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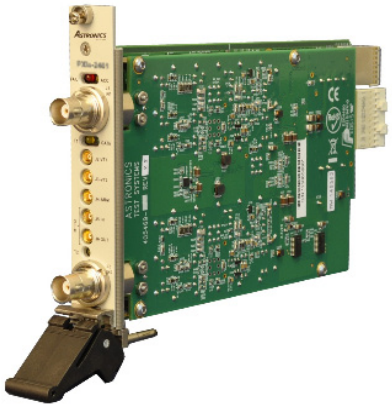
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PXIe-2461

Universal Counter/Timer

The Astronics Test Systems PXIe-2461 PXI is a high-performance, 2-channel, universal 235 MHz Universal Counter/Timer.

Occupying a single PXI Express periphal slot or hybrid slot, the frequency & time interval/counter (FTIC) offers eleven easy-to-use automatic measurement functions, including phase, pulse, peak, rise/fall time, time interval and ratio measurement, all with extremely high resolution.

Key Features

- **Perform precision timing measurements with 9 digits of resolution**
- **Automate testing using the automatic measurements including peak signal**
- **Key specifications include:**
  - **235 MHz frequency measurement**
  - **9 digits per second resolution**
  - **1 ns time interval resolution (100 ps with averaging)**
  - **2.5 mV trigger resolution**
  - **Programmable measurement timeout**
  - **9 different arming modes**

Product Information

Brief Description

The PXIe-2461 high-performance Universal Counter/Timer offers twelve automatic measurement functions:

- Frequency (Direct or Ratio) and Period
- Time Interval (Normal and Delayed)
- Rise and Fall Time
- Pulse Width (Positive or Negative)
- Duty Cycle and Phase
- Totalize (Manual or by Pulse or Cycle)
- DVM (MAX, MIN and DC voltages)

Measure with High Granularity

The PXIe-2461 counter measures frequencies up to 235 MHz with up to 9 digits of resolution per second. Capture time intervals with 1 ns single-shot resolution and 100 ps resolution with averaging enabled.

Flexible Hysteresis

The PXIe-2461 has both a low and a high hysteresis setting for improved noise immunity. Factory hysteresis settings can also be programmed to a system requirement using a hysteresis calibration tool.

Measurement Timeout

Programmable measurement Timeout enables system performance to be optimized where input signals are missing.

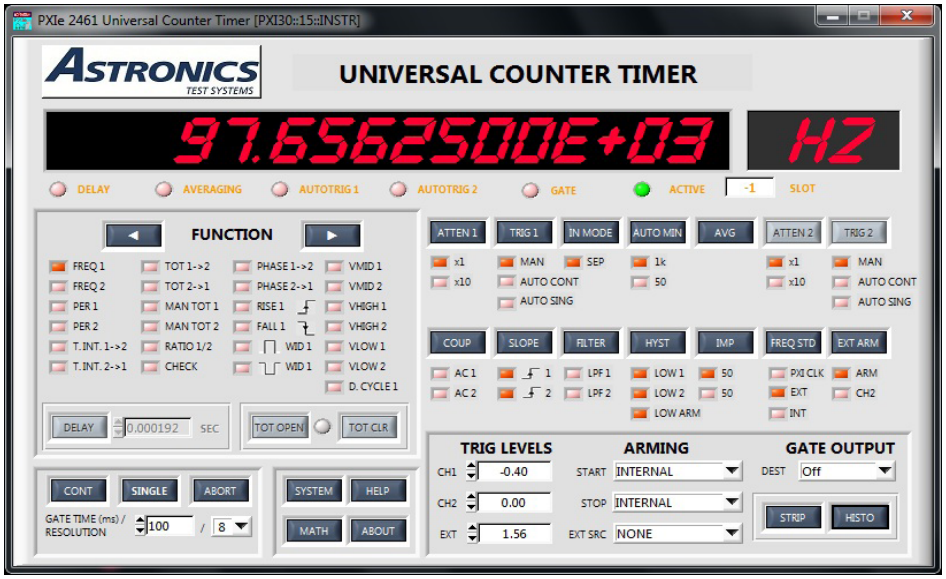


Figure 1: PXIe-2461 Soft Front Panel. Full Control Visible with no Drop-Down Menus Required

ASTRONICS TEST SYSTEMS

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Product Information
continued

High-Performance Trigger

In manual mode, the trigger level is programmable from -5.1 V to +5.1 V (-42 V to +42 V in x 10 mode) with a resolution of 2.5 mV (25 mV in x10 mode).

An automatic trigger mode is also available covering frequencies up to 20 MHz with the minimum frequency selectable (as DC, 50 Hz, or 1 kHz) to optimize measurement speed.

Pulse Characterization

The PXIe-2461 provides automatic pulse characterization including rise time, fall time, duty cycle and pulse width measurements.

Selectable Sensitivity

The sensitivity of the counter can be adjusted to optimize the front end for use with signals with noise to reduce the occurrence of false triggering. This feature is also very important for system applications, where noisy signals are encountered. Four standard sensitivity settings are provided.

measurement timing using decimating gate times for resolution from 3 to 10 digits on internal gate times from 1 ms to 10 seconds (100 µs to 100 seconds averaged). Externally gated measurements are also available via the front panel Arm Input or via the PXI trigger bus.

Complete Set of Development Tools

The PXIe-2461 counter is provided with software API's for your favorite development environments including LabVIEW and TestStand. The tools can be used to seemlessly integrate the PXIe-2461 into new applications and for applications replacing the legacy 2461 module.

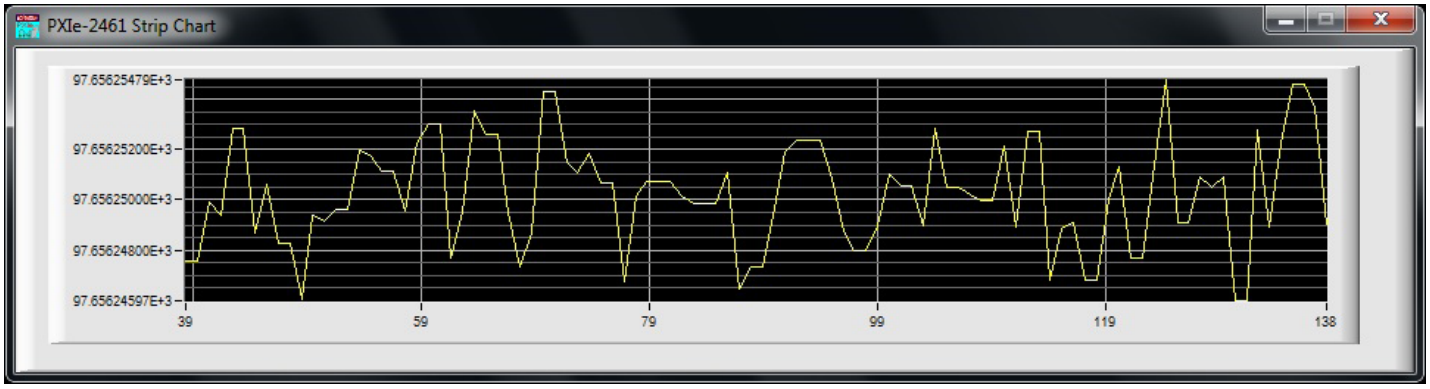


Figure 2: PXIe-2461 Strip Chart View Showing Time Variations of a Signal From a High Speed DAC

Automatic Attenuation Selection

Auto trigger mode automatically switches attenuator settings if the input signal level crosses ±5.1 V or ±51 V.

DVM Measurements

Automatic triggering is used to establish the peak voltages for setting trigger points. This feature is used to measure MAX, MIN and DC voltage levels.

Individual Channel Filtering

The PXIe-2461 counter offers independent 50 kHz low pass filters on each channel for low frequency measurements only.

Phase Measurement

Phase measurements are performed automatically for precise phase measurements on any pair of signals at the same frequency.

Powerful Arming Capability

The PXIe-2461 counter offers powerful arming capability. Nine different modes are provided with the ability to select an arming source arising from either the external arming input or the PXI trigger bus.

Precise Measurement Timing

The PXIe-2461 counter controls

Interactive Control and Monitoring

A realistic software control panel is provided including strip chart and histogram views. The control panel allows quick selection of measurement mode and signal conditioning parameters without the use of pop-up screens. A strip chart view is provided, allowing the user to monitor the stability of measurements over time. Histogram view provides a cumulative history of previously taken measurements plotted against definable test limits.

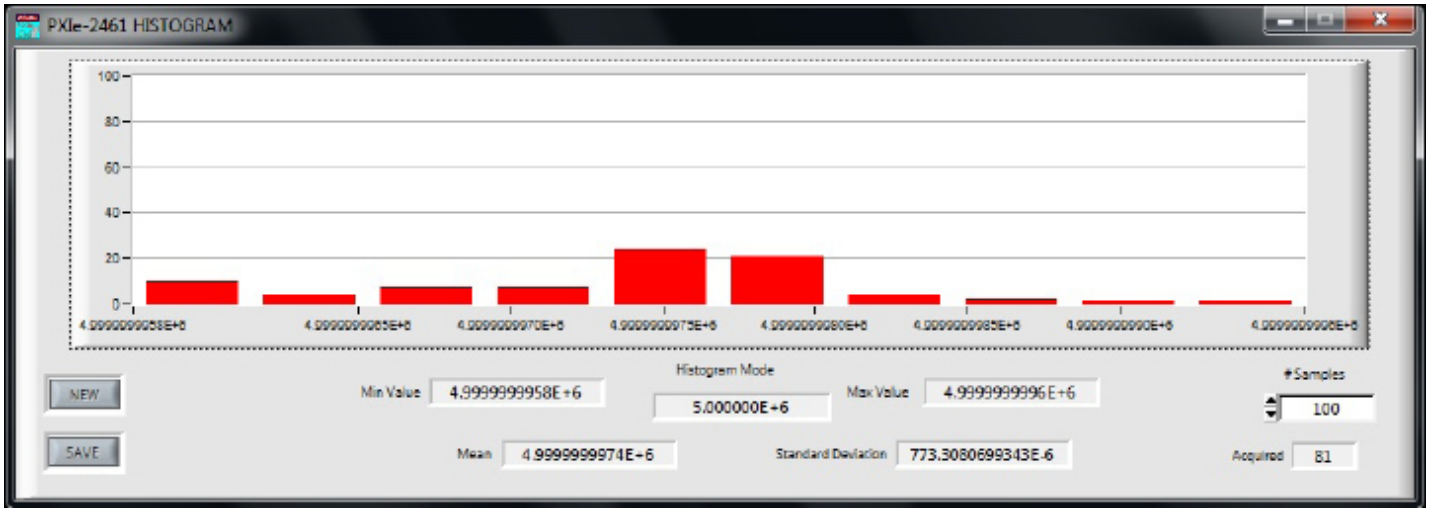


Figure 3: PXIe-2461 Histogram Characterizing a 5 MHz Oscillator Over a Pre-Determined Number of Samples

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Specifications

Note: The Astronics Test Systems policy is one of continuous development and improvement. Consequently, the equipment may vary in detail from the description and specifications in this publication.

Measurements

Frequency (Channels 1 and 2)

- Channel 1: 600 µHz to 235 MHz
- Channel 2: 600 µHz to 235 MHz
- LSD: F x 10^{D}
  Where D is the number of digits selected (3 to 10)
- Resolution: ±(1.4 x Trigger Error x Frequency/Gate Time) ±1 LSD*
  *±2 LSD with 6-10 digits selected
- Accuracy: ±(Resolution ±Timebase Error x Frequency)

Period

- Channel 1: 5 ns to 1700 s
- Channel 2: 5 ns to 1700 s
- Resolution: ±(1.4 Trigger Error x Frequency/Gate Time) ±1 LSD
- Accuracy: ±(Resolution ±Timebase Error x Frequency)

Time Interval

- Range: 2 ns to 800,000 s
- Slope (Start & Stop): (+) or (-)
- Start→Stop Configurations: N1→IN2, IN2→IN1 or IN1→IN1
- LSD: 1 ns (Average Mode: 100 ps)
- Resolution: ±1 ns_{mms} ±Trigger Error ±1 LSD
- Accuracy: ±Resolution ±(Timebase Error x TI) ±Trig Level Timing Error ±2 ns

Time Interval Delay

- Range: 200 µs to 1.078576 s

Rise/Fall Time

- Range: 20 ns to 20 ms
- Trigger Points:
- Rise: 10%→90%*
- Fall: 90%→10%*
- Minimum Pulse Height: 500 mV_{pk-pk}
- Minimum Pulse Width: 20 ns at Peak
- LSD: 1 ns (100 ps in Average Mode)
- Resolution: ±Start Trigger Error ±Stop Trigger Error ±1 LSD ±1 ns_{rms}

* % of measured pk-pk

Pulse Width

- Range: 5 ns to 20 ms
- Minimum Pulse Height: 150 mV_{pk-pk}
- LSD: 1 ns (100 ps in Average Mode)
- Resolution: ±Start Trigger Error top Trigger Error ±1 LSD ±1 ns_{rms}

Frequency Ratio (Channel 1 to Channel 2)

- Range: 600 µHz to 100 MHz
- LSD: (10 x Ratio)/(F1 x Gate Time)
- Resolution: ±(1.4 x Trigger Error 2/Gate Time) ±1 LSD
- Accuracy: ±Resolution
- Maximum Ratio: 6.8 x 10^{10}

Totalize

- Channel 1 by 2: Pulse triggered
- Channel 2 by 1: Cycle triggered
- Channel 1 by Arm input: Pulse triggered
- Range: 1 to (10^{12} - 1) events/s
- Maximum Rate: 10^{8} events/s
- Pulse Width: 5 ns min. at Trig. Points
- Accuracy: ±1 count

Duty Cycle

- Range: 0.01% to 99.99%
- LSD:
  - Fin <1 MHz: 0.01%
  - Fin <10 MHz: 0.1%
  - Fin <100 MHz: 1%

Phase (Channel 1 rel 2 or rel 1)

- Range: 0.1° to 360°
- LSD:
  - Fin <1 MHz: 0.1°
  - Fin <10 MHz: 1°
  - Fin <100 MHz: 10°

DVM Functions (Subject to Autotrigger Restrictions)

- Functions: +Peak, -Peak, Mid
- Range: -42V to +42 V
- LSD: 0.6 mV
- Resolution: ±2.5 mV (x1) ±25 mV (x10)

Math Mode

- Result: (Reading - Offset)/Scale

Averaging Mode

- Availability: all functions except DVM, Totalize & Phase
- Sample Size: 100
- Resolution: 1 extra digit relative to non-averaged mode

Input Characteristics

Frequency Range (DC Coupling)

- Channel 1: DC to 235 MHz
- Channel 2: DC to 235 MHz

Frequency Range (AC Coupling)

- Channel 1: 10 Hz to 235 MHz
- Channel 2: 10 Hz to 235 MHz

Input Conditioning (Channels 1 and 2)

- Impedance: 50 Ω or 1 MΩ
- Coupling: AC or DC
- Attenuation: x1 or x10
- Low Pass Filter: None or 50 kHz

Sine Wave Sensitivity (Channels 1 & 2, x1Atten., 0°C to 50°) C

- <100 MHz: 25 mV_{rms}
- <160 MHz: 50 mV_{rms}
- <200 MHz: 75 mV_{rms}
- <235 MHz: 125 mV_{rms}

Pulse Sensitivity (Channels 1 & 2, 5 ns Width, x1 Atten.)

- 75 mV_{pk-pk}

Nominal Hysteresis Settings

- Low: Atten x 15 mV_{Pk-Pk}
- High: Atten x 45 mV_{Pk-Pk}
- Available Range: Atten x 10 to 140 mV_{Pk-Pk}

Dynamic Range (x1 Atten.)

- <50 MHz: 5 V_{pk-pk} min.
- <100 MHz: 2.5 V_{pk-pk} min.
- <200 MHz: 1.5 V_{pk-pk} min.

Dynamic Range (x10 Atten.)

- <50 MHZ: 50 V_{pk-pk} min.
- <100 MHz: 25 V_{pk-pk} min.
- <200 MHz: 15 V_{pk-pk} min.

Damage Level Input (Channels 1 & 2)

- 1 MΩ (x1):
  ≤2 kHz: 260 V (DC + AC_{rms})
  ≤100 kHz: (5 x 10^{5}/Fin)V_{rms}
  >100 kHz: 5 V_{rms}
- 1 MΩ (x10):
  ≤20 kHz: 260 V (DC + AC_{rms})
  ≤100 kHz: (5 x 10^{6}/Fin)V_{rms}
  >100 kHz: 50 V_{rms}
- 1 MΩ (x40):
  ≤200 kHz: 260 V (DC + AC_{rms})
  ≤1 MHz: (20 x 10^{6}/Fin)V_{rms}
  >1 MHz: 500 V_{rms}
- 50 Ω: DC to 200 MHz: 5 V_{rms}

Crosstalk

- (Channel 1 to 2, 100 MHz @ 50 Ω) <36 dB

Triggering Characteristics

General (Manual or Autotrigger)

- x1
  Range: ±5.1 V
  Resolution: 2.5 mV
  Accuracy: ±(1% of rdg ±30 mV)
- x10
  Range: ±42 V
  Resolution: 25 mV
  Accuracy: ±(1% of rdg ±300 mV)

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Specifications
continued

Trigger Level Outputs (Scale by 10 for x10 attenuation mode)
- Range: ±5.1 VDC
- Resolution: 2.5 mV
- Accuracy: ±1% V_{out} ±10 mV

Autotrigger
- Frequency Range: DC and 50 Hz/ 1 kHz* to 235 MHz
- Minimum Amplitude: 150 mV_{pk-pk}

* min. freq. selectable as 50 Hz or 1 kHz to optimize acquisition time

Auto Attenuation (valid when Autotrigger enabled)
- x1: [peaks] <±4.6 VDC and amplitude <4.4 V_{pk-pk}
- x10: [peaks] >±5.1 VDC and amplitude >5.1 V_{pk-pk}

Arming Characteristics

External Arming/Gating Sources
- Front Panel “Arm” Input or PXI Trig0-7

Arming Modes
- Start: Self Arm, Rise/Fall Edge
- Stop: Self Arm, Rise/Fall Edge
- External Gating: Start/Stop Arm are both set to an edge

Programmable Input Levels
- Range: -5 V to +5 V

Arm Input Source
- Arm Input or Channel 2

Gate Output Destination
- Front Panel, PXITRG0-7

Measurement Timeout
- 1 to 10^5 s

Time Base Characteristics
Timebase selectable as follows:

Default
- PXI CLK10

External Input
- Frequency: 10 MHz
- Input Level: 100 mV min
- Input Impedance: 1 kΩ nom
- Coupling: AC

Interface

PXI Backplane Signal Support
- PXITRG0-7: External Arm Input, Gate Output
- PXI CLK10: Default Time Base

Memory Storage
- 64k readings

Cooling (10° C Rise)
- Min. Airflow: 4 l/s

Peak Current & Power Consumption
- Total Power: 31 Watts

	I_{Pm} (A)	I_{Dm} (A)
+12	1.4	1.2
+3.3	0.5	0.45

Front Panel I/O

FTIC Inputs
- Channels 1 & 2: BNC, 50 Ω or 1 M Ω
- Arm: MCX, 1 kΩ 19 V_{rms} max, DC coup.
- Clock: MCX, 1 kΩ, 100 mV_{rms}

FTIC Outputs
- Clock: MCX, 1 V_{pk-pk} into 50 Ω
- Trig. Level 1 & 2: MCX, -5.1 V to +5.1 V

Environmental
(All Environmental Conditions Tested to MIL-PRF-28800F, Class 3)

Temperature
- Operating: 0° C to 50° C
- Storage: -40° C to 71° C

Relative Humidity
- 5% to 95% RH non-condensing ≤30° C
- 5% to 75% RH above 30° C
- 5% to 45% RH above 40° C

Altitude
- Operating: 15,000 ft
- Non-Operating: 15,000 ft

Shock
- 30 g peak, half sine, 11 ms pulse

Vibration
- Random: 5 to 500 Hz

Bench Handling
- 4-inch drop at 45°

Ordering Information

408619 : Astronics Test Systems PXIe-2461 Universal Counter/Timer
235 MHz Universal Counter/Timer

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