LDM70

Fully Isolated Limited Distance Modem

Description

The LDM70 series of products is designed to allow video display terminals (VDTs) and other RS-232 devices to be connected over distances sufficient to cover any industrial or institutional complex of buildings. These modems feature a rugged aluminum enclosure small enough to mount on the back panel of VDT units, saving valuable desk and floor space.

The LDM70 series is designed for full duplex, asynchronous operation over two DC-continuity, non-loaded, twisted-wire pairs. Through special high-speed optically coupled circuits, they may communicate at data rates up to 57,600 baud. A handshake operation is implemented over the same two-wire pairs. A self-powered model and a host-powered model are available. The self-powered unit uses 12VAC from a wall-mounted transformer, while the host-powered unit takes ±DC power from pins 9 and 10 of the RS-232 connector. The modem circuits —and, consequently, the host device — are protected from electrical transients due to lightning strikes or operation of heavy industrial equipment.

Each device features a convenient Data-Communication Equipment (DCE) to Data-Terminal Equipment (DTE) switch which reverses pins 2 and 3 of the RS-232 connector. For installation and troubleshooting, each unit has diagnostic Light-Emitting Diodes (LEDs) on the transmit and receive lines. In addition, LEDs indicate valid carrier detect and data terminal ready.

The RS-232 connector may be ordered as a male or female 25-pin connector. Field connection is made through a modern, solderless, screw-termination assembly. Alternatively, a convenient four-wire modular phone jack (RJ-11) is available.

▶ Features

- DC to 57,600 Baud
- Complete Isolation with Optical Couplers and Power DC-to-DC Converter
- Data Terminal Ready, Carrier Detect Handshake without Extra Wires
- Surge Protectors
- Four LED Diagnostic Indicators
- Operation to 3 Miles (5km) at 9600 Baud, 1 Mile (1.7km) at 19,200, 0.5 Miles (0.8km) at 57,600
- Four-Wire Full Duplex, Two-Wire Simplex
- Self-Powered or Host-Powered
- Selection of Connectors
- Wide Operating Temperature Range, 0 to +70°C
- CE Compliant

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

Specifications

Model	LDM70
Baud Rate Range	0-57.6K
Baud Rate	57.6K 38.4K 19.2K 9.6K 4.8K 2.4K 1.2K-0
Distance(miles)	0.5 0.75 1.0 3.0 5.0 7.0 12.0
Distance(km)	0.8 1.21 1.6 4.8 8.1 12.9 19.3
Common Mode Isolation	Surge: 1500V Continuous: 1000V
Differential Mode Surge Protection (3 devices)	ANSI/IEEE C37.90.1
Modes	Asynchronous 4-wire duplex, 2-wire simplex
Channel Lines(1)	TD, RD
Control Lines(1)	DTR, RLSD
Power	
AC operation(2)	12VAC at 120mA
DC operation	±9VDC to ±15VDC, 45mA
Environmental:	
Operating Temperature Range	0°C to +70°C
Storage Temperature Range	-40°C to +85°C
Relative Humidity	0-95%, non-condensing
Dimensions	5.7" x 2.1" x 1" (144.8mm x 53.3mm x 25.4mm)
Weight	5.5 oz (156g) max
PT3 and PT3E	11.0 oz (312g) max
MTTF(3)	>100,000 hrs

NOTES:
(1) TD = Transmit Data, RD = Receive Data, DTR = Data Terminal 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).

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Interface

LDM70 conforms to EIA RS-232 and CCITT V.24 specifications. Pins 4 and 5 are internally connected. Pin 6, Data Set Ready (DSR), is internally tied to the asserted state through a resistor. If a DTR signal is not available from the host equipment, an open circuit on pin 20 will be equivalent to assertion, allowing operation without handshake. However, the DTR LED will only light if DTR is actively asserted. If the DTR LED lit is desired, tieing DTR, pin 20, to DSR, pin 6, will continuously assert DTR and light the DTR LED. Data Terminal Ready (DTR), pin 20, must be asserted by the host equipment before LDM70 can transmit data. When DTR is asserted, the LDM70 at the other end of the communications cable will assert Receive Line Signal Detect (RLSD), pin 8, to its host equipment. This is used by host equipment to coordinate data exchanges.

Isolation

The LDM70 is unique compared to other popular limited-distance modems in that it completely isolates the host equipment from the field wiring through the use of optical couplers and a DC-to-DC converter. Units that use only optical couplers break ground loops but circuit power is still taken from an unisolated source, and/or host circuit ground is still connected to one field wire pair. Thus, even though the ground loop between the two pieces of host equipment has been broken, induced transient currents will still flow from the field wiring through the ground circuits of the host equipment. This can cause faulty operation of the host equipment, or even damage in extreme cases. To prevent this, the LDM70 models have a transformer-coupled DC-to-DC converter which powers the field circuits, with no path for induced transients to flow into host equipment. This isolation barrier is rated to 1000Vrms. Continuous operation at high voltages is not recommended for safety reasons.

RS-232 P1 Pin Descriptions			Field P2 Pin Descriptions		
			Screw Terms	Phone Jack	
Pin 1	CASE	Case Ground	Pin 1 12VAC	Pin 1 12VAC	Screw
Pin 2	TD [3]	Transmit Data	Pin 2 AC GND	Pin 2 AC GND	Terms
Pin 3	RD [2]	Receive Data	Pin 3 RD+	Pin 2 RD+	
Pin 4	RTS [7]	Req. To Send	Pin 4 RD-	Pin 3 RD-	RJ-11
Pin 5	CTS [8]	Clear To Send	Pin 5 TD+	Pin 4 TD+	
Pin 6	DSR [6]	Data Set Ready	Pin 6 TD-	Pin 5 TD-	
Pin 7	GND [5]	Signal Ground			
Pin 8	RLSD [1]	Receive Line Signal Detect		RD+ = Receive Data +	
Pin 9	+DC	Positive DC Supply Input		RD- = Receive Data -	
Pin 10	-DC	Negative DC Supply Input		TD+ = Transmit Data +	
Pin 20	DTR [4]	Data Terminal Ready		TD- = Transmit Data -	

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

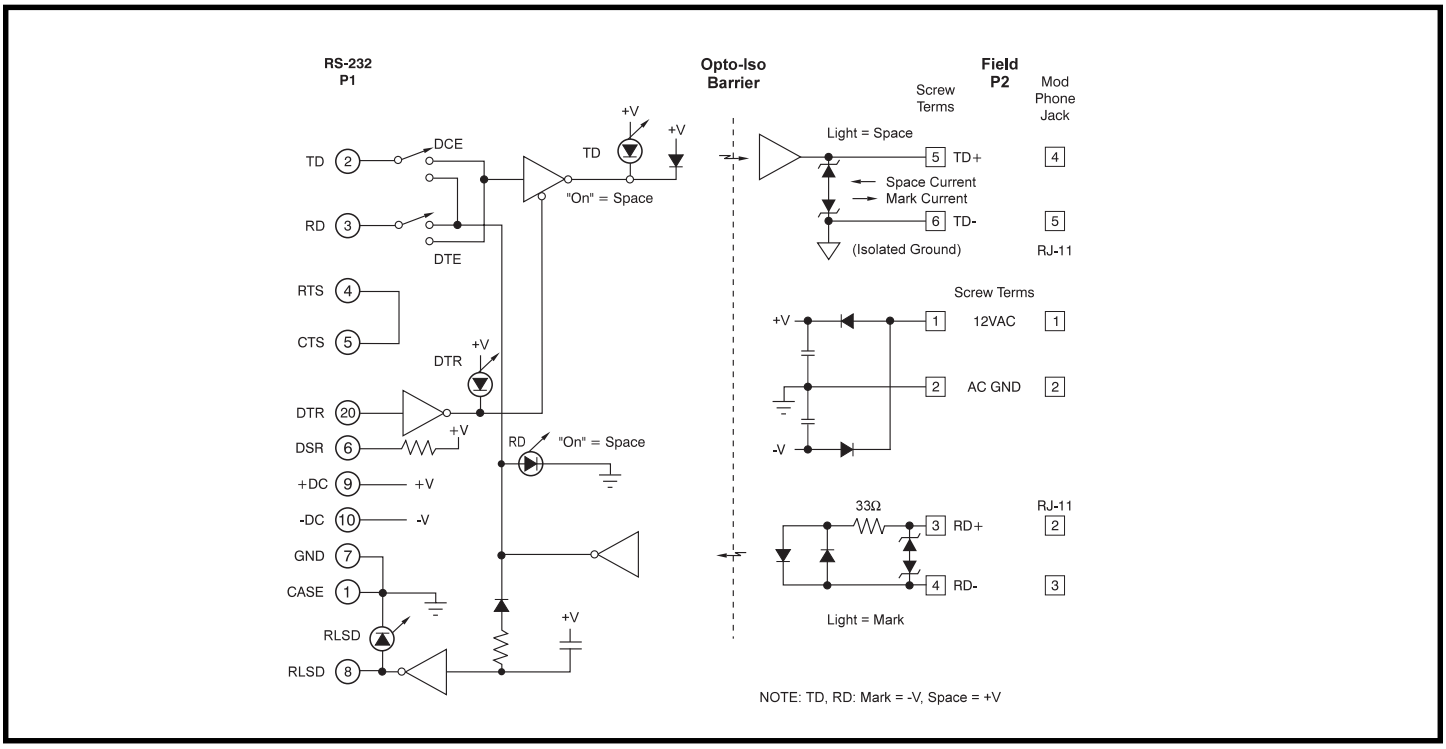


Figure 1: LDM70 Block Diagram

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Cable Capacitance Effects on Distances

Specified distances are for the wire sizes 18-24AWG (0.82-0.20mm^2) with a maximum capacitance of 25pF/ft (82pF/m). For higher capacitance cables, decrease distance specifications for 2400 baud and above by a proportionate amount. For example, shielded cable with 50pF/ft (164pF/m) would reduce the distances by 50%. For host-powered units with voltages less than 12.0 VDC, distances for 1200 baud and below are reduced proportionately. Recommended wire gauges are #18 to #24 (0.82-0.20mm^2).

For baud rates of 1200 and below, distances are limited by DC voltage drop. For 2400 baud and above, distances are limited by pulse distortion. The use of low-capacitance cable can extend the distances shown. Belden 9182 and 9184 are, respectively, single and dual twisted-pair cables that are especially designed for high-speed data communications applications. With these cables the distances can be extended by 50%. However, the DC-resistance-limited distance given under 1200 baud may not be exceeded.

Cable capacitance for individually shielded wire pairs is usually given by manufacturers as capacitance between wires and capacitance from each wire to the shield. The effective transmission line capacitance is approximately the interwire capacitance plus one-half of the wire-to-shield capacitance.

Installation

Installation of the LDM70 consists of attaching it to its mating 25-pin connector on the terminal or host computer. In some cases an RS-232 cable will be used to connect to the RS-232, 25-pin connector of the LDM70. Mounting screws are provided for the male connector, and the female connector has threaded standoffs for connection to cables.

The DCE/DTE switch must be set to be complementary to the terminal or computer port (DCE connects to DTE and DTE to DCE). For example, a terminal connector will most likely be DTE-wired; thus LDM70 must be set to DCE to work with the DTE-wired connector. Since the LDM70 is a data-communications device, its normal switch setting will be DCE. The DTE position is provided as a convenience when it must be connected to DCE equipment, such as some computer ports or other modems.

In the event that the wiring of the host port is not known, the LED indicators will indicate the proper setting. The LED indicators come on during the occurrence of "SPACE" conditions on the transmit and receive lines. The "MARK" condition is the standby condition when the DCE/DTE switch is properly set on both ends of the correctly wired communications cable. Cable connections are shown in Figure 2. The LEDs will most often be off, coming on momentarily during the passage of a burst of data. The DSR and RLSD LEDs are on for assertion.

If the correct setting of the DCE/DTE switch is not known, change the setting to the position that causes the transmit (TD) LED to come on as described above. The repeat key on some terminals is convenient for sending continuous data, causing the TD LED to come on.

In the event that the host equipment cannot assert Data Terminal Ready on pin 20, an open circuit on pin 20 is interpreted as an asserted DTR signal; however, the DTR LED will be off unless tied to pin 6, DSR.

A self-test of the LDM70 may be accomplished by connecting TD+ to RD+ and TD– to RD– on the same unit. Then a terminal or computer may transmit data to itself as a test. Both the TD and RD LEDs should be off when data is not being transmitted and come on during data transmission.

The host-powered units require +9VDC to +15VDC at 45mA on pin 9 and -15VDC to -9VDC at 45mA on pin 10 of the RS-232 connector. If AC power is used, a maximum of 12VAC is applied to field connector pins 1 and 2.

WARNING! *Pins 9 and 10 on the RS-232 connector (P1) of the LDM70 have +12VDC and –12VDC present respectively. These voltages can* ***POTENTIALLY DAMAGE*** *customer equipment, if the customer equipment has any signal connected to those pins. If there is doubt about signals on pins 9 and 10 of customer equipment, an interface cable should be used which has no connection to these pins.*

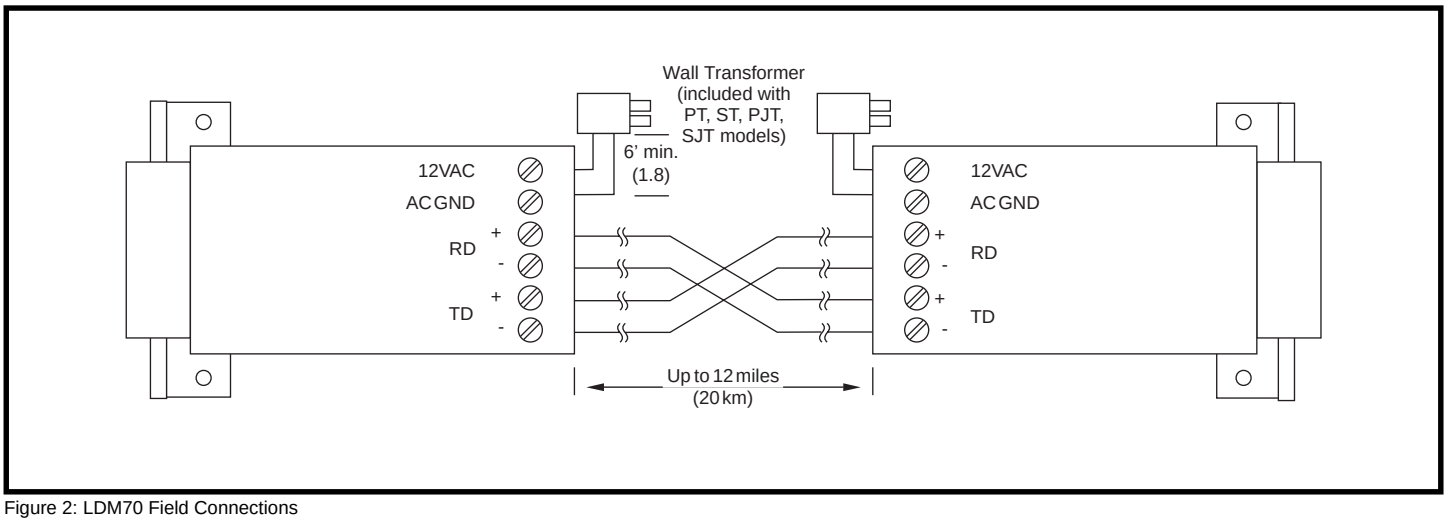


Figure 2: LDM70 Field Connections

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Ordering Information

Model	Type	Power	Termination
LDM70-P	Male	Host-powered	Screw termination
LDM70-S	Female	Host-powered	Screw termination
LDM70-PJ	Male	Host-powered	RJ-11 phone jack
LDM70-SJ	Female	Host-powered	RJ-11 phone jack
LDM70-PT	Male	U.S. transformer	Screw termination
LDM70-ST	Female	U.S. transformer	Screw termination
LDM70-PJT	Male	U.S. transformer	RJ-11 phone jack
LDM70-SJT	Female	U.S. transformer	RJ-11 phone jack
LDM70-PE	Male	European transformer	Screw termination
LDM70-SE	Female	European transformer	Screw termination
LDM70-PJE	Male	European transformer	RJ-11 phone jack
LDM70-SJE	Female	European transformer	RJ-11 phone jack

Model	Description
PT3	U.S. style wall mount transformer, 120VAC
PT3E	Euro style wall mount transformer, 220VAC

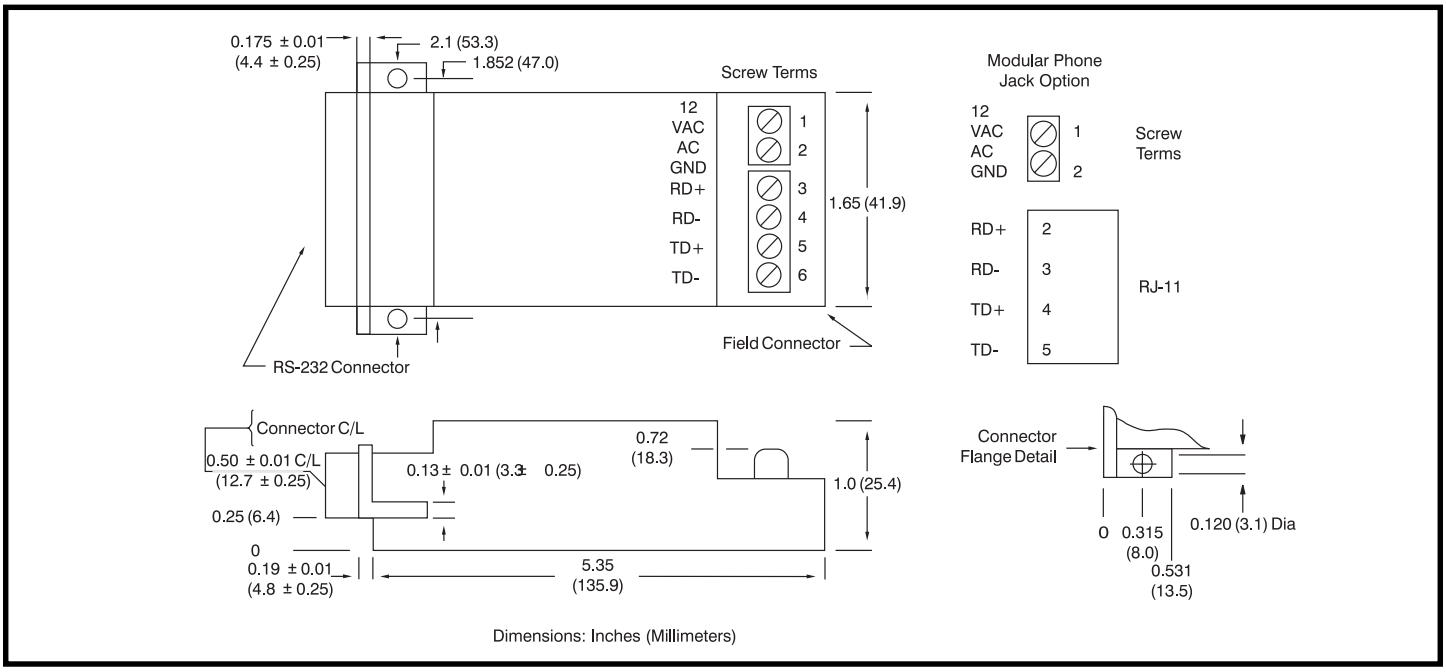


Figure 3: LDM70 Dimensions