aurora Sonata
Hand Held ISDN Tester
User Guide

Agilent Technologies
Innovating the HP Way

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Contents

Chapter 1

Welcome to aurora^{Sonata}

Contents

Welcome to auroraSonata

Welcome to auroraSonata, a hand held tester which allows you to install, configure, troubleshoot and maintain equipment and lines on the Integrated Services Digital Network (ISDN).

Tip

If you are a new user, read through Chapters 1 and 2 of this Guide for the basic information you need to get started. When you are more familiar with auroraSonata, you can use the index to find specific information in the Guide.

If you buy more options or accessories for your auroraSonata, you may want to put Chapters 1 and 2 and Appendices 3 and 4 in a separate binder. You can obtain a new binder free of charge from Agilent Technologies.

Section 1 About the User Guide

This User Guide will help you learn to use auroraSonata, and can be used for reference when you are more experienced. Useful features include:

- chapter summaries and a comprehensive index
- technical and safety notes
- an introduction to the ISDN
- a glossary of technical terms and abbreviations

Note

The text and illustrations in this Guide describe a typical auroraSonata. They may not always match your specific configuration and may include features or protocols that you did not purchase.

Intended readers

This Guide is intended for all users of aurora^Sonata—normally first- and second-line installation and maintenance personnel in telephone companies and corporate end users. Some telecommunications experience is assumed, but the Guide includes some background information on the ISDN.

How the Guide is organised

The first two chapters of the Guide provide introductory information for new users. Later chapters provide detailed operating instructions for more experienced users, and the appendices give background information.

Chapter structure

Chapt. 1 Introduces aurora^Sonata and the User Guide.

Chapt. 2 Basic instructions to get you started.

Chapt. 3 How to set up aurora^Sonata and connect and clear a basic call.

Chapt. 4 How to test an ISDN link by using aurora^Sonata to simulate ISDN equipment or the network itself.

Chapt. 5 How to use aurora^Sonata to monitor protocol information or listen to audio traffic on the line.

Chapt. 6 Advanced features such as call screening, and how to download software and system settings.

Chapt. 7 How to produce and analyse protocol decodes.

Chapt. 8 The power sources for aurora^Sonata and how to maintain them.

Chapt. 9 The technical specification of aurora^Sonata, along with information to assist equipment purchasers.

Appx. 1 Diagrams to help you navigate through the menu structure.

Appx. 2 The codes which show why a call has failed, been disconnected or cleared.

Appx. 3 Background information on the ISDN.

Appx. 4 A glossary of technical terms in the User Guide.

Index Helps you find specific information.

Conventions in the Guide

The User Guide uses a number of special symbols, typefaces and terms to show specific information.

Special typefaces

The names of keys are displayed in bold, italic typeface—for example: 'Press ***ENTER***'. Menu options are shown in a different typeface—for example: 'Choose **Setup**'.

Tips, notes and warnings

Tip Indicates useful information—for example, a short cut for the task you are performing.

Note Important information which you should keep in mind when performing the task being described.

Warning A safety warning or cautionary note. If you ignore the warning, you may endanger your own safety or damage your auroraSonata.

Protocol symbols

Information specific to one protocol is marked with a symbol:

ETSI For example, this information is only relevant to the ETSI protocol.

Information that does not apply to a particular protocol is indicated by the protocol symbol with a line through it:

~~1TR6~~ For example, this information does not apply to the 1TR6 protocol.

All example screens in the Guide relate to the ETSI protocol unless otherwise indicated.

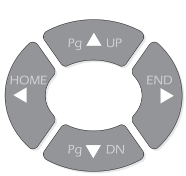
Information specific to Basic/Primary Rate

Information which only applies to Basic Rate (BRI) or Primary Rate (PRI) testing is marked as follows:

PRI BRI

All example screens in the Guide relate to BRI testing. Where the feature being described operates differently for Basic and Primary Rate, the Primary Rate screen is also included.

Special terms

	**Press**	Press the indicated key once.
	**Choose / Select**	Highlight a menu option and press ***ENTER*** to select it.
	**Exit**	Leave the current menu or option list.
	Press + *n*	Press and hold ***Shift*** ( ) while pressing the specified key (***n***), then release both keys.
	**Highlight**	Use the arrow keys to move the cursor bar over an option.

aurora^Expert for Windows

aurora^Expert for Windows is a protocol analysis package which is mentioned occasionally in the Guide. For a brief outline of this product see Chapter 9 section 2, or for more details consult your Agilent Technologies representative.

If you already use the package, you will find instructions in the aurora^Expert for Windows Reference Guide and on-line Help.

Section 2 Introducing aurora^Sonata

aurora^Sonata allows you to test ISDN links on a range of different interfaces depending on which interface modules are fitted.

aurora^Sonata may be fitted with S and/or U interface modules for testing Basic Rate links and a Primary Rate (PRI) module (E1 transmission).

How you can use your aurora^Sonata

Depending on the type of test you perform, you can check one or more of the following:

- ISDN equipment and lines
- the route through the network via ISDN switches
- the operation of the call control protocols
- ISDN fixed links, which do not use protocol support
- the integrity of a call and the quality of service
- the availability and operation of ISDN services

The basic methods for testing

There are two main ways in which you can use aurora^Sonata—these are known as the operating modes. They are:

- Simulation mode—you use the unit to simulate the operation of Terminal Equipment (TE), a Network Termination (NT) or a Line Termination (LT). aurora^Sonata can generate or receive the network clock and act as the protocol ‘master’ (network side), or ‘slave’ (user side).
- Monitor mode—aurora^Sonata monitors user traffic and protocol information on the line in real time.

Supplied with aurora^{Sonata}

aurora^{Sonata} is supplied in a carrying case along with:

- a mains adaptor/battery charger
- cables for the fitted interfaces
- any optional cables or accessories your organisation has purchased
- this User Guide

The packing list supplied with aurora^{Sonata} gives details of exactly what you should have received.

Tip

Keep your User Guide in the carrying case with aurora^{Sonata}, so that you can consult it whenever you need to.

How aurora^{Sonata} fits together

The tester consists of a main unit, onto which are fitted one or more optional interface modules. Each module is used to test a particular telecommunications interface. For details, see *About the optional interfaces* later in this chapter.

Your aurora^{Sonata} is fitted with the combination of interface modules that you or your organisation have chosen. If you need details about other interfaces, see Chapter 9 section 2.

Warning: Interface modules

Do not attempt to remove an interface module from the tester unless you have been specifically authorised to do so by Agilent Technologies or your local representative.

Safety advice

When using aurora^{Sonata}, always take basic safety precautions to reduce the risk of fire, electric shock and injury to persons. These include the following:

- Avoid using the tester during an electrical storm—there is a remote risk of electric shock by lightning.
- Use only the batteries supplied for the unit. These are described in Chapter 8 and in the power source specifications in Chapter 9 section 1.
- Do not dispose of batteries in a fire—they may explode.
- Disconnect all interface cables before removing the battery cover.
- Never remove the rear of the case while aurora^{Sonata} is switched on or connected to the network.

You must also observe all safety warnings related to the power supply. These are set out in Chapter 8.

Looking after aurora^{Sonata}

Although light and portable, aurora^{Sonata} is very robust and has been designed to operate in a typical outdoors working environment. For example, it can survive a fall onto concrete from a height of up to two metres.

To ensure reliable operation, avoid:

- very high or low temperatures—aurora^{Sonata} is designed to operate between -15°C and +55°C, although you should only charge the battery between +10°C and +30°C. You can store the unit safely between -25°C and +70°C.
- very wet conditions—aurora^{Sonata} is weather-resistant but not waterproof. You can use it in light rain when held vertically, but you should never immerse the unit in water.

To avoid damage, we recommend that you keep aurora^Sonata in its carrying case when you are not using it.

Warning: Cleaning aurora^Sonata
Do not use solvents, strong detergents or abrasive materials to clean aurora^Sonata. Use only cleaning agents approved for use on ABS and polycarbonate plastics.

A look at aurora^Sonata

The main features of aurora^Sonata are identified below.

Summary of the main features

External power supply/ Battery charger	The connector used to supply power from an external source.
Belt hook	You use this to carry aurora^Sonata or hang it up for hands-free operation. It can be easily removed and replaced.
Telephone receiver	Used for listening to speech calls during simulation or monitoring on the line.
Water-resistant covers	These protect the serial port and external power supply/battery charger connectors.

Serial port connector The connector for aurora^Sonata's RS232 serial port, which links to a terminal, printer, PC or VDU for output of protocol decodes and test results. For example, you can send decodes for analysis by aurora^Expert for Windows.

LEDs Six Light Emitting Diodes, giving instant information on line status, frame errors and battery condition.

Battery pack cover Covers the battery fittings and the bolt which holds the belt hook in place.

Keypad Alphanumeric keypad including digits 0-9, * and # keys, function keys and Shift functions.

Interface connectors Connectors for the interfaces fitted on your aurora^Sonata.

Microphone Used for making speech calls on the ISDN.

LCD An 8 x 22 character Liquid Crystal Display which shows all aurora^Sonata's menus, windows, test results and status information.

Hands-free loudspeaker When selected, this allows you to hear activity on the line while leaving your hands free to perform other tasks.

The keypad

On/Off key Press and hold for 1-2 seconds to switch aurora^Sonata on or off.

Function keys These activate particular functions, depending on the task you are currently performing, as displayed on the LCD.

Number keys

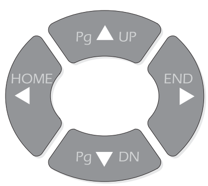
Used for entering numeric information. Some number keys also combine with ***Shift*** () to perform other tasks, as described later in this section.

*** (Asterisk)**

Provided for compatibility with standard telephone handsets. Used for DTMF tones and with the Keypad facility.

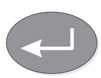
 # (Hash)

Provided for compatibility with standard telephone handsets. Used for DTMF tones and with the Keypad facility.



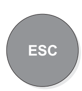
Arrow keys

You use these keys to move the cursor. To move one step, press and release an arrow. To move several steps in the same direction, hold down the arrow.



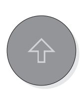
Enter

Press this key to choose a highlighted menu item or setting, or to start an operation.



Esc

Use this key to exit from menus and windows.



Shift

You can combine with other keys to perform specific tasks. For details, see *Using the Shift key* below.

Channel

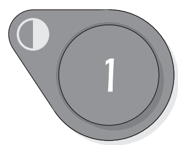
You use this key to switch between B and D channels. See *Selecting a channel for testing* in Chapter 3 section 2.

Window When there is more than one window on display, you use this key to switch between them.

Using the Shift key

The ***Shift*** ( ) key provides a quick and easy way to carry out common tasks. It works in the same way as the Shift key on a PC—you combine it with number keys to perform specific operations.

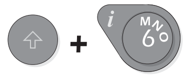
For each number key with a shifted function, the additional task is denoted by a yellow symbol. For example:



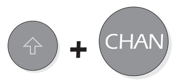
This means you can adjust the screen contrast by pressing Shift + 1.

The different combinations you can use are:

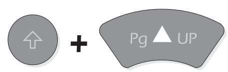
Shift + 1	Adjusts the screen contrast.
Shift + 2	Switches the screen backlight on and off.
Shift + 3	Adjusts the volume of the loudspeaker, telephone receiver or incoming call ringer, depending on which of these is currently in use.
Shift + 4	Displays context-sensitive Help. For more information, see *Getting on-screen Help* in Chapter 2 section 3.
Shift + 5	Shows the current configuration of your aurora^Sonata.



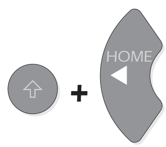
Shows call or line information. See *Getting information about the current or last call* in Chapter 3 section 2.



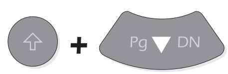
Allows you to change channels without going into the channel selection screen.



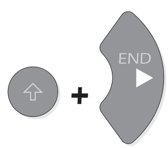
Moves up one page on a menu.



Highlights the first item on a menu.



Moves down one page on a menu.



Highlights the last item on a menu.

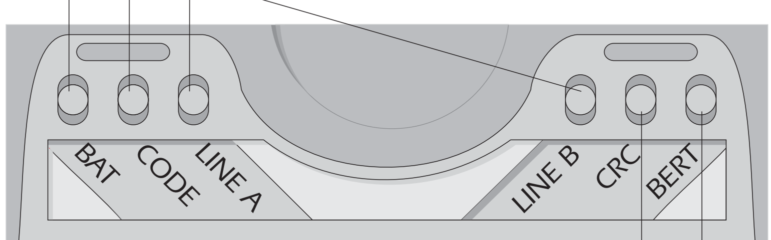
Understanding the LEDs

aurora^Sonata has six Light Emitting Diodes (LEDs), which allow you to make quick checks on the status of the line.

BAT ~ Shows the condition of the battery

CODE ~ Indicates HDB3 errors on a PRI link

LINE A & **LINE B** ~ Show layer 1 states (see table overleaf)



CRC ~ (see table overleaf)

BERT ~ Indicates BERT synchronisation

LED Information	
Display	**Meaning**
BAT	
Off	Battery fully charged.
Flashing red	Battery low.
Steady green	Battery being charged.
CODE	
Red	Indicates HDB3 error detection on a PRI link.
LINE A & LINE B	
Off	Layer 1 is deactivated.
Flashing green	Layer 1 is activating.
Steady green	Layer 1 is active.
Yellow	aurora^Sonata has detected protocol information on the line. The LED remains yellow for as long as the information is present.
Red	aurora^Sonata has received an Alarm Indication Signal (AIS) on a PRI link.
CRC	
Red	aurora^Sonata has detected NEBE or FEBE (BRI 2B1Q) or CRC4 errors (PRI E1) on the line. The LED remains red for as long as the error is present.
BERT	
Green	BERT synchronisation has been achieved.

Note

When aurora^Sonata is in Simulation mode, only ***Line A*** operates. In Monitor mode, both ***Line A*** and ***Line B*** operate—one for each receive direction.

About the optional interfaces

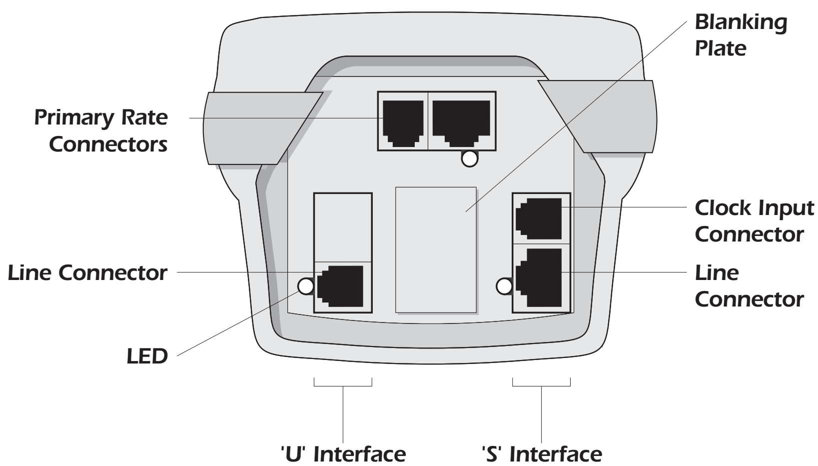
aurora^Sonata is fitted with one or more optional interface modules, each used to test a specific telecommunications interface. At present, the following modules are available:

- BRI S interface
- BRI U interface: 2B1Q line coding
- BRI U interface: 4B3T line coding
- BRI U interface: Up0 line coding
- PRI interface: E1 access

Your aurora^{Sonata} comes ready fitted with the interface modules that your organisation has chosen. For details about other interfaces see Chapter 9 section 2, or contact your Agilent Technologies representative.

The interface connectors panel

The diagram below shows a typical aurora^{Sonata} connectors panel, fitted with a set of Basic Rate connectors. It may not exactly match the interfaces fitted on your particular tester, or the way they are arranged.



Each interface has an LED which shows green (Monitor mode) or red (Simulate mode) when the interface is selected. Where two interfaces are in use (e.g. when monitoring on the U interface), the LEDs on both interfaces light up.

Warning: Interface modules

Do not remove an interface module unless you have been specifically authorised by Agilent Technologies to do so.

Connector safety

The connectors on aurora^{Sonata} conform to EN60950 safety status classifications as shown in the table overleaf. Connection with other equipment should be made such that the equipment continues to comply with clause 2.3 of EN60950 for SELV circuits, and with the requirements of clause 6 for TNV circuits after a connection is made.

Telecommunications Safety	
Connector	**Safety Status**
DC Power in	SELV (Safety Extra Low Voltage)
RS232	SELV
RJ45 & FCC684-4 Telecomms Interfaces	TNV1 (Telecommunications Network Voltage - as classified in EN60950)

Cables used with aurora^Sonata

The following cables are available for use with the basic tester:

- 2m RS232 cable with 8-pin mini-Din at tester end and 9-pin D socket at remote end, wired for direct connection to a PC communications port.
- 9-pin to 25-pin D type converter (optional).
- mains battery charger/eliminator appropriate to the country of use

For Basic Rate S interface testing:

- 2m RJ45 to RJ45 100R cable, supplied as standard
- monitor 'T' piece (optional)

For Basic Rate U interface testing:

- 2m FCC68 4-4 to banana plugs 100R cable, also connecting to crocodile clips. Supplied as standard with the U interface, but not used in the US.

For Primary Rate testing, the set of cables supplied as standard varies according to country and may include the following:

- 2m RJ45 to RJ45 100R
- 2m RJ45 to 4mm banana plugs
- 2m RJ45 to BNC connector
- 2m RJ45 to BT type 43 connector

Other cables are supplied on request as optional accessories.

Chapter 2

Getting Started

Contents

Getting Started

This chapter gets you started by describing the basic tasks you will need to perform frequently as you use your aurora^{Sonata}.

Warning: Safety advice

Before you start: remember the safety and care advice set out in Chapter 1.

Chapter summary

To allow you to find information more easily, the chapter is divided into the following sections:

Section 1	Preparing to Use aurora^{Sonata}
Section 2	Using the Menus and Windows
Section 3	Basic Operations

The information is mainly intended for beginners, although it covers operations that you will perform frequently whatever your level of experience.

Tip

If you are a new user, read through the chapter carefully and practise the different tasks it describes.

Section 1 Preparing To Use aurora$^{\text{Sonata}}$

This section covers information you need to know before you start using aurora$^{\text{Sonata}}$. It includes details about:

- connecting aurora$^{\text{Sonata}}$ and switching it on
- how to change the screen contrast and lighting
- choosing ‘hand-held’ or ‘hands-free’ operation

Connecting aurora$^{\text{Sonata}}$

Before you start, you need to connect aurora$^{\text{Sonata}}$ to an external power source if you require one (this is usually the mains supply). Then you need to connect to the interfaces on which you intend to test.

Tip

You will find more information about the power sources in Chapter 8. For details of the required voltage/frequency, see the power supply specifications in Chapter 9 section 1.

Connecting to an external power source

-1- Plug aurora$^{\text{Sonata}}$’s power supply unit into a nearby power socket which is easily accessible.

-2- Fit its connector into the external power supply socket on aurora$^{\text{Sonata}}$, as shown below.

-3- Switch on the external power source.

Connecting to the interfaces

auroraSonata can connect to the ISDN for Basic Rate testing on the S or U interfaces or for Primary Rate testing (E1 access), when the appropriate module is fitted.

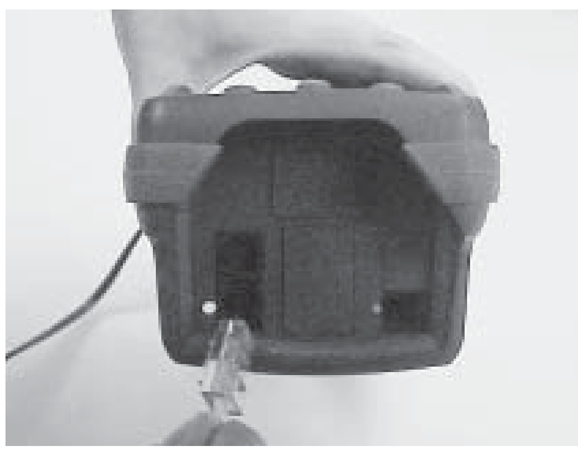
Warning: Connecting to the line

Remember that high voltages may be present on telecommunication lines.

auroraSonata's interface connectors are located on the base of the unit. You will find a diagram of the connectors and details of their corresponding cables in Chapter 1 section 2.

To connect auroraSonata to an interface

-1- Plug the interface cable into the appropriate connector on auroraSonata. In the photograph below, an RJ45 cable is being plugged into the S interface connector.



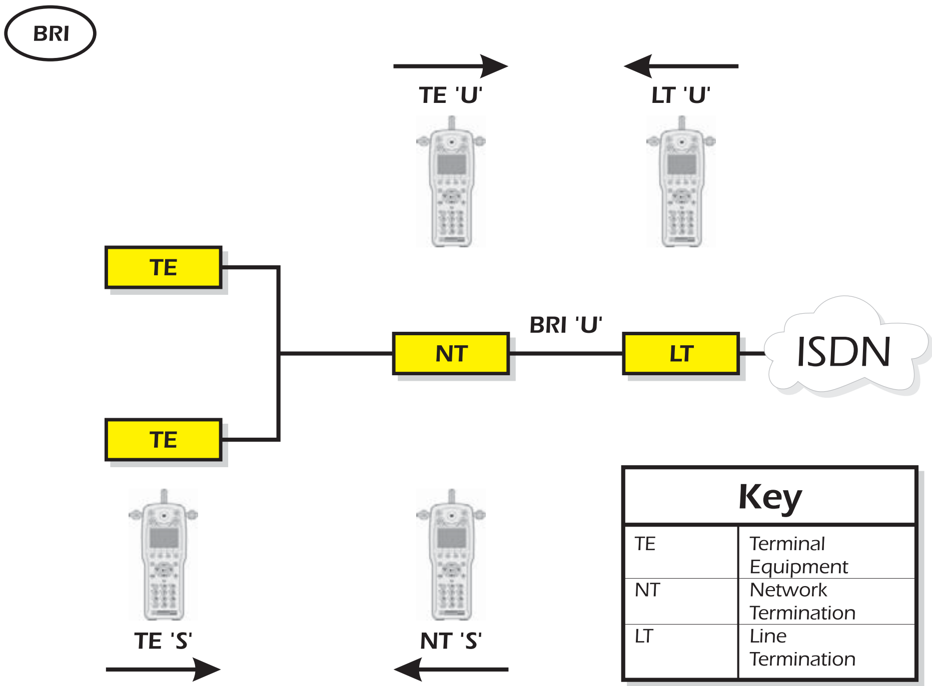
Tip

If you are not sure which connector to use, switch on auroraSonata and select the interface you require (see *Selecting an interface* in section 3 for instructions). The LED on the connector for the selected interface lights up.

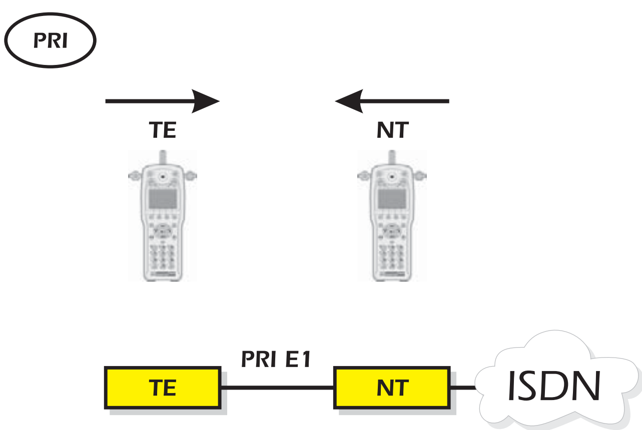
-2- Connect the other end of the cable to the equipment you intend to test.

Connections for simulation on the ISDN

The following diagrams show all the points on the ISDN where you can connect and test using aurora[Sonata] in Simulation mode. See Chapter 4 for full details.

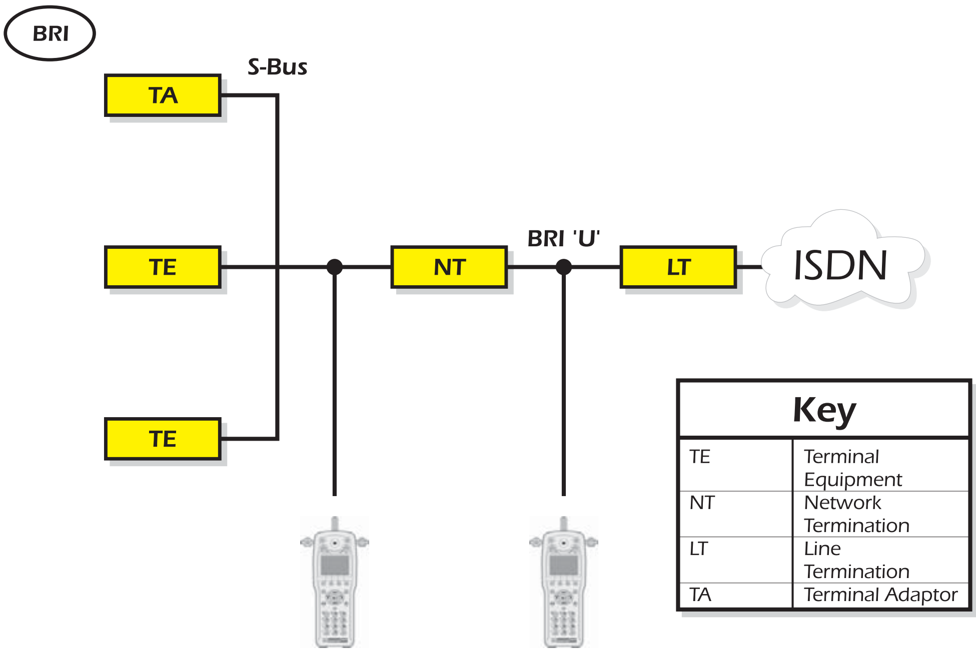


Key	
TE	Terminal Equipment
NT	Network Termination
LT	Line Termination



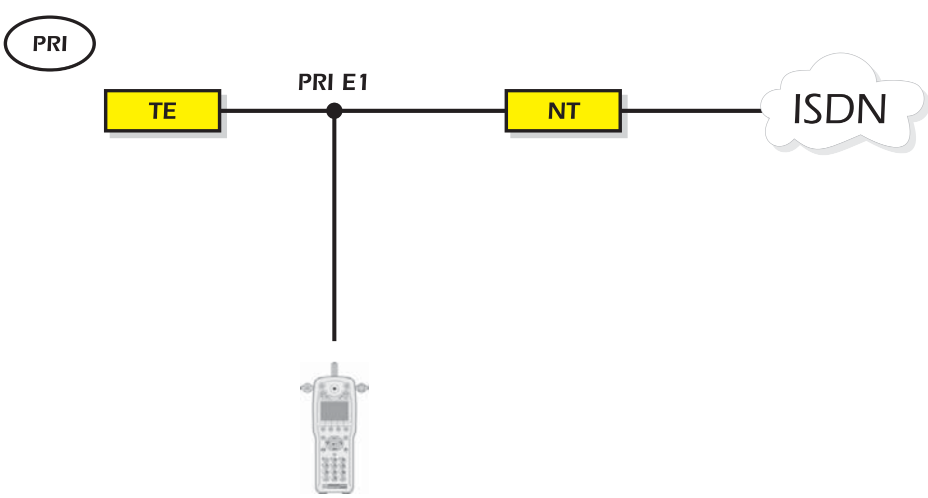
Connections for line monitoring

The following diagrams show all the points on the ISDN where you can connect and test using auroraSonata in Monitor mode. See Chapter 5 for full details.



Key

TE	Terminal Equipment
NT	Network Termination
LT	Line Termination
TA	Terminal Adaptor



Connecting to a PC or printer

You can connect aurora^Sonata to a PC to send test results or protocol information to a PC file for analysis (e.g. using aurora^Expert for Windows), download new software or upload/ download system settings. You can also connect to a printer to print out test results or the protocol decode.

Note

The serial ports on both devices must be set up in the same way. For details on how to change the configuration of aurora^Sonata's serial port, see Chapter 3 section 1.

-1- Use the RS232 cable to connect aurora^Sonata's serial port to the serial port on the PC or printer.

Tip

To check the current setup of aurora^Sonata's serial port, press ⇧ + *5* to display the **Status** screen (see *Checking the current setup of aurora^Sonata* in Chapter 3 section 1) and look at the **Serial** information.

Switching aurora^Sonata on and off

-1- Press the ⓘ key and hold it down for 1-2 seconds.

When you switch off, aurora^Sonata stores the current system settings and the last number (CPN) that you dialled.

The Welcome screen

When you switch on aurora$^{\text{Sonata}}$, a Welcome screen is displayed.

Press ***ENTER*** to display aurora$^{\text{Sonata}}$'s top level menu, from which you can select an interface, access the setup menus or begin testing in either Simulation or Monitor mode. For more details about the top level menu, see section 2.

Changing the appearance of the screen

You can make the display easier to read in different lights by changing the contrast or switching the backlight on and off.

Changing the contrast

-1- Press and hold + *1*.

The screen shifts through a range of contrasts. When the contrast is the way you want it, release the keys.

Tip

If you have made the screen slightly too dark or too light, you can reverse the direction of the contrast change by releasing the *1* key and pressing it again.

Switching the backlight on and off

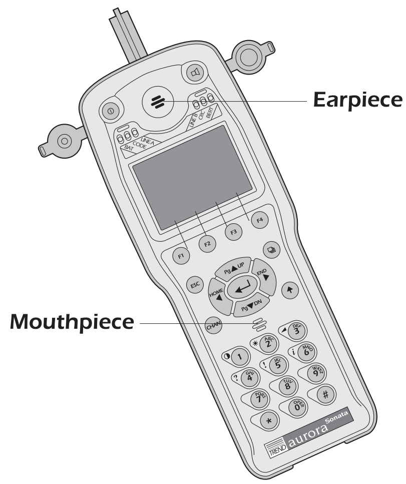
-1- Press + 2.

Note

When aurora$^{\text{Sonata}}$ is using battery power, the backlight switches off after a set time if no keys have been pressed. You can change the length of time that passes before the backlight goes off—see *Changing the basic operation* in Chapter 3 section 1.

Choosing hand-held or hands-free operation

aurora[Sonata] can be hand-held like a normal telephone handset.



You can also use the tester 'hands-free', by switching on the built-in loudspeaker. You can then set it down or hang it up and continue to hear activity on the line.

Note

When you switch on aurora[Sonata] it is always in hand-held mode, even if you set it to hands-free when you last used it.

-1- Press the key to switch the loudspeaker off for hand-held operation or on for hands-free operation.

For instructions on changing the volume of the earpiece, microphone or loudspeaker, see *Adjusting the volume* in section 3.

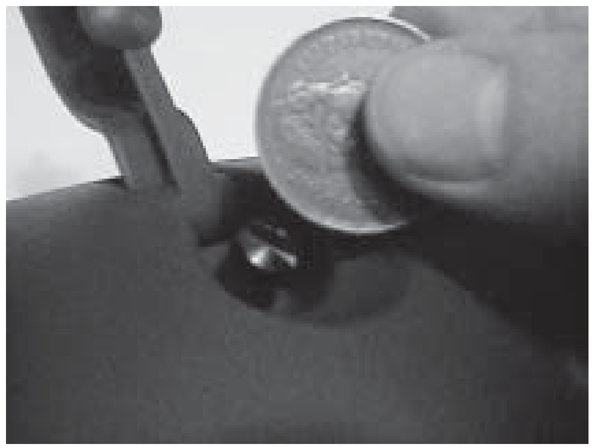
Removing & replacing the belt hook

aurora^Sonata^ has a removable belt hook, attached to the battery pack cover at the back of the unit. You can use the hook to carry the unit or to hang it up for hands-free operation.

Removing the belt hook

-1- Remove the battery pack cover. To do this:

- Loosen the screw by turning it anticlockwise using a coin or screwdriver.



- When the screw is released, it pops up. Slide the cover upwards to remove.

-2- Turn the cover over to show the belt hook release mechanism. The hook is held in place by a small bolt.

-3- Remove the bolt from its holder. To do this:

- Release the bolt by pushing it upwards.
- Slide the bolt out of its holder.

-4- Remove the belt hook from the top of the cover.

-5- Replace the bolt in its holder by sliding it back in and pushing down to secure it in place.

Warning: Belt hook bolt
Always keep the bolt in its holder. If you lose it you will not be able to replace the belt hook, and the case will not be watertight.

-6- Replace the battery pack cover:

- Slide the cover back down into place.
- Push the screw down and turn it clockwise to tighten.

Warning: Tightening the screw
Make sure the screw is tight enough to avoid the cover coming off when you try to hang up aurora[Sonata] from its belt hook.

Replacing the belt hook

-1- Remove the battery pack cover and take out the bolt from the belt hook release mechanism, as described in *Removing the belt hook* above.

-2- Replace the hook by placing it in the socket at the top of the battery pack cover with the opening pointing towards the back of the unit. Line up the bolt holes in the hook with the holes in the cover.

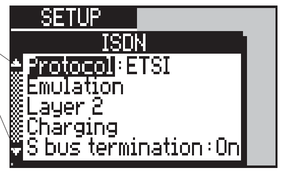
-3- Replace the bolt in its holder and secure it by pushing down.

-4- Replace the cover as described in *Removing the belt hook* above.

Section 2 Using the menus and windows

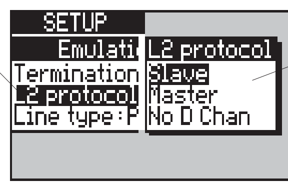
Most of aurora*Sonata*'s functions are accessed via menus and sub-menus. The choices on a menu depend on the task you are performing and the protocol and interface you have selected. A typical menu is shown below.

These arrows mean that you can press the **Up** and **Down** arrow keys to display more items



When you select some menu items (usually from the Setup sub-menus) aurora*Sonata* displays an 'option window'. This is a pop-up box listing the settings or values you can choose for the item you have selected. For example:

The menu item you selected is still visible



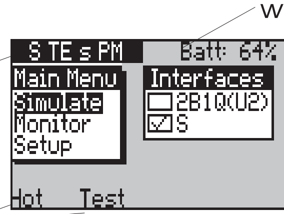
The option window for the selected item appears in the foreground

The top level menu

The top level menu leads to all aurora*Sonata*'s sub-menus and options. You can select an interface to test, access the system setup menus, and begin ISDN simulation or line monitoring. The appearance of the top level menu depends on the current operating mode. In Simulation mode it looks like this:

Battery power level (only when the battery is in use)

The current emulation mode



Function keys

In Monitor mode the top level menu looks similar to this, but the current emulation mode shows **Monitor** and the selected interface.

How to display the top level menu

When you switch on aurora^Sonata, the top level menu for Simulation mode is the first screen displayed after the Welcome screen.

At any other time, you can return to the top level menu for the operating mode (Simulation or Monitor) in which you are currently using aurora^Sonata. To do this press *ESC,* to exit from each option list and sub-menu in turn. See *Exiting from a menu or option window* later in this section.

Moving through the items in a menu

Use the arrow keys to move the cursor up and down through the menu items, one at a time.

A scroll bar (▲ and ▼) displayed to the left of a menu means that there are more options than can fit on a single screen. When a scroll bar is displayed, you can use the following keys to move through the items more quickly:

- To highlight the first item in the menu, press + ◀.
- To highlight the last item, press + ▶.
- To move up one page, press + ▲.
- To move down one page, press + ▼.

Selecting a menu item

-1- Move the cursor through the menu items until the one you require is highlighted.

-2- Press ***ENTER*** to select the highlighted item.

Depending on what you have selected, auroraSonata does one of the following:

- performs the task you have selected
- displays a sub-menu related to the selected item
- displays an option window for you to choose a setting or value for the item you have selected

Using the function keys

auroraSonata has four function keys, labelled ***F1*** to ***F4***. You use them to carry out common tasks related to the operation you are currently performing.

At any time when you can perform a task using a function key, auroraSonata shows the task name in abbreviated form at the foot of the screen, just above the key. For example:

For this task, you can press **F1** to delete a character

Note

This Guide always refers to a function key by its name as it is shown on screen. For example, 'Press the **Clear** function key'.

Exiting from a menu or option window

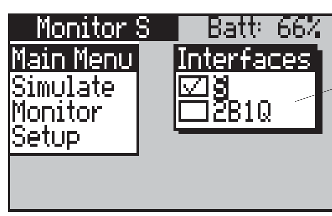
In all menus and sub-menus, when you press ***ENTER*** to select a menu item aurora[Sonata] automatically displays the sub-menu or screen appropriate to the item you have chosen. To return to the previous level without selecting a menu item, press ***ESC***.

In an option window, when you press ***ENTER*** to select a value or setting aurora[Sonata] automatically closes the window. To close the window without changing the setting, press ***ESC***.

Switching between windows

For some menus and functions, aurora[Sonata] displays more than one window at a time. For example, the top level menu has a **Main Menu** window and an **Interfaces** window.

Only one of the windows is active at a time. The active window is indicated by a 'shadow' effect—for example:



To change the active window:

-1- Press the  key.

The 'shadow' switches to the window that is now active.

Section 3 Basic Operations

This section is intended for beginners, and explains some simple operations that you are likely to perform frequently while using your aurora^Sonata. You will learn how to:

- get on-screen Help
- adjust the volume of the loudspeaker, ringer or built-in telephone earpiece
- select an interface for testing
- choose the operating mode
- enter alphanumeric information (e.g. names to identify stored test results).

Getting on-screen Help

You can get on-screen Help at any time while you are using aurora^Sonata. The information is context-sensitive—that is, it relates to the option or item which is currently highlighted.

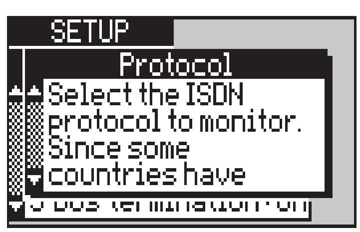
Note

You cannot display Help for most pop-up windows, including the option lists.

To display the Help information:

-1- Press + *4*.

A window similar to the following is displayed:



-2- When you have finished consulting Help, press ***ESC*** or ***ENTER*** to return to the previous screen.

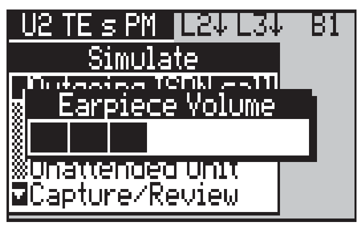
Adjusting the volume

You can change the volume of the ringer, telephone receiver or hands-free loudspeaker, depending on which of these you are currently using.

- You can change the volume of the speaker if you are operating aurora[Sonata] hands-free, or the earpiece if you are using it hand-held.
- When aurora[Sonata] is ringing for an incoming call, you can change the ringer volume.

To adjust the volume:

-1- Press + *3*. aurora[Sonata] displays a bar graph indicating the current volume and showing whether you are changing the volume of the ringer, earpiece or speaker.



-2- Change the volume to the level you require. To increase by one step, press ▶ or ▲. To decrease by one step, press ◀ or ▼.

Tips:

- To increase or decrease by several steps in succession, hold down the arrow key.
- For maximum volume press + ▲ (Page Up). For minimum volume press + ▼ (Page Down)

-3- To choose the currently displayed level and close the adjustment window, press ***ENTER***.

Selecting an interface

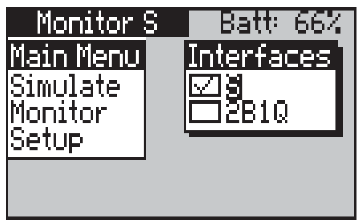
BRI auroraSonata can be fitted with Basic Rate interface modules allowing you to test at the S or U interface.

PRI The Primary Rate interface module allows you to test Primary Rate links using E1 type access.

Note

You cannot select a new interface while a call is connected.

-1- With the **Interfaces** window active in the top level menu, highlight the interface you require:



Note

The **Interfaces** window lists the interfaces that are fitted on your auroraSonata. Where you have two interfaces which can be combined to perform a specific task (e.g. two 4B3T U interfaces) you have the option to select both of them.

-2- Press *ENTER*. A tick (✓) appears next to the the selected interface. The LED on the interface module will also light up when you go into the **Simulate** or **Monitor** menu.

The **Main Menu** automatically changes to suit the tests that you can perform with the selected interface or interfaces. For example, when you choose an interface that is only used in Simulation mode, the **Monitor** option is removed.

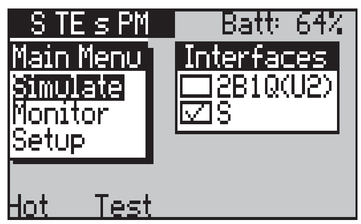
-3- Switch back to the **Main Menu** window to begin.

Choosing the operating mode

aurora[Sonata] operates in two different modes:

- **Simulation**—in this mode you can make test calls by emulating equipment on the line: e.g. Terminal Equipment (TE), a Network Termination (NT) or ISDN Line Termination (LT).
- **Monitor**—in this mode you can monitor signalling traffic on the line or listen to audio calls.

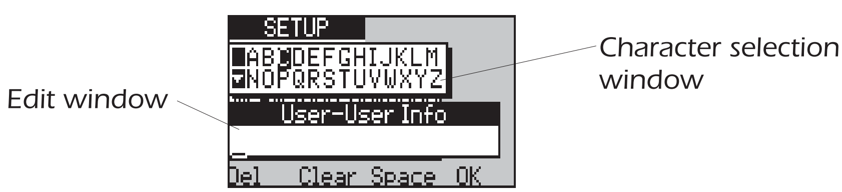
-1- With the **Main Menu** window active in the top level menu, highlight the mode you require:



-2- Press *ENTER* to select the operating mode and display its main menu or selection screen.

Entering alphanumeric information

When performing certain tasks, you need to enter a string of alphanumeric characters. For example, when storing a speed-dial number you can assign a name to identify who or what it belongs to. Each time you choose or are required to enter an alphanumeric name, the following window opens:

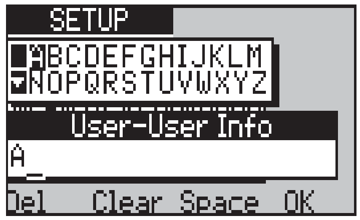


Note

The active window is the one in which the shadow appears. In the above example the selection window is active, as can be seen by the shadow and one of its letters (**C**) being highlighted. To switch between windows, press as normal.

Adding or deleting characters

-1- In the selection window, highlight each character you require and press ***ENTER*** to add it to the edit window in the cursor's current position. You can add a space by pressing the **Space** function key.



Tips:

- To enter numbers, use the keypad.
- In the selection window, to 'wrap' the cursor round to the first or last character, press ▶ or ◀.
- You can add a new character at any point in the string by switching to the edit window and moving the cursor.
- In the edit window, to move quickly from the last character to the first, press + ◀ (Home). To move from the first to the last character, press + ▶ (End).

To delete a single character:

-1- In the edit window, move the cursor under the character and press the **Del** function key.

Tip

You can delete the last character in the string or the character over the cursor without leaving the selection window, by pressing the **Del** function key.

To delete the entire string:

-1- Press the **Clear** function key. This works when either window is active.

Saving the string and exiting

-1- Press the **OK** function key.

Chapter 3

First Steps in Testing

Contents

First Steps in Testing

When you are comfortable using auroraSonata and familiar with the basic operations described in Chapter 2, you can begin to set up and use its testing features.

This chapter is divided into sections as follows:

Section 1	*Setting Up auroraSonata*
Section 2	*Connecting a Basic Call*

The information is useful for:

- beginners, who will learn about the different settings and can use the step-by-step instructions as a tutorial
- more experienced users, who can consult the chapter for reference on specific settings

Tip

System, test and installation managers can set up units by 'copying' system settings via a local PC. For details, see the *System Maintenance* section of Chapter 6.

Section 1 Setting Up aurora^{Sonata}

This section describes how to set up the way in which aurora^{Sonata} operates. It explains how to:

- set up aurora^{Sonata} to operate on the ISDN
- change general settings such as the display language
- configure the serial port (these settings also determine the format of the protocol decode)
- configure aurora^{Sonata} with default settings

Note

In this Guide, settings for specific tests are covered in the same chapters as the tests themselves. For Bit Error Rate Test (BERT) settings see Chapter 4, and for Monitor settings (e.g. Idle Codes) see Chapter 5.

When you first use aurora^{Sonata} it may be set up with default values or with settings downloaded from a PC.

Tip

To check the current setup, press + *5*. For details, see *Checking the current setup of aurora^{Sonata}* later in this section.

To begin setting up aurora^{Sonata}

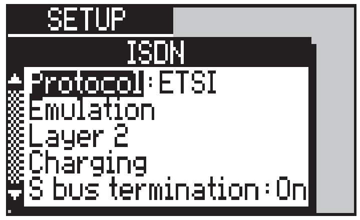
-1- Select **Setup** from the top level menu. This displays the main **Setup** menu:

Note

You cannot go into the **Setup** menus while a call is connected.

Setting up aurora^Sonata^ for ISDN operation

-1- From the main **Setup** menu, select **ISDN** to display a sub-menu of settings:



-2- Highlight the type of setting you want to define and press ***ENTER*** to display its sub-menu or option window. The settings are:

Protocol Identifies the ISDN protocol you intend to use.

Emulation Determines the way in which aurora^Sonata^ operates in Simulation mode.

Layer 2 Sets up Layer 2 operation.

Charging Determines how aurora^Sonata^ generates charging information.

BRI **S bus term'n** On the S interface, this allows you to connect and disconnect an 100Ω resistor on the S bus.

PRI **PRI term'n** Allows you to terminate the PRI link with 75Ω or 120Ω.

PRI **CRC4** Switches CRC4 checking on or off.

PRI **Return RAI** Gives you the option to return a Remote Alarm Indication (RAI) to the remote end of the connection.

Encoding The voice encoding method.

Idle Codes The code that denotes the 'idle state', i.e. absence of channel activity. See Chapter 5 for setup instructions.

Dial options Allows you to set up dialling information.

BERT Determines how Bit Error Rate Tests are performed. See chapter 4 for setup instructions.

ETSI **ECT** Allows you to set up the Explicit Call Transfer supplementary service.

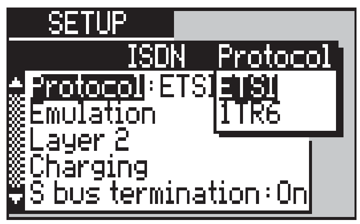
Choosing the protocol

A protocol is a set of rules for carrying out specific functions, such as exchange of information between two systems, synchronisation, error checking and so on.

Note

Some of aurora^{Sonata}'s features are only available with specific protocols. Protocol-specific information in this Guide is identified using symbols—see *Conventions in the Guide* in Chapter 1 section 1.

-1- Select **Protocol** to display list of the protocols your organisation has purchased. For example:



-2- Highlight the protocol you require and press *ENTER*.

Note

There may be national variations of a protocol, related to features such as Advice of Charge. If you need details related to your national variant, consult the service provider. See also *Changing the country of operation* later in this section.

You will find a brief description of the protocols supported by aurora^{Sonata} in the *Introduction to ISDN*.

aurora^{Sonata} automatically prevents you from selecting a protocol and access type (Primary/Basic Rate) that are incompatible with each other. For example, when PRI access is selected you cannot choose TN1R6-T as the protocol.

The access type available for the protocols are listed overleaf.

	Primary Rate	Basic Rate
ETSI	✓	✓
ITR6	✓	✓
CorNet-N	✓	✓
CorNet-T	✗	✓
TN1R6-N	✓	✓
TN1R6-T	✗	✓
VN4	✓	✓

Setting the emulation mode

The way in which aurora^Sonata emulates ISDN equipment or the network itself is called the emulation mode. This is a combination of settings which you define to suit the test you intend to perform.

The following pages describe each setting in turn, explaining what it is for and how to set it up. Following this is a set of examples indicating which combination (i.e. emulation mode) you would choose for different tests. Finally, it explains how to use aurora^Sonata's Hot Keys as a quick and easy way to change the setup of aurora^Sonata.

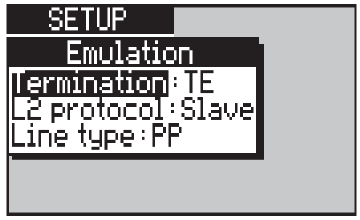
Tip

See also Chapter 4 section 1, which provides guidelines on emulating particular ISDN devices.

To begin setting the emulation mode

-1- Select the interface to test.

-2- From the **ISDN Setup** menu, select **Emulation** to display a sub-menu of emulation settings:



Termination Selects the device that aurora[Sonata] emulates (e.g. Terminal Equipment), and whether it generates or receives the line clock.

L2 Protocol Sets aurora[Sonata] to operate as either the protocol master or slave at Layer 2, or specifies that you intend to test on a fixed link (**No D Channel**).

BRI **Line Type** Identifies the ISDN protocol link on which you intend to test as either point-to-point or point-to-multipoint.

The values you can choose for these settings depend on the protocol and interface you have selected.

Selecting the device to emulate

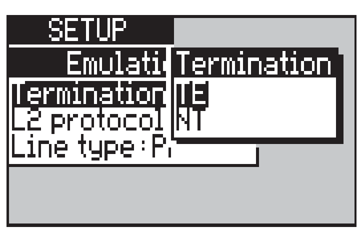
You need to identify the type of device which aurora[Sonata] is to emulate at the selected interface. This automatically determines whether aurora[Sonata] generates or receives the network clock at Layer 1.

CorNet-T When CorNet-T is selected aurora[Sonata] can only emulate a TE.

Tip

For guidelines on emulating particular ISDN devices at specific interfaces, see Chapter 4 section 1.

-1- Select **Termination** to display the options:



-2- Highlight the device aurora^{Sonata} is to emulate:

Termination Settings	
TE	Terminal Equipment. aurora^{Sonata} acts as the network clock receiver at Layer 1.
NT	Network Termination. On the S or PRI interface, choosing **NT** automatically sets aurora^{Sonata} to be the network clock generator at Layer 1. On the U interface, it sets aurora^{Sonata} to be the network clock
LT (BRI)	Line Termination (U interface). aurora^{Sonata} acts as the network clock generator at Layer 1.

Note

When you choose **TE**, aurora^{Sonata} sets **L2 protocol** (see *Identifying the protocol master and slave* below) to **Slave**. When you choose **NT** or **LT**, **L2 protocol** is set to **Master**. You can change this setting if you require.

-3- Press *ENTER* to save your selection and close the option window.

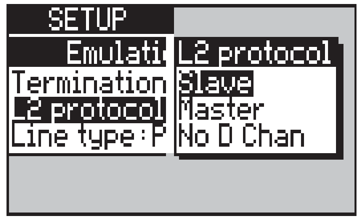
Identifying the protocol master and slave

To test ISDN protocol links, you need to identify whether aurora^{Sonata} acts as the 'master' or 'slave' of the network at Layer 2. To test fixed links, you can set aurora^{Sonata} to operate without Layer 2 protocol.

Tip

Usually, when aurora^{Sonata} emulates a TE it acts as protocol slave, and when emulating an NT or LT it acts as protocol master. However, you can use the opposite settings (**TE Master**, **NT Slave**, **LT Slave**), if required. For example, you might use **NT Slave** in order to use aurora^{Sonata} as a protocol slave and a clock master.

-1- Choose **L2 Protocol** to display the options:



-2- Highlight the option you require:

Layer 2 Protocol	
Slave	aurora^{Sonata} acts as the protocol slave.
Master	aurora^{Sonata} acts as the protocol master.
No D Chan	No Layer 2 protocol control. You would use this setting to test fixed links.

BRI

Note

When you choose **No D Chan**, the **Line Type** setting is removed from the **Emulation** menu.

-3- Press *ENTER* to save your selection and close the option window.

TN1R6-T

TN1R6-N

Identifying the Layer 3 master/slave

When TN1R6-T or TN1R6-N is selected, the Emulation menu has an additional setting: L3 Protocol. This setting determines whether it is aurora^{Sonata} or the connected device that chooses the channel to be used for a call.

Layer 3 Protocol	
Master	aurora^{Sonata} acts as Layer 3 master - i.e. it determines which channel is used for a call.
Slave	The device that is connected at the other end of the link determines which channel is used.

The Status bar at the top of the screen shows the **L3 Protocol** setting (**s** or **m**) after the link type indicator.

For example, **S TE s PP m** means that aurora[Sonata] is operating on the S interface, emulating a TE, acting as Slave at Layer 2 level, with point-to-point as the link type, acting as Master of the Layer 3 protocol.

BRI

Selecting the type of ISDN protocol link (PP/PMP)

When testing a Basic Rate link that uses ISDN protocol support (i.e. it is not a fixed link) you need to specify whether you intend to test an ISDN point-to-point (PP) link or a point-to-multipoint (PMP) link.

TN1R6-N
CorNet-N

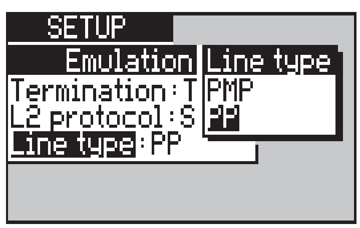
CorNet-N and TN1R6-N only operate on point-to-point links. Therefore, with these protocols, only the **PP** (point-to-point) option is available for the **Line Type** setting.

TN1R6-T
CorNet-T

CorNet-T and TN1R6-T can operate on point-to-point or point-to-multipoint links.

For more information on PP/PMP links, see the *Introduction to ISDN*.

-1- Choose **Line Type** to display an option window:



-2- Highlight the type of link you intend to test and press ***ENTER***. The options are:

Line Type	
PP	Test a point-to-point line - where one TE is connected at the end of the cable.
PMP	Test a point-to-multipoint line - where up to eight terminals can be connected in parallel along the bus.

Tip

For testing a point-to-multipoint link, you may find it useful to set up MSN screening (ETSI) or SUB (EAZ) screening (1TR6). See Chapter 6 section 1 for details on call screening.

Setting the emulation mode—Examples

The following tables show the emulation settings you would

Emulation mode: ISDN Protocol Links	
TE, **Slave**	Emulate a TE at Layers 1-3. Used for testing into the network, including the NT.
NT, **Master**	On Primary Rate or the Basic Rate S interface, aurora^{Sonata} emulates an NT at Layers 1-3. Used for testing TEs and the line itself.
LT, **Master** (BRI)	Emulate a LT at Layers 1-3. Used on the U interface to test the NT and the protocol between the LT and the TE via the NT.
TE, **Master**	Emulate a TE at Layer 1 and an NT at Layers 2 & 3. That is, aurora^{Sonata} acts as clock receiver at Layer 1 and the protocol master at Layers 2 & 3.
NT, **Slave**	On Primary Rate or the Basic Rate S interface, aurora^{Sonata} emulates an NT at Layer1 and a TE at Layers 2 & 3. That is, it acts the network clock generator at Layer 1 and the protocol slave at Layers 2 & 3.
LT, **Slave** (BRI)	At the U interface, aurora^{Sonata} emulates an LT at Layer1 and a NT at Layers 2 & 3. That is, it acts the clock generator at Layer 1 and the protocol slave at Layers 2 & 3. May be used for testing interworking between two PBXs.

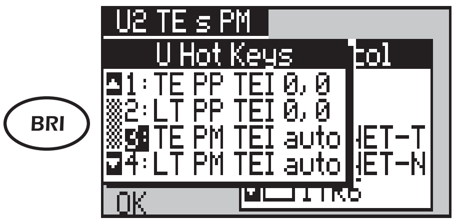
Emulation mode: ISDN Fixed Links	
TE, **No D Chan**	On Primary Rate or the Basic Rate S interface, aurora^{Sonata} emulates a TE connected to a fixed link, acting as network clock receiver. At the U interface, aurora^{Sonata} emulates a TE connected to the U interface point, acting as clock receiver. It replaces either a TE with a U interface or a TE connected through an S bus and an NT unit's U interface. This is used for testing the local PABX connection.
NT, **No D Chan**	On Primary Rate or the Basic Rate S interface, aurora^{Sonata} emulates an NT connected to a fixed link S interface, acting as network clock generator.
LT, **No D Chan** (BRI)	At the U interface, aurora^{Sonata} emulates a Line Termination,acting as network clock generator. This is used for testing into the NT.

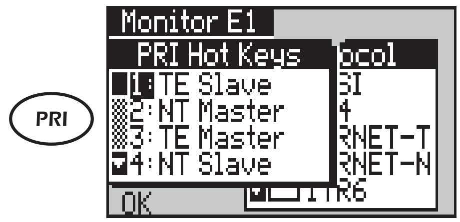
Setting up auroraSonata using Hot Keys

auroraSonata has six Hot Keys, which allow you to configure the unit quickly without having to redefine each individual setting. You can customise the Hot Keys to suit your requirements.

Displaying the current list of Hot Keys

-1- In the top level menu, press the **Hot** function key to list the available Hot Keys. For example:





Each interface has its own set of Hot Keys. The title bar on the screen shows which interface is currently selected—for example, **S Hot Keys**.

Tip

To see details of the settings assigned to a Hot Key, highlight its number and press *ENTER*.

How the Hot Keys work

Each of the most commonly used combinations of settings for the selected interface is assigned to a Hot Key. When you want to set up auroraSonata in a particular way, you simply select the Key to which the settings are assigned.

When you use Hot Keys to set the emulation mode for auroraSonata, the list of available keys is always appropriate to the selected protocol. For example, if a protocol only operates on point-to-point links there are no Hot Keys selecting point-to-multipoint operation.

Each Hot Key has a different combination of settings for:

- the device which aurora^Sonata emulates
- whether aurora^Sonata acts as protocol master or slave
- BRI the type of link to be tested
- BRI the way in which B channel Terminal Endpoint Identifiers (TEIs) are assigned
- the value or values for fixed TEIs.

From the Hot Key screen you can also change to a different protocol.

Preconfigured Hot Keys

aurora^Sonata comes with a series of preconfigured Hot Keys for each interface. The name of each Key indicates the settings assigned to it.

BRI For Basic Rate operation, the protocol master/slave setting is indicated as follows:

TE	Emulate a TE, acting as protocol slave
NT	Emulate an NT, acting as protocol master
LT	Emulate an LT, acting as protocol master

For example, **TE PP TEI 0,0** means the Hot Key configures aurora^Sonata to emulate a TE, testing a point-to-point link, with fixed B channel TEI values of 0, 0.

Note

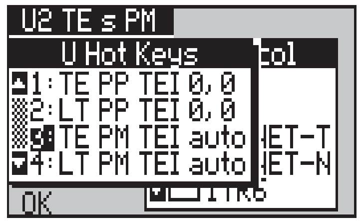
Remember that the available emulation settings, and therefore the available Hot Keys, are determined by the interface you have selected. When the S interface is selected, for example, there is no Hot Key that sets up aurora^Sonata to emulate an LT.

PRI For Primary Rate operation, the name of each Hot Key shows the emulation mode and protocol master/slave setting: for example, **NT Slave** or **TE No D Chan**.

Configuring aurora[Sonata] using the Hot Keys

-1- Select the required interface.

-2- Display the current list of Hot Keys as described above. For example:



Tip

From this screen you can also change to a different protocol. Press to switch to the protocol selection window, select the protocol you require by ticking the box as normal, then switch back to the list of Hot Keys.

-3- Highlight the Hot Key you require. You can do this by pressing the number on the keypad.

Tip

To display the settings assigned to a Hot Key, highlight its number and press ***ENTER***.

-4- Press the **OK** function key. aurora[Sonata] reconfigures its settings in the way you have selected and displays the top level menu.

Changing the name or settings for a Hot Key

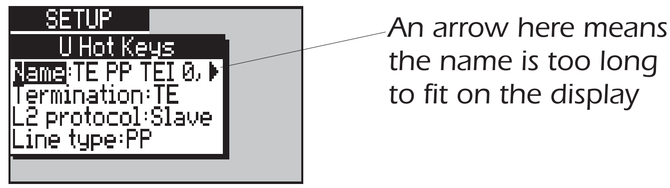
You can change the name of a Hot Key and some of the settings assigned to it.

BRI **Note**

You cannot change the B channel TEI setting (**Auto** or **Fixed**) assigned to a Hot Key, or the values of fixed TEIs—these are set to **0**, **0** (the most commonly used values) by all Hot Keys.

-1- Display the current list of Hot Keys for the selected interface and press the number of the key you want to change.

-2- Press *ENTER* to display the current settings for the key. For example:



To change a Hot Key's name:

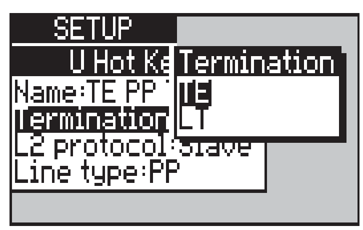
-1- Highlight **Name** and press *ENTER* to display an alphanumeric entry screen.

-2- Enter the new name (up to 17 characters). For instructions, see *Entering alphanumeric information* in Chapter 2 section 3.

-3- Press the **OK** function key to save the new name and return to the list of settings.

To change the settings assigned to a Hot Key:

-1- Highlight each setting and press *ENTER* to display an option window. For example:



-2- Change the setting as required. For details of the specific settings, see the relevant section of this chapter.

Setting up the Layer 2 protocol

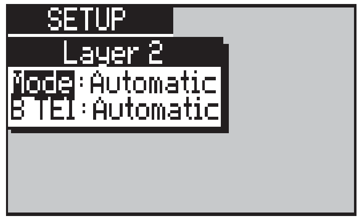
Layer 2 (the 'data link' layer of the OSI 7-layer model) provides a secure, error-free connection for Layer 3 call control information by arranging the bits in error checked frames.

For more information, see the *Introduction to ISDN* or the Help screens provided with aurora[Expert] for Windows.

CorNet-T

If **Layer 2** is set to **Automatic**, aurora^Sonata cannot accept incoming calls until after the first outgoing call has been established. If aurora^Sonata is in unattended mode and **Layer 2** is set to **Automatic**, no calls will be received.

-1- From the **ISDN Setup** menu, select **Layer 2** to display a sub-menu of the settings for Layer 2:



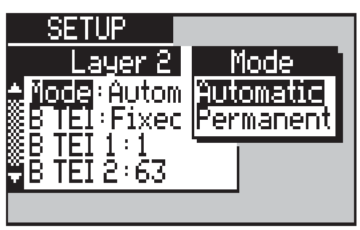
Mode Determines the way in which aurora^Sonata sets up the Layer 2 link for calls.

BRI **B TEI** Determines the way in which Terminal Endpoint Identifiers (TEIs) are used. A TEI is a unique identity for each terminal on the ISDN link. Before you can make calls from aurora^Sonata the unit needs to have one or more TEIs. When the TEI mode is set to **Fixed**, you must enter TEI values. TEI operation works differently for Basic and Primary Rate access.

Choosing when the Layer 2 link is set up

You can determine the point at which aurora^Sonata sets up the Layer 2 for incoming and outgoing calls.

-1- From the **Layer 2 Setup** menu, select **Mode.**



-2- Highlight the option you require and press *ENTER*. The options are:

Layer 2 link	
Automatic	aurora[Sonata] sets up the link only when you make a call. The link may be released again when the call is cleared.
Permanent	When you first switch on aurora[Sonata], it sets up the Layer 2 link. It keeps up this link and uses it each time you make a call. If aurora[Sonata] cannot set up the link when it is switched on, it tries again when the first call is made. If it succeeds, it keeps up the link for future calls.

Note

This setting also determines the point at which Layer 1 activates for a call—for details, see *Activation of Layer 1* in Chapter 4 section 2. If Layer 1 is not operating properly, aurora[Sonata] cannot set up the link at Layer 2 level.

BRI

Selecting the way in which B channel TEIs are assigned

For Basic Rate operation you can determine whether TEIs are assigned by the network (**Automatic**) or manually (**Fixed**) and, for fixed TEIs, assign one or two TEI values.

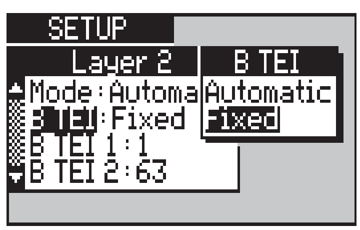
CorNet-T
TN1R6-T

When CorNet-T and TN1R6 are selected and you are testing a point to multipoint line, you can set up fixed TEI settings.

CorNet-N
TN1R6-N

CorNet-N or TN1R6-N can only operate on point to point lines, therefore you cannot set TEIs and they are set to 0,0.

-1- From the **Layer 2 Setup** menu, select **B TEI**.



-2- Highlight the method you require and press ***ENTER***. The options are:

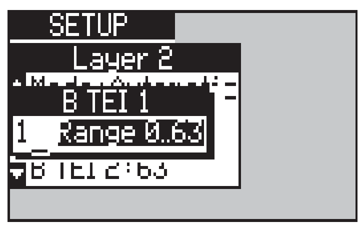
B Channel TEI	
Automatic	B channel TEIs are assigned by the network as part of the call setup protocol negotiation.
Fixed	B channel TEIs are assigned manually.

Assigning fixed B TEI values

BRI When you set **B TEI** to **Fixed** assignment (see above), you can choose the values of TEIs assigned for Basic Rate operation.

PRI For Primary Rate operation, TEI assignment is always fixed and there is only one TE on the link. You can assign one fixed TEI value.

-1- Select **B TEI 1** or **B TEI 2** to display an entry window:



-2- Type a number between 0 and 63 (you cannot enter a higher number). You can overwrite any digits already displayed.

-3- To save the displayed TEI and close the entry window, press ***ENTER***. To close the window without changing the original TEI, press ***ESC***.

BRI **Notes:**

- A single terminal can have more than one TEI, but two terminals cannot have the same TEI. If two TEIs are assigned on a Basic Rate point-to-multipoint link, aurora^Sonata can have calls on both channels.

- When TEIs are assigned automatically, the network ensures that no two terminals on the link have the same TEI. When you assign them manually, you must check this yourself.

Setting up aurora$^{\text{Sonata}}$ to generate call charging

You can define the way in which aurora$^{\text{Sonata}}$ generates charging information (known as Advice of Charge or AOC) and sends it to the caller for incoming calls. This is only used when aurora$^{\text{Sonata}}$ is emulating a Network Termination (NT).

VN4 If VN4 is selected and you are emulating a TE, aurora$^{\text{Sonata}}$ allows you to request charging information from the NT.

CorNet-T When CorNet-T is selected you cannot configure aurora$^{\text{Sonata}}$ as a NT, therefore you cannot set up charging information.

TN1R6-N CorNet-N If TN1R6-N and CorNet-N are selected charging information can be generated by either the TE or NT.

Note

AOC is an ISDN supplementary service. For details on testing supplementary services, see Chapter 4 section 5.

-1- From the **ISDN Setup** menu, select **Charging** to display the options for the selected protocol.

Mode Determines whether charging information is sent manually or automatically.

ETSI VN4 **AOC** Determines the point in the call at which aurora$^{\text{Sonata}}$ sends the information.

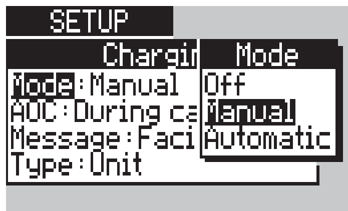
ETSI **Message** The type of message in which the information is sent.

ETSI **Type** — The format in which aurora^Sonata sends the information.

Choosing manual or automatic charging

You can enable and disable charge generation, and choose whether aurora^Sonata generates the information automatically at 10 second intervals or whether you generate it manually.

-1- Choose **Mode** to display an option list:



-2- Highlight an option and press ***ENTER***. The options are:

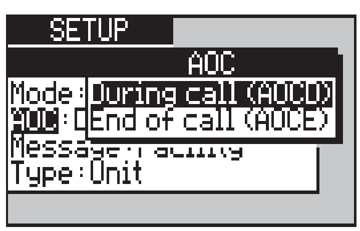
Charge Generation	
Off	Do not generate charging information.
Automatic	aurora^Sonata sends charging information to the caller automatically at 10 second intervals. The information is sent by all B Channels that have an active incoming call.
Manual	Allows you to send a charging element manually during a connected incoming call.

Choosing when to send the information

ETSI VN4

You can choose the stage at which to send charging advice.

-1- Choose **AOC** to display the options.



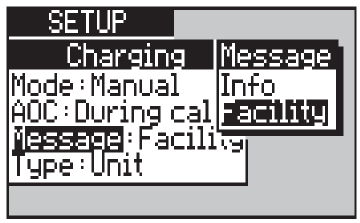
-2- Highlight your choice and press ***ENTER***.

See *Advice of Charge* in Chapter 4 section 5 for details of the AOC-D and AOC-E supplementary services.

Selecting the message type for AOC ETSI

You need to choose the type of message in which aurora[Sonata] sends charging advice. This depends on the network and the country of operation—for example, in Germany the AOC is always sent in an Information message. If you are unsure about the setting you require, contact the service provider.

-1- Choose **Message** to display the options:



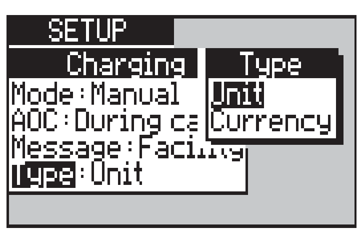
-2- Highlight the type of message to be used, and press ***ENTER***. The options are:

AOC Message Type	
Info	*Send charging details in an Information message.*
Facility	*Send charging details in a Facility message.*

Choosing the format of the information ETSI

aurora[Sonata] can send charging information either in terms of the number of units used or in currency format.

-1- Choose **Type** to display an option window:



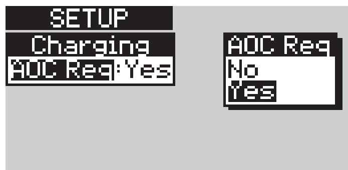
-2- Choose **Unit** or **Currency** and press *ENTER*.

VN4 Requesting charging information

If you are testing a VN4 line and you are emulating a TE, aurora[Sonata] allows you to request charging information from the NT.

-1- From the **ISDN Setup** menu, select **Charging**.

-2- Choose AOC Req to display an option list:



-3- Highlight an option and press *ENTER*.

BRI Terminating the S bus

On a Basic Rate link it is necessary to have the S bus terminated with 100Ω at either end. This is normally done by the NT and the most distant socket on the bus.

When using aurora[Sonata] for simulation on the S interface, you must switch its 100Ω termination resistor on or off as appropriate, to ensure that the bus is correctly terminated.

Note

For instructions on when you require the termination resistor, see *Simulation on the S interface* in Chapter 4 section 1.

-1- From the **ISDN Setup** menu, select **S bus termination** to display an option window.

-2- Highlight **Off** or **On** and press *ENTER*.

PRI Terminating a Primary Rate link

You need to terminate a PRI link with either 75Ω or 120Ω, to suit the equipment to which you are connecting aurora^Sonata^.

-1- From the **ISDN Setup** menu, select **PRI termination** to display an option window.

-2- Highlight **75ohm** or **120ohm** and press *ENTER*.

PRI Switching CRC4 error checking off/on

You can choose whether aurora^Sonata^ checks for CRC4 errors according to the ITU-T G.704 standard.

-1- From the **ISDN Setup** menu, select **CRC4** to display an option window.

-2- Highlight **Off** or **On** and press *ENTER*.

When CRC4 checking is switched on, the *CRC* LED lights up red when aurora^Sonata^ detects a CRC4 error. For full details of the physical tests, see Chapter 4 section 2.

PRI Setting up aurora^Sonata^ to return RAIs

aurora^Sonata^ can be set up to return Remote Alarm Indicators (RAIs) to the remote end if it is not receiving a proper signal.

-1- From the **ISDN Setup** menu, select **Return RAI** to display an option window.

-2- Highlight **No** or **Yes** and press *ENTER*.

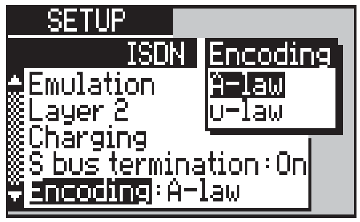
Note

For normal operation you would choose **Yes**, but you can switch off the feature (**No**) if you do not require it. For full details of the physical tests, see Chapter 4 section 2.

Setting the voice encoding type

Voice encoding is the way in which aurora[Sonata] 'translates' speech into a format which can be transmitted. The encoding type must be appropriate for the national network.

-1- From the **ISDN Setup** menu, select **Encoding** to display the possible encoding types:



-2- Highlight the type of encoding you wish to use and press *ENTER*. The options are:

Encoding	
A-law	The encoding type used in Europe.
μ-law	The encoding type used in North America, Japan and some other regions in Asia.

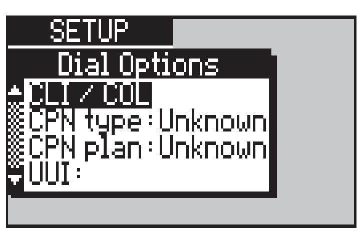
Note

aurora[Sonata] cannot have a connected call with a device using a different type of voice encoding, because the destination is incompatible.

Setting up dialling information

You can set up specific dialling information for test calls, to check particular ISDN features.

-1- From the **ISDN Setup** menu, select **Dial Options**. aurora[Sonata] lists the different types of dialling information you can set up.



Note

You can also access the **Dial Options** menu when you are setting up an outgoing call. See *Setting up information for specific tests* in section 2.

CLI/COL	Allows you to test the CLIP/R and COLP/R supplementary services.
CPN type/plan	The numbering type and plan for the Called Party Number.
1TR6 **SPC Call**	Allows you to use a Semi-Permanent Connection.
UUI	Allows you to test the User to User Signalling (UUS) supplementary service.
CUG	Allows you to test the Closed User Groups (CUG) supplementary service.

Note

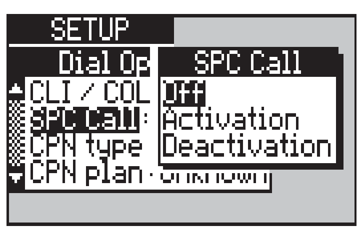
The instructions for testing CLIP/R, COLP/R, UUS and CUG are in Chapter 4 section 5 along with the other ISDN supplementary services.

Using a Semi-Permanent Connection

1TR6 TN1R6-N TN1R6-T

You can set up the call on a Semi-Permanent Connection (SPC)—this is a connection which is kept up unless specifically deactivated. (Because it can be deactivated and reactivated, an SPC is not the same as a fixed link.)

-1- From the **Dial Options** menu, select **SPC Call**.



-2- Highlight the option you require and press *ENTER*. The options are:

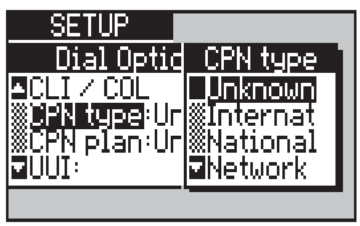
Semi-Permanent Connections	
Off	Do not use an SPC
Activation	Activate the SPC
Deactivation	Deactivate the SPC

Identifying the CPN Numbering Plan & Type

For outgoing calls, you can specify the CPN numbering plan and type of the destination. The network may use these to screen certain calls.

To identify the CPN numbering type:

-1- From the **Dial Options** menu, select **CPN type**.

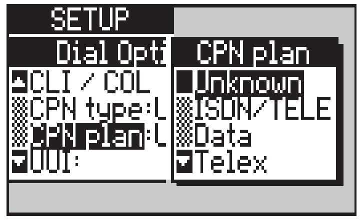


-2- Highlight the numbering type you require and press *ENTER*. The options are:

CPN Number Type	
Unknown	The destination call format is unknown.
International	Use this option when making an international connection. Number formats will vary according to the countries initiating and receiving the connections.
National	Use this option when making a connection within the same country.
Network (ETSI, CorNet N/T)	Use this option when making a connection between two exchanges.
Sub num (ETSI, CorNet N/T)	This is a subscriber number i.e. a number without area codes.
Abb num (ETSI, CorNet N/T)	This is an abbreviated number, for example, a 3 digit extension number.
Reserved (ETSI, CorNet N/T)	This is reserved for future use.

To identify the CPN numbering plan:

-1- From the **Dial Options** menu, select **CPN plan**.



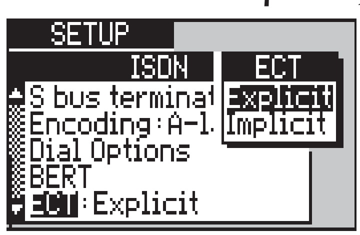
-2- Highlight the numbering plan you require and press *ENTER*. The options are:

CPN Number Plan	
Unknown	The destination numbering plan is
ISDN/Tele	ISDN/Telephony numbering plan. Refer to Recommendation E.164/E.163 for further
Data (ETSI, CorNet N/T)	Data numbering plan. Refer to Recommendation X.121 for further details.
Telex (ETSI, CorNet N/T)	Telex numbering plan. Refer to Recommendation F.69 for further details.
National (ETSI, CorNet N/T)	National Standard i.e. applies to public networks.
Private (ETSI, CorNet N/T)	Private network numbering plan.
Reserved (ETSI, CorNet N/T)	This is reserved for future use.

Selecting the linkage type for ECT (ETSI)

Explicit Call Transfer (ECT) is a supplementary service where the subscriber can connect a held call to a connected call and then disconnect their unit, leaving the other users connected to each other. For full instructions on how to test ECT and other supplementary services, see Chapter 4 section 5.

-1- From the **ISDN Setup** menu, select **ECT.**

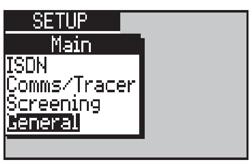


-2- Highlight the type of ECT linkage you require, and press ***ENTER***. The options are:

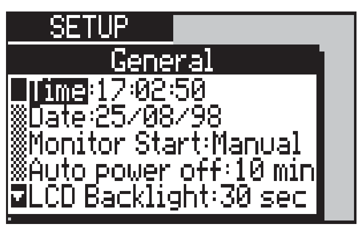
ECT Linkage	
Explicit	Normally used for systems which can have more than one call on hold. aurora^Sonata requests an ID from the network, which it then uses to identify the held call when sending the ECT request.
Implicit	The basic ECT linkage. When you put a call on hold and select ECT, aurora^Sonata sends a facility message containing the call reference. When the network receives it, it links the calls.

Changing the basic operation

You can change some of the basic operational settings of your aurora^Sonata - for example, the settings on the internal clock. Once you have defined these settings the way you want them, you will probably not need to change them often.



-1- From the main **Setup** menu, select **General** to display a sub-menu of general settings:



Time The time on aurora^Sonata's internal clock.

Date The system date.

Monitor Start Allows you to set a time at which aurora^Sonata begins monitoring the line. See Chapter 5 for instructions on the Monitor setup.

Auto power off The time delay before aurora^Sonata switches off to save the battery.

LCD Backlight The time delay before the screen backlight switches off to save the battery.

Language The language of the display.

Country The country of operation. This affects some ISDN services such as call charging.

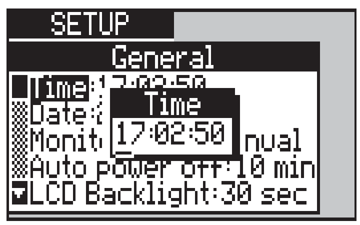
Set Defaults Allows you to select or change the default system settings.

Changing the date/time on the internal clock

aurora[Sonata] has an internal clock/calendar (Real Time Clock) which is used to time-stamp protocol decodes and test results.

To change the time

-1- From the **General Setup** menu, select **Time** to display a time entry window:

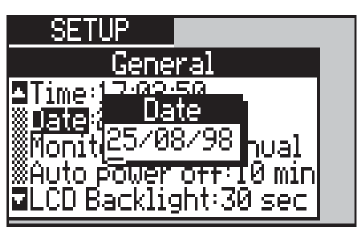


-2- Enter a time in hours, minutes and seconds, using the 24-hour clock. To enter each digit, move the cursor to the required position and type the digit. The new digit replaces the one already in that position.

-3- Press ***ENTER*** to save the new time and exit.

To change the date

-1- From the **General Setup** menu, select **Date** to display a date entry window:



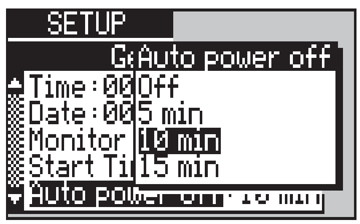
-2- Enter a date in day, month and year format, using two digits for each. To enter each digit, move the cursor to the required position and type the digit. The new digit replaces the one already in that position.

-3- Press *ENTER* to save the new date and exit.

Setting the automatic power-off time delay

When operating from the battery, aurora^Sonata can switch off automatically to save power if no calls are in progress and no keys have been pressed after a certain length of time. To choose the time delay before aurora^Sonata switches off:

-1- From the **General Setup** menu, select **Auto power off** to display the options:

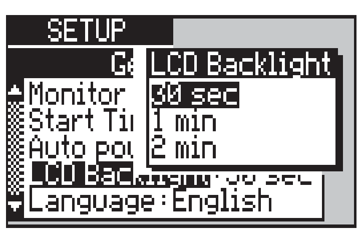


-2- Highlight the time delay you require, or **Off** to disable the power-saving feature, and press *ENTER*.

Setting the screen backlight power-off time delay

When aurora^Sonata is operating from batteries, the backlight on its LCD screen switches off to save power if no calls are active and no keys have been pressed after a certain length of time. You can change the time delay before the backlight switches off, although you cannot disable the feature entirely.

-1- From the **General Setup** menu, select **LCD Backlight** to display the options:



-2- Highlight your choice and press ***ENTER*** to save your selection. The option window closes.

Changing the language of the screen display

aurora[Sonata] operates in English and up to two other languages as requested by your organisation. The additional languages may be French, German, Spanish or Dutch.

To change the language of the screen display:

-1- Select **Language** to display a list of the languages in which your aurora[Sonata] can operate.

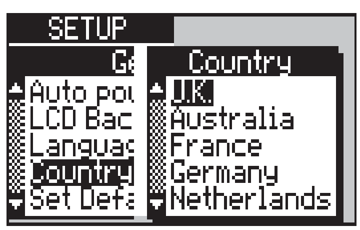
-2- Highlight the language you wish to use and press ***ENTER*** to select it. The option window closes.

Changing the country of operation

aurora[Sonata] can cater for regional variations in ISDN protocols. This affects how it handles some network features such as Advice of Charge.

You need to identify the country in which you are using your aurora[Sonata]—it then automatically changes its settings so that it can operate in that country. To do this:

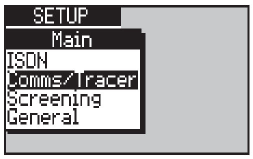
-1- Select **Country** to display a list of the countries in which aurora[Sonata] can operate:



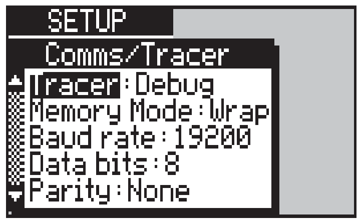
-2- Highlight the country of operation and press ***ENTER*** to select it. The option window closes.

Configuring the serial port/protocol output

aurora^Sonata has a two-way, high speed RS232 serial port, which is used to connect the tester to another device such as a PC or printer. For example, you would connect to a PC to use aurora^Expert for Windows. To configure the serial port:



-1- From the main **Setup** menu, select **Comms/ Tracer** to display the **Comms/Tracer** menu.



Note

The **Tracer** setting in this menu is used both to determine what is output at the serial port and to select the format and destination of the protocol decode. For more information on protocol analysis, see Chapter 7.

Choosing the serial port output

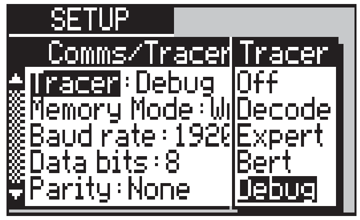
aurora^Sonata's RS232 port can be used:

- to print test results
- to output results of a BERT as it is performed
- to print a protocol information from a test call or monitor session that has been saved to aurora^Sonata's memory.
- to output protocol information while a test call or monitor session is in progress.

Note

For more information about protocol analysis, see Chapter 7.

-1- From the **Comms/Tracer Setup** menu, select **Tracer** to display a list of options:



-2- Highlight the function you want to enable, and press ***ENTER***. The options are:

Serial Port/Protocol Trace Output	
Off	Do not produce output at the serial port.
Decode	Send the decode to the serial port in standard form - i.e. a partial decode of Layer 2 and 3 information. This allows you to print the decode or view it using a PC while the call or monitor session is in progress.
Expert	Send a full output of the ISDN protocol and aurora$^{\text{Sonata}}$ operation to the serial port, in a format compatible with Trend aurora$^{\text{Expert}}$ for Windows.
BERT	Send the output generated from a BER test to the serial port.
Debug	Send the protocol decode to the serial port with additional information to be used for detailed troubleshooting by Trend engineers.

Tip

When you choose **Off**, all monitor sessions (see Chapter 5) and protocol capture sessions (Chapter 7) are automatically saved in aurora$^{\text{Sonata}}$'s memory. When you choose **Decode**, **Expert** or **Debug**, the sessions are saved to memory and aurora$^{\text{Sonata}}$ also sends the information to the serial port in the format you have selected.

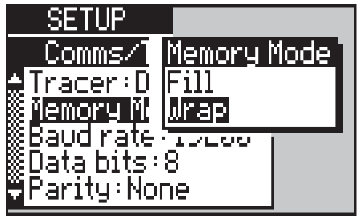
Choosing what happens when the memory is full

When you intend to save protocol data in aurora$^{\text{Sonata}}$'s memory, you can choose what happens when the memory is full.

Note

A message is displayed when aurora$^{\text{Sonata}}$'s memory is full.

-1- Select **Memory Mode.**



-2- Highlight an option and press *ENTER*. The options are:

Memory Mode	
Fill	Store data until the memory is full. After this, protocol data will not be saved.
Wrap	Store data continuously. When the memory is full aurora^Sonata begins overwriting the earliest data for the current session.

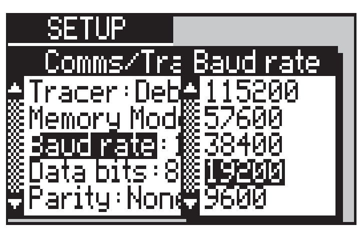
Note

This setting does not affect aurora^Sonata's 'real time buffer'—the section of memory which holds the last 8 kilobytes of protocol information. This always 'wraps' the stored information, unless the buffer is frozen. For more information about the real time buffer, see Chapter 7.

Setting the baud rate

The baud rate is the rate at which data is transmitted over the serial port. To set the baud rate:

-1- Select **Baud Rate** to display a list of possible rates, in kilobits per second:



-2- Highlight your choice and press *ENTER*.

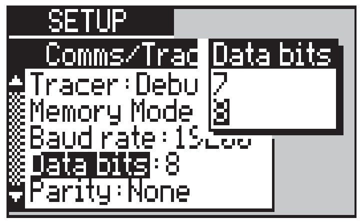
Setting the character length of serial port data

You need to specify a character length of either 7 or 8 bits for the serial port data, depending on the device to which you intend to connect your aurora[Sonata].

Note

This setting must be the same on both aurora[Sonata] and the connected device.

-1- Select **Data Bits**.



-2- Choose either **7** or **8** and press ***ENTER***.

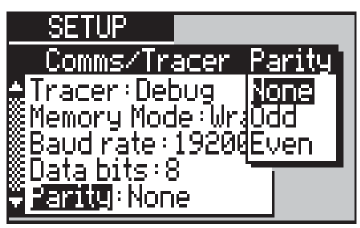
Setting the parity configuration

You need to set the parity configuration of aurora[Sonata]'s serial port to suit the device to which you are connected.

Note

This setting must be the same on both aurora[Sonata] and the connected device.

-1- Select **Parity.**



-2- Highlight the option you require and press ***ENTER***. The options are:

Parity Bit	
None	Do not use parity.
Odd	Use odd parity.
Even	Use even parity.

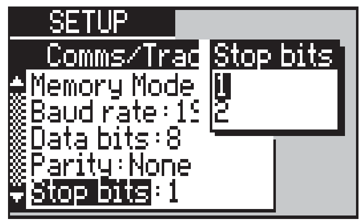
Including stop bits

Stop bits are the last bits sent in asynchronous transmission, to indicate that the message is complete. You can transmit either 1 or 2 stop bits, to suit the device to which you are connected.

Note

This setting must be the same on both auroraSonata and the connected device.

-1- Select **Stop Bits** to display an option window:

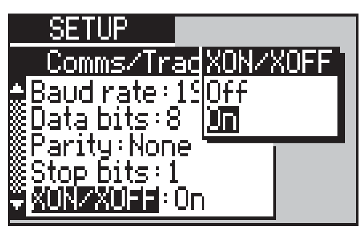


-2- Choose either **1** or **2** and press *ENTER*.

Using Xon/Xoff flow control

Xon/Xoff is a protocol which controls asynchronous flow between auroraSonata and the device to which you are connected. It allows the other device to stop and restart the flow of data it is receiving from auroraSonata.

-1- Select **XON/XOFF** to display the options:



-2- Choose either **On** or **Off** and press *ENTER*.

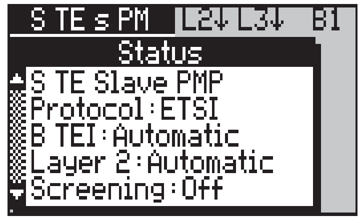
Note

It is usually best to set Xon/Xoff to **On**, on both auroraSonata and the connected device.

Checking the current setup of aurora^{Sonata}

-1- Press + 5.

A **Status** screen appears—for example:



The table below explains the status display.

aurora^{Sonata} Status Information	
Emulation	The ISDN emulation settings, consisting of the selected interface, the device aurora^{Sonata} is emulating, whether it is acting as 'master' or 'slave' of the protocol, and the type of ISDN protocol link it is configured to test. For example, **S TE Slave PMP**.
Protocol	The selected protocol. For example, **ETSI**.
B TEI	The selected method of B channel TEI assignment. For example, **Automatic**.
Layer 2	The way in which aurora^{Sonata} sets up the Layer 2 link for calls. For example, **Automatic**.
Screening	The type of call screening being used. For example, **CLI Screen**.
Encoding	The type of voice encoding being used. For example, **A-Law**.
S Bus Termination (BRI)	Shows whether a termination resistor is **On** or **Off** for testing on the S interface.
PRI Termination (PRI)	The termination selected for a Primary Rate link. For example, **75ohm**.
CRC4 (PRI)	Shows whether CRC4 error checking is **On** or **Off**.
BERT	The selected BERT pattern to be transmitted. For example, **2047 p.r.**.
Duration	The length of a BER test. For example, **Continuous**.
Tracer	The selected output at the serial port. For example, **Debug**.
Serial	The current configuration of the serial port. This consists of the baud rate, the data length, the type of parity to be used and the number of stop bits. For example, **19200 8 N 1**.

Selecting the default settings

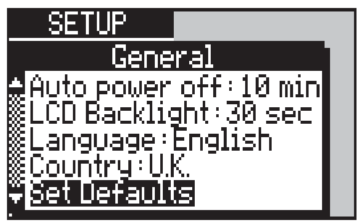
You can return the settings on aurora[Sonata] to the way they were before you changed them, by using the default settings.

Note

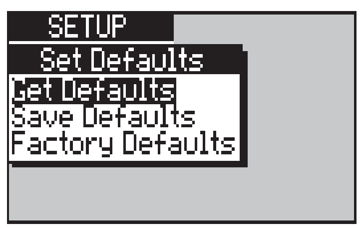
You cannot use this method to reset just one or two values—it returns ***all*** the settings to their default values.

To display the options for changing or selecting defaults:

-1- From the main **Setup** menu, select **General**. This displays the **General Setup** menu:



-2- Select **Set Defaults** to display a sub-menu for setting and selecting default values:



Get Defaults Return aurora[Sonata] to your custom settings.

Save Defaults Save the current settings as custom defaults.

Factory Defaults Return aurora[Sonata]'s settings to the way they were when your organisation first received the unit from Agilent Technologies.

Returning to the factory defaults

When you return to the factory defaults, you reset all the settings back to their original values—that is, the way they were when you first received the tester.

-1- From the **Set Defaults** menu, select **Factory Defaults**. aurora[Sonata] prompts you to confirm that you wish to select the factory defaults.

Note

This cancels any custom defaults you have set up—see *Saving the current settings as custom defaults* later in this section for details on this feature.

-2- To confirm, press the **OK** function key. To close the confirmation window without changing any settings, press *ESC*.

List of factory defaults

The following tables list aurora[Sonata]'s factory default settings.

ISDN Operation	
Mode of Operation	**Simulate**
Protocol	**First in Build**
Interface	**S**
Termination Type	**TE**
Link Type (BRI)	**PMP**
Protocol Master/Slave	**Slave**
Layer 2 Mode	**Automatic**
B TEI Allocation (BRI)	**Automatic**
Fixed B TEI Values	**Cleared (0, 0)**
Charge Mode	**Manual**
Charge Info Contained in	**Facility Message**
Charge Display (ETSI)	**Units**
AOC Type	**AOCD**
Voice Encoding	**A-Law**
S Termination (BRI)	**Off**
PRI Termination (PRI)	**120ohm**
CRC4 (PRI)	**On**
Idle Code	**11111111**

Dialling Information	
Last Dialled CPN/SUB	**Cleared**
ISDN Recall Numbers	**Cleared**
CLI/SUB to Send	**Cleared**
CLI Presentation	**Allowed**
COL/SUB to Send	**Cleared**
COL Presentation	**Allowed**
CUG	**Disabled**
CUG Index	**Cleared**
UUI String	**Cleared**

Screening	
Screening Mode	**Off**
CLI/SUB	**Cleared**
CPN/SUB	**Cleared**
EAZ Numbers	**Cleared**

Serial Port	
Baud Rate	19K2 bits/s
Data Bits	8
Parity	None
Stop Bits	1
XON/XOFF	On
Tracer Mode/Destination	Off
Memory Mode	Wrap

Dialling Setup	
CPN Numbering	Unknown
CLI Numbering Type/Plan	Unknown

BERT	
Answer	Auto
Pattern	2047
Threshold	1 Error
Duration	Continuous
Threshold Mode	Bit Errors
HRX	15%
Custom Test Length	1 Minute

General Settings	
Auto Power Off	10 Minutes
Volume Settings	All at 50% value
Screen Contrast	50% value
Language	English

One-Button Test Suite	
User Defined Tests	None
Line Config.	Test X.25 TEI range 0-63
Channel	Speech for both components
Available Services	Local teleservice test for all services available with selected protocol; all supplementary services
Line Quality	Data, 10 seconds
AOC-D	Duration 80 seconds

Saving the current settings as custom defaults

Suppose you have set up aurora^Sonata in a particular way to suit a series of tests you are performing. However, you now need to perform one test where the settings are different.

To avoid having to change the settings twice, you can save the current settings, change them for the new test and then go back to the settings you were using. To do this:

-1- From the **Set Defaults** menu, select **Save Defaults**. aurora^Sonata displays a pop-up window prompting you to confirm that you wish to save the current settings as custom defaults.

-2- To confirm, press the **OK** function key. To cancel, press *ESC*.

Note

aurora^Sonata stores these settings until the next time you return to the factory defaults, even while the tester is switched off.

Returning to the custom defaults

-1- From the **Set Defaults** menu, select **Get Defaults**. aurora^Sonata displays a pop-up window prompting you to confirm that you wish to select the custom defaults.

-2- To confirm, press the **OK** function key. To continue without changing any settings, press *ESC*.

Note

If aurora^Sonata does not return to your custom defaults, it is probably because you have returned to the factory defaults since the custom ones were set. Returning to the factory defaults always cancels your custom defaults.

Section 2 Connecting a Basic Call

This section explains how to use aurora[Sonata] to connect outgoing and incoming calls, display call status and clear calls.

Note

To set up calls, aurora[Sonata] must be in Simulation mode—that is, emulating an ISDN device or the network itself. For details, see *Choosing the operating mode* in Chapter 2 section 3.

The purpose of connecting calls

Often, the first test you would perform on an ISDN link you are provisioning or maintaining is to connect aurora[Sonata] to the line and check whether you can make a call between it and one of the following:

- another piece of ISDN equipment
- a Terminal Adaptor (TA) connected to non-ISDN equipment
- another ISDN tester
- another B channel on your own aurora[Sonata]

Once you have a connected call you can use it as the basis for testing line quality, service availability and so on. You will find full instructions for these tests in Chapter 4.

Tip

aurora[Sonata]'s ISDN Test Suite allows you to check many features of the link at the touch of a button. For an introduction to the Test Suite, see Chapter 4 section 1.

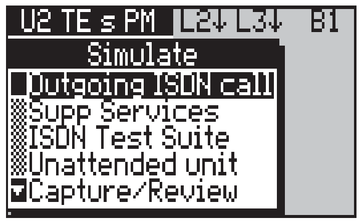
If the call fails, you can perform further tests to find out more about the problem. For example, you might test the physical link or try to make calls using other ISDN services.

Before you start

-1- Select the interface you intend to test and connect aurora$^{\text{Sonata}}$ to that interface.

-2- Set up aurora$^{\text{Sonata}}$ as described in Section 1.

-3- From the top level menu, select **Simulate**. aurora$^{\text{Sonata}}$ displays a menu listing the tasks you can perform in Simulation mode.



Selecting a channel for testing

When you make a call, aurora$^{\text{Sonata}}$ uses the channel which is currently selected. You can select a specific B channel or set up aurora$^{\text{Sonata}}$ to use any available B channel (**Bx**). You cannot connect a call on the D channel unless you have X.25 installed on your unit (see the *X.25 Operation Annex* for details), but on a Basic Rate fixed link you can perform D channel BERT—see Chapter 4 section 2 for instructions.

TN1R6-N
TN1R6-T

When TN1R6-T or TN1R6-N are selected, the **Emulation** menu has an additional setting: **L3 Protocol**. This setting determines whether it is aurora$^{\text{Sonata}}$ or the connected device that chooses the channel to be used for a call. For details, see *Identifying the Layer 3 master and slave* in Section 2 of this chapter.

When aurora$^{\text{Sonata}}$ is emulating a TE and TN1R6-N is selected, channel Bx is the default bearer channel.

Note

You cannot change channels while in the **Setup** menus.

aurora^Sonata^ shows the currently selected channel (e.g. **B01**) at the right hand side of the status bar at the top of the screen.

Switching through the channels one by one

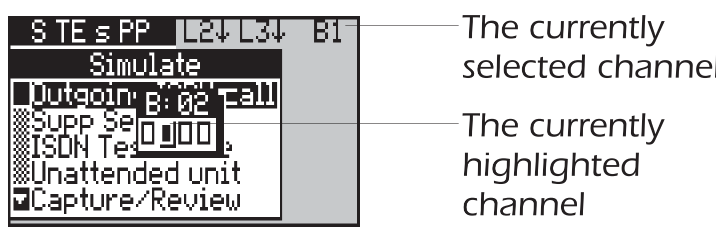
You can change channels without having to go into the channel selection screen. To do this:

-1- Press + CHAN to switch through the channels one by one. The Status bar display changes to show which channel is currently selected (**B01**, **B02**, etc.).

Changing channels using the selection screen

When you want to see the channel activity display, or when you prefer not to switch through the channels one by one (e.g. on a PRI link), you can display a graphical representation of the channels.

-1- Press the CHAN key to display a screen with a series of boxes representing the channels.



The boxes represent the B channels (2 for Basic Rate and 30 for Primary Rate, plus **Bx** (any B channel) and the D channel. At the right hand side of the status bar at the top of the screen, aurora^Sonata^ shows the currently selected channel - B1 in the BRI example above.

Each channel box contains one of a range of symbols representing activity on the channel. See *Displaying current call activity on the channels* later in this section.

Tips:

You cannot select **Bx** (any B channel) when aurora[Sonata] is set up to test a fixed link (i.e. when **L2 Protocol** is **No D Chan**).

-2- Highlight the channel you require and press *ENTER* to display the **Outgoing ISDN Call** menu for that channel.

Tips:

- To move quickly through the channels, press and hold the CHAN key.
- To move to the first or last channel on the screen (this is particularly useful for PRI operation), press ⇧ + ◀ (first channel) or ⇧ + ▶ (last channel).

Making an outgoing call—summary

The steps involved in making an outgoing call are set out below. For a detailed description of each step, see *Making an outgoing call—details* later in this section.

Note

When you change channels as described in *Selecting a channel for testing*, aurora[Sonata] automatically displays the **Simulate** menu.

-1- From the main **Simulate** menu, select **Outgoing ISDN Call**.

-2- Choose a service for the call—e.g. **Speech**.

-3- If you wish to set up dialling information for specific tests, press the **Opt** function key to access the **Dial Options** menu (see section 1).

-4- Choose the dialling mode—**En Bloc** or **Overlap**.

-5- Enter the number to be called (CPN), including a sub-address if you are using one.

-6- Press **Off Hook** (☎↑) to attempt the call.

Making an outgoing call—details

This section takes you through the details of each step in the process of making an outgoing call. For a summary, see *Making an outgoing call—summary* earlier in this section.

Choosing the service

You can use aurora[Sonata] to test the availability of the various ISDN services that can be used to make calls for a protocol. See *Bearer services and teleservices* in Chapter 4 Section 4.

CorNet-T

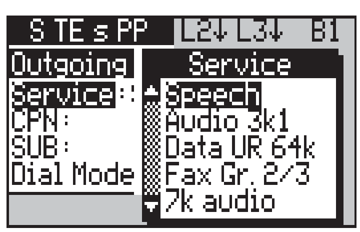
Layer 1 activation may take up to 35 seconds when connecting to a CorNet-T switch. This is a feature of the ISPBX which may vary according to load.

The results of attempting a data call from aurora[Sonata] which has been identified as a speech device (SET751 or SET500) is indeterminate.

The results of attempting a speech call from aurora[Sonata] which has been identified as a data device (DCI521 or DCI731) is indeterminate.

To choose the service for a call:

-1- From the **Outgoing ISDN Call** menu, select **Service**. aurora[Sonata] displays a window listing the services available with the protocol you are using:



-2- Highlight the service you require for the call and press ***ENTER***. For a list of the services that are available for the different protocols, see Chapter 4 section 4.

Notes on speech calls

Although you can have speech calls in progress on all B channels simultaneously, the Codec (audio coder/decoder) can only be connected to one B channel at a time. In other words, you can only talk or listen to the channel that is currently displayed on the screen.

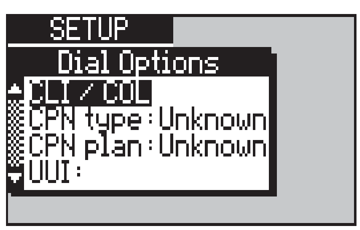
Setting up dialling information for the call

To make the testing process more convenient, aurora[Sonata] lets you access the **Dial Options** menu (see *Setting up dialling information* in section 1) from the **Outgoing ISDN Call** screen as well as from the main **Setup** menus.

You can use the **Dial Options** menu to test a number of ISDN supplementary services (see Chapter 4 section 5), use a semi-permanent connection (1TR6 only) and select a numbering plan and type for the Called Party Number and Calling Line Identity.

To display the **Dial Options** menu from the call setup screen:

-1- In the **Outgoing ISDN Call** screen, press the **Opt** function key.



For an introduction to the options on this menu, instructions for using an SPC and details on setting the CPN numbering type and plan, see section 1. The other options on the menu allow you to test ISDN supplementary services, and are described in Chapter 4 section 5.

Selecting the dialling mode

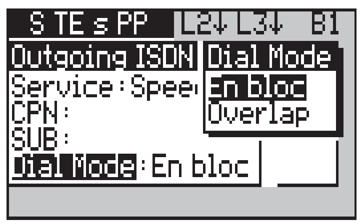
The dialling mode is the way in which the digits you dial for outgoing calls are sent to the line.

CorNet-T

If you are using Siemens HICOM ISPBX equipment with software version 3.3 or later you must use En bloc dialling. If a data call using overlap dialling is attempted, it is rejected by the ISPBX, and Cause Code 100 (Invalid information element contents) is displayed.

The call is rejected because the call is cleared by the ISPBX using an unspecified or undocumented call clearing of 52. This is a known problem of the ISPBX.

-1- From the **Outgoing ISDN Call** menu, select **Dial Mode** to display the options:



-2- Highlight the dialling mode you require and press *ENTER* to select it. The options are:

Dialling Mode	
En Bloc	The digits are all assembled in one Call Control Packet before they are sent. The entire packet is then sent at once, in the initial call setup message.
Overlap	Each digit is sent in its own Call Control Packet, either individually as it is dialled or with other digits when dialling is complete.

Note

You can only use a sub-address with En-Bloc dialling. With Overlap dialling the connection is made as soon as you have entered enough digits to identify the called party, so the call is connected before a sub-address could reach the destination.

Identifying the CPN for the call

The number to which you make an outgoing call is known as the Called Party Number (CPN).

Entering the CPN and sub-address

You enter the CPN in the same way whichever dialling mode you use, but you can only use a sub-address in En-bloc mode.

Tips:

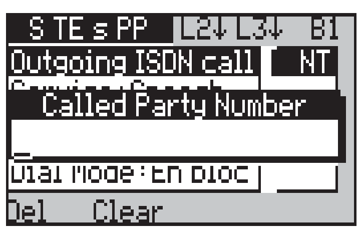
- The most recently dialled CPN and sub-address (if used) are shown on the **Outgoing ISDN Call** menu. To call this number again, simply leave it as it is and proceed with the call.
- For details on how to identify a CPN numbering plan and type, see section 1.

To change the CPN:

-1- From the **Outgoing ISDN Call** menu, select **CPN** to open an entry window.

Tip

To dial a new number instead of changing digits on the existing one, simply move the cursor to **CPN** and start typing digits. The entry window opens automatically, showing the digit you have just entered.



-2- Type the CPN (up to 20 digits). To delete a digit, move the cursor underneath it and press the **Del** function key (if the cursor is beyond the last digit, pressing **Del** deletes the last digit). To clear the entire number, press the **Clear** function key.

-3- Press *ENTER* to save the CPN. The entry window closes.

Tips:

- Instead of pressing *ENTER* to save the CPN, you can press *ESC* to return to the **Outgoing ISDN Call** menu with the previous CPN still displayed.
- You can speed-dial some numbers—see Chapter 6.

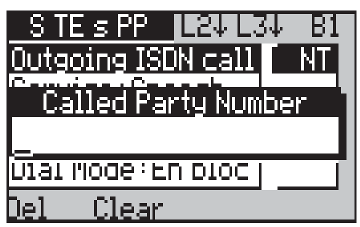
ETSI users using En-Bloc dialling can specify a sub-address for the CPN. To do this:

-1- From the **Outgoing ISDN Call** menu, select **SUB.** An entry window opens.

Tip

To dial a new sub-address instead of changing digits on the existing one, simply move the cursor to **SUB** and start typing digits. The entry window opens automatically, showing the digit you have just entered.

-2- Clear the previous sub-address if necessary by pressing the **Clear** function key.



-3- Type the sub-address (up to 19 digits). To delete a digit you can move the cursor under it and press the **Del** function key. To clear the entire number you can press the **Clear** function key.

Tip

You can cancel the new address and return to the **Outgoing ISDN Call** menu with the last address still displayed. To do this, press *ESC*.

-4- Press ***ENTER*** to save the new sub-address and close the entry window.

Notes:

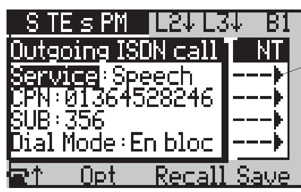
- You can only make a call to a sub-address when the dialling mode is En-bloc. See *Selecting the dialling mode* earlier in this section for details.
- The 1TR6 protocol does not use sub-addresses.

To begin the call

The way you begin the call depends on the dialling mode.

En Bloc dialling

With en-bloc dialling all the digits are sent when you have entered the whole number:



This is the window for the real-time decode display

-1- Press the **Off Hook** (☎↑) function key. aurora[Sonata] dials the CPN.

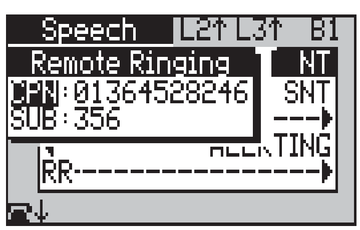
Overlap dialling

With Overlap dialling digits are dialled as you enter them.

-1- From the **Outgoing ISDN Call** menu, press the **Off Hook** (☎↑) function key. An entry window opens showing the current CPN.

-2- Select the **Dial** function key to dial the displayed digits *or* start typing to dial them.

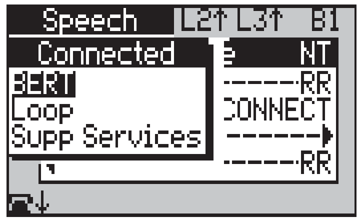
aurora[Sonata] displays the progress of the call setup. For example:



Tip

If you want to cancel the call before the called user answers, press the **On Hook** (☎↓) function key.

When the call is successfully connected, auroraSonata displays the **Connected** and **Decode** windows.



For more information about this display, see *When a call is connected* later in this section.

Receiving an incoming call

The way in which incoming calls are connected on auroraSonata depends on whether the call is a data or speech type call.

- When auroraSonata receives an incoming speech call, you always answer it manually.
- For incoming data calls, you choose in advance whether auroraSonata connects automatically or waits for you to connect manually. You would choose automatic connection when, for example, you intend to make a self call for BERT.

Tip

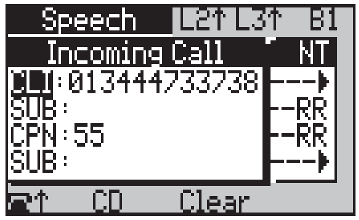
You can set up auroraSonata to screen incoming calls and present only those from or for a particular number. See Chapter 6 section 1.

Note

When no channel is free to connect the call and Call Waiting is supported, auroraSonata displays a **Call Waiting** menu. See *Incoming calls when channels are busy* later in this section. If Call Waiting is not available, the call is rejected with a User Busy Cause Code.

Answering the call manually

When aurora^Sonata receives a call which is to be connected manually, it displays an **Incoming Call** window.

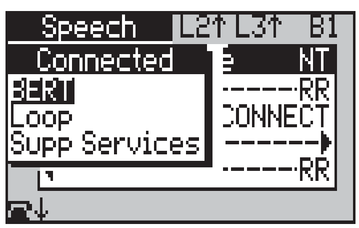


Notes:

- The **CLI** display allows you to test the CLIP/R supplementary service—see Chapter 4 section 5.
- The **CPN** display shows the number the caller dialled. This may not be the same as the connected number—for example, when the call has been forwarded.
- ETSI You can test the Call Deflection supplementary service at this point—see Chapter 4 section 5 for instructions.

To connect the incoming call:

-1- Press the **Off Hook** (☎↑) function key. aurora^Sonata displays the **Connected** screen.



To reject the call:

-1- Press the **Clear** function key. aurora^Sonata displays the Clearing Cause Code—see *Clearing an ISDN Call* later in this section for details.

When aurora^Sonata^ answers automatically

You can set up aurora^Sonata^ to connect incoming data calls automatically. You do this using the **Answer** setting in the **BERT setup** menu—see Chapter 4 section 2 for details.

Incoming calls on a background channel

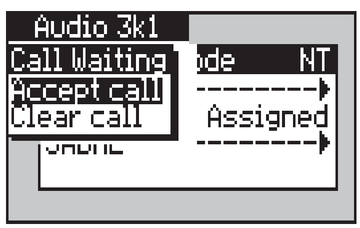
When aurora^Sonata^ receives an call on a channel other than the one currently in the foreground, it displays a pop-up message notifying you that there is a call on a background channel.

-1- To check which channel is receiving the call, press CHAN to switch to the channel activity screen (see *Displaying current call activity on the channels* later in this section).

You can then switch to this channel to accept the call.

Call Waiting notification for incoming calls

When aurora^Sonata^ receives an incoming call while all channels are busy, and Call Waiting is available, it displays the following screen:



Note

This screen is always displayed on channel B1. If you are displaying another channel in the foreground when the incoming call is received, aurora^Sonata^ displays a message prompting you to switch channels.

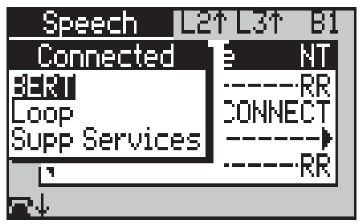
You can either accept the new call—this places the currently displayed call on hold—or reject it and return to the **Connected** window for the current call. For details on how to test Call Waiting, see Chapter 4 section 5.

Note

If Call Waiting is not supported, the call is rejected with a User Busy Cause Code.

When a call is connected

Once you have a connected call, you can use it as the basis for testing line quality, service availability and so on. You will find full information on how to use test calls in Chapter 4.



Note

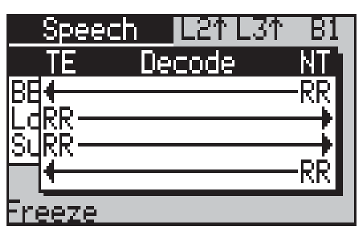
When aurora^Sonata is emulating an NT, and Advice of Charge is enabled and set up for manual generation, the **Connected** window has an **AOC** function key which you can press to generate charging information. For details on AOC, see *Advice of Charge* in Chapter 4 section 5.

About the real time decode display

During a call, aurora^Sonata displays a simple, real-time protocol decode, allowing you to identify problems on the spot.

To view all of the **Decode** display window:

-1- Press the key.



You can press the **Freeze** function key to pause the display at a particular section of decode, then return to the real-time display when you have finished examining the frozen data.

For details of the simple decode, see Chapter 7 section 1.

Restarting all channels (PRI) (ETSI) (VN4)

On a Primary Rate link you can send a Global Restart message instructing the remote end of the link to release all B channels, returning them to the Idle state.

-1- From the main **Simulate** menu, select **Restart**.

Note

aurora^Sonata displays a screen prompting you to confirm your instruction (**OK**) or cancel (**CANCEL**).

-2- Highlight your choice and press *ENTER*.

Displaying current call activity on the channels

-1- Press the CHAN key to display a screen with a series of boxes representing the channels.

The following symbols indicate the activity on each channel:

- Ringing (incoming)
- Speech call (no codec connected)
- Speech call codec connected
- Data call (no BERT connected)
- BERT pattern being transmitted
- Loop connected
- No activity

Looping back the call

A loop is a continuous transfer of information when auroraSonata transmits all data that receives. When auroraSonata receives information, it sends it back on the same channel. You would normally loop back information on a call to synchronise a BERT pattern, the BERT pattern that is transmitted by auroraSonata is also received. See Chapter 4 section 2.

PRI

Note

This section relates to a standard ‘framed’ loop—i.e. one where the data is separated into different timeslots. On a Primary Rate link you can also set up an ‘unframed’ loop, where the data is sent as a full 2-megabit stream. See *Unframed Layer 1 tests* in Chapter 4 section 2.

There are two types of loop:

- remote—information produced by auroraSonata is looped back by another device.
- local—auroraSonata loops back the information it receives from another device. You could use a local loop, for example, to return incoming BERT.

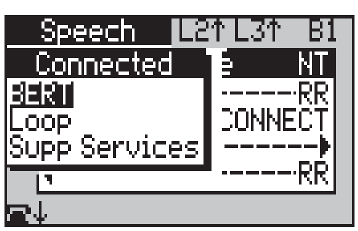
Note

In Unattended mode (see Chapter 6 section 2), auroraSonata loops back all incoming voice or data calls automatically.

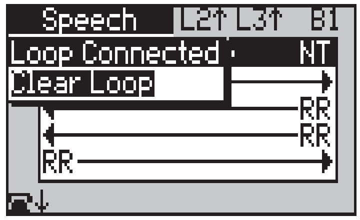
Setting up a loop

You can place loops on any B channel, individually or simultaneously, and remove a loop without disturbing any others that are set up.

When auroraSonata has a connected call:



-1- Select **Loop** to loop back the call—i.e. send the incoming data back out on the same channel.



BRI **Note**

You can also place a loop on the D channel to perform BERT on a Basic Rate fixed link. For instructions, see *BERT on the D channel* in Chapter 4 section 2.

You can press the **On Hook** (☎↓) function key to clear the call.

Clearing the loop

-1- From the **Loop Connected** window, select **Clear Loop** or press *ESC*.

Switching the Codec between speech calls

Although you can have speech calls in progress on all B channels simultaneously, the Codec (audio coder/decoder) can only be connected to one B channel at a time. When you have two or more connected speech calls, the Codec is connected to the channel you are currently displaying. To listen to a call on another B channel, you simply switch to that channel.

Getting information about the current or last call

You can display information about the current or most recent ISDN call on the channel that is currently selected.

-1- Press ⇧ + 6. aurora[Sonata] displays a screen showing the call information. The table over leaf explains the display.

ISDN Call Information	
CPN & SUB	The Called Party Number and sub-address (if used) that the caller dialled.
CLI & SUB	For an incoming call: the caller's Calling Line Identity and sub-address (if used).
COL & SUB	For an outgoing call: the Connected Line Number and sub-address (if used) of the line to which aurora^Sonata is or was connected. This may be different from the CPN that the caller dialled, since the call may have been redirected.
UUI	Any User-to-User information that has been sent or received.
Charge	Charging advice for the call.
ISDN Cause	The last received ISDN cause code. When there is a call currently connected, this is always blank.
NEBE/FEBE Count (BRI 2B1Q only)	The number of Near or Far End Block Errors.
PS1 & PS2	Shows the voltage for Power Source 1 (power supplied on the ISDN line) and Power Source 2 (power supplied via two additional pins on the ISDN interface connector).

PRI Displaying the Layer 1 alarms

On a Primary Rate link you can display a real-time count of Layer 1 alarms from the call information screen. To do this:

-1- Press the **L1** function key.

For details of the display, see Chapter 4 section 2.

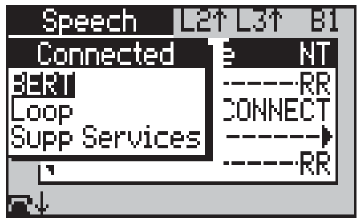
Leaving the call information screen

-1- Press *ESC*.

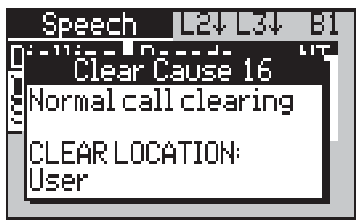
Clearing an ISDN call

The way in which a call is cleared depends on whether you initiated clearing yourself (local clearing) or whether another user or the network initiated clearing (remote clearing).

To clear the call locally



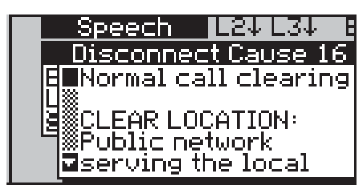
-1- Press the **On Hook** (☎↓) function key. aurora[Sonata] displays a window showing the Clearing Cause Code—see *About the Cause Codes* later in this section.



-2- Press *ESC* to close the Cause Code display. aurora[Sonata] returns to the main **Simulate** menu.

When a remote party clears the call

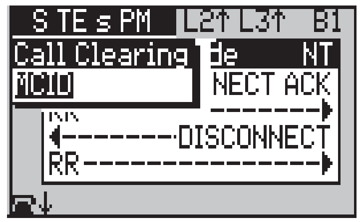
When another user or the network initiates call clearing, the call is cleared, the Clearing Cause Code its location is received in the Release Complete message is displayed (see *About the Cause Codes* later in this section for details).



Malicious Call Identification (MCID) ETSI

For an incoming call, if aurora^Sonata is configured as a TE, the call is not fully cleared. You can now test Malicious Call Identification (MCID) supplementary service. For details, see Chapter 4 section 5.

-1- Press *ESC* to leave the first display.



-2- Press **On Hook** (☎↓) to finish clearing.

When the call is fully cleared, the Clearing Cause Code received in the Release Complete message is displayed (see *About the Cause Codes* later in this section for details).

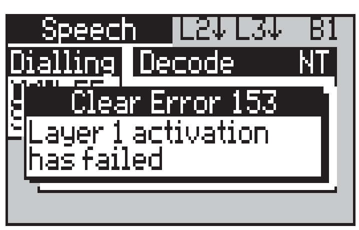
-3- Press *ESC* to leave the Cause Code display.

If you do not press **On Hook** (☎↓) or test MCID within a certain time determined by the network, the network automatically finishes clearing and goes back on hook.

-1- Press *ESC* to leave the Cause Code display.

About the Cause Codes

When a call attempt fails, or a call is cleared or disconnected, aurora^Sonata displays a **Cause Code**. This is a number which indicates the reason for failure, disconnection or clearing.



-1- Press *ESC* to leave the Cause Code display.

A glossary of the Cause Codes is provided in Appendix 2.

Tip

To display the last Cause Code that auroraSonata received, press + 6 and check the **ISDN Cause** display. This information is only shown when there are no calls connected on the current channel.

Origin of the Cause Codes

auroraSonata receives the Cause Code from the network. The message type depends upon which party initiated call clearing.

- When you clear the call, auroraSonata receives a Clearing Cause Code in the Release message.
- When a remote user or the network initiates call clearing, auroraSonata receives a Disconnect Cause Code in the Disconnect message. When you finish clearing, it receives a Clearing Cause Code in the Release Complete message.

If calls are not possible

If a call attempt is unsuccessful, first check the displayed Cause Code. You will usually want to perform further tests to find out more about the problem—for example, you can attempt a call using a different channel or service, test other equipment on the link or use auroraSonata to monitor the line.

Chapter 4

Testing in Simulation Mode

Contents

Testing in Simulation Mode

This chapter explains how to test a link by using auroraSonata to emulate ISDN equipment or the network. It is divided into sections as follows:

Section 1	Introduction
Section 2	Physical/Line Quality Checks
Section 3	Channel Testing
Section 4	Testing Service Availability
Section 5	ISDN Supplementary Services

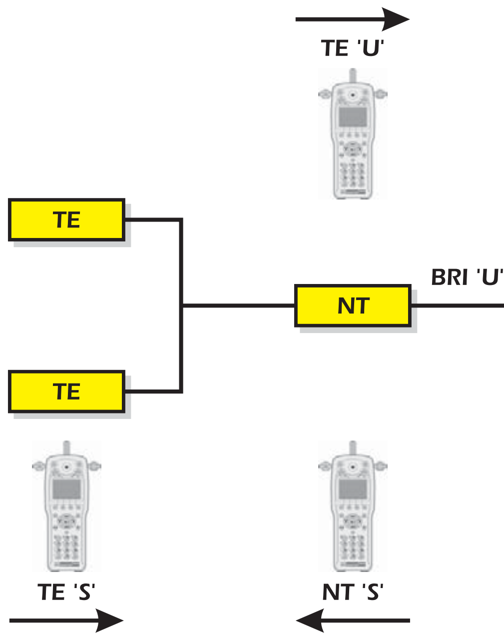
Tip

The ISDN Test Suite offers a quick way to check many of these features. See *Introducing the ISDN Test Suite* later in this section.

Connecting to the ISDN

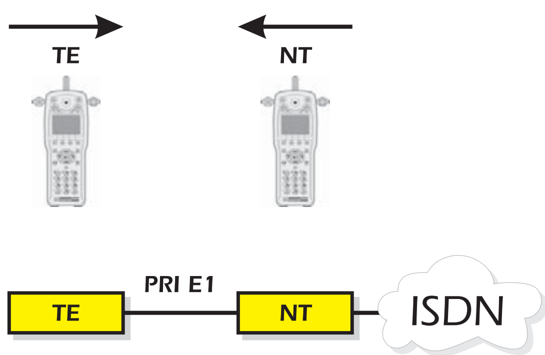
The following diagrams show the points on the ISDN where you can connect aurora[Sonata] for simulation when the appropriate interface modules are fitted.

BRI



Key	
TE	Terminal Equipment
NT	Network Termination
LT	Line Termination

PRI



Section 1 Introduction

This section includes:

- advice on simulation on Basic and Primary Rate links
- a discussion of when you might use aurora^Sonata to emulate different ISDN devices
- brief details on the types of link you can test
- an introduction to aurora^Sonata's ISDN Test Suite

BRI Simulation on a Basic Rate link

You can use aurora^Sonata for simulation on the Basic Rate S and U interfaces.

Simulation on the S interface

On the BRI S interface you can use aurora^Sonata to emulate Terminal Equipment (a TE) or a Network Termination (NT).

Using the termination resistor

The S bus must be terminated with 100Ω at each end. This is normally done by the NT and the most distant socket on the bus.

For simulation on the S bus, you must switch aurora^Sonata's 100Ω termination resistor on or off, depending on the device aurora^Sonata is emulating and the other equipment on the link. When emulating an NT, the resistor must always be **On**.

Only one TE on the interface can have the S bus termination connected at any one time. Therefore, when you need to emulate a TE on a line where there are other TEs, check whether one of the other TEs has a termination resistor. If so, you must switch aurora^Sonata's resistor **Off**. If not, you must switch aurora^Sonata's resistor **On**.

For instructions on connecting/disconnecting the resistor, see *Terminating the S bus* in Chapter 3 section 1.

Emulating a TE on the S interface

You would use aurora^{Sonata} to emulate a TE on the S interface:

- to determine whether a TE is faulty
- to check the line reliability (e.g. using BERT)
- during line provisioning or maintenance, to test the line configuration, line quality and the availability of channels and services
- to check any subscribed supplementary services

Note

You must set up the 100Ω termination resistor as appropriate.

Emulating an NT on the S interface

When you emulate an NT at the S interface you are using aurora^{Sonata} to replace the NT and the ISDN. You can use this:

- when installing a TE—you can make test calls to aurora^{Sonata} instead of the ISDN
- during line installation, to check the operation of S bus connections
- when troubleshooting a TE—to check if there is an fault with the ISDN at the S interface.

When emulating an NT, aurora^{Sonata} sends ringing tones to the TE in the same way as an exchange would do.

Notes:

- You must use an 100Ω termination resistor when emulating an NT on the S interface.
- NT powering can be supplied by an optional ‘Phantom Power Feed Box’ (PPFB) capable of supplying power to one TE on an S-bus or U interface. For more information on the PPFB, contact your Agilent Technologies representative.

Simulation on the U interface

On the U interface, you can use aurora^Sonata^ to emulate Terminal Equipment (a TE) or a Line Termination (LT) device.

Emulating a TE on the U interface

When aurora^Sonata^ emulates a TE on the U interface, it operates as both the NT1 and the TE. You would use this:

- to check the interface during line installation
- to find out whether a suspected fault is on the U interface side of the NT

aurora^Sonata^ can emulate a TE on the U interface using 2B1Q, 4B3T or Up0 line coding, when the appropriate module is fitted.

Emulating an LT on the U interface

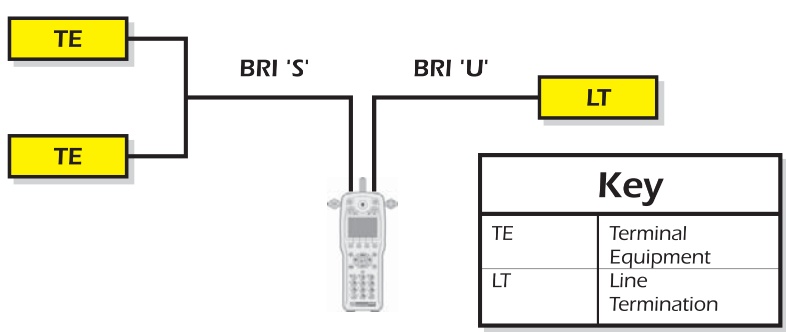
You would use aurora^Sonata^ to emulate an LT:

- to test towards the NT (check the local loop)
- to test the line from the exchange end

aurora^Sonata^ can emulate an LT on the U interface using 2B1Q, 4B3T or Up0 line coding, when the appropriate modules are fitted.

BRI 'NT replacement' test

When your aurora^Sonata^ is fitted with one S and one U interface module, you can disconnect the NT and replace it with aurora^Sonata^. This allows you to test whether the NT is faulty.



PRI Simulation on a Primary Rate link

On a Primary Rate link you can use aurora^Sonata to emulate Terminal Equipment (a TE) or a Network Termination (NT).

Terminating the link

When using aurora^Sonata for simulation on a Primary Rate link you must set its resistor to 75Ω or 120Ω to suit the equipment to which you are connecting. For instructions, see *Terminating a Primary Rate link* in Chapter 3 section 1.

Emulating a TE on a PRI link

You would use aurora^Sonata to emulate a TE on a PRI link:

- to determine whether a TE is faulty
- to check the line reliability (e.g. using BERT)
- during line provisioning or maintenance, to test the line configuration, line quality and the availability of channels and ISDN services
- to check any subscribed supplementary services

Emulating an NT on a PRI link

When you emulate an NT at the S interface you are using aurora^Sonata to replace the NT and the ISDN. You can use this:

- when installing a TE—you can make test calls to aurora^Sonata instead of the ISDN
- during line installation
- when troubleshooting a TE—to check if there is an fault with the ISDN.

When emulating an NT, aurora^Sonata sends ringing tones to the TE in the same way as an exchange would do.

Using an external source for the network clock

Normally, when aurora[Sonata] emulates an NT, it generates the network clock. However, on a Basic or Primary Rate link you can take the network clock from an external source.

-1- Connect a network link into the top connector for the S or PRI interface module, using the 4-4 cable.

Tip

This is useful, for example, when testing into a PBX which has more than one network connection. If you have any queries about this mode of operation, contact the Agilent Technologies Help Desk.

Testing ISDN links

There are two main types of ISDN link:

- links which use ISDN protocol transactions for call control. For Basic Rate such links may be either point-to-point or point-to-multipoint, while for Primary Rate they are always point-to-point (see the *Introduction to ISDN* for details).
- 'fixed' links, which do not use protocol support

For guidelines on how to set up aurora[Sonata] to test each type of link, see *Setting the emulation mode* in Chapter 3 section 1.

Notes on testing fixed links

A fixed link is a point-to-point link consisting of a single, dedicated ISDN circuit between a TE and an NT. No ISDN protocol support is used for call control, so there is no call setup process.

To test a fixed link, you must set **L2 protocol** (see *Setting the emulation mode* in Chapter 3 section 1) to **No D Chan**. During a fixed link call aurora[Sonata] displays **No D Chan**.

You can test fixed links with BRI or PRI access, provided the appropriate interface module is fitted. For Basic Rate you can test fixed links at the S interface or at the U interface using 2B1Q, 4B3T or Up0 line coding. There are two methods:

- replacing the NT with an auroraSonata
- connecting auroraSonata and another device (e.g. a Agilent Technologies ISDN tester) at either end of the link, with one emulating a TE and the other an NT

Notes:

- Because there is no D channel protocol, there is no way to tell when auroraSonata receives a fixed link call. Both ends of the link must be set up for fixed link operation.
- When auroraSonata is set up to test fixed links you do not have the option to use 'any' B channel (**Bx**) for the test. For details on channel selection, see Chapter 3 section 2.

Introducing the ISDN Test Suite

auroraSonata's ISDN Test Suite offers you a quick and easy way of performing the most common tests on an ISDN link.

If CorNet-T is selected you cannot use the Test Suite.

Displaying the ISDN Test Suite

-1- Either:

- in the top level menu, press the **Test** function key
- from the main **Simulate** menu, select **ISDN Test Suite**

How the Test Suite works

The Test Suite has five 'one-button' tests, each consisting of a different set of 'component' tests which can be enabled or disabled for a test run. Four of the tests are preconfigured to allow you to select from a specific set of components. You can configure the fifth test to suit your own requirements.

The preconfigured one-button tests

Four of the one-button tests are preconfigured with one or more of the component tests most commonly used in line provisioning. For example, the **Available services** test contains components to test ISDN teleservices and a range of supplementary services.

You can enable or disable each component before running the test. For example, for **Available services** you can choose to test only ISDN teleservices, or specific supplementary services.

Tip

To perform all the checks normally required during line provisioning, run the four preconfigured one-button tests in sequence with all components selected.

Preconfigured One-Button Tests	
Line Configurat-ion	Checks the availability of Terminal Endpoint Identifiers (TEIs) for X25 operation (ETSI and 1TR6).
Channel	Tests the availability and configuration of the B channels.
Line Quality	A Bit Error Rate Test (BERT).
Available Services	Tests the availability and operation of the ISDN teleservices, plus a series of supplementary services.

The User Defined one-button test

The fifth one-button test is available for you to customise with a set of component tests to suit your specific requirements. For example, you could set up a test to check channel availability and a series of supplementary services.

You will find instructions on how to set up a User Defined one-button test in Chapter 6 section 1.

The component tests

Each one-button test offers one or more of the following component tests for selection:

- X.25 TEI availability ETSI 1TR6
- an Outgoing Channel test
- a Full Channel test
- a Bit Error Rate Test (BERT)
- availability of each of the ISDN teleservices
- availability and operation of the Calling Line ID Presentation/Restriction (CLIP-R), Connected Line ID Presentation/Restriction (COLP/R), Sub-addressing and Advice of Charge (AOC) supplementary services

TN1R6-N TN1R6-T For TN1R6-N and TN1R6-T, the Outgoing Channel Test component is only available when **L3 Protocol** in the **Emulation** menu is set to **Master**. See *Identifying the Layer 3 master/slave* in Section 1 of Chapter 3.

TN1R6-N TN1R6-T When **L3 Protocol** in the **Emulation** menu is set to **Slave** aurora[Sonata] can only identify that a teleservice is available on a link, it cannot identify which channel the teleservice is available on.

Running a one-button test

-1- First, display the ISDN Test Suite.

-2- Highlight the one-button test you require.

Tip

You can view the current components of a one-button test by highlighting it and pressing *ENTER*.

-3- If you wish to change the setup of the test before running it, you can select the component tests to be included and set up the test details as described below.

-4- Press the **Go** function key.

Changing the component set

-1- Press *ENTER* to list the available components for the highlighted test. For example:

A tick (✓) indicates that the component is currently included in the test. To add or remove a component:

-2- Highlight the component and press *ENTER*.

Changing the test details

You need to set up test details for the components included in the one-button test. For example, for the Teleservices test you need to choose which services are to be checked.

Displaying the settings for a component

-1- With the component test highlighted, press the **Setup** function key. aurora^Sonata displays a setup screen for the component. For example:

For instructions on setting up the components for specific one-button tests, see the appropriate sections of this chapter.

Note

When you change the CPN for any individual component, aurora^{Sonata} automatically uses it for all components in all one-button tests to save you time. You can use a self-call— e.g. for BERT, if you want to use aurora^{Sonata} to perform the loopback.

During the test

While a one-button test is in progress, aurora^{Sonata} displays the results of each component on screen as they occur. You can stop the test at any time by pressing the **Abort** function key.

Viewing and printing stored results

aurora^{Sonata} stores the most recent set of results for each component test, and up to 30 sets for the BERT component.

Note

The results of a component test are also displayed on screen during and after the test.

aurora^{Sonata} lets you view the most recent results of all types of test, even if a test was performed while a different protocol was selected and is not available with the current protocol.

In other words, when CorNet-T is selected, **X.25 TEI** (for example) is still available in the **Review Results** menu and you can still use it to see the results of the most recent X.25 TEI test.

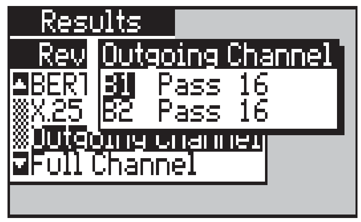
To view the results for a component test

Tip

After a test has finished you can view the results by pressing the **Results** function key.

-1- From the main **Simulate** menu, select **Review Results** to display a list of component tests.

-2- Select a test. The screen below shows typical results for the Outgoing Channel component.



If you aborted the test part way through, the results screen displays **Aborted** for each value from that point onwards.

To clear the results of a test

-1- In the **Review Results** menu, highlight the test and press the **Clear** function key.

Note

For BERT, this deletes **all** stored sets of results.

To print a set of results

-1- In the **Review Results** menu, highlight the test and press the **Print** function key.

Section 2 Physical & Line Quality Checks

This section explains the ways in which you can use aurora[Sonata] to check the physical communications interface and the quality and configuration of the ISDN line. It covers checks for:

- BRI line voltage
- the status of OSI Layers 1, 2 and 3
- BRI detection of Near/Far End Block Errors (NEBE/FEBE) at the U interface (2B1Q only)
- 1TR6 ETSI TEI availability for X.25 operation
- line quality testing (BERT)

BRI Checking the line voltage

For all Basic Rate interfaces, you can check the voltage of the line to which you are connected. aurora[Sonata] can display the voltage to an accuracy of 1V, between +250V and -250V.

-1- Press ⇧ + 6 to display the **ISDN call information** screen. For full details of this display, see *Getting information about the current or last call* in Chapter 3 section 2.

-2- Scroll down to display the **PS1** and **PS2** values.

Understanding the voltage display

For the S and Up0 interfaces, the display indicates whether the voltage is correct (**OK**), too low (**under**) or too high (**over**) for the interface. For example, on the S interface it might show **41v OK** or **33v under**.

Warning: High voltages

If the word 'over' appears after the voltage measurement for a U interface, refer to Chapter 9 section 1 for the maximum voltage that can be applied safely. A reading above this level means that a dangerous voltage may be present. Disconnect aurora^Sonata from the line, observing all safety precautions.

Checking Layer 1

Layer 1 (the 'physical' layer of the OSI 7-layer model) is responsible for the electrical, mechanical and interface aspects of transmitted data. For calls to be possible, Layer 1 needs to be active—i.e. available for passing Layer 2 frames.

Tip

You will find more information about the OSI 7-layer model in the *Glossary* and the *Introduction to ISDN*.

In Simulation mode, you can tell whether Layer 1 is active by checking the ***Line A*** LED. **Off** means that Layer 1 is not active, **flashing green** means that Layer 1 is activating and **steady green** means that Layer 1 is fully active.

Activation of Layer 1

The point at which Layer 1 activates is determined by when aurora^Sonata establishes the Layer 2 link—i.e. the **Mode** setting in the **Layer 2** menu. When this is **Permanent**, Layer 1 activates as soon as you connect to the line. When it is **Automatic**, Layer 1 activates when you make or receive a call.

For details of Layer 2 setup, see *Setting up the Layer 2 protocol* in Chapter 3 section 1.

CorNet-T

Layer 1 activation may take up to 35 seconds when connecting to a CorNet-T switch. This is a feature of the ISPBX which may vary according to the load.

The result of attempting a data call from an aurora^{Sonata} which has been identified as a speech device (SET751 or SET SET500) is indeterminate.

The result of attempting a speech call from an aurora^{Sonata} which has been identified as a data device (DCI521 or DCI731) is indeterminate.

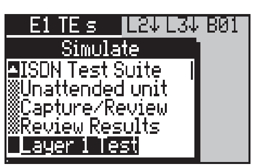
PRI Unframed Layer 1 tests

On a Primary Rate link, you can test Layer 1 by setting up an unframed loop or unframed Bit Error Rate test (BERT). ‘Unframed’ means that instead of being divided into timeslots (‘framed’), the data is transmitted as a full 2-megabit stream. You can therefore test line quality over the entire link rather than over a specific channel.

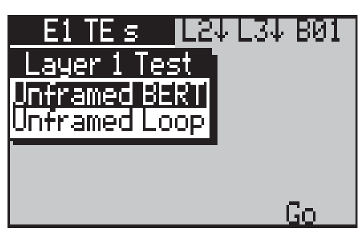
Tip

For details of how to set up a standard (i.e. framed) loop on a call, see Chapter 3 section 2. A full description of BERT and instructions on performing a framed test are provided later in this section.

Before you set up an unframed BERT or loop, check that the device to which you are connecting aurora^{Sonata} is configured to transmit and receive unframed information (i.e. it has an unframed loop).



-1- From the main **Simulate** menu, choose **Layer 1 Test**.



-2- Highlight either **Unframed BERT** or **Unframed Loop** and press the **Go** function key.

Performing an unframed BERT

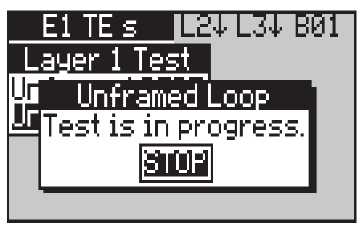
When you select **Unframed BERT**, aurora^Sonata displays the standard BERT screen for the test, setting up and running the test is performed in the same way as the standard BERT.

For full instructions, see the main *Bit Error Rate Testing (BERT)* information later in this section.

Setting up an unframed loop

When you select **Unframed Loop**, aurora^Sonata provides a loop so that all data it receives from the remote device is sent back out as a full two-megabit transmission. You would use this when performing an unframed BERT.

While the loop is set up, the following screen is displayed:



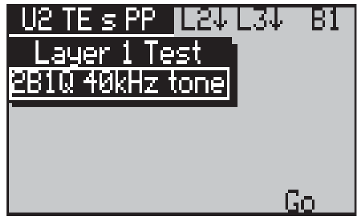
To stop the unframed loop:

-1- Press *ENTER* to select **STOP**.

BRI Sending a test tone on a 2B1Q link

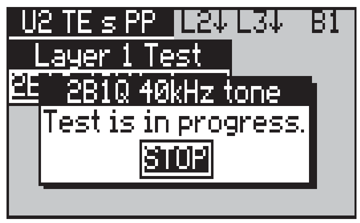
The 40kHz test is used to send a 40kHz tone at -12 dBm (decibels) across the line from the remote end, to be used by a tester at the exchange (a TIMS tester) to measure signal loss. This test may only be used on the Basic Rate U interface with 2B1Q line coding.

-1- From the main Simulate menu, choose Layer 1 Test.



-2- Highlight **2B1Q 40kHz Tone** and press *ENTER* or the **Go** function key.

aurora[Sonata] begins sending the tone down the line and displays the following screen:



To stop sending the test tone:

-3- Press *ENTER* to select **STOP**.

Note

You must turn off this test before you can exit the menu.

PRI

CRC4 error checking

When CRC error checking is enabled in the **ISDN Setup** menu (see Chapter 3 section 1), the *CRC* LED lights up red when a CRC4 error is detected. The LED remains red for as long as the error is present.

Note

For normal operation, CRC4 checking is enabled.

PRI

Returning RAI signals

When **Return RAI** is enabled in the **ISDN Setup** menu (see Chapter 3 section 1), aurora[Sonata] returns Remote Alarm Indicators (RAIs) to the remote end when it is not receiving a proper signal.

Note

For normal operation, **Return RAI** is enabled.

PRI Displaying the Layer 1 alarms

On a Primary Rate link you can display the current count of Layer 1 alarms for analysis.

-1- Press [shift key] + 6 to display the call information screen.

-2- Press the **L1** function key.

aurora^Sonata displays the Layer 1 alarm information, which updates in real time. The following table explains the display.

Layer 1 Alarms Display	
NOS	No incoming signal.*
AIS	Alarm Indication Signal received.*
LOS	Loss of Frame Synchronisation.*
RAI	Remote Alarm Indication signal received.*
FAS	The latest incoming Frame Alignment Signal word in the multiframe (as defined by ITU-T G.704).
NFAS	The latest incoming Non-Frame Alignment Signal word in the multiframe (as defined by ITU-T G.704).
CRC	Cyclic Redundancy Check 4 (CRC4).
E	The number of multiframes with CRC errors, as reported by the remote end of the connection.
Slips	The number of Frame Slips encountered. Only used in Monitor mode or when aurora^Sonata is acting as clock master.
FAS Error	The number of errored FAS words encountered while Frame Synchronisation is achieved.
HDB3 CV	The number of HDB3 code violations (bipolar variations of the same polarity).
* aurora^Sonata shows whether the alarm is currently being detected (**Y** or **N**) and displays a count of occurrences since you began monitoring the L1 alarms.	

The timer at the top left of the screen shows how long you have been monitoring the alarms.

To stop monitoring the Layer 1 alarms and return to the call information screen, press *ESC*.

Checking the status of Layers 2 and 3

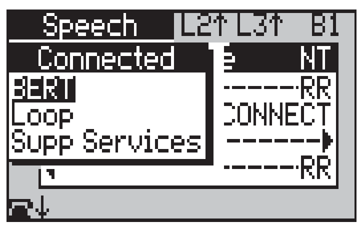
Layer 2 of the OSI 7-layer model is the Data Link layer. It performs the Link Access Procedure on the D channel (LAPD).

The Layer 3 (Network Layer) protocol provides the means to establish, maintain and terminate network connections (ISDN calls).

Tip

You will find more information about the OSI 7-layer model in the *Glossary* and the *Introduction to ISDN*.

In Simulation mode, the status of Layers 2 and 3 is indicated by vertical arrows on the Status bar. For example:



Notes

- Layer 1 must be active before Layers 2 and 3 can operate.
- If Layer 2 is not active, then Layer 3 cannot operate, since Layer 2 passes Layer 3 information along the line.

If Layers 2 and 3 are not active

If Layers 2 and 3 are not active, check that aurora[Sonata] is set up correctly for the link—the protocol is correct, the tester is configured to test the appropriate type of link, B TEI allocation is set up as required and so on.

Checking the protocol activity

When aurora^Sonata detects protocol information being passed along the line, the ***Line A*** LED shows yellow for as long as the information is present.

During a call, aurora^Sonata displays a simple decode of the protocol information. To view this, press to activate the **Decode** window in the **Connected** menu. For example:

For more detailed analysis, you can send the protocol information to aurora^Sonata's serial port or save it to memory. See Chapter 7 section 1 for instructions.

Notes

- There can be no protocol activity unless Layer 1 is active (i.e. the ***Line A*** LED must be green).
- Layers 2 and 3 must be active before the protocol information can be passed along the line.

BRI Detecting NEBE/FEBE (2B1Q)

aurora^Sonata can detect internal errors on the U interface when 2B1Q line coding is being used. Far End Block Errors (FEBE) are errors in the transmit direction, and Near End Block Errors (NEBE) are errors in the receive direction.

The ***CRC*** LED indicates NEBE/FEBE by lighting up red for as long as the error is present on the line.

Bit Error Rate Testing (BERT)

aurora^{Sonata} can perform a Bit Error Rate Test (BERT) to check the integrity and quality of the physical communications channel (Layer 1 or the physical wire).

PRI **Note**

The instructions below relate to a standard BERT, where the transmitted data is separated into timeslots. You can also perform an unframed BERT—see *Unframed Layer 1 tests* earlier in this section.

You can use BERT across the B channels to check an established ISDN link on any interface. On a BRI fixed link you can also perform D channel BERT.

Tip

You can perform BERT over voice or data type calls. However, to test audio quality it may be simpler to make a speech call to another engineer or a recorded service and listen to received voice signals in the earpiece.

How BERT works

aurora^{Sonata} generates a test pattern and transmits it repeatedly to another device, which transmits it back. aurora^{Sonata} then compares the received pattern with the original one and determines the rate of bit errors. The test passes or fails depending on whether errors occur at the rate you have set to be the 'fail' threshold for the line.

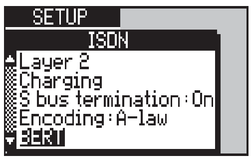
Tip

Although you can only perform one BERT at a time, you can test on two channels at once by running a self call.

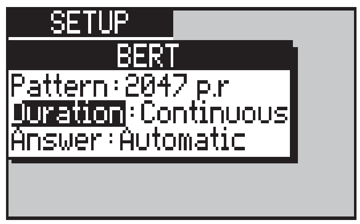
Remote and local testing

The receiving device may be another device sending a similar pattern (remote BERT) or looping the call, or your own auroraSonata (local BERT) using a self call. On a self call, auroraSonata transmits back the received pattern by looping it back to another B channel.

Setting up BERT operation



-1- From the **ISDN Setup** window, select **BERT** to display a menu of BERT settings.

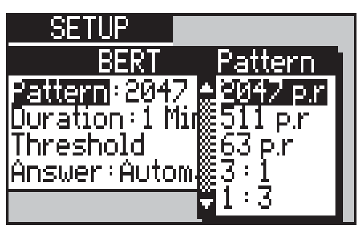


Tip

You can change the BERT settings during the call, to test with different settings on the same connection. See *Changing the BERT settings while connected* later in this section.

Choosing the test pattern

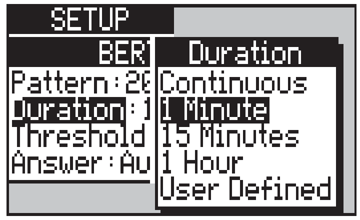
-1- Select **Pattern** from the **BERT Setup** menu to display a list of test patterns which auroraSonata can transmit for BERT. For details of the patterns, see Chapter 9 section 1.



-2- Highlight a pattern and press *ENTER*.

Choosing the length of the test

-1- Select **Duration** from the **BERT Setup** menu to display the options:

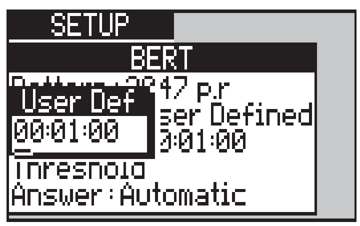


-2- Select one of the following and press *ENTER*:

- the test length you require
- **Continuous—**the test runs until you stop it. Continous BERT does not need a fail rate, so the **Threshold** setting is removed.
- **User Defined—**set a custom test length. aurora[Sonata] displays a **User Def** setting.

To set a custom (**User Defined**) test length:

-1- Select **User Def.**



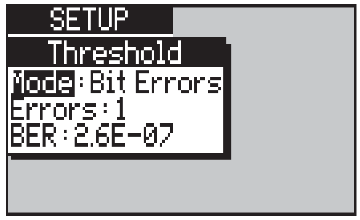
-2- Type the length in hours, minutes and seconds (two digits for each), and press *ENTER*.

Setting the fail threshold

For a timed test (i.e. when **Duration** is not **Continuous**), you need to determine the number of errors that cause the test to fail if they occur within the designated time.

The threshold you choose depends on the specification of the link you are testing. For example, if it requires a performance which is almost error-free, you would set a low threshold.

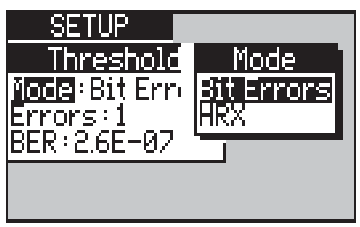
-1- Select **Threshold** from the **BERT Setup** menu.



The **BER** display shows the error rate that applies if the currently selected number of errors occur within the selected test time. The rate is shown as **x.yE-z**, where E-z means 10 to the power of z. In the above example, the rate is 2.6x10^{7}.

You can set the threshold either in terms of a number of errors or as an HRX percentage. HRX (Hypothetical Reference Connection) is a model used to study the performance of ISDN, where the percentages represent the allocation of degraded minutes and errored seconds. For details, refer to ITU-T Recommendation G.821.

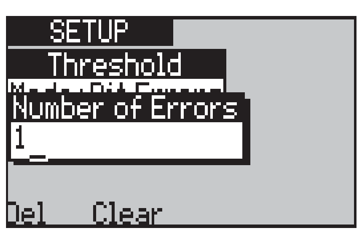
-1- Select **Mode** from the **BERT Setup** menu to display an option window.



-2- Choose either **Bit Errors**—set a number of errors as the threshold, or **HRX**—choose an HRX percentage, and press *ENTER*. The option window closes.

To set the threshold as a number of errors (i.e. **Mode** is set to **Bit Errors**):

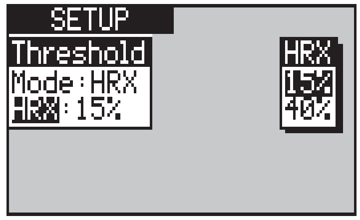
-1- Select **Errors** from the **BERT Setup** menu to display an entry window.



-2- Type a number of errors between 1 and 999999999 and press *ENTER*.

To set the threshold as an HRX percentage (i.e. **Mode** is set to **HRX**):

-1- Select **HRX** to display an option window:



-2- Choose either **15%** or **40%** and press *ENTER*.

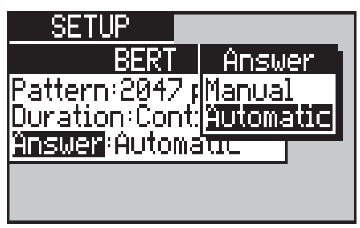
Choosing how to connect incoming data calls

You can choose whether aurora[Sonata] connects incoming data calls automatically, or whether you connect them manually.

Tip

When you intend to make data type self calls (i.e. to perform BERT using a single aurora[Sonata]), it is best to choose automatic data connection. This avoids you having to answer the incoming BERT calls and loop them back manually.

-1- Select **Answer** from the **BERT Setup** menu.



-2- Highlight the option you require and press *ENTER*. The options are:

Data Call Answer	
Manual	Data calls are connected manually. You can then loop them back manually if required.
Automatic	aurora[Sonata] automatically connects and loops back incoming data calls.

Note

In Unattended mode (see Chapter 6 section 2), aurora^Sonata always connects incoming data calls automatically, even when **Answer** is set to **Manual**.

Sending BERT results to the serial port

You can set up aurora^Sonata in advance to send BERT results to the serial port—e.g. if you want to print out the error record during the test. To do this, you need to set the **Tracer** setting in the **Comms/Tracer setup** menu to **BERT**. See *Configuring the serial port/protocol output* in Chapter 3 section 1.

Performing BERT using a connected call

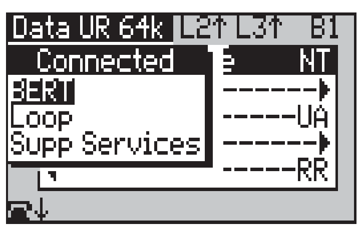
You can use BERT for quality checking across the B channels on both Data and Speech type calls.

Tip

This section explains how to perform a one-off BERT over an established connection. However, when you are testing line quality as part of a series of checks—for example, during line provisioning—you can use aurora^Sonata's ISDN Test Suite. See *Performing BERT from the Test Suite* later in this section.

To start the test

When the test call is connected:



-1- Select **BERT** to display a startup screen.

-2- Press the **Start** function key.

aurora^{Sonata} displays the length of time the test has been running (**Time:**) and counts bit errors as they are detected. You can scroll through this display.

For details of the error display, see *Understanding the bit error display* later in this section.

At any time you can stop the test manually, insert an error or reset the counters to zero.

Checking that the patterns are synchronised

For BERT to be reliable, the pattern aurora^{Sonata} receives back across the line must be synchronised with the pattern it is transmitting, so that they can be compared.

To check that this is the case, look at the ***BERT Sync*** LED. **Steady green** means that the patterns are synchronised. If they are out of step, check that the remote end is looping back and sending the same pattern as your aurora^{Sonata}.

BRI

Notes

- BERT statistics are not recorded until synchronisation is achieved.
- You can loop back information on the D channel to synchronise BERT patterns, but only on a Basic Rate fixed link.

Checking that the test is working properly

At the start of the test, you can inject a single bit error into the data stream and check that it is detected. To do this:

-1- Press the **Error** function key.

-2- Check that the error has been detected.

-3- Press the **Reset** function key to reset the counters to zero and begin the 'real' test.

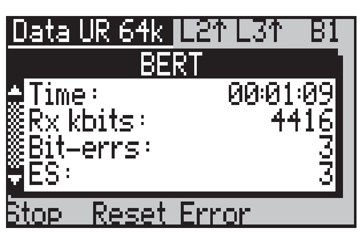
Understanding the bit error display

During the test, you can scroll up and down through the on-screen results. The table below explains the display.

BERT Results Display	
Time	The length of time the test has been running, in hours, minutes and seconds.
Rx kbits	The number of kilobits of data received while the test is running and the patterns are synchronised.
Bit-errs	The number of bit errors received while the test is running and the patterns are synchronised.
ES	The number of Errored Seconds. An errored second is any second during which one or more bit errors are received.
S-loss	The number of occasions when pattern synchronisation has been lost.
BER	The Bit Error Rate, displayed in exponential format.
SES	The number of Severely Errored Seconds. A severely errored second is one in which the bit error rate is worse than 1×10^{-3}.
US	The number of Unavailable Seconds during the test. These are seconds in which the error rate is so high that the link is considered to be unavailable.
DM	The number of Degraded Minutes during the test. A degraded minute is one in which the bit error rate is worse than 1×10^{-6}.

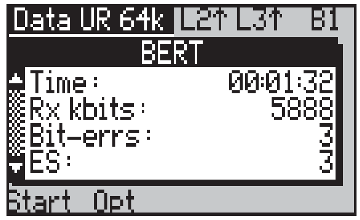
Stopping the test manually

You can stop a BER test manually at any time. You might do this when **Duration** is **Continuous** and you want to end testing, or when you want to perform a new test with different BERT settings.



-1- Press the **Stop** function key.

aurora[Sonata] stops the test and remains in the error display.



You can return to the main **Connected** window for the test call, or start a new BER test with the counters back at zero.

Tip

You can press **Opt** to change the way BERT operates without having to disconnect the test call. See *Changing the BERT settings while connected* below.

To start a new test:

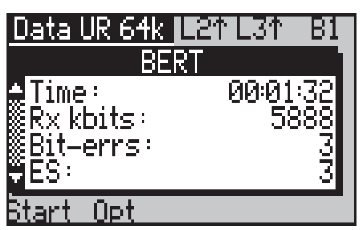
-1- Press the **Start** function key.

To return to the **Connected** window for the test call:

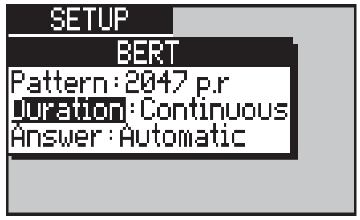
-1- Press *ESC*.

Changing the BERT settings while connected

When a BERT test has stopped, either automatically or because you stopped it manually, you can change the way BERT is performed (e.g. set a different fail threshold) and start a new test without having to disconnect the call.



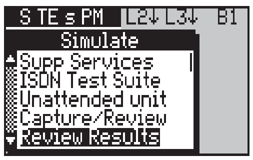
-1- In the error display for the previous test, press the **Opt** function key. The **BERT Setup** menu is displayed.



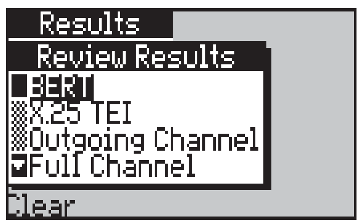
For details of these settings, see S*etting up BERT operation* earlier in this section.

Viewing stored BERT results

aurora[Sonata] can store up to 30 sets of BERT results.



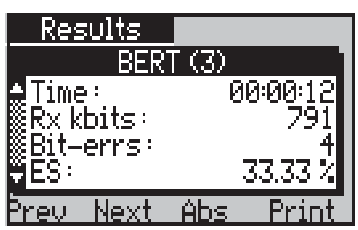
-1- From the main **Simulate** menu, select **Review Results**. aurora[Sonata] displays a sub-menu from which you can choose the type of test results you wish to view:



Note

If you press the **Clear** function key while **BERT** is highlighted, aurora[Sonata] deletes ***all*** stored sets of BERT results.

-2- Select **BERT**. aurora[Sonata] displays a **BERT results** screen showing the results of the last test that was saved to memory.



You can now:

- view other sets of stored results by pressing the **Next** and **Prev** function keys

- display the results as percentages (bit errors over received bits) rather than absolute values. To switch to percentage format, press the **%** function key. To switch to absolute values, press the **Abs** function key.
- print the currently displayed set of results
- press *ESC* to leave the results display

Performing BERT from the Test Suite

~~CorNet-T~~ When CorNet-T is selected the Test Suite is not available.

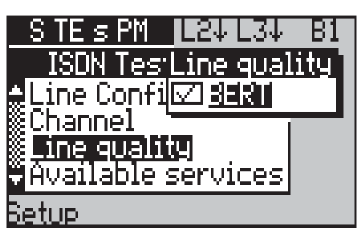
You can use aurora[Sonata]'s ISDN Test Suite to perform BERT quickly and easily, either on its own or as part of a series of checks—for example, during line provisioning. For a full introduction to the ISDN Test Suite and its applications, see *Introducing the ISDN Test Suite* in section 1.

Apart from the settings described in *Setting up the test* below, the test uses the main BERT settings.

Setting up the test

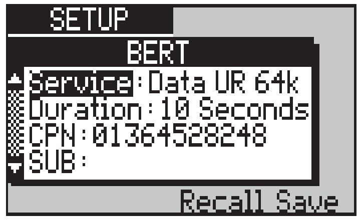
-1- Display the ISDN Test Suite as described in *Introducing the ISDN Test Suite* in section 1.

-2- Highlight **Line quality** and press *ENTER*. aurora[Sonata] displays a screen showing that the **Line quality** test includes a BERT component.



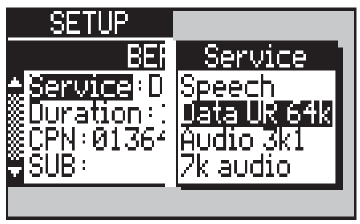
Press *ENTER* if required to place a tick in the box next to **BERT**.

-3- Press the **Setup** function key to display the settings for the BERT component.



-4- To select the service for the test call:

- Select **Service**.



- Highlight the service you require and press *ENTER* to close the option window.

-5- To change the test length:

- Select **Duration** to display an option window.
- Highlight the duration you require, or **User Defined** if you wish to set a custom duration. Press *ENTER* to close the option window.
- To enter a custom (i.e. **User Defined**) duration, select **User Def** to display an entry window. Type a time in hours, minutes and seconds (two digits for each) and press *ENTER*.

-6- To set the CPN for the test call, select **CPN** to open an entry window and enter a CPN as normal (see Chapter 3 section 2 for instructions). For a self call, the CPN is the number of the line to which aurora[Sonata] is connected. With the ETSI protocol, you can also select **SUB** and enter a sub-address if required.

Note

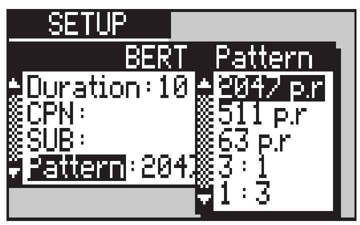
If you set a new CPN here, it is used for all components of all one-button tests.

Tip

You can use the **Recall** and **Save** function keys to access numbers in aurora[Sonata]'s speed-dial directory (see Chapter 6 section 1).

-7- To select the BERT pattern for the test:

- Select **Pattern**.



- Highlight the pattern you require and press *ENTER* to close the option window.

-8- When you have set up the test details, press *ESC* to return to the **Line quality** component display and *ESC* again to return to the main ISDN Test Suite.

-9- With **Line quality** still highlighted, press the **Go** function key.

Note

During the test any incoming calls are answered automatically and a loop applied to the relevant B channel, irrespective of call type and answer mode settings.

Understanding the test results

During the test, aurora$^{\text{Sonata}}$ displays the error count (see *Performing BERT using a connected call* earlier in this section). If the call fails during the test, the test stops and aurora$^{\text{Sonata}}$ displays the Cause Code. When the test is complete, aurora$^{\text{Sonata}}$ displays the final results.

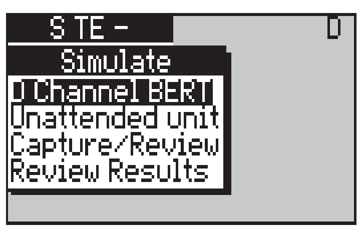
BRI BERT on the D channel

To test a Basic Rate fixed link you have the option to perform BERT on the D channel as well as the standard B channel test.

Notes:

- Do not attempt to perform D channel BERT on a live signalling line, as this could damage the operation of the switch and put the line out of service.
- For fixed link testing you must set **L2 protocol** in the **Emulation Setup** menu to **No D Chan**. See *Setting the emulation mode* in Chapter 3 section 1.

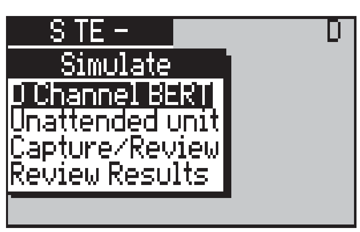
-1- Select the D channel as normal. (See *Selecting a channel for testing* in Chapter 3 section 2.) A **D Channel BERT** option appears on the main **Simulate** menu.



Note

You cannot access the ISDN Test Suite from this menu.

-2- Select **D Channel BERT**.



-3- Select the test option you require:

D Channel BERT	
BERT	Performs BERT on the D Channel.
Loop	Loops back the BERT pattern at the receiving end.

Section 3 Channel Testing

This section explains how to test the availability and configuration of the B channels for ISDN calls.

Although you can check that a channel is available for calls against a single ISDN bearer service by connecting a call using the appropriate service, the simplest way to perform a complete channel check is to use aurora^Sonata's ISDN Test Suite.

Tip
For an introduction to the ISDN Test Suite and its applications, see *Introducing the ISDN Test Suite* in section 1.

The Test Suite allows you to test channel availability and/or configuration against a range of ISDN bearer services. You might perform these checks as part of a series of tests—for example, during line provisioning.

Checking channels from the Test Suite

~~CorNet-T~~ When CorNet-T is selected the Test Suite is not available.

There are two available components for the **Channel** test:

- Outgoing Channel test—establishes and clears an outgoing call on each B channel in turn. This tests channel availability.
- Full Channel test—establishes a call on each B channel until all channels have an active call, then clears the calls in the order in which they were established. This tests the configuration of the B channels.

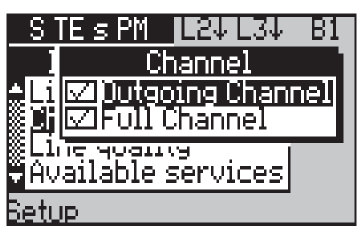
A channel test passes if incoming and outgoing calls are established successfully and cleared normally. It fails when calls are not established successfully, or are cleared with abnormal causes.

Setting up the test

TN1R6-N TN1R6-T For TN1R6-N and TN1R6-T, the Outgoing Channel Test component is only available when L3 Protocol in the Emulation menu. See *Identifying the Layer 3 master/slave* in Section 1 of Chapter 3.

-1- Display the ISDN Test Suite. For instructions on how to do this and general information about the Test Suite, see *Introducing the ISDN Test Suite* in Section 1.

-2- Highlight **Channel** and press ***ENTER***. aurora[Sonata] displays a screen showing that the **Channel** one-button test has Outgoing Channel and Full Channel test components.



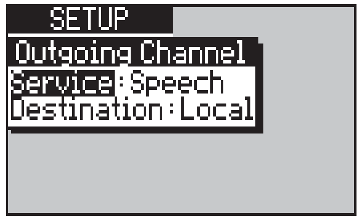
Press ***ENTER*** if necessary to place a tick in the box next to each component you require.

-3- Set up the details for the components you have selected, as described overleaf.

Setting up the Outgoing Channel test details

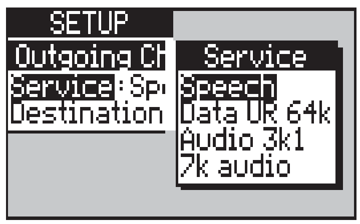
To change the operation of the Outgoing Channel component:

-1- In the **Channel** component display screen, highlight **Outgoing Channel** and press the **Setup** function key.



-2- To choose the bearer service for the test calls:

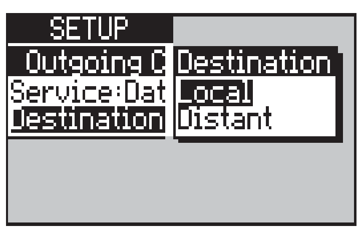
- Select **Service**.



- Highlight the service you require and press *ENTER* to close the option window.

-3- You can perform a local test (to the exchange) or a distant test (to a remote user).

- Select **Destination**.



- Highlight either **Local** or **Distant** and press *ENTER* to close the option window.

For a distant test you need to enter the number of the remote device. When you select **Distant**, the **CPN** and (ETSI only) **SUB** settings are added to the setup menu.

-4- Enter the CPN and sub-address for a distant test, if required.

Notes:

- If you set a new CPN here, it is used for all components of all one-button tests.
- If you send the CPN, aurora^Sonata waits for an Alerting message (speech calls) or a Connect message (data calls) before releasing the call. If you do not, it waits for a Setup Acknowledge message for speech and data calls.

To set up a new CPN for the test:

- Select **CPN** to display an entry window. Enter a CPN as normal—for instructions, see *Identifying the CPN for the call* in Chapter 3 section 2.
- ETSI Select **SUB** if required and repeat the process.

Tip

You can use the **Recall** and **Save** function keys to access numbers in aurora^Sonata's speed-dial directory. For details on speed-dialling, see Chapter 6 section 1.

-5- When you have set up the test, press *ESC* to return to the **Channel** component display.

Setting up the Full Channel test details

To change the operation of the Full Channel component:

-1- In the **Channel** component display screen, highlight **Full Channel** and press the **Setup** function key.

-2- Select the bearer service and the CPN, as described for the Outgoing Channel test.

Note

The Full Channel test is always Distant, so there is no **Destination** setting.

-3- Press *ESC* to return to the **Channel** component display.

Beginning the Channel test

When you have selected the component tests and set them up as described above:

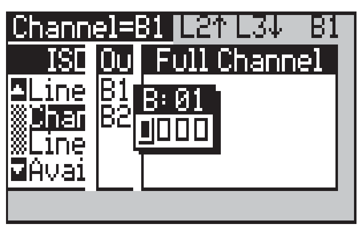
-1- Return to the main ISDN Test Suite.

-2- With **Channel** highlighted, press the **Go** function key.

Understanding the test results

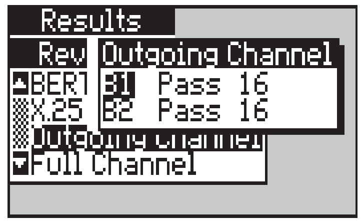
During the **Channel** one-button test, aurora[Sonata] displays the results for each component in real time. The Status bar shows the channel currently being checked.

The results are shown in textual form as the test progresses. For the Full Channel component, aurora[Sonata] displays channel boxes to show the progress of the test. For example:



When the test is complete, aurora[Sonata] lists the results for all channels that have been tested.

The example screen below shows a typical set of results for the Outgoing Channel component performed on a Basic Rate link. aurora^{Sonata} stores the most recent set of results for each component, and you can view them from the **Review Results** menu (see section 1).



Section 4 Testing Service Availability

This section explains how to test the availability of telecommunications services for ISDN calls, and TEI availability for X.25 operation.

Bearer services and teleservices

A bearer service (e.g. Data 64K) provides the basic capability for transmission of signals between user-network interfaces. A teleservice (e.g. Telex) provides the complete capability for communication between users by means of terminals, network functions etc., according to established protocols.

The services supported by aurora[Sonata] are listed below:

Bearer services and teleservices							
	ETSI	1TR6	CorNet-N	CorNet-T	TN1R6-N	TN1R6-T	VN4
Speech	✓	✓	✓	✓	✓	✓	✓
Audio 3K1	✓	✓	✓	✗	✓	✓	✓
Data UR 64K	✓	✓	✓	✓	✓	✓	✓
Fax Group 2/3	✓	✗	✓	✗	✗	✗	✓
7K Audio	✓	✓	✓	✗	✓	✓	✓
3K1 Audio	✓	✗	✓	✗	✗	✗	✓
7K Telephony	✓	✗	✓	✗	✗	✗	✓
Fax Group 4	✓	✓	✓	✗	✓	✓	✓
Video	✓	✓	✓	✗	✓	✓	✓
Teletext	✓	✓	✓	✗	✓	✓	✓
Data 56K	✓	✗	✓	✗	✗	✗	✓
Videotext New	✓	✓	✓	✗	✓	✓	✗
Videotext 64K	✓	✓	✓	✗	✓	✓	✗
X.21 UC 19	✓	✓	✓	✗	✓	✓	✗
X.25 B Channel	✓	✗	✓	✗	✗	✗	✗
Mixed mode	✗	✓	✗	✗	✓	✓	✓
Fax Group 3	✗	✓	✗	✗	✓	✓	✗
X.25 UC10	✗	✓	✗	✗	✓	✓	✗
Video 3K1	✗	✓	✗	✗	✓	✓	✗
Video 7K	✓	✗	✓	✗	✗	✗	✗
Eurofile	✓	✗	✗	✗	✗	✗	✗
FTAM App	✓	✗	✗	✗	✗	✗	✗
Fax 3c	✓	✗	✗	✗	✗	✗	✗
Videophone	✗	✗	✗	✗	✗	✗	✓
OSI	✗	✗	✗	✗	✗	✗	✓
Minitel	✗	✗	✗	✗	✗	✗	✓
Telex	✗	✗	✗	✗	✗	✗	✓
MXSX.400	✗	✗	✗	✗	✗	✗	✓
Videotext Int	✗	✗	✗	✗	✗	✗	✓

Testing services from the ISDN Test Suite

You can check that an individual bearer service or teleservice is available by connecting a call using that service. However, when you need to check the availability of more than one ISDN teleservice (for example, during line provisioning), the quickest and easiest method is to use aurora^{Sonata}'s ISDN Test Suite.

~~CorNet-T~~ When CorNet-T is selected the Test Suite is not available.

TN1R6-N TN1R6-T When **L3 Protocol** in the **Emulation** menu is set to ***Slave*** aurora^{Sonata} can only identify that a teleservice is available on a link, it cannot identify which channel the teleservice is available on.

Tip

For an introduction to the ISDN Test Suite and its applications, see *Introducing the ISDN Test Suite* in section 1.

How the test works

Before running the test, you select a range of services to be checked. aurora^{Sonata} sets up a series of calls to an exchange or remote device which you have selected, using each service in turn. Each call is either accepted or rejected. If a service is not available, aurora^{Sonata} marks the service as having 'failed' and moves on to the next service.

Note

aurora^{Sonata} also marks the service as a **Fail** and moves on to the next one if the test call fails with an internal cause—i.e. a Cause Code above 127.

Setting up the test

-1- Display the ISDN Test Suite. For instructions on how to do this and general information about the Test Suite, see *Introducing the ISDN Test Suite* in section 1.

-2- Highlight **Available services** and press *ENTER*. aurora[Sonata] displays a screen listing the component tests that can be included in the **Available services** one-button test.

Press *ENTER* if necessary to place a tick in the box next to **Teleservice**.

Note

When aurora[Sonata] is emulating a TE, the list includes a number of other components, which are used to check ISDN supplementary services. You would often run **Available Services** with the Teleservice component plus one or more of these other components. For details of the supplementary service checks, see section 5.

-3- Set up the Teleservice test details as described overleaf.

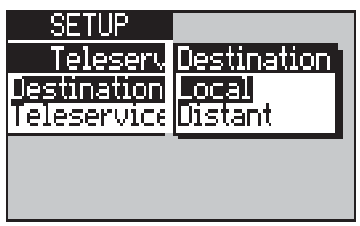
Setting up the Teleservice test details

When you have selected the Teleservice component test, you can set up the test details as follows:

-1- In the **Available services** component display screen, highlight **Teleservice** and press the **Setup** function key.

-2- You can choose to perform either a local test (to the local exchange) or a distant test (to a remote user). To do this:

- Select **Destination** to display an option window.



- Highlight either **Local** or **Distant** and press ***ENTER***. The option window closes.

For a distant test you need to enter the number of the remote device. When you select **Distant**, the **CPN** and (ETSI only) **SUB** settings are added to the setup menu.

-3- Enter the CPN and sub-address for a distant test, if required.

Note

If you set a new CPN here, it is used for all components of all one-button tests.

To set up a new CPN for the test:

- Select **CPN** to display an entry window. Enter a CPN as normal—for instructions, see *Identifying the CPN for the call* in Chapter 3 section 2.

ETSI

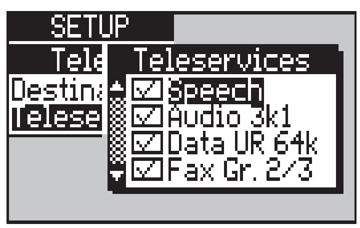
- Select **SUB** if required and repeat the process.

Tip

You can use the **Recall** and **Save** function keys to access numbers in aurora[Sonata]'s speed-dial directory. For details on speed-dialling, see Chapter 6 section 1.

-4- You need to select the services to be checked during the test. For example, you may want to check only those services that are available on the network you are testing.

- Select **Teleservices**. aurora[Sonata] displays a list of the services which can be checked.



- Select the services to be checked by pressing *ENTER* to tick or clear the appropriate boxes.

- Press *ESC* to return to the setup menu.

-5- When you have set up the test details, press *ESC* to return to the **Available services** component display, and *ESC* again to return to the main ISDN Test Suite.

Beginning the *Available Services* test

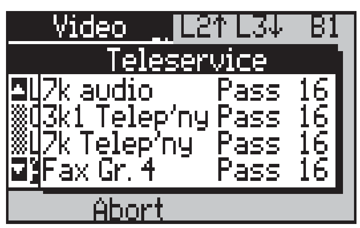
When you have selected the test components and set up the test as described above:

-1- Return to the main ISDN Test Suite.

-2- With **Available services** highlighted, press the **Go** function key.

Understanding the Teleservice test results

As the Teleservice component test proceeds, aurora[Sonata] displays the result (**Pass** or **Fail**) for each service being tested. **Pass** means that the test call for the service was successfully established and cleared normally. **Fail** means that the call could not be established, or was cleared with an abnormal cause.



The Status bar shows the service currently being checked. In the above example, aurora[Sonata] is checking Video.

When the test is complete, aurora[Sonata] lists the results for all services that have been tested. It also stores the most recent set of results for the Teleservice component—you can view this from the **Review Results** menu (see section 1).

Tip

Where a service fails, you can display a description of the Cause Code for the test call by highlighting the result line for the service and pressing ***ENTER***.

Checking TEI availability for X.25 ETSI 1TR6

As well as TEIs for ISDN operation, the network assigns TEIs for the use of D channel X.25. There are 63 possible values.

You can use aurora^{Sonata}'s ISDN Test Suite to check which TEIs are assigned in the network for D channel X.25.

How the test works

Before running the test, you set up a range of TEIs to be tested. When you start the test aurora^{Sonata} transmits a series of Layer 2 SABMEs, one at a time, each containing SAPI 16 and one of the TEIs in the range you have set up.

If aurora^{Sonata} receives a response from the network, it means that the network has recognised the TEI, and aurora^{Sonata} indicates a ‘pass’. If the network does not respond within one second, the TEI has not been accepted and aurora^{Sonata} indicates a ‘fail’. When each TEI has been checked, aurora^{Sonata} proceeds to the next one in the range.

Setting up the test

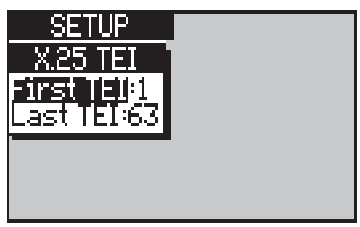
-1- Display the ISDN Test Suite (see *Introducing the ISDN Test Suite* in Section 1).

-2- Highlight **Line Config**. and press *ENTER*. aurora[Sonata] displays a screen showing that the **Line Configuration** one-button test includes an X.25 TEI component test.

Press *ENTER* if required to place a tick in the box next to **X.25 TEI**.

-3- Set the range of TEIs to test. To do this:

- Press the **Setup** function key. aurora[Sonata] displays a screen for you to set the first and last TEIs in the range to be checked.



- Select **First TEI**.

- Enter a number between 1 and 63 (you cannot enter a higher number). When there are two digits already in the entry window, you can overtype them.

- Press *ENTER* to save the displayed TEI and return to the setup screen.

- Select **Last TEI** and repeat the process for the last TEI in the test range.

-4- When you have set up the test details, press *ESC* to return to the **Line Configuration** component display and *ESC* again to return to the main ISDN Test Suite.

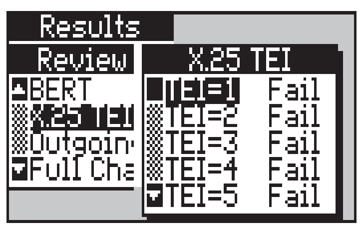
Starting the test

-1- With **Line Config**. highlighted, press the **Go** function key.

Understanding the test results

During the test aurora[Sonata] displays the result (**Pass** or **Fail**) for each TEI in the range being tested. The Status bar displays the TEI currently being checked. When the test is complete, aurora[Sonata] lists the results for all TEIs in the tested range.

aurora[Sonata] stores the most recent set of results for the component, and you can view them from the **Review Results** menu (see section 1). For example:



Section 5 Supplementary Services

Supplementary services are additional ISDN services which are available by subscription. They modify or supplement the functions of bearer services or teleservices.

This section introduces each of the supplementary services that you can test, and explains how to check that it is supported on the network and operating as specified for the protocol.

Your auroraSonata must be configured to test supplementary services, and must be emulating a TE (Terminal Equipment).

Services supported by auroraSonata

auroraSonata allows you to check the availability and operation of the following supplementary services:

- ETSI 1TR6 — Call Forwarding
- ETSI — Call Deflection
- CorNet-N CorNet-T VN4 ETSI — User to User Signalling
- BRI — Call Suspend/Resume (Terminal Portability)
- ETSI 1TR6 — Call Hold/Retrieve
- ETSI 1TR6 — Three Party Calls
- ETSI — Explicit Call Transfer
- ETSI 1TR6 — Call Waiting
- ETSI — Malicious Call Identification
- Calling Line ID Presentation/Restriction
- Connected Line ID Presentation/Restriction

- ~~CorNet-T~~ Advice of Charge (AOC)
- ~~1TR6~~ ISDN Sub-addressing
- ETSI 1TR6 Closed User Groups (CUG)

Call Forwarding ETSI 1TR6 VN4

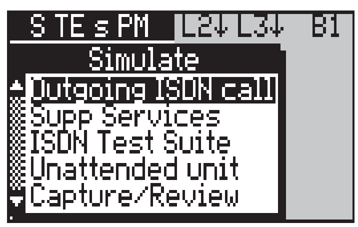
Call Forwarding allows the subscriber to send incoming calls to a different number. Various types of Call Forwarding are available, depending on the protocol being used.

Note

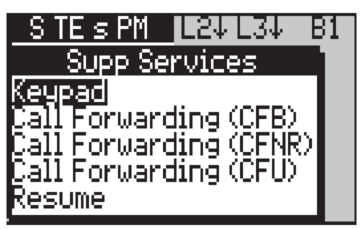
Call Forwarding is set up in advance for future incoming calls. It is not the same as Call Deflection, which deflects a single call when it is presented. For details on Call Deflection, see *Testing services for incoming calls* later in this section.

Setting up Call Forwarding

-1- Display the main **Simulate** menu.



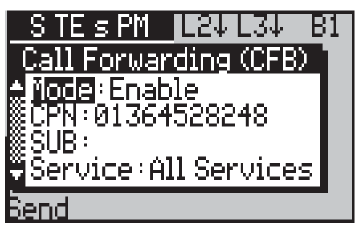
-2- Select **Supp Services**. aurora[Sonata] displays a list of the services available before call setup for the selected protocol. For example:



-3- Select the type of Call Forwarding you require:

	Types of Call Forwarding	
ETSI	Busy (CFB)	Forward calls when the line is busy.
ETSI	No Reply (CFNR)	Forward calls that are not answered within a certain time (the time is defined by the network).
ETSI	Unconditional (CFU)	Forward all incoming calls.
VN4	Unconditional or No Reply (CFU/CFNR)	Forward all incoming calls OR forward calls that are not answered within a certain time (the time is defined by the network). The type of call forwarding depends on the service subscribed to.
1TR6	AWS1	Forward all incoming calls.
1TR6	AWS2	Forward calls that are not answered

auroraSonata displays a setup screen for the type of Call Forwarding you have selected. For example:



Mode Enables or disables this type of Call Forwarding.

CPN Identifies the CPN to which calls are to be forwarded.

ETSI VN4 **SUB** The sub-address for the CPN.

ETSI **Service** Allows you to forward a specific type of call—e.g. all speech calls.

-4- To enable or disable the type of Call Forwarding you have selected:

- Select **Mode** to display an option window.
- Highlight **Enable** or **Disable** and press *ENTER*. The option window closes.

-5- Identify the number to which the calls are to be forwarded. To do this:

- Select **CPN** to display a CPN entry window.
- Type the number and press *ENTER* to save it. The entry window closes.
- ETSI VN4 Select **SUB** and enter a sub-address, if required.

ETSI VN4 **Note**

When aurora[Sonata] is set up to test a Basic Rate point-to multipoint link, the Call Forwarding setup screen has a **CLI options** selection, which displays the **CLI/COL** menu. You **must** set up a CLI to test Call Forwarding.

ETSI **-6-** To identify the type of call to be forwarded:

- Select **Service** to display a list of general call types.
- Highlight the type of call to be forwarded, or **All Services** for all call types.
- Press *ENTER* to save your selection and close the option window.

-7- Press the **Send** function key to send the forwarding request to the network. aurora[Sonata] displays a pop-up window to confirm that the network has accepted the service invocation. Press *ESC* to close the pop-up window.

Testing Call Forwarding

To test Call Forwarding, you can set up auroraSonata to forward to another terminal or ISDN tester at the destination number, then make a call to your auroraSonata (this may be a self call) to check that it is forwarded correctly.

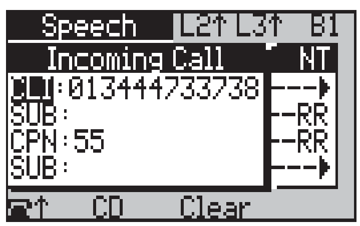
Call Deflection (ETSI)

Call Deflection allows a subscriber receiving an incoming call to send it to another number.

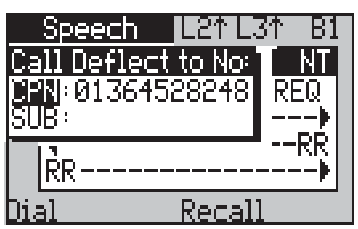
Notes:

- This service deflects a single call at the time when it is presented—unlike Call Forwarding, which you set up in advance for future calls.
- You cannot use an incoming data call to test this service if auroraSonata is set up to connect data calls automatically.

When an incoming call is presented:



-1- Press the **CD** function key.



-2- Select **CPN** to display an entry window. Type the number to which you want to deflect and press *ENTER*. To include a sub-address, select **SUB** and repeat the process.

Tips:

- You can press **Recall** to access the speed-dial directory—see Chapter 6 section 1.
- You can press *ESC* to return to the **Incoming Call** screen and answer or clear the call instead of deflecting.

-3- Press the **Dial** function key to deflect the call.

Testing services during call setup

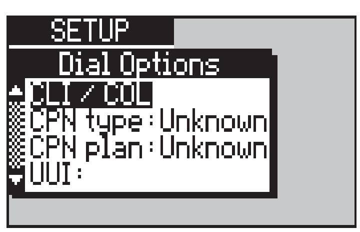
aurora^Sonata allows you to test a number of supplementary services that operate during call setup:

- Calling Line ID Presentation
- ETSI CorNet-N CorNet-T Calling Line ID Restriction
- Connected Line ID Presentation
- ETSI CorNet-N CorNet-T Connected Line ID Restriction
- ETSI CorNet-N CorNet-T User to User Signalling
- ETSI 1TR6 Closed User Groups

To test these services, you set up a test call which includes information relating to each service to be tested. When you make the call, aurora^Sonata sends this information to the network along with the call setup request.

To set up any of the above services for testing:

-1- Display the **Dial Options** menu.



Tip

You can display this menu by choosing **Dial Options** from the **ISDN Setup** menu (see Chapter 3 section 1). However, to make testing more convenient aurora^{Sonata} also lets you access the menu by pressing the **Opt** function key in the **Outgoing ISDN Call** menu for the test call.

Calling Line ID Presentation/Restriction

Calling Line ID Presentation (CLIP) allows a subscriber receiving a call to display the caller's ISDN number. The service operates even when the subscriber's line is busy.

ETSI
CorNet-N
CorNet-T

Calling Line ID Restriction (CLIR) allows a subscriber making a call to choose whether or not their ISDN number is presented to the person they are calling.

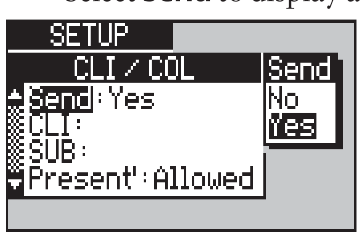
Setting up CLIP/CLIR

To test CLIP/CLIR, you need to define a number and set up aurora^{Sonata} to send it for all outgoing calls. You can then make calls to test whether the presentation of this number is allowed or restricted.

-1- From the **Dial Options** menu, choose **CLI/COL**.

-2- Choose whether aurora^{Sonata} sends the number:

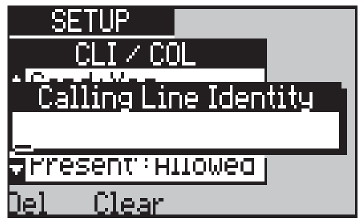
- Select **Send** to display an option window:



- Highlight **Yes** or **No** as required, and press *ENTER*. If you choose **Yes**, aurora[Sonata] sends the CLI information element to the remote unit with all outgoing calls.

-3- Enter the number to be sent.

- Choose **CLI** to display an entry window:

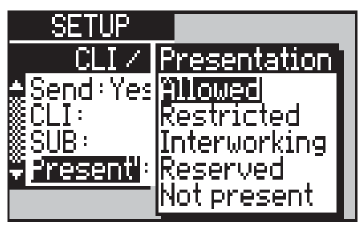


- Type the number (up to 20 characters) and press *ENTER* to save it. The entry window closes. To use a sub-address (CorNet-N, CorNet-T and ETSI only), select **SUB** and repeat the process.

CorNet-N CorNet-T ETSI

-4- Define whether, when the remote unit receives the number, it presents it to the user.

- Choose **Present'** to display the options:

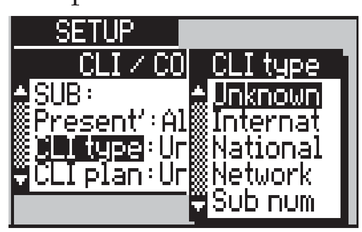


- Highlight the option you require and press *ENTER*. The options are:

CLI/COL Presentation	
Allowed	Allow presentation of the CLI or COL at the remote end.
Restricted	Do not allow presentation of the CLI or COL at the remote end.
Interworking	You can use this setting when aurora[Sonata] is emulating the network side of the link, when the test call is to be routed through two non-compliant networks. It allows you to confirm that the remote terminal does not display the CLI or COL when the Presentation Indicator is Interworking.
Reserved	Included for future development.
Not Present	Removes the Presentation Indicator from the CLI information element.

-5- Finally, set the CLI Numbering Type and Plan.

- Choose **CLI Type** or **CLI Plan** to display the options:



- Highlight the option you require and press *ENTER*.

Tip

The CLI Type and Plan work in the same way as the CPN Type and Plan, except that a CLI information element is used. See Chapter 3 section 1 for details.

Testing CLIP/CLIR

Tip

You can also test CLIP/CLIR from the ISDN Test Suite—see *Testing services from the ISDN Test Suite* later in this section.

To test CLIP, you can set up a CLI (CorNet-N, CorNet-T and ETSI users need to set **Present'** to **Allowed**), and connect a self call (see Chapter 6 section 1). The number should be displayed in the **Incoming Call** screen, or in the **ISDN call information screen** (+ 6) for the channel of the incoming call.

ETSI 1TR6

To test CLIR, you can set up a CLI (ETSI users need to set **Present'** to **Restricted**), and make a call to a unit which has CLIP enabled. When restriction is successful, the number is displayed in the **Incoming Call** screen or the **ISDN call information screen** (+ 6), but is followed by an **R**.

ETSI

Note

When the test call is to be routed through two non-compliant networks you can set **Present'** to **Interworking**—see *Setting up CLIP/CLIR* earlier in this section for details.

Connected Line Presentation/Restriction

ETSI CorNet-N CorNet-T

Connected Line Restriction (COLR) allows a subscriber receiving a call to prevent their ISDN number being presented to a connected caller unless they specifically request it.

Connected Line Presentation (COLP) allows a subscriber making a call to display the number of the line to which they are connected.

Setting up COLP/COLR

To test COLP/COLR, you need to define a number and set up aurora^{Sonata} to send it to the calling unit for all incoming calls. You can then make calls to test whether the presentation of this number is allowed or restricted.

Note

aurora^Sonata sends the same number as the CLI for outgoing and incoming calls. Therefore, to set up COLP/R you display the **Dial Options** menu, assign a CLI and set up the details as described in *Setting up CLIP/CLIR* earlier in this section.

Testing COLP/COLR

Tip

You can also test COLP/COLR from the ISDN Test Suite—see *Testing services from the ISDN Test Suite* later in this section.

To test COLP, you can set up a CLI (CorNet-N, CorNet-T and ETSI users need to set **Present'** to **Allowed**), and connect a self call (see Chapter 6 section 1). The number should be displayed in the **ISDN call information screen** (+ 6) for the channel of the incoming call.

Tip

If you are making a call to a remote unit rather than a self call, the remote unit must have COL presentation enabled. Also remember that the displayed COL may not correspond with the CLI of the remote device you called—for example, where Call Forwarding has been set up.

ETSI 1TR6

To test COLR, you can set up a CLI (ETSI users need to set **Present'** to **Restricted**), and make a call to a unit which has COLP enabled. When restriction is successful, the number is displayed in the **ISDN call information screen** (+ 6), but is followed by an **R**.

ETSI

Note

When the test call is to be routed through two non-compliant networks you can set **Present'** to **Interworking**—see *Setting up CLIP/CLIR* earlier in this section for details.

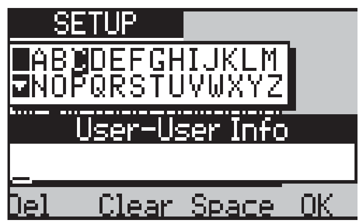
User to User Signalling (ETSI) (CorNet-N) (CorNet-T) (VN4)

This service allows the subscriber to send a text message known as User to User Information (or UUI) along with the outgoing Call Setup request.

To check the operation of outgoing UUI, you can send a text string within the call setup message for an outgoing test call (this may be a self call).

Sending UUI with the Call Setup message

-1- From the **Dial Options** menu, select **UUI**. aurora[Sonata] displays an entry window:



-2- Enter a string of characters (up to 20).

Tip

For instructions, see *Entering alphanumeric information* in Chapter 2 section 3.

-3- Press the **OK** function key to save the string and close the entry window.

When you make the test call (this may be a self call), aurora[Sonata] sends the UUI along with the Call Setup request.

Checking for incoming UUI

-1- Press + 6 to display the **ISDN call information** screen. For full details of this display, see *Getting information about the current or last call* in Chapter 3 section 2.

-2- Scroll down to the **UUI** information to check that aurora[Sonata] has received the information.

Closed User Groups (CUGs) (ETSI) (1TR6)

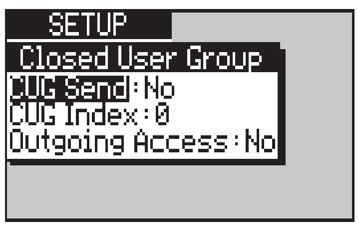
Closed User Groups (CUGs) are groups to and from which access is restricted.

Members of a CUG can usually communicate with each other, but not always—it depends upon the way the network provider has set up the CUG. Depending on the protocol and the way the CUG is set up, the members may also be able to make calls to users outside their group, but they cannot normally receive calls from the outside.

To check the operation of CUGs on a link, you can assign a CUG number to your aurora[Sonata], then try to make calls to devices within and outside the CUG.

To begin setting up CUG operation on aurora[Sonata]:

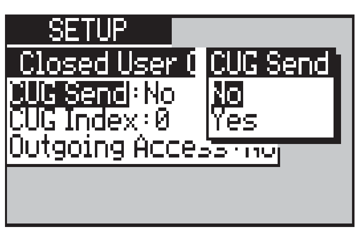
-1- From the **Dial Options** menu, select **CUG** to display a menu of CUG settings:



CUG Send	Determines whether a CUG number is sent.
CUG Index	Assigns a CUG number to aurora[Sonata].
(ETSI) **Outgoing Access**	Requests that the network allow calls to devices outside the CUG.

Choosing whether to send CUG information

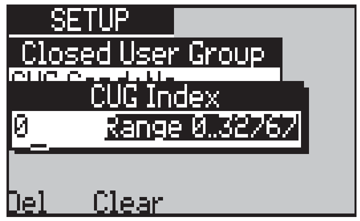
-1- Select **CUG Send**.



-2- Choose **No** or **Yes** and press *ENTER*. If you choose **Yes**, aurora^{Sonata} includes the CUG number in all call setup messages to other group members.

Entering a CUG number for aurora^{Sonata}

-1- Select **CUG Index** to display an entry window:



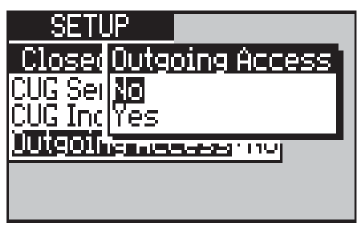
-2- Type a CUG number (this should be supplied by the network provider) and press *ENTER*. The number must be between:

1TR6 0 and 99

ETSI 0 and 32767

Requesting calls to outside devices ETSI

-1- Select **Outgoing Access**.



-2- Choose **No** or **Yes** and press *ENTER*. **No** means that any attempted calls outside the CUG will be rejected by the network. **Yes** requests outgoing access.

Testing services with a connected call

ETSI 1TR6

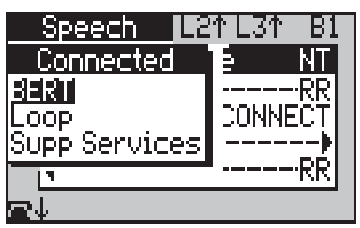
aurora^Sonata allows you to test the following supplementary services when you have an established connection:

- Call Waiting
- Call Hold/Retrieve
- Three Party Call
- ETSI Explicit Call Transfer
- ETSI Malicious Call Identification
- BRI Call Suspend/Resume (Terminal Portability)

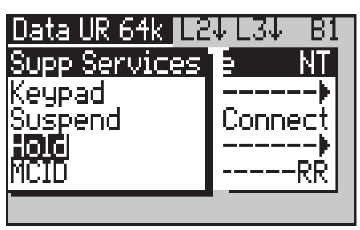
With a connected call, you can also use the Keypad facility to test supplementary services. See *Testing services using the Keypad* later in this section for details.

To display the list of available supplementary services:

-1- Connect a test call as normal. aurora^Sonata displays the **Connected** window.



-2- Select **Supp Services**.



Call Waiting (ETSI) (1TR6)

This service informs the subscriber that they have an incoming call, although there is no channel currently free to connect it.

Note

To test Call Waiting, you must set aurora^Sonata to emulate a TE.

Testing Call Waiting

Make a call to aurora^Sonata while all its channels are busy. When Call Waiting is available, the following screen appears:

Note

This screen is always displayed on channel B1. If you are displaying another channel in the foreground when the incoming call is received, aurora^Sonata displays a message prompting you to switch channels.

When you **Accept** the waiting call, aurora^Sonata places the currently displayed call on hold (see *Call Hold/Retrieve* below). When you **Reject** the waiting call, aurora^Sonata returns to the **Connected** window for the current call.

If Call Waiting is not available, the incoming call is rejected with a User Busy Cause Code.

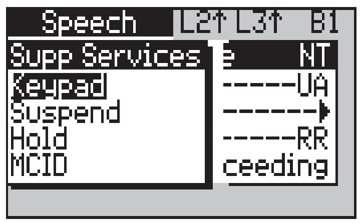
Call Hold/Retrieve (ETSI) (1TR6)

This service allows the subscriber to interrupt an existing call, connect another on the same channel, then retrieve the original call.

Note

You can test Call Hold and Retrieve for all speech type calls, when auroraSonata is emulating a TE.

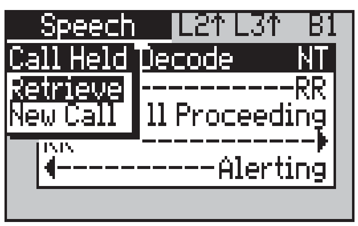
-1- For an existing connected Speech call, display the **Supp Services** menu.



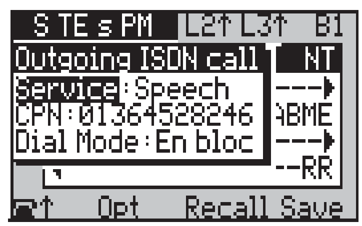
Placing the call on hold

-1- From the **Supp Services** menu, select **Hold**.

ETSI



1TR6

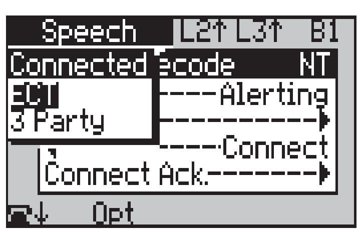


Making a new call on the B channel

(ETSI) **-1-** The original call is now on hold. Select **New Call** to display an **Outgoing ISDN Call** screen and make the call as normal.

(1TR6) **-1-** Make the call as normal. When it is connected, auroraSonata places the original call on hold.

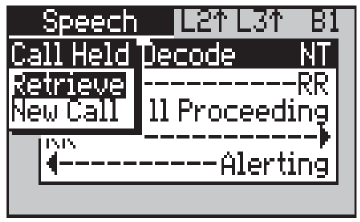
auroraSonata displays a **Connected** screen for the second call.



Now that you have one call connected and another on hold, you can test Three Party Calls, or ECT if it is available with the selected protocol. For details, see later in this section.

To clear the new call:

-1- Press **On Hook** (☎↓), then press *ESC* to leave the Cause Code display. auroraSonata displays the **Call Held** screen for the original call.



Retrieving the original call

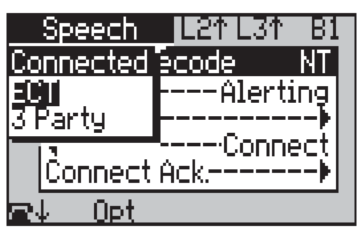
-1- From the **Call Held** screen, select **Retrieve**.

Three Party Calls (ETSI) (1TR6)

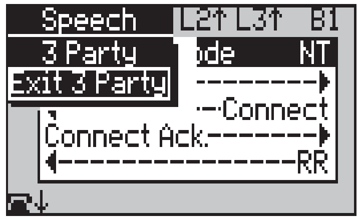
This service allows the subscriber to participate in and control a three-way conversation. To test Three Party Calls, auroraSonata must be emulating a TE.

Connecting a Three Party Call

-1- Place a call on hold and connect a new call on the B channel (see *Call Hold/Retrieve* earlier in this section).

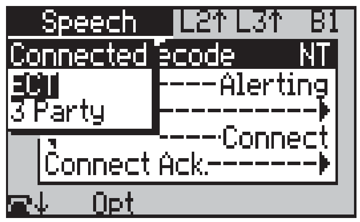


-2- Select **3 Party**. auroraSonata sends a request to the network for a three-party call. If it is accepted, all three calls are connected.



Clearing the Three Party Call

-1- Select **Exit 3 Party** to return to the **Connected** window for the second connected call.



Explicit Call Transfer (ECT) (ETSI)

This service allows the subscriber to connect a held call to a connected call and then disconnect their own unit, leaving the other users connected to each other.

Note

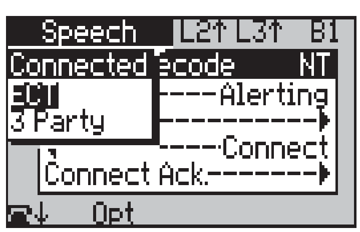
The way in which the ECT link is set up is determined by the **ECT** setting in the **ISDN Setup** menu. For details, see *Selecting the linkage type for ECT* in Chapter 3 section 1.

You can test ECT for all circuit switched teleservices using one B channel, when aurora[Sonata] is emulating a TE.

Linking two calls together using ECT

-1- Place a test call on hold and connect a new call on the B channel. For instructions, see *Call Hold/Retrieve* earlier in this section.

When the second call is connected, aurora[Sonata] displays a **Connected** window.

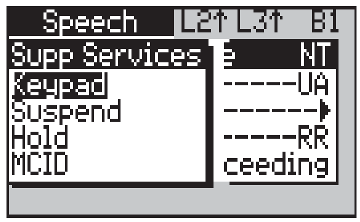


-2- Select **ECT**. This connects the active call and the held call to each other. aurora[Sonata] then clears the calls between you and the other two users and displays the main **Simulate** menu.

Malicious Call Identification (MCID) (ETSI)

This service allows the subscriber to request that the source of an incoming call is identified and registered by the network.

-1- For an existing connected call, display the **Supp Services** menu.



-2- Select **MCID**.

aurora[Sonata] displays a pop-up message to show that the MCID request has been accepted.

Note

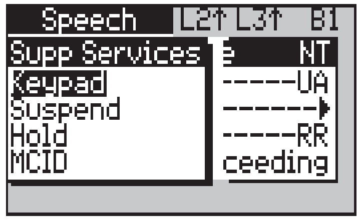
You can also test MCID after the caller has initiated clearing. See *Testing MCID during disconnection* later in this section.

Call Suspend/Resume (BRI) (ETSI) (1TR6)

This service allows the subscriber to temporarily suspend a call, normally in order to move their terminal from one socket to another on the same multi-point line. When the terminal is connected again, the subscriber can resume the call.

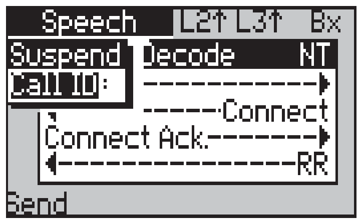
To test Suspend/Resume, aurora[Sonata] must be emulating a TE.

-1- For an existing connected call, display the **Supp Services** menu.



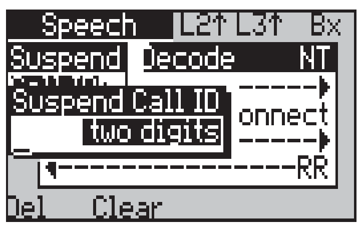
Suspending a call

-1- From the **Supp Services** menu for the connected call, choose **Suspend**.



-2- You need to assign an ID to the call, to allow the network to identify it. To do this:

- Select **Call ID** to display an entry window.

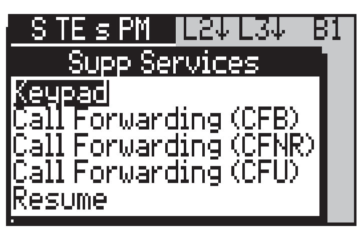


- Type a two-digit ID and press ***ENTER***.

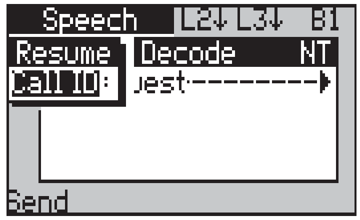
-3- Press the **Send** function key.

Resuming the call

-1- From the main **Simulate** menu, select **Supp Services**.



-2- Select **Resume**.



-3- Select **Call ID**, type the ID you assigned to the call when you suspended it and press *ENTER*.

-4- Press the **Send** function key to re-connect.

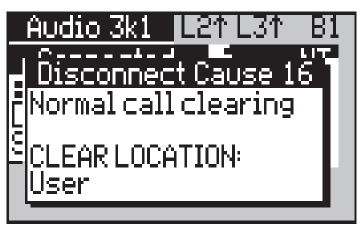
Testing MCID during disconnection ETSI

When the remote end of a connection has initiated call clearing but the call is not fully cleared, you can test the Malicious Call Identification (MCID) supplementary service. This allows the subscriber to request that the source of an incoming call is identified and registered by the network.

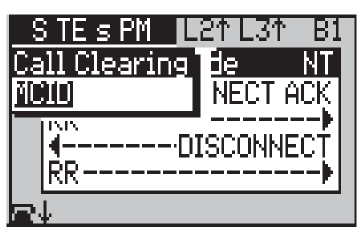
Tip

For details on call clearing, see Chapter 3 section 2.

When the other end of the connection (this can be a self call) has initiated clearing:



-1- Press *ESC* to close the display window for the cause code.



-2- Select **MCID**.

aurora^{Sonata} displays a pop-up message to indicate whether the MCID request has been accepted or rejected. In the case of failure, the Cause Code is displayed.

-3- Press **On Hook** (☎↓) to finish clearing the call.

Note

You can also test MCID during a call. For details, see *Testing services with a connected call* earlier in this section.

Advice of Charge ~~CorNet-T~~

This service allows the subscriber to display details of the charge for a call, either during the call (AOC-D) or at the end of the call (AOC-E).

You can use aurora^{Sonata} to check the availability and operation of call charging—for example, when addressing a dispute between a service provider and an equipment manufacturer.

~~CorNet-T~~ When CorNet-T is selected you cannot configure aurora^{Sonata} as a NT, therefore you cannot test call charging.

TN1R6-N CorNet-N If TN1R6-N and CorNet-N are selected charging information can be generated by either the TE or NT.

Notes:

- The way in which aurora^{Sonata} sends and displays charging information is determined by the settings in the **Charging Setup** menu. See Chapter 3 section 1.

~~TN1R6-N~~ ~~CorNet-N~~

- To send AOC (incoming calls), aurora^{Sonata} must be emulating an NT.

TN1R6-N CorNet-N

- If TN1R6-N and CorNet-N are selected aurora^{Sonata} can generate charging information when it is emulating the TE or NT.

TN1R6-N
CorNet-N

- To receive AOC (outgoing calls), it must be emulating a TE.

The quickest way to test AOC is to use the **Available services** one-button test—see *Testing services from the ISDN Test Suite* later in this section. However, you cannot use this method to check the number of charging units which have been sent.

Testing AOC-E

To check AOC-E (Advice of Charge displayed at the end of the call):

-1- With aurora^{Sonata} emulating a TE, make a self call then disconnect. The call must be long enough for charging units to be received—the actual length required depends on the network.

-2- Press + 6 to display the **ISDN call information** screen, and check that the **Charge** value is displayed. See *Getting information about the current or last call* in Chapter 3 section 2.

When the charge information is displayed in terms of currency rather than units, aurora^{Sonata} displays **CU** after the value.

Testing AOC-D

To check AOC-D (Advice of Charge generated during the call):

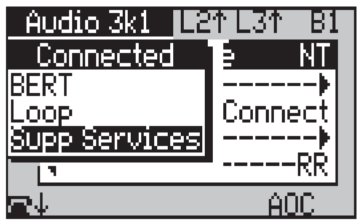
-1- With aurora^{Sonata} emulating a TE, make a self call.

-2- With the call still connected, press + 6 to display the **ISDN call information** screen, and check that the **Charge** value is displayed. See *Getting information about the current or last call* in Chapter 3 section 2.

When the charge information is displayed in terms of currency rather than units, aurora^{Sonata} displays **CU** after the value.

Sending charging information manually

When the charging **Mode** (see Chapter 3 section 1) is set to **Manual**, you can use an aurora^{Sonata} emulating an NT to send charging information to a calling unit for an incoming test call. To do this, in the **Connected** window for the call:



-1- Press the **AOC** function key. aurora^{Sonata} sends a single charge unit to the caller.

ISDN sub-addressing ETSI CorNet-N CorNet-T

This service allows the subscriber to connect to terminals on a PMP link which have the same CPN but different sub-addresses.

Testing sub-addressing

Tip

The instructions below explain a detailed way to check the operation of sub-addressing. For a quicker method, see *Testing services from the ISDN Test Suite* later in this section.

-1- Make a self call to another B channel of your aurora^{Sonata}, using a sub-address. aurora^{Sonata} sends an outgoing Setup message to the network, which includes a Called Party Sub-Address ID information element.

-2- When aurora^Sonata receives the incoming call, either:

- check the **SUB** display in the **Incoming Call** screen
- press + 6 to display the **ISDN call information** screen, and check the **CLI SUB** details. See *Getting information about the current or last call* in Chapter 3 section 2.

Testing services from the ISDN Test Suite

CorNet-T

Tip

For an introduction to the ISDN Test Suite and its applications, see *Introducing the ISDN Test Suite* in section 1.

You can use aurora^Sonata's ISDN Test Suite to check:

- Calling Line ID Presentation/Restriction
- Connected Line ID Presentation/Restriction
- ETSI ISDN Sub-addressing
- Advice of Charge (AOC)

To check one of these services, you include it as a component of the **Available services** one-button test.

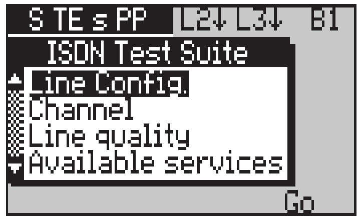
Note

For AOC, this method does not show how many charging units have been sent for the call. To see this information you need to check the **ISDN call information screen**. See *Advice of Charge* earlier in this section.

CorNet-T If CorNet-T is selected you cannot use the Test Suite.

Setting up the test

-1- Display the ISDN Test Suite.



-2- Select **Available services**. aurora[Sonata] displays a list of the components you can include in the **Available services** one-button test.

-3- Select the services to be checked by pressing *ENTER* to tick or clear the appropriate boxes.

Note

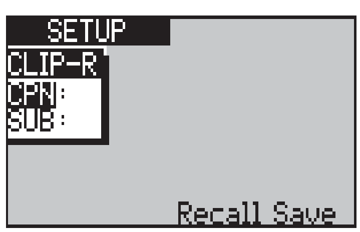
The Teleservice component checks ISDN teleservices. For details, see section 4 of this chapter.

-4- Set up the test details for each service to be checked, as described below.

Setting up the component details

When you have selected the component tests, you can set up the test details for each service as follows:

-1- In the **Available services** component display, highlight the service and press the **Setup** function key to display a setup screen. For example:



-2- To enter the CPN for the test call, select **CPN** and enter the number as normal (see *Identifying the CPN for the call* in Chapter 3 section 2). To enter a sub-address, select **SUB** and repeat the process.

Tip

You can use the **Recall** and **Save** function keys to access and store speed-dial numbers (see Chapter 6 section 1).

Notes:

- If you set a new CPN here, it is used for all components of all one-button tests.
- For the CLIP-R test, you need to enter a CLI, which may also have a sub-address.
- The ISDN sub-address test requires a sub-address. If you do not enter one, aurora[Sonata] uses a default value.

-3- For the AOC test, you need to set the duration of the test call. This must be long enough for charging units to be received—the actual value required depends on the network being tested.

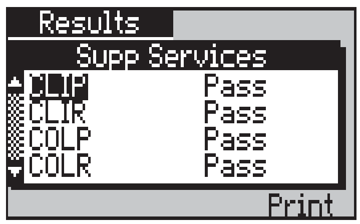
- In the **Setup** screen for the AOC component, select **Duration**.

- Use the keypad to enter the call duration in seconds (1-999) and press ***ENTER.*** The entry window closes.

Understanding the test results

During the test, aurora^Sonata displays the result (**Pass** or **Fail**) for each service. The Status bar shows which service is currently being checked. When the test is complete, aurora^Sonata lists the results for all tested services.

aurora^Sonata stores the most recent set of results for supplementary services. You can view them by selecting **Supp Services** from the **Review Results** menu (see section 1). The example screen below shows a typical set of results.



Testing services using the Keypad (ETSI)

The Keypad facility is an alternative way to test supplementary services. You use it to send coded requests to the network to initiate and test the operation of specific services. The actual codes you send depend on the network you are testing—for details, consult the service provider.

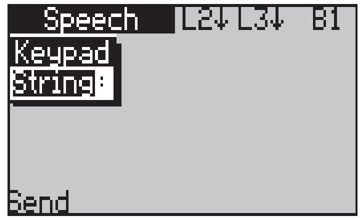
You can use the Keypad either before connection or during a test call.

-1- Select **Keypad** from the **Supp Services** menu.

Note

The Keypad is available both from the **Supp Services** menu which is accessed from the main **Simulate** menu (i.e. before connection) and from the one which is accessed from the

Connected window (i.e. during a call).



-2- Select **String** to display an entry window:

-3- Enter the code you wish to use (up to 20 characters). This can include # and * symbols.

-4- Press *ENTER* to save the string and close the entry window.

-5- Press the **Send** function key.

Chapter 5

Monitoring the Line

Contents

Monitoring the Line

This chapter explains how you can use aurora[Sonata] to monitor protocol information or listen to audio traffic on the line in real time. This feature is particularly useful for on-the-spot line troubleshooting.

Note

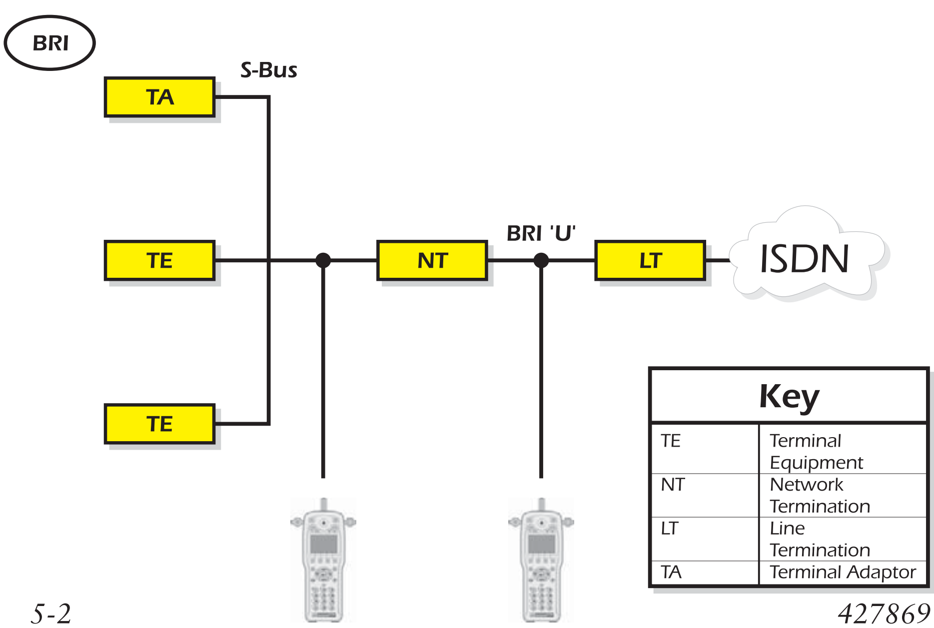
In Monitor mode you only use aurora[Sonata] to receive information, not to transmit.

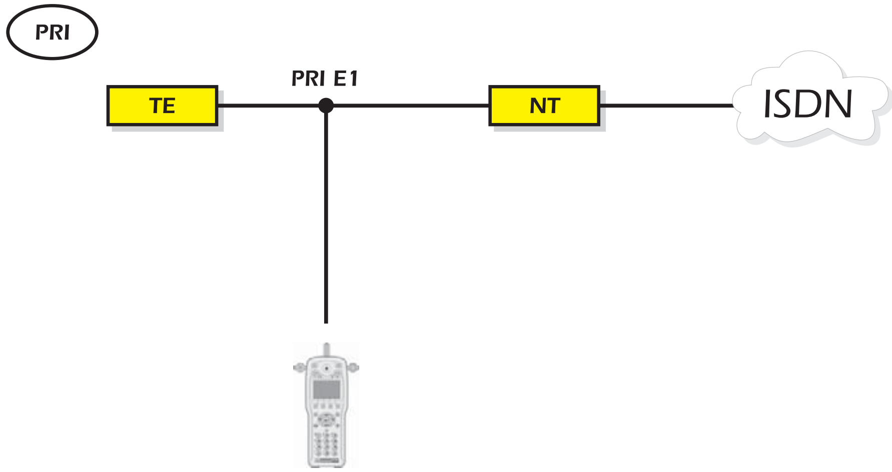
When the appropriate interface modules are fitted, aurora[Sonata] can monitor on the following types of link:

- Primary Rate
- Basic Rate links at the S interface
- Basic Rate links at the U interface with 4B3T or Up0 line coding. For U interface monitoring aurora[Sonata] must be fitted with two U interface modules of the same type (for example, two 4B3T interfaces)

Connecting aurora[Sonata]

The following diagrams show how you can connect aurora[Sonata] in Monitor mode, provided the appropriate interface is fitted:





Note on monitor connections

To connect aurora^{Sonata} to the S interface for monitoring, you need the optional 'T' piece which is available from Agilent Technologies. This allows the NT, the TE and aurora^{Sonata} to be connected to the line at the same time.

To connect to the U interface for monitoring ,the line must be broken.

For monitoring on a Primary Rate link you may need a 'T' piece, depending on the cable and switch you are using.

Setting up aurora^{Sonata} for monitoring

Before you begin monitoring, you need to determine:

- whether you want aurora^{Sonata} to begin monitoring automatically at a set time, or whether you will begin the session manually
- whether you wish to save the protocol information in aurora^{Sonata}'s memory or send it to the serial port
- the Idle Code that is used to determine an idle state (absence of activity) on a channel
- the configuration of the serial port, if it is to be used for output of the protocol decode.

Tip

You can change some of the monitor settings and other aspects of aurora^Sonata's operation while in Monitor mode—i.e. without having to go into the Setup menus. For details, see *Changing settings while in Monitor mode* later in this chapter.

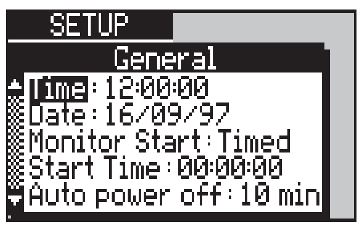
Choosing an automatic or manual start

You can set up aurora^Sonata in advance to begin monitoring at a specific time, or choose to begin the session manually.

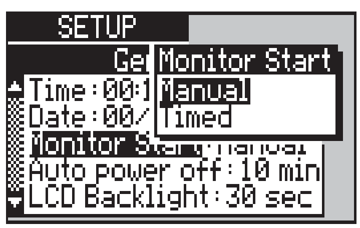
Tip

The automatic start feature means that you can leave aurora^Sonata connected to the line to begin monitoring at the designated time.

-1- From the main **Setup** menu, select **General** to display the **General Setup** menu.



-2- Select **Monitor Start** to display the options:



-3- Highlight the option you require:

Monitor Start	
Manual	aurora^Sonata begins a monitor session only when you start it manually.
Timed	aurora^Sonata begins monitoring automatically at a specific time, which you set up in advance.

Note

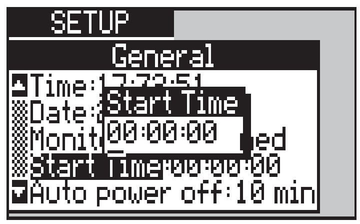
When you choose **Timed**, a **Start Time** option is added to the **General Setup** menu.

-4- Press *ENTER* to save your selection and close the option window.

Entering an automatic start time

When you want aurora[Sonata] to begin monitoring automatically at a certain time (**Timed**), you need to set the start time.

-1- From the **General Setup** menu, select **Start Time** to display an entry window.



-2- Enter the start time in 24-hour format and press *ENTER*.

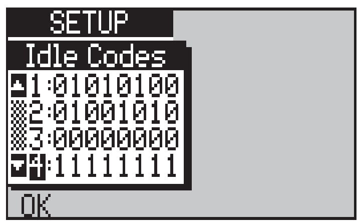
Choosing the monitor output destination

Before beginning a monitor session, you can choose to send the protocol output to the serial port during the session and select the format in which the data is to be sent. This is determined by the **Tracer** setting in the **Comms/Tracer** menu. For details, see *Configuring the serial port/protocol output* in Chapter 3 section 1.

Setting the Idle Code

Before you begin monitoring, if you wish to take advantage of the channel activity display feature you need to identify the eight-bit code which is used to determine whether a channel is in an idle state (i.e. has no activity). The code you select is determined by the network you are using—if in doubt, consult the network specification.

-1- From the **ISDN Setup** menu, select **Idle Codes** to show a list of the available fixed and editable codes.

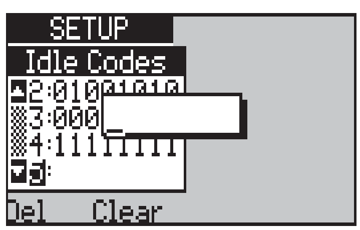


Up to eight Idle Codes are available. The first four on the list are pre-set to the most commonly used values. The others can be changed as required to suit different networks.

Entering or editing an Idle Code

You can change the Idle Codes numbered **5** to **8** on the list.

-1- Highlight the code you want to change and press *ENTER* to display an edit window.



-2- Type the eight-digit binary code and press *ENTER*. You can use the **Del** function key to delete a single digit, or the **Clear** function key to erase the entire code.

Selecting an Idle Code

-1- Highlight the code you require and press **OK**. aurora^{Sonata} returns to the **ISDN Setup** menu.

Note

If a code has fewer than eight digits, you cannot select it.

Setting up a monitor session

-1- Connect aurora^{Sonata} to the interface, using the 'T' piece if necessary (see the *Note on monitor connections* earlier in this chapter).

-2- Select the appropriate interface or combination of interfaces. For instructions, see *Selecting an Interface* in Chapter 2 section 3.

Note

The LED on an interface module shows green in Monitor mode when the interface is selected.

-3- From the top level menu, select **Monitor** as the operating mode. aurora^{Sonata} shows the Monitor channel selection/display screen.

The example below is a BRI screen—the PRI version displays boxes representing 30 B channels and the signalling channel.

Note

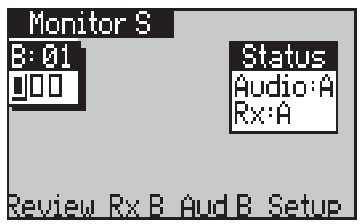
When the channel selection screen is first displayed, the D channel is always highlighted (timeslot 16 for PRI).

The **Status** window shows the current receive directions for audio information and the channel activity display. See below for instructions on how to change the directions.

Choosing the receive direction for audio

For audio monitoring, you can change the receive direction for which audio information is relayed over the speaker by changing the connection of the Codec (audio coder/decoder). When you first switch to Monitor mode, the audio connection is always **Off**.

The **Status** window shows the current setting of the audio connection. A function key at the foot of the screen allows you to change the direction.



-1- In the Monitor channel display, press the function key which shows **Aud A**, **Aud B**, **A+B** (both directions) or **Off** to indicate the next available option.

Choosing the receive direction for the channel display

You can change the receive direction for which channel activity is displayed. When you first switch to Monitor mode, the connection is always **RxA.**

The **Status** window shows the current setting. A function key at the foot of the screen allows you to change the direction.

-1- In the Monitor channel display, press the function key which shows **RxA**, **RxB** or **Off** to indicate the next available option.

Choosing the channel

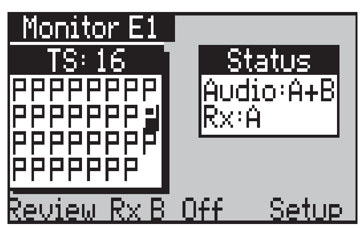
In Monitor mode, you can listen to audio activity on the B channels. You can capture data on any channel—for the D channel you can use aurora[Sonata] to decode this data (see Chapter 7), and for B channels you can look at the hexadecimal data.

-1- Highlight the channel you require. When you highlight a B channel, you can listen to audio information over the channel.

-2- To monitor protocol activity on a channel, press ***ENTER***.

Understanding the channel activity display

The channel display for monitoring shows activity on all channels in the receive direction you have selected. The example below shows a PRI display screen.



The channel activity is represented by symbols, as follows:

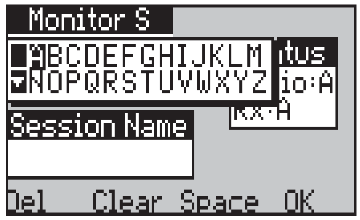
 An idle pattern matching the selected Idle Code is detected on the channel.

 A constant pattern has been detected which does not match the selected Idle Code.

 A pattern has been detected which is not constant and does not match the selected Idle Code.

Beginning a protocol monitor session

When you press *ENTER* to select a channel (usually the D channel) for protocol monitoring, you are prompted to enter a name for the session.



-1- Enter a name (up to eight characters). For instructions, see *Entering alphanumeric information* in Chapter 2 section 3. You cannot use the name of an existing stored session.

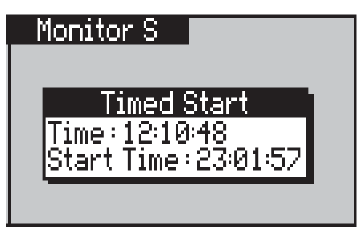
Notes:

- When **Memory Mode** is set to **Fill** (see *Choosing what happens when the memory is full* in Chapter 3 section 1), once the memory is full you cannot save a new session until you delete an existing one.
- If you do not assign a name, aurora[Sonata] automatically names the sessions **M1**, **M2** and so on.

-2- Press the **OK** function key to save the name and begin the monitor session.

When you have set an automatic start time

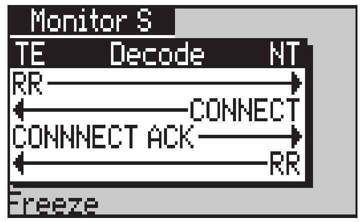
When you have set up an automatic timed start for monitoring (see *Entering an automatic start time* earlier in this chapter), and you press **OK** to start a session, aurora[Sonata] displays the following screen:



The **Time** display shows the current time. When this reaches the displayed **Start Time**, the monitor session begins.

During protocol monitoring

During protocol monitoring aurora[Sonata] displays a simple, real-time decode of the protocol information. This allows you to identify problems on the spot. The screen below shows how the display might appear at the beginning of a session.



You can press the **Freeze** function key to pause the display and examine a particular section of decode, then return to the real-time display. For full instructions and detailed information on the simple decode, see Chapter 7 section 1.

Checking the status of Layer 1

Throughout the monitoring process, you can tell whether Layer 1 is active by checking the ***Line*** LEDs. There are two of these, labelled ***Line A*** and ***Line B***, to show the status of Layer 1 for each receiver.

When a ***Line*** LED is off, Layer 1 is deactivated for that receiver. Flashing green means that Layer 1 is activating and steady green means that Layer 1 is fully active.

Ending a monitor session

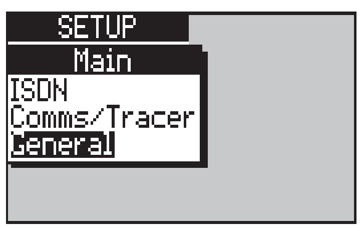
-1- Press the *ESC* key.

Changing settings while in Monitor mode

You can change some aspects of the way in which auroraSonata operates without having to leave Monitor mode and go into the Setup menus. The settings you can change are:

- the protocol and the method of voice encoding (A-law or µ-law)
- the Idle Code that is used to determine an idle state (absence of activity) on a channel
- PRI the setting (on or off) for CRC4 error checking
- the configuration of the serial port
- the general setup of auroraSonata—e.g. the real time clock setting, language of operation, etc.
- the automatic start time for monitoring.

-1- In the main Monitor channel display, press the **Setup** function key. auroraSonata displays the main **Setup** menu.



Note

auroraSonata automatically displays only those settings that are relevant to line monitoring. Therefore, this menu has fewer items than the main **Setup** menu.

-2- Select the type of setting you want to change:

ISDN The protocol, voice encoding method, Idle Code or setting for CRC4 checking.

Comms/Tracer The serial port configuration.

General General settings (including the monitor start time).

-3- Change the settings as required. Details of the monitor start time and Idle Code settings are provided earlier in this chapter—for instructions on the other settings, see the appropriate section of Chapter 3.

-4- When you have finished changing the settings, press ***ESC*** to return to the channel display.

Reviewing a stored monitor session

You can view the simple decode of a session which is stored in aurora^{Sonata}'s memory. To display a list of stored sessions:

-1- In the Monitor display screen, press the **Review** function key. aurora^{Sonata} displays a list of stored monitor sessions.

-2- Highlight a session and press ***ENTER*** to show the simple protocol decode. See Chapter 7 section 1 for details of this display.

Note

You can print the stored information and delete sessions from memory—see Chapter 7 section 2.

-3- When you have finished viewing, press ***ESC*** to return to the list of stored sessions.

Chapter 6

Advanced Features & System Maintenance

Contents

Advanced Features & System Maintenance

This chapter covers the more advanced operations which are available with aurora^Sonata. It is divided into sections as follows:

Section 1 Advanced Testing Features

This section describes several ways in which you can set up aurora^Sonata to make testing quicker and easier. It is aimed at users who are confident with the procedures described in earlier chapters of the User Guide, and covers:

- speed dialling
- call screening
- setting up a custom one-button test in aurora^Sonata's ISDN Test Suite
- using self calls—i.e. calls to another channel on the access to which you are connected

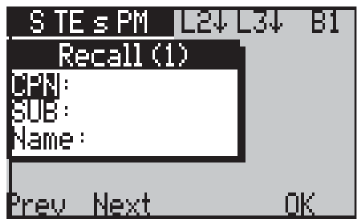
Speed dialling

You can store up to ten speed-dial numbers for outgoing calls, to save you having to enter them manually.

Displaying the items in the speed-dial directory

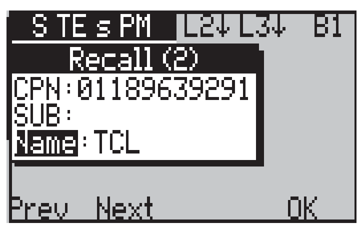
-1- In the **Outgoing ISDN Call** menu, press the **Recall** function key.

If there are already numbers in the directory, the screen displays the last number that was stored. Otherwise, an empty slot is displayed.



Calling a speed-dial number

-1- Display the items in the speed-dial directory. Use the **Next** and **Prev** function keys to scroll through them to find the CPN you require.



-2- Press the **OK** function key to select the number. aurora[Sonata] returns to the **Outgoing ISDN Call** menu. The number you have selected is now displayed as the CPN for the call.

-3- Proceed with the call as normal.

Storing a new speed-dial number

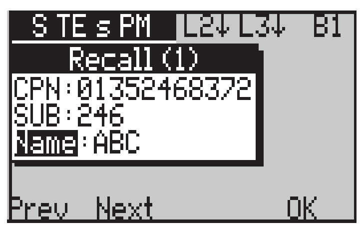
-1- Display the speed-dial directory. Use the **Next** and **Prev** function keys to check each number slot until you find an empty one.

Note

If the directory is full, you can only save a new number by replacing an existing one.

-2- When you find an empty slot, enter details of the new number as follows:

- Highlight **CPN** and type the number (up to 20 digits). Press *ENTER* to save the CPN.
- ETSI To include a sub-address, highlight **SUB** and repeat the process (up to 19 digits).
- Highlight **Name** and enter a name (up to 8 characters) to identify the number. Press the **OK** function key to save the name.



-3- To call the number, press the **OK** function key. Otherwise, press *ESC* to exit the directory.

Adding the last CPN you called to the directory

You can store the last number that you called—i.e. the CPN currently displayed in the **Outgoing ISDN Call** menu.

-1- In the **Outgoing ISDN Call** menu, press the **Save** function key to save the number in the next available slot. aurora[Sonata] displays the slot with the number in it.

Note

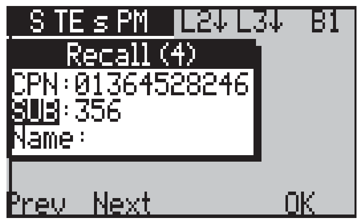
If the directory is full, you can only save the number by erasing an existing one.

-2- Add any other details you require (e.g. a sub-address or name) as normal.

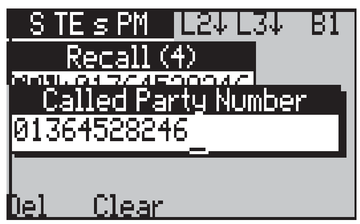
-3- To call the number, press the **OK** function key. Otherwise press *ESC* to exit the directory.

Erasing or replacing a stored number

-1- Display the speed-dial directory. Press the **Next** and **Prev** function keys until you find the number you wish to erase or replace.

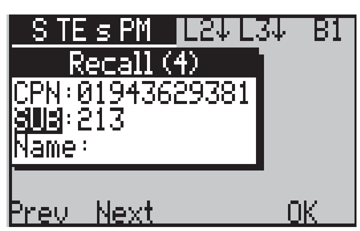


-2- Select **CPN** to display the CPN entry window.



-3- Press the **Clear** function key to erase the CPN. Enter a new one if required. Press *ENTER* to save the changes and return to the number slot.

-4- Erase the sub-address (**SUB**) and the identifying name (**Name**) in the same way and replace if required. Press *ENTER* to save the sub-address or the **OK** function key to save the name. aurora^{Sonata} returns to the number slot.



-5- To call the number, press the **OK** function key. Otherwise, press *ESC* to save the number and exit the directory.

Call screening

Sometimes you may want to accept only calls that are for a certain number (CPN), or from a certain number (CLI). To do this, you can set up auroraSonata to screen incoming calls.

ETSI
CorNet-N
CorNet-T

You can screen for up to three CPNs (this is called Multiple Subscriber Number (MSN) screening), or for a single CLI.

1TR6
TN1R6-N
TN1R6-T

You can screen for one CPN and one CLI. On a point-to-multipoint link, you can also screen for up to two 1TR6 sub-addresses. This is a single digit at the end of the subscriber number to identify the terminal—it is also known as the EAZ.

Using call screening—Examples

The following examples illustrate occasions when you might use the two main types of screening.

Example 1—Screening for Called Party Numbers

When testing a Basic Rate point-to-multipoint link, you are likely to receive calls on more than one number.

To avoid all the different numbers causing auroraSonata to ring, you can choose to accept only the calls that are for your own extension. To do this, you screen by CPN—the number the callers have dialled.

1TR6
TN1R6-N
TN1R6-T

When testing a point-to-multipoint link using the 1TR6 protocol, you can use EAZ type screening instead.

Example 2—Screening for Calling Line Identity

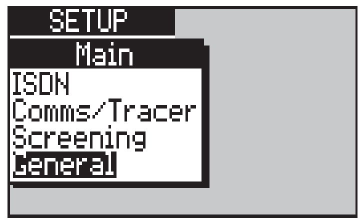
At other times—for example, when working on a live switch—you are likely to receive calls from several numbers.

To avoid receiving repeated calls due to other traffic, you may want to receive calls only from a specific number—for example, another engineer connected to the link. To do this, you screen by CLI—the number the calls are coming from.

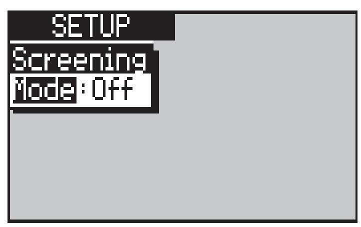
How to set up call screening

To begin setting up screening:

-1- From the top level menu, choose **Setup**.

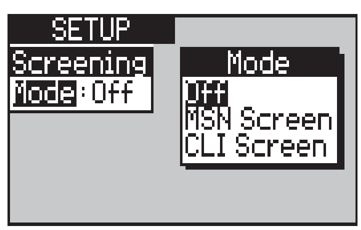


-2- Select **Screening**. aurora[Sonata] displays a window from which you select the type of screening you require and identify the numbers that you want to be accepted.



Selecting the type of screening

-1- Select **Mode** to display a list of options for the screening type.



Note

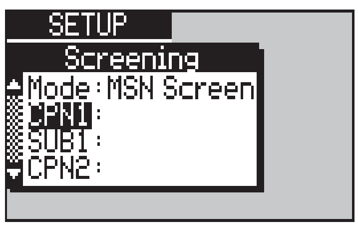
Remember: the types of screening available to you depend upon the protocol you are using.

-2- Highlight the option you require and press ***ENTER***. The options are:

Screening Mode Options

Protocol	Option	Description
	Off	No screening
ETSI, CorNet-N, CorNet-T	MSN Screen	Screen for up to three different CPNs - that is, accept calls for up to three different numbers. Each CPN can include a sub-address.
1TR6, TN1R6-N, TN1R6-T	CPN Screen	Screen for one CPN
	CLI Screen	Screen for one CLI - that is, accept calls only from a particular number. The CLI can include a sub-address.
1TR6, TN1R6-N, TN1R6-T	SUB Screen	Screen for the single digit at the end of the subscriber number which identifies the terminal

aurora[Sonata] displays a window in which you set up the numbers for your chosen screening type. For example:



Identifying the numbers for screening

When you have chosen the screening type, you need to identify the numbers to be accepted for that type of screening.

ETSI / CorNet-N / CorNet-T

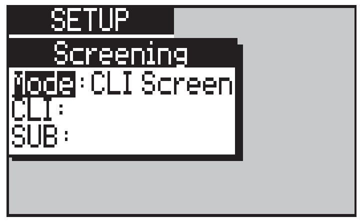
You can set up to three CPNs for MSN screening, and one CLI for CLI screening. Each number may include a sub-address.

1TR6 / TN1R6-N / TN1R6-T

You can identify one CPN for CPN screening, one CLI for CLI screening and, on a Basic Rate point-to-multipoint link, up to two 1TR6 sub-addresses (EAZs) for SUB screening.

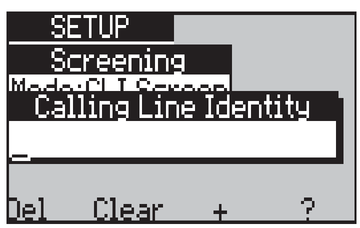
Once you have identified the numbers for a screening type, aurora[Sonata] stores them even when you are not using that type. When you use it again you can either screen for the same numbers or replace them with new ones.

In the instructions below, the example screens illustrate how to identify a CLI using the ETSI protocol.



-1- Select one of the following, depending on the screening type and protocol you are using:

- **CLI** for CLI screening
- **CPN1**, **2** or **3** for MSN screening (CorNet-N, CorNet-T and ETSI)
- **CPN** for CPN screening (TN1R6-N, TN1R6-T and 1TR6)
- **EAZ 1** or **2** for sub-address (EAZ) screening on a Basic Rate PMP link (TN1R6-N, TN1R6-T and 1TR6).



-2- Enter a CPN or CLI of up to 20 characters, or a single digit between 0 and 8 for 1TR6 EAZ screening. Press ***ENTER***.

Tip

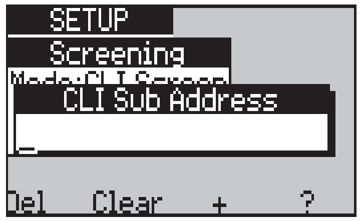
The **+** and **?** function keys allow you to use wildcards to make the screening more flexible. See *Using wildcards for call screening* later in this section.

ETSI **-3-** To include a sub-address for the CLI or CPN:

CorNet-N

CorNet-T

- Select **SUB** to display an entry window.



- Enter a sub-address (up to 19 characters), and press *ENTER*.

Using wildcards for call screening

You can make screening more flexible by using the 'wildcard' function keys (+ and ?) in the screening number setup windows. You can insert a plus sign (**+**) at the start or end of the number to denote 'any digit, any series of digits or no digits'. A question mark (**?**) anywhere in the number denotes 'any single digit'. For example:

123 The number must be an exact match—only 123 is accepted.

123+ Accept any number beginning with 123—e.g. 123, 1234 and 12345.

123? Accept only four-digit numbers beginning with 123. In this example 1234 is accepted, but not 123 or 12345.

For example, if a customer has several CPNs, all identical apart from the last digit (016285249772, 016285249773, etc.), you can screen for all of them by using **01628524977?**.

Creating a custom one-button test

As well as using the preconfigured one-button tests in aurora[Sonata]'s ISDN Test Suite, you can create a custom test with a specific set of components to suit your own requirements.

If CorNet-T is selected you cannot create a custom one-button test.

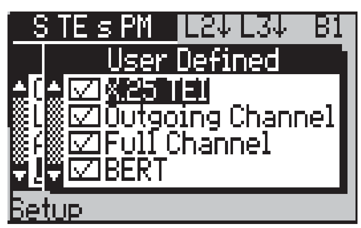
Tip

For an introduction to the ISDN Test Suite and its applications, see Chapter 4 section 1.

Choosing the component tests

To select the set of components for your custom test:

-1- From the ISDN Test Suite, select **User Defined**. aurora[Sonata] displays a window listing the full selection of available components.

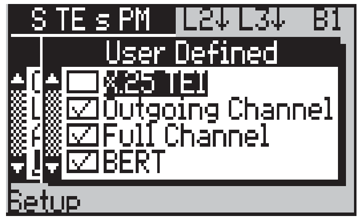


A tick (✓) next to a component shows that it is currently included in the **User Defined** test.

Tip

You can view the current components of the **User Defined** one-button test by highlighting it in the Test Suite and pressing *ENTER*.

-2- Add or remove components as required, by highlighting the component name and pressing ***ENTER*** to add or remove the tick.



-3- Set up the component details as normal. For instructions on setting up specific components, see the relevant sections of Chapter 4.

-4- When you have selected and set up the components, press ***ESC*** to save your selections and return to the ISDN Test Suite.

Understanding the test results

During the **User Defined** one-button test, aurora^Sonata displays results for the component currently in progress.

In the results screen for the test, you can use the **Next** and **Prev** function keys to view the results for each component in turn.

Using self calls

As well as calling other equipment, you can set up aurora^Sonata to make a call to another B channel on the same access to which you are connected. You might do this to test supplementary services (see Chapter 4 section 5), or to perform local BERT (Chapter 4 section 2).

For example, in a Data type self call the receiving channel answers the call and loops received data back to the origin.

Setting up a self call

You set up self calls in the same way as normal outgoing calls, but remember the following specific information:

- If you are using a Speech call, remember that the Codec (audio coder/decoder) is only connected to the currently displayed B channel.
- Although you are calling the line to which your aurora^{Sonata} is connected, you are calling a different B channel, which may have a different CPN.

Tip

If you do not know the CPN of the other B channel, try making a call from it to another channel. The network may send a CLI to the receiving channel.

Section 2 Testing in Unattended Mode

You can set up aurora^Sonata to connect and loop back incoming data or speech calls on any B channel when left unattended. This is useful, for example, when investigating a fault which only occurs occasionally. Instead of watching continuously, you can leave the tester on site and check periodically to see whether the error has occurred.

You can leave aurora^Sonata unattended and set up a link from another device (e.g. another aurora^Sonata) to perform BERT or check audio quality. For an incoming speech call aurora^Sonata sends DTMF tones down the line before applying the loop.

Notes:

- To allow aurora^Sonata to run in unattended mode its automatic power-off feature is disabled, even if you have enabled it for normal operation. Make sure the tester has adequate power before leaving it unattended.
- An unattended aurora^Sonata always connects incoming data and speech calls automatically, even if it is set up for manual connection during normal operation.

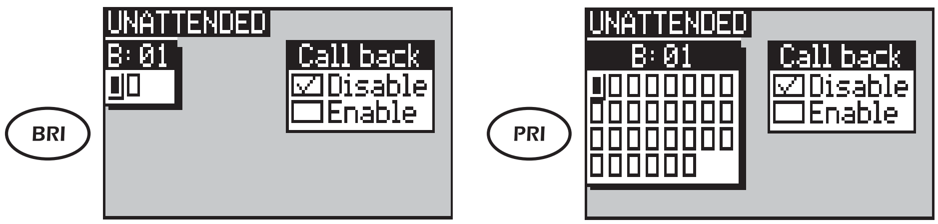
CorNet-T

If **Layer 2** is set to **Automatic**, aurora^Sonata cannot accept incoming calls until after the first outgoing call has been established. If aurora^Sonata is in unattended mode and **Layer 2** is set to **Automatic**, no calls will be received.

Beginning unattended operation

-1- From the main **Simulate** menu, select **Unattended unit**.

aurora[Sonata] is now ready to receive and connect incoming calls. The screen shows a series of boxes representing B channels.



Note

You cannot select a channel while the unit is unattended.

Enabling/disabling automatic call back

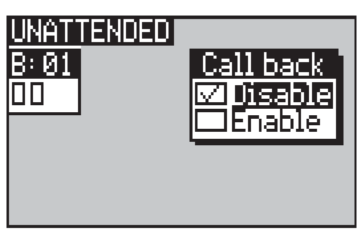
You can set up an unattended aurora[Sonata] so that, when it receives an incoming call which is then disconnected, it calls back the number from which the call was made.

Note

aurora[Sonata] uses the CLI sent by the calling unit as the callback number.

To enable or disable this feature:

-1- Press  to switch to the **Call back** option window.



-2- Highlight **Enable** or **Disable** and press *ENTER* to tick the check box.

Understanding the channel activity display

The following symbols indicate the call activity on each channel:

	Speech call connected
	Loop connected
	No activity

Displaying call information for a channel

To display information about the current or most recent call on a channel:

-1- Highlight the channel and press ***ENTER***.

For details of this display, see Chapter 3 section 2.

Clearing a connection

To clear a connection between an unattended aurora^{Sonata} and a remote unit, you clear the connection on the remote unit. aurora^{Sonata} then clears the channel to which it was connected.

Going back to normal operation

To end unattended operation, press ***ESC***. When you exit, aurora^{Sonata} clears any active calls.

Section 3 System Maintenance

This section is aimed at system, test and installation managers. It explains how to install new software on aurora^{Sonata}, and how to configure units using a local PC.

Note

Before you can perform these operations, install the Trendsend file transfer application on the PC. Trendsend is a Windows application supplied by Agilent Technologies. on the disk with the new software. A set of Installation Notes is provided to guide you through the installation process.

Warning: System maintenance

Only perform the operations described in this section if you have been specifically authorised by Agilent Technologies to do so. Otherwise, you may violate your licence agreement.

Installing new software

Agilent Technologies provides new software releases on floppy disk to customer service centres. All new software builds are configured by Agilent Technologies.

You can download the main program code, boot code, FPGA code (firmware) and up to three languages. aurora^{Sonata} prevents you from downloading the wrong code type (e.g. loading setup parameters into main code space), or downloading a software version that is incompatible with the hardware.

Copying the software onto the PC

First, you need to copy the new software onto the PC.

-1- Insert the floppy disk containing the new software into the PC's floppy disk drive.

-2- Copy the **Sntamain.bin** file into the **trendsend\transfer** directory on the PC.

Preparing the PC to download

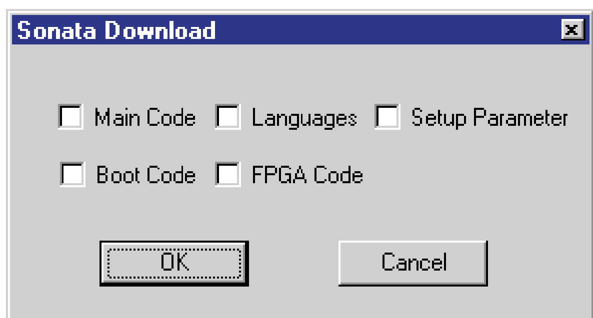
-1- Connect aurora^{Sonata} to the PC, but do not switch aurora^{Sonata} on.

-2- Connect the external power supply.

-3- Start up the Trendsend application on the PC.

Performing the download

-1- Go to the **Send** menu and choose **Sonata** to display a Sonata Download dialogue box.



-2- Select the type of upgrade you are performing by clicking the appropriate checkboxes to add or remove a tick from each one. Choose **OK**.

Note

Normally, you will only select **Main Code** and **Languages**. You may occasionally need to select the other checkboxes to perform FPGA and Boot code upgrades.

-3- To initiate the download, switch on aurora^{Sonata} by pressing I and F1 simultaneously. The PC displays a progress bar.

Note

Downloading does not begin until aurora^{Sonata} is connected to the external power. Make sure that a battery is fitted, in case the external power is removed during download.

When downloading is complete, aurora^{Sonata} displays its Welcome screen, with the new software version number.

-5- Exit Trendsend.

Note

When you switch on aurora^{Sonata}, if there is no software in the unit or an upload has been corrupted, the unit goes into upload mode so that you can transfer new software.

Copying system settings between units

You can load all settings defined using the **Setup** menus from an aurora^{Sonata} to a PC, and then from the PC to other units. This allows you to upgrade the software in several units without having to reconfigure them all manually afterwards. You can upgrade one unit, configure it, then copy the settings via a PC to the other units when you have upgraded them.

Note

The units to which you are copying settings must have the same software version number as the original unit.

Uploading the settings to the PC

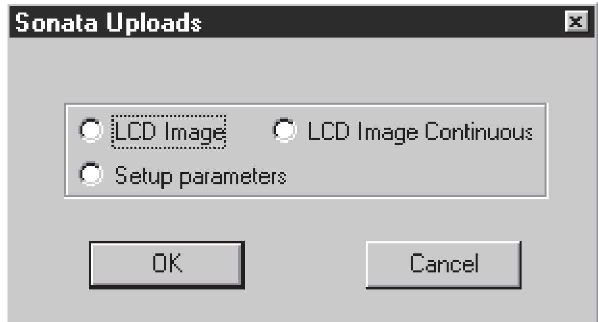
-1- Set up an aurora^{Sonata} in the way you require, connect it to a PC, and switch it on.

Tip

To display the current setup of an aurora^{Sonata}, press +5.

-2- Start the Trendsend file transfer application on the PC.

-3- Go to the **Receive** menu and choose **Sonata** to display a Sonata Uploads dialogue box.



-4- Click the **Setup Parameters** checkbox and choose **OK**. If a file containing setup parameters already exists on the PC, a pop-up window asks you to confirm that you wish to overwrite this information. When you confirm, the transfer begins and the PC displays a progress bar.

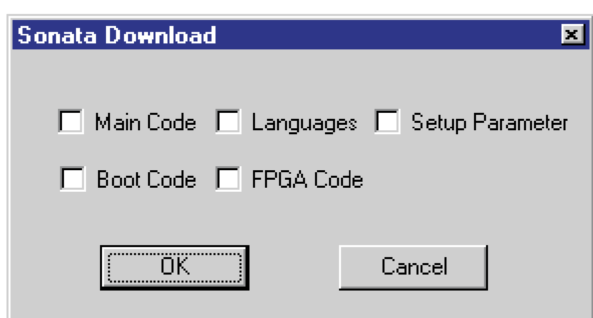
-5- When the transfer is complete, exit Trendsend.

Downloading the settings to another aurora[Sonata]

-1- Connect the unit you wish to configure to the PC and switch it on.

-2- Start the Trendsend file transfer application on the PC.

-3- Go to the **Send** menu and choose **Sonata** to display a Sonata Download dialogue box.



-4- Click the **Setup Parameter** checkbox and choose **OK**.

During the download, the PC displays a bar graph to indicate progress.

-5- Exit Trendsend.

Tip

You can check the configuration of an aurora^{Sonata} by pressing **+ *5*** to display the **Status** screen.

Chapter 7

Capturing & Analysing Protocol Information

Contents

Capturing & Analysing Protocol Information

This chapter explains how you can use aurora[Sonata] to capture and decode ISDN protocol information being transmitted across the line. It is divided into the following sections:

Section 1 Decoding in Real Time
Section 2 Capturing to Memory
Section 3 Analysing the Decode Display

About the protocol decode

Protocol information is transmitted in raw hexadecimal format. aurora[Sonata] can decode this information to identify the different messages it contains.

You can then go through the decode and check whether specific information has been transmitted, search for problems and so on.

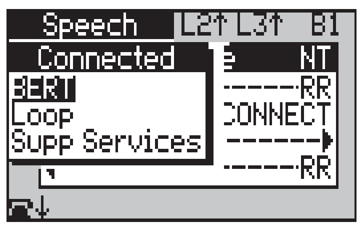
Section 1 Decoding in Real Time

There are two ways to display a decode of protocol events in real time (i.e. as they occur):

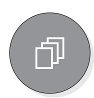
- by viewing the simple decode which aurora[Sonata] displays during test calls and line monitoring sessions.
- by sending the protocol information via the serial port to a PC or printer, where aurora[Sonata] can produce a more detailed decode.

Viewing the *simple* real-time decode

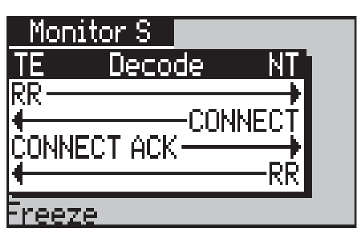
During calls in Simulation mode, aurora[Sonata] displays a simple protocol decode in a background window.



To display all of the **Decode** window for the call:

-1- Press the  key.

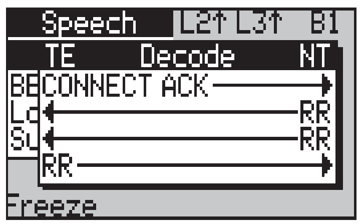
During a line monitoring session, aurora[Sonata] displays the simple, real-time decode in the foreground.



Freezing the decode display

You can press the **Freeze** function key to pause the display at a particular section of decode, then return to the real-time display when you have finished examining that part of the information.

For example, you might do this when you are waiting for a specific event to occur. When you think you see the information on the real-time decode you can pause the display and make sure it really is the relevant information, without having to stop recording and risk missing the event.



-1- Press the **Freeze** function key.

You can use the arrow keys to scroll up and down through the information as required.

-2- When you have finished examining the information, press the **RTime** function key to return to the real-time decode.

Note

You can view the decode in more detail using the extended decode display, for information see section 3 of this chapter.

Viewing the real time buffer contents

aurora^{Sonata} holds the most recent 8 kilobytes of the real-time decode in a part of its memory called the 'real time buffer'. It continues to do this even while the display is frozen.

You can view the contents of the real time buffer to see recent protocol events. This is a useful 'fallback' if, for example, a network problem arises when you have not set aurora^{Sonata} to save the information to memory or send it to the serial port.

Note

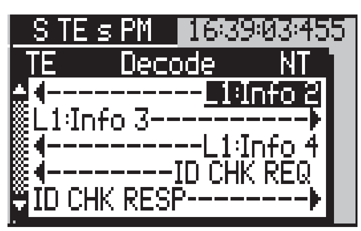
When you are capturing information for a test call in Simulate mode, you can save the contents of the real time buffer in aurora^{Sonata}'s memory for future reference. For instructions, see *Saving the contents of the real time buffer* in section 2.

Tip

To capture information for a test call, start a session from the **Capture/Review** menu (see section 2). You can save up to 200 kilobytes of information.

-1- Display the review menu for a captured Simulate session (see section 2).

-2- Highlight **Real Time** and press *ENTER* to display the current real time buffer contents. For example:



Note

If you view the real time buffer when there is no call in progress, aurora^{Sonata} shows the last information for the most recent call. If you view during a call aurora^{Sonata} continues adding data until the buffer is full, then freezes it until you stop viewing.

Navigating through the information

-1- Scroll through the decode using the arrow keys. At the top right of the screen, aurora^Sonata shows the time at which the currently highlighted event occurred.

-2- When you have finished viewing the real time buffer contents, press ***ESC*** to return to the list of sessions available for viewing.

Sending the decode to the serial port

As well as viewing a simple protocol decode displayed on-screen, you can send a more detailed decode to aurora^Sonata's serial port for output to a printer or PC.

Note

You can also output protocol information which has been previously stored in aurora^Sonata's memory. For details, see *Sending the capture session to a printer or PC* in section 2.

Choosing the format for the decode

There are various formats available for decode output to the serial port, allowing data to be analysed in different ways:

Protocol Output at the Serial Port	
Decode	A partial decode of Layer 1, Layer 2 and Layer 3 signalling with full hexadecimal dump of the D channel messages with Transmit/Receive indicator, time stamp and frame reference.
Expert	A full output of the ISDN protocol and aurora^Sonata operation, in a format which can be analysed using Trend aurora^Expert for Windows.
Debug	An OSI protocol decode, showing the messages that are sent between each layer in the protocol stack, plus D Channel messages being transmitted and received by Layer 2.

You choose a format using the **Tracer** setting in the **Comms/ Tracer** menu (see *Configuring the serial port/protocol output* in Chapter 3 section 1). When you connect to a PC or printer and begin a call or monitor session, aurora^Sonata begins sending decode in the selected format.

Section 2 Capturing To Memory

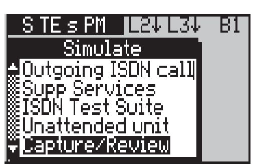
You can save the protocol information for an entire test call or monitor session in aurora[Sonata]'s memory. This is useful on sites where no PC or printer is available.

- You can retrieve the stored session and display a simple decode on screen. This allows you to view protocol information for an entire session instead of being restricted to the real-time buffer decode on site.
- You can also send a stored session to the serial port, when the equipment you require is available. For example, you can wait until you have access to a PC and then send the saved protocol information to a file for analysis using aurora[Expert] for Windows.

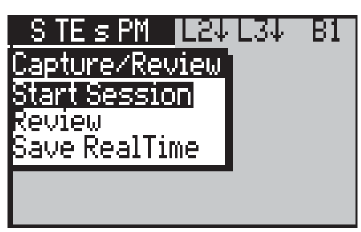
Capturing the decode for a test call

You can set aurora[Sonata] to begin capturing protocol information to memory before you connect a test call. aurora[Sonata] also allows you to stop and start capturing at any time—this means that you can capture an entire call, or only part of a call, or information for several calls within the same capture session.

To display the options for the protocol capture:



-1- From the main **Simulate** menu, select **Capture/Review**.

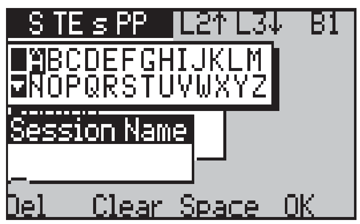


-2- Select the option you require:

Capture Options (Test Call)	
Start Session	Begin capturing protocol information to memory for a call.
Review	View a simple decode of protocol information stored in the memory for a previous session.
Save Real Time	Save the current contents of aurora^Sonata^'s real time buffer.

Starting a capture session

-1- From the **Capture/Review** menu, select **Start Session**. aurora^Sonata^ displays an entry window for you to assign a name to the session.



-2- Enter a name (up to eight characters). You cannot use the name of an existing stored session.

Tip

If you need instructions on how to use this screen, see *Entering alphanumeric information* in Chapter 2 section 3.

If you do not enter a name, aurora^Sonata^ automatically names the capture sessions **S1**, **S2** and so on.

-3- To save the name and begin capturing, press the **OK** function key. aurora^Sonata^ begins capturing and returns to the main **Simulate** menu.

While capturing is in progress

As aurora^{Sonata} captures protocol information for the call, it is added to the end of any information already in the memory.

When the memory is full, aurora^{Sonata} either displays a Memory Full message and stops saving until you delete a session, or displays a Wrap message and begins overwriting the earliest data in the memory. This is determined by the **Memory Mode** setting in the **Comms/Tracer** menu—see *Choosing what happens when the memory is full* in Chapter 3 section 1.

Ending the capture session

You can stop capturing at any time after the call has cleared.

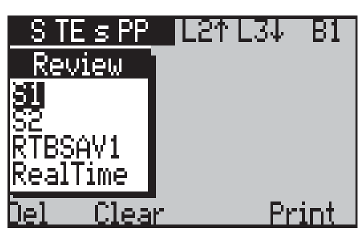
-1- From the main **Simulate** menu, select **Capture/Review**.

-2- Select **Stop Session.**

Reviewing a captured session

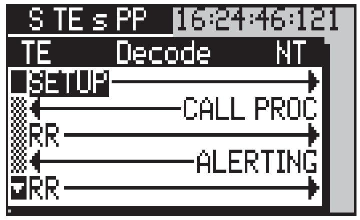
You can retrieve the captured protocol information and display a simple decode on screen.

-1- From the **Capture/Review** menu, select **Review**.

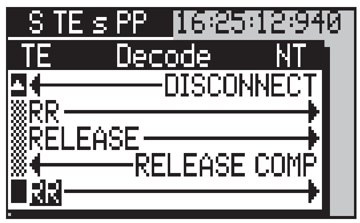


In the above example there are two stored capture sessions (**S1** and **S2**) and one set of saved real time buffer contents, named **RTBSAV1**. You can also select **Real Time** to view the current contents of the real time buffer.

-2- Highlight the session you wish to review and press ***ENTER***. The example below shows part of the setup sequence for a test call.



-3- Use the arrow keys to scroll through the information. The example below shows part of the disconnection sequence for the same call.



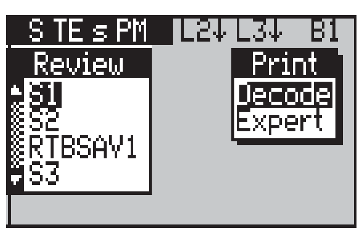
Note

You can view the decode in more detail using the extended decode display, for information see Section 3 of this chapter.

Sending the capture to a printer or PC

You can send a stored protocol capture session via aurora^Sonata's serial port to a printer or PC (e.g. for analysis using aurora^Expert for Windows). To do this:

-1- In the **Capture Review** menu, highlight the capture session and press the **Print** function key. aurora^Sonata displays a window for you to choose the format for the output.



Notes:

- You can send the contents of the real-time buffer to the serial port from this menu, by selecting **RealTime**.
- You cannot print a session with the tracer enabled—i.e. when the **Tracer** setting in the **Comms/Setup** menu is set to anything except **Off**. If you try to do this aurora^{Sonata} gives you the option to switch the tracer off. Remember to return it to the setting you require when you have finished printing.

-2- Select the format you require:

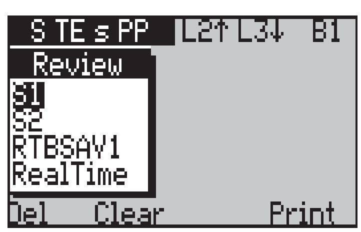
Format at the Serial Port	
Decode	A partial decode of layer 2 and layer 3 signalling with full hexadecimal dump of the D channel messages with Transmit/Receive indicator, timestamp and frame reference.
Expert	Send the protocol information in hexadecimal format, suitable to be analysed using Trend aurora^{Expert} for Windows.

aurora^{Sonata} begins printing and displays a progress bar. You can cancel printing at any time by pressing the **Abort** function key. When printing is complete, aurora^{Sonata} displays a **Print Complete** message.

-3- Press *ESC* to return to the previous screen.

Clearing sessions from the memory

You can delete capture sessions from the memory to make room for more information.



To clear an individual session, highlight it and press the **Del** function key. To clear all sessions, press the **Clear** function key.

Note

The **Real Time** option is not removed from the menu, because it is not a stored session—it always shows the most recent 8 kilobytes of information.

Saving the decode for a monitor session

The protocol information captured during a line monitoring session is essentially the same as the information captured for a test call in Simulate mode, except that you access it from different menus.

For more information on saving and retrieving protocol information for line monitoring, see Chapter 5.

Saving the contents of the real time buffer

aurora[Sonata] holds the most recent 8 kilobytes of protocol information in a part of its memory called the 'real time buffer'.

When you are capturing information for a test call in Simulate mode, you can save the current contents of the real time buffer in aurora[Sonata]'s memory for future reference. This is a useful 'fallback' if, for example, a network problem arises when you have not set aurora[Sonata] to save the protocol information to memory or send it to the serial port.

Note

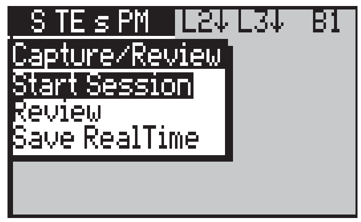
In both Simulate and Monitor mode, you can view the current contents of the real time buffer to see recent protocol events. See *Viewing the real time buffer contents* in section 1.

You can save the real time buffer contents at any time after disconnection.

Note

You must save the contents as soon as you can after the event you wish to see is displayed on screen, since the real time buffer only holds the most recent 8 kilobytes of information.

-1- In the main **Simulate** menu , select **Capture/ Review**.



-2- Select **Save RealTime**. aurora[Sonata] displays an alphanumeric entry window for you to assign a name to identify the saved information.

-3- Enter a name (up to eight characters).

Tip

If you need instructions on how to use this screen, see *Entering alphanumeric information* in Chapter 2 section 3.

If you do not enter a name, aurora[Sonata] automatically names the saved section of data ***S1***, ***S2*** and so on.

-4- Press the **OK** function key to save the name and store the information.

Viewing the saved information

You can view the information by going to the **Capture Review** menu and selecting the name you assigned to the stored section of data. See *Reviewing a captured session* earlier in this section.

Section 3 Analysing the Decode Display

This section explains each of the possible formats for the protocol decode.

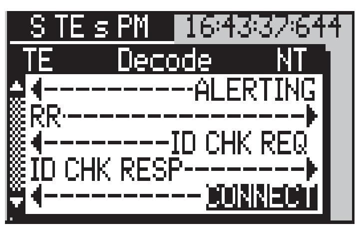
Note

The section does not cover protocol analysis using auroraExpert for Windows, because full user instructions are provided in the auroraExpert for Windows Reference Guide and on-line Help.

The simple decode

auroraSonata displays a simple protocol decode on-screen during all simulation test calls and line monitoring sessions. You can also display a simple on-screen decode for information which has been saved to memory, or for the real time buffer contents.

The example screen below shows the simple decode of a section of protocol information captured to memory during a test call in Simulation mode and now being reviewed.



About the display screen

At the top of the **Decode** window is a Status bar showing the types of device which are connected to each other. The example above is a typical display for a call between a TE and an NT. The left side of the screen shows TE activity and the right side shows NT activity.

Understanding the simple decode

The simple decode shows basic information about Layer 1, Layer 2 and Layer 3 events, with a timestamp at the top right of the screen.

The direction of each message is indicated by an arrow. For example, in the illustration on the previous page a Connect message has been sent from the NT to the TE.

For a Basic Rate link, the display shows Layer 1 Info states for the Basic Rate S interface, Layer 2 frame messages (SABME, UA, RR, etc), and Layer 3 messages. For a Primary Rate link, instead of Layer 1 Info states the display shows Layer 1 alarms as they occur.

Extended Decode

The extended decode display allows you to look at a message that is displayed in the **Decode** window in more detail.

You can use the extended decode display when:

- you are reviewing a monitor or capture session that you have stored in aurora^{Sonata}'s memory
- you are viewing the decode window for a call that is connected

Viewing the extended decode display

When the **Decode** window is displayed:

-1- If the **Decode** window is not the active window, press .

-2- If you are viewing the realtime decode window, freeze the decode, by pressing the **Freeze** function key.

-3- Move the cursor to the message you want to look at by pressing ▲ and ▼.

-4- To display the extended decode, press *ENTER*.

The following messages are displayed:

Layer 2 Fields
Service Access Point Identifier (SAPI) value
Terminal Endpoint Identifier (TEI) value
Frame type (Information, Supervisory or Unnumbered)
N\S N\R value (Number Sender\Receiver)
Polled\Final (P\F) bit
Command\Response (C\R) bit

- Layer 3 Protocol Discriminator and Call Reference values
- Layer 3 Codeset Shift and Sending Complete single byte information elements

The following Codeset 0 information elements are fully decoded:

Layer 3 Information Elements – fully decoded
Notification Indicator
Display
Keypad Facility
Restart Indicator
User to User Info

The following Codeset 0 information elements are displayed and some of the fields are expanded:

Layer 3 Information Elements - partially decoded
Bearer Capability
Cause
Connected Number
Connected Subaddress
Channel ID
Progress Indicator
Network Specific Facility
Signal
Service Profile ID
End Point ID
Calling Number
Calling Subaddress
Called Number
Called Subaddress
Redirecting number
Redirecting Subaddress
Redirection Number
Redirection Subaddress
Low Layer Compatibility
High Layer Compatibility

The following information elements are displayed, but they are not decoded beyond the name of the element:

Layer 3 Information Elements - displayed, not decoded
Call Identity
Call State
Facility
Time and Date
Information Request
Switchhook
Feature Activation
Feature Indication
Information Rate
End to End Transit Delay
Transit Delay Selection
Packet Binary Parameters
Packet Window Size
Packet Size
Throughput Class

No information from other Codesets is decoded.

Displaying the rest of the extended decode

The whole of the extended decode may not be visible at the same time in the **Decode** window.

To see other parts of the extended decode:

-1- To move up and down the extended decode - press ▲ and ▼.

-2- To move to the top of the extended decode - press ⇧ + ◀.

Viewing the extended decode for other messages

You can display the extended decode for other messages in the **Decode** window without first returning to that window.

-1- To display the extended decode for the next message in the **Decode** window, press ▶.

-2- To display the extended decode for the previous message in the **Decode** window, press ◀.

Returning to the Decode Window

To return to the main **Decode** window:

-1- Press *ENTER* or *ESC*.

Returning the Decode window to real time

If you are viewing a frozen decode window, to return the **Decode** window to real time:

-1- Press the **RTime** function key.

The detailed decode

aurora^{Sonata} can send a more detailed decode of the protocol information to the serial port. From the serial port you can send the decode to a printer or PC file.

You can choose whether to produce the decode in a standard format (**Decode**) or in a format compatible with aurora^{Expert} for Windows (**Expert**). For instructions, see the earlier sections of this chapter.

Initial output at the serial port

The standard output at the serial port begins with information identifying the software release, current date and time, the source of the decode (e.g. TE or NT), the protocol in use and the current setup of aurora^{Sonata}.

Understanding the standard decode

The standard decode shows the name of each message, with a timestamp and the direction of the message. It decodes all incoming and outgoing ISDN messages and Layer 1 events.

The output is in the form of a Layer 2 and Layer 3 partial decode of the protocol information, with the message information broken down into Layer 2 and Layer 3 parts.

The Layer 2 decode is displayed first, followed by the decode of the Layer 3 part of the message, if there is one. Finally, there is a hexadecimal print of the entire message.

For a Basic Rate link, Layer 1 Info State information is provided by the S interface for the standard decode output. For the 2B1Q U interface, the decode provides EOC and FEBE/NEBE information. For a Primary Rate link, Layer 1 alarms are shown.

Decode output—Example

The tables on the following pages show a typical protocol decode for the beginning of a call setup on a Basic Rate link. The first table shows the initial output, which displays the software release, current date and time, the source of the decode (e.g. TE or NT), the protocol in use and the current setup of aurora[Sonata].

Decode Output	Explanation
TREND aurora(Sonata) ISDN Software - V2.3 09:41:35 Nov 6 1998	Shows software release information.
Interfaces: S, DATE :14/01/99 TIME :09:42:09	Current date and time.
ISDN SETUP PARAMETERS INTERFACE : S PROTOCOL : ETSI MODE : TE LINE TYPE : P-MP LAYER 2 : PERMANENT B CH TEI : FIXED 0,0 TERMINATION : ON BERT PATTERN : 2047p.r. BERT LENGTH : CONTINUOUS	Current setup including, source of trace (TE or NT) and protocol in use.

Decode Output	Explanation
T<N 09:42:31:811 L1:Info 2	
T>N 09:42:31:812 L1:Info 3	
T<N 09:42:31:813 L1:Info 4	
TX 09:42:32:016 Frame 1 L2: SABME Sapi=0 Tei=0 Pf=1 00 01 7F	Sent Frame 1 at 09:42:32:016, **SABME**, SAPI of 0, TEI of 0, Polling Bit was 1, Frame contained hex 00 01 7F.
RX 09:42:32:075 Frame 1 L2: UA Sapi=0 Tei=0 Pf=1 00 01 73	Received **UA** reply.

Decode Output

```
TX 09:42:37:588 Frame 2
L2: Info
    Sapi=0  Tei=0
    Pf=0 Nr=0 Ns=0

L3: SETUP
    Pd=8  Cr(O)=1

I04 Bearer cap
    Bcap=Speech     A Law

I18 Channel ident
    Channel=B1

I6C Calling number
    Numb=12345

I70 Called number
    Numb=2323
00 01 00 00 08 01 01 05 04 03
80 90 A3 18 01 81 6C 07 00 80
31 32 33 34 35 70 05 80 32 33
32 33
```

Explanation

Transmitted Info frame with a **SETUP** message, Bearer Capability Speech, on Channel B1, Call Reference Originating =1.

Decode Output	Explanation

<pre>RX 09:42:37:788 Frame 2
L2: Info
    Sapi=0 Tei=0
    Pf=0 Nr=1 Ns=0
L3: CALL PROC
    Pd=8 Cr(D)=1
I18 Channel ident
    Channel=B1
02 01 00 02 08 01 81 02 18 01
89</pre>
	Received **CALL PROCEEDING** message,
	Frames received =1,
	Call reference Destination =1.

<pre>TX 09:42:37:791 Frame 3
L2: RR
    Sapi=0 Tei=0
    Pf=0 Nr=1
02 01 01 02</pre>
	Replied with an **RR.**

<pre>RX 09:42:37:895 Frame 3
L2: Info
    Sapi=0 Tei=0
    Pf=0 Nr=1 Ns=1
L3: ALERTING
    Pd=8 Cr(D)=1
02 01 02 02 08 01 81 01</pre>
	Received an **ALERTING** message,
	Frames received 1,
	Frames sent 1.

<table>
<tr><th>Decode Output</th><th>Explanation</th></tr>
<tr><td><pre>
TX 09:42:37:898 Frame 4
L2: RR
    Sapi=0 Tei=0
    Pf=0 Nr=2 02 01 01 04
</pre></td><td>Replied with an RR,
Frames received 2.</td></tr>
<tr><td><pre>
                    RX 09:42:44:773 Frame 4
                    L2: Info
                        Sapi=0 Tei=0
                        Pf=0 Nr=1 Ns=2
                    L3: CONNECT
                        Pd=8 Cr(D)=1
                    I4C Connected numb
                        Numb=123452
                    02 01 04 02 08 01 81 07 4C 08
                    21 80 31 32 33 34 35 32
</pre></td><td>Received the CONNECT message,
Frames received 1,
Frames sent 2.</td></tr>
<tr><td><pre>
TX 09:42:44:776 Frame 5
L2: RR
    Sapi=0 Tei=0
    Pf=0 Nr=3
02 01 01 06
</pre></td><td></td></tr>
<tr><td><pre>
 TX 09:42:44:787 Frame 6
L2: Info
    Sapi=0 Tei=0
    Pf=0 Nr=3 Ns=1
L3: CONNECT ACK
    Pd=8 Cr(O)=1
00 01 02 06 08 01 01 0F
02 01 06 04
</pre></td><td>Transmit CONNECT ACKNOWLEDGE
message.</td></tr>
</table>

Decode Output	Explanation

`RX 09:42:45:177 Frame 5`
`L2: RR`
`Sapi=0  Tei=0`
`Pf=0 Nr=2`
`00 01 01 04`
	Received **RR** reply.

`RX 09:42:50:325 Frame 6`
`L2: Info`
`Sapi=0  Tei=0`
`Pf=0 Nr=2 Ns=3`
`L3: DISCONNECT`
`Pd=8  Cr(D)=1`
`I08 Cause`
`Cause Code=16`
`02 01 06 04 08 01 81 45 08 02`
`82 90`
	Received a **DISCONNECT** message, Cause 16 (normal call clearing).

`TX 09:42:50:328 Frame 7`
`L2: RR`
`Sapi=0  Tei=0`
`Pf=0 Nr=4 02 01 01 08`
	Sent **RR** in reply.

Decode Output	Explanation

```
TX 09:42:50:593 Frame 8
L2: Info
    Sapi=0  Tei=0
    Pf=0 Nr=4 Ns=2
L3: RELEASE
    Pd=8  Cr(O)=1
I08 Cause
    Cause Code=16
00 01 04 08 08 01 01 4D 08 02
80 90
```

Sent a **RELEASE** message,
Cause Code 16.

```
                    RX 09:42:50:695 Frame 7
                    L2: Info
                        Sapi=0  Tei=0
                        Pf=0 Nr=3 Ns=4
                    L3: RELEASE COMP
                        Pd=8  Cr(D)=1
                    I08 Cause
                        Cause Code=16
                    02 01 08 06 08 01 81 5A 08 02
                    82 90
```

Received **RELEASE COMPLETE** message.

```
 TX 09:42:50:698 Frame 9
L2: RR
    Sapi=0  Tei=0
    Pf=0 Nr=5 02 01 01 0A
```

Sent **RR** in reply.

Understanding the Debug output

The Debug format for the protocol decode is normally only used for detailed analysis by Agilent Technologies engineers. It consists of a hex printout of any transmitted or received messages, plus additional information about the messages (primitives) which are passed between the OSI Layers, internal entities and the line at each end of the link. The layers are labelled as follows:

MMI	User interface
CC	Call control
CCP	X.25 call control
L3	Layer 3
P3	Packet layer
L2	Layer 2
L2D	HDLC controller
L1	Layer 1
ME	Management entity

The example below shows three lines of Debug output:

```
L2  ME  5   MDL_ERR_IND    Error Code   =G
L2  L3  5   DL_REL_IND      Ces=1
L3  CC  99  NL_REL_IND      Ces=1
```

- Column 1 is the source of the primitive.
- Column 2 is the destination of the primitive.
- Column 3 is the state number within the state machine of the primitive source before it is sent.
- Column 4 is the OSI primitive itself. These are described in the ISDN Layer 3 specification (Q931), apart from those relating to the user interface

(MMI).

- The rest of the line is a breakdown of the contents of the information fields sent with data requests or indication primitives. A timestamp shows the time the message was sent/received, to the nearest the message was sent/received, to the nearest millisecond.

Chapter 8

Power Sources

Contents

Power Sources

This chapter describes how to operate aurora^Sonata from external power or rechargeable batteries. It includes instructions for recharging and replacing the battery pack.

Using external (mains) power

You can power aurora^Sonata from the mains supply, using the adaptor/charger supplied with the unit. When you connect the adaptor/charger, this automatically starts up a battery charging cycle—see *Recharging the battery pack* later in this chapter.

-1- Plug aurora^Sonata's power supply unit into a nearby power socket which is easily accessible.

-2- Fit its connector into the external power supply socket on aurora^Sonata, as shown below.

-3- Switch on the mains power supply.

Note

You can also power aurora^Sonata from the 12V cigar lighter adaptor in a vehicle, using a vehicle cigar lighter power cable which is supplied as an optional extra.

Using battery power

aurora$^{\text{Sonata}}$ is supplied with a removable, rechargeable nickel metal hydride (NiMH) battery pack. The packs come in two sizes—see Chapter 9 section 1 for details.

Warning: Battery packs
The battery packs are factory-sealed and must not be opened.

Battery life

The battery life depends on the interfaces you are using, the age of the battery, surrounding temperature and the task you are performing.

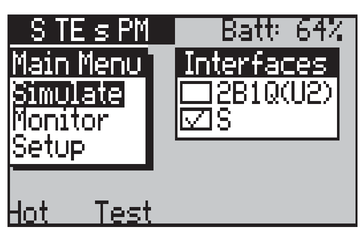
Under normal conditions, with one BRI S interface in use:

- the medium capacity battery pack lasts up to 8 hours from fully charged
- the higher capacity pack lasts up to 18 hours from fully charged

PRI operation consumes significantly more power than BRI operation.

Checking the battery voltage

When the battery is in use, aurora$^{\text{Sonata}}$ displays a percentage figure on the top level menu to indicate the battery condition. For example:



Note

Use this figure as an **approximate** indication of battery condition. Immediately after charging, it is around 100%. When the charge is adequate, it is around 60% (this varies according to surrounding temperature). This value is displayed during most of the charging cycle.

When battery power is low

When battery power has dropped to approximately 16% of its fully charged voltage, the ***Bat*** LED flashes red. You must now either recharge or replace the battery pack.

Note

If battery power falls to a level which is insufficient to power the tester reliably, aurora[Sonata] switches itself off. The system settings are stored in the memory.

Saving the batteries

aurora[Sonata] can be set to switch itself off automatically when powered from batteries, if no calls are in progress and no keys have been pressed after a certain length of time.

You can choose the length of time that aurora[Sonata] will wait before switching itself off, or disable the battery-saving feature for continuous operation. For details, see *Setting the automatic power-off time delay* in Chapter 3 section 1.

Discharging the battery pack

NiMH cells exhibit a ‘memory’, which means that if you repeatedly recharge a battery which is only partially discharged, a small amount of its capacity is lost.

This should not normally be a problem, but you may wish to discharge the battery completely before recharging it. You can do this by operating aurora[Sonata] from battery power with the battery-saving feature disabled (see above), or by leaving the unit in unattended mode (see Chapter 6 section 2).

Recharging the battery pack

Warning: Recharging the battery

Only recharge the ***rechargeable NiMH*** battery pack supplied with your aurora^{Sonata}.

You must not recharge the battery if the temperature is below 0°C or above +35°C.

-1- Plug the power adaptor/charger into the mains supply and aurora^{Sonata}'s power supply socket.

Warning: Using the adaptor/charger

aurora^{Sonata} is intended for use only with the adaptor/charger with which it is supplied. If you use any other adaptor/charger, you may damage the tester or battery, and invalidate equipment warranties and approvals relating to safety or electromagnetic compatibility.

The battery is initially charged at a high current ('fast charging'). This means it will be almost fully charged in 1-1½ hours (medium capacity pack) or 2-3 hours (higher capacity pack). During fast charging, the ***Bat*** LED lights up green.

Tip

You can use aurora^{Sonata} while the battery is recharging. You can also disconnect the adaptor/charger at any time during the charging cycle: when you reconnect, a new cycle begins.

-2- Continue until the battery is fully charged.

When fast charging is complete, the ***Bat*** LED glows green less brightly. The battery is now being charged in 'pulses'. This is the 'top off' stage, which ensures that the battery is fully charged: it lasts for 1½ hours (medium capacity pack) or 3 hours (higher capacity pack).

When charging is complete, the LED glows green very dimly, to indicate that the battery is being 'trickle charged'.

When the battery is fully recharged, it is safe to leave the charger connected for longer periods. If you do this, it continues 'trickle charging' the battery to maintain full capacity, and the ***Bat*** LED glows green very dimly.

Note

Avoid 'force charging' aurora^Sonata by repeatedly removing and inserting the charger—this may cause excessive heat in the tester and reduce the capacity of the battery.

Replacing a battery pack

It may be useful to carry spare battery packs with you, in case the battery runs out at a site where no mains power is available. Keep them in the carrying case until needed.

While you are replacing the battery, the real time clock and system settings are maintained by a memory backup capacitor. This should ensure that the settings are retained even if aurora^Sonata is left without a battery for several hours.

To remove the old battery

-1- Remove the battery pack cover, which is on the back of aurora^Sonata. To do this:

- Loosen the screw by turning it **anticlockwise** using a coin or screwdriver.

- When the screw is completely released, it pops up. Slide the cover upwards to remove.

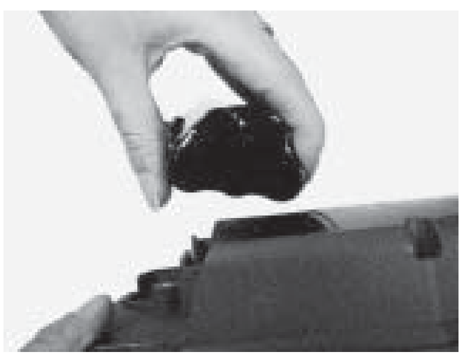
-2- Remove the battery pack. To do this:

- Gently lift the pack slightly out of its casing, with the connector still attached.

- Unplug the connector by pulling the connector itself. Do not pull on the wires.

To fit a new battery

-1- Place the new battery pack in the unit.



Fitting the medium-capacity pack

Fitting the higher-capacity pack

-2- Plug in the connector.

-3- Replace the battery pack cover:

- Slide the cover back down into place—be careful not to trap the connector wires.
- Push the screw down and turn it **clockwise** to tighten.

Warning: Tightening the screw

Make sure the screw is properly tightened—otherwise the cover will come off when you hang aurora^Sonata from its belt hook.

Disposing of the old battery

Dispose of batteries in accordance with local environmental regulations. Please recycle them wherever possible.

Warning: Disposing of batteries

Do not dispose of batteries in a fire—they may explode.

Storing the battery packs

If your aurora^Sonata is to be left unused for more than three months, you should remove the battery and store it separately, to avoid chemical changes caused by the discharge of the internal circuitry.

For maximum life, batteries should be stored in a cool dry place. The surrounding temperature must not exceed 30°C.

Note

When an aurora^Sonata battery has been stored for a long period of time, it may be necessary to perform three or four complete charge/discharge cycles to recover its full capacity.

Using aurora^Sonata without a battery pack

It is quite acceptable to use your aurora^Sonata without a battery pack. However, if you plan to do this, remember that the internal clock and system settings are maintained by the memory backup capacitor for only a few hours. You are advised to keep a note of the system settings.

Chapter 9

Technical & Purchasing Notes

Contents

Technical & Purchasing Notes

This chapter provides technical and purchasing information related to aurora^Sonata and its various interfaces. It is divided into sections as follows:

Section 1	Technical Information
Section 2	Notes for Purchasers

Section 1 Technical Information

This section sets out of the specification and other technical information related to aurora^Sonata. If you require more details, contact your local Agilent Technologies representative.

aurora^Sonata specifications

Protocols

Currently supports the ETSI, 1TR6 CorNet-N, CorNet-T, TN1R6-N and TN1R6-T protocols.

ETSI conforms to CTR3

1TR6 conforms to 1TR20

CorNet-N conforms to *CorNet-N Protocol Specification D-Channel, Layer 1,2 and 3 for ISPBX Networking*.

CorNet-T conforms to *CorNet-T D-Channel Interface Specification for the ISPBX Basic Access (Basic Rate Terminal Equipment)*.

TN1R6-N and TN1R6-T conform to *TN-1R6; TN -Fassung der FTZ-Richtline 1R6*.

Layer 2 protocol

Based on CCITT (ITU-T) Rec. Q921
Conforms to ETS 300 125

Layer 3 protocol

Based on CCITT (ITU-T) Rec. Q931
Conforms to ETS 300 102, FTZ, 1TR6

User interface

Display

Backlit, monochrome graphics Liquid Crystal Display (LCD) with contrast control, 128 dots wide by 64 dots high. Screen 61mm x 41mm, 8 rows x 22 characters.

Keypad

27 keys plus shifted functions.

Indicators

6 LEDs on front panel, 3 dual colour, 2 red only, 1 green only.
1 dual colour LED adjacent to each interface connector.

Audio

Integral telephone handset with Hearing Aid compatible receiver, plus hands free facility selectable by key press.

Physical/Environmental

Dimensions

Length 285mm; width 100mm; depth 87mm.

Weight

1.1 kg with one S interface fitted, including batteries.

Temperature range (non-condensing)

Operation	-15°C to +55°C
Battery charging:	0°C to +35°C maximum +10°C to +30°C recommended
Storage	-25°C to +70°C

Durability

Tested for 2m drop onto concrete.

Tested in accordance with:

ETS 300019-1-1 Class 1.2

ETS 300019-1-2 Class 2.2

ETS 300019-1-7 Class 7.3

IP22 (when laid flat or held upright)

Power supplies

Batteries

NiMH rechargeable pack: two possible sizes:

- Medium capacity—1.85AH or greater
- Higher capacity—3.5AH or greater

Low voltage is indicated at nominally 16% cell capacity.

External power supply

12V input DC at 2A maximum.

External power source unit

International power supply at 95-260V AC, 50/60 Hz.

Temperature range:

-10 to +40°C	operation
-20°C to +70°C	storage

Memory capacity

Static CMOS RAM

512 kilobytes.

Flash memory capacity

2 megabytes.

Interface specifications

Optional interface modules

Accommodates any two of the following BRI interface modules:

- S interface module
- U interface module (2B1Q line coding)
- U interface module (4B3T line coding)
- U interface module (Up0 line coding)

Can also accommodate one PRI interface module (E1 access)

BRI S interface

Physical

ETSI conforms to CTR3.

Connectors

S interface 8 pin RJ45. Pinout: pin 1 optional battery status, pin 2 optional battery status, pin 3 Tx (TE mode), pin 4 Rx (TE mode), pin 5 Rx (TE mode), pin 6 Tx (TE mode), pin 7 optional power, pin 8 optional power.

Clock input 4 pin FCC 68 4-4. Pinout: pin 1 data input, pin 2 no connection, pin 3 no connection, pin 4 data input.

This enables the U interface lead to be used for clock input.

BRI U interface (2B1Q)

Physical

Designed to conform to ANSI T1.601 and ETR080.

Connectors

4 pin FCC 68 4-4. Pinout: pin 1 data input, pin 2 no connection, pin 3 no connection, pin 4 data input.

Maximum line voltage

200V DC.

BRI U interface (4B3T)

Physical

Designed to conform to ETR080 and FTZ 1TR220.

Connectors

4 pin FCC 64 4-4. Pinout: pin 1 data input, pin 2 no connection, pin 3 no connection, pin 4 data input.

Maximum line voltage

120V DC.

PRI interface (E1)

Physical

ETSI conforms to CTR4.

Connectors

Primary Rate ISDN 8 pin RJ45. Pinout: pin 1 Rx (TE mode), pin 2 Rx (TE mode), pin 3 no connection, pin 4 Tx (TE mode), pin 5 Tx (TE mode), pin 6 no connection, pin 7 no connection, pin 8 no connection.

The BRI S interface lead may be used for PRI.

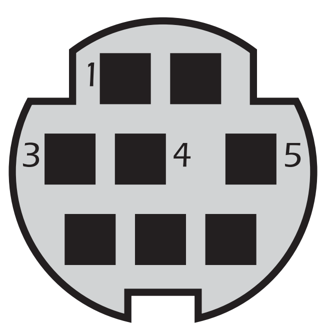
Clock input 4 pin FCC 68 4-4. Pinout: pin 1 data input, pin 2 no connection, pin 3 no connection, pin 4 data input.

This enables the U interface lead to be used for clock input.

Serial port

Bi-directional, high speed RS232 port providing baud rates of 2.4, 9.6, 19.2, 38.4, 57.6 and 115.2 KBD.

8 pin mini DIN socket:



Serial Port - 8 Pin Mini DIN Socket	
Pin	**Description**
1	DTR (Data Terminal Ready)
3	Transmit
4	Ground
5	Receive

Interface with aurora[Expert] for Windows.

Xon/Xoff flow control protocol is used.

Clock accurate to within 1.2% on asynchronous data above 19.2Kbps

Cable supplied with 9 pin 'D' type socket for direct communication with a PC serial port.

NT mode clock

Accurate to 3 ppm over operating temperature range.

Regulations and approvals

EC Directives

aurora[Sonata] complies with the following EC Directives:

89/336/EEC	Electromagnetic Compatibility
93/68/EEC	Amendment Directive
72/23/EEC	Low Voltage Directive, as modified by Marking Directive 92/31/EEC (external power source unit only)

BERT

Available patterns: Binary 0, Binary 1, 1:1, 1:3, 3:1, 63p.r. (pseudo-random), 511p.r., 2047p.r (default).

511 bit pattern conforms to CCITT Rec. V52.

2047 bit pattern conforms to CCITT Rec. 0151/152.

Error performance is gauged according to G.821 objectives.

Product safety

auroraSonata complies with EN60950, UL1950, AS/NZS 3260 and TS001, IEC950.

Quality and reliability

Designed according to Trend Communications Ltd. IS0 9000 procedures.

Section 2 Notes for Purchasers

This section provides information to help you make decisions when purchasing optional equipment for use with aurora^{Sonata}.

Customising your aurora^{Sonata}

As explained in Chapter 1, aurora^{Sonata} can be fitted with a number of different optional interface modules.

The main advantage of this is that you can customise your unit, using only those interfaces that meet your organisation's specific requirements. This means that:

- the overall cost of the tester is lower, because you only need to purchase the interfaces that you actually need
- if your requirements change, you can arrange for additional interfaces to be fitted
- the tester can easily accommodate future developments

When you first purchase aurora^{Sonata}, you specify which interface modules you require. Each module that you choose is fitted onto the main unit by Agilent Technologies. Once fitted, it is an integral part of the tester.

Your local sales representative can advise you on how to proceed with upgrades.

Warning: Interface modules

Any future upgrades will require special handling. Do not attempt to remove an interface module from the tester yourself, unless you have been specifically authorised byAgilent Technologies to do so.

Which modules are available?

At present, the following interface modules are available:

- Basic Rate S interface
- Basic Rate U interfaces (2B1Q, 4B3T or Up0)
- Primary Rate interface (E1 access)

These combine to offer TE, NT and LT emulation modes and real-time monitoring on Basic Rate (S and U interfaces) and Primary Rate links.

Guidelines for choosing the modules

At present, you can have up to two Basic Rate S or U interface modules or a Primary Rate module fitted at any one time.

To perform certain tasks you need particular combinations of interface modules. As a general guide, the modules you require for specific tasks are as follows:

Module Configurations

Task	Modules Required
Simulation on the S interface	One S module
Simulation on the U interface	One U module
Monitoring on the S interface	One S module
Monitoring on the U interface (4B3T & Up0 only)	Two U modules of the same type (e.g. two 4B3T modules)
Simulation/monitoring on a PRI link	One PRI module
NT replacement	One S module and one U module

How the modules are fitted

When you receive your aurora^Sonata, the modules you have requested are already fitted. Once a module is fitted, it is an integral part of the tester and can only be removed by persons authorised by Agilent Technologies.

Optional accessories

The following optional accessories are available for aurora^{Sonata}:

- spare battery packs of either capacity
- luxury soft carry case
- 3-way RJ45 T-piece for S interface monitoring
- S Bus Phantom Power Feed Box (PPFB)
- 2B1Q/4B3T (U2/U4) Power Feed Box
- Up0 Power Feed Box
- spare adapter/charger
- additional User Guide
- vehicle cigar lighter charger power lead
- additional cables as requested
- 9/25 pin connector adaptor for RS232 cable

For details, contact your Agilent Technologies representative.

aurora^{Expert} for Windows (Protocol analysis)

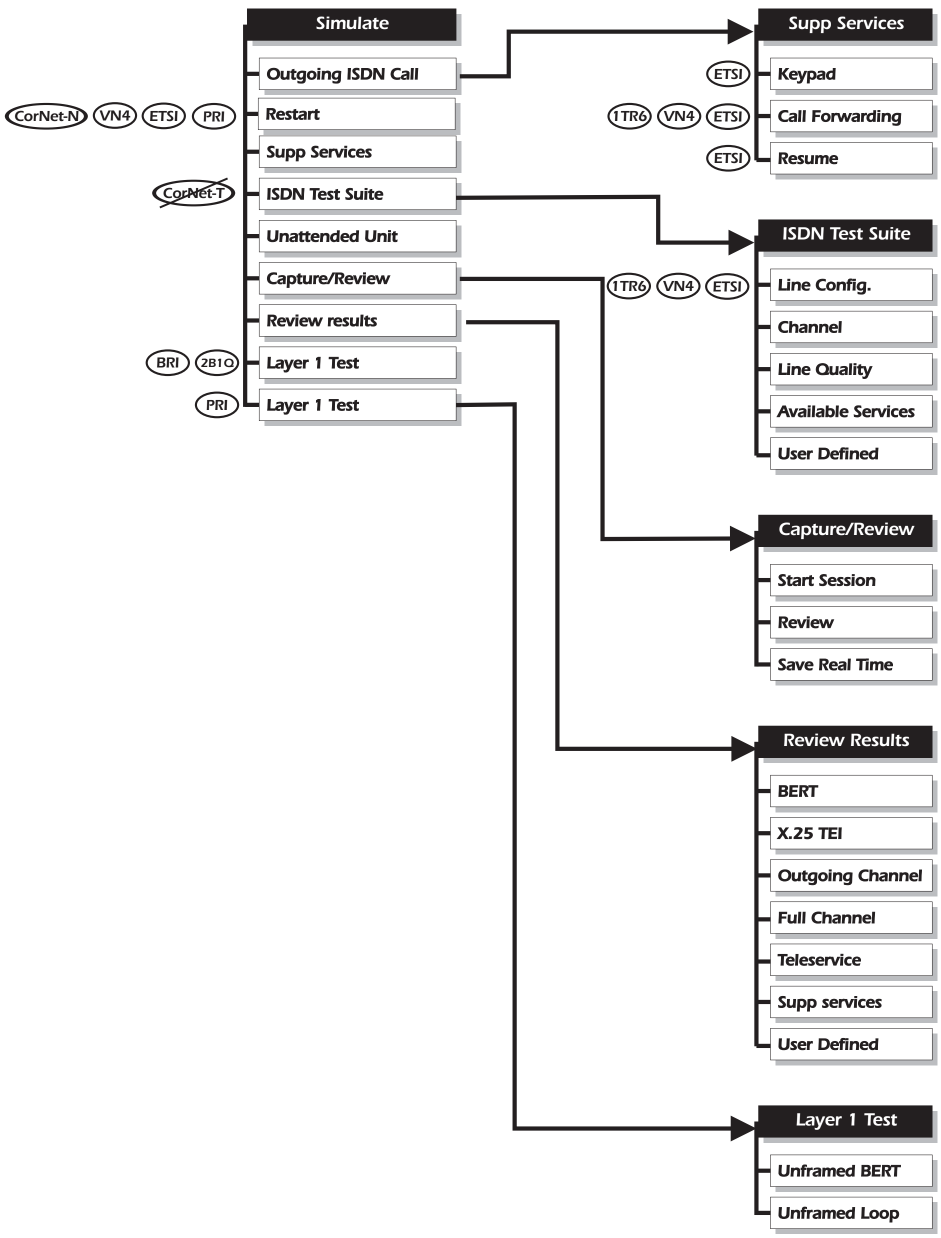
aurora^{Expert} for Windows is a protocol analysis package designed for use with Agilent Technologies' aurora ISDN testers. With aurora^{Expert} for Windows you can transfer, filter, display, store and manipulate captured data to provide a clear and concise view of the protocol being analysed.

Appendix 1

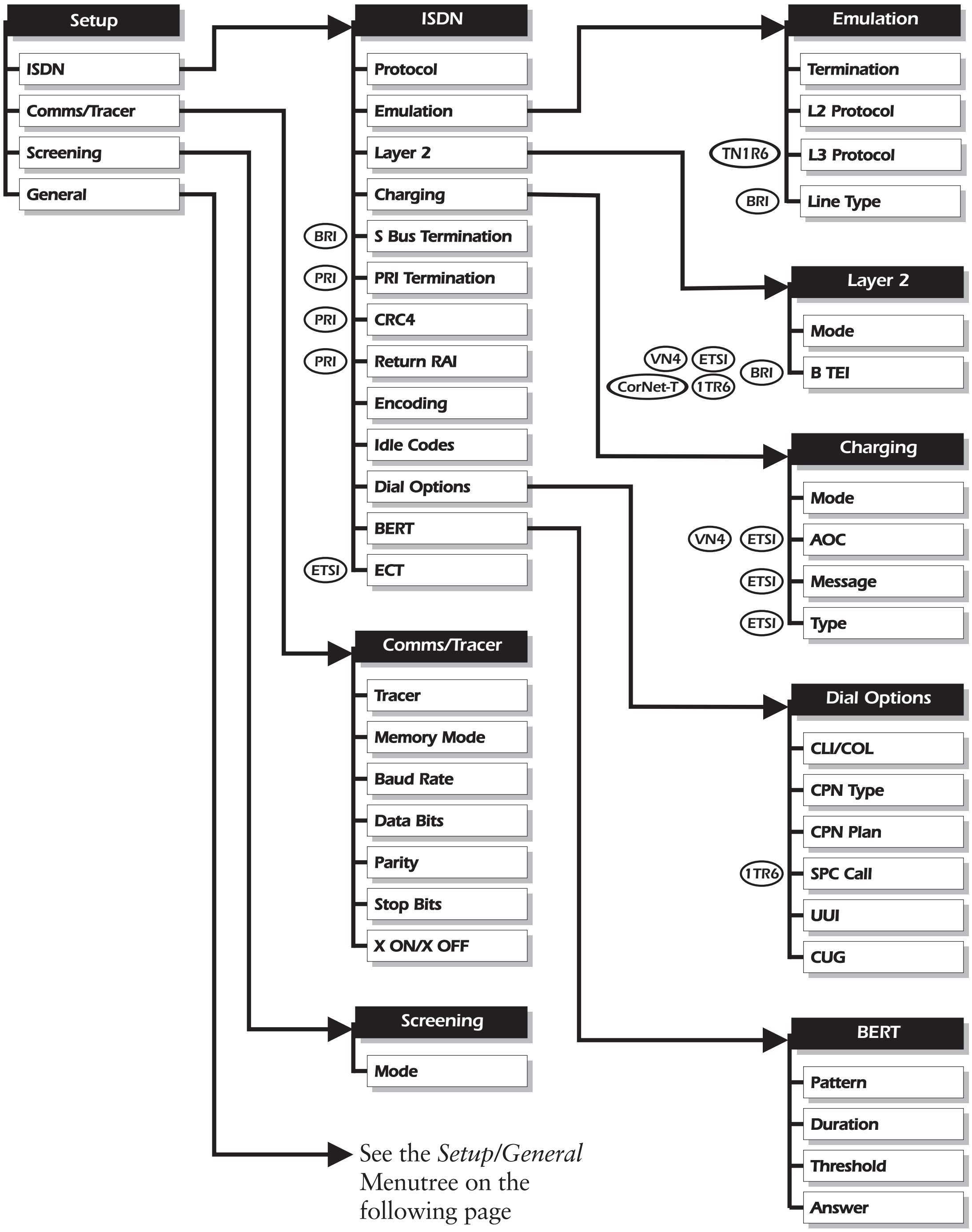
aurora^{Sonata} Menus

auroraSonata Menus

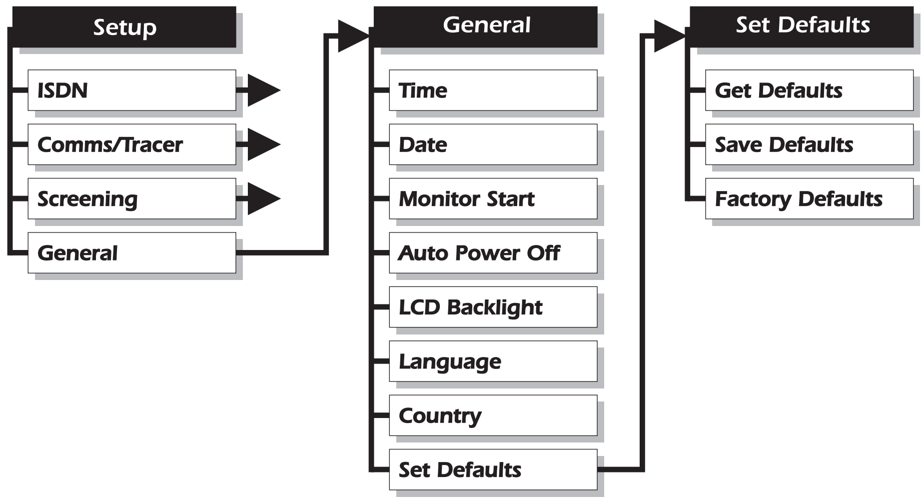
Simulation



Setup


Setup
ISDN
Comms/Tracer
Screening
General
ISDN
Protocol
Emulation
Layer 2
Charging
BRI S Bus Termination
PRI PRI Termination
PRI CRC4
PRI Return RAI
Encoding
Idle Codes
Dial Options
BERT
ETSI ECT
Emulation
Termination
L2 Protocol
TN1R6 L3 Protocol
BRI Line Type
Layer 2
Mode
VN4 ETSI CorNet-T 1TR6 BRI B TEI
Charging
Mode
VN4 ETSI AOC
ETSI Message
ETSI Type
Comms/Tracer
Tracer
Memory Mode
Baud Rate
Data Bits
Parity
Stop Bits
X ON/X OFF
Dial Options
CLI/COL
CPN Type
CPN Plan
1TR6 SPC Call
UUI
CUG
Screening
Mode
BERT
Pattern
Duration
Threshold
Answer
See the *Setup/General* Menutree on the following page

Setup/General



For ISDN, Comms/Tracer & Screening menus see the main *Setup* menutree on the previous page

Appendix 2

Disconnection, Clearing & Error Codes

Disconnection & Clearing Cause Codes

This Appendix explains the Cause Codes generated by the network (external codes) or auroraSonata itself (internal codes) to explain why a call has failed, cleared or been disconnected.

External codes

The following codes are generated by the network at the exchange to which your equipment is connected.

ETSI external codes

1 **Unallocated (unassigned) number**
The destination that the caller requested cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated).

2 **No route to specified transit network**
The equipment has received a request to route the call through a network which it does not recognise—either the network does not exist or it does not serve this equipment.

3 **No route to destination**
The destination that the caller requested cannot be reached because the network through which the call has been routed does not serve that destination.

6 **Channel unacceptable**
The last identified channel is not acceptable to the sending entity.

7 **Call awarded & being delivered in established channel**
The incoming call is being connected to a channel already established to the user for similar calls, (e.g. packet mode).

16 **Normal call clearing (peer)**
The call is being cleared at the request of one of the users involved in the call.

17 **User busy**
The called user cannot accept another call, although their equipment is compatible, because there are no resources available.

18 **No user responding**
The called user is not responding with either an Alerting or a Connecting indication within the allowed period of time.

19 **No answer from user (user alerted)**
The called user's equipment has responded with an Alerting indication, but no Connecting indication has been received within the allowed time.

21 **Call rejected**
The equipment will not accept this call, although it is not busy or incompatible.

22 **Number changed**
The called number is no longer assigned.

26 **Non-selected user clearing**
The called user has not been awarded the incoming call.

27 **Destination out of order**
The requested destination cannot be reached because its interface is not working properly. This may be because a signalling message could not be delivered to the called user (e.g. due to a physical or data link failure off-line), or because the called DN has been manually placed in timer busy state.

28 **Invalid number format**
The called number is invalid or incomplete.

29 **Facility rejected**
The network cannot provide the requested facility.

30 **Response to Status Enquiry**
This cause is included in a Status message which has been sent in response to a Status Enquiry message.

31 **Normal, unspecified**
This cause is used to report normal events only when no other cause in the 'normal' class applies.

34 **No circuit/channel available**
There is currently no appropriate circuit/channel available to handle the requested call.

38 **Network out of order**
The network is not functioning. Immediate redial is unlikely to be successful.

41 **Temporary failure**
The network is not functioning. Immediate redial is likely to be successful.

42 **Switching equipment congestion**
The switching equipment is experiencing a period of high traffic and cannot handle the call.

43 **Access information discarded**
This cause does not indicate an unsuccessful call, but relates to congestion control and setup information. The network could not deliver access information (e.g. user to user information, sub-address, etc.) to the remote user as requested.

44 **Requested circuit/channel not available**
The requested circuit or channel cannot be provided by the other side of the interface.

47 **Resources unavailable, unspecified**
A network resource is unavailable. This cause is only used when no other cause in the 'resource unavailable' class applies.

49 **Quality of service unavailable**
Throughput or transit delay cannot be supported, and the Quality of Service (as defined in ITU-T Recommendation X.213) cannot be provided.

50 **Requested facility not subscribed**
The requested supplementary service cannot be provided, because the user has not subscribed to it.

57 **Bearer capability not authorised**
The requested bearer capability is implemented by the equipment, but the user is not authorised to use it.

58 **Bearer capability not presently available**
The requested bearer capability is implemented by the equipment, but is not currently available.

63 Service or option not available, unspecified
This cause is used to report that a service or option is not available, only when no other cause in the 'service or option not available' class applies.

65 Bearer capability not implemented
The equipment does not support the requested bearer capability.

66 Channel type not implemented
The equipment does not support the requested channel type.

69 Requested facility not implemented
The equipment does not support the requested facility.

70 Only restricted digital information bearer capability is available
The user has requested an unrestricted bearer service, but the equipment only supports the restricted version.

79 Service or option not implemented, unspecified
This cause is used to report that a service or option has not been implemented, only when no other cause in the 'service or option not implemented' class applies.

81 Invalid call reference value
The equipment has received a message with a call reference which is not currently used on the user-network interface.

82 Identified channel does not exist
The equipment has received a request to use a channel not activated on the interface for a call.

83 A suspended call exists, but this call identity does not
The user has attempted to resume a call whose ID does not correspond to any currently suspended calls.

84 Call identity in use
The network has received a Call Suspend request for a call ID which is already in use for a suspended call within the domain of interfaces over which this call may be suspended.

85 No call suspended
The network has received a Call Resume request for a call ID which does not correspond to any suspended call within the domain of interfaces over which the call may be resumed.

86 **Call having the requested call identity has been cleared**
The network has received a Call Resume request for a call ID which once corresponded with a suspended call, but the call was cleared while still suspended. It may have been cleared either by the network timing out or by a remote user.

88 **Incompatible destination**
The equipment has received a request to establish a call to a destination which cannot handle the required compatibility attributes (e.g. data rate).

91 **Invalid transit network selection**

95 **Invalid message, unspecified**
This cause is used to report that a message is invalid, only when no other cause in the 'invalid message' class applies.

96 **Mandatory information element is missing**
The equipment has received a message with one or more mandatory information elements missing, and therefore cannot process the message.

97 **Message type non-existent or not implemented**
The equipment has received a message of a type it does not recognise, either because the message is undefined or because it is not implemented by the equipment.

98 **Message not compatible with call state, or message type non-existent or not implemented**
The equipment has received a message which it considers to be not permissible while in the call state; or a Status message that indicates an incompatible call state.

99 **Information element non-existent or not implemented**
The equipment has received a message containing an information element which is not recognised; either because its ID is not defined or because it is not implemented by the equipment. However, the equipment can still process the message without the information element.

100 **Invalid information element contents**
The equipment has received an information element which it has implemented. However, the contents are incorrectly coded (e.g. truncated, invalid extension bit, invalid field values, etc.).

101 **Message not compatible with call state**
The equipment has received a message which is not compatible with the current call state.

102 **Recovery on time expiry**
No further call progress in call establishment has been received, and the call has timed out. An associated Q931 error handling procedure has been initiated.

111 **Protocol error, unspecified**
This cause is used to report a protocol (call control) error, only when no other cause in the 'protocol error' class applies.

127 **Interworking, unspecified**
There has been interworking with a network which does not provide cause codes for its actions. Therefore, the precise cause for clearing is not known.

1TR6 external codes

1 **Invalid call reference value**

3 **Bearer service not implemented**

7 **Call identity does not exist**

8 **Call identity in use**

10 **No channel available**

16 **Requested facility not implemented**

17 **Requested facility not subscribed**

32 **Outgoing calls barred**

33 **User access busy**

34 **Connection not possible due to Closed User Group (CUG)**

37 **Connection not possible**

53 **Destination not obtainable**

56 **Number changed**

57 **Out of order**

58 **No user responding**

59 **User busy**

61 **Incoming calls barred**

62	**Call rejected**
89	**Network congested**
90	**Remote user initiated**
112	**Local procedure error**
113	**Remote procedure error**
114	**Remote user suspended**
115	**Remote user resumed**
127	**User information discarded locally**

VN4 external codes

VN 4 uses the same cause codes as ETSI except the codes listed below.

19	**Service element not registered**
24	**Number not assigned**
49	**SUU not transmitted**
59	**Call rejected**
60	**Rejected terminal diversion**
62	**No right to service**
92	**Erroneous CS parameter**
103	**Information element of incorrect length**
113	**Bearer service not available**
114	**End to end information transfer impossible**
126	**Switch to conversation position**

CorNet-N external codes

20	**Circuit operational**
23	**Reverse charge rejected**
33	**Circuit out of order**
37	**Degraded service**
45	**Pre-emption**

51	**Reverse charge not allowed**
52	**Outgoing Call barred**
54	**Incoming Call barred** The called user will not accept the call delivered in the SETUP message.
56	**Call waiting, not subscribed**
89	**Non existent abbreviated address**
92	**Invalid supplementary service parameter**
112	**Call redirection to mailbox**

TN1R6-N external codes

2	**Message not implemented**
4	**Connection type not implemented**
5	**Channel type not implemented**
6	**Identified channel does not exist**
9	**Overlap sending not allowed**
19	**Invalid facility parameter**
48	**Reverse charging not allowed at orig. end**
49	**Reverse charging not allowed at dest. end**
50	**Reverse charging rejected**
51	**Incompatible destination**
52	**Non-existent abbreviated address entry**
54	**Destination address missing and direct call not subscribed**
55	**This call is waiting at destination**
60	**Call waiting not subscribed**
64	**Degraded service**
65	**Call cleared (remote)**

66	Call cleared (local)
67	Hold for enquiry is not allowed
68	Buffer full (caller list)
69	No partner
70	No call at partner
71	Busy override not allowed
80	Transit network out of order
81	Transit network selection not implemented
82	Transit network does not exist
83	Transit delay range cannot be achieved
84	Throughput range cannot be achieved
88	Network failure
104	Faulty state
105	Busy-2

Internal codes

The following codes are generated by aurora^{Sonata} itself and are used for diagnostic purposes.

128	Call Control received an invalid primitive
129	Call Control received no Info field
130	Call Control received an invalid message
131	Call Control received a short Info message
132	Call Control reported an invalid B channel requested
133	SPID sent. No response from network
134	Call Control is in an inactive state
135	Call Control is in an active state
136	MMI received a bad primitive
137	MMI received a bad ME primitive

138	MMI received a message with a bad CES
139	MMI received a message with an illegal CES
140	Layer 3 timer T303 has expired
141	Call Control received a NL Release Indication from Layer 3
142	Call Control received an invalid message for the current state
143	Call Control received a MCC Reset Indication from ME, Layer 1 failure
144	MMI received a message for channel B0
145	MMI received a message with a bad Call ID
146	Incoming message had a mandatory missing Information Element
147	Layer 3 timer T318 has expired
148	Layer 3 timer T319 has expired
149	Normal call clearing
150	Incoming message had invalid Information Element contents
151	Requested Bearer Service is not available
152	Requested Bearer Service is not supported
153	Layer 1 activation has failed
154	Layer 2 has been released
155	Layer 2 failed to establish, DM received
156	No network response to TEI Request
157	The TEI has been removed by the network
158	Layer 2 failed to establish, UA not received
159	Remote end allocated another B channel
160	Service timer expired
161	Supplementary service invocation return error
162	Supplementary service invocation reject
168	Restart message received

Appendix 3

Introduction to ISDN

Introduction to ISDN

This chapter provides an overview of the Integrated Services Digital Network (ISDN).

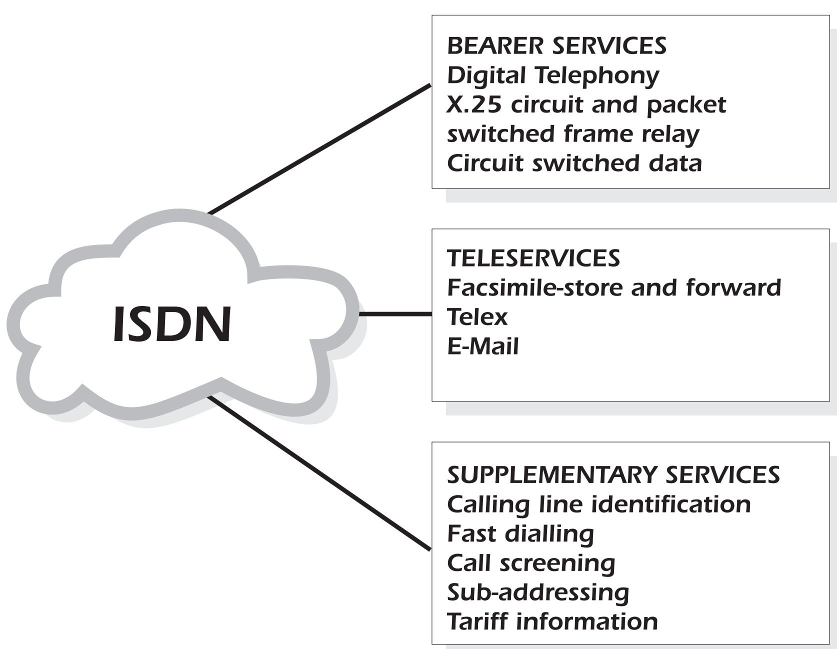
What is the ISDN?

The ISDN is an evolutionary circuit switched network based on digital telephony. It uses a common set of interface standards and allows all users to send and receive information over the network.

ISDN offers end-to-end (caller to receiver) digital connectivity between Terminal Equipment (TEs), via Network Terminators (NTs) and digital exchanges, both private and public.

ISDN Services

ISDN services are the telecommunication services which the user accesses either at an ISDN interface or a terminal connected to the ISDN. The diagram below summarises the services offered:



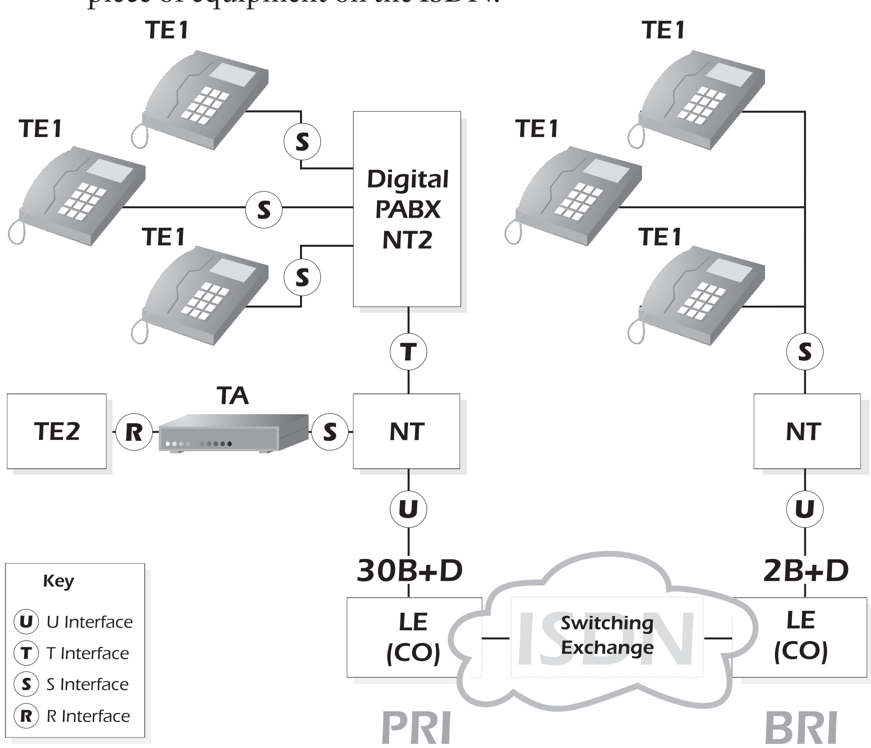
Equipment on the ISDN

Each piece of equipment ('functional group') on the ISDN has a label related to the function it performs. The labels are:

ISDN Equipment	
TE1	Terminal Equipment type 1. Uses and supports ISDN protocols and services.
TE2	TE type 2 - for example, non-ISDN compatible devices such as analogue telephones, PCs and printers.
NT1	Network Termination type 1. Terminates the ISDN line at the user's site.
NT2	NT type 2. Provides customer site switching, multiplexing and concentration, e.g. an ISDN PABX.
TA	Terminal Adaptor. Used to allow non-ISDN devices (TE2s) to access the ISDN network.
LTs	Line Termination equipment. Terminates the ISDN line at the local exchange.

ISDN interfaces

An interface ('reference point') is said to exist between each piece of equipment on the ISDN.



aurora^Sonata can be configured with interface modules for Basic Rate testing at the S, U and T interfaces, or Primary Rate testing at the S and T interfaces, provided the physical interface is compatible.

ISDN standards

ISDN is subject to standardisation by the ITU-T, which issues recommendations covering ISDN equipment and interfaces. Standards also exist for types of service, protocols and ISDN numbering.

Pulse Code Modulation

Pulse Code Modulation (PCM) is a method of converting analogue signals into digital code. An analogue waveform is sampled at regular intervals and a measurement is taken of the sample point at various levels. The number obtained is digital.

The sampling rate is 8kHz, and the sample value is translated into an 8 bit code, to conform with ITU-T standards. Therefore each speech signal results in a continuous bit stream at a rate of 64kbps.

The process of converting between analogue and digital is known as encoding. An encoding device is called a Codec.

Methods of voice encoding

The number of levels used in the sampling, and the way they are spread, affect the amount of signal noise and distortion. There are two methods of encoding: A-Law and µ-Law.

A-Law encoding

This is the type of voice encoding used in Europe. Sampling consists of 4096 levels, divided into 7 segments.

μ-Law encoding

This is the type of encoding used in the United States, Japan and some other regions of Asia. Sampling consists of 8159 levels, divided into 8 segments.

Line coding techniques

To overcome the technical difficulties raised by sending digitised information down a telephone cable originally designed for 50V pulse dialling and 4kHz speech, line coding is used. There are a number of techniques: each one involves coding digitised speech into different voltages which can then be transmitted down the telephone lines.

Basic Rate and Primary Rate ISDN

Equipment on an ISDN network may be connected either through a Basic Rate interface or a Primary Rate interface.

- Basic Rate (BRI) consists of two B channels and one D channel, known collectively as 2B+D.
- Primary Rate (PRI) consists of 30 B channels and one D channel (‘30B+D’) in Europe, and 23 B channels and one D channel (‘23B+D’) in the US.

The B channels contain user data at rates of up to 64Kbps. The data is switched by the network to provide an end-to-end transmission service.

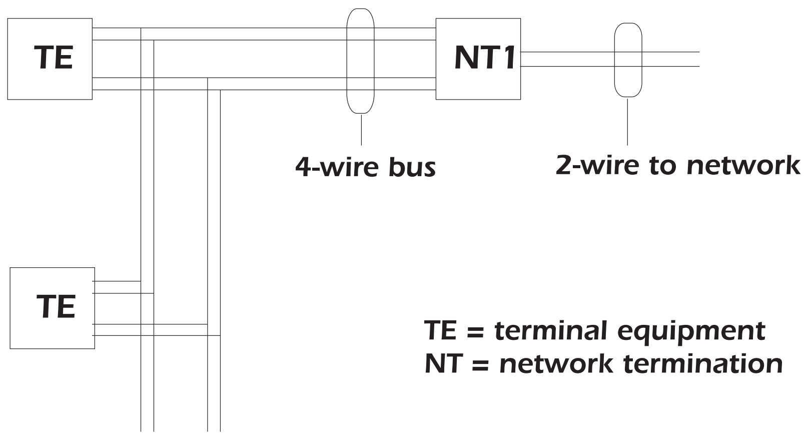
The D channel carries control and signalling data at 16kbps (Basic Rate) or 64kbps (Primary Rate). It may also be used for X.25, the Packet Switched Network.

Basic Rate

Basic Rate (BRI) consists of two B channels and one D channel, known collectively as 2B+D.

Basic Rate access to the ISDN

The diagram below illustrates Basic Rate ISDN operation.



In this illustration, a 4 wire bus consisting of a transmit and receive pair (known as the ‘S bus’), is connected to the NT1. The S bus is terminated at the NT1 and the distant end, on both the transmit and receive pairs. Connection to the bus is usually made via 8-pin plugs which conform to ISO Specification 8877. Over this bus pass the 2B+D channels.

Point-to-point and point-to-multipoint links

The S bus can operate in either point-to-point (PP) or point-to-multipoint (PMP) mode.

- On a PP link, one TE is connected at the end of up to 1km of cable.
- On a PMP link, up to 8 terminals can be connected in parallel along the bus. The length of the bus is limited to about 200m, depending on the cable.

Basic Rate power

Power is provided across the network so that, in the event of a mains failure, a basic telephone service is still provided.

Primary Rate

There are two variations of the Primary Rate Interface. In Europe, primary rate comprises of 30 B channels and one D channel, known collectively as 30B+D. In the U.S., the primary rate standard comprises of 23 B channels and one D channel, known collectively as 23B+D.

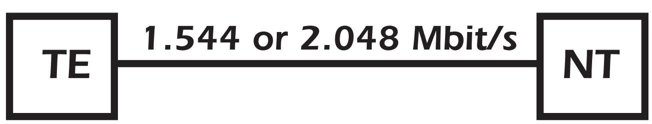
B Channels

The B channels contain user data at rates of up to 64kbps.

D Channel

The D channel is reserved for control and signalling data at 64kbps.

Primary Rate access to the ISDN



The Primary Rate Interface is point-to-point only; the connection is simply between the network and a PABX or similar piece of equipment. The line carrying the traffic is either a 75 Ohm co-axial, a 120 Ohm twisted pair or a fibre optic cable.

The OSI 7-Layer model

The Open Systems Interconnection (OSI) is an agreed, international standard governing the way systems communicate. The standard model has seven layers, as follows:

Layer 1 Physical layer—transmits bits between the terminal and the network. Defines connectors, line coding, transmission rates and anything else concerning the transfer of bits.

Layer 2 Data link layer—provides link level control. Error detection and correction are handled by assembling the bits into frames. All Layer 2 formats derive from a standard known as High Level Data Link Control (HDLC).

Layer 3 Network layer—routes messages to their destination.

Layer 4 Transport layer—the end-to-end layer which sets up and maintains connections.

Layer 5 Session layer—handles the co-ordination between processes.

Layer 6 Presentation layer—provides data formatting and code conversion.

Layer 7 Application layer—this is the task to be performed, e.g. remote login and file transfer.

Basic Rate Layer 1 S bus operation

Layer 1 transfers information in frames across the S bus between the terminals and the NT1.

Each frame is 48 bits long and lasts for 250 microseconds—its structure depends on the direction of transmission. It contains two 8 bit groups of channel B1, two 8 bit groups of channel B2, plus bits for channel D and other functions.

D Channel Contention

If two TEs attempt to make a call simultaneously, a procedure known as D Channel Contention prevents a collision.

Activation and deactivation

TEs and NTs can be deactivated to reduce power consumption, then reactivated to normal power. Both the TE and NT can receive activation messages, but only an NT can instruct a TE to deactivate.

'Info' signals

Activation and Deactivation messages are transmitted using 'Info' signals.

Info 0 idle state—neither the TEs or the NT are operating.

Info 1 TE to NT—requests activation.

Info 2 NT to TE—requests activation/responds to Info 1.

Info 3 TE to NT—contains operational data.

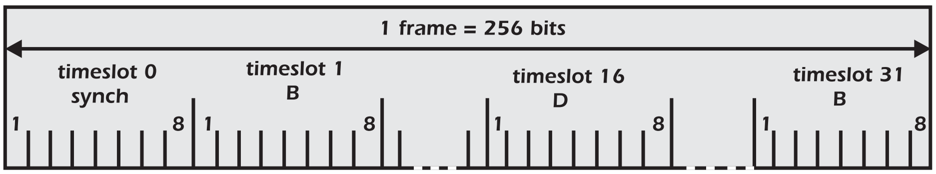
Info 4 NT to TE—contains operational data.

Primary Rate Layer 1

Layer 1 Frame Structure

Data is transferred across the line in 'layer 1' frames. In Europe, each frame is 256 bits in length and lasts for 125 microseconds. In the U.S., each frame is 193 bits in length and lasts for 125 microseconds.

The structure of the European frame is shown below:



Frame structure of 2.048 Mbit/s

Layer 2

Layer 2 provides a secure, error-free connection for Layer 3 call control information, by organising the Layer 3 bits into error checked frames. Layer 2 procedures, based on HDLC, are known as Link Access Procedure for a D Channel (LAPD).

A Layer 2 frame is structured as follows:

Flag	Address	Control	Layer 3 Information	Frame Check Sequence	Flag

Flags Indicate the start and end of the frame.

Address A unique value identifying the message type and the terminal to which it refers. Contains a SAPI to identify the service for which the frame is intended, a TEI to identify the terminal and a Command/Response bit.

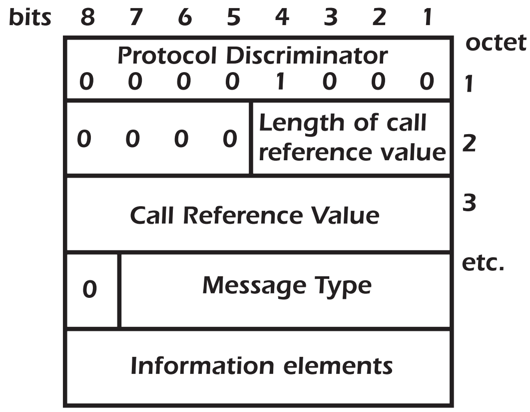
Control Carries information that identifies the frame.

Information Carries the signalling or layer 3 message.

FC Sequence Used for error detection.

Layer 3

Layer 3 routes messages to their destination. The diagram below shows the structure of the Layer 3 signalling messages.



Protocol Discriminator Identifies the protocol.

Call Reference Value Identifies the call with which a message is to be associated.

Message Type Describes the intention of the message: CONNECT, SETUP, etc.

Information Elements A number of these may be included. Their number and content depend upon the message type.

Protocols

A protocol is an agreed set of rules for carrying out a particular function such as the exchange of information.

ETSI

The standard ISDN protocol used within Europe. Based on ITU-T specifications Q.921 and Q.931.

1TR6

The national protocol for the ISDN environment in Germany. It is also often used in private networks utilising equipment of German origin.

VN4

The national protocol for the ISDN environment in France. It is also often used in private networks utilising equipment of French origin. VN4 is very similar to ETSI.

CorNet-N & CorNet-T

CorNet is a private ISDN protocol that was developed by Siemens. There are two implementations:

- CorNet-N operates between adjacent PBX links.
- CorNet-T operates between a PBX and a piece of ISDN Terminal Equipment (TE).

CorNet-N and CorNet-T are based on the ETSI protocol.

When CorNet-T is selected aurora^{Sonata} can only emulate a TE.

TN1R6-N & TN1R6-T

TN1R6 is a private ISDN protocol that was developed by Bosch Telekom.

- TN1R6-N operates between adjacent PBX links.
- TN1R6-T operates between a PBX and a piece of ISDN Terminal Equipment (TE).

TN1R6-N and TN1R6-T are based on the 1TR6 protocol.

Appendix 4

Glossary & Abbreviations

Glossary & Abbreviations

A-law Companding technique for Pulse Code Modulation, used in Europe.

Address A sequence of bits or characters which uniquely identify a user, element or application. For example, the number entered by a caller to identify the called party.

ANSI American National Standards Institute. The national co-ordinating organisation for voluntary standards in the US.

ASCII American Standard Code for Information Interchange. The US version of the ISO 7-bit data code. Usually transmitted in 8-bit characters, the additional bit being an odd or even parity bit.

Asynchronous The description used for a communications channel capable of transmitting data but not timing.

AT&T A custom ISDN protocol used by AT&T.

aurora^Expert A protocol analysis package that can be used in conjunction with the aurora family of ISDN testers.

B channel Bearer channel. ISDN utilises multiplexed channels that are transmitted over the same physical medium. The B channels typically carry the user's voice/data/video.

Basic Rate A type of ISDN circuit typically used for subscriber circuits. It consists of two B channels and one D channel, giving 144kbps of bi-directional user communications.

Baud Rate The number of line signal transitions per second. In a simple system where each bit is represented by a single level it is the same as the number of bits per second.

BER Bit Error Ratio/Rate. A measure of transmission quality: the number of errored bits divided by the total number of bits transmitted in a specific interval.

BERT	Bit Error Rate Test. Determines the probability of a single bit being misinterpreted over a defined period of time. The test synchronises and compares the received pattern with a transmitted binary test pattern, and counts the errors.
Bit	A binary digit, which can be in a state of either '0' or '1'.
BRI	Basic Rate ISDN.
CCITT	The former name of the ITU-T (from French acronym).
Channel	A path (either physical or logical) for transmission of information.
Channel Associated Signalling	Signalling in which information relating to the traffic carried by a channel is transmitted in the channel itself or in a signalling channel permanently associated with it.
Circuit	A link connecting two or more nodes.
Circuit switching	A type of network where a circuit is established and maintained between the communicating parties for the duration of the call.
Clear Cause	A code indicating the reason why a call has cleared.
CLI	Calling Line Identity. The number belonging to the caller.
Clock	An electronically generated periodic signal which provides a timing reference to the transmitted data or other circuit functions.
Closed User Group	A group to and from which access is restricted. Members can communicate with each other, and sometimes also with users outside the group.
CO	Central Office. A central switching or control centre belonging to a PTT.
Codec	Coder/Decoder. An analogue to digital converter.
COL	Connected Line number. The number of the connected party. This may be different from the CPN dialled if the call has been redirected.

Collision	Interference between packets of data which are transmitted simultaneously by 2 stations on the same medium.
Companding	A compressing/expanding process for reducing the noise transmitted in a signal.
Connection	A concatenation of transmission channels or telecoms circuits, switching and other functional units set up to provide for the transfer of signals between points in a telecoms network, to support a single communication.
Contention	The situation where multiple sources compete for the same resource.
CPN	Called Party Number. The number dialled by the calling party.
Crosstalk	Interference occurring when data is transmitted on different mediums which are adjacent to each other.
CUG	Closed User Group.
D Bit	Delivery confirmation bit or acknowledgement. Can be Local or End to End.
D Channel	Demand channel. This is one of the multiplexed channels in the ISDN information stream. It carries signalling and call setup information and can also be used for packet data transmission to the subscriber.
DASS	Digital Access Signalling System. A signalling standard designed for use between PABXs and public exchanges in the UK.
Data	Digital information, which may be text, voice or video.
Digital Exchange	An exchange that switches digital signals by means of digital switching.
DMS	Digital Multiplex System (Nortel trademark).

DPNSS Digital Private Network Signalling System. A UK signalling standard for use between PABXs in a private network.

EAZ The subscriber number for a line using 1TR6 consists of a fixed part which is common to the line and a digit which identifies the terminal—this is the EAZ. The abbreviation comes from the German word for ‘end equipment selection number’. Sometimes called a 1TR6 ‘sub-address’.

Echo In telecommunications, this is when a transmitted signal is reflected back to the sender.

EMC Electro-magnetic Compatibility.

En Bloc A type of dialling where the digits are assembled and then sent in a single call control packet.

Encoding The process of coding information into a form suitable for transmission.

End to End Signalling method in which signals pass right through from end to end without processing within intermediate nodes.

EOC Embedded Operations Channel. Used to send commands from the switch to the NT, to perform activities such as a loopback within the NT.

ES Errored Second. A second in which one or more BERT errors are measured in a single direction of transmission.

ETSI The European Telecommunication Standards Institute, which is the standards making authority for Europe. The ETSI protocol is the standard European protocol.

FAS Frame Alignment Signal. This is used in the alignment of digital transmission frames on a Primary Rate link.

Filter A device for removing unwanted information.

Fixed Link A type of ISDN point-to-point link which does not use protocol transactions to establish a clear channel.

Flag	In telecommunications, this is a predefined pattern of bits which is used in a protocol to define an event—e.g. the beginning of a transmitted frame.
Frame	A series of bits, arranged in a pattern, used for transmitting information over a channel. Different protocols have different frame structures.
Frequency	The number of cycles of an alternating signal over a given period of time (usually 1 second). Measured in Hertz.
HDLC	High level Data Link Control. The original bit oriented protocol.
HLC	Higher Layer Compatibility.
Integrated Circuit	A circuit, usually made of a semi-conductor, which is constructed as an assembly of electronic elements in a single structure.
ISO	The International Standardisation Organisation. A voluntary activity of the national standardisation organisations of each member country. The ISO works closely with the ITU-T in the development of standards.
ITU	International Telecommunications Union.
ITU-T	A committee of the ITU, organised into study groups that set standards or recommendations for telecommunications. The ITU-T has representatives from world governments. Formerly known as the CCITT.
Kbps	Kilobits per second.
LAN	Local Area Network. A high speed link, usually carrying data, connecting several communicating devices over a relatively small geographical area.
LAPD	Link Access Procedure for a D Channel.
Layer	In the OSI model, a layer is a collection of related functions within a communications system with a defined service interface to layers above and below.

LCD A Liquid Crystal Display, such as the screen on aurora[Sonata].

LE An exchange which is local to subscribers and into which their lines terminate.

LED Light Emitting Diode.

Loopback Data received on the Rx channel of a circuit is retransmitted on the Tx channel of the same circuit.

Master clock The clock which acts as a prime source within a network and from which all other clocks derive their synchronisation.

Modem A device which converts digital signals into analogue tones which can be passed through the telephone network. A modem at the receiving end reverses this process to recreate the original digital signal.

Monitoring A mode of operation where an aurora tester is set to receive information about current activity from ISDN equipment, i.e. an NT, TE or another aurora tester. The tester is only used to receive information, not to transmit.

MSN Multiple Subscriber Number.

μ-law A companding technique used for PCM systems in North America, Japan and some other regions in Asia.

Multiframe A set of consecutive frames, used in digital transmission, in which the position of each frame can be determined by a multi-frame alignment signal covering the group of frames.

Multiplexing The process of enabling several users to share the same communication channel.

NFAS Non Frame Alignment Signal (PRT or North America: Non Facility Associated Signal)

National ISDN A standardised ISDN protocol used in North America. Also referred to as NI.

Node A point where one or more functional units interconnect transmission lines.

Noise An unwanted signal.

Nortel The proprietary ISDN protocol for use with the DMS family of products.

NT Network Termination.

NT1 An NT on the customer's premises, providing a physical and electromagnetic termination of the network. The transmission line (U interface) is terminated by NT1.

NT2 The Customer Premises Equipment (CPE), with a T reference point on the network side. For example, an ISDN PABX.

Octet A digital unit of information consisting of 8 bits.

Off hook A line state which informs the Central Office that a subscriber requires a service.

On hook The unused state of a telephone circuit.

OSI 7-layer Model A model defined by the ISO, in which ISDN functions are separated into 7 clearly defined layers.

Overlap A type of dialling where the digits are sent one at a time, each in its own separate call control packet.

PABX Private Automatic Branch Exchange. Consists of a number of ‘extension lines’ connected to a central switching system. Users on these extensions can make calls to each other. ‘Exchange lines’ connect the PABX to the local public exchange, allowing the extension users access to the Public Switched Telephone Network (PSTN).

Packet switching A transmission method in which data is formed into discrete segments known as packets. A packet usually has its own control information. Packets occupy a communication channel for a short duration, so packets from several users can share a channel.

Parity A mechanism for determining whether a single bit error has occurred when individual characters are being transmitted. Parity is transmitted as an additional bit in the character frame, and may take the values **None**, **Odd** or **Even**. **None** means that a parity bit is not included—i.e. there is no error detection. **Odd** means that either a zero or a one is transmitted, such that the total number of bits sent in a character, including the parity bit, is odd. **Even** works in the same way, but ensures that the total number of transmitted bits is even.

PC Personal Computer.

PCM Pulse Code Modulation.

Physical Layer The lowest layer of the OSI model, which is responsible for the electrical, mechanical and interface aspects of transmitted data. Also known as Layer 1.

PMP Point to Multipoint.

Point to Multipoint In Point to Multipoint mode up to 8 terminals can be connected in parallel along the bus. The length of the bus is limited to about 200m, depending on the cable.

Point to Point In Point to Point mode one Terminal Equipment (TE) is connected at the end of up to 1km of cable.

Port The physical access point into and out of an electrical equipment or network.

PP Point to Point.

PRI Primary Rate ISDN.

Protocol A set of rules, usually defined by a standards making body, for carrying out a specific function such as exchange of information between systems, synchronisation, error checking, etc. Examples of protocols are ETSI and 1TR6.

PSPDN Packet Switched Public Data Network.

PSTN	Public Switched Telephone Network.
PTT	National Postal, Telephony and Telegraphy administration.
Public Network	This is usually a network owned and operated by a licensed telecommunication authority, providing a PSTN service to the public.
Pulse Code Modulation	A method of converting analogue signals into digital signals.
Ringback	The signal fed back to a caller to indicate that the called telephone is ringing.
RJ45	An 8 pin IDC phone connector.
Routing	The function which ensures that the correct path through a network is selected.
RTC	Real Time Clock. A calendar clock that is powered from its own battery and which continues to run even when the tester is switched off or the power is removed.
Rx	Receive.
S Interface	A standard interface as defined in the ITU-T recommendations, which occurs on the terminal equipment side of the NT1 (e.g. between a TE1 and an NT1, or between a TA and an NT1). It is an interface to a 192Kbps, 2B+D, 4 wire circuit.
SAPI	Service Access Point Identifier. Identifies the service for which the frame is intended.
Signalling	The transmission of information related to switching.
Simulation	A mode of operation in which an aurora tester emulates ISDN equipment or the network itself. The tester can both transmit and receive information.

Stop Bits The last bits sent in asynchronous transmission, to indicate that the message is complete. In asynchronous serial data transmission each character is sent between a start bit and one or more stop bits. At the end of each character the line goes into an idle state, known as marking. At the start of the next character it activates again—the active state is known as spacing. There is a minimum of 1, 1.5 or 2 stop bits between characters, but the line may remain idle until the next character is sent.

Synchronous data channel A communication channel that can transmit timing information as well as data.

TA Terminal Adaptor. Used within ISDN to convert between non-ISDN and ISDN references.

TE Terminal Equipment. Equipment providing the functions which allow the user to operate the access protocols.

TE1 Terminal Equipment Type 1. A terminal with an ISDN reference at reference points.

TE2 Terminal Equipment Type 2. A non-ISDN terminal, with an interface at the R reference point. Any computer or terminal equipment with an interface that conforms to a CCITT X-series or V-series specification is a TE2.

TEI Terminal Endpoint Identifier. A unique identity given to the terminal by the network.

Teleservice A type of telecommunication service that provides the complete capability, including terminal equipment functions, for communication between users according to protocols established by agreement between administrations and/or telecoms providers.

Teletex A data transmission standard, typically operating at 1200 bits, which is an upgrade on the slower telex standard.

Terminator	A resistor connected across the ends of a transmission line to provide a constant impedance, to reduce reflection and distortion of signals travelling down the transmission line.
TNV	Telecommunications Network Voltage circuit. A test circuit for definition of safety in a telecoms system.
Twisted pair	Cable in which a pair of wires are twisted around each other, to minimise noise from other circuits.
Tx	Transmit.
U Interface	An ISDN reference point between NT1 and the network. The first reference point at the customer site.
Video text	Usually refers to an interactive communication application in which a user can communicate with a video terminal.
X.25	The packet switched data network.
Xon/Xoff	Flow control where the control signal passes in band in the normal data flow. The special characters XON (11H) and XOFF (13H) are used to halt and to restart the flow of data respectively.

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