EndRun TECHNOLOGIES
"Smarter Timing Solutions"

Disciplined Oscillator *Options*

For Sonoma NTP Servers & PTP Grandmasters

Sonoma Network Time Servers can be easily upgraded with an OCXO or Rubidium oscillator. An oscillator upgrade improves performance during periods of signal loss by reducing the timing drift. The drift of the oscillator is what causes a time server to gradually move away from "perfect time" if the reference signal (GPS or CDMA) is lost. The length of time that an oscillator can hold perfect time once the signal is lost is called the holdover period. For an NTP Server an oscillator upgrade extends Stratum 1 timing performance. For a PTP Grandmaster an oscillator upgrade improves the PTP Clock Accuracy.

KEY BENEFITS

- Extended NTP Stratum 1 performance.
- Improves PTP Clock Accuracy during periods of signal loss.
- Improves short-term stability.

Signal Loss

In GPS applications, temporary signal loss could be caused by sub-optimal GPS antenna installations in windows, or on rooftops in urban canyons. Antenna damage from vandalism or lightning could interrupt GPS reception. Damaged antenna cabling can also lead to the loss of the GPS reference signal. In CDMA applications, signal loss could be due to marginal, sporadic CDMA reception, base station outages, damaged antenna or cabling.

Network Time Protocol (NTP) Servers

If the reference signal is lost, an upgraded oscillator extends the time your NTP Server can serve Stratum 1 time to your network. Your oscillator decision should be based on how long you want Sonoma to deliver Stratum 1 time after any signal loss. See the NTP Stratum 1 Holdover Period in the Summary Performance table on the next page.

Precision Time Protocol (PTP) Grandmasters

An oscillator upgrade extends clock stability and PTP timestamp accuracy while tracking the reference signal. If the reference signal is lost, then an oscillator upgrade extends the time Sonoma can maintain its precision accuracy. Your oscillator decision should be based on how tightly you want to control the PTP Clock Accuracy after any signal loss. See the Accumulated Time Error for 1st Day in the Summary Performance table on the next page. Most PTP customers purchase the OCXO option.

TCXO

The basic Sonoma is provided with a Temperature-Compensated Oscillator (TCXO) which drifts at the rate of 10 milliseconds/day. *This is the best holdover performance for any time server on the market with a TCXO.* This will allow your NTP Server to deliver Stratum 1 time for a full 24 hours after signal loss. An oscillator upgrade is indicated when your application requires a longer holdover period than 24 hours. For PTP Grandmasters an oscillator upgrade is always recommended.

Premium OCXO Option

The OCXO permits your NTP Server to deliver Stratum 1 time to your network for 35 days following the loss of a signal. For PTP Grandmasters it reduces the accumulated time error (drift) by a factor of a million. (See the chart on the next page.) The OCXO provides three orders-of-magnitude improvement in temperature stability relative to the TCXO and a further reduction in ageing.

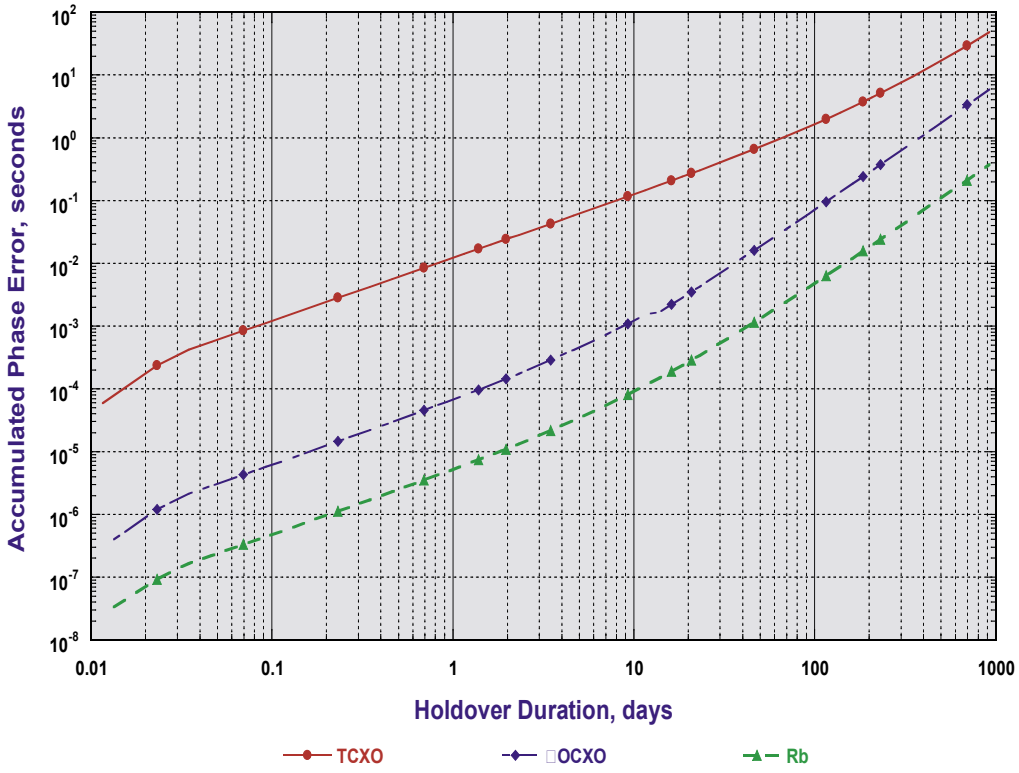
Compact Rubidium Option

If you need the ultimate in long-term holdover performance a Rubidium option is the right choice. This oscillator will permit your NTP Server to deliver Stratum 1 time to your network for a period of 140 days following the loss of a signal. Relative to the OCXO, the Rubidium option reduces the accumulated time error (drift) by an order of magnitude that is important for PTP Grandmasters. Also, the temperature stability is improved by a factor of 4 and its long-term ageing is reduced by more than an order of magnitude.

Disciplined Oscillator Options

Holdover Performance - Time Server Oscillator Options

Typical, 5° C Max Delta, 7.5° C/Hr Max SlewRate



Oscillator Options - Summary Performance Data

	TCXO	OCXO	Rubidium
NTP Stratum 1 Holdover Period	24 Hours	35 Days	140 Days
Accumulated Time Error for 1st Day*	10 millisecs	80 microsecs	5 microsecs
Temp Stability	2.5×10^{-6}	4×10^{-9}	1×10^{-9}
Temp. Range °C	-20 to +70	0 to +70	0 to +70
Ageing Rate/Year	1×10^{-6}	3×10^{-8}	1×10^{-9}
Allan Deviation @ 1 sec	6×10^{-10}	3×10^{-12}	3×10^{-11}

*During signal loss conditions.

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