APPLICATION NOTE - Holdover

What is Holdover?

Holdover, in the context of oscillators, refers to the ability of an oscillator to maintain a clocks' accuracy for a certain period when it temporarily loses its primary reference signal. This primary reference signal is typically provided by an external source, such as a GNSS satellite signal or another highly accurate clock source. When this reference signal is unavailable due to factors like signal interruption, jamming, or GNSS outage, the oscillator enters holdover mode and relies on its internal components to maintain frequency stability until the primary reference signal is restored.

Where systems are running clocks, they must all show the same time, the limits of how close these times must be will be defined in some standard. When part of the system is operating in holdover, there will be a degradation of performance and this will need to be within some limits, so there is a holdover specification. This might read something like ±1.5 µs in 24 hours: here it is specified that the clock in holdover must stay within 1.5 microseconds of the reference clock during the 24 hour period of holdover. This would give a defined limit for the repair of the system to be completed, and also an understanding of how bad performance will become during that period. This example specification is taken from the LTE requirements for telecoms networks.

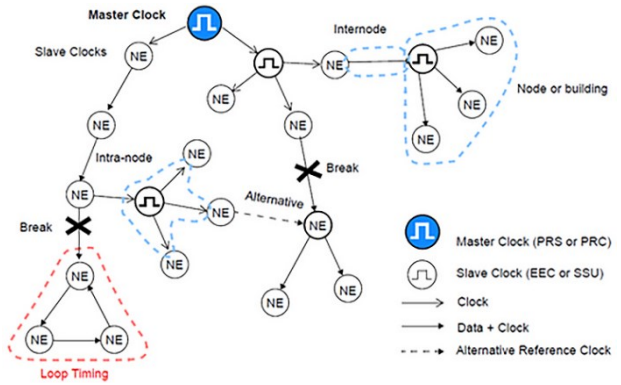

Image source: https://en.wikipedia.org/wiki/Synchronous_Ethernet

Holdover is crucial in applications where uninterrupted timing or frequency synchronisation is critical. Design Engineers must ensure that the oscillator's holdover capability meets the requirements of the specific application.

Here's why holdover is important, and its applications:

Continuous Operation: In systems where downtime is not an option, such as telecommunications networks, power grids or financial trading platforms, holdover ensures continuous operation even during signal disruptions. This uninterrupted operation is essential for maintaining system reliability and preventing data loss or service outages.

GNSS Outages: In applications relying on GNSS for timing or synchronisation, such as cellular networks or military communications, holdover becomes vital during GNSS signal outages. These outages can occur due to atmospheric conditions, signal blockages or deliberate interference. During such instances, holdover allows the system to maintain accurate timing until the GNSS signal is restored.

High-Availability Systems: Holdover is critical in systems requiring high availability, where any disruption in timing can have severe consequences. For example, in aerospace applications, like satellite communications or aircraft navigation systems, holdover ensures continuous operation even when the primary timing reference is temporarily unavailable.

Network Synchronisation: In telecommunications networks, holdover enables network elements to maintain synchronisation with each other during temporary loss of synchronisation signals. This ensures seamless operation and prevents disruptions in services like voice calls, video streaming or data transmission.

In summary, holdover is a critical feature in clocks and good quality oscillators allow them to maintain stability during temporary signal disruptions. Design Engineers must carefully consider holdover requirements when selecting oscillators for applications where uninterrupted timing is essential, such as telecommunications, aerospace and high-availability systems.

IQD offers a range of products which are suitable for the most demanding holdover requirements. We can provide the data to support the use of our oscillators within all the common specifications used in the timing industry. Not only holdover data but also include temperature drift, phase noise and jitter, MTIE and TDEV, ADEV, ageing and more.

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