High-Speed Voice and Data Link (HVDL) System

Unlock the High-Speed Potential of Copper

Charles Industries’ High-Speed Voice & Data Link (HVDL) System enables a single copper pair to deliver three voice channels and one high-speed Ethernet data channel to small business and residential subscribers in both urban and rural communities at distances up to 112,000 ft.

Utilizing low-noise, low-power TCPAM (G.shdsl) line coding, the system multiplexes three 64 Kbps Clear Channel voice lines and one high-speed symmetrical data line for transport, then demultiplexes at the subscriber site via a line-powered Remote Terminal (RT) mounted exterior to the building structure.

Reach Out to Your Entire Subscriber Base

HVDL allows you to offer high-speed internet connections to more of your total service area. An optional line-powered repeater allows the system, depending on the application and wire gauge, to deliver the full payload data rate of up to 1Mbps up to 44,000 feet or 128 Kbps up to 56,000 feet using a single repeater. Greater distances may be achieved using additional repeaters. Using the Local Power RT option, HVDL can extend high-speed data connections up to 112,000 feet!

Overcome Cost Barriers in Low-Density Areas

Unlike DSL systems that require large initial equipment investments, HVDL can be deployed one customer at time. This is because the system requires only a Central Office Terminal (COT) line card, shelf and RT to deploy. HVDL’s pay-as-you-grow scalability means you can deploy high-speed data lines without the prohibitive cost of a DSLAM. Suddenly, bringing the internet to small subdivisions and other sparsely populated areas can be both practical and profitable.

Increase Revenues with Added Services

In addition to being an excellent solution for rural and remote locations, HVDL also offers a prime opportunity for carriers to add new and upgraded services for urban customers. By offering additional voice and fax lines, small office/home office customers are provided a much sought-after solution: three voice/fax lines and one high-speed data line all on a single twisted pair.

HVDL is also ideally suited to replacing Digital Added Main Line (DAML) systems in the event that a DAML-served customer wishes to upgrade their subscription to include high-speed data services.

Unique Advantages

- User-friendly ethernet platform is easy to install and maintain
- Supports line-powered repeater: reach up to and beyond 56,000 feet
- Spectral compatibility with ADSL
- Line-powered RT provides Lifeline Service on all voice lines
- Local-powered RT extends data reach up to 112 Kft.
- Enhanced lightning protection
- Rate selectivity (data rate adjustable in 128 Kbps increments at the COT) for tiered service revenues
- Symmetric upstream/downstream data rates
- CLASS™ services compatible
- NEBS compliant (GR-63-CORE, GR-1089-CORE)
- No desktop modem or other internal subscriber premise equipment required
- 1RU shelf available for outdoor cabinets
System Capabilities

High Speed Data
• High speed symmetrical DSL data transfer (up to 1Mbps)
• Data rate selectable for tiered service revenues

Toll Quality Voice
• Up to three 64Kpbs clear channel voice lines
• Line powered RT provides Lifeline Service on all voice lines
• Supports fax, modem, and CLASS services

Robust Transmission Technology
• Standards-based TCPAM (G.shdsl) line coding provides for maximum spectral compatibility with other services
• Up to 56,000 feet transmission spans achievable with use of optional repeater (even greater distances achievable with additional repeaters and Line Powered RT)
• Up to 112,000 feet data reach achievable with Local Power RTs
• Enhanced lightening protection

Customer Interface
• RT demarcation provides easy installation and simple troubleshooting
• No modems, splitters, or microfilters required
• Ethernet data interface compatible with customer data equipment and networks

Data Network Interface
• Standard Ethernet (10Base-T) connections compatible with industry ethernet switches, routers, and network interface cards
• Optional Access Multiplexer aggregates 100Base-T connectivity to data network, provides alarming, and supports provisioning

Provisioning & Management
• Network management allows users to remotely configure and monitor the system.
• Planning tool verifies that the configuration, wire gauge and segment distance do not exceed power limit

HVDL 3.1 is the ideal solution for bringing high-speed internet connections to:

Features & Benefits

Cost Effective Delivery of Multiple Voice Lines and High Speed Data over a Single Pair
• High-speed symmetrical DSL data transfer is ideal for video conferencing and other high bandwidth applications
• Optional repeaters and remote terminals extend reach up to 112,000 feet, enabling telcos to provide service to more customers
• “Pizza Box” one rack unit (1RU) solution for deployment in outdoor cabinets
• Ethernet (10Base-T or 100Base-T) connection familiar to installers and field technicians
• Pay-as-you-grow scalability lowers start-up costs and decreases payback periods
• Data rate selectivity allows carriers to decrease data rate on COT to achieve greater distance and bill for tiered services
• Toll-quality voice connections
• Lifeline and Fail-to-POTS protection
• Demarcation at RT exterior to building entrance
• Enhanced lightening protection ideal for reliable performance in storm-prone regions
• System does not require splitters or microfilters
System Configuration

Line Power RT with one Repeater

<table>
<thead>
<tr>
<th>Data Rate</th>
<th>22 AWG</th>
<th>24 AWG</th>
<th>26 AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>832 Kbps</td>
<td>44,000</td>
<td>32,000</td>
<td>24,000</td>
</tr>
<tr>
<td>512 Kbps</td>
<td>50,000</td>
<td>34,000</td>
<td>25,000</td>
</tr>
<tr>
<td>128 Kbps</td>
<td>56,000</td>
<td>38,000</td>
<td>28,000</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Repeated Distance</strong></td>
<td>832 Kbps</td>
<td>88,000</td>
<td>64,000</td>
</tr>
<tr>
<td></td>
<td>512 Kbps</td>
<td>100,000</td>
<td>68,000</td>
</tr>
<tr>
<td></td>
<td>128 Kbps</td>
<td>112,000</td>
<td>76,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Repeated Distance</strong></td>
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Local Power RTs with multiple Repeaters

<table>
<thead>
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<th>22 AWG</th>
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<td><strong>Total</strong></td>
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</tr>
<tr>
<td><strong>Repeated Distance</strong></td>
<td></td>
<td></td>
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System Components

A HVDL Line Unit Shelf
- Installs in central office, DLC or remote hub rack enclosures
- 19" shelf: 45 voice lines and 15 data lines, requires 3 rack units
- 23" shelf: 58 voice lines and 18 data lines, requires 3 rack units

B 1RU Shelf
- Fits in small outdoor cabinets
- Supports up to 3 HVDL lines

C Central Office Terminal (COT) Line Card
- Multi-function front panel LED display to ease system provisioning and monitor line status
- Front panel provisioning of data rate
- TCPAM (G.shdsl) line coding
- Multiple line testing signatures
- NEBS Level 3 compliant

D Line Repeaters
- Provide DSL distance extension
- Line powered over the DSL by the COT line unit (Lifeline services)
- Rugged design for use at -40° to 65°C (-40° to 149°F)
- Pole/wall/pedestal model in weather-tight mounting
- 239-type model (bottom)
- Depending upon the application, up to three repeaters may be used in a span

E HVDL Access Multiplexer
- Aggregate data from up to 17 COT line cards simultaneously at up to 1.0 Mbps per COT
- Multiple Access Multiplexers may be daisy chained to a single 100Base-TX port for uplink
- Compatible with standard 10/100Base-TX Ethernet switches, routers and NICs.
- Network management facilitates remote provisioning and monitoring of HVDL system via Telnet session

F Line Power Remote Terminal
- Drops up to 3 voice/fax lines and one high-speed data line
- Line powered for Lifeline voice and data services; “Fail-to-POTS” option (non-repeatered mode only)
- Enhanced Pre-Provisioning (EPRP) for easy one-person turn-up of additional lines (non-repeatered model only)
- Robust design for use at -40° to 65°C (-40° to 149°F)

G Local Power Remote Terminals
- Facilitates super-extended reach
- Locally power at customer premise
- Desktop model supports data-only applications
- Outdoor NID model supports 1 voice and 1 data line
Specifications

System Loss in Each Direction of Transmission

3.5 ± 1.0 dB nominal

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Minimum Loss</th>
<th>Maximum Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 Hz</td>
<td>0.0 dB</td>
<td>+3.0 dB</td>
</tr>
<tr>
<td>400 Hz to 3000 Hz</td>
<td>-0.5 dB</td>
<td>+1.0 dB</td>
</tr>
<tr>
<td>3200 Hz</td>
<td>-0.5 dB</td>
<td>+1.5 dB</td>
</tr>
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<td>3400 Hz</td>
<td>0.0 dB</td>
<td>+3.0 dB</td>
</tr>
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Idle Channel Noise at Output of RT 20 dBrnC maximum

Channel Crosstalk

With 0 dBm0 single frequency input signals between 300 and 3400 Hz applied to any line, the C-message weighted total output of the other two lines at the RT in the 300 to 3400 Hz frequency band is less than -65 dBm0

DC Supervisory Range

The Rdc for the RT is 530 ohms, specified as a 430 ohm telephone instrument plus a 100 ohm cable (Rdc is the maximum external loop resistance capability of the system)

Ringing Frequency Response 15-35 Hz

Ringing Capacity

Non-repeatered mode = 5 REN per line, 8 REN simultaneously (all lines total) at 20 Hz

Repeatered mode = 5 REN per line, 8 REN simultaneously (all lines total) at 20 Hz

DSL Voltage ± 130 volts: A3 (10 mA) safety

Ethernet

320 ft. on Category 3 or 5 wiring

RJ-45 10Base-T connector at the RT and COT

Shelf Configurations

19”– 9 voice lines, 3 data lines, 1 rack space

19”– 45 voice lines, 15 data lines, 3 rack spaces

23”– 58 voice lines, 18 data lines, 3 rack spaces

Please contact an Authorized Charles Industries Distributor or call Charles direct at (847) 806-6300 for additional product and ordering information.

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Visit our web site at http://www.charlesindustries.com

Charles Industries, Ltd.
Telecommunications Group
5600 Apollo Drive
Rolling Meadows, IL60008 USA

Telephone (US): 847-806-6300
FAX (US): 847-806-6231
E-mail: mktserv@charlesindustries.com
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