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Standard Guide for Data Fields for Computerized Transfer of Digital Ultrasonic Examination Data¹

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1. Scope

1.1 This guide provides a listing and description of the fields that are recommended for inclusion in a digital ultrasonic examination data base to facilitate the transfer of such data. This guide is prepared for use particularly with digital image data obtained from ultrasonic scanning systems. The field listing includes those fields regarded as necessary for inclusion in the data base (as indicated by Footnote C in Table 1); these fields, so marked, are regarded as the minimum information necessary for a transfer recipient to understand the data. In addition, other optional fields are listed as a remainder of the types of information that may be useful for additional understanding of the data, or applicable to a limited number of applications.

1.2 It is recognized that organizations may have in place an internal format for the storage and retrieval of ultrasonic examination data. This guide should not impede the use of such formats since it is probable that the necessary fields are already included in such internal data bases, or that the few additions can be made. The numerical Field Number listing indicated in this guide is only for convenience; the specific numbers carry no inherent significance and are not a part of the data file.

1.3 The types of ultrasonic examination systems that appear useful in relation to this guide include those described in Practices E 114, E 214 and E 1001. Many of the terms used are defined in Terminology E 1316. The search unit parameters used in this guide follow from those used in Guide E 1065.

1.4 *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 214 Practice for Immersed Ultrasonic Examination by the Reflection Method Using Pulsed Longitudinal Waves²

E 1001 Practice for Detection and Evaluation of Discontinuities by the Immersed Pulse-Echo Ultrasonic Method Using Longitudinal Waves²

E 1065 Guide for Evaluating Characteristics of Ultrasonic Search Units²

E 1316 Terminology for Nondestructive Examinations²

3. Significance and Use

3.1 The primary use of this guide is to provide a standardized approach for the data file to be used for the transfer of digital ultrasonic data from one user to another where the two users are working with dissimilar ultrasonic systems. This guide describes the contents, both required and optional, for an intermediate data file that can be created from the native format of the ultrasonic system on which the data was collected and that can be converted into the native format of the receiving ultrasonic or data analysis system. The development of translator software to accomplish these data format conversions is being addressed under a separate effort; this will include specific items needed for the data transfer, for example, language used, memory requirements and intermediate specification, including detailed data formats and structures. This guide will also be useful in the archival storage and retrieval of ultrasonic data as either a data format specifier or as a guide to the data elements that should be included in the archival file.

3.2 Although the recommended field listing includes more than 120 items, only about one third of those are regarded as essential and marked with Footnote C in Table 1. Fields so marked must be addressed in the data base. The other recommended fields provide additional information that a user will find helpful in understanding the ultrasonic examination result. These header field items will, in most cases, make up only a very small part of an ultrasonic examination file. The actual stream of ultrasonic data that make up the image will take up the largest part of the data base. Since an ultrasonic image file will normally be large, the concept of data compression will be considered in many cases. Compressed data should be noted,

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² Annual Book of ASTM Standards, Vol 03.03.

along with a description of the compression method, as indicated in Field No. 122.

3.3 This guide describes the structure of a data file for all of the ultrasonic information collected in a single scan. Some systems record multiple examination results during a single scan. For example, through transmission attenuation data as well as pulse echo thickness data may be recorded at the same time. These data may be stored in separate image planes; see Field No. 102. In other systems, complete digitized waveforms may be recorded at each examination point. It is recognized that the complete examination record may contain several files, for example, for the same examination method in different

object areas, with or without image processing, for different examination methods (through-transmission, pulse-echo, radiologic, infrared, etc.) collected during the same or during different scan sessions, and for variations within a single method (frequency change, etc.). Information about the existence of other images/examination records for the examined object should be noted in the appropriate fields. A single image plane may be one created by overlaying or processing results for multiple examination approaches, for example data fusion. For such images, the notes sections must clearly state how the image for this file was created.

TABLE 1 Field Listing

Field Number ^A	Field Name and Description	Data Type/Units ^B
<i>Header Information:</i>		
1 ^C	Intermediate file name	Alphanumeric string ^D
2 ^C	Format revision code	Alphanumeric string
3 ^C	Format revision date	yyyy/mm/dd ^D
4 ^C	Source file name	Alphanumeric string
5	Examination file description notes	Alphanumeric string
6 ^C	Examining company and location	Alphanumeric string ^D
7 ^C	Examination date	yyyy/mm/dd
8 ^C	Examination time	hh:mm:ss
9 ^C	Type of examination	Alphanumeric string ^D
10 ^C	Other examinations performed	Alphanumeric string ^D
11	Operator Name	Alphanumeric string
12 ^C	Operator identification code	Alphanumeric string
13 ^C	ASTM, ISO, or other applicable standard specification	Alphanumeric string
14	Date of applicable standard	yyyy/mm/dd
15 ^C	Acceptance criteria	Alphanumeric string
16 ^C	System of units	Alphanumeric string ^D
17	Notes	Alphanumeric string
<i>Examination System Description:</i>		
18	Examination system manufacturer(s)	Alphanumeric string ^D
19 ^C	Examination system model	Alphanumeric string
20	Examination system serial number	Alphanumeric string
<i>Pulser Description:</i>		
21	Pulser electronics manufacturer	Alphanumeric string
22	Pulser electronics model number	Alphanumeric string
23	Pulser type	Alphanumeric string ^D
24	Pulse repetition frequency	Real number, kiloHertz
25	Pulse height	Alphanumeric string ^D
26	Pulse width	Real number, nsec
27	Last calibration date	yyyy/mm/dd
28	Notes on pulser section	Alphanumeric string
<i>Receiver Description:</i>		
29	Receiver electronics manufacturer	Alphanumeric string
30	Receiver electronics model	Alphanumeric string
31	Receiver electronics response center frequency	Real number, MHz ^D
32	Receiver bandwidth	Real number, MHz ^D
33	Fixed receiver gain	Real number, dB
34	User selected receiver gain	Real number, dB
35	Last calibration date	yyyy/mm/dd
	Notes on receiver section	Alphanumeric string
<i>Gate Description:</i>		
37	Number of gates	Integer
38	Gate type	Alphanumeric string ^D
39	Gate synchronization	Alphanumeric string
40	Gate start delay	Alphanumeric string
41	Gate width	Alphanumeric string
42	Gate threshold level	Alphanumeric string
43	Notes on gate section	Alphanumeric string
<i>Search Unit Description:</i>		
44	Transmit search unit manufacturer	Alphanumeric string
45	Transmit search unit model	Alphanumeric string
46	Transmit search unit serial number	Alphanumeric string
47	Transmit search unit element diameter	Real number
48	Measured beam diameter of the Transmit search unit at the examination surface	Real number
49	Location of measurement of beam diameter of the transmit search unit	Alphanumeric string ^D
50	Transmit search unit focal length	Real number ^D