RIGOL

Application Note

DG Series Function / Arbitrary Waveform Generator

Jan. 2015
RIGOL Technologies, Inc.

Guaranty and Declaration

Copyright

Trademark Information

RIGOL is a registered trademark of RIGOL Technologies, Inc.

Publication Number

APB09100-1110

Notices

- **RIGOL** products are covered by P.R.C. and foreign patents, issued and pending.
- **RIGOL** reserves the right to modify or change parts of or all the specifications and pricing policies at company's sole decision.
- Information in this publication replaces all previously corresponding material.
- Information in this publication is subject to change without notice.
- **RIGOL** shall not be liable for either incidental or consequential losses in connection with the furnishing, use or performance of this manual as well as any information contained.
- Any part of this document is forbidden to be copied, photocopied or rearranged without prior written approval of **RIGOL**.

Product Certification

RIGOL guarantees this product conforms to the national and industrial standards in China as well as the ISO9001:2008 standard and the ISO14001:2004 standard. Other international standard conformance certification is in progress.

Contact Us

If you have any problem or requirement when using our products or this manual, please contact **RIGOL**.

E-mail: service@rigol.com
Website: www.rigol.com

Document Overview

This manual guides users to get a detailed understanding of the arbitrary waveform data file formats supported by DG series function/arbitrary waveform generator as well as the store and recall methods of the arbitrary waveform data files to help users to correctly use the functions related to arbitrary waveforms.

Chapter 1 Data Files Supported by Each Series
This chapter introduces the arbitrary waveform data files applicable to the local operation and SCPI command control of each DG series in details.

Chapter 2 To Use the SCPI Commands
This chapter introduces the SCPI commands related to the arbitrary waveform operations of each DG series.

Chapter 3 To Use the Ultra Station Software
This chapter introduces how to use Ultra Station to realize the functions related to the arbitrary waveform operations briefly.

Contents

Chapter 1 Data Files Supported by Each Series

DG series provides powerful arbitrary waveform editing and output functions. You can also store the edited waveform as arbitrary waveform data file in the specified format as well as read and output the waveform via the instrument when needed. The data file types supported include RAF, TXT and CSV. Wherein, the RAF format is an arbitrary waveform data file format unique for **RIGOL** DG series.

Different DG series supports different data file types and different file formats. This chapter introduces the arbitrary waveform data files applicable to the **local operation** and **SCPI command control** of each DG series. For the detailed introductions of the local operation and SCPI command control of each DG series, please refer to the User's Guide and Programming Guide of the corresponding series.

- DG1000Z Series
- DG1000 Series
- DG4000 Series
- DG5000 Series

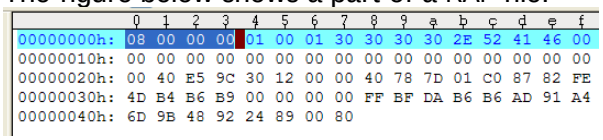
DG1000Z Series

Instrument models: DG1062Z and DG1032Z
Supported arbitrary waveform data file formats: RAF, TXT and CSV
Number of waveform points can be stored: 8 to 8M (without the Arb16M option) or 8 to 16M (with the Arb16M option)

Data File Format Introduction

RAF Format

The figure below shows a part of a RAF file.



The RAF file consists of the file header and waveform data.

File Header

The file header part stores the related information of the waveform and occupies the first 56 bytes of the file.

Format:

- The 1st byte to the 4th byte: the number of waveform points contained in the file; the file shown in the figure above contains 8 points.
- The 5th byte (bool): it is always 0x01.
- The 6th byte (bool): it is always 0x00.
- The 7th byte (bool): the output mode. 0x00 denotes period mode and 0x01 denotes sample rate mode.
- The 8th byte to the 32nd byte: the filename.
- The 33rd byte to the 40th byte (s64): the period or sample rate. When the output mode is period, this value is the period; when the output mode is sample rate, this value is the sample rate.
- The 41st byte to the 44th byte (s32): the high level value.
- The 45th byte to the 48th byte (s32): the low level value.
- The 49th and 50th bytes (u16): the CRC value of the waveform data.
- The 51st and 52nd bytes (u16): the CRC value of the file header.
- The 53rd byte to the 56th byte: they are always 0x00.

Waveform Data

The waveform data part stores the values of all the waveform points in sequence. Each waveform point occupies 2 bytes. The range of the data is from 0x0000 to 0x3FFF or from 0x8000 to 0xBFFF (when all the most significant bits are set to 1).

Format:

- The 57th and 58th bytes: the value of the first waveform point.
- The 59th and 60th bytes: the value of the second waveform point.
- The 61st and 62nd bytes: the value of the third waveform point.
- ...

TXT Format

The TXT file consists of the file information and waveform data. Each row stores a single data and ends with a carriage return. The length of each row cannot exceed 9 characters; otherwise, the data cannot be read normally. The data can be in integer, decimal or E exponent format.

File Information

The file information part stores the information related to the waveform and occupies the first 3 rows of the file.

Format:

- The 1st row: the total number of points of the waveform; it can only be an integer.
- The 2nd row: the maximum value in the waveform data.
- The 3rd row: the minimum value in the waveform data.

Waveform Data

The waveform data part stores the values of all the waveform points in sequence. This part starts from the fourth row and each waveform point occupies a row.

Format:

- The 4th row: the value of the first waveform point.
- The 5th row: the value of the second waveform point.
- The 6th row: the value of the third waveform point.
- ...
- A blank line (cannot be omitted).

CSV Format

The two figures below shows the display effects of the same CSV file (a part of the file) when viewed in Excel and UltraEdit respectively.

RIGOL:DG1:CSV DATA FILE		
TYPE:Arb		
AMP:1.0000 Vpp		
PERIOD:1.00E-6 S		
DOTS:8192		
MODE:Freq		
AFG Frequency:1000000		
AWG N:0		
x	y[V]	
	0	
	0.0008	
	0.0015	
	0.0023	
	0.0031	
	0.0038	
	0.0046	

```
1 RIGOL:DG1:CSV DATA FILE
2 TYPE:Arb
3 AMP:1.0000 Vpp
4 PERIOD:1.00E-6 S
5 DOTS:8192
6 MODE:Freq
7 AFG Frequency:1000000.000000
8 AWG N:0
9 x,y[V]
10 ,0.0000
11 ,0.0008
12 ,0.0015
13 ,0.0023
14 ,0.0031
15 ,0.0038
16 ,0.0046
17 ,0.0054
18 ,0.0061
19 ,0.0069
20 ,0.0077
```

The CSV file consists of the file header and waveform data.

File Header

The file header part stores the information related to the waveform and occupies the first 9 rows of the file. The rows are separated by carriage returns.

Format:

- The 1st row: file description. It is always "RIGOL:DG1:CSV DATA FILE".
- The 2nd row: the data file type. For arbitrary waveform data file, it is "TYPE:Arb".
- The 3rd row: the waveform amplitude. The format is "AMP:the actual amplitude". The amplitude value and unit are separated by a space.
- The 4th row: the waveform period. The format is "PERIOD:the actual period". The period value and unit are separated by a space.
- The 5th row: the total number of waveform points. The format is "DOTS:the actual total number of points".
- The 6th row to the 9th row: for further extension.

Waveform Data

The waveform data part stores the values of all the waveform points in sequence. This part starts from the 10th row and each waveform point occupies a row. Each row stores a single data and the rows are separated by commas. The length of each row cannot exceed 24 characters; otherwise, the data cannot be read normally. The data can be in integer, decimal or E exponent format.

Format:

- The 10th row: the value of the first waveform point.
- The 11th row: the value of the second waveform point.
- The 12th row: the value of the third waveform point.
- ...

File Store and Recall

Store

1. Store the edited arbitrary waveform in RAF format to the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation or by sending SCPI command.
2. Edit the RAF, TXT or CSV file that meets the file format requirements mentioned above via the PC.

Recall

1. Recall the RAF, TXT or CSV file stored in the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation.
2. Recall the RAF file stored in the internal memory or external memory (only when a USB storage device is detected) of the instrument by sending SCPI command.

Note:

- When recalling the RAF format file mentioned above, the instrument will switch to the corresponding arbitrary waveform output mode according to the file content.
- When recalling the TXT or CSV file (assume that the number of waveform points contained in the file is **Points**):
  - If 8≤Points≤8k, the instrument will still use the current arbitrary waveform output mode and download the arbitrary waveform to the volatile memory of the specified channel.
  - If 8k<Points≤16k, the instrument will automatically switch to the "sample rate" output mode and download the arbitrary waveform to the volatile memory of the specified channel.
  - If 16k<Points≤8M (without the Arb16M option) or 16k≤Points≤16M (with the Arb16M option), the instrument will automatically switch to the "sample rate" output mode and download the arbitrary waveform to the DDRII internal memory.

DG1000 Series

Instrument models: DG1022 and DG1022A
Supported arbitrary waveform data file format: RAF
Number of waveform points can be stored: 2 to 4k

Data File Format Introduction

RAF Format

The RAF file contains the waveform data and stores the values of all the waveform points in sequence. Each waveform point occupies 2 bytes and the range of the data is from 0x0000 to 0x3FFF.

Format:

- The 1st and 2nd bytes: the value of the first waveform point.
- The 3rd and 4th bytes: the value of the second waveform point.
- The 5th and 6th bytes: the value of the third waveform point.
- ...

File Store and Recall

Store

1. Store the edited arbitrary waveform in RAF format to the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation or by sending SCPI command.
2. Edit the RAF file that meets the file format requirements mentioned above via the PC.

Tip

The range of the number of waveform points can be edited is from 2 to 4k. When storing the RAF file, if the current number of waveform points is less than 4k, the instrument will automatically extend the number of waveform points to 4k using the linear interpolation mode and then store the file.

Recall

Recall the RAF file stored in the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation or by using SCPI command.

Tip

If the number of waveform points (denoted by **N**) contained in the RAF file to be recalled is less than 4k, the instrument will modify the data of the first N waveform points in sequence according to this file; the N+1th to the 4096th waveform points remain unchanged.

DG4000 Series

Instrument models: DG4162, DG4102 and DG4062
Supported arbitrary waveform data file formats: RAF, TXT and CSV
Number of waveform points can be stored: 2 to 16k

Data File Format Introduction

RAF Format

The RAF file contains the waveform data and stores the values of all the waveform points in sequence. Each waveform point occupies 2 bytes and the range of the data is from 0x0000 to 0x3FFF.

Format:

- The 1st and 2nd bytes: the value of the first waveform point.
- The 3rd and 4th bytes: the value of the second waveform point.
- The 5th and 6th bytes: the value of the third waveform point.
- ...

TXT Format

The TXT file contains the waveform data and stores the values of all the waveform points in sequence. Each waveform point occupies a row. Each row stores a single data and ends with a carriage return. The length of each row cannot exceed 63 characters; otherwise, the data cannot be read normally. The data can be in integer, decimal or E exponent format.

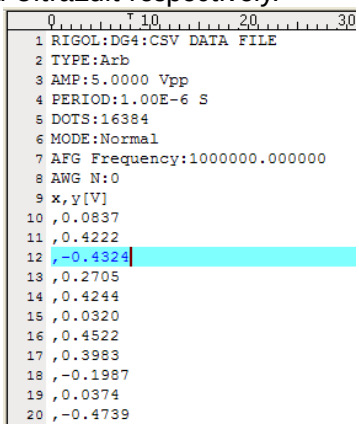
Format:

- The 1st row: the value of the first waveform point.
- The 2nd row: the value of the second waveform point.
- The 3rd row: the value of the third waveform point.
- ...
- A blank line (cannot be omitted).

CSV Format

The two figures below shows the display effects of the same CSV file (a part of the file) when viewed in Excel and UltraEdit respectively.

RIGOL:DG4:CSV DATA FILE		
TYPE:Arb		
AMP:5.0000 Vpp		
PERIOD:1.00E-6 S		
DOTS:16384		
MODE:Normal		
AFG Frequency:1000000.0000C		
AWG N:0		
x	y[V]	
	0.0837	
	0.4222	
	-0.4324	
	0.2705	
	0.4244	
	0.032	
	0.4522	



The CSV file consists of the file header and waveform data.

File Header

The file header part stores the information related to the waveform and occupies the first 9 rows of the file. The rows are separated by carriage returns.

Format:

- The 1st row: file description. It is always "RIGOL:DG4:CSV DATA FILE".
- The 2nd row: the data file type. For arbitrary waveform data file, it is "TYPE:Arb".
- The 3rd row: the waveform amplitude. The format is "AMP:the user-defined amplitude". The amplitude value and unit are separated by a space.
- The 4th row: the waveform period. The format is "PERIOD:the user-defined period". The period value and unit are separated by a space.
- The 5th row: the total number of waveform points. The format is "DOTS:the actual total number of points".
- The 6th row to the 9th row: for further extension.

Waveform Data

The waveform data part stores the values of all the waveform points in sequence. This part starts from the 10th row and each waveform point occupies a row. Each row stores a single data and the rows are separated by commas. The length of each row cannot exceed 24 characters; otherwise, the data cannot be read normally. The data can be in integer, decimal or E exponent format.

Format:

- The 10th row: the value of the first waveform point.
- The 11th row: the value of the second waveform point.

— The 12th row: the value of the third waveform point.
— ...

File Store and Recall

Store

1. Store the edited arbitrary waveform in RAF format to the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation or by sending SCPI command.
2. Edit the RAF, TXT or CSV file that meets the file format requirements mentioned above via the PC.

Tip

The range of the number of waveform points can be edited is from 2 to 16k. When storing the RAF file, if the current number of waveform points is less than 16k, the instrument will automatically extend the number of waveform points to 16k using the linear interpolation mode and then store the file.

Recall

1. Recall the RAF, TXT or CSV file stored in the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation.
2. Recall the RAF file stored in the internal memory or external memory (only when a USB storage device is detected) of the instrument by sending SCPI command.

Tip

When the number of waveform points contained in the arbitrary waveform data file to be recalled is less than 16k, the instrument will read the arbitrary waveform according to the file and then extend the number of waveform points to 16k using the linear interpolation mode.

DG5000 Series

Instrument models: DG5352, DG5351, DG5252, DG5251, DG5102, DG5101, DG5072 and DG5071
Supported arbitrary waveform data file formats: RAF and CSV
Number of waveform points can be stored: 2 to 128M

Data File Format Introduction

RAF Format

The RAF file contains the waveform data and stores the values of all the waveform points in sequence. Each waveform point occupies 2 bytes and the range of the data is from 0x0000 to 0x3FFF.

Format:

- The 1st and 2nd bytes: the value of the first waveform point.
- The 3rd and 4th bytes: the value of the second waveform point.
- The 5th and 6th bytes: the value of the third waveform point.
- ...

CSV Format

The two figures below shows the display effects of the same CSV file (a part of the file) when viewed in Excel and UltraEdit respectively.

RIGOL:DG5:CSV DATA FILE		
TYPE:Arb		
AMP:5.0000 Vpp		
PERIOD:1.00E-6 S		
DOTS:16777216		
MODE:Normal		
AFG Frequency:1000000.00000		
AWG N:0		
x	y[V]	
	0	
	0	
	0	
	0	
	0	
	0	
	0	

```
1  RIGOL:DG5:CSV DATA FILE
2  TYPE:Arb
3  AMP:5.0000 Vpp
4  PERIOD:1.00E-6 S
5  DOTS:16777216
6  MODE:Normal
7  AFG Frequency:1000000.000000
8  AWG N:0
9  x,y[V]
10 ,0.0000
11 ,0.0000
12 ,0.0000
13 ,0.0000
14 ,0.0000
15 ,0.0000
16 ,0.0000
17 ,0.0000
18 ,0.0000
19 ,0.0000
20 ,0.0000
```

The CSV file consists of the file header and waveform data.

File Header

The file header part stores the information related to the waveform and occupies the first 9 rows of the file. The rows are separated by carriage returns.

Format:

- The 1st row: file description. It is always "RIGOL:DG5:CSV DATA FILE".
- The 2nd row: the data file type. For arbitrary waveform data file, it is "TYPE:Arb".
- The 3rd row: the waveform amplitude. The format is "AMP:the user-defined amplitude". The amplitude value and unit are separated by a space.
- The 4th row: the waveform period. The format is "PERIOD:the user-defined period". The period value and unit are separated by a space.
- The 5th row: the total number of waveform points. The format is "DOTS:the actual total number of points".
- The 6th row to the 9th row: for further extension.

Waveform Data

The waveform data part stores the values of all the waveform points in sequence. This part starts from the 10th row and each waveform point occupies a row. Each row stores a single data and the rows are separated by commas. The length of each row cannot exceed 24 characters; otherwise, the data cannot be read normally. The data can be in integer, decimal or E exponent format.

Format:

- The 10th row: the value of the first waveform point.
- The 11th row: the value of the second waveform point.
- The 12th row: the value of the third waveform point.
- ...

Note: If the number of waveform points exceeds 16k, it must be the Nth power of 2.

File Store and Recall

Store

1. Store the edited arbitrary waveform in RAF format to the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation or by sending SCPI command.
2. Edit the RAF or CSV file that meets the file format requirements mentioned above via the PC.

Tip

When storing the RAF file via local operation or by using SCPI command, if the current number of waveform points is less than 16k, the instrument will automatically extend the number of waveform points to 16k using the linear interpolation mode and then store the file.

Recall

1. Recall the RAF or CSV file stored in the internal memory or external memory (only when a USB storage device is detected) of the instrument via local operation.
2. Recall the RAF file stored in the internal memory or external memory (only when a USB storage device is detected) of the instrument by sending SCPI command.

Tip

When the number of waveform points contained in the arbitrary waveform data file to be recalled is less than 16k, the instrument will read the arbitrary waveform according to this file and then extend the number of waveform points to 16k using the linear interpolation mode.

Chapter 2 To Use the SCPI Commands

You can use the SCPI commands via the remote interfaces to program and control **RIGOL** DG series function/arbitrary waveform generator to output the specified arbitrary waveform as well as store the edited arbitrary waveform in **RAF** format to the internal memory or external memory (USB storage device) of the instrument and recall the stored waveform when needed.

This chapter introduces the SCPI commands related to the arbitrary waveform operations of DG series. For the detailed introduction of each command, please refer to the Programming Guide of the corresponding series.

- DG1000Z Series
- DG1000 Series
- DG4000 Series
- DG5000 Series

DG1000Z Series

To Edit the Arbitrary Waveform

Method	Command and Function Description	
Method 1	Command:	[:SOURce[<n>]][:TRACe]:DATA:DAC VOLATILE, {<binary_block_data>|<value>,<value>,<value> ...}
	Function:	Download the binary data block or decimal DAC values to the volatile memory of the specified channel.
Method 2	Command:	[:SOURce[<n>]][:TRACe]:DATA[:DATA] VOLATILE,<value>,<value>,<value>...
	Function:	Download the floating point voltage values to the volatile memory of the specified channel.
Method 3	Command:	[:SOURce[<n>]][:TRACe]:DATA:DAC16 VOLATILE,<flag>,<data>
	Function:	Download the wavetable data to the DDRII internal memory and output it from the specified channel.
	Note:	The wavetable data downloaded to the DDRII internal memory cannot be stored.
Method 4	Command 1:	[:SOURce[<n>]][:TRACe]:DATA:POINts VOLATILE,<points>
	Function:	Set the number of initial points of the waveform in the volatile memory of the specified channel.
	Command 2:	[:SOURce[<n>]][:TRACe]:DATA:VALue VOLATILE,<point>,<data>
	Function:	Modify the decimal integer value of the specified point in the volatile memory of the specified channel.

To Store the RAF File

Method	Command and Function Description	
Method 1	Command:	*SAV {ARB1|ARB2|ARB3|ARB4|ARB5|ARB6|ARB7|ARB8|ARB9|ARB10}
	Function:	Store the arbitrary waveform data in the volatile memory of the current channel in the default name to the specified location in the internal non-volatile memory of the instrument.
Method 2	Command:	:MMEMory:STORe[:ALL] <file_name> or :MMEMory:STORe:DATA[1|2] <file_name>
	Function:	Store the arbitrary waveform data in the volatile memory of the current channel or the specified channel in the specified name to the current directory of the external memory of the instrument (only when a USB storage device is detected).
	Tip:	You can use the :MMEMory:CDIRectory <directory_name> command to set the current directory of the external memory or the :MMEMory:CDIRectory? command to query the current directory of the external memory.

To Recall the RAF File

Method	Command and Function Description	
Method 1	Command:	*RCL {ARB1|ARB2|ARB3|ARB4|ARB5|ARB6|ARB7|ARB8|ARB9|ARB10}
	Function:	Recall the RAF file stored in the specified location in the internal non-volatile memory of the instrument to the volatile memory of the current channel.
	Tip:	You can use the [:SOURce[<n>]][:TRACe]:DATA:CATalog? command to query the RAF files currently stored in the internal non-volatile memory of the instrument.
Method 2	Command:	[:SOURce[<n>]][:TRACe]:DATA:COPY <trace_name>,VOLATILE
	Function:	Copy the RAF file stored in the internal non-volatile memory of the instrument to the volatile memory of the specified channel.
	Tip:	You can use the [:SOURce[<n>]][:TRACe]:DATA:CATalog? command to query the RAF files currently stored in the internal non-volatile memory of the instrument.
Method 3	Command:	:MMEMory:LOAD[:ALL] <file_name> or :MMEMory:LOAD:DATA[1|2] <file_name>
	Function:	Load the specified RAF file under the current directory of the external memory of the instrument to the volatile memory of the current channel or the specified channel.
	Tip:	You can use the :MMEMory:CATalog:DATA:ARBitrary? command to query the RAF files under the current directory of the external memory of the instrument.

DG1000 Series

To Edit the Arbitrary Waveform

Method	Command and Function Description	
Method 1	Command:	DATA:DAC VOLATILE,<value>,<value>,...
	Function:	Download the decimal DAC values to the volatile memory of CH1.
Method 2	Command:	DATA VOLATILE,<value>,<value>,...
	Function:	Download the floating point voltage values to the volatile memory of CH1.

To Store the RAF File

Method	Command and Function Description	
Method 1	Command:	DATA:COPY <the target arbitrary waveform name>[,VOLATILE]
	Function:	Copy the waveform in the volatile memory of CH1 to the internal non-volatile memory of the instrument and name it with the specified filename.

To Recall the RAF File

Method	Command and Function Description	
Method 1	Command:	DATA:LOAD [<the target arbitrary waveform name>]
	Function:	Load the specified RAF file stored in the internal non-volatile memory of the instrument to the PC.

DG4000 Series

To Edit the Arbitrary Waveform

Method	Command and Function Description	
Method 1	Command:	[:TRACe]:DATA:DAC VOLATILE, <binary_block_data>|<value>,<value>,<value>...
	Function:	Download the binary data block or decimal DAC values to the volatile memory of the current channel.
Method 2	Command:	[:TRACe]:DATA[:DATA] VOLATILE,<value>,<value>{,<value>}
	Function:	Download the floating point voltage values to the volatile memory of the current channel.
Method 3	Command:	[:TRACe]:DATA:DAC16 VOLATILE,<flag>,<binary_block_data>
	Function:	Download the wavetable to the DDRII internal memory and output it from the current channel.
	Note:	The wavetable data downloaded to the DDRII internal memory cannot be stored.
Method 4	Command 1:	[:TRACe]:DATA:POINts VOLATILE,<points>
	Function:	Set the number of initial points of the waveform in the volatile memory of the current channel.
	Command 2:	[:TRACe]:DATA:VALue VOLATILE,<point>,<data>
	Function:	Modify the decimal integer value of the specified point in the volatile memory of the current channel.

To Store the RAF File

Method	Command and Function Description	
Method 1	Command:	:MMEMory:STORe <file_name>
	Function:	Store the arbitrary waveform data in the volatile memory of the current channel in the specified name to the current directory in the external memory of the instrument (only when a USB storage device is detected).
	Tip:	You can use the :MMEMory:CDIRectory <directory_name> command to set the current directory of the external memory or the :MMEMory:CDIRectory? command to query the current directory of the external memory.

To Recall the RAF File

Method	Command and Function Description	
Method 1	Command:	:MMEMory:LOAD <file_name>
	Function:	Load the specified RAF file under the current directory of the external memory of the instrument (only when a USB storage device is detected) to the volatile memory of the current channel.
	Tip:	You can use the :MMEMory:CATalog? command to query all the files and folders under the current directory of the external memory of the instrument.

DG5000 Series

To Edit the Arbitrary Waveform

Method	Command and Function Description	
Method 1	Command:	[:TRACe]:DATA:DAC VOLATILE, <binary_block_data>|<value>,<value>,<value>...
	Function:	Download the binary data block or decimal DAC values to the volatile memory of the current channel.
Method 2	Command:	[:TRACe]:DATA[:DATA] VOLATILE,<value>,<value>{,<value>}
	Function:	Download the floating point voltage values to the volatile memory of the current channel.
Method 3	Command:	[:TRACe]:DATA:DAC16 VOLATILE,<flag>,<binary_block_data>
	Function:	Download the wavetable to the DDRII internal memory and output it from the current channel.
	Note:	The wavetable data downloaded to the DDRII internal memory cannot be stored.
Method 4	Command 1:	[:TRACe]:DATA:POINts VOLATILE,<value>
	Function:	Set the number of initial points of the waveform in the volatile memory of the current channel.
	Command 2:	[:TRACe]:DATA:VALue VOLATILE,<point>,<data>
	Function:	Modify the decimal integer value of the specified point in the volatile memory of the current channel.

To Store the RAF File

Method	Command and Function Description	
Method 1	Command:	:MMEMory:STORe <file_name>
	Function:	Store the arbitrary waveform data in the volatile memory of the current channel in the specified name to the current directory of the external memory of the instrument (only when a USB storage device is detected).
	Tip:	You can use the :MMEMory:CDIRectory <directory_name> command to set the current directory of the external memory or the :MMEMory:CDIRectory? command to query the current directory of the external memory.

To Recall the RAF File

Method	Command and Function Description	
Method 1	Command:	:MMEMory:LOAD <file_name>
	Function:	Load the specified RAF file under the current directory of the external memory of the instrument (only when a USB storage device is detected) to the volatile memory of the current channel.
	Tip:	You can use the :MMEMory:CATalog? command to query all the files and folders under the current directory of the external memory of the instrument.

Chapter 3 To Use the Ultra Station Software

For DG1000Z series, DG4000 series and DG5000 series, you can use the waveform generation software Ultra Station provided by **RIGOL** to edit arbitrary waveforms, download waveform data to the instrument for output as well as store and recall the arbitrary waveform data file.

The Ultra Station software provides two working modes: on-line mode and off-line mode. In off-line mode, you cannot download waveform to the instrument. The following section provides a brief introduction of the two working modes. For the details, please refer to the *Ultra Station Help Document*.

On-line Mode

Start up Ultra Station via Ultra Sigma. At this point, Ultra Station is in on-line mode.

You can perform the following operations in the Ultra Station interface.

- Create a new waveform data file that is applicable to the specified DG series and edit the arbitrary waveform according to your needs or directly recall the stored arbitrary waveform data file (RAF, TXT or CSV). Configure the waveform downloading parameters and confirm the configuration; the software will download the edited waveform to the function/arbitrary waveform generator according to the current configuration.

  Note: You can edit the arbitrary waveform data after recalling the arbitrary waveform data file stored.

- Store the edited waveform in the specified arbitrary waveform data file format (RAF, TXT or CSV) to the PC.

Off-line Mode

Star up Ultra Station via the [Start] menu of the PC or the shortcut icon on the desktop. At this point, Ultra Station is in off-line mode.

You can perform the following operations in the Ultra Station interface.

- Create a new waveform data file that is applicable to the specified DG series, edit the arbitrary waveform according to your needs and store the edited waveform in the specified arbitrary waveform data file format (RAF, TXT or CSV) to the PC.
- Recall the stored arbitrary waveform data file (in RAF, TXT or CSV format), edit the arbitrary waveform data and store the edited waveform in the specified arbitrary waveform data file format (RAF, TXT or CSV) to the PC.

Tip

You can modify the arbitrary waveform data file stored via Ultra Station according to the corresponding format requirements in "**Data Files Supported by Each Series**"; then, the arbitrary waveform data file can be used in local operation and SCPI command control.