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Simulator 2

User Manual

vocality

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1. INTRODUCTION

The SIMULATOR 2 is a high performance synchronous network substitution device capable of representing authentic environmental conditions such as delay, fault and error conditions. It provides a digital communications link at speeds up to 2Mbps.

The Simulator 2 allows systems to be authentically tested during development, under controlled laboratory conditions, prior to the commitment to expensive digital networks.

Data link protocols and software stacks may be rigorously tested under most commonly encountered link conditions to ensure that a final implementation is fully robust.

Using the Simulator, equipment intended for use over links subject to varying fault conditions may be assessed for its failure and recovery modes. In this way the stability and fail-safe operation of customer equipment may be verified prior to installation.

The digital link is implemented on two ports at the rear of the unit, each of which is physically presented on a DB15F, an RJ45 and two BNC connectors. The DB15F connector is used with the V.11/V.24 Universal Interface (type 68314C) and the V.35 interface (type 68312B). The RJ45 socket is for Unshielded Twisted Pair (UTP) connection, the TX and RX BNC connectors are for Coaxial connection, both used only with the G.703 interface (type 68319). The interface standard is defined by the type of card internally fitted. In the case of the Universal Interface, selection between V.11/RS449 and V.24 may be made on the configuration menu. All interface cards are interchangeable, allowing conversion between electrical standards from Port A to Port B.

The Simulator may be operated either from the front panel or remotely via the dedicated RS232 port. The front panel provides push-button selection for all major parameters and gives a clear LED display of current settings. Alternatively, configuration and commissioning may be performed using the supervisory port which supports most standard terminal emulations and presents a display of all set-up parameters. This display offers additional configuration parameters. A simple teletype mode is available on the supervisory port for integration into an overall Network Management System.

This user manual describes the use, configuration and installation of the Simulator 2.

1.1 Functional Overview

The SIMULATOR 2 provides a synchronous, digital data link between two ports, designated Port A and Port B on the rear panel. Each port is internally fitted with a Universal V.11/V.24, V.35 or G.703 Interface Card and has a DCE presentation.

The unit may be configured using the front panel push buttons and indicators, which provide a complete set of basic functions, or via the supervisory port which gives access to either a formatted configuration display or a teletype mode for remote control. This port is labelled “Supervisor” on the rear panel and supports an RS232 interface. It has a DCE presentation on a DB9F connector and uses a standard asynchronous format at 9600bps, no parity, one stop bit. All configuration changes are automatically stored in non-volatile memory.

The unit also has a BNC port labelled “Station Clock” which may be connected to an external clock source, at TTL signal levels at rates up to 2Mbps. The Station Clock frequency should be entered on the menu and then provides a reference for the internal Phase-Locked Loop (PLL), which may be used to generate the full range of simulation frequencies on Port A and Port B. Alternatively, when the Internal clock option is selected, the simulation frequency is generated directly from the 24.576MHz oscillator for all divisible rates. This is the recommended selection and allows most commonly used bit rates to be provided from a stable source.

When a G.703 interface is fitted, only two clock rates are available namely 2.048Mbps (E1) and 1.544Mbps (T1), with the T1 frequency being derived from the PLL. The G.703 interface provides a transparent (unframed) connection using HDB3 coding for E1, B8ZS coding for T1. By fitting one G.703 interface for one port and a Universal interface for the other, it is possible to convert from one standard to another with all simulation parameters applicable between the two.

The unit is housed in a 1U 19" rack-mount metal enclosure. The lid is easily removed but there are no user-serviceable parts inside and option modules should only be fitted by trained personnel (See the Installation section 2 for details).

1.2 Basic Features - front panel operation

The clock speed is common to both ports and may be set from 9600bps up to 2Mbps. In *Internal* or *Station* clock modes the Simulator generates the Receive clock and the connected device will usually loop back the Transmit data clock, the only difference between the two modes being the reference source. The Receive clock must always be generated by the Simulator, but connected DTE equipment may supply a Transmit clock with the Simulator port in clock turnaround mode, provision for which is made by the selection of *External* clock source on the front panel. In this case, the connected DTE

provides the Transmit clock signal and the Simulator loops back the Receive clock.

Link delays of up to 2 seconds may be selected in preset increments using the *Delay* push button control or to customised values numerically input via the supervisory port with one millisecond resolution.

Link error conditions from 1 in 10^{-9} to 1 in 10^{-2} may be selected from the front panel, with the appropriate LED indicator illuminated. It is also possible to select error-free operation, represented by all LEDs extinguished. Errors are applied bidirectionally to affect the received data on both ports. Errors may be applied (i) in bit error mode, where single bit errors are continuously and uniformly injected at the prescribed rate, or (ii) in burst error mode, where an error burst of one second duration at the prescribed error rate is followed by a gap of ten error-free seconds. The burst length and burst gap times may be customized by the user via the supervisory port.

An *Inject Error* button on the front panel allows the operator to introduce single-bit errors directly into the data streams.

Associated with each port is a group of five push buttons. The *Clock Source* button selects *Internal, External* or *Station* clock as discussed above. The *Loop* button allows a local or remote data loopback to be selected, or turned off for normal full-duplex operation. The remaining three buttons are signal kills for received data, transmitted data and clock and are active when pressed, forcing the respective signals to a logic zero.

The Simulator 2 performs a front panel self-test, with progress indicated by the LEDs on the front panel, which illuminate in a sequential pattern. The test will repeat if any buttons are stuck on during the initial power-up. Any button may be depressed during power-up to invoke the test, which continues until the button is released.

Factory default settings may be applied to all parameters by depressing the *Delay* and *Error Rate* buttons simultaneously during power-up.

The Simulator 2 is fitted with FLASH memory devices which allow the software in the unit to be upgraded in the field. This operation is performed via the supervisory port and may be performed locally by PC or remotely using a suitable modem. It should only be carried out by trained personnel and in conjunction with Vocality International Ltd.

1.3 Enhanced Features - operation via the supervisory port

The supervisory port allows the operator to configure all standard settings for the unit and in addition, to program specific intermediate values for link rate, error rate and burst mode parameters. In this way, customised parameters may be applied for detailed performance testing. Numeric values may be entered between limits and the simulator will apply, if not the precise value, the closest achievable settings, accurate to the resolution of the system.

Values applied in this way are represented on the front panel by the two illuminated LEDs which straddle the custom value.

Supervisor programming may be performed interactively using either the formatted screen display on a terminal or PC, or using teletype mode for remote control by a network management system. The latter mode can be particularly powerful when used to perform a sequential test program as part of an overall performance analysis suite. Details are given in a separate document, the *Specification for the Simulator 2 TTY Command Line Interface*.

2. INSTALLATION

PLEASE REFER TO THE WARNINGS IN APPENDIX A

2.1 Supply Voltage and Connection

A.C. 85-264V A.C. 40-440Hz. Fuse rating 2A anti-surge.

The SIMULATOR 2 has a fused, switched, filtered IEC inlet which must be connected to a line voltage as specified above. It may be operated only within the above limits. EMC performance may be affected if operated below 100V A.C.

2.2 Environmental

The SIMULATOR 2 must be operated under the following conditions:

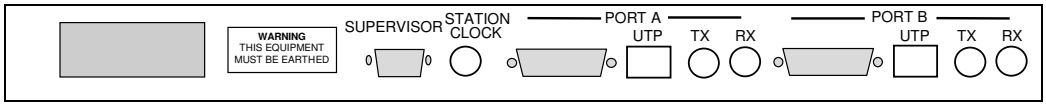
Temperature 0-40 degC
Humidity 0-90% RH non-condensing
Pressure 86-106 Kpa

2.3 Mechanical Construction

The SIMULATOR 2 is housed in a 1U tall 19" rack-mounting enclosure. The enclosure comes in three parts incorporating chassis, front panel and lid, all fastened by M3 posidrive screws.

The front panel has indicators for link rate, delay, error rate, bit/burst mode and error injection and separate indicators for each port comprising clock source and loop mode. Push buttons are provided for the selection of all of these plus signal kills for RXD, TXD and clock for each port. The meaning of these indicators is discussed later in this manual.

The rear panel is shown below.



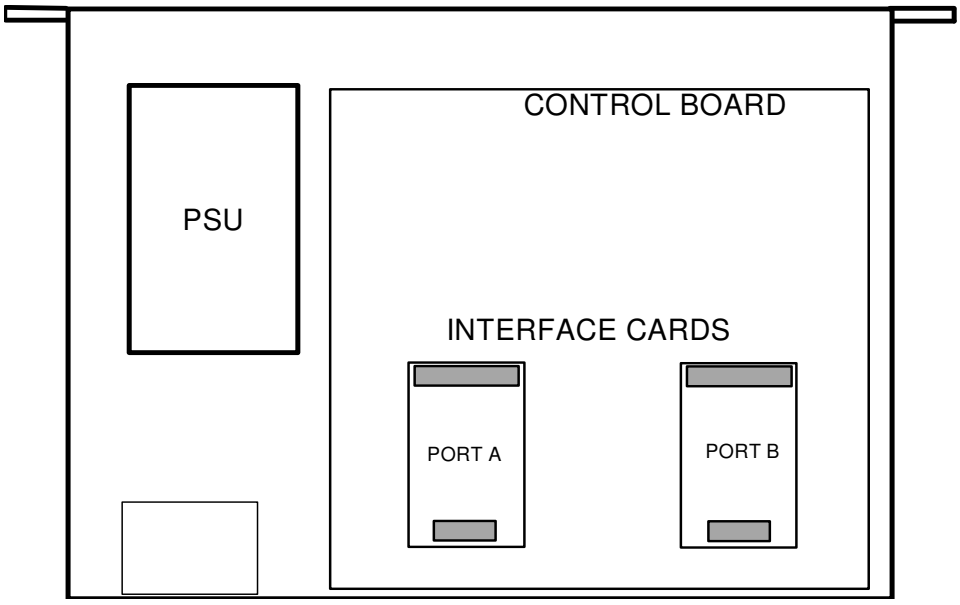
2.4 Interface Installation

To install an interface card remove the twelve screws on the left, right, and top of the enclosure using a Posidrive screwdriver and lift off the lid.

The interface cards are located in the positions marked in the diagram below.

The cards share a common footprint and are interchangeable. They may be G.703 (SO68319A), V.35 (SO68312B) or Universal Interface (SO68314C) Cards and may be changed by simply removing the card. The Universal Interface cards support V.11/RS449 or V.24 standards by software selection.

When changing the interface type, it is essential to use the correct corresponding cable to make connection to the equipment under test. Refer to the Appendices for cable specifications.

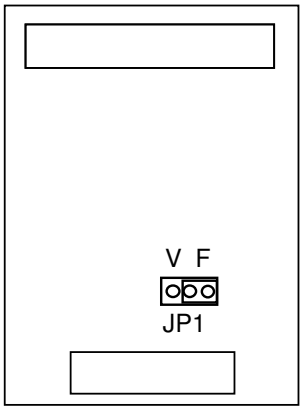


DISCONNECT THE UNIT FROM THE POWER SUPPLY BEFORE OPENING THE UNIT OR CHANGING ANY NETWORK CONNECTIONS. Antistatic precautions must be observed at all times.

2.5 Jumper Settings - Interface Cards

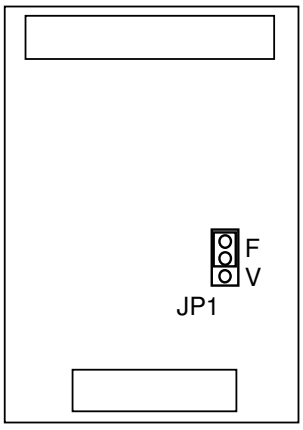
The Simulator 2 may be used with three types of interface card. The jumper settings for each are shown below:

V.11/V.24 Universal Interface (68314C)



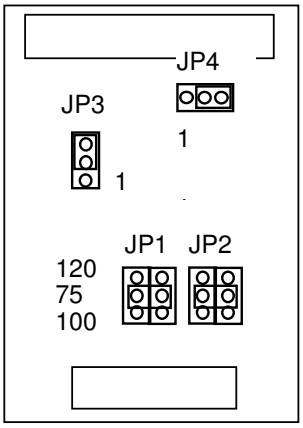
JP1 selects Fixed or Variable interface signal output. It should be left in the 'F' position when fitted in Simulator 2.

V.35 Interface (68312C):



JP1 selects Fixed or Variable interface signal output. It should be left in the 'F' position when fitted in Simulator 2.

G.703 Interface (68319A):



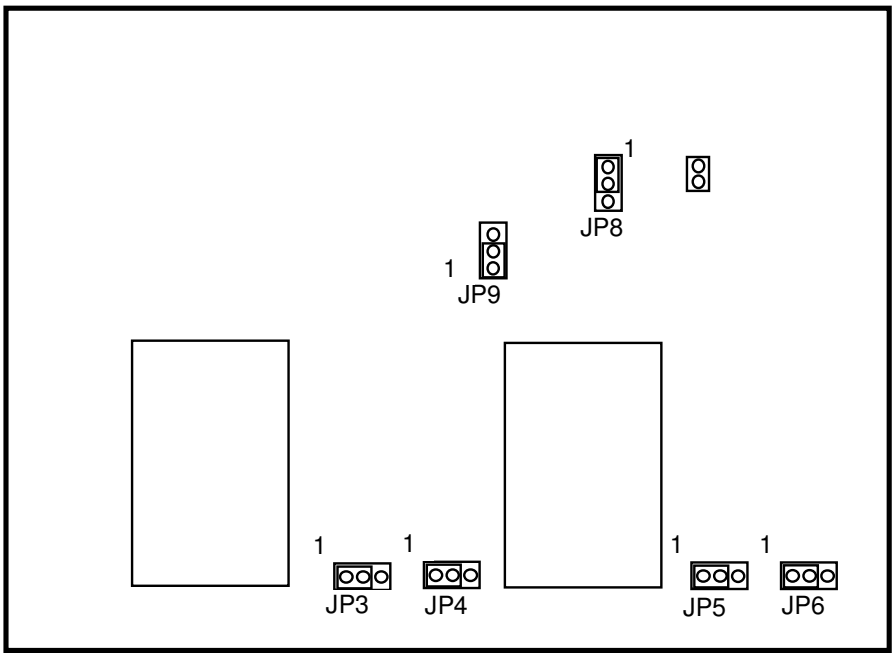
JP1 and JP2 are double-jumpers for selecting the G.703 receive termination impedance and must be set the same, in one of the three positions indicated. For E1 long-haul, select 75ohms (Coax) or 120ohms (UTP). For T1, select 100ohms.

JP3 selects host mode and must be in position 1-2.

JP4 enables the host mode chip select and must be in position 2-3.

2.6 Jumper Settings - Motherboard

The Simulator 2 motherboard contains seven jumper links to allow the user to configure the system for specific options. These are shown in the diagram below:



The function of the jumper links are given in the following table (defaults in *ITALICS*):

Jumper Link	Position 1-2	Position 2-3
3	*Port A TX isolated*	Port A TX outer ref. PRTGND
4	*Port A RX isolated*	Port A RX outer ref. PRTGND
5	*Port B TX isolated*	Port B TX outer ref. PRTGND
6	*Port B RX isolated*	Port B RX outer ref. PRTGND
7	Reset system	*N/A*
8	*Watchdog enabled*	Watchdog disabled
9	*N/A*	N/A

3. CONFIGURATION

The unit is configured using an asynchronous terminal connected to the dedicated DB9F port on the rear panel marked "SUPERVISOR". Since most RS232 devices connect via a DB25 port the unit is supplied with a DB9M-DB25F adaptor cable. PCs with a 9-way COM port may connect to the supervisor using a straight 9-way extension cable. The terminal (or emulation) should be configured to 9600bps, 8 data bits, no parity, one stop bit, XON/XOFF flow control. The SIMULATOR 2 supports most common terminal emulations, such as VT100, VT52, TVI925 and will automatically detect the emulation in use.

3.1 Using the Supervisor

When a terminal is connected to the supervisor port, the SIMULATOR 2 displays the following information:



(This menu may be returned to at any time by entering <BREAK> or <CTRL>&<E>).

When the Up Arrow key is pressed, the SIMULATOR 2 detects the emulation in use and displays the configuration page as follows:

```
--------------------------------------------------------------------------------
 PAGE: System Configuration


----------------------------[ Simulator Channels  ]-----------------------------

                            Link Rate         : 64000
                            Link Delay (ms)   : 134
                            Station Clock     : 64000

                            Error Rate        : NONE
                            Error Mode        : Bit
                            Error             : Inject

                            Burst Length (ms) : 1000
                            Burst Gap (ms)    : 10000

                            Port A Clock      : Station    Interface : V.11
                            Port A Loop       : None

                            Port B Clock      : Internal   Interface : V.11
                            Port B Loop       : None
--------------------------------------------------------------------------------
      Use <SPACEBAR>/<+>/<-> to select, cursor keys to move, <ESC> to end
```

3.2 Conventions and keys

The SIMULATOR 2 is configured by moving around the menus using the cursor keys and selecting from a choice of available options for each parameter. The current cursor position is highlighted for most emulations. There are also a number of keys which may be used as a shortcut or to access additional features. The keys are summarised below:

3.2.1 Cursor Movement

Cursor up	Move to parameter above the current cursor position.
Cursor down	Move to parameter below the current cursor position.
Cursor right	Move to parameter to the right of the current cursor position.
Cursor left	Move to parameter to the left of the current cursor position.
Carriage Return (<CR>) or Home	Return to **PAGE** field.

3.2.2 Parameter Selection

+ or <Spacebar>	Select next item in list

Alphanumeric Character	Select next item beginning with this character.
<TAB>	Select alternate configuration page.

3.2.3 Updating the configuration

All configuration changes are stored automatically after two seconds of keyboard inactivity. <ESC> is used to update the screen display and can be useful after front panel configuration changes.

3.3 *Parameters and options*

Field	Options	Description
PAGE	System Configuration	Overall control page
	Simulator channels	Simulation parameters
Link Rate	9600, 64000, 128000, 192000, 256000, 512000, 1024000, 2048000 or numeric entry	Synchronous bit rate for Ports A and B (Only 1544000, 2048000 with G.703 interface)
Link Delay (ms)	0, 25ms, 50ms, 100ms, 200ms, 300ms, 500ms, 1sec, 2sec or numeric entry	End-to-end data delay between Ports A and B
Error Rate	NONE, 10^{-9}, 10^{-8}, 10^{-7}, 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}, 10^{-2}	Bit error rate
Error Mode	Bit, Burst	Continuous data bit inversions at the specified rate in both directions Continuous data bit inversions for the duration of the Burst Length interspersed with clear periods of the Burst Gap
Error	Inject	Single bit errors may be injected by pressing the <SPACEBAR>
Burst Length (ms)	10-10000ms by numeric entry	Duration of error-injection phase
Burst Gap (ms)	10-9999999ms by numeric entry	Duration of error-free phase
Port A Clock	Internal, External, Station	RXC clocks generated from the Simulator system clock TXC clock generated by the DTE, RXC clock looped back by the Simulator RXC clock generated from the Simulator PLL

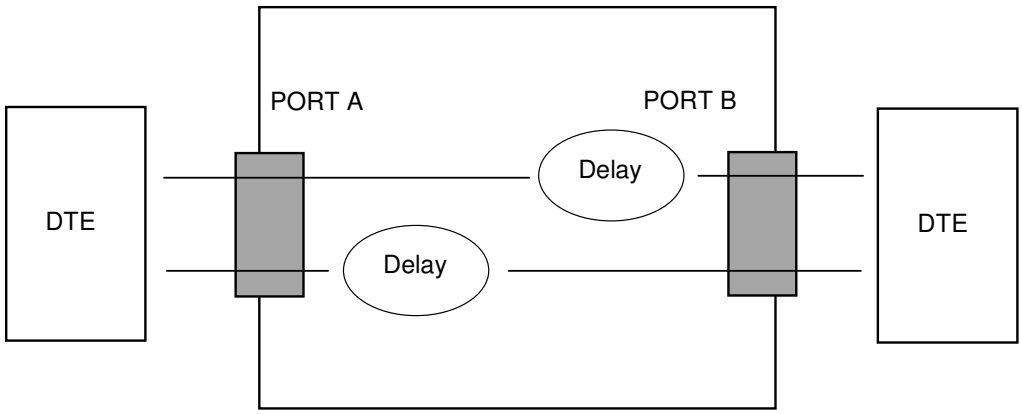
Port A Mode	None, Local, Remote	Port A data is full-duplex Port A TXD is looped back to RXD without Simulator intervention Port A TXD is looped back to RXD via the simulation functions. Delay and Errors functions are active.
(Port A) Interface	V.11, V.24, V.35, G.703	Universal Interface; V.11 selected Universal Interface; V.24 selected V.35 Interface fitted G.703 Interface fitted
Port B Clock	Internal, External, Station	RXC clock generated from the Simulator system clock TXC clock generated by the DTE, RXC clock looped back by the Simulator RXC clock generated from the Simulator PLL
Port B Mode	None, Local, Remote	Port B data is full-duplex Port B TXD is looped back to RXD without Simulator intervention Port B TXD is looped back to RXD via the simulation functions. Delay and Errors functions are active.
(Port B) Interface	V.11, V.24, V.35, G.703	Universal Interface; V.11 selected Universal Interface; V.24 selected V.35 Interface fitted G.703 Interface fitted

4. FEATURES

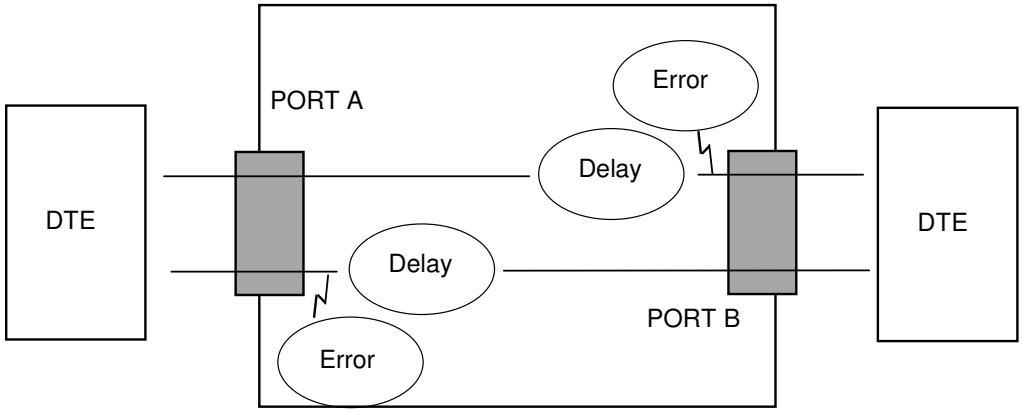
4.1 Network Simulation Applications

The Simulator 2 is typically used as a convenient alternative to complex and often costly live system performance testing. It has many versatile features which allow equipment to be rigorously exercised in many of the final configurations for which it is intended.

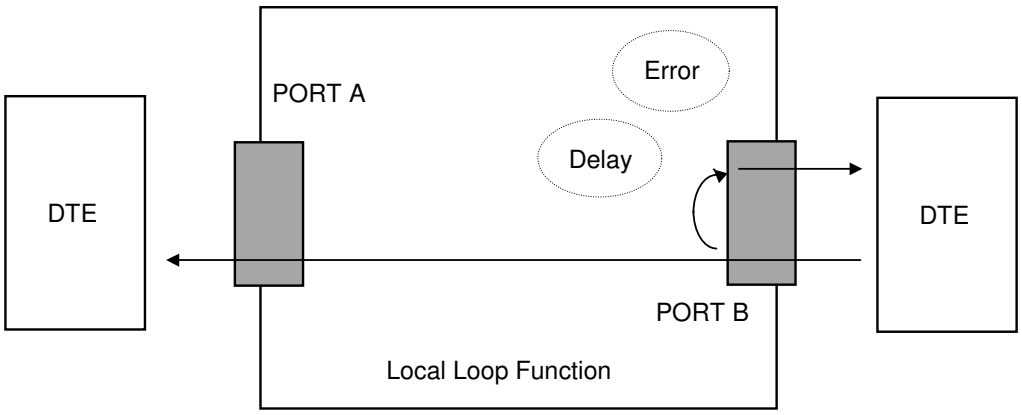
The primary function is as a synchronous full-duplex link and clock source, with variable end-to-end delay:



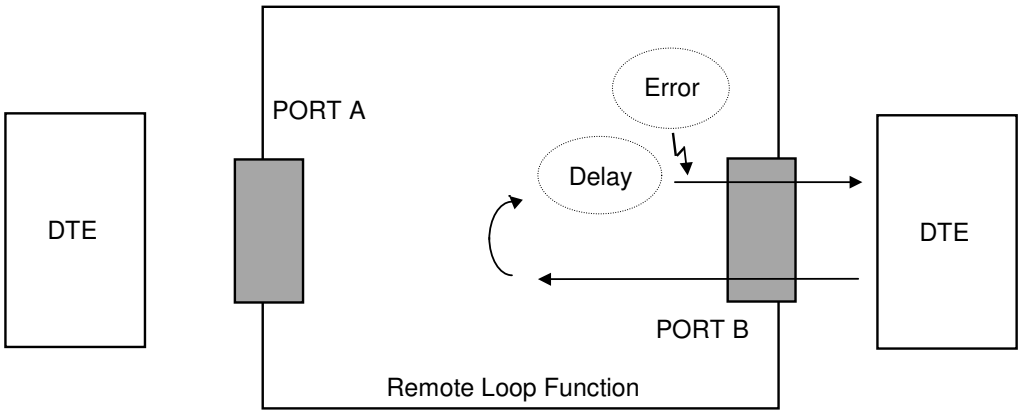
The error-injection facility allows typical line characteristics and fault conditions to be simulated, in conjunction with delay and clock generation facilities. Errors are injected in the local data stream just prior to output:



Data loop facilities are provided to allow the operator to verify the integrity of the DTE equipment and cabling connected to each port. The Local Loop mode routes data from TXD back to RXD at the local port without being subject to delay or error conditions:



The Remote Loop mode routes the data back to the local port in the same way but this time via the delay and error-injection facilities:



5. APPENDIX A - WARNINGS

WARNING: THIS EQUIPMENT MUST BE EARTHED

This equipment relies on the EARTH connection to ensure safe operation such that the user and connected DTE equipment are adequately protected. It must not under any circumstances be operated without an earth connection, which could nullify its safety approval for connection to a network.

WARNING: INSTALLATION OF EQUIPMENT

This equipment must only be installed by suitably trained service personnel.

The unit has been tested in accordance with EMC emissions standards EN55022 and immunity standards EN50082-1 and 50082-2. In order to meet the requirements of these standards it must be operated with screened link, channel and supervisor cables. Failure to do so may result in non-compliance.

DECLARATIONS OF CONFORMITY

The SIMULATOR 2 carries the CE mark, which indicates conformity with the European Directive on Electromagnetic Compatibility (EMC Directive 89/336/EEC). It been tested in accordance with EMC emissions standards EN50081-1 and immunity standards EN50082-1 and 50082-2 and conforms to the protection requirements therein.

In order to meet the requirements of these standards it must be operated with screened cables for all ports as defined in this user manual. Failure to do so may result in non-compliance.

The SIMULATOR 2 has also been tested in accordance with the standards BS7002: EN60950 and BS EN41003 and found to comply with the safety requirements therein.

Vocality International Ltd., Lydling Barn, Lydling Farm, Puttenham Lane, Shackleford, Surrey GU8 6AP, UK
May 1998

6. APPENDIX B - SUPERVISOR PORT PINOUT

9-way D-type Supervisor Pin Connections (V.24 DCE)		
Pin Number	Signal Name	Signal Type
1	DCD	Output
2	RXD	Output
3	TXD	Input
4	DTR	Input
5	GND	Signal Ground
6	DSR	Output
7	RTS	Input
8	CTS	Output
9	-	No Connection

The multiplexer requires connections to TXD, RXD and Common only. The other signals are provided for the terminal if required.

7. APPENDIX C - PORTS A and B PINOUTS

15-way D-type Interface Pin Connections (DCE)					
Pin Number	**V.11**	**RS449**	**V.24**	**V.35**	**Signal Type**
1	Prot. GND	Prot. GND	Prot. GND	A	Shield
8	G	G	COMMON	B	Common Return
2	T(A)	T(A)	TXD	P	Input
9	T(B)	T(B)	-	S	Input
3	C(A)	C(A)	RTS	C	Input
10	C(B)	C(B)	DTR	H	Input
4	R(A)	R(A)	RXD	R	Output
11	R(B)	R(B)	-	T	Output
5	I(A)	I(A)	CTS DCD	D F	Output
12	I(B)	I(B)	DSR	E	Output
6	S(A)	RT(A) ST(A)	RXC TXC	V Y	Output
13	S(B)	RT(B) ST(B)	-	X aa	Output
7	TT(A)	TT(A)	EXTXC	U	Input
14	TT(B)	TT(B)		W	Input

G.703 Pin Connections			
Pin Number	**8-way RJ45 UTP)**	**BNC (Coax)**	**Signal Type**
1	RRING	RX inner	Output
2	RTIP	RX outer	Output
3	Prot. GND	-	Shield
4	TTIP	TX inner	Input
5	TRING	TX outer	Input
6	-	-	-
7	-	-	-
8	-	-	-

8. APPENDIX E - CABLES

PORT A and B X.21/V.11 STRAIGHT 15-way Simulator DCE to Equipment DTE Cable (Part Number SC68620A)		
Simulator 15-way Male Connector UNC 4/40 Screws	DTE 15-way Male Connector UNC 4/40 Screws	Signal Name
1	1	SHIELD
8	8	G
2	2	T(A)
9	9	T(B)
3	3	C(A)
10	10	C(B)
4	4	R(A)
11	11	R(B)
5	5	I(A)
12	12	I(B)
6	6	S(A)
13	13	S(B)
7	7	TT(A)
14	14	TT(B)

Notes:
1. Dashed lines show wires to be twisted pairs.
2. Cable type: Belden 9507 14-wire twisted pair overall screen (or equivalent).
3. Use metal headshells and connect the overall screen to the tinning on the connector.
1. Cable length 2 metres.
2. Cable to be identified at both ends by part number **SC68620A.**

PORT A and B X.21/V.11 CROSSOVER 15-way Simulator DCE to Equipment DCE Cable (Part Number SC68620XA)		
Simulator 15-way Male Connector UNC 4/40 Screws	DCE 15-way Female Connector UNC 4/40 Screws	Signal Name
1	1	SHIELD
8	8	G
2	4	T(A)/R(A)
9	11	T(B)/(R(B)
3	5	C(A)/I(A)
10	12	C(B)/I(B)
4	2	R(A)/T(A)
11	9	R(B)/T(B)
5	3	I(A)/C(A)
12	10	I(B)/C(B)
6	7	S(A)/TT(A)
13	14	S(B)/TT(B)
7	6	TT(A)/S(A)
14	13	TT(B)/S(B)

Notes:
1. Dashed lines show wires to be twisted pairs.
2. Cable type: Belden 9507 14-wire twisted pair overall screen (or equivalent).
3. Use metal headshells and connect the overall screen to the tinning on the connector.
3. Cable length 2 metres.
4. Cable to be identified at both ends by part number **SC68620XA.**

PORT A and B X.21 bis/V.24 STRAIGHT 15-way Simulator DCE to Equipment DTE Cable (Part Number SC68621B)		
Simulator 15-way Male Connector UNC 4/40 Screws	DTE 25-way Male Connector UNC 4/40 Screws	Signal Name
1	1	SHIELD
8	7	COMMON
2	2	TXD
9	-	-
3	4	RTS
10	20	DTR
4	3	RXD
11	-	-
5	5,8	CTS,DCD
12	6	DSR
6	15,17	TXC,RXC
13	-	-
7	24	EXTXC
14	-	-

Notes:

1 Cable length 2 metres.
2 Use metal headshells and connect the overall screen to the tinning on the connector.
3 Cable to be identified at both ends by part number **SC68621B.**
4 Cable type: Belden 10-core overall screen 9540 (or equivalent).

PORT A and B X.21 bis/V.24 CROSSOVER 15-way Simulator DCE to Equipment DCE Cable (Part Number SC68621XB)		
Simulator 15-way Male Connector UNC 4/40 Screws	DCE 25-way Female Connector UNC 4/40 Screws	Signal Name
1	1	SHIELD
8	7	COMMON
2	3	TXD/RXD
9	-	-
3	5	RTS/CTS
10	6	DTR/DSR
4	2	RXD/TXD
11	-	-
5	4	CTS/RTS
12	20	DSR/DTR
6	24	TXC,EXTXC
13	-	-
7	15	EXTXC,TXC
14	-	-

Notes:

5 Cable length 2 metres.

6 Use metal headshells and connect the overall screen to the tinning on the connector.

7 Cable to be identified at both ends by part number **SC68621XB.**

8 Cable type: Belden 10-core overall screen 9540 (or equivalent).

PORT A and B V.35 STRAIGHT 15-way Simulator DCE to Equipment DTE Cable (Part Number SC68622A)		
Simulator 15-way Male Connector UNC 4/40 Screws	**DTE 34-way Female Connector (MRA)**	**Signal Name**
1	A	SHIELD
8	B	COMMON
2	P	SD(A)
9	S	SD(B)
3	C	RTS
10	H	DTR
4	R	RD(A)
11	T	RD(B)
5	D,F	CTS,DCD
12	E	DSR
6	V,Y	RT(A),SCT(A)
13	X,aa	RT(B),SCT(B)
7	U	SCTE(A)
14	W	SCTE(B)

Notes:

1 Dashed lines show wires to be twisted pairs.
2 Cable length 2 metres.
3 Use metal headshells and connect the overall screen to the tinning on the connector.
4 Cable to be identified at both ends by part number **SC68622A.**
5 Cable type: Belden 9507, 7 twisted pair overall screen (or equivalent).

PORT A and B V.35 CROSSOVER 15-way Simulator DCE to Equipment DCE Cable (Part Number SC68622XA)		
Simulator 15-way Male Connector UNC 4/40 Screws	**DCE 34-way Male Connector (MRA)**	**Signal Name**
1	A	SHIELD
8	B	COMMON
2	R	SD(A)/RD(A)
9	T	SD(B)/RD(B)
3	F	RTS/DCD
4	P	RD(A)/SD(A)
11	S	RD(B)/SD(B)
5	C	DCD/RTS
6	U	RT(A)/SCTE(A)
13	W	RT(B)/SCTE(B)
7	V	SCTE(A)/RT(A)
14	X	SCTE(B)/RT(A)

Notes:

6 Dashed lines show wires to be twisted pairs.

7 Cable length 2 metres.

8 Use metal headshells and connect the overall screen to the tinning on the connector.

9 Cable to be identified at both ends by part number **SC68622XA.**

10 Cable type: Belden 9506, 6 twisted pair overall screen (or equivalent).

SUPERVISOR port V.24 adaptor cable 9-way Simulator DCE to Terminal DTE Cable (Part Number SC68623A)		
Simulator 9-way Male Connector UNC 4/40 Screws	DTE 25-way Female Connector UNC 4/40 Screws	Signal Name
1	8	DCD
2	3	RXD
3	2	TXD
4	20	DTR
5	7	GND
6	6	DSR
7	4	RTS
8	5	CTS
9	-	-

Notes: 1 Cable type: Belden 8-core overall screen (or equivalent). Maximum length 10 metres.

PORT A and B EIA-RS530 STRAIGHT 15-way Simulator DCE to Equipment DTE Cable (Part Number SC68624A)		
Simulator 15-way Male Connector UNC 4/40 Screws	DTE 25-way Male Connector UNC 4/40 Screws	Signal Name
1	1	SHIELD
8	7	G
2	2	Send Data BA
9	14	Send Data Inverse /BA
3	4	Request To Send CA
10	19	RTS Inverse /CA
4	3	Receive Data BB
11	16	Receive Data Inverse /BB
5	5,6,8	Clear to Send CB
12	13,22,10	CTS Inverse /CB
6	17,15	Receive, Send Timing DD,DS
13	9,12	R, S Timing Inverse /DD,/DS
7	24	Terminal Timing DA
14	11	TT Inverse /DA

Notes:
1. Dashed lines show wires to be twisted pairs.
2. Cable type: Belden 9507 14-wire twisted pair overall screen (or equivalent).
3. Use metal headshells and connect the overall screen to the tinning on the connector.
5. Cable length 2 metres.
6. Cable to be identified at both ends by part number **SC68624A.**

PORT A and B RS449 STRAIGHT 15-way Simulator DCE to Equipment DTE Cable (Part Number SC68625A)		
Simulator 15-way Male Connector UNC 4/40 Screws	DTE 37-way Female Connector UNC 4/40 Screws	**Signal Name**
Shield	Shield	SHIELD
1	19	GND
2	4	SDA (Input)
9	22	SDB (Input)
3	7	RTSA (Input)
10	25	RTSB (Input)
4	6	RDA (Output)
11	24	RDB (Output)
5	13	RRA (Output)
12	31	RRB (Output)
6	5,8	STA,RTA (Output)
13	23,26	STB,RTB (Output)
7	17	TTA (Input)
14	35	TTB (Input)

Notes:
1 Dashed lines show wires to be twisted pairs.
2 Cable type: Belden 9507 14-wire twisted pair overall screen (or equivalent).
3 Use metal headshells and connect the overall screen to the tinning on the connector.
7 Cable length 2 metres.
8 Cable to be identified at both ends by part number **SC68625A.**

9. APPENDIX F - SIMULATOR 2 PART NUMBERS

Basic Unit

SIMULATOR 2 chassis	68610

Option cards

Universal V.11/RS449/V.24 interface card	68314
V.35 interface card	68312
G.703 interface card	68319

Cables

V.11 straight DB15-DB15 cable 2m	68620A
X.21bis/V.24 straight DB15-DB25 cable 2m	68621B
V.35 straight DB15-MRAC 34-way cable 2m	68622A
V.24 straight DB9-DB25 supervisor adaptor cable 2m	68623A
EIA-RS530 straight DB15-DB25 cable 2m	68624A
RS449 straight DB15-DB37 cable 2m	68625A

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