



## Narrowband Echo Cancellation Platform

# Quad 2 T1

Quad 2 T1 Carrier Shelf



Quad 2 T1 Enterprise Shelf



Ditech Networks' Quad 2 T1 offers the industry's leading hybrid echo tail coverage of up to 192 ms, giving service providers guaranteed echo coverage for all types of networks: wireline, wireless, VoIP, and international. In addition to cancelling hybrid echo, unidirectionally or bidirectionally for added echo elimination, the Quad 2 T1 offers optional acoustic echo control and noise reduction. Utilizing the latest in digital signal processing technology, the Quad 2 T1's compact design allows support for up to 1,920 voice channels per shelf.

### High Density Echo Cancellation

The Quad 2 T1 delivers high-capacity echo cancellation while providing voice quality features that include Adaptive Noise Reduction (ANR), unidirectional Acoustic Echo Control (AEC), and network voice level controls. Other innovative features include local or remote in-service software upgrading, and Reflectometry™ for real-time characterization and performance monitoring of each channel in a network.

Reflectometry combines advanced software algorithms with powerful DSP engines to detect subtle changes in network conditions and measure and report anomalies, allowing service providers to remotely identify and proactively address voice quality problems. Remote provisioning, control, and monitoring of the Quad 2 T1 is easy and efficient with Ditech's WinMAP™ software for terminal access and NetConsul™ EMS software for system element management.

### Enterprise Solution

When installed in the 4sa Enterprise shelf, the Quad 2 T1 provides a cost-effective solution for Enterprise or Remote Office applications, providing echo cancellation for between 1 and 4 T1s in a compact, tabletop or rack-mountable, AC- or DC-powerable chassis with RJ-48 or wire-wrap connectors.

### Carrier Solution

When installed in the 80sa Carrier shelf, the Quad 2 T1 provides a high-density narrowband echo cancellation solution that easily scales from 1 to 80 T1s per 19" rack-mount shelf assembly. The 80sa Carrier shelf is available with either wire-wrap or Amphenol connector options and is engineered with dual redundant -48 VDC power and forced-air cooling for central office deployments. Up to 6 Carrier shelves can fit in a 7' rack, for up to 480 T1s per rack.

## PRODUCT FEATURES

- 192 ms hybrid echo tail coverage
- G.168-2002 compliance
- Optional Bidirectional HEC capability
- Optional CTM/TTY adaptation for wireless applications
- Reflectometry™ monitors tail circuit characterization per channel — ERL, ERLE, voice levels, delay data, and maximum historical delay
- Failsafe metallic bypass
- Alarm relay for major/minor facility and equipment
- Local or remote in-service software upgrades
- Per DS0 and per T1 provisioning
- Easy-to-use local and remote management

## APPLICATIONS

- Hybrid Echo Cancellation (HEC)
- Bidirectional HEC
- HEC with Acoustic Echo Control and Adaptive Noise Reduction
- HEC with CTM/TTY Adaptation Support

## Shelf Options

### Carrier Shelf (80sa High Density)

20 cards, 80 T1s maximum per shelf  
6 shelves maximum per 7-foot rack (480 T1s)

Mounts for 19" or 23"  
ANSI/EIA racks

### Power Consumption

11W maximum per card,  
<115mW per DSO  
Fully loaded shelf: 220W,  
4.4A @ -48 VDC  
Fan assembly: 18W (per shelf)

### Input Voltage

Dual A&B -48 VDC: -36 to  
-60 VDC

### Dimensions (H x W x D)

Quad 2 T1 card:  
9.46 x 0.84 x 9.03 inches  
Wire Wrap shelf or Amphenol Telco  
RJ-21X shelf (5.6 RU):  
9.8 x 17.3 x 12.0 inches  
Fan assembly (1.3 RU):  
2.3 x 17.3 x 12.4 inches

### Weight

Quad 2 T1 card: 1.2 lbs (0.54 kg)  
Empty shelf: 19 lbs (8.6 kg)  
Fully loaded shelf: 43 lbs (19.5 kg)

### Enterprise Shelf (4sa)

1 card, 4 T1s maximum per shelf  
Mounts for 19" or 23"  
ANSI/EIA racks  
Rubber feet for tabletop mounting

### Power Consumption

11W maximum per card,  
<115mW per DSO  
Fully loaded shelf: 11W,  
0.22A @ -48 VDC

### Input Voltage

-48 VDC: -36 to -60 VDC  
110/240 VAC, 50/60 Hz  
autosensing, universal

### Dimensions (H x W x D)

Quad 2 T1 card:  
241 x 21 x 229 mm  
RJ-48C/Wire Wrap shelf (1 RU):  
1.75 x 17.3 x 9.4 inches

### Weight

Quad 2 T1 card: 1.2 lbs (0.54 kg)  
Empty shelf: 1.9 lbs (0.86 kg)  
Fully loaded shelf: 3.1 lbs (1.4 kg)

## TECHNICAL SPECIFICATIONS

### Hybrid Echo Cancellation

#### ERLE (Echo Return Loss Enhancement)

>35 dB (with 6dB ERL) at -10 dBm0 input  
>65 dB with NLP enabled

#### ERL (Echo Return Loss)

Selectable Threshold Level: 0, 3, 6 dB

#### Comfort Noise

Per DSO

#### Convergence Time

<50ms for 30 dB or better (ERL + ERLE)

#### Tail Circuit Delay

Selectable: 24, 32, 48, 64, 96, 128, 160, 192 ms

#### Tone Disablers

ITU-T G.164, G.165

#### Re-Enable Modes

Low Energy, End of Call

### Level Control

High Level Compensation (HLC)  
Automatic Level Control (ALC) G.169  
Fixed Gain/Loss (FGL)

### Voice Quality Options

Unidirectional Acoustic Echo Control (AEC)  
Adaptive Noise Reduction (ANR)  
Unidirectional Adaptive Listener  
Enhancement (ALE)

### Monitoring

#### Reflectometry™

ERL, ERLE, Max Delay, Send & Receive Levels  
Actual measurements per 64Kbps channel

#### Alarm Monitoring

Per GR-499-CORE  
Dry contacts for Alarms and E2A Interface

### Performance Monitoring

Referencing ANSI T1.231-1997

### Network Interface

#### Line Rate

1.544 Mbps

#### Framing Format

SF (D3/D4) per ITU-T G.733,  
ESF per AT&T CB142

#### Line Encoding

AMI-B7, B8ZS, Bipolar AMI

#### PCM Encoding

Segmented -15 μ-255 per ITU-T G.711

#### Jitter Tolerance

Per AT&T 62411, GR-499-CORE

#### Signaling Protocols

CCS (C6, C7),  
RBS (E&M, PLR, FXS-GS, FXO-GS, FXS-LS,  
FXO-LS)

#### Line Impedance

100 Ohm nominal, balanced per ITU-T G.703

#### Maximum Cable Length

655 feet using 100 Ohm balanced cable

### Synchronization

Through-timing

### Terminal Control

#### Serial Interface

3 RS-232 (RJ-11) ports (1 on faceplate,  
2 on backplane)  
Data transfer selectable up to 19200 baud

#### Local and Remote Provisioning

Local: CLI, WinMAP™ GUI  
Multisite: NetConsul™ EMS

### Front Panel Control

#### Alarm Indicators

LEDs for power/logon, ACO, and major and  
minor facility and equipment alarms

### Redundancy

#### Power Input

Carrier shelf: A&B fused inputs for failsafe  
source redundancy

#### Protection

Metallic bypass relays for failsafe operation  
Fans alarmed; no single fan critical

### Environmental

#### Operational

Temperature: 5° to 40°C  
Short Term: -5° to 55°C  
Humidity: 5 to 90%, non-condensing

#### Non Operational

Temperature: -40° to 70°C  
Humidity: 5 to 95%, non-condensing

#### Heat Output

Fully loaded Carrier shelf: 750 BTU/hour

### Reliability

MTBF Per Telcordia SR-332 Issue 1 May 2001

Quad 2 T1 card: 53 years at 40°C

### Regulatory Information

UL 60950 / EN 60950  
CAN/CSA-C22.2  
EN 300 386-1 and -2  
Telcordia GR-1089-CORE  
FCC part 15 Class A  
CE Mark  
NEBS Level 3 per Telcordia SR-3580  
RoHS 5/6



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