Abacus1™ Test System

Rack Mountable System

Portable System

Overview

Abacus1 is a modular and expandable test system that creates telephone traffic (bulk call generator) or switches telephone traffic (central office emulator). Abacus1 can perform the functions of a call generator and a call switch simultaneously in the same system. Hardware is controlled by an external PC running Abacus1 user interface software under the Windows® operating system.

Designed and manufactured by Spirent Communications™, Abacus™ systems are sold, serviced, and supported worldwide.

Features

- Communications test system
- Call generation and switching
- Modular and expandable
- Test analog, CAS, ISDN, T1, E1, GR-303, SLC-96, V5.1, V5.2, and SS7
- Expandable from 5 to 1,023 channels in a single system controller system
- Mix circuit types in the same system
- Same cards perform call generation and call switching
- User interface runs under Windows
- Compatibility with or emulation of telephone systems worldwide
- DTMF, MF R1, MF R2, SS5, pulse dialing
- Flexible call sequences
- Generate or switch up to 824k BHCA using E1 PRA (may be lower for other protocols)
- Results are automatically and continuously gathered and presented in tables and graphs
- Programmable protocols
- Built-in protocol analyzers
- Common control of multiple systems
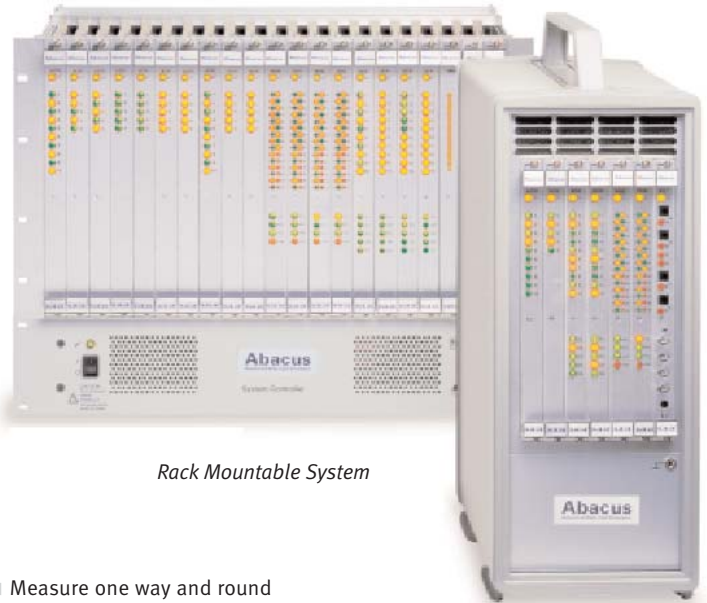- Unified control with other Spirent products

Applications

PBXs, switches, central offices
- Create traffic
- Verify correct routing
- Determine capacity
- Measure voice quality

Voice over IP, satellite, WLL
- Verify connectivity
- Tolerate and measure duration of interruptions in speech path

- Measure one way and round trip delays
- Measure quality of service
- Measure jitter
- Determine capacity

Transmission equipment
- End-to-end tests
- Verify transmission quality

Modems, routers
- Measure connection speed
- Measure throughput
- Measure transmission quality
- Test dial-up connection

Voicemail, IVR
- Transmit and receive account codes
- Create traffic to leave messages
- Replay and verify messages

Switching
- Switch any interface to any interface
- Emulate switches worldwide

Functions

Call Generation

Call generation is one of two modes in which a circuit type can operate on the Abacus1 system. In this mode, Abacus1 creates telephone traffic by executing compiled call sequences (scripts).

Abacus1 can originate and terminate a call through a switch or similar equipment. The circuit type of the originating channel can be the same as or different from that of the terminating channel. You can add call generation to an interface subsystem that already does switching. You can also mix the functions of call generation and switching on a single system.

As a call generator, Abacus1 can:
- create multiple telephone calls
- answer calls
- confirm that calls are correctly established
- create and respond to unique tones or speech
- measure and display call statistics in real-time
- generate calls on one circuit type and terminate calls on another circuit type

Switching

Switching is one of two modes where a circuit type can operate on the Abacus1 system. In this mode, Abacus1 receives a dialed number on an incoming channel and routes the call to an outgoing channel.

The circuit type of the incoming channel can be the same or different than the outgoing channel.
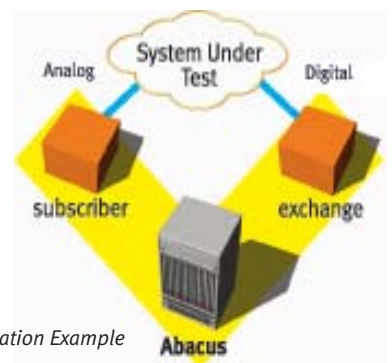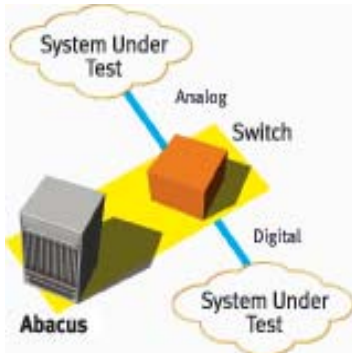

Application Example

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Application Example

You can add switching to an interface subsystem that already does call generation. You can also mix the functions of call generation and switching on a single system.

As a switch, Abacus1 can:
- receive a dialed number
- route a call to another channel on Abacus1
- forward a dialed number and caller ID
- provide a clear speech path for traffic
- measure and display call statistics in real time
- create call progress tones such as dial tone, ringback, and busy
- route calls among channels of the same circuit type or of different circuit types
- convert between A-law and µ-law

System Capacity

Rack Mountable System
- 1 to 40 subsystems or maximum of 1,023 channels
- Up to 824k BHCA with E1 PR-ISDN

Portable System
- 1 to 6 subsystems or maximum of 180 channels
- Up to 145k BHCA with E1 PR-ISDN

Modularity
- Mix and match circuit types in same system
- 1 to 4 users on any system, with restrictions
- Options for additional features are available for most subsystems
- Add more interfaces or options at any time

Documentation

Online Help
- Click on Help button or press F1 for context-sensitive topics
- Useful illustrations
- Comprehensive index and glossary

User's Manual
- More than 1,000 pages
- Useful illustrations
- Comprehensive index and glossary

Other
- Individual data sheet on each interface
- Comprehensive data sheet on entire system
- Various application notes
- Latest information and application assistance available on Spirent's Web site
- Knowledge base available online

Warranty, Service, Support

Warranty
- One year on parts and labor included with system
- Option to extend warranty in increments of two years

Software Subscription
- One year free subscription of software updates
- Option to extend subscription in increments of two years
- Intermediate software releases available on Spirent's Web site

Technical Support
- Included with software subscription
- Via telephone, fax, or e-mail ‹abacus.support@spirentcom.com›

Training
- 2-day courses on theory and use of Abacus1
- Each class 3 to 5 students
- Customized courses available

Available Interfaces

Analog
- **ACG:** 2-wire; subscriber; 10 circuits per card
- **ECG:** 2-wire; enhanced subscriber switching; 5 circuits per card
- **ECG1:** 2-wire; enhanced subscriber call generation; 25 circuits per card
- **XCG:** 2-wire; exchange; 5 circuits per card
- **MCG:** 2-wire or 4-wire voice path; E&M Type I to V; trunk or signalling; 5 circuits per card

ISDN BRA
- **BCG:** 2-wire; subscriber or exchange; U-interface; 5 circuits per card
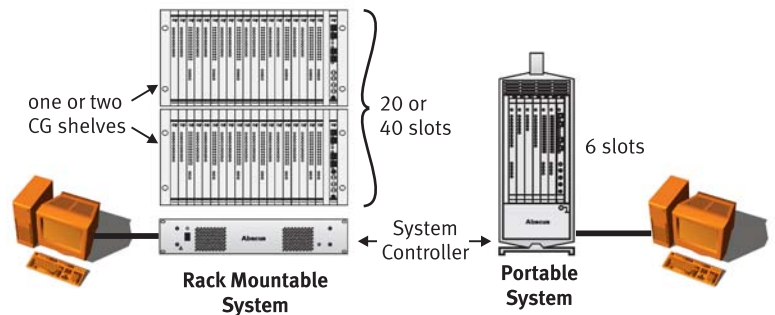- **SCG:** 4-wire; subscriber or exchange; S/T-interface; 5 circuits per card

PCM
- **PCG:** 4-wire; subscriber or exchange; one circuit per card; software selectable between T1 CAS, E1 CAS, T1 PRA, E1 PRA, SLC-96, GR-303, V5.1, V5.2, SS7

Resources
- **PRG:** SS7 resource for one to four data links
- **VRG1:** send 448 WAV files, perform 448 PSQM & 96 PESQ analyses, 72 fax/modem (up to V.92)

Other Interfaces
Additional functionality of Ethernet, RTP, SIP, MGCP, Megaco, and H.323 is supported by combining Abacus1 with

one or two CG shelves — 20 or 40 slots — **Rack Mountable System** — System Controller — 6 slots — **Portable System**

Abacus1 5.18 BHCA Measurements

Circuit Type	Portable					Rackmount 1 RG Shelf					Rackmount 2 RG Shelves				
		Channels		BHCA			Channels		BHCA			Channels		BHCA	
	Circuits	Call Gen	Switching	Call Gen	Switching	Circuits	Call Gen	Switching	Call Gen	Switching	Circuits	Switching	Call Gen	Switching	Call Gen
Analog Exchange	30	30	30	19.7k	10.2k	100	100	100	65.5k	33.9k	200	200	200	131.0k	67.8k
Analog Subscriber	60	60	60	39.3k	N/A	200	200	200	131.0k	N/A	400	400	400	262.0k	N/A
ISDN BRA	30	60	60	74.5k	67.3k	100	200	200	248.2k	224.2k	200	400	400	496.4k	448.4k
T1 PR-ISDN	6	138	138	123.2k	102.4k	20	460	448	410.8k	332.5k	40	920	896	821.6k	665.0k
T1 CAS	6	144	144	81.8k	68.2k	20	480	448	272.7k	212.2k	40	960	896	545.4k	424.4k
T1 GR-303	5	115	115	25.0k	22.5k	20	460	448	99.9k	87.7k	40	920	896	199.8k	175.4k
T1 SS7 Real Trunks	5	120	120	73.2k	73.0k	19	456	448	278.3k	272.5k	38	912	896	556.6k	545.0k
E1 PR-ISDN	6	180	180	145.5k	131.7k	17	510	448	412.3k	327.8k	34	1020	896	824.6k	655.6k
E1 CAS	6	180	180	73.1k	102.6k	17	510	448	207.0k	255.4k	34	1020	896	414.0k	510.8k
E1 V5.1	5	150	150	59.9k	46.4k	17	510	448	203.8k	138.7k	34	1020	896	407.6k	277.4k
E1 V5.2	5	150	150	23.5k	24.2k	17	510	448	79.9k	72.4k	34	1020	896	159.8k	144.8k
E1 SS7 Real Trunks	5	150	150	88.3k	90.9k	17	510	448	300.2k	271.6k	34	1020	896	600.4k	543.2k

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Abacus2 or Abacus 5000 test systems. Combine Abacus1 with Abacus2 or Abacus 5000 through a unified user interface application, Voice Connect. See Abacus2 and Abacus3 data sheets for details on these interfaces.

Architecture

The Abacus1 hardware is controlled by an external PC running the Abacus user interface software under Windows. The minimum Abacus1 system is one base subsystem and one interface subsystem. The base subsystem contains all components required to support interface subsystems.

The Abacus1 base subsystem has a midplane that houses a front card and a rear card for each Circuit Generator (CG) or Resource Generator (RG) subsystem. The front card carries active electronics to perform tests, while the rear card carries connectors to provide a physical interface to the system under test (SUT). This approach allows the front of the system to have a tidy appearance, free of dangling cables.

The rack mountable system and the portable system use the same plug-in cards, use the same user interface software, and have identical functionality.

Rack Mountable System

Components of Base Subsystem

- **System Controller (SC):** provides DC power and distributes test parameters to one or two CG shelves, and also gathers test data from those shelves
- **Circuit Generator (CG) Shelf:** houses 1 to 20 CG or RG subsystems on a common midplane
- **Power and Interface (PI) Subsystem:** distributes power and data to the Abacus1 midplane
- **Cables:** intra-system and to connect to serial port on user's PC
- **User interface software:** 32-bit application that runs under Windows

User PC Control

- Asynchronous serial (COM port) for initialization
- LAN (TCP/IP)
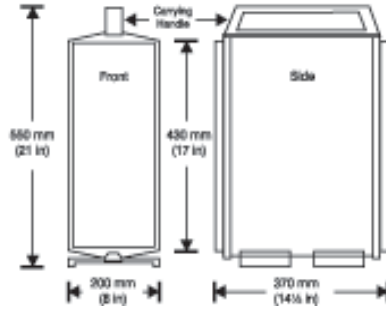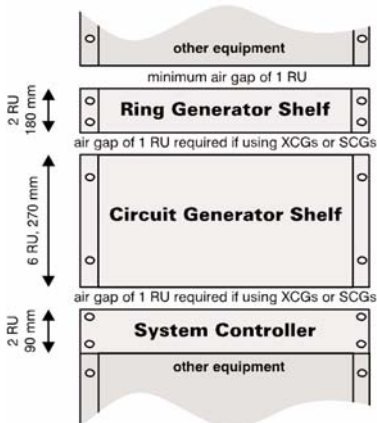
Environmental

- **Nominal AC input:** 100 to 240 Vac, 50 to 60 Hz
- **Power consumption:** maximum 300 W for entire system
- **Operating range:** 0° C to 40° C
- CE marked
- **Weight:** 5 to 35 kg

Portable System

Components of Base Subsystem

- Portable chassis has SC and CG shelf built in
- Power and Interface (PI)
- Subsystem distributes power and data to the Abacus1 midplane
- Cable to connect to serial port on user's PC
- **User interface software:** 32-bit application that runs under Windows

User PC Control

- Asynchronous serial (COM port) for initialization
- LAN (TCP/IP)

Environmental

- **Nominal AC input:** 100 to 240 Vac, 50 to 60 Hz
- **Power consumption:** maximum 85 W for entire system
- **Operating range:** 0° C to 40° C
- CE marked
- **Weight:** 11 to 13 kg

Minimum PC Requirements

- Pentium-class 133 MHz
- 32 MB RAM
- SVGA (800 x 600) resolution
- 15″ color monitor
- CD-ROM
- 30 MB free disc space
- 2-button mouse
- Free COM port or LAN
- Windows 2000 or NT 4 with SP5

Clock Sources for Digital Circuits

- Internal crystal oscillator on the PI subsystem
- External PCM signal (T1 or E1) connected to the PI subsystem
- External sine wave at 8,192 kHz or 10 MHz connected to the PI subsystem
- Receive signal on a digital card in the CG shelf
- For PCGs, independently recovered and looped from the receive signal

Audio Monitor on PI Subsystem

- Listen to speech of any four channels simultaneously (transmit or receive direction)
- 3.5 mm stereo headphone output
- Two bantam outputs for external monitoring equipment
- Two bantam inputs for injecting tones into any two channels in the CG shelf
- Listen to A-law or μ-law companded speech
- Alter volume from PC or from CG shelf

Working Off-Line (Demo Mode)

- Run user interface without Abacus1 hardware
- Emulate any hardware configuration of the Abacus1 system
- Create test configurations for later use with hardware

Expandability and Modularity

- 32-bit processor on each card
- DSPs on each card—non-blocking tone creation and tone detection for every channel
- Flash memory on each card—upgradeable in the field
- Firmware options enable additional functionality

Starting and Stopping a Test

Starting a Test

- **Call generation:** all channels initiate calls simultaneously or individually (timing is user programmable)
- **Switching:** all channels can answer simultaneously or individually (timing depends on system under test)
- **Delayed start:** start a test at a specific date and time
- **Batch mode:** configure a batch of tests to run in sequence
- **Manual start:** initiate a script on any channel at any time during a test

Length of a Test

- **Call generation:** select continuous, fixed period of time, certain number of scripts, or until specific date and time
- **Switching:** continuous or until call generating channels on the same system stop

Stopping a Test

- **Methods:** manually at anytime; automatically after the specified length of test has elapsed; automatically after a specific type of error
- **Graceful stop:** all channels finish executing their scripts at the stop of a test
- **Immediate stop:** all channels stop executing scripts regardless of status

Phone Numbers

Configuration

- Phone book method makes configuration easy
- Organize by circuit type, slot position, or mixture
- Phone number can be used for call generation (calling and called numbers) or switching (to determine routing)
- Specify own number, external number, and SPIDs (ISDN BRA)
- 1 to 20 digits for each number
- Supports same phone numbers on many channels (test ACDs with call generation or create hunt groups for switching)

Circuit Type

- Specify phone numbers independent of slot position
- Specify by channel, circuit, or card
- Sequential numbers or from a file

Slot Position

- Easily configure hunt groups across multiple circuits

Protocol Development

- **Functions:** view, edit, or create protocols
- **Analog protocols:** modify states and line conditions; graphical editor for state diagrams
- **CAS protocols:** modify states, signalling bits transmitted, and reaction to received signalling bits; graphical editor for state diagrams
- **ISDN protocols:** modify dialing method, information elements included in SETUP message, and maintenance
- **V5.1 and V5.2 protocols:** modify link start-up procedure, country variances, behaviour of call termination
- **Fax and data modem protocols:** modify the data rates, resolution, error correction mode and CSID for fax; modify modulation methods and error correction scheme for data modem
- **SS7 protocols:** modify timers, unblocking scheme, link speed, COT, and IAM parameters

Protocol Analysis

- Monitor data links of any 2 digital channels simultaneously
- Trace and decode CAS, ISDN PRA or BRA, GR-303 (TMC and signalling bits), V5.1 and V5.2, and SS7
- Save trace files of any length
- Trace circuit states of analog protocols

Test Timing - Call Generation

- Channels are grouped sequentially or randomly into sets
- Each channel of a set has common timing parameters and executes the same script
- Sets can be linked across circuit types to facilitate end-to-end tests
- Timing comprises start time (ST), start to start (SS), call length (CL), inter-call (IC), and call to call (CC)

Tone Capabilities

- Each channel can send or receive one or two frequencies simultaneously
- Programmable call progress tones verify that speech path is established (call generation) using a variety of path confirmation types
- Dial using DTMF, pulse, MF R1, MF R2, SS5
- Send or receive strings of digits
- Send and receive speech and music, and perform PSQM or PESQ analysis
- Send and receive data and fax over modem

Test Environments

- Current test configuration is automatically saved to disk on exit of user interface and automatically restored when user interface is rerun
- Save entire test configuration into a single file on user's PC
- Restore any environment file
- Specify a batch of environments to run sequentially

Reports

Formatted Report

- Print graphs
- Import graphics and logos
- Customize text and layout
- Customize contents
- Select frequency of report generation
- Save and view later

Text Report

- Customize format
- Customize contents
- Save as text file (read by any text editor)
- Select frequency of report generation
- Save and view later

Test Automation

- Use COM and DCOM technology to control the Abacus1 user interface from external test programs
- Use a program line interface to control the Abacus1 user interface from an external platform
- Integrate Abacus test environments into third-party automation tools

Ordering

The Abacus1 system can support various interfaces: T1 CAS, E1 CAS, SS5, ISDN PRA, ISDN BRA, analog, SLC-96, GR-303, V5.1, V5.2, and SS7. When unified with an Abacus2 or Abacus 5000, the Abacus family can support VoIP in addition to the above. A unifying user interface, Voice Connect, is available to help support this.

Interface cards (subsystems) may be purchased as required. Most subsystems have a range of firmware options that enable special features. Firmware options can be ordered individually or in combination.

Once the options are installed on a subsystem, the user interface software is used to select different functions.

Contact the Spirent sales representative in your area for details on configuration, pricing, and availability.

Second Channel In The Set

First Channel In The Set

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