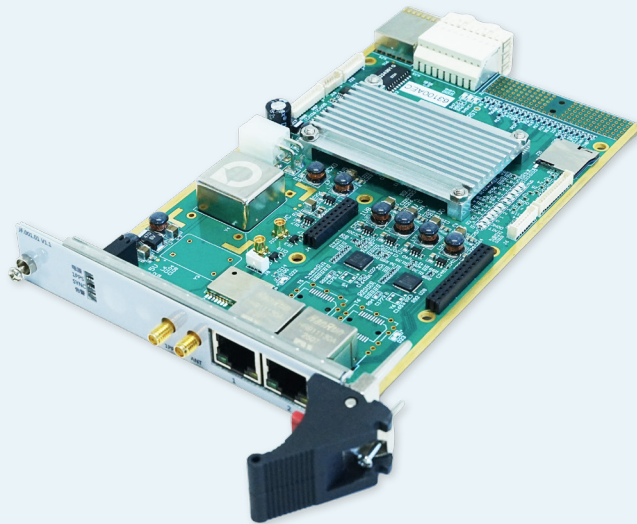


T220-X PXI/PXIe Timing Card

3U PXI/PXIe card, multi-source timing, PTP master/slave clocks, NTP, backplane clock / trigger synchronization

In automated testing, synchronized data acquisition, scientific measurement, and industrial control systems, the PXI/PXIe platform is frequently employed to support multi-board coordination, precision measurement, and real-time triggering tasks. These applications require not only a unified system time but also the establishment of a stable synchronization reference between the chassis backplane, front-panel interfaces, and the host software. The T220-X PXI/PXIe timing card is designed for modular testing and computing platforms; it can interface with satellite, B-code, PPS+TOD, or PTP reference sources, and via the PXI/PXIe bus, transmit time information and timing interrupt signals to the host, thereby achieving unified synchronization among the card's clock, the host computer's clock, and the overall testing system.

The T220-X offers comprehensive timing and synchronization capabilities, supporting PTP master-slave, NTP services, PPS, TOD, IRIG-B, and optional 10 MHz output; it also features a built-in high-stability temperature-stabilized crystal oscillator for calibration and timekeeping. The PXIe version provides a backplane 10 MHz clock and TRIG hardware triggering, while the front panel can be expanded to include high-precision 10 MHz and multi-channel timing pulse outputs, making it suitable for applications such as automated testing, multi-device synchronized data acquisition, communications, power systems, transportation, and precision time and frequency comparison.



our advantages

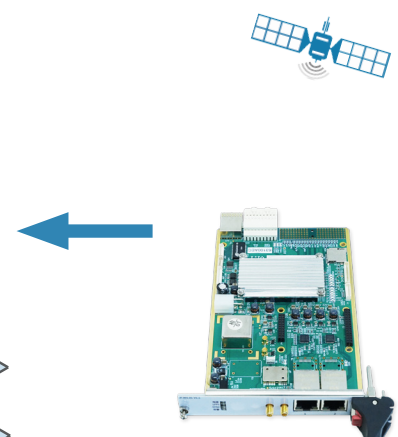
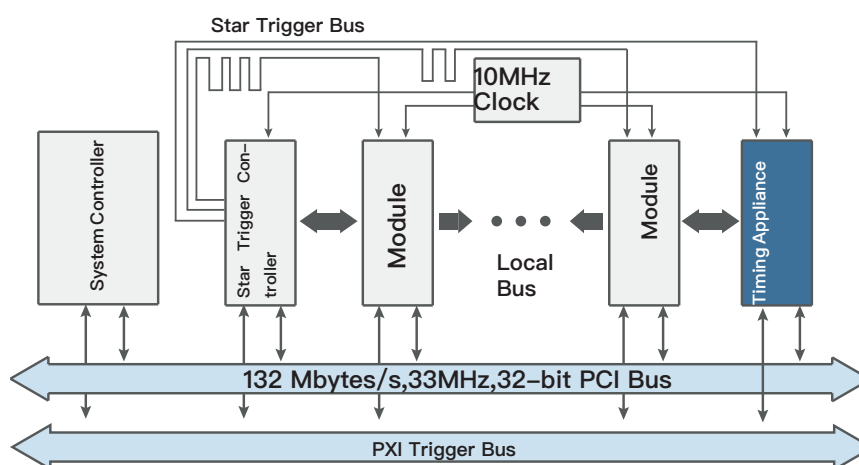
- ✓ **PXI / PXIe Dedicated Timing Platform**
3U PXI/PXIe Timing Card – designed for testing and measurement, synchronized data acquisition, and modular instrument systems
- ✓ **PXIe backplane synchronization capability**
The PXIe option supports a 10 MHz backplane clock output and a PXI_TRIG hardware trigger output, facilitating multi-module synchronous trigger control.
- ✓ **Extensive integration of reference sources**
Supports multiple time references—including GPS/BD, PTP, B-DC, and 1PPS+TOD—with flexible automatic switching based on field conditions.
- ✓ **High-precision timed pulse output**
The front panel offers optional multi-channel timed pulse outputs, supporting fine-tuning of step size, number of pulses, interval, and pulse width.
- ✓ **Comprehensive synchronous output interface**
Supports PTP, NTP, 1PPS, TOD, IRIG-B, and optional 10 MHz output, meeting unified timing requirements for hosts, instruments, acquisition devices, and external systems.
- ✓ **High Reliability, Timeliness, and Software Integration**
Equipped with a high-stability temperature-compensated crystal oscillator, it supports local clock calibration and reference-free timekeeping; it also provides APIs, periodic interrupts, alarm interrupts, PC synchronization, and web-based configuration facilitating integration and secondary development.

Key Features • Integrated GPS/BD satellite timing • Supports PTP master/slave clocks • Integrate NTP time synchronization service • Supports SyncE synchronous Ethernet • B-DC, 1PPS+TOD: optional input/output • Optional local high-precision 10 MHz frequency output	PXI/PXIe Card Form Factor and Backplane Interface • 3U PXI/PXIe Timing Card • Standard size: 100 × 160 mm • The option supports a 10 MHz backplane clock. • The option supports PXI-TRIG hardware triggering.	PTP / NTP functionality • Supports 2 PTP interfaces • The PTP master-slave configuration can be set; by default, one master and one slave are used. • Supports the IEEE 1588v2-2008 protocol • Supports UDP and ETH transmission modes • Supports E2E and P2P synchronous modes • NTPV1、V2、V3、V4、SNTP
Synchronization accuracy • GNSS satellite timing accuracy ≤ 30 ns • The timing accuracy of PTP is better than 100 ns. • The B-DC input synchronization accuracy exceeds 100 ns. • 1PPS output precision ≤ 30 ns • NTP timing accuracy ≤ 2 ms	Management and Software Interface • Supports Windows 64-bit and 32-bit • Supports Linux and Kylin operating systems • VxWorks, Windows RTX drivers • Provide drivers, API interfaces, and test utilities. • Supports automatic synchronization of computer time	Timed triggering and high-precision output • Optional 4-channel timed pulse output • Fixed step time: 8 ns • The number of pulses supports either a limited output or an infinite loop. • Optional front panel: 10 MHz output

Application in networks

PXI/PXIe Timing Card

- It can be inserted into a PXI/PXIe chassis to provide standardized, reliable, and high-precision time synchronization for test and measurement platforms, industrial control hosts, and embedded computing systems.
- Achieve unified synchronization across data acquisition devices, testing instruments, control systems, and time-sensitive software in various application scenarios, including scientific research metrology, communications, power, transportation, and automation.
- Supports the integration of multiple reference sources—including GPS/BD, PTP, B-DC, and 1PPS+TOD—enabling flexible construction of synchronization links.
- Transmit timing information and timing interrupt signals to the computer via the PXI/PXIe bus.
- Supports API calls to read board time, PC time synchronization, periodic interrupts, alarm interrupts, and web-based configuration, facilitating integrated development.



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Should there be any changes to the product specifications, Nu will not provide separate notice.

timekeeping performance

	Clock	Aging / Day (30 days later)	Temperature stability
Standard OCXO	Standard punctual type	$\pm 5 \times 10^{-10}$	$\pm 50 \times 10^{-10}$
Ultra-high stability DOCXO	High-stability environment type	$\pm 5 \times 10^{-11}$	$\pm 1 \times 10^{-11}$
Rubidium atomic clock	Punctual type	$\pm 8 \times 10^{-12}$	$\pm 5 \times 10^{-10}$

* Note: Effective daily aging is conducted one month after the equipment is energized.

	200nsec	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Standard OCXO	1 hours	2 hours	4 hours	5 hours	8 hours	1 days	1 month
Ultra-high stability DOCXO	5.5 hours	8.5hours	15 hours	18 hours	1.4 days	2 days	10 month
Rubidium atomic clock	12 hours	1days	3days	4days	8days	10days	5 years

* Note: The above values represent typical values (1 σ confidence level) assuming a controlled temperature environment after the device has been powered on and the GNSS72 lock has been achieved for 1 hour. Due to the superior temperature stability of the High-Stability Environment Model, when significant temperature fluctuations occur, the High-Stability Environment Model will exhibit better retention performance than the rubidium clock.

Primary Applications

- 1588v2 PTP Master and Slave Clocks
- PTP to Sync-E
- A GNSS receiver operating in both PRTC and PRC modes
- NTPserver

PTP Master Clock Operation Mode

- PTP Telecommunications Configuration File:
 - ITU-T G.8265.1 & Telecom 2008: Frequency TransferFunction
 - ITU-T G.8275.2: Time/Phase Transfer Function
 - ITU-T G.8275.1 Time/Phase Transport Function (Full time-domain support) for DOCSIS 3.1
- PTP Enterprise Functions (Hybrid IP Multicast and Unicast)
- PTP for power and public utilities:
 - IEC/IEEE61850-9-3
 - IEEEC37.238-2011
 - IEEEC37.238-2017
- PTP Broadcast and Media Functions:
 - SMPTE ST 2059-2
 - AES67 media profile

PTP feature

- Up to 64 unicast PTP clients, with a rate of 128 pps
- Complete IEEE 1588-2008 PTP Master and Slave
- Auxiliary Partial Timing Support (APTS) – PTP input: used when GNSS signals are lost or unavailable.
- Dedicated or generic IP PTP interface
- Sync-E to PTP output (frequency) conversion
- Conversion between PTP configuration files
- Maintain PTP from the list

PTP slave operation mode

- PTP for power and public utilities:—IEC/IEEE61850-9-3
 - IEEEC37.238-2011
 - IEEEC37.238-2017
- PTP Telecommunications Configuration File
 - ITU-TG.8265.1&Telecom2008:FrequencyTransferFunction
 - ITU-TG.8275.1Time/PhaseTransferFunction (APTS: partial timing support in BMCA and automatic asymmetric compensation between two remote hosts)
 - ITU-T G.8275.1 Time/Phase Transport Function (full time-domain support)
- IEEE 1588v2 default PTP configuration profiles: L3 (Appendix D) and L2 (Appendix F)
- PTP Enterprise Functions (Hybrid IP Multicast and Unicast)

SyncE

- Complies with the relevant provisions of ITU-T G.8261 /G.8262 / G.8264
- Supports input and output ports
- G.811 Compliant Sync-E Primary Reference Clock (PRC) when locked to GNSS
- Ethernet Synchronous Message Channel (ESMC)
- The SyncE input provides holdover functionality in the event of a GNSS interruption.

NTP serve

- The smallest NTP server
- NTP server with hardware-based security
- GNSS reference Tier-1 time server
- NTP v1, v2, v3, v4, and SNTP IPv4/IPv6
- Time & Date Agreement
- NTP responder with hardware-based DoS protection
- Up to 10,000 responses per second
- Supports both PTP and NTP services on the same port
- PTP to NTP conversion
- PTP backup in the event of a GNSS interruption
- Fixed or mobile platform

GNSS receiver

- Supports single-mode, dual-mode, and multi-mode operation for BDS/GPS (including QZSS), GLONASS, and GALILEO; defaults to dual-mode operation using BDS+GPS.
- Supports BDS B1I+B1C+B2a, GPS/QZSS L1+L5, GLO L1, and GAL E1+E5 frequency bands.
- Supports AGNSS-assisted positioning
- Features interference detection and alert functionality.
- Positioning accuracy: horizontal <2 m; vertical <3 m
- Cold start: 30s; Hot start: 2s; Recapture: 1s; Timing accuracy: <20 ns

External antenna

- Users can configure antenna cable delay compensation.
- Antenna voltage: +3.3 VDC
- Antenna connector: SMA-F (50 Ω)

Time and phase accuracy

- G.8272/G.8273.1: Compatibility with PRTC (± 100 nsec relative to UTC; MTIE <100 nsec) when locked to GNSS)
- During GNSS interruption: use the G.811PRC/G.8272 PRTC SyncE input for time transfer.
- Traceable to G.811PRC: time error <UTC ± 1 μ s over 24 hours
- Traceable to G.8272PRC: time error <UTC ± 1 μ s over 72 hours

IRIG-B Input/Output (Optional)

- Route: Route 1 (DC);
- Interface: RS422;
- Standard: IEEE Std 1344-1995/GJB 2991A-2008;
- Phase shift: ± 1000 (ns);
- Synchronization accuracy: better than 100 ns;
- Connection method: Remo interface.

1PPS+TOD output (optional)

- Route: Route 1;
- Interface: TTL (1PPS), RS232 (TOD);
- Port rates: 1200/2400/4800/9600/38400/57600/115200 can be configured;
- Synchronization accuracy: better than 100 ns;
- Format: ZDA statement, NMEA 0183 protocol; Connection method: REMO interface.

meet a criterion

- ITU-T G.8261, G.8262, G.8264
- ITU-T G.8265.1, G.8275.1, G.8275.2
- IEEE 1588v2 (PTP)
- RFC 1059 (NTPv1), RFC 1119 (NTPv2),
- RFC 1305 (NTPv3), RFC 5905 (NTPv4),
- RFC 4330 (SNTPv4)
- RFC868 (TIME), RFC867(DAYTIME)
- EN 55024
- EN 55022 Class-B
- IEC/EN 61000-3-2
- IEC/EN 61000-3-3
- IEC/EN 61000-4-3 (RI)
- IEC/EN 61000-4-4 (EFT): 1 kV / 50 A (5/50 ns)
- IEC/EN 61000-4-5 (Surge): 4KV (10/700 μ s)
- IEC/EN 61000-4-6 (CI)

Physical and environmental parameters

- Power supply: 12V, backplane power;
- Power consumption: ≤ 15 W;
- Dimensions: 3U, 100 $\times$ 160 mm;
- Humidity: $\leq 95\%$ without condensation;
- Operating temperature: -20 $^{\circ}$ C to +60 $^{\circ}$ C;
- Storage temperature: -40 $^{\circ}$ C to +80 $^{\circ}$ C.