



Emutel Symphony Base unit:

ISU9080

Protocol Analyser Option:

ISU9082-PROT

Upgrade Modules:

PRI: **ISU9080-PRI**

BRI: **ISU9080-BRI**

Network Personality Modules:

1TR6 **ISU9082-GER**

VN3 **ISU9082-FRA**

BTNR191 **ISU9082-UK**

Euro-ISDN **ISU9082-EURO**

North American **ISU9082-USA**

NTT **ISU9082-JAP**

Internal Modem Option:

ISU9080-MOD

Interface Modules:

BRI (8x U): **ISU9081-8U**

BRI (8x S): **ISU9081-8S**

PSTN (16x PSTN) **ISU9081-PSTN**

PRI (8x PRI) **ISU9081-PRI**

Emutel Symphony ISDN Simulator

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Introduction

The Emutel Symphony provides an extensive range of basic rate interface, primary rate interface or analogue port combinations

The Emutel Symphony comprises of a modular system with three interface slots. The first always contains the Controller Card while the remaining two slots are built up of standard interface cards pictured in the Quick Reference Guide section. Each slot may be basic rate, primary rate or analogue interface.

The basic rate interface (BRI) may be a S0 interface (I.430 compatible) or a U interface (ANSI T1.601 compatible).

The primary rate interface (PRI) can be configured as an S2m interface (i.e. E1 G.703 compatible) or a T1 interface.

The controller card contains a LAN port, an optional Line interface and 2 available ports that can be configured at manufacture to be dual S0 interfaces, dual U interfaces or dual PRI.

The interface cards may be added to allow up to a maximum of 16 additional ports. Each of these ports can support any one of four options; basic rate - S0 interfaces or U interfaces; primary rate; and analogue.

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 the Emutel Symphony supports unrestricted digital, voice, 3.1kHz audio, V.110 and V.120 bearer capabilities. The Emutel Symphony 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 88V 4W normal and sealing (i.e. 20mA current limit) on U interface. Internal tones (A law and (law) are provided for voice/3.1 kHz terminals.

The unit also supports X.25 packet calls on the D channel of BRI1, BRI2 and BRI3.

Also available as a software option is a protocol analyser. When activated it will report what is happening at each of the BRI and PRI interface ports. Decoding can be enabled or disabled at:

- * Layer 1 (physical layer)
- * Layer 2 (data link layer)
- * Layer 3 (call control layer)
- * X.25 decoder

If layer 1 decoding is enabled the analyser will report the state of the physical connection.

At layers 2 and 3 you can select one of four possible modes of operation:



- No reporting
- Display message contents as hex bytes
- Display message contents in brief text messages
- Display message contents in detail, decoding all the information elements in layer 3

The originator, the interface number and the time are clearly identified in each message.

The Emutel Symphony can also function as a stand-alone protocol analyser connecting between a BRI ISDN terminal and a real BRI ISDN network or between a PRI ISDN terminal and a real PRI ISDN network.

Finally, the Emutel Symphony ISDN signalling can be disabled and permanent B channel connections established between each interface.

This manual outlines how the Emutel Symphony should be set up and how the terminal equipment is connected.



Product Specification

ISDN / Analogue (PSTN) connections ISDN Simulation Mode

The Emutel Symphony provides a combination of ISDN S0 or U BRI ports, ISDN E1 or T1 PRI ports, and analogue ports, all operating as the network side of the connection.

The BRI interfaces can optionally provide a supply to power terminal equipment. This is 40V, 1W for S0 and 88V, 1.5W for U interfaces.

The analogue interfaces provide -48V power feeding to power telephones.

Permanent B Channel Connections

Normal ISDN Signalling is suspended and permanent connections made between any PRI/BRI interfaces to any other PRI/BRI interface.

LED Indicators

In operation, LEDs indicate the operating level of each port. Note that the LEDs do not operate in transparent mode. The LEDs operate as follows:

- Physical layer activated
- Data link layer activated
- B1/B2 channel connected on the BRI interfaces or a single B LED to indicate that at least one B channel is active on the PRI interface
- S Interface on BRI
- U Interface on BRI
- E1 Interface on PRI
- T1 Interface on PRI
- Alarm condition has occurred
- Power is on
- LAN Connected and activity

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.

Network Personality Module

The Emutel Symphony can be made to simulate country specific networks (e.g. 1TR6, BT, Euro ISDN etc.) by plugging a pre-programmed Network Personality Module into the top slot on the front of the unit.

Ethernet Port

An IEEE 802.3 Ethernet port is provided for connection to a local area network.

LEDs indicate (1) network present, (2) network activity.

Modem Port

An optional modem port is provided to allow the Emutel Symphony to be controlled remotely.

LEDs indicate that the modem is (1) off hook / ringing, (2) connected.

Power

The Emutel Symphony is mains powered and accepts a voltage of 110-240V a.c (50-60Hz).

Quick Reference Guide

Introduction

The Emutel Symphony consists of a chassis, mains power supply, controller card and up to 2 expansion cards. The controller card must be fitted in the first (bottom) slot.

There are no user serviceable parts inside the Emutel Symphony. The unit should only be opened by approved maintenance staff; otherwise, the warranty will be invalidated.

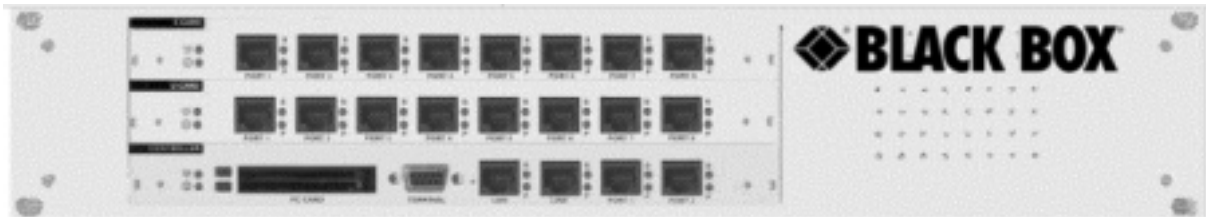


Figure 1 the Emutel Symphony front panel

Chassis

The chassis consists of a metal case with a front panel shown in Figure 1 able to accept a controller card and up to two expansion cards; S0, U, E1/T1 or Analogue.

Mains Power Supply

The mains power supply has a universal input suitable for 110V-240Vac/50-60Hz. Connection to any other source may result in the unit failing to comply with safety requirements.

Power should be supplied via an IEC mains lead (supplied).

The power supply cord must have a protective ground (earth). If not the mains filter will force the metal case to a voltage equal to half the mains supply voltage.

Controller Card

The controller card is populated with two ports BRI or PRI (optional), modem (optional), LAN, terminal port, 2 PC Card slots, and LED indicators.



Figure 2 the Emutel Symphony controller card.

The terminal port is a V.24 compatible control port to which a PC or VT100 compatible terminal or a PC emulating an ANSI terminal (e.g. running Windows Terminal, Hyper terminal etc.) can be connected.

The LAN port is an IEEE 802.3 compatible Ethernet port allowing the Emutel Symphony to be controlled over a LAN.

The Line port is the modem (optional), which connects to an analogue telephone line.

ISDN Ports 1 and 2 can be PRI (E1/T1), or BRI (2S or 2U).

For each ISDN port the P LED is on when both physical link layer and data link layer are active. It flashes when only the physical link is active. The B LED is on when any B channel is in use.

For the Ethernet port the P LED indicates network present and the B LED indicates network activity.

For the modem port the P LED is on for off-hook and flashing for ringing. The B LED indicates modem connected.

U, S and PRI cards

The U, S and PRI cards feature 8 ISDN Ports and LEDs.

LEDs indicate power and alarm.

For each port the P LED is on when both physical link layer and data link layer are active. It flashes when only the physical link is active. The B LED is on when any B channel is in use.



Figure 3 the Emutel Symphony U card, S card and PRI card

Analogue Card

The Analogue card features 16 RJ11 ports with LEDs. The card is one of the options for the slots in the Emutel Symphony.



Figure 4 the Emutel Symphony Analogue Card

Restoring Default Settings

When the unit is first switched on 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 the Emutel Symphony. If this occurs the Emutel Symphony will restore the factory defaults otherwise it will use the stored settings.

If a setting has been changed and the Emutel Symphony ceases to operate, powering up the Emutel Symphony, while holding down <ctrl-c> for the first 20 seconds will restore a working configuration to the Emutel Symphony.

Installation

Unpack the Emutel Symphony

First, unpack the Emutel Symphony and check for signs of damage in transit. If the unit or packaging is damaged this should be reported immediately to your local Black Box.

Take an Inventory

Assuming there is no damage, 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.

- The Emutel Symphony Network Simulator
- 2 ISDN Cables - RJ45-RJ45
- Mains Cable
- 1 Terminal Cable DB9-DB9
- 1 Analogue RJ11 Cable
- This Manual

Connect to a PC or terminal

Plug the terminal cable into the rear of the unit and connect to a terminal or PC. The Emutel Symphony default terminal settings are ANSI terminal compatible, 19200-baud, 8 data bits, no parity, 2 stop bits.

Connect power

Plug the power cable into the rear of the unit and switch on. The Emutel Symphony will work on 110V or 240V mains supply without adjustment.

Configure the Emutel Symphony

Set up the Emutel Symphony using the menus (see Software setup).

Connect BRI or PRI line

Plug an ISDN cable into correct BRI or PRI (power up screen will tell you what interfaces are installed on the Emutel Symphony).

Connect terminal equipment

Plug a basic rate terminal into an enabled BRI, an analogue telephone into an enabled analogue line or a primary rate terminal into PRI2 (if enabled). Make sure that the equipment is compatible with the interface it is connected to.

NB in the UK Master sockets should be connected between the analogue connections (RJ11) and telephones.

Software Set-up

Introduction

This section outlines the user interface of the Emutel Symphony and how the various functions of the Emutel Symphony are set up and used.

Copyright Screen

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

```
Copyright Black Box 1999
ISDN Simulator (XXX) Vx.xx dd mmm yyyy S/N xxxxxxxx

XX XX XX XX XX XX XX XX
XX XX XX XX XX XX XX XX
                XX XX

X.25 version Vx.xx
```

Figure 5 the Emutel Symphony copyright screen

The default data format is 19200 baud, 8 data bits, 2 stop bits, no parity. If no message appears, then this would indicate a possible problem with the control cable. If some characters are displayed but the format is peculiar then the terminal parameters are probably incorrect. Try adjusting the terminal parameters so that they match the Emutel Symphony.

Nothing further will happen until you press a key. Note that once the unit has been set up it is not necessary to set it up each time it is powered on, and consequently the terminal need not be connected thereafter.

When the menu system is first selected, the Copyright Screen is displayed. It can be displayed again by pressing <Esc> from the main menu. To return to the command line interface press <Esc> from the Copyright Screen.

Nothing further will happen until you press a key. Note that once the unit has been set up by the user it is not necessary to set it up each time it is powered on, and consequently the terminal need not be connected thereafter.

Main Menu

Press 'Enter' to display the main set up screen, shown in figure 7.

```

Hardware Configuration
Software Configuration
Telephone Number Configuration
Analyser Configuration
Ethernet Configuration

```

Figure 6 Main System Menu

Changing Parameters

The setup of the Emutel Symphony is structured rather like a tree with the menu of Figure 6 at the top. The user moves to a more detailed function by using the <up-arrow> and <down-arrow> keys. To select the desired function press <enter> on the keyboard. To move to a higher function press the <esc> key on the keyboard.

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

The <home> and <end> keys can be used to move the cursor to the first and last item in the menu if the terminal program supports them.

Once you have located the item you wish to change use <space> or <+> and <-> to cycle through the various options permitted. Numeric values can also be altered by using <enter> and typing a new value.

Use <backspace> to change to the lowest numeric value or first option.

Some information must be entered by typing it in 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 Configuration

This function allows you to set up the communications ports and various other hardware functions of the Emutel Symphony.

Software Configuration

This function allows you to change the operation of the Emutel Symphony by enabling and disabling ports/channels, setting up numbers and semi-permanent connections etc. This function can also be used to enable facilities such as Multiple Subscriber Numbering and Subaddressing.

Telephone Number Configuration

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

Analyser Configuration

This function allows you to operate the protocol analyser.

Ethernet Configuration

This function allows you to configure the Ethernet settings.

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
Simulator Mode          xxxx

Controller Port Config  xxxx
Expansion Card 1 Config xxxx
Expansion Card 2 Config xxxx

PRI E1 I/F Config      xxxx
PRI T.1 I/F Config     xxxx
Selected Tone          xxxx
```

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.

Simulator Mode

This field selects between Network Terminator Mode (NT) and Permanent B Channel Connections.

In NT mode the Emutel Symphony will simulate an ISDN network, allowing PRI and BRI terminals to be plugged in, and to call each other.

Permanent B Channel Connection disables normal ISDN signalling and allows for the creation of permanent connections between B channels. Any B channel on any interface can be connected to any other B channel.

Controller Port Config

Configuration options for the main controller 2 ISDN ports

Expansion Card 1 Config

Configuration options for expansion card 1 ports

Expansion Card 2 Config

Configuration options for expansion card 2 ports

Selected Tone

The Emutel Symphony can generate a tone on a B channel whenever a terminal dials a particular telephone number (see the section “Software Configuration/Telephone Number Configuration Screen”). 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.

PRI E1 I/F configuration

This field switches between AMI and HDB3 encoding on the E1 interface and sets the S bit to 1 or to reflects the status of the FEBE bit in the S2m interface, and to switch CRC4 multi-framing on or off.

PRI T1 I/F configuration

This field switches between AMI and B8ZS encoding on the T1 interface and sets the framing to SLC96, SF, T1DM or ESF.



Software Setup Screen

On selecting this option the screen of Figure 8 is displayed.

```
Software Setup

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

Figure 12 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

Can be changed on NAT/AT&T/DMS and BT Network Personality Modules only.

Drop Layer 2 if No Call Active

If activated the Emutel Symphony 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.

```
L2 Drop Timeout Setup

Timeout until L2 Dropped (secs) nn
```

Figure 10 Drop Timeout Menu

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

Drop Layer 1 if Layer 2 Inactive

If enabled the Emutel Symphony will deactivate layer 1 immediately layer 2 becomes inactive.

Drop TEI if Layer 1 Inactive

If activated the Emutel Symphony 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.

Number of B channels per PRI

You can select between 6 and 30 (23 if using NAT/AT&T/DMS or NTT Network Personality Module).

To set each PRI or BRI interface as being point-point or point-multipoint operation press <enter> and the screen of Figure 11 will be displayed.

Point to Point/Multipoint Setup

```

Controller Port config           xxxx
Expansion Card 1 Port Config     xxxx
Expansion Card 2 Port Config     xxxx

```

Figure 11 Point-Point/Point-Multipoint Setup

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)

This field allows the Emutel Symphony to accept a Service Profile Identifier from the terminal and assign a Terminal Endpoint to it. While using the NAT/AT&T/DMS network personality card, this field can be set to: (a) Optional - SPIDs may be used but if SPIDs are not used calls can still be made; (b) Mandatory - SPID initialisation must be completed successfully before calls can be made or (c) AutoSPID - same as (b) but the AutoSPID feature of National ISDN 1997 i.e. enabled. If using any other network support card (or none) this field is fixed at Optional. If this field is activated you can press <enter> to set up the SPIDs and the screen of Figure 12 is presented.

```

Service Profile Identifier Setup

Controller Port config           xxxx
Expansion Card 1 Port Config     xxxx
Expansion Card 2 Port Config     xxxx

```

Figure 12 Service Profile ID Setup Menu

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

Allow Overlap Sending/Receiving

If activated the Emutel Symphony will allow Overlap Receiving on certain enbloc dialled calls. If deactivated Overlap Receiving is not allowed. For a further explanation of how Overlap Receiving works read the information in the Fault Finding section entitled Overlap Receiving Will Not Work.

The remaining options affect the contents of the SETUP message sent from the Emutel Symphony 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. (Note that in BT and 1TR6 Network Personality Modules only the last digit dialled is provided regardless of whether the Called Party Number information element is enabled or not.)

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

North American software 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 (as in Normal operation).

2 DN/2 SPID/MSN

This option assigns one telephone number per B channel. The defaults are 38400 for B1 Port 1 & 384010 for B2 Port1.

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



This option leaves the last digit as a wild card on BRIs (N.B. last 2 digits for PRIs). So dialling 384020 from BRI Port 1 is like dialling 38402*. Therefore, any number dialled between 384020 & 384029 will have the same affect and dial B1 channel on Port 2. In addition to this, the dialled number is presented at the destination port.

1 DN/1 SPID (x2)

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

This option assigns the same number to each of the B channels per interface. For example, for Port 1 on the Emutel Symphony both B1 & B2 have the same number (38400).

N.B. There is no Direct Dial In operation in North American software.

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 the Emutel Symphony 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 the Emutel Symphony.

Note that a Called Party Number is sometimes included in the SETUP message from the Emutel Symphony to the called terminal even if this field is set to No.

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

```

Called Party Number Setup

Type          tttttttt
Plan         pppppppppp
    
```

Figure 13 Called Party Number IE Setup

This screen allows you 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 the Emutel Symphony 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 the Emutel Symphony to the destination terminal. This is the network generated directory number if the calling terminal did not send a Calling Party Number information element in its transmitted SETUP message to the Emutel Symphony or simply a copy of the terminal supplied number it did include a Calling Party Number information element in its transmitted SETUP message to the Emutel Symphony.

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

```
Calling Party Number Setup
Type                tttttttt
Plan                pppppppppp
Screening           ssssssssss
Presentation        pppppppppppp
```

Figure 14 Calling Party Number IE Setup

This screen allows you 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 the Emutel Symphony 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

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

Note that if Presentation Restricted is chosen no number digits will be included in the Calling Party Number information element.

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 Subaddress information element in its transmitted SETUP message to the Emutel Symphony. The CCITT and ETSI Network Personality Modules allow the generation of a Called Party Subaddress by dialling an enbloc number and the Called Party Subaddress separated by a # (e.g. dial 384000#123 to generate a subaddress of 123).

Higher Level Compatibility

If this feature is activated a Higher Level Compatibility information element is included in the SETUP message sent to the destination terminal. If this option is set to Yes, then the Emutel Symphony always generates a HLC on outgoing calls. If it set to modify then it will modify outgoing HLC' according to the HLC setup. If it set to transparent then it will pass though HLCs is present in original calls.

If activated pressing <enter> when on this field allows you 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 set up this mapping the screen of Figure 15 is displayed.



The table is edited in the normal fashion - move to the field 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
- 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.

```
Higher Layer Compatibility Setup

Speech translates as                xxxxxxxxxxxx
Unrestricted Digital translates as  xxxxxxxxxxxx
Restricted Digital translates as    xxxxxxxxxxxx
3.1 kHz Audio translates as        xxxxxxxxxxxx
7 kHz Audio translates as          xxxxxxxxxxxx
Video translates as                 xxxxxxxxxxxx
```

Figure 15 Translations from Bearer Capabilities to HLC

Lower Level Compatibility

If this feature is activated a Lower Level Compatibility 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 the Emutel Symphony generates this information element from the Bearer Capability information element.

D-Channel X.25 Set-up

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 16 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 16 X25 Setup Screen

X.25 restart

You can enter a logical channel number for PVC connections, Incoming Calls, Bothway Calls, Outgoing Calls and a TEI value to be used on the particular channel.

```
RESTART on L2 establish      xx
```

Force simulator to issue a RESTART message when L2 establishes. For more information on X.25, see Appendix.

Telephone Number Setup Screen

On selecting this option the screen of Figure 17 is displayed.

Telephone Number Setup	
Controller Port Numbers	xxxx
Expansion Card 1 Numbers	xxxx
Expansion Card 2 Numbers	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
Data Port Number	xxxx

Figure 17 Telephone Number Setup Menu

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 (last two digits for a PRI) in the telephone number is (are) 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.

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 the Emutel Symphony to send a PCM tone (A law or (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.

Analyser option

Introduction

Before the analyser can be used, it must be configured as explained in the product specification section. The information is repeated here for convenience.

On selecting the analyser setup option from the main menu the screen of Figure 19 is displayed.

```

Analyser Setup

Analyser Time          nn:nn:nn dd/mm/yy
Layer 1 Hardware       xxxx
Layer 2 Data Link     xxxx
Layer 3 Call Control  xxxx
X.25 D Channel        xxxx
Channel Filter        xxxx
Call Reference Filter  xxxx
Analyser Specification xxxx
Terminal Type         xxxx
Activate Analyser     xxxx
  
```

Figure 19 Analyser Setup Menu

This screen defines how the protocol analyser option operates.

The time stamp on the analyser display can be changed to the current time rather than elapsed time since power up.

The analyser will report activity at layers 1, 2 and 3. To select the reporting level required at each layer move to the particular option and pressing <space>. The reporting levels available are:

- Inactive - no reporting of any activity
- Hex Display - messages are displayed as hex digits
- ASCII Short Display - messages are displayed in a shortened text form
- ASCII Long Display - messages are displayed in text form and all the information elements are decoded and displayed

You can also select channel filtering. If selected, reporting will only take place on the channels selected using this option.

A call reference filter can also be set up. To use this facility, move to the Call Reference field and press <enter>. You are now prompted to enter a call reference value. Once entered only calls having this call reference will be reported at layer 3, layers 1 and 2 being unaffected.

You may also select the decoding of messages that are defined for a particular ISDN network. The networks currently supported are CCITT (general purpose), BTNR191/BT ETSI (UK), AT&T 5ESS (USA), NT DMS100 (USA), National ISDN 1 (USA), 1TR6 (Germany) and VN2/3 (France), ETSI (Europe), NTT (Japan).

Enter analyser mode by setting Activate Analyser to Yes and pressing <enter>. To exit analyser mode press <esc>.

Information Provided at Layer 1

A typical display of a layer 1 message is shown below.

```
23: Ch PRI1 L1 STATE = Activated 00:01:75:30.271
```

The information presented is outlined below.

Sequence Number

Each message has a unique sequence number so that old messages can be easily located.

Channel Number

The channel number (e.g. BRI1, BRI2, BRI3, PRI1 and PRI2) on which the event occurred.

Layer Number

The layer on which the event is being reported.

State

The new state of the physical layer e.g. Activated.

Timestamp

The time that the message was recorded. The timestamp has the form dd:hh:mm:ss.nnn where dd represents days, hh hours, mm minutes, ss seconds and nnn milliseconds.

Note that layer 1 messages are generated only if a change occurs in the state of the physical link.

Information Provided at Layer 2

A typical display of a short ASCII layer 2 message is shown below.

```
23: TE Ch BRI2 L2          00:01:75:30.271
SAPI= 0, TEI= 40, C/R= 0, P/F=1, TYPE= SABME
```

The information presented is outlined overleaf.

Sequence Number

Each message has a unique number so that old messages can be easily located.

Originator

This field reports which side generated the message, TE for terminal generated messages and NT for network generated messages.

Channel Number

The channel number (e.g. BRI1, BRI2, BRI3, PRI1 and PRI2) on which the event occurred.

Layer Number

The layer on which the event is being reported.

Timestamp

The time that the message was generated (NT message) or received (TE message). The timestamp has the form dd:hh:mm:ss.nnn where dd represents days, hh hours, mm minutes, ss seconds and nnn milliseconds.

Service Access Point Identifier***Terminal Endpoint Identifier*****Command / Response Bit*****Poll / Final Bit*****Type***

The message type, being one off I, RR, RNR, REJ, SABME, DM, UI, DISC, UA, FRMR, XID.

A typical display of a long ASCII layer 2 message is shown below.

```
23: TE Ch BRI2 L2          00:01:75:30.271
SAPI= 0, TEI= 40, C/R= 0, P/F=1, TYPE= INFO
N(R)= 1, N(S)= 1
```

The following information has been added:

Send Sequence Number N(s)***Receive Sequence Number N(r)***

Layer 2 management transactions may be also decoded in long form messages. A typical decode follows.

```
23: TE Ch BRI2 L2          00:01:75:30.271
SAPI= 0, TEI= 40, C/R= 0, P/F=1, TYPE= UI
MEI= 15, Ri= 7FCD, MSG TYPE= ID Request, Ai= 0
```

The following information has been added:

Management Entity Identifier*

Reference Number (Ri)*

Management Message Type*

One of ID Request, ID Assigned, ID Denied, ID Check Request, ID Check Response, ID Remove, ID Verify.

Action Indicator*

Only Information and certain Unnumbered Information messages at layer 2 include layer 3 messages.

A typical display of a hex layer 2 message is shown below.

```
23: TE Ch BRI2 L2          00:01:75:30.271
02 81 00 02 41 01 81 0D 18 01 89
```

The information contained in the message is not decoded but simply displayed as hex octets.

*Fields marked with * are explained further in CCITT Q.921 Digital Subscriber Signalling System No 1, Data Link Layer.*

Information Provided at Layer 3

A typical display of a short ASCII layer 3 message is shown below.

```
23: TE Ch PRI1 L3          00:01:75:30.271
PD= 65, LEN= 1, FLAG= Orig, CALL REF= 3, TYPE= SETUP
```

The information presented is outlined below:

Sequence Number

Each message has a unique sequence number so that old messages can be easily located.

Originator

This field reports which side generated the message, TE for terminal generated and NT for network generated.

Channel Number

The channel number (e.g. BRI1, BRI2, BRI3, PRI1 and PRI2) on which the event occurred.

Layer Number

The layer on which the event is being reported.

Timestamp

The time that the message was generated (NT message) or received (TE message). The timestamp has the form dd:hh:mm:ss.nnn where dd represents days, hh hours, mm minutes, ss seconds and nnn milliseconds.

Protocol Discriminator***Call Reference***

The call reference consists of three parts, the Length of the call reference, the Value of the call reference and the Originator of the call reference.

Message Type*

One of the Q.931 supported messages, or network specific message.

A typical display of a long ASCII layer 3 messages is shown below.

```
23: TE Ch PRI1 L3          00:01:75:30.271
PD = 65, LEN = 1, FLAG = Orig, CALL REF = 3, TYPE = SETUP
CALLING PARTY NUMBER:0 LENGTH = 7
TYPE = Unknown PLAN = ISDN / Telephony NUMBER = '234231'
CALLED PARTY NUMBER:0 LENGTH = 7
TYPE = Unknown PLAN = ISDN / Telephony NUMBER = '384020'
```

In the long ASCII message, decode all the information elements contained in the message are decoded. Information elements are separated by a blank line, the information element name together with relevant codeset and length appears as a heading above each information element decode and the decoded information is indented by 1 space.

A typical display of a hex layer 3 message is shown below.

```
23: TE Ch BRI2 L2          00:01:75:30.271
41 01 81 0D 18 01 89
```

The information contained in the message is not decoded but simply displayed as hex octets.

*For more information on * marked fields, messages and information elements refer to CCITT Q.931 Digital Subscriber Signaling System No 1, Network Layer.*



X.25 D Channel

None
Hex
ASCII Short Display
ASCII Long Display

Analyser Commands

As soon as you enter analyser mode, stored messages (if there are any) are displayed in accordance with the analyser options selected. You may enter <esc> to exit analyser mode, change the decode options and enter analyser mode again without losing any messages. The options available are:

<m> - Manual Mode

The analyser enters manual mode. Automatic display of incoming messages is stopped and you can review the messages in the message buffer. Pressing M again will leave manual mode.

<home> or - Go to First Message

Will display messages starting at the oldest message in the buffer. This command works in manual and automatic modes.

<end> or <e> - Go to Last Message

Will go to the last message in the buffer and display any new messages, which arrive. This command works in manual and automatic modes.

<up> or <u> - Review Previous Message

Will display the message that arrived just before the last message displayed. This command works only in manual mode.

<down> or <d> - Go to Next Message

Will display the message that arrived just after the last message displayed. This command works only in manual mode.

<c> - Clear Buffer

Will remove all messages from the buffer. This command works in manual and automatic modes.

<h> - Pause Display

Will pause a scrolling display. Pressing <h> will start the display scrolling again.

Note that whenever an attempt is made to move to a message beyond the start or end of the message buffer a beep will be sent to the terminal.

Fault Finding

Introduction

This section seeks to provide some guidance on solving common problems encountered in using the Emutel Symphony.

Changing a parameter on the Emutel Symphony caused it to stop operating

Changing parameters on the Emutel Symphony may cause the unit to change operating modes and appear to stop functioning. In particular switching NT Clock from LOCAL to REMOTE will cause the Emutel Symphony to stop running unless external clock is provided.

To recover from this condition reload the factory defaults (see Quick Reference Guide).

Windows terminal program will not move up and down menus

When 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 the Emutel Symphony.

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 the terminal program by disabling 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 the Emutel Symphony is powering up properly. The power LED should illuminate and the other LEDs should turn on and off. The internal relays should usually switch on power up and this should be audible.

Next, check the cable. the Emutel Symphony provides a DCE connection so a cable with a 9 way D male to 9 way D female connected pin for pin will connect the Emutel Symphony 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.

To restore the default communication parameters reload the factory defaults (see Quick Reference Guide).

Another possibility is that the Emutel Symphony is not powering up properly because the PC (Network Personality Card) card module installed in the Emutel Symphony will not start up. In this case see the section on "PC card will not work".

Changing parameters had no effect on operation of Emutel Symphony

Some parameters once changed will not effect the operation of the unit immediately. If the Emutel Symphony 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 the Emutel Symphony off and on again.

Protocol Analyser will not run

Check the analyser option i.e. at least one level of decode must be enabled and the interface to which the terminal is connected must be enabled. If you are unsure, set decode for layers 1, 2 and 3 on all interface ports.

Network connection will not activate at layer 1 (i.e. P led does not illuminate)

Check that you have selected the correct primary rate mode for the PRI line.

Check PRI E1/T1 mode in Hardware Setup matches the PRI line.

E1 - Check PRI E1 Mode in Hardware Setup matches the line coding and framing standard on the PRI line. If this information is not known try HDB3/CRC-4/Si=1.

T1 - Check the network is compatible with the Emutel Symphony. It should be T1 (1.544 Mbit/s) with Extended Super Frame (ESF) and B8ZS line coding.

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 the Emutel Symphony is not functioning. Check first that the terminal is connected to the correct interface type. The Copyright Screen displays the type of interface installed for each port.

If it is a BRI terminal try changing the power settings in Hardware Setup. Set BRI S/U Power Feed to ON. If it is an S interface BRI terminal try setting BRI S Power Mode to both normal and restricted.

For US originating products with U interfaces then BRI U Power Mode 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 normal power as products intended to be connected to current limited U interface may be damaged by non current limited power (e.g. Motorola Bitsurfer).

For primary rate check that PRI E1/T1 Mode in Hardware Setup matches the terminal.

For E1 equipment check that PRI E1 Mode in Hardware Setup matches the line coding and framing standard for the terminal. If this information is not known try HDB3/CRC-4/Si=1.

For T1 equipment check it is compatible with the Emutel Symphony. the Emutel Symphony supports Extended Super Frame (ESF) and B8ZS line coding.

Terminal will not make or answer a call

If the P light stays off see the section on "Terminal will not activate at layer 1". If the D light stays off check that there are not too many terminals on the line. For basic rate the maximum is 8 (1 for point-to-point) and for primary rate the maximum is 1.

For a basic rate port check that the BRI Setup is correct in Software Setup. This should be point to point if it is a point-to-point terminal expecting TEI=0. Otherwise it should be point to multipoint that uses the global TEI (127).

If the P or D lights fail to light the terminal may be faulty.

Now check that there are channels enabled on that port and that there are sufficient channels enabled on PRI 1 i.e. check Channel Setup is correct in Software Setup.

If ETSI protocol is set and routing mode is set to channel check that a route to PRI 1 has been set up.

Check that the terminal is compatible with the network. For example if using an ETSI network the terminals should be ETSI compliant. Other terminals may not function due to protocol errors.

For BRI TA's being used with National ISDN protocol check that the correct SPID has been entered in the TA. This should consist of the number for the TA (in Number Setup) + 0101. Note if BRI Require SPID in Software Setup is set to No the Emutel Symphony will allow calls to be made without a correct SPID but the TA may block the call itself.

Use the protocol analyser to display the layer 3 messages. The called terminal may send DISCONNECT, RELEASE or RELEASE COMPLETE with a cause value indicating the problem.

A potential problem may be that called terminal and calling terminal do not support the same bearer capability in which case the called terminal will send RELEASE COMPLETE with a cause "Incompatible Destination". Another possibility is that the called terminal is expecting a Called Party Number or Calling Party Number information element in the SETUP message. These are optional services from the network.

Incoming calls are rejected or not routed correctly

If the B light on the called port switches on but the P light stays off see the section on "Terminal will not activate at layer 1".

For a basic rate port check that the BRI Setup is correct in Software Setup. This should be point to point if it is a point-to-point terminal expecting TEI=0. Otherwise it should be point to multipoint that uses the global TEI (127).

Now check that there are channels enabled on that port and that there are sufficient channels enabled on PRI 1 i.e. check Channel Setup is correct in Software Setup

If ETSI protocol is set and routing mode is set to channel check that a route to PRI 1 has been set up. Otherwise check that Called Party Number and Number Setup are compatible as follows:

Use the protocol analyser to check that the network is providing a Called Party Number in the SETUP message and that a match number in Number Setup matches it.

For ETSI protocol a match requires the n digits of the match number for the port that the call is to be routed to match the last n digits of the Called Party Number.

For National ISDN protocol a match requires the match number for the BRI TA that the call is to be routed to match the Called Party Number. The n digits of the shorter number are compared to the last n digits of the longer number. This allows a match when an area code is not included in one of the numbers.

B channel not freed (B light stays on) when call is on hold

If ETSI protocol is set and routing mode is set to channel, the B channel should not be freed. Otherwise, when calls are placed on hold the B channel on PRI 1 is kept reserved. The B channel on the BRI for a call on hold is only freed if there is a spare channel on PRI 1. When the B channel is freed, it is possible for the BRI to have more than 2 B channels on PRI 1 allocated to it. Hence to ensure that all enabled BRI's still have access to 2 B channels on PRI 1 the B channel for the call on hold on the BRI is only freed if there is a spare channel on PRI 1 or it is the first call on hold with B channel reserve on.

The number of spare channels are:

- (no. of channels enabled on PRI 1)
- (no. of analogue channels enabled)
- (no. of BRI channels enabled)
- (no. of channels enabled on PRI 2)



Network Personality Module: ETSI

Introduction

This section outlines the differences in operation of the Emutel Symphony between the CCITT emulation provided on the standard the Emutel Symphony and the ETSI Network Personality Module.

Figure 20 shows the Software Setup Menu when simulating an ETSI network.

```
Software Setup

Network Type                               ETSI
Drop Layer 2 if No Call Active             xxxx
Drop Layer 1 if Layer 2 Inactive          xxxx
Drop TEI if Layer 1 Inactive              xxxx
Number of B Channels per PRI              n

Allow Overlap Sending/Receiving           xxxx
Numbering System Option                   xxxx
Called Party Number (DDI/MSN)             xxxx
Calling Party Number (CLIP)               xxxx
Called Party Subaddressing (SUB)          xxxx
Calling Party Subaddressing (SUB)         xxxx
Higher Level Compatibility                xxxx
Lower Level Compatibility                  xxxx
Supplementary Services                    xxxx
```

Figure 20 ETSI Software Setup Menu

Supplementary Services have been added to the menu. To access the supplementary services menu move to the Supplementary Services field and type <enter>.

Figure 21 below, shows the ETSI Supplementary Services Setup Menu.

```
ETSI Supplementary Services Setup

Connected Party Number (COLP)             xxxx
Advice of Charge (AOC)                    xxxx
Call Waiting (CW)                          xxxx
Call Hold (HOLD)                           xxxx
Explicit Call Transfer (ECT)               xxxx
Call Diversion (CFU/CFB/CFNR/CD)          xxxx
Malicious Call Identification              xxxx
Three-Party Calling (3PTY)                 xxxx
```

Figure 21 ETSI Supplementary Service Setup Menu

The services offered are as follows:

Connected Party Number

The Connected Party Number information element is sent to the calling terminal as part of the CONNECT message. If the called terminal supplies a Connected Party Number this is sent to the calling party otherwise the Emutel Symphony will generate one.

Advice of Charge

The Emutel Symphony sends Advice of Charge information to the calling terminal. Various options are available:

- CEPT Total - each AOC message shows total charge
- CEPT Incremental - each AOC message adds a number of units to the total bill (above options can be chosen using codeset 5 or codeset 6)
- ETSI AOC-D - AOC messages show cost of call during the call using AOC-D messages
- ETSI AOC-E - AOC messages show cost of call at the end of the call using AOC-E messages
- Currency or Units - AOC information can be sent as currency or units
- Currency Identifier - Three letters which will be sent with the AOC message when using currency

If you press <enter. When on this field the menu of Figure 22 is displayed.

Billing Parameters Setup

```

Time between billing messages (secs)  5
Amount to be added each time         1

CEPT Total          (Codeset 5)     No
CEPT Incremental   (Codeset 5)     No
CEPT Total         (Codeset 6)     No
CEPT Incremental   (Codeset 6)     No
CEPT AOC Style                               Italtel (Italy)

ETSI AOC-D ASN1                               No
ETSI AOC-E ASN1                               No
Currency or Units                               Units
Currency Identifier                               EUR

```

Figure 22 Advice of Charge Setup Menu



The amount to be added each time is the number of units or currency amount to be added when each AOC message is sent. The time between messages defines the number of seconds between each AOC message. The AOC style refers to CEPT messages only and selects the format used by various telephone companies.

Call Waiting

Call is offered to the BRI interface even if both B channels are busy. If disabled the calling user is returned busy immediately.

Call Hold

Call can be put on hold in the Emutel Symphony using ETSI call hold (HOLD) protocol.

Explicit Call Transfer

Calling terminal sets up a call and puts it on hold. Calling terminal sets up a second call. On activating Explicit Call Transfer the calling terminal is disconnected from both calls and these calls are connected together.

Call Diversion

Terminal sets may send messages to the Emutel Symphony to cause it to forward an incoming call to another number under certain conditions. Supported facilities include CFU (call forward unconditional), CFB (call forward busy), CFNR (call forward no response) and CD (call deflection).

If you press <enter> when on this field the menu of Figure 23 is displayed.

```
ETSI Call Forwarding Setup

Served User Notified of Diversion           xx
Calling User Notified of Diversion          xx
Served User Notified if Active              xx
Diverting No. Released to Diverted-to-User  xx

Call Forwarding Unconditional                (CFU)  xx
Call Forwarding User Busy                    (CFB)  xx
Call Forwarding User Busy                    (CFNR)  xx
Call Diversion                               (CD)   xx
```

Figure 23 ETSI Call Forwarding Setup Menu

This allows you to set up the call diversion parameters according to the information provided in ETS 300 207-1.

Malicious Call Identification

If enabled allows terminals to send a message to the Emutel Symphony requesting that the calling party number of the last call be recorded.

Three-Party Calling

The calling terminal sets up a call and puts it on hold. The calling terminal sets up a second call. On activating Three-Party Calling all three terminals are connected together.

Main Differences Between CCITT and ETSI

The main differences between CCITT and ETSI are:

- The CONNECT message includes the CEPT Advice of Charge information element (if enabled) and the Date/Time information element
- Advice of Charge (ETSI or CEPT option) is supplied in INFO or FACILITY messages during the call
- Date/Time information element does not include seconds

A subset of the CCITT Bearer Capability information element is allowed in the SETUP message sent to the network. The most notable restrictions are:

- (law encoding is not a valid layer 1 protocol in the Bearer Capability information element
- V.120 rate adaptation is not a valid layer 1 protocol in the Bearer Capability information element
- Keypad information element is not supported for sending the Called Party Number
- Supplementary services available only for ETSI network

Network Personality Module: BT

Introduction

This section outlines the differences in operation of the Emutel Symphony between the CCITT emulation provided on the standard the Emutel Symphony and the BT Network Personality Module.

Figure 23 shows the Software Setup Menu when simulating a BT network.

```
Software Setup

Network Type                               BTNR191
Drop Layer 2 if No Call Active             xxxx
Drop Layer 1 if Layer 2 Inactive          xxxx
Drop TEI if Layer 1 Inactive              xxxx
Number of B Channels per PRI              n

Allow Overlap Sending/Receiving           xxxx
Numbering System Option                   xxxx
Called Party Number                       xxxx
Calling Party Number                      xxxx
Called Party Subaddressing                xxxx
Voice is End-to-End ISDN                  xxxx
```

Figure 23 BT Software Setup Menu

The network type can be changed from BTNR191 (original BT ISDN Network) and BT-ETSI (new ISDN Network).

The BTNR191 network support defines a new parameter in the menu. Switching "Voice is End-to-End ISDN" to "On" changes some of the display messages used by the Emutel Symphony.

Main Differences Between CCITT and BT

The main differences between CCITT and BT are:

- In the RELEASE COMPLETE message a cause value of 21 has priority over other cause values whereas in CCITT a cause of 18 has priority.

There are many display messages on the BT network not found in the CCITT specification. The most common are:

- *03*1#
 - *86*number string#
 - *AA*NUMBER UNOBTAINABLE# or *EC*00#
 - *AA*CLEARED# or *EC*30#
 - *AA*NETWORK BUSY# or *EC*07#
 - *AA*NUMBER BUSY# or *EC*08#
 - *AA*INCOMPATIBLE TERMINAL# or *EC*13#
 - *AA*ERROR# or *EC*15#
 - *AA*NO REPLY# or *EC*1f#
 - *AA*NOT SUITABLE FOR DATA#
- A CALL PROCEEDING message in response to an outgoing SETUP message causes ALERTING to be sent to the calling party
- SETUP ACKNOWLEDGE is sent by the network in response to a SETUP message even if the SETUP message contained the complete called party number
- A subset of the CCITT Bearer Capability information element is allowed (see ETSI support card for more details)
- The Calling Party Number information element has a maximum length of 15 digits
- Progress Indicator information element location field is always "network beyond interworking type"
- Calling Party Number and Called Party Number information element type and plan field are always "unknown"
- In MSN operation only the last digit of the Called Party Number is sent to the called terminal in the SETUP message
- Generation of a Subaddress by concatenating the Called Party Number digits is supported in BT (e.g. dial enbloc 384000#123 generates a Called Party Subaddress of '123')



Network Personality Module: VN2/3

Introduction

This section outlines the differences in operation of the Emutel Symphony between the CCITT emulation provided on the standard the Emutel Symphony and the VN2/3 Networking Personality Module.

Main Differences Between CCITT and VN2/3

The main differences are:

- VN2/3 adds a new information element to the SETUP message "Mode de fonctionnement d'usager" in codeset 6. This is mandatory in the SETUP message in both user@network and network@user directions
- In the user@network SETUP message the Higher Layer Compatibility information element is mandatory
- The Sending Complete information element is not supported in VN3

A subset of the CCITT Bearer Capability information element is allowed in the SETUP message sent to the network. The most notable restrictions are:

- Coding Standard is fixed at CCITT
- Information Transfer Capability is Speech, 3.1 kHz Audio or Unrestricted Digital
- Information Transfer Rate is 64k only
- Layer 1 protocol is G.711 A law or H.221/H.242 (G.722/G.725)
- A new optional information element "Facility d'usager a usager" in codeset 6 is defined. the Emutel Symphony analyser decodes this although the Emutel Symphony does not generate it
- Octet 3a (Recommendation) is not supported in the Cause information element
- Keypad information element is not supported

Network Personality Module: 1TR6

Introduction

This section outlines the differences in operation of the Emutel Symphony between the CCITT emulation provided on the standard the Emutel Symphony and the 1TR6 Network Personality Module.

Figure 24 shows the Software Setup Menu when simulating a 1TR6 network.

```

Software Setup

Drop Layer 2 if No Call Active          xxxx
Drop Layer 1 if Layer 2 Inactive       xxxx
Drop TEI if Layer 1 Inactive           xxxx
Number of B Channels per PRI           n

Allow Overlap Sending/Receiving        xxxx
Numbering System Option                xxxx
Call Waiting                           xxxx
Billing                                 xxxx
Additional Transmission Attributes      xxxx
Called User Status                     xxxx
Date/Time                              xxxx

```

Figure 24 1TR6 Software Setup Menu

Main Differences Between CCITT and 1TR6

The German 1TR6 network is very different to Q.931 based networks such as ETSI. To understand all of the differences refer to the 1TR6 specification. the Emutel Symphony does not support all of the differences provided by 1TR6 but the following notes outline the main differences between the standard network and 1TR6.

1TR6 does not use the normal Q.931 protocol discriminator (i.e. = 8) but defines two new ones N0 (=1) and N1 (=65). Some messages are valid only with N0 and some only with N1.

The following Q.931 messages are not supported:

- PROGRESS
- RESTART
- RESTART ACKNOWLEDGE



The following N0 messages are additional to Q.931:

- REGISTER INDICATION
- CANCEL INDICATION
- FACILITY STATUS
- STATUS ACKNOWLEDGE
- STATUS REJECT
- FACILITY INFORMATION
- INFORMATION ACKNOWLEDGE
- INFORMATION REJECT
- CLOSE
- CLOSE ACKNOWLEDGE

None of these messages are supported by the Emutel Symphony.

The following N1 messages are additional to Q.931:

- DETACH
- CANCEL ACKNOWLEDGE
- CANCEL REJECT
- FACILITY ACKNOWLEDGE
- FACILITY CANCEL
- FACILITY REGISTER
- FACILITY REJECT
- REGISTER ACKNOWLEDGE
- REGISTER REJECT

None of these messages are supported by the Emutel Symphony.

The following messages (supported by the Emutel Symphony) are common to 1TR6 and Q.931 but their numeric value is different.

- INFORMATION (1TR6 = 0 x 6d)
- STATUS (1TR6 = 0 x 63)

1TR6 also defines additional information elements not found in Q.931. These are mostly found in codeset 6:

- Service Indicator
- Charging Information
- Date
- Facility Select
- Status of Facilities
- Status of Called User
- Additional Transmission Attributes

The only non-Q.931 message in codeset 0 is Connected Address.

The following Q.931 information elements are not supported in 1TR6:

- Segmented Message
- Bearer Capability
- Call State
- Facility
- Progress Indicator
- Notification Indicator
- Date / Time
- Signal
- Switchhook
- Feature Activation
- Feature Indication
- Calling Party Sub-address
- Called Party Sub-address
- Transit Network Selection
- Restart Indicator
- Low Layer Compatibility
- High Layer Compatibility

Where information elements are supported by both Q.931 and 1TR6 they may have a different structure e.g. the Cause information element supports different cause values in 1TR6 and Q.931.

Because the Bearer Capability information element is not supported 1TR6 uses the Service Indicator information element in its place.

The 1TR6 Date information element is mandatory in the CONNECT, CONNECT ACKNOWLEDGE, DISCONNECT, and RELEASE messages from the Emutel Symphony.

The 1TR6 Called User Status information element is mandatory in the ALERT message from the Emutel Symphony.

The following information elements are used by the Emutel Symphony and can be enabled in the Software Setup menu as shown in figure 25:

- Charging Information
- Additional Transmission Attributes
- Called User Status
- Date

Figure 25 Software Setup Menu

The Emutel Symphony also allows the generation of a call waiting SETUP message.

Network Personality Module: NTT

Introduction

This section outlines the differences in operation of the Emutel Symphony. between the CCITT emulation provided on the standard the Emutel Symphony and the NTT Network Personality Module.

The main Software Setup Menu is identical to the CCITT Menu but the Supplementary Service Setup Menu is shown in figure 26.

```
NTT Supplementary Service Setup
Advice of Charge                xx
```

Figure 26 NTT Supplementary Service Setup Menu

Main Differences Between CCITT and NTT

NTT protocol is based on Q.931. The main differences between the two protocols are as follows:

- Overlap Sending and Overlap Receiving states are not supported
- SUSPEND and RESUME messages are supported only in point-point interfaces
- NTT supports only (law voice/3.1kHz audio, unrestricted digital and V.110 data (64K/56K)

The following Q.931 messages are not supported in NTT:

- SETUP ACKNOWLEDGE
- USER INFORMATION
- CONGESTION CONTROL
- FACILITY

The following Q.931 information elements are not supported in NTT:

- More Data
- Sending Complete
- Congestion Level
- Repeat Indicator
- Segmented Message
- Network Specific Facilities
- Date/Time
- Transit Network Selection

The following Q.931 information elements have restrictions not imposed in Q.931:

- Bearer Capability
- Called Party Number
- Calling Party Number
- Signal

The NTT Called User Status information element is mandatory in the ALERT message from the Emutel Symphony.

The following information elements which are not supported in Q.931 are available in NTT using codeset 6:

- Advice of Charge
- Blocking Channel ID

Network Personality Module: NAT/AT&T/DMS

Introduction

This section outlines the differences in operation of the Emutel Symphony between the CCITT emulation provided on the standard the Emutel Symphony and the NAT/AT&T/DMS Network Personality Module.

The NAT/AT&T/DMS Network Personality Module covers three switch variants found in North America i.e. Bellcore NAT-1, Nortel DMS100 and AT&T 5ESS.

Main Differences Between CCITT and Bellcore National ISDN-1

National ISDN-1 (NAT-1) defines four new ISDN messages not found in Q.931. These are network specific messages (i.e. two octet) and are:

- KEY HOLD
- KEY RELEASE
- KEY SETUP
- ACKNOWLEDGE

These are not used in the Emutel Symphony.

NAT-1 does not include the following Q.931 messages:

- USER INFORMATION
- RESTART
- RESTART ACKNOWLEDGE
- SEGMENT
- CONGESTION CONTROL
- FACILITY

NAT-1 defines new information elements in codeset 0. These are:

- Information Request
- Service Profile Identification
- Endpoint Identifier
- Information Rate
- End to End Transit Delay
- Transit Delay Selection and Identification
- Packet Layer Binary Parameters
- Packet Layer Window Size
- Packet Size
- Closed User Group
- Reverse Charging Information
- Redirection Number

The Emutel Symphony supports Service Profile Identification and Endpoint Identifier information elements.

NAT-1 does not support the following Q.931 information elements:

- Segmented Message
- Call Identity
- Facility
- Network Specific Facilities
- Display
- Date / Time
- Switchhook
- Restart Indicator
- Sending Complete

NAT-1 offers the following information elements in codeset 5:

- Operator System Access
- Display Text

NAT-1 offers the following information elements in codeset 6:

- Redirection Sub-address
- Redirection Number
- Call Appearance

In NAT-1 the signal information element is mandatory in the following network@user messages:

- ALERTING
- RELEASE
- CONNECT ACKNOWLEDGE
- RELEASE
- RELEASE COMPLETE
- CALL PROCEEDING
- SETUP ACKNOWLEDGE
- DISCONNECT
- SETUP
- CONNECT



A subset of the CCITT Bearer Capability information element is allowed in the SETUP message sent to the network. The most notable restrictions are:

- Information transfer capability is speech, unrestricted, 3.1kHz audio only
- Transfer mode and rate is 64k, Packet mode
- Layer 1 protocol is rate adapted, (law
- Rate is 56k
- Layer 2 protocol is LAPD, LAPB
- Layer 3 protocol is X.25

X.25 Operation

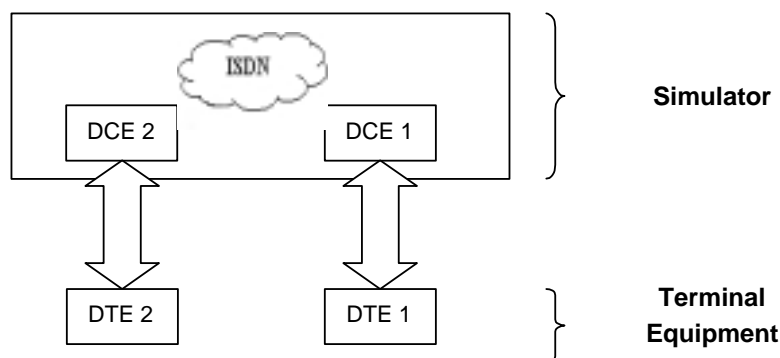
Purpose

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 Set-up

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 the 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

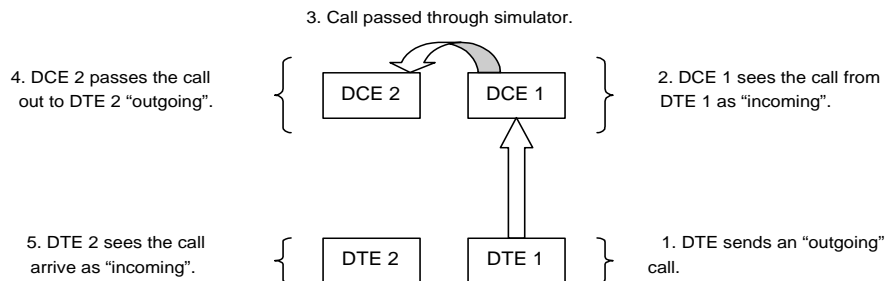
Below is a list of the default values associated with the setup of the simulator (i.e. the DCE).

BRI1 PVC LLC0	-	Lowest Logical Channel (PVC)
BRI1 PVC HLC0	-	Highest Logical Channel (PVC)
BRI1 LOC 1	-	Lowest Outgoing Channel (SVC)
BRI1 HOC2	-	Highest Outgoing Channel (SVC)
BRI1 LTC3	-	Lowest Two-way Channel (SVC)
BRI1 HTC4	-	Highest Two-way Channel (SVC)
BRI1 LIC5	-	Lowest Incoming Channel (SVC)
BRI1 HIC6	-	Highest Incoming Channel (SVC)
BRI1 TEI1	-	TEI Value to be used (Default 1)
BRI2 PVC LLC0	-	Lowest Logical Channel (PVC)
BRI2 PVC HLC0	-	Highest Logical Channel (PVC)
BRI2 LOC1	-	Lowest Outgoing Channel (SVC)
BRI2 HOC2	-	Highest Outgoing Channel (SVC)
BRI2 LTC3	-	Lowest Two-way Channel (SVC)
BRI2 HTC4	-	Highest Two-way Channel (SVC)
BRI2 LIC5	-	Lowest Incoming Channel (SVC)
BRI2 HIC6	-	Highest Incoming Channel (SVC)
BRI2 TEI1	-	TEI Value to be used (Default 1)

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
Outgoing	5 & 6
Two-way	3 & 4
Incoming	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. 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.

Restarts

Whenever an X25 call is being set up, a RESTART message must be sent. Normally the DTE will do this, however, due to a generalisation in the specification, some DTEs do not have this capability. For this reason an option has been implemented for the simulator to send a RESTART on Layer 2 establishment.

Technical Data

Interface Pinout

The S0 interface is a 4-wire interface and the U interface is 2-wire. Figure 27 shows the signals provided at the BRI RJ45 connector.

S Interface Pinout (NT Mode)

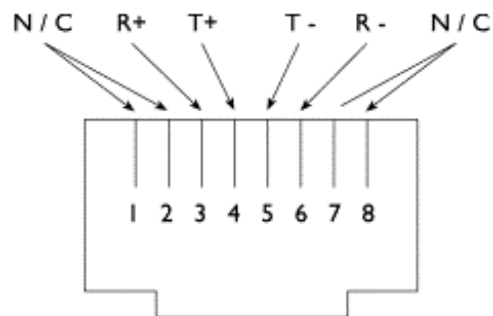


Figure 27a RJ45 Signals (S Interface NT Mode)

U Interface Pinout

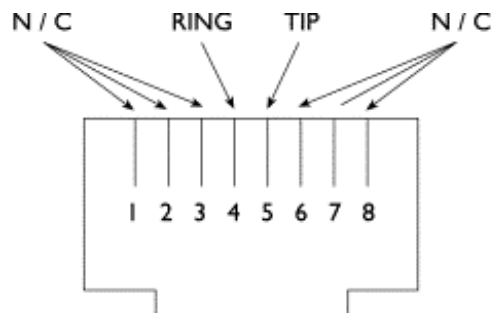


Figure 27b RJ45 Signals (U Interface)

PRI Interface Pinout T1 and E1

(NT Mode)

The S2m (E1) and T1 interfaces are 4 wire interfaces. The pinout is shown in figure 28.

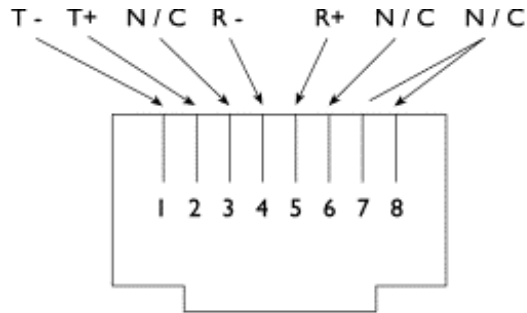


Figure 28a RJ45 Signals (E1/T1 NT Mode)

PRI Interface Pinout T1 and E1 (TE Mode) (i.e. PRI Transparent Mode)

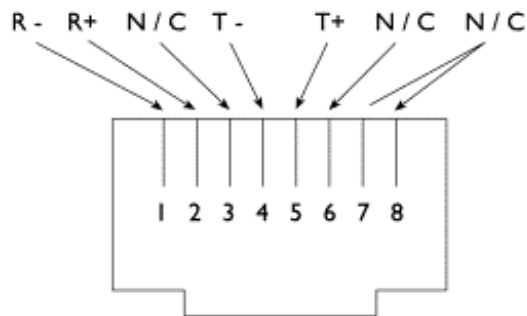


Figure 28b RJ45 Signals (E1/T1 TE Mode)

Use of PRI Connectors

The RJ45 connectors PRI1 and PRI2 provide 120Ohm balanced twisted pair connections (see figure 3) for the PRI interfaces.

Note that RJ45 cables require a 120Ohm termination.

WARNING!

Please note that if your products contain U-interfaces (as noted on the Serial No. label), then be advised of the following:

Plugging S-type Terminal Equipment (TE) into a U-type interface will short-circuit the interface. This may cause damage to the TE, the interface or both.

If using North American equipment on a U-type interface, only use equipment in "Sealing".

Interface Configuration in Transparent Mode

When using the Emutel Symphony in Network Simulator mode the ISDN cables of the terminal equipment are plugged into the sockets provided.

In BRI Transparent Mode, the terminal is plugged into the BRI1 interface and the network into the BRI2 interface. ISDN messages are routed from the terminal to the network through the Emutel Symphony.

In PRI Transparent Mode, the terminal is plugged in the PRI1 interface and the network into the PRI2 interface.

The LEDs perform no function in Transparent Mode.

LED Indicators

Beside each ISDN interface port is a group of LEDs. These LEDs indicate the state of the ISDN interface beside them. The P LED lights whenever the ISDN line has activated. The D LED lights whenever the Data Link layer for that port is active (i.e. Multi-Frame Established). The corresponding B channel LED on the BRI interfaces (B1/B2) lights whenever that bearer channel is connected.

On the PRI interface, one B LED is provided which lights whenever there is an active B channel. On the BRI, an S LED lights when the port is configured for S interface connection and a U LED lights when the port is configured for U interface connection. On the PRI, an E LED lights when the port is configured for E1 interface connection and a T LED lights when the port is configured for T1 interface connection.

The Alarm LED lights when an alarm condition has occurred within the Emutel Symphony.

In addition, the Power LED lights whenever 5V power is present in the unit.

Network Personality Module

Beside the two PRI interfaces is the slot for the Network Personality Module. the Emutel Symphony can be made to simulate specific networks (e.g. 1TR6) by plugging the relevant Network Personality Module into this slot.

Terminal Port

The Emutel Symphony has one V.24 compatible terminal port in 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 6. Table 3 lists the operation of each pin.

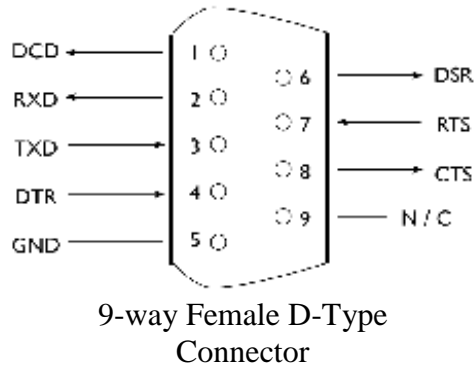


Figure 29 V.24 Terminal Port

Pin	Function	Description
4,11	RXD	Received Data (input)
2,9	TXD	Transmitted Data (output)
3,10	CON	Control (input) indicates that input data is valid
5,12	IND	Indicate (output) indicates that transmit data is valid
6,13	CLK	Data Clock (output) -frequency depends on number of B channels connected to X.21 interface
8	GND	Signal Ground

Table 29 X.21Data Port Signals

Auxiliary Port

The auxiliary port is currently used only to allow the Emutel Symphony to receive network clock and frame synchronisation from another the Emutel Symphony. This forces the two the Emutel Symphony's to align the ISDN data to each other allowing a terminal requiring more than 2 PRI or 3 BRI interfaces to be connected to multiple the Emutel Symphony's.

The pinout of this port is shown in figure 8. Table 31 defines the signals supplied on the auxiliary port.

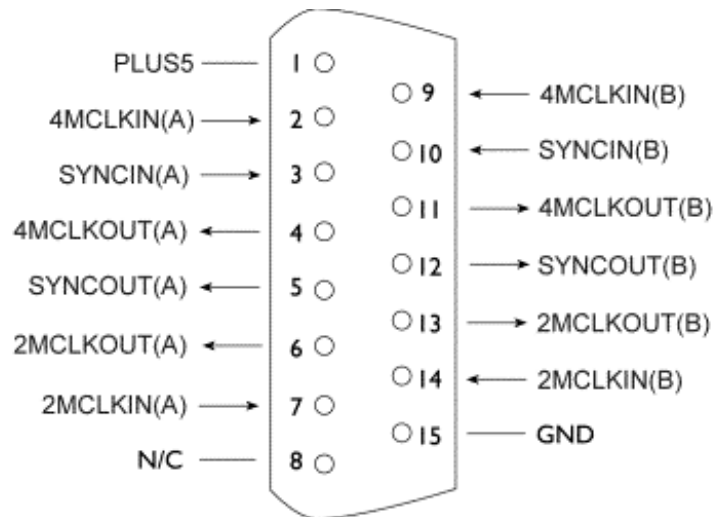


Figure 30 Auxiliary Port Pinout

Pin	Function	Description
1	PLUS5	+5 Volts DC
2, 9	4MCLKIN	Differential input 4.096MHz clock signal from another emutel Symphony to lock clock frequencies
3, 10	SYNCIN	Differential input 8kHz frame pulse signal from another emutel Symphony to lock frame alignment
4, 11	4MCLKOUT	Differential 4.096MHz clock signal to enable emutel Symphony to lock clock frequencies
5, 12	SYNCOUT	Differential 8kHz frame pulse signal to enable emutel Symphony to lock frame alignment
6, 13	2MCLKOUT	Differential 2.048MHz clock signal to enable emutel Symphony to lock clock frequencies
7, 14	2MCLKIN	Differential input 2.048MHz clock signal from another emutel Symphony to lock clock frequencies
15	GND	Signal Ground

Table 31 Auxiliary Port Signal Definitions

