

NEW

# 600 Series : 652u, 655u Models

## 10-Channel Dynamic Signal Analyzers (DSA)

iOtech®  
iotech.com

### Common Features

- USB interface
- 10 analog inputs, ±40V input range (±60V max without damage)
- 4 mA IEPE current source per channel (22V compliance)
- 0.1 Hz high-pass filter
- Dedicated 24-bit, 105.4 kS/s delta sigma ADC per analog input
- 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®, Windows Vista® x86 (32-bit), and Windows XP®
- Support for DASyLab®
- Supported by Vibrant Technology ME'scope software for Modal Analysis (excluding 655u)
- 5 temperature channels (655u only)



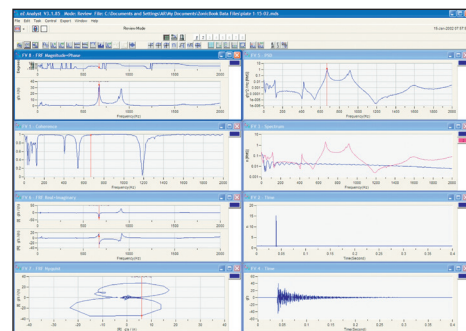
*Vibration analysis and monitoring has never been easier than with the 600 Series of dynamic signal analyzers and eZ-Series software*

### 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

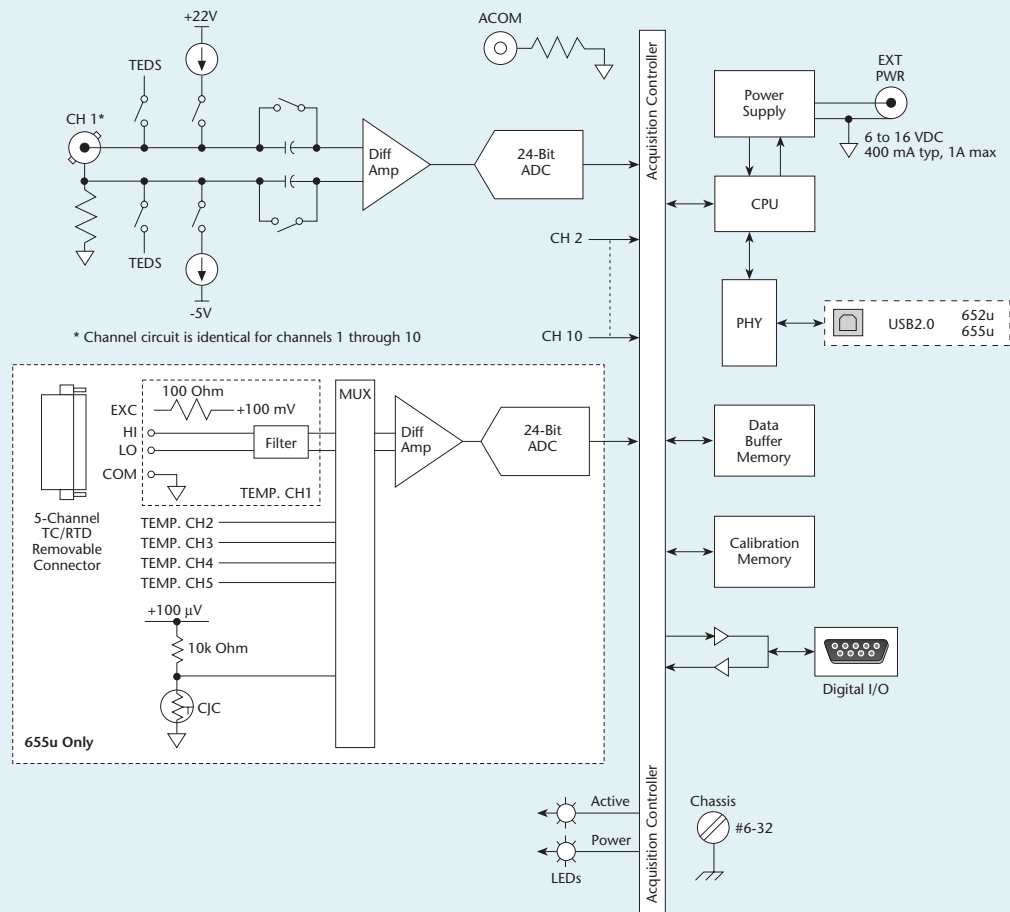
The IOtech 600 Series support a variety of analog input types, including Accelerometer, Velometer, Proximity Probe, Microphone, Tachometer, or other voltage input. The 652u and 655u models can accept up to ±40V inputs. Both are rated to withstand up to ±60V maximum without damaging the input. These signals may be either AC or DC coupled.

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.

# 600 Series : 652u, 655u Models

## General Information

652u and 655u Block Diagram



### Signal Conditioning

The 652u and 655u support software selectable AC or DC coupling, and automatically connects the 4 mA current source with AC coupling for integrated electronic piezoelectric (IEPE) sensors. Both models also supply the current source with a 22V compliance voltage at the input terminals for biasing the IEPE sensors.

All 600 Series 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.

### Power

The 652u and 655u must use external power, either user supplied, or with the included universal AC/DC power adapter. Both models may also be powered from a regulated external 5W supply ranging from 6 to 16 VDC.

### PC Connection

The 652u and 655u connect to the PC through a USB 2.0 port interface. When measuring continuous signals over multiple channels, it is recommended to use a dedicated USB connection between the 600 Series DSA and the PC to ensure the data transfer is not interrupted.

# 600 Series : 652u, 655u Models

## General Information & Specifications

### Software Overview

Three end-user software packages are available for the 652u and 655u. Each is tailored to a particular type of vibration measurement and analysis application. Select the package that best suits 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.

### Specifications

#### General Specifications

##### Environment

**Operating Temperature:** -40° to 60°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

652u: 3.5W  
655u: 4.7W

**Required Supply Voltage:** 6.0 to 16 VDC

**Supply Current:** 1 amp max

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

**PC Communication:** USB 2.0

**Dimensions:** 276.9 mm W x 169.8 mm D x 30.5 mm H (10.9" x 6.7" x 1.2")

**Weight:** 1.2 kg (2.7 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:** 10 input channels

**Input Connector:** 1 BNC per channel

##### Input Impedance

**High to Ground:** 800k Ohm || 120 pF

**Low to Ground:** 1k Ohm

**High to Low:** 801k Ohm

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

**High-Pass Filter (Cutoff):** 0.1 Hz

**Input Ranges:** ±40V peak

##### Input Protection

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

**BNC Shell to Earth Ground:** ±8V max without damage

**Over-Range Indication:** Software

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

655u: To ensure accurate temperature measurements allow the 655u to acclimate itself to ambient temperature prior to acquiring data.

**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 : 652u, 655u Models

## Specifications

655u TC Measurement Uncertainty (1 sigma °C, Ambient 23°C, ±15°C, exclusive of TC wire error)													
TC Type	Measured Temperature (°C)												
	-200	-100	0	100	200	300	400	600	800	1000	1200	1400	1600
B	–	–	–	2.94	1.84	1.48	1.49	1.14	1.10	1.05	1.02	1.04	1.03
E	0.91	0.88	0.88	0.88	0.88	0.88	0.89	0.89	0.90	0.92	–	–	–
J	0.92	0.89	0.88	0.88	0.88	0.89	0.89	0.90	0.90	0.92	0.94	–	–
K	0.95	0.89	0.88	0.88	0.89	0.89	0.90	0.91	0.92	0.94	0.96	–	–
N	1.02	0.91	0.89	0.89	0.89	0.89	0.90	0.91	0.92	0.93	0.95	–	–
R	–	–	1.18	1.04	1.04	1.03	1.01	0.99	2.01	1.01	1.01	1.03	1.05
S	–	–	1.18	1.12	1.04	1.03	1.01	1.03	1.02	1.02	1.04	1.06	1.07
T	0.95	0.90	0.88	0.88	0.88	0.89	0.89	–	–	–	–	–	–
RTD Measurement Uncertainty (1 sigma °C, Ambient 23°C, ±15°C, exclusive of RTD error, assumes 4-wire RTD)													
RTD	0.20	0.21	0.24	0.28	0.29	0.40	0.48	0.66	0.92	–	–	–	–

### Amplitude Accuracy

AC at 1 kHz: ±0.1 dB typ ±0.15 dB max  
 DC: ±(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:** <0.06°/kHz + 0.1°  
**Common Mode Rejection Ratio:** -56 dB typ -41 dB max at 1 kHz

### Wideband Noise

Analysis Frequency (Hz)	Typical Noise (µV rms) 652u, 655u <sup>1</sup>
20	11
50	15
100	20
200	26
500	37
1000	48
2000	62
5000	89
10000	116
20000	151
40000	197

1. 652u, 655u: maximum noise @ ≤50°C = 1.4x; @ >50°C = 2.1x (where x is the typical value given in the above table)

### IEPE Bias Source (Channels 1 to 10)

**Current:** 4.0 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 Temperature Measurements (655u only)

**ADC Converter Resolution:** 24 bits  
**ADC Converter Type:** Delta-Sigma  
**Sample Rate:** 200 msec per conversion  
**Channels:** 5  
**Input Range:** ±100 mV  
**Offset Voltage:** ±5 µV  
**Offset Drift:** Zero  
**Gain Uncertainty:** ±0.05%  
**Gain Drift:** 0.005%/°C  
**Input Impedance:** Each input to analog ground, 100M Ohm  
**Open Sensor Detection Current:** 50 nA  
**Common Mode Range:** ±10V  
**Common Mode Rejection Ratio:** 150 dB typ

**Maximum Voltage (without damage between inputs):** ±5V DC or 5V peak-to-peak AC

**Maximum Voltage (without damage from earth ground to input):** ±17V DC or 34V peak-to-peak AC

**Maximum Voltage (without damage from RTD excitation high to earth ground or high to RTD excitation low):** ±3V DC or rms AC

**Channels may be of mixed type, different TC types, and/or RTD**

### Cold Junction Sensor Accuracy

Ambient Temperature Range (°C)	Max Error (±°C)
-40 to -20	±1.0
-20 to 0	±0.8
0 to 10	±0.4
10 to 45	±0.2
45 to 60	±0.8

### RTD

**Type Supported:** PT100, alpha = 0.00385

**Excitation:** 100 mV through 100 Ohm

**Accuracy:** ±0.2°C; exclusive of RTD error, assumes 4-wire connection

**Connections:** 2, 3, and 4 wire

**Calibration Note:** Factory calibration of 652u and 655u is conducted with the units in their standard operating upright horizontal position, with the chassis cover clear of other devices and objects. For 655u thermocouple calibration, 5-22 AWG wires were used.

### Additional notes pertaining to the 655u and temperature readings.

- To meet the accuracy specifications, the temperature connector plastic shell must be installed.
- Following a drastic (rapid) change in ambient temperature (of the 655u's environment) allow the unit to stabilize to the new ambient before taking temperature readings. If the unit has not stabilized, temperature readings may not meet published specifications.
- A gradual change in ambient temperature (to the 655u's environment) will not result in any significant measurement error.
- Different gauge sizes and the total number of thermocouples used will affect the accuracy of the temperature readings; however, the measurements will remain within specified accuracy. For maximum accuracy, populate all five temperature channels with 5-22 AWG thermocouples.

# 600 Series : 652u, 655u Models

## Specifications & Ordering Information

### 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

10-channel, USB-based dynamic signal analyzer  
10-channel, USB-based dynamic signal analyzer,  
with 5 temperature channels

### Part No.

652u

655u

### Accessories & Cables

Handle for 652u or 655u

High-speed USB cable, 1 m.

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

USA version

European version

HA-210-5-BK

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

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

DASYLab LITE

DASYLab BASIC

DASYLab FULL

DASYLab PRO

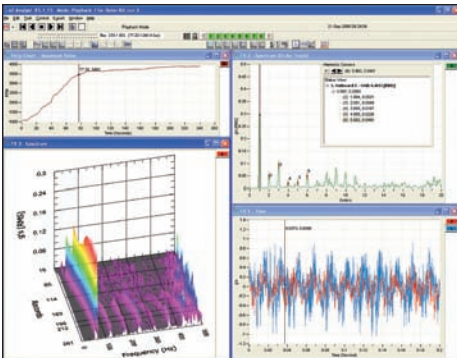
DASYLab RUNTIME

## 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

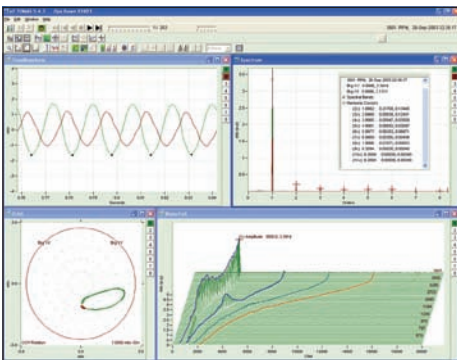
## eZ-Analyst, eZ-TOMAS, eZ-Balance



### eZ-Analyst

#### Real-Time Vibration and Acoustic Analysis Software

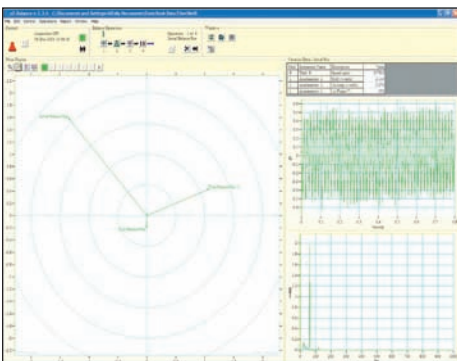
Mechanical engineers and reliability engineers often are responsible for deciding when to repair and refurbish industrial equipment such as mixers, grinders, and pulverizers. Refurbishing too often is not cost effective, but waiting too long for repairs can cause the catastrophic loss of this expensive 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.