

Waterfall Plot

Oscilloscope

Spectrum Analyzer

Correlation Analyzer

Distortion Analyzer

Signal Generator

Frequency Counter

Sound Level Meter

Device Test Plan

LCR Meter

Data Logger

Bode Plot

Vibrometer

Specifications

for sound card based systems

Scan Time	100µs~500s
Sampling Rate*	Max. 192kHz
Bandwidth*	10Hz~96kHz
Bit Depth*	8, 16, 24
Voltage Range*	-1V~1V
Input Channel	Ch.A, Ch.B
Output Channel	Ch.A, Ch.B
Trigger Mode	Auto, Normal Single, Slow
Trigger Edge	Rising, Falling, Differential...
Trigger Delay	Pre, Post
Trigger Source	Ch.A, Ch.B
FFT Size	128~4194304
Window Func.	55 types
Window Overlap	0%~99%
Octave Analysis	1/1,1/3,1/6,1/12 ,1/24,1/48,1/96
Freq. Weighting	A, B, C, ITU-R 468

* sound card dependent

Introduction

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-2810F, 2810H, 2815H, etc. It consists of an oscilloscope, a spectrum analyzer, a signal generator, a multimeter, a spectrum 3D plot, a data logger, a LCR meter and a device test plan, all of which can run simultaneously and in real time.

It has been widely used in education, scientific research, audio engineering, electronic engineering, medical diagnosis,

musical instrument inspection, vibration analysis, etc.

Supported ADC/DAC Devices/Drivers

- Sound Card MME driver
- Sound Card ASIO driver
- NI DAQmx Cards



- VT DSO Series

Oscilloscope

View Type

- Waveform for Ch.A and Ch.B
- Waveform for Ch.A + Ch.B
- Waveform for Ch.A - Ch.B
- Waveform for Ch.A × Ch.B
- Lissajous Plot

Digital Filtering

Digital filtering on a data frame can be performed before any other analyses. Supported filters are:

- FFT (Low Pass, High Pass, Band Pass, Band Stop, Arbitrary)
- FIR (Low Pass, High Pass, Band Pass, Band Stop, Arbitrary)
- IIR (Arbitrary)

Record Mode

Under this mode, the acquired data will be written to the hard disk continuously in wave file format. Meanwhile, data analysis and display will still be performed in order to monitor the input signal in real time.

Statistical Data Display

Max, Min, Mean, and RMS values of each data frame will be displayed in the oscilloscope.

Time Stamp

Each data frame will be time stamped with accuracy in minisecond.

Spectrum Analyzer

View Type

- Amplitude/Power Spectrum
- Phase Spectrum
- Auto Correlation Function
- Cross Correlation Function
- Coherence Function
- Transfer Function (Bode Plot)
- Impulse Response

FFT Size vs Record Length

If the FFT size is greater than the record length of a data frame, then zeros will be padded at the end of the data frame during FFT computation.

If the FFT size is less than the record length of a data frame, then the data frame will be split into different segments with the size of each segment equal to the FFT size. The last segment of data will be dropped if its size is not equal to the FFT size. The final result will be obtained by averaging

the FFT results from all segments.

Processing

Intra-Frame Processing

As the name suggests, it is performed within a data frame in frequency domain. It includes:

- Frequency Compensation
- Frequency Weighting (A, B, C, ITU-R 468)
- Remove DC
- Moving Average Smoothing

Inter-Frame Processing

As the name suggests, it is performed among a specified number of adjacent data frames in frequency domain. It includes:

- Peak Hold (2~200 frames, forever)
- Linear Averaging (2~200 frames, forever)
- Exponential Averaging

Parameter Measurement

It is performed after the Intra-Frame and Inter-Frame processes. Parameters that can be measured are:

- THD, THD+N, SINAD, SNR, Noise Level, in a specified frequency band
- IMD (SMPTE/DIN, CCIF...)
- Bandwidth
- Crosstalk
- Harmonics
- Energy in User Defined Frequency Bands
- Peaks

X Scaling

- Linear
- Log
- Octave 1/1, 1/3, 1/6, 1/12, 1/24, 1/48, 1/96

Y Scaling

Relative Mode

- Linear
- dB

Absolute Mode

- Vrms
- dBV
- dBu

- dB
- dBFS

Signal Generator

Waveform

- Sine
- Rectangle (with adjustable duty cycle)
- Triangle
- Saw Tooth
- White Noise
- Pink Noise
- Multi-Tones
- Arbitrary waveform
- MLS, with adjustable length (127~16777215)
- DTMF
- Unit Impulse
- Unit Step
- Musical Scale

Frequency/Amplitude Sweep

- Linear
- Log

Burst Generation

A periodic on/off mask can be configured to mask on/off the output signal. This feature can be used to generate burst-like signal. An option is provided to phase lock each burst.

Fade In/Out

Output linear fade in/out durations can be specified.

Loopback Mode

Loopback is generally used to feed the signal output by the signal generator to the input of the oscilloscope, so that the output signal can be displayed and analyzed in real time.

Hardwired Loopback

It is established via an external cable, to loopback the output signal to the input of the oscilloscope.

Mixer Level Loopback

It is established at the sound card mixer level through the configuration under Windows Control Panel.

Software Level Loopback

- No Loopback
- $iA=oA, iB=oB$

The signal from the output Ch.A is fed into the input Ch.A and the signal from the output Ch.B is fed into the input Ch.B.

- $iA=oA, iB=oA$

The signal from the output Ch.A is fed into both the input Ch.A and Ch.B.

- $iB=oA$

The signal from the output Ch.A is fed into the input Ch.B and the input Ch.A is still available for field input.

- Sync. No Loopback

The start of the signal generator and the start of the oscilloscope are synchronized with timing accuracy in the same order as the sampling rate. The delay between them can be specified. No software loopback is provided.

- Sync. $iB=oA$

This mode is the same as the $iB=oA$ mode, except the synchronization between the signal generator and the oscilloscope as described previously.

- Sync. $iB<--oA$

This mode requires an external cable to feed the signal from the output Ch.A into the input Ch.B. The start of the signal generator and the start of the oscilloscope are synchronized.

Multimeter

View Type

- RMS
- dBV
- dBu
- dB
- dB(A)
- dB(B)
- dB(C)
- Frequency Counter
- RPM (Revolutions Per Minute)
- Counter
- Duty Cycle
- F/V (Freq. Volt. Conversion)
- Cycle RMS
- Cycle Mean

- Vibrometer

Spectrum 3D Plot

It is used to trace the spectrum variation with time. Two types of plots are provided:

- Waterfall Plot
- Spectrogram

Data Logger

It provides long time data logging function for 145 derived variables, including RMS value, peak frequency, sound pressure level, RPM, THD, etc. Up to eight data logger windows can be opened and each window can trace up to 8 variables.

Three logging methods are supported:

- Fastest
Take one record whenever new data are available
- Time Interval
Take one record whenever new data are available and the specified time duration has elapsed since the last update.
- Update Threshold
Take one record whenever new data are available and the change compared with the last update exceeds the specified update threshold.

Device Test Plan

It provides a mechanism to configure and conduct your own device test steps. It takes the advantage of the sound card's (or other ADC/DAC device's) capability of simultaneous input and output, to generate a stimulus to the Device Under Test (DUT) and acquire the response from that device at the same time. Different stimuli can be generated and the response can be analyzed in different ways. The DUT can be marked as Pass or Fail after a sequence of test steps. Device Test Plan supports 14 instructions with

corresponding parameters. Test results (e.g. Gain vs Frequency, Phase vs Frequency, etc.) can be plotted in up to 8 X-Y plots in real time, and a textual test report can be generated.

LCR Meter

It is one of the dedicated Device Test Plans. It is used to measure the value of an inductor, a capacitor or a resistor, or the impedance of a network of them.

Two types of external connections are supported:

- Serial connection for high impedance measurement
- Parallel connection for low impedance measurement

DDP Viewer

Up to 16 resizable windows can be opened, each of which can be configured to display a Derived Data Point. HH, H, L, LL alarm limits can be configured for each DDP.

General Functions

Calibration

The software supports the calibration of input and output channels of the sound card so that absolute values in engineering units can be used for display, analysis or export. It is able to take into account the change of the sound card internal gain setting (e.g. Mic gain, Mic Boost, Line In gain) automatically. It also allows accounting for the external attenuation ratio if an external attenuation circuit is used. It allows the configuration of sensor sensitivities and engineering units.

Graph Operation

Zooming and Scrolling is supported in all graphs, allowing you to investigate the fine details of the data. This is very important when a large amount of data are displayed in one screen.

A cursor reader is provided in each graph to show the x and y readings of the actual measurement point. For Spectrum 3D Plot, the cursor reader supports the readout of x, y, t values of the actual measurement point.

Two markers are provided in each graph to get the x and y readings of the actual measurement points nearest (in horizontal direction) to the points of the mouse clicks.

Five chart types are supported:

- Line
- Scatter
- Column
- Bar
- Step

Line width and colors of the graph are configurable. The data in any graph can be copied into the clipboard as text and later paste into other software such as Microsoft Excel for further analysis. The image of the graph can be copied into the clipboard as Bitmap image and later paste into other software such as Microsoft Word.

Reference Curves

Up to five reference curves can be set for each channel in each graph. The reference curve can be configured by either copying the current curve, or loading a properly formatted text file or a previously saved reference file from the hard disk.

File Import and Export

The collected frame of data can be saved as a wave file (*.wav) or exported as a text file (*.txt). All analysis results can be exported as text files (*.txt). All graphs can be exported as bitmap files (*.bmp) or printed out directly.

A long wave file can be imported frame by frame either manually or automatically.

Wave files with PCM format or properly formatted text file can be imported for analysis.

The signal generated by the signal generator can be saved as a wave file or a text file for a given duration of up to 1000 seconds.

Data Merging and Extraction

Combining data from individual channels of different wave files, and extracting part of data from a wave file are supported.

Save and Load Panel Setting

You can save your preferred instrument panel setting either as default or as a customized panel setting for later use.

Controls/Options Enabling and Disabling

Graphical User Interface items such as menu items, button, combo box, edit box, radio box, check box are enabled/disabled based on context, so as to void any mis-understanding and mis-operation.

Software Redevelopment

- ActiveX Automation
- vtDAQ & vtDAO Interfaces

Multilingual User Interface

Supported languages are English, French, German, Italian, Portuguese, Spanish, Russian, Simplified Chinese, Traditional Chinese, Japanese and Korean.

System Requirement

PC/ Laptop/ NetBook with Microsoft Windows 95/98/ME/2000/XP/Vista/7 or greater. 32 or 64 bit. Screen horizontal resolution is recommended to be equal to or greater than 1024 pixels.

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P601PC Probe Kit

- Maximum Allowable Input Voltage: **±24 V**
- Built-in input protection circuit ensures its output to be less than 3V at all time, provided the input voltage is within the allowable range.
- Three switchable attenuation positions: 1, 2, 3, with input impedance equal to $1k\Omega + Z_{sc}$, $201k\Omega + Z_{sc}$, $10.001M\Omega + Z_{sc}$, respectively. Note that Z_{sc} is the sound card input impedance which ranges from 600Ω to $50k\Omega$ typically.
- Its back end is a RCA plug and can be connected to an ordinary sound card through a stereo-to-2RCA converter or a mono-to-1RCA converter. No converter is required for those sound cards that have RCA jacks for input and output.



Reasons to buy

- Unique software trigger algorithm to ensure no trigger event is missed
- Unique algorithm to ensure super stable waveform display for periodic signals
- Unique algorithm to display peak frequency with sub-FFT-bin-size accuracy
- Super fast screen refresh rate, typically 50 frames/s
- Super flexible in DSP algorithm configuration
- Super flexible in hardware configuration. ADC and DAC devices can be independently chosen.
- Most ergonomically designed GUI
- FREE upgrade in the same license level for life.