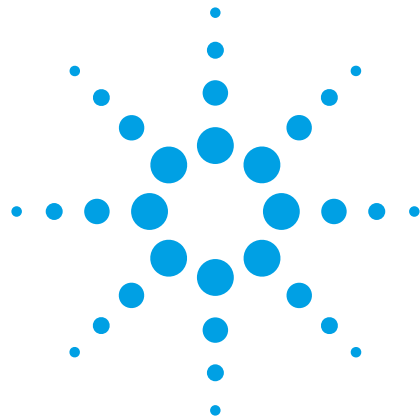


Agilent N4915A-005 Serial Bus Switch Application in SATA Receiver Test

Application Note



Features and Benefits

- Receiver test with SATA products that don't support disconnect
- Simplified test execution
- Test automation support

Overview

In SATA physical layer testing the Agilent N4915A-005 addresses two challenges related to changing between test tools during receiver testing. Because of its fast switching time the product under test (PUT) won't detect the switch between test tools. Furthermore, the switch eliminates the physical change of cables, which does not only save delicate test equipment but also supports test automation.

SATA Physical Layer Receiver Test

SATA is a high speed serial interface for storage interconnection. The main specification defines impaired signal conditions at which a receiver is required to operate at a defined bit error ratio (BER).

The SATA-IO organization's Logo task force has added a receiver compliance test (RSG) to its logo compliance program. The RSG test requirements are outlined in the unified test document (UTD) starting version 1.2. Agilent's method of implementation (MOI) document explains how to test these requirements using Agilent test equipment.

The SATA physical layer receiver test requires the switching of test tools as products under test (PUT) require the user to turn on the test mode before the actual physical layer test can be performed, i.e. firstly the PUT is connected to a tool that turns on the test mode. Once the test mode is established the PUT is connected to the instruments that perform the actual physical layer test.

The Disconnect Issue

SATA does not require a PUT to stay in the required test mode when it is being physically disconnected. Thus a PUT may detect a disconnect state when switching between test tools. If a PUT doesn't support physical disconnect the Agilent N4915A-005 serial bus switch will overcome that problem. Because of its fast switching time (6ns typical) it allows switching between signal sources without the PUT detecting a disconnect.

Benefits in Test Automation

Changing connections during physical layer test stresses costly test fixtures. Furthermore test results may be influenced by weak or incorrectly connected test cables. The N4915A-005 serial bus switch overcomes this problem with its solid state switching technology. Operators will switch between test tools by pressing a front panel button.

When using Agilent's N5990A option 103 test automation software for SATA, the automation software will remotely control the N4915A-005 serial bus switch. Thus no manual steps are required during test execution which eliminates the risk of human errors and saves time and labor. Multiple receiver tests, such as jitter tolerance and voltage margin test may be executed sequentially without operator attention.

Physical Layer Receiver Test Setup

The test requirements are outlined in the SATA main specification and the UTD version 1.2 or newer. The Agilent MOI for receiver compliance testing (RSG) explains the test setup and calibration procedure with and without N5990A test automation software.

The N4915A-005 serial bus switch seamlessly integrates into the receiver test setup. For a complete setup the following material will be needed in addition to the material listed in the Agilent RSG MOI document, the next revision of MOI may include this method. Please note that the required number of additional SMA test cables differs if the N5990A option 103 test automation software is used.

Table 1: Materials needed for receiver test setup

Item	Agilent Product Number	Quantity
Serial Bus Switch	N4915A-005	2
SMA Cables (set of 4)	15442-61601	2 (w/o N5990A) 3 (with N5990A)
Receptacle SATA to SMA testfixture	n/a	1

Figure 1 shows the N4915A-005 serial bus switch. It ships with a USB cable which is required in order to supply the switch with power. There is no other USB function integrated into the switch. No driver installation is required. Connect the mini USB plug to the back side of the switch and connect the standard USB plug to any suitable USB host that will be turned on during test execution. Typically the OOB and BIST L source will be a PC that should provide sufficient USB ports. Other Agilent instruments such as the DSO 80000 series realtime scope or a logic analyzer (if used as FER counter) will also provide USB ports.



Figure 1: N4915A-005 with front SMA connectors and back-side USB interface

Two N4915A-005 switches are used to switch between the OOB and BIST L source and the actual instruments for physical layer stress test. Typically the OOB and BIST L source is a PC with the adequate application software. In a non-switched environment that PC would be connected to the PUT with a standard SATA cable. During test execution the cable would be unplugged and the test equipment would be connected. In a switched setup the OOB and BIST L source will be connected to the additional SATA to SMA receptable fixture and its signals will be driven into one set of channels of the serial bus switch.

The remaining set of channels of the serial bus switch will be wired to the test setup. Connect the stressed signal generator's data output to channel two of the switch that will interface to the PUT's receiver. Use channel two for the stress signal as it provides slightly better signal performance compared to channel one.

Connect channel one of the switch that interfaces to the PUT's transmitter to the FER counter and channel two to the OOB and BIST L source. Using different channels on the two switches for test equipment and OOB and BIST L source will simplify the setup for test automation. See below for detailed setup requirements.

Figure 2 illustrates the connection diagram for a setup that will be operated manually, i.e. an operator will activate the switches manually. For this application make sure that the trigger inputs of the switches are open.

The setup dedicates one switch for the signals that drive the PUT's receiver and a second switch is used to handle the signals that connect to the PUT's transmitter. Each switch uses one channel for positive and one channel for negative signal polarity respectively.

The common channels (labelled with "C") of the switch interface to the PUT. For setup calibration purposes remove the SMA cables at the end of the test fixture that plugs into the PUT. During calibration these SMA cables have to be connected to channel one (positive polarity) and channel three (negative polarity) of the DSO80000 realtime oscilloscope.

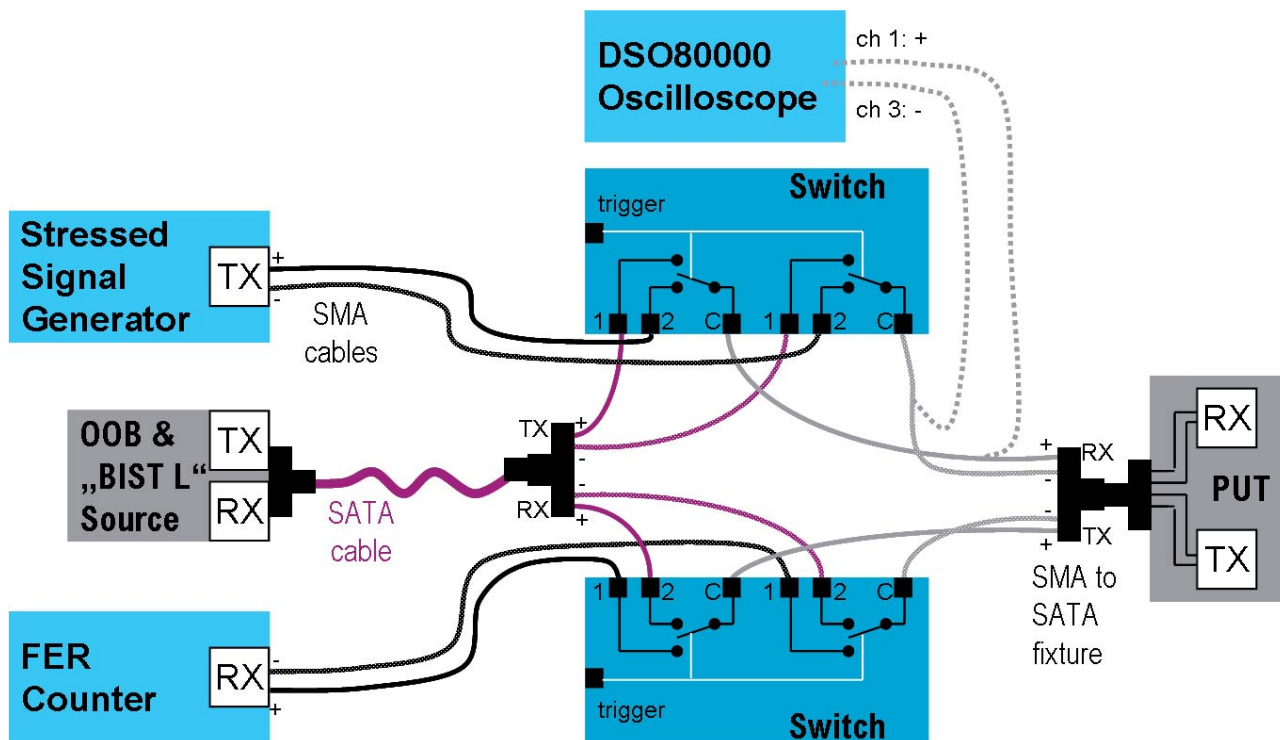


Figure 2: Receiver test setup for manual switch operation

Manual Switch Operation

Figure 3 shows the N4915A-005 operation panel. For manual setup operation choose the “Edge/Man” trigger mode. Verify that the green trigger mode LED is illuminated. Figure 4 shows the status LEDs.

Use the manual pre-set buttons to operate the two switches. In order to turn on the test mode select channel one at the switch that connects to the PUT’s receiver and select channel two at the switch that connects to the PUT’s transmitter. The switch’s position LEDs indicate which channel is currently activated.

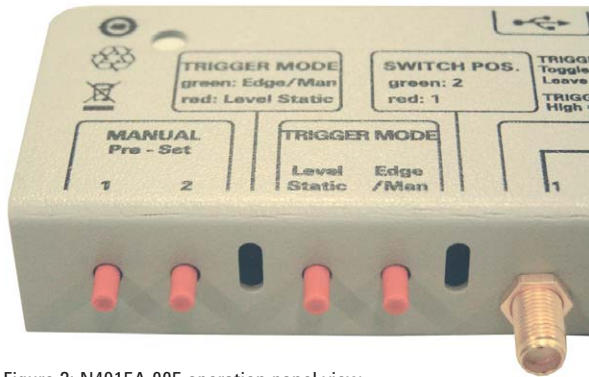


Figure 3: N4915A-005 operation panel view

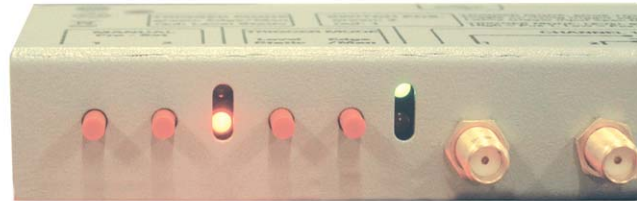


Figure 4: N4915A-005 status LED view

Required Setup Modification For Usage With Test Automation Software

Figure 5 shows the required setup extensions compared to the setup for manual operation (see Figure 2). In this setup the stressed signal generator has to be an Agilent 81134A pulse pattern generator. The Agilent 81134A pulse pattern generator's second channel is used to drive the switch's trigger inputs. The channel should be connected to the switch's trigger inputs as illustrated in Figure 5.

Before starting the automated test execution after power-up, select the level static trigger mode at both N4915A-005 switches. All other switch operation will be performed automatically by the N5990A option 103 test automation software.

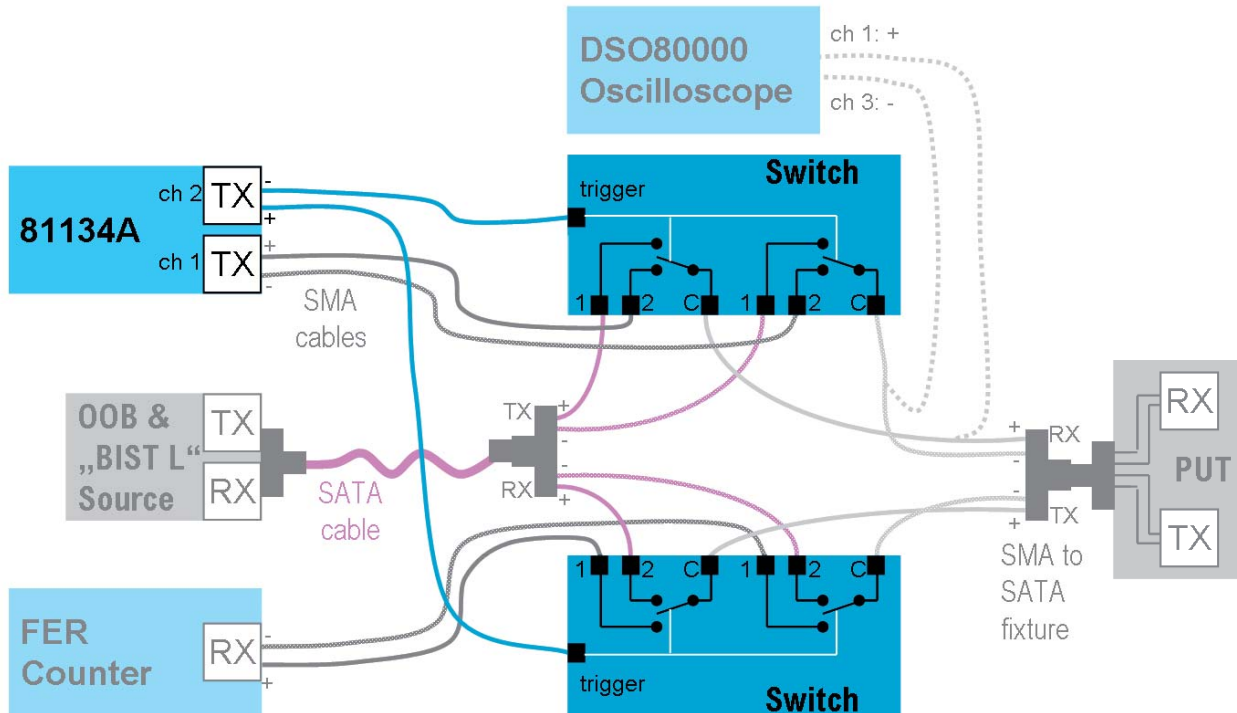


Figure 5: Receiver test setup extensions for automated switch operation with N5990A option 103

Related Agilent Literature

Agilent N4915A-005 Serial Bus Switch
Data Sheet

Agilent J-BERT N4903A
High-Performance Serial BERT with
Complete Jitter Tolerance Testing
Data Sheet

BERT Family Brochure
Brochure

Agilent ParBERT 81250
Parallel Bit Error Ratio Tester
Product Overview

Agilent Pulse Pattern and
Data Generators
Brochure

Agilent 81133A and 81134A
3.35 GHz Pulse Pattern Generators
Data Sheet

Agilent N5990A Test Automation
Software Platform
Data Sheet

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