Rack Mount Private Wire Modem Manual

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Revision History

Filenames are:

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Rev	Date	Author	Description
A	Sept. 25, 2001	R. Catalfamo	Initial release.

Approval: _____

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1. Introduction

Rack Mount Private Wire Modems work in conjunction with Europa digitisers, greatly extending the aperture of Nanometrics terrestrial Callisto networks.

It is strongly recommended that you read the entire manual before commencing testing, configuring, or using the Rack Mount Modems. On the following pages you will find a wealth of information regarding all aspects of the Rack Mount Modems. Please read the instructions carefully.

If you have problems or need technical support, please submit requests for technical support by e-mail or fax. When communicating your problem to us please give as much information as possible and include "evidence" of the problem. This allows us to reproduce the problem in our laboratories and to find a solution to your problem.

by e-mail: **support@nanometrics.ca**

by fax: **To: Support at fax (613) 592-5929**

by phone: **Please ask for Support at (613) 592-6776**

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2. Organization of this Manual

This manual is organized in these major sections:

Chapter 1	**Introduction**	Introductory notes to this manual.
Chapter 2	**Organization of this Manual**	Notes on how to use this manual.
Chapter 3	**Unpacking and Post Delivery Inspection**	Identifies components and references an "as-shipped" section.
Chapter 4	**Technical Description**	Description of features and technical specifications.
Chapter 5	**Servicing**	Recommended maintenance and repair procedures.
Appendices	These list pin connections, outline & installation drawings and the Technical Specification	

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3. Unpacking & Post Delivery Inspection

Open and inspect the shipment for possible damage. Carefully check each item for damage or defects. The following list includes items generally included with the Telesto modem. This list can vary from application to application. To determine the exact list of items included in your shipment refer to the shipping documents.

The system may include one or more of the following:

1. Rack Mount Private Wire Modems and Card Cage
2. Rack Mount Private Wire Modem Manual
3. As-shipped Sheet
4. OEM Modem Rack Manual
5. OEM Modem Manual

Checking the As-Shipped Sheets

Please study the as-shipped data sheet to determine the exact configuration of the Rack Mount Private Wire Modem unit. The as-shipped sheet lists the serial numbers of the parts shipped and the exact configuration of the parameters associated with your hardware. This determines how your rack mount modem unit operates when first powered-on and how it functions within your network.

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4. Technical Description

Overview of the Hardware

The Rack Mount Private Wire Modem is the interface at a central data acquisition site between the RM-4(s) and the telephony communications network. The central site data acquisition computer(s) receives seismic data originating from remote site Europa digitisers over the leased-line telephone network. The Rack Mount Private Wire Modem integrates all the hardware necessary to receive data from remote Europa digitisers. Each telephone modem in the rack mount unit is paired with one remote site Europa digitiser. The unit also provides for the reverse flow of data by sending various network management information from the central site to the remote Europa digitisers. The general function of the Rack Mount Private Wire Modem is shown in Figure 1.

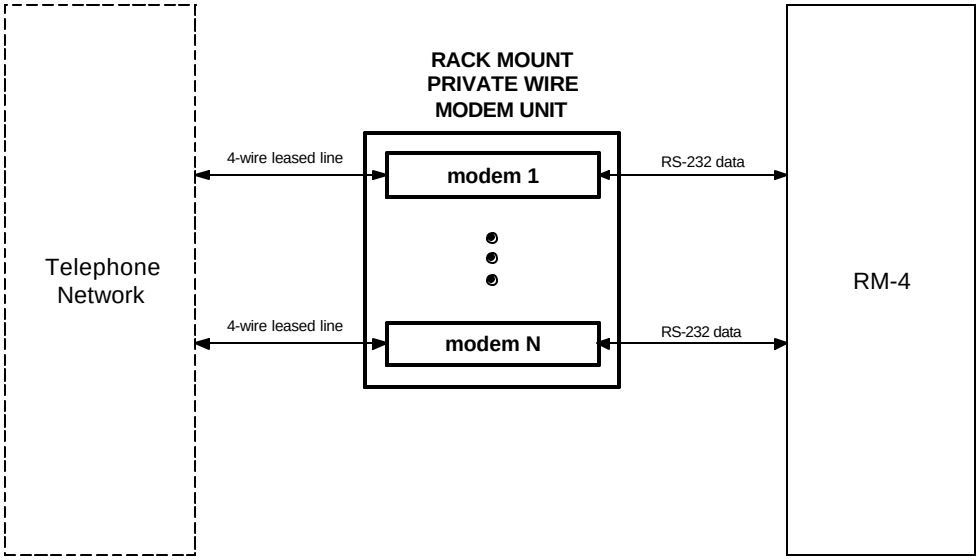

Figure 1: Rack Mount Private Wire Modem, General Function

Theory of Operation

The main function of the Rack Mount Private Wire Modem is to interface the data from the RM-4 connected to the acquisition computer at the central site to the leased-line telephony network. This function is performed by a Printed Circuit Board (PCB) modem. The Rack Mount Private Wire Modem consists of a card cage which accommodates a power supply and card slots for up to 16 individual modem PCBs; each modem PCB is associated with a remote site Europa digitiser. As well, each individual PCB features 10 LED Diagnostic Indicators and a Busy Out Toggle switch. These are described in Appendix B. The card cage is designed to fit inside an industry standard 19-inch rack.

Interfacing serial data to the leased-line telephony network

The serial data stream received from the data acquisition computer uses an RS-232 physical layer protocol. This format is not suitable for transmission over a leased-line telephone network because of signal levels, voltages, bit duration, etc. In order to efficiently couple the RS-232 data to the telephone network a device known as a modem (MOdulator/DEModulator) is used to transform the RS-232 digital data into an analog signal which can be efficiently carried on the telephony channel. By varying the properties of the analog signal such as signal amplitude, phase and duration, one can efficiently pack the RS-232 data onto the telephony channel. The telephony channel then carries the data traffic to the eventual destination. At the receiving end, the telephony signal is transformed back to RS-232 format which can then be used by the remote Europa digitisers.

Therefore, each private wire modem at the central site must be paired with a corresponding modem at the remote site. Both of these units perform the same function - they transform the local data stream to a form suitable for transmission on the leased line telephone network. Because data flow can occur in both directions, i.e., to/from a remote site, the rack mount private wire modem is a full-duplex device. This allows seismic data to be sent continuously to the central data acquisition site while also providing a return path for retransmission requests from the central site.

Both the remote site private wire modem and its counterpart at the central site perform error detection and correction which may have been caused by noise on the telephone channel. This function is performed transparently, i.e., neither the Europa digitiser nor the central site data acquisition equipment have knowledge of this real-time error correction.

The rack mount private wire modem has been designed to require no “handshaking” between itself and the data device connected to it, e.g., RM-4 at the central site computer. Only 3 signal lines are necessary to transmit/receive data over the leased-line telephone network with the modem unit; these are Tx (Transmit), Rx (Receive) and GND (Ground). Data to be transmitted is simply placed on the Tx line while data to be received is obtained by monitoring the Rx line; GND serves as an electrical return path.

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Configuration

The Rack Mount Private Wire Modem requires configuration in order to properly integrate it into the seismic network. This configuration assumes that the telephone network is a 4-wire leased line system. Because the Rack Mount Private Wire Modem at the central site is paired with a corresponding unit at the remote site, it is important to configure the central site PCB modems in ORIGINATE mode (the remote site modems, in this case, are in ANSWER mode). Three items require configuration - hardware configuration, firmware configuration and leased line assignment. These are detailed below.

Hardware Configuration

The modem card cage has 16 slots available; each slot accommodates a single telephone modem PCB (model Multitech, MT2834BLRe) as shown in Figure 2. The PCB has two dip switches containing a total of 16 switches which must be configured as in Table 1. Each PCB must be configured.

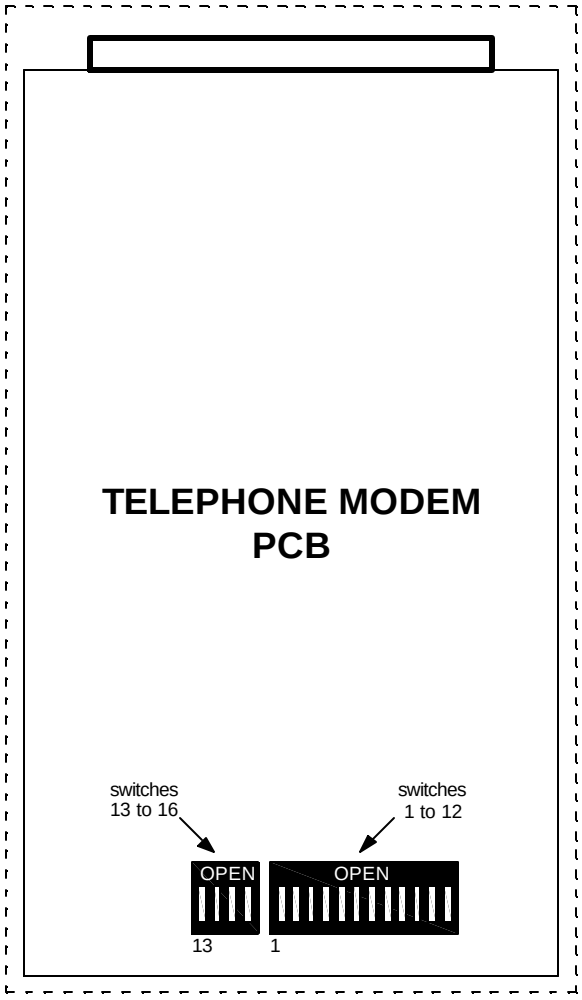

Figure 2: DIP Switch Location on Telephone Modem PCB

TELEPHONE MODEM DIP SWITCH SETTINGS				
DIP Switch No.	Function		Manufacturer's Default	Rack Mount Modem
	UP	DOWN		
1	DTR from interface	DTR forced	down	down
2	Flow control enabled	Flow control disabled	up	down
3	Tx level = -15 dB	Tx level = -9dB	down	down
4	UUCP disabled	UUCP enabled	up	up
5	Originate	Answer	up	up
6	Maximum throughput enabled	Maximum throughput disabled	up	up
7	RTS normal	RTS forced on	down	down
8	Command modem disabled	Command modem enabled	down	down
9	Local loopback	Remote loopback	down	down
10	Dial-up	Leased line	up	down
11	AT result codes	MT result codes	down	down
12	Synchronous	Asynchronous	down	down
13	See note below	See note below	up	up
14	See note below	See note below	up	up
15	CD from interface	CD forced on	up	up
16	2-wire	4-wire	down	down

Table 1: DIP Switch Settings (UP = OPEN, DOWN = CLOSED)

NOTE:

Baud Rate(kbps)	Switch 13	Switch 14
28.8	UP	UP
19.2	DOWN	UP
14.4	UP	DOWN
9.6	DOWN	DOWN

Firmware Configuration

Firmware configuration allows the user to tailor such configurable parameters as data port rate, flow control, error correction, etc. In this application, as a point-to-point private wire modem, the following settings are required. The Rack Mount Private Wire Modem is shipped with this configuration. The firmware configuration procedure is given below. This procedure must be individually performed on each telephone modem PCB contained in the modem card cage.

1. Configure the DIP switches as described above.
2. Change dip switch 10 to the UP position.
3. Install the PCB into its card slot in the card cage.

4. Connect the serial port of this PCB located at the back of the card cage to the communications port of a PC or laptop computer.
5. Start a terminal emulator, e.g., ZOC, on the computer and configure it to the correct COM port.
6. Power up the modem rack.
7. Type in the following command (this is a sequence of "AT" commands) at the terminal emulator:

at&e0&e3&e14$sb9600&w0

The modem should reply with: OK (displayed by the terminal emulator).

1. Reset the modem by typing **atz** in the terminal emulator. The modem should reply with: OK.
2. Type in **atl5** at the terminal emulator. The modem will display the configured parameters. Ensure that the above commands have configured the parameters correctly as shown in Table 2.
3. Power down the modem rack.
4. Remove the PCB from its slot, change dip switch 10 to the DOWN position and reinstall PCB.
5. The firmware has now been configured.
6. Repeat the procedure for each PCB.

TELEPHONE MODEM "AT" COMMAND SETTINGS	
AT Command	Function
&e0	No error correction
&e3	No flow control
&e14	Data compression disabled
$sb9600	Serial port data rate = 9600 bps

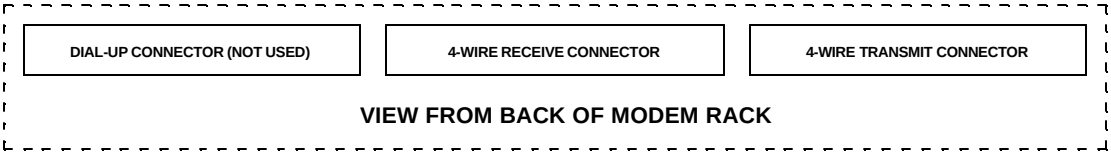

Table 2: Telephone Modem "AT" Command Settings

Leased-Line Assignment

Each private wire modem at the central site is paired with its counterpart at the remote site. This requires that each modem at the central site be connected to the appropriate wires of the 4-wire leased line network. The interface to the leased-line network consists of two 50-pin connectors at the back of the card cage to which are attached telephony cables. The connector identification is shown in Figure 3.

Figure 3: Identification of Connectors to 4-wire leased line telephone network

Each of the two connectors interfaces to the leased-line network through a telephone cable. The pinouts of the connectors are shown in Appendix A. Each private wire modem slot has 4 wires associated with it - 2 transmit wires (Tx1 and Tx2) and 2 receive wires (Rx1 and Rx2). ***For each central site modem, the transmit wires must be connected to the receive wires of the***

corresponding remote site Europa digitiser. The order of the 2 transmit wires and the 2 receive wires is not relevant.

5. Servicing

Basic troubleshooting

The Rack Mount Private Wire Modem is always used as a part of a network containing Europa digitisers. Therefore troubleshooting the Private Wire Modem usually involves setting up some combination of digitiser-Private Wire Modem-central site equipment under laboratory conditions. In this manner the comms port of the Rack Mount Modem can be checked for data continuity which is sufficient proof that the Private Wire Modem is operational.

Before you attempt any troubleshooting check all the connections, power supplies and fuses to rule out the possibility that the malfunctioning is due to one of these items.

Unable to communicate with the Rack Mount Private Wire Modem

Each modem rack contains up to 16 individual telephone modem PCBs. If it is impossible to communicate with any individual PCB then the problem lies with the card cage as a whole. The most likely candidate is the modem rack power supply. However, if the problem lies with a single PCB then proceed as follows. If an individual PCB modem fails to send any data or, during firmware configuration, the terminal emulator menu appears inaccessible on power-up, check both the settings of the terminal emulator and the Telephone Modem PCB firmware. In most cases the cause is either a mismatch in baud rate settings or the AT command settings in the modem PCB firmware are incorrect.

Disassembly and Reassembly

The objective is to troubleshoot to the board level and replace the board. Attempt to identify the faulty PCB board by swapping in a known good board from one of the adjacent slots. No special tools are required.

Disassembly Instructions

1. Power down the modem rack.
2. Open the modem rack door.
3. Remove the suspect board by pulling it away from the rear edge connector.
4. Push in a known good board in the current slot.
5. Close the modem rack door.
6. Power up the modem rack..

Assembly Instructions

The assembly instructions are the reverse of the disassembly instruction. Make sure that the swapped board has the same configuration parameter values as the previously faulty board. Refer to the as-shipped sheets for the configuration parameters. After power up , check the following:

- The telephone PCB firmware menu is accessible.
- Data is being received from the associated Europa Digitiser.
- Re-requested packets from the central site are received by the central site.

Appendix A - Connector Pinouts

4-Wire Receive Connector

slot 1, Rx1	26	1	slot 1, Rx2
slot 2, Rx1	27	2	slot 2, Rx2
slot 3, Rx1	28	3	slot 3, Rx2
slot 4, Rx1	29	4	slot 4, Rx2
slot 5, Rx1	30	5	slot 5, Rx2
slot 6, Rx1	31	6	slot 6, Rx2
slot 7, Rx1	32	7	slot 7, Rx2
slot 8, Rx1	33	8	slot 8, Rx2
slot 9, Rx1	34	9	slot 9, Rx2
slot 10, Rx1	35	10	slot 10, Rx2
slot 11, Rx1	36	11	slot 11, Rx2
slot 12, Rx1	37	12	slot 12, Rx2
slot 13, Rx1	38	13	slot 13, Rx2
slot 14, Rx1	39	14	slot 14, Rx2
slot 15, Rx1	40	15	slot 15, Rx2
slot 16, Rx1	41	16	slot 16, Rx2
unused	42	17	unused
unused	43	18	unused
unused	44	19	unused
unused	45	20	unused
unused	46	21	unused
unused	47	22	unused
unused	48	23	unused
unused	49	24	unused
unused	50	25	unused

4-Wire Transmit Connector

slot 1, Tx1	26	1	slot 1, Tx2
slot 2, Tx1	27	2	slot 2, Tx2
slot 3, Tx1	28	3	slot 3, Tx2
slot 4, Tx1	29	4	slot 4, Tx2
slot 5, Tx1	30	5	slot 5, Tx2
slot 6, Tx1	31	6	slot 6, Tx2
slot 7, Tx1	32	7	slot 7, Tx2
slot 8, Tx1	33	8	slot 8, Tx2
slot 9, Tx1	34	9	slot 9, Tx2
slot 10, Tx1	35	10	slot 10, Tx2
slot 11, Tx1	36	11	slot 11, Tx2
slot 12, Tx1	37	12	slot 12, Tx2
slot 13, Tx1	38	13	slot 13, Tx2
slot 14, Tx1	39	14	slot 14, Tx2
slot 15, Tx1	40	15	slot 15, Tx2
slot 16, Tx1	41	16	slot 16, Tx2
unused	42	17	unused
unused	43	18	unused
unused	44	19	unused
unused	45	20	unused
unused	46	21	unused
unused	47	22	unused
unused	48	23	unused
unused	49	24	unused
unused	50	25	unused

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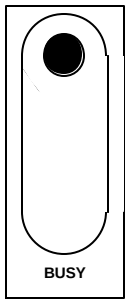
Appendix B - Modem Diagnostic Indicators

There are two versions in the appearance of the front panel diagnostic indicators. These are shown in the following table.

VERSION 1	VERSION 2	DESCRIPTION
RCV	RCV	Blinks when data is being received, ON for space, OFF for mark.
XMT	XMT	Blinks when data is being transmitted, ON for space, OFF for mark.
CD	CD	ON when a valid carrier tone has been detected.
SPD3	28.8	ON when modem is connected at 28,800 bps.
SPD2	14.4	ON when modem is connected at 14,400 bps NOTE: when both the 28.8 and the 14.4 LEDs are ON, this indicates connection at 21,600 to 26,400 bps
SPD1	2,400	ON when modem is connected at 2400 bps.
OH	OH	Off-hook. Occurs when modem is dialing, on line, or answering a call. Pulses when modem is pulse dialing in Command mode.
DTR	DTR	Data Terminal Ready. When ON, modem is permitted to answer an incoming call. When DTR goes OFF a connected modem disconnects if dependent on DTR.
RI	RI	Ring Indicator. ON during ringing interval as an incoming call is received.
OOS	OOS	Out Of Service. Flashing indicates that leased line is down and modem self-test has failed. ON indicates that the modem is out of service (when out of service, modem is busy to incoming calls)

Busy Out Switch

Each of the sixteen modems contains a two-position ON/Off switch on the front panel. This switch can be used to to create a "busy out" condition for the modem, i.e., take the modem off-hook. In the current application this switch should *never* be placed in the BUSY position. The normal switch state is shown below.



Appendix C - Technical Specifications

Description

The central site private wire modem rack is installed in a 19” equipment cabinet and consolidates up to 16 modem cards and one power supply for the modem cards.

Specifications

Description:	Metal construction with vent holes, built-in mounting brackets, and connections for power, data ports, and phone line.
Power:	Consumption: 70W when the rack is fully loaded with modems;
	Supply voltage: 90-130Vac or 230Vac, 50/60 Hz
Cooling Fan:	1
Connectors:	One 3-prong grounded receptacle, 16 DB-25 data ports, & 3 50-pin connectors (male) for RJ-21 connections (leased line models)
Dimensions:	19" w × 7" h × 15" d (48 cm × 18 cm × 38 cm)
	It requires 4 U space in the 19” equipment cabinet.
Weight:	21 lbs. with 1 power supply (9.6 kg)
Operating Temperature:	Meets office environmental specification as outlined in Nanometrics document no. 13065.

Included Parts

Modem rack.

Modem power supply.

A/C power cable (ASA or DIN).