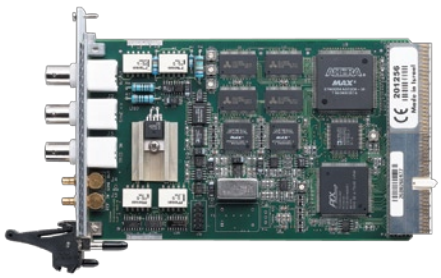
TE-5201

100 MS/s Arbitrary Waveform Generator



Features

- **100 MS/s clock**
- **10 digits resolution**
- **Multiple instrument synchronization**
- **14-bit vertical resolution**
- **2 MS memory depth**
- **Ultra fast waveform downloads using DMA**
- **Low phase noise carrier**
- **Internal trigger generation**
- **Frequency agility: FSK, ramped FSK, sweep, FM**
- **Sequence generator controls 128 k segments**

Operating Systems

• Windows Vista/XP/2000/2003

Recommended Software

• ARBDetector

Introduction

The TE-5201 is a 100 MS/s, full performance, arbitrary waveform generator on a 3U PXI form factor. The single channel AWG generates waveforms up to 2 MS in length. The clock in/clock out connector provides a synchronized platform for up to six plug-in arbitrary generators, as well as for other plug-in instruments. Built in sequencing technology links up to 4096 memory segments and repeats each segment up to 32 k times.

Specifications

Multiple Instrument Synchronization

- Description: Multiple instruments can be connected together and synchronized to provide multi-channel synchronization
- Sample Clock
  - · Source: From Master card to slave boards through the local bus
  - · Range & Resolution: Same as Sample Clock range and resolution
  - · Initial Skew: < 15 ns to the first master; 15 ns cumulative to additional slaves
- Sample Clock: Internal
  - · Range: 50 S/s to 100 MS/s
  - · Resolution: 10 digits limited by 1 μHz
  - · Accuracy: Same as reference
  - · Stability: Same as reference
    - Standard
      System clock > 0.01% (100 ppm)
    - Option
      System clock > 0.0001% (1 ppm TCXO) initial tolerance over a 19°C to 29°C temperature Range; 1 ppm/ °C below 19°C and above 29°C ; 1 ppm/year aging rate
    - External
      10 MHz TTL, 50% ±2% duty cycle

Sample Clock Modulation

- FM
  - · Description: Sample clock can be frequency modulated by internal waveforms that are resident in internal memory (fixed waveforms)
  - · Modulation Source: Internal sine square, triangle and ramp
  - · Modulation Freq. Range: 2 mHz to 100 kHz
    - Resolution: 10 digits
    - Accuracy: 0.1%
  - · Peak Freq. Deviation: DC 50 MHz
  - · Advance: Automatic, triggered, gated or software command
  - · Marker
    - Output and level same as SYNC output.
    - Position: Fixed at carrier frequency

FM-Downloaded Arbitrary Waveforms

- Description: Sample clock can be frequency modulated arbitrary waveforms that are downloaded by the user (user waveforms)
- Modulation Source: User waveform, any shape, 10 to 20000 waveform points
- Mod. Sample Clock Range: 1 mS/s
  - · Resolution: 7 digits
  - · Accuracy: 0.1%
- Peak Sample Clock Dev: DC to100 MHz
- Advance: Automatic, triggered, gated or software command
- Marker:
  - · Output and Level: Same as SYNC output
  - · Position: Programmable for selected sample clock frequency
- Waveform Download: 5 M points per second.

FSK

- Description: Current segment is sampled continuously. External low TTL level programs carrier sample clock, external high TTL level programs shifted sample clock frequency. Sample clock changes coherently between frequencies. FSK operates in arbitrary waveforms only.
- Carrier Sample Clock Range: 50 S/s to 100 MS/s
- FSK Stimuli
  - · External: Front panel Trigger input BNC
  - · Low level = carrier sample clock
  - · High level = hop frequency
- Frequency: Ranges from 10 MHz to DC
- Internal: Same as internal trigger range
- FSK Delay: Minimum 1 waveform cycle +50 ns

Ramped FSK

- Description: Same as FSK except carrier sample clock ramps to shifted frequency at a rate defined by the ramp time parameter. External low TTL level programs carrier sample clock, external high TTL level programs shifted frequency
- Ramp Time Range 10 μs to 1 s, 3 digits, ±0.1%

Sweep

- Description: Sample clock sweeps continuously from start to stop, at a rate defined by the sweep time. More complex sweep modes and types can be generated using the FM mode in conjunction with the FM composer program
- Type: Linear or logarithmic
- Direction: Up or down, depending on the start and stop setting
- Range: 50 mS/s to 100 MS/s
- Time: 1 ms to 1000 s, 7 digits, ±0.1%
- Advance: Automatic, triggered, gated or software command
- Marker
  - · Output and Level: Same as SYNC output.
  - · Position: Programmable for selected frequency

Operating Modes

- Normal: Continuous waveform is generated
- Triggered: Each input cycle generates a single output cycle
- Gated: External signal enables generator.
  First output cycle synchronous with the active slope of the triggering signal. Last cycle of output waveform always completed
- External Burst: Preset number of up to 128 k cycles stimulated by an internal, or external.
  This mode is not available in Sequencer mode

Trigger Sources

- External
  - · Input: Front panel BNC
  - · Level: TTL
  - · Slope Positive or negative, programmable
  - · Frequency: 5 MHz to DC
- Internal
  - · Range: 100 mHz to 2 MHz
  - · Resolution: 7 digits
  - · Accuracy: 0.1%
- Backplane: TTL Trig0 through TTL Trig7, STAR
- Software: SCPI command

System Delay

- Trigger to waveform out: 1 Sample Clock +120 ns

Standard Waveforms Library

- Waveforms: Sine, Triangle, Square, Pulse, Ramp, Sinc, Gaussian Pulse, Exponential decay/Rise Pulse, Noise, DC
- Frequency Range: Waveform dependent

Arbitrary Waveform

- Waveform Memory: 1 M points, 2 M points optional
- Memory Segmentation
  - · Number of Segments: 1 to 64 K (128 K with 2 Mb option)
  - · Min Segment Size: 16 points
  - · Memory Interleave: 4 (All trace lengths must be multiples of 4)
  - · Vertical Resolution: 14 bits (16,384 points)
- Sine Wave Performance
  Sine wave performance is measured using the maximum sample clock rate, at 5 Vpp, the maximum amplitude resolution of the DAC (14-bit) and without filters. Spectrum analyzer settings: Start frequency = 0 MHz; stop frequency = 50 MHz (Nyquist frequency)
- Sine wave Total Harmonic Distortion: 0.3% to 1 MHz
- Harmonics and non-related spurious
- Below 10 MHz
  - · <-55 dBc for carrier frequencies <1 MHz
  - · <-40 dBc for carrier frequencies <5 MHz
  - · <-25 dBc for carrier frequencies <25 MHz

Sequenced Arbitrary Waveform

- Operation: Permits division of the memory bank into smaller segments. Segments may be linked, and repeated in user-configurable fashion to generate extremely long waveforms
- Advance Modes
  - · Automatic Sequence Advance: No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table. Stepped Sequence Advance: Current segment is sampled con tinuously, external trigger advances to next programmed segment. Control input is TRIG IN connector
  - · Single Sequence Advance: Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment. Control input is the TRIG IN connector
  - · Mixed Sequence Advance: Each step of a sequence can be programmed to advance either a) automatically (Automatic Sequence Advance), or b) with a trig ger (Stepped Sequence Advance)
- Advance Source: External, internal, or soft trigger
- Sequencer steps from: 1 to 4096
- Segment loops from: 1 to 128 k

Outputs

- Number of Output Channel: 1
- Waveform Output
  - · Connector: Front panel BNC
  - · Stand-by: Output Off or Normal
  - · Impedance: 50 Ω, ±1%
  - · Protection: Protected against temporary short to case ground
  - · Amplitude:
    - Range: 80 mVpp to 8 Vpp, at 50 Ω load; 160 mVpp to 16 Vpp, for open circuits
    - Resolution: 3.5 digits
    - Accuracy (1 kHz):
    - ±(1%+25 mV), 1.000 V to 10 Vpp
    - ±(1%+5 mV), 80 mV to 999.9 mVpp
  - · Offset: Offset is attenuated with amplitude
    - Range: 0 to ±3.6 V, amplitude dependent
    - Resolution: 22 mV
- Accuracy
  - · ±4 V window ±(1% of reading +1% if amplitude +2 mV)
  - · ±400 mV window ±(1% of reading +1% if amplitude +200 μV)
  - · Filters: 25 MHz and 50 MHz, 7-pole elliptic

Square Wave, Pulse

- Rise/Fall time:<10 ns,10% to 90% of amplitude
- Aberration: < 5%
- SYNC/Marker Output Description: Provides dual functionality. All functions and modes, this output generates sync. pulse, which is synchronous with the output wave form. In FM and sweep modes only, this output generates a marker having properties similar to the sync pulse output
- Connector: Front panel BNC
- Impedance: 50 Ω, ±1%
- Level: > 2 V into 50 Ω, 4 V nominal into 10 kΩ
- Protection: Protected against temporary short to case ground
- Position: Point 0 to n, Programmable with 4-point resolution

Sine Output

- Description: An output that is directly derived from the sample clock generator and has an output frequency equal to the programmed sample clock frequency. This output generates sine waveforms that corresponds to sample clock setting, including modulated waveform, such as FM, sweep and FSK
- Connector: Front panel SMB
- Impedance: 50 Ω, ±1%
- Level: 1 V into 50 Ω
- Protection: Protected against temporary short to case ground
- Source: Sample clock frequency
- Frequency Range and Resolution: Same as Sample clock
- Flatness: -3 dB at 100 MHz
- Total Harmonic Distortion: <40 dBc to 1 MHz
- Harmonics & non-related spurious: <50 dBc to 10 MHz
  <38 dBc to 100 MHz

Trigger Input

- Connector: Front panel BNC
- Threshold Level: TTL
- Slope: Positive or negative going edge
- Impedance: 10 k., ±5%
- Minimum Pulse Width: 20 ns

10 MHz Reference Input

- Connector: Front panel SMB
- Threshold Level: TTL
- Impedance: 10 kΩ, ±5%
- Duty Cycle: 50%, ±5%

Ordering Information

■ **TE-5201**
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