

## Product Overview

The VCL-2145-SSU is specifically designed to provide reliable and high precision synchronization in 2G, 3G, 5G, HetNet and LTE mobile telecommunications networks as well as backhaul wire-line SDH / SONET and Synchronous Ethernet networks. The VCL-2145-SSU System is compliant with ITU-T G.811 standards. It may be also used by Railways, Airports (and Air-Traffic Control), Power Generation and Distribution companies and other Utility companies who require fail-safe, high-reliability and precise synchronized synchronization outputs that are concurrently locked to GNSS (GPS/GLONASS) References.

In addition to traditional TDM network timing capabilities, the VCL-2145-SSU supports packet networks with signals including IEEE 1588 Precision Time Protocol (PTP) and Network Time Protocol (NTP) for advanced network services. The VCL-2145-SSU platform is also ready to support the seamless introduction of SyncE-capable elements into your network. The product is designed with latest hardware and software integration technologies.

## Fully Reliable / Redundant Equipment, High Performance Network

The VCL-2145-SSU accepts a wide range of input and outputs. Output capabilities allow it to support legacy frequency timing applications, including E1/ T1, 10 Mhz, 1 PPS (PPS) as well as Time-Of-Day (ToD) using redundant Input / Output Clock cards. Additionally, the SSU may also be used to provide IEEE-1588v2 PTP Grandmaster and NTP Outputs.

### Features and Highlights:

- Single platform for TDM, NTP, PTP and SyncE
- PTP Grandmaster is Modular and compact 6U, 19" or ETSI rack mountable equipment to provide network synchronization
- Fully integrated - IEEE 1588v2 (2008) PTP server and NTP (v4) Server
- High capacity (up to 8,192 PTP slaves / clients) per chassis.
- Compliant with ITU-T Telecom Profile G8265.1 and G8275.1
- High PTP message rate (up to 128 messages per second)
- Automatic Redundant configuration
- Single or Dual GNSS (GPS) inputs with Stratum 1
- Single platform for traditional TDM, PTP, NTP and SyncE
- Integrated with Next Generation Networks Synchronization
- Time-of-Day Server
- Timing sources for Sync-E, Ethernet Network Equipment
- OCXO and Rubidium (RbXO) Holdover Clock options
- Protection / Redundancy: Module protection for all critical functions (Inputs, Holdover Clock, Outputs, Power)
- Fully Manageable Local and Remote Graphical User Interface (Omni view).

### Design:

The VCL-2145-SSU architecture is designed to integrate intelligent, functional modules into a flexible, fully redundant system to seamlessly satisfy current and future requirements.

The system provides total output capacity of up to 192 unprotected ports or 96 protected ports. Output modules may be configured in redundant pairs providing twenty-four 1:1 fully protected output per pair. Expansion shelves are designed with redundant connections for reliable uptime.

VCL-2145-SSU integrated up to 6U high performance modules enabling a total capacity of more than 8,000 PTP slave clients. Each module integrated with PTP Engine with accurate time stamping and supports 1024 PTP Clients each card.

**Auto-Reconfiguration:** If a module is removed and a like module installed in the same slot, the new module will be automatically configured to the same settings as the previous module. Input signals are passed through in case of multiple internal failures, including clock failures.

### Reliability and Flexibility:

Each VCL-2145-SSU module/card is designed for high-reliability and flexible functionality. Modules / Cards can be removed or inserted while the unit is operating without any degradation of the output signals. Each Smart Card/Module supports the management of Critical, Major and Minor alarms.



### Modules:

Each SSU module has an integrated CPU with software for superior reliability, flexibility and functionality. Modules can be removed or inserted while the unit is operating without any degradation of the output signals. Each intelligent module supports the management of critical, major and minor alarms. Powerful management can be performed to and within each module through the communication module.

### GNSS (GPS and GLONASS):

The SSU accepts single or dual GPS primary receiver modules to meet primary reference clock requirements, which provides the following key benefits:

- 50 Channel GPS Receiver / 72 Channel GNSS (GPS and GLONASS) Receiver
- Supports GPS/ L1, GLONASS Galileo, SBAS: GAGAN, WAAS, EGNOS, MSAS, QZSS
- Tracks up to 12 satellites simultaneously
- Synchronizing Time:
  - Acquisition time - Hot Start: Less than 15 sec.
  - Acquisition time - Warm Start: Less than 45 sec.
  - Acquisition time - Cold Start: Less than 140 sec.
- Antenna Connector: TNC
- Accuracy Of Time-Pulse Signal referenced to GPS: +/-30ns (raw)
- Accuracy Of Time-Pulse Signal referenced to GPS: +/-15ns (compensated)
- (Note: with all satellites in view at -130db)

## Technical Specifications:

### Synchronization Inputs:

- 1:1 Protected - E1 (2.048Mbits), 2.048 MHz inputs
- 4 x E1 (2.048Mbits), 4 x 2.048 MHz and SyncE input options
- Up to two GNSS Modules - GPS/GLONASS Inputs
- Up to two Input Modules E1 (2.048Mbits) / T1 (1.544Mbits), 2.048 MHz and 10 MHz.

### Optional Synchronized Outputs:

The VCL-2145-SSU's accepts up to eight output modules, providing 192 outputs. The output modules may also be configured for redundant operation that supplies 24 protected outputs per pair. Various output modules are available to meet specific signal and interconnection requirements including E1, T1, RS-422, NTP, IRIG-B and IEEE 1588 PTP. The activation of the output's ports are fully usercontrollable.

- Up to 8 x E1/T1, 2048MHz cards - supports 24 outputs per card (E1 /T1 and 2048MHz)
- Optional 1:1 Protection
- Up to 8 x High capacity PTP cards - supports 1 PTP Output Ports per card
- Up to 8 x High Capacity NTP cards. Each NTP card supports 4 x 100/1000BaseT (electrical) / 1000BaseX (optical) NTP outputs
- SyncE
- 1x10 MHz
- 1x NMEA0183
- 1x1 PPS.

### Holdover Oscillator Options [Internal (G.812) Synchronization]:

In case of loss of GPS and input references, the VCL-2145-SSU uses intelligent software to provide enhanced output performance beyond the required holdover stability. Its superior holdover capability retains stratum G.812 performance for three weeks during holdover conditions with a rubidium clock.

- The VCL-2145-SSU accepts single or dual clocks (1+0 or 1:1 / 1+1 protected clocks). The input reference jitter and wander are filtered by a high quality oscillator.
- Oscillator options include:
  - Oven-Controlled Crystal Oscillators (OCXO)
  - Rubidium (RbXO)
- In case of loss of GNSS and input references, the VCL-2145-SSU uses intelligent software algorithms to provide better output performance which exceed the holdover stability requirements of ITU-TG.821.

### Synchronization Performance:

- G.811 PRC referenced to GNSS (GPS/GLONASS). ITU-T G.811 quality when locked to GPS, or GPS+ GLONASS (ITU-T G.811)
- G.812 Type II SSU on Rubidium Holdover (ITU-T G.812)
- G.812 Type I & III SSU on OCXO Holdover (ITU-T G.812)
- Oven-Controlled Crystal Oscillator (OCXO) holdover drift: less than 24us (2.4e-5 seconds) in 24 hrs

### NTP - Network Time Protocol:

- NTP v2, (RFC 1119), NTP v3 (RFC 1305), NTP v4, (RFC 5905), SNTP v3 (RFC 1769), SNTP v4 (RFP 2030), MD5 Authentication
- Internet Protocol: IP v4, IP v6
- Time Protocol: TIME (RFC 868)
- Daytime Protocol: DAYTIME (RFC 867)
- Upto 10,000 NTP requests per second
  - 80,000 NTP Slaves supported
  - 500,000 SNTP Slaves supported

### PTP IEEE 1588-2008 V2 Grandmaster:

- <100ns Accuracy when locked with GNSS (GPS/GLONASS)
- PTP Slave/Client capacity: 8, 16, 32, 64 or 128, 256
- User Configurable
- 1-step and 2-step Clock
- Configuration message rate 8 pkts/sec, 16 pkts/sec, 32 pkts/sec and 64 pkts/sec
- Up to 128 message per second
- 1 x 10/100/1000Base-T (RJ45) Electrical Ports

### PTP Profiles:

- ITU-T G.8265.1 (Layer 3 unicast, Ipv4)
- Telecom-2008 Profile (Layer 3 unicast, pre-standard ITU-T G.8265.1, Ipv4)
- Power Profile: IEEE C37.238-2011
- Ethernet Default Profile (Layer 2 multicast)
- Communication: Unicast, Multicast or Mixed
- Best Master Clock Algorithm (BMCA)

### Local / Remote Management and Monitoring Ports:

- RS-232C
- USB
- 10/100BaseT Ethernet RJ45
- 2 x External Alarm Relay Contacts for Critical and Minor Alarms
- User defined alarm status for all Alarms

### Local / Remote Communication and Management Options:

- LED's on front panel
- Telnet, CLI, HTTP Web Interface
- Password Protection
- Firmware upgrade
- CLI Control Interface (HyperTerminal or VT100)
- SNMP V2 Traps (MIB File provided)
- GUI (Graphical User Interface) - Runs on any PC operating on Windows 7, Windows 8 or Windows 10 OS.

### Security and Protection:

- Password Protection
- SSH
- RADIUS

### Management:

- **VCL-UNMS** management software provides locally and remotely, powerful fault, configuration, accounting/inventory, performance, security, and other optional management functions
- Third party equipment can easily be managed through a set of electrical alarm collection inputs. The VCL-2145-SSU is also manageable by SNMP through OMNIVIEW.

### Environmental Characteristics (Equipment):

Operational	-10C to +60C (Typical: +24C)
Cold start	-0C to +50C
Storage	-20C to +70C
Humidity	-95% non-condensing
Cooling	Convention Cooled. No cooling fans are required.

### Environmental characteristics (Antenna):

Operational	-40C to +85C
Storage	-40C to +85C
Humidity	95 % non-condensing
Salt and Fog	Mil. Std. 202F, Method 101D Cond. B
Lightning Protection	According to EN610004-5

(Suitable for outdoor and rooftop installations.)

### Power Supply Options:

- Dual Redundant - maximum output / power supply card: 200W
- 1+1 AC power (100 to 240V AC, 50/60 Hz)
- 1+1 DC 24V power
- 1+1 DC -48V power
- AC or DC.

**Technical Specifications:****Antenna Specifications:**

- Protected 1:1 / 1+1 Antenna (Redundant)
- Antenna Type: Active
- N-Type (F) Connector
- Frequency: GPS L1 and L2 Bands (1.575 MHz); GLONASS: 1602-1615MHz
- Amplifier Gain: Typically +/-40dB (GPS L1 band); +/-34 (GLONASS band)
- Reverse Polarity Protection
- Lightening Protection: According to EN61000-4-5 Level 4.
- Operating temperature: -40C to +85C

**Antenna Cable Options:**

(Note: cables and connectors are not included and must be ordered separately as optional extras).

- Cable Type: LMR 400 or equivalent with N connector
- Total Cable Length: 30, 50, 60, 90 meters LMR 400
- 91 to 120 meters (LMR400 with one active in-line amplifier).
- 121 to 240 meters (LMR 600 with two active in-line amplifiers).

**MTTR:**

- < 3 hours (excluding travel time)

**MTBF:****MTBF for VCL-2145 with RbXO Option:**

- Per MIL-HDBK-217F: ≥ 32 years @ 24C
- Per Telcordia SSR 332, Issue 1: ≥ 36 years @ 24C

**MTBF for VCL-2145 with OCXO Option:**

- Per MIL-HDBK-217F: ≥ 37 years @ 24C
- Per Telcordia SSR 332, Issue 1: ≥ 42 years @ 24C

**Mechanical Specifications (Equipment):**

Height	311 mm (7U)
Width	484 mm (DIN 19-inch)
Depth	264 mm
Weight	12.0 Kg
Rack Mount Options	19", 21", 23" Rack Mounting options

**Standards and Compliance:**

- IEC - EMC** Certified to EN 55022 / CISPR 32, EN 55024, IEC 61000 4-2, EN609501, EN61000-6-2, EN61000-6-4
- FCC - FCC Part 15 B Class A:** Conducted Emission test on Power Line FCC Part 15 B Class A: Radiated Emission >1 GHz FCC, 6 GHz, on Power Line.
- Designed to meet the latest and evolving industry standards, including ANSI, Telcordia, ITU-T, ETSI, IEEE 1588 and CE/AS.

**EMI, EMC, Surge Withstand and other Compliances**

EN 50081-2	EN 50082-2	IEC 60068-2-29
IEC 61000-4-6 (Conducted Immunity)	IEC 60068-2-6	IEC 60068-2-2
IEC 60068-2-78	IEC 60068-2-1	IEC 60068-2-14
CISPR 32 / EN55032 Class A (Conducted Emission and Radiated Emission)		
IS 9000 (Part II Sec. 1-4, Part III Sec. 1-5, Part IV, Part 14 Sec. 1-3)		
IEC 60870-2-1	IEC 61000-4-5	
IEC 61000-4-3 (Radiated Immunity)	IEC 61000-4-8	
IEC 61000-4-2	IEC 61000-4-11	Telcordia
IEC 61000-4-4	GR-1089 Surge and Power Contact	

**Electromagnetic Standards Compliance:**

- EN 50081-2
- EN 50082-2
- IEC 61000-6-2 (Immunity)
- IEC 61000-6-4 (Emission)
- Complies to IEEE and IEC standards

**CE Compliance:**

- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility 2014/30/EU

**Other Regulatory Compliances:**

- RoHS
- CE Marking
- Complies with FCC Part 68 and EMC FCC Part 15
- Telcordia GR-1089 Surge and Power Contact

Technical specifications are subject to changes without notice.

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