EndRun TECHNOLOGIES
"Smarter Timing Solutions"

SONOMA *PTP/IEEE-1588 Grandmaster Option*

GPS or CDMA-Synchronized, Dual Gigabit Ports

The Sonoma Precision Time Protocol (PTP) Grandmaster Clock delivers the level of performance that is required in high-speed, low-latency systems. EndRun makes it easy to add the optional PTP/IEEE-1588 protocol to one or both of the dual gigabit ports on the Sonoma Time Server. The Sonoma is a 3rd generation Network Time Server and 2nd generation PTP Grandmaster and is a perfect choice for PTP or mixed PTP/NTP networks. The highly-integrated solid-state design is very reliable, and you can easily manage it via one of the network ports or the RS-232 serial port. A Web Interface (HTTPS) is also provided for status monitoring using your Internet browser.

Dual Gigabit Ports

The Sonoma has two 10/100/1000 Base-T Ethernet ports. The PTP protocol can be enabled on one or both of these ports. Using both ports enables one Grandmaster to service two independent PTP sub-domains.

Hardware Timestamping

Each Sonoma is shipped from the factory ready for hardware-based PTP timestamping on both gigabit ports. You can purchase the PTP/IEEE-1588 option on one or both of these ports. Hardware timestamping provides the kind of accuracy and performance that is required for today's low-latency systems.

FEATURES

- PTP/IEEE-1588 Grandmaster Clock.
- Dual gigabit ports.
- Nanosecond-resolution hardware timestamping.
- The most widely deployed PTP Default Profile.
- Free technical support and software upgrades for life.

KEY BENEFITS

- Over 1000 times more accurate than the Network Time Protocol (NTP).
- Easy to operate and maintain.

Easy PTP Configuration

You can easily configure all PTP parameters via the network console port, serial port or the front-panel keypad/display (Sonoma D12). PTP configuration can be viewed by these methods and also via the Sonoma built-in Web Interface. Once the PTP Grandmaster configuration is saved, it is broadcast to all PTP slaves who then configure themselves accordingly. If more than one Sonoma is installed on your network, the PTP Best Master Clock (BMC) algorithm automatically decides which one becomes the Grandmaster.

Oscillator Options for Improved Timestamp Accuracy if Signal Lost

The Sonoma can be configured with an oscillator option that offers improved timestamp accuracy in the case of GPS or CDMA signal loss. The drift rate of the oscillator is what causes the Grandmaster to gradually move away from "perfect time" if the reference signal is lost. The slower the drift rate of the oscillator, then the more accurate your PTP timestamps will be during periods of signal loss.

The basic Sonoma is provided with a TCXO (drift is 10 milliseconds for the first day). This is *the best performance for any time server on the market* with a TCXO. For even better performance you may want to consider an oscillator upgrade. Drift rate of EndRun's proprietary OCXO is 80 microseconds for the first day, and the drift rate of the Rubidium is 5 microseconds for the first day. Specifications for the oscillator options are shown below. For PTP purposes, the most important specification is the accumulated time error for the 1st day after signal loss.

Oscillator Options - Summary Performance Data

	TCXO	OCXO	Rubidium
Accumulated Time Error for 1st Day	10 millisecs	80 microsecs	5 microsecs
Temperature Stability	2.5×10^{-6}	4×10^{-9}	1×10^{-9}
Temperature Range °C	-20 to +70	0 to +70	-20 to +70
Ageing Rate/Year	1×10^{-6}	3×10^{-8}	1×10^{-9}
Allan Deviation @ 1 sec	1×10^{-9}	7×10^{-12}	2×10^{-11}

SONOMA

PTP/IEEE-1588 Grandmaster Specifications

Sonoma rear panel with optional dual power supplies.
Antenna input TNC connector on upper left. Two spare BNC connectors on lower left. One RS-232 connector.
Two 10/100/1000 Base-T Ethernet ports. Optional dual power supply connectors on right.

COMPLIANCE:
- PTP/IEEE-1588-2008 (Version 2).
- Grandmaster.
- Default profile.
- Two-step clock.
- Multicast.

GPS-SYNCHRONIZED GRANDMASTER ACCURACY:
- GPS Receiver Accuracy: < 30 nanoseconds RMS to UTC(USNO) when locked*.
  * See GPS-UTC Timing Specifications for details.

CDMA-SYNCHRONIZED GRANDMASTER ACCURACY:
- CDMA Receiver Accuracy: < 10 microseconds to UTC(USNO) when locked, typical.

PTP PORTS:
PTP hardware timestamping in the Sonoma can be enabled on one (eth0), or on both (eth0 and eth1) gigabit ports.
- PTP Timestamp Resolution: 8 nanoseconds.

CONFIGURABLE PTP PARAMETERS:
- Transport Protocol: UDP/IPv4.
- Delay Mechanism: E2E or P2P. Delay Interval: 32 seconds.
- Sync Interval: 1, 2, 4, 8, 16, 32, 64 or 128 packets / 1 second.
- Announce Interval: 1 packet per 1, 2, 4, 8 or 16 seconds.
- Priority 1 & 2: 0-255
- Domain: 0-255
- Packet TTL: 1-255
- Time Mode: UTC or PTP

PTP SLAVE SYNCHRONIZATION ACCURACY:
A hardware-based PTP Slave can synchronize to within 100 nanoseconds of the Grandmaster using a crossover cable or PTP-enabled switch (i.e. Transparent Clock). (This is measured from the PTP Grandmaster 1PPS output (option) to the PTP Slave 1PPS output).
A software-only PTP Slave can synchronize to the master to within 10 microseconds typically.
(This data is collected from the PTP Slave statistically gathered Offset From Master (OFM) in a logfile.)

PTP SLAVE:
- For information about PTP Slave software and hardware see www.endruntechnologies.com/ptp-slave.htm.

NETWORK I/O:
- Two rear-panel RJ-45 jacks.
- Two 10/100/1000 Base-T Ethernet.

PTP/IEEE-1588 OPTION CHOICES:
- New Orders: Any new order for a Sonoma Network Time Server can include the PTP Option so it will ship to you ready to go.
- Field Upgrades: If you already have a Sonoma then you can purchase the PTP Option and we will send you a license key with instructions on how to easily enable PTP on your unit.

OTHER SUPPORTED PROTOCOLS:
- NTP v2, v3, v4, SNTP, MD5 authentication, broadcast/multicast mode, and autokey.
- SSH client/server with "secure copy" utility, SCP.
- SNMP v1, v2c, v3 with Enterprise MIB.
- HTTPS (Web Interface).
- TIME and DAYTIME server.
- TELNET client/server.
- FTP and DHCP clients.
- SYSLOG.
- IPv4/IPv6.

OTHER OPTIONS:
- Premium OCXO, Rubidium, Dual Power Supplies, 1 PPS Output and more.

1 PPS OUTPUT (option):
The 1 PPS Output option is useful for comparing the on-time signal from the Grandmaster to the on-time signal from a hardware-based PTP slave.
- 1 PPS: Positive TTL pulse @ 50Ω or RS-422 levels.
- User-Selectable Width: 20 us, 1ms, 100 ms, 500 ms.
- Stability: TDEV < 20 ns, $\tau < 10^5$ seconds.

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