LEADING EDGE SLAT ACTUATOR ROD

1. Purpose

A. To detect circumferential and longitudinal cracks in the leading edge slat actuator rod ends. Circumferential cracks initiate from the outside diameter in the transition area where the rod begins to taper. The longitudinal cracks initiate from the inside diameter in the tapered area of the rod ends. See Figure 1.

NOTE: This procedure has been revised to include an alternate reference standard because some operators have experienced difficulties producing the internal EDM notches in the original reference standard. It is recommended that the alternate reference standard (No. 608A) be used by those operators not currently performing this inspection or who are experiencing difficulties producing reference standard No. 608.

B. Service Bulletin reference: 767-27A0095

2. Equipment

A. Any ultrasonic equipment capable of operating between 4 MHz and 6 MHz that will satisfy the requirements of this procedure may be used. The following equipment was used to develop this procedure.

(1) Instrument - Krautkramer-Branson USL 38

Krautkramer-Branson, Inc.

(2) Transducer - KB Aerotech miniature quick change style MSW-QC, 5 MHz/0.25'' diameter

(3) Transducer Wedges - 45 $\pm 2^{\circ}$ refracted shear wave in steel, manufacture wedges 608P1 and 608P2 as shown in Figure 2 and Figure 3.

NOTE: Standard 45° wedges may be purchased and shaped by hand to the 608P1 and 608P2 configurations. Style QC-X, W-201 from KB Aerotech will fit the above transducer.

(4) Reference Standards

(a) Manufacture reference standard No. 608 per Figure 4 or No. 608A per Figure 5.

NOTE: Refer to Paragraph 1.A. ''NOTE''.

(b) A 1'' thick block of 15-5 PH or low alloy steel material (i.e. 4130, 4140, 4340).

(5) Couplant - Light grease or commercial couplant compatible with the airplane structure.

3. Preparation for Inspection

NOTE: This inspection requires the leading edge slats to be placed in the landing position in order to obtain the necessary access to the aft end of the rods. It is also necessary to remove the FWD and MID support bracket clamps so that the seal door can be swiveled down, providing access to the bottom portion of the rod (Figure 6).

A. Remove all dirt and paint from the transducer scanning areas (Figure 1).

B. Clean inspection areas thoroughly to ensure good coupling.

4. Instrument Calibration

NOTE: Allow instrument to warm up per manufacturer instructions.

A. Calibration for circumferential crack detection.

(1) Connect the transducer and carry out preliminary adjustments.

(2) Ensure that reject, suppression and damping controls are turned off or set to minimum.

(3) Apply couplant to the 1-inch thick reference block.

(4) Place transducer on the block and adjust instrument controls to obtain a screen presentation as shown in Figure 7(a) for circumferential crack inspection.

(5) Apply a small amount of couplant into the threaded recess of the 608P1 wedge.

(6) Seat transducer into wedge 608P1. Be careful not to overtighten the transducer.

(7) Place transducer on reference standard over the 0.020 inch circumferential notch. Slowly move the transducer away from the notch toward the rod center. Manipulate the transducer to obtain a maximum reflection from the signal which appears at approximately 30% screen width. Adjust the gain to obtain an 80% full screen height response (Figure 8).

B. Calibration for longitudinal crack inspection.

NOTE: The inspection for longitudinal cracks is done on the tapered area of the actuator rod. Because of the taper, complete contact between the surface of the transducer wedge that is scanned and the surface of the part is not possible. As a result of this, it is not easy to keep the reference notch signal on the instrument screen during calibration. Refer to Paragraph 4.B.(7), NOTE 1), and NOTE 2).

(1) Connect the transducer and carry out preliminary adjustments.

(2) Ensure that reject, suppression, and damping controls are turned off or set to minimum.

(3) Apply couplant to the 1-inch thick reference block.

(4) Place transducer on the reference block and adjust instrument controls to obtain a screen presentation as shown in Figure 7(b) for longitudinal crack inspection.

(5) Apply a small amount of couplant in the threaded recess of the 608P2 wedge.

(6) Seat the transducer into wedge 608P2. Be careful not to overtighten the transducer.

NOTE: If a clear wedge is used, check to assure proper coupling of the transducer to the wedge by viewing through the bottom surface.

(7) Place the transducer on the tapered area of the reference standard over the region of the 0.020-inch notch. Manipulate the transducer to obtain a maximum notch signal response which should appear between 25 and 45 percent of full screen width. Adjust the gain controls so that the notch signal is at 80 percent of full screen height (Figure 9).

NOTE: 1) Notch signal amplitude may vary depending upon which side of the notch you scan. Scan the notch from both directions and adjust the amplitude on the lesser response.

NOTE: 2) To improve signal response from the notch once located, lightly rock the transducer.

5. Inspection Procedure

A. Circumferential crack inspection.

(1) Gain access to the wing area and verify that the slats are in the landing position and that the FWD and MID support bracket clamps have been removed so that the seal door can be swiveled out of the way.

(2) Calibrate instrument per Paragraph 4.A.

(3) Apply couplant to transducer scanning surface.

(4) Place the transducer on the rod and scan within the scanning area as shown in Figure 1. Continue to scan around the rod until the entire circumference has been inspected. Repeat on the opposite end.

(5) Repeat Paragraph 5.A.(4) until all actuator rods of the leading edge slats have been inspected.

B. Longitudinal crack inspection.

(1) Gain access to the wing area and verify that the slats are in the landing position and that the FWD and MID support bracket clamps have been removed so that the seal door can be swiveled out of the way.

(2) Calibrate the instrument per Paragraph 4.B.

(3) Apply couplant to the transducer scanning surface.

(4) Place the transducer on the part and scan the entire tapered area. When you have completed scanning the part from one direction, reverse the transducer and scan from the opposite direction. Maintain good coupling. Repeat on the opposite end.

NOTE: Two drain holes are present within the scanning area of the FWD end of the rods. Obtaining a signal from either of these holes is assurance of good coupling (Figure 1).

(5) Repeat Paragraph 5.B.(4) until all actuator rods of the leading edge slats have been inspected.

6. Inspection Results

A. Circumferential Cracks

(1) An ultrasonic response from the inspection area which is 50 percent or greater than the calibration notch response (40 percent full screen height if the calibration notch response is at 80 percent full screen height) is a potential crack and should be investigated further. If the ultrasonic response occurs between the initial pulse and 60 percent full screen width and cannot be identified as a response from a drain or rivet hole, or the rod end, then reject the part. It is important to note that crack responses will travel across the screen with transducer movement, but noise from the wedge coupling will remain in one place.

NOTE: A signal is obtained from the two drain holes located within the scanning area of the AFT end. Watch for cracks initiating from either side of these drain holes. Also, a signal is obtained from the end rod which occurs beyond the inspection range and should not be confused with a crack.

(2) Indications less than 50 percent of the calibration notch response which are not identified as noise signals (see Paragraph 6.A.(1)) should be recorded for monitoring during future inspections.

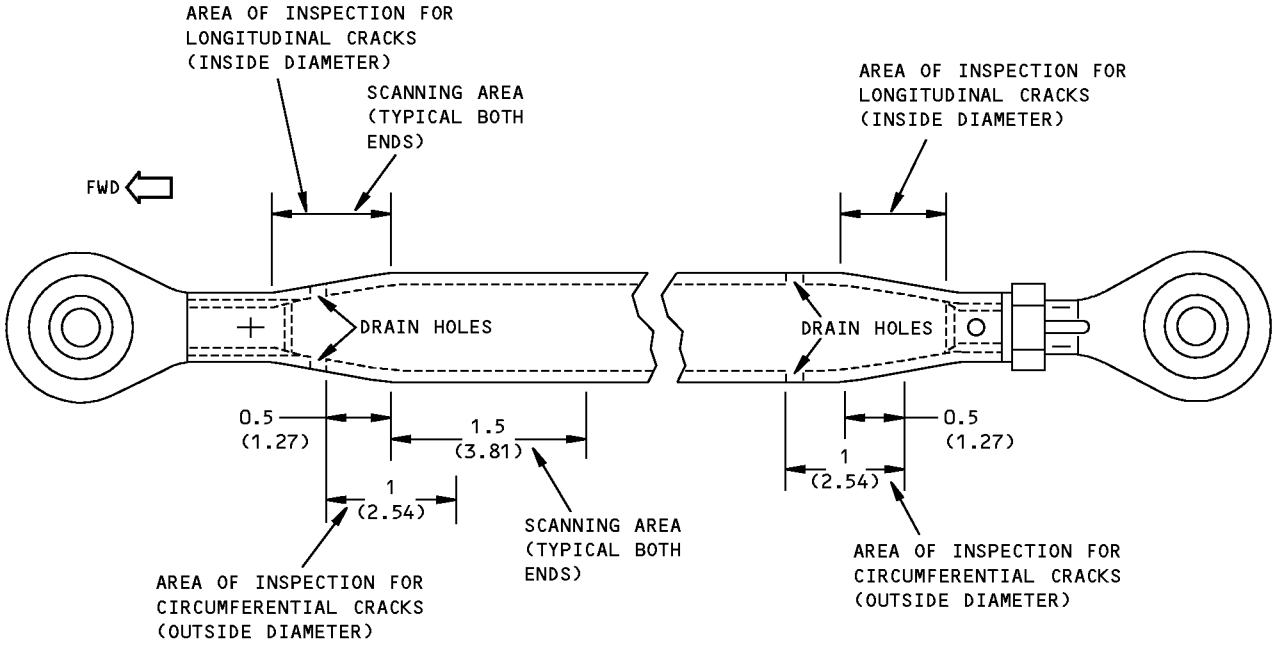
(3) Ultrasonic indications may be verified by surface eddy current inspection, penetrant inspection or magnetic particle inspection.

B. Longitudinal Cracks

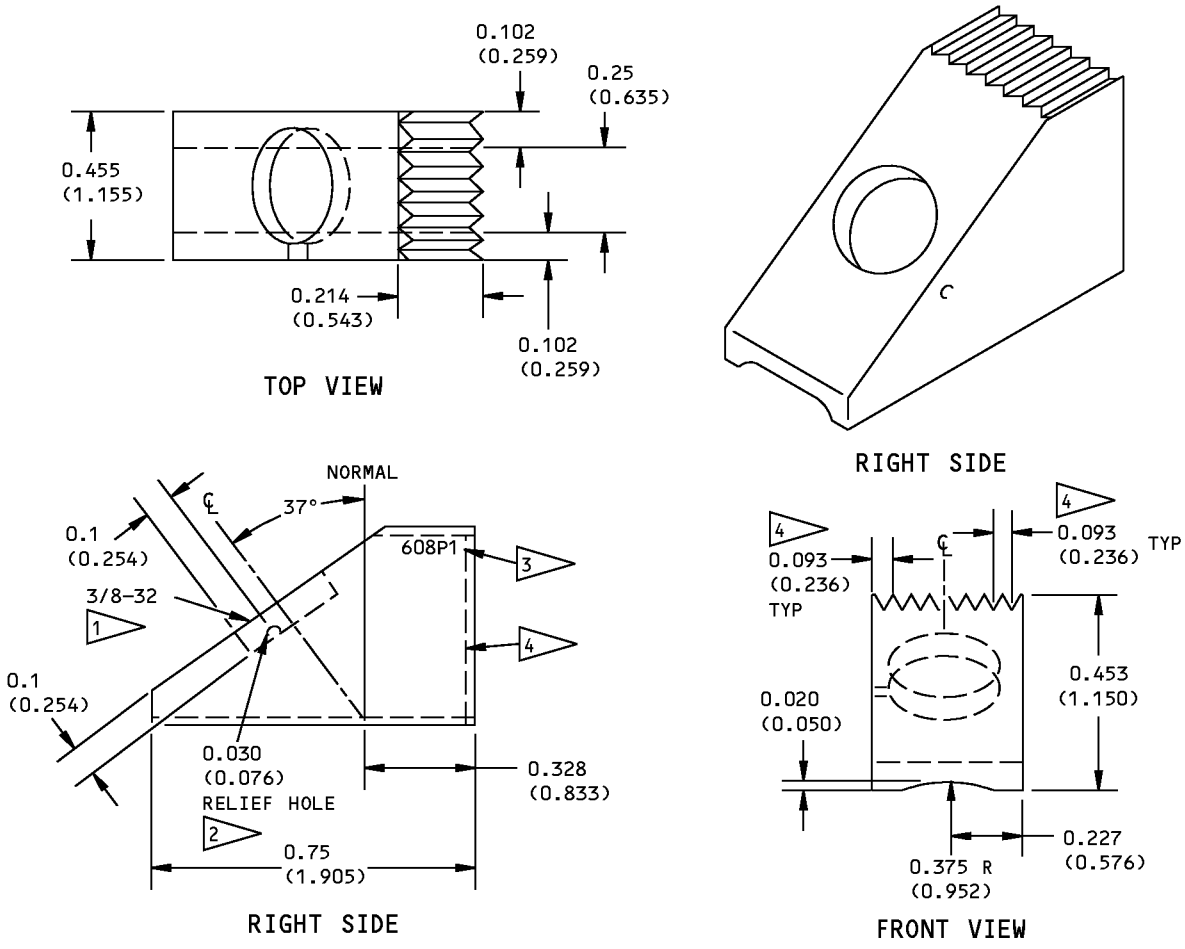
(1) An ultrasonic response from the inspection area which is 50 percent or greater than the calibration notch response (40 percent full screen height if the calibration notch response is at 80 percent full screen height) is a potential crack and should be investigated further. If the ultrasonic response occurs between the initial pulse and 50 percent full screen width and cannot be identified as a response from a drain hole, then reject the part. It is important to note that crack responses will travel across the screen with transducer movement, but noise from the wedge coupling will remain in one place.

NOTE: It is possible to obtain a signal from the drain holes on the AFT end of the rod that are close to the tapered area. This may occur when scanning at the upper portion of the taper.

(2) Indications less than 50 percent of the calibration notch response which are not identified as noise signals (see Paragraph 6.B.(1)) should be recorded for monitoring during future inspections.



Actuator Rod
Figure 1



NOTES

- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS ARE IN PARENTHESES)
- TOLERANCE: X.X ±0.05 (0.13 CM); X.XX ±0.01 (0.025 CM); X.XXX ±0.005 (0.013 CM) EXCEPT AS NOTED
- MATERIAL: LUCITE
- REFER TO PART 1, 51-01-00, PARAGRAPH 6 FOR MANUFACTURING AND ORDERING INFORMATION
- A COMMERCIAL WEDGE, SEC. 2.A.(3), MAY BE MODIFIED TO THIS CONFIGURATION
- MODIFIED TRANSDUCER WEDGE FOR DETECTION OF TRANSVERSE CRACKS USING SEC. 2.A.(2) TRANSDUCER

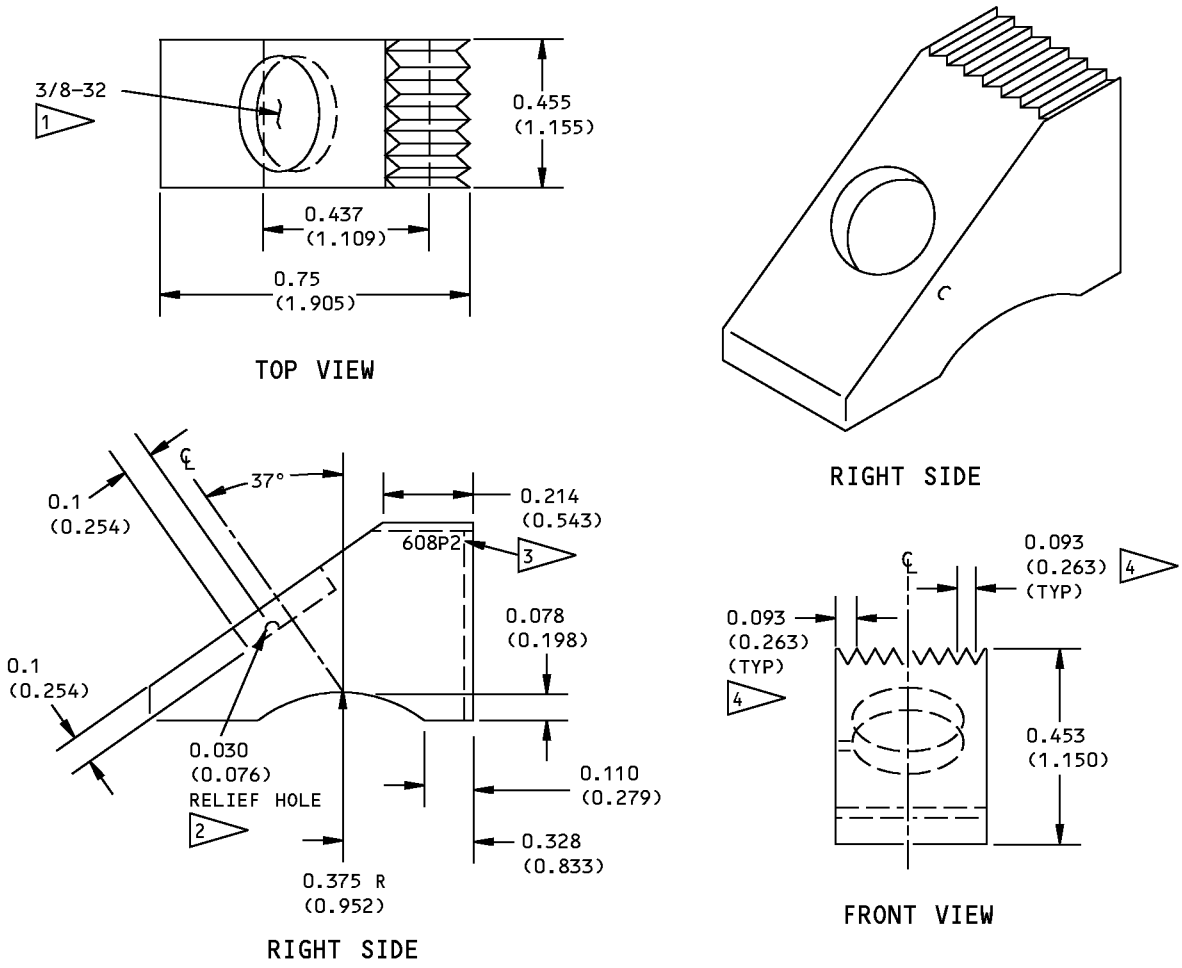
1 TRANSDUCER MOUNTING HOLE: DRILL AND TAP 3/8-32 FLAT BOTTOM HOLE

2 RELIEF HOLE: DRILL FLUSH WITH BOTTOM OF TRANSDUCER MOUNTING HOLE

3 ETCH WITH 608P1

4 GROVES (OPTIONAL): MACHINE OR FILE GROVES IN WEDGE TOP AND FRONT SURFACE TO ELIMINATE NOISE SIGNALS PRODUCED IN THE WEDGE

Transducer Wedge No. 608P1
Figure 2



NOTES

- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS ARE IN PARENTHESES)
- TOLERANCE: X.X ±0.05 (0.13 CM); X.XX ±0.01 (0.025 CM); X.XXX ±0.005 (0.013 CM) EXCEPT AS NOTED
- MATERIAL: LUCITE
- REFER TO PART 1, 51-01-00, PARAGRAPH 6 FOR MANUFACTURING AND ORDERING INFORMATION
- A COMMERCIAL WEDGE, SEC. 2.A.(3), MAY BE MODIFIED TO THIS CONFIGURATION
- MODIFIED TRANSDUCER WEDGE FOR DETECTION OF LONGITUDINAL CRACKS USING SEC. 2.A.(2) TRANSDUCER

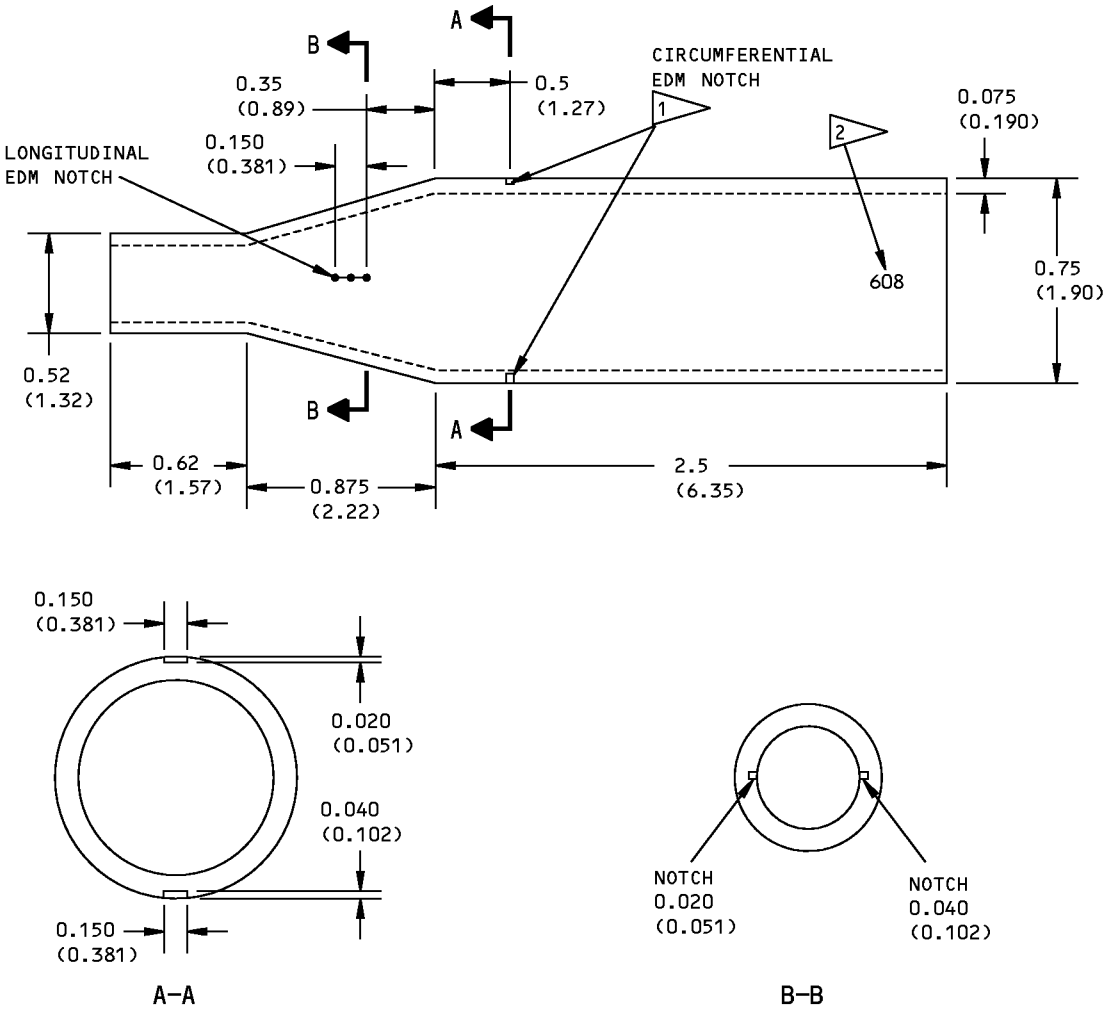
1 TRANSDUCER MOUNTING HOLE: DRILL AND TAP 3/8-32 FLAT BOTTOM HOLE

2 RELIEF HOLE: DRILL FLUSH WITH BOTTOM OF TRANSDUCER MOUNTING HOLE

3 ETCH WITH 608P2

4 GROOVES (OPTIONAL): MACHINE OR FILE GROOVES IN WEDGE TOP AND FRONT SURFACE TO ELIMINATE NOISE SIGNALS PRODUCED IN THE WEDGE

Transducer Wedge No. 608P2
Figure 3



NOTES

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

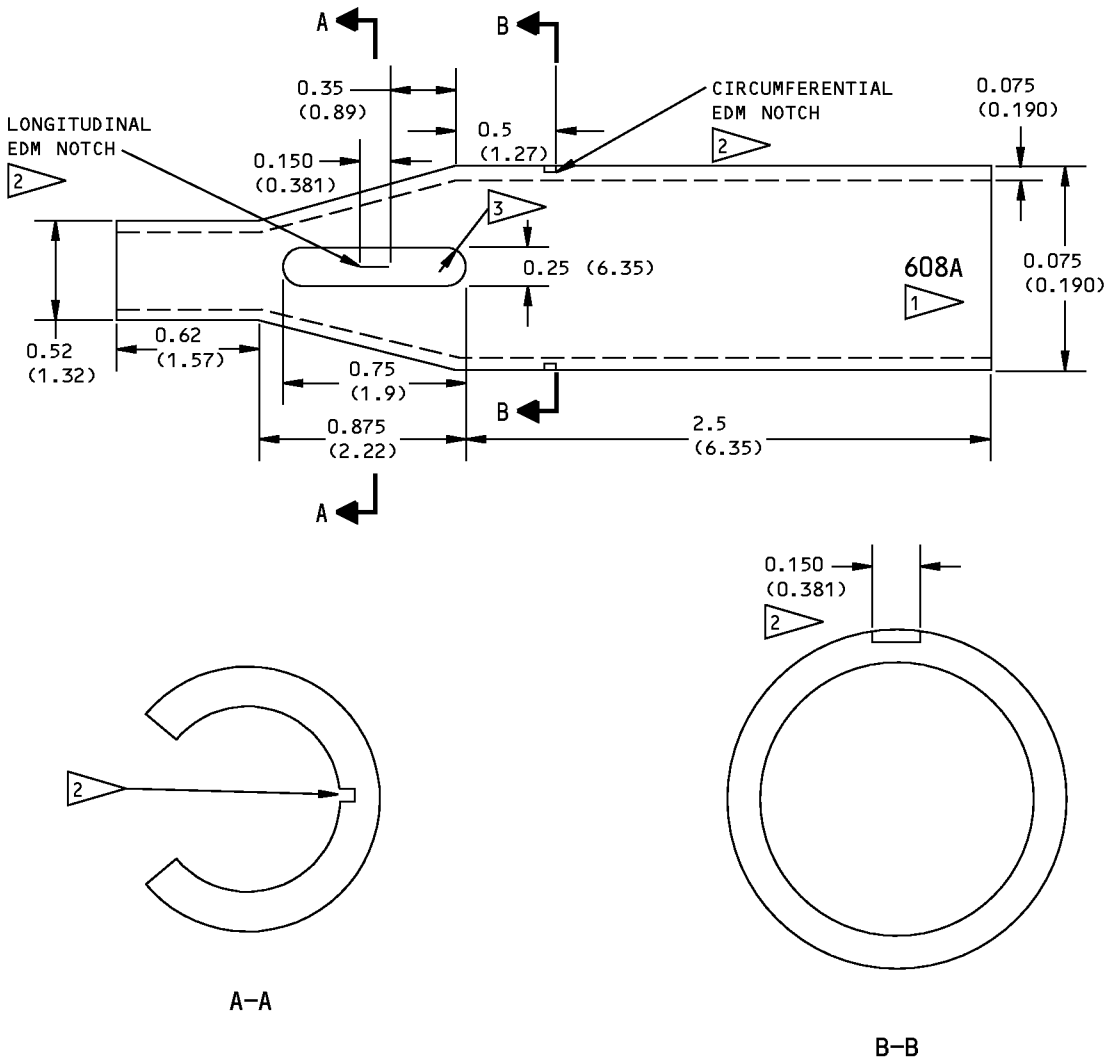
INCHES	CENTIMETERS
X.XXX = ± 0.005	X.XX = ± 0.013
X.XX = ± 0.01	X.X = ± 0.025
X.X = ± 0.05	X = ± 0.13

- MATERIAL: 15-5 PH CRES; OPTIONAL MATERIAL: 4130,4140,4340 LOW ALLOY STEEL
- SURFACE FINISH: 125 RMS

1 EDM NOTCH: 0.005 (0.013 CM) WIDE

2 ETCH OR STEEL STAMP THE REFERENCE STANDARD WITH 608

Reference Standard No. 608
Figure 4



NOTES

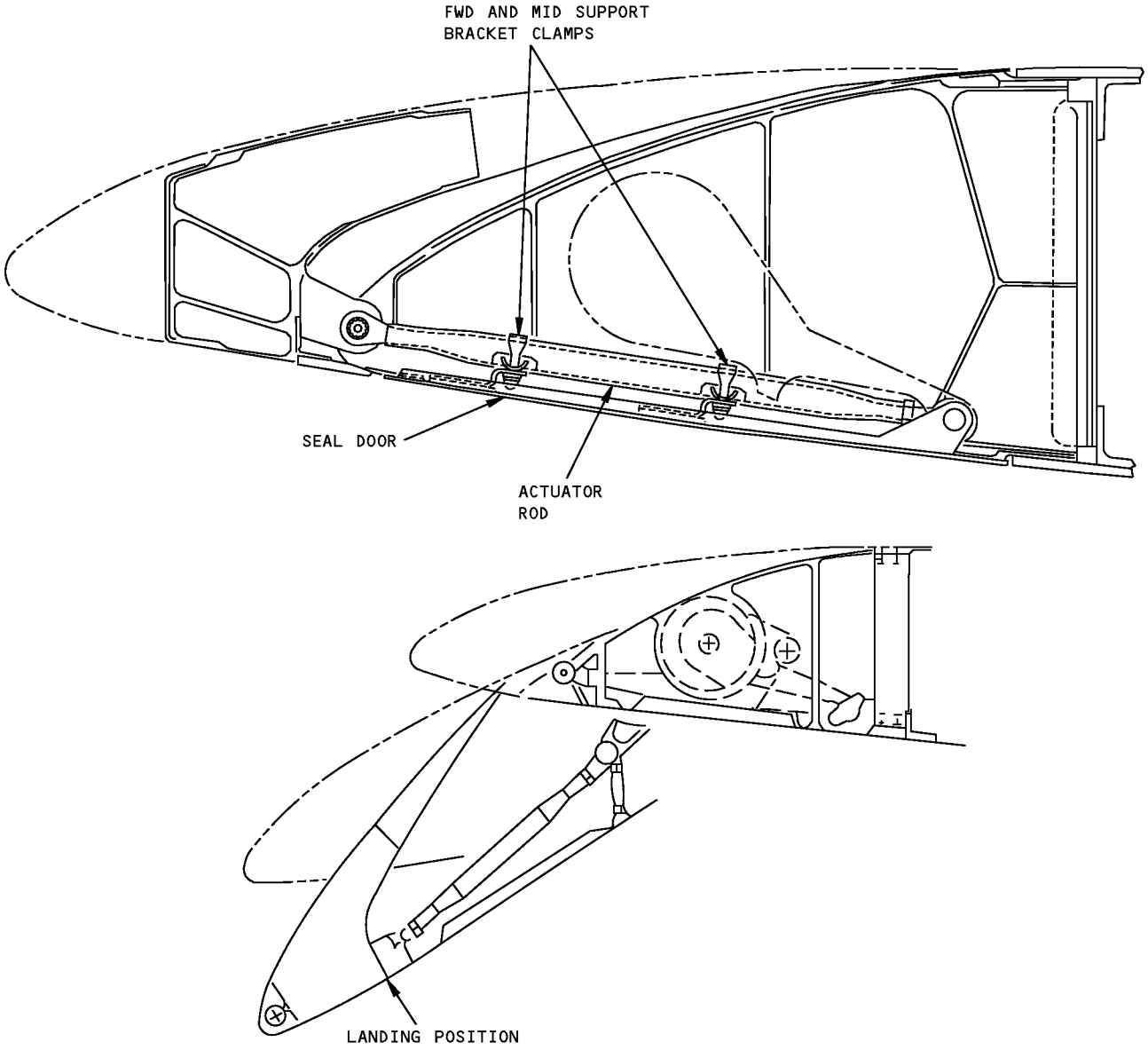
- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS ARE IN PARENTHESES)
- SURFACE FINISH: 125 RMS
- MATERIAL: 15–5 PH CRES; OPTIONAL MATERIAL: 4130,4140,4340 LOW ALLOY STEEL; 303 CRES
- TOLERANCE: X.X 0.05 (0.13 CM): X.XX 0.01 (0.025 CM): X.XXX 0.005 (0.013 CM) EXCEPT AS NOTED

1 ETCH OR STEEL STAMP P/N 608A

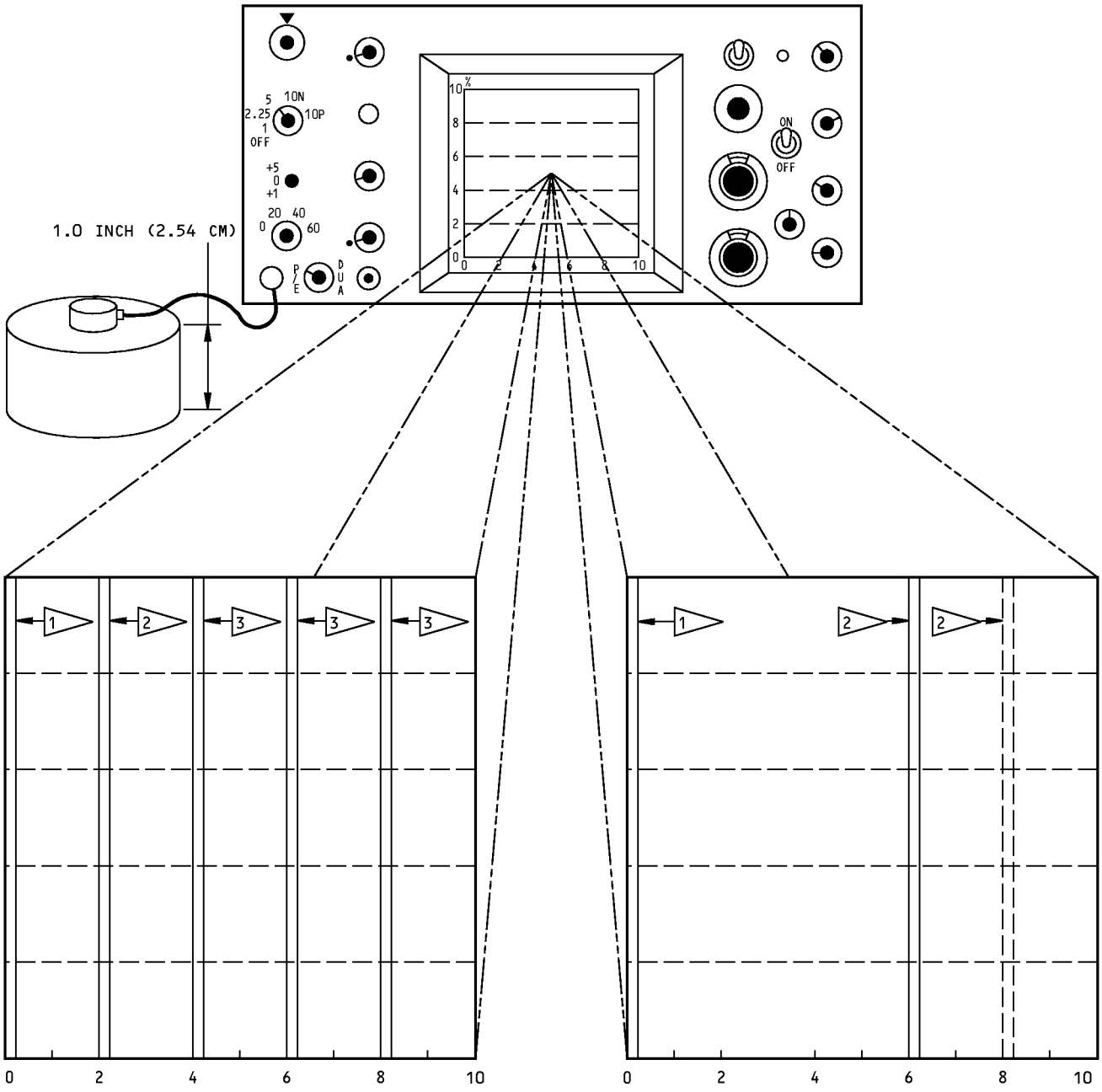
2 EDM NOTCH 0.005 (0.013 CM) WIDE, 0.020 (0.051 CM) DEEP

3 0.125 (0.138 CM) RADIUS (TYP)

Reference Standard No. 608A
Figure 5



Leading Edge Slats
Figure 6



(a) SCREEN CALIBRATION PATTERN FOR CIRCUMFERENTIAL CRACK INSPECTION

(b) SCREEN CALIBRATION PATTERN FOR LONGITUDINAL CRACK INSPECTION

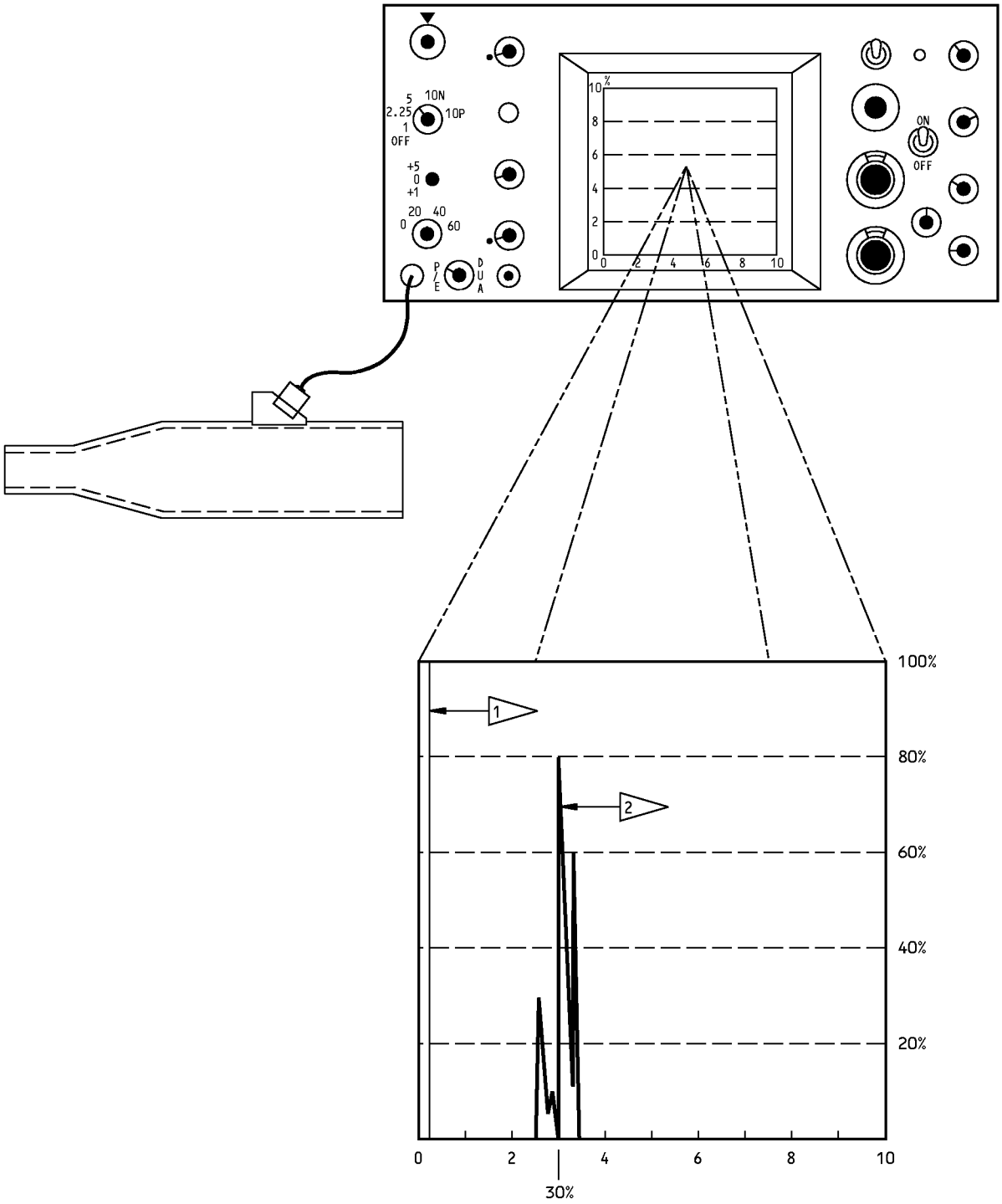
NOTE: ADJUST FIRST BACK REFLECTION BETWEEN 60 PERCENT AND 80 PERCENT FULL SCREEN WIDTH.

1 INITIAL PULSE

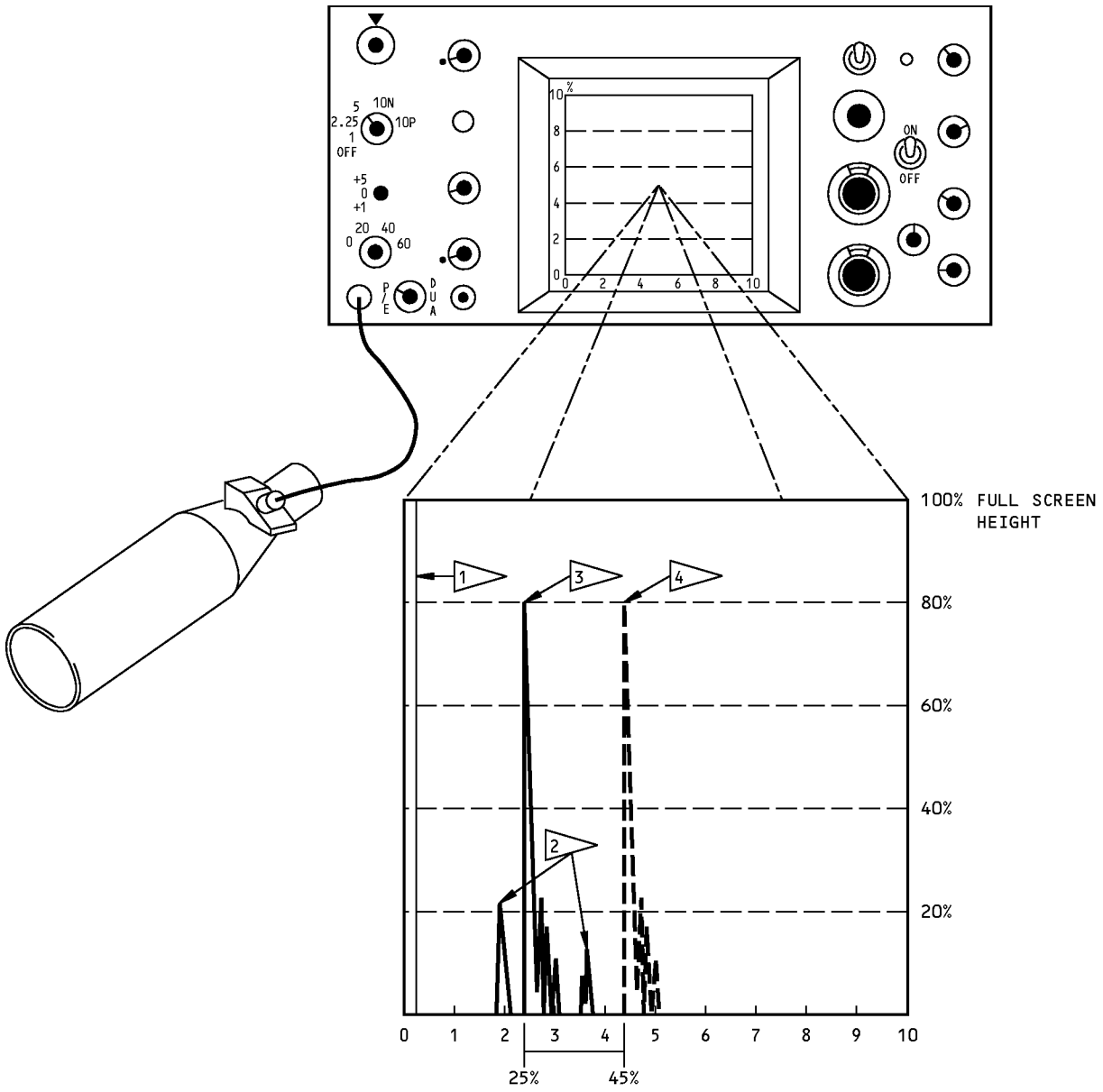
2 FIRST BACK REFLECTION FROM THE 1 INCH (2.54 CM) REFERENCE BLOCK

3 MULTIPLE BACK REFLECTIONS

Screen Calibrations
Figure 7



Instrument Sensitivity Adjustment - Circumferential Cracks
Figure 8



NOTE: 0.020 INCH (0.051 CM) LONGITUDINAL NOTCH SIGNAL WILL PEAK BETWEEN 25 PERCENT AND 45 PERCENT OF FULL SCREEN WIDTH WHEN SCANNING AROUND THE TAPERED AREA.

1. INITIAL PULSE
2. NOISE SIGNALS
3. IF THE SCREEN CALIBRATION IN FIGURE 7(b) IS 60 PERCENT FULL SCREEN WIDTH, THEN THE NOTCH SIGNAL WILL PEAK AT APPROXIMATELY 25 PERCENT FULL SCREEN WIDTH
4. IF THE SCREEN CALIBRATION IN FIGURE 7(b) IS 80 PERCENT FULL SCREEN WIDTH, THEN THE NOTCH SIGNAL WILL PEAK AT APPROXIMATELY 45 PERCENT FULL SCREEN WIDTH

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Instrument Sensitivity Adjustment - Longitudinal Cracks
Figure 9