TECHNICAL STANDARDS SUPPLEMENT

The Technical Standards Supplement is used to provide parameters and standards for services provided via Wholesale Wireline Broadband Internet Transport and or Business Data Services for the purpose of delivering wholesale Broadband from Highland Telephone Cooperative to the wholesale customer of record.

The following technical publications reflect the industry technical standards for products/services that may be provided in the course of delivering Wholesale Broadband Internet Transport and or Supporting Services and may be obtained from Telcordia Technologies, Inc. dba iconectiv (formerly Bell Communications Research, Inc. – Bellcore), 100 Somerset Corporate Blvd., Bridgewater, N.J. 08807. http://telecom-info.telcordia.com

Technical Reference:

- PUB 62310 (MDP-326-726) Digital Data System Channel Interface Specification Issued: September 1983
- TR-NWT-000335, Issue 3 Voice Grade Special Access Service - Transmission Parameter Limits and Interface Combinations Issued: May 1993
- TR-NWT-000341 Digital Data Special Access Service - Transmission Parameter Limits and Interface Combinations Issued: Issue 2, February 1993
- SR-307 Common Language NC/NCI Dictionary Issued: Issue 7, September 2008
- GR-506-CORE, Issue 3 Signaling for Analog Interfaces (LSSGR) Issued: December 2011
- ST-TEC-000053 Telecommunications Transmission Engineering Volume 3 - Networks and Services (Chapters 6 and 7) Third Edition Issued: August 1989

The following technical publications reflect the industry technical standards for products/services that may be provided in the course of delivering Wholesale Broadband Internet Transport and or Supporting Services and may be obtained from the Alliance for Telecommunications Industry Solutions (ATIS), 1200 G Street N.W., Suite 500, Washington, DC 20005 (www.atis.org).

- ATIS-0900102.1993 (R2010), Digital Hierarchy - Electrical Interfaces.
- ATIS-0600413.2009, Network To Customer Installation Interfaces – Asymmetric Digital Subscriber Line (ADSL) Metallic Interface.
- Multiple Exchange Carrier Access Billing (MECAB) Guidelines Issued: September 2010
- Multiple Exchange Carrier Ordering and Design (MECOD) Guidelines Issued: March 2018

The following technical publications reflect the industry technical standards for products/services that may be provided in the course of delivering Wholesale Broadband Internet Transport and or Supporting Services and may be obtained from the Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Lane, Piscataway, NJ 08854-4141 (www.ieee.org).

- IEEE Std. 802.1D – 2004, Local and Metropolitan Area Networks Media Access Control (MAC) Bridges, Sections 7, 9, 17 and Annex G.
- IEEE Std. 802.1Q - 2018, Local and Metropolitan Area Networks   (T) Virtual Bridged Local Area Networks, Sections 5 through 12 and Annexes E and G.
- IEEE Std. 802.3 - 2015, Information Technology – Telecommunications (T) and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements,

Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications, Sections 1 through 5.

The following technical publications reflect the industry technical standards for products/services that may be provided in the course of delivering Wholesale Broadband Internet Transport and or Supporting Services and may be obtained from the Broadband Forum, 48377 Fremont Blvd. Suite 117, Fremont, CA 94538 (www.broadband-forum.org).

- The ATM Forum Technical Committee, ATM User-Network Interface (UNI) Signaling Specification, Version 4.1, af-sig-0061.002, April, 2002.
- The ATM Forum Technical Committee, BISDN Inter Carrier Interface (B-ICI) Specification, Version 2.0 (Integrated), af-bici-0013.003, December, 1995.
- The ATM Forum Technical Committee, Private Network – Network Interface Specification, Version 1.1 (PNNI 1.1) af-pnni-0055.002, April, 2002.

The following technical publications reflect the industry technical standards for products/services that may be provided in the course of delivering Wholesale Broadband Internet Transport and or Supporting Services and may be obtained online without charge on the Internet Engineering Task Force web site (www.ietf.org) using the "RFC Pages" link.

- Request For Comments (RFC) 791, Internet Protocol, DARPA Internet Program Protocol Specification, September 1981.
- Request For Comments (RFC) 1483, Multiprotocol Encapsulation over ATM Adaptation Layer 5, July 1993.

The following technical publications reflect the industry technical standards for products/services that may be provided in the course of delivering Wholesale Broadband Internet Transport and or Supporting Services and may be obtained from the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) Place des Nations, 1211 Geneva 20, Switzerland (www.itu.int/rec/T-REC-G/e).

- ITU-T G.711 – November 1988, Pulse Code Modulation (PCM) of Voice Frequencies.
- ITU-T G.723.1 – May 2006, Dual Rate Speech Coder for Multimedia Communications Transmitting at 5.3 and 6.3 kbit/s.
- ITU-T G.729 – June 2012, Coding of Speech at 8 kbit/s Using Conjugate-Structure Algebraic-Code-Excited Linear Prediction (CS-ACELP).
- ITU-T G.7041/Y.1303 – August 2016, Generic Framing Procedure (GFP)
- ITU–T G.983.1-January 2005, Broadband Optical Access Systems Based on Passive Optical Networks (PON).
- ITU–T G.983.2-July 2005, ONT Management and Control Interface Specification for B-PON.
- ITU–T G.983.3-March 2001, A Broadband Optical Access System with Increased Service Capability by Wavelength Allocation.
- ITU–T G.983.4-November 2001, A Broadband Optical Access System with Increased Service Capability Using Dynamic Bandwidth Assignment.

- ITU–T G.984.1-March 2008, Gigabit-Capable Passive Optical Networks (GPON): General Characteristics.
- ITU–T G.984.2-March 2003, Gigabit-Capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) Layer Specification.
- ITU–T G.984.3-January 2014, Gigabit-Capable Passive Optical Networks (GPON): Transmission Convergence Layer Specification.
- ITU–T G.984.4-February 2008, Gigabit-Capable Passive Optical Networks (GPON): ONT Management and Control Interface Specification.
- ITU–T G.992.1-June 1999, Asymmetric Digital Subscriber Line (ADSL) Transceivers.
- ITU–T G.992.3-April 2009, Asymmetric Digital Subscriber Line Transceivers 2 (ADSL2).
- ITU–T G.992.4-July 2002, Splitterless Asymmetric Digital Subscriber Line Transceivers 2 (Splitterless ADSL2).
- ITU–T G.992.5-January 2009, Asymmetric Digital Subscriber Line (ADSL) Transceivers–Extended Bandwidth ADSL2 (ADSL2+).
- ITU-T G.993.1-June 2004, Very High Speed Digital Subscriber Line Transceivers 2.
- ITU-T G.993.2-January 2015, Very High Speed Digital Subscriber Line Transceivers 2 (VDSL2).
- ITU-T G.8040/Y.1340 – September 2005, GFP Frame Mapping into Plesiochronous Digital Hierarchy (PDH).
- ITU-T G.9700-April 2014, Fast Access to Subscriber Terminals (G.fast)-Power Spectral Density Specification.
- ITU-T G.9701-December 2014, Fast Access to Subscriber Terminals (G.fast)-Physical Layer Specification.
- ITU-T H.225.0 – December 2009, Call Signaling Protocols and Media Stream Packetization for Packet-Based Multimedia Communication Systems.
- ITU-T H.245 – May 2011, Control Protocol for Multimedia Communication.
- ITU-T H.323 – December 2009, Packet-Based Multimedia Communications Systems.

The following technical publications reflect the industry technical standards for products/services that may be provided in the course of delivering Wholesale Broadband Internet Transport and or Supporting Services and may be obtained from the Metro Ethernet Forum (MEF) 6033 W. Century Boulevard, Suite 1107, Los Angeles, CA 90045 (www.metroethernetforum.org).

- Implementation Agreement MEF 23.1, Carrier Ethernet Class of Service – Phase 2, January 2012.

Highland Telephone Company

Signature:_____

Printed Name:_____

Title:_____

Date:_____

Wholesale Customer:_____

Signature:_____

Printed Name:_____

Title:_____

Date:_____