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 5000 NTP requests per second. Multiple IRIG-B Outputs are also provided to synchronize local clock (time-of-day) display units to a central timing source with nanosecond accuracy.

Features and Highlights:

- Reliable, Cost-Efficient Reference GPS Receiver
- 50 Channel GNSS, L1 frequency, C/A Code Receiver
- ITU-T G.811 / Stratum 1 compliant (PR) Primary Reference when locked to GPS
- ITU-T G.812 compliant holdover function
- SSM Message format Compliant with ITU-T G.704. Optional GR-378-CORE for SONET Networks
- GPS locked G.703 compliant 1.544Mbits, 2.048Mbits, 2.048 MHz 1 PPS and 1 PPM outputs
- 1/5/10 MHz, 1 PPS, 1 PPM and IRIG-B outputs
- ToD compliant to NMEA 0183 (DB9 Serial Port)
- 4 x 10/100/1000BaseT NTP Ports
- Additional 1 x 10/100 BaseT NTP Port for IPv4 / IPv6 operation
- Leap Second Correction Support
- Concurrent IPv4 and IPv6 Operations
- MDS authentication for NTP clients
- 802.1Q VLAN support for NTP Ports
- Anti-Jamming Technology: Resistant to Jamming upto CW6 level
- SSH, Telnet, Radius, SNMP V2 MIB, Password Protection
- Available with 1+0 (VCL-2145, without GPS redundancy) and 1+1 (VCL-2145-D, with GPS redundancy) options
- Power Contact and Lightening Protection as per Telcordia GR-1089-CORE.
- Standard RJ45 and BNC connectors for all inputs and outputs
- LCD display with back light.

GNSS Options:

- GPS, GLONASS, GPS+GLONASS and GPS+GLONASS+SBAS

Available versions:

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCL-2145D, GPS Primary Reference (PR) G.811 Clock, PTP 1588v2 Grandmaster and NTP Server (Available with 1+1 and 1+0 GPS receiver option)</td>
<td>May be used in multi-service applications as a G.811, Primary Reference (PRC) Clock and NTP Provides 1PPS, 1PPM, NMEA, 1/5/10MHz, 2.048MHz, 2.048Mbits with SSM, 1.544Mbits outputs Frequency Outputs with High Stability OCXO and Rubidium (G.812) Holdover Clock options. OCXO and Rubidium (G.812) Holdover Clock options are available. Optional: GNSS: GPS, GLONASS, GPS+GLONASS, GPS+SBAS (ISRO-GAGAN)</td>
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</tbody>
</table>

Additional Features:

- IEEE - 1588v2 PTP Grandmaster
- High bandwidth NTP Server capable of supporting up to 5000 NTP requests per second
- Redundant AC and DC power supply options

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 signaling networks and railway communications
- Broadcasting Network and Broadcast equipment synchronization.

Application Diagram

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

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

GPS/GNSS Receiver Specifications:
- 50 Channel GPS Receiver
- 72 Channel GNSS Receiver
- GPS L1 frequency, C/A Code Receiver
- Tracks up to 12 satellites in GPS only mode (GPS only version)
- Tracks up to 24 satellites in GNSS mode (GNSS version)

Synchronizing Time:
- Acquisition time - Hot Start: 1 sec.
- Acquisition time - Warm Start: 28 sec.
- Acquisition time - Cold Start: 28 sec.
- GPS Signal
- Tracking and Navigation: -162 dBm
- Reacquisition -160 dBm
- Cold Start -148 dBm
- Antenna Connector: TNC

Management and Monitoring Ports:
- 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

Security and Protection:
- Password Protection
- Secured Access via SSH v1.3, SSH v1.5, SSH v2
- RADIUS

System Access, Control and Management Options:
- Telnet (RFC 854 - RFC 861), FTP, SSH (incl. SFTP, SCP), RADIUS
- HTTP/HTTPS (2616), SYSLOG, SNMP
- CLI Control Interface (HyperTerminal or VT100)
- SNMP v1, SNMP v2c, SNMP v3 Traps (MIB File provided)

Confirguration and Monitoring Software:
- CLI, English commands
- GUI (Graphical User Interface) - Windows

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 Mill-HDBK-217F: ≥ 17 years @ 40°C
  - Per Telcordia SSS 332, Issue 1: ≥ 20 years @ 40°C
- MTBF for VCL-2145 with OCXO Option:
  - Per Mill-HDBK-217F: ≥ 21 years @ 40°C
  - Per Telcordia SSS 332, Issue 1: ≥ 24 years @ 40°C
  - AC or DC

Power Consumption:
- Power Consumption with OCXO 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 characteristics (Equipment):
- Operational: -10°C to +60°C (Typical: +25°C)
- Cold start: -0°C
- Storage: -20°C to +70°C
- Humidity: 95% non-condensing

Standard Frequency and ToD* Outputs:

Clock performance - GPS / GNSS:
- Performance when locked to GPS / GNSS
- Timing accuracy: complaint to ITU-T G.811

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

Frequency holdover:
- OCXO:
  - Stability: 0.5x10⁻¹⁰ (0.5 ppb) per day,
  - 50x10⁻¹⁰ (50 ppb) per year
  - Frequency stability: 6x10⁻¹² (-5°C to +55°C)
- Rubidium:
  - Long term stability: ± 5x10⁻¹⁰ / month
  - Frequency stability: < 1x10⁻¹¹ (-5°C to +55°C)

Antenna Specifications:
- Antenna Type: Active, Wall Mounting
- Polarization: Right hand circular
- Frequency Band: 1575.42 MHz ± 10 MHz
- Amplifier Gain: 40dB ± 4dB
- VSWR: <2.0 Max, 1.0 Typical
- Operating temperature: -40°C to +85°C
- Reverse Polarity Protection
- Out of Band Rejection: ≥ -60dB @ ≤±50MHz off center (1575.42 MHz) frequency
- Lightening Protection: According to EN61000-4-5 Level 4.
- LMR400 (or equivalent) Cable Length - 30, 60, 90, 120 and 150 meters.

External Frequency Synchronization Inputs:

<table>
<thead>
<tr>
<th>External Inputs</th>
<th>Number of Inputs</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.048 MHz, 75 Ohms</td>
<td>1</td>
<td>BNC</td>
</tr>
<tr>
<td>10 MHz, 50 Ohms</td>
<td>1</td>
<td>BNC</td>
</tr>
<tr>
<td>2.048 Mbps</td>
<td>1</td>
<td>BNC</td>
</tr>
</tbody>
</table>

Environment:
- Clock output: LMR400 (or equivalent) Cable Length - 30, 60, 90, 120 and 150 meters.
- Frequency accuracy: ± 1x10⁻¹¹ (24 hour average)
- Frequency stability: 6x10⁻¹² (-5°C to +55°C)
- Frequency holdover: ± 5x10⁻¹⁰ / month
- Frequency holdover: < 1x10⁻¹¹ (-5°C to +55°C)

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