

User's Manual
for
WavePond® DAX11500z-LAN / USB3
Arbitrary WaveForm Generator
1-Channel, 1.5 GS/sec, 9-bit

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ILLUSTRATIONS / TABLES

1 GENERAL INFORMATION

1.1 Introduction

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*For **BREVITY** for the rest of this document both the **DAX11500z-LAN / USB3** will be referred to as **DAX11500** unless specific data requires a distinction between the two such as specifications.*
}

The DAX11500z-LAN / USB3 are Ethernet / USB3 based Arbitrary Waveform Generators with a maximum sampling rate of 1.5 GS/sec. They are designed to produce any waveform from DC up to and even past many times Nyquist frequency using bands and/or using RTZ mode. The 9-bit D/A and on-board high resolution frequency synthesizer allow the user to seamlessly fit looping waveforms into memory, alleviating the need for more expensive options.

The DAX11500 module has the following standard features:

- (1) Channel, 1.5 GS/sec, 9-bit D/A outputs (700 mVpp Typical) [SMA]
- DC Coupled outputs into 50 ohms
- 1ppm Internal Programmable Clock Synthesizer with < 5psec Jitter (typical)
- Internal Clock Synthesizer operates from 25 MHz to 1.5 GHz.
- SFDR less than -40 dB @ 500 MHz (typ)
- Full scale Trise/Tfall = 150 picoseconds (typical)
- 8000 Samples Memory
- 3.3V TTL Prog. Marker Out [SMA]
- 3.3V TTL TRIG_IN (Asynchronous Trigger Capability with 667 psec resolution) [SMA]
- Ethernet box powered by 12V DC power brick.
- All functions controlled through network share over Ethernet via text files.

1.2 References

See LAN specifications for GBit Ethernet applications. The DAX11500z-LAN requires a local area network with a DHCP service and user PC connected to same. The DAX11500z-USB3 only requires a USB 3.0 connection.

1.3 Deliverables

1.3.1 Software

Since the DAX11500 is controlled when a text file called "command.txt" is copied to the DAX11500 file share, it doesn't need any traditional software drivers or API. For convenience, and to expedite initial debug, we have provided two programs called "run_script.exe" and "dax115_lan_gui.exe". The GUI program is the simplest to use, particularly for quick verification, while the script program allows you to edit the text commands, save, and automatically create a copy called "command.txt" on the file share called "\\raspberrypi\\Ramdisk_Share". However, you will need to copy your waveform files to the DAX11500 file share separately. This latter part is done automatically with the GUI program.

Please note that when handling the script programs the "command.txt" file must be padded with blank lines to guarantee it has 31 or more total lines in the text file.

1.3.2 Hardware

By default the DAX11500z hardware consists of an aluminum box, Ethernet connector, and 12V power brick. The customer must provide the Ethernet cable.



1.3.3 DAX11500z Checklist

| Item # | Qty | Part Number | Description |
|--------|-----|----------------|---|
| 1 | 1 | DAX11500z-LAN | (1) Channel, 1.5 GSPS, 9-bit, Arbitrary Waveform Generator System housed in Ethernet controlled aluminum box with 8K Memory. |
| 1 | 1 | DAX11500z-USB3 | This is the same as above except its designed to use a USB-to-Ethernet adapter. It has a fixed IP address and is therefore not compatible with a LAN -- must use adapter. |

1.4 Product Specification

DAX11500 (all specifications are at 25C unless otherwise specified)

I/O SPECIFICATIONS

| | |
|--|---|
| Analog Outputs (SMA) | |
| Number of D/A Outputs | 1 |
| Vertical Resolution | 9-bits |
| Output Impedance | 50 ohms |
| Amplitude | 750 mVpp typical into 50 ohms |
| T(rise) / T(fall) | 150 psec typical |
| Memory Size | 8K samples |
| Maximum # of Segments | 1 |
| Segment Size Range | 16 samples up to total memory; Modulo 4 only. |
| Segment Resolution | 4 samples |
| Maximum Segment Loops | 1, infinite |
| LVTTL Outputs (SMA) | |
| (1) Marker Outputs (3.3V TTL). One at beginning of waveform and one user programmable. | |
| LVTTL Inputs (SMA) | |
| (1) Trigger input (3.3V). Input is DC coupled to 0.9V into 50 ohms. Actual trigger level is 1.0V. Trigger delay = TBD. | |
| See software function description for functionality. Maximum re-trigger rate is approximately 500 KHz. | |
| Master Clock (internal) | |
| Frequency | 25 MHz to 1.5 GHz standard |
| Phase Noise | -100dBc/Hz @ 1KHz Offset Typical @ Fc = 1.5 GHz |
| Jitter | < 5 picoseconds |

GENERAL

| | |
|-----------------------|------------------------------|
| Power Supply (Vcc) | + 12.0V +/- 10%, 2A typical. |
| Operating Temperature | 15 to 30 degrees C standard |
| Operating Humidity | 5 to 95% non-condensing |
| Size | 6" x 6.5" x 2.5" |
| Data Bus | Ethernet / USB 3.0 |

1.5 Technical Support / Software Updates

For technical support:

| | |
|------------|---|
| Sales/Tech | https://chase-scientific.com/sales.html |
| Mail | Chase Scientific P.O. Box 1487 Langley, WA 98260 |
| Software | https://chase-scientific.com/wavepond.html.com |

1.6 FCC Warning

This equipment is intended for use in a laboratory test environment only. The equipment generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case, the user, at their own expense, is required to take whatever measures may be required to correct this interference.

1.7 Warranty

WavePond® warrants to the original purchaser that its DAX11500z-LAN / USB3 and the component parts thereof, will be free from defects in workmanship and materials for a period of ONE YEAR from the date of purchase.

WavePond will, without charge, repair or replace at its option, defective or component parts upon delivery to WavePond's service department within the warranty period accompanied by proof of purchase date in the form of a sales receipt.

EXCLUSIONS: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. It is void if the serial number is altered, defaced or removed.

WavePond shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation or incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights. You may also have other rights that vary from state to state.

WavePond warrants products "directly" sold anywhere in the world. If a WavePond product is purchased through an authorized distributor then warranty details are resolved through them.

NOTICE: WavePond reserves the right to make changes and/or improvements in the product(s) described in this manual at any time without notice.

2 Quick Start Guide for WavePond DAX11500z-LAN / USB3 (Windows 10/11)

Quick Start Guide for WavePond DAX11500z-LAN / USB3 (Windows 10/11)

1) Connect the included 12V Power Brick to the DAX11500. Then connect your local area network (LAN) Ethernet cable to the DAX11500z-LAN. This network should include the computer you're planning on using to control the DAX11500. For the USB3 version simply connect the USB-to-Ethernet adapter + Ethernet cable. The USB3 version will not work with a LAN network.

2) Turn on the DAX11500's power switch. The PWR light will blink for 25 seconds while the onboard computer is booting up. After DAX11500 has booted up it will create a network shared folder that is described as follows:

\\raspberrypi\Ramdisk_Share [case sensitive]

It can take your Windows machine anywhere from 2 to 20 seconds to find this share. After allowing for this time you should be able to copy files to this share. For better usability we recommend assigning a drive letter to this share using the command line **terminal** like the following:

net use w: \\raspberrypi\Ramdisk_Share

You can now open the share using File Manager (or click This PC on desktop). For initial testing purposes you can drag-and-drop all the data waveform files onto **drive w:** so you won't have to copy them later. The DAX11500 only uses local waveform files located in this share.

3) Go to "https://chase-scientific.com/dax11500z_lan.html" and download the quick-start guide, manual, the GUI program (dax11500z-lan-gui.zip), and the script program (dax11500z-lan.zip). These programs will work for both -LAN and -USB3.

Quick Start Guide for WavePond DAX11500z-LAN (Windows 10/11) cont.

4) Use the program "dax115_lan_gui.exe" for non-programming GUI experience to quickly verify the unit is running (should set configuration as shown in 5 below).

You can also run the program "run_script.exe". Adjust parameters as needed. The unit boots up with the clock set to 1.5 GSamples/sec. Minimum commands are the following:

```
stop
load_wfm sweep2.txt 255 loop_1 trig_auto
run
```

Use "/" for comments. By clicking "Run Script" the program will copy what's on the screen to a file called "command.txt" to "\\raspberrypi\\Ramdisk_Share". Before it does that it pads the command.txt file with blank lines to insure that there are 31+ lines. (interpreter expects file to be 31 or more lines)

5) HIGHLY Recommended Settings to prevent timeouts or sluggish performance.

Open PowerShell (run as Administrator) and execute the following commands:

```
Set-SmbClientConfiguration -DirectoryCacheLifetime 0
Set-SmbClientConfiguration -FileNotFoundCacheLifetime 0
Set-SmbClientConfiguration -FileInfoCacheLifetime 0
```

The default values for these are 10, 5, and 10 (seconds) respectively. These default values are extreme and prevent the network share's folder from showing that the "command.txt" file has been deleted in a timely fashion.

To see all the SMB client configuration information, including above, use the following:

```
Get-SmbClientConfiguration
```


3 GUI Interface (no programming required)

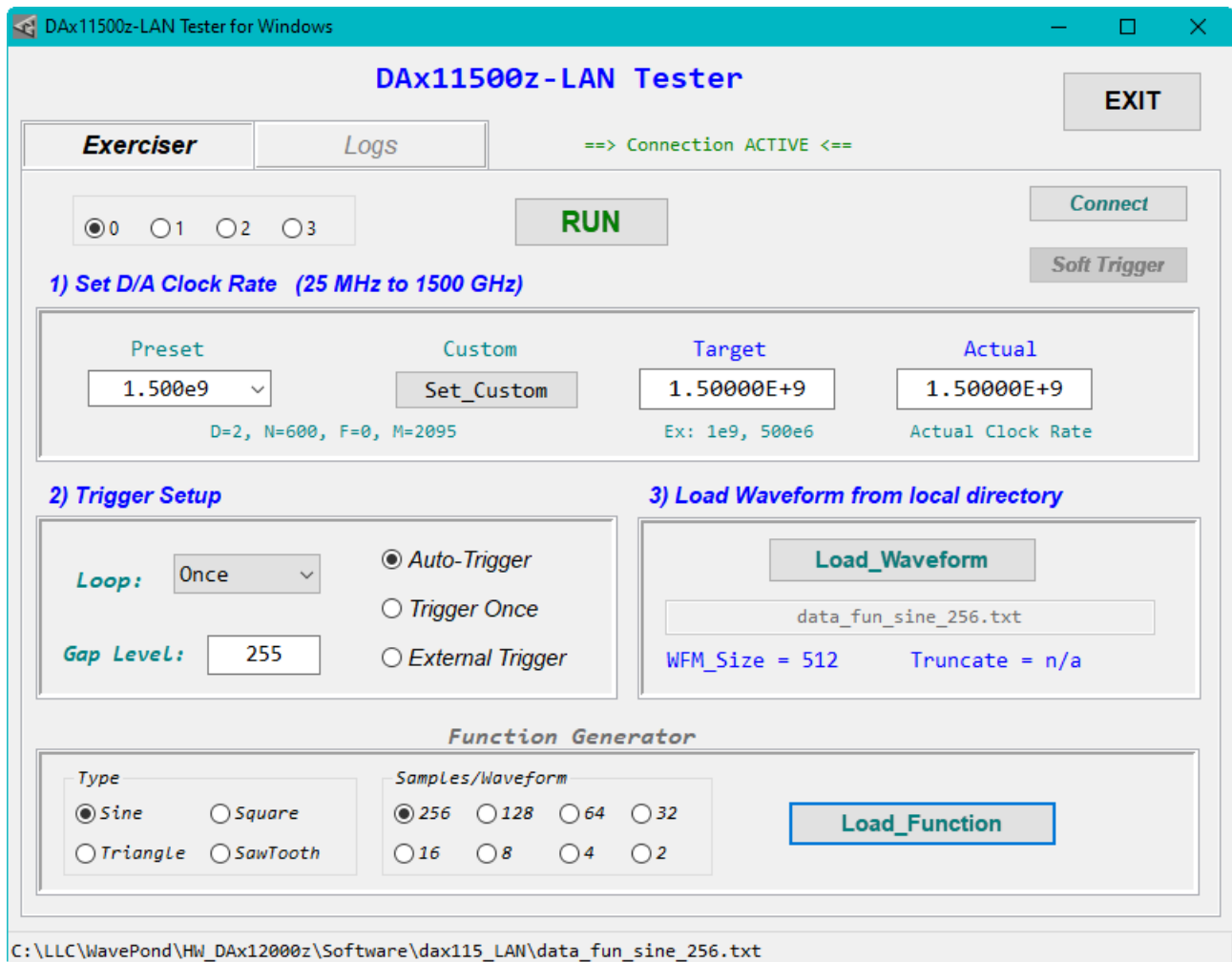
3.1 Introduction

This GUI Interface is the easiest way to use the DAX11500 without programming..

3.2 Operation

Below is a screen shot of "dax115_lan_gui.exe". Its functions should be self explanatory. Please note that the following parameters are HIGHLY recommended for proper operation (admin PowerShell):

```
Set-SmbClientConfiguration -DirectoryCacheLifetime 0
Set-SmbClientConfiguration -FileNotFoundCacheLifetime 0
Set-SmbClientConfiguration -FileInfoCacheLifetime 0
```



4 Script Editor (command.txt generator)

4.1 Introduction

This Script Editor application is provided to create and run script files.

4.2 Operation

Below is a screen shot of "run_script.exe". See next section for command descriptions. When "Run Script" button is pressed, anything on the screen is copied to a file called "command.txt" on the file share. The DAX11500 sees this and executes the file, then deletes the file. Please note that when this is done programmatically or manually, the file needs to be padded to at least 30 lines.



5 Script Command Descriptions / Usage

5.0.1 Typical "command.txt" file

```
// Defaults on power up to 1.5e9, else use "set_clock 1.0e9"
stop

// LOAD WAVEFORM (data_file / level / loop / trigger)
load_wfm sweep2.txt 255 loop_INF trig_auto

// loop = [loop_1, loop_INF]
// level: 0 <= level <= 511
// trigger = trig_auto, trig_once, trig_ext

run
```

5.0.2 Complete Command Descriptions / Usage

5.0.2.1 init

Description

This command is called internally to the DAX11500 upon boot-up and should never need to be called again. Besides initializing variables it fills waveform memory with 255 (zero volts) and executes a run/stop cycle, leaving the output of the DAX11500 at zero volts.

Parameters

none

Example

init

5.0.2.2 set_clock <value_Hz_Float>

Description

Sets the Sampling Rate to the desired value in floating point format.

Parameters

value_Hz_Float: Must be between 25e6 and 1.5e9.

Example

```
set_clock 1.500e9      {sets sampling clock to 1.5 GHz}
```

5.0.2.3 load_wfm < data_file / level / loop / trigger>

Description

Loads DA11500 with waveform "data_file" with the parameters below. The stop command is typically used before this. However, if the size of the waveform file is the same, and the level, loop, and trigger is the same, THEN you can

simply substitute another "data_file" ... it will update on-the-fly. Use "overwrite_wfm" for even faster performance (ignores level, loop, and trigger ==> assumes they're the same).

Parameters

```
level:  0 < level < 511    {this voltage shows up between triggered segments}

loop =  loop_1    {one segment per trigger}
       loop_inf  {waveform is continuously looped (no gaps)}

trig =  trig_auto {Internal Trigger every 1 msec}
       trig_once  {Internal Trigger occurs once}
       trig_ext   {External Trigger}
```

Example

```
load_wfm 255 loop_1 trig_auto
```

5.0.2.4 run

Description

Outputs the waveform previously setup.

Parameters

none

Example

```
dax115.exe run
```

5.0.2.5 stop

Description

Stops waveform output.

Parameters

none

Example

```
dax115.exe stop
```

5.0.2.6 overwrite_wfm < data_file >

Description

Overwrites DA11500 with waveform "data_file" while its running (or not). It does not require you to use the stop command, then start after loading. However, the waveform file, level, loop, and trigger MUST BE THE SAME.

Parameters

```
level:  0 < level < 511    {this voltage shows up between triggered segments}
```

5.0.3 set_rtz <rtz_mode>**Description**

Stops waveform output.

Parameters

rtz_mode = 0 (deactivate)
rtz_mode = 1 (active - default)

Example

`set_rtz 0` (turns off RTZ mode which is default)

5.0.4 set_mux (internal use only)

6 MISCELLANEOUS

6.1 Calibration

The DAX11500 have no user features to perform calibration. DC offsets on the analog outputs can be adjusted by the factory to place the center value (255 out of 511) above, below, or at zero volts.

6.2 Maintenance

No maintenance is required.

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