34970A and 3499A/B/C Switch Systems

Product Overview

Which would be best for your application?

Agilent Technologies

Introduction

The 34970A Data Acquisition/Switch Unit and the 3499A/B/C Switch/Control System are both very popular Agilent products. Both systems offer a great solution for switching applications but they each have differentiating features that will make them better suited to specific applications. With this general product overview you should have a better idea of what the 34970A and 3499A/B/C products are, what they are capable of, and which one is the best choice for your application. Module and mainframe selection, user interface and measurements, module connections, and system cost are the topics covered.

Module and Mainframe Selection

The 34970A and 3499A/B/C each have a set of modules that can be plugged into the mainframes. The modules offer different types and total number of switches and/or measurement inputs and outputs. You are able to select the modules that provide the best solution to the switch and measurement needs of your specific application.

The 34970A System offers 8 different plug-in modules. The modules include both low-frequency and RF multiplexers, a matrix switch, a general-purpose switch, and a multifunction module that includes digital input/output, analog output, and totalizer capabilities.

The 3499 Family offers a selection of 30 different plug-in modules including multiplexer, fiber-optical multiplexer, general-purpose relay, matrix, digital I/O, VHF module, RF module, Microwave module, Form-C relay, and three multifunction modules. The 3499A/B/C mainframes are also compatible with the earlier generation HP 3488A Switch/Control Unit modules (4447xx).

The size of the 34970A and 3499A, 3499B, and 3499C mainframes enable them to accommodate a specific number of modules. The 34970A mainframe provides 3 slots for modules to be installed. The 3499A, 3499B and 3499C differ only in the number of slots that are available for modules. The 3499A can accommodate up to 5 modules. The 3499B can accommodate 2 modules. The 3499C has been designed with 9 electrical connections for modules, and enough physical space for 14 modules. The additional space in the 3499C mainframe enables the 2- or 3-slot RF and Optics modules to be plugged in without giving up a usable slot. The combination of an individual module channel count, and the total number of modules that can be installed in one mainframe determines the total number of channels available for an application. Table 1 (below) gives you an idea of the maximum number of channels possible for each mainframe by showing the total number of channels available when a high channel count, 2-wire multiplexer module is installed in every available slot. The 34970A and 3499A/B/C are best suited for applications with less than 60 channels up to 360 channels. For applications with a channel count greater than 360 channels, VXI switching is recommended. Information on Agilent VXI switching can be found at **www.agilent.com/find,** then enter **System Switches**.

Table 1. Mainframes

Mainframe	Mainframe Size	# of Module Slots	Maximum # of Channels (2-wire)
34970A	½ Rack 2U	3	60
3499B	½ Rack 2U	2	80
3499A	Full Rack 2U	5	200
3499C	Full Rack 5U	9 (electrical) 14 (physical)	360

The modules available for the 34970A and the 3499A/B/C are listed below in Table 2. As you can see from the chart there are many different types of switch modules to choose from. You can easily identify a module or modules that provides the best solution your test application needs. For more specific module specifications please refer to the product data sheets at: **www.agilent.com/find/3499** and/or **www.agilent.com/find/34970A.**

Table 2. Modules

Module Type	34970A	3499A/B/C
Multiplexer	34901A 20 Ch armature 34902A 20 Ch reed 34908A 40 Ch 1 wire armature	N2260A 40 Ch armature N2266A 40 Ch reed N2270A 10 Ch 1000V 44470A 10 Ch 44470D 20 Ch
General Purpose	34903A 20 Ch	N2261A 40 Ch N2267A 8 Ch, 8A 44471A 10 Ch 44471D 20 Ch 44477A 7 Ch SPDT (Form C)
Matrix	34904A 4x8	N2262A 4x8 44473A 4x4
Digital I/O		N2263A 32-bit TTL 44474A 16-bit TTL
Multifunction	34907A Two 8-bit Dig I/O, 26-bit Event Counter, Two 16-bit Analog out	N2264A 12 GP, 3 GP 5A, 16-bit Dig I/O N2265A 4x4 matrix, 16-bit Dig I/O N2269A 2 DAC, 16-bit Dig I/O
Fiber-Optical Multiplexer		N2280A Quad 1x2 N2281A Dual 1x4 N2282A Single 1x8
RF & Microwave	34905A Dual 4 Ch 2G 50 Ω 34906A Dual 4 Ch 2G 75 Ω	N2268A Dual 1x4 3.5G 50 Ω N2272A Single 1x9 1.0G 50 Ω N2276A Dual 1x6 20G 50 Ω N2276B Relay driver (2 switches) 44472A Dual 1x4 300M 50 Ω 44478A Dual 1x4 1.3G 50 Ω 44478B Dual 1x4 1.3G 75 Ω 44476A Triple 1x2 18G 50 Ω 44476B Relay driver (2 switches)

Controlling the Switch Systems and Making Measurements

The 34970A and 3499A/B/C both use switching plug-in modules to route signals to and from your test system or multiplex signals to external instruments. Measurements and instrument control capabilities of the 34970A and 3499A/B/C are what really differentiate the products from one another. The measurement capabilities, control, monitoring ability, and channel-scan rates for each of the systems are included in this section. Comparing this information to the needs of your application will make it easy for you to identify which one of these systems is best for your application.

34970A

User Interface

The 34970A is easy to manually control by pushing front-panel buttons, or program using SCPI (Standard Commands for Programmable Instruments) commands, or the *Plug&Play* driver. BenchLink Data Logger is a PC-based software that comes with the 34970A. The BenchLink Data Logger software provides an easy way to set-up a test to acquire measurement data. The 34970A can store the data or it can perform real-time display and analysis of the incoming measurements. These user interfaces can be used to make measurements, control switch states, or implement the scan and/or monitor features.

Measurements & Alarms

The 34970A mainframe includes a DMM that works in conjunction with the Multiplexer plug-in modules 34901A, 34902A, and 34908A. Up to 11 different measurements (listed below) and engineering unit conversions can be made using these modules in the 34970A. The 34970A also has the capability to flag any out-of range measurements by comparing the input signals with four different configurable limits and activating an alarm.

34970A Measurements

- Temperature measured with Thermocouples, RTDs, and Thermistors
- DC and AC volts
- 2- and 4-wire Resistance
- Frequency and Period
- DC and AC current
- 4 alarms for High/Low or both limits for each channel
- Digital I/O
- Analog outputs (DAC)

Scanning & Monitoring

The 34970A allows you to combine a DMM (either internal or external) with the multiplexer channels to create a scan. During a scan, the instrument connects the DMM to the configured multiplexer channels one at a time and makes a measurement on each channel. Automatic scanning and channel monitoring can be started by manually pressing a front-panel button, by sending a software command, an external TTL trigger pulse, an alarm-initiated action, or an internally paced timer. During a scan you can store up to 50,000 readings in non-volatile memory. Each time a new scan is started the 34970A clears all the reading stored in memory from the previous scan.

Since the 34970A switching is performed as a scanner where only one channel is closed at any time, it may be important to your test system to achieve or exceed a specific scan rate. Switching scan rates for the 34970A modules are shown in Table 3 at right. The *measurement* scan rates vary depending on the type of measurement being made. See the 34970A data sheet for measurement scan rate details.

Continuous monitoring of a selected channel, configured for measurement, scan or digital I/O, can be displayed even during a scan. The 34970A takes readings on the single channel as often as it can. The readings displayed by the monitor are not stored in memory but the readings concurrently taken during a scan will be stored in memory.

3499A/B/C

User Interface

The 3499A/B/C is easy to manually control by pushing front-panel buttons, or program using SCPI (Standard Commands for Programmable Instruments) commands, HP 3488A commands or the convenient *Plug&Play* or IVI drivers. The 3499A/B/C user interfaces can control switch states as well as implement the scan and monitoring features.

Measurements

The 3499A/B/C provides a wide assortment of switch capability as well as Digital I/O and DAC. The 3499A/B/C is a valued component in electronics test systems for connecting instruments such as DMMs, counters, spectrum analyzers, LCR meters, signal sources, power supplies and oscilloscopes. The 3499A/B/C can also be used for applications that require microwave, and optics switching. Innovative parallel driving circuits are used in the 3499A/B/C modules to open/close switches simultaneously, which significantly increases test throughput. The 3499A/B/C does not have an internal integrated DMM for making measurements as the 34970A does.

Scanning & Monitoring

The 3499A/B/C can be programmed to perform a channel scan, or channel monitoring either from the front panel, or by using software commands. Up to 200 channels and/or bits can be included in one scan list. Once a scan is set up, the user can select an arm source, a trigger source, the number of sweeps, and the delay time for each individual channel.

The 3499A/B/C monitor feature allows users to continuously monitor a selected switch or module status from the front display. The 3499A/B/C status can be a specific switching channel, a digital I/O port, or the state of all switches or digital I/O on one plug-in module. A single channel can be monitored continuously even during an instrument scan.

The 3499A/B/C is able to store and recall instrument setups. The instrument setups include the status of relay channels, and/or the static digital I/O state, module configuration, as well as scanning setups (scan lists, arm count, arm source, etc.). Table 3 below includes the scan rates for the 34970A and 3499A/B/C modules.

Table 3. 34970A and 3499A/B/C module scan rates

	34970A		3499A/B/C	
Module Type	**Modules**	**Scan Rate Ch/s**	**Modules**	**Scan Rate Ch/s**
Multiplexer	34901A 20 Ch armature	120	N2260A 40 Ch armature	80
	34902A 20 Ch reed	120	N2266A 40 Ch reed	350
	34908A 40 Ch 1 wire armature	70	N2270A 10 Ch 1000V	100
			44470A 10 Ch	43
			44470D 20 Ch	43
General Purpose Switch	34903A 20 Ch	120	N2261A 40 Ch	80
			N2267A 8 Ch, 8A	20
			44471A 10 Ch	43
			44471D 20 Ch	43
			44477A 7 Ch SPDT (Form C)	43
Matrix	34904A 4x8	120	N2262A 4x8	80
			44473A 4x4	43
Digital I/O			N2263A 32-bit TTL	
			44474A 16-bit TTL	
Multifunction	34907A Two 8-bit Dig I/O, 26-bit Event Counter, Two 16-bit Analog out		N2264A 12 GP, 3 GP 5A, 16-bit Dig I/O	80
			N2265A 4x4 matrix, 16-bit Dig I/O	80
			N2269A 2 DAC, 16-bit Dig I/O	80
Fiber-Optical Multiplexer			N2280A Quad 1x2	50
			N2281A Dual 1x4	40
			N2282A Single 1x8	4
RF & Microwave	34905A Dual 4 Ch 2G 50Ω	60	N2268A Dual 1x4 3.5G 50Ω	20
	34906A Dual 4 Ch 2G 75Ω	60	N2272A Single 1x9 1.0G 50Ω	
			N2276A Dual 1x6 20G 50Ω	40
			N2276B Relay Driver (2 switches)	40
			44472A Dual 1x4 300M 50Ω	43
			44478A Dual 1x4 1.3G 50Ω	43
			44478B Dual 1x4 1.3G 75Ω	43
			44476A Triple 1x2 18G 50Ω	43
			44476B Relay driver (2 switches)	43

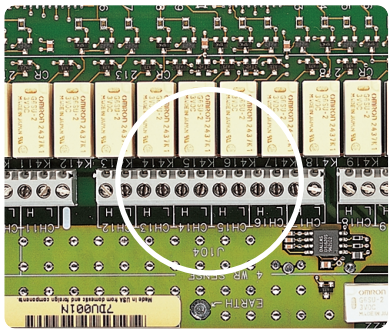
Switch and Measurement Connections

Some test systems must be easily moved or modified for different devices under test. Having a removable wiring terminal or a pre-wired cable would be optimal for this type of application. The terminal or cable can simply be swapped or moved to the new test configuration and will prevent the need to rewire a terminal for each application.

Other test systems can be configured once and may be slightly modified as time goes on and the need changes. In this case it would be easiest to connect wires directly to the module. The type of wiring connections offered by the 34970A and 3499A/B/C are very different and may be a key consideration for your application.

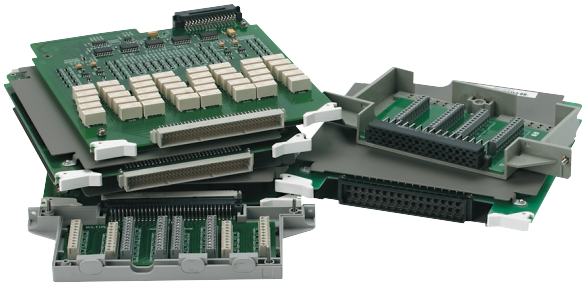
34970A

The 34970A has simplified the choice of how to wire the modules by integrating on-board screw terminal connectors.

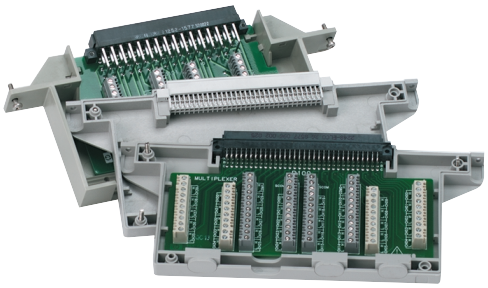


3499A/B/C

The 3499A/B/C modules offer flexibility in terminal wiring with different types of terminals and cables available. Many of the modules, N22XXX, allow the user a choice of screw terminal, crimp & insert terminal, or a DIN96 to quad D25, or dual D50 cables. Since a choice of the type of wiring connection is available the terminals/cables can be ordered in addition to the modules. The ability to order the terminals separately enables the user to purchase dedicated terminals for different applications so the terminal will not need to be re-wired if the same test system is used for different applications. Other modules such as the 4447xx, or Optics, Microwave, and RF modules include the terminals (i.e. SMA, BNC...) for application specific connections. See the 3499A/B/C data sheet for specific module wiring connection details at **www.agilent.com/find/3499.**



3499A/B/C Switch Modules



3499A/B/C Terminals

System Costs

If you have not found a differentiating factor between the 34970A and the 3499A/B/C that would convince you one is the right product for your application perhaps cost would be that deciding factor.

34970A

The 34970A can be a low cost solution to 60 Channels or less switching. The mainframe can be ordered with an option to remove the internal DMM which reduces the price significantly if measurements are not needed. The inclusion of the wiring terminals on the modules also allows the 34970A to provide a low cost solution.

3499A/B/C

The 3499A/B/C offers a wide selection of both mainframes, modules, and terminals/cables. The wide selection enables solutions for applications from 60 to 360 channel applications and specialized switching such as RF, microwave and optics. The 3499A/B/C is an affordable solution for a wide range of applications. The product versatility the 3499A/B/C offers spans a range of prices and is better determined by selecting 3499 components for specific applications.

Summary

Both the 3499A/B/C and 34970A are excellent choices for pure switching applications. The products also offer flexibility in configuration or size that would provide you a great switch solution and at a good value.

The 34970A Data Acquisition/Switch Unit is typically used in R&D and/or Manufacturing Test applications. It is a flexible instrument and can be used for data logging, as a data acquisition system, and/or a switch system. Test applications with up to 60 channels, and low to medium sample rates are easily addressed by the 34970A. The 34970A can also be used for applications requiring transducer-based measurements such as thermocouple or strain.

The 3499A/B/C Switch/Control System offers high channel count switching for various types of switches. The 3499A/B/C can be used in Engineering Test systems for R&D and/or manufacturing to switch many test instruments in a single system.

The switching topologies used are matrices, multiplexers and independent signal-quality switch closures.

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Product specifications and descriptions in this document subject to change without notice.

Printed in USA
August 1, 2002
5988-7223EN

Agilent Technologies