Agilent 34970A

Data Sheet

This document lists specifications for the Agilent Technologies 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 18ºC-28ºC 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%.

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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 to 100.0000V	3 Hz - 5 Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100 + 0.004
		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 or Period[7]	100 mV to 300 V	3 Hz - 5 Hz	0.10	0.10	0.10	0.005
		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	**<0.6V**	**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 and[4] 1.000000 A	3 Hz - 5 Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
		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]		Temperature Coefficient 0°C – 18°C, 28°C – 55°C
Thermocouple	B	1100°C to 1820°C	1.2°C	400°C to 1100°C	1.8°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	0.03 °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 1 Ω additional error in 2-wire Ohms function
[7] Input > 100 mV. For 10 mV inputs multipy % of reading error x 10
[8] Specified only for inputs >10 mA
[9] For total measurement accuracy, add temperature probe error

Measurement Characteristics[8]

DC Voltage

Measurement Method:	Continuously Integrating Multi-slope IIIA-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
100V, 300V 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 3Hz, 20Hz, 200Hz LF limit

DC Current

Shunt Resistance:	5 Ω for 10 mA, 100 mA; 0.1 Ω for 1 A
Input Protection:	1A 250V fuse on the 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 250V fuse on the 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 = 0.00392

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)	600
Thermocouple	0.1°C (1 plc)	57 (47)
	(0.02 plc)	220
RTD, Thermistor	0.01°C (10 plc)	6 (5)
	0.1°C (1 plc)	57 (47)
	1°C (0.02 plc)	220
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	600
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	
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] 6½ digits = 22 bits, 5½ digits = 18 bits, 4½ digits = 15 bits

System Characteristics

Scanning Inputs

Analog	Agilent 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	<2 ms. 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
Warranty	3 years

[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

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Software

HP BenchLink Data Logger (not included with Option 001)

System Requirements[2]

PC Hardware	486, 66 MHz, 16 MB RAM, 12 MB disk space
Operating System	Windows® 3.1, Windows 95®, Windows NT 4.0®
Instrument Support	Single 34970A operation
	Single program window

Computer Interfaces[3]

GPIB	82335B, 82340A/B/C, 82341A/B/C/D National Instruments AT-GPIB/TNT, PCI-GPIB, PC-MCIA
LAN -to- GPIB	E2050A (Windows 95 and NT only)
RS-232 (Serial Port)	PC COM 1-4

HP BenchLink Features

Configuration	Spreadsheet-like setup page
	Upload and Download intrument 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, X-Y chart with curve fit, 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 ASCII file, CSV, TSV
Event Logging	Automatic entry of alarms and errors
	Enter user notes real time
Printing	Setup spreadsheet, all graphics, and event log entries

HP BenchLink Performance[4]

Scan and Save to Disk	100 ch/s 2 strip charts displayed
Readings Saved	Maximum 150M/file

Instrument Driver Support for Programming Languages

Universal Instrument Driver[5]	Compatible with Windows 95 and NT
	Agilent VEE 3.2 or greater
	Visual Basic 4.0,
	LabWindows CVI 4.0,
	LabVIEW 4.0
Labview Driver (VI)	LabVIEW 4.0

Module 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. 20 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
GENERAL		**34901A**	**34902A**[1]	**34908A**	**34903A**	**34904A**	**34905A**	**34906A**	**34907A**
Number of Channels		20 + 2	16	40	20	4 x 8	Dual 1 x 4		See
		2/4 wire	2/4 wire	1 wire	SPDT	2 wire	50 Ω	75 Ω	Page 22
Connects to Internal DMM		•	•	•					for module
Scanning Speed		60 ch/s	250 ch/s	60 ch/s					specifications
Open/Close Speed		120/s	120/s	70/s	120/s	120/s	60/s		
INPUT									
Voltage (dc, ac rms)[2]		300V	300V	300V	300V	300V	42		
Current (dc, ac rms)		1A	50mA	1A	1A	1A	0.7A		
Power (W, VA)		50W	2W	50W	50W	50W	20W		
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					
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

Multiplexer Selection Guide

Choose between the broad functionality of the 34901A, the high speed scanning of the 34902A, or the single-ended density of the 34908A. These three modules are the only way to connect to the 34970A internal DMM. They can be used to scan with external instruments as well.

All multiplexer modules employ break-before-make scanning, ensuring only one closed channel (or channel pair) at a time. Multiple channel closures are allowed on the 34901A and 34902A modules when not configured for scanning.

The 34908A does not allow multiple channel closures at any time.

	34901A	34902A	34908A
Number of Channels	20 + 2	16	40
Max scan speed	60 ch/s	250 ch/s	60 ch/s
Number of contacts	2 or 4	2 or 4	1
Temperature			
Thermocouple	•	•	•
2-wire RTD	•	•	•
4-wire RTD	•	•	
Thermistor	•	•	•
dc Volts	•	•	•
ac Volts	•	•	•
2-wire Ohms	•	•	•
4-wire Ohms	•	•	
Frequency	•	•	•
Period	•	•	•
dc current	•		
ac current	•		

Agilent 34901A
20-Channel
General-Purpose Multiplexer

• 60 ch/s scanning

• Two- and four-wire scanning

• Built-in thermocouple reference junction

• 300 V switching

The 34901A is the most versatile multiplexer for general purpose scanning. It combines dense, multi-function switching with 60 channel/second scan rates to address a broad spectrum of data acquisition applications.

Two- and four-wire channels can be mixed on the same module. Two additional fused inputs (22 channels total) route up to 1A of current to the internal DMM, allowing ac and dc current measurements without the need for external shunt resistors.
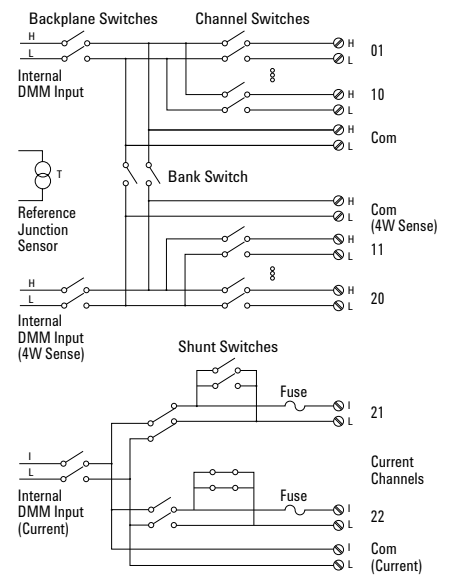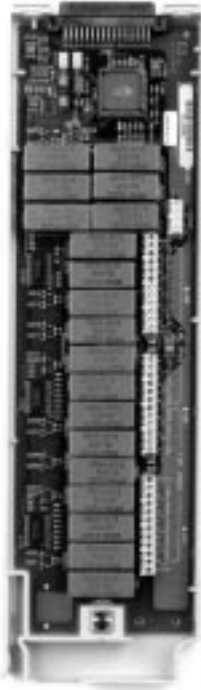
Agilent 34902A
16-Channel
High-Speed Multiplexer

- 250 ch/s scanning

- Two- and four-wire scanning

- Built-in thermocouple reference junction

The 34902A employs reed relays to achieve scan rates up to 250 channels-per-second. Use this module for high-throughput automated test applications as well as high-speed data logging and monitoring tasks.

Sixteen two-wire inputs switch up to 300 V. Two- and four-wire channels may be mixed on the same module. User provided shunt resistors are required for current measurements.
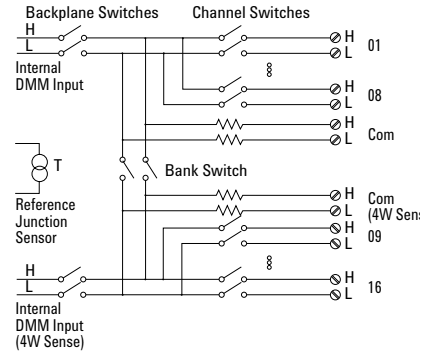
Note: Not recommended for connection to ac line without external transient suppression.
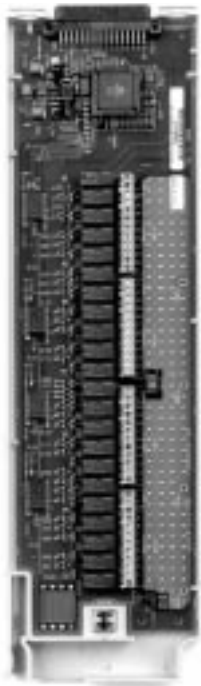
Agilent 34908A
40-Channel
Single-Ended Multiplexer

- 60 ch/s scanning

- Single-wire switching for common-low applications

- Built-in thermocouple reference junction

Use the 34908A for the greatest density in common-low applications, such as battery test, component characterization, and benchtop testing.

Each module switches 40 one-wire inputs. All two-wire internal measurements except current are supported. The module low connection is isolated from earth and can float up to 300V.
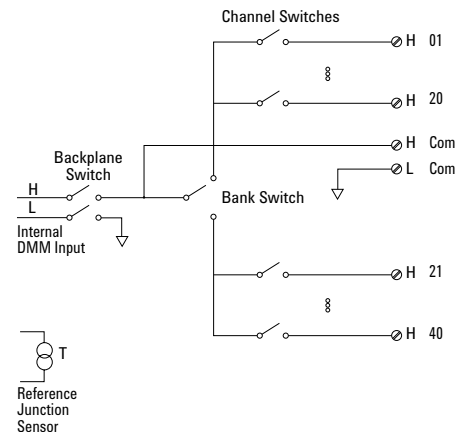
Note: Thermocouples must be electrically isolated from each other to avoid current loops and subsequent measurement errors.
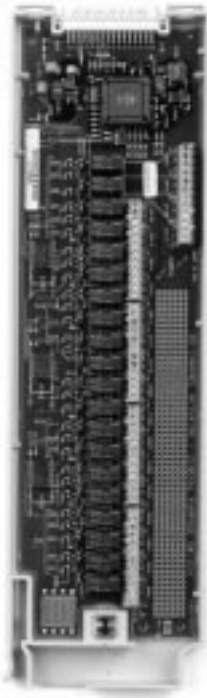
Agilent 34903A
**20-Channel Actuator/
General Purpose Switch**

• SPDT (Form C) latching relays

• 300 V, 1 A actuation and control

This general-purpose switch module has 20 independent single-pole, double-throw (SPDT) relays. Use it to cycle power to products under test, control indicator and status lights, and to actuate external power relays and solenoids. Combine it with matrix and multiplexer modules to build custom switch systems. Its 300V, 1A contacts can handle up to 50W, enough for many power line switching applications.
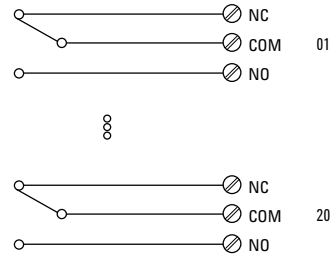
Agilent 34904A
4x8 Two-wire Matrix Switch

• 32 two-wire crosspoints

• 300V, 1A switching

The 34904A gives you the most flexible connection path between your device under test and your test equipment, allowing different instruments to be connected to multiple points on your DUT at the same time.

Rows or columns may be connected between multiple modules to build 8x8, 4x16 or larger matrices, with up to 96 crosspoints in a single frame.
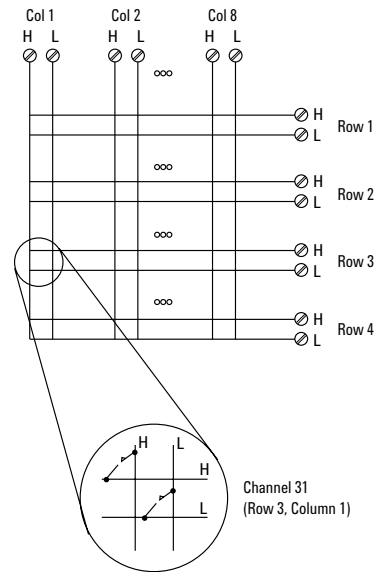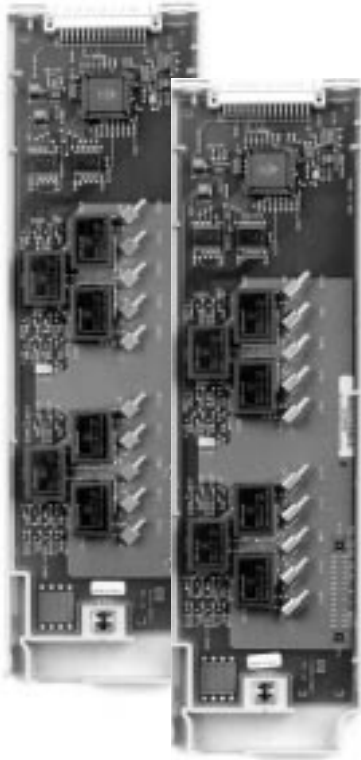
Agilent 34905A 50Ω
Agilent 34906A 75Ω
Dual 4-channel RF Multiplexers

- 2 GHz bandwidth

- BNC to SMB adapter cables included

The 34905A and 34906A RF multiplexers offer broadband switching capabilities for high-frequency and pulsed signals. Use them to route test signals between your device under test and your signal generator, oscilloscope, spectrum analyzer, or other instrumentation.

The RF multiplexers are arranged as two independent 1x4 multiplexers, each with a common shield and a switched center conductor. Connections can be made directly to SMB inputs with 2 GHz usable bandwidth, or to the BNC-to-SMB

adapters provided with 1 GHz bandwidth. Multiple banks may be cascaded together for applications requiring even larger topologies—create a stubless 16:1 multiplexer in a single frame.
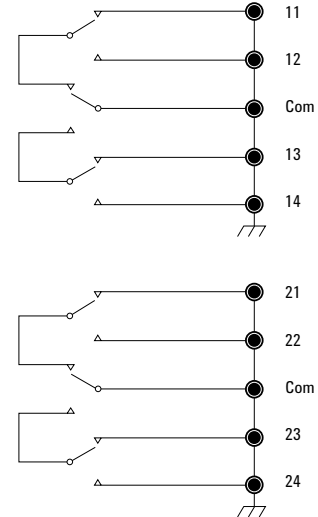
50Ω MUX Typical AC Performance Graphs
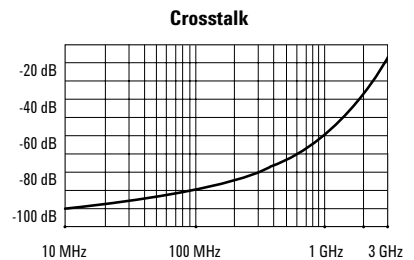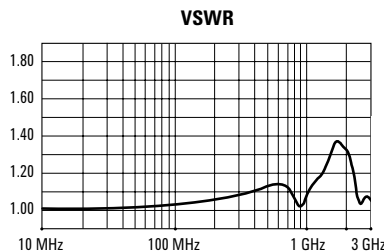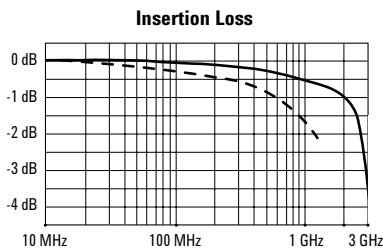
## 75Ω MUX Typical AC Performance Graphs
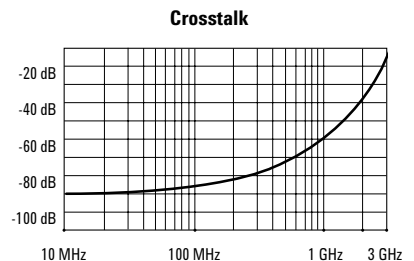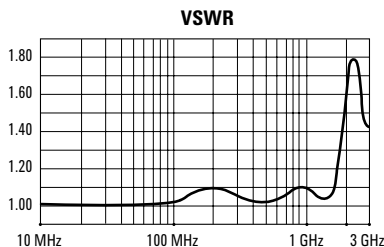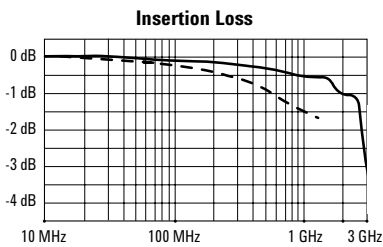
——— direct to card

- - - - using provided adapter cables

9

Agilent 34907A
Multifunction Module

- 16 bits of digital input and output
- 100 kHz totalizer input
- Two ±12V analog outputs

The 34907A allows great flexibility for a variety of sense and control applications. It combines two 8-bit ports of digital input and output, a 100 kHz gated totalizer, and two ±12V analog outputs—all on a single earth-referenced module. The digital inputs and totalizer input may be included in a scan. Alarm limits for the digital and event counter inputs are evaluated continuously, capturing and logging alarm conditions even between scans.
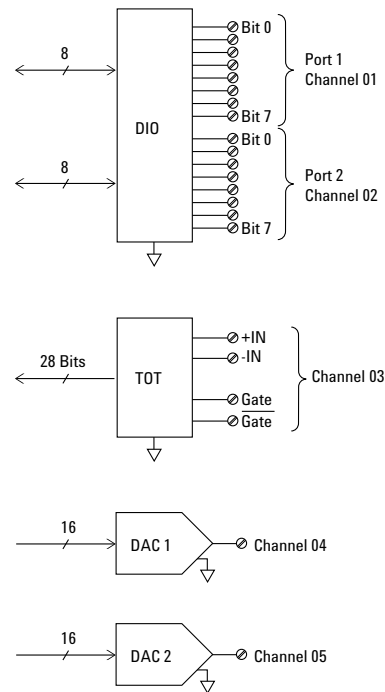
Digital Input/Ouput

Use the digital outputs with an external power supply to control microwave switches and attenuators, solenoids, power relays, indicators, and more. Use the digital inputs to sense limit switch and digital bus status. There are no complex handshake modes; reads and writes are initiated either from the front panel or the bus.

Totalize Input

Count events from devices like photo interrupters, limit switches, and Hall-effect sensors.

It keeps an updated total which can be read via the front panel or programmatically at any time. With 26 bits of resolution, it can count events at full speed for nearly 11 minutes without an overflow.

Analog Output

Use the two electronically calibrated analog outputs to source bias voltages to your device under test, to control your analog programmable power supplies, or use the outputs as setpoints for your control systems. The outputs are programmed directly in volts, either from the front panel or from the bus.

Digital Input/Output

Port 1, 2	8 bit, input or output, non-isolated
Vin(L)	< 0.8V (TTL)
Vin(H)	> 2.0V (TTL)
Vout(L)	< 0.8V @ Iout = - 400 mA
Vout(H)	> 2.4V @ Iout = 1 mA
Vout(H) max	< 42V with external open drain pull-up
Alarming	Maskable pattern match or state change
Speed	4 ms (max) alarm sampling
Latency	5 ms (typical) to 34970A alarm output
Read/Write Speed	95/s

Totalize Input

Max Count	$2^{26} - 1$
Totalize Input	100 kHz (max)
	Rising or falling edge, programmable
Signal level	1 Vp-p (min)
	42 Vpk (max)
Threshold	0V or TTL, jumper selectable
Gate Input	TTL-Hi, TTL-Lo, or none
Count Reset	Manual or Read + Reset
Read Speed	85/s9

Analog Output

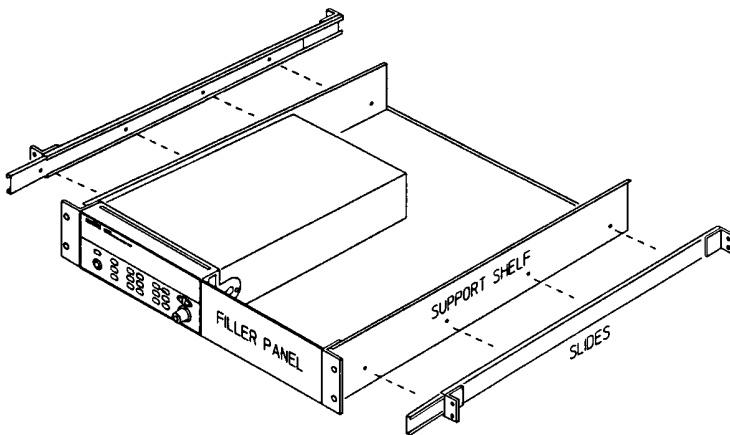|	
DAC 1, 2	± 12V, non-isolated
Resolution	1 mV
I_{out} 10 mA max	
Settling time	1 ms to 0.01% of output
Accuracy	±(% of output + mV)
1 year ±5°C	0.25% + 20 mV
Temp. Coefficient	± (0.015% + 1 mV)/°C

Rack Mounting and Dimensions
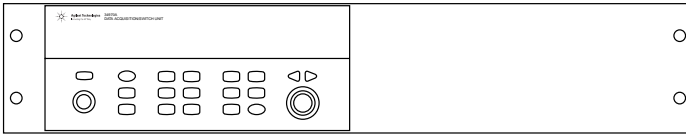
To rack mount a single instrument, order adapter kit 5063-9240 (Option 1CM).
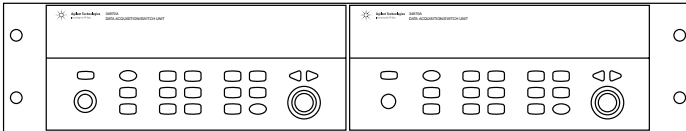
To rack mount two instruments side-by-side, order lock-link kit 5061-9694 and flange kit 5063-9212.

To install one or two instruments in a sliding support shelf, order shelf 5063-9255, and slide kit 1494-0015 (for single instrument, also order filler panel 5002-3999).

103.6 mm

254.4 mm

374.0 mm

88.5 mm

212.6 mm

348.3 mm

Module

315.

91.9
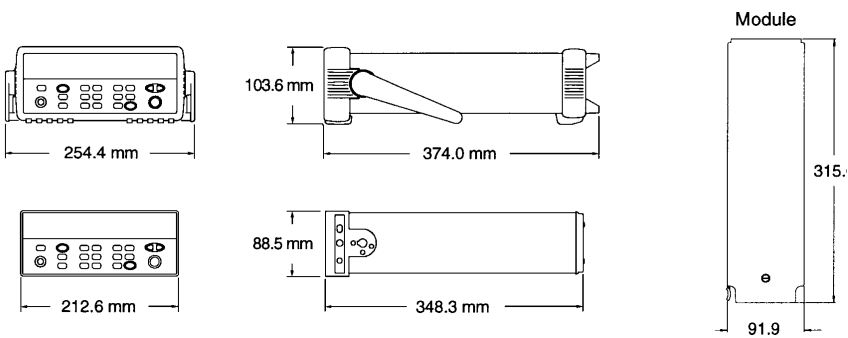
Ordering Information

Mainframe

34970   Data Acquisition/Switch Unit
Includes internal 6$\frac{1}{2}$ digit DMM, Operating and Service Manuals,
Test report, power cord, and Quick Start package (includes HP Benchlink
Data Logger software, RS-232 Cable, Thermocouple, and screwdriver)
Modules are purchased separately and are required to operate.

Option 001   Delete Internal DMM
Same as above but deletes DMM and quick start package.
Order 34970-80010 to retrofit DMM at a later time.

Option 1CM   Rack Mount Kit

Option 0B0   Delete Manual Set

Modules

34901A	20-Channel Armature Multiplexer
34902A	16-Channel Reed Multiplexer
34903A	20-Channel Actuator/General Purpose Switch
34904A	4 x 8 Two-Wire Matrix Switch
34905A	Dual 4-Channel RF Multiplexer, 50 Ohms
34906A	Dual 4-Channel RF Multiplexer, 75 Ohms
34907A	Multifunction Module
34908A	40-Channel Single-Ended Multiplexer

Accessories

34307A	10-pack of J-type thermocouples
34308A	5-pack of 10 kΩ thermistors
34161A	Accessory Pouch
34131A	Hard Carrying Case (Transit Case)
34397A	dc-to-ac Inverter
E2050A	LAN/GPIB Gateway
34970-80010	DMM Field Installation Kit
	Fully calibrated with Test Report and Quick Start Kit
34905-60001	Kit of 10 SMB-to-BNC adapter cables, 50Ω
34906-60001	Kit of 10 SMB-to-BNC adapter cables, 75Ω

Related Literature

	Pub. Number
Accessories for the Agilent 34970A Data Acquisition/Switch Unit	5966-4443EUS
Practical Temperature Measurements	5965-7822E

Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

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