

## VT DSO-2815H Manual



This product is designed to be used by those who have some basic electronics and electrical knowledge. It is absolutely dangerous to connect an unknown external voltage to the VT DSO-2815H unit. Be sure that the voltage to be measured is less than the maximum allowed input voltage.

*Note: VIRTINS TECHNOLOGY reserves the right to make modifications to this manual at any time without notice. This manual may contain typographical errors.*

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# 1 Installation and Quick Start Guide

## 1.1 Package Contents

A standard VT DSO-2815H Package contains the following items:

- 1) VT DSO-2815H unit with a hardware bundled Multi-Instrument Standard Software License



- 2) 2 × 60MHz Oscilloscope Probe PP-80 with two switchable positions: ×1, ×10



- 3) USB cable (1.05 m)



- 4) CD (contains the copy-protected Multi-Instrument Software and VT DSO-2815H driver)



## 1.2 Multi-Instrument Software Installation

Insert the installation CD into your computer's CD-ROM drive and follow the instruction on the screen to install the Multi-Instrument software.

## 1.3 Hardware Driver Installation

### 1.3.1 Installation Procedure

The USB cable has two USB A-type connectors at one end (one is black and the other is red) and one USB B-Type connector at the other end. The black A-type connector should be connected to a USB port of your computer while the B-type connector should be connected to the VT DSO-2815H unit. The red A-type connector should be connected to another USB port of your computer if the USB port with which the black A-type connector connected is not able to provide sufficient power to the VT DSO-2815H unit.

For Windows XP and Vista:

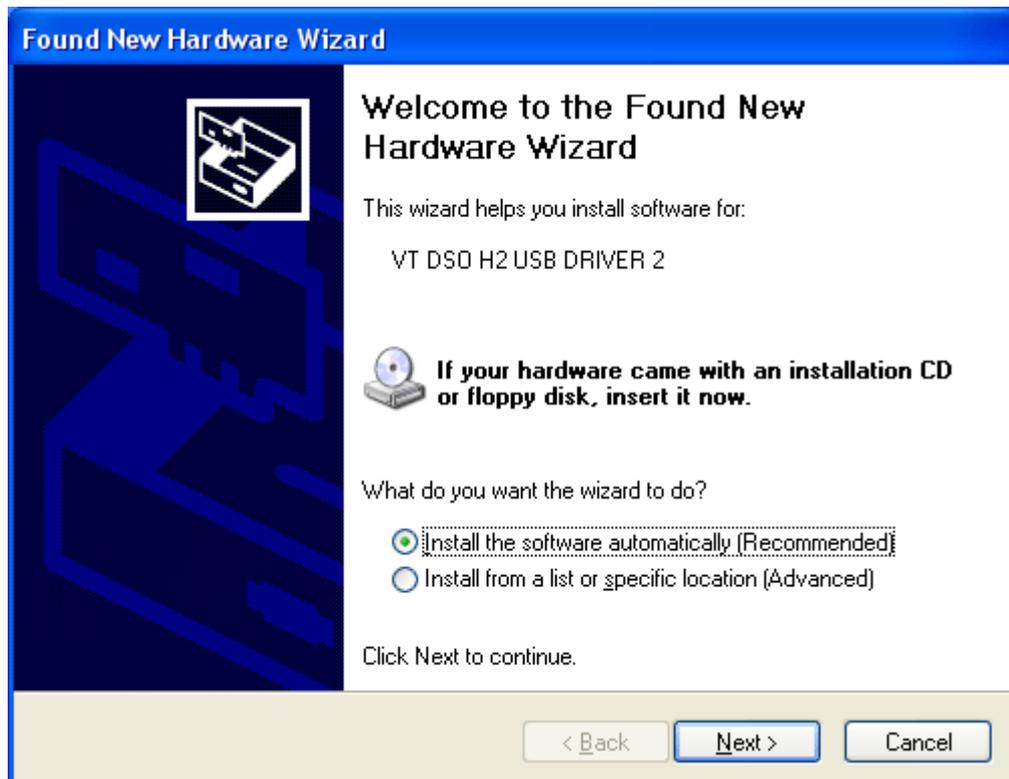
- 1) Wait for the "Found New Hardware Wizard" dialog pops up. And then select "Install the software automatically (Recommended)" and click "Next".



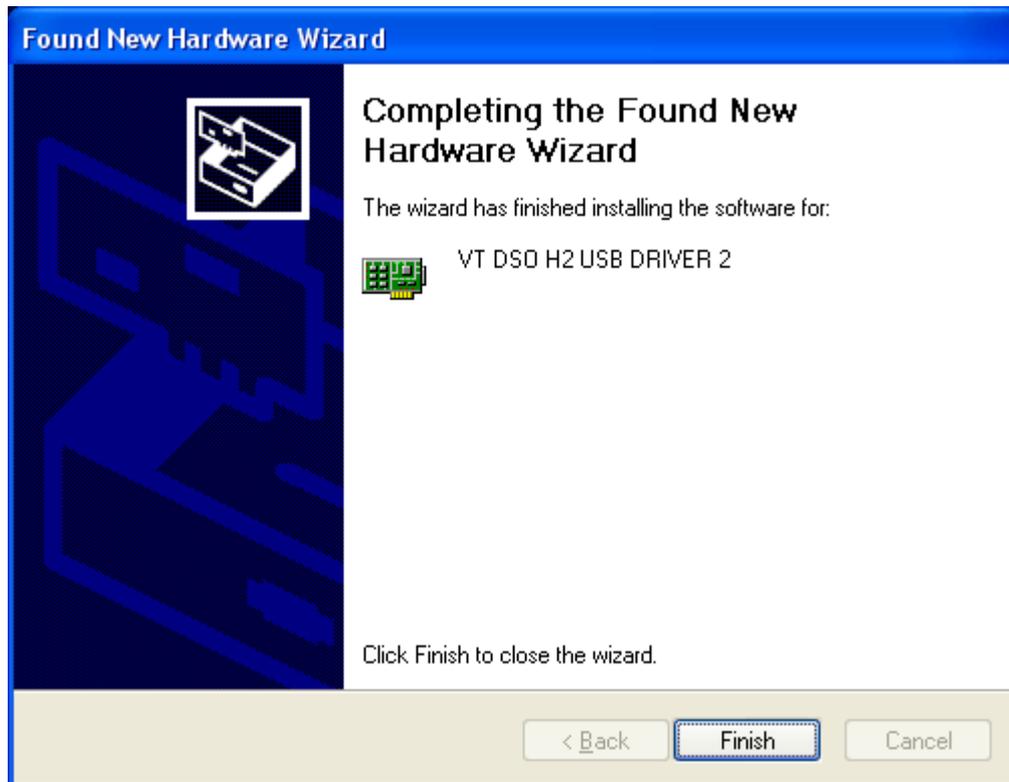
2) Click “Finish”.



3) Select “Install the software automatically (Recommended)” and click “Next”.



4) Click “Finish”.



For Windows 98SE, ME, 2000

The installation procedure is very similar as the one described above.

The driver is located in the Drivers\VTDSOH2 directory in the CD. When you install the Multi-Instrument software, a copy of the respective driver will also be installed in the directory ..\Drivers\VTDSOH2.

**Note: you may need to re-install the driver if you change to use another USB port of your computer for the VT DSO-2815H unit. However, the installation CD is not required during driver re-installation. To avoid driver re-installation, stick to a fixed USB port of your computer for the VT DSO-2815H unit.**

### 1.3.2 Installation Verification

After hardware driver installation, you can follow the steps in the next section to start the Multi-Instrument software. If the software starts in licensed mode (do not plug out the VT DSO-2815H unit), that means that the driver has been installed successfully. Otherwise, please open the Windows Device Manager via [Start]>[Control Panel]>[System]>[Hardware]>[Device Manager], you should see “VT DSO H2 USB DRIVER 2” under “VT DSO H2 USB” category. If not, then re-installation of the hardware driver is required.

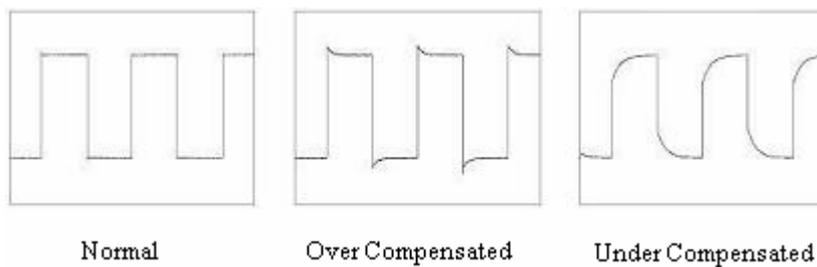


## 1.6 Probe Calibration

Connect the probe to the 2Vpp 1kHz square wave signal of the VT DSO-2815H unit, and then adjust the sampling parameters such that the waveform displayed on the screen can be clearly seen. You can also do this by simply clicking the “Auto” button at the upper right corner of the screen.



Adjust the probe compensate capacitor at the end of the probe cable such that the square wave looks normal, as shown below.



## 1.7 Hard Reset

A hard reset can be done via disconnecting the VT DSO-2815 unit from your computer and then re-connect it to the computer again. You can only do this with the Multi-Instrument software closed.

## 2 Specifications

### 2.1 VT DSO-2815H Hardware Specifications

Sampling Frequency	<u>Single Channel, Maximum 60000 Samples*</u> 150MHz, 50MHz, 10MHz, 5MHz, 2MHz, 1MHz, 500kHz, 200kHz, 100kHz, 50kHz, 20kHz, 10kHz  <u>Single or Dual Channels, Maximum 30000 Samples per Channel</u> 75MHz, 25MHz, 5MHz, 2.5MHz, 1MHz, 500kHz, 250kHz, 100kHz, 50kHz, 25kHz, 10kHz, 5kHz  <u>Single or Dual Channels, Maximum 10000 Samples per Channel</u> 50MHz, 2.5kHz  <u>Single or Dual Channels, Maximum 500 Samples per Channel, work in Roll Mode**</u> 50Hz, 25Hz, 5Hz
Analog Bandwidth	60MHz
Number of Input Channels	2
ADC Bit Resolution	8 Bit
Input Voltage Range	$\pm 40\text{mV}$ , $\pm 80\text{mV}$ , $\pm 200\text{mV}$ , $\pm 400\text{mV}$ , $\pm 800\text{mV}$ , $\pm 2\text{V}$ , $\pm 4\text{V}$ , $\pm 8\text{V}$ , $\pm 20\text{V}$
Maximum Allowed Input Voltage	<b><math>\pm 35\text{V}</math></b>
DC Accuracy	$\pm 3\%$
Coupling Type	AC/DC
Input Isolation	No
Terminal Type	Referenced Single-Ended
Buffer Size	30000 bytes per Channel
Scan Time	400 $\mu\text{s}$ ~100s (with buffer fully filled)
Trigger Source	CH1, CH2, EXT, ALT
Trigger Level	Adjustable
EXT Trigger Level	Adjustable in the range of $-4\text{V} \sim 4\text{V}$
Trigger Edge	Rising, Falling
Trigger Mode	Auto, Normal, Single
Pre-Trigger	0 ~ -100%
Input Impedance	1 M $\Omega$ , 25 pF
Output Signal for Probe Calibration	2Vpp, 1kHz, Square Wave
Streaming Supported	No
Interface	USB
Device Category in Multi-Instrument	VT DSO H2
Power	Bus powered by USB port, no external power source required.
Power Consumption	Max. 2.5W

Dimensions	203 mm (L) × 99 mm (W) × 33 mm (H)
System Requirement	Windows 98, ME, 2000, XP, Vista, 7 or above, 32 bit or 64 bit

*\*Some of these frequencies are not listed in the sampling frequency selection combo box of the Multi-Instrument software. You need to stop the oscilloscope, enter the sampling frequency value directly into that combo box and then set the number of sampling channels to single, if you need to use these sampling frequencies.*

*\*\*Under these sampling frequencies, adjusting the trigger mode, trigger source, trigger edge, trigger level, trigger delay will have no impact on the sampling. The computer's work load should be kept low (e.g. reduce the FFT size, close other running program, etc.) in order to ensure sufficient timing accuracy.*

## 2.2 PP-80 Oscilloscope Probe Hardware Specifications

Attenuation Ratio	×1, ×10
Bandwidth	DC ~ 60 MHz (×10), DC ~ 6 MHz (×1)
Input Impedance	1 MΩ (×1, with VT DSO-2815H connected) 10 MΩ (×10, with VT DSO-2815H connected)
Input Capacitance	18.5 pF~22.5 pF (×10), 85 pF~ 115 pF (×1)
Input Capacitance Compensation Range	15~40 pF
Length	1.2 m

Accessories include: a 6" snap-on rotating ground lead, a sprung hook, two marker rings, a probe compensation adjustment tool, two probe tip caps.

## 2.3 Multi-Instrument Software Specifications

Please refer to Multi-Instrument software manual for detail. The following table shows the function allocation matrix for Multi-Instrument series. The Spectrum 3D Plot, Data Logger, LCR Meter, Device Test Plan, Vibrometer are add-on modules/functions and should be purchased separately, and they are only available for Multi-Instrument Lite, Standard, and Pro versions, except that the Vibrometer is only available for Multi-Instrument Standard and Pro versions.

Legend: √ - Function available

		Sound Card Oscilloscope 3.2	Sound Card Spectrum Analyzer 3.2	Sound Card Signal Generator 3.2	Multi-Instrument Lite 3.2	Multi-Instrument Standard 3.2	Multi-Instrument Pro 3.2
<b>General Functions</b>							
ADC / DAC Hardware	Sound Card MME	√	√	√	√	√	√
	Sound Card ASIO						√
	Other Hardware					√	√
	vtDAQ, vtDAO software development kit	License automatically activated with the presence of the corresponding hardware, e.g. a USB hardkey or a VT DSO.					
File Operation	Load WAV File	√	√	√	√	√	√
	Load TXT File					√	√
	Load WAV File Frame by Frame (fore Long WAV File)					√	√
	Combine WAV Files	√	√	√	√	√	√
	Extract Data and save them into a new WAV File	√	√	√	√	√	√
	Save/Load Panel Setting	√	√	√	√	√	√
Data Export	Copy Text to Clipboard	√	√	√	√	√	√
	Copy BMP to Clipboard	√	√	√	√	√	√
	Print Preview	√	√	√	√	√	√
	Print	√	√	√	√	√	√
	Export as TXT File	√	√	√	√	√	√
	Export as BMP File	√	√	√	√	√	√
Trigger Settings	Trigger Mode	√	√		√	√	√
	Trigger Source	√	√		√	√	√
	Trigger Edge	√	√		√	√	√
	Trigger Level	√	√		√	√	√
	Trigger Delay	√	√		√	√	√
Sampling Settings	Sampling Rate	√	√	√	√	√	√
	Sampling Channels	√	√	√	√	√	√
	Sampling Bit Resolution	√	√	√	√	√	√
	Record Length	√	√		√	√	√
Calibration	Input	√	√		√	√	√
	Output			√	√	√	√
	Probe	√	√		√	√	√
	0dB Reference Vr (Sound Pressure Level)	√	√		√	√	√
	F/V Conversion					√	√
	Latency for Sync. Output/Input						√
	Sensor Sensitivity	√	√		√	√	√
Load Factor for Power Calculation	√	√		√	√	√	
Graph Operation	Zoom	√	√	√	√	√	√
	Scroll	√	√	√	√	√	√
	Cursor Reader	√	√	√	√	√	√
	Marker	√	√	√	√	√	√
	Chart Type	√	√	√	√	√	√
	Line Width	√	√	√	√	√	√

		Sound Card Oscilloscope 3.2	Sound Card Spectrum Analyzer 3.2	Sound Card Signal Generator 3.2	Multi-Instrument Lite 3.2	Multi-Instrument Standard 3.2	Multi-Instrument Pro 3.2
	Color	√	√	√	√	√	√
	Fast/Slow Display Mode	√	√	√	√	√	√
	Refresh Delay	√	√	√	√	√	√
	Font Size	√	√	√	√	√	√
	Roll Mode					√	√
	Reference Curves					√	√
Others	Gain Adjustment	√	√	√	√	√	√
	Input Peak Indicator	√	√	√	√	√	√
	Sound Card Selection	√	√	√	√	√	√
	Sampling Parameter Auto Setting	√	√	√	√	√	√
	Multilingual GUIs	√	√	√	√	√	√
	Show/Hide Toolbar	√	√	√	√	√	√
	Lock/Unlock Panel Setting	√	√	√	√	√	√
	Hot Panel Setting Toolbar	√	√	√	√	√	√
	ActiveX Automation Server	√	√	√	√	√	√
<b>Oscilloscope</b>							
Type	Individual Waveform	√	√	√ (offline)	√	√	√
	Waveform Addition	√	√	√ (offline)	√	√	√
	Waveform Subtraction	√	√	√ (offline)	√	√	√
	Waveform Multiplication	√	√	√ (offline)	√	√	√
	Lissajous Pattern	√	√	√ (offline)	√	√	√
Digital Filtering	FFT Low Pass					√	√
	FFT High Pass					√	√
	FFT Band Pass					√	√
	FFT Band Stop					√	√
	FFT Frequency Response					√	√
	FIR Low Pass					√	√
	FIR High Pass					√	√
	FIR Band Pass					√	√
	FIR Band Stop					√	√
	FIR Frequency Response					√	√
	IIR Coefficients					√	√
Others	Max, Min, Mean, RMS	√	√	√ (offline)	√	√	√
	Record Mode					√	√
<b>Spectrum Analyzer</b>							
Type	Amplitude Spectrum		√		√	√	√
	Phase Spectrum		√		√	√	√
	Auto-correlation		√		√	√	√
	Cross-correlation		√		√	√	√
	Coherence						√
	Transfer Function						√
	Impulse Response						√

		Sound Card Oscilloscope 3.2	Sound Card Spectrum Analyzer 3.2	Sound Card Signal Generator 3.2	Multi-Instrument Lite 3.2	Multi-Instrument Standard 3.2	Multi-Instrument Pro 3.2
Intra-Frame Processing	Frequency Compensation		√		√	√	√
	Frequency Weighting		√		√	√	√
	Remove DC		√		√	√	√
	Smoothing via Moving Average		√		√	√	√
Inter-Frame Processing	Peak Hold		√		√	√	√
	Linear Average		√		√	√	√
	Exponential Average		√		√	√	√
Parameter Measurement	THD, THD+N, SNR, SINAD, Noise Level		√		√	√	√
	IMD		√		√	√	√
	Bandwidth		√		√	√	√
	Crosstalk		√		√	√	√
	Harmonics		√		√	√	√
	Energy in User Defined Frequency Band		√		√	√	√
	Peaks		√		√	√	√
FFT	FFT Size 128~32768		√		√	√	√
	FFT Size 65536~4194304						√
	Intra-Frame Average		√		√	√	√
	Window function		√		√	√	√
	Window Overlap		√		√	√	√
Others	Peak Frequency detection		√		√	√	√
	Cross Correlation Peak detection		√		√	√	√
	Octave Analysis (1/1, 1/3, 1/6, 1/12, 1/24, 1/48, 1/96)		√		√	√	√
	Linear/Log Scale for X and Y		√		√	√	√
<b>Signal Generator</b>							
Waveform	Sine			√	√	√	√
	Rectangle			√	√	√	√
	Triangle			√	√	√	√
	Saw Tooth			√	√	√	√
	White Noise			√	√	√	√
	Pink Noise			√	√	√	√
	MultiTones			√	√	√	√
	Arbitrary Waveform			√	√	√	√
	MLS			√	√	√	√
	DTMF			√	√	√	√
	Musical Scale			√	√	√	√
	Play Waveform in Oscilloscope	√	√	√	√	√	√
	Cyclic Play Waveform in Oscilloscope	√	√	√	√	√	√

		Sound Card Oscilloscope 3.2	Sound Card Spectrum Analyzer 3.2	Sound Card Signal Generator 3.2	Multi-Instrument Lite 3.2	Multi-Instrument Standard 3.2	Multi-Instrument Pro 3.2
Burst (Mask)	Normal			√	√	√	√
	Phase Locked			√	√	√	√
Fade	Fade In			√	√	√	√
	Fade Out			√	√	√	√
Sweep	Frequency Sweep (Linear/Log)			√	√	√	√
	Amplitude Sweep (Linear/Log)			√	√	√	√
Others	Software Loopback (all channels)			√	√	√	√
	Software Loopback (1 channel)				√	√	√
	Sync. with Oscilloscope						√
	Save as WAV file			√	√	√	√
	Save as TXT file			√	√	√	√
<b>Multimeter</b>							
Type	RMS					√	√
	dBV					√	√
	dBu					√	√
	dB					√	√
	dB(A)					√	√
	dB(B)					√	√
	dB(C)					√	√
	Frequency Counter				√	√	√
	RPM Counter					√	√
	Duty Cycle					√	√
	Frequency/Voltage					√	√
	Cycle RMS					√	√
	Cycle Mean					√	√
Settings	Counter Trigger Hysteresis				√	√	√
	Counter Trigger Level				√	√	√
	Frequency Divider				√	√	√
<b>DDP Viewer</b>							
Function	DDP display						√
	HH, H, L, LL Alarm						√

Legend: *Blank* - Function available if purchased      *Shaded Blank* - Function NOT available

		Sound Card Oscilloscope 3.2	Sound Card Spectrum Analyzer 3.2	Sound Card Signal Generator 3.2	Multi-Instrument Lite 3.2	Multi-Instrument 3.2	Multi-Instrument Pro 3.2
<b>Spectrum 3D Plot</b>							
Type	Waterfall Plot						
	Spectrogram						
Settings	Spectrogram Color Palette						
	Waterfall Color Palette						
	Waterfall tilt Angle						
	Waterfall / Spectrogram Height						
	Linear / Log Scale for X and Y						
	Number of Spectral Profiles (10~200)						
Others	3D Cursor Reader						
<b>Data Logger</b>							
Real Time Logging							
Load Historical Log File							
Three logging methods							
145 derived data points available for logging							
Up to 8 × 8 = 64 variables can be logged simultaneously							
<b>LCR Meter</b>							
High Impedance Measurement							
Low Impedance Measurement							
Up to 8 X-Y Plots (Linear/Log)							
<b>Device Test Plan</b>							
14 Instructions							
Create/Edit/Lock/Execute/Load/Save a Device Test Plan							
Up to 8 X-Y Plots (Linear/Log)							
Device Test Plan Log							
<b>Vibrometer</b>							
RMS, Peak/PP, Crest Factor for acceleration, velocity, displacement (in Multimeter)							
Waveform conversion among acceleration, velocity and displacement (in Oscilloscope)							

## 2.4 Software Development Interface Specifications

Multi-Instrument provides the following secondary development features:

1. Multi-Instrument can work as an ActiveX automation server so that an external program can access the data and functions that Multi-Instrument exposes. You can integrate Multi-Instrument into your own software seamlessly via the ActiveX automation server interfaces exposed by Multi-Instrument.

Please refer to: *Multi-Instrument Automation Server Interfaces*

Download link:

[http://www.virtins.com/Multi-Instrument\\_Automation\\_Server\\_Interfaces.pdf](http://www.virtins.com/Multi-Instrument_Automation_Server_Interfaces.pdf)

The above document and the sample automation client programs in Visual C++ and Visual Basic can be found in the AutomationAPIs directory of the software.

2. You can use the vtDAQ and vtDAO interface DLLs supplied in this software to allow your own back-end software to interface to sound cards, NI DAQmx cards, VT DSOs, etc.. You can also develop your own vtDAQ and vtDAO compatible DLLs to allow Multi-Instrument to interface to your own hardware.

Please refer to: *vtDAQ and vtDAO\_Interfaces*

Download link:

[http://www.virtins.com/vtDAQ\\_and\\_vtDAO\\_Interfaces.pdf](http://www.virtins.com/vtDAQ_and_vtDAO_Interfaces.pdf)

The above document and the sample DAQ and DAO back-end programs in Visual C++ can be found in the DAQDAOAPIs directory of the software.

## 3 Multi-Instrument Software License Information

### 3.1 License Types

The License of Multi-Instrument software has six levels and five add-on modules/functions. The six levels are: Sound Card Oscilloscope, Sound Card Spectrum Analyzer, Sound Card Signal Generator, Multi-Instrument Lite, Multi-Instrument Standard, Multi-Instrument Pro. The five add-on modules/functions are: Spectrum 3D Plot, Data Logger, LCR Meter, Device Test Plan, Vibrometer.

The license contained in the standard VT DSO-2815H package is a hardware bundled Multi-Instrument Standard license, without any add-on modules/functions. No softkey (activation code) and USB hardkey (USB dongle) are provided in this type of license. The software will run under the licensed mode as long as the VT DSO-2815H unit is connected to your computer before you start the Multi-Instrument software.

Note: If the software is started without the VT DSO-2815H unit connected to the computer, it will enter into 21-day fully functional trial mode, unless the software is activated by a softkey (activation code) or a hardkey (USB dongle), which are NOT included in the standard VT DSO-2815H package and should be purchased separately as a brand-new license if needed. In other words, the VT DSO-2815H hardware should always be connected to the computer in order for the Multi-Instrument software to work under the licensed mode, even though you might just want to use your computer sound card for ADC and DAC.

### **3.2 License Upgrade from one level to another**

You can purchase an upgrade of the license, e.g. from Multi-instrument Standard to Multi-Instrument Pro + Data Logger, at any time if necessary. After you purchase the upgrade, a small upgrade package file will be sent to you via email. You can then use it to upgrade the license bundled within the VT DSO-2815H unit by selecting [Start]>[All Programs]>[Multi-Instrument]>[VIRTINS Hardware Upgrading Tool] on your Windows desktop.

### **3.3 Software Upgrade in the same level**

Software upgrade in the same level (if the hardware is still supported by the new version), e.g. from Multi-Instrument 3.0 Standard to Multi-Instrument 3.1 Standard, is always FREE. You just need to download the new version from our website and install it to any computer.

Thus, please do check frequently with our website to see if a new version or build is available.

## **4 Extended Use of Multi-Instrument Software**

Multi-Instrument is a powerful multi-function virtual instrument software. It supports a variety of hardware ranging from sound cards which are available in almost all computers to proprietary ADC and DAC hardware such as NI DAQmx cards, VT DSO units, and so on. Furthermore, the ADC and DAC device can be chosen independently in Multi-Instrument. For example, you can use VT DSO-2815H for data acquisition and use your computer's sound card for signal generation simultaneously.

You can change the ADC device via [Setting]>[ADC Device]>[Device Model] (Note: this menu item is disabled when the oscilloscope or the signal generator is running). For example you can also use your computer's sound card as the ADC device.

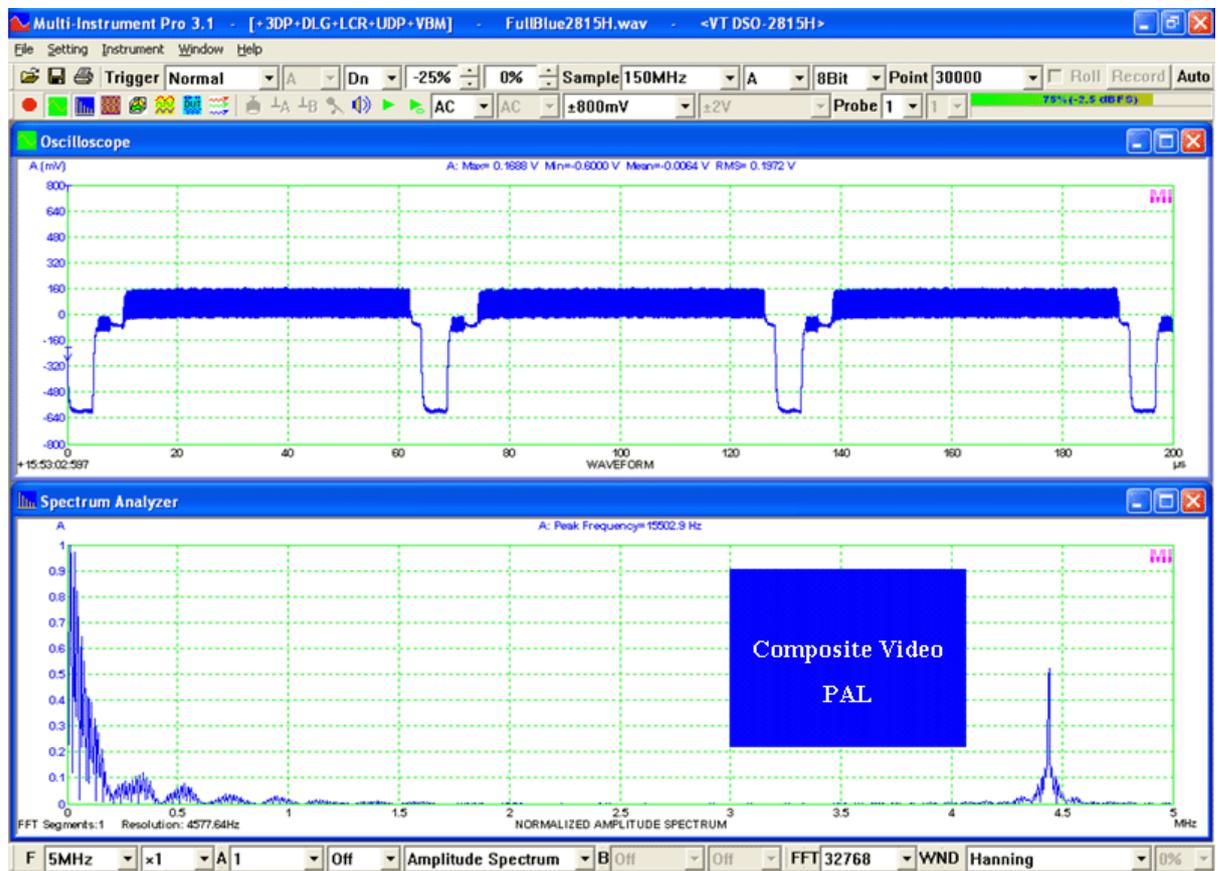
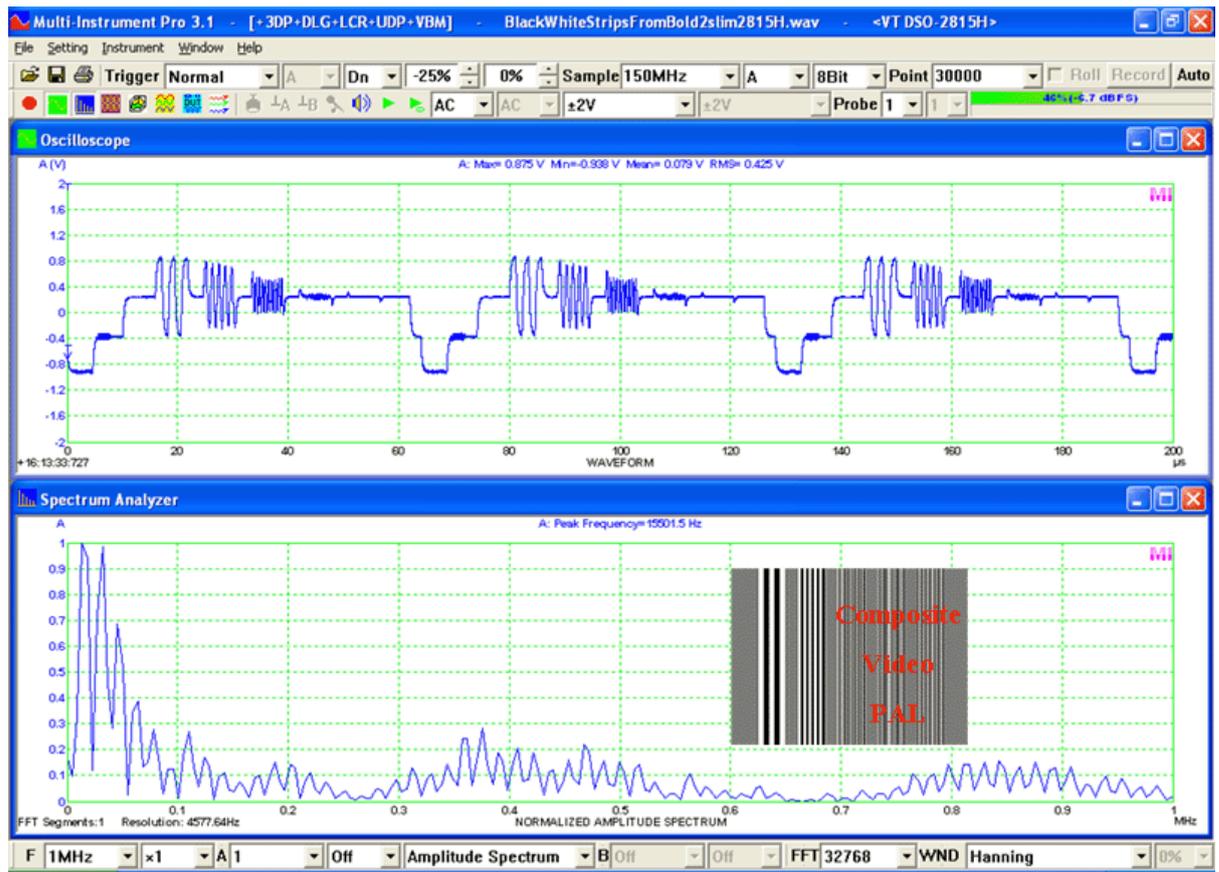
The VT DSO-2815H unit does not support DAC, thus no signal generator function is available within the hardware unit, except the 2Vpp 1kHz square wave output signal for probe calibration. However, you can choose other DAC device via [Setting]>[DAC Device]>[Device Model] (Note: this menu item is disabled when the oscilloscope or the signal generator is running). For example, you can use your computer's sound card as the DAC device and thus make full use of the signal generator function of Multi-Instrument.

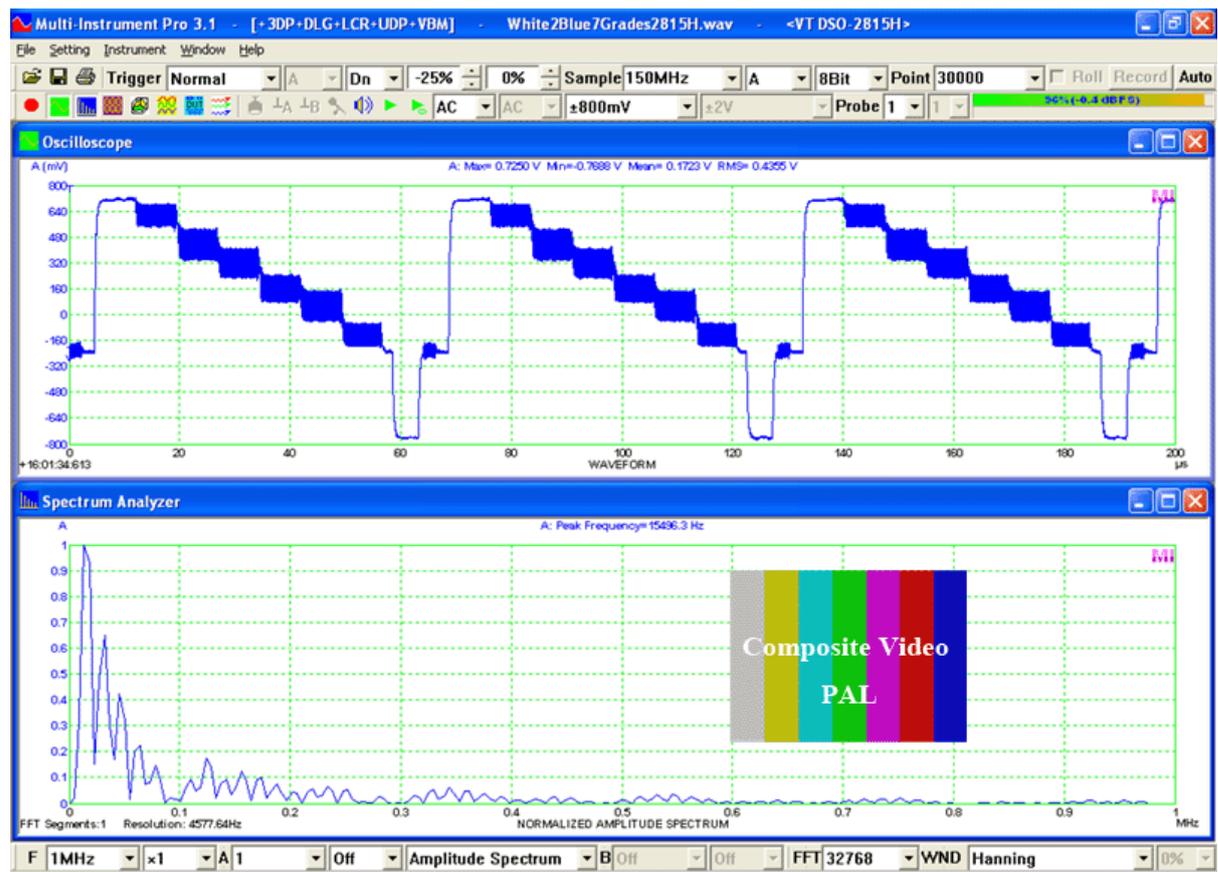
If you want to use the sound card as the ADC/DAC device, you may need to purchase the dedicated sound card oscilloscope probe kit from Virtins Technology separately, or you may make the connection by yourself.

## 5 Measurement Examples

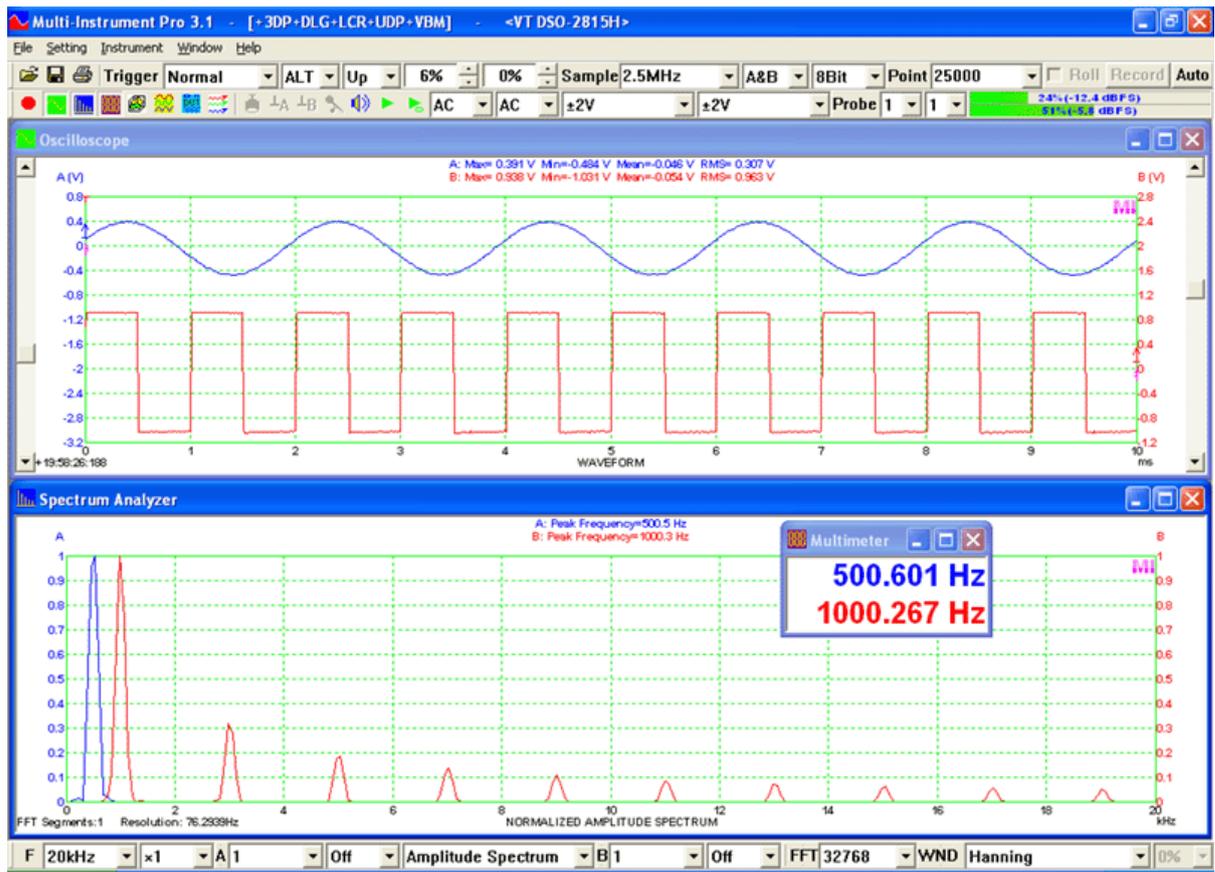
The following figures show the measurements of the PAL composite video signal from a VCD player with different video test patterns on the TV screen.







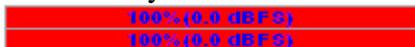
The following figure shows the measurement of a 500Hz sine wave and a 1kHz square wave under ALT trigger mode. The trigger level for both channels can be adjusted independently under this mode. The trigger level for Channel B can be adjusted by dragging the arrow on the B axis in the oscilloscope window.



## 6 Safety Instructions



- Always keep in mind that the input of the probe and the input of the VT DSO-2815H are NOT galvanically isolated from the computer connected.
- Never connect to a signal with unknown amplitude.
- Never connect to a signal with voltage greater than the measurement range.
- If you are not very sure about the exact voltage under test, always start measurement by putting the attenuation switch of the oscilloscope probe to  $\times 10$  and selecting the highest measurement range of the VT DSO-2815H unit.
- When the input peak level indicator of the Multi-Instrument software turns full RED with 100% (see the figure below), switch the probe to a higher attenuation ratio, switch the VT DSO-2815H unit to a higher measurement range, or disconnect the input signal immediately.



- Be extremely careful when the voltage under test is greater than 5V.
- It should be noted that for many computer (typically a desktop PC or a laptop PC with a built-in AC power supply adapter), the ground line of the probe is connected to mains earth. This is not a problem if the circuit under test is floating (i.e. isolated from earth).

Otherwise, you **MUST** make sure that the ground lead of the probe is connected to a point on the circuit that is also at earth potential.

## **7 Warranty**

Virtins Technology guarantees this product against defective materials and manufacturing defects for a period of 12 months. During this period of warranty, a replacement of the faulty part will be shipped to the buyer's address free of charge upon receiving and verifying the returned faulty part. The Warranty is only applicable to the original buyer and shall not be transferable. The warranty shall exclude malfunctions or damages resulting from acts of God, fire, civil unrest and/or accidents, and defects from using wrong electrical supply/voltage and/or consequential damage by negligence and/or abuse, as well as use other than in accordance with the instructions for operation. The Warranty shall immediately cease and become void if the hardware is found to have been tampered, modified, repaired by any unauthorised person(s). Decisions by Virtins Technology on all questions relating to complaints as to defects either of workmanship or materials shall be deemed conclusive and the buyer shall agree to abide by such decisions.

## **8 Disclaimer**

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