



Designation: E2580 – 24

Standard Practice for Ultrasonic Testing of Flat Panel Composites and Sandwich Core Materials Used in Aerospace Applications¹

This standard is issued under the fixed designation E2580; 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 U.S. Department of Defense.

1. Scope*

1.1 This practice covers two procedures for ultrasonic testing (UT) of flat panel (parallel surfaces) composites and flat sandwich core panels. Typical as-fabricated lay-ups include uniaxial, cross ply, and angle ply laminates, as well as honeycomb sandwich core materials. These procedures can be used throughout the life cycle of the materials: product and process design optimization, on line process control, after manufacture inspection, and in-service inspection. Contact methods, such as angle-beam techniques using shear waves, are not discussed.

1.2 Ultrasonic testing is a common subsurface method for detection of laminar discontinuities. Two techniques can be considered based on panel surface accessibility; pulse echo for one sided and through transmission (bubblers/squirters) for two sided. As used in this practice, both require the use of a pulsed straight-beam ultrasonic longitudinal wave followed by observing indications of either the reflected (pulse-echo) or received (through transmission) wave. The general types of anomalies detected by both techniques include foreign materials, delamination, disbond/un-bond, fiber de-bonding, inclusions, porosity, and voids.

1.3 This practice provides two ultrasonic test procedures. These test procedures can be applied to small area manual scanning and large area automated scanning. Each has its own merits and requirements for inspection and shall be selected as agreed upon in a contractual document.

1.3.1 *Test Procedure A, Pulse Echo (Non-contacting and Contacting)*, is at a minimum a single transducer transmitting and receiving a longitudinal wave in the range of 0.5 MHz to 20 MHz (see Fig. 1). This procedure requires access to only one side of the specimen. This procedure can be conducted by automated or manual means. Automated and manual test results may be imaged or recorded.

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

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1.3.2 *Test Procedure B, Through Transmission*, is a combination of two transducers. One transmits a longitudinal wave and the other receives the longitudinal wave in the range of 0.5 MHz to 20 MHz (see Fig. 2 for an example set-up using squirters). This procedure requires access to both sides of the specimen. This procedure is automated and the examination results are recorded.

1.4 This practice does not specify accept-reject criteria.

1.5 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D3878 Terminology for Composite Materials

D5687/D5687M Guide for Preparation of Flat Composite Panels with Processing Guidelines for Specimen Preparation

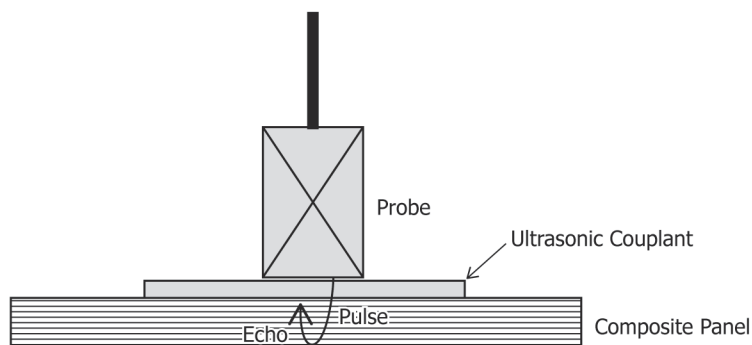
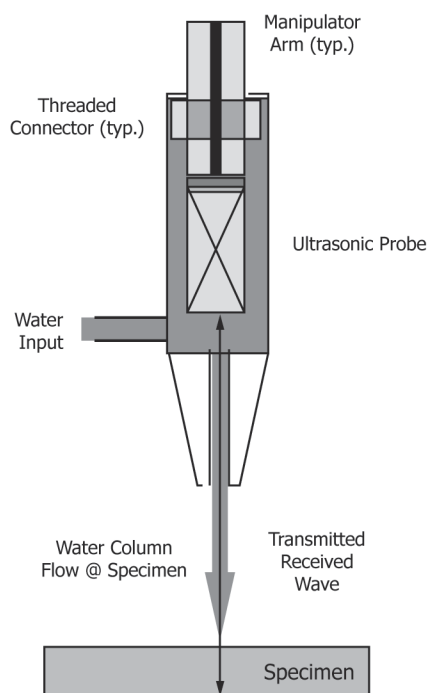
E317 Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Instruments and Systems without the Use of Electronic Measurement Instruments

E543 Specification for Agencies Performing Nondestructive Testing

E1065/E1065M Practice for Evaluating Characteristics of

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard



Automated

Manual

FIG. 1 Test Procedure A, Example Pulse Echo Apparatus Set-ups

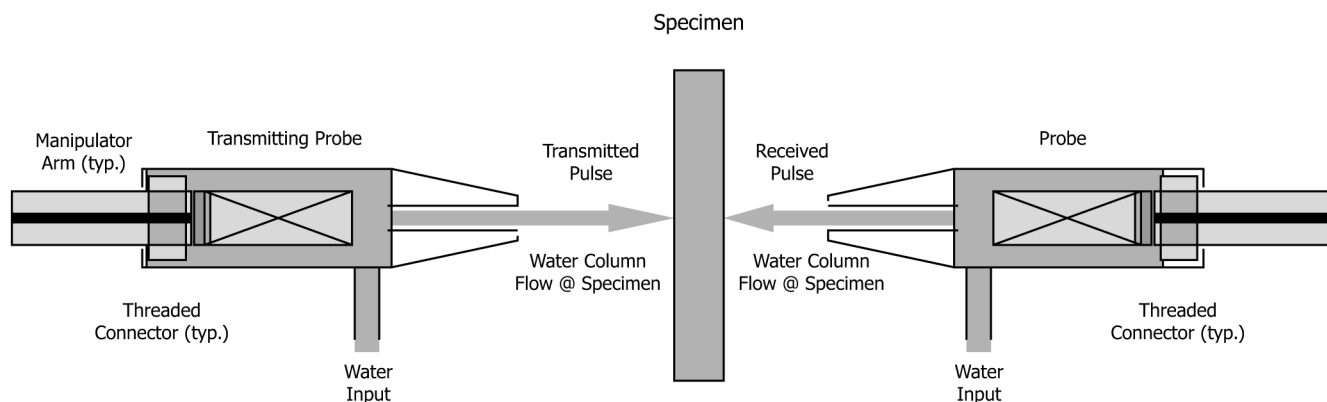


FIG. 2 Test Procedure B, Through Transmission Apparatus Set-up Using Squirters

Ultrasonic Search Units

[E1309 Guide for Identification of Fiber-Reinforced Polymer-Matrix Composite Materials in Databases \(Withdrawn 2015\)](#)³

[E1316 Terminology for Nondestructive Examinations](#)

[E1324 Guide for Measuring Some Electronic Characteristics of Ultrasonic Testing Instruments](#)

[E1434 Guide for Recording Mechanical Test Data of Fiber-Reinforced Composite Materials in Databases \(Withdrawn 2015\)](#)³

[E1471 Guide for Identification of Fibers, Fillers, and Core Materials in Computerized Material Property Databases \(Withdrawn 2015\)](#)³

³ The last approved version of this historical standard is referenced on www.astm.org.