

MiCLK

1588 Grandmaster on an SFP with Built-in GNSS



- Fully-featured Primary Reference Time Clock (PRTC) and IEEE 1588-2008 (PTP) Grandmaster
- Built-in GNSS receiver
- Miniature pluggable device fits in any standard SFP port
- Ideal for 4G small cell deployments
- Cost-effective upgrade solution for legacy 2G/3G networks

MiCLK® offers a cost-effective migration path for providing robust synchronization near the network edge. It enables flexible deployment and easy integration into existing networks. The cutting-edge embedded GNSS receiver features excellent time accuracy even under challenging deployment scenarios such as building walls and urban canyons that are typical for small-cell installations. Design and timing redundancy techniques provide resiliency against local GNSS outage.

MiCLK supports both Layer-2 and Layer-3 PTP distribution in unicast and multicast modes.

FULL-FEATURED PTP GRANDMASTER

MiCLK distributes frequency and time simultaneously, according to both ITU-T G.8265.1 (IP/unicast) and ITU-T G.8275.1 (L2/multicast), and G.8275.2 (IP/unicast) PTP telecom profiles. This is especially effective in hybrid cellular environments that comprise co-located 3G/4G base station technologies. When working in ITU-T G.8265.1 or G.8275.2 mode, MiCLK supports up to 64 simultaneous slaves (symmetric 128 packets/second).

PRIMARY REFERENCE TIME CLOCK

MiCLK is used as an ITU-T G.8272 Primary Reference Time Clock (PRTC), providing information on GNSS time and frequency information to the network, by supplying a Sync-E distribution chain (Sync-E

Ethernet SSM messages) and using its 1-PPS external interface output.

RESILIENCY

To achieve network-wide resiliency an operator may allow two or more PTP flows to reach every slave (base station), it is the slave who selects the best master available.

One option is to install two or more MiCLK units in geographically separated network elements located in the same backhaul network section.

Alternatively, two MiCLK units can be plugged into the same router/switch (connected to the same GNSS antenna via a standard passive RF splitter).

An operator may choose a combination of both resiliency types.

MiCLK supports multiple GNSS backup schemes. If the underlying network already supports Sync-E, MiCLK exploits the incoming Sync-E reference to maintain its accurate time during a GNSS outage.

Another resiliency option is the Assisted Partial Timing Support (APTS). MiCLK simultaneously functions as a Grandmaster (GM) and a slave of 1588. The slave inside MiCLK synchronizes to an incoming PTP stream received from the central GM. During a GNSS outage, MiCLK recovers the frequency from the central GM to maintain its accurate time.

MARKET SEGMENTS AND APPLICATIONS

Deployment scenarios include future 4G mobile networks, such as LTE and LTE-A, with a particular focus on small cell applications. Furthermore, support of simultaneous L2/L3 PTP distribution also provides a cost-effective upgrade solution for legacy 2G and 3G networks by supporting SDH replacement scenarios.

MiCLK's preferred deployment location is versatile. Due to its cost-effectiveness, MiCLK can be widely placed close to the base stations in order to reduce packet delay variation and asymmetry. Furthermore, MiCLK saves CAPEX by adding timing capabilities to existing aggregation points, servicing dozens of base stations.

Specifications

CAPACITY

Master capacity of 64 slaves (Symmetric 128 packets/sec)

ETHERNET

GE PTP/Sync-E input/output and management over SFP or SFP+ 1000baseX (MSA compliant)

GNSS RECEIVER

- 72-channel multi-GNSS receiver engine
- Dual frequency GNSS
- GPS L1C/A /QZSS L1 C/A
- SBAS L1 C/A: WAAS, EGNOS, MSAS
- 3.3 VDC antenna voltage supply

MANAGEMENT

- Dedicated IP address/subnet (IPv4, IPv6)
- VLAN 802.1Q
- Graphical web interface
- Remote CLI (Telnet/SSH)
- Remote SW upgrade via SFTP or TFTP
- Zero touch mechanism
- Able to save user default configuration
- Multilevel user access up to 4 sessions
- TACACS+ Authentication, Authorization and Accounting
- ACL security for management
- DSCP configuration for management

INTERFACES

- PTP/Sync-E/MGMT: GE PTP/Sync-E/MGMT input/output and management over SFP or SFP+ 1000 baseX (MSA compliant)
- GNSS: L1 GNSS input port, COAX DIN 1.0/2.3(F) screw-locking connector, 50 Ohm
- 1PPS/CLK: 1-PPS output over COAX DIN 1.0/2.3(F) screw-locking connector (50 Ohm)

TIMING

PTP

- Full featured IEEE 1588-2008 Grandmaster
- 1-step clock and 2-step clock
- ITU-T G.8265.1 or 8275.2 (IP/unicast) Telecom profile frequency and time distribution (IPv4, IPv6)
- ITU-T G.8275.1 (Eth/multicast) Telecom profile frequency and time distribution
- APTS opposite G.8275.2 GM over UDP/IP
- PTP/Sync-E hybrid (Sync-E for frequency and PTP for time)
- VLAN 802.1Q
- DSCP configuration for PTP (G.8265.1 and G.8275.2) packets

Synchronous Ethernet (Sync-E)

- Sync-E Primary Reference Clock (PRC) output with Ethernet SSM according to G.8262 and G.8264 (with GNSS)
- Sync-E reference input (with Ethernet SSM handling) for GNSS backup

Internal Oscillator

Stratum 3E OXCO ($\Delta T = \pm 20^{\circ}\text{C}$)

Time Accuracy

- Normal GNSS operation: Time error $< \text{UTC} \pm 100\text{nsec}$ and $\text{MTIE} < 100\text{nsec}$ according to ITU-T G.8272 and ITU-T G.8273.1

- Sync-E based GNSS backup: Time Error $< \text{UTC} \pm 1\mu\text{sec}$ for 24-72 hrs (depending on accuracy of Sync-E source)

Frequency Accuracy

Compliant with G.811 PRC requirements (during both GNSS normal and backup operation)

DIAGNOSTICS

Syslog

Performance Monitoring for Timing

GENERAL

Indicators

- GNSS operation status LED
- General fault indication LED

Physical

Height: 12.4 mm (0.488 in)

Width: 14.0 mm (0.55 in)

Depth: 79.0 mm (3.11 in)

Extending from chassis: 31.0 mm (1.22 in)

Power Consumption

$< 1.65\text{W}$

Environment

Operating case temperature:

-20 to 85°C (-4 to 185°F)

Relative humidity: up to 95%

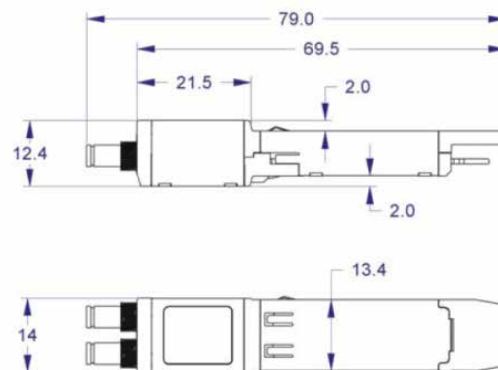


Figure 1. MiCLK Physical Dimensions in mm

MiCLK

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Ordering

RECOMMENDED CONFIGURATIONS

MiCLK/8S slaves

Distributed 1588 Grandmaster on an SFP with up to 8 slaves

MiCLK/24S slaves

Distributed 1588 Grandmaster on an SFP with up to 24 slaves

MiCLK/64S slaves

Distributed 1588 Grandmaster on an SFP with up to 64 slaves

OPTIONAL ACCESSORIES

MiCLK-GNSS-ANT-KIT/20M

GNSS antenna kit including roof antenna, mounting kit and indoor cable 20m/ 60m/ 120m (65.6ft/ 196.85ft/ 393.7ft)

MiCLK-LIGHTARR-KIT/10M

GNSS lightning arrestor kit for MiCLK, including a lightning arrestor and 10m (32.8ft) outdoor cable

CBL-MINIBNC-BNC/F

Adaptor cable (75 Ohm) to connect MiCLK's 1PPS/CLK connector to external equipment

Pulse Supply
 909 Ridgebrook Road., Sparks, Maryland
 21152, USA TEL : +1-410-583-1701
 FAX : +1-410-583-1704
 E-mail: sales@pulsesupply.com
<https://www.pulsesupply.com/rad>
www.pulsesupply.com/rad

