

Keysight Technologies

Improving Test Throughput with ASRU Speedup Feature on the *Medalist* i3070 Series 5

Application Note

Introduction

The Keysight Technologies, Inc. all new next-generation *Medalist* i3070 Series 5 comes with a new analog stimulus response unit (ASRU revision N) card along with software release 08.00p. The ASRU revision N card not only provides classical measurement operational amplifier (MOA) analog measurement capability but also includes a new digitized measurement circuitry (DMC) that can reduce unpowered analog test time. Enabling the DMC for the analog test is called ASRU speedup.

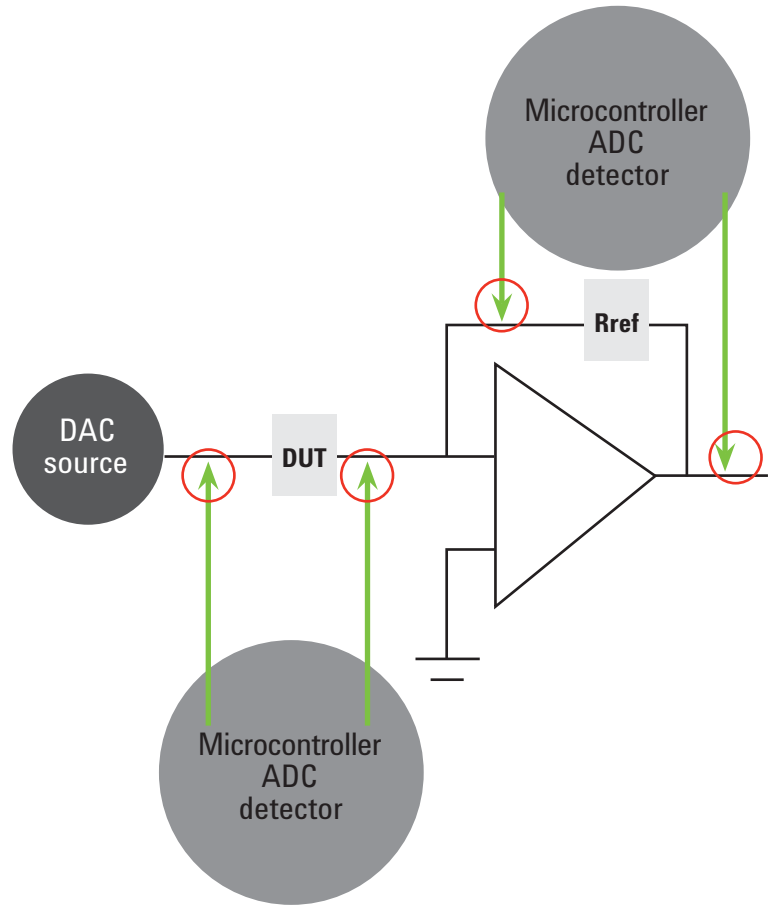


Figure 1: Digitized measurement circuitry (DMC) uses multiple microcontrollers to process all the measured values simultaneously.

What is ASRU Speedup?

ASRU speedup is a new software feature that uses the new DMC engine to speed up the testing time. The test source now accepts a new test option, "as", which is the short form for "ASRU speedup". This test option will instruct the system to measure the device under test (DUT) with the DMC which employs multiple microcontrollers with analog and digital convertors (ADC) using digital signal processing (DSP) methods to process the measured values. The detectors capture all the measurement simultaneously, thus improving test throughput.

What's Needed to Use ASRU Speedup?

The following are required when using the ASRU speedup feature:

1. ASRU revision N card or i3070 Series 5 testers
2. *Medalist* i3070 with minimum software release 08.00p
3. Windows XP based PC Controller

Using ASRU Speedup for New Test Program Development

- The ASRU revision N card must be declared in the board configuration file.
- To enable the ASRU speedup feature globally, add the 'enable' statement to the board configuration file. The "as" option will then be automatically added to all applicable device tests during the Interactive Program Generation (IPG).

```
enable asru speedup
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NOTE	IPG will write tests using the 'MOA' by default without this enable statement.
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Using ASRU speedup for existing test program

Assuming that a board test is already developed for and running on a target system with older revision ASRU cards, and that this board test is to be executed on a target system installed with ASRU revision N cards, to enjoy the faster testing speeds using ASRU speedup, the following procedures are available.

A. Using Test Consultant to re-generate tests

Benefits:

1. IPG will re-analyze the board information and existing tests and rewrite a test to include the "as" option only if the test is capable of using digital measurement circuit (DMC). Otherwise, IPG will rewrite the test using the "MOA" as a default.
2. IPG will also set the test to the correct ASRU range (ar) so that the measurement will execute faster and not go into the auto-ranging mode.

Steps:

- Modify the existing board configuration with the following steps and compile it.
 - Change ASRU revision C (or D) to ASRU revision N.
 - Add the 'enable ASRU speedup' statement.
- Next, compile board and board_xy files.
- Launch IPG Test Consultant, select either of the following:
 - Complete Analog Regeneration
 - Complete Analog; Clear Permanent

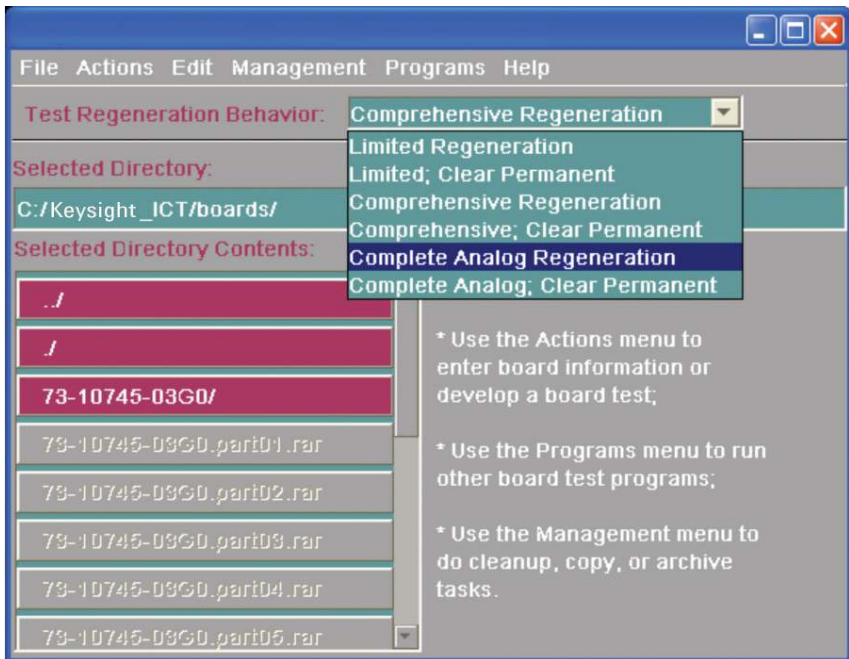


Figure 2: Keysight IPG Test Consultant with 2 new analog generation selections.

Note:

- Complete Analog Regeneration –
 - Write applicable device tests with ‘as’ option for those tests that are not marked ‘permanent’ in the ‘testorder’ file.
- Complete Analog; Clear Permanent –
 - Write applicable device tests with ‘as’ option regardless of test status in ‘testorder’ file as the “testorder” file will be recreated.
- Next, click Action → develop board test.
- Then click ‘Begin Interactive Development’.
- You can mark the following as “skip”:
 - Generate Initial Fixture Files
 - Create Custom Tests
 - Generate Test Requirements Files
 - Generate Final Fixture Files and Reports
 - Generate “testplan”
- Mark the following as “do”:
 - Generate Tests Using IPG
 - Generate Test Object Files
 - Recalculate Dependencies
- Then, click “Actions → All Steps To Stop Mark”.
- Once the above steps have been completed, you can start debugging the tests.

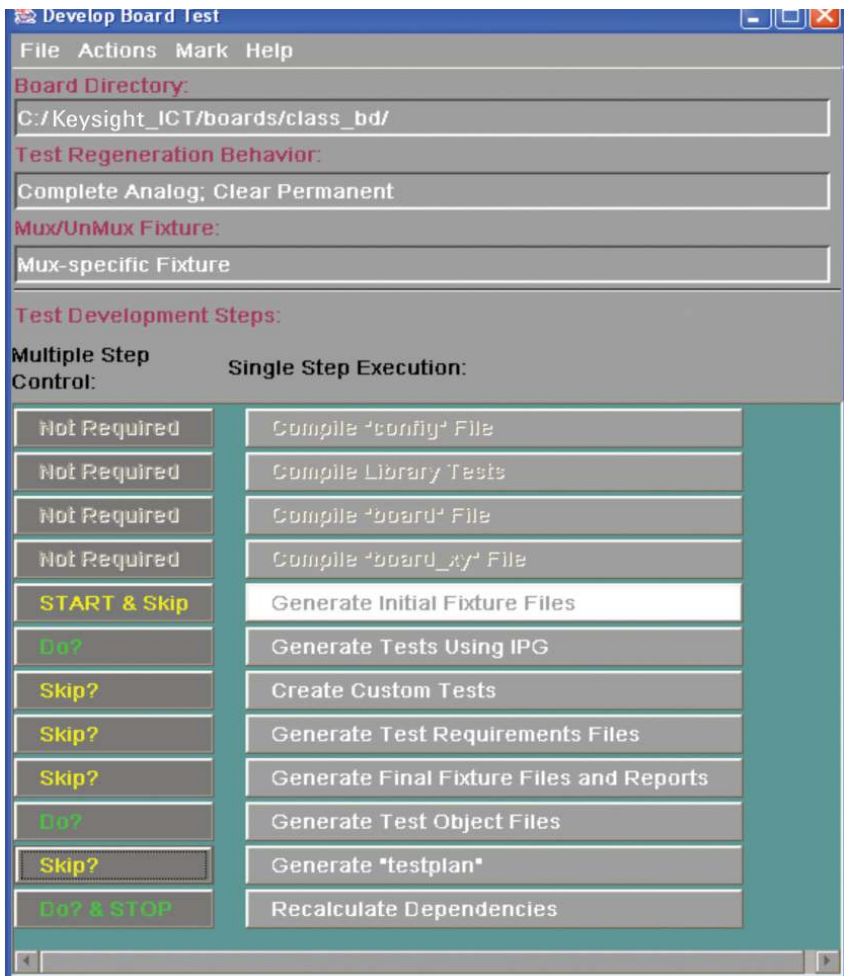


Figure 3: Marking appropriate steps with “Do” or “Skip”

B. Using ‘Mass Edit’ to add “as” options to tests

Benefits:

1. Less debug effort compared to the previous method if tests are properly debugged and maintained.
2. Requires only approximately 2-4 hours converting (adding in ‘as’ option and debugging) the tests.

Steps:

- Modify the existing board configuration with the following and compile it.
 - Change ASRU revision C (or D) to ASRU revision N.
 - enable multiple board versions.
- In this case, it is not necessary to enable ASRU speedup in the configuration file because we will be manually adding the "as" options in the procedures below instead of getting the IPG to do so.
- Start the Keysight *Medalist* i3070 and login to the Engineer Test interface.
- Load in the tests with File-Open and navigate to the device type, such as capacitor.
- Then highlight and select all the tests (Hint: use Ctrl-A to select all tests)
- Next, check one of the "ASRU Speedup" boxes. Then, right click and select "Mass Edit". The "as" option will be added to all the tests.
- Next, check one of the "Save Testsource" boxes. Then, right click and select "Mass Edit". (see picture below)
- Click "Save" button. The tests will save and compile one by one.
- Once completed, you can start to debug and run the tests.

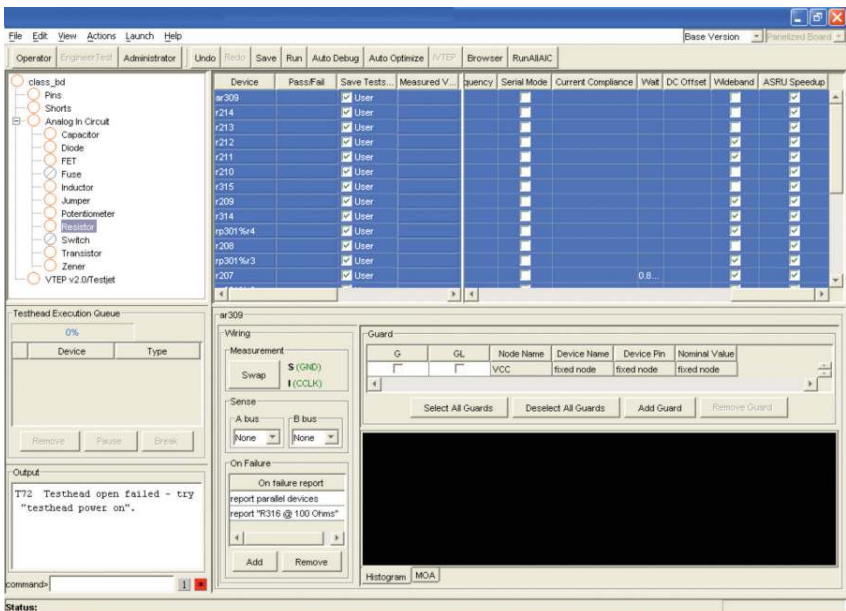


Figure 4: Edit ASRU Speedup using GUI

Best practice to maximize ASRU Speedup

Users can obtain even better test throughput with the following best practices.

To maximize the throughput, it is important to select the correct ASRU range (ar) for your test. If this option value is not chosen correctly, the detector will go out of range at the first measurement based on the range set in the test and will then automatically try to switch to correct ranges. This process results in the test to be executed twice, thus doubling the test time.

The following formula can be used to determine the correct ASRU range (ar) to set.

$$ar = V_{out} = R_{ref} / Z_{DUT} * V_s$$

V_s is default to 0.1

Z_{DUT} can be $Z_{DUT} = R$ or $Z_{DUT} = \frac{1}{2} \pi f C$ or $Z_{DUT} = 2 \pi f L$

R = Nominal value of the resistor under test

C = Nominal value of the capacitor under test

L = Nominal value of the inductor under test

F = frequency of the test ("fr" option)

For example:

$Z_{DUT} = R = 200 \Omega$

$R_{ref} = 1000$ (Re3)

$V_{out} = (1000/200) * 0.1 = 0.5$ (set ar0.5)

An alternative is to set "ar" to 1 (which is the maximum range), because at this value, the auto-range feature is turned off. However, at this range, the readings lose the resolution by a factor proportional to the difference between the correct ASRU range and the maximum.

If this loss in resolution is not desired, switch the test to use the MOA circuit for measurement instead of the DMC by removing the "as" option from the test.

The other option that is important to select correctly is the "extra digit" (ed) option. This option will increase the measurement time by 5 times if used. Use only when necessary. This applies to non-ASRU speedup tests too.

Conclusion

The *Medalist* i3070 Series 5 with the new analog stimulus response unit (ASRU revision N) can improve the unpowered analog test time. By improving the test speed, it is possible for customers to produce more products which in turn allow them to enjoy higher revenue with the increased production output.

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