

TREDESS FULLY REDUNDANT CLOCK REFERENCE



Overview:

With the background of having delivered several thousands of GPS/GNSS receiver modules integrated with our TRedess TV and Radio Transmitters worldwide, and after a process of collecting the current and future clock synchronization demands of some of the most important network operators worldwide, TRedess is now bringing to the market the **new Redundant Clock Reference**, a fully comprehensive solution that adds together maximum reliability, robustness, modularity, performance and cost optimization.

The **TRedess** standalone Redundant Clock Reference provides accurate and stable time and frequency signals for critical synchronization applications, covering a **wide range of scenarios** due to the possibility to internally discipline the internal high performance OCXOs from **multiple synchronization input sources**, such as multi-band & multi-constellation GNSS receivers, an external 1PPS input source and also PTP master clocks at the same time. The switching between these synchronization sources and OCXOs can be manually or automatically performed without timing/amplitude/phase noise side effects in the 1PPS and 10MHz outputs allowing a totally **seamless operation**.

This solution brings total **reliability** and **scalability** to the system by including two optional redundant GNSS receivers, two redundant OCXOs and also two redundant Power Supplies (both AC and DC). The high reliability is also guaranteed by a “no wires” internal design. The **compact** and **modular** architecture of the equipment (with all modules accessed & extracted from the front side and being hot-swappable) brings also the advantages of an immediate/fast replacement, easy operation and also the optimization and cost of spare modules.

Also the **high port density** available at the rear part of the equipment is optimum for the synchronization of many devices at the same time which is optimal in scenarios such as digital TV and radio transmission under SFN, feeding many transmitter and other devices simultaneously with just one equipment on each site. This high density can be even increased using an additional expansion module which can be powered by this unit.

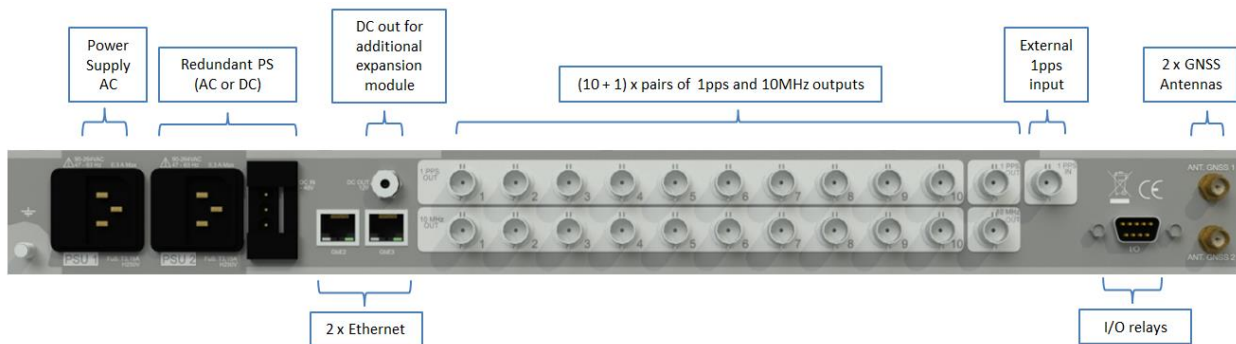
The **Multi-band** and **Multi-Constellation** (up to 4 concurrent constellations) operation of the GNSS receivers make this solution very robust, not anymore dependent of just a single positioning system, and with the capability to track a very high number of satellites.

In addition to that, **IEEE 1588 Precision Clock Synchronization Protocol v2** is also supported in multiple modes (Grandmaster, Boundary Clock and Slave Boundary clock), making this solution also suitable for applications that require precise timing synchronization but lack access to satellite navigation signals. At this respect, several Ethernet ports can be easily assigned for this purpose.

Key characteristics:

- **Modularity and Scalability. Hot-swappable modules:**
 - Redundant GNSS receivers
 - Redundant high stability and low noise OCXOs
 - Redundant Power Supplies (AC and DC)
- **Highly flexible synchronization sources configuration**
- **Multiple outputs: 10 + 1 pairs of 10MHz and 1PPS outputs**
- **Seamless switching for 10MHz & 1PPS outputs**
- **Advanced GNSS receiver features:**
 - Concurrent multi-constellation (GPS, Galileo, GLONASS, BeiDou) and SBAS operation
 - Concurrent multiband (L1 + L2) operation
 - Tracking up to 184 satellites at the same time
 - Built-in security for highest robustness against malicious attacks (jamming & spoofing)
- **NTP and PTP clock functionalities: Boundary clock, Grandmaster and Slave according to IEEE 1588 v2**

Front and Rear panel interfaces:



Rear panel interfaces



Front panel interfaces

Technical Specifications:

RECEIVER <i>2 hot-swappable modules</i>	
Constellations	BeiDou, Galileo, GLONASS, GPS
Number of concurrent GNSS	4
Satellite-based augmentation systems	IMES, SBAS, QZSS
GNSS Bands	L2OF, L2C, E1B/C, B2I, E5b, L1C/A, L1OF, B1I
Security features	Anti-jamming / anti-spoofing / secure boot / T-RAIM
Supported channels	184 channels
Tracked satellites	> 32
Acquisition - Cold start	< 5 min
Acquisition - Hot start	< 1 min
Input connector	SMA female / 50Ω

FREQUENCY OUTPUT <i>10x 10MHz + 1 Safe 10MHz output before internal distribution</i>	
Accuracy (GNSS locked)	$< \pm 5 \times 10^{-12}$
Short term stability	$5 \times 10^{-13} / 1s$
Medium term stability	$2 \times 10^{-10} / \text{day}$
Temperature stability	$\pm 1 \times 10^{-9} / ^\circ\text{C}$ from -5 to 60°C
Signal waveform	10MHz sinewave / +5dBm / 50Ω / BNC female

TIME OUTPUT <i>10x 1PPS + 1 Safe 1PPS output before internal distribution</i>	
Accuracy (GNSS locked)	$\pm 25\text{ns}$
Holdover	<1μs after 4h without GNSS source
	<10μs after 24h without GNSS source
Signal waveform	TTL / 50Ω / BNC female

OTHER	
Seamless operation	10MHz & 1PPS fully seamless switching
Cold start-up time	< 5 min
Hot start-up time	< 1 min
PTP	IEEE 1588-2008 v2, Ordinary master and slave clock, Unicast / Multicast 2x Ethernet ports
1PPS input	TTL / 50Ω / BNC female
NMEA output	GNSS RAW data file dumping
Webserver	User intuitive and responsive design
SNMP	v1, v2, v2c
Monitoring	Full integrated monitoring tool
Management	2x IEEE 802.3af Gigabit Ethernet / RJ-45 / remote & local
	Front panel (display, LEDs and buttons)
Contacts	4 inputs / 2 outputs / configurable trigger & histeresys
DC output	12V for auxiliary equipment

POWER SUPPLY <i>2 hot-swappable modules</i>	
Electrical characteristics	PSU 1: AC 100 to 240V / 48 to 63Hz
	PSU 2: AC 100 to 240V / 48 to 63Hz / DC -48V
Typical power consumption	12W
Max power consumption at startup	15W

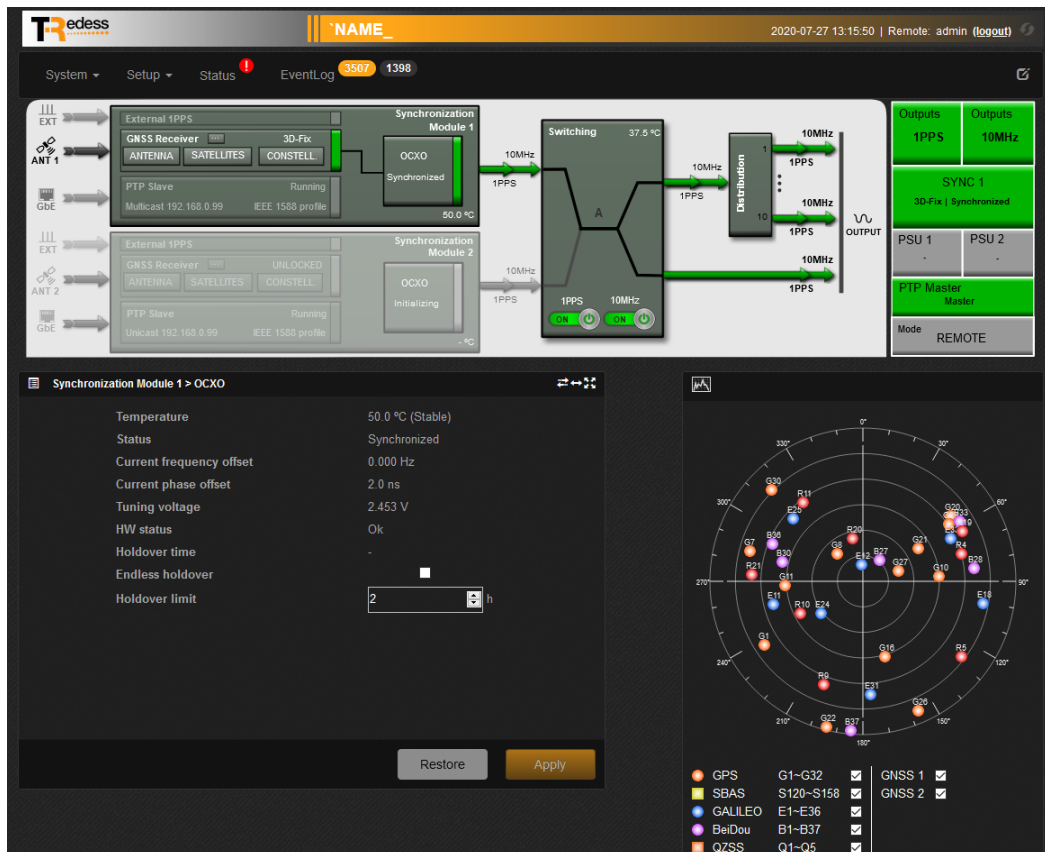
COMPLIANCE	
Safety	EN 60950-1
EMC	EN 61000-6-2, EN61000-6-3
RoHS	2011/65/EU
WEEE	2012/19/EU

ENVIRONMENTAL	
Operation range	-5 to 50°C
	95% @ 40°C, non condensing
	Up to 3000m m. o. s. l.

PHYSICAL	
Size	1RU (483 x 300 x 44mm)



Totally modular solution: Hot-pluggable modules accessible from front panel



Responsive and intuitive WEB GUI interface