PART 4 - ULTRASONIC

VERTICAL FIN REAR SPAR ATTACHMENT FITTINGS

1. Purpose

A. Use this procedure to examine the primary fittings for the rear spar of the vertical fin on the forward and aft sides of the station 1088 bulkhead for cracks. This procedure uses ultrasonic shear waves to examine the top two fasteners in the outboard primary fittings. See Figure 1 for the inspection areas.

B. An ultrasonic shear wave transducer is put on the primary fitting below the splice angle to examine the primary fitting for far side corner cracks that are 0.15 inches (3.8 mm) long. A total of four fastener holes are examined on each side of the airplane. See Figure 1 for the inspection areas, example probe positions and example crack directions.

C. The primary fittings are made from titanium.

D. 737 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 53-80-06-1

2. Equipment

A. General

(1) Use equipment that can be calibrated on the reference standard as specified in Paragraph 4.

(2) Refer to Part 1, 51-01-00, for data about the equipment manufacturers.

B. Instruments

(1) Use a pulse-echo instrument. The instrument that follows was used to help prepare the procedure.

(a) Phasor XS; GE Inspection Technologies

C. Transducers

(1) Use a 5 MHz transducer that can put a 70 degree shear wave in titanium. The transducer that follows was used to help prepare this procedure.

(a) ST-605S; Techna NDT

D. Reference Standards

(1) Use reference standard NDT3109. See Figure 2 for details.

E. Couplant

(1) Use couplant that is permitted for use with the airplane structure.

3. Prepare for the Inspection

A. Go through stabilizer access door opening 311BL to get access to the inspection area shown in Figure 1.

B. Remove sealant, loose paint, dirt and fully clean the inspection area that the transducer will touch on the primary fittings. It can be necessary to smooth or remove the finish so the transducer can put sufficient sound in the primary fitting. See Detail III in Figure 1.

4. Instrument Calibration

A. Set the instrument frequency between 4 and 6 MHz. A frequency adjustment is not necessary if you use a broadband instrument. Make sure the reject is set to off.

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B. Apply a sufficient quantity of couplant at transducer position 1 (TP1) and at transducer position 2 (TP2) on reference standard NDT3109 as shown in Details III and IV in Figure 3.

C. Put the transducer at TP1 on the reference standard as shown in Detail III in Figure 3 so that the sound points at the hole.

D. Move the transducer a small distance to and from the hole and to the left and right until the hole signal is at a maximum height on the screen display. Make sure the transducer does not move across the scribe line. See Detail III in Figure 3.

E. Adjust the instrument delay to set the initial pulse to 0 percent of full screen width (FSW). Adjust the instrument range to set the signal from the hole at 60 percent of FSW. See Detail I in Figure 3.

F. Put the transducer at TP2. Slowly turn the transducer to the left and to the right and move it toward and away from the notch to get the maximum signal from the notch. The notch signal will be to the right of the hole signal. Make sure the transducer does not move across the scribe line.

G. Adjust the gain to set the notch signal to 80 percent of full screen height (FSH). See Detail II in Figure 3.

H. Record the gain setting.

I. Add 6 dB of gain.

5. Inspection Procedure

A. Identify the inspection areas of the primary fittings. See Figure 1.

B. Apply a sufficient quantity of couplant on the inspection surfaces. See Figure 1.

C. Calibrate the instrument as specified in Paragraph 4.

D. Put the transducer on the inspection surface and point the transducer at the fastener hole. Move the transducer away from the hole and toward the hole so that the hole signal is at a maximum height.

(1) If the hole signal does not occur on the screen display, increase the gain until the hole signal is 30 percent of full screen height. Do not lower the gain if the hole signal is initially above 30 percent of full screen height.

(2) It can be necessary to move the transducer nearer to the fasteners on the inspection surface. At each transducer location, keep the transducer as perpendicular to the expected crack location as possible. See Detail III in Figure 1 for example transducer positions and example crack directions.

E. Make a scan as you slowly turn the transducer approximately 10 to 15 degrees to the left and right to find possible cracks. While you turn the transducer to the left and right, slowly move the transducer toward and away from the hole. Move the transducer a least one full transducer length on the inspection surface when you make your scan. Examine the primary fitting for cracks on each side of the fastener hole. During the scan:

(1) Carefully monitor the signal from the fastener hole. If there is a crack, the signal from the crack will occur to the right of the signal from the fastener hole and will increase in FSH as the fastener hole signal decreases in FSH. If a crack occurs, then move the transducer as necessary to get the maximum crack signal.

(2) Refer to Paragraph 6. to make an analysis of all possible crack signals that are 40 percent or more of FSH.

F. Make sure to examine all the inspection areas as shown in Figure 1. Each side of the 4 fastener holes must be examined on the forward and aft sides of the BS 1088 bulkhead.

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G. After all the fastener holes are examined, set the gain to the value recorded in Paragraph 4.H. Then use the reference standard to do a calibration check to make sure that the signal from the notch is 70 percent of FSH or more. If the signal from the calibration notch is less than 70 percent of FSH, do the calibration and inspection again.

6. Inspection Results

A. Ultrasonic signals that are 40 percent (or more) of FSH and are to the right of the hole signal are possible crack indications. Compare the signals that occur during the inspection with the signal from the notch on the reference standard.

B. To make sure of a crack indication, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17.

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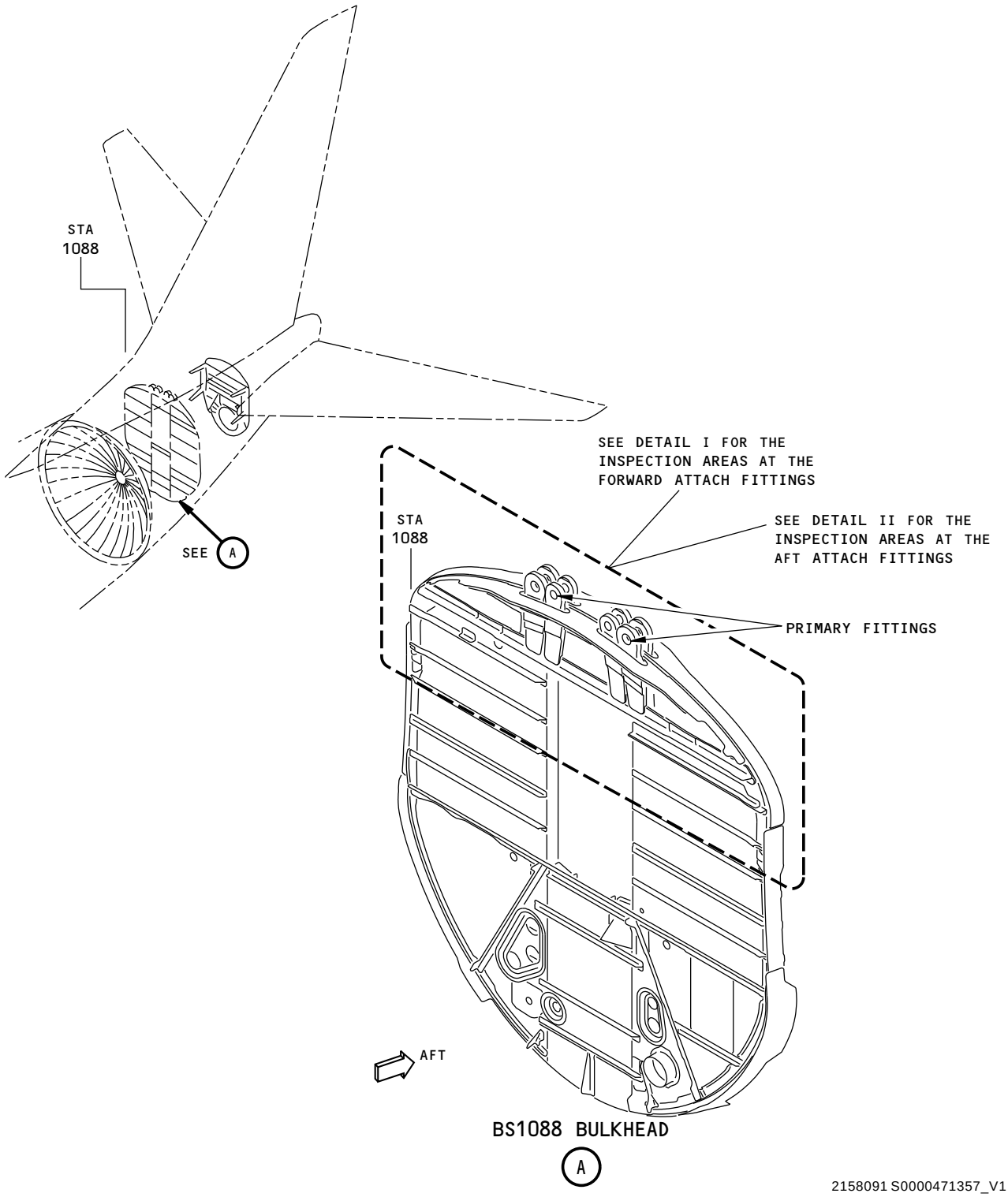

Inspection Areas
Figure 1 (Sheet 1 of 3)

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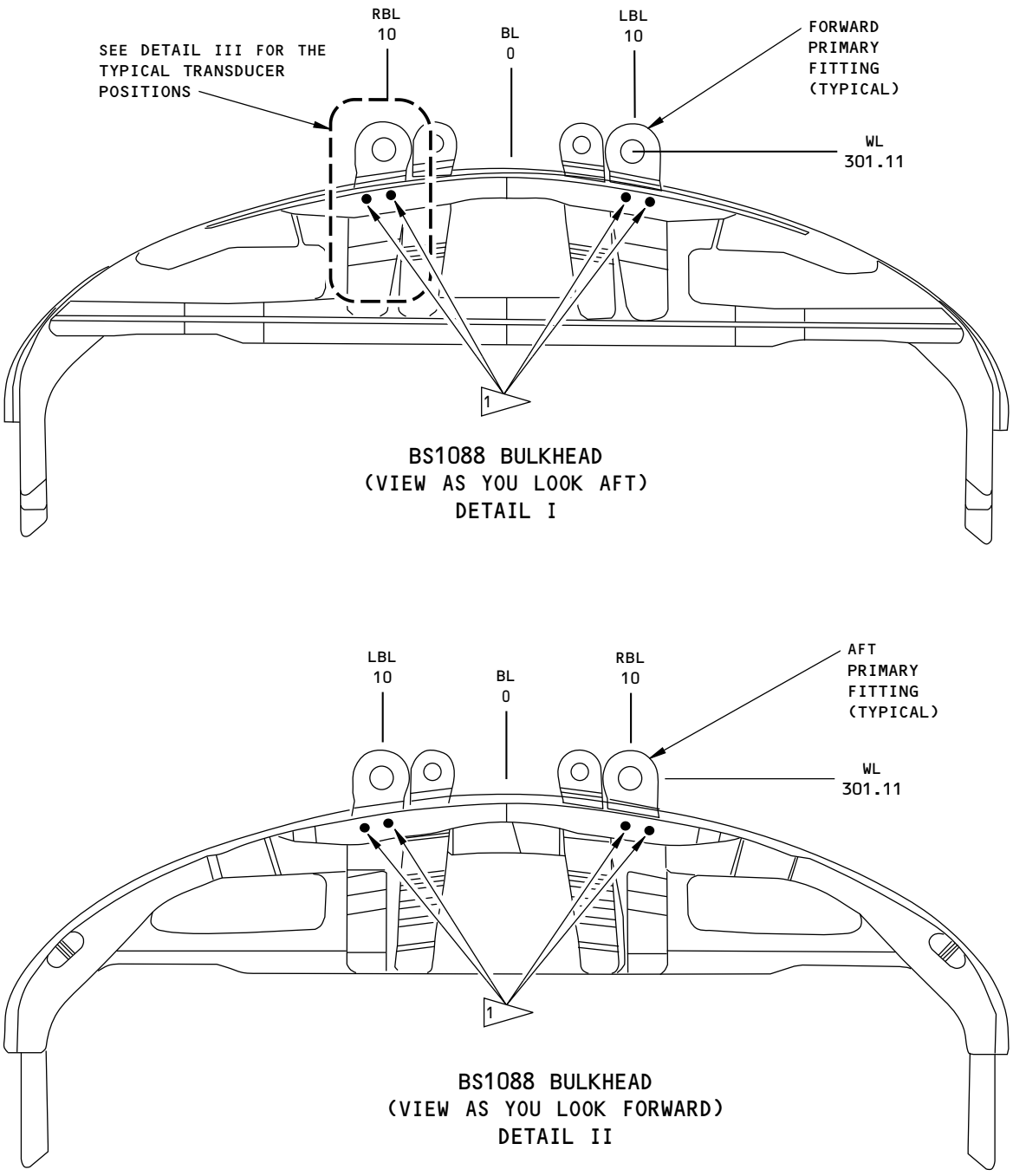

Inspection Areas
Figure 1 (Sheet 2 of 3)

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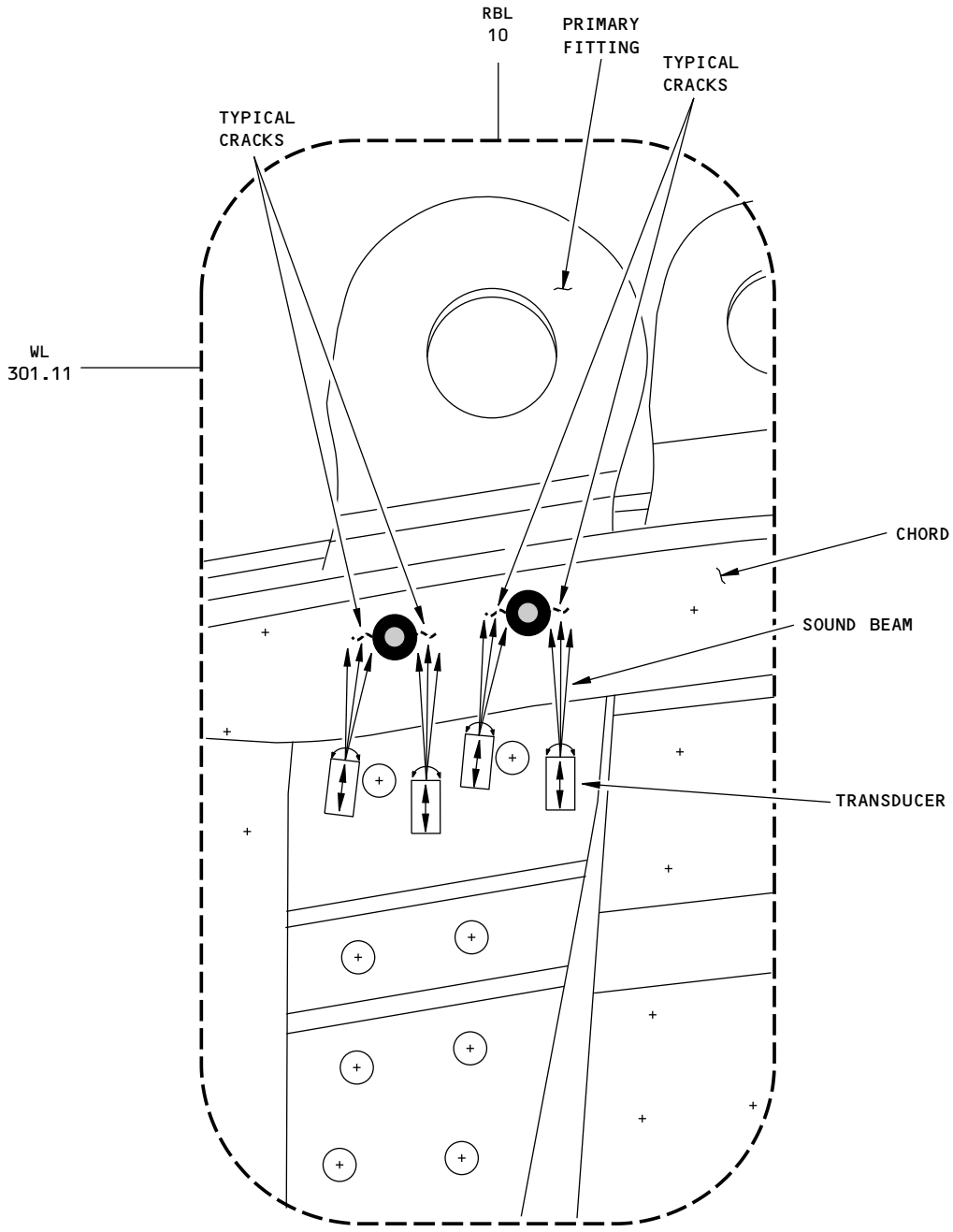

EXAMPLE TRANSDUCER POSITIONS
DETAIL III

NOTES:

- THE RIGHT SIDE OF THE FORWARD PRIMARY FITTING IS SHOWN; THE LEFT SIDE IS OPPOSITE. THE AFT SIDE IS ALMOST THE SAME.

FASTENER HOLES TO BE EXAMINED

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Inspection Areas
Figure 1 (Sheet 3 of 3)

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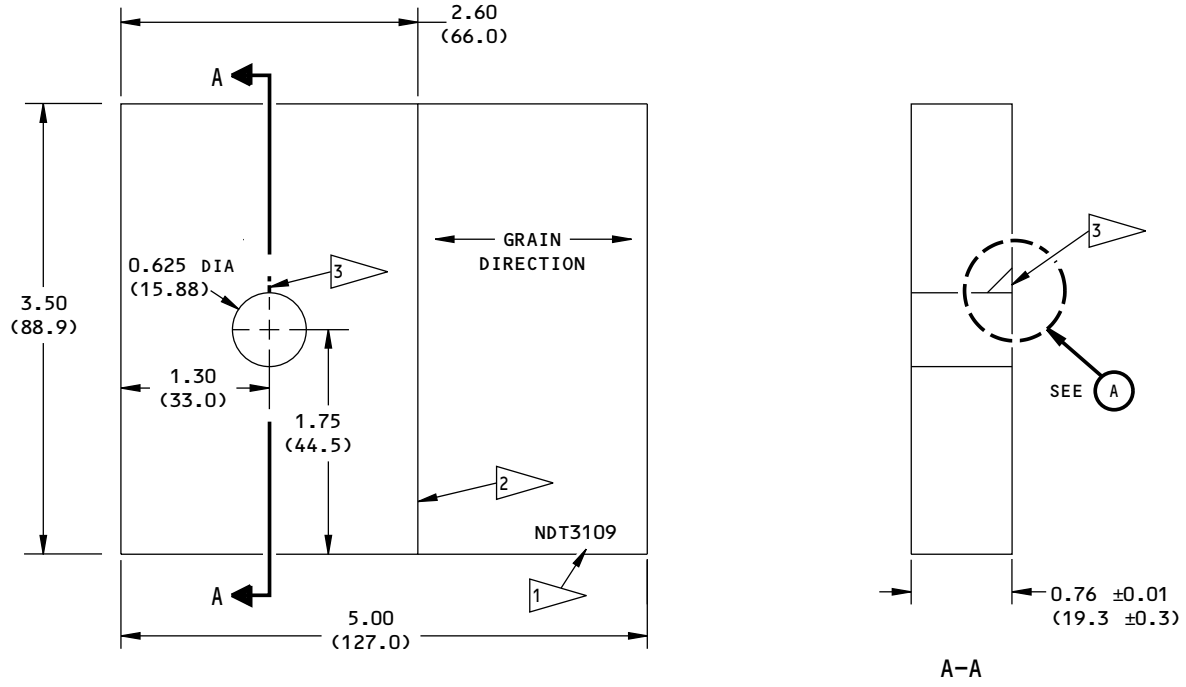

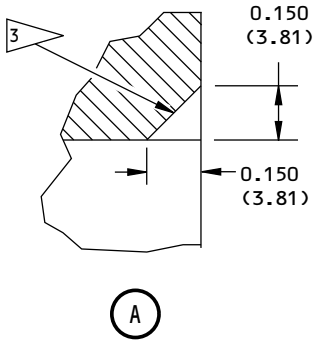

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: 6AL–4V TITANIUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.010
X.XX = ±0.025	X.X = ±0.05
X.X = ±0.050	X = ±1

1. ETCH OR STAMP THE REFERENCE STANDARD NUMBER AT APPROXIMATELY THIS LOCATION
2. ETCH A SCRIBE LINE AT THIS LOCATION TO A MAXIMUM DEPTH OF 0.005 (0.13)
3. EDM NOTCH: 0.150 X 0.150 (3.15 X 3.15) CORNER NOTCH; 0.012 (0.30) MAXIMUM WIDTH

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Reference Standard NDT3109
Figure 2

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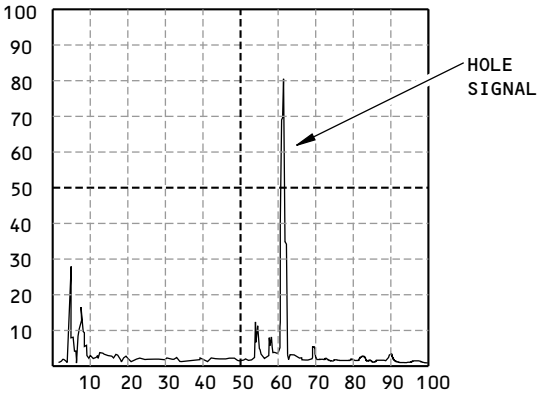
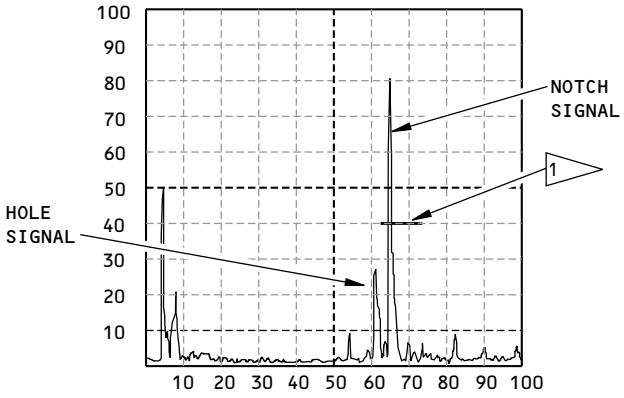
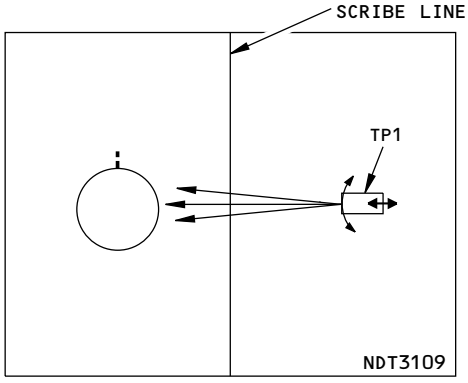


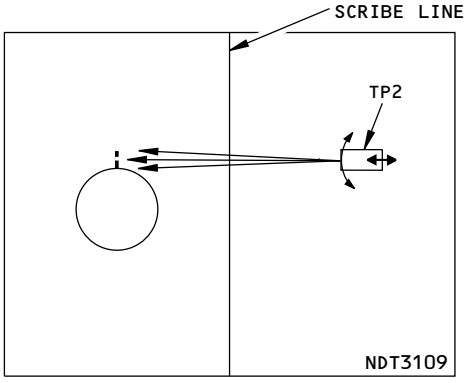
TRANSDUCER POSITION 1 SIGNAL
DETAIL I



TRANSDUCER POSITION 2 SIGNAL
DETAIL II



TRANSDUCER POSITION 1
DETAIL III



TRANSDUCER POSITION 2
DETAIL IV

NOTES:

TP = TRANSDUCER POSITION

1 EXAMINE AREAS THAT CAUSE SIGNALS TO OCCUR THAT ARE 40 PERCENT (OR MORE) OF FULL SCREEN HEIGHT (FSH) AND WITHIN 10 PERCENT OF FULL SCREEN WIDTH (FSW) TO THE RIGHT OF THE HOLE SIGNAL. THE SIGNAL FROM THE FASTENER HOLE WILL CHANGE IN FULL SCREEN WIDTH AS THE TRANSDUCER MOVES TO AND FROM THE FASTENER HOLE.

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Calibration Details
Figure 3

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