Introduction:

VCL-2145-LC (VCL-GPS-2145), GPS Primary Reference Clock is a high precision frequency synchronization solution which may be used to provide ITU-T, G.811 Primary Reference Clocks which are referenced to a GPS source.

The VCL-2145-LC (VCL-GPS-2145), GPS 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 require a highly precise G.811 frequency synchronization locked to a GPS Reference.

The VCL-2145-LC (VCL-GPS-2145) locks to a GPS or GLONASS reference to provide multiple G.811 / Stratum 1 quality frequency outputs. The VCL-2145-LC is also equipped highly accurate, low-noise OCXO / Rubidium oscillator which provides a high stability, ITU-T G.812 compliant holdover clock that is typical of a Network SSU in the event of unavailability of satellite signal, or antenna failure.

Features and Highlights:

- Reliable, Cost-Efficient Reference GPS Receiver
- 50 Channel GPS and GLONASS, L1 frequency, C/A Code Receiver
- Simultaneous tracking of up to 32 satellites
- ITU-T G.811 Primary Reference (PRC) Clock
- GPS locked G.703 compliant E1, 2.048 MBits, 1.544 Mbits and 2.048 MHZ outputs
- Primary reference and holdover functionality:
  - ITU-T G.811 / Stratum 1 compliant (PR) Primary Reference when locked to GPS
  - ITU-T G.812 compliant holdover
  - SSM Message format Compliant with ITU-T G.704. Optional GR-378-CORE for SONET Networks
  - 1/5/10 MHz output
  - 2MHz and 2Mbps Primary Reference Clock outputs
  - 1 PPS outputs
  - Standard RJ45 and BNC connectors for all inputs and outputs
  - ToD compliant to NMEA0183 (DB9 Serial Port).

Standards & Compliance:

- CE – 2001/95/EC, 2006/95/EC, EN60950-1, 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

Additional Features:

- Telnet, SNMP V2 MIB, Password Protection
- Redundant AC and DC power supply options
- Power Contact and Lightening Protection as per Telcordia
- GR-1089-CORE.

Available Version:

GPS and GLONASS Primary Reference Clock

Product: VCL-2145-LC (VCL-GPS-2145) GPS Primary Reference (PRC) Clock

Description:

(I) VCL-2145-LC, GPS Primary Reference (PRC) G.811 Clock. Provides 1PPS, NMEA, 1/5/10MHz, 2.048MHz, 2.048Mbits with SSM, 1.544Mbits Frequency Outputs with High Stability OCXO (G.812) Holdover.

(II) VCL-2145-LC, GPS Primary Reference (PRC) G.811 Clock. Provides 1PPS, NMEA, 1/5/10MHz, 2.048MHz, 2.048Mbits with SSM, 1.544Mbits Frequency Outputs with Ultra-High Stability Rubidium (G.812) Holdover.

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
- Synchronization of Defense Networks
- Synchronization of airports and aviation communications
- Synchronizing railway signaling networks and railway communications
- Broadcasting Network and Broadcast equipment
- Synchronization.

Application Diagram:

GPS Receiver as a Primary Reference (PRC) Clock
Technical Specifications

GPS and GLONASS Receiver:
• 50 Channel GPS and GLONASS Receiver
• GPS L1 frequency, C/A Code Receiver
• 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.

GPS Signal:
• Tracking and Navigation: -162 dBm
• Reacquisition: -160 dBm
• Cold Start: -148 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 satellites in view at -130db)

Internal (G.812) Synchronization Options:
• Rubidium
• OCXO (Oven-Controlled Crystal Oscillator)

Management and Monitoring Ports:
• RS-232C
• USB
• 10/100BaseT Ethernet - RJ-45
• 2 x External Alarm Relay Contacts.

System Access, Control and Management Options:
• Telnet
• CLI Control Interface (HyperTerminal or VT100)
• SNMP V2 Traps (MIB File provided)

Security and Protection:
• Password Protection

Configuration and Monitoring Software:
• Telnet, CLI
• GUI (Graphical User Interface) - Runs on any PC operating on Windows XP, Windows 7, Windows 8 OS or Windows 10 OS.

Power Supply Options:
• Dual Redundant
• 1+1 AC power (100 to 240VAC, 50/60 Hz)
• 1+1 DC 24V power
• 1+1 DC 48V power
• 1+1 DC 110/125V DC power
• AC or DC

Standard Frequency and ToD* Outputs:
• 2.048 Mbit/s (E1) / 1.544 Mbit/s (T1) compliant with ITU-T G.703
• 2.048 MHz, 75 Ohms, phase-locked to GPS
• 1 PPS, phase-locked to UTC**
• TOD (Time-Of-Day) output compliant to NMEA0183

Part Numbers:
VCL-2145-LC-OCXO
(AC or DC power 1+0 or 1+1)
VCL-2145-LC-RbXO
(AC or DC power 1+0 or 1+1)

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

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

Frequency Accuracy:
• <1x10^-12 (24 hour average)
• G.811 quality when locked to GPS / GNSS

Frequency holdover:
OCXO:
• Long-term stability: 1x10^-12/day, 2x10^-9/year
• Frequency stability: 6x10^-12 (-5°C to +55°C)

Rubidium:
• Long-term stability: ± 5x10^-11 / month
• Frequency stability: < 1x10^-12 (-5°C to +55°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.

MTBF:
MTBF for VCL-2145-LC 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-LC with OCXO Option:
• Per MIL-HDBK-217F: ≥ 21 years @ 40°C
• Per Telcordia SSR 332, Issue 1: ≥ 24 years @ 40°C

External Frequency Synchronization Inputs:

<table>
<thead>
<tr>
<th>Input Type</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>

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