SPIRENT Communications Inspired Innovation

Abacus™ 5000 – PCG3 Subsystem

T1 AND E1 TRAFFIC GENERATOR WITH CHANNEL ASSOCIATED SIGNALING

The Abacus 5000 PCG3 subsystem provides PCM circuits to emulate a telephone exchange (central office) or a terminal. The PCG3 subsystem simulates T1 and E1 call generation and switching.

APPLICATIONS

VoIP Convergence

- Test convergence to VoIP devices (in combination with ICG3 subsystem)
- Measure one-way delay between TDM and VoIP devices
- Verify functionality of media and voice gateways
- Check dial-up connectivity of voice traffic
- Assess voice quality
- Generate calls from a T1 or E1 link into an IP network through a media gateway

PBXs, Switches, Central Offices

- Create traffic
- Determine capacity

Transmission Equipment, Channel Banks, Multiplexers

- End-to-end test
- Verify transmission quality

Voicemail, IVR

- Transmit and receive account codes
- Generate traffic to leave messages
- Replay messages

Switching

- Switch PCG3 interface to PCG3, TCG3, XCG3 interfaces

The PCG3 subsystem provides TDM call generation and switching functionality to test PCM T1/E1 circuits with 24 or 30 channels per circuit. Each channel can be configured as an originating (calling party) or terminating (called party) channel. In call generation mode, the PCG3 subsystem executes a call setup/teardown for each channel and executes a media script that includes transmission and reception of audio signals and files. When performing switching, it routes a call from one channel to another channel on the Abacus 5000 system, based on the number dialed by the system under test.

PCG3 subsystems support 4, 14 or 28 full-duplex T1, or 4, 14 or 21 full-duplex E1 circuits.

Spirent has the most complete TDM, VoIP and analog solution in one platform using the same GUI. For TDM: OCG3, TCG3, PCG3, Abacus 50 T1/E1. For VoIP: ICG3, Abacus 50 Ethernet Test System. For analog: XCG3, ECG3, Abacus 50 Analog and Abacus 100 Analog.

PCG3 Front Card

T1 AND E1 TRAFFIC GENERATOR WITH CHANNEL ASSOCIATED SIGNALING

TCI3 Rear Card
(28/21-Circuits)

PCI3 Rear Card
(14-Circuits)

PCI3 Rear Card
(4-Circuits)

BENEFITS

- Simplify the testing of converged IP telephony and PSTN networks and services with functional and performance testing for SS7, T.30 fax, V.90 data modem, clear channel, SCCP/TCAP/IN and PSTN/IP ladder diagrams
- Achieve overall cost savings by giving the user full flexibility in convergence testing with synchronized IP, TDM and analog measurements with the same user interface

FEATURES

- Supports SS7 (ANSI, ETSI, ITU-T, China and Japan), CAS, MF R1/R1.5/R2, ISDN PRI, GR-303, V5.1/V5.2 and SLC-96/TR08 (Mode 1)
- 4, 14 or 28 full-duplex T1 with 24 channels per circuit at the T1 rate (1.544 Mbps)
- 4, 14 or 21 full-duplex E1 with 30 channels per circuit at the E1 rate (2.048 Mbps)
- 96, 336 or 672 channels (T1), or 120, 420 or 630 channels (E1)
- Call generation and switching
- Built-in protocol analyzers
- Custom protocols
- Sends and receives tones, PRBS and speech

- Performs voice quality measurements on each call using PSQM and PSQM+
- Performs voice quality measurements (PESQ) on 96 channels (T1), or 120 channels (E1) on 4-circuit PCG3
- Performs PESQ voice quality measurements on 392 channels on 14-circuit or 28/21-circuit PCG3
- PSQM, PSQM+ to MOS conversion
- MOS-LQO, R-factor (P.834) and J-MOS calculations from PESQ measurements
- Performs fax measurements on 96 channels (T1), or 120 channels (E1) on 4-circuit PCG3
- Performs fax measurements on 336 channels on 14-circuit or 28-circuit PCG3
- Programmable call progress tones
- Detects and forwards DTMF, MF R1/R1.5/R2 pulse dialing
- Flexible call sequences
- Generates over 600,000 (E1 PRI-ISDN) calls per hour per subsystem
- Switches over 400,000 (T1 PRI-ISDN) calls per hour per subsystem
- Program test duration to be random or fixed from 1 second to indefinite
- Verifies speech path is established and retained for duration of call
- Results are automatically and continuously gathered and presented in tables and graphs
- SS7 event analyzer
- T.30 fax up to 14.4 kbps
- Up to V.90 data modem (48 channels max for 4-circuits and 112 channels max for 14-circuits and 28/21-circuits)
- Echo measurements
- QSIG basic call support on ISDN PRI
- BRI over V5
- SS7 COT CCR
- 16 groups of SS7, PRI, GR-303, or V5 trunks per subsystem
- Clear channel
- Voice quality measurements and fax within one script
- 2048 logical channels with GR-303 concentration
- SCCP/TCAP/IN (ANSI and ITU-T)
- SS7 CIC phone book
- SS7 ISUP Configurability
- Call Tracer (ladder diagram for SS7)
- Load Profiling (Saw Tooth, Rectangle, Trapezoid and Poisson)
- Graphical display of Measurements-over-Time
- Facility message support in PRI
- Idle bit pattern
- Pulse dialing on V5.1 Exchange
- Perform QoS validation using the Scripting for Voice Pattern Matching

TONE SPECIFICATIONS

- Send any two frequencies with 1 Hz resolution
- Send noise or silence
- Send with a resolution of 8 ms and an accuracy of ±20 ms
- Detect two frequencies with a minimum difference of 10 Hz for no noise
- Detect energy or silence
- Detect signals with a minimum duration of 40 ms at various thresholds, with an accuracy of ±20 ms

PATH CONFIRMATION SPECIFICATIONS

- 3-tone: use series of three single frequencies
- Physical: use series of dual frequencies to identify unique address of channel
- Resilient: exchange tones with precise voice activation factor (VAF), and measure disturbances in the speech path
- PRBS: send and receive 2^{11}-1 or 2^{15}-1, and perform full-duplex BERT
- Programmable cut through time

VOICE QUALITY SPECIFICATIONS

- PSQM, PSQM+ and PESQ measurements
- PSQM, PSQM+ to MOS conversion
- MOS-LQO, R-factor (P.834) and J-MOS calculations from PESQ measurements

SPECIFICATIONS FOR MAKING AND RECEIVING CALLS

Making and Receiving Calls, Sending and Receiving Digits

- Signaling: DTMF, MF R1/R1.5/R2, pulse, and custom digits; transmit level, receive level and digit timing can be configured

DTMF or FSK Caller ID

- DTMF or FSK; send and receive with date and time
- Programmable timer for tone on and tone off
- Programmable make interval, break interval, and inter-digit pause for pulse dialing
- Number of digits selectable between fixed or automatically detected

Call Progress Tones

- Send and detect dial tone, ring back, busy, howler tone and congestion
- Programmable frequencies and cadences

Audio Monitor

- Listen to any 2 channels from the controlling PC

VOICE PATH MEASUREMENT SPECIFICATIONS

Perform measurements on each channel

- Delays
  - Dial tone
  - Single tone
  - Dual tone
  - Call acknowledgement
  - Call setup
  - Round trip
  - One way delay
- Hits and clips
  - Measure up to 1 second of interruptions in speech path (with resilient path confirmation)
- Bit error rate (with PRBS path confirmation)

SWITCHING SPECIFICATIONS

- Number dialed into a switching channel can comprise called and calling party numbers
- Number forwarded from Abacus 5000 can comprise called and calling party numbers
- Called and calling party numbers can be received and forwarded with prefix and suffix
- A single number can be allocated to any number of channels on Abacus 5000
- Maximum of 5 subsystems that stand in the left-most shelf slots

PROTOCOL SPECIFICATIONS

- CAS, MF R1/R1.5/R2, and pulse dialing
- Primary rate ISDN (US, ETSI, Lucent, Nortel Japan)
- GR-303 (IDT and RDT)
- V5.1 and V5.2 (AN and LE)
- SS7 (ANSI, ETSI, ITU-T, China, Japan)
- SCCP/TCAP/IN (ANSI and ITU-T)
- SLC-96/TR08 (Mode 1)
- QSIG basic call support on ISDN PRI

STANDARD FRAMING, LINE CODING AND SIGNALING SPECIFICATIONS

- T1 frame format: D4 and ESF
- E1 frame format: 2 frame, 16 frame, or 16 frame with CRC
- T1 line code: AMI, B8ZS
- E1 line code: AMI, HDB3
- Signaling included with T1 option: Loop Start, Ground Start, E&M, FGD
- Signaling included with E1 option: R2, China R1, T1097, T0466, E&M, Q.50

CUSTOM TDM PROTOCOLS SPECIFICATIONS

- Create protocols for T1 and E1
- Create any CAS state machine with unlimited number of states
- Each state sends any signaling bit
- Each state has 16 exit conditions
- Incorporate MF R2 state machine
- Send and detect caller ID and meter pulses

ECHO MEASUREMENT SPECIFICATIONS

- Echo cancellation on/off
- Echo delay
- ERL (Echo Return Loss)
- ERLE measurement (Echo Return Loss Enhancement)
- Talk Echo Loudness Rating (TELR) measurements
- Support echo measurements on 14 channels (supported only with the latest 14 and 28/21-circuit PCG3B subsystems)
- Support echo measurements on 6 channels (supported only with the latest 4-circuit PCG3B subsystem)

INTERFACES

- PCG3 subsystem for call generation, T1 and E1

PHYSICAL CONNECTIONS

- PCG3 front card with active components fits into one Abacus 5000 slot
- PCI3 rear card provides 4 or 14 RJ-45 connectors
- TCI3 rear card provides BNC and 68-pin connectors for the 28/21-circuit

ELECTRICAL SPECIFICATIONS

- T1 transmit level: 3 Vb-p
- E1 transmit level: 2.4 Vb-p for E1 75 ohms; 3 Vb-p for 120 ohms
- Transmit timing: recovered (loop) or derived from internal system clock
- Receive level: 0 to -6 dB from transmit level
- T1 line impedance: 100 ohms
- E1 line impedance: software selectable between 75 ohms and 120 ohms
- Isolation: 500 VAC rms between line and electronics

ORDERING INFORMATION

4-Circuits

- PCG3 subsystem for call generation: 4 circuits T1 (P/N PCG-3000B)
- PCG3 subsystem for call generation: 4 circuits E1 (P/N PCG-3001B)
- PCG3 subsystem with switching: 4 circuits T1 (P/N PCG-3002B)
- PCG3 subsystem with switching: 4 circuits E1 (P/N PCG-3003B)

14-Circuits

- PCG3 subsystem for call generation: 14 circuits T1 (P/N PCG-3004B)
- PCG3 subsystem for call generation: 14 circuits E1 (P/N PCG-3005B)
- PCG3 subsystem with switching: 14 circuits T1 (P/N PCG-3006B)
- PCG3 subsystem with switching: 14 circuits E1 (P/N PCG-3007B)

28/21-Circuits

- PCG3 Subsystem for call generation: 28 circuits T1 (P/N PCG-3008B)
- PCG3 Subsystem for call generation: 21 circuits E1 (P/N PCG-3009B)
- PCG3 Subsystem with switching: 28 circuits T1 (P/N PCG-3010B)
- PCG3 Subsystem with switching: 21 circuits E1 (P/N PCG-3011B)

TDM Bundles

- T1 call generation – Abacus 5000: 4 CKT-T1, with CAS, PRI and SS7 (P/N PCG-3020B)
- T1 call generation – Abacus 5000: 14 CKT-T1, with CAS, PRI and SS7 (P/N PCG-3021B)
- 4 CKT-E1 call generation – Abacus 5000 with CAS, PRI and ETSI+ITU-T SS7 (P/N PCG-3022B)
- 14 CKT-E1 call generation – Abacus 5000 with CAS, PRI and ETSI+ITU-T SS7 (P/N PCG-3023 B)
- 4 CKT-E1 call generation – Abacus 5000 with CAS, PRI and Chinese SS7 (P/N PCG-3024B)
- 14 CKT-E1 call generation – Abacus 5000 with CAS, PRI and Chinese SS7 (P/N PCG-3025B)
- T1 call generation – Abacus 5000: 28 CKT-T1, with CAS, PRI and SS7 (P/N PCG-3026B)
- 21 CKT-E1 call generation – Abacus 5000 with CAS, PRI and ETSI+ITU-T SS7 (P/N PCG-3027B)
- 21 CKT-E1 call generation – Abacus 5000 with CAS, PRI and Chinese SS7 (P/N PCG-3028B)

4-Circuit Firmware Options

- Call generation (P/N SWF-3030)
- Switching (P/N SWF-3031)
- E1 (P/N SWF-3032)
- T1 (P/N SWF-3033)
- PRI: NI, Lucent, Nortel, ETSI (P/N SWF-3034)
- GR-303 (TMC only), for T1 (P/N SWF-3035)
- V5.1 and V5.2, for E1 (P/N SWF-3036)
- ANSI SS7 (P/N SWF-3037)
- ETSI and ITU-T SS7 (P/N SWF-3038)
- Chinese SS7 (P/N SWF-3039)
- Japanese SS7 (P/N SWF-3040)
- SS7 Virtual Trunks (P/N SWF-3041)
- PSQM, PSQM+ (P/N SWF-3042)
- PESQ (P/N SWF-3043)
- T.30 fax up to V.17 (P/N SWF-3044)
- V.90 data modem (P/N SWF-3046)
- T.30 fax and V.90 data modem combo (P/N SWF-3049)
- BRI over V5 (P/N SWF-3051)
- SS7 COT CCR and advanced (P/N SWF-3053)
- MF R1.5 Signaling (P/N SWF-3054)
- SLC-96/TR-08 (Mode 1) (P/N SWF-3055)
- Clear channel (P/N SWF-3200)
- Echo measurements (P/N SWF-3222)
- SCCP/TCAP/IN (P/N SWF-3230)
- Scripting for Voice Pattern Matching (P/N SWF-3235)

14-Circuit Firmware Options

- Call generation (P/N SWF-3060)
- Switching (P/N SWF-3061)
- E1 (P/N SWF-3062)
- T1 (P/N SWF-3063)
- PRI: NI, Lucent, Nortel, ETSI (P/N SWF-3064)
- GR-303 (TMC only), for T1 (P/N SWF-3065)
- V5.1 and V5.2, for E1 (P/N SWF-3066)
- ANSI SS7 (P/N SWF-3067)
- ETSI + ITU-T SS7 (P/N SWF-3068)
- Chinese SS7 (P/N SWF-3069)
- Japanese SS7 (P/N SWF-3070)
- SS7 virtual trunks (P/N SWF-3071)
- PSQM, PSQM+ (P/N SWF-3072)
- PESQ (P/N SWF-3073)
- T.30 Fax up to V.17 (P/N SWF-3074)
- V.90 data modem (P/N SWF-3076)
- T.30 Fax and V.90 data modem combo (P/N SWF-3079)
- BRI over V5 (P/N SWF-3081)
- SS7 COT CCR and advanced (P/N SWF-3083)
- MF R1.5 Signaling (P/N SWF-3084)
- SLC-96/TR-08 (Mode 1) (P/N SWF-3085)
- Clear channel (P/N SWF-3201)
- Echo measurements (P/N SWF-3223)
- SCCP/TCAP/IN (P/N SWF-3231)
- Scripting for Voice Pattern Matching (P/N SWF-3236)

28/21-Circuit Firmware Options

- Call generation (P/N SWF-3260)
- Switching (P/N SWF-3261)
- E1 (P/N SWF-3262)
- T1 (P/N SWF-3263)
- PRI: NI, Lucent, Nortel, ETSI (P/N SWF-3264)
- GR-303 (TMC only), for T1 (P/N SWF-3265)
- V5.1 and V5.2, for E1 (P/N SWF-3266)
- ANSI SS7 (P/N SWF-3267)
- ETSI + ITU-T SS7 (P/N SWF-3268)
- Chinese SS7 (P/N SWF-3269)
- Japanese SS7 (P/N SWF-3270)
- SS7 Virtual trunks (P/N SWF-3271)
- PSQM, PSQM+ (P/N SWF-3272)
- PESQ (P/N SWF-3273)
- T.30 fax, up to V.17 (P/N SWF-3274)
- V.90 data modem (P/N SWF-3276)
- T.30 fax and V.90 data modem combo (P/N SWF-3279)
- BRI over V5 (P/N SWF-3281)
- SS7 COT CCR and advanced (P/N SWF-3283)
- MF R1.5 Signaling (P/N SWF-3284)
- SLC-96/TR-08 (Mode 1) (P/N SWF-3285)
- Clear channel (P/N SWF-3204)
- Echo measurement (P/N SWF-3224)
- SCCP/TCAP/IN (P/N SWF-3232)
- Scripting for Voice Pattern Matching (P/N SWF-3237)

FOR MORE INFORMATION

Visit Spirent Communications' Website at www.spirent.com/go/voice where you can learn about Spirent IP Telephony test systems and services, download product literature, white papers and test methodologies. Contact your local sales representative for details.

SPIRENT GLOBAL SERVICES

Spirent Global Services provides a variety of professional services, support services and education services — all focused on helping customers meet their complex testing and service assurance requirements. For more information, visit the Global Services website at www.spirent.com/gs or contact your Spirent sales representative.

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