# LDM85

## Fiber Optic Modem

### Description

The LDM85 is a small, inexpensive fiber optic transmitter/receiver. It features a complete RS-232/422/423 port as well as high speed TTL data transmit and receive. It is capable of data rates from DC to 5M baud. A pair of these units allows most RS-232C cable links to be replaced and extended with a duplex fiber optic cable. The normal 50-foot RS-232 limit may be extended to 1.2 miles (2 km). Fiber optic data communications provide complete EMI/RFI rejection, isolation, elimination of ground loops, and reduced error rates. Data security is enhanced by almost nonexistent electromagnetic emissions. A unique multipoint capability allows local area networks to be formed with the isolation and data security of a fiber optic data highway.

The LDM85 is packaged in a rugged aluminum enclosure small enough to mount on the back panel of typical computer equipment, saving valuable desk and floor space. The RS-232 connection is through male or female EIA 25-pin connectors. The fiber optic connection is either through SMA (905) or ST connectors. Additional features include a TD/RD reversing switch for connection to DTE (Data Terminal Equipment) or DCE (Data Communication Equipment) ports, three diagnostic LED indicators, and locally connected handshake lines. The TTL port combined with the RS-232 port may be interfaced to RS-422/423 ports in 4-wire point-to-point mode only. Fiber optic cables may be ordered with connectors factory installed.

### ▶ Features

- Data Rates to 5M Baud
- RS-232, RS-422, TTL System Interfaces
- Multipoint Capability
- LED Indicators
- DCE/DTE Switch
- Small Size
- Low Cost
- SMA- or ST-Compatible Optic Connectors
- Connectored Cables Available
- 120/220VAC, +5VDC or 8 to 20VAC/DC Power
- CE Compliant

Dataforth does not authorize or warrant its products for use in life support/critical applications.

### Specifications

| Model | LDM85 |
|---|---|
| Baud Rate Range TTL | 0 – 5M, 0 – 2.5M NRZ |
| Baud Rate Range RS-232/422/423 | 0 – 100K |
| Distance (miles) | Up to 1.2 depending on cable |
| Distance (km) | Up to 2 depending on cable |
| Modes | Asynchronous 2-fiber full duplex, 1-fiber simplex |
| Channel Lines(1) | TD, RD, TTL TD, TTL RD |
| Control Lines(1) | RTS, CTS, DSR, DTR, RLSD |
| Optical Transmitter | 820 nm wavelength -11.5dBm typical output from 1 m cable, -16dBm minimum output (-40°C to +85°C) |
| Numerical Aperture | 0.49 |
| Optical Port Diameter | 290 mm |
| Optical Receiver | -25dBm to -12dBm dynamic range for logic 1, -24dBm minimum input logic 1 (-40°C to +85°C), -40dBm maximum input logic 0 |
| Equivalent Numerical Aperature | 0.50 |
| Optical Port Diameter | 400 µm |
| Optical Connectors | ST, SMA (905) |
| Power Budget | 8dB (-40°C to +85°C), 10dB (-20°C to +55°C) |
| DCE/DTE Switch | 1 |
| Diagnostic LEDs | 3 |

| Model | LDM85 |
|---|---|
| Power | |
| AC operation(2) | 120VAC or 220VAC (3W wall transformer) or 10VAC to 20VAC (3W transformer rating) |
| DC operation | +8VDC to +24VDC at 130mA or +5VDC ±0.25VDC at 130mA |
| Environmental: | |
| Operating Temperature Range | -40°C to +85°C |
| Storage Temperature Range | -40°C to +85°C |
| Relative Humidity | 0-95% non-condensing |
| Dimensions | 3.75" x 2.1" x 1" (95.3mm x 53.3mm x 25.4mm) |
| Weight | 3.7 oz (105g) max |
| PT3, PT3E | 11.0 oz (312g) |
| MTTF(3) | >120,000 hrs |

NOTES:
(1) TD = Transmit Data, RD = Receive Data, TTL TD and TTL RD are DCE referenced TTL signals, RTS = Request To Send, CTS = Clear To Send, DTR = Data Terminal Ready, DSR = Data Set Ready, RLSD = Received Line Signal Detect.
(2) 120VAC and 220VAC power transformers are available.
(3) Ground-benign environmental conditions (no salt atmosphere, <50°C ambient temperature).



For information call **800-444-7644**

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## Recommended Cables

The LDM85 optical transmitter is optimized for launching power into fiber sizes 85/125, 100/140, and 200$\mu$m plastic coated silica (PCS). Due to a lensed optical system, receiver response does not vary with fiber size.

| Model | LDM85CA (1 or 2) Cable |
|---|---|
| No. of Fibers | one in CA1, two in CA2 |
| Fiber Type | Glass |
| Core Diameter | 100µm |
| Cladding Diameter | 140µm |
| Outside Cable Diameter | 3mm each |
| Max Attenuation | 3dB plus 4dB/km |
| Cable Weight Per Channel | 7.5kg/km |
| Max. Installation Load Per Channel<br>Max. Operational Load Per Channel | 300N (67lb)<br>150N (33lb) |
| Min. Bend Radius-Unloaded | 3.0cm |
| Operating Temperature Range | -20°C to +70°C |
| Operational Distance with LDM85 Modem | 0.93 mi (1.5 km), min. (-20°C to +55°C) |

## Multipoint Operation

Local Area Networks (LANs) are easily implemented with LDM85. When a talker unit raises Request To Send (RTS), echo to the fiber is inhibited and its data is communicated to all other devices on a common loop. Data returns to the sending unit, verifying physical integrity of the loop (see Figure 6). Additionally, if pin 16 is strapped to pin 17, RD is forced to a -V (MARK) state as well as the echo to the fiber is inhibited (see Figure 3 for RS-232 or Figure 4 for RS-422/(TTL)). Units may be ordered with this connection made internally. For multipoint installations, it is important that power be applied to all LDM85s. For small networks it will likely be acceptable to power each unit from a local source. Larger networks may benefit from routing a common low voltage power bus along with the fiber optic cable. An AC bus with isolation transformers at each unit will preserve system resistance to electrical disturbances. The wide low voltage AC and DC tolerance makes voltage drop on this bus easily accommodated.

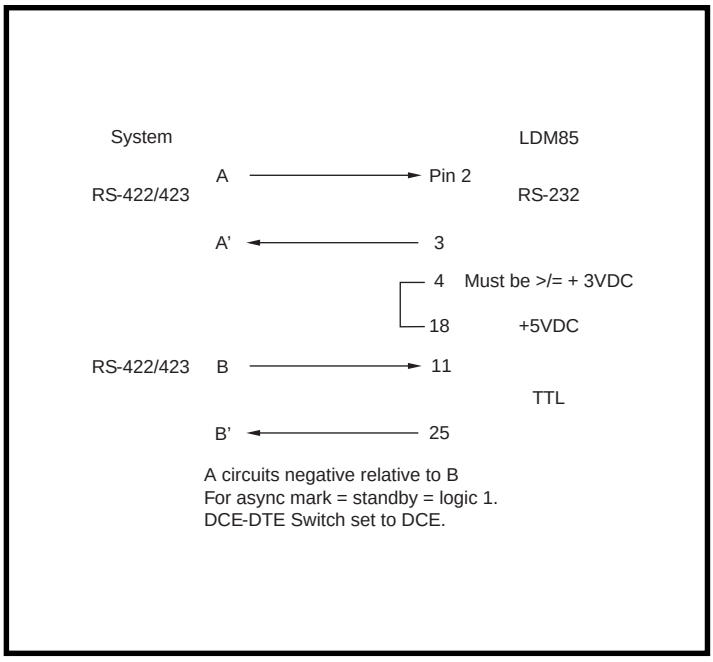



Figure 2: Alternate RS-422/423 Connections



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## Installation

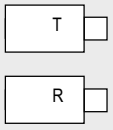
For installation and check-out it is recommended that a short fiber optic cable be connected from transmit to receive on a locally connected device. Then the computer, or alternately a computer terminal, may send characters to itself. During data transmission, the transmit (TD) and receive (RD) LEDs will come on during data spaces. The activity (ACT) LED is on when RTS is disabled and the optic receiver is spacing (no light). This indicates activity from a remote unit. The DCE/DTE switch is provided as a convenience to allow easy hookup to either terminal or communications equipment — it reverses pins 2 and 3 on the RS-232 connector. TD LED operation as above will indicate correct setting of the switch.

AC or DC power may be applied to the screw terminals or to pin 9 of the 25-pin connector. Alternatively the unit may be powered by +5VDC on pin 18.

***WARNING!*** *Observing the transmitter output power under magnification may cause injury to the eye. Observing the output under magnification may exceed the limits recommended in ANSI Z136.1 — 1981.*

| P1 Pin Descriptions | | | P2 Pin Descriptions |
|---|---|---|---|
| Pin 1 SHIELD | | Case Ground | Pin 1 12VAC |
| Pin 2 TD | [3] | Transmit Data | Pin 2 AC RTN (GND) |
| Pin 3 RD | [2] | Receive Data | |
| Pin 4 RTS | [7] | Request To Send | |
| Pin 5 CTS | [8] | Clear To Send | |
| Pin 6 DSR | [6] | Data Set Ready | |
| Pin 7 GND | [5] | Signal Ground | |
| Pin 8 RLSD | [1] | Receive Line Signal Detect | |
| Pin 9 +VDC | | +8 to +24 VDC Power In | |
| Pin 11 TTL TD | | TTL TD Inverse of TD | |
| Pin 16 Echo Sup 1 | | Echo Suppress Control Out | |
| Pin 17 Echo Sup 2 | | Echo Suppress Control In | |
| Pin 18 +5VDC | | +5VDC Power In, Pull Up Power Out | |
| Pin 20 DTR | [4] | Data Terminal Ready | |
| Pin 25 TTL RD | | TTL RD Inverse of RD | |

**Fiber Optic**




Pin numbers given are for the 25-pin connector with the 9-pin equivalent in [ ].

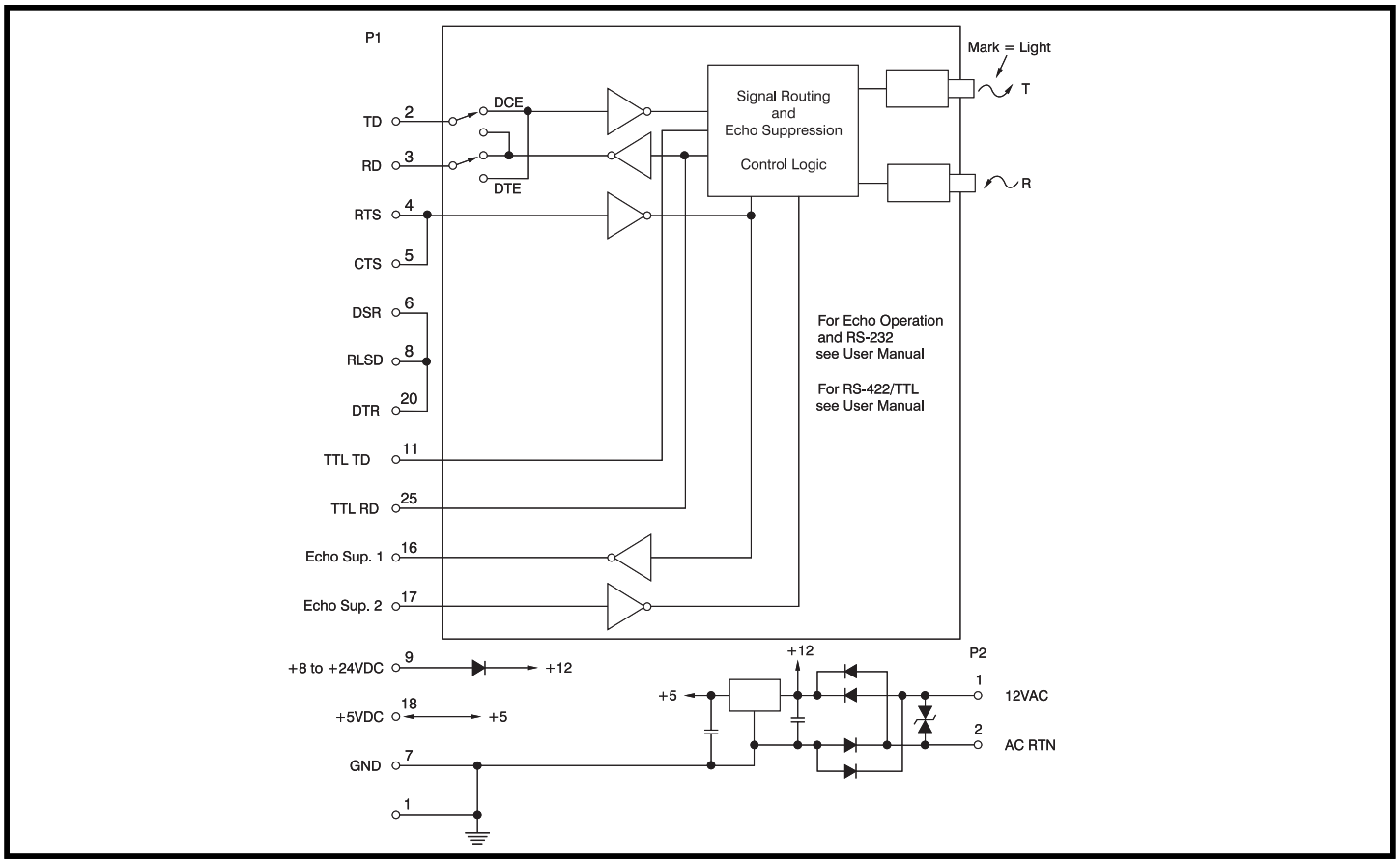


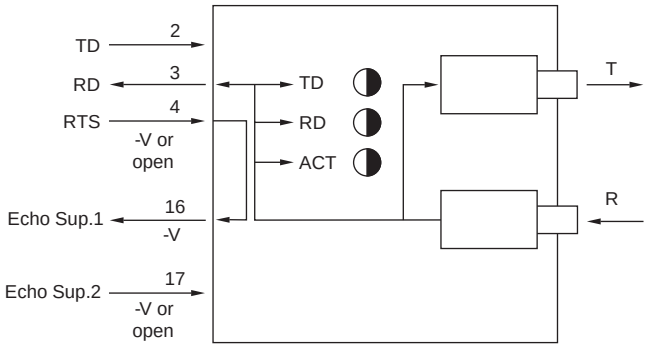

Figure 1: LDM85 Block Diagram



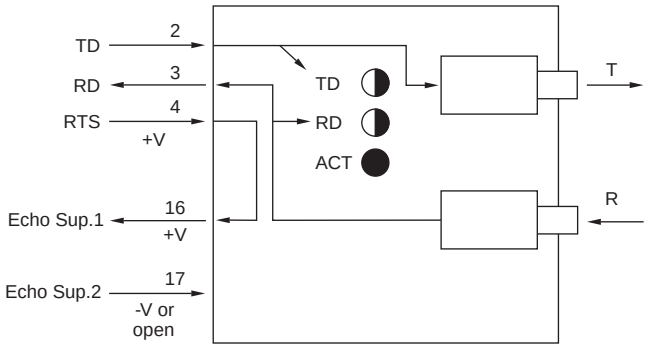
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**LDM85-xx** **RS-232 to Fiber**

**Echo**

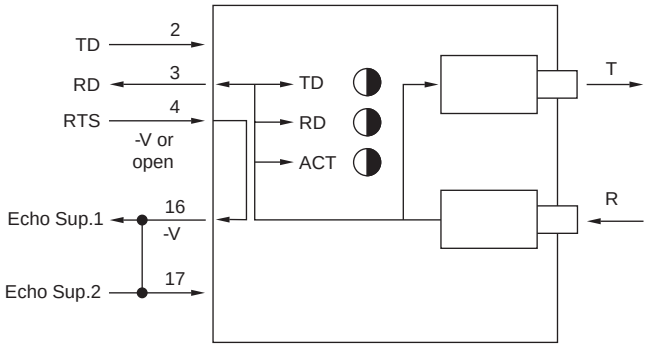



**Echo Suppressed**

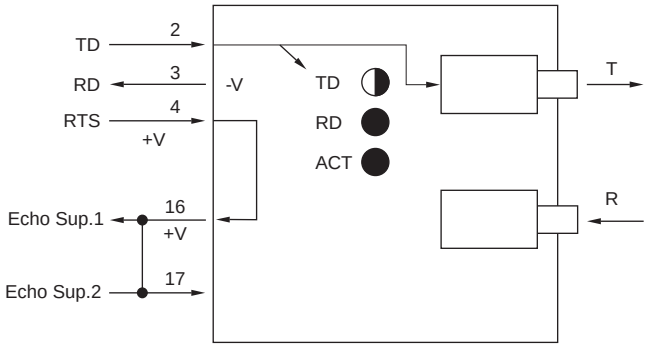



LDM85-xx with P1-16 to 17 jumper applied externally
OR
LDM85-xx-1 = LDM85-xx with P1-16 to 17
jumper applied internally at factory

**Echo**




**Echo Suppressed and RD Disabled by Jumper**




Notes: (1) All examples shown are connected as RS-232 and set as DCE.
(2) Interpretation of LED symbols:

◑ LED flashing ● LED dark

Figure 3: LDM85 Echo Operation Illustrated by Signal Paths and as Modified by Echo Suppress Jumper



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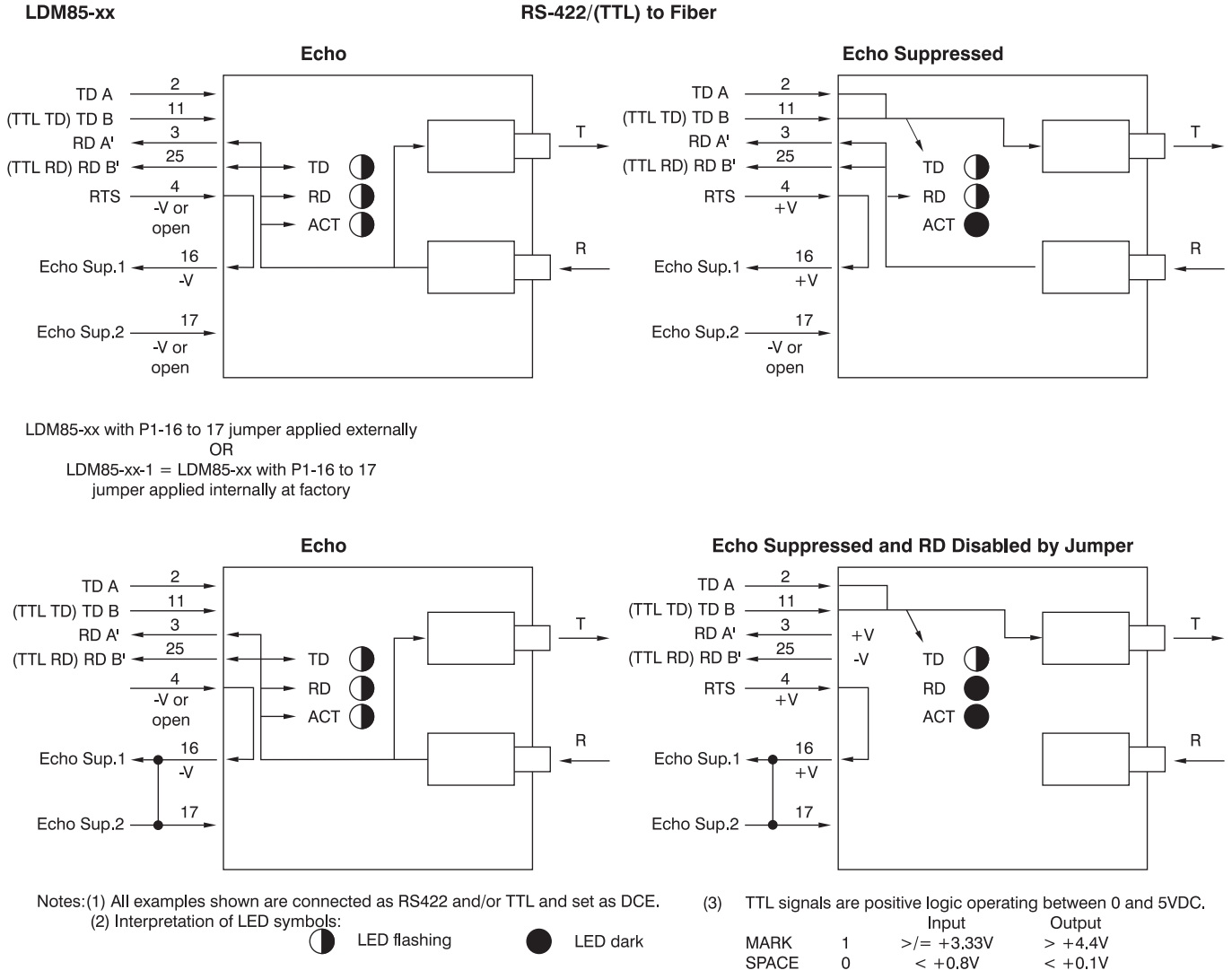



Figure 4: LDM85 Echo Operation Illustrated by Signal Paths and as Modified by Echo Suppress Jumper



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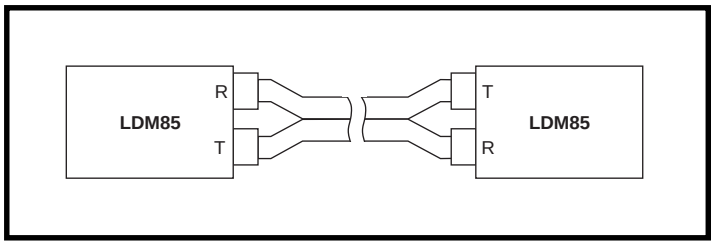



Figure 5: Single-Drop Connection

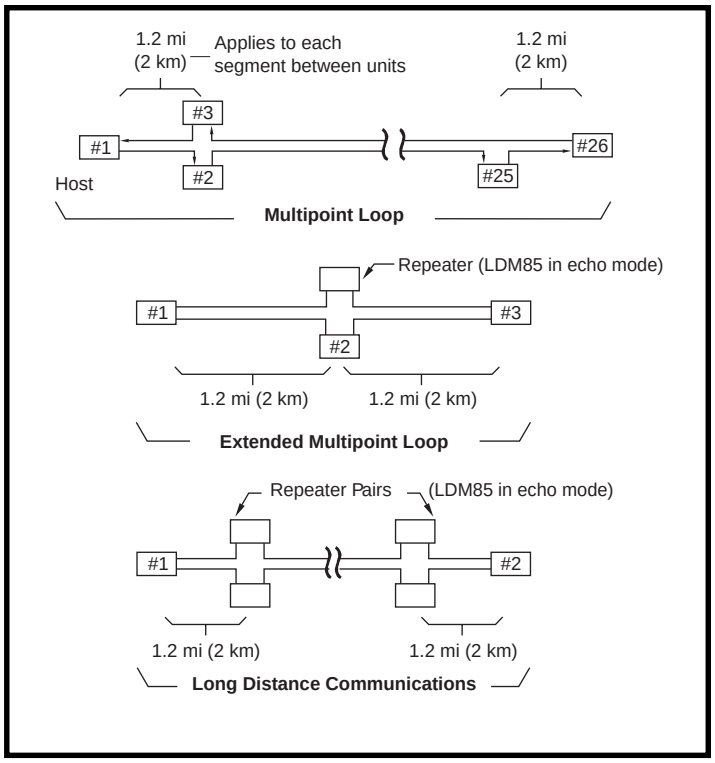



Figure 6: Multipoint Connection

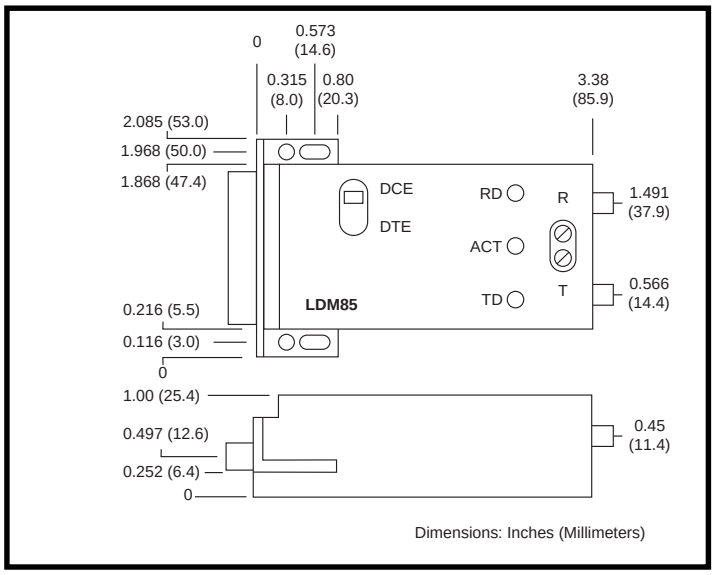



Figure 7: LDM85 Dimensions

## Ordering Information

| Model | Description |
|---|---|
| LDM85-P(1)(3) | Pinned RS-232 connector |
| LDM85-S(1)(3) | Socketed RS-232 connector |
| LDM85-PT(1)(3) | Pinned RS-232 connector, U.S. wall transformer, 120VAC |
| LDM85-ST(1)(3) | Socketed RS-232 connector, U.S. wall transformer, 120VAC |
| LDM85-PE(1)(3) | Pinned RS-232 connector, European wall transformer, 220VAC |
| LDM85-SE(1)(3) | Socketed RS-232 connector, European wall transformer, 220VAC |
| LDM85CA1-XXXX(2) | Single-channel optical cable, SMA |
| LDM85CA2-XXXX(2) | Dual-channel optical cable |
| LDM86CA1-XXXX(2) | Single-channel optical cable, ST |
| LDM86CA2-XXXX(2) | Dual-channel optical cable, ST |
| PT3 | U.S. wall Transformer, 120VAC |
| PT3E | European wall transformer, 220VAC |

NOTES:
(1) For internal echo suppression, add 1 to the part number.
(2) Specify length to the nearest meter. Example: LDM85CA2-0550 for 550 meters dual cable. Maximum length available is 1000 meters.
(3) For ST fiber optic connector, add -025 to the part number.



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