



Standard Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Systems Without the Use of Electronic Measurement Instruments¹

This standard is issued under the fixed designation E 317; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice describes procedures for evaluating the following performance characteristics of ultrasonic pulse-echo testing systems: Horizontal Limit and Linearity; Vertical Limit and Linearity; Resolution-Entry Surface and Far Surface; Sensitivity and Noise; Accuracy of Calibrated Gain Controls. Relevant terminology can be found in Terminology E 1316 and IEEE Standard 100.

1.2 Ultrasonic test systems using pulsed-wave trains and A-scan presentation (rf or video) may be evaluated.

1.3 The procedures are applicable to shop or field conditions; additional electronic measurement instrumentation is not required.

1.4 This practice establishes no performance limits for test systems; if such acceptance criteria are required, these must be specified by the using parties.

1.5 The specific parameters to be evaluated, conditions and frequency of test, and report data required, must also be determined by the user.

1.6 This practice is intended primarily for the evaluation of a complete testing system, including search unit, instrument, interconnections, and fixtures. However, certain characteristics of the instrument alone can be determined within the limitations discussed.

1.7 Required test apparatus includes selected test blocks and a precision external attenuator (where specified) in addition to the system to be evaluated.

1.8 Precautions relating to the applicability of the procedures and interpretation of the results are included.

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

E 114 Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method²

E 127 Practice for Fabricating and Checking Aluminum Alloy Ultrasonic Standard Reference Blocks²

E 214 Practice for Immersed Ultrasonic Examination by the Reflection Method Using Pulsed Longitudinal Waves²

E 428 Practice for Fabrication and Control of Steel Reference Blocks Used in Ultrasonic Inspection²

E 1316 Terminology for Nondestructive Examinations²

2.2 Other Standard:

IEEE Std 100, *IEEE Standard Dictionary of Electrical and Electronic Terms*³

3. Summary of Practice

3.1 A testing system to be evaluated comprises an ultrasonic pulse-echo instrument, search unit, interconnecting cables, and couplant; for immersion testing systems suitable fixturing is required.

3.2 Test conditions are selected that are consistent with the intended end-use of the inspection system, as determined by the user.

3.3 The ultrasonic response from appropriate test blocks is obtained, and presented in numerical or graphical form.

3.4 The test data can be used to characterize the related system parameters in accordance with user requirements.

4. Significance and Use

4.1 This practice describes procedures applicable to both shop and field conditions. More comprehensive or precise measurements of the characteristics of complete systems and their components will generally require laboratory techniques and electronic equipment such as oscilloscopes and signal generators. Substitution of these methods is not precluded where appropriate; however, their usage is not within the scope of this practice.

4.2 This document does not establish system acceptance

¹ This practice is under the jurisdiction of ASTM Committee E-7 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.06 on Ultrasonic Testing Procedures.

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² *Annual Book of ASTM Standards*, Vol 03.03.

³ Published by Wiley-Interscience, New York, NY.