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AMERITECH UNBUNDLED ANALOG LOOPS TECHNICAL SPECIFICATIONS

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GENERAL

This document describes the Unbundled Analog Loops offered by Ameritech. This service provides the customer with a transmission path of approximately 3 kHz of usable bandwidth between the customer premises Network Interface (NI) and the central office NI.

1. INTRODUCTION

1.1. PURPOSE

The intent of this document is to provide customers, service providers, and equipment manufacturers with a description of the service, and operational characteristics and interface descriptions for Ameritech's Unbundled Analog Loops.

1.2. REASON FOR REISSUE

This document is being revised to clarify the supported impedance values in Section 3 NETWORK CHANNEL AND NETWORK CHANNEL INTERFACE CODES, Tables 4.3.3 TWO-WIRE ANALOG LOOP TRANSMISSION PARAMETERS and 4.4.3. FOUR-WIRE ANALOG LOOP TRANSMISSION PARAMETERS

1.3. UNBUNDLED ANALOG LOOPS

Unbundled analog loops are transmission paths capable of carrying analog signals from the NI on a customer's premises to an Ameritech central office. Unbundled loops may be provided using a variety of transmission technologies including but not limited to copper wire, copper wire based digital loop carrier and fiber optic digital loop carrier systems. Such technologies can be used singularly or in tandem to provide an unbundled loop.

2. SERVICE DESCRIPTION

2.1. UNBUNDLED ANALOG LOOP

An unbundled analog loop is a transmission path that runs from an Ameritech Central Office (CO) (from a main distribution frame or other suitable frame called the CO-NI) to the customer network interface (CUST-NI) located on the customer's premises.

The transmission parameters associated with the loop as defined above are specified by the following interfaces:

- Two-wire analog interface to a transmission path designed to carry analog voice grade signals between 300 and 3000 Hz.

- Four-wire analog interface to a transmission path designed to carry analog voice grade signals between 300 and 3000 Hz using separate transmit and receive paths.

- Electronic Key transmission path designed to support exchange connections for electronic key telephones. This transmission path will carry basic analog voice frequency transmission in the 300 to 3000 Hz range and signaling in the 8 kHz range.

- Coin loops

- Tone controlled and battery controlled coin loops will comply with the transmission parameters specified for two-wire analog loops.

- Coin first loops support ground start signaling.

- Dial tone first loops support loop start signaling.

- Battery controlled coin/loops will meet the specifications shown in Table A, following. If digital loop carrier is utilized in the provisioning of these loops, these specifications will apply between the remote terminal and the CUST-NI.

Table 1.
Table A - Battery Controlled Coin Loops

Loop Resistance	
Tip to Ground	{Greater than or equal to} 150 K Ohms
Ring to Ground	{Greater than or equal to} 150 K Ohms
Tip to Ring	{Greater than or equal to} 150 K Ohms
Conductor - Maximum	{less than or equal to} 1700 Ohms
- Minimum	{Greater than or equal to} 900 Ohms
Applied Voltage (Maximum)	{less than or equal to} 135 Volts DC
Maximum Current	{less than or equal to} 100 ma.

2.2. APPLIED POWER LEVEL

The applied power level of any transmitted signal must comply with ANSI specification T1.401. Continuous voltages applied to these loops must fall within the range of 0 to -140 volts D.C. with respect to ground potential.

3. NETWORK CHANNEL AND NETWORK CHANNEL INTERFACE CODES

3.1. GENERAL

Network Channel (NC) codes describe, in standard format, the characteristics of the service channel. Network Channel Interface (NCI) codes describe the physical and electrical characteristics of the NI. These coding schemes are fully described in Bellcore Special Report SR-STS-000307, Industry Support Interface (ISI); NC/NCI Code Dictionary. The codes shown in this document have either been approved by the Bellcore chaired NC/NCI Common Language Organization, or approval has been requested.

3.2. NC CODES

The NC codes currently available for unbundled analog loops are shown in Table B.

Table 2.
Table B - NC Codes

NC Code	Option Code Char 3	Option Code Char 4
LX	-	-

3.3. NCI CODES

NCI codes describe the NI. Table B shows the currently available NCI codes combinations for Unbundled Analog Loops.

Table 3.
Table C - Compatible NCI Codes

NCI Code	Description	
CUST-NI	**CO-NI**	
02N02	02QC(X).OOF	No Signaling - Transmission Only
02L02	02QC(X).OOE	Loop Start Signaling
02LS2	02QC(X).OOD	Loop Start Signaling
02G02	02QC(X).OOC	Ground Start Signaling
02GS2	02QC(X).OOB	Ground Start Signaling
02RV2.T	02QC(X).RVO	Reverse Battery Signaling
02RV2.0	02QC(X).RVT	Reverse Battery Signaling

04LS2	04QC(X).OOD	Loop Start Signaling
04L02	04QC(X).OOE	Loop Start Signaling
04GS2	04QC(X).OOB	Ground Start Signaling
04G02	04QC(X).OOC	Ground Start Signaling
04DX2	04QC(X).DXO	DX Signaling
04N02	04QC(X).OOF	No Signaling - Transmission Only
02LE3	02QC(X).OOR	Electronic Business Set Interface, 8 KHz ASK Signaling
02LS2	02QC(X).OOT	Coin - Tone Controlled
02GS2	02QC(X).OOU	Coin - Battery Controlled

(X) = Allowable Impedance Code

3.4. IMPEDANCE CODE

The supported impedances are: 600 ohms and 900 ohms.

The valid impedance codes are: 2 = 600 ohms, 3 = 900 ohms.

4. TECHNICAL SPECIFICATIONS

4.1. GENERAL

This section details the technical characteristics; available configurations, signaling capabilities (if any); transmission performance parameter limits; and information concerning the compatible Network Interfaces for each of the unbundled analog loops. Compatible NIs are listed in Table B, preceding.

4.2. TRANSMISSION PERFORMANCE

In this document, transmission performance parameter limits are specified as the maximum (or minimum) measured transmission parameter value that is permitted at the interface.

The parameters that are measured during acceptance testing at new service turn-up include:

- VG Continuity
- Measured Loss (1004 Hz)
- C-Message Noise

When an un-bundled analog loop is provided over digital loop carrier, the transmission performance of the loop is evaluated by measuring analog Voice Grade (VG) parameters on the DS0 channel between the End User (EU) and the Central Office Network Interfaces.

4.3. UNBUNDLED TWO-WIRE ANALOG LOOP

Two-wire analog loops provide a transmission path between the customer's premises and Ameritech's CO, and terminate in an analog interface.

Usable frequencies are nominally 300 to 3000 Hz. The service extends from a CO-NI to an NI at a customer location. A typical configuration is shown in Figure 1.

Figure 1. Two-Wire Analog Loop Configuration

4.3.1. AVAILABLE SIGNALING TRANSPORT CAPABILITY - TWO-WIRE ANALOG LOOP

A. No signaling (other than in-band signaling furnished by the customer).

B. Loop-start on the "closed-end" customer NI to loop start on the "open-end" at the CO-NI.*****

C. Loop-start on the "open-end" at the customer NI to loop-start on the "closed-end" at the CO-NI.*****

D. Ground-start on the "closed-end" at the Customer NI to ground-start on the "open-end" at the CO-NI.*****

E. Ground-start on the "open-end" at the Customer NI to ground-start on the "closed-end" at the CO-NI.*****

***** Range extension is required if the loop resistance exceeds 1300 Ohms.

4.3.2. AVAILABLE OPTIONS

None

4.3.3. TWO-WIRE ANALOG LOOP TRANSMISSION PARAMETERS

This matrix indicates the transmission parameters supported by state:

	Illinois	**Indiana**	**Michigan**	**Ohio**	**Wisconsin**

D.C. Conductor Resistance	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms
Loop Current	{Greater than or equal to} 20ma	{Greater than or equal to} 20ma	{Greater than or equal to} 20ma	{Greater than or equal to} 20ma	{Greater than or equal to} 20ma
Input Capacitance	{less than or equal to} 2.0{Undeclared entity}F	{less than or equal to} 2.0{Undeclared entity}F	{less than or equal to} 2.0{Undeclared entity}F	{less than or equal to} 2.0{Undeclared entity}F	{less than or equal to} 2.0{Undeclared entity}F
Insertion Loss	{less than or equal to} 10.0dB	{less than or equal to} 10.0dB	{less than or equal to} 8.5dB	{less than or equal to} 8.0dB	{less than or equal to} 8.5dB
Input Impedance	900 Ohms + 2.16 micro F 600 Ohms + 2.16 micro F	900 Ohms + 2.16 micro F 600 Ohms + 2.16 micro F	900 Ohms + 2.16 micro F 600 Ohms + 2.16 micro F	900 Ohms + 2.16 micro F 600 Ohms + 2.16 micro F	900 Ohms + 2.16{Undeclared entity}F 600 Ohms + 2.16 micro F
Loss Deviation	±1.5dB	±1.5dB	±1.5dB	±1.5dB	±1.5dB
Attenuation					
Distortion					
Frequency Range					
504 to 2504Hz	-1.5 to +7.5dB*	-1.5 to +7.5dB*	-1.5 to +7.5dB*	-1.5 to +7.5dB*	-1.5 to +7.5dB*
404 to 2804Hz	-1.5 to +9.5dB*	-1.5 to +9.5dB*	-1.5 to +9.5dB*	-1.5 to +9.5dB*	-1.5 to +9.5dB*

304 to 3004Hz	-1.5 to +11.5dB*	-1.5 to +11.5dB*	-1.5 to +11.5dB*	-1.5 to +11.5dB*	-1.5 to +11.5dB*
3 Tone Slope	-1.5 to +9.5dB*	-1.5 to +9.5dB*	-1.5 to +9.5dB*	-1.5 to +9.5dB*	-1.5 to +9.5dB*
C-Message Noise	{less than or equal to} 30dBRNC	{less than or equal to} 30dBRNC	{less than or equal to} 30dBRNC	{less than or equal to} 25dBRNC	{less than or equal to} 25dBRNC

***** Limits are the maximum deviation of the loss measured at the test frequency relative to the actual measured loss (AML) at 1004 Hz. The "+" limit means more loss and the "-" limit means less loss.

4.3.4. TWO-WIRE ANALOG LOOP COMPATIBLE TLP RANGES AT THE CUSTOMER NI

Table 5.
Two-Wire Transmission at the Customer NI

Protocol Code	Transmit	Receive
NO, LS, LO, GS, GO, RV	0	{Greater than or equal to}-10 *

4.3.5. TWO-WIRE ANALOG LOOP COMPATIBLE TLP RANGES AT THE CO-NI

Table 6.
Two-Wire Transmission at the CO-NI

Protocol Code	Transmit	Receive
GO, GS, LO, LS, NO, RV	0	{Greater than or equal to} -10 *

***** In general, the receive TLP will be a function of the Ameritech cable facilities.

4.4. FOUR-WIRE UNBUNDLED ANALOG LOOP

Four-wire analog loops provide a transmission path with separate transmit and receive pairs between the customer's premises and Ameritech's Central Office. Usable frequencies are nominally 300 to 3000 Hz. The service extends from a CO-NI to a Customer NI. A typical configuration is shown in Figure 2.

Figure 2. Four-Wire Analog Loop Configuration

4.4.1. AVAILABLE SIGNALING

A. Loop-start on the "closed-end" at the Customer NI to loop-start on the "open-end" at the CO-NI.

B. Loop start on the "open-end" at the Customer NI to loop start on the "closed-end" at the CO-NI.

C. Ground-start on the "closed-end" at the Customer NI to ground-start on the "open-end" at the CO-NI.

D. Ground-start on the "open-end" at the Customer NI to ground-start on the "closed-end" at the CO-NI.

E. Loop-reverse battery.

F. DX at the Customer NI to DX at the CO-NI.

G. No signaling.

4.4.2. AVAILABLE OPTIONS

None

4.4.3. FOUR-WIRE ANALOG LOOP TRANSMISSION PARAMETERS

This matrix indicates the transmission parameters supported by state:

	Illinois	Indiana	Michigan	Ohio	Wisconsin

D.C. Conductor Resistance	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms	{less than or equal to} 1500 Ohms
Loop Current	{Greater than or equal to} 20 ma	{Greater than or equal to} 20ma	{Greater than or equal to} 20ma	{Greater than or equal to} 20ma	{Greater than or equal to} 20ma
Input Capacitance	{less than or equal to} 2.0microF	{less than or equal to} 2.0microF	{less than or equal to} 2.0microF	{less than or equal to} 2.0microF	{less than or equal to} 2.0microF
Insertion Loss	{less than or equal to} 10.0dB	{less than or equal to} 10.0dB	{less than or equal to} 8.5dB	{less than or equal to} 8.0dB	{less than or equal to} 8.5dB
Input Impedance	900 Ohms + 2.16microF 600Ohms+ 2.16microF	900Ohms + 2.16microF 600Ohms+ 2.16microF	900Ohms + 2.16microF 600Ohms+ 2.16microF	900Ohms + 2.16microF 600Ohms+ 2.16microF	900Ohms + 2.16microF 600Ohms+ 2.16microF
Loss Deviation	±1.5dB	±1.5dB	±1.5dB	±1.5dB	±1.5dB
Attenuation					
Distortion					
Frequency Range					
504 to 2504 Hz	-1.5 to +7.5dB*****	-1.5 to +7.5dB*****	-1.5 to +7.5dB*****	-1.5 to +7.5dB*****	-1.5 to +7.5dB*****
404 to 2804 Hz	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****

304 to 3004 Hz	-1.5 to +11.5dB*****	-1.5 to +11.5dB*****	-1.5 to +11.5dB*****	-1.5 to +11.5dB*****	-1.5 to +11.5dB*****
3 Tone Slope	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****	-1.5 to +9.5dB*****
C-Message Noise	{less than or equal to} 30dBRNC	{less than or equal to} 30dBRNC	{less than or equal to} 30dBRNC	{less than or equal to} 25dBRNC	{less than or equal to} 25dBRNC

***** Limits are the maximum deviation of the loss measured at the test frequency relative to the actual measured loss (AML) at 1004 Hz. The "+" limit means more loss and the "-" limit means less loss.

4.4.4. FOUR-WIRE ANALOG LOOP COMPATIBLE TLP RANGES AT THE CUSTOMER NI

Table 8.
Four-Wire Transmission at the Customer NI

Protocol Code	Transmit	Receive
DX, GO, GS, LO, LS, NO, RV	0	0 to -10 **

4.4.5. FOUR-WIRE ANALOG LOOP COMPATIBLE TLP RANGES AT THE CO-NI

Table 9.
Four-Wire Transmission at the CO-NI

Protocol Code	Transmit	Receive
DX, GO, GS, LO, LS, NO, RV	0	0 to -10 **

****** In general, the receive TLP will be a function of the Ameritech cable facilities.

4.5. TWO-WIRE UNBUNDLED ANALOG LOOP FOR USE WITH ELECTRONIC BUSINESS SET SERVICE

The unbundled analog loop suitable for the support of Electronic Business Set Service provides a balanced, two-wire termination allowing access to two spectrum separated channels.

The first is a voice grade channel of a nominal 3000 Hz bandwidth that is available for voice and voice grade data communications and is also utilized for conveying call progress and alerting signals to the CPE. The second is a channel centered at 8000Hz used to pass Amplitude

Shift Keying (ASK) supervisory and signaling information across the interface. The two channels are specified independently. Table D summarizes the interface characteristics.

DC continuity shall be maintained between the CO-NI and the customer's NI. DC current is utilized by the switch to verify that CPE is attached and to maintain loop continuity.

Table 10.
Table D - Summary of Interface Characteristics for EBS Loops

Voice Transmission Bandwidth	approximately 3.0 kHz
Signaling Bandwidth	uses an above voiceband channel, centered at 8 kHz
Signaling Rate	1 kbits/s, half duplex
Connector	miniature 6-position jack
Voice Signals	electrical characteristics similar to those of a Public Switched Network voice pair (see Sections 3.3.3 to 3.3.5)
Loop Loss	{less than or equal to} 5.0 dB at 1004 Hz {less than or equal to} 21.0 dB at 8000 Hz
Signaling and Supervision Channel	8 kHz ASK into 900 Ohms
Loop Resistance	{less than or equal to} 1230 Ohms

5. REFERENCES

1. Bellcore Technical Reference TR-NWT-000335, Issue 3, May 1993. Voice Grade Special Access Services - Transmission Parameter Limits and Interface Combinations.

2. Technical Reference PUB 61100. Description of the Analog Voiceband Interface between the Bell System Local Exchange Lines and Terminal Equipment. January 1983.

3. AM TR-NPL-000004, Issue B, December 1988. Ameritech Technical Reference, Electronic Business Service Network Access Interface Specification.

4. Bellcore Technical Reference TR-NWT-000057, Issue 2, January 1993. Functional Criteria for Digital Loop Carrier Systems.

5. American National Standards Institute - ANSI T1.401-1993 Telecommunications - Interface between Carriers and Customer Installations - Analog Voice Grade Switched Access Lines Using Loop-Start and Ground-Start Signaling.

6. Code of Federal Regulations, Section 47, Part 68, Connection of Terminal Equipment to the Telephone Network.

7. AM TR-TMO-000080, Issue 2, June 1993. Ameritech Services Network Channel and Network Channel Interface Codes - General Availability.

8. Bellcore Special Report SR-STS-000307, Industry Support Interface (ISI); NC/NCI Code Dictionary.

6. ORDERING INFORMATION

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