

VCL-2145-D, GPS / GNSS PRIMARY REFERENCE CLOCK PTP GRANDMASTER AND NTP SERVER

Introduction:

VCL-2145 (VCL-2145-D) is a high-performance, high-reliability GPS / GNSS Primary Reference Clock and IEEE-1588v2 PTP Grandmaster that provides ITU-T G.811 Primary Synchronization Frequency References which are locked to a user selected Satellite source.

The VCL-2145 (VCL-2145-D) Satellite Receiver also has an integrated, high bandwidth NTP Server engine that is capable of handling up to 4500 NTP requests per second. Multiple IRIG-B Outputs are also provided to synchronize local clock (time-of-day) display units as well as RTUs to a central timing source with nanosecond accuracy.

The VCL-2145 (VCL-2145-D), Primary Reference (PRC) Clock is specifically designed for frequency synchronization of 2G, 3G, HetNet and LTE mobile telecommunications networks as well as backhaul wire-line SDH / SONET and Synchronous Ethernet networks. It may be also used by Railways, Airports (and air-traffic control), Power generation and distribution companies and other Utility companies who not only require highly precise G.811 frequency synchronization locked to a GPS Reference but who also need to provide an accurate time-of-day reference in their networks.



Features and Highlights:

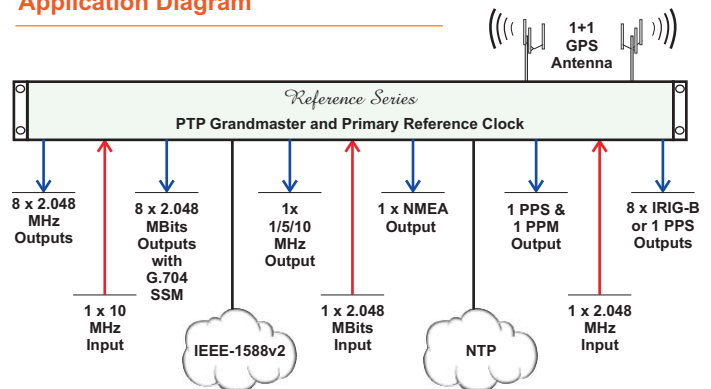
- Reliable, Cost-Efficient Reference GPS Receiver
- 50 Channel GNSS, L1 frequency, C/A Code Receiver
- Available with 1+0 (VCL-2145, without GPS redundancy) and 1+1 (VCL-2145-D, with GPS redundancy) options
- Tracks up to 12 GPS Satellites / 10 GLONASS Satellites.
- Anti-Jamming Technology: Resistant to Jamming upto CW6 level
- Concurrent tracking of up to a total of 34 Satellites
- ITU-T G.811 Primary Reference (PRC) Clock
- GPS locked G.703 compliant 1.544Mbits, 2.048Mbits, 2.048 MHz 1 PPS and 1 PPM outputs
- SSM Message format Compliant with ITU-T G.704. Optional GR-378-CORE for SONET Networks
- ITU-T G.811 / Stratum 1 compliant (PR) Primary Reference when locked to GPS
- Primary reference and holdover functionality:
- ITU-T G.812 compliant holdover
- 1/5/10 MHz output
- 1 PPS and 1 PPM
- IRIG-B outputs
- Standard RJ45 and BNC connectors for all inputs and outputs
- ToD compliant to NMEA0183 (DB9 Serial Port)
- LCD display with back light.

Available versions:

Product	Description
VCL-2145 (VCL-2145-D), GPS Primary Reference (PRC) Clock	
VCL-2145, GPS Primary Reference (PRC) G.811 Clock	Provides 1PPS, 1PPM, NMEA, 1/5/10MHz, 2.048MHz, 2.048Mbits with SSM, 1.544Mbits Frequency Outputs with High Stability OCXO and Rubidium (G.812) Holdover Clock options.
VCL-2145, GPS Primary Reference (PRC) G.811 Clock with NTP Server	May be used in multi-service applications as a G.811, Primary Reference (PRC) Clock and NTP Server 1/5/10MHz, 2.048MHz, 2.048Mbits with SSM, 1.544Mbits GNSS referenced outputs. OCXO and Rubidium (G.812) Holdover Clock options are available. Optional: GNSS: GPS, GLONASS, GPS+GLONASS, GPS+SABS (ISRO-GAGAN)

The VCL-2145-D incorporates up to dual (1+1 redundant) GNSS receiver engines and dual (1+1 redundant) power supply options for added reliability which are always locked to a user selected satellite (GNSS) reference to provide multiple G.811 / Stratum 1 quality frequency and time-of-day (PTP, NTP and IRIG-B) outputs. The VCL-2145 is also equipped highly accurate, low-noise OCXO / Rubidium oscillator which provides a high stability holdover clock that is typical of a Network SSU in the event of the GPS signal, or its antenna failure.

Application Diagram



GPS Receiver as a Primary Reference (PRC) Clock with IEEE-1588v2 Grandmaster and NTP Server

Additional Features:

- IEEE - 1588v2 PTP Grandmaster
- SyncE
- High bandwidth NTP Server capable of supporting up to 4500 NTP requests per second
- Leap Second Support
- IPv4 and IPv6 compatible NTP Server
- SSH, Telnet, Radius, SNMP V2 MIB, Password Protection
- Redundant AC and DC power supply options
- 4, 10/100/1000BaseT Network Interface Ethernet Ports
- Power Contact and Lightning Protection as per Telcordia GR-1089-CORE.

Typical Synchronization Applications:

- Synchronizing Cellular networks like UMTS, GPRS, 3G and LTE
- Power generation and distribution companies and other utility companies
- Wireless and Wireline Telecom synchronization
- Distributing Time (ToD) and Frequency reference for power utilities across all nodes of the network
- Synchronization of Defense Networks
- Synchronizing airports and aviation communications
- Synchronizing railway signalling networks and railway communications
- Synchronizing traffic management
- Broadcasting Network and Broadcast equipment synchronization.

Technical Specifications

GPS Receiver:

- 50 Channel GNSS Receiver
- Options of 1+0 and 1+1 GPS Receivers for redundant and non-redundant GNSS applications
- GNSS L1 frequency, C/A Code Receiver
- Tracks up to 12 GPS satellites simultaneously
- Tracks up to a total of 34 GNSS satellites concurrently
- Synchronizing Time:
 - Acquisition time - Hot Start: Less than 15 sec. (90%)
 - Acquisition time - Warm Start: Less than 45 sec. (90%)
 - Acquisition time - Cold Start: Less than 140 sec. (90%)
- GNSS Signal
 - Tracking and Navigation: -161 dBm
 - Reacquisition -161 dBm
 - Cold Start -151 dBm
- 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 12 satellites in view at -130db)

Internal (G.812) Synchronization Options:

- Rubidium
- OCOXO (Oven-Controlled Crystal Oscillator)

NTP Server:

- NTP Protocols: NTP v2 (RFC 1119), NTP v3 (RFC 1305), NTP v4
- IP Protocols: IPV4, IPV6
- Time Protocol: (RFC 868)
- Daytime Protocol: (RFC 867)
- Synchronization of IEC 61850 compliant devices using NTP/ SNTP protocol
- Capable of processing up to 4500 requests per second.
- Multiple LAN Support

IEEE-1588 PTP Grandmaster:

- Compliant with IEEE-1588 v2 (2008) specifications
- Profiles supported: Telecom profile, Power profile
- Frequency Accuracy: +/- 50ppb referenced to GPS
- Time Accuracy: < 50ns

Management and Monitoring Ports:

- RS-232C Connector
- USB Connector
- 10/100BaseT Ethernet
- 1 x External Alarm Relay Contact

Security and Protection:

- Password Protection
- Secured Access via SSH V2
- RADIUS
- Firewall

System Access, Control and Management Options:

- Telnet, SSH, RADIUS
- CLI Control Interface (HyperTerminal or VT100)
- SNMP V2 Traps (MIB File provided)

Standard Frequency and ToD* Outputs:

Output:	Number of Ports	Connector
ITU-T G.811 Complaint 2.048 Mbit/s (E1) / 1.544 Mbit/s (T1) outputs	8 (8E1 or 8T1)	RJ45
ITU-T G.811 Complaint 2.048 MHz, 75 Ohms, phase-locked to GPS	8	BNC
ITU-T G.811 Complaint 1/5/10 MHz, 50 Ohms, phase-locked to GPS	1	BNC
IEEE 1588v2 PTP Grandmaster: 10/100/1000 BaseT	1	RJ45
SyncE in as per ITU-T G.8261, G.8262 and G.8264	2	RJ45
IRIG-B / 1 PPS, phase synchronized to GPS**	8	BNC
1 PPS, phase-locked to UTC**	1	BNC
1 PPM, phase-locked to UTC	1	3 Pin Connector
TOD (Time-Of-Day) output compliant to NMEA0183	1	DB9, RS-232C
NTP v4, IPv4 and IPv6 10/100/1000 BaseT	4	RJ45

*ToD Time Of Day

**Note: User selectable between IRIG-B and 1PPS Outputs

Configuration and Monitoring Software:

- Telnet, CLI
- GUI (Graphical User Interface) - Runs on any PC operating on Windows XP, Windows 7 or Windows 8 OS.

Power Supply Options:

- Dual Redundant
- 1+1 DC 24V power
- 1+1 DC -48V power
- 1+1 DC 110/125V DC power
- 1+1 AC power (100 to 240V AC, 50/60 Hz)

MTBF:

MTBF for VCL-2145 with RbXO Option:

- Per MIL-HDBK-217F: ≥ 17 years @ 40°C
- Per Telcordia SSR 332, Issue 1: ≥ 20 years @ 40°C

MTBF for VCL-2145 with OCOXO Option:

- Per MIL-HDBK-217F: ≥ 21 years @ 40°C
- Per Telcordia SSR 332, Issue 1: ≥ 24 years @ 40°C
- AC or DC

Power Consumption:

Power Consumption with OCOXO Oscillator:

- < 25W during startup,
- < 18W at steady state 23°C

Power Consumption with Rubidium Oscillator:

- < 40W during startup,
- < 32W at steady state 23°C

Environmental:

Environmental characteristics (Equipment):

- Operational -10°C to +60°C (Typical: +25°C)
- Cold start -0°C to +50°C
- Storage -20°C to +70°C
- Humidity 95% non-condensing
- Cooling Convention Cooled. No cooling fans are required

Clock performance - GPS / GNSS:

- Performance when locked to GPS / GNSS Timing accuracy: < 60ns (at constant temperature) < 90ns (at variable temperature, -5°C to +55°C)

Frequency Accuracy:

- < 1x10⁻¹¹ (24 hour average)
- G.811 quality when locked to GPS / GNSS

Frequency holdover:

OCOXO:

- Long-term stability: 1x10⁻¹⁰/day, 2x10⁻⁸/year
- Frequency stability: 6x10⁻¹⁰(-5°C to +55°C)

Rubidium:

- Long term stability: ± 5x10⁻¹¹ / month
- Frequency stability: < 1x10⁻¹⁰ (-5°C to +55°C)

External Frequency Synchronization Inputs:

External Inputs	Number Of Inputs	Connector
2.048 MHz, 75 Ohms	1	BNC
10 MHz, 50 Ohms	1	BNC
2.048 Mbps	1	BNC

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