MEGGITT

DATA SHEET

Vibro-Meter®

TSU151 precision signal generator

CE

KEY FEATURES AND BENEFITS

- Two-channel signal/function generator
- Direct digital synthesis (DDS) for high resolution and accuracy
- Voltage and charge outputs
- Sine, square, triangle and sawtooth signals
- Pulse (speed/ratio), single-pulse, odd-pulse and sweep functions
- Dynamic (AC) voltage range: 0 to 10 V PEAK
- Static (DC) voltage range: ±10 V_{DC}
- Charge output range: 0 to 10000 pC PEAK
- Wide frequency range: up to 100 kHz
- 40 memories to save and recall settings
- Battery operated for portability
- Compact and rugged

APPLICATIONS

- Functional testing of measurement chains with voltage-based or charge-based (piezoelectric) sensors, and of monitoring and protection systems
- In-situ measurement chain and monitoring system calibration and testing
- Suitable for commissioning and maintenance applications, including the rapid identification of faulty system components

DESCRIPTION

The TSU151 precision signal generator is a two-channel signal/function generator using direct digital synthesis (DDS) for high resolution and accuracy.

The TSU151, also known as transducer simulator unit, is a multi-purpose instrument that generates voltage and charge signals over a wide range of frequencies to make calibration and testing easier and faster. With two digitally synthesised channels (outputs) capable of producing several

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DESCRIPTION *(continued)*

types of signals, pulses and sweep functions, the TSU151 has the accuracy and flexibility to calibrate and test all types of measurement and monitoring system components from measurement chains to monitoring and/or protection systems such as VM600 and VibroSmart®.

For example, the TSU151 precision signal generator can:

- Act as a voltage generator to emulate/replace a vibration sensor such as a CE6xx or PV6xx, in order to test measurement chains including components such as junctions boxes, cabling and galvanic separation.
- Act as a charge generator to emulate/replace a piezoelectric sensor such as a CAxxx or CPxxx, in order to test measurement chains including components such as signal conditioners, cabling and galvanic separation.
- Act as a voltage generator to emulate/replace a measurement chain providing a voltage output, in order to test monitoring system cabling/ connections and functionality such as sensor/ measurement chain OK levels, alarm levels, filters and so on.

For specific applications, contact your nearest Meggitt representative.

SPECIFICATIONS

Channel A

Sine wave signal

Voltage range (0.1 Hz to 100 kHz)	: 0 to 9.9999 V PEAK
Voltage accuracy (10 mV to 10 V)	
• *10 Hz to 20 Hz*	: 0.15% ±0.1 mV of setting
• *20 Hz to 30 kHz*	: 0.05% ±0.1 mV of setting
• *30 kHz to 50 kHz*	: 0.07% ±0.1 mV of setting
• *50 kHz to 80 kHz*	: 0.08% ±0.1 mV of setting
• *80 kHz to 100 kHz*	: 0.10% ±0.1 mV of setting
Charge range (10 Hz to 100 kHz)	: 1 to 9999.9 pC PEAK
Charge accuracy (10 to 10000 pC)	
• *10 Hz to 30 kHz*	: 0.20% ±0.1 pC of setting
Resolution	: 0.1 mV or 0.1 pC
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range	: 0.1 to 99999.9 Hz
Distortion	
• *10 Hz to 50 kHz*	: <0.5%
• *50 kHz to 100 kHz*	: <3.0%
Frequency accuracy	
• *3 Hz to 100 kHz*	: ±0.005% of setting
Variable phase (all Channel A wave signals)	: 0 to 360°

SPECIFICATIONS *(continued)*

Square wave signal

Voltage range	: 0 to 9.9999 V PEAK
Charge range	: 0 to 9999.9 pC PEAK
Resolution	: 0.1 mV or 0.1 pC
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range	: 0.1 Hz to 20 kHz
Frequency accuracy	
• *3 Hz to 100 kHz*	: ±0.005% of setting
Rise/fall time (10 to 90%)	: ≤3.0 µs
Asymmetry	: <3% at 10 kHz
Overshoot	: <2%
Accuracy	: 0.1% typical, 0.25% maximum of setting

Triangle wave and sawtooth wave signals

Voltage range	: 0 to 9.9999 V PEAK
Charge range	: 0 to 9999.9 pC PEAK
Resolution	: 0.1 mV or 0.1 pC
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range	: 0.1 Hz to 20 kHz
Frequency accuracy	
• *3 Hz to 100 kHz*	: ±0.005% of setting
Accuracy	: 0.1% typical, 0.25% maximum of setting

DC output – standard

Voltage range	: ±9.9999 V_{DC}
Voltage accuracy	: 0.05% ±0.1 mV of setting
Resolution	: 0.1 mV

Note: The standard DC output can be generated alone or simultaneously with a wave signal (AC signal) in order to provide an offset.

DC output – microvolt

Voltage range	: ±1 µV to ±99.999 mV_{DC}
Voltage accuracy	: 0.05% ±5 µV of setting
Resolution	: 0.1 µV

Note: The microvolt DC output is generated under closed-loop control in order to ensure accuracy. Microvolt accuracy is based on use of special RG58/U coaxial cable. At low microvolt signal levels, connector metal dissimilarities can cause false readings.

Connectors

Type

• *CHAN A Volts*	: Channel A voltage signal. BNC connector (female).
• *CHAN A PC DE*	: Channel A charge signal – differential output. 3-pin MIL-C/DTL-5015 type connector (MS310x).
• *CHAN A PC SE*	: Channel A charge signal – single-ended output. Microdot 10-32 type connector.
Impedance (connector)	: 50 Ω
Recommended cable assemblies	: See **Accessories on page 7**

SPECIFICATIONS *(continued)*

Channel B

Sine wave signal

Voltage range (0.1 Hz to 100 kHz)	: 0 to 9.9999 V PEAK
Voltage accuracy (10 mV to 10 V)	
• *10 Hz to 20 Hz*	: 0.15% ±0.1 mV of setting
• *20 Hz to 30 kHz*	: 0.05% ±0.1 mV of setting
• *30 kHz to 50 kHz*	: 0.07% ±0.1 mV of setting
• *50 kHz to 80 kHz*	: 0.08% ±0.1 mV of setting
• *80 kHz to 100 kHz*	: 0.10% ±0.1 mV of setting
Resolution	: 0.1 mV
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range	: 0.1 to 99999.9 Hz. Note: Channel B frequency can also be configured as a ratio of the Channel A frequency. See **Pulse (speed/ratio) function on page 5**.
Distortion	
• *10 Hz to 50 kHz*	: <0.75%
• *50 kHz to 100 kHz*	: <3.0%
Frequency accuracy	
• *3 Hz to 100 kHz*	: ±0.005% of setting
Variable phase (all Channel B wave signals)	: 0 to 360°. Note: Channel B frequency can also be configured as a ratio of the Channel A frequency.

Note: Channel B sine wave signal specifications are the same as for Channel A, except for distortion (10 Hz to 50 kHz) and that Channel B does not support a charge signal.

Square wave signal

Voltage range	: 0 to 9.9999 V PEAK
Resolution	: 0.1 mV
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range	: 0.1 Hz to 20 kHz
Frequency accuracy	
• *3 Hz to 100 kHz*	: ±0.005% of setting
Rise/fall time (10 to 90%)	: ≤3.0 µs
Asymmetry	: <3% at 10 kHz
Overshoot	: <2%
Accuracy	: 0.1% typical, 0.25% maximum of setting

Note: Channel B square wave signal specifications are the same as for Channel A except that Channel B does not support a charge signal.

Triangle wave and sawtooth wave signals

Voltage range	: 0 to 9.9999 V PEAK
Resolution	: 0.1 mV
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range	: 0.1 Hz to 20 kHz
Frequency accuracy	
• *3 Hz to 100 kHz*	: ±0.005% of setting
Accuracy	: 0.1% typical, 0.25% maximum of setting

Note: Channel B triangle wave and sawtooth wave signal specifications are the same as for Channel A except that Channel B does not support a charge signal.

SPECIFICATIONS *(continued)*

Pulse (speed/ratio) function

Signal type	: Sine, square, single pulse or odd pulse
Voltage range	: 0 to 9.9999 V PEAK
Resolution	: 0.1 mV
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range (ratio)	: 0.1 to 100 times the Channel A frequency, in steps of 0.1

Single-pulse function

Signal type	: 1-cycle sine or ½-cycle square (TTL)
Voltage range	: 0 to 9.9999 V PEAK
Resolution	: 0.1 mV
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Pulse duty cycle	: 3 to 100%
Frequency range (fixed)	: 1 Hz to 100 kHz
Frequency range (ratio)	: 0.1 to 100 times the Channel A frequency, in steps of 0.1

Odd-pulse function

Signal type	: Long (larger) or short (smaller)
Signal size	: 0 to 999% of base pulse
Number of base pulses between odd pulse	: 1 to 100
Voltage range	: 0 to 9.9999 V PEAK
Resolution	: 0.1 mV
Qualifier/rectifier type	: RMS, PEAK or PK-PK
Frequency range (fixed)	: 1 to 99999.9 Hz
Frequency range (ratio)	: 0.1 to 100 times the Channel A frequency, in steps of 0.1

Sweep function

Sweep time	: 1 to 999 s (16.6 min)
Sweep time step	: 1 s
Configurable options	: Start frequency, stop frequency and sweep time
User controls	: Start (go), pause and cancel
Channels	: A alone or A and B together

Note: Channel B is swept synchronously with Channel A if the Channel B frequency is configured as a ratio of the Channel A frequency. The phase between Channel A and Channel B is preserved during a sweep.

Connectors

Type

• *CHAN B*	: Channel B voltage signal. BNC connector (female).
Impedance (connector)	: 50 Ω

SPECIFICATIONS *(continued)*

Electrical

Power source	: Battery operated. Four rechargeable NiMH AA (LR6 / 15A) batteries.
Operating time	: Up to 6 hours. Note: Battery life varies depending upon the type of signals being generated and the loads that are being driven.
Battery charger	: 115/230 V_{AC}, 50-60 Hz, 400 mA input. 9 V_{DC}, 1.5 A output.

Environmental

Temperature range : 0 to 50°C (32 to 122°F)

Note: Specifications are stated at 25°C (77°F) under no-load conditions, after a 30 minute (minimum) warm-up time.

Approvals

Conformity	: CE marking, European Union (EU) declaration of conformity
Environmental management	: RoHS compliant (2002/95/EC)

User interface

Display

Display : Backlit black and white LCD display.
4-lines of 18-characters (128 × 64 pixels).

Controls

Keypad : 16-button spill-proof keypad:
- 12 data entry keys (0-9, backspace, decimal separator, on/off).
- 4 function ("soft") keys that depend on the operating mode, defined by displayed prompts.

Memory : 40-memory locations to save and recall settings.
Note: Saving and recalling frequently used configurations reduces set-up time and can help to ensure consistency between tests.

Connectors

Battery charger port	: Used to recharge the internal NiMH batteries. The TSU151 can also be continuously operated using power provided via this connector.
Communications port	: Used to remotely control and program the TSU151 using optional software. USB 1.0 Type-A receptacle (socket).

Physical

Dimensions (height × width × depth)	: 19 × 11 × 5.7 cm (7.5 × 4.25 × 2.25")
Weight	: 0.8 kg (1.8 lb) approx.

ORDERING INFORMATION

To order please specify

Type	Designation	Ordering number (PNR)
TSU151	Precision signal generator	957.09.05.1510

Note: The TSU151 precision signal generator is supplied with a protective case.

ACCESSORIES

To order please specify

Type	Designation	Ordering number (PNR)
TSU151 output cable	Differential charge signal cable assembly. 1.5 m (5 ft) low-noise cable with a 3-pin MIL-C/DTL-5015 type connector (MS310x) and flying leads with crimped contacts.	957.18.40.1510

Note: The MIL-C/DTL-5015 type connector connects to the TSU151 precision signal generator; the flying leads with crimped contacts connect to a measurement chain or monitoring system.

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