ASMi-54L

SHDSL.bis Modem

High-speed Ethernet and E1 traffic over copper links

- Managed modem transmitting full-duplex at data rates of up to 5.7 Mbps over 2-wire and 11.4 Mbps over 2/4-wire lines
- Dual Bearer mode for E1 and Ethernet HDLC
- Extended rates of up to 11.4/15 Mbps over 2-wire with RAD proprietary solution
- SHDSL bonding – for EFM: PAF according to IEEE802.3, for HDLC: M-Pair according to G.991.2
- SHDSL ITU-T G.991.2 and ETSI 101524 compliance
- 4-port 10/100BaseT interface with integrated Ethernet switch
- Full interoperability with Megaplex-4100/LRS-102 ASMi-54C and ASMi-54C/N cards and/or point-to-point applications

ASMi-54L is a simple, cost-effective, dedicated managed SHDSL.bis modem that extends the range of high-speed services over existing copper pairs. The modem is used for point-to-point Ethernet and E1 service extension at rates of up to 11.4 Mbps/15 Mbps over 2-wire lines using bonding technology (see *Figure 1*).

A special RAD proprietary solution provides extended rates of up to 15 Mbps over 2-wire lines and up to 30 Mbps over 4-wire lines.

RAD
data communications
The Access Company

The modem employs TPS-TC framing 64/65o for EFM (IEEE802.3) and HDLC (G.991.2) on the SHDSL link.

ASMi-54L performs line probing according to G.991.2. When enabled, the DSL interface adapts its rate to the condition of the line (noise, loop attenuation, etc.). When disabled, traffic on the DSL line is transmitted at a fixed rate selected by the user.

ASMi-54L can operate as a CO device or a CPE device according to user configuration.

The modem uses an Embedded Operation Channel (EOC) for controlling and monitoring the SHDSL/SHDSL.bis repeaters. Up to eight SHDSL/SHDSL.bis repeaters can be installed in line to increase the operation range of E1- and Ethernet-based modems.

EFM BONDING

EFM bonding on the Ethernet interface ensures that a failure or addition of a link does not drop the traffic being transmitted over the other wires in the group. The capacity of the group does not decrease when a new link is added at a lower rate.

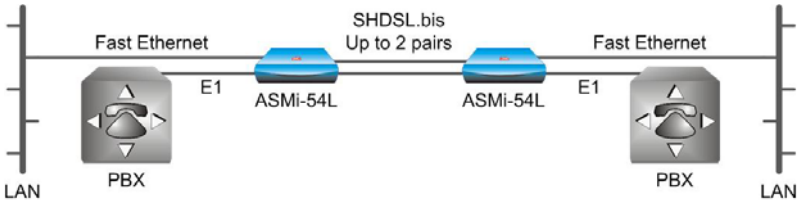


Figure 1. Multiplexing Services over SHDSL

ETHERNET SUPPORT

ASMi-54L features up to four Ethernet 10/100BaseT ports with half/full-duplex, autonegotiation and flow control. The fault propagation functionality enables the unit to shut down the Ethernet user port when an SHDSL line failure is detected. LANs are connected by bridging.

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.

QUALITY OF SERVICE

The 802.1D, DSCP, and Per Port priority schemes allow users to define different QoS levels according to application requirements.

The modem implements the IEEE's 802.1q standards to provide VLAN-tagging with four levels of prioritization, enabling carriers to offer differentiated Ethernet services. VLAN tagging can also be employed to separate traffic, ensuring transparency of the customer traffic and bolstering security of management traffic. The user can activate or deactivate the priority mechanism, and each priority (VLAN priority, DSCP or per port) can be configured and mapped to one of four priority queues.

Ingress data rate can be limited on each Ethernet port.

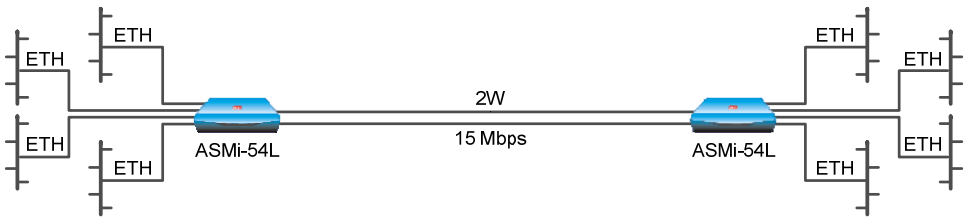


Figure 2. Extended Rates over 2-wire

MANAGEMENT

The ASMi-54L unit can be managed using the following connections:

- Local RS-232 terminal
- Telnet server, SNMP (Ver.1)
- Web server
- Inband management with or without dedicated VLAN.

ASMi-54L supports the IEEE 802.3ah (IEEE 802.3-2005) standard for Operation, Administration, and Maintenance (OAM), originally developed for Ethernet in the First Mile (EFM) applications. OAM is a set of functions designed to monitor network operation on an SHDSL line, in order to detect line faults and measure performance.

DYING GASP

Dying Gasp condition occurs if there is an interruption in the ASMi-54L power source. ASMi-54L reports power failures to the specified network management stations by sending an SNMP trap. This helps a service provider identify and isolate the end-point device experienced a power failure.

PHYSICAL

ASMi-54L is available with several power supply options:

- AC/DC wide range (100 to 240 VAC, -48 to -60 VDC nominal)
- 24 VDC.

The modem is encased in a compact half-19" plastic enclosure that can be mounted alone or in pairs in a 19-inch rack using RAD's optional rack mount kits (see *Ordering*). The modem is available in extended temperature versions (by special request).

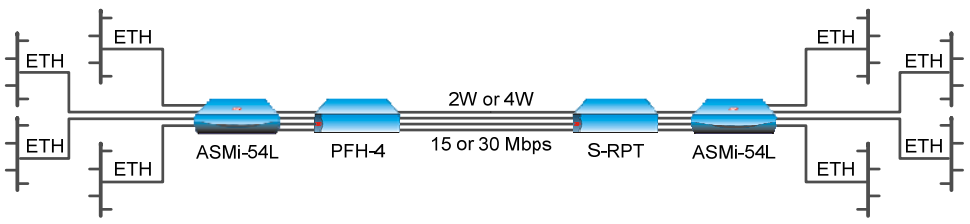


Figure 3. Extended Rates over 2-wire or 4-wire lines with S-RPT Repeater and PFH-4 Feeder

Specifications

LINE INTERFACE

Line Type
Symmetrical PSD
2/4-wires unconditioned dedicated line (twisted pair)

EFM Bonding
Per IEEE802.3ah and ITU-T G.991.2 (for Ethernet only)

OAM
According to IEEE 802.3ah (passive and active)

Line Coding
TC-PAM 16/32/64/128

Frame Size
2047 bytes

Line Rate
For EFM: 192 to 15296 kbps in steps of n x 64 kbps for each pair
For HDLC: 192 to 8576 kbps in steps of n x 64 where n=134 for each pair

SHDSL Reference Clock

E1+Ethernet user interfaces:
Clock Mode 1 or 2
Ethernet only user interface:
Clock Mode 3a

Range
See Table 1, noise-free environment (per pair) on 26 AWG wire

Extended Range over DSL Line

License key for transmitting up to 15 Mbps over 1 pair or up to 30 Mbps over 2 pairs (point-to-point only)

Table 1. Typical Ranges

Data Rate [kbps]	Range [km]	[miles]
192	6.6	4.1
1536	4.9	3.0
2048	4.5	2.8
4096	3.2	2.0
4608	3.0	1.9
5696	2.6	1.6
11400	1.2	0.7

Impedance

135Ω

Connectors
RJ-45

Compliance
ITU-T G.991.2, ETSI TS 101524

E1 PORT

Coding
HDB3

Line Impedance
120Ω, balanced
75Ω, unbalanced (via adapter cable)

Jitter Performance
As per ITU G.823

Connector
RJ-45

Diagnostics
Local analog loopback
Remote digital loopback

CONTROL PORT

Interface
V.24/RS-232

Type
DCE

Format
Asynchronous; 8 bits, 1 stop bit, no parity

Data Rate
9.6, 19.2, 115.2 kbps

Connector
9-pin, D-type, female

ETHERNET PORTS

Interface
10/100BaseT

Connectors
4 x RJ-45

Frame Size
1580 bytes

INDICATORS

Front Panel
PWR (green) –
On: power supply is on
Off: power supply is off

TST (yellow) –
On: a test is active
Off: no test is active

ALM (red) –
On: new alarm in the alarm buffer
Off: no alarms in the alarm buffer

SHDSL SYNC (green/red) –
Green: the SHDSL line is synchronized and can pass data
Green flashing: the SHDSL line is in training process
Red flashing: the SHDSL line is in PAF/M-pair establishment stage
Red: the SHDSL line is either not synchronized, or in training process or in PAF/M-pair establishment stage

Rear Panel
Ethernet Ports LINK/ACT (per port)
ACT (yellow) –
Flashing: Ethernet traffic on the port
LINK (green) –
On: Ethernet port link is up
Off: No Ethernet link on the port
E1 LOC (red) -
On: Loss of signal or sync loss (in framed mode only) or unframed AIS is received on the E1 port
E1 REM (red) -
On: Remote alarm is received on the E1 port

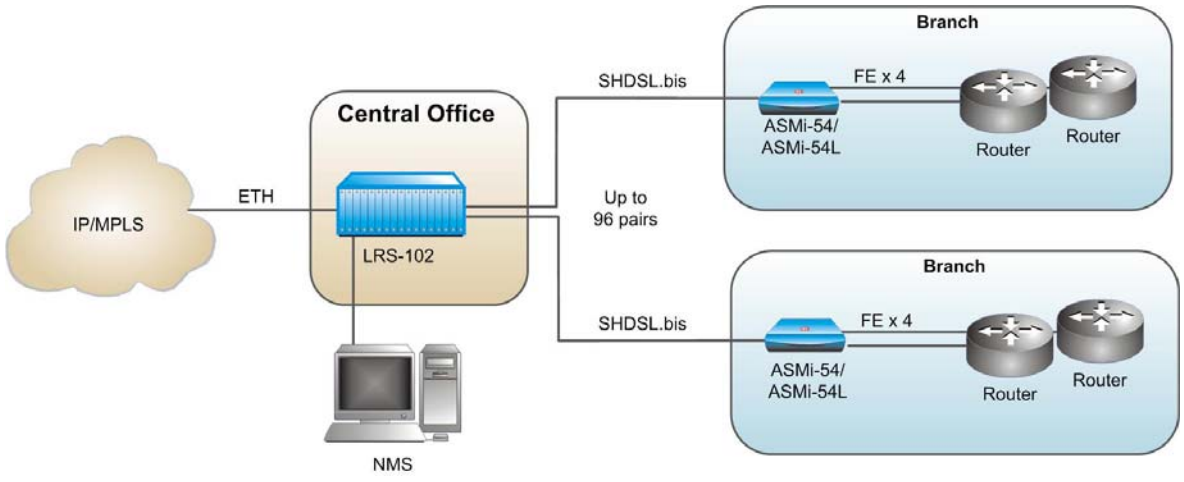


Figure 4. Up to 96 Remote ASMi-54L sites with LRS-102 as a Central Solution

GENERAL

Power Supply
Wide-range AC/DC: 100 to 240 VAC,
-48 to -60 VDC nominal
DC: 24 VDC nominal

Timing
For CO:
Internal – derived from the modem
External – derived from E1 port

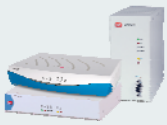
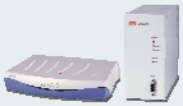
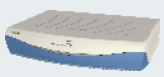
For CPE:
Receive – derived from the SHDSL line

Performance Monitoring
SHDSL and E1 statistics collection

Physical
Height: 43.7 mm (1.7 in)
Width: 217 mm (8.5 in)
Depth: 170 mm (6.7 in)
Weight: 0.6 kg (1.2 lb)

Environment
Temperature: 0°C to 50°C (32°F to 122°F)
Extended temperature (4 X ETH interface version only): -20°C to 70°C (-4°F to 158°F)
Humidity: Up to 90%, non-condensing

Table 2. Modem Comparison Chart

Feature	ASMi-52 (Ver. 2.7)	ASMi-52L (Ver. 2.0)	ASMi-54 (Ver. 3.5)	ASMi-54L (Ver. 2.6)	ASMi-54LRT (Ver. 2.1)
					
Max. data rate (Mbps)	2.3/4.6	2.3/4.6	5.7/11/22	5.7/11.4 (11.4/15 per pair with license key)	5.7/11
Interface	V.35, RS-530, X.21, E1, ETH	V.35, X.21, E1, ETH, 4 x ETH	4 x ETH, E1/4 x E1	4 x ETH, E1	4 x ETH, E1
Router					✓
Line	2W/4W	2W/4W	2W/4W/8W	2W/4W	2W/4W/8W

ASMi-54L

SHDSL.bis Modem

Ordering

STANDARD CONFIGURATIONS

ASMi-54L/4ETH/2W/ETR
ASMi-54L/4ETH/4W/ETR
ASMi-54L/24V/4ETH/4W/ETR
ASMi-54L/4ETH/4W/E1/ETR
ASMi-54L/4ETH/2W/E1
ASMi-54L/4ETH/4W/E1
ASMi-54L/4ETH/4W

SPECIAL CONFIGURATIONS

ASMi-54L/$/#/*/@/^/&

Legend

$ Optional 24 VDC power supply (Default=wide-range AC/DC power supply, 100 to 240 VAC, -48 to -60 VDC):
24V 24 VDC

Ethernet interface (mandatory):
4ETH Four-port ETH module with 4 x RJ-45 connectors

***** SHDSL interface:
2W 2-wire (1 pair)
4W 4-wire (2 pairs)

@ User interface (Default=no E1 interface):
E1 E1

^ Extended temperature for device with 4 X ETH interface (Default= 0°C–50°C/32°F–122°F)
ETR -20°C to 70°C (-4°F to 158°F) range (according to special request)

& License key for high data rate (Default=no key)
HR License key for 11.4 Mbps data rate per pair)

ASMi-54L-LIC/HR

License key for high data rate

SUPPLIED ACCESSORIES

Power cord

AC/DC adapter for -48 VDC

OPTIONAL ACCESSORIES

RM-33-2
Hardware kit for mounting one or two plastic ASMi-54L units in a 19-inch rack

CBL-DB9F-DB9M-STR
Standard 9-pin male to female RS-232 control port cable

CBL-RJ45/2BNC/E1
Interface adapter for converting a balanced E1 RJ-45 connector into a pair of BNC unbalanced coaxial connectors

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