



Errata

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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aurora^{Duet} User Guide



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Issue 01 - 06/99

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Chapter 1

Welcome to aurora^{Duet}

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Section 1 - About this Guide	1-2
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Welcome to aurora^{Duet}

Welcome to aurora^{Duet}, a hand held tester which allows you to install, configure, maintain, troubleshoot and analyse equipment and lines on the Integrated Services Digital Network (ISDN).

This chapter introduces you to the User Guide provided with aurora^{Duet} and the conventions used throughout it. It also describes aurora^{Duet}'s hardware and the protocols supported, and it provides safety advice.

This Chapter has the following structure:

Section 1 About this Guide

Section 2 Introducing aurora^{Duet}

Section 1

About this Guide

This Guide will help you learn to use aurora^{Duet} and, for more experienced users, it can be used for reference purposes. Useful features include:

- a table of contents and chapter summaries
- a comprehensive index
- technical and safety notes
- a glossary of terms and abbreviations
- Quick Start sections
- a troubleshooting section

When not in use, we recommend that you keep this Guide in the carry case with aurora^{Duet}.



Note

The text and illustrations in this guide describe a typical aurora^{Duet}. They may not match your specific configuration and may describe features that you did not purchase.

Intended Readers

This Guide is intended for all users of aurora^{Duet} - typically second and third line installation and maintenance engineers in telephone companies and corporate end users. Telecommunications and ISDN knowledge is assumed, but the Guide includes a comprehensive glossary to help you.

How to use this Guide

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

The structure of the guide is as follows:

- Chapter 1** Introduces aurora^{Duet} and the User Guide
- Chapter 2** Describes the power sources and teaches the basics to get you started
- Chapter 3** Setting up aurora^{Duet} for testing on the ISDN
- Chapter 4** Connecting and clearing calls and how to test using aurora^{Duet} to simulate ISDN equipment or the network
- Chapter 5** Monitoring protocol information or listening to audio traffic on the line
- Chapter 6** Reviewing and interpreting protocol decode captured during testing or monitoring
- Chapter 7** Operating aurora^{Duet} using the optional Remote Control application
- Chapter 8** Operating instructions for the optional X.25/X.31 Generic Packet Mode support feature
- Appx 1** Technical information about aurora^{Duet}
- Appx 2** Explains the call clearing cause codes
- Appx 3** Diagrams to help you navigate the menu system
- Appx 4** Troubleshooting common errors
- Appx 5** Glossary of technical terms used in this Guide
- Index** Helps you find information in the User Guide.

Conventions in the Guide

The terms, phrases and conventions used throughout this guide are explained below:

Special Typefaces

Menu options are shown in a different typeface - for example 'choose **SETUP**'. Keys are displayed in a bold, italic typeface - for example 'press *SELECT*'.

Symbols

Instructions

Instructions are clearly labelled using an arrow '➤' symbol. For example:

➤ Choose **Setup**.

Tips, notes and warnings



Tip

Indicates a useful tip, such as a short cut for the task you are performing.



Note

Used to draw your attention to important information concerning the task being described.



Warning

Used to draw your attention to situations that could result in **personal injury**.



Caution

Used to draw your attention to situations that could result in **serious damage to the tester**, or have other important consequences.

Quick Start

Some chapters contain a Quick Start section which gives you the basic information you need to perform a task. The rest of the chapter discusses the task in more detail. The following symbol denotes Quick Start information:



Quick Start

Protocol symbols

Information specific to one protocol is marked with a symbol; for example:



Indicates information which is only relevant to the ETSI protocol.

Information that does not apply to a particular protocol is indicated by a line through the protocol symbol; for example:



Indicates information which does not relate to the 1TR6 protocol.

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



Note

See also *About the Protocols* in Section 2 of this Chapter.

Basic Rate and Primary Rate symbols

Differences between Basic Rate (BRI) and Primary Rate (PRI) modes of operation are indicated using the following symbols:



Text that applies to both modes is not labelled.

Simulate and Monitor symbols

Differences between the Simulate and Monitor operating modes are indicated by the following symbols:

Simulate

Monitor

Special terms



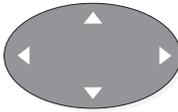
Press

Press the indicated key once.



Choose

Highlight a menu option and press *SELECT* to choose it.



Toggle

Press the *LEFT* or *RIGHT* arrow keys on the cursor pad to cycle through the available options and display the option you want.

Exit

Leave the current menu or option.

Section 2

Introducing aurora^{Duet}

This section provides an overview of aurora^{Duet}, together with advice about safety and care of aurora^{Duet}. It also introduces you to aurora^{Duet}'s hardware and to the protocols which are supported.

Product Overview

aurora^{Duet} is a hand held tester which lets you install, configure, troubleshoot and maintain ISDN equipment and lines. It provides a full suite of physical layer and ISDN tests which allow you to quickly verify the service or perform in-depth and specialist analysis.

aurora^{Duet} can be used to test ISDN links on both the S and U interfaces. It may also be fitted with an optional Primary Rate Interface (PRI), which lets you test the ISDN PRI at the 'T' reference point.

aurora^{Duet} can operate at layer 1 as supplier of the clock or as receiver of the clock. It may be set to be the 'master' (network side) of the protocol at layers 2 and 3, or the 'slave' (user side) of the protocol. You can also test with Fixed Links - i.e. without protocol support.

An optional Remote Control feature is available, which lets you operate aurora^{Duet} using a PC connected over a PSTN modem to modem, Terminal Adaptor or direct V.24 connection.

Multiple protocols can be stored and accessed on aurora^{Duet} and various language options are also available, including English, French, German and Spanish.

Software upgrades can be automatically downloaded from a PC into aurora^{Duet}'s flash memory.

Operating Modes

There are two main ways in which you can use aurora^{Duet} - these are known as the operating modes.

Simulate mode This allows you to simulate the operation of Terminal Equipment (TE), a Network Termination (NT) or a Line Termination (LT). aurora^{Duet} can generate or receive the network clock and act as a protocol 'master' (network side), or 'slave' (user side).

Monitor mode This allows you to monitor network traffic and protocol information on the line, in real time.

You can also use aurora^{Duet} to test Fixed Links or ISDN circuits which do not require a protocol to establish a clear channel.

How you can use aurora^{Duet}

You can use your aurora^{Duet} held in the hand like a telephone handset, or laid on its back. There is also a hook on the back of the unit so that you can hang it up, and a carry strap so you can carry the tester around.

Supplied with aurora^{Duet}

aurora^{Duet} is supplied in a carry case along with:

- a mains adaptor/battery charger
- cables for the interfaces
- an 8 way 'T' piece for connecting 2 S bus connectors into a single ISDN socket
- a carry strap
- this User Guide
- any optional equipment you may have ordered

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

Safety Advice



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

- Do not open the back of the unit while it is switched on or connected to the network
- Use only the batteries indicated in this manual. These are described in Chapter 2 Section 1.
- Do not dispose of batteries in a fire - they may explode. Check with local codes for possible special disposal instructions.
- Avoid using the tester during an electrical storm - there is a risk of electric shock from lightning.

Looking after aurora^{Duet}

aurora^{Duet} has been designed and constructed to withstand the rigours of a typical telecommunications working environment and provide you with years of reliable service.

However, when using aurora^{Duet} avoid:

- exposing it to extreme temperatures. aurora^{Duet} is designed to operate between 0°C and 45°C. You can store the unit safely between -25°C and +60°C.
- very wet conditions. aurora^{Duet} can be used in wet conditions but it is not waterproof and will not withstand excessive ingress of water.

To avoid damage, we recommend that you keep aurora^{Duet} in its carry case when you are not using it.

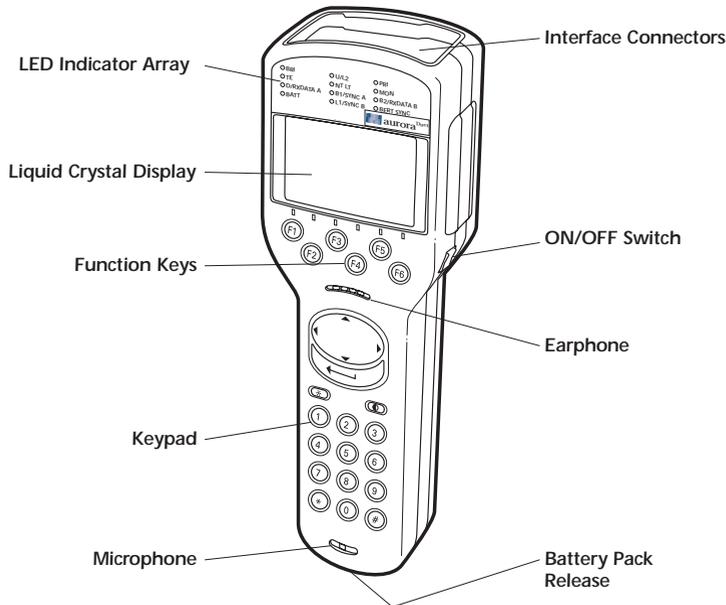


Caution:

Do not use solvents, strong detergents or abrasive materials to clean your aurora^{Duet}. Use only cleaning agents approved for use on plastics.

A look at aurora^{Duet}

The following illustration shows the controls, interfaces and connectors of aurora^{Duet}.



Audiovisual Interfaces

aurora^{Duet} has the following audiovisual interfaces:

Earphone. An earphone with a loudspeaker is provided which lets you use the tester as a handset for voice communication and listen to speech calls. The volume can be adjusted using function keys.

Microphone. The microphone lets you use the tester as a handset for voice communication. You speak into this when making voice calls.

Ringer. This provides an audible ringing tone for incoming calls. The volume of the ringer can be adjusted - see Chapter 3 Section 4.

Liquid Crystal Display (LCD). This is a backlit screen, suitable for use in low light conditions, with contrast control.



Note

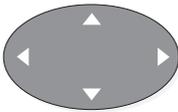
For information about the Headset, see *Communications Ports and Connectors*, later in this section.

The Keypad

The following describes each one of aurora^{Duet}'s keys:



Function keys. There are six of these keys which activate functions related to the current operation.



Cursor pad. Use this key to move the cursor *UP*, *DOWN*, *LEFT* or *RIGHT*. To move the cursor a single step, press and release; to 'auto-repeat', hold the arrow down.

Use the *UP* and *DOWN* arrows to move the cursor between menu options. The current selection is displayed in reverse video (light text on a black background). At the top of a menu, press *UP* to bring the cursor to the bottom; at the bottom of a menu, press *DOWN* to bring the cursor to the top. This does not apply to the Main menu, which has a scroll bar.

Use the *LEFT* and *RIGHT* arrows to toggle between available options, or to move the cursor to the start or end of a line where you can enter data. Use the *LEFT* arrow to erase characters in text entry screens. You can also use the cursor keys to move around the Graphical User Interfaces (GUIs).



Contrast. Use this key to adjust the contrast of aurora^{Duet}'s screen. Press and hold to sweep through the available contrast range. Release the key to choose your preferred setting.



Backlight. Press this key to illuminate the LCD; press it again to switch the backlight *OFF*. If you are running from the battery and there has been no keypad activity for a minute, the backlight switches off automatically. The backlight remains on constantly when operating from the mains supply.



SELECT. Press this key to choose a highlighted menu option or to start an operation.



Number Keys (0 to 9). Use these keys to input telephone numbers and data.

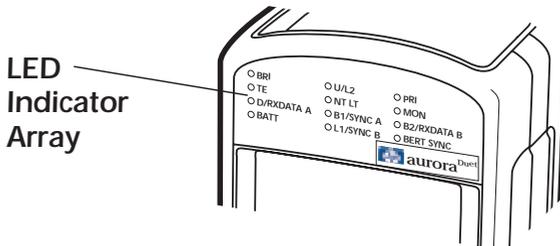


***** - this key is provided for compatibility with standard telephone handsets.



- this key is provided for compatibility with standard telephone handsets.

LED Indicators



There are eleven Light Emitting Diode (LED) status indicators grouped on the front of the BRI aurora^{Duet} and twelve on the PRI aurora^{Duet}.

The LEDs marked in white text are general or apply to the Basic Rate aurora^{Duet}; the LEDs marked in blue text apply to the Primary Rate aurora^{Duet}.

Understanding the LEDs

The LEDs have the following labels, colours and functions:

	BRI	<i>Green</i> shows the unit is operating in the BRI mode on the S or U interface.
	U	<i>Green</i> shows the unit is operating on the U interface.
	L2	<i>Green</i> shows the presence of Layer 2.
	PRI	<i>Green</i> shows the unit is operating in the PRI mode on the T or U interface.
	TE	<i>Green</i> shows the unit is operating in TE emulation mode.
	NT LT	<i>Green</i> shows the unit is operating in NT or LT emulation mode.
	MON	<i>Green</i> shows the unit is operating in monitor mode.
	D	<i>Green</i> shows the presence of D channel signal with polarity logic 1 (mark) on line. <i>Red</i> shows the presence of D channel signal with polarity logic 0 (space) on line.
	RXDATA A	<i>Green</i> signals the presence of received data on the RXA receiver.
	B1	<i>Green</i> shows the presence of B1 channel signal with polarity logic 1 (mark) on line. <i>Red</i> shows the presence of B1 channel signal with polarity logic 0 (space) on line. <i>Orange</i> indicates a fairly even mixture of 1's and 0's.

- PRI** SYNC A *Red* indicates the loss of multi-frame synchronisation (**LFA**) of the received data or the loss of signal (**LOS**).
- Green* indicates multi-frame synchronisation.
- BRI** B2 *Green* shows the presence of B2 channel signal with polarity logic 1 (mark) on line.
- Red* shows the presence of B2 channel signal with polarity logic 0 (space) on line.
- PRI** RXDATA B *Green* signals the presence of received data on the RXB receiver.
- BATT *Green* shows the battery is charging.
- Red* (flashing) shows the battery is nearly discharged and will be unable to power the unit within about 5 minutes. You should immediately connect and switch on the mains adaptor/charger - see Chapter 2 Section 1.
- BRI** L1 *Red* shows the presence of the layer 1 clock on the line.
- Green* shows full layer 1 activation.
- PRI** SYNC B *Red* indicates the loss of multi-frame synchronisation (**LFA**) of the received data or the loss of signal (**LOS**).
- Green* indicates multi-frame synchronisation.

BERT SYNC Green shows a BER test is running and that pattern synchronisation has been achieved on the data call in progress.

Red is not used.



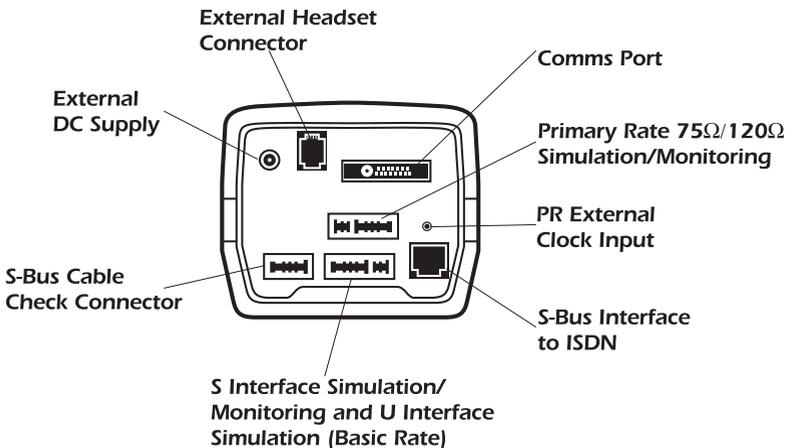
Note

If you are using the DASS2 and DPNSS protocols, the *TE, NT and Layer 2* LEDs behave differently. Refer to *Notes for DASS2 and DPNSS Protocol Users* later in this Chapter.

Communications Ports and Connectors

aurora^{Duet}'s communications ports and connectors are located on the top side of the unit.

The diagram below shows an aurora^{Duet} fitted with a Primary Rate Interface. The diagram may not match your particular tester - the ports and connectors depend on what options have been purchased.



The following explains the ports and connectors:

External DC Supply. Use this to connect aurora^{Duet} to an external power source using the supplied mains adaptor/charger.

External Headset Connector. This RJ-11 socket is used to connect a telephone headset or handset. In order to meet the requirements of the EC Directive on EMC, an 'EMC handset extender cable' must be used when a handset is connected. Contact Hewlett Packard or your local representative for details.

Comms Port. This is a single 15-way multi-pin connector which can be configured using a menu option to act as a high speed parallel interface or an RS232 serial port. Use this to connect to a PC, terminal or printer for remote reporting and control. Separate cables are provided for connecting to serial or parallel devices.

PRI

Primary Rate 75Ω/120Ω Simulation/ Monitoring. This TAE 8 + 4 socket is used (8-part) for 'T' interface simulation/monitor functions. Various 75Ω & 120Ω terminations are available - contact your Hewlett Packard representative for details.

PRI

PR External Clock Input. Connect this 2 pin connector to a second channel receive circuit to source an external clock. aurora^{Duet} detects the presence of an external clock and overrides the internal clock.

'S' Bus cable check connector. This TAE 8 socket is used for S Bus cable checking in 'S' tests.

BRI

'S' Interface Simulation/Monitoring & 'U' Interface Simulation. This TAE 8 + 4 socket is used: 8-part for 'S' interface simulation/monitor functions and 4-part for 'U' interface simulation.

'S' Bus Interface to ISDN. This RJ-45 socket is used for connection to the ISDN 'S' reference point for simulation/monitor functions. An RJ-45 'T' piece is supplied for monitoring on an S Bus. This must be used in conjunction with the EMC RJ-45 extender lead by first plugging the extender lead into the aurora^{Duet} RJ-45 socket and fitting the 'T' piece into the end of the extender lead.

Cables used with aurora^{Duet}

In addition to any optional interface cables you may have purchased, aurora^{Duet} is supplied with the following:

RJ45 to RJ45 cable. This is a standard 8 wire modular connector used to connect aurora^{Duet} to the ISDN.

RS232 cable. Use this to connect aurora^{Duet} to a PC or printer.

Connector safety

The connectors on aurora^{Duet} conform to EN41003 safety status classifications. These are shown in the following table where:

SELV = Safety Extra Low Voltage

TNV = Telecommunications Network Voltage

Telecommunications Safety	
Connector	Safety Status
DC Power In	SELV
RJ11 Headset	SELV
Parallel/RS232	SELV
TAE 8/RJ45 (S Bus Test)	SELV
TAE 8+4 (S & U Basic Rate Interfaces)	8 pin section (S interface) TNV 4 pin section (U interface) SELV
RJ45 (S Basic Rate Interface)	TNV
TAE 8+4 (Primary Rate Interface 120ohm)	SELV
2.5 mm jacksocket (Primary Rate Clock input 120 ohm)	SELV

Connections 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.

About the Protocols

aurora^{Duet} currently meets the requirements for the following:

- basic and primary rate implementation of the ETSI, VN4, 1TR6, TPH, QSIG, CorNet-N, TN1R6-T and TN1R6-N protocols
- basic rate implementation of the CorNet-T, Spectrum B Stimulus and Spectrum B Functional protocols
- primary rate implementation of the DASS2, DPNSS and V5 protocols
- X.25/X.31 access on D and B channels.

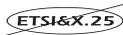
Many of the functions available with aurora^{Duet} are protocol-specific. In other words, their availability and the way they work depend on which protocol you are using. Protocol-specific information in this Guide is identified using symbols - see *Conventions in the Guide* in Section 1 of this chapter.

Notes for ETSI Protocol Users

There are 2 builds of ETSI software:

- ETSI and Supplementary Services
- ETSI and X.25

Information specific to a particular build is indicated using the following symbols:



Notes for Spectrum B Protocol Users

The Spectrum B Stimulus and Functional protocols operate in basic rate mode only. Therefore, please disregard any references to primary rate mode mentioned in this Guide.

Notes for DASS2 and DPNSS Protocol Users

DASS2 and DPNSS only operate on primary rate links. Therefore, please disregard any references to basic rate mode mentioned in this Guide.

The aurora^{Duet} implementation enables testing of LAP D and LAP B whilst functioning as either a PBX or an ET (DASS) or a PBXA or PBXB (DPNSS).

In DASS and DPNSS, the *TE*, *NT* and *Layer 2* LEDs function as follows:

TE Green shows the unit is operating in PBX emulation mode (DASS2) or PBXB mode (DPNSS).

NT Green shows the unit is operating in ET emulation mode (DASS2) or PBXA mode (DPNSS).

The **Layer 2 LED** is not used for DASS or DPNSS.

Notes for CorNet-T Protocol Users

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 result of attempting a data call from an aurora^{Duet} which has been identified as a speech device (SET751 or SET500) is indeterminate. The result of attempting a speech call from an aurora^{Duet} which has been identified as a data device (DCI521 or DCI731) is also indeterminate.

Notes for QSIG Protocol Users

On all interfaces except 4B3T 'U', aurora^{Duet} can act as either Master (generator) or Slave (receiver) of the clock. On a 4B3T 'U' interface, it can only act as the clock Slave.

Because QSIG is an inter-network protocol, you do not use aurora^{Duet} to emulate a specific type of ISDN device (TE, NT or LT). However, for consistency with other protocols, these terms are used in the setup menus. Therefore, to choose whether aurora^{Duet} acts as clock Master or Slave, you choose **TE**, **NT** or **LT** as if you were selecting the device to be emulated. Thus:

- To configure aurora^{Duet} as the clock Slave, choose **TE** as the emulation mode.
- To configure aurora^{Duet} as the clock Master, choose **NT** or **LT** (2B1Q only) as the emulation mode.

Proprietary signalling within QSIG and supplementary services are not supported with the current version of aurora^{Duet} software.

Point-to-multipoint (PMP) operation is not relevant to QSIG, therefore QSIG users should ignore references to this type of configuration in this Guide.



Chapter 2

Getting Started

Contents

Section 1 - Power Sources	2-4
Section 2 - Preparing to Use aurora^{Duet}	2-11
Section 3 - Using the Menus	2-20
Section 4 - Displaying Configuration and Help Information	2-25



Quick Start: Getting Started

- 1** Switch on aurora^{Duet} - the *ON/OFF* switch is located on the right-hand side of the unit.

aurora^{Duet} begins to boot up - for information, see *Switching aurora^{Duet} On and Off* in this Chapter.

- 2** Check the charge of the battery and, if necessary, connect the mains adaptor/charger (see *Recharging the Battery Pack*, in this Chapter).

If the **BATT** LED is flashing red, the battery is nearly discharged. The charge condition of the battery pack is also displayed in the Main menu when running from the battery pack.

- 3** Connect aurora^{Duet} to the line you wish to test - see *Connecting aurora^{Duet}* in this Chapter.

Getting Started

This chapter discusses the basics to help get you started. It tells you:

- how to power aurora^{Duet} from an external source or from rechargeable batteries.
- how to connect up aurora^{Duet} ready for testing
- about the menu system and menu navigation
- how to display configuration information and get on-screen help

This Chapter has the following structure:

Section 1 Power Sources

Section 2 Preparing to Use aurora^{Duet}

Section 3 Using the Menus

Section 4 Displaying Configuration and Help Information

Section 1

Power Sources

This section describes how to operate aurora^{Duet} from mains (AC) power or the rechargeable batteries supplied with the unit.

aurora^{Duet} is supplied with an adaptor/charger and a Nickel-Cadmium rechargeable battery which is fitted inside the unit.

aurora^{Duet} also contains a button cell battery which powers the Real Time Clock (RTC) and system settings - this battery is only charged when the unit is switched on.



Caution

- If you suspect that the button cell battery is defective, you must return the whole aurora^{Duet} to an authorised Hewlett Packard service centre.
- Do not apply a voltage greater than 20V D.C. to the RS232/parallel port, the DC power input connector, the headset connector or the S Bus Test connector.

Before Using aurora^{Duet} for the First Time

Ensure that the Nickel-Cadmium battery is fully charged before using aurora^{Duet} for the first time - see *Recharging the Battery Pack* in this Section.

aurora^{Duet} contains a button cell battery which is only charged when the unit is switched on. If you have not used aurora^{Duet} before, this battery may be flat and you may experience problems with the real time clock (RTC) 'losing time'. Therefore, connect the mains adaptor/charger, switch the unit on, and allow the battery to fully charge - see *Recharging the Battery Pack* in this Section.

Using AC power



Caution

aurora^{Duet} is intended for use only with the supplied adaptor/charger. If you use any other adaptor/charger, you may damage the tester or battery and invalidate approvals relating to safety or electromagnetic compatibility.

To power aurora^{Duet} from the external AC supply:

- Plug the supplied power adapter/charger into the DC supply input socket and switch aurora^{Duet} on.



Note

The location of the DC supply is indicated in *Communications Ports and Connectors* in Chapter 1.

aurora^{Duet} can operate without a battery pack, on mains energy only. Simply remove the battery pack, as described in *Replacing the Battery Pack*, and secure the cover. Store the unused battery pack in the carry case.

Using Battery Power

aurora^{Duet} is powered by a removable, rechargeable Nickel-Cadmium battery pack with a capacity of 2300mAh. There is also a button cell battery which maintains the real-time clock (RTC) and the system settings.

Battery Life

The battery life under normal working conditions is up to 5 hours, depending on the age of the battery, the ambient temperature and the interface being used. Primary Rate emulation consumes the most power.

Checking the charge of the battery

The charge condition of the battery pack is indicated in the Main menu as a column of up to 5 blocks. This is only displayed when you are running aurora^{Duet} from the battery pack, not from the mains supply.



Battery Charge Indicator

This display is only an approximate indication of battery condition.

When battery power is low

When the battery pack is within 5 minutes of becoming dead, the **BATT** LED on the front of aurora^{Duet} flashes red. You must now charge the battery pack.

If the battery level falls to a level insufficient to power the tester reliably, aurora^{Duet} clears any active calls and automatically switches itself off. Your setup values, however, are retained in memory.

Conserving battery power

aurora^{Duet} can be set to switch itself off automatically, when powered from batteries, if there has been no keypad activity for a certain length of time and no calls are in progress.

You can specify the length of time that aurora^{Duet} will wait before switching itself off, or disable this feature altogether, using the Auto Power Off function. For details, see *Setting the Automatic Power-off Time Delay* in Chapter 3 Section 4.

If you have not used aurora^{Duet} for some time

If you have not used your unit for some time, the button cell battery may be flat and you may experience problems with the Real Time Clock 'losing time', and loss of the system settings. To avoid this happening, connect the mains adaptor/charger, switch the unit on, and allow the battery to fully charge.

Discharging the Battery Pack

All Nickel-Cadmium cells exhibit a 'memory', which means that if you recharge a battery which is only partially discharged, some of its capacity is lost. Therefore, discharge all battery packs completely before recharging.

A convenient way of discharged the battery is to leave aurora^{Duet} switched on in the **RINGER VOLUME** screen (see Chapter 3 Section 4). While in this screen, aurora^{Duet} will only switch itself off automatically when the battery is discharged.



Caution

Please dispose of the battery pack in accordance with local environmental regulations or procedures.

Recharging the Battery Pack



Caution

Only recharge the battery pack supplied with aurora^{Duet}. Use only the supplied adaptor/charger - if you use any other adaptor/charger you may damage the tester or the battery.

- Check that the battery pack is completely discharged.

The charge condition of the battery pack is indicated in the Main menu. For a quick method of discharging the battery, refer to *Discharging the Battery Pack* in this section.

- Plug the adaptor/charger into the mains (AC) supply and connect this to aurora^{Duet}'s DC Supply socket.



Note

The location of the DC supply is indicated in *Communications Ports and Connectors* in Chapter 1.

aurora^{Duet} may be switched on and used while the battery pack is being recharged. The *BATT* LED is lit *GREEN* when the battery pack is fast charging.

- Continue charging the battery pack until it is fully charged.

The battery pack takes approximately 2 hours to fully recharge. When fully charged, all blocks on the battery charge indicator on the Main menu are highlighted, when the mains adaptor is disconnected.

- When charging is complete, switch off the mains power source and disconnect the adaptor/charger.

When the battery pack is fully recharged, it is safe to leave the charger connected for longer periods.



Caution

Avoid 'force charging' aurora^{Duet} by repeatedly removing and inserting the adaptor/charger lead - this may cause the batteries to overheat.

Replacing the Battery Pack

While you are replacing the battery, the real time clock and system settings are maintained by the button cell battery.

To remove a battery pack

- Press the battery pack release button, located on the bottom of the unit.
- Remove the cover and gently pull the battery pack out of the unit.



Keep spare battery packs in the carry case when not in use. Do not open the battery packs - these are factory-sealed.

To refit a battery pack

Dirty contacts will cause intermittent malfunctions of aurora^{Duet}. So, before refitting a battery pack, check that the contacts are clean and, if necessary, remove any deposits using a cloth or tissue.



Caution

Do not use any solvents, abrasives or detergents on the battery contacts - damage will be caused.

- Gently slide the battery pack into the unit, contacts first.

The contact end of the battery is keyed such that the flat edge should line up with the flat side of the aurora^{Duet}.

- Firmly secure the cover, ensuring the battery pack release is firmly engaged.

Alternative Power Sources

A 3 amp fused cigar lighter adaptor is available as an optional accessory. This lets you charge batteries from the 12 Volt DC negative earth cigar lighter connection available in most vehicles.

Section 2

Preparing To Use aurora^{Duet}

This section covers information you need to know before you start using aurora^{Duet}. It tells you how to:

- connect aurora^{Duet} to the ISDN and switch it on
- perform a self test
- register your aurora^{Duet}
- change the screen contrast and lighting
- connect a headset or handset to aurora^{Duet}

Connecting aurora^{Duet}

Before you start, you need to connect aurora^{Duet} to an external power source, if you require one (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 Section 1 of this Chapter.

Connecting to the ISDN

aurora^{Duet} can connect to the ISDN on the S or U interfaces for Basic Rate testing or, if the PRI option is fitted, to the E1 interface for Primary Rate testing.



Warning: Connecting to the line

Take care when connecting aurora^{Duet} to the line, as high voltages may be present on some telecommunication lines.

aurora^{Duet}'s interface connectors are located on the top of the unit. See *Communications Ports and Connectors* in Chapter 1 Section 2.

- Connect the appropriate cable to aurora^{Duet} and the equipment under test.

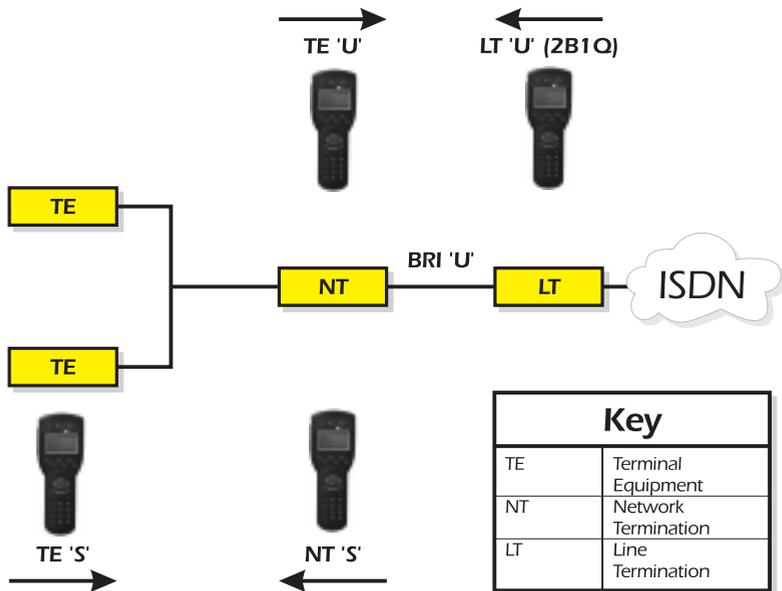


Note

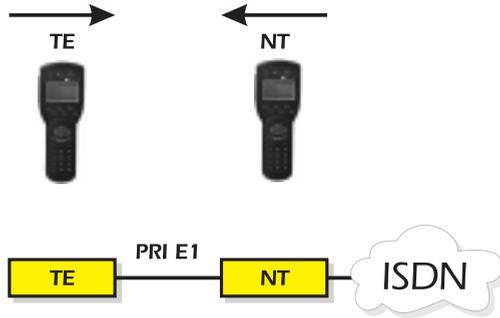
An RJ-45 'T' piece is supplied for monitoring on an S Bus. This must be used in conjunction with the EMC RJ-45 extender lead by first plugging the extender lead into the aurora^{Duet} RJ-45 socket and fitting the 'T' piece into the end of the extender lead.

The following diagrams show the points on the ISDN where you can connect aurora^{Duet} for simulation and monitoring.

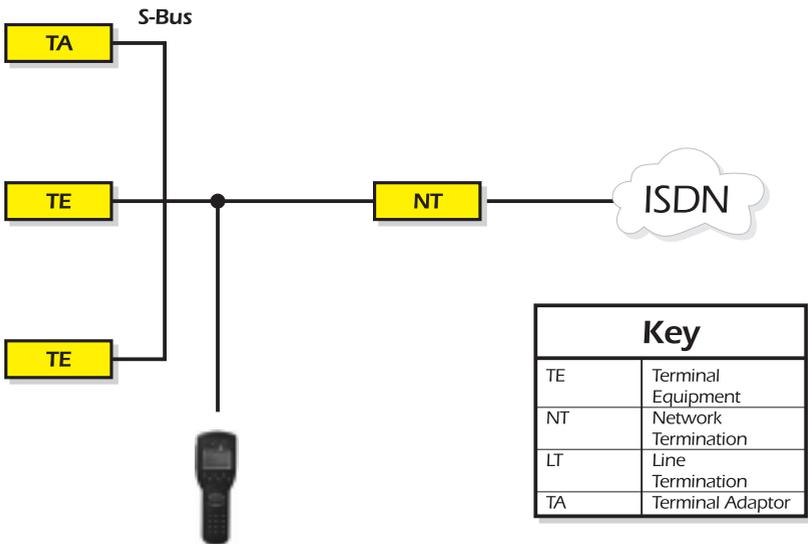
Simulate mode connections BRI

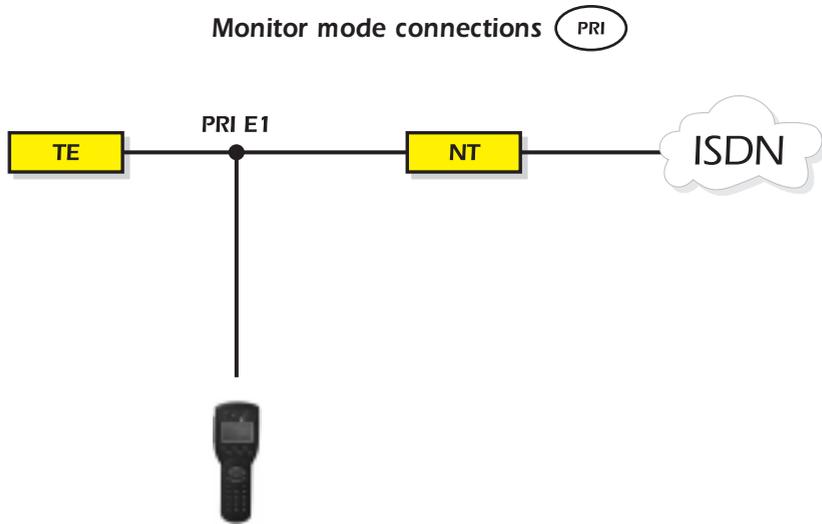


Simulate mode connections PRI



Monitor mode connections BRI





Switching aurora^{Duet} On and Off

The *ON/OFF* switch is located on the right-hand side of the unit.

Switching aurora^{Duet} On

- Push the *ON/OFF* switch momentarily in an upwards direction.

aurora^{Duet} begins to boot up. First, it checks the flash memory where aurora^{Duet}'s internal code is stored - aurora^{Duet} displays **Checking Flash Memory**.



Tip

If you experience problems with the screen contrast when you switch on aurora^{Duet} (in other words, you find it difficult to read the screen during boot-up), adjust the initial contrast - refer to *Changing the Appearance of the Screen* later in this Section.

- To bypass the flash memory check, press *F1*.

A logo screen is displayed. This screen is only displayed for about 10 seconds before the Main menu appears.

- To display the Main menu immediately, press **SELECT**.

Performing a Self Test of aurora^{Duet}

To carry out a comprehensive self test of flash memory and I/O devices:

- Press **F2** from the logo screen.

The self test begins and the results are displayed as they occur. When the self test completes satisfactorily, aurora^{Duet} displays the Main menu. A detailed description of the Main menu is found in the next section.

If the self test fails

If the self test fails, a message is displayed advising you to contact Hewlett Packard. Refer to the contact numbers at the front of this Guide.

Registering your aurora^{Duet}

After you purchase aurora^{Duet}, you need to register the unit with Hewlett Packard. Registered users receive a free gift, together with regular information about upgrades and special offers.

To register your aurora^{Duet} you can contact Hewlett Packard by telephone.

Switching Off aurora^{Duet}

- Push the ON/OFF switch, located on the right side of the unit, in a downwards direction.

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

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

Adjusting the initial contrast

The initial contrast is the contrast setting used when aurora^{Duet} is switched on and it begins to boot up. This contrast setting may differ to that used in subsequent screens, such as the Main menu.

To adjust the initial contrast:

- Switch aurora^{Duet} off, then on again.
- Press and hold the contrast key  until the logo screen is displayed - this may take a few seconds. Press and hold the key to sweep through the available range; release the key to choose your preferred setting.
- Press **F2** to begin a self test.
- In the self test screen, again press and hold the contrast key to sweep through the available range, then release the key to choose your preferred setting.

The logo screen is displayed and the initial contrast is set. This setting is retained and will be used in future, each time you switch on aurora^{Duet}.

Adjusting the main contrast

To adjust the contrast setting which is used after aurora^{Duet} has completed the boot-up procedure and the Main menu is displayed:

- Press and hold the  key.

The screen sweeps through the available contrast range. Release the key to choose your preferred setting.



Tip

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

Switching the Backlight On and Off

- Press and hold the  key.



Note

When aurora^{Duet} is running from battery power, the backlight switches off automatically after one minute if no keys have been pressed.

Attaching the Carry Strap to aurora^{Duet}

A carry strap is supplied with aurora^{Duet} which you can use as a shoulder strap to carry the tester around.

On the back of aurora^{Duet} near the base are two carry strap attachment points, one on either side.

- Slide one end of the carry strap through the attachment point (with the buckle facing upwards), then loop the end back through the buckle and tighten.
- Attach the other end of the carry strap to the second attachment point, in the same way.



- Use the buckles to adjust the length of the carry strap.

Connecting a Headset/Handset to aurora^{Duet}

You can listen to voice calls using aurora^{Duet}'s built-in speaker or through a standard telephone headset or handset connected to aurora^{Duet}.



Notes

- In order to meet the requirements of the EC Directive on EMC, an 'EMC handset extender cable' must be used when a handset is connected. Contact Hewlett Packard or your local representative for details.
- Specifications for commonly available headsets and handsets vary widely, so some headsets and handsets may not work with your aurora^{Duet}. Contact your Hewlett Packard representative for information on recommended accessories.

To connect a headset or handset:

- Plug the handset (using an EMC handset extender cable) or headset into the *External Headset Connector* port.

The location of the *External Headset Connector* is shown in *Communications Ports and Connectors* in Chapter 1 Section 2.

Section 3

Using the Menu

Most of aurora^{Duet}'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 are using.

The Main Menu

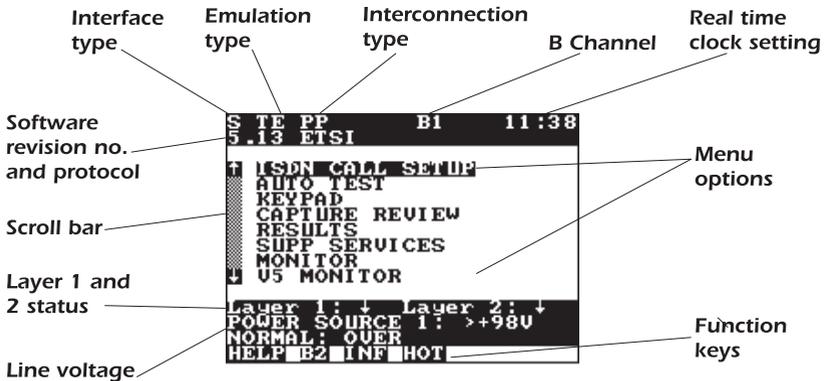
The Main menu is automatically displayed when aurora^{Duet} is switched on and it has booted-up.

The examples below are for the ETSI protocol in Simulate mode. If you are using a different protocol, the options available may differ.



Note

For information about the Main menu in Monitor mode, see Chapter 5.



<i>B channel</i>	B1 Bearer channel 1 B2 Bearer channel 2 Bx Either bearer channel Bnn Bearer channel number where nn = a number from 1 to 30.
<i>Real time clock</i>	The time held by aurora ^{Duet} 's real time clock.
<i>Software revision</i>	The revision number of the software currently loaded on aurora ^{Duet} .
<i>Protocol</i>	The currently selected protocol.
<i>Scroll bar</i>	Indicates there are more options than can fit on a single screen. Use the <i>UP</i> and <i>DOWN</i> arrow cursor keys to scroll through the available options.
<i>Layer 1 & 2 status</i>	shows the real-time status of layers 1 and 2: ↑ the layer is up ↓ the layer is down.
PRI <i>Line voltage</i>	Indicates the monitored power source. In TE mode this line displays POWER SOURCE 1 , followed by the measured voltage. In NT mode this line displays LINE POWER , followed by the measured voltage.
<i>Menu options</i>	Lists the available menu options.
<i>Function keys</i>	Displays the available function keys.

Moving Through Items in a Menu

- Use the *UP* and *DOWN* arrow keys to move the cursor through the menu items, one at a time.



On the Main menu, a scroll bar is displayed on the left-hand side of the screen to indicate that there are more options than can fit on a single screen.

Selecting a Menu Option

- Move the cursor through the menu items until the one you want is highlighted.
- Press *SELECT* to choose the menu item.

Depending on what you have selected, aurora^{Duet} does one of the following:

- performs the task you have selected
- displays a further sub-menu.



Tip

Appendix 3 contains 'menutree' diagrams which illustrate the complete aurora^{Duet} menu structure.

Using the Function Keys

aurora^{Duet} has six function keys, labelled *F1* to *F6*. Use these to carry out tasks related to the operation you are currently performing.

aurora^{Duet} shows the task name, in abbreviated form, at the foot of the screen, just above the key. For example:



Note

In this Guide, function keys are indicated using bold italic text; for example, 'Press *F1* to display on-line help'.

Some of the function keys are standard across menus. For example, *F1* usually displays on-line help and *F6* exits the current function.

Exiting from a Menu or Function

To exit from a menu or screen, without selecting an option:

- Press *F6* **EXIT**.

Generally, the previous menu is displayed.

Section 4

Displaying Configuration and Help Information

This section explains how to display information about the current configuration of *aurora^{Duet}*, and how to get on-screen Help.

Checking *aurora^{Duet}*'s Configuration

You can display information about the way *aurora^{Duet}* is currently set up, at any level in *aurora^{Duet}*'s menu structure.

➤ Press **F1 HELP**.

The **STATUS** screen is displayed. The following example shows a status screen for BRI Simulate mode.

```

5.13      STATUS
ETSI      S TE PP
LAYER2    PERMANENT
B TEI:    FIXED 0 0
DIAL TYPE: EN BLOC
SCREENING: OFF
S-TERMINATION: ON
ENCODING: A-law
SERIAL:   19.2K  8 N I
TRACER: OFF
BERT SETUP No 1
PATTERN:  2047p.r
TEST LENGTH: CONTINUOUS
PRN      11000  12000

```

The following tables explain the display:

Simulate

aurora ^{Duet} Status Information	
Emulation Settings	Displays the selected: - protocol - e.g. ETSI, 1TR6 , - interface - e.g. S, 2B1Q (BRI) and S2M (PRI), - type - TE, NT - line type (BRI) - e.g. PP, PMP .
Layer2	Displays the current ISDN layer 2 parameters, e.g. PERMANENT , or AUTOMATIC (BRI)..
B TEI	Displays B channel Terminal Endpoint Identifier (TEI) settings: FIXED or AUTOMATIC . TEI values are also displayed.
Dial Type	Shows the selected dial type: EN BLOC or OVERLAP .
Screening	Displays call screening settings, e.g. CLI SCREEN, CPN SCREEN .
S-Termination 	Shows if the S Termination relay is set to ON or OFF .
Termination 	Shows the resistance value: 75Ω or 120Ω .
Encoding	Displays the type of encoding, e.g. A-LAW or μ-LAW .
Communications Port	Shows the type of communications port selected, e.g. SERIAL 19.2K 8 N 1 (port, baud rate, bits, parity and stop bits).
Tracer	Displays the type of tracer output selected, e.g. TO MEMORY .
BERT Setup Number	Shows the currently selected BER Testing combination.
Pattern	Displays the selected pattern for Bit Error Rate testing.
Test Length	Shows the selected BER Test length.
CRC4 	Displays if CRC4 error checking is switched ON or OFF .

Monitor

aurora ^{Duet} Status Information	
Emulation Settings	Displays the selected: - protocol - e.g. ETSI, 1TR6 , - software release number.
Communications Port	Shows the type of communications port selected, e.g. SERIAL 19.2K 8 NONE 1 (port, baud rate, bits, parity and stop bits).
Tracer	Displays the type of tracer output selected, e.g. TO MEMORY .

Printing Configuration Information

- Connect aurora^{Duet} to a PC or printer - see Chapter 3 Section 3.
- Press **F1 PRN**.

The configuration information is sent to the PC or printer.

Exiting the Status Screen

- Press **F6 EXIT**.

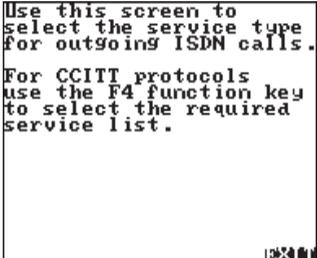
The status screen is exited and you return to the previous display.

Getting On-screen Help

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

- Press **F1 HELP** to display the **STATUS** screen, then press **F4 HELP**.

Help text for the current menu is displayed. The following example shows the first help screen for the **ISDN CALL SETUP** menu.



```
Use this screen to
select the service type
for outgoing ISDN calls.
For CCITT protocols
use the F4 function key
to select the required
service list.
```

Browsing through the Help Text

If there is more help text than can fit on a single screen, function keys are provided to browse through the text.

- To display the next page of help text, press **F4 NXT**.
- To display the previous page of help text, press **F2 PREV**.

Exiting On-screen Help

- Press **F6 EXIT**.

The help screen is exited and you return to the previous display.



Chapter 3

Setting up aurora^{Duet}

Contents

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Section 2 - Other Setup Options	3-19
Section 3 - Communications Setup	3-55
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Quick Start: Setting up aurora^{Duet}

Once aurora^{Duet} is switched on and connected to the line you wish to test:

- 1** Check that aurora^{Duet} is configured correctly for the line under test.

Check the LED indicators to determine if aurora^{Duet} is in BRI, PRI or Monitor mode. Alternatively, press **F1 HELP** to display status information - see *Checking aurora^{Duet}'s Configuration* in Chapter 2.

- 2** To select the operating mode, choose **Simulate** or **Monitor** from the Main menu - see *Choosing the Operating Mode* in this Chapter.
- 3** To configure aurora^{Duet} to suit the line under test (in Simulate mode), use the Hot Key settings. Press **F4 HOT** from the Main menu - see *Setting up aurora^{Duet} using Hot Keys* in this Chapter.

Alternatively, choose **EMULATION** from the **ISDN SETUP** menu and change the protocol, access type, interface, mode, line type and layer 2 settings - see *Changing the Emulation* in this Chapter.

- 4** If testing in PRI mode, enable or disable Layer 1 CRC4 checking and generation - see *Switching CRC4 Error Checking Off/On* in this Chapter.
- 5** If using the TPH or Spectrum B protocols, set up a SPID - see *Storing a Service Profile Id* in this Chapter.
- 6** Configure aurora^{Duet} with other optional settings, e.g. call screening and charging - see Section 2 of this Chapter.

Setting up aurora^{Duet}

When you are comfortable using aurora^{Duet} and familiar with the operations described in Chapter 2, you are ready to set up aurora^{Duet} and use its testing features. This chapter tells you how to set up aurora^{Duet} ready for testing on the ISDN.

This Chapter has the following structure:

Section 1 Essential Setup Options

Section 2 Other Setup Options

Section 3 Communications Setup

Section 4 General Setup

Section 1

Essential Setup Options

This section describes the essential options you must set up to operate on the ISDN in both Simulate and Monitor mode. It includes information on how to:

- choose the operating mode: Simulate or Monitor
- switch between Basic and Primary rate
- select the protocol, interface, mode and line type and identify the protocol master and slave
- quickly configure aurora^{Duet} using Hot Keys
- terminate the S Bus or a PRI link
- set the voice encoding type for speech calls
- switch CRC4 checking on or off
- store a service profile Id (SPID)

When you first use aurora^{Duet} it may be configured with default values, called 'factory defaults'.



Tip

To check how aurora^{Duet} is currently setup, press **F1 HELP** - see *Checking aurora^{Duet}'s Configuration* in Chapter 2.

Choosing the Operating Mode

aurora^{Duet} operates in two different modes:

ISDN Simulate in this mode you can make 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.

To select the operating mode:

- From the Main menu, choose either **Simulate** or **Monitor**.

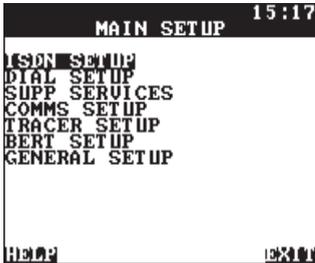
aurora^{Duet} displays a screen to indicate that it is reconfiguring itself - this may take a few moments. The operating mode is selected and the appropriate main menu is displayed.

Accessing the Setup Menu

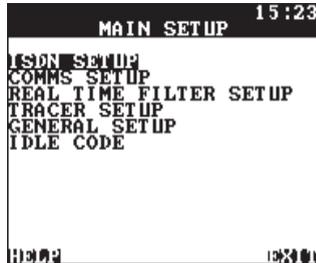
- Simulate** ➤ Choose **SETUP** from the Main menu.
- Monitor** ➤ Choose **SETUP** from the **ISDN MONITOR MENU**, **S I/F MONITOR MENU** or **V5 MONITOR MENU**.

The **MAIN SETUP** menu is displayed.

Simulate



Monitor

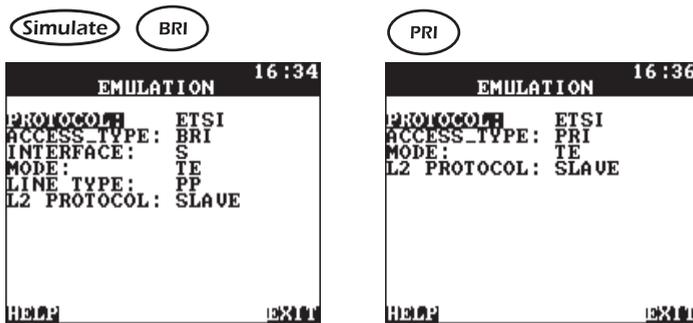


Changing the Emulation

Use the **ISDN SETUP** menu to select the protocol, interface, mode, line type and layer 2 protocol you wish to use. You can also switch between Basic and Primary rate modes, if the PRI option is fitted.

- Choose **EMULATION** from the **ISDN SETUP** menu.

The **EMULATION** screen is displayed.



Make your selections from this screen from the **top down**. Each time you choose an option, aurora^{Duet} automatically updates the screen to only show the valid options. For example, if you choose an Access Type of PRI, the Interface option is no longer shown.

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^{Duet}'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.

- **Simulate** Highlight **PROTOCOL** in the **EMULATION** screen.
- **Monitor** Highlight **PROTOCOL** in the **ISDN SETUP** menu.
- Use the **LEFT** and **RIGHT** arrow keys to choose an option.

Choosing Basic or Primary Rate

To switch between Basic Rate (BRI) and Primary Rate modes, if Primary Rate (PRI) mode is fitted on your aurora^{Duet}:

- **Simulate** Highlight **ACCESS_TYPE** in the **EMULATION** screen.
- **Monitor** Highlight **ACCESS_TYPE** in the **ISDN SETUP** menu.
- Use the **LEFT** and **RIGHT** arrow keys to choose **PRI** (Primary Rate) or **BRI** (Basic Rate).

The **BRI** or **PRI** LED lights up, depending on your selection.



Notes

- The DASS and DPNSS protocols only operate in PRI mode.
- The CorNet-T and Spectrum B protocols only operate in BRI mode.

Selecting an Interface **Simulate** **BRI**

In Basic Rate (BRI) mode, aurora^{Duet} can connect to the ISDN on either the S, T or U interfaces. In Primary Rate (PRI) mode, aurora^{Duet} connects to the ISDN on the S or T interface.

In BRI mode, to select the interface you wish to use during testing:

- Highlight **INTERFACE** in the **EMULATION** screen.
- Use the **LEFT** and **RIGHT** arrow keys to choose from the S interface, or any U interface options (Up0, 2B1Q or 4B3T) which are fitted.

Choosing the Device to Emulate Simulate

You need to identify the type of device which aurora^{Duet} is to emulate at the selected interface. This automatically determines whether aurora^{Duet} generates or receives the network clock at Layer 1.

- Highlight **MODE** in the **EMULATION** screen.
- Using the *LEFT* and *RIGHT* arrow keys, toggle between the available options.

The *TE* or *NT / LT* LED lights up, depending on your selection.

The options are as follows:

Termination Settings	
TE	Terminal Equipment. aurora ^{Duet} acts as the network clock receiver at Layer 1.
NT	Network Termination. aurora ^{Duet} acts as the network clock generator at Layer 1. On the U interface, aurora ^{Duet} acts as the network clock receiver at Layer 1.
LT (BRI)	Line Termination (U interface). aurora ^{Duet} acts as the network clock generator at Layer 1.



Notes

- When you choose TE, aurora^{Duet} sets the L2 protocol to Slave (see *Identifying the Protocol Master and Slave* in this Section), and if you choose NT or LT, the L2 protocol is set to Master. This is the normal configuration, but you can change this setting, e.g. for testing fixed links or stress testing.

Spectrum B-S

- **MODE** is set to TE. NT cannot be selected.

QSIG

- The conventional terms 'TE' 'NT' and 'LT' are used for consistency with other protocols, although they are not relevant for QSIG - see *Notes for QSIG Users* in Chapter 1 Section 2.

Selecting the Type of Protocol Link Simulate BRI

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

- Highlight **LINE TYPE** in the **EMULATION** screen.
- Use the **LEFT** and **RIGHT** arrow keys to choose one of the following options:

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



Notes

CorNet-T

- The default is PMP.

CorNet-N

- CorNet-N and QSIG do not support Point-to-Multipoint operation.

Identifying the Protocol Master and Slave Simulate

To test ISDN protocol links, you need to identify whether aurora^{Duet} acts as the ‘master’ (exchange side) or ‘slave’ (customer side) of the network at Layer 2. To test fixed links, you can set aurora^{Duet} to operate without Layer 2 protocol.



Tip

Usually, when aurora^{Duet} 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^{Duet}’s internal clock when the network clock is not reliable.

Setting Layer 2 DASS DPNSS

- Highlight **L2 PROTOCOL** in the **EMULATION** screen.
- Use the *LEFT* and *RIGHT* arrow keys to choose from the following options:

Layer 2 Protocol	
Slave	aurora ^{Duet} acts as the customer side of the network (TE).
Master	aurora ^{Duet} acts as the exchange side of the network (NT).
No D Chan	No Layer 2 protocol control. Use this setting to test fixed links - in other words, test a cable or network without establishing a call.

Setting Level 2 DASS DPNSS

- Highlight **LEVEL 2** in the **EMULATION** screen.
- Use the *LEFT* and *RIGHT* arrow keys to choose from the following options:

Level 2	
ET (DASS)	aurora ^{Duet} acts as the exchange side of the network.
PBX (DASS)	aurora ^{Duet} acts as the customer side of the network.
PBXA (DPNSS)	aurora ^{Duet} acts as the exchange side of the network.
PBXB (DPNSS)	aurora ^{Duet} acts as the customer side of the network.

Setting PBXX and PBXY DPNSS

To set call collision handling parameters in the PBX:

- Highlight **LEVEL 3** in the **EMULATION** screen.
- Use the *LEFT* and *RIGHT* arrow keys to choose from the following options:

Level 3	
PBXX	Set call collision parameter to PBXX. PBXX always wins during call collision.
PBXY	Set call collision parameter to PBXY. PBXY always yields during call collision.

Changing the Emulation - Examples

The following tables show the emulation settings you would choose for testing ISDN protocol links and fixed links.



Note

To test a cable or network without establishing a call, refer to *Fixed links: Testing a Cable or Network without Establishing a Call* in Chapter 4 Section 2.

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 ^{Duet} emulates an NT at Layers 1-3. Used for testing TEs and the line itself.
LT, Master (BRI)	Emulate a TE 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 ^{Duet} 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 ^{Duet} emulates an NT at Layer 1 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 ^{Duet} emulates an LT at Layer 1 and a TE 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 ^{Duet} emulates a TE connected to a fixed link, acting as network clock receiver. At the U interface, aurora ^{Duet} 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 ^{Duet} 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 ^{Duet} emulates a Line Termination, acting as network clock generator. This is used for testing into the NT.

Saving your Selections

- Press **F6 EXIT** until you return to the Main menu. aurora^{Duet} reconfigures itself to the settings you have chosen - this may take a few moments.

Setting up aurora^{Duet} using Hot Keys Simulate

aurora^{Duet} provides Hot Keys, which allow you to configure the unit automatically, at the touch of a button.

The Hot Keys available depend on how your unit is set up.

- BRI In BRI mode:
 - Hot Keys 5 and 6 are only available when a Up0 interface is fitted.
 - Hot Key 7 is only available when a 2B1Q interface is fitted.
 - Hot Key 8 is only available when a 4B3T interface is fitted.

If you try to select a configuration which is not available, a message is displayed next to the Hot Key indicating why you cannot select it, e.g. **Up0 NOT FITTED**.

Displaying the Hot Keys

- In the **MAIN** menu, press the **F4 HOT** function key.

The **HOT KEYS** menu is displayed.

BRI

```

[BRI] ETSI 17:41
↑ TO SELECT MODE
+ TO SELECT PROTOCOL
← ACCEPT SELECTION

1. S TE P-P
2. NT P-P
3. TE P-MP
4. NT P-MP
5. UP0 NOT FITTED
6. UP0 NOT FITTED
7. 2B1Q NOT FITTED
8. 2B1Q NOT FITTED
9. 4B3T NOT FITTED
    
```

PRI

```

[PRI] ETSI
↑ TO SELECT MODE
+ TO SELECT PROTOCOL
← ACCEPT SELECTION

1. TE Slave
2. NT Master
3. TE Master
4. NT Slave
5. TE Fixed
6. NT Fixed
    
```

Switching between BRI and PRI

To toggle between the hotkeys for BRI and PRI modes.

- Press **F3**.

Changing the protocol

aurora^{Duet} displays the currently selected protocol at the top of the screen.

- Press the **LEFT** and **RIGHT** arrow keys to switch between the available protocols until the one you require appears at the top of the screen.

As you switch between the protocols, aurora^{Duet} changes the list of Hot Key settings to suit the protocol that is currently displayed

When you switch to a protocol which operates in only BRI or PRI mode, aurora^{Duet} automatically switches to the appropriate mode. For example, if the unit is set to PRI mode and you display the CorNet-T protocol, aurora^{Duet} switches to BRI mode.

Choosing a Hot Key Configuration

- Use the *UP* and *DOWN* arrow keys to highlight the configuration you want.
- Press *SELECT*.

aurora^{Duet} resets itself to the chosen configuration, displaying the message **CONFIGURING SIMULATE PLEASE WAIT**. The Main menu is then displayed.

The following tables show the settings assigned to the Hot Keys.

Hot Key Settings BRI

The following parameters are assigned to Hot Keys in BRI mode:

Hot Key Number	Interface	Mode	Line Type	L2 Protocol	TEI	Layer 2	S-Term
1	S	TE	PP	Slave	Fixed	Permanent	On
2	S	NT	PP	Master	Fixed	Permanent	On
3	S	TE	PMP	Slave	Auto	Auto	On
4	S	NT	PMP	Master	Auto	Auto	On
5	UP0	TE	PMP	Slave	Auto	Auto	
6	UP0	NT	PMP	Master	Auto	Auto	
7	2B1Q	TE	PP	Slave	Fixed	Permanent	
8	4B3T	TE	PP	Slave	Fixed	Permanent	

Hot Key Settings PRI

The following parameters are assigned to Hot Keys in PRI mode:

Hot Key Number	Interface	Mode	Line Type	L2 Protocol	TEI	Layer 2	S-Term
1	S	TE	PP	Slave	Fixed	Permanent	On
2	S	NT	PP	Master	Fixed	Permanent	On
3	S	TE	PP	Master	Fixed	Permanent	On
4	S	NT	PP	Slave	Fixed	Permanent	On
5	S	TE	PP	-	Fixed	Permanent	On
6	S	NT	PP	-	Fixed	Permanent	On



Note

All Hot Keys set Layer 2 to Permanent.

Exiting without Making a Selection

- To exit from the **HOT KEYS** menu without making any changes, press **F6**.

Terminating the S Bus



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

When using aurora^{Duet} for simulation on the S interface, you must switch its 100Ω termination resistor on or off, depending on the device aurora^{Duet} is emulating and the other equipment on the link. When emulating an NT, the resistor must always be **ON**.

Only one socket on the interface can have the S bus termination connected at any one time. Therefore, when you 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^{Duet}'s resistor **OFF**; if not, you must switch aurora^{Duet}'s resistor **ON**.



Tip

Also check the NT to see if the termination resistor is switched or linked in or out. The NT has two termination resistors - one for the NT end and one for the terminal end. When the terminal end is directly connected, the terminal end resistor can be switched in or out (or linked in the NTE6)

- From the **ISDN SETUP** menu, highlight **S-TERMINATION**.
- Using the **RIGHT** and **LEFT** arrow keys, choose either **OFF** or **ON**.

Spectrum B-S



Note

When you are using Spectrum B Stimulus, **S-TERMINATION** must be set to **ON**.

Terminating a Primary Rate Link

Simulate

PRI

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

- From the **ISDN SETUP** menu, highlight **TERMINATION**.
- Using the **RIGHT** and **LEFT** arrow keys, select either **75 OHM** or **120 OHM**.

Setting the Voice Encoding Type

Voice encoding is the way in which aurora^{Duet} ‘translates’ speech into a format which can be transmitted. The encoding type must be appropriate for the national network.

- From the **ISDN SETUP** menu, highlight **ENCODING**.
- Using the **RIGHT** and **LEFT** arrow keys, select either **A-LAW** or **μ-LAW**.

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.

Switching CRC4 Error Checking Off/On PRI

You can enable and disable Layer 1 CRC4 checking and generation, according to the ITU-T G.704 standard. Both ends of the line must be set the same.

- From the **ISDN SETUP** menu, highlight **CRC4**.
- Using the **RIGHT** and **LEFT** arrow keys, select either **OFF** or **ON**.

Storing a Service Profile Id TPH Spectrum B-S Spectrum B-F

A SPID is used by the terminal equipment to identify the service profile to the network on point to multipoint connections. The SPID is included as an information element in outgoing calls.

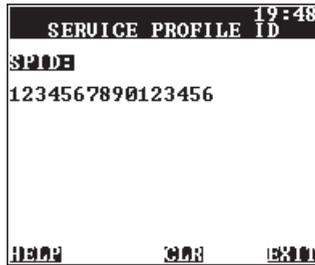
Spectrum B-S Note:

When using Spectrum B Stimulus, you must have a stored SPID value.

To store a 16 digit Service Profile Identifier (SPID) in aurora^{Duet}'s memory:

- Choose **SPID** in the **DIAL SETUP** menu.

The **SERVICE PROFILE ID** screen is displayed.



- Highlight **SPID** and press the *DOWN* arrow key.

A flashing cursor indicates the point where you can enter the next digit.

- Enter a **SPID** of up to 16 digits in length.

To clear the current **SPID**, press *F4 CLR*. If you make a mistake, use the *LEFT* arrow key to delete the previous digit.

- To save the **SPID** and return to the **DIAL SETUP** menu, press *F6 EXIT*.

Section 2

Other Setup Options

This section describes other options which, although not essential, you may want to set up for operation on the ISDN in both Simulate and Monitor mode. It includes information on how to:

- supply power to Terminal Equipment
- set up the layer 2 protocol
- set up Call Screening and Call Charging
- define your own Bearer Capabilities, Service Indicator Codes and HLCs
- specify the type of dialling to be used
- create a directory of Called Party Numbers (CPNs) or Dialed Address Numbers (DAs)
- store the Calling Line ID (CLI), Originating Line ID (OLI) or TLI (Terminating Line ID) of your aurora^{Duet}

Supplying Power to Terminal Equipment

BRI

Simulate

When aurora^{Duet} is set to emulate a Network Termination (NT), it can be used to supply power to Terminal Equipment on the line. For example, you could use this to supply power to a telephone.

- Connect the power adapter/charger into the *DC* supply input socket on aurora^{Duet}.

The charger *must* be connected when supplying NT power, as the battery will be unable to power both aurora^{Duet} and the terminal.

- Choose **SETUP / ISDN SETUP / EMULATION**.

- Highlight **POWER FEED** and, using the *LEFT* and *RIGHT* arrow keys, choose **ON**.

Power is supplied to the TE.

- To save this setting, press *F6* **EXIT** until you return to the Main menu.



Note

The Power Feed option is automatically set to **OFF** when aurora^{Duet} is switched off.

Setting up the Layer 2 Protocol Simulate

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.

- Select **LAYER2** from the **ISDN SETUP** menu.

The **LAYER2** screen is displayed.



Choosing when the Layer 2 Link is Set up BRI

To determine the point at which aurora^{Duet} sets up the Layer 2 for incoming and outgoing calls:

- Highlight **LAYER2**
- Using the *LEFT* and *RIGHT* arrow keys, toggle between **PERMANENT** and **AUTOMATIC**.

The options are explained in the following table:

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

Spectrum B-5 **LAYER 2** must be **PERMANENT**.

CorNet-T The default is **PERMANENT**. If **LAYER 2** is set to **AUTOMATIC**, aurora^{Duet} cannot accept incoming calls until after the first outgoing call has been established. If aurora^{Duet} is in Unattended mode and **LAYER 2** is set to **AUTOMATIC**, no calls will be received.

CorNet-N The default is **PERMANENT**.

Specifying how B Channel TEIs are Assigned BRI

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

- Highlight **B TEI**
- Using the *LEFT* and *RIGHT* arrow keys, toggle between **FIXED** and **AUTOMATIC**:

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.

CorNet-T The default is **AUTOMATIC**.

CorNet-N **B TEI** is always set to **FIXED** and both TEIs have a value of 0.

Assigning Fixed B TEI Values

- BRI** If you set **B TEI** to **FIXED** (see above), you can assign two fixed B channel TEI values.
- PRI** For Primary Rate operation, TEI assignment is always fixed - you can assign two fixed B channel TEI values.
 - Press **F3 TEI1** to edit the **FIXED B TEI1** line or **F4 TEI2** to edit the **FIXED B TEI2** line.

The cursor flashes on the appropriate line.

- Key-in a two digit value.

The fixed B channel TEI values must be in the range 00 to 63 - you cannot enter a number greater than this. You must enter two digits before you can exit the line - so, for single digit numbers you need a leading zero e.g. 04.

Saving your Selections

- When you have finished making your selections, press **F6 EXIT**.

The settings are saved.

Setting up User Defined SICs

Simulate **ITR6**

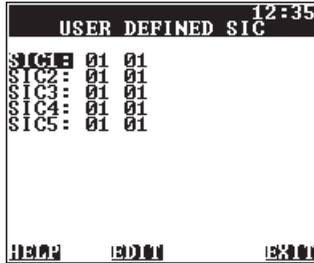
DASS **DPNSS**

Service Indicator Codes (SICs) identify specific ISDN service types. SICs are sent out in the Layer 3 messages during call setup.

Sometimes you may want to test out a new service type which is not pre-defined in aurora^{Duet}. You can do this by defining your own SICs. Up to five SICs can be stored in aurora^{Duet}'s memory for selection during call setup. For information on selecting a user defined SIC at call setup, please refer to Chapter 4 Section 1.

- Choose **USER DEFINED SIC** from the **ISDN SETUP** menu.

A screen similar to the following is displayed, showing any current SIC settings.



Each SIC string is displayed as two groups of two hexadecimal digits. The default is **01 01**.

Entering User Defined SICs

- Use the cursor to highlight the line you want to edit and press **F3 EDIT**.

A flashing cursor appears at the point where you can enter the first digit.

- Use the keypad to enter digits *0* to *9* and the function keys to enter hexadecimal digits *A* to *F*, as follows:

F1 = A, F2 = B, F3 = C, F4 = D, F5 = E, F6 = F.

You can enter any hexadecimal number in the range **00** to **FF FF**.

If you make a mistake, use the **LEFT** arrow to move the cursor to the start of the line and begin again.

To save your settings, press the **UP** or **DOWN** arrows while editing. Once four valid digits have been entered, aurora^{Duet} saves the value automatically. To continue entering SICs, highlight an SIC line and press **F3 EDIT**.

- When you have finished entering SICs, press **F6 EXIT**.

aurora^{Duet} saves the SICs and returns to the **ISDN SETUP** menu.

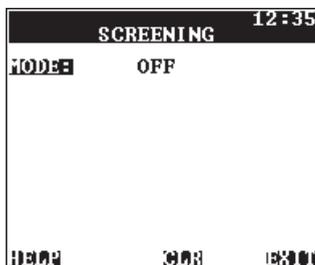
Setting up Call Screening Simulate

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 aurora^{Duet} to screen incoming calls.

Depending upon the protocol you are using, you can screen for:

- ITRG • a specific EAZ
 - ~~DASS~~ ~~DPNSS~~ • Calling Line Identifier (CLI)
 - ~~DASS~~ ~~DPNSS~~ • Called Party Number/Multiple Subscriber Number (CPN/MSN)
 - DASS DPNSS • specific Dialed Address numbers (DAs) or Originating Line Identifiers (OLIs).
- Choose **SCREENING** from the **ISDN SETUP** menu.

A screen similar to the following is displayed:



Choosing the Type of Screening

At first, **MODE** is set to **OFF** which means that screening is disabled.

- Highlight **MODE** and use the **RIGHT** and **LEFT** arrow keys to toggle between the following options:

Call Screening Types	
Off	No screening
MSN Screen (ETSI)	Use this to enter up to three different CPNs - that is, accept calls for up to three different numbers. Each CPN can be up to 20 digits in length and can include a sub-address, preceded by an asterisk (*).
CLI Screen	Use this to screen for one CLI - that is, accept calls only from a particular number. Each CLI can be up to 20 digits in length and can include a sub-address, preceded by an asterisk (*). With ITR6, you cannot enter a sub-address.
OLI Screen (DASS & DPNSS)	This screening type allows you to enter a Dialed Address (DA). With DASS, you can also display the NAE SELECTION screen to enter a Network Address Extension - refer to <i>Choosing a Network Address Extension</i> in Chapter 3 Section 2.
EAZ (ITR6)	Allows you to enter up to two different EAZs - that is, accept calls for up to two different numbers. Each EAZ can be up to 20 digits in length. Note: EAZ screening can only be used when aurora ^{Duet} is using the ITR6 protocol and is configured in TE PMP (BRI) mode..
DA Screen (DASS & DPNSS)	Allows you to enter up to three different DA (Dialed Address numbers). These may be up to 20 digits in length. With DASS, you can also display the NAE SELECTION screen to enter a Network Address Extension - see <i>Choosing a Network Address Extension</i> in Chapter 3 Section 2.
CPN Screen	Allows you to enter up to three CPN or MSN numbers. Each CPN can be up to 20 digits in length and can include a sub-address, preceded by an asterisk
Cross Connect	Use this option to set up the automatic cross connection of two BRI channels - refer to <i>Establishing a Cross Connection</i> for details. In NT mode, when aurora ^{Duet} receives a call, its CPN is checked against the numbers that you have set up here. If it matches one of them, aurora ^{Duet} makes a call on the other channel to the same originator's CPN. Enter up to three CPNs, consisting of a maximum of 20 digits, including a sub-address preceded by an asterisk (*).



Note

The types of screening available to you depend upon the protocol you are using.

The numbers to be screened are displayed with each screening type.

Editing the numbers to be screened

- Use the *UP* and *DOWN* arrow keys to highlight the number you wish to edit.
- Use the keypad to enter the number to be screened.

If you make a mistake use the *LEFT* arrow to delete one digit at a time, or press *F4 CLR* to delete the entire number.

- When you have finished, press *F6* to save and exit the screen.

The numbers you enter are retained when aurora^{Duet} is switched off.

Call Charging

You can define the way in which aurora^{Duet} generates charging information in NT mode (known as Advice of Charge or AOC) and sends it to the caller for incoming calls. With the VN4 protocol, you can also request charging information.

Each B channel is capable of generating its own charging messages. The **Tx CHARGE** count on the **ISDN CALL INFO** screen is updated each time charge information is transmitted.



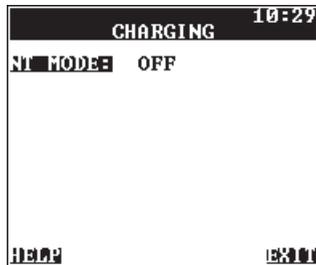
Notes

- AOC is an ISDN supplementary service. For details on testing supplementary services, see Chapter 4 Section 4.
- To add national-specific information elements for AOC, see *Applying National-Specific Elements to the Setup Message* later in this Section.

Setting up Call Charging (ITR6) (ETSI) (Cornet-N)

- Choose **CHARGING** from the **ISDN SETUP** menu.

A screen similar to the following is displayed:



Generating charging information

- Highlight **NT MODE** and use the **LEFT** and **RIGHT** arrow keys to toggle between the available options:

The charging options available to you depend upon the protocol you are using. The options are as follows:

Charge Generation	
Off	Do not generate charging information. This is the default.
Manual	Allows you to send a charging element manually, each time the F4 function key is pressed, during a connected incoming call
Automatic	aurora ^{Duet} sends charging information to the caller automatically at 10 second intervals. The information is sent for all B channels that have an active incoming call.

Choosing when to send charging advice ETSI

- Highlight **AOC TYPE** and use the *LEFT* and *RIGHT* arrow keys to toggle between the following options:

Advice of Charge	
AOC D	Send charging information during a call
AOC E	Send charging information at the end of a call.

Selecting the message type ITR6

You need to choose the type of message in which aurora^{Duet} 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.

- Highlight **MSG** and use the *LEFT* and *RIGHT* arrow keys to toggle between **INFO** and **FACILITY**.

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

If you select **FACILITY**, the **TYPE** option appears. Use this to specify the format of the charging information. aurora^{Duet} can send charging information in terms of the number of units used, or in currency format.

- Highlight **TYPE** and use the *LEFT* and *RIGHT* arrow keys to choose either **UNIT** and **CURRENCY**.



Notes

CorNet-N

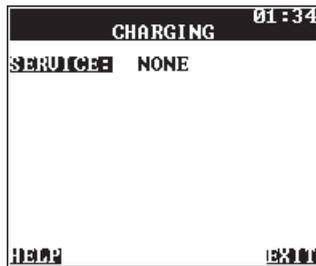
- Charging information is generated as **UNIT** within Information messages.
- In CorNet-N, only **UNIT** type charging is available, and the charging information can only be delivered as an Information message.

Setting up Call Charging **DASS**

To set up aurora^{Duet} to generate call charging in ET mode, using the DASS protocol:

- Choose **CHARGING** from the **ISDN SETUP** menu.

A screen similar to the following is displayed:



- Highlight **SERVICE** and use the **LEFT** and **RIGHT** arrow keys to toggle between the following options:

Call Charge Service Types	
None	Do not generate charging information. This is the default.
CCI	Call Charge Indication. Charging is advised from the TE to the PBX on completion of the call.
CCRD	Call Charge Rate Data. Charging is advised from the TE to the PBX at the beginning of the call.

Setting the minimum charge

If you select **CCRD** as the service, to specify the minimum number of units which will be charged for a call:

- Highlight **INITIAL UNITS** and enter a number, up to seven digits in length.

Setting the cost of each unit

If you select **CCRD** as the service, to set the cost of each unit in pence:

- Highlight **UNIT COST** and enter a number, up to seven digits in length. To enter a decimal point, press **F3 PNT**.

Setting the duration of each unit

If you select **CCRD** as the service, to set the duration of a single unit in seconds:

- Highlight **UNIT TIME** and enter a number, up to seven digits in length. To enter a decimal point, press **F3 PNT**.



Note

To clear current information, use the **F4 CLR** key.

Choosing manual or automatic charging

If you select **CCI** as the service, to specify whether charging is to be generated manually or automatically:

- Highlight **MODE** and use the **LEFT** and **RIGHT** arrow keys to toggle between **MANUAL** and **AUTOMATIC**:

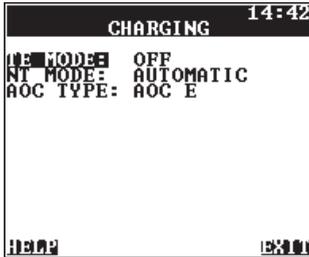
Charge Generation	
Manual	Charging accrues at five pence for each press of the charge function key in the Call Connected screen
Automatic	Charging accrues at five pence for every ten seconds that the call is connected. When the call is cleared the total call charge is sent to the PBX.

Setting up Call Charging VN4

To set up aurora^{Duet} to request, generate and send call charging, using the VN4 protocol:

- Choose **CHARGING** from the **ISDN SETUP** menu.

A screen similar to the following is displayed:



Requesting charging information in TE mode

To request charging information when aurora^{Duet} is in TE mode:

- Highlight **TE MODE** and use the *LEFT* and *RIGHT* arrow keys to choose **ON**.

Generating charging information

To generate and send charging information when aurora^{Duet} is in NT mode:

- Highlight **NT MODE** and use the *LEFT* and *RIGHT* arrow keys to toggle between the following options:

Charge Generation	
Off	Do not generate charging information. This is the default.
Manual	Allows you to send a charging element manually, each time the F4 function key is pressed, during a connected incoming call
Automatic	aurora ^{Duet} 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.

Choosing when to send charging advice

- Highlight **AOC TYPE** and use the *LEFT* and *RIGHT* arrow cursor keys to toggle between the following options:

Advice of Charge	
AOC D	Send charging information during a call
AOC E	Send charging information at the end of a call.

Dealing with Swap Requests Simulate DASS

With the DASS protocol, you can change the service type part way through a call, while still maintaining the connection. Requests to change the service type are known as 'swap' requests.

To determine whether to accept or reject incoming swap requests:

- From the **ISDN SETUP** menu, highlight **SWAP SIC**.
- Using the *RIGHT* and *LEFT* arrow keys, select either **OFF** or **ON**.



Note

Outgoing swap requests from aurora^{Duet} are always enabled, provided the call was originally set up using an 'end-to-end digital information' bearer service - for example, a speech category 1 or data call.

Setting up User Defined Bearer

Capabilities, HLC and LLC

Simulate

ETSI

ETSI&X.25

Bearer capability information tells the network what conditions should be applied to route a call. aurora^{Duet} provides a number of pre-defined bearer capabilities which you can choose from. However, if you want to test out a different bearer capability, aurora^{Duet} lets you define your own.

Up to five bearer capabilities can be stored in memory and selected during call setup.

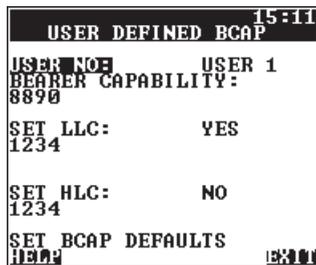


Note

This function is only available for the ETSI& Supplementary Services build of software. If you have the ETSI/X.25 build of software, see *Setting up User Defined HLCs* later in this Chapter.

- From the **ISDN SETUP** menu, highlight **USER DEFINED BCAP**.

A screen similar to the following is displayed.



Each bearer capability consists of a number of octets, and each octet consists of two hexadecimal characters. A bearer capability must contain at least two and no more than eleven octets.

Entering a Bearer Capability

- Highlight **USER NO** and, using the *LEFT* and *RIGHT* arrow keys, select the bearer capability number you wish to edit.

The display toggles between **USER 1**, **USER 2**, **USER 3**, **USER 4** and **USER 5**.

- Highlight **BEARER CAPABILITY** and press *SELECT*.

EDIT appears at the bottom of the display.

- Press *F3* **EDIT** to edit the bearer capability.

The flashing cursor indicates the point where you can enter the first digit. In edit mode, the function keys become the six hexadecimal digits:

F1 = A, *F2* = B, *F3* = C, *F4* = D, *F5* = E and *F6* = F.

- Use the keypad to enter digits 0 to 9 and the function keys to enter hexadecimal digits.

Your entry can be any hexadecimal number in the range 00 to FF. The bearer capability must contain a minimum of two and a maximum of eleven octets. For example, 98 91 A5 is circuit mode video at 2 x 64kbps H.221/H.242 coded.

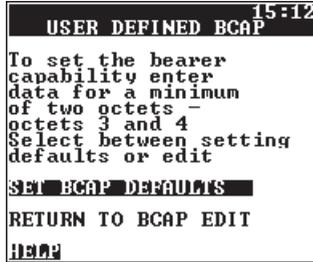
If you make a mistake, press the *LEFT* arrow to delete one octet.

- Press either the *UP* or *DOWN* arrow keys to finish editing the **BEARER CAPABILITY** line.

If you have not entered an even number of digits (i.e. complete octets) aurora^{Duet} will not allow you to finish editing.

If an error is detected

If aurora^{Duet} detects an error in the bearer capability you have entered, the following error screen is displayed:



- To return to the **USER DEFINED BCAP** screen, choose **RETURN TO BCAP EDIT**, or to set the bearer capability default value choose **SET BCAP DEFAULTS**.

Setting the Default Bearer Capability Value

The default bearer capability is Data UR/64k, which has a hex value of 8890.

- Move the cursor to **SET BCAP DEFAULTS** and press **SELECT**.

Including Low Layer Compatibility (LLC)

Some call types require LLC information to tell destination equipment about lower layer conditions - for example, the modem bit rate. See *About Bearer Capabilities, HLCs and LLCs* in Appendix 1.

To include LLC with your bearer capability:

- Move the cursor to **SET LLC** and use the **LEFT** and **RIGHT** arrow keys to choose **YES**.
- To enter an LLC value, press **SELECT**.

The **EDIT** key appears at the bottom of the display.

- Press the **F3 EDIT** to edit the LLC value.

The flashing cursor indicates the point where you can enter the first digit. In edit mode, the function keys become the six hexadecimal digits:

F1 = A, F2 = B, F3 = C, F4 = D, F5 = E and F6 = F.

- Use the keypad to enter digits 0 to 9 and the function keys to enter hexadecimal digits.

Your entry can be any hexadecimal number in the range 00 to FF. Each LLC must contain a minimum of one and a maximum of fourteen octets.

If you make a mistake, press the *LEFT* arrow to delete one octet.

- To finish editing the **LLC**, press either the *UP* or *DOWN* arrow keys.

If you have not entered an even number of digits (i.e. complete octets) aurora^{Duet} will not allow you to finish editing.

Including High Layer Compatibility (HLC)

HLC information provides destination equipment with additional compatibility details about the call. See *About Bearer Capabilities, HLCs and LLCs* in Appendix 1.

To include HLC with your bearer capability:

- Move the cursor to **SET HLC** and use the *LEFT* and *RIGHT* cursor keys to choose **YES**.

HLCs are input in the same way as LLCs (see previous). Your entry can be any hexadecimal number in the range 00 to FF. Each HLC must contain at least one and no more than three octets.

Saving your Selections

- When you have finished entering the bearer capabilities, press *F6* **EXIT**.

aurora^{Duet} saves your settings and returns to the **ISDN SETUP** menu.

Setting a Progress Indicator

To send a progress indicator as part of the Call Setup message, and define what it includes.

- Choose **PROGRESS** from the **ISDN SETUP** menu.

The following screen is displayed.

```

PROGRESS 12:39
OCTET 1 00011110 1E
OCTET 2 00000010 02
OCTET 3 11000000 C0
OCTET 4 10000001 81
INCLUDE : YES
CODING : NATIONAL
LOCATION : USER
DESCRIPT : END TO END

```

The screen displays the four octets that make up the progress indicator and which are transmitted in the element. These change depending on how you define the **CODING** setting (see below).

- Highlight **INCLUDE** and use the **LEFT** and **RIGHT** arrow keys to toggle between **YES** and **NO**.
- Select **YES** to include the progress indicator as part of the Setup message.

If you choose **NO**, the remaining settings on the screen are disabled.

To indicate which standard the fields are coded to:

- Highlight **CODING** and use the **LEFT** and **RIGHT** arrow keys to toggle between:

Progress Indicator - Coding	
CCITT	CCITT standardised coding, as in Q.931
National	National standard coding
Ident. Loc	Standard specific to identified location
ISO/IEC (QSIG)	International Standards Organisation/International Electrotechnical Commission coding

To indicate where in the network the progress indicator is generated:

- Highlight **LOCATION** and use the *LEFT* and *RIGHT* arrow keys to toggle between the following options:

Progress Indicator - Location	
User	The calling or called terminal
Pvte local	Private network serving the local user
Pbhc local	Public network serving the local user
Pbhc remote	Public network serving the remote user
Pvte remote	Private network serving the remote user
International	International network (ETS300:102, BTNR 191)
Interworking	Terminal in a network,beyond the interworking point.

- Highlight **DESCRIPT** and use the *LEFT* and *RIGHT* arrow keys to toggle between the following options:

Progress Indicator - Description	
End to end	Call is not end to end ISDN (PI = 1)
Dest non ISDN	Destination address is non ISDN (PI = 2)
Orig non ISDN	Originating address is non ISDN (PI = 3)
Returned	Call has returned to the ISDN (PI = 4)
Inband	In-band information or an appropriate pattern is now available (PI = 8)



Note

For full details of these settings, see Q.931 (1993) 4.5.23 and Annex G.

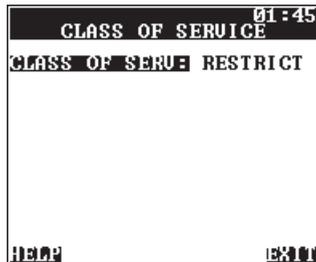
Choosing the Class Of Service Simulate DPNSS

Class of Service (COS) is a supplementary service within DPNSS.

To choose the COS to be sent in outgoing calls.

- Choose **CLASS OF SERVICE** from the **ISDN SETUP** menu.

The following screen is displayed.



- Highlight **CLASS OF SERV** and use the **LEFT** and **RIGHT** arrow keys to toggle between the following options:

Class of Service	
Off	No COS is sent in outgoing calls
Restrict	Route Restriction. Indicates which route a call may take
Bargroup	Call Barring group. Indicates groups of called /calling parties who may make calls to each other
FAC List	Facility list. This is a network dependant list of facilities a user is allowed to use, e.g. call diversion, voicemail etc.

**Tip**

To erase any existing information, press **F4 NULL**

Setting up User Defined HLCs Simulate ETSI&X.25

HLC (High Layer Compatibility) information provides destination equipment with additional compatibility details about a call. HLC information is used by the destination terminal, not by the network.

aurora^{Duet} provides a number of pre-defined HLCs which you can choose from. However, you may want to test out an HLC which is not provided, so aurora^{Duet} lets you define your own.

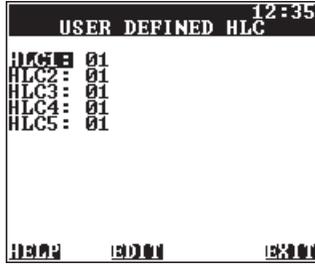
You can store up to five HLCs in memory which can be used as bearer capabilities at call setup time.

**Note**

This function is only available for the ETSI/X.25 build of software. If you have the ETSI/Supplementary Services build of software, see *Setting up User Defined Bearer Capabilities, HLC and LLC* in this Chapter.

- From the **ISDN SETUP** menu, highlight **USER DEFINED HLC**

A screen similar to the following is displayed.



Each HLC string is displayed as a set of two hexadecimal digits. The default setting for each of the **HLCs** is **01**.

- Highlight the **HLC** you wish to edit and press **F3 EDIT**.

The flashing cursor indicates the point where you can enter the first digit. In edit mode, the function keys become the six hexadecimal digits:

F1 = A, F2 = B, F3 = C, F4 = D, F5 = E and F6 = F.

- Use the keypad to enter digits **0** to **9** and the function keys to enter hexadecimal digits **A** to **F**.

You can enter any hexadecimal number in the range **00** to **FF**.

If you make a mistake use the **LEFT** arrow to move the cursor to the beginning of the HLC and start again.

Press the **UP** or **DOWN** arrows to save your settings; once you have entered two valid digits, aurora^{Duet} saves your selections and leaves edit mode. To continue editing, highlight an HLC and press **F3 EDIT**.

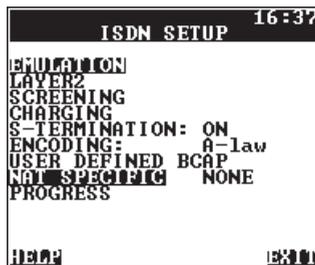
Saving your selections

- When you have finished entering HLCs, press **F6 EXIT** to save your settings and return to the **ISDN SETUP** menu.

Applying National-Specific Elements to the Setup Message

You can add any national-specific information elements to the setup message structure.

At present this allows implementation of the Telefonica 'IBERCOM' charging facility; future development may add other options.



- From the **ISDN SETUP** menu, highlight **NAT SPECIFIC**.
- Use the *LEFT* and *RIGHT* arrow keys to toggle between **NONE** (normal operation) and the national-specific element.

The setting you choose is retained when the unit is switched off.

Accessing the Dial Setup Options Simulate

- Choose **DIAL SETUP** from the **MAIN SETUP** menu.

The following screen shows the dial options available for the ETSI protocol. The options available depend upon the protocol you are using.

```

DIAL SETUP 05:08
CPN DIRECTORY
CALLING LINE ID
DIAL TYPE: EN BLOC
CPN NUM PLAN: ISDN
CLI NUM PLAN: ISDN
CPN NUM TYPE: UNKNOWN
CLI NUM TYPE: UNKNOWN
SEND COMPLETE: OMIT
CLOSED USER GROUP
UII SETUP
HELP EXIT

```



Note

The dial settings are only available in **SIMULATE** mode - that is, emulating an ISDN device or the network itself. For details, see *Choosing the Operating Mode* in Chapter 2 Section 4.

Selecting the Dialling Mode

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

- Choose **DIAL TYPE** and, using the *LEFT* and *RIGHT* arrow keys, toggle between **ENBLOC** and **OVERLAP**.

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



Note

In some networks, dialled digits of more than 20 must be sent in overlap mode.



Notes for CorNet-T users

- 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 with Cause Code 100 (Invalid information element contents). This occurs because the call is cleared by the ISPBX using an unspecified or undocumented call clearing code of 52. This is a known problem of the ISPBX.

Storing CPN Numbers in Memory ~~DASS~~ ~~DPNSS~~

You can store up to 10 Called Party Numbers (CPNs) in aurora^{Duet}'s memory. This saves time when setting up calls and it is useful for storing numbers which you use regularly.

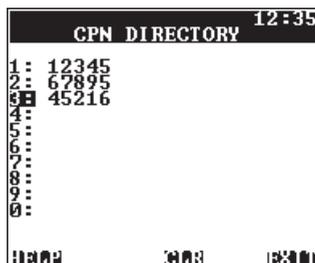


Note

All stored CPNs are erased if you apply factory defaults using the **SET DEFAULTS** option.

- Choose **CPN DIRECTORY** from the **DIAL SETUP** menu.

A screen similar to the following is displayed.



- Highlight the CPN you wish to edit.

A flashing cursor indicates the point where you can enter a number. To erase the entire CPN, press **F4 CLR**.

- Key in a CPN of up to 20 digits.

To delete a character, press the **LEFT** arrow key.

- To store the CPN and proceed to a new line, press the **UP** or **DOWN** arrow keys.
- To save the CPNs, press **F6**.

Entering a Sub-address

For some protocols you can enter a sub-address in the CPN. Sub-addresses are preceded by an asterisk (*).

- Press the  key at the point where you wish to enter the sub-address
- Key-in the sub-address

Storing DA Numbers in Memory

You can store up to 10 Dialed Address Numbers (DAs) in aurora^{Duet}'s memory. This saves time when setting up calls and it is useful for storing numbers which you use regularly.

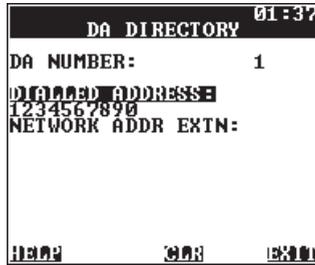


Note

All stored DAs are erased if you apply factory defaults using the **SET DEFAULTS** option.

- Choose **DA DIRECTORY** from the **DIAL SETUP** menu.

A screen similar to the following is displayed.



Each DA is stored in one of ten memory locations, labelled **1**, **2** etc. The **DA NUMBER** indicates which DA you are currently displaying. For example, **DA NUMBER 1** shows the first DA number stored in memory.

Switching Between DAs

- Highlight **DA NUMBER** and use the *LEFT* and *RIGHT* arrow keys to scroll through the ten memory locations.

As you switch to each location, the DA number is displayed.

Adding and Editing DAs

To edit a DA or add a new one:

- Display it, then use the keypad to enter an address of up to 20 digits.
- To clear the current value, press *F4 CLR*.
- To save the DAs, press *F6*.

Choosing a Network Address Extension DASS

A Network Address Extension (NAE) can be sent with the call setup, for dialling directly to a PBX extension. If a Network Address Extension (NAE) has been entered for the current DA, its value is displayed.

To select an NAE or change the existing one:

- Highlight **NETWORK ADDR EXTN** and press **SELECT**.

The **NAE SELECTION** screen is displayed.



- Enter an NAE of up to 6 characters. Use the arrow keys to highlight each character you want and press **SELECT**. Use the keypad to enter numbers.

Each character you select is displayed at the top of the screen. To erase the entire sub-address, press **F4**. To delete the last digit, press **F3**.

- When you have finished building the sub-address, press **F6**.

The previous screen is displayed.

Storing CLI Numbers in Memory ~~DASS~~ ~~DPNSS~~

You can store a 20-digit Calling Line ID (CLI) in aurora^{Duet}'s memory. The CLI is the number belonging to the caller. When you make a call, the CLI is sent in the Setup message and, when you receive a call, it is present in the Connect message.



Note

All stored CLIs are erased if you apply factory defaults using the **SET DEFAULTS** option.

Displaying the CLI

- Choose **CALLING LINE ID** from the **DIAL SETUP** menu.

~~ETSI~~ If a CLI was entered previously, it is displayed.

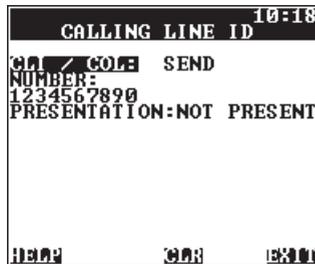
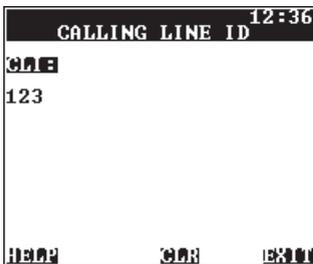
- ETSI** **ITR6** ➤ Highlight **CLI / COL** and use the **LEFT** or **RIGHT** arrow keys to toggle between **SEND** and **DON'T SEND**.

If you choose **SEND** and a CLI was entered previously, it is displayed.

The following examples show what is displayed for the various protocols.

~~ETSI~~ ~~ITR6~~

ETSI **ITR6**



Adding or Editing a CLI

- ETSI** **ITR6** ➤ Highlight **NUMBER** and enter a CLI of up to 20 digits.
- ~~ETSI~~ ➤ Enter a **CLI** of up to 20 digits.

A flashing cursor indicates where you can key-in the first digit. If you make a mistake, use the **LEFT** arrow key to delete the previous digit. To erase the whole CLI press **F4 CLR**.

Entering a sub-address

For some protocols you can enter a sub-address in the CLI. Sub-addresses are preceded by an asterisk (*).

- Press the  key at the point where you wish to enter the sub-address
- Key-in the sub-address

Setting CLI 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.

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.

- Highlight **PRESENTATION** and use the *LEFT* or *RIGHT* arrow keys to toggle between the following options:

CLI Presentation	
Allowed	Allow presentation of the CLI at the remote end.
Restricted	Do not allow presentation of the CLI at the remote end.
Interworking	Use this setting when aurora ^{Duet} is emulating the network side of the link, when the call is to be routed through two non-compliant networks. It allows you to confirm that the remote terminal does not display the CLI.
Reserved	Included for future development.
Not Present	Removes the Presentation Indicator from the CLI information element.



Note: CLI Screening Indicator

The CLI Screening Indicator is set to 'user-provided, not screened' (value 0). In the Terminal to Network direction, the screening indicator is disregarded by the network.

Choosing the Numbering Plan and Type

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

-  With the ETSI protocol, you can define separate number plans and number types for the CLI (calling line identity) and the CPN (called party number).

Identifying the Numbering Plan

-  ➤ Highlight **NUMBER PLAN** in the **DIAL SETUP** menu and use the *LEFT* or *RIGHT* arrow keys to toggle between the available options.
-  ➤ Highlight **CPN NUM PLAN** or **CLI NUM PLAN** in the **DIAL SETUP** menu and use the *LEFT* or *RIGHT* arrow keys to toggle between the available options.

The following table explains the options:

Number Plan	
Unknown	The destination numbering plan is unknown. This is the default for ETSI, TPH and Spectrum B.
ISDN/Tele	ISDN/Telephony numbering plan. Refer to Recommendation E.164/E.163 for further details. This is the default setting for ITR6.
Data (not ITR6)	Data numbering plan. Refer to Recommendation X.121 for further details.
Telex (not ITR6)	Telex numbering plan. Refer to Recommendation F.69 for further details.
National (not ITR6)	National Standard i.e. applies to public networks.
Private (not ITR6)	Private network numbering plan.
Reserved (not ITR6)	This is reserved for future use.

Identifying the Numbering Type

- ~~ETSI~~ ➤ Highlight **NUMBER TYPE** in the **DIAL SETUP** menu and use the *LEFT* or *RIGHT* arrow keys to toggle between the available options.

- ETSI ➤ Highlight **CPN NUM TYPE** or **CLI NUM TYPE** in the **DIAL SETUP** menu and use the *LEFT* or *RIGHT* arrow keys to toggle between the available options.

The following table explains the options:

Number Type	
Unknown	The destination call format is unknown. This is the default setting for ETSI, TPH, ITR6 and Spectrum-B.
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 (not ITR6)	Use this option when making a connection between two exchanges.
Sub num (not ITR6)	This is a subscriber number i.e. a number without area codes.
Abb num (not ITR6)	This is an abbreviated number, for example, a 3 digit extension number.
Reserved (not ITR6)	This is reserved for future use.

Storing an OLI or TLI in Memory DASS DPNSS

You can store an Originating Line Id (OLI) or Terminating Line Id (TLI) in aurora^{Duet}'s memory.

The OLI is the DASS and DPNSS equivalent of the CLI - that is, the number belonging to the caller. The TLI is the connected number - this may differ from the called number if the call has been diverted.

When you make a call, the OLI is sent in the Initial Service Request Message (ISRM) and, when you receive a call, it is present in the incoming ISRM message. The data sent in TLI with a Number Acknowledge Message (NAM) or Caller Accepted Message (CAM) is identical to that for OLI, excluding any NAE.

The OLI consists of a:

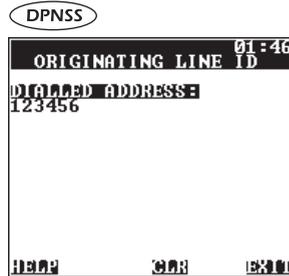
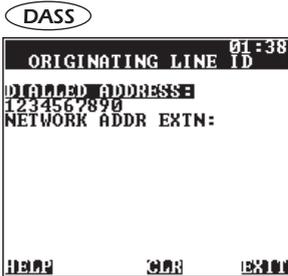
- Dialed Address (DA)
- DASS Network Address Extension (NAE)



Note

All stored OLI's are erased if you apply factory defaults using the **SET DEFAULTS** option.

- Choose **ORIGINATING LINE ID** from the **DIAL SETUP** menu.



Adding and Updating an OLI

- Highlight **DIALLED ADDRESS** and enter a dialled address, up to 20 digits in length.

To clear the currently displayed value, press **F4 CLR**.

Entering an NAE DASS

If a Network Address Extension has been previously entered, it is displayed.

- Highlight **NETWORK ADDRESS EXTN** and press **SELECT**.

The **NAE SELECTION** screen is displayed.

- Enter an NAE of up to 6 digits in length - see *Choosing a Network Address Extension* earlier in this Section.

Using a Semi-Permanent Connection ITRG

You can set up a 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.

- Highlight **SPC** in the **DIAL SETUP** menu and use the **LEFT** or **RIGHT** arrow keys to toggle between the available options.

The following table describes the options:

Semi-Permanent Connections	
Off	Do not use an SPC.
SPC Act	Activate the SPC.
SPC Deact	Deactivate the SPC.

Including a Send Complete Flag ETSI

To include a Send Complete message within the Call Setup message and choose the format you wish to use.

- Highlight **SEND COMPLETE** in the **DIAL SETUP** menu and use the **LEFT** or **RIGHT** arrow keys to toggle between the following options:

Send Complete	
Omit	No Send Complete flag is included.
Hash	Send Complete is denoted by a hash symbol (#).
Info EI	Send Complete is denoted by an Information Element.

Section 3

Communications Setup

This section describes how to connect to and communicate with other devices, such as PCs or printers. It tells you how to:

- set up aurora^{Duet}'s communications port
- connect aurora^{Duet} to another device
- set up the Tracer function to capture and download ISDN signalling information
- choose the format in which data is stored or downloaded

Configuring the Communications Port

aurora^{Duet} has a single communications port which can be used to connect to another device such as a PC or printer. For example, you might use the port to connect to a PC running aurora^{Expert} for Windows.

The communications port can be configured to act as either a parallel interface or a serial port:

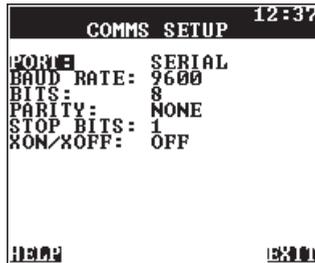
Serial Port A standard asynchronous RS232 port.

Parallel Port A high speed port which is Centronics compatible with 8 data lines, control and acknowledge handshake lines and use of the Centronic 'busy' signal. It operates at speeds in excess of 128kbps.

Selecting the Type of Port

- Choose **COMMS SETUP** from the **MAIN SETUP** menu.

The following screen is displayed:



- Highlight **PORT** and use the *LEFT* and *RIGHT* arrow keys to toggle between the following options:

Communications Port	
Serial	Selects the standard asynchronous RS232 port.
Parallel	Selects the high speed parallel port.
Modem	This option is available if Remote Control software is installed in aurora ^{Duet} . Use this to operate the tester remotely over a PSTN modem to modem or terminal adaptor connection. For further information, refer to the section on <i>Remote Control</i> .



Note

If you choose the parallel port, all other options are removed from the screen.

Setting the Baud Rate

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

- Highlight **BAUD RATE** and use the *LEFT* and *RIGHT* arrow keys to toggle between the available options.

Choose a data rate to suit the PC, terminal or printer you are connecting to.

Setting the Number of Bits

You need to specify a character length of either 7 or 8 bits for the serial port data, depending on the device connected to aurora^{Duet}. This setting must be the same on both aurora^{Duet} and the connected device.

- Highlight **BITS** and use the *LEFT* and *RIGHT* arrow keys to toggle between **7** or **8**.

Setting the Parity Configuration

You need to set the parity configuration of aurora^{Duet}'s serial port to suit the device to which you are connected. This setting must be the same on both aurora^{Duet} and the connected device.

- Highlight **PARITY** and use the *LEFT* and *RIGHT* arrow keys to toggle between the available options:

Parity Bit	
None	Do not use parity.
Odd	Include an odd parity bit in the transmitted data.
Even	Include an even parity bit in the transmitted data.

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. This setting must be the same on both aurora^{Duet} and the connected device.

- Highlight **STOP BITS** and use the *LEFT* and *RIGHT* arrow keys to toggle between **1** and **2**.

Using Xon/Xoff Flow Control

Xon/Xoff is a protocol which controls asynchronous flow between aurora^{Duet} 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 aurora^{Duet}.

- Highlight **XON/XOFF** and use the **LEFT** and **RIGHT** arrow keys to toggle between **ON** and **OFF**.

We recommend that you set Xon/Xoff to **On**, on both aurora^{Duet} and the connected device. Xon/Xoff *must* be set to **On** when communicating with aurora^{Expert}.



Notes for aurora^{Expert} users

For aurora^{Expert}, the communications options *must* be set as follows:

- Bits = 8
- Parity = None
- XON/XOFF = On

We also recommend you set Stop Bits to 1.

Connecting aurora^{Duet} to a PC or Printer

To connect the supplied RS232 cable to aurora^{Duet}'s communications port:

- Grasp the handles on either side of the RS232 connector and press together.

The clip expands, as shown in the following diagram:



- Align the connector with the communications port, and release the clips, so that the RS232 connector grips on to the comms port.



- Now attach the other end of the RS232 cable to the PC or printer.

Configuring Protocol Tracer Output

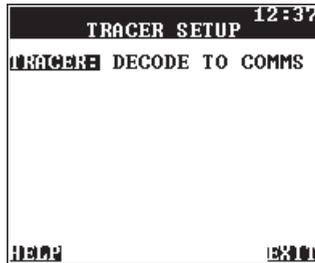
The Tracer is the function which lets you capture and download ISDN signalling information from the D channel, during an attempted or established call. This information is called 'decode'.

Using the Tracer, you can determine whether aurora^{Duet} stores decode in its memory or downloads it to another device, such as a PC or printer. You can also specify the format of the decode - for example: full decode, simple decode or Expert for Windows.

Setting Up the Tracer

- From the Main menu, choose **SETUP/TRACER SETUP**.

The **TRACER SETUP** screen is displayed.



- Highlight **TRACER** and use the *RIGHT* and *LEFT* arrow keys to toggle between the options.

The options available depend on whether aurora^{Duet} is in Monitor or Simulate mode:

Protocol Trace Output	
To Memory	All layers of information are stored in aurora ^{Duet} 's memory, unless filters are applied. This can be reviewed later using the Trace Capture Review feature.
Expert to Comms	Send all D channel signalling information to the serial port, in a format compatible with aurora ^{Expert} for Windows.
Decode to Comms (Simulate)	Send the decode to the serial port in standard form. Decode consists of a partial decode of Layer2 and Layer 3 signalling with a full hexadecimal dump of the D-channel messages, complete with a Tx/Rx indicator, time stamp and frame reference number.
Simple to Comms (Simulate)	Send a simple decode to the serial port i.e. a simple decode of the message type, direction and timestamp.
Test to Comms (Simulate)	This option is reserved for use by Hewlett Packard.
Results to Comms (Simulate)	Send test results to the serial port. Results may be the output generated from a BER test or an autoservice test, or real-time errored seconds.
ASCII Hex Comms (Monitor)	All bytes received on the line are formatted into ASCII and sent to the serial port. You can use a standard communication application such as Procomm or Hyperterminal on the remote device to capture the ASCII hex output.
Raw Hex Comms (Monitor)	All bytes received on the line are sent to the serial port. You must use an application on the remote device which is capable of receiving raw binary bytes.
Off	Do not store or download output.



Notes: ASCII Hex Comms and Raw Hex Comms

- Only those bytes that are in valid HDLC frames (i.e. Layer 2 and Layer 3 frames) are sent to the serial port.
- You cannot apply real time filters to the hexadecimal information.

Choosing What Happens When Memory is Full

Full **Monitor**

In Monitor mode, if you set up the Tracer to capture decode **TO MEMORY**, you can choose what happens when the memory is full.



- Highlight **MODE** and use the *RIGHT* and *LEFT* arrow keys to toggle between **FILL** and **WRAP**.

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

Using Decompel to Filter Out Repeated

Messages **DASS** **DPNSS**

With the DASS and DPNSS protocols, if you set up the Tracer to capture decode **TO MEMORY**, you can switch the decompel filter on and off. The decompel filter prevents the storage of repeated occurrences of the same message. We recommend you switch the decompel filter on to conserve aurora^{Duet}'s memory.



Caution

If the Decompel Filter is enabled on busy lines, it may affect message capture performance and messages could be lost.

- Highlight **DECOMPEL** and use the **RIGHT** and **LEFT** arrow keys to toggle between **ON** and **OFF**.

Choose **ON** to filter out repeated occurrences of the same message.



Note

The decompel filter operates in real time. This means that if a session is captured with the decompel option enabled, it cannot be viewed in full at a later stage.

When Using aurora^{Expert} for Windows

If you set up the Tracer to **EXPERT TO COMMS**, decode is downloaded in a format compatible with aurora^{Expert} for Windows.

You must start the aurora^{Expert} session on the PC *before* setting the Tracer on aurora^{Duet} to **EXPERT TO COMMS**. If you do not, the first initialisation message containing the start time and the version number will not be received by aurora^{Expert}.

What is aurora^{Expert} for Windows?

aurora^{Expert} for Windows is a protocol analysis package designed for use with 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. For further information, contact your Hewlett Packard representative.

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

Section 4 General Setup

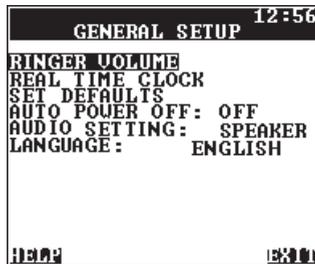
This section describes how to configure general settings on aurora^{Duet}. These are settings which are unlikely to change very often, including:

- the volume of the ringer
- the date and time held by aurora^{Duet}
- the language of aurora^{Duet}'s display
- the time delay before automatic power off.

Also described is how to apply factory default settings and install new software.

To access the General Settings menu:

- Choose **GENERAL SETUP** from the **MAIN SETUP** menu.

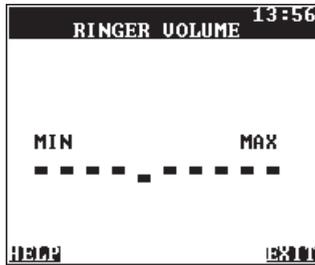


Adjusting the Ringer Volume Simulate

To adjust the volume of the ringer which indicates an incoming call:

- Choose **RINGER VOLUME** from the **GENERAL SETUP** menu.

A screen similar the following is displayed.



The graph indicates the current volume setting as one of ten levels. The ringer also sounds at the current volume setting.

- To increase the volume, press the **RIGHT** arrow key.
- To decrease the volume, press the **LEFT** arrow key.

The graph indicates the new level and ringer sounds at the new volume.



Note

You cannot adjust the ringer volume while there is a call in progress.

Changing the Internal Date and Time

aurora^{Duet} has an internal clock/calendar, termed the 'Real Time Clock' (RTC), which is used to time-stamp protocol decodes and test results.

To change the date and time held by aurora^{Duet}:

- Choose **REAL TIME CLOCK** from the **GENERAL SETUP** menu.

The following screen is displayed:



Changing the Date

The date is held in *DD/MM/YY* (day, month and year) format.

- Highlight **DATE**.

A flashing cursor indicates where you can enter the first character.

- Using the keypad, enter the new date.

Do not enter the slashes ('/') between the characters - aurora^{Duet} does this automatically.



Tip

To return to the beginning of the date, press the **LEFT** arrow.

Changing the Time

The date is held in *HH:MM:SS* (hours, minutes and seconds) format.

- Highlight **TIME**.

A flashing cursor indicates where you can enter the first character.

- Using the keypad, enter the new time.

Do not enter the hyphens (':') between the characters - aurora^{Duet} does this automatically.



Tip

To return to the beginning of the time, press the *LEFT* arrow.

Saving your Settings

- Press *F6 EXIT* to save the currently displayed date and time.



Note: Clock Accuracy for Network Simulation

Certain switches demand the exceptional clock accuracy that is only available from atomic clocks that control the network timing. In these rare cases, the switch may report an error when aurora^{Duet} is simulating the network.

Should you encounter this situation, please contact Hewlett Packard for further advice.

Changing the Language of the Screen Display

aurora^{Duet} can operate in the following languages:

- English
- French
- German
- Spanish

The language options available depend on what was requested by your organisation.

To change the language of the screen display:

- Highlight **LANGUAGE** in the **GENERAL SETUP** menu.
- Use the **LEFT** and **RIGHT** arrow keys to choose an option.
- Press **F3** to load the new language.



Note

If aurora^{Duet} is operating in Spanish, on-screen helptext is displayed in English.

Setting the Automatic Power-off Time Delay

When operating from the battery, you can set aurora^{Duet} to switch off automatically to conserve 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^{Duet} switches off:

- Highlight **AUTO POWER OFF** in the **GENERAL SETUP** menu.
- Use the **LEFT** and **RIGHT** arrow keys to toggle between the following options.

Auto Power Off Settings	
Off	aurora ^{Duet} operates continuously with no automatic power off
1 Min	aurora ^{Duet} automatically powers off after 1 minute..
5 Mins	aurora ^{Duet} automatically powers off after 5 minutes.
20 Mins	aurora ^{Duet} automatically powers off after 20 minutes.

- Press **F6 EXIT** to save your settings.

Choosing the Default Audio Setting

For voice calls, you can specify whether aurora^{Duet} uses the speaker or the headset as the default audio setting. If this is not set, the speaker is used as the default.

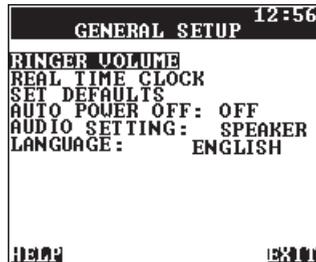
This feature is available with the ETSI, TPH, 1TR6, TN1R6, Spectrum B Stimulus and CorNet-N/T protocols.



Note

For information on connecting a headset or handset to aurora^{Duet}, refer to Chapter 2 Section 2.

- Highlight **AUDIO SETTING** in the **GENERAL SETUP** menu.



- Use the *LEFT* and *RIGHT* arrow keys to choose **SPEAKER** or **HEADSET**.

aurora^{Duet} uses this setting automatically for voice calls, and retains it when switched off.

Applying Factory Default Settings Simulate

You can reset all the settings back to their original factory values - that is, the way they were when you first purchased the tester.

This resets *all* the settings to their factory default values - you cannot use this method to reset just one or two values.



Caution

Choosing **SET DEFAULTS** erases all your settings, including CPNs, DAs, stored decode, test results and communication port settings.

- Choose **SET DEFAULTS** in the **GENERAL SETUP** menu.

aurora^{Duet} prompts you to confirm this.

- Press **F3** to confirm.

Setting is displayed.

- Press **F6** twice to exit the menus.

aurora^{Duet} reconfigures itself and the **MAIN** menu is displayed.

The following tables show the defaults settings:

ISDN SETUP		
EMULATION	PROTOCOL	No Change
	ACCESS_TYPE	BRI
	INTERFACE	S
	MODE	TE
	LINE TYPE	PMP
	L2 PROTOCOL	SLAVE
LAYER 2	LAYER 2	AUTOMATIC
	BCH TEI	AUTOMATIC
	FIXED BTEI1	0
	FIXED BTEI2	0
USER DEFINED HLC (not 1TR6)		Cleared = 01
USER DEFINED SIC (1TR6 only)		Cleared = 01 01
SCREENING		Off
CHARGING (1TR6 only)		Off
CHARGING (not 1TR6)		Off Msg: Facility Type: Unit
S-TERMINATION		On
ENCODING		A-LAW

DIAL SETUP	ETSI/TPH/ SPECTRUM B	1TR6
CPN DIRECTORY	All Numbers are Cleared	All Numbers are Cleared
CALLING LINE ID	Cleared	Cleared
DIAL TYPE	EN BLOC	EN BLOC
NUMBER PLAN	Unknown	ISDN
NUMBER TYPE	Unknown	National
SPC	Unknown	Off
CUG	No 0101	No 0101
OA	No	No
UUI	Cleared	Cleared

COMMS SETUP	
PORT	SERIAL
BAUD	19200
BITS	8
PARITY	N
STOP BITS	1
XON/XOFF	OFF

TRACER SETUP	
TRACER	DECODE TO COMMS

BERT SETUP	
PATTERN	2047RR
TEST LENGTH	CONTINUOUS
THRESHOLD	USER DEF
RESYNC	25%
ERROR INSERT	1 IN 10 [^] 3
USER TEST LENGTH	10 SECONDS / 00:00:01
USER PATTERN	00 77
USER DEF HRX	15%

GENERAL SETUP	
RINGER VOLUME	Not Changed
REAL TIME CLOCK	Not Changed
AUTO POWER OFF	CONT (Continuous)
LANGUAGE	First in language list (usually English)

BERT RESULTS

All saved BERT results are cleared

AUTO TEST RESULTS

All saved AUTO test results are cleared

Installing New Software

Hewlett Packard provide new software releases on floppy disk, or via email, to customer service centres. A single, self-extracting Zip file is provided which contains:

Prom1.bin aurora^{Duet} software

Field.exe Software download program



Note

When requesting a software upgrade from Hewlett Packard, you need to supply the serial number of your aurora^{Duet}. Hewlett Packard use this to identify the ESN (electronic serial number) of your tester, so the correct software may be supplied.



Caution

Under certain circumstances, errors may occur in the software download when it is performed using the Windows 95 operating system. Thus, to download onto a PC which runs Windows 95, do the following:

1. Restart your computer with no applications running.
2. Perform the download.
3. Restart your computer in the normal way, so that any applications which run automatically at start-up will do so.

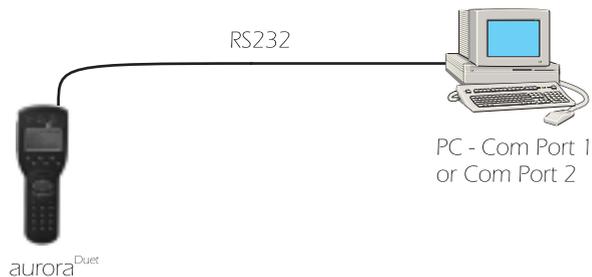
Continue working as normal.

Connecting aurora^{Duet} to the PC

To connect aurora^{Duet} up to the PC:

- Connect the RS232 cable (cable number 422354) between aurora^{Duet} and the PC you intend to use for the download - see *Connecting aurora^{Duet} to a PC or Printer* in Chapter 3 Section 3.

Use either Comm Port 1 or Comm Port 2 of the PC.



Preparing aurora^{Duet} for Download

Next, put aurora^{Duet} in download mode:

- Switch on aurora^{Duet} and wait for the logo screen to appear.



Tip

If the battery is running low, connect the adaptor/charger.

- Press **F1**.

A screen showing the unit's Electronic Serial Number (ESN) is displayed:

- Press **SELECT** to enter download mode.



Note

If you do not press **SELECT** within 10 seconds, aurora^{Duet}

returns to the logo screen.

When aurora^{Duet} is in download mode

In download mode, aurora^{Duet} displays:

AURORADUET DOWNLOAD

Waiting For Remote Sync

Preparing the PC to Download

- Insert the floppy disk containing the new software into the PC's floppy disk drive.
- Ensure that the mouse driver is not installed on the selected COM port.

Beginning the Download

Once you have connected aurora^{Duet} to the PC and you have prepared it and the PC for downloading, you are ready to begin.

- Open a DOS window on the PC.
- Type `a:\setup`
- Input 1 or 2 to select the appropriate COM port you are downloading from
- Press the *ENTER* key.

The download begins.

- Follow the instructions displayed on the PC.

During the download

Caution

- *Do not disturb any connections. The PC and aurora^{Duet} must remain connected throughout the download operation.*
- *Do not press any keys on aurora^{Duet} or on the PC.*

aurora^{Duet} and your PC display messages indicating that the unique Electronic Serial Number has been checked correctly.



After the Download Ends

- aurora^{Duet} resets itself.
- the PC displays a 'Download Completed' message.

When the logo screen is displayed:

- Press the **F2** key on aurora^{Duet} to perform a self test.



Important

You MUST press the F2 key when the logo screen is displayed. This allows aurora^{Duet} to run a memory check and test the U interface configuration. You must follow this procedure every time you install new software.

If the Download Fails

If the download procedure fails, switch off aurora^{Duet}, then switch on again. Restart your PC in DOS mode and repeat the download procedure.

If the problem persists, contact Hewlett Packard.



Chapter 4

Testing in Simulate Mode

Contents

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Quick Start: Making a Call

Once aurora^{Duet} is connected to the line under test, and is correctly set up and in Simulate mode:

- 1** If using the CorNet-T protocol, identify the terminal to the ISPBX - see *Terminal Identification Process* in this Chapter.
- 2** Select a service for the call, for example a Speech call - see *Choosing the Service* in this Chapter.
- 3** Enter the number to be dialled.

For example, enter the number for the speaking clock.

- 4** Choose **DIAL** to dial the number.

When the call is successfully connected, aurora^{Duet} displays the Call menu, which lets you access further options to test line quality, supplementary services etc. or clear the call.



Tip

If you receive an error code, you can display a description of it on-screen - see *About the Cause Codes* in this Chapter.

Testing in Simulate Mode

Once you have set up aurora^{Duet} you are ready to begin connecting calls and testing the ISDN link.

This chapter describes how to connect outgoing and incoming calls and how to test a link by using aurora^{Duet} to emulate ISDN equipment or the network. Also described are testing using aurora^{Duet}'s automatic test suite, checking the supplementary services supported on the network and testing in unattended mode.

This chapter has the following structure:

- Section 1* Making and Receiving Calls
- Section 2* Physical and Line Quality Checks
- Section 3* Using aurora^{Duet}'s Automatic Test Suite
- Section 4* Supplementary Services
- Section 5* Testing in Unattended Mode.

Section 1

Making and Receiving Calls

This section explains how to use aurora^{Duet} to connect outgoing and incoming calls, display call status and clear calls.



Note

To set up calls, aurora^{Duet} must be in Simulate mode - that is, emulating an ISDN device or the network itself. For details, see *Choosing the Operating Mode* in Chapter 3 Section 1.

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^{Duet} 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^{Duet}

Once you have a connected call you can use it as the basis for testing line quality. You will find full instructions for these tests in later sections of this chapter.

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.

About Voice Calls

Voice calls are a useful way of testing audio quality on the line. For example, you could make a voice call to another engineer or to a recorded service and listen to received voice signals.

Although you can have voice 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 listen to the channel that is currently displayed on the screen.

In Basic Rate, the second call remains connected, but without the Codec. This means you can switch between the two channels and listen into each call.

If a data call is in progress, you can make or receive a voice call at the same time. This is a useful test to detect any cross-channel interference which may be present.

DASS

Notes for DASS users

Three types of Speech Call are available—**3.1K AUDIO**, **SPEECH C1** and **SPEECH C2**. Category 1 calls require, and are guaranteed, a fully digital path while Category 2 calls may be routed over analogue lines at some point during the call. Therefore, Category 1 speech calls are only accepted by ISDN telephones, whereas Category 2 may be used to call analogue or ISDN telephones. For further information, refer to BT specification BTNR190 Vol. 1 Sections 0-8.

About Data Calls

Data calls can be used to test the quality and integrity of the line. This is done by running a Bit Error Rate (BER) test in the data connection established by a call. For information on BER testing, refer to Section 2 of this Chapter.

Before you Start

- Select the interface you intend to test and connect aurora^{Duet} to that interface - see Chapter 2 Section 2.
- Set up aurora^{Duet} as described in Chapter 3.
- Ensure aurora^{Duet} is in Simulate mode. Refer to *Choosing the Operating Mode* in Chapter 3 Section 1.
- Identify the terminal to the ISPBX - see the *Terminal Identification Process* described below.

CorNet-T



Tip

To capture protocol information to aurora^{Duet}'s memory, set the Tracer **TO MEMORY**, before you connect a call - see *Configuring Protocol Tracer Output* in Chapter 3 Section 3.

Terminal Identification Process

CorNet-T

With the CorNet-T protocol, before an ISPBX will allow a call to be made from, or placed to, a terminal, the terminal must identify itself to the ISPBX. A Directory Number and a Device Type must be passed to the ISPBX by aurora^{Duet}. The Directory Number provides a unique terminal identifier; the Device Type establishes which type of terminal is associated with the Directory Number.

Data devices are identified using a Terminal Selection Identifier (TSI) value. The default TSI value is 2; this is the value used by aurora^{Duet} during the identification process.

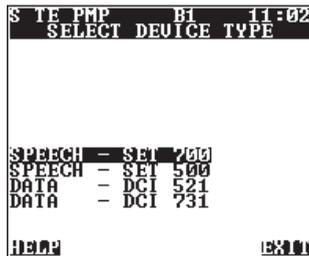
The terminal identification process occurs immediately upon successful Layer 2 establishment. The **ENTER DEVICE NUMBER** screen is displayed.

If a Directory Number has been entered previously, it is displayed.



- Key-in a unique number, up to 20 digits in length.
- To store the Directory Number in memory, press **F6** or **SELECT**.

The **SELECT DEVICE TYPE** screen is displayed.



- Use the **UP** and **DOWN** arrow keys to select a Device Type and press **F6** or **SELECT** to store it.

On successful completion of the identification process, aurora^{Duet} displays the Download screen, for approximately 10 seconds, to indicate that it has entered the download phase.



If the Terminal Identification process fails

If either the Directory Number or the Device Type are invalid, the Terminal Identification Process fails and you will have to repeat it. The Identification Process may fail, for example, if the Directory Number is not associated with the current port, if it is not unique, or if the Device Type is not appropriate to the Directory Number.

Accessing the Call Setup Screen

- Choose **ISDN CALL SETUP** from the Main menu.

The **CALL SETUP** screen is displayed. This shows a list of bearer capabilities and teleservices - the options available depend upon the protocol you are using.



Selecting a Channel for Testing

When you make a call, aurora^{Duet} uses the currently selected channel. You can select a specific B channel or, in TE mode, you can set up aurora^{Duet} 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 Chapter 8 for details), but on a Basic Rate fixed link you can perform D channel BERT - see Chapter 4 Section 2 for instructions.



Notes

- aurora^{Duet} must be set to Slave mode before making any outgoing Bx (any B) channel calls.
- aurora^{Duet} will not execute any Auto Tests if the Bx channel has been selected.
- In TE mode, you can select the Bx channel even if the B1 and B2 channels are busy.



Selecting a B Channel **BRI**

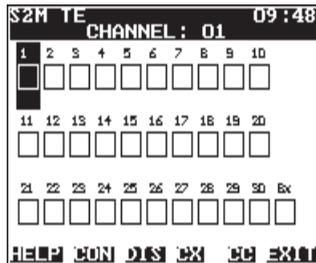
- From the Main menu or **CALL SETUP** screen, press the **F2** function key.

The currently selected channel is displayed in the top line of the screen, for example **B1**.

Selecting a B Channel **PRI**

- From the Main menu or **CALL SETUP** screen, press the **F2 CH** key.

The **CHANNEL** selection screen is displayed. Each box represents a B channel. There are 31 boxes corresponding to the 30 primary rate B channels and the Bx channel.



- Highlight the channel you want, using the arrow keys, and press **SELECT**.

The previous screen is displayed and the selected channel is shown in the top line - for example: **B25**.

QSIG B Channel Selection and Negotiation QSIG

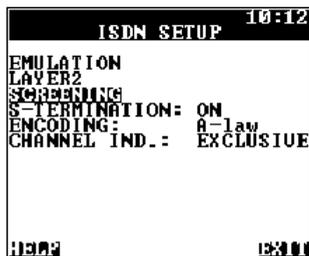
B channel selection for QSIG works in a similar way to selection for ETSI, described previously. However, you cannot select 'any available' B-channel (Bx), since QSIG is an inter-network protocol. You must select a specific channel - B1 or B2 for Basic Rate operation or B1 to B30 (including B16) for Primary Rate operation.

Determining whether an alternative channel is used

To determine whether aurora^{Duet} uses an alternative channel, if the one you have selected is not available, you can choose the basis on which B channel selection is made: either 'exclusive' or 'preferred'.

To change the channel negotiation conditions:

- Highlight **CHANNEL IND.** in the **ISDN SETUP** menu.



- Use the *LEFT* and *RIGHT* arrow keys to choose one of the following options:

Channel Negotiation	
Exclusive	Do not use an alternative B channel if the channel you selected is not available
Preferred	Use any available alternative B channel if the channel you selected is not available.

Selecting a LAP

For the DASS and DPNSS protocols, which only operate in PRI mode, you can select the Link Access Protocol (LAP) as follows:

- Press *F2* to display the **LAP SELECTION** screen.

This screen operates in exactly the same way as the Primary Rate B channel selection screen (see previous).

Understanding the status symbols

The status of each channel or LAP is indicated using a symbol. The symbols have the following meanings:

-  Channel/LAP has no active calls.
-  A voice call is in progress with the CODEC connected.
-  A data call is in progress.
-  A looped back data call is in progress.
-  A speech call is in progress but the CODEC is not connected.
-  A data call is in progress - the BER pattern generator is not connected.
-  An incoming voice call requires answering.
-  The channel/LAP number associated with this box has a through connection to the channel number displayed below.
-  Uninitialised channel/LAP.

Making an Outgoing Call

There are two steps to making an outgoing voice or data call:

From the **ISDN CALL SETUP** menu:

- 1 Select a service for the call - e.g. **SPEECH CALL**
- 2 Enter the number to be dialled and choose **DIAL**.

These steps are described below.

Choosing the Service

You can use aurora^{Duet} to test the availability of ISDN services that can be used to make calls. The **CALL SETUP** screen displays a list of bearer capabilities and teleservices for the protocol you are using.



Note

Refer to Appendix 1 for information on the Bearer Capabilities, HLCs and LLCs supported by aurora^{Duet}.

- Highlight the service you want and press **SELECT**.

aurora^{Duet} displays a bearer capability **DIAL** screen.

Displaying Additional Services (ETSI) (TPH) (VN4)

With the ETSI, TPH and VN4 protocols, there are two **CALL SETUP** screens displaying ISDN services:

(ETSI) With the ETSI protocol, choose from:

- **CCITT CALL SETUP**
- **DSS1 CALL SETUP**

(TPH) With the TPH protocol, choose from:

- **CCITT CALL SETUP**
- **NAT'L (National) CALL SETUP**

(VN4) With the VN4 protocol, choose from:

- **CCITT CALL SETUP**
- **NAT (National) CALL SETUP**

In VN4, CCITT call setup consists of two screens of services. Press **F5** to toggle between the next (**NXT**) and previous (**PRV**) screens.

Toggling between the Call Setup screens

To switch between the **CALL SETUP** screens:

- Press **F4**.

Selecting a Calling Line Category (DPNSS)

The Calling Line Category ensures calls are routed via a path which can support the call type.

To select a Calling Line Category:

- From the **CALL SETUP** menu, press **F5 CLC**.

The **CALLING LINE CATEGORY** screen is displayed.



- Highlight the option you want and press *F6* to save and exit the screen.

The following table describes the options:

Calling Line Category	
CLC-ORD	Ordinary PBX Extension. This is the default.
CLC-DEC	Decadic (10pulses/second analogue dialled line).
CLC-ISDN	Digital line using DASS2 signalling.
CLC-PSTN	Public Switched Telephone Network.
CLC-MF5	Via an SSMF5 (Signalling System Multifrequency No. 5) route. (DTMF)
CLC-OP	PBX Operator.
CLC-CONF	Conference Call
CLC-NET	Network.

Dialling the Called Party Number/Destination Address

When you select a bearer capability from the **CALL SETUP** menu, a Dial screen is displayed. Use this to enter the Called Party Number (CPN) or, if you are using the DASS or DPNSS protocols, the Destination Address (DA) for the call.

For details on how to setup dialling options, see Chapter 3.

The examples below show the Dial screen for a Speech Call.



Tip

The CPN/DA last dialled is automatically displayed. To call this number again, highlight **DIAL** and press **SELECT**.

How you enter the CPN or DA depends on whether the dialling mode is set to **OVERLAP** or **EN BLOC** in the **DIAL SETUP** screen - see Chapter 3 Section 2. To quickly check the dialling mode, press **F1** to display the **STATUS** screen.



Notes for CorNet-T users

- 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 with Cause Code 100 (Invalid information element contents). This occurs because the call is cleared by the ISPBX using an unspecified or undocumented call clearing code of 52. This is a known problem of the ISPBX.

Overlap dialling

To enter a new CPN or DA:

- Use the keypad to enter up to 20 digits, or up to 6 digits for DASS in ET mode.

With Overlap dialling, each digit you enter is sent immediately to the exchange until the call connects. This means that you cannot delete the digits you enter.

En Bloc dialling

To enter a new CPN or DA:

- Use the keypad to enter up to 20 digits, or up to 6 digits for DASS in ET mode.

To delete the last CPN/DA and enter a new one, press any number on the keypad; or use the *LEFT* arrow to erase the last digit of the number.

With En Bloc dialling, the digits are assembled in a group and then sent in a single call control message. To initiate dialling:

- Highlight **DIAL** and press *SELECT*.

The CPN/DA is dialled.

Including a sub-address



With some protocols you can include a sub-address in the CPN. The sub-address is prefixed with an asterisk (*).

To include a sub-address:

- Enter an asterisk (using the  key) in the CPN and press *F4*.

The **SUB-ADDRESS SETUP** screen is displayed.

Sending an NAE **DASS**

You can send a Network Address Extension (NAE) with the call setup, for dialling directly to a PBX extension.

- Press **F5 NAE** from the Dial screen.

The **NAE SELECTION** screen is displayed.

- Enter an NAE of up to 6 characters.

For information about entering an NAE using this screen, please refer to *Choosing a Network Address Extension* in Chapter 3 Section 2.

- Press **F5 DIA** to return to the Dial screen.

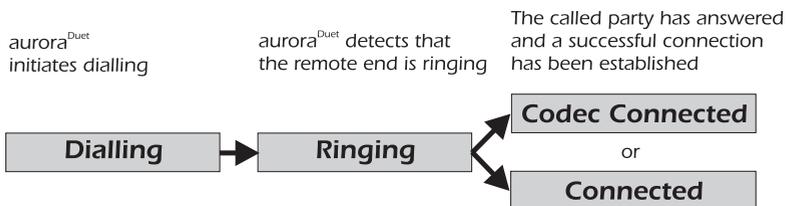
When Dialling is Initiated

When you choose **DIAL**, aurora^{Duet} initiates a call to the CPN/DA. If a CLI has been setup (see Chapter 3 Section 2), this value is included in the outgoing Call Setup message.

The **STATUS** field at the bottom of the dial screen changes as the call progresses. For example:

STATUS: CODEC CONNECTED

The following diagram shows the sequence of status displays you would expect to see during a successful connection:





Notes

- With En Bloc dialling, before you initiate a call the status is **ON HOOK**.
- **CODEC CONNECTED** is displayed for voice calls; **CONNECTED** is displayed for data calls.

For information on connected calls, please refer to *When a Call is Connected* later in this section.

Receiving an Incoming Call

The way in which incoming calls are connected on aurora^{Duet} depends on whether the call is a data or voice type call.

Voice Calls Incoming speech calls must be answered manually.

Data calls Incoming data calls are answered automatically by aurora^{Duet}.



Tip

You can set up aurora^{Duet} to screen incoming calls. See Chapter 3 Section 2.

Answering a Voice Call

When an incoming voice call is received the ringer sounds and a screen similar to the following is displayed:

```

S NT PMP      B1      13:43
              3.1k AUDIO
CPN 2
CLI Info element missing

ANSWER SPEECH
CLEAR CALL

STATUS: INCOMING CALL
HELP B2 LINE

```

The top of the screen shows the bearer capability. The **STATUS** line, at the bottom of the screen, displays **INCOMING CALL**.

The Called Party Number (CPN) is displayed, together with the Calling Line Identity (CLI), if present in the incoming call setup.

To answer the call:

- Highlight **ANSWER SPEECH** and press **SELECT**.

The call is answered and the Call menu is displayed.

When aurora^{Duet} Answers a Data Call Automatically

When aurora^{Duet} receives an incoming data call on the currently selected channel, and no BER test is in progress, the call is answered automatically.



The top of the screen shows the bearer capability. The **STATUS** line, at the bottom of the screen, displays **LOOP CONNECTED**.

The Called Party Number (CPN) is displayed, together with the Calling Line Identity (CLI), if present in the incoming call setup.

Incoming Calls on a Background Channel

If an incoming voice or data call is received on a channel other than the one currently selected, the **F2** (channel selection) function key flashes to alert you to the call. With voice calls the ringer also sounds.

When a Call is Connected

When a call is successfully connected, aurora^{Direct} displays the Call menu. This lets you clear the call or access further options to test line quality, service availability, supplementary services and so on.



Note

When a voice call is successfully connected, the Codec (audio coder/decoder) is automatically connected to let you listen to the voice signals on the line.

The following example shows the Call menu for the ETSI protocol:



Displaying the Connect Menu

To access options for testing line quality:

- Highlight **CONNECT MENU** and press **SELECT**.

The Connect menu is displayed - this contains options which let you run a BER test, connect a loop, connect an external headset and so on.



To return to the previous screen:

- Choose **CALL MENU**.

Looping Back a Call

A loop is a continuous transfer of information between aurora^{Duet} and another device. There are two types of loop:

Remote Loop aurora^{Duet} transmits data but tells the receiving end to loop it back.

Local Loop aurora^{Duet} transmits back the data it receives from another device.



Note

In Unattended mode (see Section 5 of this Chapter) aurora^{Duet} loops back all incoming voice or data calls automatically.

Setting up a Loop

You can place a loop on any B channel that has a connected call:

- Choose **CONNECT LOOP** from the Connect menu to loop back the call.

All incoming data is transmitted back out on the same channel. The **STATUS** line displays **LOOP CONNECTED**.

Clearing the Loop

To clear a loop, select one of the other options from the Connect menu.

Switching the Codec Between Calls

Switching the Codec Between Voice Calls

Although you can have voice 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 voice calls, the Codec is automatically connected to the selected channel - that is, the channel currently displayed.

For example, a voice call is connected on B channels 1 and 2. B channel 1 is currently selected. To switch the codec to B channel 2:

- Press **F2**.

Switching the Codec Between Data Calls

With data calls, the Codec must be manually connected.

- Choose **CONNECT CODEC** from the Connect menu.

Switching Between Speaker and Headset

When a voice call is connected, you can listen to the call using aurora^{Duet}'s speaker or through a standard telephone headset or handset connected to aurora^{Duet}.



Note

With the ETSI, TPH, 1TR6, TN1R6, Spectrum B Stimulus and CorNet-N/T protocols, you can set the speaker or the headset as the default audio setting (see Chapter 3 Section 4).



Tip

For information on connecting a headset or handset to aurora^{Duet}, see Chapter 2 Section 2.

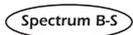
Changing the Audio Setting During a Call

When a voice call is connected, to change the audio setting to switch between the speaker and headset:



From the Connect menu:

- To switch from speaker to headset, choose **CONNECT HEADSET**.
- To switch from headset to speaker, choose **DISCONNECT HEADSET**.



With the Spectrum B Stimulus protocol, when a voice call is connected, you can switch from the default audio setting. From the Connect menu:

- Press **F1**.

The non-default audio setting (either handset or headset) is selected.

Adjusting the Volume

To adjust the audio volume of the speaker or the headset/handset, when a voice call is connected:

- To increase the volume, press **F3 VOL+**.
- To decrease the volume, press **F5 VOL-**.

Establishing a Cross Connection

In NT mode, you can use aurora^{Duet} to connect B channels that have calls established on them. This allows equipment connected to the B channels to communicate. This feature lets you verify the operation of each TE prior to connection to the ISDN.



Note

The B channels must have calls established on them *before* they can be connected.

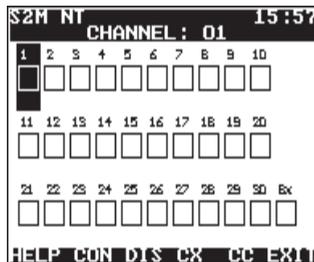
The way you establish a cross connection depends on whether aurora^{Duet} is operating in PRI or BRI mode.

Cross Connecting PRI

In PRI mode, up to 15 pairs of channels may be cross connected.

From the Call Menu or the Connect menu:

- Press **F2 CH** to display the **B CHANNEL SELECTION** screen.



The currently selected B channel is highlighted and its number appears at the top of the screen.

To select another channel:

- Highlight it by moving the cursor or entering the channel number you require.

You must enter two digits - for example, for channel 3 you would enter 03.

- Press **F2 CON**.

An arrow pointing downwards appears in the channel box.

- Highlight the second B channel and press **F2 CON**.

An arrow pointing downwards appears in the channel box. This completes the cross connection. Each channel in the pair displays the number of the channel to which it is connected, directly below the box.



Note

You cannot connect a channel that does not already have an established call, or which is already part of a connected pair.

Removing a Cross Connection

PRI

- Press **F2 CH** to display the **B CHANNEL SELECTION** screen.
- Move the cursor to highlight either of the channels in a cross connected pair and press **F3 DIS**.

The vertical arrow is replaced in both channel boxes by the symbol for an established call.

Cross Connecting BRI

On a basic rate interface, cross connections may be established in both NT and LT mode, either manually or automatically.

Establishing a cross connection manually

When the two B channels have calls established on them, from the Connect menu:

- Choose **CROSS CONNECT**.

The two B channels are cross connected.

Automatically establishing a cross connection

You can automatically cross connect two B channels which have calls established on them, using a call screening function.

- Choose a call screening type of **CROSS CONNECT** and input the CPN you wish to screen for - refer to *Setting up Call Screening* in Chapter 3 Section 2.

When aurora^{Duet} receives an incoming call in which the last 3 digits of the CPN match, a call is made by aurora^{Duet} to the CPN and it automatically cross connects the two B channels.

Removing a Cross Connection BRI

- Clear the B1 or B2 call to remove the cross connection.

Swapping the ISDN Service DASS

With the DASS protocol, you can change the service indicator code (SIC) or service type for a connected call, while maintaining the connection. Requests to change the SIC/service type are known as Swap requests.

From the Connect screen:

- Press **F5 SWAP**.



Note

In the Connect screen, there are more function keys than can fit on a single screen. Therefore, to see the **F5 SWAP** function key, press **F6 MORE** to toggle through the function keys.

The **SWAP SIC** screen is displayed.

S2M	E1	B1	02:23
SWAP SIC			
SPEECH CAT1		DATA UR/64k	
SPEECH CAT2		SIC 1	
3.1k AUDIO		SIC 2	
FAX Gr.4		SIC 3	
VIDEOTEX NEW		SIC 4	
TELETEX		SIC 5	
SSTU			

To change the SIC for a connected call:

- Highlight the SIC or service type you require and press **SELECT**.

aurora^{Duet} displays a Connect screen for the new SIC.

Displaying Information about a Call

You can display information about the current call or the last ISDN call on the currently selected channel. ISDN call information is available from the main menu or any of the screens displayed when a call is connected or cleared.



Note

In the Connect screen, to see the **F3 INF** function key, press **F6 MORE** to toggle through the available keys.

➤ Press **F3 INF**.

The **ISDN CALL INFO** screen is displayed.



S2M	TE	BI	18:43
ISDN CALL INFO			
CPN	0049893230090		
COL	0049893230090		
UII			
RX CHARGE	8 UNIT		
TX CHARGE	-		
CAUSE	16		
-			
		ESC	EXIT



S2M	PBX	BI	01:18
ISDN CALL INFO			
DA			
OLI			
RX CHARGE	-		
LAST RCUD MSG	-		
SIS	:		
MIM	:		
		ESC	EXIT

The channel to which the call information relates is displayed on the top line - in this case, B1.

The following tables explain the call information shown.



ISDN Call Information	
CPN	Called Party Number and sub-address (if used) that the caller dialed.
CLI/COL	For an incoming call, the Calling Line Identity (CLI) is displayed - this is the number of the calling party. For an outgoing call, the COL (Connected Line Number) is shown - this is the number of the connected party. It may be different from the CPN dialed, if the call was redirected.
UUI	User to User Information. Any UUI text sent with the call is shown here. For details on the types of User to User Information, see Section 4 of this Chapter.
Rx Charge Tx Charge	Charging advice for the call is displayed - this updates automatically as charging advice is received. The display indicates whether the received charging is in units (UNIT) or currency (CURR)- see <i>Advice of Charge (AOC)</i> in Section 4 of this Chapter.
Cause	The last received ISDN cause code. When there is a call currently connected, this is always blank.
Display IE contents	The last received Display Element is shown on the bottom lines of the screen. A maximum of 100 characters is displayed.



ISDN Call Information	
DA	Destination address and Network Address Extension (if used) that the caller dialed.
OLI	Originating Line Identity (OLI). This is the originator's line identity number.
Rx Charge	Charging advice for the call is displayed - this updates automatically as charging advice is received.
Last Rcvd Msg	The last message received by aurora ^{Duet} .
SIS	The last Supplementary Information String
MIM	Maintenance Information Message.

If call activity other than charging information occurs while the **ISDN CALL INFO** screen is displayed, aurora^{Duet} returns to the previous screen.



Tip

To display a description of the call clear cause code, press **F4 CSE**.

Exiting the call information screen

- Press **F6 EXIT**.

Clearing a 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

- Choose **CLEAR CALL** from the call menu.

aurora^{Duet} displays **CALL CLEARED**, together with the error type or call clearing cause code - see *About the Cause Codes* later in this Section.

```

S TE PP      B1      16:39
      SPEECH CALL
CPN 123456
COL
      CALL CLEARED
      ISDN ERROR 153
STATUS: CLEARED
HELP B2 INF CSE RDL EXIT
    
```

When a Remote Party Clears the Call

When another user or the network initiates call clearing, aurora^{Duet} displays **CALL CLEARED**. The Clearing Cause Code received in the Release Complete message is displayed - see *About the Cause Codes* later in this Section.



Tips

- You can redial the most recently dialled CPN immediately after a call has cleared - see *Redialling a CPN*, earlier in this Section.
- If you have captured protocol decode to memory, using the Tracer, you can review the decode - see Chapter 6 for details.

About the Cause Codes

When a call attempt fails, or a call is cleared or disconnected, aurora^{Duet} displays a **Cause Code**. This is a value which indicates the reason for failure, disconnection or clearing. A brief description of the cause code is also provided.

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

Displaying the last Cause Code

To display the last Cause Code or error type that aurora^{Duet} received or detected:

- Press **F3 INF** and then **F4 CSE**.

```
S TE PP      B1      16:41
  SPEECH CALL

ISDN CAUSE 153
LAYER 1 ACTIVATION
HAS FAILED

CLEAR LOCATION:
UNKNOWN

STATUS: CLEARED
HELP      EXIT
```

This information is only shown when no calls are connected on the current channel.

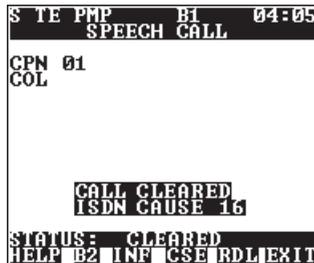
Origin of the Cause Codes

aurora^{Duet} receives Cause Codes from the network. The message type depends upon which party initiated call clearing. Error types greater than 127 are internal - in other words, they are generated by aurora^{Duet} itself.

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

Redialling a CPN after a Call has Cleared

After a call has cleared, you can redial the most recently dialled CPN immediately. This feature is available with the ETSI, TPH, 1TR6, TN1R6 and CorNet-N/T protocols.



From the **CALL CLEARED** screen:

- Press **F5 RDL**.

aurora^{Duet} redials the last destination address, using the same bearer service.

Section 2

Physical and Line Quality Checks

This section explains how to check the physical communications interface and the quality and configuration of the ISDN line.

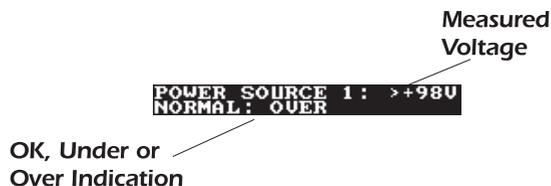
The following are described:

- checking the S Bus cable
- checking the line voltage
- checking layer 1 and layer 2
- Bit Error Rate Testing (BERT) using a connected call
- Testing fixed links and D channel BERT
- Multi-channel BERT on fixed links
- Testing with Spectrum B Stimulus

Checking the Line Voltage BRI

On Basic Rate S/T interfaces, you can check the voltage of the line to which you are connected. aurora^{Duet} can display the voltage to an accuracy of 1V, between +99V and -99V.

The voltage is displayed at the foot of the Main menu.



In TE mode **POWER SOURCE 1** is displayed, followed by the measured voltage. In NT mode **LINE POWER** is displayed, followed by the voltage supplied by aurora^{Duet}.

aurora^{Duet} also indicates if the power source is normal or restricted, and if the voltage is correct for the interface:

Voltage Indication: TE Mode	
Normal: OK	NT is supplied with local mains power. The voltage is correct for the interface.
Normal: Over	NT is supplied with local mains power. The voltage is too high for the interface.
Normal: Under	NT is supplied with local mains power. The voltage is too low for the interface.
Restricted: OK	NT is supplied with power from the line. The voltage is correct for the interface.
Restricted: Over	NT is supplied with power from the line. The voltage is too high for the interface.
Restricted: Under	NT is supplied with power from the line. The voltage is too low for the interface.
No Power	There is no power on the interface.

Voltage Indication: NT Mode	
Power Feed Active	aurora ^{Duet} is supplying power to terminal equipment.
Power Feed Off	aurora ^{Duet} is not supplying power to terminal equipment.
Power Feed Activating	aurora ^{Duet} is checking line power, prior to supplying power



Warning: High voltages

If **OVER** appears after the voltage measurement for a U interface, a dangerous voltage may be present.

Disconnect aurora^{Duet} from the line, observing all safety precautions.

Checking the S-bus Cable

You can test the integrity of the S-bus cable using the S Bus cable tester, which is an optional accessory - for information, contact your Hewlett Packard representative.

With the S Bus Tester, you can test the integrity of all 8 conductors on an S-Interface cable of up to 300m length. This is useful for identifying cable defects, including short and open circuits and crossed connections. You can also use the S Bus Tester to detect termination resistors.



Note

For information on using the S bus cable tester, please refer to the *aurora^{Duet} S-Bus Cable Tester User Guide* (422984).

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.

BRI

In Simulate mode, you can tell whether Layer 1 is active by checking the *L1* LED. *Off* means that Layer 1 is not active, *Red* shows the presence of the layer 1 clock on the line and *Green* shows that Layer 1 is fully active.

The status of Layer 1 is also indicated by a vertical arrow on the status bar of the Main menu. For example:

Layer 1: ↓

- ↑ indicates the layer is up
- ↓ indicates the layer is down.

About the Activation of Layer 1

The point at which Layer 1 activates depends on when aurora^{Duet} establishes the Layer 2 link (i.e. what is defined in the **LAYER 2** setting in the **ISDN SETUP** menu).

PERMANENT means Layer 1 activates as soon as you connect to the line; **AUTOMATIC** means Layer 1 activates when you make or receive a call.

For details of Layer 2 setup, see *Choosing when the Layer 2 Link is Set up* in Chapter 3 Section 2.

Displaying Layer 1 Alarms PRI

You can display the status of the current layer 1 link, or the history of the layer 1 link (since the counters were last reset or aurora^{Duet} was switched on).

For example, you can display alarms and counters, such as the G703 alarms and the latest FAS (Frame Alignment Signal) and the NFAS (Non Frame Alignment Signal) words.

To display Layer 1 Status information:

- Press the **F5 L1** key from any PRI Monitor or Simulate menu.

The **Layer 1 Status** screen is displayed.

SIMULATE

```

S2M TE BI 16:06
Layer 1 Status 1/2
alarm errors
LOS Y 0
AIS n 0
LFA Y 0
RAI n 0
CRC - 0
E - 0

FAS 00000000
NFAS 00000000
HELP CLR MORE EXIT
    
```

MONITOR

```

Layer 1 Status 1/2 16:10
alarm errors
RxA RxB RxA RxB
LOS Y Y 0 0
AIS n n 0 0
LFA Y Y 0 0
RAI n n 0 0
CRC - - 0 0
E - - 0 0

FAS 00000000/00000000
NFAS 00000000/00000000
HELP CLR MORE EXIT
    
```

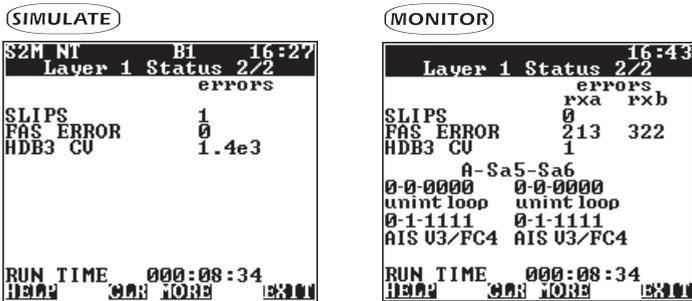
In Simulate mode, one set of Layer 1 information is displayed. In Monitor mode, two sets of **LAYER 1** information are displayed (one set for each of the two receivers: RXA and RXB).

Displaying further Layer 1 Status information

Layer 1 Status information spans two pages. To switch between the two pages:

- Press **F4 MORE**.

The second page of layer 1 information is shown below:



The alarms and counters are constantly updated, even when the **LAYER 1** screen is not displayed.

Understanding Layer 1 alarms and counters

- Black text** No alarm is present.
- Flashing black text** This alarm occurred, but the error condition is no longer present.
- Inverse video text** This alarm is present.

The error counters range from 0 to 9999 in integer notation, and 10000 to 9.9e9 in scientific notation. The counters do not extend beyond 9.9e9.

The following table explains the Layer 1 alarms and counters:

Layer 1 Alarms & Counters	
LOS	Loss of incoming signal detected. y = 255 consecutive zeroes have been received n = at least 32 ones have been received in 255 bit times. The error count increases every time the alarm is switched from n to y.
AIS	Alarm Indication Signal received. y = less than 3 zeroes in 512 bits have been received n = more than 2 zeroes in 512 bits have been received. The error count increases every time the alarm is switched from n to y.
LFA	Loss of Frame Alignment. y = frame synchronisation has been lost n = frame synchronisation has been achieved. The error count increases every time the alarm is switched from n to y.
RAI	Remote Alarm Indication signal received. y = Bit 3 of NFAS has been set to 1 on three consecutive occasions n = Bit 3 of NFAS is set to zero The error count increases every time the alarm is switched from n to y.
CRC	Cyclic Redundancy Check 4 (CRC4) errors have been detected. The error count increases every time a CRC4 error is encountered.
E	Counts the number of multiframes with CRC errors, as reported by the remote end of the connection.
FAS	Displays the latest incoming FAS word in the multiframe.
NFAS	Displays the latest incoming NFAS word in the multiframe.
SLIPS	Records the number of frame slips encountered. This is used in MONITOR mode and when SIMULATE mode is running as the clock master.
FAS ERROR	Records the number of FAS words in error encountered while frame synchronisation is achieved.
HDB3 CV	Records the number of HDB3 code violations (bipolar violations of the same polarity) encountered.
A-Sa5-Sa6	Records the last four distinct function elements that are decoded in timeslot 0, with the most recent message first. If there are no messages, a blank line is displayed.
Run Time	Shows the number of seconds that the Layer1 test has been running. This is not reset when you exit the screen.



Note: FAS and NFAS

S bits are displayed as a '1' or a '0' in the relevant bit position of the FAS or NFAS word. Bit positions not carrying S bits are represented by a dash '-'. Bit position 1 in **NFAS** words only carries S bits when **CRC4** checking is switched off.

Resetting the counters

To reset the Layer 1 counters and Run Time back to zero:

- Press **F3 CLR**.

Exiting the Layer 1 display

- Press **F6 EXIT**.

Checking the Status of Layer 2

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

PRI

In Simulate mode, you can tell whether Layer 2 is active by checking the **L2** LED. *Off* means that Layer 2 is not active, *Green* shows that Layer 2 is present.

The status of Layer 2 is also indicated by a vertical arrow on the status bar of the Main menu. For example:

Layer 2: ↓

- ↑ indicates the layer is up
- ↓ indicates the layer is down.

Bit Error Rate Testing (BERT)

aurora^{Duet} 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).

You can use BERT across the B channels to check an established ISDN link. On a BRI fixed link you can also perform D channel BERT. In addition, you can perform BER tests on several channels at once, without using a protocol.



Note

Spectrum B Stimulus users should refer to *Testing with Spectrum B Stimulus* in Chapter 4 Section 2.

How BERT Works

aurora^{Duet} generates a test pattern and transmits it repeatedly to another device, which transmits it back. aurora^{Duet} 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 the test over a looped link.

Remote and local testing

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

Setting up BERT Operation

You can define up to four different combinations of settings for Bit Error Rate testing. To do this:

- Choose **BERT SETUP** from the **MAIN SETUP** menu.



The top of the screen displays which of the four BERT Setups you are currently working on - in the above example **BERT SETUP No 1** is displayed.

Switching between the BERT Setup screens

- Press **F2 NXT**.

The next BERT Setup screen is displayed. The BERT Setup displayed when you press **F6 EXIT**, is used when you perform a BER test.

Choosing the test pattern

- Highlight **PATTERN** and use the **LEFT** and **RIGHT** arrow keys to toggle between the available test patterns.

To specify a user defined test pattern:

- Set **PATTERN** to **USER DEF**.

If a **USER PATTERN** already exists, it is displayed.

- Press **F3 EDIT**.

A flashing cursor indicates where you can enter the first digit and aurora^{Duet} enters edit mode. In edit mode the function keys become the six hexadecimal digits: $F1 = A$, $F2 = B$, $F3 = C$, $F4 = D$, $F5 = E$ and $F6 = F$.

- Enter a custom BERT pattern, using the keypad to enter digits 0 to 9 and the function keys to enter hexadecimal digits A to F.

The new pattern must consist of two groups of two hexadecimal digits (that is, any hexadecimal numbers in the range $00\ 00$ to $FF\ FF$).

Once you have entered four valid digits, edit mode is exited.

Choosing the length of the test

- Highlight **TEST LENGTH** and use the *LEFT* and *RIGHT* arrow keys to toggle between the available options:

BERT Test Length	
Continuous	The test runs until you stop it
1 Min	The test runs for 1 minute
15 Mins	The test runs for 15 minutes
1 Hour	The test runs for 1 hour
User Def	Lets you set a custom test length. See below for details.

To specify a user defined test length:

- Set **TEST LENGTH** to **USER DEF**.

If a user defined **TEST LENGTH** already exists, it is displayed.

- Press $F3$ **EDIT**.

A flashing cursor indicates where you can enter the first digit and aurora^{Duet} enters edit mode.

- Enter a custom test length, using the keypad to enter digits 0 to 9.

The test length must be in the format *HH:MM:SS* (hours, minutes and seconds).

Once you have entered six valid digits, edit mode is exited.

Choosing the fail threshold

You can determine the number of errors that cause the test to fail. 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.

- Highlight **THRESHOLD** and use the *LEFT* and *RIGHT* arrow keys to toggle between the available options.
- Choose the appropriate threshold. For example, select **1 in 10²** to set the threshold as 1 in 10² bits, or choose **UNLIMITED** to allow an unlimited number of errors.

You can also set the threshold to 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.

To set the threshold to an HRX percentage:

- Set **THRESHOLD** to **USER DEF.**

USER DEF HRX appears; if a user defined threshold already exists, it is displayed.

- Press *F3* **EDIT.**

A flashing cursor indicates where you can enter the first digit and aurora^{Duet} enters edit mode.

- Enter an HRX percentage, using the keypad to enter digits 0 to 9.

The HRX percentage must consist of two digits between 00 and 99. For example, to define a value of 4% you would enter *04*.

Once you have entered two valid digits, edit mode is exited.



Note

The default threshold is **USER DEF**, with an HRX value of 15%.

Setting the resynchronisation level

You can set the level at which aurora^{Duet} will automatically resynchronise to the received BERT pattern. This level is expressed as a percentage of errors within a 100 millisecond time period.

- Highlight **RESYNC** and use the *LEFT* and *RIGHT* arrow keys to toggle between **5%**, **10%**, **15%**, **20%** and **25%**.

Setting the error injection rate

To set the rate that bit errors are automatically injected into the transmitted data stream, during a BER Test:

- Highlight **ERROR INSERT** and use the *LEFT* and *RIGHT* arrow keys to toggle between **1 in 10²**, **1 in 10³**, **1 in 10⁴**, **1 in 10⁵** and **1 in 10⁶**.

For example, choose **1 in 10²** to inject errors at the rate of 1 in 10² bits.



Note

You can only select **1 in 10²** if the correct hardware is installed.

Downloading BERT results to the comms port

You can set up aurora^{Duet} in advance to download BER test results, for example to a PC. To do this, you need to set the **TRACER** option to **RESULTS TO COMMS** - see *Configuring Protocol Tracer Output* in Chapter 3 Section 3.

Performing BERT Using a Connected Call

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

To run a BER test from a connected call:

- Choose **CONNECT BERT** from the Connect menu.



Note

For information about connecting calls, refer to *Making and Receiving Calls* in Section 1 of this chapter.

The BER test begins and the BERT results are displayed. The results are updated approximately every second.

```

S T E P M P      B I      17:53
  DATA UR/64k

ELAPSED TIME      00:00:32
RX KBIT/S:        2048
BIT ERRS:         0
BER 0.0E-0 S-LOSS 0
ES 0 SES          0
US 0 DM           0

CLEAR CALL
CONNECT MENU
SUPP SERVICE MENU

STATUS: BERT CONNECTED
HELP B2 CLR ERR AUT MORE
    
```

The **STATUS** line displays **BERT CONNECTED** when an end to end link is established and a test is in progress.

If the BER test is timed and the test ends, **BERT RESULT** is displayed together with a **PASS** or **FAIL** indication. The length of the BER test and the pass / fail threshold are defined in the **BERT SETUP** menu - see *Setting up BERT Operation* in this section.

The following table explains the BERT results.

BERT Results Display	
Elapsed 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 BER test is running and in pattern synchronisation
Bit Errs	The number of bit errors received while the BER test is running and in pattern synchronisation
BER	Bit Error Rate, displayed in exponential format.
ES	The number of Errored Seconds. An errored second is any second during which one or more bit errors are received.
US	The number of Unavailable Seconds. These are seconds in which the error rate is so high that the link is considered to be unavailable.
SLOSS	The number of occasions when pattern synchronisation has been lost.
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} .
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} .



Note

Very large or very small values requiring more than 8 digits including the decimal point, are displayed in exponential format (y.yyyEsxx), where 'y.yyy' is a floating point number, 'E' is the exponent, 's' is the sign of the exponent (either 'minus' or 'plus'), and 'xx' is the 2-digit exponent.

Checking that the patterns are synchronised

For BERT to be reliable, the pattern `auroraDuet` 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^{Duet}.

Injecting single bit errors

During a BER test, aurora^{Duet} lets you inject single bit errors into the transmitted data stream.

- Press **F4 ERR** to inject a single bit error.

The bit error count **BIT ERRS** increases by one.



Tip

A useful method of confirming that the test is working properly is to inject a single bit error at the start of a test, and check that it is detected.

Injecting multiple bit errors

You can inject multiple bit errors automatically, into the transmitted data stream, during a BER test. The ratio of errors injected depends on what is specified in the **ERROR INSERT** option in the **BERT SETUP** menu - see *Setting up BERT Operation* in this section.

- Press **F5 AUT** to inject multiple bit errors.

Errors are injected and the bit error count increments.

- To stop automatic error injection, press **F5 OFF**.

Resetting the BERT counters

You can reset the counters back to zero and restart the clock, while a BER test is running.

- Press **F3 CLR** to reset the counters and the elapsed time.

Stopping the test

You can stop a BER test at any time. You might do this, for example, to stop a continuous BER test.

- Choose **CONNECT MENU/DISCONNECT BERT**.

The BER test ends and the results are stored.

Clearing the call and stopping the test

To clear the call, stop the BER test and store the results:

- Choose **CLEAR CALL**.

The call clearing cause code is displayed and the **STATUS** line displays **CLEARED**. Press *F6* **EXIT** to return to the Main menu.



Note

If there is an incoming Clear Call request, aurora^{Duet} stops the test, stores the results and displays the call clearing cause code.

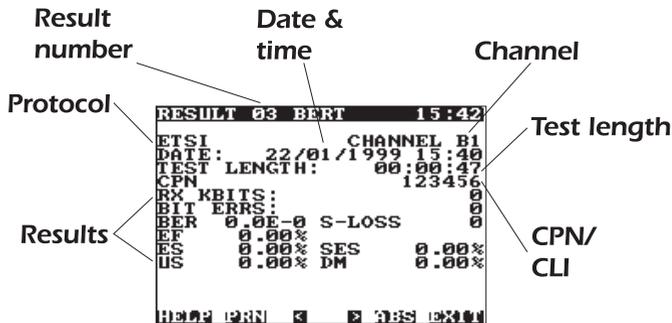
Viewing Stored BERT Results

aurora^{Duet} can store up to 30 BER test results in memory. Once 30 sets of results have been stored, aurora^{Duet} overwrites the oldest set with any subsequent results.

To view stored BERT results:

- From the Main Simulate menu, choose **RESULTS**.

The most recent results are displayed first. A screen similar to the following is displayed:



The stored BERT results display is explained below:

Result Up to 30 BER test results can be stored in memory and these are labelled **RESULT 01** to **30**. This shows which set of BERT results is currently displayed.

Protocol Protocol used for the BER test.

Channel Channel the BER test was performed on.

Date & Time Date and time the BER test was performed. The date is in the format DD/MM/YY (days/months/years); the time is in the format HH:MM (hours:minutes).

Test Length Length of time the BER test was running, in the format HH:MM:SS (hours:minutes:seconds).

CPN/CLI Called Party Number (CPN) or Calling Line Identity (CLI), depending on the call direction.

Results BER test results. See *Performing BERT Using a Connected Call*, in this Section, for an explanation of the BERT results.

Pass/Fail Indicates whether the BER test has passed or failed. This is only displayed for timed BER tests.

If no results are stored in memory, **NONE AVAILABLE** is displayed.

Choosing Absolute or Percentage results

aurora^{Duet} can display BER test results as absolute values or as percentages. To select how results are displayed:

- Press **F5** to toggle between absolute and percentage.

Browsing through the BERT results

To navigate through all the sets of stored BERT results, use the following function keys:

- To display the previous result, press **F3 <**
- To display the next result, press **F4 >**.

Printing stored BERT results

To print the currently displayed BERT results:

- Connect aurora^{Duet} to a printer. See *Connecting aurora^{Duet} to a PC or Printer* in Chapter 3 Section 3.
- Press **F2 PRN**.

The BERT results are sent to the printer. Results are printed as both absolute and percentage values.

The following additional information, which is not visible on the screen, is included in the printout:

Additional Information	
Channels	Indicates if the BERT was on an incoming or outgoing channel; also provides the channel numbers.
Cause	Indicates whether the local or the remote was responsible for the clear-down; also provides the clear cause code.
Test time	The actual time taken to run the test, from the time of first synchronisation.
BERT Setup information	Shows which of the four BERT settings was used. Also shows the settings used: test length, pattern, threshold, resynchronisation and error insert.

Fixed Links: Testing a Cable or Network Without Establishing a Call

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, perform the following steps:

- 1 Connect up aurora^{Duet} for testing on a fixed link. You can do this in two ways:
 - Physically loop the line at the remote end
 - Connect aurora^{Duet} and another device (such as another aurora ISDN tester) at either end of the link, with one emulating a TE and the other an NT.
- 2 Switch off protocol support, by setting the **L2 PROTOCOL** to **NO D CHAN** - see *Identifying the Protocol Master and Slave* in Chapter 3 Section 1.
- 3 Run a BER test on the D channel - this is explained

in the following.

Running BERT on the D Channel

To test a Basic Rate fixed link you can perform a BER test on the D channel as well as on the B channels.



Caution:

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.



Notes

- D Channel BERT is only supported on aurora^{Duet} purchased from December 1995 onwards. If your aurora^{Duet} was purchased prior to this date, contact your Hewlett Packard representative for further details.
- You cannot select **D CHANNEL BERT** in PRI mode (although this option is displayed on the Main menu) or while a call is in progress, because D channel signalling is active.
- Layer 2 functionality cannot be guaranteed if it is active when you select the **D CHANNEL BERT** option.

Performing a BER test on the D channel

- Choose **D CHANNEL BERT** from the Main menu.

The D Channel is selected and the following screen is displayed.

```

S TE PP 15:28
D CHANNEL BERT

CONNECT LOOP
CONNECT BERT

STATUS: ON HOOK
HELP EXIT
    
```

➤ Choose **CONNECT BERT**.

The test begins automatically and the BERT results are displayed. The results are updated approximately every second.

```

S NT PP 12:41
D CHANNEL BERT

ELAPSED TIME 00:00:03
RX KBITS: 0
BIT ERRS: 0
BER 0.0E-0 S-LOSS 0
ES 0 SES 0
US 0 DM 0

STOP TEST

STATUS: BERT CONNECTED
HELP CLR ERR AUT EXIT
    
```

The **STATUS** line displays **BERT CONNECTED**.

Refer to *Performing BERT Using a Connected Call*, in this Section, for an explanation of the BERT results and how to inject bit errors and reset counters.



Note

You cannot switch to or access any B channel whilst operating in this mode.

Stopping the test

- Select **STOP TEST**. Alternatively, press *F6* to stop the test and exit the screen.

The test ends and the results are stored.



Tip

To view and print stored BERT results, refer to *Viewing Stored BERT Results* in this Section.

Looping Back D Channel BERT

To loop back the BERT pattern at the receiving end:

- Choose **D CHANNEL BERT** from the Main menu.
- Choose **CONNECT LOOP**.

A loop test on the D channel is started. The **STATUS** line displays **LOOP CONNECTED**.

Stopping the test

- Press *F6* to stop the test and exit the screen.

Multi-channel BERT on Fixed Links (No Protocol)

You can perform BER tests on several channels at once, without using a protocol. You can test up to 3 timeslots in BRI mode and 31 timeslots in PRI mode. The settings used are those defined in the **BERT SETUP** screen - see *Setting up BERT Operation* in this section.



Note

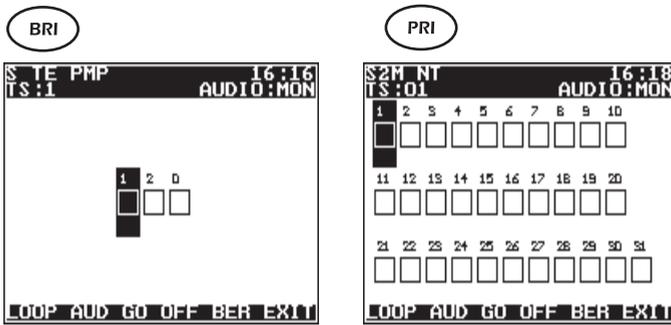
Multi-channel BERT on fixed links is an optional feature - it is only available if your unit has been configured to

use it. For details, contact your local Hewlett Packard representative.

- From the Main menu, select **LAYER 1 TEST**.

aurora^{Duet} takes 2-3 seconds to initialise before you can continue.

A screen showing the available channels is displayed: 31 channels for PRI mode, 3 channels for BRI mode.



Note

These screens are not displayed if there are any active calls.

Testing on particular channels

To test on particular channels simultaneously, perform the following process for *each* channel:

- Highlight a channel, using the **RIGHT** and **LEFT** arrow keys
- Choose a test to run on the channel, as follows:
 - To run a BER test, press **F5 BER**.
 - To loop back the BERT pattern, press **F1 LOOP**.
 - To make a voice (audio) call, press **F2 AUD**.

Testing on all channels

To test on all channels simultaneously, do the following:

- Press **F6 MORE** to display a second set of 'select all' function keys.
- Choose a test, as follows:
 - To run BERT on *all* B channels, press **F2 BER***.
 - To loop back *all* B channels, press **F1 LP***.
 - To clear calls on *all* B channels, press **F3 CLR***.



In BRI mode, you cannot perform a BER test on more than one channel at a time, due to hardware restrictions.



Note

To toggle between the 'select particular' and 'select all' function keys, press the **F6** and **F5 MORE** keys.



Tip

To select a large number of channels, use the 'select all' function keys, then remove the channels you do not require, using the 'select particular' function keys.

Understanding the symbols

Depending on the test you select, a symbol is displayed in the box representing the channel. The symbols are as follows:



A data call (BERT) is in progress.



A looped back data call is in progress.



A voice (audio) call is in progress with the Codec connected.

If data on a channel is not of a fixed octet pattern, a bar flashes above the appropriate box.

Starting the test

- Press **F3 GO**.

The test begins and a results screen is displayed.

```

$2M NT          16:21
 6*64K BERT
ELAPSED TIME    00:01:23
RX KBITS:      12346
BIT ERRS:      544
BER 4.4E-5 $-LOSS 0
ES 0 SES 0
US 1 DM 0

STATUS: BERT CONNECTED
        CLR ERR AUT EXIT
    
```

PRI

In PRI mode, the number of channels selected is displayed at the top of the screen. For example, if you selected 6 B channels, **6*64K BERT** is displayed.

Refer to *Performing BERT Using a Connected Call*, in this Section, for an explanation of the BERT results and how to inject bit errors and reset counters.

Stopping the test

- Press **F6 EXIT**.

aurora^{Duet} returns to the channel display screen.

- Highlight a channel and press **F4 OFF**

BERT or loop activity is removed from the channel.

Exiting the Layer 1 test

- Press **F6 EXIT** from the channel display screen.

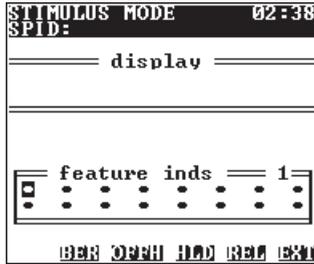
aurora^{Duet} takes 2-3 seconds to initialise before you can continue.

Testing with Spectrum B Stimulus Spectrum B-S

With the Spectrum B Stimulus protocol, you can verify what features are available on the PABX, establish calls and perform a BER test.

- Choose **ISDN CALL SETUP** from the Main menu.

The **STIMULUS MODE** screen is displayed:



Understanding the Display

The screen has the following features:

SPID

The top of the screen displays the time and the Service Profile Identifier (SPID) - see *Storing a Service Profile Id* in Chapter 3 Section 1.

Display Information

The **display** area is used to 'echo' display information sent by the network, such as keypad digits. Two lines of 24 characters can be displayed.

Feature Indicators

The **Feature inds** display represents feature indicators 1 to 16. These tell you what features are available on the PABX. The status of each feature is represented by a symbol, as follows:

- Idle
- ⊗ Active

- ?** Prompt
- P** Pending

Activating a Feature

To send a request to the network to activate a feature:

- Highlight the required indicator, using the arrow keys, and press **SELECT**.

The number of the selected feature indicator is displayed in the top, right-hand corner of the feature indicator box.

Making an Outgoing Call

From the **STIMULUS MODE** screen:

- Press **F3 OFFH** to place aurora^{Duet} off hook.
 - Using the keypad, dial the Called Party Number.
- aurora^{Duet} attempts to establish a call.

Placing a call on hold

To send a Hold Request message to the network:

- Press **F4 HLD**.

Releasing a held call

To send a request to the network to release the hold on the call:

- Press **F5 REL**.

Performing a BER test

Once a call is established, you can perform a Bit Error Rate (BER) test:

- Press **F2 BER**.

The Codec is disconnected from the B channel and the BERT results are displayed:

```

S TE PMP          02:45
UNKNOWN
ELAPSED TIME     00:00:15
RX KBITS:        0
BIT ERRS:        0
BER 0.0E-0 S-LOSS 0
ES 0 SES        0
US 0 DM         0

CONNECT BERT
CONNECT CODEC

STATUS: BERT CONNECTED
DISP CLR BERT AUT

```

Refer to *Bit Error Rate Testing (BERT)* in this Section for further information.

Restarting the BER test

To clear all the counters and restart the BER test:

- Choose **CONNECT BERT**.

Ending the BER test

To end the BER test and reconnect the Codec:

- Choose **CONNECT CODEC**.

Clearing the Call

- Press **F3 ONH** (on hook) to clear the call.

Section 3

Using aurora^{Duet}'s Automatic Test Suite

This section describes how to use aurora^{Duet}'s automatic test suite to check the line under test. It explains how to:

- test service availability using the service test
- test channel availability and configuration
- perform a 'Combination test' i.e. run a service test, followed by a channel availability test.

Introducing aurora^{Duet}'s Automatic Test Suite

aurora^{Duet} provides a number of automatic tests which offer a quick and easy method of performing the most common tests on an ISDN link.

Automatic tests allows you to test channel availability and/or configuration against a range of ISDN bearer services, and check which services the link is configured to carry. You might perform these checks as part of a series of tests - for example, during line provisioning.

The automatic tests are as follows:

SERVICE TEST	Checks the ISDN services subscribed to on the line under test, and tells you which ones are available.
OUTGOING CHANNEL TEST	Determines channel availability.
FULL CHANNEL TEST	Tests the configuration of the B channels.
COMBINATION TEST	Runs a Service Test and an Outgoing Channel Test.

Some of these tests are only available for certain protocols - refer to the particular test for details.

Notes on Channel Negotiation OSIG

With the QSIG protocol, aurora^{Duet} automatically changes the channel negotiation setting (exclusive/preferred - see *QSIG B Channel Selection and Negotiation* in Chapter 4 Section 1) to ensure that the automatic test you select works properly:

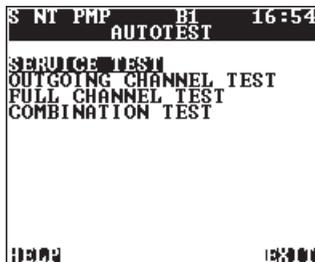
- Since the Service Test is independent of a specific channel, the setting you have chosen is retained.
- For the Outgoing Channel Test and Full Channel Test, which rely on the testing of specific channels, the channel negotiation is always **EXCLUSIVE** (no alternative accepted), regardless of what you have chosen in the **ISDN SETUP** menu. After the test, aurora^{Duet} returns to the setting you have chosen.

Accessing the Automatic Test Suite

To access aurora^{Duet}'s automatic test suite:

- From the Main menu, choose **AUTO TEST**.

The **AUTOTEST** menu is displayed.



Testing Service Availability

The following explains how to test the availability of telecommunications services for ISDN calls.

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, the quickest and easiest method is to perform a Service Test.

How the Service Test Works

The Service Test checks the ISDN services subscribed to on the line under test, and tells you which ones are available. It does this by initiating a series of calls which use all of the bearer capabilities for the current protocol, in turn. A call is made on the selected B channel for each of the supported bearer capabilities, Higher Layer Compatibility or Service Indicator Code values.

When the test is complete, the results indicate which services the link is configured to carry. Service test results are stored even when aurora^{Duet} is switched off.

Setting up a Service Test

- Choose **SERVICE TEST** from the **AUTOTEST** menu.

The following screen is displayed:

```
S NT PMP BI 12:39
SERVICE TEST

TEST TYPE LOCAL
START TEST
RECALL
SERVICE RESULTS
STATUS: ON HOOR
HELP EXIT
```

Choosing a Local or Distant test ~~DASS~~ ~~DPNSS~~

To select the type of service test:

~~OSIG~~

- Highlight **TEST TYPE** and, using the *LEFT* and *RIGHT* arrow keys, choose either **LOCAL** or **DISTANT**:

Service Test Type	
Local	This tests the acceptance of calls at the device to which aurora ^{Duet} is connected - for example, your local exchange.
Distant	This tests the acceptance of calls at all points over the ISDN network.

Entering the number to dial for the test

If you choose a Distant test, a **CALLED PARTY NUMBER** line is displayed. For the DASS and DPNSS protocols, this reads **DIALLED ADDRESS (DA)**. The last CPN or DA dialled is displayed.

To change this or add a CPN:

- Enter a CPN or DA of up to 20 digits, or up to 6 digits for DASS in ET mode.

Use the *LEFT* arrow key to erase the last digit.

- ~~DASS~~ ~~DPNSS~~ ➤ To enter a Network Address Extension (NAE) press **F5 NAE**. This displays the **NAE SELECTION** screen - see *Choosing a Network Address Extension* in Chapter 3 Section 2.

Selecting a previously stored CPN

- Highlight **RECALL** and press **SELECT**.

The **CPN DIRECTORY** or **RECALL** screen is displayed.

- Choose a number to dial and press **SELECT**.

Starting the Service Test

After you have set up the parameters for the Service Test, begin the test as follows:

- Choose **START TEST**.

The test begins. After each service is tested, aurora^{Duet} shows you whether a channel has passed or failed the test.

When the Service Test is complete, the **SERVICE RESULTS** screen is displayed.



Note

You can also display Service Test results by selecting the **SERVICE RESULTS** option in the **SERVICE TEST** screen.

SERVICE RESULTS			12:41
SERVICE	RESULT	CAUSE	
SPEECH CALL	PASS	16	
DATA UR/64k	PASS	16	
3.1k AUDIO	PASS	16	
7k CALL	PASS	16	
3.1k TEL'NY	PASS	16	
FAX Gr-2/3	PASS	16	
FAX Gr-4	PASS	16	
VIDEOTEK NEW	PASS	16	
TELETEK	PASS	16	

- Use the *UP* and *DOWN* arrow keys to scroll through the results.

Understanding Service Test Results

The **RESULT** column shows whether the service is available or not.

PASS Indicates the ISDN service is available

FAIL Indicates the ISDN service is unavailable.

A cause code is display to the right of each service in the **CAUSE** column. To display the cause code description:

- Highlight the appropriate line and press **F4 CSE**. Press **F6** to exit from the cause code description.



Notes

- If a test fails with an internal call cause code, all further tests are aborted. **FAIL** is displayed against each test, together with a cause code of 0.
- If you press *F6* during a test, all further tests are aborted after the current call has cleared. **FAIL** is displayed against the remaining tests, together with a cause code of 0. The status line displays **SERVICE TEST STOPPING**.

Channel Testing

The following 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 perform an Outgoing Channel test or a Full Channel test:

The **OUTGOING CHANNEL TEST** determines channel availability. It does this by establishing and clearing an outgoing call on each B channel in turn. You can also run a BER test on data calls.

The **FULL CHANNEL TEST** tests the configuration of the B channels. It does this by establishing a call on each B channel, until all channels have an active call. The calls are then cleared down in the order in which they were established. You can also run a BER test on data calls.

Setting up a Channel Test

Both the Outgoing Channel test and Full Channel test are set up as follows:

- Choose **OUTGOING CHANNEL TEST** or **FULL CHANNEL TEST** from the **AUTOTEST** menu.

A screen similar to the following is displayed:

```

S NT PMP BI 17:46
OUTGOING CHANNEL TEST
CALLED PARTY NUMBER:-
01628524977
SERVICE DATA UR/64k
AUTO BERT: ON
START TEST
TEST LENGTH: USER DEF
RECALL
OUTGOING RESULTS
TEST LENGTH: 00:00:10
STATUS: ON HOOK
HELP EXIT
    
```

Selecting the bearer service

First, select the bearer service for the test calls:

- Highlight **SERVICE** and, using the *LEFT* and *RIGHT* arrow keys, choose either **DATA UR/64K** or **SPEECH**.

Performing a BER test

You can perform a BER test on each channel, if you have chosen the **DATA UR/64K** bearer service:

- Highlight **AUTO BERT** and select **ON** to run a BER test.

~~DASS~~ ~~DPNSS~~

- To specify the duration of the BER test, highlight **TEST LENGTH** and select 1 minute, 10 minutes, 1 hour or user defined. For details on specifying a user defined BER test length, see *Setting up BERT Operation* in Section 2 of this Chapter.

Entering the number to dial for the test

The last CPN or DA dialled is displayed. To change this or enter a new CPN:

- Input the digits using the keypad. Enter a CPN or DA of up to 20 digits, or up to 6 digits for DASS in ET mode.

If you make a mistake, use the *LEFT* arrow key to erase the last digit.

The digits you enter are displayed below **CALLED PARTY NUMBER** or, in the DASS and DPNSS protocols, **DIALLED ADDRESS**.

- DASS** **DPNSS** ➤ To enter a Network Address Extension (NAE) press *F5 NAE*. This displays the **NAE SELECTION** screen - see *Choosing a Network Address Extension* in Chapter 3 Section 2.

Selecting a previously stored CPN

- Highlight **RECALL** and press *SELECT*.

The **CPN DIRECTORY** or **RECALL** screen is displayed.

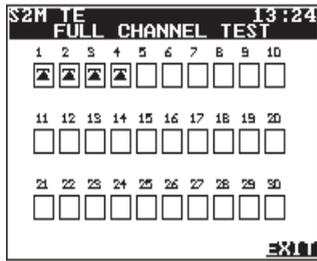
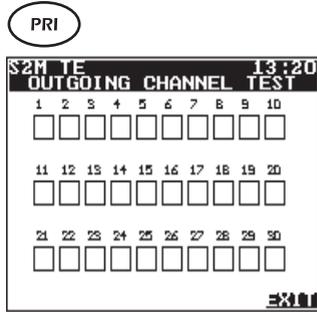
- Choose a number to dial and press *SELECT*.

Starting the Channel Test

Once you have set up the parameters for the Channel Test, begin the test as follows:

- Choose **START TEST**.

The test begins and a screen similar to the following is displayed:



Each box represents a B channel: two for basic rate; 30 for primary rate.

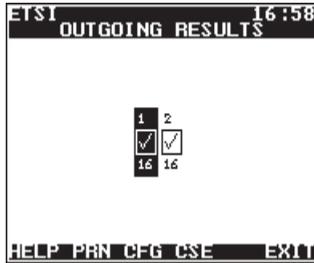
As each channel is tested, the corresponding box is highlighted and a symbol is displayed:

 is displayed when a **SPEECH** call is performed.

 is displayed when a **DATA UR/64K** call is performed. If **AUTO BERT** is **ON**, a BER test is executed when the call is connected.

Understanding Channel Test Results

When all channels have been tested, the test ends and the **OUTGOING RESULTS** or **FULL RESULTS** screen is displayed. For example:



Note

You can also display channel test results by selecting the **OUTGOING RESULTS** or **FULL RESULTS** option on the **OUTGOING/FULL CHANNEL TEST** screen.

aurora^{Duet} indicates whether a channel has passed or failed the test. The following symbols are used:

- ✓ The call has passed
- ✗ The call has failed. The cause code is displayed underneath.

A blank box indicates the channel could not be tested because a call was already active on the channel - the cause code is displayed underneath.

To display a cause code description:

- Highlight the channel and press **F4 CSE**. Press **F6** to exit from the cause code description.

Printing Test Results to the Comms Port

To print Service or Channel Test results to the communications (comms) port:

- Connect aurora^{Duet} to a printer- see *Connecting aurora^{Duet} to a PC or Printer* in Chapter 3 Section 3.
- Press **F2 PRN**.



Note

The results of each BER test are automatically printed to the RS232 port when the Tracer is set to **RESULTS TO COMMS** and **AUTO BERT** is **ON**. The results are stored if aurora^{Duet} is powered off.

Displaying Test Configuration Details

To display information about the configuration of aurora^{Duet} when a service or channel test was made.

- Press **F3 CFG**.

A screen similar to the following is displayed.

```
18:11
SERVICE RESULTS
START TIME      18:07
START DATE     22/01/99
PROTOCOL:      ETSI
ACCESS_TYPE:   BRI
INTERFACE:     S
MODE:          TE
LINE TYPE:     PP
L2 PROTOCOL:   SLAVE
CHANNEL        B1
TEST TYPE:     LOCAL
```

The following table explains the configuration information displayed.

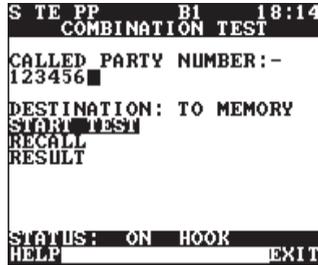
Configuration Information	
Start Time	Time the test was started, in hours:minutes format.
Start Date	Date on which the test was run, in day/month/year format.
Protocol	Protocol in use.
Access Type	Indicates if aurora ^{Duet} was in basic rate (BRI) or primary rate (PRI) mode.
Interface (BRI)	Indicates if the test was run on the S , T or U interface.
Mode	Device aurora ^{Duet} was emulating - TE , NT or LT (BRI).
Line Type (BRI)	Line type in use - PP or PMP .
L2 Protocol	Indicates the layer 2 protocol - Slave or Master .
Channel (service test)	The B channel on which the test was performed - BI through to B30 .
Test Type (service test)	Displays the type of service test - Local or Distant .
Service (channel tests)	Bearer service used for the test.

Performing a Combination Test

With the Combination test, you can automatically run the following tests, one after the other:

- a Service Test
- an Outgoing Channel Test on the current channel
- In  mode, Layer 1 is also monitored and its status reported on.
 - Choose **COMBINATION TEST** from the **AUTOTEST** menu.

The following screen is displayed:



Setting up a Combination Test

You need to specify a CPN for the test, and tell aurora^{Duet} where to store or send the results to.

Entering the number to dial for the test

The last CPN dialled is displayed. To overwrite this with a new CPN:

- Enter a CPN of up to 20 digits.

Use the *LEFT* arrow key to erase the last digit.

Selecting a previously stored CPN

- Highlight **RECALL** and press *SELECT*.

The **CPN DIRECTORY** is displayed.

- Select a number to dial and press *SELECT*.

Saving or downloading the results

You can send the results of the combination test to the communications (comms) port or save them to memory. aurora^{Duet} can store up to 10 sets of test results.

- Highlight **DESTINATION** and, using the *LEFT* and *RIGHT* arrow keys, toggle between **TO COMMS** and **TO MEMORY**.

To save results in aurora^{Duet}'s memory, choose **TO MEMORY**.

Alternatively, to download the test results, connect aurora^{Duet} to a PC or printer (see *Connecting aurora^{Duet} to a PC or Printer* in Chapter 3 Section 3) and select **TO COMMS**. The **PRINT** option is displayed.

- Highlight **PRINT** and, using the *LEFT* and *RIGHT* arrow keys, toggle between the following options:

Print Options	
Off	No information is downloaded
On Err	Information is downloaded every time an error is encountered
Every HH:MM:SS	Information is downloaded at specific intervals. Specify the time interval in hours (HH), minutes (MM) and seconds (SS) format. The default is every 10 seconds.

Starting the Combination Test

- Choose **START TEST**.

The **COMBINATION SESSION NAME** screen is displayed.

- Enter a test session name, up to eight characters in length.

Use the arrow keys to highlight a character and press **SELECT** to choose it. Use the keypad to enter digits. To delete a character, press **F3 DEL**.

- Press **F5 START**.

The test begins - aurora^{Duet} runs a Service test followed by an Outgoing Channel Test. The screens displayed are the same as those shown when each of the tests is run independently.

When the Combination Test is complete, the **COMBINATION TEST** screen is redisplayed.

Reviewing Stored Combination Test Results

To review Combination test results stored in memory, after the test has completed:

- Choose **RESULT** from the **COMBINATION TEST** screen.

A list is displayed of all test sessions currently stored in the memory.

- Highlight a test session and press **SELECT** to display the first set of results.

Toggleing between the sets of results

To display the next set of results, for example the Outgoing Channel Test results:

- Press the **LEFT** arrow key.

To display the previous set of results:

- Press the **RIGHT** arrow key.



Notes

- For an explanation of Service Test results, refer to *Understanding Service Test Results* in this Section.
- For an explanation of Channel Test results, refer to *Understanding Channel Test Results* in this Section.
- For an explanation of Layer 1 results, refer to *Displaying Layer 1 Alarms* in Chapter 4 Section 2.

PRI

Section 4

Supplementary Services

ETSI

ITR6

~~ETSI&X.25~~

This section introduces the supplementary services that you can test. It explains how to check which services are supported on the network, and if the service is operating correctly for the protocol.

Supplementary services are additional ISDN services which are available by subscription. They modify or supplement the functions of bearer services or teleservices.

You can check the availability and operation of the following supplementary services:

- Call Forwarding (Divert)
- User to User Signalling
- Closed User Groups (CUG)
- Conference Calls
- Call Completion on Busy Subscriber (CCBS)
- Call Hold/Retrieve
- Three Party Calls
- Malicious Call Identification
- Call Suspend/Resume (Terminal Portability)
- Advice of Charge (AOC)
- Keypad

Some of these supplementary services are only available for certain protocols - refer to the particular service for details.

To test supplementary services, your aurora^{Duet} must be emulating a TE (terminal equipment).



Tip

To display information about the supplementary services which have been invoked, press **F2 SUPP** from the **SUPPLEMENTARY SERVICES** menu - see *Displaying Supplementary Services Information* in this Section.

Call Forwarding (Divert)

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 attempts on an S interface may not succeed unless a valid CLI (Calling Line Identity) is set up - see *Storing CLI Numbers in Memory* in Chapter 3 Section 2.

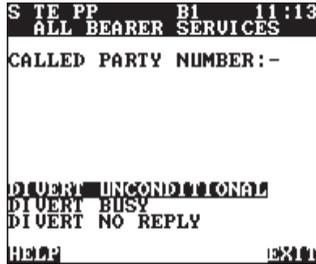
Setting up Call Forwarding

- Choose **SUPP SERVICES** from the Main menu.
- Select **DIVERT**.

A bearer capability screen is displayed for the protocol you are using. You can activate call forwarding for a particular bearer capability, for all telephony services or all bearer services.

- To activate call forwarding for a **particular bearer capability**, highlight the bearer capability and press **SELECT**.
- To activate call forwarding for **all telephony services**, press **F2 TEL**
- To activate call forwarding for **all bearer services**, press **F3 ALL**.

The following screen is displayed:



- Key-in the Called Party Number (CPN) to which calls will be forwarded, using the key pad.

Choosing the Call Forwarding Type

- Use the *UP* and *DOWN* arrow keys to select the type of Call Forwarding you require:

Call Forwarding Types	
Divert Unconditional	All incoming calls are forwarded.
Divert Busy (ETSI)	Calls are forwarded when the line is busy.
Divert No Reply (ETSI)	Forward calls that are not answered within a certain time (the time is defined by the network).
Divert Conditional (ITR6)	Forward calls that are not answered within a certain time, when the line is busy or when the terminal equipment is absent or out of order.

- Press *SELECT* to send the call forwarding request to the network.

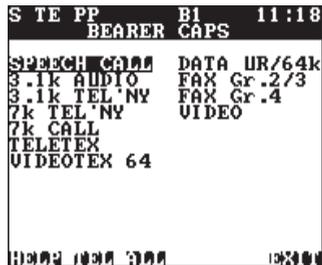
aurora^{Duet} displays a screen to confirm that the network has accepted the call forwarding request.

- Press *F6* to exit from this screen.

Deactivating Call Forwarding

- Choose **REMOVE DIVERSION** from the **SUPP SERVICES** menu.

A bearer capability screen is displayed for the protocol you are using.



You can deactivate call forwarding for a particular bearer capability, for all telephony services or all bearer services.

- To deactivate call forwarding for a **particular bearer capability**, highlight the bearer capability and press **SELECT**.
- To deactivate call forwarding for **all telephony services**, press **F2 TEL**
- To deactivate call forwarding for **all bearer services**, press **F3 ALL**.

To send the deactivate call forwarding request to the network:

- Press **SELECT**.

The request is sent and aurora^{Duet} displays any acknowledgements from the network.

- Press **F6** to exit from this screen.

Testing Services During Call Setup

aurora^{Duet} allows you to test the following supplementary services that operate during call setup:

- User to User Signalling
- Closed User Groups
- Conference Calls

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^{Duet} sends this information to the network along with the call setup request.

User to User Signalling at Call Setup ETSI

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.



Note

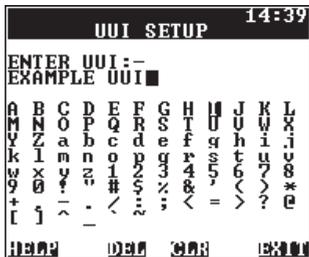
This function sends User to User Signalling type 1 (UUS1), which is information sent as part of the call setup message. There is another type of signalling - UUS3, which can be sent once a call is connected. For details, see *User to User Signalling at Call Connection*, later in this Section.

- Choose **SETUP / SUPP SERVICES** from the Main menu.

The **SUPPLEMENTARY SERVICES** menu is displayed.

- Choose **UUI SETUP**.

The **UUI SETUP** screen is displayed.



- Enter up to 20 characters of UI text.

Use the arrow keys to highlight a character from the display and press *SELECT* to choose it. Use the keypad to enter digits. You can select spaces from the 'blank' characters on the last line of the character display. To erase the last character, press *F3*. To delete all the text, press *F4*.

Selected characters are displayed under **ENTER UI**.

- Press *F6* to send the UI and exit the screen.

Closed User Groups (CUGs)

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^{Duet}, then try to make calls to devices within and outside the CUG.

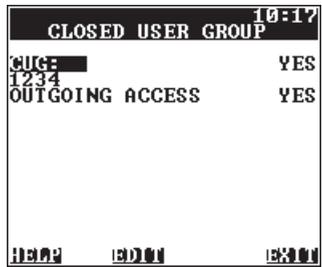
To set up CUG operation on aurora^{Duet}:

- Choose **SETUP / SUPP SERVICES** from the Main menu.

The **SUPPLEMENTARY SERVICES** menu is displayed.

- Choose **CLOSED USER GROUP**.

The **CLOSED USER GROUP** screen is displayed.



- Highlight **CUG** and use the *LEFT* and *RIGHT* arrow keys to toggle between the available options:

Closed User Group	
Yes	A CUG is sent in all Call Setup messages.
No	No CUG is sent
No Index	A CUG is sent with no index; the network uses the default CUG

To enter a new CUG:

- Set **CUG** to **YES** and press *F3* **EDIT**.

aurora^{Duet} enters edit mode and the function keys become the six hexadecimal digits:

F1 = A, *F2* = B, *F3* = C, *F4* = D, *F5* = E and *F6* = F.

- Enter a CUG, using the function keys and the keypad. You can enter four characters (for ETSI) or two characters (00-63, for 1TR6).

The CUG is automatically stored.

To determine whether calls are permitted outside the CUG:

- Highlight **OUTGOING ACCESS** and use the *LEFT* and *RIGHT* arrow keys to switch between **YES** and **NO**.

Select **YES** to permit calls outside the Closed User Group; select **NO** to prevent calls outside the CUG.

Conference Calls

BRI

This service allows up to 10 parties to communicate with one another simultaneously. The Conference Call supplementary service is similar to Three Party Calls, but you activate the Conference Call service *before* you set up a call.

- Choose **SUPP SERVICES** from the Main menu.

The **SUPPLEMENTARY SERVICES** menu is displayed.

- Choose **CONFERENCE CALL**.

aurora^{Duet} sends a request to the network to set up a conference call.

If the request is successful, you are prompted to dial the first party, then up to eight further parties.

Testing Services With a Connected Call

aurora^{Duet} allows you to test the following supplementary services when you have an established connection:

- Call Completion on Busy Subscriber (CCBS)
- Call Hold/Retrieve
- Three Party Calls
- Malicious Call Identification (MCID)
- Call Suspend/Resume (Terminal Portability)
- User to User Signalling (UUS)

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.



Note

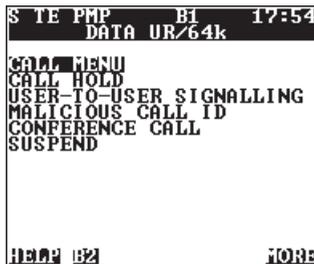
For information on connecting calls, see Chapter 4 Section 1.

To display the list of available supplementary services, from the Call menu:

- Choose **SUPP SERVICE MENU**

The supplementary services menu is displayed:

(ETSI)



Tip

To return to the call menu from here, choose **CALL MENU**.

Call Completion on Busy Subscriber

The CCBS service lets the subscriber, on dialling a busy extension, activate a waiting state, so that when the remote end becomes free the call is re-established.

Once the waiting state is activated, you can continue to make outgoing calls - however, you risk being busy when the remote end is free. During the waiting state the B channel is free.

Activating CCBS

- Highlight **CCBS** in the **SUPPLEMENTARY SERVICE** menu and use the *RIGHT* and *LEFT* arrow keys to select **ON**.

aurora^{Duet} sends a message to the network informing it that it is supporting CCBS.

Testing CCBS

After activating CCBS, you can test its operation as follows:

- Make a call to a busy extension (for information on making calls, see Chapter 4 Section 1).

aurora^{Duet} displays **CCBS activated**. When the remote end becomes free, aurora^{Duet} attempts to re-establish the call.

Call Hold / Retrieve

This service allows the subscriber to interrupt an existing call, connect another on the same channel, then retrieve the original call.

Placing a call on hold

From an existing connected speech call:

- Choose **SUPP SERVICE MENU** from the Call menu.

The supplementary services menu is displayed.

- Choose **CALL HOLD**.

The call is put on hold and the status line displays **CALL ON HOLD**.

Making a new call on the B Channel

- Press **F6** to exit from the supplementary services menu.

aurora^{Duet} displays a Dial screen.

- Make a second call, as normal.

Once you have one call connected and another on hold, you can test Three Party Calls. For details, see later in this section.

Clearing the new call

- Choose **CLEAR CALL**.

The new call is cleared.

- Exit the Dial screen.

aurora^{Duet} returns you to the supplementary services menu.

Retrieving the original call

- Choose **CALL RETRIEVE** from the supplementary services menu.

The held call is retrieved.



Note

If you do not clear down the new call and you select **CALL RETRIEVE**, aurora^{Duet} swaps the new call with the held call - in other words, the held call is retrieved and the new call is placed on hold. You can then proceed with or clear the original call, as normal.

Three Party Calls ETSI

This service allows the subscriber to participate in and control a three-way conversation. To test Three Party Calls, aurora^{Duet} must be emulating a TE and the call type must be voice band.

Connecting a Three Party Call

- Place a connected (second party) call on hold and connect a new call on the B channel (see *Call Hold/Retrieve* earlier in this Section).
- Choose **THREE PARTY CALL** from the supplementary services menu.

aurora^{Duet} sends out a Facility message to the network to request a three-party call. If it is accepted, all three calls are connected and aurora^{Duet} displays a Connect screen showing **CALL MENU** and **END 3 PARTY CALL** options.

Clearing the Three Party Call

- Choose **END 3 PARTY CALL** to clear the third party.
- Choose **RETRIEVE** and **CLEAR** to clear the second party.

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.

From an existing connected call:

- Choose **SUPP SERVICE MENU** from the Call menu. The supplementary services menu is displayed.
- Choose **MALICIOUS CALL ID**.

The ID is used by the network to identify the call.

- Press **F2** to send the request.

Resuming the call

To resume the suspended call:

- Choose **RESUME** from the **SUPPLEMENTARY SERVICES** menu
- Key-in the two-character ID assigned to the call when you suspended it.

See *Suspending a Call* for details on entering the ID.

- Press **F2** to send the request.

The suspended call is resumed.

User to User Signalling at Call Connection ETSI

This service allows the subscriber to send a text message known as User to User Information (or UUI) once a call is connected.



Note

This screen sends User to User Signalling type 3 (UUS3), inside a User Information Message, which is information sent once the call is connected. There is another type of signalling - UUS1, which can be sent as part of the call setup message. For details, see *User to User Signalling at Call Setup*, earlier in this Section.

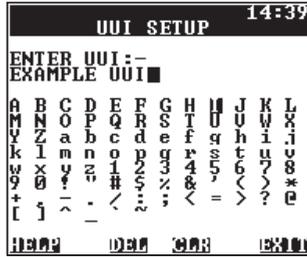
From an existing connected call:

- Choose **SUPP SERVICE MENU** from the Call menu.

The supplementary services menu is displayed.

- Choose **USER-TO-USER SIGNALLING**.

aurora^{Duet} displays the following screen:



For information on entering UII text, refer to *User to User Signalling at Call Setup*, earlier in this Section.



Tip

To check that UII has been sent or received, display the Supplementary Services information screen - see *Displaying Supplementary Services Information* later in this Section.

Advice of Charge (AOC)

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^{Duet} to check the availability and operation of call charging.



Notes

- The way in which aurora^{Duet} sends and displays charging information is determined by the settings in the **CHARGING** Setup menu. See Chapter 3 Section 2.
- To send AOC (incoming calls), aurora^{Duet} must be emulating an NT. To receive AOC (outgoing calls), it must be emulating a TE.

Testing AOC-E

To check AOC-E (Advice of Charge displayed at the end of the call):

- With aurora^{Duet} emulating a TE, make a call then disconnect.

The call must be long enough for charging units to be received - the actual length required depends on the network.

- Press **F3 INF** to display Call Information and check the **RX CHARGE** value is displayed. See *Displaying Information About a Call* in Chapter 4 Section 1.

Testing AOC-D

To check AOC-D (Advice of Charge generated during the call):

- With aurora^{Duet} emulating a TE, make a call.
- Press **F3 INF** to display Call Information and check the **RX CHARGE** value is displayed. See *Displaying Information About a Call* in Chapter 4 Section 1.

Sending charging information manually

To use an aurora^{Duet} to send charging information to a calling unit:

- Set the charging **NT Mode** to **Manual** (see Chapter 3 Section 2). aurora^{Duet} must be emulating an NT.

From the Connect menu:

- Press the **F4 CHG** key. aurora^{Duet} sends a single charge unit to the caller.

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.

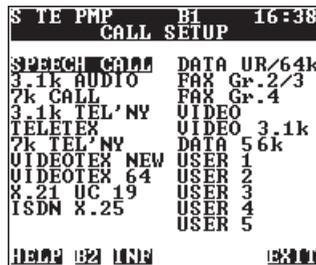
You can use the Keypad before connection or during a test call.

- From an existing connected call, choose **CONNECT KEYPAD** from the Connect menu.

OR

- From the Main menu, when there is no call connected, choose **KEYPAD**.

aurora^{Duet} displays a bearer capability selection screen.



- Highlight the bearer capability you require and press **SELECT**.

If you choose a voice type call, aurora^{Duet} automatically selects the Codec.

- Enter a code of up to 20 characters.

Use the arrow keys to highlight a character from the display and press **SELECT** to choose it. Use the keypad to enter digits, and the * and # keys to enter * or #. To delete the last digit, press **F5**.

- Press **F4 SND** to send the string to the network.

Section 5

Testing in Unattended Mode

This section explains how to set up aurora^{Duet} 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 as you can leave the tester on site and check periodically to see whether the error has occurred.

You can leave aurora^{Duet} unattended and set up a link from another device (e.g. another aurora^{Duet}) to perform BERT or check audio quality. For an incoming speech call aurora^{Duet} sends DTMF tones down the line before applying the loop.



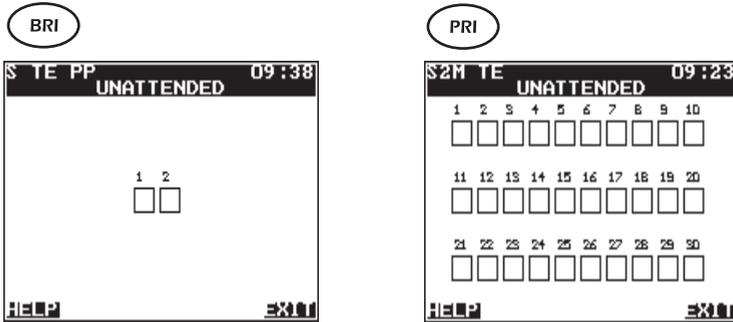
Notes

- You cannot switch between the B-channels in this mode.
- To allow aurora^{Duet} to run in unattended mode its automatic power-off feature is disabled, even if you have enabled it for normal operation.

Starting Unattended Operation

- Ensure the tester has adequate power before leaving it unattended.
- Choose **UNATTENDED** from the Main menu.

The following screen is displayed.



Understanding the Channel Activity Display

Each box on the screen represents a B channel. The following symbols indicate the type of call activity on each channel:

-  A call has been established and a loop applied
-  No activity

- BRI** The B1 and B2 LED indicators are illuminated if there are any active calls.

Clearing a Connection

Clear the connection from the remote unit. Alternatively, to clear a connection from an unattended aurora^{Duet}:

- Press **F6** to exit from unattended mode.

Going Back to Normal Operation

To end unattended operation:

- Press **F6**.

When you exit, aurora^{Duet} clears any active calls.



Chapter 5

Monitoring the Line

Contents

Section 1 - Monitoring an ISDN link.....	5-3
Section 2 - Monitoring a V5 interface	5-26
Section 3 - Testing Layer 1	5-36

Monitoring the Line

This chapter explains how you can use aurora^{Duet} to monitor protocol information or 'listen in' on audio traffic on an ISDN line, in real-time. This feature is particularly useful for on-the-spot troubleshooting.

This chapter also tells you how to set up and monitor the LAPD and V5 protocols, which operate on the V5 interface. Also explained is how to test Layer 1, when monitoring in Primary Rate mode.

This chapter has the following structure:

Section 1 *Monitoring an ISDN Link*

Section 2 *Monitoring a V5 Interface*

Section 3 *Testing Layer 1*

Section 1

Monitoring an ISDN Link

This section describes how to use aurora^{Duet} to monitor activity on an ISDN line. In Monitor mode you only use aurora^{Duet} to receive information, not to transmit.

aurora^{Duet} can monitor on the following types of link:

- Primary Rate
- Basic Rate links at the S interface



Note

For information on setting up aurora^{Duet} to operate on the ISDN, refer to Chapter 3.

Setting up aurora^{Duet} for Monitoring

- Set up aurora^{Duet} in Monitor mode - see Chapter 3 Section 1.

The MON LED glows green and aurora^{Duet} displays the Monitor Main menu. In BRI mode, this is the **S I/F MONITOR MENU**; in PRI mode this is the **MONITOR MENU**.

BRI



PRI



The MON LED glows green when aurora^{Duet} is in Monitor mode.

Before you begin monitoring, you need to determine:

- whether you want aurora^{Duet} 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^{Duet}'s memory or send it to the comms port
- if filters are to be applied to the captured information
- the Idle Code that is used to determine an idle state (absence of activity) on a channel.

Setting an Automatic Start Time

The automatic start feature allows you to leave aurora^{Duet} connected to the line to begin monitoring at a designated time.

To set up aurora^{Duet} to begin monitoring at a specific time:

- Choose **SETUP / GENERAL SETUP** from the Main menu.
- Choose **START TIME**.

The following screen is displayed.



Activating automatic start

- Highlight **AUTO START** and use the *LEFT* or *RIGHT* arrow keys to select **ON**.
- Highlight **START TIME**.

The cursor appears at the start of the value.

- Use the keypad to enter a start time, in 24 hour, HH:MM:SS (hours, minutes and seconds) format.

If you make a mistake, press the *LEFT* arrow key to return to the start of the value.

- Press the *F6* **EXIT** to save the settings and exit the screen.

Deactivating automatic start

- Highlight **AUTO START** and use the *LEFT* or *RIGHT* arrow keys to select **OFF**.

Choosing the Format to Review Protocol Decode

Before you begin a monitor session, you need to decide the format in which you intend to review the information. You can:

- display a simple real-time decode on screen when capturing to aurora^{Duet}'s memory
- store the session in aurora^{Duet}'s memory
- send the information to the serial port in real-time to be analysed using aurora^{Expert} for Windows.

For details, see *Communications Setup* in Chapter 3 Section 3.

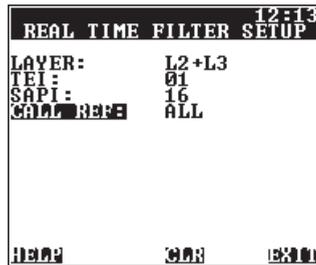
Filtering the Information to be Saved to Memory

You can set up and apply a filter to the information that is to be saved to memory. A filter lets you isolate and capture only the data you are interested in. Using filters also helps to conserve space in aurora^{Duet}'s memory.

To set up and apply a filter:

- From the Main menu, choose **SETUP / REAL TIME FILTER SETUP**

The **REAL TIME FILTER SETUP** screen is displayed.



Filtering on specific layers

To filter data at a specific layer:

- Highlight **LAYER** and, using the arrow keys, toggle between the following options:

Filtering on a specific layer	
L1	Capture only layer 1 information
L2	Capture only layer 2 information
L3	Capture only layer 3 information
L2+3	Capture both layer 2 and layer 3 information

Filtering on a TEI

To capture data for a specific Terminal Endpoint Identifier (TEI):

- Highlight **TEI** and, using the keypad, key-in a TEI value. To capture data for **ALL** TEIs, press **F4**.

TEI values 0 - 127 are valid.

Filtering on a SAPI

To capture data for a specific Service Access Point Identifier (SAPI):

SAPI values 0 - 64 are valid. Values 0, 16 and 63 are commonly used.

- Highlight **SAPI** and, using the keypad, key-in a SAPI value. To capture data for **ALL** SAPIs, press **F4**.

Filtering on a Call Reference

To capture data for a specific Call Reference value:

- Highlight **CALL REF** and, using the keypad, key-in a value. To capture data for **ALL** Call Reference values, press **F4**.

Setting the Idle Code DASS DPNSS ETSI ITR6

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.

- Choose **SETUP / IDLE CODE** from the Main menu.

aurora^{Dnet} displays the following screen:



The first idle code is displayed.

Selecting an idle code

aurora^{Duet} provides eight idle codes. Codes 1 to 4 are preconfigured and cannot be changed; codes 5 to 8 can be used to hold custom idle codes.

To scroll through and select an idle code:

- Use the **F2 NXT** and **F3 PRV** keys to display the next and previous codes.

Preconfigured Idle Codes	
Code 1	01010100
Code 2	00101010
Code 3	00000000
Code 4	01111111

The last idle code displayed is selected and this is saved in memory, even when aurora^{Duet} is switched off.

Defining your own idle codes

- Use the **F2 NXT** and **F3 PRV** keys to select an idle code - you can only edit codes 5 to 8.
- Enter an idle code

The idle code must be eight digits long and binary (a sequence of ones and zeros). To delete the last digit you entered, press **F5 DEL**.

- To save and exit, press **F6**.

Using Call Trace to Trigger Monitoring Automatically

Call Trace allows you to specify a particular condition or event which, when encountered, automatically triggers the capture of data to aurora^{Duet}'s memory.

For example, you might want aurora^{Duet} to automatically capture data when it receives a particular Called Party Number (CPN). You can specify the CPN as the capture trigger - when aurora^{Duet} receives a frame containing the matching CPN, it begins capturing events to memory. You can also filter out unwanted frames and store only those that match your capture trigger.

Call Trace is available in Monitor mode on both Basic Rate and Primary Rate links. It supports the following D Channel protocols:

- ETSI / DSS1
- CorNet N/T
- 1TR6
- TN1R6 N/T
- QSIG (see *Notes for QSIG Users*, below)

Notes for QSIG Users

The Call Trace application supports QSIG *without* segmentation. aurora^{Duet} does not decode QSIG Layer 3 message segments.

What is segmentation?

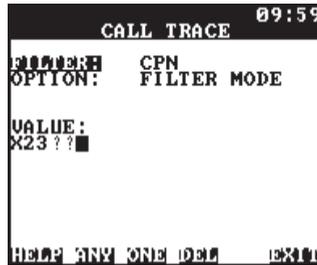
QSIG supports Layer 3 messages which are longer than 260 octets. To send these messages over the line, they must be split into frames called 'segments'. The receiver collects these frames and rebuilds the original message.

Setting up Call Trace

To set up the parameters for the Call Trace Application:

- Choose **SETUP / CALL TRACE** from the Main menu.

The **CALL TRACE** screen is displayed:



Specifying a Capture Trigger

The capture trigger tells aurora^{Duet} the event which, when encountered, triggers the automatic capture of events. To specify the capture trigger:

- Highlight **FILTER** and use the **RIGHT** and **LEFT** arrow keys to toggle between the available options.

The following capture triggers can be set:

Capture Triggers	
L2 DISC	Automatic capture begins each time a Layer 3 disconnect is received by aurora ^{Duet} .
SAPI	Automatic capture begins each time aurora ^{Duet} receives a frame with a matching Service Access Point Identifier. The capture trigger remains active until a Layer 3 disconnect is received or you end the monitor session.
TEI	Terminal Endpoint Identifier. Automatic capture begins each time aurora ^{Duet} receives a frame with a matching TEI. The capture trigger remains active until a Layer 3 disconnect is received or you end the monitor session.
CREF	Automatic capture begins when aurora ^{Duet} receives a frame with a matching Call Reference. When you choose CREF , the F5 DCR function key becomes available. This lets you trigger capture using the dummy call reference. The capture trigger remains active until a Layer 3 disconnect is received, you end the monitor session, or the call is cleared
CPN	When aurora ^{Duet} receives all the frames for a particular Called Party Number (i.e. when a Send Complete information element or a Call Proceeding, Call Alerting or Call Connect message is received) automatic capture begins. The capture trigger remains active until a Layer 3 disconnect is received, you end the monitor session, or the call is cleared
CLI	Automatic capture begins when aurora ^{Duet} receives a frame containing a matching Calling Line Identification. The capture trigger remains active until a Layer 3 disconnect is received, you end the monitor session, or the call is cleared
CAUSE	Automatic capture begins each time aurora ^{Duet} receives a frame containing a matching Call Clearing Cause Code. aurora ^{Duet} then continues to capture and store frames containing the first part of the CPN. If the capture trigger occurred in the last call clearing message, the trigger is immediately cleared; otherwise, the Capture Trigger remains active until a Layer 3 disconnect is received, you end the monitor session, or the call is cleared
B-CHANNEL	Automatic capture begins when aurora ^{Duet} receives a frame containing a matching channel information element. The Capture Trigger remains active until a Layer 3 disconnect is received, you end the monitor session, or the call is cleared
OFF	Call Trace is disabled



Notes

Maximum Number of Triggers:

If aurora^{Duet} receives a frame containing a matching parameter which it cannot reconcile with a currently running trigger, aurora^{Duet} starts a new trigger. The maximum number of triggers which can run at a time is 50.

CPN and Cause Code Capture Triggers:

Due to the way aurora^{Duet} stores frames in its buffer, it may not be able to trace back to the Setup message which signals the start of the call. Therefore, in some cases, data may be lost.

B-Channel Capture Trigger:

Automatic capture is triggered as soon as a matching B Channel value is received. Therefore, capture is still triggered even if the actual channel used for the call changes. Automatic capture is also triggered if, later in the call establishment procedure, a call is assigned to a channel which matches the B Channel trigger. The following examples illustrate this:

Example 1 - you specify a capture trigger of B Channel 2: aurora^{Duet} receives a Setup message for B Channel 2 and automatic capture is triggered. However, this channel is unavailable and the call is established on B Channel 1 - automatic capture is still triggered.

Example 2 - you specify a capture trigger of B Channel 2: A call is received for B Channel 1, but this channel is unavailable, so the call is assigned to B Channel 2 and the capture trigger is activated.

Setting the value of the Capture Trigger

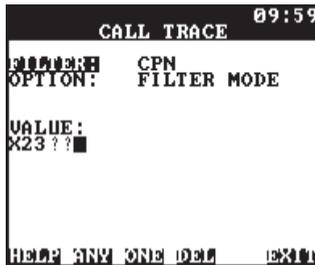
For some capture triggers, you need to specify a value -

e.g. a particular CPN. When a capture trigger requires a value, the **VALUE** line is displayed.

- Enter the value of the capture trigger, using the keypad.

If you make a mistake, use the **F4** function key to delete the last digit.

The following example shows the setting of a particular CPN value:



Using Wildcards

You can use wildcard characters to denote 'any character' or 'any combination of characters'. This is useful, for example, if you want to specify only the first few digits of a CPN.

To denote 'any character':

- Press **F3 ONE** to display **?**

To denote 'any combination of characters':

- Press **F2 ANY** to display **X**.

For example, if you enter **X23??**, aurora^{Duet} begins automatic capture when it encounters the following

values:

- 2310
- 1232399
- 02345
- 232300

However, the following values will not trigger automatic capture:

- 123456 (i.e. too many digits after the '23')
- 089123 (i.e. no digits after the '23').

Choosing a Filter Option

Filtering conserves space in aurora^{Duet}'s internal memory. To filter out unwanted frames and store only those that match your specified capture trigger:

- Highlight **OPTION** and use the *RIGHT* and *LEFT* arrow keys to toggle between the following options:

Filter Options	
Filter Mode	aurora ^{Duet} only stores frames which match the specified filter value, or which can be matched to an active, running capture trigger
Monitor Mode	aurora ^{Duet} stores all received frames, once a trigger is active



Note

If you select either **FILTER MODE** or **MONITOR MODE** and you exit from the **CALL TRACE** screen, the monitor trace output is automatically set to **TRACER: TO MEMORY**. Call Trace does *not* support output in **EXPERT TO COMMS** mode.

Monitoring Using Call Trace

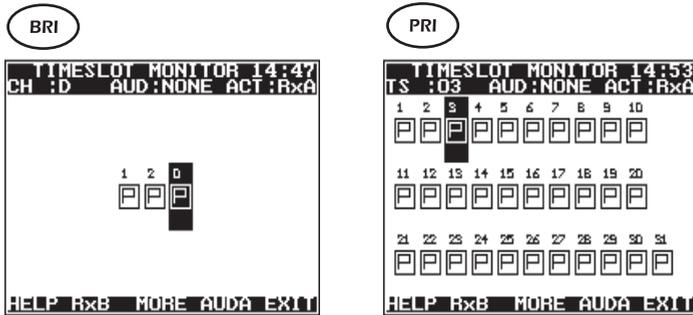
Once you have set up call trace, you are ready to begin

monitoring calls using aurora^{Duet}. The remainder of this section describes how to set up and begin a monitor session.

Setting up a Monitor Session

- Connect aurora^{Duet} to the line for monitoring - see Chapter 2 for details.
- Choose **MONITOR** from the Monitor Main menu.

The **TIMESLOT MONITOR** screen is displayed:



Understanding the Channel Activity Display

In PRI mode, 31 boxes are displayed corresponding to the 30 primary rate channels and the signalling channel. In BRI mode, 3 boxes are displayed corresponding to the 2 B channels and the signalling channel. The channel number is displayed above each box.

aurora^{Duet} looks for the presence of an idle pattern on each channel to determine the status. The status is then indicated by a symbol displayed within the box.

The symbols have the following meanings:

- An idle channel. A constant idle pattern, matching the selected idle code, is detected on the channel.

-  An active channel. Constant data, which is not an idle pattern, is detected on the channel.
-  A flickering symbol represents an active channel in which non-constant data, which does not match the selected idle code, is detected.

Choosing the Receive Direction - RxA and RxB

You can change the receive direction for which channel activity is displayed. When you first switch to Monitor mode, the connection is always **RxA**.

- Press **F2 RxA/B**.

The current receive direction is displayed at the top right of the screen.

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 **NONE**.

- Press **F5** to switch between **AUD A**, **AUD B**, **BOTH** and **NONE**.

The current selection is displayed at the top of the screen.

Changing the Audio Setting

You can change the audio setting to switch between the speaker and the headset. You can also adjust the volume of the headset and speaker.

- Press **F4 MORE** to display additional function key options.

The function key display changes.

- To switch from speaker to headset, press **F3 HSET/**

SPKR

- To increase the volume of the headset/speaker, press **F2VOL+**
- To decrease the volume of the headset/speaker, press **F5VOL-**
- To switch to the previous set of function keys, press **F6EXIT**.

Selecting a Timeslot for Monitoring

- Use the arrow keys to highlight a timeslot.

The current timeslot number is displayed at the top left of the screen.

- Press **SELECT** to capture monitor data from the current timeslot.

The **MONITOR SESSION** screen is displayed.

```

CH:01   FRAMED   15:49
MONITOR SESSION
ENTER SESSION NAME:-
SESS4█
SESS TYPE D Channel
A B C D E F G H I J K L
M N O P Q R S T U V W X
Y Z 1 2 3 4 5 6 7 8 9 0
HOME SES DEL START EXIT
  
```

- Enter a name for the monitor session, up to 8 characters in length.

Use the arrow keys to highlight a character and press **SELECT** to choose it. Use the keypad to enter digits. To delete a character, press **F3 DEL**.

If you do not enter a monitor session name, aurora^{Duet} automatically assigns the name: *Snn* (where *nn* is the

existing number of stored sessions plus 1).

Assigning Session Parameters

To choose the type of monitor session:

- Press **F2 SES** from the **MONITOR SESSION** screen.

The session parameters are displayed.

```

CH:01   FRAMED   15:51
MONITOR SESSION
SESSION NAME:SESS4
SESS TYPE   D Channel
PROTOCOL:   ETSI-X25
TRACER:     TO MEMORY
MODE:       WRAP

HELP NAME   START EXIT
    
```

Choosing the type of monitor session

- Highlight **SESS TYPE** and use the **LEFT** or **RIGHT** arrow keys to toggle between the following options:

Session Type	
Option	Description
B Channel	Monitor and capture B channel signalling information
D Channel	Monitor and capture D channel signalling information.
C Channel	Monitor and capture V5 C channel signalling information.



Note

D Channel is applicable to ISDN; **C Channel** is applicable to V5.

Selecting the Protocol

Use the **PROTOCOL** option to select the protocol for the

monitor session. The options available depend on the Session Type you selected - e.g., if you select a session type of B-Channel, only B channel protocol options are available.

- Highlight **PROTOCOL** and use the *LEFT* or *RIGHT* arrow keys to toggle between the available options.



Note

LAPB has two modes of operation - LAPB modulo 8 and LAPB modulo 128. If you select a session type of B-Channel, the following options are displayed:

LAPBX25_8 and **LAPBX25_128**. Select the option appropriate to the link you are monitoring.



Note for Remote Control users

If you are using Remote Control to operate aurora^{Duet}, the following ISDN protocols *cannot* be selected from the D channel **PROTOCOL** menu.

- TPH 1856
- TPH 1962
- Spectrum B Stimulus
- Spectrum B Functional

Selecting the protocol tracer output

Use the **TRACER** option to select the format in which you wish to output and store the information. For information about the tracer options, refer to *Configuring Protocol Tracer Output* in Chapter 3 Section 3.

Choosing the memory mode

Use the **MODE** option to specify how aurora^{Duet} should handle the storage of data in its memory - see *Choosing What Happens When Memory is Full* in Chapter 3 Section 3.

Changing the session name

- To change the session name, press **F2 NAME** to

toggle to the session name display.

Starting the Monitor Session

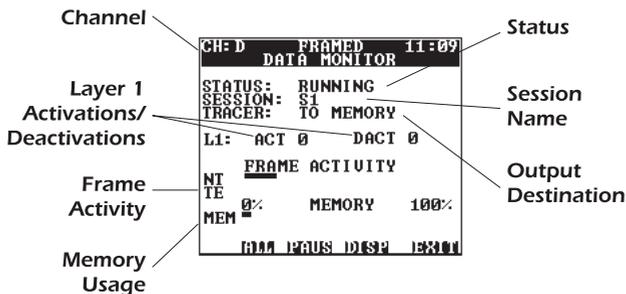
- Press **F5 START** to begin the monitor session.

The monitor session begins and aurora^{Duet} displays the **DATA MONITOR** screen:

If you have set an automatic start time

If you have set up an automatic timed start for monitoring (see *Setting an automatic start time* earlier in this chapter), and you press **F5** to start a session, aurora^{Duet} does not begin the monitor session. It displays: **STATUS: START hh:mm:ss**, where hh:mm:ss is the time the monitor session will begin.

Understanding the Data Monitor Screen



Channel the channel selected for monitoring

Status the current status of the data monitor: **PAUSED**, **RUNNING** or **START**. If a protocol other than the one specified is being monitored, **WRONG PROTOCOL** is displayed. If a filter is applied, **FILTERING** is displayed. **CALL TRACE AP** is

	displayed if the Call Trace application has been triggered.
<i>Session Name</i>	the session name you entered.
<i>Output Destination</i>	where monitor output is sent. TO MEMORY means data is stored in aurora ^{Duet1} 's memory; EXPERT TO COMMS means data is sent to the comms port in aurora ^{Expert} format - see <i>Configuring Protocol Tracer Output</i> in Chapter 3 Section 3.
<i>Layer 1 Activations/Deactivations</i>	the number of Layer 1 activations and deactivations during the monitor session.
<i>Frame Activity</i>	two bar graphs, one for NT and one for TE, indicate activity on the line. While a connection is successful, a continuous line is displayed. If a connection fails the bar graph line stops.
<i>Memory Usage</i>	bar graph representing the amount of aurora ^{Duet1} 's memory currently used. This is only displayed when the Tracer is set TO MEMORY .

Displaying Decode During a Monitor Session

During a monitor session, to display a simple, decode of the protocol information in real-time (i.e. as it occurs):

- Press **F4 DISP** to display the decode.

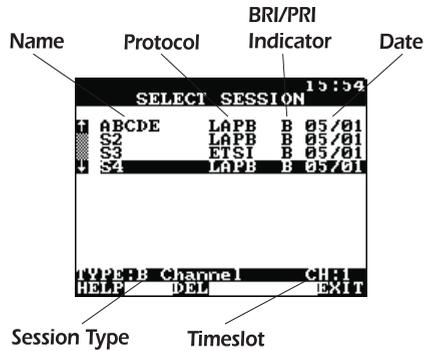
Reviewing a Stored Monitor Session

Up to 20 monitor sessions can be stored in aurora^{Duet}'s memory, up to the memory's capacity.

Displaying a List of Stored Sessions

- Choose **MONITOR REVIEW** from the Monitor Main menu.

The **SELECT SESSION** screen displays a list of sessions stored in aurora^{Duet}'s memory.



The Protocol indicator tells you the protocol associated with the stored session. The BRI/PRI indicator shows whether the session is Primary or Basic rate.

The bottom of the screen displays the session type and timeslot associated with the currently highlighted session:

- TYPE** indicates the session type: B Channel, D Channel or C Channel
- CH** indicates the monitored timeslot (e.g., for basic rate this may be 1, 2 or D; for primary rate this may be 1 - 31 or D).

- Highlight a session and press **SELECT**.

aurora^{Duet} displays the **MONITOR REVIEW** menu.



Note

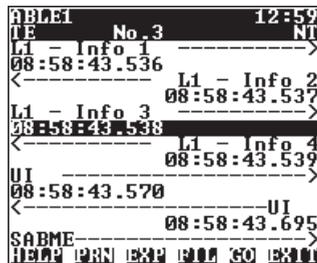
To return to the previous screen, choose **SELECT SESSION**.

Displaying the Decode

To display a simple decode of the protocol information:

- Choose **DISPLAY DECODE** to display the simple decode.

A screen similar to the following is displayed:



Tip

For an explanation of the decode, how to navigate through it and download it to a PC or printer, refer to Chapter 6.

Deleting a Stored Monitor Session

To delete a stored monitor session from aurora^{Duet}'s memory:

- Choose **MONITOR REVIEW** from the Monitor Main menu.
- Highlight the session you wish to delete and press **F3 DEL.**

The monitor session is deleted.

Clearing Monitor Memory

To clear the monitor memory of all stored sessions:

- Choose **CLEAR MEMORY** from the Monitor Main menu.

Section 2

Monitoring a V5 Interface PRI

This section describes how to monitor activity on a V5 interface.

aurora^{Duet} automatically detects which form (V5.1 or V5.2) is running, and provides a full decode of every message type and information element for all V5 communication protocols within a C-channel. It can detect and decode ISDN signalling frames that are transferred across the V5 interface within a C-channel.



Note

For ISDN LAP-D aurora^{Duet} lists all information element types and provides limited detail on specific information elements.

aurora^{Duet} also has a Protocol Scan facility which detects which protocols are present within the C-channels.

Beginning V5 Operation

If your aurora^{Duet} was operating in V5 Monitor mode when it was last switched off, the **V5 MONITOR** menu is automatically displayed when you switch the unit back on. Otherwise, to select V5:

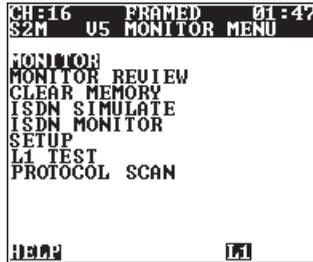
- Choose **V5 MONITOR** from the Main menu.



Note

Although you can select **V5 MONITOR** from the Main menu in both Basic and Primary Rate modes, the V5 interface is only supported on the Primary Rate interface. When you select it during Basic Rate operation, aurora^{Duet} automatically switches to Primary Rate mode.

aurora^{Duet} displays the **V5 MONITOR** Main menu.



Setting up V5 Operation

- From the **V5 MONITOR** Main menu, choose **SETUP**.

The **MAIN SETUP** menu is displayed.

- Choose **V5 SETUP** to configure aurora^{Duet} for the V5 interface.

Only the set up options relevant to V5 operation are displayed - see Chapter 3 for information on setting up aurora^{Duet}.

Choosing the Format to Review the Decode

Before you begin a V5 monitor session, you need to decide the format in which you intend to review the information.

As with ISDN monitoring, you can:

- display a simple real-time decode on screen
- store the session in aurora^{Duet}'s memory
- send the information to the serial port in real time to be analysed using aurora^{Expert} for Windows.

For details, see *Communications Setup* in Chapter 3 Section 3.

Filtering the Information to be Saved to Memory

You can set up and apply a filter to the information that is to be saved to memory. A filter lets you isolate and capture only the data you are interested in. Using filters also helps to conserve space, if you are capturing data to aurora^{Duet}'s memory.

To set up and apply a filter:

- Choose **REAL TIME FILTER SETUP** from the **MAIN SETUP** menu.

The **REAL TIME FILTER SETUP** screen is displayed - see *Filtering the Information to be Saved to Memory* in Section 1 of this Chapter. The filters that are specific to V5 are described below.

Filtering for specific V5 protocols

- In the **REAL TIME FILTER SETUP** screen, select **L3 PROTOCOLS**.

aurora^{Duet} displays a list of the Layer 3 protocols which you can filter in or out of the stored information.



Note

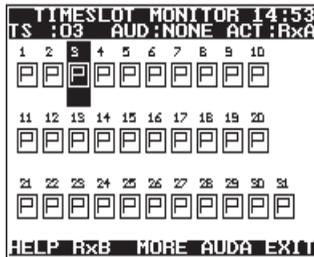
Refer to the *V5 Filters* table on page 5-30 for information on these filters.

- To filter a particular protocol in or out, highlight it and press the **LEFT** and **RIGHT** arrow keys to switch between **FILTER IN** (include information on this protocol) and **FILTER OUT** (do not include the information).

Beginning a V5 Monitor Session

- Connect aurora^{Duet} to the line for monitoring - see Chapter 2 for details.
- From the main **V5 MONITOR** menu, choose **MONITOR**.

aurora^{Duet} displays the **TIMESLOT MONITOR** screen.



Note

You set up a monitor session for V5 in the same way as for ISDN line monitoring. For a full explanation, see Section 1 of this Chapter.

Displaying Decode in Real-time

To display a simple decode of the information on screen (i.e. a single line description of each message type):

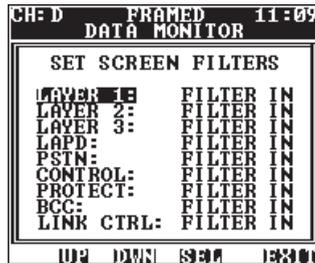
- Press **F4 DISP** to display the decode. Press **F4** again to toggle back to the previous display.

Applying filters to the real-time display

To filter the layers and protocols displayed on the screen in real time:

- Press **F2 FIL**.

aurora^{Duet} displays the following menu:



- To highlight an option, press **F2 UP** and **F3 DWN**.
- To filter information in or out, press **F4** to toggle between **FILTER IN** (include information) and **FILTER OUT** (do not include information).

The options are as follows:

V5 filters	
Layer 1	All layer 1 indications only
Layer 2	All layer 2 frames, regardless of protocol
Layer 3	All layer 3 messages, regardless of protocol
LAPD	ISDN protocol only
PSTN	PSTN protocol only
Control	V5.x node control messages only
Protect	V5.2 node switch-over protection messages only
Bcc	V5.2 Bearer Channel Connection messages only
Link Ctrl	V5.2 Link Control messages only



Note

These filters specify the information which appears on the real-time display - they do not affect the information that is being stored to memory. If you wish to filter the information to be stored during a monitor session, you need to set up the filters before you begin the session. For details, see *Filtering the Information to be Saved to Memory* earlier in this Section.

Scanning the Channels for V5 Protocols

You can scan selected channels for the presence of the following communications protocols:

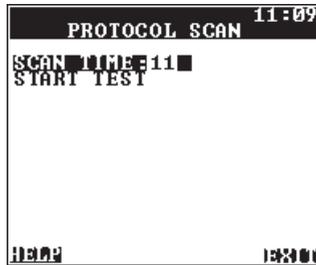
- ISDN D channel signalling
- X.25 protocol
- V5 PSTN signalling
- V5 Control protocol
- V5 BCC protocol
- V5 Protection protocol
- V5 Link Control protocol

Setting the Channel Scan Time

To select the length of time you want to scan each channel for the presence of the protocols and/or data activity:

- From the main **V5 MONITOR** menu, select **PROTOCOL SCAN**.

The **PROTOCOL SCAN** screen is displayed.



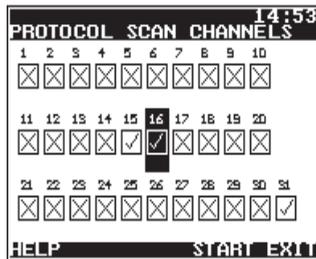
- Highlight **SCAN TIME**. Use the number keys to enter a new scan time, in seconds.

To erase the current scan time, press the *LEFT* arrow key.

Starting the test

- Highlight **START TEST** and press *SELECT*.

aurora^{Duet} displays a screen in which to select the channels to be scanned.



Selecting the Channels for the Protocol Scan

The channel selection screen above shows a series of boxes representing the channels. A tick in the channel box indicates that the channel is currently selected for scanning; a cross indicates that it is not selected.

- To select/deselect a channel from the scan, highlight it and press *SELECT*.

To Start Scanning

- Press **F5 START** to begin scanning.

aurora^{Duet} begins the scan, monitoring each selected channel in turn for the number of seconds you have specified (see *Setting the Channel Scan Time*). While the scan is in progress, aurora^{Duet} displays the channel screen. The channel currently being scanned is highlighted.

When aurora^{Duet} has finished scanning a channel, the channel box indicates the results of the scan. For details of the results, see *Understanding the Scan Results* later in this Section.

Stopping the Scan Part Way Through

To stop the scan before it finishes and display the results for the channels that have been tested:

- Press **F6 EXIT**.

aurora^{Duet} stops scanning. The screen displays the results for the channels that have been scanned. For details, see *Understanding the Scan Results*.

Any channels which you had selected for scanning, but which had not been scanned at the time you stopped the test, are marked with a cross.

Understanding the Scan Results

When aurora^{Duet} has finished scanning a channel, the results of the scan are displayed in the channel box in symbol form, as follows:

- ✓ Channel had data activity which matched at least one of the protocols for which aurora^{Duet} was scanning. You can display a list of the protocols which have been detected - see the following for details.

- ⏏ Channel had data activity, but it did not match any of the protocols for which aurora^{Duet} was scanning.
- Channel was 'idle' - no data was detected.
- ✘ Channel was not tested.

Sending the results to the serial port

To send the channel results display to the comms port:

- Connect aurora^{Duet} to a PC or printer - see Chapter 3 Section 3.
- Press **F2 PRN**.

Listing the protocols detected on a channel

To see more information about the results for a specific channel:

- Highlight the channel box and press **SELECT**.

aurora^{Duet} displays text related to the test results, as follows:

- If data for one or more of the V5 protocols was present on the channel, the screen displays a list of the protocols that were detected.
- If the channel was not tested, or no data was detected, or data was detected for a protocol other than those for which aurora^{Duet} was scanning, a message is displayed.

Reviewing a Stored V5 Monitor Session

To review a V5 monitor session which has been stored in aurora^{Duet}'s memory:

- Select **MONITOR REVIEW** from the **V5 MONITOR** menu

The **SELECT SESSION** menu is displayed which lists the sessions stored in memory.

SELECT SESSION						11:09
I	S1	U5	P	22/06		
	S2	ETSI	P	04/06		
	S3	U5	P	06/06		
L	S4	ETSI	B	02/07		
CHANNEL MONITORED = 16						
HELP		DEM		EXIT		

For information refer to *Reviewing a Stored Monitor Session* in Section 1 of this Chapter.



Note

When aurora^{Duet} is operating in V5 Monitor mode, you can review the contents of either V5 or ISDN monitor sessions. However, you can only review a V5 monitor session file when aurora^{Duet} is operating in V5 Monitor mode.

Section 3

Testing Layer 1



This section describes how to test Layer 1, when aurora^{Duet} is in PRI mode. You can test Layer 1 when monitoring either an ISDN link or a V5 interface.

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.

- Choose **L1 TEST** from the Monitor Main menu.



Setting up the Layer 1 Test

To specify whether the test results are sent to the communications port or saved in memory:

- Highlight **DESTINATION** and use the arrow keys to toggle between **MEMORY** and **COMMS**.



Note

If there are fewer than ten Layer 1 test sessions currently stored in the memory, the destination is automatically set to **MEMORY**.

Printing Layer 1 Information Automatically

If the destination is set to **COMMS**, you can set up aurora^{Duet} to automatically print Layer 1 errors as they occur, or at specified intervals.

- Highlight **PRINT** and use the arrow keys to toggle between the following options:

Layer 1 Print Options	
Off	No Layer 1 errors are printed
On Error	Layer 1 errors are printed as they occur
Every HH:MM:SS	Layer 1 errors are printed at specified intervals. Key-in the interval in HH:MM:SS (hours, minutes and seconds) format. The default is every 10 seconds.

Starting the Layer 1 Test

To start the test:

- Highlight **START TEST** and press **SELECT**.

Assigning a Session Name

When you start a Layer 1 test, if the destination is set to **MEMORY**, you are prompted to enter a name for the test session. The **L1 TEST SESSION NAME** screen is displayed.

```

CH:D          FRAMED    17:38
L1 TEST SESSION NAME
SESSION NAME:
█
A B C D E F G H I J K L
M N O P Q R S T U V W X
Y Z 1 2 3 4 5 6 7 8 9 0
HOME      DEL      START  EXIT
  
```

- Key-in a session name up to eight characters long. Use the arrow keys to highlight a character and press **SELECT** to choose it. Use the key-pad to enter numeric digits.

The session name you enter is displayed under **SESSION NAME**. If you make a mistake, press **F3** to erase the last character.

- Press **F5** to start the test.



Notes

- If you do not enter a session name, aurora^{Duet} automatically assigns the name *Snn* (where *nn* is the existing number of stored sessions, plus 1. For example, S10).
- If there are already ten sessions stored, aurora^{Duet} displays the message **NO SESSIONS AVAILABLE**. Before you can store another session you must delete one of the previous sessions from the **L1 TEST RESULTS** screen - see *Deleting Layer 1 Test Results from Memory*, later in this section.

When the Test Begins

When the Layer 1 test begins, the **LAYER 1 RESULTS** screen is displayed.

CH:D	FRAMED 14:14			
Layer 1 Results				
	alarm		errors	
	RxA	RxB	RxA	RxB
NOS	M	M	0	0
AIS	n	n	0	0
LOS	M	M	0	0
RAI	n	n	0	0
CRC			0	0
E			0	0
SLIP			0	0
FAS			0	0
HDB3			0	0
RUN TIME			000:00:10	
PRN				██████

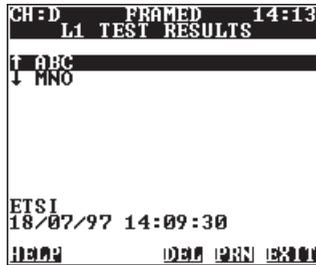
For an explanation of the Layer 1 test results, refer to *Understanding Layer 1 Alarms and Counters* in Chapter 4 Section 2.

Displaying Stored Layer 1 Test Results

To display, print or delete the results of Layer 1 test sessions which are stored in aurora^{Duet}'s memory.

- Choose **RESULT** from the **L1 TEST** menu.

The Layer 1 test sessions currently stored in aurora^{Duet}'s memory are displayed:



- Highlight the test session you want to display results for

At the foot of the screen, aurora^{Duet} indicates the protocol (e.g. ETSI), date and time associated with the currently highlighted session. **V5** is displayed against any V5 results.

- Press **SELECT**.

The **LAYER 1 RESULTS** screen is displayed.



For an explanation of the Layer 1 test results, refer to *Understanding Layer 1 Alarms and Counters* in Chapter 4 Section 2.

Printing Layer 1 Test Results

- First, connect aurora^{Duet} to a suitable printer - see Chapter 3 Section 3.

Printing Results During a Test

To print test results during a test:

- Press **F1 PRN**.

Printing Results Stored in Memory

To print test results which are stored in aurora^{Duet}'s memory:

- In the **L1 TEST RESULTS** screen, highlight the test session you want to print and press **F5 PRN**. Alternatively, when the results are displayed in the **LAYER 1 RESULTS** screen, press **F1 PRN**.
-

Deleting Layer 1 Test Results from Memory

To delete test results:

- Choose **RESULT** from the **L1 TEST** menu.

The Layer 1 test sessions currently stored in aurora^{Duet}'s memory are displayed.

- Highlight the test session you want to delete and press **F4**.

The test session is deleted.



Chapter 6

Analysing Protocol Decode

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Analysing Protocol Decode

This chapter explains how to review and interpret the protocol information captured during testing or monitoring. Both ISDN and V5 protocol information are described.

Protocol information is transmitted in raw binary format. aurora^{Duet} can decode this information to identify the different messages it contains.

You can then analyse the decode and check whether specific information has been transmitted, search for problems and so on.

Displaying Protocol Decode

In both Monitor and Simulate modes, decode is captured to aurora^{Duet}'s memory, by setting the Tracer **TO MEMORY** - see Chapter 3 Section 3. Up to 20 Monitor sessions can be stored in memory; only the most recent decode captured during a Simulate test session is stored.

The way you display decode depends on whether you are operating in Simulate or Monitor mode.

Monitor

In Monitor mode, during a monitor session, to display decode on-screen, in real-time (i.e. as it occurs):

- Press **F4 DISP** in the **DATA MONITOR** screen.

Monitor

To review a stored Monitor session:

- Choose **MONITOR REVIEW** from the Monitor Main menu.
- Choose the session you want to review
- Choose **DISPLAY DECODE**.

Simulate

To review the most recent decode captured during a Simulate test session:

- Choose **CAPTURE REVIEW** from the Main menu.
- Choose **DISPLAY 'D' DECODE**.

Understanding the Decode Display

Two levels of decode are available - Simple and Full.

Simple Decode

Simple decode shows basic information about Layer 1, Layer 2 and Layer 3 events, with a timestamp at the top right of the screen.

```

ABLE1                               12:59
TE      No. 3                        NI
L1 - Info 1 ----->
08:58:43.536
<----- L1 - Info 2
                                08:58:43.537
L1 - Info 3 ----->
08:58:43.538
<----- L1 - Info 4
                                08:58:43.539
UI ----->
08:58:43.570
<----- UI
                                08:58:43.695
SABME ----->
HELP PRN EXP F10 GO EXIT

```

Full Decode

Full decode shows the message type, together with a timestamp. All incoming and outgoing ISDN messages and Layer 1 events are decoded.

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.

```

FULL DECODE 15:23
N<T 15:20:29.684 Fr.5
L2: Sapi=63 Tei=127
   UI
   pf=0
ID REQUEST
Ai=127 Ri=12362
FC FF 03
N>T 15:20:29.730 Fr.6
L2: Sapi=63 Tei=127
   UI
   pf=0

```

What the Arrows Signify

An arrow is displayed against each event to indicate where it was *received*. In the following example, an Info message was received at the network end:

```

ABLE1 12:59
TE No.3 NT
LI - Info 1 ----->
08:58:43.536

```



Note

No arrows are displayed against LFA and LOS alarms which are received.

About the naming of the endpoints

BRI

The endpoints of the links are **TE** and **NT**, as in the above example.

PRI

In PRI mode, it is not always possible to distinguish between NT and TE, so the endpoints of the links are **RXA** and **RXB**. If sufficient layer 2 information is received, aurora^{Duet} indicates if the event was received at the **USR** (user) or **NET** (network) side of the protocol. This is shown in the following example:

```

TEST                               15:55
RXA:Ulr No.3                       RXB:Net
RR ----->
15:51:11.668
SETUP (CR 1)---->
15:51:16.130
RR ----->
15:51:16.561
CONNECT ACK (CR 1)---->
15:51:17.957
RR ----->
15:51:26.700
RELEASE (CR 1)---->
15:51:26.721
RR ----->

```

DASS**DPNSS**

When you are using the DASS protocol, the endpoints of the links are ET and PBX; with the DPNSS protocol, the endpoints of the links are PBXA and PBXB.

Switching Between Simple and Full Decode

To toggle between Full and Simple decode:

- Press the **F3 EXP / SIM** function key.

Navigating Through the Decode

The following tells you how to navigate through the display, regardless of whether Full and Simple decode is displayed.

To scroll downwards through the data one line at a time:

- Press the **DOWN** arrow key.

To scroll upwards through the data one line at a time:

- Press the **UP** arrow key.

You can also scroll through the data using the following keys:

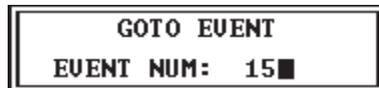
Navigation Keys	
Key	Function
1	Displays the first event
2	Displays the previous event
3	'Pages up'
7	Displays the last event
8	Displays the next event
9	'Pages down'
*	Sets up display markers - see <i>Using File markers</i>
#	Accesses marked events- see <i>Using File markers</i>

Displaying a Particular Event

To go to a specific event number:

- Press *F5* **GO**.

The **GOTO EVENT** pop-up box is displayed.



- Key in the event number. Use the *LEFT* cursor key to delete any existing values.
- Press *F6* to exit the pop-up box.

The event is displayed.

Using File Markers

aurora^{Duet} lets you apply markers to events saved in memory, so that you can quickly display them at a later stage. Up to nine markers may be set.



Note

All markers are deleted when you exit the decode display screens.

Setting a marker

- Highlight a line of the appropriate event's decode and press the asterisk key *****.

The **SET MARKER** pop-up box is displayed.

SET MARKER	
1: 13	6: Empty
2: 16	7: Empty
3: Empty	8: Empty
4: Empty	9: Empty
5: Empty	

If a marker has been set, an event number is displayed against it - in the above example, marker 1 contains event 13. **Empty** is displayed next to unused markers.

- Key in the number of the marker to be used to store the event number.

If the marker already contains a value, this is overwritten.

For example, to store event 4 in marker number 3, highlight a line of event 4's decode and key-in '*3'.

Displaying an event using a marker

To go to a marked event:

- Press the hash key **#**.

The **GOTO MARKER** pop-up box is displayed.

GOTO MARKER	
1: 13	6: Empty
2: 16	7: Empty
3: Empty	8: Empty
4: Empty	9: Empty
5: Empty	

- Key-in the number of the marker associated with the event you wish to display.

The event is displayed.

Using the example above, to display event number 16, enter '#2'.

Printing an Extract of Events

To print out an extract of the decode.

- Connect aurora^{Duet} to a printer - see Chapter 3 Section 3.
- Press **F2 PRN**.

The **PRINT** pop-up box is displayed.



- In **From Event**, key in the number of the first event from which you wish to print. In **To Event**, key in the number of the event where you wish to stop printing.

To erase the last digit entered, use the **LEFT** arrow key.

- To exit the pop-up box and print the information, press **F6**.

Applying a Filter ~~DASS~~ ~~DPNSS~~ ~~V5~~

Filters let you isolate the data you are interested in.



Notes

- For **V5**, see *Applying a Filter to V5 Decode* in this Chapter.
- Note that all filters are deleted when you exit the decode display screens.

To set up and apply a filter to the decode:

- Press **F4 FIL**.

The **SET FILTERS** pop-up box is displayed.

```

SET FILTERS
LAYER:      2+3
TEI:       ALL
SAPI:      0
CALL REF:  ALL

```

Filtering on Specific Layers

To filter data at a specific layer:

- Highlight **LAYER** and, using the function keys, toggle between the following options:

Layer Function Keys	
Key	Function
F1	Display information for all layers
F2	Display both Layer 2 and Layer 3 information
F3	Display only Layer 3 information
F4	Display only Layer 2 information
F5	Display only Layer 1 information

Filtering on a TEI

To filter on a specific Terminal Endpoint Identifier (TEI):

- Highlight **TEI** and, using the keypad, key-in a TEI value. To capture data for **ALL** TEIs, press **F1**.

Filtering on a SAPI

To filter on a specific Service Access Point Identifier (SAPI):

- Highlight **SAPI** and, using the keypad, key-in a SAPI value. To capture data for **ALL** SAPIs, press **F1**.

Filtering on a Call Reference

To filter on a specific Call Reference value:

- Highlight **CALL REF** and, using the keypad, key-in a value. To capture data for **ALL** Call Reference values, press **F1**.

Applying a Filter to V5 Decode V5

You can apply filters to V5 decode to isolate specific message group. The filters available differ to those for ISDN protocols.

- In the decode display, press **F4 FIL** to display the **SET FILTERS** pop-up box.



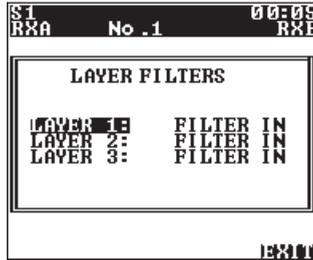
- Highlight the type of filter you wish to apply and press **SELECT** to display a list of filters of that type.

Filtering for Specific Layers

To display information for specific ISDN or V5 layers.

- Choose **LAYERS** as the filter type.

aurora^{Duet} displays the following pop-up box:



- Highlight each layer and use the *LEFT* and *RIGHT* arrow keys to switch between **FILTER IN** and **FILTER OUT**, as required.
- Press *F6* **EXIT** to return to the main **FILTERS** pop-up box.

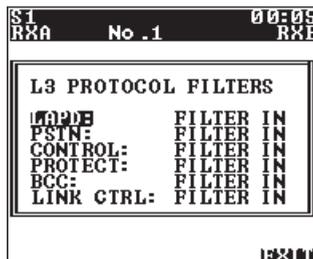
The filters you choose remain in operation until you exit the decode display, then they return to their default settings - all layers filtered in.

Filtering for Specific Layer 3 Protocols

To display information for specific Layer 3 protocols: i.e. ISDN LAP-D frames or any of the V5 communication protocols:

- Choose **L3 PROTOCOLS** as the filter type.

aurora^{Duet} lists the different protocols - see the table of V5 *Filters* in Chapter 5 Section 2.



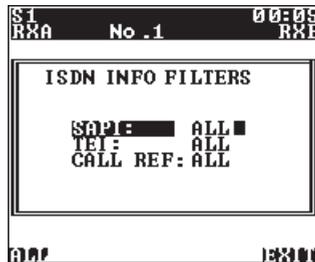
- Highlight each protocol type and use the **LEFT** and **RIGHT** arrow keys to switch between **FILTER IN** and **FILTER OUT**, as required.
- Press **F6 EXIT** to return to the main **FILTERS** menu.

The filters you choose remain in operation until you exit the decode display, then they return to their default values - all protocols filtered in.

Filtering for SAPIs, TEIs and Call References

To display ISDN LAP-D frames for specific SAPI, TEI and call reference values:

- Choose **ISDN INFO** as the filter type.
- aurora^{Duet} displays the following pop-up box:



For information on filtering on SAPIs, TEIs and call reference values, see *Applying a Filter*, earlier in this Chapter.

The filters you choose remain in operation until you exit the decode display, then they return to their default values - all SAPIs, TEIs and call references.



Note

These filters do not affect the display of any V5 information: they only apply to the ISDN LAP-D frames.

Filtering for Specific Addresses

To display frames for specific envelope addresses or Layer 3 addresses.

- Choose **V5 INFO** as the filter type.

aurora^{Duet} displays the following pop-up box:



Note

The Layer 3 address filter does not affect the display of any ISDN LAP-D information - it only applies to the V5 frames.

To change the filter for an address:

- Highlight it and press the **LEFT** arrow key to delete the value currently assigned to it.
- Use the number keys to enter a new value, or press **F1 ALL** to display V5 frames for all addresses - i.e. to disable filtering for this address type.
- Press **F6 EXIT** to return to the main **FILTERS** pop-up box.

The filters you choose remain in operation until you exit the decode display, then they return to their default values - all addresses included.

Filtering Display Fields

When full decode is displayed, you can view or hide the information for specific fields - for example, you can choose to display only Layer 3 message types.

- Choose **DISP FORMAT** as the filter type.

aurora^{Duet} displays the following screen:



- Highlight each 'display field' and use the *LEFT* and *RIGHT* arrow keys to switch between **Y** (filter in) and **X** (filter out), as required.
- Press **F6 EXIT** to return to the main **FILTERS** pop-up box.

The filters you choose remain in operation until aurora^{Duet} is switched off, then they return to their default values - **Y** (filter in) for all fields.

Downloading Decode via the Comms Port

To send the protocol decode to aurora^{Duet}'s communications (comms) port for output to a PC or printer.

- Connect aurora^{Duet} to a PC or printer - see Chapter 3 Section 3.

**Tip**

You may find it useful to print out information about aurora^{Duet}'s current configuration with the protocol decode. To do this, press **F1 HELP** then **F1 PRN**.

Downloading Decode to aurora^{Expert}

To send the protocol decode to the comms port, in a form compatible with aurora^{Expert} for Windows:

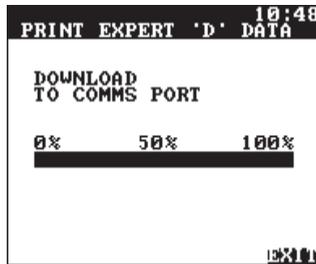
Monitor

- Choose **PRINT EXPERT DATA** from the **MONITOR REVIEW** menu.

Simulate

- Choose **PRINT EXPERT 'D' DATA** from the **TRACE CAPTURE REVIEW** menu.

A screen similar to the following is displayed:



A bar graph indicates the time taken to download, in a percentage format.

Downloading the Decode in Full

Full decode consists of a partial decode of Layer 2 and Layer 3 signalling with a full hexadecimal dump of the D Channel messages. It also includes a Tx/Rx indicator, time stamp and frame reference number.

To send the protocol decode to the comms port, in full:

- **Monitor** Choose **PRINT FULL DECODE** from the **MONITOR REVIEW** menu.
- **Simulate** Choose **PRINT FULL 'D' DECODE** from the **TRACE CAPTURE REVIEW** menu.

A screen is displayed which contains a bar graph to indicate the time taken to download, in a percentage format.

Downloading the Decode in Simple Form

Simple decode consists of the message type, direction and timestamp. To send the protocol decode to the comms port, in simple form:

- **Monitor** Choose **PRINT SIMPLE DECODE** from the **MONITOR REVIEW** menu.
- **Simulate** Choose **PRINT SIMPLE 'D' DECODE** from the **TRACE CAPTURE REVIEW** menu.

A screen is displayed which contains a bar graph to indicate the time taken to download, in a percentage format.

Decode - A Look at Some Examples

Example of ISDN Decode

The following illustrates a typical example of protocol decode, generated during call setup and clear down:

Decode Output

```
N<T 15:37:23.752 Fr.1
L2: Sapi=0 Tei=64
    SABME
    pf=1
    00 81 7F
```

```
N>T 15:37:23.808 Fr.2
L2: Sapi=0 Tei=64
    UA
    pf=1
    00 81 73
```

```
N<T 15:37:23.822 Fr.3
L2: Sapi=0 Tei=64
    INFO
    pf=0 Nr=0 Ns=0
    00 81 00 00
L3: PD=08 CR(O)=2
M05 SETUP
I04 bcap=Speech A Law
I18 channel=B1
IA1 sending complete
I6C cli=01628524977
    Allowed
I70 cpn=01613391132
I71 cpn sub=PHIL
I7E uui=TESTCALL
    08 01 02 05 A1 04 03
    80 90 A3 18 01 89 6C
    0D 01 80 30 31 36 32
    38 35 32 34 39 37 37
    70 0C 81 30 31 36 31
    33 33 39 31 31 33 32
    71 06 80 50 50 48 49
    4C 7E 09 04 54 45 53
    54 43 41 4C 4C
```

```
N>T 15:37:23.906 Fr.4
L2: Sapi=0 Tei=64
    INFO
    pf=0 Nr=1 Ns=0
    02 81 00 02
L3: PD=08 CR(D)=2
M02 CALL PROC
I18 channel=B1
    08 01 82 02 18 01 89
```

```
N<T 15:37:24.004 Fr.5
L2: Sapi=0 Tei=64
    RR
    pf=0 Nr=1
    02 81 01 02
```

Explanation

Terminal Equipment sends SABME to Network at 15:37, to initialise layer 2. Contains SAPI=0, TEI=64.

Network responds with a UA to acknowledge layer 2 is active.

TE sends a call Setup message: Bearer Capability = Speech, Encoding Type = A Law, on channel B1, CLI=01628524977, CPN=01613391132 and sub-address = Phil and User to User Info. = Testcall.

Network responds to the Call Setup request with a Call Proceeding message.

TE transmits an RR (Receiver Ready) to keep alive the link at layer 2.

N>T 15:37:24.188 Fr.6
 L2: Sapi=0 Tei=64
 INFO
 pf=0 Nr=1 Ns=1
 02 81 02 02
 L3: PD=08 CR(D)=2
 M01 ALERTING
 08 01 82 01

NT responds with an Alerting message. This tells the TE that the destination equipment is ringing.

N<T 15:37:24.294 Fr.7
 L2: Sapi=0 Tei=64
 RR
 pf=0 Nr=2
 02 81 01 04

TE transmits an RR

N>T 15:37:26.225 Fr.8
 L2: Sapi=0 Tei=64
 INFO
 pf=0 Nr=1 Ns=2
 02 81 04 02
 L3: PD=08 CR(D)=2
 M07 CONNECT
 08 01 82 07

NT responds with a Connect message to tell the TE that the call is connected at the remote terminal.

N<T 15:37:26.235 Fr.9
 L2: Sapi=0 Tei=64
 INFO
 pf=0 Nr=3 Ns=1
 00 81 02 06
 L3: PD=08 CR(O)=2
 M0F CONNECT ACK
 08 01 02 0F

TE acknowledges with Connect Acknowledge and charging begins.

N>T 15:37:26.582 Fr.10
 L2: Sapi=0 Tei=64
 RR
 pf=0 Nr=2
 00 81 01 04

N>T 15:37:36.413 Fr.11
 L2: Sapi=0 Tei=64
 RR
 pf=1 Nr=2
 02 81 01 05

Layer 2 'keep alive'.

N<T 15:37:36.418 Fr.12
 L2: Sapi=0 Tei=64
 RR
 pf=1 Nr=3
 02 81 01 07

N<T 15:37:46.424 Fr.13
 L2: Sapi=0 Tei=64
 RR
 pf=1 Nr=3
 00 81 01 07

N>T 15:37:46.446 Fr.14
 L2: Sapi=0 Tei=64
 RR
 pf=1 Nr=2
 00 81 01 05

```

N>T 15:37:56.415 Fr.15
L2: Sapi=0 Tei=64
RR
pf=1 Nr=2
02 81 01 05

N<T 15:37:56.420 Fr.16
L2: Sapi=0 Tei=64
RR
pf=1 Nr=3
02 81 01 07
    
```

```

N>T 15:37:58.952 Fr.17
L2: Sapi=0 Tei=127
UI
pf=0
02 FF 03
L3: PD=08 CR(O)=2
M05 SETUP
I04 bcap=Data 64K/UR
I18 channel=B2
I70 cpn=01628524977
I71 cpn sub=1211
I7C llc=Data 64K/UR
I7D hlc=Group 4 Fax
08 01 02 05 04 02 88
90 18 01 8A 70 0C 80
30 31 36 32 38 35 32
34 39 37 37 71 06 80
50 31 32 31 31 7C 04
88 90 D1 E7 7D 02 91
A1
    
```

A new call Setup Request is received by the TE on channel B2. CPN=01628524977, sub address = 1211. Contains an llc = Data 64K/UR and an hlc = Group 4 Fax. Note: all incoming calls to the S reference point, are delivered on the Group (or Broadcast) TEI (value = 127d).

```

N<T 15:37:58.982 Fr.18
L2: Sapi=0 Tei=64
INFO
pf=0 Nr=3 Ns=2
00 81 04 06
L3: PD=08 CR(D)=2
M07 CONNECT
I18 channel=B2
I4C col=01628524977
Allowed
08 01 82 07 18 01 8A
4C 0D 01 80 30 31 36
32 38 35 32 34 39 37
37
    
```

TE acknowledges the request and connects.

```

N>T 15:37:59.203 Fr.19
L2: Sapi=0 Tei=64
INFO
pf=0 Nr=3 Ns=3
02 81 06 06
L3: PD=08 CR(O)=2
M0F CONNECT ACK
08 01 02 0F
    
```

Network responds with Connect Acknowledge.

```
N<T 15:37:59.304 Fr.20
L2: Sapi=0 Tei=64
RR
pf=0 Nr=4
02 81 01 08
N<T 15:38:06.330 Fr.21
L2: Sapi=0 Tei=64
INFO
pf=0 Nr=4 Ns=3
00 81 06 08
L3: PD=08 CR(O)=2
M45 DISCONNECT
I08 Cause=16
08 01 02 45 08 02 80
90
```

TE sends a Disconnect message to request call clearing: call clearing cause code=16.

```
N>T 15:38:06.402 Fr.22
L2: Sapi=0 Tei=64
INFO
pf=0 Nr=4 Ns=4
02 81 08 08
L3: PD=08 CR(D)=2
M4D RELEASE
I08 Cause=16
08 01 82 4D 08 02 82
90
```

Network responds with a Release message.

```
N<T 15:38:06.413 Fr.23
L2: Sapi=0 Tei=64
INFO
pf=0 Nr=5 Ns=4
00 81 08 0A
L3: PD=08 CR(O)=2
M5A REL. COMP
I08 Cause=16
08 01 02 5A 08 02 80
90
```

TE transmits a Release Complete message. The B1 channel is now free again and the call reference value is cancelled.

```
N>T 15:38:06.724 Fr.24
L2: Sapi=0 Tei=64
RR
pf=0 Nr=5
00 81 01 0A
N>T 15:38:07.804 Fr.25
L2: Sapi=0 Tei=64
INFO
pf=0 Nr=5 Ns=5
02 81 0A 0A
L3: PD=08 CR(O)=2
M45 DISCONNECT
I08 Cause=16
08 01 02 45 08 02 82
90
```

The call on B2 is now requested to clear down by the network side (remote user initiated clear).

N<T 15:38:07.820 Fr.26
L2: Sapi=0 Tei=64
INFO
pf=0 Nr=6 Ns=5
00 81 0A 0C
L3: PD=08 CR(D)=2
M4D RELEASE
I08 Cause=16
08 01 82 4D 08 02 80
90

N>T 15:38:07.989 Fr.27 **B2 is now free again.**

L2: Sapi=0 Tei=64
INFO
pf=0 Nr=6 Ns=6
02 81 0C 0C
L3: PD=08 CR(O)=2
M5A REL. COMP
I08 Cause=16
08 01 02 5A 08 02 82
90

N<T 15:38:08.090 Fr.28
L2: Sapi=0 Tei=64
RR
pf=0 Nr=7
02 81 01 0E

N<T 15:38:08.155 Fr.29
L2: Sapi=0 Tei=64
DISC
pf=1
00 81 53

**The layer 2 link at TEI 64
is now disconnected.**

N>T 15:38:08.206 Fr.30
L2: Sapi=0 Tei=64
UA
pf=1
00 81 73

N>T 15:38:13.738
L1: Info 0

N<T 15:38:13.748
L1: Info 0

Example of V5 Decode

The following illustrates a typical example of V5 protocol decode, generated during a call:

Decode Output

```

RXB 12:26:06.519 Fr.4
V5: Env Addr=8177
DL Addr=8177
V5 CONTROL PROTOCOL
L2: RR
   pf=1 Nr=61
   FC E3 FC E3 01 7B
    
```

```

RXA 12:26:08.253 Fr.5
   V5: Env Addr=8176
   DL Addr=8176
V5 PSTN SIGNALLING
L2: INFO
   pf=0 Nr=25 Ns=27
   FC E1 FC E1 36 32
L3: PD=48
   L3 ADDR=29001
M00 V5 ESTABLISH
I03 Steady signal
   Steady-signal type=
   Off hook-loop closed
   48 E3 49 00 03 01 84
    
```

```

RXB 12:26:08.256 Fr.6
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
   pf=0 Nr=28
   FC E1 FC E1 01 38
    
```

```

RXB 12:26:08.318 Fr.7
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: INFO
   pf=0 Nr=28 Ns=25
   FC E1 FE E1 32 38
L3: PD=48
   L3 ADDR=29001
M01 V5 EST. ACK
   48 E3 49 01
    
```

Explanation

Duet Frame 4 (Fr.4) is a Receiver Ready frame for keeping alive the layer 2 of the Control Protocol. Envelope address 8177 always uniquely identifies the V5 Control Protocol.

Frame 5 contains a PSTN Protocol message, in this case a layer 3 line seizure message sent by the Access Network (AN) to the 'National PSTN' entity following the user's POTS terminal (address 29001) going off hook. Envelope address 8176 uniquely identifies the V5 PSTN Protocol.

Frame 6 is a Receiver Ready for the PSTN Protocol, used in this case as an Information Frame acknowledgement.

Frame 7 is the loop acknowledgement to the Access Network from the 'National PSTN' layer 3 entity behind the Local Exchange (LE). Dial tone is likely to be presented to port no. 29001 by the LE at this time.

```

RXB 12:26:08.321   Fr.8
V5: Env Addr=8176
   DL Addr=8176
   V5 PSTN SIGNALLING
L2: INFO
   pf=0 Nr=28 Ns=26
   FC E1 FE E1 34 38
L3: PD=48
   L3 ADDR=29001
M0E V5 PROTOCOL PARAM
I00 Sequence number
   Number=0
I10 Recognition time
   Steady-signal type=
   On hook-loop open
   Duration type=1
   48 E3 49 0E 00 01 80
   10 02 85 81

```

Frame 8 contains a protocol parameter update from the LE to the AN, in this case to set the AN's recognition time criterion for 'user back on hook' to a value ('duration type' = 1) which is held in some look-up table in the AN. This would allow a loop 'open' during pulse dialling not to be misinterpreted as an on-hook.

```

RXA 12:26:08.322   Fr.9
V5: Env Addr=8176
   DL Addr=8176
   V5 PSTN SIGNALLING
L2: RR
   pf=0 Nr=26
   FC E1 FE E1 01 34

```

Acknowledgement of frame Ns(25) (Duet Fr.7).

```

RXA 12:26:08.326   Fr.10
V5: Env Addr=8176
   DL Addr=8176
   V5 PSTN SIGNALLING
L2: RR
   pf=0 Nr=27
   FC E1 FE E1 01 36

```

Acknowledgement of frame Ns(26) (Duet Fr.8).

```

RXB 12:26:10.985   Fr.11
V5: Env Addr=8176
   DL Addr=8176
   V5 PSTN SIGNALLING
L2: INFO
   pf=0 Nr=28 Ns=27
   FC E1 FE E1 36 38
L3: PD=48
   L3 ADDR=29001
M02 V5 SIGNAL
I00 Sequence number
   Number=1
IA1 Auto signal sequence
   Sequence type=1
   48 E3 49 02 00 01 81
   A1

```

Frame 11 is a command from the LE to the AN to begin a pre-defined autonomous local signalling sequence with the user ('type 1' in this instance). This sequence is too fast to be conveyed in discrete V.5 signalling entities.

```

RXA 12:26:10.989   Fr.12
V5: Env Addr=8176
   DL Addr=8176
   V5 PSTN SIGNALLING
L2: RR
   pf=0 Nr=28
   FC E1 FE E1 01 38

```

```

RXA 12:26:13.324   Fr.13
V5: Env Addr=8176
    DL Addr=8176
    V5 PSTN SIGNALLING
L2: INFO
    pf=0  Nr=28  Ns=28
    FC E1 FC E1 38 38
L3: PD=48
    L3 ADDR=29001
M03 V5 SIGNAL ACK
I00 Sequence number
    Number=2
    48 E3 49 03 00 01 82

RXB 12:26:13.327   Fr.14
V5: Env Addr=8176
    DL Addr=8176
    V5 PSTN SIGNALLING
L2: RR
    pf=0  Nr=29
    FC E1 FC E1 01 3A

RXA 12:26:16.522   Fr.15
V5: Env Addr=8177
    DL Addr=8177
    V5 CONTROL PROTOCOL
L2: RR
    pf=1  Nr=85
    FC E3 FC E3 01 AB

RXB 12:26:16.526   Fr.16
V5: Env Addr=8177
    DL Addr=8177
    V5 CONTROL PROTOCOL
L2: RR
    pf=1  Nr=61
    FC E3 FC E3 01 7B

RXB 12:26:16.792   Fr.17
V5: Env Addr=8176
    DL Addr=8176
    V5 PSTN SIGNALLING
L2: INFO
    pf=0  Nr=29  Ns=28
    FC E1 FE E1 38 3A
L3: PD=48
    L3 ADDR=29001
M02 V5 SIGNAL
I00 Sequence number
    Number=2
I02 Pulsed signal
    Pulse signal type=
    Meter pulse
    Sup ind=No suppress
    Pulse duration=0
    Ack=Not requested
    Number pulses=4
    48 E3 49 02 00 01 82
    02 03 F8 00 84

```

Frame 13 contains the Layer 3 Signal Acknowledge for the autonomous sequence command (sequence no. 1) in Duet frame 11. The sequence number of any subsequent Signal or Protocol Parameter message is 2.

Frame 17 contains meter pulse information for optional POTS advice-of-charge. The call is likely to have been answered by the remote party. The absence of any Signal message(s) containing the Digit-signal information element, indicates that no pulse dialling has taken place. Thus the destination address was either dialled inband (DTMF through the allocated B channel) or this was a fixed analogue leased line.

```
RXA 12:26:16.796 Fr.18
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
pf=0 Nr=29
FC E1 FE E1 01 3A
RXA 12:26:21.789 Fr.19
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: INFO
pf=0 Nr=29 Ns=29
FC E1 FC E1 3A 3A
L3: PD=48
L3 ADDR=29001
M03 V5 SIGNAL ACK
I00 Sequence number
Number=3
48 E3 49 03 00 01 83
Signal Ack for Signal in
sequence no. Z
RXB 12:26:21.791 Fr.20
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
pf=0 Nr=30
FC E1 FC E1 01 3C
RXA 12:26:26.528 Fr.21
V5: Env Addr=8177
DL Addr=8177
V5 CONTROL PROTOCOL
L2: RR
pf=1 Nr=85
FC E3 FC E3 01 AB
RXB 12:26:26.531 Fr.22
V5: Env Addr=8177
DL Addr=8177
V5 CONTROL PROTOCOL
L2: RR
pf=1 Nr=61
FC E3 FC E3 01 7B
RXA 12:26:31.794 Fr.23
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
pf=1 Nr=29
FC E1 FC E1 01 3B
```

```

RXB 12:26:31.797 Fr.24
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
pf=1 Nr=30
FC E1 FC E1 01 3D
RXB 12:26:36.267 Fr.25
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: INFO
pf=0 Nr=30 Ns=29
FC E1 FE E1 3A 3C
L3: PD=48
L3 ADDR=29001
M0E V5 PROTOCOL PARAM
I00 Sequence number
Number=3
I10 Recognition time
Steady-signal type=
On hook-loop open
Duration type=0
48 E3 49 0E 00 01 83
10 02 85 80
RXB 12:26:36.270 Fr.26
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: INFO
pf=0 Nr=30 Ns=30
FC E1 FE E1 3C 3C
L3: PD=48
L3 ADDR=29001
M02 V5 SIGNAL
I00 Sequence number
Number=4
I03 Steady signal
Steady-signal type=
Reduced battery
48 E3 49 02 00 01 84
03 01 8A

```

Frame 25 sets a new value for loop-open recognition time in the AN; this would allow a loop 'open' to be seen either as register recall or 'on-hook' according to the locally defined look-up table for signal criteria.

Frame 26 contains a command to the AN to reduce the battery voltage supplied to the user port, in order to save power or to park the line (on certain types of PBX line).

```

RXA 12:26:36.271 Fr.27
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
pf=0 Nr=30
FC E1 FE E1 01 3C
RXA 12:26:36.275 Fr.28
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
pf=0 Nr=31
FC E1 FE E1 01 3E

```

```

RXA 12:26:36.524 Fr.29
V5: Env Addr=8177
DL Addr=8177
V5 CONTROL PROTOCOL
L2: RR
pf=1 Nr=85
FC E3 FC E3 01 AB

RXB 12:26:36.527 Fr.30
V5: Env Addr=8177
DL Addr=8177
V5 CONTROL PROTOCOL
L2: RR
pf=1 Nr=61
FC E3 FC E3 01 7B

RXA 12:26:41.268 Fr.31
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: INFO
pf=0 Nr=31 Ns=30
FC E1 FC E1 3C 3E
L3: PD=48
L3 ADDR=29001
M03 V5 SIGNAL ACK
I00 Sequence number
Number=5
48 E3 49 03 00 01 85

RXB 12:26:41.271 Fr.32
V5: Env Addr=8176
DL Addr=8176
V5 PSTN SIGNALLING
L2: RR
pf=0 Nr=31
FC E1 FC E1 01 3E

```

Acknowledgement of the Signal message, send sequence no. 4. Next expected Signal or Protocol Parameter message sequence number is 5.

...the call remains 'up'...

Notes About QSIG Decode

QSIG protocol decode is similar to ETSI, with the following exceptions:

- The call reference length is always 2, even in BRI mode.
- The Channel information element is always coded as if it were related to PRI operation, even if it relates to BRI.



Note

If aurora^{Duet} detects a coding error in the Channel information element, a **CHANNEL IE ERROR** message is

displayed instead of the channel number.

Clearing the Memory

To clear memory of all stored Monitor sessions:

- Choose **CLEAR MEMORY** from the **MONITOR Main** menu.

To clear memory of decode from the last Simulate session:

- Choose **CLEAR MEMORY** from the **CAPTURE REVIEW** menu.
- Press **F2** to confirm.



Chapter 7

Remote Control

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Remote Control

This chapter describes the optional Remote Control application, which is available on both Basic and Primary Rate units.

Remote Control lets you control an unattended aurora^{Duet} in real-time, via a remote PC. The PC may be attached via a direct wire connection, a PSTN line or over the ISDN network.

This chapter has the following structure:

Section 1 *Setting up Remote Control*

Section 2 *Operating aurora^{Duet} with Remote Control*

Section 3 *Modems - an Overview*

This Chapter assumes that you are familiar with Windows conventions and terminology. If this is not the case, please refer to your Microsoft Windows Reference Guide.



Note

Significant differences between Windows 95, Windows 3.1 and Windows NT versions are labelled using the following icons:



Text that applies to all versions is not labelled.

Section 1

Setting up Remote Control

This section introduces you to the Remote Control application and outlines the minimum and recommended system and modem requirements for using it.

This section also tells you how to:

- install Remote Control software
- make physical connections between the tester, the modems and the PC
- set up aurora^{Duet} for Remote Control operation.

Introducing Remote Control

With Remote Control you can operate your aurora^{Duet} using a PC connected directly to aurora^{Duet}, or connected over a PSTN modem to modem or Terminal Adaptor connection.

You can also use Remote Control to simultaneously run the aurora^{Expert} for Windows protocol analysis package and to download and display data on your PC.

Supplied with Remote Control

When you purchase Remote Control you will receive the following:

- Floppy disks containing Remote Control software
- A Licence Agreement
- An adaptor for connecting the serial cable between aurora^{Duet} and the modem.
- A Quick Reference Card

PC System Requirements

The following outlines the minimum and recommended PC specification you need for Remote Control, depending on the version of Windows you are running.

Windows 3.11 Requirements

Minimum specification

- An Intel 386 25DX processor with a minimum of 8 MB of application random-access memory (RAM)
- 10 MB available hard disk space for installation, and 10 MB available after installation for Windows virtual memory
- VGA monochrome display card
- A high speed serial port (16550 UART) if you are using an external modem or direct connection

Recommended specification

- An Intel 486 processor with 8 MB of RAM
- Colour VGA display card
- A high speed serial port (16550 UART) if you are using an external modem or direct connection

Windows 95 Requirements

Minimum specification

- An Intel 486 processor with a minimum of 16 MB of application random-access memory (RAM)
- 10 MB available hard disk space for installation, and 10 MB available after installation for Windows virtual memory
- Colour VGA display card
- A high speed serial port (16550 UART) if you are using an external modem or direct connection

Recommended specification

- A Pentium processor with 24 MB of RAM
- Colour VGA display card
- A high speed serial port (16550 UART) if you are using an external modem or direct connection

Windows NT Requirements

Minimum specification

- An Intel 486 processor with a minimum of 24 MB of application random-access memory (RAM)
- 10 MB available hard disk space for installation, and 10 MB available after installation for Windows virtual memory
- Colour VGA display card
- A high speed serial port (16550 UART) if you are using an external modem or direct connection

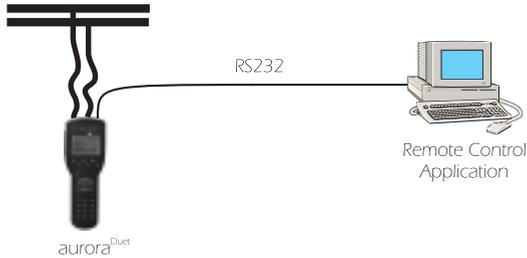
Recommended specification

- A Pentium processor with 32 MB of RAM
- Colour VGA display card
- A high speed serial port (16550 UART) if you are using an external modem or direct connection.

Additional Equipment Required

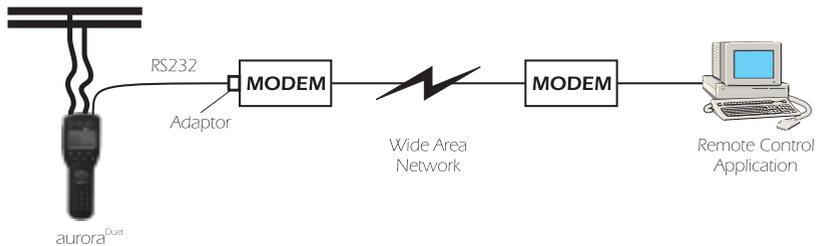
You may require other equipment, depending on the type of connection you make between aurora^{Duet} and your PC.

Equipment Required for a Direct Connection



If you are connecting aurora^{Duet} directly to a PC you do not require any additional equipment. Use the RS232 cable supplied with aurora^{Duet} to make the physical connection, as shown in the diagram above.

Equipment Required for a Modem or TA Connection



If you are connecting aurora^{Duet} to your PC via a modem or terminal adaptor, you require the following equipment:

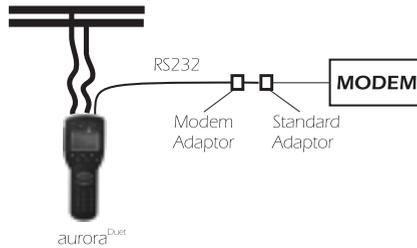
- A suitable modem or terminal adaptor, one at the PC side of the network and one at the aurora^{Duet} side. See *Modem Requirements and Recommendations* in this Chapter for details of suitable modems.

- The supplied RS232 cable and adaptor to connect from aurora^{Duet} to the modem or terminal adaptor.
- An RS232 cable to connect from the PC to the modem (if you are using an external modem) or terminal adaptor.



Note

If you are using a modem with a 9-pin 'D' connector, you will need two adaptors: the remote modem adaptor and a standard 9 to 25 adaptor, as shown below:



Modem Requirements and Recommendations

If you are making a modem or terminal adaptor connection, you must use the correct type of modem or terminal adaptor equipment. The modem attached to both the PC and aurora^{Duet} **must** be Hayes AT command set compatible. The modem attached to the PC may be internal or external.

Minimum Modem Specification

V.32 (9,600 bps) is the minimum specification.

Recommended Modem Specification

V.32bis (14,400 bps) is the recommended specification. Hewlett Packard also recommend that a modem using V.42 error correction and detection be used.



Note: US Robotics 'FLASH' modem

Hewlett Packard do not recommend the use of the US Robotics 'FLASH' modem with Remote Control for aurora^{Duet}. Issues with DTR override will prevent the modem from operating correctly. This issue involves only the US Robotics 'FLASH' modem. For advice on this subject and other Remote Control issues please contact your vendor.



Tip

Remote Control supports all the modems currently supported by Microsoft Windows. To see a list of the supported modems in Windows 95, go to **Settings, Modem, Add Modem**. If you are not using Windows 95, you can display the list by opening the **Modems.inf** file (supplied with the Remote Control application) as a text file.

Installing Remote Control

Remote Control is PC Windows based software, supplied on floppy disk(s). Before installing Remote Control:

- Turn off any virus-detection and screen saver software on your computer.

This frees up memory for installation and prevents possible conflicts between the Remote Control for Windows installer and other programs.

- Start Windows then follow the appropriate instructions below, depending on what version of Windows you are using:

Installing on Windows 95 and Windows NT

- Insert Disk 1 into the appropriate drive (usually the a: drive).
- Choose **Settings/Control Panel** from the **Start** menu.
- Choose **Add/Remove Programs** and click on the **Install/Uninstall** tab.
- Follow the instructions on your screen.

Installing on Windows 3.1

- Insert Disk 1 into the appropriate drive (usually the a: drive).
- Choose **File/Run** from the Program Manager.
- Type in **a:\setup.exe** (where a: is the drive indicator) and click on **OK**.
- Follow the instructions on your screen.

Entering the Serial Number

When you are instructed to enter the serial number, use the number that is printed on the diskettes.

Installation Troubleshooting

If you have trouble installing Remote Control, try one or more of the following:

- Check there is not a version of Remote Control installed already with write-protected files.
- Check the Readme file on Disk 1 for any last minute news about installing Remote Control.
- If installation stops on a particular disk, check to see whether the disk is bad by quitting the installer and copying the disk to your hard disk or to another disk. If you receive an error during copying, contact Hewlett Packard Customer Support - you will find contact numbers at the front of this Guide.

- Check that your system, hard disk space, and available RAM meet or exceed those required for Remote Control (see *PC System Requirements* in this Section).

Connecting up your Equipment

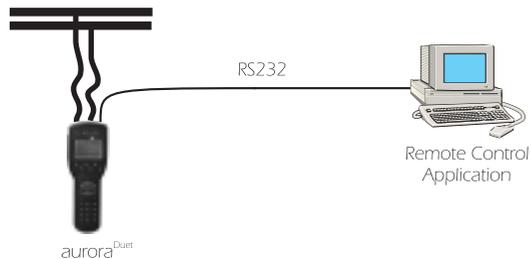
You can use Remote Control to operate an aurora^{Duet} connected either directly to a PC or via a modem to modem or TA connection. The equipment you require depends on the type of connection you make between aurora^{Duet} and your PC - refer to *Additional Equipment Required* earlier in this Chapter.



Warning

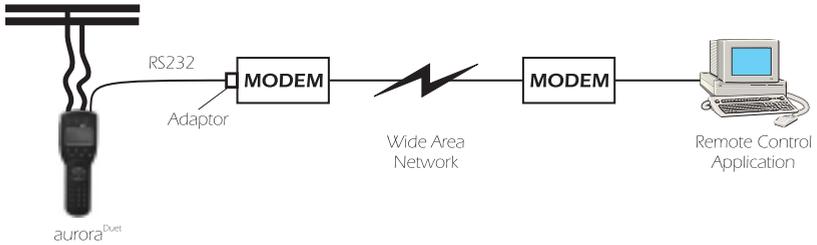
When connecting up the various equipment for Remote Control, connect aurora^{Duet} to the ISDN line *last*. Take care when you do this as high voltages may be present on the line.

Connecting aurora^{Duet} Directly to the PC



- Connect the supplied RS232 cable to aurora^{Duet} and to the PC, as shown above.

Connecting aurora^{Duet} via Modems or Terminal Adaptors



Note

If you are using a modem with a 9-pin 'D' connector, you will need two adaptors: the remote modem adaptor and a standard 9 to 25 adaptor - see *Equipment Required for a Modem or TA Connection* earlier in this Chapter.

Connections between aurora^{Duet} and a modem

- Connect the supplied RS232 cable between aurora^{Duet} and the modem using the adaptor supplied.
- Ensure the modem is plugged into the telephone network or, if you are using a terminal adaptor (TA), that it is plugged into the ISDN.
- If you are using a modem, connect its external power supply and switch it on.
- Switch on aurora^{Duet}. Remote Control mode uses more power than other modes so we recommend you connect the power adaptor/charger.



Note

If your modem has DIP (Dual In-line Package) switches, ensure the following settings are enabled before switching on your aurora^{Duet}:

- DTR override
- Carrier detect override
- Display results codes

If you switch on your aurora^{Duet} before enabling the settings, you will have to turn the unit off and on again before the settings operate.

Connections between the PC and the modem

- If you are using an external modem or terminal adaptor, connect the RS232 cable between the PC running the Remote Control software and the modem or TA.
- Ensure the modem is plugged into the telephone network or the terminal adaptor is plugged into the ISDN.
- If you are using an external modem, connect its power supply and switch it on.



Note

For information on the types of modems supported by Remote Control, refer to *Modem Requirements and Recommendations* earlier in this Chapter.

Setting Up aurora^{Duet} for Remote Control

There are two steps to setting up aurora^{Duet} ready for Remote Control:

- 1- You need to tell aurora^{Duet} what type of connection you are making to the Remote Control PC. There are two options:
 - DIRECT** Via the serial port.
 - MODEM** Using a modem or terminal adaptor.
- 2- You need to place aurora^{Duet} in **REMOTE** control mode.

The steps are explained in the following.

Choosing the Connection Type

First, you need to tell aurora^{Duet} the type of connection you are making to the PC running Remote Control.

Making a direct connection

- Choose **SETUP/COMMS SETUP** from the Main menu.
- Toggle the **PORT** option to display **SERIAL**.
- Choose the **BAUD RATE**.
- Set the number of **BITS** to **8**.
- Choose the **PARITY**.
- Select the number of **STOP BITS**.
- Toggle the **XON/XOFF** flow control option to set it on or off. We strongly recommend that flow control is set to **ON**.



Notes:

- The **BAUD RATE**, **BITS**, **PARITY** and **STOP BITS** options must match the settings for the tester specified in the Remote Control software - see *Setting up the Port* in Section 2 of this Chapter.
- Remember to set the Tracer to the setting you require. For Remote control we recommend that you choose **TO MEMORY** - see Chapter 3 Section 3.

Making a modem or TA connection

- Choose **SETUP/COMMS SETUP** from the Main menu.
- Toggle the **PORT** option to display **MODEM**.
- Highlight the **SETUP** option below and use the **LEFT** and **RIGHT** arrow keys to toggle between the following options:

Modem Configuration	
Default	Use a default modem configuration string provided by aurora ^{Duet} .
User	User Defined String. Use this to specify a custom modem configuration string.

Specifying a User Defined String

To enter a user defined string or overwrite an existing string:

- Press **F3 EDIT**.

A character set is displayed.

- Enter a string of up to 26 characters.

Use the arrow keys to highlight the character you want and press **SELECT** to choose it. The character is displayed above. If you make a mistake, press **F3 DEL** to erase the last character.

To save the user defined string:

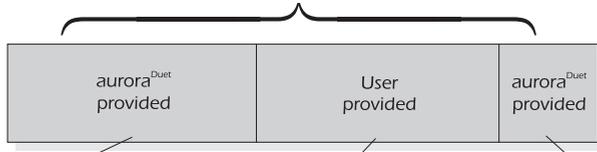
- Press **F5 SAVE**.

About the modem configuration strings

aurora^{Duet} automatically negotiates with the modem to which it is connected to provide part of the modem configuration string.

The following diagram illustrates how the user defined string is made up:

AT Command



aurora ^{Duet} Settings	Command
Sets link speed (baud rate) between aurora ^{Duet} and the modem	AT
Resets the modem	AT &F
Local echo off	AT E0
Numeric responses	AT V=0
Sets DTR override	AT &D0
Sets carrier detect on	AT &C0
Sets speaker off	AT M0

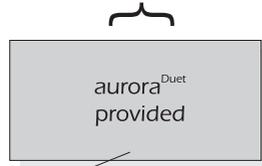
Your own Settings

You can include your own parameters here; for example, the modem class, software handshaking (XON/XOFF flow control) and the speaker volume.

aurora ^{Duet} Settings	Command
Sets the modem to auto-answer so all incoming calls are answered automatically.	AT S0=2

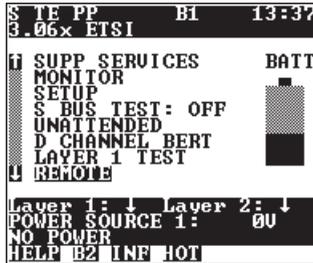
The following diagram illustrates how the default string is made up:

AT Command



aurora ^{Duet} Settings	Command
Sets link speed (baud rate) between aurora ^{Duet} and the modem	AT
Resets the modem	AT &F
Local echo off	AT E0
Numeric responses	AT V=0
Sets DTR override	AT &D0
Sets carrier detect on	AT &C0
Sets speaker off	AT M0
Detects modem type	AT &B1
Sets up software handshaking XON/XOFF flow control	AT &H2&I2 or AT &K4
Sets the modem to auto-answer, so all incoming calls are answered automatically.	AT S0=2

Placing aurora^{Duet} in Remote Control Mode



- Choose **REMOTE** from the Main menu to put aurora^{Duet} into Remote Control mode.

The **Switching to Remote** screen is displayed and the status shows **REMOTE (Setting Up)**:

The aurora^{Duet} Main menu is then displayed, the keypad is disabled and the status bar at the bottom of the screen displays **REMOTE (In Remote)**. The **REMOTE** option on the Main menu is no longer displayed.

Status displays in Remote Control mode

When aurora^{Duet} is in Remote Control mode the status display at the bottom of the screen shows **REMOTE** together with information about the current state of the connection. The following table explains the various status information displayed:

aurora ^{Duet} Remote Status	
Status	Description
REMOTE (Setting Up)	Displayed when you choose REMOTE from the Main Menu. aurora ^{Duet} is setting itself up for Remote Control communication.
REMOTE (In Remote)	aurora ^{Duet} is in Remote Control mode but there is no connection.
REMOTE (Ringing)	The modem attached to aurora ^{Duet} detects ringing.
REMOTE (Connecting)	The modem attached to aurora ^{Duet} is attempting to establish a connection.
REMOTE (No Carrier)	The modem attached to aurora ^{Duet} fails to detect a carrier signal on the line.
REMOTE (Connected)	A connection has been successfully established between aurora ^{Duet} and the PC.
REMOTE (Error)	The modem attached to aurora ^{Duet} detects an error.
REMOTE (Unknown)	An unknown status is detected.

The following illustrates the sequence of status displays shown when a successful modem connection is made.



Exiting Remote Control Mode

To exit Remote Control mode in aurora^{Duet}:

- Press the **F6 EXIT** function key on aurora^{Duet} to display **EXIT REMOTE ?** in the status bar at the bottom of the screen.
- Press **F6 YES** to exit Remote Control mode, or press **F5 NO** to remain in this mode.



Note

You can only exit from Remote Control mode in aurora^{Duet} if a connection has not been established with the PC. If a connection is currently active you must disconnect from the Remote Control application on the PC - refer to *Disconnecting a Tester* in Section 2 for further information.

About Automatic Disconnection

If aurora^{Duet} has an active connection - in other words, it is in the **REMOTE (Connected)** state - but there is no activity on the line for over 5 minutes, aurora^{Duet} automatically disconnects. However, aurora^{Duet} continues to remain in **REMOTE** mode, ready to accept any new connections.



Note

If aurora^{Duet} is switched off, it will restart in the mode it was last in. For example, if aurora^{Duet} was last in Remote Control it restarts in this mode.

Section 2

Operating aurora^{Duet} with Remote Control

This section tells you how to use the Remote Control application on your PC to set up and connect to aurora^{Duet}. It also describes how to 'remotely control' the tester and how to download information to the PC and use aurora^{Expert} for Windows.

Starting Remote Control

Once you have made all your physical connections and you have placed aurora^{Duet} in Remote mode, you are ready to begin using Remote Control on the PC.



- Choose **Remote Control** from the **Start/Programs/RC Duet** menu or click the **RC Duet** icon on the desktop.



- Double-click the Remote Control program icon.

When the **Remote Control** screen is displayed you are ready to start.

Getting Help!

Remote Control provides two types of on-line help:



Help on Remote Control - this gives information on the Remote Control application.



Modem help - this gives information on using modems with Remote Control.

Accessing On-line Help

- Click on the **HELP** menu
- Choose one of the following options:

Online Help Options	
Contents	Use this option to search through the Remote Control Help table of contents.
Search	Use this option to display and select help information from an alphabetic list of topics.
Help on Help	Use this option to get information on using Windows on-line help.
Modem Help	Select this option for information on using modems with Remote Control.
About Remote Control	Use this option to display information about the current software version of Remote Control you are running. Refer to <i>Displaying Software Information</i> for further information.

- Follow the instructions on your screen.

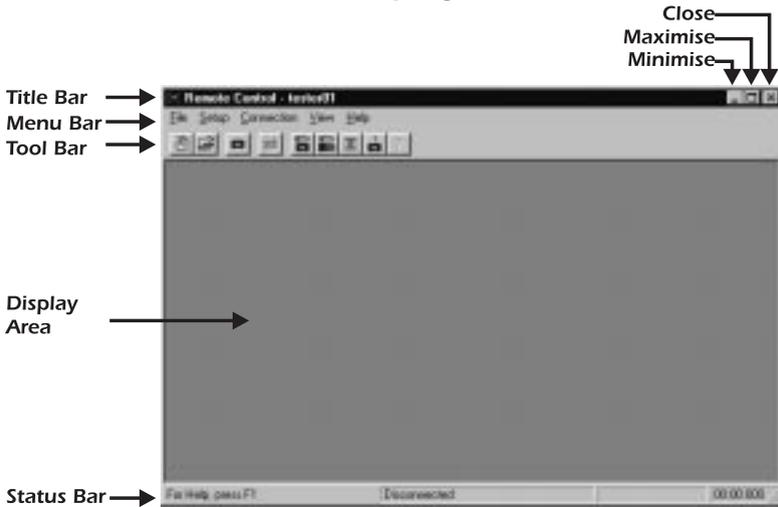
Displaying help on a specific item

To get help on a specific item:

- Click on the question mark button  and then click on the item.

A description then appears on the screen.

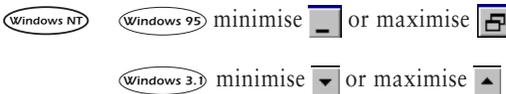
A Look at the Main Display



When you start Remote Control, a screen similar to the above Windows '95 version is displayed. This has the following features:

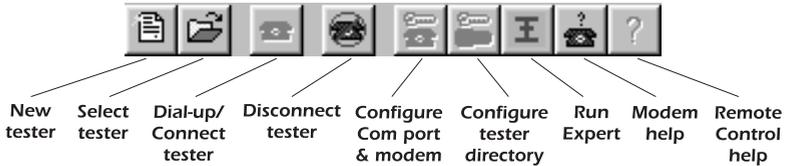
Title Bar: The title bar displays the name of the current tester. It is also used to reposition the Remote Control window on the screen.

Use the **Maximise** and **Minimise** icons, on the right hand side of the title bar, to expand the window to full screen size or reduce the window to an icon:

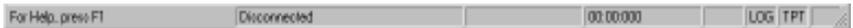


Menu Bar: This contains the names of the menus. Clicking on a menu displays a list of commands for accessing the Remote Control functions.

Toolbar: The toolbar gives you quick access to the most common operations in Remote Control. The icons are grouped so that related operations are located together; for example: New Tester and Select Tester:



Status Bar: This gives you information about the current status of your Remote Control session. During an active connection, it also tells you about the ESN (Electronic Serial Number) of the connected tester, the connection time, the current link data throughput and the data link loop time.



Understanding the Status Display

The following table explains the information which may be shown in the status bar.

Status Details	
Status	Description
Dialling	The modem is dialling the tester in order to establish a connection.
Waiting	Remote Control is waiting for the modem to go on-line.
On-line	The modem is on-line. In other words, the 2 modems are communicating with each other or there is a direct connection from the PC to the tester.
On-line, waiting	On-line but a connection to the tester has not yet been established.
Connected	Remote Control has established a connection to the tester.
Disconnected	There is currently no connection to a tester.



Note

Dialling, **Waiting** and **On Line, waiting** only apply when communicating via a modem or TA.

Status during a direct connection

The following shows the sequence of status displays you would expect to see during a successful direct connection from the PC to the tester:



Status during a modem/TA connection

The following shows the sequence of status information you would expect to see during a successful modem or terminal adaptor connection from the PC to the tester:



Customizing the Main Display

- To display or hide the Toolbar and Status Bar on the Main Display, choose the **View** menu.



Displaying the Toolbar

- Click on the **Toolbar** option.

When a tick (✓) is displayed against it, the option is enabled and the Toolbar is displayed on the screen.

Displaying the Status Bar

- Click on the **Status Bar** option.

When a tick (✓) is displayed against it, the option is enabled and the Status Bar is displayed on the screen.

About Files

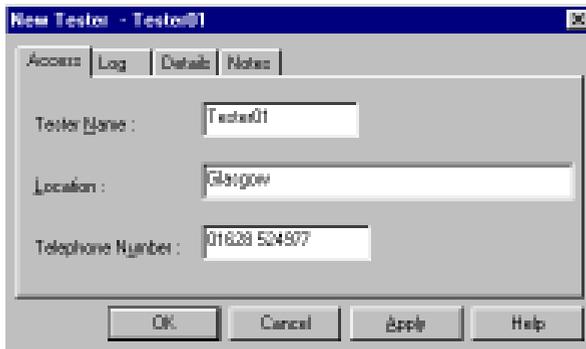
Files are used within the Remote Control application to describe the testers which are configured for Remote Control. For example, you may have two aurora^{Duet}s which you wish to operate using Remote Control - each aurora^{Duet} will have a different file associated with it in the Remote Control application.

Configuring a New Tester for Remote Control

The following describes how to set up a new aurora^{Duet} ready for Remote Control.

- Choose **File/New** to display the **New Tester** dialog box.

This lets you specify the properties of the new tester.



Tip

You can also set up a new tester from within the **Configure Testers** dialog box.

Entering Access Information

- In **Tester Name**, enter the unique name you wish to give the aurora^{Duet}.

For example, enter 'Tester01'. The first eight characters of this name will be used for the default session and log file names.



Note

The tester name should have no spaces.

- In **Location**, enter the current location of the aurora^{Duet}.

- In **Telephone Number**, enter the telephone number associated with the aurora^{Duet}.

If the tester is never called up over a modem, leave the **Telephone Number** field blank.

- Choose **Apply** to save your entries without exiting the dialog box, or choose **OK** to save and exit.

Entering Log Information

- Click on the **Log** tab on the **New Tester** dialog box to display the following dialog box. Use these options to tell Remote Control where you want to place stored data such as ASCII text or Expert data.



Specifying an ASCII log file

- In the **Ascii log file** area, enter the **Filename** where you wish to save any logged ASCII data.

If you want to store this file in a different directory, click on the **Browse** button, to the right of this option, and browse through the directory structure to specify where you wish to place the file.



Note

ASCII files are given the file extension .log and take their default name from the name given to the tester. For example, if you call your tester 'Tester1', the log file defaults to 'Tester1.log'.

- Click in the **Enable** check box.

When a tick (✓) is displayed information is logged to the file you have specified.

- Choose **Overwrite** to overwrite the file each time data is saved, or choose **Append** to add new data to the end of the file.

Specifying an Expert log file

- In **Expert data file**, enter the **Filename** where you wish to capture data in 'Expert' format, for use in the aurora^{Expert} for Windows protocol analysis application.

If you want to store this file in a different directory, click on the **Browse** button, to the right of this option, and browse through the directory structure to specify where you wish to place the file.



Note

Expert files are given the file extension .exp and take their default name from the name given to the tester. For example, if you call your tester 'Tester1', the session file defaults to 'Tester1.exp'.

- Click in the **Enable** check box.

When a tick (✓) is displayed information is logged to the file you have specified. Choose **Overwrite** to overwrite the file each time data is saved or choose **Append** to add new data to the end of the file.

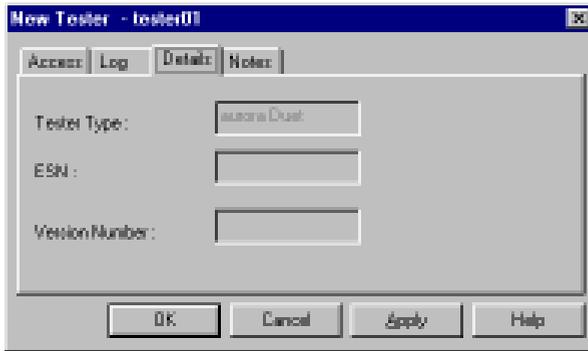
Saving your changes

- Choose **Apply** to save your entries without exiting the dialog box, or choose **OK** to save and exit.

Checking aurora^{Duet} Details

To tell Remote Control about the type of tester and the version of software running on it:

- Click on the **Details** tab on the **New Tester** dialog box to display the following dialog box:



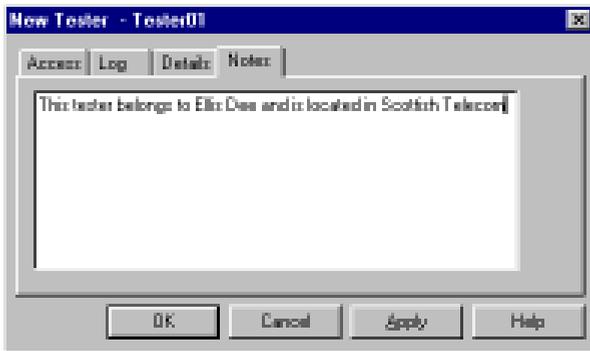
You cannot enter these details - Remote Control automatically downloads and updates them on connection to the tester. The information is as follows:

- Tester Type** displays the type of tester you are using, in this case aurora^{Duet}.
- ESN** tells Remote Control the Electronic Serial Number (ESN) from aurora^{Duet}.
- Version Number** tells Remote Control about the version of software currently loaded on aurora^{Duet}.

Entering Notes

To record notes that you wish to keep about the session:

- Click on the **Notes** tab on the **New Tester** dialog box to display the following dialog box.



You can enter as much information here as you want, the only restriction being the storage capacity on your PC. This information is not mandatory, but may prove useful as a future reference.

- Choose **Apply** to save your entries without exiting the dialog box, or choose **OK** to save and exit.



Note

When you add a new tester, Remote Control automatically uses this as the currently selected tester and the name is displayed in the title bar of the window.

Selecting a Previously Configured Tester

To select an aurora^{Duet} which you have previously set up within Remote Control:

- Choose **File/Open** to display the **Select a Tester** dialog box.

This displays a list of all the testers you currently have configured within Remote Control.

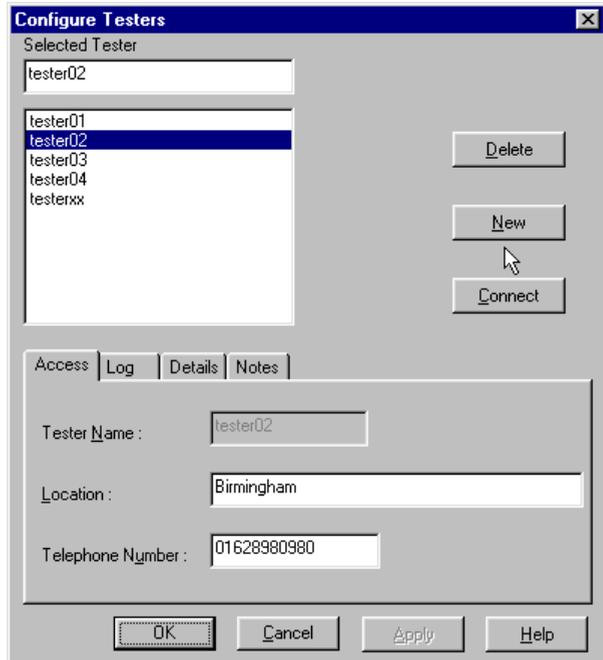


- Click on the tester you wish to work with.
The current selection is displayed within **Selected Tester**.
 - Choose **OK** to save your selection and exit the dialog box.
- On exit, the name of the selected tester is displayed in the title bar of the window.

Updating a Tester's Details

Once you have set up a tester you can update its details using the **Configure Testers** dialog box. You can also set up new testers, connect to and delete testers from this dialog box.

- Choose **Setup/Configure Testers** to display the **Configure Testers** dialog box.



The name of the currently selected tester is displayed together with a list of all the other testers currently configured within Remote Control.

To update a tester:

- Select the tester you wish to edit and update the information in the Access, Log, Details and Notes tabs - refer to *Configuring a New Tester for Remote Control* for information on completing these options.



Tip

Use the **Connect** and **New** buttons in the **Configure Testers** dialog box to connect to the selected tester or set up a new tester.

Deleting a Tester from Remote Control

To delete a tester's details from Remote Control using the **Configure Testers** dialog box.

- Select the tester whose file you wish to delete from Remote Control.
- Click on the **Delete** button.

A dialog box appears asking you to confirm the deletion.

- Click **OK** to confirm the request.

The tester is deleted and its name no longer appears in the display. Alternatively, choose **Cancel** to abandon the deletion.

Saving Your Changes

- Choose **Apply** to save your changes without exiting the dialog box or **OK** to save and exit.

Viewing a Tester's Properties

You can also view and update the properties of the currently selected tester using the **Properties** menu option. The name of the currently selected tester is displayed in the title bar of the window.

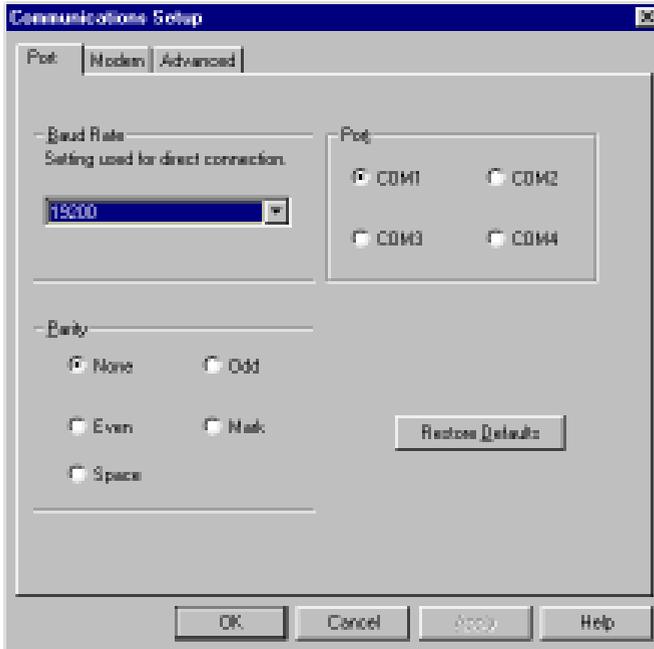
- Choose **File/Properties** to display the **Properties** dialog box.

This dialog box is similar to the one displayed when you set up a new tester - refer to *Configuring a New Tester for Remote Control* for further information.

Communications Setup

To set up Remote Control to communicate with your selected tester:

- Choose **Setup/Communications** to display the **Communications Setup** dialog box.



Setting up the Port

- Click on the **Port** tab within the **Communications Setup** dialog box to specify the COM port, parity and baud rate you wish to use for Remote Control.

Setting the Baud Rate

This is the rate at which data is transmitted over the serial port **during a direct connection**. A range of baud rates are provided to allow you to optimise the baud rate in relation to the attached modem. Whatever value you choose must match the baud rate of the tester.

- Click on the dropdown box, to the right of **Baud Rate**, to display a list of available options.
- Click once on the appropriate baud rate to select it.

We recommend you use a baud rate no lower than 19,200bps, which is the default.

Choosing a Parity Bit

Parity is a form of error checking in which a single bit (the parity bit) is added to the transmitted data. The value you choose must match the parity bit of the tester.

- Click on the appropriate parity option:

Parity Options	
Type	Description
None	No parity bit is included in the transmitted data.
Odd	A zero or a one is transmitted such that the total number of bits sent in a character is odd.
Even	A zero or a one is transmitted such that the total number of bits sent in a character is even.
Mark	A parity bit of one is added.
Space	A parity bit of zero is added.

Selecting the Com Port

To specify the COM port through which you are connected to the tester:

- Click on the appropriate COM port to select it.

Restoring Communications defaults

To restore the default communication settings:

- Click once on the **Restore Defaults** button.

The defaults are as follows:

Port Default Settings	
Baud Rate	19200
Port	Com Port 1
Parity	None

Saving your selections

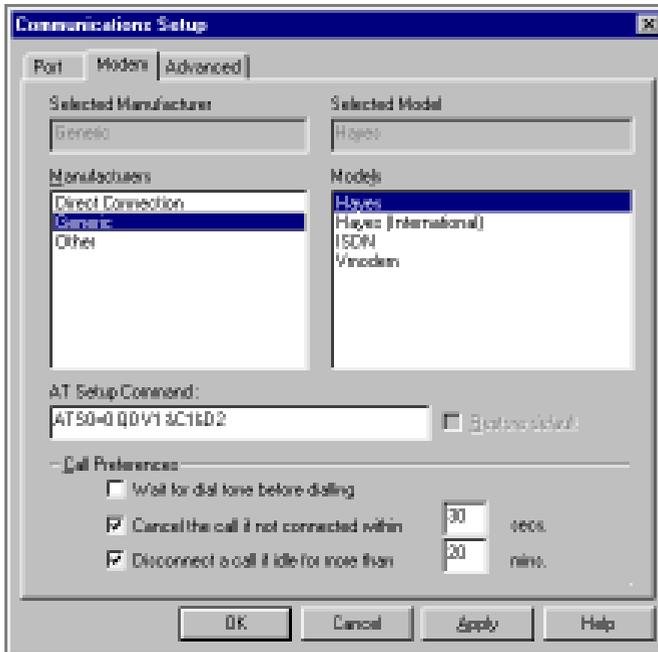
- Choose **Apply** to save your selections without exiting the dialog box, or choose **OK** to save and exit.

Specifying the Modem

The modem attached to the PC *must* be Hayes AT command set compatible - please refer to Section 1 of this Chapter for details of the modems supported by Remote Control.

To specify the modem you wish to use to communicate with the tester:

- Click on the **Modem** tab within the **Communications Setup** dialog box.



Selecting a modem type and model

- Click on the appropriate modem manufacturer listed under **Manufacturers**.

The currently selected manufacturer is displayed under **Selected Manufacturers**. Alternatively, if you are making a direct connection to the tester, choose **Direct Connection**.

- Choose the appropriate modem model.

The currently selected model is displayed under **Selected Model**.

Specifying an AT setup command

Remote Control provides a default AT Setup Command for the selected modem. To change this:

- Overwrite the value in the AT Setup Command.

If you change the default AT Setup Command, Remote Control will use your amended command for this tester in future.

Restoring the default AT setup command

If you have previously amended the AT Setup Command, but wish to return to the default command:

- Click on the **Restore default** check box to display a tick (✓).

The default AT Setup Command is restored.

Setting Call Preferences

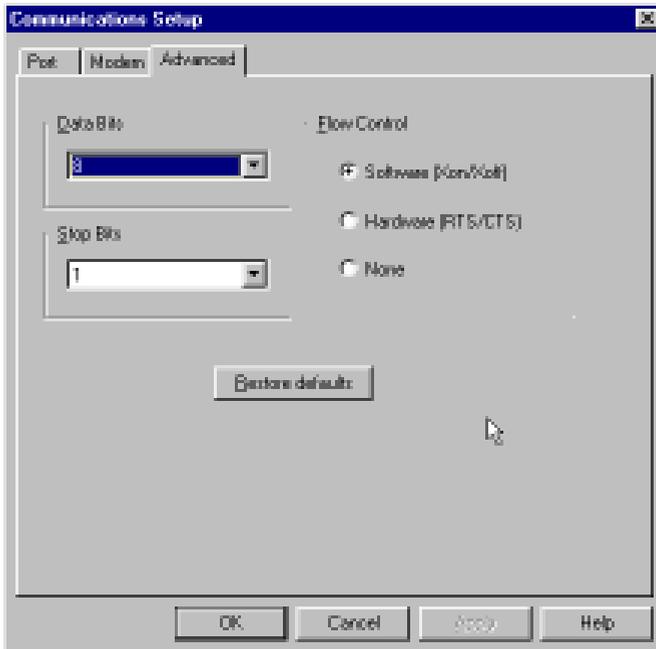
You can specify various call preferences within Remote Control for communicating with the tester.

- To instruct Remote Control to wait for a dial tone before dialling begins, click on the **Wait for dial tone before dialling** check box to display a tick (✓).
- To cancel the call within a specified number of seconds when not connected, click on the **Cancel the call if not connected within** check box to display a tick (✓) and enter the appropriate number of seconds after which the call is to be cancelled.
- To instruct Remote Control to disconnect an idle call within a specified number of minutes, click on the **Disconnect a call if idle for more than** check box to display a tick (✓) and enter the appropriate number of minutes after which the call is to be disconnected.

Specifying Advanced Communications Settings

Advanced settings are those which do not usually need to be changed unless you are using a non standard modem or an unusual communication configuration.

- Click on the **Advanced** tab within the **Communications Setup** dialog box to specify the Data Bits, Stop Bits and Flow Control settings for Remote Control.



Setting the number of data bits

To determine the character length of the port data:

- Click on the dropdown box, to the right of **Data Bits**, to display a list of available options.
 - Click once on the appropriate bit length to select it.
- 8** bits is the default and we recommend that you use this.

Choosing the number of stop bits

To choose the number of transmitted stop bits to suit the connected tester:

- Click on the dropdown box, to the right of **Stop Bits**, to display a list of available options.
- Click once on the appropriate value to select it.

The default number of stop bits is **1**.

Specifying the type of flow control

To specify the type of flow control to suit the connected modem:

- Click on the appropriate flow control to select it - the options are as follows:

None	No flow control
Software	Switch on the XON/OFF asynchronous flow control protocol.
Hardware	Switch on the RTS/CTS flow control protocol.

The default depends on the type of connection you are making to the tester - the default is **Software** for a direct connection and **Hardware** for a modem or TA connection.

Restoring advanced defaults

To restore the default advanced settings:

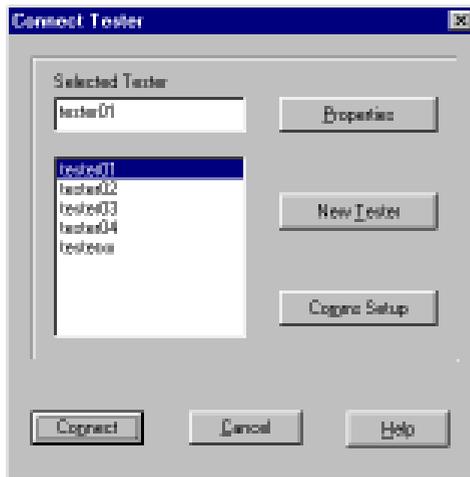
- Click once on the **Restore defaults** button. The defaults are as follows:

Advanced Default Settings	
Data Bits	8
Flow Control	Software Xon/Xoff
Stop Bits	1

Connecting to a Tester

To select and connect to an aurora^{Duet} which you have configured within Remote Control.

- Choose **Connect** from the **Connection** menu to display the **Connect Tester** dialog box :



- The currently selected tester is displayed under **Selected Tester** but you can choose a different tester by making a selection from the box beneath it.

Specifying the Type of Connection

You need to tell Remote Control what type of connection you are making in the **Modem** tab of the **Communications Setup** dialog box.

If you are making a direct connection to a tester, the connection will be established much quicker if you specify **Direct Connection** in the **Selected Manufacturers** dialog box - refer to *Specifying the Modem* earlier in this Section for further details.

If you are making a modem or TA connection and you specify a modem, Remote Control searches for a modem, beginning at the highest baud rate and working its way downwards until it locates the modem. If it does not locate a modem at any of the baud rates, it attempts to make a direct connection to the tester.

Displaying and updating the tester's properties

- To view and update the currently selected tester's properties, click on the **Properties** button.

Refer to *Configuring a New Tester for Remote Control* for a description of the properties displayed.

Configuring a new tester

- To add a new tester, from the **Connect Tester** dialog box, click on the **New Tester** button.

Refer *Configuring a New Tester for Remote Control* for information on setting up a new tester.

Setting up the COM port & modem

- To set up the COM port and modem, from the **Connect Tester** dialog box, click on the **Comms Setup** button.

Refer to *Communications Setup* for further information.

Making a Connection

- Click on the **Connect** button at the bottom of the **Connect Tester** dialog box to connect to the tester.

The **COM Port I/O** window is displayed (sometimes only for a split second). This window shows the commands and responses received and transmitted between the COM port and the modem. This window is useful for diagnostic purposes but you can minimise or close it if you prefer.



Tip

If you close the **COM Port I/O** window, you can open it again at a later stage - see *Redisplaying Windows*.



Note

You can also connect to a tester from within the **Configure Testers** dialog box.

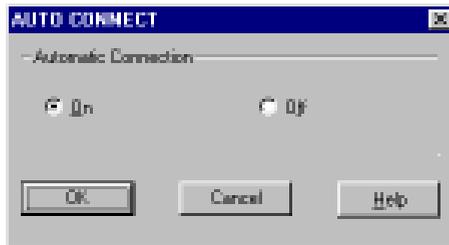
Automatic Connection

To set up Remote Control so that, when first started, it automatically looks for and tries to connect to the currently selected tester.

- Choose the tester you wish to automatically connect to in future.

The currently selected tester is displayed in the title bar - refer to *Selecting a Previously Configured Tester* for information on choosing a different tester.

- Choose **Automatic Connection** from the **Connection** menu to display the following dialog box:

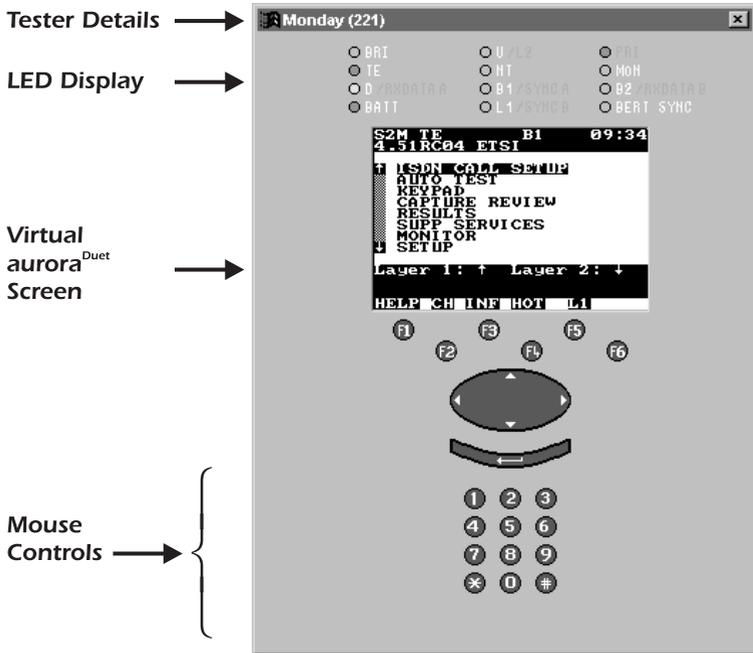


- Click the **ON** radio button to enable automatic connection.

Remote Control, when started, will now automatically attempt to connect to the currently selected tester either directly, or via a modem or TA, depending on the modem setup.

Using the Virtual aurora^{Duet}

When Remote Control makes a successful connection to a tester, the Virtual Instrument window is displayed to represent aurora^{Duet}. This window allows you to control aurora^{Duet} and access its functions just as if it were in your hand.



Accessing aurora^{Duet}'s menus and functions

You can access aurora^{Duet}'s menus and functions in two ways:

1. Using the PC keyboard.
 - Use the arrow keys, keypad, function keys and the *ENTER* key on your PC keyboard.
2. Using the mouse.
 - Use the mouse to click on the arrow keys, keypad, function keys and *ENTER* key displayed in the lower half of the Virtual Instrument window.

The following examples help to illustrate this:

- To move up and down through aurora^{Duet}'s menus, use the **UP** and **DOWN** arrow keys on your PC *or* point to the **UP** and **DOWN** arrow keys on the display with the mouse, in the same way as you would use the arrow keys on aurora^{Duet}.
- To trigger a function key action, use the corresponding function keys on your PC *or* point to the function keys on the display with your mouse, in the same way as you would use the function keys on aurora^{Duet}.
- To choose an option, use the **ENTER** key on your PC *or* point to the **ENTER** key with the mouse, in the same way as you would on aurora^{Duet}.
- To enter digits, use the mouse to click on the keypad on the display.

Unavailable Functions on Virtual aurora^{Duet}

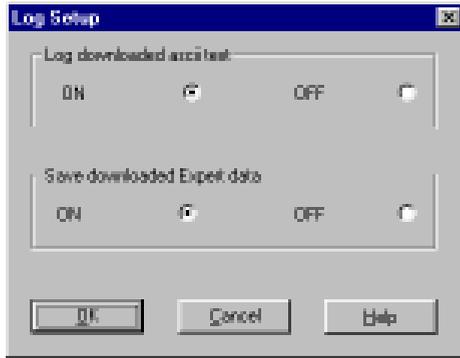
You cannot perform the following functions with the virtual aurora^{Duet}:

- Adjusting the contrast of the screen
- Switching the backlight on and off
- Making selections from the **SETUP/COMMS SETUP** screen
- Making selections from the **SETUP/GENERAL SETUP/SET DEFAULTS** screen.

Saving Data from the Session to File

You can save data, in either ASCII or Expert format, from your Remote Control session using the **Log Setup** dialog box. Data is saved in the files specified when you first set up the tester (refer to *Configuring a New Tester for Remote Control* for further information about specifying the log and exp files).

- Choose **Log** from the **Setup** menu to display the **Log Setup** dialog box.



Note

The options in this dialog box apply to all testers. To turn logging on or off for individual testers, go to **Configure Testers** and display the **Log** dialog box.

- To capture data in ASCII format to the .log file, click on the **ON** radio button below **Log downloaded ascii text**.
- To capture data in Expert format to the .exp file, click on the **ON** radio button below **Save downloaded Expert data**.
- Click on **OK**.

The dialog box is exited.

Stopping data capture

- Click on the appropriate **OFF** radio button and then click **OK** to stop saving data to file.

The dialog box is exited.



Note

The settings in the **Log Setup** dialog box affect all testers. When you set data capture on, data is captured from any tester you are connected to, provided logging is on for that tester. If you disconnect from one tester and connect to another, data capture continues. Likewise, if you set data capture off, all data capture stops for all testers.

Starting aurora^{Expert} for Windows

If aurora^{Expert} for Windows is currently installed on your PC, you can start it from within Remote Control, regardless of whether you are currently connected to a tester or not.

- Choose **Start Expert** from the **Connection** menu to display the aurora^{Expert} Window.

Refer to the aurora^{Expert} for Windows Reference Guide for information about the aurora^{Expert} application.



Tip

You may find it useful to arrange your screen so that both the Remote Control and aurora^{Expert} windows are open, side by side on your screen. For example, in Windows 95 and NT, point to the taskbar and click the right mouse button. Choose **Tile Horizontally** to place the windows side by side.

Redisplaying Windows

If you have closed the **COM Port I/O** or the Virtual Instrument window (and you are still connected to the tester) you can redisplay the window from the **View** menu.

- Choose **COM Port I/O** or **Virtual Instrument** from the **View** menu.

The appropriate window is displayed.

Disconnecting a Tester

To clear down a connection to an aurora^{Duet}:

- Choose **Disconnect** from the **Connection** menu.

The Virtual Instrument window is exited.



Note

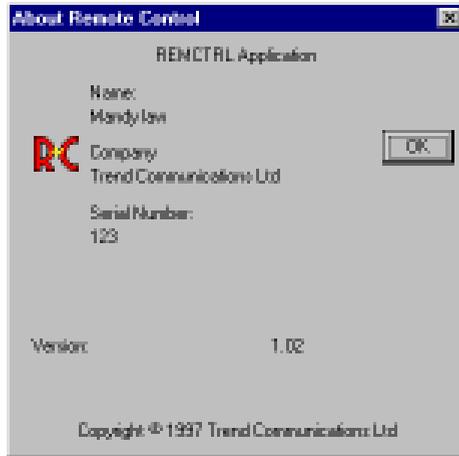
This menu option is only available when there is a current connection to a tester.

Displaying Software Information

To display information about the Remote Control software you are running, such as the current version, build and copyright details.

- Choose **About Remctrl** from the **HELP** menu.

The following screen is displayed:



- Click on **OK** to close this dialog box.

Quitting Remote Control

To exit Remote Control, select **File / Exit** or:

-  ➤ Doubleclick on the Close icon 
-   ➤ Click on the Close icon 

Section 3

Modems - an Overview

This section provides a brief introduction to modems and how they operate. A troubleshooting guide is also provided to help you if you experience problems with your modem.

Why Use a Modem?

A modem acts as an interface between the analogue and the digital world. Modems convert digital signals into analogue tones which can then be passed over the telephone network. A modem at the receiving end reverses this process, converting analogue signals into the original digital signal.

The process of converting digital signals into analogue signals is called MODulation; the process of converting analogue signals into digital signals is called DEModulation, hence the name MODEM.

Some Useful Terminology

A modem is often referred to as a Data Circuit-terminating Equipment (DCE). A computer is known as Data Terminal Equipment (DTE).

The computer which initiates the call is termed the *Originating* DTE and the computer receiving the call is called the *Answering* DTE. For example, if you dial from your PC at home into the computer at work, you are the *Originating* DTE and the office computer is the *Answering* DTE.

Standards for Modems

International standards for modems exist in the form of ITU-T V series recommendations. These standards have been adopted in both European and, to a lesser degree, North American PTTs. Various other proprietary standards have also emerged for features such as data compression and error correction.

External versus Internal Modems

A modem may be either an external, stand-alone device or it may be internally built into the PC's adaptor card. Internal modems may also take the form of a Modem PC card (PCMCIA) which can be slotted into a computer, usually a laptop.

External modems require their own power supply, whereas internal modems (including the PC card type) take their power from the PC. Cabling needs constitute another significant difference between internal and external modems; both types of modem need a connection to the telephone line, however only the external modem requires cabling to the PC via the serial port.

Another advantage of using an internal modem is that you do not require a high speed serial port. Internal modems have their own UART (Universal Asynchronous Receiver/Transmitter); with external modems the UART is on the serial board.

About UARTs

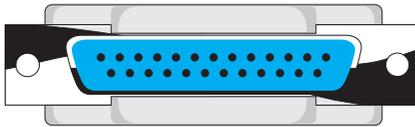
A UART is an electronic component which converts bytes into serial bits for transmission, and vice versa. It also generates and strips the start and stop bits appended to each character. If parity is in use, the UART verifies the parity and strips the parity bit from each byte passed to the computer.

Recommended UART speed

There are several speeds of UART chips but the 16550 UART is the minimum we recommend that you use. To determine what type of UART you have in your PC, run Microsoft Diagnostics (MSD) which tells you what type of UART is in your system.

Connecting an External Modem

You need to use a different type of serial cable to connect a modem to a computer than you would use, say, to connect a computer to a computer. The EIA (Electronic Industries Association) RS232 25-pin connector (DB25) is the standard interface between a modem and a PC:



Connector pins

Of the 25 pins available on the connector, only 10 are commonly used. The following table shows the function of the most commonly used pins:

RS232 DB25 Standard		
Pin	Description	Function
1	Ground Shield (GND)	Protects and minimises interference.
2	Transmit Data (TD)	Carries information from the computer (DTE).
3	Receive Data (RD)	Carries information from the modem (DCE) to the computer.
4	Request To Send (RTS)	This is the signal from the computer to the modem telling it to send data.
5	Clear To Send (CTS)	This is the signal from the modem to tell the computer when to send data.
6	Data Set Ready (DSR)	Indicates the modem is connected and ready.
7	Signal Ground (SG)	Used as a ground reference for all other signals.
8	Carrier Detect (CD)	Indicates to the computer that the modem can hear the remote modem.
20	Data Terminal Ready (DTR)	Indicates that the computer is powered and ready.
22	Ring Indicator (RI)	Indicates that a ringing signal is being received.

Modem Control

Modern day modems are intelligent devices with a memory that allows them to store command sets and perform functions including automatic dialling, data compression and error detection and correction.

Command Sets

Command sets are simply codes which are recognized and acted upon by modems. A modem's command set determines its operational capability.

The Hayes command set emerged when Hayes Microcomputer Products captured approximately fifty percent of the PC modem market with their Smartmodem, the result being that their command set became the industry standard. Therefore, the term 'Hayes compatible' means that a modem loosely follows the command set of the original Hayes Smartmodem.

The Hayes command set comprises of a set of basic codes which have various command extensions. The basic codes are common to all Hayes compatible modems but the command extensions may only apply to modems of a high enough specification.

Hayes commands

Nearly all Hayes commands begin with the characters AT (attention code) and end with a carriage return (note that there are two exceptions to this rule - the **+++** command and the **AV** command). The AT command gets the attention of the modem which should in turn respond with an OK.

Modes of Operation

Today's intelligent modems have four different operating modes. These are as follows:

- Local Command mode** Your modem is in local command mode, ready to accept instructions, when you first power it on.
- Handshaking mode** When attempting to communicate and negotiate transmission settings with another modem, your modem is in handshaking mode.
- On-line mode** This is also called **Data Transfer Mode**. In this mode the modem de/modulates and transmits/receives data between itself and a distant modem. Your modem will not respond to any AT commands in this mode - you must use the **+++** escape sequence to exit this mode.
- On-line Command mode** Sometimes called **Off-line Command mode**. If you escape on-line mode, as described above, your modem will respond to commands, despite the fact that it is still connected to the distant modem.

Troubleshooting

The following is intended to help you identify and correct common problems which you may experience with your modem while using Remote Control. It is not intended as a comprehensive modem troubleshooting guide or as an alternative to your modem manufacturer's user guide which you should always refer to first.

What to Check First!

If you experience problems, the first points to check are the physical connections, cables and power supply.

Check connections, cables and power supply

If you are using an external modem:

- Check that it has power, is switched on and that the telephone lead is plugged into both the modem and the telephone line.

If you are using an internal modem:

- Check that the phone jack is plugged into the PC.

Check DIP switches

If your modem has DIP (Dual In-line Package) switches, ensure the following settings are enabled:

- DTR override
- Carrier detect override
- Display results codes

Remember that if you are using a modem with a 9-pin 'D' connector, you need two adaptors: the remote modem adaptor and a standard 9 to 25 adaptor. For an illustration of this, see *Equipment Required for a Modem or TA Connection* in Section 1.

Simple Fault Finding Tests

You can use the following tests to determine whether your modem is operating correctly, and to test the various connections. These tests should be performed from the Windows **HyperTerminal** (Windows 95 & NT) or **Terminal** (Windows 3.1).

Test 1

A simple way of checking that your modem is operating correctly is to:

- Enter the Attention command (AT).

The modem should respond with the message 'OK' or 'O' (assuming result codes are enabled, which is normally the default). If the modem does not respond, ensure it is powered on and check the physical connections between it and the DTE.

Test 2

To test the connections between the modem and the DTE, perform the following steps:

- Turn on the modem's speaker so you can hear the dial tones. For example, give the command `ATM2L3`.
- Give the modem the tone dialling command followed by a sequence of digits. For example, `ATDT1234567`

You should now hear tones in the speaker as they are dialled. If you do not, there may be a problem with the connection between the modem and the DTE or the telephone line.

Test 3

To quickly check the telephone line:

- Connect a normal telephone hand set to the line and listen for a dial tone.

If you cannot hear a dial tone then there is a problem with the phone line, not the modem.

Troubleshooting Problems Between the PC and Modem

Problem : **the modem does not respond to any AT commands**

Possible cause: you may be using the wrong COM port or, if you are using an older modem, there may be a speed mismatch.

Possible solutions :

- If you are using an external modem, check it is hooked up to the correct COM port.
- Ensure you are addressing the correct COM port in your communications software (for example, check the **Port** setting within Remote Control).
- If you have a card modem installed, check there are no addressing or interrupt conflicts; for example, both the mouse and the modem installed on the same COM port.
- Check that the baud rate in your communications software matches the modem's serial data rate. This really only applies if you are using an older modem as newer models 'auto detect' the serial port speed.
- Ensure the AT command is either all in UPPERCASE or lowercase characters and not a mixture of both.

Problem : **the PC freezes when you try to use the modem**

Possible cause: there may be an addressing or interrupt conflict - in other words, the modem may not be the only equipment assigned to this COM port.

Possible solutions:

- Change the COM port address

Problem : **the modem dials but fails to establish a connection**

Possible cause: the remote modem connected to aurora^{Duet} may not be set up to automatically answer calls.

Possible solutions:

- Try making the call again. The call may be successful on the 2nd attempt as each call is routed differently.
- Also check that aurora^{Duet} is set up for modem communication and is in Remote mode (refer to *Setting up aurora^{Duet} for Remote Control* in Section 1 for further details).

Problem : **data appears to be missing from the transmission**

Possible cause: flow control between the modems may be the problem.

Possible solutions:

- Ensure the XON/OFF flow control is set to ON in both the Remote Control software on the PC and in aurora^{Duet}.

Problem : **the modem hangs up for no reason during a connection**

Possible cause: other equipment on the line may be interfering.

Possible solutions:

- Try disconnecting all other phones or answering machines on the same line.

Troubleshooting Problems Between aurora^{Duet} and its Modem

Problem : **the modem fails to answer an incoming call**

Possible cause: the modem connected to aurora^{Duet} may not be set up to automatically answer calls.

Possible solutions:

- Check the physical connection between aurora^{Duet} and the modem and ensure the modem's power supply is connected and switched on.
- Check aurora^{Duet} is set up for modem communication and is in Remote mode (refer to *Setting up aurora^{Duet} for Remote Control* in Section 1 for further details).



Chapter 8

X.25 Operation

Contents

Section 1 - Introducing X.25	8-3
Section 2 - Setting up X.25 Operation	8-5
Section 3 - Outgoing & Incoming X.25 Calls ..	8-19

X.25 Operation

This chapter provides operating instructions for the optional X.25/X.31 Generic Packet Mode Support feature.

It is assumed that you are already familiar with the basic functions of the tester, as described in the previous chapters.

X.25/X.31 allows you to test the X.25 packet mode switched system accessed on the ISDN.

This chapter has the following structure:

Section 1 Introducing X.25

Section 2 Setting up X.25 Operation

Section 3 Outgoing and Incoming X.25 Calls

Section 1

Introducing X.25

This section introduces you to X.25/X.31 Generic Packet Mode Support.

Overview of X.25 Operation

When X.25 operation is enabled, aurora^{Duet} supports incoming and outgoing X.25 packet switched calls for testing over the B and D channels of the ETSI ISDN Basic and Primary Rate interfaces.



Note

Generic Packet Mode Support is available only when aurora^{Duet} is emulating a TE (Terminal Equipment).

X.25 Service Types

aurora^{Duet} allows you to test the following CCITT (ITU-T) recommended X.31 functionality service types:

X.31 Service Types	
D-channel X.25	This is an X.25 protocol with access to ISDN virtual circuit services on the D-channel. A call is made to the remote equipment using the D-channel. Because the amount of ISDN signalling data is very low, both the ISDN signalling data and the X.25 packet data can be multiplexed on the same D-channel.
B-channel X.25	This is an X.25 protocol with access to ISDN virtual circuit services on the D-channel. A call is made to the remote equipment using the D-channel. The ISDN signalling data uses the D-channel and the X.25 data uses the B-channel.



Note

X.25 protocols are used by data communication devices, which have various protocol options. X.25 is standardized up to layer 3 of the ISO 7-layer model, and applications require additional upper layer protocols. The testing of X.25 creates data packages encapsulated in Layer 3, which transfer through the network so that the service setup and functionality can be checked.

Notes on X.25 Operation

TEI Allocation **BRI**

Terminal Endpoint Identifiers (TEIs) are set up separately for the B and D channels. You can use the same type of allocation (Fixed or Auto) for both the B and D channels, or use Auto allocation for the B channel and Fixed for the D channel. However, you cannot choose Fixed for the B channel and Auto for the D channel.

When TEI allocation is set to Fixed for both the B and D channels, you can specify a separate set of TEI values for each channel type.

Section 2

Setting up X.25 Operation

This section describes how to set up aurora^{Duet} for X.25 operation.



Tip

Appendix 3 contains X.25 menutree diagrams to help you navigate the menu structure.

Accessing the X.25 Setup Screen

To set up aurora^{Duet} for X.25 operation:

- From the Main menu, choose **SETUP** to display the **MAIN SETUP** menu.
- Choose **X.25 SETUP**.

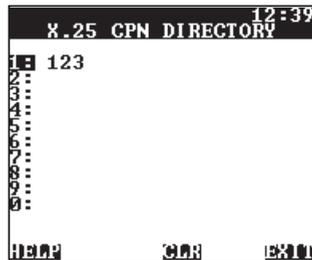
The following screen is displayed:



Setting up an X.25 CPN Directory

You can set up a directory of frequently dialled X.25 Called Party Numbers, similar to the CPN directory for ISDN - see Chapter 3 Section 2. Up to ten X.25 CPNs may be stored in aurora^{Duet}'s memory.

- Choose **X25 CPN DIRECTORY** from the **X.25 SETUP** menu.



Entering an X.25 CPN

- Use the *UP* and *DOWN* arrow keys to highlight the CPN line you wish to edit.

A flashing cursor indicates the point where you can enter a number.

- Key in a CPN of up to 15 digits.

To delete a character, press the *LEFT* arrow key. To erase the entire CPN, press **F4 CLR**.

- To save the CPN, press **F6**.



Note

When you return aurora^{Duet} to its factory defaults (using the **SET DEFAULTS** option on the **GENERAL SETUP** menu), all CPNs in the directory are cleared.

Setting up B-Channel and D-Channel X.25

To set up D and B Channel ISDN X.25 parameters for both Basic and Primary Rate testing:

- Choose **B-CHANNEL X.25** or **D-CHANNEL X.25** from the **X.25 SETUP** menu.

The **X.25 SETUP** menu for the B or D channel, is displayed:

```

D-CHANNEL      12:39
X.25 SETUP

NEGOTIATION
PRI TYPE:      SUC
D BIT:         LOCAL
R CHARGE:      NO
TEST LENGTH:   USER DEF
LCGN           0
LCN            1
PACKET RATE:   33
ERROR CHECK:   NO
TEST LENGTH:   00:00:15
  
```

Entering the X.25 Address (LCGN & LCN)

X.25 uses a 12 bit address, which is made up of:

- an 8 bit Logical Channel Number (LCN) between 0 and 255
- a 4 bit Logical Channel Group Number (LCGN) between 0 and 15.



To enter the X.25 address, you use two menu options: **LCGN** and **LCN**. For addresses between 1 and 255, set **LCN** to the address and **LCGN** to 0; for addresses between 256 and 511, set **LCN** to a number between 0 and 255 and **LCGN** to 1, and so on.

- Highlight **LCGN** and enter an LCGN between 0 and 15.
- Then highlight **LCN** and enter an LCN between 0 and 255.

aurora^{Duet} prevents you from entering a complete address (LCGN and LCN combined) of 0, since this is reserved for maintenance/overhead purposes. Thus, for example, when you enter an LCGN of 0, you cannot set the LCN to 0.

 With the VN4 protocol, you enter the X.25 address using a single menu option: **LCN/LCGN**.

- Highlight **LCN/LCGN** and enter an address between 0 and 4095.

Setting up the D-bit

The 'D' Bit is known as the Delivery Confirmation (or acknowledgement). It indicates whether data packet reception should be acknowledged locally by the network (and the data packet passed on to the next stage of the network on its journey to its final destination) or whether the final destination should acknowledge the final data packet.

This allows flow control to be performed either locally or end-to-end. If the acknowledgement is end-to-end and there are several stages in the journey, there can be a significant time delay for acknowledgements when testing this form of flow control.

- Highlight **D-BIT** and press the *LEFT* and *RIGHT* arrow keys to choose **LOCAL** or **END-TO-END** operation.



Notes

- If an incorrect D bit is received, the packet is discarded; this does not apply to data packets. After discarding the packet, aurora^{Duet} shows the previous call setup screen whilst waiting for the packet to be retransmitted.

- Use of an RS232 output option is not recommended when transmitting large packets at high data rates. If you wish to use an RS232 output option, e.g. Decode, set the parameters to a reduced packet rate and use smaller packet sizes.

Setting up Reverse Charging

To determine whether aurora^{Duet} accepts calls which request reverse charging:

- Highlight **R CHARGE** and press the *LEFT* and *RIGHT* arrow keys to toggle between **YES** and **NO**.

Reverse Charging Setup	
Yes	aurora ^{Duet} accepts any incoming call where a request for reverse charging has been made, and allows reverse charging on outgoing calls.
No	aurora ^{Duet} rejects any incoming call where a request for reverse charging has been made, and prevents requests for reverse charging on outgoing calls.

Setting the Test Length

The test length determines the period for which a logical connection is established and aurora^{Duet} is transmitting packets.

- Highlight **TEST LENGTH** and press the *LEFT* and *RIGHT* arrow keys to choose one of the following:

Test Length	
Continuous	The test runs until you stop it
1 Min	The test runs for 1 minute
15 Mins	The test runs for 15 minutes
1 Hour	The test runs for 1 hour
User Def	Lets you set a custom test length.

Specifying a user defined test length

- Set **TEST LENGTH** to **USER DEF.**

If a user defined **TEST LENGTH** already exists, this is displayed.

- Press **F3 EDIT.**

A flashing cursor indicates where you can enter the first digit and aurora^{Duet} enters edit mode.

- Enter a custom test length, using the keypad to enter digits 0 to 9.

The test length must be in the format **HH:MM:SS** (hours, minutes and seconds).

Setting the Maximum Number of Packets in a Sequence VN4

To determine the maximum number of packets which can be transmitted in sequence before an acknowledgement or rejection is expected:

- Highlight **MAX WINDOW** and press the **LEFT** and **RIGHT** cursor keys to choose **8** or **128**.



Note

Although **MAX WINDOW** can be set to **128**, due to memory restrictions, the maximum window size that can be negotiated on aurora^{Duet} is 8.

Setting the Packet Rate

The packet rate is the number of times per minute that aurora^{Duet} attempts to send data packets during a packet test.

- Highlight **PACKET RATE** and press the **LEFT** and **RIGHT** arrow keys to choose **33**, **75**, **150** or **300**.

Choosing Whether Packets are Error Checked

To determine whether the content of received data packets is checked for corruption against the data that was sent:

- Highlight **ERROR CHECK** and press the *LEFT* and *RIGHT* arrow keys to toggle between **YES** and **NO**.

Corrupted packets are recorded as **ERR'ED** (errored) in the test results.

Setting up X.25 Negotiation

To choose the way in which the Throughput, Packet Size and Window Size are negotiated during call setup:

- From the B or D Channel **X.25 SETUP** menu, choose **NEGOTIATION**.

D-CHANNEL 12:40	
X.25 NEGOTIATION	
PACKET SIZE:	NO
TS :	128
RS :	128
THROUGHPUT:	NO
TS :	9600
RS :	9600
WINDOW SIZE:	NO
TS :	2
RS :	2

- For each setting (**PACKET SIZE**, **THROUGHPUT**, or **WINDOW SIZE**) choose either **YES** or **NO**.

If you enter **YES** against a setting, the value you specify is used during the negotiation process of a Call Setup. If the network accepts this value, the call continues. If not, an alternative value is offered back by the network. If the alternative is accepted by aurora^{Duet} the call continues; if it is rejected, the call is cleared.

If you enter **NO** against a setting, the value you specify for the setting is used for outgoing calls. For incoming calls, all values equal to or below the specified value are accepted.

You can set up aurora^{Duet} to negotiate separate parameters for each transmission direction for **PACKET SIZE**, **THROUGHPUT** and **WINDOW SIZE**, by setting values for **Tx** (transmission from aurora^{Duet}) and **Rx** (transmission from the remote device).

With all negotiation parameters, the values actually used may be less than those originally requested if the network cannot support those values. If you enter **NO** against a setting and the network cannot accommodate the requested values, you will be unable to call.

Determining the packet size negotiation

The packet size is the maximum size of each block of data transferred across the network.

- Highlight **PACKET SIZE** and use the *LEFT* and *RIGHT* arrow keys to toggle between **YES** and **NO**.
- Highlight **TX** (transmit) and **RX** (receive) in turn, and use the *LEFT* and *RIGHT* arrow keys to choose a value.

The available values differ for D-Channel X.25 and B-Channel X.25 as follows:

D-Channel 32, 64, 128 and 256 octets

B-Channel 32, 64, 128, 256, 512, 1024, 2048 and 4096 octets



Notes

- RS232 output is not recommended when transmitting large packets at high data rates. If you wish to use an RS232 output option, e.g. DECODE, set the parameters to a reduced packet rate and use smaller packet sizes.
- When set to loopback mode, aurora^{Dnet} loops any size of packet up to a maximum of 256 octets. When originating a packet, aurora^{Pnet} uses the packet sizes as described above.

Determining the throughput negotiation

To specify the maximum value of throughput negotiation between the caller, the network and the end destination terminal:

- Highlight **THROUGHPUT** and use the *LEFT* and *RIGHT* arrow keys to toggle between **YES** and **NO**.
- Highlight **TX** (transmit) and **RX** (receive) in turn, and use the *LEFT* and *RIGHT* arrow keys to choose a value.

The available values differ for D-Channel X.25 and B-Channel X.25 as follows:

D-Channel 75, 150, 300, 600, 1200, 2400, 4800 and 9600 bits per second

B-Channel 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 48000 and 64000 bits per second.

Determining the window size negotiation

The window size is the maximum number of packets which can be transmitted in sequence before an acknowledgement or rejection is expected.

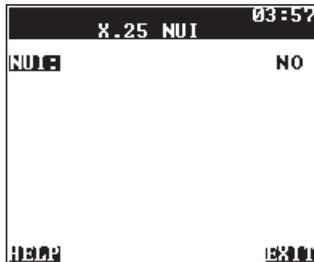
Normally packets should be acknowledged immediately, however flow control can take place when the window size is reached by acknowledging the first few packets. This allows additional packets to be transmitted and the acknowledgement process to be repeated.

- Highlight **WINDOW SIZE** and use the *LEFT* and *RIGHT* arrow keys to toggle between **YES** and **NO**.
- Highlight **TX** (transmit) and **RX** (receive) in turn, and use the *LEFT* and *RIGHT* arrow keys to choose **1, 2, 3, 4, 5, 6** or **7**.

Setting up a Network-User Identifier (X.25 NUI)

You can send an NUI to the network along with the request for an outgoing call. An NUI is an alphanumeric string of up to 12 characters which identifies the user to the network. The NUIs for a particular network are defined by its users. When you send the NUI, the DTE or DCE checks the text to determine whether calls can be connected for the user ID you have sent.

- From the **X.25 SETUP** menu, choose **X.25 NUI**. aurora^{Duet} displays an NUI setup screen. If an NUI has previously been set up it is displayed.



Choosing Whether to Send an NUI

- Highlight **NUI** and use the *LEFT* and *RIGHT* arrow keys to toggle between **YES** (include an NUI) and **NO** (do not include an NUI).

Creating or Editing the NUI String

You can set up or change the NUI string even when **NO** is selected. aurora^{Duet} saves the string and displays it on screen but does not send it in any call setup requests until the flag is set to **YES**.

To create or edit the NUI:

- Press the **DOWN** arrow key to move the cursor to the line below **NUI**.

An **F3 EDIT** function key appears.

- Press **F3 EDIT**.

aurora^{Duet} displays an alphanumeric selection screen.

- Enter a string of up to 12 characters.

Use the arrow keys to highlight each character you want and press **SELECT** to choose it. To delete the last character entered press **F3 DEL**. To erase the entire string press **F4 CLR**.

- When you have finished entering the string press **F6 EXIT** to return to the **X.25 SETUP** menu.

aurora^{Duet} saves the string.

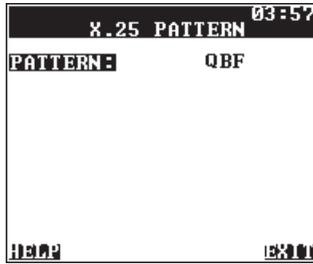
The next time you attempt an outgoing call, if the NUI flag is set to **YES**, aurora^{Duet} sends the NUI to the network.

Setting up the Test Pattern

You can choose the text pattern which aurora^{Duet} sends in test messages. It can send either the industry-standard 'Quick Brown Fox' (QBF) pattern or a custom ('user defined') pattern which you can set up.

- From the **X.25 SETUP** menu, choose **X.25 PATTERN**.

aurora^{Duet} displays a setup screen.



If a user defined pattern has previously been set up it is displayed.

Choosing the Type of Test Pattern

- Highlight **PATTERN** and use the *LEFT* and *RIGHT* arrow keys to toggle between **QBF** (standard 'Quick Brown Fox' pattern) and **USER** (user defined pattern).

Creating or Editing a User Defined Pattern

You can set up or change the user defined pattern even when **QBF** is selected. aurora^{Duet} saves the pattern and displays it on screen but uses the 'Quick Brown Fox' message until the flag is set to **USER**.

To create or edit the user defined pattern:

- Press the *DOWN* arrow key to move the cursor to the line below **PATTERN**.

An *F3* **EDIT** function key appears.

- Press *F3* **EDIT**.

aurora^{Duet} displays an alphanumeric selection screen.

- Enter a string of up to 20 characters.

Use the arrow keys to highlight each character you want and press *SELECT* to choose it. To delete the last character entered press *F3* **DEL**. To erase the entire string press *F4* **CLR**.

- When you have finished entering the pattern press **F6 EXIT** to return to the **X.25 SETUP** menu.

aurora^{Duet} saves the pattern.

X.25 Default Settings

If you return aurora^{Duet} to its factory defaults (refer to *Applying Factory Default Settings* in Chapter 3 Section 4), the following default settings are applied for X.25:

X.25 Default Setup Parameters	
Parameter	Value
PACKET TYPE	SVC
PACKET SIZE	128
THROUGHPUT	9600 bits/sec
WINDOW	2
D BIT	LOCAL
LCGN	0
LCN	1
REVERSE CHARGE	NO
TEST LENGTH	1 MINUTE
NEGOTIATION	NO
PACKETS PER MINUTE	33
PACKET ERROR CHECKING	YES

Section 3

Outgoing and Incoming X.25 Calls

This section describes how to make outgoing X.25 calls and how aurora^{Duet} handles incoming calls. It also explains how to perform packet tests and how to view and print test results.

PRI



Note

In Primary Rate mode, only one of the B channels can operate X.25 at a time.

Making X.25 SVC Calls

X.25 SVC (Switched Virtual Circuit) calls can be made on either the D Channel or the B Channel.

Channel Selection

For X.25 operation you select the B or D channels as normal - see *Selecting a Channel for Testing* in Chapter 4 Section 1.

PRI

When you select a channel in Primary Rate mode, the **CHANNEL** selection screen is displayed. Note that an additional selection box is displayed at the top right-hand corner to allow you to select the D channel.

```

S2M TE                               14:55
CHANNEL : 01
 1  2  3  4  5  6  7  8  9  10  D
           
 11 12 13 14 15 16 17 18 19 20
          
 21 22 23 24 25 26 27 28 29 30 Ex
          
HELP  CON  DIS  EX  CR  EXIT
  
```

Making Calls on the D Channel

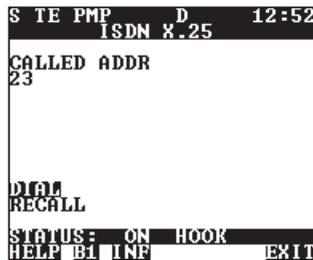
- Choose **X.25 CALL SETUP** from the Main menu.

aurora^{Duet} displays a D channel **CALL SETUP** screen:



- Press **SELECT** to choose the **ISDN X.25** option.

The following screen is displayed:

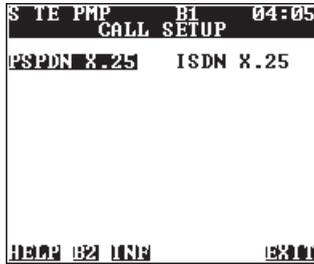


- Now enter a Called Address - for details, see *Entering the Called Address* in this Section.

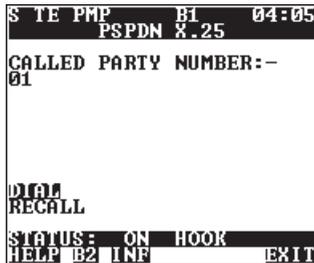
Making Calls on the B Channel

- Choose **X.25 CALL SETUP** from the Main menu.

aurora^{Duet} displays a B channel **CALL SETUP** screen:



- Press **SELECT** to choose the **PSPDN X.25** option. The following screen is displayed:



- Enter a Called Party Number (CPN) of up to 20 digits.

The last number dialled is automatically displayed. To delete this, enter a new number to overwrite it.

Alternatively, to access one of the 10 CPNs stored in the CPN Directory:

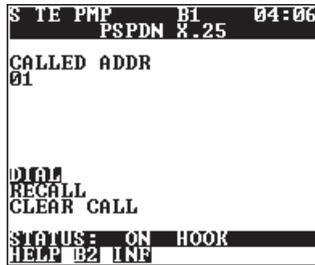
- Choose **RECALL**.

Dialling may be automatically initiated, depending on the **DIAL TYPE** selected in the **DIAL SETUP** menu.

To dial the CPN:

- Choose **DIAL**.

The number is dialled. If the call attempt is successful, aurora^{Duet} connects the ISDN part of the call and displays a screen similar to the **ISDN X.25** screen:



The Status bar shows the current status of the call. Before a call is initiated, the status is **ON HOOK**.

Entering the Called Address

A Called Address is required, for X.25 calls on the D Channel or the B Channel.

- Enter a Called Address of up to 15 digits.

The last number dialled is automatically displayed. To delete this, enter a new Called Address to overwrite it.

Alternatively, to access one of the addresses in the X.25 CPN Directory:

- Choose **RECALL**.

Dialling the Called Address

The way in which the Called Address is dialled, depends on the **DIAL TYPE** selected in the **DIAL SETUP** menu. To dial the Called Address:

- Choose **DIAL**.

When a Call is Connected

When a call is connected a screen similar to the following is displayed.

```

S TE PMP D 13:00
ISDN X.25/PACKET LAYER
ELAPSED TIME 00:00:00
RX 0
LOST 0

CLEAR CALL
PACKET TEST
CONNECT LOOP

STATUS: RECEIVE ONLY
HELP B1 INF CLR PRM

```

aurora^{Duet} counts the data packets it receives from the other end of the link, then discards them. The Status bar displays **RECEIVE ONLY**.

The following table explains the display.

X.25 Connected Display	
Elapsed Time	Duration of the test is displayed in hours, minutes, seconds format.
Rx	The number of packets received
Lost	The number of lost packets

Understanding the Status Display

The call status is displayed at the foot of the screen. This may be:

Status Display	
On Hook	No call in progress
Dialling, Receive Only	Packet test in receive only mode
Packet Test	Packet test in progress
Loop Connected	An incoming call is received and the D channel is looped
Call Clearing	Call clearing has been initiated
Cleared	Call has been cleared

Switching Between Frame and Packet Layer Statistics

- Press **F5 FRM/PKT** to switch between frame layer and packet layer statistics.

Performing an X.25 Packet Test

The X.25 packet test allows you to assess the quality of the link. It transmits data packets, containing a test pattern, using the parameters you set up. It counts the number of packets transmitted, the number received and the number which had to be retransmitted, and displays the results.

To start a packet test:

- Choose **PACKET TEST**.

The packet test begins and the following screen is displayed:

S	TE	PMP	D	12:39
ISDN X.25/PACKET LAYER				
ELAPSED TIME		00:00:03		
TX	3	RX	3	
RESENT	0	LOST	0	
RESTART	0	PKT/M	0	
MINPULL	0			
BIT/S	0			
CALL: CALL		PKT	PKT	
CONNECT	LOOP	SIZE	RATE	
RECEIVE	ONLY	128	33	
STATUS: PACKET TEST				
HELP B1 LNF CLR TRM				

If there is an incoming **CLEAR CALL** request, aurora^{Duet} stops the packet test and stores the results.

Understanding the packet test results

The packet test results which are shown depend on whether aurora^{Duet} is set to display frame layer or packet layer statistics - see *Switching Between Frame and Packet Layer Statistics* in this Section.

The results start to increment as soon as the first data packet has been transferred or received, and are updated approximately every second. The only exceptions to this rule are **BIT/S**, which updates every 5 seconds, and **PKT/M**, which updates every minute.

The following tables explain the packet layer and frame layer results:

Packet Layer Results	
Elapsed Time	Duration of the test (packet, loop or receive only) displayed in hours, minutes, seconds format.
Tx	Number of packets transmitted
Rx	Number of packets received
Resent	Number of packets resent by the Tx side
Restart	Number of restarts
Lost	Number of packets considered as lost by the Rx side, due to missing sequence numbers
Winfull	Number of window full conditions
Bit/s	This is a transmit statistic. This is the number of bits per second. At the end of the test, this result indicates the bits per second averaged over the entire test length
Pkt/m	This is a transmit statistic. This is the number of packets per minute. At the end of the test, this result indicates the number of packets per minute averaged over the entire test length

Frame Layer Results	
Elapsed Time	Duration of the test (packet, loop or receive only) displayed in hours, minutes, seconds format.
Tx	Number of I frames sent to Layer 1
RR	Number of RRs sent to Layer 1
RNR	Number of RNRs sent to Layer 1
Rx	Number of I frames received from Layer 1
RR	Number of Receiver Ready messages received from Layer 1
RNR	Number of Receiver not Ready messages received from Layer 1
HDLC Errors	Number of HDLC errors (CRCs, ABORTS and Overflows detected by Layer1).

Resetting the Counters and Restarting the Test

- Press **F4 CLR** to reset all the counters and the elapsed time, then restart the packet test.

Ending the Packet Test

To stop the packet test:

- Choose **CLEAR CALL**

aurora^{Duet} stops the packet test, stores the results and initiates clearing of the call. When the call is cleared, the X.25 cause and Diagnostic codes are displayed.

Answering Incoming X.25 Calls

aurora^{Duet} answers incoming X.25 data calls automatically and a packet loopback is set up - refer to *Establishing a Packet Loopback* later in this Section.



Notes

- aurora^{Duet} does not answer B and D Channel X.25 calls when it is in **SETUP**, **BERT RESULTS**, **S-BUS TEST**, **CAPTURE REVIEW** or **AUTO TEST** mode.
- You can only receive an incoming call on one channel at a time.
- An LCN/LCGN must be available.

LOOPBACK CONNECTED is displayed until the call is cleared, or you select the **RECEIVE ONLY** or **PACKET TEST** options.

Incoming Calls While a Call is in Progress

If an incoming call is received while a call is in progress, the call is accepted and a loopback set up, as long as no more than two LCN/LCGNs are in use. The presence of a second call in the background is indicated by an asterisk (*) next to the channel on line 1. You can demonstrate this by making a self call.

Establishing a Packet Loopback

If an incoming call is received, aurora^{Duet} answers it automatically and a packet loopback is set up. A loopback is also established if aurora^{Duet} receives an incoming call while a call is in progress.

Setting up a Loopback from a Connected Call

When an outgoing call is connected, you can set up a packet loopback to the D Channel:

- Choose **CONNECT LOOP** from the packet test or Connect screen.

A loop is established and **LOOP CONNECTED** is displayed in the Status bar:

```
S TE PMP      D      13:02
ISDN X.25/PACKET LAYER
ELAPSED TIME  00:00:00
TX            0 RX
RESENT        0
RESTART       0 LOST    0
WINFULL       0
BIT/S         0 PRT/M    0
CLEAR CALL
PACKET TEST
RECEIVE ONLY
STATUS: LOOP CONNECTED
HELP BT INE CLR FRM
```

Clearing an X.25 Call

To initiate call clearing:

- Choose **CLEAR CALL**.

When the call is cleared, aurora^{Duet} displays the ISDN cause, X.25 Cause and the Diagnostic codes.

Viewing and Printing Packet Test Results

aurora^{Duet} can store up to 30 sets of test results, including X.25 packet test results, in its memory.

To view or print the results of a recent packet test:

- Choose **RESULTS** from the Main menu, while no calls are in progress.

The test results are displayed.

```

RESULT 04 PACKET 12:42
PACKET TEST
ETS1 CHANNEL D
DATE: 14/02/1996 15:02
TEST LENGTH: 00:00:20
CPN
PACKET LAYER
TX 12 RX 12
RESENT 0
RESTART 0 LOST 0
WINFULL 0
BIT/S 614 PKT/M 36
  
```

Navigating Through the Results

- To display the previous test result, press **F3 <**.
- To display the next result, press **F4 >**.

Choosing Frame Layer or Packet Layer Format

To switch between the display of frame layer and packet layer results:

- Press **F5 FRM/PKT**.

Printing the Results

- Connect aurora^{Duet} to a printer - see Chapter 3 Section 3.
- To print a set of results, press **F2 PRN**.

aurora^{Duet} prints the results in a similar format to that displayed on the screen, as shown in the following example:

Example: X.25 Packet, loop and receive only tests

```
RESULT 4 PACKET
DATE: 14/02/1996          TIME: 15:02:03
PROTOCOL:                ETSI
CHANNEL:                 B1
CPN:
CALLED ADDR:            01
PACKET TEST:
NEGOTIATIONTX          RX
PACKET SIZE:           NO (NO) 128      (128) 128  (128)
THROUGHPUT:NO (NO)      9600      (9600)9600 (9600)
WINDOW SIZE:           NO (NO) 2  (2)  2  (2)
TEST LENGTH:           CONTINUOUS
R CHARGE:              NO
PKT TYPE:              SVC
D BIT:                 LOCAL
ERROR CHECK:           NO
LCGN                   0
LCN                     1
PACKET RATE:           33
CAUSE                   0 LOCAL CLEAR
ELAPSED TIME           00:00:20
X.25 CAUSE              167
X.25 DIAG               0
PACKET LAYER
TX I                    12   RX I    12
I ACK                   12   ERR'ED  0
I REJ                   0    LOST    0
RR                      12   RR      12
RNR                     0    RNR    0
RESETS                  0    RESETS 0
RESTARTS                0
WINFULL                 0
BIT/S                   614  BIT/S   614
```

PKT/M	36	PKT/M	36
FRAME LAYER			
TX I	25	RX I	25
I ACK	25		
I REJ	0		
RR	1	RR	12
RNR	0	RNR	0
REJ	0	REJ	0
	HDLC ERRORS		0



Appendix 1

Technical Information

Technical Information

This appendix provides technical and safety information about your aurora^{Duet}.

Standards

aurora^{Duet} has been tested to the following standards:

- Basic Rate ISDN - iCTR3 layers 1, 2 and 3.
- Primary Rate ISDN - iCTR4 layers 1, 2 and 3.

EC Directives

aurora^{Duet} complies with the requirements of the following EC Directives:

- 89/336/EEC - Electromagnetic Compatibility
- 93/68/EEC - Amendment Directive

Compliance with these Directives is demonstrated by the 'CE' mark fixed to the product. In order to meet the requirements of the EC Directive on EMC, your aurora^{Duet} must be used with the cables and battery eliminator/charger supplied by Hewlett Packard, and connections must not be made simultaneously to any of the S, U or Primary Rate (where this is fitted) interfaces.

aurora^{Duet} Specifications

Display

Backlit, Supertwist Liquid Crystal Display (LCD) with contrast control. 24 characters by 16 lines.

Keypad

25 key pad incorporating 6 function keys.

Interfaces

BRI

S Interface

Conforms to CCITT (ITU-T) Rec. I430

Total Bit Rate 192Kbps.

Net Data Rate 144Kbps.

Connector RJ45 or TAE 8+4.

Primary Rate. BT Type 43 (only on units manufactured before March '98) + TAE 8+4, 2.048mbs. CCITT G703.

2B1Q U Interface (optional)

Designed to comply with ANSI T1.601 (1988)

Net Data rate 144 kbps.

Connector TAE 8+4.

4B3T U Interface (optional)

Designed to comply with FTZ 1TR220

Net Data rate 144 kbps.

Connector TAE 8+4.

Up0 Interface (optional)

Designed to comply with ZVEI Specification: FVI+K,

FA-PN/AGZ, DKZ-N

part 1.2 July 1989

Net Data rate 192 kbps.

Connector TAE 8+4.

Layer 2 protocol

Based on CCITT (ITU-T) Rec. Q921.

Tested to ETS 300 125.

Layer 3 protocol

Based on CCITT (ITU-T) Rec. Q931.

Tested to ETS 300 102.

Based on 1TR6.

PRI

Primary Rate Interface

Based on CCITT G703.

Bit rate 2.048 Mbit/sec.

Layer 2 protocol

Tested to ETS 300 125.

Layer 3 protocol

Tested to ETS 300 102-1/2.

V5

V5 Interface

V5 support on aurora^{Duet} is designed to conform to the following ETSI recommendations:

- ETS 300 347-1 Sept. 1994
- ETS 300 347-1 A1 May 1997
- ETS 300 324-1 Feb. 1994
- ETS 300 324-1 A1 Jan. 1996

X25

X25 support on aurora^{Duet} is designed to conform to the following ETSI recommendations:

- CCITT (ITU-T) Recommendation X.31 (11)
- ETSI Specification ETS 300-007 (13).

Environmental

Size	320mm x 105mm x 75mm
Weight	1.4 kg. (Basic Rate) 1.6 kg. (Basic & Primary Rate)
Temperature Range	0°C to 45°C (operating). -25°C to +60°C (storage).

Power Supply

Rechargeable Nickel Cadmium battery. 13V DC input supplied with 220/240 AC to DC adaptor.

Memory Buffer Capacity

Flash Capacity	Either 2MB or 4MB
Monitor Memory	Either 256K or 512K
Tracer Capacity	20K

Measurements

Physical

- Indicates common-mode voltage between line pairs on BRI interface.
- G703 alarms S bits at FAS, NFAS words on PRI interface.

Voice

- 3.1kHz and ISDN voice calls on user selected B channel.
- Manual answer.

BERT

- Selectable test length - custom, 1 min., 15 mins., 1 hour or continuous.
- Patterns - Binary 0, Binary 1, 1:1, 63p.r., 511p.r., 2047p.r., 4095p.r., 2¹⁵-1p.r., 2²⁰-1p.r., 2^{20B}-1p.r., 2²³-1p.r. or user definable 16 bit pattern.

- Selectable pass/fail threshold - 1 in 10^1 to 1 in 10^9 , unlimited or user definable HRX percentage.
- Automatic or manual bit error inject.
- Automatic or manual answer and loop of receive to transmit data.

Results

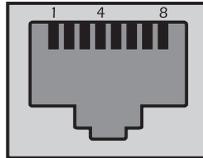
- Bits received, Bit Errors, Bit Error Ratio, Errored Seconds, Severely Errored Seconds, Elapsed Time and Sync Losses.

Protocol

- Indicates call progress, showing status and clear/fail cause.
- Monitor and tracer facility providing time stamped full decode/layer primitives on screen or via selected printer port.

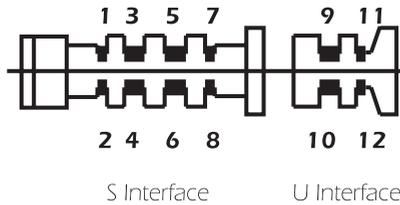
Connector Configurations

RJ45 S Interface Connector



RJ45 Connections			
Pin Number	Monitor Function	TE Function	NT Function
1	Not Used	Not Used	Not Used
2	Not Used	Not Used	Not Used
3	RXB-	TX+	RX+
4	RXA-	RX+	TX+
5	RXA+	RX-	TX-
6	RXB+	TX-	RX-
7	Not Used	Not Used	Not Used
8	Not Used	Not Used	Not Used

ISDN Line Connections



Primary Rate Connections

Primary Rate Connections				
Pin Number	Wire Colour	Monitor Function	NT Function	TE Function
1	Brown/White	RxA+	NT RXB	TE TXB
2	White/Brown	RxA-	NT RXA	TE TXA
3	Green/White	RxB+	NT TXB	TE RXB
4	White/Green	RxB-	NT TXA	TE RXA
5	Orange/White	Not Used	Not Used	Not Used
6	White/Orange	Not Used	Not Used	Not Used
7	Blue/White	Not Used	Not Used	Not Used
8	White/Blue	Not Used	Not Used	Not Used
9	Blue	Not Used	Not Used	Not Used
10	Brown	Not Used	Not Used	Not Used
11	N/A	Not Used	Not Used	Not Used
12	Screen	Cable Screen	Cable Screen	Cable Screen

Basic Rate Connections

Basic Rate Connections				
Pin Number	Wire Colour	Monitor Function	TE Function	NT Function
1	Brown/White	Not Used	Not Used	Not Used
2	White/Brown	Not Used	Not Used	Not Used
3	Green/White	RxA-	RX+	TX+
4	White/Green	RxA+	RX-	TX-
5	Orange/White	RxB+	TX-	RX-
6	White/Orange	RxB-	TX+	RX+
7	Blue/White	Not Used	Not Used	Not Used
8	White/Blue	Not Used	Not Used	Not Used
9	Blue	Not Used	U1	U1
10	Brown	Not Used	U2	U2
11	N/A	Not Used	Not Used	Not Used
12	Screen	Cable Screen	Cable Screen	Cable Screen

Safety

The level of sound produced by the earpiece may exceed the safe level defined by NET 33 under some conditions, hence the earpiece should not be pressed hard against the ear. Care should also be exercised when using an external handset or headset, since the sound level generated by a user's handset or headset is beyond the control of Hewlett Packard.



Warning

aurora^{Duet} contains a Lithium battery which maintains the real time clock and system settings. There is a danger of explosion if the battery is incorrectly replaced. The battery must only be replaced by the same or equivalent type recommended by Hewlett Packard. Should a defective battery be suspected, the whole aurora^{Duet} must be returned to an authorised Hewlett Packard service centre.

The voltage applied to the RS232/parallel port, the DC power input connector, the headset connector and the S Bus Test connector must not exceed 20V D.C.

About Bearer Capabilities, HLCs and LLCs

ISDN terminal compatibility can be checked at the intended destination *before* a call is established. This is achieved by including Bearer Capability, Low Layer and High Layer Compatibility information elements in the outgoing and incoming Call Setup messages.

Bearer Capability

The bearer capability (BC) information element is mandatory. It tells the originating network what kind of link bearer capability is required to route the call. The remote terminal can then decide, based on the bearer capability, to answer or ignore the call.

Bearer Services and Teleservices

ISDN services take two forms: 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.

Information about the Bearer Service is contained in the bearer capability information element, and information about the Teleservice in the Higher Layer Compatibility information element.

The following bearer services are supported by aurora^{Duet}:

- Speech
- 3.1 KHz audio
- Unrestricted Digital Information (64 kbit/s 'Data' call)
- Unrestricted Digital Information with tones/announcements (7 KHz audio call).

Low Layer Compatibility

The calling terminal uses the optional Low Layer Compatibility (LLC) to indicate to the remote terminal, the lower layer attributes of the call. For example, it may indicate:

- user bit rate (if there is an additional DTE interface on the remote TE)
- duplex type
- modem type
- data framing
- codec type information for voiceband calls.

In practice, this information element is coded as a replica of the Bearer Capability. LLC information is transparent to the network - it is only used by the destination terminal. Most called party equipment ignores the LLC, as sufficient information is contained in the Bearer Capability.

If you are involved in troubleshooting on the ISDN, bear in mind that some networks may modify or discard LLC, in part or in whole, before sending D channel information to the called party.

High Layer Compatibility

The optional High Layer Compatibility (HLC) information element identifies the terminal type at the higher layers of the OSI 7-layer model.

The simplest example of an HLC is 'Telephony 3.1 KHz'. This indicates to an ISDN called party, that for a call to succeed, there must be a telephone handset or speakerphone available, with two-way real time speech transfer capability. This HLC is usually combined with a Bearer Capability of Speech, in the Call Setup message.

If you are involved in troubleshooting on the ISDN, bear in mind that some networks may modify, re-map or discard HLC, in part or in whole. This is especially true when crossing PTO boundaries, and for calls interworking between ISDNs using different versions of ETSI/Q.931, or in networks using DASS, 1TR6 and other pre-standard protocols.

aurora^{Duet}'s pre-defined bearer services and teleservices

aurora^{Duet} provides a number of pre-defined bearer services and teleservices from which you can choose. These are described in the following tables.

ETSI Bearer Services and Teleservices					
ISDN Service	BC Bearer Capability		HLC High Layer Compatibility		LLC Low Layer Compatibility
SPEECH CALL	80 90 A3	Speech Circuit mode, 64 kbps Recommendation G.711 A law			
DATA UR/64k	88 90	Unrestricted digital information Circuit mode, 64 kbit/s			
3.1k AUDIO	90 90 A3	3.1 KHz audio Circuit mode, 64 kbps Recommendation G.711 A law			
7k CALL	91 90 A5	Unrestricted digital information with tones/announcements Circuit mode, 64 kbps Recommendations H.221 and H.242			
3.1k TEL'NY	80 90 A3	Speech Circuit mode, 64 kbps Recommendation G.711 A law	91 81	First (primary or only) high layer characteristics. Telephony	
FAX Gr.2/3	90 90 A3	3.1 KHz audio Circuit mode, 64 kbps Recommendation G.711 A law	91 84	First (primary or only) high layer characteristics. Facsimile Group 2/3 (Recommendation F.182)	
FAX Gr.4	88 90	Unrestricted digital Information Circuit mode, 64 kbps	91 A1	First (primary or only) high layer characteristics. Facsimile Group 4 Class 1 (Recommendation F.184)	88 90 D1 E7 Unrestricted digital Information Circuit mode, 64 kbps (L2) ISO 7776 DTE-DTE operation (L3) ISO/IEC 8208 (X.25 packet level protocol.)
VIDEOTEX NEW	88 90	Unrestricted digital information Circuit mode, 64 kbps	91 B2	First (primary or only) high layer characteristics. Syntax-based Videotex (Recommendations F.300 and T.102)	88 90 Unrestricted digital information Circuit mode, 64 kbps
TELETEX	88 90	Unrestricted digital information Circuit mode, 64 kbps	91 B1	First (primary or only) high layer characteristics. Teletex service, basic mode of operation (Recommendation F.200)	88 90 Unrestricted digital information Circuit mode, 64 kbps

ETSI Bearer Services and Teleservices						
ISDN Service	BC Bearer Capability		HLC High Layer Compatibility		LLC Low Layer Compatibility	
MIXED MODE	88	Unrestricted digital information	91	First (primary or only) high layer characteristics. Teletex service, basic and mixed mode of operation (Recommendation F.230).	88	Unrestricted digital information
	90	Circuit mode, 64 kbps	A4		90	Circuit mode, 64 kbps
OSI	88	Unrestricted digital information	91	First (primary or only) high layer characteristics. OSI Application [X.200-Series Recommendations]	88	Unrestricted digital information
	90	Circuit mode, 64 kbps	C1		90	Circuit mode, 64 kbps
7k TEL'NY	91	Unrestricted digital information with tones/announcements	91	First (primary or only) high layer characteristics. Telephony		
	90 A5	Circuit mode, 64 kbps Recommendations H.221 and H.242	B1			
VIDEOTEX 64	88	Unrestricted digital information			88	Unrestricted digital information
	90	Circuit mode, 64 kbps			90 D1 EA	Circuit mode, 64 kbps (L2) ISO 7776 DTE-DTE operation (L3) Recommendation T.70
VIDEO	88	Unrestricted digital information	91	First (primary or only) high layer characteristics. Audio visual (Recommendation F.721)		
	90	Circuit mode, 64 kbp	E0			
	A5	Recommendations H.221 and H.242				
VIDEO 3.1k	91	Unrestricted digital information with tones/announcements	91	First (primary or only) high layer characteristics. Audio visual (Recommendation F.721)		
	90	Circuit mode, 64 kbps	E0			
	A5	Recommendations H.221 and H.242				
DATA 56k	88	Unrestricted digital information			88	Unrestricted digital information
	90	Circuit mode, 64 kbps			90	Circuit mode, 64 kbps
					21 8F	CCITT standardised rate adaption V.110 and X.30 56 kbps Recommendation V.6

ETSI Bearer Services and Teleservices						
ISDN Service	BC Bearer Capability		HLC High Layer Compatibility		LLC Low Layer Compatibility	
X.21 UC 19	88	Unrestricted digital information			88	Unrestricted digital information
	90	Circuit mode, 64 kbps			90	Circuit mode, 64 kbps
					21	(L1) CCITT standardised rate adaptation V.11.0 and X.30.
					90	64 kbit/ Recommendation X.1
ISDN X.25	88	Unrestricted digital information				
	C0 C6 E6	Packet mode (L2) Recommendation X.25, link layer (L3) Recommendation X.25, packet layer				
PSPDN X.25	88	Unrestricted digital information			88	Unrestricted digital information
	90	Circuit mode, 64 kbps			90	Circuit mode, 64 kbps
					A9	(L1) CCITT standardised rate adaptation X.31 HDLC flag.
					C6	(L2) Recommendation X.25, link layer
					E6	(L3) Recommendation X.25, packet layer
FAX 3c	88	Unrestricted digital information	91	First (primary or only) high layer characteristics.	88	Unrestricted digital information
	90	Circuit mode, 64 kbps	84	Facsimile Group 2/3 (Recommendation F.182)	90	Circuit mode, 64 kbps
EUROFILE	88	Unrestricted digital information	D1	National standard First (primary or only) high layer.	88,	Unrestricted digital information
	90	Circuit mode, 64 kbps	C1	(ETSI standard) Eurofile transfer (ETS 300 075)	90	Circuit mode, 64 kbps
FTAM APP	88	Unrestricted digital information	91	First (primary or only) high layer characteristics	88	Unrestricted digital information
	90	Circuit mode, 64 kbps	C2	FTAM application (ISO 8571)	90	Circuit mode, 64 kbps
USER 1-5 (factory default setting;)	88	Unrestricted digital information				
	90	Circuit mode, 64 kbps				

1TR6 Bearer Services and Teleservices				
ISDN Service	SIC	Service Indicator Code	Octet 2	Additional Information
Fax Gr 3	02	AVB Service	02	Fax Gr. 3
Teletex	09	TTX 64	00	
X.25 UC 10	08	X.25 Service	03	UC 10
Fernwirken	0D	Remote Control	00	
Data 64k	07	Data 64k	00	
SIC 1-5 (Default)	01	Telephony	01	3.1 KHz
GraphTel	0E	GraphTel	00	



Note

For a comprehensive description of the coding of Bearer Capability, HLC and LLC for various terminal and application types, refer to ETR 018 and ETS 300 403-1(ETSI), and Q.931 (ITU White Book).



Appendix 2

Call Clearing Cause Codes

Call Clearing Cause Codes

This Appendix explains the Cause Codes generated by the network (external codes) or aurora^{Duet} itself (internal codes) to explain why a call has failed, cleared or been disconnected.

Cause codes for the following protocols are explained:

- ETSI
- VN4
- 1TR6
- CorNet-T
- CorNet-N
- TPH
- DASS2
- DPNSS
- Spectrum B Stimulus
- Spectrum B Functional

External Cause Codes

Cause codes 1 to 127 are *external* - that is, they are generated by the Exchange to which your equipment is connected.

ETSI-Based Protocols

This section describes call clearing cause codes for the following protocols:

- ETSI
- TPH
- VN4
- CorNet-T
- CorNet-N

Cause	Number	Cause
	1	<p><i>Unallocated (unassigned) number</i></p> <p>The destination requested by the calling user cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated).</p>
(TPH)	2	<p><i>No route to specified transit network</i></p> <p>The equipment sending this cause has received a request to route the call through a transit network which it does not recognise, either because the transit network does not exist or because it does not serve the equipment sending this cause.</p>
(TPH)	3	<p><i>No route to destination</i></p> <p>The destination requested by the calling user cannot be reached because the network through which the call has been routed does not serve the desired destination.</p>
	6	<p><i>Channel unacceptable</i></p> <p>The called user cannot negotiate for a B-channel other than that specified in the SETUP message.</p>

- ~~(TPH)~~ **7** *Call awarded and being delivered in an established channel*
The user has been awarded the incoming call, which is being connected to a channel already established to that user for similar calls (e.g. packet-mode, X.25 virtual calls, etc.).
- 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 is unable to accept another call because there are no resources available to handle the new call. It is noted that the user equipment is compatible with the call.
- 18** *No user responding*
A user is not responding to a call establishment message with either an Alerting or Connecting indication within the prescribed period of time.
- ~~(TPH)~~ **19** *No answer from user (user alerted)*
No valid Connect message has been received and the call has been cleared. The network will send a call clearing message to the calling user.
- (VN4)** **19** *Not registered to supplementary service*
- (CorNet-N)** **20** *Circuit operational*
- 21** *Call rejected*
The equipment sending this cause does not wish to accept this call, although it could have accepted the call because the equipment sending this cause is neither busy nor incompatible.

22 *Number changed*
The called number is no longer assigned.

CorNet-N **23** *Reverse charge rejected*

VN4 **24** *Unassigned number*

26 *Non-selected user clearing*
The user has not been awarded the incoming call.

27 *Destination out of order*
The requested destination cannot be reached because the interface to it is not functioning correctly. This may be because a signalling message could not be delivered to the remote user due to, for example, a physical or data link layer failure at the remote user or user equipment off-line, or because the called DN has been manually placed in timer busy state.

28 *Invalid number format*
The destination indicated by the calling user cannot be reached because the number is not in a valid format or is not complete.

29 *Facility rejected*
A facility requested by the user cannot be provided by the network.

30 *Response to STATUS ENQUIRY*
This cause is included in the Status message when the reason for generating the Status message was the prior receipt of a Status Enquiry message.

31 *Normal, unspecified*
This cause is used to report a normal event only when no other cause in the normal class applies.

- CorNet-N** **33** *Circuit out of order*
- 34** *No circuit/channel available*
At present there is no appropriate circuit/channel available to handle the call request.
- CorNet-N** **37** *Degraded service*
- 38** *Network out of order*
The network is not functioning. Immediate redial is unlikely to be successful.
- 41** *Temporary failure*
The user or network is not functioning correctly, but the condition is not likely to last a long period of time.
- 42** *Switching equipment congestion*
The switching equipment generating this cause is experiencing a period of high traffic.
- 43** *Access information discarded*
The network could not deliver user information to the remote user as requested, e.g. user-to-user information, low layer compatibility, sub-address, etc. Note: this cause does not apply to an unsuccessful call, but is used for congestion control and setup status information.
- 44** *Requested circuit/channel not available*
The channel requested by the user during local channel negotiation is not currently available (e.g. engaged or out of service for maintenance).
- CorNet-N** **45** *Pre-emption*

- 47** *Resources unavailable, unspecified*
This cause is used to report a network resource unavailable event only when no other cause in the network congestion class applies.
- ~~TPH~~ **49** *Quality of service unavailable*
Throughput or transit delay cannot be supported and the Quality of Service (as defined in Recommendation X.213) cannot be provided.
- 49** *User to User Information not transmitted*
- 50** *Requested facility not subscribed*
The user has not subscribed to this facility and therefore cannot access the facility at this time.
- 51** *Reverse charge not allowed*
- 52** *Outgoing Call barred*
- 53** *Outgoing Call barred within CUG*
- 54** *Incoming Call barred*
The called user will not accept the call delivered in the SETUP message.
- 55** *Incoming Call barred within CUG*
- 56** *Call waiting, not subscribed*
- 57** *Bearer capability not authorised*
The user has requested a bearer capability which is implemented by the equipment generating this cause, but the user is not authorised to use it.
- 58** *Bearer capability not presently available*
The user has requested a bearer capability which is implemented by the equipment generating this cause, but which is not available at this time.

- VN4** 59 *Call restriction*
- VN4** 60 *Terminal Diversion rejected*
- VN4** 62 *Service not authorised*
- TPH** 62 *Inconsistency in designated outgoing access information and subscriber class*
- 63 *Service or option not available, unspecified*
This cause is used to report a service or option not available event, only when no other cause in this class applies.
- 65 *Bearer capability not implemented*
The equipment sending does not support the bearer capability requested.
- 66 *Channel type not implemented*
The called party has reached a channel type that is not supported.
- ~~TPH~~ 69 *Requested facility not implemented*
The requested facility is not implemented and therefore cannot be accessed at this time.
- 70 *Only restricted digital information bearer capability is available*
The user has requested an unrestricted bearer service, but the equipment sending this cause only supports the restricted version of the service.
- 79 *Service or option not implemented, unspecified*
This cause is used to report a service or option not implemented event only when no other cause in this class applies.

- 81** *Invalid call reference value*
The equipment sending this cause has received a message with a call reference which is not currently in use on the user-network interface.
- 82** *Identified channel does not exist*
The equipment sending this cause 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*
A call resume has been attempted with a call identity which differs from that in use for any currently suspended call(s).

84 *Call identity in use*
The network has received a call suspended request. This request contained a call identity (including the null call identity) which is already in use for a suspended call within the domain of interfaces over which this call may be resumed.

85 *No call suspended*
The network has received a call resume request which contained a call identity information element which does not indicate 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 which contained a call identity information element which once indicated a suspended call; but that suspended call was cleared while suspended (either by network timeout, or by a remote user).

87 *Destination address not in CUG*

88 *Incompatible destination*

The equipment sending this cause has received a request to establish a call to a destination in which the required compatibility attributes (e.g. data rate) cannot be accommodated.

 **89** *Non existent abbreviated address*

 **90** *Non existent CUG*

 **91** *Invalid transit network selection*

 **92** *Invalid facility parameter*

 **92** *Invalid supplementary service parameter*

95 *Invalid message, unspecified*

This cause is used to report an invalid message event only when no other cause in this class applies.

96 *Mandatory information element is missing*

The equipment sending this cause has received a message with one or more mandatory information elements missing. Therefore, the message cannot be processed.

97 *Message type non-existent or not implemented*

The equipment sending this cause has received a message of a type it does not recognise, either because this message is not defined, or because it is defined but not implemented by the equipment sending this cause.

98 *Message not compatible with call state or message type non-existent or not implemented*
The equipment sending this cause has received a message which it considers as non-permissible while in the call state; or a **STATUS** message was received indicating an incompatible call state.

99 *Information element non-existent or not implemented*
The equipment sending this cause has received a message which includes information elements not recognised, either because the information element identifier is not defined, or because it is defined but not implemented by the equipment sending the cause. However, the information element does not need to be present in order for the equipment to process the message.

100 *Invalid information element contents*
The equipment sending this cause has received an information element which it has implemented but the contents are invalid (e.g. truncated, invalid extension bit, invalid field values, etc.).

101 *Message not compatible with call state*
The equipment sending this cause has received a message that procedures indicate is not a permissible message to receive at this time.

102 *Recovery on time expiry*
No further call progress in call establishment has been received, and the call has timed out. A clearing message should be sent to the user.

VN4 **103** *Mandatory information element of incorrect length*

111 *Protocol error, unspecified*

This cause is used to report a protocol error event only when no other cause in this class applies.

CorNet-N **112** *Call redirection to mailbox*

VN4 **113** *Bearer service unavailable*

VN4 **114** *End to End information transfer impossible*

VN4 **126** *Switch to conversation mode*

127 *Interworking, unspecified*

There has been interworking with a network which does not provide cause codes for its actions. Therefore the precise cause for a message being sent is unknown.

1TR6

Cause

Number

Cause

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 CUG
(Closed User Group)*
- 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*

DASS2 & DPNSS

Cause

Number Cause

	0	<i>Number unobtainable</i>
	1	<i>Address incomplete</i>
	2	<i>Network termination</i>
	3	<i>Service unavailable</i>
	4	<i>Subscriber incompatible</i>
	5	<i>Subscriber changed number</i>
DPNSS	6	<i>Invalid request for Supplementary Service</i>
	7	<i>Congestion</i>
	8	<i>Subscriber engaged/busy</i>
	9	<i>Subscriber out of service</i>
	10	<i>Incoming calls barred</i>
	11	<i>Outgoing calls barred</i>
	18	<i>Remote procedure error</i>
	19	<i>Service incompatible</i>
	20	<i>Acknowledgement</i>
	21	<i>Signal not understood</i>
DASS	22	<i>Signal not valid</i>
DASS	23	<i>Service temporarily unavailable</i>
DASS	24	<i>Facility not registered</i>

DASS	25	<i>Reject</i>
	26	<i>Message not understood</i>
DASS	27	<i>Signalling system incompatible</i>
DASS	28	<i>Route out of service</i>
DASS	29	<i>Transferred</i>
	30	<i>NAE error</i>
	31	<i>No reply from subscriber</i>
	32	<i>Service termination</i>
DASS	35	<i>Channel out of service</i>
DASS	36	<i>Priority forced released</i>
	41	<i>CUG Access barred</i>
	45	<i>DTE controlled not ready</i>
	46	<i>DTE uncontrolled not ready</i>
	48	<i>Subscriber call termination</i>
	50	<i>ET isolated implemented</i>
	51	<i>Local procedure error</i>

Spectrum B Stimulus

Cause

Number Cause

- | | |
|-----|--|
| 34 | <i>Circuit/channel congestion</i> |
| 69 | <i>Requested facility not implemented</i> |
| 81 | <i>Invalid call reference value</i> |
| 97 | <i>Message type non-existent or not implemented</i> |
| 99 | <i>Information element non-existent or not implemented</i> |
| 100 | <i>Invalid information element contents</i> |
| 111 | <i>Protocol error, unspecified.</i> |

Spectrum B Functional

Cause

Number Cause

- | | |
|----|--|
| 1 | <i>Unallocated (unassigned) number</i>
The destination requested by the calling user cannot be reached because, although the number is in a valid format, it is not currently assigned (allocated). |
| 6 | <i>Channel unacceptable</i>
The called user cannot negotiate for a B-channel other than that specified in the SETUP message. |
| 16 | <i>Normal call clearing (peer)</i>
The call is being cleared at the request of one of the users involved in the call. |

17 *User busy*

The called user is unable to accept another call because there are no resources available to handle the new call. It is noted that the user equipment is compatible with the call.

18 *No user responding*

A user is not responding to a call establishment message with either an Alerting or Connecting indication within the prescribed period of time.

21 *Call rejected*

The equipment sending this cause does not wish to accept this call, although it could have accepted the call because the equipment sending this cause is neither busy nor incompatible.

22 *Number changed*

The called number is no longer assigned.

26 *Non-selected user clearing*

The user has not been awarded the incoming call.

27 *Destination out of order*

The destination specified by the user cannot be reached because the interface to the destination is not functioning correctly. This may be because a signalling message was unable to be delivered to the remote user due to, for example, a physical or data link layer failure at the remote user or user equipment off-line, or because the called DN has been manually placed in timer busy state.

28 *Invalid number format*

The destination indicated by the calling user cannot be reached because the number is not in a valid format or is not complete.

- 30** *Response to STATUS ENQUIRY*
This cause is included in the Status message when the reason for generating the Status message was the prior receipt of a Status Enquiry message.
- 31** *Normal, unspecified*
This cause is used to report a normal event only when no other cause in the normal class applies.
- 34** *No circuit/channel available*
At present there is no appropriate circuit/channel available to handle the call request.
- 38** *Network out of order*
The network is not functioning. Immediate redial is unlikely to be successful.
- 41** *Temporary failure*
The user or network is not functioning correctly, but the condition is not likely to last a long period of time.
- 42** *Switching equipment congestion*
The switching equipment generating this cause is experiencing a period of high traffic.
- 43** *Access information discarded*
The network could not deliver user information to the remote user as requested, e.g. user-to-user information, low layer compatibility, sub-address, etc. Note: this cause does not apply to an unsuccessful call, but is used for congestion control and setup status information.
- 44** *Requested circuit/channel not available*
The channel requested by the user during local channel negotiation is not currently available (e.g. engaged or out of service for maintenance).

- 47** *Resources unavailable, unspecified*
This cause is used to report a network resource unavailable event only when no other cause in the network congestion class applies.
- 55** *Incoming Call barred within CUG*
- 57** *Bearer capability not authorised*
The user has requested a bearer capability which is implemented by the equipment generating this cause, but the user is not authorised to use it.
- 58** *Bearer capability not presently available*
The user has requested a bearer capability which is implemented by the equipment generating this cause, but which is not available at this time.
- 63** *Service or option not available, unspecified*
This cause is used to report a service or option not available event, only when no other cause in this class applies.
- 65** *Bearer capability not implemented*
The equipment sending does not support the bearer capability requested.
- 66** *Channel type not implemented*
The called party has reached a channel type that is not supported.
- 70** *Only restricted digital information bearer capability is available*
The user has requested an unrestricted bearer service, but the equipment sending this cause only supports the restricted version of the service.

- 79** *Service or option not implemented, unspecified*
This cause is used to report a service or option not implemented event only when no other cause in this class applies.
- 81** *Invalid call reference value*
The equipment sending this cause has received a message with a call reference which is not currently in use on the user-network interface.
- 82** *Identified channel does not exist*
The equipment sending this cause has received a request to use a channel not activated on the interface for a call.
- 87** *Destination address not in CUG*
- 88** *Incompatible destination*
The equipment sending this cause has received a request to establish a call to a destination in which the required compatibility attributes (e.g. data rate) cannot be accommodated.
- 95** *Invalid message, unspecified*
This cause is used to report an invalid message event only when no other cause in this class applies.
- 96** *Mandatory information element is missing*
The equipment sending this cause has received a message with one or more mandatory information elements missing. Therefore, the message cannot be processed.

- 97** *Message type non-existent or not implemented*
The equipment sending this cause has received a message of a type it does not recognise, either because this message is not defined, or because it is defined but not implemented by the equipment sending this cause.
- 98** *Message not compatible with call state or message type non-existent or not implemented*
The equipment sending this cause has received a message which it considers as non-permissible while in the call state; or a **STATUS** message was received indicating an incompatible call state.
- 99** *Information element non-existent or not implemented*
The equipment sending this cause has received a message which includes unrecognised information elements, either because the information element identifier is not defined, or because it is defined but not implemented by the equipment sending the cause. However, the element does not need to be present in order for the equipment to process the message.
- 100** *Invalid information element contents*
The equipment sending this cause has received an information element which it has implemented but the contents are invalid (e.g. truncated, invalid extension bit, invalid field values, etc.).
- 101** *Message not compatible with call state*
The equipment sending this cause has received a message that procedures indicate is not a permissible message to receive at this time.

- 102** *Recovery on time expiry*
No further call progress in call establishment has been received, and the call has timed out. A clearing message should be sent to the user.
- 111** *Protocol error, unspecified*
This cause is used to report a protocol error event only when no other cause in this 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 a message being sent is unknown.

Internal Cause Codes

Cause codes with numbers higher than 127 (codes 128 to 159), are *internal* - that is, they are generated by aurora^{Duet} itself. These codes are used by Hewlett Packard for diagnostic purposes.

Cause

Number	Cause
128	<i>Call Control received an invalid primitive</i>
129	<i>Call Control received no Info field</i>
130	<i>Call Control received an invalid message</i>
131	<i>Call Control received a short Info message</i>
132	<i>Call Control reported an invalid B channel requested</i>
133	<i>Call Control is in an idle state</i>
134	<i>Call Control is in an inactive state</i>
135	<i>Call Control is in an active state</i>
136	<i>MMI received a bad primitive</i>

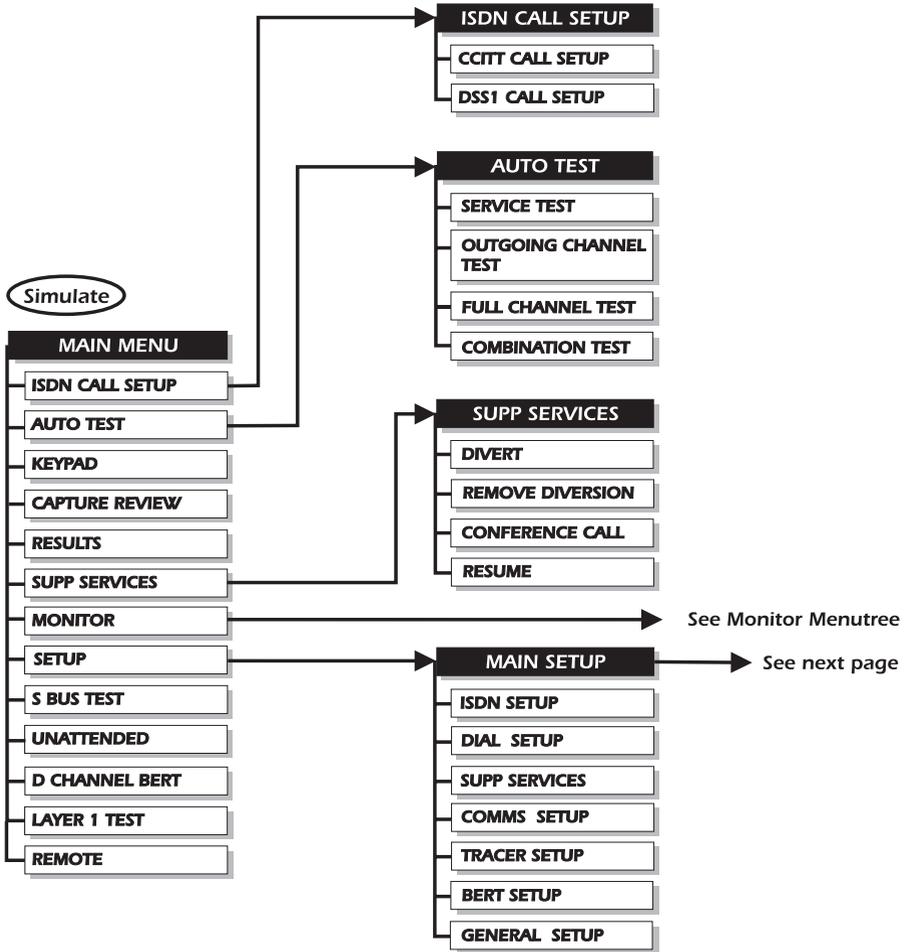
- 137 *MMI received a bad ME primitive*
- 138 *MMI received a message with an invalid CES*
- 139 *MMI received a message with an illegal CES*
- 140 *Layer 3 timer T303 has expired*
- 141 *Call Control received a NL Release Indication from Layer 3*
- 142 *Call Control received an invalid message for the 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*



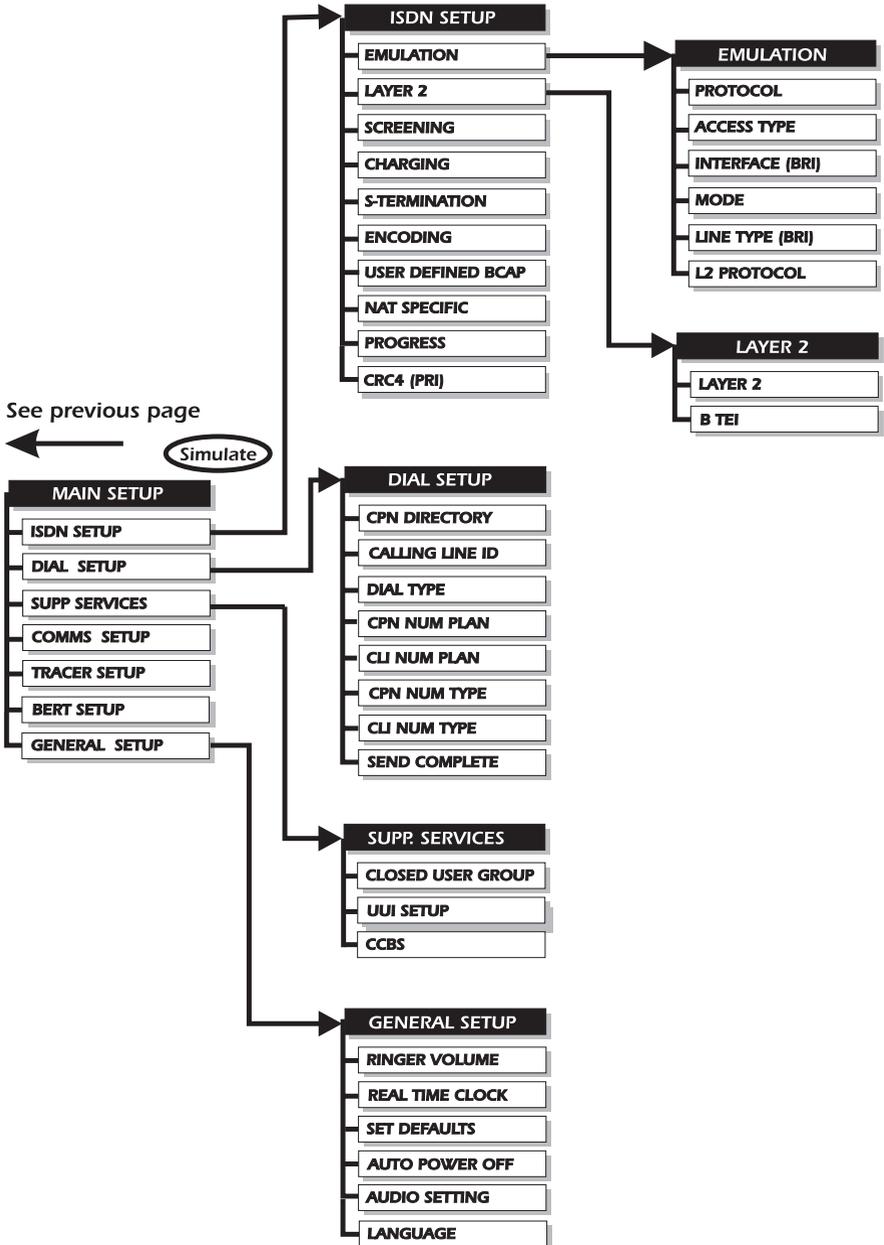
Appendix 3

Menutrees

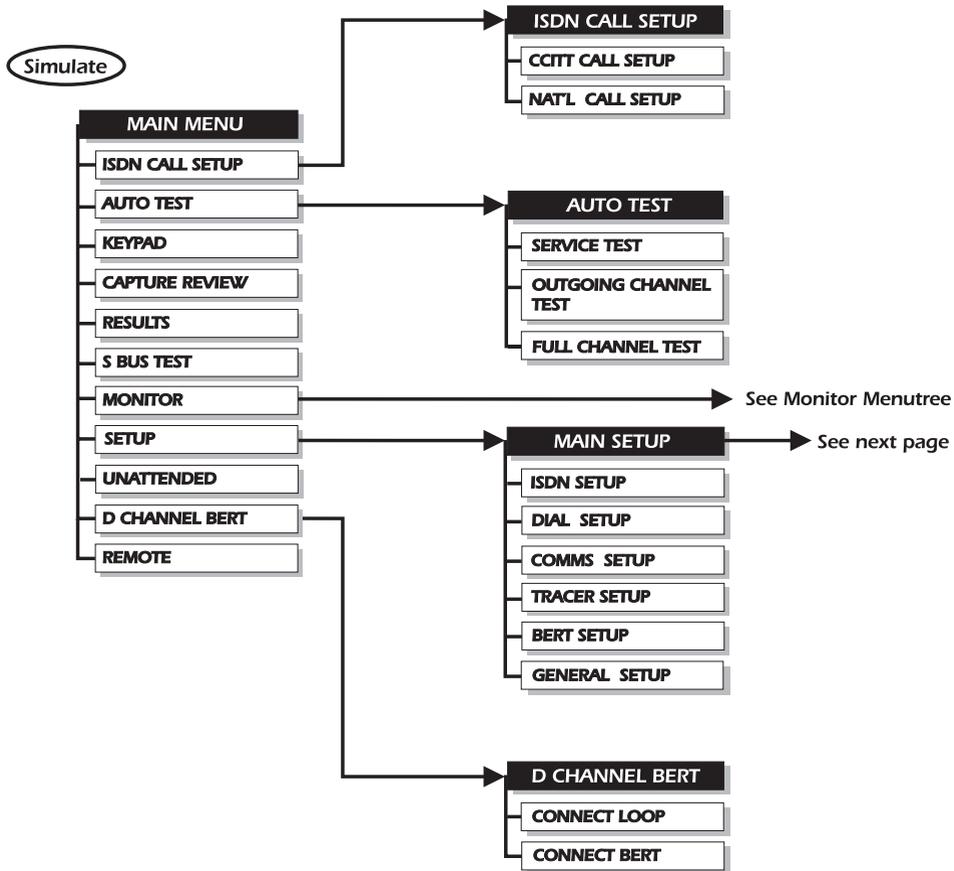
ETSI



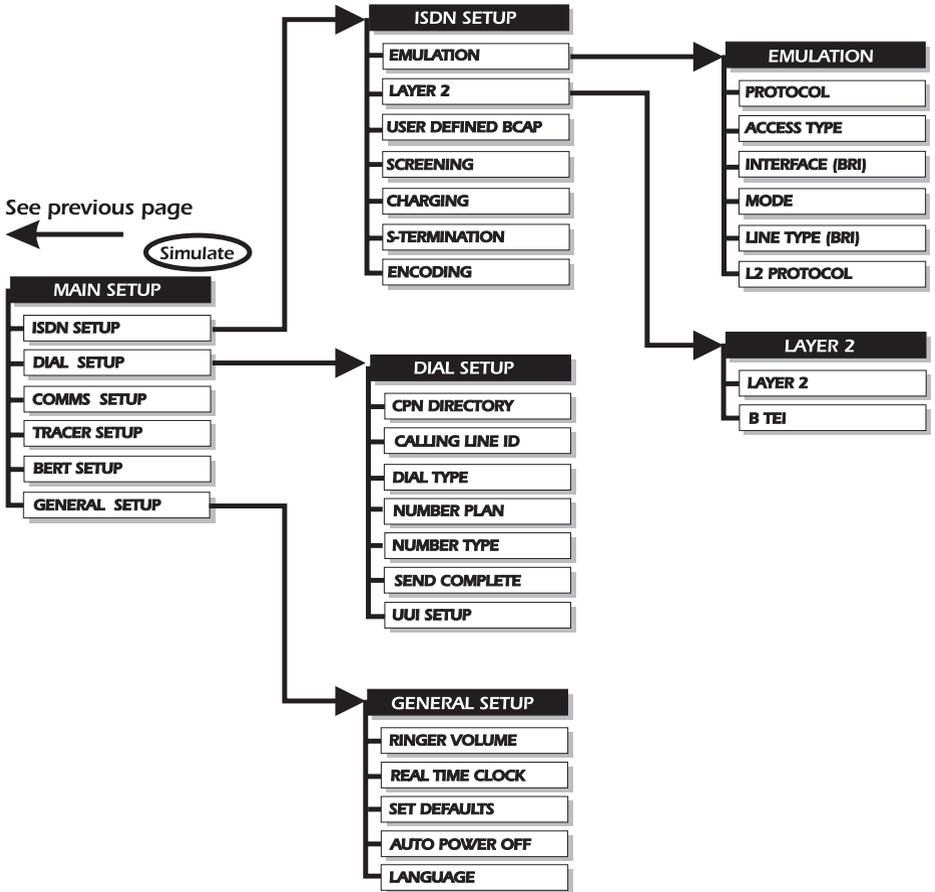
ETSI continued



VN4

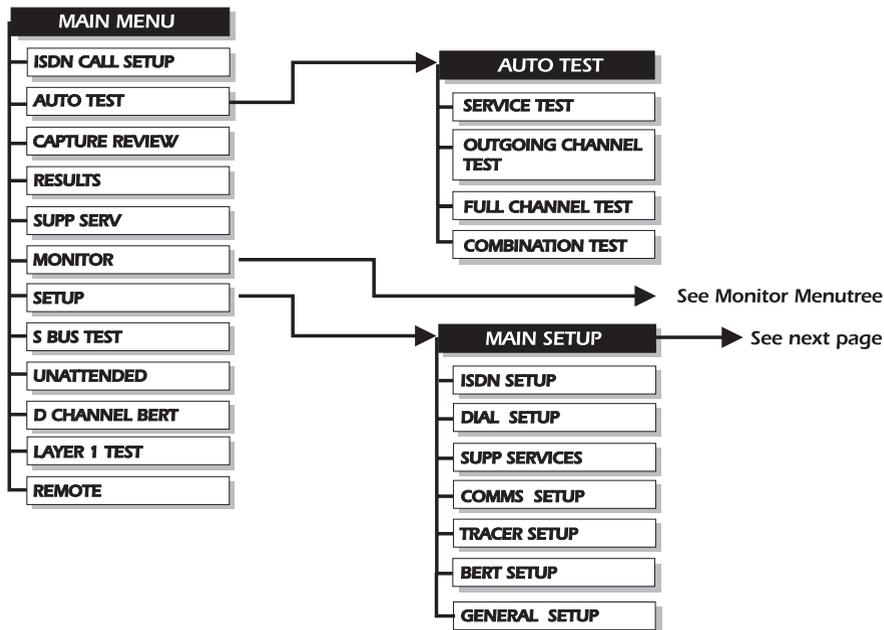


VN4 continued

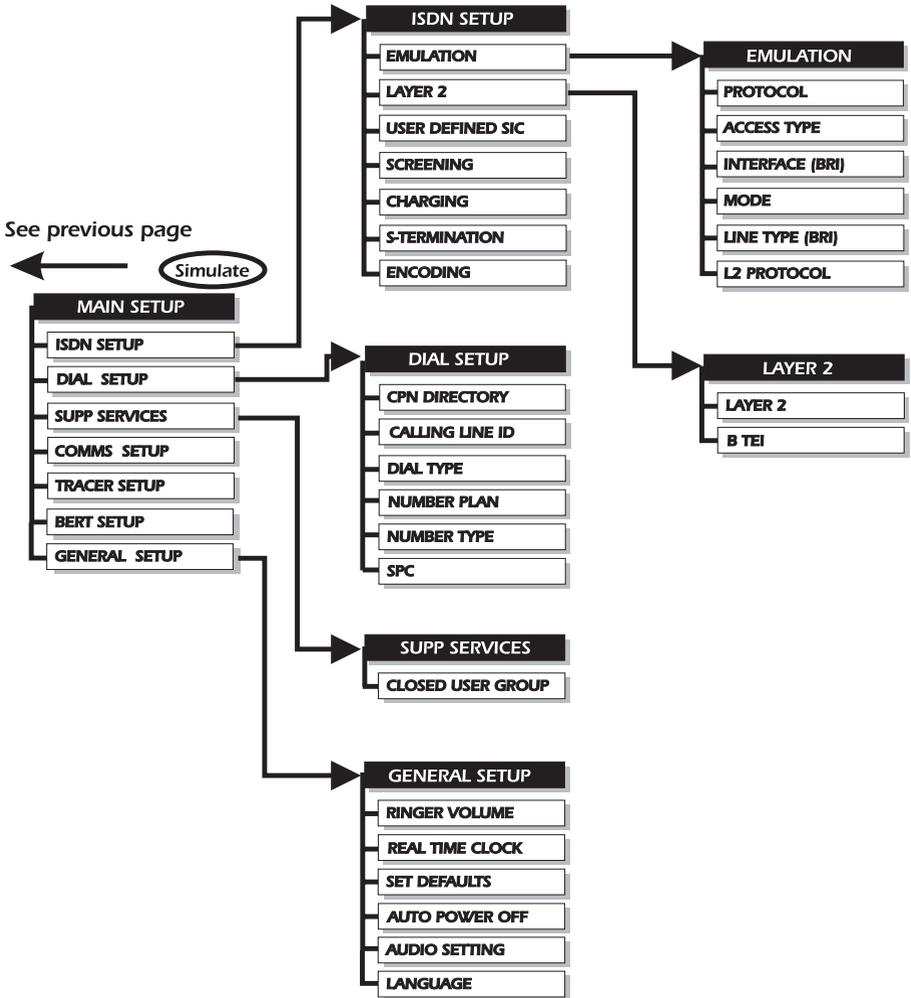


1 TR6

Simulate

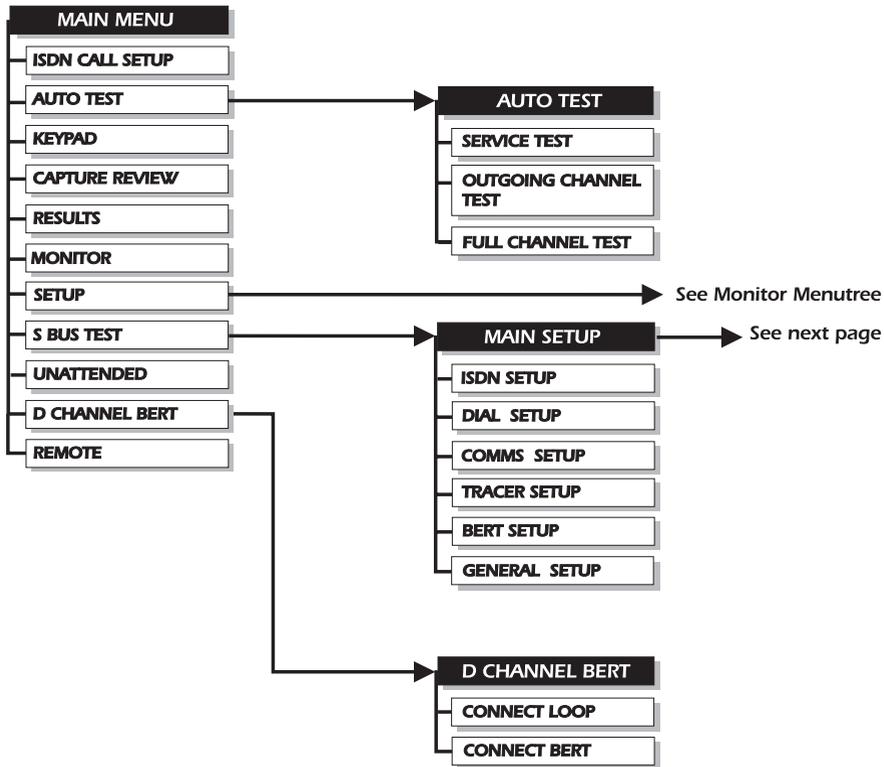


1TR6 continued

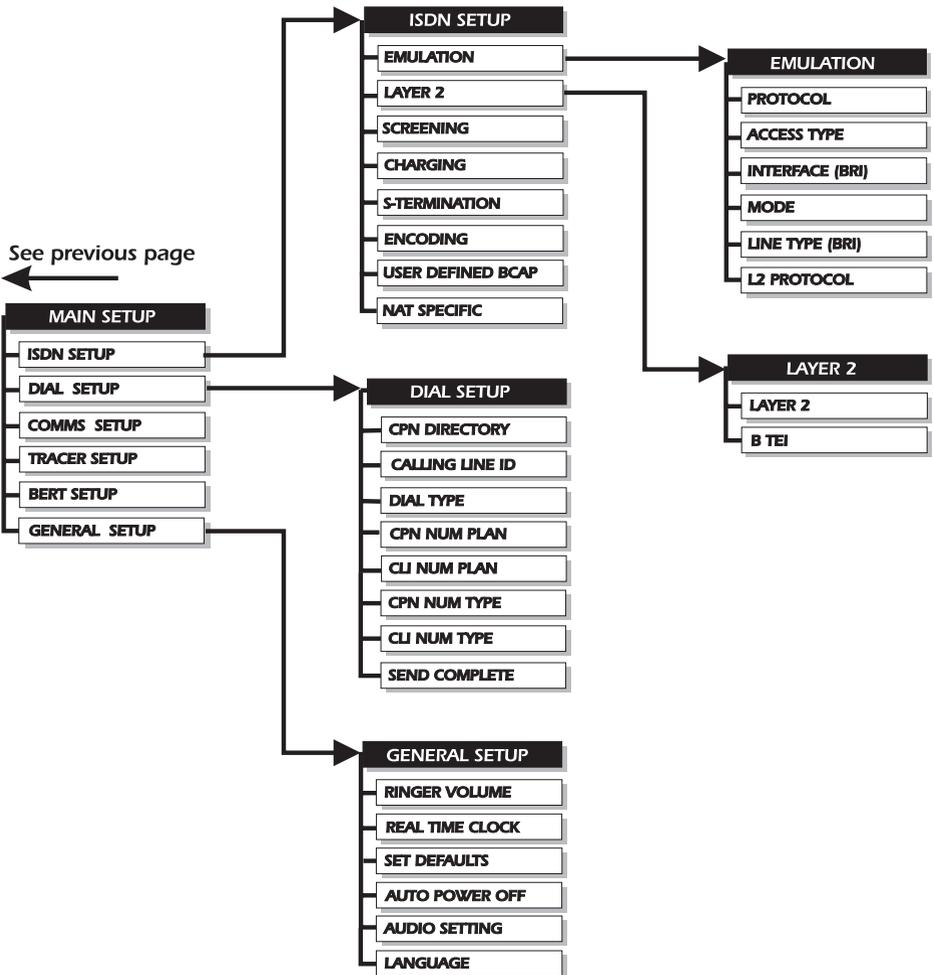


CorNet-N

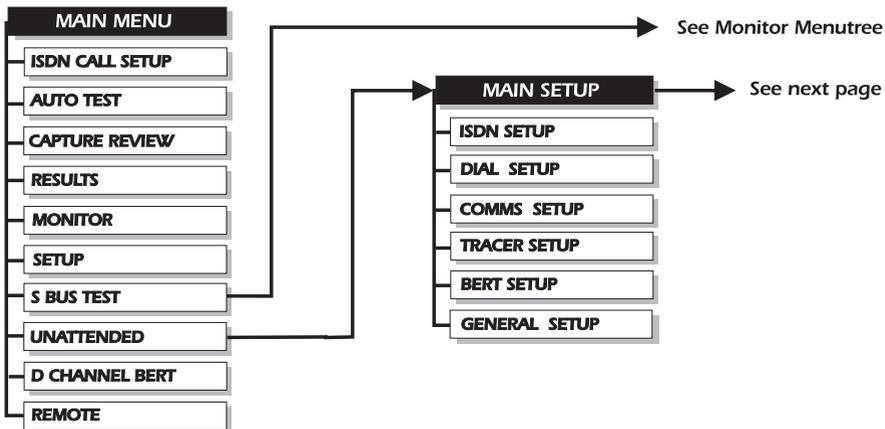
Simulate



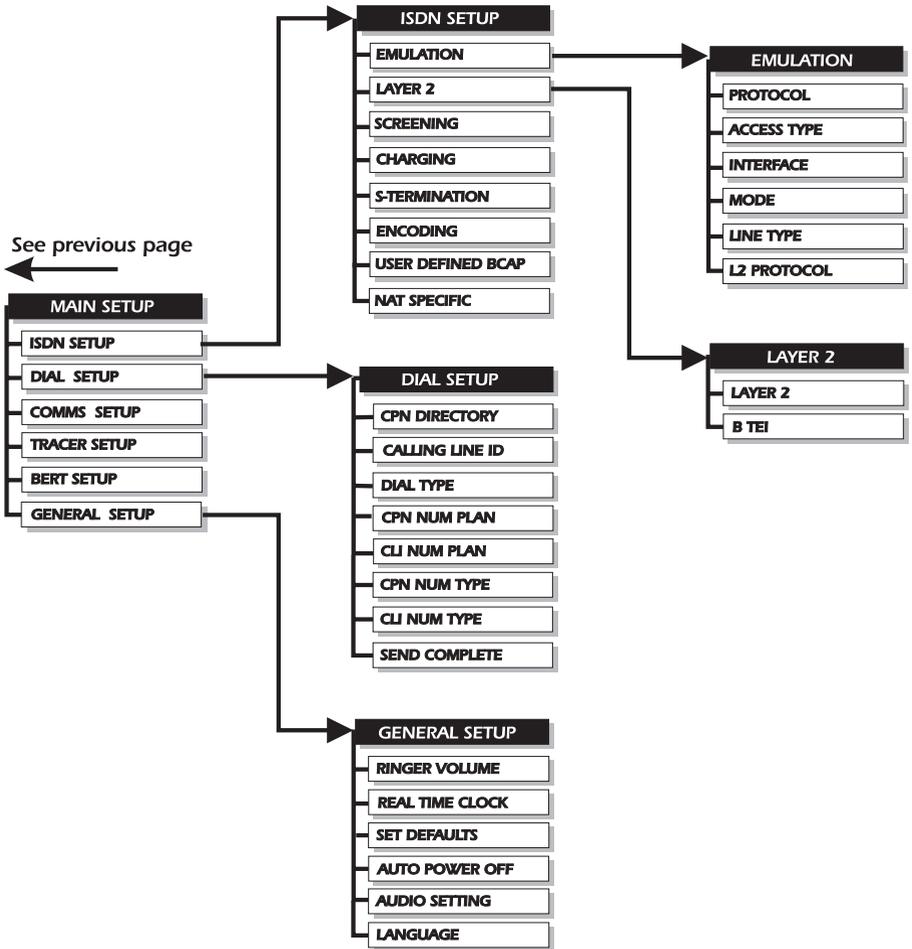
CorNet-N continued



CorNet-T

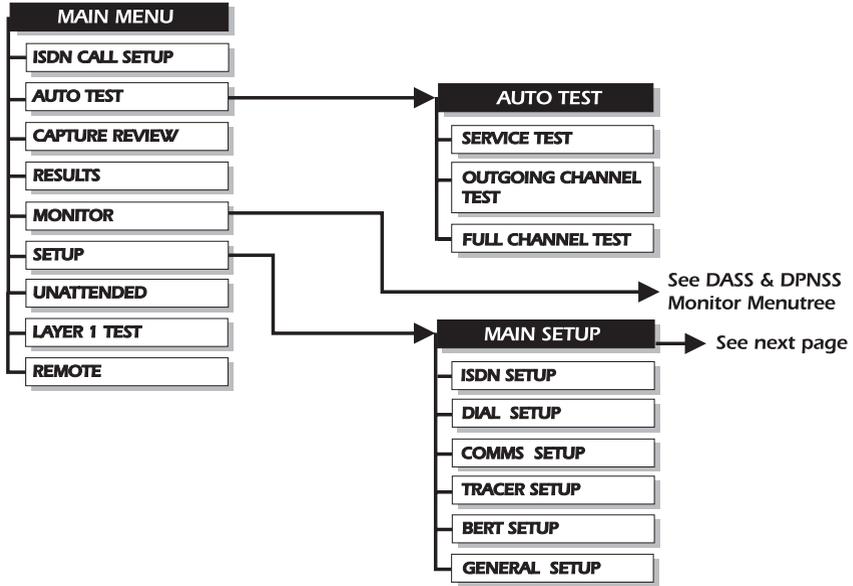


CorNet-T continued

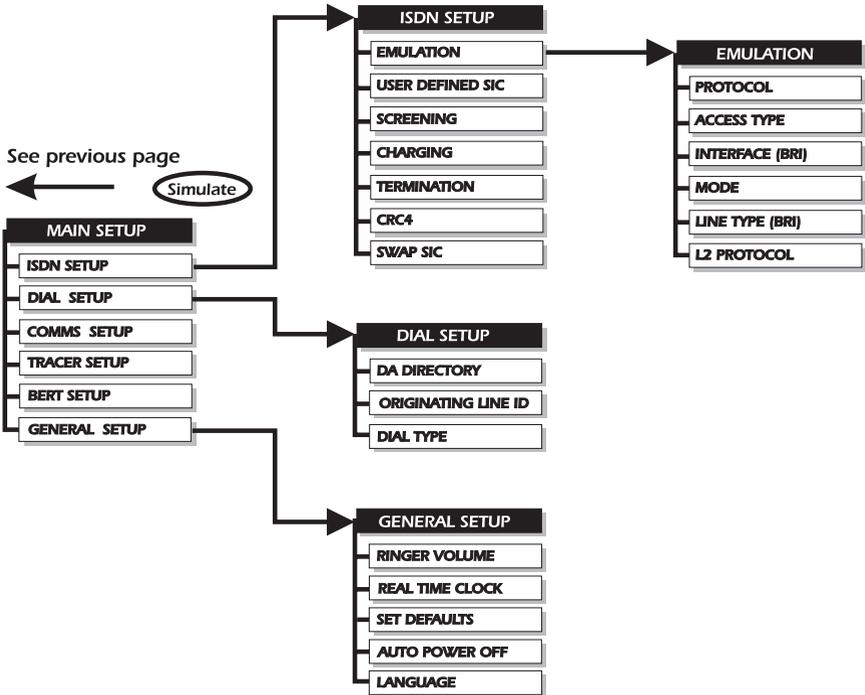


DASS & DPNSS

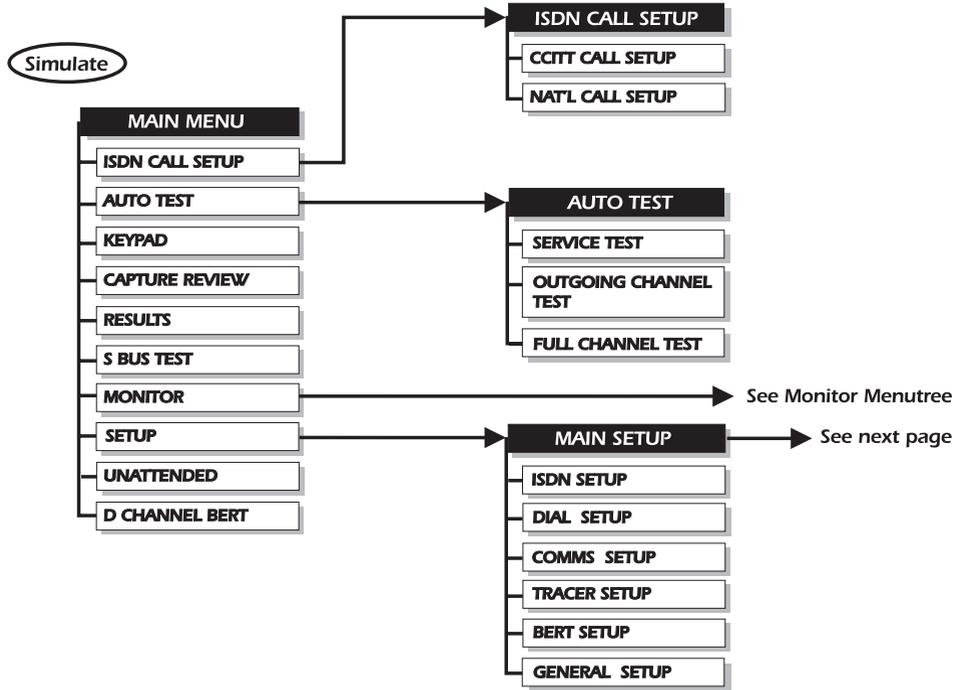
Simulate



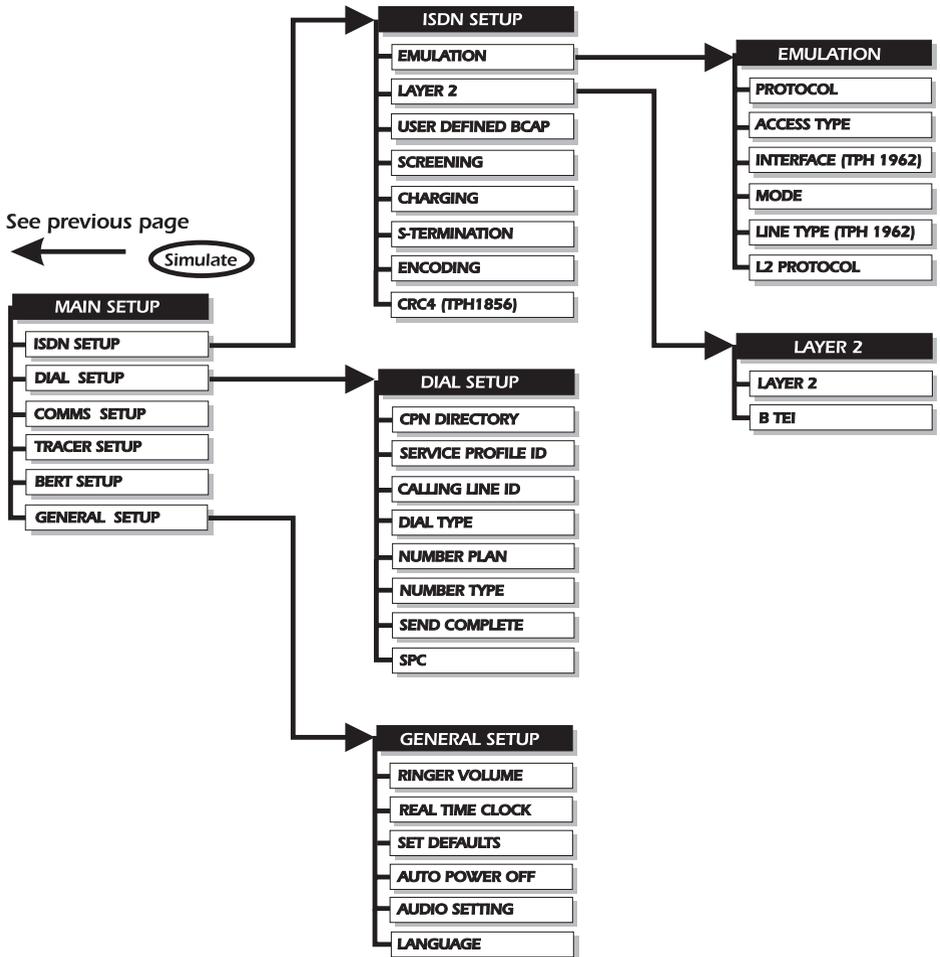
DASS & DPNSS continued



TPH

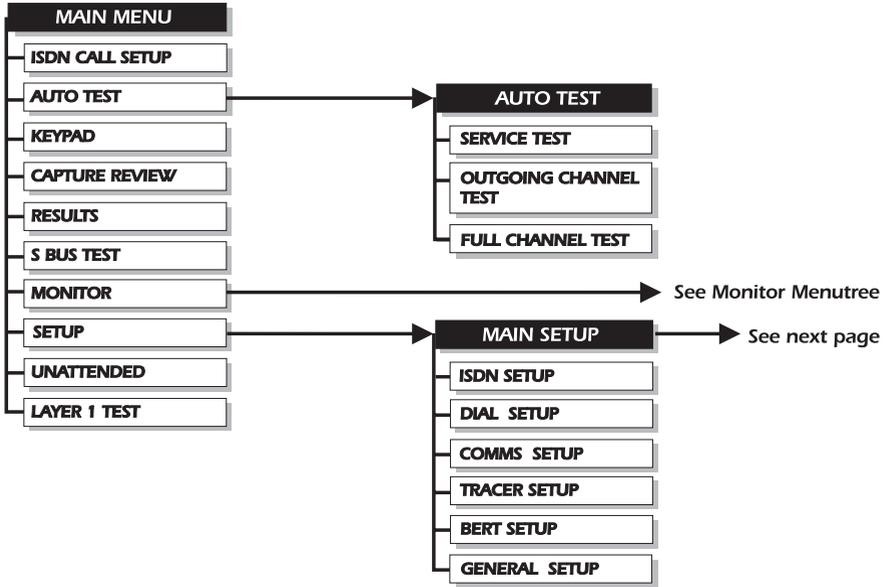


TPH continued

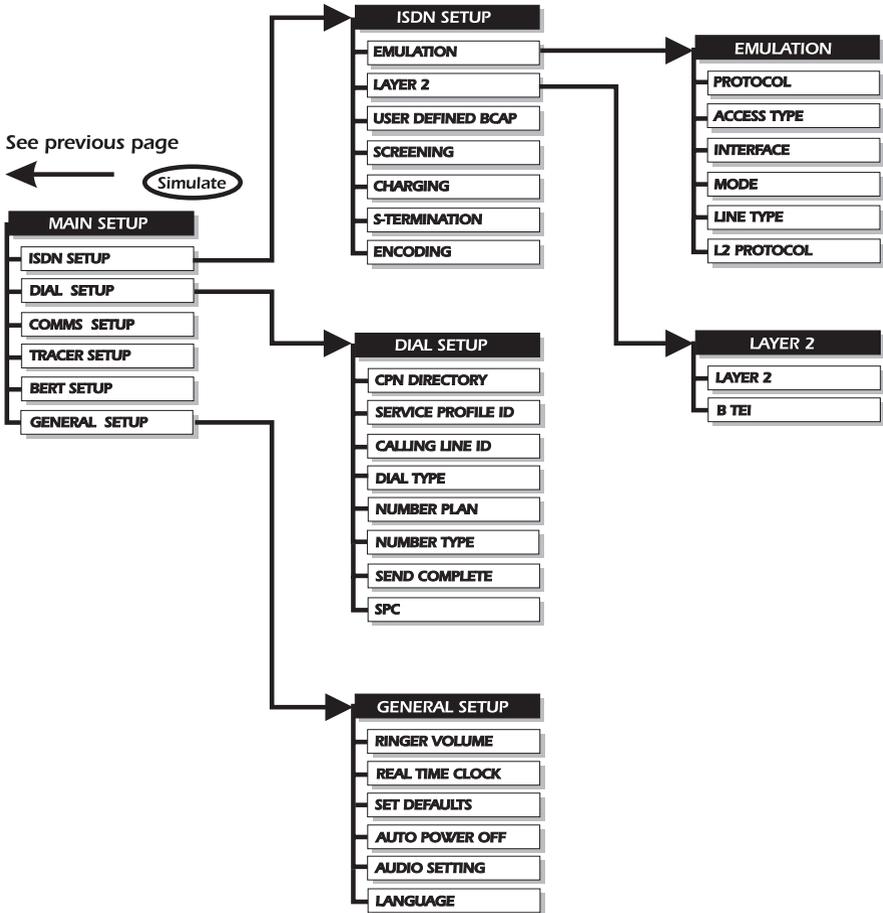


Spectrum-B Functional

Simulate

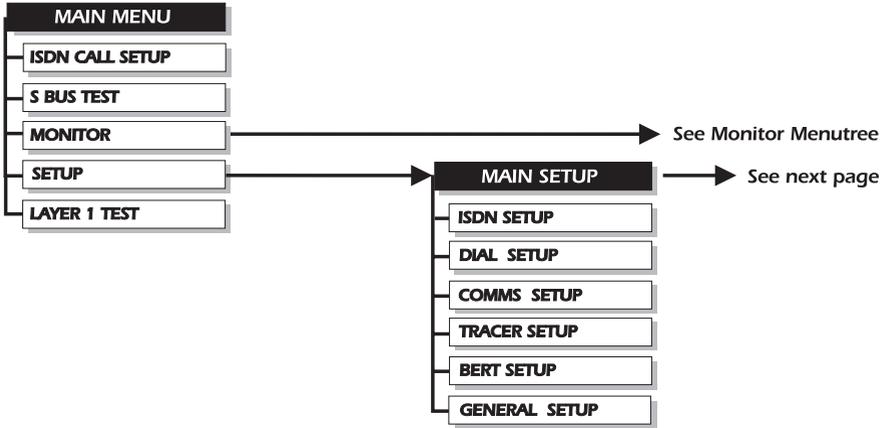


Spectrum-B Functional continued

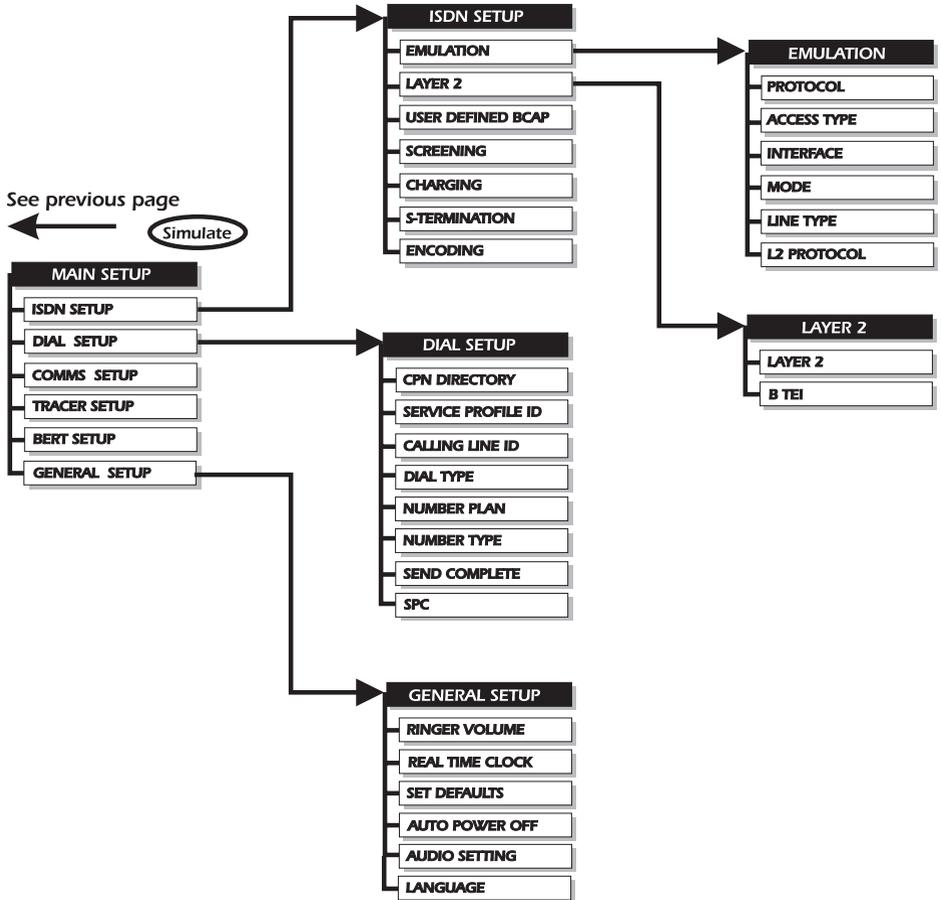


Spectrum-B Stimulus

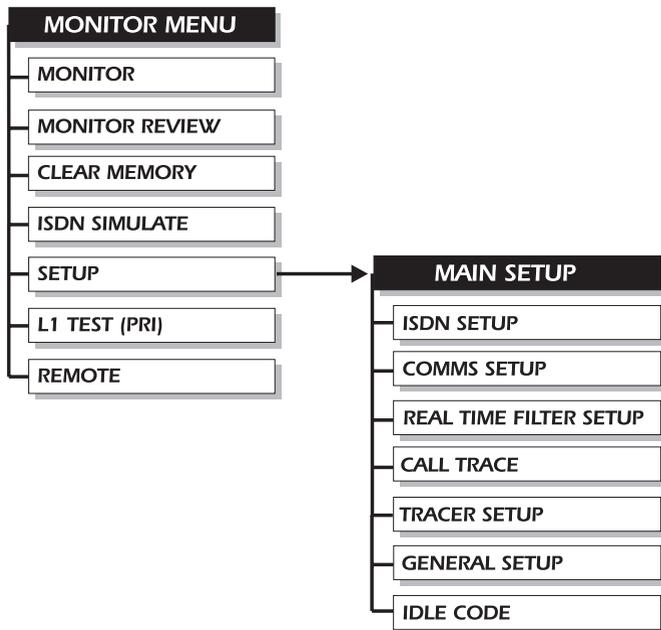
Simulate



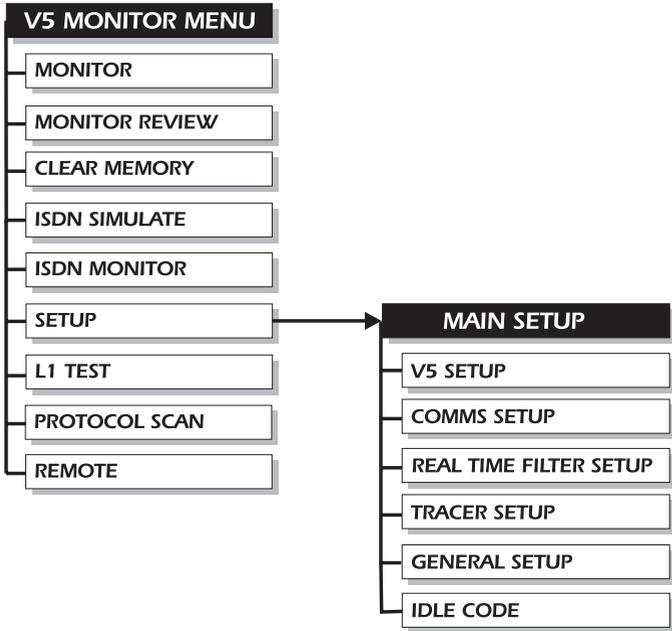
Spectrum-B Stimulus continued



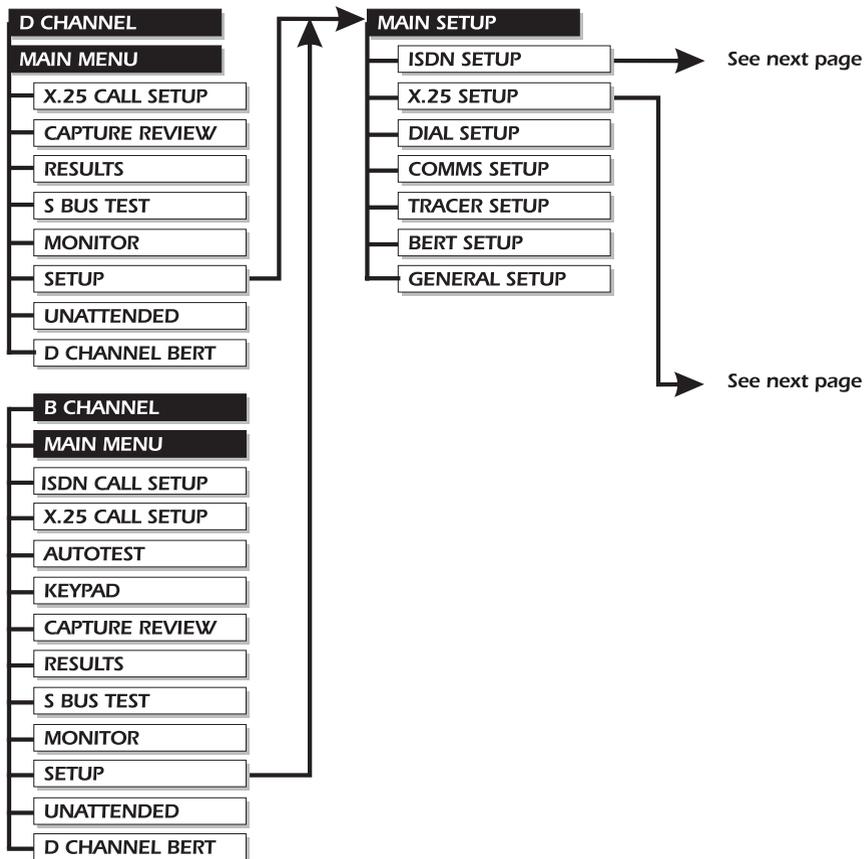
Monitor



V5 Monitor

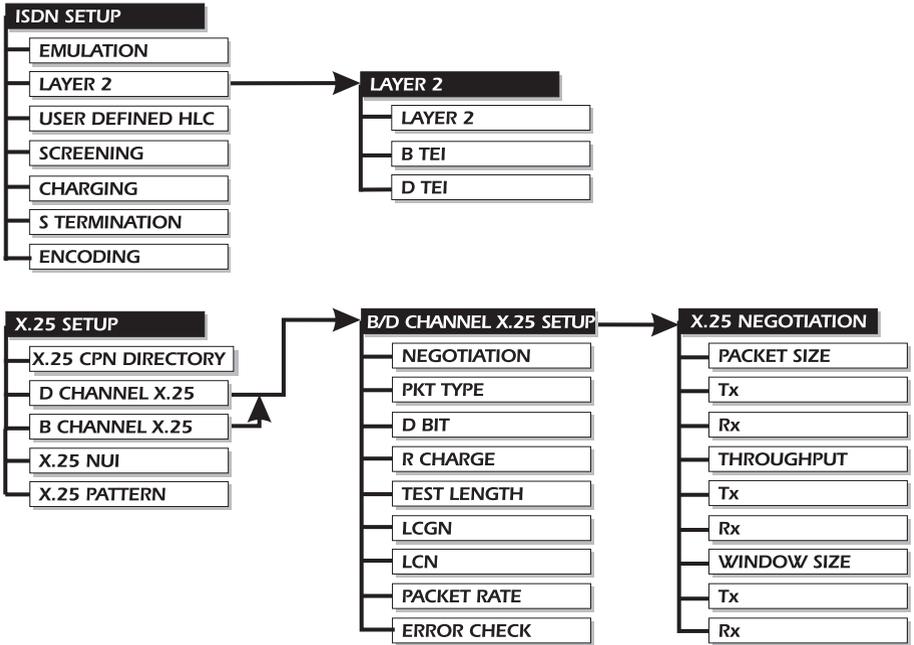


X.25



X.25 continued

See previous page
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Appendix 4

Troubleshooting

Troubleshooting

This appendix explains how to get information about errors and helps you identify and correct common problems you may experience when using aurora^{Duet}.

Getting Information on an Error

When a call attempt fails, or a call is cleared or disconnected, aurora^{Duet} displays a cause code.

To display information about the cause code:

- Press **F4 CSE**.

See also *Appendix 2* for a glossary of Cause Codes.

Checking aurora^{Duet}'s Configuration

Some errors occur because aurora^{Duet} is not set up correctly for the ISDN line under test.

To display information about how aurora^{Duet} is currently set up:

- Press **F1 HELP**.

See *Checking aurora^{Duet}'s Configuration* in Chapter 2 Section 4.



Tip

To select an automatic hot key configuration:

- Press **F4 HOT** from the Main menu.

See *Setting up aurora^{Duet} using Hot Keys* in Chapter 3 Section 1.

Troubleshooting Common Errors

What to Check First!

- If testing in BRI mode, make sure you are using the RJ45 connector socket - this is labelled with an *S*.
- If testing in PRI mode, either at 75 ohm or 120 ohm, make sure you are using the TAE8+4 connector socket - this is labelled *Primary 120Ω/Primary*.

Common Errors

Below is a list of common errors, together with possible solutions:

Common cause codes

- 153** Check the cabling between aurora^{Duet} and line. Press **F5 L1** to display the status of the line. In PRI mode, also check the CRC4 setting.
- 156** Change the mode from PMP (Point-to-Multipoint) to PP (Point-to-Point).
- 158** Change the mode from PP to PMP. In PRI mode, check the CRC4 setting.
- 140** The other end is not responding to call control messages and has a problem at layer 3.



If the SYNC A LED is lights up red

Press **F5 L1** to display the status of the line. Also check the CRC4 setting.

If the Problem Persists

Try resetting aurora^{Duet} back to factory defaults - this quickly clears any nonstandard settings:

- Choose **SET DEFAULTS** from the **GENERAL SETUP** menu.

See *Applying Factory Default Settings* in Chapter 3 Section 4.

- Configure aurora^{Duet} as required.

Before You Call the Help Desk

Before you call the Help Desk, try to have the following to hand:

- Information about the ISDN setup of the line under test - i.e. BRI, PRI, PMP, PP, CRC4 off/on, protocol, MSN (where applicable), DDI number (where applicable) etc.
- Information about the current configuration of aurora^{Duet}. To display this, press **F1 HELP**.
- If possible, have the tester to hand, switched on and connected to the ISDN line. If this is not possible, note down the LEDs which are lit and their colour.



Appendix 5

Glossary

Glossary

Acoustic Coupler	Device which allows a modem to connect to a telephone hand set when there is no telephone socket available.
A-Law	Companding technique for Pulse Code Modulation, used in Europe.
ANSI	American National Standards Institute. The national co-ordinating organisation for voluntary standards in the US.
ASCII	American Standard Code for Information Interchange.
Asynchronous	The description used for a communications channel capable of transmitting data but not timing.
AT commands	Also called Hayes commands, these allow you to control a modem.
aurora^{Duet}	A hand held BRI and/or PRI ISDN tester that enables you to verify the integrity of public switched and private wire ISDN connections.
aurora^{Expert}	aurora ^{Expert} for Windows is a protocol analysis package designed to be used with 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.

Autoanswer	A feature which enables a modem to automatically answer an incoming call.
Autobaud	The ability of a modem to detect the speed of the calling modem and adjust its own speed accordingly.
Basic Rate	The type of ISDN circuit that is typically used for subscriber circuits. It consists of two B channels and one D channel = 144 Kbps of bidirectional 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.
B Channel	Bearer Channel. ISDN utilises multiplexed channels that are transmitted over the same physical medium. The channels that typically carry the user (subscriber's) voice/ data/video are referred to as Bearer Channels.
BER	Bit Error Ratio/Rate. A measure of transmission quality. This is represented as the number of bits received in error during a transmission, 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. It is determined by synchronising and then comparing the received pattern with the binary test pattern as transmitted and counting any errors detected.
Bit	A binary digit, which can be in a state of either '0' or '1'.
Bps	Bits per second.
BRI	Basic Rate Interface.
Carrier	A continuous frequency which can carry a signal.
CCITT	The previous name of the ITU-T (from the French acronym).
Channel	A path (either physical or logical) for transmission of information.
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/digital to analogue 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.
Compression	A method for increasing throughput by compressing data.
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.
CPN DIR	Called Party Number Directory.
Crosstalk	Interference occurring when data is transmitted on different mediums which are adjacent to each other.
CTS	Clear To Send. A type of flow control where the Request To Send (RTS) line is used by the Data Terminal Equipment to indicate that it wishes to send data. The Data Communications Equipment indicates it may send the data by asserting CTS.
CUG	Closed User Group. Groups to and from which access is restricted.
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.
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.

Digital Exchange	An exchange that switches digital signals by means of digital switching.
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.
EIA	Electronic Industries Association. This body sets standards for electronic components and consumer products.
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.
Error correction	Techniques for correcting line errors.
ES	Errored Second. A second in which one or more BERT errors are measured in a single direction of transmission.
ESN	Electronic Serial Number.
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.
Handshaking	A series of signals governing the way in which modems accept data from DTEs and communicate with each other.
Hayes Compatible	The industry standard command set. The term means that a modem loosely follows the command set of the original Hayes Smartmodem.
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. 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.
LAPM	Link Access Procedure Modem - a method of error detection and correction recognized under the ITU-T V.42 specification.
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 ^{Duet} .
LCGN	Logical Channel Group Number.
LCN	Logical Channel Number.
LE	Local Exchange. 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.
LT Mode	On a Basic Rate U interface with 2B1Q line coding, 'NT mode' is referred to as the LT (line termination) mode.

Master clock	The clock which acts as a prime source within a network and from which all other clocks derive their synchronisation.
μ-law	A companding technique used for PCM systems in North America, Japan and some other regions in Asia.
MNP4	Microcom Networking Protocol - a common standard for error correction recognized under the ITU-T V.42 specification.
MNP5	Microcom Networking Protocol. A standard data compression technique recognized under the ITU-T V.42 specification.
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.

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.
Negotiation	Negotiation of facilities during X.25 Call Setup. If there is no negotiation then the current parameter settings are used.
NFAS	Non Frame Alignment Signal (PRT or North America: Non Facility Associated Signal)
Node	A point where one or more functional units interconnect transmission lines.
Noise	An unwanted signal.
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 Size	X.25 packet size.
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.
Packet Type	Type of X.25 channel or connection.

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.
PCMCIA	Personal Computer Memory Card International Association - an organization which develops standards for expansion cards.
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.
QAM	Quadrature Amplitude Modulation. A combined modulation technique to obtain high speed transmission over voice-grade lines.
RAM	Random Access Memory.

Ringback	The signal fed back to a caller to indicate that the called telephone is ringing.
RJ45	An 8 pin IDC phone connector.
RNR	Received Not Ready.
Routing	The function which ensures that the correct path through a network is selected.
RR	Received Ready.
RS232	An EIA standard for the DB25 interface connector.
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.
RTS	Request To Send. This is a type of flow control called Hardware flow control preferred for PC to external modem connections. The RTS line is used by the Data Terminal Equipment to indicate that it wishes to send data. The Data Communications Equipment indicates it may send the data by asserting Clear To Send (CTS).
Rx	Receive.

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.
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.
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.
SVC	Switched Virtual Circuit.

Synchronous data	Data without start and stop bits.
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.
Throughput	This is the bit rate per second attained by the Application. Note: it is impossible to obtain a throughput of 64K on a B Channel or 16K on a D Channel, due to the overhead of the lower Layers in terms of packaging (addressing,....) /bit stuffing /L2 retransmission /etc.
TNV	Telecommunications Network Voltage circuit. A test circuit for definition of safety in a telecoms system.
TOA/NZI	Type of Address / Numbering Zone Identifier.
Twisted pair	Cable in which a pair of wires are twisted around each other, to minimise noise from other circuits.
Tx	Transmit.
UART	Universal Asynchronous Receiver/ Transmitter. A UART is an electronic component which controls the speed of a modem.

U Interface	An ISDN reference point between NT1 and the network. The first reference point at the customer site.
V.22	The ITU-T data standard for 1200bps transmission speeds.
V.22bis	The ITU-T data standard for 2400bps full-duplex transmission.
V.23	The ITU-T 1200/75bps data standard.
V.29	The ITU-T standard for data transmission at 9600bps.
V.32	The ITU-T 9600bps data standard.
V.32bis	The ITU-T standard for modems operating at data rates up to 14400bps.
V.34	An ITU-T standard for fast data transmission at 28800bps.
V.42	The ITU-T error correction standard which uses the LAPM and MNP4 methods.
V5.1	V5.1 interfaces consist of a single 2.048Mbps link, and support the following access types: analogue telephone access, ISDN Basic Rate access and other analogue or digital accesses for semi-permanent connections without associated outband signalling information.

- V5.2** V5.2 interfaces consist of up to sixteen 2.048Mbps links, and support all access types supported by V5.1 plus ISDN Primary Rate access. A V5.2 interface is required if Primary Rate ISDN is to be supported. V5.2 supports the concentration of bearer traffic, so that the bearers on the user ports are supported by a smaller number of bearer channels on the interface. The allocation of bearer channels to user ports may change with each call, unlike the allocation for a V5.1 interface.
- V5 Interface** This is the interface between an access network and a host exchange for the support of narrowband telecommunications services. It allows multiple access technologies to be supported across a common interface. The V5 interface has two forms: V5.1 and V5.2.
- Video text** Usually refers to an interactive communication application in which a user can communicate with a video terminal.
- Window** The number of packets which can be transmitted without acknowledgement being received.
- X.25** The packet switched data network.
- X modem** One of the first file transfer protocols.

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.
Y modem	A file transfer protocol which does not perform any error checking.
Z modem	One of the fastest file transfer protocols.



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