



“If an IED has a copper port, it needs a DYMEC Link/Repeater”

- Extends distance
- Protects signal integrity and data equipment
- Allows network configurations not available with copper
- Allows mixture of RS232 and RS485 on same network segment without additional equipment
- “DYMEC Hardened” is a respected Premium



Substations and Generating Plants With Harsh Environments

- GPR
- Power surges / transients
- EMI / RFI
- Temperature extremes
- Lightning

DYMEC Link Specifications

- Operating temperatures -40° to +85 °C
- Bus powered
 - 12 Vdc
 - 24-48Vdc and 90-250 Vac or Vdc
 - C37.90.1 and IEEE1613 (Surge and Transient)
- IEEE1613, IEC61850, CSA/UL 60950 and CE
- 5km range on MM fiber, up to 30km on SM Fiber
- Modes are user selectable
- 5 year warranty
- Multiple mounting options
- Diagnostics
- Passive to Protocols and Baud Rates
- EMI Resistant metal enclosure

Link Repeater Power Options

- Small form factor
 - 9-15 Vdc
- Large form factor from station battery
 - Low Voltage 18-62 Vdc
 - High Voltage 90-250 Vdc/ac



Ethernet Fiber Links



- Ethernet-over-fiber links
- 10baseT to 10baseFL MM or SM
- 100baseT to 100baseFX MM or SM
- Automatic polarity detection and correction
- Auto-adapts to half or full duplex mode
- Substation hardened and powered



Serial Fiber Link Types

- RS 232
- RS 485
- Multi-channel RS 232

Serial Fiber Links Topologies

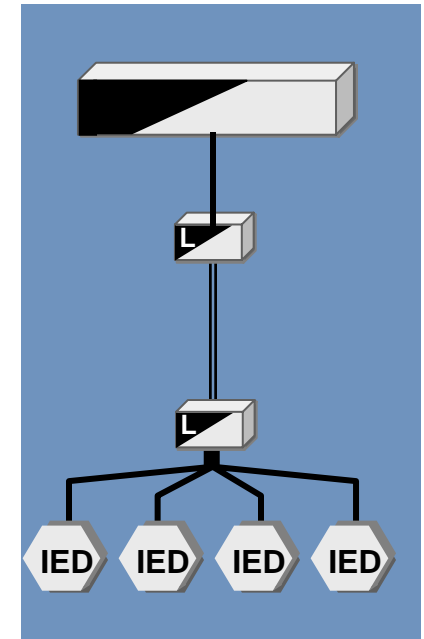
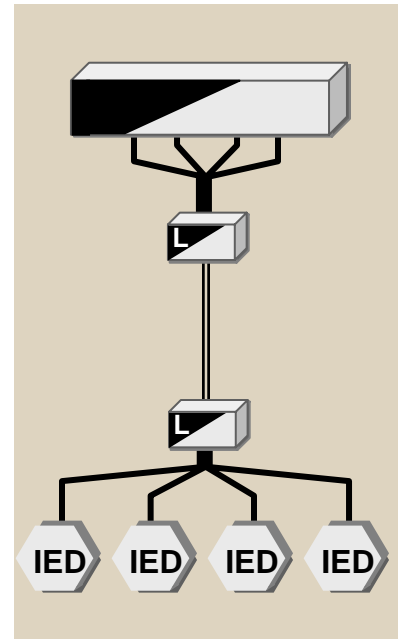
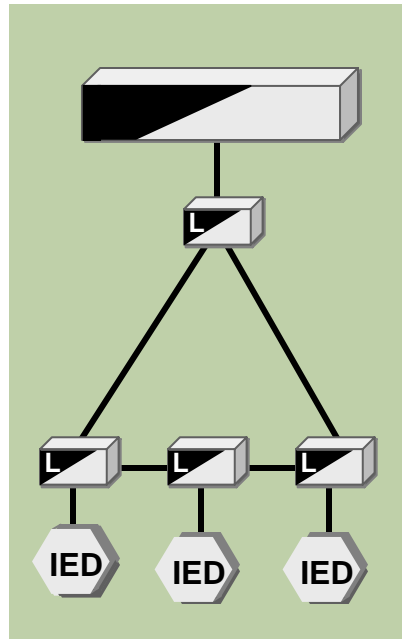
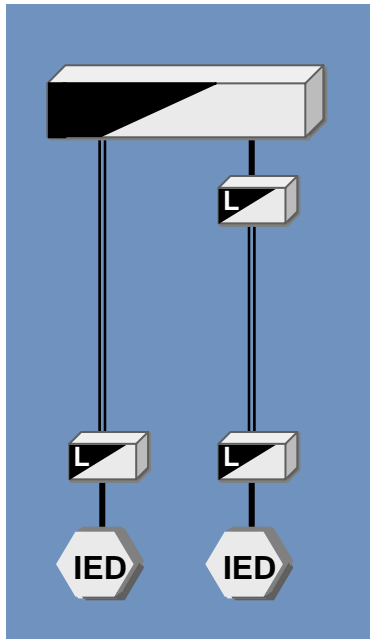
Point-to-point

Loop

4-Ch. Mux

4-Ch. Star

Data device: e.g., router, FRAD, concentrator, processor



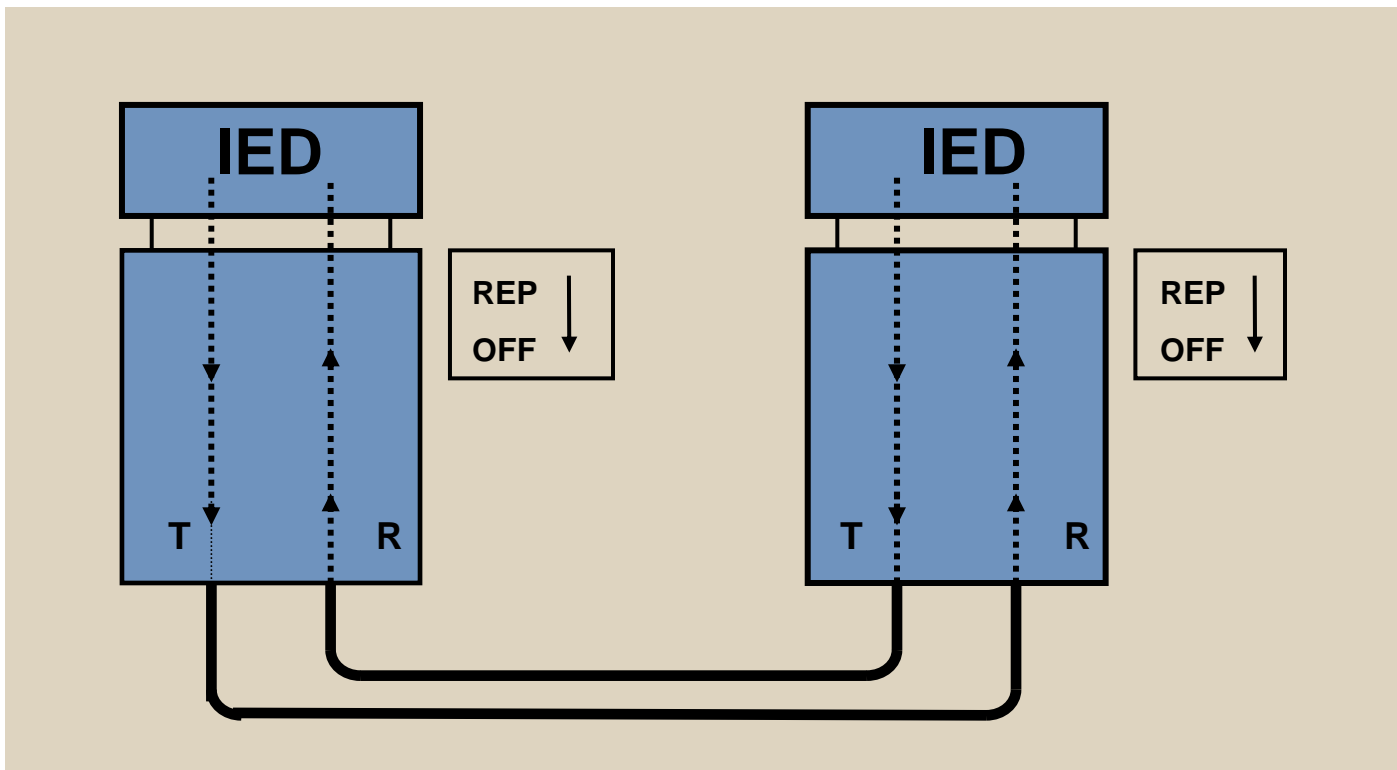
Copper IED interfaces



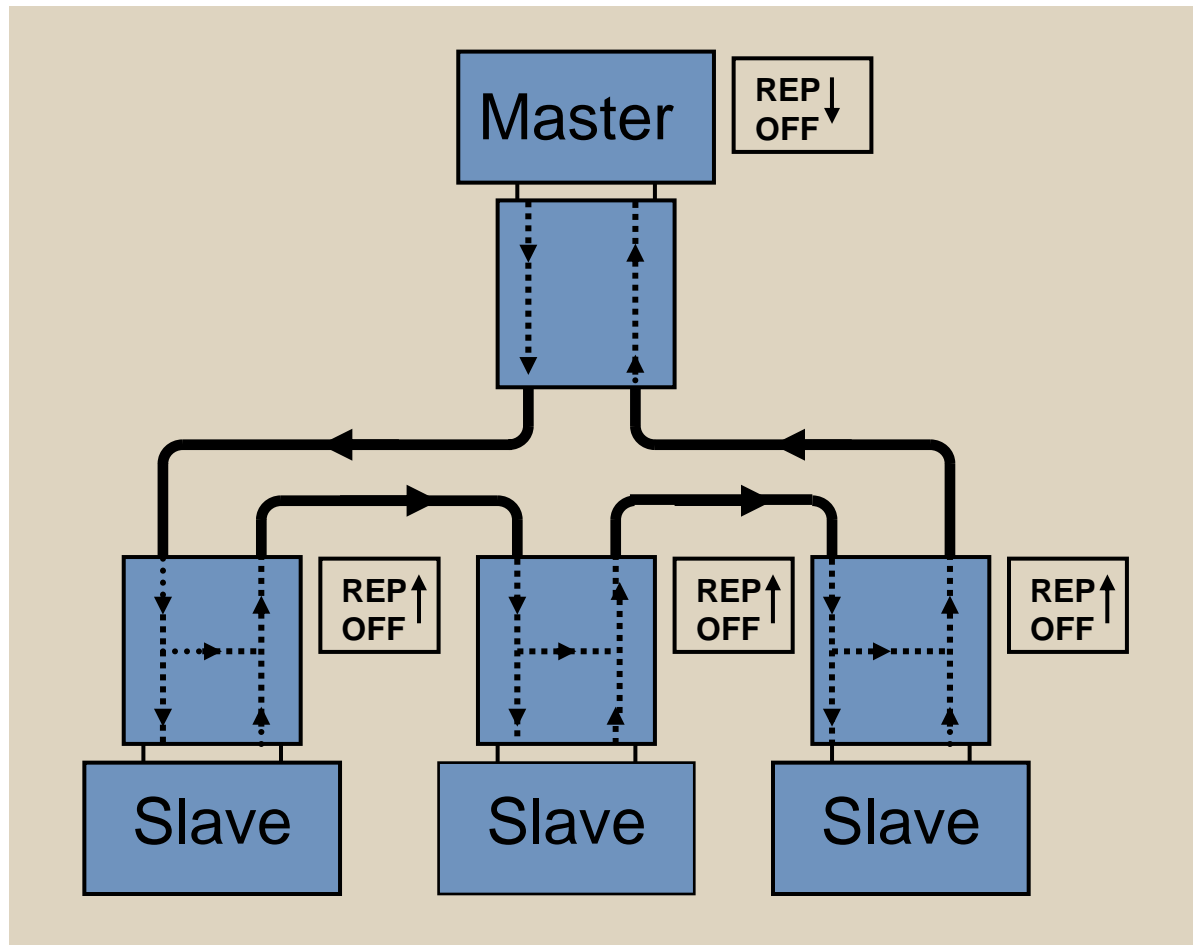
RS 232 Link Repeaters

- Asynchronous single channel
- Sync single and dual channel
- Full handshaking, RTS/CTS, DSR/DTR
- Multiple Channels over Single Fiber
- Multiple Channels with IRIG-B
- Contact Closures (DC)
- Create Loops, Buses and Stars
- DC to 250Kb
- MM or SM Fiber

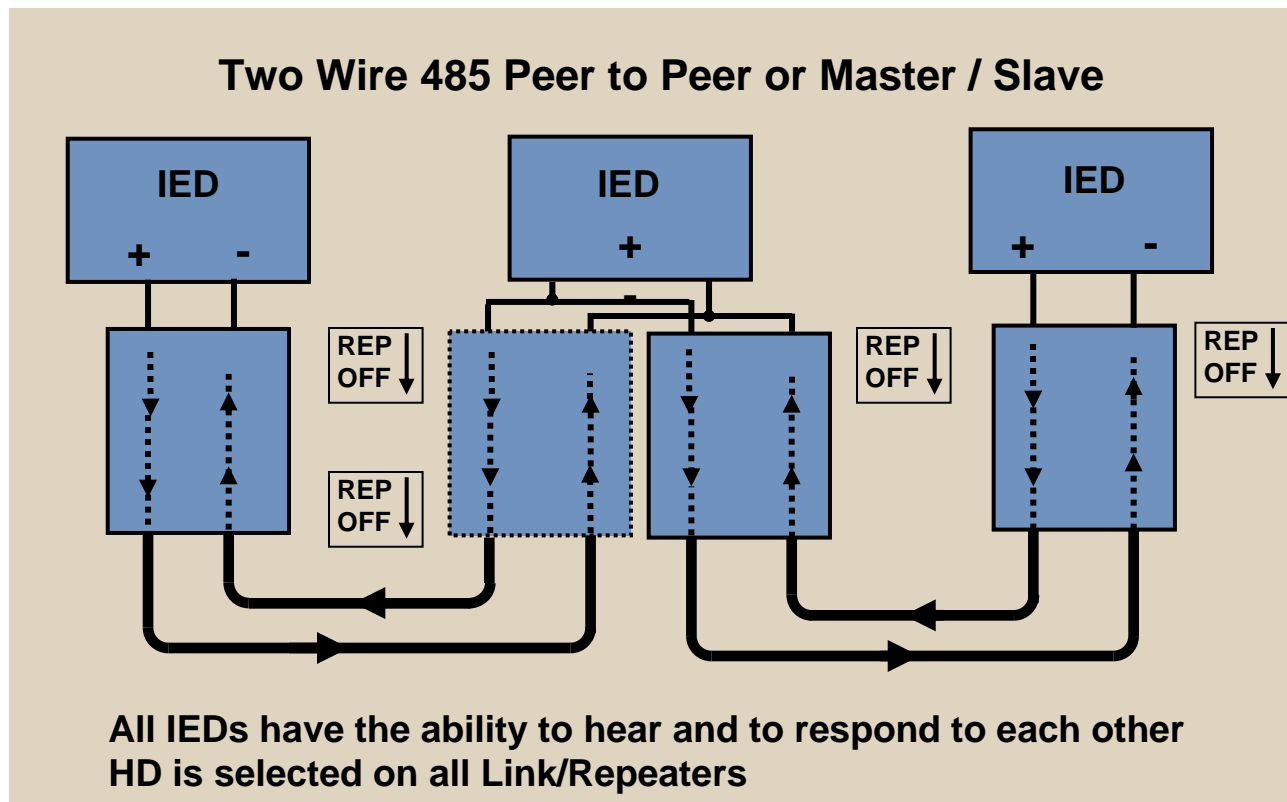
Traditional Point to Point



Loop Configuration



Optical Bus Configuration for EIA 485 (2 Wire)



RS-232 Single-channel Links

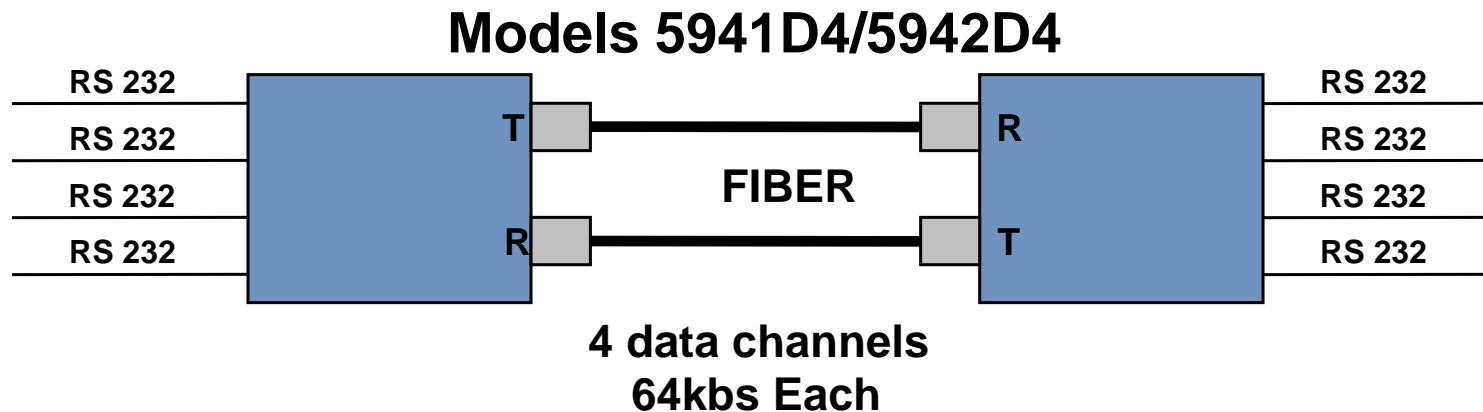
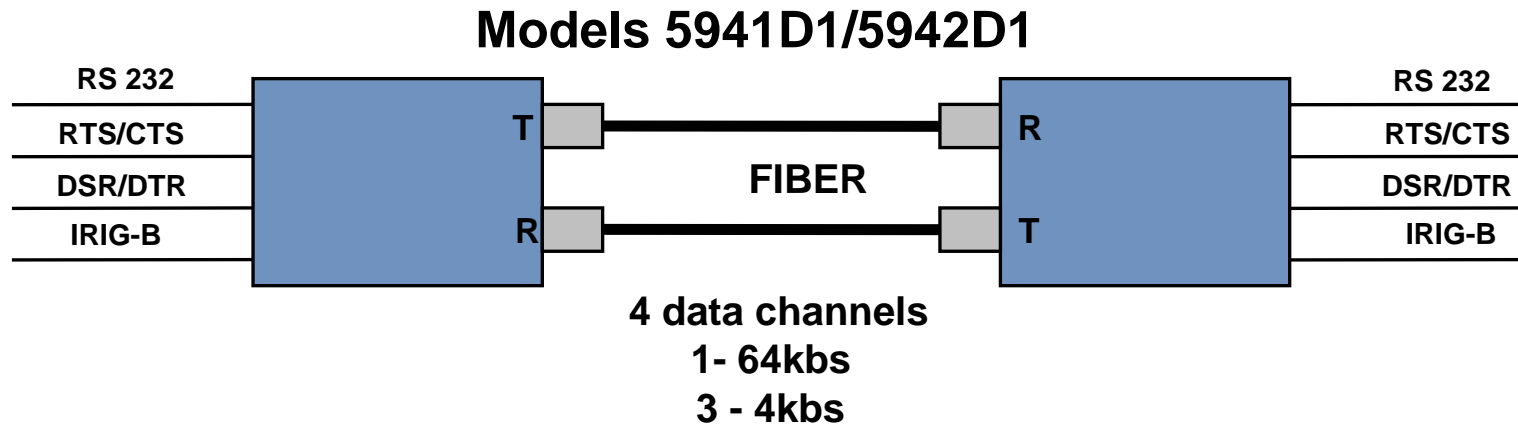
| Model | Input | Fiber Type | Input Power Rating |
|--------------|--------------|-------------------|---------------------------|
| 5843HRT | RS232/TTL | Multimode | 9 - 15 Vdc |
| 5844HRT-H | RS232/TTL | Multimode | 90-250 Vdc/ 90-250 Vac |
| 5844HRT-L | RS232/TTL | Multimode | 24 to 48 Vdc |
| 5843SHRT | RS232/TTL | Single-Mode | 9 - 15 Vdc |
| 5844SHRT-H | RS232/TTL | Single-Mode | 90-250 Vdc/ 90-250 Vac |
| 5844SHRT-L | RS232/TTL | Single-Mode | 24 to 48 Vdc |



Multi Channel RS 232 Links Models 5941 and 5942

- Four Separate Data Channels on a Single Fiber
- Supports IRIG-B
- Supports
 - Handshaking
 - Contact Closure

Multi-Channel RS 232 Links



Model 5941D1/5942D1

Common Applications

- Data
 - Async data with IRIG-B signal
 - Async data with full handshaking
 - Async data with “push to talk” signal for radios
 - Sync data using auxiliary channel for clock
- Contact
 - KYZ contacts from meters
 - Relay contacts for point to point trip
 - Simple dry contact closures

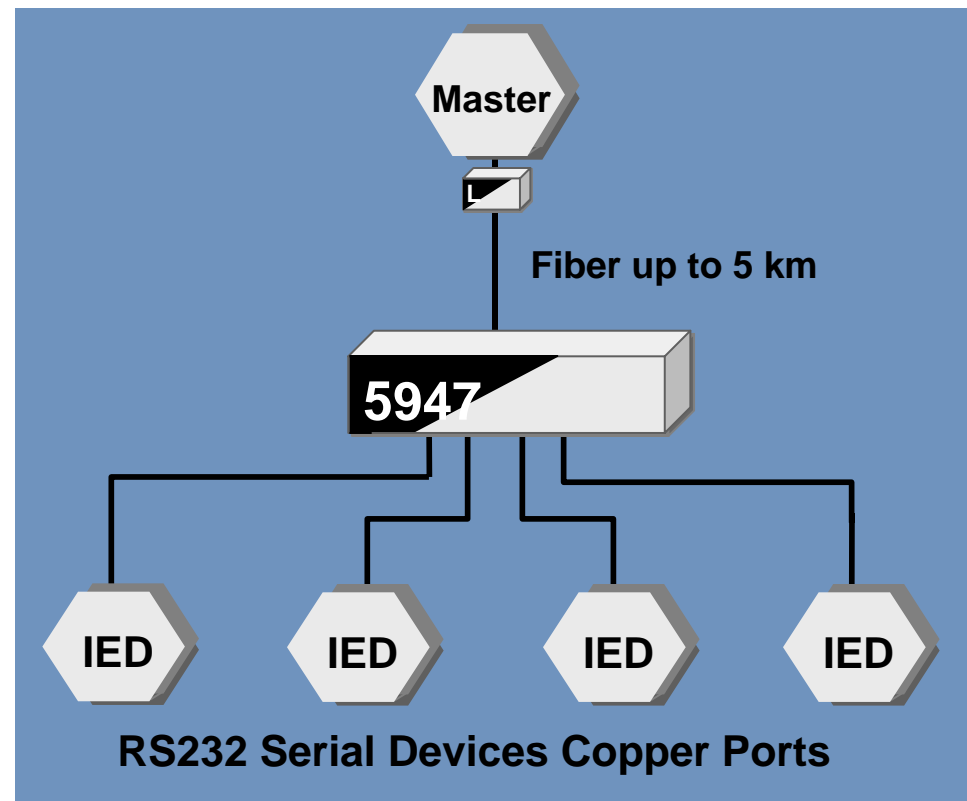


Model 5941D4/5942D4 Common Applications

- Data
 - Four separate Async RS 232 64kb channels
 - Two separate sync RS 232 with clock

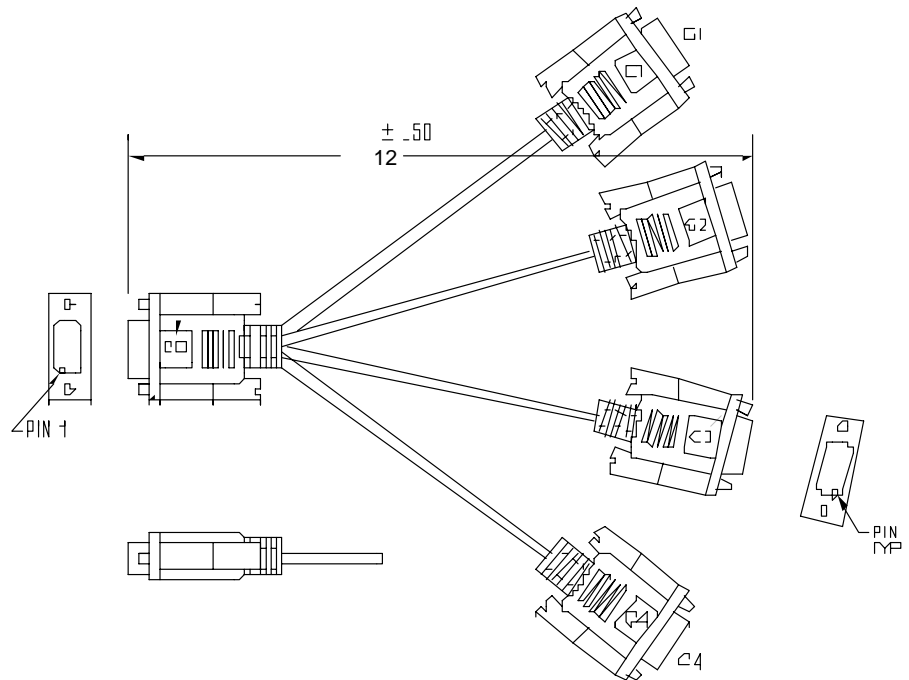
4 Port Fiber Up Link 5947 & 5948

- Optical Star functionality in a Link/ Repeater
- RS-232 Only
- 4 Copper Ports
- 1 Fiber Port MM or SM
- Works with all other serial Link/Repeaters and Optical Stars except the 5941/42 Series
- Use with ACC-CBL2 “Hydra Cable”



ACC-CBL2 “Hydra Cable”

- 1 Male DB9
- 4 Female DB9
- 1 Foot Length
- Fully Shielded
- -40 to +85
Rated



RS232 Multi-channel Links

| Model | EIA Std | Fiber | Input Pwr Rating | 64K Data Rate |
|--------------|----------------|--------------|-------------------------|----------------------|
| 5941D1HRT | RS232/TTL | Multimode | 9 - 15 Vdc | 1 Channel |
| 5942D1HRT-H | RS232/TTL | Multimode | 90-250 Vdc/ 90-250 Vac | 1 Channel |
| 5942D1HRT-L | RS232/TTL | Multimode | 24 to 48 Vdc | 1 Channel |
| 5941SD1HRT | RS232/TTL | Single-Mode | 9 - 15 Vdc | 1 Channel |
| 5942SD1HRT-H | RS232/TTL | Single-Mode | 90-250 Vdc/ 90-250 Vac | 1 Channel |
| 5942SD1HRT-L | RS232/TTL | Single-Mode | 24 to 48 Vdc | 1 Channel |
| 5941D4HRT | RS232/TTL | Multimode | 9 - 15 Vdc | 4 Channels |
| 5942D4HRT-H | RS232/TTL | Multimode | 90-250 Vdc/ 90-250 Vac | 4 Channels |
| 5942D4HRT-L | RS232/TTL | Multimode | 24 to 48 Vdc | 4 Channels |
| 5941SD4HRT | RS232/TTL | Single-Mode | 9 - 15 Vdc | 4 Channels |
| 5942SD4HRT-H | RS232/TTL | Single-Mode | 90-250 Vdc/ 90-250 Vac | 4 Channels |
| 5942SD4HRT-L | RS232/TTL | Single-Mode | 24 to 48 Vdc | 4 Channels |



RS 422/485 Link Repeaters

- Two wire, 485 (half duplex)
- Four wire, 422/485 (full duplex)
- Bus and star configurations
- Auto conversion of RS 232 to RS 485
- DC to 2 Mbs
- MM or SM Fiber

RS-422/485 Links

| Model | Input | Fiber Type | Input Power Rating |
|--------------|--------------|-------------------|---------------------------|
| 5845HRT | EIA 422/485 | Multimode | 9 - 15 Vdc |
| 5846HRT-H | EIA 422/485 | Multimode | 90-250 Vdc/ 90-250 Vac |
| 5846HRT-L | EIA 422/485 | Multimode | 24 to 48 Vdc |
| 5845SHRT | EIA 422/485 | Single-Mode | 9 - 15 Vdc |
| 5846SHRT-H | EIA 422/485 | Single-Mode | 90-250 Vdc/ 90-250 Vac |
| 5846SHRT-L | EIA 422/485 | Single-Mode | 24 to 48 Vdc |

Optical Stars



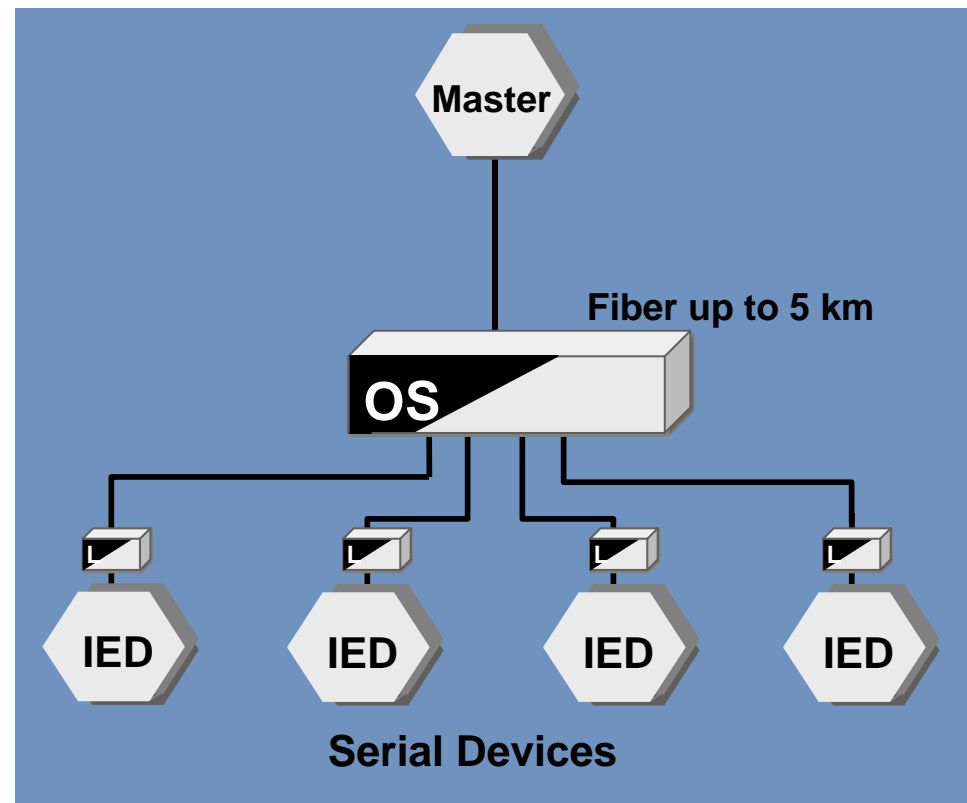
OS5

OS9



Serial Optical Star

- Optical star connections for polled serial connections
- RS-232 or RS-485
- Master/Slave or Peer/Peer
- 5 or 9 ports
- May be cascaded
- Optional copper master port

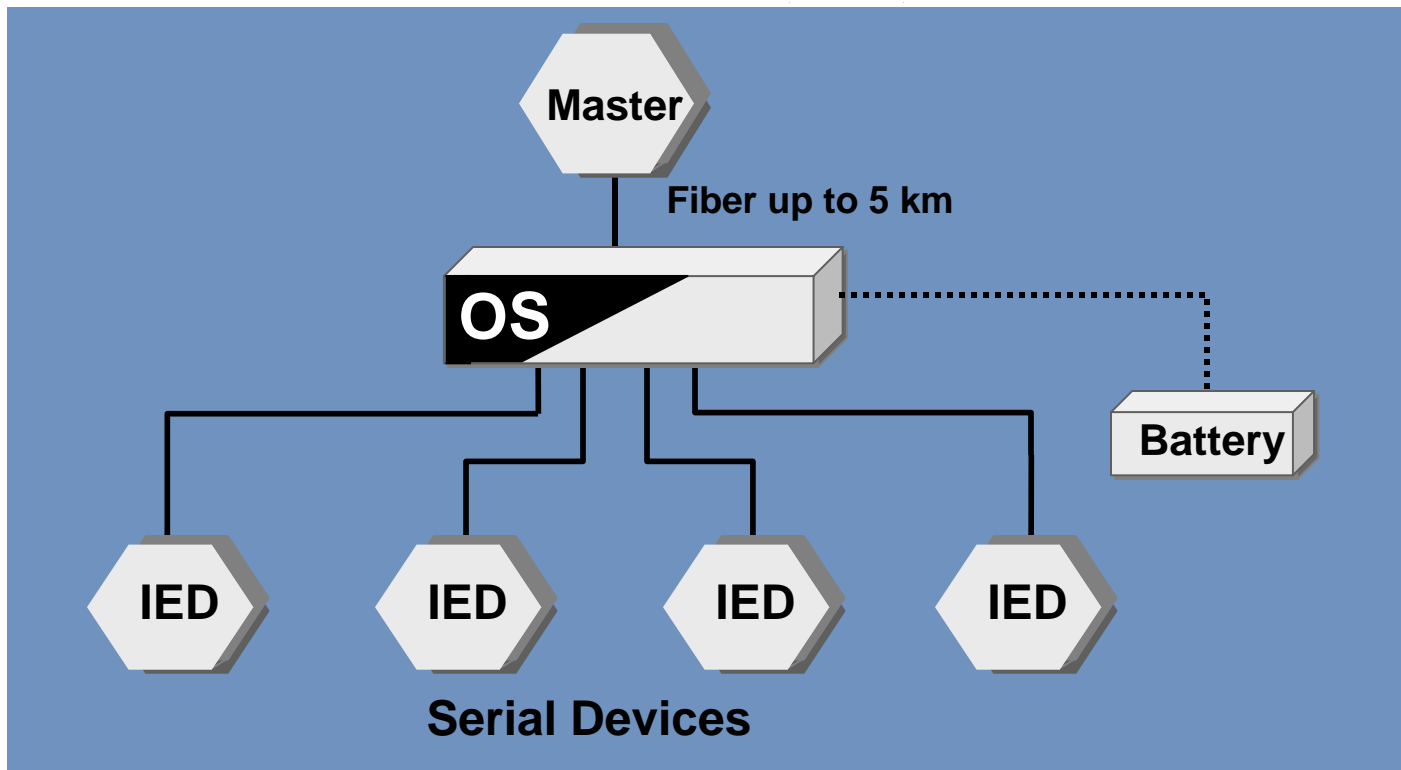




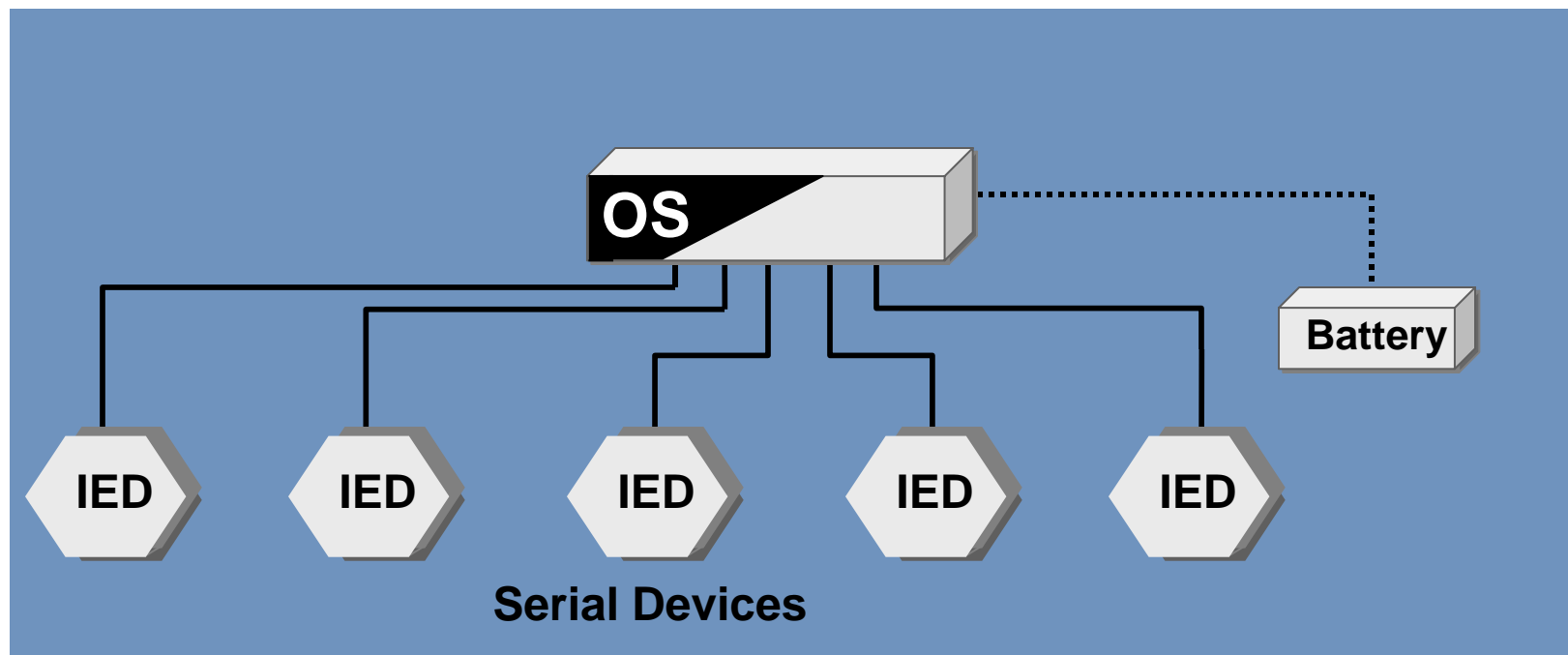
Optical Star Configurations

- Master slave
- Peer to peer
- Cascaded

Master/Slave RS 232 or RS 485

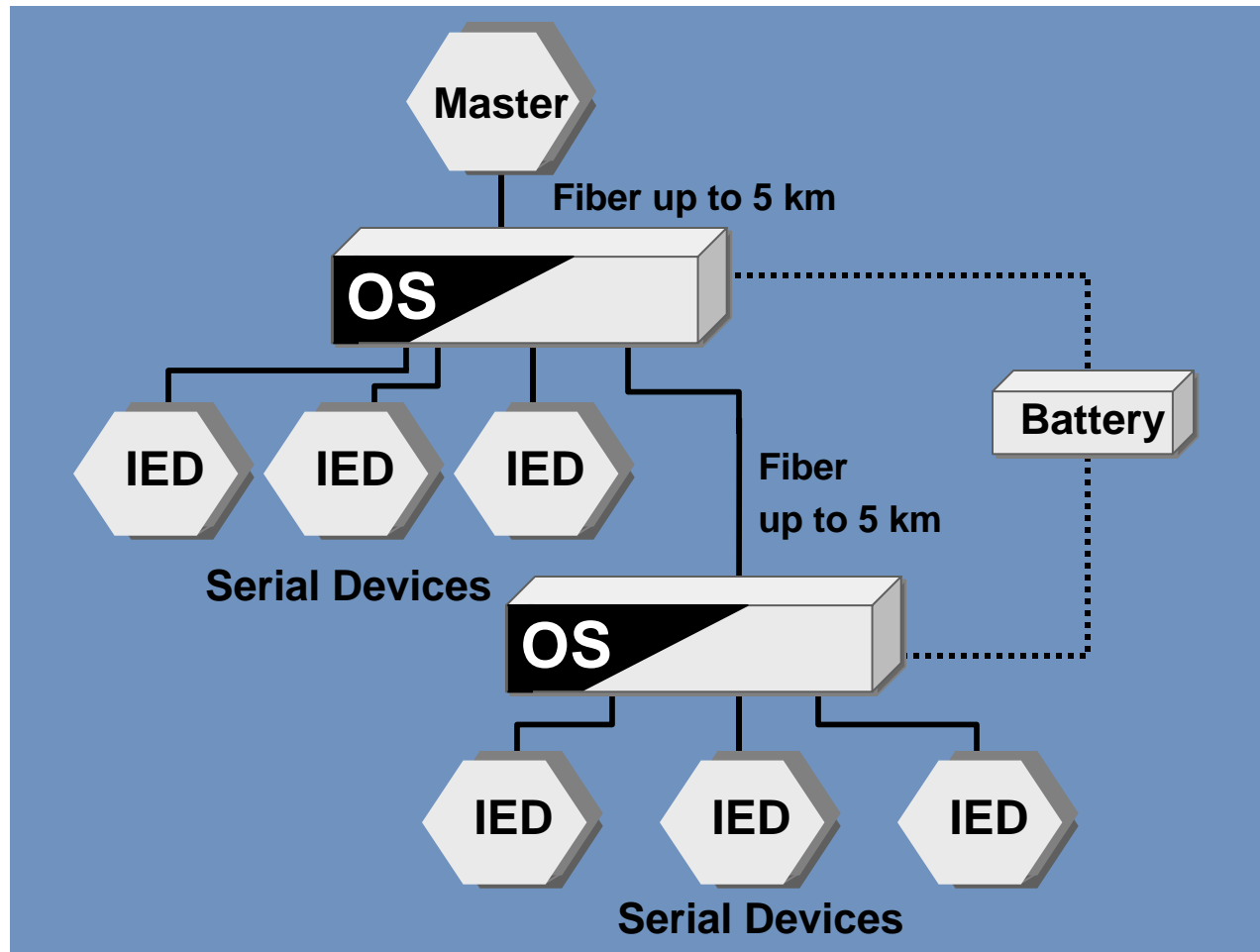


Peer-to-Peer RS 232 or RS 485



Cascaded Master/Slave

RS 232 or RS 485





Optical Stars Power Options

- From Station Batteries
 - Low Voltage 18-62 Vdc
 - High Voltage 90-250 Vdc/ac
- IEEE C.37.90, IEEE 1613, IEC 61850
- UL, CE, FCC



Optical Stars

- Operating Temperatures -40° to $+85^{\circ}$ C
- 5 km range with MM Optics
- Up to 30 km range with SM Optics
- Modes are user selectable
- 5 year warranty
- Multiple mounting options

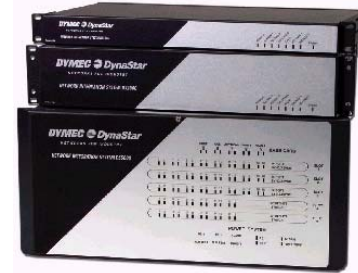
DYMEC Product Lines

Wide-Area Network Access and Integration



DynaStar Industrial Frame Router

DynaStar Network Integration System



Ethernet Switch Systems

Ethernet Terminal Server



Ethernet Media Converters

Ethernet Convergence

Optical Star



Link / Repeaters

Serial-over-Fiber



GarrettCom®
Industrial Networking at Its Best™



Robust ... Flexible ... Cost-effective

Communications solutions for substation automation