600 Series

Dynamic Signal Analyzer (DSA)

NEW

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Common Features

- 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 IO port
- Supported Operating Systems: Windows 2000®, Windows Vista® x86 (32-bit), and Windows XP®
- Supported by Vibrant Technology ME'scope software for Modal Analysis (excluding 655u)

640 Models

- USB or Ethernet interface
- 4 analog inputs, ±10V input range (±60V max without damage)
- 2.1 mA IEPE current source per channel (22V compliance)
- 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

- USB or Ethernet interface
- 5 analog inputs, ±40V input range (±60V max without damage)
- 2.1 mA IEPE current source per channels 1-4 (22V compliance)
- 0.1 Hz high-pass filter

652u Model

- USB interface
- 10 analog inputs, ±40V input range (±60V max without damage)
- 4 mA IEPE current source per channels 1-10 (22V compliance)
- 0.1 Hz high-pass filter

RoHS

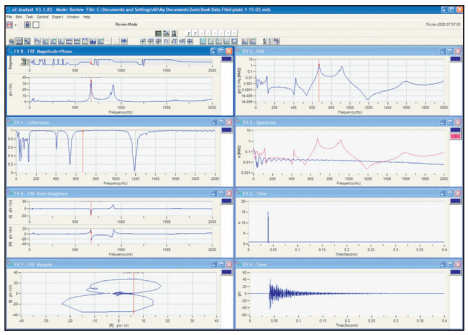
RoHS

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

655u Model

- USB interface
- 10 analog inputs, ±40V input range (±60V max without damage)
- 4 mA IEPE current source per channels 1-10 (22V compliance)
- 0.1 Hz high-pass filter
- 5 temperature channels

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.



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

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.

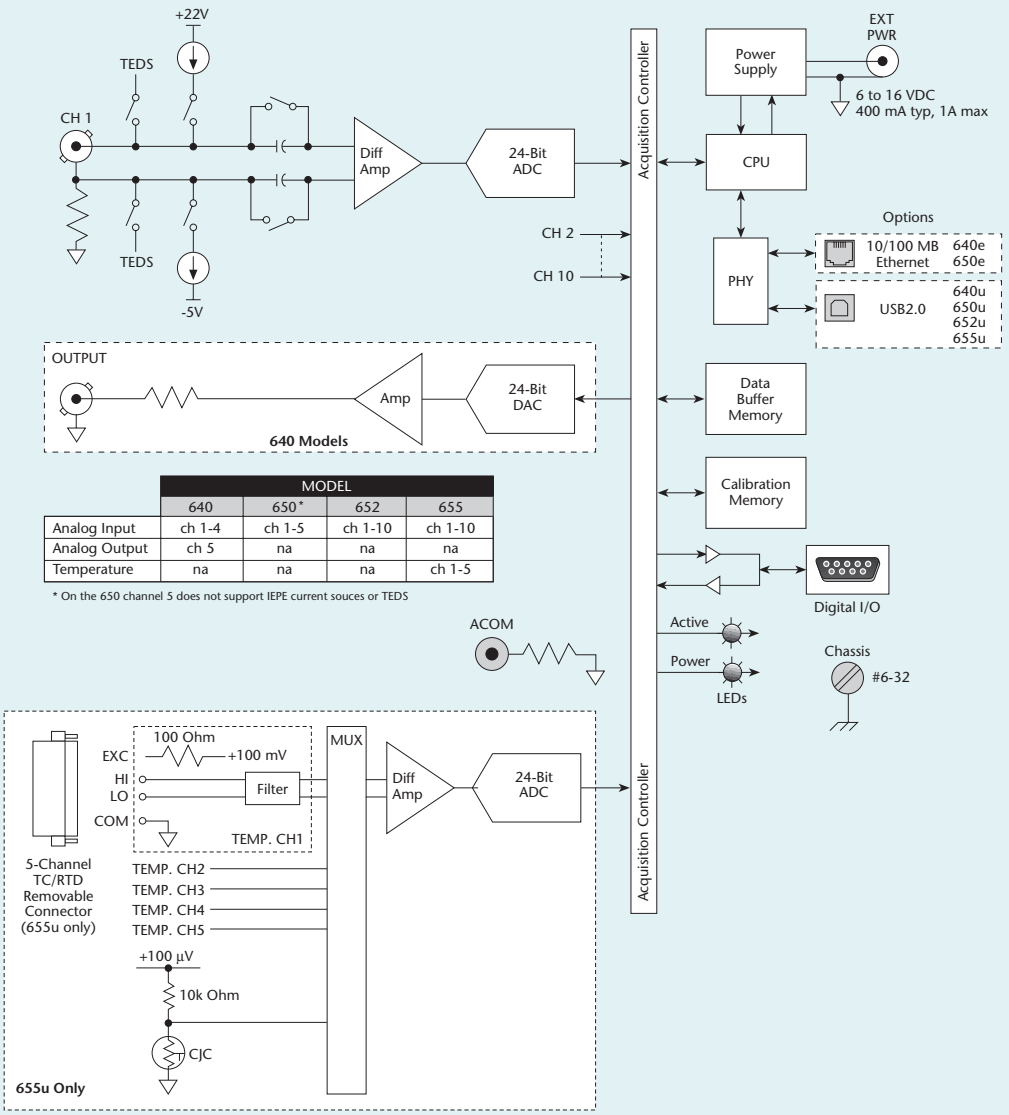
Measurement

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.

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 ±10V inputs, while the 650, 652, and 655 models can accept up to to ±40V inputs. All are rated to withstand up to ±60V maximum without damaging the input. These signals may be either AC or DC coupled.

600 Series Block Diagram



	MODEL			
	640	650*	652	655
Analog Input	ch 1-4	ch 1-5	ch 1-10	ch 1-10
Analog Output	ch 5	na	na	na
Temperature	na	na	na	ch 1-5

* On the 650 channel 5 does not support IEPE current souces or TEDS

Signal Conditioning

The 600 Series supports software selectable AC or DC coupling, and automatically connects the 2.1 mA (640, 650), or 4 mA (652u, 655u) 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. Additional advantages include detecting over-voltage and open or shorted inputs for IEPE sensors.

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.

Power

The 640u and 650u models draw power from either the USB source (PC or USB hub) or an external power source. The 640e, 650e, 652u, and 655u 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.

* Not compatible with 652u and 655u models

Specifications

General Specifications

Environment
- **Operating Temperature**
  - **640u, 650u, 652u, 655u:** -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
  - **652u:** 3.5W
  - **655u:** 4.7W
- **Required Supply Voltage**
  - **640e, 650e:** 6.5 to 16 VDC
  - **640u, 650u, 652u, 655u:** 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, 652u, 655u:** 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")
- **652u, 655u:** 276.9 mm W x 169.8 mm D x 30.5 mm H (10.9" x 6.7" x 1.2")

Weight
- **640, 650:** 0.7 kg (1.5 lbs)
- **652u, 655u:** 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
- **640:** 4 input channels
- **650:** 5 input channels
- **652u, 655u:** 10 input channels

Input Connector: 1 BNC per channel

Input Impedance	640	650/652u/655u
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, 652u, 655u:** 0.1 Hz

Input Ranges
- **640:** ±10V peak
- **650, 652u, 655u:** ±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
Specifications

655u TC Measurement Uncertainty (1 sigma ˚C, Ambient 23˚C, ±15˚C, exclusive of TC wire error)													
	Measured Temperature (˚C)												
TC Type	-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

	640	650/652u/655u
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, 652u, 655u: <0.06˚/kHz + 0.1˚
Common Mode Rejection Ratio
640e, 640u: -70 dB typ -55 dB max at 1 kHz
650e, 650u, 652u, 655u: -56 dB typ -41 dB max at 1 kHz
Wideband Noise

Analysis Frequency (Hz)	Typical Noise (µV rms) 640e, 640u[1]	650e, 650u, 652u, 655u[2]
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, 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
640, 650 (Channels 1 to 4)
Current: 2.1 mA, 22V compliance (on/off software programmable per channel)
Impedance: >255k Ohm
652u, 655u (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 was conducted with the units in a standard upright position, with the chassis cover clear of other devices and/or objects. For 655u thermocouple calibration, 5-22 AWG wires were used. For maximum accuracy, all five channels should be populated with 22 AWG thermocouples; different gauge sizes and number of thermocouples will increase errors; however the measurements will still be within the specified accuracy. To meet the accuracy specifications, the temperature connector's plastic shell must be installed. Slowly changing ambient temperatures cause immeasurable errors, but drastic, rapid changes may require some time for the unit to stabilize.

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

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	Part No.
Ethernet-based dynamic signal analyzer	640e
Ethernet-based dynamic signal analyzer for rotating machinery and maintenance	650e
USB-based dynamic signal analyzer	640u
USB-based dynamic signal analyzer for rotating machinery and maintenance	650u
10-channel, USB-based dynamic signal analyzer	652u
10-channel, USB-based dynamic signal analyzer, with 5 temperature channels	655u

Accessories & Cables

Handle for 652u or 655u	HA-210-5-BK
High-speed USB cable, 1 m.	CA-179-1
External power supply, 90 to 264 VAC; requires additional cable	TR-2U
USA version	CA-1
European version	CA-216

Software (DASYLab drivers included)

Real-time vibration and acoustic analysis software	eZ-Analyst
Rotating machine monitoring and analysis software	eZ-TOMAS
Remote access and control client for eZ-TOMAS	eZ-TOMAS Remote
Machine balancing software	eZ-Balance
Resonant inspection software	eZ-NDT
Lite version, includes all drivers; comes without analysis, limited module count, and one Layout Window	DASYLab LITE
Basic version, includes all drivers; comes with all standard modules (except Signal Analysis and Actions), and one Layout Window	DASYLab BASIC
Full version, includes all drivers; comes with all standard modules, 200 Layout Windows, and Control Sequencer	DASYLab FULL
Pro version, includes all drivers; includes Full version plus all add-on modules (without third-party modules)	DASYLab PRO
Run-time license for DASYLab	DASYLab RUNTIME

BUY NOW!

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