INSTALLATION AND OPERATION MANUAL

ASMi-54C

Ethernet over SHDSL.bis 8-Port Module

LRS-102 Version 2.0

RAD
data communications
The Access Company

ASMi-54C

Ethernet over SHDSL.bis 8-Port Module

LRS-102 Version 2.0

Installation and Operation Manual

Notice

For further information contact RAD at the address below or contact your local distributor.

International Headquarters
RAD Data Communications Ltd.

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel: 972-3-6458181
Fax: 972-3-6498250, 6474436
E-mail: market@rad.com

North America Headquarters
RAD Data Communications Inc.

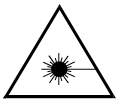
900 Corporate Drive
Mahwah, NJ 07430, USA
Tel: (201) 5291100, Toll free: 1-800-4447234
Fax: (201) 5295777
E-mail: market@radusa.com

 Publication No. 416-253-12/08

Quick Start Guide

If you are familiar with the ASMi-54C modules, use this guide to prepare it for operation.

Preparations for Operation



Warning

SFPs installed on ASMi-54C modules 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.

For your safety:

- Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the optical transmitter.
- Do not use broken or unterminated fiber-optic cables/connectors.
- Do not look straight at the laser beam, and do not directly into the optical connectors while the unit is operating.
- Do not attempt to adjust the laser drive current.
- The use of optical instruments with this product will increase eye hazard. Laser power up to 1 mW could be collected by an optical instrument.
- Use of controls or adjustment or performing procedures other than those specified herein may result in hazardous radiation exposure.

ATTENTION: The laser beam may be invisible!

1. If necessary, install the prescribed SFPs in the ASMi-54C SFP sockets.
2. Insert the module in the assigned I/O slot.
3. Refer to the site installation plan, identify the cables intended for connection to the ASMi-54C connectors, and connect the cables as explained below.

➤ To connect cables to SHDSL ports:

1. Connect the 26-pin connector of the CBL-DB26-8SHDSL cable to the module SHDSL.bis front panel SHDSL.bis connector.
2. Connect the RJ-45 plug of each line (the plugs are marked CH-1 to CH-8) to the prescribed user's equipment or patch panel connector. Insulate unused connectors, to prevent accidental short-circuiting of their exposed contacts to metallic surfaces.

➤ To connect cables to the optical Ethernet ports:

1. Connect each prescribed cable to the corresponding ASMi-54C connector, ETH1 or ETH2. When two fibers are used, pay attention to connector polarity: the transmitter output is at left-hand side.

➤ **To connect cables to the electrical Ethernet ports:**

1. Connect the prescribed cable to the corresponding connector, ETH1 or ETH2.

Configuring Physical Layer Parameters of SHDSL Lines

For the supervision terminal, use the **Configuration › Physical layer › I/O › SHDSL › Line** screen.

Parameter	Values	Parameter	Values
Line	**1** to 8 All Lines	Transmission Mode	**ANNEX B/G** ANNEX A/F
Administrative Status	**DOWN** UP	Line Probe	DISABLE **ENABLE**
Name	Up to 25 alphanumeric characters	Payload Rate	**192** to 5696
Wires	**2 Wires** 4 Wires 8 Wires	Current Margin	**0 dB**, -10 to +21 dB DISABLE
TC Layer	**64/65-OCTET** HDLC	Worst Margin	-10 to +21 dB **DISABLE**
STU	**CENTRAL** REMOTE	Loop Attenuation Threshold (dB)	**0** to 127
Power Backoff (dB)	**0** to 31	SNR Margin Threshold (dB)	**0** to 15

Configuring PCS Parameters

For the supervision terminal, use **Configuration › Physical layer › I/O › SHDSL › PCS**.

Parameter	Values
PCS	**1** to 8
Administrative Status	**DOWN** UP
Name	Up to 25 alphanumeric characters
Lines (when TC Layer is 64/65-Octec)	Single line: same number as PCS Multiple lines: see table below

*Supported PCS Groups versus **Lines** Parameter*

Maximum Number of PCS Groups	Number of SHDSL Ports (Lines) in PCS Group	SHDSL Lines in PCS Group	Master PCS in the Group
2	4	1, 2, 3, 4	1
	4	5, 6, 7, 8	5

Maximum Number of PCS Groups	Number of SHDSL Ports (Lines) in PCS Group	SHDSL Lines in PCS Group	Master PCS in the Group
4	2	1, 2	1
		3, 4	3
	2	5, 6	5
		7, 8	7

Configuring Physical Layer Parameters of Ethernet Ports

For the supervision terminal, use **Configuration > Physical layer > I/O > Ethernet**.

Parameter	Values	Parameter	Values
Administrative Status	**DOWN** UP	Max. Capability Advertised (auto-negotiation enabled)	**100Mbps full duplex** 100Mbps half duplex 10Mbps full duplex 10Mbps half duplex
Name	Up to 25 alphanumeric characters	Speed & Duplex	**100Mbps full duplex** 100Mbps half duplex 10Mbps full duplex 10Mbps half duplex
Auto Negotiation	**ENABLE** DISABLE	Flow Control	**DISABLE** ENABLE

Contents

Chapter 4. Troubleshooting and Diagnostics

Appendix A. Pinouts

Chapter 1
Introduction

1.1 Overview

This manual describes the technical characteristics, applications, installation and operation of the ASMi-54C SHDSL.bis I/O modules for the LRS-102 high-density SNMP managed modem rack.

ASMi-54C modules are primarily intended to operate in a link with the ASMi-54 G.SHDSL.bis standalone modems offered by RAD, to provide a simple and low-cost connectivity solution for delivering Ethernet data to customer's premises over the existing twisted pair (copper) infrastructure of the distribution plant, while eliminating the need for repeaters. Each ASMi-54C module can connect to up to eight ASMi-54 standalone modems, however it can also operate in a link with another ASMi-54C module.

For details regarding the integration of ASMi-54C modules in LRS-102 systems and systems applications, refer to the *LRS-102 Installation and Operation Manual*.

Product Options

ASMi-54C has eight independently configurable SHDSL.bis external ports for SHDSL services, and two 10/100 Mbps Ethernet ports for packet-based services (with license-based activation), with internal Ethernet switching subsystem. It is offered in two models with similar characteristics, which differ only in the type of interfaces supported by the Ethernet ports:

- ASMi-54C/ETH/UTP: 10/100BASE-TX interfaces terminated in RJ-45 connectors.
- ASMi-54C/ETH/SFP: two sockets for Fast Ethernet SFP optical transceivers. RAD offers several types of SFPs capable of meeting a wide range of operational requirements.

Application

Installing ASMi-54C modules connected to ASMi-54 standalone modems enhances the LRS-102 capabilities and services by offering cost-effective high-speed Ethernet access over SHDSL, at ranges up to several kilometers, based on the Ethernet for the First Mile (EFM) standard per IEEE 802.3-2005. ASMi-54C is capable of operating at variable rates up to 5.7 Mbps over one twisted pair, and supports bonding of 2 and 4 twisted pairs for rates up to 22.8 Mbps.

Figure 1-1 shows a typical application for an LRS-102 equipped with ASMi-54C modules connected to ASMi-54 standalone modems.

Note *ASMi-54C modules can also be used to interconnect different LRS-102 units by means of SHDSL links. In this case, one ASMi-54C module must be configured to operate in the STU-C (central) mode, and the other ASMi-54C module(s) must be configured to operate in the STU-R (remote) mode. The traffic handling capabilities are similar to what is available with ASMi-54 standalone modems.*

In the configuration shown in *Figure 1-1,* each ASMi-54C module operates independently, to provide the ASMi-54 standalone modem connected to it access to Ethernet services, for example, to metro Ethernet networks, at the Fast Ethernet level. Therefore, for Ethernet traffic, each ASMi-54C module effectively operates as a modem with an internal Ethernet switching subsystem.

The internal Ethernet switching subsystem enables configuring multiple flows within the ASMi-54C, to filter the traffic flowing between each ASMi-54C Ethernet port and the attached ASMi-54 modem in accordance with the user's application requirements. ASMi-54C internal Ethernet switching subsystem is flexible enough to enable configuring traffic flows between the different ASMi-54 standalone modems connected to the same module.

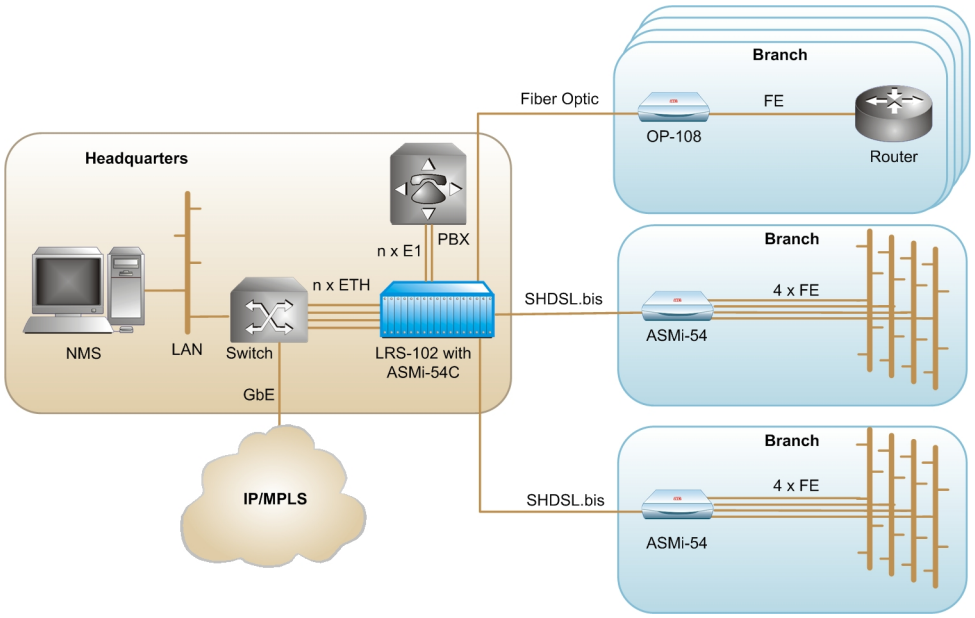


Figure 1-1. Typical ASMi-54C Application

Features

SHDSL Transport

ASMi-54C uses the SHDSL.bis version of the Symmetrical High-speed Digital Subscriber Line technology, as standardized in ITU-T Rec. G.991.2. This recommendation supports variable, extended, payload data rates up to 5.696 Mbps (5.7 Mbps line rate) on a single unloaded and unconditioned twisted copper pair, of the type used in the local telephone distribution plant.

The type of SHDSL interfaces provided by the module: central (STU-C: SHDSL terminal unit – CO) or remote (STU-R: SHDSL terminal unit – remote), as well as the transport bandwidth, are selected by software, and the module handles all the signal processing, framing and signaling processing tasks necessary for SHDSL.bis interoperability.

ASMi-54C modules can be configured by the user to operate either in accordance with ITU-T Rec. G.991.2 Annex A or F for compatibility with North American (or similar) networks, or Annex B or G for compatibility with European (and similar) networks.

Each of the eight SHDSL.bis module ports is supported by a multirate modem that operates at independently user-selectable data rates in the range of 192 to 5696 kbps in 64 kbps increments. Each group of four SHDSL.bis ports (1 to 4, and 5 to 8) is handled by a separate SHDSL section.

Note *The terms **SHDSL port** and **SHDSL line** are both used below, in accordance with the conventions used on ASMi-54C supervision terminal screens. However, note that the terms are interchangeable only when the SHDSL transport function (the SHDSL line) is handled by a single port: when more ports are used, for example, by bonding, PAF, etc., the term **line** represents the **group of ports** that provide the transport function.*

ASMi-54C supports two types of Transmission Convergence (TC) layers:

- 64/65 octet encapsulation: supports only packet traffic, that is, only Ethernet services. Each SHDSL port operates as an independent port (2-wires mode only), but the total bandwidth available for carrying Ethernet traffic can be increased by bonding together two or four lines (4-wires and 8-wires mode, respectively), using the PAF (PME Aggregation Function) defined in IEEE 802.3-2005. Bonding enables achieving line rates up to 22.8 Mbps, or operating at a longer range by selecting a lower rate.
- HDLC encapsulation: to increase available bandwidth or extend the maximum range at a given rate, it is possible to bond together two or four lines (4-wires and 8-wires mode, respectively), a capability referred to as the M-pair mode per ITU-T Rec. G.991.2.

Ethernet Service

ASMi-54C Ethernet services are supported by the SHDSL transport subsystem and an internal Ethernet switching subsystem.

- Ethernet transport over SHDSL is provided in accordance with the Ethernet in the First Mile (EFM) standards, covered by IEEE 802.3-2005.

  Ethernet traffic can be encapsulated using the 64/65-octet TPS-TC (Transmission Protocol Specific – Transmission Convergence) layer as standardized in IEEE 802.3-2005, or HDLC.

  When ASMi-54C provides only Ethernet services, Ethernet traffic is always encapsulated using the 64/65-octet TPS-TC. With this encapsulation, line probing according to ITU-T Rec. G.991.2 can be enabled, to automatically adapt the SHDSL line rate to the condition of the line (noise, loop attenuation, etc.). When line probing is disabled, the SHDSL line operates at a fixed rate selected by the user.

As mentioned above, PAF can be used to bond several SHDSL lines, where each line can operate at a different rate. Bonding is possible only for lines handled by the same SHDSL section (either the section handling ports 1 to 4, or ports 5 to 8).

A significant advantage of bonding per IEEE 802.3-2005 is that a failure of a SHDSL line does not drop the traffic being transmitted over the other wires in the bonded group.

- The forwarding of Ethernet traffic is handled by the internal Layer 2 Ethernet switching subsystem that fully complies with the IEEE 802.3/Ethernet V.2 standards, and has full VLAN support in accordance with IEEE 802.1Q and 802.1p. The Ethernet switch serves both traffic and management: traffic is supported by means of the two external Ethernet ports of the module and by internal ports connected to the SHDSL lines, and management is supported by a dedicated port internally connected to the ASMi-54C management subsystem, and by another Fast Ethernet port connected to the management handling section of the CL modules installed in the LRS-102 (this section is available on all CL modules).

  The internal Ethernet switching subsystem enables forwarding traffic between the external Ethernet ports and the SHDSL lines. The internal forwarding of Ethernet traffic can be configured in two ways:

  - By specifying the ports (a mode identified as ***unaware*** in accordance with Metro Ethernet Forum (MEF) standards). In this mode, all the Ethernet traffic reaching one of the ports is forwarded to the other port, and vice versa
  - By using VLANs for classification: (a mode identified as ***aware*** in accordance with Metro Ethernet Forum (MEF) standards). In this mode, Ethernet traffic reaching one of the ports is forwarded to another port in accordance with its VLAN identifier.

Capacity

A LRS-102 chassis can contain up to 12 ASMi-54C modules. The number of ASMi-54 standalone modems that can be connected to a single ASMi-54C module depends on the application requirements versus SHDSL range/bandwidth considerations:

- When a single pair is sufficient to meet the transmission requirements, each SHDSL port can be connected to a separate ASMi-54 standalone modem, for a maximum of 96 modems per LRS-102 chassis.
- When more pairs are needed for each SHDSL line to reach the required bandwidth/range performance, either two or four pairs can be combined:
  - When all lines use the 4-wires modes, the total number is four ASMi-54 per ASMi-54C and a total of 48 modems per LRS-102 chassis
  - When all lines use the 8-wires modes, the total number is two ASMi-54 per ASMi-54C and a total of 24 modems per LRS-102 chassis.

A LRS-102 chassis equipped to its full capacity (12 modules) with ASMi-54C modules can thus provide links to 24 ASMi-54 standalone modems, for a total capacity of 24 Ethernet ports per chassis (2.4 Gbps per chassis).

Note *When only up to 8 ASMi-54C cards are planned for the chassis operation, a separate low-consumption power supply can be ordered from RAD (see ASMi-54C Data Sheet).*

The total Ethernet traffic handling capacity of each ASMi-54C depends on the SHDSL line rates. The maximum is always 2 × 22.8 Mbps each (approx. 45 Mbps), irrespective of the number of pairs used for SHDSL transmission.

In general, the above-mentioned capacities should be interpreted as average capacities; the peak traffic handling value may be much higher, considering the statistical characteristics of the customer's Ethernet traffic reaching the module ports, and the effects of activating the flow control option (independently configurable for each external Ethernet port).

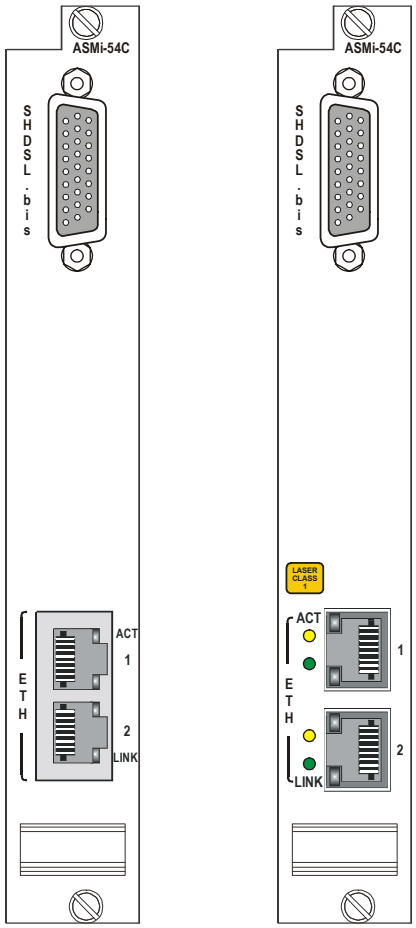
Support for Inband Management

ASMi-54C supports the transfer of inband management traffic for Ethernet applications. Inband management over ASMi-54C Ethernet ports (both external and SHDSL-based) is possible by configuring the desired ports in the management flow configured by the user (LRS-102 supports up to 64 bridge ports in the management flow).

1.2 Physical Description

ASMi-54C modules occupy one I/O slot in the LRS-102 chassis. Typical panels are shown in *Figure 1-2*.

Figure 1-2. Typical Module Panels



ASMi-54C with Copper Ethernet Ports

ASMi-54C with Ethernet Ports Equipped with SFPs

The module panels include:

- 26-pin D-type female connector, designated SHDSL.bis, for connecting to all the SHDSL ports.
- Ethernet interfacing section: includes two Ethernet ports, designated ETH1 and ETH2. The ports are equipped either with SFPs, or terminated in RJ-45 connectors. Each port has its own set of ACT and LINK status indicators. The functions of the ETH port status indicator are as follows:
  - ACT (yellow): flashes in accordance with the transmit and/or receive activity on the corresponding port
  - LINK (green): lights when the link integrity signal is detected by the corresponding port (normal operating condition).

1.3 Functional Description

Functional Block Diagram

Figure 1-3 shows the functional block diagram of the ASMi-54C module.

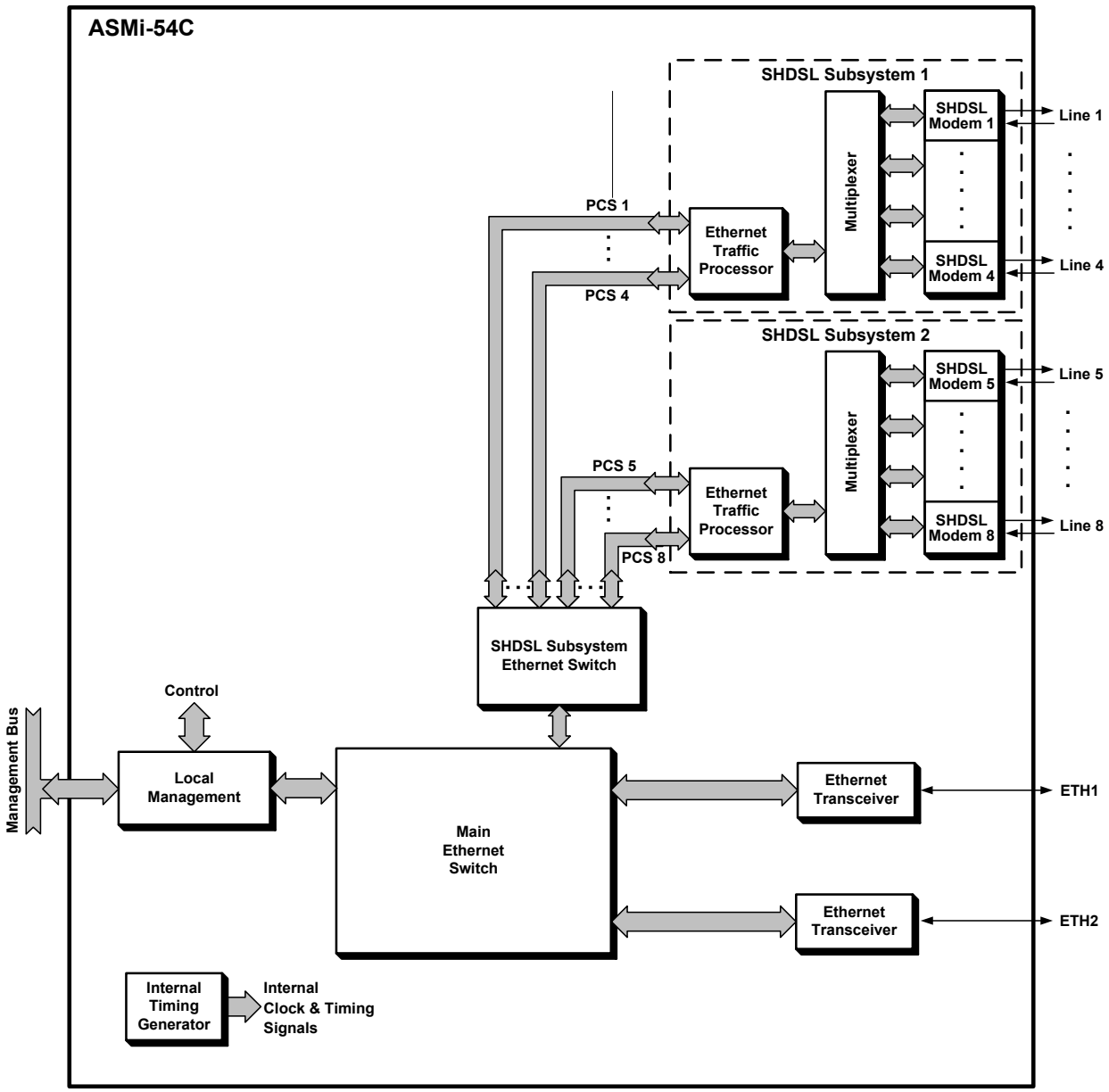


Figure 1-3. ASMi-54C Functional Block Diagram

The ASMi-54C module includes the following main subsystems:

- SHDSL subsystems, including the following functions:
  - SHDSL modems
  - Payload multiplexer
  - Ethernet traffic processor

- Ethernet subsystem, including the following functions:
  - Main Ethernet switch
  - Ethernet switch for access to the SHDSL subsystem
  - External Ethernet port interfaces (transceivers)
- Timing subsystem, including the internal timing generator
- Local management subsystem.

SHDSL Subsystems

ASMi-54C includes two identical, independently-operating SHDSL subsystems, each handling four lines: one for lines 1 to 4, and the other for lines 5 to 8.

The SHDSL subsystems comply with the applicable SHDSL.bis sections of ITU-T Rec. G.991.2 (2004). See the *SHDSL Transport* section on page *1-2* for a description of SHDSL subsystem characteristics and capabilities. The type of SHDSL interfaces provided by the module, central (STU-C) or remote (STU-R), is user-selectable:

- In the STU-C mode, the SHDSL subsystem handles the SHDSL link activation, which includes the handshaking and synchronization processes needed to set up a link between the STU-C and the STU-R in accordance with the SHDSL parameters selected by the user. The subsystem operating in the STU-C mode also provides the timing reference for the generation of SHDSL line signals.
- In the STU-R mode, the SHDSL subsystem performs similar activities, except that its operation is coordinated by the STU-C, and the SHDSL subsystem timing is locked to the clock recovered from the line signal.

Note

An ASMi-54C module can operate as STU-R only if the far-end equipment is another LRS-102 (which must include an ASMi-54C module serving as STU-C).

SHDSL Modems

Each SHDSL modem includes two main sections: a digital processor that prepares the transmit data stream sent to the line and demultiplexes the data stream received from the line, and an SHDSL line interface that generates the transmit line signal and regenerates the received line signal.

- The transmit path of the digital processor accepts the transmit payload stream from the payload multiplexer, and then adds the SHDSL overhead to form a standard SHDSL.bis signal with variable rate, from a minimum of 200 kbps to a maximum of 5700 kbps.

  The main types of SHDSL overhead are: framing data, error detection and correction data (also used for performance monitoring), and an embedded operations channel (***eoc***) that enables the STU-C function to control the STU-R function of the remote equipment connected to the corresponding port. The SHDSL line interface section of the modem then encodes the resulting data stream in accordance with the user-specified parameters (line data rate and regional characteristics), and transmits the resulting signal to the external line.

In general, the line rate is determined by the number of payload timeslots that need to be transmitted over the line served by the corresponding modem, which is user-selectable from a minimum of 3 timeslots to a maximum of 89 timeslots.

Note *If the number of timeslots routed to the corresponding port is lower than the maximum rate, any unused timeslots in the SHDSL signal frame is filled with the idle timeslot code.*

Because of the modulation method used by SHDSL modems, a lower rate reduces the bandwidth needed on the external SHDSL line, and thus enables operation over longer ranges (it also reduces the power consumption of the ASMi-54C module).

Note *Another way to increase range is to use multiple-pair bonding (M-pair mode defined in ITU-T Rec. G.991.2), which distributes the available traffic over two or four twisted pairs.*

The minimum payload data rate supported by an SHDSL signal, however, is 192 kbps (corresponding to three timeslots on the SHDSL line), which results, together with the SHDSL overhead (8 kbps) in a minimum line rate of 200 kbps. Therefore, you cannot select data rates lower than 192 kbps.

However, for packet applications (that is, when only Ethernet traffic is transmitted over the line), it is possible to allow the modem configured as STU-C to automatically select the highest possible line rate, by performing a special handshaking process in cooperation with the STU-R modem (line probing in accordance with ITU-T Rec. G.991.2). This process can also be used to renegotiate the line rate when the performance is degraded by noise, and thus it also enables adapting to varying operating conditions. Line probing can be used only when using the 64/65-octet TC layer.

- The receive path of the SHDSL modem line interface section regenerates the line signal and recovers the data stream transmitted by the STU-R. The recovered SHDSL data stream is then processed by the receive path of the digital processor, which decodes and demultiplexes the data stream to retrieve the various types of data sent by the STU-R. The payload is sent to the payload multiplexer, and the overhead data is used internally.

  The receive path of the SHDSL modem can provide performance statistics for evaluating SHDSL line transmission quality.

Payload Multiplexer

The payload multiplexer participates in the bonding of several SHDSL lines (two or four lines) to operate as a single logical link (4-wires and 8-wires mode, respectively), a capability referred to as the M-pair mode per ITU-T Rec. G.991.2. For this mode, which is available when using the HDLC TC (Transmission Convergence) layer (see the *Ethernet Service* section on page *1-3*), the payload multiplexer distributes the payload among the bonded SHDSL lines. All the lines must use identical SHDSL parameters, and therefore, when lines are bonded, one of the lines (the line with the lowest port index in the group) is automatically selected as the master line, from which all the other lines copy their parameters.

Ethernet Traffic Processor

Each Ethernet traffic processor provides four independently-configurable Physical Coding Sublayers (PCSs as defined in IEEE 802.3-2005), one for each SHDSL line in the corresponding group (1 to 4 or 5 to 8). In IEEE 802.3-2005 terminology, each PCS is associated with a PME (Physical Medium Entity): for ASMi-54C modules, the PME is an SHDSL line (when using the M-pair mode, the PME is the SHDSL master line).

The main functions performed for each PCS include:

- Ethernet payload data rate matching: the average payload rate accepted by each PCS is matched to the physical rate supported by the corresponding PME.
- PAF (PME Aggregation Function), defined in IEEE 802.3-2005. PAF creates PCS groups (two or four, as selected by the user) that enable increasing the available bandwidth when using the 64/65-octet TC layer. As for M-pair bonding, one of the PCSs (the PCS with the lowest index in the group) is automatically selected as the master PCS, from which all the other PCSs copy their parameters.
- TC encapsulation, in accordance with the user-selected mode (64/65-octet or HDLC).

Note *Each active PCS can serve as a bridge port that can terminate Ethernet flows.*

Ethernet Subsystem

ASMi-54C Ethernet services are supported by configuring flows within the LRS-102 (flows are a generic type of Ethernet virtual connections that interconnect user-specified bridge ports). For an overview of Ethernet services, refer to the *LRS-102 Installation and Operation Manual*.

Two types of bridge ports can be defined on an ASMi-54C module:

- Each PCS configured on the module SHDSL ports.
- Each Ethernet physical port can also serve as a bridge port.

The maximum number of bridge ports that can be defined on an ASMi-54C module, together with the two Ethernet ports, is up to 10.

ASMi-54C Ethernet Handling Subsystem

The functional block diagram of the ASMi-54C local Ethernet handling subsystem is shown in *Figure 1-3*. This subsystem includes:

- Ethernet port interfaces: provide 10/100 Mbps physical interfaces for external Ethernet links.
- Main layer 2 Ethernet switch: provides the local Ethernet classification and switching functions. The Ethernet switch determines the destination of each frame in accordance with the configured flows. The classification of each user network is based on the VLAN ID, or on the port, if no C-VLAN is configured.

- SHDSL Ethernet switch: a layer 2 switch that handles the traffic directed to SHDSL lines, through the PCS ports (the traffic handled by this switch is forwarded by the main Ethernet switch). Using a separate switch provides the flexibility needed to operate the required number of PCS ports.

Note *LRS-102 supports traffic and management flows. ASMi-54C bridge ports can also serve the management flow. Unless specifically mentioned otherwise, in this manual the term* ***flow*** *means* ***traffic flow****.*

Main Ethernet Switch Capabilities

The function of the ASMi-54C main Ethernet switch is to route traffic between external Ethernet ports and internal Ethernet ports, in accordance with the configuration parameters specified by the user. The Ethernet switch fully complies with the IEEE 802.3/Ethernet V.2 standards, and has full VLAN support in accordance with IEEE 802.1Q and 802.1p. The switch has memory-based switch fabric with true non-blocking switching performance. The switch collects a wide range of performance monitoring parameters, which can be read by management.

The Ethernet switch ports are used as follows:

- Connection to the ETH 1 and ETH 2 external port transceivers.
- Connection to the Ethernet switch serving the SHDSL subsystem, for transferring the traffic directed through the PCS ports to the SHDSL lines
- One of the Fast Ethernet ports without transceivers is connected, via the local management subsystem, to the management handling section of the CL modules installed in the LRS-102 (this section is available on all CL modules). One management port connects to the ASMi-54C local management subsystem.

Each switch port is supported by an independent MAC controller that performs all the functions required by the IEEE 802.3 protocol. The frames passed by the MAC controller are analyzed by the ingress policy controller of the corresponding port before being transferred to an internal queue controller, which controls the frame egress priorities and inserts them in separate queues. The queues are connected to the ports through the port egress policy controllers. This approach provides full control over traffic flow, and ensures that congestion at one port does not affect other ports.

Ethernet Port Interfaces

The external Ethernet ports have 10/100 Mbps interfaces capable of auto-negotiation. The user can configure the advertised data rate (10 or 100 Mbps) and operating mode (half-duplex or full-duplex). Alternatively, auto-negotiation can be disabled, and the rate and operating mode be directly specified.

The Ethernet ports can be ordered with one of the following types of interfaces:

- Sockets for SFP Fast Ethernet transceivers. RAD offers several types of SFPs with optical interfaces, for meeting a wide range of operational requirements (SFPs with copper interfaces are also available). The SFPs are hot-swappable.

- 10/100BASE-TX interfaces terminated in RJ-45 connectors. In addition to auto-negotiation, MDI/MDIX polarity and cross-over detection and automatic cross-over correction are also supported. Therefore, these ports can always be connected through a "straight" (point-to-point) cable to any other type of 10/100BASE-T Ethernet port (hub or station).

Timing Subsystem

The timing subsystem generates the clock and timing signals required by the transmit paths of the module.

Local Management Subsystem

The local management subsystem performs three main functions:

- Controls the operation of the various circuits located on the ASMi-54C module in accordance with the commands received from the CL module through the LRS-102 management channel.

  The management subsystem in an ASMi-54C module cannot manage remote units connected to SHDSL ports through the *eoc*.

- Stores the application software of the ASMi-54C module. The software can be updated through the CL module.

- Controls the routing of management traffic through the desired link interfaces, in accordance with the management mode selected by the user for each link interface.

  ASMi-54C Ethernet ports and bundles can also support inband management, when attached to the LRS-102 management flow.

Diagnostics

Performance statistics for the SHDSL and Ethernet ports may be obtained and analyzed via the LRS-102 management system.

The ASMi-54C ports support the collection of performance diagnostics in accordance with the requirements of ITU-T Rec. G.991.2.

1.4 Technical Specifications

General	*Number of Ports*	8
External SHDSL.bis Port	*Port Interface Type*	SHDSL
	Signal Format	TC-PAM32
	Applicable Standards	ITU-T Rec. G.991.2, ETSI TS 101524
	Port Type	Software configurable for all the ports: • Central (STU-C) – default mode • Remote (STU-R)
	Line Type	Single unloaded, unconditioned copper twisted pair, 26 AWG or thicker
	Nominal Line Impedance	135 Ω
	Range at 26 AWG, noise-free	See *Table 1-1*

Table 1-1. Range by Data Rate

Data Rate*	Range	
[kbps]	[km]	[miles]
192	6.4	4.0
1024	5.5	3.4
2048	3.8	2.4
4096	3.5	2.2
5696	2.5	1.5

** 26 AWG, noise-free*

	Port Timing	• STU-C: locked to LRS-102 station clock • STU-R: locked to the line signal received from the STU-C • Internal
	Connector	DB-26 convertible to 8 RJ-45 connectors via adaptor cable. Adapter cables available from RAD
Ethernet Interfaces	*Number of Ports*	Two ports (either fiber-optic or copper, in accordance with order)

	Data Rate	• 10/100 Mbps (Fast Ethernet) • Autonegotiation
	Total Bandwidth per Module	100 Mbps per module
	Maximum Frame Size	*1600 bytes*
	Fiber Optic Ports	*Hot-swappable SFPs* ***Note**: For detailed specifications of the SFP transceivers, see the SFP Transceivers data sheet*
	Copper Ports	
	Interface Type	10/100Base-TX
	Connector	Shielded RJ-45
	Indicator functions (per Ethernet port)	• ACT (yellow): flashes in accordance with the transmit and/or receive activity on the corresponding port LAN data activity • LINK (green): lights when the link integrity signal is detected by the corresponding port LAN link integrity
Diagnostics	*Performance Monitoring*	In accordance with ITU-T Rec. G.991.2, G.826
Configuration		Programmable via LRS-102 management system

Chapter 2

Installation and Setup

This Chapter provides installation and setup instructions for ASMi-54C modules.

ASMi-54C connector pin functions and the wiring of the relevant cables are presented in *Appendix A*.

The information presented in this Chapter supplements the general LRS-102 installation, configuration and operation instructions contained in the *LRS-102 Installation and Operation Manual*.

2.1 Installing the Module

Warning

Before performing any internal settings, adjustment, maintenance, or repairs, first disconnect all the cables from the module, and then remove the module from the LRS-102 enclosure.
No internal settings, adjustment, maintenance, and repairs may be performed by either the operator or the user; such activities 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.

Caution

The ASMi-54C module contains components sensitive to electrostatic discharge (ESD). To prevent ESD damage, always hold the module by its sides, and do not touch the module components or connectors.

Caution

To prevent physical damage to the electronic components assembled on the two sides of the module printed circuit boards (PCB) while it is inserted into its chassis slot, support the module while sliding it into position and make sure that its components do not touch the chassis structure, nor other modules.

ASMi-54C modules may be installed in an operating chassis (hot insertion).

Note

ASMi-54C software can be updated by downloading from the CL module. Therefore, if the ASMi-54C module is not yet loaded with the required software version, refer to Appendix B of the LRS-102 Installation and Operation Manual for detailed software downloading instructions.

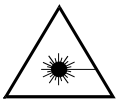
Preparations for Installation

No preparations are required for ASMi-54C modules with UTP Ethernet ports, terminated in RJ-45 connectors.

For ASMi-54C modules equipped with Ethernet ports having SFP sockets, it may be necessary to install, or replace, SFPs. ASMi-54C modules have two installation positions for SFPs, designated ETH1 and ETH2:

- To install an SFP, use the procedure given in the *Installing an SFP* section below.
- SFPs may be replaced using the procedure given in the *Replacing an SFP* section below.

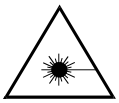
ASMi-54C modules equipped with RAD-supplied SFP plug-in modules comply with laser product performance standards set by government agencies for Class 1 laser products. The modules do not emit hazardous light, and the beam is totally enclosed during all operating modes of customer operation and maintenance.



Warning

Third-party SFP optical transceivers may be also used, provided they are approved by an internationally recognized regulatory agency, and comply with the national laser safety regulations for Class 1 laser equipment. However, RAD strongly recommends ordering the ASMi-54C with RAD SFPs, as this permits full performance testing of the supplied equipment.

ASMi-54C modules are shipped with protective covers installed on all the optical connectors. Keep the covers for reuse, to reinstall the cover over the optical connector as soon as the optical cable is disconnected.



Warning

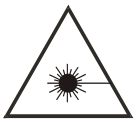
SFPs installed on ASMi-54C modules may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the SFP socket. The laser warning symbol may be also attached.

For your safety:

- **Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the optical transmitter.**
- **Do not use broken or unterminated fiber-optic cables/connectors.**
- **Do not look straight at the laser beam, and do not look directly into the optical connectors while the module is operating.**
- **Do not attempt to adjust the laser drive current.**
- **The use of optical instruments with this product will increase eye hazard. Laser power up to 1 mW could be collected by an optical instrument.**
- **Use of controls or adjustment or performing procedures other than those specified herein may result in hazardous radiation exposure.**

ATTENTION: The laser beam may be invisible!

Installing an SFP



Warning

When installing an optical SFP in an operating module, be aware that it may immediately start generating laser radiation.

Caution During the installation of an SFP with optical interfaces, make sure that all the optical connectors are closed by protective caps.

Do not remove the covers until you are ready to connect optical fibers to the connectors.

Note *All the following procedures are illustrated for typical SFPs with optical interfaces. Your SFPs may look different.*

➤ **To install the SFP:**

1. Lock the latch wire of the SFP module by lifting it up until it clicks into place, as illustrated in *Figure 2-1*.

Note *Some SFP models have a plastic door instead of a latch wire.*

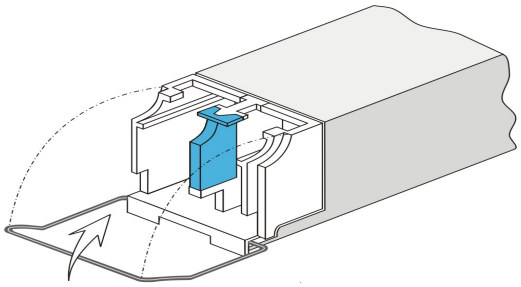


Figure 2-1. Locking the Latch Wire of a Typical SFP

2. Carefully remove the dust covers from the corresponding SFP socket of the ASMi-54C module, and from the SFP electrical connector.
3. Orient the SFP as shown in *Figure 2-1*, and then insert the rear end of the SFP into the module socket.
4. Push SFP slowly backwards to mate the connectors, until the SFP clicks into place. If you feel resistance before the connectors are fully mated, retract the SFP using the latch wire as a pulling handle, and then repeat the procedure.
5. If necessary, repeat the procedure for the other SFP.

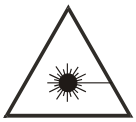
Replacing an SFP

SFPs can be hot-swapped. It is always recommended to coordinate SFP replacement with the system administrator. Note that during the replacement of SFPs, only the traffic on the affected ETH link is disrupted (the other ETH link can continue to carry traffic).

➤ **To replace an SFP:**

1. If necessary, disconnect any cables connected to the SFP connectors.
2. Push down the SFP locking wire, and then pull the SFP out.
3. Reinstall protective covers on the SFP electrical and optical connectors.
4. Install the replacement SFP in accordance with the *Installing an SFP* section.

Module Installation Procedure



Warning

The ASMi-54C module starts operating as soon as it is inserted in an operating chassis.

➤ **To install an ASMi-54C module:**

1. Refer to the system installation plan and identify the prescribed module slot.
2. Check that the fastening screws at the module sides are free to move.
3. Insert the ASMi-54C module in its chassis slot and slide it backward as far as it goes.
4. Secure the ASMi-54C module by tightening its two fastening screws.
5. The module starts operating as soon as it is plugged into an operating enclosure. At this stage, ignore the alarm indications.

2.2 Connecting to ASMi-54C Modules

Before starting, identify the cables intended for connection to each port of this module, in accordance with the site installation plan.

Connecting to Electrical Ethernet Ports

➤ **To connect cables to the ASMi-54C electrical Ethernet ports:**

1. Connect the prescribed cable to the corresponding connector, ETH1 or ETH2.

Connecting to Optical Ethernet Ports

Before starting, review the general optical cable handling instructions section in *Chapter 2* of the *LRS-102 Installation and Operation Manual*.

➤ **To connect cables to the optical Ethernet ports:**

1. Connect each prescribed cable to the corresponding ASMi-54C connector, ETH1 or ETH2.

   When two fibers are used, pay attention to connector polarity: the transmitter output is at left-hand side.

Connecting Cables to SHDSL Ports

Using the site installation plan, identify the cable intended for connection to the ASMi-54C SHDSL.bis connector, and connect the cable to the module connector as explained below.

➤ **To connect the cable to the module:**

1. Connect the 26-pin connector of the CBL-DB26-8SHDSL cable to the module SHDSL.bis front panel SHDSL.bis connector.
2. Connect the RJ-45 plug of each line (the plugs are marked CH-1 to CH-8) to the prescribed user's equipment or patch panel connector. Insulate unused connectors, to prevent accidental short-circuiting of their exposed contacts to metallic surfaces.

Chapter 3
Configuration

This Chapter provides specific configuration information for ASMi-54C modules that supplement the LRS-102 configuration instructions appearing in the *LRS-102 Installation and Operation Manual*.

The configuration activities are performed by means of the management system used to control the LRS-102 unit.

For general instructions, additional configuration procedures, and background information, refer to the *LRS-102 Installation and Operation Manual*.

3.1 Normal Indications

After the equipment connected to the ASMi-54C Ethernet ports is operational, the following indications should appear for each port:

- The LINK indicator lights as long as the port is connected to operational equipment
- The ACT indicator may light continuously, or flash from time to time, in accordance with the transmit and receive activity at the corresponding port.

3.2 Default Settings

Table 3-1 lists the ASMi-54C factory-default parameters.

Table 3-1. ASMi-54C Factory-Default Parameters

Parameter	Description	Factory Default Value
	SHDSL Line Physical Layer Parameters	
Line	SHDSL line index number	1
Administrative Status	Port administrative status	Down
Name	Line logical name	Empty string
Wires	Number of lines (wire pairs)	2 wires
TC Layer	Transmission Convergence layer	64/65-octet
STU	Port operating mode	Central
Power Backoff	Transmit power backoff	0

Parameter	Description	Factory Default Value
Transmission Mode	Regional-dependent parameters set	Annex B/G
Line Probe	Line probing per ITU-T Rec. G.991.2	Enable
Payload Rate	Line payload rate, in kbps	192
Current Margin (dB)	Measured noise level	0
Worst Margin (dB)	Target margin for signal-to-noise ratio	Disable
Loop Attenuation Threshold (dB)	Generation of an alarm in case the attenuation measured on the SHDSL line exceeds a selected threshold value	0
SNR Margin Threshold (dB)	Generation of an alarm in case the attenuation measured on the SHDSL line exceeds a selected SNR margin threshold	0
	PCS Parameters	
PCS	PCS index number	1
Administrative Status	PCS administrative status	Down
Name	PCS logical name	Empty string
Lines	Lines in the PCS group	1
	Ethernet Port Physical Layer Parameters	
Port	Ethernet port index number	1
Administrative Status	Ethernet port administrative status	Down
Name	Ethernet port logical name	Empty string
Auto Negotiation	Ethernet port autonegotiation mode	Enable
Max. Capability Advertised	Highest traffic handling capability advertised when autonegotiation is enabled	100Mbps full duplex
Speed & Duplex	Ethernet port data rate and operating mode when autonegotiation is disabled	100Mbps full duplex
Flow Control	Ethernet port flow control or back pressure	Disable

3.3 ASMi-54C Configuration Sequence

Outline of Configuration Sequence

Make sure to plan ahead the configuration sequence, because LRS-102 databases can be updated only after correctly completing the configuration activities: any sanity error will prevent saving the changes to the database being modified. For example, a common cause of sanity errors that may prevent updating the database is that timeslots have to be assigned to ports of other modules that will be served by the ASMi-54C ports.

ASMi-54C configuration includes the following main types of tasks:

- Tasks needed to configure an ASMi-54C module and put it into service. These tasks include the programming of ASMi-54C modules not yet installed in LRS-102 database, and configuring the parameters of the desired module SHDSL ports (lines) and PCSs.
- Tasks related to the utilization of the module TDM ports (TDM services).
- Tasks related to the utilization of the module Ethernet ports, and the provisioning of Ethernet services.

The recommended configuration sequence for each type of task is described below, together with references to the supervision terminal screens used to perform each task.

➤ **To configure an ASMi-54C module and put it into service (see *Section 3.4*):**

1. If necessary, program (add) an ASMi-54C module not yet installed in the LRS-102 chassis to the database.

   For the supervision terminal, use **Configuration > System > Card Type**.

➤ **To configure the SHDSL physical layer parameters (see *Section 3.5*):**

1. Configure the physical layer parameters for the active SHDSL ports (lines) of the ASMi-54C module.

   For the supervision terminal, use **Configuration > Physical Layer > I/O > SHDSL > Lines**.

2. Configure the physical layer parameters for the active PCSs of the ASMi-54C module.

   For the supervision terminal, use **Configuration > Physical layer > I/O> SHDSL > PCS**.

➤ **To configure the Ethernet physical layer parameters (see *Section 3.6*):**

- Configure the physical layer parameters for the Ethernet ports of the ASMi-54C module.

  For the supervision terminal, use **Configuration > Physical Layer > I/O > Ethernet**.

➤ **To configure Ethernet services supported by the module bridge ports (see *Section 3.7*):**

- Configure each Ethernet services flow that is terminated at a PCS or Ethernet port defined on the ASMi-54C being configured, and map the other end to the prescribed bridge port.

  For the supervision terminal, use **Configuration > Applications > Ethernet Services > Flows** (for instructions, refer to the *LRS-102 Installation and Operation Manual*).

Configuration Guidelines and Considerations

The first step in planning the configuration sequence of ASMi-54C modules is to select the Transmission Convergence (TC) layer to be used by the module, HDLC or 64/65 octet encapsulation:

- 64/65 octet encapsulation: supports only packet traffic, that is, only Ethernet services. Each SHDSL line then operates alone (2-wires mode only), but the total bandwidth available for an Ethernet port can be increased by bonding together several lines, using the PAF (PME Aggregation Function).

  For ASMi-54C modules, PAF can combine two or four lines for serving a single PCS. The PCS can be connected by a flow to an Ethernet port (with four lines per PCS, two PCSs can be configured, one for each ASMi-54C Ethernet port).

- HDLC encapsulation. To increase available bandwidth, it is possible to bond together two or four lines (4-wires and 8-wires mode, respectively). Thus, the maximum bandwidth for Ethernet services is obtained by configuring two 8-wires lines.

After selecting the TC layer, it is necessary to select the bandwidth, considering the required range (see range data in *Chapter 1*). When range is significant, it is recommended to consider the use of multiple lines: this can yield the same throughput as a single line, but because a lower rate per line is used, thus increasing the range and reducing the effects of interference and crosstalk.

After determining the general planning parameters, other configuration parameters can be selected in accordance with the specific application requirements.

3.4 Including an ASMi-54C in LRS-102 Database

➤ **To program an ASMi-54C module in the LRS-102 database:**

1. Navigate to the **Configuration > System > Card Type** screen.
2. Bring the cursor to the field of the prescribed I/O slot by clicking <**Tab**>, and select **ASMi54C**.
3. Update the LRS-102 database, to save the new selection (type **%**, and then type **y** to confirm).

Note *If the programmed module is not yet installed in the LRS-102, it is normal to get a warning message reporting a programmed/installed module mismatch.*

3.5 Configuring Physical Layer Parameters of SHDSL Lines

The SHDSL physical layer parameters include two groups:

- SHDSL line parameters, which determine the transmission performance provided by the module ports
- PCS parameters, which determine the Ethernet (packet) physical layer transmission capabilities over SHDSL lines.

Configuring SHDSL Line Parameters

ASMi-54C has 8 independent SHDSL ports, supported by means of two internal SHDSL processing subsystems (one subsystem handles ports 1 to 4, and the other – ports 5 to 8). Each port requires a 2-wire line.

Note *An ASMi-54 standalone unit supports the connection of up to four SHDSL lines, which must always be in the same group: either 1 to 4, or 5 to 8.*

In each group, ports can be configured to operate separately (2 wires mode), or can be bonded together in groups of two ports (4 wires mode), or 4 (8 wires mode).

Note *Since ports can be bonded together to provide a single transmission line, the term* ***line*** *is used, instead of ports, on the supervision terminal screens.*

➤ **To configure the physical layer parameters for the ASMi-54C SHDSL ports:**

1. Navigate to the **Configuration > Physical layer > I/O** screen, and then select the I/O slot of the desired ASMi-54C module.
2. Select the **SHDSL** option.
3. Select the **Line** option.

   You will see the configuration screen for the first SHDSL line (the line with the lowest index number). Scroll using **F** and **B** to reach the desired port, or use the **Line** field to enter manually the desired port number, in the range of 1 to 8.

   Alternatively, if you will use the **2-Wires** option, first preconfigure all the lines with the same basic parameters by selecting **All Lines**, and then sequentially select each line and change its parameters as required.

Table 3-2 lists the ASMi-54C SHDSL physical line parameters.

Table 3-2. ASMi-54C SHDSL Physical Port Parameters

Parameter	Function	Values
Rate	Displays the total SHDSL line rate, which includes the overhead and the payload rate. The displayed value is automatically adjusted to the selected **Wires** and **Payload Rate** values. This parameter is not displayed when **Line Probe** is **ENABLE.** Note that at the **REMOTE** side, the line probing must always be enabled, and therefore it is not possible to select a specific rate	The range is 200 to 22816 kbps
Line	Selects the index number of the SHDSL line to be configured. When using multiple lines (selected by means of the **Wires** parameter), only lines that can be independently configured are displayed: the index numbers of lines that are grouped together are automatically skipped. See details in *Table 3-3*	The range of SHDSL lines index numbers is **1** to **8**. In addition, it is also possible to select **All Lines**. **Default: 1**
Administrative Status	Used to enable/disable the selected SHDSL port (line)	**UP** – The selected line is enabled. **DOWN** – The selected line is disabled. This state should be selected as long as the line configuration has not yet been completed, or when it is necessary to stop traffic flow through the line. **Default: DOWN**
Name	Used to enter a logical name for the selected line	Up to 25 alphanumeric characters. **Default: Empty string**
Wires	Selects the number of lines (wire pairs) bonded together to. The available selections depend on the **TC Layer** parameter	**2 Wires** – Each port operates independently. In this The number of the line is identical to the number of the physical SHDSL port in the ASMi-54C SHDSL.bus connector to which the line is connected. **4 Wires** – Two ports (with sequential index numbers) are bonded together. See *Table 3-3* for details regarding the ports that support this option. This selection is available only when **TC Layer** is **HDLC**. **8 Wires** – Four ports (with sequential index numbers) are bonded together. See *Table 3-3* for details regarding the ports that support this option. This selection is available only when **TC Layer** is **HDLC**. **Default: 2 Wires**

Parameter	Function	Values
TC Layer	Selects the Transmission Convergence layer used by the ASMi-54C module. All the module ports use the same Transmission Convergence layer (the last selection is automatically applied to all the ports)	**64/65-OCTET** – TC layer uses 64/65-octet encapsulation. This mode supports only packet traffic over a single line (wire pair). **HDLC** – TC layer uses HDLC encapsulation. This mode enables using multiple lines (wire pairs). **Default: 64/65-OCTET**
STU	Selects the port operating mode. All the module ports use the same mode (the last selection is automatically applied to all the ports)	**CENTRAL –** ASMi-54C ports operate in the SHDSL terminal unit – central mode (also referred to as *STU-C*). This is the mode to be used when the equipment connected to the far end of the lines is an ASMi-54 standalone unit. **REMOTE –** ASMi-54C ports operate in the SHDSL terminal unit – remote mode (also referred to as *STU-R*). This mode should be used only when the equipment connected to the far end of the lines is an ASMi-54C module installed in another LRS-102. Note that in the **REMOTE** mode, the line probing must always be enabled, and therefore it is not possible to select a specific **Rate**. **Default: CENTRAL**
Power Backoff	Controls the use of transmit power backoff. Power backoff is used to reduce the transmit power below the nominal value specified in the standards: this reduces interference caused by your signal to other equipment using pairs in the same cable, without degrading the link transmission quality	The available selections are **0** to **31**. **0** means that the nominal transmit power is always used. Any other value indicates the maximum power backoff value, in dB below the nominal transmit power specified in the standards. **Default: 0**
Transmission Mode	Selects the set of regional-dependent parameters used by the module SHDSL modems. All the module ports use the same mode (the last selection is automatically applied to all the ports)	**ANNEX A/F** – Compliance with Annex A or F of ITU-T Rec. G.991.2, required for compatibility in North American networks. **ANNEX B/G** – Compliance with Annex B or G of ITU-T Rec. G.991.2, required for compatibility in European networks. **Default: ANNEX B/G**

Parameter	Function	Values
Line Probe	Controls the use of line probing per ITU-T Rec. G.991.2 for the corresponding line. Line probing is used to automatically select the maximum data rate supported by the line. When enables, the **Payload Rate** of the line is automatically set to 192 kbps, and is increased when line conditions permit. This parameter is relevant only when when **TC Layer** is **64/65-OCTET**	**DISABLE** – Line probing is disabled. This is the only option available when **TC Layer** is **HDLC.** **ENABLE** – Line probing is enabled. Note that line probing must always be enabled for the **REMOTE** mode. **Default: ENABLE**
Payload Rate	Selects the line payload rate, in kbps. This parameter is not displayed when **Line Probe** is **ENABLE**	The available selections are **192** to **5696** kbps, in multiples of 64 kbps (n × 64 kbps, corresponding to **n** values in the range of **3** to **89**. **Default: 192**
Current Margin(dB)	Specifies the target margin for the measured signal-to-noise ratio relative to the current noise level. Alternatively, line activation may be performed in accordance with the **Worst Margin** value. This parameter is displayed only when the **Line Probe** is **ENABLE**	• To use the signal-to-noise ratio measured relative to the current noise level during SHDSL line activation, select the desired value, in the range of **-10** to **+21** dB. • To disable the use of the signal-to-noise ratio measured relative to the current noise level, select **DISABLE**. **Default: 0**
Worst Margin(dB)	Specifies the target margin for the measured signal-to-noise ratio relative to the reference worst-case near-end crosstalk noise specified in ITU-T Rec. G.991.2. Alternatively, line activation may be performed in accordance with the **Current Margin** value. This parameter is displayed only when the **Line Probe** is **ENABLE**	• To use the signal-to-noise ratio measured relative to the near-end crosstalk during SHDSL line activation, select the desired value, in the range of **-10** to **+21** dB. • To disable the use of the signal-to-noise ratio measured relative to crosstalk and use the signal-to-noise ratio measured relative to the current noise level, select **DISABLE.** **Default: DISABLE**
Loop Attenuation Threshold (dB)	Selects the loop attenuation threshold: if the attenuation measured on the SHDSL link exceeds the threshold value, and alarm is generated	The allowable range is **0** to **127** (the number specifies the maximum value, in dB). **Default: 0**
SNR Margin Threshold (dB)	Selects the SNR margin threshold: if the attenuation measured on the SHDSL link exceeds the specified value, an alarm is generated	The allowable range is **0** to **15** (the number specifies the maximum value, in dB). **Default: 0**

*Table 3-3. Supported Lines versus **Wires** Parameter*

Line Number	Available Modes	Description
1	2 Wires	Line independently configurable
	4 Wires	Line 1 bonded with Line 2. Line 1 is the master line, and all its parameters will be copied to Line 2. Line 2 and PCS 2 will not be available to selection by the user
	8 Wires	Line 1 bonded with Line 2, Line 3 and Line 4. Line 1 is the master line, and all its parameters will be copied to Line 2, Line 3, and Line 4. Line 2, 3, 4 and PCS 2, 3, 4 will not be available for selection by the user
2	2 Wires	Line independently configurable
3	2 Wires	Line independently configurable
	4 Wires	Line 3 bonded with Line 4. Line 3 is the master line, and all its parameters will be copied to Line 4. Line 4 and PCS 4 will not be available to selection by the user
4	2 Wires	Line independently configurable
5	2 Wires	Line independently configurable
	4 Wires	Line 5 bonded with Line 6. Line 5 is the master line, and all its parameters will be copied to Line 6. Line 6 and PCS 6 will not be available to selection by the user
	8 Wires	Line 5 bonded with Line 6, Line 7 and Line 8. Line 5 is the master line, and all its parameters will be copied to Line 6, Line 7 and Line 8. Line 6, 7, 8 and PCS 6, 7, 8 will not be available for selection by the user
6	2 Wires	Line independently configurable
7	2 Wires	Line independently configurable
	4 Wires	Line 7 bonded with Line 8. Line 7 is the master line, and all its parameters will be copied to Line 8. Line 8 and PCS 8 will not be available to selection by the user
8	2 Wires	Line independently configurable

Configuring PCS Parameters

PCSs are defined in IEEE 802.3-2005. In LRS-102 they are used to transport Ethernet traffic from a local Ethernet port over SHDSL.

The ASMi-54C internal SHDSL processing subsystem enables to configure for each SHDSL line (actually – for each SHDSL port) the desired Physical Coding Sublayer parameters. Therefore, ASMi-54C supports 8 PCS entities, one for each associated SHDSL port, and on the supervision terminal screens, the PCS index number is the same as the associated SHDSL port.

As for SHDSL ports, PCSs are processed in two groups of four (one group includes PCSs 1 to 4, and the other – PCSs 5 to 8).

Note *An ASMi-54 standalone unit supports the connection of up to four PCSs, which must be in the same group (either 1 to 4, or 5 to 8).*

The PCSs are independently configurable, except that only PCSs associated with master lines (see *Table 3-3*) can be selected.

In IEEE 802.3-2005 terminology, each PCS is associated with a PME (Physical Medium Entity): for ASMi-54C modules, it is the SHDSL master line.

The PCS bandwidth depends on the rate provided by the associated line:

- When using the 64/65-octet TC layer, the available bandwidth is the payload rate of the associated line. This bandwidth is a maximum of 22784 kbps (when using the 8-wires mode with four SHDSL ports operating at the maximum rate, 5696 kbps).
- When using the HDLC TC layer, the available bandwidth is the payload rate of the associated line, less any bandwidth assigned to the associated internal DS1 port of the same line.

Even when all the eight SHDSL lines of the ASMi-54C module operate in the 2 Wires mode (see *Table 3-2*), the PCS transport bandwidth can be increased using PAF (PME Aggregation Function), also defined in IEEE 802.3-2005. PAF creates PCS groups. The PCS groups that can be configured on the ASMi-54C are listed in *Table 3-4*.

*Table 3-4. Supported PCS Groups versus **Lines** Parameter*

Maximum Number of PCS Groups	Number of SHDSL Ports (Lines) in PCS Group	SHDSL Lines in PCS Group	Master PCS in the Group
2	4	1, 2, 3, 4	1
	4	5, 6, 7, 8	5
4	2	1, 2	1
		3, 4	3
	2	5, 6	5
		7, 8	7

➤ **To configure the PCS parameters:**

1. Navigate to the **Configuration > Physical layer > I/O** screen, and then select the I/O slot of the desired ASMi-54C module.
2. Select the **SHDSL** option.
3. Select the **PCS** option.

   You will see the configuration screen for the first PCS (the PCS with the lowest index number). Scroll using **F** and **B** to reach the desired PCS, or use the **PCS** field to enter manually the desired port number, in the range of 1 to 8.

Table 3-5 lists the ASMi-54C PCS parameters.

Table 3-5. ASMi-54C PCS Parameters

Parameter	Function	Values
Slot	Identifies the I/O slot and module types on which the PCS is supported	I/O-1 to I/O-12, followed by the ASMi-54C card type designation
Rate	Displays the PCS payload rate, in kbps. The displayed value is automatically adjusted to the selected **Lines**, **Wire Pair** and **Payload Rate** values. This parameter is not displayed when **Line Probe** is **ENABLE**	The range is 192 to 22784 kbps
Wire Pair	When the PCS is associated with a line using the multiple wire mode (available only when **TC Layer** is **HDLC**), displays the master line and the list of other lines, as determined by means of the **Wires** parameter (see *Table 3-2*)	The lines are displayed in the format **Master line.Line**, with commas as separators. For example, when the master line is 1 and the **Wires** parameter is **8-Wires**, the list is **1.1, 1.2, 1.3, 1.4**
PCS	Selects the PCS to be configured	The available selections are 1 to 8, subject to restrictions given in *Table 3-4*. **Default: 1**
Administrative Status	Used to enable/disable the flow of traffic through the selected PCS	**UP** — The flow of traffic is enabled. **DOWN** — The flow of traffic is disabled. This state should be selected as long as the PCS configuration has not yet been completed, or when it is necessary to stop traffic flow through the PCS. **Default: DOWN**
Name	Used to enter a logical name for the selected PCS	Up to 25 alphanumeric characters. **Default: Empty string**

Parameter	Function	Values
Lines	Used to select the number of lines in the PCS group. See the available selections in *Table 3-4*. This parameter is displayed only when **TC Layer** = **64/65-Octet**	For single line: the line with the same index as the PCS. For multiple lines: the list of lines (2 or 4), separated by commas (see range in *Table 3-4*)

3.6 Configuring Physical Layer Parameters of Ethernet Ports

➤ **To configure the parameters for the ASMi-54C Ethernet ports:**

1. Navigate to the **Configuration > Physical Layer > I/O** screen, and then select the module I/O slot.
2. Select the **Ethernet** option.

   You will see the configuration screen for the first Ethernet port (the port with the lowest index number). Scroll using **F** and **B** to reach the desired port, or use the **Port** field to enter manually the desired port number, 1 or 2.

   Alternatively, first preconfigure all the ports with the same basic parameters (**All Ports** option), and then sequentially select each port and change its parameters as required. You will see the configuration screen for the selected line.

Table 3-6 describes the Ethernet port physical layer configuration parameters.

Table 3-6. Ethernet Port Physical Layer Configuration Parameters

Parameter	Function	Values
Administrative Status	Used to enable/disable the flow of traffic through the selected Ethernet port	**DOWN –** The flow of traffic is disabled. This state should be selected as long as the configuration of the corresponding port has not yet been completed, or when it is necessary to stop traffic flow through the port. **UP –** The flow of traffic is enabled. **Default: DOWN**
Name	Used to enter a logical name for the selected Ethernet port	Up to 25 alphanumeric characters. **Default: Empty string**

Parameter	Function	Values
Auto Negotiation	Controls the use of auto-negotiation for the selected Ethernet port. Auto-negotiation is used to select automatically the mode providing the highest possible traffic handling capability	**ENABLE –** Auto-negotiation is enabled. This is the normal operation mode. **DISABLE –** Auto-negotiation is disabled. This mode should be used only when the equipment connected to the port does not support auto-negotiation. **Default: ENABLE**
Max. Capability Advertised	When **Auto Negotiation** is **ENABLE**, selects the highest traffic handling capability to be advertised during the auto-negotiation process. The operating mode selected as a result of auto-negotiation cannot exceed the advertised capability. When **Auto Negotiation** is **DISABLE**, this parameter is replaced by **Speed & Duplex**	The available selections are listed in ascending order of capabilities: **100Mbps full duplex** – Full-duplex operation at 100 Mbps. **100Mbps half duplex** – Half-duplex operation at 100 Mbps. **10Mbps full duplex** – Full-duplex operation at 10 Mbps. **10Mbps half duplex** – Half-duplex operation at 10 Mbps. **Default: 100Mbps full duplex**
Speed & Duplex	When **Auto Negotiation** is **DISABLE**, selects the data rate and the operating mode of the selected Ethernet port. When **Auto Negotiation** is **ENABLE**, this parameter is replaced by **Max. Capability Advertised**	Same selections as for the **Max. Capability Advertised** parameter. **Default: 100Mbps full duplex**
Flow Control	Controls the use of flow control for the selected Ethernet port (when operating in the full duplex mode), or back pressure (when operating in the half-duplex mode)	**ENABLE** – Flow control or back pressure is enabled. In this case, when the offered Ethernet traffic exceeds the available transmission bandwidth, the port forces the source to reduce its traffic volume. **DISABLE** – Flow control and back pressure are disabled. **Default: DISABLE**

3.7 Configuring Ethernet Services

LRS-102 Ethernet services are supported by configuring flows within the LRS-102 (flows are a generic type of Ethernet virtual connections that interconnect user-specified bridge ports).

Two types of bridge ports can be defined on an ASMi-54C module:

- Each PCS configured on the module SHDSL ports.
- Each Ethernet physical port can also serve as a bridge port.

The maximum number of bridge ports that can be defined on an ASMi-54C module, together with the two Ethernet ports, is up to 10.

After performing the configuration activities listed above, you can configure each Ethernet services traffic flow that is terminated on the ASMi-54C being configured (either at a bundle or at an Ethernet port), and map the other end to the prescribed bridge port.

For the supervision terminal, use **Configuration > Applications > Ethernet Services > Flows** (for instructions, refer to the *LRS-102 Installation and Operation Manual*; bridge ports are referred to as ***bridge ports*** on supervision terminal screens).

Note *To configure a management flow, use **Configuration > System > Management > Flow**.*

Chapter 4

Troubleshooting and Diagnostics

This Chapter explains the specific troubleshooting and diagnostic functions of the ASMi-54C module. These functions include:

- Collection of ASMi-54C performance monitoring and status data – presented in *Section 4.1*.
- Interpretation of alarms – presented in *Section 4.2*. This section covers only the ASMi-54C specific alarms: for other alarms, refer to the *LRS-102 Installation and Operation Manual*.
- Troubleshooting instructions: *Section 4.3*.

The diagnostic information presented in this Chapter supplements the general LRS-102 diagnostics instructions contained in the *LRS-102 Installation and Operation Manual*.

If you need additional support for this product, see *Section 4.4* for technical support information.

4.1 Monitoring Performance

This section presents the ASMi-54C performance statistics and status data. For other monitoring tasks, refer to the *LRS-102 Installation and Operation Manual*.

When using the LRS-102 supervision utility, the performance monitoring functions are accessed under the **Monitoring** menu.

ASMi-54C collects the following types of performance monitoring and status data:

- For ASMi-54C SHDSL Physical Layer:
  - Status data for each SHDSL port
  - Transmission performance statistics

  When using the LRS-102 supervision utility, the ASMi-54C SHDSL physical port performance monitoring functions are accessed after selecting the desired module under **Monitoring > Physical Layer > IO**.
- For ASMi-54C Ethernet Physical Layer:
  - Status data for each Ethernet port, and SFP data when the ASMi-54C Ethernet ports are equipped with optical interfaces
  - Transmission performance statistics

When using the LRS-102 supervision utility, the ASMi-54C Ethernet physical port performance monitoring functions are accessed after selecting the desired module under **Monitoring > Physical Layer > IO > Ethernet**.

The collected data enables the system administrator to monitor the transmission performance, and thus the quality of service provided to users, for statistical purposes. In addition, when problems are reported by users served by ASMi-54C, the collected data can be used for diagnostic purposes, because it can help identify the source of the problem.

For SHDSL ports, the basic performance data is calculated for each second, and accumulated and displayed over a 15-minute (900 second) interval. The data accumulated for each interval, up to a maximum of 96 previous intervals (that is, over the last 24-hour interval) is stored and can also be displayed. The oldest interval is 1, and the most recent one is the interval with the largest number. Only the data for the most recent 96 intervals is stored, and therefore the oldest data is overwritten by new data. For SHDSL ports, data is also stored for up to seven previous 24-hour intervals (that is, the last 7 days).

The performance statistics data is continuously collected, and is stored as long as the equipment operates. The stored data is deleted when the ASMi-54C is reset or removed, and is also lost when the LRS-102 is powered down.

Monitoring SHDSL Ports (Lines)

The physical layer performance monitoring data for SHDSL lines includes:

- Status data for each SHDSL line
- Statistics data. For each port, you can see:
  - Current 15-minute interval
  - A previous 15-minute interval within the last 24 hours, for which valid performance data exists
  - Current 24-hour interval
  - A previous 24-hour interval within the last 7 days, for which valid performance data exists.

The information displayed on the screen, which is accumulated continuously, is automatically refreshed every few seconds.

You can clear the displayed statistics (that is, reset the displayed performance monitoring counters) by selecting **Clear Statistics**. This ensures that only fresh data is displayed, a useful feature during troubleshooting.

Displaying SHDSL Line Status

➤ **To display the SHDSL line status:**

1. Navigate to the **Monitoring > Physical Layer > IO** screen, and then select the I/O slot of the desired ASMi-54C module.
2. Select the **SHDSL** option.
3. Select the desired **Line**.
4. Select **Status**. You will see the **Port Status** screen for the selected SHDSL port.

The parameters displayed on the screen are explained in *Table 4-1*. Note that the information regarding the **SHDSL Rate**, **Current Noise Margin**, **Current Loop Attenuation**, and **Current Power Backoff** parameters can be displayed only when the SHDSL line is in the **Data** state (that is, after a successful activation: in other states, ignore these fields - they display **0** to indicate that the displayed values are irrelevant).

Table 4-1. SHDSL Line Status Parameters

Parameter	Description
Administrative Status	Displays the administrative status of the line: **Up** or **Down**
SHDSL State	Displays the current line state: • **PreActivation** – the SHDSL line waits to start the activation process • **Activation** – the SHDSL line performs the activation process • **Data** – the SHDSL line completed the activation process and is now carrying data. In this case (Data) the following fields display the values listed below. Otherwise they dispay 0.
SHDSL Rate	Displays the current line rate, in kbps
Current Noise Margin	Displays the currently estimated noise margin at the local endpoint, in dB
Current Loop Attenuation	Displays the currently estimated loop attenuation at the local endpoint, in dB
Current Power Backoff	Displays the current power backoff value at the local endpoint, in dB

Displaying SHDSL Line Performance Monitoring Statistics

➤ **To display the SHDSL line performance monitoring statistics for the current 15-minute interval:**

1. Navigate to the **Monitoring › Physical Layer › IO** screen, and then select the I/O slot of the desired ASMi-54C module.
2. Select the **SHDSL** option.
3. Select the desired **Line**.
4. Select **Statistics › Current (15 min)**. You will see the current 15-minutes statistics screen for the selected SHDSL line.

The displayed parameters are explained in *Table 4-2*.

Table 4-2. SHDSL Line Statistics Parameters – Current 15-Minute Interval

Parameter	Description
Current ES	Displays the number of SHDSL errored seconds (ES) on this end point in the current interval. An SHDSL ES is a second during which one or more CRC anomalies are declared, and/or one or more LOSW defects are declared

Parameter	Description
Current UAS	Displays the number of SHDSL unavailable seconds (UAS) on this end point in the current interval. The SHDSL UAS is a second during which the SHDSL line is unavailable. The SHDSL line becomes unavailable at the onset of 10 contiguous SESs (the 10 SESs are included in the unavailable time). Once unavailable, the SHDSL line becomes available at the onset of 10 contiguous seconds with no SESs (the 10 seconds with no SESs are excluded from the unavailable time)
Current SES	Displays the number of SHDSL severely errored seconds (SES) on this end point in the current interval. The SHDSL SES is any second which is not declared a UAS, during which at least 50 CRC anomalies are declared, or one or more LOSW defects are declared
Current LOSWS	Displays the number of SHDSL LOSW seconds (LOSWS) on this end point in the current interval. The SHDSL LOSWS is a second during which one or more SHDSL LOSW defects are declared
CRC Anomalies	Displays the number of CRC anomalies on this end point in the current interval. A CRC anomaly is declared when the CRC bits generated locally on the data in the received SHDSL frame do not match the CRC bits received from the transmitter. A CRC anomaly only pertains to the frame over which it was declared
Current Elapsed Time	The elapsed time (in seconds) since the beginning of the current interval, in seconds. The range is 1 to 900 seconds. This parameter is available only for the current interval
24H Intervals	The number of 24-hour intervals for which statistics data is available (up to 7)
15-min Intervals	The number of 15-min intervals for which statistics data can be displayed (up to 96)

➤ **To display SHDSL line performance monitoring statistics for a selected 15-minute interval:**

1. Navigate to the **Monitoring > Physical Layer > IO** screen, and then select the I/O slot of the desired ASMi-54C module.
2. Select the **SHDSL** option.
3. Select the desired **Line**.
4. Select **Statistics > Select Interval (15 min)**.
5. Select the desired interval, by selecting **Interval** and pressing **<Enter>**: you can then enter the desired interval number, 1 to 96.
6. After pressing **<Enter>**, the data displayed on the screen is updated in accordance with your selection.

The displayed parameters are explained in *Table 4-3*.

Table 4-3. SHDSL Line Statistics Parameters – Selected 15-Minute Interval

Parameter	Description
Current ES	Displays the total number of SHDSL errored seconds (ES) in the selected 15-minute interval
Current UAS	Displays the total number of SHDSL unavailable seconds (UAS) in the selected 15-minute interval
Current SES	Displays the total number of SHDSL severely errored seconds (SES) in the selected 15-minute interval
Current LOSWS	Displays the total number of SHDSL LOSW seconds (LOSWS) in the selected 15-minute interval
CRC Anomalies	Displays the total number of CRC anomalies in the selected 15-minute interval
Interval	Used to select the desired 15-minute interval (the available range is displayed in the **15-min Intervals** field of the **Current (15 min)** statistics screen – see *Table 4-2*)

➤ **To display SHDSL line performance monitoring statistics for current 24-hour interval:**

1. Navigate to the **Monitoring > Physical Layer > IO** screen, and then select the I/O slot of the desired ASMi-54C module.
2. Select the **SHDSL** option.
3. Select the desired **Line**.
4. Select **Statistics > Current (24 hours)**. You will see the current 24-hour statistics screen for the selected SHDSL line.

The displayed parameters are explained in *Table 4-4*.

Table 4-4. SHDSL Line Statistics Parameters – Current 24-Hour Interval

Parameter	Description
ES	Displays the total number of SHDSL errored seconds (ES) in the last 24-hour interval
UAS	Displays the total number of SHDSL unavailable seconds (UAS) in the last 24-hour interval
SES	Displays the total number of SHDSL severely errored seconds (SES) in the last 24-hour interval
LOSWS	Displays the total number of SHDSL LOSW seconds (LOSWS) in the last 24-hour interval
CRC Anomalies	Displays the total number of CRC anomalies in the last 24-hour interval
Current Elapsed Time	The elapsed time since the beginning of the current 24-hour interval

➤ **To display SHDSL line performance monitoring statistics for a selected 24-hour interval:**

1. Navigate to the **Monitoring > Physical Layer > IO** screen, and then select the I/O slot of the desired ASMi-54C module.
2. Select the **SHDSL** option.

3. Select the desired **Line**.
4. Select **Statistics > Select Interval (24 hours)**.
5. Select the desired interval, by selecting **24-Hour Interval** and pressing **<Enter>**: you can then enter the desired interval number, 1 to 7.
6. After pressing **<Enter>**, the data displayed on the screen is updated in accordance with your selection.

The displayed parameters are explained in *Table 4-5*.

Table 4-5. SHDSL Line Statistics Parameters – Selected 24-Hour Interval

Parameter	Description
ES	Displays the total number of SHDSL errored seconds (ES) in the selected 24-hour interval
UAS	Displays the total number of SHDSL unavailable seconds (UAS) in the selected 24-hour interval
SES	Displays the total number of SHDSL severely errored seconds (SES) in the selected 24-hour interval
LOSWS	Displays the total number of SHDSL LOSW seconds (LOSWS) in the selected 24-hour interval
CRC Anomalies	Displays the total number of CRC anomalies in the selected 24-hour interval
24-Hour Interval	Used to select the desired 24-hour interval (the available range is displayed in the **24H Intervals** field of the **Current (15 min)** statistics screen – see *Table 4-2*)

Monitoring Ethernet Ports

The Ethernet port physical layer performance monitoring data includes:

- Status data for the port.
- Statistics data. Statistics can be displayed only for enabled ports: if the Ethernet port is not enabled, its monitoring display is empty.

Displaying Ethernet Port Status

➤ **To display status data for an Ethernet port:**

1. Navigate to the **Monitoring > Physical Layer > IO > Ethernet** screen of the desired module, and select the desired Ethernet port, **ETH 1** or **ETH 2**.
2. On the Ethernet port screen, select **Status**. The Ethernet port status parameters are explained in *Table 4-6*.
3. For an Ethernet port with optical interface, you can also display information and status data for the SFP serving the port: select **SFP Status** on the corresponding Ethernet port **Status** screen. The SFP status parameters are explained in *Table 4-7*.

Note *When no SFP is installed, or the data cannot be read, you will see **Missing** for the **Connector Type**, and the other fields display zero.*

Table 4-6. Ethernet Port Physical Layer Status Parameters

Parameter	Description
Connector Type	Displays the port connector type: • **RJ-45** – RJ-45 connector for copper interface. • **SFP** – in accordance with the installed SFP. • **Missing** – port equipped with SFP socket, but no SFP is installed.
Operation Status	Displays the Ethernet port status: • **Up** – the port is connected to a LAN and operating normally • **Down** – the port does not carry traffic, e.g., it is not connected to an active LAN
Auto Negotiation	Displays the auto-negotiation status: • **Completed** – the port completed the negotiation process and the operating rate and mode has been selected • **Negotiating** – the port uses auto-negotiation, and is currently performing the negotiation process needed to select the operating rate and mode • **Disabled** – the port operating rate and mode is manually selected
Speed and Duplex	Displays the port current rate and mode: • **10Mbps half duplex** – Half-duplex operation at 10 Mbps • **10Mbps full duplex** – Full-duplex operation at 10 Mbps • **100Mbps half duplex** – Half-duplex operation at 100 Mbps • **100Mbps full duplex** – Full-duplex operation at 100 Mbps

Table 4-7. SFP Status Parameters

Parameter	Description
Connector Type	Displays the SFP connector type, for example, **LC**, **SC**, **SC/APC, FC**, etc.
Manufacturer Name	Displays the original manufacturer's name
Vendor PN	Displays the original vendor's part number
Typical Max. Range	Displays the maximum range expected to be achieved over typical optical fibers, in kilometers
Wave Length	Displays the nominal operating wavelength of the SFP, in nm
Fiber Type	Displays the type of optical fiber for which the SFP is optimized: single mode or multi mode
TX Power (dBm)	Displays the current optical power, in dBm, transmitted by the SFP
RX Power (dBm)	Displays the current optical power, in dBm, received by the SFP
Laser Bias (mA)	Displays the measured laser bias current, in mA
Laser Temperature	Displays the measured laser temperature, in °C

Displaying Ethernet Performance Monitoring Statistics

Statistics can be displayed only for enabled ports: if the Ethernet port is not enabled, its monitoring display is empty.

The information is accumulated continuously while the ASMi-54C operates, and is automatically refreshed every few seconds.

You can clear the displayed statistics (that is, reset the displayed performance monitoring counters) by typing **C**. This ensures that only fresh data is displayed, a useful feature during troubleshooting.

➤ **To display the Ethernet port performance monitoring statistics:**

1. Navigate to the **Monitoring > Physical Layer > IO > Ethernet** screen of the desired module, and select the desired Ethernet port, **ETH 1** or **ETH 2**.
2. On the Ethernet port screen, select **Statistics**.
3. You will see the **Statistics** screen for the selected Ethernet port. The screen includes a large number of items and therefore it consists of three pages:
   - To continue from the first page to the next page, type **N** (next)
   - To return from the second page to the previous page, type **P** (previous).

Table 4-8 explains the statistics parameters.

The information displayed on the screen, which is accumulated continuously, is automatically refreshed every few seconds. You can clear the displayed statistics (that is, reset the displayed performance monitoring counters) by typing **C**. The counters are also reset when the ASMi-54C is powered up.

Table 4-8. I/O Ethernet Physical Layer Performance Monitoring Statistics

Parameter	Description
Rx Total Frames	Total number of frames received through the corresponding Ethernet port
Rx Total Octets	Total number of data octets carried by all frames received through the corresponding Ethernet port
Rx Correct Frames	Total number of good frames received through the corresponding Ethernet port
Rx FCS Errors	Total number of frames received by the corresponding Ethernet port which has an invalid FCS, but met the following conditions: • Frame data length is between 64 bytes, and 1518 or 1536 bytes (depending on mode) • Collision event has not been detected • Late collision event has not been detected
Rx Jabber Errors	Total number of frames received by the corresponding Ethernet port during jabber (such frames are frames with a data field length exceeding 1518 or 1536 bytes, and also having invalid CRC)
Rx Fragments Errors	Number of fragmented frames received at the corresponding Ethernet port (a fragmented frame is a frame with a data field length less than 64 bytes and invalid CRC, for which no collision event and no late collision event have not been detected during its reception)
Rx Pause Frames	Total number of **pause** frames (used for flow control) received through the corresponding Ethernet port

Parameter	Description
Rx Undersized Frames	Total number of frames with size less than 64 bytes received through the corresponding Ethernet port
Rx Oversized Frames	Total number of frames with size more than the maximum allowed received through the corresponding Ethernet port
Rx Discard Frames	Total number of valid frames received by the corresponding Ethernet port that have been discarded because of a lack of buffer space. This includes frames discarded at ingress, as well as those dropped due to priority and congestion considerations at the output queues
Rx Errors	Total number of frames received by the corresponding Ethernet port that had other types of errors
Rx Unicast Frames	Total number of good unicast frames received through the corresponding Ethernet port
Rx Multicast Frames	Total number of good multicast frames received through the corresponding Ethernet port
Rx Broadcast Frames	Total number of good broadcast frames received through the corresponding Ethernet port
Rx 64 Octets	Total number of 64-byte frames received through the corresponding Ethernet port
Rx 65-127 Octets	Total number of frames with size of 65 to 127 bytes received through the corresponding Ethernet port
Rx 128-255 Octets	Total number of frames with size of 128 to 255 bytes received through the corresponding Ethernet port
Rx 256-511 Octets	Total number of frames with size of 256 to 511 bytes received through the corresponding Ethernet port
Rx 512-1023 Octets	Total number of frames with size of 512 to 1023 bytes received through the corresponding Ethernet port
Rx 1024-long Octets	Total number of frames with size of 1024 up to 1600 bytes received through the corresponding Ethernet port
Tx Total Frames	Total number of good frames transmitted by the corresponding Ethernet port
Tx Total Octets	Total number of data octets carried by all the good frames transmitted by the corresponding Ethernet port
Tx Correct Frames	Total number good frames transmitted by the corresponding Ethernet port
Tx Collisions	Total number of collisions detected at the corresponding Ethernet port
Tx Discard Frames	Total number of valid frames that were intended for transmission by the corresponding Ethernet port that have been discarded. This includes frames discarded at egress, as well as those dropped due to priority and congestion considerations at the output queues
Tx Unicast Frames	Total number of good unicast frames transmitted by the corresponding Ethernet port

Parameter	Description
Tx Multicast Frames	Total number of good multicast frames transmitted by the corresponding Ethernet port
Tx Broadcast Frames	Total number of good broadcast frames transmitted by the corresponding Ethernet port

4.2 Handling Alarms

Table 4-9 lists the specific alarm messages that may generated by LRS-102 for ASMi-54C modules, and explains their interpretation. The messages are listed in ascending order of their codes.

For other alarm messages, refer to the *LRS-102 Installation and Operation Manual*.

Table 4-9. ASMi-54C Specific Alarms

Code	Message	Type	Default Severity	Interpretation
023	RESET OCCURRED		Event	The module installed in the specified slot has been reset automatically
645	SHDSL LOOP ATTENUATION ERROR		Minor	Loop attenuation has exceeded the alarm threshold
646	SHDSL SNR MARGIN ERROR		Minor	Signal-to-noise margin has exceeded the alarm threshold
647	SHDSL LOSW FAILURE		Minor	Loss of Sync Word is detected
648	SHDSL PSD NOT COMPATIBLE		Minor	Mismatch between PSD mode selected by the user and PSD mode used by the line
651	SHDSL CRC6 ERROR		Event	CRC errors are detected
652	SHDSL SYNC LOSS		Major	SHDSL line is not synchronized

4.3 Troubleshooting

In case a problem occurs, check the displayed alarm messages and refer to *Table 4-9* and to the *LRS-102 Installation and Operation Manual* for their interpretation.

Note *If the problem is detected the first time the module is put into operation, perform the following preliminary checks before proceeding:*

- *Check for proper module installation and correct cable connections, in accordance with the system installation plan.*
- *Check the module configuration parameters in accordance with the specific application requirements, as provided by the system administrator.*

If after collecting all the relevant information, the problem appears to be related to the operation of one of the ASMi-54C ports, perform the actions listed below, until the problem is corrected:

- Make sure that no test has been activated on the corresponding ASMi-54C port. Use the LRS-102 management system to find the active test or loopback and deactivate it.

4.4 Technical Support

Technical support for this product can be obtained from the local distributor from whom it was purchased.

For further information, please contact the RAD distributor nearest you or one of RAD's offices worldwide. This information can be found at www.rad.com (offices – About RAD > Worldwide Offices; distributors – Where to Buy > End Users).

Appendix A
Pinouts

A.1 Connection Data for SHDSL Ports

All the SHDSL ports of the ASMi-54C modules are terminated in a 26-pin D-type male connector, designated SHDSL.bis. RAD offers as an ordering option an adapter cable, CBL-DB26-8SHDSL, for connecting to the module SHDSL interfaces. CBL-DB26-8SHDSL is 2-meter long cable, ending in 8 RJ-45 connectors, one for each channel. *Figure A-1* shows the cable construction. *Table A-1* presents the cable wiring and also identifies the ASMi-54C SHDSL.bis connector pin assignment.

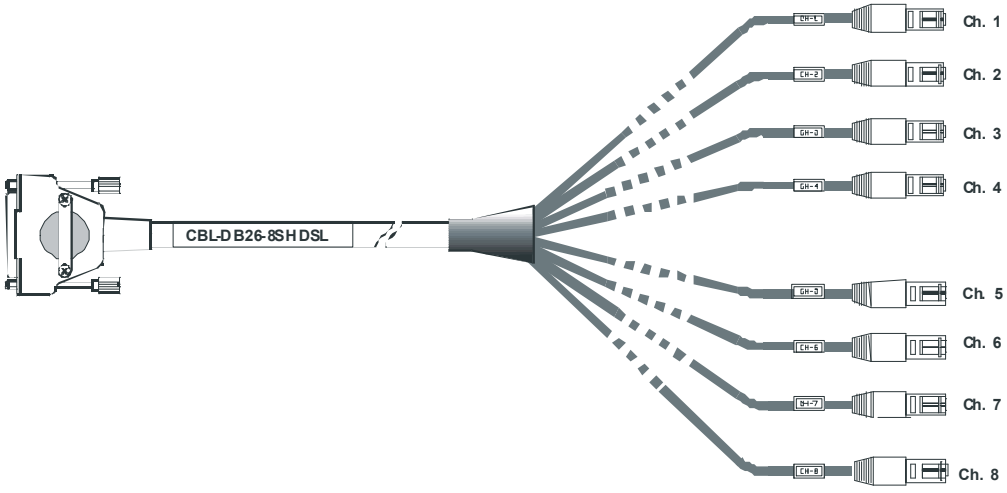


Figure A-1. CBL-DB26-8SHDSL Cable

Table A-1. CBL-DB26-8SHDSL Cable Wiring

Channel	26-Pin Connector		RJ-45 Connector		Channel	26-Pin Connector		RJ-45 Connector	
	Pin	Function	Label	Pin		Pin	Function	Label	Pin
1	1	Tip	CH-1	5	5	22	Tip	CH-5	1
	2	Ring		4		23	Ring		2
2	19	Tip	CH-2	5	6	16	Tip	CH-6	1
	20	Ring		4		15	Ring		2
3	12	Tip	CH-3	5	7	7	Tip	CH-7	1
	13	Ring		4		8	Ring		2
4	4	Tip	CH-4	5	8	25	Tip	CH-8	1
	5	RX Ring		4		26	RX Ring		2

A.2 Connection Data for ETH Electrical Ports

Each ASMi-54C ETH electrical port has a 10/100BASE-TX Ethernet interface terminated in an RJ-45 connector. The port supports the MDI/MDIX crossover function, and therefore it can be connected by any type of cable (straight or crossed) to any type of 10/100BASE-TX Ethernet port. The port also corrects for polarity reversal in the 10BASE-T mode.

Connector pin functions for the MDI state are listed in *Table A-2*. In the MDIX state, the receive and transmit pairs are interchanged.

Table A-2. ETH Connector, Pin Functions

Pin	Designation	Function
1	TxD+	Transmit Data output, + wire
2	TxD–	Transmit Data output, – wire
3	RxD+	Receive Data input, + wire
4, 5	–	Not connected
6	RxD–	Receive Data input, – wire
7, 8	–	Not connected

RAD
data communications
The Access Company

24 Raoul Wallenberg Street, Tel Aviv 69719, Israel
Tel: +972-3-6458181, Fax +972-3-6483331, +972-3-6498250
E-mail: erika_y@rad.com, Web site: http://www.rad.com

Customer Response Form

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: ASMi-54C LRS-102 Ver. 2.0

Publication Number: 416-253-12/08

Please grade the manual according to the following factors:

	Excellent	*Good*	*Fair*	*Poor*	*Very Poor*
Installation instructions	☐	☐	☐	☐	☐
Operating instructions	☐	☐	☐	☐	☐
Manual organization	☐	☐	☐	☐	☐
Illustrations	☐	☐	☐	☐	☐
The manual as a whole	☐	☐	☐	☐	☐

What did you like about the manual?

_____

_____

_____

_____

Error Report

Type of error(s) or problem(s):

- ☐ Incompatibility with product
- ☐ Difficulty in understanding text
- ☐ Regulatory information (Safety, Compliance, Warnings, etc.)
- ☐ Difficulty in finding needed information
- ☐ Missing information
- ☐ Illogical flow of information
- ☐ Style (spelling, grammar, references, etc.)
- ☐ Appearance
- ☐ Other _____

Please list the exact page numbers with the error(s), detail the errors you found (information missing, unclear or inadequately explained, etc.) and attach the page to your fax, if necessary.

_____

_____

_____

_____

Please add any comments or suggestions you may have.

_____

_____

_____

You are:

- ☐ Distributor
- ☐ End user
- ☐ VAR
- ☐ Other

Who is your distributor? _____

Your name and company: _____

Job title: _____

Address: _____

Direct telephone number and extension: _____

Fax number: _____

E-mail: _____

Publication No. 416-253-12/08

Order this publication by Catalog No. 803827

International Headquarters

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel. 972-3-6458181
Fax 972-3-6498250, 6474436
E-mail market@rad.com

North America Headquarters

900 Corporate Drive
Mahwah, NJ 07430, USA
Tel. 201-5291100
Toll free 1-800-4447234
Fax 201-5295777
E-mail market@rad.com

www.rad.com

RAD
data communications
The Access Company