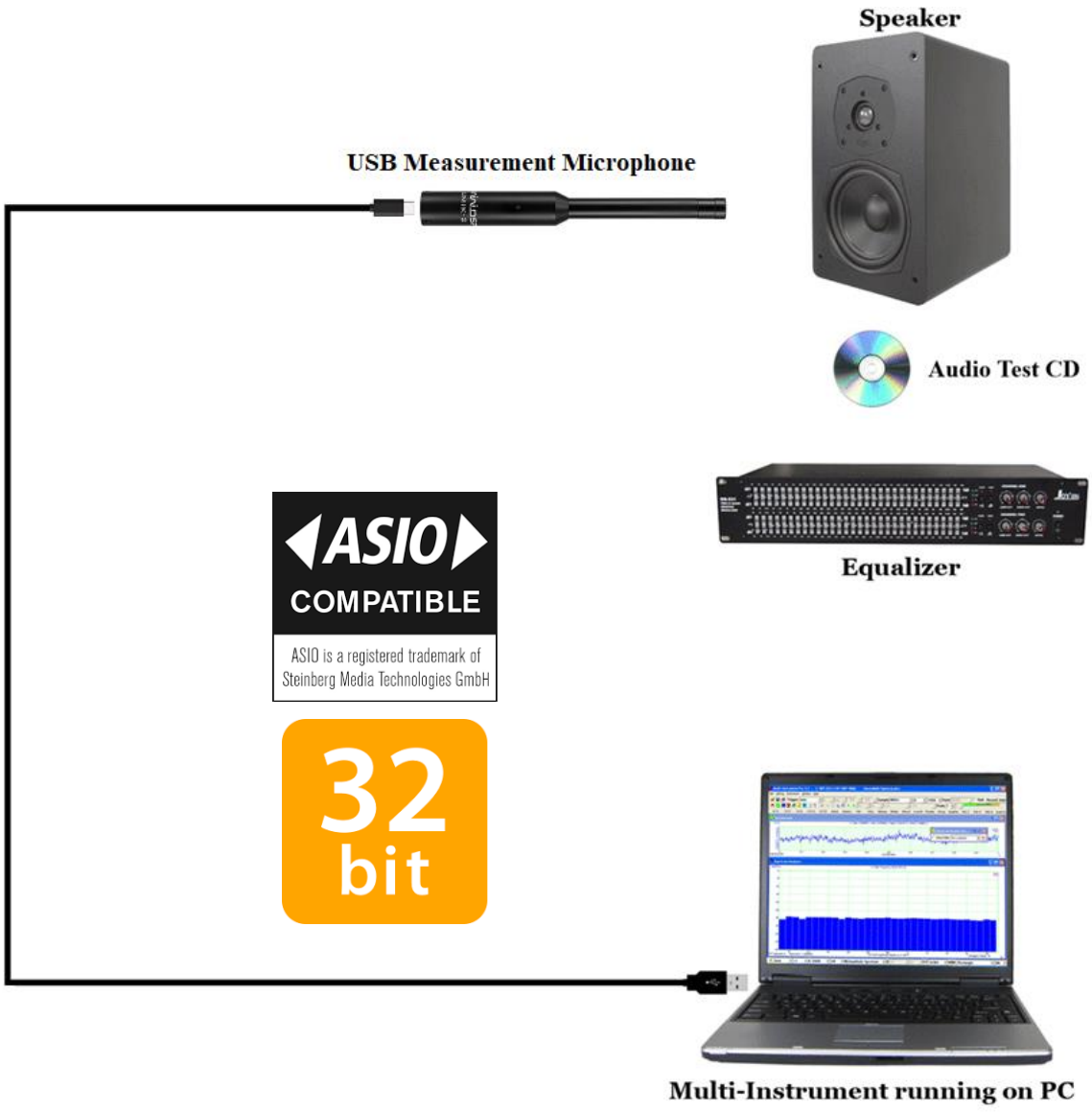
VT RTA-168D Manual

A Low-Noise Real Time Acoustic Analyzer, Sound Level Meter, Distortion Analyzer, Polarity Tester …



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 RTA-168D Package contains the following items:

1) USB Measurement microphone and its accessories (a windshield, a microphone clip and stand)

USB Measurement Microphone

Windshield

Microphone Clip and Stand

2) USB cable (2 m)

3) CD (containing the copy-protected Multi-Instrument software)

The latest software can always be downloaded from www.virtins.com/MIsetup.exe.

4) USB hardkey (containing a Multi-Instrument Pro license)

5) Audio Test WAV files (containing a list of audio test tones and noises)

They can be downloaded at: www.virtins.com/AudioTestCD.zip and then burnt into a CD or saved into a USB memory stick. They can also be generated directly from the Signal Generator of Multi-Instrument.

6) 1/8” TRS cable (1.8m)

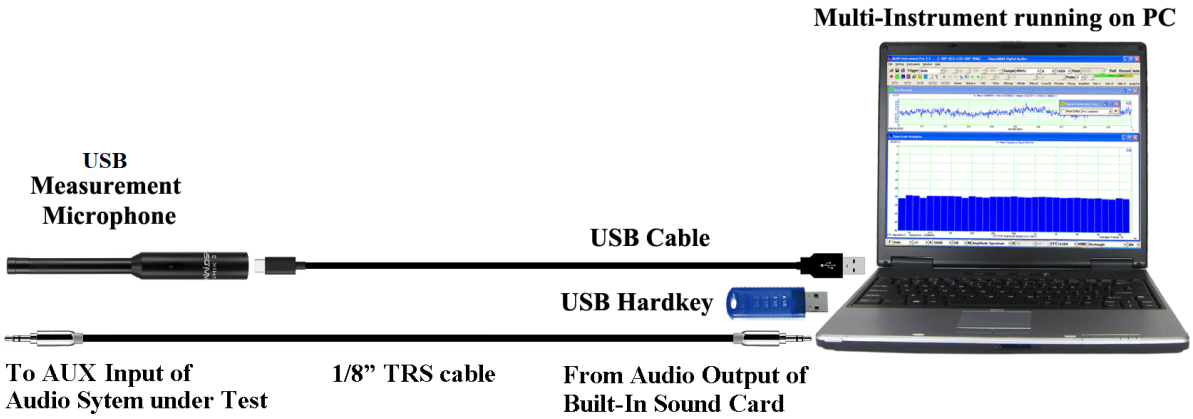
7) Black Soft Pouch Case

8) Unique Sound Level Calibration Data (in CD)

9) Unique Microphone On-Axis and 90-degree Calibration Data (in CD)

1.2 Hardware Connection Diagram

Connect the corresponding ends of the USB cable to the USB measurement microphone and a PC’s USB port. When this is complete, the blue LED lights up indicating that it is receiving power.



Software Activation
The USB hardkey needs to be plugged into any USB port of the PC in order to activate the Multi-Instrument software. Otherwise the software will run under the 21-day fully functional free trial mode before the trial period expires.

Test Signal Generation
You can generate the test signals from the Signal Generator of Multi-Instrument. The USB measurement microphone does not have any audio output channels, so you need to use your computer’s built-in sound card or any other sound card for audio test signal output. The quality of the test signals would depend on the sound card used. Generally, the built-in sound

card of a laptop is good enough for generating quality test signals for magnitude frequency response measurement of an audio system.

The 1/8" TRS cable provided in the product package can be used to connect the sound card's audio output (e.g. Line Out, Headphone, Speaker) to the AUX input of the audio system under test.

Alternatively, you can play the test signals from an audio CD or a memory stick.

1.3 Hardware Driver Installation

The device driver installer is located in the Drivers\VTRTA168D directory in the CD. When you install the Multi-Instrument software, a copy of the device driver installer will also be installed in the software installation directory\Drivers\VTRTA168D. Two installers are provided, RTA168D_DriverInstallerForWinXP_Vista.exe for Windows XP and Vista, and RTA168D_DriverInstaller.exe for Windows 7 or later. Run the respective driver installer to install the driver. After driver installation, the device will be supported by both sound card MME and ASIO drivers in Multi-Instrument.

1.4 Multi-Instrument Software Installation and Configuration

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 DSOs and so on. It consists of multiple test instruments such Oscilloscope, Spectrum Analyzer, and Multimeter, etc.

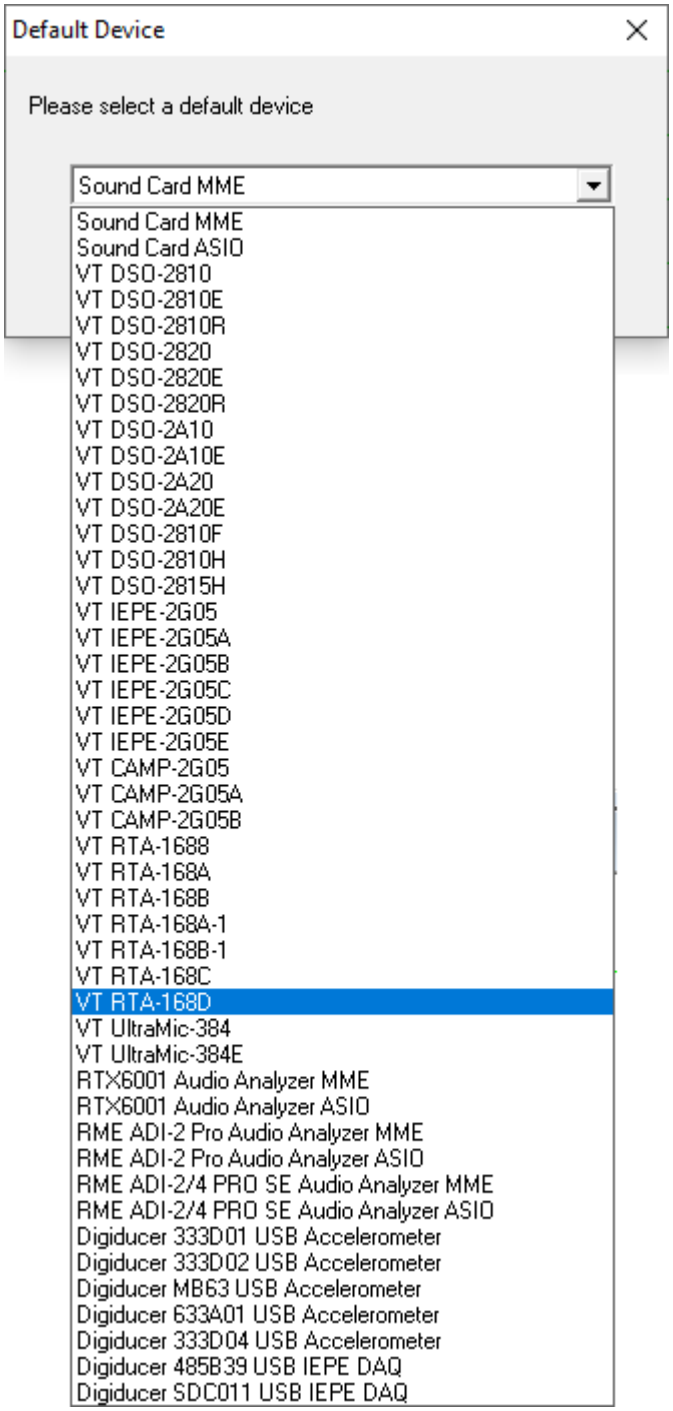
1.4.1 Install Multi-Instrument

Insert the Multi-Instrument installation CD into your computer's CD-ROM drive and follow the instruction on the screen to install the Multi-Instrument software. The installation file can also be downloaded from www.virtins.com/MIsetup.exe.

1.4.2 Start Multi-Instrument

To start Multi-Instrument, on the Windows desktop, select [Start]>[All Programs]>[Multi-Instrument]>[VIRTINS Multi-Instrument], or simply double click the MI icon.

If the software is started for the very first time after installation, it will prompt the user to select a default device (see figure below). Select VT RTA-168D according to the hardware device to be used.

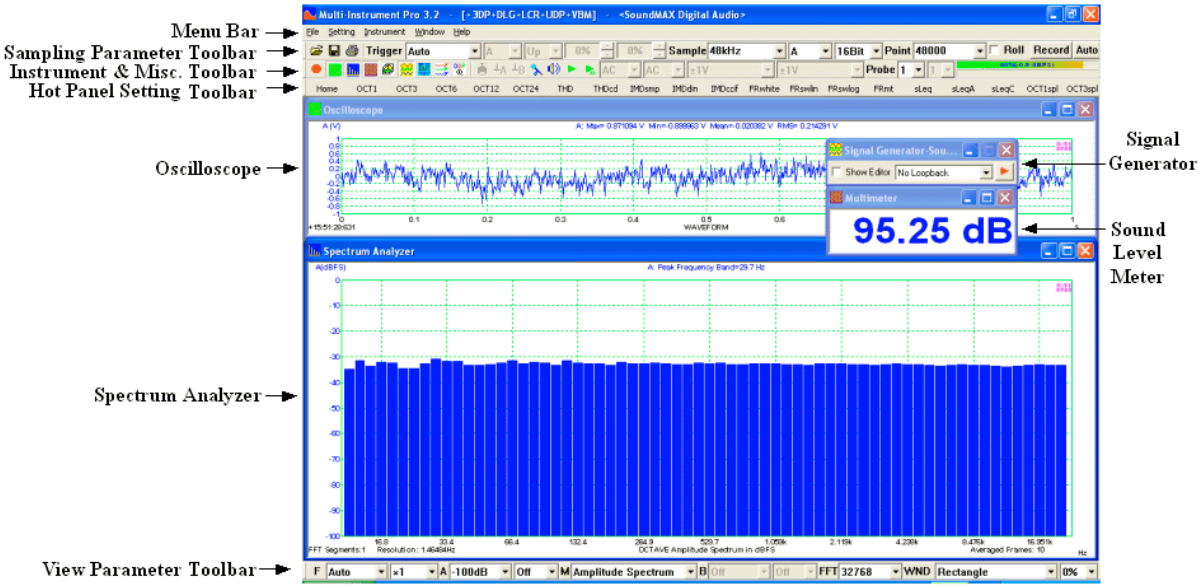


The default device can also be changed later via [Setting]>[ADC Device], [Setting]>[DAC Device], and [Setting]>[Configure Hot Panel Setting Toolbar], or simply [Setting]>[Restore to Factory Default]. **However, if [Restore to Factory Default] command is executed, all calibration data entered manually via [Setting]>[Calibration] after software installation will be reset to the default values of the selected product. To avoid the loss of the manually entered calibration data, you can save them as a calibration file first. Otherwise, you will have to enter the unique calibration data that come with the product package again**.

In case the driver has not yet been installed, the software will prompt the user to install the driver. Restarting program is required after that.

After the default device is selected, the software will prompt the user to select a default color scheme (Skin). The default skin can also be changed later via [Setting]>[Display].

The main window of the software will open after the above skin selection. The following figure shows a typical screen layout (obtained by clicking the "OCT3" button in the Hot Panel Setting Toolbar after the launch of the software). Please refer to the software manual for detailed functions of the software. The software manual can be accessed via [Start]>[All Programs]>[Multi-Instrument]>[VIRTINS Multi-Instrument Manual] (in PDF format) or [VIRTINS Multi-Instrument Help] (in HTML format) on Windows Start menu, or [Help]>[Software Manual] or F1 inside the software.



1.4.3 Configure Multi-Instrument

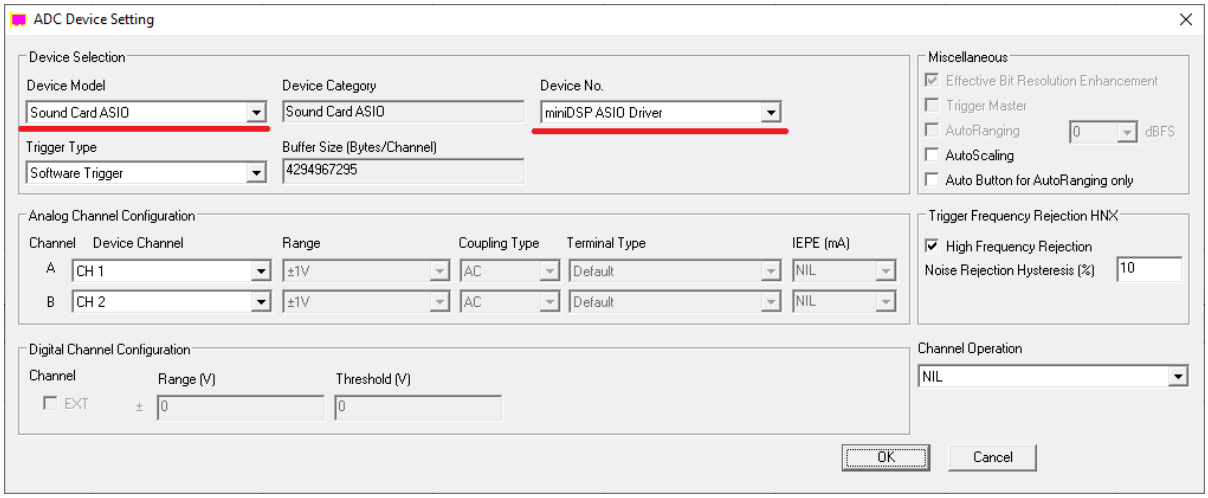
In Multi-Instrument, the menu items are enabled / disabled based on context. Many menu items are disabled when the Oscilloscope or the Signal Generator is running. To do the configuration, stop the oscilloscope first by pressing the green button at the upper left corner of the screen (see figure below). The button will turn red once the Oscilloscope is stopped.

1.4.3.1 Configure Sound Recording Devices for Multi-Instrument

The USB measurement microphone can be used with either MME or ASIO driver. ASIO driver is recommended as it uses the sampling rate selected in Multi-Instrument directly and bypasses the possible sampling rate conversion and audio signal enhancement by Windows, which may otherwise alter the original samples and lead to measurement inaccuracies.

1.4.3.1.1 Using ASIO Driver

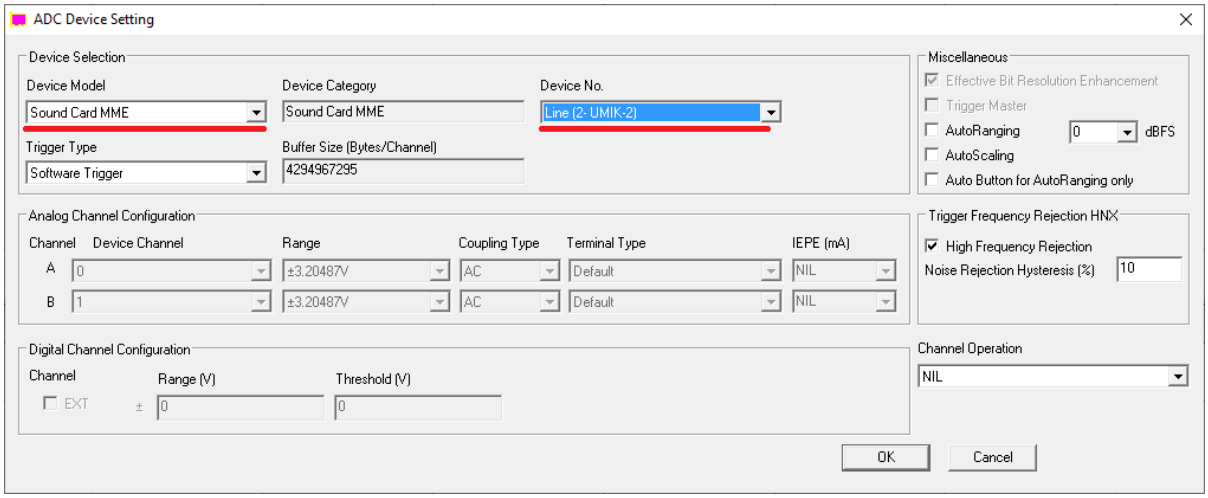
Go to [Setting]>[ADC Device], and select “Sound Card ASIO” in the “Device Model” field. Then choose “miniDSP ASIO Driver” in the “Device No.” field (see figure below). This is to configure the USB measurement microphone Umik-2 as the sound recording device for the software.



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.

1.4.3.1.2 Using MME Driver

Go to [Setting]>[ADC Device], and select “Sound Card MME” in the “Device Model” field. Then choose “Line (UMIK-2)” in the “Device No.” field (see figure below). This is to configure the USB measurement microphone Umik-2 as the sound recording device for the software.



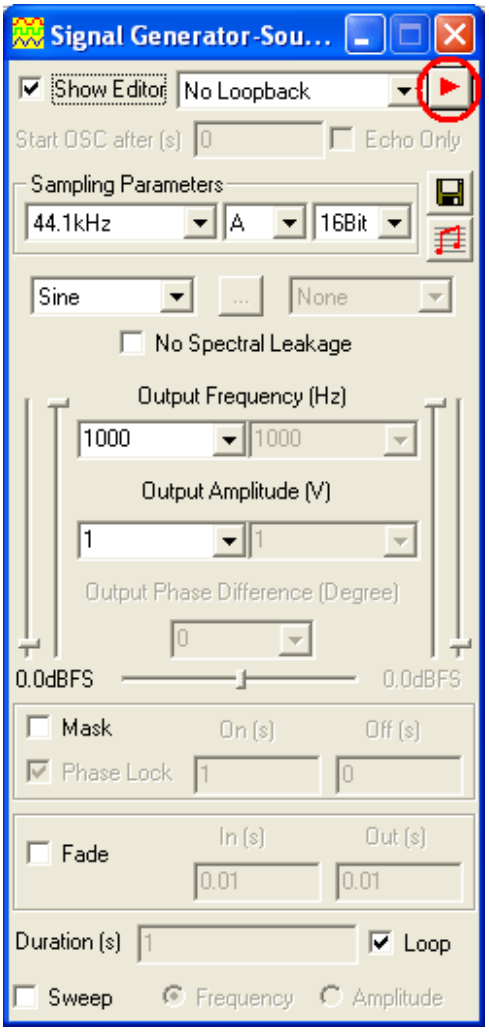
Note that the displayed name of the USB microphone may vary a bit under different Windows versions or with different USB ports.

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.

1.4.3.2 Configure Sound Playback Devices for Multi-Instrument

The USB microphone does not have any audio output channels, but you can use your computer's built-in sound card or any other sound card for audio test signal output, if you want to use the Signal Generator in Multi-Instrument to generate the test signals. To configure the sound card for the Signal Generator, go to [Setting]>[DAC Device] and choose the corresponding sound card's name in the "Device No." field. By default, Multi-Instrument will use the computer's built-in sound card for signal output. The "Device Model" field should be set to "Sound Card MME" unless you want to use a sound card with its own ASIO driver.

Now, if you press the Signal Generator button (see figure above), the Signal Generator panel will be opened (see figure below). Press the red triangle button at the upper right corner of the Signal Generator panel, you should hear a 1kHz test tone from the speaker or earphone connected to the selected playback sound card. Press it again to stop the sound.



1.5 Input of Sound Level Calibration Data and Adjustment of Input Gain

Sound Level Calibration is not required for those relative measurements such as frequency response, THD, THD+N, IMD, etc.. It is required only if you want to measure the absolute sound level.

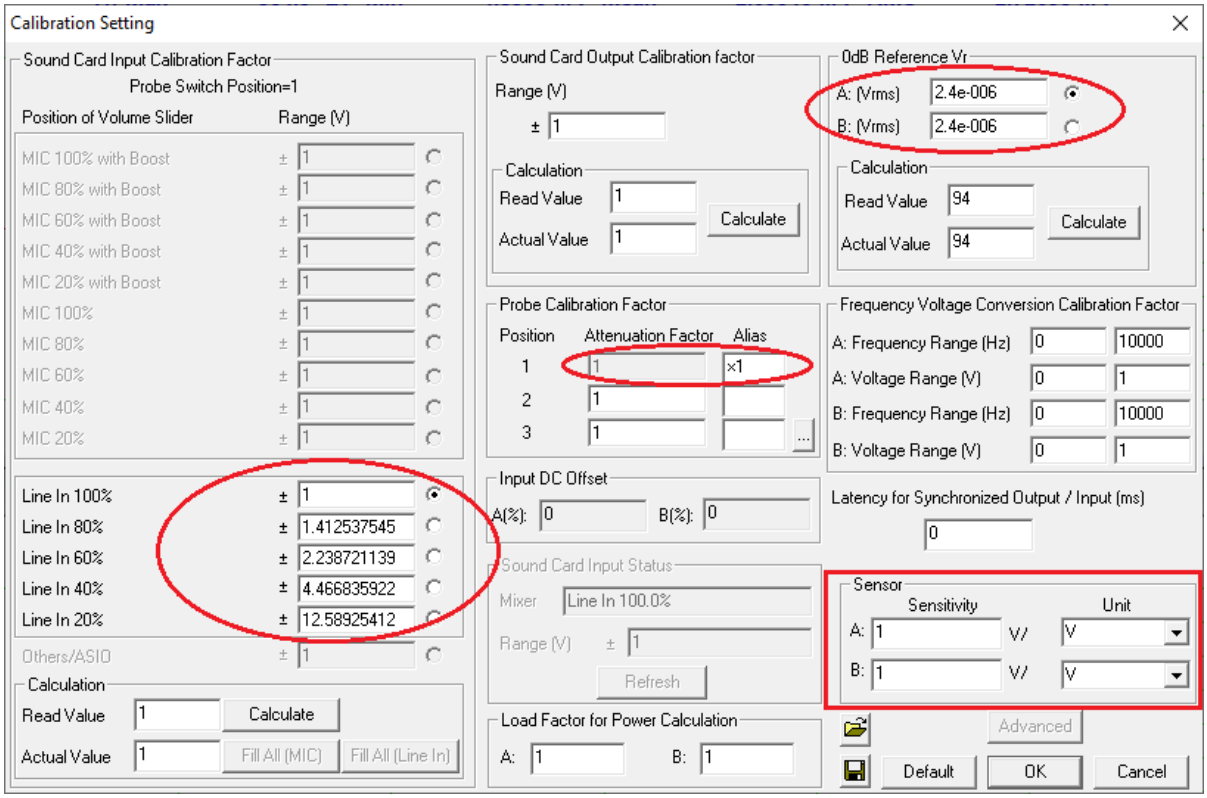
The USB measurement microphone has been calibrated in the factory. The sound level calibration data are provided in a separate sheet inside the product package. Please refer to the calibration data sheet provided and enter the calibration data in the respective highlighted fields in the Calibration Setting dialog box (see figures below). Note that different calibration data are required for different Windows versions. The Calibration Setting dialog box is opened via [Setting]>[Calibration] in Multi-Instrument.

You can adjust the sound level measurement range by adjusting the input gain of the USB microphone through software.

1.5.1 Under Windows 8/8.1/10/11

Input of the Sound Level Calibration Data

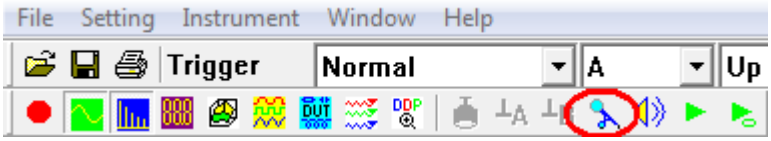
Note that the calibration data in the following figure are examples only, you should enter the actual calibration data provided inside the product package.



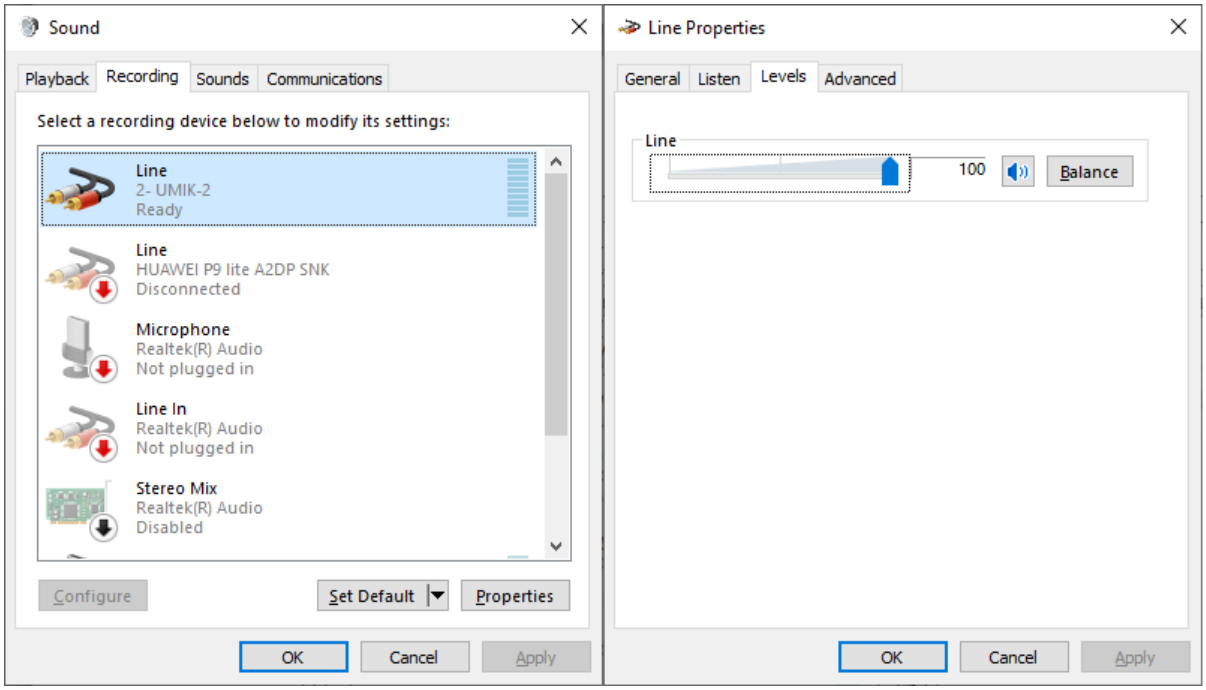
Adjustment of Input Gain via Software

You can adjust the input gain by clicking the respective radio buttons beside the "Line In 100%", "Line In 80%", "Line In 60%", "Line In 40%" and "Line In 20%" in the above figure. It should be noted that the selection status of the radio button does not necessarily reflect the actual input gain (For example, when you open the Calibration Setting dialog box, if the selected radio box is "Line In 80%", it does not necessarily mean the current input gain is set at 80%.). The actual input gain is reflected by the "Mixer" status under the "Sound Card Input Status" in the above figure. You can press the "Refresh" button to make sure the status display has been refreshed.

The input gain is also adjustable in the Sound Recording Tab under Windows Control Panel. You can access the Sound Recording Tab by clicking the "Windows Recording Control" button (see figure below) in Multi-Instrument.



This will bring up the Sound Recording Tab (see left part of the figure below).



If you right click “Line (Umik-2)” and select “Properties”, the right part of the figure above will be shown. You can then adjust the input gain through the “Line” slider. It is recommended that only 100%, 80%, 60%, 40% or 20% is used.

1.5.2 0dB Reference Vr

The “0dB Reference Vr” in the Calibration Setting dialog box is used to finally calibrate the input voltage to dBSPL. The input voltage here should be considered as a relative value as the actual input is not a voltage but a sound pressure. The “0dB Reference Vr” is the parameter to be recalibrated if a sound level recalibration is necessary. To do the recalibration, simply enter the actual sound level value into the “Actual Value” edit box and the measured sound level value into the “Read Value” edit box, and then press the “Calculate” button once. It should be noted that the Sensor Sensitivity is kept at 1V/V in his method.

In case you want to display the measured raw data in Pa rather than Volt, then you should enter the “actual” Sensor Sensitivity in V/Pa, which can be calculated using the following formula:

Sensitivity = [“0dB Reference Vr” (in Volt)] / [Standard 0dB Reference (in Pa)]

where the Standard 0dB Reference for sound pressure level in air is 20 µPa (i.e. 2e-005 Pa) and that in water is 1 µPa (i.e. 1e-006 Pa). If the “actual” Sensor Sensitivity is used, then the standard 0dB reference should be entered into the “0dB Reference Vr” edit box. For example, the following two methods are equivalent.

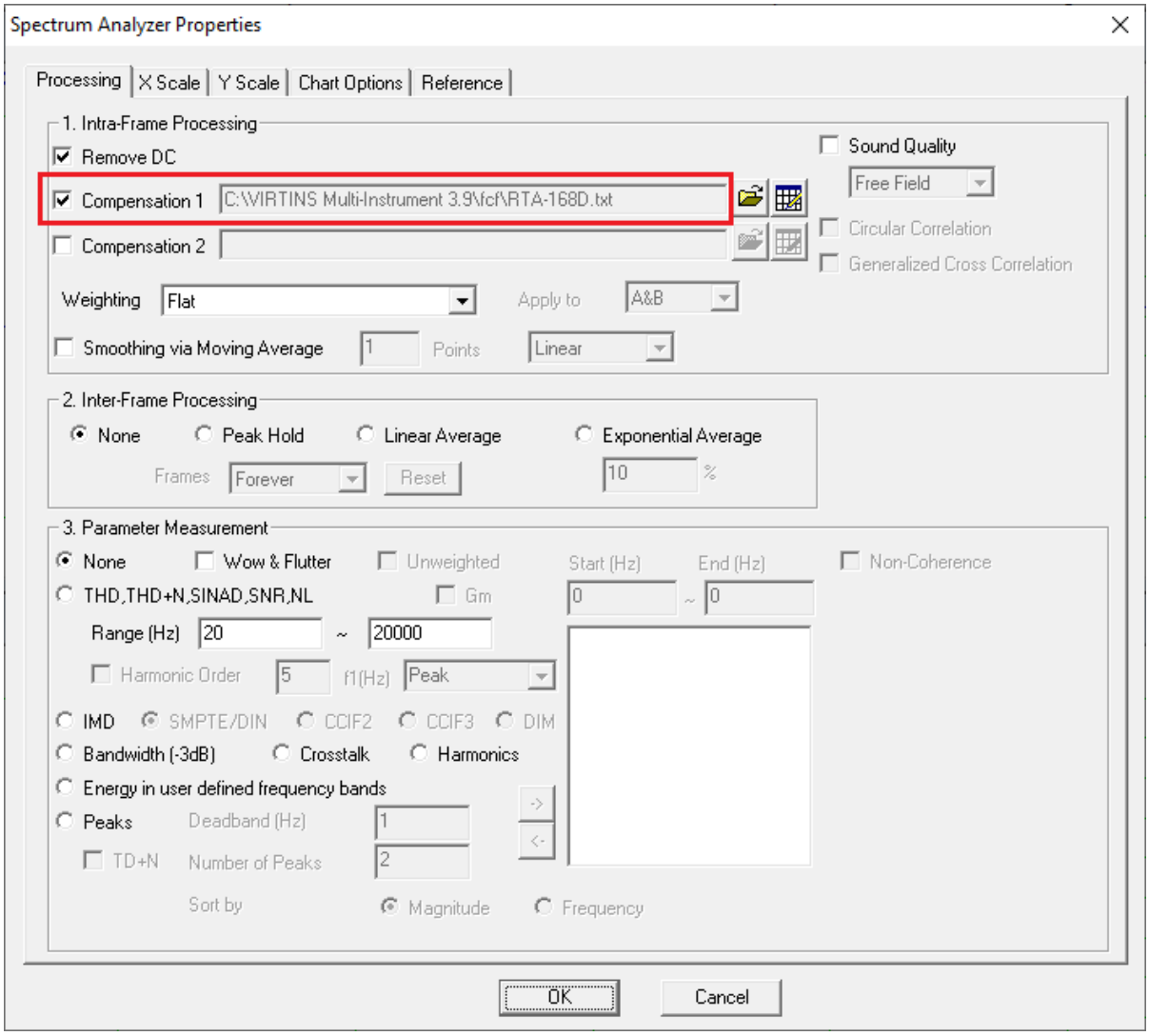
Method 1: [0dB Reference Vr] = 2.4e-006 (V) and [Sensor Sensitivity] = 1 V/V
Method 2: [0dB Reference Vr] = 2.0e-005 (Pa) and [Sensor Sensitivity] = 0.12 V/Pa

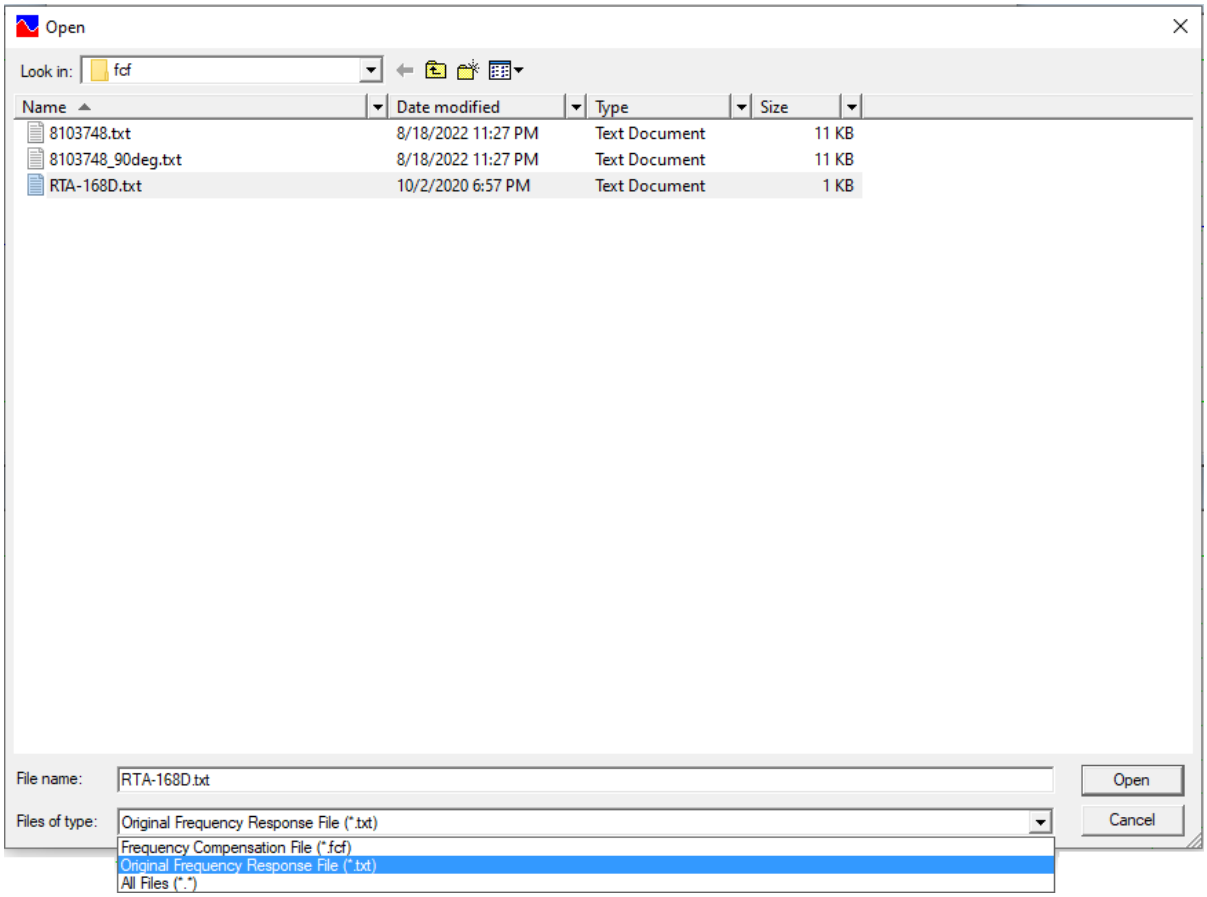
1.6 Microphone Frequency Compensation

The measurement microphone in RTA-168 series has an extremely flat frequency response in the audio frequency range. Generally, there is no need to compensate for the microphone frequency response. However, a higher degree of accuracy can be achieved if the microphone comes with a frequency response file or a frequency compensation file. The difference between these two files is the sign of the gain values (in dB). For example, a gain of 3dB in a frequency response file should have a gain of -3dB in its equivalent frequency compensation file.

The USB microphone Umik-2 in RTA-168D comes with an individually calibrated Original Frequency Response File RTA-168D.txt. "Original" means that it has exactly the same format and contents as the calibration file provided by the microphone manufacturer. **This file is located in the CD directory "\Microphone Frequency Compensation File". Please copy this file to the "\fcf" directory under the installation directory of Multi-instrument in the hard disk (if the file already exists, overwrite it), so that you can use it later.** This file is also used by the default panel settings configured in the Hot Panel Setting Toolbar (The third toolbar from the top) except the one labelled "Ultrasound".

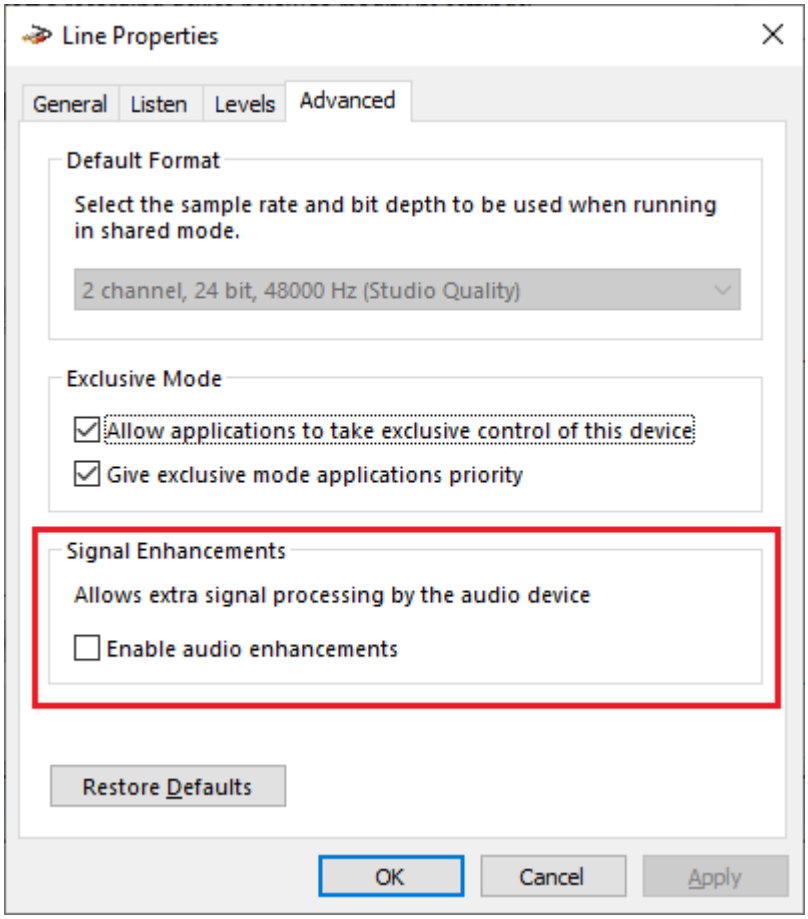
You can load the Original Frequency Response File by right clicking anywhere within the Spectrum Analyzer window, selecting [Spectrum Analyzer Processing]> "Intra-Frame Processing"> "Compensation 1", changing the "Files of type" from "Frequency Compensation File (*.fcf)" to "Original Frequency Response File (*.txt)" in the pop-up File Open dialog box, and loading that file (see figures below). If you want to apply it to the twenty most frequently used panel settings in the Hot Panel Setting Toolbar, you will need to configure and save the corresponding panel setting files one by one. Luckily, this has already been done for the default panel settings.





The above frequency compensation file RTA-168D.txt is actually copied and renamed from the original calibration file supplied by the manufacturer of Umik-2. Two original calibration files are provided: one for 0 degree (on-axis) and the other for 90 degree. The RTA-168D.txt is renamed from the 0 degree calibration file by default. Normally the 0 degree file should be used in a mono or stereo system with the microphone pointing to the sound source while the 90 degree file should be used in a surround sound environment with the microphone pointing upwards. These two original calibration files **can also be found in the CD directory "\Microphone Frequency Compensation File". Their file names are something like xxxxxxx.txt and xxxxxxx_90deg.txt where xxxxxxx is the serial no. labelled on the Umik-2 microphone body.**

Some Windows versions / editions come with some audio signal enhancement features which are enabled by default. These features must be disabled through the Sound Recording Control under Windows Control Panel to prevent them from altering the originally sampled data, as shown below. One of the possible problems caused by these features is the unwanted alteration of the frequency response of the setup. Using ASIO driver instead of MME driver can avoid these problems.



1.7 Twenty Most Frequently Used Measurement Settings

Multi-Instrument bundled with VT RTA-168D comes with many pre-configured panel setting files. This saves you time to configure various parameters for some frequently performed measurements by yourself. You can load these panel setting files via [Setting]>[Load Panel Setting]. Furthermore, 20 most frequently used panel setting files are pre-configured in the Hot Panel Setting Toolbar (The third toolbar from the top). You can load one of them by a single mouse click. These 20 measurement settings are:

(1) Home: Default Setting
The factory default panel setting. It is equivalent to the [File]>[New] command.

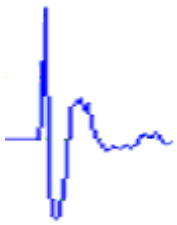
(2) Ultrasound: Audio and Ultrasound Analysis
Unlike other pre-configured panel settings in this toolbar, the sampling rate of the Oscilloscope is intentionally set to 192 kHz, which is the highest sampling rate supported by Umik-2 microphone. Also, the 10 Hz ~ 20 kHz frequency response file RTA-168D.txt is not configured in the Spectrum Analyzer in order to allow for a much wider frequency range, which is theoretically from 0 to 96 kHz. Please note that the frequency response in the infrasonic and ultrasonic ranges may not be as flat as that in the audio frequency range.

(3) OCT3: 1/3 Octave Analysis (Avg. 10)
Pink noise will be generated by pressing the start button of the Signal Generator. The pink noise will be injected into the DUT (Device Under Test), and the response of the DUT will

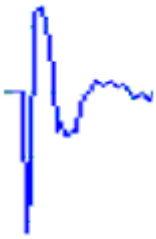
be captured and analyzed by the Oscilloscope and Spectrum Analyzer. A flat curve in the Spectrum Analyzer would indicate a flat magnitude frequency response of the DUT. The equivalent continuous sound level in dB will be displayed in the Multimeter window.

(4) OCT3ppn: 1/3 Octave Analysis
Same as OCT3, but periodic pink noise instead of ordinary (non-periodic) pink noise is used as the stimulus. One advantage of using periodic pink noise is that its spectrum is ideally flat under octave analysis even without inter-frame averaging.

(5) Polarity: Speaker, Microphone, Amplifier Polarity Tester with Crest Factor Check
A polarity test signal will be generated by pressing the start button of the Signal Generator. Point the microphone close to the center of the speaker under test along its axis, and observe the polarity of the captured pulse in the oscilloscope window. If the pulse goes positive initially, then the polarity of the speaker under test is positive, and vice versa.



Positive



Negative

(6) THD: THD,THD+N,SNR,SINAD,Noise Level, ENOB (Avg. 10)
A 1 kHz (to be precise, a frequency very close to 1 kHz) sine wave will be generated by pressing the start button of the Signal Generator. The sine wave will be injected into the DUT (Device Under Test), and the response of the DUT will be captured and analyzed by the Oscilloscope and Spectrum Analyzer. All the above parameters of the DUT will be measured and displayed. This panel setting should be used only if the same sound card is used for signal input and output.

(7) THDcd: THD,THD+N,SNR,SINAD,Noise Level, ENOB (Avg. 10)
A 1 kHz sine wave will be generated by pressing the start button of the Signal Generator. The sine wave will be injected into the DUT (Device Under Test), and the response of the DUT will be captured and analyzed by the Oscilloscope and Spectrum Analyzer. All the above parameters of the DUT will be measured and displayed. This panel setting should be used if different sound cards are used for signal input and output, such as the case of RTA-168. It should also be used if the 1 kHz test tone is played from an audio CD or a memory stick.

(8) IMDsmp: IMD SMPTE (60 Hz + 7 kHz, 4:1) (Avg. 10)
A 60 Hz and a 7 kHz sine waves mixed at an amplitude ratio of 4:1 will be generated by pressing the start button of the Signal Generator. The mixed signals will be injected into the DUT (Device Under Test), and the response of the DUT will be captured and analyzed by the Oscilloscope and Spectrum Analyzer. The SMPTE IMD value of the DUT will be measured and displayed.

(9) IMDdin: IMD DIN (250 Hz + 8 kHz, 4:1) (Avg. 10)
A 250 Hz and a 8 kHz sine waves mixed at an amplitude ratio of 4:1 will be generated by pressing the start button of the Signal Generator. The mixed signal will be injected into the

DUT (Device Under Test), and the response of the DUT will be captured and analyzed by the Oscilloscope and Spectrum Analyzer. The DIN IMD value of the DUT will be measured and displayed.

(10) IMDccif: IMD CCIF2 (19 kHz + 20 kHz, 1:1) (Avg. 10)
A 19 kHz and a 20 kHz sine waves mixed at an amplitude ratio of 1:1 will be generated by pressing the start button of the Signal Generator. The mixed signal will be injected into the DUT (Device Under Test), and the response of the DUT will be captured and analyzed by the Oscilloscope and Spectrum Analyzer. The CCIF2 IMD value of the DUT will be measured and displayed.

(11) FRwhite: Magnitude Frequency Response (White Noise, Avg. 30)
White noise will be generated by pressing the start button of the Signal Generator. The white noise will be injected into the DUT (Device Under Test), and the response of the DUT will be captured and analyzed by the Oscilloscope and Spectrum Analyzer. The curve in the Spectrum Analyzer indicates the magnitude frequency response of the DUT.

(12) FRpwn: Magnitude Frequency Response (Periodic White Noise)
Periodic white noise will be generated by pressing the start button of the Signal Generator. The periodic white noise will be injected into the DUT (Device Under Test), and the response of the DUT will be captured and analyzed by the Oscilloscope and Spectrum Analyzer. The curve in the Spectrum Analyzer indicates the magnitude frequency response of the DUT. One advantage of using periodic white noise is that its spectrum is ideally flat even without inter-frame averaging.

(13) FRswLin: Magnitude Frequency Response (Frequency Sweep, Linear)
A 0.68266667-second 20Hz-to-20kHz linear frequency swept sine wave will be generated by pressing the start button of the Signal Generator. The signal will be injected into the DUT (Device Under Test), and the response of the DUT will be captured by the Oscilloscope and Spectrum Analyzer. The curve in the Spectrum Analyzer indicates the magnitude frequency response of the DUT. Note that you will need to adjust the trigger level so that the Oscilloscope will be triggered just upon the start of the sweep.

(14) FRswLog: Magnitude Frequency Response (Frequency Sweep, Log)
A 0.68266667-second 20Hz-to-20kHz logarithmic frequency swept sine wave will be generated by pressing the start button of the Signal Generator. The signal will be injected into the DUT (Device Under Test), and the response of the DUT will be captured by the Oscilloscope and Spectrum Analyzer. The curve in the Spectrum Analyzer indicates the magnitude frequency response of the DUT. Note that you will need to adjust the trigger level so that the Oscilloscope will be triggered just upon the start of the sweep.

(15) FRmt: Magnitude Frequency Response (MultiTone, 31 1/3 Octave Bands)
A multitone consists of 31 1/3 octave band center frequencies from 20 Hz to 20kHz will be generated by pressing the start button of the Signal Generator. The signal will be injected into the DUT (Device Under Test), and the response of the DUT will be captured by the Oscilloscope and Spectrum Analyzer. The curve in the Spectrum Analyzer indicates the magnitude frequency response of the DUT.

(16) sLeq: Short Equivalent Continuous Sound Level (Short Leq, 125ms)

This panel setting will display the short equivalent continuous sound level. The value is time-averaged over continuous 125 ms.

(17) sLeqA: Short Equivalent Continuous Sound Level (Short Leq, 125ms) (A-Weighted)
This panel setting will display the A-weighted short equivalent continuous sound level. The value is time-averaged over continuous 125 ms.

(18) RT60pn: Reverberation Analysis via Interrupted Noise (1/1 Octave Band)
Pink noise will be generated for 5 seconds only by pressing the start button of the Signal Generator. It will be projected into the enclosure under test. After about 4.5 seconds, the Oscilloscope will be started automatically by the software under the "Sync. No Loopback" mode of the Signal Generator. This is to capture the last 0.5 second of the emitted pink noise and 4.5 seconds of its subsequent decay process. **The data analysis may take quite a long time. Please be patient!** The measured RT20 value in each 1/1 octave band as well as its overall value will be displayed. RT30 can also be displayed if needed. Please refer to the sections for Reverberation in the software manual for details.

(19) RT60imp: Reverberation & Speech Intelligibility Analysis via Impulse Response (1/1 Octave Band)
Reverberation and Speech intelligibility analysis will be performed based on Impulse Response Schroeder Integration. The impulse response can be obtained through direct methods (such as a gunshot) or indirect methods (such as transfer function measurement). **The data analysis may take quite a long time. Please be patient!** Please refer to the sections for Reverberation and Speech Intelligibility in the software manual for details.

(20) OCT3spl: 1/3 Octave Analysis (Avg. 10) in SPL
Same as OCT3, but with the Y axis displayed in dBSPL instead of dBFS in Spectrum Analyzer.

1.8 More Acoustic Analysis Functions Available in Multi-Instrument Pro or Above

Multi-Instrument is very versatile and supports a comprehensive set of acoustic measurements. To highlight a few not mentioned in the previous sections: Reverberation (including RT60), Speech Intelligibility (including STI), ANSI / CEA-2010 Subwoofer Peak SPL Test, Cumulative Spectral Decay, Speaker Rub & Buzz, Sound Quality (loudness, loudness level, sharpness, articulation index, etc.), etc. Some of these functions are only available in Multi-Instrument Pro or above. Please refer to Multi-Instrument software manual for more details.

1.9 List of Audio Test WAV Files (AudioTestCD.zip)

Track	Description	Length (second)	Recommended Panel setting to be used
1	Pink Noise in Phase (-1dBFS)	298	OCT1 ~ OCT24 OCT1spl, OCT3spl

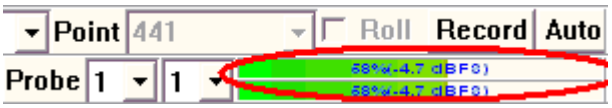
2	Pink Noise out of Phase (-1dBFS)	298	
3	White Noise in Phase (-1dBFS)	298	FRwhite
4	White Noise out of Phase (-1dBFS)	298	
5	Log Sweep 20Hz~20kHz (-1dBFS)	60	
6	Log Sweep 20Hz~20kHz out of Phase (-1dBFS)	60	
7	Linear Sweep 20Hz~20kHz (-1dBFS)	60	
8	Linear Sweep 20Hz~20kHz out of Phase (-1dBFS)	60	
9	Log Sweep 20Hz~200Hz (-1dBFS)	60	
10	Log Sweep 20Hz~200Hz out of Phase (-1dBFS)	60	
11	Linear Sweep 20Hz~200Hz (-1dBFS)	60	
12	Linear Sweep 20Hz~200Hz out of Phase (-1dBFS)	60	
13	Log Sweep 2kHz~20kHz (-1dBFS)	60	
14	Log Sweep 2kHz~20kHz out of Phase (-1dBFS)	60	
15	Linear Sweep 2kHz~20kHz (-1dBFS)	60	
16	Linear Sweep 2kHz~20kHz out of Phase (-1dBFS)	60	
17	Log Sweep 20Hz~20kHz (-1dBFS)	0.683	FRswlog
18	Log Sweep 20Hz~20kHz out of Phase (-1dBFS)	2.73	
19	Linear Sweep 20Hz~20kHz (-1dBFS)	0.683	FRswlin
20	Linear Sweep 20Hz~20kHz out of Phase (-1dBFS)	2.73	
21	MultiTone32Octave1/3 in Phase (-1dBFS)	60	FRmt
22	MultiTone32Octave1/3 out of Phase (-1dBFS)	60	
23	1kHz (0dBFS)	60	
24	1kHz (-1dBFS)	60	THDcd
25	1kHz (–3dBFS)	60	
26	1kHz (–10dBFS)	60	
27	1kHz (–60dBFS)	60	
28	60Hz and 7kHz mixed at 4: 1 (-1dBFS)	60	IMDsmp
29	250Hz and 8kHz mixed at 4: 1 (-1dBFS)	60	IMDdin
30	19kHz and 20kHz mixed at 1: 1 (-1dBFS)	60	IMDccif
31	1kHz Square (-1dBFS)	60	
32	Digital Silence	60	
33	LeftRight (English)	60	
34	Left Right Center Surround (English)	60	
35	LeftRight (Chinese)	60	
36	Left Right Center Surround (Chinese)	60	
37	12.5 Hz (-1dBFS)	60	1/3 Octave Band 1
38	16 Hz (-1dBFS)	60	1/3 Octave Band 2
39	20 Hz (-1dBFS)	60	1/3 Octave Band 3
40	25 Hz (-1dBFS)	60	1/3 Octave Band 4
41	31.5 Hz (-1dBFS)	60	1/3 Octave Band 5
42	40 Hz (-1dBFS)	60	1/3 Octave Band 6
43	50 Hz (-1dBFS)	60	1/3 Octave Band 7
44	63 Hz (-1dBFS)	60	1/3 Octave Band 8
45	80 Hz (-1dBFS)	60	1/3 Octave Band 9
46	100 Hz (-1dBFS)	60	1/3 Octave Band 10
47	125 Hz (-1dBFS)	60	1/3 Octave Band 11
48	160 Hz (-1dBFS)	60	1/3 Octave Band 12
49	200 Hz (-1dBFS)	60	1/3 Octave Band 13
50	250 Hz (-1dBFS)	60	1/3 Octave Band 14
51	315 Hz (-1dBFS)	60	1/3 Octave Band 15
52	400 Hz (-1dBFS)	60	1/3 Octave Band 16
53	500 Hz (-1dBFS)	60	1/3 Octave Band 17
54	630 Hz (-1dBFS)	60	1/3 Octave Band 18
55	800 Hz (-1dBFS)	60	1/3 Octave Band 19
56	1250 Hz (-1dBFS)	60	1/3 Octave Band 21
57	1600 Hz (-1dBFS)	60	1/3 Octave Band 22
58	2000 Hz (-1dBFS)	60	1/3 Octave Band 23
59	2500 Hz (-1dBFS)	60	1/3 Octave Band 24

60	3150 Hz (-1dBFS)	60	1/3 Octave Band 25
61	4000 Hz (-1dBFS)	60	1/3 Octave Band 26
62	5000 Hz (-1dBFS)	60	1/3 Octave Band 27
63	6300 Hz (-1dBFS)	60	1/3 Octave Band 28
64	8000 Hz (-1dBFS)	60	1/3 Octave Band 29
65	10000 Hz (-1dBFS)	60	1/3 Octave Band 30
66	12500 Hz (-1dBFS)	60	1/3 Octave Band 31
67	16000 Hz (-1dBFS)	60	1/3 Octave Band 32
68	20000 Hz (-1dBFS)	60	1/3 Octave Band 33
69	999.9481201 Hz (-1dBFS)	60	THD
70	One 0.5ms Inverted Saw Tooth Pulse Every 100ms (-1dBFS)	1	Polarity Test

Note that you can compare the sound level of the in-phase signal with that of the out-of-phase signal to judge whether you need to swap the polarity of the speakers in one channel.

1.10 Operation Notes

- The sound level of the test signal should be at least 30 dB higher than that of the background noise in order to achieve sufficient signal-to-noise ratio in the measurement.
- The volume of the test signal and the input gain of the RTA should be adjusted such that the input peak level (displayed at the upper right corner of the screen) is in the range of 10%~95% (preferably around 85%). This is to ensure sufficient measurement accuracy and at the same time avoid distortion caused by input saturation. **When the input peak level reaches 100% (the bar turns fully red), the results cannot be trusted.**

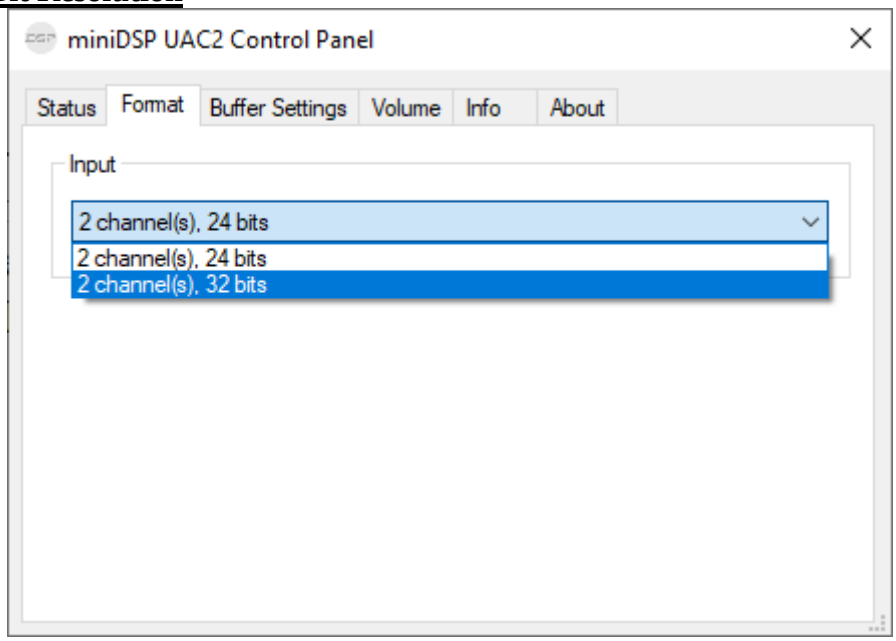


- You can change the number of frames for averaging by right clicking anywhere within the Spectrum Analyzer window and selecting [Spectrum Analyzer Processing]> “Inter-Frame Processing”> “Linear Average” and choose a number in the “Frames” field.
- You can change the frequency weighting by right clicking anywhere within the Spectrum Analyzer window and selecting [Spectrum Analyzer Processing]>“Intra-Frame Processing” and choose a weighting profile in the “weighting” field.
- You can save a panel setting file via [Setting]>[Save Current Panel Setting]
- You can load a panel setting file via [Setting]>[Load Panel Setting].
- You can configure your own Hot Panel Setting Toolbar via [Setting]>[Configure Hot Panel Setting Toolbar].
- You can lock the panel setting via [Help]>[Lock Panel Setting].
- You can unlock the panel setting via [Help]>[Unlock Panel Setting].
- You can set or change the password for unlocking the panel setting via [Setting]>[Change Password].

1.11 UAC2 Control Panel

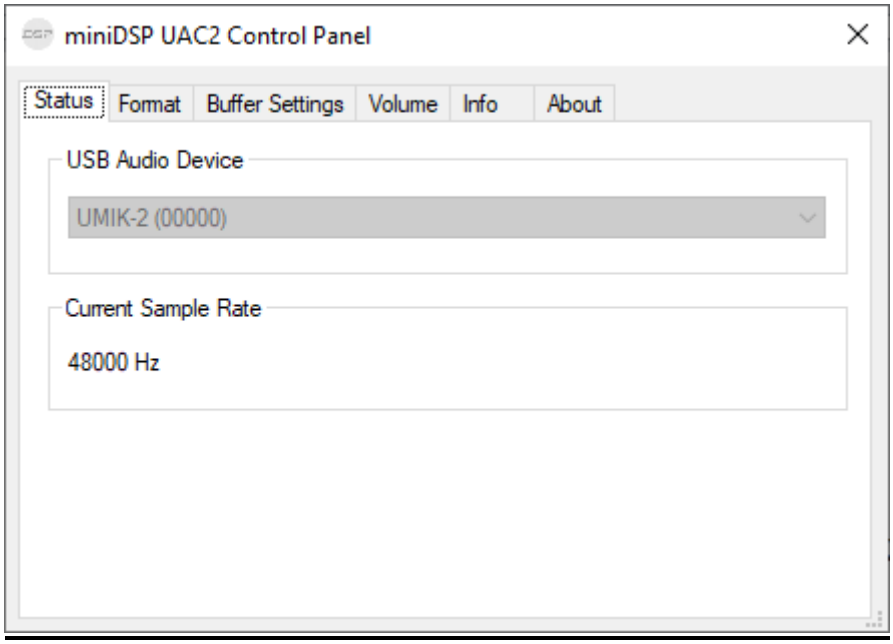
The dedicated UAC2 Control Panel for UMik-2 is installed during driver installation. Normally, there is no need to open it as the default settings will work perfectly. For test and measurement applications, the most import parameters on the UAC2 Control Panel are: Sampling Bit Resolution (Bit Depth), Sampling Frequency (Sampling Rate) and Input Gain (Input Volume), which are set by default to 24 bits, 48 kHz and 0 dB (100%), respectively. The only parameter you might want to change here is the Sampling Bit Resolution, from 24 bits to 32 bits. The UAC2 Control Panel can be opened via [Windows Start Menu]> [miniDSP UAC2 Control Panel].

Sampling Bit Resolution



The actual Sampling Bit Resolution used by the hardware can be set from the above tab. For both MME and ASIO drivers, if the Sampling Bit Resolution selected in Multi-Instrument differs from the above setting, the system will perform Sampling Bit Resolution conversion automatically.

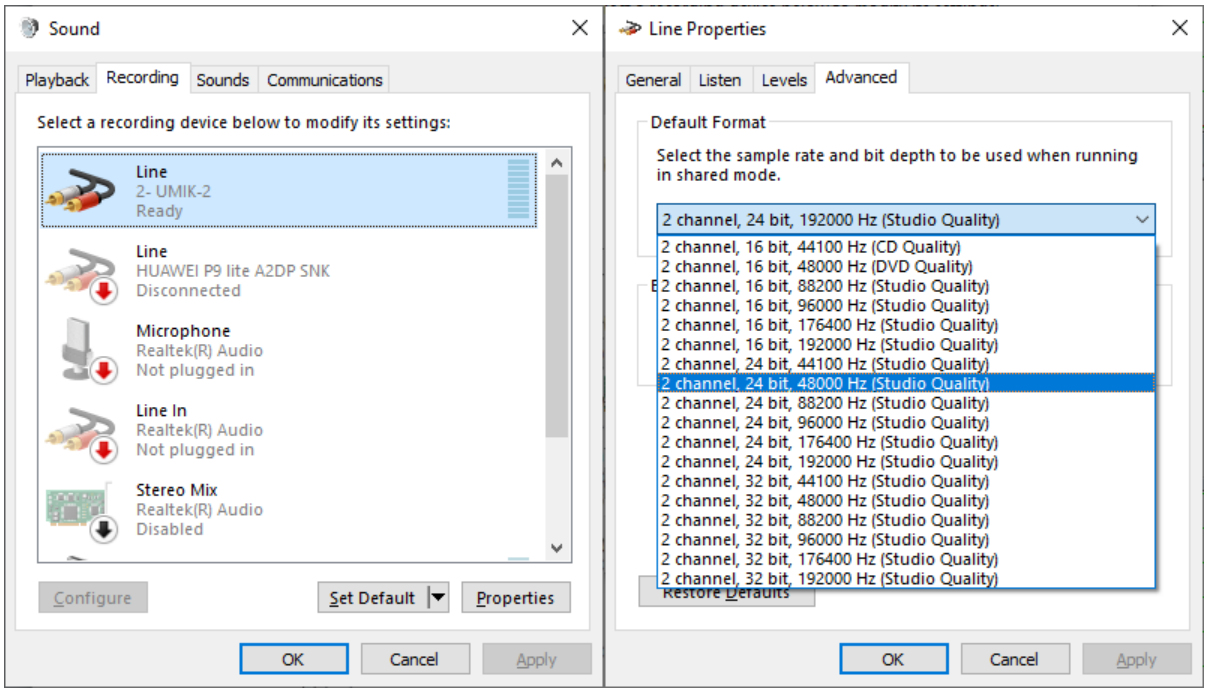
Sampling Frequency



The above status reflects the actual Sampling Frequency used by the hardware, but it cannot be set here. The methods used to set the actual Sampling Frequency are different with MME and ASIO drivers.

(1) For ASIO driver, the actual Sampling Frequency is set directly in Multi-Instrument.

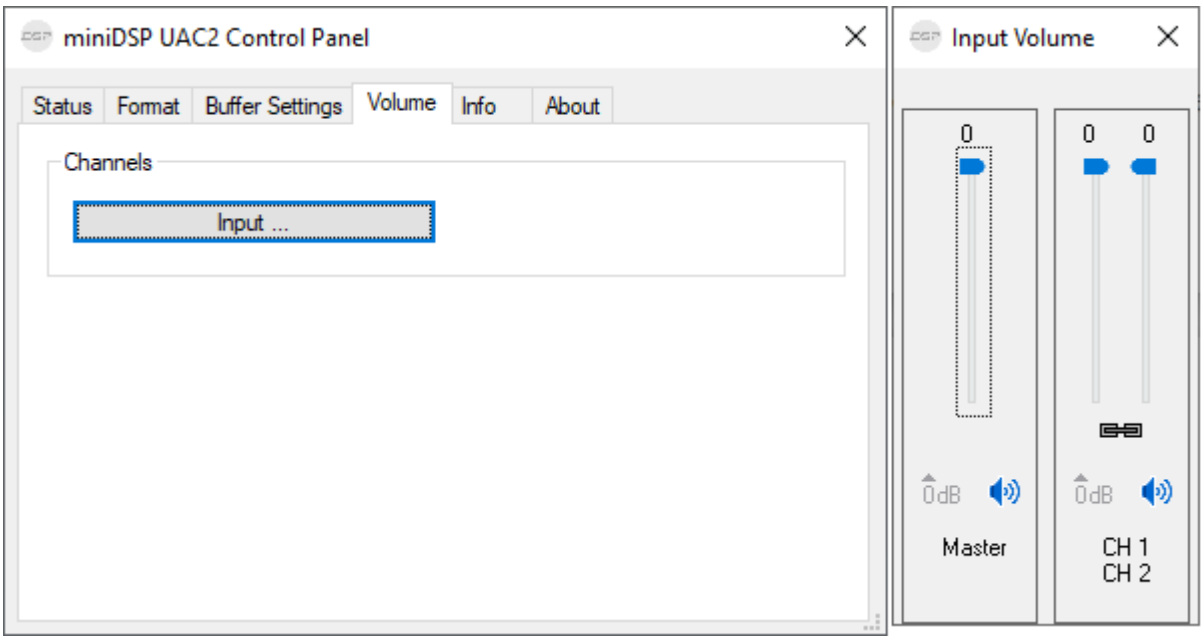
(2) For MME driver, the actual Sampling Frequency is configured in the Sound Recording Tab under Windows Control Panel (see figure below).



If you right click “Line (Umik-2)” and select “Properties”> “Advanced”, the right part of the figure above will be shown. You can then set the Sampling Bit Resolution and the actual Sampling Frequency for MME driver. For MME drivers, if the Sampling Frequency selected

in Multi-Instrument differs from the above setting, the system will perform Sampling Frequency conversion automatically.

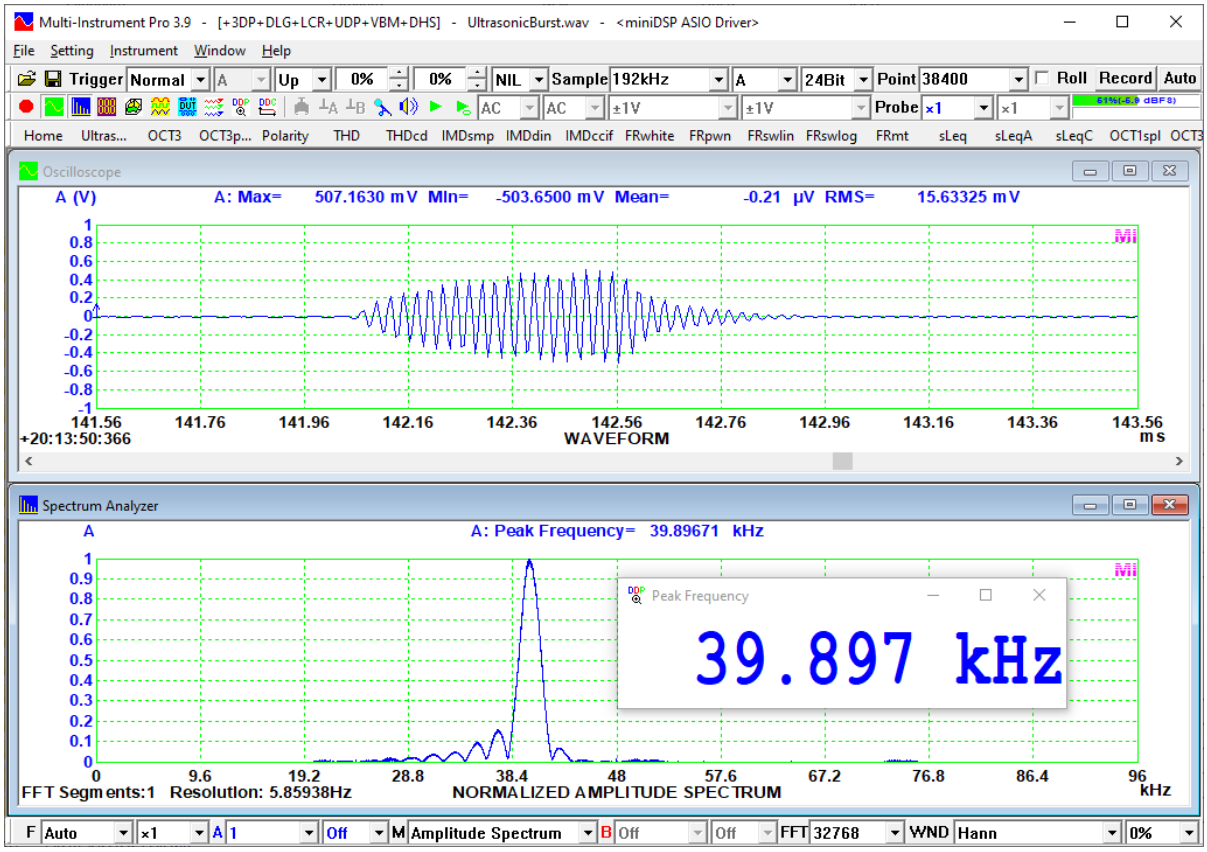
Input Volume



The above settings reflect the actual input gain. It is not recommended to change the input gain here or through Windows Sound Recording Control Panel. For both MME and ASIO drivers, it is recommend to change it through [Setting]>[Calibration]> Line In 100%, 80%, 60%, 40% or 20% in Multi-Instrument. This ensures that only these 5 gain values will be used, which are enough to cover the specified measurement range.

1.12 Audio and Ultrasound Analysis

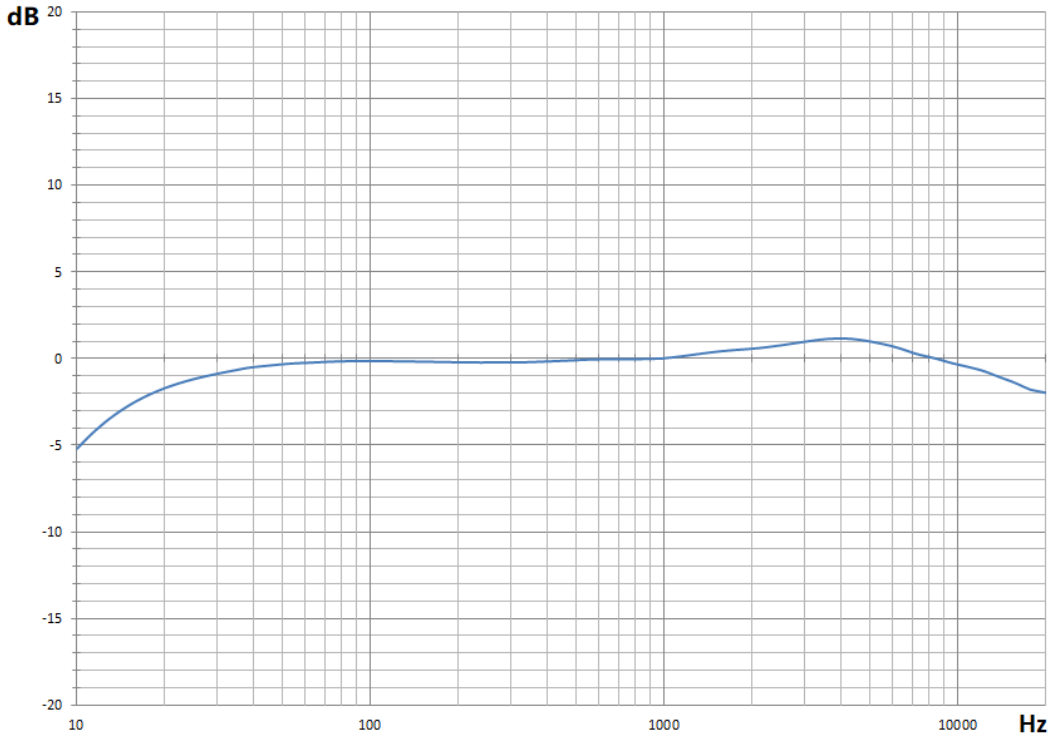
The highest sampling rate supported by this USB measurement microphone is 192 kHz. Thus it has the potential to measure sound beyond the audio frequency range. The frequency response in the infrasonic and ultrasonic ranges may not be as flat as that in the audio frequency range. In fact, the supplied frequency response calibration files only cover the frequency range from 10 Hz to 20 kHz. If sound beyond this range is also of interest, then those files should not be loaded directly without modification in the Spectrum Analyzer of Multi-Instrument, in order not to filter out those frequencies outside this range. Again, ASIO driver is recommended and a sampling frequency of 192 kHz should be used. The following figure shows the captured ultrasound burst (about 40 kHz) emitted by a car parking sensor.



2 Specifications

2.1 Hardware Specifications

Transducer Type	½" low-noise pre-polarized condenser on 60UNS thread
Polar Pattern	Omni-directional
Frequency Response	10Hz ~ 20kHz (±1dB with the frequency response calibration file loaded) Useful Range: 1 Hz ~ 90 kHz
Sampling Rate	44.1kHz, 48 kHz, 88.2kHz, 96kHz, 176.4kHz, 192kHz
Bit Depth	32 Bit (120 dB SNR ADC)
Number of Input Channels	1
Frequency Accuracy	0.01%
Frequency Weighting	Flat, A, B, C, ITU-R 468
Time Weighting	Linear, Exponential (Equivalent continuous sound level (*Leq*) fully complies with IEC61672)
Max. SPL (THD<1%, 1kHz)	125 dBSPL
Sound Level Measurement Range	25dB ~ 125dB (typical), adjustable through software gain slider. Recalibration is not required after the gain setting changes.
Sound Level Measurement Accuracy	± 0.3 dB at 94dB, 1kHz after calibration
Sound Level Calibration	Calibrated using Type 1 Sound Level Calibrator
Octave Analysis	1/1,1/3,1/6,1/12,1/24,1/48, 1/96 (Complies with IEC61260)
Other Functions	THD, THD+N, SINAD, SNR, SMPTE IMD, DIN IMD, CCIF2 IMD, Frequency Response, etc. Much more functions are described in the software manual.
USB Audio	USB Audio Class 2.0 (driver installation required)
Connector	USB Type C socket
Case Material	Aluminum
Weight	150 g
Dimensions	Φ21.0 × 185.0 mm
Power Supply	USB bus powered (5V)
System Requirements	Windows XP/VISTA/7/8/8.1/10/11, 32 bit or 64 bit. Minimum Screen Resolution: 1024 × 600
Calibration	Individually calibrated. Calibration files for on-axis and 90 degree included.



Typical Frequency Response

Note: This is only a typical frequency response chart. Umik-2 measurement microphone is calibrated individually and the calibration data is included in the product package.

2.2 Multi-Instrument Software Specifications

A complete Multi-Instrument software package consists of basic and add-on modules with all features in each of them. The basic modules include Oscilloscope, Spectrum Analyzer, Signal Generator, Multimeter, Derived Data Point Viewer, Derived Data Curve, and General Functions. The add-on modules include Spectrum 3D Plot, Data Logger, LCR Meter, Device Test Plan, Vibrometer, and Dedicated Hardware Support.

There are six license levels to access the basic modules: Sound Card Oscilloscope, Sound Card Spectrum Analyzer, Sound Card Signal Generator, Multi-Instrument Lite, Multi-Instrument Standard, and Multi-Instrument Pro. The add-on modules need to be purchased separately. They can only run with Multi-Instrument Lite, Standard, or Pro, except that Vibrometer can only run with Multi-Instrument Standard or Pro. The following table shows the function allocation among different license levels. Please note that a license of Multi-Instrument Full Package contains Multi-Instrument Pro and all add-on modules.

*Legend: √ - Function available * - Function available in Multi-Instrument Full Package only*

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
General Functions							
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	√	√		√	√	√
	Load Factor for Power Calculation	√	√		√	√	√
Graph Operation	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	√	√		√	√	√
Oscilloscope							
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	Remove DC					√	√
	Rectification					√	√
	FFT Low Pass					√	√
	FFT High Pass					√	√
	FFT Band Pass					√	√

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	FFT Band Stop					√	√
	FFT Frequency Response					√	√
	FIR Low Pass					√	√
	FIR High Pass					√	√
	FIR Band Pass					√	√
	FIR Band Stop					√	√
	FIR Frequency Response					√	√
	IIR Coefficients					√	√
Parameter Measurement	Reverberation / Speech Intelligibility						√
	Discontinuity						√
	Step Response						√
	Echo						*
	Damping Ratio						*
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 / Power Spectrum Density / Impedance Spectrum		√		√	√	√
	Phase Spectrum		√		√	√	√
	Auto-correlation (Linear/Circular)		√		√	√	√
	Cross-correlation (Linear/Circular) (Original /Generalized)		√		√	√	√
	Coherence/Non-Coherence						√
	Transfer Function / Impedance Analyzer						√
	Impulse Response						√
Intra-Frame Processing	Frequency Compensation		√		√	√	√
	Frequency Weighting		√		√	√	√
	Remove DC		√		√	√	√
	Smoothing via Moving Average (Linear/Octave)		√		√	√	√
Inte	Peak Hold		√		√	√	√

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	Linear Average		√		√	√	√
	Exponential Average		√		√	√	√
Parameter Measurement	THD,THD+N,SNR, SINAD,Noise Level, ENOB		√		√	√	√
	IMD/DIM		√		√	√	√
	Bandwidth		√		√	√	√
	Crosstalk		√		√	√	√
	Harmonics & Phase		√		√	√	√
	Energy in User Defined Frequency Band		√		√	√	√
	Peak Detection, SFDR, TD+N		√		√	√	√
	Wow & Flutter						*
	Sound Loudness						√
	Sound Loudness Level						√
	Sound Sharpness						√
	Sound Articulation Index						√
	Total Non-Coherent Distortion + Noise						√
	GedLee Metric						√
FFT	FFT Size 128~32768		√		√	√	√
	FFT Size 65536~4194304						√
	Intra-Frame Average		√		√	√	√
	Window function		√		√	√	√
	Window Overlap		√		√	√	√
Others	Octave Analysis (1/1, 1/3, 1/6, 1/12, 1/24, 1/48, 1/96)		√		√	√	√
	Linear / Log Scale for X and Y		√		√	√	√
	Peak Marker / Label		√		√	√	√
Signal Generator							
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	√	√	√	√	√	√

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
Sweep	Frequency Sweep (Linear/Log)			√	√	√	√
	Amplitude Sweep (Linear/Log)			√	√	√	√
	Forward + Reverse Sweep			√	√	√	√
Burst (Mask)	Normal Phase			√	√	√	√
	Locked Phase			√	√	√	√
	Window-Shaped Burst			√	√	√	√
	On/Off Amplitude Ratio			√	√	√	√
Fade	Fade In			√	√	√	√
	Fade Out			√	√	√	√
Modulation	AM			√	√	√	√
	FM			√	√	√	√
	PM			√	√	√	√
Others	Software Loopback (all channels)			√	√	√	√
	Software Loopback (1 channel)				√	√	√
	Sync. with Oscilloscope						√
	Save as WAV file			√	√	√	√
	Save as TXT file			√	√	√	√
	DDS				√	√	√
	DC Offset				√	√	√
Multimeter							
Type	RMS					√	√
	dBV					√	√
	dBu					√	√
	dB					√	√
	dB(A)					√	√
	dB(Z)					√	√
	dB(C)					√	√
	Frequency Counter				√	√	√
	RPM					√	√
	Counter					√	√
	Duty Cycle					√	√
	Frequency/Voltage					√	√
	Cycle RMS					√	√
	Cycle Mean					√	√
	Pulse Width					√	√
	Jitter Statistics						√
Settings	Counter Trigger Hysteresis				√	√	√
	Counter Trigger Level				√	√	√
	Frequency Divider				√	√	√
DDP (Derived Data Point) Viewer							
Function	DDP & UDDP display						√

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument Standard	Multi-Instrument Pro
	HH, H, L, LL Alarm						√
	Set Display Precision						√
	Define UDDP						√
	Alarm Sound						√
	Alarm Acknowledge						√
	Inter-frame Linear / Exponential Average						√
DDP Array Viewer	Harmonic Frequencies, RMS, Phases Report						√
	Octave Bands, RMS Report						√
	Peak Frequencies, RMS, Phases Report						√
	Frequency Bands, RMS Report						√
	Reverberation / Speech Intelligibility Report (1/1 Octave)						√
	Reverberation / Speech Intelligibility (1/3 Octave)						√
Derived Data Curve (DDC)							
Function	Energy Time Curve (Log-Squared)						√
	Energy Time Curve (Envelop)						√
	Energy Time Curve (dBSPL)						√
	Impulse Response Schroeder Integration Curve						√
	Step Response Curve (via Impulse Response Integration)						√
	Frequency Time Curve (Demodulated)						√
	X-Y Plot						√
	Shock Response Spectrum						√
	Frequency Time Curve (Timed)						√
	RPM Time Curve						√

Legend: Blank - Function available if purchased Shaded Blank - Function NOT available in that license level

		Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument	Multi-Instrument Pro
Spectrum 3D Plot							
Type	Waterfall Plot (Inter-frame, STFT)						
	Waterfall Plot (Intra-frame, STFT)						
	Waterfall Plot (Intra-frame, CSD)						
	Spectrogram (Inter-frame, STFT)						
	Spectrogram (Intra-frame, STFT)						
	Spectrogram (Intra-frame, CSD)						
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						
	Octave Analysis (1/1, 1/3, 1/6, 1/12, 1/24, 1/48, 1/96)						
	Spectrogram Smoothing						
Data Logger							
Real Time Logging							
Load Historical Log File							
Three logging methods (Fastest, Time Interval, Update Threshold)							
262 derived data points available for logging							
Up to 8 × 8 = 64 variables can be logged simultaneously							
LCR Meter							
High Impedance Measurement							
Low Impedance Measurement							
Up to 8 X-Y Plots (Linear/Log)							
Device Test Plan							
25 Instructions							
Create/Edit/Lock/Execute/Load/Save a Device Test Plan							
Up to 8 X-Y Plots (Linear/Log)							
Device Test Plan Log							
Automatic Mutli-Step Generation							
User Log In / Out							
Volatile & Non-volatile							

	Sound Card Oscilloscope	Sound Card Spectrum Analyzer	Sound Card Signal Generator	Multi-Instrument Lite	Multi-Instrument	Multi-Instrument Pro
Variables						
Vibrometer						
RMS, Peak/PP, Crest Factor for acceleration, velocity, displacement (in Multimeter)						
Waveform conversion among acceleration, velocity and displacement (in Oscilloscope)						
SI / English units						
Dedicated Hardware Support						
RTX6001 Remote /Local Control						

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, and Dedicated Hardware Support.

The license contained in the standard VT RTA-168D package is a hardkey activated Multi-Instrument Pro license, without any add-on modules/functions. No softkey (activation code) is provided. The software will run under the licensed mode as long as the USB hardkey (dongle) is connected to your computer before you launch the Multi-Instrument software.

Note: If the software is launched 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 is NOT included in the standard VT RTA-168D 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 information inside the USB hardkey by selecting [Start]>[All Programs]>[Multi-Instrument]>[VIRTINS Hardware Upgrading Tool] on your Windows desktop.

3.3 Software Upgrade in the Same License Level

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

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

4 Warranty

Virtins Technology guarantees this product against defective materials and manufacutring 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.

5 Disclaimer

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