NOSE LANDING GEAR ACTUATOR SUPPORT BEAM

1. Purpose

A. This ultrasonic procedure was developed to inspect for possible forging laps in the actuator support beam of the nose landing gear (Figure 1).

B. Service Bulletin reference: 767-32-0088.

2. Equipment

A. All ultrasonic equipment that can operate between 4 and 6 MHz and satisfies the requirements of this procedure can be used. The following equipment was used during development of this procedure:

(1) Instrument -- Krautkramer-Branson USL 38; Krautkramer-Branson, Inc.

(2) Transducer -- Two transducers are required for this procedure.

NOTE: The length of the transducer should not be greater than 0.7 inches.

(a) 5.0 MHz, 45 degrees in aluminum with top mounted connector, case dimensions are 0.7 inches long, 0.3 inches wide, and 0.6 inches high, P/N 57A3064; Automation Industries, Inc.

(b) 5.0 MHz, 60 degrees in aluminum with top mounted connector, case dimensions are 0.7 inches long, 0.3 inches wide, and 0.6 inches high, P/N 57A3065; Automation Industries, Inc.

B. Reference Standard -- Manufacture reference standard No. 610 per Figure 2.

C. Couplant -- Light grease or commercial couplant compatible with the airplane structure.

3. Preparation for Inspection

A. Identify inspection area.

B. Get access to the inspection area through the nose landing gear compartment. A ladder of scaffolding is necessary in order to do this inspection.

WARNING: THIS IS A HAZARDOUS AREA. MAKE SURE THAT ALL SAFETY PRECAUTIONS HAVE BEEN CARRIED OUT TO PREVENT ACCIDENTAL ACTIVATION OF THE LANDING GEAR DOOR DURING THE INSPECTION PROCEDURE.

C. Clean all grease, dirt, and loose paint from the transducer scanning areas. If necessary, lightly sand to smooth.

4. Instrument Calibration

A. Instrument calibration with 45-degree transducer.

(1) Turn the instrument on and permit it to warm up per manufacturers instructions.

(2) Connect the transducer and carry out the initial adjustments.

(3) Make sure that the reject control is turned off or set to minimum.

(4) Apply a thin film of couplant to the reference standard on the side opposite the reference notch.

(5) Put the transducer on the reference standard directly over the reference notch and slide the transducer rearwards until the first signal from the reference notch appears. Refer to Figure 3, Position A.

(6) Move the transducer to get a maximum signal from the reference notch. Using the gain controls, adjust the notch signal amplitude to 80 percent full screen height. Refer to Figure 3, Position A.

NOTE: Be sure that the first signal from the reference notch is used for calibration by starting with the transducer directly over the reference notch.

(7) Use the delay control to position the initial pulse at the left edge of the screen. With the range control, position the reference notch signal at 40 percent full screen width. Refer to Figure 3, Position A.

(8) Increase the instrument gain 6 db above reference level.

B. Instrument calibration with 60-degree transducer.

(1) Connect the 60-degree transducer and get a signal from the reference notch per Paragraph 4.A.(1) through Paragraph 4.A.(5). Refer to Figure 3, Position B.

(2) Use the gain controls to adjust the signal amplitude to 80 percent full screen height. Refer to Figure 3, Position B.

NOTE: Do not adjust the range and delay controls. Use the same settings that were used with the 45-degree transducer. The signal will occur at approximately 55 percent of full screen width.

(3) Increase the instrument gain 6 db above reference level.

5. Inspection Procedure

A. Calibrate the instrument per Paragraph 4.A.

B. Identify the inspection area per Figure 1.

C. Apply a thin film of couplant to the inspection surfaces.

D. Put the transducer on inspection surface A directing the sound beam toward the inspection zone using Scan Direction 1. Refer to Figure 4. While scanning the part, aim the transducer in a slight side-to-side motion to provide better detection of off-angle defects. Scan the entire inspection zone from edge to edge in an overlapping scan pattern.

E. After inspecting from Scan Direction 1, scan the same area from the opposite direction. Refer to Figure 4, Scan Direction 2.

F. Do Paragraph 5.D. and Paragraph 5.E. again on inspection surface B of the actuator support beam.

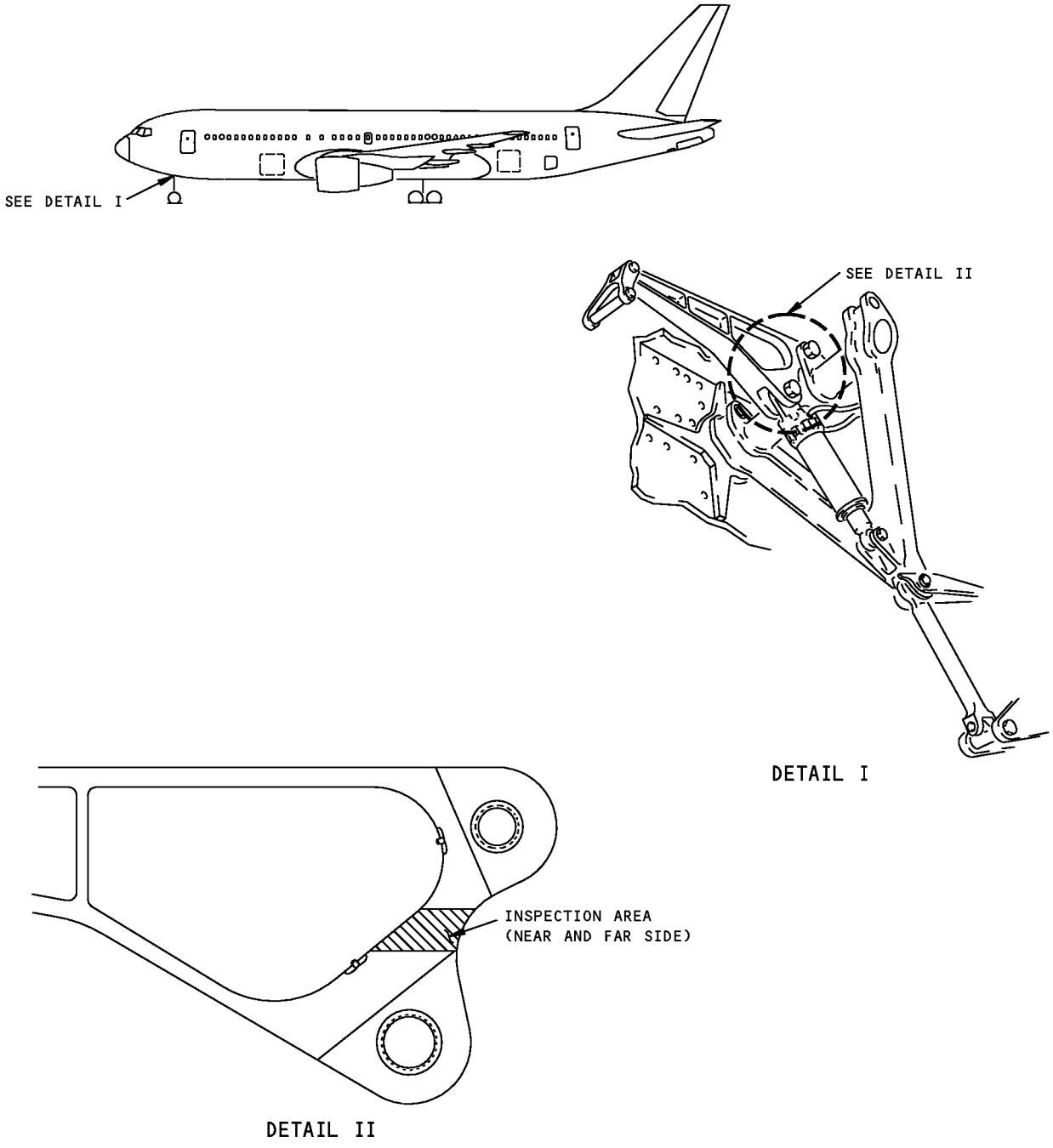
G. Do Paragraph 5.C. through Paragraph 5.F. again using the 60-degree transducer and calibrating the instrument per Paragraph 4.B.

6. Inspection Results

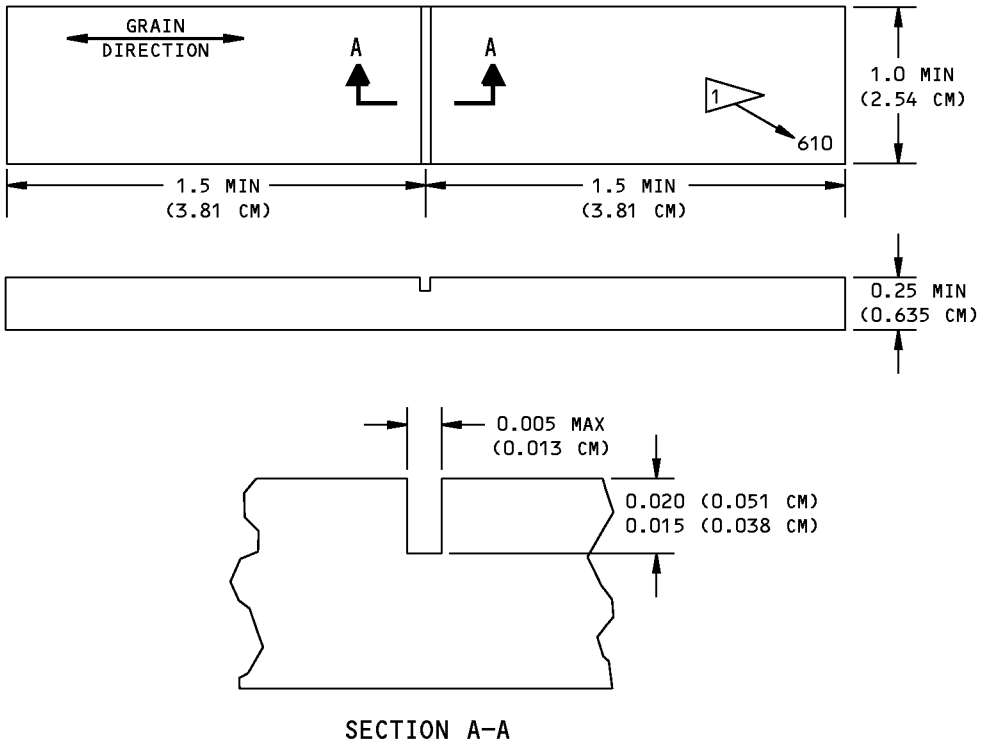
A. A signal response from the inspection area that is greater than 30 percent of the reference notch signal response and comes into view between the initial pulse and 80 percent full screen width shows the presence of a forging lap. If the signal travels as noted in NOTE 1) below, reject the part. A try to verify the indication can be done as noted in NOTE 2) below.

NOTE: 1) Note if the indication travels across the screen in relation to transducer movement. The reference notch response as well as a forging lap response will travel across the screen in relation to transducer movement, but internal noise signals from the transducer will stay in one place.

NOTE: 2) It is possible for a forging lap to be in the part that cannot be found by a penetrant inspection. This is because of the tightness of the lap which also prevents positive detection by an eddy current inspection. A fluorescent penetrant inspection can be done before the removal of the rejected part in a try to make sure that a forging lap is found. Removal of the paint from the unsatisfactory area will be necessary. The paint should be removed only with chemical strippers to prevent masking the defect.



Inspection Location
Figure 1



SECTION A-A

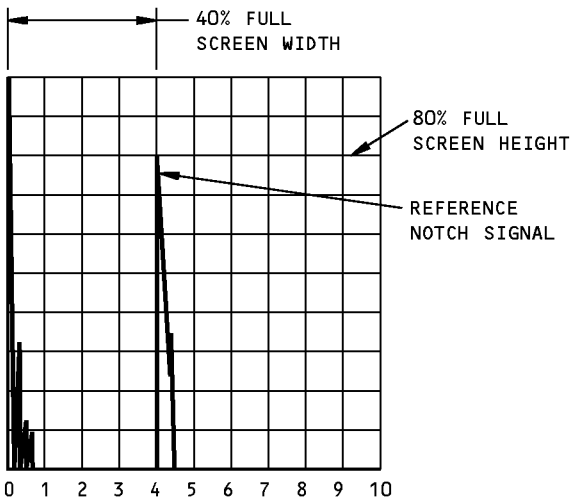
NOTES

- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS ARE IN PARENTHESES)
- TOLERANCE ±0.050 (0.127 CM) ON ALL DIMENSIONS EXCEPT AS NOTED
- FABRICATE FROM ANY OF THE FOLLOWING:
  2024-T3 OR -T4
  2075-T6 OR -T73
  7079-T6
  7178-T6
- SURFACE FINISH: 63 OR BETTER
- REFER TO PART 1, 51-01-00 FOR MANUFACTURING AND ORDERING INFORMATION

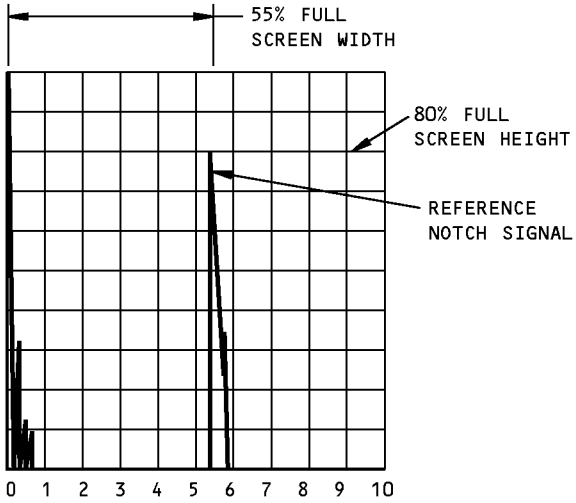
1 ETCH OR STEEL STAMP WITH 610

NOTE: THIS REFERENCE STANDARD IS THE SAME AS EDDY CURRENT REFERENCE STANDARD 126 WITH THE SQUARE BOTTOM NOTCH. STANDARD 126 MAY BE USED INSTEAD OF REFERENCE STANDARD 610 IF THE NOTCH HAS THE SAME DIMENSIONS.

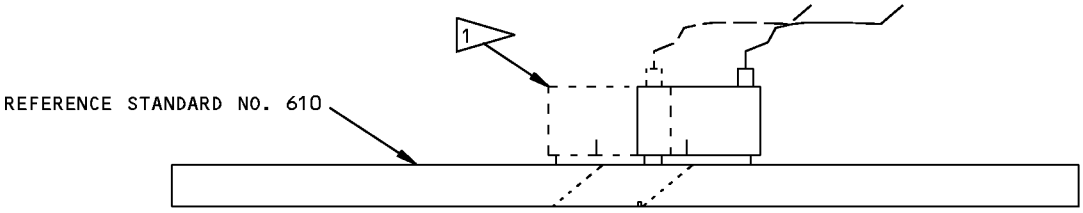
Reference Standard 610
Figure 2



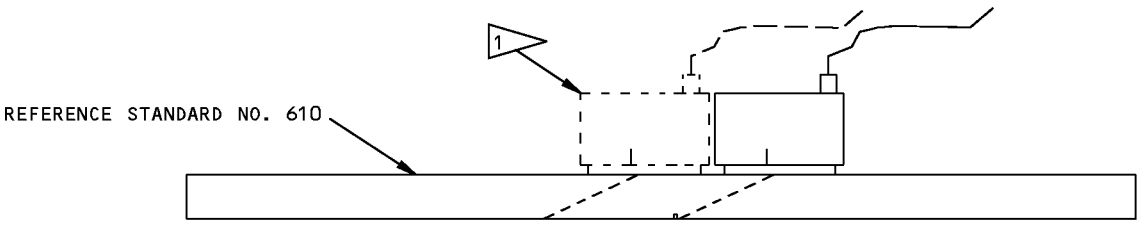
REFERENCE NOTCH SIGNAL RESPONSE WITH THE 45 DEGREE TRANSDUCER - INSTRUMENT CALIBRATION PER PARAGRAPH 4.A.



REFERENCE NOTCH SIGNAL RESPONSE WITH THE 60 DEGREE TRANSDUCER - INSTRUMENT CALIBRATION PER PARAGRAPH 4.B.



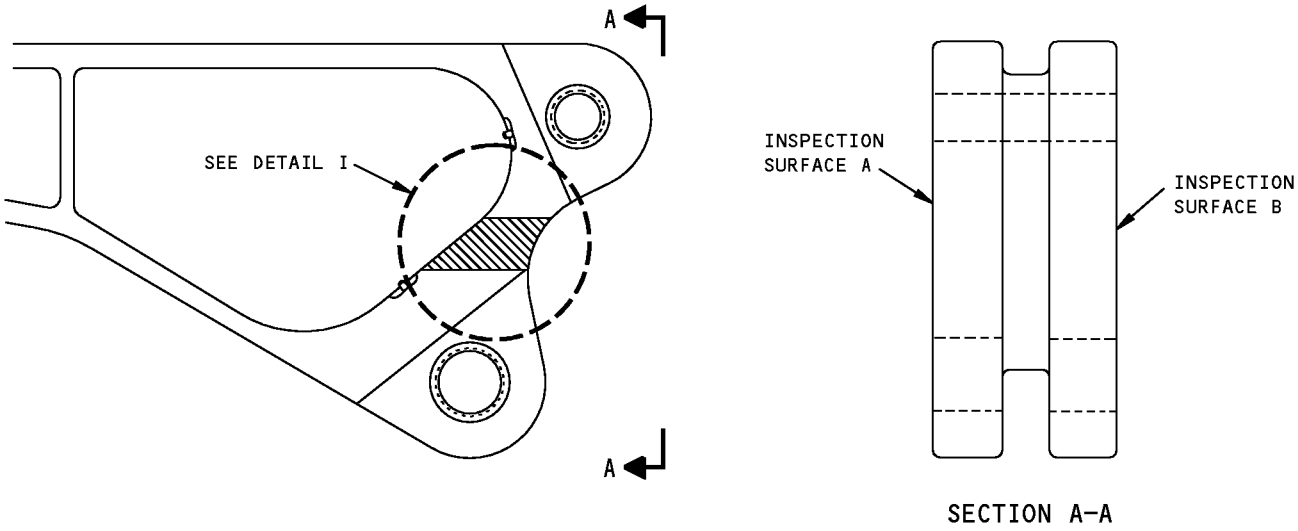
CALIBRATION WITH 45 DEGREE TRANSDUCER
POSITION A

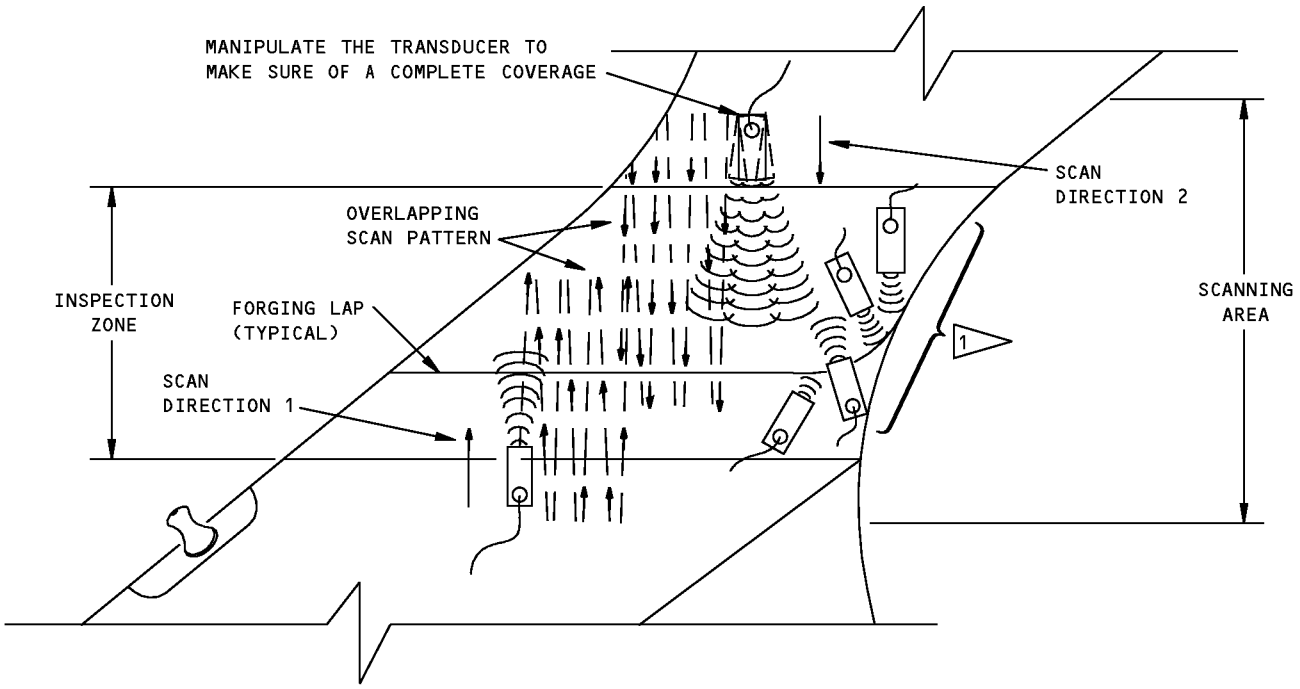


CALIBRATION WITH 60 DEGREE TRANSDUCER
POSITION B

1 NOTE: BEGIN WITH TRANSDUCER HERE AND SLIDE BACKWARDS UNTIL THE NOTCH SIGNAL APPEARS AND IS MAXIMIZED.

Instrument Screen Calibration
Figure 3





1 THIS IS THE AREA WHERE A FORGING LAP WILL OCCUR FIRST. THE LAP ORIENTATION MAY VARY FROM PART TO PART. INSPECT THIS AREA FROM DIFFERENT ANGLES TO GET MAXIMUM SENSITIVITY TO EVERY POSSIBLE LAP ORIENTATION.

NOTE: A SIGNAL WILL OCCUR FROM THE PART EDGE IF THE TRANSDUCERS SOUND BEAM IS DIRECTED TOWARDS THE PART EDGE AT 90° DEGREES.

Inspection Coverage
Figure 4

NOSE LANDING GEAR - LOWER DRAG STRUT THICKNESS CHECK

1. Purpose

A. Use this procedure to identify the material thickness of the lower drag strut of the nose landing gear. A thickness check is made at the top end of the strut tube at the machine runout area. See Figure 1 for the inspection area.

NOTE: The lower drag struts to be examined are steel stamped with part numbers 162T2003-4 or 162T2003-6. Drag strut 162T2003-4 is used on drag strut assemblies 162T2003-1 and -3; drag strut 162T2003-6 is used on drag strut assembly 162T2003-5.

B. A digital ultrasonic thickness gage is recommended for this inspection. If a digital thickness gage is used, refer to the instrument manufacturer's instructions and use the reference standard given in this procedure to calibrate the instrument.

C. Use the calibration instructions below as an alternative to a digital thickness gage.

D. Service Bulletin reference: 767-32A0185.

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, 51-01-00 for data about the equipment manufacturers.

B. Instrument

(1) Use a pulse-echo instrument that can operate at a frequency of 5 MHz.

(2) The pulse-echo instruments specified below were used to help prepare this procedure:

(a) USN 50, Krautkramer Branson

(b) Sonic 136, Staveley Instruments

C. Transducers

(1) Use a 5 MHz, 0.25 inch (6.3 mm) diameter, delay line transducer.

(2) The transducer that follows was used to help prepare this procedure.

(a) 124-660 with D-050 delay line, KB Aerotech

D. Reference Standard - A steel step wedge with 0.100 inch (2.54 mm), 0.200 inch (5.08 mm), and 0.300 inch (7.62 mm) thick steps (all steps are ± 0.010 inch (0.25 mm)) is recommended. Other step wedges can be used if the minimum (0.100 inch (2.54 mm)) and maximum (0.300 inch (7.62 mm)) thickness steps are included.

3. Preparation for Inspection

A. Get access to the drag strut.

B. Make sure the inspection area is clean.

4. Instrument Calibration

A. Set the instrument frequency to 5 MHz, if necessary.

B. Set the reject and damping controls to a minimum.

NOTE: It is possible that, for some instruments, if the damping control is not set to a minimum, the first back surface signal from the 0.050 inch (1.27 mm) step on the step wedge will not show on the instrument screen - only the multiple signals from the back surface will show on the screen. If this occurs, it will not be possible to do a correct calibration.

C. Put couplant on the reference standard on each step.

D. Put the probe on the 0.10 inch (2.54 mm) step of the reference standard and adjust the instrument gain to put the back surface signal at 100 percent of full screen height (FSH).

E. With the probe still on the 0.10 inch (2.54 mm) step, adjust the instrument delay control to put the left edge of the back surface signal at 20 percent of full screen width (FSW).

F. Put the probe on the 0.30 inch (7.62 mm) step of the reference standard and adjust the instrument gain control to put the back surface reflection at 100 percent of FSH.

G. With the probe still on the 0.30 inch (7.62 mm) step, adjust the instrument range control to put the left edge of the back surface signal at 60 percent of FSW.

H. Put the probe back on the 0.10 inch (2.54 mm) step and adjust the gain control to put the back surface signal at 100 percent of FSH.

I. With the probe still on the 0.10 inch (2.54 mm) step, adjust the instrument delay control to again put the left edge of the back surface signal at 20 percent of FSW.

J. Put the probe back on the 0.30 inch (7.62 mm) step and again adjust the instrument gain control to put the back surface reflection at 100 percent of FSH.

K. With the probe still on the 0.30 inch (7.62 mm) step, adjust the instrument range control to again put the left edge of the back surface signal at 60 percent of FSW.

L. Do Paragraph 4.H. thru Paragraph 4.K. until the left edge of the 0.10 inch step is at 20 percent of FSW and the left edge of the 0.30 inch step is at 60 percent of FSW.

M. The instrument is now calibrated. Each 10 percent of FSW is equal to 0.05 inch (1.27 mm) of material thickness. For example, a signal at 40 percent of FSW is equal to a material thickness of 0.20 inch (5.08 mm).

N. Put the transducer on the other thicknesses of the step wedge. Compare the thickness of the step wedge as measured by the instrument to the thicknesses of the step wedge.

5. Inspection Procedure

A. Calibrate the instrument as specified in Paragraph 4. or the instrument manufacturer's instructions.

B. Find the inspection area at the top end of the drag strut.

C. Put couplant on the drag brace in the area to be examined.

D. Make a line around the drag brace tube as shown in Figure 1, Sheet 2. This line will be referred to as the start line.

E. Put the transducer just below the start line. Adjust the instrument gain control to put the back surface reflection at 100 percent of FSH.

NOTE: The nominal wall thickness of the 162T2003-4 drag strut is 0.175 inch (4.45 mm). This is equivalent to an indication that occurs on the instrument that is at approximately 35 percent of FSW.

NOTE: The nominal wall thickness of the 162T2003-6 drag strut is 0.225 inch (5.71 mm). This is equivalent to an indication that occurs on the instrument that is at approximately 45 percent of FSW.

NOTE: Some digital ultrasonic thickness gages cannot make measurements through paint. If a good measurement value cannot be made, remove the paint and do the inspection again.

F. Measure and make a record of the thickness at eight locations (approximately 45 degrees between locations) around the drag strut, in the inspection area shown in Figure 1, Sheet 2. Do the inspection as follows:

NOTE: Use the left edge of the back surface signal to measure the thickness.

(1) Make the first set of eight measurements with the transducer just below the start line.

(2) Move the transducer 1/2 inch (12.5 mm) from the start line into the inspection area for the second set of measurements.

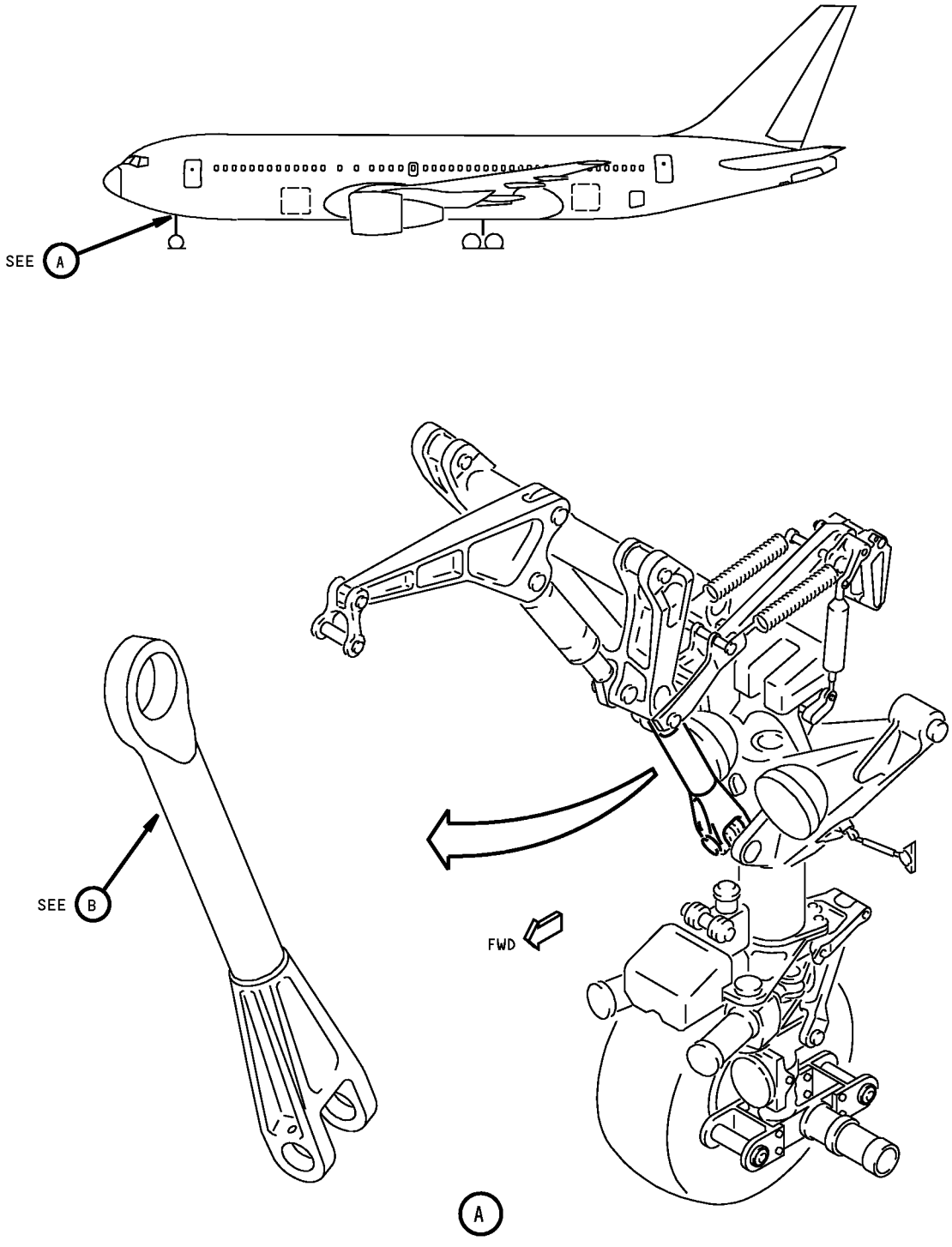
(3) Continue to make measurements around the drag strut at 1/2-inch (12.5 mm) increments until the inspection area shown in Figure 1, Sheet 2 has been examined.

(4) Make a record of the locations where the thickness is 0.16 inch (4.0 mm) or less for the 162T2003-4 drag strut or 0.21 inch (5.3 mm) or less for the 162T2003-6 drag strut.

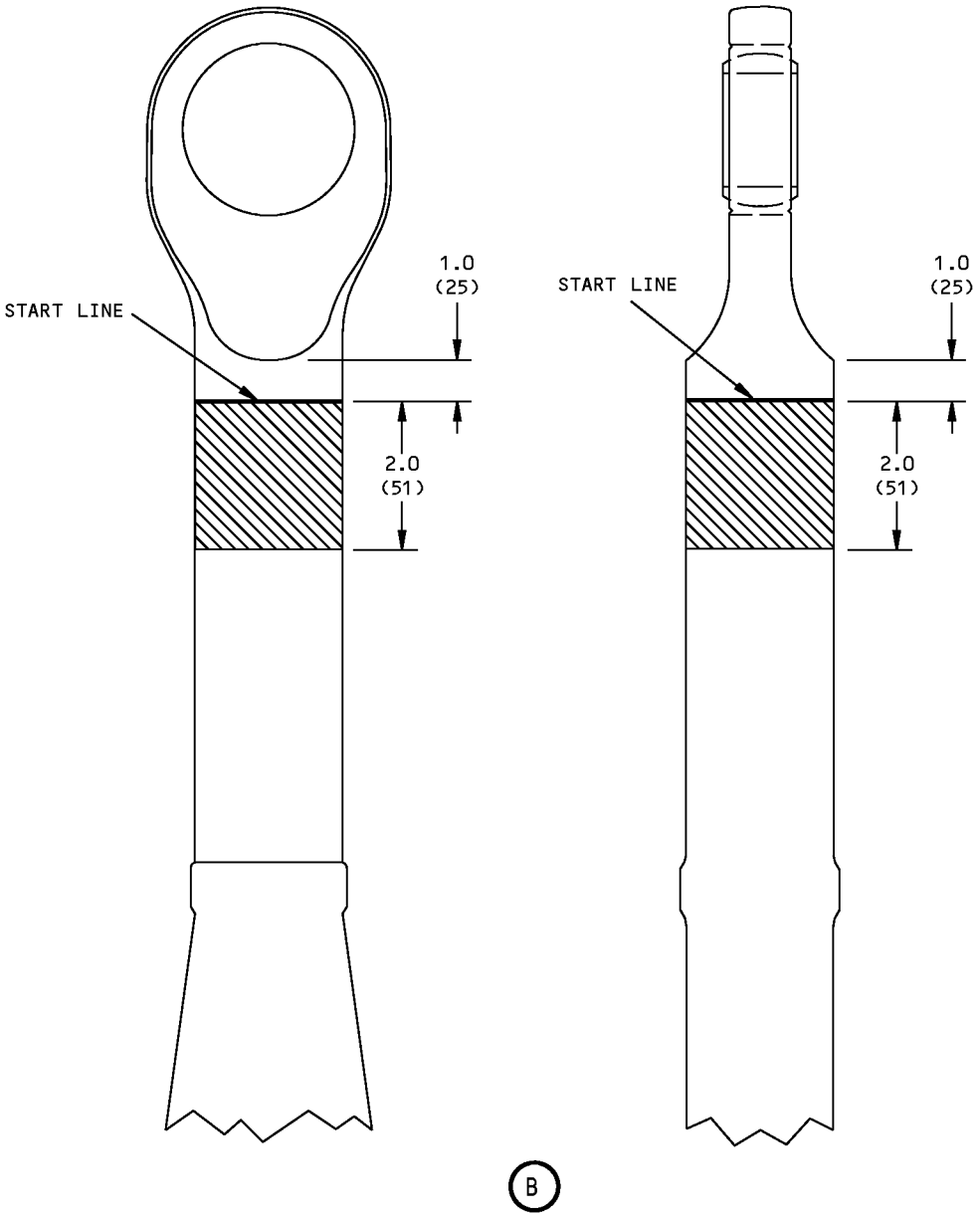
G. Put the transducer above the start line and measure the thickness. The thickness must increase as the transducer is moved towards the lug. At some locations above the start line it will not be possible to get the thickness indications because of the shape of the inner diameter.

6. Inspection Results

A. Make a mark on the drag strut at all locations that are 0.16 inch (4.0 mm) or less for the 162T2003-4 drag strut or 0.21 inch (5.3 mm) thick or less for the 162T2003-6 drag strut.



Nose Landing Gear - Lower Drag Strut - Inspection Location
Figure 1 (Sheet 1 of 2)



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- INSPECTION AREA

Nose Landing Gear - Lower Drag Strut - Inspection Location
Figure 1 (Sheet 2 of 2)