

ID-MUX

Reference Guide

Edition 4.3b

Copyright 2005 Telindus NV

This document contains information that is property of Telindus NV. This document may not be copied or reproduced to any electronic medium or otherwise duplicated except with the written consent of Telindus NV.

Reference guide - Identification code : DX/PRTA/5942 Edition 4.3b

13/04/2005

Table of contents

1. Release notes for ID-MUX SW rev. 4.3b.....	1
2. Operators.	2
2.1. Overview.....	2
2.2. Login sequence.	2
2.3. Operator's Access rights	3
2.4. Required access levels.....	3
3. Configuration databases and procedures.....	4
3.1. Overview.....	4
3.2. Reconfiguration procedure (Activation).....	4
3.3. Effects of reconfiguration.....	4
4. The ANSI Human Interface.....	5
4.1. Overview.....	5
4.2. Screen interface.	5
4.3. Line interface.	6
4.4. X-modem interface.	6
5. The World Wide Web based Human Interface.....	7
6. The IP-Router software module.....	8
7. Text Configuration Syntax.	9
7.1. Database configuration syntax.	9
7.2. Command syntax.....	13
8. Configuration screens.....	14
8.1. System Configuration.	14
8.2. Slot Configuration.	16
8.3. Line Configuration.	16
8.4. Fixn64 Configuration.	17
8.5. Route Configuration.....	19
8.6. CLIP Configuration.	20
8.7. AOC Profile Configuration.	21
8.8. AOC Holiday Configuration.	22
8.9. Operator Configuration.....	22
8.10. PPP Configuration	23
8.11. IP_StatRoute Configuration.....	25
8.12. IP_PortFW	25
9. Status Screens.....	26
9.1. System Status.....	26
9.2. Slot Status	26
9.3. Line Status.....	27
9.4. FixN64 Status.	28
9.5. Route Status.....	28
9.6. Clip Status.	29
9.7. AOC Profile Status.	29
9.8. Operator Status.	30
9.9. IPRoute Status.....	30

10. History Screens	31
10.1. Line History.....	31
10.2. Route History.....	31
11. Commands	33
11.1. Features.....	33
11.2. Syntax conventions.....	33
11.3. Command organisation and required access.....	33
12. Tracing, Logs and Traps	36
12.1. Overview.....	36
12.2. Trap and message format	36
12.2.1. <i>Message format</i>	36
12.2.2. <i>Traps</i>	37
12.2.3. <i>Physical layer events (PH)</i>	37
12.2.4. <i>Q921 Datalink events (DL)</i>	37
12.2.5. <i>Q931 Call Control events (CC)</i>	37
12.2.6. <i>ISDN Protocol Errors (ERR)</i>	39
12.2.7. <i>Incoming call (INC)</i>	39
12.2.8. <i>Outgoing call (OUT)</i>	39
12.2.9. <i>Connected Call (Connected)</i>	39
12.2.10. <i>Disconnected Call (Disconnected)</i>	39
12.3. Overview of Slot Messages.....	40
12.3.1. <i>TIME related events (TIME)</i>	40
12.3.2. <i>Datapath related events (PATH)</i>	40
12.3.3. <i>Slot related errors (ERR)</i>	40
12.4. Overview of General and Internal Messages.....	40
12.4.1. <i>System related messages (SYS)</i>	40
12.4.2. <i>Errors in operating system, and general support code (ERR)</i>	40
12.5. List of messages and their levels.....	41
12.6. ISDN call clear causes.....	41
13. Technical specifications	43
13.1. Table top housing.....	43
13.2. Connector definitions.....	44
13.2.1. <i>BRI port: RJ-45 (TE pin definition)</i>	44
13.2.2. <i>PRI port: RJ-45 (TE pin definition)</i>	44
13.2.3. <i>Control port: RJ-45 (V24/V28)</i>	44
13.2.4. <i>Ethernet port: RJ-45 (10Base-T)</i>	44
13.2.5. <i>Power inlet: XLR (+5V DC)</i>	44
13.3. Cable. Definitions.....	45
13.3.1. <i>DX_C2DMM-R45-R45 (BRI & PRI straight)</i>	45
13.3.2. <i>DX_C2XMM-R45-BRI (BRI crossed)</i>	45
13.3.3. <i>DX_C2XMM-R45-R45 (PRI crossed)</i>	45
13.3.4. <i>Control port adapter RJ45 to SubD9</i>	45
14. Floorplan – location of jumpers	46

1. Release notes for ID-MUX SW rev. 4.3b.

Telindus continues its development efforts in the ISDN based service multiplexers and releases a new SW version for both PRI-MUX and ID-MUX.

This SW supports a range of very useful features, each of which are based on actual customer requirements. The list below sums up the main enhancements and corresponding benefits compared to the previous version.

- It is now possible to strap the ID-MUX in Free Running clocking mode. In this mode, the internal clock of the ID-MUX is used as the master clock of the lines.
- If for some reason the layer 2 (LAPD) connection is dropped on a point to point connection (i.e. for which TEI is strapped to 0), then the ID-MUX will continuously retry to bring up again layer 2.
- There is now the ability to customize the 'Type Of Number' field in the Calling Party Number Information Element, which can be useful in situations where the calling number needs to be verified and/or replaced.
- There is an additional option field that allows the ID-MUX to check for compatible states when a status message is received.
- For primary rate interface: next to a layer 1 failure, an alternative route will also be considered when the layer 2 (LAPD) fails on the primary rate interface.

2. Operators.

2.1. Overview.

There are three basic ways to operate the ID-MUX:

- Locally via the control port (DB9 to RJ45 adapter necessary). This gives access to the ID-MUX HI (ANSI Human Interface).
- Remotely via TCP/IP through LAN interface.
- Remotely via TCP/IP through ISDN interface.

Each of the last two access types has it's own unique IP address.

Telnet gives access to the ID-MUX HI.

SNMP provides access to the Simple Network Management interface.

Any access to the ID-MUX requires validation of the operator. This validation consists of:

- Identification of the operator by means of a login sequence.
- Verification of the operator's access rights when reading, writing, executing or performing special actions.

Multiple operators can be logged in simultaneously, according to the following rules:

- Only one operator at a time can use the local serial port.
- Only one operator at a time can be associated with a given IP address. The association between the operator and the IP address is made dynamically through the login sequence. When logged in, the operator is allowed to use SNMP and Telnet (if enabled): no separate login for these facilities is needed. The same rule holds for the logout sequence.
- Access to the ID-MUX HI is restricted to a single operator, either local or remote.

Remark that only one Telnet session can be used at a time.

2.2. Login sequence.

The login sequence consists of identification of the operator by a shorthand operator name, and validation through a password check. Login is possible through either HI or SNMP using their respective facilities to pass commands.

The following rules apply concerning the login sequence:

- Access to the HI is granted only if no other operator is currently logged in.
- A local operator is logged out automatically after an inactivity of up to 4 minutes.
- A Telnet session is disconnected automatically after a configurable inactivity period, thus allowing a local operator to access the HI. However, the operator remains validated for TCP/IP and is still able to interact via SNMP
- When connecting using Telnet, the login sequence is executed automatically if the operator is still validated for TCP/IP.
- A login will effectuate a logout of the preceding operator in order to assure that no more than one operator is associated with an IP or local port.

The following rules apply for the definition of operators:

- The ID-MUX comes with a default Administrator which is defined as:

Name:	ADM
Password:	ADM
Rights:	x7777

- The ADM password can be modified by using the SET PSW command. It is important not to forget this password, because the only way to recover access in that case is to force a configuration erase (local maintenance!).
- Definition of new operators (names and rights) requires the highest write level. When defining a new operator, the ID-MUX will automatically assign a password, which is equal to the name. This password can be modified using the SET PSW command. It is not possible to reverse calculate a password: If this password is forgotten, then changing the name of the operator will re-create the entry.

- User names and passwords are always treated as uppercase strings, even if they are entered in lowercase. This means that a username entered as 'adm' will always be interpreted as 'ADM'.

2.3. Operator's Access rights

Access rights are classified into:

- R: Read rights (access to configuration and status items).
A numeric value 0-7. Value comparison occurs when verifying the rights.
- W: Write rights (access to configuration item).
A numeric value 0-7. Value comparison occurs when verifying the rights.
- X: Execute rights (access to commands).
A numeric value 0-7. Value comparison occurs when verifying the rights.
- P: Protocol rights (access to special protocols).
A bitmap value. Bit comparison occurs when verifying the rights.
Current values are:
 - 1: PPP access allowed
 - 2: HTTP access allowed

Note that numeric values larger than 7 can be specified. These values are provided for maintenance and should not be granted elsewhere. The representation of the access rights is as follows: xPXWR

The following actions are taken when the operator has insufficient rights:

- insufficient Read rights:
 - strings are shown as "*****"
 - numbers are shown as "-1"
- insufficient Write rights:
 - Edition of the item is disabled in the HI
 - SNMP Set action is ignored
- insufficient Execute rights:
 - The error message "Denied" is returned and the command is ignored
- insufficient access rights:
 - The error message "Access denied" is returned, or the access is ignored.

2.4. Required access levels.

Description tables throughout this guide contain a column that indicates the required access levels for configuration items, status items, command execution and protocol use.

The required access levels are represented by the numbers p, x, w, r, which are compared to the operator access rights PXWR :

- If $R \geq r$ then the operator has read access to the corresponding field.
- If $W \geq w$ then the operator has write access to the corresponding field.
- If $X \geq x$ then the operator has the right to execute the corresponding command.
- If $P \geq p$ then the operator has the right to use the corresponding protocol.

3. Configuration databases and procedures.

3.1. Overview.

The ID-MUX makes use of three copies of the configuration:

- **SAVED Database:** Non-volatile copy of the configuration.
- **EDT Database:** Copy of the configuration, used during edition.
- **RUN Database.** Copy of the configuration and status items used by the ID-MUX for actual operation.

The EDT database can be modified using the screen oriented human interface (WIN CFG command).

The RUN database can be inspected using the WIN STS and WIN HISTORY command.

It is important to realise that editing the configuration will not have any influence on the running configuration until explicitly confirmed with an activation command (CFG RUN). All manipulations with databases are grouped in the CFG command class (See section "Commands").

3.2. Reconfiguration procedure (Activation).

Before enabling the use of a physical element (slot, line, port), a number of checks are performed first.

The results of these checks is shown in the *Sts* (Status) field of the Status Database for the respective element, using the following configuration status codes:

- **INIT:** Initial setting
- **HW:** A hardware problem was detected for the particular device or the device is not present
- **KEY:** A software key is required to activate the device
- **IDLE:** The device is not configured for use
- **ACT:** The device is configured and functions properly
- **RES:** A reset is required to activate the device
- **CFG:** A configuration error was detected for the device

3.3. Effects of reconfiguration.

Sometimes it is not possible to ensure that configuration changes can be resolved without risk for the consistency of the system. In this case, the configuration changes are not handled, and the *Sts* field indicates RES. A restart (RESET SYS) may then be used.

Note however that a warm restart of the hardware may lead to problems with attached equipment (especially ISDN network when reconfiguration is done while calls are in an active state). A safe method for performing a warm reset consists of physically disconnecting the ISDN interface. This is also the reason of being of the FailSafe activation timer while booting the system. Its default value is set to 20 seconds. This is the time needed for a network to return to a known idle state.

The warm restart is discussed in the Command Section (RESET SYS).

4. The ANSI Human Interface.

4.1. Overview.

The ANSI human interface can be accessed locally via the serial port, or remotely via a Telnet session, as described in the 'Operators' section.

This interface provides 3 main facilities:

- A Screen (window) oriented interface for configuration, status and history.
- A Line oriented interface for commands (including status and logging).
- File transfer with X-modem.

4.2. Screen interface.

This interface is activated using a line command

- WIN Top level menu.
- WIN CFG EDT Databases (configuration screens)
- WIN STS RUN Databases (status screens)
- WIN HISTORY RUN Database (history screens)

The screen interface allows to edit the configuration, and to inspect the status of the system. It does not allow the execution of commands.

The following keystrokes are interpreted:

Key (c- = control-)	Action
Single ESC	Confirm the current entry - if any - and return to the higher menu level. Note: on some PC keyboards, ESC cannot be sent when Caps-Lock is on. In that case, use c-X.
ANSI F1 c-K	In WIN STS only: switch between status and running configuration view.
ANSI F2 c-W	Switch between Browse and Record view
c-B	Page-Up ("Back")
c-D, ANSI cursor down	Cursor Down
c-F	Page-Down ("Forward")
c-H	Back-space: Cursor back or go to previous field. Does not erase.
c-I	Tab (goes to next field)
c-L, ANSI cursor left	Cursor Left
c-M (Enter)	Enter
c-N	Immediate refresh when in status screen
c-Q	Abort edition of current record (all modifications to record are ignored)
c-R, ANSI cursor right	Cursor Right
c-T	Back Tab
c-U, ANSI cursor up	Cursor Up
c-V	View link to other database. This allows to copy field contents between related fields: Pressing c-V again in the viewed database will copy the field contents to the edited field. Any other key will abort the view without copy.
c-X	Confirm the current entry.
c-Z	Abort edition of current record (all modifications to record are ignored)

4.3. Line interface.

This is the default interface when logging into the system.

The line interface allows to issue commands and to inspect the status of the system. It does not allow editing the configuration.

The line interface features a command history of 500 characters.

The following keystrokes are interpreted:

Key (c- = control-)	Action
c-B	Top of history
c-D, ANSI cursor down	Next in history
c-F	End of history
c-H	Back-space: Does not erase.
c-I	Tab is ignored
c-L, ANSI cursor left	Cursor Left
c-M (Enter)	Enter, confirm command
c-N	Linefeed is ignored
ANSI home	Start of Line
ANSI end	End of line.

4.4. X-modem interface.

The standard X-modem protocol is implemented, and the following extensions are supported:

- CRC instead of Checksum.
- Abort with double cancel (c-X c-X).
- Transmission is fully driven by receiver.

The X-modem file transfer is activated using the commands "CFG XMSEND <file>" or "CFG XMRECV <file>", where <file> stands for *CFG.TXT* or *CFG.BIN*, for transferring *text*, respectively *binary* configuration files. If <file> is omitted, the default *CFG.BIN* will be assumed.

Transmission is done using either Checksum or CRC, as required by the receiver.

Reception is done using either Checksum or CRC. First CRC is requested 6 times (1 minute), then CHK is requested for another 3 times (30 sec).

Upon completion, the number of transferred blocks and retries is shown, and the final result. The possible result codes generated on an Xmodem error are:

- NoData: no data was received from the remote side
- BadData: the remote side is consistently sending protocol-foreign data
- BadSeq: an unrecoverable sequence error occurred
- RemoteAbort: the transfer was aborted by a double c-X.
- LocalAbort: the application on the ID-MUX aborted the X-Modem (due to reading an end of file)

Other error messages are generated due to parsing errors of the text configuration file (only for the upload of text configurations). These error messages are listed in the paragraph on text configuration (see par. 7.1).

5. The World Wide Web based Human Interface.

The WWW human interface can be accessed through a TCP/IP connection between a Web browser and the ID-MUX. This TCP/IP link can be locally established (through the LAN Ethernet port), or remotely (through a PPP dial-up session).

The ID-MUX web server is HTTP 1.1 compliant, but is compatible with HTTP 1.0 clients. The HTTP server listens on TCP port 80 for incoming HTTP connections.

The number of simultaneous HTTP connections is limited to 6. As most browsers use one connection for the download of the HTML page, and one for graphics, this implies that at most 3 concurrent connections are supported.

The WWW interface provides the following facilities:

- HTTP 1.0 authentication. The user entered should be one of the users defined in the operator database.
- A configuration, status and history view through a set of HTML tables (equivalent to the human ANSI human interface).
- A simulated view of the frontpanel of the ID-MUX, containing a picture of the status of the LEDs.
- An HTML page for uploading and downloading a *text* configuration. The configuration syntax of the file is described in chapter 6. Binary uploads or downloads are not supported.
- A button for launching a direct Telnet session to the ID-MUX.

The WWW server is compatible with Internet Explorer 4 and higher versions, and Netscape Communicator 4.7.

6. The IP-Router software module.

The IP-Router software module allows the ID-MUX to be configured as a basic IP router. The IP-Router software module has the following features:

Connectivity:

- 64 kbps ISDN dialup
- up to 256 kbps FE1 leased line (128 kbps sustained, 256 kbps peak performance)
- Link protocol: Point To Point protocol (PPP) on HDLC
- dial on demand routing on the dialup link
- dial-in is supported.
- possibility for a dial backup link in leased line configuration

Security:

- If Masquerading is selected, incoming IP connections are forbidden.
- Calling Line Identification (CLI) verification in dialup mode.
- PPP negotiation with PAP authentication. For incalls and leased line configuration, PAP authentication to the ID-MUX is required. The username/password used in the PAP authentication process must be an operator with PPP rights.

Address Translation:

- Masquerading (NAPT) translation with up to 1400 simultaneous IP connections. The masqueraded packets have port numbers in the range of 63000 to 64400.
- Support for ICMP, UDP and TCP connections
- Support for passive and active FTP connections. Other applications, containing IP addresses in their PDUs are not guaranteed to work. Examples are RealAudio, H.323 (i.e. Microsoft Netmeeting), Quake.
- Port Forwarding (access to internal servers) for up to 10 internal servers when Masquerading is active.
- If Port Forwarding is configured, only passive FTP connections to an internal FTP server are supported.

IP features:

- Dynamic IP address negotiation and assignment on WAN link
- Provision for the configuration of up to 10 static routes. No routing protocols, such as RIP or OSPF are supported.

7. Text Configuration Syntax.

7.1. Database configuration syntax.

The syntax used for the configuration of the Edit database in text format is based on the LISP language, and is constituted of nested lists of values, enclosed within brackets.

It follows the following scheme:

```
(Database,
  (<dbase1>, ( ( [<fieldtag1>, ...]),
                ( [<field1>, ...]),
                ( [<field2>, ...]),
                ...
              ),
    , ( ( [<fieldtag2>, ...]),
        ( [<field1>, ...]),
        ( [<field2>, ...]),
        ...
      ),
    ...
  ),
  (<dbase2>, ( ( [<fieldtag1>, ...]),
                ( [<field1>, ...]),
                ( [<field2>, ...]),
                ...
              ),
    , ( ( [<fieldtag2>, ...]),
        ( [<field1>, ...]),
        ( [<field2>, ...]),
        ...
      ),
    ...
  ),
  ...
)
```

The following is a concrete example:

```
(Database,
(Sys,
  (
    (N, Type, Name, Log, Trp, IP, SubMask, Gateway, PrimMgr, SecdMgr, RdComm,
    WrComm, TrpComm, TLogOff, TFailSf, ClkSlve, AlmTime, HttpRef, AOCEnbl, AOCType, AOCCTyp, AOCCurr,
    AOCMult, IPRoute, Masq, MasqIP, RCNetIP, RCMask),
    (1, IMX, IMX, 20, 50, 192.168.100.200, 255.255.255.000, 000.000.000.000,
    000.000.000.000, 000.000.000.000, public, netman, trap, 0, 20, AUTO, 00:00:00, 0, Off, AOC-D, Unit, ,
    0.001, Off, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000)
  ),
(Slot,
  (
    (N, Type, Name),
    (1, IMX, S1),
    (2, VXI, S2)
  ),
),
(Line,
  (
    (N, Type, Name, Act, Sgn, Tei, NT, Idle, Crc4, StrInc, EndInc, StrOutg,
    EndOutg, AlmFrom, Options),
    (1, BR, L1, On, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (2, BR, L2, Off, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (3, BR, L3, Off, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (4, BR, L4, Off, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (5, BR, L5, Off, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (6, BR, L6, Off, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (7, BR, L7, Off, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (8, BR, L8, Off, Isdn, 64, NT, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (9, PR, L9, On, Isdn, 0, TE, x49, NoCRC4, 0, 0, 0, 0, -----, -----),
    (10, PR, L10, Off, Isdn, 0, TE, x49, NoCRC4, 0, 0, 0, 0, -----, -----)
  ),
)
```

```

),
(FixN64,
  (
    (N, Act, Name, NrTS, LineIn, TSIn, LineOut, TSOut, PContrl),
    (1, Off, F1, 0, NONE, 1, NONE, 1, ---),
    (2, Off, F2, 0, NONE, 1, NONE, 1, ---),
    (3, Off, F3, 0, NONE, 1, NONE, 1, ---),
    (4, Off, F4, 0, NONE, 1, NONE, 1, ---),
    (5, Off, F5, 0, NONE, 1, NONE, 1, ---),
    (6, Off, F6, 0, NONE, 1, NONE, 1, ---),
    (7, Off, F7, 0, NONE, 1, NONE, 1, ---),
    (8, Off, F8, 0, NONE, 1, NONE, 1, ---),
    (9, Off, F9, 0, NONE, 1, NONE, 1, ---),
    (10, Off, F10, 0, NONE, 1, NONE, 1, ---)
  )
),
(Route,
  (
    (N, Act, LineIn, Search, Replace, LineOut, Calltyp, FailMin, ChgProf, CliProf),
    (1, On, 1-----, 1, *, -----9-, -----, 0, , t1),
    (2, On, 1-----, 2, *, -----9-, -----, 0, , t2),
    (3, On, 1-----, 3, *, -----9-, -----, 0, , t3),
    (4, Off, -----, , , -----, -----, 0, , ),
    (5, Off, -----, , , -----, -----, 0, , ),
    (6, Off, -----, , , -----, -----, 0, , ),
    (7, Off, -----, , , -----, -----, 0, , ),
    (8, Off, -----, , , -----, -----, 0, , ),
    (9, Off, -----, , , -----, -----, 0, , ),
    (10, Off, -----, , , -----, -----, 0, , ),
  )
),
(Clip,
  (
    (N, Act, Label, Search, Replace),
    (1, On, t1, 015333000, 2222),
    (2, On, t2, 99*, 3333),
    (3, On, t3, ?123, 9999),
    (4, Off, , , ),
    (5, Off, , , ),
    (6, Off, , , ),
    (7, Off, , , ),
    (8, Off, , , ),
    (9, Off, , , ),
    (10, Off, , , )
  )
),
(AOCProf,
  (
    (N, Act, Label, Days, StrTime, EndTime, c0, t0, DeltaC, DeltaT),
    (1, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (2, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (3, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (4, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (5, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (6, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (7, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (8, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (9, Off, , -----, 0, 0, 0, 0, 0, 0, 0),
    (10, Off, , -----, 0, 0, 0, 0, 0, 0, 0)
  )
),
(AOCHDay,
  (
    (N, Act, Date),
    (1, Off, 01/01),
    (2, Off, 01/01),
    (3, Off, 01/01),
    (4, Off, 01/01),
    (5, Off, 01/01),
    (6, Off, 01/01),
    (7, Off, 01/01),
    (8, Off, 01/01),
    (9, Off, 01/01),
    (10, Off, 01/01)
  )
),
(Oper,
  (
    (N, Name, Rights, Info),

```

```

        (1, ADM, x7777, ),
        (2, SUP, x7766, ),
        (3, SYS, x0222, ),
        (4, USR, x0111, ),
        (5, , x0000, ),
        (6, , x0000, ),
        (7, , x0000, ),
        (8, , x0000, )
    )
),
(PPP,
    (
        (N, IPAddr, TimeOut, InCDN, InCLI, RemUser, RemPwd, OutCDN, OutCLI, OutLine,
        LLine, LLStrTS, LLEndTS),
        (1, 192.168.003.001, 0, *99, *, , , , , -----, NONE, 0, 0)
    )
),
(IP_StatRoute,
    (
        (N, Act, NetAddr, NetMask, Gateway, Intface),
        (1, On, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (2, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (3, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (4, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (5, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (6, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (7, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (8, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (9, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN),
        (10, Off, 000.000.000.000, 000.000.000.000, 000.000.000.000, WAN)
    )
),
(IP_PortFW,
    (
        (N, Act, DstPort, Address),
        (1, Off, 0, 000.000.000.000),
        (2, Off, 0, 000.000.000.000),
        (3, Off, 0, 000.000.000.000),
        (4, Off, 0, 000.000.000.000),
        (5, Off, 0, 000.000.000.000),
        (6, Off, 0, 000.000.000.000),
        (7, Off, 0, 000.000.000.000),
        (8, Off, 0, 000.000.000.000),
        (9, Off, 0, 000.000.000.000),
        (10, Off, 0, 000.000.000.000)
    )
)
)
)

```

The format of text configuration file follows the following syntax rules:

- The configuration should start with the 'Database' tag, and end with a bracket. The database tag denotes that what follows between brackets are configuration items for the Edit Database of the ID-MUX.
- Each field in the 'database' section is a configuration of a particular database of the ID-MUX.
- A particular database configuration has the following syntax:
 1. Starts with the database name, a comma, and an opening bracket.
 2. Within brackets, the various field names of the database to be configured, separated by commas. The field names are the same as those used in the Human Interface of the ID-MUX.
 3. Within brackets, the values of one or more records, corresponding to the fields referred to by the previous list of field names, separated by commas. The format for the values reflects the format as used in the Human Interface of the ID-MUX.
 4. If necessary, one can continue the configuration of a particular database by repeating steps 2 and 3. As such, configurations of different field arrays can be done in an easy way (as an example, see the line configuration in previous example).
 5. Close the configuration of the particular database with a closing bracket.
- Everything following a semicolon (;) character on the same line is considered as comment.

When writing a configuration, one should pay attention to the following syntax items:

- An opening bracket always has to be followed by a closing bracket.
- Items enclosed within brackets have to be separated by commas.
- Whitespace characters (space, tab or newline) are ignored, except if they are enclosed by double quotes (""). Whitespace characters only serve to enhance readability and have no syntactical meaning.
- Configuration values that contain whitespace characters, such as strings, *must* be enclosed by double quotes ("").
- Each record to be configured must start with the index of the record (the 'N' field).
- Database and Field tags are case-insensitive.

On an upload of a text configuration to the ID-MUX, the syntax of the configuration will be verified by the ID-MUX for errors. The following errors can be generated:

Error	Warning/Error	Explanation
Unexpected opening bracket	Error	An unexpected opening bracket was encountered
Expected opening bracket	Error	An opening bracket was expected
Expected closing bracket or comma	Error	A closing bracket or comma was expected on the specified line
Unrecognized field <tag>	Warning	A field name was encountered that is not equal to the field names pertaining to the database that is being parsed
Index field missing	Error	The index field must be the first field in the description of the record to be configured.
Field too long	Error	The length of the field supplied exceeds 80 characters
Bad Index <index>	Error	The record index used is out of range for the database that is being configured
Bad field contents <field value> or insufficient rights	Warning	The value of the field is invalid or not recognized, or you have insufficient rights. This can be because of: <ul style="list-style-type: none"> ▫ The syntax doesn't correspond to the type of field being configured ▫ The value is out of range for the particular field ▫ For a field that represents an enumerated list, the value doesn't match one of the items in the enumerated list ▫ The operator with which you logged in has insufficient rights to write to this field
Values cnt doesn't match fields cnt	Error	The number of values in the record doesn't match the number of field types listed
Invalid Tag	Error	The Tag supplied was not 'Database' or 'Command'
Unrecognized dbase name <db name>	Error	The database name supplied is not one of <i>System, Slot, Line, FixN64, Route, Operator.</i>

An occurrence of an error will cause the ID-MUX to abort the upload in progress. In this case, the ID-MUX will return a description of the error encountered, together with the line number on which the error was detected. A non-critical error (warning) causes the ID-MUX to ignore the configuration item that caused the warning, and the parsing of the configuration will continue. At the end of the upload, the ID-MUX will return a description of the *last* warning encountered, together with the line number.

7.2. Command syntax.

The possibility exists to add commands to the configuration file. In this way, you can execute commands, together with the configuration of the device.
The syntax is the following:

```
(Command, "command1", "command2", ...)
```

The following is a concrete example:

```
(Command, "cfg run", "reset sys")
```

Following rules apply for commands:

- Commands are executed in the same order as they appear in the configuration file.
- Commands are only executed when the complete configuration is read, and is regardless of the relative position of the command section with respect to the database section.
- If an error is encountered during the parsing of the database section, then no commands will be executed.

8. Configuration screens.

- The running configuration can be accessed in the HI using the command
WIN STS (+) press F1 to show current configuration.
- The edit copy of the configuration can be accessed in the HI by using the command
WIN CFG

Note that the screens show the record number (index) on the top-right of the window, unless only 1 record number exists. Note that capital letters and/or numbers should be used for names.

The configuration screens shown below are for a ID-MUX with all software keys installed (including SNMP, AOC and IP-Route key). When some of these keys are not installed on the ID-MUX, then the corresponding configuration databases will not be visible. The 'SW key' column indicates which software key is necessary to see the corresponding field. If no 'SW key' column is present, then all fields in the table are always visible.

8.1. System Configuration.

```

-Sys-----
N          1
Type      IMX
Name      IMX
Log       20
Trp       50
IP        192.168.100.229
SubMask   255.255.255.000
Gateway   000.000.000.000
PrimMgr   000.000.000.000
SecdMgr   000.000.000.000
RdComm    public
WrComm    netman
TrpComm   trap
TLogOff   0
TFailsf   0
ClkSlve   L2
AlmTime   00:00:00
HttpRef   15
AOCEnbl   On
AOCType   AOC-D
AOCCTyp   Currency
AOCCurr   BEF
AOCMult   0.01
IPRoute   On
Masq      Off
MasqIP    000.000.000.000
RCNetIP   000.000.000.000
RCMask    000.000.000.000

```

Nr	Item	SW key	r,w	Description
2	Type		1,8	System type (IMX).
3	Name		1,3	MIB-II System Name
4	Log		1,3	Log threshold level: 0-99. All events with level equal or greater than this threshold will be logged.
5	Trp		1,3	Trap threshold level: 0-99. All events with level equal or greater than this threshold will generate traps.
6	IP		1,7	IP address assigned to the ID-MUX for remote control via LAN interface.
7	SubMask		1,7	IP submask for the ID-MUX
8	Gateway		1,3	IP address of the default gateway for the ID-MUX
9	PrimMgr		1,3	IP address of the primary SNMP manager (receives Traps). If not specified, then every IP is allowed to connect. SNMP access and traps will only be possible if a valid login was done for this IP.
10	SecdMgr		1,3	IP address of secondary SNMP manager (does not receive traps). If not specified, then every IP is allowed to connect. SNMP access will only be possible if a valid login was done for this IP
11	RdComm		1,3	The SNMP Community String which allows Read-Only.

				A valid login with read rights is additionally required
12	WrComm		1,3	The SNMP Community String which allows Read/Write. A valid login with write rights is additionally required
13	TrpComm		1,3	The Community String sent along with SNMP Traps
14	TlogOff		1,3	Telnet and Local control port will be logged off after TlogOff seconds (0=disable auto logoff). Note that SNMP is not logged off: The logout command must be issued to logoff SNMP
15	TfailSF		1,3	Delay taken into account before the failsafe relays are activated when the power down condition is fulfilled.
16	ClkSlve		1,3	Clock slaving of the ID-MUX: <ul style="list-style-type: none"> • Lxx: Preferred ISDN Line on which clock slaving will be attempted • AUTO: if there is no preference. In this case, first PRI lines, then BRI lines will be tried to slave on. If there's no slaving possible on the defined line, the ID-MUX will revert back to auto slaving. • FreeRun: The internal clock of the ID-MUX is used as the master clock for all the lines.
17	AlmTime		1,3	Time of Day on which an alarm remote control outcall will be attempted to the ISDN number as specified in the PPP configuration table. A value of 00:00:00 disables this feature.
18	HttpRef		1,3	Refresh rate of the web server pages in seconds. If zero, no refreshing of web pages will be applied.
19	AOCEnbl	AOC	1,3	System wide flag enabling or disabling the generation of Advice of Charge information.
20	AOCType	AOC	1,3	Type of AOC information to be generated: Advice of charge during the call (AOC-D) or Advice of charge at the end of the call (AOC-E). AOC-D generates an Advice of Charge pulse contained in an Facility Information Element at each expiry of a time interval, as defined by the charging profile (see par. 8.6). AOC-E only generates a total charge at the end of the call.
21	AOCCTyp	AOC	1,3	AOC Charging type to be generated: 'Currency', in which the charging amount is expressed in currencies, or 'Unit', in which the charging amount is expressed in units (i.e. units of fixed amount of money).
22	AOCCurr	AOC	1,3	Character field (max. 4 characters) specifying the currency in which the charging will be applied. Only applicable if 'Currency' is selected in the AOCCTyp field.
23	AOCMult	AOC	1,3	Multiplier applied to the charging amount. Ranges are from 0.001 to 1000. Only applicable if 'Currency' is selected in the AOCCTyp field.
24	IPRoute	IPR	1,3	This flag will enable or disable the ip-router function. If this flag is set, incoming packets not destined for a local interface will be routed to a gateway as specified in the IP router table.
25	Masq	IPR	1,3	Activation of the Masquerading function. Only valid if routing has been enabled (through the IPRoute flag). When this flag is set, private internal IP addresses of to be routed packets will be translated to a unique Internet address
26	MasqIP	IPR	1,3	This is the IP-address that will be used for translating internal IP-addresses to the external IP-address. If this field is empty (000.000.000.000) and if Masquerading is enabled, then the masquerading address will be the IP address of the WAN interface (as defined in the PPP configuration table, or negotiated through PPP).
27	RCNetIP	IPR	1,7	If filled in, the IP address denotes the network address from which remote access (telnet or HTTP access) to the ID-MUX is allowed.
28	RCMask	IPR	1,7	Subnet mask of the RCNetIP address

The field 'Name' is used to define the MIB-II System group. Note that this field cannot be directly modified in the MIB-II group, but only indirectly via the field defined here. As a consequence, only a validated operator is able to change the MIB-II System group contents.

Note also that the MIB-II System description is read-only and contains the manufacturer, product and serial number identification.

8.2. Slot Configuration.

```
-Slot-----0001--
N          1
Type      IMX
Name      S
```

Nr	Item	r,w	Description
1	N	0,8	Index. This corresponds to the record number, and is used to identify the slot (as S1,S2,..) in loggings and in commands.
2	Type	1,8	Type of card (IMX in Slot 1 & VXI in slot 2 if any)
3	Name	1,2	Name (for info only)

8.3. Line Configuration.

```
-Line-----0001--
N          1
Type      BR
Name      L1
Act       On
Sgn       Isdn
Tei       64
NT        NT
Idle      x49
Crc4      NoCRC4
StrInc    0
EndInc    0
StrOutg   0
EndOutg   0
AlmFrom   -----
Options   -----
```

Nr	Item	r,w	Description
1	N	0,8	Index. This corresponds to the record number, and is used to identify the line (as L1,L2,..) in loggings and in commands
2	Type	1,8	Type of line interface (PR=Primary Rate;BR=Basic Rate)
3	Name	1,2	Name given to the line interface.
4	Act	1,2	Line Enabling (Off, On).
5	Sgn	1,3	Signalling protocol PR : None=Ts16 for data; ISDN=Ts16 for LapD BR : None or ISDN.
6	Tei	1,3	Terminal Equipment Identifier.- PR: Should be 0 (fixed); - BR: can be 0 (Fixed) , 64 (automatic) or 65 for multipoint configuration (max. 2 devices). In case TEI is 0, physical and data-link activation of the line will continuously be attempted, for BRI as well as PRI lines. As a consequence, a line with configured TEI == 0 and with no physical activation is considered 'dead' and won't be selected during the route selection process.
7	NT	1,3	Specifies if the line interface is connected to a network (Net) or to a DTE equipment (Usr) Note: - connection Line-DTE: crossed cables - connection Line-ISDN or Line-DCE: straight cables
8	Idle	1,2	IDLE code sent in a none-active timeslot. To specify as hex, precede the value with 'x'.

			For PR lines: Advised code for ISDN connection is x49 For BR lines: Advised code for ISDN connection is x49
9	Crc4	1,2	Specifies if 2MB frame CRC procedure should be enabled. On: CRC is enabled. Off: CRC is disabled. Auto: automatic detection of the usage of the CRC procedure by the remote device. Use of CRC is advised unless not supported by the ISDN network This field has no meaning for BRI lines, as the CRC procedure is not supported on those lines.
10	StrInc	1,3	First B Channel to be used for incoming calls, if a B Channel is requested by the remote end. StrInc can range from 0 to 31 (0 defining the first B-channel). Remark that it doesn't make sense to select B-channel 0 as the starting channel, as it is the framing channel on PR and the D-channel on BR.
11	EndInc	1,3	Last B Channel to be used for incoming calls, if a B Channel is requested by the remote end. If StrInc and EndInc both are set to zero, then the default assignment of channels is taken, i.e. assignment of channels in ascending order. EndInc can range from 0 to 31 (0 defining the first B-channel)
12	StrOutg	1,3	First B Channel to be used for outgoing calls, if a B Channel can be assigned by the ID-MUX (i.e. if the line is an NT line, or the line is set in exclusive mode, i.e. the first bit in the Line Options field is set). StrOutg can range from 0 to 31 (0 defining the first B-channel). Remark that it doesn't make sense to select B-channel 0 as the starting channel, as it is the framing channel on PR and the D-channel on BR.
13	EndOutg	1,3	Last B Channel to be used for outgoing calls, if a B Channel can be assigned by the ID-MUX (i.e. if the line is an NT line, or the line is set in exclusive mode, i.e. the first bit in the Line Options field is set) If StrOutg and EndOutg both are set to zero, then the default assignment of channels is taken, i.e. assignment of channels in descending order. EndOutg can range from 0 to 31 (0 defining the first B-channel)
16	AlmFrom	1,2	Specifies lines which may force a datalink error on this line. - The datalink on this line will be forced down when one of the indicated lines detects a persistent deactivation condition. When the line gets activated again, then the alarm is cleared. This is a special feature which is not needed in most cases.
17	Options	1,2	Options Bitmask. Following bits are defined: Bit 1: If set, the ID-MUX will force the other end to accept the proposed B-Channel in the ISDN Setup message. Bit 2: By default, the ID-MUX will send a 'Call Proceeding' message in response of a 'Setup message', if both the source and destination of the call are configured as TE (i.e., the lines selected on the ID-MUX for the route are configured as NT). If bit 2 is set, then the ID-MUX will NOT send a 'Call proceeding' message in this case. Bit 3: By default the ID-MUX will not check the compatibility of the state in Status messages. If bit 3 is set, then the ID-MUX will do a check on an compatible state, and in case the state is incompatible, will release the connection.

8.4. Fixn64 Configuration.

```
-FixN64-----0001--  
N          1  
Act       Off  
Name      F1  
NrTS      0  
LineIn    NONE  
TSIn      1  
LineOut   NONE  
TSOut     1  
PContrl   ---
```

Nr	Item	r,w	Description
1	N	0,8	Index. This corresponds to the record number, and is used to identify the Port (as P1,P2,..) in loggings.
2	Act	1,3	Activates the fixed channel.
3	Name	1,2	Name given to the Port. This name is used in the port definition. Syntax: [GROUP:]NAME[.priority] ID-MUX: Group and Priority are not used.
4	NrTS	1,3	Number of consecutive 64kbit/s timeslots that are to be crossconnected from LineIn to LineOut.
5	LineIn	1,3	The incoming line
6	TSIn	1,3	The position of the first timeslot on the incoming line at which the port starts. Remark: timeslot 16 is excluded from a port if ISDN is enabled on the line.
7	LineOut	1,3	The outgoing line. This can be an ISDN line (L1 – L10), or a port on the VXI module (P1 – P4).
8	TSOut	1,3	The position of the first timeslot on the outgoing line at which the port starts. Remark: timeslot 16 is excluded from a port if ISDN is enabled on the line.
9	PContrl	1,3	Bitmask, defining the signals to be asserted on the port of the VXI module, if used. The following signals are defined: <ul style="list-style-type: none"> ▪ X : - External/internal clock. When set enabling DTE timing - when not set DCE timing is used ▪ S : - asserts DSR and CTS. When set, DSR & CTS will be always ON - if not set DSR & CTS will be ON when DTR is activated ▪ C : - asserts DCD/I (for X21). When set, DCD (I) will be always ON - When not set, DCD/I will be ON if G704 is activated (PH-AI) & not digital loop is performed or Local loop is performed.

8.5. Route Configuration.

```

-Route-----0001--
N          1
Act       Off
LineIn    1-----
Search    123456*
Replace   *
LineOut   -2-----
Calltyp   -----
FailMin   0
ChgProf
CliProf

```

Nr	Item	r,w	Description
1	N	0,8	Index. This corresponds to the record number, and is used to identify the route (as R1,R2,..) in loggings.
2	Type	1,3	De/Activation of the current route.
3	LineIn	1,3	The set of incoming lines which are to be taken in account for this route. Multiple input lines are selectable.
4	Search	1,3	The incoming CDN ¹ is matched with the value of 'Search'. If equal, the CDN is replaced with 'Replace' else the next route in the table is checked. Some special features are : <ul style="list-style-type: none"> * : this symbol is a group wildcard. If placed in front, the last numbers of the CDN make the difference. If placed last, the first numbers of the CDN make the difference. Example : Search = 02* & Replace = 5552*

¹ CDN : Called Dial Number

			<p>The incoming CDN=023128 becomes CDN=55523128. ? : this symbol is a single wildcard. The '?' can be a value between 0 and 9. Example : Search = 023?2 & Replace = 02302 The incoming CDN=02372 becomes CDN=02302.</p>
5	Replace	1,3	The total/partial replacement for the Search value. See Search above.
6	LineOut	1,3	<p>The outgoing line(s) where the call has to be forwarded. If the route is considered as valid. If multiple lines are selected (hunting groups), the calls are forwarded in a round robin manner. This means the first call is forwarded to the first available line, the second call to the second available line, If the last line in the route is reached and a new call is coming in, the call is forwarded back to the first line, the next call to the second line,..... . If the line is configured for a TEI value of 0, or the line is a PRI line, the hunting group algorithm will skip the line if it is unavailable (i.e. if its level 1 is down). If all lines are occupied, the next route in the table is taken.</p>
7	Calltyp	1,3	<p>Bitmask defining the call types to be verified during route selection. The bitmask is based on the CIP (Connection Identification Profile) mask as defined in the CAPI standard. It defines the following bits: Bit 1: Speech call Bit 2: Unrestricted digital information call Bit 3: Restricted digital information call Bit 4: 3.1 kHz audio call Bit 5: 7 kHz audio call Bit 6: video call Bit 7: packet mode call Bit 8: call with 56 kBit/s rate adaptation Bit 9: unrestricted digital information with tones/announcements call Only calls with a bearer capability corresponding to the bit fields set will be selected for the route. If no bits are set in this field, the Calltyp field will be ignored.</p>
8	FailMin	1,3	<p>If specified (non-0), the route may be temporarily disabled during the specified number of minutes depending on the cause of the latest call failure. The following causes will disable the route: class 2: 34,38,41,42,43,44,47 class 3: ,49,50,57,58,63 class 4: 65,66,69,70,79 class 5: 81,82,83,84,85,86,88,91,95</p>
9	ChgProf	1,3	<p>ASCII string defining the charging profile label applied to this route. This label should correspond to a charging profile label in the charging profile database (see par.8.6). If there is no matching label in the charging profile database, then a free of charge call will be assumed. If the label is empty, or the originator of the call is on a 'User' (TE) line, then no charging will be applied.</p>
10	CliProf	1,3	This is a character string that is looked up in the CLIP table (matching the Label field) to identify the applicable CLIP checks.

8.6. CLIP Configuration.

```

-Clip-----0001--
N 1
Act On
Label t1
Search 015333000
Replace 2222
TONSrch All
TONRepl All

```

Nr	Item	r,w	Description
1	N	0,8	Index. This corresponds to the record number, and is used to identify the Clip in loggings.
2	Type	1,3	De/Activation of the current Clip
3	Label	1,3	ASCII string defining the label of the charging profile. This label is linked to the 'CliProf' label field in the route configuration. Multiple CLI profiles with the same label can be configured in the Clip database. The database will be searched for a certain label in consecutive order from top to bottom. If no Cli profile is found with a certain label, there will be no Cli replacement.
4	Search	1,3	The incoming Cli is matched with the value of 'Search'. If equal, the Cli is replaced with 'Replace' else the next Clip in the table is checked. Some special features are : * : this symbol is a group wildcard. If placed in front, the last numbers of the Cli make the difference. If placed last, the first numbers of the Cli make the difference. Example : Search = 02* & Replace = 5552* The incoming Cli=023128 becomes Cli=55523128. ? : this symbol is a single wildcard. The '?' can be a value between 0 and 9. Example : Search = 023?2 & Replace = 02302 The incoming Cli=02372 becomes Cli=02302.
5	Replace	1,3	The total/partial replacement for the Search value. See Search above.
6	TONSrch	1,3	The 'type of number' (TON) field in the Calling Party Number Information Element is checked against the value of this field. If they are equal, then the type of number field is replaced by the value defined in the TONRepl field. Possible values are: <ul style="list-style-type: none"> All: no matching is done on the TON field Unknown: Unknown TON Inter: International TON Ntnl: National TON Network: Network specific TON Subscr: Subscriber TON Abbr: Abbreviated TON Rsrvd: Reserved TON
7	TONRepl	1,3	Defines the Type Of Number (TON) that is replaced with when TONSrch matches.

8.7. AOC Profile Configuration.

```

-AOCProf-----0001--
N          1
Act       On
Label     weekday peak
Days      -MTWTF--
StrTime   0
EndTime   24
c0        165
t0        60
DeltaC    80
DeltaT    60

```

Nr	Item	SW key	r,w	Description
1	N	AOC	0,8	Index. This corresponds to the record number, and is used to identify the charging profile entry in status screens.
2	Act	AOC	1,3	Activates the charging profile.
3	Label	AOC	1,3	ASCII string defining the label of the charging profile. This label is linked to the 'ChgProf' label field in the route configuration. Multiple charging profiles with the same label can be configured in the charging profile database. The

				database will be searched for a certain label in consecutive order from top to bottom, i.e. the most specific charging profiles should come first in the database. If no charging profile is found with a certain label, a 'free of charge' charging profile will be implied.
4	Days	AOC	1,3	Bitmask defining the first letter of the days of the week. Starts with a Sunday. The last bit (H) represents holidays, and enable the charging profile for a holiday. The definition of holidays is done in the holidays database (see par. 0). Setting these bits enable the charging profile for the corresponding days of the week.
5	StrTime	AOC	1,3	Starting hour at which the charging profile is enabled.
6	EndTime	AOC	1,3	End hour at which the charging profile is disabled. Charging will be applied when this hour is reached. It is possible to define a time zone with the StrTime and EndTime fields that crosses a midnight boundary, i.e. a time zone with StrTime 18 and EndTime 8 defines a time zone from 6 pm to 8 am next morning. Remark however that the charging profile will only be valid in the days that are configured in the Days field, i.e. if the time zone crosses the midnight boundary into a day not defined in the Days field, then the charging profile will not be applicable.
7	c0	AOC	1,3	Initial charge amount. This is the amount charged immediately after the call is connected through (i.e. when the Connect message is sent). Ranges from 0 – 9999. Remark that this field should be used in combination with the system flags AOCCTyp and AOCCMult, i.e. the resulting amount charged depends on the 'Charging type' (Currency or Units), and in the case of 'Currency', on the multiplier chosen.
8	t0	AOC	1,3	Initial time interval in seconds for which the initial charging amount applies. When this interval expires, incremental charges will apply. Ranges from 0 – 3600 sec.
9	DeltaC	AOC	1,3	Charging increment applied at each expiry of a DeltaT time interval (see field 10). Ranges from 0 – 9999 Remark that this field should be used in combination with the system flags AOCCTyp and AOCCMult, i.e. the resulting amount charged depends on the 'Charging type' (Currency or Units), and in the case of 'Currency', on the multiplier chosen.
10	DeltaT	AOC	1,3	Time interval in seconds after which a charging increment DeltaC will be applied. Ranges from 0 – 3600 sec.

8.8. AOC Holiday Configuration.

```
-AOCHDay-----0001--
N          1
Act       Off
Date      01/01
```

Nr	Item	SW key	r,w	Description
1	N	AOC	0,8	Index. This corresponds to the record number of the holiday
2	Act	AOC	1,3	Activates the holiday.
3	Date	AOC	1,3	month and day (in this order!) of the holiday.

8.9. Operator Configuration.

```
-Oper-----0001--
N          1
Name      ADM
Rights    x7777
Info
```

Nr	Item	r,w	Description
1	N	0,8	Index. This corresponds to the record number, and is used to identify the operator (as O1,O2,..) in logings and in commands
3	Name	3,7	Short-Name for the operator
4	Rights	3,7	Hex-map specifying the operators access rights: <ul style="list-style-type: none"> ▪ mask x000F : read rights (0-7) ▪ mask x00F0 : write rights (0-7) ▪ mask x0F00 : execute rights (0-7) ▪ mask xF000 : protocol rights (0-7) The following levels are advised (see Ref. Manual for rights-lists): <ul style="list-style-type: none"> ▪ USR: x0111 (loc,tcp R=1 W=1 X=1) ▪ SYS: x0222 (loc,tcp R=2 W=2 X=2) ▪ SUP: x0333 (loc,tcp R=3 W=3 X=3) ▪ ADM: x7777 (all rights)
5	Info	3,3	User Info field

8.10. PPP Configuration

```

-PPP-----
N      1
IPAddr 000.000.000.000
TimeOut 15
InCDN  *99
InCLI  *
RemUser MyName
RemPwd  MyPassword
OutCDN 123499
OutCLI 03123123
OutLine -----
LLine  L9
LLStrTS 1
LLEndTS 4

```

Nr	Item	r,w	Description
2	IPAddr	1,3	IP address assigned to the ID-MUX for remote control via ISDN. Remark that if the host at the other end is not configured with an own PPP address, the ID-MUX will assign it an IP address with a host address one higher than the address defined here.
3	TimeOut	1,3	Idle timeout. If no IP packets have been received on the PPP connection during this time, the dialup connection will be dropped.
4	InCDN	1,7	Special assigned ISDN phone number for incoming PPP ISDN calls. The number specified can contain wildcards (* and ?) which will be matched against the called phone number of the remote control call. If this field is left blank, incoming PPP connections via ISDN will be disabled.
5	InCLI	1,7	Calling Line Identifier for incoming PPP connections via ISDN. This ISDN number will be checked against the ISDN phone number of the calling entity of the remote control call. The number can contain wildcards (* and ?).
6	RemUser	1,6	User name of the remote device, used in the PPP authentication process.
7	RemPwd	1,6	Password of the remote device, used in the PPP authentication process.
8	OutCDN	1,7	Telephone number of your ISP's Point Of Presence (POP)
9	OutCLI	1,7	Your telephone number. You only need to supply the number here if the network does not supply the CLI, and a security check is done on the CLI by the remote router.
10	Outline	1,3	Bitmask of lines that can be used for initiating the dialup connection
11	LLine	1,3	Line to be used for initiating a leased line connection. Remark that only primary rate lines can be used.
12	LLStrTS	1,3	The first time slot of the leased line that will be used for the connection
13	LLEndTS	1,3	The last time slot of the leased line that will be used for the connection

The settings in this menu are relevant in the following situations:

- Incoming Remote Control connections, i.e. access to the ID-MUX with Telnet or Web browser through an ISDN dialup-connection.
- Outgoing Alarm Calls to a management station.
- Dial on Demand connections to a remote router when the IP-Router functionality is activated (i.e. when the WIN.CFG.SYS.IPROUTE field is set to on)
- Incoming PPP connections from a remote router, when the IP-Router functionality is activated (i.e. when the WIN.CFG.SYS.IPROUTE field is set to on)

8.11. IP_StatRoute Configuration

```
-IP_StatRoute-----0001--
N      1
Act    On
NetAddr 000.000.000.000
NetMask 000.000.000.000
Gateway 000.000.000.000
Intface WAN
```

Nr	Item	SW key	r,w	Description
1	N	IPR	0,8	Index number
2	Act	IPR	1,3	Enables or disables the routing entry.
3	NetAddr	IPR	1,3	The destination address of a to be routed packet is matched against the value of "NetAddr". If the destination address belongs to the defined network, the entry will be taken as the route. Remark that the matching process is from top to bottom. Therefore, the most general routes should be placed at the bottom.
4	NetMask	IPR	1,3	Network mask address of the defined NetAddr
5	Gateway	IPR	1,3	Address of the host where packets will be forwarded to. Can be 000.000.000.000 if the destination interface is the WAN
6	Interface	IPR	1,3	The interface on which routed packets need to be sent (LAN or WAN)

8.12. IP_PortFW

```
-IP_PortFW-----0001--
N      1
Act    Off
DstPort 0
Address 000.000.000.000
```

Nr	Item	SW key	r,w	Description
1	N	IPR	0,8	Index.
2	Act	IPR	1,3	Enables or disables the Port Forwarding entry
3	DstPort	IPR	1,3	TCP port for which Port forwarding will be applied, i.e. each incoming TCP connection with this port will be forwarded to the host with address as specified in field 4. If this field is set to zero (0), then all incoming connections will be routed to the address specified in field 4.
4	Address	IPR	1,3	Address of the host to which TCP packets will be forwarded.

9. Status Screens.

The status screens can be accessed using the command WIN STS.

9.1. System Status.

```

-Sys-----
N          1
Sts       ACT
Date      2001/02/02
Time      12:29:14
ClkSrc    9
Trc       0
HWErrs   x0000
    
```

Nr	Item	r,w	Description
1	N	1,8	Index
2	Date	1,8	Current date
3	Time	1,8	Current time
4	Clksrc	1,8	Specifies which interface is used as a provider for clock synchronisation for all lines. 0=free run.
5	Trc	1,8	Current trace level
6	HwErr	1,8	0 = No errors Contact support if this value differs from 0

9.2. Slot Status

```

-Slot-----0001--
N          1
Sts       ACT
SW        BRTA5331 4.0.001
HW        00000001
LED       gG--G-----G---
    
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the record number, and is used to identify the entry (as S1,S2,..) in loggings and in commands
2	Sts	1,8	Gives the status of the entry INIT : entry is not checked HW : hardware error related with this entry KEY : entry is not activated by the key option IDLE : entry passed checks and is ready but not active ACT : entry passed checks and is active RES : entry has been changed and a reset system is required to activate the changes CFG : entry has been changed but configuration error occurs
3	SW	1,8	SW Version for card in this slot.
4	HW	1,8	HW Version for card in this slot
5	LED	1,8	LED status. As on front panel. R=Red,G=Green,Y=yellow

9.3. Line Status.

```

-Line-----0001--
N          1
Sts       ACT
L1State   G3nrm
PH        Up
DL        Down
DL 2      Down
L2State   4
L2Sta 2   4
TEI       64
TEI 2     65
BConn     --
AlmFrom   -----
Trc       0
ChInUse   0

```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the record number, and is used to identify the entry (as L1,L2,..) in loggings and in commands
2	Sts	1,8	Gives the status of the entry INIT : entry is not checked HW : hardware error related with this entry KEY : entry is not activated by the key option IDLE : entry passed checks and is ready but not active ACT : entry passed checks and is active RES : entry has been changed and a reset system is required to activate the changes CFG : entry has been changed but configuration error occurs
3	L1State	1,8	State of the line according to the I430/I431 protocols
4	PH	1,8	Up : physical layer is up Dn : physical layer is down
5	DL	1,8	External state of the first data link Up : datalink is up Down : datalink is down
6	DL 2	1,8	External state of the second data link (only relevant in Point to Multipoint configurations) Up : datalink is up Down : datalink is down
7	L2State	1,8	State of the first data link, according to the Q921 protocol
8	L2Sta 2	1,8	State of the second data link, according to the Q921 protocol (only relevant in Point to Multipoint configurations)
9	TEI	1,8	The current TEI value assigned to the first datalink of this line. The field will show 127 if no TEI is assigned
10	TEI 2	1,8	The current TEI value assigned to the second datalink of this line. The field will show 127 if no TEI is assigned (only relevant in Point to Multipoint configurations)
11	Bconn	1,8	Bitmap indicating connected Timeslots. For ISDN, this corresponds to the connected B channels <ul style="list-style-type: none"> • O = Outgoing connection on the indicated timeslot (as seen from the ID-MUX) • I = Incoming connection on the indicated timeslot (as seen from the ID-MUX) • N = Nailed- up timeslot. • V = timeslot connected with a VXI port. • - = Available timeslot
12	AlmFrom	1,8	Specifies lines which may force a datalink error on this line. The datalink on this line will be forced down when one of the indicated lines detects a persistent deactivation condition during a time T_DI (advised value 1-5 seconds). When the condition during a time T_AI (advised 1-5 seconds),

			then the alarm is cleared. This is a special feature which is not needed for most cases.
13	Trc	1,8	Current trace level
14	ChInUse	1,8	The number of channels currently in use.

9.4. FixN64 Status.

```
-FixN64-----0001--
N      1
Sts    IDLE
PortSts -----
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the record number, and is used to identify the entry (as P1,P2,..) in loggings and in commands.
2	Sts	1,8	Gives the status of the entry INIT : entry is not checked HW : hardware error related with this entry KEY : entry is not activated by the key option IDLE : entry passed checks and is ready but not active ACT : entry passed checks and is active RES : entry has been changed and a reset system is required to activate the changes CFG : entry has been changed but configuration error occurs
3	PortSts	1,8	Gives the status of the DTE and DCE signals on the VXI module port X: DTE timing is ON S: DSR and CTS are ON C: DCD (I) is ON T: DTR is ON M: Test mode indication (TMI) i.e. when in Local or Digital loop L: Local loop is set. D: Digital loop is set.

9.5. Route Status.

```
-Route-----0001--
N      1
Sts    IDLE
State  Ok
Date   0000/00/00
Time   00:00:00
Cause  0
CGN
CDN
LineOut 0
AOCndx 0
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the record number, and is used to identify the entry (as R1,R2,..) in loggings and in commands.
2	Sts	1,8	Gives the status of the entry INIT : entry is not checked HW : hardware error related with this entry KEY : entry is not activated by the key option

			IDLE : entry passed checks and is ready but not active ACT : entry passed checks and is active RES : entry has been changed and a reset system is required to activate the changes CFG : entry has been changed but configuration error occurs
3	State	1,8	OK : route is possible WAIT : route has failed and fail timer was started for this route. The indication remains until the next time that the route is tried.
4	Date	1,8	Date of last use of this route.
5	Time	1,8	Time of last use of this route. If in Wait state, then attempts to use this route will fail until Time+WaitMin
6	Cause	1,8	Latest ISDN cause received on this route
7	CGN	1,8	Full calling number on this route
8	CDN	1,8	Full called number on this route.
9	Lineout	1,8	Indicates the line that was selected.
10	AOCNdx	1,8	Charging profile index last selected for the route

9.6. Clip Status.

```
-Clip-----0001--
N      1
Sts    ACT
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the record number, and is used to identify the entry (as R1,R2,..) in loggings and in commands.
2	Sts	1,8	Gives the status of the entry INIT : entry is not checked HW : hardware error related with this entry IDLE : entry passed checks and is ready but not active ACT : entry passed checks and is active CFG : entry has been changed but configuration error occurs

9.7. AOC Profile Status.

```
-AOCProf-----0001--
N      1
Sts    ACT
Route  0
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the record number, and is used to identify the entry (as R1,R2,..) in loggings and in commands.
2	Sts	1,8	Gives the status of the entry INIT : entry is not checked HW : hardware error related with this entry KEY : entry is not activated by the key option IDLE : entry passed checks and is ready but not active ACT : entry passed checks and is active RES : entry has been changed and a reset system is required to activate the changes CFG : entry has been changed but configuration error occurs
3	Route	1,8	Last route for which this charging profile applied

9.8. Operator Status.

```

-Oper-----0001--
N          1
Sts       ACT
Intf      LAN
Time      12:27:56
Date      2001/02/02
IP        192.168.100.045
BadPsw    0
Logins    6
  
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the record number, and is used to identify the entry (as O1,O2,..) in logings and in commands.
2	Sts	1,8	Gives the status of the entry INIT : entry is not checked HW : hardware error related with this entry KEY : entry is not activated by the key option IDLE : entry passed checks and is ready but not active ACT : entry passed checks and is active RES : entry has been changed and a reset system is required to activate the changes CFG : entry has been changed but configuration error occurs
3	Intf	1,8	LOCAL : connected via control port. LAN : connected via lan interface. PPP : connected via remote control.
4	Time	1,8	Time of latest login/logout
5	Date	1,8	Date of latest login/logout
6	IP	1,8	Current or Last used IP address
7	BadPsw	1,8	Number of unsuccessful login. Reset when changing password
8	Logins	1,8	Number of successful logins.

9.9. IPRoute Status.

```

-IPRoute-----
N          1
Sts       ACT
MsqAddr   000.000.000.000
WANConn   Leased
MsqSess   0
  
```

Nr	Item	r,w	Description
2	Sts	1,8	Gives the status of the entry ACT: entry passed checks and is active RES : entry has been changed and a reset system is required to activate the changes CFG : entry has been changed but configuration error occurs
3	MsqAddr	1,8	This is the address to which all source addresses of outgoing packets are translated to.
4	WanConn	1,8	Denotes the type of access you have to the Internet. Values are <i>Off</i> (no connection established), <i>Dialup</i> and <i>Leased</i> .
5	MsqSess	1,8	Gives an indication on the number of Masquerading sessions. Each TCP connection results in a Masquerading sessions. A maximum of 1400 sessions is supported.

10. History Screens.

The history screens can be accessed using the command WIN HISTORY.

10.1. Line History.

```

-Line-----0001--
N      1
AMaxIn 0
AMaxOut 0
AMinFre 2
APHDown 0
ACRCErr 0
AFrmErr 0
AConTim 0
AChrges 0
ErrSec 0
SErrSec 0
UnvlSec 0
  
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the line number for which history info is printed
2	AmaxIn	1,8	Maximum number (high watermark) of channels occupied by incoming calls on this line since reset of the ID-MUX
3	AmaxOut	1,8	Maximum number (high watermark) of channels occupied by outgoing calls on this line since reset of the ID-MUX
4	AminFre	1,8	Minimum number (low watermark) of free channels on this line since reset of the ID-MUX
5	APHDown	1,8	Total time in seconds level 1 went down on this line since reset of the ID-MUX
6	ACRCErr	1,8	Number of CRC errors occurred since reset of the ID-MUX
7	AfrmErr	1,8	Number of framing errors occurred since reset of the ID-MUX
8	AConTim	1,8	Total connection time for all calls on this line since reset of the ID-MUX. The connection time is counted from the moment the B-channels are connected through
9	Achrges	1,8	Total charges applied to all calls on this line since reset of the ID-MUX
10	ErrSec	1,8	G.821 Errored Second statistics. Denotes the number of seconds with at least one bit error.
11	SErrSec	1,8	G.821 Severely Errored Second statistics. Denotes the number of seconds with at least one bit error out of thousand bits (Bit Error Ratio of 10^{-3}).
12	UnvlSec	1,8	G.821 Unavailable Seconds statistics. Denotes the number of seconds with at least 10 consecutive Severely Errored Seconds..

10.2. Route History.

```

-Route-----0001--
N      1
ACllAtt 0
AScCall 0
AFlCall 0
AConTim 0
ADblCnt 0
AChrges 0
  
```

Nr	Item	r,w	Description
1	N	1,8	Index. This corresponds to the route record index for which history are printed.
2	ACIIAtt	1,8	Number of call attempts made on this route since reset of the ID-MUX
3	AScCall	1,8	Number of successful calls made on this route since reset of the ID-MUX. Each call resulting in a successful 'connect through' of B-channels is considered as a successful call.
4	AFICall	1,8	Number of failed calls made on this route since reset of the ID-MUX. A call is considered failed if for some reason the connection was dropped before both ends B-channels were connected through.
5	AConTim	1,8	Total connection time for all calls made on this route since reset of the ID-MUX. The connection time is counted from the moment the B-channels are connected through.
6	ADbICnt	1,8	Number of times this route has been disabled since reset of the ID-MUX
7	AChrges	1,8	Total charges applied to all calls for which this route is selected since reset of the ID-MUX

11. Commands.

11.1. Features.

- Commands can be abbreviated. The first match will be used.
- When a command is incomplete, then an error message is displayed according to the following logic:
 - the recognised and accepted part is shown
 - the offending remainder of the input is replaced by a question mark
 - the question mark is followed by the expected input pattern (or alternatives list).
- When a command can be executed, then either the result of the command is returned or a message indicating that the command has been processed.

11.2. Syntax conventions.

<x> indicates a variable argument
 [] denotes optional arguments
 { | } denotes alternatives
 CAP capitals denote keywords

11.3. Command organisation and required access.

Command	x	Action
LOGIN <name> [<psw>]	0	Login sequence. If <psw> is not specified, then it is requested by the HI. In that case, the password is not echoed to the screen, and is not saved in the command history. When doing a login via SNMP, <psw> must be specified.
LOGOUT	0	Logout the current operator. When the command is issued via the serial port, the local operator is logged out. When the command is issued via TCP/IP (Telnet or SNMP), then the remote operator associated with the IP address is logged out (effectively disabling SNMP and Telnet until new login).
WIN [{ CFG STS HISTORY }]	1	Telnet or Local only (Error for SNMP and other). Provide access to the screen interface
SHOW {..}	1	Telnet or Local only (Error for SNMP and other).
SHOW TIME	1	Show the current time and date (hh:mm:ss,yyyy/mm/dd)
SHOW CFG <from> [<to> [X]]	1	Show a sequence of CFG records (from the RUN database) in browse format. <ul style="list-style-type: none"> ▪ <from>, <to>=<class><index> where <class> is G(general system), S(slot), L(line), F(FixN64), R(Route), A(AOC_Profile), H(AOC_Holiday) or O(operator). ▪ If X is specified, extended information will be shown. In this case, all fields are shown for the specified records. In the other case, the fields shown are the same as can be found in the screen browser.
SHOW STS <from> [<to> [<dt>[X]]]	1	Show a sequence of STS records (from the RUN database) in browse format. See SHOW CFG. <ul style="list-style-type: none"> ▪ <dt> specifies an optional time interval in seconds for repeated showing
SHOW HISTORY <from> [<to> [<dt>[X]]]	1	Show a sequence of HISTORY records (from the RUN database) in browse format. See SHOW CFG. <ul style="list-style-type: none"> ▪ <dt> specifies an optional time interval in seconds for repeated showing
SHOW ID	1	Show identification of the components of the ID-MUX firmware and hardware : <ul style="list-style-type: none"> ▪ Global FW code and revision ▪ Pcode : HW product code and revision

		<ul style="list-style-type: none"> ▪ Model : or product name ▪ SerNr : serial number ▪ MacAdr : Mac address
SHOW ID X	1	<p>Show identification extended : in addition to SHOW ID the following identification is displayed :</p> <ul style="list-style-type: none"> ▪ Options:P<p>,H<h>,S<s>,K<kkkkkkkkkk> activated options where <p> is product option, <h> HW option, <s> SW option, <k...> keycode. ▪ FW release date ▪ L2+L3 FW component code and revision ▪ L1 FW component code and revision ▪ XW component code, revision and release date
SHOW LOG <number>	1	<p><number>=0: start the log output at the oldest entry <number> =non-0: show the next <number> log entries.</p>
SHOW KEYS	0	Show installed hardware keys and software keys in plain text format.

CFG {..}	2	Access to manipulation of databases.
CFG RUN	2	Copy EDT database to SAVED database. Copy EDT database to RUN database. (Re)Activate the RUN database
CFG SAVE	2	Copy EDT database to SAVED database. No further actions are done
CFG LOAD	2	Copy SAVED database to EDT database. No further actions are done
CFG ACTIVATE	2	(Re)Activate the RUN database
CFG DEFAULT	2	Erase the EDT database, and fill with factory defaults. No further actions are done
CFG XMSEND { CFG.TXT CFG.BIN ROUTE.TXT AOC.TXT STS.TXT HISTORY.TXT }	2	<p>Sends various info to a PC using X-modem:</p> <ul style="list-style-type: none"> ▪ CFG.TXT: the EDT database will be sent in text format (see also chapter 5 on page 7). ▪ CFG.BIN: the EDT database will be sent in binary format. ▪ ROUTE.TXT: the route configuration will be sent in text format. ▪ AOC.TXT: the configuration for Advice of Charge will be sent in text format. ▪ STS.TXT: the status information will be sent in text format ▪ HISTORY.TXT: the history information will be sent in text format.
CFG XMRECV { CFG.TXT CFG.BIN }	2	Receive the EDT Database from a PC using X-modem. If CFG.TXT is supplied, then the EDT database will be sent in text format (see also chapter 5 on page 7). If CFG.BIN is supplied, then the EDT database will be sent in binary format. Note that a CFG RUN is needed to activate the received database.

SET {..}	2	Operational settings.
SET PSW	1	This command can only be executed Locally or via Telnet. The old password is requested and verified, then the new password is requested and verified.
SET TIME hh:mm:ss [,yyyy/mm/dd]	2	Set the current time and optionally the current date
SET TRACE <for> <level>	2	Set an extended tracing level for either a specific Line(<L<n>) or Slot(S<n>). If <n> is omitted, then the setting is made for all.
SET LOOP {OFF LL DL} P<n>	2	<p>Enables a local or digital loop on a port of the VXI module.</p> <ul style="list-style-type: none"> ▪ OFF: Disables the local or digital loop on the specified port ▪ LL: Creates a local loop on the specified port ▪ DL: Creates a digital loop on the specified port ▪ P<n>: the port on which the loop needs to be enabled or disabled

RESET {..}	2	Reset commands
RESET SYS	2	Execute a warm system restart.
RESET HISTORY	2	Reset the history database to initial values
RESET LOG	2	Reset the database of loggings.

REM {..}	1	A remark line. The REM command is not interpreted by the command shell. Its only purpose is to add comments in the tracing info.
MAINT	3	Start maintenance operations. See user manual.
MAINT REMUPGRADE	3	Starts a remote software upgrade. See user manual for details

12. Tracing, Logs and Traps.

12.1. Overview.

The occurrence of specific events may be signalled as follows:

- Trace messages on the local or telnet interface.
The trace message appears when the operator is not entering data (cursor at beginning of line). While the operator is performing commands (e.g.: edition, file transfer,...), traces are temporarily stored, to be shown when the operator finishes the respective command. Up to 100 events can be remembered in this way.
- Logged in a non-volatile buffer within the ID-MUX. Up to 400 events can be stored. The stored events are not cleared by a power down.
- Sent to an SNMP station as traps. Every logged event can be sent in this way.

Each event has an associated level. This level is compared with the configured trace, log and trap levels to determine whether the event should be traced, logged and/or trapped. This is done according to the following logic:

- If the event level is higher than the SYS.LOG level, then the event is logged.
- If the event level is higher than the SYS.TRP level, then a trap is generated for this event.
However, only logged events can generate traps.
- If the event level is higher than the trace level (SET TRACE command), then the event is traced. Tracing is enabled only while the operator is logged in.

The advised level for logging and trapping is respectively 20 and 50.

The events which trigger the above actions are classified in 3 classes.

- Slot related events:
 - Datapath settings
 - Time adjustments between slots
- Line related events:
 - ISDN Physical, Datalink, and Call Control events
 - Incoming calls before attribution to a port.
- Other events:
 - LAN related events
 - Internally detected error conditions (bugs or recoverable unexpected conditions).

12.2. Trap and message format.

The traps and messages share a number of common properties in order to simplify treatment by management software.

12.2.1. Message format.

Some examples of typical messages are shown below.

```
16:20:1850 L4 PH DI
```

```
16:25:2005 S1 TIME Adjust Log time (old 1999)
```

The message format consists of:

- Event time (referred to the real time of the ID-MUX), in the format HH:MM:nnnn where nnnn is the time in 1/100 seconds
- Space
- Class identifier followed by relevant record number:
Ln = Line defined in record number n

Sn = Slot defined in record number n (n=1 for ID-MUX)

<underscore><subclass> = other events.

- Space
- Sub classification (see list below)
- rest of message.

The use of this message format allows to perform pattern matching on the contents of the message.

12.2.2. Traps.

To further simplify treatment by SNMP based managers, the trap message contains the following elements:

- The Trap time stamp refers to the number of 1/100 seconds since power-up as required.
- The message is sent as a string 'varbind'.
- The record number is also sent separately as an integer 'varbind'.

For each class, a separate Trap type is defined.

Overview of Line Messages.

12.2.3. Physical layer events (PH).

- L<n> PH DI = signals loss of physical activation
- L<n> PH AR = signals higher layer activation request
- L<n> PH AI = signals achievement of physical activation

12.2.4. Q921 Datalink events (DL).

The DL tracing is comparable to the tracing obtained by a Q921 analyser. In addition, the internal working of the Q921 layer can be verified. This tracing is generally useful for specialists only.

- L<n> DL R <lapd-type> <bytes> = reception of Q921 packet
- L<n> DL T <lapd-type> <bytes> = transmission of Q921 packet

Tracing of Q921 message exchanges in the D channel.

<lapd-type> = {INFO | RR | RNR | REJ | SABME | DM | UINFO | DISC | UA | FRMR | XID}

<bytes> = shows the first few bytes of the packet.

- L<n> DL ST<nr> <primitive> <code>= Q921 primitive

Refer to the Q921 specification for a list of the primitives.

In the case of MDL primitives, the respective type is shown as an integer value in code.

12.2.5. Q931 Call Control events (CC).

The CC tracing is comparable to the tracing obtained by a Q931 analyser. In addition, the internal working of the Q931 layer can be verified. This tracing is generally useful for specialists only and may help to identify protocol problems with non-ETSI networks.

- L<n> CC R CR=<crv> ST<state> <messagetype> (<cause>)
- L<n> CC T CR=<crv> ST<state> <messagetype> (<cause>)

Reception and Transmission of Q931 packets.

<crv> = Call reference value.

<state> = State of the Q931 entity before receiving/sending the message

<messagetype>= message type as specified in ETSI Q931.

<cause> = cause value if sent in message. Else unspecified.

- L<n> CC CR=<crv> ST<state> Err-Abort (err <err_nr>)
- L<n> CC CR=<crv> ST<state> Err-Disc (err <err_nr>)
- L<n> CC CR=<crv> ST<state> Err-release (err <err_nr>)

Recovery of network interaction problems according to Q931. These traces show abnormal events during interaction with the ISDN network, which have been identified are remedied (either by aborting the call, by sending a disconnect, or by sending a release).

Refer to the Q931 norm for interpretation of these errors.

Class	Error	Description	
Abort	3	Datalink release indication	
	4	Reception of release complete after outgoing call	
	5	Datalink release in state 2	
	6	Datalink release indication	
	7	Call not in state 0 as expected by network	
	8	T309 expired	
	9	T303 expired	
	10	Release received in state 19	
	12	T308 expired	
	13	Status error in state 19	
	Disc	1	DL establish indication during overlap
		2	T304 expired
		3	T310 expired
5		T313 expired	
7		T301 expired	
Release		4	State error
	6	N322 error	

12.2.6. ISDN Protocol Errors (ERR).

- L<n> ERR<nr> at <unit>.<line>

This message is internally generated when a condition is detected which is unexpected or which cannot be handled according to the ETSI norms.

Signal these errors to TELINDUS, if possible accompanied by a detailed line trace.

12.2.7. Incoming call (INC).

- L<n> INC from <cg> to <cd>

This message is generated on an incoming call, before it is accepted or refused.

<cg> specifies the calling number, and <cd> specifies the called number, as extracted from the setup message.

Note that some networks may omit <cg> and/or <cd> in the setup message. In this case, the value 0 is shown. If the number is longer than 9 digits, then only the last 9 digits are shown.

12.2.8. Outgoing call (OUT).

- L<n> CID <c> OUT to <cd>

This message is generated when an incoming call is being forwarded by the ID-MUX to its final destination. The CID² <c> represents the index in the connection table the call has been assigned to the connection.

<cd> specifies the called number. If the number is longer than 9 digits, then only the last 9 digits are shown.

12.2.9. Connected Call (Connected).

- L<n> CID <c> Connected

This message is generated when a connect indication is received on line <n> to indicate that the calling/called party is connected. The CID <c> represents the index in the connection table the call has been assigned to the connection.

12.2.10. Disconnected Call (Disconnected).

- L<n> CID <c> Disconnected

This message is generated when a disconnect indication is received on line <n> to indicate that the calling/called party is being disconnected. The CID <c> represents the index in the connection table the call has been assigned to the connection.

² CID: Connection identifier

12.3. Overview of Slot Messages.

12.3.1. TIME related events (TIME).

- S<n> TIME D yyyy/mm/dd hh:mm:ss

This message is generated every hour on slot n. It gives you some reference about the time in the log. D is the first letter of the day of the week.

12.3.2. Datapath related events (PATH).

- S<n> PATH NRM L<l1>T<t1>=L<l2>T<t2>

This message is generated when a path is laid between line <l1> timeslot <t1> and line <l2> timeslot <t2> on slot.

12.3.3. Slot related errors (ERR).

- S<n> ERR<nr> at <unit>.<line>

This message is internally generated when a condition is detected which is unexpected or which cannot be handled and which is related to slot related procedures.

Signal these errors to TELINDUS, if possible accompanied by a detailed trace.

12.4. Overview of General and Internal Messages.

12.4.1. System related messages (SYS).

- _SYS Boot up.

Generated at power up.

12.4.2. Errors in operating system, and general support code (ERR).

- _ERR_<nr>_<description> (<additional info>)

This message is internally generated when a condition is detected which is unexpected or which cannot be handled and which is related to general or operating system procedures.

Signal these errors to TELINDUS, if possible accompanied by a detailed trace.

- _CFG ERR<nr> <description> <entry>

This message is generated when an error in a new configuration is detected. The entry field returns the index of the record in the configuration.

12.5. List of messages and their levels.

Class	Level	Message format	
General	1	CHK<nr> at <module>.<line>	
Line	6	L<n> DL ST <nr> <primitive>	
Line	8	L<n> DL R <lapd-type> <bytes>	
Line	8	L<n> DL T <lapd-type> <bytes>	
General	8	Tracer Error (index <nr>)	
General	10	S<n> PATH L<n>T<ts>=L<n>T<ts>	
General	10	S<n> PATH L<n>T<ts>=P<port>	
General	10	S<n> PATH L<n>T<ts> idle	
Line	10	L<n> PH_BCHAN <n> st<status>	
	20		--- Advised level for logs
Line	20	L<n> CC R CR=<crv> ST<state> <messagetype> (<cause>)	
Line	20	L<n> CC T CR=<crv> ST<state> <messagetype> (<cause>)	
Line	22	L<n> MDL Error <code>	
Line	22	L<n> MDL TEI = <nr>	
Line	22	L<n> MDL TEI Removed	
Line	30	L<n> PH DI	
Line	30	L<n> PH AI	
Line	30	L<n> PH AR	
General	40	R<n> Connect <cdn>	
General	40	R<n> Disconnect <cdn>	
General	40	R<n> Charged amount <amount>	
General	40	Alarm Call	
General	40	PPP <remote local> login: Invalid user/pwd	
General	40	Link disconnected: PAP Auth required	
	50		--- Advised level for traps
General	60	TIME <hh:mm:ss>	
General	99	ERR<nr> at <module>.<line>	

12.6. ISDN call clear causes.

Following ISDN cause values are defined in ITU-T Q931:

Normal class	Class 0		
		1	Unallocated (unassigned) number
		2	No route to specified transit network
		3	No route to destination
		6	Channel unacceptable
		7	Call awarded and being delivered in an established channel
	Class 1	16	Normal call clearing
		17	User busy
		18	No user responding
		19	No answer from user (user alerted)
		21	Call rejected
		22	Number changed
		26	Non-selected user clearing
		27	Destination out of order
		28	Invalid number format (address incomplete)
		29	Facility rejected
		30	Response to STATUS ENQUIRY
		31	Normal, unspecified
Resource unavailable class	Class 2	34	No circuit/channel available
		38	Network out of order
		41	Temporary failure
		42	Switching equipment congestion
		43	Access information discarded
		44	Requested circuit/channel not available

		47	Resource unavailable, unspecified
Service or option not available class	Class 3	49	Quality of Service not available
		50	Requested facility not subscribed
		57	Bearer capability not authorised
		58	Bearer capability not presently available
		63	Service or option not available, unspecified
Service or option not implemented class	Class 4	65	Bearer capability not implemented
		66	Channel type not implemented
		69	Requested facility not implemented
		70	Only restricted digital information bearer capability is available
		79	Service or option not implemented, unspecified
Invalid message (e.g. parameter out of range) class	Class 5	81	Invalid call reference value
		82	Identified channel does not exist
		83	A suspended call exists, but this call identity does not
		84	Call identity in use
		85	No call suspended
		86	Call having the requested call identity has been cleared
		88	Incompatible destination
		95	Invalid message, unspecified
Protocol error (e.g. unknown message) class	Class 6	96	Mandatory information element is missing
		97	Message type non-existent or not implemented
		98	Message not compatible with call state or message type non-existent or not implemented
		99	Information element non-existent or not implemented
		100	Invalid information element contents
		101	Message not compatible with call state
		102	Recovery on time expiry
		111	Protocol error, unspecified
Interworking class	Class 7	127	Interworking, unspecified

13. Technical specifications.

13.1. Table top housing.

Interfaces:

- BR ISDN S2 interfaces:
Connector: RJ-45 female
Conform to CTR3, I430, Q921 & Q931
- PR ISDN S2 interfaces:
Connector: RJ-45 female
Conform to CTR4, I431, Q921 & Q931
- Control port interface:
Connector: RJ-45 female (with convertor DB9 to RJ45)
Electrical: V28
Functional: V24 (CT 102, 103, 104; no XON/XOFF or RTS/CTS flow control on DTE)
Speeds: asynchronous from 9600 to 115200 bit/s
- Ethernet interface:
Connector: RJ-45 female
Recommendations fulfilled: 10Base-T, IEEE 802.3 & 802.2

Front panel:

- LED indications: HB, ALM, LAN, BR1 to BR8, PR1, PR2

Human Interface:

- Local: ANSI compatible terminal on control port
- Remote through ethernet port: SNMP and Telnet based on TCP/IP stack
- Remote through B-channel: SNMP and Telnet based on the PPP protocol

Operating environment:

- Recommendations fulfilled:
 - Safety: EN 60950
 - EMC/EMI: EN 50081-1 & EN 50082-1
- Operating temperature: 5°C to 40°C
- Max. humidity: 15% to 80% non condensing

Power supply:

- AC power supply: Input voltage: 100-240 VAC \pm 10%, 50-60 Hz
- DC power supply: Input voltage: 36-72 VDC
- Power consumption: < 15 Watt

Mechanical data:

- W x H x D: 268 x 39 x 243 mm
- Weight: < 2 kg

13.2. Connector definitions.

13.2.1. BRI port: RJ-45 (TE pin definition).

Pin nr	Circuit name	Input/Output
1		
2		
3	TX +	O
4	RX +	I
5	RX -	I
6	TX -	O
7		
8		

13.2.2. PRI port: RJ-45 (TE pin definition).

Pin nr	Circuit name	Input/Output
1	RX 1	I
2	RX 2	I
3		
4	TX 1	O
5	TX 2	O
6		
7		
8		

13.2.3. Control port: RJ-45 (V24/V28).

Pin nr	Circuit name	Input/Output
1	RXD	O
2	DCD	O
3	TXD	I
4	RTS	I
5	DSR	O
6	CTS	O
7	DTR	I
8	SGND	O

13.2.4. Ethernet port: RJ-45 (10Base-T).

Pin nr	Circuit name	Input/Output
1	TX +	O
2	TX -	O
3	RX +	I
4		
5		
6	RX -	I
7		
8		

13.2.5. Power inlet: XLR (+5V DC).

Pin nr	Circuit name	Input/Output
1	+5V	I
2	SGND	I
3		

13.3. Cable. Definitions.

13.3.1. DX_C2DMM-R45-R45 (BRI & PRI straight).

Connector 1			Connector 2		
Pin number	Circuit name		Pin number	Circuit name	
	BRI	PRI		BRI	PRI
1		RX 1	1		RX 1
2		RX 2	2		RX 2
3	TX +		3	TX +	
4	RX +	TX 1	4	RX +	TX 1
5	RX -	TX 2	5	RX -	TX 2
6	TX -		6	TX -	
7			7		
8			8		

13.3.2. DX_C2XMM-R45-BRI (BRI crossed).

Connector 1		Connector 2	
Pin nr	Circuit name	Pin nr	Circuit name
1		1	
2		2	
3	TX +	3	RX +
4	RX +	4	TX +
5	RX -	5	TX -
6	TX -	6	RX -
7		7	
8		8	

13.3.3. DX_C2XMM-R45-R45 (PRI crossed).

Connector 1		Connector 2	
Pin nr	Circuit name	Pin nr	Circuit name
1	RX 1	1	TX 1
2	RX 2	2	TX 2
3	-	3	-
4	TX 1	4	RX 1
5	TX 2	5	RX 2
6	-	6	-
7	-	7	-
8	-	8	-

13.3.4. Control port adapter RJ45 to SubD9.

RJ45		SubD9	
Pin nr	Circuit name		Input/Output
1	RXD	1	DCD
2	DCD	2	RXD
3	TXD	3	TXD
4	RTS	4	DTR
5	DSR	5	SGND
6	CTS	6	DSR
7	DTR	7	RTS
8	SGND	8	CTS

14. Floorplan – location of jumpers.

