

Tellabs® 5500 Digital Cross-Connect System (DCS) Integrated Voice Quality Enhancement (iVQE)

Introduction

Tellabs® echo cancellation and Voice Quality Enhancement (VQE) solutions deliver superior voice quality in long-distance and wireless networks to over 300 customers in 70 countries. Tellabs has one of the world's largest installed base of echo cancellation circuits. Customers rely on Tellabs products to control echo, improve call quality, and enable service providers around the world to meet the high call quality standards their customers expect.

Tellabs® 5500 Digital Cross-Connect System (DCS) Integrated Voice Quality Enhancement (iVQE) provides a unique solution for operators to incorporate voice quality enhancements into their networks as part of their digital cross-connect needs. It allows carriers to achieve added benefits from their Tellabs® 5500 Digital Cross-Connect System (DCS) including savings on footprint, power, installation time and administrative costs. iVQE provides more rapid deployment of new VQE functionality and facilitates replacement of low-density, higher power, legacy echo cancellers. The new Tellabs 5500 iVQE delivers industry-leading voice quality and enhances network performance for digital wireless and long-distance service providers.

Features and Benefits

- **Integrates the Tellabs best-in-class VQE technology into the High-Density 96 (HD-96) port shelf of the Tellabs 5500 system.**

Two new VQE mapper modules provide both VQE and traditional cross-connect functionality. The MM24V (VQE mapper module) delivers up to 128 ms endpath delay processing and the MM24VE (VQE extended mapper module) delivers up to 255 ms endpath delay processing, one of the best in the industry. Both the MM24V and MM24VE support the current functionality of the existing Tellabs 5500 system mapper modules in addition to providing Tellabs VQE. The MM24V/VE fits into the existing mapper module slots of the Tellabs 5500 system High Density 96 (HD-96) shelf. Each MM24V has a capacity of 4032 voice channels (6 STS) of Tellabs iVQE, for a total of 16,128 voice channels (24 STS) per HD-96 shelf. The MM24VE module has a capacity of 2016 voice channels (3 STS) of Tellabs iVQE, for a total of 8,064 voice channels (12 STS) per shelf. Remaining HD-96 shelf capacity can be used for traditional digital cross-connects, thereby optimizing the utilization of the HD-96 capacity. The MM24V/VE provides any-to-any interface flexibility as all current and future interfaces on the Tellabs 5500 system can be routed to the MM24V/VE for VQE processing. Tellabs 5500 iVQE allows carriers to provide consistent voice quality across all switch vendor types and feature package loads without using switch resources or separate VQE equipment.



Tellabs® 5500 Digital Cross-Connect System and Port Shelf

- **Delivers superior voice quality throughout the entire call.**

Tellabs 5500 iVQE incorporates Tellabs' latest generation voice processor technology to deliver superior performance for even the most challenging network environments. Tellabs 5500 system iVQE can provide fast and stable convergence across a wide range of echo paths, during call transfer and wireless hand-offs and after abrupt changes in network routing. Tellabs' technology also can provide superior double-talk (simultaneous conversation) capability, even in high background noise situations.

In addition to echo control, other voice quality enhancements include Tellabs® Acoustic Control (TAC), Tellabs® Noise Reduction (TNR), Tellabs® Adaptive Gain (TAG) and Tellabs® Level Control (TLC). TAC provides protection from acoustic echo generated in wireless handsets and hands-free kits, minimizing clipping and enhancing double-talk performance. TNR reduces background noise typically found in wireless environments, further improving call intelligibility. TAG enhances speech clarity in a noisy environment by adjusting gain and spectral components of the signal going to the mobile user.

Voice level variations that are found in today's multi-vendor, interconnected networks are addressed with TLC. TLC adjusts speech levels to the optimal level for the network, lowering levels that are too high to prevent further overload distortion, and compensating for levels that are too low, while preserving conversational dynamics. As a result, speech clarity and intelligibility are substantially improved by maintaining consistent levels during the entire call and throughout the network.

- **Reduces operating, capital and maintenance costs.**

By deploying Tellabs 5500 iVQE, service providers will realize economic and operational savings in their network. Eliminating separate VQE equipment provides a “zero-footprint” advantage — enabling carriers to conserve valuable floor space in their switching offices. It also reduces points of failure in the network, reduces installation, testing and maintenance costs, and minimizes central office cable congestion. Like the existing mapper module, the MM24V/VE supports software field upgrades without service interruption. Other benefits include lower power consumption and full integration with the Tellabs® MetroWatch® solution.

- **Provides highest density, most reliable VQE solution.**

Tellabs 5500 iVQE is twice as dense as 12 OC-3 per rack stand-alone systems. Each MM24V module has a VQE capacity of 4032 voice channels (6 STS) for a total of 16,128 channels (24 STS) per HD96 shelf (or 8 OC-3s). Each rack can provide up to 48,384 channels (72 STS) of VQE (or 24 OC-3s). The system is also architected for high reliability and redundancy with a 4:1 protection scheme for the MM24V mapper modules.

- **Provides VQE solution for longer amounts of end path delay.**

The MM24VE provides both Tellabs best-in-class VQE performance, and endpath delay processing up to 255 ms, one of the best in the industry. Today's wireless and wireline carriers are concerned about the increasing delays resulting from transporting of telephone calls over nationwide fiber rings and the additional packetization delays resulting from VoIP calls. Delay causes echo to become more noticeable, and the MM24VE allays carriers' concerns about increasing endpath delays by providing endpath delay processing up to 255 ms. The MM24VE module has a capacity of 2016 voice channels (3 STS) of Tellabs iVQE, for a total of 8,064 voice channels (12 STS) per shelf.

- **Provides both Loop-Around and In-Line VQE Configurations — both with identical VQE features.**

The MM24V/VE can be easily provisioned via software into either a “Loop-Around” or “In-Line” configuration, thereby maximizing wireless and wireline carriers' flexibility to fit within their current network architecture.

The Loop-Around configuration shown in Figure 1 allows carriers to leave their existing network architecture intact, and uses the Tellabs 5500 system grooming functionality to route the traffic to the MM24V/VE for VQE processing. For wireless networks, the Loop-Around configuration allows an operator to load balance the voice and cell traffic on both the MSC and PSTN interfaces. It also provides greater flexibility, by supporting any-to-any interface cross-connects through the Tellabs 5500 system. One other advantage of the loop-around configuration is that there is no additional wiring or cabling required, as traffic is routed to VQE inside the Tellabs 5500 system via intra-system cabling. The Loop-Around configuration supports up to 24 STS's worth of VQE per shelf, leaving 48 STS's available for traditional digital cross-connects per shelf.

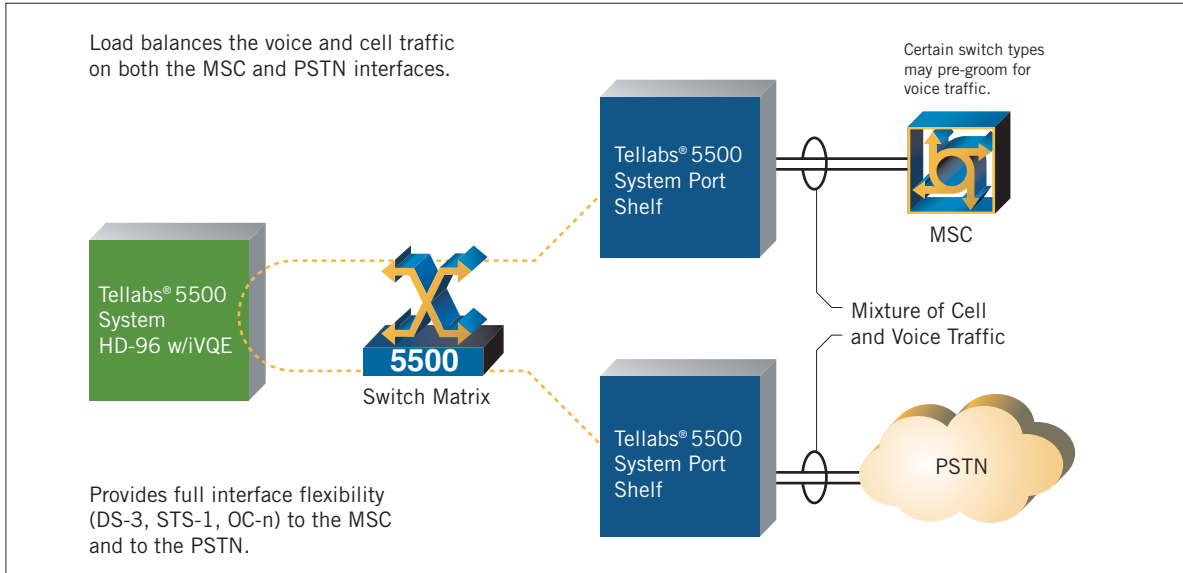


Figure 1 – Tellabs 5500 System iVQE Loop-Around Configuration

For start-up Tellabs 5500 systems applications with VQE, a more ideal configuration consists of just the Tellabs 5500 system HD-96 shelf with VQE and the Tellabs 5500 system switch matrix — without the need for additional port shelves. Since the Tellabs 5500 system HD-96 shelf performs both VQE and digital cross-connect functionality, additional port shelves are not required.

The In-Line configuration shown in Figure 2 optimizes Tellabs 5500 system switch matrix and module utilization. In this configuration, traffic routes directly to the MM24V/VE for VQE processing, then routes through the Tellabs 5500 system to the terminating facility. The In-Line configuration optimizes Tellabs 5500 system port and switch matrix utilization. It supports up to 24 STS's worth of VQE per shelf, leaving 72 STS's available for traditional digital cross-connects.

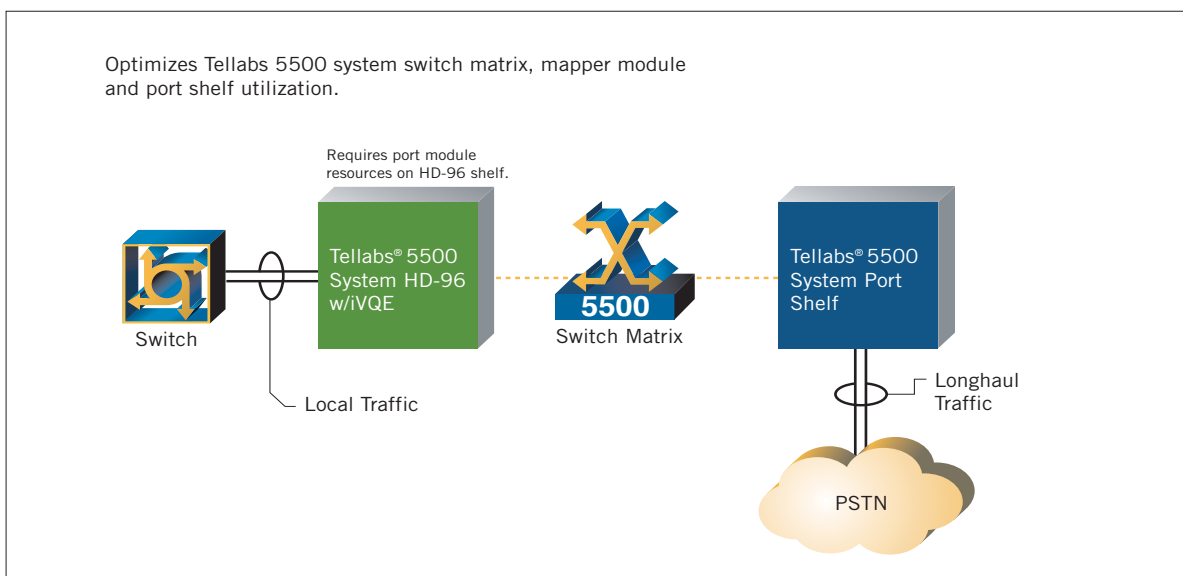


Figure 2 – Tellabs 5500 System iVQE In-Line Configuration

VQE Specifications

HYBRID ECHO CANCELLATION

Endpath Delay

- MM24V: User selectable 64 or 128 ms
- MM24VE: User selectable 64,128,192 or 255 ms

Convergence Time

- ITU-T G.168 (2002) compliant

Echo Return Loss Enhancement (ERLE)

- ITU-T G.168 (2002) compliant

Minimum Echo Return Loss (ERL)

- User selectable 0 or 6dB

ACOUSTIC ECHO CANCELLATION— TELLABS ACOUSTIC CONTROL (TAC)

Endpath Delay

- 180-360 ms

Terminal Coupling Loss (TCL)

- User selectable, 25 or 35 dB

Tellabs Noise Reduction (TNR)

- 10dB reduction of noise typical, even during periods of speech

Tellabs Level Control (TLC)

- ITU-T G.169 compliant
- User selectable, Uni- or Bi-directional operation
- User selectable Target Audio Level (TAL) settings -12, -15 or -18dBm0

Signal-Processing Delay

(MM24V/VE processing delay only)

- Send-side processing:
VQE: <0.125 ms
- Framing: 0.5– 1.25 ms
- Receive-side processing:
VQE: 0.125 ms
- Framing: 0.5– 1.25 ms
- TNR: 8 ms

Data Tone Disabler

- 2100Hz per ITU-T G.164 or 2100 Hz with two phase-reversals per ITU-T G.165 and G.168

Signaling Systems Support

- Idle Code: Supports 7F and FF
- Channel Associated Signaling (CAS): Supports E&M signaling

VQE Capacity

- Shelf: 16,128 bi-directional voice channels (24 STS) with MM24V; 8,064 bi-directional voice channels (12 STS) with MM24VE
- 7 ft. rack: 48,384 bi-directional voice channels (72 STS) with MM24V; 24,192 bi-directional voice channels (36 STS) with MM24VE

Regulatory / Environmental / Power

- Refer to Tellabs 5500 DCS User Manual

Ordering and Availability

Tellabs 5500 system iVQE functionality is available now. For more information, please contact your local Tellabs sales representative, local Tellabs sales office or visit www.tellabs.com.

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