WHITE PAPER

Satellite Communication *Systems*

Large earth stations host communication systems that provide mission-critical, high-bandwidth services to multiple customers. Within these earth stations are many frequency-based devices with independent local oscillators that generate and convert carrier frequencies, and modulate and demodulate data. Locking these oscillators to a common, stable and low-noise frequency reference distribution system is fundamental to minimizing frequency issues and supporting higher data rates. This application note focuses on the important role and benefits of a frequency reference distribution system, design considerations, and best practices to deploy a system that meets large earth station reliability and quality-of-service requirements.

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but the architecture differs relative to the number of devices to be synchronized. Both systems are based upon GPS-synchronized frequency reference(s). Application note Satellite Communication Systems Ń GPS Frequency Reference for Earth Stations discusses the high value that a GPS frequency reference with ultra-low phase noise provides to earth station operations.

HIGH-RELIABILITY FREQUENCY REFERENCE DISTRIBUTION SYSTEM

Large earth station operators have the challenge of providing multiple services to a large number of customers at the highest data rates. The overall volume of data serving critical applications necessitates an infrastructure with a higher level of reliability and redundancy to meet customer availability and quality-of-service requirements.

Earth station quality-of-service is directly related to the frequencies used to carry the payloads through the modulators, demodulators, uplinks and downlinks. The independent local oscillators within these devices are subject to frequency drift and temperature instability that can result in degraded performance and errors. Best practice is to stabilize these oscillators with a phase-locked-loop (PLL) connected to an external GPS-based frequency reference. The frequency output from the GPS reference, that is traceable to the United States Naval Observatory (USNO), provides excellent short- and long-term stability. This enables earth-station devices to correct the local oscillator accuracy and stability by continuously compensating for drift and temperature.

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