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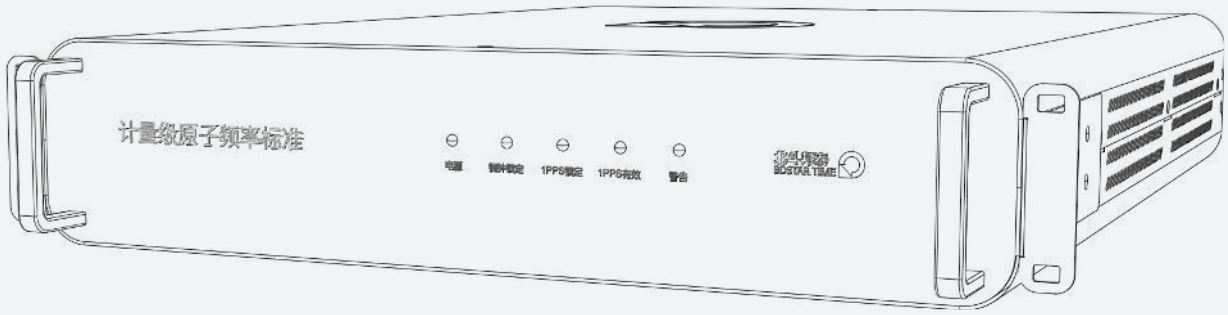
BDSTAR TIME

# Metrology-Grade Atomic Frequency Standard




ePRTC

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# Metrology-Grade Atomic Frequency Standard

# T770

## Cesium clock-grade GNSS-Disciplined rubidium atomic clock and ultra-stable crystal oscillator combination


## Feature

+ Extremely low environmental sensitivity, with a typical temperature coefficient of 2E-14/°C
+ Automatic Calibration of Rubidium Clock Frequency Using GNSS
+ Highly sensitive GNSS concurrent reception to adapt to the harsh global environment
+ Supports Full GNSS: GPS/QZSS、GLONASS、BeiDou、GALILEO
+ Cesium-clock-level, rubidium atomic clock and temperaturecontrolled crystal oscillator combined frequency standard
+ Frequency stability 100000 second <4E-14
+ 1s\10s stability 3E-13
+ Suppoots five 10 MHz ultra-low-noise isolated amplifier outputs
+ Supports 1-channel 10 MHz sine wave output
+ Built-in high-performance rubidium atomic clock with a monthly deviation of the level of 2 s
+ High reliability with an ultra-long rubidium bubble design life of ≥20 years
+ 1PPS disciplining function, automatically calibrates frequency and eliminates frequency drift
+ Relative to UTC time accuracy reaches nanosecond level
+ MTBF > 100000 hours

## Application

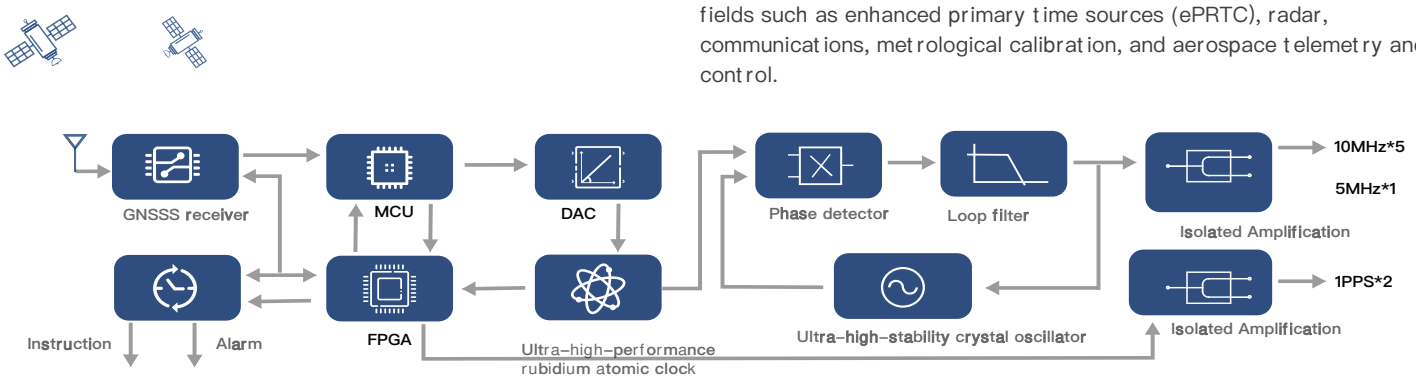
+ Used in metrological calibration, deep-space exploration, and ePRTC

## Overview

The T770 metrology-grade rubidium atomic frequency standard is an ultra-stable rubidium atomic clock specifically designed for high-precision time-keeping and frequency measurement. The device employs a high-performance quantum system and intelligent control circuitry, combined with precision temperature control technology and intelligent algorithms. Its frequency stability, frequency drift, and temperature coefficient are all 10 times better than those of standard commercial rubidium clocks, and its frequency stability curve intersects with that of a small cesium clock at approximately the 1-day mark.

The T770 GNSS metrology-grade rubidium atomic frequency standard outputs a 1PPS signal,which is derived by frequency division of the rubidium atomic clock signal and is synchronized with the UTC time output by GNSS. Compared to the raw GNSS 1PPS, the frequency-divided pulse has been smoothed to eliminate the effects of fluctuations and jumps in the raw pulse, thereby providing a reproducible UTC time reference. When GNSS signals are lost or abnormal, the device intelligently detects the issue and automatically switches to rubidium atomic clock time-keeping mode, continuously providing a highly stable time and frequency signal. The device software employs multiple anti-interference detection and identification algorithms developed by BDSTAR TIME to detect signal anomalies caused by interference and malicious attacks on GNSS signals. It can be flexibly configured with various clock signal outputs.

The T770 metrology-grade rubidium atomic frequency standard features a 2U chassis design and can output 10 MHz and 5 MHz sine waves, 1PPS, and TOD information (optional support for multiple 100 MHz, 90 MHz, 80 MHz, and IRIG-B outputs). It is widely applicable in fields such as enhanced primary time sources (ePRTC), radar, communications, metrological calibration, and aerospace telemetry and control.

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## Output

Output frequency: 10 MHz, 5 channels, BNC , standard sine wave, range 13 ± 1 dBm, 50 Ω

| | | Standard | High-Performance |
|---|---|---|---|
| Frequency stability | 1s | ⩽ 5E–13 | ⩽ 3E–13 |
| | 10s | ⩽ 5E–13 | ⩽ 3E–13 |
| | 100s | ⩽ 1E–13 | ⩽ 1E–13 |
| | 1000s | ⩽ 5E–14 | ⩽ 4E–14 |
| | 10000s | ⩽ 5E–14 | ⩽ 3E–14 |
| | 100000s | ⩽ 5E–14 | ⩽ 4E–14 |

Phase noise: ⩽ –113dBc/Hz @1Hz
⩽ –143dBc/Hz @10Hz
⩽ –155dBc/Hz @100Hz
⩽ –157dBc/Hz @1kHz
⩽ –160dBc/Hz @10kHz
⩽ –160dBc/Hz @100kHz

Distortion: Harmonic⩽ –40dBc, Non–harmonic: ⩽ –80dBc

Output frequency: 5 MHz, number of channels: 1, specifications similar to 10 MHz

| | | Standard | High-Performance |
|---|---|---|---|
| Drift rate/Day | | ±3E–13 | ±1E–13 |
| Temperature coefficient | /° C | ⩽ 1E–13 | ⩽ 5E–14 |

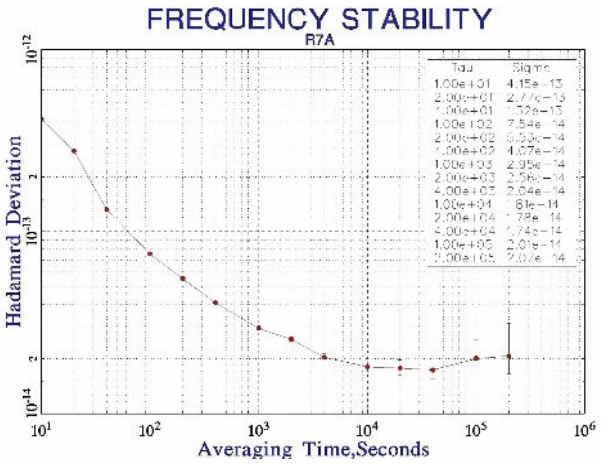
1PPS: 4–channel configuration, BNC , TTL level, 50Ω impedance.
Pulse width: 100ms; rising edge: <10ns; jitter: <1ns.
When GNSS is locked, the 1PPS synchronizes with GNSS. 1PPS input: 1 channel, TTL level.

## GNSS receiver

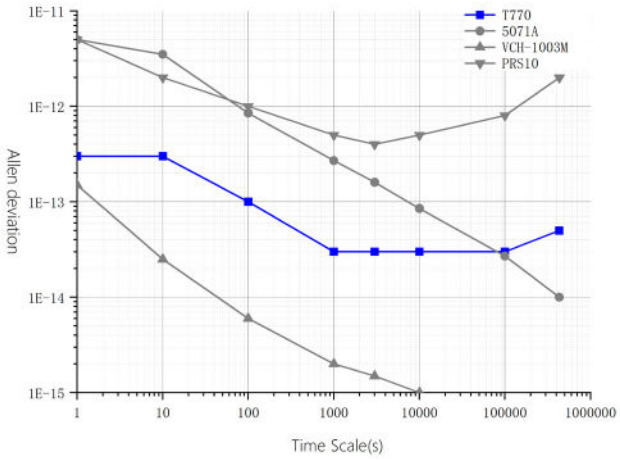
Receiver Type: 72–channel professional timing–grade GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1, SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN, Galileo E1B/C
Data Update Rate: Up to 4 Hz for parallel GNSS
Positioning Accuracy: 2.5 m CEP; Cold Start: 28 s;
Assisted Cold Start: 2 s;
Timing Accuracy: 20 ns
Sensitivity: Tracking and Navigation: –166 dBm; Cold Start: –157 dBm;

## Physical and Environmental Parametersand Dimensions

2U chassis:447×89×300mm
Power Supply: 220V±20% 47Hz ～ 63Hz
Operating Temperature: –10°C to +55°C (main unit); –40°C to +75°C (antenna)
Storage Temperature: –45°C to +85°C
Humidity: 95% non–condensing
Power Consumption: 100W Weight: 3.5 kg




Comparison with similar products




T710 front view


T710 back view