BLACK BOX Catalogue Ltd
The Source for Connectivity

2.048-Mbps HDSL Modem:
MDU9658-R2

Interface Modules:

X21 Nx64	-	MDU9200
X.21 2.048 Mbps	-	MDU9201
Ethernet Router	-	MDG9467
G.703 (2.048 Mbps)	-	MDU9197
Ethernet Bridge	-	MDU9466
V.35 2.048 Mbps	-	MDU9666

2.048-Mbps HDSL Modem

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Safety requirements

The interfaces provided on the 2.048-Mbps HDSL should only be connected to circuit types as listed below:

Interface	Port description	Circuit type
line interface	MKDS	TNV-1
management interface	subD	SELV

Preface

This manual contains three main parts:

The ... part	gives ...
installation manual	a standard installation of the modem.
reference manual	a complete description for lookup purposes.
annex	additional reference lists.

Icons

The following icons are used throughout the manual. The table below explains what they mean.

Icon	Name	What it indicates
	remark	Useful information or tips.
	caution	Read the text that follows carefully in order to avoid damage to the device.
	warning	Read the text that follows carefully in order to avoid injury.
	DIP switch	A configuration attribute which can be set by means of the DIP switches.
	basic TMA	A basic configuration attribute of the Total Maintenance Application.
	advanced TMA	An advanced configuration attribute of the Total Maintenance Application.
	TMA action	A certain action which can be performed in the Total Maintenance Application.

Contents

Introduction

This chapter introduces the 2.048-Mbps HDSL Modem.

Congratulations on your purchase of a Black Box 2.048-Mbps HDSL Modem.

The 2.048-Mbps HDSL (High bit rate Digital Subscriber Line) Modem is a Baseband modem for E1 digital subscriber lines or private copper networks. It is designed to cover long distances at 2 Mbps over unshielded twisted pairs without the need for expensive repeaters or pair selection. Therefore, the 2.048-Mbps HDSL Modem re-enhances the value of the installed copper base to a large extent. Furthermore, the 2.048-Mbps HDSL Modem offers:

- 2 pair operation (compliant to ETSI ETR 152)
- a flexible data interface adaptation through modular interfaces (V35, X21, G703, 10baseT Bridge and IP-Router)
- different powering possibilities (230/115 Vac, 48 Vac or -48 Vdc)
- easy self-test and link-test functions
- extended management possibilities for configuration and inspection purposes
- flash memory for easy firmware updating.

The Modem can be powered with 230/115 Vac, 48 Vac or -48 Vdc.

DTE interface overview

The 2.048-Mbps HDSL Modem can be provided with the following interface modules:

2.048-Mbps HDSL Modem xP	
Interface name	**Interface type**
V35	transparent (2 Mbps) or Nx64 kbps (up to 2 Mbps)
X21	transparent (2 Mbps) or Nx64 kbps (up to 2 Mbps)
Bridge	transparent (2 Mbps) or Nx64 kbps (up to 2 Mbps)
Router	transparent (2 Mbps) or Nx64 kbps (up to 2 Mbps)

The G703 interface is a special case. Here the following applies:

2.048-Mbps HDSL Modem xP	
G703 module	transparent (2 Mbps) or G.704 framing

Management overview

The 2.048-Mbps HDSL Modem can be configured on three levels:

- A set of DIP switches is provided, setting the basic configuration for the modem. This enables the field technician to install and check the modem. The DIP switch configuration can always be overruled by management interventions.
- The Total Maintenance Application (TMA) is a free Windows based software package which enables the user to maintain the modem. All configuration, status and performance attributes can be accessed for both the local and remote modem.
- The 2.048-Mbps HDSL Modem can be connected to an Orchid 1003 LAN management concentrator. This allows a number of management solutions like management under HP Openview .
- For more information on TMA, refer to the TMA manual.

Installing and connecting the 2.048-Mbps HDSL Modem

This chapter explains how to install and connect the 2.048-Mbps HDSL Modem

Safety instructions

SAFETY WARNING
To avoid damage to the equipment, please observe all procedures described in this chapter.

SICHERHEITSBESTIMMUNGEN
Um eine Beschädigung des Gerätes zu verhindern, beachten Sie bitte unbedingt die Sicherheitsbestimmungen, die in diesem Abschnitt beschrieben werden.

IMPORTANT SAFETY INSTRUCTIONS
Unplug the unit from the wall power outlet before installing, adjusting or servicing. The safety of this product depends upon the third pin (ground pin) of the 3-wire grounding type plug. Do not defeat this safety feature. If the power outlet at your site only has 2 pins, please consult a qualified electrician.

ACHTUNG! WICHTIGE SICHERHEITSINSTRUKTIONEN
Vor sämtlichen Arbeiten am Gerät (Installation, Einstellungen, Reparaturen etc.) sollten Sie den Netzstecker aus der Steckdose ziehen. Die Sicherheit dieses Gerätes ist abhängig von dem dritten Kontakt (dem Erdungspin) des 3-poligen Steckers. Beachten Sie unbedingt diese Sicherheitsstandard. Sollten Sie nur eine ältere 2-polige Steckdose zur Verfügung haben, lassen Sie diese von einem Elektriker gegen eine 3-polige Steckdose auswechseln.

Ensure that the unit and its connected equipment all use the same AC power and ground, to reduce noise interference and possible safety hazards caused by differences in ground or earth potentials.

Unpacking

Rough handling during shipping causes most early failures. Before installation, check the shipping carton for signs of damage. If damaged, please place a claim with the carrier company immediately.
If the carton box is undamaged, do not dispose of it in case you need to store the unit or ship it in the future.

Selecting a site

WARNING
Always place the unit on its feet without blocking the air vents.
Do not stack multiple units directly onto each other, as stacking can cause heat build-up that could damage the equipment.

ACHTUNG
Stellen Sie das Modem niemals seitlich, sondern nur auf den Füßen auf und achten Sie darauf, daß die Lüftungsschlitze an der Seitenverkleidung frei bleiben.
Stapeln Sie nicht mehrere Geräte direkt übereinander, dies kann zu einem Hitzestau führen.

Install the unit in an area free of extreme temperatures, humidity, shock and vibration. Position it so that you can easily see and access the front panel and its control indicators. Leave enough clearance at the back for cables and wires. Position the unit within the correct distances for the different accesses and within 2m of a power outlet.

Installation and connection precautions

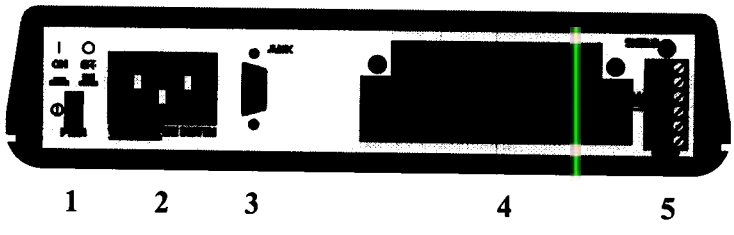
ESD WARNING

The circuit boards are sensitive to electrostatic discharges (ESD) and should be handled with care. It is advisable to ensure an optimal electrical contact between yourself, the working area and a safety ground before touching any cards. Take special care not to touch any component or connector on the PCB.

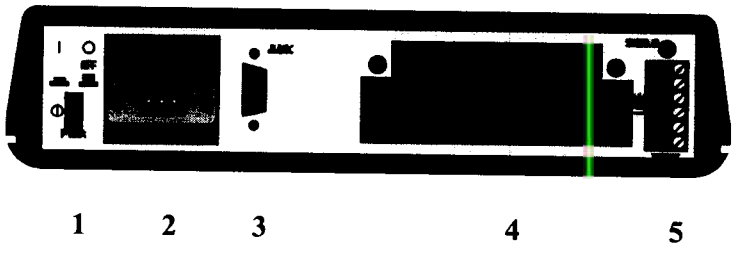
Connecting the Modem

This section explains how to connect the 2.048-Mbps HDSL Modem.

Modem Connections



Rear view of the 2.048-Mbps HDSL Modem - 230/115 Vac model



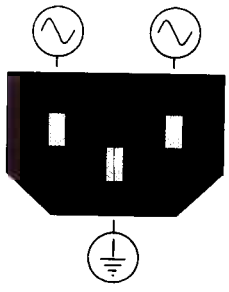
Rear view of the 2.048-Mbps HDSL Modem - 48 V model

No.	Part
1	power switch
2	power inlet
3	auxiliary connector
4	DTE interface slot
5	line connection

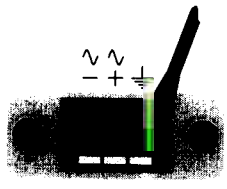
Connecting the Power Supply

The 2.048-Mbps HDSL Modem exists in two different powering models:

- 230/115 Vac
- -48 Vdc or 48 Vac.



230/115 VAC Power Supply Plug



48 V power Supply Connector

For the 230/115 Vac models, a standard IEC power supply plug is provided.

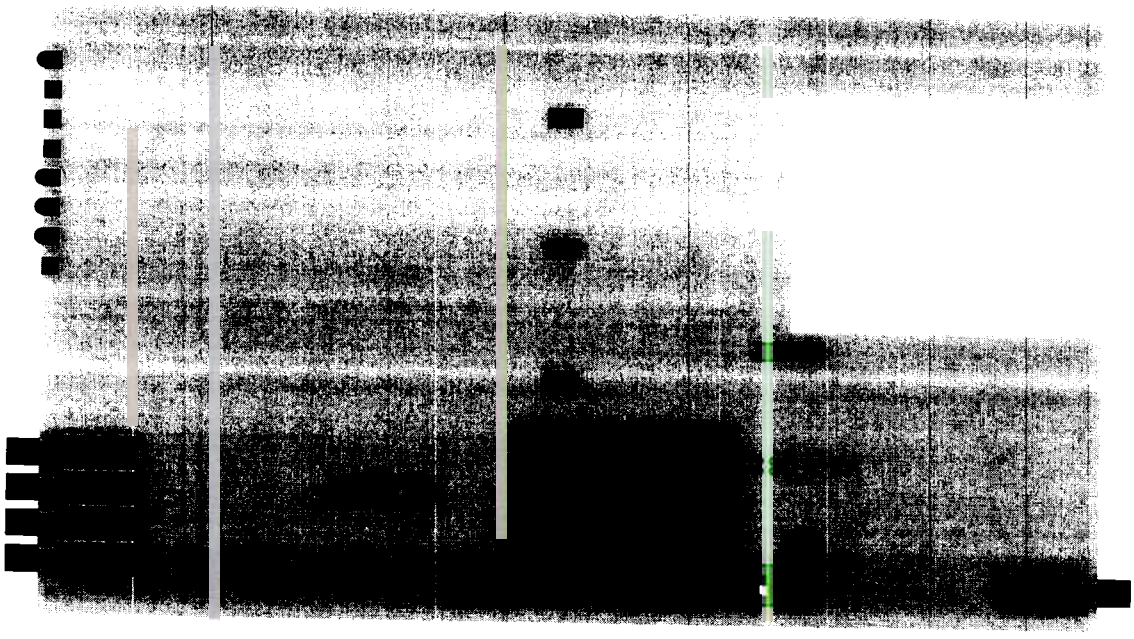
For the -48 Vdc or 48 Vac models, a 48 V power supply connector is provided.

For the -48 V models, the + and - indications are with respect to each other, not to the ground level. This means that for a standard -48 Vdc connection, the ground will be connected to +, while the negative voltage is connected to the -.

Voltage selection – 230/115 Vac

Switching between 230 Vac and 115 Vac operation is done with the voltage selection switch SW3. The position of the switch on the modem's motherboard is indicated on the figure below.

The default position of this switch is 230 VAC.



Position of SW3 and ST11 on the modem's motherboard

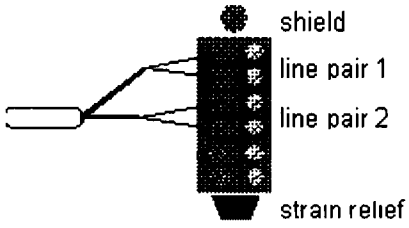
Signal and protective ground interconnection

With strap ST11, the interconnection between signal ground and protective ground can be configured.
As default, the signal ground is disconnected from the earth (protective ground). This avoids problems, which might occur when the earth potential of the modem and the connected application is not the same. In such a situation earth, current loops may induce distortion on the transmitted data, resulting in transmission errors.

ST11 strap position	Signal and protective ground connection
1	**disconnected**
2	connected through 100 ohms resistor
3	directly connected

Connecting Lines to the Modem

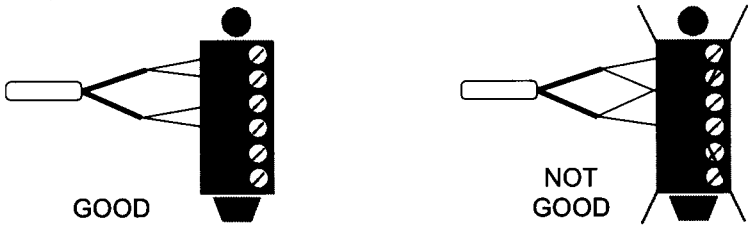
At the rear of the Modem, a line connector is provided. It has the following parts:



Part	Explanation
shield	Used to connect the common shield of every line pair.
line pair ...	On a 2.048-Mbps HDSL Modem, 2 line pairs can be connected. Therefore, up to 4 connections are provided.
strain relief	Secures the connected line cable.

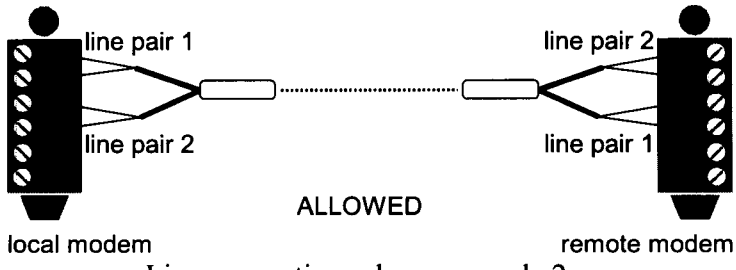
Line connection rules:

- make sure a twisted pair is connected to one line connection only.



Line connection rules – example 1

- it is allowed to connect a twisted pair to line connection 1 on the local modem and to line connection 2 on the remote modem.



Line connection rules – example 2

Inserting the DTE interface in the Table Top

At the rear of the modem, an empty space is provided in which the desired interface module can be inserted without opening the housing. To insert the DTE interface, proceed as follows:

Step	Action
1	Gently slide it on the two inner slides.
2	When nearly inserted, press tight.
3	Lock both screws.

When the interface module is present, connect the application.

Front panel LED indicators

This section gives an overview of the front panel LEDs and whet they indicate.

When all the connections are made and the 2.048-Mbps HDSL Modem is powered, the LEDs on the front panel reflect the actual status of the modem.

Power LED

- Indication on the modem: PWR.
- LED colour: green.

This LED indicates that the modem is connected to the power supply and is switched on.

Test LED

- Indication on the modem: 142 / TST.
- LED colour: red.

This LED indicates whether the modem is in normal operation or in test condition (ET, AL, RDL, DL or a combination of them). Four different modes can be distinguished:

LED status	Explanation
off	No test is active.
permanently on	A front panel or interface test is active.
blinking	A test initiated by the management system is active.
flashing	A front panel or interface test has been terminated by the management system.

Termination of an active test by the management system is necessary to prevent hang-up situations caused by accidental activation of a test. Once the test indicator starts flashing, all active test conditions should be removed first, before initiating a new test session.

Error LED

- Indication on the modem: AIS / ERR.
- LED colour: red.

This LED indicates an error has occurred. There are three possibilities:

Possibility	Explanation
1	The modem its internal error test pattern generator/detector (ET) is active, and the modem has received bit errors.
2	Local alarm signalling is active, and an internal alarm has been generated.
3	When a G703 interface is used, it indicates an Alarm Indication Signal (AIS) is detected on the incoming G703 transmit data. This means that the application has detected an error, and it communicates this to the interface by setting all data bits to 1 (which is the AIS condition).

Transmit data LED

- Indication on the modem: 103 / TXD.
- LED colour: yellow.

This LED monitors the data sent by the data terminal equipment to the data interface module.

Note that the data is monitored after it went through the data interface circuitry. Some interfaces (G703, bridge and router) will add framing information which will activate the TXD LED even if no real user data is being transmitted.

Synchronisation LED

- Indication on the modem: S1 / SQ1; S2 / SQ2; S3 / SQ3.
- LED colour: green / orange / red.

This LED indicates whether the modem is in synchronisation with the remote modem for the corresponding line pair. It also gives an indication of the data link quality on the corresponding line pair.

Four different modes can be distinguished:

LED status	On the corresponding line pair ...
green and blinking	a training phase is in progress.
green	a proper data link is present.
orange	a medium quality data link is present.
red	the connection is lost.

In case of a 2.048-Mbps HDSL Modem 2P F, the SQ3 LED is not lit.

Receive data LED

- Indication on the modem: 104 / RXD.
- LED colour: green.

This LED monitors the data sent to the data terminal equipment by the data interface module.

Note that the data is monitored before it went through the data interface circuitry. Some interfaces (G703, bridge and router) used on the remote side will add framing information which will activate the RXD LED even if no real user data is being transmitted.

Basic configuration

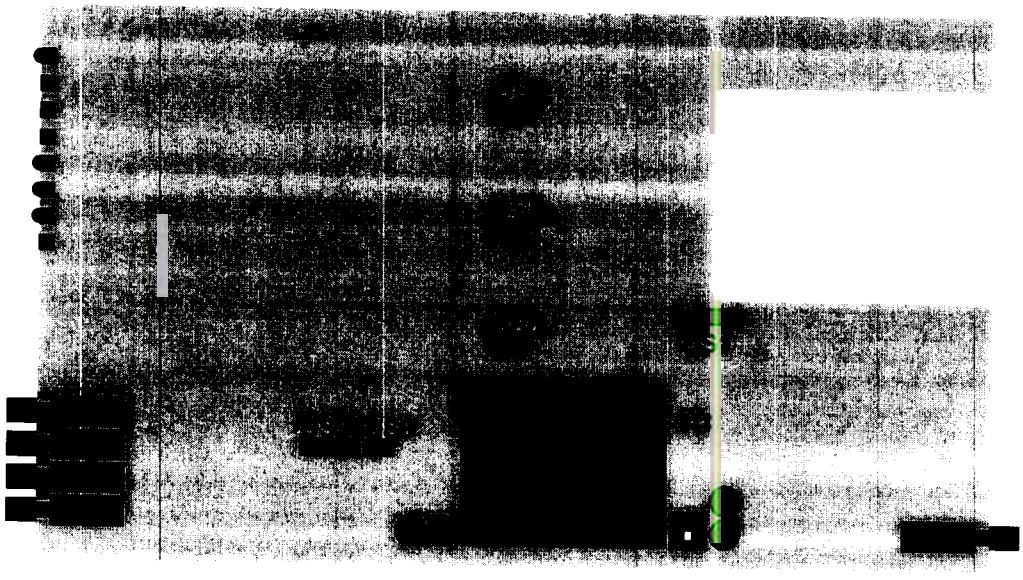
- This chapter describes how to perform a basic configuration of the 2.048-Mbps HDSL Modem by means of the DIP switches and TMA (Total Maintenance Application). When configuring with TMA, there is no need to open the housing of the modem.

A complete configuration attribute description can be found in the reference manual section.

Changing the DIP switches

The DIP switches can be used to customise the power-on configuration of the 2.048-Mbps HDSL Modem. This section locates the DIP switches on the motherboard and gives the procedure to change the settings.

Make sure to power-off, power-on after changing the DIP switch settings.



DIP switch position on the modem's motherboard

The following table gives an overview of the function of the DIP switches.

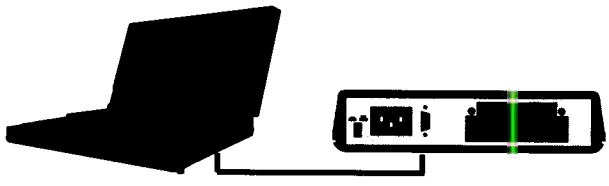
DIP switch no.	This dip switch is ...
DS2, DS3	used to customise the power-on configuration of the 2.048-Mbps HDSL Modem.
DS4, DS5, DS6	not a user changeable DIP switch. The mandatory setting is off.

To change the DIP switch settings, proceed as follows:

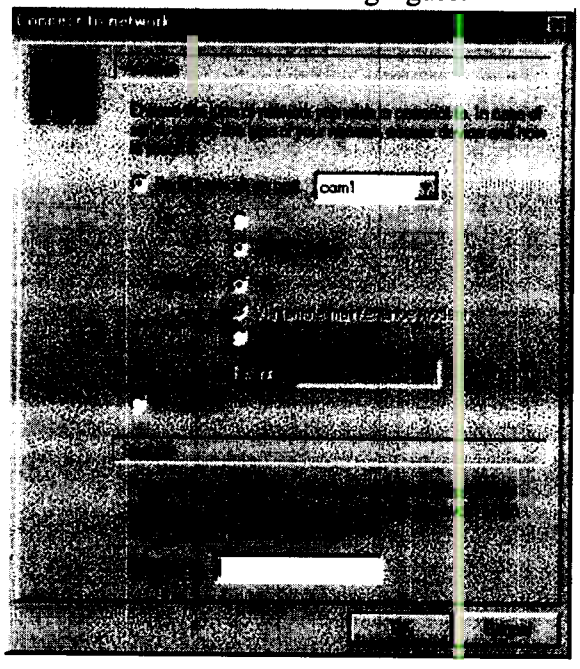
Step	Action
1	Switch the modem off.
2	**Disconnect the modem from the mains.**
3	Unscrew the four screws located at the bottom of the modem.
4	Lift the cover from the modem.
5	Change the DIP switch settings.
6	Replace the cover and close tight.
7	Fasten the four screws located at the bottom of the modem.
8	Reconnect the modem to the mains.
9	Switch the modem on.

Connecting to TMA (Total Maintenance Application)

Changing the basic configuration by means of the dip switches can be discursive. If a laptop is within an arm's reach, it is preferable to configure the modem by means of TMA. This section describes how to establish a link between TMA and the 2.048-Mbps HDSL Modem. For installation and operation of TMA, refer to the TMA manual.
For the connection between the COM port of the PC and the auxiliary connector of the 2.048-Mbps HDSL Modem modem, a straight 9 pins SubD (Male/Female) cable or a regular 25/9 pins SubD adapter cable is used.

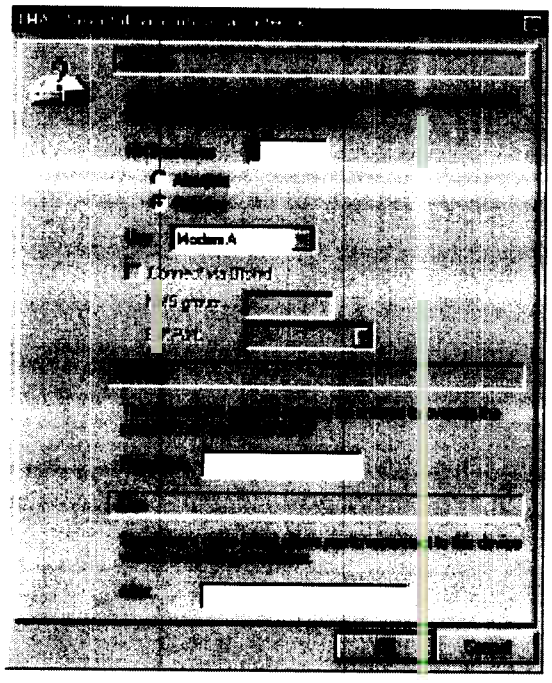


To established a link between TMA and the modem, proceed as follows:

Step	Action
1	Start TMA.
2	In the *Connect* menu, choose *Network...* or press the following button:  The *Connect to network* window is being displayed.
3	Configure this window as indicated in the following figure. 
4	Press the OK button.

Continued on next page ...

Connecting to TMA, continued …

5	In the *Connect* menu, choose *Select device...* or press the following button:  The *Select device window* is being displayed. 
6	Enter relative NMS address 0 to connect to the local modem. Enter relative NMS address 1 to connect to the remote modem. The remote modem can only be contacted if the link is up. Note that when a router interface is used on the local side, it has relative address 0. Consequently, the local modem has relative address 1, the remote modem has relative address 2 ...
7	Optionally, an alias can be entered for quick access later on.
8	Press the OK button.
9	After a couple of seconds, the configuration attributes of the selected modem should appear in the TMA window.

Configuring the 2.048-Mbps HDSL Modem

This section explains the basic strap settings which have to be performed to get the 2.048-Mbps HDSL Modem up and running.

DIP switch configuration table structure

To be able to read the DIP switch configuration tables, this section explains the structure of such tables.
A DIP switch configuration table has the following layout:

Strap name	Modem DS2 No.	Setting	Function
initial settings	0	off **on**	DIP switch **flash memory**
1	2	3	4

The different columns display the following information:

Column	This column displays ...
1	the strap name.
2	on which DIP switch bank the strap can be found the strap number.
3	the settings off and on. The default setting is printed in **bold**.
4	the function associated with the corresponding DIP switch setting.

- For an overview of the DIP switch settings of the 2.048-Mbps HDSL Modem, refer to Annex A: DIP switch configuration tables.
- For an overview of all the attributes of the 2.048-Mbps HDSL Modem, refer to the reference manual.
- The configuration items which can be accessed by TMA are attributes of the 2.048-Mbps HDSL Modem containment tree. The name of these attributes and their position within the containment tree are indicated in **Arial Narrow bold** printing (e.g. **bb2048HDSL/<interface>/clocking**).

Initial settings

The initial settings strap is used to define which configuration is read at start-up.

Strap name	DS2 No.	Setting	Function
initial settings	8	off **on**	DIP switch **flash memory**

Because the default setting is *on* (flash memory), the modem can immediately be used with TMA without opening the housing. When *off* is selected, settings which cannot be changed by the DIP switches are reset to their default values.

Note that this DIP switch setting cannot be overruled by TMA

Channel selection

Strap name	DS3 no.	Setting	Function
channel	1	off **on**	central **remote**

bb2048HDSL/modem/channel central / remote

The channel strap is used to define which modem will act as central and which as remote modem. The setting determines which modem will act as master during the synchronisation procedure of the modem.

Generally, it is a good practice to set the modem closest to the backbone or management system as central. Consequently, the modem at the customer site has to be set as remote.

Clocking

Strap name	DS2 no.	Setting	Function
clocking	1 2 3	**off off off** on off off off on off on on off off off on	**internal preferred** internal alternative slave receive preferred slave receive alternative external

Clock selection strap

bb2048HDSL/<interface>/clocking

Clocking scheme	Explanation
internal	The modem generates the transmit clock signal and sends it to the application via the TxClk circuit (circuit 114).
slave receive	The transmit clock signal is derived from the received line data. This reconstructed clock signal is send to the application via the TxClk circuit (circuit 114).
external	The application generates the transmit clock signal and sends it to the modem via the ExtTxClk circuit (circuit 113).

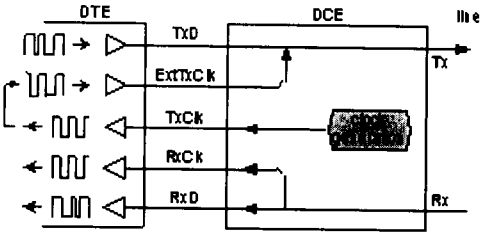
Internal, slave receive and external clocking

Clocking scheme	Explanation
preferred	The application loops back the output of the TxClk circuit (circuit 114) to the ExtTxClk circuit (circuit 113). It guarantees an optimal phase relationship between the transmitted data and the transmitted clock. This because the transmission delays of the TxD circuit (circuit 103) and the ExtTxClk circuit are exactly the same, since both circuits their outputs originate in the application and are fed into the modem.
alternative	Does not require the TxClk (circuit 114) to ExtTxClk (circuit 113) loop-back. In this case the clock is looped back within the modem itself.

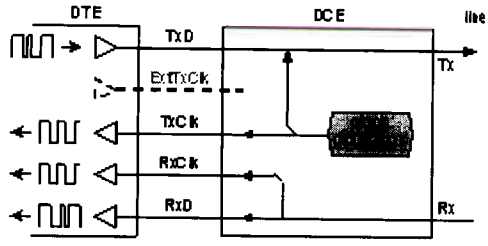
Preferred and alternative clocking

It may be necessary to use preferred clocking when delays are introduced in the communication between the DTE and the modem. Delays may occur in case of long interconnection cables or interface converters.

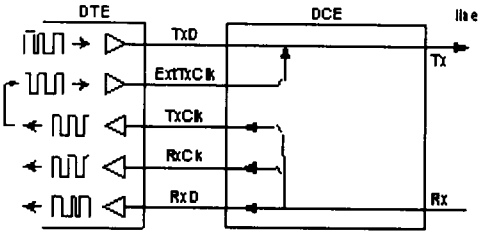
The following figures give an overview of all the clocking possibilities.



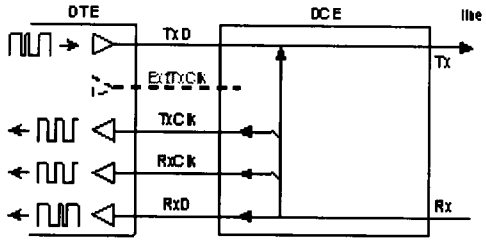
Internal preferred clocking



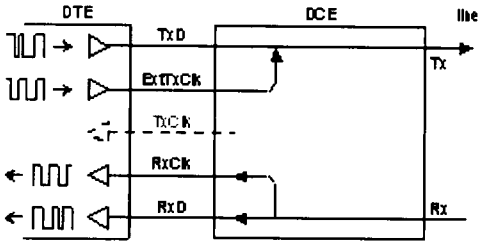
Internal alternative clocking



Slave receive preferred clocking



Slave receive alternative clocking



External clocking

The possible clocking selections depend on the used interface, as shown in the table below.

Interface	Explanation
V35	All the necessary clock circuits (RxClk, TxClk, ExtTxClk) are present on these interfaces. Therefore, they support all the possible clocking schemes.
X21	Normal X21 operation only provides the S clock (DCE originated), which is used for both transmit and receive clocking. Therefore, the normal clock configuration would be internal alternative at one side, and slave receive alternative at the other. If the X clock is present, external clocking is possible also. Than the S clock is used for the receive data only.
G703	Only external clock is possible.
bridge and router	The clocking configuration for the bridge and the router interfaces is always internal alternative or slave receive alternative.

Clock selection depending on the used interface

RTS control

bb2048HDSL/<interface>/rTSControl **external** / internal

(only for V35 interface type)
Normal operation requires the RTS signal (circuit 105) to be active before the modem activates its data transfer state, as indicated by the CTS signal (circuit 106). Therefore, make sure the RTS signal is activated either by the application, or by the modem.

If RTS control is set to ...	... the RTS signal is activated by ...	This strap setting is used when ...
external	the application.	the application has to be in command of the RTS signal.
internal	the modem.	the application is not able to activate the RTS signal.

RTS control strap

G703 interface configuration

bb2048HDSL/g703/framing **unframed** / framed

A G703 interface can be used in framed or unframed mode:

Mode	Explanation
unframed	Unframed mode means that a 2 Mbps data stream is sent transparently over the line. In unframed mode, fallback or fractional operation and G.703 interface tests are not possible.
framed (G.704 framing)	Up to 31 time slots each containing a 64 kbps data stream can be sent over the line. Each 64 kbps time slot can be disabled or enabled. In framed mode, time slot 0 is reserved for synchronisation and signalling.

Unframed and framed mode

Time slot allocation of a G.704 framed data stream is explained in the section below.

Nx64k interface configuration

bb2048HDSL/nx64/timeslots

The Nx64k interfaces for the 2.048-Mbps HDSL Modem offer the possibility to configure the interface speed to any multiple of 64 kbps by means of G.704 framing.
The allocation of the time slots is done by means of TMA, and is done as follows:

Step	Action
1	Set time slot TS0 = 0 (disabled) to enable G.704 framing.
2	Allocate the desired time slots on the local modem by setting them to value 1 (enabled).
3	Allocate the desired time slots on the remote modem by setting them to value 1 (enabled).

Allocating time slots

A local 2.048-Mbps HDSL Modem with a Nx64k interface, can only operate with a remote 2.048-Mbps HDSL Modem which also has a Nx64k interface or a G703 interface set to framed mode. Exception: when working at 2048 kbps, a Nx64k and a non-Nx64k can be used together.

Example 1

Setting:
TS0 = 0
TS6, TS12, TS25 = 1
all other time slots = 0

Setting:
TS0 = 0
TS6, TS12, TS25 = 1
all other time slots = 0

Allocating time slots – example 1

Example 2

When a Nx64k interface is used at one side, and a G703 interface at the other, it is sufficient to configure the time slots of the Nx64k interface. When the G703 interface is set to framed mode, it will take over the time slots which where allocated by the Nx64k interface.

Setting:
TS0 = 0
TS6, TS12, TS25 = 1
all other time slots = 0

Setting:
framed mode

Allocating time slots – example 2

Time slot allocation of a G.704 framed data stream is explained on page 28.

Activating the configuration

Once the basic configuration of the local modem is set, it has to be activated.

In case of configuration with ...	do the following:
the DIP switches	start-up the modem
TMA	press the following button: 

Activating the configuration

Repeat the installation for the remote modem.
Now both modems are set, try sending data to check whether the link is established. If any problems occur, the status, performance and alarms of the modem can be checked.

Performance and alarms

Performance information intervals

Performance information is useful to keep track of the global performance of the network and for solving network problems. The performance information is stored in the modem itself.
The performance information is accumulated during three different time intervals:

2 hours

The performance information is accumulated during a 15 minute time span, called a period. Each 15 minutes, a new period begins. To cover a 2 hours interval, 8 periods are kept. The information is stored in a circular way. I.e. each 15 minutes the most recent measured and calculated values are added, and the oldest values are lost.

24 hours

This is basically the same as for 2 hours. To cover a larger time interval (24 hours), 12 periods of 2 hours are collected.

Since boot

In this case the performance information is kept since the latest cold boot of the modem. This can be considered as a performance information *summary*.
The modem does not contain a real-time clock, therefore time information is related to its internal clock. To allow the user to situate the time intervals in the real time, the TimeSinceLastUpdate performance attribute is returned together with the performance information. Another time indication is the SystemUpTime status attribute, which reflects the time since the latest cold boot of the modem.

Performance attribute types

Performance attribute type	Explanation
validity	Indicates, for the corresponding period, whether the performance information is valid or invalid. When the modem has just booted, all periods are labeled as invalid, because no performance information could be gathered yet.
period	Gives a time indication for the corresponding period. • The oldest period, labeled 1, has time indication -120min -> -105min. This period is listed at the top of the performance table. • The most recent period, labeled 8, has time indication -15min -> 0min. This period is listed at the bottom of the performance table.
min, max, avrg	Display the minimum, maximum and average values calculated for the corresponding period. E.g. min-max-avrg value of the noise margin.
count	Counts the number of times an event occurred during the corresponding period. E.g. the number of retrains.
time	Indicates the time duration of an event during the corresponding period. E.g. the time during which the synchronisation is lost.

Performance parameter types

Only the available statistics are displayed. If the interrogation happens shortly after boot, no parameters are displayed. For example in the 2 hours and 24 hours selection, the new statistical data is available only when a complete time span (15 min, 2 hrs) has elapsed.

Alarm configuration

Alarms are an indication that an occurred. The information an alarm supplies to the operator, allows him to take appropriate actions.

Alarm configuration attribute	Explanation
alarmMask	Enables or disables the sending of an alarm to the central management system.
alamrLevel	A level of importance can be assigned to each alarm. If several alarms are generated at the same time, the one with the highest level of importance will be shown.

Alarm configuration

Alarm monitoring

Alarm attribute	Explanation
totalAlarmLevel	Is shown in the top object (e.g. bb2048HDSL) and displays the active alarm with the highest alarm level. This enables the operator to have a quick estimation of the problem.
alarmInfo	Is shown in the sub objects and displays the most recent and the second most recent alarms. It also displays a discriminator, which is a counter used for the alarm exchange with the centralised management system. Finally, the alarmMask and alarmLevel as set in the configuration are shown as well.

Alarm monitoring

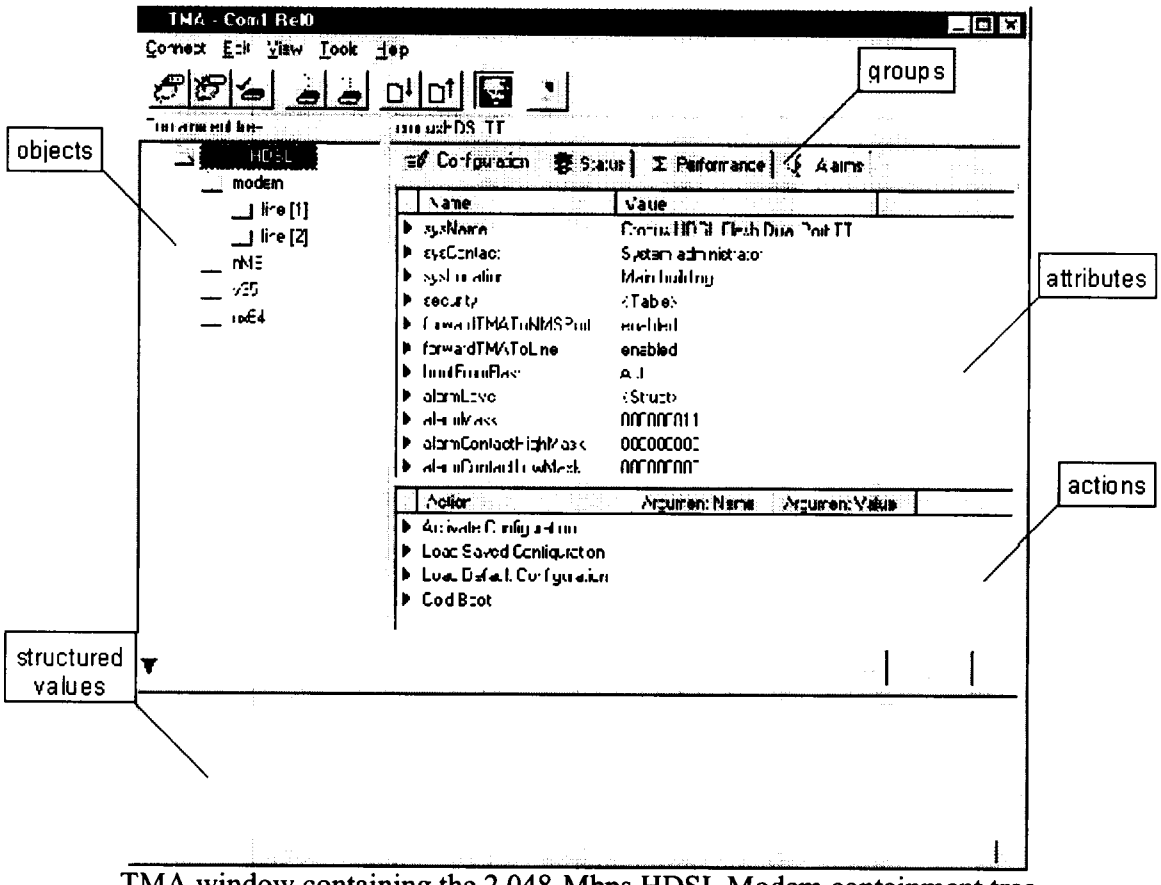
Reference manual

Configuration

This chapter introduces the 2.048-Mbps HDSL Modem containment tree. It also discusses all the configuration attributes.

2.048-Mbps HDSL Modem containment tree

This section gives an introduction to the 2.048-Mbps HDSL Modem containment tree. It also introduces the terms *group*, *object*, *attribute*, *value* and *action*.
The figure below depicts the TMA window containing the 2.048-Mbps HDSL Modem containment tree.



TMA window containing the 2.048-Mbps HDSL Modem containment tree

The following table explains the terminology associated with the containment tree.

Term	Explanation
containment tree	The containment tree resembles a Windows directory structure: • it is also a levelled structure, with nodes which can be expanded or reduced • the containment tree objects can be compared with file folders • the objects contain attributes like file folders contain files.
object	Objects group a set of attributes related to one domain. The object name indicates which domain is covered. E.g. the top object bb2048HDSL contains the sub object line[1]. This object contains all the attributes concerning line pair 1. For example: the status attribute lineAttenuation (dB).
attribute	Attributes are part of an object. The attributes are the "straps" of the object and have certain values. E.g. the modem object contains the channel attribute, which has the values central and remote.
value	Attributes have certain values. These values are either: • changeable, as for configuration attributes • read only, as for status, performance and alarm attributes. E.g. the configuration attribute channel can be set to the value central or remote.
structured value	Some attributes contain structured values such as tables. These values are displayed in the structured value window. If an attribute contains structured values, the string <Table> or <Struct> is displayed. E.g. the alarmLevel attribute contains a structure which displays alarms and their corresponding priority level.
group	Groups assemble a set of attributes related by functionality. There are four groups, which correspond with the four tabs in the TMA window: • configuration • status • performance • alarms.
action	With TMA, certain actions can be executed. These actions are displayed in the action window. The actions are linked to a group in combination with a certain object. E.g. the Force Full Retrain action only appears when the modem object in combination with the performance group is selected.

Containment tree terminology

This chapter and the following three chapters explain all the attributes of the 2.048-Mbps HDSL Modem containment tree. The attributes are described by group. I.e. this chapter describes the configuration attributes, the following the status attributes, ... Within a chapter, the objects and their underlying attributes are discussed in a sequential manner (from top to bottom).

The table below lists the different objects of the 2.048-Mbps HDSL Modem containment tree.

Object	This object contains ...
bb2048HDSL	general system attributes. It is the top object. E.g. the system description; sysDesc: 2.048-Mbps HDSL Modem 2P V35 Nx64 T2114/00700.
modem	the modem attributes, i.e. attributes related to the data pump. E.g. the configuration attribute channel.
line[ ]	the line pair attributes. E.g. the status attribute noiseMargin. The containment tree of a 2 pair modem contains 2 line[ ] objects.
nMS(Twin)	the network management attributes. E.g. the network management interface speed; ifSpeed: 9600.
<interface>	the DTE interface attributes. E.g. clocking: internal alternative. The name of this object depends on the type of DTE interface. E.g. v35 in case of a V35 interface, g703 in case of a G703 interface, ...
nx64	the time slots of a Nx64k DTE interface. This object is only present when a Nx64k interface is used.

Objects of the 2.048-Mbps HDSL Modem containment tree

- Default value settings are printed in **bold**.
- The name of the attributes and their position within the containment tree are indicated in **Arial Narrow bold** printing (e.g. **bb2048HDSL/<interface>/clocking**).

Configuration attribute overview

Object bb2048HDSL

bb2048HDSL
- sysName
- sysContact
- sysLocation
- security
- forwardTMAToNMSPort
- forwardTMAToLine
- bootFromFlash
- alarmLevel
- alarmMask
- alarmContactHighMask
- alarmContactLowMask

Object bb2048HDSL – actions

bb2048HDSL
- Activate Configuration
- Load Saved Configuration
- Load Default Configuration
- Cold Boot

Object modem

modem
- retimingBuffer
- tests
- retrain
- fallbackStepup
- auxChannelMode
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask
- syncLossAlarmTimeout
- highBitErrorAlarm
- lowBitErrorAlarm
- nEBECountAlarm
- fEBECountAlarm
- channel

Object line

line[ ]
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask

Object NMS(Twin)

nMS(Twin)
- cms2Address

Object powerOffDetection

powerOffDetection
- mode
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask

Object <interface> (v35, g703, bridge or router)

V35
- rTSControl
- cTSDelay
- tests
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask
- clocking

x21
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask
- clocking

g703
- g703Coding
- framing
- tests
- cRC4Insertion
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask

bridge
- IANFilter
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask
- clocking

router
- alarmMask
- alarmLevel
- alarmContactHighMask
- alarmContactLowMask
- clocking

Object nx64

nx64
- timeslots

2.048-Mbps HDSL Modem configuration

bb2048HDSL/sysName (max. 64 characters)

In this field the modem name can be filled in (SNMP MIB2 parameter).

bb2048HDSL/sysContact (max. 64 characters)

In this field the name of the contact person can be filled in (SNMP MIB2 parameter).

bb2048HDSL/sysLocation (max. 64 characters)

In this field the modem location can be filled in (SNMP MIB2 parameter).

bb2048HDSL/security

In order to avoid unauthorised persons accessing the modem and network, 5 passwords of maximum 10 characters can be defined. The access level linked with each password is determined by its access template. If no password is programmed, the user has total access to all parameters. The table below shows the different access levels.

accessRights	Description
ReadAccess	The user is allowed to read the modem parameters (without security items).
WriteAccess	The user can modify line, NMS and interface parameters.
SecurityAccess	The user can read and modify security parameters.

Access rights table

Without the correct password, it is impossible to access the 2.048-Mbps HDSL Modem with TMA. To restore the default password, follow the procedure below:

Step	Action
1	Switch the modem off.
2	Write down the current DIP switch configuration.
3	Set DS2 position 8 to *off*. To change the DIP switch settings, refer to page 20
4	Switch the modem on. The modem reboots and all attributes are reset to their DIP switch settings or their default values.
5	After the modem has finished its boot cycle (the TST and ERR LEDs light up), switch the modem off again.
6	Reset the DIP switch configuration as it was before step 3.
7	Switch the modem on again. The modem reboots.
8	It may be necessary to reconfigure some attributes using TMA.

Restoring the default password

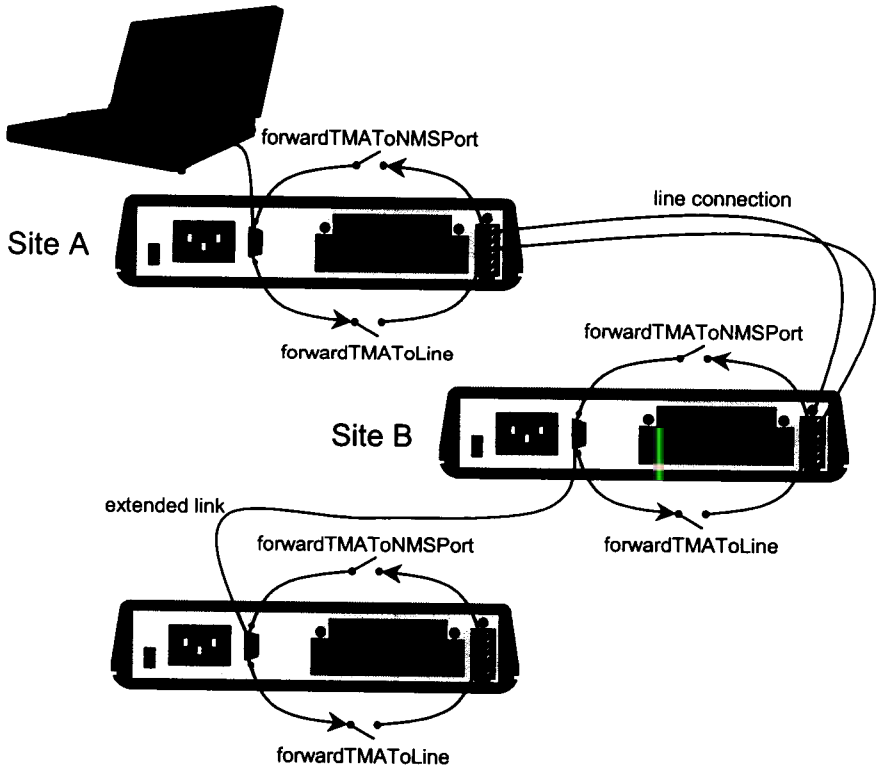
bb2048HDSL/forwardTMAToLine disabled / **enabled**

Disables or enables TMA management access to the remote modem.

bb2048HDSL/forwardTMAToNMSPort disabled / **enabled**

Disabled or enables propagation of TMA management information from the line to the NMS port.

The management system has been designed to provide access not only to the local modem, but also to all remote modems in a network.



TMA access to the remote modems

Management commands and information can be propagated over the line from site A to a remote modem in site B via a dedicated management channel, if the attribute forwardTMAToLine is enabled. If the remote modem in site B is connected (via its NMS port) to another modem, than the management information can also be propagated to this modem, if the attribute forwardTMAToNMSPort is enabled.

bb2048HDSL/bootFromFlash Flash 1 / Flash 2 / **Auto**

The 2.048-Mbps HDSL Modem has two flash memory banks. Each flash memory can contain a complete software version, but only one can be active.

bootFromFlash attribute	Explanation
Flash 1	The first flash memory bank is activated after a cold boot.
Flash 2	The second flash memory bank is activated after a cold boot.
Auto	By comparing the version numbers of the software, the modem automatically chooses the flash memory containing the most recent software.

bootFromFlash configuration attribute

Note that new software is always downloaded in the non-active flash memory bank.

bb2048HDSL/alarmMask

To ensure a continuous operation of the network, detected problems have to be communicated to the network manager. Alarm notification is done in four different ways:

- The detected alarm is communicated to the management system.
- A visual indication is given on the modem itself (the error LED).
- A hardware alarm circuit can be triggered with the signals on the auxiliary connector.

The alarmMask attribute enables or disables for each alarm, the sending to the central management system. For more information on each alarm of the bb2048HDSL object, refer to the 2.048-Mbps HDSL Modem alarms section.

bb2048HDSL/alarmLevel

Each object has its own set of alarms. When an alarm is generated, it may take some time to go through all the objects to check their alarm status. Therefore, a priority level can be assigned to each alarm of the object. When an alarm is generated, its level is put in the attribute bb2048HDSL/totalAlarmLevel (refer to page 67). When several alarms are generated at the same time, the highest priority level is shown. If the alarm levels are set in a structured manner, one look at the totalAlarmLevel attribute enables the operator to make a quick estimation of the problem.

The alarm level range goes from 0 to 256, where 0 is the lowest and 256 the highest level.

bb2048HDSL/alarmContactHighMask

With the alarmContactHighMask attribute, each alarm can be configured to:

- generate a visual indication (blinking error LED)
- generate an alarm signal on pin 1 of the auxiliary connector.

bb2048HDSL/alarmContactLowMask

With the alarmContactLowMask attribute, each alarm can be configured to:

- generate a visual indication (blinking error LED)
- generate an alarm signal on pin 9 of the auxiliary connector.

2.048-Mbps HDSL Modem configuration actions

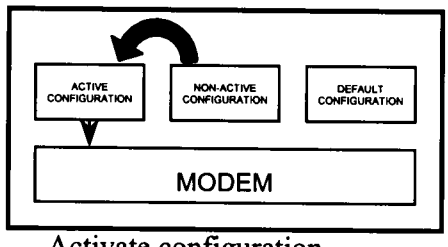
Three types of configuration are present in the modem:

- the non-active configuration
- the active configuration
- the default configuration.

When the computer running TMA is connected with the modem, the non-active configuration is displayed on the screen. This is the copy on which modifications are done. Therefore they have no immediate influence on the current configuration of the modem. After modifying this copy and executing the Activate Configuration action, the non-active configuration is send to the modem and becomes active. When necessary the user can always recall the default configuration.

bb2048HDSL/Activate Configuration

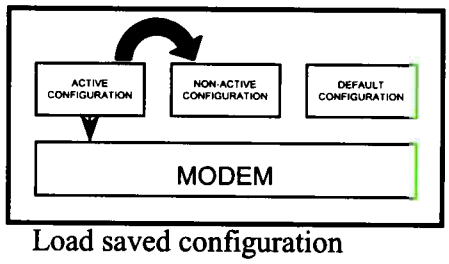
The active configuration is overwritten by the non-active configuration.



Activate configuration

bb2048HDSL/Load Saved Configuration

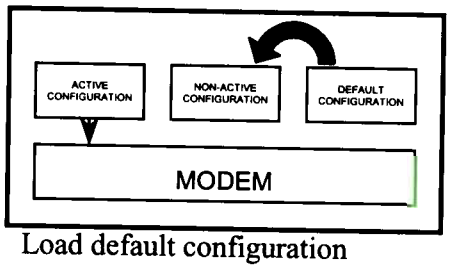
The non-active configuration is overwritten by the active configuration.



Load saved configuration

bb2048HDSL/Load Default Configuration

The non-active configuration is overwritten by the default configuration.



Load default configuration

bb2048HDSL/Cold Boot

The modem performs a cold boot.

Modem configuration

bb2048HDSL/modem/retimingBuffer **short** / long

Inside the modem, a buffer is used to reduce jitter on the transmit clock signal. The longer the retiming, the better the jitter is reduced, but the higher the throughput delay of the link.

bb2048HDSL/modem/tests disabled / **enabled**

The keyboard tests of the 2.048-Mbps HDSL Modem are useful to trace possible problems when installing the modem. The tests are:

Test	Meaning ...
keyboardET	Error Test which can be initiated by the keyboard.
keyboardAL	Analogue Loop which can be initiated by the keyboard.
keyboardRDL	Remote Digital Loop which can be initiated by the keyboard.
keyboardDL	Digital Loop which can be initiated by the keyboard.

Keyboard tests

Once installed it can be better to disable some keyboard tests using the tests attribute. This prevents accidental initiation of a test resulting in a disturbance of the data transfer.
For more information on diagnostic tests, refer to the Diagnostics section.

bb2048HDSL/modem/tests/detectRDL disabled / **enabled**

When set to disabled, this attribute prevents that a digital loop can be initiated by a remote modem on the local modem.

When detectRDL is disabled, and a remote modem initiates a RDL test, the local modem will not go in digital loop. However, the DTE interface will be clamped and data transfer is interrupted.

bb2048HDSL/modem/tests/alDuration **3 minutes**

The analogue loop (AL) test causes a contact loss between the management system and the remote modem. Therefore, this test is automatically terminated after a time-out period which is specified in alDuration. The time-out can be disabled by entering 0 as value.

bb2048HDSL/modem/tests/testPattern

With this attribute seven different test patterns can be selected. The selected pattern is used when the error test (ET) is initiated (refer to the Diagnostics section). The different patterns are:

Test pattern	Meaning ...
2exp4-1	$1+x^3+x^4$
2exp15-1	$1+x^{14}+x^{15}$
2exp20-1	$1+x^{17}+x^{20}$
2exp23-1	$1+x^{18}+x^{23}$
Mark	The test pattern consists completely out of 1's.
Space	The test pattern consists completely out of 0's.
Dot	The test pattern consists of 1's alternated with 0's. E.g. 0101010101

Different test patterns

bb2048HDSL/modem/retrain

The following two attributes define at what bit error rate (BER) a retrain cycle will be initiated in case the line quality deteriorates.

retrain attribute	Value range	Explanation
averagingPeriod(seconds)	1 ... **10** ... 255	Period over which the average BER value is calculated. If within this period the average BER value equals or exceeds the value entered in the threshold attribute, the modem will retrain.
threshold	$2x10^{-3}$ ... $\mathbf{10^{-3}}$ ... 10^{-5}	BER value which defines when the modem should retrain.

retrain configuration attributes

bb2048HDSL/modem/fallbackStepup

It is possible to perform a fall-back or step-up action when the line quality of one of the line pairs deteriorates or improves. The deactivation and reactivation of a line pair is based on a bit error rate measurement per line pair.

- Fall-back means that the modem disables the deteriorated line pair, and continues with a reduced number of line pairs.
- Step-up means the line pair is reused when the line problems are solved.

The fall-back / step-up mechanism is only possible when framing is used. This means in case of:

- a G703 interface in G.704 framed mode
- a Nx64k interface.

The time slots of such a framed data stream have certain priority levels. Under normal circumstances high priority is given to the time slots on line pair 1. Medium priority time slots are those on line pair 2.

The mapping of the time slots on the line pairs is conform the ETSI ETR-152 recommendation.

2.048-Mbps HDSL Modem 2 pair	
Line pair 1	**Line pair 2**
TS0	TS0
TS1	TS2
TS3	TS4
TS5	TS6
TS7	TS8
TS9	TS10
TS11	TS12
TS13	TS14
TS15	TS16
TS16	TS17
TS18	TS19
TS20	TS21
TS22	TS23
TS24	TS25
TS26	TS27
TS28	TS29
TS30	TS31

Priority time slots

In fall-back operation, the high priority time slots are preserved. This means that if line pair 1 would fail, the high priority time slots are moved to line pair 2.
When a Nx64k interface operating in either internal or slave receive clocking is used, the interface clocking speed is automatically adapted when time slots are lost due to line pair failure. This guarantees communication integrity, even in case of line problems.

In order to keep the highest possible Nx64k interface speed in fall-back operation, it is recommended to allocate the high priority time slots first.

The fallbackStepup configuration attributes are:

fallbackStepup attribute	Value range	Explanation
autoFallbackStepup	**disabled** / enabled	Disables or enables the fall-back / step-up mechanism.
fallbackAveragingPeriod(seconds)	1 … **10** … 255	Period over which the average BER value is calculated in fall-back operation. If within this period the average BER value equals or exceeds the value entered in the fallbackThreshold attribute, the modem will fall back.
fallbackThreshold	$2x10^{-3}$ … **10^{-4}** … 10^{-9}	BER value which defines when the modem should fall back.
stepupAveragingPeriod(seconds)	1 … **10** … 255	Period over which the average BER value is calculated in step-up operation. If within this period the average BER value equals or exceeds the value entered in the stepupThreshold attribute, the modem will step up.
stepupThreshold	$2x10^{-3}$ … **10^{-5}** … 10^{-9}	BER value which defines when the modem should step up.

fallbackStepup configuration attributes

bb2048HDSL/modem/auxChannelMode disabled / transparent / **alarm signalling**

The auxiliary connector can be used for either:

- carrying a transparent asynchronous 2400 bps secondary channel
- local alarm signalling.

TMA management via the auxiliary connector is always possible provided an adapter cable is used.

E.g. to be able to use the transparent channel and the TMA management channel at the same time, a cable with two connectors has to be used. The pins concerning the transparent channel have to be connected to the transparent channel connector. The pins concerning the TMA channel have to be connected to the TMA channel connector

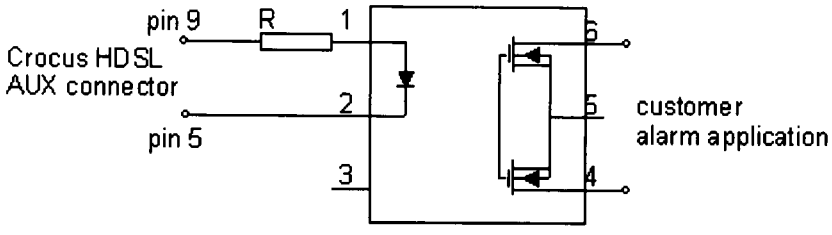
For the pin layout of the 9 pins subD auxiliary connector, refer to page 79.

Alarm signalling

Each possible alarm can individually be selected to drive the high or low alarm output pin of the auxiliary connector. For more information concerning alarms, refer to the Alarms section, commencing on page 67.

The alarm outputs are physically located on pin 1 (high alarm) and pin 9 (low alarm) of the auxiliary connector. Its electrical characteristics are V.28 compatible. A positive (active) voltage indicates an alarm condition, a negative (inactive) voltage indicates an alarm idle condition. When the alarm output circuitry is activated, the ERR led on the front panel flashes. This enables easy identification of the device that generated the alarm.

If tensionless alarm contacts are required, it is possible to use very simple hardware (without any need for power supply). This hardware is based on a solid state relay and is shown below. The amount of hardware is so small that it can be build into the cable connector itself. The circuitry makes use of a solid state relay (SSR) and can be build as a tension free *normal open* or *normal closed* contact, suitable for DC and AC current.



Alarm output circuit

Recommended values :
SSR = LCA110 from Clare Corporation (normally open contact)
SSR = LCB110 from Clare Corporation (if normally closed contact is required)
R = 2K2 ...4K7

bb2048HDSL/modem/alarmMask

bb2048HDSL/modem/alarmLevel

bb2048HDSL/modem/alarmContactHighMask

bb2048HDSL/modem/alarmContactLowMask

For more information on masking and levelling alarms, refer to the 2.048-Mbps HDSL Modem configuration section.

For more information on each alarm of the modem object, refer to page 69.

bb2048HDSL/modem/syncLossAlarmTimeout 0 ... **10s** ... 4m15s

With this attribute one can specify how long the synchronisation may be lost before a synchronisation loss alarm is generated.

If fall-back is enabled, no synchronisation loss alarm is generated as long as a line pair is available.

bb2048HDSL/modem/highBitErrorAlarm

bb2048HDSL/modem/lowBitErrorAlarm

The 2.048-Mbps HDSL Modem permanently monitors the bit error rate (BER) of each line pair. The bit error alarm is divided in two levels:

- highBitErrorAlarm: the bit error rate has reached critical values. Line quality is extremely bad.
- lowBitErrorAlarm: the bit error rate has not yet reached critical values, but line quality is not longer optimum.

The highBitErrorAlarm configuration attributes are:

highBitErrorAlarm attribute	Value range	Explanation
averagingPeriod(seconds)	1 ... **60** ... 255	Period, in seconds, over which the average BER value is calculated.
onThreshold	$2x10^{-3}$ ... $\mathbf{10^{-3}}$ ... 10^{-5}	BER value which defines when the alarm is activated.
offThreshold	$2x10^{-3}$ ... $\mathbf{10^{-4}}$ ... 10^{-5}	BER value which defines when the alarm is deactivated.

highBitErrorAlarm configuration attributes

The lowBitErrorAlarm configuration attributes are:

lowBitErrorAlarm attribute	Value range	Explanation
averagingPeriod(minutes)	1 ... **10** ... 60	Period, in minutes, over which the average BER value is calculated.
onThreshold	10^{-5} ... $\mathbf{10^{-6}}$ ... 10^{-9}	BER value which defines when the alarm is activated.
offThreshold	10^{-5} ... $\mathbf{10^{-7}}$ ... 10^{-9}	BER value which defines when the alarm is deactivated.

lowBitErrorAlarm configuration attributes

Avoid setting the averaging period too short. The shorter this period, the faster an alarm will be generated. As transmissions errors are statistically spread, a short averaging period could result in spurious alarms.

The low bit error rate alarm requires a longer averaging period. Therefore, the averaging period is expressed in minutes instead of seconds.

bb2048HDSL/modem/nEBECountAlarm

An alarm can be generated when the near end block error (NEBE) rate on a line pair exceeds a predefined value. The NEBE is expressed as block errors per second and is calculated by counting cyclic redundancy check (CRC) errors on the framed data on the line. The CRC is calculated every 6 msec, which results in a range of 0 ... 166 CRC errors per second.

The alarm can be generated for each line pair.

The nEBECountAlarm attributes are:

nEBECountAlarm attribute	Value range	Explanation
averagingPeriod(seconds)	1 ... **3** ... 255	Period, in seconds, over which the average NEBE value is calculated.
onThreshold	1 ... **3** ... 166	NEBE value, in block errors per second, which defines when the alarm is activated.
offThreshold	**0** ... 166	NEBE value, in block errors per second, which defines when the alarm is deactivated.

nEBECountAlarm configuration attributes

bb2048HDSL/modem/fEBECountAlarm

The NEBE measured on the remote side of the line is called the far end block error rate (FEBE). This count is communicated to the local side. An alarm can be generated when the FEBE on a line pair exceeds a predefined value. This alarm is especially useful for generating a local alarm when a remote performance problem is detected.

The fEBECountAlarm attributes are:

fEBECountAlarm attribute	Value range	Explanation
averagingPeriod(seconds)	1 ... **3** ... 255	Period, in seconds, over which the average FEBE value is calculated.
onThreshold	1 ... **3** ... 166	FEBE value, in block errors per second, which defines when the alarm is activated.

fEBECountAlarm configuration attributes

bb2048HDSL/modem/channel central / remote

Refer to page 25.

Line configuration

bb2048HDSL/modem/line[ ]/alarmMask

bb2048HDSL/modem/line[ ]/alarmLevel

bb2048HDSL/modem/line[ ]/alarmContactHighMask

bb2048HDSL/modem/line[ ]/alarmContactLowMask

For more information on masking and levelling alarms, refer to the 2.048-Mbps HDSL Modem configuration section.

For more information on each alarm of the line object, refer to page 70.

NMS configuration

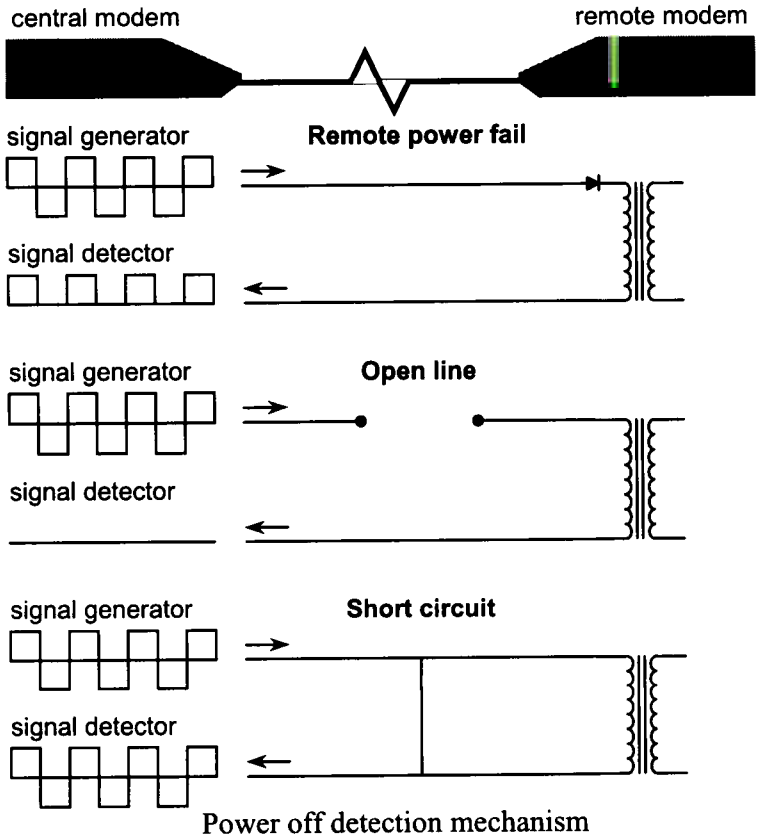
bb2048HDSL/ nMS(Twin)/cms2Address

This attribute sets the absolute address of the modem (0 to 65536).

Power-off detection configuration

When the remote modem generates a SyncLoss alarm, the power-off detection mechanism gathers information which enables the network manager to determine the possible cause of the synchronisation loss.

On detection of a SyncLoss alarm, the central modem generates an alternating DC current on the first wire of line pair 1 and detects the signal on the second wire of line pair 1.



Power off detection mechanism

- When the remote modem is not powered, a diode is introduced in the line circuitry. Consequently, the alternating DC current is rectified and the central modem knows that the remote modem has a power fail.
- When the line is interrupted, no signal returns. The central modem generates an open line alarm.
- When the line is short circuited, the complete signal returns. The central modem generates a short circuit alarm.

Due to the nature of the short circuit detection mechanism, it is possible that a cause other than a short circuited line triggers this alarm.

E.g. some error which makes normal data transfer impossible, which causes the SyncLoss alarm. But as long as the remote modem is powered, the line transformer is not replaced by the diode. Consequentely, the signal which is put on the line returns unchanged. This may be interpreted as a short circuit situation.

- The power-off detection mechanism only works on line pair 1 of the modem.

bb2048HDSL/powerOffDetection/mode **disabled** / enabled

Disables or enables the power-off detection mechanism.

bb2048HDSL/powerOffDetection/alarmMask

bb2048HDSL/powerOffDetection/alarmLevel

bb2048HDSL/powerOffDetection/alarmContactHighMask

bb2048HDSL/powerOffDetection/alarmContactLowMask

For more information on masking and levelling alarms, refer to the "2.048-Mbps HDSL Modem Configuration" section.

For more information on each alarm of the powerOffDetection object, refer to page 70.

Interface configuration

This section gives an overview of all the configuration attributes of the different DTE interfaces.

The general interface configuration attributes are attributes which are applicable for each interface. The specific interface attributes are discussed for each DTE interface separately.

General interface configuration

bb2048HDSL/<interface>/alarmMask

bb2048HDSL/<interface>/alarmLevel

bb2048HDSL/<interface>/alarmContactHighMask

bb2048HDSL/<interface>/alarmContactLowMask

Note that the underlying alarms may differ for each interface.

For more information on masking and levelling alarms, refer to "2.048-Mbps HDSL Modem Configuration" section.

For more information on each alarm of the <interface> object, refer to page 71.

V35 configuration

bb2048HDSL/<interface>/rTSControl **external** / internal

Refer to page 28.

bb2048HDSL/<interface>/cTSDelay **0 ms** / 4 ms / 16 ms / 64 ms

If account is taken with the RTS signal from the interface, it is possible to set the delay between the moment the active edge of the RTS signal comes in, and the moment the active edge of the outgoing CTS signal is generated.
Between the moment the RTS signal drops and the moment the CTS signal drops, no delay is provided.
If the RTS signal is forced on, the CTS signal will not be influenced by any change of RTS.

bb2048HDSL/<interface>/tests **disabled** / enabled

The application can initiate a test via the interface. The tests are:

Test	Meaning ...
interfaceAL	Analogue Loop which can be initiated by the application.
interfaceRDL	Remote Digital Loop which can be initiated by the application.

Interface tests

These tests can be individually enabled or disabled. If these tests are not supported by the application, it is best to disable their detection to avoid the activation of an undesired test.
For more information on diagnostic tests, refer to theDiagnosyic tests section.

bb2048HDSL/<interface>/clocking

Refer to Page 25.

X21 configuration

bb2048HDSL/x21/clocking

Refer to Page 25.

G703 configuration

bb2048HDSL/g703/g703Coding — **AMI** / **HDB3**

On a G703 interface two encoding modes are available:

Encoding mode	Meaning ...
AMI	Alternate Mark Inversion is a bipolar code with no zero substitution.
HDB3	High Density Bipolar 3 is a modified bipolar code.

G703 interface encoding modes

With HDB3 encoding, more than three consecutive zeroes occurring in the data are replaced by a substitution word. This to ensure a high pulse density. Therefore, 2 Mbps links using the HDB3 code can carry data patterns with a low 1 density. Most of the G703 applications use HDB3 encoding.

bb2048HDSL/g703/framing — **unframed** / framed

Refer to Page 28.

bb2048HDSL/g703/tests — **disabled** / enabled

The application can initiate a test via the G703 interface. The tests are:

Test	Meaning ...
g703AL	Analogue Loop which can be initiated by the application.
g703RDL	Remote Digital Loop which can be initiated by the application.

Interface tests

These tests can be individually enabled or disabled. If these tests are not supported by the application, it is best to disable their detection to avoid the activation of an undesired test.
For more information on diagnostic tests, refer to the diagnostics test section.

bb2048HDSL/g703/cRC4Insertion — **disabled** / enabled

It is possible that a G.704 framed data stream carries a CRC in time slot 0 to check the data integrity on the G.703 connection. If such a data stream is carried over a reduced number of line pairs (fractional E1), it is best to enable cRC4Insertion. Than, the CRC is recalculated in the receive data stream (RxD).

Bridge configuration

bb2048HDSL/bridge/IANFilter

If a bridge interface is used, it is possible to enable or disable the bridge (filter) functionality. If disabled, the interface basically acts as a repeater.

bb2048HDSL/bridge/clocking

Refer to Page 25.

Router configuration

bb2048HDSL/router/clocking

Refer to Page 25.

Nx64k configuration

bb2048HDSL/nx64/timeslots

Refer to Page 28.

Status

This chapter discusses all the status attributes of the 2.048-Mbps HDSL Modem.

Status attribute overview

Object bb2048HDSL

bb2048HDSL
- sysDesc
- sysObjectID
- systemUpTime
- sysServices
- flash1Version
- flash2Version
- activeFlash
- bootVersion

Object modem

modem
- testType
- testOriginator
- testStatus
- errorCount
- ifDescr
- ifType
- ifSpeed
- ifOperStatus

Object line

line[ ]
- timeSinceLastRetrain
- lineState
- connectionToCentral
- lineAttenuation(dB)
- noiseMargin(dB)
- ifSpeed
- ifOperStatus

Object nMS

nMS
- ifSpeed

Object powerOffDetection

powerOffDetection
- state

Object <interface> (v35, g703, bridge or router)

v35	x21	g703	bridge (or router)
tXDCCT103	tXDCCT103	tXDCCT103	wANTXD
rXDCCT104	rXDCCT104	rXDCCT104	wANRXD
rTSCCT105	indicator	tXDAIS	ifDescr
cTSCCT106	ifDescr	tXDLFA	ifType
dSRCCT107	ifType	tXDLOS	ifSpeed
dCDCCT109	ifSpeed	ifDescr	ifOperStatus
rDLCCT140	ifOperStatus	ifType	
aLCCT141		ifSpeed	
tlCCT142		ifOperStatus	
ifDescr			
ifType			
ifSpeed			
ifOperStatus			

2.048-Mbps HDSL Modem status

bb2048HDSL/sysDesc

Gives a description of the device (SNMP MIB2 parameter). First the name of the modem is given. Than the interface type which is currently used. The last string of characters indicates the version of the firmware.

Example: 2.048-Mbps HDSL Modem 2P G703 T2114/00700

bb2048HDSL/sysObjectID

Is the SNMP identification (SNMP MIB2 parameter).

bb2048HDSL/systemUpTime

Displays the time since the last cold boot.

bb2048HDSL/sysServices

Is the SNMP service identification (SNMP MIB2 parameter).

bb2048HDSL/flash1Version

bb2048HDSL/flash2Version

Displays the control software version currently used in flash 1 and 2, respectively.
Example: T2114/00700

bb2048HDSL/activeFlash Flash1 / Flash2

Displays which flash is currently active.
Example: Flash 2

bb2048HDSL/bootVersion

Displays the current boot software version.
Example: T2121/00700

Modem status

bb2048HDSL/modem/testType

Displays the type of the test which is running. The possible indications are:

testType	Explanation
NO test	No test is active.
AL test	An analogue loop test is active.
DL test	A digital loop test is active.
RL test	A remote digital loop is active.
ET test	The error test pattern generator / detector is active.
ALET test	An analogue loop in combination with an error test is active.
RLET test	A remote digital loop in combination with an error test is active.

testType status attributes

bb2048HDSL/modem/testOriginator

Displays the origin of the test which is running. The possible indications are:

testOriginator	Explanation
interfacetst	The test is initiated by the interface
nmstst	The test is initiated by the management system
keyboardtst	The test is initiated by means of the buttons on the front panel of the modem
remotetst	The test is initiated by the remote modem
unknown	For some reason it is not possible to define the origin of the test.

testOriginator status attributes

bb2048HDSL/modem/testStatus

Displays the status of the test which is running. The possible indications are:

testStatus	Explanation
progressing	The test is initiating.
ending	The test is ending.
running	The test is running.
unknown	For some reason it is not possible to retrieve the status of the test.

testStatus status attributes

bb2048HDSL/modem/errorCount

Displays the amount of detected errors since the start of the test (only for ET, ALET and RLET).

bb2048HDSL/modem/ifDescr modem

SNMP MIB2 defined parameter.

bb2048HDSL/modem/ifType 1

SNMP MIB2 defined parameter.

bb2048HDSL/modem/ifSpeed

Displays the current modem speed in bps.
Example: 2048000 bps

bb2048HDSL/modem/ifOperStatus up / down

Displays the operation status of the modem.

Line status

bb2048HDSL/modem/line[ ]/timeSinceLastRetrain

Displays the time since the last retrain cycle occurred.

bb2048HDSL/modem/line[ ]/lineState

Displays the status of the line pair. The possible indications are:

lineState	Explanation
idle	No connection is established.
training	A training cycle is in progress.
data state	A connection is established.

lineState status attributes

bb2048HDSL/modem/line[ ]/connectionToCentral line 1 / line 2 / line 3

To enable synchronisation, the two modems have to communicate with each other. The configuration attribute channel (refer to page 25) determines which modem acts as master during the synchronisation procedure. The status attribute connectionToCentral displays on which line pair the synchronisation connection is made.

bb2048HDSL/modem/line[ ]/lineAttenuation(dB)

Displays the attenuation of the line in dB.

bb2048HDSL/modem/line[ ]/noiseMargin(dB)

Displays the noise margin of the line pair in dB.

bb2048HDSL/modem/line[ ]/ifSpeed

Displays the current line pair speed in bps.
Example: 1024000 bps

bb2048HDSL/modem/line[ ]/ifOperStatus up / down

Displays the operation status of the line pair.

NMS status

bb2048HDSL/nMS/ifSpeed

Displays the current NMS speed in bps.
Example: 9600 bps

Power-off detection status

bb2048HDSL/powerOffDetection/state

Displays the power-off detection status. The possible indications are:

state	Explanation
disabled	The power-off detection mechanism is disabled.
normal	The condition of the line is normal.
open line	An open line is detected.
remote power fail	A power fail of the remote modem is detected.
short circuit	A short circuit of the line is detected.

powerOffDetection/state status attributes

Interface status

This section gives an overview of all the status attributes of the different DTE interface modules.

V35 status

bb2048HDSL/<interface>/tXDCCT103 on / off

Status of the interface signal of circuit 103 (transmit data circuit).

bb2048HDSL/<interface>/rXDCCT104 on / off

Status of the interface signal of circuit 104 (receive data circuit).

bb2048HDSL/<interface>/rTSCCT105 on / off

Status of the interface circuit 105 (request to send circuit).

bb2048HDSL/<interface>/cTSCCT106 on / off

Status of the interface circuit 106 (clear to send circuit).

bb2048HDSL/<interface>/dSRCCT107 on / off

Status of the interface circuit 107 (data set ready circuit).

bb2048HDSL/<interface>/dCDCCT109 on / off

Status of the interface circuit 109 (data carrier detect circuit).

bb2048HDSL/<interface>/rDLCCT140 on / off

Status of the interface circuit 140 (remote digital loop circuit).

bb2048HDSL/<interface>/aLCCT141 on / off

Status of the interface circuit 141 (analogue loop circuit).

bb2048HDSL/<interface>/tICCT142 on / off

Status of the interface circuit 142 (test indication circuit).

bb2048HDSL/<interface>/ifDescr

SNMP MIB2 defined parameter.

bb2048HDSL/<interface>/ifType

SNMP MIB2 defined parameter.

bb2048HDSL/<interface>/ifSpeed

Displays the current interface speed in bps.
E.g. 1024000 bps

bb2048HDSL/<interface>/ifOperStatus up / down

Displays the operation status of the interface.

X21 status

For the explanation of the status attributes tXDCCT103, rXDCCT104, ifDescr, ifType, ifSpeed and ifOperStatus, refer to page 58.

bb2048HDSL/x21/indicator on / off

Status of the indicator signal.

G703 status

For the explanation of the status attributes tXDCCT103, rXDCCT104, ifDescr, ifType, ifSpeed and ifOperStatus, refer to page 58.

bb2048HDSL/<interface>/tXDAIS on / off

Indicates whether an alarm indication signal has been sent.

bb2048HDSL/<interface>/tXDLFA on / off

Indicates whether a loss of frame alignment has occurred.

bb2048HDSL/<interface>/tXDLOS on / off

Indicates whether a loss of signal has occurred.

Bridge and Router status

For the explanation of the status attributes ifDescr, ifType, ifSpeed and ifOperStatus, refer to page 58.

bb2048HDSL/<interface>/wANTXD on / off

Status of the transmit data on the DTE interface module connector.

bb2048HDSL/<interface>/wANRXD on / off

Status of the receive data on the DTE interface module connector.

Performance

This chapter discusses all the performance attributes of the 2.048-Mbps HDSL Modem.

Performance attribute overview

Object modem

modem
- errorCount
- h2TimeSinceLastUpdate
- h2Modem
- h24TimeSinceLastUpdate
- h24Modem
- relModem

Object modem – actions

modem
- Test Activation
- Force Full Retrain

Object line

line[ ]
- h2TimeSinceLastUpdate
- h2LineParameters
- h2NEBECount
- h2FEBECount
- h2BitError
- h2Performance
- h24TimeSinceLastUpdate
- h24LineParameters
- h24NEBECount
- h24FEBECount
- h24BitError
- h24Performance
- lineParameters
- nEBECount
- fEBECount
- bitError
- performance

Modem performance

bb2048HDSL/modem/errorCount

Displays the amount of errors detected during an ET test.

bb2048HDSL/modem/h2TimeSinceLastUpdate

Indicates the time since the last update of the 2 hours performance attributes of the modem.

bb2048HDSL/modem/h2Modem

Gives a performance summary of the modem for a 2 hour interval, with measurements during 15 minutes periods (which results in 8 periods per interval). The h2Modem attributes are:

h2Modem attribute	For the corresponding period, this attribute displays ...
validity	whether the performance information is valid or invalid.
period	a time indication. The oldest period is listed at the top of the performance table, the most recent at the bottom.
noSyncTime	the time during which synchronisation was lost. Note that the synchronisation loss time only starts running after the synchronisation loss alarm timeout period (refer to page 42 - syncLossAlarmTimeout).
fallbackAlarmCount	the number of fallback alarms which was counted.
fallbackAlarmTime	the time during which a fallback alarm was active.

h2modem performance attributes

bb2048HDSL/modem/h24TimeSinceLastUpdate

Indicates the time since the last update of the 24 hours performance attributes.

bb2048HDSL/modem/h24Modem

Gives a performance summary of the modem for a 24 hour interval, with measurements during 2 hour periods (which results in 12 periods per interval). The h24Modem performance attributes are the same as the h2Modem performance attributes (See the table above).

bb2048HDSL/modem/relModem

Gives a performance summary of the modem since the last cold boot. Except for validity and period which are not present, the relModem performance attributes are the same as the h2Modem performance attributes (See the table above).

Modem performance actions

bb2048HDSL/modem/Test Activation

Activates the test which is selected in the drop down box under the heading Argument Value.

bb2048HDSL/modem/Force Full Retrain

Initiates a retrain cycle.

Line performance

bb2048HDSL/modem/line[ ]/h2TimeSinceLastUpdate

Indicates the time since the last update of the 2 hours performance attributes of the line.

bb2048HDSL/modem/line[ ]/h2LineParameters

Gives a line parameter summary for a 2 hour interval, with measurements during 15 minutes periods (which results in 8 periods per interval). The h2LineParameters performance attributes are:

h2LineParameters attribute	For the corresponding period, this attribute displays ...
validity	whether the performance information is valid or invalid.
period	a time indication. The oldest period is listed at the top of the performance table, the most recent at the bottom.
lineAttenuationMin(dB)	the minimum line attenuation which was measured.
lineAttenuationMax(dB)	the maximum line attenuation which was measured.
lineAttenuationAvrg(dB)	the average line attenuation which was calculated.
noiseMarginMin(dB)	the minimum noise margin of the line which was measured.
noiseMarginMax(dB)	the maximum noise margin of the line which was measured.
noiseMarginAvrg(dB)	the average noise margin of the line which was calculated.

h2LineParameters performance attributes

bb2048HDSL/modem/line[ ]/h2NEBECount

Gives a near end block error detection summary for a 2 hour interval, with measurements during 15 minutes periods (which results in 8 periods per interval). The h2NEBECount performance attributes are:

h2NEBECount attribute	For the corresponding period, this attribute displays ...
validity	whether the performance information is valid or invalid.
period	a time indication. The oldest period is listed at the top of the performance table, the most recent at the bottom.
min	the minimum number of near end block errors which was counted.
max	the maximum number of near end block errors which was counted.
avrg	the average number of near end block errors which was calculated.
totalCount	the total number of near end block errors which was counted.
alarmCount	the number of near end block error alarms which was counted.
alarmTime	the time during which a near end block alarm was active.

h2NEBECount performance attributes

bb2048HDSL/modem/line[ ]/h2FEBECount

Gives a far end block error detection summary for a 2 hour interval, with measurements during 15 minutes periods (which results in 8 periods per interval). The h2FEBECount performance attributes are the same as the h2NEBECount performance attributes (See the table above).

bb2048HDSL/modem/line[ ]/h2BitError

Gives a bit error detection summary for a 2 hour interval, with measurements during 15 minutes periods (which results in 8 periods per interval) The h2BitError performance attributes are:

h2BitError attribute	For the corresponding period, this attribute displays ...
validity	whether the performance information is valid or invalid.
period	a time indication. The oldest period is listed at the top of the performance table, the most recent at the bottom.
bERMin	the minimum bit error rate which was measured.
bERMax	the maximum bit error rate which was measured.
bERAvrg	the average bit error rate which was calculated.
highAlarmCount	the number of high bit error rate alarms which was counted.
highAlarmTime	the time during which a high bit error rate alarm was active.
lowAlarmCount	the number of low bit error rate alarms which was counted.
lowAlarmTime	the time during which a low bit error rate alarm was active.

h2BitError performance attributes

bb2048HDSL/modem/line[ ]/h2Performance

Gives a performance summary of the line for a 2 hour interval, with measurements during 15 minutes periods (which results in 8 periods per interval). The h2Performance attributes are:

h2Performance attribute	For the corresponding period, this attribute displays ...
validity	whether the performance information is valid or invalid.
period	a time indication. The oldest period is listed at the top of the performance table, the most recent at the bottom.
retrainAlarmCount	the number of retrain alarms which was counted.
retrainAlarmTime	the time during which a retrain alarm was active.
erroredSecCount	the number of errored seconds which was counted.
sevErrSecAlarmCount	the number of severely errored second alarms which was counted.
sevErrSecAlarmTime	the time during which a severely errored second alarm was active.
unavailAlarmCount	the number of unavailability alarms which was counted.
unavailAlarmTime	the time during which an unavailability alarm was active.

h2Performance performance attributes

bb2048HDSL/modem/line[ ]/h24TimeSinceLastUpdate

Indicates the time since the last update of the 24 hours performance attributes of the line.

bb2048HDSL/modem/line[ ]/h24LineParameters

Gives a line parameter summary for a 24 hour interval, with measurements during 2 hour periods (which results in 12 periods per interval). The h24LineParameters performance attributes are the same as the h2LineParameters performance attributes.

bb2048HDSL/modem/line[ ]/h24NEBECount

Gives a near end block error detection summary for a 24 hour interval, with measurements during 2 hour periods (which results in 12 periods per interval). The h24NEBECount performance attributes are the same as the h2NEBECount performance attributes.

bb2048HDSL/modem/line[ ]/h24FEBECount

Gives a far end block error detection summary for a 24 hour interval, with measurements during 2 hour periods (which results in 12 periods per interval). The h24FEBECount performance attributes are the same as the h2NEBECount performance attributes.

bb2048HDSL/modem/line[ ]/h24BitError

Gives a bit error detection summary for a 24 hour interval, with measurements during 2 hour periods (which results in 12 periods per interval). The h24BitError performance attributes are the same as the h2BitError performance attributes.

bb2048HDSL/modem/line[ ]/h24Performance

Gives a performance summary of the line for a 24 hour interval, with measurements during 2 hour periods (which results in 12 periods per interval). The h24Performance performance attributes are the same as the h2Performance performance attributes.

bb2048HDSL/modem/line[ ]/lineParameters

Gives a current line parameter summary. The lineParameters performance attributes are:

lineParameters attribute	Displays the current ...
lineAttenuation(dB)	line attenuation.
noiseMargin(dB)	noise margin of the line.

lineParameters performance attributes

bb2048HDSL/modem/line[ ]/nEBECount

Gives a near end block error detection summary since the last cold boot. The nEBECount performance attributes are:

nEBECount attribute	For the time since the last cold boot, this attribute displays ...
totalCount	the total number of near end block errors which was counted.
alarmCount	the number of near end block error alarms which was counted.
alarmTime	the time during which a near end block alarm was active.

nEBECount performance attributes

bb2048HDSL/modem/line[ ]/fEBECount

Gives a far end block error detection summary since the last cold boot. The fEBECount performance attributes are the same as the nEBECount performance attributes see the table above.

bb2048HDSL/modem/line[ ]/bitError

Gives a bit error rate detection summary since the last cold boot. The bitError performance attributes are:

bitError attribute	For the time since the last cold boot, this attribute displays ...
bER	the current bit error rate.
highAlarmCount	the number of high bit error rate alarms which was counted.
highAlarmTime	the time during which a high bit error rate alarm was active.
lowAlarmCount	the number of low bit error rate alarms which was counted.
lowAlarmTime	the time during which a low bit error rate alarm was active.

bitError performance attributes

bb2048HDSL/modem/line[ ]/performance

Gives a performance summary of the line since the last cold boot. The performance performance attributes are:

performance attribute	For the time since the last cold boot, this attribute displays ...
retrainAlarmCount	the number of retrain alarms which was counted.
retrainAlarmTime	the time during which a retrain alarm was active.
erroredSecCount	the number of errored seconds which was counted.
sevErrSecAlarmCount	the number of severely errored second alarms which was counted.
sevErrSecAlarmTime	the time during which a severely errored second alarm was active.
unavailAlarmCount	the number of unavailability alarms which was counted.
unavailAlarmTime	the time during which an unavailability alarm was active.

performance performance attributes

Alarms

This chapter discusses all the alarm attributes of the 2.048-Mbps HDSL Modem.

General alarm attributes

bb2048HDSL/totalAlarmLevel

This attribute is only present in the top object of the containment tree, bb2048HDSL.
It displays the priority level of an unmasked, active alarm. When several alarms are generated at the same time, the highest priority level is shown. If the alarm levels are set in a structured manner, one look at the totalAlarmLevel attribute enables the operator to make a quick estimation of the problem.

The value of the totalAlarmLevel attribute is also communicated to the central management system (e.g. HP Openview) where it determines the colour of the icon. This colour is an indication of the severity of the alarm.

bb2048HDSL/alarmInfo

Contains the actual alarm information. The alarmInfo attributes are:

alarmInfo attribute	Explanation
discriminator	Displays the total alarm count of the object since the last cold boot.
currentAlarms	Displays the current alarms of the object.
previousAlarms	Displays the second most recent alarms of the object.
alarmMask	Shows for which alarms the sending to the central management system (e.g. HP Openview) has been disabled or enabled (also refer to page 38)
alarmLevel	Shows the priority level of each alarm (also refer to page 38)

Alarm information of the 2.048-Mbps HDSL Modem

Alarm overview

object bb2048HDSL

bb2048HDSL
- NotResponding
- AlarmSyncLoss
- StrapChanged
- Access
- RemoteAlarm
- UnknownState
- Boot
- CodeConsistencyFail
- ConfigConsistencyFail

object modem

modem
- LinkDown
- TestActive
- SyncLoss
- Fallback

object line

line[ ]
- LinkDown
- Retrain
- HighBitError
- LowBitError
- NEBEError
- FEBEError
- SeverelyErroredSecond
- Unavailability

object powerOffDetection

powerOffDetection
- Open line
- Remote power fail
- Short circuit

object <interface> (v35, g703, bridge or router)

(or v35 or x21 or bridge or router)
- LinkDown

g703
- LinkDown
- AIS
- LFA

2.048-Mbps HDSL Modem alarms

The different bb2048HDSL object alarms, their explanation and their default alarmLevel value are given in the following table:

bb2048HDSL alarm	The alarm is generated ...	alarmLevel default
NotResponding	by the Orchid 1003 when the modem does not respond on its polling session.	4
AlarmSyncLoss	when the internal alarm buffer overflows.	4
StrapChanged	when the local strapping has been changed.	1
Access	when TMA is connected to the modem.	1
RemoteAlarm	when the remote modem is in an alarm condition.	0
UnknownState	every time a new modem is added to the network, and before the Orchid 1003 has completed a first successful polling session.	0
Boot	each time the modem reboots. The reboot could be the result of a power shut down, an internal error detection, etc.	1
CodeConsistencyFail	when the version of the software stored in the Orchid 1003 does not correspond with version of the software stored in the modem.	1
ConfigConsistencyFail	when the modem configuration stored in the Orchid 1003 does not correspond with the actual configuration of the modem.	1

2.048-Mbps HDSL Modem alarms

Modem alarms

The different modem object alarms, their explanation and their default alarmLevel value are given in the following table:

modem alarm	The alarm is generated ...	alarmLevel default
LinkDown	when no line connection is present. E.g. all the line pairs are disconnected.	3
TestActive	when a test is initiated.	1
SyncLoss	when synchronisation is lost. The delay between the actual loss of synchronisation and the activation of the SyncLoss alarm can be set with the syncLossAlarmTimeout attribute (refer to page 42) If fall-back operation is enabled, no synchronisation loss alarm is generated as long as a line pair is available.	3
Fallback	when the modem operates in fall-back. E.g. the modem operates on one line pair instead of two.	2

Modem alarms

Line alarms

The different line[ ] object alarms, their explanation and their default alarmLevel value are given in the following table:

line alarm	The alarm is generated ...	alarmLevel default
LinkDown	when no line connection is present. E.g. all the line pairs are disconnected.	3
Retrain	when the modem is retraining.	2
HighBitError	when the bit error rate exceeds the predefined value entered in the onThreshold of the highBitErrorAlarm attribute (refer to page 42)	2
LowBitError	when the bit error rate exceeds the predefined value entered in the onThreshold of the lowBitErrorAlarm attribute (refer to page 42)	1
NEBEError	when the near end block error rate exceeds the predefined value entered in the onThreshold of the nEBECountAlarm attribute (refer to page 42)	1
FEBEError	when the far end block error rate exceeds the predefined value entered in the onThreshold of the fEBECountAlarm attribute (refer to page 42)	0
SeverelyErroredSecond	when a second is detected during which the bit error rate exceeded 10^{-5}. The measurement is conform G.821 annex A. For each second the alarm condition is true, the alarm is activated. If a non-severely errored second occurs, the alarm is cleared.	2
Unavailability	when 10 consecutive severely errored seconds have been detected. If a non-severely errored second occurs, the alarm is cleared.	2

Line alarms

Power-off detection alarms

The different powerOffDetection object alarms, their explanation and their default alarmLevel value are given in the following table:

powerOffDetection alarm	The alarm is generated ...	alarmLevel default
Open line	when an open line is detected. The power-off detection mechanism is explained on page 49.	3
Remote power fail	when the remote modem has a power failure. The power-off detection mechanism is explained on page 49.	3
Short circuit	when a short circuit in the line is detected. The power-off detection mechanism is explained in page 49.	3

Power-off detection alarms

Interface alarms

The different <interface> object alarms, their explanation and their default alarmLevel value are given in the following table:

<interface> alarm	The alarm is generated ...	alarmLevel default
LinkDown V35	when no RTS signal is detected, i.e. the connection between the modem and the DTE is down, provided the attribute rTSControl is set to external. If the attribute rTSControl is set to internal, the LinkDown alarm will never be generated.	3
LinkDown (for X21)	when no valid C signal is detected, i.e. the connection between the modem and the DTE is down.	3
LinkDown (for Bridge)	when the LAN connector is not plugged in the interface.	3
AIS (G703)	when an alarm indication signal has been detected on the incoming G703 transmit data. It means the application has detected an error.	2
LFA (G703)	when the frame alignment signal (FAS), which is present in time slot 0 of the G.704 framed data, is not detected after a certain period.	2

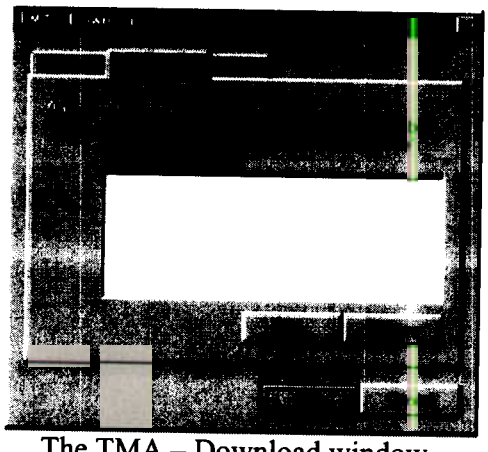
Interface alarms

Software download

This chapter explains how to download new software into the flash memory of the 2.048-Mbps HDSL Modem.

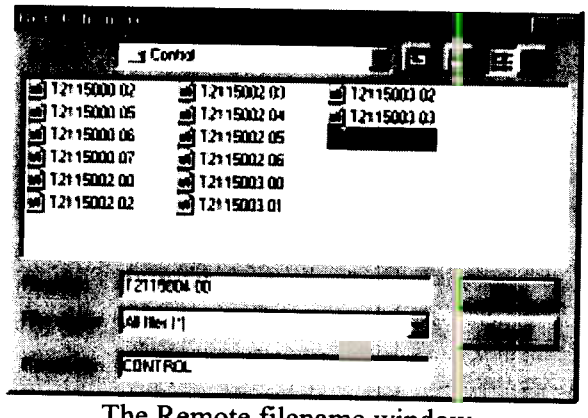
Downloading with TMA

To download software with TMA, proceed as follows:

Step	Action
1	Establish a connection between the PC running TMA and the modem (refer to page 21)
2	In the TMA window: select *Tools*, *Download...*
3	In the *TMA – Download* window, select the *Options* tab and verify whether the initial speed is set to 9600 bps.  The TMA – Download window
4	In the *TMA – Download* window, select the *Configuration* tab and press *Add...*

Continued on next page ...

Downloading software with TMA, continued …

5	In the *Remote filename* window, select the filename to download (e.g. t2752001.00), type CONTROL as remote file and press *Open*.  The Remote filename window
6	The *TMA – Download* window reappears. Press *OK*. A DOS window opens and shows the download progress.

Downloading software with TMA

Downloading in boot mode

In some cases it may be impossible to access the modem with TMA. E.g. when a flash memory error occurs. In that case, new software can still be downloaded by setting the modem in boot mode.

Step	Action
1	**Disconnect the modem from the mains.**
2	Open the housing.
3	Set DIP switch bank DS2 position 7 to *off*.
4	Close the housing and reconnect the modem to the mains. The modem is now in boot mode (the TST and ERR LEDs light up).
5	Establish a connection between the PC and the modem (refer to page 21)
6	Open a DOS window on the PC.
7	Go to the directory *\program files\tma*.
8	Place the file which has to be downloaded in this directory.
9	Enter the following command: tml -v -c1 -f<filename>@CONTROL (where filename is the file to download, e.g. t2752001.00).
10	After the download, **disconnect the modem from the mains**, open the housing and reset DIP switch bank DS2 position 7 to *on*.

Downloading software in boot mode

Strap name	DS2 no.	Setting	Function
software	7	off **on**	boot **application**

Software strap

When a flash memory software download has failed or when a flash memory error occurs, the modem can be forced to boot by setting DIP switch position 7 in the *off* position. When a new software download is successfully completed, the DIP switch must be reset to the *on* position, in order to restart operation from flash memory.

Note that this DIP switch setting cannot be overruled by TMA.

Diagnostic tests

This chapter describes the diagnostic tests of the 2.048-Mbps HDSL Modem.

Once installed and operational, the 2.048-Mbps HDSL Modem modems offer the network manager and/or the user the possibility to carry out diagnostic tests. They are a helpful tool when locating problems, should one occur.

Diagnostic tests can be generated by ...	... with the priority level ...
TMA	high.
the front panel buttons of the modem	medium.
the interface	low.
the remote modem (RDL only)	low.

Diagnostic test originators

- Within the same priority level the rule *first come, first served* is applied.
- Note that TMA can inhibit all tests, disregarding the originator.

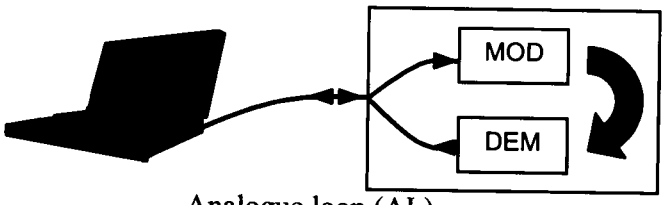
Error test [ET]

Initiating the ET test activates the internal error test pattern generator and detector. Possible errors which are received by the detector are accumulated in an internal register. This register can be read via the management system. The error LED on the front panel will also light.
How to use this test?
Example:
Connect the modem to the line at the local side, and loop the line at the remote side (by pressing the RDL button at the local side, or the DL button on the remote side). If the ET test button of the local modem is pressed, a certain test pattern is send down the line. The detector receives this information, and can compare it with the original transmitted pattern. The quantity of inconsistencies that might exist between the original and the returned pattern could be an indication of the line quality.

Note that ET is always used in combination with another test (e.g. AL or RDL).

Analogue loop [AL] or loop 3

Initiating the AL test establishes an analogue loop on the local modem. This loop is compliant to loop 3 as described in the ITU-T recommendation V.54.
The loop is situated immediately behind the analogue part of the local modem, schematically represented as follows:



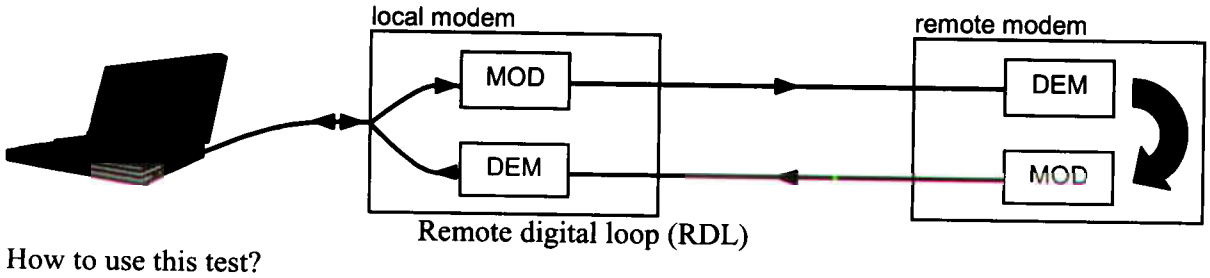
Analogue loop (AL)

How to use this test?

This test is used to verify the connection between the data terminal equipment and the modem. In combination with the ET test, it can also be used ad a *self-test* of the modem.
During the execution of an AL test, no normal data communication is possible. In order to avoid that this test would stay active for an indefinite time, and thus blocking the normal data transfer, an alDuration attribute is linked with the test (refer to page 42). This attribute determines how long the test lasts

Remote digital loop [RDL] or loop 2

Initiating the RDL test establishes a digital loop on the remote modem. This loop is compliant to loop 2 as described in the ITU-T recommendation V.54.
The loop is situated immediately behind the digital part of the remote modem, schematically represented as follows:



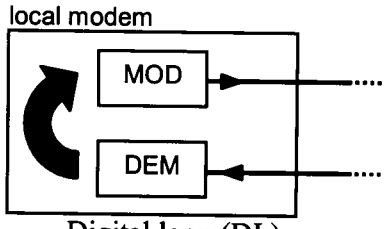
Remote digital loop (RDL)

How to use this test?

Together with the ET test it is possible to verify the end-to-end behaviour of the link.

Digital loop [DL]

Initiating the DL test also establishes a digital loop, but this time on the local modem itself.



Digital loop (DL)

How to use this test?

With this test, one can verify the same things as with the remote digital loop. The only difference is that the loop is not made on the *remote* modem (as with RDL), but on the *local* modem. This can be necessary when, for example, the remote modem can not initiate a remote digital loop test.

Interface tests

Interface tests (circuit 140 and 141) are only present on the V35 interface boards.

Interface RDL (circuit 140)

The activation of this signal will initiate a loop 2 on the remote modem (RDL), in compliance with ITU-T recommendation V.54.

Interface AL (circuit 141)

The activation of this signal will initiate a loop 3 on the local modem (AL), in compliance with ITU-T recommendation V.54.

Technical specifications

This chapter gives the technical specifications of the 2.048-Mbps HDSL Modem family.

Basic modem unit

The basic modem unit is 2.048-Mbps HDSL Modem with a modular interface. The modem can be powered with either 230/115 Vac, 48 Vac or -48 Vdc.

Line interface

connections	up to 2 pair + shield (screw connections)
impedance	135 Ω
line speed per pair	2E1: 1168 kbps 3E1: 784 kbps
throughput delay	300 µsec compliant to ETSI DTR/tm-3036
transmit level	13.5 dBm compliant to ETSI DTR/tm-3036
coding	2B1Q conform ETSI ETR 152
supports	fractional E1
G.704 mode	G.704 time slot prioritisation
performance (distance covered noise free)	satisfies or exceeds standard noise margin specifications: Bellcore TA-NWT-001210, ANSI T1E1.4/94-006, ETSI ETR 152

Line interface specifications

The following table gives the line interface performance:

Wire diameter (mm)	Noise free covered distance (km) 2 pair version
0.4	3.6
0.5	5.0
0.6	7.1
0.7	7.3
0.8	8.9
0.9	11.3
1.0	12.5
1.1	12.9
1.2	13.9

Line interface performance

Management interface

Connection via the ...	Connector type	Interface speed
auxiliary connector	9 pins subD	9600 bps (asynchronous)

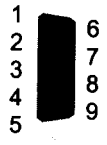
Management interface specifications

Auxiliary connector

The auxiliary connector is a 9 pins subD connector with the following pin layout:

Pin	Signal	DCE
1	high alarm signal *	output
2	RXD NMS	output
3	TXD NMS	input
4	not used	
5	GND	
6	not used	
7	RTS NMS	input
8	CTS NMS	output
9	low alarm signal *	output

The auxiliary connector – pin layout



The auxiliary connector

- The connection with TMA can be made with a straight 9 pins subD (Male/Female) cable or a regular 25/9 pins subD adapter cable.
- The cable which is used to connect the modem with the Orchid 1003 LAN management concentrator can be obtained as a custom cable from Black Box.
- Even if no management system is used, it is still possible to configure different modem alarms to generate a local alarm. This is called alarm signalling. Refer to page 42.

Power requirements

Voltage	Frequency	Current without RP	Current with RP
230 Vac +/-10%	50 – 60 Hz	70 mA	-
115 Vac +/-10%	50 – 60 Hz	140 mA	-
-48 Vdc (-25 Vdc → -80 Vdc)	-	280 mA	2 pair: 600 mA

Power requirements

Environmental requirements

- Dimensions:

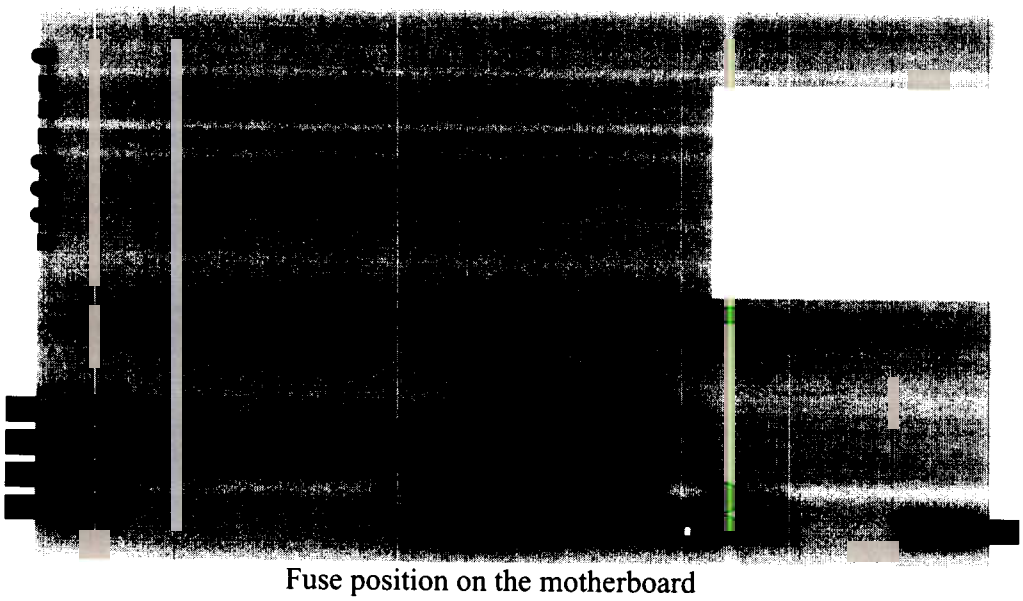
Height : 50mm
Width: 200mm
Depth: 300mm
Weight: 2kg

- storage temperature: -10°C to +70°C
- maximum altitude: 3000 m
- relative humidity: 5% to 95% non-condensing
- statutory requirement: EN60950, class I equipment
  EN55022B, IEC 1000-4-2, IEC 1000-4-3, IEC1000-4-4
- safety regulations: EN60950, EN41003

Fuse replacement

FUSE REPLACEMENT

For continued protection against the possibility of fire, replace fuses only with the specified voltage, current and type ratings.



Fuse position on the motherboard

To replace the fuses, proceed as follows:

Step	Action
1	**Make sure the modem is disconnected from the mains.**
2	Unscrew the four screws located at the bottom of the modem.
3	Lift the cover from the modem.
4	**Verify the specifications of the fuse(s) about to be replaced.**
5	Replace the fuse(s).
6	Replace the cover and close tight.
7	Fasten the four screws located at the bottom of the modem.

Replacing a fuse.

The following fuse values are provided:

115Vac / 230 Vac powered		48 V powered (non-RP)		48 V powered (RP – Source)	
Reference	Value	Reference	Value	Reference	Value
FS1	T160mAL/250 V	FS1	T500mAL/250 V	FS1	T2AL/250V
FS2	T2AL/250V	FS5	T500mAL/250 V	FS5	T2AL/250V
FS3	T800mAL/250 V				

FS4	T800mAL/250 V				
FS5	T160mAL/250 V				

Fuse values

Annexes

Annex A: DIP switch configuration tables

An overview of all the DIP switch banks and their settings is given below. Default values are printed in **bold**.

The following table shows the basic configuration DIP switch settings.

Strap name	DS2 no.	Setting	Function
clocking	1 2 3	**off off off** on off off off on off on on off off off on	**Internal preferred** internal alternative slave receive preferred slave receive alternative External
	4 5 6		Reserved
Software	7	off **on**	Boot **application**
initial settings	8	off **on**	DIP switch **flash memory**

The following table shows the channel configuration DIP switch settings.

Strap name	DS3 no.	Setting	Function
channel	1	off **on**	central **remote**

The following table shows the wetting current configuration DIP switch settings for a standard modem.

Strap name	Standard DS3 no.	Setting	Function
wetting current	2	**off** on	**normal operation** wetting current operation
	3 4		reserved

Annex B: Abbreviations

Abbreviations used in this manual are listed below.

Abbreviation	Explanation
2P	2 pair
AIS	Alarm Indication Signal
AL	Analogue Loop
AMI	Alternate Mark Inversion
BER	Bit Error Rate
bps	bits per second
CRC	Cyclic Redundancy Check
CTS	Clear To Send
DCE	Data Communications Equipment
DIP	Dual In line Pin
DL	Digital Loop
DS	Dip Switch bank
DTE	Data Terminal Equipment
ERR	ERRor
ET	Error Test
ExtTxClk	External Transmit Clock
FAS	Frame Alignment Signal
FEBE	Far End Block Error
FS	FuSe
HDB3	High Density Bipolar 3
HDSL	High bit rate Digital Subscriber Line
HDSL F	HDSL Flash
if	interface
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
LFA	Loss of Frame Alignment
LOS	Loss Of Signal

Abbreviation	Explanation
MIB	Management Information Base
NEBE	Near End Block Error
NMS	Network Management System
PWR	PoWeR
RDL	Remote Digital Loop
RTS	Request To Send
Rx	Receive
RxClk	Receive Clock
RxD	Receive Data
SNMP	Simple Network Management Protocol
SQ	Signal Quality
SSR	Solid State Relay
TMA	Total Maintenance Application
TML	Total Memory Loader
TST	TeST
Tx	Transmit
TxClk	Transmit Clock
TxD	Transmit Data
WAN	Wide Area Network