzer task and generates an HTML-based report with the results. You can use the Easy VI Analysis VI as a model when you create VIs using the VI Analyzer VIs.

Open the block diagram. Notice that the example VI includes subVIs such as the VIAn Easy Analyze VI and the VIAn Easy Report VI, as shown in the following block diagram.



Run the Easy VI Analysis VI. After the example VI runs, front panel indicators display the percentage of tests passed and failed and the total analysis time. A Web browser opens to display the HTML-based report. Compare the report to the one you created in the [Exporting VI Analyzer Results](#) section.

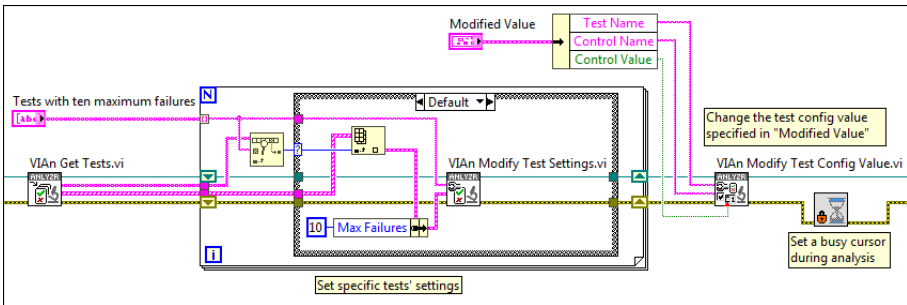
Automating VI Analyzer Tasks

You can use the VI Analyzer VIs to create a program that dynamically creates and modifies a VI Analyzer task.

Use the NI Example Finder to open the Advanced VI Analysis VI. Select **Help»Find Examples** and select the **Directory Structure** view. Open the **VI Analyzer Toolkit** folder to find the Advanced VI Analysis VI. This example VI allows you to exclude specific VIs and specific tests from a VI Analyzer task. You can use the Advanced VI Analysis VI as a model when you create VIs for detailed VI Analyzer tasks.

Open the block diagram. SubVIs in the example VI include a number of VI Analyzer VIs you can use to perform a VI Analyzer task, generate an HTML report, and provide a list of the VIs analyzed and tests run in the VI Analyzer task.

The following block diagram shows some of the VI Analyzer VIs on the Advanced VI Analysis VI block diagram. The block diagram is very wide and includes VIs and objects not visible in the following illustration. The VIAn Modify Test Settings VI excludes certain tests from the analysis. The VIAn Modify Test Config Value VI deselects the **Control Descriptions** option in the **VI Documentation** test. You can use the front panel controls to change the criteria that these VIs set.



Run the Advanced VI Analysis VI. After the example VI runs, front panel indicators display lists of the VIs and tests that the VI Analyzer task included. A Web browser opens to display the HTML-based report.

Where to Go from Here

The *LabVIEW Help* includes procedures for using the VI Analyzer Toolkit as well as VI reference help and information on VI style guidelines. Access the *LabVIEW Help* by selecting **Help»LabVIEW Help**.

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