



data communications

Installation and Operation Manual

ASM-61

***2-Wire Symmetric
VDSL-Based Modem***

Version 1.0

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Limited Warranty

RAD warrants to DISTRIBUTOR that the hardware in the ASM-61 to be delivered hereunder shall be free of defects in material and workmanship under normal use and service for a period of twelve (12) months following the date of shipment to DISTRIBUTOR.

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General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.

Safety Symbols



Warning

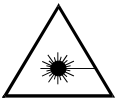
This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.



Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.



Protective earth: the marked lug or terminal should be connected to the building protective earth bus.



Warning

Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached.

Please observe the following precautions:

- **Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.**
- **Do not attempt to adjust the laser drive current.**
- **Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.**
- **The use of optical devices with the equipment will increase eye hazard.**
- **Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.**

ATTENTION: The laser beam may be invisible!

In some cases, the users may insert their own SFP laser transceivers into the product. Users are alerted that RAD cannot be held responsible for any damage that may result if non-compliant transceivers are used. In particular, users are warned to use only agency approved products that comply with the local laser safety regulations for Class 1 laser products.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

Handling Energized Products

General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective earth terminal. If an earth lug is provided on the product, it should be connected to the protective earth at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

Connection of AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

In cases when the power distribution system is IT type, the switch must disconnect both poles simultaneously.

Connection of DC Mains

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC mains systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

DC units should be installed in a restricted access area, i.e. an area where access is authorized only to qualified service and maintenance personnel.

Make sure that the DC supply is electrically isolated from any AC source and that the installation complies with the local codes.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Before connecting the DC supply wires, ensure that power is removed from the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

If the DC mains are floating, the switch must disconnect both poles simultaneously.

Connection of Data and Telecommunications Cables

Data and telecommunication interfaces are classified according to their safety status.

The following table lists the status of several standard interfaces. If the status of a given port differs from the standard one, a notice will be given in the manual.

Ports	Safety Status
V.11, V.28, V.35, V.36, RS-530, X.21, 10 BaseT, 100 BaseT, Unbalanced E1, E2, E3, STM, DS-2, DS-3, S-Interface ISDN, Analog voice E&M	SELV Safety Extra Low Voltage: Ports which do not present a safety hazard. Usually up to 30 VAC or 60 VDC.
xDSL (without feeding voltage), Balanced E1, T1, Sub E1/T1	TNV-1 Telecommunication Network Voltage-1: Ports whose normal operating voltage is within the limits of SELV, on which overvoltages from telecommunications networks are possible.
FXS (Foreign Exchange Subscriber)	TNV-2 Telecommunication Network Voltage-2: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are not possible. These ports are not permitted to be directly connected to external telephone and data lines.
FXO (Foreign Exchange Office), xDSL (with feeding voltage), U-Interface ISDN	TNV-3 Telecommunication Network Voltage-3: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are possible.

Always connect a given port to a port of the same safety status. If in doubt, seek the assistance of a qualified safety engineer.

Always make sure that the equipment is grounded before connecting telecommunication cables. Do not disconnect the ground connection before disconnecting all telecommunications cables.

Some SELV and non-SELV circuits use the same connectors. Use caution when connecting cables. Extra caution should be exercised during thunderstorms.

When using shielded or coaxial cables, verify that there is a good ground connection at both ends. The earthing and bonding of the ground connections should comply with the local codes.

The telecommunication wiring in the building may be damaged or present a fire hazard in case of contact between exposed external wires and the AC power lines. In order to reduce the risk, there are restrictions on the diameter of wires in the telecom cables, between the equipment and the mating connectors.

Caution

To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cords.

Attention

Pour réduire les risques d'incendie, utiliser seulement des conducteurs de télécommunications 26 AWG ou de section supérieure.

Some ports are suitable for connection to intra-building or non-exposed wiring or cabling only. In such cases, a notice will be given in the installation instructions.

Do not attempt to tamper with any carrier-provided equipment or connection hardware.

Electromagnetic Compatibility (EMC)

The equipment is designed and approved to comply with the electromagnetic regulations of major regulatory bodies. The following instructions may enhance the performance of the equipment and will provide better protection against excessive emission and better immunity against disturbances.

A good earth connection is essential. When installing the equipment in a rack, make sure to remove all traces of paint from the mounting points. Use suitable lock-washers and torque. If an external grounding lug is provided, connect it to the earth bus using braided wire as short as possible.

The equipment is designed to comply with EMC requirements when connecting it with unshielded twisted pair (UTP) cables. However, the use of shielded wires is always recommended, especially for high-rate data. In some cases, when unshielded wires are used, ferrite cores should be installed on certain cables. In such cases, special instructions are provided in the manual.

Disconnect all wires which are not in permanent use, such as cables used for one-time configuration.

The compliance of the equipment with the regulations for conducted emission on the data lines is dependent on the cable quality. The emission is tested for UTP with 80 dB longitudinal conversion loss (LCL).

Unless otherwise specified or described in the manual, TNV-1 and TNV-3 ports provide secondary protection against surges on the data lines. Primary protectors should be provided in the building installation.

The equipment is designed to provide adequate protection against electro-static discharge (ESD). However, it is good working practice to use caution when connecting cables terminated with plastic connectors (without a grounded metal hood, such as flat cables) to sensitive data lines. Before connecting such cables, discharge yourself by touching earth ground or wear an ESD preventive wrist strap.

FCC-15 User Information

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the Installation and Operation manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Emission Requirements

This Class A digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Warning per EN 55022 (CISPR-22)

Warning

This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.

Avertissement

Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ces cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.

Achtung

Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Declaration of Conformity

Manufacturer's Name: RAD Data Communications Ltd.

Manufacturer's Address: 24 Raoul Wallenberg St.
Tel Aviv 69719
Israel

declares that the product:

Product Name: ASM-61

conforms to the following standard(s) or other normative document(s):

EMC:	EN 55022: 1998	Information technology equipment, radio disturbance characteristics, limits and methods of measurement.
	EN 50024: 1998	Information technology equipment, immunity characteristics, limits and methods of measurement.
Safety:	EN 60950: 2000	Safety of information technology equipment.

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC, the Low Voltage Directive 73/23/EEC and the R&TTE Directive 99/5/EC for wired equipment. The product was tested in a typical configuration.

Tel Aviv, 31st October, 2002



Haim Karshen
VP Quality

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Chapter 1

Introduction

1.1 Overview

ASM-61 is a dedicated carrier-class VDSL (Very High-bitrate Digital Subscriber Line) modem operating at symmetrical line rate of 10 Mbps. ASM-61 serves for transporting 10/100BaseT Ethernet traffic over 2-wire line using VDSL technology.

Product Options

ASM-61 always operates in pairs:

- ASM-61/CO, for the central office deployment
- ASM-61/CPE, for customer premises deployment.

Application

Figure 1-1 shows a typical application for ASM-61, connecting two LANs over 2-wire line.

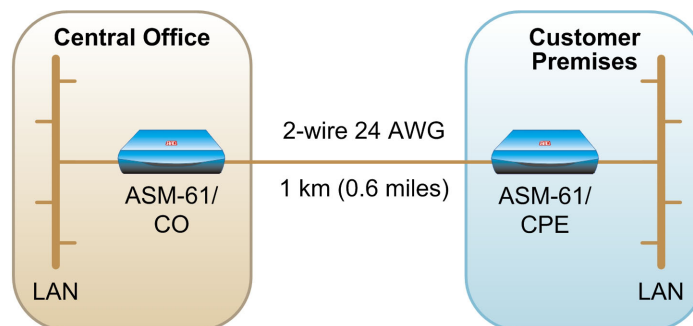


Figure 1-1. Typical Application

Features

ASM-61 utilizes the QAM-based modulation to extend the range of 10/100BT data transmission over 2-wire 24 AWG line up to 1 km (0.6 miles), operating at 10 Mbps line rate. [Table 1-1](#) lists line attenuations for 1 km range at 6.05 MHz for different cable types.

Table 1-1. Line Attenuation

Cable Type	Attenuation [dB]
PIC 0.4 mm/26 AWG	-66.0
PIC 0.5 mm/24 AWG	-53.0
PE 0.4 mm/26 AWG	-64.2
PE 0.5 mm/24 AWG	-50.0
PE 0.63 mm/22 AWG	-41.4
PE 0.9 mm/19 AWG	-29.1
FP 1.14 mm	-49.7
CAT-3	-71.5
CAT-5	-50.0

DTE Interface

The ASM-61 DTE interface is an Ethernet/Fast Ethernet port with VLAN support. The plug-and-play 10/100BT interface uses on-chip autonegotiation algorithm to configure itself automatically for 10 Mbps or 100 Mbps half- or full-duplex operation.

Management

Operating with the constant line rate and preset timing modes, ASM-61 does not require any user configuration.

Timing

ASM-61/CO operates with internal clock, and ASM-61/CPE uses clock received from the line.

Synchronization

ASM-61 units reach synchronization in about 15 seconds at cold restart (power-on) and in less than one second at warm restart.

Test Capabilities

ASM-61 performs an extensive self-test at start-up. During the self-test, ASM-61 checks its CPU, internal framer, DTE/line interfaces and power supply.

1.2 Physical Description

Figure 1-2 shows a 3D view of the ASM-61 standalone modem.



Figure 1-2. 3D View of ASM-61

The front panel includes three LEDs, which display the status of power, line synchronization status and LAN activity status. For detailed description of the front panel, see Chapter 3.

The rear panel includes power connector, LAN interface connectors and a line connector. The ASM-61 rear panel is described in greater detail in Chapter 2.

1.3 Functional Description

This section provides a functional description (Figure 1-3) of ASM-61 in the form of block diagram.

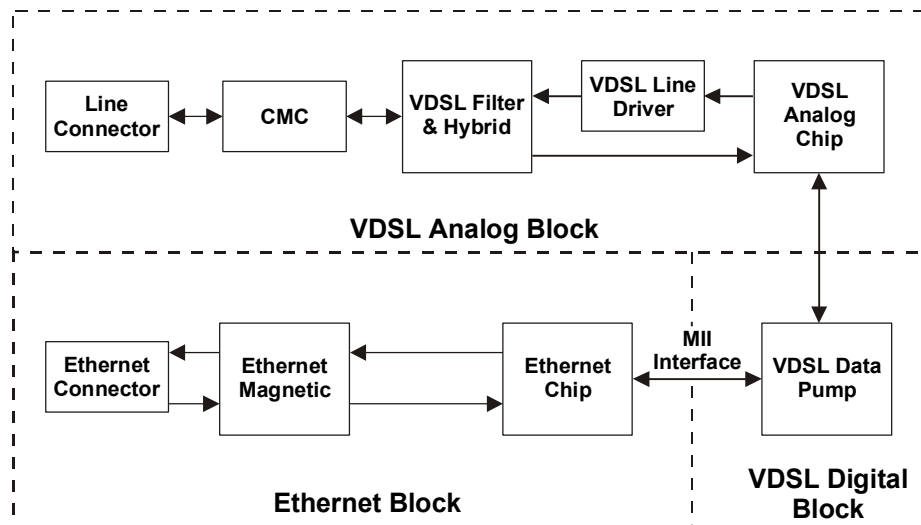


Figure 1-3. ASM-61 Block Diagram

The modem consists of the following major modules:

- **Ethernet Block** includes an external Ethernet component configured as a single PHY and connected in one end at LAN interface by passive components and to the second end to a standard Ethernet device acting as MAC (Media Access Controller). By autonegotiation procedure each MAC can configure its Ethernet PHY independently of the remote site. The configuration parameters are: 10 Mbps or 100 Mbps, half or full duplex, backpressure in half duplex. MII serial management configures all those parameters to PHY. It also includes embedded 8-kilobyte Ethernet transmit and 16-kilobyte Ethernet receive buffers.
- **VDSL Digital Block** is based on a QAM VDSL data pump serving as an Ethernet physical layer. The VDSL digital block operates as a *master* (CO) or *slave* (CPE). It includes an Ethernet interface, an AFE interface, an embedded micro-controller for standalone operation and monitoring. VDSL digital block is built around a DSP, which is based on a QAM VDSL data pump serving as an Ethernet physical layer. It includes an Ethernet interface (described above), an AFE interface, and an embedded micro-controller for standalone operation and monitoring. In addition, it provides an embedded operation channel for the control of remote unit. The VDSL digital block operates at symmetrical line rate of 12.5 Mbps, including the standard VDSL channels, delivering a user data payload at 11.25 Mbps. This block operates as ‘master’ (CO) or ‘slave’ (CPE). The VDSL digital block complies with VDSL standard requirements in respect of data randomizer support, Reed-Solomon forward error correction (FEC) and convolution interleave algorithm for noisy environment and poor quality lines. The DSP configures the DSL analog block via the AFE interface.
- **VDSL Analog Block** is built around the VDSL-A analog chip. It employs an external crystal oscillator to provide timing for the system. Analog output from the VDSL analog chip drives the differential line driver. The VDSL filters and hybrid perform upstream and downstream channel separation.

1.4 Technical Specifications

Line Interface	<i>Protocol</i>	Very High-bit-rate Digital Subscriber Line (VDSL)
	<i>Type</i>	2-wire, unconditioned dedicated lines (twisted pair)
	<i>Line Rate</i>	10 Mbps, symmetric
	<i>Payload Rate</i>	Greater than 10 Mbps, symmetric (11.25 Mbps)
	<i>Line Coding</i>	QAM-based
	<i>Range</i>	1 km (0.6 miles)
	<i>Duplexing Method</i>	Frequency Division Duplexing (FDD)
	<i>Synchronization</i>	Link activation less than 1 sec at warm restart, with blind timing recovery and blind training algorithm
	<i>Line Impedance</i>	100Ω
	<i>Output Power</i>	10 dBm

	<i>Line Attenuation</i>	See Table 1-1
	<i>Power Spectral Density</i>	-58 dBm/Hz to -98 dBm/Hz, as per ETSI TS 101270-1 requirements
	<i>Spectral Placement</i>	Downstream: 0.9 MHz to 3.5 MHz Upstream: 4 MHz to 7.9 MHz
	<i>Connector</i>	RJ-45; pin 4 and pin 5
10/10Base-T Interface	<i>Network Topology</i>	Ethernet extension
	<i>Port</i>	One 10/100 Mbps LAN
	<i>Autonegotiation</i>	Always enabled (for appropriate configuration mode)
	<i>Standard</i>	IEEE 802.3, IEEE 802.3q
	<i>Mode</i>	Half-duplex, full-duplex, backpressure support
	<i>Maximum Packet Size</i>	1536 bytes
	<i>Backpressure</i>	Always ON
	<i>Latency</i>	2.5 msec for 1518-byte packet (end-to-end)
	<i>Connector</i>	RJ-45
Diagnostics Indicators	<i>Self-Test</i>	Self-test at startup
	<i>PWR (green)</i>	Power
	<i>SYNC (green/red)</i>	VDSL line synchronization
	<i>LAN (yellow)</i>	Ethernet traffic is detected
	<i>ACT (yellow)</i>	Ethernet traffic is detected
	<i>LINK (green)</i>	Good link integrity
Physical	<i>Height</i>	44 mm (1.7 in 1U)
	<i>Width</i>	237 mm (9.3 in)
	<i>Depth</i>	170 mm (6.7 in)
	<i>Weight</i>	0.58 kg (1.4 lb)
Power	<i>Combined AC/DC</i>	100 to 240 VAC ($\pm 10\%$), 50 to 60 Hz, 4.6W -48 VDC (-36 to -72 VDC), 7W
	<i>Fuse</i>	0.250A, slow-blow
Environment	<i>Temperature</i>	0–50°C (32–122°F)
	<i>Humidity</i>	Up to 90%, non-condensing

Chapter 2

Installation

This chapter describes installation and setup procedures for the standalone ASM-61 modem.

After installing the unit, refer to [Chapter 3](#) for the operating instructions.



Warning

Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is aware of the hazards involved. Always observe standard safety precautions during installation, operation, and maintenance of this product.

Note

Before installing the product, review [Handling Energized Products](#) at the beginning of the manual.

2.1 Site Requirements and Prerequisites

ASM-61 has a combined AC/DC power supply. Units should be installed within 1.5m (5 ft) of an easily accessible grounded AC outlet furnishing 100 VAC to 240 VAC or DC power source of –48 VDC.

For instructions on connecting ASM-61 to a DC power source, see the [DC Power Supply Connection Supplement](#).

Allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Allow at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature of ASM-61 is 0 to 50°C (32 to 122°F) at relative humidity of 90%, non-condensing.

2.2 Package Contents

The ASM-61 package includes the following items:

- One ASM-61 unit
- Last Mile Access and Intelligent Modems CD
- AC/DC power cord.

2.3 Installation and Setup

ASM-61 is delivered completely assembled. It is designed for tabletop, wall or 19-inch rack installation.

The ASM-61/CO units are installed at the central site, ASM-61/CPE units are installed at the remote site.

► **To install an ASM-61 unit:**

1. Connect the line (see [Connecting the Line](#) below).
2. Connect the DTE (see [Connecting the DTE](#) below).
3. Connect power to the unit (see [Connecting the Power](#) below).

Connecting the Interfaces

[Figure 2-1](#) shows the rear panel of a typical ASM-61 unit.

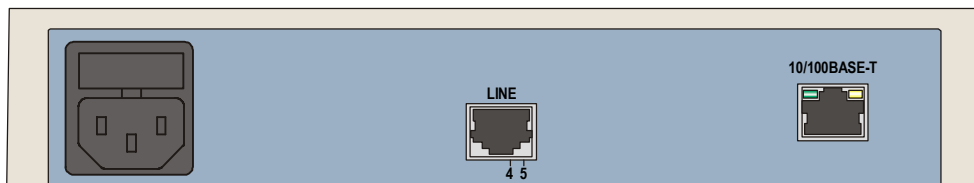


Figure 2-1 ASM-61 Rear Panel

Connecting the Line

The ASM-61 line interface terminates in an RJ-45 connector (pin 4 and pin 5).

► **To connect the RJ-45 connector:**

- Connect the line cable to the RJ-45 connector designated LINE.

Connecting the DTE

The ASM-61 DTE interface provides interface for input/output data according to autonegotiation procedures, clock reference and control signals between the modem and the DTE. The ASM-61 DTE interface is 10/100BaseT port, which terminates in an RJ-45 connector (see [Table 2-1](#) for the connector pinout).

► **To connect the DTE interface:**

- Connect the Ethernet cable to the RJ-45 connector designated 10/100BASE-T.

Table 2-1. 10/100BASE-T Connector Pinout

Pin	Signal
1	Rx +
2	Rx -
3	Tx +
4	-
5	-
6	Tx -
7	-
8	-

Connecting the Power



Warning

Before switching on this unit and connecting or disconnecting any other cable, the protective earth terminals of this unit must be connected to the protective ground conductor of the power cord. If you are using an extension cord (power cable) make sure it is grounded as well.

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.

The line fuse is located in an integral-type fuse holder located on the rear panel. Make sure that only fuses of the required rating, as marked on the rear panel, are used for replacement. Do not use repaired fuses or short-circuit the fuse holder. Always disconnect the mains cable before removing or replacing the fuse. Whenever it is likely that the fuse protection has been damaged, make the unit inoperative and secure it against unintended operation.

AC power is supplied to the ASM-61 modem through a standard 3-prong plug with an integral fuse holder (see [Figure 2-1](#)). A cable 1.5m (5 ft) is provided with the unit.

► To connect the AC power:

1. Connect the power cable to the power connector on the ASM-61 rear panel.
2. Connect the power cable to the mains outlet.

The unit will be turned on automatically upon connection to the mains.

► To connect the DC power:

- See the [DC Power Supply Connection Supplement](#).

Chapter 3

Operation

This chapter provides the description of the ASM-61 front-panel indicators, and details the modem's operating procedures (turn-on, front-panel indications, performance monitoring and turn-off).

Installation procedures given in [Chapter 2](#) must be completed and checked before attempting to operate ASM-61.

3.1 Front Panel Indicators

The front panel of ASM-61 includes three LED indicators that show the current operating status of the unit.

[Figure 3-1](#) shows the ASM-61 front panel. [Table 3-1](#) lists and describes the ASM-61 indicators.

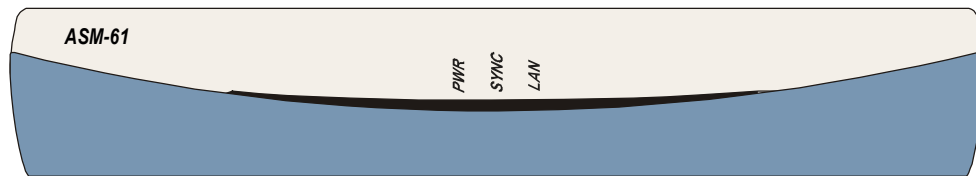


Figure 3-1 ASM-61 Front Panel

Table 3-1. ASM-61 LED Indicators

Name	Function	Location
PWR (green)	On – Power is On	Front panel
SYNC (red/green)	On (red) – Data link is not synchronized with the remote modem On (green) – Data link is synchronized with the remote modem	Front panel
LAN (yellow)	On – Traffic from attached DTE is detected Off – No traffic detected	Front panel
LINK (green)	On – Ethernet link is properly connected Off – Ethernet link is disconnected	10/100BASE-T connector
ACT (yellow)	On – Traffic from attached DTE is detected Off – No traffic detected	10/100BASE-T connector

3.2 Operating ASM-61

Turning On ASM-61

ASM-61 is turned on as soon as the power is connected to the unit. The PWR indicator lights up and remains lit as long as ASM-61 receives power.

Normal Operation

Always operate ASM-61 in pairs: ASM-61/CO opposite ASM-61/CPE.
ASM-61 units operate with the constant line rate (10 Mbps) and preset timing modes (ASM-61/CO – internal, ASM-61/CPE – received).

Note *If a DTE attached to ASM-61 does not support autonegotiation, the modem automatically switches to half duplex mode at 10 Mbps or 100 Mbps.*

ASM-61 requires no operator attention once installed and powered up, with the exception of occasional monitoring of front panel indicators.

Turning Off ASM-61

To turn off ASM-61, remove the power cord from the power source.



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RAD Data Communications would like your help in improving its product documentation. Please complete and return this form by mail or by fax or send us an e-mail with your comments.

Thank you for your assistance!

Manual Name: ASM-61

Publication Number: 182-200-01/06

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