DDS-140 Hardware Manual

for Oscilloscope, Signal Generator, Logic Analyzer
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1 WARNINGS

△ Please ensure that the equipment should not be out of the input voltage range.

△ Please make sure that the black clip of the probe is well grounded and it is equipotent with the PC ground.

△ Please make sure that the probe should not connect to the 220V/110V mains socket directly. It is dangerous for the device or operating personnel.

WARNING! Damage caused by violation warning behavior will not be covered under warranty.

Comments on △: Input voltage range of the virtual oscilloscope device is ± 5v. Although the virtual oscilloscope device has internal input overvoltage protection circuit and it can protect several times or even ten times over the range of input. But there are still too many over-range unpredictable risks. So you must choose the suitable attenuator probe according to the nature of the test voltage and use the device within the voltage range. The equipment is standard for the 1X/10X probes: When you select 1X position, the voltage input range is ± 5v; when you select 10X position, the voltage input range is ± 50v; If you use the optional 100X probes, the voltage input range is ± 500v.

Comments on △: Virtual oscilloscope equipment takes power from the PC’s USB port directly. So the virtual oscilloscope device and PC connect together and it connects to the black clip of the probe. If the PC gets the power by the socket, then PC should connect to the earth through the connection protected hole of the three core mains socket according to the safety regulations; If a laptop runs on battery power, then the land will be suspended. In most cases, the equipment, PC and the black clip of the probe are connecting to the earth. If the black clip connects to a non-earth potential of the circuit under test at this time, it is equivalent to the circuit under test with a black clip connecting to earth directly and cause a short circuit.
Comments on △: The measurement of the 220V mains is equivalent to measure the peak which is approximately 611V voltage signals as the description in △. It needs a high voltage 100:1 probe. As the description in △, if the probe connects to 220VAC directly, it is equivalent that the L or N of 220VAC connect to the oscilloscope internal GND by its probe and then cause a short circuit to the AC input circuit which is protected. It may burn the probe or oscilloscope in severe cases. There are several solutions: using isolation probe or oscilloscope power taking an isolation transformer or breaking off the FGND feet of three-wire power cord which connects to the oscilloscope. If you do not take the scheme of isolation probe and test the non-safety voltage directly, the oscilloscope itself (such as shell bare metal part) will also bring non-safe voltage. So contacting to these places is not safe and you should be careful when you use it.

2 Version

RECORD OF CHANGES

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Model</th>
<th>Description</th>
<th>Reviser</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0.0</td>
<td>09/25/2013</td>
<td>DDS-140</td>
<td>Adding &quot;Color Mode&quot; menu item function, you can select the drawing area into white with black lines, it is easy to make a report document screenshot</td>
<td>jiangtao</td>
</tr>
</tbody>
</table>
3 Features

**Hardware Features**
- Optional signal generator function
- Optional logic analyzer function
- Real-time sampling rate up to 200M hz
- Recommended input: 1 ~ 30M hz
- 10kV ESD protection
- 10 times over voltage protection
- DC-coupled and AC-coupled input
- Computer USB supply power directly
- 1K HZ square wave signal output

**Software features**
- Support XP~Win8 series of operating system
- Open source of software interface could be combined with the third party software
- Waveform recording and continuous playback as well as specified frame playback functions by frame-by-frame
- Input channel arithmetic and FFT analysis
- Anti-aliasing features of waveform drawing to reduce rendering errors further
- Memory function of user personalization settings
- The rapid completion of the mouse to control the trigger function settings
- Optional colors of black and white pattern to create reports document screenshot easily

**Application**
- Site engineer travel to debug
- AE engineers diagnose equipment and solve the problem for customer on-site
- Electronics Engineer develop tools, save money and desktop space
- The ideal partner of electronic enthusiasts for their amateur making
- Fault diagnosis equipment for repair personnel
- Demonstration Teaching Laboratory aids of colleges and Universities
- Automatic test equipment for production

**Introduction**
DDS-140 is a medium-performance oscilloscope. It can be extended to achieve oscilloscope, signal generator and logic analyzer triple main functions by inserting different sub-modules. The highlighting advantages are the optional modular structure and high performance price ratio. When you do not want to spend a high price to buy a traditional oscilloscope, a signal generator and a logic analyzer. This product will be a good choice.

DDS-140 body take operation of traditional oscilloscope operation and part function of
display transfer drawing into the computer by the software to achieve. As long as the DDS-140 device via USB cable into your compute, it will form a complete oscilloscope test system after running the software.

Device structure

DDS-140 Top View, R=1MΩ, C=25pF
4 Product Interface

4.1 USB connection

This device uses USB 2.0 interface. Please use the USB2.0 cable included with the product or use the cable which have convinced over the high-quality of the USB2.0 cable included with the product. If it is a desktop PC, please use the back of the chassis USB2.0 interface and try not to use the front of the chassis USB interface for power supply capacity considerations.

In some aftermarket cases, poor quality USB cable and the front USB interface may cause shortage of power supply and then emerge software crashes, slowdown, problems that devices can not recognize and other problems of uncertainty.
4.2 Standard square wave reference signal output

Between two BNC analog input channels of the main oscilloscope device, it will extend a metal lugs which provide a square wave signal whose frequency is 1KHZ and amplitude is about 3.25V. It is convenient for users to detect oscilloscope function rapidly, adjust the compensation characteristics of the probe and use as a reference signal. The reference signal inside the device has connected to the oscilloscope circuit. So the measurement of the signal with the device itself does not need to connect to the earth additionally.

The standard square wave in the signal generator module extension is enabled and then may lose the original function because of resource sharing. It will become normal when the signal generator is closed or it is not used.

4.3 Probe Connection

Optional equipment Standard 1X/10X, 40M probe two stalls, as shown below:

4.3.1 Attenuation Switch

When the probe position switch is struck to the 1X position as follows, the probe tip in contact with the measured voltage signal will be fed into the virtual oscilloscope equipment without any attenuation, because the range of the equipment itself is ±5v, so
in this case only can measure the voltage range of ± 5v signal. When the attenuation switch is slide to the 10X position, the probe tip in contact with the measured voltage signal will be attenuated to a tenth and sent to the device, so in this case can be measured within ± 50v voltage signal.

10X stalls have better frequency characteristics and a wider bandwidth, so when faced with a bandwidth and frequency bottleneck, you can try using 10X stalls for better measurement results.

**4.3.2 Compensation Trimmer**

Using 10X position, can be adjusted by the compensation capacitor to the probe frequency characteristic. The probe attenuation switch to 10X stalls, and connect the device comes with the standard square wave reference signal, adjust the compensation capacitor can be over-compensation or under-compensation of the probe correction to the appropriate state.
4.3.3 Probe ground clip

Probe ground clip and virtual oscilloscope to the circuit directly connected to the PC through a USB cable connected to the ground. When powered PC using a power outlet, PC power jack is connected with the earth through three core holes in the protective earth. So when we use it, make sure the probe's ground clip of the circuit under test are connected to ground potential and the PC ground equipotent in use, otherwise it will lead to leakage, short circuit or measurement error, can cause serious damage to the equipment, as detailed in chapter one described.

4.4 Expansion interface modules (model interface)

Through this interface you can access the extended functional sub-modules, such as the signal generator module and a logic analyzer module, to achieve reuse of the main oscilloscope’s hardware and software resources to complete more useful complementary functions. Through testing, sub-function modules, and connecting to the main body of the oscilloscope is plug and play, but do not plug circuit design considerations, so we still do it in the power-off state removable module.
5 Signal Generator module (optional)

Signal generator module provides one BNC connector Signal output:

<table>
<thead>
<tr>
<th>Entry</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waveform Type</td>
<td>Square wave, sine wave, triangle wave, PWM</td>
</tr>
<tr>
<td>Output amplitude</td>
<td>Software adjustable output range-4V ~ +4 V</td>
</tr>
<tr>
<td>Output frequency</td>
<td>1 ~ 20M HZ (sine wave) continuously adjustable, PWM output frequency limit 20K HZ</td>
</tr>
<tr>
<td>Output bandwidth</td>
<td>5M HZ (Sine wave)</td>
</tr>
<tr>
<td>Output Bias</td>
<td>Software adjustable</td>
</tr>
<tr>
<td>Duty</td>
<td>Software adjustable PWM output duty cycle, 10% of the ladder</td>
</tr>
<tr>
<td>Size</td>
<td>10 cm X4 cm X2.5 cm</td>
</tr>
</tbody>
</table>
6 Logic Analyzer Module (optional)

<table>
<thead>
<tr>
<th>Entry</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>8 channels</td>
</tr>
<tr>
<td>Input Level</td>
<td>3.3V/5v TTL/CMOS Logic level compatible</td>
</tr>
<tr>
<td>Maximum sampling rate</td>
<td>100M HZ</td>
</tr>
<tr>
<td>Memory Depth</td>
<td>32K per channel</td>
</tr>
<tr>
<td>Output Bias</td>
<td>Software adjustable</td>
</tr>
<tr>
<td>Size</td>
<td>10cmX4cmX2.5cm</td>
</tr>
</tbody>
</table>

![Logic Analyzer Module](image)

![Interface front view](image)

7 Performance index

<table>
<thead>
<tr>
<th>Category</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>USB 2.0</td>
</tr>
<tr>
<td>Number of Channels</td>
<td>2</td>
</tr>
<tr>
<td>Export</td>
<td>1K Hz, 3.25V level standard reference square wave output</td>
</tr>
<tr>
<td>Maximum sampling rate</td>
<td>200M sps (single), 100M sps (dual channel)</td>
</tr>
<tr>
<td>Feature</td>
<td>Specification</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Vertical resolution</td>
<td>8 bit</td>
</tr>
<tr>
<td>Voltage range</td>
<td>±5v, can be extended to ±50v through X10 table pen, extended to ±500v through X100 table pen</td>
</tr>
<tr>
<td>Noise size</td>
<td>±50mv 1v/div Stalls, ±25mv 500mv/div Stalls, ±10mv 200mv/div Stalls, ±8mv 100mv/div Stalls, ±4mv 50mv/div Stalls</td>
</tr>
<tr>
<td>Trigger coupling</td>
<td>AC AC-coupled, DC DC-coupled</td>
</tr>
<tr>
<td>Triggering conditions</td>
<td>Trigger level + rising / falling-edge trigger</td>
</tr>
<tr>
<td>Trigger</td>
<td>Auto, Normal and Single Trigger</td>
</tr>
<tr>
<td>Input impedance</td>
<td>1M / 25pf</td>
</tr>
<tr>
<td>Memory Depth</td>
<td>64k Byte</td>
</tr>
<tr>
<td>Power</td>
<td>&lt; 2 W</td>
</tr>
<tr>
<td>Weight</td>
<td>&lt; 400g</td>
</tr>
<tr>
<td>Automatic measurement</td>
<td>Maximum, minimum, peak to peak, frequency, average, RMS, rise time, Positive Width, Negative Width, Duty Cycle</td>
</tr>
<tr>
<td>Size</td>
<td>12 cm X 7.5 cm X 2.5 cm</td>
</tr>
</tbody>
</table>

8 Typical Characteristics

The noise is less than ±50mv, 1V / vertical grid display

The noise is less than ±4mv, 50mV / vertical grid display
4V, 1Khz sine wave chart, 1V / vertical grid display

0.5V, 1Khz sine wave chart, 200mV / vertical grid display

200mv, 1Khz sine wave chart, 50mV / vertical grid display

4V, 10Mhz sine wave chart, 1V / 50ns display

4V, 20Mhz sine wave chart, 1V / 50ns display
3V, 1k Hz sine wave chart, 1V / vertical grid display

3V, 1M Hz sine wave chart, 1V / vertical grid display