

# WHITE RABBIT ZEN TP-FL

The fundamental standalone node



## WHITE RABBIT ZEN TIME PROVIDER: WR-ZEN TP-FL

The fundamental standalone node that provides the White Rabbit features to a wide range of applications making use of its redundant connections.

The WR-ZEN TP-FL easily distributes time and frequency to other equipment by implementing widely available timing protocols: PTP, NTP, 10MHz/PPS.

The WR-ZEN TP-FL combines ultra-stable clocks with low jitter and temperature compensated clock resources to enhance its synchronization accuracy in a cost-effective 1U form factor.

Optional expansion modules are available in order to provide additional configurable timing outputs, including 1PPS, 10MHz and IRIG signals, or/and enhanced holdover capability.

- Sub-nanosecond time accuracy and picosecond level precision
- WR, PTPv2 and NTP over optical interfaces
- Extended management and monitoring
- Distance range over 80km using fiber
- Multi-source time references
- Linux-based WRZ OS
- Failover mechanisms & Holdover
- Robustness & Redundancy
- Configurable timing outputs via expansion modules

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## High Accuracy

The WR-ZEN TP-FL implements the White-Rabbit (WR) protocol, an high-accuracy extension of PTP based on SyncE, that allows to easily distribute sub-nanoseconds timing within Metro Area Network distances and beyond.

Worth to mention, that a timing network using WR protocol is not affected by the traffic load nor the number of hops.

## Resiliency

To ensure continuous operation the WR-ZEN TP-FL incorporates a failover mechanism. It provides a safer version of the “Best-Master-Clock” algorithm as it only allows switching over multiple (predetermined) timing sources when a failure is detected. Additionally, an optional Holdover oscillator can be included to maintain high accuracy ( $1.5\mu s < 24h$ ) even if all timing references are down.

## Advanced Management

The WR-ZEN TP devices enable extensive monitoring via REST-API and SNMP including the combination of smart alerts with traps. By providing templates, it facilitates its integration with third-party networking and monitoring tools. Moreover, it allows automatic topology discovery via LLDP and comprehensible remote logging through rsyslog.

## Interoperability

Used as time provider or interoperability node, the WR-ZEN TP-FL can distribute standard PTP IEEE 1588-2008 for the last hop through its 2x fiber ports using the most common profiles such as Telecoms profiles (G.8265.1, G.8275.1) & Power profiles (IEEE C37.238-2011 and IEEE/IEC 61850-9-3). It also provides NTP interoperability and 10MHz/PPS distribution.

## Intuitive configuration

The new version of WRZ-OS introduces a complete web interface redesigned to provide an excellent user experience: By the means of timing presets, a complex configuration can be done in a few clicks. Simultaneously, the CLI tool has also been rethought to allow straightforward configuration from the terminal to advanced users.

## Enhanced Security

TACACS+/RADIUS have been integrated to enable remote authentication for networked access control through a centralized server. The secure version of most of the protocols such as SFTP, HTTPS, SNMPv3 has been implemented and a firewall has been incorporated to provide a robust system against malicious users.

# Technical Specifications

Timing & Synchronization	
Multi-sources	<p>Failover mechanism to ensure continuous operation by switching over multiple timing sources in case of failure:</p> <ul style="list-style-type: none"> <li>White Rabbit (accuracy &lt;1ns)</li> <li>External references (GNSS, Atomic Clocks)</li> </ul>
WR	Supports GM/ Master/ BC/ Slave modes
PTP IEEE 1588-2008	<p>Supports Master mode, E2E/P2P, L2/L3, Multicast/ Unicast.</p> <p>Supported Profiles:</p> <ul style="list-style-type: none"> <li>Default</li> <li>G.8265.1[1]</li> <li>G.8275.1 [1][2]</li> <li>IEEE C37.238-2011[1]</li> <li>IEEE/IEC 61850-9-3[1]</li> </ul>
NTP	<p>Supports Client &amp; Server modes</p> <p>Supports NTP v2, v3 &amp; v4</p> <p>Supports hardware timestamping</p>
IRIG-B (optional)	Supported via expansion card
Holdover (optional)	Accuracy (learning 3 days from GNSS) below 1.5us @ 24h
Management & Communications	
Control	CLI & Web-GUI: HTTP(s)
Authentication	<ul style="list-style-type: none"> <li>RADIUS</li> <li>TACACS+</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>SNMPv3 (SNMPv2) + Traps with enterprise MIB</li> <li>Smart-Alerts</li> <li>REST-API</li> </ul>
Network	<ul style="list-style-type: none"> <li>SSHv2 (OpenSSH 8.1) + SFTP/SCP</li> <li>HTTP(s)</li> <li>DHCP</li> <li>LLDP</li> <li>Rsyslog</li> </ul>

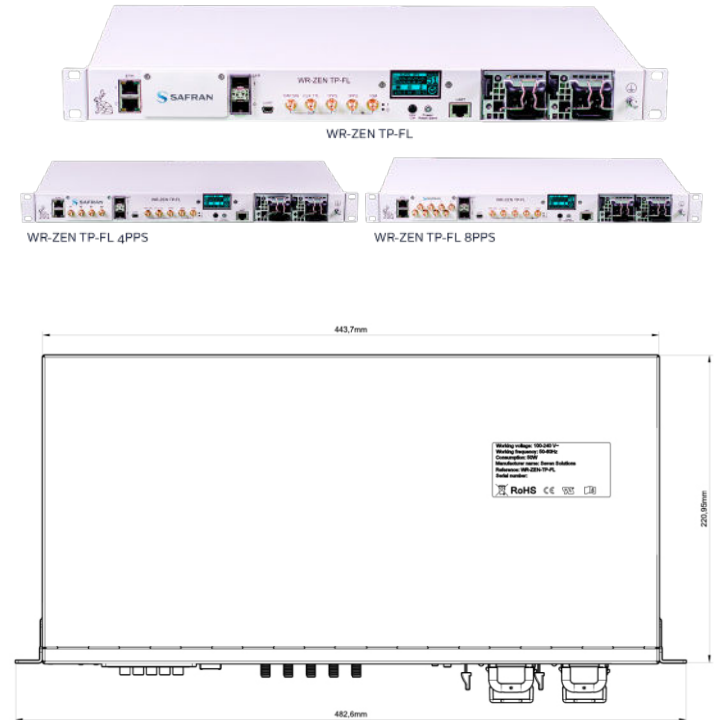
[1]: PTP License not included in default package  
 [2] Not supported in firmware version v5.0

Security Features		
<ul style="list-style-type: none"> <li>Configurable Password Policy</li> <li>Authentication: RADIUS; TACACS+</li> <li>Enable/Block protocols</li> <li>SFTP/SCP: Securely transfers files to and from the device over an SSH session</li> <li>SNMP v3: Remotely configure and manage over an encrypted connection</li> <li>HTTPS support</li> <li>Firewall configuration</li> <li>Alert notifications via SNMP traps and email</li> <li>Signed software updates</li> </ul>		
Specifications: 10MHz output		
Phase noise (dBc/Hz)	GM	Slave
1 Hz	-86.2	-76.5
10 Hz	-87.6	-79.7
100 Hz	-107.2	-112.4
1 kHz	-140.8	-143.6
10 kHz	-143.0	-145.3
100 kHz	-146.0	-149.1
Signal waveform & Levels: LVTTTL into 50 ohm, SMA		

Specifications: 1PPS output	
Accuracy when locked (WR or ext. reference)	< 1ns
Holdover (after 3 days locked to GNSS reference) *requires Holdover option	
After 4 hours	< 100 ns
After 8 hours	< 500 ns
After 24 hours	< 1.5us
Signal waveform & Levels: LVTTTL into 50 ohm, SMA	

Front Panel	
UART	<ul style="list-style-type: none"> <li>• RS232 Serial, RJ45 connector (Management)</li> <li>• 1x ARM Mini- USB (B) UART (Management)</li> </ul>
Ethernet	2x 100/1000 Base-T RJ45 (Management, PTP, NTP)
SFP Ports	2x 1GbE for timing distribution (M WR/ PTPv2/NTP)
Timing I/O	5x SMA connectors (3V @50Ω, TTL compatible): <ul style="list-style-type: none"> <li>• 10 MHz SIN OUT (LVTTTL)</li> <li>• 10MHz OUT (LVTTTL)</li> <li>• PPS OUT (LVTTTL)</li> <li>• PPS IN (LVTTTL)</li> <li>• 0MHz IN (TTL/CMOS/ECL/clipped sine)</li> </ul>
LCD display	Information panel for alerts and basic network configuration
LEDs	3xLEDs for status information
Power supply	2x Redundant & Hot-swappable <ul style="list-style-type: none"> <li>• 100-240 VAC, 50-60 Hz</li> <li>• 48 VDC modules available (optional)</li> <li>• 50W (max. 80W)</li> </ul>
Physical Specification	
Dimension	444 mm x 43 mm x 221 mm (Designed for EIA 19" rack)
Color	White (Metallic)
Certifications	ROHS, FCC, CE, SE
Environmental Conditions	
Temperature	-10°C ~ +50°C
Humidity	0% ~ 90% RH
Fans	2x Embedded fan modules Airblow: blowing out
Expansion modules (optional)	
FMC 4x1PPS expansion	LVTTTL into 50 ohm, SMA Configurable options: <ul style="list-style-type: none"> <li>• 4x 1PPS/10 MHz/ xPPS/ IRIG-B</li> <li>• 2x 1PPS/10 MHz/ xPPS/ IRIG-B +</li> <li>• 2x 1PPS/10 MHz/ xPPS/ IRIG-B</li> </ul>
FMC 8x1PPS expansion	LVTTTL into 50 ohm, SMA Configurable options: <ul style="list-style-type: none"> <li>• 8x 1PPS/10 MHz/ xPPS/ IRIG-B</li> <li>• 4x 1PPS/10 MHz/ xPPS/ IRIG-B +</li> <li>• 4x 1PPS/10 MHz/ xPPS/ IRIG-B</li> </ul>

Ordering information	
Base unit	P/N: EQP-TMP-FL-01
Product configuration	P/N
WR ZEN TP FL with FMC 4x1PPS WR ZEN TP FL with FMC 8x1PPS WR ZEN TP FL with HO WR ZEN TP FL with FMC 4x1PPS & HO WR ZEN TP FL with FMC 8x1PPS & HO WR ZEN TP FL with 48 VDC	EQP-TMP-FL-4-01 EQP-TMP-FL-8-01 EQP-TMP-FL-02 EQP-TMP-FL-4-02 EQP-TMP-FL-8-02 EQP-TMP-FL-100



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