DSO NANO V2 MANUAL V0.9B

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INTRO

DSO Nano v2 is a Digital Storage Oscilloscope designed for basic electronic engineering tasks. Within its smart shell, the device runs on ARM Cortex™-M3 32 bit platform, provides basic waveform monitoring with extensive functions. It is equipped with 320*240 color LCD, micro SD card storage, portable probes, LiPo Battery, USB connection and signal generator. Due to palm size and handy performance, it fits in-field diagnosis, quick measurement, hobbyist projects and wherever convenience matters. Scheme and source files are also open for re-innovating.

FEATURES

- Portable and lightweight
- Color display
- Waveform storage and playback
- 6 triggering mode
- 1Mhz Analog Bandwidth
- Abundant measurement markers and signal info
- Built-in Signal Generator
- Extra accessories available
- Open Source and community based

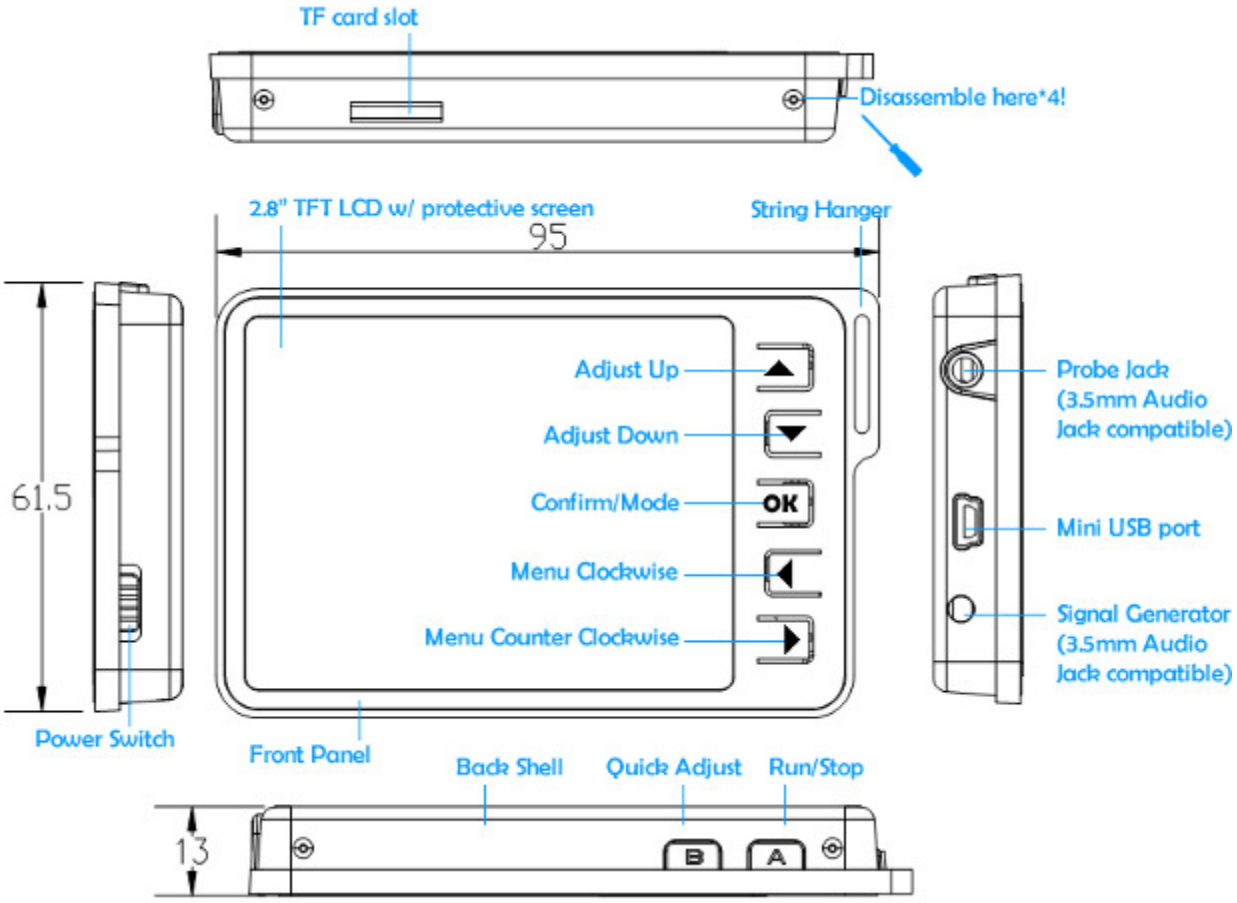
Specification

Display	Full Color 2.8" TFT LCD 65K 320×240
Analog bandwidth	0 - 1MHz
Max sample rate	1Msps 12Bits
Sample memory depth	4096 Point
Horizontal sensitivity	1uS/Div~10S/Div
Horizontal position	adjustable with indicator
Vertical sensitivity	10mV/Div~10V/Div (with ×1 probe)
	0.5V/Div~100V/Div (with ×10 probe)
Vertical position	adjustable with indicator
Input impedance	>500KΩ
Max input voltage	80Vpp (by ×1 probe)
Coupling	DCs
Trig modes	Auto, Normal, Single, None, Scan and Fit
	Rising/Falling edge/level trigger
	Trig level adjustable with indicator
	Trig sensitivity adjustable with indicator
Waveform Functions	Auto measurement: f*requency, cycle time, duty cycle, peak voltage, RMS voltage, Average voltage and DC voltage*
	Precise vertical measurement with markers
	Precise horizontal measurement with markers
	Hold/Run
Signal Generator	10Hz~1MHz square wave
Waveform storage	Micro SD card
PC connection via USB	as SD card reader
Upgrade	USB
Power supply	500mAh 3.7V Lithium battery / USB
Dimension (w/o probe)	95mm*62mm*13mm
Weight	76 gram

*Software related specifications are based on v2.4 firmware

INSTRUCTIONS

STRUCTURE

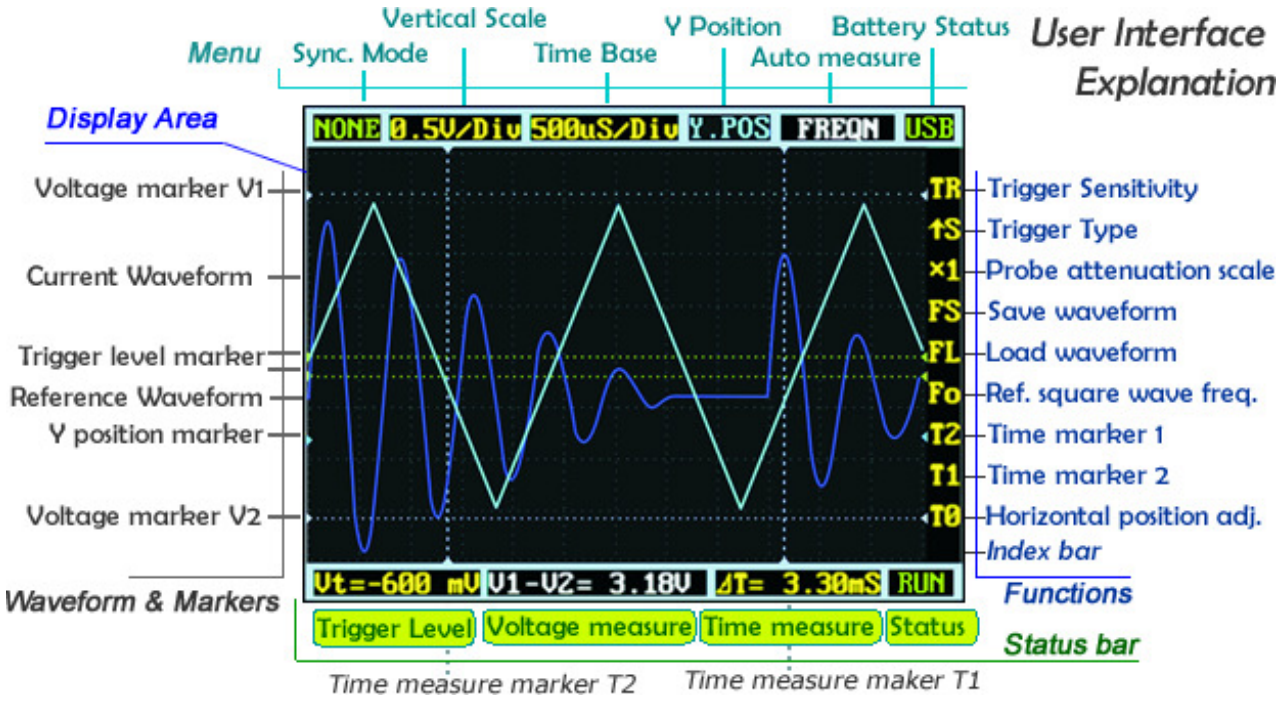


BASIC OPERATION

Left/Right buttons are mainly used to navigate through menu items. Selected menu item will be highlighted; corresponding screen element will blink, press **UP/Down buttons** to adjust. **OK button** could control display/hide markers or confirm operations.

Pressing **A (Run/Stop) Button** once will freeze current display, press again to resume. **B (Shift) Button** is used for quick functions.

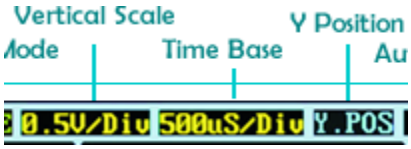
In future texts, adjustable items will be underlined.



USER INTERFACE INTRO

The screen is consisted of **display area** and 3 operation bars around it. **Menu** is on the top providing most frequent adjustment to display signals. **Status bars** on the bottom provides precise measurement result and monitoring status. More functions could be adjusted through the column of **function** keys on the right.

ZOOM TO YOUR SIGNALS



Move cursor to Vertical Scale and Time Base could be a start to signal explorations. Press up/down button to adjust voltage/div or time/div. Each "div" means a grid unit of the screen; count div could give you a quick measurement. Vertical scale ranges from 10mV/div to 10V/div. Time base ranges from 1uS/div to 10S/div. Beware that in larger time base display would look freezing, since under 10S/div it takes 120 seconds to refresh whole screen.

The waveform might be out of the display in the comfortable voltage/div. You could change the Y position to move the waveform up and down. The Y position marker indicates 0V for your reference.

Press button A to freeze current display (status HOLD) and press again to resume refreshing (status RUN). When status is hold, you can move cursors to T0 and press up/down button to pan back and forth. Press OK button to display or hide X position marker (a yellow dotted vertical line)

TRIGGERING MODE:

AUTO: Always refresh display, synchronize when triggered.

NORM (al): Display synchronized waveform when triggered, blank if not triggering.

SING (le): Display triggered waveform and hold, blank before triggering.

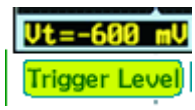
SCAN: Repeatedly sweep waveform from screen left to right.

NONE: Refresh unsynchronized waveform ignoring triggering.

FIT: Automatically adjust vertical and horizontal scale to display waveform per human favor.

Mode	Trigger	Display Waveform	Synchronization	Example Application
AUTO	Yes	Always	Yes	General use
NORM	Yes	Triggered	Yes	Only watch periodic signals
SING	Yes	Triggered	Auto-hold	Capture a random pulse
SCAN	No	Always	No	Keep monitoring signals
NONE	No	Always	No	Watch Unsynchronized waveform
FIT	Yes	Auto-adjust	Yes	Easy watching periodic signals

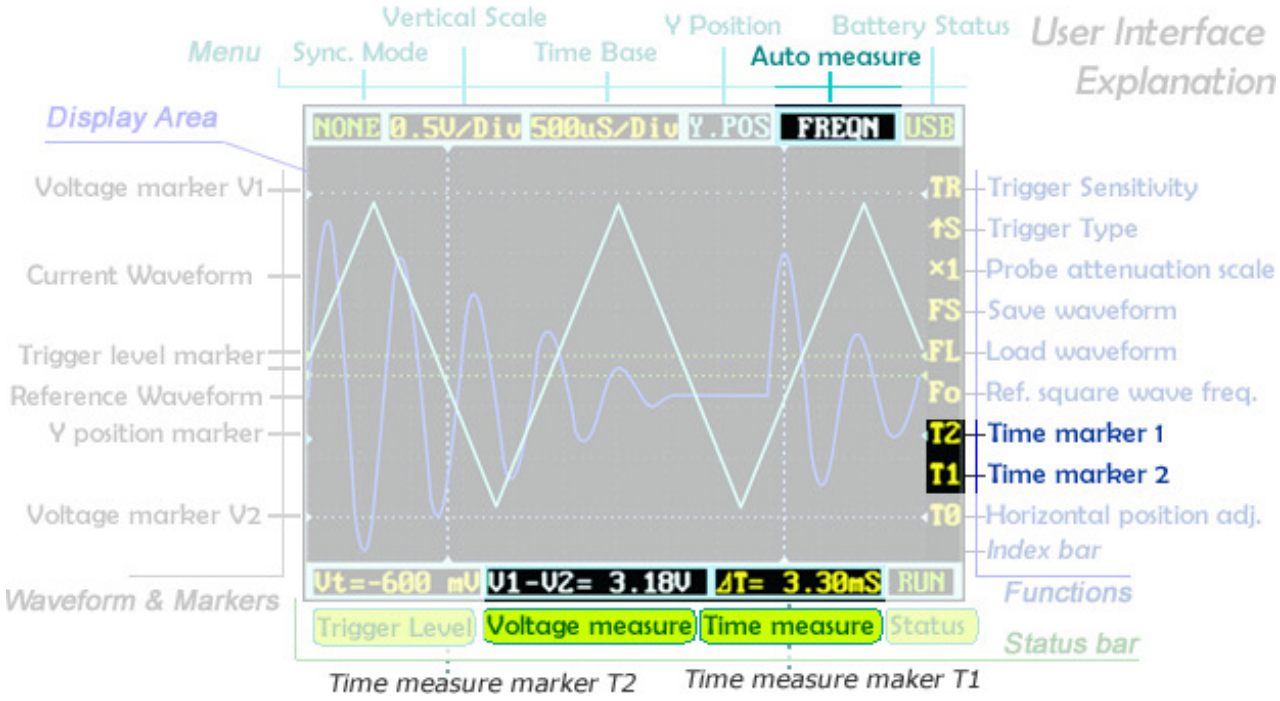
Comparison table of the triggering modes



To set the triggering level, move cursor to Vt = ??.?mV and press up/down button. You may press OK button to display the trigger level marker (horizontal green dotted lines). To fine tune triggering, you may tweak trigger sensitivity TR and trigger slope. By default trigger type is set to ↑S which means only the signal rises from lower trigger level marker to higher level marker, the signal syncs. ↓S means vice versa.

This could prevent mistaken triggering caused by noises, especially while measuring fast low-amplitude signals. If you set sensitivity to 0, where the two trigger level markers overlap each other, you get level triggering. Please refer to al-mighty Wikipedia for more info and tutorial on oscilloscope triggering:

MEASUREMENT

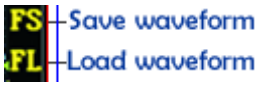


Auto measurement could be a quick tool to look at the signal characteristics. Measurement items include *frequency, cycle time, duty cycle, peak voltage, RMS voltage, Average voltage and DC voltage*. Please note that frequency, cycle time and duty cycle could only be measured while triggering.

To get a more precise measurement, you may use measurement markers. T2 and T1 control time markers which are two vertical dotted lines. A precise time difference between two marker positions is displayed on time measure near bottom of the screen. V1 marker and V2 marker could be adjusted directly from the voltage measure result V1-V2=? V.

All marker lines could be switched display or hide by pressing OK button in corresponding menu item.

WAVEFORM STORAGE



Waveform could be saved to TF card or load to display. You would need a small micro SD card to do this. Please note SDHC card (high speed card larger than 2 GB) is not supported for now. Follow below steps:

1 . Make sure your SDcard supports SPI mode. (Most SDHC and over 2GB card does not)
2 . Format your SDcard with FAT16
3 . Create a new file named FILEXXX.DAT in your SDcard root (file size must bigger than 1KB). Or directly download from http://dso.seeedstudio.com and copy it into SD card root.

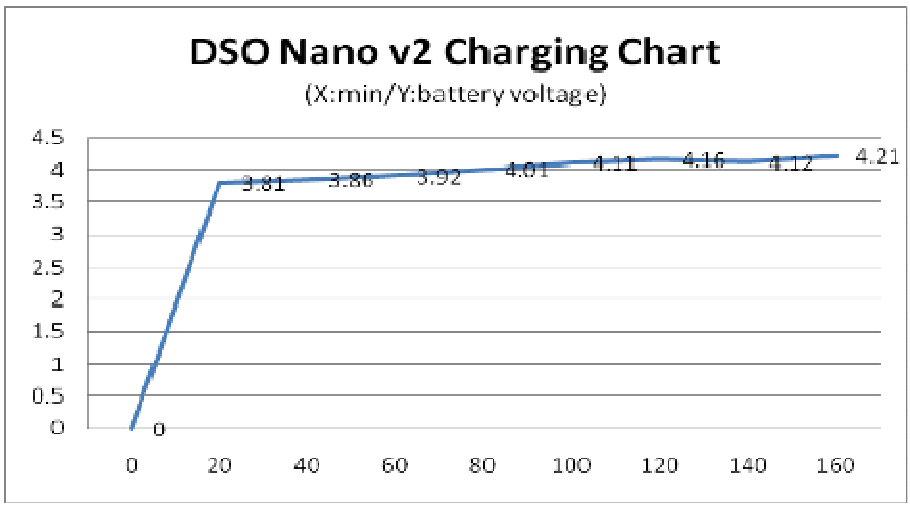
When the micro SD card is prepared, FS and FL are enabled. Press OK button on FS to save waveform, or on FL to load waveform from micro SD card.

SIGNAL GENERATOR

The 3.5mm audio jack under mini USB port is used for signal generator, it outputs 10Hz~1MHz square wave. Frequency could be adjusted via Fo. The peak voltage is the same as supplied power, approximately 3.7v if powered from battery, and 5v powered by USB.

POWER SUPPLY

DSO Nano could be powered by internal 500mAh LiPo battery or external mini-USB port. charging takes about 2 hour 20 min to reach 4.12V. **A fresh unit** could only run about 1 hour by battery, battery life will be extended after the LiPo fully activated.



UPDATE FIRMWARE

It's easy to upgrade firmware with USB boot loader.

1. Download "DfuSe USB Device Firmware Upgrade" from http://www.st.com/stonline/products/support/micro/files/um0412.zip and install. Instruction is available at http://www.st.com/mcu/familiesdocs-110.html#Application%20Note.
2. Connect Oscilloscope with PC, press and hold [▼], switch on power, until oscilloscope displays:

"Please Connect to USB Host!"

"DS0201 Device Firmware Upgrade Ver 1.0"

When PC connection is detected,

"Firmware Upgrading..."

"Please Wait"

"DS0201 Device Firmware Upgrade Ver 1.0"

3. Run “Dfuse Demo” on PC, check (1）, select firmware to be uploaded （e,g."DS0201_FW_V2.00.DFU"）at（2）

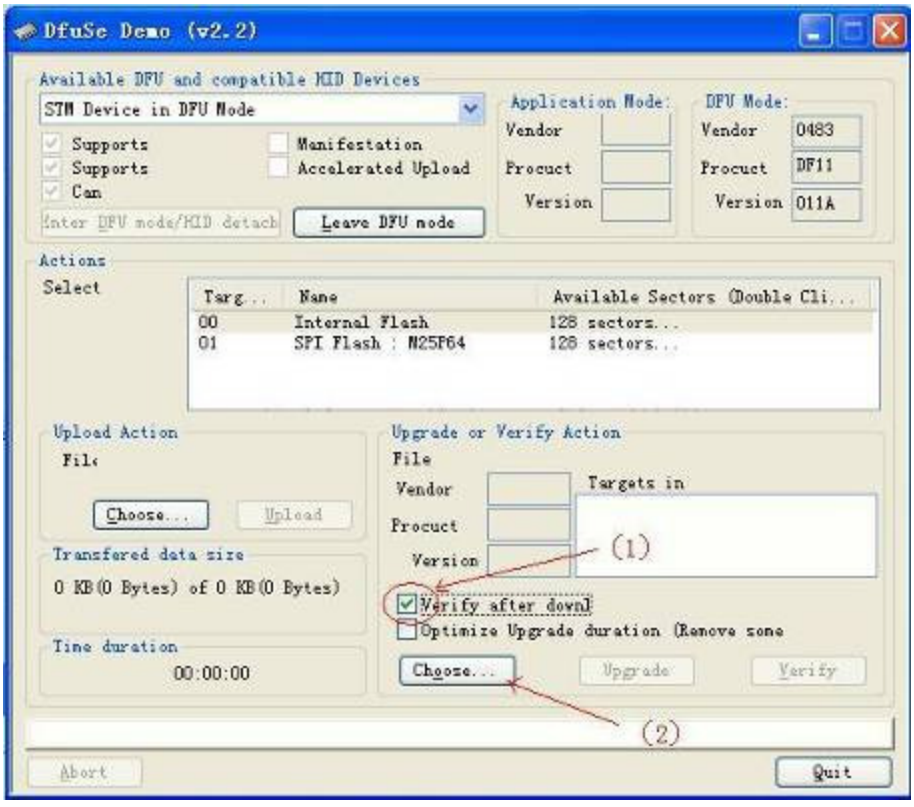
Firmware structure:

APP – Application firmware. Basic usage and reference for user modification, kept as simple as possible.

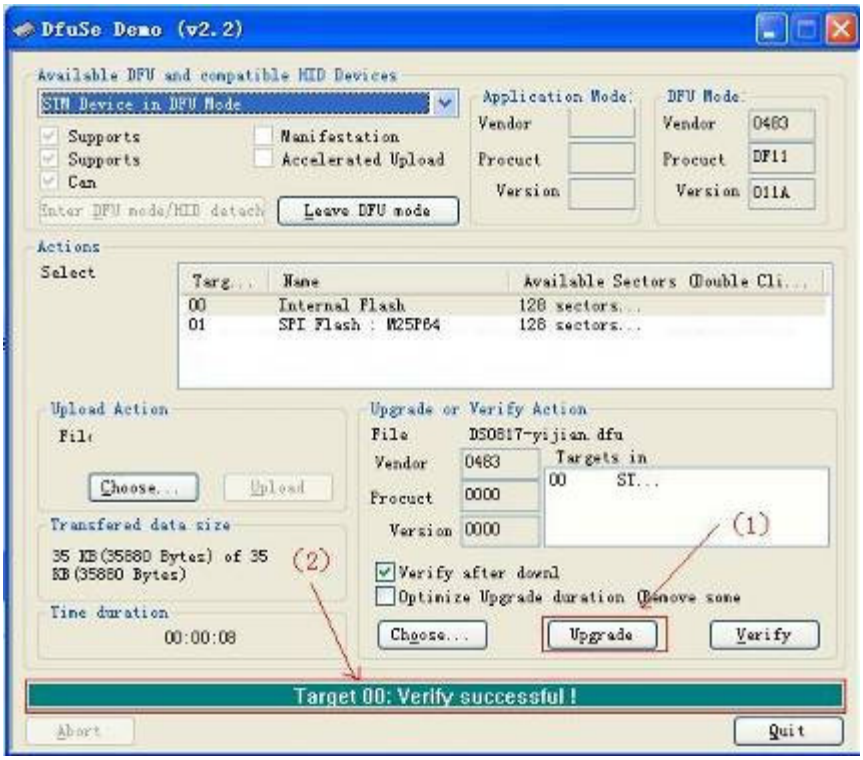
LIB – Library firmware. contains libraries for hardware operation, upgrade periodically.

Bootloader – contains basic hardware parameter and serial number. Pre-programmed during manufacturing to enable DFU mode upgrading via USB port.

Please note that both APP firmware and LIB firmware (.dfu) files needs to be programmed while upgrading.



4. In the next screen, press（1）"Upgrade", when upgrade finishes successfully, status bar will notify（2）



5. Shut down and reactivate power to use new firmware.

MADE WITH COMMUNITY

Please visit our forum for prompt tech support and usage discussion:
http://www.seeedstudio.com/forum/viewforum.php?f=12
Latest firmware, schematic and development documentations could be found at:
http://code.google.com/p/dsonano/
Thanks for inputs from our user, we could provide better Nano v2 revision and future models.
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CHANGE LOG:

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