

NEW

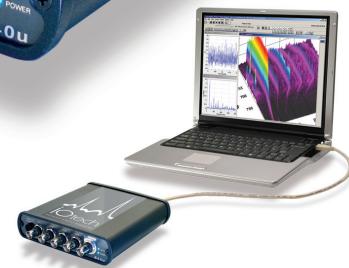
# 600 Series : 640, 650 Models

## 4- or 5-Channel Dynamic Signal Analyzers (DSA)

**iOtech**<sup>®</sup>  
iotech.com

### Common Features

- USB or Ethernet interface
- Dedicated 24-bit, 105.4 kS/s delta sigma ADC per analog input
- 2.1 mA IEPE current source per channel (22V compliance)
- Spurious-free dynamic range of 108 dB (typical)
- AC/DC coupling, software selectable per channel
- TEDS support for accelerometers
- Pseudo-differential input
- Total harmonic distortion of -100 dB (typical)
- Channel-to-channel phase matching of <0.12 degrees at 1 kHz
- 8-bit digital I/O port
- Supported Operating Systems: Windows 2000<sup>®</sup>, Windows Vista<sup>®</sup> x86 (32-bit), and Windows XP<sup>®</sup>
- Support for DASYLab<sup>®</sup>
- Supported by Vibrant Technology MEscope software for Modal Analysis



*Vibration analysis and monitoring has never been easier than with the 600 Series of dynamic signal analyzers and eZ-Series software*

### 640 Models

- 4 analog inputs,  $\pm 10V$  input range ( $\pm 60V$  max without damage)
- 1.0 Hz high-pass filter
- 24-bit delta sigma DAC analog output
- Analog outputs: sine, swept sine, random, burst, arbitrary
- Analog output signal-to-noise ratio: 100 dB (typical)

### 650 Models

- 5 analog inputs,  $\pm 40V$  input range ( $\pm 60V$  max without damage)
- 0.1 Hz high-pass filter

Vibration data acquisition, analysis, and monitoring has never been easier than with the IOtech 600 Series of dynamic signal analyzers and eZ-Series software. More than 30 years of engineering experience in vibration measurements have gone into the design of the 600 Series of DSAs. They come in either USB or Ethernet versions for maximum flexibility. The DSA

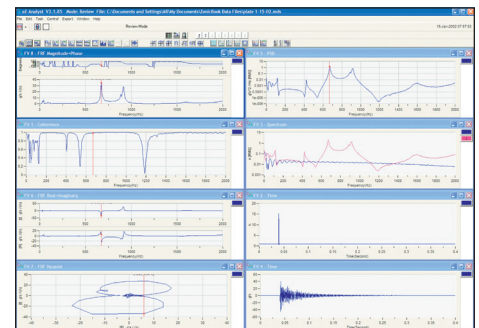
hardware provides signal conditioning and data acquisition, while the eZ-Series PC-based software provides monitoring and analysis functions.

### Hardware Overview

The IOtech 600 Series are 24-bit dynamic signal analyzers with USB or Ethernet interfaces to transfer acquired data to the PC in real time. This means that every data sample can reside on a PC's hard drive, which makes effective waveform recreation and post acquisition analysis.

### Measurement

The spurious-free dynamic range of the 600 Series analog input is 108 dB. The 24-bit delta sigma ADC provides high resolution and excellent AC and DC accuracy. All channels are sampled synchronously and provide better than 0.12° of channel-to-channel phase matching at 1 kHz. The extremely low noise floor and extremely low distortion provide the user with high quality test data.



*eZ-Analyst software with the 600 Series and your PC makes a real-time, portable vibration and acoustic analysis system*

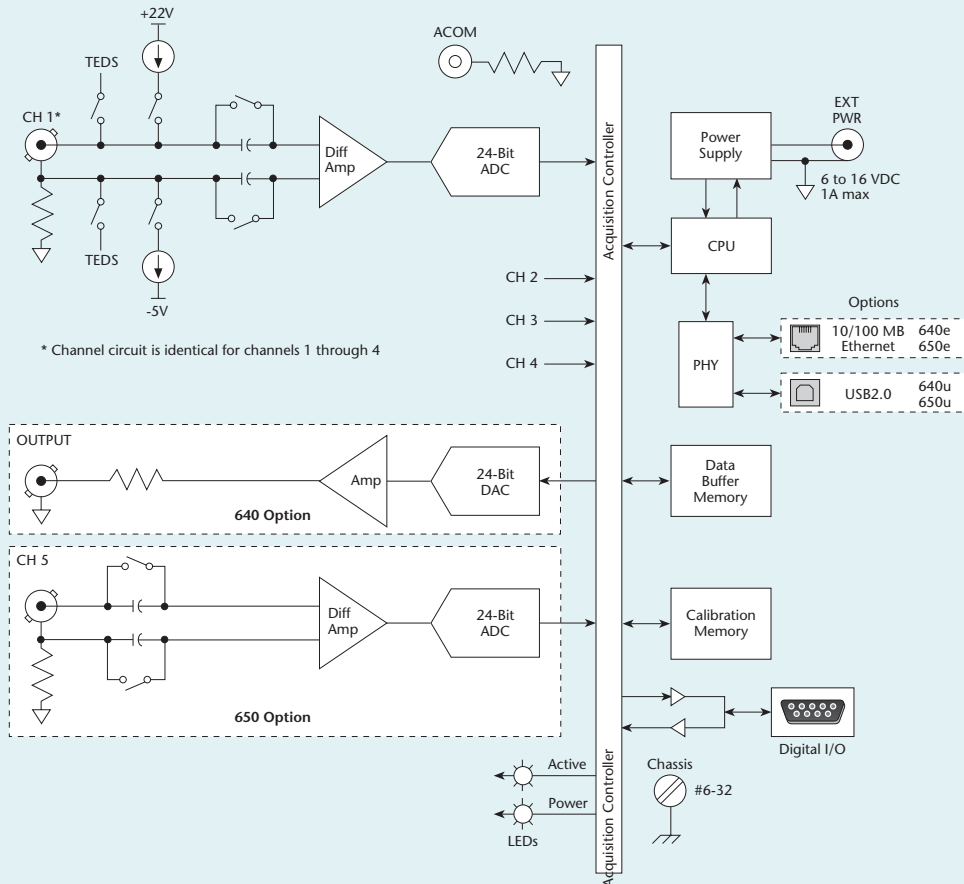
### Analog Inputs

The IOtech 600 Series support a variety of analog input types, including Accelerometer, Velometer, Proximity Probe, Microphone, Tachometer, or other voltage input. The 640 model accepts up to  $\pm 10V$  inputs, while the 650 model can accept up to  $\pm 40V$  inputs. All are rated to withstand up to  $\pm 60V$  maximum without damaging the input. These signals may be either AC or DC coupled.

# 600 Series : 640, 650 Models

## General Information

640 and 650 Series Block Diagram



### Signal Conditioning

The 600 Series supports software selectable AC or DC coupling, and automatically connects the 2.1 mA current source with AC coupling for integrated electronic piezoelectric (IEPE) sensors. All models also supply the current source with a 22V compliance voltage at the input terminals for biasing the IEPE sensors.

All models can be programmed to select IEPE sensors and read sensor calibration information using Transducer Electronic Data Sheets (TEDS). The software can automatically connect to the sensors' EEPROM memory, and retrieve their data sheet.

### Source Output

The 640 model contains one programmable analog output channel that generates continuous or swept sine-wave signals, as well as random, burst, and arbitrary signals. A programmable 24-bit, delta sigma DAC and an internal amplifier stage drives these output signals at 93 kS/s. In addition, it can operate while receiving analog input data. The software synchronizes the signals between the ADC and the DAC within the unit. The analog output signal can drive audio or shaker table amplifiers and can be used for noise, vibration, and harshness (NVH) testing with a typical signal-to-noise ratio of 100 dB.

# 600 Series : 640, 650 Models

## General Information & Specifications

### Power

The 640u and 650u models draw power from either the USB source (PC or USB hub) or an external power source. The 640e and 650e must use external power, either user supplied, or with the included universal AC/DC power adapter. All models may also be powered from a regulated external 5W supply ranging from 6 to 16 VDC.

### PC Connection

The 600 Series DSA comes in two interface versions: one connects to the PC through a 10/100BaseT Ethernet interface, and the other uses a USB 2.0 port.

The 600 Series Ethernet version, the 640e or 650e models, also may be attached to a sufficient wide-band network. The data bandwidth is a function of the analysis rate, number of spectral lines, Nyquist factor, and the number of signals being measured. When measuring continuous signals over multiple channels, however, it is recommended to use a dedicated Ethernet or USB connection between the 600 Series DSA and the PC to ensure the data transfer is not interrupted.

### Software Overview

Four end-user software packages are available for the 600 Series, each tailored to a particular type of vibration measurement and analysis application. Select the packages that best suit your application, and add additional packages as your requirements evolve. These packages support analysis rates from 20 Hz to 40 kHz.

**eZ-Analyst** provides throughput data recording and multiple channel vibration analyses. Time Waveform, Spectrum, Waterfall, FRF, Cross, Transfer Function, Coherence, and Octave analyses are provided. Data acquisition and storage can be triggered based on events or scheduled. Direct export to the most accepted Modal Analysis packages.

**eZ-TOMAS** is a highly sophisticated, yet easy-to-use tool for the monitoring and analysis of single or multiple machines, which allows the user to assess the reliability and operation of his process, and the critical machines pertaining to his process. Notification of faults are displayed locally, but can also be sent via text message or email, allowing the user to be notified of any problem regardless of his location.

**eZ-Balance** is used to balance rotating machinery with up to seven planes. A Toolkit, which includes Split Weight calculations, supports the balance process. The vibration vectors and correction weights are displayed on polar displays. Time and Spectrum plots show the detailed vibration measurements during the balance process.

**eZ-NDT** is used in production applications to determine the quality of production products. Resonance Inspection provides a measure of quality. Spectral limit criteria can be learned by comparing known good and bad samples. Production rates of one part per second are supported.

### Specifications

#### General Specifications

##### Environment

**Operating Temperature**

640u, 650u: -40° to 60°C

640e, 650e: 0° to 50°C

**Humidity:** 0° to 95% RH, non-condensing

**Vibration:** IEC 60068-2-64

**Shock:** IEC 60068-2-27

**Ingress:** IP 40

##### Power Supply

**Maximum Power Draw**

640e, 650e: 4.2W

640u, 650u: 2.5W

**Required Supply Voltage**

640e, 650e: 6.5 to 16 VDC

640u, 650u: 6.0 to 16 VDC

**Power Jack:** Barrel type; 5.5 mm O.D., 2.5 mm I.D.

##### PC Communication

640e, 650e: 10/100BaseT Ethernet

640u, 650u: USB 2.0

##### Dimensions

640, 650: 142.2 mm W x 180.3 mm D x 38.1 mm H (5.6" x 7.1" x 1.5")

##### Weight

640, 650: 0.7 kg (1.5 lbs)

**Warm-Up:** 10 minutes to rated specifications

### Analog Specifications

#### Analog Measurements

**ADC Converter Resolution:** 24 bits

**ADC Converter Type:** Delta-Sigma per channel

**Sample Rates:** Up to 105,468 samples per second

**Sample Rate Accuracy:** ±50 ppm

##### Channels

640: 4 input channels

650: 5 input channels

**Input Connector:** 1 BNC per channel

Input Impedance	640	650
High to ground	200k Ohm    130 pF	800k Ohm    120 pF
Low to ground	1k Ohm	1k Ohm
High to low	201k Ohm	801k Ohm

**Input Coupling:** DC, AC, or AC + IEPE; software programmable per channel basis

**High-Pass Filter (Cutoff)**

640: 1.0 Hz

650: 0.1 Hz

##### Input Ranges

640: ±10V peak

650: ±40V peak

##### Input Protection

**BNC Shell to BNC Center:** ±60V max without damage

**BNC Shell to Earth Ground:** ±5V max without damage

**Over-Range Indication:** Software

**Low-Pass Filter:** Software programmable per channel

**Type:** Anti-aliasing hardware 3-pole 360 kHz, software selectable FIR filter. Any unwanted signals above 27 MHz are lost in the noise floor of 64k FFT.

# 600 Series : 640, 650 Models

## Specifications & Ordering Information

### Amplitude Accuracy

	640	650
AC at 1 kHz	±0.07 dB typ ±0.12 dB max	±0.1 dB typ ±0.15 dB max
DC	±(0.05% of reading + 2 mV)	±(0.2% of reading + 15 mV)

**Amplitude -3 dB:** 0.49 x sample rate

**Amplitude Flatness:** ±0.05 dB typ ±0.10 dB max DC to 20 kHz

**Total Harmonic Distortion:** -100 dB typ 1 kHz, -97 dB typ 10 kHz

**SFDR Including Harmonics:** 108 dB typ DC to 50 kHz

**SFDR (@ -60 dB):** 128 dB typ DC to 50 kHz

**Channel-to-Channel Crosstalk:** <-100 dB at 1 kHz

**Channel-to-Channel Phase Matching**

640e, 640u: <0.04°/kHz + 0.08°

650e, 650u: <0.06°/kHz + 0.1°

**Common Mode Rejection Ratio**

640e, 640u: -70 dB typ -55 dB max at 1 kHz

650e, 650u: -56 dB typ -41 dB max at 1 kHz

**Wideband Noise**

Analysis Frequency (Hz)	Typical Noise (µV rms)	
	640e, 640u <sup>1</sup>	650e, 650u <sup>2</sup>
20	2.4	11
50	3.5	15
100	4.6	20
200	6.2	26
500	9.0	37
1000	12.0	48
2000	16.0	62
5000	23.3	89
10000	31.1	116
20000	41.4	151
40000	55.1	197

1. 640e, 640u: maximum noise @ ≤50°C = 1.4x; @ >50°C = 1.6x (where x is the typical value given in the above table)

2. 650e, 650u: maximum noise @ ≤50°C = 1.4x; @ >50°C = 2.1x (where x is the typical value given in the above table)

**IEPE Bias Source – 640, 650 (Channels 1 to 4)**

**Current:** 2.1 mA, 22V compliance (on/off software programmable per channel)

**Impedance:** >255k Ohm

**IEPE Fault Detection Thresholds:** <1V (short), >20V (open)

**IEPE Fault Indication:** Software indicator, per channel

### Analog Output (640 only)

**Channels:** 1

**Signal Connection:** BNC

**Frequency Range:** DC to 45 kHz (-3.0 dB)

**Frequency Accuracy:** ±50 ppm

**DAC Resolution:** 24 bit

**DAC Update Rate:** 93.75 kS/s

**DAC Type:** delta sigma

**Total Harmonic Distortion:** 1 kHz; -96 dB typ

**Total Harmonic Distortion + Noise:** 1 kHz; -87 dB typ

**Amplitude Settings:** 0 to 7V p-p

**Amplitude Accuracy at 1 kHz:** ±0.05 dB typ ±0.12 dB max

**Amplitude Flatness (DC to 20 kHz):** ±0.02 dB typ ±0.1 dB max

**SNR (DC to 20 kHz):** 100 dB typ 90 dB max

**Maximum Load:** 1k Ohm (50 Ohm with external power)

**Waveform Modes:** Sine, swept sine, random, burst, arbitrary

**Output Impedance:** 50 Ohm

**Calibration Note:** Factory calibration of 640 and 650 is conducted with the units in their standard operating upright horizontal position, with the chassis cover clear of other devices and objects.

### Tachometer Inputs

Any analog input channel may be used as a tachometer input

### Digital I/O Lines

**Channels:** 8 digital I/O, programmable as inputs or outputs on a line by line basis

**Ports:** 1 x 8-bit; each bit is programmable as input or output

**Power-Up Mode:** Inputs pulled low

**Connector:** DB9 female

**Input Modes:** 2 programmable input modes: asynchronous, under program control at any time relative to analog scanning; synchronous with analog scanning

**Input Protection:** -0.6 and +5.6V

**Input Levels**

**Low:** 0 to +0.8V

**High:** +2.0V to +5.0V

**Input Pull-Down Resistor:** 10k Ohm

**Synchronous Sampling:** 105,468 Hz max

**Output Voltage Range:** 0 to +3.3V, may be pulled up to +5V

**Output Resistance:** 100 Ohm

**Output Levels**

**Low:** <0.8V

**High:** >3.0V with no load

**Output Timing:** Outputs are always written asynchronously

## Ordering Information

### Description

Ethernet-based dynamic signal analyzer

Ethernet-based dynamic signal analyzer for rotating machinery and maintenance

USB-based dynamic signal analyzer

USB-based dynamic signal analyzer for rotating machinery and maintenance

### Part No.

640e

650e

640u

650u

### Accessories & Cables

High-speed USB cable, 1 m.

External power supply, 90 to 264 VAC; requires additional cable

USA version

European version

CA-179-1

TR-2U

CA-1

CA-216

### Software (DASYLab drivers included)

Real-time vibration and acoustic analysis software

Rotating machine monitoring and analysis software

Remote access and control client for eZ-TOMAS

Machine balancing software

Resonant inspection software

Lite version, includes all drivers; comes without analysis,

limited module count, and one Layout Window

Basic version, includes all drivers; comes with all

standard modules (except Signal Analysis and Actions),

and one Layout Window

Full version, includes all drivers; comes with all standard

modules, 200 Layout Windows, and Control Sequencer

Pro version, includes all drivers; includes Full version

plus all add-on modules (without third-party modules)

Run-time license for DASYLab

eZ-Analyst

eZ-TOMAS

eZ-TOMAS Remote

eZ-Balance

eZ-NDT

DASYLab LITE

DASYLab BASIC

DASYLab FULL

DASYLab PRO

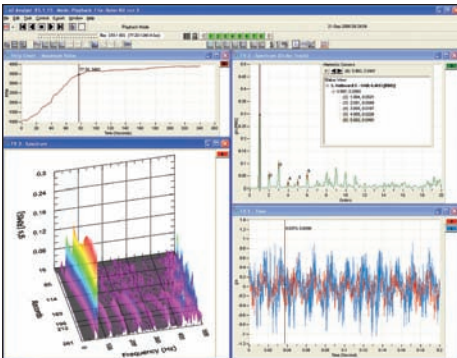
DASYLab RUNTIME

## BUY NOW!

For complete product specifications, pricing, and accessory information, call 1-888-714-3272 (U.S. only) or visit [iotech.com/600series](http://iotech.com/600series).

# eZ-Series Software

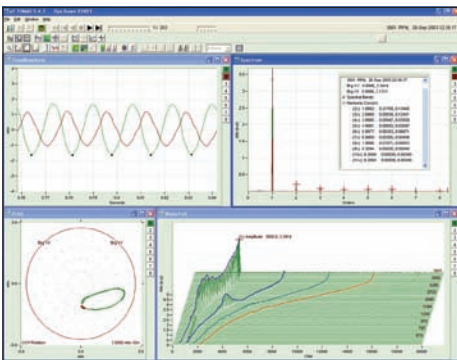
eZ-Analyst, eZ-TOMAS, eZ-Balance, eZ-NDT



## eZ-Analyst

### Real-Time Vibration and Acoustic Analysis Software

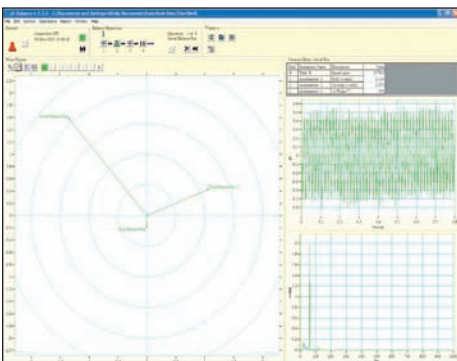
Mechanical engineers and reliability engineers often are responsible for deciding when to repair and refurbish industrial equipment such as mixers, grinders, and pulverizers. Refurbishing too often is not cost effective, but waiting too long for repairs can cause the catastrophic loss of this expensive equipment. eZ-Analyst software working with 600 Series data acquisition hardware allows continuous monitoring of the vibration and acoustic characteristics of industrial equipment. By tracking these parameters over time, the engineer can detect imminent problems and make sound decisions regarding repair schedules.



## eZ-TOMAS & eZ-TOMAS Remote

### Rotating Machine Monitoring and Analysis Software

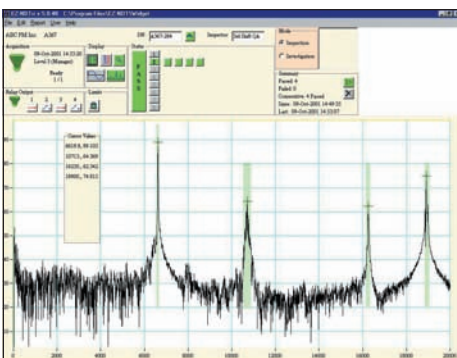
Industrial equipment consists of rotating machinery such as motors, gearboxes, and transmissions. These components are subject to wear over time and require periodic maintenance and repair. Instead of overhauling the complete set of machinery, it is often cost-effective to determine the components that are near the failure point and replace or repair only these. eZ-TOMAS is designed specifically for monitoring rotating machinery and detecting problems with it. For example, it is possible to compare the magnitude and frequency of the vibration in a gearbox to the motor speed and determine if there is a problem in the gearbox. eZ-TOMAS provides an economical solution for monitoring and analyzing rotating machinery, and troubleshooting problems.



## eZ-Balance

### Machine Balancing Software

One of the ways to reduce vibration in rotating machinery is to attach known weights to appropriate locations on the machinery. This technique is similar to placing balance weights on your automotive wheels to eliminate vibration at certain speeds. The challenge is to figure out what weights to use and where to place them. When used in combination with 600 Series data acquisition hardware, eZ-Balance software provides that information.



## eZ-NDT

### Resonant Inspection Software

IOtech's eZ-NDT (non-destructive test) systems provide a fast and inexpensive method of 100% inspection of production parts, such as powder metal, ceramics, and composites. eZ-NDT uses acoustic analysis to identify part variations that are caused by process inconsistencies and defects. eZ-NDT systems apply acoustic energy to your part, monitor its acoustic response, and analyze its resonant frequencies. It then compares the results to the acoustic signature of a known-good part stored in its library. The test takes less than two seconds and requires no special tooling, dyes, chemicals, cleaning, magnetization, or expensive time-consuming visual inspection equipment.