



TBU1016-R3
TBU1025-R2
TBU1025-PRI-R2

ISDN SIMULATOR

ISDN Network Simulator



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Getting Started

Overview

The ISDN Simulator is a powerful, compact network simulator designed to assist with evaluation, training, demonstration and development of ISDN terminal equipment.

For exhibition or training purposes, calls can be in progress reliably for long periods between several terminals. ISDN uses a complex message based protocol, which requires a pre-defined sequence of messages to be exchanged between the network and each terminal. The ISDN Simulator accurately emulates this protocol for reliable operation.

A user friendly Windows™ software package is provided for simple configuration. Parameters such as telephone numbers or operating modes can easily be saved to flash memory. Once configured as required, the ISDN Simulator is ready to operate at any time without the presence of a PC host.

Three models of the ISDN Simulator are available from Black Box as follows:-

<u>Part Number</u>	<u>Product</u>	<u>Number of Ports</u>
TBU1016-R3	ISDN Simulator 2	2 basic rate ports
TBU1025-R2	ISDN Simulator 6	6 basic rate ports
TBU 1025-PRI-R2	ISDN Simulator 6 + PRI	6 basic rate ports + one E1 primary rate port

This user guide covers all models. The majority of features are common to each simulator and where variances occur they have been clearly highlighted.



Packing List

- ISDN Simulator Pod
- Power Supply Adapter
- Mains Lead with an IEC Connector
- Serial Lead
- Gender changer
- This user guide
- Software on CD ROM
- Padded carrying case with handle and shoulder strap

System Requirements

- IBM Compatible PC with at least one Serial Port
- Windows 95/98/NT4/2000
- CD ROM Drive



Software Installation

1. Connect the ISDN Simulator to the PC Serial Port using the serial lead supplied
2. Plug in the power adapter to switch on the ISDN Simulator
3. Insert the CD ROM labelled **ISDN Simulator configuration software** into the CD ROM Drive
4. From Windows™ click **START** and then **RUN**
5. Open the file **D:\Setup.exe**
6. Follow on-screen instructions
7. When Setup is complete the program can be launched by clicking **START, PROGRAMS, BLACK BOX / ISDN SIMULATOR**

Note: ISDN Simulator 2 Self Cleaning Relays

When the ISDN Simulator 2 is initially switched on, 14 clicks can be heard as each of the relays automatically clean their contacts. This helps to ensure reliable operation and takes about 7 seconds to complete. Please ensure these relays have finished clicking before running the configuration software.



Running the ISDN Simulator Software

Having installed the software supplied, connect the ISDN Simulator to COM1 on your PC host using the Serial Lead supplied. Plug in the power adapter to switch on the ISDN Simulator. Wait for the ISDN Simulator self cleaning relays to finish clicking (if applicable), then click on the Windows™ **Start** Icon, select **Programs, Black Box™ / ISDN Simulator**.

Click on the **ISDN Simulator** Icon to run the program. The ISDN Simulator software will now search for the pod and will initially display 'no product'. When found, the pod type will be displayed in the product selector Window and at the bottom of the Window you will see confirmation of the upload procedure. Double click on **Simulator 2 or Simulator 6** to display Icons to configure Global Settings and Ports.

Note

In order to assure backward compatibility, the software automatically detects the Baud rate that may be used. If power is disconnected from the ISDN Simulator while the software application is running, synchronisation will be lost. Should this occur close the application and restart to re-synchronise.



Configuring the ISDN Simulator

Default Telephone Numbers

The default numbering mode is Single Number, where the same telephone number is dialled to access both bearer channels. B1 will be allocated first if available and then B2.

Model	Port Number	B1	B2
ISDN Simulator 2	BRI 1	1111	1111
	BRI 2	2222	2222
ISDN Simulator 6	BRI 1	1111	1111
	BRI 2	2222	2222
	BRI 3	3333	3333
	BRI 4	4444	4444
	BRI 5	5555	5555
	BRI 6	6666	6666
	PRI E1 Port (optional)	7777 (single number dialling mode only)	

Other Dialling Modes

The Basic Rate ports on the ISDN Simulator may also be configured with a separate telephone number for each bearer channel (Dual Number Mode).

Last Digit MSN or Full Number MSN can also be configured.

Up to 20 dialled digits can be entered for each bearer channel on each port and a Global prefix can be selected with up to 10 digits. A maximum of 30 digits may be allocated for each port. For more information see Definition of Global Numbers.



Numbering Modes

Single Number Mode (BRI/PRI)

This mode is standard in most of Europe and allows calls to bearer channel 1 and bearer channel 2 to be established by dialling the same telephone number for each. In the default configuration dialling 1111 once will establish a call to the first available bearer channel (usually B1) and dialling 1111 again will connect to the next available bearer channel. If both channels on Port 1 are in use and 1111 is dialled, the call will not be accepted by the ISDN Simulator in accordance with the protocol. In order to simulate a real working environment user specified telephone numbers may be entered. Numbers may be up to 20 digits in length. In the unlikely event that more than 20 digits are required, an exchange pre-fix of up to 10 digits (similar to an area code) can be globally entered in the **Global Numbers** Window as part of the Global Settings.

Dual Number Operation (BRI Only)

If selected, Dual Number operation will allow different numbers to be allocated to bearer channel 1 (B1) and Bearer channel 2 (B2) thus fixing a bearer channel to a dialled number. In this mode the default configuration allocates the number 1111 to B1 and the number 1112 to B2 but these can be altered and saved as required.

Multiple Subscriber Number (BRI Only)

Multiple Subscriber Numbering allows either one or more dialled digits to be passed through the public network to terminals connected to an ISDN 'S' bus. Each terminal on the Passive Bus must be allocated a different MSN number which is programmed into the terminal. Only the terminal with an MSN number matching the MSN number included in the incoming SETUP Message will accept the call.



MSN is used to route particular types of call i.e. Video or ISDN fax to a particular terminal. The provision of MSN has changed recently from a single digit in the range of 0 - 9 (10 possible combinations) to ten independent complete numbers (each with up to 20 digits).

The ISDN Simulator will support both the older last digit MSN provision and the new full number MSN provision. The MSN number will be included in the SETUP Message broadcast to the appropriate ISDN Simulator port, in order to test that the connected terminal correctly accepts or rejects the call.

Last Digit MSN

If this mode is selected, calls to Port 1, by default will be connected to the first available bearer channel when any number in the range of 1110 to 1119 is dialled by the calling terminal. Up to 19 leading digits may be entered by the user but the last digit must always be entered as 'X' in order to allow the last digit range of 0 - 9. Only the last digit will be included in the SETUP Message broadcast to the appropriate ISDN Simulator port.

Full Number MSN

This is the more recent MSN provision to fall in line with the latest ETSI specification. In this mode, a range of 10 full MSN numbers (each of up to 20 digits) can be entered by the user. The full number is included in the SETUP Message broadcast to the appropriate ISDN Simulator port.



Download and Upload Functions

Download to Pod

Having entered the required configuration it is **important** to click the button labelled **Download to Pod** to fix this configuration. Once the configuration has been successfully downloaded to the ISDN Simulator Pod, it may be disconnected from the PC host and used completely independently.

Upload from Pod

To read the configuration of an unknown ISDN Simulator, simply connect the unit to the PC host and click **Upload from Pod** to ascertain exactly how the unknown ISDN Simulator has been configured.



Saving Profiles

The main ISDN Simulator Window allows the user to save a number of different configurations as Profiles using the **File, Save As** command. Save each Profile with the extension **.pds** and click on **Open** to reload the profile.

Restoring the Default Configuration

The ISDN Simulator default configuration can be restored at any time by clicking on the **Defaults** button in the main ISDN Simulator Window.



Configuring S0 Ports

Global Settings

From the main ISDN Simulator Window double click **ISDN Simulator** to display the Global Settings icon. Next, double click on **Global Settings** to display the 3 tabs labelled Global Physical, Global Timers and Global Numbers.

Note: The Global Physical Window varies between the ISDN Simulator 2 and the ISDN Simulator 6.

Global Physical – ISDN Simulator 6

The Global Physical window displays the ISDN Simulator 6 default clock mode which is Master. This can be changed by clicking next to the required option.

Global Physical – ISDN Simulator 2

The Global Physical window displays the ISDN Simulator 2 default phantom power (PS1) setting, which is 'off'. A normal or restricted PS1 supply may be selected by the user.

Global Timers (BRI only)

Click on the **Global Timers** tab to display the default timer values at Layer 2 and Layer 3. This feature allows the simulation of different European ISDN networks but is not required for normal operation. See Definition of Global Timers for more information.

Global Numbers (BRI only)

This feature has been included for development purposes and is not required for normal operation. The numbers listed in the Global Numbers Window can be called from the user's terminal equipment and will result in a momentary connection and then disconnection



by the ISDN Simulator using the desired Clearing Cause value. This feature enables the user to test the response of an ISDN terminal to a range of clearing cause values issued by the network. See Definition of Global Numbers for more information.

S0 Port Numbers

From within the ISDN Simulator Window click on **S0 Port 1** and then click on the tab labelled **S0 Port 1 Numbers**. By default Single Number operation is selected. The default telephone number for the port selected is shown in the box below the Single Number selection. Numbering modes are independent for each port. Having configured S0 Port 1 simply click on other ports to reconfigure as required.

S0 Port Services

Click on S0 Port 1. Two tabs will be displayed, labelled S0 Port 1 Services and S0 Port 1 Numbers. Click on the tab labelled **S0 Port 1 Services** to display the ISDN Simulator default Supplementary Service provision. All Supplementary Services supported by the ISDN Simulator are selected for presentation since some of these may be required by the terminals for successful operation. To de-select the presentation of any information click next to the items which are not required. Repeat this process for other ports as required. **For normal operation no adjustments are necessary.**



Configuring the Optional PRI Port

(ISDN Simulator 6 option only)

E1 Port Numbers

From within the ISDN Simulator 6 Window click on **E1 Port** and then click on the tab labelled **E1 Port Numbers**. The number can be set to a maximum of 20 digits.

The default telephone number for the E1 port is 7777.

E1 Port Services

Click on E1 Port. Two tabs will be displayed, labelled E1 Port Services and E1 Port Numbers. Click on the tab labelled **E1 Port Services** to display the ISDN Simulator default Supplementary Service provision. All Supplementary Services supported by the ISDN Simulator 6 are selected for presentation since some of these may be required by the terminals for successful operation. To de-select the presentation of any information click next to the items which are not required. **For normal operation no adjustments are necessary.**



LED Indicators

B Channel Indicators (BRI Ports)

When a call is in progress on any or all of the BRI ports available on the ISDN Simulator, the B channels or channels being used are indicated by a green LED indicator. If calls are in progress on both bearer channels, both LED indicators at the top of the appropriate RJ45 socket will illuminate green. Each port is labelled to show the position and colour of each LED indicator.

B1 Channel Indicator

If B1 has a call in progress the top left hand LED on the appropriate port will change from orange (see PH Indicator) to green.

B2 Channel Indicator

If B2 has a call in progress the top right hand LED on the appropriate port will change from orange (see PH Indicator) to green.

E1 Port Indicator (ISDN Simulator 6 only)

The optional E1 primary rate port is positioned on the rear of the ISDN Simulator 6. Should any/all channels be in use, the B LED (top left of port) will illuminate green.

PS1 Indicator (BRI Only) ISDN Simulator 6

By default the ISDN Simulator 6 is configured to provide phantom power on each of the six network ports in NORMAL mode. An LED on the front panel confirms this mode of operation.

PS1 Indicator (BRI Only) ISDN Simulator 2

By default the ISDN Simulator 2 is configured not to provide phantom power but the user can select normal or restricted by using the Global Physical Window (see Global Settings). An LED on the front panel confirms selection.



PH Indicator

An orange PH indicator is provided in the top left hand corner of each RJ45 socket. When a terminal is plugged into any port and gains synchronisation with the network clock provided by the ISDN Simulator, this LED will illuminate.

DL Indicator

The DL (Datalink) indicator is located in the top right hand corner of each RJ45 socket and will illuminate orange when Layer 2 is established between a terminal and any port of the ISDN Simulator.

5v and 3.3v Indicators

These LED's are intended to confirm that the two internal power rails required for reliable operation are both present in the ISDN Simulator.



Protocol Trace Function

For those that are developing, testing or training on ISDN terminals this new protocol trace feature will be of great benefit. Full analysis of the ISDN protocol is provided displaying messages sent by both the terminals and the network ports.

Running the Protocol Trace Function

To switch on the trace simply click on the **Open ISDN Trace** Icon or click on **Trace** and then **Trace On**. A 'Save As' Window will open prompting you to choose a file name (.txt) and a directory that you would like to use. If you click 'cancel' at this point the protocol trace Window will open on the display but the events will not be saved to disk. Type any name with the extension .txt and click **Save** to open the trace Window and to start recording.

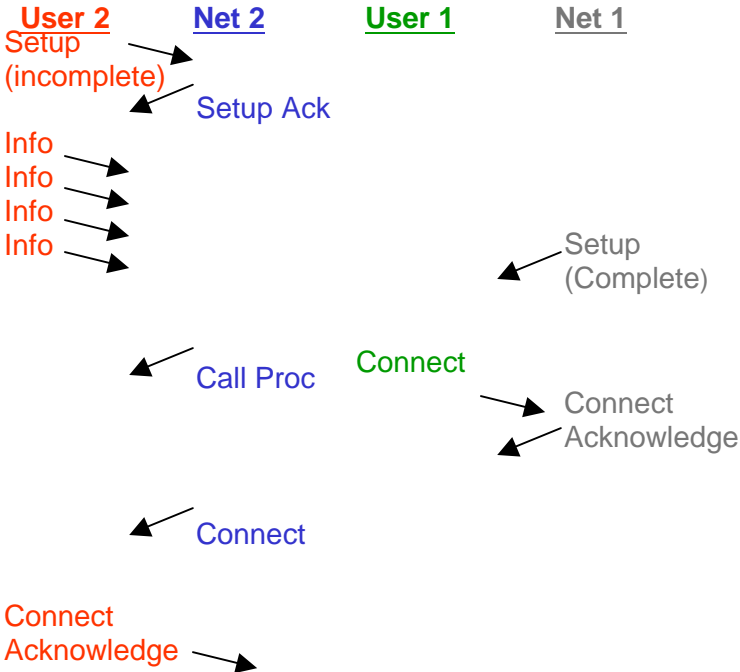
Setting up the Protocol Trace Display

The functions of the Icons at the top of the Trace Window are shown below:-

<	Switches off auto end so that the scroll bar may be used to review the trace
>	Switches on auto end so that new events appear immediately on the trace
F	When selected this displays the originator of each message
L1	Switches on or off the Layer 1 display
L2	Switches on or off the Layer 2 display
L3	Switches on or off the Layer 3 display
H	Switches on or off the HEX display
P1 – P6	Switches on or off the display of activity on each port

Protocol Analysis Example

- User 2 calling User 1 through the simulated ISDN network



User 2 goes off hook which causes a SETUP message to be sent to Network port 2. This SETUP is incomplete since it does not contain any dialled digits so the network simply responds with a SETUP ACKNOWLEDGE message.

User 2 now dials four digits using his keypad and each of these are sent as separate INFO messages to Network port 2.



As soon as the fourth INFO message is received the network knows it has enough information to route the call so a SETUP message is sent from Network Port 1 to User 1.

This second SETUP message is sent by the network and is complete containing all the dialled digits as a Called Party Number Information Element (user selectable message). Network 2 sends a Call Proceeding message to User 2 to confirm progress.

Shortly after, User 1 sends a Connect message to Network 1 which responds with a Connect Acknowledge message and Network 2 then sends a Connect message to the Calling Party, User 2.

User 2 responds with a Connect Acknowledge and call connection has now been successfully established.

This example is useful because it contains an overlap dialled call where each digit is dialled individually by a terminal and then an en-bloc call where all digits are contained in one SETUP message sent by the network. ISDN is a simple and effective protocol which can be fully investigated using this powerful ISDN Simulator trace feature.



Advanced Features

Overview of Advanced Features

European ISDN networks vary so the ISDN Simulator allows the user to define the following:

- The number of digits allowed for each bearer channel
- The numbering plan: Single Number, Dual Numbers, Multiple Subscriber Number (BRI only)
- Network Timers to drop Layer 2 and Layer 1 after any call or if no calls are established (BRI only)

These timers may be used to simulate problems experienced by a terminal trying to work in some parts of France. It is also important to check a terminal's response to call Clearing Causes issued by the ISDN network. The ISDN Simulator does this with a range of pre-defined numbers, which can be dialled by the terminal to automatically return a particular cause value. This is achieved by the ISDN Simulator momentarily answering the call and then clearing with the chosen cause.

If the connected terminals require particular Information Elements to be contained within the Setup Message of an incoming call, a range of these may be configured. Once any configuration has been defined or changed on the ISDN Simulator it can be saved to flash memory so that the ISDN Simulator returns to this configuration as soon as it is switched on. These powerful features make the ISDN Simulator a great choice for test and development applications.



Definition of Global Timers (BRI only)

To display the Global Timers from the ISDN Simulator Window, click on **Global Settings** and then click on the **Global Timers** tab.

Global Timers is a special feature allowing the user to test the reaction of any ISDN basic rate terminal to the behaviour of ISDN networks in different countries. In the UK these Layer 2 and Layer 1 timers are quite long, so generally problems do not exist but in some European countries Layer 2 will be dropped immediately at the end of a Layer 3 session and Layer 1 may be dropped immediately after Layer 2.

Since ISDN is a message based protocol there is a finite time required to respond to messages at each Layer and if the Layer is dropped by the network it is possible for the connected terminal to hang in an unknown state. The ISDN Simulator enables the testing of terminal behaviour in these situations. **Note: these timers do not operate on the E1 port of the ISDN Simulator 6.**

DL Idle Release Delay

The DL Idle Release Delay timer is switched off by default. This is the time taken by the ISDN Simulator to drop Layer 2 if no calls are forthcoming. When a terminal is physically connected to a network port the protocol starts a sequence of Layer 2 messages to check and allocate Terminal End Point Identifier (TEI) values. Once the TEI is allocated the network and the terminal exchange Receiver Ready 'RR' messages to confirm that they are ready to communicate. Some European networks will drop Layer 2 to recover TEI values if no calls exist after a pre-defined time in order to remain efficient. The DL Idle Release Delay Timer is started as soon as the terminal receives a TEI and this timer value can be altered by the user in the range of 1 to 999 seconds. 0 switches the timer off (default).



PH Idle Deactivation Delay

Before Layer 2 can start, the ISDN terminal must go through an information state exchange with the network to ensure that accurate timing and synchronisation exists. This is a Layer 1 (Physical Layer) activity and some networks will deactivate at Layer 1 if Layer 3 and Layer 2 are inactive. The PH Idle Deactivation Delay timer on the ISDN Simulator starts as soon as synchronisation is achieved with a terminal. After the user sets PH Idle Deactivation Delay the network will deactivate until a call is sent to or from the terminal. The user may enter any value in the range of 1 to 999 seconds and the default value is 0 (off).

DL Release After Call Delay

ISDN call control exists at Layer 3 and at the end of a call, some networks will drop layer 2 after a pre-determined time which may be as little as 50ms. This can cause problems with a terminal so the ISDN Simulator allows the user to enter any value between 50ms and 499s (0.5 x 9999) for this timer which starts as soon as a call (Layer 3) is disconnected. The default value is 0 (off).

DL Release to PH Deactivation Delay

When Layer 2 is dropped, a timer is started in the ISDN Simulator. When this timer expires the Physical Layer (Layer 1) is automatically deactivated and will not reactivate until a call is sent to or from the terminal. This timer allows true ISDN European network simulation and may be altered to any value between 100ms and 999S. The default value is 0 (off).



Definition of Global Numbers (BRI only)

To display the Global Numbers from the ISDN Simulator Window, click on **Global Settings** and then click on the **Global Numbers** tab.

This feature allows the user to connect an ISDN terminal to any of the ISDN Simulator network ports and dial one of the pre-defined numbers. If 3000 is dialled on the terminal the ISDN Simulator will respond to the incoming SETUP Message by momentarily connecting the call. The call will then be disconnected using 'Unallocated Number' clearing cause of '1'. Similarly, if 3001 is dialled the call will be disconnected with a 'User Busy' clearing cause value of '17'.

The most frequently tested Clearing Cause Values have been given default numbers to simplify operation and the user can easily alter these numbers to any number of up to 20 digits.

If a Cause Value is required that is not in the Global numbers panel, it is possible for the user to enter any cause value of between 1 and 3 digits in the 'Other Cause' panel (default is 16). This value is returned when 3009 is dialled on the terminal but again this may be altered to any number of up to 20 digits.

Exchange Prefix's

If you select to use an exchange pre-fix by selecting this option in the Global Numbers Window you can enter a dialling code of up to 10 digits. This prefix must be dialled before the number allocated to any bearer channel on any port. This simply allows the dialled digit number length to be increased from 20 digits to 30 digits to meet the extra requirements placed on terminals destined for Italy.



Loopback Testing

If the user wishes to test just one ISDN terminal, the terminal may be connected to any of the basic rate ports available on the ISDN Simulator. By dialling 4000 from the terminal the call will be automatically answered by the ISDN Simulator as if it had been routed to another terminal. Any data or test pattern sent to the unit by the connected terminal will be looped back.

If a 128Kbit/s ISDN Video Conferencing terminal is connected and 4000 is dialled twice, the ISDN Simulator will answer the calls on both bearer channels and loop the data on each, resulting in the users own image appearing on the Video terminal. This is very useful for individual acceptance test of ISDN terminals.



Upgrade Procedure

Connect the ISDN Simulator to the host PC using the serial lead supplied. From the main ISDN Simulator Window select **Upgrade** and then **Pod Firmware**. A Window will appear to warn you that old firmware will be erased before new firmware can be loaded. Click **OK** to continue.

A Pod Firmware Upgrade Window will open showing the action and status throughout the upgrade.

After the pod has been checked and the memory has been erased a Window will open allowing you to select your upgrade file. To upgrade an ISDN Simulator 2, select the file with the Simulator 2 prefix. To upgrade an ISDN Simulator 6, select the file with the Simulator 6 prefix.

When the correct .pfu file has been selected click **Open**. You will return to the Pod Firmware Upgrade Window and the progress of the new firmware download will be displayed.

When completed, a Window will open asking you to power cycle the pod and then click **OK**.

ISDN Simulator 2 Power Cycling: wait until the pod has finished clicking (self cleaning relays) and then click OK.



Ports

ISDN S0 Interface

Connection	2 - 6 RJ45
Physical Layer	I.430 'S' bus. NT Mode
Layer 2	Q.921. EuroISDN
TEI's	1 off
Layer 3	Q.931. EuroISDN
PS1 Feeding	Normal/Reversed. 30V d.c
Pinout 5	Tx 1
Pinout 4	Tx 2
Pinout 3	Rx 1
Pinout 6	Rx 2

ISDN E1 Interface (option on the ISDN Simulator 6)

Connection	RJ45 (on rear of unit)
Physical Layer	I.431 'S' bus, NT mode
Layer 2	Q.921. EuroISDN
TEI's	1 off fixed at 0
Layer 3	Q.931. EuroISDN
Pinout 1	Tx Ring
Pinout 2	Tx Tip
Pinout 4	Rx Ring
Pinout 5	Rx Tip



Serial Port

Connection	9 way 'D' type Male
Physical Layer	RS232
Speed	19200
Bits	8
Parity	None
Stop Bits	1
Pinout 2	Tx output
Pinout 3	Rx input
Pinout 5	Signal Ground

Serial Port Options

If you wish to re-configure the Com Port parameters for the ISDN Simulator, Click on **Communications** at the top of the ISDN Simulator Window and then click to select **Select Port**. A Com Port Options Window will open to show the default configuration and this can be modified by the user as required. Click on **OK** to confirm or **Cancel** to restore the default settings.

USB Port (ISDN Simulator 6 only)

The standard USB connection provided on the ISDN Simulator 6 can be used to provide power to the unit. In this configuration PS1 will not be supplied on the S bus of the ISDN Simulator 6.



Auxiliary Port (ISDN Simulator 6 only)

The Auxiliary Port can be used for two functions:

- To input an external synchronising signal
- To monitor B channels

The port is a standard male 15 way 'D' type with V.11 (RS422) drivers and receivers. Pins that are undefined must be left unconnected. The Pinout is as follows:-

Pinout	Signal	Description
8	GND	Signal Ground
5, 12	CLK	4MHz clock out when clock mode is set to Master
3,10	FSC	8KHz frame sync signal when clock mode is Master
7, 14	DATA	64 channel PCM data output

In order to lock the ISDN Simulator 6 to an external clock the synchronising signal can be 8KHz or multiple up to 4MHz. The internal Clock mode must be set to SLAVE. When monitoring the B channels use the Master clock mode. Each B channel will be present in time slots 1 to 12 of the data signal, starting with B1 then B2 of BRI port 1 and so on.



Technical Specification

Power Supply Unit

Connection	8 pin miniDIN for use only with the supplied power adapter
Type	Universal with IEC input
Voltage	+5V, 40V d.c.

Environment

Operating Temperature	0 to 40°C
Storage Temperature	-20 to +50°C
Relative Humidity	90% non-condensing
ISDN Simulator 2 - Size	160mm x 130mm x 50mm
ISDN Simulator 2 - Weight	575g
ISDN Simulator 6 - Size	200mm x 135mm x 65mm
ISDN Simulator 6 - Weight	800g
PSU Size	110mm x 57mm x 32mm
PSU Weight	300g

CE Marking

72/23/EEC Low Voltage Directive	Compliance with: EN60950 - User Safety (Power Supply)
89/336/EEC - EMC directive	Compliance with: EN5502 - Emissions EN50082-1 - Immunity



Warnings

Lethal Voltages - are present within the power supply adapter which is supplied with each ISDN Simulator. There are no user serviceable parts in the unit. On failure, return to the supplier.

Configuration - of the unit does not require access into the case. Entry into the case by removing screws should only be made by persons authorised by the supplier, otherwise Warranty could become void.

Power Supply - only the provided Power Supply Unit should be used with the ISDN Simulator, otherwise Warranty could become void. There are no replaceable fuses in the unit or power supply.

Disposal - The ISDN Simulator contains hazardous components that require safe disposal at the end of life. Disposal should be carried out by a competent person.



Glossary

Basic Rate ISDN

The Basic Rate ISDN interface provides a bandwidth of 144Kbit/s which is divided into two bearer channels of 64Kbit/s each and one data (D) channel for signalling with an available bandwidth of 16Kbit/s.

Bearer Channel

A 64Kbit/s time slot available to carry voice or data across the ISDN network. Two bearer channels are available on a basic rate interface (2B+D) and thirty bearer channels are available on a primary rate interface (30B+D).

Clearing Cause Values

A range of more than 50 reasons which can be given by the network or the terminal in Disconnect or Release messages to indicate why a call has ended or failed. A successful call will always end with a clearing cause of 016 (normal call clearing) but a failed call will clear with another cause such as 088 (incompatible destination). Cause values are very useful for fault diagnosis.

DL

Data Link Layer (Layer 2/Q.921 protocol).

Global Settings

These are parameters such as timer values and telephone numbers which apply to all ports on the ISDN Simulator.

Global Timers

Timer values in seconds for dropping Layer 2 and Layer 1 before or after a call, which apply to all BRI ports on the ISDN Simulator .

Information Element

This is the name for data fields carried in an ISDN Layer 3 message.

ISDN

Integrated Services Digital Network.



ISDN E1 Interface

2Mbit/s HDLC framed digital interface used for Primary Rate where it is divided into 32 64Kbit/s channels, comprising of one for signalling (TS16) and one for synchronisation (TS0) and 30 bearer channels.

ISDN S Interface

144kbit/s HDLC framed digital interface used for Basic Rate ISDN where it is divided into 3 channels, comprising of one for signalling (16Kbit/s D channel) and two 64Kbit/s bearer channels. The Physical interface used is RJ45.

Passive Bus

This is an ISDN feature which allows up to 6 terminal devices and two voice devices to share the same twisted pair each with unique identification.

PH

Physical Layer for synchronisation and activation.

PS1

Power Source 1 or Phantom Power provided by the network to the ISDN S bus.

PSU

Power Supply Unit.

Receiver Ready

This is a handshake message at Layer 2, exchanged between the ISDN network and each terminal to confirm that both are ready to communicate.

RJ45

Standard eight way physical connector for basic rate and primary rate (E1) ISDN.

S Interface

The standard interface between ISDN terminals or terminal adapters and the network channel termination.



Setup Message

An ISDN Layer 3 message generated by, or to an ISDN terminal in order to establish a call.

Supplementary Service

These are optional services above the basic ability to make a call. Public Telephone Operators offer a range of Supplementary Services as cost options which can include: Calling Line Identification, Call Waiting, Call forwarding, Multiple Subscriber Number and Subaddressing.

Terminal Equipment

Telephones and other equipment such as video conferencing equipment and terminal adapters that the user will connect to the telephone line.

Time Slot

Term used to describe each 64Kbit/s channel available over ISDN.

Issue 1.3

Specifications subject to change without notice.

