And the 34970A measures and converts 11 different input signals:

- temperature with thermocouples, RTDs, and thermistors
- dc and ac volts
- 2- and 4-wire resistance
- frequency and period
- dc and ac current

What's more, each channel is independently configurable. This means you can configure channel 1 for dcV, channel 2 for a K-type thermocouple, and channels 3 and 13 for a 4-wire RTD measurement—all on the same module, all in a single scan. For custom linear conversions, use the Mx+B scaling function on any channel. You can even display a custom 3-character engineering label like RPM or PSI to identify your measurement units.

Versatile alarms

Alarms are available on a per-channel basis as well. Enter a high limit, a low limit, or both. The 34970A compares each reading to its limits and flags any out-of-range measurements. You can assign one of four TTL alarm outputs to any input channel to trigger external alarm lights, sirens, or send a TTL pulse to your control system, all without a PC connected.

Scanning made simple

The 34970A automatically builds a scan list that includes all configured inputs (even digital inputs from the Agilent 34907A multifunction module) in ascending order by channel number. You can pace scans by setting the 34970A's internal timer for automatic scanning at a specific interval, by manually pressing a front-panel button, or by sending a software command or external TTL trigger pulse.

Monitor any input

A special display mode monitors a selected input channel, continuously updating the display with new readings—even during a scan. It's great for keeping an eye on a key input, or for troubleshooting your system before a test.

Nonvolatile memory adds convenience, portability

All readings are automatically time-stamped and stored in a nonvolatile 50,000-reading memory—enough memory to hold more than a week's worth of data (20 channels scanned every five minutes). The nonvolatile memory holds your data even after power is removed, so you can use the 34970A to collect data at a remote location for later uploading to a PC. And because the nonvolatile memory also holds your system configuration, if you lose power in the middle of a test, the 34970A resumes scanning when power is returned.

Data Logging Feature Checklist

- From 1 to 120 channels of analog input
- Measurements include dc volts, ac volts, thermocouple, thermistor and RTD temperature measurements, 2- and 4-wire Ohms, dc current, ac current, frequency, and period
- 6½ digits (22 bits) of resolution with 0.004% basic 1-year dcV accuracy
- 50k reading nonvolatile memory including timestamp
- Scaling and alarms available on each channel
- Full-featured front panel for stand-alone configuration, troubleshooting, and data viewing
- BenchLink Data Logger II software for configuration and data analysis
- Nonvolatile storage for five complete instrument states

A powerful, flexible data acquisition system for automated test

The 34970A gives you the resolution, accuracy, repeatability, and speed you've come to expect from an Agilent data acquisition system. It provides the measurement muscle you need, along with signal routing and control capability, in a flexible, modular format that can grow and change to match your varied applications.

Powerful measurements

The internal 6½-digit DMM brings the power and performance of a world-class stand-alone DMM to the 34970A, but at a fraction of the cost and in a fraction of the space. It's as accurate as the best bench DMM available: 0.004% basic 1-year dcV accuracy, 0.06% basic 1-year acV accuracy, and 0.01% basic 1-year resistance accuracy. Our patented Multi-slope III A-D technology offers incredible linearity (2 ppm of reading +1 ppm of range) along with 22 bits of real resolution. And since it is an integrating A/D, it provides excellent noise rejection as well—a nice change from noisy PC plug-ins and sampling A/Ds. No more averaging lots of samples just to see the real data you wanted. And if you need high scan rates, the 34970A is capable of delivering fully converted measurements at speeds up to 250 ch/s.

The input section of the DMM is optically isolated and shielded from the 34970A's earth-referenced circuitry and computer interface, offering up to 300 V of input isolation. This is important for reducing ground loop and common mode voltage errors associated with long wiring runs and floating measurement sources.

Flexible functionality

The DMM is installed inside the chassis rather than in one of the slots, leaving all three mainframe slots free for switch and control modules. You can choose from eight different modules (see page 11) to get the precise functionality you need now—while giving you flexibility for future expansion.

The internal DMM gives you the flexibility to measure 11 types of inputs easily and inexpensively. The built-in signal conditioning and conversion routines turn raw inputs directly into real information. Each measurement channel is independently configurable, so you can set different measurement functions, scale factors and alarm limits, even on adjacent channels. Advanced measurement features such as offset compensation, variable integration time, and delay are also selectable on a per-channel basis.

Get better measurements with built-in signal conditioning

The Agilent 34970A architecture offers advantages over other data acquisition solutions which rely on external or plug-in signal conditioning modules for handling functions other than dcV:

- Minimizes external wiring and the resultant potential for noise and errors to enter your system
- Reduces hidden costs and overall system cost by avoiding unnecessary cables, breakout boxes and signal conditioning elements
- Simplifies your configuration—for faster, easier setup—with fewer connections and components
- Takes the guesswork out of error analysis. Measurement accuracies are specified to include all system-related errors
- Improves reliability, with fewer interconnects and fewer parts that can fail

Software drivers

Your months of test system software development time need not go to waste. Software drivers that support Agilent VEE and National Instruments LabView® are available for the 34970A to make integration into your test system easy. Standard RS-232 and GPIB interfaces and SCPI programming language make integration even easier.

ATE Feature Checklist

- 3-slot cardcage with 6½ digit (22 bit) internal DMM
- 0.004% basic 1-year dcV accuracy; 0.06% acV accuracy
- Up to 120 single-ended measurements or 96 matrix crosspoints in a 3½" high, half-rack instrument
- Eight switch and control modules include low-frequency and RF multiplexers, matrix and actuation switches, digital input and output, analog output, and event recording
- Scan rates up to 250 ch/s
- GPIB and 115 kbaud RS-232 interfaces standard
- Software drivers available to support Agilent VEE and National Instruments LabView
- Relay maintenance feature for system maintenance

Compact 60-channel data acquisition system

Low-cost, high-quality switching for automated test

If you don't need the built-in measurement capability of the 34970A, save money by ordering it without the DMM. What you end up with is the lowest-cost switch unit on the market. It's an ideal solution for routing test signals to and from your DUT and assorted instruments, including external DMMs, scopes, counters, and power supplies. Plus, you can add the DMM later if your needs change.

The functionality you need

We put a lot of thought into defining and designing the modules for the 34970A in order to cover a broad spectrum of switching and signal routing requirements with fewer modules. The result? Simplified ordering and easier configuration.

And while we were at it, we improved performance and density. The 34970A modules can switch from microvolts to 300 volts, dc to 2 GHz, and with densities as high as 120 single-ended channels or 96 matrix crosspoints per frame. Plus, simple control capabilities like analog outputs, open collector digital outputs, and isolated Form-C relays for controlling higher-powered devices are available.

Easy scanning

The 34970A can easily scan with external instruments. It builds a scan list that includes all enabled low-frequency multiplexer inputs. Scans are controlled with the external "channel advance" input, or with the front panel "Step" key.

Low-cost switching system for automated testing

Customize your Agilent 34970A with plug-in modules

A complete selection of plug-in modules gives you high-quality measurement, switching, and control capabilities to choose from. 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. You can mix and match modules to get just the functionality you need right now—then change or add more channels later as your application grows.

Modules for the 34970A are designed to make your testing easier, faster, and more reliable. Here's how:

Higher throughput

Our unique architecture incorporates a high-performance microprocessor on each module, off-loading the mainframe processor and minimizing backplane communications for faster throughput.

More channels in less space

Surface mount construction and a highly integrated design minimize the space required for relay drive and interface circuitry. High density on-module connectors save both board and connector space normally required by a terminal block. We use the latest technology to squeeze the most out of the remaining board space, giving you up to 40 single-ended channels in roughly the same space used by many data acquisition system terminal blocks.

Convenient connections

On-module screw-terminal connectors make wiring more convenient. Built-in strain-relief cable routing and cable tie points keep your wiring secure and safe from accidental tugs and pulls. An internal analog bus routes signals from any of the low-frequency multiplexers directly to the internal DMM, without the need for external connections.

Use the chart below to help you pinpoint the modules that meet your needs.

Agilent Modules-at-a-Glance Selection Guide

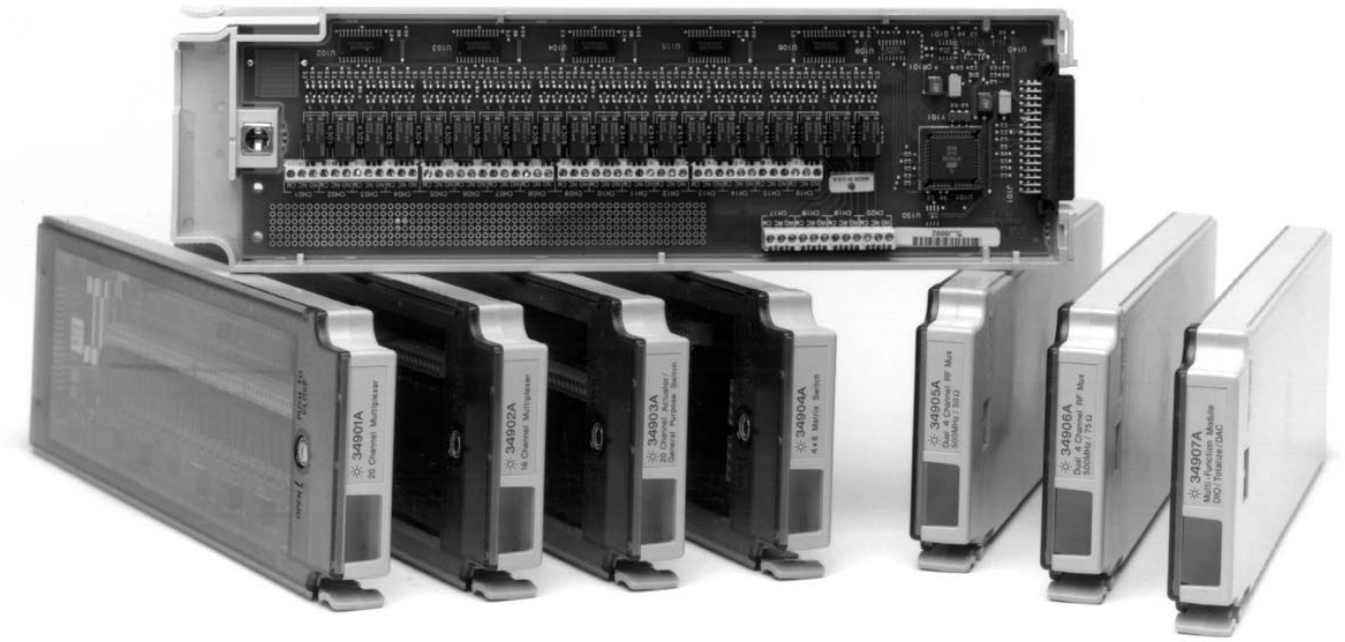
Model Description	Type	Speed (ch/sec)	Max Volts	Max Amps	Bandwidth	Thermal Offset	Comments	Page
34901A **20 ch Multiplexer**	2-wire armature (4-wire selectable)	60	300 V	1A	10 MHz	< 3 µV	Built-in cold junction reference 2 additional current channels (22 total)	18
34902A **16 ch Multiplexer**	2-wire reed (4-wire selectable)	250	300 V	50 mA	10 MHz	< 6 µV	Built-in cold junction reference	19
34903A **20 ch Actuator/GP Switch**	SPDT/form C	120	300 V	1A	10 MHz	< 3 µV		20
34904A **4 x 8 Matrix**	2-wire armature	120	300 V	1A	10 MHz	< 3 µV		20
34905A **Dual 4 ch RF Mux 50Ω**	Common Low (unterminated)	60	42 V	0.7 A	2 GHz	< 6 µV	1 GHz bandwidth through BNC-to-SMB adapter cable	21
34906A **Dual 4 ch RF Mux 75Ω**	Common Low (unterminated)	60	42 V	0.7 A	2 GHz	< 6 µV	1 GHz bandwidth through BNC-to-SMB adapter cable	21
34907A **Multifunction Module**	Two 8-bit digital I/O ports 26-bit Event Counter Two 16-bit Analog outputs		42 V 42 V ±12 V	400 mA 10 mA	 100 KHz dc		Open drain Selectable input threshold Max 40 mA total output per frame	22
34908A **40 ch Single-Ended Mux**	1-wire armature (common low)	60	300 V	1A	10 MHz	< 3 µV	Built-in cold junction reference No four-wire measurements	19

Agilent Quality

We know you can't afford instrument downtime due to hardware failures and unscheduled maintenance. That's why our engineers designed reliability into the 34970A: A rugged enclosure, state-of-the-art surface mount construction throughout, reduced parts counts, and rigorous and thorough testing on all aspects of the product.

Take the guesswork out of relay maintenance

The 34970A uses our proprietary relay maintenance system to help you to predict relay end-of-life and avoid costly production-line downtime. It automatically counts every individual switch closure and stores it in nonvolatile memory on each module. You can query the total number of cycles on any individual channel so you can schedule maintenance and avoid erratic end-of-life failures.



Spec Interpretation Guide

The following pages list the technical specifications for the Agilent 34970A Data Acquisition/Switch Unit and its modules. The explanations and examples below are helpful in understanding how to interpret these specifications:

- Measurement accuracy is specified as percent of reading plus percent of range, where reading is the actual measured value and range is the name of the scale (1V, 10V, etc.)—not the full scale value (1.2V, 12V, etc.).
- DMM measurement accuracies include all switching errors. Switching errors are also listed separately in the module specifications section. Temperature measurement accuracies include ITS-90 conversion errors. The thermocouple accuracies include the reference junction error as well.
- Accuracies are listed as either 24-hour, 90-day, or 1-year specifications. This refers to the length of time since the instrument's last calibration. Use the specification that matches your calibration cycle. The 24-hour specifications are useful for determining short-term relative performance.

EXAMPLE 1: Basic dcV accuracy
Calculate the accuracy of the following measurement:

9 V dc input
10 V dc range
1-year accuracy specifications
Normal operating temperature (18°C–28°C)

From the following page, the 1-year accuracy is:
0.0035% of reading + 0.0005% of range

Which translates into:
(0.0035/100 x 9 V)+
(0.0005/100 x 10 V) = 365µV

For a total accuracy of:
365 µV / 9 V = 0.0041%

EXAMPLE 2: Extreme operating temperature
When the 34970A is used outside of its 18°C–28°C temperature range, there are additional temperature drift errors to consider. Assume the same conditions in example 1, but at a 35°C operating temperature.

The basic accuracy is again:
0.0035% of reading + 0.0005% of range=365 µV.

Now, multiply the 10 V temperature coefficient from the following page by the number of degrees outside of operating range for additional error:
(0.0005% reading + 0.0001% range)
/°C x (35°C - 28°C) =
(0.0005% reading + 0.0001% range)
/°C x 7°C =
0.0035% reading + 0.0007% range = 385 µV

Total error is then:
365 µV + 385 µV = 750 µV or 0.008%

EXAMPLE 3: Thermocouple measurement accuracy
Calculating the total thermocouple reading error is easy with the 34970A–just add the listed measurement accuracy to the accuracy of your transducer. Switching, conversion, and reference junction errors are already included in the measurement specification.

For this example, assume a J-type thermocouple input reading 150°C.

From the following page, total error is:
Thermocouple probe accuracy + 1.0°C
The probe vendor specifies accuracy of 1.1°C
or 0.4%, whichever is greater.

Total error is then:
1.0°C + 1.1 °C = 2.1°C total, or 1.4%

EXAMPLE 4: acV Accuracy
The acV function measures the true RMS value of the input waveform, regardless of waveshape. Listed accuracies assume a sinewave input. To adjust accuracies for non-sinusoids, use the listed crest factor adder.

For this example, assume a ±1 V square wave input with 50% duty cycle and a 1 kHz frequency.

Accuracy for 1 V, 1 kHz sinusoid is:
0.06% reading + 0.04% range
A 50% duty cycle squarewave has a crest factor of
Peak Value / RMS value = 1 V / 1 V = 1

From Crest Factor table, add:
0.05% of reading

The total accuracy is:
0.11% of reading + 0.04% of range = 1.5 mV or 0.15%

Accuracy Specifications ±(% of reading + % of range)[1]

Includes measurement error, switching error, and transducer conversion error

	Range[3]	Frequency, etc.	24 Hour[2] 23°C±1°C	90 Day 23°C±5°C	1 Year 23°C±5°C	Temperature Coefficient 0°C–18°C, 28°C–55°C
DC Voltage						
	100.0000 mV		0.0030 + 0.0035	0.0040 + 0.0040	0.0050 + 0.0040	0.0005 + 0.0005
	1.000000 V		0.0020 + 0.0006	0.0030 + 0.0007	0.0040 + 0.0007	0.0005 + 0.0001
	10.00000 V		**0.0015 + 0.0004**	**0.0020 + 0.0005**	**0.0035 + 0.0005**	**0.0005 + 0.0001**
	100.0000 V		0.0020 + 0.0006	0.0035 + 0.0006	0.0045 + 0.0006	0.0005 + 0.0001
	300.000 V		0.0020 + 0.0020	0.0035 + 0.0030	0.0045 + 0.0030	0.0005 + 0.0003
True RMS AC Voltage[4]						
	100.0000 mV	3 Hz–5 Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100 + 0.004
	to 100.0000V	5 Hz–10 Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.004
		10 Hz–20 kHz	**0.04 + 0.03**	**0.05 + 0.04**	**0.06 + 0.04**	**0.005 + 0.004**
		20 kHz–50 kHz	0.10 + 0.05	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50 kHz–100 kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100 kHz–300 kHz[5]	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	300.0000V	3 Hz–5 Hz	1.00 + 0.05	1.00 + 0.08	1.00 + 0.08	0.100 + 0.008
		5 Hz–10 Hz	0.35 + 0.05	0.35 + 0.08	0.35 + 0.08	0.035 + 0.008
		10 Hz–20 kHz	0.04 + 0.05	0.05 + 0.08	0.06 + 0.08	0.005 + 0.008
		20 kHz–50 kHz	0.10 + 0.10	0.11 + 0.12	0.12 + 0.12	0.011 + 0.012
		50 kHz–100 kHz	0.55 + 0.20	0.60 + 0.20	0.60 + 0.20	0.060 + 0.020
		100 kHz–300 kHz[5]	4.00 + 1.25	4.00 + 1.25	4.00 + 1.25	0.20 + 0.05
Resistance[6]						
	100.0000Ω	1 mA current source	0.0030 + 0.0035	0.008 + 0.004	0.010 + 0.004	0.0006 + 0.0005
	1.000000 kΩ	1 mA	0.0020 + 0.0006	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	10.00000 kΩ	**100 µA**	**0.0020 + 0.0005**	**0.008 + 0.001**	**0.010 + 0.001**	**0.0006 + 0.0001**
	100.0000 kΩ	10 µA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	1.000000 MΩ	5.0 µA	0.002 + 0.001	0.008 + 0.001	0.010 + 0.001	0.0010 + 0.0002
	10.00000 MΩ	500 nA	0.015 + 0.001	0.020 + 0.001	0.040 + 0.001	0.0030 + 0.0004
	100.0000 MΩ	500 nA/10 MΩ	0.300 + 0.010	0.800 + 0.010	0.800 + 0.010	0.1500 + 0.0002
Frequency and Period[7]						
	100 mV	3 Hz–5 Hz	0.10	0.10	0.10	0.005
	to 300 V	5 Hz–10 Hz	0.05	0.05	0.05	0.005
		10 Hz–40 Hz	0.03	0.03	0.03	0.001
		40 Hz–300 kHz	**0.006**	**0.01**	**0.01**	**0.001**
DC Current (34901A only)						
	10.00000 mA	<0.1 V burden	0.005 + 0.010	0.030 + 0.020	0.050 + 0.020	0.002+ 0.0020
	100.0000 mA	**<0.6 V**	**0.010 + 0.004**	**0.030 + 0.005**	**0.050 + 0.005**	**0.002 + 0.0005**
	1.000000 A	<2 V	0.050 + 0.006	0.080 + 0.010	0.100 + 0.010	0.005 + 0.0010
True RMS AC Current (34901A only)						
	10.00000 mA	3 Hz–5 Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
	and[4] 1.000000 A	5 Hz–10 Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.006
		10 Hz–5 kHz	**0.10 + 0.04**	**0.10 + 0.04**	**0.10 + 0.04**	**0.015 + 0.006**
	100.0000 mA[8]	3 Hz–5 Hz	1.00 + 0.5	1.00 + 0.5	1.00 + 0.5	0.100 + 0.06
		5 Hz–10 Hz	0.30 + 0.5	0.30 + 0.5	0.30 + 0.5	0.035 + 0.06
		10 Hz–5 kHz	0.10 + 0.5	0.10 + 0.5	0.10 + 0.5	0.015 + 0.06

Temperature	Type	1-Year Accuracy[9]		Extended Range 1-Year Accuracy[9]		
Thermocouple[10]	B	1100°C to 1820°C	1.2°C	400°C to 1100°C	1.8°C	0.03 °C
	E	-150°C to 1000°C	1.0°C	-200°C to -150°C	1.5°C	
	J	**-150°C to 1200°C**	**1.0°C**	**-210°C to -150°C**	**1.2°C**	
	K	-100°C to 1200°C	1.0°C	-200°C to -100°C	1.5°C	
	N	-100°C to 1300°C	1.0°C	-200°C to -100°C	1.5°C	
	R	300°C to 1760°C	1.2°C	-50°C to 300°C	1.8°C	
	S	400°C to 1760°C	1.2°C	-50°C to 400°C	1.8°C	
	T	-100°C to 400°C	1.0°C	-200°C to -100°C	1.5°C	
RTD	R_0 from 49 Ω to 2.1 kΩ	-200°C to 600°C	0.06°C			0.003 °C
Thermistor	2.2 k, 5k, 10k	-80°C to 150°C	0.08°C			0.002 °C

[1] Specifications are for 1 hr warm-up and 6½ digits, Slow ac filter
[2] Relative to calibration standards
[3] 20% over range on all ranges except 300 Vdc and ac ranges and 1 Adc and ac current ranges
[4] For sinewave input > 5% of range. For inputs from 1% to 5% of range and < 50 kHz, add 0.1% of range additional error
[5] Typically 30% of reading error at 1 MHz, limited to 1 x 10^8 V Hz
[6] Specifications are for 4- wire ohms function or 2-wire ohms using Scaling to remove the offset. Without scaling, add 4 Ω additional error in 2-wire Ohms function
[7] Input > 100 mV. For 10 mV to 100 mV inputs multiply % of reading error x 10
[8] Specified only for inputs >10 mA
[9] For total measurement accuracy, add temperature probe error
[10] Thermocouple specifications not guaranteed when 34907A module is present

Measurement Characteristics[8]

DC Voltage		
Measurement Method	Continuously Integrating Multi-slope III A-D Converter	
A-D Linearity	0.0002% of reading + 0.0001 % of range	
Input Resistance		
100 mV, 1 V, 10 V ranges	Selectable 10 MΩ or > 10,000 MΩ	
100 V, 300 V ranges	10 MΩ ± 1%	
Input Bias Current	< 30 pA at 25°C	
Input Protection	300 V all ranges	
True RMS AC Voltage		
Measurement Method	AC coupled True RMS — measures the AC component of the input with up to 300 Vdc of bias on any range	
Crest Factor	Maximum of 5:1 at Full Scale	
Additional Crest Factor Errors (non-sinewave)	Crest Factor 1-2	0.05 % of reading
	Crest Factor 2-3	0.15 % of reading
	Crest Factor 3-4	0.30 % of reading
	Crest Factor 4-5	0.40 % of reading
Input Impedance	1 MΩ ± 2% in parallel with 150 pF	
Input Protection	300 Vrms all ranges	
Resistance		
Measurement Method	Selectable 4-wire or 2-wire Ohms Current source referenced to LO input	
Offset Compensation	Selectable on 100Ω, 1kΩ, 10kΩ ranges	
Maximum Lead Resistance	10% of range per lead for 100 Ω and 1 kΩ ranges. 1 kΩ on all other ranges	
Input Protection	300 V on all ranges	
Frequency and Period		
Measurement Method	Reciprocal counting technique	
Voltage Ranges	Same as AC Voltage function	
Gate Time	1s, 100 ms, or 10 ms	
Measurement Timeout	Selectable 3 Hz, 20 Hz, 200 Hz LF limit	
DC Current		
Shunt Resistance	5 Ω for 10 mA, 100 mA; 0.1 Ω for 1 A	
Input Protection	1A 250 V fuse on 34901A module	
True RMS AC Current		
Measurement Method	Direct coupled to the fuse and shunt. AC coupled True RMS measurement (measures the ac component only)	
Shunt Resistance	5 Ω for 10 mA; 0.1 Ω for 100 mA, 1 A	
Input Protection	1A 250 V fuse on 34901A module	
Thermocouple		
Conversion	ITS-90 software compensation	
Reference Junction Type	Internal, Fixed, or External	
Open thermocouple Check	Selectable per channel. Open >5kΩ	
Thermistor	44004, 44007, 44006 series	
RTD	α = 0.00385 (DIN) and α = 0.00391	

Measurement Noise Rejection 60 (50) Hz[1]	
dc CMRR	140 dB
ac CMRR	70 dB
Integration Time	**Normal Mode Rejection[2]**
200 plc/3.33s (4s)	110 dB[3]
100 plc/1.67s (2s)	105 dB[3]
20 plc/333 ms (400 ms)	100 dB[3]
10 plc/167 ms (200 ms)	95 dB[3]
2 plc/33.3 ms (40 ms)	90 dB
1 plc/16.7 ms (20 ms)	60 dB
< 1 plc	0 dB

Operating Characteristics[4]

Single Channel Measurement Rates[5]

Function	Resolution[9]	reading/s
dcV, 2-wire Resistance	6½ digits (10 plc)	6 (5)
	5½ digits (1 plc)	57 (47)
	4½ digits (0.02 plc)	490
Thermocouple	0.1°C (1 plc)	49 (47)
	(0.02 plc)	280
RTD, Thermistor	0.01°C (10 plc)	6 (5)
	0.1°C (1 plc)	47 (47)
	1°C (0.02 plc)	280
acV	6½ Slow (3 Hz)	0.14
	6½ Med (20 Hz)	1
	6½ Fast (200 Hz)	8
	6½[6]	100
Frequency, Period	6½ digits (1s gate)	1
	5½ digits (100 ms)	9
	4½ digits (10 ms)	70

System Speeds[7]	
INTO Memory	**ch/s**
single channel dcV	490
34902A scanning dcV	250
34907A scanning digital in	250
34902A scanning dcV with scaling & 1 alarm fail	220
34907A scanning totalize	170
34902A scanning temperature	160
34902A scanning acV[6]	100
34902A scanning dcV/Ohms on alternate channels	90
34901A/34908A scanning dcV	60
INTO and OUT of memory to GPIB or RS-232 (init, fetch)	
34902A scanning dcV	180
34902A scanning dcV with timestamp	150
OUT of memory to GPIB[10]	
Readings	800
Readings with timestamp	450
Readings with all format options ON	310
OUT of memory to RS-232	
Readings	600
Readings with timestamp	320
Readings with all format options ON	230
DIRECT to GPIB or RS-232	
single channel dcV	440
34902A scanning dcV	200
single channel MEAS DCV 10 / MEAS DCV 1	25
single channel MEAS DCV/ MEAS OHMS	12

[1] For 1 KΩ unbalance in LO lead
[2] For power line frequency ±0.1%
[3] For power line frequency ±1% use 80 dB or ±3% use 60 dB
[4] Reading speeds for 60 Hz and (50 Hz) operation
[5] For fixed function and range, readings to memory, scaling and alarms off, AZERO OFF
[6] Maximum limit with default settling delays defeated
[7] Speeds are for 4½ digits, delay Ø, display off, autozero off. Using 115 kbaud RS-232 setting
[8] Isolation voltage (ch - ch, ch - earth) 300 Vdc, ac rms
[9] 6 ½ digits = 22 bits, 5½ digits = 18 bits, 4½ digits = 15 bits
[10] Assumes relative time format (time since start of scan)

System Specifications

Scanning Inputs	
Analog	34901A, 34902A, and 34908A multiplexer channels
Digital	34907A digital in and totalize
Scan list	Scans channels in ascending order
Scan Triggering	
Source	Interval, external, button press, software, or on monitor channel alarm
Scan count	1 to 50,000 or continuous
Scan interval	0 to 99 hours; 1ms step size
Channel delay	0 to 60 seconds per channel; 1 ms step size
External trig delay	<300 µs. With monitor on <200 ms
External trig jitter	<2 ms
Alarms	
Analog inputs	Hi, Lo, or Hi + Lo evaluated each scan
Digital inputs	34907A digital in maskable pattern match or state change 34907A totalize: Hi limit only
Monitor channel	Alarm evaluated each reading
Alarm Outputs	4 TTL compatible Selectable TTL logic Hi or Lo on fail
Latency	5 ms (typical)
Memory	
	Battery backed, 4 year typical life[1]
Readings	50,000 with timestamp Readable during scan
States	5 instrument states with user label
Alarm Queue	Up to 20 events with channel number, reading, and timestamp
System Features	
Per-channel Math	Individual Mx + B scaling and Min/Max/Average calculated real time
Power Fail Recovery	Resumes scanning automatically
Relay maintenance	Counts each relay closure and stores on module User resettable
Real-time clock	Battery-backed, 4-year typical life[1]
General Specifications	
Power Supply	100V/120V/220V/240V ±10%
Power Line Frequency	45 Hz to 66 Hz automatically sensed
Power Consumption	12 W (25 VA peak)
Operating Environment	Full accuracy for 0°C to 55°C Full accuracy to 80% R.H. at 40°C
Storage Environment	-40°C to 70°C[1]
Weight	Net: 3.6 kg (8.0 lbs)
Safety	Conforms to CSA, UL-1244, IEC 1010 Cat I
RFI and ESD	CISPR 11, IEC 801/2/3/4

Software

Agilent BenchLink Data Logger II
(not included with Option 001)

System Requirements[2]	
Operating System	Windows 98SE, NT® 4.0 SP6a, 2000 SP4, XP Adobe® Acrobat® Reader V5.0 or higher (to view documentation) Microsoft® Internet Explorer V5.0 or higher (required when using Windows NT)
Controller	Recommend Pentium® 4, 800 MHz or greater, Min: Pentium III, 500 MHz
RAM	Recommend 256MB or greater, Min 128MB
Disk Space	Recommend 200MB, Min 70MB
Display	800x600 resolution, 256 colors
Computer Interfaces[3]	
GPIB	Agilent and National Instruments PCI-GPIB
LAN-to-GPIB	E5810A
USB-to-GPIB	82357A
	RS-232 (Serial Port) PC COM 1-4
Agilent BenchLink Features	
Configuration	Spreadsheet-like setup page Upload and Download instrument setups Computed channels using + - */, dB, dBm, dBV, x^2, $\sqrt{x}$ and full, 1/2, or 1/4 bridge strain
Graphical Displays	Real-time and historical data displays Add, delete, size, and configure real time Strip chart with markers and alarm indication, bar and scatter charts, Histogram with statistics, Bar meter, Digital meter, and Data table
Graphical Controls	Sliders, switches, buttons, and LED lights
Alarm / Limit testing	Start/Stop scanning on alarm condition Control 34903A relay state or 34907A digital output on alarm
Data	Real time streamed (saved) to disk Copy data or graphics to windows clipboard Export user-selected data to .CVS, .XML, or .TXT formats
Event logging	Automatic entry of alarms and errors Enter user notes real time
Printing	Setup spreadsheet, all graphics, and event log entries
Instrument Driver Support for Programming Languages	
Universal	Compatible with Windows 95 and NT
Instrument Driver[5]	Agilent VEE 3.2 or greater Visual Basic 4.0, LabWindows CVI 4.0, LabVIEW 4.0
Labview Driver (VI)	LabVIEW 4.0

[1] Storage at temperatures above 40°C will decrease battery life
[2] Software provided on CD-ROM and includes utility to create floppy disks for installation
[3] Interface and driver must be purchased and installed separately
[4] 90 MHz Pentium, 20 MB RAM
[5] Requires VISA command library for IEEE-488

Modules Specifications

The Agilent 34970A accuracy specifications already include the switching offset and reference junction errors shown below. These errors are listed separately for determining system error with external measurement devices.

Up to three modules, in any combination, can be inserted into a single mainframe. The 34970A's internal DMM connections are accessible only through the 34901A, 34902A, and 34908A low-frequency multiplexers.

On-module screw terminals accept wire sizes from 16 gage to 22 gage. Twenty-gage wire is recommended for high channel count applications. The 34905A and 34906A RF Multiplexers use SMB connectors. A standard set of (10) BNC-to-SMB adapter cables is provided with each RF module for convenient BNC connections.

		Multiplexer			Actuator	Matrix	RF Multiplexer		Multifunction
		34901A	34902A[1]	34908A	34903A	34904A	34905A	34906A	34907A
General									
Number of Channels		20 + 2	16	40	20	4 x 8	Dual 1 x 4		See page 22 for module specifications
		2/4 wire	2/4 wire	1 wire	SPDT	2 wire	50 Ω	75 Ω	
Connects to Internal DMM		•	•	•					
Scanning Speed		60 ch/s	250 ch/s	60 ch/s					
Open/Close Speed		120/s	120/s	70/s	120/s	120/s	60/s		
Input									
Voltage (dc , ac rms)[2]		300 V	300 V	300 V	300 V	300 V	42 V		
Current (dc , ac rms)		1A	50mA	1A	1A	1A	0.7A		
Power (W , VA)		50 W	2 W	50 W	50 W	50 W	20 W		
DC Characteristics									
Offset Voltage [3]		< 3uV	< 6uV	< 3uV	< 3uV	< 3uV	< 6uV		
Initial Closed Channel R [3]		< 1 Ω	< 1 Ω	< 1 Ω	< 0.2 Ω	< 1 Ω	< 0.5 Ω		
Isolation ch-ch, ch-earth		> 10 G Ω	> 10 G Ω	> 10 G Ω	> 10 G Ω	> 10 G Ω	> 1 G Ω		
AC Characteristics									
Bandwidth[4]		10 MHz	10 MHz	10 MHz	10 MHz	10 MHz	2 GHz [5]	2 GHz [5]	
Insertion Loss (dB)	10 MHz	—	—	—	—	—	-0.1	-0.1	
	100 MHz	—	—	—	—	—	-0.4	-0.4	
	500 MHz	—	—	—	—	—	-0.6	-0.5	
	1 GHz	—	—	—	—	—	-1	-1	
	1.5 GHz	—	—	—	—	—	-1.2	-1.5	
	2 GHz	—	—	—	—	—	-3	-2	
SWR	10 MHz	—	—	—	—	—	1.02	1.02	
	100 MHz	—	—	—	—	—	1.05	1.05	
	500 MHz	—	—	—	—	—	1.20	1.25	
	1 GHz	—	—	—	—	—	1.20	1.40	
	1.5 GHz	—	—	—	—	—	1.30	1.40	
	2 GHz	—	—	—	—	—	1.40	2.00	
ch-ch Cross Talk (dB)[4]	10 MHz	-45	-45	-18[6]	-45	-33	-100	-85	
	100 MHz	—	—	—	—	—	-85	-75	
	500 MHz	—	—	—	—	—	-65	-65	
	1 GHz	—	—	—	—	—	-55	-50	
	1.5 GHz	—	—	—	—	—	-45	-40	
	2 GHz	—	—	—	—	—	-35	-35	
Risetime							< 300 ps		
Signal Delay							< 3 ns		
Capacitance	HI - LO	< 50 pF	< 50 pF	< 50 pF	< 10 pF	< 50 pF	< 20 pF		
	LO - Earth	< 80 pF	< 80 pF	< 80 pF	< 80 pF	< 80 pF	—		
Volt-Hertz limit		10^8	10^8	10^8	10^8	10^8	10^{10}		
Other									
T/C Cold Junction Accuracy[3]									
	(typical)	0.8°C	0.8°C	0.8°C[8]					
Switch Life	No Load (typical)	100M	100M	100M	100M	100M	5M	5M	
	Rated Load (typical)[7]	100k	100k	100k	100k	100k	100k	100k	
Temperature	Operating	all cards — 0°C to 55°C							
	Storage	all cards — -20°C to 70°C							
Humidity	(non-condensing)	all cards — 40°C/80% RH							

[1] Not recommended for connection to ac line without external transient suppression
[2] Channel-to-channel or channel-to-earth
[3] Errors included in DMM measurement accuracy specifications
[4] 50Ω source, 50Ω load
[5] Bandwidth direct to card SMB connectors
[6] Isolation within channel 1 to 20 or 21 to 40 banks is -40 dB
[7] Applies to resistive loads only
[8] Thermocouple measurements not recommended with 34908A module due to common lo configuration