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NONDESTRUCTIVE TEST MANUAL

PART 4 - ULTRASONIC

EDGE FRAMES OF THE LARGE CARGO DOOR CUTOUT

1. Purpose

- A. Use this procedure to examine the fail safe strap for cracks at locations where the fail safe strap is behind other structure (clips). The areas to examine are at STA 478, between stringers S-26R and S-27R, and at STA 618, between stringers S-29R and S-30R. See Figure 1 for the inspection areas.
- B. MPD Appendix B DTR Check Form reference:
 - (1) ITEM 53-30-I19B

2. Equipment

- A. General
 - (1) Use inspection equipment that can be calibrated on the reference standard as specified in Paragraph 4.
 - (2) Refer to Part 1, 51-04-00 for more data about ultrasonic inspection.
- B. Instrument
 - (1) Use an ultrasonic instrument that:
 - (a) Can do pulse echo inspection.
 - (b) Operates in a frequency range of 4 to 6 MHz.
 - (2) The instruments that follow were used to help prepare this procedure.
 - (a) Sonic 136; Staveley, Inc.
 - (b) USN 50; Krautkramer-Branson, Inc.
 - (c) Epoch 2002; Panametrics, Inc.
- C. Transducer
 - (1) Use a transducer that has these properties:
 - (a) Operates in a frequency range of 4 to 6 MHz.
 - (b) Puts a refracted shear wave of approximately 60 degrees in aluminum.
 - (c) Has a maximum crystal width of 0.25 inch (6.4 mm).
 - (d) Has a top mounted connector.
 - (2) The transducers that follow were used to help prepare this procedure.
 - (a) XAB-6028; made by Xactex, Inc.
 - (b) 57A3065; made by Staveley Sensors/Qualcorp.
- D. Reference Standard
 - (1) Use reference standard NDT661. See Figure 2 for data about the reference standard.
- E. Couplant
 - (1) Use an ultrasonic couplant that will not cause corrosion or other damage to the airplane.

3. Preparation for Inspection

- A. Clean the inspection surface of loose paint and dirt.
- B. Remove the forward cargo handling accessory panel housing at STA 478 between stringers S-23R and S-26R to get access to the fail safe strap inspection area.

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4. Instrument Calibration

NOTE: The reference standard has four scribe lines on the top surface. Two scribe lines around the 0.25 inch (6.35 mm) diameter holes identify the diameter of the fastener head installed at that location. The other two scribe lines identify the location of the clips that are attached to the edge frame. These clips will keep the transducer at that distance from the hole to be examined during the inspection on the airplane (see Figure 1). At each transducer position on the reference standard, do not move the transducer across the scribe line.

- A. On narrow band instruments, set the frequency to 5 MHz or the nearest set frequency range to 5 MHz.
- B. Put couplant on reference standard NDT661 at positions 1 and 2 as shown in Figure 3, Sheet 1.

NOTE: Do not put couplant at positions 3 and 4 (Figure 3, Sheet 2) at this time because it can cause interference signals when the transducer is at position 1 or 2.

- C. Set the initial pulse signal at 0% of full-screen width (FSW).
- D. Put the transducer at position 1 and get a signal from the 0.188 inch (4.78 mm) diameter hole as shown in Detail I of Figure 3, Sheet 1.
- E. Adjust the range and delay controls so that the initial pulse signal is at 0% of FSW and the maximum signal from the hole is at 80% of FSW. Do not move the transducer across the scribe line at position 1.

NOTE: The fastener hole signal will be at approximately this screen location when you examine the far fasteners on the airplane. The far fasteners are identified by flagnote 3 in Figure 1.

- F. Put the transducer at position 2 and again get a maximum signal from the 0.188 inch (4.78 mm) diameter hole. Do not move the transducer across the scribe line at position 2.
- G. Slowly turn the transducer in the direction of the reference notch. See that the signal from the reference notch comes into view to the right of the hole signal and increases in height as the signal from the hole decreases in height.
- H. Adjust the transducer as necessary to get a maximum signal from the reference notch. Do not move the transducer across the scribe line.
- I. Adjust the gain to put the signal from the reference notch at 80% of full screen height (FSH).
- J. Increase the gain 6 dB and make a record of the gain used for reference during this inspection.
- K. Put couplant on reference standard NDT661 at positions 3 and 4 as shown in Figure 3, Sheet 2.
- L. Put the transducer at position 3 on the reference standard.
- M. Move the transducer as necessary to get a maximum signal from the 0.188 inch (4.78 mm) diameter hole. This signal will occur at approximately 40% of FSW as shown in Detail III of Figure 3, Sheet 2. Do not move the transducer across the scribe line at position 3.

NOTE: The fastener hole signal will be at approximately this screen location when you examine the near fasteners. The near fasteners are identified by flagnote 4 in Figure 1.

- N. Put the transducer at position 4 as shown in Figure 3, Sheet 2 and again get a maximum signal from the 0.188 inch (4.78 mm) diameter hole.
- O. Slowly turn the transducer in the direction of the reference notch. See that the signal from the reference notch comes into view to the right of the hole signal and increases in height as the signal from the hole decreases in height as shown in Detail IV of Figure 3, Sheet 2.

5. Inspection Procedure

- A. Put couplant on the surface of the fail safe strap at the transducer locations identified in Figure 1.

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- B. Put the transducer on the fail safe strap and as near as possible to the fastener hole to be examined. Refer to Figure 1 for the location of the fastener holes to be examined.
- C. Move the transducer to get a maximum signal from the fastener hole.

NOTE: It is possible to receive little or no signal from a fastener hole if most of the sound transfers into the fastener. If this occurs, add more gain as necessary to set the signal from the fastener hole at approximately 40% of FSH.

- D. Turn the transducer to point the sound beam at one side of the fastener hole and carefully monitor the signal from the hole. Turn the transducer until the fastener hole signal decreases to 0% of FSH. Look for a crack signal to come into view to the right of the fastener hole signal as it decreases in full screen height.
- E. Do Paragraph 5.D. on the opposite side of the fastener hole.

NOTE: If additional gain was used in Paragraph 5.C. and Paragraph 5.D., remove the additional gain at this time.

- F. Do Paragraph 5.B. thru Paragraph 5.E. at all fastener locations identified in Figure 1.

6. Inspection Results

- A. A crack signal that is 40 percent or more of FSH is cause for rejection. Compare the crack signal to the signal you get from the notch in the reference standard to be sure it is a crack signal.

NOTE: If additional gain was added during the inspection of a fastener hole, do not change the adjustment to make an analysis of a crack signal.

- B. To make sure of crack indications, remove the fastener and do an open hole eddy current inspection as given in Part 6, 51-00-04, Part 6, 51-00-11, or Part 6, 51-00-16.

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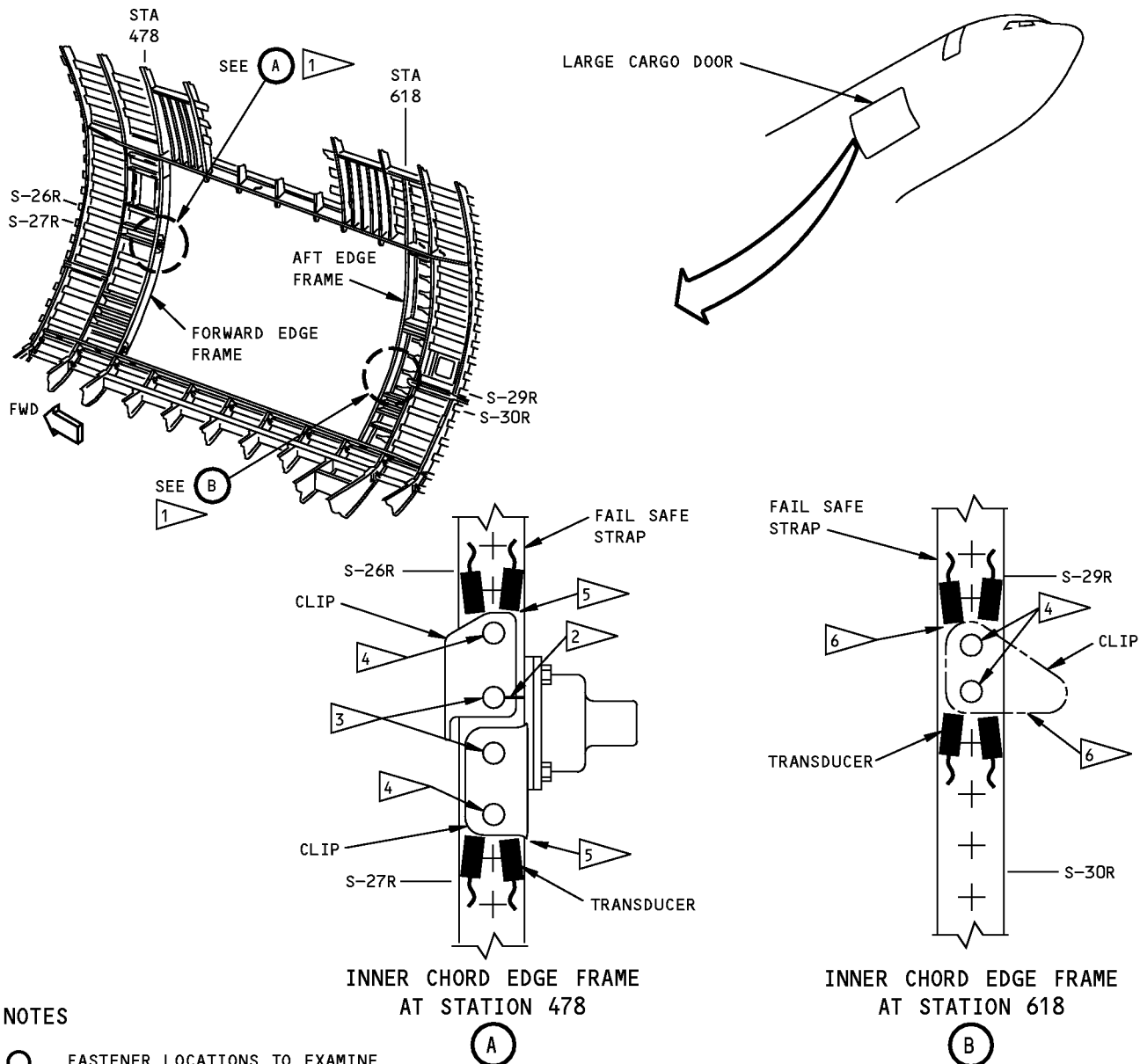
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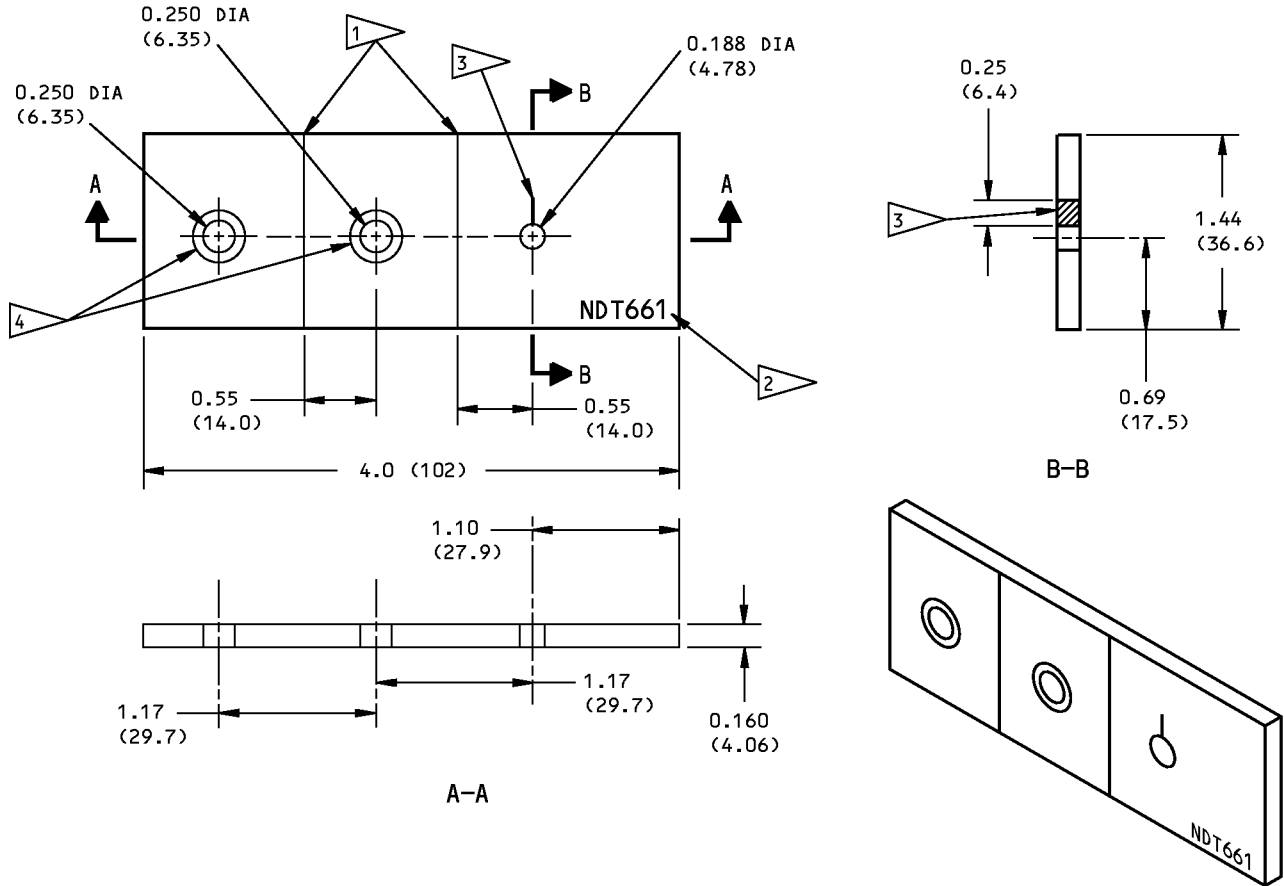
- FASTENER LOCATIONS TO EXAMINE
- 1 AREA OF INSPECTION; FORWARD AND AFT EDGE FRAMES
- 2 CRACK EXAMPLE; CRACKS CAN OCCUR IN THE FAIL SAFE STRAP AND GROW IN THE FORWARD AND AFT DIRECTION
- 3 FOR THE APPROXIMATE LOCATION WHERE SIGNALS FROM THESE FASTENER HOLES WILL OCCUR, SEE FIGURE 3, (SHEET 1) DETAILS I AND II.
- 4 FOR THE APPROXIMATE LOCATION WHERE SIGNALS FROM THESE FASTENER HOLES WILL OCCUR, SEE FIGURE 3, (SHEET 2) DETAILS III AND IV.
- 5 THE STRAIGHT SCRIBE LINE AT TRANSDUCER POSITIONS #1 AND #2 (SEE FIGURE 3, SHEET 1, FLAGNOTE 6) SHOWS THE APPROXIMATE EDGE OF THE CLIP AT THESE LOCATIONS.
- 6 THE STRAIGHT SCRIBE LINE AT TRANSDUCER POSITIONS #3 AND #4 (SEE FIGURE 3, SHEET 2, FLAGNOTE 12) SHOWS THE APPROXIMATE EDGE OF THE CLIP AT THESE LOCATIONS.

Inspection Location
Figure 1

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NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ± 0.005	X.XX = ± 0.10
X.XX = ± 0.025	X.X = ± 0.5
X.X = ± 0.050	X = ± 1
- MATERIAL: 7075-T6 (2024-T4 OR 7075-T735 OPTIONAL)
- SURFACE ROUGHNESS: 63 Ra OR BETTER

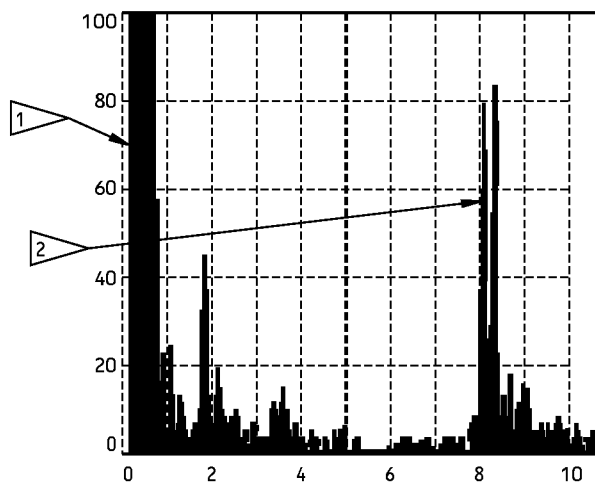
- 1 ETCH OR SCRIBE A 0.005 (0.13) DEEP LINE AT THIS LOCATION.
- 2 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT661 AT APPROXIMATELY THIS LOCATION
- 3 EDM NOTCH OR SAWCUT: 0.25 (6.4) LONG X 0.020 (0.51) MAXIMUM WIDTH, THROUGH THE THICKNESS.
- 4 ETCH OR SCRIBE A 0.390 (9.91) DIAMETER X 0.005 (0.13) DEEP (APPROXIMATE) LINE CENTERED ON THE HOLE.

Reference Standard NDT661
Figure 2

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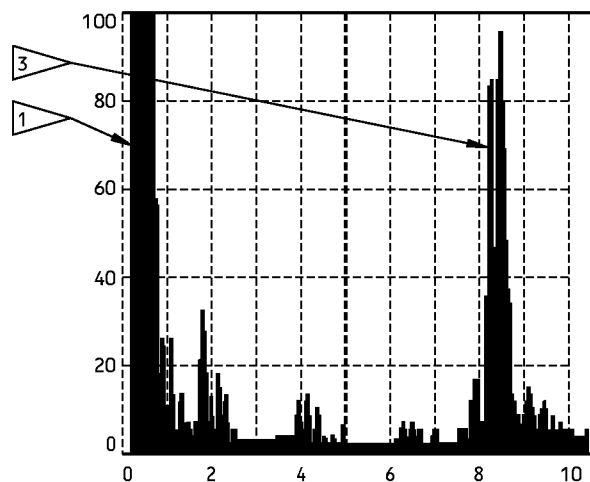
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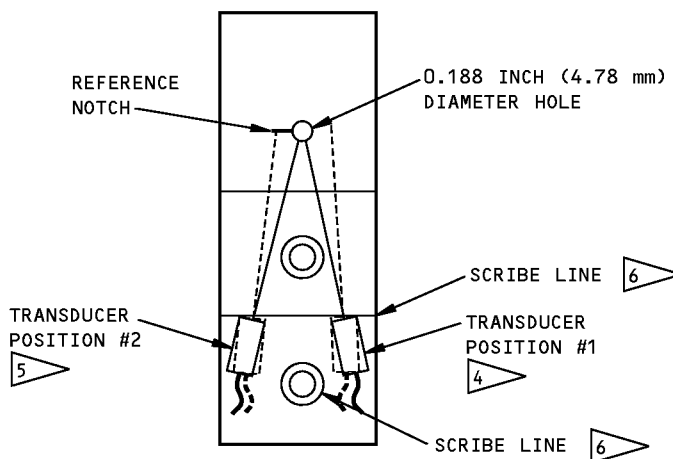
SET THE INITIAL PULSE SIGNAL AT 0% OF FULL SCREEN WIDTH (FSW) AND THE SIGNAL FROM THE HOLE AT 80% FSW

DETAIL I



SIGNAL FROM THE REFERENCE NOTCH. SEE THAT THE SIGNAL COMES INTO VIEW TO THE RIGHT OF THE HOLE SIGNAL

DETAIL II



NOTES

INSPECTION OF THE FAR FASTENERS

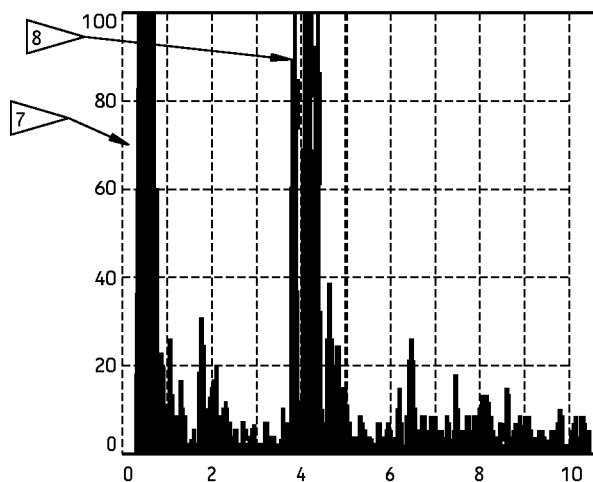
- 1 INITIAL PULSE SIGNAL
- 2 SIGNAL FROM THE 0.188 INCH (4.78 mm) DIAMETER HOLE WITH THE TRANSDUCER AT POSITION #1
- 3 SIGNAL FROM THE REFERENCE NOTCH WITH THE TRANSDUCER AT POSITION #2
- 4 MOVE THE TRANSDUCER TO GET A MAXIMUM SIGNAL FROM THE HOLE AND THEN SLOWLY TURN THE TRANSDUCER IN A CLOCKWISE DIRECTION AND SEE HOW THE SIGNAL FROM THE HOLE DECREASES IN FULL SCREEN HEIGHT (FSH)
- 5 MOVE THE TRANSDUCER TO GET A MAXIMUM SIGNAL FROM THE HOLE AND THEN SLOWLY TURN THE TRANSDUCER IN THE DIRECTION OF THE REFERENCE NOTCH. SEE THAT THE SIGNAL FROM THE REFERENCE NOTCH COMES INTO VIEW TO THE RIGHT OF THE HOLE SIGNAL AND INCREASES IN FULL SCREEN HEIGHT AS THE SIGNAL FROM THE HOLE DECREASES IN FSH.
- 6 DO NOT MOVE THE TRANSDUCER ACROSS THE SCRIBE LINE

Calibration Details
Figure 3 (Sheet 1 of 2)

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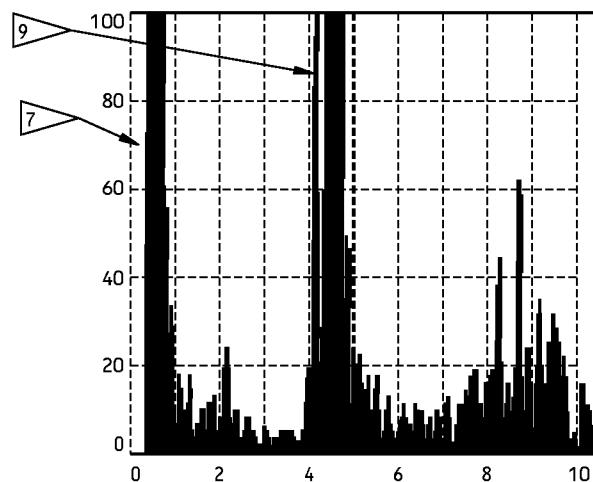
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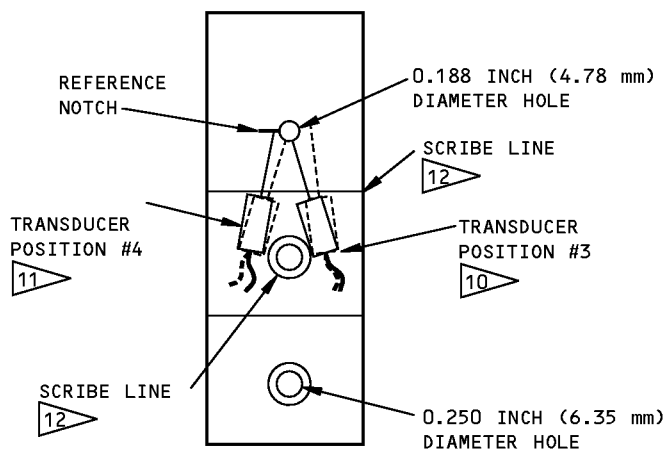
THE SIGNAL FROM THE 0.188 (4.78 mm) DIAMETER HOLE WITH THE TRANSDUCER AT POSITION #3

DETAIL III



THE SIGNAL FROM THE REFERENCE NOTCH WITH THE TRANSDUCER AT POSITION #4

DETAIL IV



NOTES

INSPECTION OF THE NEAR FASTENERS

- 7 INITIAL PULSE SIGNAL
- 8 SIGNAL FROM THE 0.188 INCH (4.78 mm) DIAMETER HOLE WITH THE TRANSDUCER AT POSITION #3
- 9 SIGNAL FROM THE REFERENCE NOTCH WITH THE TRANSDUCER AT POSITION #4
- 10 MOVE THE TRANSDUCER TO GET A MAXIMUM SIGNAL FROM THE HOLE (FLAGNOTE 8) AND THEN SLOWLY TURN THE TRANSDUCER IN A CLOCKWISE DIRECTION AND SEE HOW THE SIGNAL FROM THE HOLE DECREASES IN FULL SCREEN HEIGHT (FSH)
- 11 MOVE THE TRANSDUCER TO GET A MAXIMUM SIGNAL FROM THE HOLE AND THEN SLOWLY TURN THE TRANSDUCER IN THE DIRECTION OF THE REFERENCE NOTCH. SEE THAT THE SIGNAL FROM THE REFERENCE NOTCH COMES INTO VIEW TO THE RIGHT OF THE HOLE SIGNAL AND INCREASES IN FULL SCREEN HEIGHT AS THE SIGNAL FROM THE HOLE DECREASES IN FSH.
- 12 DO NOT MOVE THE TRANSDUCER ACROSS THE SCRIBE LINE

Calibration Details
Figure 3 (Sheet 2 of 2)

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