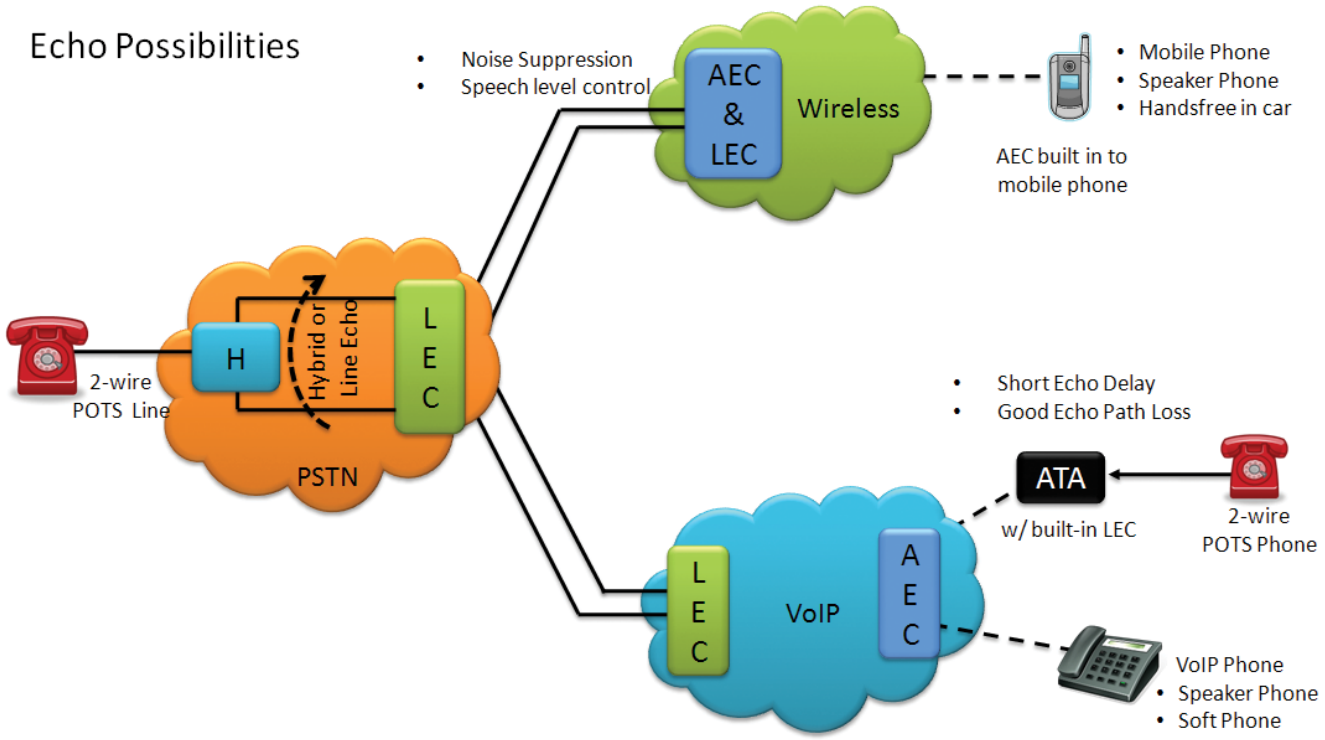
Echo Canceller Testing in VoIP Networks



Echo Testing Solutions

In VoIP networks - gateways and ATAs usually contain echo cancellers (ECs) to cancel the echo generated by the landline 2/4 wire hybrids. To effectively test ECs in such elements, access to 2-wire, T1, E1, and IP sides of these elements are necessary. GL's test tools provide access to all these interfaces for performance testing and G.168 compliance testing of ECs in such VoIP network elements. Various solutions and configurations are described below.

GL's ITU-T Specification **G.168 EC Compliance Test Suite** are developed for testing Echo Cancellers (EC) that reside within a VoIP (Voice over Internet Protocol) and TDM (Time Division Multiplex) environments.

GL's **RTP ToolBox™** is used to provide a VoIP test interface creating RTP streams to send and record test files. The application includes the ability to send different types of traffic including, voice files, digits, tones, RTP events, and so on. For inter-working with TDM networks, RTP Toolbox™ can be used with **GL's T1E1 analyzer**. In addition, RTP Toolbox™ includes client-server command-line modules for automation and GLC View application for graphical analysis.

GL's **Voice Band Analyzer (VBA)** is an analysis tool developed for monitoring the quality of voice band Traffic for Voice Quality Analysis over VoIP, TDM and Wireless Networks.

For more information, please visit VoIP EC Testing Solutions webpage.

Main Features

- Performance testing of ECs in ATAs and Gateways
- G.168 compliance testing of ECs in ATAs and Gateways
- Access to the IP interface with RTP Toolbox™
- Access to the T1 E1 interface with GL's T1 and E1 Cards
- Ability to simulate in real time - echo, delay, attenuation, dispersion, and more
- Ability to measure and verify compliance to G.168
- Manual, semi-automated, and fully automated test configurations
- Monitor voice band traffic for voice quality using VBA

GL Communications Inc.

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A

(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com

Manual G.168 EC Compliance Testing of ATAs and Gateways with a Two-Wire Interface

- Manually test most G.168 compliance cases
- Echo Path Loss (EPL) & Echo Path Delay (EPD) not controllable due to being embedded in gateway
- Use RTP ToolBox™ (PKB100) and G.168 compliance test suite (PKB105)
- Uses GLC View to manually analyze G.168 compliance
- More information is provided at VoIP ATAs on specific G.168 procedures covered
- Manual procedures are very similar to the procedures provided at Manual EC Testing

Items required for this solutions- **PKB100**, **PKB105**.

For more information, please visit VoIP Solution 1 webpage.

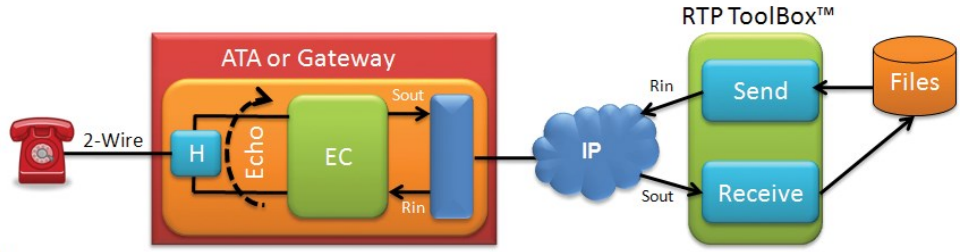


Figure: EC Testing ATAs & Gateways with Two-Wire Interface

Manual G.168 EC Compliance Testing of ATAs and Gateways with T1 E1 Interfaces

- Manual testing of all G.168 cases
- Echo Path Loss (EPL) and Echo Path Delay (EPD) fully controllable in T1/E1 card
- Use RTP ToolBox™ (PKB100) and G.168 compliance test suite (PKB105)
- Dual HD T1/E1 card (HDT001 or HDE001) with Delay /Attenuate software
- Uses GLC View to manually analyze G.168 compliance
- Full automation currently not available (coming soon)
- Manual procedures are very similar to the procedures provided at Manual EC Testing

Items required for this solutions- **PKB100**, **PKB105**. + **T1 E1 Hardware**, **Software**.
For more information, please visit VoIP Solution 2 webpage.

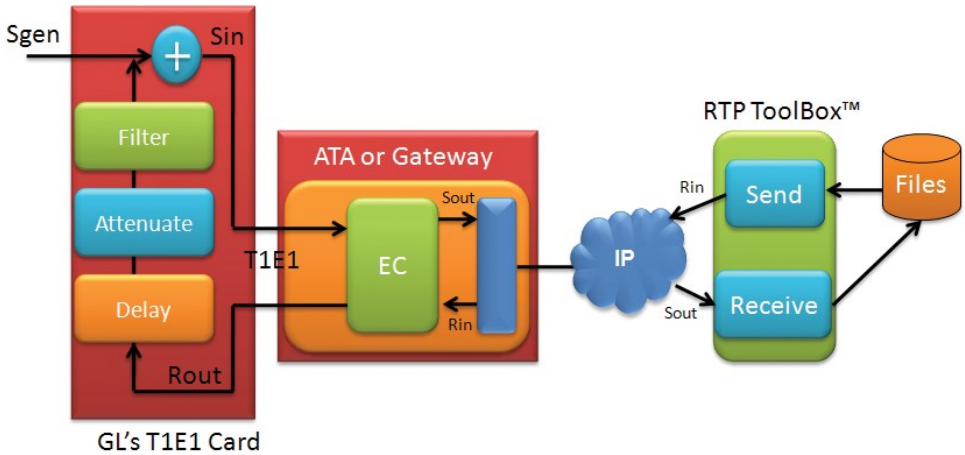


Figure: EC Testing ATAs & Gateways with T1/E1 Interface

Automated G.168 EC Compliance Testing of ATAs and Gateways - All IP Solution

- AutoECTest talks via a CLI (Command Line Interface) to an RTP Toolbox™ Server
- RTP Toolbox™ Server establishes two RTP sessions with the EC under test
- Full automation requires that Rout, Sin, Rin, and Sout streams are available through the IP interface
- Semi – automated operation is also possible with manual control of the EC
- For each compliance test in the G.168 test suite
  - Sin and Rin signals are transmitted files
  - Rout and Sout are captured files via the IP interface
  - Sout is analyzed by AutoECTest and the results displayed graphically

Items required for this solutions- **PKB100**, **PKB067, PKB110**

For more information, please visit VoIP Solution 3 webpage.

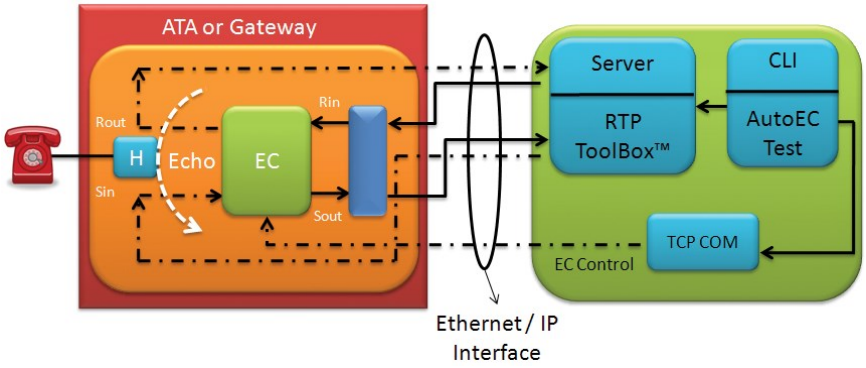


Figure: EC Testing of ATAs & Gateways - All IP Solution

Automated G.168 Compliance Testing of Gateways - Back to Back Gateway Solution

- Back-to-back gateways with testing interface at T1 E1 side
- Full Automation
- Full manual testing
- Semi-automated testing
- Quick performance testing is also possible -
  - GUI Based Echo Canceller Testing
  - Digital Echo Canceller
  - Loop Delay/ERL

Items required for this solutions- **XX067**, **XX062**, **XX063**, **XX066**, **XX020, XX065,** + **T1 E1 Hardware**, **Software** .

For more information, please visit VoIP Solution 4 webpage.

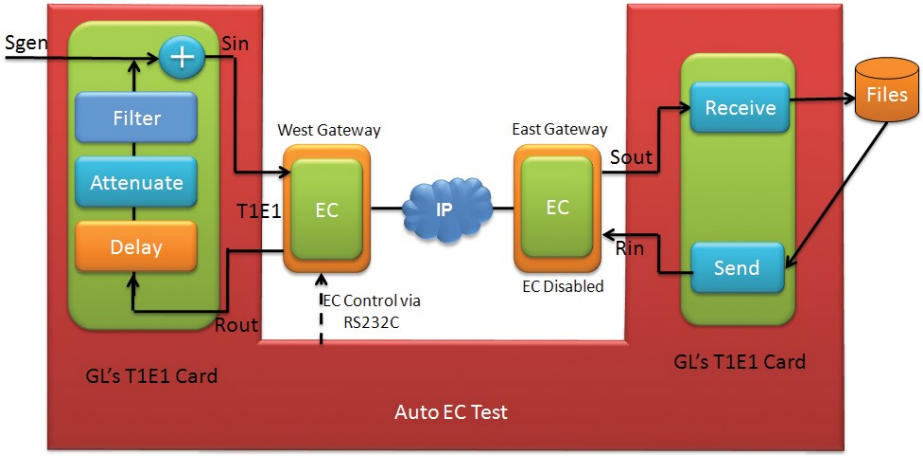


Figure: Automated EC Testing of Gateways

Automated G.168 EC Compliance Testing of Gateways –VoIP & TDM Interfaces

- Test ECs in Gateways
- Echo Path Loss (EPL), Echo Path Delay (EPD), and hybrid dispersion fully controllable in T1/E1 card
- Use of RTP ToolBox™ (PKB100) and Client-Server (PKB110) for automation on IP side
- Use of Windows Client Server (xx600, xx610, and xx630) for automation on TDM side
- Requires Dual HD T1/E1 card (HDT001 or HDE001) or USB T1 E1 Analyzer (UTE001)
- Use of Windows Client Server (xx600, xx610, and xx630) for automation on TDM side
- Automatic procedures are very similar to the procedures provided at Fully Automated EC Compliance Testing per G.168 for VoIP and TDM systems

Items required for this solutions- **PKB100**, **PKB067, PKB110, +T1 E1 Hardware**, **Software.**

For more information, please visit VoIP Solution 3b webpage.

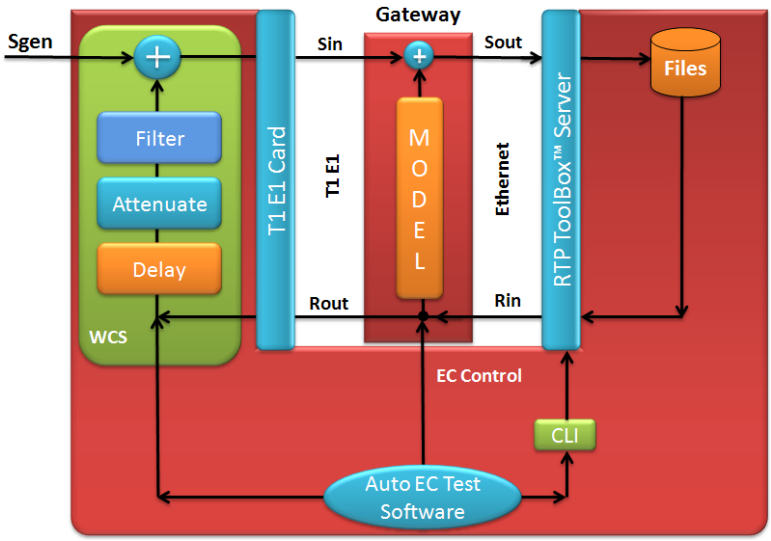


Figure: EC Testing of ATAs & Gateways - VoIP & TDM interfaces

Measurement of Echo Return Loss (ERL) and Echo Loop Delay (ELD)

- Non-intrusive measurement of Echo Return Loss (ERL) and Echo Path Delay using GL's Echo Measurement Utility (EMU037)
- Supports different echo types (sidetone, line, and acoustic echo)
- The following components are either required or recommended
- For VoIP – VQuad™ or RTP Toolbox™
- For 2Wire – VQuad™ with Dual UTA

Items required for this solutions- **EMU037, PKB100**, **VQuad Hardware**, **Software.**

For more information, please visit Echo Measurement Utility webpage.

Network Monitoring of Hybrid Echo and Voice Quality

- VBA works in conjunction with GL's TDM, Packet, and Wireless non-intrusive capture products, such as T1 and E1 Call Capture and Analysis, VoIP PacketScan™, and GSM, CDMA, and 3G Call Capture Products.
- Required software PKV100 and VBA032 at each probe location and PKV170 PacketScanWeb™ - Network Surveillance Software
- Required hardware - 1U rack PC with sufficient hard disk for capturing over 10,000 calls (80 GB HD) for each VBA collocated with a probe
- Additional hardware - PC for (PKV100) VoIP PacketScan ™ Software
- Also see Voice Band Analyzer

Test the Acoustic Echo Cancellation per G.167

- Simulate acoustic echo into modules such as a Sound Card, a Mobile Phone, a Regular Phone, an IP Phone, or a Speaker Phone
- Generate dynamic (changing) acoustic echo
- Test acoustic echo cancellers in mobile phones and other signal processing devices
- Acoustic filter types includes Static and dynamic kinds of Small Office, Medium Office, Large Office and room impulse response (RIR) generator based on room parameters)
- Levels for pseudo speech, Echo path delays and losses
- Allows real-time testing using DSP commands to perform functions such as Amplification/Attenuation, Delay, Filter, File Tx/Rx, Logical , and Echo Cancel operations.
- The following components are either required or recommended
- PKB100 - RTP Toolbox™ software
- PKBxxx - RTB Toolbox™ Server software and Command Line Software

For more information, please visit Acoustic Echo Simulation webpage.

Buyer's Guide

Item No	Product Description
PKB067	AutoECTest - Automatic G.168 Compliance Test Suite
PKB105	G.168 Echo Canceller Test Compliance Suite
PKB080	AutoECTest TDM-VoIP Fully Automated EC Testing per G.168 for combined TDM-VoIP Interfaces
PKB100	RTPToolBox™
PKB110	RTPToolBox™ Client-Server Application (C++, TCL)
PKV100	PacketScan™ (Online and Offline)
PKS170	PacketScanWeb™
VBA032	Near Real-time Voice Band Analyzer
XX020	Record / Playback File Software
XX062	Echo Path Delay / Loss Simulation
XX063	Echo Path Delay / Loss Measurement Software
XX065	Manual G.168 Echo Canceller Test Suite
XX066	Digital Echo Canceller
XX067	Automated Echo Canceller Testing w/o VQT
XX610	File based Record / Playback
XX620	Transmit/Detect digits
XX630	DSP Functionality

For more information, please visit VoIP EC Testing Solutions webpage.

GL Communications Inc.
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A
(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com