

Standards

*Set # 8
Bertalle
7/18/01*

for

Premises

Wire

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Witness _____

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Ameritech

STANDARDS FOR PREMISES WIRE

This document sets forth the minimum material, technical, and workmanship standards. These standards are required of Ameritech and the customer in regard to premises wire (PW), its installation and connection to basic single line telephone service.

Premises wire consists of the wiring, connecting blocks, plugs, and jacks on a customer's premises that extends from the termination of the exchange access line to the locations where customer provided equipment is connected for access to the exchange network. For single line basic telephone exchange service, such wiring is to be used only with Federal Communications Commission (FCC) registered or grandfathered telephone sets and associated ancillary devices. The FCC's Registration Program does not apply to telephone sets on party line services.

All building codes applicable in areas served by Ameritech must be complied with. Article 800, of the National Electrical Code (NEC), entitled "Communication Circuits" and all relevant sections of the code must be followed. The Electronic Industries Association / Telecommunications Industry Association wiring standards are to be used in designing and installing of premises wiring. These requirements are incorporated into this document and must be complied with.

CONNECTION TO THE TELECOMMUNICATION NETWORK

The physical and/or electrical connection of premises wire to the telephone network shall be accomplished by using either of the two connecting arrangements described below:

1. A Telephone Company installed Network Interface (NI) Device.

The Network Interface serves as the demarcation point between the customer's premises wire and Ameritech's telecommunication network.

The Network Interface shall be positioned in the telephone circuit between the drop wire and the premises wiring. The Network Interface's function is to enable the disconnection of the premises wire and associated equipment from the telephone network.

2. Where a Network Interface is not present, the premises wire may be accessed at least 12 inches or closest practical point from the Telephone Company provided protector located at the demarcation point.

NOTE: No connections or modifications whatsoever are to be made by the customer to the drop wire or line protector.

INSTALLATION OF A NETWORK INTERFACE - NI

1. The installation of the Network Interface will, in all cases, be performed by the Telephone Company.
2. An Network Interface will be placed when new service is being installed and may be placed on repair visits when one is not present.
3. On newly constructed single unit dwellings, the Network Interface will be installed in a location adjacent to the outdoor electrical meter. All prewiring should be routed within 12" to 15" of the electrical meter. Should this location prove not practical, the location of the Network Interface shall be determined by the Telephone Company.
4. In newly constructed multi dwelling units, the Network Interface will normally be placed in the same location as the electrical service panel (fuse box, circuit breaker panel). When this is not prac-

tical, the location of the Network Interface will be determined by the Telephone company.

5. No modification to the Network Interface is to be made by the customer. Connection of premises wire to the Network Interface by the customer is to be accomplished only by means of its wiring bridge (screw terminals). Connection to the network is to be done by means of the modular plug-in connector.
6. The Network Interface, once placed, is to be grounded through a connection to the electrical power ground rod. The ground should not be removed for any reason as this could pose an electrical hazard.

CUSTOMER PREMISES WIRING

Telephone wiring may only be used to conduct the operating signals, voltage, and currents normally found on basic telephone service. Premises wire must be capable of being exposed to and conducting, without damage, possible induced lightning surges and 60 Hz power. This standard requires that such wire and its associated hardware be designed, installed, and maintained so as to operate safely when conducting these signals, surges, and/or disturbances.

Existing telephone connections may have varying amounts of electrical current on the bare wires and terminal screws. Therefore, customer premises wiring should not be installed or maintained by the customer without first disconnecting the wiring at the Network Interface.

INSTALLING PREMISES WIRE

A. PLANNING

Before starting, plan the entire job and decide what material and components will be needed. The following is a list of material and components that could be used.

Wall mounted modular outlets
Surface mounted modular outlets
Fasteners
Bridging connector
Wire

Modular Outlets - are jacks which modular telephones are plugged into. There are two basic types of outlets: one to connect desk sets and one to connect wall sets. There are several varieties of jacks for desk sets available. Some are surface mounted, others are placed flush with the wall. Surface mounted jacks attach to the baseboard or wall. Flush mounted are set into the wall similar to an electrical outlet. surface or flush mounted outlets can be equipped with a spring loaded door that acts as a dust cover over the opening. Outlets for wall telephones are attached to the surface of the wall approximately 5 feet from the floor.

Fasteners - are used to attach wiring to walls, baseboards, and supporting beams. Fasteners are made of different type of materials - metal, plastic, or porcelain. Each fastener is made for a specific function and should be used according to their design.

Bridging Connectors - are used to connect two or more telephone wires together. Some are equipped with a modular plug to allow for connection to a jack. Others are used to connect one wire run to other wire runs. If used properly bridges will reduce the amount of wire needed to be placed.

Wire - should be manufactured for telecommunication service and meet all applicable requirements and standards. For ease of installation each individual conductor should be color coded. For additional information on wire see MATERIALS SECTION - Wire.

Determine where outlets are to be placed and what type of outlet would work the best. Review the path to follow between the Network Interface and the outlet. Make sure there are no obstacles in the path. Determine if bridging connectors are needed or can be used. Locations where multiple wire paths cross or come together are candidates for bridging connectors.

Installation of wiring and jacks must comply with all local, state, and national buildings standards. Failure to follow these standards could result in poor service and possibly pose a safety hazard to anyone using the telephone service.

Gather all tools needed to complete the job. A list of some tools that can be used are as follows:

- Screwdriver with insulated handle
- A pair of wire cutters with insulated handles
- A wire stripper to remove the insulation from the ends of each conductor

A hammer or staple gun to use when fastening wire to walls or other items

Drill with drill bits the sizes needed to place wire through walls, install toggle bolts, screws, or other type of anchors

A saw to cut a hole in the wall if installing a flush mounted jack

During the planning stage remember not to use outlets or junction boxes containing electrical wiring to place connections for telephone wiring in. Do not route telephone wiring through conduit containing electrical wiring or in any heating or cooling duct.

B. INSTALLATION

When the planning is completed, all materials and tools are gather, installation can begin. Read all documentation accompanying the materials to be used. The simple steps listed below should be followed to complete the wiring job.

1. Attach the jacks to the wall or baseboard. Use wood screws or screw anchors to attach the jacks based on the type of surface they are mounted to. Wood screws for a wood surface, screw anchors for a plaster or hollow walls.
2. Run the wire from the Network Interface location to each outlet attaching it to the wall or baseboard using the proper type of fasteners. Do not pinch or pierce the wire while attaching it. Allow enough wire at the end of the run to attached to the modular jack. Leave enough wire at the Network Interface location to make the final connection after all outlets are installed.
3. Strip approximately 1 inch of insulation off of each conductor in order to attach to screw type terminals. For outlets that have push on connectors, trim all wires evenly before making the connection. Be sure to make the connections the same at all outlets (use the color coding of the wires).
4. When all wiring is completed, to each outlet, go to the Network Interface and attach the wire to the entrance/customer wiring bridge. Insert the modular plug associated with the bridge into the test jack provided by the telephone company.

MATERIALS

A. WIRE

1. Customer premises wire must be solid 22-24 gauge, annealed copper. Each individual conductor must be insulated with distinctly colored high density polyvinylchloride or a functionally equivalent compound.
2. Each wire shall consist of a minimum of four conductors (two pairs).
3. Two pair wire shall be twisted in a four conductor spiral or as two twisted pairs.
4. Six conductor or larger wire shall have the conductors twisted together to form individual pairs (3 or more pairs) and then grouped together to form the overall wire (cable).
5. Pairs within the cable cannot be split. Table A sets forth typical wire types and appropriate pair color code matches used to insure pair integrity.
6. The wire pairs shall be covered with a jacket of polyvinylchloride or a functionally equivalent compound, with a 1500 volt rms minimum breakdown rating.
7. Wire runs should be limited to 250 feet for 22 gauge wire and 200 feet for 24 gauge wire.
8. Wire should be rated as Category 3 to allow for voice and data transmission in accordance with EIA/TIA Technical Systems Bulletin - 36.
9. Wire should be rated as CM or higher in accordance with the National Electric Code - Article 800. The CM rating is for general purpose wiring that will handle most telecommunication services.

B. JACKS

1. All jacks used in conjunction with premises wire must comply with Part 68 of the FCC registration program.
2. Jacks should be equipped with 4, 6, or 8 contacts (pins).

NOTE: Failure to comply with the above minimum material standards may result in service problems, causing poor transmission (voice and data), cross talk and/or static.

C. WIRE CONNECTION AND ROUTING

1. The continuity of the wire color coding must be maintained through all connections (e.g., red wire connected to red wire). Typical connections and wire coding for service are shown in Table A.
2. Premises wire is to be securely fastened by the appropriate means, to any surface encountered, without abrading or puncturing the insulating jacket. Typical fasteners and spacing intervals are shown in Table B.
3. Removal of wiring jacket or individual conductor insulation for connections shall be accomplished by removing the minimum amount of insulation necessary to make a good connection.
4. Wires shall be installed so as to assure that there is adequate insulation of telephone wiring from commercial power wiring and grounded surfaces.
5. Telephone wire shall not be placed in the same conduit or raceways with wires that conduct electricity.
6. Wiring is required to be sheathed in an insulating jacket in addition to the insulation covering each individual conductor. It shall be assured that the physical and electrical protection, afforded by this insulation, shall not be damaged or abraded during the installation. Locations that should be avoided in the placement of wiring are listed in Table C.
7. Premises wire shall not be placed between buildings or structures out-of-doors. Such a condition would allow exposure to lightning. Wiring between building shall conform to local building National Electrical Code standards.

D. WIRE SEPARATIONS

1. Minimum separations are required in or on buildings, between telephone wiring, and other conductors or metallic objects. The wiring separations specified in Table D are required for crossing and parallel type wire runs.

PREMISES WIRE **TESTING**

Premises wire should be tested whenever any installation or rearrangement is performed.

There are two types of tests conducted on premises wiring: (1) before the premises wiring is connected to the Network Interface, wiring integrity tests should be performed, and (2) operational tests, which are performed after connection to the Network Interface, and after service is provided. These tests should be conducted with no customer provided equipment connected to the premises wire except the equipment needed for testing.

A. WIRING INTEGRITY TESTS

Equipment required: A volt-ohm meter or continuity indicator, a battery with test leads for applying battery voltage of known polarity, and a tester that shows both voltage and polarity.

NOTE: Caution should be taken to insure that the premises wiring is not connected at the Network Interface before these tests are performed.

Short Circuit Test

This test is conducted at a distribution device (Network Interface, entrance bridge, or connecting block).

1. Locate a reliable grounding conductor for testing the ground, such as the grounding pin from a properly wired ac receptacle.
2. All combinations of distribution and station wire conductors and ground should be checked for a shorting condition.

Continuity Test

This test is conducted at the Network Interface or at a wire junction point such as an entrance bridge.

1. Connect the battery across each pair of wires to provide the same polarity on the conductors at each telephone outlet. Insure the connections are similar for each wire run.
2. At each telephone outlet check each pair of contacts/conductors for continuity and polarity.

Test Failures

If any shorts, grounds, discontinuities, or polarity reversals are indicated, locate and correct the problems. Short circuits to ground should be corrected first, since grounds can be mistaken for shorts between wires. All problems should be cleared before operational tests are conducted.

B. OPERATIONAL TESTS

Equipment required: A working telephone set. The following procedures are for standard telephone service.

Dial Tone Testing

This test is to be conducted at each telephone outlet.

1. Plug the telephone into the telephone outlet. Lift the handset of the telephone and listen. Dial tone should be present.
2. Break the dial tone by dialing a single number. Notice that dial tone is no longer present.
3. With dial tone broken, confirm that there is neither an audible hum or noise.

Ring Back Test

This test is to be conducted at each telephone outlet.

1. Have someone, at another location, dial the telephone number of the line being tested.
2. Permit the telephone to ring for one minute (approximately ten rings).
3. Lift the handset of the telephone. Ringing should stop.
4. Hang up, wait five seconds, and then lift the handset again. Check for return of normal dial tone.

Test Failures

In case of a test failure, always confirm that the telephone is working properly, and that any service work has been completed by the telephone company. When this has been verified, proceed as follows:

1. Repeat the tests with the telephone plugged into the Network Interface. If operation is still not proper (no dial tone), notify the service provider.

2. Proper performance at the Network Interface would indicate a problem in the premises wiring. Reconnect the Network Interface jack. Make sure no customer provided equipment is connected except for the set being used to test. Disconnect the wire going to each outlet, one by one, until the problem is isolated. After all problems have been cleared, reconnect the wire and retest any outlets involved.

BASIC SERVICE STANDARDS

Telephone service is designed and installed by Ameritech to meet a number of electrical specifications. These required standards ensure that a customer receives the highest quality service available. The standards allow Ameritech to check for and correct problems that could occur on a telephone line.

Problems encountered could be due to trouble in the Ameritech network, the customer's premises wire, or even another service provider's network. These problems could be low volume (hard to hear), noise (clicking, static, hum), or radio interference. Ameritech maintains the network as part of the ongoing monthly service charges. By Ameritech maintaining the network at the proper standards, the customer is assured of quality voice service, which assures conversations over the telephone network will be completed without error. By following the information provided in this booklet, both Ameritech and the customer will help reduce problems that premises wire can cause.

Other providers of service, such as long distance companies, maintain their networks in a similar manner as Ameritech. They work to establish a network that meets all standards for proper voice transmission. When all portions of service are working correctly and meet the required standards, customers are satisfied with their telephone service.

With the growth of computer usage and dial up modems, other problems have arisen for customers. Customers attempting to transmit data using a basic telephone line, could encounter problems during the process. Similar to voice services, there are many things that could affect data transmission. Customers need to be aware of the basic service standards and take certain measures to minimize possible problems when using their service.

The following is a list of items that could reduce data transmission capabilities.

Type of modem - older modems do not allow for high speed data transmission. It is recommended that the modem used be V.34 compatible.

Type of service being called - each service provider has a different requirement to access their service. These differences could cause differences in the way a modem will connect.

Where the call is placed to - calling a long distance number over a local number could have an effect on the calls. When more than one provider is involved, problems on either network will effect the other.

Premises wire - even the condition of the wiring used could have an effect on data transmission in the same manner as it would have on a normal conversation.

As can be seen, many things can affect the overall telephone service and it is important for Ameritech and the customer to take steps to insure that standards are met.

BASIC SERVICE TESTING

Ameritech provides voice grade services that must meet specific transmission parameters. Keeping in mind that it is a voice grade service, if standard transmission parameters are met, a transmission speed of at least 9600 bps should be attainable. A couple of standard transmission tests which can be run on a voice grade line are listed below. Ameritech's requirements are also listed with the test.

- 1) Transmission Loss Test (Circuit Loss) - The test is used to verify signal strength from the central office to the customer's premises. This test is performed using one frequency as a reference point. The maximum amount of signal loss is 8.5 dB.
- 2) Noise test (Circuit Noise) - The test is used to check for noise on the line when a connection is made to the network. Noise levels are to be as low as possible to insure that conversations can be heard. The noise level is to be less than 20 dBrnC.
- 3) Test for electrical interference (Power Influence) - This test is done to determine if the electrical lines in the area are causing noise on the cable. The purpose of the test is to determine if the electrical line will interrupt the customer's service. Readings on the line are to be between 70 and 80 dBrnC.

- 4) Frequency sweep test (3 and 10 tone) - This test is used to determine if the signals are of sufficient strength for the customer to hear. The tones used are within the voice frequency range. The voice range is between 300 and 3000 Hertz.

The tests mentioned have the most effect on data transmission over voice grade service. These tests are performed to insure that the customer's line works properly. As you can see, these tests are to insure the voice quality of the exchange line. When the parameters are met, a customer's line should not experience problems transmitting data when using a dial up analog modem.

Ameritech is continually looking for ways to improve the network and service offerings to increase the data capabilities of our facilities.

TABLE A
WIRE SELECTION AND TERMINATION

Pair No.	Wire Colors			6 Position Jack	8 Position Jack		Multiple Line Service
	2 Pair*	3 Pair	4 Pair		@	#	
1	Green Red	White/Blue Blue	White/Blue Blue	4	5	5	Tip Ring
2	Black Yellow	White/Orange Orange	White/Orange Orange	3 2	4 3	4	Tip Ring
3		White/Green Green	White/Green Green	5 1	6 2	3	Tip Ring
4			White/Brown Brown	6	7	6	Tip Ring
					1	7	Tip Ring
					8	8	Tip Ring

* If the four conductors are not separated into two distinct pairs, the wire is not to be used for multiple line service.
 @ Wiring for RJ61X type registered jack.
 # Alternate wiring for 8 Position Jack (T568A) jack designation).

Fasteners	Horizontal	Vertical	From Corner
Wire Clamp	16 inches	16 inches	2 inches
Staples (wire)	7 inches	7 inches	2 inches
Bridle Rings *	4 feet	8 feet	2 - 8.5 inches **
Drive Rings *	4 feet	8 feet	2 - 8.5 inches **

* To avoid possible injury do not use drive rings below a 6 foot clearance level, use bridle rings.

** When changing direction of wire runs the fasteners should be spaced to hold the wire at approximately a 45 degree angle.

• Damp locations.
• Locations not easily accessible.
• Temporary structures.
• Wire runs that provide support for foreign objects (e.g., decorative items, lighting, etc.).
• Excessively hot locations (steam pipes, etc.).
• Locations where wire and cable will be subject to abrasion.

Source	Type of Wire Involved	Minimum Separations	Wire Coating Alternatives
Electric Supply	Bare wire (any Voltage), or open wire over 300 volts.	5 feet	No Alternatives
	Open wire not over 300 volts.	2 inches	See Note 1
	Wires in separate conduit, in armored or non-metallic sheath, or ground wire.	None	N/A
Radio & Television Signal or Control	Antenna lead-in and ground wire.	4 inches	See Note 1
	All types.	None	N/A
CATV	Coaxial cables with grounded shielding.	None	N/A
	Drop wire, all types.	2 inches	See Note 1
Telecommunications	Wire from transformer.	6 inches	No Alternative
Neon Signs	Lightning rods and wires.	6 feet	See Note 2
Lightning System			

Note 1: If minimum separations cannot be obtained, additional protection of a plastic tube, wire guard, or two layers of vinyl tape extending 2 inches beyond each side of object being crossed must be provided.

Note 2: Separations of less than 6 feet, but not less than 4 inches, are permissible under the following conditions:
 (1) Where telecommunications, power, and lightning rod ground connections are made to a common metallic cold water pipe that is properly grounded, or.
 (2) Where separately driven ground rods are used for telecommunication, power, and lightning rod installations, and the ground rods are bonded together.

DEFINITION OF TERMS

Armored or Non-metallic Sheathed Cable

A cable of two or more insulated conductors having an outer sheath of moisture resistant, flame retardant, or non-metallic material.

Bare Wire

An electrical conductor having no covering or insulation whatsoever.

Bridle Ring

A fastener used to loosely hold telephone wiring when appearance is not a factor. The bridle ring screws into a surface. It is usually used where the wire is run below six feet and contains no sharp or hazardous edges. The telephone wire is inserted after the ring is in place.

Coaxial Cable

A two conductor cable for transmitting electrical signals that consists of a tube of conducting material surrounding a second centrally located conductor which is held in place by insulators.

Conduit

A plastic or metal pipe used to protect telephone or electrical wiring.

Connecting Block

A device used for terminating premises wiring and a means of connecting telephone sets to such wiring.

Customer Provided Equipment

Telephone equipment which is registered for connection to the telecommunications network in accordance with Subpart C of Part 68 of the FCC's rules. If a telephone device has been properly registered it will have an identification number permanently affixed to it.

Drive Rings

A fastener used to loosely hold telephone wiring in place when appearance is not a factor. The nail in a drive ring is driven into the supporting surface and then the ring is opened to permit placing of the wires. A drive ring must be at least six (6) feet from the floor so that its nail will not present a hazard.

Drop Wire

Wire used to provide telephone service into a customer's premises. It may be aerial or buried.

Entrance Bridge

A modular connecting unit to which the premises wiring is terminated. This unit is then connected to the Telephone Company's Network Interface. This unit serves as a dividing point between the customer's wiring and the Telephone Company network and may be installed by either the customer or the Telephone Company.

Ground

Part of an electrical path or connection (Earth ground).

Ground Connections

Metal paths (wires, metal pipes, rods, and clamps) which connect electrical circuits to earth ground, for protective reasons.

Ground Rods

A solid metal rod or pipe which is driven into the earth in order to provide an earth ground for electrical circuits.

Hardwired

The term "hardwired" as applied to a telephone set means the connection of the line (mounting) cord to a connecting block with screw terminations.

Modular

The term "modular" applies to the connection of a telephone set mounting cord to the telecommunications network via plugs located on the end of such cords and jacks used to terminate premises wire.

Network Interface

A Telephone Company installed modular connection unit which serves as a demarcation point between the customer owned premises wiring and the Telephone Company network.

Non-Modular

The term "non-modular" applies to the connection of a telephone set mounting cord to the telecommunications network via a four (4) pin plug and matching jack, or via hardwiring.

Open Wiring

A wiring method using cleats, knobs, tubes, or flexible tubing for the protection and support of insulated conductors run in or on buildings. Cleats, knobs, and tubes are porcelain fasteners which are used to affix electrical wires that are insulated but do not have an outer protective jacket to a surface.

Party Line

Basic telephone service whose use is shared by two or more residential subscribers.

Premises Wire

This is wire provided and owned by the customer. It is connected to the telephone network by means of a modular jack and plug at the Network Interface.

Protector

A device used as protection from hazardous voltages. It may be mounted separately or in conjunction with the Network Interface.

Raceways

A metal or plastic channel used to loosely hold electrical and telephone wires in buildings. A raceway is usually located in the floor and is encased on three or four sides by concrete.

Ring

"Ring" refers to that side of a two wire telephone circuit which is connected to the negative side of a battery located at the Telephone Company Central Office. It is like the "hot" side of a residential lighting circuit.

Tip

"Tip" refers to that side of a two wire telephone circuit which is connected to the positive side of a battery located at the Telephone Company Central Office. It is like the "neutral" side of a residential lighting circuit.

Wire Clamp

A fastener used to secure telephone wires to a surface. One end is U-shaped for placement over the wire. The other end contains a tab which is affixed to the mounting surface with a nail or screw.

Wire Guard

A length of plastic (round or U-shaped) used to protect telephone wiring from abrasion.

REFERENCES**National Electric Code**

Chapter 8. Communication Systems
Article 800 - Communication Circuits

EIA/TIA Standards

EIA/TIA-568A Commercial Building
Telecommunication Wiring Standard
EIA/TIA-570 Residential and Light Commercial
Telecommunication Wiring Standard

EIA/TIA Bulletin

TSB-36 Technical System Bulletin Additional Cable
Specifications for Unshielded Twisted Pair Cables

47 Code of Federal Regulations

Part 68 - Connection of Terminal Equipment to the
Telephone Network

