Telenetics

Installation, Operation & Diagnostics

for the

MIU9.6FPD

Industrial Grade, Digital Fast Poll
Standalone Modem

Telenetics

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1. STANDARDS

Meets FCC Rules Part J, Subpart 15, Class A for radiated emissions.

2.   PRODUCT OVERVIEW

The **MIU9.6FPD** is an industrial grade Digital Fast Poll modem designed for multidropping applications over unconditioned metallic lines (eg; pilot wires). Available as single channel device (MIU9.6FPD), 2-channel device (MIU9.6FPD/D) or repeater (MIU9.6FPD/R)

The MIU9.6FPD can be powered from a wide range of AC and DC power supplies, it is internally surge protected on both the power and analog lines, and it will operate in temperatures from -40 to +85 deg C.

Internally, the MIU9.6FPD consists of a **baseboard** and a **communication module**. The **baseboard** includes the power supply regulation and surge protection. The **communication module** is a Telenetics™ **Pony Express™ PE9.6FPD** Modem Module.

The MIU9.6FPD is packaged specifically for the harsh environments found in utility substations and industrial facilities. Though functionally similar to commercial modems, the MIU9.6FPD includes special features that make it particularly well suited for utility and industrial applications:

Environment: The MIU9.6FPD has been designed specifically for use in harsh environments. In addition to an extended temperature range (-40 to +85º C), the MIU9.6FPD includes surge, shock, vibration, and safety features superior to those of conventional commercial modems.

Power Supply: The MIU9.6FPD can be powered from a broad range of AC and DC power supplies, such as an auxiliary supply (eg; 12VDC) from another piece of equipment, 125VDC from a station battery or a standard 120VAC.

Industrial: The MIU9.6FPD is packaged in a rugged, compact, non-metallic (ABS) enclosure. Designed for unmanned locations, the MIUs do not include the array of pushbuttons and LEDs normally associated with consumer-type modems. Configuration is by dip switches. Standard industrial connectors for data, analog and power interfaces allow reliable interconnection to other industrial components.

3. GENERAL PRODUCT SPECIFICATIONS

Dimensions: 5.3 x 4.0 x 1.375 inches
Weight: 1 lb

Voltage Supply: Standard Model: 40 to 270VDC
                                            40 to 270VAC, 50/60Hz
             LV Model (Suffix "-LV"):   9 to 36VDC

Current Requirements:

	12VDC	24VDC	125VDC	120VAC	220VAC
MIU9.6FPD					
MIU9.6FPD/D					
MIU9.6FPD/R					

Surge Protection: Power Supply: 8kVrms
                             Analog Line: **3.75kVac IEC255-5**
                             Digital Line: ESD ± 10kV

Operating Temperature: -40 to +85 deg C

Operating Humidity: 0 to 90% (non-condensing.)

Storage Temperature: -55 to 100 deg C

4. MODEM SPECIFICATIONS

Modulation:	Pulse Position Modulation (PPM)
Synch/Async:	Asynchronous Only
Data Rate:	0 – 1200bps
Error Correction:	None
Data Compression:	None
Data Modulation Connectivity:	Using 16ms Polling Test

99.999% or better at -37dBm
99.5% or better at -40dBm
95% or better at -43dBm

Serial Formats and Flow Control:

Asynchronous and RTS/CTS flow control

Analog Interface

Tx Output Level:	-0 dBm or -10 dBm *
Rx Sensitivity:	-43dBm or -33dBm *
	-43dBm for constant carrier
	-40dBm for polling carrier
Line Termination:	Dip Switch Selectable *
Line Impedance:	600 ohms balanced
2 or 4 Wire Configuration:	Dip Switch Selectable *

Other Features

Receiver Equalization:	Compromise Equalization
Self Test Diagnostics:	None
Local Analog Loopback:	See Section 13
Local Digital Loopback:	See Section 13
Remote Analog Loopback	See Section 13
Remote Digital Loopback	See Section 13
Anti-Streaming:	OFF or 45 Seconds ($\pm$ 5 sec) *
RTS/CTS delay:	1ms, 12ms, 35ms or 50ms ($\pm$5%) *
	Note: Soft Carrier will effect RTS/CTS delay time (see Dip Switch Settings ~ Section 8)
Constant Carrier	Switch Selectable ON or OFF
Soft Carrier Turn Off	20ms of 900Hz after RTS is turned Off
Carrier Turn ON/OFF	8ms $\pm$0.5ms

* Dip Switch Selectable ~ See Section 9

5. METALLIC CONDUCTOR SPECIFICATIONS

The MIU9.6FPD contains digital circuitry for connection 2 or 4-wire metallic conductors (eg; pilot wires). The MIU9.6FPD will also interface to Power Line Carrier or Microwave radio voice channel networks.

The MIU9.6FPD has an RJ-11terminated connector. The following lists the MIU9.6FPD conductor interfaces

Conductor Type:

Conditioned or unconditioned, Bell type 3002, 2 or 4-wire, full duplex voice grade or metallic lines or better.
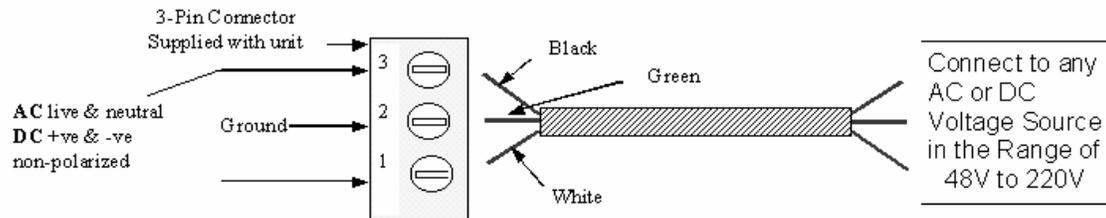
Analog Line Specifications:

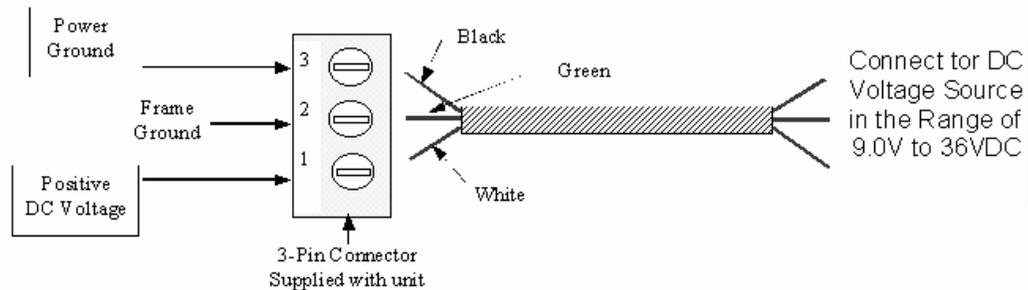|	
Bandwidth	300 Hz to 3400 Hz (±3dB)
Impedance	600 / 900 ohms , balanced
Frequency Response	400 to 3000Hz (±2dB)
Receiver Input Level	-16dBm max.
Output Level	+7 dBm
Noise Signal Level	-48 dBmO

RJ11
Leased/Private Line
Connector

RX
TX
RX
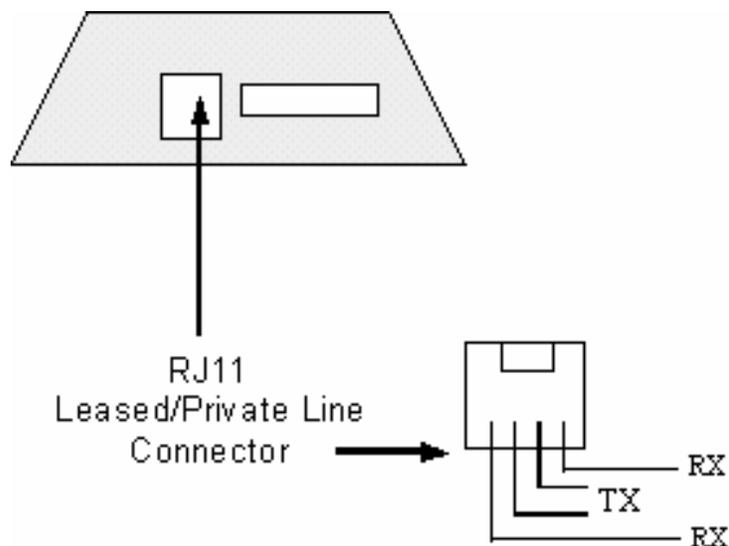
6. POWER CONNECTIONS
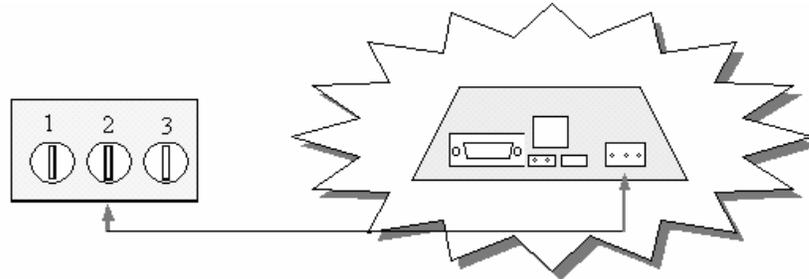
MIU2.4, MIU9.6, MIU9.6L, MIU14.4, MIU14.4L, MIU28.8, MIU202T, MIU9.6FP, MIU9.6FPD

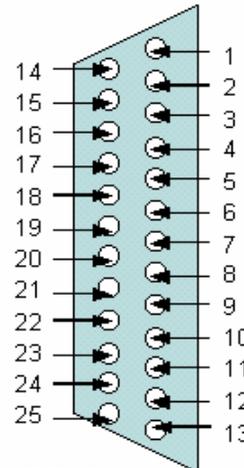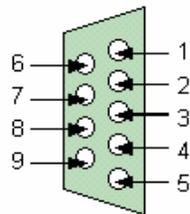MIU Models as above, but with suffix "-LV" (eg; MIU2.4-LV)

IMPORTANT NOTES

1. Wire colors shown are for optional Telenetics cable, if ordered.

2. Customer supplied cable must be suitable for site environmental conditions.

3. Surge protection only guaranteed if ground wire >18 AWG

4. Solidly earthed ground connection required to guarantee surge protection

5. Screw terminals accept 28 to 16 AWG.

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7. SERIAL DATA PORT PIN-OUTS

RS232C is the most commonly used serial data interface and defines the Physical, Functional and Electrical boundaries between two or more communicating devices

~ D-SHAPED SERIAL PORT CONNECTORS ~
are usually used to interconnect DTEs (computers, controllers, etc.)
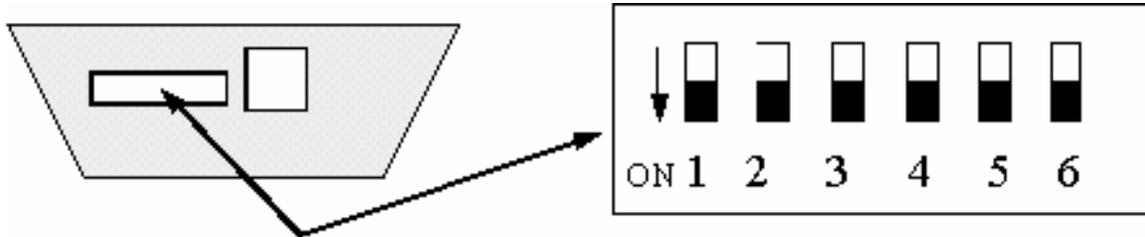and DCEs (modems, converters, etc.)

DB9

DB25

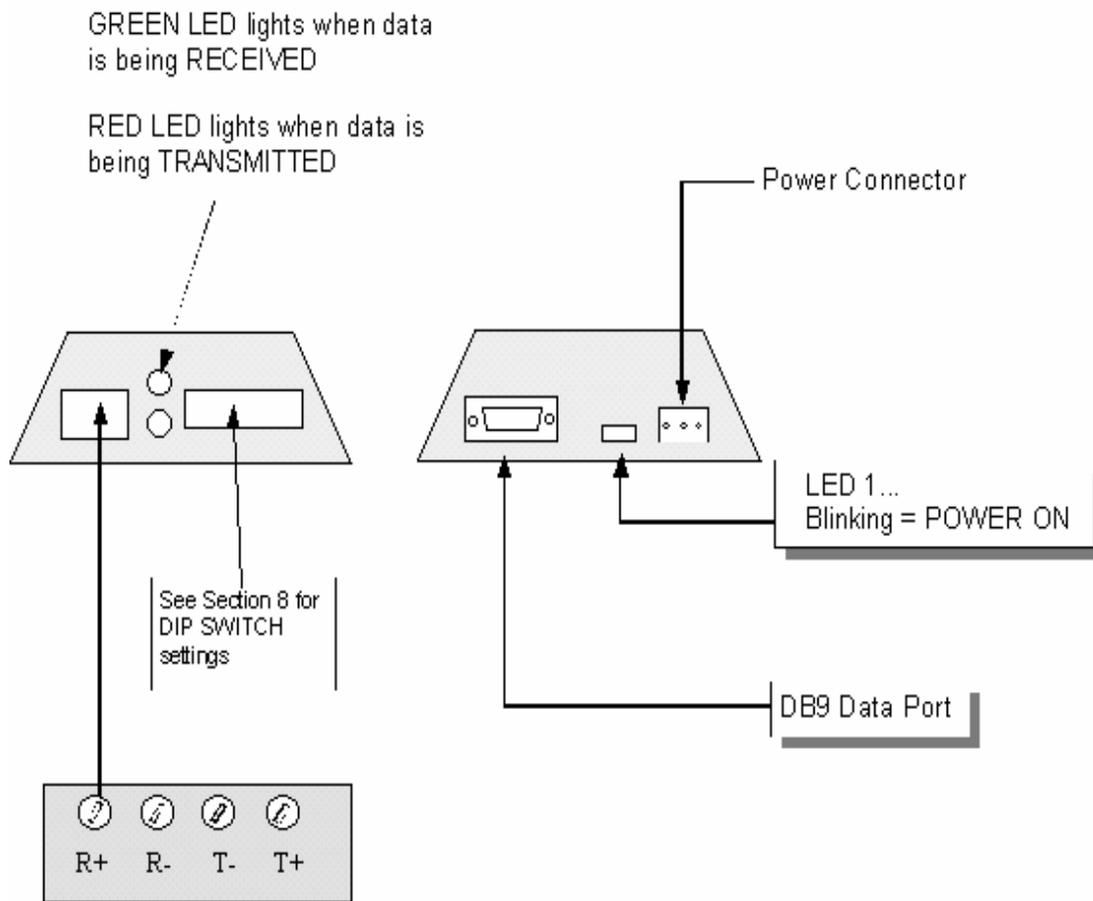| Pin	Signal	Pin	Source
1	CD - Carrier Detect	8	MODEM
2	RXD - Receive Data	3	MODEM
3	TXD - Transmit Data	2	TERMINAL
4	DTR - Data Term'l Ready	20	TERMINAL
5	Signal Ground	7	N/A
6	DSR - Data Set Ready	6	MODEM
7	RTS - Ready to Send	4	TERMINAL
8	CTS - Clear to Send	5	MODEM
9	RI - Ring Indication (Dial Modems Only)	22	MODEM

8. DIP SWITCH FUNCTIONS
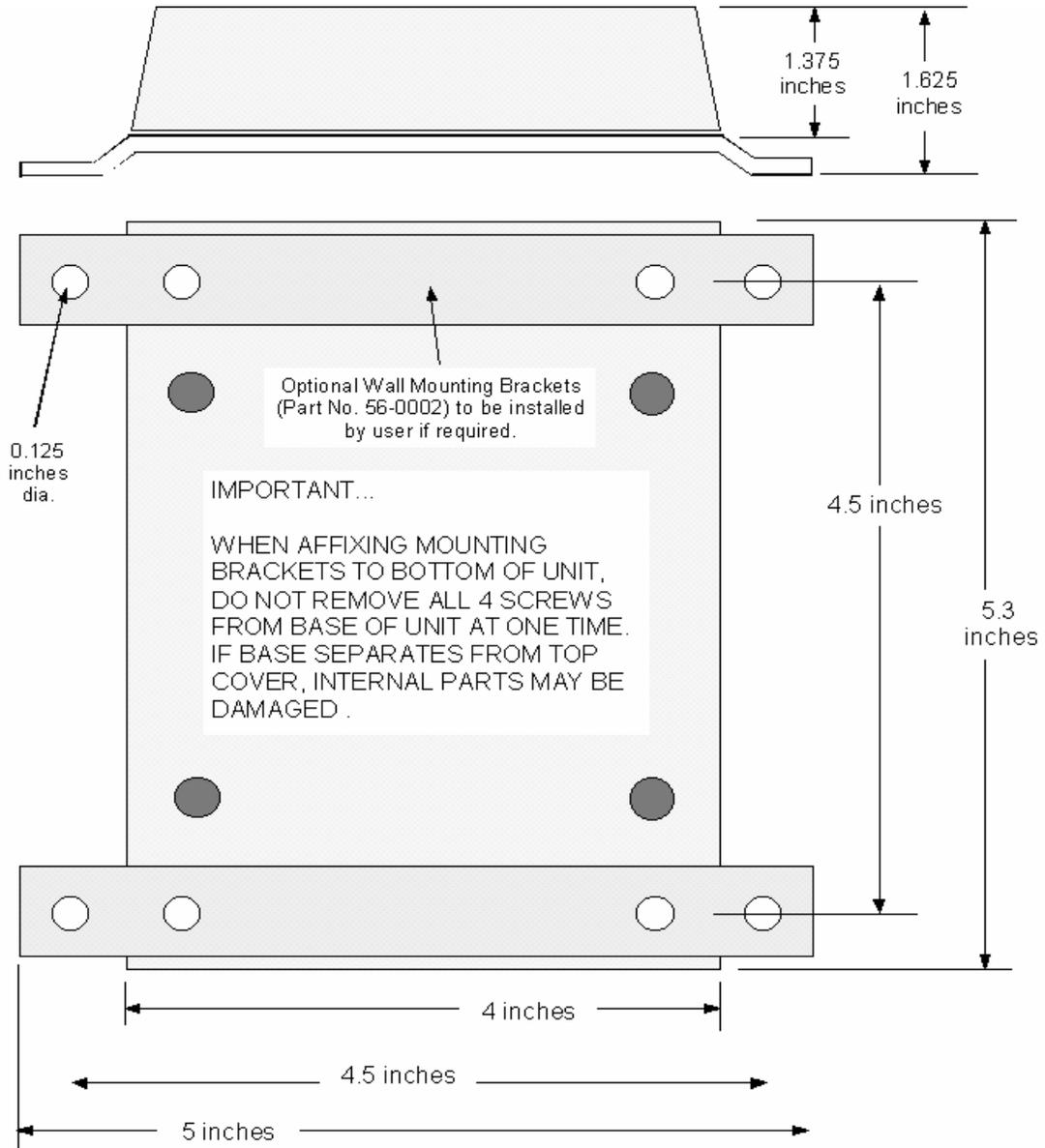

IMPORTANT NOTE: Invert modem to view dip switches as shown above

Table 1

Switch	Function	ON	OFF
Switch 1	Antistreaming		
Switch 2			
Switch 3	Data Rate = 19200 bps		
Switch 4	Data Rate = 9600 bps		
Switch 5	Data Rate = 4800 bps		
Switch 6	Data Rate = 2400 bps		

9. LED INDICATOR

GREEN LED lights when data is being RECEIVED

RED LED lights when data is being TRANSMITTED

Power Connector

LED 1...
Blinking = POWER ON

See Section 8 for DIP SWITCH settings

DB9 Data Port

R+   R-   T-   T+

10. OUTLINE DRAWING & MOUNTING

1.375
inches

1.625
inches

Optional Wall Mounting Brackets
(Part No. 56-0002) to be installed
by user if required.

0.125
inches
dia.

4.5 inches

5.3
inches

IMPORTANT...

WHEN AFFIXING MOUNTING
BRACKETS TO BOTTOM OF UNIT,
DO NOT REMOVE ALL 4 SCREWS
FROM BASE OF UNIT AT ONE TIME.
IF BASE SEPARATES FROM TOP
COVER, INTERNAL PARTS MAY BE
DAMAGED .

4 inches

4.5 inches

5 inches

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11.   DIAGNOSTICS

The following pages provide hardware techniques for diagnosing communication problems and thereby isolating the problem at the local modem, the remote modem or the interconnecting line.

(a) LOCAL ANALOG LOOPBACK (Figure 2)

Requires a loop back cable with a built-in circuit for line loss to simulate a typical leased line condition (See Figure 3).

Connect the loop back cable to the RJ11 connector on the modem under test.

Set Dip Switches as follows…

Switch 7 = OFF   4-Wire
Switch 9 = ON   Soft Carrier Turn Off Enabled
Switch 1 = ON   Transmit (TxA) Signal Level = 0dBm
Switch 3 = ON   Receive (RxA) Signal Level = –33dBm
Switch 6 = OFF   Switched Carrier
Switch 4&5 = ON   RTS/CTS Delay = 50ms

Test 1: RTS/CTS Analog Control

Set RTS "ON" and check that CD (Carrier Detect) turns "ON".

Turn RTS "OFF" and ensure that CD turns "OFF"

With RTS "ON", run a test message at TxD and verify that the same message is received at RxD with no data errors.

Test 2: Transmit Signal Power & Receive Levels

Set Dip Switch 1 OFF (TxA = -10dBm)

CD will be OFF.

Change Dip Switch 1 to ON (TxA = 0dBm)

CD should now be ON.

Test 3:   Received Signal Level

Set Dip Switch 1 OFF (TxA = -10dBm) and Dip Switch 3 OFF (RxA = -43dBm).

CD will be ON.

Run a test message at TxD and verify that the same message is received at RxD with no data errors.

Test 4: Repeat Test 3 for various RTS/CTS delay times and with soft carrier ON and OFF.

(b) LOCAL DIGITAL LOOPBACK – 4/Wire Network (Figure 4)

On the modem under test, connect TxD to RxD

Switch 1 = ON (TxA = 0dBm)
Switch 3 = ON (RxA = -33dBm)
Switch 4 = OFF (RTS/CTS = 35ms)
Switch 5 = ON   (RTS/CTS = 35ms)
Switch 6 = ON (Constant Carrier mode).
Switch 7 = OFF (4-Wire)
Switch 8 = ON (Line Termination = 600 ohms)
Switch 9 = ON (Soft Carrier = ON)

Transmit a test message from a remote modem and confirm that the same message is received back at RxD on the remote modem with no data errors.

(c) REMOTE DIGITAL LOOPBACK – 4/Wire Network (Figure 5)

Configure both the local and remote modems as follows:

Switch 1 = ON (TxA = 0dBm)
Switch 3 = ON (RxA = -33dBm)
Switch 4 = OFF (RTS/CTS = 35ms)
Switch 5 = ON   (RTS/CTS = 35ms)
Switch 6 = ON (Constant Carrier mode).
Switch 7 = OFF (4-Wire)
Switch 8 = ON (Line Termination = 600 ohms)
Switch 9 = ON (Soft Carrier Turn Off = ON)

Connect TxD to RxD at the remote modem.

Transmit a test message from the local modem and confirm that the same message is received back at RxD on the local modem with no data errors.

(d) LINE DIAGNOSTICS

(i) Typical modem configuration for **4-wire Point-to-Point** system…

    Switch 1 = ON (TxA = 0dBm)
    Switch 3 = ON (RxA = -33dBm)
    Switch 4 = OFF (RTS/CTS = 1ms)
    Switch 5 = OFF (RTS/CTS = 1ms)
    Switch 6 = ON (Constant Carrier mode).
    Switch 7 = OFF (4-Wire)
    Switch 8 = ON (Line Termination = 600 ohms)
    Switch 9 = OFF (Soft Carrier = OFF)

(ii) Typical modem configuration for **4-wire Multi-Point** system…

    Switch 1 = ON (TxA = 0dBm)
    Switch 3 = ON (RxA = -33dBm)
    Switch 4 = OFF (RTS/CTS = 1ms)
    Switch 5 = OFF (RTS/CTS = 1ms)
    Switch 6 = ON (Constant Carrier mode).
    Switch 7 = OFF (4-Wire)
    Switch 8 = ON (Line Termination = 600 ohms)
    Switch 9 = OFF (Soft Carrier = OFF)

Adjustments…

In a network with high line loss (greater than 16dB) change Switch 3 (RxA) to OFF (-43dBm).

If there are conditions that can cause cross-talk (TxA leaking into RxA path) set Switch 1 (TxA) to OFF (-10dBm).

Note that noise level should be –50dBm or lower for most FSK operation (signal-to-noise ratio of 15dB or higher)
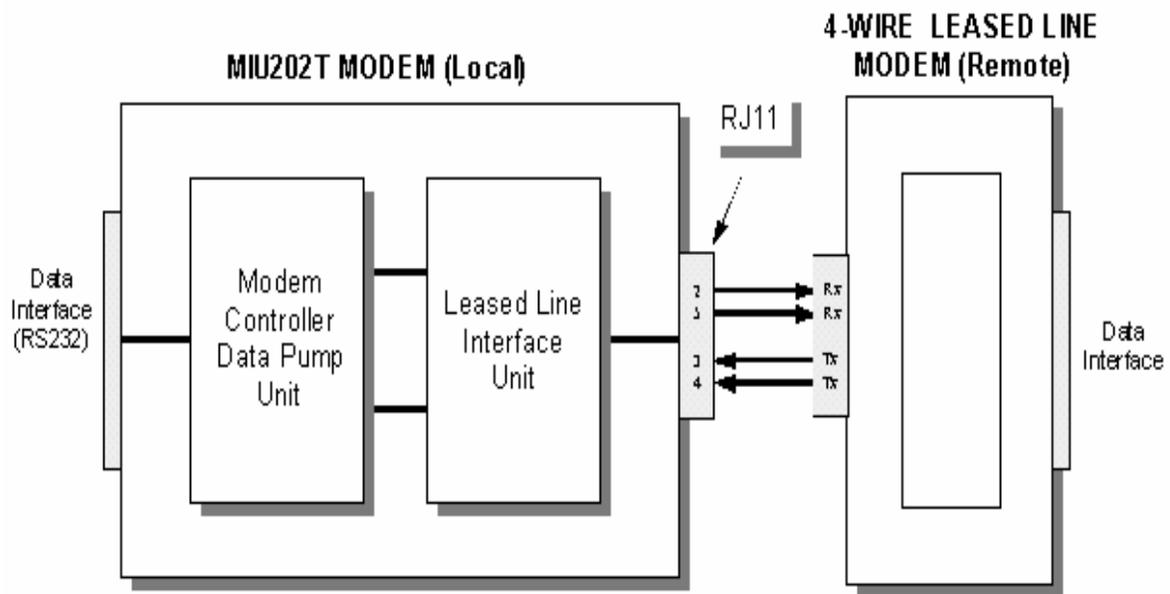
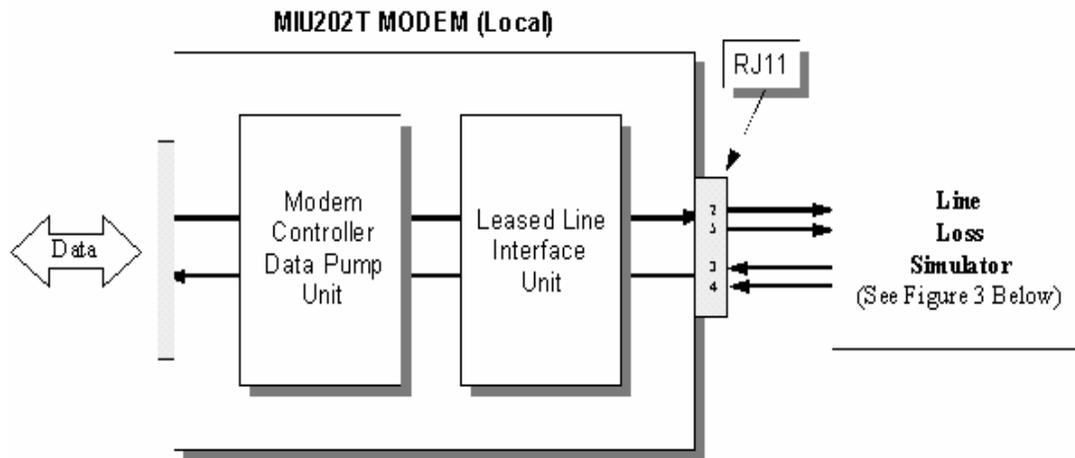Figure 1   TYPICAL 4-WIRE LEASED LINE MODEM CONFIGURATION
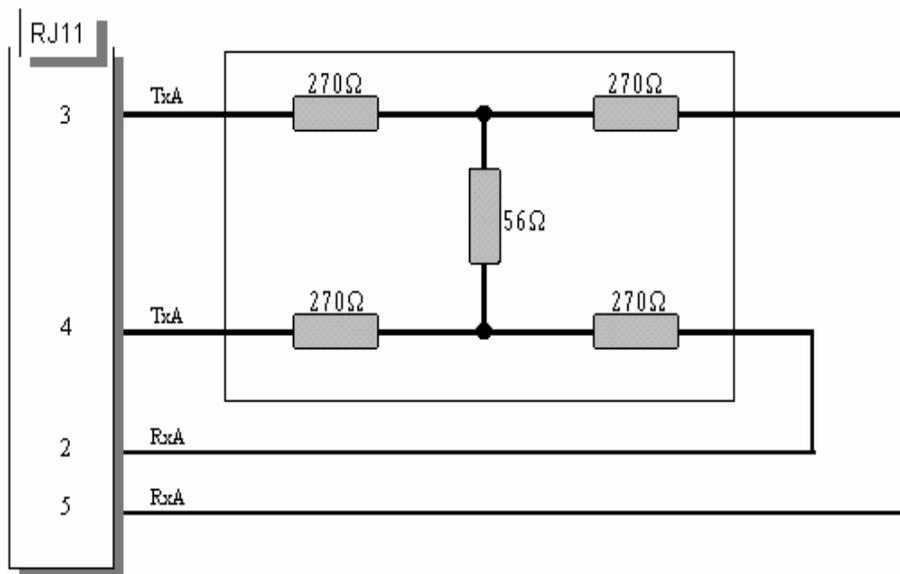
Figure 2   LOCAL ANALOG LOOPBACK

Figure 3   LINE LOSS SIMULATOR (Approx. -26dB)

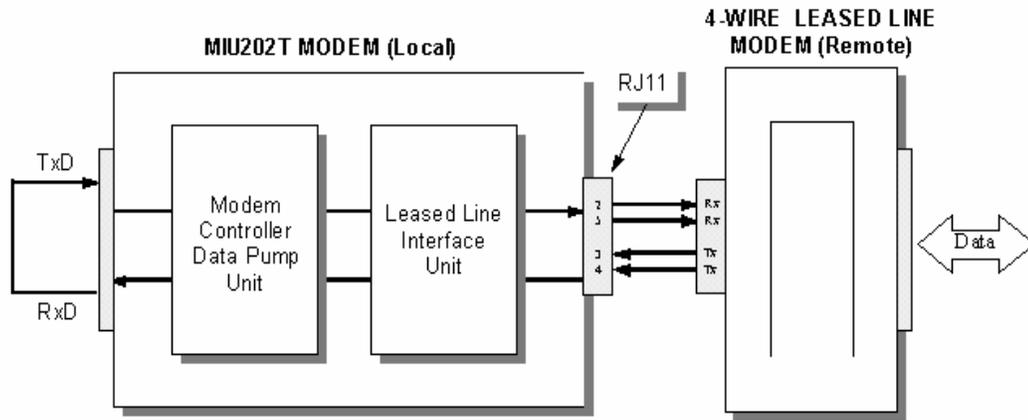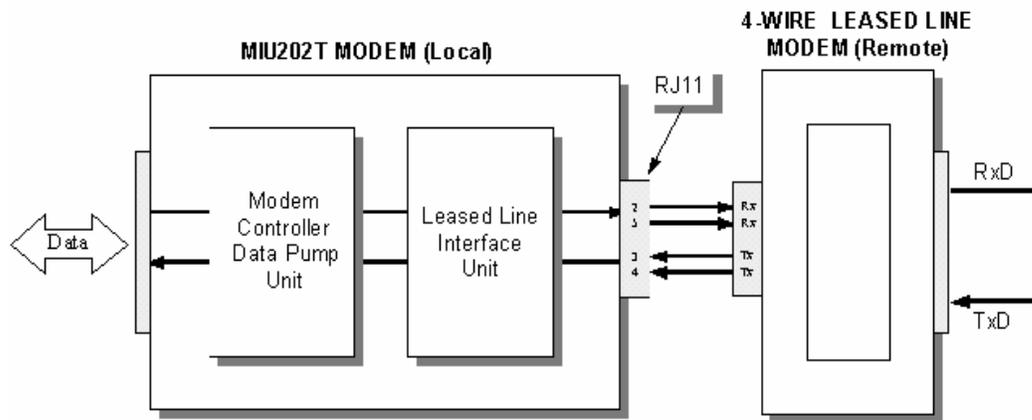Figure 4   **LOCAL DIGITAL LOOPBACK**

Figure 5   **REMOTE DIGITAL LOOPBACK**

NOTES: