How to Verify the Functionality of Your 34980A Switch Modules

Application Note

Introduction

Many customers have asked for a quick and easy way to check the switch modules for the Agilent 34980A multifunction switch/measure unit. The Agilent Y1131A verification/ diagnostic package provides a way to perform verification and diagnostic tests on these modules. This product improves efficiency by decreasing production downtime and time spent troubleshooting test-system failures. This application note outlines the benefits of the Y1131A and demonstrates its effectiveness via an example.

If you use switch modules, you can benefit from incorporating verification and diagnostic checking into your test systems. The verification process provides quick module pass/fail results based on module-specific tests. The diagnostic checking process enables you to easily identify common system failures.

Figure 1: Y1131A hardware: a custom terminal block.

The Y1131A is a verification and diagnostics checking package for the low frequency multiplexer, matrix, and general purpose switch modules of the 34980A multifunction switch/measure unit. The Y1131A supports the following modules: 34921A, 34922A, 34923A, 34924A, 34925A, 34931A, 34932A, 34933A, 34937A, and 34938A. To use the Y1131A, your 34980A must have the optional DMM installed.

The Y1131A package contains both software and hardware. The software provides module-specific tests to troubleshoot possible relay failures and predict system maintenance requirements. The hardware, shown in Figure 1, includes custom terminal blocks to route signals and isolate individual relays for verification and diagnostic checking.

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Running diagnostics

The Y1131A allows you to reliably conduct tests on the 34980A switch modules to find possible relay failures and to predict when each module needs maintenance. This capability increases your efficiency by enabling you to be better prepared for future relay failures, and it cuts costs by decreasing production downtime and troubleshooting time.

The Y1131A software tests for the three primary types of relay failures: shorts, opens, and single-sided shorts on a differential channel. The degree to which these failures can be isolated to a particular channel depends on the methodology used to test the channel and the number of relay failures on the module. First and foremost is the pass/fail result of the test. If a failure occurs, then the software displays the failure type and corresponding relay. In multi-relay failures, it is difficult to isolate single contacts. This package overcomes this difficulty to the greatest

possible extent. Channel resistance is recorded to aid in scheduled maintenance as well. The Y1131A displays pass/fail and diagnostic test results promptly after test execution and identifies possible errors in the measurement system.

Failure prediction and isolation

Channel resistances change over time. The extent of this change depends largely on the frequency of that channel's relay use as well as other less controllable influences. Tracking channel resistance and relay count provides a viable method for predicting when a relay is nearing the end of its life. This capability helps you reduce downtime by giving you good insight into future failures caused by bad relays in the measurement system.

The Y1131A software, used in conjunction with the provided verification terminal blocks, isolates measurement channels in a repeatable manner. Although the absolute reported measurement of a channel may vary depending on the application or signal routing, the relative

measurement with respect to the channel itself will be indicative of the actual variation in channel resistance over time. As much as possible, the methodology used to measure channel resistance is noted in the test report generated by the software. In addition, simplified block diagrams are provided for all of the verification terminal blocks to help you better understand how specific channels are measured.

Setup and installation of the Y1131A verification/ diagnostic package

The Y1131A Getting Started Guide provides complete and easy-to-follow instructions on how to set up and install the Y1131A verification/diagnostic package. You will find this document on the web. Go to **www.agilent.com** and search for "Y1131A."

An example

Consider the following scenario: You use a 34980A multifunction switch/measurement unit with a 34923A 40/80 channel reed multiplexer module for testing a particular device. Suppose you encounter unexpected results with your testing environment. No intentional changes have been made to the device under test or testing environment. Therefore, you

decide to run the verification and diagnostic tests provided by the Y1131A to ensure that the 34923A is working properly.

To start, you disconnect the terminal cards on modules currently in the 34980A and start the verification/diagnostic software included in the Y1131A package. The software searches for available instruments on one of the three different interfaces (GPIB, USB, or LAN) and locates the targeted 34980A. The instrument is initialized as shown in Figure 2.

Next, you select the appropriate slot containing the 34923A module by clicking on the middle tab labeled "Run Tests." The required connection between the Y1131A Option 001 terminal block and the 34923A module is made, along with a connection between the serial cable on the terminal card and the analog bus output on the 34980A (as described in the Y1131A Getting Started Guide). The verification/ diagnostics tests are then executed, along with the optional repeated reliability tests.

Figure 3 shows that a test has failed, as indicated in the "Status" frame. To view the test results and examine the errors found by the Y1131A, you
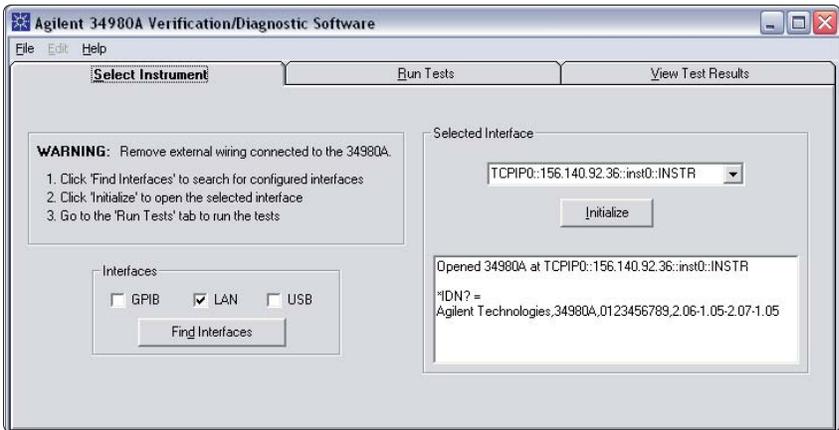
Figure 2: Selecting an instrument
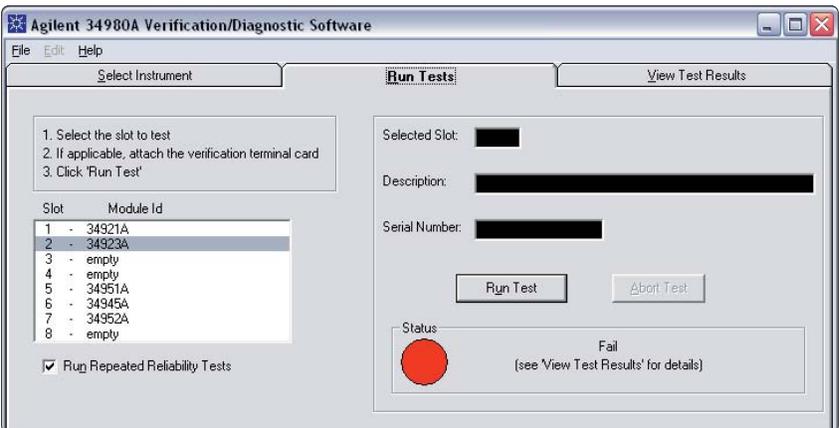
Figure 3 Running the tests

click on the "View Test Results" tab at the top of the software graphical user interface. By scrolling down the Test Results display, you can see that two channels may have bad relays, as shown in Figure 4.

The test indicates that channel 8 may have a relay that is stuck open and channel 12 may have a single-sided short. With this knowledge, you have several options: verify the results, replace the relays, or reroute test signals to avoid using these two channels.

When you scroll further down the Test Results display, you will see the Channel Information section, as shown in Figure 5. The Channel Information reports the relay count and channel resistance for each channel. You can predict when a particular relay will fail by analyzing its channel resistance in conjunction with its relay count.
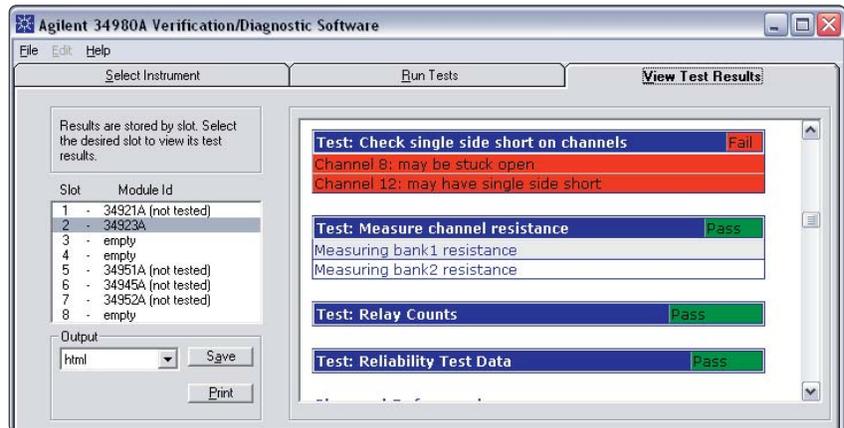
Figure 4: Viewing the results
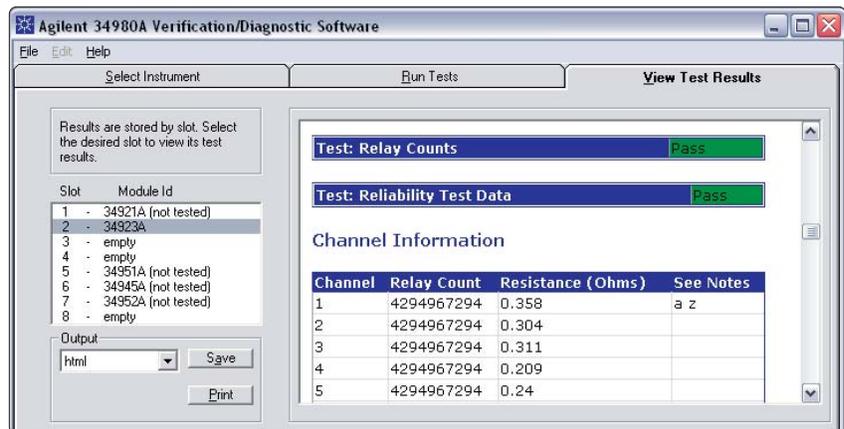
Figure 5: Viewing channel information

Figure 6 shows the Channel Resistance Repeatability Details report. This data gives you a higher measure of confidence in your relays and the precision of your channel resistance values. You can save these results in either HTML or CSV format to track channel resistances over time, which allows you to foresee when relay failures are likely to occur. Corrective action can then be taken.

The Y1131A verification/ diagnostics package results indicate that two relays may be causing errors. One solution is to replace the relays that the Y1131A indicates are bad. A more immediate solution is available if two other channels on the 34923A terminal card are not in use. In this case, you can simply reroute the channel 8 and channel 12 signals appropriately and replace those relays at a more convenient time.
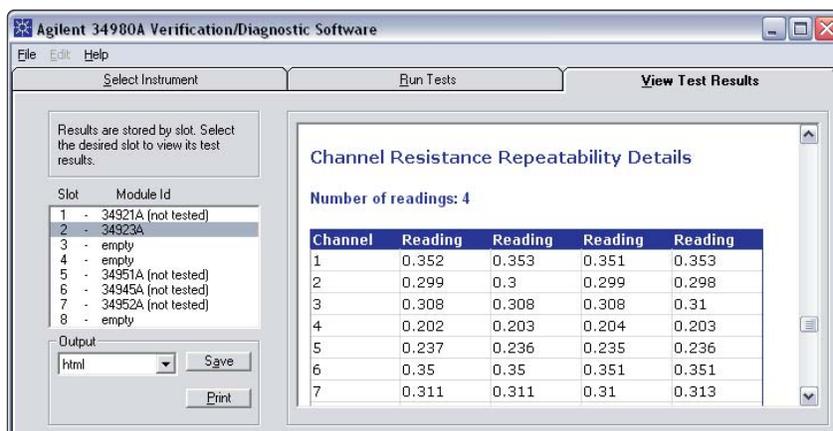
Figure 6: Viewing repeated reliability test results

Conclusion
If you use switch modules, you can prepare for possible relay failures and maximize your system's uptime by incorporating verification and diagnostic checking into your test systems. The Y1131A verification/diagnostics package makes it easy to verify operation and diagnose common system failures.

Related Agilent literature

Agilent 34980A Multifunction Switch/Measure Unit

Data sheet

http://cp.literature.agilent.com/litweb/ pdf/5989-1437EN.pdf

Y1131 Verification/Diagnostic Software

Getting Started Guide

http://www.home.agilent.com/upload/ cmc_upload/All/Y1131-90000_GSG_ Ed2.pdf

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