

Discover the Benefits of Auto Ramp and Scan Functions



with the Agilent U3606B Multimeter | DC Power Supply

Introduction

In many general purpose test and measurement applications, engineers often use a power supply to provide power to devices and use a digital multimeter (DMM) for voltage or current measurements. The engineers also need to perform instrument programming when dealing with sweep voltage/current signals. In this application note, you will discover the advantages of using U3606B's auto ramp and scan features in performing multilevel DC test from the front panel, without any programming required for reliability test and power on/off test. Towards the end of this document, you will also learn how to use the front panel interface to create and store a completed ramp and scan DC bias method.

Application Note

Anticipate — Accelerate — Achieve



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What are Ramp and Scan Signal?

The U3606B Multimeter | DC Power Supply is equipped with sweep ramp and scan capability. The ramp function generates ramp signal with length based on input parameters (Figure 1), and the scan function generates a scan signal with length and number of steps based on input parameters (Figure 2).

Both functions are conveniently configurable from the front panel to sweep up to 10,000 steps for ramp and 100 steps for scan, programmable to 105% of full scale.

Ramp Signal

A typical ramp signal length is based on the following parameters:

- The amplitude end position, and
- The number of steps required to reach the amplitude end position

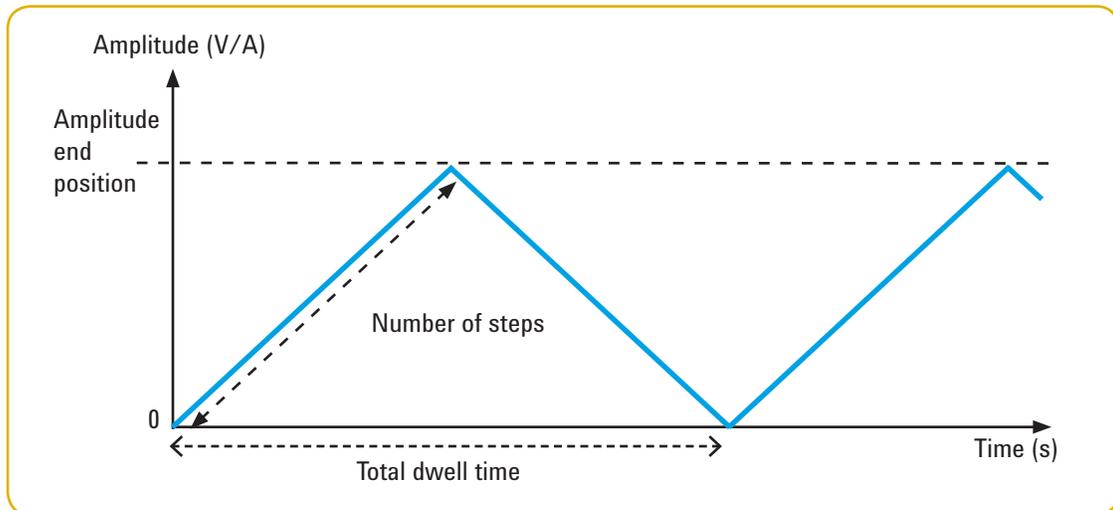


Figure 1. Ramp function

The amplitude end position essentially refer to the maximum level of voltage/current of the signal. A higher number of steps provide a more linear ramp signal. This however will result in an increase of total dwell time. A lower number of steps will result in a shorter total dwell time and a more stepped ramp signal.

What are Ramp and Scan? (continued)

Scan Signal

A typical scan signal length is based on the following parameters:

- The amplitude end position,
- The number of steps required to reach the amplitude end position, and
- The dwell time length for each step

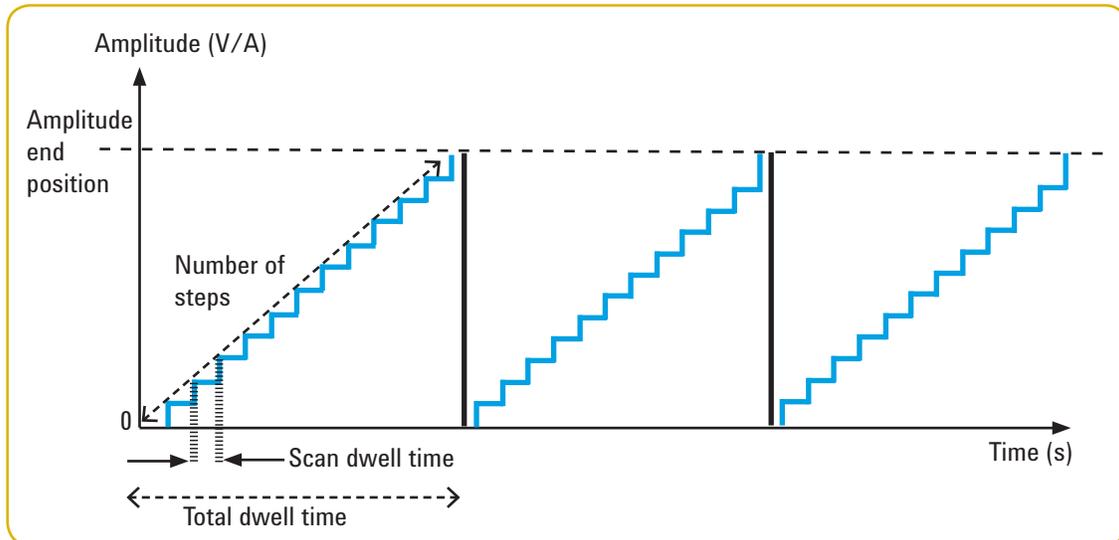


Figure 2. Scan function

The total dwell time of a scan signal will increase with respect to the number of steps and the scan dwell time per step selected, as shown in Figure 2. The scan dwell time is defined as the length of time the scan signal will dwell in the present step before incrementing to the next step.

Application



The U3606B is a two-in-one multimeter | DC power supply instrument. It can perform both multimeter and DC power supply applications simultaneously or work as a standalone 5½-digits DMM or a 30-W dual range DC power supply. This hybrid instrument provides efficient, affordable testing while saving space on the bench or in a rack.

Applications such as diode testing and DC-to-DC converter testing will need both DMM and DC power supply. Now with U3606B, users no longer need to have two instruments to complete the task. The Agilent U3606B simplifies the testing setup and also reduces cost and test space.

Ramp Function

DC Motor Reliability Testing

Let's take a look at how the ramp signal function can be used to perform DC motor monitoring or reliability testing. In this discussion, a 24 V DC motor is used. The U3606B source meter can provide a linear ramp signal from 0 V to 24 V to the motor as shown in Figure 3 below. This helps you to monitor the behavior of the motor characteristics while the voltage changes.

The ramp signal can be ideal for a variety of motor tests, including ramp test, Rotations Per Minute (RPM) test, efficiency, or motor noise test. The ramp signal parameters can be easily configured by using the utility menu from the front panel or Standard Commands for Programmable Instruments (SCPI) programming. The total dwell time to reach to the amplitude end position, 24 V in this case, depends on how many steps you set, as shown in Figure 4. A higher number of steps will result in a more linear ramp signal. This, however, will result in an increase in the total dwell time.

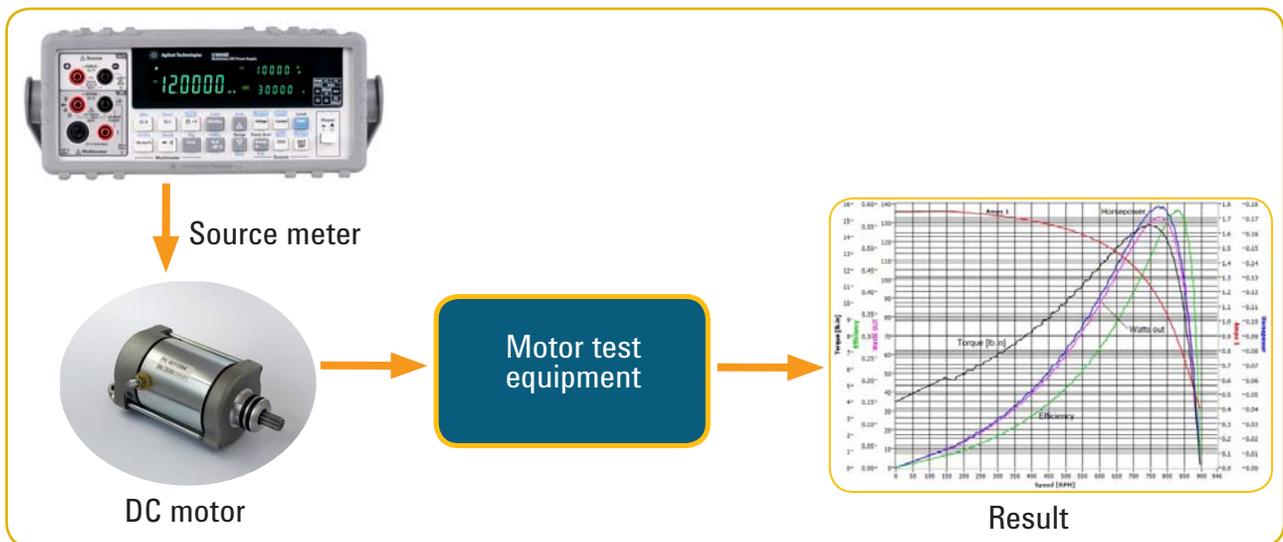


Figure 3. Typical DC motor reliability testing flow

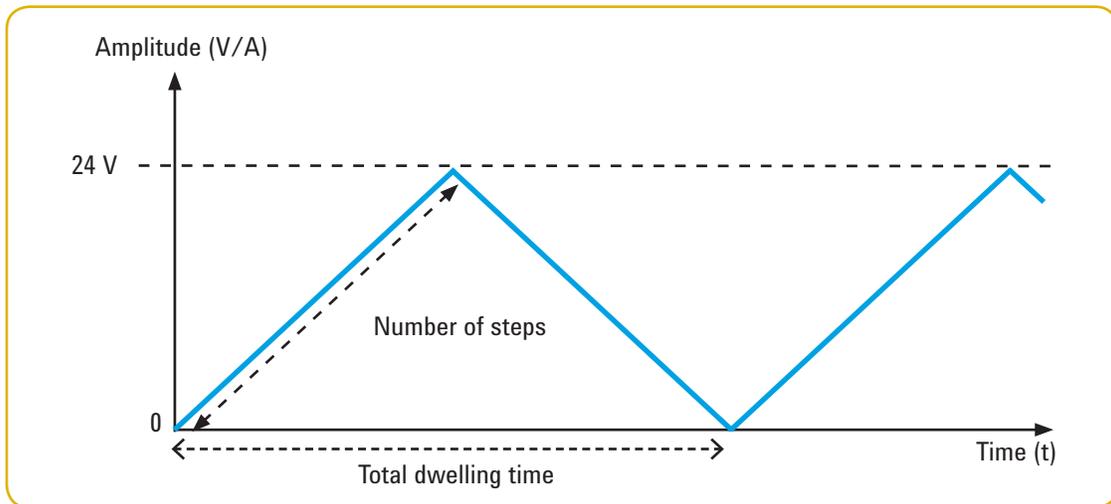


Figure 4. Ramp signal for motor testing

How to Configure a Ramp Signal Parameter via the Front Panel?

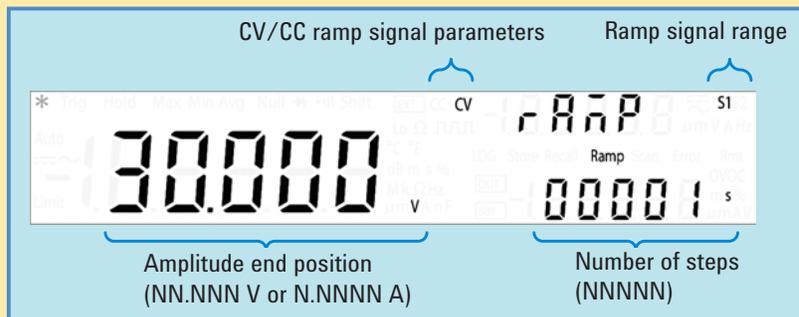
Procedures

In order to configure a ramp signal parameter via front panel method, follow the procedure in Figure 5.

Table 1. Ramp signal parameters

Ramp signal	Output					
	Constant Voltage			Constant Current		
Items	S1	S2	S2	S1	S1	S2
Range						
Amplitude end position ^[1]	31.500 V	8.400 V	1050.0 mV	105.00 mA	1.0500 A	3.1500 A
Number of steps	1 step to 10,000 steps					
Dwell time	Fastest of the instrument output capability					

- 1 To access the utility menu, press **Shift** > **Utility**.
- 2 The first utility menu item (Error) will be shown in the upper secondary display.
- 3 Press **◀** or **▶** until the menu item “rAMP” is shown in the upper secondary display.
- 4 Press **Voltage** or **Current** if you wish to configure the ramp signal parameters for CV or CC output. (The CV or CC annunciator illuminates when selected.)
- 5 Select an appropriate output range by pressing **Shift** > **Range**. The ramp signal amplitude end position is limited by the range selected. (The S1 or S2 annunciator illuminates when selected.)



- 6 Press **▲** or **▼** to change the ramp signal amplitude end position.
- 7 Press **◀** or **▶** until the cursor is positioned on the ramp signal number of steps. Press **▲** or **▼** to change the number of steps for the ramp signal to increase from zero to the amplitude end position.
- 8 After configuring the ramp signal parameters, press **Shift** > **Save** to save or press **Shift** > **Exit** to exit the edit mode without saving.
- 9 Press **Shift** > **Exit** to exit the utility menu.

Figure 5. Procedure to configure ramp signal

^[1] The ramp output start position is fixed at 0 (V or A) by default.

Scan Function

Relay Testing

In product development, reliability testing is one of the key tasks that must be performed to ensure that the product meets the quality requirements. With the two-in-one multimeter|DC power supply capability, the relay electrical test can be easily performed by using the U3606B scan function and the continuity test with the source meter feature, using just one instrument.

You can use the scan function to generate a signal similar to a square waveform with a 50% duty cycle (0 V and 12 V) for a 12 V relay and perform the continuity test. This scan signal consist of two steps: 0 V and 12 V. When 0 V is provided, the relay is in idle mode and the U3606B source meter front panel shows the “OPE.n” reading. When the signal reaches 12 V the coil inside the relay will generate a small magnetic field and cause the switch to close, and the U3606B will beep and show the Ω reading. Please refer to Figure 6 for the test setup connection.

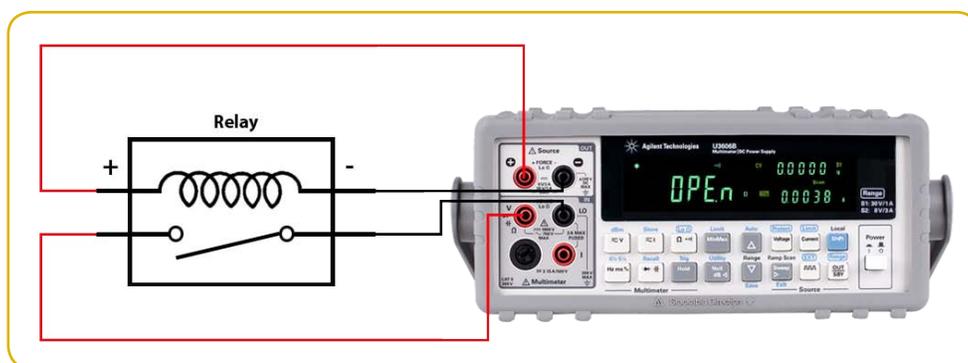


Figure 6. Relay testing

How to Configure a Scan Signal Parameter via the Front Panel?

Procedures

In order to configure a scan signal parameter via the front panel method, follow the procedure in Figure 7.

- 1 To access the utility menu, press **Shift > Utility**.
- 2 The first utility menu item (Error) will be shown in the upper secondary display.
- 3 Press **◀** or **▶** until the menu item “SCAN” is shown in the upper secondary display.

Figure 7. Procedure to configure scan signal

How to Configure a Scan Signal Parameter via the Front Panel? (continued)

Power On/Off Testing

Another similar application that is ideal for the scan function is to perform the device power on/off test for product reliability. Connect your device to the U3606B source multimeter and generate a scan signal with one step 0 V and a high voltage stage to turn on the device. The signal will look like a clock signal in the form of a square wave with a 50% duty cycle. With this built-in scanning capability, the device reliability test can be carried out easily in just a few steps and without performing any programming. This also simplifies your test setup and lowers your setup cost.

For those who need to control and take preset measurement with a PC, the built-in USB 2.0 interface and GPIB interface provide easy and robust connection between the PC and the U3606B Multimeter|DC Power Supply. The USB and GPIB interfaces work seamlessly with Agilent Connectivity software and can be controlled remotely via standard industry SCPI.

- 4 Press **Voltage** or **Current** if you wish to configure the scan signal parameters for CV or CC output. (The CV or CC annunciator illuminates respectively when selected.)
- 5 Select an appropriate output range by pressing **Shift > Range**. The scan signal amplitude end position is limited by the range selected. (The S1 or S2 annunciator illuminates respectively when selected.)

Table 2. Scan signal parameters

Scan signal	Output					
	Constant Voltage			Constant Current		
Items	S1	S2	S2	S1	S1	S2
Range						
Amplitude end position ^[1]	31.500 V	8.400 V	1050.0 mV	105.00 mA	1.0500 A	3.1500 A
Number of steps	1 step to 100 steps					
Dwelling time	1 second to 99 seconds					

- 6 Press **Δ** or **∇** to change the scan signal amplitude end position.
- 7 Press **◀** or **▶** until the cursor is positioned on the scan signal number of steps. Press **Δ** or **∇** to change the number of steps for the scan signal to increment from zero to the amplitude end position.
- 8 Press **◀** or **▶** until the cursor is positioned on the scan signal dwell time. Press **Δ** or **∇** to change the scan signal dwelling time. In this case, the dwell time is set to 2s.
- 9 After configuring the scan signal parameters, press **Shift > Save** to save or press **Shift > Exit** to exit the edit mode without saving.
- 10 Press **Shift > Exit** to exit the utility menu.

Figure 7. Procedure to configure scan signal

^[1] The scan output start position is fixed at 0 (V or A) by default.

Conclusion

As described in this application note, the Agilent U3606B Multimeter|DC Power Supply is a remarkable tool that combines both DC digital multimeter and DC power supply. The built-in ramp and scan functions provide an easy way to access sweep signals for device monitoring tests, and is especially well suited for device reliability or device characterization testing. The two-in-one instrumentation concept provides simpler cable connectivity, and more efficient use of work space. The measurement is made by using the sweep signal methods, as shown above.



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(BP-3-1-13)

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Published in USA, August 20, 2013
5990-4579EN

