Comparisons: DAQ970A to 34970A/34972A

Data Acquisition System

The Keysight DAQ970A is the next generation of data acquisition system (DAQ) for users that own the Keysight 34970A or the 34972A. The DAQ970A design provides higher performance and flexibility while maintaining compatibility with the 34970A and 34972A.

The DAQ970A improves the user experience with a color LCD, internal module calibration, and improved temperature accuracy and measurement speeds. A new solid-state multiplexer module is also available for higher switching speeds.

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Introduction

The 34970A and 34972A data acquisition systems are legacy data acquisition/ switching systems. Both designs are for ease of use with low cost per channel, modular flexibility, standard connectivity, and impressive measurement performance. The 34970A/34972A also offers the best combination of price and measurement performance.

The next generation DAQ970A builds on the proven design of the 34970A and 34972A.

Features

- Built-in advanced 6 ½ digit DMM & signal conditioning; no external boxes required, with improved accuracy and speed

- The ability to measure very low current ranges; 1 µA DC and 100 µA AC, and higher resistance range 1000 MΩ

- Eleven measurement types that the 34970A/34972A can measure, as well as diode and capacitance; 1nF – 100µF ranges

- Auto-calibration which compensates for drifts in the internal DMM; or on the DAQM907A multifunction module caused by time and temperature changes

- Intuitive LCD screen and soft keys for easy configuration and measurement displays in multiple formats: number, bar meter, trend chart, and histogram

- Scan rate of up to 450 channels/s with a new DAQM900A solid-state multiplexer module

- Ten times more accurate and higher resolution DAC output and two additional voltage/current sensing channels with the DAQM907A multifunction module

- Test automation without programming using the BenchVue's DAQ software

Compatibility

The DAQ970A design is compatible with the 34970A and 34972A with several exceptions. See Table 1 for product comparisons.

These are just some of the areas where the DAQ970A is equivalent with the 3497XA:

1. **Functions and ranges**
   The DAQ970A is a superset of 34970A/34972A capability. Differences are listed below.

2. **Measurement accuracy and resolution**
   The DAQ970A's specifications are as accurate or better with few exceptions. See Table 2.

3. **SCPI compatibility**
   The DAQ970A will work with SCPI programs written for the Keysight 34970A/34972A. Programming considerations and differences are listed below.

Sample more signals, faster, with new DAQ970A improvements:

- Up to 2X scan rate speed improvement; up to 450 ch/sec

- Up to 10X reading rates improvement to I/O interface & memory

- Up to 55% accuracy improvements for resistance

- Up to 75% accuracy improvements for AC voltage

- Up to 90% accuracy improvement for AC current

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4. **Mechanical size**
   Height, width, and depth dimensions are the same as the 34970A/34972A.

5. **Accessories**
   Rackmount kit accessories are compatible with both products. However, there are new part numbers for the rack mount kits to be color compatible with the DAQ970A.

6. **Manufacturing**
   Both DAQs have the same rigorous quality standards and manufacturing process controls.

7. **Service and support from Keysight**
   Our worldwide team is available to help you calibrate your DAQ970A or answer any questions about either instrument.

Model	DAQ970A	34970A/34972A
Slots	3	3
Built-in DMM	• New: Auto calibration • 6 1/2-digit resolution;	• 6 1/2-digit resolution
Multiplexer scan rate	Up to 450 channels per second	Up to 250 channels per second
Types of measurements	Measures and converts 13 different input signals: • **New**: Capacitance, and diode test • Temperature with thermocouples • RTDs and thermistors • DC/AC volts • 2- and 4-wire resistance • Frequency and period • DC/ AC current	Measures and converts 11 different input signals: • Temperature with thermocouples • RTDs and thermistors • DC/AC volts • 2- and 4-wire resistance • Frequency and period • DC/ AC current
Added ranges	• 1000 MΩ range for resistance • 1 µA range for DC current • 100 µA, 1 mA ranges for AC current • Square wave input for frequency	No additional ranges
Display	Color LCD / GUI	Single line alpha-numeric display

Model	DAQ970A	34970A/34972A
Modules	• **New**: 20 ch solid state switch mux • 20 ch armature switch mux • 16 ch reed switch mux • 20 ch actuator/switch • 4 X 8 matrix switch • Dual 4 ch RF Mux 50 Ω • Multi-function module • 40 ch armature switch mux	• 20 ch armature switch mux • 16 ch reed switch mux • 20 ch actuator/switch • 4 X 8 matrix switch • Dual 4 ch RF Mux 50 Ω / 75 Ω • Multi-function module • 40 ch armature switch mux
PC based BenchVue DAQ Application Software	BenchVue to configure and control tests, display results, and collect and export data for further analysis	
Interface	• Front and back USB; LAN/ LXI • External Trigger / Alarms	• Front and back USB; LAN/ LXI; GPIB • External Trigger/alarms

Table 1. Key product comparison between DAQ970A and 34970A/34972A

Model	DAQ970A	34970A/34972A	Remarks
1-year accuracy (%)	Accuracy +/- (% of Reading + % of Range)	Accuracy +/- (% of Reading + % of Range)	
DCV (1 V)	0.0035 + 0.0006	0.0040 + 0.0007	13% improvement
DCV (300 V)	0.0040 + 0.0020	0.0045 + 0.0030	20% improvement
Resistance (1 kΩ)	0.0040 + 0.0007	0.008 + 0.001	48% improvement
Resistance (1 MΩ)	0.0070 + 0.0005	0.008 + 0.001	17% improvement
Resistance (100 MΩ)	0.350 + 0.001	0.800 + 0.010	57% improvement
Resistance (1000 MΩ)	3.500 + 0.001	Out of range	
DCA (1 A)	0.080 + 0.010	0.080 + 0.010	
ACV (up 100V range at 10 Hz - 20 kHz)	0.05 + 0.02	0.06 + 0.04	30% improvement
ACV (up to 300V range at 10 Hz - 20 kHz)	0.05 + 0.06	0.06 + 0.08	21% improvement
ACA (up to 1mA range at 5 kHz - 10 kHz)	0.10 + 0.04	0.30 + 0.04	59% improvement
ACA (up to 1A range at 5 kHz - 10 kHz)	0.10 + 0.04	0.30 + 0.5	83% improvement
Frequency (1 kHz - 300 kHz)	0.007	0.01	
Temperature accuracy (°C)			
Thermocouple (J type)	1.0°C	1.0°C	
Thermocouple (K type)	0.9°C	1.0°C	
Thermocouple (R type)	0.5°C	1.2°C	General improvements
RTD (R0 from 49Ω to 2.1kΩ)	0.05°C	0.06°C	
Thermistor (2.2kΩ, 5kΩ, 10kΩ)	0.1°C	0.1°C	
Max measurement speed (Single ch ASCII readings - DCV, Ohms)	5000 readings per second	500 readings per second	10X faster
Internal memory	100,000 scan readings	50,000 scan readings	2X more
DAC output			
Voltage output	+/-0.027% output + 4.4 mV	+/-0.25% output + 20 mV	10X improvement

Table 2. Key specifications comparison between DAQ970A and 34970A/34972A

Differences

Physical/functional differences

1. GPIB is not currently available for the DAQ970A. If you cannot use the faster USB or LAN interface that comes with SCPI compatible command interface, you can continue to purchase the 34970A until the DAQ970A with GPIB becomes available.

2. DAQM908A single-ended MUX card does not support thermocouple temperature measurements.

3. Removal of a card when power to the DAQ970A is on, causes an immediate power-on reset of the mainframe.

4. All the modules DAQ970A offers cannot be used on 34970A/34972A mainframe and vice versa.

Programming differences

1. **Alarm as a trigger source.** In DAQ970A, the alarm trigger condition re-evaluates with every sweep, such that it will trigger for as long as an alarm condition remains true. The 34970A required that the alarm condition go away, and then come back to generate a new trigger event. For backward compatibility, the 34970A or 34972A model behavior is restored for alarm triggering when 'SYST:PERSona:MODel' is set to either "34970A" or "34972A".

2. **Allowed values of TEMP:TRAN:RTD:RES:REFerence are restricted to values of either 100 Ohms or 1 kOhms +/- 1%.**

3. **In RTD temperature measurements, support for the alpha .000391 RTD type (as specified by the 'TEMP:TRAN:RTD:TYPe' command) is not available.** DAQ970A gives an "Illegal parameter value" error if any numeric value other than '385' is specified as a parameter to the 'TEMP:TRANsducer:RTD:TYPe' command.

4. **Digital Input and Totalizer channels are not allowed in the scan list when INST:DMM:STATe is OFF.**

5. **Attempts to add a digital channel to the scan list that has a current configuration as an output will now generate an error.** Using 'ROUTe:SCAN' to put a digital channel into the scan list in the 34970A/34972A would silently switch the channel to input mode if it was configured as an output. DAQ970A will give an error like, +308, "Channel not able to perform requested operation; Chan 201".

6. **ROUTe:MONitor:DATA?/DATA:FULL? will return 9.91E37 (NaN) if no measurement has been taken on the monitor channel rather than waiting for a measurement to occur.** The 34970A/34972A will wait until a measurement is available. The problem is that there's no guarantee about how long this may take, and the user's program may hit a VISA timeout before it occurs.

7. **ROUTe:CLOSe? and ROUTe:OPEN? will return an error when querying the state of channels on a MUX card that is currently devoted to a scan.**

8. **In DAQ970A, the mapping of measurement resolution to NPLC in DC functions is different from the 34970A/34972A.** If you set the aperture using CONFigure/MEASure <range>, <resolution>, or use the SENSe:<function>:RESolution command, the result may be a shorter NPLC value on DAQ970A than on the 34970A/34972A. In particular, the result may be a fractional NPLC value (NPLC < 1) on DAQ970A where the 34970A/34972A would select a 1 PLC aperture, and line cycle rejection can be lost, increasing susceptibility to power line related noise.

9. **DAQ970A will not disable alarms (i.e. 'CALC:SCAL:LIMit{UPPer | LOWer}') when UNIT:TEMP changes.** This behavior of the 34970A/34972A can still be obtained using the setting of 'SYST:PERSona:MODel'.

10. **The DEFault/*RST value of CALC:LIMit:UPPer will be '0.0' for Totalizer channels, to be consistent with all other channel types.** In the 34970A/34972A, the *RST value of the upper limit on totalizer channels was '1.0' when all other channel types had a default value of '0.0'.

Conclusion

The next generation DAQ970A data acquisition system is here. It improves over its predecessor in accuracy over multi-types of signals and measurement speed. It comes with a very user-friendly LCD screen and soft buttons to enable you to easily configure your test setup and display measurements in multiple formats. It comes with added ranges over its predecessor such as measuring low AC and DC current and high resistance. BenchVue DAQ application software now comes with Test Flow application that allows you to automate your test without programming.

The DAQ970A is the next generation 34970A and 34972A data acquisition system. You can easily replace the 34970A or 34972A with the new DAQ970A. With the new generation DAQ970A, you will experience the ease of use with its interface and the simplicity of automating your test without programming so that you can focus on your primary work - designing your products.

To learn more about DAQ970A, please visit www.keysight.com/find/daq.

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

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