ValiFrame Test Automation Software Platform

N5991, N5992, AE2010R, AE6910R, AE6920R

KEYSIGHT

GETTING STARTED GUIDE

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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1 Introduction

Overview

This ValiFrame Getting Started Guide provides information for an initial setup of the ValiFrame Test Automation Software Platform.

This guide focuses on how to start the ValiFrame software, run the procedures with the desired hardware configurations, and obtain results. It concentrates on things that are common to ValiFrame software for nearly all the standards.

NOTE

The Test Automation Software Platform “ValiFrame” is a solution for testing a wide range of digital buses for compliance with various standards. It is not possible to apply all the new features described in this guide simultaneously to all standards. Instead, they will be added when a new release of the corresponding software appears. This means that in some cases not all features will be available.

Test Automation Software Platform

The Test Automation Software Platform 'ValiFrame' is an open and flexible framework for automating tests such as electrical compliance tests for digital buses. ValiFrame supports a wide range of buses, for example, PCI Express, USB, HDMI, and MIPI.

The product runs on a standard PC that controls a wide range of test hardware. Typically, the hardware comprises instruments for stimulus and response tests, such as AWGs, BERTs, and oscilloscopes.

ValiFrame is implemented in C# within the Microsoft .NET Framework.

NOTE The acronyms and abbreviations used in this Guide are defined in Appendix A: Acronyms and Abbreviations.

Document History

First Edition (September 2020)

The first edition of this user's guide describes the functionality of the ValiFrame Test Automation Software Platform based on Framework version 1.0.

Second Edition (August 2021)

The second edition of this user's guide describes the functionality of the ValiFrame Test Automation Software Platform based on Framework version 1.13.

Third Edition (August 2022)

The third edition of this user's guide describes the functionality of the ValiFrame Test Automation Software Platform based on Framework version 1.51.

Fourth Edition (February 2024)

The fourth edition of this user's guide describes the functionality of the ValiFrame Test Automation Software Platform based on Framework version 1.618.

Fifth Edition (October 2024)

The fifth edition of this user's guide describes the functionality of the ValiFrame Test Automation Software Platform based on Framework versions up to August 2024.

Sixth Edition (January 2026)

The sixth edition of this user's guide describes the functionality of the ValiFrame Test Automation Software Platform based on Framework versions up to August 2025.

2 Software Prerequisites

Certain prerequisites have to be fulfilled in order for the ValiFrame Test Automation Software to be installed.

Other Required Software

Before the ValiFrame software can be installed, the following software requirements must be met:

- Windows Operating System
- Microsoft .NET Framework
- Keysight IO Libraries Suite

The exact software versions required are listed in the changelog for the particular version of ValiFrame. The changelogs can be found on the BitifEye Download Hub.

During the installation process of the ValiFrame test automation software, the installer setup program will check for the required software (see Figure 3-6). If any is missing, a link to the specific download page will be available.

3 Installing the Software

The ValiFrame Test Automation Software runs on a standard PC, which controls the test instruments. This chapter provides details of the installation. If ValiFrame is already installed on the PC and it is not to be updated, proceed to the next chapter.

Downloading User's Guides and Data Sheets

For each standard, User's Guides, Data Sheets and, in some cases, Language Guides for the software can be downloaded from the corresponding standard page of the BitifEye website. Go to BitifEye.com > Digital Test Solutions > "Standard". Part of the page for the standard PCI Express is shown in Figure 3-1.

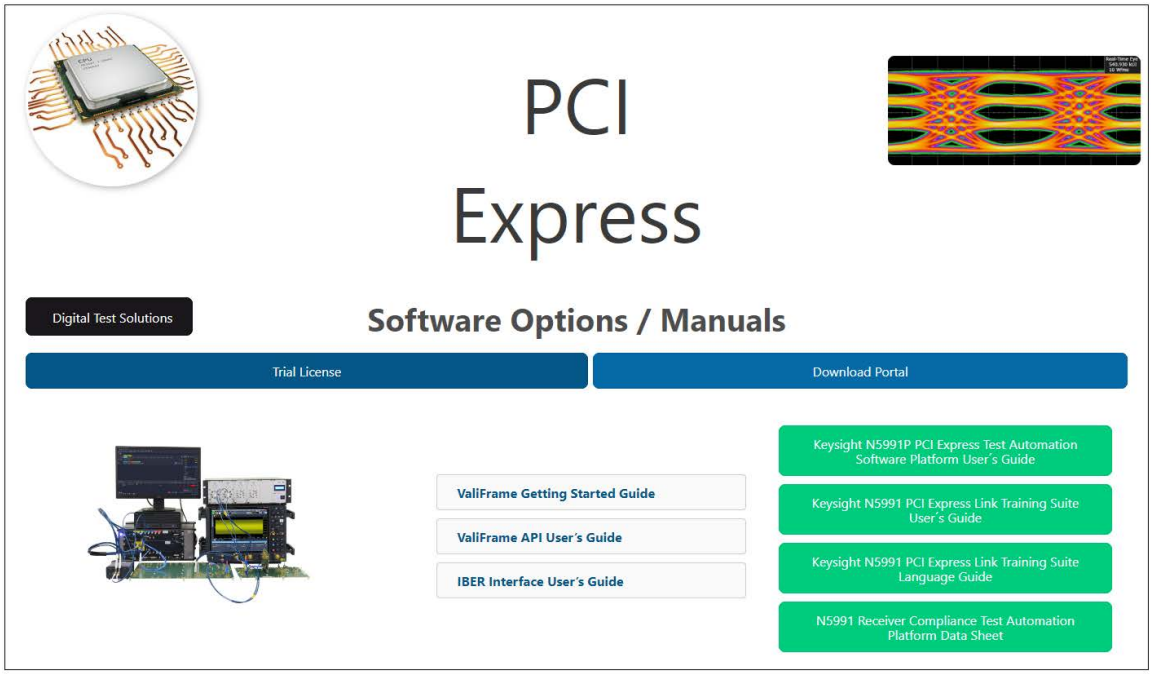

Figure 3-1 PCI Express page of the BitifEye web portal

The colored buttons on the right (green for PCI Express, Figure 3-1) link to the User's Guides, Language Guide and Data Sheet for PCI Express (in this case), which can be downloaded.

The white buttons in the center link to manuals that apply to more than one standard.

Downloading the Software

The ValiFrame SW installers can be found on the BitifEye Download Hub, which requires an account (unlike the general BitifEye website). The first time you access the Download Hub you will be asked to register. Once you have an account, when you log on you will see the start page (Figure 3-2). Click on the standard you are interested in to see the software that is available to download (Figure 3-3).

NOTE

Registration is only possible after you have confirmed your email address. If you do not see an automatic email from BitifEye requesting confirmation, please check your spam folder.

The final registration step for the BitifEye Download Hub is processed manually and only during German working hours, so please be patient.

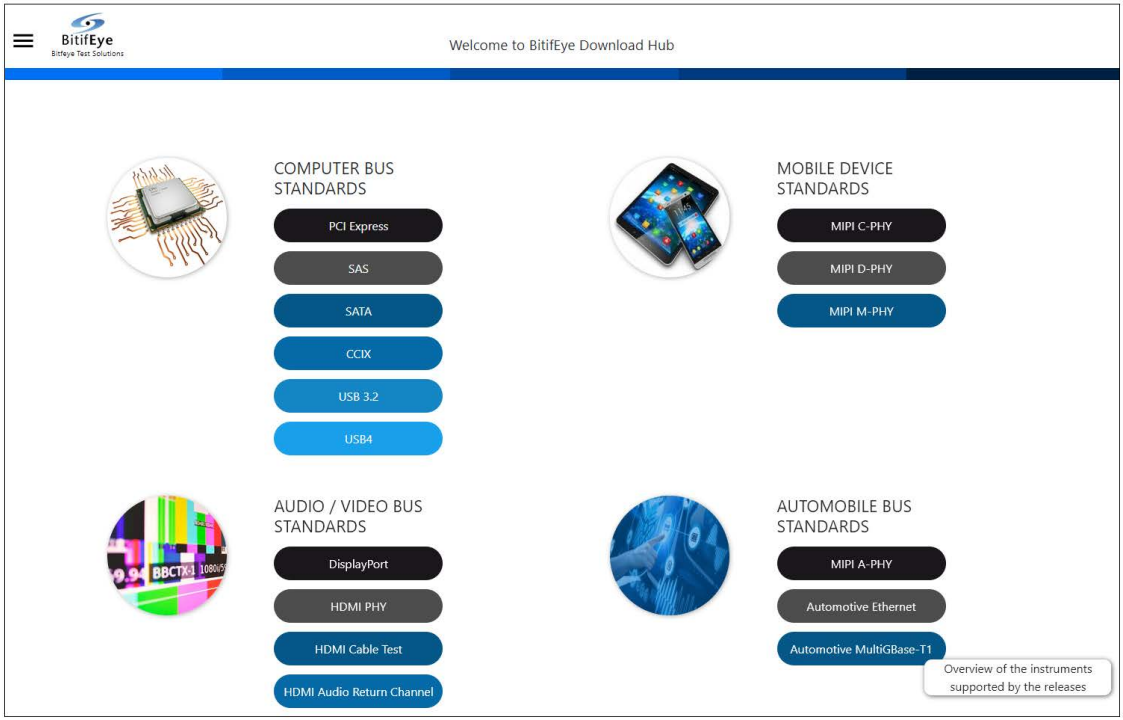

Figure 3-2 Start page of the BitifEye Download Hub

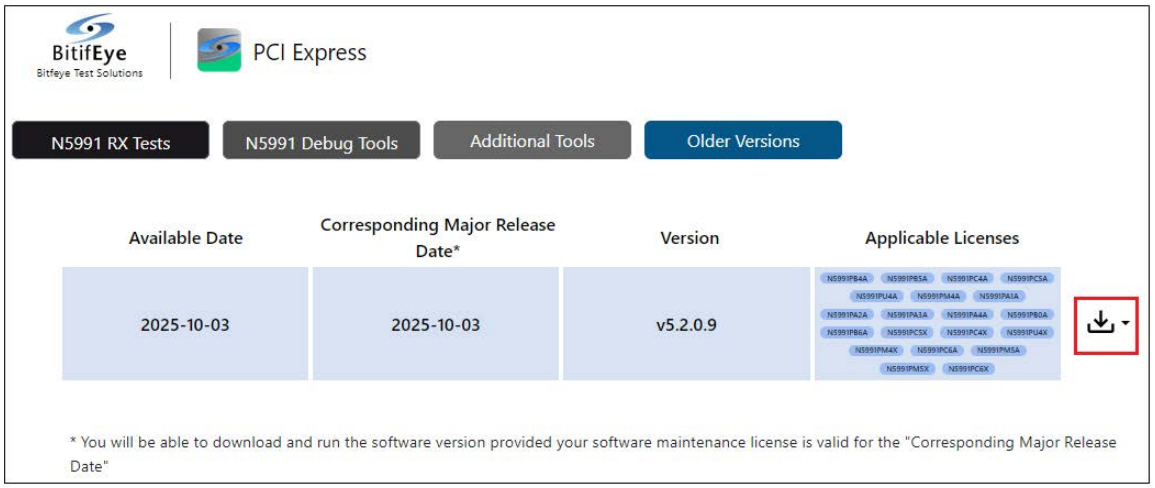

Figure 3-3 Example download page (for PCI Express Receiver Tests)

The buttons near the top act as tabs. Various types of software can be downloaded:

- XXXXX RX Tests: Here XXXXX can be N5991, N5992, AE2010R, AE6910R or AE6920R. This corresponds to the ValiFrame receiver test automation software. If both N5991 and N5992 are available for a single standard, two buttons are shown.
- XXXXX Debug Tools: For some standards, debugging tools are available, for example, the Link Training Suite for PCI Express and the Frame Generator for MIPI® standards.
- Additional Tools: For some standards, additional tools are required. For example, for PCI Express, several versions of the VFSeasim software (required for Rx testing, for different transfer rates) are required in order to be able to run the N5991 ValiFrame receiver test automation software.
- Older Versions: In some cases, it may be necessary to install an older version of software. Some older versions of installers can be found here.

Click the download icon (red frame in Figure 3-3) to download the SW installer file or the corresponding changelog.

Installing the Software

To install a product, just execute the corresponding installer and follow the steps of the Setup program.

NOTE If a ValiFrame version is already installed on the PC and you wish to update it, see Updating the Software on page 24.

As an example, the following figures (Figure 3-4 to Figure 3-7) show the installation of the PCI Express N5991 ValiFrame software.

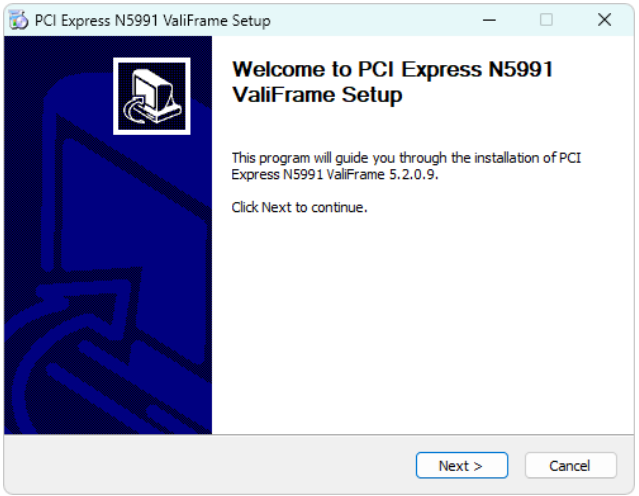

Figure 3-4 Installer 'Welcome to Setup' window

The second page of the Setup program will show the software license agreement (see Figure 3-5). Read it carefully and select **I accept the terms of the License Agreement** option. Then, click **Next** to continue.

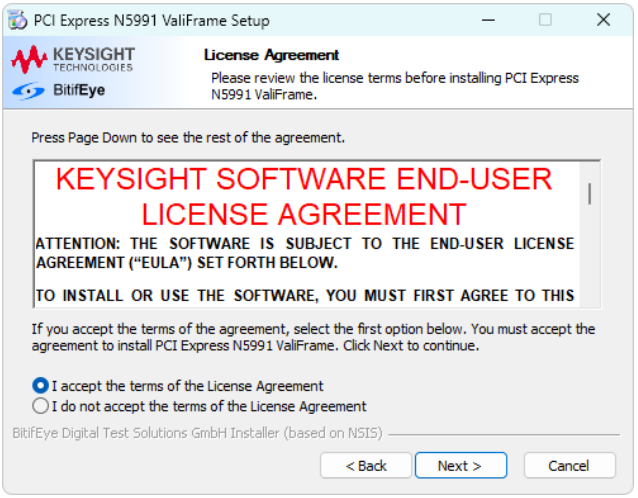

Figure 3-5 Installer 'License Agreement' window

A list of additional software required by the ValiFrame software and also the status of individual software is then shown (Figure 3-6). If any required software is not yet installed, the ValiFrame Setup Required Software window shows that the missing software needs to be installed.

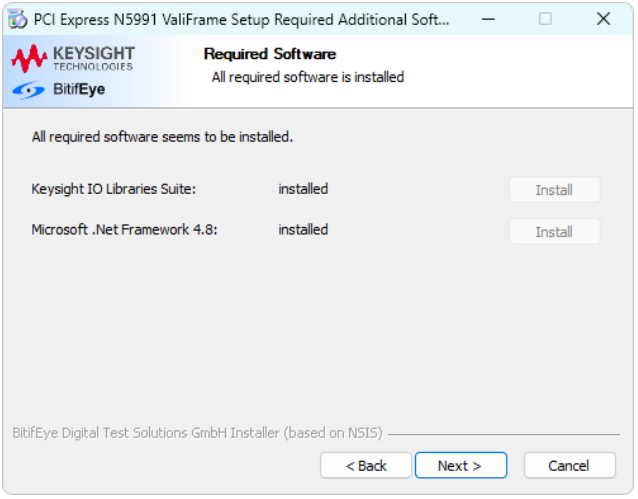

Figure 3-6 Installer 'Required Software' window

When all the required software has been installed, click **Next**.

The **Choose Install Location** window is displayed as shown in Figure 3-7. We recommend that the default destination folder is used. However, if you do not wish to install the ValiFrame software in the default destination folder, click **Browse...** to select the destination folder in which the software is to be installed. Then, click **Install** to install the software.

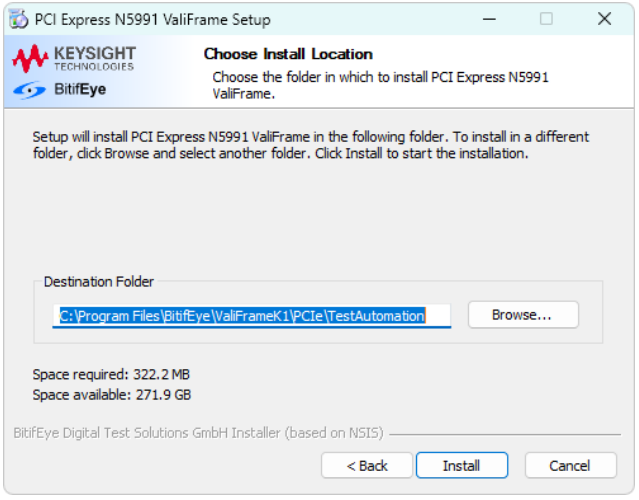

Figure 3-7 Installer 'Choose Location' window

The next panel that appears shows the status of the installation. Once the installation is completed, click **Next** to continue. In the final window you have the chance to open the changelog, if wished.

If you try to install a version of the ValiFrame Test Automation Software that has a release date after the software maintenance expiration date of one or more of the relevant licenses, a warning appears (Figure 3-8). Click 'No' to exit and update the license(s). Alternatively, click 'No' to exit and install a version of the ValiFrame software that is supported by the licenses available on the host computer. See Chapter 4: Licenses. Clicking 'Yes' is likely to lead to problems.

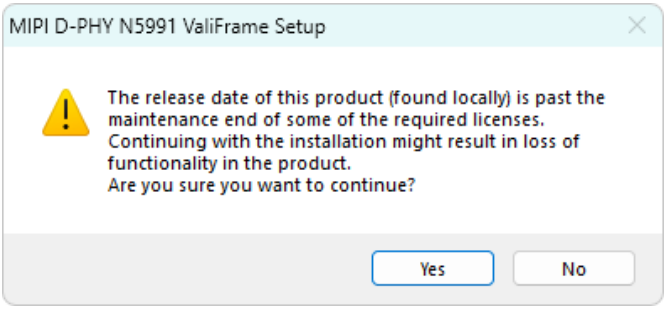

Figure 3-8 'Past end of license maintenance' warning

Once the software has been successfully installed, a shortcut icon will appear on the desktop (Figure 3-9).

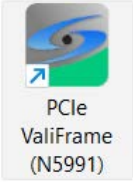

Figure 3-9 Desktop ValiFrame icon (example for PCI Express)

NOTE For older versions of ValiFrame, two desktop icons appear, one for the Station Configurator and one for ValiFrame.

Starting the Software

Double-click the ValiFrame icon on the desktop that corresponds to the standard you wish to use, e.g. PCIe ValiFrame (N5991) or USB4 ValiFrame (N5992) or A-PHY ValiFrame (AE2010R). Alternatively, in Windows 11, search for the name of the application.

If the correct license for the ValiFrame version is already activated, the software will start automatically. In that case, proceed to Chapter 5: Using the Software.

NOTE **If you are using a version of ValiFrame with a separate Configurator icon, you need to open the Configurator first (before clicking on the ValiFrame icon) if you are starting ValiFrame for the first time.**

Updating the Software

New Version Available Notification

It is possible to receive a notification that a new version of ValiFrame is available for the standard that you are using. You will see a red dot on the About button and an info message in the log (Figure 3-10).

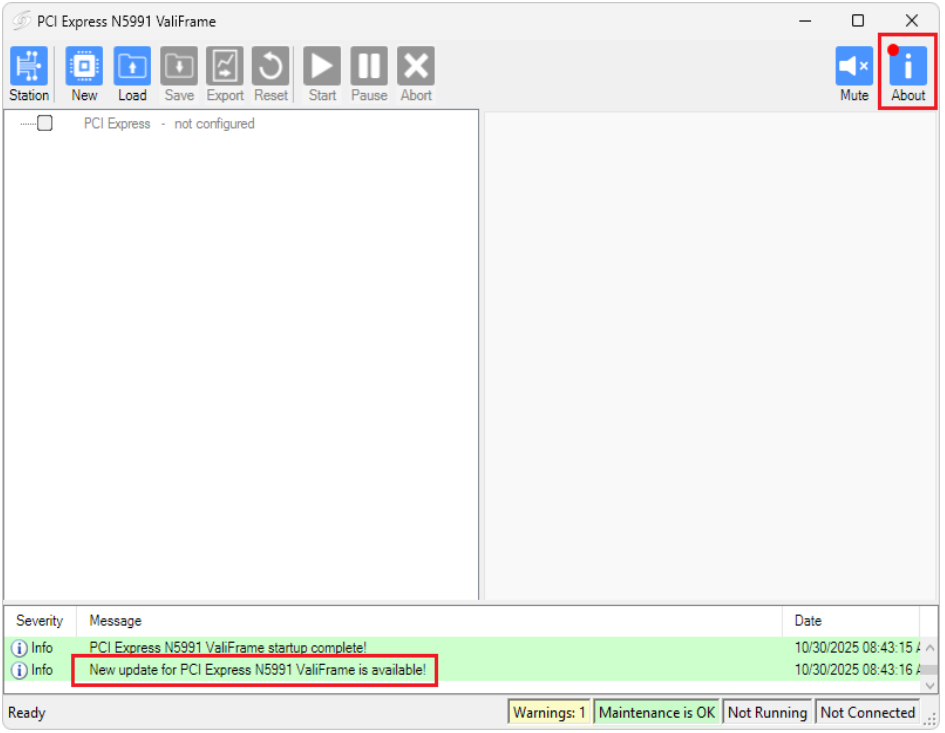

Figure 3-10 Notification of a new ValiFrame version

In order to activate this function, click **About** and make sure the box 'Check For Updates' (small red frame in Figure 3-11) is ticked. This check is performed when you launch ValiFrame. If an update is available, this is noted in an apricot-colored area, as shown in Figure 3-11.

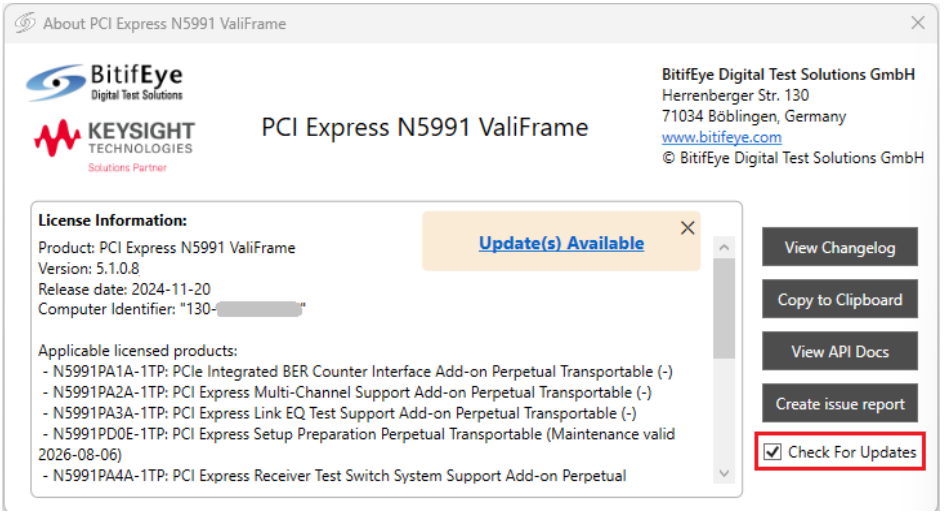

Figure 3-11 About Window when an updated ValiFrame version is available

Click 'Update(s) Available' to open the ValiFrame Updates window. At the top, license details of the currently installed version are given (Figure 3-12).

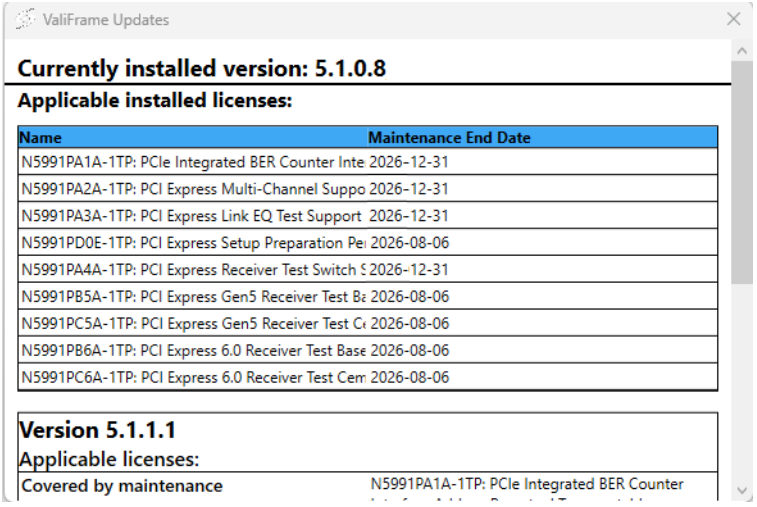

Figure 3-12 ValiFrame Updates window (top)

In the lower part of the window (Figure 3-13), the various license options that are relevant to the new version are listed in three groups:

- **Covered by maintenance**: These are the options for which there are relevant licenses on the controller PC with SW maintenance that is valid for the new version.
- **Not covered by maintenance**: These are the options for which there are relevant licenses on the controller PC but the SW maintenance is insufficient. In order to use these options in the new version, you will need to extend the SW maintenance. See Software Maintenance on page 32 for more details.
- **Not supported**: These are the options for which there are no relevant licenses on the controller PC. In order to use these, you will need to purchase a license. Contact your Keysight representative for details.

Right at the bottom of the window, there is a link to the BitifEye Download Hub, where you can download the SW update if you wish.

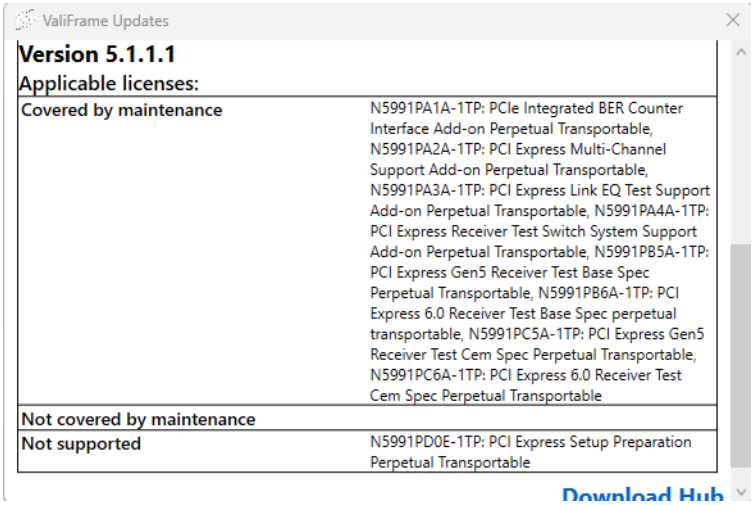

Figure 3-13 ValiFrame Updates window (bottom)

Installing a New Version

To keep your software settings when upgrading to a new version of ValiFrame for a particular standard, see ValiFrame Data Structure on page 73.

Then download the software (see Downloading the Software on page 17) and install it (see Installing the Software on page 19).

At the beginning of the installation you will be asked if you want to uninstall the currently installed version of ValiFrame from the PC. You must do this in order to install the new version. Click 'Yes' and the Uninstaller will open.

NOTE Ensure that no versions of ValiFrame are running before beginning to uninstall it.

In the 'Choose Components' window of the Uninstaller (Figure 3-14), you can specify whether your data, in addition to the program files, should be removed from the PC. Only if you no longer require this data should you check the box 'User Data' before clicking **Uninstall**.

CAUTION If you check 'User Data', your calibration data and other data will be removed during the uninstallation.

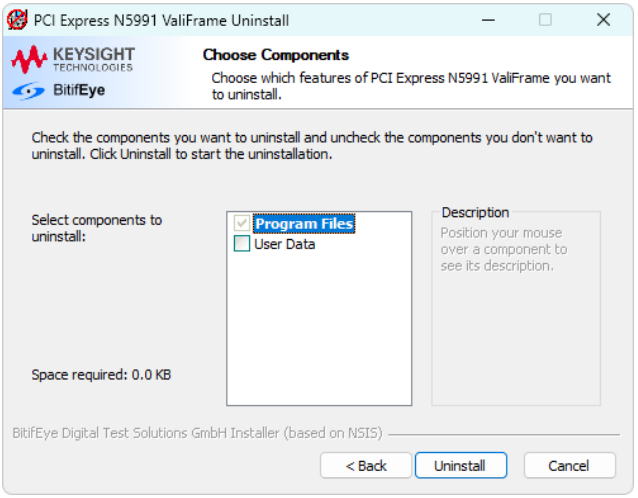

Figure 3-14 Uninstaller 'Choose Components' window

4 Licenses

This chapter explains how to obtain the licenses that you require to run the Test Automation Software.

Licenses for the Software

ValiFrame software is protected by licenses. If the software is started without a valid license, the following panel (Figure 4-1) will open. (In older versions of ValiFrame, the panel looks different.)

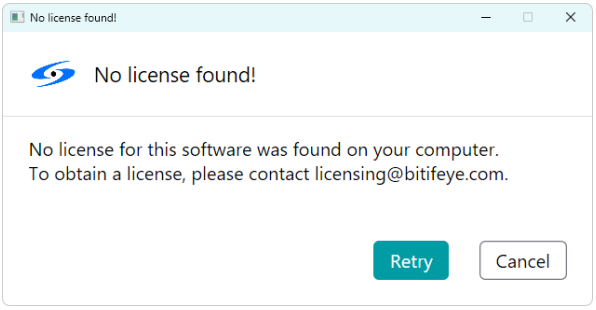

Figure 4-1 'No license found' dialog window

If you do not have a license, contact your Keysight representative.

If you have a license but ValiFrame does not seem to be able to find it, please contact your Keysight representative as well, and be prepared to provide as much information as possible about the setup, the license(s) that you have (including certificate numbers), and the version of ValiFrame that you want to use.

Once you have the license certificate, you can add the license to your PC and activate it. You can do this on the BitifEye License Manager (BLM) portal. The first time you access the BLM, you will need to create an account. Note that this is not the same account as the BitifEye Download Hub (where you can download ValiFrame software); you need to register for each separately.

For detailed instructions on how to use the BLM, refer to the BitifEye License Manager User's Guide. There are also tutorial videos on the BitfiEye web portal.

When the ValiFrame SW is open, click **About** in the toolbar (Figure 4-2) to view ValiFrame license information (Figure 4-3).

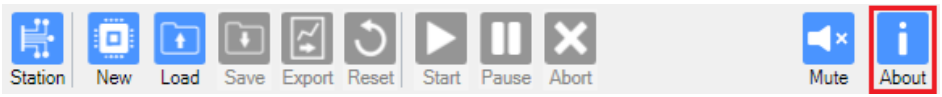

Figure 4-2 ValiFrame toolbar

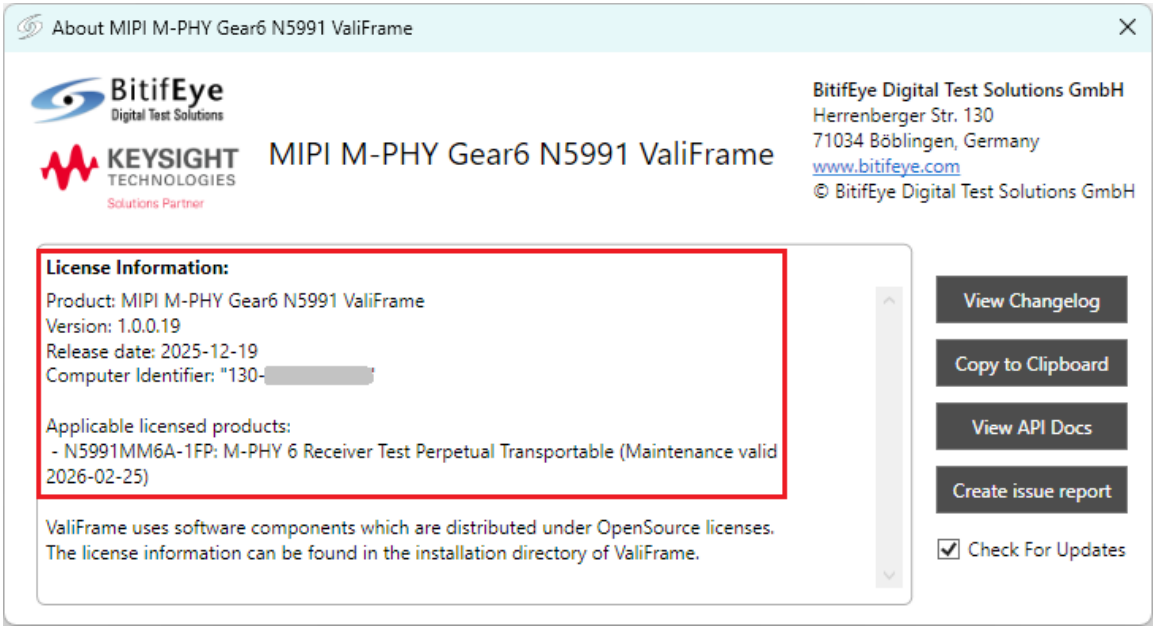

Figure 4-3 ValiFrame license information

Software Maintenance

Software maintenance ensures that new releases of the software can be installed as long as the maintenance is valid. Ninety days before the software maintenance expires, a warning will be shown in the ValiFrame main window. See the yellow areas in Figure 4-4.

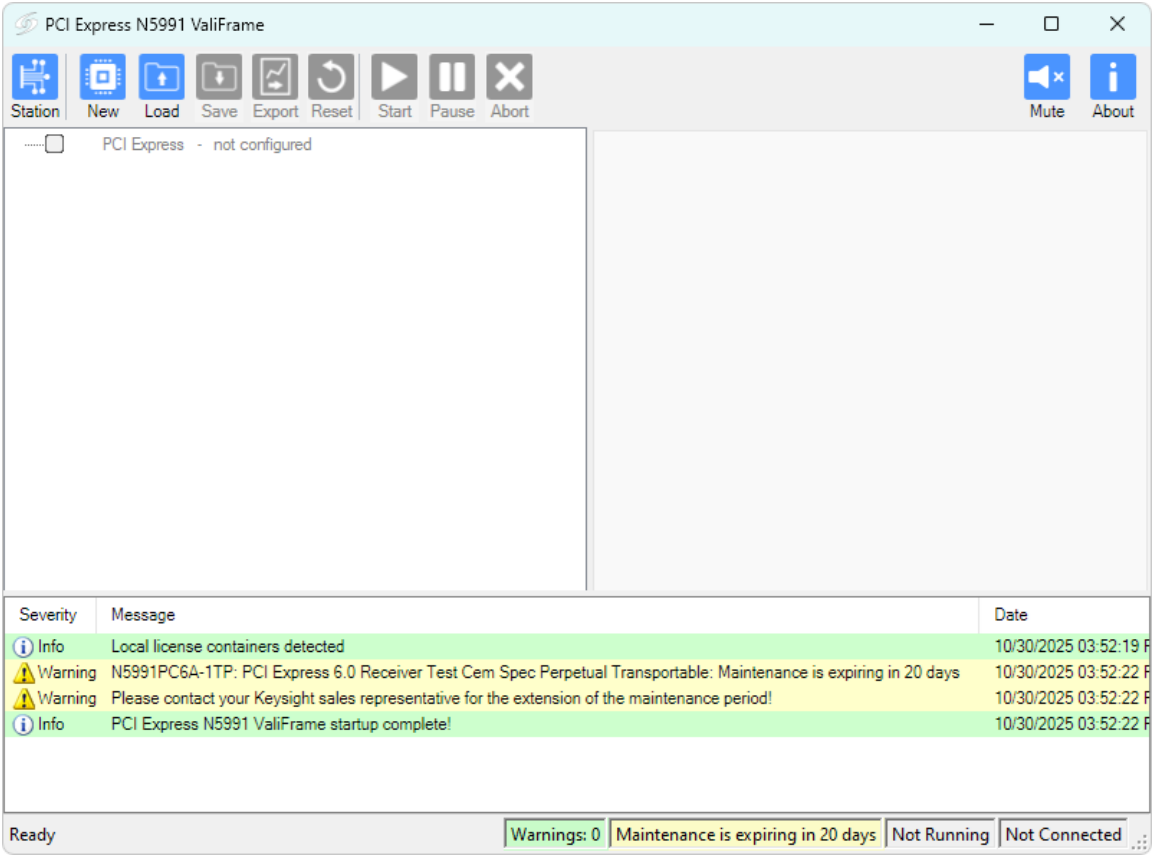

Figure 4-4 Warning that the software maintenance will expire shortly

Once the software maintenance has expired, a warning will be shown in red in the ValiFrame main window (Figure 4-5).

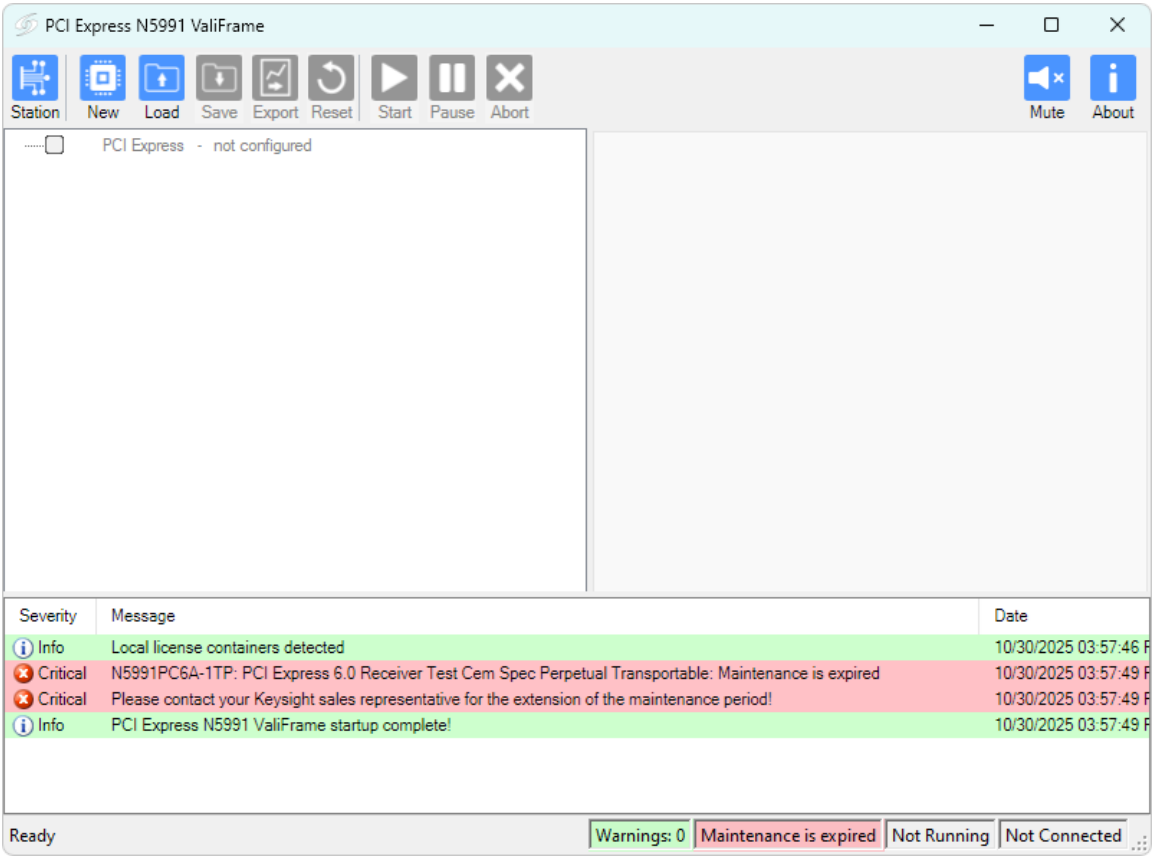

Figure 4-5 Warning that the software maintenance has expired

NOTE When the software maintenance expires, you can continue to use the software version that you have been using. However, you cannot use newer versions of the software with a corresponding major release date outside of the software maintenance period.

If you wish to update to a newer version of the software, contact your Keysight representative to purchase a software maintenance extension license.

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5 Using the Software

This chapter describes, first, how to configure and start the test station, and then, how to select the calibrations and test procedures that are to be run.

Normal Workflow

When testing a DUT, the normal procedure is as listed below. More details about each step are provided in the following sections.

- **Start ValiFrame app** (see Starting the Software on page 23)
- **Configure the station** (see Configuring the Test Station on page 37)
  - Station configuration
  - Instrument configuration
- **Configure the DUT** (see Configuring the DUT on page 43)
- **Calibrate the system**
  - Select calibration procedure(s) (see Selecting Procedures on page 51)
  - Modify parameters (see Modifying Parameters on page 51)
  - View connection diagram and connect setup (see Connection Diagrams on page 58)
  - Run calibration procedure(s) (see Running Procedures on page 56)
  - Save/export calibration results (see Exporting Results on page 67)
- **Run test procedures**
  - Select test procedure(s) (see Selecting Procedures on page 51)
  - Modify parameters (see Modifying Parameters on page 51)
  - View connection diagram and connect setup (see Connection Diagrams on page 58)
  - Run test procedure(s) (see Running Procedures on page 56)
  - Save/export test results (see Exporting Results on page 67)

Configuring the Test Station

The set of test instruments that are used for a specific application are referred to in the following as the 'Test Station' or simply 'Station'. The test station is controlled by a suitable PC and the ValiFrame Test Automation Software Platform.

Double-click the ValiFrame desktop icon to launch the software. Alternatively, to launch ValiFrame in Windows 11, search for the ValiFrame app for the appropriate standard, for example, PCI Express ValiFrame (N5991) or DP ValiFrame (N5992).

In the main ValiFrame window that opens, click 'Station' (red frame in Figure 5-1) to open the Station Configuration window (Figure 5-2).

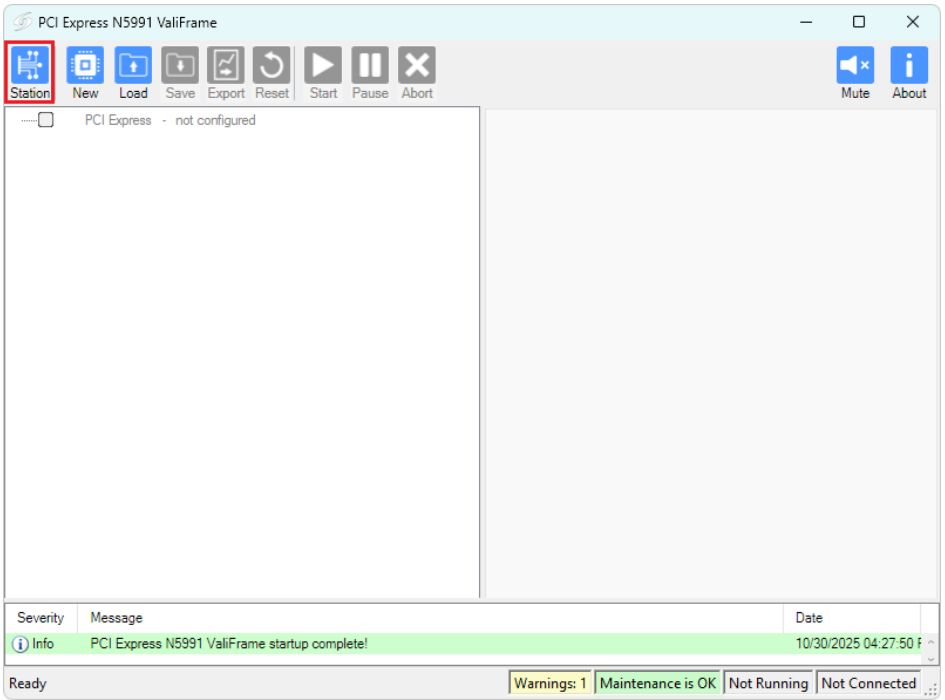


Figure 5-1 Example ValiFrame main window

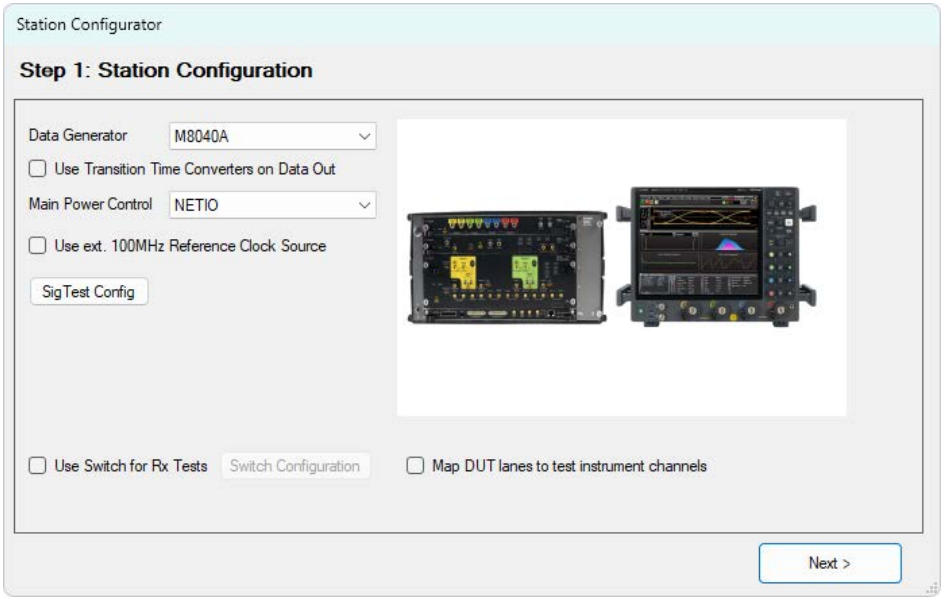


Figure 5-2 Example Station Configuration window

This shows the various options for instruments that can be used for testing, which vary according to the station in use.

Once the instruments have been selected, click 'Next' to see them listed in the Instrument Configuration window.

Instrument Configuration

Once all required instruments have been selected, these are listed in the Instrument Configuration window (Figure 5-3).

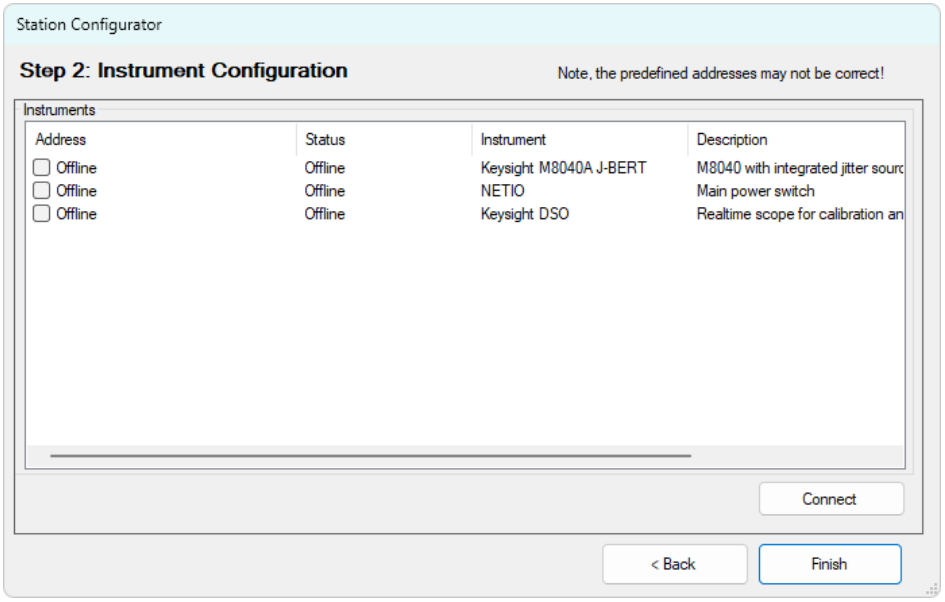


Figure 5-3 Example Instrument Configuration window

NOTE

When starting a specific test station configuration for the first time, all instruments are set to 'Offline' mode. In this mode the ValiFrame Test Automation Software does not connect to any instrument. This mode can be used for demonstrations or checks only. **'Offline' mode does not produce valid data.**

In order to control the instruments that are connected to the PC, the instrument address must be entered. The address depends on the bus type used for the connection, for example, USB or LAN.

Most of the instruments require a VISA connection. To determine the VISA address, run the **VISA Connection Expert** (refer to Using Keysight IO VISA

Connection Expert on page 41). Copy the address string for each instrument from the Connection Expert entries and paste it as the instrument address in the Instrument Configuration window of ValiFrame.

The applications running on the oscilloscope use a different technology to provide remote access to ValiFrame, called .NET Remoting. Remote access is only possible using a LAN connection to the oscilloscope, and for this reason the IP address needs to be used with this type of instrument.

Still other instruments use neither VISA nor .NET Remoting but require other connections and thus other address formats. Details vary depending on the instrument. Typically those instruments are only used for one specific standard.

NOTE **If a standard requires an oscilloscope application to be used, configure the controller's firewall to allow communication to ports 9945 and 9946.**

After the address strings have been entered, click **Connect** to verify that the connections for the instruments have been established successfully. If anything is wrong with the instrument address, a window pops up with a message describing the problem.

Finally, click **Finish** to save the changes, close the Instrument Configuration window and return to the ValiFrame main window.

Using Keysight IO VISA Connection Expert

The Keysight Connection Expert is recommended for setting up new connections or verifying existing connections. Perform the following steps:

1. Start the **Connection Expert**. Either click the **Keysight IO Libraries Suite** icon in the system tray and select **Connection Expert** or, alternatively, in Windows 11, search for **Keysight Connection Expert**.
2. A window similar to that shown in Figure 5-4 is displayed. If you are not familiar with the Connection Expert, click the question mark (top right) for help or to watch a short introductory video.
3. Select **Instruments** (top left). If the instruments you are looking for are not listed in the left column, click **Rescan**.

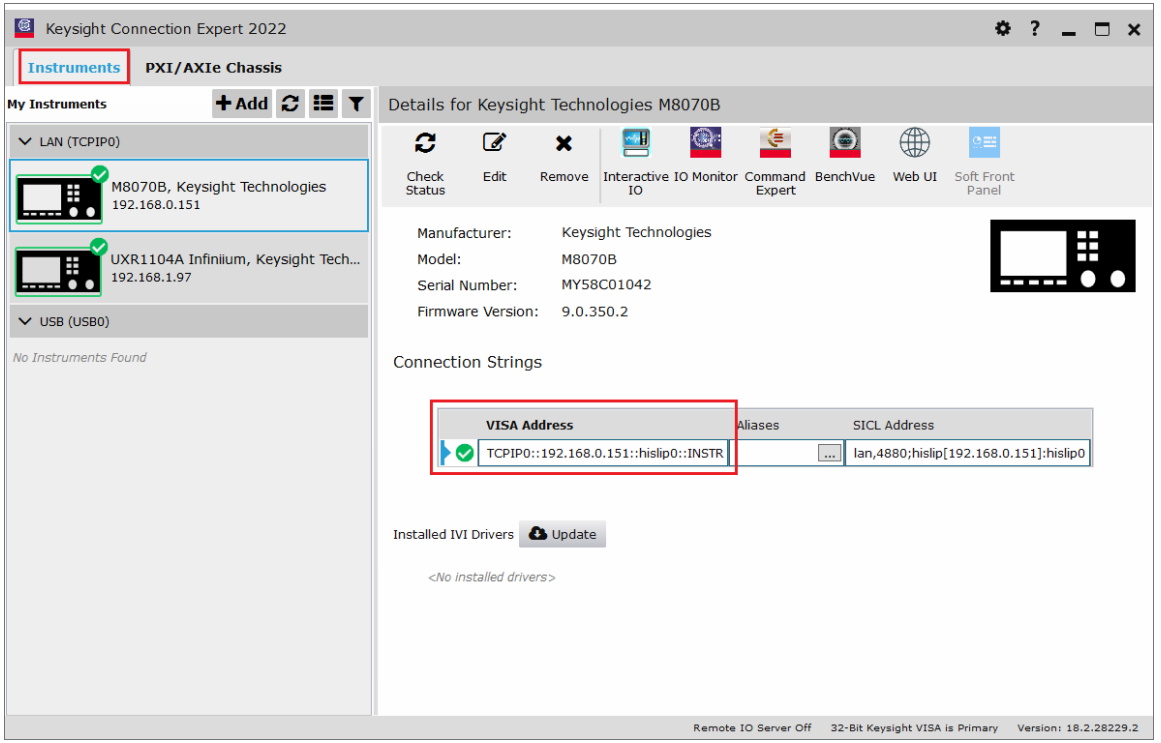


Figure 5-4 Keysight Connection Expert

4. Select one of the instruments you want to connect and verify that its **VISA Address** appears as shown (larger red frame in Figure 5-4) with a tick beside it.
5. Repeat for all required instruments that use VISA addresses.
6. Use these addresses (connection strings) in the Station Configuration as follows:
   a. Copy one of the VISA addresses from the Connection Expert.
   b. Select the same instrument in the Instrument Configuration window (Figure 5-3) and paste the address in the corresponding Address text field.
   c. Repeat this procedure for all the required instruments that use VISA addresses.

Configuring the DUT

After the test station has been configured, ValiFrame connects automatically to the instruments that are set to “Online” mode in the Instrument Configuration window (Figure 5-3). Once all the connections have been initialized successfully, you will see the ValiFrame main window (Figure 5-1). The top is shown again in Figure 5-5.

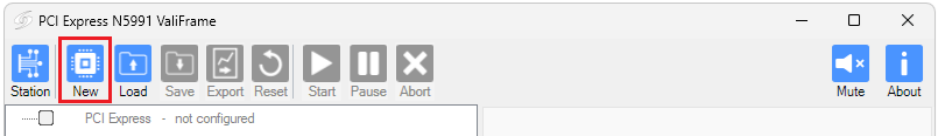


Figure 5-5 Example ValiFrame main window (top)

The next step is to configure the test parameters. Click New (red box in Figure 5-5) to open the Configure DUT or Configure Product dialog. The name depends on the standard.

Configure DUT Panel

The parameter selections available in the **Configure DUT** (or Configure Product) panel depend on the specific application. Two examples are shown in Figure 5-6 and Figure 5-7. In the text fields, enter all the information that is relevant for the DUT and the procedures to be run. The selected DUT parameters and the information entered by you will be shown in the measurement reports.

Details of the various parameter fields can be found in the user’s guide for the relevant standard.

NOTE In most applications, either **Compliance Mode** or **Expert Mode** must be selected. In compliance mode, the tests are run according to the specific compliance test specification, whereas in expert mode the DUT can be characterized to determine performance margins, for example. Expert mode is provided so that advanced users can run additional tests. Also, the tests may be implemented differently than in compliance mode.

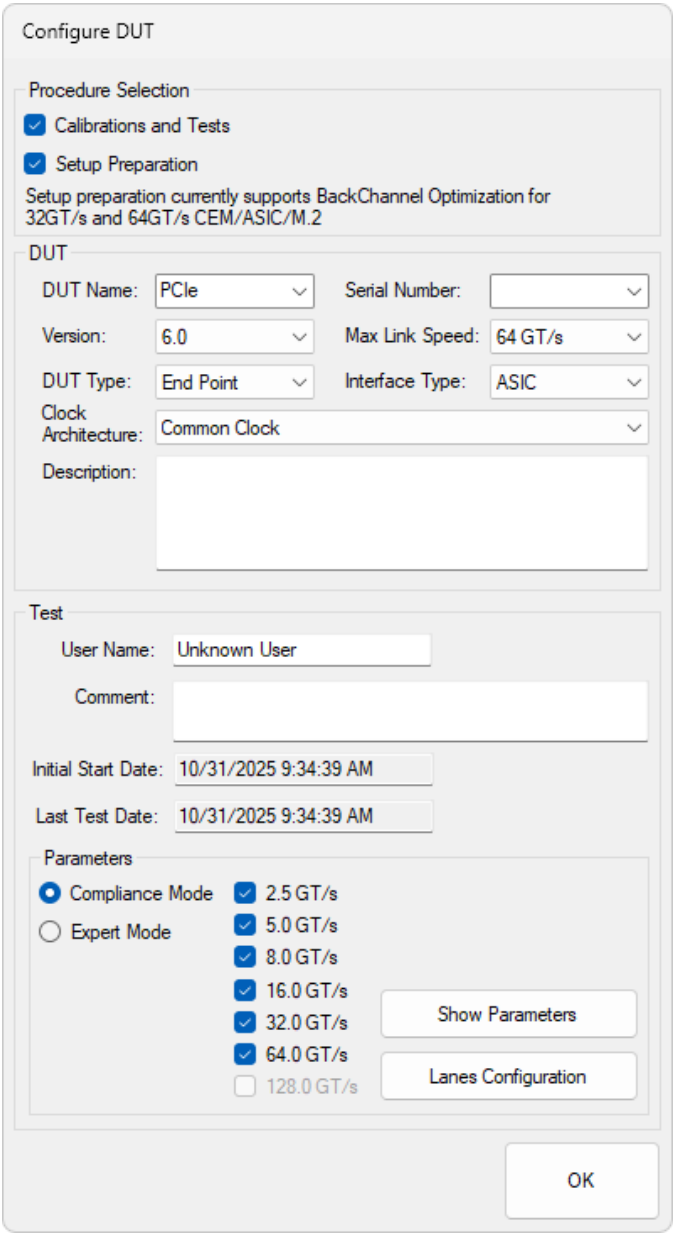


Figure 5-6 Example configure DUT panel (for PCI Express)

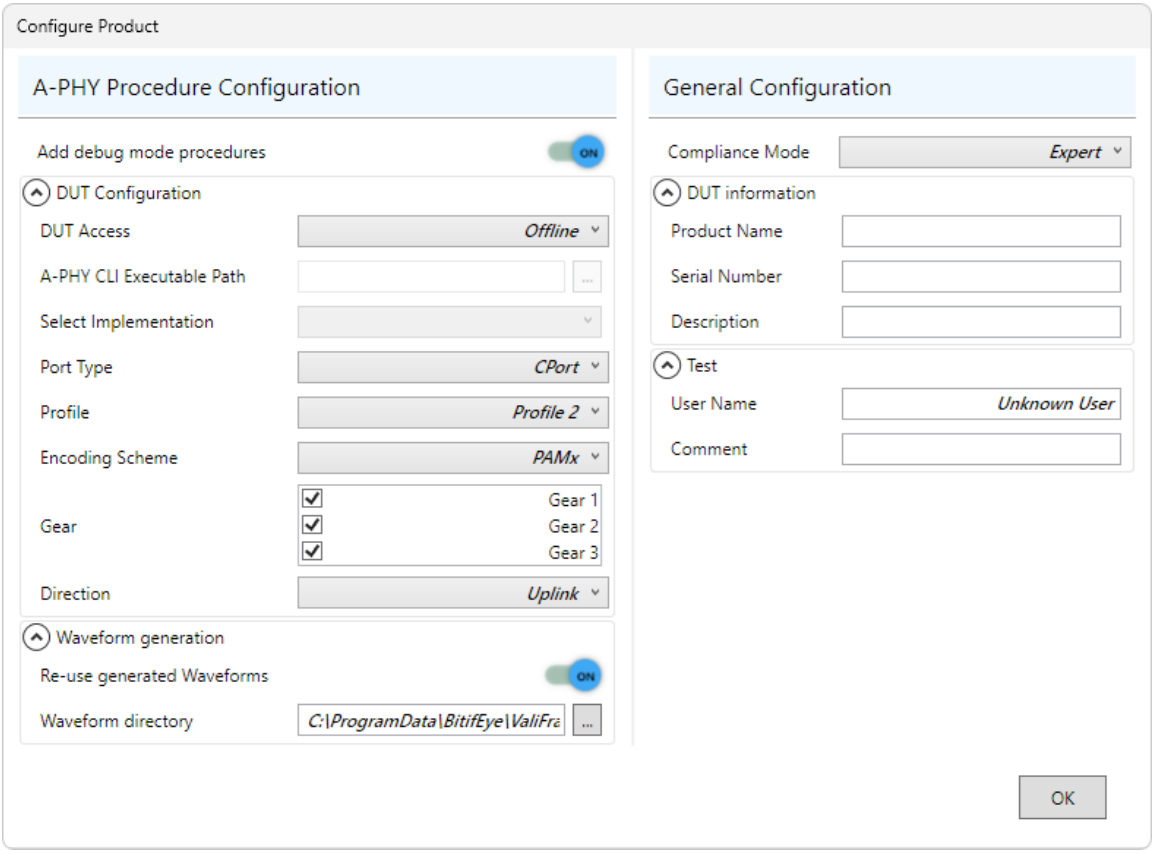


Figure 5-7 Example configure product panel (for MIPI A-PHY)

ValiFrame Main Window

Once the DUT has been configured, press **OK** in the **Configure DUT** panel. The ValiFrame main window is displayed with the procedure tree on the left, as shown in Figure 5-8. It contains the list of calibration and test procedures, the top-level groups typically being

- Calibration
- Receiver

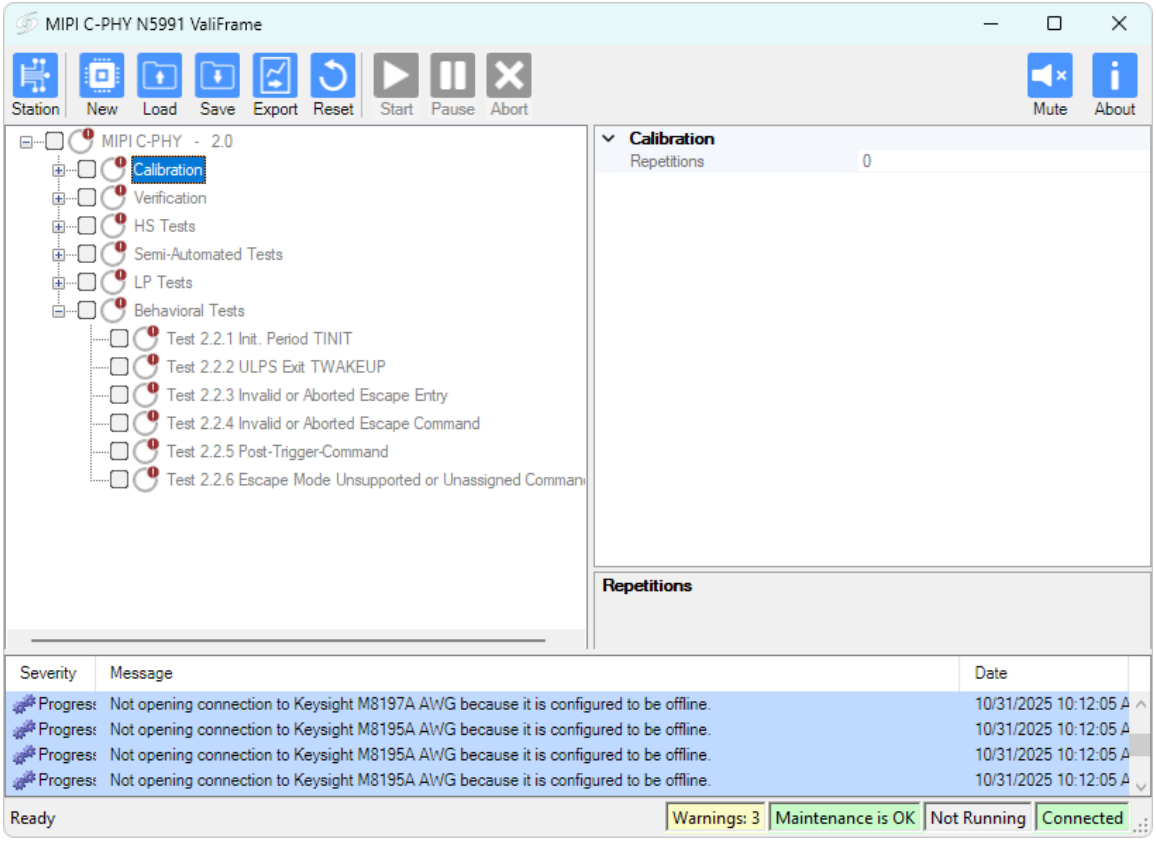


Figure 5-8 Example main window with procedure tree (here MIPI C-PHY)

Menu Buttons

The menu buttons control the main actions.

- **Station**: Use this to configure the test station. See Configuring the Test Station on page 37.
- **New**: Use the New button to configure a new DUT or change the DUT and test parameters, for example when swapping between Expert and Compliance Modes.
- **Load**: The Load button makes it possible to load a previously saved ValiFrame configuration (.vfc) or project (.vfp) file, which avoids having to configure the DUT again. This can save a lot of time.

NOTE **When loading a .vfc or .vfp file, it can happen that it is rejected because it was created with/for a station configuration that is incompatible with the current one. When that occurs, an error message will appear listing the incompatible settings.**

- **Save**: Once a DUT has been configured, the ValiFrame configuration can be stored as a single ".vfc" (configuration) file using the Save button. Similarly, once some procedures have been run, Save can be used to save a ".vfp" (project) file. A project file contains the same as a configuration file but in addition the results of the current run. See Running Procedures on page 56 for more details.
- **Export**: Use the Export button to save calibration and test data results. See Exporting Results on page 67.
- **Reset**: The Reset button sets all properties/parameters to their default values.
- **Start**: When the Start button is enabled (blue), clicking it starts the next marked procedure.
- **Pause**: Click Pause to stop the current procedure. See Running Procedures on page 56 for more details.
- **Abort**: Click Abort to abandon the current procedure.
- **Mute**: Click to mute/unmute the sound that ValiFrame makes when a different state of the program has been reached.
- **About**: Click About to open a window that provides License Information.

About Window

The About window (Figure 5-9) provides the following information:

- Product: Name of the SW product (including the name of the standard and whether N5991 or N5992, etc.).
- Version of ValiFrame that is being run.
- Release date of the corresponding major version of ValiFrame.
- Computer Identifier: This is also called Container ID and provides information about the controller PC (where the SW is running and the license is activated).
- Applicable Licensed Products: These are the names of the licenses relevant to the ValiFrame version specified under 'Product' and 'Version' above, along with the date when the software maintenance of the license(s) will expire (or has expired).

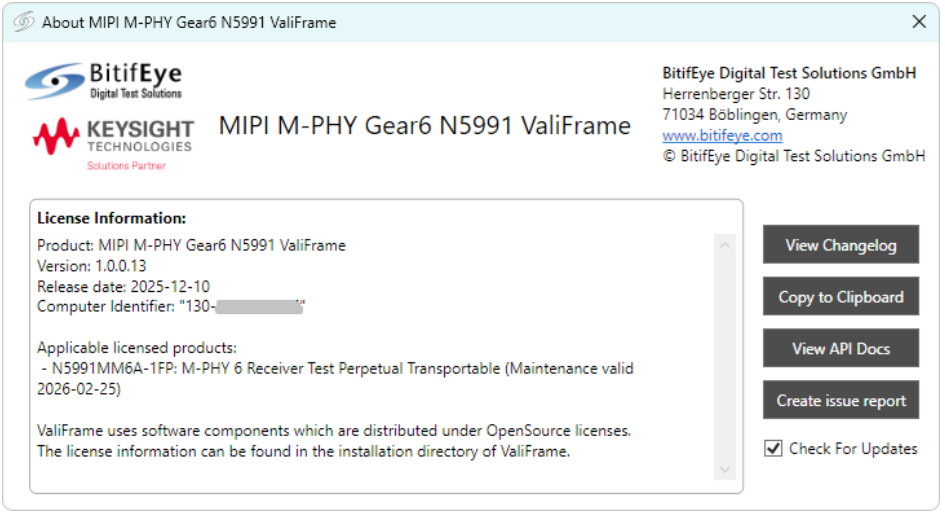


Figure 5-9 Example About window

Further functions:

- 'View Changelog' button: This provides access to the changelog.
- 'Copy to Clipboard' button: This copies all the details in the About window to the clipboard, making it easy to insert them in an email.

- 'View API Docs' button: This is currently not activated. If you require details of the ValiFrame API, see the API for ValiFrame User's Guide or contact your Keysight representative.
- 'Create issue report' button: See Support on page 81 for more information.
- 'Check for Updates' check box: See New Version Available Notification on page 24 for further details.

Other Parts of the Main Window

The **parameter grid** on the right shows the parameters that are related to the individual procedure or group of procedures selected on the left.

The **log list** pane at the bottom of the window shows calibration and test status messages (regular progress updates as well as warnings and error messages). Right-clicking the log list pane opens a context menu (Figure 5-10).

- 'Show Log File' can be used for troubleshooting (see Troubleshooting on page 80).
- 'Export Log to JSON...' is useful if you want to analyze or filter the log with another program.
- Enabling 'Only Severe Messages' removes many routine messages, leaving just those that are important if something goes wrong.
- 'Clear Log List' deletes the current log list.
- If 'Show Icons' is ticked, icons appear at the left of the log list that depend on the function of each message (examples in the red frame in Figure 5-10).
- Enable 'Use Severity Color' to add a colored background for each type of message. For example, error messages are shown on a red background if it is checked.
- Check 'Group Logs' to add headings to the log list that describe the stage that has been reached, for example, 'ValiFrame Startup'.

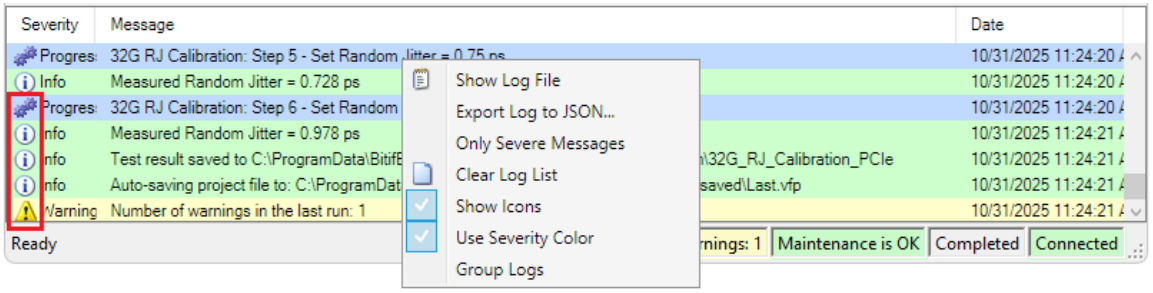


Figure 5-10 Customizing the log list

The **status bar** at the very bottom of the main window provides information about how many error messages and warnings have been sent, the software maintenance license and whether ValiFrame is running.

Selecting, Modifying and Running Procedures

System Calibration

It is necessary to calibrate the test system before you run the first test, in order to ensure that test results are consistent from run to run. Provided the equipment has achieved thermal stability before the calibration is started (typically after 30 min of warm-up), the thermal environment is stable (no significant temperature changes), and no system elements have been exchanged, the calibration is very stable and may only have to be repeated once a week or even less frequently. The calibration interval depends on the degree of accuracy desired. If the station is not calibrated prior to a DUT test, the results of the previous calibration will be used for the current tests.

Selecting Procedures

Groups of calibration or test procedures can be selected globally by clicking the check box next to the name of the group. Alternatively, one or more individual test procedures can be selected by checking the specific selection boxes in front of the test names. Only the procedures that are selected will be executed.

To start one or more procedures, select the corresponding check box(es). Then the Start button in the toolbar is enabled and turns blue. Click **Start** to run the selected procedure(s).

Modifying Parameters

Most calibration and test procedures, as well as the groups containing them, have parameters that control the details of how the procedures are run. In compliance mode, most of these parameters are read-only. In expert mode, almost all parameters can be modified.

First, click a specific calibration or test procedure or one of the groups contained in the ValiFrame procedure tree. The corresponding parameters are displayed in a property list (parameter grid) on the right-hand side of the screen (see Figure 5-11).

In the parameter grid, click on the parameter to be modified. These parameters can be set only before the execution of the procedure subgroup or procedure is started. The selected values of the test parameters are listed in the test results.

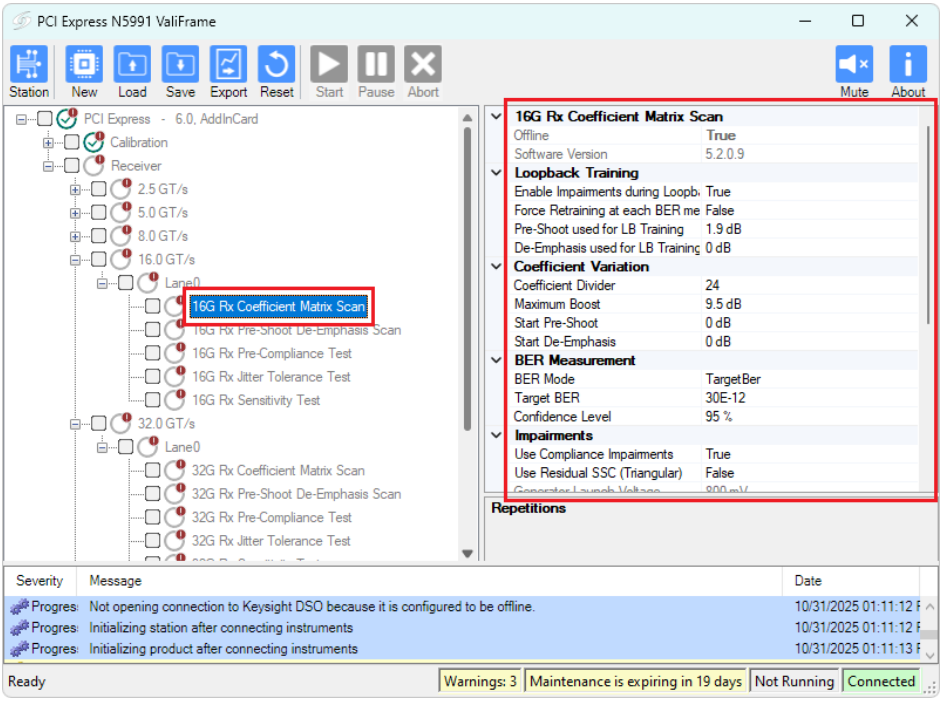


Figure 5-11 Modifying parameters

There are different types of parameters:

- sequencer parameters
- common parameters
- procedure parameters

These are explained in more detail below.

Sequencer Parameters

Sequencer parameters control the flow of the test sequencer, not the behavior of individual procedures. They are identical across all versions of ValiFrame. One of them, Repetitions, is available for all procedures and groups in the procedure tree. The others are available only for procedures.

Like all other parameters, the sequencer parameters are shown on the right side of the ValiFrame user interface (Figure 5-11) and they can be changed by the user.

The sequencer parameters are listed and described in Table 5-1.

Table 5-1 Sequencer Parameters

Parameter	Parameter Description
Procedure Error Case Behavior	– "Proceed With Next Procedure": If an error occurs in the current test or calibration procedure, continue by running the next procedure in the sequence. – "Abort Sequence": Abort the execution of the sequence.
Procedure Failed Case Behavior	– "Proceed With Next Procedure": If the current test or calibration procedure fails, continue by running the next procedure in the sequence. – "Abort Sequence": Abort the execution of the sequence.
Repetitions	The number of times the group or procedure is going to be repeated. If the value is '0', it runs only once.

Common Parameters

'Common parameters' are used for several related calibration or test procedures. They are shown on the right side of the ValiFrame user interface when the selected entry of the procedure tree on the left is a group instead of an individual procedure.

Procedure Parameters

'Procedure parameters' are all the parameters that do not fall into one of the previous two categories. They are shown on the right side of the ValiFrame user interface when the selected entry of the procedure tree on the left is an individual procedure. They only change the behavior of that single procedure.

Different procedures often have parameters with the same name, but the settings that are set always apply just to the selected procedure, and the meaning may vary slightly for different procedures.

Procedure Context Menu

The context menu is a convenient way of finding out more about the procedures. When you right-click the name of a group, calibration or test in the procedure tree, a menu appears with several entries (Table 5-12), which depend on the state of the procedure.

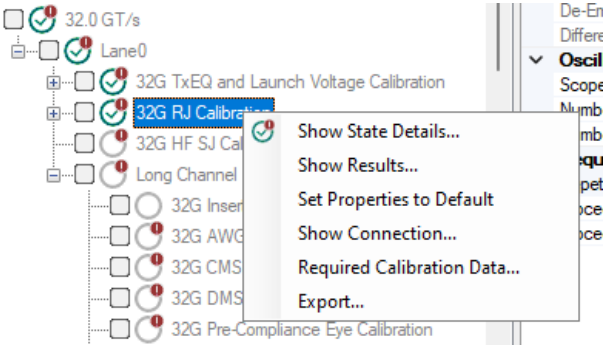


Figure 5-12 Example context menu for procedures

Show State Details...

Select this to reveal what the state icon next to the name of the procedure means. All state icons and their definitions are listed in Table 5-2 on page 71.

Show Results...

After the procedure has been run, click here to open the results viewer. For more details see the section Results on page 63.

Set Properties to Default

If you are working in Expert mode, click here to return the parameters to their default values.

Show Connection...

Clicking here opens the Connection Diagram. For more details see Connection Diagrams on page 58.

Required Calibration Data...

Click here to open the list of calibrations that must be performed before the current procedure can be run (Table 5-13).

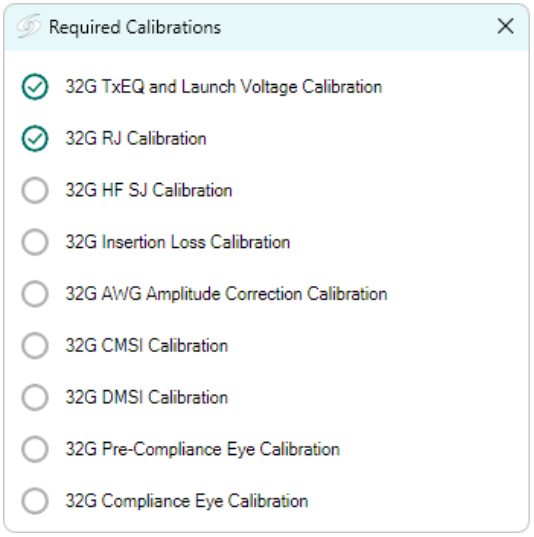


Figure 5-13 Example list of required calibrations

The icon next to the name of a calibration procedure in the list indicates whether the calibration has been run successfully (green), is incomplete (yellow), failed (red) or has not yet been run (gray).

Export...

You can export the results of all or just selected procedures by clicking on Export... in the context menu. The process is described in Exporting Results on page 67.

Running Procedures

To run the selected procedures, click the **Start** button. The procedures are run in the order shown in the procedure selection tree.

Some procedures require other procedures to have been run previously. These prerequisite procedures are arranged above their dependents in the procedure tree.

Some procedures may require user interaction, such as changing cable connections or entering DUT parameters. The required action is prompted in a pop-up dialog box when it is required.

CAUTION **Before executing the calibration or test procedures, ensure that the Station Configuration is conducted properly with all necessary instruments such as the Infiniium oscilloscope set to 'online'. All calibrations can be run in offline mode, that is, without any instrument connected. The offline mode is intended for product demonstrations with simulated data. CALIBRATIONS RUN IN OFFLINE MODE DO NOT GENERATE VALID CALIBRATION DATA.**

When a test is running, use the **Pause** button to pause the test at the next step of the procedure sequence. When the test is paused, the Start button is relabeled Step (Figure 5-14).

You have two options when a procedure is paused.

- Click **Step** to continue the procedure and pause at the next step.
- Click **Pause** again to continue running the procedure. This will also toggle the state of the Start/Step button. You have the choice of allowing the procedure to continue running until the end of the procedure or clicking Pause again.

The Step feature is useful for debugging purposes, for example to analyze the signal on the oscilloscope at each step. When a procedure is paused, a message at the bottom of the main window (lower red frame in Figure 5-14) indicates which step has been reached.

To force the sequencer to stop running the tests, click **Abort**. This will stop the procedure in progress and will prevent the remaining tests from running.

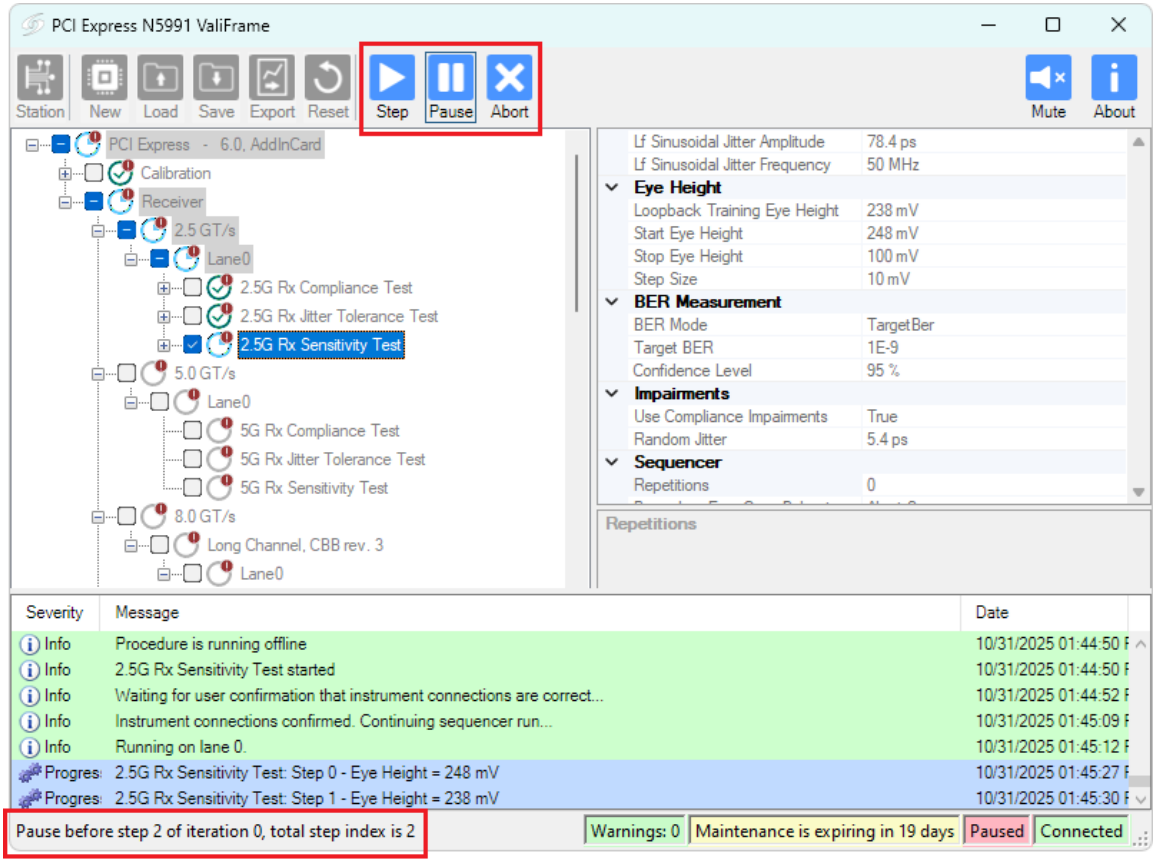


Figure 5-14 Main window when a procedure is paused

The **Save** button has two purposes. First, it can be used to save the current ValiFrame configuration as a '.vfc' (ValiFrame configuration) file. This will include the selections made in the 'Configure DUT' panel and the parameters on the right side of the main window (in the parameter grid). Second, once some procedures have been run, it can be used to save the results of these procedures along with the current configuration in a single '.vfp' (ValiFrame project) file.

Use the **Load** button to recall a saved configuration — or a saved configuration plus the corresponding results — to avoid having to configure the DUT again.

Connection Diagrams

Connection diagrams can be accessed in two ways:

- Right-click the name of the procedure in the procedure tree and select 'Show connection...' from the menu.
- When a procedure is running, the connection diagram appears in a pop-up dialog box prior to execution. In some apps this function can be turned off.

Default View

The default view consists of a connection diagram surrounded by five buttons, which are outlined in red and numbered in Figure 5-15. (For some standards the default view consists of two panes, see Figure 5-17, but nothing else changes.) The function of the buttons is explained in more detail in the following.

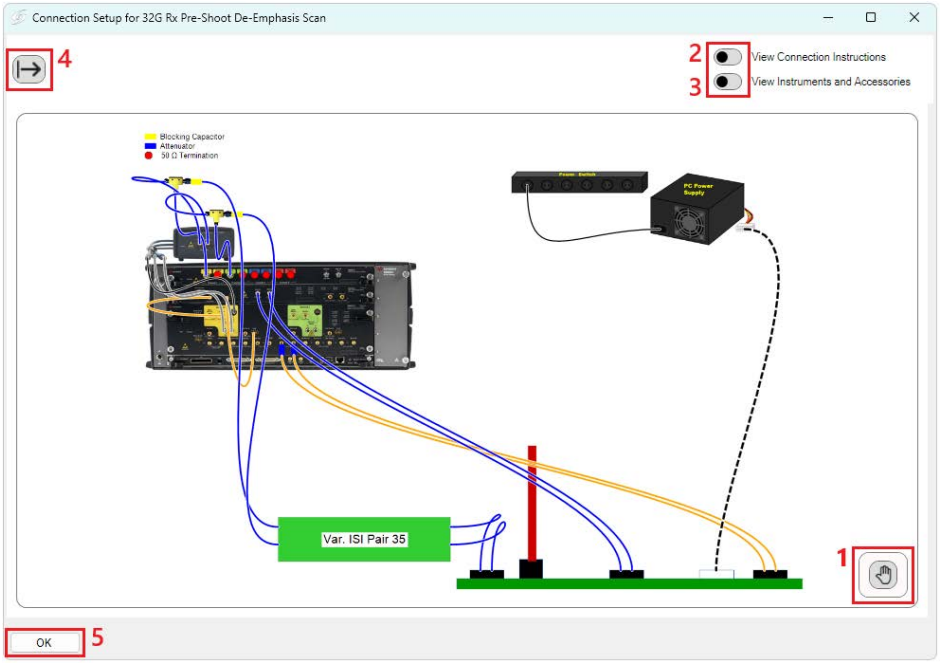


Figure 5-15 Example connection diagram dialog – default view

1 **Export Mode**: Click here to change the layout of the connection diagram before exporting it (Figure 5-16).

2 **Connection Instructions**: Toggle to 'on' to view connection instructions and further information (Figure 5-17).

3 **Instruments and Accessories**: Toggle to 'on' to view the list of required instruments and accessories (Figure 5-18).

4 **Export**: Export the diagram as an HTML file. If the list of instruments and accessories is expanded, that will be included in the HTML report as well.

5 **OK**: Click here to close the connection diagram window.

Export Mode View

In the Export Mode view (Figure 5-16), you can change the layout of the connection diagram before exporting it.

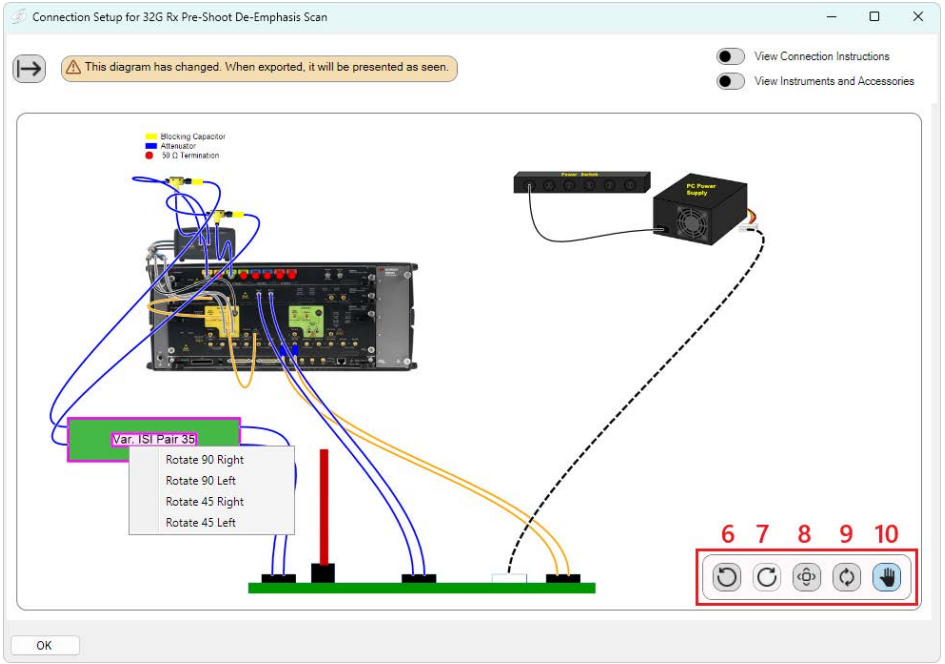


Figure 5-16 Example connection diagram dialog – Export Mode view

Functions of buttons 6–10.

6 Undo

7 Redo

8 Resize, to show the whole diagram

9 Reinstate the original diagram layout

10 Exit Export Mode (this reinstates the original diagram layout)

Other possibilities:

- To **move** an instrument or accessory: Double click the instrument and then drag-and-drop it to the required position.
- To **rotate** an instrument: Double left click to select an instrument, then right click. Select the required rotation from the pop-up menu (see Figure 5-16).
- To **zoom** in on or out from an instrument: Double left click to select an instrument, then use the mouse wheel.
- To **alter the angle** of cables: Single click on a node (where the cable enters or exits an instrument). The cable will be highlighted. Right click and select either “Tightest curvature” or “Slackest Curvature” from the pop-up menu.

Connection Instructions View

If “View Connection Instructions” is toggled to ‘on’, a second pane listing instructions in order appears.

- Click the eye symbol next to each step for further information, such as the color used for the cable in the diagram.
- If there is extra information or a warning about a particular step, this is indicated by icons. Reveal the information or warning by clicking the eye symbol.

Toggling “Step-by-Step Instructions” within the Connection Instructions pane leads to a view such as in Figure 5-17. That view helps avoid any connections being overlooked, as each step is highlighted, in sequence.

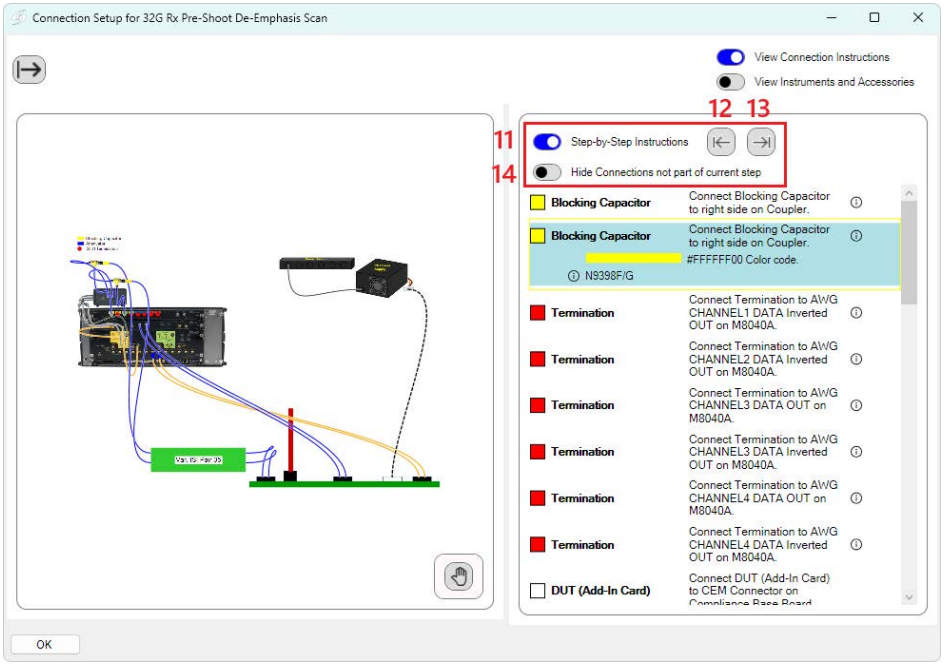


Figure 5-17 Example connection diagram dialog – with Connection Instructions pane

Functions of buttons 11–14:

11 Toggle button for step-by-step instructions.

12 Return to previous step. Only visible if step-by-step instructions are activated.

13 Go on to next step. Only visible if step-by-step instructions are activated.

14 If “Hide Connections” is activated, all connections (cables, terminations, etc.) that are not part of the step are hidden. The instruments are grayed out. A warning appears that what can be seen is not the complete setup.

For activated step-by-step instructions, the current connection (the one in the highlighted step of the list) is highlighted in the connection diagram.

Instruments and Accessories View

In the Instruments and Accessories view, a lower pane opens that contains a list of instruments and accessories. This can also be viewed in combination with the Connection Instructions pane, as shown in Figure 5-18.

When all three panes are visible, if you click a component in the list of instruments and accessories, that component will be highlighted in the connection diagram, as will the relevant step in the step-by-step connection instructions (Figure 5-18).

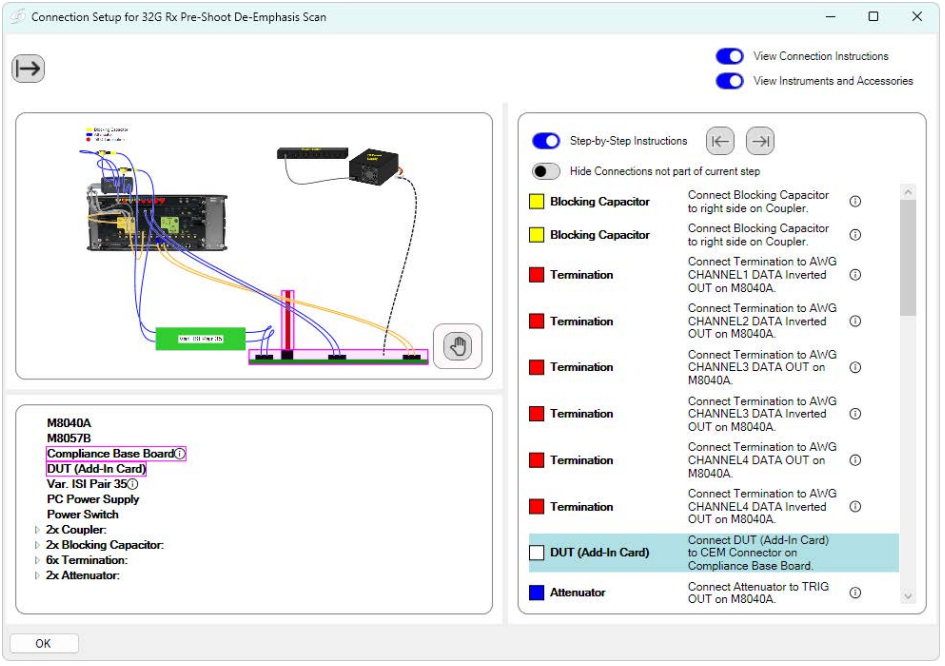
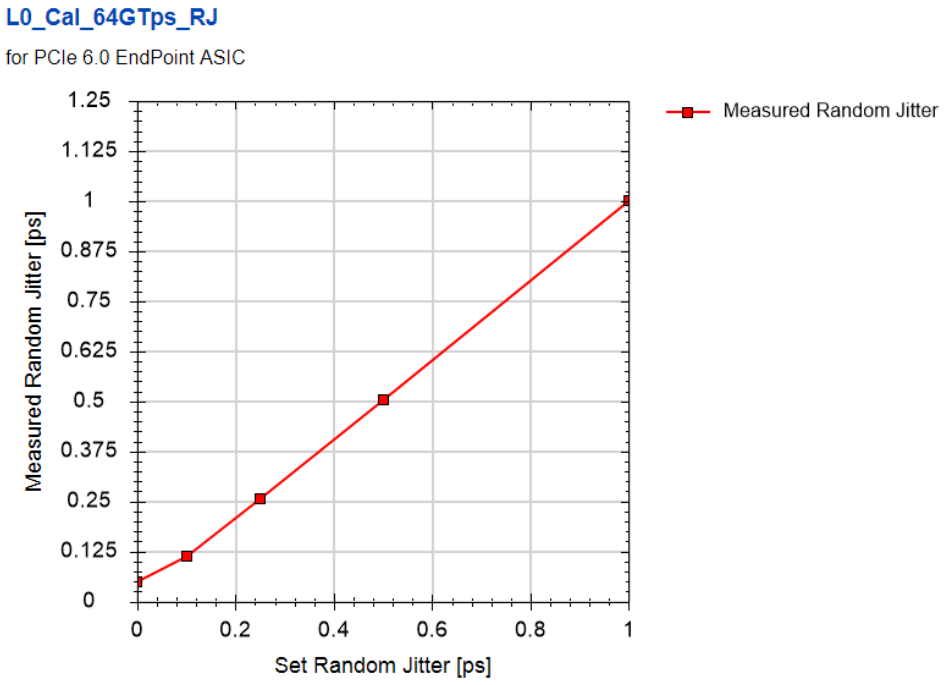


Figure 5-18 Example connection diagram dialog – all panes

Results

Viewing Results

Most procedures generate data output. While the procedure is running, the data is displayed in a **Results Viewer** window, which opens automatically for each individual procedure. An example is given in Figure 5-19.



----General----	
Offline	True
Software Version	5.2.0.9
Spec Deviations	
Comments	
Verification Mode	False
----Oscilloscope----	
Scope Bandwidth	50 GHz
Use Bessel Filter	True
Remove Scope Noise	True
Scope RJ	78 fs

Number of Averages	7
Number of UIs	3 MUI
Scope Connection for Calibration	Chan 1 3 Direct Connect
----Instruments----	
Calibrated Instrument 1	Name: Keysight M8040A J-BERT ; Company: Keysight Technologies ; Model: Keysight M8040A J-BERT ; SN: Unknown ; FW rev.: Unknown ; Description: M8040 with integrated jitter sources for BER tests ; Firmware Version Supported: False ; Calibrated Instrument
Calibrated Instrument 2	Name: DataOut1 ; Company: Keysight Technologies ; Model: M8045A,M8057A ; SN: DE[redacted],DE[redacted] ; FW rev.: 7.5.700.8 ; Description: M8040 with integrated jitter sources for BER tests ; Firmware Version Supported: Unknown ; Calibrated Instrument
Calibrated Instrument 3	Name: DataOut1 ; Company: Keysight Technologies ; Model: M8195A ; SN: DE[redacted] ; FW rev.: 4.0.0.0 ; Description: M8040 with integrated jitter sources for BER tests ; Firmware Version Supported: Unknown ; Calibrated Instrument
Calibrated Instrument 4	Name: DataOut2 ; Company: Keysight Technologies ; Model: M8195A ; SN: DE[redacted] ; FW rev.: 4.0.0.0 ; Description: M8040 with integrated jitter sources for BER tests ; Firmware Version Supported: Unknown ; Calibrated Instrument
Measurement Instrument 1	Name: Keysight DSO ; Company: Keysight Technologies ; Model: DSO Infiniium Series ; SN: Unknown ; FW rev.: Unknown ; Description: Realtime scope for calibration and transmitter tests ; Firmware Version Supported: False ; Measurement Instrument

Set Random Jitter [ps]	Measured Random Jitter [ps]
0.00	0.050
0.10	0.113
0.25	0.256
0.50	0.503
1.00	1.002

Figure 5-19 Example procedure result

The results viewer window that is opened during the procedure run closes once the specific procedure is finished. As long as the ValiFrame software is running, the results window for each procedure can be reopened with a double-click on the respective procedure. However, the individual results of a test procedure will be lost when the ValiFrame main window is closed, unless you have saved them.

While the results viewer is open, that page of results can be saved as an HTML file or printed using the drop-down menu under ‘File’ (Figure 5-20).

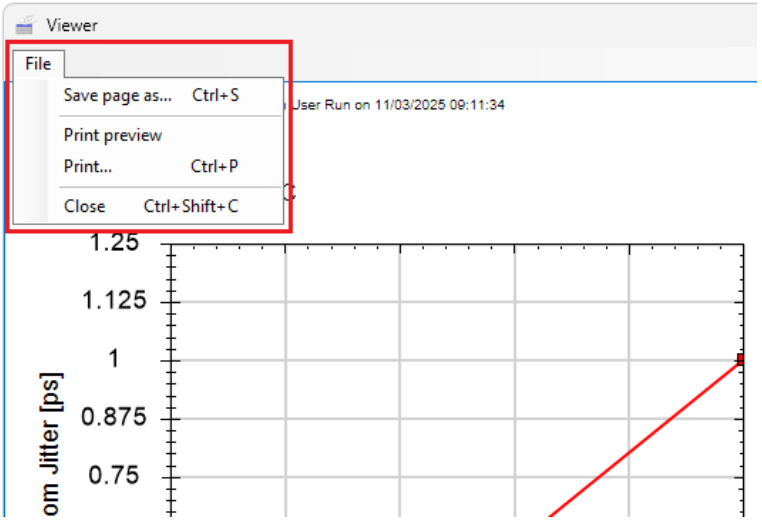


Figure 5-20 Exporting a single result from the results viewer

If a test or calibration procedure was run more than once, a list of the results with their timestamps is visible in the main ValiFrame window below the particular procedure after expanding the procedure tree. You can view a particular set of results in two ways:

- Left-click the timestamp of the results you want to see. The results will be displayed in the right-hand pane of the main window (Figure 5-21).
- Right-click the timestamp of a particular result and select 'Show Results...' to open it in the Results Viewer.

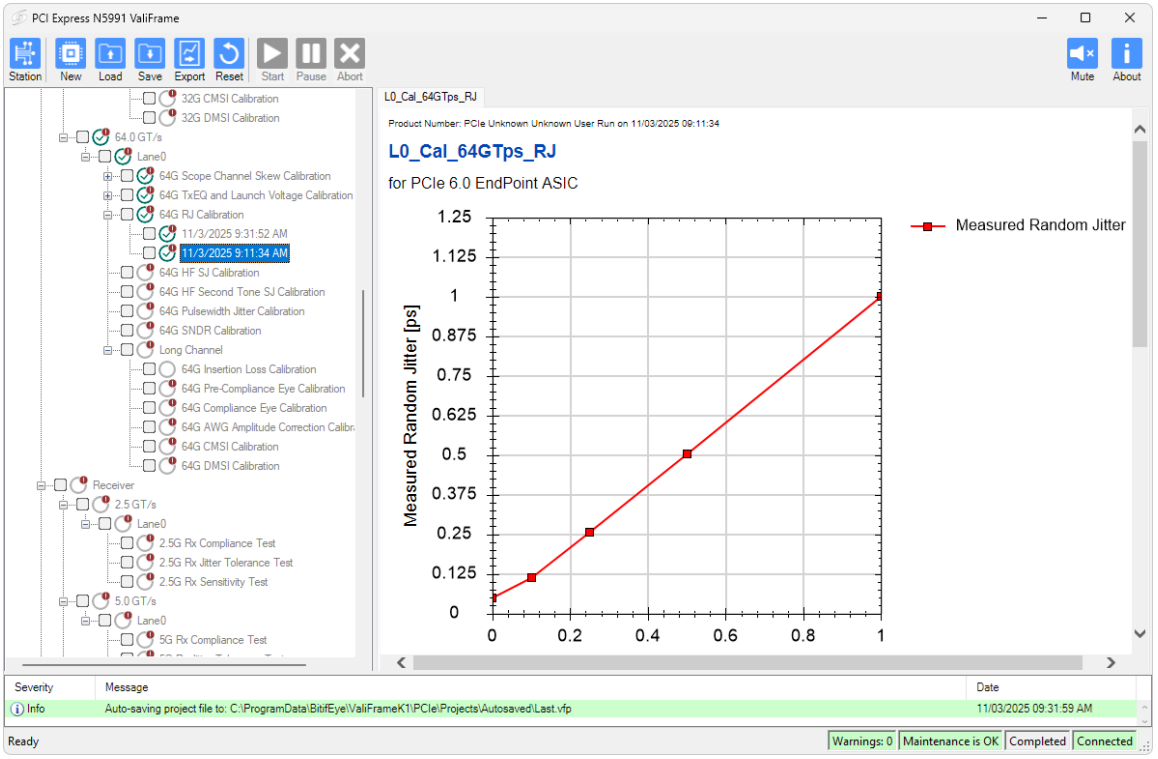


Figure 5-21 Displaying a particular set of results

Exporting Results

All calibration and test data results from one ValiFrame run can be saved together by clicking the **Export** button at the top of the main window at any time. We recommend you to carry out this step at least at the end of each ValiFrame run.

The Export Procedure Results window opens (Figure 5-22).

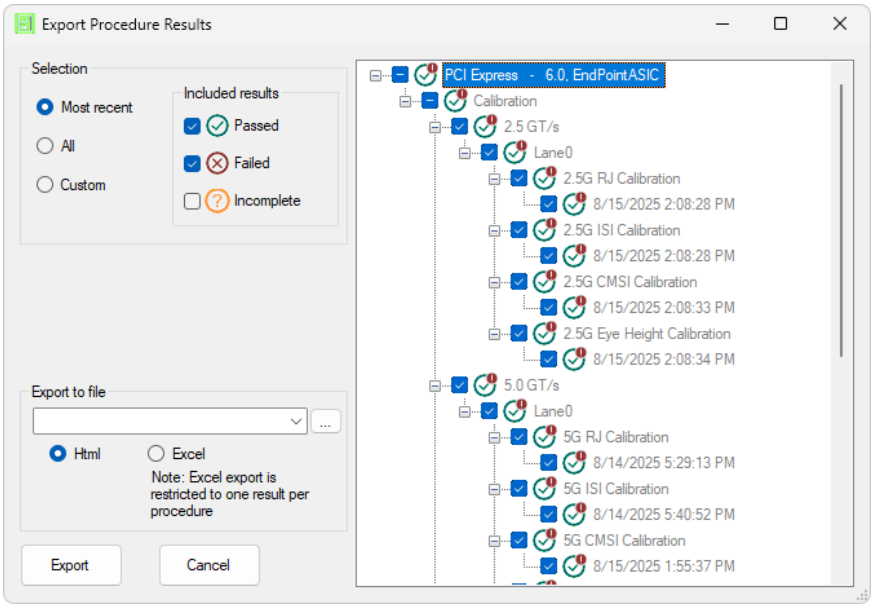


Figure 5-22 Example Export Procedure Results window

Make the following selections:

- The results to be exported: Most recent, All or Custom
- The type(s) of results to be included (for 'Most recent' and 'All'): Passed, Failed, Incomplete
- Path to the file to which the results should be exported
- HTML or Excel format

NOTE **An Excel report is restricted to one result per procedure.**

ValiFrame HTML Workbook

A workbook consists of a summary of the procedures performed, details of the instruments used and the results of the individual procedures carried out. On the left you can select a test to view, whose results are then displayed on the right.

Figure 5-23 shows an example Procedure Result Summary, and Figure 5-24 an example Instrument Summary.

Procedure result summary

Shows the procedure results as an overview

Product Number: MPhyG6
Serial Number:
Description:
User Name: Unknown User
User's Comment:
Software Version:
MIPI M-PHY Gear6 N5991 ValiFrame 1.0.0.14

Procedure name	Timestamp	Result	Instruments	Software Version	Spec Deviations	Comments
Reference Clock Calibration0	11/14/2025 11:22:49 AM	Passed	Offline	1.0.0.14		
Reference Clock CalibrationA	11/14/2025 11:22:49 AM	Passed	Offline	1.0.0.14		
DMI Cal. AwgChannel1	11/14/2025 11:39:52 AM	Passed	Offline	1.0.0.14		
TxEq Cal. 23296MBdData0	11/14/2025 11:45:12 AM	Passed	Offline	1.0.0.14		
Level Cal. Term. 23296MBdData0O	11/14/2025 11:57:45 AM	Passed	Offline	1.0.0.14		
Level Cal. Term. 23296MBdData0A	11/14/2025 11:57:45 AM	Passed	Offline	1.0.0.14		
RJ Cal. 23296MBdData0	11/14/2025 2:16:15 PM	Passed	Offline	1.0.0.14		
SJ Cal. 23296MBdData0	11/14/2025 2:25:03 PM	Passed	Offline	1.0.0.14		
SNDR Cal. 23296MBd Data0	11/14/2025 2:31:24 PM	Passed	Offline	1.0.0.14		
SNDR Meas. 23296MBd Data0	11/14/2025 2:37:27 PM	Passed	Offline	1.0.0.14		
Eye Ver. 23296MBd Data0	11/14/2025 2:41:31 PM	Passed	Offline	1.0.0.14		
JTol 23296MBd Data0 P. Offset	11/14/2025 3:26:14 PM	Passed	Offline	1.0.0.14		

Figure 5-23 Example test result summary in a ValiFrame HTML workbook

- **Procedure Name**: Abbreviated name of the procedure (test or calibration).
- **Timestamp**: The date and time at which the procedure ended.
- **Result**: Passed – The procedure was successful. Failed – The data did not fulfill the conditions required by the specification.
- **Instruments**: Either 'Connected' or 'Offline' (simulation mode).
- **Software Version**: The version number of the ValiFrame software used to perform the procedure (calibration or test).
- **Spec Deviations**: The changes to parameters made in Expert Mode so that the procedure is no longer compliant with the CTS.
- **Comments**

Instrument Summary

This table lists the instruments used to run these procedures.

Company	Instrument Name	Serial	Instrument Revision	Description
Keysight Technologies	Keysight M8050A J-BERT	Unknown	Unknown	M8042A 120GBd BERT Pattern Generator
Keysight Technologies	DSO Infiniium Series	Unknown	Unknown	Real-Time Oscilloscope

Figure 5-24 Example list of instruments in a ValiFrame HTML workbook

- **Company**: The manufacturer of the instrument.
- **Instrument Name**: The model number or name of the instrument.
- **Serial**: The serial number of the instrument.
- **Instrument Revision**: The revision number or version of the software running on the instrument.
- **Description**: The type of instrument, e.g., real-time oscilloscope.

Icon Representation of Results

Once the selected procedures have been run, the icons that appear for individual procedures in the procedure tree indicate the result (Pass / Fail / Incomplete) and provide further information.

For an explanation of the icon beside a particular procedure, right-click the name of the procedure and select “Show State Details...”. The pop-up window displays the meaning of the icons (Figure 5-25). The meanings of all result or state icons are listed in Table 5-2.

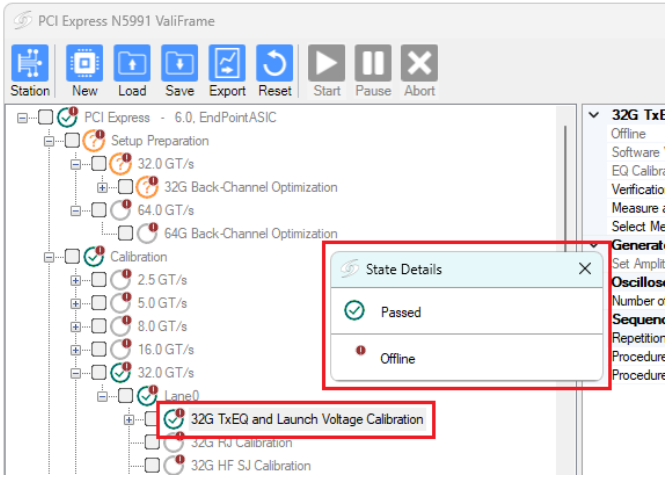


Figure 5-25 Icon representation of results

Table 5-2 List of All State Icons

Icon	Description
	NotRun. The procedure has not been run yet.
	NotRun – Iterative. The procedure is going to be run more than once.
	Running. The procedure is running. Note: This icon is animated.
	Running – Iterative. The procedure is running with several repetitions. Note: This icon is animated.
	Pass. The procedure passed successfully.
	Pass – Imported. The procedure (result “pass”) has been imported.
	Pass – Iterative. The procedure was run for several repetitions and passed successfully.
	Fail. The procedure failed.
	Fail – Imported. The procedure (result “fail”) has been imported.
	Fail – Iterative. The procedure was run for several repetitions and failed.
	Incomplete. The procedure was aborted/interrupted.
	Incomplete – Imported. The imported procedure was aborted/interrupted.
	Incomplete – Iterative. The procedure was run for several repetitions and they were incomplete.

Table 5-2 List of All State Icons (cont.)

Icon	Description
Additional States	
	CalMissing. This icon appears on the lower right portion of the main icon. For example:  It is specific to calibration procedures. It indicates that the calibration data is missing, and therefore is not available to be used in the Rx tests.
	Offline. This icon appears on the upper right portion of the main icon. For example:  It indicates that the procedure was run (or will be run) in offline mode.
	Both states can occur at the same time. For example:  It indicates that the calibration was run offline and that the offline calibration data is not available.

ValiFrame Data Structure

All the ValiFrame internal data is saved on the PC's local disk in the application data folders

- ProgramData\BitifEye\ValiFrameK1\"Application" for N5991, AE2010R and AE69x0R ValiFrame applications
- ProgramData\BitifEye\ValiFrameK2\"Application" for N5992 ValiFrame applications

In both cases, "Application" stands for PCIe, SATA, USB4, DisplayPort, MPhy, APhy, AutomotiveEthernet, etc., as appropriate.

NOTE **Windows hides the system folders by default. To make the application data folder visible, check 'Hidden items' in the Windows file explorer > View > Show/ hide.**

The ValiFrame application data folder contains some or all of the following folders.

- **Calibrations**: The calibration data is stored in the Calibrations or CalibrationsOffline folder, depending on whether the calibration was run in online or offline mode. For each calibration procedure run, at least one calibration file is saved. Offline calibrations are for demonstration purposes only. They do not give valid data.
- **Data**: For most standards, this folder is not used. For some standards, ValiFrame stores waveform files or other files necessary for tests here.
- **Examples**: Standard-specific examples but also example scripts for ValiFrameAPI are stored here. See the ValiFrame Application Programming Interface User's Guide for more details.
- **History**: This folder is used for miscellaneous internal data. It should not be modified by the user.
- **Pattern**: The Pattern folder contains test pattern/sequence files.
- **Projects**: Projects (.vfp files) are saved here by default. The sub-folder 'Autosaved' contains the most recent project. It is overwritten each time.
- **Settings**: The Settings folder contains various settings files. These files include, for example, the instrument connection setup. Details depend on the specific application.

- **SParameter**: The SParameter folder contains the S-parameter files that are required for some applications.

6 Additional Tools

Additional tools are available that are either necessary or increase the usefulness of the ValiFrame Test Automation Software Platform.

ValiFrameAPI

The ValiFrame Application Programming Interface allows ValiFrame functionality to be accessed from external programming environments, for example Python scripts. Accessible functionality includes test setup information, calibration and test procedures, and results. ValiFrameAPI can thus be used to control ValiFrame by external software. In typical use, a top-level external test sequencer makes use of ValiFrame functionality, for example to run a series of tests at different temperatures.

For more details about ValiFrameAPI, download the Application Programming Interface for the ValiFrame Test Automation Software Platform User's Guide ("ValiFrameAPI User's Guide" for short).

IBerReader Interface

For some DUTs, proprietary tools exist to control the device (e.g., set it to loopback mode) as well as for reading internal checksum error counters, burst counters, or other indicators. These indicators make it possible to determine whether the receiver was able to receive the data properly. The integration of such proprietary tools into the ValiFrame Test Automation Software can be achieved with the Integrated BER Counter (IBerReader) software interface.

The C# .NET software interface acts as a wrapper for the proprietary tools. It contains methods that will be called by ValiFrame during test execution to configure the DUT and request the pass/fail information from the DUT. A DLL will be loaded at run time and a class will be instantiated that supports the IBerReader interface.

For more details, see the Integrated BER Counter Interface for ValiFrame User's Guide.

The IBerReader interface is part of the ValiFrame installers, so no additional software needs to be installed. However, an additional license is required for each standard (e.g., PCI Express, MIPI C-PHY®, USB) you want to use it for. The licenses are available as "Integrated BER Counter Interface Add-on" options.

Contact your Keysight representative if you wish to purchase a license. To activate a license, use the BitifEye License Manager (BLM): https://licensing.bitifeye.com/. See also Chapter 4: Licenses.

SAS N5991 Eye Opening Script Server

In order to run the SAS3 Amplitude and ISI Calibrations (12G), a connection to the Sas3EyeOpeningScript needs to be established. This is provided by the SAS N5991 Eye Opening Script Server application. It contains the MATLAB script that is required to calculate the eye parameters from waveform data.

You can download this tool from the BitifEye Download Hub.

For more details, see the N5991 SA4A/3A SAS Test Automation Software Platform User's Guide.

7 Troubleshooting and Support

This chapter describes what to do if you run into a problem with the ValiFrame Test Automation Software.

Troubleshooting

If you encounter problems when running the software, check the log list at the bottom of the main window. The log file can be viewed by right-clicking within the log list section (see red frame in Figure 7-1). The log file is temporarily saved

- at C:\ProgramData\BitifEye\ValiFrameK1\Tmp for N5991, AE2010R and AE69x0R ValiFrame applications
- at C:\ProgramData\BitifEye\ValiFrameK2\Tmp for N5992 ValiFrame applications

Note that all log information will be lost when the ValiFrame application is terminated unless you save the log file.

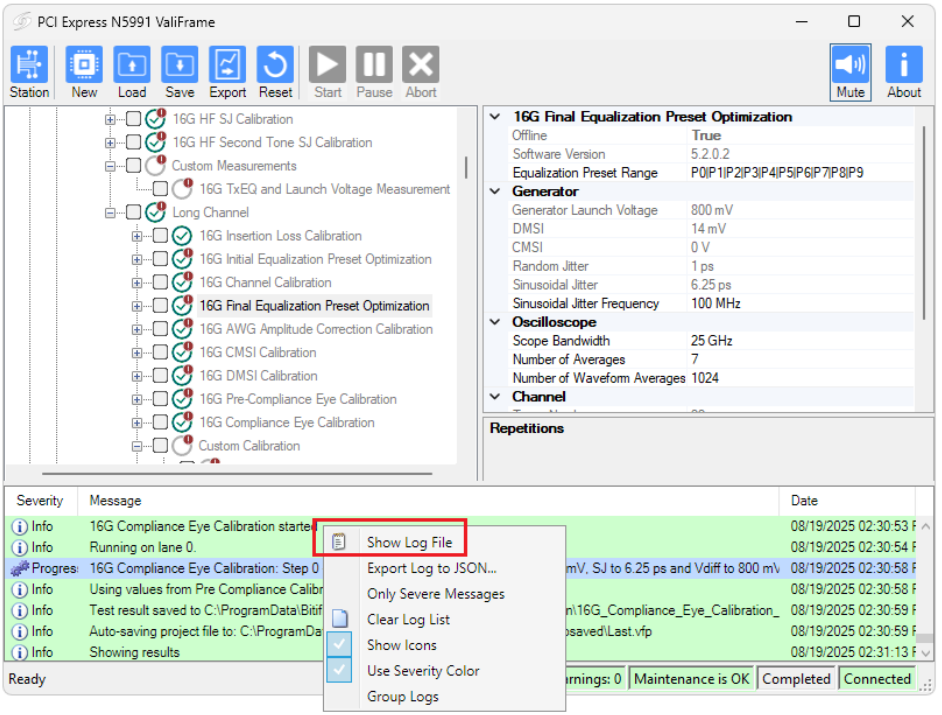


Figure 7-1 Accessing the log file

Support

If a problem with an application persists, click **About** (in the main window, Figure 7-2), create an issue report file (in the About window, Figure 7-3) and send this zip file (BitifEye_IssueReportFile.zip, which will be saved to your desktop) to your Keysight support contact.

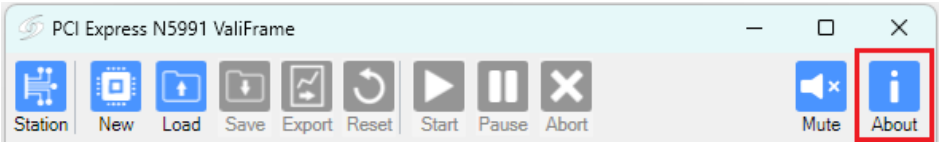


Figure 7-2 About button

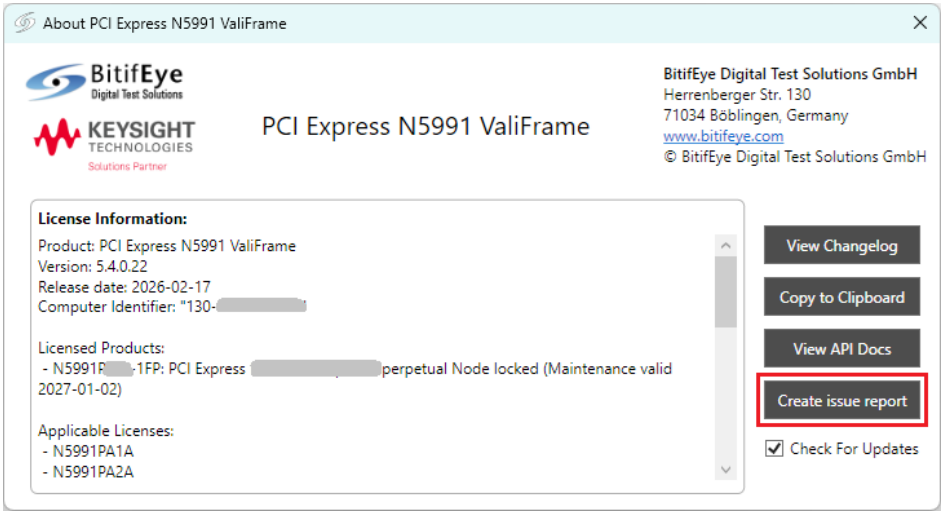


Figure 7-3 Creating an issue report file

The Keysight support team is also happy to help should you require further information about a particular application.

For support options, visit www.keysight.com/find/contactus.

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A Acronyms and Abbreviations

This Appendix contains a list of acronyms and abbreviations used in this Getting Started Guide.

List of Acronyms

Acronym	Definition
A	
AE	Automotive Ethernet
API	Application Programming Interface
ASIC	Application-Specific Integrated Circuit
AWG	Arbitrary Waveform Generator
B	
BER	Bit Error Ratio
BERT	Bit Error Ratio Tester
BLM	BitifEye License Manager
C	
CLI	Command-Line Interface
CTS	Compliance Test Specification
D	
DLL	Dynamic Link Library
DUT	Device Under Test
F	
FW	Firmware
G	
GUI	Graphical User Interface
H	
HDMI	High-Definition Multimedia Interface
HTML	HyperText Markup Language
I	
ID	Identifier
IO	Interface; Input-Output

Acronym	Definition
ISI	Inter-Symbol Interference
J	
JSON	JavaScript Object Notation
L	
LAN	Local Area Network
M	
MIPI	Mobile Industry Processor Interface
P	
PC	Personal Computer
PCIe	Peripheral Component Interconnect Express
R	
RJ	Random Jitter
S	
SAS	Serial Attached SCSI
SCSI	Small Computer System Interface
SJ	Sinusoidal Jitter
SW	Software
U	
USB	Universal Serial Bus
V	
vfc	ValiFrame Configuration
vfp	ValiFrame Project
VISA	Virtual Instrument System Architecture

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