

with this rule in a manner which cannot be readily altered by software control or other user controlled media.

(5) As used in this § 68.314(h), *Private Branch Exchange or similar system* ("PBX") means customer premises equipment, such as private branch exchanges, key equipment, multifunction systems, multiplexers, and any equipment for which adopted industry standard signalling is the standard mode of returning answer supervision.

[45 FR 20853, Mar. 31, 1980, as amended at 47 FR 10219, Mar. 10, 1982; 47 FR 39687, Sept. 9, 1982; 47 FR 42750, Sept. 29, 1982; 49 FR 48725, Dec. 14, 1984; 50 FR 27251, July 2, 1985; 51 FR 950, Jan. 9, 1986; 51 FR 16690, May 6, 1986; 55 FR 46066, Nov. 1, 1990]

§ 68.316 Hearing aid compatibility magnetic field intensity requirements: Technical standards.

A telephone handset is hearing aid compatible for the purposes of this section if it complies with the following standard, published by the Telecommunications Industry Association, copyright 1983, and reproduced by permission of the Telecommunications Industry Association:

ELECTRONIC INDUSTRIES ASSOCIATION RECOMMENDED STANDARD RS-504 MAGNETIC FIELD INTENSITY CRITERIA FOR TELEPHONE COMPATIBILITY WITH HEARING AIDS

[Prepared by EIA Engineering Committee TR-41 and the Hearing Industries Association's Standards and Technical Committee]

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Magnetic Field Intensity Criteria for Telephone Compatibility With Hearing Aids

(From EIA Standards Proposal No. 1652, formulated under the cognizance of EIA TR-41 Committee on Voice Telephone Terminals and the Hearing Industries Association's Standards and Technical Committee.)

1 Introduction

Hearing-aid users have used magnetic coupling to enable them to participate in telephone communications since the 1940's. Magnetic pick-ups in hearing-aids have provided for coupling to many, but not all, types of telephone handsets. A major reason for incompatibility has been the lack of handset magnetic field intensity requirements. Typically, whatever field existed had been provided fortuitously rather than by design. More recently, special handset designs, e.g., blue grommet handsets associated with public telephones, have been introduced to provide hearing-aid coupling and trials were conducted to demonstrate the acceptability of such designs. It is anticipated that there will be an increase in the number of new handset designs in the future. A standard definition of the magnetic field intensity emanating from telephone handsets intended to provide hearing-aid coupling is needed so that hearing-aid manufacturers can design their product to use this field, which will be guaranteed in handsets which comply with this standard.

1.1 This standard is one of a series of technical standards on voice telephone terminal equipment prepared by EIA Engineering Committee TR-41. This document, with its companion standards on Private Branch Exchanges (PBX), Key Telephone Systems (KTS), Telephones and Environmental and Safety Considerations (Refs: A1, A2, A3 and A4) fills a recognized need in the telephone industry brought about by the increasing use in the public telephone network of equipment supplied by numerous manufacturers. It will be useful to anyone engaged in the manufacture of telephone terminal equipment and hearing-aids and to those purchasing, operating or using such equipment or devices.

1.2 This standard is intended to be a living document, subject to revision and updating as warranted by advances in network and terminal equipment technology and changes in the FCC Rules and Regulations.

2 Scope

2.1 The purpose of this document is to establish formal criteria defining the magnetic field intensity presented by a telephone to

which hearing aids can couple. The requirements are based on present telecommunications plant characteristics at the telephone interface. The telephone will also be subject to the applicable requirements of EIA RS-470, Telephone Instruments with Loop Signaling for Voiceband Applications (Ref: A3) and the environmental requirements specified in EIA Standards Project PN-1361, Environmental and Safety Considerations for Voice Telephone Terminals, when published (Ref: A4).

Telephones which meet these requirements should ensure satisfactory service to users of magnetically coupled hearing-aids in a high percentage of installations, both initially and over some period of time, as the network grows and changes occur in telephone serving equipment. However, due to the wide range of customer apparatus and loop plant and dependent on the environment in which the telephone and hearing aid are used, conformance with this standard does not guarantee acceptable performance or interface compatibility under all possible operating conditions.

2.2 A telephone complies with this standard if it meets the requirements in this standard when manufactured and can be expected to continue to meet these requirements when properly used and maintained. For satisfactory service a telephone needs to be capable, through the proper selection of equipment options, of satisfying the requirements applicable to its marketing area.

2.3 The standard is intended to be in conformance with part 68 of the FCC Rules and Regulations, but it is not limited to the scope of those rules (Ref: A5).

2.4 The signal level and method of measurement in this standard have been chosen to ensure reproducible results and permit comparison of evaluations. The measured magnetic field intensity will be approximately 15 dB above the average level encountered in the field and the measured high-end frequency response will be greater than that encountered in the field.

2.5 The basic accuracy and reproducibility of measurements made in accordance with this standard will depend primarily upon the accuracy of the test equipment used, the care with which the measurements are conducted, and the inherent stability of the devices under test.

3 Definitions

This section contains definitions of terms needed for proper understanding and applica-

tion of this standard which are not believed to be adequately treated elsewhere. A glossary of telephone terminology, which will be published as a companion volume to the series of technical standards on Telephone Terminals For Voiceband Applications, is recommended as a general reference and for definitions not covered in this section.

3.1 A telephone is a terminal instrument which permits two-way, real-time voice communication with a distant party over a network or customer premises connection. It converts real-time voice and voiceband acoustic signals into electrical signals suitable for transmission over the telephone network and converts received electrical signals into acoustic signals. A telephone which meets the requirements of this standard also generates a magnetic field to which hearing-aids may couple.

3.2 The telephone boundaries are the electrical interface with the network, PBX or KTS and the acoustic, magnetic and mechanical interfaces with the user. The telephone may also have an electrical interface with commercial power.

3.3 A hearing aid is a personal electronic amplifying device, intended to increase the loudness of sound and worn to compensate for impaired hearing. When equipped with an optional inductive pick-up coil (commonly called a telecoil), a hearing aid can be used to amplify magnetic fields such as those from telephone receivers or induction-loop systems.

3.4 The reference plane is the planar area containing points of the receiver-end of the handset which, in normal handset use, rest against the ear (see Fig 1).

3.5 The measurement plane is parallel to, and 10 mm in front of, the reference plane (see Fig 1).

3.6 The reference axis is normal to the reference plane and passes through the center of the receiver cap (or the center of the hole array, for handset types that do not have receiver caps).

3.7 The measurement axis is parallel to the reference axis but may be displaced from that axis, by a maximum of 10 mm (see Fig 1). Within this constraint, the measurement axis may be located where the axial and radial field intensity measurements, are optimum with regard to the requirements. In a handset with a centered receiver and a circularly symmetrical magnetic field, the measurement axis and the reference axis would coincide.

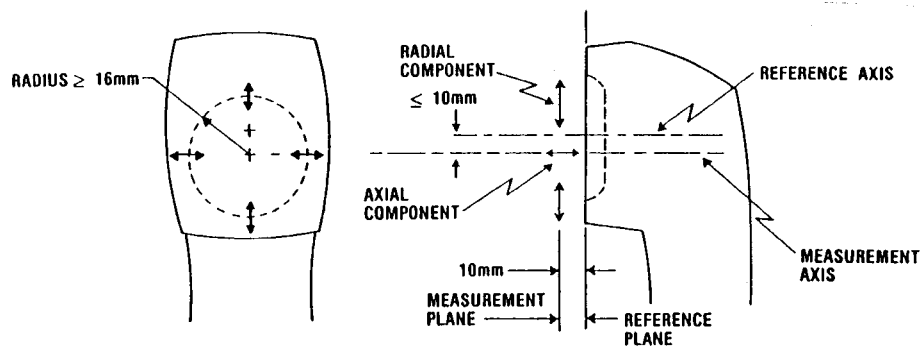


FIG 1 REFERENCE AND MEASUREMENT PLANES AND AXES

4 Technical Requirements

4.1 General.

These criteria apply to handsets when tested as a constituent part of a telephone.

4.1.1 Three parameters descriptive of the magnetic field at points in the measurement plane shall be used to ascertain adequacy for magnetic coupling. These three parameters are intensity, direction and frequency response, associated with the field vector.

4.1.2 The procedures for determining the parameter values are defined in the IEEE Standard Method For Measuring The Magnetic Field Intensity Around A Telephone Receiver (Ref: A6), with the exception that this EIA Recommended Standard does not require that the measurements be made using an equivalent loop of 2.75 km of No. 26 AWG cable, but uses a 1250-ohm resistor in series with the battery feed instead (see Fig 2).

4.1.3 When testing other than general purpose analog telephones, e.g., proprietary or digital telephones, an appropriate feed circuit and termination shall be used that produces equivalent test conditions.

4.2 Axial Field Intensity.

When measured as specified in 4.1.2, the axial component of the magnetic field directed along the measurement axis and located at the measurement plane, shall be

greater than -22 dB relative to 1 A/m, for an input of -10 dBV at 1000 Hz (see Fig 2).

NOTE: If the magnitude of the axial component exceeds -19 dB relative to 1 A/m, some relaxation in the frequency response is permitted (See 4.4.1).

4.3 Radial Field Intensity.

When measured as specified in 4.1.2, radial components of the magnetic field as measured at four points 90° apart, and at a distance ≥ 16 mm from the measurement axis (as selected in 4.2), shall be greater than -27 dB relative to 1 A/m, for an input of -10 dBV at 1000 Hz (see Fig 2).

4.4 Induced Voltage Frequency Response.

The frequency response of the voltage induced in the probe coil by the axial component of the magnetic field as measured in 4.2, shall fall within the acceptable region of Fig 4A or Fig 4B (see 4.4.1 and 4.4.2), over the frequency range 300-to-3300 Hz.

4.4.1 For receivers with an axial component which exceeds -19 dB relative to 1 A/m, when measured as specified in 4.1.2, the frequency response shall fall within the acceptable region of Fig 4A.

4.4.2 For receivers with an axial component which is less than -19 dB but greater than -22 dB relative to 1 A/m, when measured as specified in 4.1.2, the frequency response shall fall within the acceptable region of Fig 4B.

**BLOCK DIAGRAM
MAGNETIC FIELD MEASURING APPARATUS**

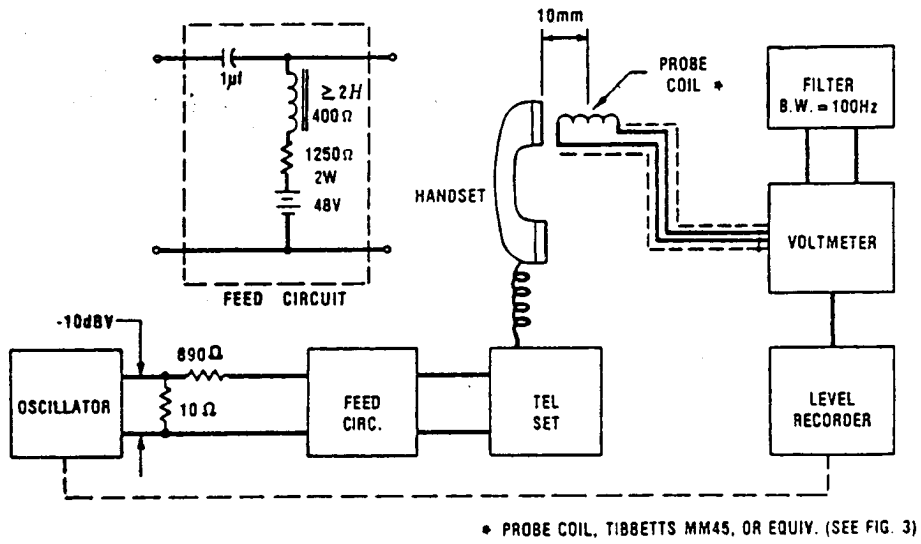
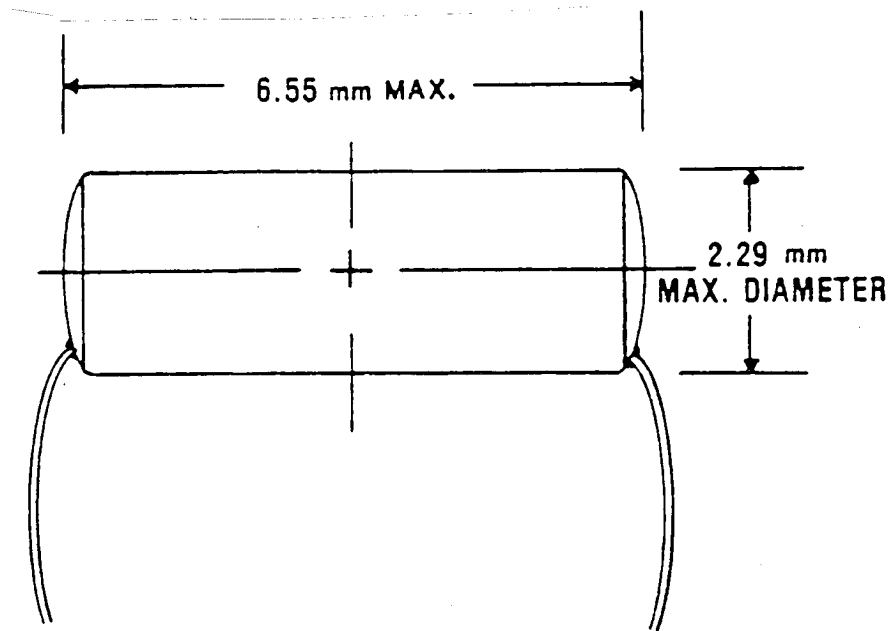


FIG 2 MEASUREMENT BLOCK DIAGRAM



TYPICAL PARAMETERS OF PROBE COIL

DC RESISTANCE: 900 Ω
INDUCTANCE: 140 mH
SENSITIVITY: -60.5 dBV/(A/m)

FIG 3 PROBE COIL PARAMETERS

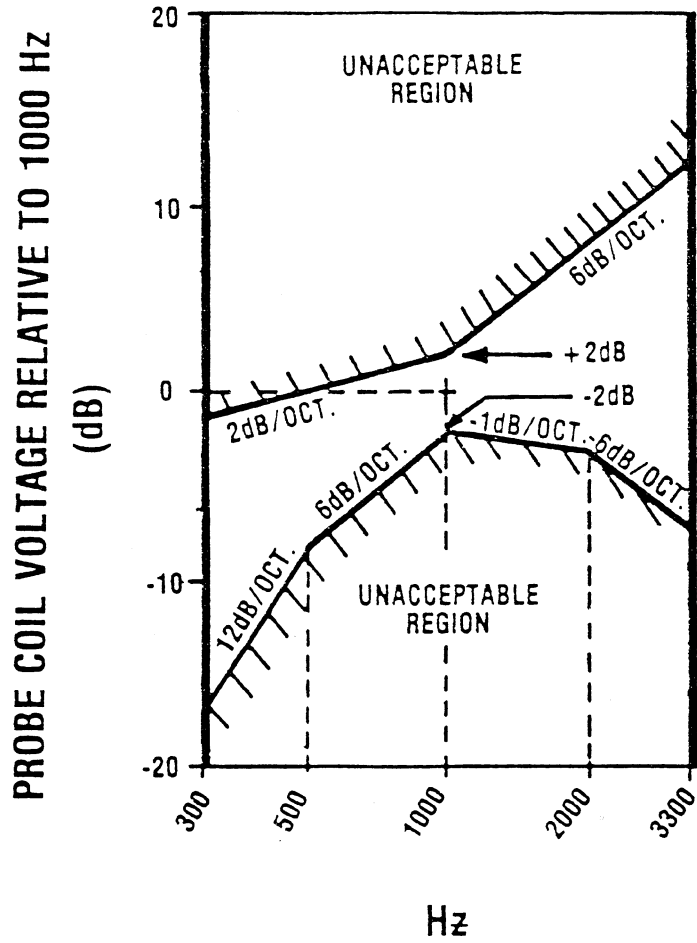


FIG 4A INDUCED VOLTAGE FREQUENCY RESPONSE FOR RECEIVERS WITH AN AXIAL FIELD THAT EXCEEDS -19 dB

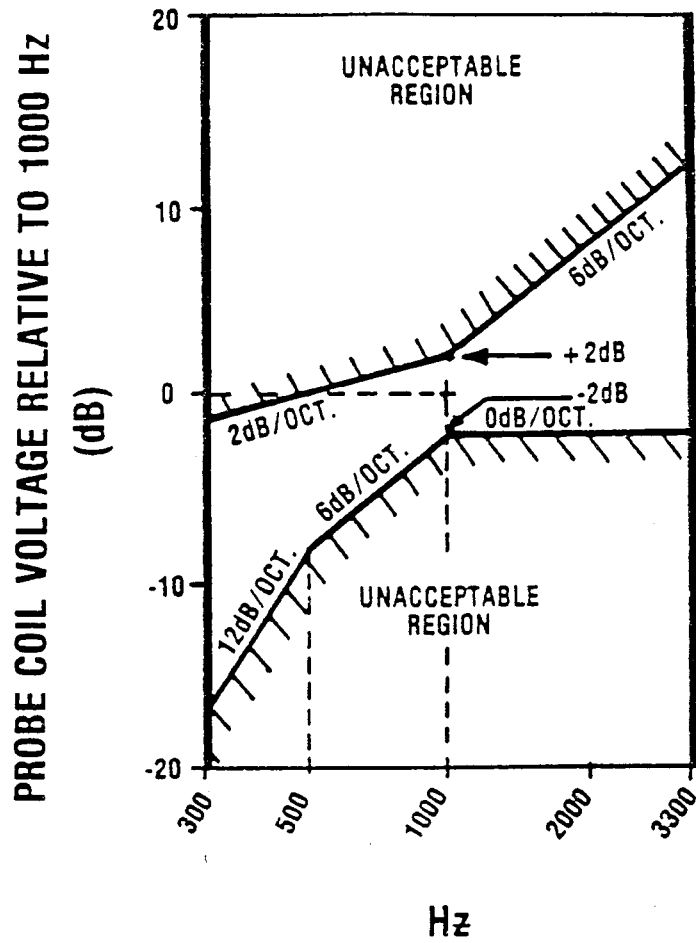


FIG 4B INDUCED VOLTAGE FREQUENCY RESPONSE FOR RECEIVERS WITH AN AXIAL FIELD THAT EXCEEDS -22 dB

APPENDIX A—BIBLIOGRAPHY

(A1) EIA Standard RS-464, Private Branch Exchange (PBX) Switching Equipment for Voiceband Applications.

(A2) EIA Standard RS-478, Multi-Line Key Telephone Systems (KTS) for Voiceband Applications.

(A3) EIA Standard RS-470, Telephone Instruments with Loop Signaling for Voiceband Applications.

(A4) EIA Project Number PN-1361, Environmental and Safety Considerations for Voice Telephone Terminals.

(A5) Federal Communications Commission Rules and Regulations, part 68, Connection of Terminal Equipment to the Telephone Network.

(A6) IEEE Standard, Method for Measuring the Magnetic Field around a Telephone Receiver. (to be published)

[49 FR 1363, Jan. 11, 1984, as amended at 61 FR 42187, Aug. 14, 1996]

§ 68.317 Hearing aid compatibility volume control: Technical standards.

(a) An analog telephone complies with the Commission's volume control requirements if the telephone is equipped with a receive volume control that provides, through the receiver in the handset or headset of the telephone, 12 dB of gain minimum and up to 18 dB of gain maximum, when measured in terms of Receive Objective Loudness Rating (ROLR), as defined in paragraph 4.1.2 of ANSI/EIA-470-A-1987 (Telephone Instruments With Loop Signaling). The 12 dB of gain minimum must be achieved without significant clipping of the test signal. The telephone also shall comply with the upper and lower limits for ROLR given in table 4.4 of ANSI/EIA-470-A-1987 when the receive volume control is set to its normal unamplified level.

NOTE TO PARAGRAPH (a): Paragraph 4.1.2 of ANSI/EIA-470-A-1987 identifies several characteristics related to the receive response of a telephone. It is only the normal unamplified ROLR level and the change in ROLR as a function of the volume control setting that are relevant to the specification of volume control as required by this section.

(b) The ROLR of an analog telephone shall be determined over the frequency range from 300 to 3300 HZ for short, average, and long loop conditions represented by 0, 2.7, and 4.6 km of 26 AWG nonloaded cable, respectively. The specified length of cable will be simu-

lated by a complex impedance. (See Figure A.) The input level to the cable simulator shall be -10 dB with respect to 1 V open circuit from a 900 ohm source.

(c) A digital telephone complies with the Commission's volume control requirements if the telephone is equipped with a receive volume control that provides, through the receiver of the handset or headset of the telephone, 12 dB of gain minimum and up to 18 dB of gain maximum, when measured in terms of Receive Objective Loudness Rating (ROLR), as defined in paragraph 4.3.2 of ANSI/EIA/TIA-579-1991 (Acoustic-To-Digital and Digital-To-Acoustic Transmission Requirements for ISDN Terminals). The 12 dB of gain minimum must be achieved without significant clipping of the test signal. The telephone also shall comply with the limits on the range for ROLR given in paragraph 4.3.2.2 of ANSI/EIA/TIA-579-1991 when the receive volume control is set to its normal unamplified level.

(d) The ROLR of a digital telephone shall be determined over the frequency range from 300 to 3300 Hz using the method described in paragraph 4.3.2.1 of ANSI/EIA/TIA-579-1991. No variation in loop conditions is required for this measurement since the receive level of a digital telephone is independent of loop length.

(e) The ROLR for either an analog or digital telephone shall first be determined with the receive volume control at its normal unamplified level. The minimum volume control setting shall be used for this measurement unless the manufacturer identifies a different setting for the nominal volume level. The ROLR shall then be determined with the receive volume control at its maximum volume setting. Since ROLR is a loudness rating value expressed in dB of loss, more positive values of ROLR represent lower receive levels. Therefore, the ROLR value determined for the maximum volume control setting should be subtracted from that determined for the nominal volume control setting to determine compliance with the gain requirement.

(f) The 18 dB of receive gain may be exceeded provided that the amplified receive capability automatically resets to nominal gain when the telephone is