VConsole>_
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PRI (T1/E1) Bulk Call Generators

This user manual is applicable to the following products:

BCG-2PRI, BCG-4PRI, BCG-8PRI

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1. Chapter 1:   Important Information

1.1 General Disclaimer

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The warranty is limited to the original purchaser and is not transferable. Any liability of
Virtual Console or its suppliers with respect to the product or the performance thereof under any warranty, negligence, strict liability or other theory will be limited exclusively to product repair
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Except for the foregoing, the product is provided "as is" without warranty of any kind including without limitation, any warranty of merchantability or fitness for a particular purpose.

The entire risk of the quality and performance of the software programs contained in the system is with you.

1.6 Limitation of Remedies and Damages

Virtual Console, LLC, its agents, employees, suppliers, dealers and other authorized representatives shall not be responsible or liable with respect to the product or any other subject matter related thereto under any contract, negligence, strict liability or other theory for any indirect, incidental, or consequential damages, including, but not limited to loss of information, business, or profits .The law of certain states or nations does not permit limitation or exclusion of implied warranties and consequential damages, so the above limitations, disclaimers, or exclusion may not apply to you. This warranty gives you special legal rights. You may also have other rights that vary by state and nation.

1.7 Important Safeguards

Read and understand the following instructions before using the system:

Close supervision is necessary when the system is used by or near children.
Do not leave unattended while in use.

Always disconnect the system from power before cleaning and servicing and when not in use.

Do not spray liquids directly onto the system when cleaning.
Always apply the liquid first to a static free cloth.

Do not place this product onto unstable desk, cart or table.
The product may fall causing serious damage to the product.

Do not immerse the system in any liquid or place any liquids on it.
Do not disassemble this system (except as instructed in the manufacturer's instructions).
To reduce the risk of shock and to maintain the warranty on the system, a qualified technician must perform service or repair work.

Connect this appliance to a grounded outlet.
Connect the system only to surge protected power outlets.
Keep ventilation openings free of any obstructions.

Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

1. When the power supply adapter or plug is damaged or frayed.

2. If liquid has been spilled into the product.

3. If the product has been exposed to rain or water.

4. If the product has been dropped or the enclosure has been damaged.

5. If the product exhibits a distinct change in performance.

SAVE THESE INSTRUCTIONS

2. Chapter 2: Introduction. Overview of Bulk Call Generator

2.1 Functional Overview

Bulk Call Generator (BCG) is a hardware appliance that allows to generate or terminate (accept) large number of G.711 (a-law/u-law) voice calls via ISDN Primary Rate Interface.

Bulk Call Generator is capable of generating 15,000 calls per hour per PRI port with 3ms inter-call delay at a full rate of T1 or E1 interface. Each call can carry G.711 a-law or u-law encoded audio stream provided by custom WAV audio sample stored in Flash memory or external audio source such as PC sound card or MP3/CD player.

Call Generator consists of two independent sub-systems: Call Generator and Call Acceptor.

Call Generator acts as a source of the calls and Call Acceptor acts as a recipient of the calls. Each subsystem is independently configurable and can be used separately depends on the setup of the system under test. The primary purpose of Call Generator subsystem is to send calls towards the System Under Test (SUT), where purpose of Call Acceptor is to accept calls coming from SUT.

Bulk Call Generator functional diagram

System under test
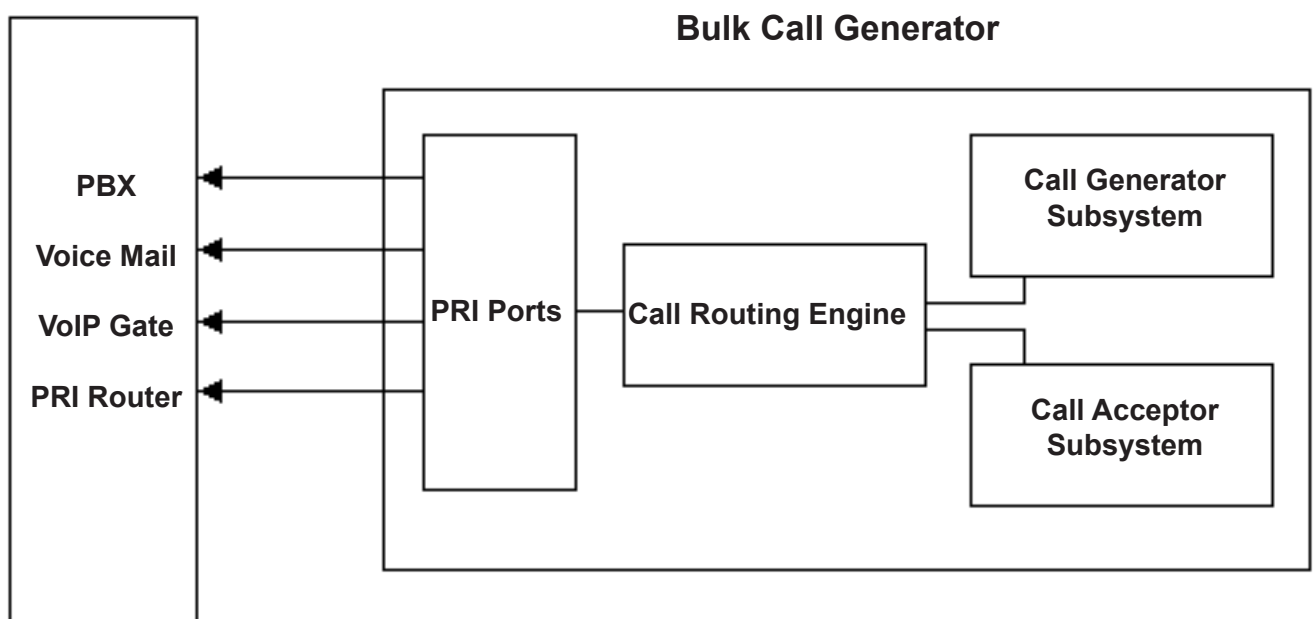
Bulk Call Generator comes with 2, 4 or 8 PRI ports depending on the model.
Bulk Call Generator can be configured to act as a CPE (User Side) or Telco (Network side) of the PRI, which allows it to test any possible combination and type of PRI devices including ISDN switches, ISDN routers, IVR systems, VoIP gateways, PBXs or Voice-Mail servers. Call Generator Can provide network clock to a CPE, be

a Master clock source or synchronize to external clock source and be a clock slave.

2.2 ISDN Manager

Bulk Call Generator kit comes with a CD with Win32 "ISDN Manager" application.
ISDN Manager is the only way of configuring Bulk Call Generator.
ISDN Manager is a Win32 application that can be installed on the following operating systems: Windows 2000 and XP.

3. Chapter 3: Getting started with Bulk Call Generator

3.1 Configuring T1/E1/PRI parameters

Before you can start generating calls you need to configure T1/E1 and PRI physical layer parameters such as: Clock source, Linecode, Framing, PRI Switch Type and a phone numbers for each T1/E1 Port.
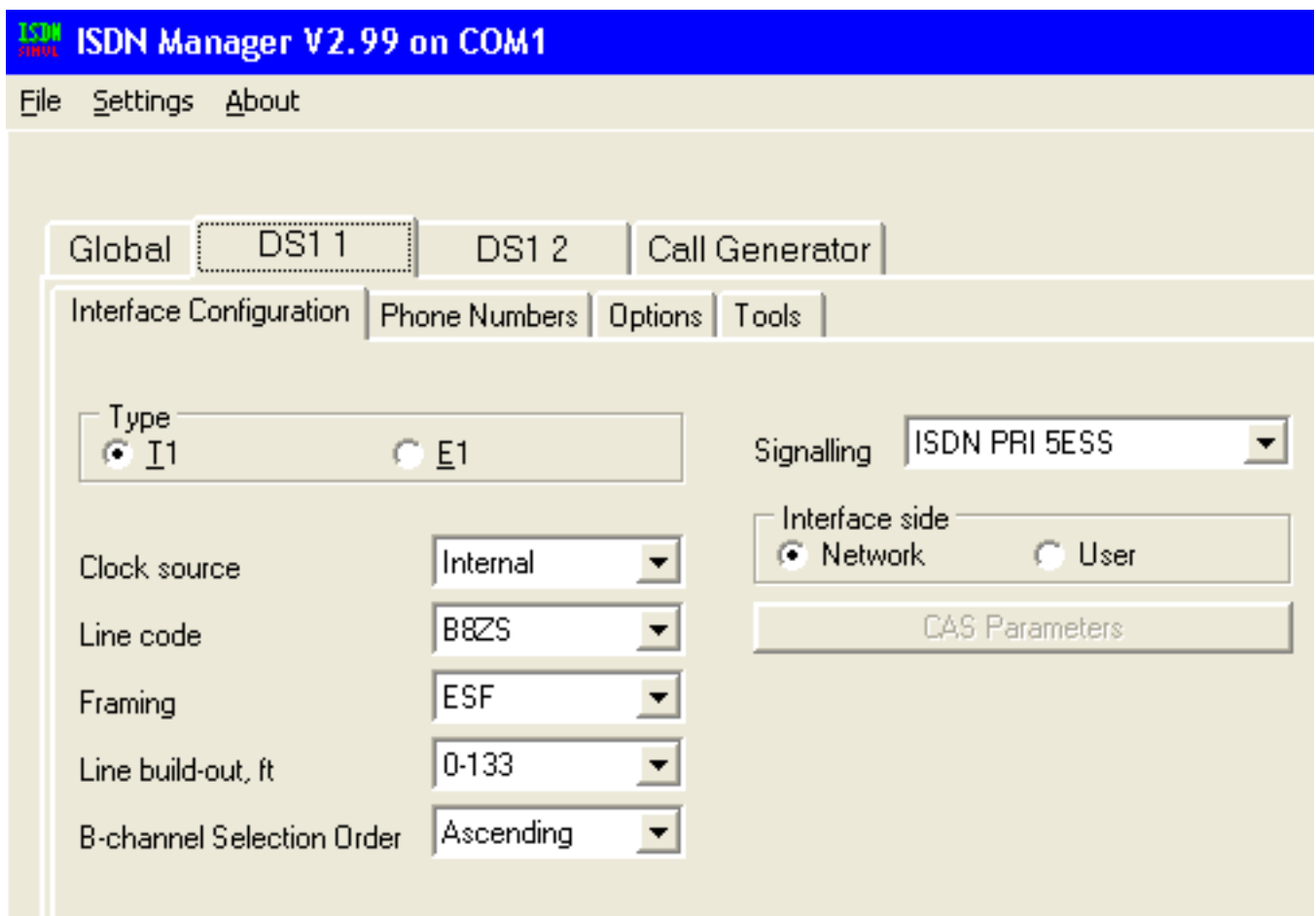
3.2 Connecting System Under Test (SUT) to a Call Generator

To Connect System Under Test to a Call Generator you can always use a straight-through CAT3 or CAT5 cable. Call Generator has an internal relay that changes pin-out of the RJ45 ports based on selection of User

or Network Side on each PRI port.

3.3 Generating Calls

To start generating call to go the "Generate Calls" sub-tab in ISDN Manager which is located Under global tab "Call Generator"

By pressing "Start Generating Calls" button at the bottom of the tab you can start the call flow from the generator to the System Under Test. You can see the progress and detailed information with Q.931 messages in a live log window.

Pressing the "Stop Generating Calls" button will stop the calls flow.
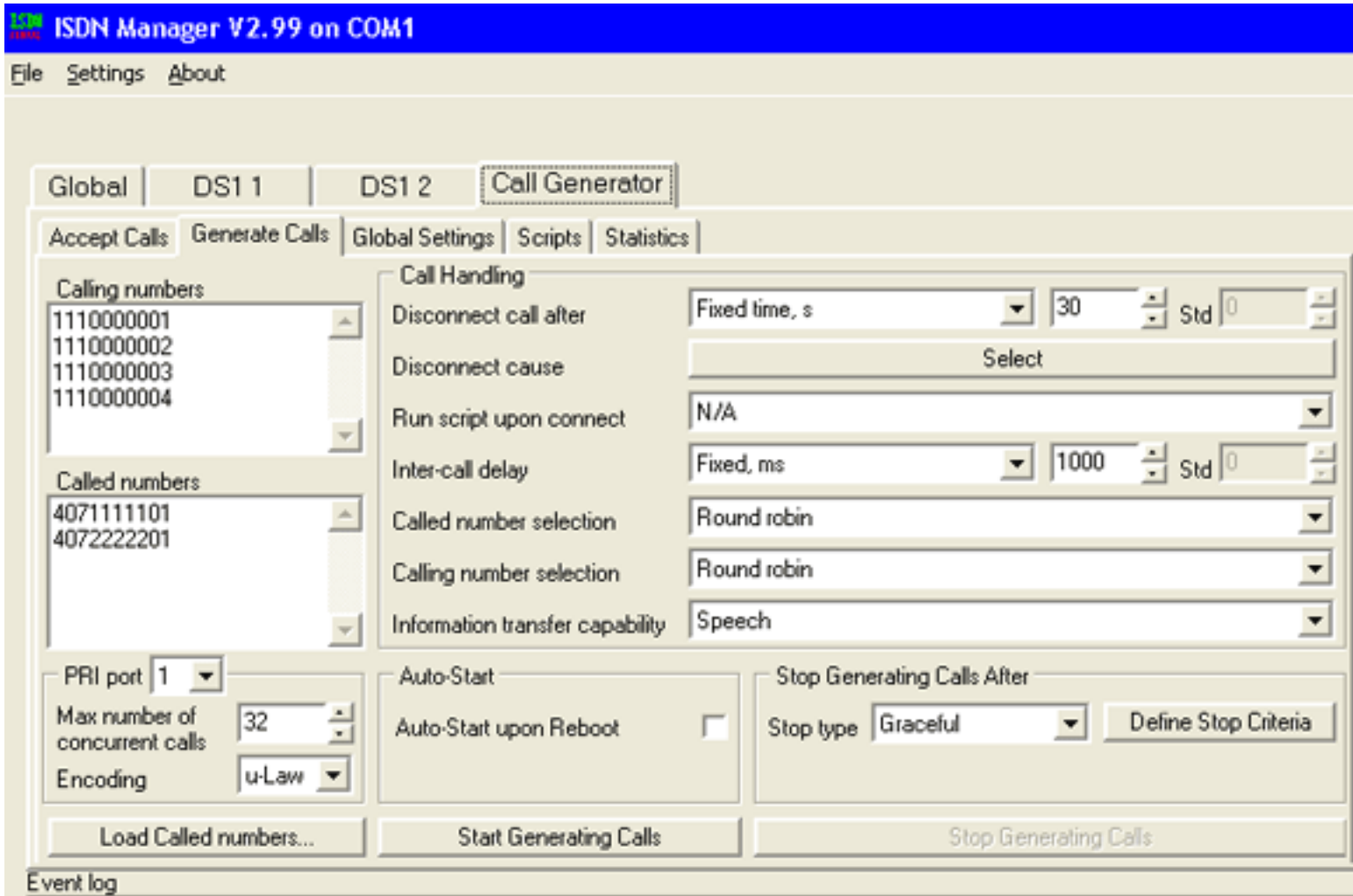
3.4 Terminating (accepting) Calls

To start accepting calls from System Under Test, go to the "Accept Calls" sub-tab and press "Start Accepting Call" button. Note that Call Generator will not terminate calls unless "Start Accepting Calls" button is pressed. By default that button's status is OFF.
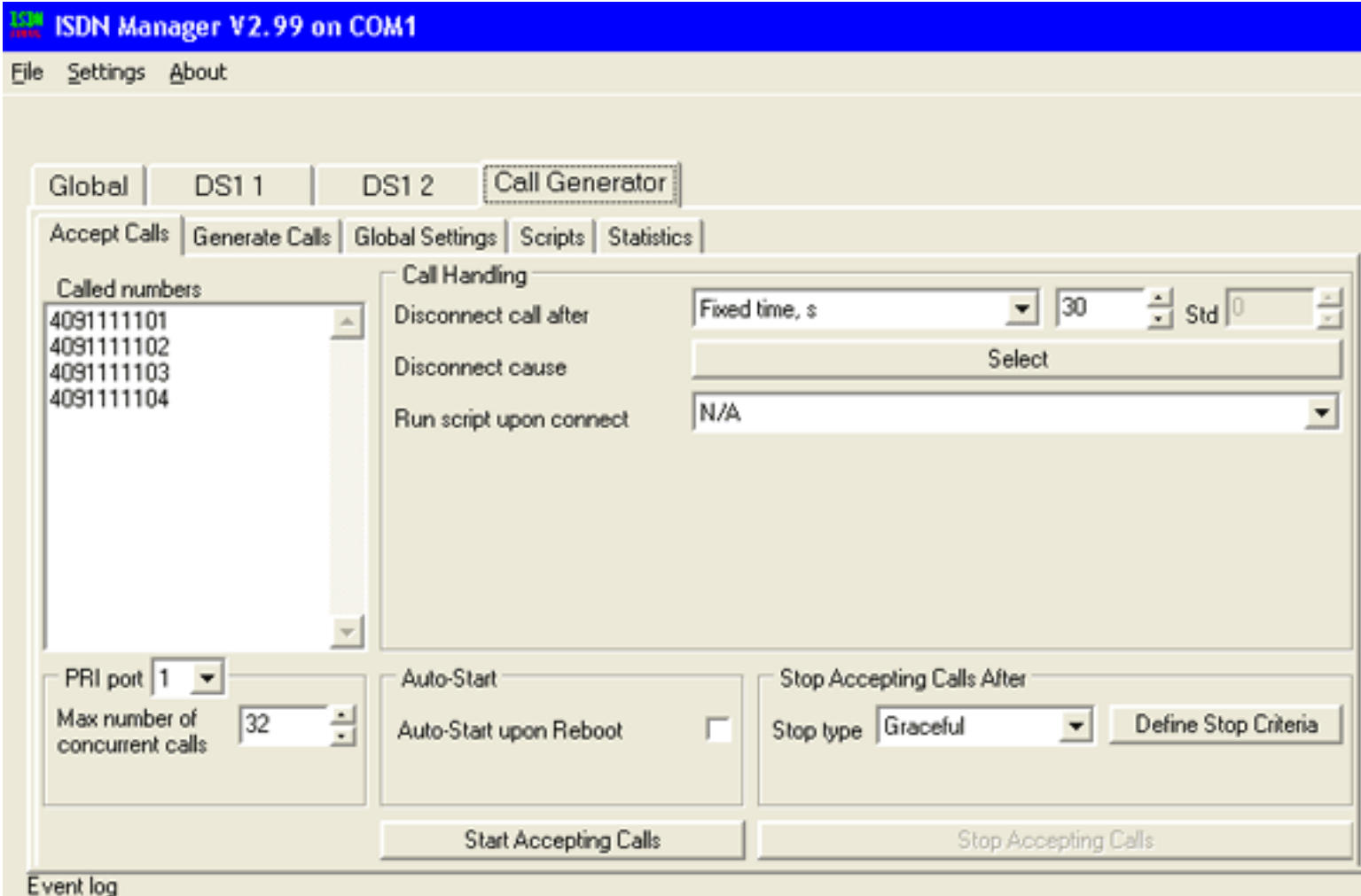
3.5 Calls Routing Rules

It is very important to understand how call routing work inside of the Call Generator. Every call that comes in or comes out of Call Generator has to go through the Call Routing Engine (CRE).

CRE maintains a table with port-to-phone number associations, which is used in a process of determining the next hop for the calls.

CRE uses a Called Number (DNIS) information to route calls in and out of Call Generator. CRE has several ports: physical and logical which are being used for actual forwarding of the calls once the destination port is determined.

Each port has a several (up to 32 per port) phone numbers associated with it.
Those phone number populates the CRE table and are primary source of information for switching calls among the ports.

CRE physical ports match the physical PRI ports. In addition to physical ports there are two logical PRI ports which are being used to connect CRE to Call Generator and Call Acceptor.

4. Chapter 4: Configuring simulator with PSTN Manager

4.1 Generated Calls Parameters

4.1.1 Calling and Called Numbers

You can specify up to 64 Calling numbers that will be used as a pool of numbers for "Calling number" Information Element (IE) in SETUP packets generated by Bulk Call Generator (BCG).

Calling numbers identify a Caller (source of the call) and usually used for ANI or Caller ID purposes.

You can specify up to 64 Called numbers that will be used as a pool of numbers for "Called number" Information Element (IE) in SETUP packets generated by Bulk Call Generator (BCG).

Called Numbers identify a recipient of the call and are used to call routing purposes.

Selection of Calling and Called numbers is done on Random or Round-robin basis depends on Settings in "Called/Calling number Selection" drop down menu.

Note that because the numbers that appear in Called Number "IE" in Q.931 SETUP packets are used by CRE (Call Routing Engine) for call routing and outgoing PRI port selection, they must to be present on at least one physical PRI port.

If CRE can't match Called Number to any of PRI ports, it will generate a log message similar to this:

Called Number can't be mapped to an active PRI Port

If the Called Number has been assigned to one of the PRI ports, but that PRI port is not Active (not connected to CPE) the same massage will appears in the log.

By specifying identical Called numbers on several PRI ports you can load balance calls among several PRI ports.
Please refer to ISDN simulator user manual for details on configuring Load Balancing policies.

4.1.2 Inter-Call Delay

"Inter-call delay" parameter defines the frequency of generated calls. If you assign a 1ms inter-call delay, BCG will generate a new call every 1 ms.

4.1.3 Disconnect Call After

"Disconnect Call After" control defines the duration of the calls generated by BCG. Call Generator will keep calls connected until this timer is expired or until System Under Test issues a Disconnect Message. You can define a fixed timer in seconds or specify a normally or exponentially distributed random value within a given range.

4.1.4 Disconnect Cause

"Disconnect Cause" control allows to generate different disconnect cause Information Elements (IE) inside if the Q.931 Disconnect packet issued by BCG upon disconnection of the call.

Disconnect Cause Selection ✕

Disconnect Causes to Use

☐ Unallocated (unassigned) number	☐ Normal, unspecified
☐ No route to destination	☐ No circuit/channel available
☐ Channel unacceptable	☐ Network out of order
☐ Call awarded and being delivered in an established channel	☐ Temporary failure
☐ Preemption	☐ Switching equipment congestion
☐ Preemption - circuit reserved for reuse	☐ Requested circuit/channel not available
☑ Normal call clearing	☐ Resource unavailable, unspecified
☐ User busy	☐ Service or option not available, unspecified
☐ No user responding	☐ Service or option not implemented, unspecified
☐ No answer from user (user alerted)	☐ Invalid call reference value
☐ Subscriber absent	☐ Call identity in use
☐ Call rejected	☐ Incompatible destination
☐ Number changed	☐ Invalid message, unspecified
☐ Non-selected user clearing	☐ Mandatory information element is missing
☐ Destination out of order	☐ Protocol error, unspecified
☐ Invalid number format (address incomplete)	☐ Interworking, unspecified

☐ Custom Cause

Custom Cause Octets

Octet2 (length): `2`   Octet3 (Standard/Location): `129`   Octet3a/4: `144`   Octet4/5: `0`   Octet5 (if 3a used): `0`

[OK]   [Cancel]   [Set Defaults]   [Clear All]   Cause Selection Order: `Round robin` ▼

4.1.5 Called/Calling Number Selection

Selection of the Called and Calling numbers can be done in round-robin or random fashion. You must provide at least one Calling and Called number for BCG to be able to generate and route calls.

4.1.6 Information transfer capabilities (ITC)

ITC control allows you to simulate different types of SETUP packets, for different types of traffic such as Data, Speech, Video etc.. Note that this settings effect only format of SETUP packet and not the actual payload of B-channels.
Call Generator can only generate payload for Speech type, content for which is provided by "External Audio" input or internal WAV file stored in flash memory.

4.1.7 Stop Types

"Stop Type" menu defines two types of behavior when BCG stops generating Calls.

Graceful stop will result in Call Generator sending a Disconnect, Release and Release Complete messages, correctly closing all active calls.

None-graceful stop will drop all the active calls without sending any Q.931 messages.
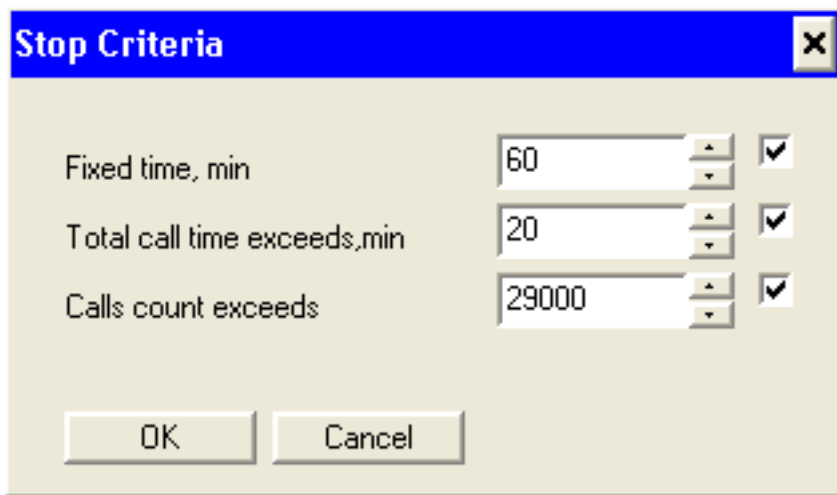
4.1.8 Auto Start

Enabling **Auto-Start** will result in Call Generator automatically starting generating call right after reboot or power on.

4.1.9 Running Scripts

BCG allows you to perform specific actions after the call is connected. By creating a Custom Script and specifying it in a "Run Script Upon connect" drop down menu you can send a DTMF digits, play audio samples, create a flexible logic with variables and cycles.
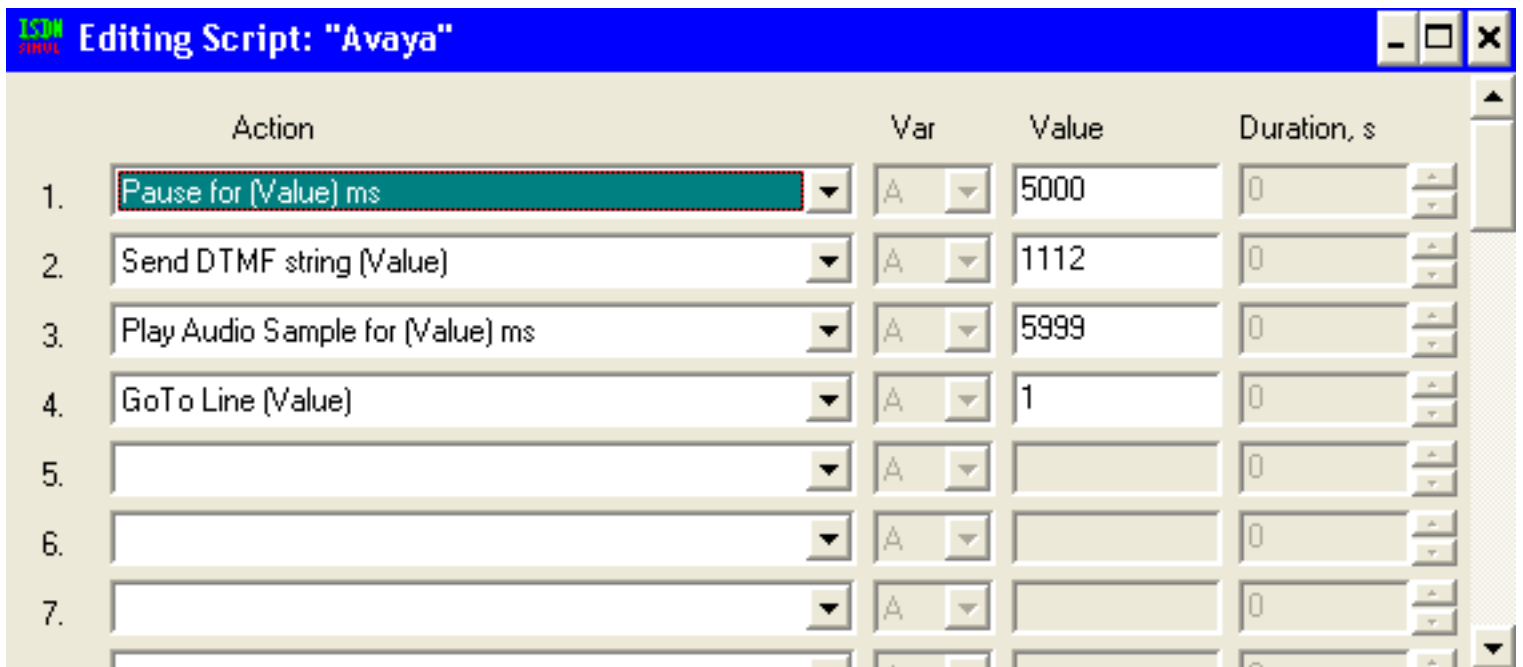
4.1.10 Maximum number of concurrent calls

This parameter defines the maximum number of calls that can be active on given PRI port. This includes incoming and outgoing calls. This parameter is a port specific.
Assigning 0 will prevent this PRI port from making or accepting any calls.

4.1.11 Loading Called Numbers from PRI ports

For correct call routing by CRE, you have to make sure that Called numbers that you enter in Call Generator are also assigned to PRI ports. To ease this task and prevent typos you can use this control which allows you to populate "Called numbers" window with the numbers that already present in PRI ports.

4.2 Accepted Calls Parameters

Parameters for Accepting Calls logic is identical to Generated Calls except it applies only for inbound Calls. The most important parameter is the list of Called Numbers. Call Generated will only accept calls if Called number in Q.931 SETUP packet is present in Called Numbers list under Accept Calls Tab

5. Chapter 5: Working with Audio Payload

5.1. Audio Sample
5.1.1 Using WAV audio samples

Using a WAV file is the primary way of creating audio payload for the generated and accepted calls.
By creating a sample script, Call Generator can play a WAV file for each of the connected calls.
You can create your own WAV audio samples with an application such as CoolEdit or any of your favorite Audio editing or converting tools
Bulk Call generator can only accept WAV files created with the following parameters:

Format: Microsoft WAV
Bit rate: 8 or 16 bit
Sample Rate: 8 khz sample rate
Mono/Stereo: Mono.

5.1.2 Loading audio samples to Bulk Call Generator

To load your own WAV file to a Call Generator go to the "Global Settings" sub-tab in Call Generator section of ISDN Manager. Call Generator will not be functional during the time of uploading of the WAV file and will perform automatic reboot upon completion.

If the size of the WAV file exceeds the size of internal Flash, ISDN Manager will automatically truncate the file size to a maximum allowed and display the estimated duration of truncated version.

Note that WAV files created in Mono will play twice longer than in created in Stereo.

5.2 External Audio Input

Each Call Generation is equipped with external 3.5mm "Audio In" port. "Audio In" port can be used as an alternative way of feeding an audio stream for the generated calls. You can connect any suitable source of audio signal such as CD/MP3 player or PC Sound Card.
The advantage of this way is that you will not be limited by the size of the internal flash and do not have to create a WAV files in advance.

6. Chapter 6: Statistics

Statistics Tab in ISDN Manager provided overview of activity of the Call Generator:

```
Generated Calls Statistics
---------------------------------------------------

Total time active:                      0.00 s
Total number of generated calls:        0
Total number of connected calls:        0
Total time of connected calls:          0.00 s
Total number of rejected calls:         0

Accepted Calls Statistics
---------------------------------------------------
Total time active:                      0.00 s
Total number of incoming calls:         0
Total number of connected calls:        0
Total time of connected calls:          0.00 s
Total number of rejected calls:         0
```

7. Chapter 7: Script Editor

7.1 Creating Scripts

Script is the small routine that can be executed within any active call. Scripts allow simulation of various "real life" events such as pressing single or multiple DTMF digits or simulating a conversation by playing an audio WAV file.

Execution of the Script starts only when call is connected and terminates after call disconnects.
Script consists of multiple steps executed in sequential order, similar to a simple programming language.

Scripts allows use of variables, counters and simple loops.

7.1.1 Play Audio Sample

To play Audio sample in a script select "Play Audio Sample for (Value) sec" command in drop-down menu in script editor.
Number assigned to the "Value" column specifies duration of this command (duration of the play) in seconds (sec).

7.1.2. Connect to "Audio In"

If you prefer to use External Audio port for feeding a voice stream into a call, select "Connect to Audio In for (Value) sec"
Number assigned to the "Value" column specifies duration of this command in seconds.

7.1.3. Sending DTMF Digits

You can send DTMF digits as a part of the script by using a "Send DTMF string (Value)" command.

String defined in "Value" column is the sequence of DTMF digits that will be played.

String can include single or multiple digits.

Examples of DTMF strings: 1,   8327548894 , 8#, *0912386#

Note that there is special set of DTMF related parameters available in Global sub-tab.
Those define DTMF digit duration, inter-digit delays and signal levels that may effect
performance of application running on System Under Test.

7.1.4. Working with Variables

You can use up to N variables while creating a script. Each variable had an Integer type with a valid range from 0 to 65355. Call Generator does per form a limited underflow and overflow verification during a script execution.

8. Chapter 8: Upgrading firmware

Virtual Console, LLC is constantly working on adding new features to its products.
Please check **http://www.vconsole.com** for the latest firmware updates for your simulator.
After upgrading a firmware always use a latest Manager application which is available for downloading from **http://www.vconsole.com**. In most cases valid support contract is required to access a latest firmware.
Please contact your local sales office for details.

To determine the current version firmware use ISDN Manager log window output
or "About" page.

```
* Log started 1-May-04 19:21:55
* Hardware version:          "VH.2.2.1.1"
* Serial Number:             "0000000000"
* Firmware version:          "V01.03 (Apr 30 2004)"  <- Firmware version
* AVR version:               "V01.01 (Apr 14 2004)"
* Configuration version:     "00040100"
* Codec revision:            "15/15/15/15"
```

Firmware is distributed as a ZIP package containing following files:

```
XLOAD.EXE     -        Firmware loading application
XXXXX.XMD     -        Firmware binary file (XXXXX  is the hardware platform designator)
DEV.CFG       -        Device Default configuration file
README.TXT    -        Firmware loading instructions
RUN.BAT       -        Batch file for starting a firmware upgrade
```

RUN.BAT is written with an assumption that you are using a COM1 port for Generator
Management purposes. If you are using a different COM port, please edit the RUN.BAT accordingly.