

2 BRI NETWORK SIMULATOR

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INTRODUCTION

emutel™|Solo is an invaluable tool which is useful when multiple basic rate ISDN terminals must be tested or demonstrated

emutel™|Solo is an ISDN/IDSL simulator providing two basic rate interfaces (BRI) into which ISDN Terminal Equipment (e.g. terminal adapters, ISDN telephones, PABXs, video conferencing systems) can be plugged. The BRIs may operate as S₀ interfaces (i.e. I.430 compatible) or as U interfaces (i.e. ANSI T1.601 compatible).

A call on any bearer channel on any interface can be connected to any other bearer channel on any other interface. Virtually any type of call can be connected as **emutel™|Solo** supports unrestricted digital, voice, 3.1kHz audio, V.110 and V.120 bearer capabilities. **emutel™|Solo** can also provide a 40V, 1W power supply on each of the BRIs operating in both normal and restricted modes if they are S₀ interfaces and 55V 1.5W normal and sealing (i.e. 750mW current limit) on U interface. Internal tones (A law and μ law) are provided for voice/3.1 kHz terminals.

This manual outlines how **emutel™|Solo** should be set up and how the terminal equipment is connected in simulator mode.

emutel™|Solo is supplied with ETSI, USA or NTT protocol support built in to the unit.

emutel™|Solo can operate as an ISDN simulator or as an IDSL simulator

emutel™|Solo can operate as either an ISDN simulator or as an IDSL simulator. In either mode, the BRI interfaces can be switched from S or U independently using the user-friendly configuration menus.

BRI ports can be switched from S to U

PRODUCT SPECIFICATION

Introduction This section allows you to set up and use your **emutel™|Solo** with minimum effort. If you follow this guide and the terminal equipment still does not function then please read the complete manual.

The steps are as follows:

Unpack emutel™|Solo Unpack **emutel™|Solo**. There should be a Terminal Cable (DB9-DB9), two ISDN Cables (RJ45-RJ45) and a Mains Power Adapter with Power Cable.

Plug in the power cable Plug the power adapter into the rear of the unit. Plug the power adapter into the power supply and switch on (**emutel™|Solo** power adapter will work on 110V or 240V mains supply without adjustment).

Plug terminals into correct interface Plug terminals into correct BRI interface.

Make a call Make a call from one terminal to the other. (The default telephone numbers and other parameters are shown in Table 1).

If the call did not work If the call did not work and no LEDs came on the front panel then the terminals probably require 55V/40V power feeding. If not already switched on turn it on by following the instructions in Chapter 2 Software Setup/Hardware Setup Screen.

If the P LED comes on but no D LED then there is a problem with Layer 2. Try making the call again - this may fix the problem.

PRODUCT SPECIFICATION

Parameter	Default Setting
Baud Rate	19,200
Parity	None
Stop Bits	2
Data Bits	8
55 V / 40 V Power	ON
Use SPIDS	No
Numbering Option	Normal
CLIP	OFF
BRI 1	384000/10
BRI 2	384020/30

Table 1 **emutel™|Solo** Default Settings

PRODUCT SPECIFICATION

ISDN Connections **emutel™|Solo** provides two ISDN S₀ / U BRI ports. The BRI interfaces can optionally provide 40 V, 1 W on the S interface and 55 V 1.5W on the U interface to power terminal equipment.

LED Indicators In operation, LEDs indicate the operating level of each port:

- Physical layer activated
- Data link layer activated
- B1/B2 channel connected on the BRI interfaces
- Power is on
- Unit is operational

Terminal Port A V.24 port is provided at the rear of the unit allowing the connection of an ANSI compatible terminal or PC for setting up the unit.

Internal Battery **emutel™|Solo** contains an internal battery which will power the interface and electronics in portable applications.

There are no user serviceable parts inside **emutel™|Solo**. **emutel™|Solo** should only be opened by approved maintenance staff, otherwise the warranty will be invalidated.

HARDWARE SETUP

Unpack **emutel™|Solo** Take an Inventory

First unpack **emutel™|Solo** and take an inventory of the parts supplied. Check that the items ordered were actually received. The list below should be of help in identifying each part.

Check Options Supplied

To check which options have been installed inside the main unit check the option label on the back of the unit or the power up screen on the TERMINAL:

- **emutel™|Solo** Network Simulator
- Cables for ISDN - RJ45-RJ45 (2 off)
- Mains Power Adaptor
- Mains Cable
- Terminal Cable DB9-DB9 (1 off)
- This Manual
- Carry case

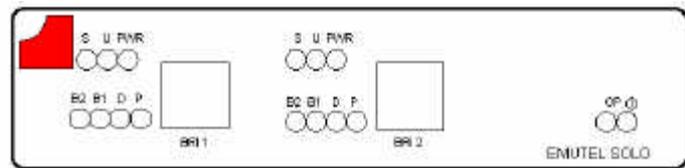


Figure 1 **emutel™|Solo** Front Panel

The BRI 1 and BRI 2 RJ45 connectors provide the BRI interfaces into the unit.

Start Up Sequence

When the unit is first switched on all the LEDs will illuminate. During this period the terminal port will default to 19200 baud, no parity, 8 data bits and 2 stop bits and will search for a <ctrl-c> being transmitted to **emutel™|Solo**. If this occurs **emutel™|Solo** will restore the factory defaults. This is useful if a setting has been changed and **emutel™|Solo** ceases to operate as a result. Powering up **emutel™|Solo** and immediately typing <ctrl-c> will restore a working configuration to the unit.

HARDWARE SETUP

S Interface Pinout

The S_0 interface is a 4 wire interface and the U interface is 2 wire. Figure 2 Shows the signals provided as the BRI RJ45 connector.

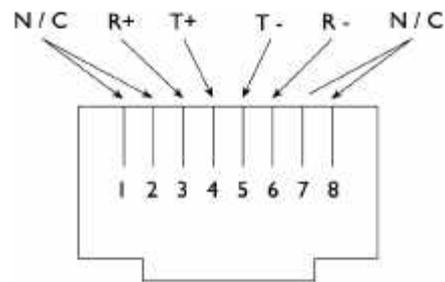


Figure 2a RJ45 Signals

U Interface Pinout

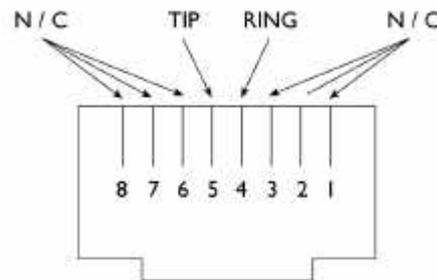


Figure 2b RJ45 Signals

LED Indicators

Beside each ISDN interface port there are two groups of LEDs. The upper group indicate the configuration of the port whilst the lower group indicate the state of the ISDN port beside them.

The S LED illuminates when the port is setup as an ISDN S_0 interface. The U LED illuminates when the port is setup as an ISDN U interface. The PWR LED illuminates when Power Feeding is ON, it will also 'pulse' if Restricted/Sealing mode is selected and 'flash' if power overload has occurred.

The P LED lights whenever the ISDN line has activated. The D LED lights whenever the Data Link layer for that port is active

HARDWARE SETUP

(i.e. Multi-Frame established). The corresponding B channel LED on the BRI interfaces (B1/B2) lights whenever that bearer channel is connected.

In addition the main Power LED lights whenever power is present in the unit. The Operating LED blinks whenever **emutel™|Solo** is running.



Figure 4 **emutel™|Solo** Back Panel

Control Port

emutel™|Solo has one V.24 compatible control port to which a PC or VT100 compatible terminal or a PC emulating an ANSI terminal (e.g. running Procomm, Windows, Terminal, Hyper Terminal etc.) can be connected. The pinout of the port is shown in Figure 5. Table 2 overleaf lists the operation of each pin.

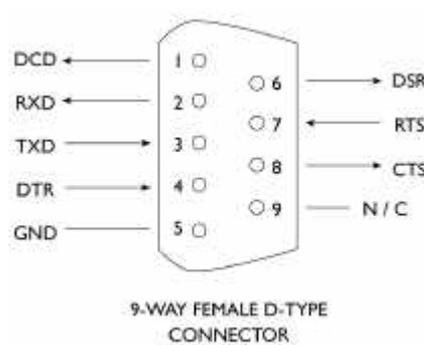


Figure 5 V.24 Terminal Port

HARDWARE SETUP

Pin	Function	Description
1	DCD	Data Carrier Detect (always active)
2	RXD	Received Data (output)
3	TXD	Transmitted Data (input)
4	DTR	Data Terminal Ready (input- ignored)
5	GND	Ground
6	DSR	Data Set Ready (always active)
7	RTS	Request to Send (input- ignored)
8	CTS	Clear to Send (output - active when emutel™ Solo can receive Data)

Table 2 Terminal Port Pin Description

Start-up Sequence

When **emutel™|Solo** is powered up it transmits an opening message, referred to later in the “Copyright Screen” (see Chapter 2). Once **emutel™|Solo** has been set up properly then it is not necessary to connect a terminal. To set up **emutel™|Solo** press any key on the terminal or PC keyboard and the setup screen, Figure 6, is presented. Chapter 2 covers setting up **emutel™|Solo**.

The factory default settings for **emutel™|Solo** are 19200 baud, 8 data bits, 2 stop bits, no parity, although these settings can be changed by the user. If **emutel™|Solo**'s settings in memory become corrupt it may not be possible to operate the terminal as the baud rate may be wrong. **emutel™|Solo** will always power up with the terminal port operating at 19200 baud, 8 data bits, 2 stop bit, no parity and will maintain this setting during the time when the power up LED's are on. Typing <ctrl-c> during this time will reload the factory defaults and the terminal should start to function normally again.

Power

emutel™|Solo power adapter will accept an IEC mains lead (supplied). **emutel™|Solo** power adapter has a universal input suitable for 90-250 V ac 50-60 Hz. Connection to any other source may result in the unit failing to comply with safety requirements.

HARDWARE SETUP

NOTE: The socket outlet should be installed near the equipment and should be easily accessible

Once the terminal has been connected to the control port, power can be applied. All the LEDs will light and then extinguish once the power on self-test is completed. (The power LED will stay on). The terminal should now display the opening copyright message and can be set up as described in the next chapter.

SOFTWARE SETUP

Introduction

This chapter outlines the user interface of **emutel™|Solo** and how the various functions of **emutel™|Solo** are set up and used.

Assuming that the hardware has been set up as described in Chapter 1, when power is applied the following message should be displayed on your terminal or PC.

Copyright Screen

© Copyright Arca Technologies 2000

ISDN/IDSL Simulator (XXX) Vx.xx dd mmm yyyy

XX XX

B1 B2

X.25 version Vx.xx

The default data format is 19200 baud, 8 data bits, 2 stop bits, no parity. If no message appears then please check the terminal cable connection. If some characters are displayed but the format is strange then try adjusting the terminal parameters so that they match **emutel™|Solo**.

Nothing further will happen until you press a key. Note that once the unit has been set up it is not necessary to connect a terminal to it each time it is powered on.

emutel™|Solo now displays the main set up screen, shown in Figure 6.

```
Hardware Setup
Software Setup
Telephone Number Setup
```

Figure 6 Main System Menu

Changing Parameters

The set up of **emutel™|Solo** is structured rather like a tree with the menu of Figure 6 at the top. You move to a more detailed lower function by using the <up-arrow> and <down-arrow> keys to select the desired function and presses <enter> on the keyboard. To move to the next higher function, press the <esc>

SOFTWARE SETUP

key on the keyboard. Note that <u> and <d> perform the same function as <up-arrow> and <down-arrow>.

Once you have located the item you wish to change use <space> to cycle through the various options permitted.

Some information must be typed rather than using <space> (e.g. telephone numbers). Move to the item to be changed and press <enter>. A prompt will appear at the bottom of the screen requesting the information. The options listed in Figure 6 are as follows:

Hardware Setup This function allows you to set up the communications ports, and various other hardware functions of **emutel™|Solo**.

Software Setup This function allows you to change the operation of **emutel™|Solo** by switching on and off information elements in the call control messages or by changing the way in which the layer 2 and layer 3 software operates. This function can be used to enable facilities such as Multiple Subscriber Numbering and Sub-Addressing.

Telephone Number Setup This function allows you to change the default telephone numbers for each B channel and the special purpose telephone numbers.

SOFTWARE SETUP

Hardware Setup Screen

On selecting this option you are presented with the screen of Figure 7.

```
Hardware Setup

Coms Port Baud Rate      xxxx
Coms Port Parity         xxxx
Coms Port Stop Bits     xxxx
Coms Port Data Bits     xxxx
ISDN/IDSL Operation     xxxx
BRI1 Mode                xxxx
BRI2 Mode                xxxx
BRI Power                xxxx
U Power Operation       xxxx
S Power Operation       xxxx
Selected Tone           xxxx
Ch1/B1 Delay            xxxx ms
Ch1/B2 Delay            xxxx ms
```

Figure 7 Hardware Setup Menu

All of the fields in Figure 7 are changed by highlighting the required field and cycling through the options using the <space>. The fields are listed below:

Coms Port Parameters

These are the parameters for the control terminal i.e. baud rate, parity, stop bits and data bits. Note that changing these parameters will mean that you will have to change the terminal setup also.

ISDN/IDSL Operation

emutel™|Solo will function only in ISDN simulation mode or in IDSL mode.

IDSL mode disables normal ISDN signalling and allows for the creation of permanent connections between the 2B+D channels.

To change the B channel connections move to the relevant field and press <space> until the desired B channel is selected.

SOFTWARE SETUP

BRI Power	Setting this to ON forces emutel™ Solo to provide a nominal 40 V 1 W dc supply to the ISDN S ₀ - interface and a 55V 1.5 W dc supply to the U interface if any terminal adapters or ISDN telephones require it.
BRI x MODE	Change the operation of the BRI port to either S to U interface type
S Power Operation	This field allows you to switch the power from normal mode to restricted mode, i.e. the power provided at the ISDN BRI. So interface will switch polarity. This field should be set to normal operation unless you wish to test the terminal adapter operation in restricted power mode.
U Power Operation	The U interface module is fitted with a current limiter circuit which restricts the total current to 20 mA in sealing mode. Switching to normal mode power will disable the current limiter and the U interface will be supplied with the full 55 V 1.5 W power available. This will be necessary for testing NT1s and other line powered devices.
Selected Tone	emutel™ Solo can generate a tone on a B channel whenever a terminal dials a particular telephone number (see Telephone Number Setup). This field is used to select the tone frequency and power level. It is also possible to select dial tone, ring tone, error tone (reorder tone) and busy tone using this field. Note that the '+' and '-' keys can be used to skip frequencies while <space> will skip to the next supported power level.

SOFTWARE SETUP

Software Setup Screen On selecting this option the screen of Figure 9 is displayed.

```
Software Setup

Network Type                xxxx
Drop Layer 2 if No Call Active  xxxx
Drop Layer 1 if Layer 2 Inactive  xxxx
Drop TEI if Layer 1 Inactive  xxxx
Point to point/Multi-point setup  xxxx
Use Service Profile IDs (SPIDs)  xxxx
Numbering System Option        xxxx
Called Party Number           xxxx
Calling Party Number          xxxx
Called Party Sub-addressing    xxxx
Calling Party Sub-addressing    xxxx
Higher Level Compatibility     xxxx
Lower Level Compatibility     xxxx
D-Channel X25 Setup           xxxx
```

Figure 9 Software Setup Menu

These features are only available when in ISDN simulation mode and are enabled or disabled by selecting the relevant field and pressing <space>:

- Network Type** Displays country specific ISDN emulation **emutel™|Solo** is configured for.
- Drop Layer 2 if No Call Active** If activated **emutel™|Solo** will disconnect layer 2 after a predetermined time if there are no active calls. This time can be set up by pressing <enter> on this field if it is activated. The screen of Figure 10 is presented.

SOFTWARE SETUP

L2 Drop Timeout Setup

Timeout until L2 Dropped (secs) nn

Figure 10 Drop Timeout Menu

Pressing <esc> will leave the value unchanged and <enter> will allow you to change the default value.

Drop Layer 1 if Layer 2 Inactive

If enabled **emutel™|Solo** will deactivate layer 1 immediately layer 2 becomes inactive.

Drop TEI if Layer 1 Inactive

If activated **emutel™|Solo** will remove its TEI value(s) once the layer 1 is deactivated. The terminals will then have to send an ID Request once they become active again.

Point to Point/Multipoint setup

Point to Point/Multipoint Setup

BRI # 0 xxxxx

BRI # 1 xxxxx

Figure 11 Point-Point/Point-Multipoint Setup

Press <enter> to setup point to point/multipoint options. Each interface can be set to point-point mode (i.e. no broadcast TEI in use for SETUP messages) or in point-multipoint mode (i.e. broadcast TEI 127 used).

Use Service Profile IDs (SPIDs)

If activated **emutel™|Solo** will accept a Service Profile Identifier from the terminal and assign a Terminal Endpoint to it. If this field is activated you can press <enter> to set up the SPIDs and the screen of Figure 12 is presented. (This feature applies to North American network version only.)

SOFTWARE SETUP

```
Service Profile Identifier Setup - Main Board

Channel #1 Tel No tttttt          ssssssssss
Channel #1 Tel No tttttt          ssssssssss
Channel #2 Tel No tttttt          ssssssssss
Channel #2 Tel No tttttt          ssssssssss
```

Figure 12 Service Profile ID Setup Menu (main board)

You can change any of the SPIDs by moving to the relevant SPID and pressing <enter>. A prompt appears requesting the new SPID value.

The remaining options affect the contents of the SETUP message sent from emutel™|Solo to the called terminal as follows:

Numbering System Option

The **Normal** numbering system uses the numbers assigned to each B channel in the Telephone Number Setup Menu. **Multiple Subscriber Numbering** (MSN) is also available. If this feature is enabled and a number is called the last digit (last two digits on a PRI) is treated as a wildcard i.e. dialling 384001 will connect to the channel whose number is set up as 384000. In addition to this the dialled number is provided to the destination terminal in the Called Party Number information element, assuming that the Called Party Number information element is enabled.

The third option is **Auxiliary Working**. Enabling this feature sets all B channels on an interface to the same telephone number. **Direct Dialling In** (DDI) is also provided. This works in basically the same way as MSN. Overlap receiving works independently of the numbering option.

North American Only

The numbering option in the Software setup has been re-worded.

2 DN/2 SPID (Fixed B)

Each BRI port has 1 Directory Number (DN) and 1 SPID number for each B channel. (Normal Mode)

SOFTWARE SETUP

2 DN/2 SPID/MSN Each BRI port has 2 Directory Numbers (DN) and 2 SPID numbers. MSN also operates in this mode.

1 DN/1 SPID (x2) Each BRI port has 1 Directory Number (DN) and 1 SPID number only. (Auxiliary Working)

In North American software there is no Direct Dialling In.

Called Party Number If activated a Called Party Number information element is included in the SETUP message sent to the destination terminal. This is the network generated directory number, if the calling terminal did not send a Called Party Number information element to **emutel™|Solo** in its transmitted SETUP message or simply a copy of the terminal supplied number if it did include a Called Party Number information element in its transmitted SETUP message to **emutel™|Solo**.

Note that a Called Party Number is always included in the SETUP message from emutel™|Solo to the called terminal if Multiple Subscriber Numbering is enabled.

If switched to Yes pressing <enter> when on this field displays the screen of Figure 13.

SOFTWARE SETUP

Called Party Number Setup

```
Type                tttttttt
Plan                pppppppppp
```

Figure 13 Called Party Number IE Setup

This screen allows the user to reconfigure the Called Party Number information element before it is sent to the called party. If Type or Plan are set to automatic then the Called Party Number will be passed through **emutel™|Solo** unaltered. The Type field can be forced to a different setting by pressing <space> while on the Type field.

Available settings are:

- Unknown
- International
- National
- Network
- Subscriber
- Abbreviated

Similarly, the Plan field can be forced to a fixed value.

Available plans are:

- Unknown
- ISDN / Telephony
- Data
- Telex
- National
- Private

Calling Party Number

If this feature is activated a Calling Party Number information element is included in the SETUP message sent from **emutel™|Solo** to the destination terminal. This is the network generated directory number if the calling terminal did not send a

SOFTWARE SETUP

Calling Party Number information element in its transmitted SETUP message to **emutel™|Solo** or simply a copy of the terminal supplied number it did include a Calling Party Number information element in its transmitted SETUP message to **emutel™|Solo**.

If switched to Yes pressing <enter> when on this field displays the screen of Figure 14.

Calling Party Number Setup

Type	tttttttt
Plan	ppppppppp
Screening	sssssssss
Presentation	pppppppppp

Figure 14 Calling Party Number IE Setup

This screen allows the user to reconfigure the Calling Party Number information element before it is sent to the called party. If Type, Plan, Screening or Presentation are set to automatic then the Called Party Number will be passed through **emutel™|Solo** unaltered.

The Type field can be forced to a different setting by pressing <space> while on the Type field.

Available settings are:

- Unknown
- International
- National
- Network
- Subscriber
- Abbreviated

Similarly the Plan field can be forced to a fixed value.

Available plans are:

SOFTWARE SETUP

- Unknown
- ISDN / Telephony
- Data
- Telex
- National
- Private

The Screening field can be forced to a fixed value.

Available screening indicators are:

- User Provided Not Screened
- User Provided Verified and Passed
- User Provided Verified and Failed
- Network Provided

The Presentation field can be forced to a fixed value.

Available presentation indicators are:

- Presentation Allowed
- Presentation Restricted
- Number Not Available

Called Party Subaddress

If this feature is enabled a Called Party Subaddress information element is included in the SETUP message sent to the destination terminal, but only if the calling terminal sent a Called Party Sub Address information element in its transmitted SETUP message to **emutel™|Solo**.

Calling Party Subaddress

If this feature is enabled a Calling Party Subaddress information element is included in the SETUP message sent to the destination terminal, but only if the calling terminal send a Calling Party Subaddress information element in its transmitted SETUP message.

Higher Level Compatibility

If this feature is activated a Higher Level Compatibility information element is included in the SETUP message sent to the

SOFTWARE SETUP

destination terminal. If this option is set to Yes, then **emutel™|Solo** always generates a HLC on outgoing calls. If it set to modify then it will modify outgoing HLCs according to the HLC setup. If it set to transparent then it will pass though HLCs present in original calls.

If activated, pressing <enter> when on this field allows the user to map the “information transfer capability” field of the Bearer Capability information element to the “high layer characteristics identification” of the High Layer Compatibility information element (see Q.931). To allow the user to set up this mapping the screen of Figure 15 is displayed.

The table is edited in the normal fashion - move to the element to be changed and use <space> to cycle through the available options until the desired option is selected.

The available options are:

- Telephone
- Fax Group 2 / 3
- Slow Scan Video
- Fax Group 4
- Teletex - basic mixed and fax
- Teletex - basic and processible
- Teletex - basic
- International Videotex
- Telex
- Message Handling
- OSI Application
- Maintenance
- Management

One of these options is then chosen for each of the displayed fields to define the mapping required. For example, ‘Speech’ in the Bearer Compatibility information element might be mapped to ‘Telephony’ in the High Layer compatibility information element.

Lower Level Compatibility

If this feature is activated a Lower Level Compatibility

SOFTWARE SETUP

information element is included in the SETUP message sent to the destination terminal. If this information element is supplied by the calling terminal then a copy is simply passed to the destination terminal, otherwise **emutel™|Solo** generates this information element from the Bearer Capability information element.

D Channel X.25 Setup

If this feature is activated then it is possible to send D channel packet data between BRI1 and BRI2.

When activated typing <enter> when on this field allows you to configure the parameters of each interface. The screen of figure 19 is displayed.

X.25 Setup

```
BRI1 PVC LLC          xxxxxxxxxxxx
BRI1 PVC HLC          xxxxxxxxxxxx
BRI1 LOC              xxxxxxxxxxxx
BRI1 HOC              xxxxxxxxxxxx
BRI2 LTC              xxxxxxxxxxxx
BRI2 HTC              xxxxxxxxxxxx
BRI2 LIC              xxxxxxxxxxxx
BRI2 HIC              xxxxxxxxxxxx
BRI2 TEI Value        xxxxxxxxxxxx

BRI1 PVC LLC          xxxxxxxxxxxx
BRI1 PVC HLC          xxxxxxxxxxxx
BRI1 LOC              xxxxxxxxxxxx
BRI1 HOC              xxxxxxxxxxxx
BRI2 LTC              xxxxxxxxxxxx
BRI2 HTC              xxxxxxxxxxxx
BRI2 LIC              xxxxxxxxxxxx
BRI2 HIC              xxxxxxxxxxxx
BRI2 TEI Value        xxxxxxxxxxxx
```

Figure 19 X.25 Setup Screen

You can enter a logical channel number for PVC connections, Incoming Calls, Bothway Calls, Outgoing Calls and a TEI value

SOFTWARE SETUP

to be used on the particular channel.

The first two entries on each channel are used to specify the highest and lowest logical channel number for Permanent Virtual Connections. The next six entries are used to specify highest and lowest logical channels for outgoing calls, highest and lowest logical channels for bothway calls and the highest and lowest logical channels for incoming calls. Lastly the fixed TEI value to be used on the particular channel is specified.

X.25 restart RESTART on L2 establish xx

Force simulator to issue a RESTART message when L2 establishes. For more information on X.25 refer to Chapter 4.

Telephone Number Setup On selecting this option the screen of Figure 16 is displayed.

```
Telephone Number Setup

BRI 1 B1 Number          xxxx
BRI 1 B2 Number          xxxx
BRI 2 B1 Number          xxxx
BRI 2 B2 Number          xxxx

Busy Number              xxxx
Unallocated Number      xxxx
No User Responded Number  xxxx
Call Rejected Number    xxxx
Out of Order Number     xxxx
Temporary Failure Number  xxxx
No Answer Number        xxxx
Test Tone Number        xxxx
Loop Number              xxxx
```

Figure 16 Telephone Number Setup Menu

The fields of Figure 16 are modified by selecting the relevant telephone number using the <up-arrow> and <down-arrow> keys and pressing <enter>. A prompt to enter a new telephone number

SOFTWARE SETUP

appears at the bottom of the screen.

To make a call simply dial the telephone number of the relevant port and B channel. Whenever Multiple Subscriber Numbering (MSN) is enabled (see Software Setup Menu/Numbering System Option) the last digit in the telephone number is treated as a wildcard i.e. if Port 1 B1 Number is set to 384010 and you dial 384016 a connection will be made to Port 1 B1. If Auxiliary Working is enabled all B channels on an interface use the same telephone number but only one number is allowed. Direct Dialling In (DDI) works in exactly the same way as MSN except that the Called Party Number information element is always enabled for MSN operation.

A series of failure numbers are also defined. If you dial any of these numbers the call is rejected with a cause value defined by the failure mode, i.e. calling the User Busy number will cause the call to be rejected with cause value 17.

A number is defined for test tones. Dialling this number will force **emutel™|Solo** to send a PCM tone (A law or μ law) on the B channel. The tone frequency and power level are adjusted in the Hardware Setup Menu. Note that silence, dial tone, busy tone, and error tone can also be sent.

FAULT FINDING

Introduction

This section seeks to provide some guidance on solving common problems encountered in using **emutel™|Solo**.

Changing a parameter on **emutel™|Solo** forced it to stop operating

Changing parameters on **emutel™|Solo** may cause the unit to change operating modes and appear to stop functioning.

To recover from this condition reload the factory defaults. When **emutel™|Solo** powers up the configuration LED's will light for about 1 second. During this period if **emutel™|Solo** receives a <ctrl-c> character it will reload the defaults. **emutel™|Solo** defaults to 19200 baud, 2 stop bits, 8 data bits and no parity during this period.

Terminal will not activate at layer 1 (i.e. P LED does not illuminate)

If the P LED does not illuminate then the physical connection between the terminal and **emutel™|Solo** is not functioning. Check first that the terminal is connected to the correct interface type. The "Copyright Screen" displays the type of interfacing installed. Or check the settings in the Hardware Setup Menu. Switch on the 55 V / 40 V power supply. If this does not help switch power operation between normal and restricted if the terminal is connected to a So BRI.

For US originating products with U interfaces then the U interface power should be set to sealing. To power NT-1's the U interface power should be set to Normal. Be careful when switching to U interface to normal power as products intended to be connected to a current limited U interface may be damaged by non current limited power.

Terminal will not answer a call

Check first that the call is actually being routed to the called terminal as expected. To do this dial the number of the called terminal and check that one of the B channel LEDs illuminate. If the terminal responds by activating the ISDN line (P LED illuminates) and by starting up layer 2 (D LED illuminates) then the terminal has received the call and is not answering for a specific reason (e.g. incompatible Bearer Capability, wrong Calling Party Number etc).

If neither the P nor D LED illuminate then the terminal may be

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faulty or else refer to the guidance notes for section entitled Terminal will not activate at layer 1.

Another possibility is that the called terminal is expecting a Called Party Number or Calling Party Number information element in the SETUP message. Turn on these options in the Software Setup Menu and ensure that the called terminal is programmed accordingly. It is also necessary that both terminals are running the same protocols.

Another possibility is that the terminal requires a Subaddress. Switch on Called Party Subaddress and Calling Party Subaddress in the Software Setup Menu.

Terminal can dial only one number to set up two calls

If the calling terminal can be programmed with one telephone number to dial two calls then **emutel™|Solo** Numbering System option must be switched from Normal to Auxiliary Working, MSN or DDI. In Normal operation each B channel has a separate telephone number. To call B1 on interface 2 dial 384020 and to dial B2 on interface 2 dial 384030 (if using the default numbering system).

The other possibilities are:

Auxiliary Working

One number is assigned per interface. Dialling this number can route a call to B1 on the called interface. Dialling this number again will route a call to B2 on the called interface, and so on. No other numbers will be accepted.

Multiple Subscriber Numbering (MSN)

A base number is assigned to an interface. An interface can be called by dialling any of ten numbers referenced to the base by changing the last digit. For example, using MSN and the default numbering system interface B1 will respond to all numbers in the range 384000-384009. The Called Party Number information element is always included in the SETUP message sent to the

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terminal.

Direct Dialling In (DDI)

This works in exactly the same way as MSN except that the called party number is sent to the called terminal if the Called Party Number option is enabled in the Software Setup Menu.

Windows Terminal Emulation will not move up and down menus

If using the Windows terminal emulation program in its default configuration the <up> and <down> arrow keys will not function with the menus. This is because Windows uses these keys and does not pass any characters to **emutel™|Solo**. In most cases <up> can be replaced with the ‘u’ or ‘U’ key and <down> by the ‘d’ or ‘D’ key.

Alternatively change the operation of Windows by clicking on the Settings and Terminal Preferences / Properties options and then disable the “Use Function, Arrow and Ctrl Keys for Windows” option.

No communication with terminal port

Communication failure can occur for several reasons. First, check that **emutel™|Solo** is powering up properly. The power LED should illuminate and the correct power up sequence should be observed (see chapter 1). In particular the internal relays should switch on power up and this should be audible.

Next check the cable. **emutel™|Solo** provides a DCE connection so a cable with a 9 way D male to 9 way D female connected pin for pin will connect **emutel™|Solo** to a PC.

If the cable is correct then check the communication parameters. The default is 19200 baud, no parity, 2 stop bits and 8 data bits. If the parameters have changed then during the power up sequence type <ctrl-c> at the keyboard of the terminal (terminal set for default communications parameters) and the factory defaults should be restored (see chapter 1). Another possibility is that **emutel™|Solo** is not powering up properly because the network personality module installed in **emutel™|Solo** will not start up and the LEDs on the front panel may flash. In this case see section

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entitled Network Personality Module will not work.

Overlap receiving will not work

Overlap Sending/Receiving is available on **emutel™|Solo** and operates as follows.

Overlap Sending used to dial the call

Here the calling terminal sends a SETUP message to **emutel™|Solo** without any Called Party Number information. **emutel™|Solo** will respond with SETUP ACK and the calling terminal can now dial the call by sending the Called Party Number as digits in INFO messages. Once **emutel™|Solo** has received enough digits to route the call **emutel™|Solo** will send SETUP to the called terminal but will not include the Sending Complete information element. If the called terminal responds with CALL PROCEEDING, ALERTING or CONNECT then **emutel™|Solo** will send CALL PROCEEDING to the calling terminal followed by ALERTING or CONNECT as appropriate. The called terminal does not support overlap receiving in this case. However, if the called terminal sends SETUP ACK then **emutel™|Solo** will continue to accept digits in INFO messages from the calling terminal and will pass these to the called terminal. Once the called terminal has received enough digits to route the call internally it will send CALL PROCEEDING, ALERTING or CONNECT to **emutel™|Solo** and **emutel™|Solo** will send CALL PROCEEDING to the calling terminal followed by ALERTING or CONNECT as appropriate.

Enbloc dialling used to dial the call

Here the calling terminal sends a SETUP containing the Called Party Number information required to route the call. If the Called Party Number option is enabled in the Software Setup Menu then all of the enbloc digits are forwarded to the called terminal. Otherwise only the overlap extension digits (i.e. the full dialled number less the digits used to route the call e.g. 384000 for BRI 1) are sent in the Called Party Number information element.

Enbloc Dialling used to dial the call with an incomplete

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number

This is a combination of (a) and (b). The SETUP message contains some of the Called Party Number information to **emutel™|Solo**. If the Called Party Number option is enabled in the Software Setup Menu then all of the enbloc digits are forwarded. If not only the overlap extension digits are forwarded. The terminal responds with SETUP ACK. The calling terminal supplies the remaining digits in INFO messages until enough digits are sent to start routing. Operation at the called terminal is the same as before.

However, dialling a Called Party Number (i.e. base number plus overlap extension digits) ending in '0' will disable overlap receiving at the called terminal and the SETUP message sent by **emutel™|Solo** to the called terminal will include a Sending Complete information element. The called terminal must respond with CALL PROCEEDING, ALERTING or CONNECT without waiting for more digits from **emutel™|Solo**.

If overlap receiving does not work check the called party number does not end in '0'. To change this reprogram the base number using the Telephone Number Setup Menu or enable DDI / MSN which will provide a range of 10 numbers with the last digit being any number between 0 and 9.

It is also possible to completely disable Overlap Receiving for all numbers by setting the Enable Overlap Sending / Receiving option in the Software Setup Menu to No. All SETUP messages sent to the called terminal will now have the Sending Complete information element included.

It is worth checking if the terminal (say PABX) requires point-point operation at **emutel|Solo** to function in overlap receiving. If so the interface into which the terminal has been plugged requires setting to point-point mode (see Software Setup/Software Setup Screen).

Changing parameters had no effect on

Some parameters once changed will not effect the operation of the

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operation of emutel™|Solo

unit immediately. If **emutel™|Solo** does not seem to be operating properly use the <esc> key to go back to the main power up Copyright Screen. If this does not work then switch **emutel™|Solo** off and on again. Please inform your supplier.

Garbage appears on screen everytime I power on

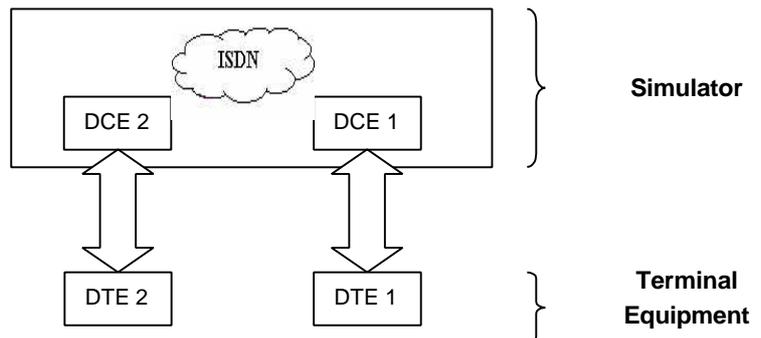
The most likely reason for this is the simulator and software Communications Package (eg. Hyperterminal) are at two different Baud Rates. To rectify this, you can either go through the various baud rates on the Communications Package until the correct one is found, or do a Factory Reset (ensuring you use a Baud Rate of 19200 on the Comms Package) when typing <ctrl-c>.

X.25 OPERATION

Purpose The aim of this section is to give users a guide to the setup involved when using the X.25 option on **emutel** series. The X.25 implementation was developed to aid customers demonstrating user X.25 TE equipment. The X.25 functionality on **emutel™|Solo** is limited and may not be suitable for the development of customer equipment.

Example Setup For the purpose of this example, An X.25 call will be placed from DTE 1 to DTE 2.

DTE 1 calls DCE 1
Call is routed through the ISDN cloud
DCE 2 call DTE 2



X.25 Setup Menu on emutel Series

Permanent Virtual Circuits (PVCs) – this is like a leased line connection, where a permanent connection is established between the two DTEs.

Switched Virtual Circuits (SVCs) – in this case the connection between the two DTEs is on a Temporary basis, and is only maintained for the duration of the call.

Parameters Below is a list of the default values associated with the setup of the simulator (i.e. the DCE).

BRI1 PVC LLC	0 - Lowest Logical Channel (PVC)
BRI1 PVC HLC	0 - Highest Logical Channel (PVC)
BRI1 LOC	1 - Lowest Outgoing Channel (SVC)

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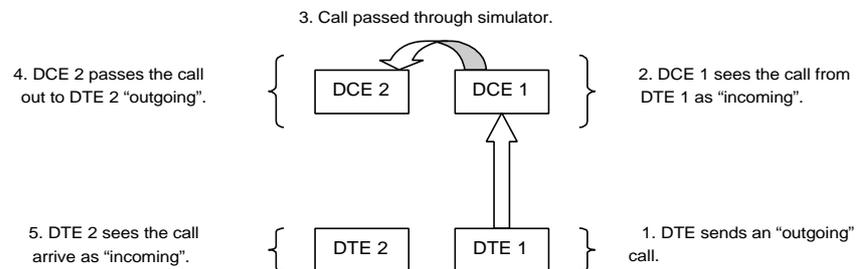
BRI1 HOC	2	-	Highest Outgoing Channel (SVC)
BRI1 LTC	3	-	Lowest Two-way Channel (SVC)
BRI1 HTC	4	-	Highest Two-way Channel (SVC)
BRI1 LIC	5	-	Lowest Incoming Channel (SVC)
BRI1 HIC	6	-	Highest Incoming Channel (SVC)
BRI1 TEI	1	-	TEI Value to be used (Default 1)
BRI2 PVC LLC	0	-	Lowest Logical Channel (PVC)
BRI2 PVC HLC	0	-	Highest Logical Channel (PVC)
BRI2 LOC	1	-	Lowest Outgoing Channel (SVC)
BRI2 HOC	2	-	Highest Outgoing Channel (SVC)
BRI2 LTC	3	-	Lowest Two-way Channel (SVC)
BRI2 HTC	4	-	Highest Two-way Channel (SVC)
BRI2 LIC	5	-	Lowest Incoming Channel (SVC)
BRI2 HIC	6	-	Highest Incoming Channel (SVC)
BRI2 TEI	1	-	TEI Value to be used (Default 1)

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There should be similar options on the DTE, and it is important that the above settings within the simulator (i.e. DCE) match those of the DTEs. It is also worth noting that what is deemed as outgoing at one side is deemed as incoming at the other.

To expand on this:

When placing a call from DTE 1 to DTE 2 the following happens.



The process is reversed for a call in the opposite direction (i.e. DTE 2 to DTE 1).

Logical channel setup

Assuming that the simulator settings are not changed (highlighted in italics below), then the DTE settings will be as follows.

DTE	Channel
Outgoing	5 & 6
Two-way	3 & 4
Incoming	1 & 2

DCE	Channel
<i>Outgoing</i>	5 & 6
<i>Two-way</i>	3 & 4
<i>Incoming</i>	1 & 2

The Two-way channels are used as reserve logical channels, and as they are bi-directional they support both Incoming and Outgoing.

TEI Value Pressing <Enter> can change the Terminal Endpoint Identifier.

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As default this value is set to "1".

Called Party Number

When using SVCs it is necessary to send the called party number, as the call is still using the ISDN network. However, depending upon the Terminal Equipment being used, this may be called one of the following.

1. Called Party Number
 2. Telephone number
 3. Address
- Etc.

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