

Fortissimo Capabilities Summary

Fortissimo Network Load Generators simulate PSTN and IP telephony subscribers generating large volumes of telephone traffic. They are used to validate the performance and proper operation of telephony networks and infrastructure equipment.

Fortissimo units support a wide range of telephony interfaces including analog POTS, IP, T1/E1, DS3, OC3/STM1 and wireless DECT. Analog units support complex impedances. Fortissimos support commonly used telephony protocols including SS7, PRI, DASS2/DPNSS, MFR1 and MFR2 CAS, SIP, MGCP, Loop Start and Ground Start. They support commonly used codecs, such as G.711, G.729, iLBC and G.722. All units interoperate, thus allowing testing between all supported interfaces. Fortissimos also interoperate with Allegro Network Load Generators.

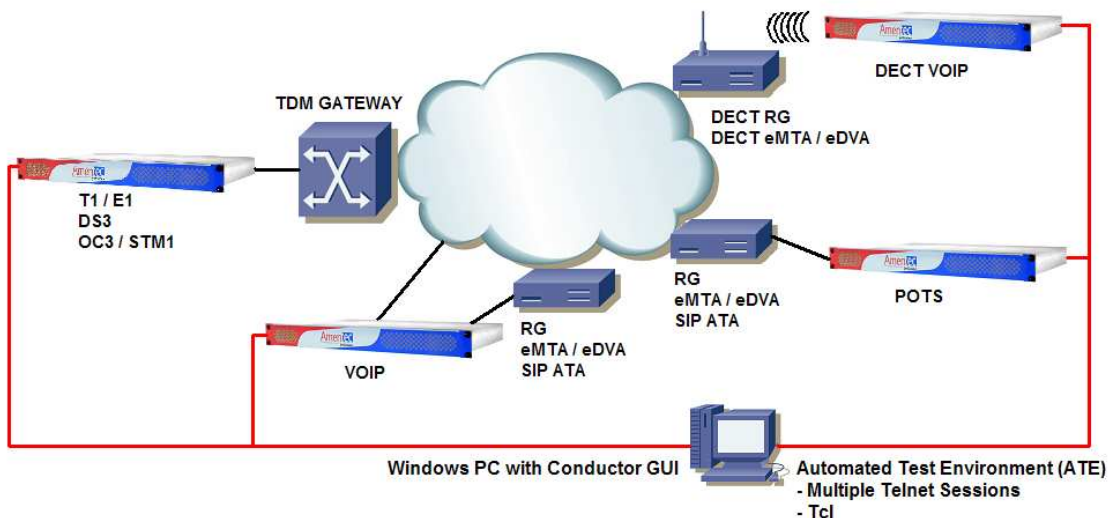
All Ameritec Network Load Generators are typically controlled via the supplied

Conductor GUI. Through Conductor the user may manage multiple units simultaneously as a single system. Each line or channel may be independently controlled, as well as programmed with unique parameter settings (call duration, intercall delay, etc.). Allegro or Fortissimo configuration files may be shared across systems, allowing test conditions to be easily reproduced in different test environments.

All Fortissimo units measure call completion performance and two-way voice path continuity. Fortissimo units can also objectively measure voice quality and voice path impairments.

Fortissimo Network Load Generators possess a flexible call scripting capability that allows the user to modify existing call scenarios or create new call flows.

Fortissimos may be automated via a test scheduler utility that resides within the Conductor GUI. Alternately, a command line interface allows external unit control via Telnet and TFTP. Fortissimos may also be managed via Tcl using an available Ameritec Tcl Extension.



VOICE PATH TESTING

Voice Path Integrity

Fortissimo call generators utilize real audio to verify 2-way voice path continuity for every call. Path verification tests can use:

- Single frequency tones
- DTMF or MF digits
- GoldenVoice audio for voice quality analysis and impairment measurements
- Bit Error Rate patterns

Voice Quality and Path Impairments

Fortissimo measures voice path quality and impairments utilizing ITU-T standard G.107, also known as E-model. The E-model was designed as a means of objectively estimating voice quality on transmission networks and thus is ideal for testing transport networks and equipment. Fortissimo produces R-factor and MOS scores as well as conversions to PESQ and PSQM scores. All lines or channels of a Fortissimo unit may be set to measure voice quality.

Fortissimo is unique in that it not only produces R-factor, MOS, PESQ and PSQM voice quality scores, but also the impairment values used to calculate these scores. Thus the user can see if a change in QoS score is due to delay (one-way or round-trip), audio path dropouts (packet loss), audio level or circuit noise.

Fortissimo is also unique in that it can produce and log these voice quality and impairment results for each call. Thresholds may be set allowing the user to capture only those calls that violate the threshold. *(Requires QoS Option)*.

HD Voice Quality

Fortissimo IP and DECT units support the widely used G.722 codec for HD (wideband) voice. The HD voice quality test operates similarly to the narrowband voice quality test, but it also verifies end-to-end wideband continuity and linearity of frequency response. *(Requires QoS Option)*.

Echo Detection

Fortissimo's Voice Echo Response Test can be used to detect and measure the level and duration of echo tail and is supported on any number of lines or channels.

Echo Cancellers

Digital and IP Fortissimo units can perform an Echo Canceller Test that verifies the effectiveness of echo cancellers by simulating echo and detecting that it has been removed. The user may specify the level and delay of the echo signal to determine the limits of the echo canceller. The Echo Canceller Test is supported on any number of channels. *(Requires Extended Feature Set Option)*.

Protection Switching

Fortissimo may be used to test protection switching or failover scenarios by detecting and measuring interruptions in the speech path from 5ms up to a user specified maximum value. *(Requires QoS Option)*.

SIP Videophone

Fortissimo IP can simulate SIP videophone calls and verify the transport quality. It measures the synchronization between each audio/video RTP pair, as well as Media Delivery Index, packet loss

and lost I-frames. *(Requires Video Skew Factor Option)*.

FAX AND MODEM TESTING

Fax

Fortissimo units can be equipped with fax call generation capability. Real fax simulation includes transmission of single or multiple pages, Group 3 fax format and data rates up to V.17. Analog and Digital Fortissimo units support T.30 fax endpoints, while Fortissimo IP supports T.38 fax endpoints. *(Requires AF or DS3-F models with NLG-FRM or IP model with T.38 Fax Option)*.

Modem Pass Through

Fortissimo can be used to verify the modem pass through mode of a VoIP gateway or network. Fortissimo transmits one of several available modem calling and answer tone combinations ranging from low-speed Bell and TTY modems to high-speed V.90. It then evaluates the transmission path for continuity, transparency and throughput. *(Requires Modem QoS Option)*.

CLASS FEATURE TESTING

Calling Features

The scripting flexibility of Ameritec call generators allows them to test a wide range of CLASS calling features. A sample list of supported calling features includes:

- 3-way Calling (A or B conferences)
- Call Forwarding (Unconditional, No Answer, Busy)
- Call Waiting (with or without Caller ID)
- Call Transfer (Blind or Attended)

- Call Hold
- Call Return

Ameritec can provide or assist with the creation of additional calling feature scripts. *(Requires Extended Feature Set Option)*.

Caller ID

Fortissimo Analog call generators support Caller ID (ANSI/Bellcore) detection and decoding for both SMDF and MDMF formats. Thus calling features that require Caller ID (such as Call Waiting with Caller ID) may be tested. Received Caller ID information may be captured and displayed on any number of lines. *(Requires Analog PLUS models)*.

IVR AND VOICEMAIL TESTING

Speech Energy Detection

Fortissimo can be used to test voice response and voicemail applications. When it is not possible to tag the speech prompts with known audio (DTMF or tone) Fortissimo may detect the energy of the voice prompt and respond appropriately. *(Requires QoS Option)*.

Voice Replay

The ability to playback speech is often needed when testing applications such as IVR and voicemail. Fortissimo call generators may store and play 60 seconds of recorded speech phrases or other audio samples. *(Requires Voice Replay Option)*.

CALL FLOW CREATION

Custom call flows for testing conference bridges, calling features, voicemail and other applications are created via the XpresScript graphical scripting tool.

XpresScript features a visual “drag and drop” interface, where the user pulls action blocks from categorized pallets and interconnects them to create a call flow. XpresScript compiles the completed script into a downloadable format and checks the script’s structure. XpresScript may be used as a standalone application or accessed from the Conductor GUI. *(Requires XpresScript).*

AUTOMATION

Command Line Interface

Fortissimo may be externally controlled via simple text commands over a Telnet session. The user may load configuration files from a TFTP server; change parameter and line assignments in the configuration; control test execution at the unit, span or line/channel level; and request reports. *(Requires Command Set Option).*

Tcl Extension

An Ameritec extension is available for the Tcl programming language that simplifies the automation process. The extension passes Command Set commands to Fortissimo units, manages multiple Telnet sessions for multi-unit control and captures asynchronous responses and reports. *(Requires Tcl Option).*

NETWORK TESTING

Fortissimo call generators may be deployed throughout a live network and used to verify the network’s quality and performance.

Call Completion Testing

Fortissimo call generators may originate calls to existing network endpoints, such as test lines or voice response terminations, and provide positive

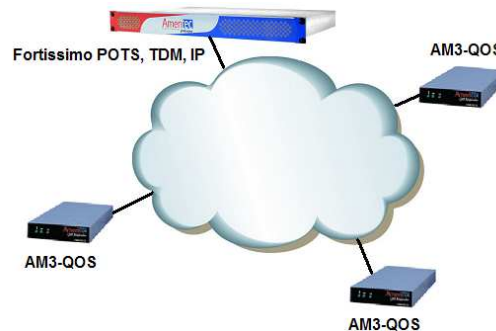
detection of call answer. Results include a customizable call detail record issued for each call that can include time of call, calling number, called number, pass/fail status and other information.

Voice Quality Testing

For voice quality testing, distributed Fortissimo units serve as both the call originators and call terminators and voice quality is measured between the Fortissimo endpoints. In addition to the call detail record information, voice quality scores and path impairment measurements are provided per call.

AM3-QOS Responders

AM3-QOS responders provide cost effective call terminators when network voice quality measurements are required. A centrally located Fortissimo calls remote AM3-QOS responders, which answer and play the audio needed for voice quality and path impairment measurements.



FORTISSIMO FAMILY

NLG-A	Fortissimo Analog Network Load Generator: (100) loop start lines
NLG-A-PLUS	Fortissimo Analog Network Load Generator: (100) loop start lines with caller ID and complex impedances
NLG-AF	Fortissimo Analog Network Load Generator: (50) loop start lines, supports (32) fax lines
NLG-AF-PLUS	Fortissimo Analog Network Load Generator: (50) loop start lines with caller ID and complex impedances, supports (32) fax lines
NLG-AG	Fortissimo Analog Network Load Generator: (50) loop start or ground start lines
NLG-H	Fortissimo Handset Network Load Generator: (50) 4-wire handset or headset connections for IP or mobile phones
NLG-DECT	Fortissimo DECT Network Load Generator: (20) DECT RF interfaces
NLG-IP	Fortissimo IP Network Load Generator: (192) SIP endpoints
NLG-DS3-F	Fortissimo DS3 Network Load Generator: (1) DS3, supports (32) fax channels
NLG-M13	M13 Multiplexer for NLG-DS3-F: provides (28) T1 spans or (21) E1 spans
NLG-OC3-VT	OC3/STM-1 Multiplexer for NLG-DS3-F: provides 1 OC3 or STM-1 connection
AM3-QOS	Analog QoS Responder: (1) loop start line
AM3-QOS-IP	SIP QoS Responder: (1) SIP endpoint