# INTRACOM

# *netMod*

## ISDN NETWORK TERMINATION UNIT

### USER'S MANUAL

# Contents

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## Terms and Abbreviations

| | |
|---|---|
| 2B1Q | 2 Binary 1 Quaternary Line Code |
| AMI | Alternate Mark Inversion |
| BAP | Bandwidth Allocation Protocol |
| BACP | Bandwidth Allocation Control Protocol |
| BOD | Bandwidth on Demand |
| Bps | Bits per second |
| BRA | Basic Rate Access |
| DTE | Data Terminal Equipment |
| DCE | Data Communications Equipment |
| FSK ` | Frequency Shift Key |
| HDLC | High Level Data Link Control |
| ISDN | Integrated Services Digital Network |
| ISP | Internet Service Provider |
| kbps | Kilobits per second |
| ML-PPP | Multilink PPP |
| MSN | Multiple Subscriber Number |
| NT1 | Network Termination 1 |
| PPP | Point-to-Point Protocol |
| PC | Personal Computer |

# INTRODUCTION

## An Introduction to ISDN

**ISDN** (Integrated Services Digital Network) is a digital network capable of providing the end user with high speed data, voice and image transmission at the same time. A way of accessing the network, is by using the (Basic Rate Access or BRA or 2B+D) communication protocol which supplies three channels to the subscriber. Two of these channels are 64kbps channels (B-channels) used for the transmission of voice or / and data, while the third one is a 16kbps channel (D-channel), used for signalling transmission between the ISDN Exchange and the Network Termination NT1.
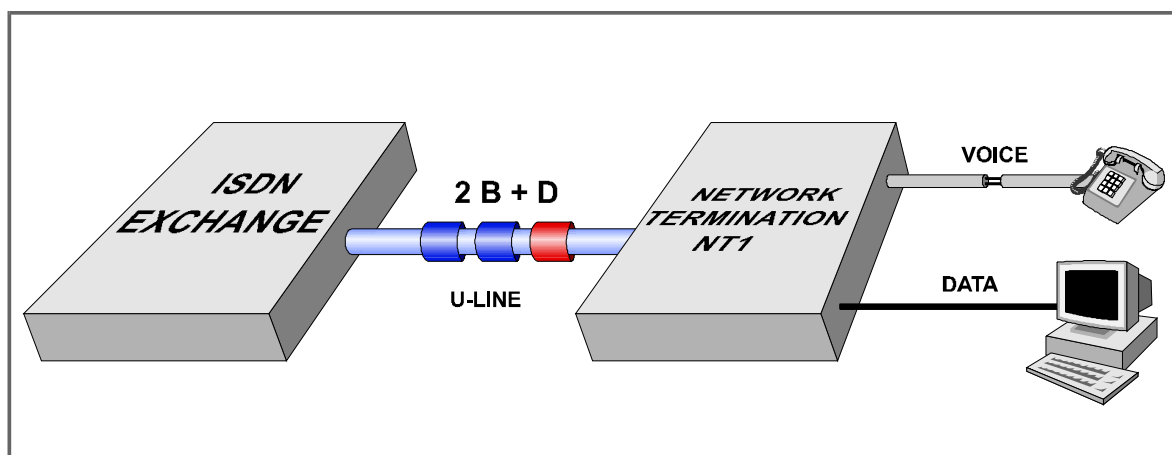


**Figure 1: The basic rate access connection (BRA) between the subscriber and the ISDN network**

The connection of a subscriber terminal device to the network requires an intermediate device, called **Network Termination 1** or **NT1**. The device is installed at the subscriber side and is connected to the ISDN Exchange via a simple 2-wire line, known as U-line (Figure 1). The U-line transfers the digital signal that corresponds to the 2B+D channels.

Different types of terminal devices can be connected to the NT1 (ISDN or plain analogue terminals). In order to cover up the different subscriber's needs, INTRACOM offers the following types of Network Termination units:

- **netCon**

- **netCon+**

- **netMod**

## netCon

netCon offers to the subscriber the possibility of connecting up to 8 ISDN terminal devices to the ISDN network. The connection is via a 4-wire cable, known as the S-bus. netCon has two RJ-45 jacks used for the connection of the ISDN terminal devices to the S-bus. Up to 8 ISDN terminal devices can be connected as described in the paragraph "Connecting an ISDN Device" on page 18.

## netCon+

netCon+ besides offering the possibility of connecting ISDN terminal devices to the ISDN network, also offers the possibility of connecting plain analogue devices (like analogue telephones, FAX G3, analogue modems, etc.). The connection of plain analogue devices is made via the two analogue ports (RJ11-jacks), while at the same time the connection of up to 8 ISDN terminal devices is made via the two RJ-45 jacks of the S-bus (see paragraphs "Connecting Analogue Devices" and "Connecting an ISDN Device", on page 17 and 18 respectively).

## netMod

netMod, besides offering the possibilities of connecting ISDN terminal devices and plain analogue devices to the ISDN network, also offers the possibility of connecting a Personal Computer (PC) to the Internet (or similar networks) without using any extra equipment. The connection of up to 8 ISDN terminal devices is made via the S-bus, while the plain analogue devices are connected through the two analogue ports and the Personal Computer (PC) through the asynchronous serial port (RS232) or the USB port, (see paragraphs "Connecting Analogue Devices", "Connecting an ISDN Device" and "Connecting a Personal Computer", on pages 17, 18 and 19 respectively).

The connection of NT1 type devices to the ISDN exchange and to the subscriber terminal devices is shown in Figure 2.
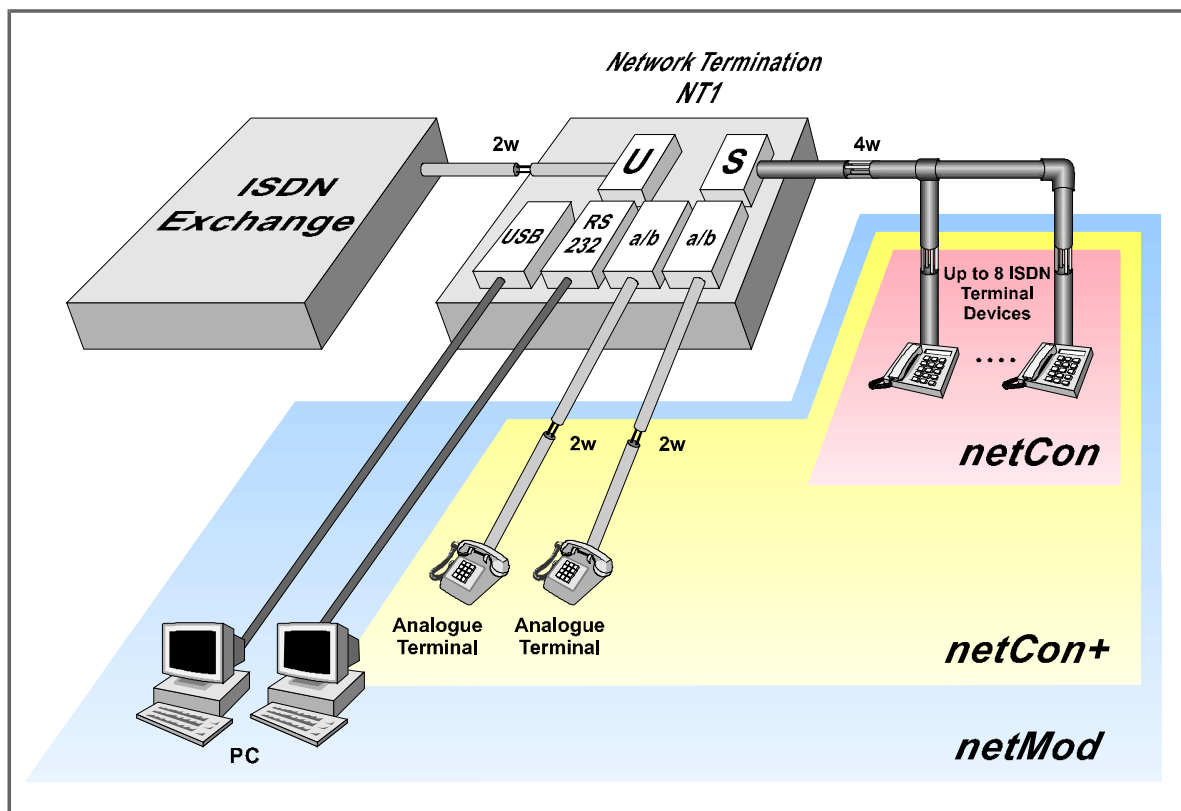
**Figure 2: Connections of NT1 type devices**

Figure 2 clearly shows (shade levels) that netMod surpasses the potentiality of netCon+, and netCon+ surpasses the potentiality of netCon.

## FAMILIARIZATION WITH netMod NETWORK TERMINATION UNIT

**netMod** is equipped with:

- 2×RJ-45 jacks for ISDN terminal devices connection. These jacks are the S-Interface (S-bus) ports of the device.

- 2×RJ-11 jacks for analogue terminal devices connection. These jacks are the analogue ports (ab1 and ab2) of the device.

- an RJ-11 jack for two wire U-line connection.

- a DB-9 connector to connect the personal computer (PC). This connector is the serial port RS232 of the device.

- a USB receptacle to connect the personal computer (PC).

- a power supply cable of 230VAC.

**netMod** offers the following functions and capabilities:

- transmission of data to the serial port with rates up to 230.4 kbps, to and from the connected personal computer (PC), for point-to-point connections or Internet access. Note that most of the personal computers do not support rates of 230.4kbps on their serial port, so the rate is limited to 115.2kbps. In this case a peripheral card is added to the PC, in order to support the desired rates of 230.4kbps.

- transmission of data to the USB port Ver. 1.1 compatible (with rates up to 12Mbps) for full availability of the bandwidth of 128kbps.

- interoperability with any operating system (Linux, Macintosh, Windows' 95/98/NT/ME/2K/XP etc.) using non-proprietary protocols.

- PPP (Point-to-Point Protocol) synchronous to asynchronous conversion for 64kbps communication.

- B-channels bundling with Multilink-PPP support up to 128 kbps.

- PPP over X.25 over D channel protocol for Always On/Dynamic ISDN (AO/DI) use and X.25 applications.

- transparent operation between B channels and data ports (RS232 or USB).

- bandwidth allocation protocols BACP/BAP.

- bandwidth allocation adjustments depending on the demands and the transmission conditions (Bandwidth on Demand).

- transparent data and signalling transmission to the S-bus.

- support of supplementary ISDN services on the analogue ports.

- Second flash memory for easy and convenient firmware upgrade.

## Installation of netMod

netMod can be wall mounted or desktop. Wall mounting is achieved through the two mounting points, located on the back side of netMod (the distance between the two mounting points is 10cm), as shown in the next figure.
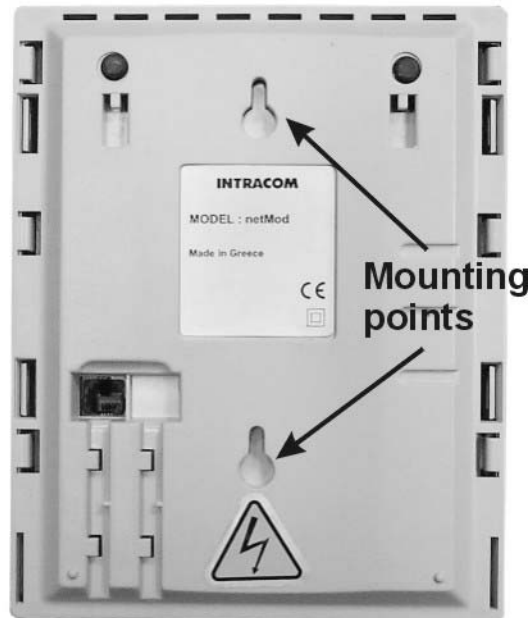


**Figure 3: netMod's mounting points**

To install netMod follow the instructions given below (see Figure 4):

- Connect the U-line (2-wire cable of the ISDN service provider) to the corresponding RJ-11 jack.

- Plug the AC cable to the AC mains.

- Check the orange LED status on the topside of netMod: The AC Mains Power LED (M.P.) should be lit.

- Depending on the devices that you want to connect, use the relevant jacks:

  - RJ-11 jacks (ab1, ab2) for the analogue devices (analogue telephone, fax).

  - RJ-45 jack for the ISDN terminals.

  - RS232 serial port for the personal computer (PC).

  - USB port for the personal computer (PC)
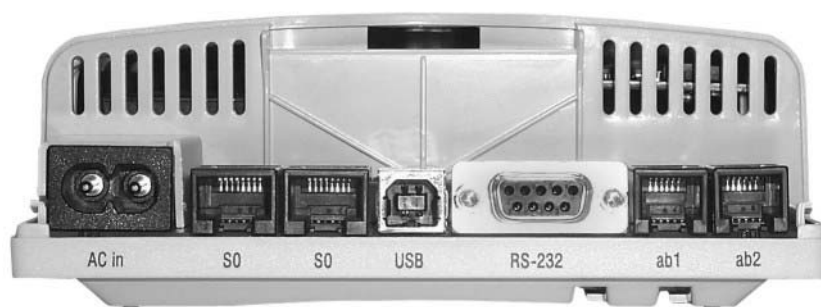


**Figure 4: netMod's Connections**

Follow the steps hereafter in order to install the netMod:

- Turn off the power of the PC (only for RS232 connections).

- Connect the male end of the 9-pin cable to the serial port of netMod or the USB connector to the USB receptacle of the netMod

- Connect the female end of the 9-pin cable to the computer's serial port or the USB connector to the USB receptacle of your PC

- Turn the PC on.

> ☛ ***The installation of netMod as a PC peripheral unit is described in the chapter "CONNECTING TO A PC".***

> ☛ ***Never connect the serial port cable to a device currently in use. The device can be damaged.***

> ☛ ***Especially for the USB installation we suggest to follow the instructions described in the chapter "CONNECTING TO A PC".***

## Switch Settings

netMod is equipped with 3 on-board switches, located just behind the front accessible connectors (see Figure 5). By using these switches, the subscriber can define the desired settings.

These settings are:

- S-bus configuration

- S-bus termination

- System restart

and are explained in the following table.

| Function | Switch | Position | Operation |
|---|---|---|---|
| **S-bus Termination** | SW1 | ON(*) | 100 ohm termination |
| | | OFF | Without termination |
| **System Restart (Reset)** | SW2 | Push-button | Restarts the system |
| **S-bus Configuration** | SW3 | ON(*) | extended bus configuration |
| | | OFF | short bus configuration |

**(*)** default settings
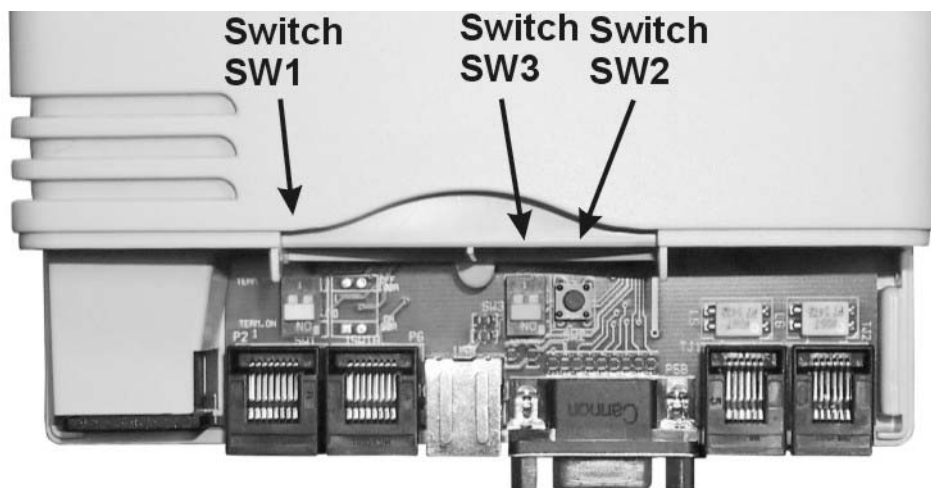


**Figure 5: netMod's switch settings on the motherboard card**

## Indicators

There are six LEDs on the non-removable cover (see Figure 6), described in the table below:

| LED | STATUS | FUNCTION |
|---|---|---|
| **M.P.** | Orange | netMod is powered by mains |
| | OFF | Absence of mains power |
| **R.P (Remote Power)** | Continuously ON (green) | Remote Power from ISDN Exchange. netMod is powered by mains power. |
| | OFF | No Remote Power from ISDN Exchange |
| | Flashing green (Fast) | Upgraded software version has been downloaded. netMod is powered by Mains power. |
| | Flashing green (Slow) | Upgraded software version has been downloaded. netMod is powered by Remote Power only (Emergency mode) |
| **LINK** | Continuously ON (green) | The U-link is fully synchronised |
| | OFF | The U-link is not synchronised |
| **B1/B2** | Flashing green | B channels are occupied (voice) |
| | Flashing red | B channels are occupied (data) |
| | Flashing yellow | B channels are occupied by a terminal connected on the S-bus (ISDN telephone, ISDN external TA) |
| | OFF | B channels are not occupied |
| **USB** | Continuously ON (green) | The communication between the netMod and the PC has been established |
| | Flashing (green) | Data transfer is activated |
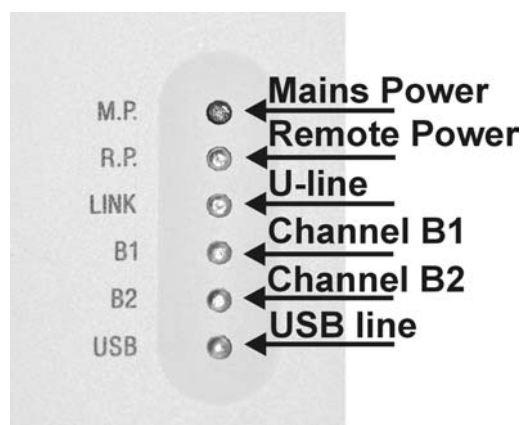


**Figure 6: netMod's LEDs**

## netMod's Functionality in Case of Emergency Operation

When the mains power 230VAC is missing, netMod operates in the emergency mode. In this case the user shall select which analogue or ISDN telephone sets will remain operational (allowed is the operation of one ISDN telephone set or two analogue telephone sets maximum).

The selection is done by pressing:

### *\*\*83\*X#*

where X=0 refers to the POTS ports ab, and

     X=1 refers to the ISDN ports of the S-bus (S0).

> ☛ *The above selection procedure is possible only when the mains power is present.*

In order to define which analogue device will remain operational when both analogue devices are simultaneously in function and the mains power fails, lift the handset and press

### *\*\*80#*

for the analogue device connected at port ab1

### *\*\*81#*

for the analogue device connected at port ab2

### *\*\*82#*

for both analogue devices connected at the analogue ports.

> ☛ *Check if your ISDN device operates in emergency mode (ATTENTION: not all ISDN devices can operate in emergency mode – please refer to your device handbook).*

> ☛ *In case where you selected the S-Bus to be operational in emergency mode, then only one ISDN device will operational.*

> ☛ *If the user do not select any specific analogue port, the port that will remain operational in emergency mode will be the port ab1.*

> ☛ *If the distance between you and the provider's telephone exchange is more than 3.5km, then the simultaneous operation of both analogue devices in emergency mode could be impossible.*

## U-line Connection

netMod is equipped with an RJ-11 (located in the bottom side) jack to connect the U-line (see Figure 7), with the following connection points (see bottom of netMod).

| Pin | Description |
|-----|-------------|
| 1 | not connected |
| 2 | not connected |
| 3 | Ua |
| 4 | Ub |
| 5 | not connected |
| 6 | not connected |
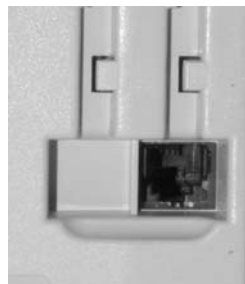


**Figure 7: U-line connector**

## Terminal Devices Connection

### Connecting Analogue Devices

netMod is equipped with two RJ-11 jacks to connect analogue devices, such as analogue telephones, FAX G3, etc. (Figure 8).



| Pin | Description |
|-----|-------------|
| 1 | not connected |
| 2 | not connected |
| **3** | **Tip** |
| **4** | **Ring** |
| 5 | not connected |
| 6 | not connected |

**Figure 8: The connection points of plain analogue devices to RJ-11 jacks**

☛ *The pin numbering of RJ-11 and RJ-45 jacks is from left to right.*

## Connecting an ISDN Device

netMod is equipped with two RJ-45 jacks for ISDN devices connection (see Figure 9). The subscriber can directly connect up to two devices to the corresponding jacks, or create a passive bus (S-bus) for the connection of more than two devices (see paragraph "CREATION OF A PASSIVE BUS (S-BUS)" page 79).
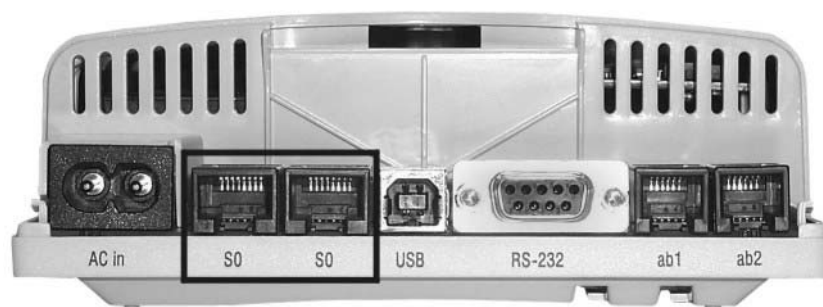
| Pin | Description |
|-----|-------------|
| 1 | not connected |
| 2 | not connected |
| **3** | **RX +** |
| **4** | **TX +** |
| **5** | **TX -** |
| **6** | **RX -** |
| 7 | not connected |
| 8 | not connected |

**Figure 9: The connection points of ISDN devices to RJ-45 jacks**

## Connecting a Personal Computer

netMod provides two data ports to connect a Personal Computer (PC):

- a serial communication port RS232 and

- a USB port.

An RS232 cable is required for connecting netMod to the PC with male connector DB9 at one end (netMod's side), and female connector DB9 at the other end (PC's side).

For the USB port you need a cable with a connector Type B for netMod side and a connector Type A for PC side.

Both cables are included in the package.



**Figure 10: Connecting a PC**

| netMod RS232 (male) | Signal | PC RS232 (Female) |
|---|---|---|
| 3 | TXD | 3 |
| 2 | RXD | 2 |
| 7 | RTS | 7 |
| 8 | CTS | 8 |
| 6 | DSR | 6 |
| 5 | Ground | 5 |
| 1 | CD (DCD) | 1 |
| 4 | DTR | 4 |
| 9 | RI | 9 |

| netMod USB (Type B) | Signal | PC USB (Type A) |
|---|---|---|
| 1 | +5V | 1 |
| 2 | - DATA | 2 |
| 3 | + DATA | 3 |
| 4 | Ground | 4 |

# ISDN SERVICES

The ISDN services are divided into three main categories:

- the **Bearer Services**

- the **Teleservices**

- the **Supplementary Services**

The **Bearer Services**, are services responsible to transfer information (voice, data, image etc.) between the subscribers, in real time, without changing the information structure. These services concern the ISDN connection providers.

The **Teleservices** are telephone network services and are described below:

- Telephony at 3.1kHz

- Telephony at 7kHz (high quality level voice telephony)

- Facsimile with FAX G4 (advanced FAX with very high transmission rate)

- Videotext

- Teletext

- Videotelephony

The **Supplementary Services** are services offered via ISDN connections and are described in detail in the next Chapter.

netMod also supports some other services known as **Additional Services**, which can be activated / deactivated in the same way as Supplementary Services.

netMod supports some supplementary / additional services on its analogue ports, that can be activated / deactivated separately on each port by means of an analogue telephone set with (DTMF) dialling connected to the corresponding netMod's analogue port. This activation / deactivation can also be achieved via the AT Commands (see "Supplementary Services using AT Commands" page 73, "Additional Services using AT Commands" page 78) through the serial port connection of the PC.

netMod **does not** activate / deactivate the supplementary / additional services on the **S-bus**. Signalling and data on the S-bus are transferred transparently through the netMod. The subscriber, following the **user's instructions** of the terminal device connected to the S-bus, can activate / deactivate the supplementary / additional services, separately on each device.

> ☛ *You have to confirm that the Supplementary and Additional Services described below have been activated in the ISDN Exchange of the ISDN service provider.*

The operator of the ISDN exchange has to activate supplementary / additional services after a subscriber's request. The subscriber then, can activate / deactivate these services on each **analogue** port, depending on his/her needs.

> ☛ *The settings made for the supplementary / additional services by pressing the keys of the analogue devices are permanently stored in netMod. The settings made using AT commands are not permanently stored in netMod (excluding the "Multiple Subscriber Number") and are not restored after resetting the device. To permanently store these settings, you have to follow the process described in paragraph "Permanent Storage of the S-Registers Settings" page 71.*

## Detailed Description and Use of Supplementary Services

> ☞ *The marking of the* **FLASH** *key varies between different telephone devices. Sometimes it is shown as FL, and other times as PR. For further information consult the manufacturing instructions given for your device.*

> ☞ *Some services like (CLIP service) require special terminal devices with LCD display, in order to be supported (e.g. INTRACOM'S IRIS 6020-CID telephone device).*

## 1.     Multiple Subscriber Number (MSN)

One of the basic ISDN services, is the Multiple Subscriber Number, which offers multiple subscriber numbers in the same ISDN subscriber line (up to 10, while the ISDN service providers offer up to 8). Through the MSN service the subscriber assigns multiple subscriber numbers (MSN) to a single BRI line. These subscriber numbers are assigned and partitioned from netMod to the analogue ports (ab1 and ab2) and to the serial port. MSN numbers are assigned to the ISDN terminals from the terminal's keyboard, based on the corresponding instructions given by the manufacturer. The subscriber is able to know the MSN numbers given by the service provider, through a simple request for an ISDN line acquisition.

Up to three subscribers numbers can be assigned to each analogue and data port, and they can be stored in the corresponding netMod's memory locations.

The following procedures assign or delete (MSN) numbers to the memory of each of netMod's analogue port (ab1 or ab2):

- For each analogue port write the desired (MSN) number to the memory location X ( X= '1' or '2' or '3' ) by pressing **\*\*9X\*MSN#**

- For each analogue port delete the (MSN) number that is stored to the memory location X ( X= '1' or '2' or '3' ) by pressing **\*\*9X\*#**

> ☞ *To assign MSN numbers to the devices connected to the S-bus see page 37.*

## 2.        Call Waiting (CW)

When this service is activated on an analogue port, the subscriber during his/her active call receives a tone indicating an incoming call.

The incoming call is placed in a waiting state for a certain time period and the subscriber can answer this waiting call by pressing:

- The keys *FLASH 2* to accept the waiting call and place the active call on hold (the same key combination is used to switch between the two calls).

- The keys *FLASH 1* to accept the waiting call and release the active call.

- The keys *FLASH 0* to reject the waiting call.

When the subscriber ignores the call waiting indication, the waiting call is rejected after a certain time period.

The call waiting can be activated on each analogue port by pressing *\*43#*

The call waiting can be deactivated on each analogue port by pressing *#43#*

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☞ *Note that this service is initially activated on both analogue ports of netMod.*

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## 3.    Call Hold and Enquiry Call (CH)

The subscriber can have an active call on line and make a second call from the same analogue port.

The key combinations are listed below:

- The key *FLASH* to place the active call on hold and wait for the dial tone.

- After the dial tone, the enquiry call can take place by dialling the called subscriber number and waiting for an answer.

Then the following keys can be pressed:

- The keys *FLASH 2* to switch between the two calls

  or

- The keys *FLASH 1* to release the active call and retrieve the call on hold

  or

- The keys *FLASH 0* to clear the call on hold.

## 4.    Three Party Conference (3PTY)

When the subscriber has an active call on line and a second call on hold, then by pressing:

- The keys *FLASH 3* establish a three party conference for the active call and the held call.

If the subscriber has a three party conference established then by pressing:

- The keys *FLASH 2* split up the three party conference. There is again an active call on line and a second call on hold.

## 5. Calling Line Identification Presentation

### 5.1. Calling Line Identification Presentation (ON HOOK CLIP)

Calling Line Identification Presentation is a service offered to the called subscriber and presents the calling party's number before answering the call (ON HOOK). In the display of the called subscriber's telephone set, appears the number of the calling subscriber. This service is implemented by means of **FSK** signalling on netMod's analogue ports. The called subscriber should have the proper terminal device that transforms the **FSK** signalling to a visual indication (e.g. INTRACOM'S IRIS 6020-CID).

Note that if the CLIP service is available to the subscriber, netMod initially allows the forwarding of the calling subscriber number through **FSK** signalling, to the called subscriber terminal device connected to the analogue ports ab1 and ab2.

- By pressing the keys ***85#*** the transmission of the CLIP signal is activated, separately on each of netMod's analogue port ab1 or ab2.

- By pressing the keys ***#85#*** the transmission of the CLIP signal is restricted, separately on each of netMod's analogue port ab1 or ab2.

  ☛ *Note that this service is initially activated on both analogue ports of netMod.*

### 5.2. Setting the Own Number

The calling subscriber can define which of the MSN numbers assigned to each analogue port will be presented on the called subscriber when he makes a call from the specified port by pressing the following keys combinations:

## *\*\*90\*MSN#*

### 5.3. Calling Line Identification Presentation (OFF HOOK CLIP or CLIP on CW)

This service allows the called subscriber to identify the calling subscriber, during off hook state. Activating this service, the subscriber that has already answered a call is able to identify all the new incoming calls (Waiting Calls).

- By pressing the keys ***84#*** the transmission of the CLIP signal is activated on each of netMod's analogue port ab1 or ab2.

- By pressing the keys ***#84#*** the transmission of the CLIP signal is restricted on each of netMod's analogue port ab1 or ab2.

  ☛ *Note that this service is initially deactivated on both analogue ports of netMod.*

## 6.     Calling Line Identification Restriction (CLIR)

Calling Line Identification Restriction is a service offered to the calling subscriber to restrict the presentation of his/her calling party's number to the called subscribers. The following keys combinations are valid, only when the user is a subscriber of the CLIR service in a call-by-call basis.

- Restrict the presentation of calling party's number when pressing ***31#***

- Allow the presentation of calling party's number when pressing ***#31#***

- Restrict the presentation on a call by call basis when pressing:

## *31*CalledParty'sNumber

> ☛ *Note that this service is initially deactivated on both analogue ports of netMod.*

## 7.     Connected Line Restriction (COLR)

This service is offered to the called subscriber, to restrict presentation of his/her party's number during the connection of the call.

- Activate the restriction by pressing ***77#***

- Deactivate the restriction by pressing ***#77#***

> ☛ *Note that this service is initially deactivated on both analogue ports of netMod.*

## 8.     Malicious Call Identification (MCID)

The Malicious Call Identification service allows the called subscriber to ask the Operator about the identification of the calling party number, provided that the calling subscriber has the CLIR service activated. The information is given in a printed form, by the local exchange of the called subscriber.

The malicious call identification can be activated during the call, by pressing ***FLASH*39#***.

## 9.    Advice Of Charge During the call (AOC-D)

The Advice of Charge service informs the calling subscriber about the charge of his/her call, during the call.

> ☛ *The subscriber should have the proper equipment in order to convert the metering pulses into an optical indication. This equipment is connected to the telephone device in series. Alternatively, a telephone device which supports this feature can be connected.*

- Turn pulse metering on when pressing ***89#***

- Turn pulse metering off when pressing ***#89#***

> ☛ *Note that the AOC-D service is initially deactivated on both analogue ports of netMod.*

## 10.    Closed User Group (CUG)

This service allows the creation of closed user groups between the subscribers. When this service is activated, the communication is subjected to specific restrictions.

By pressing ***01*CUGIndex#CalledParty'sNumber*** or ***01#CalledParty'sNumber*** you can make a CUG call.

## 11.     Terminal Portability (TP)

The subscriber can suspend an active call and then resume it within three minutes from the same or another analogue or ISDN terminal.

Suspend an active call by pressing:

- The keys ***FLASH\*19#***

or

- The keys ***FLASH\*19\*X#***

where X (0..9) is the call id.

Resume a suspended call on the analogue ports by pressing:

- The keys ***#19#***

or

- The keys ***#19\*X#***

where X (0..9) is the call id.

## 12.     Call Diversion

When the Call Diversion service is activated all incoming calls that refer to the number of the called subscriber, are forwarded conditionally or unconditionally to another number destination pre-selected by the called subscriber.

Some of the Call Diversion services are directly linked to the Multiple Subscriber Number service. The subscriber has to assign MSN numbers to the analogue ports of netMod to make the call diversion service functional.

Up to three different MSN numbers can be assigned on each analogue port, and are stored in netMod's corresponding memory locations. For each assigned MSN number, the call diversion service can be activated / deactivated. The settings concerning this service are permanently stored in netMod's memory.

## 12.1.  Call Forwarding Unconditional (CFU)

When the Call Forwarding Unconditional service is activated, all incoming calls that refer to subscriber number of the called subscriber, are forwarded to another pre-selected number destination.

- The CFU service for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3') is activated by pressing:

  ***21DialNumber*X#*** or ***21*Dial Number#*** in case you don't have MSN numbers available.

  X takes the values '1' or '2' or '3'.

  > ☞ *DIAL NUMBER is the subscriber number to which the call will be forwarded after the activation of (CFU) service.*

- The CFU service for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3') is deactivated by pressing:

  ***#21*X#*** or ***#21#*** in case you don't have MSN numbers available.

  X takes the values '1' or '2' or '3'.

- The inspection on whether the CFU service is supported by the local ISDN exchange for the subscriber number of an analogue port that is stored in memory location X (X='1' or '2' or '3') is done by pressing:

  ***#21*X#*** or ***#21#*** in case you don't have MSN numbers available.

  X takes the values '1' or '2' or '3'.

Then the subscriber will hear on the handset

- a continuous tone or a voice message when the service is supported

- an interrupted tone or a voice message when the service is not supported.

  > ☞ *The [*X] parameter is optional for all the above commands. If no value is assigned for the [*X] parameter, the subscriber number that is forwarded is the one that is stored in memory location '1'.*

## 12.2.  Call Forwarding on Busy (CFB)

The function of this service requires the assignment of MSN on the corresponding port. When a netMod port is busy, all incoming calls that concern a subscriber number (MSN) of the called subscriber port, are forwarded to another pre-selected number destination.

- The CFB service for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3') is activated by pressing:

# *67*DialNumber*X#

X takes the values '1' or '2' or '3'

> ☛ **DIAL NUMBER is the subscriber number to which the call will be forwarded after the (CFB) service activation.**

- The CFB service for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3') is deactivated by pressing:

# #67*X#

X takes the values '1' or '2' or '3'.

- The inspection on whether the call forwarding on busy service is supported by the local ISDN exchange for the subscriber number of an analogue port that is stored in memory location X (X='1' or '2' or '3') is done by pressing:

# *#67*X#

X takes the values '1' or '2' or '3'

Then the subscriber will hear on the handset

- a continuous tone or a voice message when the service is supported

- an interrupted tone or a voice message when the service is not supported.

> ☛ **The [*X] parameter is optional for all the above commands. If no value is assigned for the [*X] parameter, the subscriber number that is forwarded is the one that is stored in memory location '1'.**

## 12.3.  Call Forwarding on No Reply (CFNR)

In case of no answer in an incoming call for an subscriber number, the call is diverted to another pre-selected number destination.

- The CFNR service for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3') is activated by pressing:

  ***61*DialNumber*X#*** or ***61*Dial Number#*** in case you don't have MSN numbers available.

  X takes the values '1' or '2' or '3'.

  > ☞ **DIAL NUMBER is the subscriber number to which the call will be forwarded after the (CFNR) service activation.**

- The CFNR service for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3') is deactivated by pressing ***#61*X#*** or ***#61#*** in case you don't have MSN numbers available

  X takes the values '1' or '2' or '3'

- The inspection on whether the CFNR service is supported by the local ISDN exchange for the subscriber number of an analogue port that is stored in memory location X (X='1' or '2' or '3') is done by pressing ***\*#61\*X#*** or ***\*#61#*** in case you don't have MSN numbers available

  X takes the values '1' or '2' or '3'

Then the subscriber will hear on the handset

- a continuous tone or a voice message when the service is supported

- an interrupted tone or a voice message when the service is not supported.

  > ☞ **The [*X] parameter is optional for all the above commands. If no value is assigned for the [*X] parameter, the subscriber number that is forwarded is the one that is stored in memory location '1'.**

## 12.4.   Call Forwarding Unconditional to Voice Mail

When the Call Forwarding Unconditional to Voice Mail function is activated, all incoming calls that refer to a certain terminal are forwarded unconditionally to a Voice Mail box of the Operator (if the service is available).

- The service is activated by pressing ***27#***

- The service is deactivated by pressing ***#27#***

## 13.     Completion of Calls to a Busy Subscriber (CCBS)

This service allows a calling user, on encountering a busy destination, to have his/her call established when the busy destination becomes free, without having to make another call attempt.

- The Completion of Call to a Busy Subscriber is activated by pressing *FLASH 5*

- The service is deactivated by pressing ***37#***

- The confirmation that the CCBS service is supported from the ISDN exchange is done by pressing ***#37#***

Then the subscriber will hear on the handset

- a continuous tone or a voice messages when the service is supported

- an interrupted tone or a voice message when the service is not supported.

## Detailed Description and Use of Additional Services

| 1. | Functional / Keypad Protocol |
|---|---|

If the ISDN exchange is using the FUNCTIONAL protocol to activate / deactivate the supplementary services, you do not need to program anything. netMod initially supports the FUNCTIONAL protocol.

If the ISDN exchange supports the KEYPAD protocol for the activation / deactivation of supplementary services, then it has also to be activated in netMod.

- To activate the KEYPAD protocol, press **11#

- To re-establish the FUNCTIONAL protocol, press **10#

Alternatively, you can activate the KEYPAD protocol by writing on the register S100 the value '1'. If the ISDN exchange supports only the KEYPAD protocol, the supplementary services Three Party Conference and Malicious Call Identification are not supported.

The activation of KEYPAD protocol using the keypad commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation of KEYPAD protocol using S-Registers is not permanent. In this case to permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings.

| 2. | Hot Line (HL) |
|---|---|

If you have activated the HL service and you hook off the handset of your telephone device, then an inspection of 10 seconds starts. After 10 seconds, a call is made to a preselected subscriber number. If the subscriber calls another subscriber number before the end of 10 seconds, the HL service is cancelled.

- To activate the HL service press *53*Number#

- To deactivate the HL service press #53#

## 3.        Delayed Clear Back

When a call has been established and the B-party (called subscriber) has placed the handset on-hook, an inspection of 90 seconds is initiated. If during this inspection the subscriber places the handset off-hook, the active call will be restored. When this inspection of 90 seconds ends, the connection is released.

- To turn Delayed Clear Back on press ***70#**

- To turn Delayed Clear Back off press ***71#**

> ☛   *Note that this service is initially activated on both analogue ports of netMod.*

## 4.        Incoming Call Management

Incoming call Management is specific for using in analogue PBX's. This feature is ideal when you have not MSN numbers available or programmed in netMod. We can program that only one POTS will be ringing at incoming calls.
Four different options are supported:

***03*0#** :Broadcast. Both ab1 and ab2 are ringing.

***03*1#** :ab1 preferred.

***03*2#** : ab2 preferred.

***03*3#** : ab1 and ab2 ring alternatively.

## 5.        Hook Flash Detect Time for Analogue Adapters

In order to set the Flash detect time you can also use the DTMF code: ***25*Time#**

<time> value must be assigned in steps of 10ms (as is in the corresponding S register).

To restore the default value (700 ms) press: ***25#**

| 6. | Distinctive Ringing |
|----|---------------------|

netMod can provide a special Distinctive Ringing tone, except the default one, for each one of the total 3 MSN numbers defined at each POTS port. For each one of the 3 memory locations, there is a ringing tone defined, that can be activated as follows:

## *\*\*9X\*MSN\*#*

This combination defines an MSN number in the required memory location X (X=1,2,3) and simultaneously activates the relevant ringing tone.

In order to deactivate the distinctive ringing tone and simultaneously to delete the MSN number, press: *#\*9X\*#*

In order to define the MSN numbers without distinctive ringing tone, follow the procedure described on page 37.

**Detailed characteristics of the distinctive ringing tones**

| Ringing tone 1 | Ringing tone 2 | Ringing tone 3 | Ringing tone 4 |
|----------------|----------------|----------------|----------------|
| Signal 500ms | Signal 700ms | Signal 300ms | Signal 1000ms |
| Pause 200ms | Pause 200ms | Pause 200ms | Pause 4000ms |
| Signal 500ms | Signal 300ms | Signal 700ms | |
| Pause 3600ms | Pause 3600ms | Pause 3600ms | |

| 7. | Polarity Reverse |
|----|------------------|

With the activation of this function, netMod will reverse the polarity of each POTS port, when the connected telephone device answers or releases a telephone call. This functionality is provided only on the POTS ports and should be supported from the connected telephone device. With this function the telephone device can i.e. start a call charging or time monitoring procedure up to the moment of the call answering or releasing.

In order to activate this function, connect a telephone device that supports this service on the required POTS port, where the service will be activated, lift the handset and press:

## *\*\*26\*Value#*

The parameter <value> will take the value «0» for deactivation and «1» for activation of this service.

## 8.    Call Pickup

The function of this service demands the assignment of MSN in at least one POTS port.

Call Pick-Up service allows the subscriber to answer calls directed to a POTS port other than the one to which the subscriber's telephone set is connected.

When a telephone set connected to another POTS port is ringing, then take the following actions in order to answer the call from your own telephone set:

- Lift your handset

- Press *82#

- Answer the call

---

☛ *Note that netMod also supports the following extra services on both analogue ports ab1 and ab2:*

- *Alarm Call*
- *Voice Mail etc.*

*The detailed description and use of these services is provided by the Operator.*

---

## SUPPLEMENTARY SERVICES AND TERMINAL DEVICES

netMod supports three different types of terminal devices (analogue devices, ISDN devices, Personal Computer) and various supplementary services to the subscriber. For the best use of terminal devices connected to netMod, attention must be given when using supplementary services, during establishment, duration or answer of a call.

**Connecting a Terminal Device to the S-bus**

Note that:

- netMod **does not** activate / deactivate supplementary services on the S-bus. Signalling and data concerning the S-bus are transferred transparently via netMod. The subscriber, following the user's instructions of the terminal device connected to the S-bus, can activate / deactivate the supplementary services separately on each device.

- netMod **does not** program MSN numbers on the S-bus. Programming of MSN numbers is done on the devices connected to that port. Each of these devices compares the called party number of the incoming call, with the programmed MSN numbers stored in its memory. The device will accept the call when the called party number is identical to one of the MSN numbers programmed in the device. If there are no programmed MSN numbers in the device, then all the incoming calls are accepted.

**Connecting a Videophone**

Many videophones interchange with the ISDN exchange the same information as netMod, for the establishment-answer of a call.

For this reason, in order to answer a videophone call, the following steps are suggested:

- Assign MSN numbers (MSN service) to the data port, so as to prevent a PC connected to netMod port from answering a videophone call. In case of an incoming videophone call, the call must have a called party number different from the MSN number assigned to the data port.

  Assign MSN numbers forcing netMod to compare the called party subscriber number that follows an incoming call, with the MSN numbers of each port. After this comparison the call will be driven to the analogue port, or the data port whose MSN number is identical to the called party number of the call. If the called party number is not identical to any of the MSN numbers assigned to the analogue ports or the data ports, it will be driven to the S-bus transparently.

When a videophone device is connected to the S-bus, it is suggested to program MSN numbers on the videophone device **(netMod does not program MSN numbers on the S-bus)**. In case of an incoming videophone call, the call will be transparently driven to the S-bus, because when a port has no assigned MSN numbers, it accepts all the calls. The videophone will then compare the called party number of the incoming call with the programmed MSN numbers. If the called party number is identical to an MSN number, the videophone will accept the call.

**Connecting a FAX or MODEM to the Analogue Ports**

When a FAX or an analogue Modem is connected to an analogue netMod's port, it is suggested:

- to deactivate the CW (Call Waiting) service on this port. An audio tone is generated when this service is active and can interrupt the transmission of a FAX or the connection of an analogue modem.

- to assign MSN numbers to this port. In this case the incoming calls from the FAX or the analogue modem, must have called party numbers identical to one MSN number of the port, to which the FAX or the analogue modem is connected. Assigning MSN numbers prevents the devices from answering a call that does not refer to them.

**Communication with an ISDN MODEM**

In case of an incoming data call from an ISDN modem, it is suggested to assign MSN numbers to the data port. In case of an incoming call from an ISDN modem, the call should have a called party number identical to the one of the MSN numbers assigned to the data port.

> ☛ *When the analogue or the data ports have no MSN numbers assigned, they accept any call (netMod does not make any comparison of numbers).*

> ☛ *When the device connected to the S-bus has no MSN numbers assigned on its memory, it accepts any call.*

# CONNECTING TO A PC

## Installation of netMod

In order to install your netMod via the nMsetup (netMod setup) S/W, you should start up your PC **without** the RS232 and USB cables connected. Wait until Windows is loaded correctly and insert the relevant CDROM in your CD-drive. The installation will start automatically.

## Installation Procedure
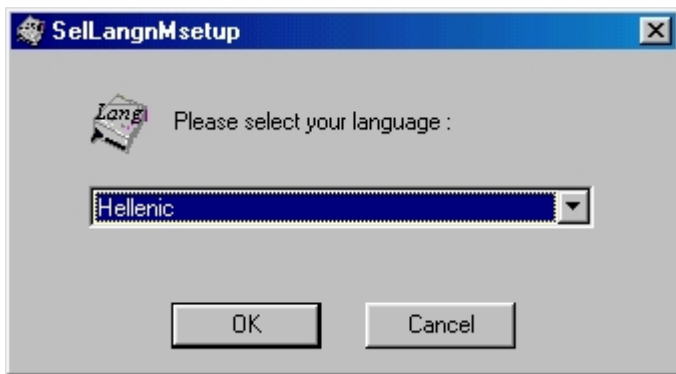


Select the installation language.



This is your first installation S/W screen. Select <Next> to continue. If you need help, press the <Help> button anytime you need it.

Press <Yes> to accept the licence agreement and to continue with the installation.
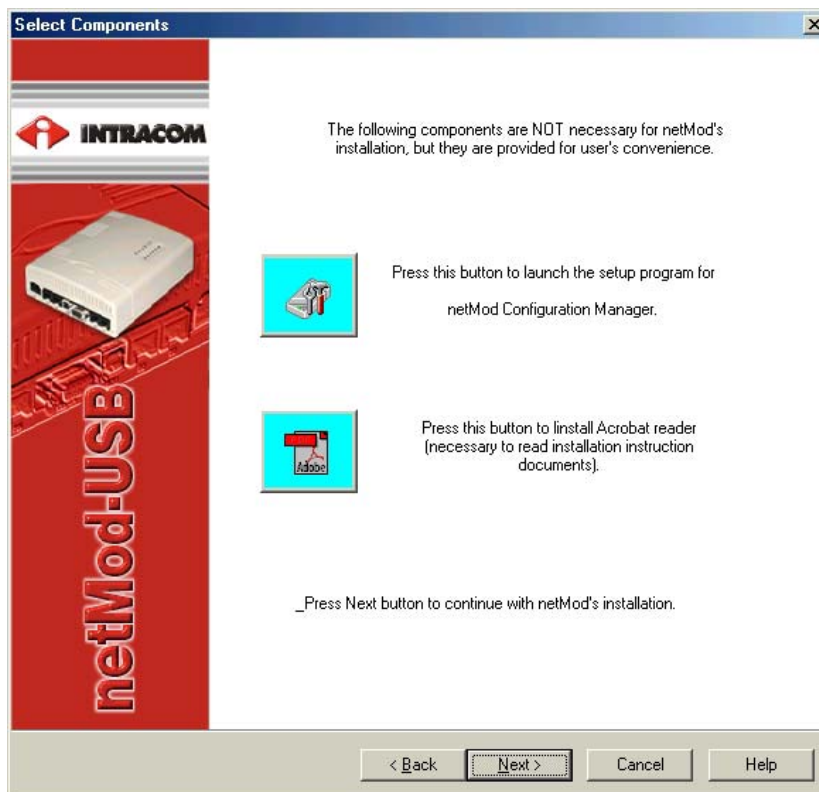


Select the S/W you would like to install and press <Next>.

☞ *The S/W in the CD-ROM provided in netMod's packaging is customized and adapted on the local service provider requirements.*
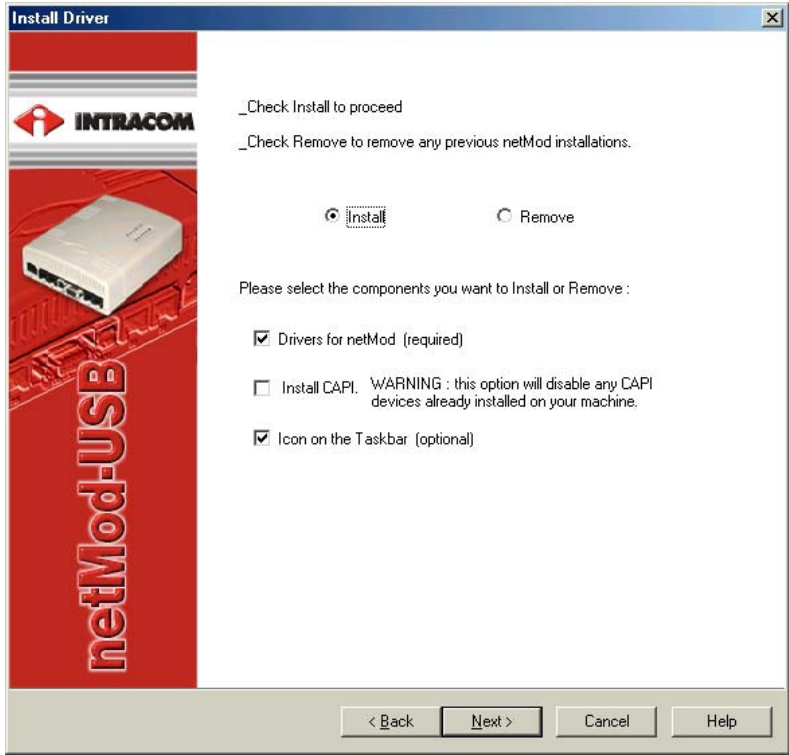
Select between the installation and the deactivation of a previous installation. Select the required configuration (the needed fields are already selected) and press <Next> to continue.

☞ *If you have selected the CAPI drivers installation, you must take into consideration, that any previous CAPI drivers installation will be deactivated.*
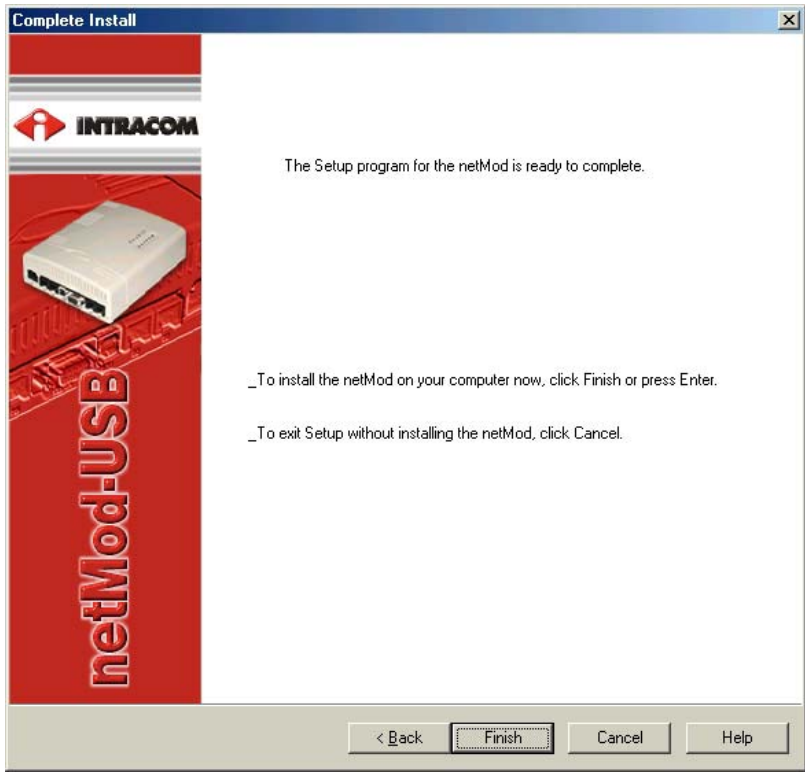


The installation is almost ready. Press <Finish> to start the drivers copying.

Press <Back> to return to the previous state or <Cancel> to cancel the installation.
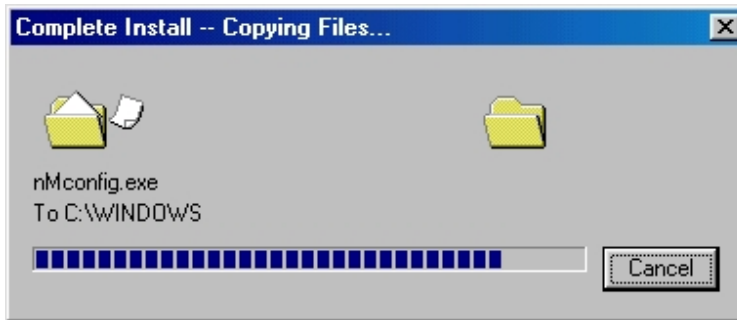
This window shows the copying of the drivers' files. The window will disappear when the procedure is completed.

## Installation Completion

Now you can connect the RS232 and/or USB cables. Windows will detect your new hardware and the installation will be completed in a few seconds. In order to check the correct installation open the "Device Manager" **(Windows9x/ME "Start → Settings → Control Panel → System"Win2000/XP "Start → Settings → Control Panel → System → Hardware")** and under the selection «Modems» you will see "*Intracom netMod USB ver.xx*" and/or "*Intracom netMod Winxxxx*". In case of a USB installation, you can check under "the USB controllers" (Universal Serial Bus controllers) for the device installation of "*CAPI nMUSB Driver ver x.x.x"* and "*Intracom netMod USB ISDN Modem Ver x.xx*".
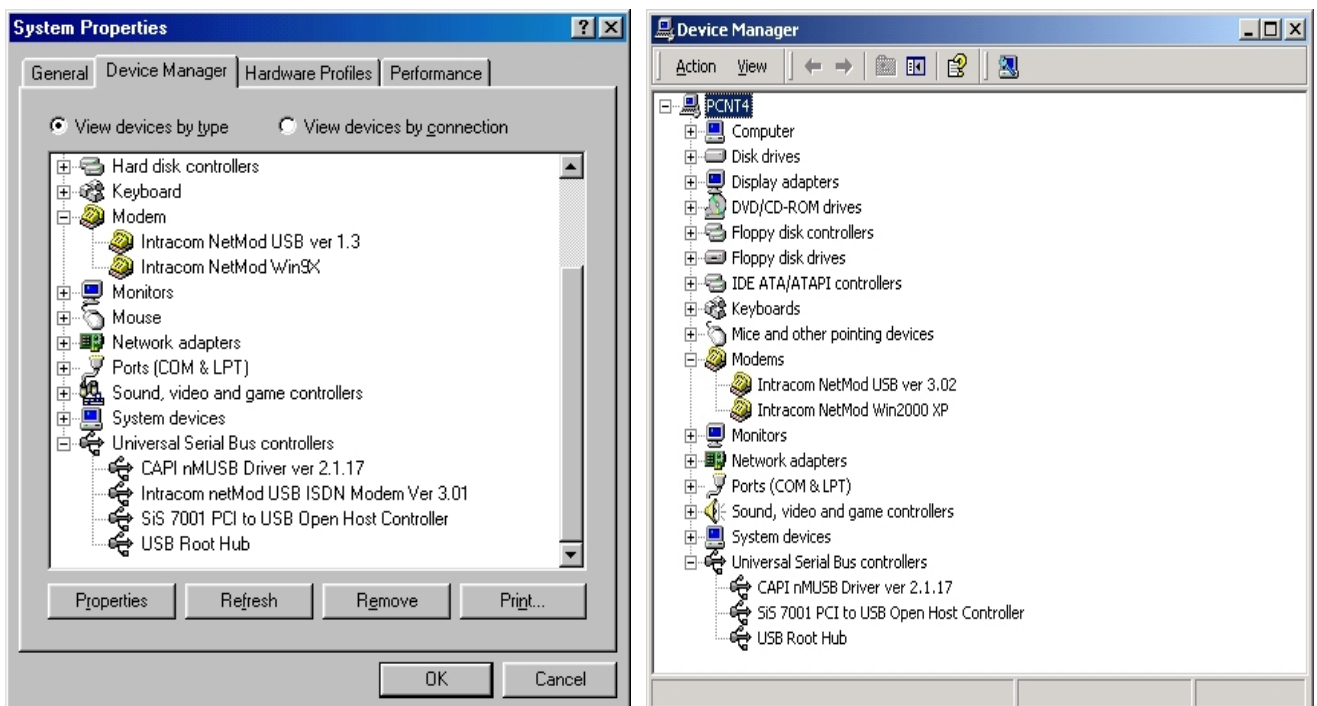


The above windows present the Device Manager settings under Windows98/ME and WindowsXP/2000 as well as the device configuration after netMod's USB installation.

☞ *In case of an RS232 connection, you may need to restart your PC in order to complete the installation.*

☞ *netMod's CAPI drivers operate only under USB installation.*

☞ *In order to upgrade your firmware follow the procedure described in the CD-ROM accompanying your netMod or in INTRACOM's Helpdesk (http://netmod.intracom.gr). Alternatively you can use the embedded upgrade operation of the netMod Configuration Manager (NCM) supplied in netMod's packaging.*

☞ *For all latest news, manuals, drivers' versions etc, consult our special Helpdesk (http://netmod.intracom.gr).*

☞ *Configuration and installation instructions for other operating systems can be found in the netMod CD-ROM and in our Helpdesk (http://netmod.intracom.gr).*

☞ *For the correct installation of the USB driver, please follow exactly the previous described procedure.*

☞ *CAPI drivers developed for netMod are provided in the CD-ROM, included in netMod's packaging or in INTRACOM's Helpdesk page (http://netmod.intracom.gr).*

## Configuring netMod with the netMod Task Bar Utility (nMtsk)

After the installation completion of the USB driver, the ![icon] icon will appear in the system tray of your system and will inform you about the B-channels status using the colour code of netMod's LEDs, as well as about the incoming and outgoing call type performed at that moment. By double clicking (or simple right-clicking and selecting "Settings") on this icon the netMod configuration application window will appear on your screen. The relevant application functions are described in the following.
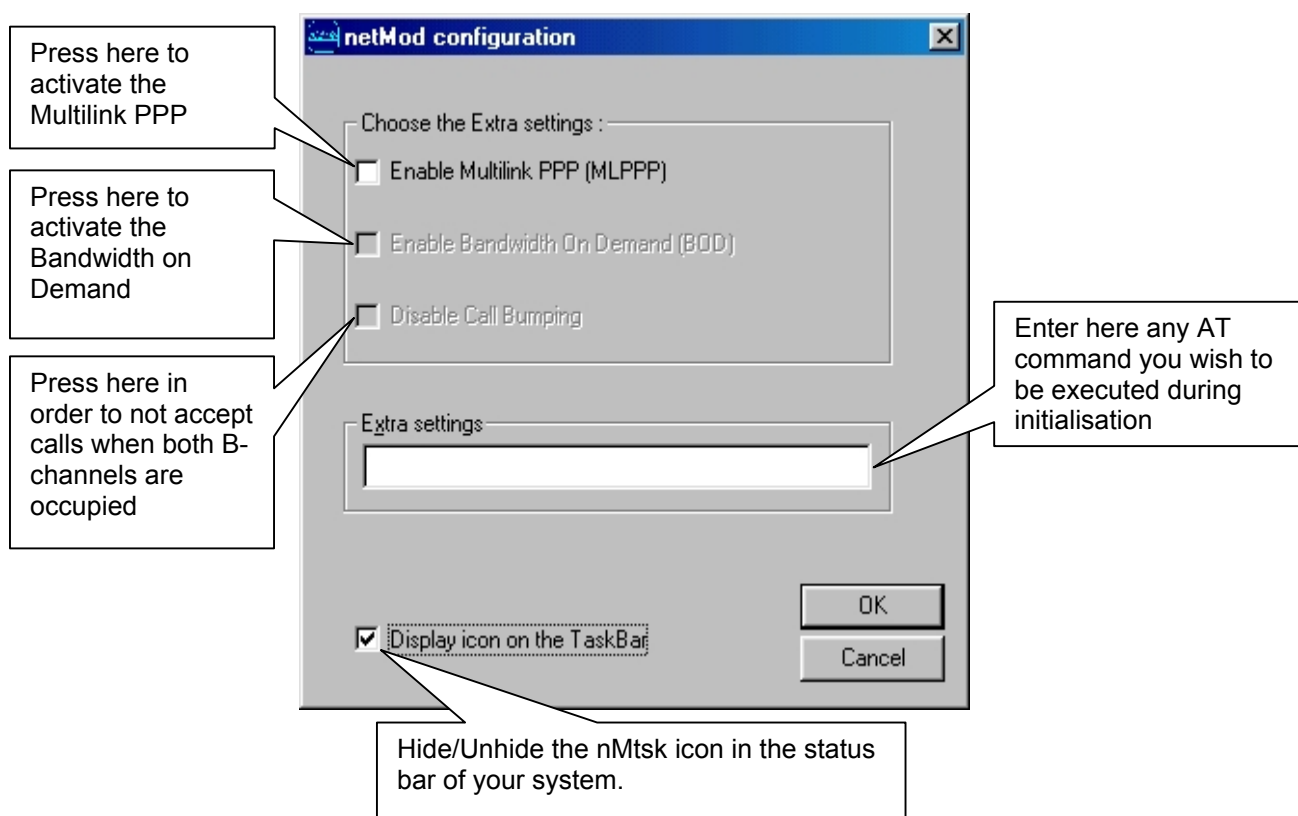


In order to activate the settings press on "OK", otherwise press "Cancel".

By moving the cursor over the nMtsk icon, a text box will appear on your screen informing you about the current status of the B-channels.

☛ *The nMtsk application icon appears only if the USB connection with the PC is used.*

## RVS-COM Lite

### RVS-COM Lite in brief

RVS-COM Lite is a complete software package, which transforms the PC, which connected to an ISDN Terminal Adaptor to an operation centre with additional capabilities.

Provided services are:

- FAX G3/G4 transmission (Fax G4 provides digital transmission with speed rate up to 64 kbps)

- An easy to use Telephone Answering machine with capabilities of voice messaging and remote access to messages

- Communication with other PC's at high-speed data transfer rates

- Analogue modem simulation operation for connection with plain PSTN telephone lines and analogue modems, as well as simple connections with the Internet

- Videophone for simultaneous transmission of voice and image with one or two channels (Required is a simple camera for PCs and a microphone)

- An easy to use address book, which provides the capability of connection with the existing Outlook Express address book

- Software – PPP driver for Remote Access Servers.

- Fully compatible with the standard CAPI 2.0 and with the netMod CAPI drivers. Support and serial connection specifically for netMod use.

RVS-COM Lite is an additional software package for netMod but is provided only upon request of the telephone service provider. Therefore, it may not be available in all countries.

> ☞ *In order to utilize its capabilities, RVS-COM should be used in combination with the CAPI drivers developed for netMod.*

## CONNECTING TO THE INTERNET

### Required Settings

Once you have netMod installed correctly you can use it to be connected to the Internet. To do so you must have an account to an Internet provider for ISDN Internet access.

> ☞ *You need an Internet access account via dial-up ISDN. The old simple dial-up account will not operate.*

In order to add your new ISDN Internet connection open the <Dial-Up Networking> item in <Accessories> menu. If such an item does not exist, you should install it from your Windows' 95/98/Me CD-ROM. For further information on this subject, please refer to your Windows' 95/98/Me manual. The first time you run <Dial-Up Networking> a window like the following will appear:
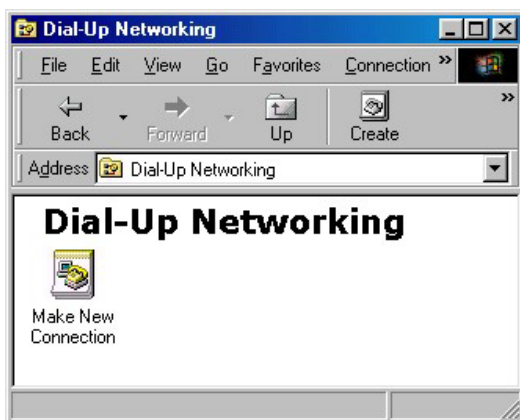


Double click on the <Make New Connection> icon.



Click on <Configure> to configure your connection.

The next window shows the connection port.
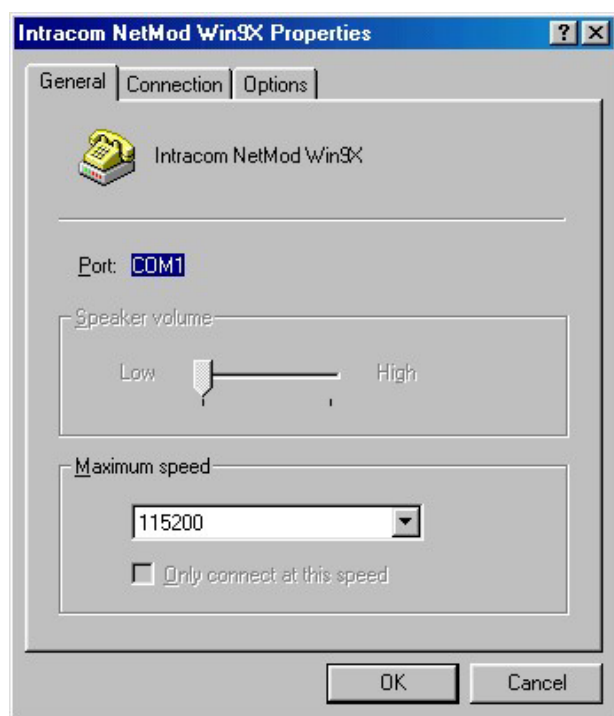
If there are some discrepancies between the values of the window on your screen and this window, set the correct values accordingly.

Do the same for the <Connection> and <Options> tabs.
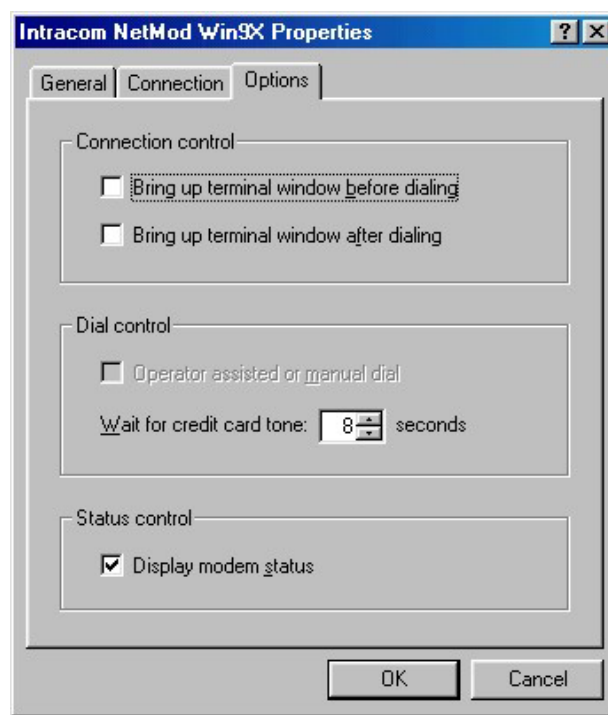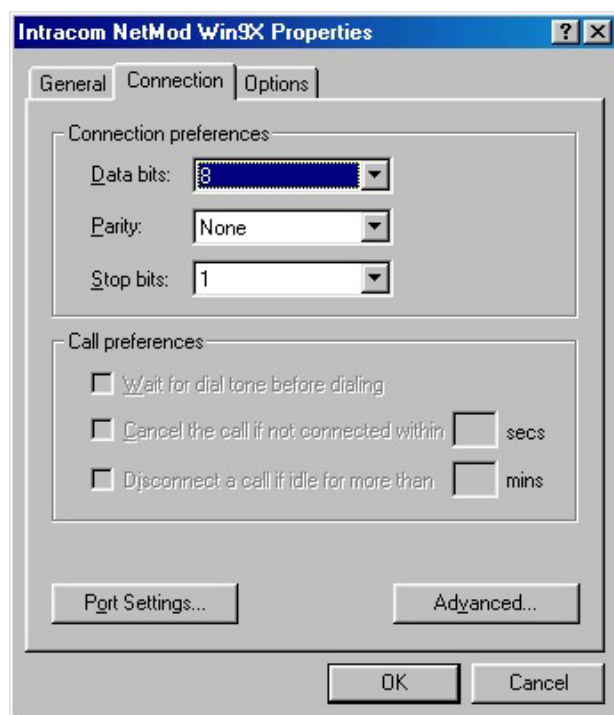




If you have finished, click <OK> to return to the initial window <Make New Connection> and click <Next>. The next window will appear on your screen:

Enter the country code, the area code and the calling number with the correct values, corresponding to your Internet Service Provider. Click <Next> to continue.
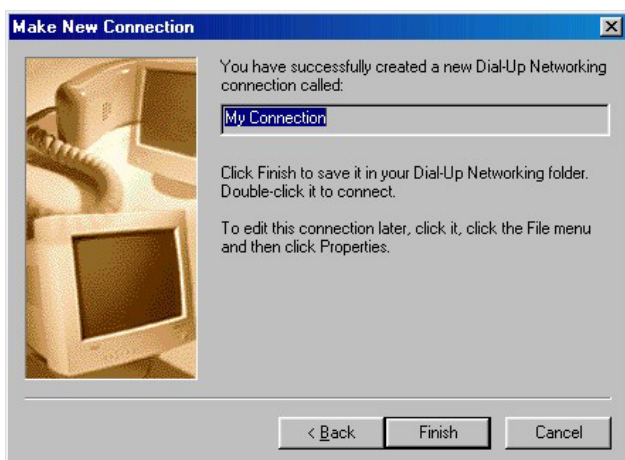


In the last window click <Finish>. Your new connection has been added to the <Dial-Up Networking> window.
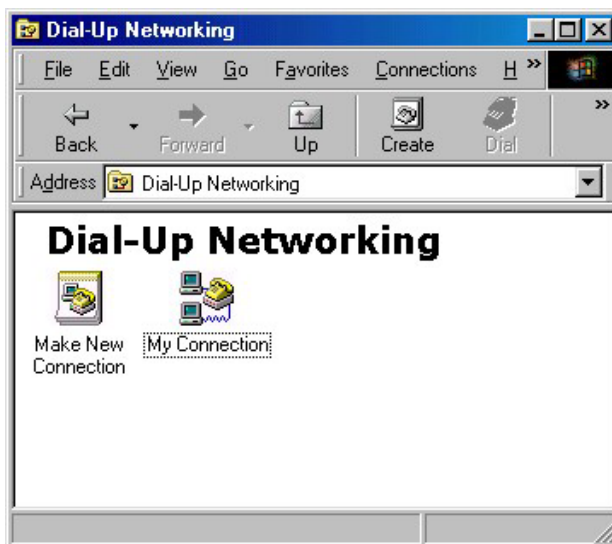


To activate your new connection double click on the <My Connection> icon.

In the next dialogue window, enter your username and password, as provided by your ISP.

Click on <Connect>.
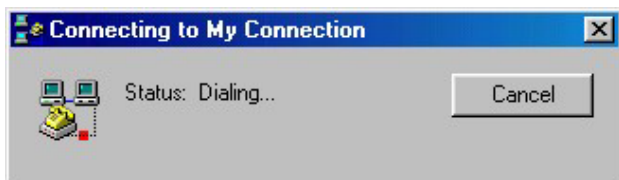
If all the above steps have been followed correctly your computer will soon be connected to the Internet and you will be able to run a WWW browser, an FTP (File Transfer Protocol) program or any other Internet application.

**Connecting to the Internet using PPP or ML-PPP Protocol**

For the connection to an Internet Service Provider (ISP) with the appropriate ISDN equipment, anything mentioned above remains valid. In the last netMod's software version, is presumed that the ML-PPP connection to the Internet Service Provider is deactivated. If the subscriber wishes to use both B-channels for the connection, he / she has to give the command atb0 to netMod and to make it negotiate the ML-PPP.

> ☛ *Before you activate this service, it is important to be registered as Internet subscriber at 128kbps, and to be sure that the ISP supports connection with the use of the ML-PPP protocol.*

> ☛ *PPP indicates maximum transmission data rate of 64kbps, therefore, only one B-channel is used.*
>
> *ML-PPP indicates maximum transmission data rate at 128kbps, therefore, both B-channels are used, but only when it is required by the transmitted data volume.*

> ☛ *If you are connected to the Internet at 128kbps using both B-channels and you receive an incoming call for an analogue telephone, then one of the two channels is released to answer this call. Moreover, if you wish to make a call from an analogue telephone, then one (of the two) channel is released from the Internet connection.*

In case of connection, the H/W flow control has to be activated in the computer's data port used for the connection to netMod.

The way of activation / deactivation of ML-PPP through the <Dial Up Networking> of Windows' 95/98/Me, is described below.

Having created a connection using the <Dial-Up Networking> from the <Accessories> windows menu, you can activate / deactivate the ML-PPP when you access the Internet.

Open the <Dial-Up Networking> window, choose the connection <My Connection> that you have created and press the right mouse button. From the menu that appears, select the <Properties>.

On the window that appears, select the <Connection> page.
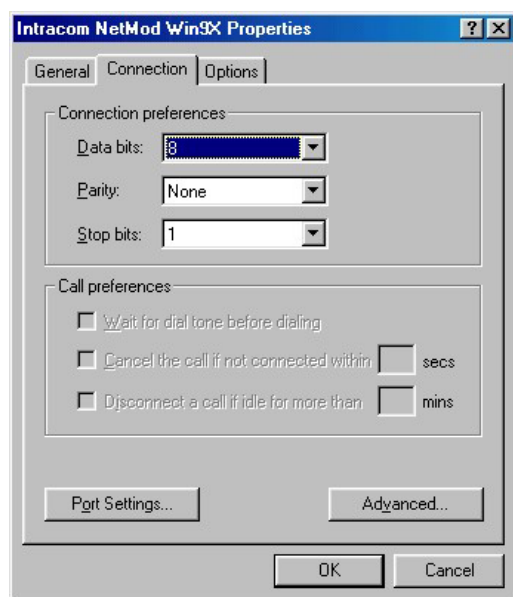
Click on <Advanced>.

The next window will appear on your screen:
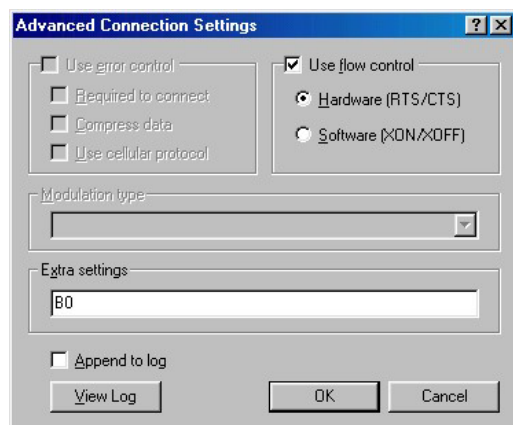
In the <Extra Settings> field enter the *b0* command and click on <OK>, if you want to activate the ML-PPP and use data rates of 128kbps, whenever needed for your Internet connection.
or
In the <Extra Settings> field enter the *b40* command and then click on <OK> to deactivate the ML-PPP and use the simple PPP with data rates of 64kbps for your Internet connection.

☛ *In order to avoid extra meaningless charges, it is suggested to the subscribers of 64kbps to give the b40 command in the area of Extra Settings, when they access the Internet.*

*The b0 command should be given only when your Internet access rate is of 128kbps.*

In case of a ML-PPP connection, the second B channel is added or subtracted according to the transferred data rate (Bandwidth On Demand). When you use a B-channel and the data rate exceeds a limit for a specific time period, the second B-channel will be added to the connection. On the other hand, when both B-channels are used and the rate drops below the limit for a specific time period, the second B-channel will be subtracted from the connection. The limits of this rate for the addition / subtraction of B-channel, as well as the time period for which the rate has to be above / below these limits, so that the B-channel can be added / subtracted, are defined through AT Commands as described in the chapter "AT COMMANDS".

*INTRACOM's Web site http://netmod.intracom.gr/ includes all the latest news*

*concerning netMod.*

# FIRMWARE UPDATE

One of the basic netMod's capabilities is its Software Upgrade capability. In this case you have to use the appropriate software file version, which can be found in netMod's Helpdesk site (http://netmod.intracom.gr). The downloading procedure is simple and is done by using a communication program with XMODEM protocol support (e.g. Windows Hyper Terminal). An alternative solution for upgrading netMod is the embedded upgrade option of NCM (netMod Configuration Manager) supplied in netMod's packaging.

Follow the instructions given below:

Once you have connected and activated netMod, you can use the command ATUPX. netMod will then ask to confirm your selection. If you answer 'Y' you **MUST** download the new firmware. **Be aware to have the correct file before you answer 'Y'**. Adjust the communication parameters to 115200bps 8N1 with hardware flow control and use the protocol XMODEM to load the firmware as a *send file* procedure. If you encounter any problem (loss of mains power supply, procedure fail, etc.) press switch SW2. netMod will restore its initial state and will be fully operational according to the factory settings, using the firmware stored in one of its two flash memories. Repeat the above procedure if you wish to download the new firmware.

## Software Update Instructions

☞ *Use the ati0 command to check the version of your device.*

☞ *Be sure that you have selected the software edition appropriate for your device.*

☞ *netMod has to be connected to the AC mains and to the ISDN line.*

☞ *Be sure that you have correctly downloaded the whole file.*

Use the Hyper Terminal communication program of Windows' 95/98Me to update netMod's software, by following the steps given below:

- Open the <HyperTerminal> program on Windows' 95/98/Me.

- On the <Connection Description> window enter a name and then press <OK>.

- On the <Phone Number> window assign a number and select <Connect> using <Direct to Com1> or <Direct to Com2> depending on the PC's communication port connected to netMod and press <OK>.

- On the next window <Port Setting> select:

    Bits per second:     115200

    Data bits:           8

    Parity:              None

    Stop bits:           1

    Flow Control:        Hardware

- Press <OK>.

- On the <HyperTerminal> window type: *at*

netMod will answer *OK*.

- Type: *atupx*

netMod will give a message for updating the software.

- Type: *Y*

netMod will reset the previous version.

- Once you receive the *OK* message, select from the main menu <Transfer> and then <Send file>.

- On the next window <Send file> select the <Xmodem Protocol> and then browse to find the file that you want to download.

- Select the file *XXXX.dnl* that corresponds to your device and on the window <Send file> select <Send>.

- Wait for a few seconds.

On the window <Xmodem file send>, you will notice that the data packets and the size of the file that is being downloaded are increasing.

Once you finish the update, wait for a few seconds and then:

- Type: *ati3*

netMod will return the version of the new software.

netMod is now equipped with the new software.

# COMMUNICATION BY OTHER MEANS

A PC connected to netMod is able to communicate with another PC connected to a corresponding ISDN device. A basic requirement to achieve this communication is that the other device has to use one of the communication protocols that netMod uses. netMod uses the PPP, ML-PPP, Transparent PPP and Voice Transparent protocols, which are described in more details below. Apart from using the same protocol, both PCs must also have the appropriate software.

In any case of connection the H/W flow control has to be activated on the PC's serial port used for the connection to netMod.

**Transmission using a PPP Protocol**

In case of PPP connection, using Windows '9x/Me, the user should make a dial-up connection. The dial number has to be the device number that you want to communicate with. The PC that receives the incoming call has to have the dial-up software active, waiting for this call. On Windows' 95 you can activate the Dial-Up Server from the <Connection> menu on the <Dial-Up Networking> window.
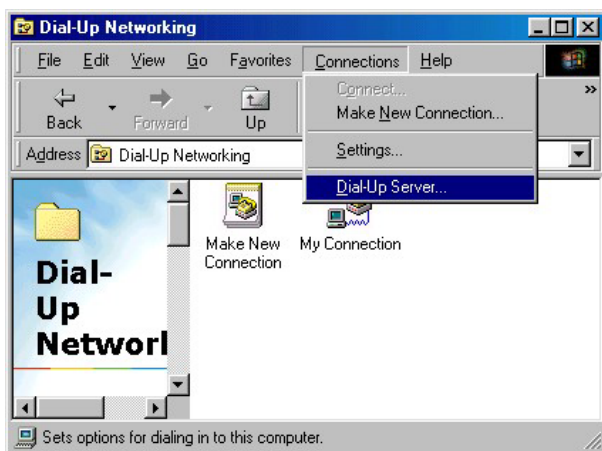


On the window that appears select your netMod and press the <Allow caller access> to activate your incoming calls.

Once the connection is established, you can have access to the hard disk of the remote PC (when the File Sharing is activated on the Dial-Up Server). To do so you can use the Find Computer on the Start menu. Search for the PC that you are connected to, by using its network identification name. When you find the PC double click on the icon that appears. All the shared hard disks of the remote PC will appear on a new window and you can have access to them in the same way that you have access to your local disk.

☞ *In specific dial-up server versions the ATS42=0 command has to be given in the area of <Extra Settings>, in the <Advanced Connection Settings> window, appeared by selecting <Properties> of the connection.*

## Transparent Modes

For applications like voice or fax through the PC (with proper software running in the PC), netMod transfers data transparently from the data port to the occupied B-Channel and vice versa. Then the PC software processes these data.

The following types of transparent modes are available:

### Voice Transparent Mode

In this mode the data received from the data interface are transparently transmitted to the connected B-channel and vice versa. If no data are available from the data interface, an audio pattern that corresponds to silence and depends on the coding law used in the particular country is transmitted to the B-Channel. If this mode is enabled, netMod will use the 3.1kHz audio bearer capability for outgoing data calls and will accept incoming calls with speech and 3.1kHz audio bearer capability. This means that you are able to answer a call or make one to a fax or to an analogue telephone. The data that are received and transferred to the computer **must** be handled by appropriate software.

You can enable audio transparent mode by writing to the S82-Register the value 76.

### PPP Transparent Mode

In this mode the received and transmitted data are transferred from / to the data port and the B-Channels in the same way as in the PPP protocol (HDLC framing with PPP heading). The only difference is that these data will be transparently transferred by netMod. Only CRC inspection is done in each packet. When an error is found, the packet is rejected. netMod uses the unrestricted digital bearer capability for the outgoing calls and does not accept incoming voice calls and 3.1kHz audio. The transmitted and received data from / to the PC have to be processed through the proper software.

You can activate the PPP transparent mode by writing to the S82-Register the value 78.

**Data Transparent Mode**

This mode is used for direct communication between netMods. All the data are received and transmitted transparently from / to the serial port, but they are received and transmitted with an HDSL framing from / to the B-Channels. In this mode, netMod uses the unrestricted digital bearer capability for the incoming / outgoing calls. It does not accept calls with speech or 3.1kHz audio bearer capability. Use this mode for direct communication with another netMod that also uses this mode. Use a simple communication program (like Hyper Terminal). You **can not** use this mode for communication with other modems.

You can activate the Data Transparent Mode by writing to the S82-Register the value 80.

**netMod and AO/DI**

AO/DI (Always On Dynamic ISDN) is the most appropriate solution for permanent connection (Always On) with the Internet using the ISDN network. This technology is based on the distribution and use of part of the available range of the signalling D channel of your ISDN line. From the 16kbps, the 9600 bps can be released and be available for data transfer without causing problem to the ISDN line operation. By this way, your connection constantly remains open providing you with the advantages of a leased circuit.

The above technology is accomplished through the use of X.25 and PPP protocols (PPP over X.25 over D channel) and is combined with the use of B channels and the ML/PPP protocol when necessary, i.e. for high rate data transmission. Utilizing Bandwidth on Demand, netMod can connect the B channels in order to achieve speed rates up to 64 or 128 kbps. The B channels will be disconnected when the demand for high rate transmissions is no longer required and the connection will revert to AO/DI state. Some of the advantages of the AO/DI operation are:

- Software use for "Instant Messaging"

- Dispatch and receipt of e-mail messages without calling the Internet provider

- Terminal devices and software can be easily used for verification of credit card data from commercial stores

- 24 hour Internet connection with no telephone charges

- B channels availability for telephone calls

netMod can support the AO/DI capability, provided that it is available from the telephone service provider and the Internet provider, by upgrading only netMods' software.

In order to make an AO/DI call, no additional software is required to be installed on your PC. All you need is Windows' DialUp networking.

☛ *When netMod is operating with one or both B channels open for data transmission, the AO/DI connection (i.e. 9600 bps range) is placed out of operation. AO/DI operation will be re-established as soon as the B channels are disconnected.*

☛ *Also provided is the ability to use the X.25 protocol over the D channel without simultaneous use of the AO/DI connection.*

# AT COMMANDS

## AT COMMANDS Definition

The AT COMMANDS is a group of standard commands, used for the control of communication devices like netMod. Each command starts with the AT prefix and then follows the main command body that states which function has to be performed.

You can configure netMod using the AT COMMANDS and a simple communication program (e.g. The Hyper Terminal of Windows '95/98/Me/2000/XP).

If you select a communication program, you can select different baud-rates. netMod will automatically recognise the selected rate and it will respond to the AT COMMANDS. The rate of 115200bps is the usual choice. Always use the Hardware Flow Control to inspect the data flow on the serial port. The AT COMMANDS, described below, refer to S/W versions later than the V1.7 version.

## ML-PPP Settings using the AT COMMANDS

ATJAn: where n is the B-channel's addition limit, in kilobits per second (kbps). The factory pre-set value is 52 kbps.

ATJSn: where n is the B-channel's subtraction limit, in kilobits per second (kbps). The factory pre-set value is 48 kbps.


ATKAxn: where x defines the kind of time units (x=M for minutes or x=S for seconds) and n defines the time period in the corresponding time units. When the rate during this time period is above the limit, the second B-channel will be added. The factory pre-set value is 20 seconds.

ATKSxn: where x defines the kind of time units (x=M for minutes or x=S for seconds) and n defines the time duration in the corresponding time units. When the rate during this time duration is below the limit, the second B-channel will be subtracted. The factory pre-set value is 40 seconds.

Conclusively, in accordance with the factory values, when the data rate is above 52kbps for a time period of 20 seconds, the second B-channel will be added. When both B-channels are used and the rate drops below 48kbps for a time period of 40 seconds, the second B-channel will be subtracted from the connection.

## Basic "AT" Command Set

| Command | Option | Function and description |
|---------|--------|--------------------------|
| +++ | | Escape sequence code, entered in data state, wait for modem to return to command state |
| **All the Following Commands Require an "AT" Prefix** | | |
| A | | Go on-line in answer mode |
| Bnn | | Select ISDN Teleservice 'B' must be followed by two digits |
| | B0 | Enables Multilink PPP protocol negotiation for outgoing data calls (2B Channels bundling). |
| | B40 | Forces PPP protocol negotiation (1B Channel). This setting is mandatory for incoming data calls. |
| CDn$^{(**)}$ | n=0-7 | Signalling Monitoring |
| | CD0 | Disable monitoring of layer 1 (D Channel hex data) signalling |
| | CD1 | Enable monitoring of layer 1  (D Channel hex data) signalling |
| | CD2 | Disable monitoring of layer 2  (Q921 Decoded data) signalling |
| | CD3 | Enable monitoring of layer 2 (Q921 Decoded data) signalling |
| | CD4 | Disable monitoring of layer 3 (Q931 Decoded data) signalling |
| | CD5 | Enable monitoring of layer 3 (Q931 Decoded data) signalling |
| | CD6 | Disable monitoring of application layer signalling |
| | CD7 | Enable monitoring of application layer signalling |
| | CD8 * | Disables signalling monitoring. |
| | CD9 | Enables signalling monitoring to the serial port. |
| | CD10 | Disables monitoring of U/S interface events. |
| | CD11 | Enables monitoring of U/S interface events. |
| CH? | | Displays the charging units of the last call and the total charging units per port (ab1, ab2 and DATA Port). The counter of the total charging units resets with every system restart or with the ATCH0 command. This function requires the activation of AOC-D supplementary service and the proper value of register S89. |
| CH0 | | Resets the counters of the total charging units and the last call's charging units. |
| Ds | | Dial's (numbers and options) that follow. The options of s are listed as follows: |
| Das | | Dial's (numbers and options) that follows for the analogue adapter, ab1. The dialling of s will take place when an OFFHOOK action of ab1 port is detected (hotline). This feature is disabled when ATDA (without's) is given. |
| DBs | | Dial s (numbers and options) that follows for the analogue adapter, ab2. The dialling of s will take place when an OFFHOOK action of ab2 port is detected (hotline). This feature is disabled when ATDB (without's) is given. |
| DL | | Repeat last ATD command |
| En | | Command mode local echo of keyboard commands |
| | E0 | Echo off |
| | E1 * | Echo on |
| Hn | | On/off hook control for modem |
| | H0 | Hang up modem call |
| | H3 | Hang up the analogue adapter, ab1 |
| | H4 | Hang up the analogue adapter, ab2 |
| Vn | V0 | Verbose mode is disabled |
| | V1 | Verbose mode is enabled |

| In, n=0-11 | | Display inquired information |
|---|---|---|
| | I0 | Display product hardware code, same as 'ATI'<br>Results:<br>00 or 01 |
| | I1 | Display ROM checksum. |
| | I3 | Display software version.<br>Results:<br>Software Version V X.XX |
| | I4 | Display product name.<br>Results:<br>INTRACOM netMod VX.X |
| | I9 | Display PNP string |
| | I10 | Displays base flash checksum |
| | I11 | Displays download flash checksum |
| Jan | n=0-255<br>52 * | Add-threshold for BOD (see note) in kbps unit. When data rate is above this threshold for the time interval that is specified with the Kaxn command the second B Channel will be added. |
| JSn | n=0-255<br>48 * | Sub-threshold for BOD (see note) in kbps unit. When data rate is under this threshold for the time interval that is specified with the KSxn command the second B Channel will be dropped. |
| Kaxn | n=0-63<br>20 * | Add-persist time interval for BOD (see note); BOD is disabled if n=0; x=M (in Minute unit) or S (in Second unit) |
| KSxn | n=0-63<br>40 * | Sub-persist time interval for BOD (see note); BOD is disabled if n=0; x=M (in Minute unit) or S (in Second unit) |
| | | **Note: Bandwidth On Demand (BOD) is the function that adds or subtracts the second B Channel when ML-PPP protocol is used. The time at which the second B Channel is added or subtracted depends on data rate and is defined with the Jan, JSn, Kaxn, KSxn AT commands.**<br>**If BOD is disabled and ML-PPP protocol is used then both B Channels will always be "up" apart from the case in which one B Channel is used for voice call by one analogue terminal.** |
| Qn | n=0-1 | Result code displayed |
| | Q0 * | Modem returns result code |
| | Q1 | Modem does not return result code |
| Sr.b=n | | Set bit 'b' of S-register 'r' to value 'n'. 'n' is a binary digit '0' or '1' |
| Sr.b? | | Display value of bit 'b' of S-register 'r' |
| Sr=n | | Set S-register 'r' to value 'n'. 'n' must be a decimal number between 0 and 255 |
| Sr? | | Display value stored in S-register 'r' |
| UPX | | Download firmware to the Flash EPROM |

| Xn, n=0-6 | | Dialling and connect result codes |
|---|---|---|
| | n=0 | Respond CONNECT when connected. Respond NO CARRIER in all cases of connection failure. |
| | N=1 | Same as X0, respond CONNECT XXXX when connected where XXXX is DCE connection speed. |
| | N=2 | Same as X1. Additionally respond NO DIALTONE when connection fails due to no dial tone. |
| | N=3 | Same as X1. Additionally respond BUSY and NO ANSWER when connection fails due to these reasons. |
| | N=4 | Same as X2. Additionally respond BUSY and NO ANSWER when connection fails due to these reasons. |
| | N=5 * | Same as X4. Respond CONNECT XXXX/PROT when connected where XXXX is DCE connection speed and PROT is the B Channel connection protocol. |
| | N=6 | Same as X5. Respond CONNECT XXXX/YYYY PROT when connected where XXXX is DCE connection speed, PROT is the B Channel connection protocol and YYYY is DTE connection speed (64000). |
| Zn | n=0-4 | Reset modem and set power-on profile |
| | Zn | Reset modem and load user profile n (0-3) |
| | Z4 | Reset modem and load factory settings |
| /CLIPLEVEL <space> n | n=0-19 | Number n defines the level of FSK sequence. Larger values of n attenuate the level of FSK sequence. Default value is 2. |

## Extended "AT&" Command Set

| Command | Option | Function and Description |
|---|---|---|
| &F | | Load factory settings to RAM as active configuration |
| &Jn | | Bundle selection |
| | &J0 * | Bundle connection is disabled.  One B Channel will be used for data transfer. |
| | &J2 | Bundle connection is enabled for outgoing calls. Two B Channels will be used for data transfer. |
| &Vn | | View profile settings |
| | &V0 | View current active settings |
| | &V1-4 | View the (n-1)th user profile settings |
| | &V5 | View factory default settings |
| &WN | N=0-3 | Write current settings to user profile n in FLASH memory for permanent storage. |
| &ZIN=S | N=0-8 S=phone number | MSN setting. Assign the phone number for port ab1, port ab2 & DTE Port. In answer mode, these numbers will be compared with the received called_party_number information. The call will be accepted if the assigned number matches with the called_party_number. The coding of  N parameter is as follows: |
| | N=0-2 | Assign the phone number 's' for analogue adapter, ab1 N=0->MSN1, N=1->MSN2, N=2->MSN3. |
| | N=3-5 | Assign the phone number 's' for analogue adapter, ab2 N=3->MSN1, N=4->MSN2, N=5->MSN3. |
| | N=6-8 | Assign MSN 's', for DTE Port N=6->MSN1, N=7->MSN2, N=8->MSN3. |

| &ZI? | Display the phone number for port ab1, port ab2 & DTE Port. |
|---|---|
| &ZO? | Display the own phone number for port ab1, port ab2 & DTE Port. |
| &ZON=X | Write own phone number X. The number specified will be used as the calling party number while dialling (in the outgoing SETUP message).<br>Values for "N"<br>I = for DTE port<br>a = analogue adapter, ab1<br>b =  analogue adapter, ab2 |

## Extended AT! Command set (AO/DI - X.25 Functionality)

| Command | Option | Function and description |
|---|---|---|
| !X0=n | n = 0 – 63 | Set TEI (Terminal Endpoint Identifier) |
| !X1=n | n = 0 - 255 | Set LCN (Logical Channel Number) |
| !X2=xxx | xxx = X.121 address (Max.15 digits) | Set X.121 address |
| !X3=n | n = 1 – 7 | Set Layer 2 window size |
| !X4=n | n = 1 - 7 | Set Layer 3 window size |
| !X5=n | n = 0 – 3 | Restart Request Wait after L2 activation |
|  | 0 | None |
|  | 1 | 1 second |
|  | 2 | 5 seconds |
|  | 3 | 20 seconds |
| !X6=xxx | xxx = 0 - 255 | Set CUG (Closed User Group) identifier (255 = no CUG) |
| !X7=xxx | xxx = 4 - 256 | Set packet size (must always be multiple of 2) |
| !X8=n | n = 0 - 15 | X.121 number of address prefix digits. |
| !X9=n | n = 0 - 15 | X.121 number of address postfix digits. |
| !X10=n | n = 0 - 255 | Add persist time interval for D channel in seconds (Default value is 5 seconds) |
| !X11=n | n = 0 – 100 | Add threshold as a percentage of the total 9600 bits/sec (e.g n=40%, 50%, 60% e.t.c) value must be assigned without "%" sign. |
| !X12=n | n = 0 – 255 | Sub persist time for the First B channel. Value is assigned in seconds (Default value is 60 seconds). |
| !X13=n | n = 0 – 64 | Sub threshold rate for the first B channel. Value is assigned in kbits/sec. (Default value is 4 kbits/sec). |
| !X14=n | n = 0 – 255 | Add persist time for the first B channel. Value is assigned in seconds. (Default value is 20 seconds). |
| !X15=n | n = 0 – 64 | Add threshold rate for the first B channel. Value is assigned in kbits/sec. (Default value is 52 kbits/sec). |
| !X16=n | n = 0 – 255 | Sub persist time for the second B channel. Value is assigned in seconds. (Default value is 40 kbits/sec). |
| !X17=n | n = 0 – 64 | Sub threshold rate for the second B channel. Value is assigned in kbits/sec. (Default value is 48 kbits/sec). |
| !X? |  | By typing this command you can see all the parameters of X.25 (including AO/DI). |
| !P |  | Enable PAD (Packet Assembler Dissembler) mode in X.25 |

## Basic S-Registers "ATSN=X"

| Command | Function and Description |
|---|---|
| S0= | Set the number of rings on which the modem will answer. A 0 value disables auto-answer |
| S2= | Define escape code character, default <+> (43dec.) |

## Extended S-Registers "ATSN=X"

The values written on the S-Registers have to be decimal.

| Command | bit | dec | hex | Function and Description |
|---|---|---|---|---|
| S15= | bit | dec | hex | Bit-mapped register |
| | 7-5 | 0 | 0 | Profile 0 as active settings after power ON |
| | | 32 | 20 | Profile 1 as active settings after power ON |
| | | 64 | 40 | Profile 2 as active settings after power ON |
| | | 96 | 60 | Profile 3 as active settings after power ON |
| | | 128 | 80 * | Factory default as active settings after power ON |
| S18= | | dec | | DTE speed selection mode. |
| | | 0 * | | Disable fixed baud function (Autobaud mode). |
| | | N+1 | | Enable baud rate fixing at n=0-13 baud rate. Value settings of n are the same as S20 values. |
| S20= | | dec | hex | DTE speed decided by autobaud (bps). Valid only if S18=0. |
| | | 0 | 0 | 230400 bps (not supported by autobaud, only fixed value) only for netMods with hardware version V01 |
| | | 1 | 1 | 115200 bps |
| | | 2 | 2 | 57600 bps |
| | | 3 | 3 | 38400 bps |
| | | 4 | 4 | 28800 bps |
| | | 5 | 5 | 19200 bps |
| | | 6 | 6 | 14400 bps |
| | | 7 | 7 | 12000 bps |
| | | 8 | 8 | 9600 bps |
| | | 9 | 9 | 7200 bps |
| | | 10 | A | 4800 bps |
| | | 11 | B | 2400 bps |
| | | 12 | C | 1200 bps |
| | | 13 | D | 300 bps |
| S23= | bit | dec | hex | Bit mapped register |
| | 0 | 0 | 0 | Command echo disabled |
| | | 1 | 1 | Command echo enabled |
| | 345 | 0 | | Corresponds to ATX0 |
| | | 8 | | Corresponds to ATX1 |
| | | 16 | | Corresponds to ATX2 |
| | | 24 | | Corresponds to ATX3 |
| | | 32 | | Corresponds to ATX4 |
| | | 40 | | Corresponds to ATX5 |
| | | 48 | | Corresponds to ATX6 |
| | 6 | 0 | 0 | Display result code in numeric format |
| | | 64 | 40 | Display result code in verbose format |
| | 7 | 0 | 0 | Modem returns result code |
| | | 128 | 80 | Modem does not return result code |

| S40= | bit | Dec | hex | Bit mapped register |
|---|---|---|---|---|
| | 1 | 2 | 2 | No result code displayed in answer mode |
| S42= | | dec | hex | Bit mapped register |
| | | | | This register defines the RING answer format. Possible values and the corresponding RING formats are listed below: |
| | | 0 | | RING |
| | | 1 | | RING <Called Party Number> |
| | | 2 | | RING <Calling Party Number> |
| | | 4 | | RING <Bearer Service> |
| | | 3 * | | RING <Called Party Number> ; <Calling Party Number> |
| S56= | | 20-100 | | Hook flash detect time for analogue Adapter (analogue port); units 10ms. This register's contents can give a Hook flash detect time of up 1 second. Default value is 700 ms (70). |
| S79= | bit | dec | hex | Bit mapped register |
| | 2 | 0 | 0 | ab1 call-waiting disabled |
| | | 4 * | 4 | ab1 call-waiting enabled |
| | 3 | 0 | 0 | ab2 call-waiting disabled |
| | | 8 * | 8 | ab2 call-waiting enabled |
| S82=[***] | | dec | hex | Bit mapped register |
| | | 70 | 46 | V.120 B channel Protocol |
| | | 72 | 48 | V.110 B channel Protocol |
| | | 74 | 4A | PPP/ML-PPP B Channel Protocol. |
| | | 76 | 4C | Voice Transparent B Channel Protocol |
| | | 78 | 4E | PPP Transparent B Channel Protocol |
| | | 80 | 50 | Data Transparent B Channel Protocol |
| | | 82 | 52 | X.75 Transparent B channel Protocol |
| | | 84 | 54 | X.25 over D channel Protocol |
| | | 86 | 56 | PPP over X.25 over D Channel Protocol (AO/DI) |
| S83= | bit | dec | hex | Bit mapped register |
| | 0 | 0 * | 0 | ab1 delayed clear-back enabled. |
| | | 1 | 1 | ab1 delayed clear-back disabled. |
| | 1 | 0 * | 0 | ab2 delayed clear-back enabled. |
| | | 2 | 2 | ab2 delayed clear-back disabled. |
| | 2 | 0* | 0 | ab1 Reverse Polarity enabled |
| | | 1 | 1 | ab1 Reverse Polarity disabled |
| | 3 | 0* | 0 | ab2 Reverse Polarity enabled |
| | | 1 | 1 | ab2 Reverse Polarity disabled |

| S84= | Bit | dec | hex | Bit mapped register |
|---|---|---|---|---|
| | 0 | 0* | 0 | Do not drop any channel if both B channels are used for data bunlde connection (ML/PPP) in case of an incoming voice call destinated to port ab1. |
| | | 1 | 1 | Drop one B channel if both B channels are used for data bundle connection (ML/PPP) in case of an incoming voice call destinated to port ab1. |
| | 1 | 0* | 0 | Do not drop any channel if both B channels are used for data bunlde connection (ML/PPP) in case of an incoming voice call destinated to port ab2. |
| | | 2 | 2 | Drop one B channel if both B channels are used for data bundle connection (ML/PPP) in case of an incoming voice call destinated to port ab2. |
| | 4 | 0 * | 0 | Indicates ON HOOK Caller ID for ab1. |
| | | 16 | 10 | Disable ON HOOK Caller ID indication for ab1. |
| | 5 | 0 * | 0 | Indicates ON HOOK Caller ID for ab2. |
| | | 32 | 20 | Disable ON HOOK Caller ID for ab2. |
| | 6 | 0 | 0 | Indicates OFF HOOK Caller ID for ab1. |
| | | 64 * | 40 | Disable OFF HOOK Caller ID for ab1. |
| | 7 | 0 | 0 | Indicates OFF HOOK Caller ID for ab2. |
| | | 128 * | 80 | Disable OFF HOOK Caller ID for ab2. |
| S85= | bit | dec | hex | Bit mapped register |
| | 0 | 0 * | 0 | Calling Line Identification Restriction disabled on ab1. |
| | | 1 | 1 | Calling Line Identification Restriction enabled on ab1. |
| | 1 | 0 * | 0 | Calling Line Identification Restriction disabled on ab2. |
| | | 2 | 2 | Calling Line Identification Restriction enabled on ab2. |
| | 2 | 0* | 0 | Connected Line Identification Restriction disabled on ab1. |
| | | 4 | 4 | Connected Line Identification Restriction enabled on ab1. |
| | 3 | 0 * | 0 | Connected Line Identification Restriction disabled on ab2. |
| | | 8 | 8 | Connected Line Identification Restriction enabled on ab2. |
| S86= | | 0 | 0 | Message Waiting Indication is disabled |
| | | 1 | 1 | Message Waiting Indication is enabled on ab1 |
| | | 2 | 2 | Message Waiting Indication is enabled on ab2 |
| | | 3 | 3 | Message Waiting Indication is enabled on both POTS |
| S87= | bit | dec | hex | Bit mapped register |
| | | | | Note: Global calls are those incoming calls that do not contain Called_Party_Number Information Element in the SETUP message. |
| | 0 | 0 * | 0 | Enable ab1 port to receive global calls (see note). |
| | | 1 | 1 | Disable ab1 port to receive global calls (see note). |
| | 1 | 0 * | 0 | Enable ab2 port to receive global calls (see note). |
| | | 2 | 2 | Disable ab2 port to receive global calls (see note). |
| | 5-6 | 0 * | 0 | Bundle connection is disabled. |
| | | 96 | 60 | Bundle connection is enabled on outgoing calls. |

| S89= | bit | dec | hex | Bit mapped register |
|---|---|---|---|---|
| | 0 | 0 | 0 | Disable Total and Last call's charging counters of analogue adapter, ab1. |
| | | 1 | 1 | Enable Total and Last call's charging counters of analogue adapter, ab1. |
| | 1 | 0 | 0 | Disable Total and Last call's charging counters of analogue adapter, ab2. |
| | | 2 | 2 | Enable Total and Last call's charging counters of analogue adapter, ab2. |
| | 2 | 0 | 0 | Disable Total and Last call's charging counters of data port. |
| | | 4 | 4 | Enable Total and Last call's charging counters of data port. |
| | 5 | 0 | 0 | Disable the metering pulse of analogue adapter, ab1. |
| | | 32 | 32 | Enable the metering pulse of analogue adapter, ab1. |
| | 6 | 0 | 0 | Disable the metering pulse of analogue adapter, ab2. |
| | | 64 | 40 | Enable the metering pulse of analogue adapter, ab2. |
| S90= | | 0 – 63 | 0-3F | Set TEI (Terminal Endpoint Identifier) |
| S91= | | 0 - 255 | 0 - FF | Set LCN (Logical Channel Number) |
| S100= | bit | dec | hex | Supplementary Services Protocol |
| | 0 | 0* | 0* | Functional Protocol is enabled. |
| | | 1 | 1 | Keypad Protocol is enabled. |
| | 1 | 0 | 0 | 3.1 Khz Audio Bearer capability |
| | | 1 | 1 | Speech Bearer capability |
| S101= | bit | dec | hex | CID transmission method |
| | 0 | 0* | 0* | CID FSK pattern is transmitted during ringing between the 1$^{st}$ and 2$^{nd}$ ring. |
| | | 1 | 1 | CID FSK pattern is transmitted prior to ringing. |
| S102= | | 1 | 1 | Enable BAP (Bandwidth Allocation Protocol) for PPP links |
| S103= | | Bit | Bin | |
| | | 0-1 | 0 | Do not wait for restart |
| | | | 01 | Wait for 1 second |
| | | | 10 | Wait for 5 seconds |
| | | | 11 | Wait for 20 seconds |
| | | 2 | 1 | PAD connection, makes a X.28 PAD call when is set. That means to send a X.29 PAD protocol ID (01000000) as call user data in the call request packet. |
| | | 3 | | Selects PAD initial profile |
| | | | 0 | Default profile is simple X.28 profile. |
| | | | 1 | Default profile is transparent X.28 profile. |
| | | 4 | | Configure the X.25 link to be a PVC |
| | | 5 | | Sends a restart request when Layer 2 is up. |
| | | 6 | | When is set you can use a PAD interface, instead of an AT interface. |
| | | 7 | 0 | Default (no semi – permanent connection) |
| | | | 1 | Set it if your connection type is semi permanent |
| S108+n= | | dec | hex | n=0 for analogue adapter ab2, n=1 for analogue adapter ab1 |
| | | 1 | 1 | High Layer Telephony |
| | | 2 | 2 | High Layer Compatibility with Fax G2/G3 |
| | | 0 * | 0 | No High-Layer-Compatibility information element will be sent |

| S118= | Bit | dec | hex | Bit mapped register |
|---|---|---|---|---|
| | 0 | 0* | 0 | Enable analogue adapter ab1 incoming calls |
| | | 1 | 1 | Reject analogue adapter ab1 incoming calls |
| | 1 | 0 * | 0 | Enable analogue adapter ab2 incoming calls |
| | | 2 | 2 | Reject analogue adapter ab2 incoming calls |
| | | dec | hex | Incoming Call Management |
| | 2 | 4 | 4 | Disable Call Bumping on ab1 |
| | 3 | 8 | 8 | Disable Call Bumping on ab2 |
| | Bit | bin | hex | |
| | 4-5 | 0 | 0 | Normal Operation |
| | | 1 | 1 | ab1 preferred |
| | | 10 | 2 | ab2 preferred |
| | | 11 | 3 | ab1 and ab2 are ringing alternatively |
| S119= | bit | dec | hex | Layer 2 Deactivation |
| | 0 | 0* | 0* | Layer 2 will be deactivated on expire of a 10 seconds timer. This timer starts after the end of the call. |
| | | 1 | 1 | Layer 2 will be deactivated only from network side. |
| S123= | | dec | hex | Full Functionality Emergency Mode |
| | | 0 | 0 | Disables Full Functionality Emergency Mode |
| | | 1-255 | 1-FF | Enables Full Functionality Emergency Mode Forces analogue ports & the serial port to remain operational if AC power fails. If this mode is selected, it is possible that the power from the U-line is not enough. In this case the user must restore the default value (0). |
| S124= | | 0-255 | 0-FF | Add persist time for BOD in seconds unit |
| S125= | | 0-255 | 0-FF | Sub persist time for BOD in seconds unit |
| S126= | | 0-255 | 0-FF | Add-threshold for BOD in kbps unit |
| S127= | | 0-255 | 0-FF | Sub-threshold for BOD in kbps unit |

(*)Default values.
(**) Some of the signalling monitoring commands may be not available in some software versions of netMod
(***)Some protocols described in Register S82 may not be available in some software versions of netMod

## Permanent Storage of the S-Registers Settings

The changes in the S-Registers settings are stored in netMod's RAM memory. This means that when we restart the system the values in the S-Registers are the factory pre-set values. To make the storage of the settings permanent, the subscriber has to use the "user profiles". The process is described below.

When the desired settings are completed, the user has to give the following commands:

- **AT&Wn**, where n takes the values from 0 to 3, and is the "profile number" where the settings are stored. This command will store the present settings in the desired "profile". To make this "profile" an "active profile" after restarting the system, you have to give the command:

- **ATS15=** the value that corresponds to the "profile" where we stored the desired settings.

The settings from the POTS devices keyboard change the values in the S-Registers. These settings are not permanent. For the storage of these settings, the user profile 0 is used, and becomes active after resetting.

The key combinations that change the values in the S-Registers are the following:

*43#             Activates the Call Waiting service

#43#             Deactivates the Call Waiting service

**10#            FUNCTIONAL Protocol Activation

**11#            KEYPAD Protocol Activation

*89#             Activates the Advice of Charge During the call service

#89#             Deactivates the Advice of Charge During the call service

**70#            Activates the Delayed Clear Back service

**71#            Deactivates the Delayed Clear Back service

*77#             Activates the COLR service

#77#             Deactivates the COLR service

*85#             Activates the ON HOOK CLIP service

#85#             Deactivates the ON HOOK CLIP service

*84#             Activates the OFF HOOK CLIP service

#84#             Deactivates the OFF HOOK CLIP service

*31#             Activates the CLIR service

#31#             Deactivates the CLIR service

## Supplementary Services using AT Commands

Some of the Supplementary Services can be activated / deactivated through the use of AT COMMANDS.

| 1. | Multiple Subscriber Number (MSN) |
|---|---|

By using AT commands, you assign or delete (MSN) numbers on the memory for each of netMod's analogue port (ab1 or ab2).

For the port ab1 type:

**at&ziN=** MSN number, to assign an MSN number on the port ab1

The number N takes the values:

N=0, for the first MSN port number

N=1, for the second MSN port number

N=2, for the third MSN port number

**at&ziN=** Enter key, to delete a previously assigned MSN number on the port ab1

(N=0 or 1 or 2)

For the port ab2 type:

**at&ziN=** MSN number, to assign an MSN number on the port ab2

The number N takes the values:

N=3, for the first MSN port number

N=4, for the second MSN port number

N=5, for the third MSN port number

**at&ziN=** Enter key, to delete a previously assigned MSN number on the port ab2

(N=3 or 4 or 5)

By using AT Commands, MSN numbers are assigned on the data port (RS232 or USB).

Type:

**at&ziN=** MSN number, to assign an MSN number on the data port

The number N takes the values:

N=6, for the first MSN port number

N=7, for the second MSN port number

N=8, for the third MSN port number

**at&ziN**= Enter key, to delete a previously assigned MSN number on the data port (N=6 or 7 or 8)

To view the MSN numbers assigned on both analogue ports (ab1 and ab2) and the data port type:

at&zi?

> ☛ *Note that the above settings, initiated by AT Commands are permanently stored in netMod's memory.*

| 2. | Call Waiting (CW) |
|---|---|

Using AT Commands write the proper values in the S79-Register to activate / deactivate the supplementary services on each of netMod's analogue port (ab1 or ab2).

**ATS79=0** deactivates the service on both analogue port ab1 and ab2

**ATS79=4** activates the service on the analogue port ab1 and deactivates the service on the analogue port ab2

**ATS79=8** deactivates the service on the analogue port ab1 and activates the service on the analogue port ab2

**ATS79=12** activates the service on both analogue port ab1 and ab2

> ☛ *Note that this service is initially activated on both analogue ports of netMod.*

## 3. Calling Line Identification Presentation (CLIP)

Using AT Commands the called subscriber can write the proper value on the S84-Register to allow / restrict the presentation of the calling party number on both analogue netMod's ports.

**ATS84=0** allows the forwarding of the calling party number to the called subscriber's terminal devices connected to the analogue ports ab1 and ab2, in OFF HOOK and ON HOOK state.

**ATS84=190** restricts the forwarding of the calling party number to the called subscriber's terminal devices connected to the analogue ports ab1 and ab2 when OFF HOOK, and allows the forwarding of the calling subscriber's number when ON HOOK.

**ATS84=240** restricts the forwarding of the calling party number to the called subscriber's terminal devices connected to the analogue ports ab1 and ab2 either in OFF HOOK or in ON HOOK state.

The calling subscriber can define which of his/her multiple subscriber numbers (MSN) defined on each port will appear on the called subscriber's device, when he / she initiates calls from the specified port.

Type the following commands:

**at&zoa**= MSN number, for the analogue port ab1

**at&zob**= MSN number, for the analogue port ab2

**at&zoi**= MSN number, for the data port

The above settings are stored permanently in netMod's memory. If the calling subscriber does not make the above assignments for each port, then by making a call from that specific port, the basic subscriber number defined for this BRA access will appear on the called subscriber's devices.

Using AT Commands write on the S82-Register the proper value, to allow the presentation of the calling party number on the screen of your communication program (e.g. Hyper Terminal) on your PC.

**ATS82=76** allows the presentation of the calling party number on the monitor of your PC. To restore the proper functionality and to be connected to the Internet by using the PPP or ML-PPP protocol, give the command:

**ATS82=74**, that allows the restoration of the proper functionality for the connection to the Internet.

> ☞ *In order to be connected to the Internet, write on the S82-Register the value 74.*

## 4. Calling Line Identification Restriction (CLIR)

Using AT Commands write on the S85-Register the proper value to activate / deactivate this service on the analogue ports ab1 and ab2 of netMod.

**ATS85=0** deactivates the service on both analogue ports ab1 and ab2 (your number will appear on the device of the called subscriber).

**ATS85=1** activates the service on the ab1 port and deactivates the service on the ab2 port. Your number will not appear on the device of the called subscriber when calling from the ab1 port.

**ATS85=2** deactivates the service on the ab1 port and activates the service on the ab2 port. Your number will not appear on the device of the called subscriber when calling from the ab2 port.

**ATS85=3** activates the service on both analogue ports ab1 and ab2 of netMod (your number will not appear on the device of the called subscriber).

Note that the S85-Register is also used for the COLR service.

## 5. Connected Line Restriction (COLR)

**ATS85=0** deactivates the service on both analogue ports ab1 and ab2.

**ATS85=4** activates the service on the analogue port ab1 and deactivates the service on the analogue port ab2.

**ATS85=8** deactivates the service on the analogue port ab1 and activates the service on the analogue port ab2.

**ATS85=12** activates the service on both analogue ports ab1 and ab2.

It must be noticed that the S85-Register is also used for the CLIR service.

## 6. Advice Of Charge During the call (AOC-D)

Using AT commands write on the S89-Register the proper values to allow / restrict the forwarding of metering pulses on each of netMod's analogue port (ab1 or ab2).

**ATS89=0** deactivates the service on both analogue ports ab1 and ab2.

**ATS89=32** deactivates the service on the analogue port ab1 and activates the service on the analogue port ab2.

**ATS89=64** activates the service on the analogue port ab1 and deactivates the service on the analogue port ab2.

**ATS83=96** activates the service on both analogue ports ab1 and ab2.

Using AT commands write on the S89-Register the proper values in order to be informed through a communication program (e.g. Hyper Terminal) of your PC for the charging on the analogue ports (ab1 and ab2) and the data port.

**ATS89=1** and **ATCH?** presents the charging of the last outgoing call from the port ab1 and the total charging.

**ATS89=2** and **ATCH?** presents the charging of the last outgoing call from the port ab2 and the total charging.

**ATS89=4** and **ATCH?** presents the charging of the last outgoing call from the data port and the total charging.

**ATCH0** resets the charging metering.

> ☞ *Note that this service is initially deactivated in both analogue ports of netMod.*

# Additional Services using AT Commands

Some of the Additional services can be activated / deactivated through the use of AT Commands.

| 1. | Delayed Clear Back |
|---|---|

By using AT commands write on the S83-Register the proper values to activate / deactivate this service on each of netMod's analogue port (ab1 or ab2).

**ATS83=0** activates the service on both analogue ports ab1 and ab2.

**ATS83=1** deactivates the service on the analogue port ab1 and activates the service on the analogue port ab2.

**ATS83=2** activates the service on the analogue port ab1 and deactivates the service on the analogue port ab2.

**ATS83=3** deactivates the service on both analogue ports ab1 and ab2.

> ☞ *Note that this service is initially activated on both analogue ports of netMod.*

| 2. | Activation of Functional / Keypad Protocol |
|---|---|

Alternatively, you can activate the KEYPAD protocol by writing on the S100-Register the value '1'. To restore the FUNCTIONAL protocol, write on the S100-Register the value '0'.

## CREATION OF A PASSIVE BUS (S-BUS)

ISDN devices can be connected to the netMod via the S-bus (four wire cable), by the following ways:

**Short Passive Bus 1**

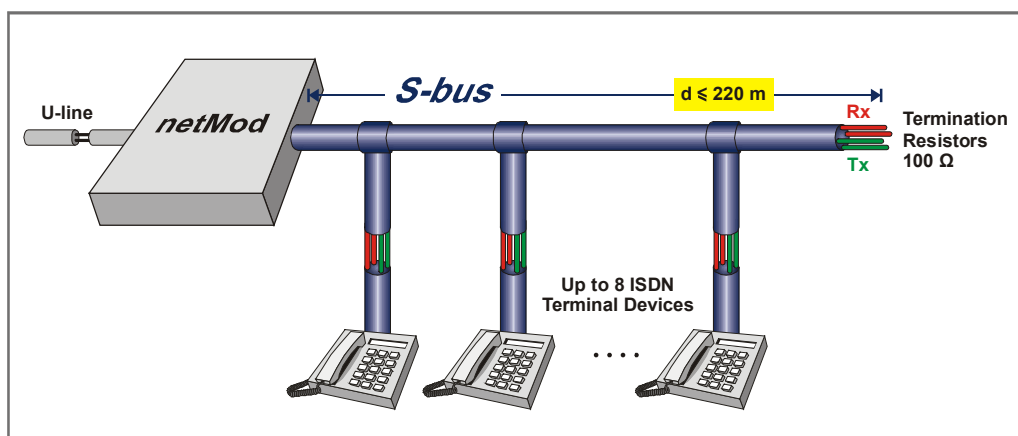netMod is connected to the ISDN devices via the S-bus as shown in the figure below:



**Figure 11: Short passive bus 1 connection**

The switch SW1 has to be in position "ON" and the switch SW3 (see Figure 5) has to be in position "OFF". The distance of 220m is achieved for a cable of 0.6mm diameter.

The S-bus is connected to one of the two RJ-45 jacks in one end and has to be terminated with two resistors of 100 ohm at the other end (see Figure 15). Up to 8 terminal devices can be connected randomly along the S-bus.

If an extra ISDN terminal device is connected to the second RJ-45 jack, then up to 7 ISDN terminal devices can be connected randomly along the S-bus.

## Short Passive Bus 2

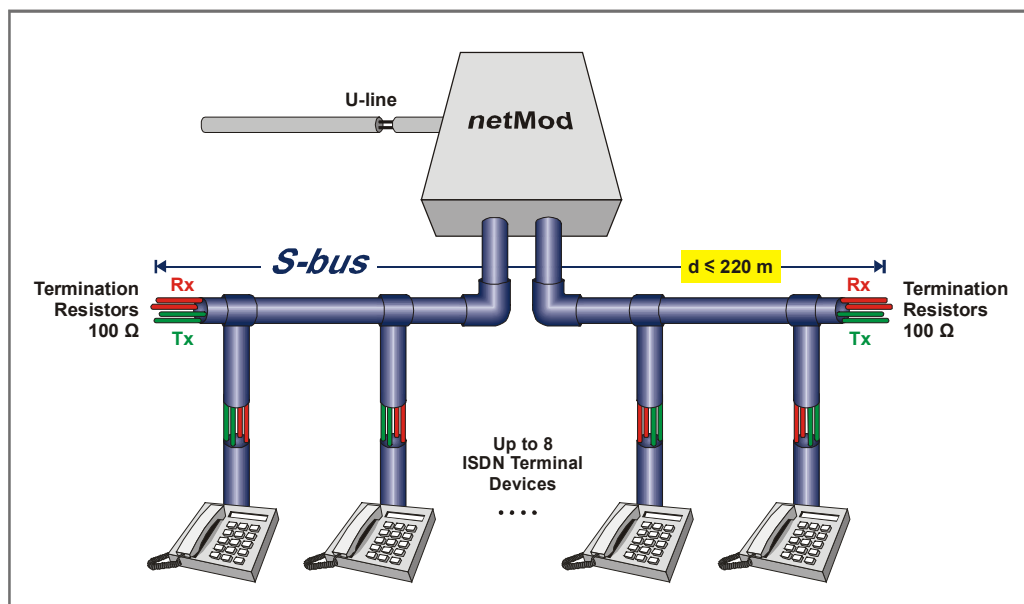netMod can be connected to the S-bus as shown in the figure below:



**Figure 12: Short passive bus 2 connection**

The switches SW1 and SW3 (see Figure 5) must be in position "OFF". The distance of 220m is achieved for a cable of 0.6mm diameter.

Both RJ-45 jacks are used to connect to the S-bus. Each S-bus should be terminated with two 100 ohm resistors (see Figure 15). Up to 8 terminal devices can be connected randomly along the S-bus.

## Extended Passive Bus

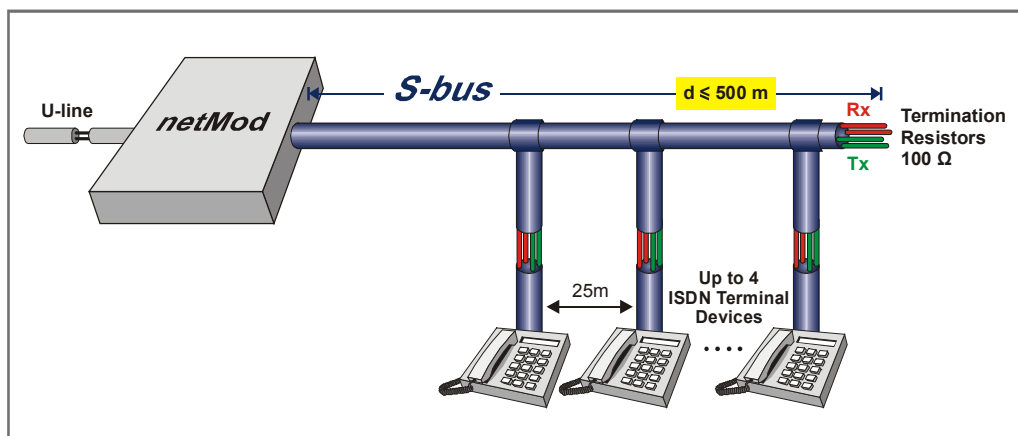netMod is connected to the end of the S-bus as shown in the following figure:



**Figure 13: Extended passive bus connection**

The switches SW1 and SW3 (see Figure 5) must be in position "ON". The distance of 500m is achieved for a cable of 0.6mm diameter.

The S-bus is connected to one of the two RJ-45 jacks and has to be terminated with two 100 ohm resistors (see Figure 15). Up to 4 terminal devices can be connected to the other end of the S-bus. The distance between the connecting points of terminal devices has to be 25m.

## Point-to-point Connection

In a point to point connection, only one terminal device can be connected to netMod via the S-bus, at a maximum length of 1100m using a cable of 0.6mm diameter.
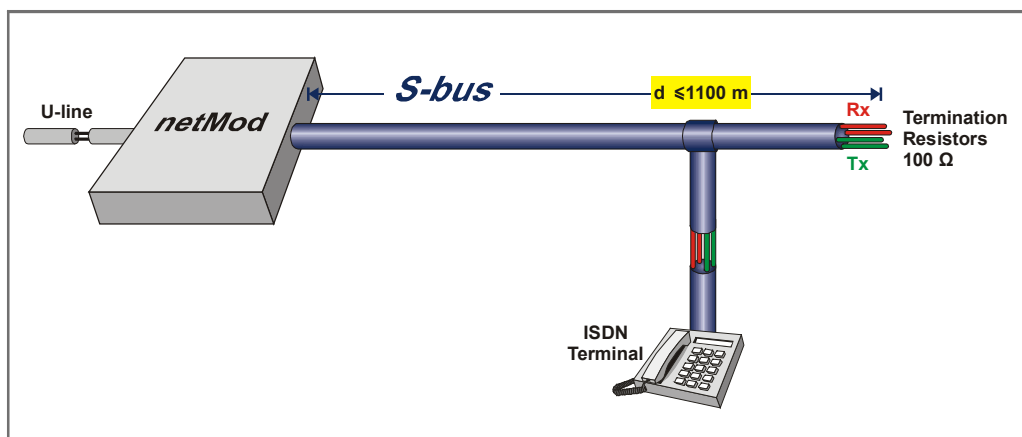


**Figure 14: Point-to-point connection**

The switches SW1 and SW3 (see Figure 5) must be in position "ON".

☞ *The termination of the passive bus (S bus) for all the connections mentioned above is achieved by terminating the transmit (Tx) and the receive (Rx) pairs with a 100 ohm resistor each, as shown in the figure below. It must be mentioned that some ISDN devices include already the 100 ohm resistors. In this case, the S-bus is terminated by connecting this device at the end of the S-bus.*
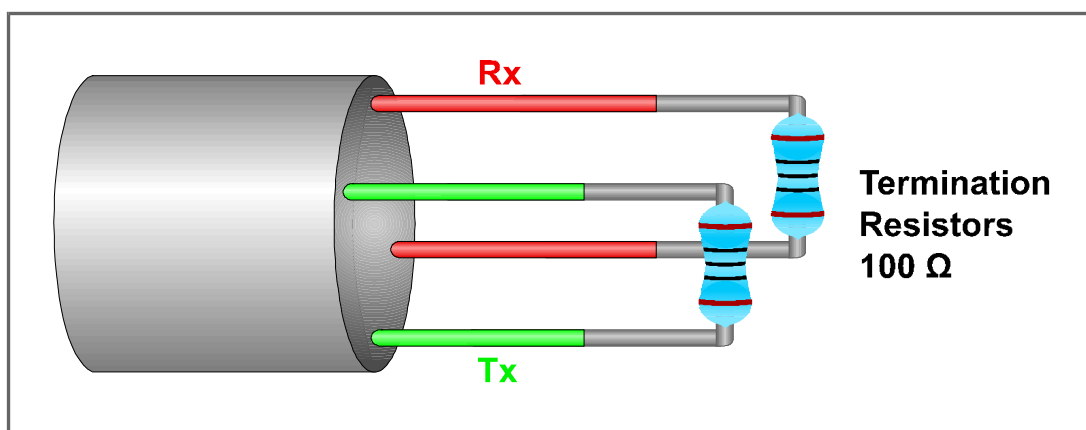


**Figure 15: S-bus termination**

## TECHNICAL CHARACTERISTICS

**U-line**

| | | |
|---|---|---|
| ♦ *In compliance with* | : | ETSI ETR 080 |
| ♦ *Line code* | : | 2B1Q |
| ♦ *Output Level* | : | 2.5V peak at 135Ω Load |
| ♦ *Carrier* | : | twisted copper pair |
| ♦ *Bit rate* | : | 160 kbps |
| ♦ *Net bit rate* | : | 144 kbps |
| ♦ *Interface* | : | Telephone jack (RJ-11) |

**S-bus**

| | | |
|---|---|---|
| ♦ *In compliance with* | : | ETSI 300 012, ITU-T.430 |
| ♦ *Line code* | : | AMI |
| ♦ *Output Level* | : | 750mV peak |
| ♦ *Carrier* | : | 4-wire passive bus |
| ♦ *Bit rate* | : | 192 kbps |
| ♦ *Interface* | : | telephone 8-pin jack connector (RJ-45) |

**a/b Line**

| | | |
|---|---|---|
| ♦ *In compliance with* | : | ITU-T Q.552 |
| ♦ *Dialling* | : | DTMF/Pulse signalling |
| ♦ *Voice encoding* | : | A-law PCM |
| ♦ *VF output level* | : | -7dBr |
| ♦ *VF input level* | : | 0dBr |
| ♦ *Subscriber loop voltage* | : | ON-HOOK: 48V (±2V) |
| ♦ *Subscriber loop current* | : | ≥20 mA |
| ♦ *Line termination impedance* | : | 600 ohm |
| ♦ *Ringing frequency* | : | 25Hz |
| ♦ *Charging Pulses* | : | 16kHz |
| ♦ *Interface* | : | telephone jack (RJ-11) |
| ♦ *CLIP supplementary service according to* | : | ETS 300 089, ETS 300 659-1, V.23 signalling |

| | | |
|---|---|---|
| **RS232 Interface** | : | V24, asynchronous communication |
| ♦ *Interface* | : | D-9pin connector |
| **USB Interface** | : | According to USB V1.1 |
| ♦ *Interface* | : | USB receptacle type B |
| **Power supply** | | |
| ♦ *Normal operation* | : | locally from 230 VAC (+10%/-15%), 50Hz with power consumption <7.5W |
| ♦ *Emergency operation* | : | Remote power feeding from the local exchange via U-Interface for one Terminal (ISDN or Analogue). |
| ♦ *Maximum power supply voltage via the U-line* | : | 115V |
| ♦ *Minimum power supply voltage via the U-line* | : | 30V |
| ♦ *Power Consumption on U-interface in case of emergency service* | : | < 1.7 W |
| ♦ *S-bus output voltage* | : | Typical 35.6V (min 34V, max 42V) |
| ♦ *Power feeding to the S-bus* | : | • 4.5 W in normal operation using Power Supply from Mains |
| | | • 420mW in emergency operation (Via U-interface) |
| **Environmental Conditions** | | |
| ♦ *Operating Temperature* | : | -5 $^{\circ}$C to 45 $^{\circ}$C / ETS 300019-2-3 class 3.2 |
| ♦ *Humidity* | : | Up to 95%RH, |
| | | 0$^{\circ}$C to 45$^{\circ}$C |
| **Safety and Protection** | | |
| ♦ *In compliance with* | : | EN 60950+A1/A2/A3/A4, ITU-T K22, ETS 300 047, ITU-T K41 |
| **Electromagnetic Compatibility and Interference (EMC/EMI)** | | |
| ♦ *Emission* | : | EN 550 22 Class B Limits |
| ♦ *Immunity* | : | EN 300 386-2 |
| **Status Indication** | | |
| ♦ *AC Power Supply status* | : | 1 orange LED |

## MALFUNCTION DETECTION AND TROUBLESHOOTING

| Malfunction | Possible Cause | Correcting Action |
|---|---|---|
| The green led is off. | The device is not connected to the AC mains. | Connect the device to the AC mains Power Supply (the AC mains voltage should be at least 100VAC). |
| netMod is not supplied by the AC mains, you Hook-off and you do not hear the dial tone. | The device that you are using does not operate in case of emergency operation. | • If your device is an ISDN device, be sure that it can operate in emergency mode and then check if the switch SW3 of netMod is in the "ON" position.<br><br>• If your device is an analogue device, be sure that the SW3 switch of netMod is in the "OFF" position. |
| Some of the supplementary services do not function on the analogue ports. | These supplementary services have not been activated on the ISDN line (ISDN connection). | Check if the local ISDN exchange supports the functional or the keypad protocol to activate / deactivate the Supplementary / Additional services and set-up the netMod accordingly. Request the activation of the desired Supplementary / Additional services on your line from the Local Exchange.<br><br>Adjust the identification time period of *FLASH* key on the analogue ports, assigning to the S56 register the proper value. |
| You connect an analogue modem or a FAX to the analogue port, but when you receive an incoming call the connection is interrupted. | The Call Waiting service has been activated on this port. | Deactivate the Call Waiting service on the port to which the analogue modem or the FAX is connected. |

| Malfunction | Possible Cause | Correcting Action |
|---|---|---|
| You have a device that supports the CLIP service connected to the analogue port, but the service does not work. | Your device does not recognise the CLIP information. | • Be sure that the CLIP service has been activated by the operator.<br><br>• Be sure that your device is working with FSK signalling.<br><br>• Raise the level of transmitted signal using the command<br><br>AT/CLIPLEVEL=10. |
| You get overcharged when you are connected to the Internet Service Provider. | Incompatibility on the negotiation process between the ISP equipment and the netMod, when using the second B-channel. | • If you are not a ML-PPP subscriber at 128Kbps, be sure that you have not the ML-PPP service activated on netMod. At the selection of Extra Settings, give the command b40.<br>• Ask from the operator to activate the AOC-D service and then check the charge metering using the AT Commands<br><br>ats89=4 and<br><br>atch? |

| Malfunction | Possible Cause | Correcting Action |
|---|---|---|
| netMod is installed but you can not give an AT command. | There is no communication between netMod and the PC. | • Be sure that during the installation you assigned the right port on your PC (COM1 or COM2) for the communication with netMod.<br>• Be sure that netMod is connected to the AC mains (230VAC).<br>• Be sure that the cable between netMod and your PC is in good condition and properly connected. |
| You can not be connected to the Internet via netMod using your old account, for an analogue modem. | Incompatible equipment technology of Internet Service Provider (ISP). | Your old account is valid for connection to an analogue modem. You should request a new account for ISDN Internet connection. You can select between 64kbps or 128kbps rates. |
| The old programs that you used with your analogue modem (fax, voice mail etc.) do not work using netMod. | Software Incompatibility. | The old programs were compliant with analogue modems. You can use programs which are compliant with ISDN applications on your PC and are compatible with netMod (reassure that your netMod's firmware version supports the CAPI protocol). |
| You have an account for an ISDN connection at 64kbps but you do not have a satisfactory data transfer rate. | ISP fails to provide greater rates of data transfer. | Try not to be connected to the ISP during the busy hours. |

| Malfunction | Possible Cause | Correcting Action |
|---|---|---|
| You have an account for an ISDN connection at 128kbps but you do not have a satisfactory data transfer rate. | The second B-channel is not working.<br><br>ISP fails to provide greater rates of data transfer, or the ISP lines are busy. | • Be sure that you have given the atb0 command on netMod.<br>• Try not to be connected to the ISP during the busy hours.<br>• Be sure that the information you want to download demands the use of the second B-channel. |
| Your connection is interrupted frequently. | | • Check the cable of your data connection.<br>• ISP interrupts the connection due to inactivity.<br>• Check your Internet browser settings.<br>• You have exceeded the daily access time limit. |