

## VT UltraMic-384 Manual



*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

VT UltraMic-384 is a 16-bit, single-channel, audio and ultrasonic USB microphone specially designed for sound measurement in the frequency range from 20Hz to up to 190kHz. When used in conjunction with the Multi-Instrument<sup>®</sup> software, it converts any desktop, laptop, or tablet PC into a powerful audio and ultrasonic sound analyzer.

## 1.1 Package Contents

A standard VT UltraMic-384 Package contains the following items:

- 1) VT UltraMic-384 USB microphone with an integrated 1.1 m USB cable



- 2) USB hardkey (contains a Multi-Instrument Pro software license)



- 3) Microphone Clip and Stand



- 4) CD (contains the copy-protected Multi-Instrument software)



- 5) Carrying case



## 1.2 Multi-Instrument Software Installation

Multi-Instrument is a powerful multi-function virtual instrument software. It is a professional tool for time, frequency and time-frequency domain analyses. 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, VT RTA, VT IEPE, VT CAMP and so on. It consists of an oscilloscope, a spectrum analyzer, a multimeter, a spectrum 3D plot, a vibrometer, a data logger, a LCR meter and a Device Test Plan, all of which can run simultaneously. Please refer to the Multi-Instrument software manual for details.

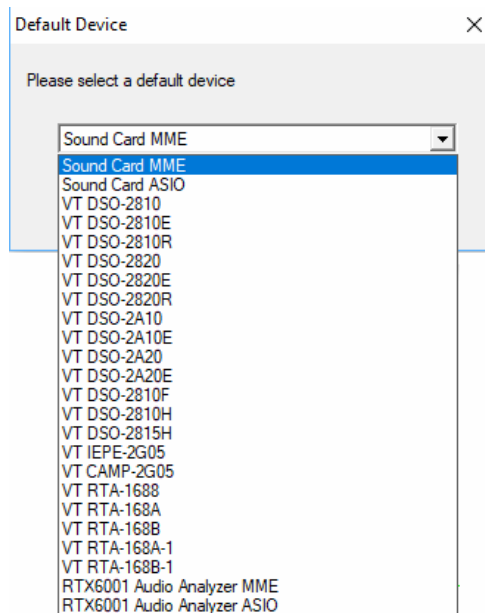
Insert the installation CD into your computer's CD-ROM drive and follow the instruction on the screen to install the Multi-Instrument software. Alternatively, you can always download the latest software from: [www.virtins.com/MIsetup.exe](http://www.virtins.com/MIsetup.exe).

By default, VT UltraMic-384 uses sound card MME driver which comes natively with all Windows versions. Thus no driver installation is required.

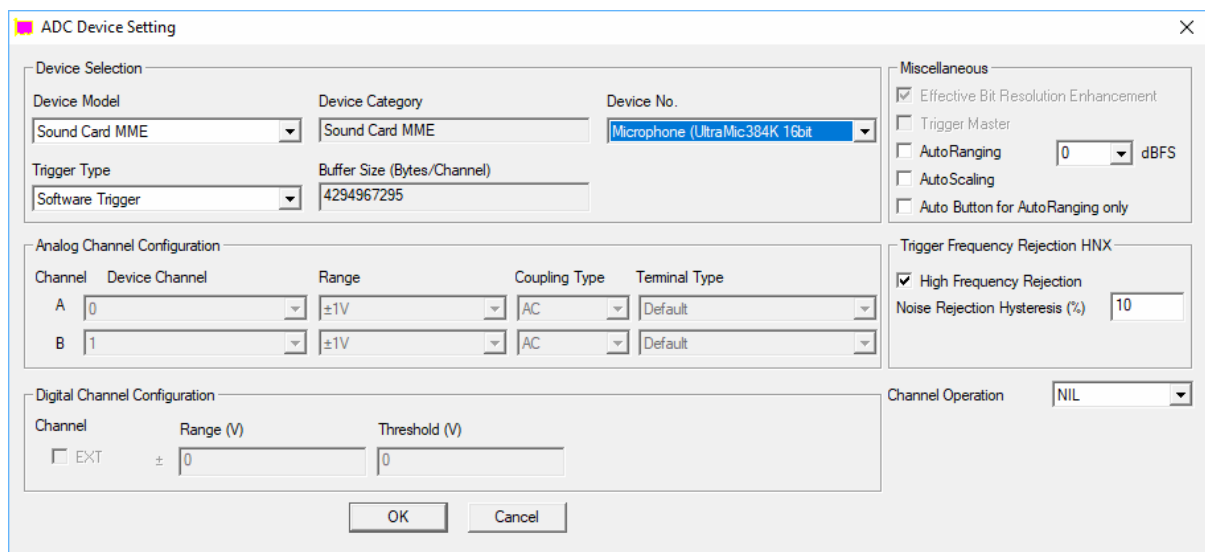
## 1.3 Start Multi-Instrument Software

With the hardkey activated Multi-Instrument license, the hardkey must be connected to a USB port of the computer first before the software can be launched. Otherwise, the software will work in 21-day fully functional trial mode.

To start the Multi-Instrument software, on Windows desktop, click the MI icon directly, or select [Start]>[All Programs]>[Multi-Instrument]>[VIRTINS Multi-Instrument]. If the software is started for the very first time, the following dialog box will pop up. Select "Sound Card MME" to make it the default data acquisition device. This dialog box can also be accessed via [Setting]>[Restore to Factory Default].

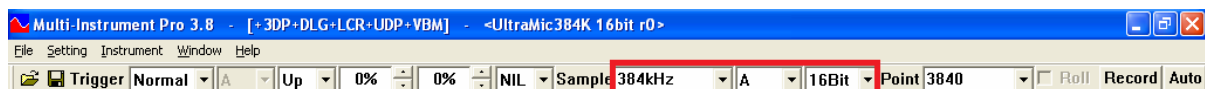


All sound cards in the system will be listed as Sound Card MME devices. To select VT UltraMic-384 for data acquisition, with the UltraMic-384 connected, go to [Setting]>[ADC Device], and make sure that Sound Card MME is selected in the Device Model selection box, and select UltraMic384 in the Device No selection box, as shown below.



After returning to the software’s main window, click the round button at the upper left corner of the screen, or simply press the ENTER key, to start or stop data acquisition. The button will turn green when the data acquisition is running and red when it is stopped.

Note: Under Windows XP, 384 kHz sampling rate, single channel and 16 bits must be selected in the software for data acquisition, as shown below. Otherwise, an error message will pop up. The above parameters are recommended for other Windows versions as well.



Now, if you start the oscilloscope by pressing the red button at the upper left corner of the screen, and then talk before the measurement microphone, you should be able to see your “voices” in the Oscilloscope and Spectrum Analyzer.

## 1.4 Gain Adjustment and Sound Level Calibration

The UltraMic-384 hardware has two internal manual switches to switch the gain among:  $\times 1$ ,  $\times 10$  and  $\times 100$ .

- (1) Switch 1 Off, Switch 2 Off,  $\times 1$ , typically 114 dB SPL @1kHz at full-scale
- (2) Switch 1 On, Switch 2 Off,  $\times 10$ , typically 94 dB SPL @1kHz at full-scale (default)
- (3) Switch 1 Off, Switch 2 On,  $\times 100$ , typically 74 dB SPL @1kHz at full-scale

The hardware gain of the unit is pre-fixed at (2) in the factory and normally there is no need to change it. Contact Virtins Technology for more information if you really need to adjust it in your particular applications.

Software gain adjustment through the Recording Control under Windows Control Panel does not have any effect on the unit.

It is possible to calibrate the sound level using a sound level calibrator or a sound level meter. Please refer to Section 2.6.2.3.5 of the Multi-Instrument software manual for details.

## 1.5 Unattended Audio and Ultrasonic Recorder Mode

In addition to its ordinary use as a USB audio and ultrasonic microphone, the hardware unit can also be used as an unattended audio and ultrasonic recorder. Under this mode, it can be powered from an external USB battery and works independently on its own without connection to a PC and PC software. A formatted SD card is needed under this mode to store the sampled data and configuration files. Continuous recording, triggered recording and scheduled recording are supported. Configuration can be performed through a dedicated program via blue tooth. If the front cap of the microphone is sealed with a PTFE membrane, the whole unit will become waterproof. But the membrane will attenuate the incoming sound. Contact Virtins Technology for more information in case you need to use it under this mode.

## 2 Specifications

### 2.1 VT UltraMic-384 Hardware Specifications

Sampling Frequency	384 kHz (original)	
Frequency Range	20 Hz ~ 190 kHz	
ADC Bit Resolution	16 Bits	
Number of Input Channels	1	
Frequency Accuracy	0.01%	
Full-Scale Sound Level (at 1 kHz)	94 dB (Typical), when Switch 1 = On, Switch 2 = Off (default Setting).  74 dB (Typical), when Switch 1 = Off, Switch 2 = On  114 dB (Typical), when Switch 1 = Off, Switch 2 = Off	
Anti-aliasing Filter	190 kHz at Sampling Rate 384 kHz, proportionally adaptive to Sampling Rate Chosen	
Buffer Size	Virtually unlimited (streaming mode)	
Digital Input/Output Standard	USB Audio Class 1.1	
PC Interface	USB 2.0 Full Speed / USB 1.1	
Device Category in Multi-Instrument	ADC Device	Sound Card MME
	DAC Device	Not Applicable
Power	Bus powered by USB port, no external power source required	
Power Consumption	Max. 0.7W	
Dimensions	Φ25.4 × 160 mm, aluminum case	
System Requirement	Windows XP, Vista, 7, 8, 10 or above, 32 bit or 64 bit	
Operating Temperature	0°C ~50°C	

### 2.2 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, Dedicated Hardware Support are add-on modules/functions and should be purchased separately, and they are only available for Multi-Instrument Lite, Standard, and Pro editions, except that the Vibrometer is only available for Multi-Instrument Standard and Pro editions.

Legend: √ - Function available      √\* - Function available in Full version only

	Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
<b>General Functions</b>						
ADC / DAC	Sound Card MME	√	√	√	√	√
	Sound Card ASIO					√
	Other Hardware			√	√	√

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	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	√	√		√	√	√
	High Frequency Rejection	√	√		√	√	√
	Noise Rejection	√	√		√	√	√
Sampling Settings	Sampling Rate	√	√	√	√	√	√
	Sampling Channels	√	√	√	√	√	√
	Sampling Bit Resolution	√	√	√	√	√	√
	Record Length	√	√		√	√	√
Calibration	Input	√	√		√	√	√
	Output			√	√	√	√
	Probe	√	√		√	√	√
	Sound Pressure Level	√	√		√	√	√
	F/V Conversion					√	√
	Latency for Sync. Output/Input						√
	Sensor Sensitivity	√	√		√	√	√
Graph Operation	Load Factor for Power Calculation	√	√		√	√	√
	Zoom	√	√	√	√	√	√
	Scroll	√	√	√	√	√	√
	Cursor Reader	√	√	√	√	√	√
	Marker	√	√	√	√	√	√
	Chart Type	√	√	√	√	√	√
	Line Width	√	√	√	√	√	√
	Color	√	√	√	√	√	√
	Fast/Slow Display Mode	√	√	√	√	√	√
Refresh Delay	√	√	√	√	√	√	



		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	Font Size	√	√	√	√	√	√
	Roll Mode					√	√
	Reference Curves & Limits					√	√
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	√	√	√	√	√	√
	AutoRanging	√	√	√	√	√	√
	AutoScaling	√	√		√	√	√
Input Channel Operation	√	√		√	√	√	
<b>Oscilloscope</b>							
Type	Individual Waveform	√	√	√ (offline)	√	√	√
	Waveform Addition	√	√	√ (offline)	√	√	√
	Waveform Subtraction	√	√	√ (offline)	√	√	√
	Waveform Multiplication	√	√	√ (offline)	√	√	√
	Lissajous Pattern	√	√	√ (offline)	√	√	√
Inter-Frame Processing	Linear Average					√	√
	Exponential Average					√	√
Intra-Frame	Time Delay Removal					√	√
Demodulation (Intra-Frame)	AM					√	√
	FM					√	√
	PM					√	√
Digital Filtering (Intra-Frame Processing)	Remove DC					√	√
	Rectification					√	√
	FFT Low Pass					√	√
	FFT High Pass					√	√
	FFT Band Pass					√	√
	FFT Band Stop					√	√
	FFT Frequency Response					√	√
	FIR Low Pass					√	√
FIR High Pass					√	√	

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	FIR Band Pass					√	√
	FIR Band Stop					√	√
	FIR Frequency Response					√	√
	IIR Coefficients					√	√
Others	Max, Min, Mean, RMS	√	√	√ (offline)	√	√	√
	Record Mode					√	√
	Persistence Display Mode	√	√		√	√	√
	Equivalent Time Sampling Mode	√	√		√	√	√
	Analog & Digital Signal Mixed Display				√	√	√
SINC Interpolation	√	√	√	√	√	√	
Spectrum Analyzer							
Type	Amplitude Spectrum		√		√	√	√
	Phase Spectrum		√		√	√	√
	Auto-correlation		√		√	√	√
	Cross-correlation		√		√	√	√
	Coherence/Non-Coherence						√
	Transfer Function / Impedance Analyzer						√
	Impulse Response						√
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, ENOB		√		√	√	√
	IMD		√		√	√	√
	Bandwidth		√		√	√	√
	Crosstalk		√		√	√	√
	Harmonics & Phase		√		√	√	√
	Energy in User Defined Frequency Band		√		√	√	√
	Peaks, SFDR		√		√	√	√
	Wow & Flutter						√*
	Sound Loudness						√
	Sound Loudness Level						√
Sound Sharpness						√	

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	Total Non-Coherent Distortion + Noise						√
	GedLee Metric						√
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/Power Spectral Density Scale for X and Y		√		√	√	√
	Peak Marker		√		√	√	√
<b>Signal Generator</b>							
Waveform	Sine			√	√	√	√
	Rectangle			√	√	√	√
	Triangle			√	√	√	√
	Saw Tooth			√	√	√	√
	White Noise			√	√	√	√
	Pink Noise			√	√	√	√
	MultiTones			√	√	√	√
	Arbitrary Waveform			√	√	√	√
	MLS			√	√	√	√
	DTMF			√	√	√	√
	Musical Scale			√	√	√	√
	Wave File					√	√
	Play Waveform in Oscilloscope	√	√	√	√	√	√
	Cyclic Play Waveform in Oscilloscope	√	√	√	√	√	√
Sweep	Frequency Sweep (Linear/Log)			√	√	√	√
	Amplitude Sweep (Linear/Log)			√	√	√	√
Burst (Mask)	Normal			√	√	√	√
	Phase Locked			√	√	√	√
Fade	Fade In			√	√	√	√
	Fade Out			√	√	√	√
Modulation	AM			√	√	√	√
	FM			√	√	√	√
	PM			√	√	√	√
Other	Software Loopback (all channels)			√	√	√	√

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	Software Loopback (1 channel)				√	√	√
	Sync. with Oscilloscope						√
	Save as WAV file			√	√	√	√
	Save as TXT file			√	√	√	√
	DDS				√	√	√
	DC Offset				√	√	√
<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					√	√
Pulse Width					√	√	
Settings	Counter Trigger Hysteresis				√	√	√
	Counter Trigger Level				√	√	√
	Frequency Divider				√	√	√
<b>DDP Viewer</b>							
Function	DDP & UDDP display						√
	HH, H, L, LL Alarm						√
	Set Display Precision						√
	Define UDDP						√
	Alarm Sound						√
	Alarm Acknowledge						√
	Linear / Exponential Average						√
DDP Array Viewer						√	

Legend: Blank - Function available if purchased Shaded Blank - Function NOT available for that version

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
<b>Spectrum 3D Plot</b>							
Type	Waterfall Plot						
	Spectrogram						
Settings	Spectrogram Color Palette						

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument	Multi-Instrument Pro
	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							
212 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>							
25 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)							
SI / English units							
<b>Dedicated Hardware Support</b>							
RTX6001 Remote /Local Control							

### 2.3 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>

The above document and the sample automation client programs in Visual C++, Visual Basic and Visual C# 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, VT RTAs, 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>

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

3. Virtins Technology's Signal Processing and Analysis (vtSPA) Application Programming Interfaces (APIs) provides a suite of generic APIs for data processing and analysis. It contains some unique features / algorithms originated and only available from Virtins Technology.

Please refer to: *Signal Processing and Analysis (vtSPA) Interfaces*

Download link:

<http://www.virtins.com/Signal-Processing-and-Analysis-APIs.pdf>

The above document and the sample programs in Visual C++ can be found in the DAQDAOAPIs directory of the software.

Furthermore, Multi-Instrument is well prepared to be rebranded for OEM services. Its look and feel can be readily changed through configuration without even reprogramming. Contact Virtins Technology if interested.

## 3 Multi-Instrument Software License Information

### 3.1 License Types

The License of Multi-Instrument software has six levels and six 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 six add-on modules/functions are: Spectrum 3D Plot, Data Logger, LCR Meter, Device Test Plan, Vibrometer, Dedicated Hardware Support.

The license contained in the standard VT UltraMic-384 package is a USB hardkey activated Multi-Instrument Pro license, without any add-on modules/functions. No softkey (activation code) are provided in this type of license. The software will run under the licensed mode as long as the USB hardkey is connected to your computer before you start the Multi-Instrument software.

Note: If the software is started without the USB hardkey connected to the computer, it will enter into 21-day fully functional trial mode, unless the software is activated by a softkey (activation code), which are NOT included in the standard VT UltraMic-384 package and should be purchased separately as a brand-new license if needed.

### 3.2 License Upgrade from one level to another

You can purchase an upgrade of the license, e.g. from Multi-instrument Pro 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 inside the USB hardkey by selecting [Start]>[All Programs]>[Multi-Instrument]>[VIRTINS Hardware Upgrading Tool] on your Windows desktop.

### 3.3 Software Upgrade for the same level

Software upgrade for 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 on any computer.

Thus, please do visit frequently 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 UltraMic-384 for data acquisition and use your computer’s sound card for signal generation simultaneously.

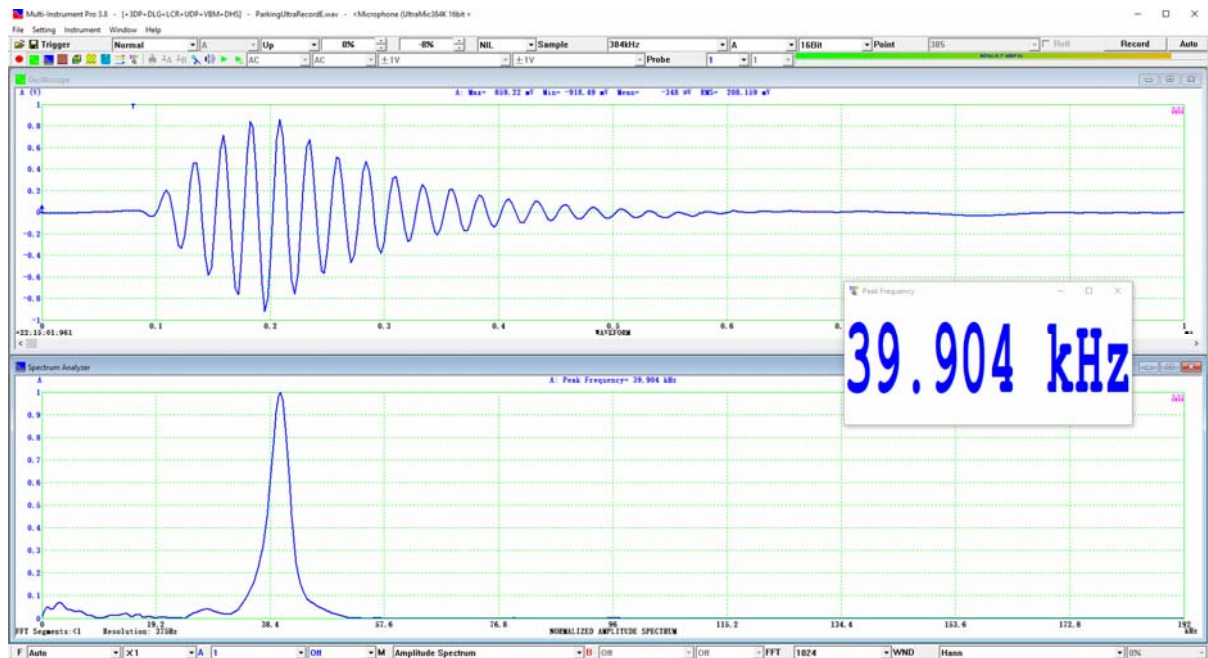
You can change the ADC device via [Setting]>[ADC Device]>[Device Model]. For example you can also use your computer’s sound card as the ADC device.

You can choose a DAC device via [Setting]>[DAC Device]>[Device Model]. 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

### 5.1 Detection of Ultrasound Burst (about 40 kHz) Emitted by Car Parking Sensor





## **6 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 unauthorized 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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