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Process improvements continually bring new equipment and technologies to the market. But leveraging the benefits of new systems with costly legacy equipment relies on effective data communications. With the industry's widest selection of serial and fiber conversion devices, B&B Electronics has the tools and guidance you need to make the most of all your equipment investments — old or new.

People have been predicting the demise of serial communications for years. Yet, there are millions of serial ports still performing in the field today. B&B Electronics keeps perfectly good, even costly old equipment operating and data flowing with serial and fiber optic conversion and isolation products.

**Serial Converters & Repeaters**

- **Hardened Converter & Repeaters**
  - UL, Class 1/Division 2 listed
  - NEMA TS1/TS2 requirements for transportation
  - IEC 61850-3 rated for electrical substations
  - Shock and vibration tested
  - 3-way, 2 kV optical isolation - input/output/power
  - Level 4 ESD protection, 15 kV air, 8 kV contact
  - Wide operating temperature range
  - Modbus compatible
  - Removable terminal blocks
  - Automatic Send Data Control

- **Isolated Converters**
  - UL, Class 1/Division 2 listed
  - UL Recognised
  - UL 508 certification, EMX rated
  - Isolated and non-isolated versions
  - ESD protection - 8 kV contact, 15 kV Air
  - Built-in switchable bias & termination
  - Wide operating temperature range
  - Modbus compatible
  - Automatic Send Data Control

- **Fiber Optic Converters**
  - UL, Class 1/Division 2 listed
  - UL Listed
  - UL Recognised
  - IEC 61850-3 rated for electrical substations
  - Shock and vibration tested
  - Optical isolation
  - Single- and multi-mode, SC or ST
  - High bandwidths
  - Impervious to noise and ground differentials
  - Modbus compatibility
  - Wide operating temperature range

- **Fiber Optic Modems**
  - Optical isolation
  - Connectors: multi-mode ST fiber; 9-pin serial
  - Modbus compatible
  - Up to 4 km (2.5 mi) range
  - Port-powered

- **Port Powered Converters**
  - Port powered (battery or external options)
  - Up to 1,200 meter (4,000 ft.) range
  - Automatic Send Data Control
  - Modbus compatibility

- **TTL Converters**
  - UL Listed
  - 2-channel TTL to RS-232/422 bi-directional
  - Isolated and non-isolated versions
  - 3.3 or 5 V versions
  - Port powered or external power supply

- **Current Loop Converters**
  - Optical isolation
  - 20 mA current loop
  - Transmit (T+, T-) and Receive (R+, R-) loop; active or passive
  - UL Recognised
  - Wide operating temperature range

- **CAN/Fiber Converter**
  - CAN (Controller Area Network)
  - Optical isolation to 2 kV
  - Terminal block connections
  - Extend network node capacity
  - DIN rail mount
For applications requiring Class 1/Division 2 certification, B&B Electronics has a range of connectivity and communication solutions designed to operate in hazardous environments. For a complete listing of C1D2 products, see page 470.
## SERIAL CONVERTERS & REPEATERS

<table>
<thead>
<tr>
<th>PRODUCT FAMILY</th>
<th>Hardened Converters &amp; Repeaters</th>
<th>Isolated Converters</th>
<th>Fiber Optic Converters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Features:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>RS-232 Connector</td>
<td>DB9 female</td>
<td>DB9 female, DB25 female, terminal block</td>
<td></td>
</tr>
<tr>
<td>RS-422/485 Connector</td>
<td>Terminal block</td>
<td>Terminal block</td>
<td></td>
</tr>
<tr>
<td>Fiber Connector</td>
<td>SC or ST, Single- or multi-mode</td>
<td>SC or ST, Single- or multi-mode</td>
<td></td>
</tr>
<tr>
<td>Fiber Range</td>
<td>4 or 15 km (2.5 or 9 mi)</td>
<td>4 or 15 km (2.5 or 9 mi)</td>
<td></td>
</tr>
<tr>
<td>TTL Connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Loop Connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN Connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Rate</td>
<td>Up to 115.2 kbps</td>
<td>Up to 460.8 kbps</td>
<td>Up to 115.2 kbps</td>
</tr>
<tr>
<td>Automatic Send Data Control?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Modbus?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Wide Temperature?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Power</td>
<td>10-48 VDC, external</td>
<td>10-30 VDC or 10-48 VDC, external</td>
<td>10-30 VDC or 10-48 VDC, external</td>
</tr>
<tr>
<td>Mounting</td>
<td>Panel (DIN rail option)</td>
<td>DIN rail, inline, panel</td>
<td>DIN rail (panel option)</td>
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</table>

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<table>
<thead>
<tr>
<th>PRODUCT FAMILY</th>
<th>Fiber Optic Modems</th>
<th>Port Powered Converters</th>
<th>TTL Converters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Features:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation?</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔</td>
<td></td>
</tr>
<tr>
<td>RS-232 Connector</td>
<td>DB9 female</td>
<td>DB9 female</td>
<td>DB9 female, DB25 male, DB25 female</td>
</tr>
<tr>
<td>RS-422/485 Connector</td>
<td>Multi-mode ST</td>
<td>DB9 female, RJ11, terminal block</td>
<td></td>
</tr>
<tr>
<td>Fiber Connector</td>
<td>Fiber Range</td>
<td>4 km (2.5 mi)</td>
<td></td>
</tr>
<tr>
<td>TTL Connector</td>
<td>DB9 female</td>
<td>DB9 male, DB25 female, DB25 male</td>
<td></td>
</tr>
<tr>
<td>Current Loop Connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN Connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Rate</td>
<td>Up to 115.2 kbps</td>
<td>Up to 115.2 kbps</td>
<td>38.4 up to 115.2 kbps</td>
</tr>
<tr>
<td>Automatic Send Data Control?</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Modbus?</td>
<td>✔ ✔ ✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Wide Temperature?</td>
<td>✔ ✔ ✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>Port-powered</td>
<td>Port-powered (battery and external options)</td>
<td>Port-powered (external option)</td>
</tr>
<tr>
<td>Mounting</td>
<td>Inline</td>
<td>Inline</td>
<td>Inline</td>
</tr>
<tr>
<td>Additional Features (may vary by model)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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# SERIAL CONVERSION

## WHICH IS RIGHT FOR YOU?

### SERIAL CONVERTERS & Repeaters

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<thead>
<tr>
<th>FEATURES</th>
<th>Current Loop Converters</th>
<th>CAN Converter</th>
<th>Optically Isolated Repeaters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serial to [protocol]</strong></td>
<td>20 mA Current Loop</td>
<td>CAN (bidirectional)</td>
<td>RS-232, RS-422/485</td>
</tr>
<tr>
<td><strong>Isolation?</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>RS-232 Connector</strong></td>
<td>DB9 female, Terminal block</td>
<td></td>
<td>DB9 male, DB9 female, Terminal block</td>
</tr>
<tr>
<td><strong>RS-422/485 Connector</strong></td>
<td>Terminal block</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fiber Connector</strong></td>
<td></td>
<td></td>
<td>ST</td>
</tr>
<tr>
<td><strong>Fiber Range</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TTL Connector</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Loop Connector</strong></td>
<td>Terminal block</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CAN Connector</strong></td>
<td>Terminal block</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Rate</strong></td>
<td>19.2 kbps</td>
<td>250 kbps</td>
<td>230.4 kbps</td>
</tr>
<tr>
<td><strong>Automatic Send Data Control?</strong></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Modbus?</strong></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wide Temperature?</strong></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>Port-powered or external</td>
<td>10-30 VDC, external</td>
<td>10-12-14 VDC, external</td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>DIN rail, inline</td>
<td>DIN rail</td>
<td>DIN rail, Inline, panel</td>
</tr>
<tr>
<td><strong>Additional Features</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>(may vary by model)</em></td>
<td></td>
<td></td>
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</table>

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**B&B Electronics**

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**398**
# Surge Protectors

## Product Family

<table>
<thead>
<tr>
<th>Feature</th>
<th>Heavy Duty, 3-Stage</th>
<th>Single-stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection (may vary by model)</td>
<td>3 Stages for each line: 1 - gas discharge tube 2 - series resistor 3 - transient voltage suppressor Protected Signal Ground connection Dedicated chassis #10 grounding screw</td>
<td>500W surge suppression (500 W for 485FP) Transient voltage suppressor Fast-acting 125 mA PCB fuses (disposable) #10 grounding screw</td>
</tr>
<tr>
<td>Connectors</td>
<td>Terminal blocks</td>
<td>Terminal blocks</td>
</tr>
<tr>
<td>Protocol</td>
<td>RS-232, or RS-422/485</td>
<td>RS-422/485</td>
</tr>
<tr>
<td>Lines Protected</td>
<td>5 lines - RS-232, or 3 lines - RS-422/485, or 5 lines - RS-422/485</td>
<td>4 lines - RS-422/485</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Metal or molded plastic</td>
<td>Open board</td>
</tr>
<tr>
<td>Mounting</td>
<td>DIN rail, panel</td>
<td>Inline</td>
</tr>
<tr>
<td>Additional Features (may vary by model)</td>
<td>IEEE1000-4-5:1995, IEEEC62.41-1991, NEMA TS2</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>456 - 458</td>
<td>459</td>
</tr>
</tbody>
</table>
The ILinx™ 485DRCI-PH is our premium Heavy Industrial RS-232 to RS-422/485 Isolated Converter. Designed for rugged industrial environments, it has been put through some of the most exacting compliance tests in the industry. Meeting the requirements of IEC 61850-3 and IEEE 1613, it is suitable for installation in electrical substations. These specifications are more stringent than the NEMA TS1/TS2 requirements for transportation applications. Powerful isolation on both data ports protects your equipment and data from damaging ground loops and surges. Additional isolation on the power supply circuits adds a third degree of protection.

Packaged in a rugged IP30 metal case, it converts unbalanced, full or half-duplex RS-232 signals to balanced RS-422/485 signals. Featuring Automatic Send Data Control circuitry, it does not require special software control of handshake signals in RS-485 mode. Our bit-wise enabled circuitry automatically detects the data rate without setting a DIP switch.

**PRODUCT FEATURES**

- IEEE-61850-3, IEEE-1613
- NEMA TS2
- -40 to 85°C Operating Temperature
- Rugged IP30 Metal Panel Mount Case
- 50G Shock, 4G Vibration
- 2kV Triple Isolation
- 10 to 48 VDC Input Power

**SPECIFICATIONS**

**SERIAL TECHNOLOGY**

- RS-232: TD, RD, GND
- RS-422: TDA(-), TDB(+), RDA(-), RDB(+)
- RS-485 4-Wire: TDA(-), TDB(+), RDA(-), RDB(+)
- RS-485 2-Wire: Data A(-), Data B(+)
- RS-232 Connector: DB9 Female (DCE)
- RS-422/485 Connector: 5 Position, Removable Terminal Block
- Data Rate: 1.2 to 115.2 Kbps
- Isolation: 2 KV RMS, 1 minute
- Surge Protection: 600 W Peak Power Dissipation Clamping time < 1 pico-second
- Industrial Bus: MODBUS ASCII / RTU
- Bias: Built-in, switchable 1.2KΩ XMT/RCV
- Termination: Built-in, switchable 120Ω

**POWER**

- Source: External
- Power Connector: 2 Position Removable Terminal Block
- Input Voltage: 10 to 48 VDC (56 VDC Maximum)
- Power Consumption: 0.5 W typical (1.9 W with termination)

**TERMINAL BLOCKS**

- Wire Size Accepted: 28 to 12 AWG, Copper wire only.
- Pitch: 5.08 mm
- Insulation Resistance: ≥500 MΩ @ 500 VDC
- Maximum Torque: 5 Kg / cm

**INDICATORS**

- Power: Red LED
- TD / RD (Each Port): Green LED

**MECHANICAL**

- Dimensions: 5.2 x 3.7 x 1.3 in
- Enclosure: IP30 Metal, Panel Mount
- Weight: 0.46 lbs (208.65 grams)
- MTBF: 163611 Hours
- MTBF Calc. Method: Parts Count Reliability Prediction

**ENVIRONMENTAL**

- Operating Temperature: -40 to 85°C (-40 to 176°F)
- Storage Temperature: -40 to 85°C (-40 to 176°F)
- Operating Humidity: 0 to 95% Non-condensing

**REGULATORY**

- Approvals: FCC, CE, IEC 61850-3, IEEE 1613
- UL C1 D2, File: E245458, NEMA TS2

**ACCESSORIES**

MDR-40-24 - DIN Rail Mount Power Supply 24VDC, 1.7 A output power
### IEC 61850-3 Electro Magnetic Interference Specifications

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Test Level</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>61000-4-2</td>
<td>ESD</td>
<td>Enclosure Contact</td>
<td>8 kV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enclosure Air</td>
<td>15 kV</td>
</tr>
<tr>
<td>61000-4-3</td>
<td>Radiated RFI</td>
<td>Enclosure Ports</td>
<td>10 V/m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC Power Ports</td>
<td>4 kV</td>
</tr>
<tr>
<td>61000-4-4</td>
<td>Burst (Fast Transient)</td>
<td>Signal Ports</td>
<td>4 kV @ 2.5 kHz</td>
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<tr>
<td></td>
<td></td>
<td>DC Power Ports</td>
<td>4 kV</td>
</tr>
<tr>
<td>61000-4-5</td>
<td>Surge</td>
<td>Signal Ports</td>
<td>2 kV line to earth, 1 kV line to line</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC Power Ports</td>
<td>2 kV line to earth, 1 kV line to line</td>
</tr>
<tr>
<td>61000-4-6</td>
<td>Induced (Conductive) RFI</td>
<td>Signal Ports</td>
<td>10 V RMS</td>
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<tr>
<td></td>
<td></td>
<td>DC Power Ports</td>
<td>10 V RMS</td>
</tr>
<tr>
<td>61000-4-12</td>
<td>Damped Oscillatory</td>
<td>Signal Ports</td>
<td>2.5 kV common, 1 kV diff mode @ 1MHz</td>
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<tr>
<td></td>
<td></td>
<td>DC Power Ports</td>
<td>2.5 kV common, 1 kV diff mode @ 1MHz</td>
</tr>
<tr>
<td>61000-4-16</td>
<td>Mains Frequency Voltage</td>
<td>Signal Ports</td>
<td>30 V Continuous, 300 V for 1 s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC Power Ports</td>
<td>30 V Continuous, 300 V for 1 s</td>
</tr>
<tr>
<td>61000-4-17</td>
<td>Ripple on DC Power Supply</td>
<td>DC Power Ports</td>
<td>10%</td>
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### IEEE 1613 C37.90 Electro Magnetic Interference Specifications

<table>
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<th>Test</th>
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<tbody>
<tr>
<td>C37.90.3</td>
<td>ESD</td>
<td>Enclosure Contact</td>
<td>8 kV</td>
</tr>
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<td></td>
<td></td>
<td>Enclosure Air</td>
<td>15 kV</td>
</tr>
<tr>
<td>C37.90.2</td>
<td>Radiated RFI</td>
<td>Enclosure Ports</td>
<td>10 V/m</td>
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<tr>
<td>C37.90.1</td>
<td>Fast Transient</td>
<td>Signal Ports</td>
<td>4 kV @ 2.5 kHz</td>
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<td>DC Power Ports</td>
<td>4 kV</td>
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</table>

### Environmental Specifications

<table>
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<th>Test Level</th>
<th>Level</th>
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</thead>
<tbody>
<tr>
<td>60068-2-1</td>
<td>Cold Temperature</td>
<td>Test Ad</td>
<td>(+)40 C, 16 Hours</td>
</tr>
<tr>
<td>60068-2-2</td>
<td>Dry Heat</td>
<td>Test Bd</td>
<td>(+)85 C, 16 Hours</td>
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<tr>
<td>60068-2-30</td>
<td>Humidity (damp heat cycle)</td>
<td>Test Dd</td>
<td>90% (non-condensing) (+)/55C, 6 Cycles</td>
</tr>
<tr>
<td>IEC 60068-2-6</td>
<td>Vibration</td>
<td>Test Fc</td>
<td>4G</td>
</tr>
<tr>
<td>IEC 60068-2-27</td>
<td>Shock</td>
<td>Test Ea</td>
<td>50G</td>
</tr>
<tr>
<td>IEC 60068-2-32</td>
<td>Drop</td>
<td></td>
<td>6 faces, 3 edges, 1 corner total 10 drops at 1 m</td>
</tr>
</tbody>
</table>
The FOSTCDRI-PH-xx series are premium heavy industrial serial to fiber optic converters. Designed for rugged industrial environments, they have been put through most exacting compliance testing in the industry. Meeting IEC 61850-3 and IEEE 1613 requirements, they are suitable for installation in electrical substations. These specifications are more stringent than the NEMA TS1/TS2 requirements for transportation applications. Powerful isolation protects equipment and data from damaging ground loops and surges. Additional isolation on the power supply circuits adds a third degree of protection.

Packaged in a rugged IP30 metal case, these converters convert serial signals to multi-mode or single-mode fiber optic. Bit-wise enabled circuitry automatically detects the data rate without setting a DIP switch.

In addition to direct point-to-point connectivity, operation in multi-drop mode is possible. This enables serial devices to communicate with up to 31 others in a fiber ring. Supporting mixed standards, you can replace other converters and add the EMI / RFI protection inherent to fiber optic communications.
### Heavy Industrial RS-232/422/485 to Fiber Optic Converters

**FOSTCDRI-PH-MC, FOSTCDRI-PH-MT, FOSTCDRI-PH-SC**

#### SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RS-232</strong></td>
</tr>
<tr>
<td><strong>RS-422</strong></td>
</tr>
<tr>
<td><strong>RS-232 4-Wire</strong></td>
</tr>
<tr>
<td><strong>RS-485 2-Wire</strong></td>
</tr>
<tr>
<td><strong>Serial Connector</strong></td>
</tr>
<tr>
<td><strong>Data Rate</strong></td>
</tr>
<tr>
<td><strong>Isolation</strong></td>
</tr>
<tr>
<td><strong>Surge Protection</strong></td>
</tr>
<tr>
<td><strong>Industrial Bus</strong></td>
</tr>
<tr>
<td><strong>Bias</strong></td>
</tr>
<tr>
<td><strong>Termination</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FIBER OPTIC TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type / Wavelength</strong></td>
</tr>
<tr>
<td><strong>Output Power (MM)</strong></td>
</tr>
<tr>
<td><strong>Output Power (SM)</strong></td>
</tr>
<tr>
<td><strong>RCV Sensitivity</strong></td>
</tr>
<tr>
<td><strong>Cable</strong></td>
</tr>
<tr>
<td><strong>Data Rate</strong></td>
</tr>
<tr>
<td><strong>Distance</strong></td>
</tr>
<tr>
<td><strong>Fiber Light</strong></td>
</tr>
</tbody>
</table>

#### POWER

| **Source** | External |
| **Power Connector** | 2-position, removable terminal block |
| **Input Voltage** | 10 to 48 VDC (56 VDC maximum) |
| **Power Consumption** | 0.9 W typical (2.6W with termination) |

<table>
<thead>
<tr>
<th>IEC 61850-3 ELECTROMAGNETIC INTERFERENCE SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test</strong></td>
</tr>
<tr>
<td>61000-4-2</td>
</tr>
<tr>
<td>61000-4-3</td>
</tr>
<tr>
<td>61000-4-4</td>
</tr>
<tr>
<td>61000-4-5</td>
</tr>
<tr>
<td>61000-4-6</td>
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<tr>
<td>61000-4-12</td>
</tr>
<tr>
<td>61000-4-16</td>
</tr>
<tr>
<td>61000-4-17</td>
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<table>
<thead>
<tr>
<th>IEEE 1613 C37.90 ELECTROMAGNETIC INTERFERENCE SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test</strong></td>
</tr>
<tr>
<td>C37.90.3</td>
</tr>
<tr>
<td>C37.90.2</td>
</tr>
<tr>
<td>C37.90.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test</strong></td>
</tr>
<tr>
<td>60068-2-1</td>
</tr>
<tr>
<td>60068-2-2</td>
</tr>
<tr>
<td>60068-2-30</td>
</tr>
<tr>
<td>61000-6-2-6</td>
</tr>
<tr>
<td>61000-6-2-27</td>
</tr>
<tr>
<td>61000-6-2-32</td>
</tr>
</tbody>
</table>
The ILinx™485OPDRI-PH is our premium Heavy Industrial RS-422/485 Isolated Repeater. Designed for rugged industrial environments, it has been put through some of the most exacting compliance tests in the industry. Meeting the requirements of IEC 61850-3 and IEEE 1613, it is suitable for installation in electrical substations. These specifications are more stringent than the NEMA TS1/TS2 requirements for transportation applications. Powerful isolation on both data ports protects your equipment and data from damaging ground loops and surges. Additional isolation on the power supply circuits adds a third degree of protection.

Packaged in a rugged IP30 metal case, it extends full or half-duplex RS-422/485 signals an additional 4000 feet and allows you to add another 32 nodes to your network. Our bit-wise enabled circuitry automatically detects the data rate without setting a DIP switch.

**PRODUCT FEATURES**
- IEEE-61850-3, IEEE-1613
- NEMA TS2
- -40 to 85°C Operating Temperature
- Rugged IP30 Metal Panel Mount Case
- 50G Shock, 4G Vibration
- 2kV Triple Isolation
- 10 to 48 VDC Input Power

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>485OPDRI-PH</td>
<td>Heavy Industrial RS-232 to RS-422/485 Isolated Repeater</td>
</tr>
</tbody>
</table>

**ACCESSORIES**
- MDR-40-24 - DIN Rail Mount Power Supply 24VDC, 1.7 A output power
- DRAD35 - DIN Rail Mounting Kit 35mm
- TBKT1 - Replacement Term Block, 2
Heavy Industrial RS-422/485 Isolated Repeater
4850PDRI-PH

SPECIFICATIONS

SERIAL TECHNOLOGY
- RS-422: TDA(-), TDB(+), RDA(-), RDB(+)
- RS-485 4-Wire: TDA(-), TDB(+), RDA(-), RDB(+)
- RS-485 2-Wire: Data A(-), Data B(+)
- RS-422/485 CON.: 5 Position, Removable Terminal Block

Data Rate
- 1.2 to 115.2 Kbps

Surge Protection
- 600 W Peak Power Dissipation
- Clamping time < 1 pico-second

Indust. Bus
- MODBUS ASCII / RTU

Bias
- Built-in, switchable 1.2KΩ XMT/RCV

Termination
- Built-in, switchable 120Ω

POWER

Source
- External

Power Connector
- 2 Position Removable Terminal Block

Voltage
- 10 to 48 VDC (56 VDC Maximum)

Power Consumption
- 0.5 W typical (2.3 W with termination)

TERMINAL BLOCKS

Wire Size Accepted
- 28 to 12 AWG, Copper wire only.

Pitch
- 5.08 mm

Insulation Resistance
- >500 MΩ @ 500 VDC

Temperature rating of field installed conductors
- 105°C minimum.

INDICATORS

Power
- Red LED

TD / RD (Each Port)
- Green LED

MECHANICAL

Dimensions
- 13.24 x 9.29 x 3.30 cm
- 5.2 x 3.7 x 1.3 in

Enclosure
- IP30 Metal, Panel Mount

Weight
- 0.46 lbs (208.65 grams)

MTBF
- 122832 Hours

MTBF Calc. Method
- Parts Count Reliability Prediction

ENVIRONMENTAL

Operating Temperature
- -40 to 85°C (-40 to 176°F)

Storage Temperature
- -40 to 85°C (-40 to 176°F)

Operating Humidity
- 0 to 95% Non-condensing

REGULATORY

Approvals
- FCC, CE, IEC 61850-3, IEEE 1613, UL C1 D2,
  File: E245458, NEMA TS2

IEC 61850-3 ELECTRO MAGNETIC INTERFERENCE SPECIFICATIONS

Test
- 61000-4-2 ESD
- 61000-4-3 Radiated RFI
- 61000-4-4 Burst (Fast Transient)
- 61000-4-5 Surge
- 61000-4-6 Induced (Conductive) RFI
- 61000-4-12 Damped Oscillatory
- 61000-4-16 Mains Frequency Voltage
- 61000-4-17 Ripple on DC Power Supply

Test Description
- Enclosure Contact
- Enclosure Air
- Signal Ports
- DC Power Ports
- Signal Ports
- Signal Ports
- Signal Ports
- Signal Ports
- Signal Ports

Test Level
- 8 kV
- 15 kV
- 4 kV @ 2.5 KHz
- 4 kV
- 2 kV line to earth, 1 kV line to line
- 2 kV line to earth, 1 kV line to line
- 10 V RMS
- 10 V RMS
- 2.5 kV common, 1 kV diff mode @ 1MHz
- 2.5 kV common, 1 kV diff mode @ 1MHz
- 30 V Continuous, 300 V for 1 s
- 30 V Continuous, 300 V for 1 s
- 10%

IEEE 1613 C37.90 ELECTROMAGNETIC INTERFERENCE SPECIFICATIONS

Test
- C37.90.3 ESD
- C37.90.2 Radiated RFI
- C37.90.1 Fast Transient

Test Description
- Enclosure Contact
- Enclosure Air
- Signal Ports

Test Level
- 8 kV
- 15 kV
- 4 kV @ 2.5 kHz

ENVIRONMENTAL SPECIFICATIONS

Test
- 60068-2-1 Cold Temperature
- 60068-2-2 Dry Heat
- 60068-2-30 Humidity (damp heat cycle)
- IEC 60068-2-6 Vibration
- IEC 60068-2-27 Shock
- IEC 60068-2-32 Drop

Test Description
- Test Ad
- Test Bd
- Test Dd
- Test Dc
- Test Fc
- Test Ea

Test Level
- (-)40 C, 16 Hours
- (+)85 C, 16 Hours
- 90% (non-condensing) (+)55C, 6 Cycles
- 4g
- 50g
- 6 faces, 1 corner, 3 edges, total 10 drops at 1 m
Heavy Industrial RS-232 Isolated Repeater

232OPDRI-PH

**PRODUCT FEATURES**
- IEEE-61850-3, IEEE-1613
- NEMA TS2
- -40 to 85°C Operating Temperature
- Rugged IP30 Metal Panel Mount Case
- 5G Shock, 4G Vibration
- 2kV Triple Isolation
- 10 to 48 VDC Input Power

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>232OPDRI-PH</td>
<td>Heavy Industrial RS-232 Isolated Repeater</td>
</tr>
</tbody>
</table>

**ACCESSORIES**
- MDR-40-24 - DIN Rail Mount Power Supply 24VDC, 1.7 A output power
- DRAD35 - DIN Rail Mounting Kit 35mm
- TBKT1 - Replacement Term Block, 2

The 232OPDRI-PH is our premium Heavy Industrial RS-232 Isolated Repeater. Designed for rugged industrial environments, it has been put through some of the most exacting compliance tests in the industry. Meeting the requirements of IEC 61850-3 and IEEE 1613, it is suitable for installation in electrical substations. These specifications are more stringent than the NEMA TS1/TS2 requirements for transportation applications.

Powerful isolation on both data ports protects your equipment and data from damaging ground loops and surges. Additional isolation on the power supply circuits adds a third degree of protection.

Packaged in a rugged IP30 metal case, this repeater operates in wide temperature extremes. The panel mount form factor with DIN Rail mount option makes it easy to integrate into your control panel or other industrial equipment.

Installation and configuration is easy. Data is connected with a DB9 female connector (DCE) and a DB9 male connector (DTE). Power is connected through terminal block that accepts 10 to 48 VDC from any external source.
# Heavy Industrial RS-232 Isolated Repeater

**2320PDRI-PH**

## Specifications

### Serial Technology
- **Serial Connector**: DB9 F (DCE), DB9 M (DTE)
- **Data Rate**: Up to 115.2 Kbps
- **Isolation**: 2 KV RMS, 1 minute

### Power
- **Source**: External (Not Included)
- **Power Connector**: 2 Position Removable Terminal Block
- **Input Voltage**: 10 to 48 VDC (56 VDC Maximum)
- **Power Consumption**: 0.55 W (typical), 1.5 W (maximum)

### Terminal Blocks
- **Wire Size Accepted**: 28 to 12 AWG
- **Pitch**: 5.08 mm
- **Insulation Resistance**: ≥500 MΩ @ 500 VDC
- **Maximum Torque**: 5 Kg / cm

### Indicators
- **Power**: Red LED
- **Data**: Green LED TD, RD, CTS, RTS

### Mechanical
- **Dimensions**: 13.24 x 9.29 x 3.30 cm
- **Enclosure**: IP30 Metal, Panel Mount
- **Weight**: 0.46 lbs (208.65 grams)
- **MTBF**: 194712 Hours
- **MTBF Calc. Method**: Parts Count Reliability Prediction

### Environmental
- **Operating Temperature**: -40°C to 85°C (-40°F to 176°F)
- **Storage Temperature**: -40°C to 85°C (-40°F to 176°F)
- **Operating Humidity**: 0 to 95% Non-condensing

### Regulatory
- **Approvals**: FCC, CE, IEC 61850-3, IEEE 1613 UL C1 D2, File: E245458, NEMA TS2

### IEC 61850-3 Electromagnetic Interference Specifications

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Enclosure Contact</th>
<th>Enclosure Air</th>
<th>DC Power Ports</th>
<th>Signal Ports</th>
<th>Test Level</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>61000-4-2</td>
<td>ESD</td>
<td>8 kV</td>
<td>15 kV</td>
<td>10 V/m</td>
<td>-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>61000-4-3</td>
<td>Radiated RFI</td>
<td>10 V/m</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>61000-4-4</td>
<td>Burst (Fast Transient)</td>
<td>4 kV @ 2.5 KHz</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>61000-4-5</td>
<td>Surge</td>
<td>2 kV line to earth, 1 kV line to line</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>61000-4-6</td>
<td>Induced (Conductive) RFI</td>
<td>10 V RMS</td>
<td>10 V RMS</td>
<td>10 V RMS</td>
<td>-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>61000-4-12</td>
<td>Damped Oscillatory</td>
<td>2.5 kV common, 1 kV common @ 1MHz</td>
<td>2.5 kV common, 1 kV common @ 1MHz</td>
<td>2.5 kV common, 1 kV common @ 1MHz</td>
<td>2.5 kV common, 1 kV common @ 1MHz</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>61000-4-16</td>
<td>Mains Frequency Voltage</td>
<td>30 V Continuous, 300 V for 1 s</td>
<td>30 V Continuous, 300 V for 1 s</td>
<td>30 V Continuous, 300 V for 1 s</td>
<td>30 V Continuous, 300 V for 1 s</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>61000-4-17</td>
<td>Ripple on DC Power Supply</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10%</td>
<td>3</td>
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</tr>
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</table>

### IEEE 1613 C37.90 Electromagnetic Interference Specifications

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Enclosure Contact</th>
<th>Enclosure Air</th>
<th>DC Power Ports</th>
<th>Signal Ports</th>
<th>Test Level</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>C37.90.3</td>
<td>ESD</td>
<td>8 kV</td>
<td>15 kV</td>
<td>10 V/m</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>C37.90.2</td>
<td>Radiated RFI</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>C37.90.1</td>
<td>Fast Transient</td>
<td>4 kV @ 2.5 kHz</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
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</table>

### Environmental Specifications

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
<th>Test Ad</th>
<th>Test Bd</th>
<th>Test Dd</th>
<th>TestFc</th>
<th>Test Ea</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>60068-2-1</td>
<td>Cold Temperature</td>
<td>(-)40 C, 16 Hours</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>60068-2-2</td>
<td>Dry Heat</td>
<td>(+)85 C, 16 Hours</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td>60068-2-30</td>
<td>Humidity (damp heat cycle)</td>
<td>90% (non-condensing) (+)55C, 6 Cycles</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td>IEC 60068-2-6</td>
<td>Vibration</td>
<td>4g</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>IEC 60068-2-27</td>
<td>Shock</td>
<td>50g</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>IEC 60068-2-32</td>
<td>Drop</td>
<td>6 faces, 1 corner, 3 edges, total 10 drops at 1 m</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
The 485LDRC9 is an optically isolated RS-232 to RS-422/485 converter. RS-232 signals interface through a DB9 female connector or a terminal block. RS-422/485 signals and power inputs connect to the terminal block. Terminal blocks are arranged to allow easy wiring inside a control panel.

Built-in Automatic Send Data Control circuitry allows quick set-up and eliminates the need for external software drivers to control handshake signals. The converter operates on externally sourced 10-30 VDC power.

Optically isolated data lines (2,000 V on input/output) with 500W surge suppression ensure that connected equipment is protected even in the harshest environments. DIN rail mount design snaps on standard 35mm rail and a small form factor fits neatly into tight cabinets.

The 485LDRC9 is ideal for critical industrial communications, factory automation, in-cabinet conversion, warehouse automation, security, and many other applications.

**PRODUCT FEATURES**

- Extend data up to 1.2 km (4,000 ft.)
- 2 kV optical isolation on input/output
- Wide operating temperature (-40 to +80 °C)
- Modbus compatible
- UL Recognized, NEMA TS2
- Automatic Send Data Control

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 CONNECTOR</th>
<th>RS-422/485 CONNECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>485LDRC9</td>
<td>DB9 Female or Terminal Block</td>
<td>Terminal Blocks</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

**SERIAL TECHNOLOGY**

**RS-232 - 2 options**
- Option 1: Connector DB9 Female (DCE)
- Option 1: Signals TD, RD, GND
- Option 2: Connector Terminal block
- Option 2: Signals TD, RD, GND

**RS-422**
- Connector Terminal block
- Signals TDA(-), TDB(+), RDA(-), RDB(+), GND
- Termination 120 (switchable)

**RS-485**
- Connector Terminal Block
- Signals TDA(-), TDB(+), RDA(-), RDB(+), GND
- Modes 2-wire and 4-wire
- Termination 120 (switchable)

**ISOLATION**
- Lines Protected Data lines
- Method Optical
- Rating 2,000 V

**SURGE SUPPRESSION**
- Lines Protected Data lines
- Method TVS
- Rating 7.5V bi-directional avalanche breakdown device
- Response Time < 1 pico-second

**INDUSTRIAL BUS**
- Modbus ASCII/RTU

**ACCESSORIES**
- MDR-40-24 - DIN Rail Mount Power Supply 24VDC, 1.7 A output power
- 9PAMF6 - 6 ft. (1.8 m) 232 DB9 male to DB9 female serial cable
**SPECIFICATIONS**

**POWER**
- Connector: Terminal block
- Voltage: 10-30 VDC
- Consumption: 0.5 W
- Source: External powering required

**TERMINAL BLOCKS**
- Wire Size: 24 to 14 AWG
- Torque: 4 kgf-cm

**LED INDICATORS**
- Power (RED): On when power applied
- TD (RED): Flashes when RS-422/485 data is transmitted
- RD (RED): Flashes when RS-422/485 data is received

**ENCLOSURE**
- Material: Plastic
- IP Rating: 20
- Dimensions: 2.5 x 7.9 x 9.5 cm (1.0 x 3.1 x 3.7 in)
- Mounting: 35 mm DIN rail (panel mount adapter available)

**ENVIRONMENTAL**
- Operating Temperature: -40 to +80 °C (-40 to +176 °F)
- Storage Temperature: -40 to +85 °C (-40 to +185 °F)
- Operating Humidity: 0 to 95% non-condensing
- MTBF, 485LDRC9: 257448 hours
- MTBF Calculation Method: Parts Count Reliability Prediction

**APPROVALS / CERTIFICATIONS - 485LDRC9**
- cULus Recognized, File Number: E222870, NEMA TS2
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
- EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
- EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at www.bb.elec.com
Isolated Serial Converter
4850I9TB

Model 4850I9TB is a basic, isolated converter. It converts unbalanced, full duplex RS-232 signals to balanced full-duplex (4-wire) RS-422/485 or half-duplex (2-wire) RS-485 signals.

The converter provides 1,500 Volts RMS optical isolation of the data lines and ground (and connected devices) between the RS-232 and RS-422/485 signals. RS-232 port has a female DB9 connector. RS-422/485 port has a 6-position terminal block.

The RS-232 side of the converter draws power from the handshake lines (DTR, RTS). At least one handshake line must be asserted (raised high) to power the RS-232 side. The RS-422/485 side must be powered by an external 12 VDC power supply (sold separately).

### PRODUCT FEATURES
- 1,500 Volts optical isolation
- Converts RS-232 to RS-422/485
- 4-wire, full-duplex RS-485
- 2-wire, half-duplex RS-485

### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 CONNECTOR</th>
<th>RS-422/485 CONNECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>4850I9TB</td>
<td>DB9 Female</td>
<td>Terminal Block</td>
</tr>
</tbody>
</table>

### ACCESSORIES
- 485P52 - 12VDC@100mA wall transformer power supply, tinned stripped leads
- 9PAMF6 - 6 ft. (1.8 m) RS-232 Serial Cable
- E1250BL-BB3 - 12VDC @ 500MA European wall transformer power supply, tinned stripped leads
- MMNM9 - DB9 male to DB9 male Null Modem Adapter

### SPECIFICATIONS

**SERIAL TECHNOLOGY**
- **Data Rate**: 9600 bps
- **Connector**: DB9 Female (DCE)
- **Signals**: TD, RD, GND

**RS-422/485**
- **Connector**: Terminal block
- **RS-485, 2-Wire**: Data A (-), Data B (+), GND
- **RS-422/485, 4-Wire**: TDA(-), TDB(+), RDA(-), RDB(+), GND

**ISOLATION**
- **Lines Protected**: Data lines
- **Method**: Optical
- **Rating**: 1,500 V

**POWER**
- **Note**: Requires 2 Power Sources
  - **Source**: Port-powered from DTR and RTS handshake lines
  - **RS-422/485**: Terminal block
  - **Voltage**: 10-14 VDC
  - **Consumption**: 0.9 W
  - **Source**: External

**TERMINAL BLOCK**
- **Wire Size**: 26 to 16 AWG
- **Torque**: 2.0 lb fin

**ENCLOSURE**
- **Material**: Plastic
- **Dimensions**: 5.5 x 8.3 x 1.7 cm (2.2 x 3.3 x 0.7 in)
- **Mounting**: Inline

**ENVIRONMENTAL**
- **Operating Temperature**: 0 to +50 °C (+32 to +122 °F)
- **Storage Temperature**: -40 to +85 °C (-40 to +185 °F)
- **Operating Humidity**: 0 to 95% non-condensing
- **MTBF**: 272581 hours
- **MTBF Calculation Method**: MIL 217F Parts Count Reliability Prediction

**APPROVALS / CERTIFICATIONS - 4850I9TB**
- cULus, File Number: E222870
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- Download complete Declaration of Conformity at www.bb.elec.com
Isolated In-line Serial Converters  
4WSD9OTB, 4WSD25OTB

Isolated Models 4WSD9OTB and 4WSD25OTB convert RS-232 to RS-422 or RS-485 (2 or 4-wire). 2,000V two-way optical isolation protects devices from power surges, spikes and ground loops in harsh electrical environments.

These in-line converters support distances up to 1,200 m (4000 ft.) and data rates up to 115.2 kbps. Switchable modes support 2-wire RS-485, 4-wire RS-485, and full duplex RS-422. Available with female DB9 or DB25 RS-232 inputs.

Removable terminal blocks for RS-422/485 and external power make wiring easy. Accepts external power from 10-48 VDC.

### Mechanical Diagram

#### Specifications

<table>
<thead>
<tr>
<th>Serial Technology</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>115.2 kbps maximum</td>
<td></td>
</tr>
<tr>
<td>LED Indicators</td>
<td>TD and RD</td>
<td></td>
</tr>
</tbody>
</table>

**RS-232**

- Connectors: 4WSD9OTB: DB9 female  
  4WSD25OTB: DB25 female
- Signals: TD, RD, GND

**RS-422/485**

- Connectors: 4WSD9OTB: Terminal block, removable  
  4WSD25OTB: Terminal block, removable
- Signals: Data A(-), Data B (+), GND

**RS-485, 2-wire**

- Signals: TDA(-), TDB(+), RDA (-), RDB(+), GND

**Power**

- Input Required: 10-48 VDC
- Current Draw: 28 mA at 12 VDC (typical)

### Product Features

- Modbus compatible serial conversion
- Removable terminal blocks for RS-422/485
- 2,000V two-way optical isolation
- Automatic Send Data Control - no software drivers necessary
- Accepts external power from 10-48 VDC

### Ordering Information

<table>
<thead>
<tr>
<th>Model Number</th>
<th>RS-232 Connector</th>
<th>RS-485 Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>4WSD9OTB</td>
<td>DB9 Female</td>
<td>Removable Terminal Blocks</td>
</tr>
<tr>
<td>4WSD25OTB</td>
<td>DB25 Female</td>
<td>Removable Terminal Blocks</td>
</tr>
</tbody>
</table>

### Accessories

- 485PS2 - 12VDC@100mA wall transformer power supply, tinned stripped leads
- 7175 - 2 position 3.5MM Replacement Terminal Block (power, included)
- 7372 - 5 position 3.5MM Replacement Terminal Block (data, included)
- TBKT4 - 5 position 3.5MM Replacement Terminal Block
- 9PAMF6 - 6 ft. (1.8 m) RS-232 Serial Cable
- E1250BL-BB3 - 12VDC @ 500mA European wall transformer power supply, tinned stripped leads
- MMNM9 - DB9 male to DB9 male Null Modem Adapter

### Mechanical

- Dimensions, 4WSD9OTB: 9.8 x 4.3 x 2.3 cm (3.9 x 1.7 x 0.9 in)
- Dimensions, 4WSD25OTB: 9.8 x 5.5 x 2.3 cm (3.9 x 2.2 x 0.9 in)
- MTBF: 179604
- MTBF Calculation Method: MIL 217F Parts Count Reliability Prediction

### Environmental

- Operating Temperature: 0 to +70 °C (+32 to +158 °F)
- Storage Temperature: -40 to +85 °C (-40 to +185 °F)

### Approvals / Certifications

- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
Model 485DRCi industrial-grade isolated serial converter changes RS-232 signals to RS-422 for increased range, or to RS-485 for increased range plus multi-drop capability.

Designed for rugged industrial use, the 485DRCi is UL approved and certified for operation in Class 1/Division 2 environments and also offers 2,000V 3-way optical isolation on input, output, and power lines. In addition to optical isolation, the unit has surge suppression on the RS-422/485 lines. This DIN rail mountable converter optically isolates and converts unbalanced, full or half-duplex, RS-232 signals to balanced RS-422/485 signals at baud rates up to 115.2 kbps. Configuration is made via a 12-position DIP switch on the bottom of the converter.

Featuring Automatic Send Data Control circuitry, the converter does not require special software control of handshake signals in RS-485 mode. Removable terminal blocks for power and RS-422/485 signals make wiring easy. It is powered by a supply voltage of 10 to 48 VDC which is isolated from all data and signal ground lines.

**Product Features**
- Data rates up to 115.2 kbps
- Three-way 2,000V optical isolation (input, output, power)
- Wide operating temperature
- UL Class 1/Division 2
- Modbus ASCII/RTU compatible
- 10–48 VDC input power range

**Ordering Information**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>RS-232 Connector</th>
<th>RS-422/485 Connector</th>
<th>Isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>485DRCi</td>
<td>DB9 Female (DCE)</td>
<td>Removable Terminal Block</td>
<td>2,000 V</td>
</tr>
</tbody>
</table>

**Accessories**

- MDR-40-24 - DIN Rail Mount Power Supply 24VDC, 1.7 A output power
- EK-CLIP-MPC - Replacement DIN Rail Clip
- TBKT1 - Replacement Term Block, 2 position 5.08mm
- TBKT2 - Replacement Term Block, 5 position 5.08mm

**Automatic Send Data Control Explained**

As operating systems become more complex, it is increasingly difficult to control an RS-485 driver with standard software and the RTS line. This is especially true in Windows and multi-tasking operating systems. With B&B Electronics’ Automatic Send Data Control circuit, driver control is in the converter hardware, so you do not have to work with software at all.

The circuit monitors data flow and enables the driver during transmission and automatically disables it when no data is being sent. There is no need to rework software or install new drivers. Most B&B Electronics RS-232 to RS-485 converters and RS-485 serial cards include Automatic Send Data Control.

**In the Field**

Resolving Electrical Substation Data Glitches

Industry: Energy & Natural Resources Utilities
Product: Optically Isolated Converter

www.bb-elec.com/Substation
485DRCi
Carrier data charges may apply.
**SPECIFICATIONS**

**SERIAL TECHNOLOGY**
- **Data Rate**: 1.2 to 115.2 kbps
- **RS-232**
  - **Connector**: DB9 female (DCE)
  - **Signals**: TD, RD, GND
- **RS-422/485**
  - **Connector**: Removable terminal block, 28 to 14 AWG
  - **RS-485, 2-wire**: Data A(-), Data B (+), GND
  - **RS-422/485, 4-wire**: TDA(-), TDB(+), RDA (-), RDB(+), GND

**ISOLATION**
- **Rating**: 2,000 V
- **Lines Protected**: 3-way (input, output, power lines)
- **Method**: Optical

**SURGE SUPPRESSION**
- **Lines Protected**: Data lines
- **Rating**: 600W peak power dissipation
- **Clamping/Response Time**: < 1 pico-second

**INDUSTRIAL BUS**
- **Modbus**: ASCII/RTU

**POWER**
- **Connector**: Removable terminal block, 28 to 14 AWG
- **Voltage**: 10-48 VDC
- **Consumption**: 960 mW
- **Source**: External

**MECHANICAL**
- **LED Indicators**: Transmit, Receive, and Power
- **Dimensions**: 11.4 x 3.3 x 12.4 cm (4.5 x 1.3 x 4.9 in)
- **Enclosure**: 35mm DIN mount, plastic, IP30
- **Weight**: 204.12 g (0.45 lbs)

**ENVIRONMENTAL**
- **Operating Temperature**: -40 to +80 °C (-40 to +176 °F)
- **Storage Temperature**: -40 to +85 °C (-40 to +185 °F)
- **Operating Humidity**: 0 to 95% non-condensing
- **MTBF**: 25,461.7 hours
- **Calculation Method**: Parts Count Reliability Prediction

**CLASS 1/DIVISION 2 WIRING**
- **Type**: Solid copper only
- **Size**: 28 to 14 AWG
- **Temperature**: 105 °C (221 °F) minimum
- **Terminal Torque**: 0.5 Nm (Newton-meters)

**APPROVALS / CERTIFICATIONS - 485DCi**
- cUL 508, File Number: E222870 (C1 D2 E245458)
- CE
  - EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
  - EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
  - EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
  - EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
  - EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at www.bb.elec.com

**MECHANICAL DIAGRAM**
The SCP series RS-232 to RS-422/485 serial converters are compact and tough. Each model is designed and tested to meet heavy industrial EMC standards. The RS-232 signal is connected through a female DB9 connector. The RS-422/485 (2-Wire and 4-Wire) signal is connected through a removable terminal block, making wiring easy. Power is connected through a two position removable terminal block. Bit-wise enabled circuitry automatically detects the character time-out eliminating the need to set DIP switches for the baud rate.

Basic model SCP211-DFTB3 is non-isolated and made for less demanding temperature extremes. If you need a wider operating temperature but do not require isolation, model SCP211T-DFTB3 is available. These models should be used when isolation is not required, such as applications in which the data line does not exit the control cabinet.

Model SCP311T-DFTB3 offers 2 kV Isolation and will stand up to -40 to 80°C temperature variations. This is our most rugged model in this series. The SCP311 is an excellent investment for protecting your expensive control equipment.

**PRODUCT FEATURES**
- Isolated and Non-Isolated Models
- ESD Protection - 8 kV Contact, 15 kV Air
- Rugged Metal Case
- Wide Operating Temperature Models
- Panel Mount with Available DIN Rail Adapters
- Built in Switchable Bias & Termination

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCP211-DFTB3</td>
<td>RS-232 to 422/485 Converter</td>
</tr>
<tr>
<td>SCP211T-DFTB3</td>
<td>Wide-Temp, RS-232 to RS-422/485 Converter</td>
</tr>
<tr>
<td>SCP311T-DFTB3</td>
<td>Wide-Temp, Isolated, RS-232 to 422/485 Converter</td>
</tr>
</tbody>
</table>

**ACCESSORIES**
- MDR-40-24 - DIN Rail Mount Power Supply 24VDC, 1.7 A output power
- DRAD35 - DIN Rail Mounting Clips 35mm
- TBKT1 - Replacement Term Block, 2 position 5.08mm
- TBKT2 - Replacement Term Block, 5 position 5.08mm
- TBKT4 - (2) Replacement Term Block, 5 position 5.08mm
- 9PAMF6 - RS-232 serial cable DB9 Male To DB9 Female, 6 ft. (1.8 m)
- 232AMF500 - RS-232 serial cable DB25 Male To DB25 Female, 6 ft. (1.8 m)
# Specifications

## Serial Technology

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232</td>
<td>TD, RD, GND</td>
</tr>
<tr>
<td>RS-422/485 4W</td>
<td>TDA(-), RDA(-), TDB(+), RDB(+), GND</td>
</tr>
<tr>
<td>RS-485 2W</td>
<td>DATA A(-), DATA B(+), GND</td>
</tr>
</tbody>
</table>

### Data Rate
460.8 Kbps

### Isolation
2 kV (SCP311T-DFTB3)

### Surge Protection
+/- 0.5 kV DC Ports, +/- 1 kV Signal Ports

### Industrial Bus
Modbus ASCII/RTU

### Bias
1 KΩ Switchable

### Termination
120 Ω Switchable

### Connectors
- RS-232 – DB9F (DCE)
- RS-422/485 – Removable Terminal Block

## Power

### Source
External

### Connector
Terminal Block

### Input Voltage
10 to 30 VDC

### Power Consumption
1.0 Watt Maximum

## Indicators

<table>
<thead>
<tr>
<th>Description</th>
<th>LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>TD / RD</td>
<td>Green (Also used to indicate power)</td>
</tr>
</tbody>
</table>

## Mechanical

### Dimensions
99x22.9x73.7 mm (3.9x0.9 x2.9 in)

### Enclosure
IP 30, Metal

### Weight
0.33 lbs, 0.15 kg

### MTBF SCP211 Series
313926 Hours

### MTBF SCP311-DFTB3
217576 Hours

### MTBF Calc. Method
MIL 217F Parts Count Reliability

## Environmental

### Operating Temperature
- SCP211-DFTB3: 0 to 70°C
- SCP211T-DFTB3: -40 to 80°C
- SCP311T-DFTB3: -40 to 80°C

### Storage Temperature
- SCP211-DFTB3: -40 to 85°C
- SCP211T-DFTB3: -40 to 85°C
- SCP311T-DFTB3: -40 to 85°C

### Operating Humidity
0 to 95% Non-condensing

## Approvals / Certifications

### Regulatory
UL Listed, UL File Number: E222870

### Emissions
- FCC Class B, CISPR Class B (EN55022)
- EN61000-6-2:2005 (Heavy Industrial)
- EN61000-4-2:2008 (ESD) 8kV contact, 15kV air
- EN61000-4-3:2006 (RI) 10 V/m
- EN61000-4-4:2004 (EFT Burst) 1kV signal, 2kV power
- EN61000-4-5:2005 (Surge) 1kV signal, 500V DC, 1kV AC
- EN61000-4-6:2005 (CI) 10 Vrms
Standard Serial to Fiber Optic Converters

FOSTCDR, FOSTCDRKT, FOSTCDR-INV

The FOSTCDRx line of fiber optic converters are suitable for standard industrial installations. These converters extend data communications up to 4 km (2.5 mi) and provide two-way optical isolation on the input and output lines.

Model FOSTCDR industrial serial to multimode fiber optic converter, provides the most versatile connection possible between any asynchronous full or half-duplex serial equipment. In addition to direct point-to-point connectivity, it is capable operating in a multi-drop mode. This allows one serial device to communicate with up to 31 other devices around a fiber optic ring. Since the FOSTCDR supports mixed serial standards, you can replace other converters and isolators and add the EMI/RFI immunity inherent to fiber optic communications.

An Automatic Send Data Control circuit controls the RS-422/485 driver chip, eliminating the requirement for special software. Easy to install and configure, it has an 8-position DIP switch to set up the RS-422/485 parameters and terminal blocks to connect serial signals and power. In RS-232 mode, it supports Transmit and Receive data. Handshaking signals are not passed through.

A kit option, Model FOSTCDRKT, conveniently bundles two FOSTCDR converters with two matched power supplies.

Model FOSTCDR-INV features an "inverted fiber state" and is suitable for applications requiring the fiber optic light to be Off in the idle state.

PRODUCT FEATURES
- Data rates up to 115.2 kbps
- 4 km (2.5 mi) range
- 10 to 30 VDC input voltage
- Wide operating temperature
- 2000V, 2-way isolation
- Modbus ASCII/RTU compatible
- EMI/RFI protection
- TD, RD and Power LED’s

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>SERIAL CONNECTOR</th>
<th>FIBER CONNECTOR</th>
<th>ISOLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOSTCDR</td>
<td>Terminal Block</td>
<td>Multi-mode ST</td>
<td>2,000 V</td>
</tr>
<tr>
<td>FOSTCDR-INV</td>
<td>Terminal Block</td>
<td>Multi-mode ST</td>
<td>2,000 V</td>
</tr>
<tr>
<td>FOSTCDRKT</td>
<td>Bundled Kit Version, includes: (2) FOSTCDR Converters, (2) MDR-20-24 Power Supplies, (1) DFMM-STST-1M Fiber Optic 1-Meter Cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ACCESSORIES
- MDR-40-24 - DIN Rail Mount Power Supply 24VDC, 1.7 A output power
- DFMM-STST-1M - Multimode fiber patch cable ST-ST connectors

What is the difference between Model FOSTCDR and Model FOSTCDR-INV?

The FOSTCDR keeps the light in the fiber turned On when no data is transmitted and the input signal is in the MARK state (idle). If light is lost or too low, the electrical signals go to the SPACE state. The input signal turns the light Off/On in step with the data. This model has an indicator for Transmit and Receive, if no light is received, the RD LED will come on, the RD output will be positive relative to GND (normally negative), and in RS-422 or RS-485 mode, no light will set the TD(A)- line high relative to TD(B)+. The usual voltage with light in the fiber and no signal sets the B line high relative to A (about 4.4 Volts DC no termination).

The FOSTCDR-INV is the opposite. The fiber is Off in the idle state.
**SPECIFICATIONS**

**SERIAL TECHNOLOGY**

<table>
<thead>
<tr>
<th>Specification</th>
<th>RS-232</th>
<th>RS-422/485</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>RS-232: 115.2 Kbps maximum</td>
<td>RS-422/485: 460.8 Kbps maximum</td>
</tr>
<tr>
<td>Connector</td>
<td>Terminal block (24 to 14 AWG)</td>
<td>Terminal block (24 to 14 AWG)</td>
</tr>
<tr>
<td></td>
<td>RS-232: TD, RD, GND</td>
<td>RS-485, 2-wire: Data A(-), Data B(+), GND</td>
</tr>
<tr>
<td></td>
<td>RS-422/485, 4-wire: TDA(-), TDB(+), RDA(-), RDB(+), GND</td>
<td></td>
</tr>
</tbody>
</table>

**ISOLATION**

- **Rating**: 2KV RMS, 1 minute
- **Lines Protected**: 2-way (input, output lines)
- **Method**: Optical

**FIBER OPTIC TECHNOLOGY**

- **Type / Wavelength**: Multi-mode / 820 nm
- **Output Power**: (-) 17 to (-) 10 dBm
- **Receive Sensitivity**: (-) 25.4 dBm to (-) 24 dBm
- **Cable**: 62.5/125 micro-meter
- **Connector**: ST
- **Data Rate**: 9.6 to 115.2 kbps
- **Maximum Distance**: 4 km (2.5 mi)
- **Idle State**: Transmitter light ON

**POWER**

- **Source**: External
- **Input Voltage**: 10 to 30 VDC
- **Consumption**: 1.7 Watts
- **Connector**: Terminal block, (24 to 14 AWG)

**INDUSTRIAL BUS**

- **Modbus**: ASCII/RTU

**MECHANICAL**

- **LED Indicators**: Serial TD, RD, and Power
- **Dimensions**: 10.6 x 7.9 x 2.5 cm (4.3 x 2.3 x 0.95 in)
- **Enclosure**: 35mm DIN mount, plastic
- **Weight**: 182 g (0.4 lbs)

**ENVIRONMENTAL**

- **Operating Temperature**: -40 to +80 °C (-40 to +176 °F)
- **Storage Temperature**: -40 to +85 °C (-40 to +185 °F)
- **Operating Humidity**: 0 to 95% non-condensing

**APPROVALS / CERTIFICATIONS - FOSTCDR**

- cULus Recognized, File Number: E222870
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 + A1 + A2 + IS1 Radiated Field Immunity (RFI)
- EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
- EN 61000-4-6: 2009 Conducted Immunity

**APPROVALS / CERTIFICATIONS - FOSTCDR - INV**

- UL 508, File Number: E222870
- CE
- MTBF
  - FOSTCDR: 460854 hours
  - FOSTCDR-INV: 138904 hours

**MECHANICAL DIAGRAM**

Dimensional Diagram of FOSTCDR

---

**INDUSTRIAL BUS**

- **Modbus**: ASCII/RTU

**MECHANICAL**

- **LED Indicators**: Serial TD, RD, and Power
- **Dimensions**: 10.6 x 7.9 x 2.5 cm (4.3 x 2.3 x 0.95 in)
- **Enclosure**: 35mm DIN mount, plastic
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- **Operating Humidity**: 0 to 95% non-condensing

**APPROVALS / CERTIFICATIONS - FOSTCDR**

- cULus Recognized, File Number: E222870
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 + A1 + A2 + IS1 Radiated Field Immunity (RFI)
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Download complete Declaration of Conformity at www.bb.elec.com

**APPROVALS / CERTIFICATIONS - FOSTCDR - INV**

- UL 508, File Number: E222870
- CE
- MTBF
  - FOSTCDR: 460854 hours
  - FOSTCDR-INV: 138904 hours

**MECHANICAL DIAGRAM**

Dimensional Diagram of FOSTCDR
Industrial Serial to Fiber Optic Converters
FOSTCDRI, FOSTCDRI-INV

Model FOSTCDRI is B&B Electronics’ premium industrial serial to multi-mode fiber optic converter. Its rugged design is UL approved and certified for Class 1/Division 2 industrial environments. It extends data communications up to 4km (2.5 miles). It provides three-way optical isolation on the input, output and power lines.

In addition to direct point-to-point connectivity, it is capable of operating in a multi-drop mode. This allows one serial device to communicate with up to 31 other devices around a fiber ring. Since it supports mixed standards, you can replace other converters and isolators and add the EMI / RFI protection inherent to fiber optic communications.

In RS-232 mode, the converter supports Transmit and Receive data. Handshaking signals are not passed through. An Automatic Send Data Control circuit controls the RS-422/485 driver chip, eliminating the requirement for external software.

Easy to install and configure, it has a 12-position DIP switch on the bottom to configure RS-422/485 parameters. Serial data and power cables connect to removable terminal blocks. ST connectors are used for the fiber.

Model FOSTCDRI-INV features an “inverted fiber state” and is suitable for applications requiring the fiber optic transmit light to be Off in the idle state.

PRODUCT FEATURES
- Data rates up to 115.2 kbps
- 10 – 48 VDC input power range
- Wide operating temperature
- 2,000V, 3-way optical isolation
- Modbus ASCII/RTU compatible
- EMI / RFI protection
- UL Class 1/Division 2
- Inverted fiber state option (Model FOSTCDRI-INV)
- TD, RD and Power LED’s

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>SERIAL CONNECTOR</th>
<th>FIBER CONNECTOR</th>
<th>ISOLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOSTCDRI</td>
<td>Terminal Block</td>
<td>Multi-mode ST</td>
<td>2,000 V</td>
</tr>
<tr>
<td>FOSTCDRI-INV</td>
<td>Terminal Block</td>
<td>Multi-mode ST</td>
<td>2,000 V</td>
</tr>
</tbody>
</table>

ACCESSORIES
MDR-40-24 - 24 VDC, 1A, slim-line DIN rail power supply
DFMM-STST-1M - Multi-mode fiber optic cable with ST/ST connectors (62.5/125 micro-meter), 1 meter
TBKT1 - Replacement 2-position terminal block, 5.08 mm
TBKT2 - Replacement 5-position terminal block, 5.08 mm

What is the difference between Model FOSTCDRI and Model FOSTCDRI-INV?

The FOSTCDRI keeps the light in the fiber turned On when no data is transmitted and the input signal is in the MARK state (idle). If light is lost or too low, the electrical signals go to the SPACE state. The input signal turns the light Off/On in step with the data. This model has an indicator for Transmit and Receive, if no light is received, the RD LED will come on, the RD output will be positive relative to GND (normally negative), and in RS-422 or RS-485 mode, no light will set the TD(A)- line high relative to TD(B)+. The usual voltage with light in the fiber and no signal sets the B line high relative to A (about 4.4 Volts DC no termination).

The FOSTCDRI-INV is the opposite. The fiber is Off in the idle state.
**SPECIFICATIONS**

**SERIAL TECHNOLOGY**

<table>
<thead>
<tr>
<th>Data Rate</th>
<th>9.6 to 115.2 kbps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connector</strong></td>
<td>Removable terminal block</td>
</tr>
<tr>
<td><strong>Signals</strong></td>
<td>TD, RD, GND</td>
</tr>
</tbody>
</table>

**RS-422/485**

<table>
<thead>
<tr>
<th>Connector</th>
<th>5-position, removable terminal block</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signals</strong></td>
<td>TDA(-), TDB(+), RDA(-), RDB(+), GND</td>
</tr>
<tr>
<td><strong>Bias</strong></td>
<td>Built-in, switchable, 1.2KΩ</td>
</tr>
<tr>
<td><strong>Termination</strong></td>
<td>Built-in, switchable, 120Ω</td>
</tr>
</tbody>
</table>

**ISOLATION**

| Rating | 2KV RMS, 1 minute |
| Surge Protection | 600 W peak power dissipation |
| Clamping Time | < 1 pico-second |
| Lines Protected | 2-way (input, output lines) |
| **Method** | Optical |

**FIBER OPTIC TECHNOLOGY**

| Type / Wavelength | Multi-mode / 820 nm |
| **Output Power** | -16dBm min, -12dBm typical, -9dBm maximum |
| **Receive Sensitivity** | -24dBm min, -25.4dBm maximum |
| **Cable** | 62.5/125 micro-meter |
| **Connector** | ST |
| **Data Rate** | 9.6 to 115.2 kbps |
| **Maximum Distance** | 4 km (2.5 mi) |
| **Idle State, FOSTCDRI** | Transmitter light ON |
| **Idle State, FOSTCDRI-INV** | Transmitter light OFF |

**INDUSTRIAL BUS**

| Modbus | ASCII/RTU |

**POWER**

| Source | External |
| Input Voltage | 10 to 48 VDC (56 VDC maximum) |
| Consumption | 0.5 W (typical), 1.3W (with termination) |
| **Connector** | 2-position, removable terminal block, 24 to 14 AWG |

**TERMINAL BLOCKS**

| Wire Size Accepted | 28 to 12 AWG |
| Pitch | 5.08 mm |
| **Insulation Resistance** | ≥ 500 MO @ 500 VDC |
| **Maximum Torque** | 5 Kg / cm |

**LED INDICATORS**

| Power | Red LED |
| FO Receive | Red LED |
| FO Transmit | Red LED |

**MECHANICAL**

| Dimensions | 12.3 x 11.3 x 3.2 cm (4.9 x 4.5 x 1.3 in) |
| **Enclosure** | IP 20 plastic, 35 mm DIN mount |
| **Weight** | 199.6 g (0.44 lbs) |

**ENVIRONMENTAL**

| Operating Temperature | -40 to +80 °C (-40 to +176 °F) |
| Storage Temperature | -40 to +85 °C (-40 to +185 °F) |
| Operating Humidity | 0 to 95% non-condensing |
| **MTBF** | 138904 hours |
| **MTBF Calculation Method** | Parts Count Reliability Prediction |

**APPROVALS / CERTIFICATIONS - FOSTCDRI**

- UL Class 1 Division 2, Groups A, B, C, D
- File Number: E222870 (HAZLOC E245458)
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
- EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
- EN 61000-4-6: 2009 Conducted Immunity
- Download complete Declaration of Conformity at www.bb.elec.com

**APPROVALS / CERTIFICATIONS - FOSTCDRI-INV**

- UL 508, File Number: E222870
- CE

**MECHANICAL DIAGRAM**

![Mechanical Diagram](image)
In-line Fiber Optic Modem

FOSTC

Fiber optic cabling has inherent resistance to EMI/RFI and transient immunity, making it ideal for industrial and utility data communication applications.

Model FOSTC provides the most versatile connection possible between asynchronous serial equipment using fiber optic cable. Any two pieces of asynchronous serial equipment can communicate full or half-duplex over two fibers at distances up to 4 km (2.5 mi). The converter can be used for point-to-point communications between serial devices. It can also be used to create a multi-drop master/slave configuration, allowing one serial device to talk to multiple slave devices around a fiber ring.

RS-232, RS-422, or RS-485 data signals are supported. Different standards can be mixed and matched to allow RS-232 devices to connect to RS-422 or RS-485 systems. This means the FOSTC can replace converters and isolators when connecting remote devices, while providing the EMI/RFI and transient immunity of optical fiber.

Supports both the Transmit Data and Receive Data lines, and provides full hardware control of the RS-485 driver with B&B Electronics’ Automatic Send Data Control circuit. All serial connections are provided on the same DB25 female connector, while the multi-mode fiber is connected via two ST connectors. Powered by 12 VDC at 140 mA max. An external power supply is available.

PRODUCT FEATURES
- Inherent EMI/RFI immunity from surges, spikes, ground loops
- Extend serial signals up to 4 km (2.5 mi) with Multimode Fiber
- Point-to-point or multi-drop ring configuration
- Converts RS-232 to RS-422/485
- RS-232 data rates up to 115.2 kbps; RS-422/485, 500 kbps
- RS-485 Automatic Send Data Control

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>SERIAL CONNECTOR</th>
<th>FIBER CONNECTOR</th>
<th>MODBUS?</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOSTC</td>
<td>DB25 female</td>
<td>Multi-mode ST</td>
<td>✔</td>
</tr>
</tbody>
</table>

ACCESSORIES

232PS3 - 12 VDC DIN rail mount power supply, USA
PS1EU-1000 - 220-240 VAC to 12 VDC wall power supply, jack, Euro CEE7/7 plug
PS1UK-1000 - 220-240 VAC to 12 VDC wall power supply, jack, UK BS-1363 plug
232CAM - PC-AT serial computer to modem cable, 6 ft. (1.8 m)

Automatic Send Data Control Explained

As operating systems become more complex, it is increasingly difficult to control an RS-485 driver with standard software and the RTS line. This is especially true in Windows and multi-tasking operating systems. With B&B Electronics’ Automatic Send Data Control circuit, driver control is in the converter hardware, so you do not have to work with software at all.

The circuit monitors data flow and enables the driver during transmission and automatically disables it when no data is being sent. There is no need to rework software or install new drivers. Most B&B Electronics RS-232 to RS-485 converters and RS-485 serial cards include Automatic Send Data Control.
### In-line Fiber Optic Modem FOSTC

#### SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Rate</strong></td>
<td>RS-232: 115.2 kbps maximum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RS-422/485: 500 kbps maximum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RS-232</strong></td>
<td>Connector DB25 female (DCE)</td>
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<td></td>
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</tr>
<tr>
<td><strong>Signals</strong></td>
<td>TD, RD, GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RS-422/485</strong></td>
<td>Connector DB25 female (DCE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RS-422, 2-wire</strong></td>
<td>Data A(-), Data B(+), GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RS-422/485, 4-wire</strong></td>
<td>TDA(-), TDB(+), RDA(-), RDB(+), GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### FIBER OPTIC TECHNOLOGY

| Transmission Line | Dual, multi-mode glass optical cable |   |   |   |   |   |
| Connector         | ST |   |   |   |   |   |
| Wavelength        | 820 nm |   |   |   |   |   |
| Size Options      | 50/125, 62.5/125, 100/140, 200 µm |   |   |   |   |   |
| Output Power      | (-) 17 to (-) 10 dBm |   |   |   |   |   |
| Receive Sensitivity | (-) 25.4 dBm to (-) 24 dBm |   |   |   |   |   |
| Cable             | 62.5/125 micro-meter |   |   |   |   |   |
| Data Rate         | 9.6 to 115.2 kbps |   |   |   |   |   |
| Maximum Distance  | 4 km (2.5 mi) |   |   |   |   |   |

#### FIBER COMMUNICATION MODES

| Point-to-Point Transmission | Asynchronous, half or full-duplex |   |   |   |   |   |
| Multi-Drop Transmission    | Asynchronous, half duplex fiber ring |   |   |   |   |   |

#### POWER

| Source         | External |   |   |   |   |   |
| Input Voltage  | 12 VDC |   |   |   |   |   |
| Range DC       | 10-14 VDC |   |   |   |   |   |
| Connections    | 2.5mm phone jack (Tip Positive) or DB25 pins 25(+) & 12(-) |   |   |   |   |   |
| Power Consumption | 1.7 W max 1 W typical |   |   |   |   |   |

#### FIBER OPTIC CABLES

<table>
<thead>
<tr>
<th>MULTI-MODE DUPLEX FIBER</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MODEL NUMBER</strong></td>
<td><strong>CONNECTOR TYPE</strong></td>
</tr>
<tr>
<td>DFMM-LCLC-XX</td>
<td>LC TO LC</td>
</tr>
<tr>
<td>DFMM-SCLC-XX</td>
<td>SC TO LC</td>
</tr>
<tr>
<td>DFMM-SCSC-XX</td>
<td>SC TO SC</td>
</tr>
<tr>
<td>DFMM-STLC-XX</td>
<td>ST TO LC</td>
</tr>
<tr>
<td>DFMM-STSC-XX</td>
<td>ST TO SC</td>
</tr>
<tr>
<td>DFMM-STST-XX</td>
<td>ST TO ST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SINGLE-MODE DUPLEX FIBER</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MODEL NUMBER</strong></td>
<td><strong>CONNECTOR TYPE</strong></td>
</tr>
<tr>
<td>DFSM-LCLC-XX</td>
<td>LC TO LC</td>
</tr>
<tr>
<td>DFSM-SCLC-XX</td>
<td>SC TO LC</td>
</tr>
<tr>
<td>DFSM-SCSC-XX</td>
<td>SC TO SC</td>
</tr>
<tr>
<td>DFSM-STLC-XX</td>
<td>ST TO LC</td>
</tr>
<tr>
<td>DFSM-STSC-XX</td>
<td>ST TO SC</td>
</tr>
<tr>
<td>DFSM-STST-XX</td>
<td>ST TO ST</td>
</tr>
</tbody>
</table>

Note: Model Number change the xx to its fiber length number for the actual Model Number. Example: If ou want a 1M Multi-Mode LC to LC Fiber the part number would be DFMM-LCLC-1M.
Heavy Industrial RS-232/422/485 to Fiber Optic Converters
FOSTCDRI-PH-MC, FOSTCDRI-PH-MT, FOSTCDRI-PH-SC

The FOSTCDRI-PH-xx series are premium heavy industrial serial to fiber optic converters. Designed for rugged industrial environments, they have been put through most exacting compliance testing in the industry. Meeting IEC 61850-3 and IEEE 1613 requirements, they are suitable for installation in electrical substations. These specifications are more stringent than the NEMA TS1/TS2 requirements for transportation applications. Powerful isolation protects equipment and data from damaging ground loops and surges. Additional isolation on the power supply circuits adds a third degree of protection.

Packaged in a rugged IP30 metal case, these converters convert serial signals to multi-mode or single-mode fiber optic. Bit-wise enabled circuitry automatically detects the data rate without setting a DIP switch.

In addition to direct point-to-point connectivity, operation in multi-drop mode is possible. This enables serial devices to communicate with up to 31 others in a fiber ring. Supporting mixed standards, you can replace other converters and add the EMI / RFI protection inherent to fiber optic communications.

PRODUCT FEATURES
- IEEE-61850-3
- IEEE 1613
- Multi or Single Mode, ST or SC Versions
- -40 to 85°C Operating Temperature
- Rugged, IP30 Metal Panel Mount Case
- 50G Shock, 4G Vibration
- 2kV Triple Isolation

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOSTCDRI-PH-MC</td>
<td>Serial to Multi-mode SC Converter</td>
</tr>
<tr>
<td>FOSTCDRI-PH-MT</td>
<td>Serial to Multi-mode ST Converter</td>
</tr>
<tr>
<td>FOSTCDRI-PH-SC</td>
<td>Serial to Single-mode SC Converter</td>
</tr>
</tbody>
</table>

ACCESSORIES

MDR-20-24 - DIN Rail Mount Power Supply 24VDC, 1.0 A output power
Heavy Industrial RS-232/422/485 to Fiber Optic Converters
FOSTCDRI-PH-MC, FOSTCDRI-PH-MT, FOSTCDRI-PH-SC

SPECIFICATIONS

**SERIAL TECHNOLOGY**
- **Data Rate**: 9.6 to 115.2 kbps
- **Connector**: Removable terminal block
  - **RS-232**
  - **Signals**: TD, RD, GND
- **RS-422/485**
  - **Connector**: 5-position, removable terminal block
  - **RS-485, 2-wire**: Data A(−), Data B(+), GND
  - **RS-422/485, 4-wire**: TDA(−), TDB(+), RDA(−), RDB(+), GND
  - **Bias**: Built-in, switchable, 1.2KΩ
  - **Termination**: Built-in, switchable, 120Ω

**ISOLATION**
- **Rating**: 2KV RMS, 1 minute
- **Surge Protection**: 600 W peak power dissipation
- **Clamping Time**: < 1 pico-second
- **Lines Protected**: 2-way (input, output lines)
- **Method**: Optical

**Fiber Optic Technology**
- **Type / Wavelength**: Multi-mode / 820 nm
- **Output Power**: -16dBm min, -12dBm typical, -9dBm maximum
- **Receive Sensitivity**: -24dBm min, -25.4dBm maximum
- **Cable**: 62.5/125 micro-meter
- **Connector**: ST
- **Data Rate**: 9.6 to 115.2 kbps
- **Maximum Distance**: 4 km (2.5 mi)
- **Idle State, FOSTCDRI**: Transmitter light ON
- **Idle State, FOSTCDRI-INV**: Transmitter light OFF

**INDUSTRIAL BUS**
- **Modbus**: ASCII/RTU

**POWER**
- **Source**: External
- **Input Voltage**: 10 to 48 VDC (56 VDC maximum)
- **Consumption**: 0.5 W (typical), 1.3W (with termination)
- **Connector**: 2-position, removable terminal block, 24 to 14 AWG

**TERMINAL BLOCKS**
- **Wire Size Accepted**: 28 to 12 AWG
- **Pitch**: 5.08 mm
- **Insulation Resistance**: ≥ 500 MO @ 500 VDC
- **Maximum Torque**: 5 Kg / cm

**LED INDICATORS**
- **Power**: Red LED
- **FO Receive**: Red LED
- **FO Transmit**: Red LED

**MECHANICAL**
- **Dimensions**: 12.3 x 11.3 x 3.2 cm (4.9 x 4.5 x 1.3 in)
- **Enclosure**: IP 20 plastic, 35 mm DIN mount
- **Weight**: 199.6 g (0.44 lbs)

**ENVIRONMENTAL**
- **Operating Temperature**: -40 to +80 °C (-40 to +176 °F)
- **Storage Temperature**: -40 to +85 °C (-40 to +185 °F)
- **Operating Humidity**: 0 to 95% non-condensing
- **MTBF**: 138904 hours
- **MTBF Calculation Method**: Parts Count Reliability Prediction

**APPROVALS / CERTIFICATIONS - FOSTCDRI**
- **UL Class 1 Division 2, Groups A, B, C, D**
- **File Number**: E222870 (HAZLOC E245458)
- **EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments**
- **EN 61000-4-2: 2009 Electro-Static Discharge (ESD)**
- **EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)**
- **EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)**
- **EN 61000-4-6: 2009 Conducted Immunity**
- **Download complete Declaration of Conformity at www.bb.elec.com**

**APPROVALS / CERTIFICATIONS - FOSTCDRI-INV**
- **UL 508, File Number**: E222870
- **CE**

**MECHANICAL DIAGRAM**

[Diagram showing mechanical specifications]
B&B Electronics’ ILinx™ fiber converters designed with functionality required for heavier industrial environments. Model FOSTCDRI-Sx industrial-grade isolated converter changes RS-232, RS-422, or RS-485 to single-mode fiber optics.

Designed for industry, FOSTCDRI-Sx extends serial data ranges up to 15 km (9 mi) and provides the most versatile connection possible between asynchronous full or half-duplex serial equipment. In addition to direct point-to-point connectivity, it is capable operating in a multi-drop mode. This allows one serial device to communicate with up to 31 others around a fiber optic ring. Since it supports mixed serial standards, it can replace other converters and isolators and add the EMI/RFI immunity inherent to fiber optic communications. Fiber optic connectors are SC or ST.

B&B Electronics’ Automatic Send Data Control circuit controls the RS-422/485 driver chip, eliminating the requirement for special software. Easy to install and configure, it has a 12-position DIP switch to set up the RS-422/485 parameters and removable terminal blocks to connect serial signals and power. In RS-232 mode, the FOSTCDRI-SC supports Transmit Data and Receive Data. Handshaking signals are not passed through.

**Fiber Optic Benefits**

Fiber optic cable carries serial data up to 15 kilometers (9 miles), much farther and reliably than conventional copper lines.

Power surges, spikes and ground loops are created by electrical equipment, by nearby lightning strikes, and from other sources. They are easily picked up by copper data lines and transmitted to connected devices, garbling data communications and damaging equipment.

However, fiber optic data transmission uses light in glass fiber cable as a communication medium. Being inherently non-electric, fiber optic cable will not pick up noise and provides the most reliable system possible — ideal for spanning areas with severe interference, such as near heavy electrical equipment, welding or radio transmissions. It does not transmit power spikes or surges and prevents ground loops by not providing a conductive path for the ground.

**PRODUCT FEATURES**

- Data rates up to 115.2 kbps
- 15 km (9 mi) range
- 10 to 48 VDC power input
- Wide operating temperature
- 2000V isolation
- Modbus ASCII/RTU compatible
- EMI/RFI protection

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>SERIAL CONNECTOR</th>
<th>FIBER CONNECTOR</th>
<th>MODBUS?</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOSTCDRI-SC</td>
<td>Terminal Blocks, removable</td>
<td>Single-mode SC</td>
<td>✔</td>
</tr>
<tr>
<td>FOSTCDRI-ST</td>
<td>Terminal Blocks, removable</td>
<td>Single-mode ST</td>
<td>✔</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

- MDR-20-24 - 24 VDC @ 1.0 A DIN rail mount power supply, slim-line
- TBKT1 - Replacement Terminal Block, 2-position, 5.08mm
- TBKT2 - Replacement Terminal Block, 5-position, 5.08mm

**MECHANICAL DIAGRAM - FOSTCDRI-SC**
Serial/Single-mode Fiber Converter

**FOSCDRI-ST, FOSCDRI-SC**

**SPECIFICATIONS**

**SERIAL TECHNOLOGY**
- **Data Rate**: 9.6 to 115.2 kbps
- **Connector**: Removable Terminal Block (12 to 28 AWG)
- **Signals**: TD, RD, GND

**RS-232**
- **Connector**: Removable Terminal Block (12 to 28 AWG)
- **Signals**: Data A(-), Data B(+), GND

**RS-422/485**
- **Connector**: Removable Terminal Block (12 to 28 AWG)
- **Signals**: TDA(-), TDB(+), RDA(-), RDB(+), GND

**ISOLATION**
- **Isolation**: 2KV RMS, 1 minute
- **Surge Protection**: 600 W peak power dissipation
- **Clamping Time**: < 1 pico-second

**FIBER OPTIC TECHNOLOGY**

**Connector**: ST
- **Type / Wavelength**: Single-mode / 1310 nm
- **Output Power**: (-) 15 to (-) 8 dBm
- **Receive Sensitivity**: Less than or equal to (-) 32 dBm
- **Cable**: 9/125 micro-meter
- **Data Rate**: 9.6 to 115.2 kbps
- **Maximum Distance**: 15 km (9 mi)

**POWER**
- **Source**: External
- **Input Voltage**: 10 to 48 VDC (Class 2)
- **Power Consumption**: 1.4 Watts
- **Connector**: Removable terminal block (12 to 28 AWG)

**INDUSTRIAL BUS**
- **Modbus**: ASCII/RTU

**MECHANICAL**
- **LED Indicators**: FO Receive, FO Transmit, Power
- **Dimensions**: 12.8 x 9.7 x 2.8 cm (5.0 x 3.8 x 1.1 in)
- **Enclosure**: 35mm DIN Mount, Plastic, IP30
- **Weight**: 149.7 g (0.3 lbs)

**ENVIRONMENTAL**
- **Operating Temperature**: -40 to +80 °C (-40 to +176 °F)
- **Storage Temperature**: -40 to +85 °C (-40 to +185 °F)
- **Operating Humidity**: 0 to 95% non-condensing
- **MTBF**: 88423 hours
- **MTBF Calculation Method**: Parts Count Reliability Prediction

**APPROVALS / CERTIFICATIONS - FOSCDRI-SC**
- **UL 508, File Number**: E222870
- **CE**
  - EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
  - EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
  - EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
  - EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
  - EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at www.bb.elec.com

**FIBER OPTIC CABLES**

**MULTI-MODE DUPLEX FIBER**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>CONNECTOR TYPE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DFMM-LCLC-XX</strong></td>
<td>LC TO LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>DFMM-SCLC-XX</strong></td>
<td>SC TO LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>DFMM-SCSC-XX</strong></td>
<td>SC TO SC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>DFMM-STLC-XX</strong></td>
<td>ST TO LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>DFMM-STSC-XX</strong></td>
<td>ST TO SC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>DFMM-STST-XX</strong></td>
<td>ST TO ST</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
</tbody>
</table>

**SINGLE-MODE DUPLEX FIBER**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>CONNECTOR TYPE</th>
<th>LENGTH</th>
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<tbody>
<tr>
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<tr>
<td><strong>DFS-SCLC-XX</strong></td>
<td>SC TO LC</td>
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</tr>
<tr>
<td><strong>DFS-SCSC-XX</strong></td>
<td>SC TO SC</td>
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<tr>
<td><strong>DFS-STLC-XX</strong></td>
<td>ST TO LC</td>
<td>✔ ✔ ✔ ✔</td>
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<tr>
<td><strong>DFS-STSC-XX</strong></td>
<td>ST TO SC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td><strong>DFS-STST-XX</strong></td>
<td>ST TO ST</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
</tbody>
</table>

**Note**: Model Number change the xx to its fiber length number for the actual Model Number. Example: If you want a 1M Multi-Mode LC to LC Fiber the part number would be DFMM-LCLC-1M.
Fiber Optic Modem
9PFLST, 232FLST

These port-powered fiber optic modem allows two RS-232 serial devices to communicate transparently over longer distances and with greater reliability. The inherent immunity of fiber optic protects data from line surges, spikes and ground loops.

They transmit RS-232 data, full or half duplex, over two fibers at distances up to 4 km (2.5 mi) and data rates up to 115.2 kbps. They have a DCE female serial connector and multi-mode ST fiber connectors. TD, RD, and RTS/CTS handshake lines are supported.

The modem is powered from the RS-232 data and handshake lines. A power jack is provided for connecting an optional +12 VDC supply (not included) for use with low powered ports such as laptops and PCs.

**PRODUCT FEATURES**
- Transparent asynchronous RS-232 at 115.2 Kbps
- Full or half-duplex
- Range up to 4 km (2.5 mi)
- TD, RD, RTS and CTS supported
- EMI/RFI transient immunity to surges, spikes, ground loops
- Port powered, no external power required

**ACCESSORIES**
- 232PS - 12VDC@1000ma, Wall Transformer Power Supply, 2.5 mm male plug
- E1250BL-BB3 - 230 VAC to 12 VDC Wall Transformer Power Supply, 2.5 mm male plug
- 9PAMF6 - RS-232 serial cable DB9 Male To DB9 Female, 6 ft. (1.8 m)
- 232AMF5 - RS-232 serial cable DB25 Male To DB25 Female, 6 ft. (1.8 m)
- DFMM-STST-3M - Multi-Mode Duplex Fiber Cable, ST To ST, 9.8 ft. (3 m)

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>SERIAL CONNECTOR</th>
<th>FIBER CONNECTOR</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9PFLST</td>
<td>DB9 Female</td>
<td>Multi-mode ST</td>
<td>RS-232</td>
</tr>
<tr>
<td>232FLST</td>
<td>DB25 Female</td>
<td>Multi-mode ST</td>
<td>RS-232</td>
</tr>
</tbody>
</table>

Note: Must be used in pairs

**Fiber Optic Benefits**

Fiber optic cable carries serial data up to 4 kilometers (2.5 miles), much farther and reliably than conventional copper lines.

Power surges, spikes and ground loops are created by electrical equipment, by nearby lightning strikes, and from other sources. They are easily picked up by copper data lines and transmitted to connected devices, garbling data communications and damaging equipment.

However, fiber optic data transmission uses light in glass fiber cable as a communication medium. Being inherently non-electric, fiber optic cable will not pick up noise and provides the most reliable system possible – ideal for spanning areas with severe interference, such as near heavy electrical equipment, welding or radio transmissions. It does not transmit power spikes or surges and prevents ground loops by not providing a conductive path for the ground.
Fiber Optic Modem
9PFLST, 232FLST

SPECIFICATIONS

SERIAL TECHNOLOGY
Data Rate 115.2 kbps maximum
Connector DB9 female
Signals TD, RD, RTS, CTS, GND

FIBER OPTIC TECHNOLOGY
Connector Multi-mode ST
Typical Range Up to 4 km (2.5 mi) on multi-mode glass fiber
Transmission Line Dual multi-mode optical cable
Transmission Mode Asynchronous, half or full-duplex, point-to-point

POWER
Source Port-powered from serial port TD, RTS, and DTR lines
Optional External 10–16 VDC @ .5 Watt max
Optic Wavelength 820 nm

MECHANICAL
9PFLST Dimensions 10.9 x 4.3 x 2.4 cm (1.3 x 1.7 x 1.0 in)
232FLST Dimensions 10.9 x 5.8 x 2.4 cm (4.3 x 2.3 x 1.0 in)
Enclosure Plastic, inline
MTBF 404846
MTBF Calc. Method Parts Count Reliability Prediction

ENVIRONMENTAL
Operating Temperature 0 to +70 °C (+32 to +158 °F)
Storage Temperature -40 to +85 °C (-40 to +185 °F)

APPROVALS / CERTIFICATIONS - 9PFLST
CE
EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
EN 61000-6-4: 2009 Electro-Static Discharge (ESD)
EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
EN 61000-4-6: 2009 Conducted Immunity
Download complete Declaration of Conformity at www.bb.elec.com

FIBER OPTIC CABLES

MULTI-MODE DUPLEX FIBER

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>CONNECTOR TYPE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFMM-LCLC-xx</td>
<td>LC TO LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFMM-SCLC-xx</td>
<td>SC TO LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFMM-SCSC-xx</td>
<td>SC TO SC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFMM-STLC-xx</td>
<td>ST TO LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFMM-STSC-xx</td>
<td>ST TO SC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFMM-STST-xx</td>
<td>ST TO ST</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
</tbody>
</table>

Note: Model Number change the xx to its fiber length number for the actual Model Number.
Example: If you want a 1M Multi-Mode LC to LC Fiber the part number would be DFMM-LCLC-1M.

SINGLE-MODE DUPLEX FIBER

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>CONNECTOR TYPE</th>
<th>LENGTH</th>
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<tbody>
<tr>
<td>DFSM-LCLC-xx</td>
<td>LC to LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFSM-SCLC-xx</td>
<td>SC to LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFSM-SCSC-xx</td>
<td>SC to SC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFSM-STLC-xx</td>
<td>ST to LC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFSM-STSC-xx</td>
<td>ST to SC</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>DFSM-STST-xx</td>
<td>ST to ST</td>
<td>✔ ✔ ✔ ✔ ✔ ✔ ✔</td>
</tr>
</tbody>
</table>

Fiber Optic Modem
WWW.BB-ELEC.COM 427
Port Powered RS-232/485 Converters
485SD9R, 485SD9RJ, 485SD9TB

These port-powered, two channel converters allow your computer to communicate longer distances by converting TD and RD RS-232 lines to RS-485 signals. RS-485 also provides multi-drop capability.

All converters feature Automatic Send Data Control which enables the driver when data is present on the RS-232 side. Control of the driver is automatic at speeds up to 115.2 kbps.

Converters are powered by the RS-232 port DTR and RTS handshake lines, or by an optional external 12 VDC power supply. When port powered, at least one of these handshake lines must be asserted (high) to power the unit. By raising RTS, the RS-485 driver is enabled and the RS-485 receiver is disabled. By lowering RTS, the RS-485 driver is disabled and the RS-485 receiver is enabled.

These converters are suitable for field service, where a power supply would add clutter, or anywhere you need compact, easy-to-use, economically priced serial conversion.

PRODUCT FEATURES
- Extend RS-232 data signals up to 1.2 km (4,000 ft.)
- Change RS-232 TD and RD to RS-485 signals
- Automatic Send Data Control - no software drivers necessary
- Baud rates up to 115.2 kbps
- Powered from RS-232 handshake lines - no power supply required

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 CONNECTOR</th>
<th>RS-485 CONNECTOR</th>
<th>OUTPUT</th>
<th>OPTIONAL POWER SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>485SD9R</td>
<td>DB9 Female</td>
<td>DB9 Female</td>
<td>RS-485 2-wire</td>
<td></td>
</tr>
<tr>
<td>485SD9RJ</td>
<td>DB9 Female</td>
<td>RJ11</td>
<td>RS-485 2-wire</td>
<td></td>
</tr>
<tr>
<td>485SD9TB</td>
<td>DB9 Female</td>
<td>Terminal Block</td>
<td>RS-485 2-wire ✔</td>
<td></td>
</tr>
</tbody>
</table>

ACCESSORIES
- 485PS2 - 120 VAC to 12 VDC power supply, 100 mA, tinned leads, USA
- PS1EU-1000 - 220-240 VAC to 12 VDC power supply, 1A, tinned leads, Euro CEE7/7 plug
- PS1UK-1000 - 220-240 VAC to 12 VDC power supply, 1A, tinned leads, UK BS-1353 plug
- 9PAMF6 - DB9 male to DB9 female adapter cable, 6 ft. (1.8 m)

Why use an “optional” power supply with a port-powered converter?

Simply put, all RS-232 ports are not created equal. Many laptop PC’s, for example, deliberately reduce power to the RS-232 port to save the battery. And, if you are working at the distance limits of RS-422 or 485, you might need an extra boost. For the majority of applications though, the converter’s port powering is sufficient to accomplish the task.

Automatic Send Data Control Explained

As operating systems become more complex, it is increasingly difficult to control an RS-485 driver with standard software and the RTS line. This is especially true in Windows and multi-tasking operating systems. With B&B Electronics’ Automatic Send Data Control circuit, driver control is in the converter hardware, so you do not have to work with software at all.

The circuit monitors data flow and enables the driver during transmission and automatically disables it when no data is being sent. There is no need to rework software or install new drivers. Most B&B Electronics RS-232 to RS-485 converters and RS-485 serial cards include Automatic Send Data Control.
Port Powered RS-232/485 Converters
485SD9R, 485SD9RJ, 485SD9TB

SPECIFICATIONS

SERIAL TECHNOLOGY
Data Rate 115.2 kbps maximum

RS-232
Connector
485SD9R: DB9 female
485SD9RJ: DB9 female
485SD9TB: DB9 female

RS-485
485SD9R: DB9 female
485SD9RJ: RJ11
485SD9TB: Terminal block

Biasing Resistors 4.7k Ohms

POWER
Source Port-powering: from RS-232 handshake lines. External 12-16 VDC power supply, optional.
Power Connector 485SD9TB only (terminal block)
Input Voltage 485SD9TB only (12VDC)
Power Consumption 40mA max

MECHANICAL
Dimensions
485SD9R: 7.8 x 4.3 x 2.0 cm (3.0 x 1.6 x 0.8 in)
485SD9RJ: 2.3 x 3.3 x 2.9 cm (0.9 x 1.3 x 0.9 in)
485SD9TB: 8.9 x 3.4 x 1.7 cm (3.50 x 1.34 x 0.67 in)
Enclosure plastic
Weight .18 lbs (81.6 g)
MTBF
485SD9R: 986473
485SD9RJ: 897656
485SD9TB: 968410
MTBF Calc. Method Parts Count Reliability Prediction

ENVIRONMENTAL
Operating Temperature 0 to +70 °C (+32 to +158 °F)
Storage Temperature -40 to +85 °C (-40 to +185 °F)
Operating Humidity 0 to 95% non condensing

APPROVALS / CERTIFICATIONS - 485SD9R, 485SD9RJ, 485SD9TB
CE
EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at www.bb.elec.com
The 4WSD9TB and 4WSD9R Universal Converter provides RS-232 to RS-422/RS-485 conversion using either port-power or an external power supply. The 4WSD9TB has a Terminal Block RS-485 connector, and the 4WSD9R has a DB9 Female connector.

Data is converted in both directions, RS-232 Transmit data is converted to balance RS-422 or RS-485 Transmit, and Received RS-422/485 signals are converted to RS-232. Unlike converters which require programming hardware handshaking signals to control RS-485 or RS-422 operation, the 4WSD9TB and 4WSD9R provides automatic Send Data Control. In RS-485 mode, the RS-485 driver is enabled by circuitry which senses the RS-232 TD input. In half duplex RS-485 mode, the receiver is enabled when not transmitting. For full duplex operation, the receiver is set always enabled. In RS-422 mode, the transmitter and receiver are always enabled. The operating mode is set with 4 switches (Table 1). The converters are powered by the RS-232 signal lines whether they are set high or low. If not enough power is available from the port, or no handshaking lines are available, a DC Jack is provided to connect a 12VDC supply. The DB9 female connector for RS-232 is wired as DCE (like a modem).

No external power is required if two RS-232 output handshake lines are available and the cable run is short. If the handshake lines are raised and no termination is used, the power efficiency is greatly increased. Less than 3mA is required to operate the 4WSD9R plus the load current. For applications that do not have handshake lines or require a large load current, power may be externally supplied with a +12VDC power supply with a 2.5mm plug (tip positive).

The RS-232 port has a female DB9 connector with pins 2 (RD), 3 (TD), and 5 (Signal Ground) supported. Pins 7 (RTS) and 8 (CTS) are tied together, and pins 6 (DSR), 1 (DCD), and 4 (DTR) are also tied together. Any incoming data lines in either the high or low state are used to port power the 4WSD9R. The more handshake lines available, the more likely the unit can be port powered. Table 2 shows the RS-232 pinout.

Although handshake lines can be used to power the converter, no handshaking is required to control the RS-422/RS-485 driver. With switch 1 set to RS-422, the driver is always enabled. When switch 1 is in the RS-485 position, the RS-485 driver is automatically enabled during each spacing state on the RS-232 side. During the marking or idle state, the RS-485 driver is disabled and the data lines are held in the marking state by the 4.7K Ohm pull-up and pull-down resistors. The value of these resistors may need to be changed to a different value when termination is used in order to maintain the proper DC bias during the idle state.
**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RS-232</strong></td>
<td></td>
</tr>
<tr>
<td>Data Rate</td>
<td>115.2 kbps maximum</td>
</tr>
<tr>
<td>Connector</td>
<td>4WSD9R: DB9 female, 4WSD9TB: DB9 female</td>
</tr>
<tr>
<td>Signals Port Power</td>
<td>RD, TD, GND, DCD, DTR, DSR, RTS, CTS</td>
</tr>
<tr>
<td><strong>Signals</strong></td>
<td>Pins 7 (RTS) and 8 (CTS) are tied together, and pins 6 (DSR), 1 (CD), and 4 (DTR) are also tied together.</td>
</tr>
<tr>
<td><strong>RS-422/485</strong></td>
<td></td>
</tr>
<tr>
<td>Connector</td>
<td>4WSD9R: DB9 female, 4WSD9TB: Terminal block</td>
</tr>
<tr>
<td>Biasing Resistors</td>
<td>4.7k Ohms</td>
</tr>
<tr>
<td>Signals Termination</td>
<td>TDA (-), TDB (+), RDA (-), RDB (+), GND</td>
</tr>
<tr>
<td>Operation</td>
<td>Dipswitch selectable RS-422 or RS-485</td>
</tr>
<tr>
<td><strong>POWER</strong></td>
<td></td>
</tr>
<tr>
<td>Source</td>
<td>Port-powered: from RS-232 handshake lines. External 12-16 VDC power supply, optional.</td>
</tr>
<tr>
<td>Power Connector</td>
<td>2.5 mm plug (tip positive)</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>12 VDC @ 100 mA</td>
</tr>
</tbody>
</table>

**MECHANICAL**

| Dimensions | 4WSD9R: 7.8 x 4.3 x 2.0 cm (3.0 x 1.6 x 0.8 in), 4WSD9TB: 9.0 x 4.3 x 2.3 cm (3.6 x 1.7 x 0.9 in) |
| Enclosure | Plastic, Inline |
| Weight | 4WSD9R: 0.10 lbs. (49 g); 4WSD9TB: 0.11 lbs. (50 g) |
| MTBF | 4WSD9R: 880179, 4WSD9TB: 345242 |
| MTBF Calc. Method | Parts Count Reliability Prediction |

**ENVIRONMENTAL**

| Operating Temperature | 0 to +70 °C (+32 to +158 °F) |
| Storage Temperature | -40 to +85 °C (-40 to +185 °F) |
| Operating Humidity | 0 - 95% Non-condensing |

**APPROVALS / CERTIFICATIONS - 4WSD9R, 4WSD9TB**

- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
  - EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
  - EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
  - EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
  - EN 61000-4-6: 2009 Conducted Immunity
- Download complete Declaration of Conformity at www.bb.elec.com
Battery Powered Serial Converter

485BAT3

Three Versatile Powering Options
Model 485BAT3 features power versatility, making it perfect for field testing solutions. It can be powered in three ways: batteries, port powered, or external power supply.

Use the battery power option with a low power RS-232 port (found on many laptops) or no handshake lines or when it is inconvenient to use a power supply. The 485BAT3 will draw as much power as possible from the RS-232 port and get any additional current necessary from the batteries.

If you have a full power port and all your handshake lines, turn off the battery switch. This allows you to run full port powering and saves the batteries for emergencies. Note: The battery On-Off switch conserves battery life. It does not turn on and off all power to the unit.

Lastly, a stripped and tinned +12VDC external power supply may be used. Simply attach it to the terminal blocks and plug it in.

485BAT3 converts unbalanced RS-232 signals to balanced RS-422 or RS-485 signals. RS-485 is an enhanced version of the RS-422 standard, allowing multiple drivers and receivers on a 2-wire system.

PRODUCT FEATURES
- 3 Power Options: Battery (2-AAA), RS-232 handshake lines, or external power supply
- Extend RS-232 data signals up to 1.2 km (4,000 ft.)
- Change RS-232 TD and RD to RS-485 signals
- Automatic Send Data Control - no software drivers necessary
- Baud rates up to 115.2 kbps

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 CONNECTOR</th>
<th>RS-485 CONNECTOR</th>
<th>OUTPUT</th>
<th>OPTIONAL POWER SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>485BAT3</td>
<td>DB9 Female</td>
<td>Terminal Block</td>
<td>RS-485 2 or 4-wire or RS-422</td>
<td>(2) AAA batteries or port powered or external source</td>
</tr>
</tbody>
</table>

ACCESSORIES
- 485PS2 - 12 VDC (wired) power supply, 100 mA, USA
- PS1EU-1000 - 220-240 VAC to 12 VDC power supply, 1A, tinned leads, Euro CE/EE7/7 plug
- PS1UK-1000 - 220-240 VAC to 12 VDC wall power supply, jack, UK BS-1363 plug
- 9PAMF6 - DB9 male to DB9 female adapter cable, 1.8 m (6 ft.)
- 9PMTT - RS-232 mini tester

Why use an “optional” power supply with a port-powered converter?
Simply put, all RS-232 ports are not created equal. Many laptop PC’s, for example, deliberately reduce power to the RS-232 port to save the battery. And, if you are working at the distance limits of RS-422 or 485, you might need an extra boost. For the majority of applications though, the converter’s port powering is sufficient to accomplish the task.

Automatic Send Data Control Explained
As operating systems become more complex, it is increasingly difficult to control an RS-485 driver with standard software and the RTS line. This is especially true in Windows and multi-tasking operating systems. With B&B Electronics’ Automatic Send Data Control circuit, driver control is in the converter hardware, so you do not have to work with software at all.

The circuit monitors data flow and enables the driver during transmission and automatically disables it when no data is being sent. There is no need to rework software or install new drivers. Most B&B Electronics RS-232 to RS-485 converters and RS-485 serial cards include Automatic Send Data Control.
### SPECIFICATIONS

#### SERIAL TECHNOLOGY

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Rate RS-232</strong></td>
<td>115.2 kbps maximum</td>
</tr>
<tr>
<td><strong>Connector RS-232</strong></td>
<td>DB9 Female (DCE)</td>
</tr>
<tr>
<td><strong>Signals Port Power</strong></td>
<td>DCD, DTR, DSR, RTS, CTS. Pins 7 (RTS) and 8 (CTS) are tied together, and pins 6 (DSR), 1 (CD), and 4 (DTR) are also tied together.</td>
</tr>
<tr>
<td><strong>RS-422/485</strong></td>
<td>Connector Terminal Block</td>
</tr>
<tr>
<td><strong>Signals Port Power</strong></td>
<td>TDA (-), TDB (+), RDA (-), RDB (+), GND</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Dipswitch selectable RS-422 or RS-485</td>
</tr>
<tr>
<td><strong>Biasing Resistors</strong></td>
<td>4.7k Ohms</td>
</tr>
<tr>
<td><strong>Termination</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

#### MECHANICAL

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions</strong></td>
<td>9.0 x 6.5 x 2.8 cm (3.6 x 2.6 x 1.1 in)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>0.23 lbs. (104.3 g)</td>
</tr>
<tr>
<td><strong>MTBF</strong></td>
<td>241370</td>
</tr>
<tr>
<td><strong>MTBF Calc. Method</strong></td>
<td>Parts Count Reliability Prediction</td>
</tr>
</tbody>
</table>

#### ENVIRONMENTAL

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>0 to +70 °C (+32 to +158 °F)</td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-40 to +85 °C (-40 to +185 °F)</td>
</tr>
<tr>
<td><strong>Operating Humidity</strong></td>
<td>95% Non-Condensing</td>
</tr>
</tbody>
</table>

#### APPROVALS / CERTIFICATIONS - 485BAT3

- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
- EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
- EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at [www.bb.elec.com](http://www.bb.elec.com)
These port-powered, two-channel converters change TD and RD RS-232 lines to balanced RS-422 signals extending communication distances up to 1.2 km (4,000 ft.). Automatic Send Data Control feature enables the RS-422 driver when data is present on the RS-232 side. Control of the driver is automatic at rates up to 115.2 kbps. The RS-422 driver and receiver are always enabled.

With port-powering, no power supply is required. Power is derived from the DTR and RTS RS-232 handshake control lines. If port-powering the unit, at least one handshake line must be present, in either the positive or negative voltage state. This permits use in applications without worrying about software control of the handshake lines. Can also be powered externally.

Converters are configured to transmit both directions in an RS-232 and RS-422 system. RS-232 pinout connects directly to a computer’s COM port or any other DTE device. Connections to the RS-422 side are made through the terminal blocks.

These converters are suitable for field service, where a power supply would add clutter, or anywhere you need compact, easy-to-use, economically priced serial conversion.

PRODUCT FEATURES
- Extend RS-232 data signals up to 1.2 km (4,000 ft.)
- Change RS-232 TD and RD to balanced RS-422 signals
- Automatic Send Data Control - no software drivers necessary
- Baud rates up to 115.2 kbps
- Powered from RS-232 handshake lines - no power supply required

ACCESSORIES
422PS2 - 12 VDC (wired) power supply, 100 mA, USA
PS1EU-1000 - 220-240 VAC to 12 VDC power supply, 1A, tinned leads, Euro CEE7/7 plug
PS1UK-1000 - 220-240 VAC to 12 VDC wall power supply, jack, UK BS-1363 plug
9PAMF6 - DB9 male to DB9 female adapter cable, 1.8 m (6 ft.)

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 CONNECTOR</th>
<th>RS-422 CONNECTOR</th>
<th>OUTPUT</th>
<th>OPTIONAL POWER SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>422PP9R</td>
<td>DB9 Female</td>
<td>DB9 Female</td>
<td>RS-422</td>
<td></td>
</tr>
<tr>
<td>422PP9TB</td>
<td>DB9 Female</td>
<td>Terminal Block</td>
<td>RS-422</td>
<td>✓</td>
</tr>
</tbody>
</table>

Why use an “optional” power supply with a port-powered converter?
Simply put, all RS-232 ports are not created equal. Many laptop PC’s, for example, deliberately reduce power to the RS-232 port to save the battery. And, if you are working at the distance limits of RS-422 or 485, you might need an extra boost. For the majority of applications though, the converter’s port powering is sufficient to accomplish the task.

Automatic Send Data Control Explained
As operating systems become more complex, it is increasingly difficult to control an RS-485 driver with standard software and the RTS line. This is especially true in Windows and multi-tasking operating systems. With B&B Electronics’ Automatic Send Data Control circuit, driver control is in the converter hardware, so you do not have to work with software at all.

The circuit monitors data flow and enables the driver during transmission and automatically disables it when no data is being sent. There is no need to rework software or install new drivers. Most B&B Electronics RS-232 to RS-485 converters and RS-485 serial cards include Automatic Send Data Control.
Port Powered RS-232/422 Converters
422PP9R, 422PP9TB

SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>115.2 kbps maximum</td>
</tr>
<tr>
<td><strong>RS-232</strong></td>
<td></td>
</tr>
<tr>
<td>Connector</td>
<td>422PP9R: DB9 female</td>
</tr>
<tr>
<td>Signals</td>
<td>422PP9TB: DB9 female</td>
</tr>
<tr>
<td><strong>RS-422</strong></td>
<td></td>
</tr>
<tr>
<td>Connector</td>
<td>422PP9R: DB9 female</td>
</tr>
<tr>
<td>Signals</td>
<td>422PP9TB: Terminal block</td>
</tr>
<tr>
<td>Operation</td>
<td>RS-422, 4-wire</td>
</tr>
<tr>
<td>Biasing Resistors</td>
<td>4.7k Ohms</td>
</tr>
<tr>
<td>Termination</td>
<td>None</td>
</tr>
</tbody>
</table>

| POWER                       |               |
| Source                      | Port-powered from RS-232 handshake lines. (422PP9TB Only) Optional, external 12-16 VDC power supply. |
| Power Connector             | Terminal Block |
| Input Voltage               | 12 VDC @ 100 mA |

MECHANICAL

| Dimensions                  | 422PP9R: 6.1 x 3.3 x 1.7 cm (2.4 x 1.3 x 0.66 in) |
|                            | 422PP9TB: 8.9 x 3.3 x 1.7 cm (3.5 x 1.3 x 0.7 in) |
| Enclosure                   | Plastic, In-line |
| Weight                      | 0.10 lbs (45.3 g) |
| MTBF                        | 422PP9R: 2094328 |
|                            | 422PP9TB: 849670 |
| MTBF Calc. Method           | Parts Count Reliability Prediction |

ENVIROMENTAL

| Operating Temperature       | 0 to +70 °C (+32 to +158 °F) |
| Storage Temperature         | -40 to +85 °C (-40 to +185 °F) |
| Operating Humidity          | 0-95% Non-Condensing |

APPROVALS / CERTIFICATIONS - 422PP9R, 422PP9TB
CE
EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
EN 61000-4-6: 2009 Conducted Immunity

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MECHANICAL DIAGRAM - 422PP9R

MECHANICAL DIAGRAM - 422PP9TB
Port Powered TTL/RS-232 Converters
232LPTTL, 232LPTTL33

These non-isolated, four channel TTL/CMOS converters make easy
connections between TTL equipment and RS-232 ports and run at a
maximum baud rate speed of 115.2 kbps. All models convert two channels
(TX and RX) in each direction (bi-directional) from TTL to RS-232. Use
these converters with almost any micro controller or programmable logic
controller that supports TTL.

Model 232LPTTL converts RS-232 to 5VDC TTL/CMOS competitive levels.
Model 232LPTTL33 converts RS-232 to 3.3VDC TTL/CMOS compatible
levels. Two channels are used to convert from RS-232 to TTL/CMOS signals
and two channels are used to convert from TTL/CMOS signals to RS-232.
These converters support TD, RD, RTS, and CTS. DB9S female connector on
the RS-232 side. DB9P male connector on the TTL/CMOS side. This unit is
powered from the
RS-232 data and handshake lines, whether the lines are high or low.

Pins used are:

<table>
<thead>
<tr>
<th>RS-232 DB9S Female Pin</th>
<th>Function</th>
<th>TTL/CMOS DB9P Male Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (input)</td>
<td>TD</td>
<td>3 (output)</td>
</tr>
<tr>
<td>2 (output)</td>
<td>RD</td>
<td>2 (input)</td>
</tr>
<tr>
<td>7 (input)</td>
<td>RTS</td>
<td>7 (output)</td>
</tr>
<tr>
<td>8 (output)</td>
<td>CTS</td>
<td>8 (input)</td>
</tr>
<tr>
<td>5 (signal gnd)</td>
<td>GND</td>
<td>5 (signal gnd)</td>
</tr>
</tbody>
</table>

Pin 5 is signal ground for both connectors. Both models are powered by the
signals on pins 7(RTS), 4 (DTR), and 3(TD). These handshake lines can be in
either the high or low condition, but must be present to power the converter.
The unit can work at baud rates up to 115.2 kbps.

It is important that TTL/CMOS logic, and only TTL/CMOS logic (0 to +5 VDC
for the 232LPTTL, and 0 to +3.3 VDC for the 232LPTTL33) is used for the
TTL/CMOS side of the converter. The maximum sinking current for one TTL/
CMOS output is 3.2 mA. The maximum source current for one TTL/CMOS is
1 mA. Signal levels are inverted by the converters. Please refer to the table
under Specifications.

PRODUCT FEATURES
- Convert 2 channels in each direction from TTL ("Transistor Transistor
  Logic") to RS-232
- Automatic Send Data Control - no software drivers necessary
- 5V and 3.3V TTL options
- Baud rates up to 115.2 kbps
- Powered from RS-232 data/handshake lines - no power supply required

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 CONNECTOR</th>
<th>TTL CONNECTOR</th>
<th>TTL VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>232LPTTL</td>
<td>DB9 Female</td>
<td>DB9 Male</td>
<td>5V</td>
</tr>
<tr>
<td>232LPTTL33</td>
<td>DB9 Female</td>
<td>DB9 Male</td>
<td>3.3V</td>
</tr>
</tbody>
</table>

ACCESSORIES

9PAMF6 - DB9 Male to DB9 Female, 1.8 m (6 ft.)
MMNM9 - Null Modem Adapter - DB9 Male / DB9 Male

Automatic Send Data Control Explained
As operating systems become more complex, it is increasingly difficult to
control an RS-485 driver with standard software and the RTS line. This is
especially true in Windows and multi-tasking operating systems. With B&B
Electronics’ Automatic Send Data Control circuit, driver control is in the
converter hardware, so you do not have to work with software at all.
The circuit monitors data flow and enables the driver during transmission
and automatically disables it when no data is being sent. There is no need to
rework software or install new drivers. Most B&B Electronics RS-232 to RS-
485 converters and RS-485 serial cards include Automatic Send Data Control.
Port Powered TTL/RS-232 Converters
232LPTTL, 232LPTTL33

SPECIFICATIONS

SERIAL TECHNOLOGY

Data Rate 115.2 kbps maximum
RS-232

Connector DB9 female
Signals TD, RD, RTS, CTS

TTL

Connector DB9 male
Signals 2 Input/2 Output Channels, GND
Logic CMOS
VDC Level 232LPTTL: 5V
232LPTTL33: 3.3V

POWER
Source Port-powered: from RS-232 handshake lines

MECHANICAL

Dimensions 5.29 x 3.33 x 1.74 cm (2.08 x 1.31 x 0.66 in)
Enclosure Plastic, In-line
Weight 0.08 lbs (36.2 g)
MTBF, 232LPTTL33 1674682
MTBF Calc. Method, 232LPTTL33 Parts Count Reliability Prediction

ENVIRONMENTAL

Operating Temperature 0 to +70 °C (+32 to +158 °F)
Storage Temperature -40 to +85 °C (-40 to +185 °F)
Operating Humidity 0 to 95% Non-Condensing

APPROVALS / CERTIFICATIONS - 232LPTTL

CE
EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
EN 61000-4-6: 2009 Conducted Immunity

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MECHANICAL DIAGRAM - 232LPTTL, 232LPTTL33

POLARITY

5VDC TTL/CMOS 3.3VDC TTL/CMOS RS-232 Output
Input Low (< .8V) Low (< .8V) +5V minimum, +9V typical
High (> 2V) High (> 2V) -5V minimum, -9V typical

5VDC TTL/CMOS 3.3VDC TTL/CMOS RS-232 Input
Output +3.45V minimum, +4.6V typical +2.4V minimum, +3.0V typical
+3.5V maximum, +1V typical +.55V maximum, .1V typical
Low (< .2V)
High (> 2.4V)
Models 232TTL and 232OTTL convert RS-232 signals to 0-5 VDC TTL levels. The 232OTTL provides 1500V optical isolation. Two channels are used to convert from RS-232 to TTL signals and two channels are used to convert from TTL signals to RS-232.

These converters support RD, TD, RTS, and CTS. The DB25P male connector (DCE) is for the RS-232 side. The DB25S female connector is for the TTL side. The 232TTL supports baud rates up to 115K baud, the 232OTTL supports up to 38.4K baud.

It is important that only TTL logic (0 to +5V) is used for the TTL side of the converter. The maximum sinking current for one TTL output is 8 mA. The maximum source current for one TTL is 0.8 mA. Signal levels are inverted by the converter in its standard configuration as shown in Table 1.

### Table 1: Standard inverted Outputs

<table>
<thead>
<tr>
<th>TTL Input</th>
<th>RS-232 Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>high (&gt;2.0V)</td>
<td>-5 V maximum, -9V typical</td>
</tr>
<tr>
<td>low (&lt;0.8V)</td>
<td>+5 V minimum, +9V typical</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TTL Output</th>
<th>RS-232 Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>high (&gt;2.0V)</td>
<td>-5 V maximum, -9V typical</td>
</tr>
<tr>
<td>low (&lt;0.8V)</td>
<td>+5 V minimum, +9V typical</td>
</tr>
</tbody>
</table>

The 232OTTL has the option for non-inverted outputs. See table 2, “Operations Requiring Modification” if non-inverted outputs are desired.

### Power

The 232TTL requires an external +12VDC power supply connected either through 2.5mm jack or pins 12(GND) and 25 (+12VDC) on the TTL side.

The 232OTTL requires both Port Power on the RS-232 side, and external +12VDC power supply connected either through 2.5mm jack or pins 12(GND) and 25 (+12VDC) on the TTL side.

Port power is derived from the outputs of the host RS-232 port. TD, RTS, and DTR lines may be used to port power the RS-232 side. A minimum of two of these lines in either high or low states is required for proper operation. To externally power the RS-232 side, connect the positive lead of the +12VDC power supply to pin 25 and the GND lead to pin 12 of the DB25 female connector.

### PRODUCT FEATURES

- Convert 2 channels in each direction from TTL to RS-232
- Baud rates up to 115.2 kbps (38.4 kbps on isolated model)
- Powered from RS-232 data/handshake lines - no power supply required
- Optically isolated version (Model 232OTTL)

### ACCESSORIES

- 232PS - 12VDC@100mA wall transformer power supply, 2.5mm plug
- E1250BL-BB3 - 220-240 VAC to 12 VDC wall power supply, 2.5mm plug
- Euro CEE7/7 plug
- 232CAMS - DB25 male to DB9 female adapter cable, 15.24 cm/6 in
- 232SGF - 25-pin gender reverser - changes male port to female

### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 CONNECTOR</th>
<th>TTL CONNECTOR</th>
<th>TTL VDC</th>
<th>ISOLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>232TTL</td>
<td>DB25 Male</td>
<td>DB25 Female</td>
<td>5V</td>
<td></td>
</tr>
<tr>
<td>232OTTL</td>
<td>DB25 Female</td>
<td>DB25 Male</td>
<td>5V</td>
<td>1500V</td>
</tr>
</tbody>
</table>

### OPTIONS REQUIRING MODIFICATION

The 232OTTL may be modified to non-inverted signals as shown in Table 2 by placing a jumper wire across JP1:A labeled “NI”

<table>
<thead>
<tr>
<th>TTL Input</th>
<th>RS-232 Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>high (&gt;2.0V)</td>
<td>-5 V maximum, -9V typical</td>
</tr>
<tr>
<td>low (&lt;0.8V)</td>
<td>+5 V minimum, +9V typical</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TTL Output</th>
<th>RS-232 Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>high (&gt;2.0V)</td>
<td>-5 V maximum, -9V typical</td>
</tr>
<tr>
<td>low (&lt;0.8V)</td>
<td>+5 V minimum, +9V typical</td>
</tr>
</tbody>
</table>

The 232OTTL may also be modified to accept a +5V supply on the TTL side. Remove the 0 ohm surface mount resister labeled R13 and place a jumper wire across JP1:B labeled +5V. A +4.75 to +5.25V at a maximum of 25mA is necessary to power the TTL side of the converter when this modification is made.
Port Powered TTL/RS-232 Converters
232TTL, 2320TTL

SPECIFICATIONS

SERIAL TECHNOLOGY
Data Rate
- 232TTL: 115.2 kbps maximum
- 2320TTL: 38.4 kbps maximum

RS-232
Connector
- 232TTL: DB25 male (DCE)
- 2320TTL: DB25 female (DCE)

Signals
- TD, RD, RTS, CTS, GND

TTL
Connector
- 232TTL: DB25 female
- 2320TTL: DB25 male

Signals
- 2 Input/2 Output Channels, GND

Logic
CMOS

VDC Level
5V

ISOLATION
Isolation
2,000 V optical

POWER
232TTL Source
- External +12VDC power supply on 2.5mm jack for pins 25 (+) and 12 (-) on TTL DB25

2320TTL Source
- Port-powered from RS-232 handshake lines

TTL: requires +12 VDC external power supply

Input Voltage
12 VDC (<100 mA)

MECHANICAL
Dimensions,
- 232TTL: 5.4 x 5.6 x 1.7 cm (2.1 x 2.2 x 0.7 in)
- 2320TTL: 7.8 x 5.4 x 2.1 cm (3.1 x 2.1 x 0.8 in)

Enclosure
- 232TTL: GE LEXAN POLYCARBONATE GRADE 920
- 2320TTL: Plastic, ABS - Inline

Weight
- .011 lbs (49.9 g)

MTBF
- 232TTL: 1367614
- 2320TTL: 517206

MTBF Calc. Method
Parts Count Reliability Prediction

ENVIRONMENTAL
Operating Temperature
- 0 to +70 °C (+32 to +158 °F)

Storage Temperature
- -40 to +85 °C (-40 to +185 °F)

Operating Humidity
- 0 to 95% Non-Condensing

APPROVALS / CERTIFICATIONS - 232TTL
CE
EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
EN 61000-4-6: 2009 Conducted Immunity

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APPROVALS / CERTIFICATIONS - 2320TTL
CE

Download complete Declaration of Conformity at www.bb.elec.com

MECHANICAL DIAGRAM
Models 422TTL and 422TTL33 convert RS-422 or EIA-530 signals to TTL at data rates up to 115.2 Kbps. Two channels are used to convert RS-422 to TTL and two channels are used to convert TTL to RS-422.

Select Model 422TTL for 5 VDC TTL or select Model 422TTL33 for 3.3 VDC TTL. A DB25 male connector is used on the TTL side and a DB25 female connector is used on the RS-422 / EIA-530 side. The converters support RD, TD, RTS, and CTS. Pin 7 is signal ground for both connectors.

These units can work at baud rates up to 115.2 Kbps. Open pads are provided for each line. Therefore, if you choose to, you can change the pin connectors for any of the 4 channels.

When converting a second RS-422 channel, use the corresponding RTS A and RTS B pins (refer to the Quick Start Guide).

These converters invert the TTL signal. Refer to the specifications table to determine polarity. An external +12 VDC power supply is required (not included).

**PRODUCT FEATURES**
- Convert 2 channels in each direction from TTL ("Transistor Transistor Logic") to RS-422
- Baud rates up to 115.2 kbps
- 5V and 3.3V TTL options
- Open pads to change pin configuration

**PRODUCT FEATURES**
- Convert 2 channels in each direction from TTL ("Transistor Transistor Logic") to RS-422
- Baud rates up to 115.2 kbps
- 5V and 3.3V TTL options
- Open pads to change pin configuration

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-422 CONNECTOR</th>
<th>TTL CONNECTOR</th>
<th>TTL VDC</th>
<th>POWER SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>422TTL</td>
<td>DB25 Female</td>
<td>DB25 Male</td>
<td>5V</td>
<td>✔</td>
</tr>
<tr>
<td>422TTL33</td>
<td>DB25 Female</td>
<td>DB25 Male</td>
<td>3.3V</td>
<td>✔</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

- 422PS - 12VDC@100mA wall transformer power supply, 2.5mm plug
- E1250BL-BB3 - 220-240 VAC to 12 VDC wall power supply, 2.5mm plug Euro CEE7/7 plug
- 232CAMS - DB25 male to DB9 female adapter cable, 15.24 cm/6 in
- PS1EU-1000 - 220-240 VAC to 12 VDC Power Supply, jack, Euro CEE7/7 plug
- PS1UK-1000 - 220-240 VAC to 12 VDC wall power supply, jack, UK BS-1363 plug
TTL to RS-422 Converters
422TTL, 422TTL33

SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th>RS-422</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>115.2 kbps maximum</td>
</tr>
<tr>
<td>Connector</td>
<td>DB25 female</td>
</tr>
<tr>
<td>Signals</td>
<td>TDA(-), TDB(+), RDA(-), RDB(+), RTS A(-), RTS B (+), RTS B (+)</td>
</tr>
<tr>
<td>(EIA-530 pinout)</td>
<td>CTS A(-), CTS B (+)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TTL</th>
<th>Connector</th>
<th>DB25 male</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDC Level</td>
<td>422TTL: 5V</td>
<td>422TTL33: 3.3V</td>
</tr>
<tr>
<td>Signals</td>
<td>TD, RD, RTS, CTS</td>
<td></td>
</tr>
</tbody>
</table>

POLARITY (VOLTS)

<table>
<thead>
<tr>
<th>TTL Input</th>
<th>RS-422 / EIA-530 Output – V(A)–V(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Negative</td>
</tr>
<tr>
<td>Low</td>
<td>Positive</td>
</tr>
<tr>
<td>TTL Output</td>
<td>RS-422 / EIA-530 Input – V(A)–V(B)</td>
</tr>
<tr>
<td>High</td>
<td>Negative</td>
</tr>
<tr>
<td>Low</td>
<td>Positive</td>
</tr>
</tbody>
</table>

POWER

<table>
<thead>
<tr>
<th>Source</th>
<th>External (2.5 mm positive tip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>12 VDC (&lt;100 mA)</td>
</tr>
</tbody>
</table>

MECHANICAL

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>5.4 x 5.6 x 1.7 cm (2.1 x 2.2 x 0.7 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTBF, 422TTL</td>
<td>1539882</td>
</tr>
<tr>
<td>MTBF Calc. Method, 422TTL</td>
<td>Parts Count Reliability Prediction</td>
</tr>
</tbody>
</table>

ENVIRONMENTAL

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>0 to +70 °C (+32 to +158 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>-40 to +85 °C (-40 to +185 °F)</td>
</tr>
</tbody>
</table>

APPROVALS / CERTIFICATIONS - 422TTL

| SGS - TÜV Rheinland - CE |
| EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments |
| EN 61000-4-2: 2009 Electro-Static Discharge (ESD) |
| EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI) |
| EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT) |
| EN 61000-4-6: 2009 Conducted Immunity |

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MECHANICAL DIAGRAM - 422TTL33

5.13 cm
2.02 in

5.44 cm
2.14 in

1.57 cm
0.62 in
UL Rated Current Loop Converter

The 232CLDR is a DIN rail mountable RS-232 to current loop converter. It is wide temperature rated and UL Recognized for industrial applications. It has one optically isolated 20 mA transmit loop and one optically isolated receive loop. Each loop can be set to either “Active” or “Passive.” When set to “Active” an isolated 20 mA current is supplied for each loop (Transmit and Receive). One 10 to 30 VDC power supply (not included) provides power to the converter and both current loops.

The 232CLDR communicates at baud rates up to 19.2 kbps and can extend communications up to 600 meters (2,000 ft.). 2,000V optical isolation protects equipment from damaging ground loops and surges. Two LED’s indicate data flow. Connections are made on terminal blocks.

PRODUCT FEATURES

- Converts RS-232 to 20mA current loop
- 2000V optical isolation protection from transients
- One Transmit current loop & Receive current loop
- Current loops can be set to Active or Passive
- -40 to 80°C operating temperature

ACCESSORIES

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>SERIAL CONNECTOR</th>
<th>CURRENT LOOP CONNECTOR</th>
<th>POWER SOURCE FOR SERIAL SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>232CLDR</td>
<td>Terminal Block</td>
<td>Terminal Block</td>
<td>External power supply</td>
</tr>
</tbody>
</table>

MDR-20-24 - DIN rail mount power supply 24VDC, 1.0 A output power
MDR-20-12 - DIN rail mount power supply 12VDC, 1.7 A output power
DRPM25 - 35mm DIN Rail to Panel Mount Bracket, 25mm wide

Current Loop Explained

Current loop devices use Current On or Current Off to transmit binary digits. Current loop signals can often transmit over circuits that serial signals can’t traverse reliably, due to distance, marginal conductors and electrical noise.

Current loop converters from B&B Electronics interface RS-232 or RS-422/485 to the most common current loop ports – 20mA with open circuit voltages up to 30 V – at a maximum baud rate of 19.2 kbps. High speed optical isolators couple and isolate Transmit and Receive data. All B&B Electronics’ current loop converters have a transmit (T+ and T-) loop and a Receive (R+ and R-) loop. Each loop may be operated as an active or passive loop. When the converter needs to provide the loop current, a 12 VDC power supply is required for the current loop side.

Contact B&B Electronics’ Technical Support for information on modifications for higher loop currents and voltages.

Additional Reading

Current Loop Application Note
www.bb-elec.com/CurrentLoop
UL Rated Current Loop Converter

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Rate</strong></td>
<td>19.2 kbps maximum</td>
</tr>
<tr>
<td><strong>RS-232</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Connector</strong></td>
<td>Terminal block</td>
</tr>
<tr>
<td><strong>Signals</strong></td>
<td>TD, RD, GND</td>
</tr>
<tr>
<td><strong>Current Loop</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Connector</strong></td>
<td>Terminal block</td>
</tr>
<tr>
<td><strong>Signals</strong></td>
<td>T+, T-, R+, R-, GND</td>
</tr>
<tr>
<td><strong>ISOLATION</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Optical</td>
</tr>
<tr>
<td><strong>Rating</strong></td>
<td>2,000 V</td>
</tr>
<tr>
<td><strong>POWER</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Connector</strong></td>
<td>Terminal block</td>
</tr>
<tr>
<td><strong>Input Voltage</strong></td>
<td>10-30 VDC</td>
</tr>
<tr>
<td><strong>Power Consumption</strong></td>
<td>2.5 W</td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td>External</td>
</tr>
<tr>
<td><strong>TERMINAL BLOCKS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Wire Size</strong></td>
<td>24 to 14 AWG</td>
</tr>
<tr>
<td><strong>Torque</strong></td>
<td>4 kfg-cm</td>
</tr>
<tr>
<td><strong>LED INDICATORS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Data LEDs</strong></td>
<td>RS-232 &amp; Current Loop flash red when data is transmitted</td>
</tr>
</tbody>
</table>

**ENCLOSEMENT**

| **Material**                               | Plastic              |
| **IP Rating**                              | 20                   |
| **Dimensions**                             | 2.5 x 7.9 x 9.5 cm (1.0 x 3.1 x 3.7 in) |
| **Mounting**                               | 35 mm DIN (panel mount adapter option) |
| **MTBF**                                   | 401834               |
| **MTBF Calc. Method**                      | Parts Count Reliability Prediction |

**ENVIRONMENTAL**

| **Operating Temperature**                  | -40 to +80°C (-40 to +176 °F) |
| **Storage Temperature**                    | -40 to +85°C (-40 to +185 °F) |
| **Operating Humidity**                     | 0 to 95% non-condensing   |

**APPROVALS / CERTIFICATIONS - 232CLDR**

- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
- EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
- EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at www.bb.elec.com

**MECHANICAL DIAGRAM**

Dimensional Diagram of 232CLDR
Model 232CL9R is a port-powered RS-232 to current loop converter. No external power required for passive loop installations, but a power supply is required to generate an active loop.

Current Loop Explained

Current loop devices use Current On or Current Off to transmit binary digits. Current loop signals can often transmit over circuits that serial signals can’t traverse reliably, due to distance, marginal conductors and electrical noise.

Current loop converters from B&B Electronics interface RS-232 or RS-422/485 to the most common current loop ports – 20mA with open circuit voltages up to 30 V – at a maximum baud rate of 19.2 kbps. High speed optical isolators couple and isolate Transmit and Receive data. All B&B Electronics’ current loop converters have a transmit (T+ and T-) loop and a Receive (R+ and R-) loop. Each loop may be operated as an active or passive loop. When the converter needs to provide the loop current, a 12 VDC power supply is required for the current loop side.

Contact B&B Electronics for information on modifications for higher loop currents and voltages.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Rate</strong></td>
<td>19.2 kbps maximum</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RS-232</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connector</strong></td>
<td>DB9 female</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Signals</strong></td>
<td>TD, RD, GND</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Loop</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connector</strong></td>
<td>Terminal block</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Signals</strong></td>
<td>T+, T-, R+, R-, GND</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>POWER</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td>Terminal Block</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Input Voltage</strong></td>
<td>12VDC @ 100 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MECHANICAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MTBF</strong></td>
<td>714354</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MTBF Calc. Method</strong></td>
<td>Parts Count Reliability Prediction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PRODUCT FEATURES

- Optically isolated digital current loop to serial conversion
- Baud rates up to 19.2 kbps
- Transmit (T+ and T-) loop and Receive (R+ and R-) loop
- Each current loop may be operated active or passive
- Designed for 20mA digital current loop (other values available)

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>SERIAL CONNECTOR</th>
<th>CURRENT LOOP CONNECTOR</th>
<th>POWER SOURCE FOR SERIAL SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>232CL9R</td>
<td>DB9 Female</td>
<td>Terminal Block</td>
<td>Port-powered or external power supply</td>
</tr>
</tbody>
</table>

ACCESSORIES

232PS2 - 12VDC @ 100 mA wall transformer power supply, tinned stripped leads
MDR-20-12 - DIN rail mount power supply 12VDC, 1.7 A output power
PS1UK-1000 - 220-240 VAC to 12 VDC Power Supply, jack, UK BS-1363 plug
PS1EU-1000 - 220-240 VAC to 12 VDC Power Supply, jack, Euro CEE7/7 plug

ENVIRONMENTAL

- Operating Temperature: 0 to +70 °C (+32 to +185 °F)
- Storage Temperature: -40 to +85 °C (-40 to +185 °F)
- Operating Humidity: 0 to 95% Non-Condensing

APPROVALS / CERTIFICATIONS - 232CL9R

- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RF)
- EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
- EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at www.bb.elec.com
Serial to CAN to Fiber Isolated Repeater

CANOP

Model CANOP copper to fiber converter extends the node capacity of CAN (Control Area Network) systems while protecting CAN networks from component killing surges and transients. This optically isolated CAN repeater provides 2,000 VDC of optical isolation, allowing you to separate and protect critical segments of the system from the rest of the CAN network.

Connections are made by terminal blocks or ST fiber. Fiber optic cable offers natural resistance to EMI/RFI noise and surges that commonly interfere with electrical networks on factory floors and in industrial environments.

Model CANOP is housed in a rugged DIN rail mountable enclosure, making it easy to install in an industrial cabinet. A power supply of 10-30 VDC is required.

PRODUCT FEATURES

- Convert CAN signals to fiber, and fiber to CAN
- Boosts signals to increase number of nodes
- Extend the node capacity of your CAN network
- 2,000 V optical isolation protection from surges and spikes
- Terminal Block & ST Fiber Optic Connectors

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>FIBER OPTIC CONNECTOR</th>
<th>CAN ( COPPER )</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANOP</td>
<td>ST</td>
<td>Terminal Blocks</td>
</tr>
</tbody>
</table>

ACCESSORIES

- MDR-40-12 - DIN rail mount power supply 12VDC, 3.4 A output power
- DR-30-12 - DIN rail mount power supply 12VDC, 2 A output power
- FOP3MST - 3m Ready-To-Use Duplex (ST) Fiber Optic Cable Assembly

CAN in Industrial Automation

The multi-layer structure of Controller Area Network (CAN) allows any station on a serial bus to communicate with any other station. There are also benefits in central control and self-diagnosis and correction of transmission errors. A number of CAN-based higher level protocols have been developed for use in industrial automation applications. CAN Application Layer (CAL), CAN Kingdom, CAN-open, DeviceNet and Smart Distributed System are just a few of these variations.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baud Rate</strong></td>
</tr>
<tr>
<td><strong>CAN</strong></td>
</tr>
<tr>
<td><strong>Fiber Optic</strong></td>
</tr>
<tr>
<td><strong>Turnaround</strong></td>
</tr>
<tr>
<td><strong>LEDs</strong></td>
</tr>
</tbody>
</table>

ISOLATION

- 2,000 VDC

POWER

- 150 mA @ 12V, fully loaded
- Source: External, 10-30 VDC

MECHANICAL

- Dimensions: 9.3 x 8.6 x 3.6 cm (4.0 x 3.4 x 1.4 in)
- Enclosure: 35mm DIN mount
- MTBF: 269297
- MTBF Calc. Method: Parts Count Reliability Prediction

ENVIRONMENTAL

- Operating Temperature: 0 to +70 °C (+32 to +158 °F)
- Storage Temperature: -40 to +85 °C (-40 to +185 °F)
High-Speed, Isolated, RS-422/485 Repeater

485PDR-HS

The 485PDR-HS is a high speed, optically isolated RS-422/485 repeater that supports data rates up to 1.5 Mbps, making it suitable for use in fieldbus systems such as Profibus.

Isolation
The 485PDR-HS provides 2 kV digital Isolation with 8 kV air ESD protection and 600 W transient voltage suppression on the data lines.

Range Extension
The 485PDR-HS can be used to extend the range of a network up to 4000 ft. (1.2 km), depending on data rates, and to add additional nodes. 2-Wire RS-485, 4-Wire RS-485 and RS-422 are supported. Data signals and the power inputs connect to built-in terminal blocks.

Enclosure
The repeater operates on externally sourced 10 to 30 VDC power. The enclosure has a DIN rail mount that is designed to fit easily on a standard 35mm rail.

PRODUCT FEATURES
- 2 kV Isolation
- IEC Level 2, ± 4 kV contact ESD protection, IEC Level 3, ± 8 kV air ESD Protection
- 1.5 Mbps Data Rate
- -40 to 80°C Operating Temperature
- USB 2.0 – High Speed (480 Mbps)
- NEMA TS2

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>HIGH SPEED ISOLATED RS-422/485 REPEATER</th>
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</thead>
<tbody>
<tr>
<td>485PDR-HS</td>
<td>High Speed Isolated RS-422/485 Repeater</td>
</tr>
</tbody>
</table>

ACCESSORIES

MDR-20-24 - DIN rail mount power supply 24VDC, 1.0 A output power
MDR-40-24 - DIN rail mount power supply 24VDC, 1.7 A output power

Profibus Overview

PROFIBUS “Process Field Bus” is communication standard for automation technologies and applications.

PROFIBUS DP (“Decentralized Peripherals”) is the most common version of Profibus. It is used for deterministic communication between Profibus masters and their remote I/O slaves and supports numerous standard diagnostic options. Applications include production automation processes and operating sensors/actuators via centralized controllers.

PROFIBUS PA (“Process Automation”) is less prevalent and tends to be application specific. It is often used to monitor measurement equipment via process control systems. PA and DP can be used together to help bridge application networks. PA uses the same protocol as DP so it can be linked to a faster DP backbone network to better transmit process signals from equipment to controllers. PA can also be used in hazardous areas. The IEC 61158-2 rated physical layer can bus-power instruments and limit current flow to prevent explosive conditions.

PROFIBUS FMS (“Field Bus Message Specification”) is a complex communication protocol for more sophisticated communication needs. It supports non-deterministic data communication between Profibus masters.
### Specifications

| **RS-422/485** |  
| --- | --- |
| Connector | Terminal Block |

| **Signals** |  
| --- | --- |
| TDA(-), TDB(+), RDA(-), RDB(+), GND | RS-422 |
| RS-485 2-Wire and 4-Wire | Protected GND on Isolated Side |

| **Data Rate** |  
| --- | --- |
| Bit-Wise Enabled | Up to 1.5 Mbps |

| **Isolation** |  
| --- | --- |
| Method | Optical |
| Rating | 2000 V |

| **Surge Supression** |  
| --- | --- |
| Method | TVS |
| Rating | 12 V bi-directional avalanche breakdown device |
| 600 W peak power dissipation |
| Response Time | < 1 pico-second |

| **Power** |  
| --- | --- |
| Connector | Terminal Block |
| Voltage | 10 to 30 VDC |
| Power Consumption | 0.7 W |
| Source | External |

| **Terminal Blocks** |  
| --- | --- |
| Wire Size | 24 to 14 AWG |
| Torque | 4 kgf-cm |

### LED Indicators

- **2 Data LEDs (Green)**: Data LED for each side of isolator
  - Flashes when data transmitted

### Enclosure

- **Material**: Plastic
- **IP Rating**: 20
- **Dimensions**: 1.0 x 3.1 x 3.7 in (2.5 x 7.9 x 9.5 cm)
- **Mounting**: 35 mm DIN (Panel Mount Adapter is available)

### Environmental

- **Operating Temperature**: -40 to 80°C (-40 to 176°F)
- **Storage Temperature**: -40 to 85°C (-40 to 185°F)
- **Operating Humidity**: 0 to 95% Non-condensing
- **MTBF**: 117316

### Approvals and Certifications

- **Agency Approvals**: CE, FCC, NEMA TS2
- **EN 61000-6-2 (Heavy Industrial)**
- **EN 61000-4-2 (ESD)**: ± 4 kV contact, ± 8 kV air
- **EN 61000-4-3 (RFI)**: 10 V/m, 80-1000 MHz; 3 V/m 1.3 to 2.7 GHz
- **EN 61000-4-4 (EFT Burst)**: ± 2 kV DC ports; ± 1 kV signal ports
- **EN 61000-4-5 (Surge)**: ± 2 kV common; ± 1 kV differential
- **EN 61000-4-6 (CISPR Class B)**: 10 Vrms, 0.15 to 80 MHz
- **EN 61000-4-8 (Magnetic)**: 10 A/m, 50 Hz & 60 Hz
- **IEC 60608-2-27 (Shock)**: 50 G Peak, 11 ms, 3 axes
- **IEC 60608-2-6 (Vibration)**: 140-500 Hz, 4G, 3 axes
- **IEC 60608-2-32 (Drop)**: 10 total drops from sides, corner, edges
- **Emissions**: FCC Class B, CISPR Class B (EN55022)
RS-422/485 Isolated Repeater
485OPDR

The 485OPDR is an optically isolated RS-422/485 isolated line repeater that can be used to isolate a piece of equipment from the rest of the network. As a repeater, it extends the distance of an existing network an additional 1.2 km (4000 ft.) and expands it beyond the typical 32-node limitation. Data signals and the power inputs connect to the terminal block. 600W surge suppression ensures that the connected equipment is protected even in the harshest of environments. 2-wire RS-485, 4-wire RS-485 and RS-422 are supported.

The repeater operates on externally sourced 10 to 30 VDC power. The enclosure has a DIN rail mount that is designed to fit easily on a standard 35mm rail.

PRODUCT FEATURES
- Extend data up to 1.2 km (4000 ft.)
- 2000V optically isolated data lines
- -40 to 80°C operating temperature
- Modbus ASCII/RTU

ACCESSORIES
MDR-20-24 - DIN rail mount power supply 24VDC, 1.0 A output power
MDR-40-24 - DIN rail mount power supply 24VDC, 1.7 A output power
DRPM25 - 35mm DIN Rail to Panel Mount Bracket, 25mm wide
EK-CLIP-MPC - DIN rail clip for enclosure

ORDERING INFORMATION

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<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>485OPDR</td>
<td>RS-422/485 Isolated Repeater</td>
</tr>
</tbody>
</table>

SPECIFICATIONS

<table>
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<tr>
<th>RS-422/485</th>
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</thead>
<tbody>
<tr>
<td>Connector</td>
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<td>Signals</td>
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<td>ISOLATION</td>
</tr>
<tr>
<td>Method</td>
</tr>
<tr>
<td>Rating</td>
</tr>
<tr>
<td>SURGE SUPPRESSION</td>
</tr>
<tr>
<td>Method</td>
</tr>
<tr>
<td>Rating</td>
</tr>
<tr>
<td>Response Time</td>
</tr>
<tr>
<td>INDUSTRIAL BUS</td>
</tr>
<tr>
<td>Modbus ASCII/RTU</td>
</tr>
<tr>
<td>POWER</td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Power Consumption</td>
</tr>
<tr>
<td>Source</td>
</tr>
<tr>
<td>TERMINAL BLOCKS</td>
</tr>
<tr>
<td>Wire Size</td>
</tr>
<tr>
<td>Torque</td>
</tr>
<tr>
<td>LED INDICATORS</td>
</tr>
<tr>
<td>2 DATA LEDs (RED)</td>
</tr>
<tr>
<td>ENCLOSE</td>
</tr>
<tr>
<td>Material</td>
</tr>
<tr>
<td>IP Rating</td>
</tr>
<tr>
<td>Dimensions</td>
</tr>
<tr>
<td>Mounting</td>
</tr>
<tr>
<td>ENVIRONMENT</td>
</tr>
<tr>
<td>Operating Temperature</td>
</tr>
<tr>
<td>Storage Temperature</td>
</tr>
<tr>
<td>Operating Humidity</td>
</tr>
<tr>
<td>MTBF</td>
</tr>
<tr>
<td>MTBF Calculation Method</td>
</tr>
<tr>
<td>Agency Approvals</td>
</tr>
</tbody>
</table>
The 485OPDRI isolated RS-422/485 repeater is designed for rugged industrial environments. It is UL listed and certified for use in Class 1/Division 2 locations. Powerful optical isolation on both data ports protects your equipment and data from damaging ground loops and surges. Additional isolation on the power supply circuits add a third degree of protection.

Packaged in a rugged ABS plastic case, this repeater operates in wide temperature extremes. With a 35mm DIN rail mounting bracket, it easily integrates into control panels or other industrial equipment.

Installation and configuration is easy with DIP switches to set up baud rate and serial communications mode. Removable terminal blocks make wiring a snap. Power is connected through separate terminal block that accepts 10 to 48 VDC from any external source.

**ACCESSORIES**
- MDR-20-24 - DIN rail mount power supply 24VDC, 1.0 A output power
- MDR-40-24 - DIN rail mount power supply 24VDC, 1.7 A output power
- DRPM25 - 35mm DIN Rail to Panel Mount Bracket, 25mm wide
- EK-CLIP-MPC - DIN rail clip for enclosure

**PRODUCT FEATURES**
- Supports data rates up to 115.2 Kbps
- Extends signal 1,200 m (4,000 feet)
- Wide -40 to +80°C temperature range
- 10 to 48 VDC input power range
- 2000 V, 3-way optical isolation
- UL Class 1/Division 2 Listed
- Built-in, switchable termination & bias

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>485OPDRI</td>
<td>Industrial RS-422/485 Isolated Repeater</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

**SERIAL TECHNOLOGY**
- RS-422: TDA(-), TD/B(+), RDA(-), RDB(+)
- RS-485 4-Wire: TDA(-), TD(B), RDA(-), RDB(+)
- RS-485 2-Wire: Data A(-), Data B(+)
- Serial Connector: 5 Position, Removable Terminal Block
- Data Rate: 2.4 to 115.2 Kbps
- Isolation: 2KV RMS, 1 Minute
- Surge Protection: 600 W Peak Power Dissipation
- Clamping time: < 1 pico-second
- Industrial Bus: Modbus ASCII / RTU
- Bias: Built-in, Switchable, 1.2KΩ XMT/RCV
- Termination: Built-in, Switchable, 120Ω

**POWER**
- Source: External power required
- Power Connector: 2 Position, Removable Terminal Block
- Input Voltage: 10 to 48 VDC (56 VDC Maximum)
- Power Consumption: 0.5 W (typical), 1.3 W (termination on both sides)

**TERMINAL BLOCKS**
- Wire Size Accepted: 28 to 12 AWG
- Pitch: 5.08 mm
- Insulation Resistance: ≥500 MΩ @ 500 VDC
- Maximum Torque: 5 Kg / cm

**INDICATORS**
- Power: Red LED
- Data: Red LED for Each Data Port

**MECHANICAL**
- Dimensions: 12.3 x 11.3 x 3.2 cm (4.9 x 4.5 x 1.3 in)
- Enclosure: IP 20 Plastic, 35 mm DIN Mount
- Weight: 222 g (0.49 lbs)
- MTBF: 114696 Hours
- MTBF Calc. Method: Parts Count Reliability Prediction

**ENVIRONMENTAL**
- Operating Temperature: -40 to 80°C (-40 to 176°F)
- Storage Temperature: -40 to 85°C (-40 to 185°F)
- Operating Humidity: 0 to 95% Non-condensing

**REGULATORY**
- Approvals: FCC, CE, UL, UL Class 1 DIV 2, Groups A, B, C, D
- UL File: E222870 (HAZLOC E245458)
The 232OPDR is a DIN rail mountable RS-232 optical isolator and repeater. It provides 2,000 V isolation for four RS-232 signal lines (two in each direction). The isolator has four LED’s to show data flow and one LED to indicate power. Connections are made to a terminal block. The isolation provides protection for computer equipment from ground loops and induced currents caused by lightning or heavy electrical loads. It also functions as a repeater to extend RS-232 signals another 15.2 meters (50 ft.). The 232OPDR can support two data pairs or one data pair plus control signals in both directions.

**PRODUCT FEATURES**
- Extend RS-232 data another 15.2 m (50 ft.)
- 2,000V optically isolated data lines
- -40 to +80°C operating temperature
- Terminal block connections
- UL Recognized
- NEMA TS2

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>RS-232</th>
<th>Connector Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signals</td>
<td>4 signal lines in each direction. Protected ground on isolated side.</td>
</tr>
<tr>
<td>ISOLATION</td>
<td>Method Optical</td>
</tr>
<tr>
<td></td>
<td>Rating 2,000 V</td>
</tr>
<tr>
<td>POWER</td>
<td>Connector Terminal block</td>
</tr>
<tr>
<td></td>
<td>Voltage 10 to 30 VDC</td>
</tr>
<tr>
<td></td>
<td>Power Consumption 1.2 W</td>
</tr>
<tr>
<td></td>
<td>Source External</td>
</tr>
<tr>
<td>TERMINAL BLOCKS</td>
<td>Wire Size 24 to 14 AWG</td>
</tr>
<tr>
<td></td>
<td>Torque 4 kgf-cm</td>
</tr>
<tr>
<td>LED INDICATORS</td>
<td>DATA LEDs (RED) Data LED for each side of isolator Flashes when data transmitted</td>
</tr>
<tr>
<td></td>
<td>Power LED (RED) ON when power applied</td>
</tr>
<tr>
<td>ENCLOSURE</td>
<td>Material Plastic</td>
</tr>
<tr>
<td></td>
<td>IP Rating 30</td>
</tr>
<tr>
<td></td>
<td>Dimensions 2.5 x 7.9 x 9.5 cm (1.0 x 3.1 x 3.7 in)</td>
</tr>
<tr>
<td></td>
<td>Mounting 35 mm DIN (panel mount adapter available)</td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td>Operating Temperature -40 to 80 °C (-40 to 176 °F)</td>
</tr>
<tr>
<td></td>
<td>Storage Temperature -40 to 85 °C (-40 to 185 °F)</td>
</tr>
<tr>
<td></td>
<td>Operating Humidity 0 to 95% Non-condensing</td>
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<tr>
<td></td>
<td>MTBF 244689 hours</td>
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<tr>
<td></td>
<td>MTBF Calculation Method MIL217F Parts Count Reliability</td>
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<td>REGULATORY</td>
<td>Approvals CE, FCC, NEMA TS2</td>
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<td></td>
<td>cULus Recognized, File E222870</td>
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</tbody>
</table>

**ACCESSORIES**
- MDR-20-24 - DIN rail mount power supply 24VDC, 1.0 A output power
- MDR-40-24 - DIN rail mount power supply 24VDC, 1.7 A output power
- DRPM25 - 35mm DIN rail to Panel Mount Bracket, 25mm wide
- EK-CLIP-MPC - DIN rail clip for enclosure
The 2320PDRI is our premium Industrial RS-232 Isolated Repeater. Designed for rugged industrial environments, it is UL listed and certified for use in Class 1 Division 2 locations. Powerful Optical Isolation on both data ports protects your equipment and data from damaging ground loops and surges. Additional isolation on the power supply circuits adds a third degree of protection.

Packaged in a rugged plastic case, the 2320PDRI operates in wide temperature extremes. With a 35mm DIN rail mounting bracket, it is easy to integrate into a control panel or other industrial equipment.

Installation and configuration is easy. Data is connected with a DB9 female connector (DCE) and a DB9 male connector (DTE). Power is connected through terminal block that accepts 10 to 48 VDC from any external source.

PRODUCT FEATURES

- Supports Data Rates up to 115.2 Kbps
- Wide -40 to 80°C Temperature Range
- 10 to 48 VDC Input Power Range
- 2000 V 3-Way Optical Isolation
- UL Class 1 Division 2 Listed

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
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<tbody>
<tr>
<td>2320PDRI</td>
<td>Industrial RS-232 Isolated Repeater</td>
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</table>

ACCESSORIES

- MDR-20-24 - DIN rail mount power supply 24VDC, 1.0 A output power
- MDR-40-24 - DIN rail mount power supply 24VDC, 1.7 A output power
- DRPM25 - 35mm DIN Rail to Panel Mount Bracket, 25mm wide
- EK-CLIP-MPC - DIN rail clip for enclosure

SPECIFICATIONS

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<th>SERIAL TECHNOLOGY</th>
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<td>Approvals</td>
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</table>
Model 485OP is an optically isolated RS-422/485 signal repeater. In addition to 2KV isolation on the data lines, it can be used to extend RS-422/485 circuits an additional 1.2 km (4,000 ft.), thereby doubling the range. An added benefit is the ability to add another 32 nodes to an RS-485 network and join 2 and 4 wire systems.

The compact design fits almost anywhere. Terminal blocks allow easy installation. Wiring schematic on the label eliminates guesswork. A 12 VDC power supply is required.

**PRODUCT FEATURES**

- 2 KV isolation
- Add up to 32 nodes to RS-485 network
- RS-422 2-wire, RS-485 2 or 4-wire
- Modbus
- UL Recognized

---

**SPECIFICATIONS**

**SERIAL PROTOCOLS**
- RS-422 4-wire
- RS-485 2-wire
- RS-485 4-wire

**ISOLATION**
- Lines Protected: Data lines
- Method: Optical
- Rating: 2000 V

**SURGE SUPPRESSION**
- Lines Protected: Data lines
- Method: TVS
- Rating: 6.5V bi-directional
- 600W peak power dissipation

**INDUSTRIAL BUS**
- Modbus ASCII/RTU

**POWER**
- Connector: Terminal block
- Voltage: 10 to 14 VDC
- Power Consumption: 1.0 W
- Source: Included wall transformer or other 10 to 14 VDC source

**POWER SUPPLY**
- Input Voltage: 120 VAC (USA); 220-240 VAC (EU, UK)
- Output Voltage: 12 VDC
- Output Connection: USA: Stripped and tinned leads
- EU: UK BS-1363 plug, jack
- UK: Euro CEE7/7 plug, jack

**TERMINAL BLOCKS**
- Wire Size: 22 to 14 AWG
- Torque: 0.5 Nm

**LED INDICATORS**
- 2 x DATA (RED): Flashes when data received

**ENCLOSURE**
- Material: Plastic
- IP Rating: 30
- Dimensions: 9.7 x 6.1 x 2.5 cm (3.8 x 2.4 x 1.0 in)
- Mounting: In line

**ENVIRONMENTAL**
- Operating Temperature: 0 to 55 °C (32 to 131 °F)
- Operating Humidity: 0 to 95% non-condensing
- MTBF: 453103 hours
- MTBF Calculation Method: Parts Count Reliability Prediction

**AGENCY APPROVALS**
- CE, FCC
- cULus Recognized, File E222870
- Declaration of Conformity available for download at www.bb.elec.com

---

**ACCESSORIES**

- PS1EU-1000 - 220-240 VAC to 12 VDC power supply, jack, Euro CEE7/7 plug
- PS1UK-1000 - 220-240 VAC to 12 VDC power supply, jack, UK BS-1363 plug
- 485HESP - RS-485 surge protector
- 485PS4 - 12VDC @ 500 mA, wall power supply, tinned stripped leads

---

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
<th>POWER SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>485OP</td>
<td>RS-422/485 Fiber Optic Isolated Repeater</td>
<td>USA (included)</td>
</tr>
<tr>
<td>485OPB</td>
<td>RS-422/485 Fiber Optic Isolated Repeater</td>
<td>EU or UK (sold separately)</td>
</tr>
</tbody>
</table>
The 9POP4 isolates and protects RS-232 equipment from lightning surges, accidental high voltage shorts, and ground loops. RS-232 data signals TD, RD, RTS, and CTS are supported at up to 230.4 kbps. Isolation circuits are 2.5 kV rated and protects valuable equipment while maintaining maximum uptime.

Each side of the isolator receives power from a single 12 VDC power supply to maintain the isolation. This powering configuration allows the device to be used in a system with only one power supply, regardless of the power provided by the RS-232 ports.

The isolator uses DB9 male and DB9 female connectors. The female connector is wired as a DCE and should be connected to a DTE port. The male connector is a DTE and should be connected to a DCE port. If you are connecting a DTE to a DTE or a DCE to a DCE, you will need a null modem adapter.

Power supplies recommended and available from B&B Electronics have been tested and certified. Using any other power supply may bypass or degrade the isolation barrier.

**PRODUCT FEATURES**

- 2.5 kV isolation
- ESD protection - 15 kV
- Protects up to 4 channels
- 230.4 kbps
- Ideal for laptops, lower power serial ports

**ACCESSORIES**

- 232PS2 - 12VDC@100mA wall transformer power supply, tinned stripped leads
- MMNM9 - Null Modem Adapter – DB9 Male / DB9 Male

**SPECIFICATIONS**

**SERIAL TECHNOLOGY**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9POP4</td>
<td>RS-232 4-Channel Optical Isolator</td>
</tr>
</tbody>
</table>

**POWER**

- Source: External required
- Power Connector: 2.5 mm jack
- Input Voltage: 12 VDC
- Power Consumption: 731 mW

**MECHANICAL**

- Dimensions: 10.4 x 4.3 x 2.0 cm (4.1 x 1.7 x 0.86 in)
- Enclosure: IP 30, plastic
- Weight: 54.4 g (0.12 lbs)
- MTBF: 262084 hours
- MTBF Calc. Method: MIL 217F Parts Count Reliability

**ENVIRONMENTAL**

- Operating Temperature: 0 to 70°C
- Storage Temperature: -40 to 85°C
- Operating Humidity: 0 to 95% Non-condensing

**APPROVALS / CERTIFICATIONS**

- Emissions: FCC Class B, CISPR Class B (EN55022)
- CE: EN61000-6-1:2007 (Light Industrial)
- ESD: ±8kV ±15kV (contact/air)
- RFI: 80-1000MHz 3V/m, 1.3 - 2.7 GHz, 3V/m
- EFT: ±1kV Power, ±500V Data Lines
- Surge: ±2kV Power (AC), N/A on Data Lines
- CI, 3Vrms all ports
Model 9SPOP2 is a port powered two-channel isolator with a 2,500 Volt protection level. It optically isolates both the RS-232 Transmit and Receive data lines and RS-232 equipment from lightning surges, accidental high voltage shorts, and ground loops. RS-232 data signals TD and RD are supported at up to 115.2 kbps.

Surge Protection Standards

IEC 1000-4-5: 1995 “Surge Immunity Test” and IEEE C62.41-1991 “IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits” are the recognized standards for surge protection. B&B Electronics’ heavy duty surge protectors have been tested at 6 kV to meet these two specifications.

Learn more about surge suppression & isolation

www.bb-elec.com/TechLibrary

- “Isolation: Your Best Investment for Reliability”
- “Dataline Isolation Theory”
- “Dataline Surge Protection”

MECHANICAL DIAGRAM
The 232SPHI4 isolates and protects RS-232 equipment from lightning surges, accidental high voltage shorts, and ground loops. RS-232 data signals at up to 115.2K bps as well as the RTS and CTS handshake lines are supported. The 232SPHI4 provides 4000 Volts of isolation between sides, and maintains creepage and air clearances required for double or reinforced insulation by IEC 60601-1.

Model 232SPHI4 has 4000 Volts of isolation — twice the rating of most isolators — to protect RS-232 equipment from lightning strikes, accidental high voltage shorts and ground loops.

DTE device connections are made through a DB-25 female. DCE device connections are made through a DB-25 male. The two sides of the isolator are powered independently to maintain isolation. Both sides can draw power from the RS-232 data and handshake lines, eliminating external powering requirements in nearly all systems.

If the isolator is to be used with low power ports or when no handshake lines are available, external power can be supplied to either side. This versatile powering configuration minimizes the number of supplies required by the overall system.

ACCESSORIES

232PS2 - 12VDC@100mA wall transformer power supply, tinned stripped leads
PS1EU-1000 - 220-240 VAC to 12 VDC Power Supply, jack, Euro CEE7/7 plug
PS1UK-1000 - 220-240 VAC to 12 VDC wall power supply, jack, UK BS-1363 plug
232CAMR - DB9 Male to DB25 Female, 6 in (15.2 cm)
232CAMS - DB9 Female to DB25 Male, 6 in (15.2 cm)
Three-stage DIN Rail Surge Protector
HESP4DR

Model HESP4DR meets IEEE 1000-4-5: 1995 and IEEE C62.41-1991 recognized standards for premium surge protectors. It protects against lightning strikes, power surges, and other types of voltage disturbances with three stages of protection for each supported line: a gas discharge tube followed by a series resistor and finally a Transient Voltage Suppresser (TVS). Five RS-232 signals on terminal blocks are supported with a clamping voltage of 6.8 Volts.

The HESP4DR is housed in a sturdy DIN rail mount case with a #10 grounding screw. In order to work properly, it is important to have a good connection between the #10 screw and a solid earth ground.

PRODUCT FEATURES
• Three stages of protection on every data line
  1) Gas discharge tube
  2) Series resistor
  3) Transient voltage suppressor
• Protected signal ground connection
• Rugged terminal block connections
• Dedicated chassis ground lug
• Wide operating Temperature
• NEMA TS2

ORDERING INFORMATION

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<th>MODEL NUMBER</th>
<th>INTERFACE</th>
<th>LINES PROTECTED</th>
<th>MOUNTING</th>
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<tbody>
<tr>
<td>HESP4DR</td>
<td>RS-422/485</td>
<td>(5) RS-422/485</td>
<td>DIN Rail Mount</td>
</tr>
</tbody>
</table>

ACCESSORIES
CU15B - Copper Grounding Strap

Surge Protection Standards
IEC 1000-4-5: 1995 “Surge Immunity Test” and IEEE C62.41-1991 “IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits” are the recognized standards for surge protection. B&B Electronics’ heavy duty surge protectors have been tested at 6 kV to meet these two specifications.

Learn more about surge suppression & isolation
www.bb-elec.com/TechLibrary
• “Isolation: Your Best Investment for Reliability”
• “Dataline Isolation Theory”
• “Dataline Surge Protection”
### Specifications

#### Serial Technology
- Connectors, line: 5 position terminal blocks
- Connectors, equipment: 5 position terminal blocks

#### Surge Suppression
- **Clamping Voltage**
  - Stage 1: 72 VDC, minimum
  - Stage 1: 108 VDC, maximum
- **Series Resistance**
  - Stage 2: 2.7 Ohms
- **Clamping Voltage**
  - Stage 3: 6.45 VDC, minimum
  - Stage 3: 7.14 VDC, maximum
- **Clamping Time**: Less than 5 x 10^-9 seconds
- **Dimensions**: 3.55 x 7.88 x 10.53 cm (1.4 x 3.1 x 4.2 in)
- **Installation**: DIN rail mount
- **Weight**: 0.114 kg (4.02 oz)

#### Environmental
- **Operating Temperature**: -40 to 80°C (-40 to 176°F)
- **Storage Temperature**: -40 to 85°C (-40 to 185°F)
- **Operating Humidity**: 0 to 95% Non-condensing

#### Approvals / Certifications - HESP4DR
- CE, NEMA TS2
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-5: 2006 Electrical Surges

Download complete Declaration of Conformity at www.bb.elec.com

### Mechanical Diagram

*Diagram showing the layout of the HESP4DR surge protector with dimensions labeled.*
Three-stage RS-422/485 Surge Protectors
485HESP, 422HESP, 232HESP

PRODUCT FEATURES
- Three stages of protection on every data line
  1) Gas discharge tube
  2) Series resistor
  3) Transient voltage suppressor
- Protected signal ground connection
- Rugged terminal block connections
- Dedicated chassis ground lug

These three-stage surge protectors meet IEEE 1000-4-5: 1995 and IEEE C62.41-1991 recognized standards for premium surge protectors. It protects against lightning strikes, power surges, and other types of voltage disturbances with three stages of protection for each supported line: a gas discharge tube followed by a series resistor and finally a Transient Voltage Suppressor (TVS). Three RS-422/485 signals on terminal blocks are supported with a clamping voltage of approximately 6.8 Volts.

These surge protectors housed in a tough metal, panel mount case with a protected signal ground connection and dedicated chassis ground lug. In order to work properly, it is important to have a good connection between the #10 screws and a solid earth ground. The 485HESP provides two terminal posts and two metal mounting brackets to provide a good ground connection.

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<tbody>
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<td>RS-422/485</td>
<td>(3) RS-422/485</td>
<td>Panel Mount</td>
</tr>
<tr>
<td>422HESP</td>
<td>RS-422/485</td>
<td>(5) RS-422/485</td>
<td>Panel Mount</td>
</tr>
<tr>
<td>232HESP</td>
<td>RS-232</td>
<td>(5) RS-232</td>
<td>Panel Mount</td>
</tr>
</tbody>
</table>

ACCESSORIES
CU15B - Copper Grounding Strap

SPECIFICATIONS

SERIAL TECHNOLOGY
485HESP
- Connectors, line 3 position terminal blocks
- Connectors, equipment 3 position terminal blocks
422HESP/232HESP
- Connectors, line 5 position terminal blocks
- Connectors, equipment 5 position terminal blocks

SURGE SUPPRESSION
- Clamping Voltage
  - stage 1 72 VDC, minimum
  - stage 2 108 VDC, maximum
- Series Resistance
  - stage 2 2.7 Ohms
- Clamping Voltage
  - stage 3 6.45 VDC, minimum
  - stage 4 7.14 VDC, maximum
- Clamping Time Less than 5 x10-9 seconds
- Dimensions 11.4 x 8.4 x 4.6 cm (4.5 X 3.3 x 1.8 in)
- Installation In-line
- Weight 0.19 kg (6.7 oz)

ENVIRONMENTAL
- Operating Temperature 0 to +70 °C (+32 to +185 °F)
- Storage Temperature -40 to +85 °C (-40 to +185 °F)
- Operating Humidity 0 to 95% Non-Condensing

APPROVALS / CERTIFICATIONS - 485HESP
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-5: 2006 Electrical Surges
- Download complete Declaration of Conformity at www.bb.elec.com

Surge Protection Standards
IEC 1000-4-5: 1995 “Surge Immunity Test” and IEEE C62.41-1991 “IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits” are the recognized standards for surge protection. B&B Electronics’ heavy duty surge protectors have been tested at 6 kV to meet these two specifications.

Learn more about surge suppression & isolation
www.bb-elec.com/TechLibrary
- “Isolation: Your Best Investment for Reliability”
- “Dataline Isolation Theory”
- “Dataline Surge Protection”
Single stage surge protectors offer a high degree of protection with Transient Voltage Suppressors (TVS) for each protected line.

Model 485FPP has 600W Transient Voltage Suppressors to clamp voltages without adversely affecting normal RS-422/485 data. Fast-acting 125 mA PCB fuses to protect RS-422 and RS-485 circuits against transient voltages that are too long or too large for normal suppression.

The 485FPP has 4 wires and terminal blocks for easy installation inline between the data cables – as close as possible to the serial port. Once a fuse is blown, the unit should be disposed and replaced.

**SPECIFICATIONS**

**SERIAL TECHNOLOGY**
- Connectors: Terminal blocks
- RS-422/485: (4) wire leads

**SURGE SUPPRESSION**
- Surge Suppressors: 7.5 Volts, bi-directional avalanche breakdown device
- Clamping Voltage: < 1 x 10^-12 seconds, theoretical
- Fuses: 125 mA fast-acting type
- Peak Power: 500 Watts dissipation
- Series Resistance: 7.2 Ohms, maximum
- Capacitance: 6,000 picofarads, maximum
- Installation: In-line
- Weight: 0.05 lbs (22.7 g)

**ENVIRONMENTAL**
- Operating Temperature: 0 to +70 °C (+32 to +185 °F)
- Storage Temperature: -40 to +85 °C (-40 to +185 °F)
- Operating Humidity: 0 to 95% Non-Condensing

**APPROVALS / CERTIFICATIONS - 485FPP**
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments

Download complete Declaration of Conformity at www.bb.elec.com
Serial Modem Data Splitters
9PMDS, 232MDS

With B&B Electronics’ serial port splitters you gain reliability by capturing data from one peripheral on redundant PCs. These serial RS-232 splitters can improve a system’s economy by sharing multiple PCs on a single peripheral.

Model 9PMDS connects two computers or terminals to one modem without switching. The modem data splitter can combine two 9-pin DTE ports to one 9-pin DCE port.

Model 232MDS can be connected so two computers or terminals can use one modem without switching. This modem data splitter can combine two 25-pin DTE ports and connect them to a 25-pin DCE port.

PRODUCT FEATURES
• Computers & terminals use one modem without switching
• Connect two or three PCs to one peripheral
• Use with modems, scanners, scales, other serial devices
• Quick plug-and-play installation – no configuration required
• Port powered – no external power required
• May be left permanently installed

ORDERING INFORMATION

<table>
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<tr>
<th>MODEL NUMBER</th>
<th>PC PORTS</th>
<th>PERIPHERAL PORTS</th>
</tr>
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<tbody>
<tr>
<td>9PMDS</td>
<td>(2) DB9 Female</td>
<td>(1) DB9 Male</td>
</tr>
<tr>
<td>232MDS</td>
<td>(2) DB25 Female</td>
<td>(1) DB25 Male</td>
</tr>
</tbody>
</table>

ACCESSORIES

9PAMF6 - DB9 Male To DB9 Female, 6 ft. (1.8 m)
232CAM - DB9 Female to DB25 Male, 6 ft. (1.8 m)
232CAMS - DB9 Female to DB25 Male, 6 in (15.2 cm)
232AMF5 - DB25 Male to DB25 Female, 6 ft. (1.8 m)

SPECIFICATIONS

SERIAL TECHNOLOGY
RS-232
9PMDS - Connectors: Straight Through Ports: (2) DB9 Female Monitoring Port: (1) DB9 Male
232MDS - Connectors: Straight Through Ports: (2) DB25 Female Monitoring Port: (1) DB25 Male
Installation: In-line

MECHANICAL
Weight
9PMDS: 81.7 grams (0.18 lbs)
232MDS: 179.9 grams (0.39 lbs)

ENVIRONMENTAL
Operating Temperature: 0 to +70 °C (+32 to +185 °F)
Storage Temperature: -40 to +85 °C (-40 to +185 °F)
Operating Humidity: 0 to 95% Non-Condensing

MTBF
9PMDS: 2595488
232MDS: 1133093

MTBF Calc. Method: Parts Count Reliability Prediction

APPROVALS / CERTIFICATIONS - 9PMDS, 232MDS
CE
EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments

Download complete Declaration of Conformity at www.bb.elec.com
Model 232UDS universal serial data splitter can be connected so that any two RS-232 devices can connect to any one RS-232 device. For example, two computers can share the same modem or serial printer at the same time and each can remain connected at all times.

The 232UDS can function as either a modem data splitter or a printer data splitter. It allows you to switch select which lines are OR'd together and which lines are passed straight through. This unit is self-powered from the RS-232 line and can be left permanently installed.

**PRODUCT FEATURES**
- Share your printer or modems
- Use as either a modem or printer data splitter
- Program data flow via DIP switch

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>CONNECTOR</th>
<th>MAIN CONNECTOR</th>
<th>CONNECTOR</th>
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</thead>
<tbody>
<tr>
<td>232UDS</td>
<td>DB25 Female</td>
<td>DB25 Male</td>
<td>DB25 Female</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

- 232SGM - DB25 Gender Reverser – Changes Female Port to Male (M to M)
- 232SGF - DB25 Gender Reverser – Changes Male Port to Female (F to F)
- 232AMF5 - DB25 Male to DB25 Female, 6 ft. (1.8 m)

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th>RS-232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectors</td>
<td>DB25 female, DB25 male, DB25 female</td>
</tr>
<tr>
<td>Pins 1 through 8, 20.</td>
<td>(Pins 1 and 7 connected between all 3 connectors.)</td>
</tr>
<tr>
<td>(Other pins programmable for data flow direction.)</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>In-line</td>
</tr>
<tr>
<td>ISOLATION</td>
<td>2,000 VDC</td>
</tr>
<tr>
<td>POWER</td>
<td>Port-powered</td>
</tr>
<tr>
<td>Source</td>
<td>RS-232 handshake lines</td>
</tr>
<tr>
<td>MECHANICAL</td>
<td>Weight: 176.9 grams (0.39 lbs)</td>
</tr>
<tr>
<td></td>
<td>MTBF: 400449</td>
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<tr>
<td></td>
<td>MTBF Calc. Method: Parts Count Reliability Prediction</td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td>Operating Temperature: 0 to +70 °C (+32 to +158 °F)</td>
</tr>
<tr>
<td></td>
<td>Storage Temperature: -40 to +85 °C (-40 to +185 °F)</td>
</tr>
<tr>
<td></td>
<td>Operating Humidity: 0 to 95% Non-Condensing</td>
</tr>
</tbody>
</table>
Monitor and control multiple scales, scanners, terminals or other serial devices with a single PC. Economizes systems by connecting a PC port to several data sources – ideal for devices requiring only intermittent access. The first device to send captures the data path, locking out other lines.

Data flow may also be software controlled using the RTS line. Data from the host PC is sent to all attached devices. Port combiners can be cascaded by connecting the master port of each successive unit to one of the slave ports of the preceding unit. Each additional port combiner adds one slave port to the system. Model 232PTC9 requires external 12 VDC @ 100 mA power (included).

**Product Features**
- Two or more serial devices can share a PC serial port
- Cascade combiners to connect many devices
- Automatic or software PC access control
- Quick, easy installation – may be left in place

**Ordering Information**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>HOST PC PORT</th>
<th>PERIPHERAL PORTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>232PTC9</td>
<td>(1) DB25 Female</td>
<td>(2) DB9 Female</td>
</tr>
</tbody>
</table>

**Accessories**
- 232PS - 12VDC@100mA wall transformer power supply, 2.5mm plug
- PS1EU-1000 - 220-240 VAC to 12 VDC Power Supply, jack, Euro CEE7/7 plug
- PS1UK-1000 - 220-240 VAC to 12 VDC wall power supply, jack, UK BS-1363 plug
- 9PAMF6 - DB9 Male To DB9 Female, 6 ft. (1.8 m)
- 9SGM - DB9 Gender Reverser – Changes Female Port to Male (M to M)

**Specifications**

<table>
<thead>
<tr>
<th>Serial Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232</td>
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<table>
<thead>
<tr>
<th>Connectors</th>
<th>Host PC Port: (1) DB9 Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral Ports</td>
<td>(2) DB9 Female</td>
</tr>
<tr>
<td>Signals</td>
<td>TD, RD, RTS (slave to master only)</td>
</tr>
<tr>
<td></td>
<td>CTS indicates open channel (slave only)</td>
</tr>
<tr>
<td>Configuration</td>
<td>DCE</td>
</tr>
<tr>
<td>Installation</td>
<td>In-line</td>
</tr>
</tbody>
</table>

**Mechanical**
- Dimensions: 10.19 x 5.08 x 2.29 cm (4.01 x 2.00 x 0.9 in)
- Weight: 0.26 lbs (117.9 g)

**Power**
- Input Required: 12-17 VDC
- Current Draw: 95 mA

**Environmental**
- Operating Temperature: 0 to +50 °C (+32 to +122 °F)
- Storage Temperature: -40 to +85 °C (-40 to +185 °F)
- Operating Humidity: 0 to 95% Non-Condensing
- MTBF: 938745
- MTBF Calc. Method: Parts Count Reliability Prediction

**Approvals / Certifications - 232PTC9**
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments
- EN 61000-4-2: 2009 Electro-Static Discharge (ESD)
- EN 61000-4-3: 2006 +A1 +A2 +IS1 Radiated Field Immunity (RFI)
- EN 61000-4-4: 2012 Electrical Fast Transients-Burst Immunity (EFT)
- EN 61000-4-6: 2009 Conducted Immunity

Download complete Declaration of Conformity at www.bb.elec.com
RS-232 Data Taps
9PCDT, 232CDT

Tap in on a serial data stream and transparently feed another monitor, printer or other device.

Model 9PCDT allows an RS-232 port to tap into and check data being transmitted between two other RS-232 ports. DIP switches set programming to monitor the main Transmit and Receive lines individually or together. Choose between monitoring the DCE or DTE port. Also allows the monitoring port to be either DTE or DCE. The DTE connector is male, and DCE and TAP connectors are female.

Model 232CDT has DIP switches that allow programming to monitor the main Transmit and Receive lines individually or together. The male RS-232 connector on the top and the female RS-232 connector on the bottom are connected straight through, pin for pin. These connectors are used to connect the device – in series – with the RS-232 line to be tapped.

### PRODUCT FEATURES
- Monitor and record serial data streams
- Easy to install, may be left in place
- Transparent connections
- No external power required

### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>STRAIGHT THROUGH CONNECTORS</th>
<th>MONITORING PORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9PCDT</td>
<td>(1) DB9 Male, (1) DB9 Female</td>
<td>DB9 Female</td>
</tr>
<tr>
<td>232CDT</td>
<td>(1) DB25 Male, (2) DB25 Female</td>
<td>DB25 Female</td>
</tr>
</tbody>
</table>

### ACCESSORIES
- 9PAMF6 - DB9 Male To DB9 Female, 6 ft.
- 232CAM - DB9 Female to DB25 Male, 6 in
- 232AMFS - DB25 Male to DB25 Female, 6 ft.
- 232SGM - DB25 Gender Reverser – Changes Female Port to Male (M to M)
- 232SGF - DB25 Gender Reverser – Changes Male Port to Female (F to F)

### SPECIFICATIONS

#### SERIAL TECHNOLOGY
- RS-232
  - 9PCDT: Straight Through Ports: (1) DB9 Male, (1) DB9 Female Monitoring Port: DB9 Female
  - 232CDT: Straight Through Ports: (1) DB25 Male, (2) DB25 Female Monitoring Port: (1) DB25 Female

#### MECHANICAL
- Weight: 9PCDT: 63.5 grams (0.14 lbs)
- 232CDT: 90.7 grams (0.2 lbs)

#### ENVIRONMENTAL
- Operating Temperature: 0 to +70 °C (+32 to +185 °F)
- Storage Temperature: -40 to +85 °C (-40 to +185 °F)
- Operating Humidity: 0 to 95% Non-Condensing
- MTBF, 232CDT: 1637197
- MTBF Calc. Method: Parts Count Reliability Prediction

#### APPROVALS / CERTIFICATIONS - 9PCDT
- CE
- EN 61000-6-1: 2007 Generic Standards for Residential, Commercial and Light-Industrial Environments

Download complete Declaration of Conformity at www.bb.elec.com

www.bb-elec.com
Which RS-232 data lines are active? Find out with this RS-232 mini tester. It makes troubleshooting easy by helping to check interface connections, equipment, cable problems or failures.

Model **9PMTT** RS-232 mini tester is designed to connect with any RS-232 interface. The tester may be left in the line permanently. It is transparent to data transfer. Bright red or green LED signals clearly show which lines are active. The LEDs’ color indicates Negative or Positive voltage (red meaning Negative; green meaning Positive).

**PRODUCT FEATURES**
- Test for RS-232 data line or equipment failures
- Convenient LEDs for line status
- Can be permanently installed in-line

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>RS-232 connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>9PMTT</td>
<td>DB9 Male</td>
</tr>
<tr>
<td></td>
<td>DB9 Female</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

- 9SGF - DB9 Gender Reverser – Changes Male Port to Female (F to F)
- 9SGM - DB9 Gender Reverser – Changes Female Port to Male (M to M)

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th>RS-232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectors</td>
<td>DB9 male</td>
</tr>
<tr>
<td></td>
<td>DB9 female</td>
</tr>
<tr>
<td>Signals</td>
<td>TD, RD, RTS, CTS, DSR, CD, DTR</td>
</tr>
<tr>
<td>Installation</td>
<td>In-line</td>
</tr>
<tr>
<td>LEDS</td>
<td>TD, RD, RTS, CTS, DSR, CD, DTR</td>
</tr>
<tr>
<td></td>
<td>RED = negative voltage (mark)</td>
</tr>
<tr>
<td></td>
<td>GREEN = positive voltage (space)</td>
</tr>
<tr>
<td>Line Status</td>
<td>Port-powered from RS-232 handshake lines</td>
</tr>
<tr>
<td>Source</td>
<td>DTR &amp; RTS</td>
</tr>
<tr>
<td>Dimensions</td>
<td>5.0 x 5.4 x 1.6 cm (2.0 x 2.14 x .63 in)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Plastic</td>
</tr>
<tr>
<td>Weight</td>
<td>63.5 grams (0.14 lbs)</td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td>Operating Temperature: 0 to +70 °C (+32 to +185 °F)</td>
</tr>
<tr>
<td></td>
<td>Storage Temperature: -40 to +85 °C (-40 to +185 °F)</td>
</tr>
<tr>
<td></td>
<td>Operating Humidity: 0 to 95% Non-Condensing</td>
</tr>
</tbody>
</table>
MiPort™ Universal PCI Cards
One to Four Port RS-232/422/485 Cards

MiPort™ Universal PCI Cards suit most any application. Outputs are independently configurable for RS-232, RS-422, or RS-485. Optically isolated cards offer 2000 VDC port-to-port isolation. Compare B&B’s cards to others – B&B’s premium Isolation Zone along with optical couplers and our unique isolated DC-DC converter design protect your PC from voltage surges and ground loops. DB9M connectors offer positive thumbscrew locking, more robust than phone jack connectors. Four port models include fan-out cables. Four port isolated model 3PCIOU4 has two RS-232/422/485 ports and two RS-422/485 ports. All models support data rates up to 460.8 kbps. MiPort™ cards are plug-and-play compatible and have adjustable FIFO trigger thresholds for input and output. RS-485 operation supports both 2-Wire and 4-Wire (full and half-duplex), and Automatic Send Data Control. All models include a comprehensive technical manual and CD ROM with drivers.

Whether your application is Industrial Monitoring and control, SCADA, Point of Sale, Medical, or Security, MiPort™ Universal PCI Cards are your number one choice.

ACCESSORIES

9PAMF6 - DB9 Male To DB9 Female, 6 ft. (1.8 m)
9SGF - DB9 Gender Reverser – Changes Male Port to Female (F to F)
9SGM - DB9 Gender Reverser – Changes Female Port to Male (M to M)

PRODUCT FEATURES

- Add 1, 2, or 4 Serial Ports to your PC
- Optical Isolation Available
- RS-232/422/485 Selectable on Each Port
- 5 and 3.3 V PCI Bus Compatible
- PCI-X Compatible
- Data Rates up to 460.8 Kbps

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PCIOU1</td>
<td>1 RS-232/422/485 1 DB9 M</td>
</tr>
<tr>
<td>3PCIOU2</td>
<td>2 RS-232/422/485 2 DB9 M</td>
</tr>
<tr>
<td>3PCIOU4</td>
<td>2 RS-232/422/485 2 DB9 M on card, 2 DB9 M on second exp slot (cable and bracket included)</td>
</tr>
<tr>
<td>3PCIU2</td>
<td>2 RS-232/422/485 DB9 M</td>
</tr>
<tr>
<td>3PCIU4</td>
<td>4 RS-232/422/485 DB37 F (DB37 to 4 x DB9 M cable included)</td>
</tr>
</tbody>
</table>

SPECIFICATIONS

| Operating Systems | Windows XP, Windows 2008 Server (32/64 bit), Windows Vista (32/64 Bit), Windows 7 (32/64 Bit), Linux Kernel 2.6.x in the following distributions: Ubuntu 10.04 Desktop Edition (32/64 Bit) and Ubuntu 10.04 Server Edition (32/64 Bit). |
| BUS              | PCI (33 MHz/32-bit) |
| Data Rate        | Up to 460.8 kbps (RS-232/422/485) |
| UARTs            | XRI17D15X (16C550 Compatible) |
| Buffer           | 64 byte FIFO Buffer |
| Character Length | 5, 6, 7, or 8 bits |
| Parity           | Even, Odd, None, Space or Mark |
| Stop Bits        | 1, 1.5, or 2 |
| *Isolation       | From PC Power, Ground, and other ports on the same card |
| **RS-232 Signals | TD, RD, and all handshake signals |
| RS-422 Signals   | TDA(+), TDB(+), and GND |
| RS-485 Signals   | Data A(-), Data B(+), and GND |
| Operating Temperature | 32 to 122 F (0 to 50 C) |
| Operating Humidity | 0 to 95% Non-condensing |
| Dimensions       | 12.2 x 9.6 cm (4.8 x 3.8 in) Card Edge |
| Mounting Bracket | 1.2 x 12.1 x 0.9 cm (0.5 x 4.8 x 0.4 in) |
| Approvals        | FCC, CE |

*Note: Isolated Models Only
**Note: Model 3PCIOU4 supports RS-232 TD, RD, RTS, CTS, and Ground only
PCI Express Low Profile Serial Card
DSLP-PCIE-100

PCI Express low profile serial cards offer a high-speed, serial I/O bus that maintains backwards capability with PCI applications and drivers. The layered architecture supports existing PCI applications and drivers by maintaining compatibility with the existing PCI model. Defined by high performance, scalable, serial bus, PCI Express Cards are dedicated to the device while multiple PCI Express devices can be active without interfering with each other.

The DSLP-PCIE-100 is configured to fit into low profile systems using one PC slot. It has a fanout cable to connect two serial devices, supports hot swapping, plug-n-play connections.

About PCI Express Card Technology
B&B Electronics’ Quatech brand PCI Express Serial Cards are the breaking edge standard in serial card PCI technology and the successor for server- and client system I/O interconnects. In addition to bus technology upgrades, such as faster speeds and deeper FIFO rates, PCI Express cards have many advantages over traditional PCI cards including point-to-point link dedicated to each device (instead of PCI shared bus); lower latency in server architectures due to a more direct connection to the chip set; small connectors with easier implementation for system designers and advanced features via isochronous channels for guaranteed bandwidth delivery, advanced power management and hot swap support.

Advanced Features - As client system boards migrate from the PCI connector to the PCI Express connector, Quatech PCI Express cards maximise advanced features such as:
- Advanced power management
- Support for real-time data traffic
- Hot plug and hot swappability
- Data integrity and error handling

PCI Express vs. Universal PCI - Although PCI and UPCI Cards can be used in a variety of platforms, PCI Express reflects an industry trend to replace legacy shared parallel buses with high-speed serial buses. They both have the same dimensions and are equipped with rear brackets. But, the difference lies in the I/O connectors. PCI Express has 36 pins versus the 120 pins on a standard PCI connector.

PRODUCT FEATURES
- Supports serial data transfer rates to 230.4 kbps
- Advanced architecture utilises point-to-point technologies
- Data bus transfer rate of up to 2.5 Gbps under one-lane operation
- Compliant with PCI Express Base Specification 1.0a

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSLP-PCIE-100</td>
<td>2-port Serial RS-232 to DB9, Low Profile, PCI Express Board</td>
</tr>
</tbody>
</table>

SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Transfer Rate</td>
<td>Up to 230.4 kbps</td>
</tr>
<tr>
<td>Interface</td>
<td>RS-232</td>
</tr>
<tr>
<td>Bus</td>
<td>PCI-Express X1</td>
</tr>
<tr>
<td>Ports/Connectors</td>
<td>(2) DB-9 serial fan out cable, requires 1 PC bracket slot</td>
</tr>
<tr>
<td>Machine Compatibility</td>
<td>Low profile systems, standard height configuration with low profile orb installed</td>
</tr>
<tr>
<td>O/S Support</td>
<td>Windows 2000/XP/Server 2003/Vista/Win7 32/64 bit</td>
</tr>
</tbody>
</table>

ENVIRONMENTAL

| Operating Temperature | -30 to 75°C (-30 to 167°F) |
| Storage Temperature | -40 to 85°C (-40 to 185°F) |
| Ambient Relative Humidity | 5 to 95% Non-condensing |

APPROVALS / CERTIFICATIONS

Certifications | CE, FCC, Compliant with PCI Express Base Specifications 1.0a |
Low Profile Universal PCI Serial Cards
DSCLP-100, ESCLP-100, QSCLP-100, SSCLP-100/-200/300

PRODUCT FEATURES
- 1, 2, 4 or 8 independent RS-232 ports
- RS-232 speeds up to 921.6 kbps (100 series)
- RS-422 or 485 configurable, full or half duplex (excludes ESCLP-100)
- RS-422/485 speeds up to 460.8 kbps (200/300 series)
- Auto enable/disable of RS-422/485 transmitter
- 16550 UARTs with 16-byte FIFOs (1, 2, 4 port boards)
- 16750 UARTs with 64-byte FIFOs (8 port boards)

These Low Profile Universal PCI Serial Cards utilise a single PCI slot to provide two independent asynchronous serial ports sharing a single interrupt. Multi-port versions require only one slot to connect. The cards include a fan out cable with independent DB-9 male connectors. All PCI registers are properly implemented, so you can be assured that these boards will be good citizens on the PCI bus. These models use a universal PCI connector compatible with both the 3.3V connector key required by PCI 2.3 and later specifications and the 5V connection used by older systems. Full modem control and hardware and software flow control

Serial port connections are made via DB-9 male connectors with 16550 UARTs containing 16-byte FIFOs. To maintain maximum signal integrity, the four-layer board design ensures maximum protection versus noise propagation throughout the communication lines.

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSCLP-100</td>
<td>1 Port, RS-232, DB9, Low Profile, Universal PCI</td>
</tr>
<tr>
<td>SSCLP-200/300</td>
<td>1 Port, RS-422/485, DB9, Low Profile, Universal PCI</td>
</tr>
<tr>
<td>DSCLP-100</td>
<td>2 Port, RS-232, DB9, Low Profile, Universal PCI</td>
</tr>
<tr>
<td>QSCLP-100</td>
<td>4 Port, RS-232, DB9, Low Profile, Universal PCI</td>
</tr>
<tr>
<td>ESCLP-100</td>
<td>8 Port, RS-232, DB9, Low Profile, Universal PCI</td>
</tr>
</tbody>
</table>

About Low Profile Universal Cards
Low Profile Universal PCI cards add serial connectivity to a variety of desktop, thin client, embedded systems, and server environments. These boards provide true universal connectivity, enabling a single product to be used to implement systems with dramatically different resource requirements. This makes Quatech boards the most robust, flexible, and economical choice for any application requiring multiple serial ports. These cards are mechanically similar to standard PCI cards, but use a shorter board and a different mounting bracket. With greater flexibility, they are designed on the smallest MD1 low profile footprint, but come with both a full size ORB for standard systems, and a smaller ORB for use in low profile backplanes to fit even 2U racks without riser cards. A wide range of OS options facilitates system upgrades and multiplatform installations.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus Interface</td>
</tr>
<tr>
<td>O/S Support</td>
</tr>
<tr>
<td>Data Rate</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-232 Connectors/Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSCLP: DB-25 male to cable with 2 DB-9 male</td>
</tr>
<tr>
<td>QSCLP: HD-44 female to cable with 4 DB-9 male</td>
</tr>
<tr>
<td>ESCLP: VHDCI-68 male to cable with 8 DB-9 male</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-422/485 Connectors/Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSCLP: DB-25 female to cable with 2 DB-9 female</td>
</tr>
<tr>
<td>QSCLP: HD-44 female to cable with 4 DB-9 female</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-232 UARTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/ DSCLP: 16550 UARTs; 16-byte FIFOs (1 per port)</td>
</tr>
<tr>
<td>ESCLP: 16750 UARTs; 64-byte FIFOs (1 per port)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-422/485 UARTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>QSCLP: 16750 UARTs; 64-byte FIFOs (1 per port)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-232 Transceiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICL3245CA or compatible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-422/485 Transceiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX3076E or compatible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-232 Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Level Output: +5V (min), +5.4V (typical)</td>
</tr>
<tr>
<td>Low Level Output: -5V (min), -5.4V (typical)</td>
</tr>
<tr>
<td>Transition Time (THL-TLH): 25ns (typical)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-422/485 Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential Voltage: ±3.3V</td>
</tr>
<tr>
<td>Transition Time (THL): 52ns (typical)</td>
</tr>
<tr>
<td>Transition Time (THL): 60ns (typical)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-232 Receive Buffers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Range: -25V (max), -25V (minimum)</td>
</tr>
<tr>
<td>Transition Time (THL-TLH): 50ns (typical)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RS-422/485 Receive Buffers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential Input Threshold: ±0.2V</td>
</tr>
<tr>
<td>Voltage Range: -7V to +12V Common Mode Input</td>
</tr>
<tr>
<td>Transition Time (THL-TLH): 65ns (typical)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD1 board, fits 2U racks: 6.36 x 11.99 cm (2.5 x 4.72 in)</td>
</tr>
<tr>
<td>Low profile PCI bracket: 7.92H cm (3.12 in)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
</tr>
<tr>
<td>+5V, 260mA (typical)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
</tr>
<tr>
<td>0 to +70 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
</tr>
<tr>
<td>-50 to +80 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPROVALS / CERTIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certifications</td>
</tr>
<tr>
<td>CE, FCC Class B</td>
</tr>
<tr>
<td>RoHS and WEEE compliant</td>
</tr>
</tbody>
</table>
These boards support serial data transfer rates up to 115.2 kbps plus hot swapping, plug-n-play connection availability. PCIe Express serial/parallel boards has many advantages over traditional PCI cards, including a point-to-point link dedicated to each device instead of the PCI’s shared bus; lower latency in server architectures due to a more direct connection to the chip set; small connectors with easier implementation for system designers and advanced features via isochronous channels for guaranteed bandwidth delivery, advanced power management and hot swap support.

**Orders Information**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS-PCIE-100</td>
<td>2-port Serial RS-232 to DB-9 (requires 1 PC bracket slot)</td>
</tr>
<tr>
<td>QS-PCIE-100</td>
<td>4-port Serial RS-232 to DB-9 (requires 1 PC bracket slot)</td>
</tr>
<tr>
<td>HS-PCIE-100</td>
<td>6-port Serial RS-232 to DB-9 (requires 3 PC bracket slots)</td>
</tr>
</tbody>
</table>

**Specifications**

**Serial Technology**

| Compliance | Compliant with PCI Express Base Specification 1.0a |
| UART/FIFO  | Built-in 16C550 compatible UART with 16 byte transmit-receive FIFO |
| Serial Data Rate | Up to 115.2 kbps |
| Interface | RS-232 |
| Machine Compatibility | Full height systems |
| Bus | PCI-Express X1 |
| DS-PCIE-100 Ports/Connectors | 2 DB-9 serial on orb bracket, requires 1 PC bracket slot |
| QS-PCIE-100 Ports/Connectors | 4 DB-9 serial, requires 1 PC bracket slot, fan out cable |
| HS-PCIE-100 Ports/Connectors | 6 DB-9 serial, requires 3 PC bracket slots |

**Environmental**

| Operating Temperature | 0 to +70 °C |
| Storage Temperature | -50° to +80°C |
| Operating Humidity | 10 to 90% Non-Condensing |

**Approvals / Certifications**

| Agency Approvals | FCC, CE |
| Compliant with PCI Express Base Specification 1.0a |

**About PCI Express Card Technology**

These PCI Express Serial Cards are the breaking edge standard in PCI card technology for server and client system I/O interconnects. In addition to bus technology upgrades, such as faster speeds and deeper FIFO rates, PCI Express card advantages include a point-to-point link to each device (instead of PCI’s shared bus); lower latency in server architectures due to a more direct connection to the chip set; and small connectors with easier implementation for system designers.

**Advanced Features**

- As client system boards migrate from PCI connectors to PCI Express connectors, Quatech PCI Express cards maximise advanced features such as advanced power management, support for real-time data traffic, hot plug and hot swappability, and data integrity and error handling.

**PCI Express vs. Universal PCI**

- Although PCI and UPCI Cards can be used in a variety of platforms, PCI Express reflects an industry trend to replace legacy shared parallel buses with high-speed serial buses. They both have the same dimensions and rear brackets. But, the difference is in the I/O connectors: PCI Express has 36 pins versus the 120 pins on a standard PCI connector.
Serial Express Cards
DSPXP-100

PCI ExpressCard technology is emerging with faster speeds and better efficiency than typical PC cards, connecting high-bandwidth peripherals to notebooks and other portables. The serial ExpressCard’s credit-card form factor provides a smaller, faster and more desktop-friendly format.

Since laptops often do not provide the number and variety of built-in serial I/O ports available on a desktop PC, these one, two and four port cards can support I/O expansion and connectivity to serial devices in mobile laptop applications.

This 34mm PCI ExpressCard can be used in either 34 or 54mm slots. An included 54mm adapter improves the fit and durability of 34mm cards in larger 54mm slots and helps the card withstand normal or accidental stress and dislodging from the slot.

About PCI ExpressCards
The PXP card series was designed with a PCI Express (PCIe) interface rather than using USB controller interfaces. The PXP series is a great solution to connect to existing peripherals and maintain compatibility and functionality with current application software.

Advantages of a PCIe-based ExpressCard design are in the interface to the laptop’s motherboard. The PCIe bus interface is the successor to the PCI bus, which in turn was the successor to the ISA bus to which built-in ports were originally attached. As such, the ExpressCard adapter utilises a PCIe-based design and can still directly use I/O space addresses and interrupts, thus more closely emulating built-in ports than can be done via USB-based design.

Moreover, because there is no USB stack for the drivers to contend with, throughput can be higher and latency will be lower (significantly in many cases). Due to improved data transfer rate, the ExpressCard is more efficient for multi-tasking operations. The PXP series supports data rates of up to 921.6 Kbps, providing steady flow of data throughput.

PRODUCT FEATURES
- I/O notebook expansion - adds PCIe serial ports
- Built-in 1024-byte FIFOs buffers boost data transmit/receive speed
- Baud rates up to 921.6 Kbps
- Hot plug & play, hot swapping capabilities
- Installs in any 34mm and 54mm Expresscard slots
- Supports PCI Express Base Specification Revision 1.1a

ORDERING INFORMATION

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<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
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<td>DSPXP-100</td>
<td>2-port RS-232 Express Card</td>
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SPECIFICATIONS

<table>
<thead>
<tr>
<th>SERIAL TECHNOLOGY</th>
<th>EXPRESSCARD STANDARD, PCI EXPRESS-BASED DESIGNS SPECIFICATION, REVISION 1.1 COMPLIANT INTERFACE</th>
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<tr>
<td>Bus Interface</td>
<td>ExpressCard Standard, PCI Express-based Designs Specification, Revision 1.1 compliant interface</td>
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<tr>
<td>Baud Rate</td>
<td>921.6 kbps per port</td>
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<tr>
<td>UART</td>
<td>16450/550/750-compatible register set</td>
</tr>
<tr>
<td>Data FIFO</td>
<td>1024-bytes</td>
</tr>
<tr>
<td>Data Bits</td>
<td>Supports 5, 6, 7, 8</td>
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<tr>
<td></td>
<td>Supports even, odd, mark, space &amp; no parity</td>
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<tr>
<td></td>
<td>Supports 1, 1.5 &amp; 2 stop bits</td>
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<tr>
<td>O/S Support</td>
<td>Windows XP/Vista/7, 32 &amp; 64 bit</td>
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<td>Ports/Connectors</td>
<td>DSPXP-100: 2, RS-232, DB9 Male</td>
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ENVIRONMENTAL

| OPERATING TEMPERATURE                     | 0 to +70 °C                                                                                        |
| STORAGE TEMPERATURE                       | -50 to +80 °C                                                                                     |
| OPERATING HUMIDITY                        | 10 to 90%                                                                                         |

APPROVALS / CERTIFICATIONS

DSPXP -100 | TIA-232-F (RS-232) compliant
Agency Approvals | FCC, CE, RoHS

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