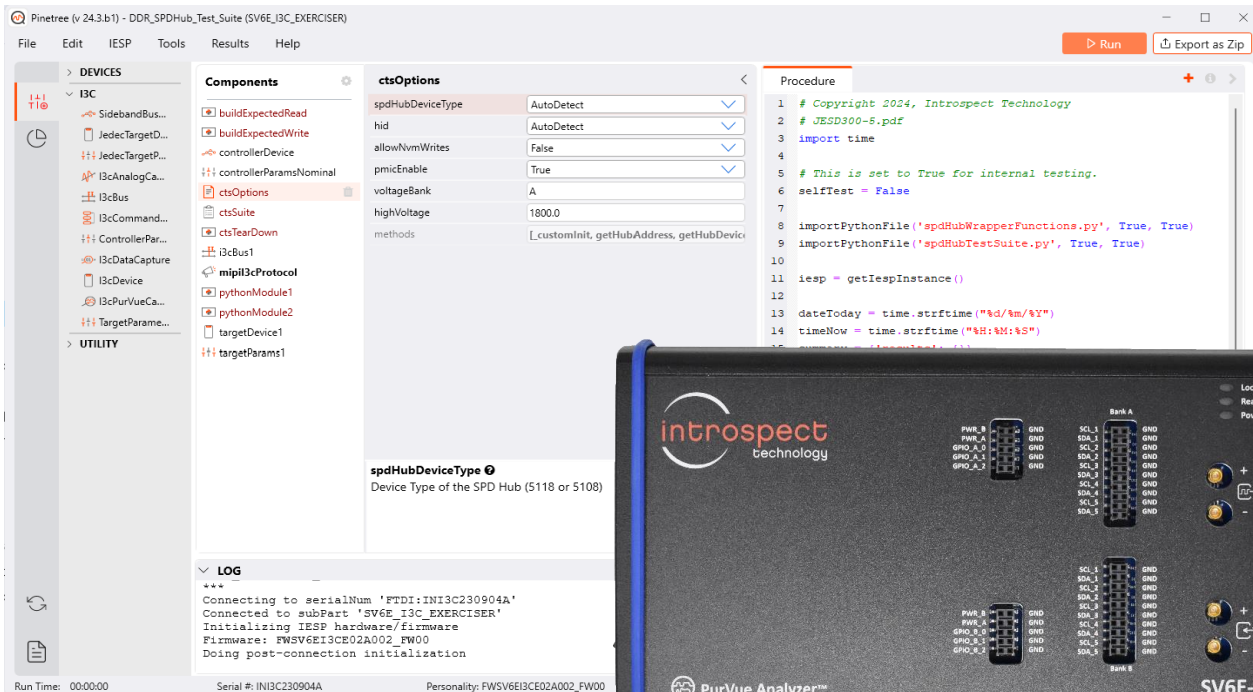




QUICK START GUIDE

DDR5 SPD Device Hub

Conformance Test Suite



The screenshot shows the Pinetree software interface for the DDR5 SPD Device Hub Conformance Test Suite. The interface includes a menu bar (File, Edit, IESP, Tools, Results, Help), a toolbar with 'Run' and 'Export as Zip' buttons, and several panels:

- DEVICES:** A tree view showing the device hierarchy, including I3C, I3C Bus, and I3C Device.
- Components:** A list of components such as buildExpectedRead, buildExpectedWrite, controllerDevice, and ctsOptions.
- ctsOptions:** A configuration panel for the ctsOptions component, with fields for spdHubDeviceType (AutoDetect), hid (AutoDetect), allowNvmWrites (False), pmicEnable (True), voltageBank (A), highVoltage (18000), and methods.
- Procedure:** A code editor showing a Python script for the test suite, including imports, initialization, and test execution logic.
- LOG:** A log window showing connection details, including serial number 'FTDI:INI3C230904A' and personality 'FWSV6E13CE02A002_FW00'.

At the bottom of the software window, the following information is displayed: Run Time: 00:00:00, Serial #: INI3C230904A, Personality: FWSV6E13CE02A002_FW00.



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Introduction

This document is a quick start guide for Introspect's Conformance Test Suite (CTS) application used for testing JEDEC's Double-Data Rate 5 (DDR5) Serial Presence Detect (SPD) Device Hub specification. It executes within the Pinetree software environment and enables automated testing with the Introspect SV6E-X module. The test procedure provides a fast and easy way to validate and debug interface parameters and signal protocols as specified in this standard.

Hardware Layout

Figure 1 shows the physical connections on the SV6E-X module. The SV6E-X has two USB ports (USB 2.0 and USB 3.0) located on the left side of the chassis, which allows the SV6E-X to communicate directly with a PC. Power is provided to the SV6E-X module with a 12 V DC supply through a barrel connector. The recommended DC power supply, included with the SV6E-X module, is produced by CUI Incorporated, Part # CUI SDI65-12-U-P5.

Next, there are two GPIO and power banks, shown as GPIO & Power (Bank A) and GPIO & Power (Bank B). You can connect your device under test to either the DUT Interface (Bank A) or DUT Interface (Bank B), depending on your DUT's voltage range. See more information on the GPIO connections and signal pinouts in Tables 1 to 4 below. Finally, the SV6E-X has connections for a Reference Clock Output and a Reference Clock Input.

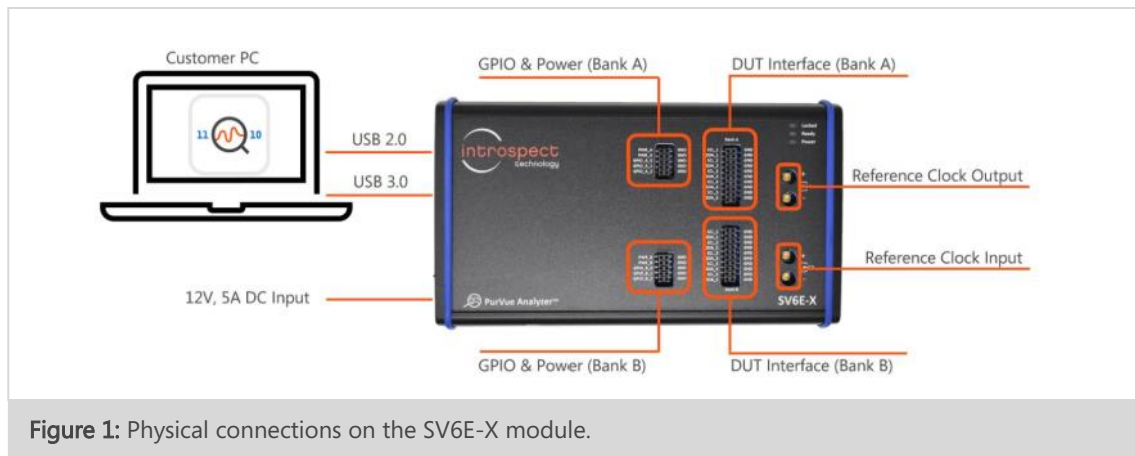


Figure 1: Physical connections on the SV6E-X module.

The current version of the DDR5 SPD test suite offers tests that cover both host and local bus testing as shown below in Figure 2.

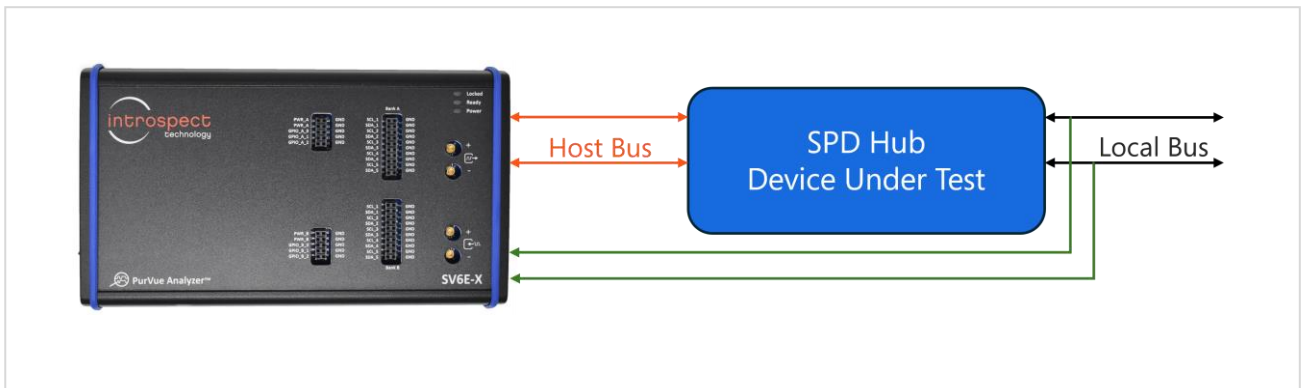


Figure 2: The DDR SPD test suite offers tests that cover both host and local bus testing.

Pinetree Installation

SYSTEM REQUIREMENTS

Introspect's software, Pinetree, provides an easy-to-use environment for device characterization and test plan development. To run the software, the following components are required:

- A PC installed with Windows 10 or later
- The Pinetree install executable
- USB device drivers (refer to the driver installation instructions)

INSTALLING PINETREE

1. PREPARE FOR INSTALLATION

Quit any Pinetree sessions before starting the installation.

2. INSTALL SOFTWARE

- a) From the directory containing the installation files, double-click on the icon for "IntrospectESP_Installer.exe" and follow the instructions on the screen.
- b) The installer will install a local Python environment, and it has no dependence on any Python installation that already exists on your PC.
- c) When prompted, specify the location where you want to install the Pinetree application. (Note that this must be a new location, not a location of a previous installation). The default location is the "Introspect" folder under the Windows "Program Files" folder. The application will be installed into a sub-folder with a name that includes the version number. The application will also create a folder called "Introspect" under the "My Documents" folder of your account. This folder is where test procedures are typically stored.

3. INSTALL LICENSE FILE

- a) Towards the end of the installation, you will be asked to provide either an activation key or a license file for the software.

- b) If you have a valid activation key, simply select the "Use Activation Key" option, and continue with the installation. You will be asked to enter the Activation Key code later when you start the GUI for the first time.
- c) If you were provided with a license file instead, or if you have valid license files from a previous installation, select the "Use Existing License" option, and the installer will help you copy the license file into the new installation folder.
- d) If you do not have any of the above, select the "Get a New License" option, and the installer will provide you with information that needs to be sent to Introspect Technology customer support. Before continuing, you will need to send this information to license_support@introspect.ca to request a license. Then, upon receipt of the valid license files, place them into the following directory:

C:\[Your Introspect Installation Folder]\Licenses

NOTE

The installer creates a folder called "Introspect" under the "My Documents" folder of your Windows account. This folder is where test procedures are saved by default.

4. RUN PINETREE

- a) Double-click on the "Pinetree" shortcut on your desktop and you should see the first "welcome" window of the GUI. Specify the hardware as "SV6E_I3C_EXERCISER" and Press "Next" to continue.

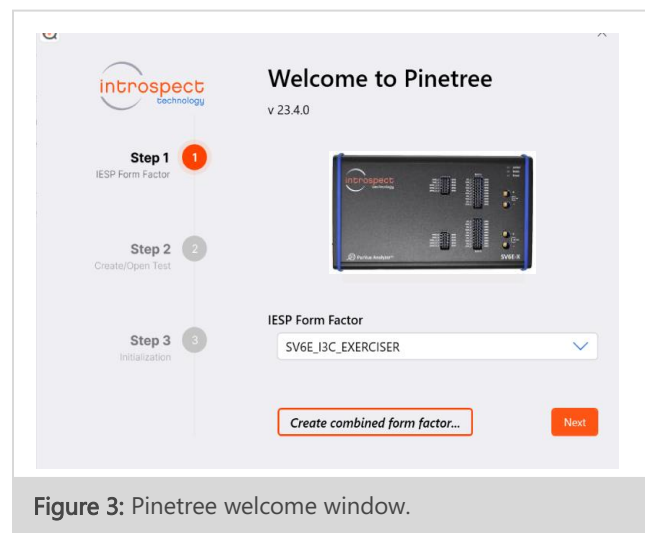


Figure 3: Pinetree welcome window.

- b) Select the option "Create a new Test" and click the "Next" button.

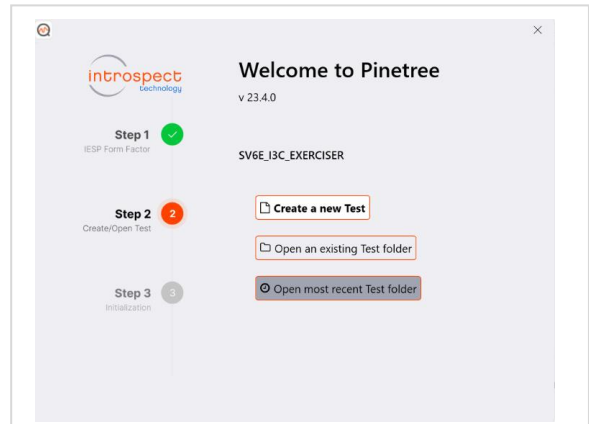


Figure 4: Prompt for creating a new test.

- c) With a valid license in the "Licenses" directory, the following GUI screen should come up, which indicates that Pinetree has been successfully installed.

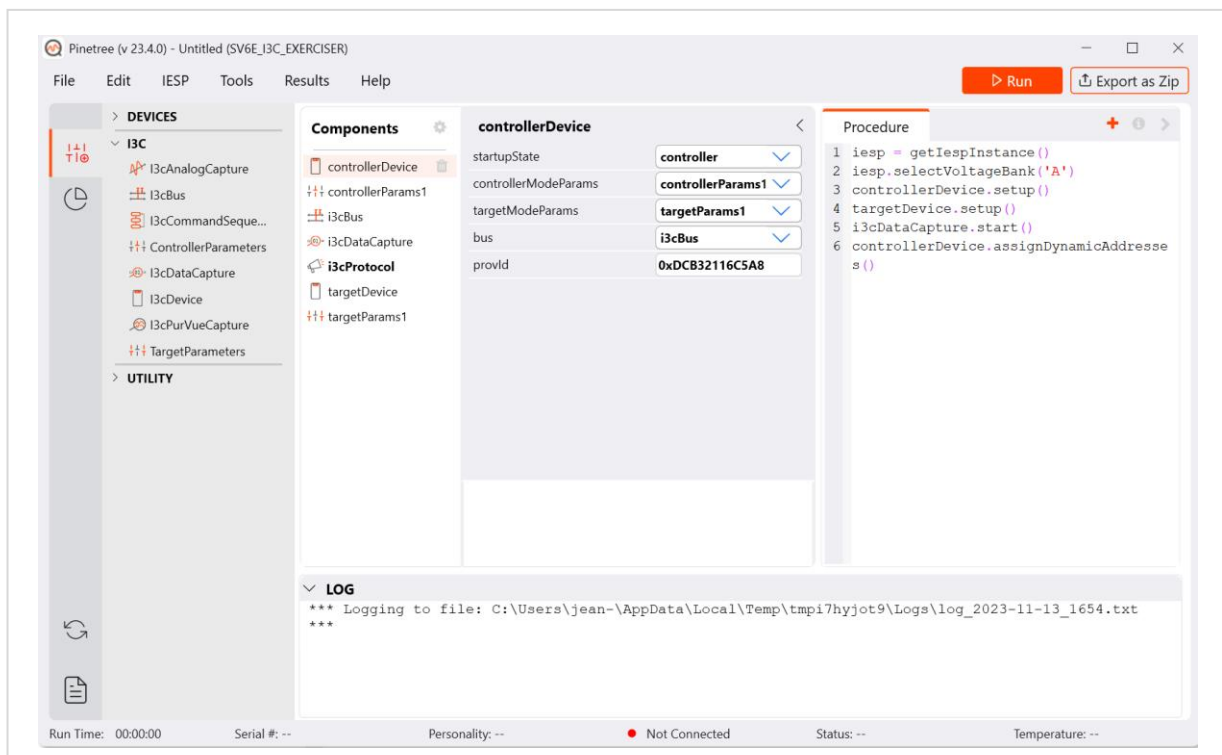


Figure 5: SV6E_I3C_EXERCISER window in Pinetree.

FURTHER DOCUMENTATION

The "[IntrospectESP_install_dir]\Doc" folder contains the following information on the software:

"IntrospectESP_UserManual.pdf" is the user manual for Pinetree and is recommended reading for all users.

"svt.html" and "iesp.html" provide documentation on the Python component classes and lower-level functions specific to the selected form factor. Both files can be found in "`<iESP_inst_dir>\Doc\FormFactors\SV6E_I3C_EXERCISER`". These are intended for intermediate and advanced users.

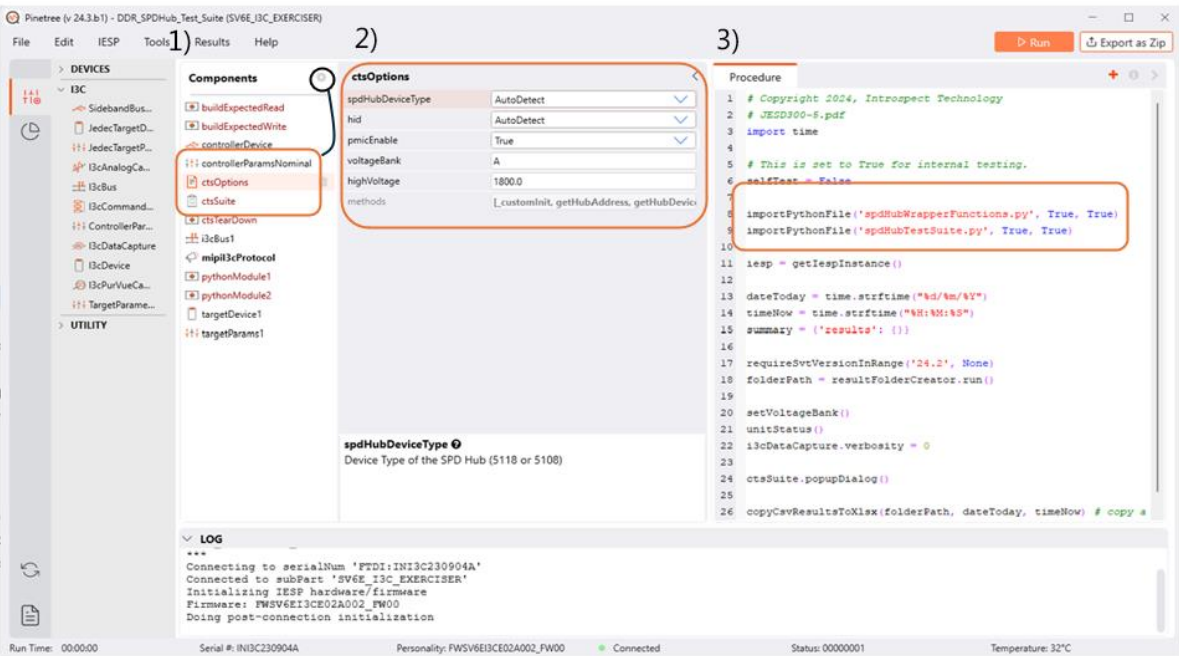
NOTE

Both the user manual and the above html files are also conveniently available from the "Help" drop down menu located on the top right corner of the main Pinetree window.

"Application Notes" can also be found in the "[IntrospectESP_install_dir]\Doc" sub-folder and have more advanced features, often in the form of tutorials.

Running the DDR5 SPD Conformance Test Suite

Figure 6 shows the CTS application window when “DDR5_SPDHub_Test_Suite.intr” is first loaded in Pinetree. As can be seen, it is populated with a group of components that are highlighted, and these constitute the principal method for configuring tests and automating them. These components are described briefly in the following sections.



1) The components that are used to run the test suite.

The individual CTS tests can be made visible using the “gear” button at the top right

2) The middle panel shows the attributes available for each component. The default values can be updated by user as needed.

3) The test procedure that is executed when user hits ‘Run’. The python files containing the methods used in the test are highlighted.

Figure 6: Illustration of the DDR5 SPD CTS test procedure when opened in Pinetree.

1. CONFIGURE GENERAL TEST OPTIONS:

Figure 7 shows the ctsOptions data record component, which is used to select the various options for the test. You can see the attribute descriptions in the box below when you click on an attribute. The user should modify the “highVoltage” and “voltageBank” attributes based on their test needs.

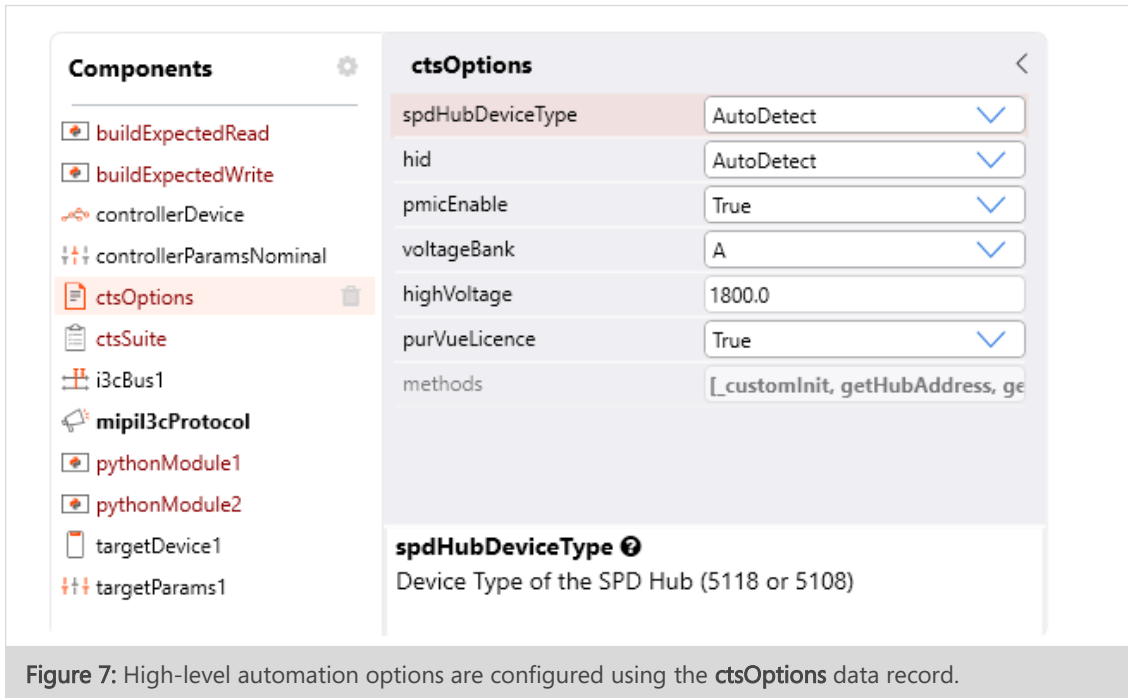


Figure 7: High-level automation options are configured using the ctsOptions data record.

2. IDENTIFYING WHICH TESTS TO EXECUTE

All the tests available for this CTS are described in the Method of Implementation (MOI) document accompanying the test suite. Once the general options are established, the next step is to select which CTS tests to execute. This is done with the ctsSuite Component. There are four choices for the collectionMode : allTestCases, byNamePrefix, byNameRegex and manual. By default, all the tests are executed but here we discuss which modes can be used to provide more control over this setting:

In byNameRegex mode, there is a "nameRegex" parameter, where you can set a rule to filter out the CTS tests that you want to execute. For example, "^cts_.*_.*_.*" means that all CTS tests should be executed, while "^cts_2_3_.*" means that only the tests in Section 2 Group 3 should be executed.

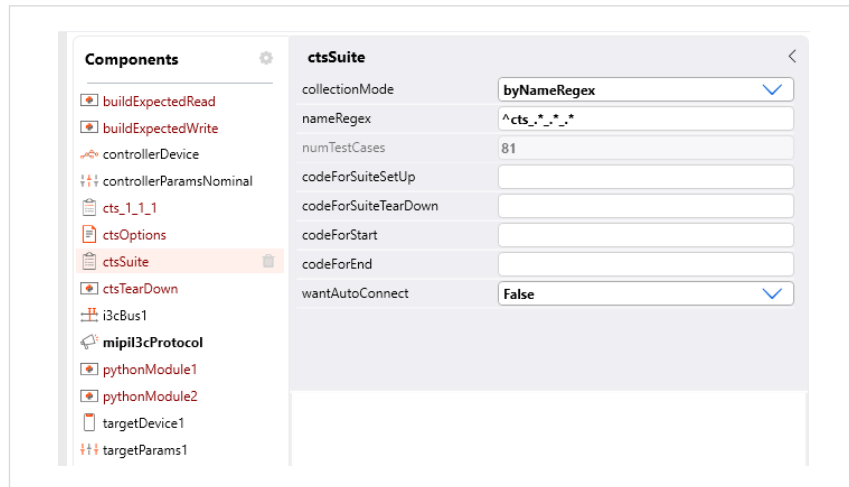


Figure 8: Illustration of the selection mechanism for CTS test suite.

In manual mode, there is a "testCases" parameter, where you can manually select names of the CTS tests to the list. This is a useful feature when you want to execute a small selection of tests.

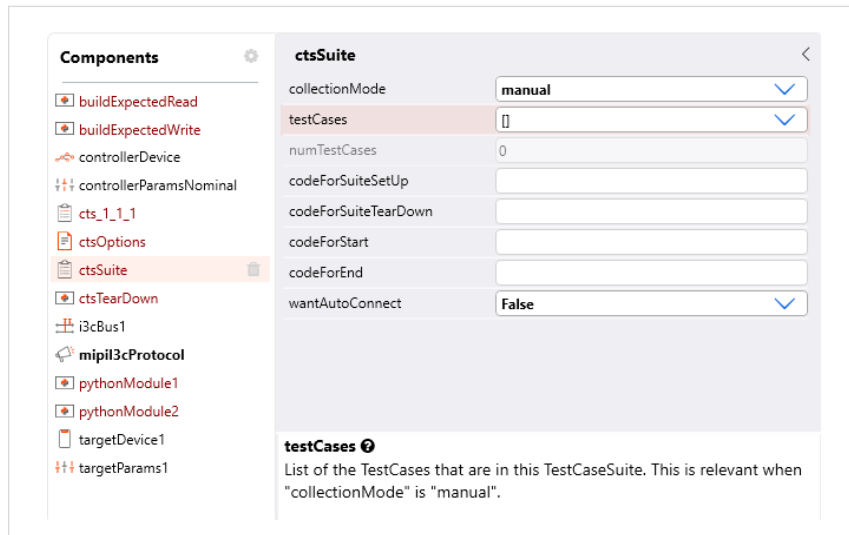


Figure 9: Execute a small selection of tests using the testCases parameter.

3. EXECUTING THE TESTS

At this point, the main execution flow for the test is configured. The test suite can now be launched by ensuring the target device under test (DUT) is connected properly to the SV6E and then hitting “Run” on the application window.

After the Controller has connected to the DUT and detected the Host ID, a pop dialog will appear as shown in Figure 10 prompting the user to select which test to execute. The user can run each test individually or select the option to run all tests from the ‘lists’ tab. It is recommended to run a few tests individually and ensure the test setup is working before launching all of them. Some tests, such as 6.1.1 and 6.1.2, prompt the user to carry out certain checks which should be executed manually when they appear.

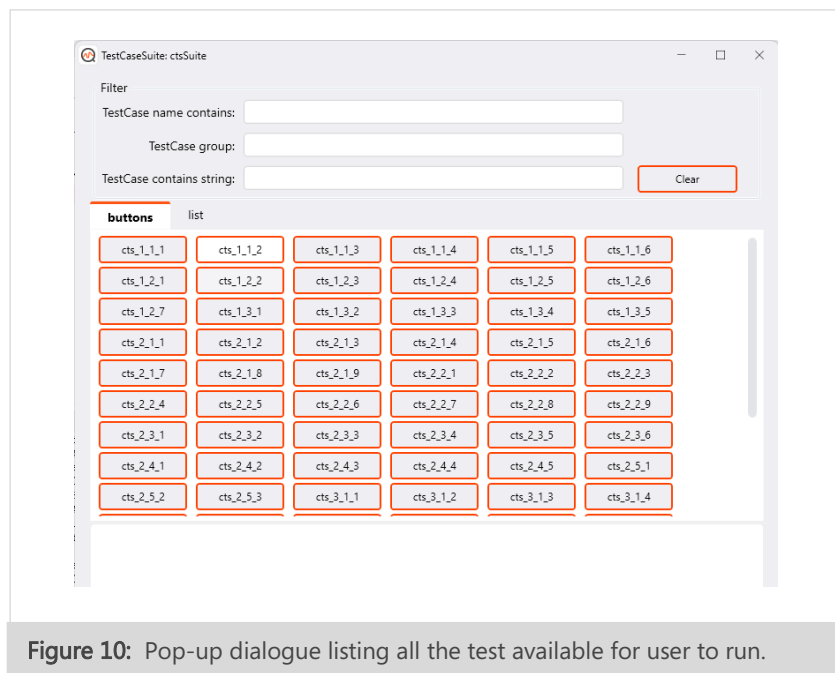


Figure 10: Pop-up dialogue listing all the test available for user to run.



REVISION NUMBER	HISTORY	DATE
1.0	Document Release	June 20, 2024
1.1	Updated Figure 7	June 25, 2024

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