"Results You Can Count On"

VxT-48-DC+ Crosstalk Emulator for TR-249 Issue 1 and WT-249 Issue 2 Testing

The VxT-48-DC+ (48-Channel xTalk Emulator)

Solution Features

- 48 independent loops
- FEXT emulation between all loops
- Simulates all loops in TR-249 Issue 1 and WT-249 Issue 2 (Rev 1)
- Symmetrical crosstalk matrix
- Complex Mechanical Interruptions
- 48 independent channels of AWGN
- Efficient automation
- Repeatable testing
- Ideal for parallel testing
- Also suitable for bonding
- Remote control via Ethernet, RS-232, USB or User-friendly GUI

Repeatable • Configurable • Complete

Introducing the world's first standards-based VDSL2 Vectoring Crosstalk Emulator, designed to simulate the test loops in TR-249 Issue 1 and WT-249 Issue 2.

Vectoring technology promises to bring a wealth of new opportunities to Service Providers as well as manufacturers of DSLAMs, CPE Modems and Chipsets. This exciting new technology allows for a more efficient utilization of existing copper infrastructure by cancelling the crosstalk between neighboring pairs within a cable. This increases data rates far beyond current levels, making bandwidth-intensive applications such as IPTV and Triple Play available in areas where it was not possible before.

Bringing products and services based on Vectoring technology to the marketplace requires repeatable testing of multiple loops. Until now, breakthroughs in this technology have not been matched by innovations in commercially available testing solutions. The only choices have been Cable Farms where correlating test results from site to site is problematic.

Telebyte's VxT-48-DC+ is an advanced 48-channel crosstalk emulator that is fully compliant with the test loops in TR-249 Issue 1 and WT-249 Issue 2 (Rev 1). In addition, the VxT-48-DC+ simulates a wide variety of complex mechanical interruptions.

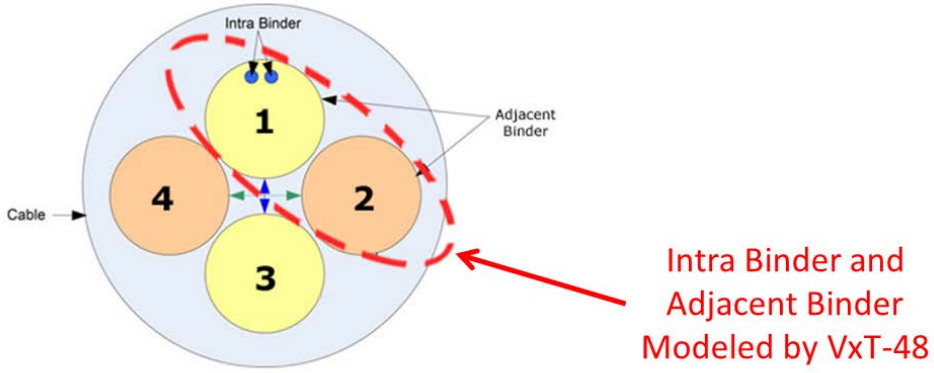
It is the world's first commercially available, standards-based solution for testing of equipment that utilizes VDSL2 Vectoring technology. It offers repeatable and configurable Vectoring performance and is ideal for parallel testing to ensure consistent performance from site to site.

Crosstalk Emulation

The Model VxT-48+ xTalk Emulator for Vectored VDSL2 Testing emulates the symmetric model of the ATIS Multiple-Input Multiple-Output (NIPP-NAI-2009-014R3) on 48 channels (using the upper-left 48 x 48 quadrant of the 100 x 100 random-drawn matrix). It also models crosstalk between xDSL multi-pairs within a cable binder and is sufficient for automatically running test cases for systems with Vectoring capabilities.

The crosstalk channel transfer function accuracy is based on FEC coupling transfer function as defined in ATIS-PP-0600024_MIMO_Channel_Model_NIPP-NAI-2009-014R3 with the random drawn matrix for amplitude offset.

The coupling between the pairs is realized using fixed coupling elements between pair [i] and pair [j] for [i],[j] = 1,..,48. The VxT-48+ provides independent control of 48 channels. The majority of coupling paths in the VxT-48+ have higher crosstalk than which is specified in the ATIS model. However, it remains compliant with the crosstalk accuracy specified in TR-249 Issue 1.



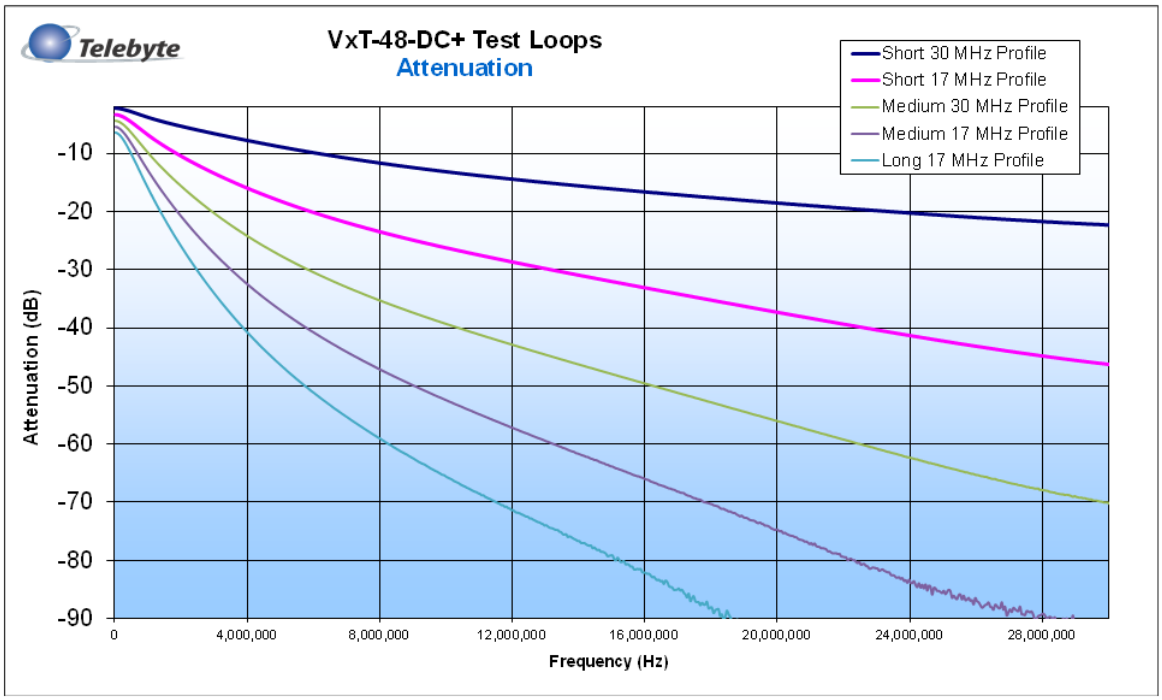
Test Loops Simulated

The line section emulates the insertion loss of the following loops:

Test Loop	Attenuation at 1 MHz	Examples
WT-249 Issue 2 (Rev 1) Short loop (30 MHz profile)	3.75 dB	150 m / 0.4 mm PE 500 ft / 26 AWG 600 ft / 24 AWG 200 m / TP100
TR-249 Issue 1 Short loop (17 MHz profile)	6.95 dB	300 m / 0.4 mm PE 1000 ft / 26 AWG 1200 ft / 24 AWG 400 m / TP100
WT-249 Issue 2 (Rev 1) Medium loop (30 MHz profile)	10.05 dB	450 m / 0.4 mm PE 1500 ft / 26 AWG 1900 ft / 24 AWG 625 m / TP100
TR-249 Issue 1 Medium loop (17 MHz profile)	13.15 dB	600 m / 0.4 mm PE 2000 ft / 26 AWG 2500 ft / 24 AWG 850 m / TP100
TR-249 Issue 1 Long loop (17 MHz profile)	16.25 dB	750 m / 0.4 mm PE 2500 ft / 26 AWG 3000 ft / 24 AWG 1075 m / TP100

Compliant with all loops defined in Table 17 of the TR-249 Issue 1 to support profile 17A.
In addition, we include the two additional loops added in WT-249 Issue 2 (Rev1) to support testing profile 30A.

Test Loops Attenuation Graph



Mechanical Loop Interruptions

A Mechanical Loop Interruption is either a total or partial loss of the signal reception capability on the local loop due to external mechanically based actions. There are several categories of mechanical loop interruptions that can have an effect on a vectored group. These include Micro-Interruptions, Single-Wire Interruptions, Micro-Shorts and Disorderly Leave. The VxT-48+ has the capability to test these types of mechanical loop interruptions in a Vectored VDSL2 test environment.

- **Micro-Interruptions:** A Micro-Interruption results from a temporary impedance discontinuity of the local loop at a particular position. The impedance observed at the discontinuity is finite but very large. The VxT-48+ simulates micro-interuptions at the CO end of any test loop, the CPE end of any test loop and/or the 40% point of Long Loop (17MHz Profiile) as measured from the CO side of the loop. Micro-interruptions are configured for a one-time opening of the line on Tip or Ring - or Tip and Ring. Furthermore, a more complex, repeatable scheme may be setup by adding optional parameters. In addition, they are configured for one line (up to three lines from a random draw).

- **Single-Wire Interruption:** A Single-Wire Interruption is an actual physical break of only one of the two conductors of the loop at a specific position. There is only a partial loss of the received signal as transmission can continue but in a degraded common mode. The VxT-48+ simulates a single-wire interuption at the CO end of any test loop, the CPE end of any test loop and/or the 40% point of Long Loop (17MHz Profiile) as measured from the CO side of the loop. In addition, they are configured for one line (up to three lines from a random draw).

- **Micro-Shorts:** A Micro-Short results from an external mechanical action causing a temporary impedance discontinuity observed at a position on the local loop. The resulting impedance at the discontinuity is positive but quite small. For all practical purposes the discontinuity makes the local loop appear, at this position, electrically, to have a short circuit. The VxT-48+ simulates Micro-Shorts at the CO end of any test loop, the CPE end of any test loop and/or the 40% point of the Long Loop (17MHz Profiile) as measured from the CO side of the loop. In addition, they are configured for one line (or a range of up to 48 lines).

- **Disorderly Leave:** A Disorderly Leave occurs when the CPE or CO transceiver is unexpectedly disconnected placing an open circuit in the lateral paths of both the Tip and the Ring causing all communications to cease. The duration of the open circuit is so long that it forces all protocol functions eventually to cease and the communication between the CO and the CPE transceivers appears to become permanently disabled. The VxT-48+ can simulate a disorderly leave at at the CO end of any test loop, or the CPE end of any test loop. In addition, they are configured for one line (or a range of lines up to 48 lines) and defined in minutes or hours.

Ordering Options

Crosstalk Emulation	Description	
Model	Power	Control
VxT-48-DC+	DC	Ethernet, RS-232

- Custom CAT7 TERA Cables Quoted Upon Request

VxT-48-DC+ Specifications

Simulation	• TR-249 Issue 1 - All Test Loops • 2 additional test loops added in WT-249 Issue 2 for profile 30A • 48 Independent Test Loops • 2256 Coupling paths
Bandwidth	20 kHz to 30 MHz
Maximum Modem Output Power Allowed	20 dBm
Average Noise Floor	< -143 dBm/Hz
Attenuation (at 1 MHz)	Short loop (30 MHz profile): 3.75 dB Short loop (17 MHz profile): 6.95 dB Medium loop (30 MHz profile): 10.05 dB Medium loop (17 MHz profile): 13.15 dB Long loop (17 MHz profile): 16.25 dB
Crosstalk Accuracy	Meets all the crosstalk accuracy requirements for P20, P50, P80 and P100 as specified in TR-249 Issue 1
Micro-Interruptions (Micro-cut)	• Any 3 channells from a random draw. • Micro-cut applied to Tip or Ring - or Tip & Ring simultaneously • Delay to start Micro-cut: 0 s to 65,535 s, in 1-s steps • Micro-cut time: Allowable range 1 ms to 300ms, in 1 ms steps • Period: 0 s to 65,535 s, in 1-s steps • Cycle repetition: 1 to 65,535 in steps of 1, or endless cycle
Single-wire interruption (Cut)	• Any 3 channels from a random draw • Cut applied to single wire • Delay to start Cut: 0 s to 65,535 s, in 1-s steps • Cut time: Allowable range 1 s to 65,535 s, in 1-s steps • Period: 0 s to 65,535 s, in 1-s steps • Cycle repetition: 1 to 65,535 in steps of 1, or endless cycle
Micro-Shorts (Short)	• Any or all channels • Short applied across Tip and Ring • Delay to start short: 0 s to 65,535 s, in 1-s steps • Short time: Allowable range 1 ms to 300ms, in 1 ms steps • Period: 0 s to 65,535 s, in 1-s steps • Cycle repetition: 1 to 65,535 in steps of 1, or endless cycle
Disorderly leave (Disconnect)	▪ Any or all channels ▪ Disconnect applied to Tip and Ring simultaneously ▪ Delay to start disconnect: 0 s to 65,535 s, in 1-s steps ▪ Disconnect time: Allowable range 1 s to 65,535 s, in 1-s steps ▪ Period: 0 s to 65,535 s, in 1-s steps ▪ Cycle repetition: 1 to 65,535 in steps of 1, or endless cycle
Remote Control	• RS-232 / USB / IEEE 802.3 Ethernet (including high-level command set for remote control)
Power Supply	DC power 48 V (100 W maximum) +/- 10%
DC Rating	50 V maximum
xDSL Connection	CAT7 TERA Connectors
Dimensions	355 mm x 465 mm x 278 mm (H x W x D)
Mounting options	Mountable in 19" rack