EN/LZB 111 0539 R1A

HDSL
High Bit Rate Digital Subscriber Line
HTU

PRODUCT UNIT ACCESS AND PRODUCT OFFERINGS

High Bit Rate Digital Subscriber Line System

Documentation for Ericsson HDSL HTU System

EN/LZB 111 0539 R1A

PU Access and Product Offerings
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ERICSSON

1

HTU Product Description

2

HTU Technical Description

3

HTU Installation Instruction

4

NCS-HTU Product Description
Network Control System

5

6

7

E

Product Description for

Ericsson HDSL

HTU

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Table of Content

SYSTEM OVERVIEW

General

HDSL is a transmission technology that will provide high speed digital access on non-loaded telephone loop plant in a repeater less subscriber loop network. The typical speed is 2 Mbit/s. HDSL enables high bandwidth to be delivered in both directions (full duplex).

HDSL has been developed in the US to carry 784 kbit/s full duplex on a single copper pair over a distance of around 3,5 km. This allows to carry a US T1 signal (1,5 Mbit/s) over two pairs. However, the European standard uses E1 signals (2 Mbit/s) and therefore there are three options for HDSL in Europe:

use of **three pairs** with 784 kbit/s (US standard) for the 2 Mbit/s European standard

use of **two pairs** with a higher bit rate of 1.168 kbit/s per pair

use of **one pair** with a bit rate of 2048kbit/s.

The standard line code is usually 2B1Q but ETSI also accepted now the use of CAP (carrier-less amplitude modulation) and both 2B1Q and CAP are approved as European standards.

The Ericsson HDSL system today is a two pair system with 2B1Q.

The HTU is a straightforward 2 Mbit/s HDSL transmission system, and it is our aim to offer a cost-efficient solution for the operator with:

- reduced investment costs (compared to the actual solutions)
- reduced costs for installation
- reduced costs for maintenance

HDSL CHARACTERISTICS

- transmission over existing unconditioned twisted copper pairs
- fibre quality on copper wires
- full duplex rates of up to 2 Mbit/s
- ISDN primary rate connections
- repeater less operation
- no pair selection required
- very low BER
- line code is 2B1Q

HDSL ADVANTAGES

- HDSL lines can be provided very quickly
- very fast and easy delivery of 2 Mbps service to customer
- very cost efficient
- use of existing copper cable plants
- no repeaters needed = improved transmission quality (data transmission)
- performance monitoring is the standard in HDSL systems
- reduces the number of electronics in the circuit (PCM30, fibre)
- HDSL transmission is less sensitive to cable characteristics

HDSL APPLICATIONS

A number of business applications require E1 service, which could be economically supplied by HDSL. This includes rapidly growing market segments like video-conferencing, LAN-to-LAN connection, transmission to base stations for mobile communication, etc. A further possibility for HDSL application is the provision of primary rate ISDN. Also the interconnection of private PABXs via HDSL could be an interesting application.

HDSL is clearly meant for use in business and professional/semi-professional applications and there will be a very limited use for pure residential applications.

World-wide, the demand for digital leased lines is growing rapidly and there is a market for E1 lines to small and medium-sized businesses.

A significant number of these applications will probably be implemented with HDSL, particularly in areas where copper networks exist and a very fast providing of service at reasonable cost is required. For green field applications fibre cables or radio may be the first choice.

At least in the short term, the other major use of HDSL will be primary rate access (PRA) ISDN and in mobile networks.

- Highs peed (2 Mbps) Subscriber Access
- Fully transparent connections
- PRA (Primary Rate Access) for ISDN including NT1 functionality
- Interconnection of Local Exchanges
- LAN to LAN connections
- Linking Base Stations to Switches in Mobile Telephone Networks
- Providing digital 2 Mbps connection to network for PABXs

FEATURES

- fibre optic quality on copper wire
- 4-wire operation
- For operation on ordinary copper wire
- Makes complicated pair selection obsolete
- Standard G.703 Interface
- Unrepeated range up to 10 km
- 2B1Q line code according to ETSI
- NT/LT functionality

- Simple installation and maintenance

System Description

The system HTU is a 2-pair (4-wire) HDSL based transmission system to provide 2 Mbit/s services via standard copper access network for high speed access to telecommunication networks. It offers great flexibility in installation and operation because it is possible to use any standard copper cable without using repeaters for a maximum distance of 10 km depending on the cable diameter. The data terminal interface used is the G.703 interface. The HTU can be controlled and configured via the NCS (Network Control System).

The basic operation modes for the HTU-system are:

- structured primary rate 2 Mbit/s -data transmission (time slots 0 up to 32)
- unstructured 2 Mbit/s-data transmission (transparent data stream).
- ISDN PRA connection (including NT functionality)

The applications of HDSL are determined by the functionality of mapping and interfaces according to ETSI:

- ISDN primary rate access digital section according to ETS 300 233
- ONP leased-line access D2048U based on ETS 300 246 and ETS 300 247
- ONP leased-line access D2048S based on DE/BT-20221and DE/ET-2022

ETSI standards specify definitely HDSL as a repeaterless transmission technique. We think that more than 95% of the potential applications do not require any repeaters because they are within the normal transmission range of the HTU system. For longer transmission distances you can use HTU with a back-to-back installation in a cable distribution building.

OVERVIEW

HTU	The HTU transmission system consists of the following parts:
• HTU line card	Line card unit which is located in the subrack
• HTU desktop unit	table unit

HTU-SR	The HTU subrack consists of the following parts:
• HTU-SR	19“ subrack (to plug in the line cards)
• SVB3	DC power supply unit
optional:	
• NCS	Network Control System software
• CPU card	NCS controller card

PRINCIPAL CONFIGURATION

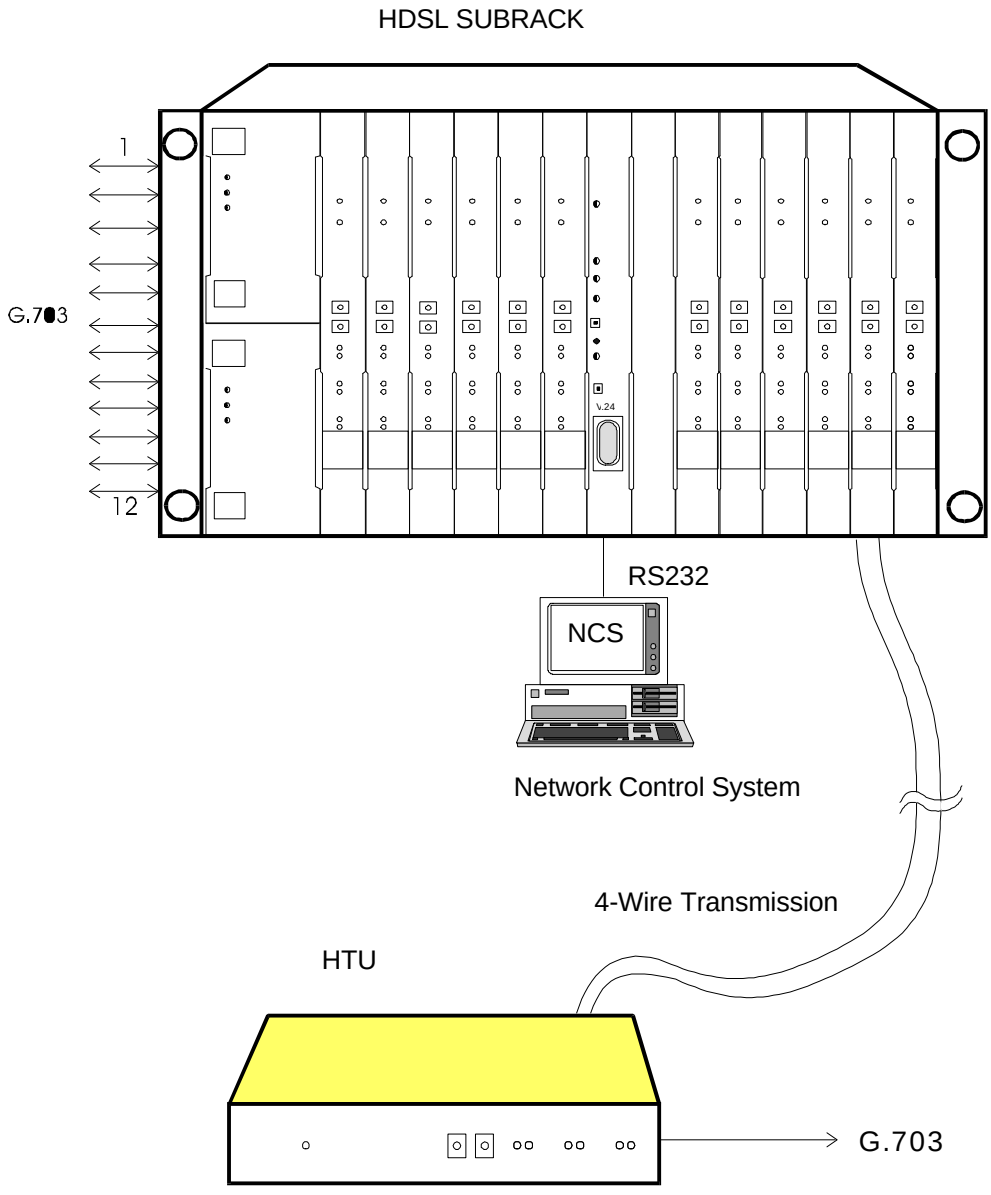

Fig.0: HTU system principle diagram

Short description of the system

HTU LINE CARD

The HTU line card is the system to be installed at the exchange site into the 19“ subrack type HTU-SR (BGTR) or the ETSI subrack type HTU-SR/E (BGTR/E).

HTU DESKTOP UNIT

The HTU is the table-top unit for indoor mounting to be installed next to the subscriber premises.

HTU-SR

The HTU-SR (BGTR) is the 19“ subrack with a capacity of 12 HTU line cards.

The HTU-SR/E (BGTR/E) is the subrack in compliance with the ETSI standard with the capacity for 12 HTU line cards.

The SVB 3 is the central power supply unit to be installed into the subrack. The subrack can house up to two power supply units for full power supply redundancy. For each six line cards at least one power supply is used.

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Please note: The PC required to run the NCS software is not a component of the HTU system and therefore not included in any offer or delivery.

Applications for HTU

The HTU is an HDSL system for the provision of 2 Mbit/s subscriber access, providing fibre quality on copper wires. Today we can see three main application areas:

- business applications
- applications in telecom operator networks
- applications in residential areas

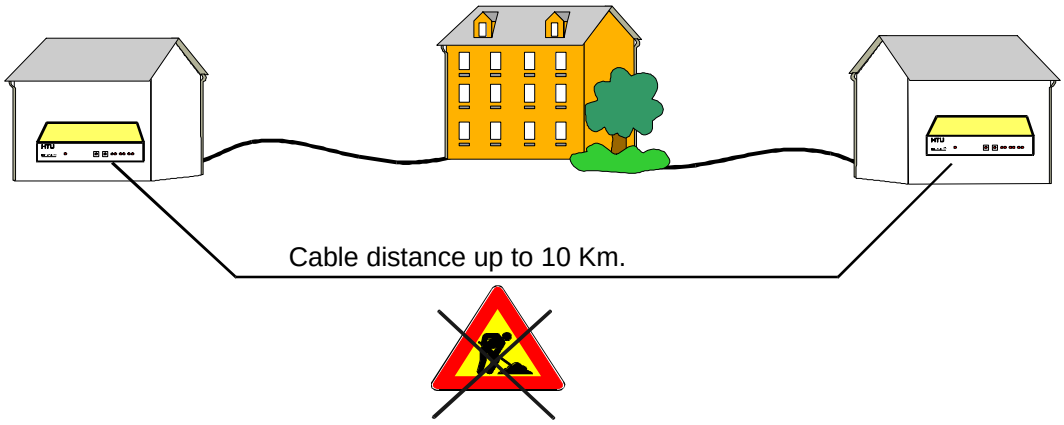

Fig.1, typical application

APPLICATIONS FOR BUSINESS CUSTOMERS

HDSL transmission devices can be used for all business applications which require a 2Mbit/s / E1 transmission, because using existing copper cables is the easiest way to bridge the last few kilometres between the exchanges and the customers in the local loop.

Another possibility for HDSL application is the provision of primary rate ISDN.

- Corporate networks
- PABX trunk line connections
- PABX interconnections e.g. MD110 - LIM (see Fig.2)
- ISDN primary rate connections
- LAN interconnections
- 2Mbit/s leased lines
- 2Mbit/s data services
- Video conferences
- SMO (small/medium office)
- SOHO (small office/home office)

The typical parameters for business applications are:

- copper cable diameter is usually 0.4 mm or 0.5 mm
- average distance between local exchange and customer is 2.5 km

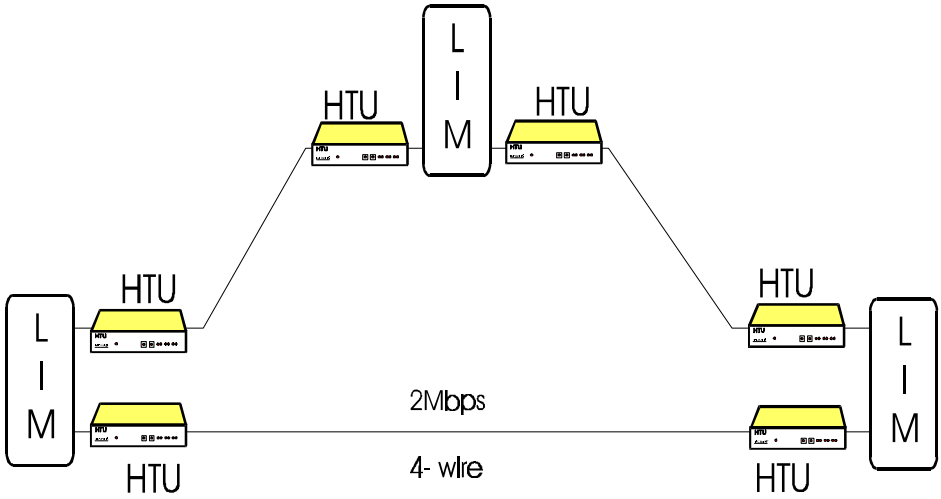

Fig.2, typical application

APPLICATIONS IN TELECOMMUNICATION NETWORKS

Because of the fast development of cities, industrial areas, etc. it is often necessary to offer new services very quickly. HTU offers easy and fast connection e.g. remote subscriber multiplexers over existing copper wires to the exchanges.

In mobile networks the HTU can be used to connect radio base stations to base station controller.

- High speed 2 Mbit/s subscriber access
- E1 connection between local exchange and some kind of remote subscriber multiplexers, such as a connection between AXE and RSS/ RSM/DiaMUX, etc.
- E1 connections between base station controller and base station in GSM and other mobile and cellular networks.(see Fig.3)
- DECT systems, RAS 1000 applications
- Data networks

The typical parameters for operator applications are:

- copper cable diameter is usually 0.5 mm or 0.6 mm
- average distance 3 km

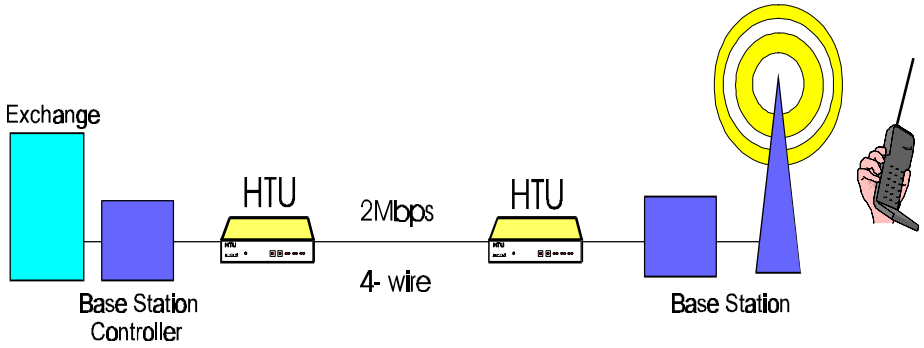

Fig.3, typical application

APPLICATIONS IN RESIDENTIAL AREAS

- SOHO (Small Office and Home Office) applications for tele-worker and professionals (e.g. broadcast reporters and journalists), medical centres, etc.

The typical parameters for operator applications are:

- copper cable diameter is usually 0.4 mm
- average distance 3.5 km

Line code 2B1Q

The shape of the digital signal to the system's efficiency is related to:

a. The signal's spectrum on the line

b. Near End Cross-talk immunity

c. Near End Cross-talk

d. Digital Interference

According to 2B1Q coding, one signal output level corresponds to a pair of two successive input bits according to the following table.

First Bit	Second Bit	Signal Level 2B1Q
1	0	+3
1	1	+1
0	1	-1
0	0	-3

Fig.4: 2B1Q line code

Echo cancellation

Echo in transmission through a two-wire line is caused by:

- Line impedance variations at different frequencies
- Variations of conductor diameter
- Bridges taps

This phenomenon results in the reflection at the receiver, of a part of the transmitter signal. The echo cancellation technique used in the HTU is based on the detection and initial storage of each line reflection characteristics and their consequent usage during transmission for echo cancellation by the received signal.

This is carried out by Digital Signal Processors programmed to function as adaptive echo chancellors.

The basic diagram of the operation of an echo chancellor is shown in figure 5:

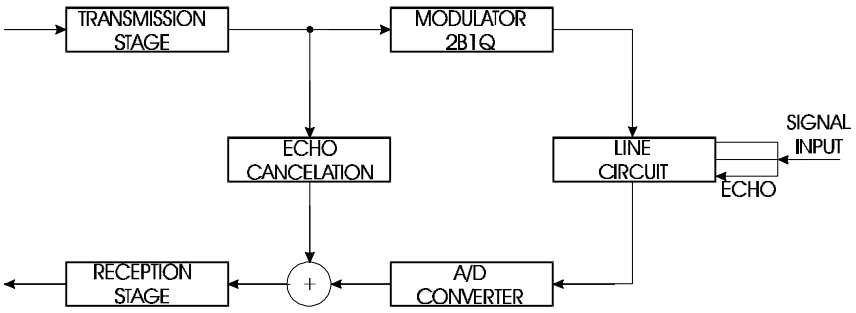

Fig.5: Echo cancellation

Technical Description for

Ericsson HDSL

HTU

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- HTU-SR — 19“ subrack (to plug in the line cards)
- SVB3 — DC power supply unit

optional:

- NCS — Network Control System software
- CPU card — NCS controller card

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The optional CPU-card is a plug-in card for the subrack and is the hardware required to run the NCS (Network Control System) software for operation & maintenance of the HTU-system.

NCS

The NCS may be installed on any PC with the minimum configuration specified in

Section III: NETWORK CONTROL SYSTEM

Please note: The PC required to run the NCS software is not a component of the HTU system and therefore not included in any offer or delivery.

TECHNICAL SPECIFICATIONS

Standards

The HDSL transmission system HTU fulfils the following specifications:

ETSI HDSL specification:	ETR 152
Interface Specifications:	CCITT G.703, CCITT G.704
Safety standards:	EN41003, EN60950
Overvoltage protection:	CCITT K20, CCITT K.21
Electromagnetic compatibility:	EN 50 082 - 1;Class A
Radio interference:	EN 55 022 / 1988

Electrical characteristics

SUBRACK

DC-power supply:

Input-voltage range:	-36V to -72V positive pole grounded The DC/DC-converter is protected against reversal of the power supply polarity
Output power	550W
Protection norm	EN60950

Power consumption:

HDSL card:	<8W
CPU card:	<3.5W

DESKTOP-UNIT

AC-power supply:

Input-voltage range:	220V -10%/ 230V +10%
Input-frequency range:	47 Hz - 53 Hz
Protection norm:	EN60950

DC-power supply:

Input-voltage range:	-20V to -72V positive pole grounded The DC/DC-converter is protected against reversal of the power supply polarity

Power consumption:

Desktop unit:	<15W

Line interface

INTERFACE PARAMETERS:

Code	2B1Q
Bit rate	2 x 1168kbps dualduplex
Transmission level	14dBm
Line impedance	135Ω

Transmission characteristic

PERFORMANCE

Transmission distance without ETSI noise:	
∅ 0,4mm:	up to 3,7km
∅ 0,6mm:	up to 6km
∅ 0,8mm:	up to 8km

Transmission distance with ETSI noise:	
∅ 0,4mm:	up to 3km
∅ 0,6mm:	up to 4,5km
∅ 0,8mm:	up to 7,5km

ETSI LOOP TEST

The HTU-transmission equipment is designed for the transmission on two non loaded cable pairs. It can bridge a line attenuation of at least 27 dB @ 150kHz (defined by ETSI). Our system has a 4 to 8dB margin depending on the different ETSI loops. This means that our system can bridge 31dB to 35dB cable attenuation measured at 150kHz.

The upper edge of the transmission spectrum of the 2B1Q transceivers ends at 292kHz declining with 80dB/octave, the frequency range between 500kHz and 1MHz is not used any more.

Regarding the cascading of cables with different diameters please refer to the following picture, which shows the 7 standardised ETSI loops as an example configuration. (fig.10)

ETSI LOOPS

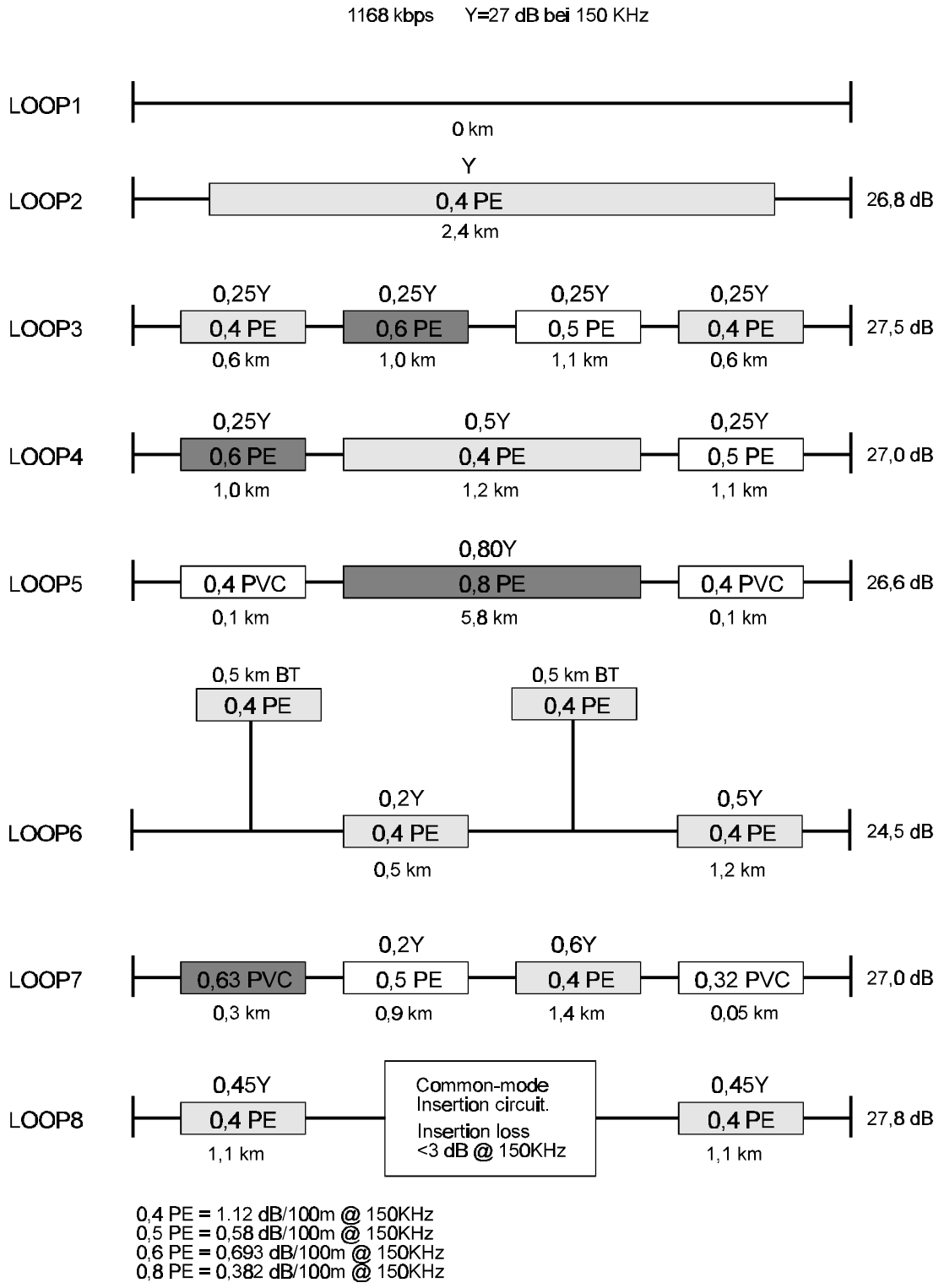

fig.10: ETSI loops

Block diagrams

SYSTEM BLOCK DIAGRAM

The 2 Mbps data stream is splitted into two data streams of 1.168 kbps each to be transmitted over the 2 copper pairs (4-wires). The HTU includes two 2B1Q transceivers, the multiplexer/demultiplexer and the codirectional G.703 interface towards the terminal equipment. The HTU controller takes care of control and supervision of the unit and provides the interface to the optional Network Control System NCS. (fig.7)

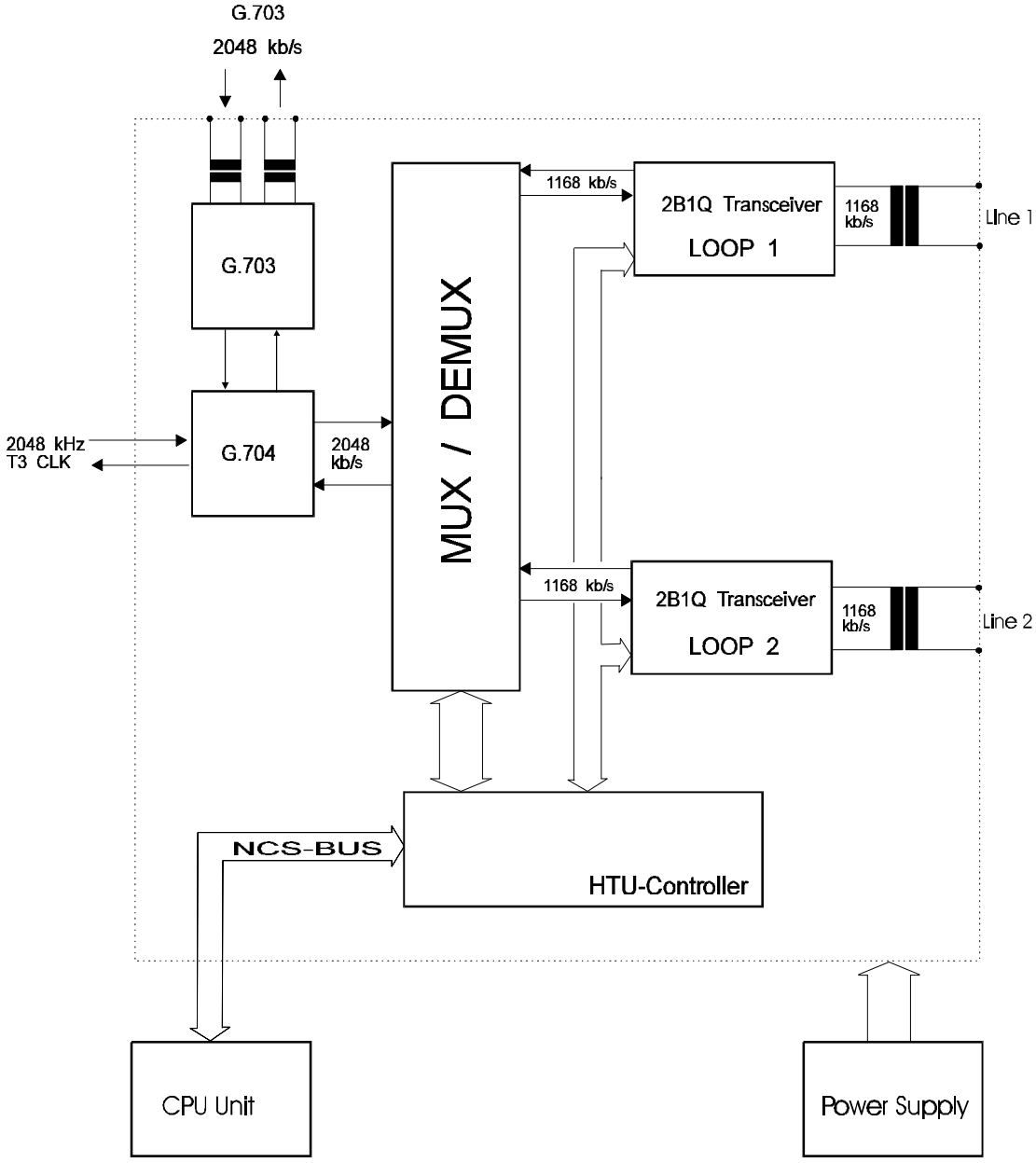

fig.7: HTU system, block diagram

The HTU is mainly splitted in three function blocks:

CORE, MAPPING and INTERFACE (fig.8).

The CORE and MAPPING block are responsible for the basic transmission functions.

The INTERFACE block is responsible for the transmission of structured PCM30 data and for the communication with the CPU card.

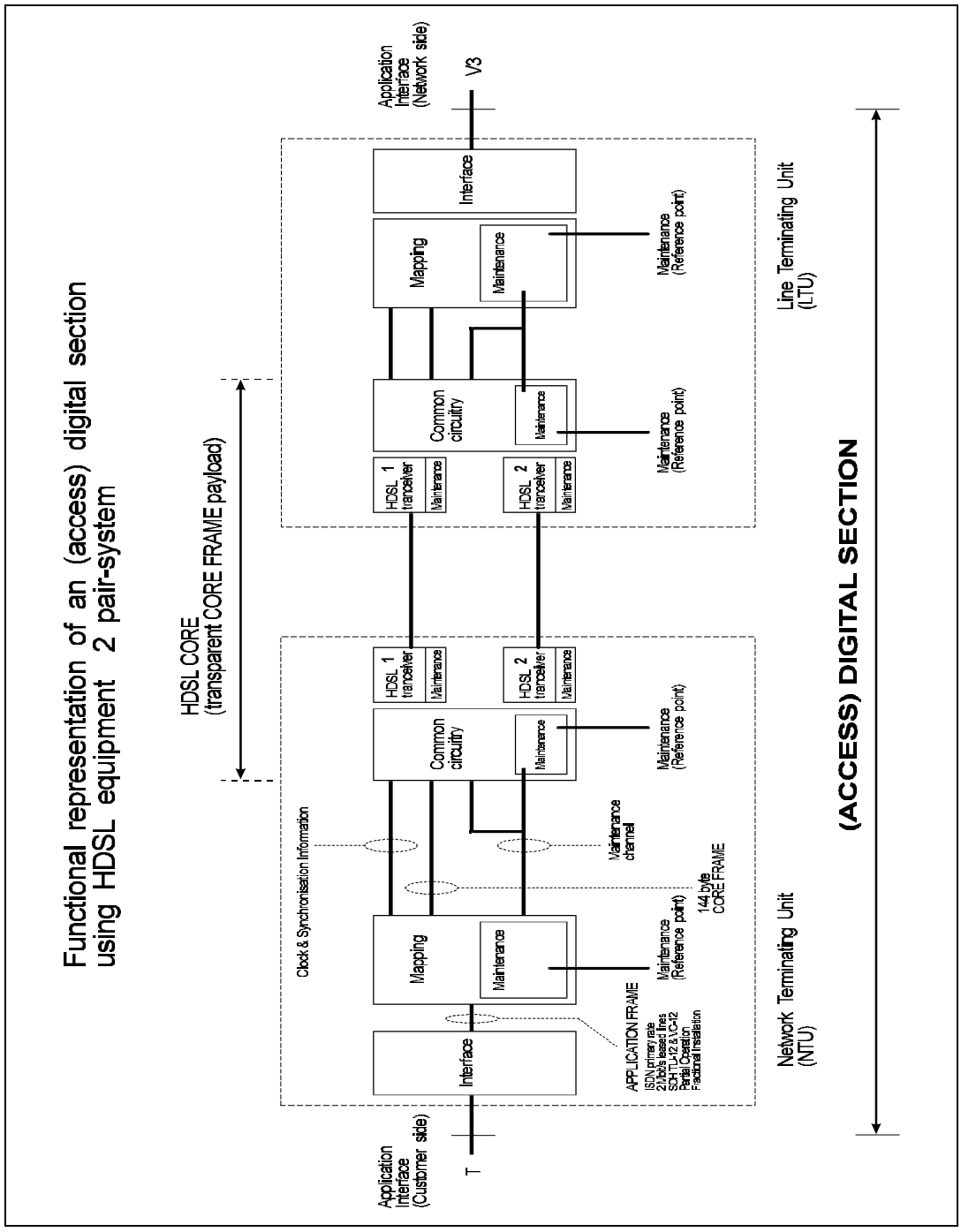

fig.8: HTU core block diagram

HTU-TRANSMISSION UNIT

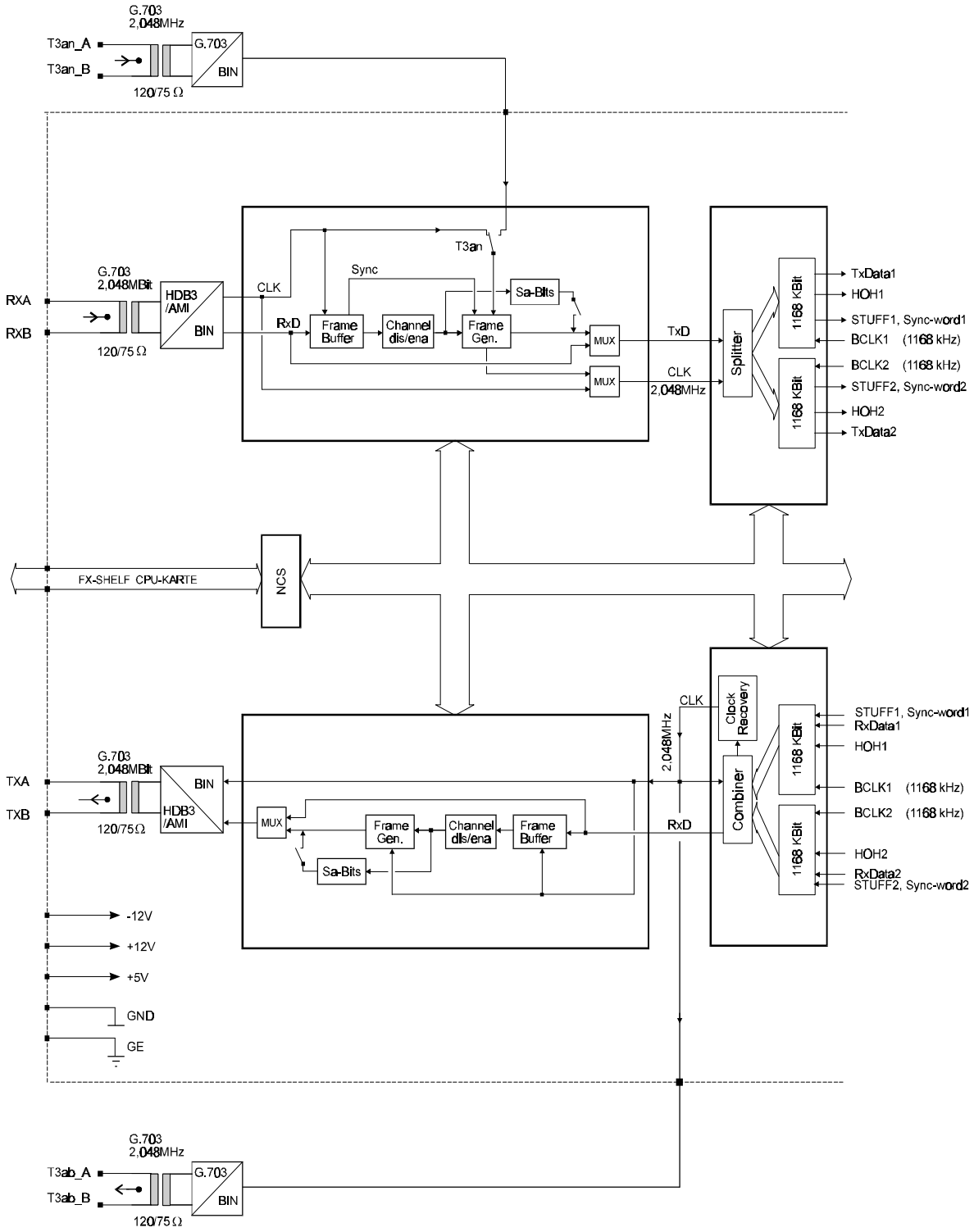

fig.9a: HTU block diagram

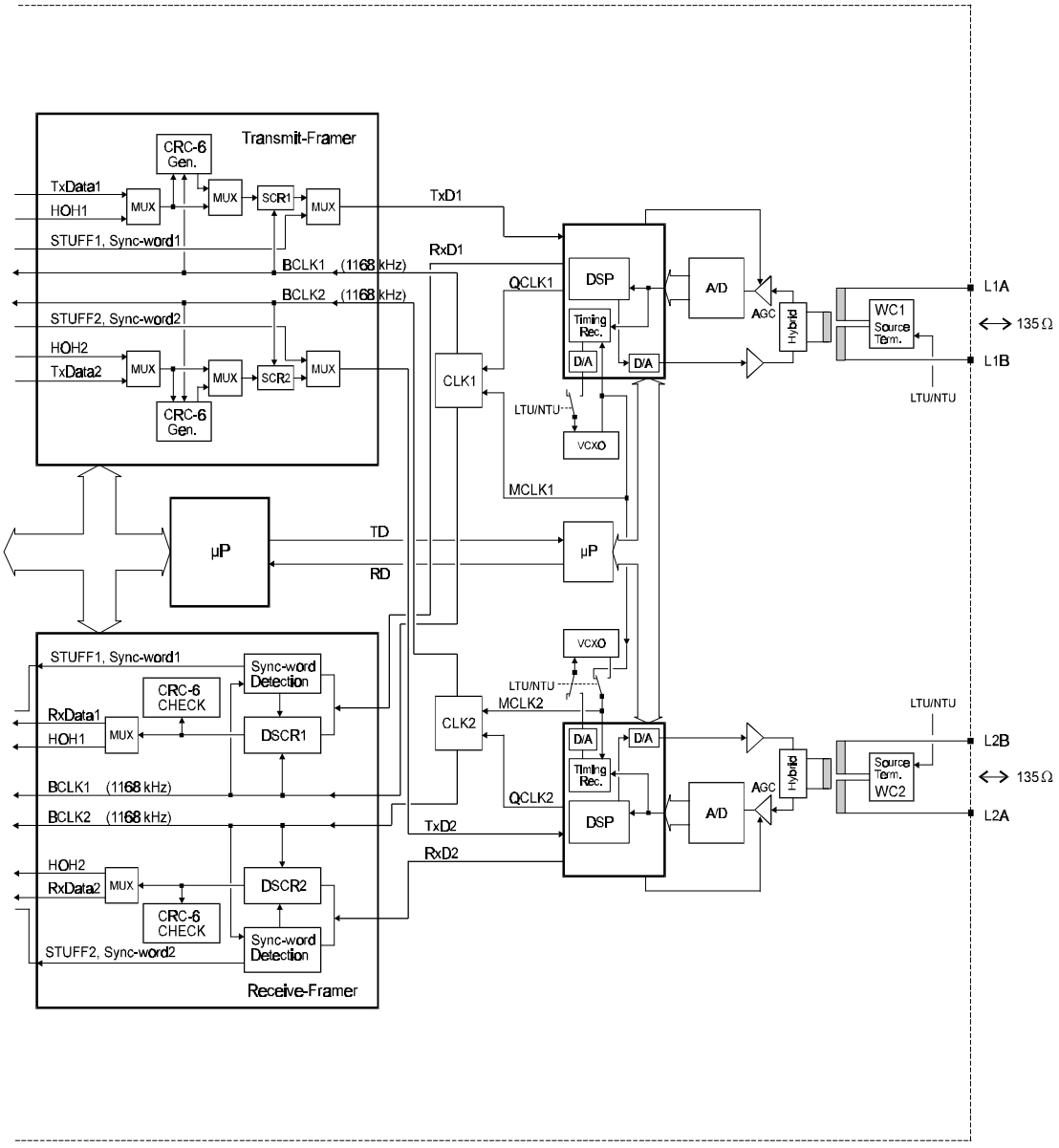

fig.9b: HTU block diagram

ELECTRICAL PROTECTION

Overvoltage protection:

The overvoltage protection at the subrack card is designed according to the CCITT recommendation K.21. In the desktop unit the overvoltage protection is in accordance with CCITT K.20, K.21.

a to b	peak voltage 2kV	10/700 and 1,2/50 µS
a, b to earth	peak voltage 2kV	10/700 and 1,2/50 µS

Isolation resistance:

a, b to earth	200MΩ / 100VDC

2Mbps interface

The 2 Mbps interface of the HTU is in accordance with to CCITT G.703 Version 1 and can be configured to 120 Ω symmetrical or 75 Ω asymmetrical with jumper bridges.

Code	HDB3 / AMI
Bit rate	2048 kbps ± 50 ppm
Amplitude (sym. - 120 Ω) peak	3 V ± 10%
Amplitude (asym. - 75 Ω) peak	2,37 V ± 10%

Maximum allowed attenuation of an interface cable at 1 MHz: 0 to 6 dB
(6 dB equals about 300 m cable 2Y (St)Y 2*0.5/2.2)

RETURN LOSS (120 Ω) :

to	102 kHz	> 12 dB
to	2048 kHz	> 18 dB
above	2048 kHz	> 14 dB

TRANSMISSION DELAY

The one way delay in the digital access section (reference points T / V3) is less than 1250µs.

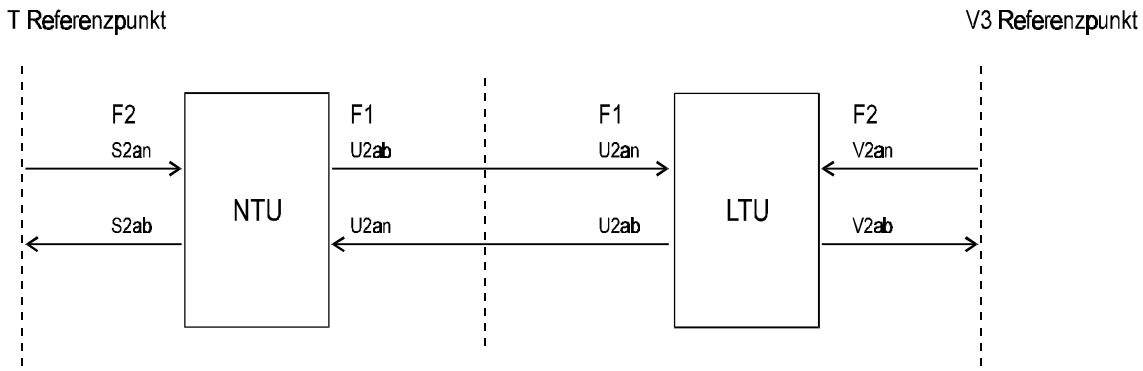

fig.11:

ELECTRICAL PROTECTION

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Clock interface

The clock interface of the HTU is in accordance with to CCITT G.703 Version 1 and can be configured to 120 Ω symmetrical or 75 Ω asymmetrical with jumper bridges.

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Maximum allowed attenuation of an interface cable at 1 MHz: 0 to 6 dB
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Maintenance interface

ALARM RELAYS

For visual displaying of alarms one relay is available.

Contact power:	max. 30W / 50VA
Contact current:	max. 1,25A
Contact voltage:	max. 150V

NCS (NETWORK CONTROL SYSTEM)

The NCS is a general usable network management system with the capability to manage network elements (configuration and control).

Interface to the NCS PC:	RS232
Interface between the subracks:	RS485

Mechanical characteristics

SUBRACK

The dimensions of the 19“ subrack are:

Width:	483mm - 19“
Height:	266mm
Depth:	175,5mm

DESKTOP UNIT

The dimensions of the desktop unit are:

Width:	239mm
Height:	48mm
Depth:	215mm

Environmental characteristics

OPERATING CONDITIONS

The operation temperature range for the HTU is between -10°C and 50°C

The max. humidity is 85% non condensing.

STORAGE AND TRANSPORT CONDITIONS

Unless otherwise agreed, the equipment shall be supplied in the packing determined by the manufacturer.

The package is labelled with the necessary transport information.

As the equipment is designed for stationary use, the transport of the board assembly and the individual parts shall be performed in the stated transport packages only.

The HDSL equipment in the transport package may be transported by usual means of transport (car, railway, plane) at an ambient temperature ranging from -40°C to +70°C, a relative humidity of up to 98 % and a minimum air pressure of 23 kPa.

During transport, it is necessary to protect the packed equipment from rain, direct solar irradiation as well as from sudden changes in temperature.

The equipment can be stored without transport packing in closed rooms at an ambient temperature of 0° C to 50° C with a relative humidity of up to 85% non condensing.

The equipment can be stored in the transport packing in closed rooms at an ambient temperature of -20° C to 70° C with a relative humidity of up to 85 % condensing for a period of max. one year.

ABBREVIATIONS / TERMINOLOGY

AIS	Alarm Indication Signal
ALB	Analogue Loopback
F1	Application (G.703) Interface
F2	Line Interface
G.703	CCITT G.703 Interface
G.704	CCITT G.704 frame structure and signalling like a PCM30
HDSL	High-Bit rate Digital Subscriber Line
HTU	HDSL - Transmit Unit
HTU/E	HTU configured for the exchange side (LTU)
HTU/R	HTU configured for the remote or customer side (NTU)
LED	Light Emitting Diode
LTU	Line Termination Unit (HTU/E)
NCS	Network Control System
NTU	Network Termination Unit (HTU/R)
RLB	Remote Loopback

ERICSSON

Installation for

Ericsson HDSL

HTU

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Principle system configuration

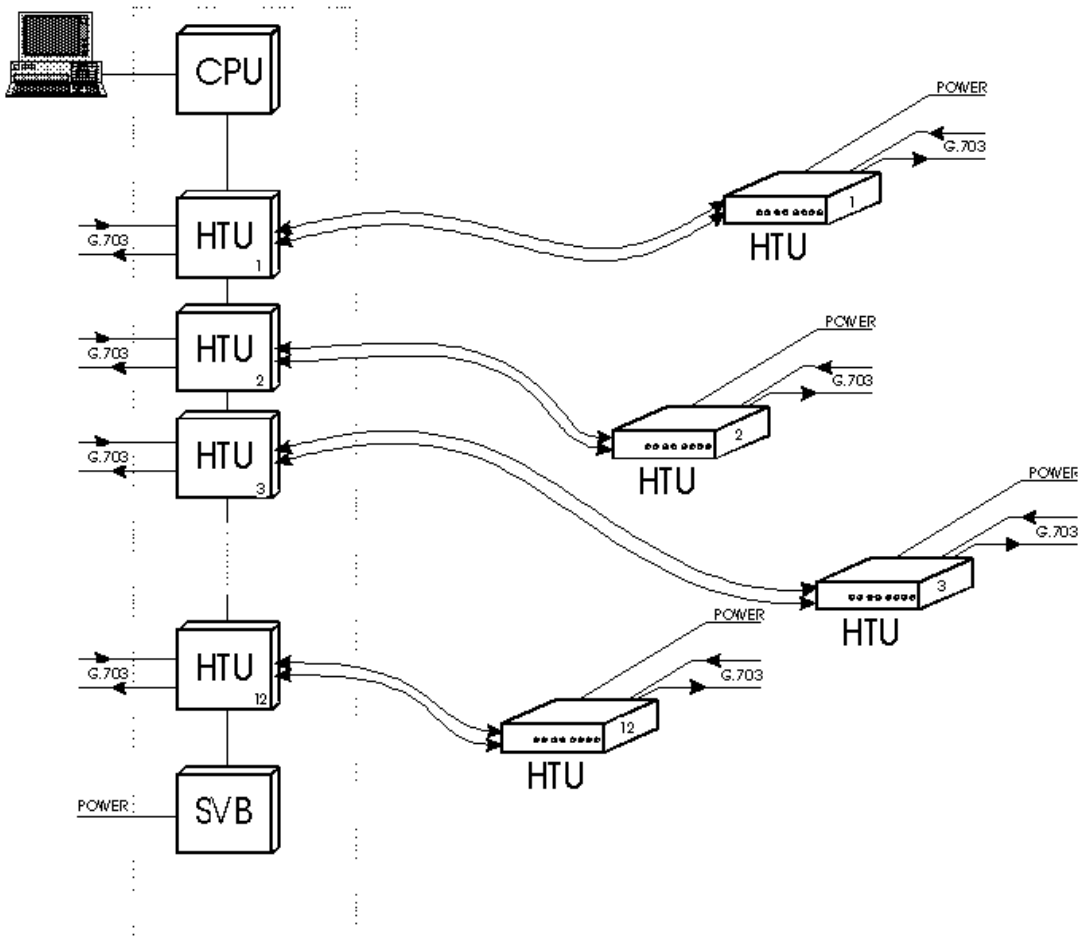


Fig.0: Principle system configuration

SYSTEM COMPONENTS

Subrack

The subrack system provides space for up to 12 HTU line cards, two power supplies and the CPU-board which is responsible for the entire control and monitoring of the subrack and for the communication with the NCS.

The subrack is a 19"-subrack, which is adapted to a subrack system corresponding to the ETS300119 standard by slight mechanical changes. The subrack accommodates 14 double-Europe printed circuit boards with 5 TE width and 2 power supply units with 14 TE width. The two power-supply units are located at the left side of the subrack on top of each other. To their right are 14 plug-in positions; plug-in positions 1 - 6 and 9 - 14 are provided for HTU Line card Units and plug-in position 7 is provided for the CPU-board. Plug-in position 8 is not used in the HDSL application.

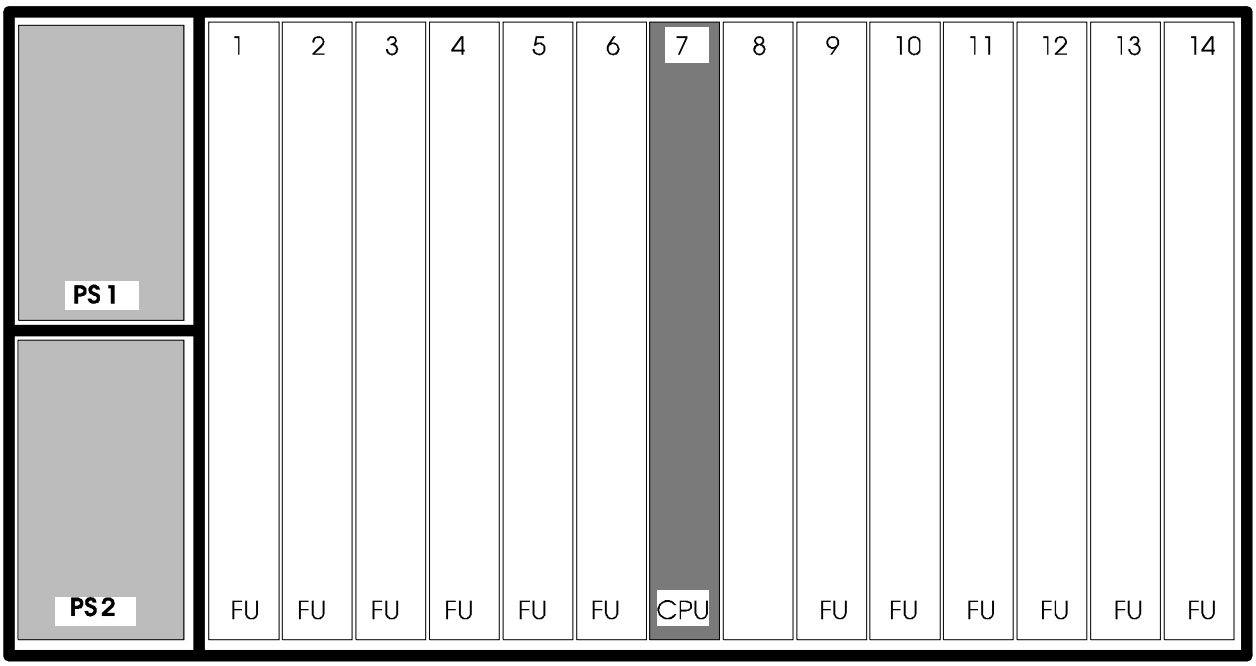


Fig.2: Arrangement of the printed circuit boards in the HTU-subrack

All necessary connections between the printed circuit boards and all external connections are conducted across the back print which extends across the height of the subrack. This back print has two 96-pole DIN41612 connector strips: one serves for the connections within the subrack and the other one serves for the external connections. Here the external connections are effected via the AMP RV100 connector system which is used on the backside of the back print. The relevant cable connectors are protected against polarity reversal.

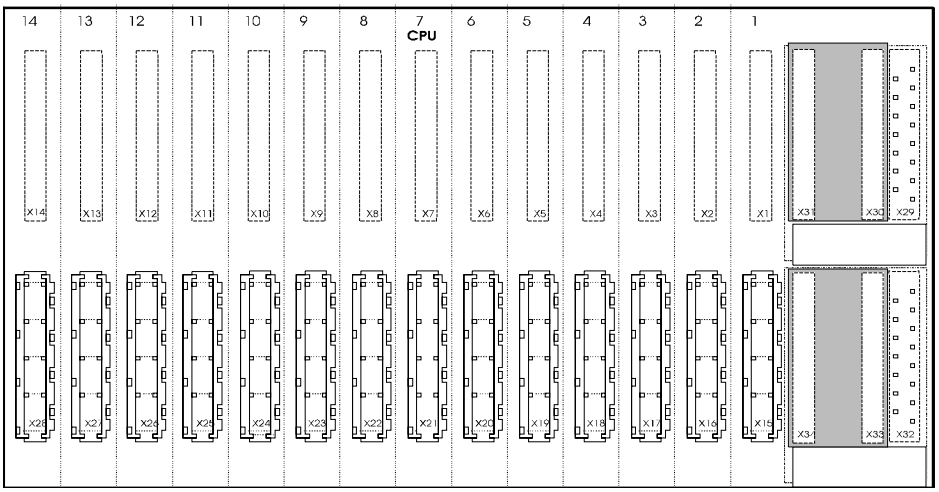


Fig.3: Back view of the subrack

MECHANICAL DIMENSIONS:

Height:	.....357,2 mm
Width:	.....533 mm
Length:	.....175,5 mm
Hole distance:	.....515 mm

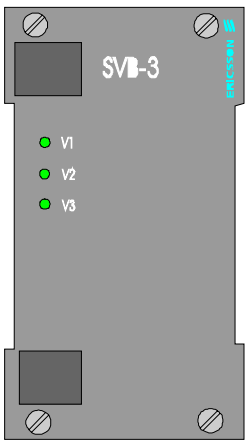
Power Supply

SUBRACK

The subrack can be supplied with DC - 36V to 72V from the exchange battery. Two power supplies can be putted in one subrack.

From the point of view of performance one power supply is sufficient for normal operation. The second power supply is redundant and is therefore used for reliability reasons.

DC Power Supply SVB-3



Input voltage range: -36V to -72V positive

The DC/DC converter is protected against reversal of the power supply polarity

LED Description:

LED: V1

Power LED for +5V supply voltage

LED: V2

Power LED for +12V supply voltage

LED: V3

Power LED for -12V supply voltage

DESKTOP UNIT

AC-Power Supply

The AC/DC converter is an external device.

Input voltage range: .....220V -10% / 230V +10%

Input frequency range: .....47 Hz - 53 Hz

DC-Power Supply

Input voltage range: .....-20V to -72V

.....The DC/DC converter is protected against reversal of

.....the power supply polarity.

HTU Line Card/ LTU

FACTORY SET-UP

The factory set-up from the HTU line card is as LTU or central unit, all bold printed set-up possibilities are the factory set-up from the LTU. It is also possible to configure the line card as NTU.

CONFIGURATION POSSIBILITIES FOR LTU

The HTU can be configured in two ways. The first and most comfortable way is with NCS from the Network Control Terminal. The second one is without NCS direct on the board.

NCS CONFIGURATION

The NCS-Configuration is possible only from the central side, if the CPU board is inserted. With the NCS system the configuration for central and remote side is possible.

For the description please see also the NCS Manual.

HARDWARE CONFIGURATION

DIL Switches

On the HTU-card are 16 DIL-switches placed (see fig.6). With this switches the set-up can be done without NCS. The switches are read out only in power-on reset.

S1	ON OFF	HTU will be configured by NCS HTU will be configured by DIL Switches	This switch defines whether or not the HTU ignores the configuration dates from the NCS terminal. If the NCS is not used the DIL switches configuration is valid in both settings
S2	ON OFF	Structured data transmission Unstructured data transmission	Defines whether the transmission is structured or unstructured. In unstructured mode the data transmission is fully transparent.
S3	ON OFF	HDB3 code on G.703 interface AMI code on G.703 interface	Defines whether the G.703 coding is AMI or HDB3
S4	ON OFF	reserved	
S5	ON OFF	T3 timing function enabled T3 timing function disabled	Defines whether or not the HDSL transmission lines synchronises to an exchange clock (T3in function). This function is used if a whole network must have the same clock.
S6	ON OFF	reserved	
S7	ON OFF	reserved	
S8	ON OFF	NTU (Remote Unit) LTU (Central Unit)	Defines whether the HTU works as central unit (LTU) or as remote unit (NTU).
S9	ON OFF	ALB button enabled ALB button disabled	Defines whether or not the ALB-push button on the front panel is enabled.
S10	ON OFF	RLB button enabled RLB button disabled	Defines whether or not the RLB push button on the front panel is enabled.
S11	ON OFF	Wetting current enabled Wetting current disabled	Defines whether or not the wetting-current function is enabled. For the wetting-current feature a DC voltage to the pins shown in Fig. 3.1.1.a have to be connected.
S12	ON OFF	AIS or AUXP signal to the DTE enabled AIS or AUXP signal to the DTE disabled	Defines whether some fault occurs AIS or AUXP is sent to the G.703 interface or the signals from the line interface were passed through transparent from the line interface.
S13	ON OFF	ALB request from TS0 enabled ALB request from TS0 disabled	Defines the controlling of the request of the analogue loop back.
S14	ON OFF	AIS at S2Mab AUXP at S2Mab	Defines in connection with S12 if AIS or AUXP is send to the DTE in a fault case.
S15	ON OFF	T3ab enabled T3ab disabled	
S16	ON OFF	G.703 clock enabled G.703 clock disabled	

Bridges

With the bridges the impedance of the G.703 can be changed between 120Ω symmetrical and 75Ω asymmetrical.
For the position of the bridges see fig.6.

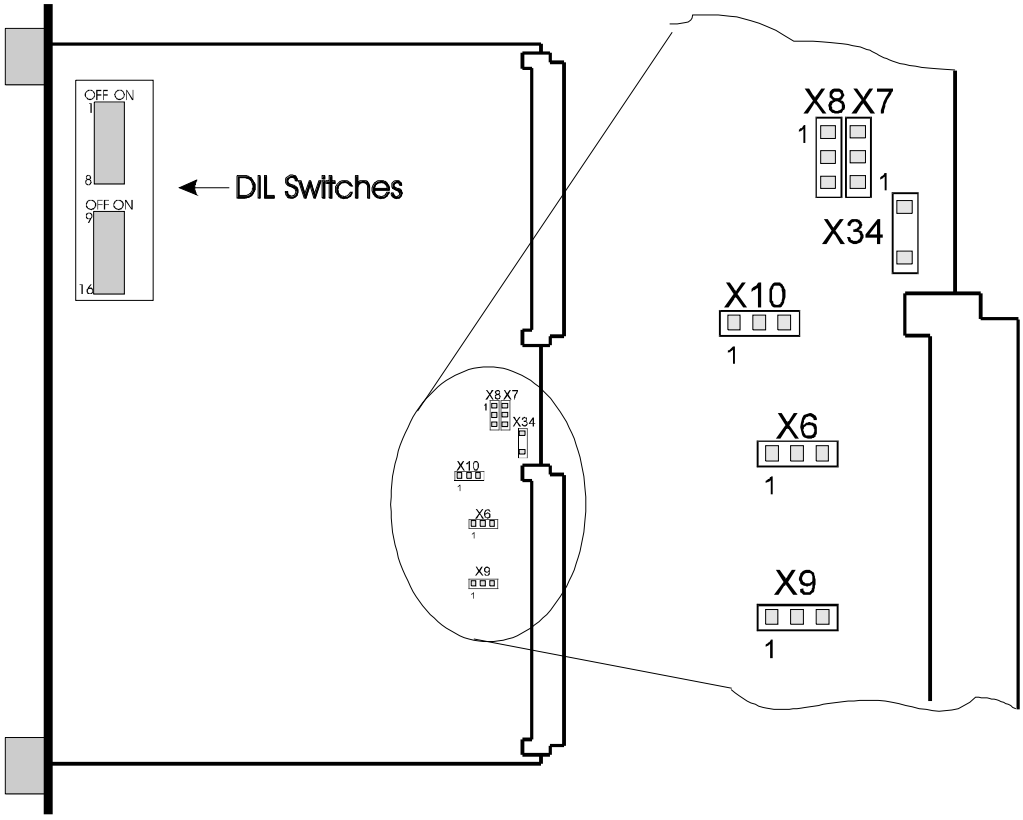


Fig.6: Bridges and DIL switches for hardware set-up of the HTU line card.

Set-up G.703:

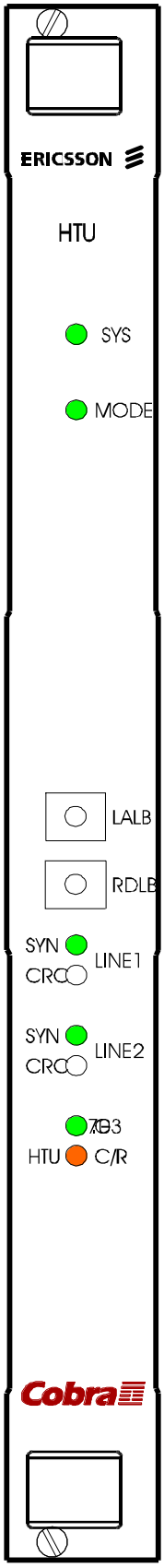
Bridges					Set-up
X6	X7	X8	X9	X10	
open	**1 - 2**	**2 - 3**	**1 - 2**	**2 - 3**	**120Ω symmetrical**
2 - 3	2 - 3	1 - 2	2 - 3	1 - 2	75Ω asymmetrical

X34	CLOSED	Rack earth connected with GND of the power supply
	OPEN	**Rack earth not connected with GND of the power supply**

FUNCTIONAL DESCRIPTION OF THE LEDS

The LEDs indicate different operation states and failures of the HDSL-line in different colours. The detailed description follows in the following points.

For a drawing of the front panel see fig.7.



LED: SYS
The SYS LED indicates two states:
a) During the start-up procedure the HTU makes a hard ware test
- if the LED is green, the hard ware is OK
- if the LED is red a hard ware error occurs
b)During the normal operation the LED indicates if the supply voltages are OK - green all voltages are OK
- red power failure

LED: MODE
If the LED is green, a normal data transfer is possible
If the LED is red, no data transfer is possible (the HTU is in a test mode).

LED: SYN LINE1
If the LED is green, the local and the remote device are synchronous on this wire pair.
AIS will be sent on the G.703 interface:
If the LED is red, there is no synchronisation on this wire pair.
If there is no LED-indication, the receive level is too low.
If the LED flashes red, a failure with the wetting current has occurred (either a short circuit or a broken cable pair).

LED: CRC LINE1
The LED flashes for 125ms red, if an CRC6 error occurs on this wire pair.

LED: SYN LINE2
If the LED is green, the local and the remote device are synchronous on this wire pair.
AIS will be sent on the G.703 interface:
If the LED is red, there is no synchronisation on this wire pair.
If there is no LED-indication, the receive level is too low.
If the LED flashes red, a failure with the wetting current has occurred (either a short circuit or a broken cable pair).

LED: CRC LINE2
The LED flashes for 125ms red, if an CRC6 error occurs on this wire pair.

LED: G.703
The following errors will be indicated with different states of the LED.
If the LED is green: normal data transmission
If the LED is red, is no synchronisation or no data signal.
If the LED flashes red, AIS signal is send

LED: HTU C/R
If the LED is green, the HTU is configured as network termination unit (NTU - remote side)
If the LED is orange, the HTU is configured as line termination unit (LTU - central side)

LED: LALB

HTU Desktop Unit

FACTORY SET-UP

The factory set-up from the HTU-board is as NTU or remote unit, all bold printed set-ups possibilities are the factory set-up from the NTU. It is also possible to configure the desktop unit as LTU or central unit to establish a point-to-point connection for the configuration see also in chapter 2.3.

CONFIGURATION POSSIBILITIES FOR NTU

The HTU can be configured in two ways. The first and most comfortable way is with NCS from the Network Control Terminal. The second one is without NCS direct on the board.

Hardware Configuration

DIL Switches

On the HTU-card 16 DIL-switches are placed (see fig.7).With this switches the set-up can be done without NCS, if the HTU is configured with NCS than the NCS configuration has priority

S1	ON OFF	HTU will be configured by NCS HTU will be configured by DIL Switches	This switch defines whether or not the HTU ignores the configuration dates from the NCS terminal. If the NCS is not used the DIL switches configuration is valid in both settings
S2	ON OFF	Structured data transmission Unstructured data transmission	Defines whether the transmission is structured or unstructured. In unstructured mode the data transmission is fully transparent.
S3	ON OFF	HDB3 code on G.703 interface AMI code on G.703 interface	Defines whether the G.703 coding is AMI or HDB3
S4	ON OFF	reserved	
S5	ON OFF	T3 timing function enabled T3 timing function disabled	Defines whether or not the HDSL transmission lines synchronises to an exchange clock (T3in function). This function is used if a whole network must have the same clock.
S6	ON OFF	reserved	
S7	ON OFF	reserved	
S8	ON OFF	NTU (SLAVE) LTU (MASTER)	Defines whether the HTU works as central unit (LTU) or as remote unit (NTU).
S9	ON OFF	Sa5 and Sa6 new Sa5 and Sa6 pass through	Defines whether the Sa5 and Sa6 bits from time slot 0 (TS0) at the G.703 interface in both directions were transparent transmitted or if they were rebuilt in the HTU
S10	ON OFF	CRC4 procedure from DTE enabled CRC4 procedure from DTE disabled	Defines whether or not the subscriber side will be informed about CRC4 errors with a bit in TS0. (CRC4 Procedure)
S11	ON OFF	CRC4 procedure to DTE enabled CRC4 procedure to DTE disabled	Defines whether or not the exchange side will be informed about CRC4 errors with a bit in TS0. (CRC4 Procedure)
S12	ON OFF	AIS or AUXP signal to the DTE enabled AIS or AUXP signal to the DTE disabled	Defines whether some fault occurs AIS or AUXP is sent to the G.703 interface or the signals from the line interface were passed through transparent from the line interface.
S13	ON OFF	ALB request from TS0 enabled ALB request from TS0 disabled	Defines the controlling of the request of the analogue loop back.
S14	ON OFF	AIS at S2Mab AUXP at S2Mab	Defines in connection with S12 if AIS or AUXP is send to the DTE in a fault case.
S15	ON OFF	T3ab enabled T3ab disabled	
S16	ON OFF	G.703 clock enabled G.703 clock disabled	

Bridges

With the bridges the impedance of the G.703 can be changed between 120Ω symmetrical and 75Ω asymmetrical. For the position of the bridges see fig.7.

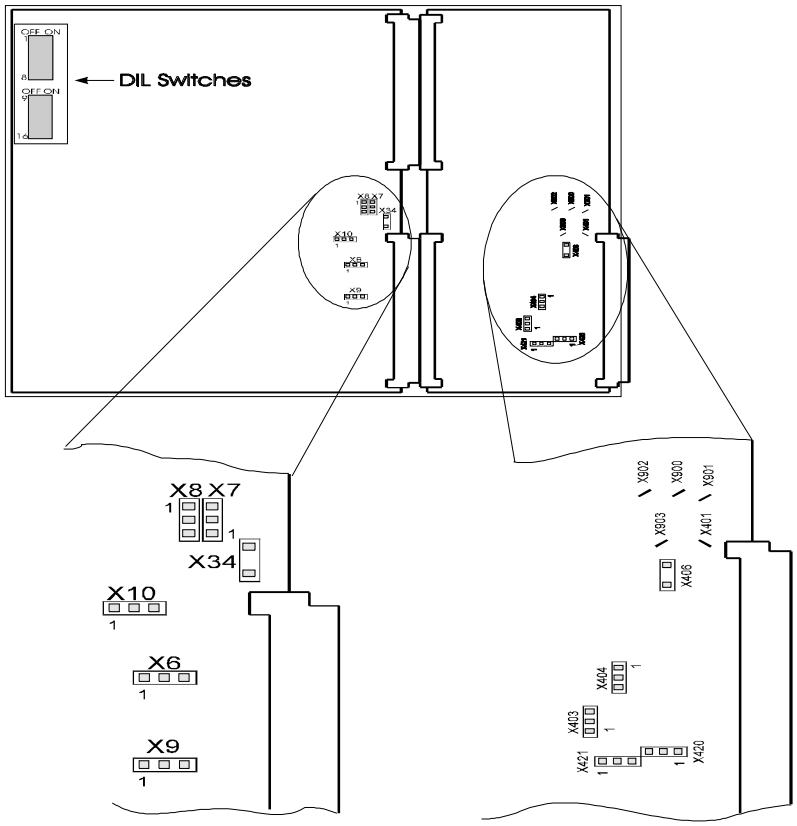


fig.7: Bridges and DIL switches for hard ware set-up of HTU desktop unit (NTU)

Set-up G.703:

Bridges					Set-up
X6	X7	X8	X9	X10	
open	**1 - 2**	**2 - 3**	**1 - 2**	**2 - 3**	**120Ω symmetrical**
2 - 3	2 - 3	1 - 2	2 - 3	1 - 2	75Ω asymmetrical

X34	CLOSED	Rack earth connected with GND
	OPEN	**Rack earth not connected with GND**

Set-up T3 clock interface:

Bridges				Set-up
T3out		T3in		
X420	X421	X403	X404	
1 -2	**1 - 2**	**1 - 2**	**1 – 2**	**120Ω symmetrical**
2 - 3	2 - 3	2 - 3	2 – 3	75Ω asymmetrical

FUNCTIONAL DESCRIPTION OF THE LEDS

The LEDs indicate different operation states and failures of the HDSL line in different states. The detailed description follows in the following points.

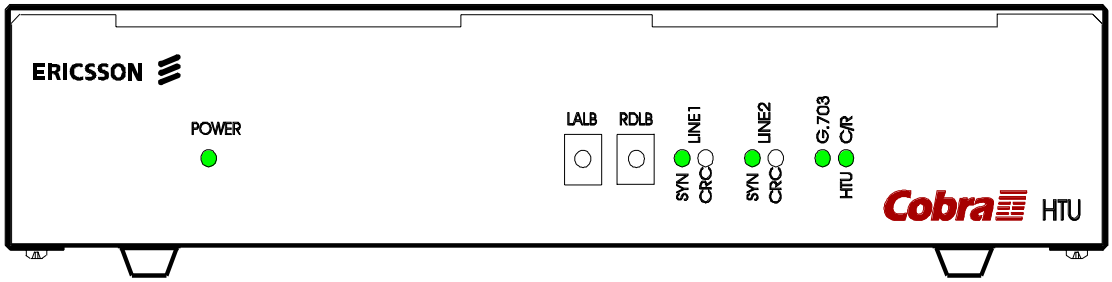


Fig.8: Front panel of the HTU desktop unit

LED: POWER

The POWER LED indicates two states:
a) During the start-up procedure the HTU executes a hardware test - if the LED is green, the hardware is OK
- if the LED is red, a hardware defect has occurred
b) During normal operation the LED indicates whether the supply voltages are OK - green: all voltages are OK - red: power failure

LED: SYN LINE1

If the LED is green, the local and the remote device are synchronous on this wire pair.
AIS will be send on the G.703 interface:
If the LED is red, there is no synchronisation on this wire pair.
If there is no LED-indication, the receive level is too low.
If the LED flashes red. a failure with regard to the wetting current has occurred (either a short circuit or a broken cable pair).

LED: CRC LINE1

The LED flashes for 125ms red, if an CRC6 error occurs on this wire pair.

LED: SYN LINE2

If the LED is green, the local and the remote device are synchronous on this wire pair.
AIS will be send on the G.703 interface:
If the LED is red, there is no synchronisation on this wire pair.
If there is no LED-indication, the receive level is too low.
If the LED flashes red. a failure with regard to the wetting current has occurred (either a short circuit or a broken cable pair).

LED: CRC LINE2

The LED flashes for 125ms red, if an CRC6 error occurs on this wire pair.

LED: G.703

The following errors will be indicated with different states of this LED.
If the LED is green: normal data transmission

If the LED is red, there is no synchronisation or no data signal.
If the LED flashes red, AIS signal is sent

LED: HTU C/R

If the LED is green, the HTU is configured as network termination unit (NTU - remote side)
If the LED is orange, the HTU is configured as line termination unit (LTU - central side)

LED: LALB

The LED is red, if the local analogue loopback is active.

LED: RDLB

The LED is red, if the remote digital loopback is active.

MECHANICAL DIMENSIONS

Height:	.....48 mm
Width:	.....239 mm
Length:	.....215 mm

PUTTING THE SYSTEM IN OPERATION

Subrack

POWER SUPPLY

Connection of power:

The DC-power is connected with connectors to the exchange battery where the positive pole is grounded (see fig.9).

Connection of wetting current

If the wetting-current feature is used then the DC-voltage has to be connected to the UBAT+ and UBAT- pins (see fig.9).

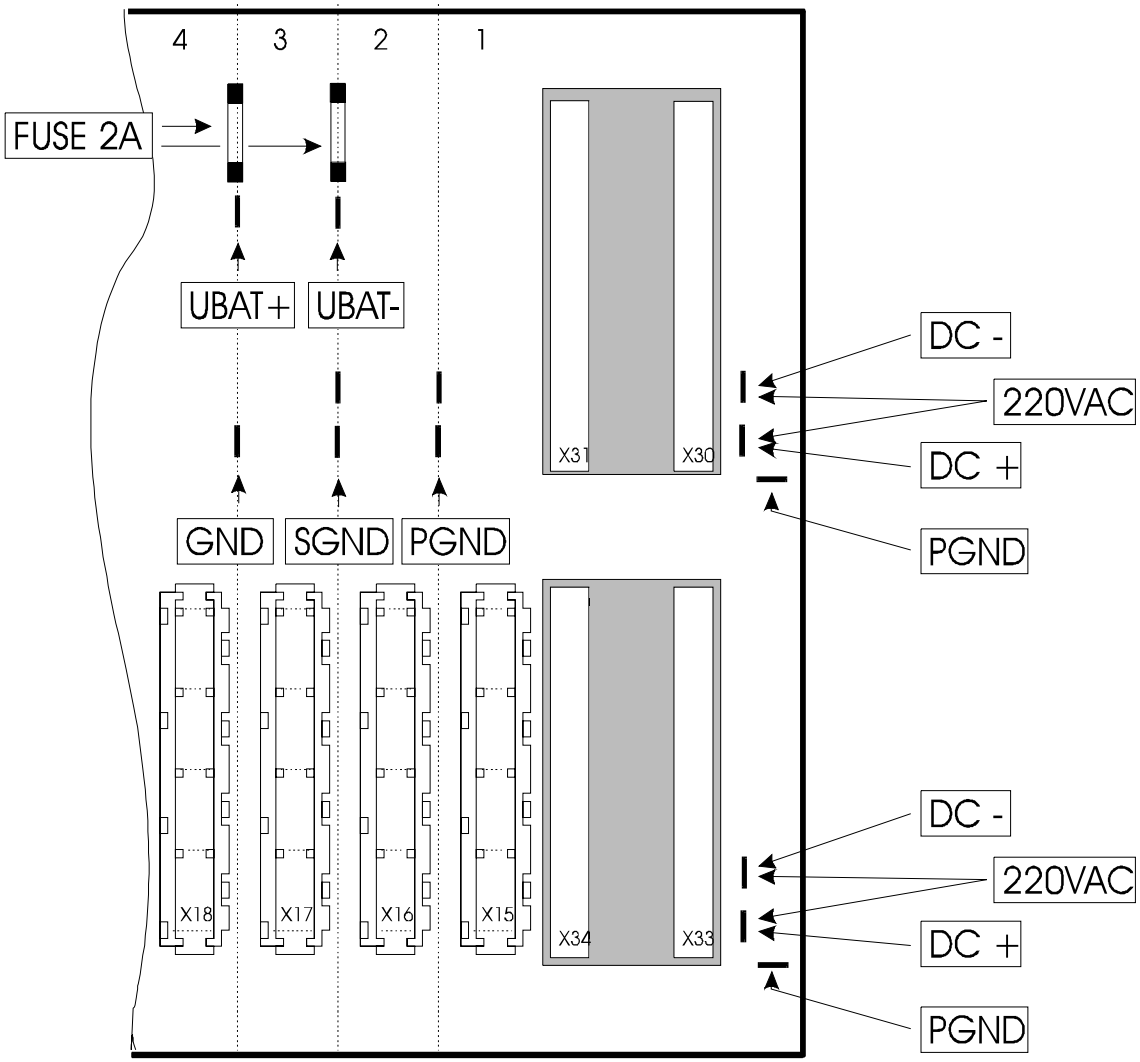


Fig.9: Back-plane of the subrack with power connection pins

HTU LINE CARD (LTU)

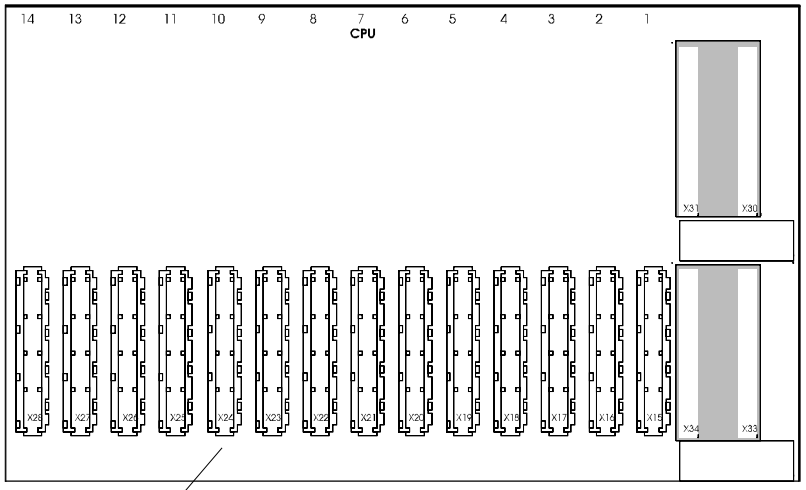
The interface connections of the exchange unit can be made with an AMP RV100 or a 96 pole DIN41612 connector. The pinning of the connectors for HDSL line, G.703 and clock interface is explained in fig.10.

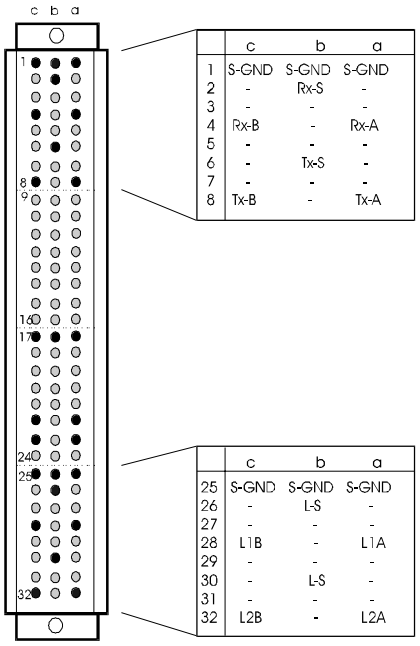
Connection of the HDSL lines:

The cables of the HDSL-line are polarity independent and the two lines can be mixed. This means that the HDSL-line 1 at the central HTU can be connected to line 2 at the remote HTU and the other way round.

Connection of the G.703 interface:

Depending on the impedance of the interface. (120Ω or 75Ω).





	c	b	a
1	S-GND	S-GND	S-GND
2	-	Rx-S	-
3	-	-	-
4	Rx-B	-	Rx-A
5	-	-	-
6	-	Tx-S	-
7	-	-	-
8	Tx-B	-	Tx-A

	c	b	a
25	S-GND	S-GND	S-GND
26	-	L-S	-
27	-	-	-
28	L1B	-	L1A
29	-	-	-
30	-	L-S	-
31	-	-	-
32	L2B	-	L2A

Pin description of the Subrack connector:
S-GND..... Screen ground
Rx-A ..... G.703 read data
Rx-B ..... G.703 read data / Rx ground with 75Ω
Rx-S ..... Shield of read data
Tx-A..... G.703 transmit data
Tx-B..... G.703 transmit data / Tx ground with 75Ω
Tx-S..... Shield of transmit data
L-S..... Shield of HDSL transmission line
L1A..... HDSL-line 1
L1B..... HDSL-line 1
L2A..... HDSL-line 2
L2B..... HDSL-line 2

Fig.10: Pinning of the subrack connector of the HTU/E

CPU-CARD

Connection of NCS

The CPU-card is only necessary if the optional NCS or the alarm contacts are used. The NCS PC can be connected over a RS232 interface with a DB9 connector at the front panel of the CPU card, or with a connector at the back plane of the subrack (see fig.11). If both positions are connected, the connector of the front panel has priority.

If more than one subrack has to be supervised, the RS485 interface of each subrack should be connected with a twisted and shielded 120Ω cable. (see fig.11)

Pay attention that at the beginning and at the end of the RS485 bus a 120Ω final resistor is connected.

Connection of the alarms

In connection with the CPU-card one alarm contacts available. (see fig.11)

Connection of the clock

If the T3in feature is used the clock should be supplied in a G.703 format with 75Ω or 120Ω depending of the pinning. (see fig.11)

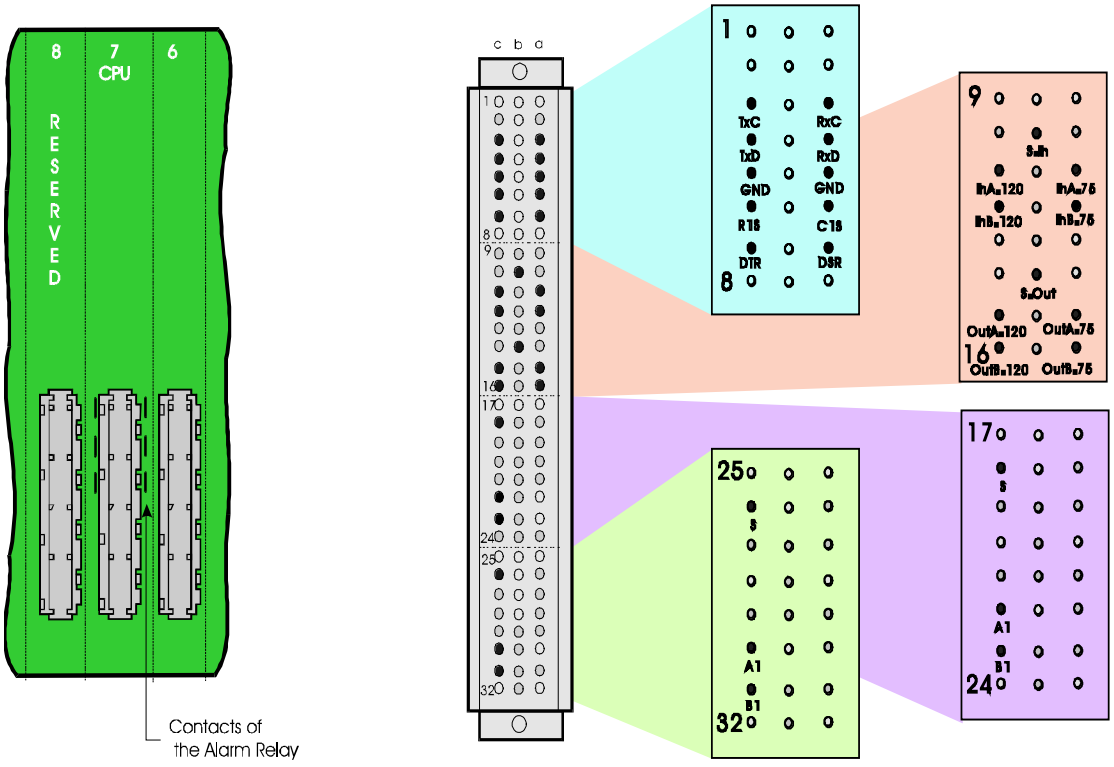


Fig.11: Pinning of the subrack connector of the CPU-card and relays contacts

Pin description of the CPU card connector:

RS232 interface:		T3in clock interface:	
TxC	Transmit clock	InA-120	Receive clock with 120
RxC	Receive clock	InB-120	Receive clock with 120
TxD	Transmit data	OutA-120	Transmit clock with 120
RxD	Receive data	OutB-120	Transmit clock with 120
GND	Ground	InA-75	Receive clock with 75
RTS	Request to send	InB-75	Receive clock with 75
DTR	Data terminal ready	OutA-75	Transmit clock with 75
CTS	Clear to send	OutB-75	Transmit clock with 75
DSR	Data set ready	S-In	Shield for receive clock
		S-Out	Shield for transmit clock
RS485 bus:			
S	Shield of RS485 bus		
A1	Line 1		
B1	Line 2		

HTU Desktop Unit

The interface connections of the desktop unit can be made with an AMP RV100, 96 pole DIN41612 connector or the optional adapter box. The pinning of the connector for HDSL-line, G.703 and clock interface is explained in fig.12.

Connection of the HDSL lines:

The cables of the HDSL-line where polarity-independent and the two lines can be mixed. This means that the HDSL-line 1 at the central HTU can be connected to line 2 at the remote HTU and the other way round.

Connection of the G.703 interface:

Depending on the impedance of the interface (75Ω or 120Ω).

Connection of the clock interface:

The connection of the clock interface is a additional feature. In case of normal 2Mbps transmission it is not necessary.

If the clock interface is used, then the connection procedure is the same as in the G.703 interface.

Connection of the power supply:

The connection of the power supply is explained in fig. 13, the AC-power supply has already been connected in the factory on the pins X900 and X901. The DC power can be connected instead of the AC-power on the pins X902 with the negative or "-" potential and on X903 with the positive or "+" potential. The DC/DC-converter of the desktop unit is protected against reversal of the DC power.

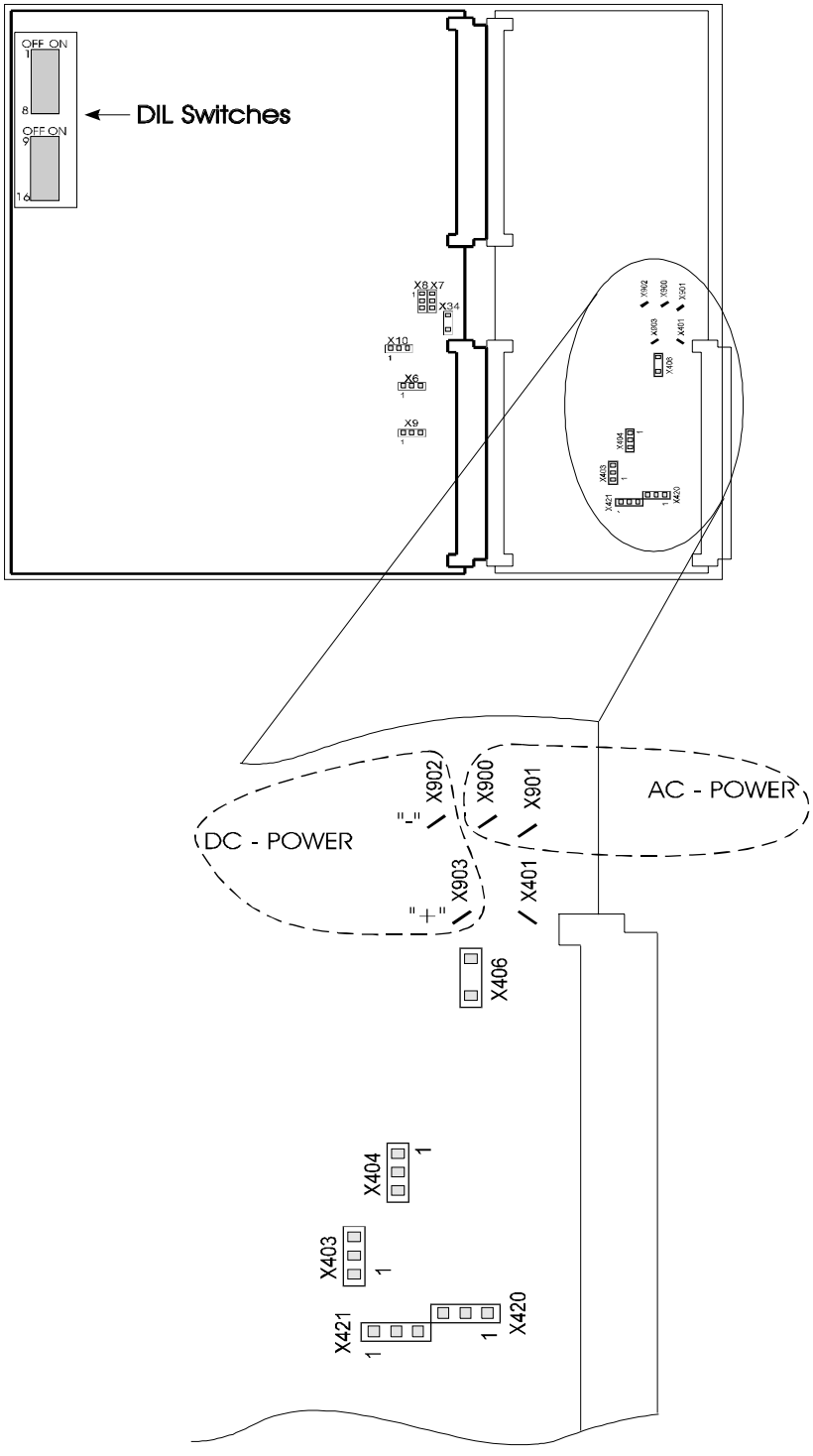


Fig.12: Connection of the power supply

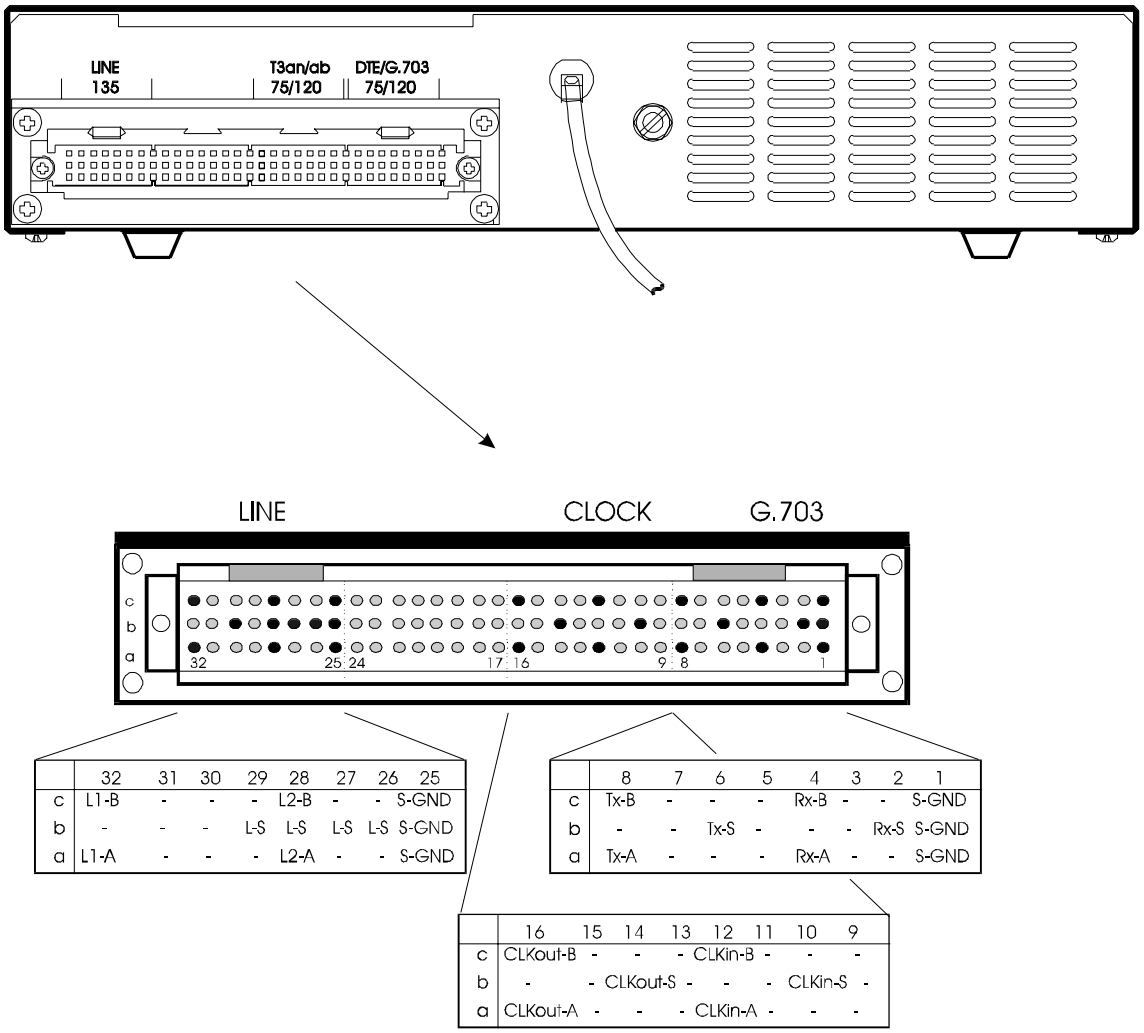


fig.13: Pinning of the desktop unit connector

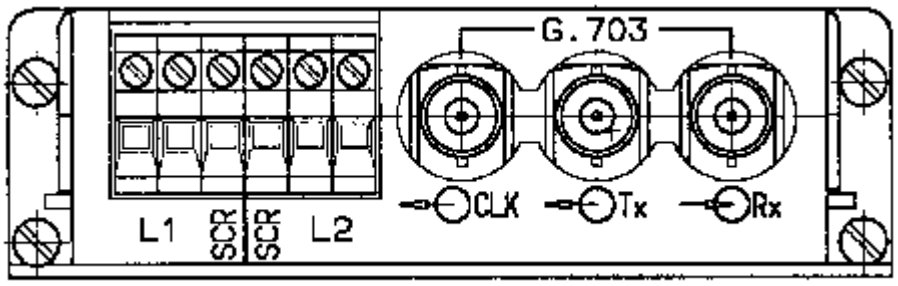
Pin description of the Subrack connector:

S-GND	Screen ground
Rx-A	G.703 read data
Rx-B	G.703 read data / Rx ground with 75Ω
Rx-S	Shield of read data
Tx-A	G.703 transmit data
Tx-B	G.703 transmit data / Tx ground with 75Ω
Tx-S	Shield of transmit data
L-S	Shield of HDSL transmission line
L1A	HDSL-line 1
L1B	HDSL-line 1
L2A	HDSL-line 2
L2B	HDSL-line 2

Pinning of the adapter boxes

For the easier connection of the lines we have designed two optional adapter boxes. For 75Ω asymmetrical G.703 interface with BNC, and for 120Ω symmetrical G.703 interface with a sub-D connector.

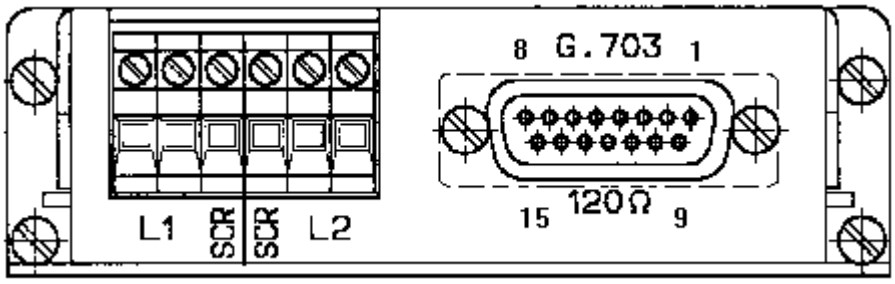
ADAPTER BOX 75Ω ASYMMETRICAL



Pin description of the adapter box:

HDSL line connector		G.703 connector
L1	HDSL line 1	Rx ..... G.703 read data
SCR	Screen ground line 1	Tx..... G.703 transmit data
SCR	Screen ground line 2	CLK..... G.703 transmit clock 2,048MHz
L2	HDSL line 2	

ADAPTER BOX 120Ω SYMMETRICAL



Pin description of the adapter box:

HDSL line connector		G.703 connector
L1	HDSL line 1	Pin 1 ...Read data Rx-A
SCR	Screen ground line 1	Pin 9 ...Read data Rx-B
SCR	Screen ground line 2	Pin 2 ...Shield of read data Rx-S
L2	HDSL line 2	Pin 3 ...Transmit data Tx-A
		Pin 11 .Transmit data Tx-B
		Pin 10 .Shield of transmit data Tx-S
		Pin 8 ...G.703 transmit clock CLKout-A
		Pin 15 .G.703 transmit clock CLKout-B
		Pin 7 ...Shield of transmit clock CLKout-S

ABBREVIATIONS

AIS	Alarm Indication Signal
ALB	Analogue Loop Back
F1	Application (G.703) Interface
F2	Line Interface
G.703	CCITT G.703 Interface
G.704	CCITT G.704 frame structure and signalling like a PCM30
HDSL	High-Bit rate Digital Subscriber Line
HTU	HDSL - Transmit Unit
LED	Light Emitting Diode
LTU	Line Termination Unit
NCS	Network Control System
NTU	Network Termination Unit
RLB	Remote Loop Back

Product Description for

Ericsson HDSL

Network Control System HTU

PU Access and Product Offerings
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Fax: +43 1 81100-6566
Email: copper.enhancement@sea.ericsson.se

Table of Content

SYSTEM DESCRIPTION

The system HTU is a 2-pair (4-wire) HDSL based transmission system to provide 2 Mbit/s services via standard copper access network for high speed access to telecommunication networks. It offers great flexibility in installation and operation because it is possible to use any standard copper cable without using repeaters for a maximum distance of 10 km depending on the cable diameter. The data terminal interface used is the G.703 interface. The HTU can be controlled and configured via the NCS (Network Control System).

The **ERICSSON AUSTRIA Network Configuration System** software, **FX-NCS**, is a general use-able network management system with the capability to manage network elements which are generally based on the ERICSSON AUSTRIA FX-Basic Unit.

The heart of an HDSL-subrack is an additional board, the so-called FX-CPU-card, providing for configuration and control over the local exchange sited LTU-boards as well as over the customer-sited NTU-boards and communication with the HDSL element manager. Therefore the FX-CPU card acts as **subrack management function (HDSL-SMF)** inside one HDSL-subrack.

Overview

HTU	The HTU transmission system consists of the following parts:

- HTU line card — Line card unit which is located in the subrack
- HTU desktop unit — table unit

HTU-SR	The HTU subrack consists of the following parts:

- HTU-SR — 19“ subrack (to plug in the line cards)
- SVB3 — DC power supply unit

optional:

- NCS — Network Control System software
- CPU card — NCS controller card

Short description of the system

HTU LINE CARD

The HTU line card is the system to be installed at the exchange site into the 19“ subrack type HTU-SR (BGTR) or the ETSI subrack type HTU-SR/E (BGTR/E).

HTU DESKTOP UNIT

The HTU is the table-top unit for indoor mounting to be installed next to the subscriber premises.

HTU-SR

The HTU-SR (BGTR) is the 19“ subrack with a capacity of 12 HTU line cards.

The HTU-SR/E (BGTR/E) is the subrack in compliance with the ETSI standard with the capacity for 12 HTU line cards.

The SVB 3 is the central power supply unit to be installed into the subrack. The subrack can house up to two power supply units for full power supply redundancy. For each six line cards at least one power supply is used.

The optional CPU-card is a plug-in card for the subrack and is the hardware required to run the NCS (Network Control System) software for operation & maintenance of the HTU-system.

NCS

The Network Control System (NCS) is the operation & maintenance software to control the HTU-system.

Please note: The PC required to run the NCS software is not a component of the HTU system and therefore not included in any offer or delivery.

Abbreviations

LTU	Line Termination Unit
NTU	Network Termination Unit
FX-CPU	the same as HDSL-SMF
HDSL-SMF	HDSL-Subrack Management Function
FU	Function Unit (a board inserted into FX-subrack, e.g. LTU)
HDSL-NCS	HDSL-Network Configuration System
HDSL-NCS-PC	Personal Computer running NCS software
HDSL-system	An entity of one LTU and NTU

NETWORK TOPOLOGY

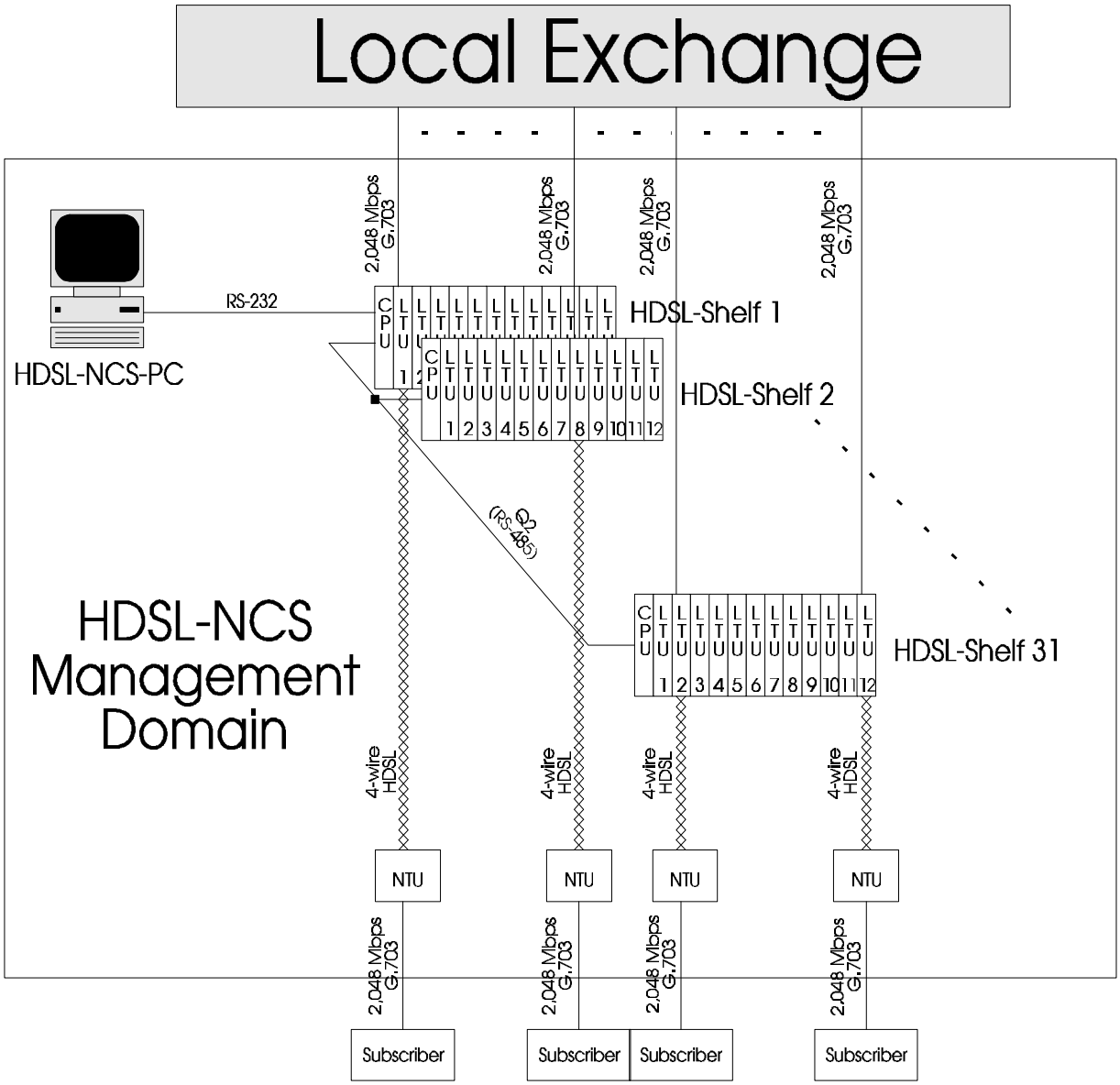

fig.1: HDSL-Network Configuration System's Management Domain

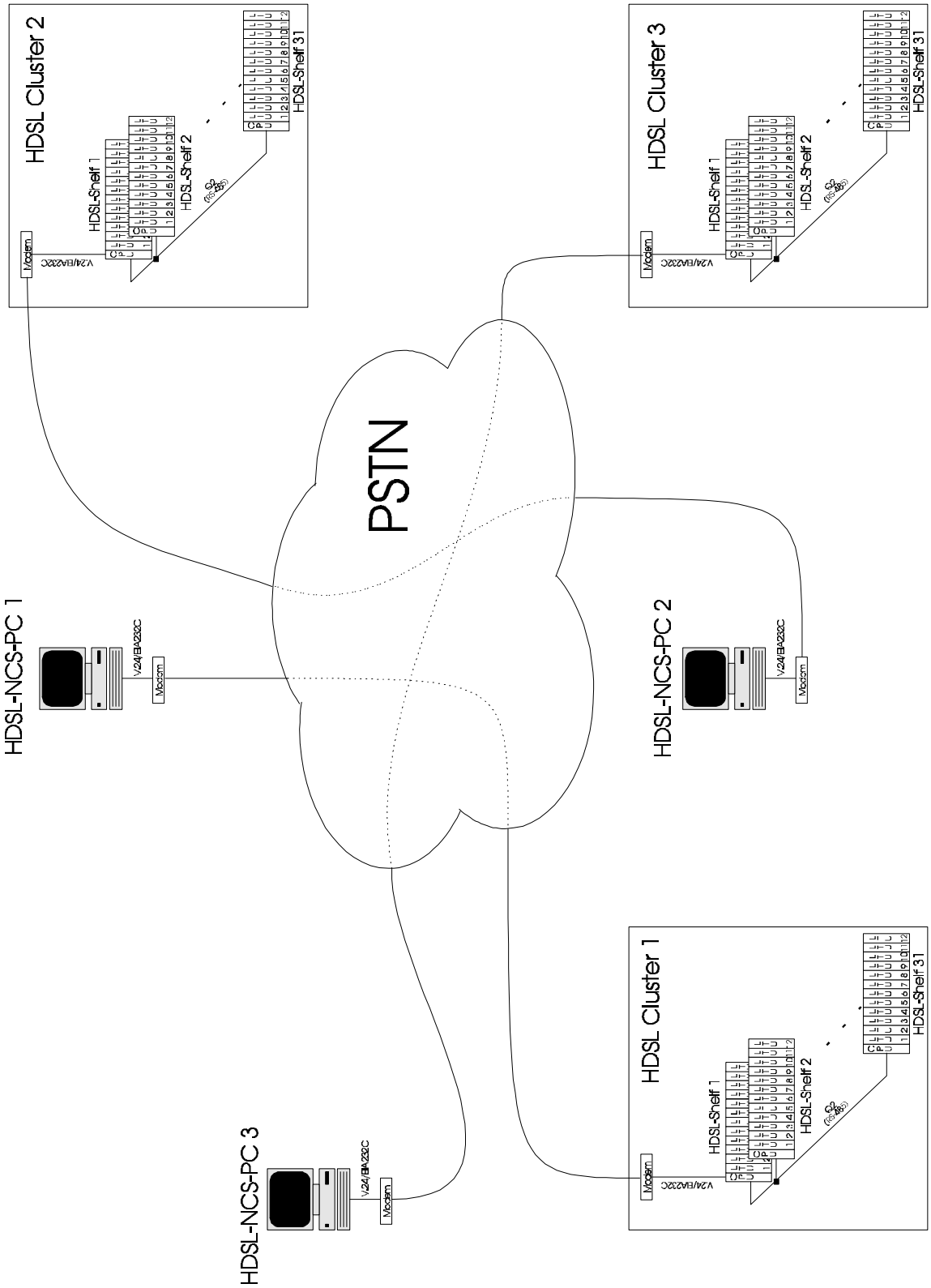

fig.2: Network Configuration at Higher Network Size and Simultaneous Sessions

Up to 31[1] HDSL-subracks can be interconnected via one Q2-bus (standard 2-wire RS-485-bus). These HDSL-subracks form a manageable **HDSL-cluster** and therefore the management domain of the HDSL element manager (NCS-PC) (see fig.1). The NCS-PC can transparently access each subrack of the cluster and its plug-in cards. If network size increases, the entire HDSL-network is subdivided into several HDSL clusters, each consisting of up to 31[1] HDSL subracks (see fig.2).

Since each HDSL-subrack can have up to 12 LTU plug-in cards inserted, the maximum number of LTU-boards per cluster manageable by one NCS-PC is 372.

The NTUs can be controlled indirectly by accessing the corresponding LTU-board, which uses the Embedded Operation Channel (EOC) to control and monitor the remote unit.

The NCS-software is running on an IBM-compatible PC, which acts as operator terminal and is connected to the CPU-board of one centrally located HDSL-subrack via a standard serial RS-232-interface. The NCS-PC can be connected directly to the CPU-card as well as remotely from the HDSL-equipment by using any bit-transparent data-transmission service (e.g. dial-up modem)[2].

Generally, each HDSL-cluster will be managed by exactly one NCS-PC. Accessing one HDSL-cluster with several NCS-PCs simultaneously is not possible and suitable for this configuration. Such access conflicts are automatically handled by PSTN, because only one PC can communicate with one cluster at the same time[2].

Otherwise, the number of NCS-PCs managing the overall HDSL-network simultaneously is equal or less the number of HDSL-clusters the overall HDSL-network is subdivided into.

Furthermore, it is possible to manage the overall HDSL-network with a single NCS-PC, but it shall be noted that one NCS-PC can access only a single HDSL-cluster (up to 31[1] HDSL-subracks) at once[2].

Note 1: For future implementations the number of HDSL-subracks per cluster can be increased.

Note 2: For future implementations remote access of the HDSL-equipment via X.25 PSS network with all its features will be possible.

USER GUIDE - GENERAL

Start of the NCS program

As any other MS-Windows application, the NCS program may be started by a double-click on the icon of the NCS program in the PROGRAM MANAGER or by a double-click on the file name NET.EXE in the FILE MANAGEMENT.

If the program was started successfully, the main window will be maximized.

In the following cases the start of the NCS program might not be successful:

- the PC does not have enough RAM
- as other programs are active simultaneously under MS-Windows needing much memory space, there is not enough RAM left for the NCS program
- MS-Windows has been started in 'Real Mode', not in 'Protected Mode'

Main Window (network window)

Immediately after starting the program, the main window will be maximized and the NCS-PC icon will be displayed.

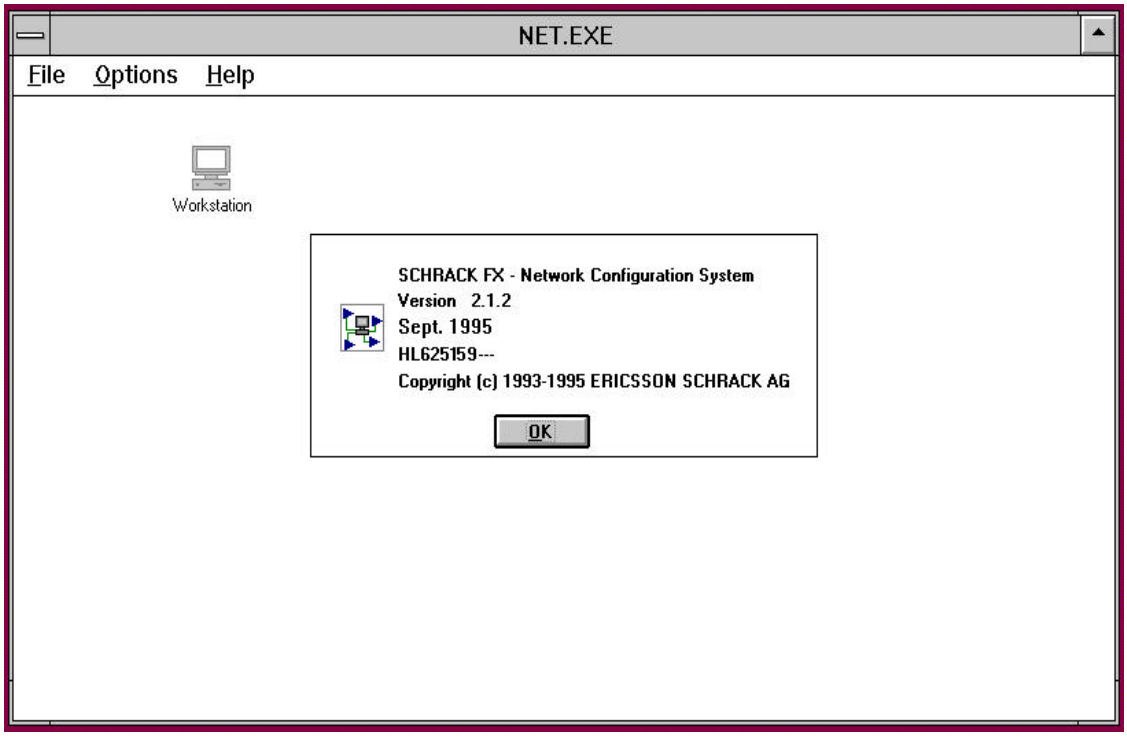

fig.3: Network window after start of program

DISPLAY OF THE NETWORK

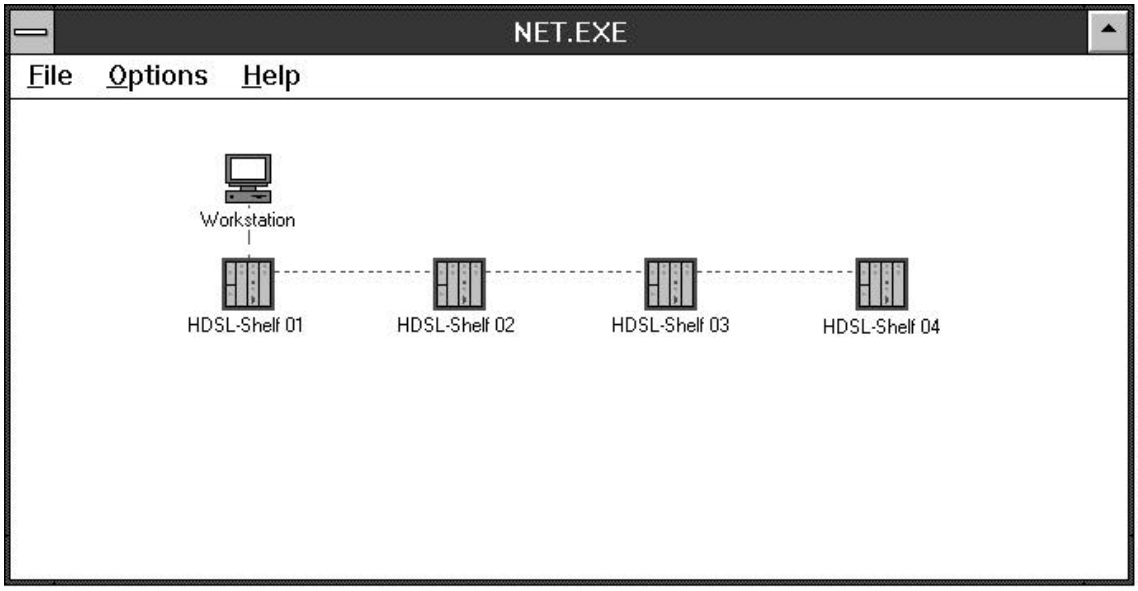

fig.4: Display of the network in the network window

In the network window the network and its elements are displayed together with their error and test conditions as well as their designations and NMS interconnections.

There are two types of network elements:

- the NCS-PC designated **workstation**
- the Ericsson FX-Basic Unit rack designated Ericsson **FX-BASIC UNIT** (factory setting)

The NCS program supports three types of NMS connections:

- RS-232 connection between the PC and the network element connected to it (**broken line**, starting point in the center of the network element icon, point-to-point)
- Inband NMS connection (**full line**, starting point in the lower left corner (for NMS channel 1) or in the lower right corner (for NMS channel 2) of the network element icon, point-to-point)

EURO ISDN multiplexer and analog front-end multiplexer application:

The display of the inband NMS channel 1 corresponds to link 1, that of inband NMS channel 2 to link 2 between DLINK cards.

- RS-485 connection (**pointed line**, starting point in the center of the upper half of the network element icon, bus)

Directly below the PC symbol, the network element connected to it via the RS-232 line is displayed. Network elements which are connected to inband NMS channel 1 are displayed on the left side below the element. Network elements which are connected to inband NMS channel 2 of an element are displayed on the right side below the element. Network elements of a Q2-(RS-485) bus system are displayed horizontally side by side.

If network elements are connected via several lines, it is not possible to keep the above-mentioned rules. After completion of auto configuration some network configurations may cause two network elements to be displayed one above the other. You may recognize this by the fact that the name displayed directly below the network element cannot be read. You may move one of the network elements as described under point 3.2.3.

SELECTION OF NETWORK ELEMENTS

After completion of auto configuration no network element is selected. A network element may be selected by a click of the left mouse button on the icon. For this network element, e.g. the command **Polling** may be selected in the menu **Options**. A selected network element is displayed by a colored name box.

In order to be able to configure a network element and to poll its status,

- you have to double-click the icon with the left mouse button.

Then, the rack window will be opened, in which you may set all configuration and polling activities (see chapter 3.3).

MOVING NETWORK ELEMENTS AND ELEMENT NAMES

If the network display generated by the auto configuration does not fit, the positions of the network elements and element names may be changed by means of the so-called Drag & Drop mechanism.

- position the mouse pointer on the element icon.
- press the left mouse button and move the icon holding the left mouse button.
- release the left mouse button as soon as the icon is in the selected position.

When moving a network element, its name is moved along as well. If you only want to change the position of the element name, execute the Drag & Drop procedure for the element name box.

DISPLAY OF LARGE NETWORKS

In case of larger networks (e.g. several network elements on one Q2 bus), the auto configuration cannot display all symbols in the network window. In order to be able to access also the invisible network elements, proceed according to the following steps:

- Choose **Restore** on the right side of the Title bar of the main window.

The main window will be displayed in the size chosen by MS-Windows. In addition, the horizontal and/or vertical scroll bar of the main window is displayed.

- By means of these scroll bars, you may go to the other element icons.
- By moving the icons, you may reduce the size of the network to such an extent that the entire network may be displayed in the network window.
- After changing the element positions, choose "**Maximize**" on the right hand side of the Title bar.

Please note! The number of the network elements that may be displayed on the screen or in the network window depends on the network configuration as well as on the monitor and its resolution.

DISPLAY OF ERROR AND TEST CONDITIONS IN THE NETWORK WINDOW

According to the color scheme, CPU and function unit error and test conditions as well as NMS protocol error conditions of racks are displayed in the network window.

CPU AND FUNCTION UNIT ERROR CONDITIONS

According to the alarm scheme, the alarms WARNING and ERROR and a non-alarming network element are displayed in the network window as follows:

- WARNING — the network element icon is yellow-rimmed.
- ERROR — the network element icon is red-rimmed.
- NORMAL — the network element icon is green-rimmed.

A network element icon shows an alarm by means of the corresponding color rim, as long as at least one function unit indicates an alarm to the NCS program.

TEST CONDITIONS OF FUNCTION UNITS

- TEST ON — the network element icon is displayed in blue.
- TEST OFF — the network element icon is displayed in light-gray.

A network element icon shows a test condition by means of the corresponding coloring as long as at least one function unit is in a test condition.

PROTOCOL ALARMS

In the network window, only protocol alarms with the priority ERROR are displayed.

Layer 2 - error:

- LAYER2-ERROR: — the PC icon is displayed in yellow
  the network element icon is displayed in red.
- NORMAL and
- TEST OFF: — the PC icon is displayed in light-gray
  the network element icon is displayed in light-gray.

Layer 6 - error:

- LAYER6-ERROR: the network element icon is displayed in red.
- NORMAL and
- TEST OFF: the network element icon is displayed in light-gray.

Protocol alarms are displayed and overwrite the text display of the network element in the network window until a packet may again be transmitted successfully and is acknowledged correctly by the respective CPU -card.

MENUS OF THE NETWORK WINDOW

CREATION OF NETWORK ACCESS

You will get access to the network if you proceed according to the following steps:

- From the **File** menu, choose **Login**.
- The dialog window **Login** will be displayed.
- Optionally, this window may be chosen by double-clicking the NCS-PC icon.

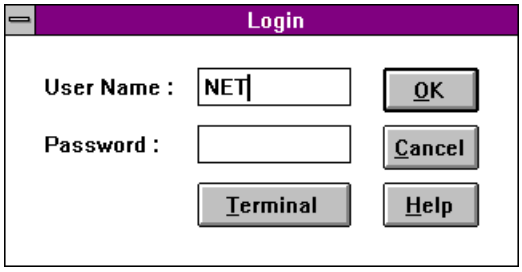

fig.5: Dialog Window Login

- Type **NET** or **LOCAL** into the field **User Name**.

By writing **NET**, you are authorized to configure and supervise the entire network,. By writing **LOCAL**, you may only access the rack to which your PC is connected.

If you leave this field empty, **LOCAL** is chosen automatically.

- In the field **Password**, a valid password has to be entered. A detailed description is given in the next chapter. If an unknown password is entered, the program indicates an error message.

If the NCS-PC is directly connected to the CPU-card of the rack,

- choose "**OK**".

You are now logged into the NCS program and auto configuration is started automatically. During auto configuration you cannot make any entries. By pressing the **Esc** key, however, auto configuration can be canceled.

If the PC is in remote connection to a rack (e.g. via ISDN),

- do not choose "**OK**", but choose **Terminal**.

Only the terminal program is started which is entered in the NET.INI file.

In the following you will find a description of how an ISDN connection to the Ericsson TA V.24 - 2 terminal adapter and the MS-Windows terminal program TERMINAL.EXE and its configuration file TAV24.TRM may be set up.

- From the **Setting** menu, choose **Telephone Number**.

The dialog window **Telephone Number** will be displayed.

- Into the field **Dial**, enter the number of the (ISDN) extension to which the remote rack network is connected.
- Choose **OK**.
- By choosing **Dial** in the **Telephone** menu the dialing process is executed.

The terminal adapter dials the number. A successful connection is indicated by the terminal adapter with **CONNECT**. If the connection cannot be set up, the terminal adapter indicates **NO CARRIER** and a number (the meaning of this number is described in the manual of the terminal adapter).

- From the **File** menu, choose **Exit**.

Before exiting the terminal program, a dialog window is displayed, by which you may clear down the existing data connection. Do **not** clear down the connection, and

- choose **No**.

Again, the dialog window **Login** of the NCS program will be displayed.

If it was possible to set up a data connection to the terminal program,

- choose **OK**.

As in the case of a direct connection, the auto configuration is started.

If it was not possible to set up a data connection,

- choose **CANCEL**.

STARTING OF AUTO CONFIGURATION

After accessing the network, an auto configuration is started automatically.

It is possible to repeat the auto configuration at any time in log-in state.

- From the **File** menu, choose **New**.

An auto configuration attempt is successful if the NCS program finds at least one network element. An unsuccessful auto configuration attempt is indicated by a yellow PC icon.

Abortion of the network access

Before leaving the NCS program, you have to cancel the network access and to log off from the NCS program.

- Choose **Logout** from the **File** menu,.

This command deletes the entire network in the network window.

If the NCS-PC is connected to a remote network (e.g. via ISDN), the terminal program registered in the file NET.INI is evoked.

End the existing data connection by

- choosing **Replace** from the **Telephone** menu.

If you use for example the SCHRACK Terminal Adapter TA V.24 - 2 for an ISDN connection, the adapter releases the connection and acknowledges this by **OK** and **NO CARRIER** as well as a number.

In order to abort the terminal program,

- choose **Exit** from the **File** menu.

Now you are again in the NCS program and the main window is displayed as shown in fig.3.

LEAVING THE PROGRAM

In order to leave the NCS program,

- choose **Exit** from the **File** menu.

Please note! The NCS program may only be ended after your logging-off from the NCS program by the command **Logout**.

ASSIGNING PASSWORDS AND AUTHORIZATIONS

Version V2.1.2 supports 2 levels of rights of access.

1st level (low) no setting changes possible
only display of status windows and performance diagrams
no possibility to assign passwords

2nd level (high) all functions are available
it is possible to assign new passwords.

It is only possible to change the two passwords at level 2. A password has to have the following characteristics in order to be accepted:

at least 3 characters
at most 10 characters

only letters and numbers, any combination thereof.

It is not permitted to assign the same password to both access levels. In case of a faulty entry, an error message is indicated and the procedure has to be repeated.

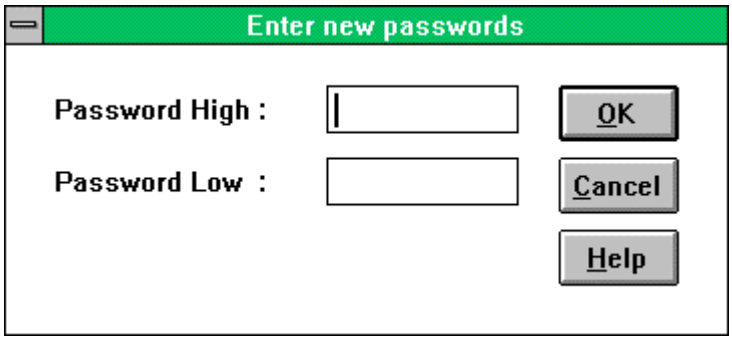

fig.6: Dialog Window changing of passwords

At the first installation, the password of the 2nd level is „**high**“. It is recommended to change the passwords right away, by choosing **Options/Passwords**.

If the passwords are changed or deleted in the NET.INI file, access no longer is possible. It is necessary to newly install the NCS program on the PC.

SETTING OF POLLING AND TIMEOUT INTERVALS

The NCS software allows to set polling and time-out intervals for each individual network element.

- Select the network element for which polling and time-out intervals are to be changed.
- From the **Options** menu, choose **Polling**.

The dialog window **Polling & Time-out** will be displayed.

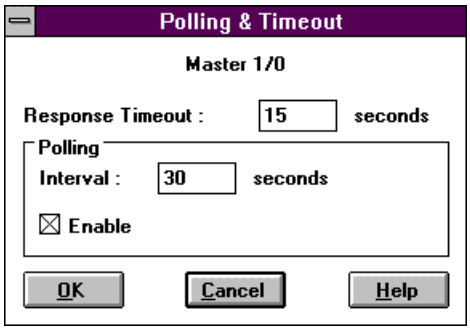

fig.7: Dialog Window Polling & Time-out

- In the field **Response Time-out**, it is possible to set (in seconds) the time which the NCS program waits for a valid answer from the network element after packet transmission before indicating an error message.
- The setting limits for this value are determined at the one hand by the address length of this network element (minimum value) and on the other hand by the polling interval

(maximum value). If this value is beyond the limit, after choosing **OK**, you are requested to re-enter the value.

- It is possible to change the Polling Interval (in seconds) for this network element in the field **Interval**. The lower limit of this setting is determined by the address length of the network element.

If "Polling" is to be deactivated for the selected network element,

- do not click option **Enable Polling**.

Please note! If "Polling" is deactivated, there is **no cyclic status request for this network element**, which means that the alarm indication on the screen does not correspond to the current status of the network element.

- Choose **OK**.

Please note! Polling Interval and Response Time-out are adjusted optimally during auto configuration of the NCS program and should not be changed by the user. Polling and time-out intervals that are too short might lead to a bottleneck in the data transmission between NCS-PC and the network, by which more protocol errors are indicated on the NCS-PC.

POLLING ACTIVATION AND DEACTIVATION

In order to activate or deactivate the cyclic status request for **all** network elements,

- choose **Polling Off** from the **Options** menu.

"Polling" is deactivated if a check mark appears next to the menu item, otherwise "Polling" is activated.

Please note! If "Polling" is deactivated, there is **no cyclic status request for all network elements**, which means that the alarm indication on the screen does not correspond to the current status of the network.

INDICATION OF THE SERIAL NUMBER

- From the **Help** menu, choose **About**.

A dialog window will be displayed which indicates the following information:

- NCS software version
- creation date of the NCS software
- Ericsson item number of the NCS software
- name of user or office
- name of the company of the user
- serial number of the software package

Rack Window

This window displays a network element as rack, its disposition of function units and their alarms. In this window, the following actions may be taken:

- configuration of the Ericsson FX-Basic Unit (CPU-card) and of the function units
- status request of the Ericsson FX-Basic Unit and the function units
- placing of alarm filters
- resetting of alarms
- reboot of the CPU card and of individual function units
- several tests of the individual function units

In order to open the rack window of a specific network element,

- double-click the icon of the network element with the left mouse button.

DISPLAY OF THE RACK

The following figure displays the window of a rack which is used for a EURO ISDN multiplexer application and at the same time for an analog front-end multiplexer application. In addition, at this application, the 2 Mbit/s links of the FX-DLINK are extended via HDSL links (a "Cobra" line product).

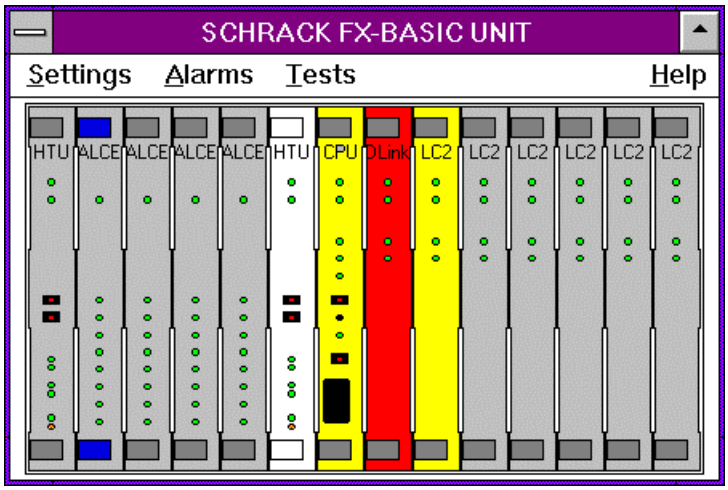

fig.8: Rack Window

DISPLAY OF ERROR AND TEST STATUSES IN THE RACK WINDOW

According to the color scheme, CPU as well as function unit alarms, the NCS status of function units and NMS protocol alarms are indicated in the rack window by means of a change in color of the individual plug-in boards.

CPU AND FUNCTION UNIT ERROR CONDITIONS

According to the alarm plan the alarms WARNING and ERROR, a non-alarming CPU or function unit as well as a function unit with latched alarms are displayed in the rack window as follows:

- ALARMS DISABLED: the front panel of the function unit is displayed in white.
- WARNING: the front panel of the CPU-card or the function unit is displayed in yellow.
- ERROR: the front panel of the CPU-card or the function unit is displayed in red.
- NORMAL: the front panel of the CPU-card of the function unit is displayed in light-gray.

The NCS program indicates an alarm of a plug-in board by means of the corresponding color until the alarm in the respective card is recovered. In the Latched Register Mode this alarm has to be acknowledged by the user by opening the respective status window, or by choosing **Clear Alarms** from the **Alarms** menu .

FUNCTION UNITS NCS STATUS

According to the color scheme, the NCS status of a function unit will be displayed as follows:

- NCS OFF: the **handles of the CPU-card or the function unit** are d displayed **in white**. Moreover, the **front panel of the CPU-card** **or the function unit** is displayed **in white**, as they are not included in the alarm system due to the NCS OFF function.

A user may not switch a CPU-card into the NCS OFF status. A CPU-card is automatically in the NCS OFF status if a protocol alarm with the priority ERROR has occurred.

- NCS ON: the **handles of the CPU-card or function unit** are displayed **in** **dark-gray** if the card is not in test status.

TEST STATUS OF FUNCTION UNITS

According to the color scheme, the test status of a function unit will be displayed as follows:

- TEST OFF: the **handles of the function unit are** displayed in **dark-gray** if the card is in NCS ON status.
- TEST ON: the **handles of the function unit are** displayed in **blue**.

PROTOCOL ALARMS

In the rack window only protocol alarms of ERROR priority are displayed.

- NO PROTOCOL ALARM: The front panel of the CPU-card is displayed in color in accordance with the alarm status. The handles of the CPU-card are displayed in color according to the test status.

- PROTOCOL ALARM: The front panel and the handles of the CPU-card are displayed in white.

NMS protocol alarms are displayed in the rack window until a data package can again be transmitted successfully and is acknowledged correctly by the respective CPU-card.

MENUS OF THE RACK WINDOW

GENERAL SETTINGS OF THE ERICSSON SCHRACK FX-BASIC UNIT

- From the **Settings** menu, choose **General**.

The configuration window **General Settings** will be displayed.

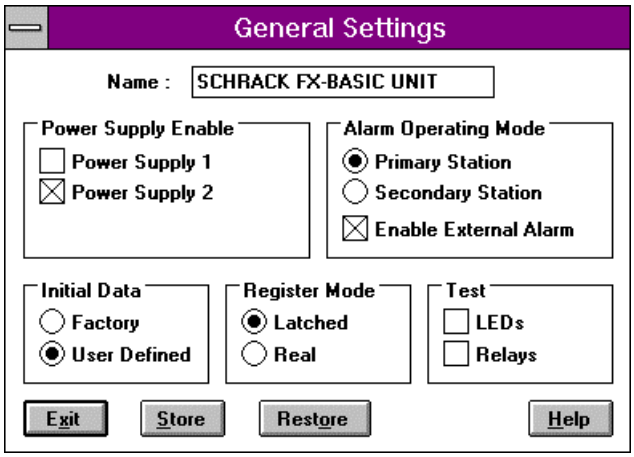

fig.9: Dialog Window General Settings

In this window the following settings can be determined:

DESIGNATION OF THE NETWORK ELEMENT

In the field **Name** a designation can be given to the network element. The text can comprise up to 30 characters.

SELECTION OF POWER SUPPLY

Select the option(s) **Power Supply 1/2** in accordance with the respective power supply of the rack. Only if the respective option has been selected will a breakdown or error of power supply be shown as alarm.

SETTING OF THE ALARM OPERATING MODE

In the group **Alarm Operating Mode** one of the following options can be selected:

- Primary Station
- Secondary Station[1]
- **External Alarm**: Select this option, if this FS BASIC UNIT rack is to process an external alarm source and if this alarm is to cause an error indication in the window **CPU - Status Display**.

SELECTION OF THE CONFIGURATION PROFILE UPON REBOOT

In the group **Initial Data** it is possible to choose the initialization profile of the rack after the next reset.

- **Factory**: The rack is initialized with the factory settings.
- **User Defined**: The rack is initialized with the current setting:

SELECTION OF REGISTER MODE

The settings concerning the alarm behavior of the network element and the NCS software can be found in the group **Register Mode**.

- **Latched**: Alarms are stored in the status registers until they are acknowledged by the user.
- **Real**: The alarms in the status registers are stored according to the current error status of the plug-in boards.

ACTIVATION OF THE LED TEST

To activate a LED test

- select option **LEDs** in the group **Tests**.

All LEDs at the rack light up in their respective color. Two-colored LEDs light up in orange.

ACTIVATION OF THE RELAY TESTS

To activate a relay test,

- select option **Relays** in the group **Tests**.

Both relays, the local and the remote alarm relay, are activated.

AUTOMATIC ACTUALIZATION OF OTHER DIALOG WINDOWS:

By choosing **Store** in this dialog window, the above-mentioned options are stored into the CPU-card of this rack. Furthermore, the following dialog window will be updated if they are open:

- CPU - Status Display

CLOCK SETTINGS

- From the **Settings** menu, choose **Clocks**

The dialog window **Clock Settings** will be displayed.

[1] The setting of the Alarm Operating Mode **Secondary Station** is only important for the EURO ISDN multiplexer and the analog front-end multiplexer application.

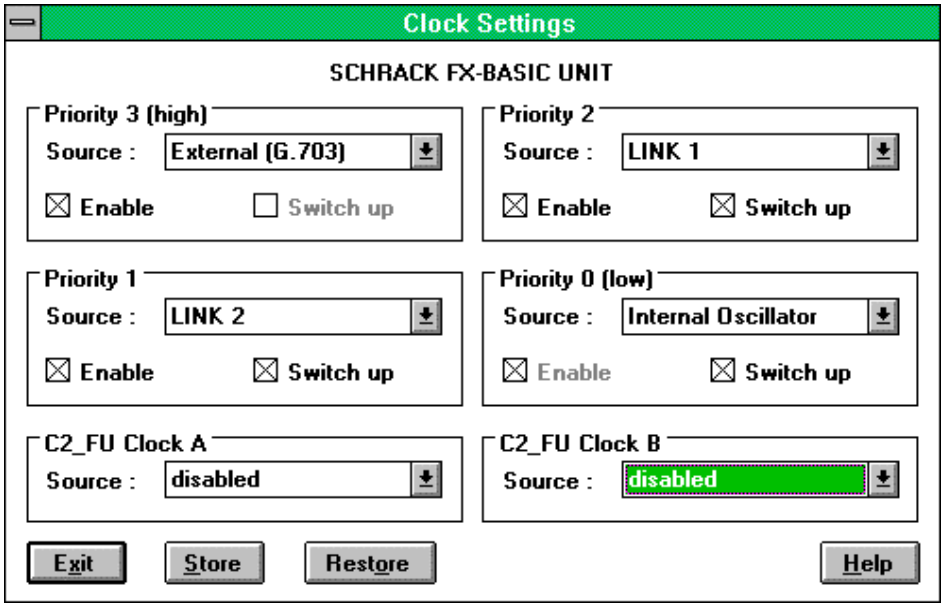

fig.10: Dialog Window Clock Settings

In the groups **Priority 3 ... 0** the following settings can be selected:

SELECTION OF A CLOCK SOURCE OF A CLOCK PRIORITY LEVEL

In the field **Source** one of the following clock sources can be selected:

- External (G.703): external clock source
- C2_FU Clock A: clock source is the function unit that is registered in the field **C2_FU Clock A**
- C2_FU Clock B: clock source is the function unit that is registered in the field **C2_FU Clock B**
- Internal Oscillator: free-running (internal) clock
- Link 1: 2 Mbit/s link 1 of the CPU-card is used as clock source (this option is only available in case of a mounted LINK card).
- Link 2: 2 Mbit/s-link 2 of the CPU-card is used as clock source (this option is only available in case of a mounted LINK card).

For priority level 0 only the option **Internal Oscillator** is available.

Please note! The factory configuration of the ERICSSON SCHRACK FX-Basic Unit CPU-card includes clock settings where LINK cards supply the clock to the clock priority levels. Upon applications with no mounted LINK card, the source fields of those clock source levels remain free upon reading that are supplied with the clock by the link card. If you wish to store this configuration again by choosing **Store**, the storing process will not be executed and you are prompted to choose a clock setting that is useful for your application.

LATCHING OF A CLOCK SOURCE LEVEL

- Click the option **Enable** for all priority levels that are not to be latched.

Clock priority level 0 cannot be latched.

LATCHING OF AUTOMATIC SWITCH-OVER TO HIGHER CLOCK PRIORITY LEVEL

If the rack runs with the clock of a specific priority level, it switches to the next highest priority level, if

- this level is not latched (**Enable**),
- the clock source of this level exists and is not defective,
- option **Switch up** of the respective priority level is ticked.

LATCHING OF THE FUNCTION UNIT CLOCK SOURCE

The clock sources **C2_FU Clock A** and **C2_FU Clock B** can be latched,

- by choosing option **disabled** in the field **Source**.

SELECTION OF THE FUNCTION UNIT AS A CLOCK SOURCE

For the clocks **C2_FU Clock A** and **C2_FU Clock B** you may choose a function unit as a clock source, by

- choosing one of the options **FU 1 ... 6** and **FU 9 ... 14** in the field **Source**.

AUTOMATIC UPDATING OF OTHER DIALOG WINDOWS

By choosing **Store** in this dialog window, the above-mentioned options are stored into the CPU-card of this rack. Furthermore, the following dialog window will be updated if they are open:

- CPU - Status Display

CONFIGURATION OF THE SWITCH MT8980 ON THE CPU-CARD (DROP & INSERT)

In case of **"COBRA"** applications a change of MT8980 switch setting **causes no change in the functionality** of the transmission links.

The MT8980 is a switch with 8 serial 2.048 kbit/s inputs and outputs each. Every single serial channel is split up into 32 64 kbit/s time slots. Each of the 256 64 kbit/s channels of the inputs can be switched to each of the 56 64 kbit/s channels of the outputs.

Version 2.1.1 of the NCS software offers a dialog window which supports the configuration of the MT8980 switch (drop & insert function) both for the **EURO-ISDN multiplexer application**, where **5 subsequent 64 kbit/s time slots** have to be switched at a time, and for the **analog front-end multiplexer application,** where it has to be possible **to switch every single 64Bit/s time slot separately**.

In case of **"COBRA"** applications a change of MT8980 switch setting **causes no change in the functionality** of the transmission links.

To open this configuration window

- choose **Drop & Insert** from the menu **Setting**.

The dialog window **Drop & Insert** will be displayed.

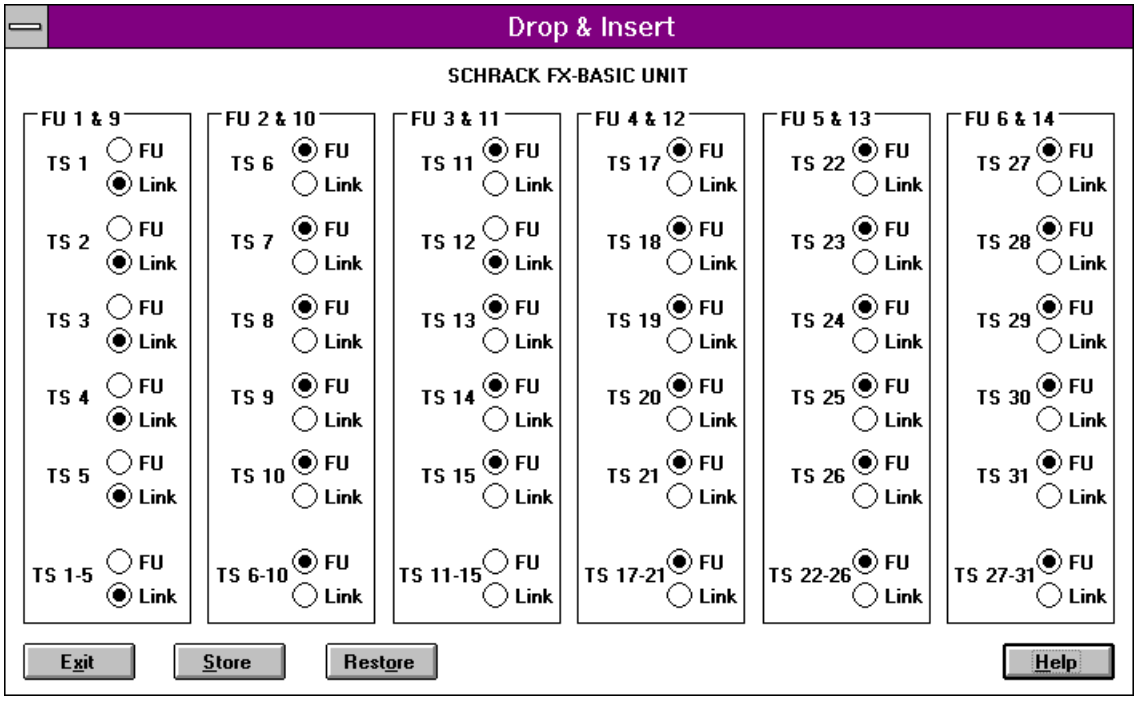

fig.11: Dialog Window Drop & Insert

FIG NORMAL EURO ISDN SWITCH SETTING

In this setting a channel group of a 2 Mbit/s port of a link of the DLINK is switched to a respective function unit (in this case the LC2 card) .

To set the channel group **TS 6 ... 10** (TS...time slot) of link 1 according to this setting

- choose option **FU** of group of options **TS 6-10** for this channel group.

All switch settings of time slots **TS 6 ... 10** of group **FU 2 & 10** change automatically to option **FU**.

EURO ISDN DROP & INSERT SETTING

In this setting a channel group of a 2 Mbit/s port of the DLINK is switched to the respective channel group of the other 2Mbit/s port.

To set channel group **TS 1 ... 5** in accordance with this configuration

- choose option **Link** of the group of options **TS 1-5** for this channel group.

All switch settings of time slots **TS 1 ... 5** of group **FU 1 & 9** change automatically to option **Link**.

NORMAL ANALOG FRONT-END MULTIPLEXER SETTING

This setting is identical to the setting mentioned in item a) for the ISDN multiplexer.

ANALOG FRONT-END MULTIPLEXER DROP & INSERT SETTING

In this application every individual 64kBit/s time-slot channel can be switched into the drop & insert function.

To switch for instance time slot **TS 12** into the drop & insert function

- choose option **Link** of channel group **TS 12**.

To switch this time slot again into the original setting

- choose option **FU** of channel group **TS 12**.

If, for instance, only time slot **TS 12** within group **FU 3 & 11** is set to option **Link** and all other time slots (**TS 11**, **TS 13**, **TS 14** and **TS 15**) are set to option **FU**, neither option **FU** nor option **Link** is selected automatically for channel group **TS 11 - 15**.

Furthermore, the mounting guidelines for ALCE and ALCS cards of the analog front-end multiplexer application have to be taken into consideration. Please note that ALCE and ALCS cards must be placed only at the following plug-in positions and occupy the following time slots:

- ALCE/S at plug-in position **2** uses time slots **TS 1 ..... 8 of Link 1** **(8 time slots)**
- ALCE/S at plug-in position **3** uses time slots **TS 9 ..... 15 of Link 1** **(7 time slots)**
- ALCE/S at plug-in position **4** uses time slots **TS 17 ..... 24 of Link 1** **(8 time slots)**
- ALCE/S at plug-in position **5** uses time slots **TS 25 ..... 31 of Link 1** **(7 time slots)**
- ALCE/S at plug-in position **10** uses time slots **TS 1 ..... 8 of Link 2** **(8 time slots)**
- ALCE/S at plug-in position **11** uses time slots **TS 9 ..... 15 of Link 2** **(7 time slots)**
- ALCE/S at plug-in position **12** uses time slots **TS 17 .... 24 of Link 2** **(8 time slots)**
- ALCE/S at plug-in position **13** uses time slots **TS 25 .... 31 of Link 2** **(7 time slots)**

DESIGNATION OF CONTROL ELEMENT GROUPS

The designations of the control element groups of this dialog window for **2 function units** each refers to the EURO ISDN-multiplexer application.

Furthermore the following has to be noted:

If a time slot (e.g. TS 12) of a link of the FX-DLINK card (e.g. Link 1) is not switched to a function unit (LC2 or ALCE/S), it is switched to the respective time slot (i. e. TS 12 again) of the other link (i. e link 2) by means of the drop & insert function. Thus, this time slot of the other link cannot be used by the other function unit at the other side of the rack.

RESET OF THE RACK AND INDIVIDUAL FUNCTION UNITS

- From the **Alarms** menu, choose **Restart**.

The dialog window **Restart** will be displayed.

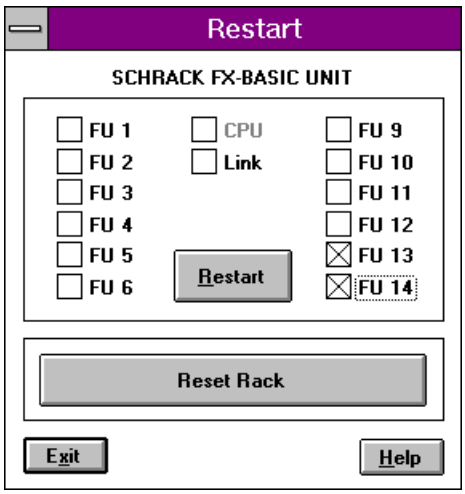

fig.12: Dialog Window **Restart**

The system offers the opportunity to reboot the individual function units or the entire rack.

To reset the entire rack,

- choose **Reset Rack**.

The CPU-card and **all** function units are reset and a reboot is executed.

After choosing this item the dialog window is closed.

Please note! A reboot of a rack takes between 30 and 60 seconds, depending on the respective disposition. During this time it is not possible to access the registers of the CPU-card. If during this time a network element is polled or its registers are accessed by opening of status and configuration dialog windows, protocol alarms occur and the respective network element is displayed in red and its CPU-card is displayed in white.

For a reset of individual function units

- select the respective function unit(s) (**FU 1 ... FU 6**, **Link**, **FU 9 ... 14**).
- choose **Restart**.

A restart of all selected function units is executed.

ALARM FILTERS AT FUNCTION UNIT LEVEL

- From the **Alarms** menu, choose **Enable Alarms**.

The dialog window **Enable Alarms** is displayed.

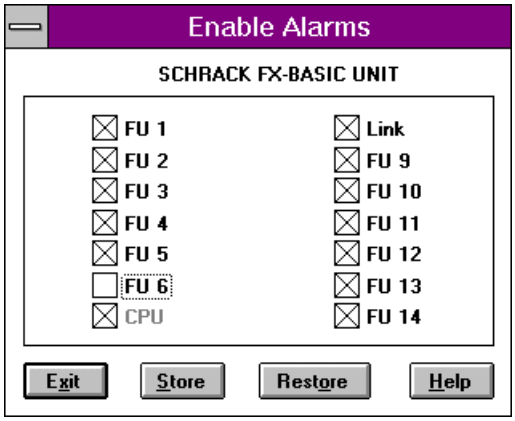

fig.13: Dialog Window **Enable Alarms**

If you want to latch alarms for a specific function unit by the NCS-PC and by alarm relays,

- do **not** click the respective option **FU 1 ... 6**, **Link**, **FU 9 ... 14**.

The function unit is displayed in **white** in the rack after the following polling cycle, even if alarms occur. If the alarms of a function unit are latched, errors of this card are displayed in the respective status dialog window according to the "register mode".

Alarms of the CPU-card cannot be latched.

ACKNOWLEDGMENT OF ALARM RELAYS

In order to reset the alarm relays of a rack,

- choose Quit Alarm Relay from the Alarms menu

Both the local and remote alarm relays will be reset immediately.

This menu item can be selected only if at least one of the two relays has been activated and the network element has been polled.

By selecting this menu item only the relays are reset. The acknowledgment of the alarm display at the NCS-PC occurs independently.

ACKNOWLEDGMENT OF ALARMS

If in the Latched Register Mode a number of errors on different boards of a network element have occurred and are active no longer, all of these errors can be acknowledged by means of a command.

- From the **Alarms** menu, choose **Clear Alarms**.

All errors of the board that are no longer active are acknowledged immediately and cannot be read out any longer by opening of a status window. Furthermore, both alarm relays are reset by this command.

This menu item can only be selected if Latched Register Mode is set in the rack.

Acknowledging of an alarm takes a few seconds in FX-CPU. During this time the following window will be displayed:

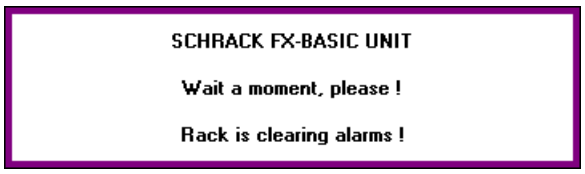

fig.14: Window during alarm acknowledgment

MANUAL STATUS POLLING

Alarms and a change of the configuration of a network element and its function units are indicated to the NCS-PC in intervals depending on the polling interval of this network element. The time for changes in the color display of function units by acknowledging or latching of alarms, adding and removing of function units, etc. can be the duration of a polling interval at most. If this time is too long or if polling is inactive by default, you can initiate a new poll immediately.

- From the **Alarms** menu, choose **Immediate Poll**.

A poll of the respective network element is executed immediately and after receipt of the answer, the current status is displayed graphically in the rack window and in the network window.

FX-CPU CARD

Menu of the FX-CPU window

To get to the menu of the-CPU card,

- click the CPU-card with the right mouse button.

The menu of the CPU card is displayed at the position where you have clicked the mouse button.

- Select from the menu the respective command, by clicking the command with the left mouse button.

Please note that selection of menu items depends on the respective access authorization.

CONFIGURATION OF CPU CARDS

The CPU-card is configured via the menus of the rack window.

STATUS DISPLAY OF THE CPU-CARD

- Choose **Status** from the CPU menu or double-click the CPU-card with the left mouse button.

The dialog window **CPU - Status Display** will be displayed

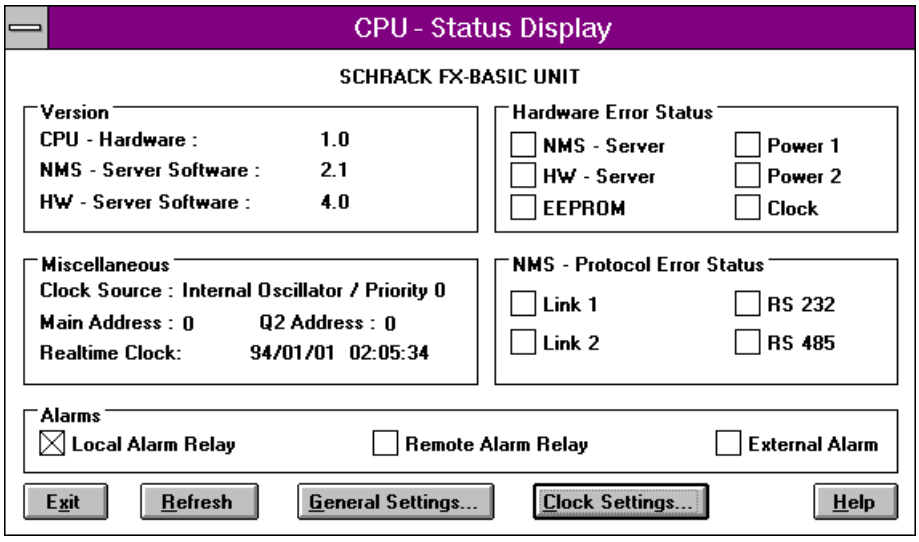

fig.15: Dialog Window CPU - Status Display

In this window general status information and errors of the CPU-card are displayed.

VERSION OF THE CPU-CARD

(Group Version)

- CPU - Hardware
- NMS - Server Software Version
- HW - Server Software Version

CURRENT CLOCK SOURCE OF THE RACK

(Group Miscellaneous)

- **Clock Source**: Current clock source and clock priority level that synchronizes the entire rack.

NETWORK ADDRESS OF THE RACK

(Group Miscellaneous)

- **Main Address**: Main address of the rack (DIP-Switch 5 - 13)
- **Q2 Address**: Sub-address of the rack (DIP-Switch 0 - 4)

  0: Master

  1 - 30: Slave 1 - 30

  31: Rack is not connected to a Q2-Bus

REAL TIME CLOCK OF THE CPU-CARD

- **Real time ClockF:** The FX-CPU card has a real time clock that is set automatically by the auto configuration of the NCS software to the NCS-PC system time. This clock is required by the FX-CPU and the NCS software in particular for the calculation of performance parameter histograms (e. g. for the HDSL equipment.)

Please note that the system time of the PC on which the NCS software is running is set correctly!

ALARM RELAY STATUS

(Group Alarms)

- **Local Alarm**: status of the alarm relay 1
- **Remote Alarm**: status of the alarm relay 2

STATUS OF THE EXTERNAL ALARM INPUT OF THE RACK

(Group Alarms)

EXTERNAL ALAR **HARDWARE ERROR INDICATIONS OF THE CPU-CARD**

(Group Hardware Error Status)

- **NMS - Server**: Internal CPU error of the NMS server or hardware error in the server area
- **HW - Server**: Internal CPU error of the hardware server or hardware error in the area of the hardware server.
- **EEPROM**: CRC error in EEPROM. The factory setting has been loaded as configuration profile.
- **Power 1/2**: Failure or faulty power supply 1/2.
- **Clock**: Clock switch-over to a clock source of lower priority or faulty unlatched clock source

PROTOCOL ERROR IN THE NMS CHANNEL

(Group NMS - Protocol Error Status)

- **Link 1**: Protocol error in NMS channel 1
- **Link 2**: Protocol error in NMS channel 2.
- **RS 232**: Protocol error in the RS-232 link between the NCS-PC and the CPU-card
- **RS 485**: Protocol error at the RS-485 (Q2-) bus interface

System errors that can be processed by the FX-CPU card

Error	Abbreviation	Alarm Relay
NMS Server Hard- & Software Error	-	x
Hardware-Server Hard- & Software Error	-	x
Power 1 Failure	-	x
Power 2 Failure	-	x
EEPROM CRC Error	-	x
Clock Error or Switching	-	x

Table 1: Possible hardware and software errors

Error	Abbreviation	Alarm Relay

	Link 1 NMS Protocol Error	-	-
	Link 2 NMS Protocol Error	-	-
	RS-232 NMS Protocol Error	-	-
	RS-485 (Q2-Bus) NMS Protocol Error	-	-

Table 2: Possible errors in NMS protocols

- **m:** An external alarm is active

Setting of alarm relays

Users with access level 2 (high) may allocate the error as ERROR or WARNINGS themselves. For this purpose they have to select menu item **Alarm Relays**. By activating (clicking) the desired entry this error is treated as an ALARM. If no entry is activated the error will be treated as a WARNING.

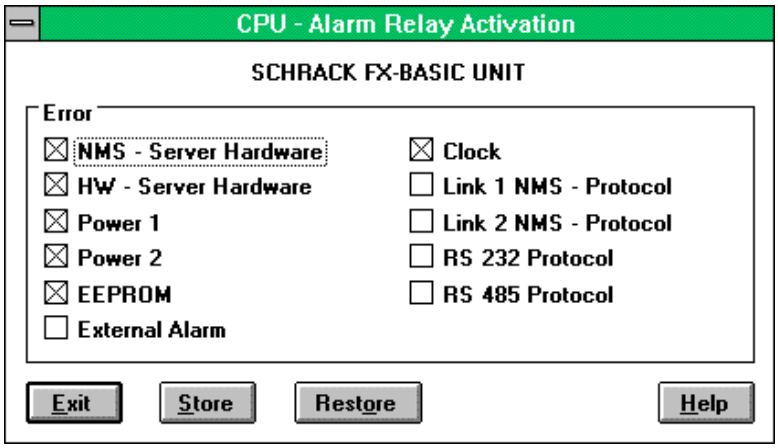

fig.16: Dialog Window - CPU Alarm Relay

HDSL (HTU) CARD

Menu of the HTU Window

The menu of the HTU card (**= an HDSL link**) is displayed,

- if you click the HTU card with the right mouse button.

The menu of the HTU card or of an HDSL link is displayed at the position where you have clicked. This menu consists of two menu items, the **LTU** containing the commands for the central LTU card and the **NTU** containing the commands of the corresponding remote NTU card.

- Choose the respective item from the menu by clicking the menu item with the left mouse button.

The respective sub-menu for the LTU or NTU card will be displayed.

- From this sub-menu, choose the respective command by clicking the command with the left mouse button.

Please note that selection of menu items depends on the respective access authorization.

COMMANDS OF THE LTU SUB-MENU

CONFIGURATION OF THE LTU CARD

- From the LTU sub-menu, choose **Configuration**.

The Dialog Window **LTU - Configuration** will be displayed.

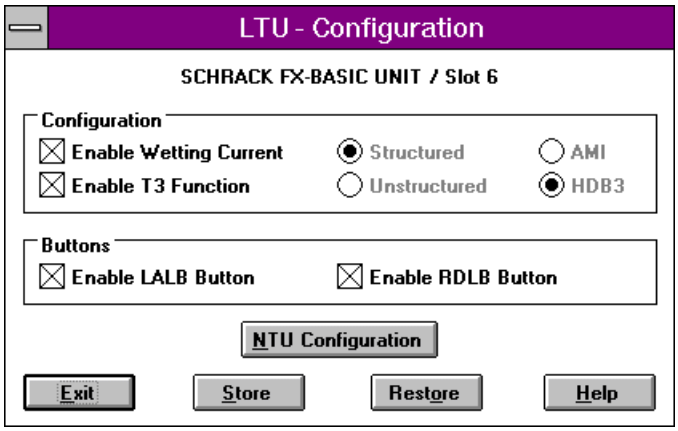

fig.17: Dialog Window LTU - Configuration

ENABLING/DISABLING OF THE MONITORING CURRENT LOOP

(group Configuration)

- **Enable Wetting Current**: If this option is ticked, the monitoring current loop is formed and monitored by the LTU card.

ENABLING/DISABLING OF THE T3 CLOCK FUNCTION, OF HDSL TRANSMISSION MODE AND OF CODING

(group Configuration)

- **Enable T3 Function**: If this option is ticked, the T3 clock function and the T3 clock supervision are enabled.
- **Structured/Unstructured**: Choose one of these options for using the respective HDSL transmission mode. Make sure that the corresponding NTU card has the same transmission mode as the LTU card.
- **AMI/HDB3**: Choose one of these options for using the respective coding.

For the three functions T3 clock, HDSL transmission mode and coding not all combinations are possible. If the T3 clock function is enabled, the LTU card is switched automatically to the transmission mode "Structured" and to the coding "HDB3". If the transmission mode is set to "Structured", the LTU card is switched automatically to the coding "HDB3".

T3 clock function	HDSL transmission	Coding	possible ?
off	structured	AMI	no
off	structured	HDB3	yes
off	unstructured	AMI	yes
off	unstructured	HDB3	yes
on	structured	AMI	no
on	structured	HDB3	yes
on	unstructured	AMI	no
on	unstructured	HDB3	no

Table 3: Possible combinations of the LTU configuration regarding T3 clock, HDSL transmission mode and coding

LATCHING OF THE BUTTONS ON THE LTU FRONT PANEL

(group **Buttons**)

- **Enable LALB Button**: If this option is not ticked, the function will be latched if the LALB button is enabled (Local Analogue Loop-back).
- **Enable RDLB Button**: If this option is not ticked, the function will be latched if the RDLB button is enabled (Remote Digital Loop-back).

AUTOMATIC UPDATING OF OTHER DIALOG WINDOWS

By choosing **Store** in this dialog window, the above-mentioned options are stored into the registers of the FX-CPU card and of this rack.

Furthermore, the following dialog windows will be updated as soon as they are opened:

- LTU - Status Display
- NTU - Status Display

STATUS DISPLAY OF THE LTU CARD

- From the LTU sub-menu, choose **Status** or double-click the HTU card with the left mouse button.

The Dialog Window **LTU - Status Display** will be displayed.

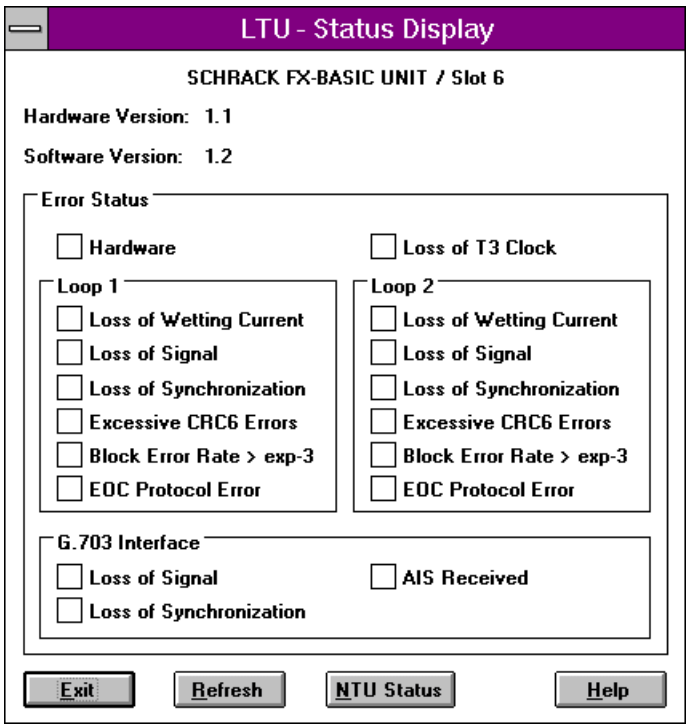

fig.18: Dialog Window LTU - Status Display

In this window general status information and errors of the LTU card are displayed.

VERSION OF THE LTU CARD

- Hardware - Version
- Software - Version

ERROR INDICATION OF THE LTU CARD

(group Error Status)

- **Hardware:** Hardware error of the LTU card.
  The following errors lead to the indication of a hardware error:
  boot/reboot: EPROM CRC16 Error
  RAM Error
  Datapump Loop 1 Error
  Datapump Loop 2 Error
  G.703-Framer 1 Error
  G.703-Framer 2 Error
  during operation: Transmit-FIFO Error
  Receive-FIFO Error
- **Loss of T3 Clock**: This option shows an error during the T3 clock supervision. This error may only occur if the option **Enable T3 Clock** is chosen in the Dialog Window **LTU Configuration**.

(group **Loop 1/2**) In these groups, errors are displayed which could occur on both transmission links Loop 1 and 2:

- **Loss of Wetting Current**: Indicates an error in the monitoring current loop. This error can only occur if the option **Enable Wetting Current** is chosen in the Dialog Window **LTU Configuration**.
- **Loss of Signal**: Loss of signal.
- **Loss of Synchronization**: Loss of synchronization.
- **Excessive CRC6 Errors**: This error occurs if during transmission on this loop more than 150 errors occur within one second.
- **Block Error Rate > exp-3**: Block error rate is higher than $1x10^{-3}$.
- **EOC Protocol Error**: This option indicates errors which occur at data transmission in the **E**mbedded **O**peration **C**hannel. In this data channel, status and configuration data of the corresponding NTU installation are transmitted. If such an error occurs immediately after configuration of the NTU by means of the Dialog Window **NTU Configuration** or after data polling of the NTU by means of other NTU dialog windows, it is possible that the data shown in the NTU dialog windows do not correspond to the actual data in the NTU. Therefore, repeat the previous NTU action. If this error occurs several times, there might be a unrecoverable error on the NTU or LTU card.

(group **G.703 Interface**) In this group, errors are indicated which might occur in the G.703 interface.

- **Loss of Signal**: Loss of signal.
- **Loss of Synchronization**: Loss of synchronization.
- **AIS Received**: The signal "AIS" is (was) received at the G.703 interface.

TESTING THE HDSL LINK BY MEANS OF THE LTU CARD

- From the LTU sub-menu, choose **Tests**.

The Dialog Window **LTU - Test Activation** will be displayed.

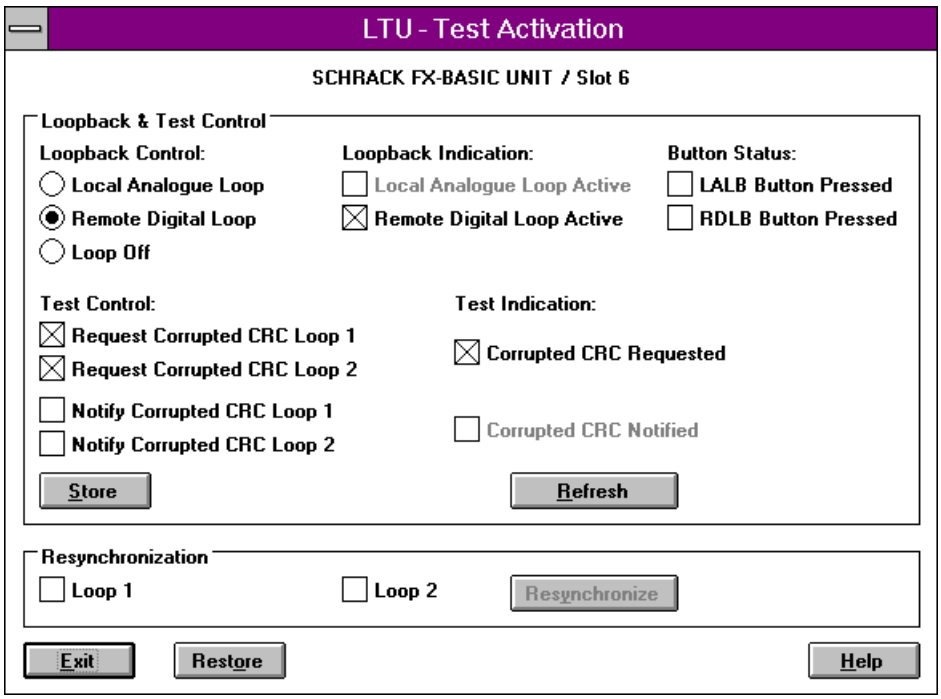

fig.19: Dialog Window LTU - Test Activation

REQUEST OF TEST LOOPS VIA THE NCS

(group Loopback Control)

You may choose one of the following three options:

- **Loop Off**: All test loops which were requested via the NCS are released.
- **Local Analogue Loop**: By selecting this option a local analogue loop is set. The loop is executed correctly by the LTU if in the group **Loopback Indication** the option **Local Analogue Loop Active** is unlatched (i.e. black characters) **and** ticked. A local analogue loop that has been requested via the NCS may only be released via the NCS.

- **Remote Digital Loop**: By selecting this option a remote digital loop is set. The loop is executed correctly by the NTU if in the group **Loopback Indication** the option **Remote Digital Loop Active** is unlatched (i.e. black characters) **and** ticked. A remote digital loop that has been requested via the NCS may only be released via the NCS.

(group **Loopback Indication**)

- **Local Analogue Loop Active**: If this option is unlatched (black characters), this indicates that a local analogue loop has been requested via the NCS or the LALB button on the LTU front panel. If this option is selected (ticked) this indicates that the local analogue loop has been executed correctly.
- **Remote Digital Loop Active**: If this option is unlatched (black characters), this indicates that a remote digital loop has been requested via the NCS or the RDLB button on the LTU front panel. If this option is selected (ticked) this indicates that the remote digital loop has been executed correctly.

(group **Button Status**)

- **LALB Button Pressed**: Indicates that a local analogue loop has been requested by means of the LALB button on the front panel of the LTU. Such a loop may only be released by means of the LALB button.
- **RDLB Button Pressed**: Indicates that a remote digital loop has been requested by means of the RDLB button on the front panel of the LTU. Such a loop may only be released by means of the RDLB button.

REQUEST OF FURTHER TESTS

(group Test Control)

- Request Corrupted CRC Loop 1/2: By selecting this option, the CRC errors are included into the transmission data stream of the respective loop. This action is executed correctly by the LTU if in the group Test Indication the option Corrupted CRC Requested is unlatched (black characters) as well as ticked. In the dialogue window NTU - Status Display these CRC errors are indicated by the option Excessive CRC6 Errors.
- Notify Corrupted CRC Loop1/2: By selecting this option, the NTU enters the CRC errors in the received data stream of the respective loop of the LTU. This is executed correctly by the NTU if in the group Test Indication the option Corrupted CRC Notified is unlatched (black characters) as well as ticked. In the dialogue window LTU - Status Display these CRC errors are indicated by the option Excessive CRC6 Errors.

(group Test Indication)

- Corrupted CRC Requested: If this option is unlatched (black characters) and ticked, this indicates that CRC errors upon request into the transmission data stream of at least one loop. of the LTU are entered
- Corrupted CRC Notified: If this option is unlatched (black characters) and ticked, this indicates that CRC errors upon request into the transmission data stream of at least one loop. of the NTU are entered

RESYNCHRONIZATION OF INDIVIDUAL LOOPS

(group Re-synchronization)

- **Loop 1/2**: If at least one of the two options is selected **Re-synchronize** is available, by means of which the marked loop(s) may be re-synchronized.

AUTOMATIC UPDATING OF OTHER DIALOG WINDOWS

By choosing **Store** in this dialogue window, the above-mentioned options are stored into the register of the FX-CPU card and of this rack.

Furthermore, the following dialogue windows will be updated as soon as they are opened:

- LTU - Status Display
- NTU - Status Display
- LTU - Performance Parameters
- NTU - Performance Parameters

PERFORMANCE PARAMETERS OF THE HDSL LINK BY MEANS OF THE LTU CARD

- From the LTU sub-menu, choose **Performance**.

The dialogue window **LTU - Performance Parameters** will be displayed.

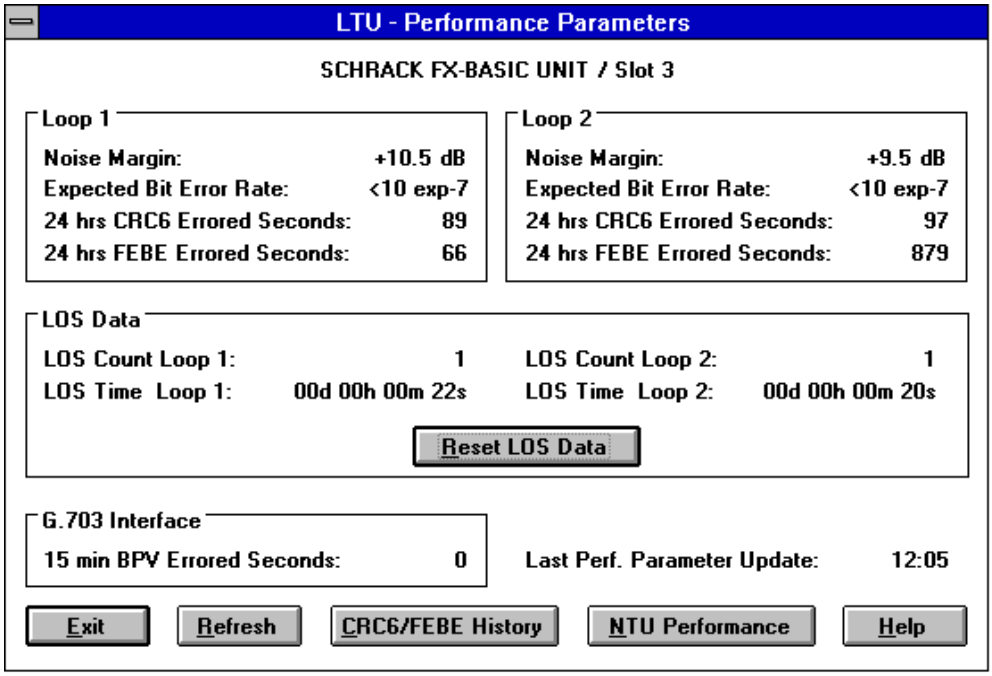

fig.20: Dialog Window LTU - Performance Parameters

LOOP1/2 - PERFORMANCE PARAMETER

(group **Loop 1/2**)

- **Noise Margin**: Signal-noise-ratio in dB.
- **Expected Bit Error Rate**: Is calculated directly out of the **Noise Margin** of this loop.
- **24 hrs CRC6 Errored Seconds**: The number of the CRC6 errored seconds of the last 24 hours is indicated. This value is updated every 15 minutes. The last updating is indicated by the entry **Last Performance Parameter Update**.
- **24 hrs FEBE Errored Seconds**: The number of the FEBE errored seconds of the last 24 hours is indicated. This value is updated every 15 minutes. The last updating is indicated by the entry **Last Performance Parameter Update**.

(group **LOS Data**) is only supported by new HDSL and CPU cards

- **LOS Count Loop1/2**: Number of LOS for this loop
- **LOS Time Loop 1/2**: Time during which a loop was not available because of LOS Indication in days (d), hours (h), minutes (m) and seconds (s)
- **Reset LOS Data:** Used for resetting the counter and times

G.703-INTERFACE PERFORMANCE PARAMETER

(group G.703 Interface)

- **15 min BPV Errored Seconds**: The number of the BPV errored seconds on the G.703 interface of the last 15 minutes is indicated. This value is updated every 15 minutes. The last updating is indicated by the entry **Last Performance Parameter Update**.

PERFORMANCE PARAMETER HISTOGRAM BY MEANS OF THE LTU CARD

- From the LTU sub-menu, choose **CRC6/FEBE History**.

The dialogue window HDSL CRC6/FEBE Error Seconds History will be displayed

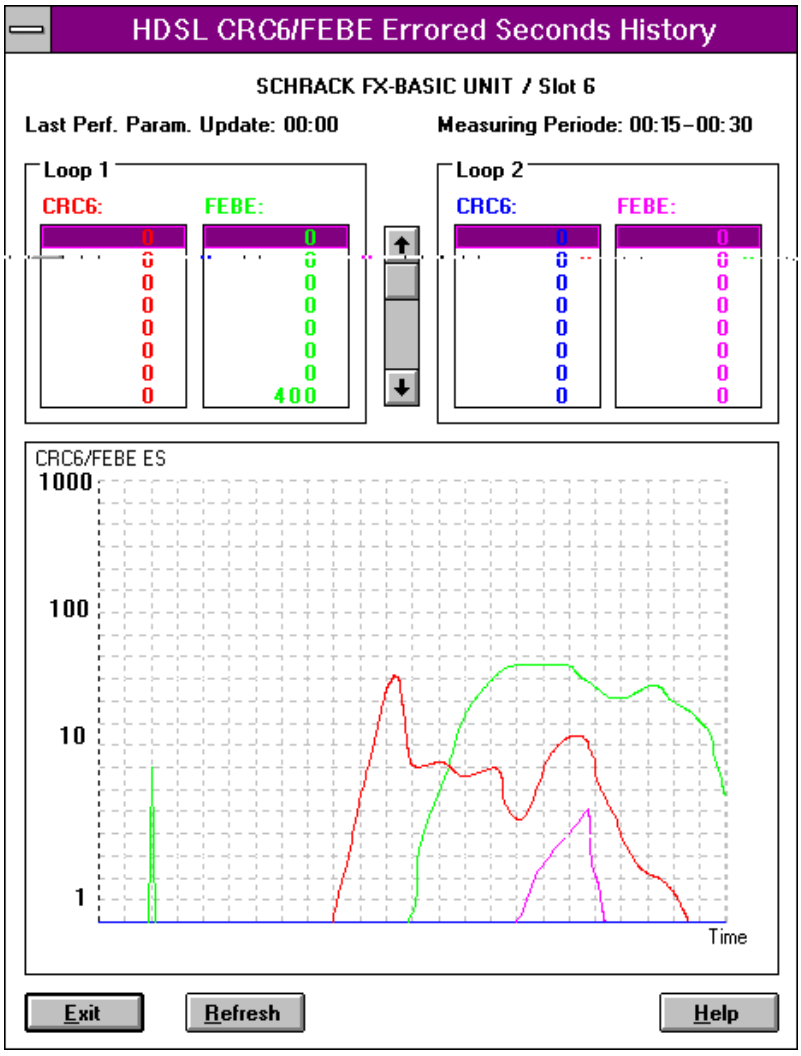

fig.21: Dialogue Window - HDSL CRC6/FEBE Error Seconds History

In this dialogue window the 15-minutes values of the last 24 hours of the Performance Parameter CRC6 and FEBE Error Seconds of Loop 1 as well as Loop 2 are displayed graphically as well as in a table by means of the LTU card. The vertical axis is shown with a Log-Lin scale. Within large sections (10,100,1000), the scaling pitch is linear. In this window, you have 3 possibilities to choose determined values:

SCROLL THROUGH ONE OF THE 4 TABLES LOOP 1 CRC6**,** LOOP 1 FEBE**,** LOOP 2 CRC6 **OR** LOOP 2 FEBE**.**

- Click one of the four tables with the mouse button.
- Scroll through the table using the PAGE UP, PAGE DOWN or Arrow keys <↑> or <↓>.

USING THE SCROLL BAR.

SELECTING A SPECIAL POINT IN THE HISTOGRAM.

- Click the point in the histogram which you want to be displayed in the table with the left mouse button.

In case of all three types of value selection,

- all respective values are selected in the four tables,
- the scroll bar is positioned accordingly,
- the cursor is positioned accordingly in the graphics window, and
- the 15-minutes measuring period corresponding to the selected values is shown in the entry **Measuring Period**.

Thus, it is possible to determine at a later time how many errored seconds have occurred during which period of time.

Please note ! Since the time basis for the performance parameter calculation is taken from the real-time clock of the FX-CPU, be careful that the system time of your NCS-PC is set correctly as it is loaded into the FX-CPU card during each auto configuration

Please note ! There are no results during the first 15 minutes after starting an LTU card. If you open this dialogue window during this time, the following message window will be displayed:

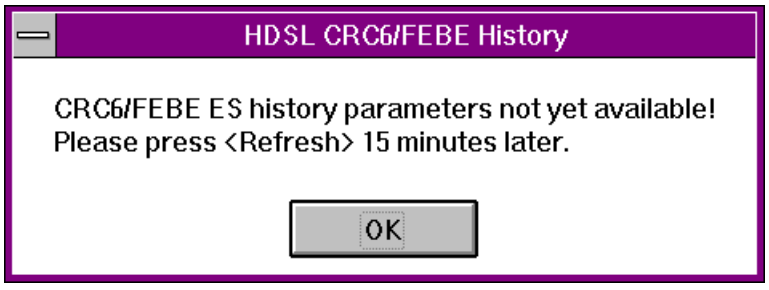

fig.22: Message Window HDSL CRC6/FEBE Errored Seconds History

This message requests you to open the dialogue window again 15 minutes later or to press **Refresh** 15 minutes later. If this message window appears again and the LTU has not been reset, an error of the FX-CPU cannot be excluded.

COMMANDS OF THE NTU SUB-MENU

CONFIGURATION OF THE NTU CARD

- From the NTU sub-menu, choose **Configuration**.

The dialogue window **NTU - Configuration** will be displayed.

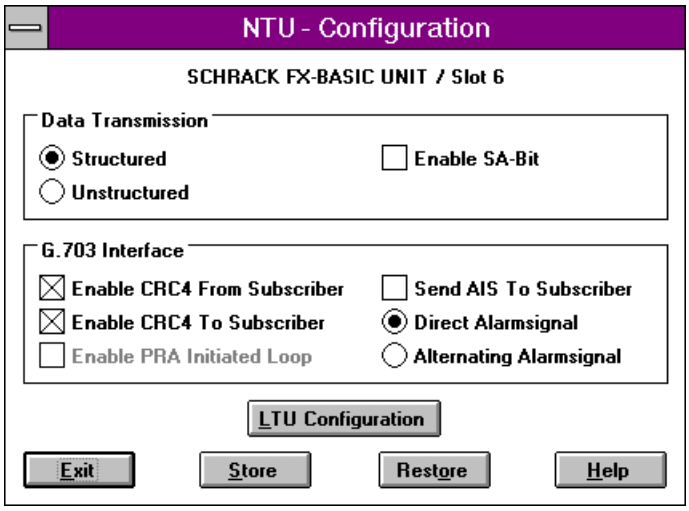

fig.23: Dialogue Window NTU - Configuration

ENABLING/DISABLING THE HDSL-TRANSMISSION MODE

(group Data Transmission)

- **Structured/Unstructured**: Choose one of these options for using the respective HDSL transmission mode. Be careful that the corresponding LTU card has the same transmission mode as the NTU card.
- **Enable SA-Bit**: Choose this option if signaling via the SA-Bits is requested. Only if this option is selected, the option **Enable PRA Initiated Loop** may be chosen. If this option is not selected, the option **Enable PRA Initiated Loop** will be automatically dimmed (grayed), will not be ticked and will not be available to the user.

CONFIGURATION OF THE G.703 INTERFACE

(group G.703 Interface)

- Enable CRC4 from Subscriber: If this option is ticked, the CRC4 back-up data received by the NTU at the G.703 interface is evaluated.
- Enable CRC4 to Subscriber: If this option is ticked, the CRC4 back-up data are inserted by the NTU into the transmission data stream at the G.703 interface.
- Enable PRA Initiated Loop: This option is available only if the option Enable SA-Bit has been selected. If this option is ticked, a remote digital loop may be set by the Primary Rate Access. In the dialogue window NTU - Status Display the option PRA Initiated Loop Active indicates whether a remote digital loop has been set by the PRA.
- Send AIS to Subscriber: If this option is ticked, an "AIS" signal will be sent to the terminal in case of an error.
- Direct/Alternating Alarm Signal: You may choose one of the two options.

AUTOMATIC UPDATING OF OTHER DIALOG WINDOWS

By choosing **Store** in this dialogue window, the above-mentioned options are stored into the register of the FX-CPU card and of this rack.

Furthermore, the following dialogue windows will be updated as soon as they are opened:

- LTU - Status Display
- NTU - Status Display

STATUS DISPLAY OF THE NTU CARD

- From the NTU sub-menu, choose **Status**.

The dialogue window **NTU - Status Display** will be displayed.

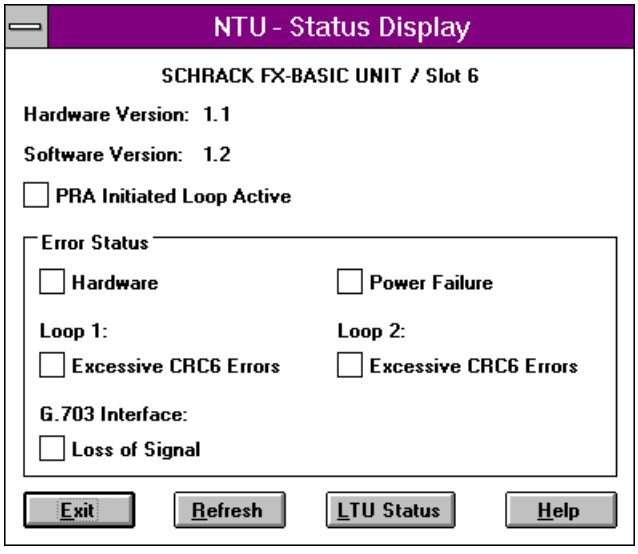

fig.24: Dialog Window NTU - Status Display

In this window general status information and errors of the NTU card are displayed.

VERSION OF THE NTU CARD

- Hardware - Version
- Software - Version

REQUEST OF A REMOTE DIGITAL LOOP BY MEANS OF PRA

- **PRA Initiated Loop Active**: This option indicates whether a remote digital loop has been requested by the Primary Rate Access.

ERROR INDICATION OF THE NTU CARD

(group Error Status)

- Hardware: Hardware error of the NTU card.

  The following errors lead to the indication of a hardware error:

  boot/reboot:
  EPROM CRC16 Error
  RAM Error
  Datapump Loop 1 Error
  Datapump Loop 2 Error
  G.703-Framer 1 Error
  G.703-Framer 2 Error

  during operation:
  Transmit-FIFO Error
  Receive-FIFO Error

- **Power Failure**: This option is ticked if the operating voltage of the NTU is lower than a determined threshold value and thus sends the signal "Power Failure" to the LTU.

(group **Loop 1/2**) In these groups, errors are displayed which could occur on both transmission links Loop 1 and 2:

- **Excessive CRC6 Errors**: This error occurs if on this loop more than 150 errors occur within one second during transmission.

(group **G.703 Interface**) In this group, errors are indicated which might occur in the G.703 interface.

- **Loss of Signal**: Loss of signal.

PERFORMANCE PARAMETERS BY MEANS OF THE NTU CARD

- From the NTU sub-menu, choose **Performance**.

The dialog window **NTU - Performance Parameters** will be displayed.

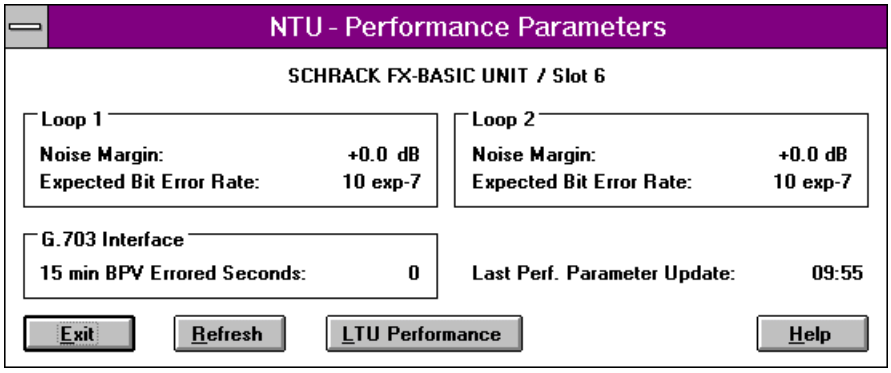

fig.25: Dialog Window NTU - Performance Parameters

LOOP1/2 - PERFORMANCE PARAMETER

(group **Loop 1/2**)

- **Noise Margin**: Signal-noise-ratio in dB.
- **Expected Bit Error Rate**: Is calculated directly out of the **Noise Margin** of this loop.

G.703-INTERFACE PERFORMANCE PARAMETER

(group G.703 Interface)

- 15 min BPV Errored Seconds: The number of the BPV errored seconds on the G.703 interface of the last 15 minutes is indicated. This value is updated every 15 minutes. The last updating is indicated by the entry Last Performance Parameter Update.

System errors that can be processed by the LTU and NTU cards

Error	Abbreviation	Alarm Relay
Hardware Error	-	x
Loss of T3 Clock	T3	x
Loss of Wetting Current (Loop 1/2)	WC	x
Loss of Signal (Loop1/2)	LOS	x
Loss of Synchronization (Loop 1/2)	SYNC	x
Excessive CRC6 Errors (Loop 1/2)	CRC6	x
Block Error Rate higher than 10^{-3} (Loop 1/2)	BLER>exp-3	x
EOC Protocol Error (Loop 1/2)	EOC	x
Loss of Signal (G.703)	-	x
Loss of Synchronization (G.703)	-	x
AIS Received (G.703)	AIS	x

Table 4: LTU - possible errors

Error	Abbreviation	Alarm Relay
Hardware Error	-	x
Power Failure	PWR	x
Excessive CRC6 Errors (Loop 1/2)	CRC6	x
Loss of Signal (G.703)	-	-

Table 5: NTU - possible errors

Setting of alarm relays

Users with access level 2 (high) may allocate the errors as ERROR or WARNINGS themselves. For this purpose they have to select menu item **Alarm Relays**. By activating (clicking) the desired entry this error is treated as ALARM. If no entry is activated the error will be treated as WARNING.

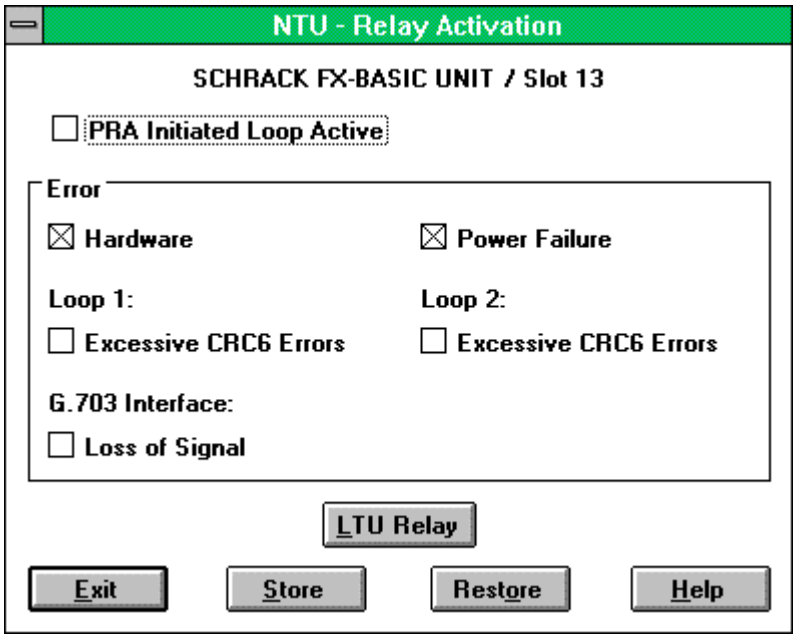

fig.26: Dialogue window Alarm Relay NTU

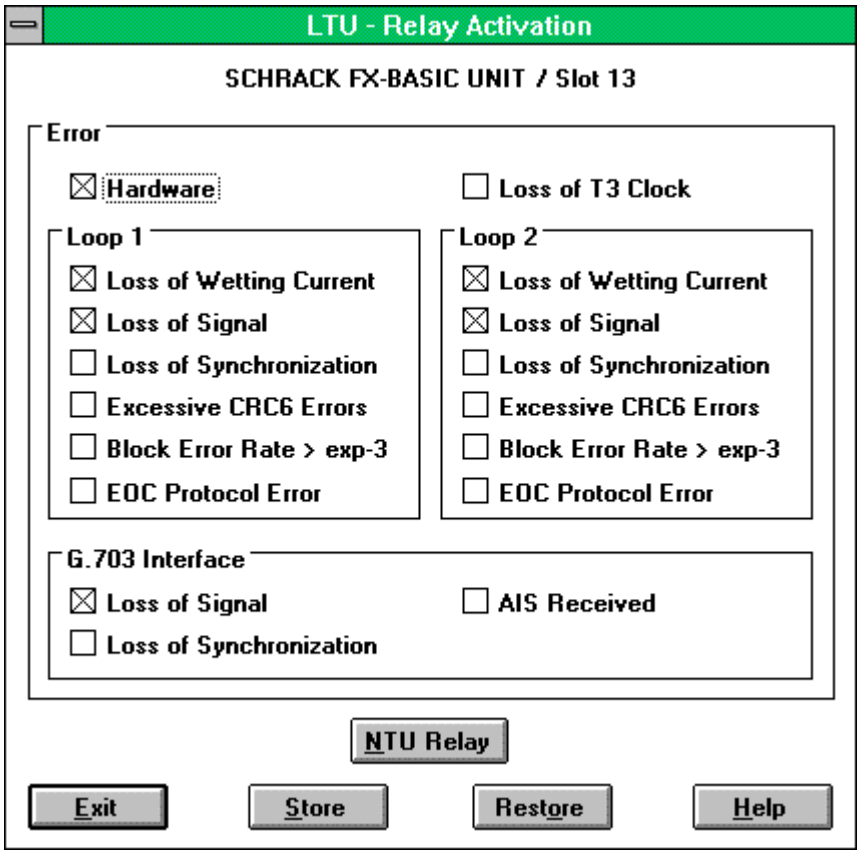

fig.27: Dialog Window Alarm Relay LTU

General information on the processing of Performance Parameters of an HDSL link

Every minute the LTU makes available to the FX-CPU the Performance Data CRC6 and FEBE Errors of the HDSL link as well as the G.703-BPV Errors of the LTU and the respective NTU card. The FX-CPU processes these minute values into **15-minutes values** and stores them in the respective registers that may be read out by means of the **LTU** and **NTU Performance Parameters** and the dialog window **HDSL CRC6/FEBE Errored Seconds History**. The entry the **Last Performance Parameter Update** in these dialog windows Performance Parameters indicates the time at which the 15-minute performance register was last updated by the FX-CPU card.