S-ACCESS TELCOLINK RACKCARD IAD

TELCOLINK xDSL TRANSMISSION SYSTEMS

USER MANUAL

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FIGURES

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VERSION CONTROL

User Manual Version	*Soft Release*	*Major changes to previous version*
1.0	1.7.5.12	Initial Version.
1.1	1.7.5.13	Text changes
1.2	1.7.5.13	Implementation EN50419
2.0	3.0.V5.L4 3.0.V5.L4S	Added new commands and new functions.

SAFETY REGULATIONS

IF THE UNIT IS NOT USED IN ACCORDANCE TO REGULATIONS DESCRIBED AND DEFINED IN THE CHAPTER AND “TECHNICAL SPECIFICATIONS”, S-ACCESS GMBH REFUSES TO TAKE ANY RESPONSIBILITY. FURTHERMORE, NO WARRANTY IS GRANTED IN SUCH CASE!

IT’S ONLY ALLOWED TO USE EXTERNAL POWER SUPPLYS THAT ARE APPROVED ACOORDING TO THE SAFETY STANDARD IEC/EN 60950-1.

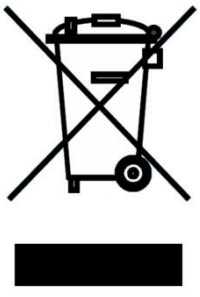
IT’S ONLY ALLOWED TO USE THE UNITS WITH SUBRACKS OR MINIRACK UNITS SUPPLYED FROM S-ACCESS GMBH. THE RACK HAS TO BE CONNECTED PERMANENTLY TO A RELIABLE PROTECTIVE ERTH CONDUCTOR.

THE LTU UNIT HAS TO BE FIXED TO THE RACK PERMANENTLY WITH THE TWO PANEL SCREWS.

INCORRECT USE OF THIS DEVICE, USE IN ANY OTHER ENVIRONMENT AND/OR HOUSING THAN PROVIDED BY S-ACCESS MIGHT LEAD TO HARMFUL CONDITIONS. FAILURE TO FOLLOW THESE PRECAUTIONS MAY RESULT IN DEATH, SEVERE INJURY OR PROPERTY DAMAGE.

Please read this manual carefully before operating the system.
Installation of this equipment has to be done by **qualified** personnel only.

EU DIRECTIVE 2002/96/EC AND EN50419



This equipment is marked with the above recycling symbol. It means that at the end of the life of the equipment you must dispose of it separately at an appropriate collection point and not place it in the normal domestic unsorted waste stream. (European Union only)

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1 SELECTION GUIDE

RACK-CARDS (TELCOLINK)**, E1 / Nx64 / Ethernet Bridge / FXx**

	2 wire (2,3Mb)	4 wire (4,6Mb)	1 E1	2 E1	Ethernet Bridge	Multi-Service	Point to Point	Point to Multipoint	48V-DC	Remotely powerable	Remote Powersource	VT100 Management	Telnet Management
SA-RC-TELCOLINK-E1	■		■				■		■		■	■	■
SA-RC-TELCOLINK-2E1-MP-RP		■		■		■	■		■		■	■	■
SA-RC-TELCOLINK-E1/ETH/N64/FXx	■		■		■		■	■	■			■	■
SA-RC-TELCOLINK-2E1/ETH/N64/FXx-MP		■		■	■	■	■	■	■			■	■

Note: It's not possible to use IAD units remote powered!

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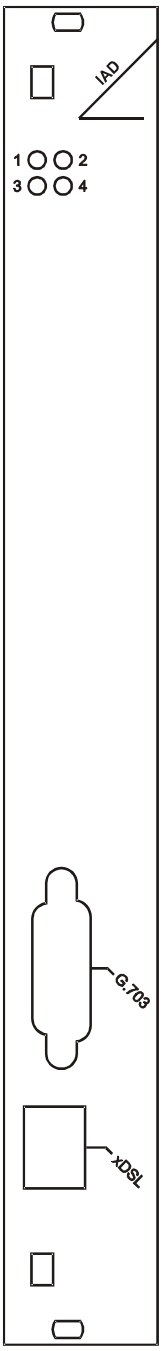
2 LTU FRONT PANEL DESCRIPTION

2.1 SA-RC-TELCOLINK-E1, V25; SA-RC-TELCOLINK-2E1-MP-RP, V36



1: Tricolour LED for local status channel 1
2: Tricolour LED for remote status channel 1
3: Tricolour LED for local status channel 2 (V36 only)
4: Tricolour LED for remote status channel 2 (V36 only)

E1 120Ohm Sub-D15 male Connector

XDSL RJ/45 8 pin connector

Figure 2-1: Subrack Front Panel (E1 120 Ω)

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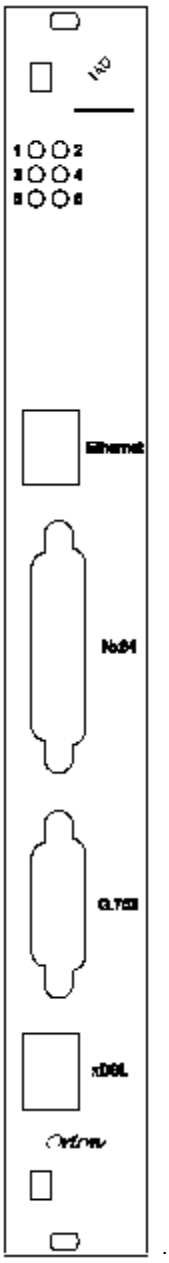
2.2 SA-RC-TELCOLINK-E1/ETH/N64/FXx-MP, SA-RC-TELCOLINK-E1/ETH/N64/FXx-MP



1. Tricolour LED for local status channel 1
2. Tricolour LED for remote status channel 1
3. Tricolour LED for local status channel 2 (V42 only)
4. Tricolour LED for remote status channel 2 (V42 only)
5. Tricolour LED for status of voice card 2
6. Tricolour LED for status of voice card 1

Ethernet RJ-45 8 pin connector

Nx64 Sub-D25 female connector

E1 120 Ohm Sub-D15 male connector

xDSL RJ-45 8pin connector

Figure 2-2: Subrack Front Panel (E1 120 Ω)

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3 CONFIGURATION OPTIONS

The following sections describe the various configuration options. The operating modes for the LTU are configurable via the V.24 monitor interface on the backplane or via the TMN. The only hardware settings on the LTU board are for the wetting current and remote power described later. The operating modes for the NTU are configurable via the V.24 monitor interface on the rear panel as well as from remote LTU (or NTU) via DSL in case of establishing of the link..

3.1 xDSL

The following two configuration options refer to the xDSL side only and do not affect other interfaces operating mode.

3.1.1 Master / Slave

To start up an xDSL link, one system unit must be configured as master and the other one as slave, as the link start-up procedure is controlled by the slave. If both system units are configured as master or both as slave, no start-up will occur.
Normally, the LTU is configured as master (default setting). In addition, it is also possible to set up an xDSL link with two LTUs, given that one is configured as master and the other one as slave. In an LTU - LTU connection, at least one of the units must be configured as master. It should be noted that if a xDSL link is set up with two LTUs, the "External Clock" option is possible on only one subrack side. Also no wetting current is possible in an LTU - LTU connection.
The "Master / Slave" option also affects the EOC related functions.
Generally, the master-slave rights are:

- The master unit has local access as well as access to the slave unit. Only the master / slave and the autorestart configuration cannot be altered by the master unit over the xDSL link for safety reasons.

LTUs are always delivered as *master* (factory setting).
NTUs are always delivered as *slave* (factory setting).

The slave unit has the far end LED always off, whereas the master unit has it always on.

3.1.2 Normal- Dualpair / Multipoint mode

Units with two xDSL interfaces can operate in 2-wire (Normal) or 4-wire (Dual Pair) mode according to ITU-T G.992.1. To start up an xDSL link, both system units must be set to the same mode. Rate adaptation does not supported in Dual Pair Mode, so in this mode both system units must be set to the same base rate.

In Multipoint mode E1 data is multiplexed to two xDSL interfaces. First n channel time slot is transmitted through xDSL interface A, while other m channel slots – via xDSL interface B. There are two sub-modes: PCM30, when signaling slot is processed, and PCM31, when signaling slot is considered as channel slot.

3.2 E1-Interface (2 Mbit/s G.703 / G.704)

The following configuration options refer to the E1 side only and do not affect the xDSL operating mode.

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3.2.1 Framing

3.2.1.1 Transparent Mode

In the transparent mode, the E1 data will be transmitted without any changes, whereas in the framed mode the frame / multiframe alignment words and eventually the CRC4 bits are searched for by the E1 framer.
The “CRC4” option is not relevant in the transparent mode. Transparent mode does not supported in Multiservice mode.

3.2.1.2 Framed Mode ITU-T G.704

In the framed mode (framing according to ITU-T Rec. G.704), the incoming E1 data stream passes through an E1 framer before entering the xDSL section. On the other side, the E1 data stream received from the xDSL section first passes through the E1 framer before being transmitted to the E1 network.
The E1 framer operates in the CCS mode. Signaling time slot is fully transparent (except PCM30 mode, see 4.2.6).
Consider the “CRC4” option when operating in the framed mode.

3.2.2 CRC4 Option

If operating in the framed mode, the “CRC4” option can be used to adapt the LTU to specific E1 network requirements:

- If enabled, the E1 framer will synchronize on CRC4 multiframes and CRC4 errors will be reported, also the E1 framer regenerates the CRC4 multiframe alignment and checksum words in the outgoing E1 signal.
- If disabled, the E1 framer will synchronize on basic frames only and no CRC4 errors will be reported, also time slot 0 passes transparently in the outgoing E1 signal.

The A-Bit and all national bits (Sa-Bits) are fully transparent.

3.2.3 E-bit Insertion

If operating in the framed mode and “CRC4” option is enabled, the “EBIT” option can be used to adapt the LTU to specific E1 network requirements:

- If the automatic E-Bit generation is enabled, detected CRC4 errors will cause the assertion of the E-bits.
- If disabled, all the E-Bits are set to ‘1’.

The E-bit insertion option is not relevant in transparent mode or if “CRC4” is disabled.

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3.2.4 AIS Generation

If this option is enabled, an unframed AIS (all 1's) will be transmitted on the E1 side, irrespective of whether the system is configured in the transparent or framed mode. AIS generation will be activated on the following conditions:

- xDSL link to the remote station is not established (loss of signal or loss of frame alignment on xDSL side) or
- remote station is sending AIS or
- AIS-R alarm is active

If “AIS Generation” is disabled, no signal will be transmitted on the E1 side if any of these three conditions occurs.

3.2.5 AIS Detection

If “AIS Detection” is enabled, receiving AIS from the E1 side will cause the following actions:

- The Non-Urgent alarm will be set active (AIS-S).
- AIS will be transmitted to the remote station by AIS-R.

3.2.6 Transmission of signaling slot

Use PCM30 mode for transmission of signaling slot in desired position. There are two ways to setup signaling slot’s number, assign it manually for each interface or use AUTO mode.
In AUTO mode signaling slot is always transmitted in TS16 for the E1 interface, and for xDSL interfaces it will be transmitted in TS16 if line rate is higher than 17x64+8 kbps, otherwise it will be transmitted in the last available xDSL slot.

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3.2.7 E1 - Clock Modes

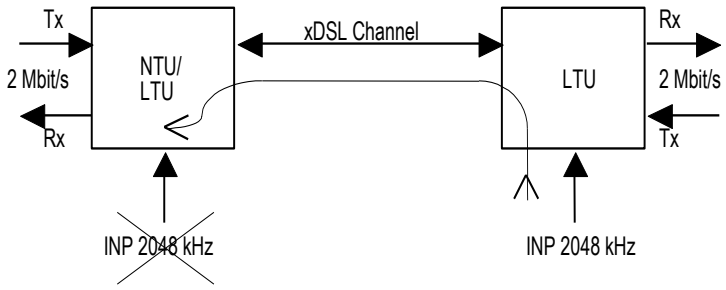

Figure 3-1: External Clock Mode

In "External Clock" mode, the 2048 kHz input clock coming from a clock input card via the backplane to the LTU is used as the E1 reference clock. As the xDSL transceivers operate at a maximum clock frequency of 2064 kHz, the 2048 kHz clock is not used physically to drive the xDSL transmit clock. Data rate adaptation between the 2048 kHz clock and the xDSL transmit clock is achieved by stuffing / deleting bits in the xDSL frames.

Note: Signals towards the XVR section are always TX and signals coming from the XVR sections are always RX.

The following block diagram shows the possible clock sources on the LTU. Note that the clock sources are intended to be references only and do not drive the HDSL transmit section physically. The E1 interface clock is never affected by the crystal controlled HDSL clock.

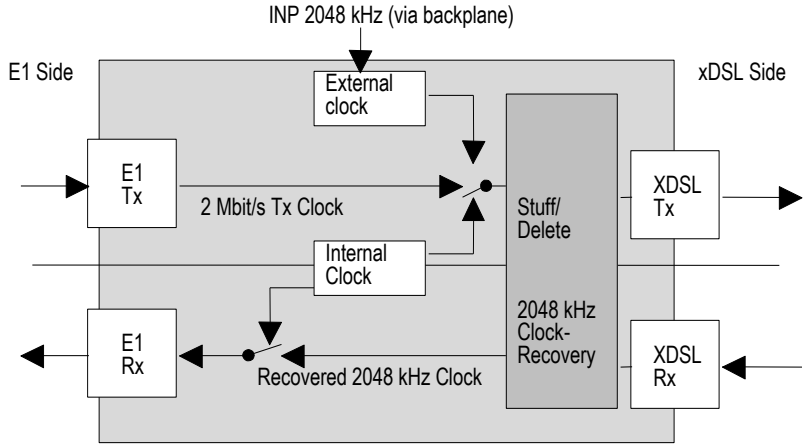

Figure 3-2: Clock Sources

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If the "External Clock" option is enabled, the primary E1 clock source is the external clock. If no external clock is present at the 2048 kHz clock input, the E1 transmit clock is used as the clock source (on the master side only). If no signal is received at the E1 port, then the internal clock is used as the clock source.
If the "External Clock" option is disabled, the primary E1 clock source is the 2 Mbit/s transmit clock. If no signal is received at the E1 port, then the internal clock is used as the clock source.
The external clock is never used to drive the E1 RX direction.
As long as the xDSL link is not established, the internal clock oscillator is used as the clock source.
The clock sources are automatically switched by the microcontroller, depending on the actual signal and clock status, which is updated every 100 ms.

3.2.7.1 Synchronous and plesiochronous operation

Both synchronous and plesiochronous operation modes are possible.
Synchronous operation occurs, when the E1 equipment at one end of the xDSL link uses the receive clock as transmit clock, as shown below. In this case receive PLL in master modem XVR is disabled.

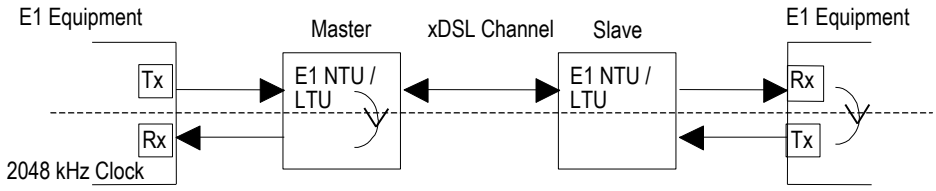

Figure 3-3: Synchronous Operation

Plesiochronous operation occurs, when the E1 equipment at both ends of the xDSL link has its own clock generator, as shown below. In this case receive PLL in master XVR should be enabled.

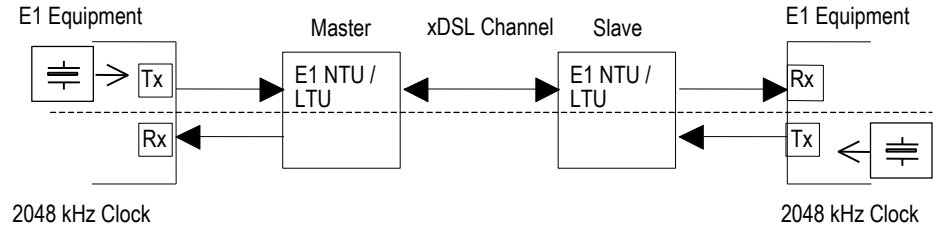

Figure 3-4: Plesiochronous Operation

Warning: Do not configure the E1 interfaces at both ends to use the receive clock as transmit clock except if one xDSL equipment is an LTU using the "External Clock" option. Otherwise there will be no defined clock.

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3.3 Nx64/RS232 Interface (DCE)

The following configuration options refer to the Nx64 (V.35/V.36/X.21/V.28/RS232 – SW configurable) side only and does not affect the xDSL operating mode.

3.3.1 Nx64/RS232 Services

One can choose between three available services:

- E1 only: With this service mode, the Nx64 interface is shut down. No payload data is transferred to/from Nx64 transceiver.
- Nx64 only: With this service mode, the E1 transceiver is shut down or is sending AIS. No payload data is transferred to/from E1 transceiver.
- Ethernet only:
  In this mode the E1 transceiver is shut down or is sending AIS. All other interfaces except Ethernet are shut down.
- Voice only:
  In this mode the E1 transceiver is shut down or is sending AIS. All other interfaces except the Voice card Interfaces (FXO, FXS) are shut down.
- Multiservice Nx64 & fE1: With this service mode, the available xDSL payload is divided into Nx64 (or RS232) payload and E1 payload. The Nx64 payload always starts at timeslot 1 upwards, skipping timeslot 16 up to timeslot 31, then using timeslot 16 and at last timeslot 0. The E1 payload follows after the last used Nx64 timeslot. The RS232 payload starts at timeslot that is defined by “RS232SLOT” command. For data rates from 110 to 38400 kbps RS232 payload occupies one timeslot. For data rates 57600 and 115200 kbps RS232 payload occupies 2 and 3 timeslots accordingly.

3.3.2 Nx64/RS232 Interface Types

There are following interface types/data rates supported (SW configurable):

- V.35 / 64…2048 kbps;
- V.11 (V.36 or X.21, cable selectable) without termination / 64…2048 kbps;
- V.11 (V.36 or X.21, cable selectable) with termination / 64…2048 kbps;
- V.28 (synchronous) / 64 and128 kbps;
- RS232 (asynchronous) / 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 kbps.

3.3.3 Nx64 Clock Directions (V.35, V.11 and V.28 only)

There are two options available:

- codirectional: Transmit clock and transmit data have same directions, i.e. both are inputs to the modem at signal number 113 (clock) and 103 (data).
- contradirectional: Transmit clock and transmit data have opposite directions, i.e. transmit clock is output from modem at signal number 114 and transmit data is input to the modem at signal number 103.

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3.3.4 Nx64 Clock Modes (V.35, V.11 and V.28 only)

The following table shows different combinations of clock modes, some of which are invalid. There are three possible DCE clock modes:

- from E1: This clock mode is active when the E1 interface is active.
- external: In this clock mode, the DCE is clock slave and has its PLL on the transmit side (from Nx64 to the xDSL interface) is on.
- internal: In this clock mode, the DCE is clock master and the PLL is off, generating a 2048 kHz clock from the internal oscillator directly.

Service	DTE Clock Mode	DCE Clock Mode	DCE Clock Direction	xDSL Clock Mode
Nx64 only	Slave	internal	don't care	Master
	~~Slave~~	~~external~~	~~don't care~~	~~Slave~~
	Master	external	codirectional	Slave
	~~Master don't care~~	~~external~~	~~contradirectional~~	~~Master don't care~~
	~~Master~~	~~don't care~~	~~don't care~~	~~Master~~
Nx64 & fE1	Slave	from E1	don't care	~~Master~~
	Slave	from E1	don't care	~~Slave~~
	~~Master~~	~~don't care~~	~~don't care~~	~~don't care~~

Note: Invalid clock modes are ruled out.

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3.3.5 Nx64 Block Diagram

The following block diagram shows the receive and transmit path separately. Each direction possesses a FIFO buffer and a PLL.

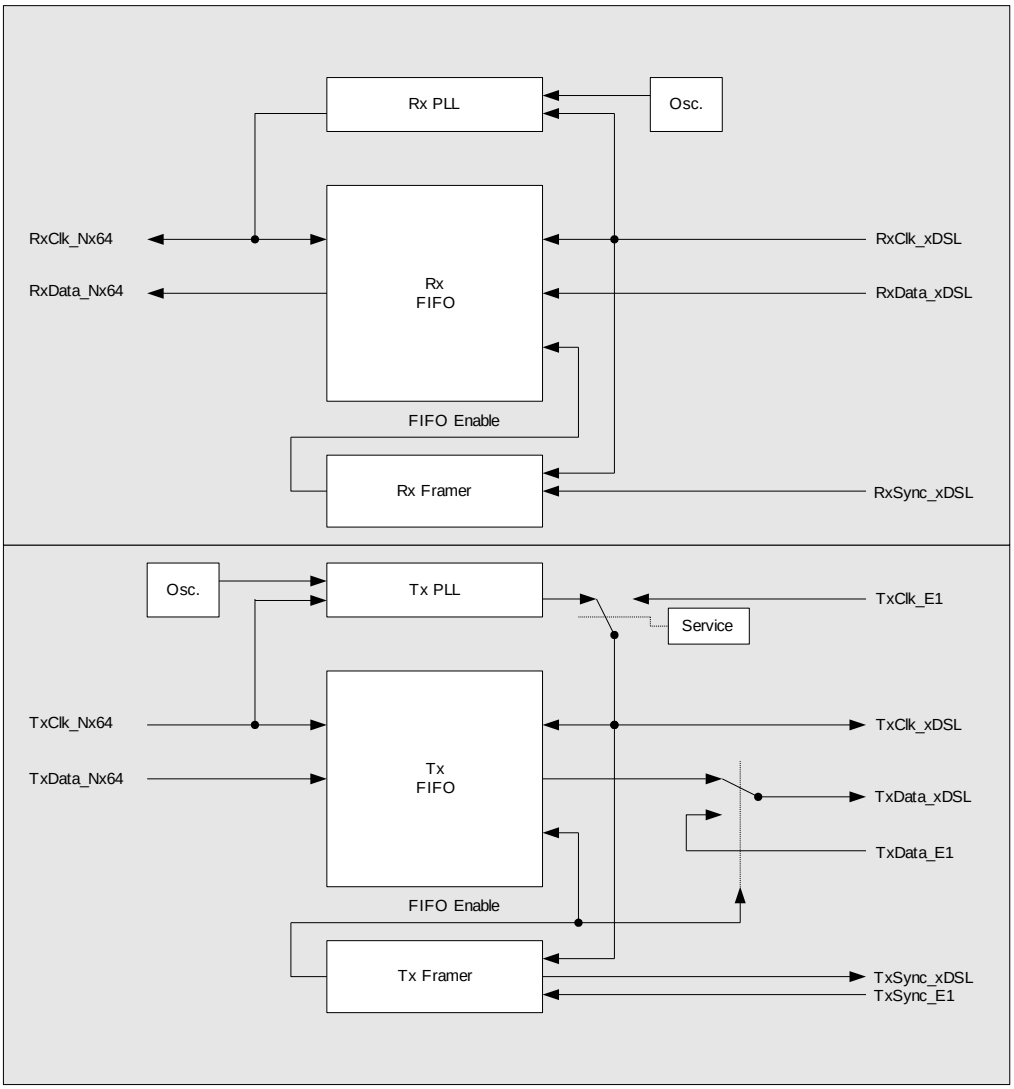

Figure 3-5: Nx64 Block Diagram

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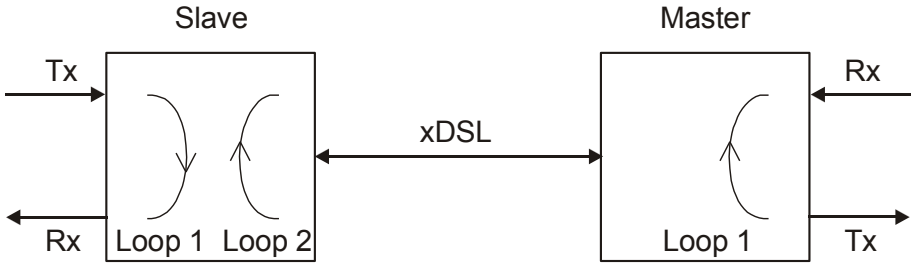
3.3.6 Automatic V.54 loops

System supports V.54 loops, managed by 140-142 lines. Supporting of V.54 loops is SW programmable.



	Master			Slave				
State Name	RL	LL	TI	RL	LL	TI	DSR	State Description
Normal	1	1	1	1	1	1	0	Data Transmission
Loop1 at Master Side (Setting by terminal command)	1	1	0	1	1	1	0	TX Data is looped back to RX at Nx64 Master Network Interface. LOOP1 alarm is active on Master side.
Loop2 (Setting by terminal command)	1	1	0	1	1	0	1	Data from DSL is looped back towards Master side in Slave DSP (Core loopback). LOOP2 alarm is active on Master and Slave sides.
Loop1 at Slave Side (Setting by terminal command)	1	1	1	1	1	0	0	TX Data is looped back to RX at Nx64 Slave Network Interface. LOOP1 alarm is active on Slave side.
Automatic Loop1 setting at Master side (activated by LL line on Master interface)	1	0	0	1	1	1	0	TX Data is looped back to RX at Nx64 Master Network Interface. LOOP1 alarm is active on Master side
Automatic Loop2 (activated by RL line on Master interface)	0	1	0	1	1	0	1	Data from DSL is looped back towards Master side in Slave DSP (Core loopback). LOOP2 alarm is active on Master and Slave sides.
Automatic Loop1 setting at Slave side (activated by LL line on Slave interface)	1	1	1	1	0	0	0	TX Data is looped back to RX at Nx64 Slave Network Interface. LOOP1 alarm is active on Slave side.

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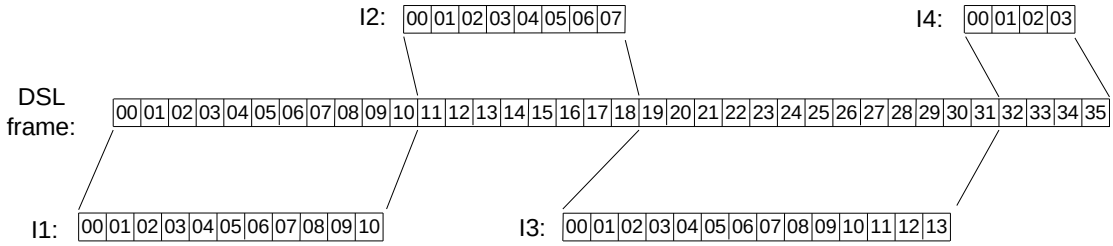
3.4 Ethernet

The Ethernet interface is integrated as two ports Ethernet switch. One port is located at the front panel, the second port is connected to internal data bus. The switch supports “store-and-forward” technology. It filters packets with errors. Also the switch determines Ethernet connection parameters (link speed, duplex) automatically or uses the manual settings.

3.5 Multiservice

In the in Multiservice mode data from different interfaces are transmitted through xDSL simultaneously. Depending on the selected services,the parameters for the number of used TS are defined from the PAYLOAD, BITRATE, RS232SLOT, ETHPAYLOAD and VOICECH commands.

Example: SERVICE I1,I2,I3,I4



Mapping rules:

- In the PCM30 mode the signaling timeslot position is defined by the SIGSLOTS parameter
- The Ethernet payload is defined by the ETHPAYLOAD parameter
- The Nx64 payload is defined by the BITRATE parameter. The Timeslot(s) for the RS232 mode are defined by the RS232SLOT parameter
- The Voice card timeslots can be allocated only in the first 32 xDSL timeslots. If E1 PCM30 mode is not active, then one more timeslot will be used for signaling.
- The Timeslots for the E1 interface are allocated in empty timeslots, which are not used for other interfaces. If the E1 is setup to G704, for the timeslot 0 of the E1 interface the xDSL’s timeslot 0 is used anytime.
- Timeslots from E1 interface cannot be allocated over 31 timeslot of xDSL frame, except in case of using the unframed mode.
- Empty slots are filled with data xFF.

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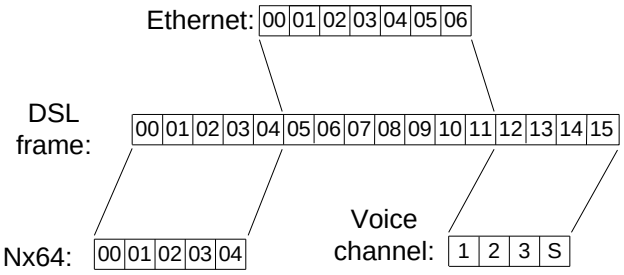
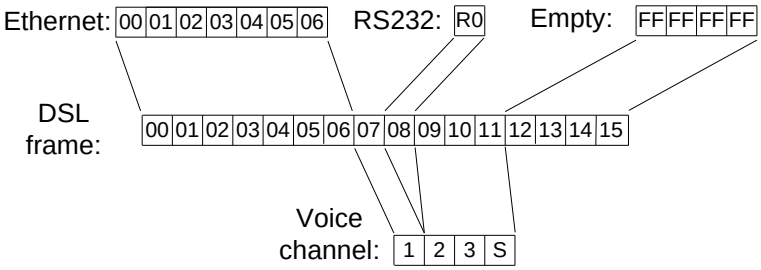
Example 1.
SERVICE N, ETH, V
Nx64: TYPE 0; SLOTUSAGE ON; BITRATE 5
Ethernet: ETHPAYLOAD 7
Voice cards: VOICECH = 3; PCM 30; SIGSLOTS 15
xDSL: BASERATE 16



Example 2
SERVICE N, ETH, V
Nx64: TYPE 4, SLOTUSAGE ON; RS232SLOT 8; RS232RATE 9600;
Ethernet: ETHPAYLOAD 7;
Voice cards: VOICECH 3; PCM 30; SIGSLOTS 11
xDSL: BASERATE 16



Example 3
SERVICE N, ETH, V
Nx64: TYPE 0, SLOTUSAGE OFF; BITRATE 4;
Ethernet: ETHPAYLOAD 7;
Voice cards: VOICECH 3; PCM 30; SIGSLOTS 15
xDSL: BASERATE 16

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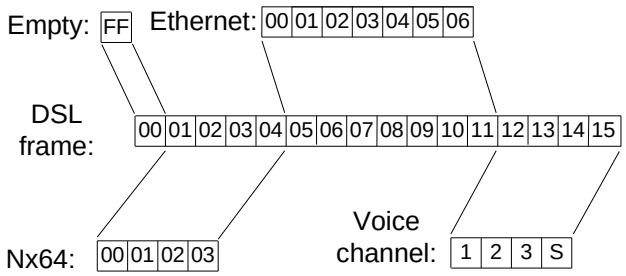
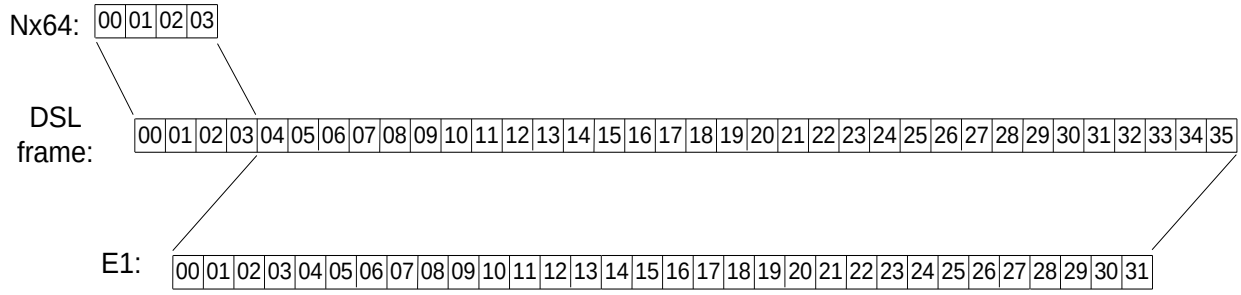


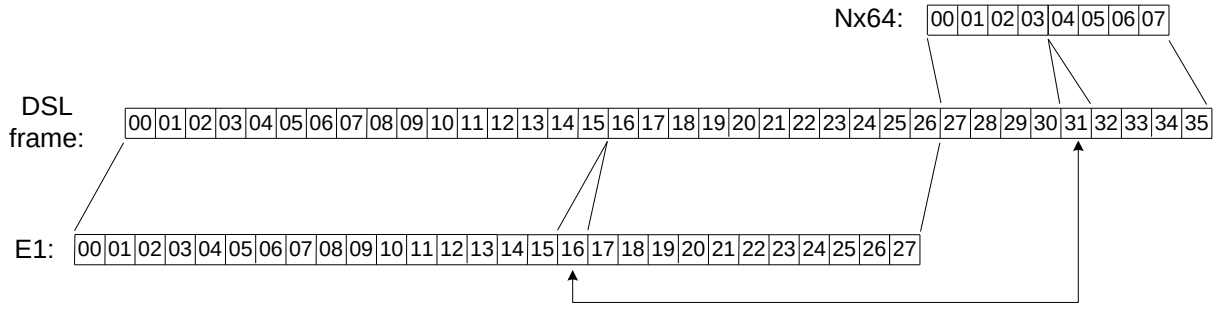
Example 4

SERVICE	N, E
Nx64:	TYPE 0, BITRATE 4
E1:	Transparent
xDSL:	BASERATE 36



Example 5

SERVICE	E,N
Nx64:	TYPE 0, BITRATE 8
E1:	PCM 30, SIGSLOTS 31,16
xDSL:	BASERATE 36



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3.6 Working with two channels units SA-RC-TELCOLINK-2E1/ETH/N64/FXX-MP-xxx..

These devices are working like two independent units.

3.6.1 Restrictions for second channel

- Not accessible for Nx64 (RS232) and Ethernet
- Only four voice channels
- Maximum xDSL rate is 2056 kbps

3.6.2 Dual slave mode

In this mode the unit works like two independent slave units. Please be aware of the restrictions for the channel 2 described in chapter Restrictions for second channel.

3.7 Test Loops

3.7.1 Standard Test Loops

The test loops can be activated via the monitor interface.

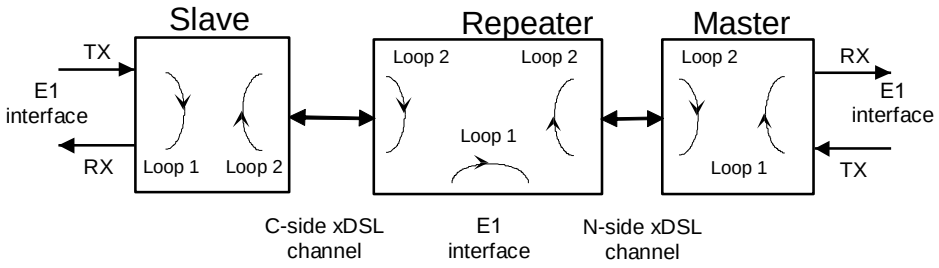

Figure 3-6: standard Test Loops

Note:
On the slave side, Loop 1 can only be activated locally, Loop 2 can be activated remotely by the master or locally.
Both the NE LED on the slave and the FE LED on the master will be lit amber when Loop2 is active.
At the regenerator point Loop2 and Loop1 can be activated locally or remotely by the master.
Both the NE LED on the regenerator and the FE LED on the master will be lit amber when Loop2 is active.
On the master side, Loop 1 and Loop 2 can only be activated locally. The NE LED will be lit amber when Loop 1 or Loop2 is active.

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3.7.2 Analog Loop Back

To test the S-Access equipment itself, the Analog Loop Back can be used. To perform this test, the xDSL - cable has to be disconnected from the unit and the test can be activated with the appropriate monitor command (see chapter 'S-Access Monitor').
During the Analog Test Loop, the xDSL-receiver part receives the transmitted signal of its own transmitter due to the impedance mismatch in the xDSL-line transformer.
All data of the user interface is looped back according the UIF and its settings.
An Analog Loop Back causes a non-urgent alarm.

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4 PERFORMANCE MONITORING

The transmission performance of a xDSL link can be monitored in two different ways. The xDSL signal quality is typically used during installation and maintenance procedures, whereas the G.826 error performance parameters are intended to be used for long-term evaluation of operating xDSL links. Refer also to the “SQ” and “G826” monitor commands described in the “S-Access Monitor” section.

4.1 G.826 Performance Monitoring

The G.826 error performance parameters provide *quantitative* performance information of a specific loop. They are intended to be used for long-term evaluation of operating xDSL links.
The evaluation of the G.826 error performance parameters is based on CRC (Cyclic Redundancy Check) error detection:

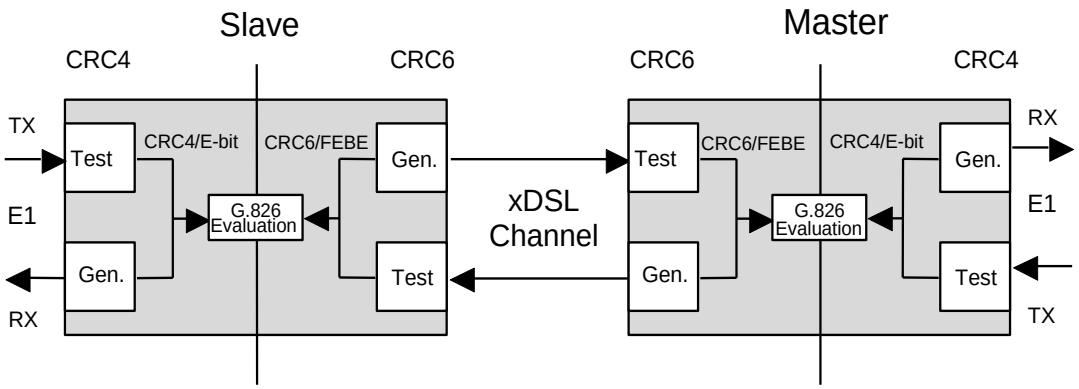

Figure 4-1: G.826 Performance Evaluation

CRC generation and detection on the LTU/NTU are handled separately for the E1 side and the xDSL side.
On the E1 side, four CRC4 check bits are generated per sub-multiframe (SMF) and compared with the corresponding CRC4 bits in the following SMF. If they do not match, the CRC4 error counter is incremented. The opposite station is informed of detected CRC4 errors by setting E-bits in the transmitted frames. At the same time, the E-Bits from the opposite station are counted and can be used for performance monitoring.
Similarly, on the xDSL side, six CRC6 check bits are generated per xDSL frame for each channel and direction. For signaling detected block-errors in the return direction, the FEBE-bits are used. The HDSL G.826 performance of the opposite unit is calculated according to these FEBE-bits.
CRC6 errors are used by software to count the block-errors of the respective xDSL channel and to evaluate its error performance according to ITU-T Rec. G.826.
For the E1 interface, calculations according to G.826 are only possible in the framed mode with CRC4 option enabled. In framed mode with CRC4 option disabled only FAS-errors are detected.
The estimation of a *bit-error rate* is not within the scope of the G.826 calculations.

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4.2 History

The LTU/NTU units calculate and save statistics of alarms and errors:

- Time and date of the first and the last alarm counter of alarms between them
- G.826 statisics of last 24 hours in 15 minutes steps
- G.826 statisics of last 7 days in 1 day steps

It's necessary to setup date and time after power up, because statistics and date/time parametrs are not saved in case of power failures or swtiching off/on the unit.

5 ALARMS

5.1 General

This chapter describes a possible implementation for the alarm signalization.

5.2 LEDs

The four LTU LEDs '1: local status channel 1', '2: remote status channel 1', '3: local status channel 2' and '4: remote status channel 2' and the two NTU LEDs 'far end (FE) status' and 'near end (NE) status' are used to display normal operation condition and alarm condition. Each LED can be green, amber or red when lit according to the following table.

5.2.1 Status LEDs LTU/NTU

Status	Local (NE) LED	Remote (FE) LED
LTU Power failure	off	off
Hardware - / Software failure	blinking red	off
Normal operation local	green	don't care
xDSL training	blinking amber	off
xDSL framer synchronizing	blinking green-amber	don't care
Normal operation remote	don't care	green
Minor alarm local	amber	don't care
Minor alarm remote	don't care	amber
Major alarm local	red	don't care
Major alarm remote	don't care	red

Status	Ext1 LED	Ext2 LED
Normal operation voice	off	off
Voice card error	red	red
Ring at least on 1 channel (@ no talks)	blinking green	blinking green
Talk at least on 1 channel	green	green
No signaling in input stream	amber	amber

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5.2.2 Local LED - Alarm Conditions

5.2.2.1 Local (NE) LED

An alarm condition is displayed with the Local LED if one of the following conditions occurs:

Major alarm (red):
- Hardware or software failure (blinking)
- loss of signal / frame alignment on the xDSL side
- xDSL block-error-rate according G.826 ≥ 30% (BER-H)
- E1 block-error-rate according G.826 ≥ 30% (BER-S)
- Shortcut signal from remote power block (SC)

Minor alarm (amber):
- loss of signal on the E1 side (LOS-S)
- loss of frame alignment on the E1 side (LFA-S)
- Segment defect alarm (SEGD)
- receiving AIS on E1 side (AIS-S)
- either Loop 1, Loop 2 is activated
- Analog Loopback is activated
- Spectrum Transmission activated
- Loss of Ethernet connection

Displaying a major alarm has a higher priority than displaying a minor one, i.e. an amber alarm will be “overwritten” by a red alarm.

5.2.2.2 Remote (FE) LED

The remote LED is an image of the local LED of the remote station (see previous LED-table for exceptions).

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5.3 Alarm Relays LTU

5.3.1 Implementation

The two alarm relays "Major" and "Minor", are located on the relay card and are "wired-OR" on the backplane to the "open-collector" alarm outputs of the LTUs. Under normal LTU power conditions the two output-stages of each LTU are controlled by its microcontroller. But even in case of a power failure on an LTU, both the "Major" and "Minor" alarms will be activated on the relay card. The backplane generates an auxiliary +5 V_{DC} that is used to "pull-up" the "open-collector" alarm outputs stages of the LTUs.

5.3.2 Relay - Alarm Conditions

Major alarm:
- At least one of the LTU - LEDs displays a red alarm
- Power failure of any one of the LTUs
- Power failure of the auxiliary +5 V_{DC} auxiliary supply on the backplane
- Power failure of both the -48 V_{DC} supplies

Minor alarm:
- At least one of the LTU - LEDs displays an amber alarm and none of the LTU - LEDs displays a red alarm
- Power failure of any one of the LTUs
- Power failure of the auxiliary +5 V_{DC} auxiliary supply on the backplane
- Power failure of one of the -48 V_{DC} supplies

5.4 Alarm Relays NTU

5.4.1 Implementation

The two alarm relays "Major" and "Minor" are located on the NTU board itself.

5.4.2 Relay - Alarm Conditions

Major alarm:
- At least one of the NTU LEDs displays a red alarm
- Power failure of the NTUs

Minor alarm:
- At least one of the NTU LEDs displays an amber alarm and none - a red alarm
- Power failure of the LTUs

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6 LTU POWER CONCEPT

Each LTU is fed via the backplane with (dual) -48 V_{DC} (referenced to 0 VDC of the exchange battery). The LTU converts these voltages to its onboard supply, the wetting current voltage and remote power voltage (see below).
The ground reference of all voltages on the secondary side of the LTU's DC/DC-converter are tied to FPE (Functional Protective Earth). This is done over the backplane as well as over the subrack with its LTU front-panels.
Additionally, the LTU is fed over the backplane's DC/DC-converter with an auxiliary +5 V_{DC} supply (referenced to ground). The only purpose of this voltage to drive the alarm-circuitry on each LTU, even in the case of a failure of the LTU's onboard DC/DC-converter.
In case of a failure of the LTU's onboard power supply, all LEDs on the front-panel will be extinguished.

6.1 Power modes

Each channel of dual LTU can be independently configured as wetting current source or wetting current receipt or remote power source.

6.1.1 Wetting current source

With *wetting current* option LTU sends to the loop low voltage signal to 'wet' the bad contact and this way cure it. Our long-term experience in Eastern European markets shows that *wetting current* options can dramatically increase number of pairs usable for DSL installations.
The wetting current is a small current of about 2 – 4 mA, which is sourced by the LTU and sinked by the NTU.

6.1.2 Wetting current receipt

In LTU-LTU application one of LTUs can be also configured as wetting current receipt.

6.1.3 2x100V power mode

Allows having one remotely powered NTU or Repeater at each xDSL line. The output remote power voltage is 115VDC.

6.1.4 1x200V power mode

Allows having one remotely powered Regenerator and NTU, or two remotely powered Regenerators at xDSL line A. The output remote power voltage is 200VDC.

Please note:
Using this feature is not allowed in many countries. Please check your local law regulations for this feature.

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6.1.5 Power jumpers

There are four jumpers J1111, J1112, J1113 and J1114 for remote power voltage selection and ten jumpers J1101 – J1110 (five for each xDSL) on the LTU to select between wetting current source/wetting current receipt and remote power mode.

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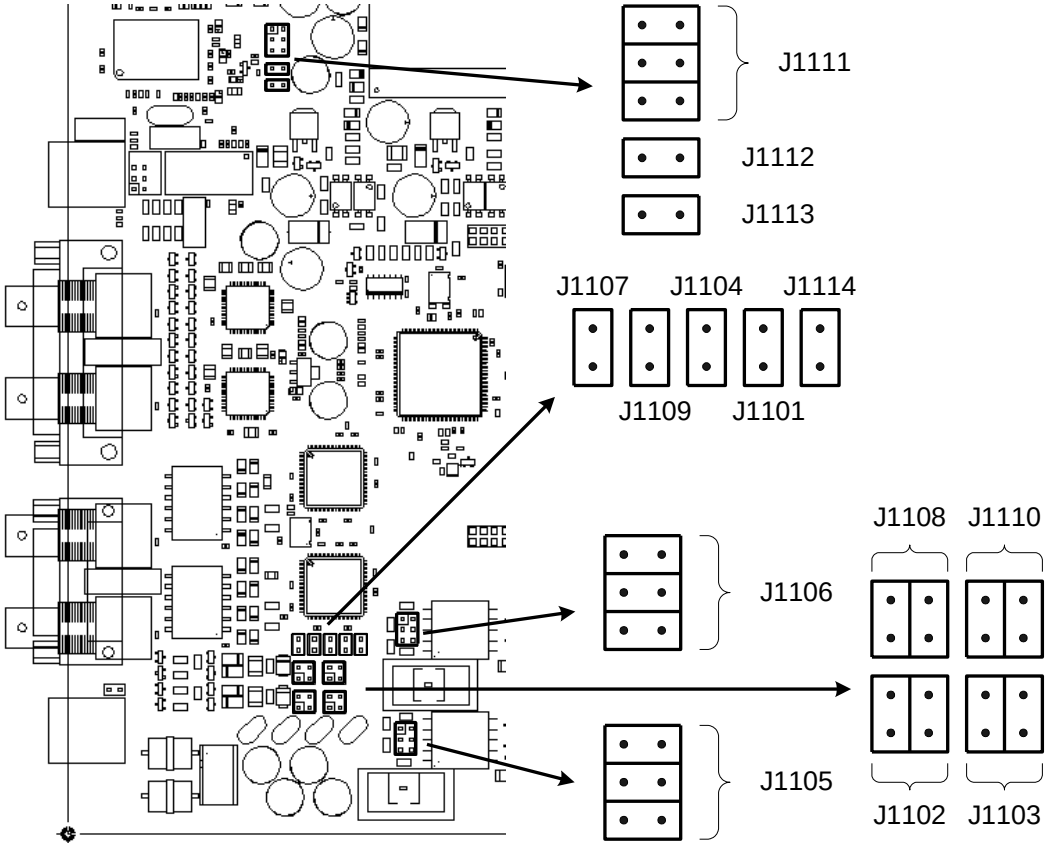

Figure 6-1: LTU current jumper locations

6.1.5.1 Remote power source settings:

Function	Jumper	State
110V	J1111	Close
	J1112	Open
	J1113	Open
	J1114	Open
200V	J1111	Open
	J1112	Close
	J1113	Close
	J1114	Close

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6.1.5.2 Remote power mode settings:

Power modes of channel A:

Function	Jumper	State
Remote power to channel A	J1101	Open
	J1102	Open
	J1105	Open
	J1107	Close
	J1108	Close
Wetting current source on channel A	J1101	Close
	J1102	Close
	J1105	Open
	J1107	Open
	J1108	Open
Wetting current receipt on channel A	J1101	Open
	J1102	Open
	J1105	Close
	J1107	Open
	J1108	Open

Power modes of channel B:

Function	Jumper	State
Remote power to channel B	J1103	Open
	J1104	Open
	J1106	Open
	J1109	Close
	J1110	Close
Wetting current source on channel B	J1103	Close
	J1104	Close
	J1106	Open
	J1109	Open
	J1110	Open
Wetting current receipt on channel B	J1103	Open
	J1104	Open
	J1106	Close
	J1109	Open
	J1110	Open

! Important: **Any jumpers configurations that are different then defined in the table above will damage the device. In such cases any warranty is refused.**

6.1.6 Remote power concept

Remote Feeding mode has the following characteristics:
Cross-wiring tolerant
Power feeding voltage within TNV-Limits (max. < 120 V_{DC})
current limiters microcontroller - controlled
Tolerant against microinterruptions
Automatic system restart after power failure
Protection according to ITU-T Rec. K.20

The remote power feeding is under firmware control and can therefore be controlled by the monitor.

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7 MONITOR

7.1 General

The module can be connected to a terminal or a PC (with terminal emulation) in order to monitor relevant events and to display additional information such as the signal quality of the xDSL link or the G.826 error performance parameters. In addition, full system configuration and fault localization can be done over the monitor interface
The terminal for monitoring should be VT100 compatible and configured as follows:

- 9600 baud, asynchronous
- 8 bits, no parity, one stop bit
- no new line on carriage return (i.e. no line feed on carriage return)

7.2 Monitor Interface

There is a point / multipoint TTL-bus on the subrack's backplane.
At any time only one of the LTUs in the subrack can be logically connected to the monitor interface. The appropriate LTU is selected according its physical position in the subrack, starting with the leftmost slot number 01 and ascending rightwards to number 14. To select the LTU in slot number *SN*, just type <%*SN*> at the terminal, even in the case it does not show any prompt. (e.g. to select the LTU in slot 01, type '%01'). To access the second channel on a dual LTU, add 20 (twenty) to the slot number or access it over the main menu screen of the first channel.
To see which units in a rack are available, you can use the <ECHO> command. Each present unit will respond with its associated slot number (%SN).
The response could be: %01 %03 %08 %10 %11 %12
Note: Each command must be terminated by a carriage return.
Please note that if the auxiliary +5 V_{DC} power supply on the backplane fails (indicated by an extinguished +5V LED on the backplane), the monitor function will cease to function but the transmission facilities of the LTUs are still fully guaranteed.
The NTU can be connected to terminal or PC directly.

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7.3 Structure & Organization

The structure and organization of the S-Access monitor is adapted to ITU-T Recommendation M.3400 for TMNs with its five sub-sets.

Sub-set	Short-form
Performance management	PM
Fault and maintenance management	FMM
Configuration management	CM
Accounting management	AM
Security management	SM

As S-Access does not support Accounting management, AM is not in the monitor's main menu.
At any time, the <H> ("Help") command shows and explains the available commands and their parameters.
The prompt on the screen consists of:

- a master/slave or repeater (CO - central office, CP - customer premise) indication
- the slot-number <SN> indication or the repeater address indication
- the shortform of the specified sub-set menu.

For example: "CO_04_FMM>".

Note: Repeater address is calculated as repeater position (starting from CO side) in the xDSL chain plus 2. Thus the repeater nearest to CO side has address 03, second one – 04, etc.

7.3.1 Command's history

The five last entered commands are saved in the input memory. Use "up arrow" and "down arrow" key to scroll the saved commands.

7.3.2 Shortened command

Shortened command usage will reduce time for device configuring. A list of this commands is shown in Appendix A Command set.

7.3.3 IAD / LTU command set tree for Normal and Dual modes

Main Menu			
Performance management (PM)	Fault and maintenance management (FMM)	Configuration management (CM)	Security management (SM)
H	H	H	H
G826	SQ	CONFIG	PSW [USER/ADMIN]
G826 C	STARTUP	HW	CONNECT [n]
G826 E1	STATUS	G704 [ON/OFF]	DISCONNECT
G826 E1 C	VSTATUS	CRC4 [ON/OFF]	M
RESETG826	ALARM	EBIT [ON/OFF]	
RESETHIST	ALARM T	AISGEN [ON/OFF]	
HIST [i] [t]	TLM	AISDET [ON/OFF]	
DATE [date]	RESETTLM	PCM [30/31]	
DATE	TLMCONF	IDLECAS [hex]	
TIME [time]	TLMSET [Rn-k] [abc]	IDLEPAT [hex]	
TIME	LOOP1 [E/N] [ON/OFF]	SIGSLOTS [AUTO/a,b,e]	
NETSTAT	LOOP2 [n] [ON/OFF]	SERVICE [l]	
RESETNETSTAT	STARTAL	TYPE [n]	
CONNECT [R/1..13]	RESTART	BITRATE [n]	
DISCONNECT	SPECTRUM	CLOCKMODE [EXT/INT]	
M	ACO [ON/OFF]	CLOCKDIR [CO/CONTRA]	
	RESET	AUTOLOOP [ON/OFF]	
	RING [n]	SLOTUSAGE [ON/OFF]	
	TONE [n]	MODE [N/D/M]	
	HOOK [ON/OFF] [n]	MASTER [ON/OFF]	
	CONNECT [R/1..13]	PLL [ON/OFF]	
	DISCONNECT	RS232SLOT [n]	
	M	RS232BITS [n]	
		RS232RATE [n]	
		RS232ERATE [n]	
		ETHPAYLOAD [n]	
		ETHSD [10/100/AUTO] [H/F]	
		VOICECH [n]	
		LOCKCH [n]	
		UNLOCKCH [n]	
		GAIN [TX/RX] [n] [m]	
		VLOAD [n]	
		VDEFAULT [n]	
		AUTORST [ON/OFF]	
		BASERATE [n]	
		ADAPT [ON/OFF]	
		SETADDR [n]	
		SCALE [n]	
		DEFAULT [0..5]	
		ANNEX [A/B/AB]	
		ID [Text]	
		ID	
		CONNECT [R/1..13]	
		DISCONNECT	

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M

Figure 7-1: LTU/NTU Monitor Command Set Tree (Normal/Dual Pair Modes)

7.3.4 LTU command set tree for Multipoint mode

Main Menu			
Performance management (PM)	Fault and maintenance management (FMM)	Configuration management (CM)	Security management (SM)
H	H	H	H
G826	SQ	CONFIG	PSW [USER/ADMIN]
G826 C	STARTUP	HW	CONNECT [A/B] [n]
G826 E1	STATUS	CRC4 [ON/OFF]	DISCONNECT
G826 E1 C	ALARM	EBIT [ON/OFF]	M
RESETG826	ALARM T	AISGEN [ON/OFF]	
RESETHIST	TLM [A/B]	AISDET [ON/OFF]	
HIST [i] [t]	RESETTLM [A/B]	PCM [30/31]	
DATE [date]	TLMCONF [A/B]	PAYLOAD [a] [b]	
DATE	TLMSET [A/B] [Rn-Rk] [abc]	IDLECAS [hex]	
TIME [time]	LOOP1 [E/N] [ON/OFF]	IDLEPAT [hex]	
TIME	LOOP2 [A/B] [n] [ON/OFF]	SIGSLOTS [AUTO/a,b,e]	
CONNECT [R/1..13]	STARTAL [A/B]	MODE [N/D/M]	
DISCONNECT	RESTART [A/B]	MASTER [ON/OFF]	
M	SPECTRUM [A/B]	PLL [ON/OFF]	
	ACO [ON/OFF]	POWER [A/B] [ON/OFF]	
	RESET	AUTORST [A/B] [ON/OFF]	
	CONNECT [A/B] [n]	BASERATE [A/B] [n]	
	DISCONNECT	ADAPT [A/B] [ON/OFF]	
	M	SETADDR [n]	
		SCALE [A/B] [n]	
		DEFAULT [n]	
		ANNEX [A/B] [A/B/AB]	
		ID [Text]	
		ID	
		CONNECT [A/B] [n]	
		DISCONNECT	
		M	

Figure 7-2: LTU Monitor Command Set Tree (Multipoint Mode)

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7.3.5 Main Menu

```
MODEL         SA-RC-TELCOLINK-2E1/ETH/N64/FXX,V42
HW            E0
SW            3.0.V5.L.4 / R308_2
SW-DATE       Mar 30 2007
ID
RUNS          0000d 00:00:10
ALARM         URGENT
STATUS        LINK DOWN
MODEL-DESC.   S-Access Subrack Dual E1/Nx64/Ethernet/FXO 120 Ohm

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------------- Main Menu -----------------
1. Performance management (PM)
2. Fault and maintenance management (FMM)
3. Configuration management (CM)
4. Security management (SM)
5. Select next channel
6. Exit
-----------------------------------------

CO_01_1_MM>Select [1..6]:
```

To select the sub-menus type 1 to 6.

Note: Each command must be terminated by a carriage return.

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7.3.6 Common Commands

Common commands are available in every sub menu.

7.3.6.1 HELP Command

By typing the letter "H" followed by [ENTER], all available commands of the actual sub menu are displayed.

7.3.6.2 MAIN Command

By typing the letter "M" followed by [ENTER], you return to the Main Menu Screen.

7.3.6.3 CONNECT Command

The CONNECT command opens a virtual terminal connection to the remote unit, i.e. characters received at the local unit's V.24 interface are sent to the remote unit, and characters (screen messages) sent from the remote unit are transmitted back to the local unit's V.24 interface.
During a virtual terminal session, the local unit is not available any more, unless you close your virtual terminal connection by typing the DISCONNECT command or by selecting "Exit" on the Main Menu Screen (of the remote unit).
Some commands will be unavailable from a virtual terminal connection for safety reasons.
Add the parameter “R” to connect to the remote unit (i.e. LTU or NTU) or type the repeater number (1 to 13) instead of “R” to connect to the selected repeater (this is only possible from master side).

7.3.6.4 DISCONNECT Command

The DISCONNECT command closes the virtual terminal connection to the remote unit.

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7.3.7 Performance management PM

```
Performance management activated
Enter <M> to return to MAIN, or <H> for HELP information
```

Type <***H***> and the monitor lists all available commands in the performance sub-menu.

7.3.7.1 G826 Command

The G826 command displays the ITU-T G.826 error performance on xDSL line side:

```
CO_01_PM>G826
------------------------------------------------------------------------
G.826 Error Performance  :    CRC6
------------------------------------------------------------------------
Errored blocks           :  00000000
Errored seconds          :  00000000
Severely errored seconds :  00000000
Background block errors  :  00000000
Available time           :  00000123
Unavailable time         :  00000012
------------------------------------------------------------------------
CO_01_PM>
```

Option:

C Updates the G.826 parameters continuously

Definitions:

1. CRC6: Cyclic redundancy check indicating errored blocks received on the local xDSL side.
2. Errored block (EB): A block in witch one or more bits are in error.
3. Errored seconds (ES): A one second period with one or more errored blocks. SES defined below is a subset of ES.
4. Severely errored second (SES): A one second period which contains >=30% errored blocks.
5. Background block error (BBE): An errored block not occurring as part of an SES.

Note: Units in Dual Pair modes represent data for both xDSL interfaces.

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7.3.7.2 G826 E1 Command

The G826 E1 command displays the ITU-T G.826 error performance parameters on the E1 2Mbit/s side. This command is only available if framed mode is enabled.
If CRC4 mode is on, the following parameters are displayed:

```
CO_01_PM> G826 E1
-------------------------------------------------------------------------
G.826 Error Performance  :    CRC4      E-Bit
-------------------------------------------------------------------------
Errored Blocks           :  00000000  00000000
Errored seconds          :  00000000  00000000
Severely errored seconds :  00000000  00000000
Background block errors  :  00000000  00000000
Available time           :  00524129  00524129
Unavailable time         :  00000024  00000024
-------------------------------------------------------------------------
CO_01_PM>
```

If CRC4 detection mode is off, the following parameters are displayed:

```
CO_01_PM> G826 E1
-------------------------------------------------------------------------
G.826 Error Performance  :    FAS
-------------------------------------------------------------------------
Errored blocks           :  00000000
Errored seconds          :  00000000
Severely errored seconds :  00000000
Background block errors  :  00000000
Available time           :  00009841
Unavailable time         :  00000024
-------------------------------------------------------------------------
CO_01_PM>
```

Option:

C Updates the G.826 E1 parameters continuously

Definitions:

1. CRC4: Cyclic redundancy check indicating errored sub-multiframes received on the local 2Mbit/s E1 side.
2. E-bit: CRC-4 indication bit indicating received errored sub-multiframes on the 2Mbit/s E1 remote side.
3. FAS: Errored Frame Alignment Signal received on the 2Mbit/s E1 side. The criteria for severely errored seconds (SES) is 28 FAS-Errors per second. (In accordance to G.821)

7.3.7.3 RESETG826 Command

The RESETG826 command sets the G.826 error performance parameters back to zero.

```
CO_01_PM> RESETG826
G.826 error performance parameter reset
CO_01_PM>
```

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7.3.7.4 HIST Command

The HIST command displays history statistics.
i – interface
- D - xDSL
- E - E1
- N - Nx64

t – type of statistics
- A - alarms
- 24 - last 24 hours G.826 statistics with 1 hour steps
- 7 - last 7 days G.826 statistics with 1 day steps

7.3.7.5 RESETHIST Command

The RESETHIST command clears all history statistics.

7.3.7.6 NETSTAT Command

The NETSTAT command displays the Ethernet statistics.

Definitions:

Bytes transmitted:	Bytes transmitted to Ethernet network
Packets transmitted:	Packets transmitted to Ethernet network
Bytes received:	Bytes received from Ethernet network
Packets received:	Packets received from Ethernet network
Errors	Number of transmission errors
Collisions	Number of Ethernet collisions
Available time	Ethernet connection time
Unavailable time	None Ethernet connection time

7.3.7.7 RESETNETSTAT Command

The RESETNETSTAT command clears network statistics.

7.3.7.8 TIME Command

The TIME command displays or setup current time.
Time format: HH:MM:SS

7.3.7.9 DATE Command

The DATE command displays or setup current date.
Date format: DD/MM/YYYY

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7.3.8 Fault and maintenance management FMM

```
Fault and maintenance management activated
Enter <M> to return to MAIN, or <H> for HELP information
```

Type <H>and the monitor lists all available commands in the fault and maintenance sub-menu.

7.3.8.1 SQ Command

The SQ command allows the user to toggle the signal quality trace on and off:

```
CO_01_FMM> SQ
signal quality trace on
xDSL SNR: local 38.8 dB, remote 39.0 dB
xDSL SNR: local 41.3 dB, remote 38.8 dB
xDSL SNR: local 38.6 dB, remote 39.0 dB

CO_01_FMM> SQ
signal quality trace off
CO_01_FMM>
```

Note: Units in Dual Pair modes represent data for both xDSL interfaces.

7.3.8.2 STARTUP Command

The STARTUP command allows the user to toggle the startup trace on and off, in order to observe the LTU / NTU activation state diagram transitions conforming to ITU-T G.991.2.

```
CO_01_FMM> STARTUP
xDSL transceiver startup trace on
CO_01_FMM>
CO_01_FMM> STARTUP
xDSL transceiver startup trace off
CO_01_FMM>
```

Note: Units in Dual Pair modes represent data for both xDSL interfaces.

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7.3.8.3 STATUS Command

The STATUS command displays the actual system status:

```
CO_01_FMM> STATUS
------------------------------------------------------------------------
Local System Status
------------------------------------------------------------------------
LOSD       :     1
SEGA       :     1
PS         :     1
SEGD       :     1
Tx power   :  07.5 dBm
Rx gain    :  09.7 dB
Loop attn.:  00.0 dB
SNR        :  38.6 dB
Bitrate    :  2056 kbit/s
SRU #      :     0
Annex      :     A
Ethernet   :   100 Mbit/s, full duplex
Power      :    off
Address    :    05 (RACKADDR)
------------------------------------------------------------------------
CO_01_FMM>
```

Definitions:

LOSD:	(Loss of Signal) Indicates the loss of signal from the application interface. Loss of Signal = 0, Normal = 1.
SEGA:	(Segment Anomaly) Indicates a CRC error on the incoming xDSL frame. A segment anomaly indicates that a regenerator operating on a segment has received corrupted data and therefore the regenerated data is unreliable. CRC Error =0, Normal = 1.
PS:	(Power Status)
SEGD:	(Segment Defect)
Tx power:	Local transmit power in dBm
Rx gain:	Local receiver gain in dB
Loop attn.:	Estimate of the loop attenuation in dB of the actual connection
SNR:	Signal to noise ratio in dB
Bitrate:	Bitrate of the actual connection
SRU #:	Number of detected repeater in loop
ANNEX:	Indicates actual selected Annex
Power:	Remote power status
Ethernet	Ethernet link status
Address:	Unit address (RACKADDR- address in rack, SETADDR – address defined by SETTADDR command)

Note: Units in Dual Pair modes represent data for both xDSL interfaces.

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7.3.8.4 VSTATUS Command

The VSTATUS command displays current parameters of voice cards.

```
CO_11_1_FMM>VSTATUS
Voice status
------------------------------------------------------------------------
Vch   TXGain   RXGain   Status     Loop_Current,mA   Loop_Voltage,V   Lockch
------------------------------------------------------------------------
#1    -2 db    +2 db    IDLE       00.0              00.0             Unlock
#2    -2 db    +2 db    IDLE       00.0              00.0             Unlock
#3    -2 db    +2 db    IDLE       00.0              00.0             Unlock
#4    -2 db    +2 db    IDLE       00.0              00.0             Unlock
CO_11_1_FMM>
```

Definitions:

Vch:	Channel number
TXGain:	Transmit gain
RXGain:	Receive gain
Status:	Channel status
Loop_Current:	Loop Current
Loop_Voltage:	Loop Voltage
Lockch:	Lock – channel locked Unlock – channel unlocked

7.3.8.5 ALARM Command

The ALARM command displays the actual alarm status:

```
CO_01_1_FMM>ALARM
------------------------------------------------------------------------
Local Alarm Status
------------------------------------------------------------------------
LOS-S      : on
LFA-S      : on
AIS-S      : off
AIS-R      : off
BER-S      : off
EXT-LOC    : ---
DTR-OFF    : ---
LOS/LFA-H  : off
SEGD       : off
BER-H      : off
LOOP1_E1   : off
LOOP1_NX64 : off
LOOP2      : ---
ALB        : off
TEST       : off
LOS-E      : off
SC         : off
------------------------------------------------------------------------
```

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```
CO_01_1_FMM>
```

Options:

T Turns alarm trace on / off

Definitions:

LOS-S:	Loss of signal at subscriber (E1) side
LFA-S:	Loss of frame alignment at subscriber (E1) side
AIS-S:	AIS (Alarm Indication Signal) detected at subscriber (E1) side
AIS-R:	AIS (Alarm Indication Signal) detected at subscriber (E1) side of remote unit
BER-S:	Excessive Block Error Rate on subscriber side If CRC4 enabled : BER-S = on if more than 805 CRC4 Errors per second. If CRC4 disabled : BER-S = on if more than 28 FAS Errors per second.
DTR-OFF:	V.35/V.36: DTR input is off X.21: RTS input is off
LOS/LFA-H:	Loss of signal or frame alignment at xDSL loop
SEGD:	Segment Defect indication
BER-H:	xDSL block-error-rate according G.826 ≥ 30%
LOOP1_E1:	xDSL test loop 1 on E1 active (see section)
LOOP1_NX64:	xDSL test loop 1 on Nx64 active (see section)
LOOP2:	xDSL test loop 2 active
ALB:	Analog loopback
TEST:	At least one test function is active
LOS-E	Ethernet connection loss
SC	Remote power shortcut or overload

Note: Units in Dual Pair modes represent data for both xDSL interfaces.

7.3.8.6 TLM

This command displays external alarm table.

7.3.8.7 RESETTLM

This command clears external alarm table.

7.3.8.8 TLMCONF

This command displays external alarm setup table.

7.3.8.9 TLMSET

This command sets up the external alarms.

Rnn - number repeater.

Rn-k - numbers repeater.

ABC - reaction alarms.
- A - ALM1
- B – ALM2
- C – ALM3

A,B,C = 0..3
- 0 - no reaction
- 1 - response
- 2 - response & MIN relay
- 3 - response & MAJ relay

Example:

```
CO_01_1_FMM>TLMSET R01 321
Reactions table for distance ext. alarms
---------------------------
REPTR | ALM1 | ALM2 | ALM3 |
---------------------------
REPT 1| MAJ  | MIN  | RES  |
REPT 2|  -   |  -   |  -   |
REPT 3|  -   |  -   |  -   |
REPT 4|  -   |  -   |  -   |
REPT 5|  -   |  -   |  -   |
REPT 6|  -   |  -   |  -   |
REPT 7|  -   |  -   |  -   |
REPT 8|  -   |  -   |  -   |
REPT 9|  -   |  -   |  -   |
REPT10|  -   |  -   |  -   |
REPT11|  -   |  -   |  -   |
REPT12|  -   |  -   |  -   |
REPT13|  -   |  -   |  -   |
REPT14|  -   |  -   |  -   |
---------------------------
CO_01_1_FMM>
```

7.3.8.10 LOOP1 Command

The LOOP1 command starts the local loopback (see section Standard Test Loops):
E – set LOOP1 state on E1 interface (if available)
N – set LOOP1 state on Nx64 interface (if available)

```
CO_01_FMM> LOOP1 N ON
Loop 1 on Nx64 interface on
CO_01_FMM>

CO_01_FMM> LOOP1 E OFF
Loop 1 on E1 interface off
CO_01_FMM>
```

7.3.8.10.1 LOOP2 Command

The LOOP2 command starts the remote loopback (see section 3.7.1: Standard Test Loops):

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```
CO_01_FMM> LOOP2 R ON
remote loop activation initiated
CO_01_FMM>

CO_01_FMM> LOOP2 R OFF
remote loop deactivation initiated
```

Note: The remote loopback is only possible from the master side.

7.3.8.11 STARTAL Command

```
This command toggles the analog loopback on and off.

CO_01_1_FMM>STARTAL
Analog loopback started
CO_01_1_FMM>STARTAL
Analog loopback stopped
CO_01_1_FMM>
```

Notes:

- Detach the xDSL line before starting the analog loopback. If the analog loopback is started while a remote station is attached to the xDSL line, the remote station signal will interfere with the loopback signal, causing bit errors on the network interface.

7.3.8.12 SPECTRUM Command

The SPECTRUM command initializes the xDSL analog output for power measurements.

```
CO_01_FMM>SPECTRUM
analog spectrum started
analog spectrum active
CO_01_FMM>
CO_01_FMM>SPECTRUM
analog spectrum stopped
CO_01_FMM>
```

7.3.8.13 RESTART Command

By typing RESTART, the actual channel will be restarted.

```
CO_01_FMM> RESTART
restarting channel
CO_01_FMM>
```

7.3.8.14 RESET Command

By typing RESET, the system unit will be restarted.

```
CO_01_FMM> RESET
system reset
```

7.3.8.15 RING Command

This command start/stop ringing for selected voice channel.

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```
CO_01_FMM> RING 1
system reset
```

7.3.8.16 TONE Command

This command start/stop 1000Hz tone toward phone-set on selected voice channel.

```
CO_01_FMM> TONE 1
Tone on channel 1 activated, type <TONE 1> for deactivation
CO_01_FMM>
```

7.3.8.17 HOOK Command

This command initiate Hook On/Off transition for selected voice channel..

```
CO_01_FMM> HOOK ON 1
Hook on channel 1 activated, type <HOOK 1> for deactivation
CO_01_1_FMM>
```

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7.3.9 Configuration management CM

```
Configuration management activated
Enter <M> to return to MAIN, or <H> for HELP information
```

Type <***H***> and the monitor lists all available commands in the configuration sub-menu.

7.3.9.1 CONFIG Command

The CONFIG command displays the configuration of the unit.
Note: After each configuration change, the new configuration is automatically displayed.

7.3.9.2 HW Command

The HW command displays the actual hardware configuration of the unit.

7.3.9.3 G704 Command

Set framed mode / transparent mode.

7.3.9.4 CRC4 Command

Set CRC4 option on / off

7.3.9.5 EBIT Command

Set automatic E-Bit insertion on / off

7.3.9.6 AISGEN Command

Set AIS generation on / off

7.3.9.7 AISDET Command

Set AIS detection on / off

7.3.9.8 EXTCLK Command

Set external clock mode on / off

7.3.9.9 PCM Command

This command enables/disables signaling timeslot processing:
[30]: Set signaling timeslot processing on.
[31]: Set signaling timeslot processing off

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7.3.9.10 IDLECAS Command

This command sets the idle pattern (1..F) for signaling timeslot

7.3.9.11 IDLEPAT Command

This command sets the idle pattern (00..FF) for unused timeslots in E1 interface

7.3.9.12 SIGSLOTS Command

This command sets the signaling slot number for each interface.

Option:

AUTO Automatic allocation of signaling slot

7.3.9.13 SERVICE Command

Select one of four available services:
[E] : E1 only
[N] : Nx64 only
[ETH] : Ethernet only
[V] : Voice only
[M] : Multiservice Nx64 & fE1 (for compatibility with old versions)

Or define Multiservice by typing a string sequence of available services with parameters of SERVICE commands: SERVICE [I]

Where [I] is sequence of [E], [N], [ETH] and [V]

Example:
SERVICE E, ETH selects Multiservice with E1&Ethernet
SERVICE N,E,V selects Multiservice with Nx64&E1&Voice cards

7.3.9.14 TYPE Command

This command sets the Nx64 interface type.
0: V.35
1: V.36/X.21 without termination
2: V.36/X.21 with termination
3: V.28
4: RS232

7.3.9.15 BITRATE Command

Set Nx64 payload bitrate to [1..36] x 64 kBit/s
(for V.28 payload bitrate it's [1..3], for RS232 payload see RS232RATE and RS232SLOT commands)

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7.3.9.16 CLOCKMODE Command

Nx64 only: Set Nx64 unit clock mode to 'external', i.e. the internal PLL of the modem (DCE) is enabled, or 'internal', i.e. the modem (DCE) is clock master and the PLL is disabled. 'internal' clock mode is not applicable when the unit is configured as xDSL slave.

E1 only or multiservice: The Nx64 clock is derived from the E1 port.

7.3.9.17 CLOCKDIR Command

Set Nx64 port clock direction to codirectional or contradirectional. Codirectional uses input line 113 for TXD sampling, contradirectional uses output line 114 for TXD sampling

7.3.9.18 AUTOLOOP Command

This command enables/disables the usage of lines 140/141 for
automatic V.54 loop control.

7.3.9.19 SLOTUSAGE Command

Set usage of timeslot 0 for Nx64 only mode on / off.

7.3.9.20 MODE Command

This command sets the operation mode.
N: Normal mode
D: Dual pair mode
M: Multipoint mode

7.3.9.21 MASTER Command

Set xDSL master/slave mode. One unit must be configured as master, the other as slave.

7.3.9.22 PLL Command

This command enables/disables the PLL on channel A of xDSL port.

7.3.9.23 POWER Command

Set remote power on/off

7.3.9.24 RS232SLOT Command

This command sets the timeslot number for RS232. Two timeslots will be used on baudrate 115200, defined by RS232SLOT command and next one.

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7.3.9.25 RS232BITS Command

This command sets the size of RS232 frame. Parity bit and second stop bit are includes in RS232 frame like data bits.

7.3.9.26 RS232RATE Command

This command sets RS232 baud rate. Available rates: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200.

7.3.9.27 RS232ERATE Command

This command sets the excess rate of transmitter over receiver.
1 - 0 percent
2 - 0.5 percent
3 - 1 percent
4 - 2 percent

7.3.9.28 AUTORST Command

Set autorestart on / off

7.3.9.29 BASERATE Command

This command sets the base rate for xDSL interface. This value must be between 3 and 36 and defines the available 64 kbit/s channels. To optimize the bandwidth of your connection, you have to set the base rate value to the maximum where you get a stable connection.

7.3.9.30 ADAPT Command

Set rate adaption on / off

7.3.9.31 SETADDR Command

This command sets the virtual address of the modem.

Adress command line	Adress decimal	Remarks
00	0	virtual address disabled sub-rack unit uses its slot number Stand Alone unit does not use addressing
01 – 99	1 – 99	-
A0-A9	100-109	-
B0-B9	110-119	-
C0-C7	120-128	-

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7.3.9.32 SCALE Command

This command sets the output TX power offset from ITU-T value (13.5dBm) in dB. The Parameter must be in the range [-16.0..2.0] with 0.5 dB increment steps. For standard operation SCALE value must be set to 0.0 dB.

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7.3.9.33 ANNEX Command

This command sets the ITU-T G.991.2 Annex type.
Parameter:
A ITU-T G.991.2 Annex A
B ITU-T G.991.2 Annex B
AB Autodetection of Annex type

7.3.9.34 DEFAULT Command

The DEFAULT command sets a default configuration. Six default settings are available (three for master, three for slave) in all modes except Multipoint. In Multipoint there are two default settings.

E1 Only (SERVICE E, MODE N/D)							
Interface	Parameter	DEFAULT 0	DEFAULT 1	DEFAULT 2	DEFAULT 3	DEFAULT 4	DEFAULT 5
E1	Framing	Transp.	G.704	G.704	Transp.	G.704	G.704
	CRC4	-	Off	On	-	Off	On
	E-bit Insertion	-	-	On	-	-	On
	AIS Detection	On	On	On	On	On	On
	AIS Generation	On	On	On	On	On	On
	PCM Mode	-	PCM31	PCM31	-	PCM31	PCM31
xDSL	Master/ Slave	Master	Master	Master	Slave	Slave	Slave
	Base Rate	32	32	32	adaptive	adaptive	adaptive
Nx64 Only (SERVICE N, MODE N/D)							
Interface	Parameter	DEFAULT 0	DEFAULT 1	DEFAULT 2	DEFAULT 3	DEFAULT 4	DEFAULT 5
Nx64	Interface Type	V.35	V.35	V.35	V.35	V.35	V.35
	Bitrate(kbit/s)	512	1024	2048	512	1024	2048
	Use Timeslot	no	no	yes	no	no	yes
	Clock Mode	internal	internal	internal	remote	remote	remote
	Clock Direction	contradir	contradir	contradir	contradir	contradir	contradir
	V.54 Loops	disabled	disabled	disabled	disabled	disabled	disabled
xDSL	Master/ Slave	Master	Master	Master	Slave	Slave	Slave
	Base Rate	9	17	32	adaptive	adaptive	adaptive
Ethernet Only (SERVICE Eth, MODE N/D)							
Interface	Parameter	DEFAULT 0	DEFAULT 1	DEFAULT 2	DEFAULT 3	DEFAULT 4	DEFAULT 5
Ethernet	ETHSD	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO
	ETHPAYLOAD	8	16	32	8	16	32
xDSL	Master/ Slave	Master	Master	Master	Slave	Slave	Slave

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	Base Rate	9	17	32	adaptive	adaptive	adaptive
Voice Only (SERVICE V, MODE N/D)							
Interface	Parameter	DEFAULT 0	DEFAULT 1	DEFAULT 2	DEFAULT 3	DEFAULT 4	DEFAULT 5
Voice	Voice Channel	4	4	4	4	4	4
xDSL	Master/ Slave	Master	Master	Master	Slave	Slave	Slave
	Base Rate	32	32	32	adaptive	adaptive	adaptive

Nx64&fE1 (SERVICE M, MODE N/D)							
Interface	Parameter	DEFAULT 0	DEFAULT 1	DEFAULT 2	DEFAULT 3	DEFAULT 4	DEFAULT 5
E1	Framing	G.704	G.704	G.704	G.704	G.704	G.704
	CRC4	On	On	On	On	On	On
	E-bit Insertion	On	On	On	On	On	On
	AIS Detection	On	On	On	On	On	On
	AIS Generation	On	On	On	On	On	On
	PCM Mode	PCM31	PCM31	PCM31	PCM31	PCM31	PCM31
Nx64	Interface Type	V.35	V.35	V.35	V.35	V.35	V.35
	Bitrate(kbit/s)	256	512	1024	256	512	1024
	Clock Mode	from E1	From E1	from E1	remote	remote	remote
	Clock Direction	contradir	contradir	contradir	contradir	contradir	contradir
	V.54 Loops	disabled	disabled	disabled	disabled	disabled	disabled
xDSL	Master/ Slave	Master	Master	Master	Slave	Slave	Slave
	Base Rate	32	32	32	adaptive	adaptive	adaptive

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Multiservice (SERVICE I, MODE N/D)							
Interface	Parameter	DEFAULT 0	DEFAULT 1	DEFAULT 2	DEFAULT 3	DEFAULT 4	DEFAULT 5
E1	Framing	G.704	G.704	G.704	G.704	G.704	G.704
	CRC4	On	On	On	On	On	On
	E-bit Insertion	On	On	On	On	On	On
	AIS Detection	On	On	On	On	On	On
	AIS Generation	On	On	On	On	On	On
	PCM Mode	PCM31	PCM31	PCM31	PCM31	PCM31	PCM31
Nx64	Interface Type	V.35	V.35	V.35	V.35	V.35	V.35
	Bitrate(kbit/s)	256 kbit/s	512 kbit/s	1024 kbit/s	256 kbit/s	512 kbit/s	1024 kbit/s
	Clock Mode	from E1	From E1	from E1	remote	remote	remote
	Clock Direction	contradir	contradir	contradir	contradir	contradir	contradir
	V.54 Loops	disabled	disabled	disabled	disabled	disabled	disabled
Ethernet	ETHSD	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO
	ETHPAYLOAD	12	10	6	12	10	6
Voice	Voice Channel(s)	4	4	4	4	4	4
xDSL	Master/ Slave	Master	Master	Master	Slave	Slave	Slave
	Base Rate	32	32	32	adaptive	adaptive	adaptive

Multipoint (Mode M)			
Interface	Parameter	DEFAULT 0	DEFAULT 1
E1	Framing	G.704	G.704
	CRC4 Detection	On	On
	E-bit Insertion	On	On
	AIS Detection	On	On
	AIS Generation	On	On
	PCM Mode	PCM31	PCM30
	Idle Pattern	-	D
	Payload	16 15	15 15
xDSL	Base Rate	17 16	17 17

7.3.9.35 ID Command

This command sets a unique identification string printed on the main screen. Maximum string length is 20 symbols.

7.3.9.36 ETHPAYLOAD Command

This command sets the number of xDSL timeslots [1…36] for transmitting Ethernet.

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7.3.9.37 ETHSD Command

The ETHSD command sets the Ethernet link parameters: link speed (10/100 mbit/s) and half/full duplex (H/F).

Example:
ETHSD 10, F sets 10 mbit/s and full duplex
ETHSD 100, H sets 100 mbit/s and half duplex

Option:
AUTO – automatic setup Ethernet link parameters

7.3.9.38 VOICECH Command

This command sets the number of voice channels. The channel number is limited from 1 to 8.

7.3.9.39 VLOAD Command

This command reloads the software to the selected voice card. The voice card number is limited from 1 to 2.
Parameter:
1 = voice card 1 (channel 1 – 4)
2 = voice card 2 (channel 5 – 8)

7.3.9.40 LOCKCH Command

This command locks (disables) the selected voice channel. The channel number is limited from 1 to 8.

7.3.9.41 UNLOCKCH Command

This command unlocks (enables) the selected voice channel. The channel number is limited from 1 to 8.

7.3.9.42 VDEFAULT Command

This command sets the default gain settings for selected voice channel. The channel number is limited from 1 to 8.

7.3.9.43 GAIN Command

The GAIN command sets input/output gain for appropriate voice channel interface.
Parameters:

- TX/RX - change gain toward CO/Subscriber
- C - channel number value must be in the range [1..8]
- G - gain value in dB, must be in the range [-6..+6] with 1 dB increment.

Example:

```
CO_01_FMM> GAIN TX 2 0
```

7.3.10 Security management SM

7.3.10.1 PSW Command

The PSW command sets USER/ADMINISTRATOR password.
PSW ADMIN sets ADMINISTRATOR password.
PSW USER sets USER password.
See chapter Command set for commands, that not accessible for USER.

```
CO_SM>PSW ADMIN
Enter password: ******
Confirm new password: ******
New password was fixed
CO_SM>PSW USER
Enter password: ******
Confirm new password: ******
New password was fixed
```

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8 SOFTWARE UPDATE

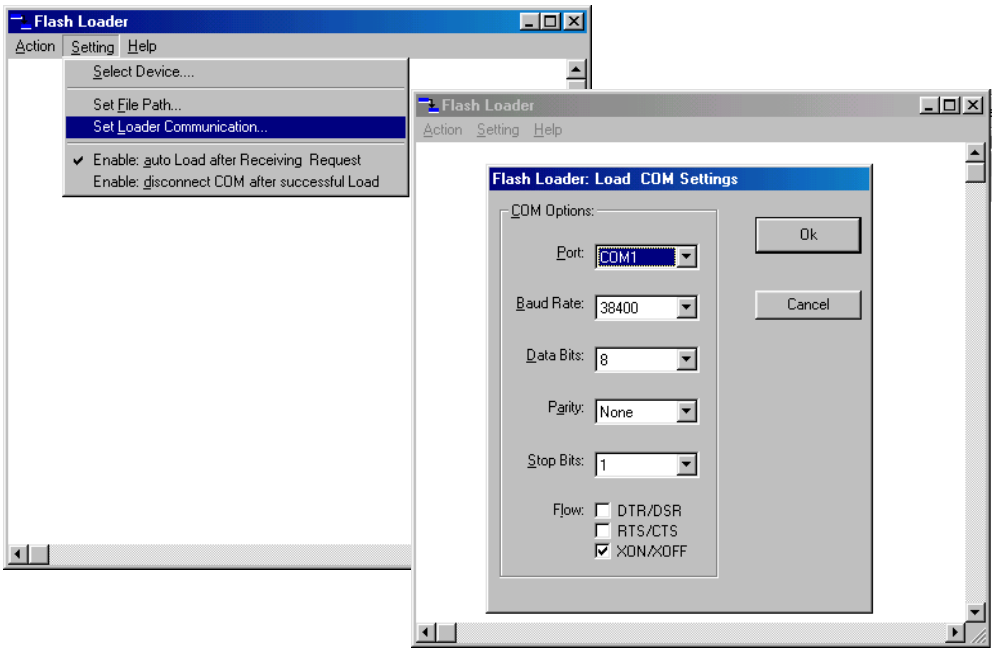
8.1 General

The software of the S-Access boards has the possibility for field updates. To do a field update, you need only a Windows 95/98/NT/ME/XP computer, the *Flash Loader* program installed, a connection between the Windows computer and the LTU Monitor connector (ACU/TCU/LIT..) and the newest release of the S-Access software.

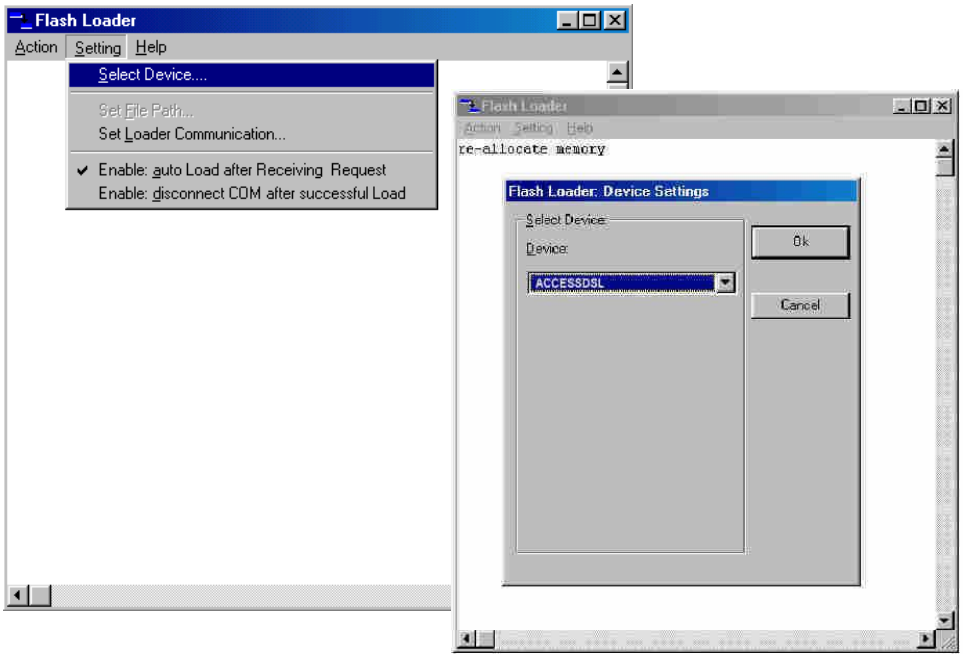
8.2 Software download

To update the software on your LTU you have to run through the following steps:

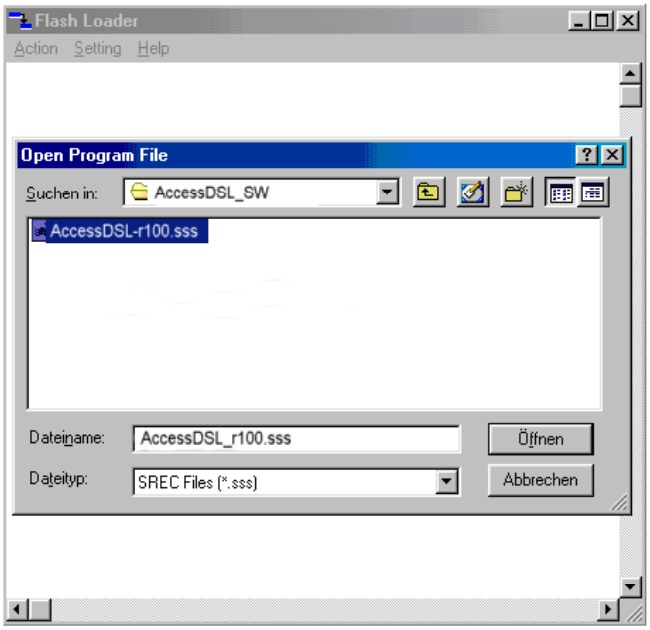
1. Power the LTU (over ACU, TCU, LIT….).
2. Plug off the LTU (power off).
3. Connect the LTU monitor connector with your Windows computer's RS232 interface.
4. Start the *Flash Loader* software on your Windows computer
5. Choose *Set Loader Communication* in the menu *Setting*. Select the right communication port, the communication information and press *Ok*.



6. Choose *Select Device* in the *Setting* menu, select the device *S-Access* and press *Ok*.



7. Choose the newest software version and press *Öffnen*.



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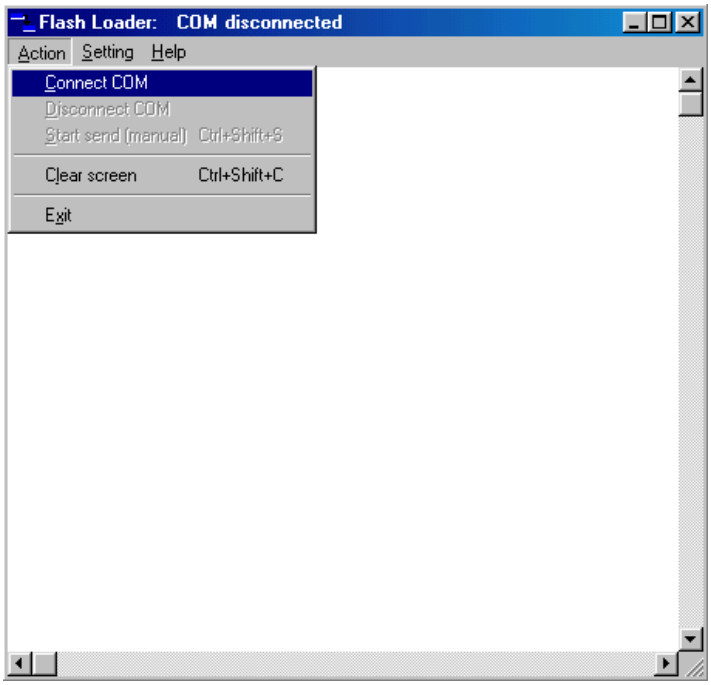
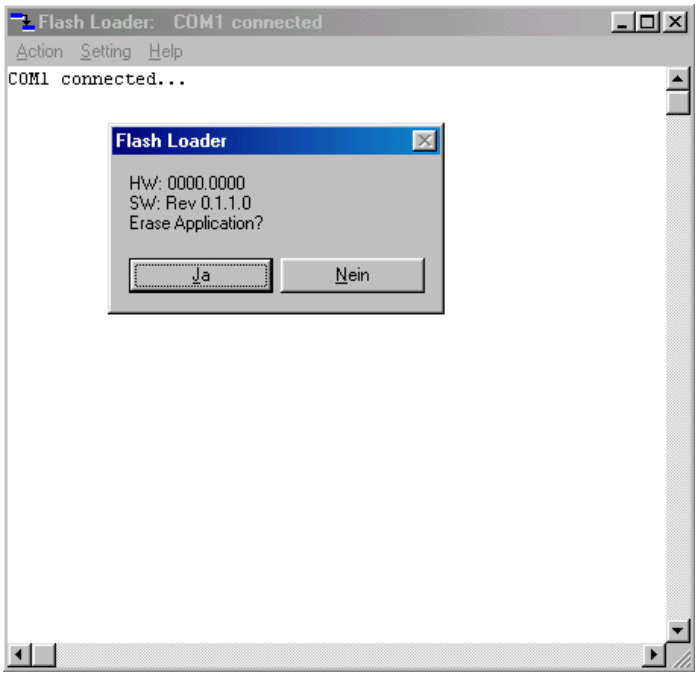
8. Execute the command *Connect COM* in the menu *Action*.



9. Plug in the LTU unit (Switch on the power of your LTU).
10. The following message appears on the screen, then press *Ja*.



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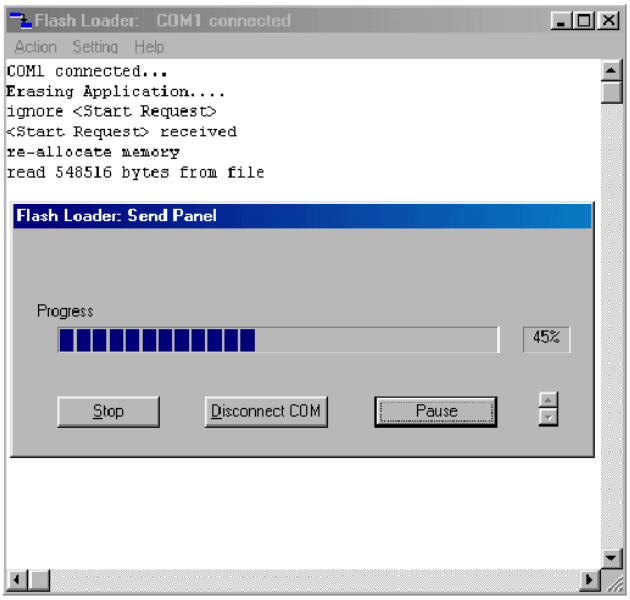
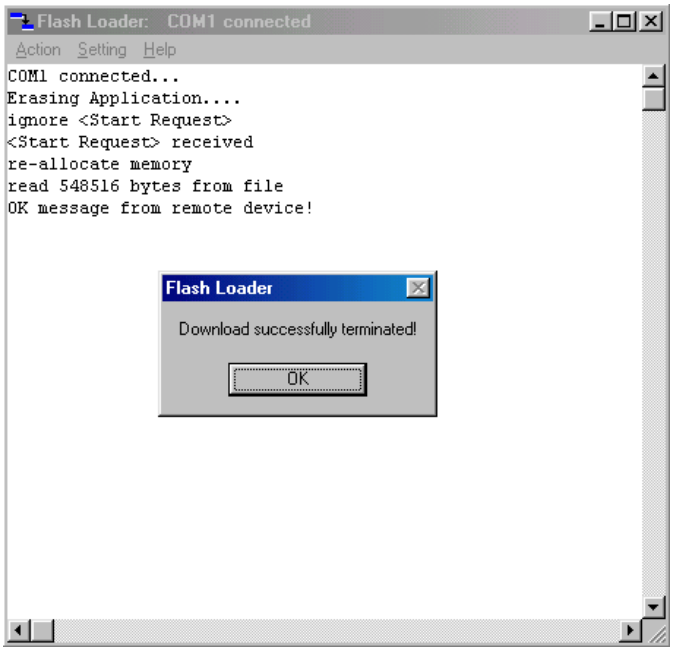
11. During the download the FE-LED is green blinking and the NE-LED is amber. On the Windows screen you see the ongoing download.



12. If the download is successfully finished the *Flash Loader* program sends the following message:



13. If the download was successful, the LTU restarts automatically.

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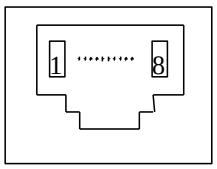
9 CONNECTORS' DESCRIPTION

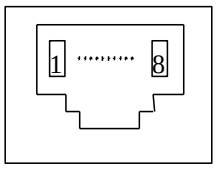
9.1 xDSL Connector



Front View
RJ45-8

Pin	Signal	Description
1	NC	Not used
2	Shield	DSL cable shield
3	TXA.a	Loop B, Tip (C-side)
4	LA.a	Loop A, Tip (N-side)
5	LA.b	Loop A, Ring (N-side)
6	TXA.b	Loop B, Ring (C-side)
7	Shield	DSL cable shield
8	NC	Not used

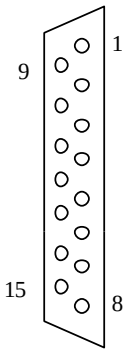
9.2 Ethernet connector



Front View
RJ45-8

Pin	Signal	Description
1	RX+	Ethernet Receiver
2	RX-	
3	TX+	Ethernet Transmitter
4	NC	Not used
5	NC	Not used
6	TX-	Ethernet Transmitter
7	NC	Not used
8	NC	Not used

9.3 E1 120 Ohm Connector



Pin	Signal	Description
1	Out_A1	E1 Output → A (wire 1sym)
2	FPE	Functional Protective Earth (cable shield Out_A)
3	Inp_A1	E1 Input→ A (wire 1sym)
4	FPE	Functional Protective Earth (cable shield Inp_A)
6	Out_A2	E1 Output → A (wire 2sym)
8	Inp_A2	E1Input → A (wire 2sym)
Only for Dual pair units		
5	FPE	Functional Protective Earth (cable shield Inp_B)
7	FPE	Functional Protective Earth (cable shield Out_B)
9	Out_B1	E1 Output → B (wire 1sym)
11	Inp_B1	E1Input → B (wire 1sym)
13	Out_B2	E1 Output → B (wire 2sym)
15	Inp_B2	E1Input → B (wire 2sym)
12	NC	-

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14	NC	-
10	NC	-

9.4 E1 75 Ohm In / Out Connectors

Type: BNC 75 Ω
Optionally equipped for E1 interface with 75 Ω

9.5 V.35 DCE Connector

Pin	V.24 (V.35/V.36)			X.21		Direction
	ITU-T #	Description	Name	Description	Name	
1	-			Shield		
7	102	Signal Gnd	SG	Signal Gnd	G	
2	103a	Transmit Data (A)	TD(A)	Transmit (A)	Ta	To DCE
14	103b	Transmit Data (B)	TD(B)	Transmit (B)	Tb	To DCE
3	104a	Receive Data (A)	RD(A)	Receive (A)	Ra	To DTE
16	104b	Receive Data (B)	RD(B)	Receive (B)	Rb	To DTE
4	105a	Request To Send (A)	RTS(A)	Control (A)	Ca	To DCE
19	105b	Request To Send (B)	RTS(B)	Control (B)	Cb	To DCE
5	106a	Clear To Send (A)	CTS(A)	Indication (A)	Ia	To DTE
13	106b	Clear To Send (B)	CTS(B)	Indication (B)	Ib	TO DTE
6	107a	Data Set Ready (A)	DSR(A)			TO DTE
22	107b	Data Set Ready (B)	DSR(B)			TO DTE
20	108a	Data Terminal Ready (A)	DTR(A)			TO DCE
23	108b	Data Terminal Ready (B)	DTR(B)			TO DCE
8	109a	Data Carrier Detect (A)	DCD(A)			TO DTE
10	109b	Data Carrier Detect (B)	DCD(B)			TO DTE
24	113a	Terminal Transmit Clock (A)	TTC(A)	DTE Signal Element Timing (A)	Xa	TO DCE
11	113b	Terminal Transmit Clock (B)	TTC(B)	DTE Signal Element Timing (B)	Xb	TO DCE
15	114a	Transmit Clock (A)	TC(A)			TO DTE
12	114b	Transmit Clock (B)	TC(B)			TO DTE
17	115a	Receive Clock (A)	RC(A)	Signal Element Timing (A)	Sa	TO DTE
9	115b	Receive Clock (B)	RC(B)	Signal Element Timing (B)	Sb	TO DTE
21	140	Remote Loopback	RLB			TO DCE
18	141	Local Loopback	LLB			TO DCE
25	142	Test Mode	TM			TO DTE

Pin	V.24 (V.28) synchronous			RS232 asynchronous		Direction
	ITU-T #	Description	Name	Description	Name	
1	-	Shield				
7	102	Signal Gnd	SG	Signal Gnd	SGND	
21	103	Transmit Data	TD	Transmit Data	TXD	TO DCE
5	104	Receive Data	RD	Clear To Send	CTS	TO DTE
4	105	Request To Send	RTS	Request To Send	RTS	TO DCE
6	107	Data Set Ready	DSR	Data Set Ready	DSR	TO DTE
20	108	Data Terminal Ready	DTR	Data Terminal Ready	DTR	TO DCE
18	113	Terminal Transmit Clock	TTC			TO DCE
25	114	Transmit Clock	TC	Receive Data	RXD	TO DTE
8	115	Receive Clock	RC	Data Carrier Detect	DCD	TO DTE

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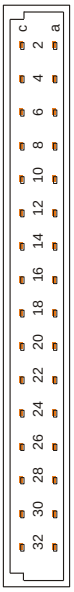
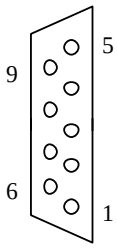
9.6 Voice Interface



Pin	Signal	Description
2a, 2c	FXx 1	Line Channel 1
4a, 4c	FXx 2	Line Channel 2
6a, 6c	FXx 3	Line Channel 3
8a, 8c	FXx 4	Line Channel 4
10a, 10c	FXx 5	Line Channel 5
12a, 12c	FXx 6	Line Channel 6
14a, 14c	FXx 7	Line Channel 7
16a, 16c	FXx 8	Line Channel 8
18a, 18c 20a, 20c 22a, 22c 24a, 24c 28a, 28c 32c	NC	
26a, 26c	FG	Ground
30a, 30c	-Vbat	Negative power supply terminal (- 48V)
32a	0V	Positive power supply terminal

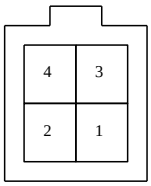
9.7 Monitor Interface



Pin	Signal	Description
1	FPE	Functional Protective Earth
2	TXD	EIA-232 Transmit Data
3	RXD	EIA-232 Receive Data
4	ALACOM	Common Contact*
5	SGND	EIA-232 Signal Ground
6	ALMAJ_NC	Major Alarm Contact, normally closed*
7	ALMAJ_NO	Major Alarm Contact, normally open*
8	ALMIN_NC	Minor Alarm Contact, normally closed*
9	ALMIN_NO	Minor Alarm Contact, normally open*

* on NTU only

9.8 Power Interface



Pin	Signal	Description
1	-MainsPWR	Negative power supply terminal for mains adapter
2	FPE	Functional Protective Earth
3	NC	-
4	+PWR	Positive power supply terminal

Molex Mini-Fit, 4-pin

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10 TECHNICAL SPECIFICATION

10.1 Interfaces

10.1.1 xDSL Line Interface

Specification	ITU-T G.SHDSL, Rec G.991.2
Option	4-wire Interface (separate Tx and Rx Pairs)
Line Code	TC-PAM
Impedance	135Ω
Transmit Power	13.5 or 14.5 dBm @ 135 Ω
Number of Pairs	1 or 2
Bit Rate	200 to 2320 kbps
Connector Type	RJ-45, 8 pin
Overvoltage Protection	ITU-T Rec. K.20/K.21
Specification	ITU-T G.SHDSL, Rec G.991.2
Wetting Current	2-4 mA @ 60 V

10.1.2 E1 Line Interface

Specification	ETS 300 166, ITU-T Rec G.703, G.704
Number of Interfaces	1 or 2
Line Code	HDB3
Impedance	Either 120Ω or 75Ω
Jitter	ITU-T Rec G.823, ETSI TS 101 135
Bit Rate	2048 kbit/s ± 50 ppm
Connector Type	Either DB15 male (120Ω) or two BNC 75Ω
ESD Protection	8 kV (Air discharge)

10.1.3 V.35 DCE User Interface

Specification	ITU-T Rec V.24/V.28V.35/V.36/X.21 / RS232
Number of Interfaces	1
Connector Type	DB25 female

10.1.4 Ethernet Interface

Specification	IEEE 802.3
Link Speed	10/100 mbps

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10.1.5 Voice Interface

10.1.5.1 FXO card

Description	Exchange isolated interface card for CO connection
Specification	ITU-T Q.552
Coding	Law A to ITU-T G.711
Relative Input Level	-3dB nominal
Input Impedance	600 Ohm, active
Ringing Frequency detection	15 to 50 Hz
Ringing Voltage	35..110 Vrms
Ringing Detector Impedance	Idle state (on-hook) >10 kOhm @ 1000 Hz Ring Receiving>2 kOhm @ 25 Hz
Loop Current in off-hook state (normal operation)	10...40mA
On-hook resistance	>100 kOhm

10.1.5.2 FXS card

Description	Subscriber non-isolated interface card.
Specification	ITU-T Q.552
Coding	Law A to ITU-T G.711
Relative Input Level	0dB nominal
Input Impedance	600 Ohm, active
Ringing Frequency	25 Hz
Ringing Voltage	35..46 Vrms
On-hook loop current	22±2mA
Off-hook voltage	-60±3 V
Loop detection limit	4 mA

10.1.6 Monitor Interface

Specification	EIA-232 / V.28
Data Rate	9600 baud, asynchronous
Protocol	8 bit, no parity, 1 stop bit no linefeed with carriage return XON/XOFF enabled
Signal Level	V.28 on DB9 female connector
Connector Type	DB9 female connector

10.2 Power Supply

Specification	ETSI ETS 300 132-2
Plug-in	2 x 40V/60V_{DC} over backpanel (redundant)
Tabletop	1 x 40V/60V_{DC} over Molex type safety approved connector
Power Consumption (Power source switched off)	Typ x.xW SA-RC-TELCOLINK-2E1/ETH/N64/FXX-MP-E1B, V25 Typ 5.5W SA-RC-TELCOLINK-2E1/ETH/N64/FXX-MP-E1B-MP-RP, V36 Typ 4.6W SA-RC-TELCOLINK-2E1/ETH/N64/FXX-MP-E1B/N64/Eth/FXx, V39 Typ 4.6W SA-RC-TELCOLINK-2E1/ETH/N64/FXX-MP-E1B/N64/Eth/FXO-RP, V39RP

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Typ 6.3W	SA-RC-TELCOLINK-2E1/ETH/N64/FXX-MP-E1B/N64/Eth/FXx-MP, V42
Typ 6.3W	SA-RC-TELCOLINK-2E1/ETH/N64/FXX-MP-E1B/N64/Eth/FXO-MP-RP, V42RP

Typ 100mW	FXO Module (without load)
Typ 450mW	FXS Module (without load)

10.3 Environmental

10.3.1 Climatic Conditions

Storage:	ETS 300 019-1-1 Class 1.2	(-25°C … +55°C)
Transportation:	ETS 300 019-1-2 Class 2.3	(-40°C … +70°C)
Operation:	ETS 300 019-1-3 Class 3.2	(-5°C … +45°C)

10.3.2 Safety / EMC

According to EN60950 / EN 55022 , Class B

10.4 Physical Dimensions and Weight

19“ Plug-in unit:

Dimensions:	height: 262 mm (6 HE), width: 30 mm
Weight:	0.5 kg

Minirack:

Dimension:	483(W)x230(D)x43.5(H) mm
Weight:	3 kg

Table Top:

Dimension:	240(W)x230(D)x43(H) mm
Weight:	1 kg

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11 APPENDICES

11.1 Initialization Errors

At system startup, various hardware selftests are performed. If any initialization error occurs, the startup procedure will be aborted and the monitor will display an initialization error code in hexadecimal representation. Each bit of the word value corresponds to a specific initialization error and is set to one if the corresponding hardware is faulty. The table below lists the possible initialization errors and their corresponding bit position in the error code word.

Bit Nr	Initialization Error
0	Microcontroller RAM test failure
1	
2	

11.2 Abbreviations

2B1Q	2 Binary - 1 Quaternary
ACO	Alarm Cut Off
AIS	Alarm Indication Signal
AIS-R	Alarm Indication Signal (Alarm bit in xDSL frame)
AIS-S	Alarm Indication Signal Subscriber
BER-H	Block Error Rate High (> 30 % according G.826)
BER-L	Block Error Rate Low (> 15 % & < 30% according G.826)
BER-S	Excessive Block Error Rate (CRC-4 Errors > 805) on Subscriber
CCITT	International Telegraph and Telephone Consultative Committee
CCS	Common Channel Signaling
CMU	Control and Management Unit
CRC	Cyclic Redundancy Check
E1	ITU-T G.703 User Interface at 2048 kbit/s
ET	Exchange Termination
EOC	Embedded Operations Channel
FAS	Frame Alignment Signal
FC	Failure Condition
FEBE	Far End Block Error
HDSL	High Bit Rate Digital Subscriber Loop
HRP	HDSL Regenerator Present

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ISDN	Integrated Services Digital Network
ITU-T	International Telecommunication Union
LFA	Loss of Frame Alignment
LFA-L	Loss of Frame Alignment xDSL
LFA-S	Loss of Frame Alignment Subscriber
LOS-L	Loss of Signal
LOS-S	Loss of Signal Subscriber side
LT	Line Termination
LTU	Line Termination Unit
NC	Not Connected
NEXT	Near End Cross Talk
NM	Noise Margin
NT	Network Termination
NTU	Network Termination Unit
PDH	Plesiochronous Digital Hierarchy
PRA	Primary Rate Access
RX	Receive
SDH	Synchronous Digital Hierarchy
SMF	Sub-Multiframe
SQ	Signal Quality
TE	Terminal Equipment
TMN	Telecommunication Management Network
TX	Transmit
UIF	User Interface
UTP	Unshielded Twisted Pair
XVR	Transceiver

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11.3 Command set

Full command	Short command	Full command	Short command	Full command	Short command
G826	G				
		LOOP1*	L1	BITRATE*	BTR
		LOOP2*	L2	CLOCKMODE*	CM
G826 C	G C	STARTAL*	SAL	CLOCKDIR*	CD
G826 E1	G E1	RESTART*	RE	AUTOLOOP*	AUL
G826 E1 C	G E1 C	SPECTRUM*	SP	SLOTUSAGE*	SU
RESETG826*	RG	ACO*	ACO	MODE*	MO
RESETHIST*	RH	RESET*	RST	MASTER*	MA
HIST [i] [t]	HI [i] [t]	CONFIG	C	PLL*	PLL
DATE	DA	HW	HW	RS232SLOT*	RSS
DATE [date]*	DA [date]	G704*	G704	RS232BITS*	RSB
TIME	TI	CRC4*	C4	RS232RATE*	RSR
TIME [time]*	TI [time]	EBIT*	E	RS232ERATE*	RSER
NETSTAT	NETS	AISGEN*	AG	AUTORST*	AR
RESETNETSTAT*	RNS	AISDET*	AD	BASERATE*	BR
CONNECT	CO	PCM*	PCM	ADAPT*	ADP
DISCONNECT	DIS	PAYLOAD*	PL	SETADDR*	SA
SQ	SQ	IDLECAS*	IC	SCALE*	SC
STARTUP*	SUP	IDLEPAT*	IDP	DEFAULT *	DF
STATUS	ST	SIGSLOTS*	SS	ANNEX*	AN
ALARM	AL	SERVICE*	SRV	ID*	ID
ALARM T	AL T	TYPE*	TP	ETHPAYLOAD*	EPL
TLM	T	CONNECT	CO	ETHSD*	ESD
RESETTLM*	RT	DISCONNECT	DIS		
TLMCONF	TC				
TLMSET*	TS				

* This command is not accessible for USER access level

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11.4 References

11.4.1 Standards

ETSI ETR 152, “Transmission and Multiplexing (TM); High Bit Rate Digital Subscriber Line (xDSL) Transmission System on Metallic Local Lines; xDSL Core Specification and Applications for 2048 kbit/s Based Access Digital Sections”
ITU-T G.821, “Error Performance of an International Digital Connection Forming Part of an Integrated Services Digital Network”
ITU-T G.826, “Error Performance Parameters and Objectives for International, Constant Bit Rate Digital Paths at or above the Primary Rate”
ITU-T G.823, “The Control of Jitter and Wander within Digital Networks Which Are Based on the 2048 kbit/s Hierarchy”
ITU-T G.703, “Physical/Electrical Characteristics of Hierarchical Digital Interfaces”
ITU-T G.704, “Synchronous Frame Structures Used at Primary and Secondary Hierarchical Levels”
ITU-T M.3400, “TMN Management Functions”
ITU-T K.20, “Resistibility of Telecommunication Switching Equipment to Overvoltages and Overcurrents”
ITU-T K.21, “Resistibility of Subscribers’ Terminals to Overvoltages and Overcurrents”
EN 60950, “Safety of Information Technology Equipment Including Electrical Business Equipment”
EN 55022, “Grenzwerte und Messverfahren für Funkstörungen von informationstech-nischen Einrichtungen”
ETS 300 019, “Equipment Engineering; Environmental Conditions and Environmental Tests for Telecommunications Equipment”

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