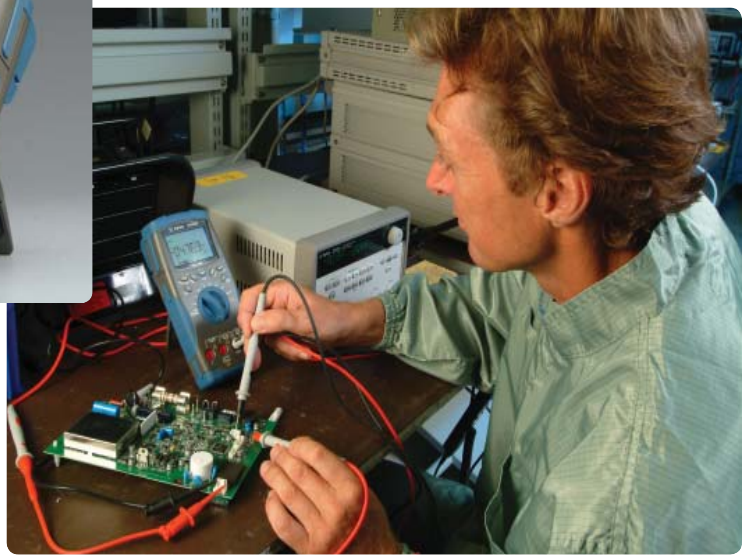
Agilent U1250A Series

Getting the Best Out of the U1250A Series Handheld DMM

Application Note



Agilent Technologies

Introduction

As electronic circuitries continue to become more prevalent in today's machinery and equipment; technical personnel in various industries are faced with added complexity and challenges brought on by these technologies. Commissioning, troubleshooting, and maintaining these complex systems are no longer straightforward but require proper diagnostic tools that can provide precise and consistent data. These challenges are added further by the increased demand of adopting portability in everyday work.

The Agilent U1250A Series handheld digital multimeter (DMM) delivers top-notch performance and functionality while maintaining its portability, ruggedness, and safety compliances. This portable instrument includes all the basic measurement functions with additional functionality needed in today's changing manufacturing environment.

This application note explains the usage of the U1250A Series DMM in monitoring the industrial environment using the Agilent GUI datalogger software. It also shows you how to check the reference clock and perform a square wave output function. Additionally, it provides various tips on how to get the most out of your DMM.

Agilent GUI Datalogger Software

Maintenance personnel from factories can now perform a limitless range of troubleshooting, monitoring, and process documentation jobs using the bundled Agilent GUI datalogger software. The U1250A Series with the GUI datalogger software can be used to collect information on general trends and develop an environmental profile of a factory. It is capable of collecting data over a week's period to support systems such as the installation or repair of heating, ventilation, and air-conditioning (HVAC) systems in a factory.

Benefits

The GUI datalogger software is able to log and time-stamp up to a maximum of 10000 records. It is also capable of displaying up to two types of parameters—that the DMM is capable of measuring—simultaneously. These various supported measuring parameters are voltage, current, resistance, frequency, capacitance, inductance, temperature, diode parameters, and so on.

Figure 1. Performing data logging with the U1250A Series handheld DMM and the GUI datalogger software.

Exporting data to MS Excel

The GUI datalogger provides a simple way of tabulating and plotting acquired data by saving the data to CSV file format, which can be directly exported into other common applications like Microsoft® Excel for further data analysis and display.

Datalogging with internal memory

Even without the GUI datalogger, the U1250A Series can perform manual data logging and interval data logging. However, users are only able to view limited portion of the collected data on the DMM's display. The U1250A Series is capable of storing up to 100 records for manually measured data and up to 200 records for interval logged data. Users can transfer their records to their PCs by using the GUI dataloggger's memory loading function to perform further analysis on their PC.

Data Logging Table | Graphs | Memory | Square wave program

Shows | Secondary | Directory: ... | c:\

Records	Time	Primary Function	Primary Reading	Primary Range	Primary Resolution	Secondary Function	Secondary Reading	Secondary Range	Secondary Resolution
1	12/21/2007 13:13:23	VOLT:AC	237.86	500.0	10.00 m	FREQ	49.914	100.0	1.000 m
2	12/21/2007 13:13:24	VOLT:AC	237.61	500.0	10.00 m	FREQ	49.911	100.0	1.000 m
3	12/21/2007 13:13:25	VOLT:AC	237.49	500.0	10.00 m	FREQ	49.918	100.0	1.000 m
4	12/21/2007 13:13:26	VOLT:AC	237.7	500.0	10.00 m	FREQ	49.92	100.0	1.000 m
5	12/21/2007 13:13:27	VOLT:AC	238.06	500.0	10.00 m	FREQ	49.924	100.0	1.000 m
6	12/21/2007 13:13:28	VOLT:AC	238.17	500.0	10.00 m	FREQ	49.913	100.0	1.000 m
7	12/21/2007 13:13:29	VOLT:AC	237.63	500.0	10.00 m	FREQ	49.916	100.0	1.000 m
8	12/21/2007 13:13:30	VOLT:AC	237.72	500.0	10.00 m	FREQ	49.931	100.0	1.000 m
9	12/21/2007 13:13:31	VOLT:AC	237.65	500.0	10.00 m	FREQ	49.914	100.0	1.000 m
10	12/21/2007 13:13:32	VOLT:AC	238.02	500.0	10.00 m	FREQ	49.915	100.0	1.000 m
11	12/21/2007 13:13:33	VOLT:AC	237.77	500.0	10.00 m	FREQ	49.917	100.0	1.000 m
12	12/21/2007 13:13:34	VOLT:AC	237.75	500.0	10.00 m	FREQ	49.919	100.0	1.000 m
13	12/21/2007 13:13:35	VOLT:AC	237.57	500.0	10.00 m	FREQ	49.918	100.0	1.000 m
14	12/21/2007 13:13:36	VOLT:AC	237.88	500.0	10.00 m	FREQ	49.918	100.0	1.000 m
15	12/21/2007 13:13:37	VOLT:AC	238.21	500.0	10.00 m	FREQ	49.922	100.0	1.000 m
16	12/21/2007 13:13:38	VOLT:AC	238	500.0	10.00 m	FREQ	49.926	100.0	1.000 m
17	12/21/2007 13:13:39	VOLT:AC	237.73	500.0	10.00 m	FREQ	49.94	100.0	1.000 m
18	12/21/2007 13:13:40	VOLT:AC	237.66	500.0	10.00 m	FREQ	49.945	100.0	1.000 m
19	12/21/2007 13:13:41	VOLT:AC	237.57	500.0	10.00 m	FREQ	49.929	100.0	1.000 m
20	12/21/2007 13:13:42	VOLT:AC	238.24	500.0	10.00 m	FREQ	49.942	100.0	1.000 m
21	12/21/2007 13:13:43	VOLT:AC	237.88	500.0	10.00 m	FREQ	49.926	100.0	1.000 m
22	12/21/2007 13:13:44	VOLT:AC	237.91	500.0	10.00 m	FREQ	49.931	100.0	1.000 m
23	12/21/2007 13:13:45	VOLT:AC	237.66	500.0	10.00 m	FREQ	49.926	100.0	1.000 m
24	12/21/2007 13:13:46	VOLT:AC	237.48	500.0	10.00 m	FREQ	49.946	100.0	1.000 m
25	12/21/2007 13:13:47	VOLT:AC	237.65	500.0	10.00 m	FREQ	49.93	100.0	1.000 m

Figure 2. Dual parameters (AC voltage and frequency) datalogging.

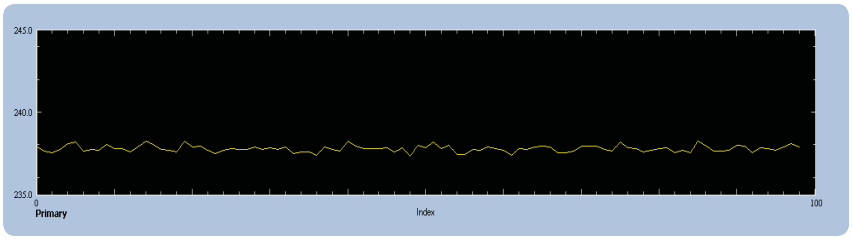


Figure 3. Primary display showing AC voltage.

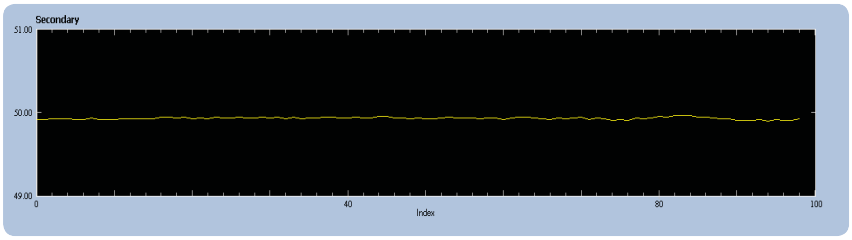


Figure 4. Secondary display showing frequency.

Ensuring a Complete Set of Logged Data

The logging interval can be configured to any value from 00:00:00:00 to 24:59:59:100 inclusive (hours:minutes:seconds:milliseconds). Hence, by calculating the minimal interval value, we are able to estimate that a maximum 10000 records is sufficient to cover the required duration. The minimum logging interval value is calculated as shown in the following section.

Duration of measurement/10000 records = Minimum logging interval

For example, if you require data for a specific duration of seven days (168 hours or 10080 minutes), the minimum interval value is calculated as shown below:

10080 minutes/10000 records = 1.008 minutes or 60.48 seconds

The result shows that 60.48 seconds is the lowest logging interval required to guarantee seven days of data logging, hence the logging interval should be set to one minute one second accordingly. However, if the monitored signal is stable, the logging interval can be increased, and the measurement duration can be increased further.

Checking Reference Clock with DMM

Voltage-controlled crystal oscillators that are used to generate precise and stable radio frequencies are found in a wide variety of electronic equipment such as computers, television, and telecommunication systems. A weak clock that has stop producing frequencies or produces pulse that varies inconsistently might cause electronic equipment to show intermittent problems or might stop functioning altogether. The U1250A Series handheld DMM comes with Frequency Counter function that can measure up to 20 MHz, provides a cost effective solution to measure the waveform generated by the voltage controlled oscillators.

Example of reference clock troubleshooting

In an audio analyzer, you can customize the test application by slotting in different cards in the PCI slots to accommodate different testing environments. The need for synchronization of the cards in the expansion slot can be achieved with the reference clock in the carrier board. To troubleshoot an audio analyzer's expansion slot that has ceased to function, you have to check the reference clock in the carrier board after checking the voltage supply.

The following steps and figure (Figure 4) demonstrate the process of troubleshooting a carrier board. Figure 4 shows a carrier board that is generating 10 MHz reference frequency for the expansion slot, while the steps shows the procedure troubleshooting the reference clock.

Troubleshooting the reference clock procedure

Step 1:
Select the frequency counter function of the U1250A Series and measure point A of a carrier board as shown in Figure 4 for the source of the reference clock. Any measurement below 10 MHz is an indication of faulty voltage-controlled crystal oscillators.

Step 2:
Measure point B, C, D, E, and F of the 16-bit buffer/line with 3-STATE outputs. If any of the measurements are lower than 10 MHz, either the voltage controlled crystal oscillator or the low voltage 16-bit buffer/line driver with 3-STATE outputs is faulty. The faulty component(s) should be replaced accordingly.

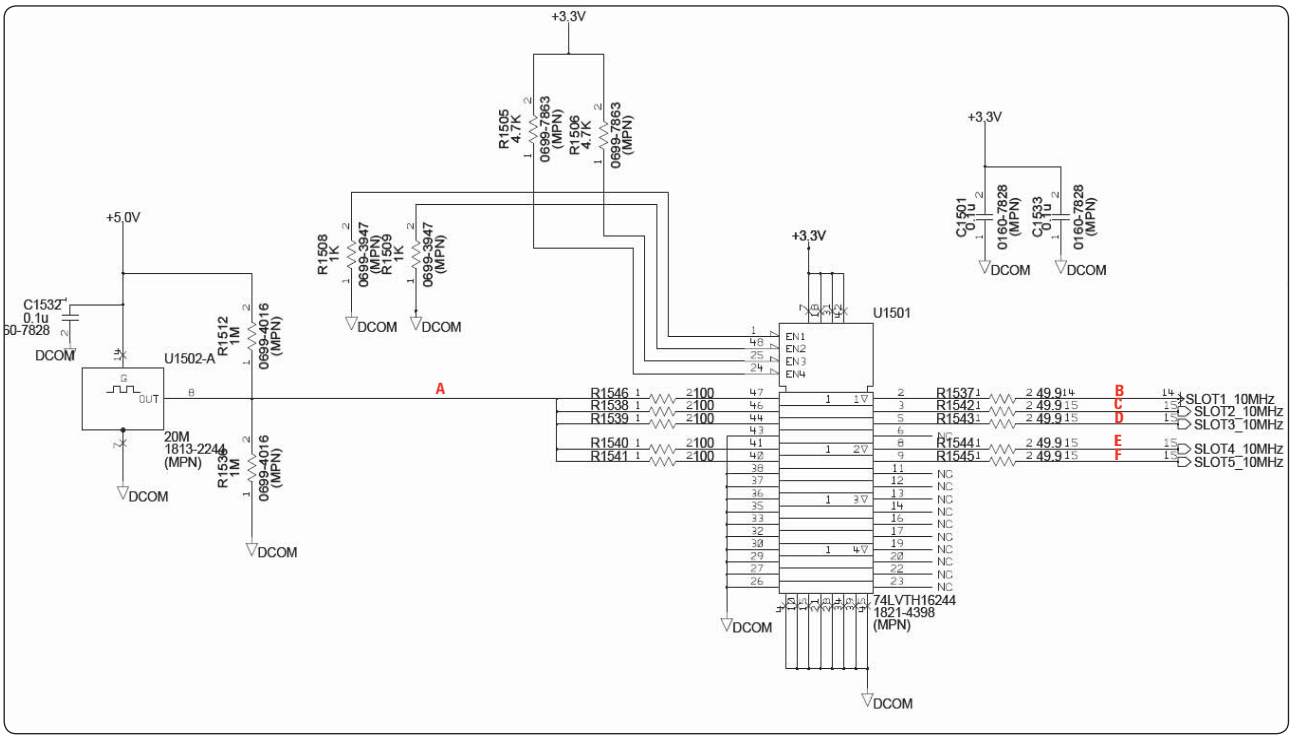


Figure 4. Reference clock schematic for carrier board

Electronic Circuit Troubleshooting Made Easy with Square Wave Output Function
(Only Applicable for U1252A Model)

Square wave output is a unique function for many applications, such as pulse width modulation (PWM) output, adjustable voltage control, and synchronic clock (baud rate generator). You can use this function to check and calibrate flow-meter displays, counters, tachometers, oscilloscopes, frequency converters, frequency, and transmitters.

Now with the U1252A Series, users can generate low duty-cycle PWM for low-frequency applications with a relatively inexpensive cost.

The features U1252A Handheld DMM

The various functions of the U1252A makes the troubleshooting of complex electronic circuitry simple. It has the capability of generating PWM output range from 0.5 Hz to 4800 Hz with maximum amplitude of 2.8 V. The duty cycle can be adjusted from 0.39% to 99.6% according to your needs, while the default setting is set to 50% at 600 Hz.

To learn more on how to use the U1252A handheld DMM to create PWM signals, you may refer to the *PWM Waveform Generation Using U1252A DMM application note* (5989-6673EN) that is available on the Agilent's web.

Accessories to Get the Most out of Your Multimeter

Standard test lead

Agilent U1160A standard test leads are compatible with the U1250A Series handheld DMM. It is also designed to withstand the rugged conditions found in electrical, industrial, and HVAC environments. The set includes a pair (one red and one black) of the following items:

- Double silicon-insulated test lead with right-angled banana connector on one end and a brass tip on the other end. The silicon insulation provides superior flexibility in cold temperature and resistance to high temperature.
- Electrical alligator clips with safety grip and spring-loaded jaws. The alligator clip has a 10 A CAT III 1000 V rating.
- Fine tip test probes with slender for reaching hard-to-reach test points or recessed terminals.
- SMT grabber with small opening of 1 mm is best used for test point on SMT component in close contact areas.
- One black colored mini grabber with spring-loaded pin-grabber hook.

The fine tip, mini grabber, and SMT grabber attachments are plugged onto the probe end of the test leads.

Extended Test Lead Kit

The Agilent U1161A extension test lead kit is an optional accessory. This set includes a pair (one red and one black) of the following items:

- Silicon-insulated extension leads which have right-angled connector on one end and male banana plug socket on the other end.
- Medium sized full insulated alligator clips with extra strong teeth. New spring design provides superior grip.
- 4-mm banana plugs to connect the test probes and alligator clips.

PC connectivity via IR-USB cable

GUI datalogger software enables instant capturing of data that can be displayed in real time in the form of tables and graphs on a computer screen.

To enable this, the DMM has to be connected remotely to the PC via IR-USB cable. This special detachable design allows simple communication between the DMM and the PC.

The cable has a maximum baud rate of 19200 bits per second and effective temperature range from 0 °C to 50 °C.

Fast and accurate temperature data acquisition

Thermocouple adapter is a cost effective solution to your temperature measuring needs. The Agilent U1180A thermocouple adapter and lead set includes a non-compensation transfer adapter, J-type and K-type thermocouple beads. The transfer adapter is used to convert the thermocouple's miniature connector to banana plugs (for adapting to the DMM's terminal). Both thermocouple J-type and K-type have effective temperature range of −20 °C to 200 °C.

Keeping the Probes and Battery Charger with the Instrument

Ever wasted time hunting for your probes or battery charger? You'll always know right where they are if you store them in the Agilent U1250A series handheld DMM instrument pouch. The black color soft carrying case fits U1250A series handheld DMM and provides compartments for the users to store test probes, and battery charger for U1250A series handheld DMM.

Conclusion

The Agilent U1250A Series is a low cost, feature-rich handheld DMM that offers technical personnel with high performance, versatile, and durable instrument. With the rapid change in technology and increased complexity with size reduction of the electronic devices, the U1250A Series handheld DMM will be an added advantage to engineers, technicians, and electricians working in the electronic test and industrial markets.

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