

T220-C PCI Timing Card

Full-height PCI card, PTP master-slave clock, NTP/B-code/PPS/TOD synchronization

In industrial control, communications, testing and measurement, and embedded computing systems, many legacy hosts still employ the stable and well-proven PCI architecture to perform real-time data acquisition, control scheduling, and data logging tasks. The T220-C PCI Timing Card is designed for such computing platforms; it can be directly inserted into a host to provide the system with reliable time information, timing interrupts, and a variety of external synchronization interfaces. The card supports the integration of reference clocks—including satellite timing, PTP, B-code, and PPS+TOD—and, through priority switching and local clock synchronization, ensures continuous synchronization in complex field environments.

The T220-C provides comprehensive computer time-keeping capabilities, capable of outputting PTP, NTP, PPS, TOD, IRIG-B, and optional frequency signals. It features a built-in high-stability temperature-stabilized crystal oscillator that can be synchronized with an external reference; in the event of satellite, network, or B-code anomalies, it automatically switches to a valid reference or enters a time-keeping maintenance mode to continue maintaining system time. Via the PCI bus, the host system can read the board's time, synchronize its local time, and utilize the interface to implement periodic interrupts and alarm interrupts. This makes the device well-suited for scientific research and metrology, communications, power systems, industrial automation, and upgrades of legacy PCI platforms.



our advantages

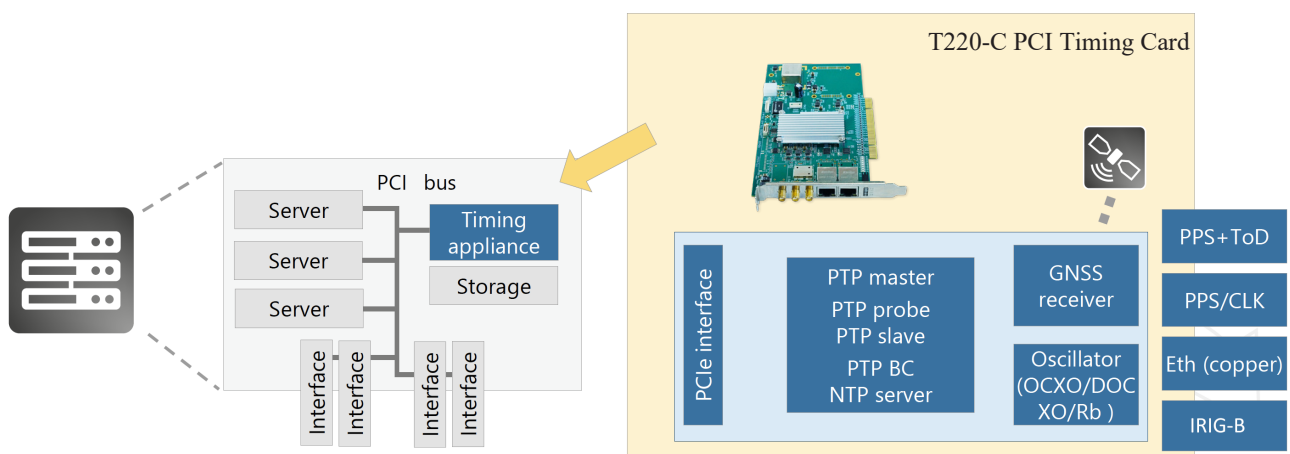
- ✓ **Mature PCI time synchronization platform**
Full-height PCI timing card, compatible with computers, industrial PCs, and servers, ideal for high-precision timing upgrades of devices based on traditional PCI architectures.
- ✓ **Extensive integration of reference sources**
Supports multiple time references—including GPS/BD, PTP, B-DC, and 1PPS+TOD—allowing flexible integration and switching based on field conditions.
- ✓ **Comprehensive synchronous output interface**
Supports PTP, NTP, 1PPS, TOD, IRIG-B, and optional 10 MHz output, meeting the unified timing requirements of hosts, terminal devices, and external systems.
- ✓ **High reliability and punctuality**
Features a built-in high-stability temperature-compensated crystal oscillator with support for local clock discipline; continuous time output can be maintained even after an external reference interrupt.
- ✓ **Precision Timing and High-Performance Services**
Satellite-based timing, PTP, 1PPS, and B-code provide synchronization precision that meets the requirements of high-precision applications; the NTP service supports high-concurrency timing operations, making it well-suited for multi-terminal system integration.
- ✓ **Open software interfaces and compatibility with domestic platforms**
Provides drivers, API interfaces, and test utilities; supports time reading, PC synchronization, periodic interrupts, and alarm interrupts; and is compatible with Windows, Linux, Kylin, x86, and Phytium/Shenwei platforms.

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	PCI Card Form Factor and Compatibility • PCI 32-bit interface, compatible with 64-bit systems • Bus rate: 33 MHz • Voltage compatibility: 3.3V and 5V • PCI slot power supply • Full-height mounting bracket	PTP / NTP functionality • Supports two PTP interfaces • PTP master-slave configuration is configurable, with the default setting of one master and one slave • Supports IEEE1588v2-2008 • Supports UDP and ETH transmission modes • Supports E2E and P2P time-sync 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 • Provide drivers, API functions, and test utilities • Support for API to read board time • Supports automatic synchronization of computer system time • 4-channel periodic interrupt; 4-channel alarm interrupt • Supports web-based configuration and online firmware updates.	Built-in GNSS and timing • Supports GPS/BD multi-mode receiver • Supports GPS L1 and BD B1 frequency bands • Built-in high-stability temperature-stabilized crystal oscillator

Application in networks

PCI Timing Card

- It can be integrated into servers, industrial PCs, and embedded hosts based on traditional PCI architectures, providing stable, reliable, and high-precision time synchronization for computer systems.
- In application scenarios such as scientific research metrology, communications, power systems, and industrial automation, achieve unified time synchronization for critical host devices, data acquisition systems, control systems, and time-sensitive business software.
- Supports multiple reference access modes—including GPS/BD, PTP, B-DC, and 1PPS+TOD—tailored to diverse field conditions such as satellite-based timing, network-based timing, and B-code-based timing.
- No external synchronization equipment required
- The optimal choice for achieving direct management integration through open-mode control.



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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	Temperature stability
Standard OCXO	Standard punctual type	$\pm 5 \times 10^{-10}$	$\pm 50 \times 10^{-10}$
Ultra-high stability DOXO	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 DOXO	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 (1σ confidence level) assuming a controlled temperature environment after the device has been powered on and the GNSS72 has been locked for 72 hours. Due to the superior temperature stability of the High-Stability Environment Model, when significant temperature fluctuations occur, the retention rate of the High-Stability Environment Model will exceed that of 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 Transport Functions — ITU-T G.8275.2: Time/Phase Transport Functions
 - 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 facilities:
 - IEC/IEEE 61850-9-3
 - IEEE C37.238-2011
 - IEEE C37.238-2017
- 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 Clock
- 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/IEEE 61850-9-3
 - IEEE C37.238-2011
 - IEEE C37.238-2017
- PTP Telecommunications Configuration Profile
 - ITU-T G.8265.1 & Telecom 2008: Frequency Transfer Function —ITU-T G.8275.1 Time/Phase Transfer Function (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.



NTPserve

- The smallest NTP server
- NTP server with hardware-based security

GNSS 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
- Transition from PTP to NTP
- PTP backup in the event of a GNSS interruption
- Fixed or mobile platform

GNSSreceiver

- Supports single-mode, dual-mode, and multi-mode operation with BDS/GPS (including QZSS), GLONASS, and GALILEO; defaults to dual-mode operation with 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 Sync-E input for time transfer.
 - Traceable to G.811PRC: Time error <UTC ±1 μs over 24 hours
 - Traceable to G.8272PRTC: time error <UTC ±1 μs 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 type: 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 μs)
- IEC/EN 61000-4-6 (CI)

Physical and environmental parameters

- Power supply: Powered via the PCI slot;
- Power consumption: ≤ 15 W (steady-state operation at 25 °C);
- Dimensions: Full-height PCI mounting bracket, compatible with computers.
- Industrial PCs, servers;
 - Operating temperature: -40 °C to +60 °C;
- Storage temperature: -40 °C to +80 °C.

