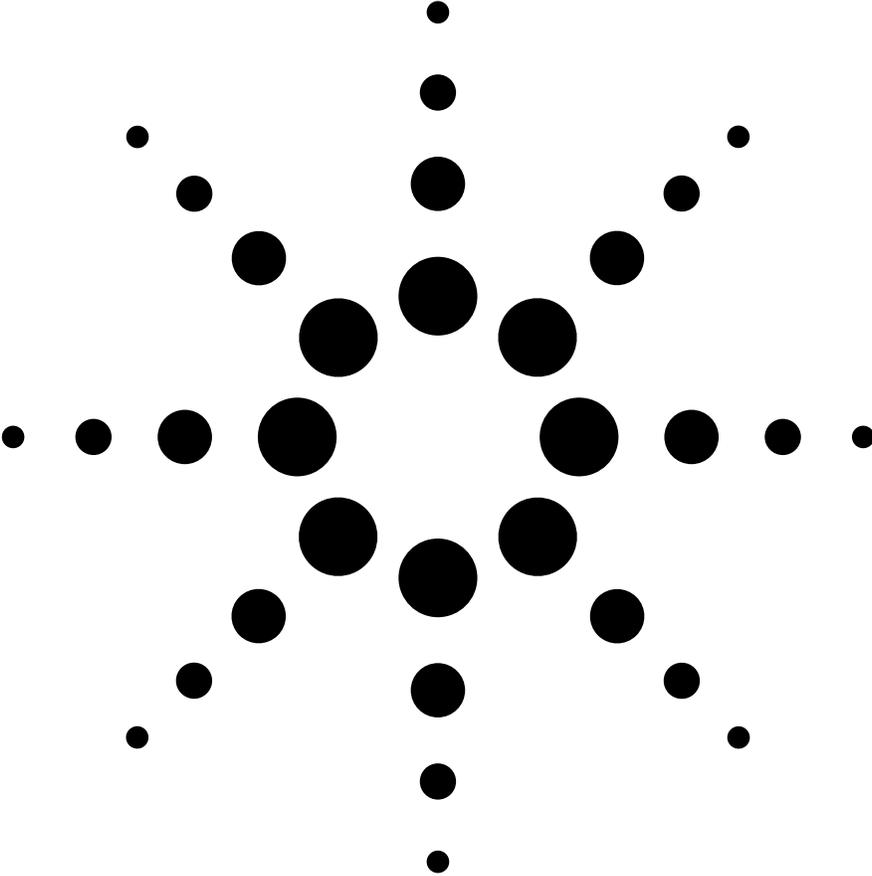


Tips for Speeding Test Development with the Agilent Medalist i5000

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Overview

The Agilent Technologies Medalist i5000 in-circuit test (ICT) system includes four important features to accelerate test development, debug and run-time performance at ICT:

- Test developer graphical user interface (GUI)—guides test developers through board development, helps prepare fixture files for the fixture supplier, and makes sure the test program is complete and ready for turn-on once the fixture is available.
- Debug GUI—provides a single interface for pins, shorts, analog in-circuit, and vector-less test debug, and includes a customizable automated analog in-circuit test debugger to get test programs turned-on quickly.
- Un-multiplexed digital architecture—allows fixture files to be created faster, produces cleaner digital signals to the DUT, and allows faster implementation of engineering change orders (ECOs).
- Operator GUI—provides an intuitive interface for test operators, and gives them full control over the test system and test program execution.

For engineers who are used to developing, debugging and running tests on other platforms, the power of these Medalist i5000 features may not be immediately obvious. This paper explores the features, discusses tips and techniques for using each feature, and provides insights with regard to the i5000 and its ability to enhance test development, debug, and run-time performance. These tips help get tests into production sooner.

Test Developer GUI

The Medalist i5000 test developer GUI guides the entire test development process. This process begins with the board and board_xy files that are created via a CAD data translator (for example, RSI's CAMCAD Professional) and continues through final test development.

An overview of this powerful interface can be seen in Figure 1. More detail around its operation can be found in the online help system.

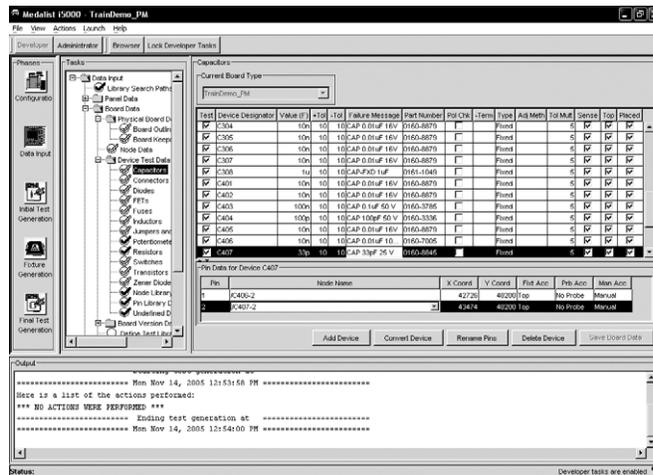


Figure 1. The Medalist i5000 test developer GUI

Tips for using the test development GUI

- To create the fixture files, you must go through the first four test development “phases.”
- Libraries for digital devices are not required to generate fixture files. In fact, it will be quicker if the software does not find the libraries; instead, you should specifically define the test type for your digital devices in the “define test library” task of the “data input” phase of test development. You will need digital libraries for your devices in order to complete the “final test generation” phase, however. This is the recommended process. Refer to the online help for the Medalist i5000 for more information.
- You do need analog functional and mixed test libraries to generate fixture files. These can be created by launching a BT-Basic window from the “launch” menu on the GUI and creating a “setup-only” library for the device. For mixed test libraries, you must have both an analog library and a digital library. The digital libraries for mixed tests can be created by launching the setup test editor from the “launch” menu of the GUI. You should also have libraries for analog part description libraries such as resistor packs and three-pin diodes.

- Analog libraries should be used to describe impedances within a device. This will help the in-circuit program generator (IPG) write a better test that has a better chance of turning on without debug. For example, an RJ-45 twisted-pair LAN connector on a board will have the magnetics and termination defined within the connector itself. If these components are not described to the IPG, the surrounding components may require additional debug. This can be further complicated since data communication boards may have many (48 or more) of these types of connectors on the board, each of which will require additional debug.
- Use the column “sort” capability on the test development GUI to quickly identify tests with no device values or tolerance values. This is useful in cases where the CAD data translator has not created all the entries in the board file. To sort on a particular column for a device type, simply click on the column heading to sort the table in alphabetical ascending order. Click the column heading again to sort in descending order. You can also use the sort capability to quickly identify devices that will not have a test (click on the “test” column), capacitors that are using the polarity check feature (click on the “Pol Chk” column for capacitors), and devices that have a high tolerance value (click on the “+ Tol” or “– Tol” column).
- The test developer GUI allows you to change values for multiple components at the same time (i.e., mass edit). Here is the quick procedure to do this:
 1. Click on the cell of the column you want to change (for example, the “+ Tol” column) for one of the devices in the group.
 2. Select the other devices by holding the “Shift” key and selecting the last device in the contiguous group or hold the “Ctrl” key and select individual devices for the group you want to change.
 3. Press and hold the “Shift” or “Ctrl” key (depending on how you selected the devices in step 2 above), and click on the value in the column you want to change.
 4. Enter the value you want for that column and press “Enter.” All other selected components in the column should also change values when you press “Enter.”
- There is no “undo” for any changes that you make for a particular device type (for example, on capacitors, resistors, and pin library devices). If you make a mistake and want to start over, simply select a different device type. A warning message (Figure 2) will appear, stating that the board data has been changed but not been saved. Just press “No” and any changes you have made will not be saved to the file.

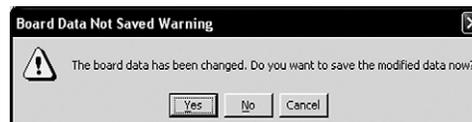


Figure 2. The “board data not saved warning” message box.

- You should periodically save your work if you are doing quite a bit of data manipulation in the test developer GUI for a particular component type. To do this, press the “save board data” button located at the lower right corner of the device data panel.
- If you are using the Medalist i5000 boundary scan tools, you must fully enter the boundary scan table and have the corresponding BSDL file available for the devices you are adding. You should also enter the boundary scan chain information. You can have the test developer GUI calculate the boundary scan chains on your board by clicking on the “calculate chains” button on the “boundary scan” task of the “data input” phase. This will look at the boundary scan devices you have entered, the BSDL files for those devices, and the connections in the board file to determine what chains exist on the board.
- Note that a few of the pull-down menu selections can be accessed by keyboard “accelerator” keys rather than the mouse. A table of keyboard accelerator keys can be found in Appendix A in this document.
- You can use “cut/copy and paste” to fill fields in the test developer GUI. There is no pull-down menu selection to do this, but you can use the standard Windows keyboard accelerator keys to do this: “cut” is CNTL-X, “copy” is CNTL-C, and “paste” is CNTL-V. You can also use the copy and paste feature to move between applications. This feature works for the tables in the test developer GUI as well as the output area. Use CNTL-A to select all items in the area.
- Once a test is fully debugged, press the “lock developer tasks” button on the test developer GUI. This will prevent accidental changes to the board data. Thereafter, if you try to resave board data, a message box (Figure 3) will appear, warning that the development on this board has been locked.



Figure 3. The “developer tasks locked” message box.

Test Debug (EngineerTest) GUI

The test debug GUI, labeled “EngineerTest,” is available only on the Medalist i5000 test-head controller. For the rest of this document, it will be referred to as the “Engineer” GUI. This GUI skin is intended as the main interface to debug programs and test fixtures.

An overview of the engineer GUI is shown in Figure 4. For more information regarding layout and general use, please refer to the online help system.

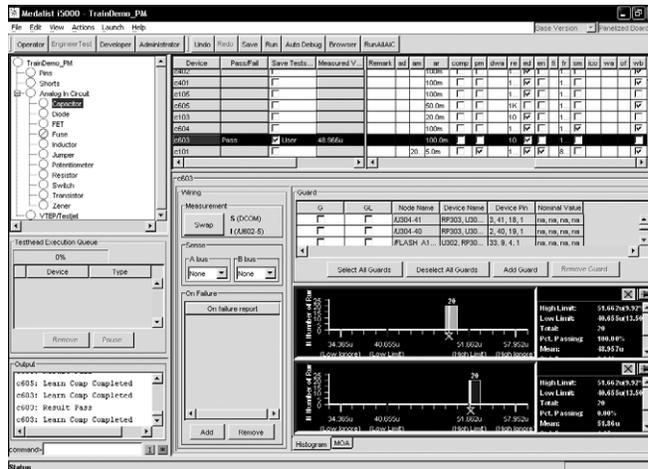


Figure 4. The Medalist i5000 engineer GUI.

- Use the column “sort” feature of the GUI to sort information into different views. For example, if you run a test and get failures, you can click on the failing component type (capacitor, diode, resistor, etc.) and press the “pass/fail” column header top see all failing tests of that component type. You can also use the sort feature to list components of a particular value, option, and tolerance. Note that the sorting feature will not work for shorts test debug because the shorts test is executed in the order that the nodes are listed.
- The “mass edit” feature allows you to change many component options such as extra digit, change the upper and lower tolerance, or remarks (i.e., comments). To use this feature:
 1. Select the tests that you wish to change.
 2. Click on the value or option checkbox you want to change in that group of tests.
 3. Change the value or select/deselect the option box.
 4. Right-click with the mouse and select “mass edit.” The selected tests will change to the new value or option.
 5. You can repeat the procedure for other options or values on the same group of tests as they remain selected after the “mass edit” action.
- Drag and drop columns to any position in the GUI. For example, you might find it easier to debug a test by moving the “measured value” column next to the “pass/fail” column. Also note that column widths are adjustable as well.

- Use the “find device” command to search for component tests. This is helpful for finding tests that are commented or fail a specific type of test. For example, use “find” to look for all commented resistor tests by selecting “resistor” as the type and “commented” as the status of the component. To show these options, check the “search options” checkbox on the “find device” command dialog box (Figure 5). Note that the accelerator key for the “find” command is “CNTL-F”, the same as in many Microsoft Windows® applications.

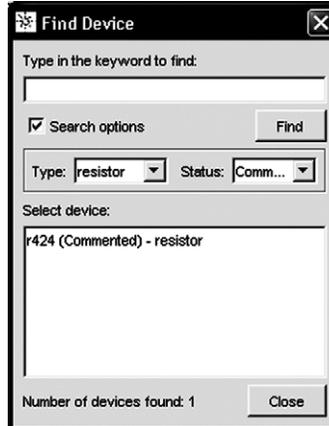


Figure 5. The find device dialog box.

- AutoDebug is not recommended for low-value capacitors (capacitors with the “comp” option selected). If you run “AutoDebug” on a capacitor with “comp” selected, the vacuum will cycle for each iteration of the “AutoDebug” rule that is being applied to the capacitor test. This happens because the system is re-learning the capacitor compensation value each time the test is executed. This issue will be addressed in a future release of the Medalist i5000 software.
- When using pull-down menus, use the keyboard “accelerator” keys rather than the mouse to speed things up. For example, to turn-on the vacuum to the test fixture, use the “F2” accelerator key rather than using the mouse to select “actions ►► test head ►► vacuum A on.” Most functions have an accelerator key. A table can be found in Appendix A in this document.
- The AutoDebug feature for analog in-circuit debug is a powerful feature of the Medalist i5000, but while its standard rule sets will give you a working test, the test may not have the fastest execution performance. You should experiment with custom rule sets if test turn-on rate and test execution time need to be accelerated. Please refer to the Medalist i5000 online help system for more information about creating custom AutoDebug rule sets.
- The engineer GUI can be localized to local languages. In fact, a Chinese language localization file is included with the Medalist i5000. Simply use the Windows regional and language options to set the GUI to Chinese (PRC). For more information on localization, please refer to the Medalist i5000 online help system.

The Un-multiplexed Digital Architecture

One of the primary features of the Medalist i5000 is the un-multiplexed digital architecture, which provides a fully programmable digital driver and receiver at every pin. This feature enables the i5000 to quickly create the wiring information for the test fixture without requiring digital test libraries.

This feature can also be used to improve productivity during digital debug. For example, while debugging a digital device, you might realize that additional disabling or conditioning is needed for surrounding digital devices that are causing your test to fail during debug. This can easily be accomplished provided you already have physical access to the problem node. You would simply add that node or nodes to the digital test you are debugging and recompile the test. Since the Medalist i5000 is un-multiplexed, no wires need to be added to the test fixture. This allows you to turn on digital tests quicker and also allows easier implementation of ECOs.

The un-multiplexed hybrid pin card used on the Medalist i5000 also includes “scanner” sensing for analog in-circuit measurements. This feature allows analog in-circuit measurements to be taken using the remote sense busses (A, B, or L) without adding wires to the test fixture. The un-multiplexed hybrid card simply closes relays on the card to make a connection between the source bus and sense bus on the card itself. This will not be as accurate as “true” remote sensing (i.e., with wires added to the test fixture), but it will be much closer than eliminating remote sense altogether. This feature helps improve the accuracy of measurements in the debug environment, without having to add wires.

The Operator GUI

The main interface to the Medalist i5000 for production testing is the operator GUI (Figure 6). The operator GUI has a few areas that should be noted:

- The testhead control panel is located on the upper-left side of the GUI and provides the main controls for loading and running a test program.
- The information area of the GUI contains the test program status, the first pass yield (FPY) area used to display the current yield (number of boards passed/number of boards tested), and the worst probe report area that displays a list of probes that are related to failing tests. If certain tests fail frequently, it could be an indication that a probe is dirty or damaged and should be replaced. The FPY and worst probe report areas can be disabled if needed.
- The user defined control area is located on the lower left side of the GUI. This area can be used to launch a special application such as a WIP tracking program.
- The output area uses a majority of the GUI and is located in the upper right side. This is where testplan messages appear.
- The board graphics area is used primarily for panelized boards. Operators can select the boards that will be tested.

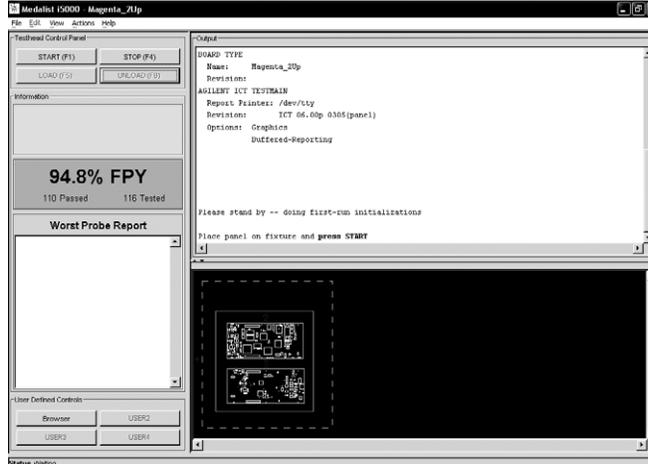


Figure 6. The Medalist i5000 operator GUI.

Some tips for using the operator GUI:

- The operator GUI can be localized to display local language text and character sets. In fact, the Chinese localization file is already on the Medalist i5000. To access the file, simply change the local to “Chinese (PRC)” and start the Medalist i5000 software (Figure 7). To fully utilize the Medalist i5000 localization feature, the testplan should be localized as well. This will allow you to display the testplan messages as well as the operator GUI labels in the local language. For more information on localization, please refer to the online help system.



Figure 7. The Medalist i5000 operator GUI with Chinese characters.

- As with the engineer GUI debug screen, most actions for the GUI can be controlled by keyboard accelerator keys. For example, the “start” button can be activated by pressing the “F1” key on the keyboard.
- The FPY display requires the testplan file to have a “first pass yield” statement in it. The details on this statement are in the Medalist i5000 online help system.
- The worst probe report requires that the testplan have a “probe report on” statement in it and that it is executed prior to the “load board” command in the testplan. The details on this statement are in the Medalist i5000 online help system.
- Both the FPY and worst probe report areas can be enabled or disabled by going to “view \Rightarrow operator” and checking or un-checking the first pass yield and worst probe report selections.
- The results for FPY, worst probe report, and the output area also can be cleared by going to “view \ddagger operator” and selecting the appropriate “clear” commands at the bottom of that menu. For example, you may want to track the first pass yield of a new batch of boards that you just received in your production line.
- The operator does not need to log-off for an engineer to have access to the system (for debugging a test program or device, for example). Simply go to “actions \Rightarrow login ...” or press the ‘F9’ key on the keyboard and you will see a logon prompt (Figure 8).

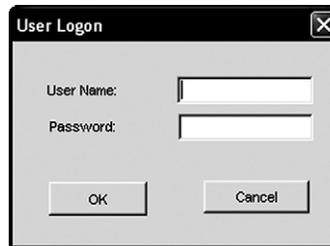


Figure 8. The Medalist i5000 engineer logon dialog box

- You should logon with an account that is a member of the “AgilentICTUsers” group. The default account for this is “engineer”, but can be any valid account on the Medalist i5000 that is a member of this group. No other users will be allowed to logon to the engineer GUI (including administrator) unless that user is a member of the “AgilentICTUsers” group.

Conclusion

The Agilent Medalist i5000 provides a major improvement in test development times by allowing test developers to quickly create fixture files and thus shorten the overall development cycle. Initial test debug can be achieved in a minimal amount of time so debugged tests can be released to manufacturing sooner. Significant productivity-enhancing features, including interfaces that are intuitive and localizable, help developers create fixtures and tests quickly while working in a familiar, productive environment.

Appendix A. Table of Keyboard Accelerator Keys

Action	Medalist i5000 GUI Skin			
	Operator	EngineerTest	Developer	Administrator
Actions --> Login (to EngineerTest)	F9			
File --> Open	Control-O	Control-O	Control-O	
File --> Reopen		Control-R		
File --> Save		Control-S		
File --> New			Control-N	
Select All Text	Control-A	Control-A	Control-A	Control-A
Cut Text	Control-X	Control-X	Control-X	Control-X
Copy Text	Control-C	Control-C	Control-C	Control-C
Paste Text	Control-V	Control-V	Control-V	Control-V
Edit --> Undo		Control-Z		
Edit --> Redo		Control-Y	Control-C	
Edit --> Link		Control-Shift-L		
Edit --> Unlink		Control-Shift-U		
Edit --> Find Device		Control-F		
View --> Clear Output Area	Control-Alt-A	Control-Alt-A	Control-Alt-A	
AutoDebug --> Run		F4		
AutoDebug --> Rule Editor		Control-Shift-E		
Verify --> Fixture		Control-Shift-X		
Verify --> Mux Cards		Control-Shift-M		
Verify --> VTEP/TJ Probes		Control-Shift-V		
Learn --> Capacitor Comp		F5		
Testhead --> Power On	Control-Shift-P	Control-Shift-P		
Testhead --> Power Off	Control-Shift-F	Control-Shift-F		
Testhead --> is 1	F6	F6		
Testhead --> Fixture Lock	Control-L	Control-L		
Testhead --> Fixture Unlock	Control-U	Control-U		
Testhead --> Vacuum A On	F2	F2		
Testhead --> Vacuum B On		Control-Shift-B		
Testhead --> Vacuum C On		Control-Shift-C		
Testhead --> Vacuum D On		Control-Shift-D		
Testhead --> Vacuum Off	Shift-F2	Shift-F2		
Testhead --> is *	F7	F7		
Execute Test --> Run		F9		
Execute Test --> Run Until Fail - Start		Control-T		
Execute Test --> Run Until Fail - End		Control-G		
Execute Test --> Run N Times		F11		
Execute Test --> Run All AIC		Shift-F9		
Launch --> Part Description Editor		Control-I	Control-I	
Launch --> Access Consultant		Control-E	Control-E	
Launch --> Boundary Scan		Control-D	Control-D	
Launch --> ScanWorks		Control-W	Control-W	
Launch --> Korn Shell		F3	F3	
Launch --> BT-Basic		F8	F2	
Launch --> Push Button Q-Stats		Control-H	Control-H	
Launch --> Coverage Analyst		Control-R	Control-R	
Launch --> Push Button Debug		F12	F12	
Launch --> i5000 Diagnostics		Control-Shift-N	Control-Shift-N	
Help --> Help Topics		F1	F1	F1

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