Fortissimo is the world's smallest, high-capacity network load generation product designed to test and qualify the voice and packet network.

Fortissimo speeds up your system integration, functional and performance testing at an unbeatable price/performance ratio.

Fortissimo is designed to place calls to or receive calls from other Allegro, Fortissimo or AM3-QoS units to provide a complete test system of call generation and Quality of Service (QoS) measurements.

The Fortissimo family of network load generators represents a significant technological advancement in high-capacity call generation. Designed to meet the requirements of today's developer of both legacy and new generation switches including hardware and software modules. Operators focusing on system integration or revenue and quality assurance will also enjoy the functionality, ergonomics and costs of this solution. The Fortissimo packs the power of 192 simultaneous SIP/MGCP calls, up to 28 × T1/E1 spans, 1 DS3, 1 OC3/STM-1 or 100 × analog POTS (loop/ground) circuits in a unit that takes up 1 rack unit of space.

The Fortissimo comes in seven versions, each with the ability to support Ameritec’s industry leading QoS measurement package:

- Up to 100 2-wire analog loop/ground lines
- 1 DS3 circuit supporting CAS, PRI, SS7, GR303 signaling
- Up to 28 T1/E1 circuits
- Up to 192 SIP/MGCP circuits
- 1 OC3/STM-1 circuit
- Up to 50 4-wire handset/headset circuits
- Up to 32 FAX circuits
Applications

- Load Generation
- Cable Telephony
- Automated Testing
- FAX/Modem Recognition
- Quality of Service Testing
- Calling Feature Testing
- Network Testing

Operation

The Fortissimo products allow the developer to simulate various types of network traffic on a large number of spans or lines without having to consume a large amount of rack space. Maintaining full testing flexibility on a large line count is the premise behind Fortissimo. Each Fortissimo is controlled via a PC workstation over a 10/100 MB Ethernet port and utilizes a Conducto graphical user interface (GUI) that is intuitive and easy to use. Alternately, a command set option allows the user to remotely control units via a Telnet session for test automation applications. Full scripting of call scenarios is accommodated and manipulation of signaling protocols is provided to allow the user to fully test and debug equipment under test before releasing product to the next stage of development. Audio output is provided on the Fortissimo to complete the testing phase so that a developer can further verify the integrity of any call scenario.

Measurements

Long known for providing the most comprehensive set of measurements in the call generation industry, Ameritec has incorporated into every Fortissimo product the ability to simultaneously measure traditional call statistics such as calls originated and completed as well as a comprehensive set of QoS measurements designed to provide packet quality and voice quality scoring. This complete set of measurements provides the developer with PSTN to packet network correlation scores. The ability to utilize our GoldenVoice technology to measure packet loss, jitter, signal to noise ratio, clipping and delay while simultaneously providing R-factor, GMOS, GPSPM, and GPESQ scoring on all lines makes this product an invaluable development tool.

Enhanced Features

A modem QoS feature verifies accurate detection and transport of FAX, Modem and TTY/TTD signals in pass-through scenarios. The Echo Cancellation Test and Voice Echo Response test are features that can be used to detect and characterize Echo and verify operation of Echo cancellers. Synchronized call scripts provide the ability to test complex call scenarios such as A->B, A->B; B->A, conference calling, call waiting, etc.

A Cable Telephony Multiplexer is available for IP applications that require individual and unique Ethernet MAC addresses.

FAX call generation is available on all Fortissimo analog, DS3/DS1 IP units by either utilizing an appropriate license key or Fax Resource Module. This functionality provides full fax call simulation for TDM-TDM, IP-IP and TDM-IP applications.

Configuration

Upon power up, each Fortissimo prompts the user to recall previously stored test configurations from the PC. This includes the type of call programs that the user desires to run as well as G711, G729, T1, or E1 span selection, the type of signaling required (CAS, PRI, SS7 for digital units and loop or ground start for analog units), and any parameter settings that are required for a specific test. At the completion of any test, the user is prompted to store the unit’s configuration so that it may later be retrieved to verify test integrity or re-run a previous test. Virtually, an unlimited number of these configurations can be stored on the workstation for easy recall.

Performance

With the Fortissimo the user gets both high capacity call generation and high performance. Utilizing independent resources, each Fortissimo can generate as many calls as your equipment can support. The Fortissimo can configure nearly every parameter associated with the generation or answering of a call and therefore it is possible to test for load related issues as well as fundamental integrity issues. Additionally, multiple Fortissimo units can be used in a rack to increase call volumes without significantly increasing your investment.
**Voice channel functions**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detectors</td>
<td>Tone detectors are based on digital signal processors (DSPs) 1 per channel</td>
</tr>
<tr>
<td>Call progress detectors</td>
<td>- One detector per line or B-channel</td>
</tr>
<tr>
<td>Path confirmation</td>
<td>- One receiver per line or B-channel receiver</td>
</tr>
<tr>
<td>Signal tone decoders</td>
<td>One receiver per channel</td>
</tr>
<tr>
<td>Digit receiver</td>
<td>Decodes received DTMF, MFR1, MRF2 digits</td>
</tr>
<tr>
<td>Single frequency</td>
<td>64 selectable tones</td>
</tr>
</tbody>
</table>

**Audio monitor**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio port</td>
<td>Provides audio output for direct connection into PC speakers</td>
</tr>
<tr>
<td>Sync. ports</td>
<td>Synchronize multiple Fortissimo units or connect to AMSG unit of remote testing for QoS measurements</td>
</tr>
</tbody>
</table>

**Call programs and scripts**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>- Commonly used scripts supplied with unit</td>
</tr>
<tr>
<td></td>
<td>- Scripts created and downloaded from workstation or PC</td>
</tr>
</tbody>
</table>

**System**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>192 unique IP sessions, 100 analog lines, or 28 digital spans</td>
</tr>
<tr>
<td>Call volume</td>
<td>Typically 500 confirmed calls per hour per channel/line (DTMF dialing, tone ID confirmation, 2 unpaired lines)</td>
</tr>
<tr>
<td>Line types</td>
<td>- SIP/MGCP calls</td>
</tr>
<tr>
<td></td>
<td>- Loop start/ground start, 2 wire</td>
</tr>
<tr>
<td></td>
<td>- T1/E1 spans (CAS, PRI, SS7)</td>
</tr>
<tr>
<td></td>
<td>- Pulse, DTMF, MFR1 &amp; MFR2 dialing</td>
</tr>
<tr>
<td>System start modes</td>
<td>- Synchronous</td>
</tr>
<tr>
<td></td>
<td>- Random</td>
</tr>
<tr>
<td>Test interface</td>
<td>RJ45 (IP), RJ45 (T1/E1), BNC (DS3) amphenol (analog)</td>
</tr>
</tbody>
</table>

**Voice path confirmation**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel path verification voice circuit switched</td>
<td>10 user selectable single tone signals to send unique channel ID tones</td>
</tr>
<tr>
<td>Encoding scheme</td>
<td>0: 1025 Hz</td>
</tr>
<tr>
<td></td>
<td>1: 1150 Hz</td>
</tr>
<tr>
<td></td>
<td>2: 1275 Hz</td>
</tr>
<tr>
<td></td>
<td>3: 1400 Hz</td>
</tr>
<tr>
<td></td>
<td>4: 1525 Hz</td>
</tr>
<tr>
<td></td>
<td>5: 1650 Hz</td>
</tr>
<tr>
<td></td>
<td>6: 1775 Hz</td>
</tr>
<tr>
<td></td>
<td>7: 1900 Hz</td>
</tr>
<tr>
<td></td>
<td>8: 2025 Hz</td>
</tr>
<tr>
<td></td>
<td>9: 2150 Hz</td>
</tr>
<tr>
<td>Circuitswitch data</td>
<td>64 user selectable single tone signals</td>
</tr>
<tr>
<td></td>
<td>511 and 2047 BERT pattern test for 56 kb/s or 64 kb/s channels</td>
</tr>
<tr>
<td></td>
<td>511 bits pattern conforms to ITU-T O.153</td>
</tr>
<tr>
<td></td>
<td>2047 bits pattern conforms to ITU-T O.152</td>
</tr>
<tr>
<td>Packet switched data (PRI only)</td>
<td>Up to 5 user selectable X.25 packets for confirmation</td>
</tr>
</tbody>
</table>

**Voice over Packet**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice path confirmation voicer</td>
<td>GoldenVoice™ signal designed to pass through vocoder</td>
</tr>
<tr>
<td>Packet drop count</td>
<td>Count lost packets for frame sizes of 5, 10, 15, 20, 30, 40 and 100 ms</td>
</tr>
<tr>
<td>Measure delays through systems</td>
<td>- Round trip delay ± 10 ms resolution</td>
</tr>
<tr>
<td></td>
<td>- One way delay ± 5 ms resolution</td>
</tr>
<tr>
<td>Measure clipping of voice (leading &amp; trailing edge)</td>
<td>Peak and average clipping of standard reference with ± 5 ms accuracy</td>
</tr>
</tbody>
</table>
### Call statistics for each terminate line or channel
- Attempted calls count
- Completed calls count
- Custom code report count (programmable in test script)

### VoP statistics

#### Signal analysis tests
- Average and maximum dropout duration (ms)
- Dropouts categorized into 5 Bins
- Average and maximum front clip duration (ms)
- Front clips categorized into 5 Bins
- Average and maximum back clip duration (ms)
- Back clips categorized into 5 Bins
- Average and maximum jitter duration (ms)

#### Dropout tests
- Average and maximum dropout duration (ms)
- Dropouts categorized into 5 Bins
- No tone detected
- Tone lost

#### One-way delay tests
- Average, minimum, and maximum one-way delay (ms)
- One-way delay categorized into 5 Bins

#### Round trip delay tests
- Average, minimum, and maximum round trip delay (ms)
- Round trip delay categorized into 5 Bins

### GoldenVoice tests
- Minimum and maximum total energy
- Minimum and maximum signal to noise ratio
- Minimum and maximum GoldenVoice energy
- Maximum spurious energy overflow
- Spurious energy overflow
- Low signal to noise ratio

### GMOS tests
- Average and maximum percent (%) drop
- Drop packet size (ms)
- Drop test time (s)
- Average and maximum one-way delay (ms)
- Average and minimum circuit noise
- Minimum and maximum receive level
- Average and minimum round trip delay (ms)
- Terminating channel indicator
- Average and maximum SNR

### MQoS tests
- Equivalent data rate Kbps
- Total Bit Errors
- Total Block Errors
- Round trip delay
- MQoS score
- FAX pages sent per hour

### Echo Canceller tests
- Average energy level
- Max energy level
- Energy threshold exceeded

### Voice Echo Response tests
- Average energy level per time bin

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**Digit generators**

**Dialed digit strings are of unlimited length**

**Dial pulse generator**
- Programmable dial speed: 1 pps to 999 pps
- Dial break: 1 to 99%
- Inter-digit time: 1 to 999 ms

**Digit generators**
- One digit generator per line
- Dialing codes: MFR1, MFR2, DTMF
- Default level: -9 dBm
- Default frequencies: Nominal + 0.005%
- Programmability: Each line individually
- Programmable for level 0 dBm to -50 dBm in 1-dB steps for each frequency component
- Programmable frequency range: Up to 12.5 above or below nominal in 0.1% steps for each frequency component

**Printout and reports - call statistics**

**Manual reports**
- Call statistics for each line or channel
- Totals for all lines and channels

**Automatic reports**
- Prints automatically on the hour or every half or quarter hour
- Contents of each column in the printout are user selectable

**Call statistics for each originate line or channel**
- Call attempt count
- Call completion count
- Delayed start signal count
- No start signal count
- No alert signal count
- No voice path or B-channel confirmation count
- Busy signal encountered count
- No answer signal count
- Ring-time count (ISDN PRI)
- Average dial tone delay
- Average post dial delay
- Custom code report count (programmable in test script)
Digit generators - dialed digit strings are of unlimited length

**Dial pulse generator**
- Programmable dial speed: 1 pps to 999 pps
- Dial break: 1 to 99%
- Inter-digit time: 1 to 999 ms

**Digit generators:**
- One digit generator per line
- Dialing codes: MF R1, MF R2, DTMF
- Default level: -9 dBm
- Default frequencies: Nominal ±0.05%
- Programmability: Each line individually
- Programmable for level 0 dBm to -50 dBm in 1 dB steps for each frequency component
- Programmable frequency range: Up to 12.5% above or below nominal in 0.1% steps for each frequency component

**Ordering information**

Mainframe/Chassis/Test Set

<table>
<thead>
<tr>
<th>NLG-A</th>
<th>Fortissimo 100-line Analog POTS Call Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLG-DS3</td>
<td>DS3 Network Load Generator</td>
</tr>
<tr>
<td>NLG-M13</td>
<td>DS3/M13 Multiplexer</td>
</tr>
<tr>
<td>NLG-OC3-VT</td>
<td>DS3/OC3/STM-1 Multiplexer</td>
</tr>
<tr>
<td>NLG-IP</td>
<td>Fortissimo 192-IP session ETH 10/100 Call Generator</td>
</tr>
</tbody>
</table>

**Options**

- 250532 Fortissimo Command Set Feature
- 250533 Fortissimo G.729 Software
- 250538 Fortissimo Extended Feature Set

**Accessories**

- 190005 Fortissimo Protocol Development Kit
- 240091 XpressScript Visual Scripting Tool for Fortissimo

**Cables**

- 480182 RJ45 to RJ45 cable, 5 ft.
- 480163 RJ45 Modular to open end, 10' ea.
- 480164 RJ45 Modular to Miniator, 10' ea.
- 480165 RJ45 Modular to Sleeve, 10' ea.

Please ask for further information on:

- VoIP test applications including GMOS, PESQ, etc.
- Overview of supported protocol variants

All statements, technical information and recommendations related to the products herein are based upon information believed to be reliable or accurate. However, the accuracy or completeness is not guaranteed, and no responsibility is assumed for any inaccuracies. The user assumes all risks and liability whatsoever in connection with the use of a product or its applications. Ameritec reserves the right to change at any time without notice the design, specifications, function, fit or form of its products described herein, including withdrawal at any time of a product offered for sale. Please contact Ameritec for more information. Ameritec and the Ameritec logo are trademarks of Ameritec. Other trademarks are the property of their respective holders. © 2005 Ameritec. All rights reserved. 110707