PART 6 - EDDY CURRENT

PLATES AND SKINS

COUNTERSINK INSPECTION OF ALUMINUM PARTS (METER DISPLAY)

1. **NOTICE**

   A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 1, was identified as Part 6, 53-30-00, Fig. 1. Because of a publishing system change, the term "Fig." was changed to "Procedure". The technical instructions were not changed.

2. **Purpose**

   A. To find the cracks that extend across the countersink surface after the fasteners have been removed. Refer to Detail I in Figure 1 for an illustration of a usual crack.

   B. Part 6, 53-30-00, Procedure 3 or Part 6, 53-30-00, Procedure 4 can be used as an alternative to this procedure.

3. **Equipment**

   A. A countersink probe which can operate between 100 and 500 kHz is necessary for this procedure. All metered instrument and probe combinations that meet the calibration requirements of this procedure can be used.

   The following equipment was used to make this procedure:

   (1) Instrument

   (a) MIZ-10B, Zetec, Inc.

   (b) Locator UH, Hocking Instruments

   (2) Probe - Countersink Probe and Collar

   (a) Use a probe that:

   1) Operates at a frequency range of 100 to 500 kHz.

   2) Has an external diameter that fits in the countersunk hole that is shown in Figure 2 or Figure 3 or the counterbore hole that is shown in Figure 4.

   NOTE: A 100 degree countersunk probe can be used in the counterbore hole shown in Figure 4.

   (b) The probes specified below were used to prepare this procedure.

   1) CSM-100-10 (0.156 inch diameter);
   CSM-100-12 (0.187 inch diameter)
   CSM-100-14 (0.218 inch diameter)
   CSM-100-16 (0.250 inch diameter)
   NDT Engineering Corp.

   2) VM103C 5/32 (0.156 inch diameter);
   VM103C 3/16 (0.187 inch diameter)
   VM103C 7/32 (0.218 inch diameter)
   VM103C 1/4 (0.250 inch diameter)
   VM Products

   (3) Reference Standard

(a) Use reference standard 194 or 194A to do 100-degree countersunk hole inspections. See Figure 2 or Figure 3 for data about the reference standards.

(b) Use reference standard NDT194B to do 120-degree counterbore hole inspections. See Figure 4 for data about the reference standard.

NOTE: Refer to Part 1, 51-01-00, for data about the equipment and the reference standard manufacturers.

4. Prepare for the Inspection

A. Remove the fasteners.

B. Make sure the inspection surface is clean.

NOTE: Be careful not to cause damage to or make the countersink larger when the fasteners are removed. Only deburr and make the surface clean.

5. Instrument Calibration

A. Start the instrument and do the initial adjustments as specified in the manufacturer's instructions.

B. Connect the probe to the instrument and set the frequency between 100 and 500 kHz.

NOTE: The reference standard and the eddy current probe must be the same size as the countersink hole that will be inspected.

C. Put the probe in the countersink hole of the reference standard with the coil installed opposite of the notch. Adjust the probe collar to keep the probe vertical to the reference standard surface. Refer to Detail II in Figure 1.

D. Balance the instrument and adjust the meter signal to 10 percent of the full scale.

E. Put a 0.003 to 0.005 inch (0.007 to 0.013 cm) thick nonconductive shim between the probe coil and the countersink surface of the reference standard.

NOTE: An ordinary piece of writing paper is approximately 0.003 inch thick and can be used as the nonconductive shim during the lift-off adjustments.

F. Adjust the instrument's lift-off or the phase control as specified in the manufacturer's instructions until no needle movement is monitored between the probe coil on the bare surface and when lifted off the surface with a 0.003 to 0.005 inch thick nonconductive shim.

G. Adjust the meter signal to 10 percent of the full scale as specified in Paragraph 5.D.

H. Turn the probe until the coil is above the notch and adjust the instrument sensitivity controls to get a 40 to 60 percent of the full scale signal.

I. Recheck lift-off. If an adjustment is made, do a check of the sensitivity as specified in Paragraph 5.H. and adjust if necessary.

NOTE: The use of an audible or a visual alarm is recommended and can increase the scan speed. Set the alarm to operate to signals that are 80 percent of the reference-standard-notch-signal amplitude.

J. Make a note of the instrument signal as the probe is turned over the notch to find the scan speed.

6. Inspection Procedure

A. Put the probe into the countersink and adjust the probe collar to hold the probe vertical to the surface.

B. Balance the instrument or adjust the meter signal to 10 percent of the full scale.

C. Scan the countersink. The probe must be turned more than 360 degrees to make sure the complete countersink is covered. Keep the probe vertical to the inspection surface during the inspection. Refer to Detail III in Figure 1. Keep a probe scan speed that is almost the same as when the instrument was calibrated in Paragraph 5.

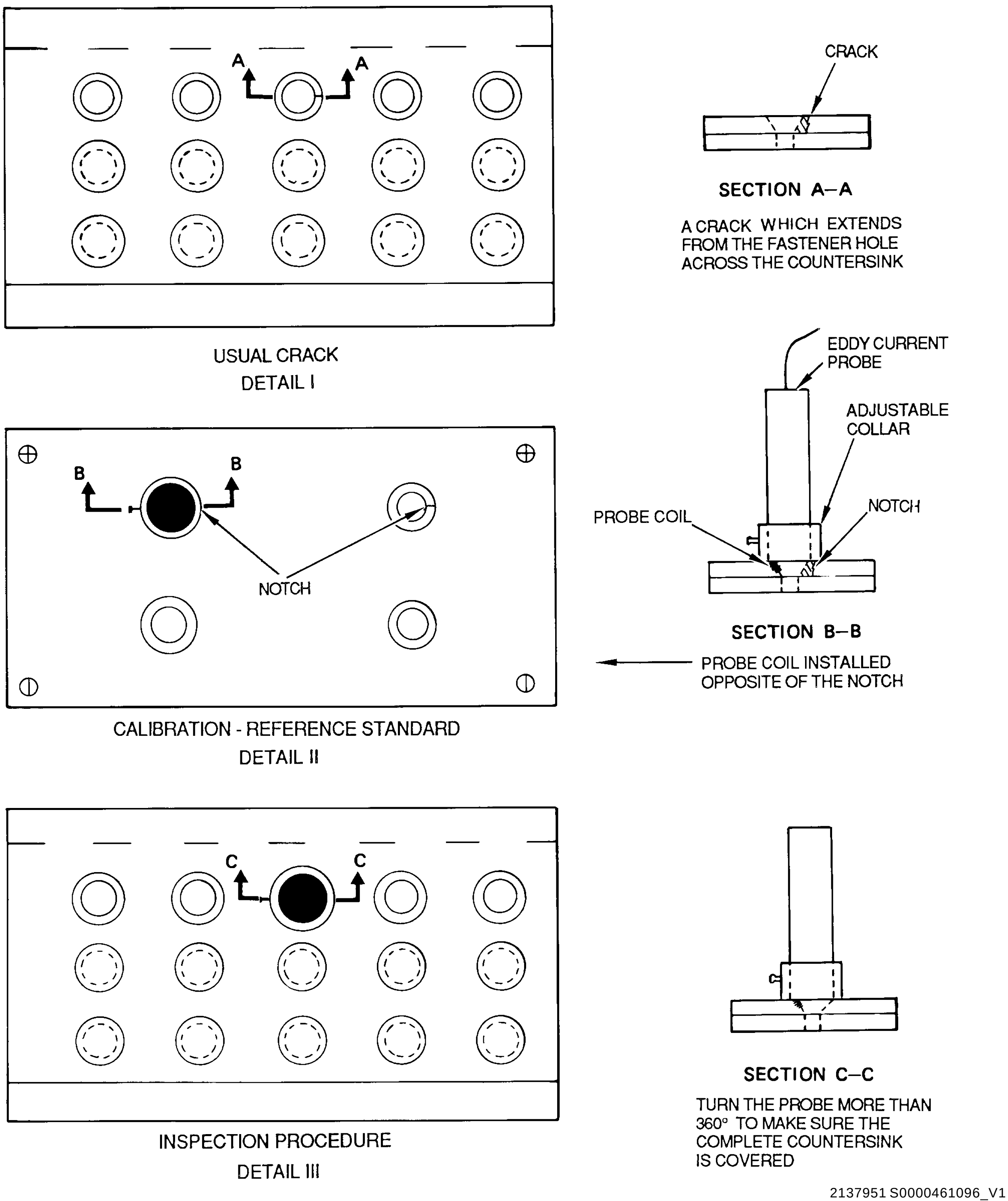
NOTE: The eddy current instrument will show cracks by a rapid meter deflection over a short-probe-scan distance. If the fastener hole is not circular, the eddy current instrument can show a slow meter change over a large-probe-scan distance. This is not a crack indication. Compare all crack indications with the reference-standard-notch signal.

D. At regular times throughout the inspection, do a check of the instrument calibration as specified in Paragraph 5.C. thru Paragraph 5.I. and adjust if necessary.

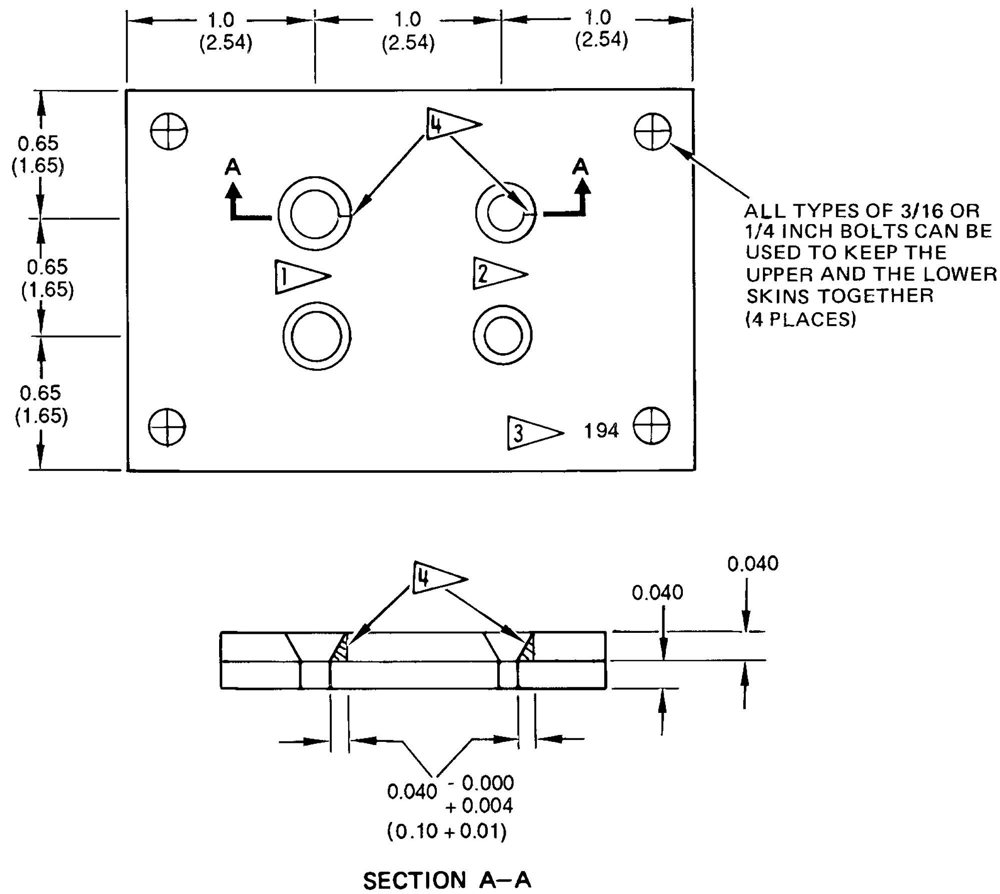
7. Inspection Results

A. All signals that are equal to or more than the reference-standard-notch signal and occur over a short scan distance are possible crack indications.

B. Part 6, 51-00-00, Procedure 4 can be used to examine the area of the crack indication.



Usual Crack, Calibration - Reference Standard and Inspection Procedure
Figure 1



ALL DIMENSIONS ARE IN INCHES (CENTIMETERS IN PARENTHESES)
TOLERANCE: X.X±0.05 (0.13) X.XXX±0.005 (0.013) (UNLESS NOTED)
MATERIAL: 2024 T3 OR T4 CLAD ALUMINUM

1 FOR A 3/16 INCH HOLE SIZE, DRILL A NO. 11 (0.191 INCH DIA) HOLE AND COUNTERSINK 100°–TOP SHEET

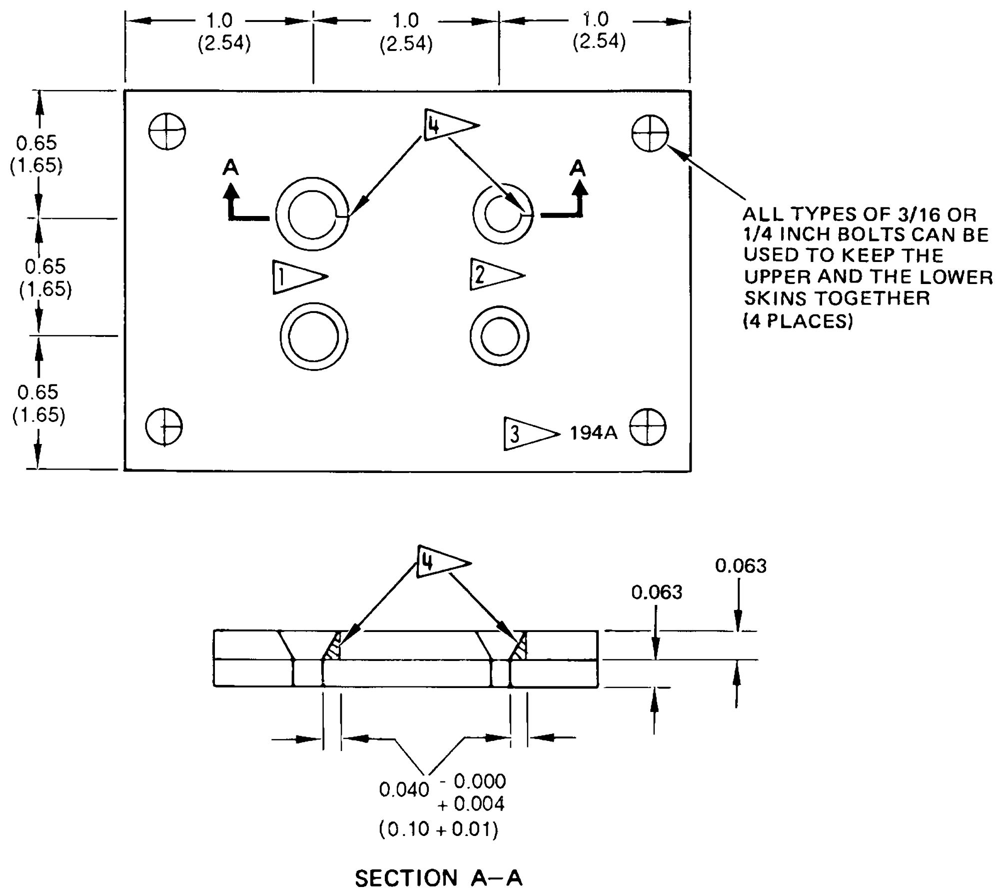
2 FOR A 5/32 INCH HOLE SIZE, DRILL A NO. 20 (0.161 INCH DIA) HOLE AND COUNTERSINK 100°–TOP SHEET

3 ETCH OR STAMP PART NUMBER 194.

4 EDM NOTCH OR EQUIVALENT 0.007 (0.018) MAXIMUM WIDTH

2137952 S0000461099_V1

Reference Standard 194
Figure 2



ALL DIMENSIONS ARE IN INCHES (CENTIMETERS IN PARENTHESES)
TOLERANCE: X.X±0.05 (0.13) X.XXX±0.005 (0.013) (UNLESS NOTED)
MATERIAL: 2024 T3 OR T4 CLAD ALUMINUM

1 FOR A 1/4 INCH HOLE SIZE, DRILL A 0.250 INCH DIA HOLE AND COUNTERSINK 100°–TOP SHEET

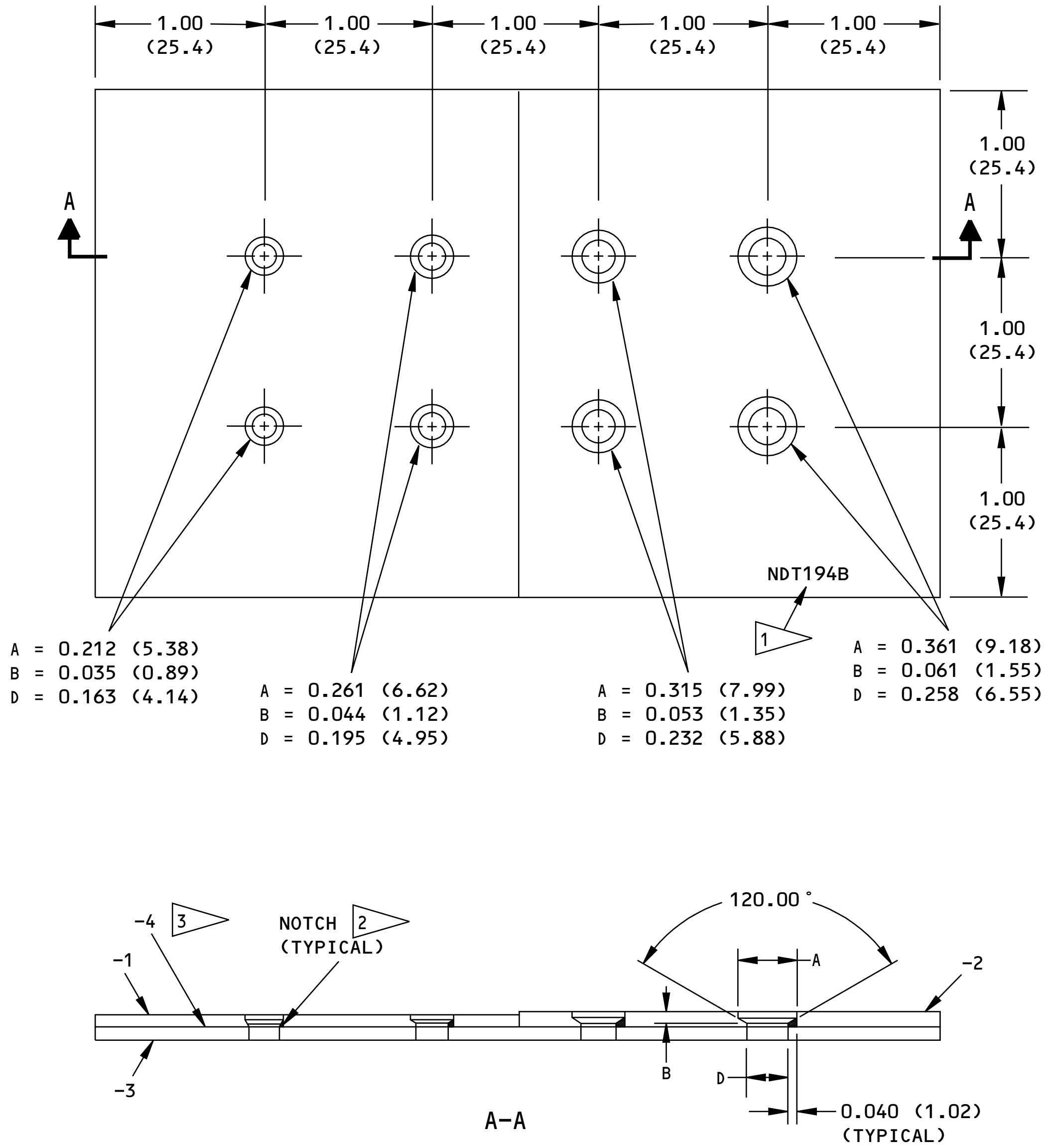
2 FOR A 7/32 INCH HOLE SIZE, DRILL A 0.218 INCH DIA HOLE AND COUNTERSINK 100°–TOP SHEET

3 ETCH OR STAMP PART NUMBER 194A

4 EDM NOTCH OR EQUIVALENT 0.007 (0.018) MAXIMUM WIDTH

2137953 S0000461100_V1

Reference Standard 194A
Figure 3



2137954 S0000461101_V1

Reference Standard NDT194B
Figure 4 (Sheet 1 of 2)

NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XXX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- ANGULAR TOLERANCE: ±1.0 DEGREE
- SURFACE ROUGHNESS = 125 Ra OR BETTER.
- MATERIAL:

ID NO.	QUANTITY	DIMENSIONS	MATERIAL
-1	1	0.056 X 3.0 X 2.5 (1.42 X 76 X 64)	2024-T3 OR -T4 CLAD ALUMINUM
-2	1	0.081 X 3.0 X 2.5 (2.06 X 76 X 64)	2024-T3 OR -T2 CLAD ALUMINUM
-3	1	0.081 X 3.0 X 5.0 (2.06 X 76 X 127)	2024-T3 OR -T3 CLAD ALUMINUM
-4	1	0.010 X 3.0 X 5.0 (0.25 X 76 X 127)	ADHESIVE LAYER (USE A WATER RESISTANT ADHESIVE)

1 ETCH OR STEEL STAMP THE NUMBER "NDT194B" ON THE REFERENCE STANDARD.

2 EDM NOTCH: THE LENGTH OF THE NOTCH IS 0.040 (1.02) ±10% FROM THE FASTENER SHANK. THE DEPTH OF THE NOTCH IS THROUGH THE TOP LAYER. THE NOTCH WIDTH IS 0.005 ±0.002 (0.13 ±0.05). THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTER OF THE HOLE.

3 APPLY AN EVEN LAYER OF ADHESIVE BETWEEN THE TOP AND BOTTOM LAYERS (-1 AND -3) (-2 AND -3).

2137955 S0000461102_V1

Reference Standard NDT194B
Figure 4 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

COUNTERSUNK HOLE INSPECTION OF ALUMINUM PARTS (ROTARY SCANNER)

1. **NOTICE**

   A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 3, was identified as Part 6, 53-30-00, Fig. 3. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. **Purpose**

   A. Use this procedure to do an inspection for cracks on the countersunk surfaces of open fastener holes. See Figure 1 for an example of a crack in a countersunk hole.

   B. This procedure uses an impedance plane display instrument and a rotary scanner.

   C. This procedure is for holes with diameters that are between 0.156 inch (3.97 mm) and 0.375 inch (9.53 mm).

   D. Part 6, 53-30-00, Procedure 1 or Part 6, 53-30-00, Procedure 4 can be used as an alternative to this procedure

3. **Equipment**

   A. General

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

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

   B. Instrument

      (1) Use an eddy current instrument with a rotary scanner that:

         (a) Has an impedance plane display.

         (b) Operates from 100 to 500 kHz.

         (c) Can be calibrated as specified in the calibration instructions of this procedure.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) Phasec 2d/3d; GE Inspection Technologies

         (b) Nortec 2000/500/600; Olympus NDT

   C. Probes

      (1) Use a rotary probe that:

         (a) Operates from 100 to 500 kHz.

         (b) Has an external diameter that fits in the 100 degree countersunk holes that are in the reference standards shown in Figure 4 thru Figure 6 or the 120 degree counterbore holes in the reference standard shown in Figure 7.

         NOTE: A 100 degree countersunk probe can be used in the 120 degree counterbore hole shown in Figure 7. But differences between the shape of the probe and the counterbore hole can cause the probe to wear quickly.

         (c) Operates with a minimum 5:1 signal-to-noise ratio on the reference standard and a minimum 3:1 signal-to-noise ratio on the part to be examined.

      (2) The probes that follow were used to help prepare this procedure.

(a) CSU100-10 (0.156 inch (4.0 mm) diameter); Olympus NDT

(b) UC1.187 (0.187 inch (4.8 mm) diameter); Techna NDT

(c) CSU100-14 (0.218 inch (5.5 mm) diameter); Olympus NDT

(d) UC1.250 (0.250 inch (6.3 mm) diameter); Techna NDT

(e) AURCSF100-.312 (0.312 inch (8.0 mm) diameter); Aerofab NDT

(f) AURCSF100-.375 (0.375 inch (9.5 mm) diameter); Aerofab NDT

D. Reference Standards

(1) Use reference standards 194, 194A and 194C to examine the 100 degree countersunk holes. See Figure 4 thru Figure 6 for data about the reference standards.

(2) Use reference standard NDT194B to examine the 120 degree counterbore holes. See Figure 7 for data about reference standard NDT194B.

NOTE: Refer to Part 1, 51-01-00, for data about the equipment and the reference standard manufacturers.

4. Prepare for the Inspection

A. Remove the fasteners.

B. Make sure the inspection surface is clean.

C. Visually look into all countersunk holes to be eddy current examined for surface conditions that can cause rejectable noise signals during the inspection. Visual aids can be used to help the visual inspection. Look for these conditions:

(1) Burrs

(2) Galling

(3) Corrosion

(4) Out-of-round holes

NOTE: If a clean-up of the countersink surface is necessary to remove one or more of these conditions, a 125 Roughness Height Rating (RHR) (or better) surface finish is necessary. Get local engineering approval to do a clean-up.

5. Instrument Calibration

A. Connect the rotary scanner to the instrument.

B. Energize the instrument and do the initial adjustments as specified in the manufacturer's instructions.

C. Identify the countersunk hole size and type (100 degree countersink or 120 degree counterbore) to be examined.

D. Get the applicable reference standard and probe.

E. Connect the probe to the rotary scanner.

F. Set the instrument frequency between 200 and 500 kHz.

NOTE: The reference standard and the eddy current probe must be the same size as the countersunk hole to be examined.

G. If possible, set the rotary scanner speed above 1000 RPM. Rotary scanner speeds less than 1000 RPM are not recommended because it is not as easy to find a short crack at the lower speed.

H. Set the instrument display to the impedance plane mode (X/Y). If possible, use a split screen display to display the impedance plane (X/Y) and the timebase (Sweep) modes on one screen.

I. Set the instrument balance point on the impedance plane (X/Y) display to 50% of full screen width (FSW) and 50% of full screen height (FSH) and balance the instrument with the probe in the air.

J. Energize the rotary scanner and put the probe on the upper surface of the reference standard such that the coil touches the surface as shown in Figure 2, Detail I.

K. Adjust the instrument gain and phase controls to get the lift-off signal to show on the impedance plane display and to be horizontal. See Figure 2, Detail II. Monitor the timebase display shown in Figure 2, Detail III, that shows the lift-off signal height. Adjust the phase as necessary to get the minimum signal height.

L. Put the probe in the hole with the notch and balance the instrument if necessary. See Figure 3, Detail I. Make sure the probe countersink is in full contact with the countersink of the hole.

M. Monitor the notch signal on the timebase display and adjust the instrument high pass and low pass filters and gain controls to get the notch signal to be symmetrical and set to 80% of FSH. See Figure 3, Detail III. A minimum signal-to-noise ratio of 5:1 is necessary (example: notch signal of 80% of FSH and noise of 16% of FSH = 5:1 signal-to-noise ratio).

NOTE: The maximum high pass filter adjustment must not be higher than the low pass filter adjustment.

NOTE: If the speed of the rotary scanner is changed, it will be necessary to adjust the filters and the instrument gain.

N. Set the instrument alarms to 80% of FSH as shown in Figure 3, Detail III.

O. Identify the zero position on the rotary scanner as it relates to the notch signal FSW location on the timebase display. See Figure 3, Details I and III. The zero position for the rotary scanner can be different with different instrument and rotary scanner combinations.

P. Adjust the instrument horizontal gain or gain ratios to keep the notch signal on the impedance plane display as shown in Figure 3, Detail II.

Q. Put the probe in the hole without the notch and monitor the timebase and impedance plane displays for typical screen displays for a good fastener condition.

6. Inspection Procedure

A. Energize the rotary scanner and put the probe into the countersunk hole. Make sure the probe is in complete contact with the countersink of the hole.

B. Do a scan of the countersunk hole for cracks. During the scan inspection of the hole, be sure to monitor the screen impedance plane and timebase displays for:

(1) Crack type signals that are almost the same as the notch signal from the reference standard. Record the hole location and clock location of the crack type signal.

(2) Noise signals that are more than a minimum signal-to-noise ratio of 3:1, (example: crack type signal of 80% of FSH and noise of 27% of FSH = 3:1 signal-to-noise ratio) caused by surface conditions in the countersink and/or out-of-round holes. Record the holes that have a signal-to-noise ratio that is less than 3:1.

NOTE: Get local engineering approval to do a clean-up of these countersink surfaces.

C. At regular times during the inspection, do a check of the instrument calibration as specified in Paragraph 5.L. and Paragraph 5.M. and adjust if necessary. If the sensitivity has decreased since the last calibration check, all fastener holes examined since the last calibration check must be examined again.

7. Inspection Results

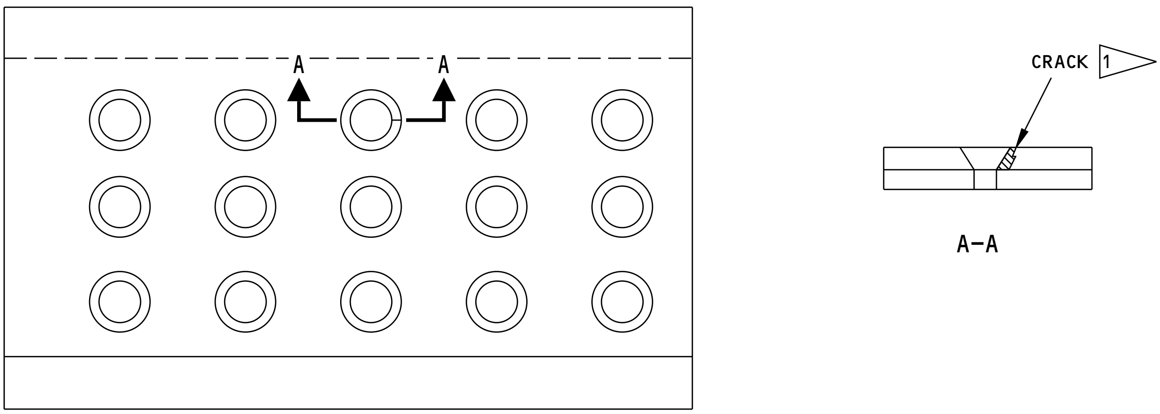
A. Fastener holes with no crack signals are satisfactory. An eddy current crack signal will look almost the same as the notch signal you got from the reference standard. Noise signals have a wider shape than crack signals and can make it not easy to see crack signals. If the signal-to-noise ratio between the reference standard notch signal and the inspection surface noise level is less than 3:1, go to Paragraph 4.C.

B. Fastener holes must be rejected if they cause crack signals to occur that are 100% (or more) of the reference standard notch signal.

C. A fastener hole that causes an eddy current signal to occur that looks almost the same as a crack signal and is between 50 and 100% of the height of the notch signal from the reference standard must be examined as follows:

(1) Do a visual inspection of the countersink surface to look for surface conditions that can cause an eddy current crack signal to occur (see Paragraph 4.C.). If a surface condition is seen at the same position of the eddy current signal, the fastener hole can be accepted. If no surface conditions are seen that could be the cause of the eddy current signal, reject the hole.

NOTE: Get local engineering approval to accept the hole with the surface condition that caused the eddy current indication.

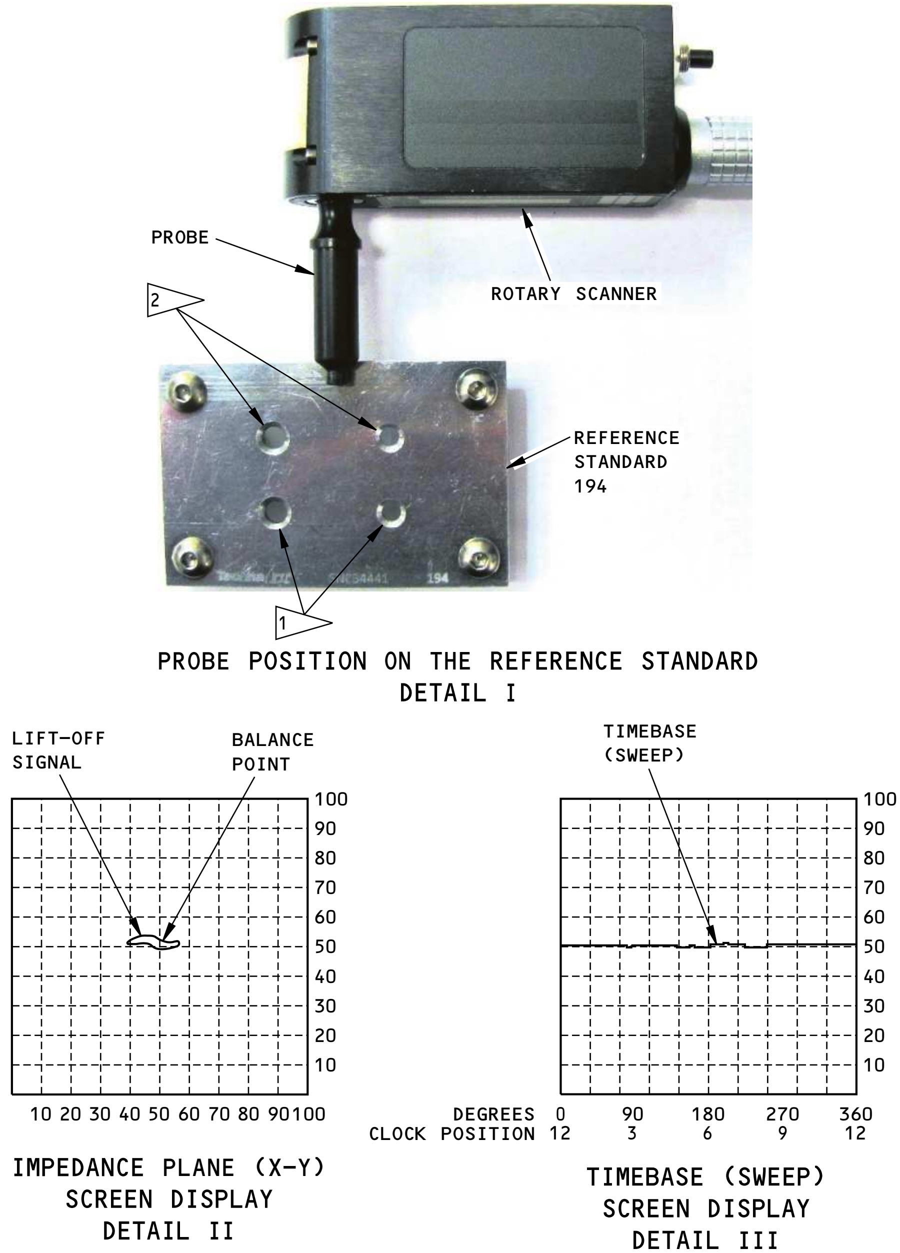


NOTES:

1 THE CRACK EXTENDS FROM THE FASTENER HOLE ACROSS THE COUNTERSINK.

2137978 S0000461116_V2

Usual Crack
Figure 1



NOTES:

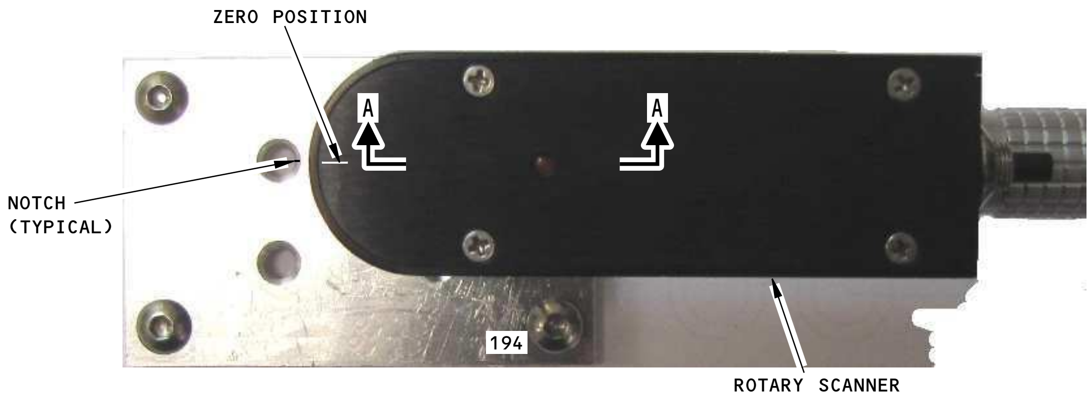
- THE SCREEN DISPLAYS SHOWN IN DETAILS II AND III ARE EXAMPLES AND CAN LOOK DIFFERENT WITH YOUR PROBE AND INSTRUMENT.

1 FASTENER HOLE WITHOUT A NOTCH

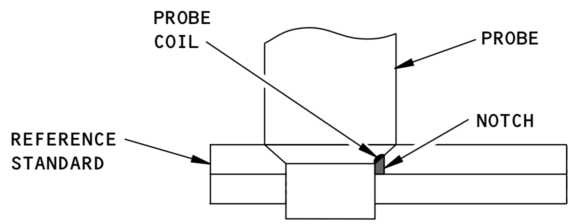
2 FASTENER HOLE WITH A NOTCH

2505008 S0000589445_V1

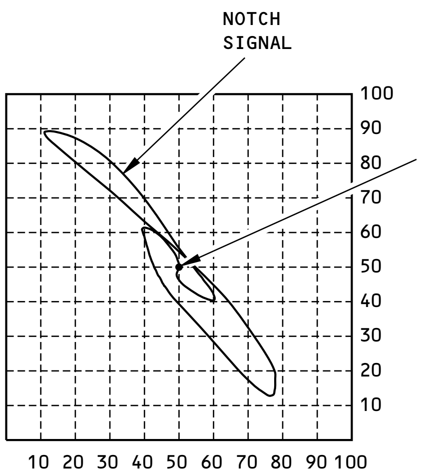
Instrument Calibration - Lift-Off Adjustment on the Reference Standard
Figure 2

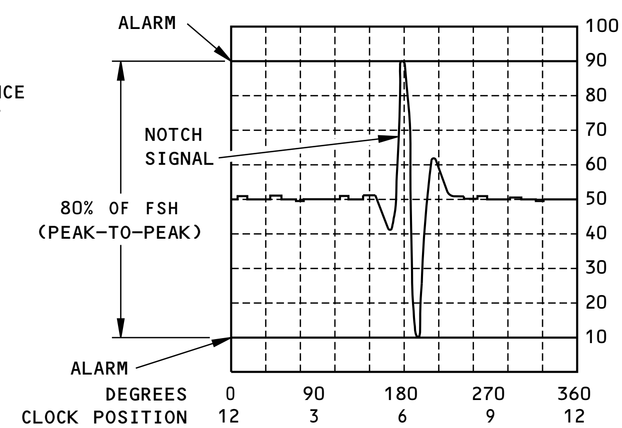


ROTARY SCANNER POSITION ON THE REFERENCE STANDARD
DETAIL I



A-A





IMPEDANCE PLANE (X-Y)
SCREEN DISPLAY
DETAIL II

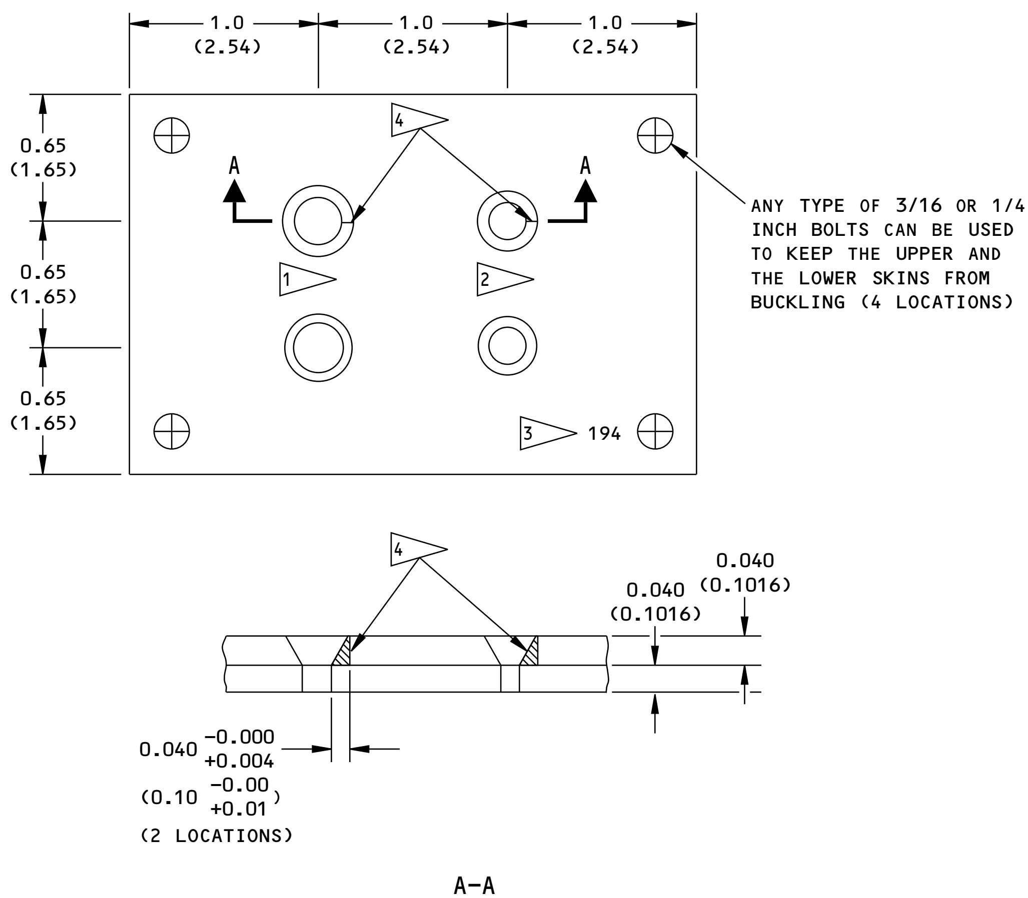
TIMEBASE (SWEEP)
SCREEN DISPLAY
DETAIL III

NOTES:

- THE SCREEN DISPLAYS SHOWN IN DETAILS II AND III ARE EXAMPLES AND CAN LOOK DIFFERENT WITH YOUR PROBE AND INSTRUMENT.
- THE ZERO POSITION SHOWN ON THE ROTARY SCANNER IN DETAIL I IS A TYPICAL ZERO POSITION AND AGREES WITH THE NOTCH SIGNAL POSITION SHOWN IN DETAIL II. THE ZERO POSITION ON OTHER ROTARY SCANNERS CAN BE 180 DEGREES FROM THE ZERO POSITION SHOWN IN DETAIL I.

2505590 S0000589446_V1

Instrument Calibration - Notch Signal Adjustment on the Reference Standard
Figure 3



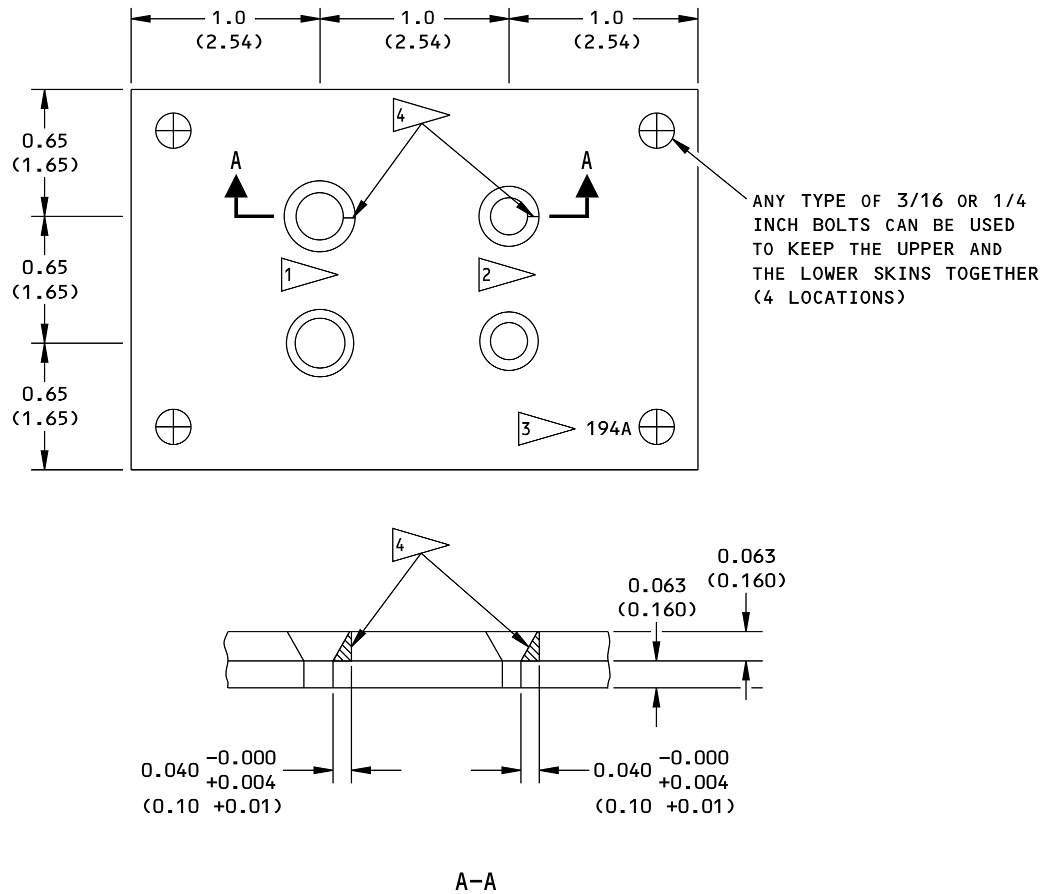
NOTES:

- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS ARE IN PARENTHESES)
- TOLERANCE: X.X ±0.05 (0.13) X.XXX ±0.005 (0.013) (UNLESS NOTED)
- MATERIAL: 2024 T3 OR T4 CLAD ALUMINUM

1. FOR A 3/16 INCH HOLE SIZE, DRILL A NO. 11 (0.191 INCH DIA) HOLE AND COUNTERSINK 100°-TOP SHEET
2. FOR A 5/32 INCH HOLE SIZE, DRILL A NO. (0.161 INCH DIA) HOLE AND COUNTERSINK 100°-TOP SHEET
3. ETCH OR STAMP PART NUMBER 194.
4. EDM NOTCH OR EQUIVALENT 0.007 (0.018) MAXIMUM WIDTH

2137982 S0000461119_V2

Reference Standard 194
Figure 4



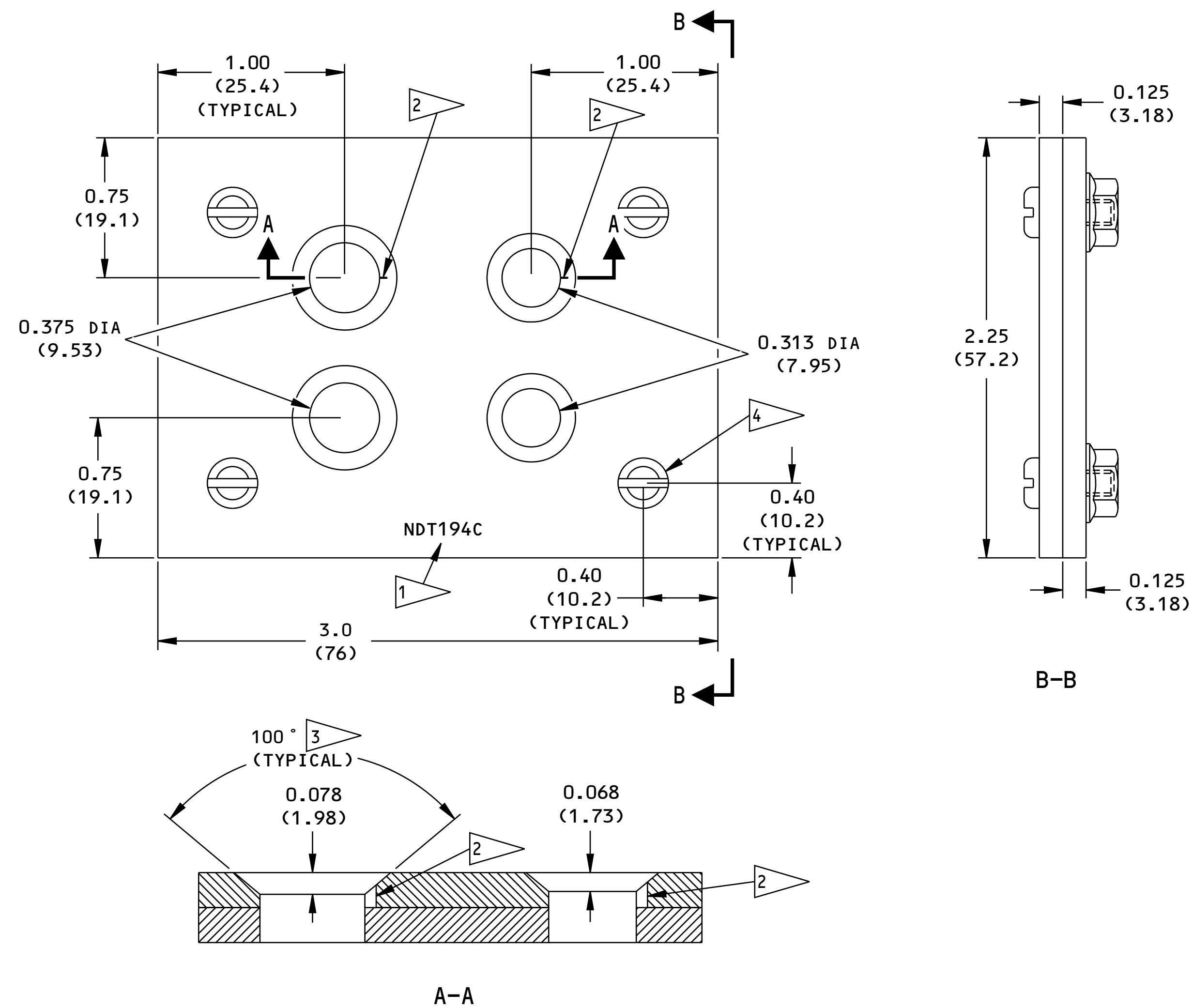
NOTES:

- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS IN PARENTHESES)
- TOLERANCE: X.X ±0.05 (0.13) X.XXX ±0.005 (0.013) (UNLESS NOTED)
- MATERIAL: 2024 T3 OR T4 CLAD ALUMINUM

1. FOR A 1/4 INCH HOLE SIZE, DRILL A 0.250 INCH DIA HOLE AND COUNTERSINK 100°-TOP SHEET
2. FOR A 7/32 INCH HOLE SIZE, DRILL A 0.218 INCH DIA HOLE AND COUNTERSINK 100°-TOP SHEET
3. ETCH OR STAMP PART NUMBER 194A.
4. EDM NOTCH OR EQUIVALENT 0.007 (0.018) MAXIMUM WIDTH

2137983 S0000461120_V2

Reference Standard 194A
Figure 5



NOTES:

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

INCHES	MILLIMETERS	ANGULAR
X.XXX = ±0.005	X.XX = ±0.10	±1 DEGREE
X.XX = ±0.025	X.X = ±0.5	
X.X = ±0.050	X = ±1	

- SURFACE ROUGHNESS: 63 Ra OR BETTER.
- MATERIAL: 2024-T3 OR T4 (CLAD) ALUMINUM

1 ETCH OR ENGRAVE THE REFERENCE STANDARD NUMBER, NDT194C, AT APPROXIMATELY THIS LOCATION.

2 EDM NOTCH:
LENGTH: 0.040 (1.02)
DEPTH: THROUGH THE THICKNESS
WIDTH: 0.005 ±0.002 (0.13 ±0.05)

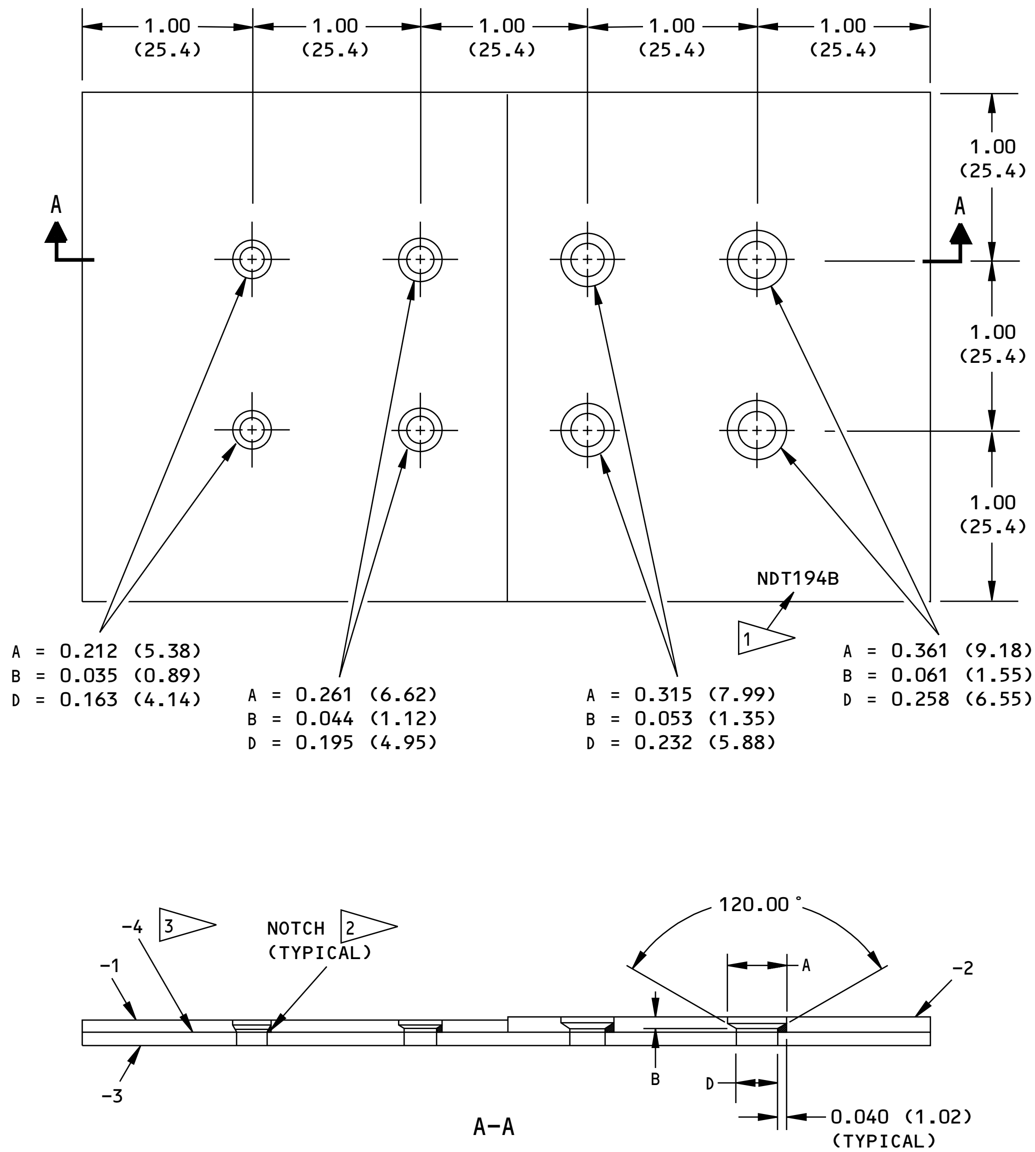
THE NOTCH LENGTH IS FROM THE EDGE OF THE HOLE. MAKE SURE THE NOTCH IS WITHIN ±0.005 (0.10) OF THE CENTER OF THE HOLE AS SHOWN.

3 COUNTERSINK THE FOUR HOLES IN THE TOP PLATE TO THE DEPTH IDENTIFIED IN SECTION A-A.

4 DRILL A 0.146 (3.71) DIAMETER HOLE AND INSTALL A 0.138 (3.51) DIAMETER MACHINE SCREW, WITH A NUT, AT 4 LOCATIONS TO HOLD THE TWO PARTS TOGETHER.

2505574 S0000589447_V1

Reference Standard NDT194C
Figure 6



2137985 S0000461121_V2

Reference Standard NDT194B
Figure 7 (Sheet 1 of 2)

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

- ANGULAR TOLERANCE: ±1.0 DEGREE
- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL:

ID NO.	QUANTITY	DIMENSIONS	MATERIAL
-1	1	0.056 X 3.0 X 2.5 (1.42 X 76 X 64)	2024-T3 OR -T4 CLAD ALUMINUM
-2	1	0.081 X 3.0 X 2.5 (2.06 X 76 X 64)	2024-T3 OR -T2 CLAD ALUMINUM
-3	1	0.081 X 3.0 X 5.0 (2.06 X 76 X 127)	2024-T3 OR -T3 CLAD ALUMINUM
-4	1	0.010 X 3.0 X 5.0 (0.25 X 76 X 127)	ADHESIVE LAYER (USE A WATER RESISTANT ADHESIVE)

1 ETCH OR STEEL STAMP THE NUMBER "NDT194B" ON THE REFERENCE STANDARD.

2 EDM NOTCH: THE LENGTH OF THE NOTCH IS 0.040 (1.02) ±10% FROM THE FASTENER SHANK. THE DEPTH OF THE NOTCH IS THROUGH THE TOP LAYER. THE NOTCH WIDTH IS 0.005 ±0.002 (0.13 ±0.05). THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTER OF THE HOLE.

3 APPLY AN EVEN LAYER OF ADHESIVE BETWEEN THE TOP AND BOTTOM LAYERS (-1 AND -3) (-2 AND -3).

2137987 S0000461122_V2

Reference Standard NDT194B
Figure 7 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

COUNTERSINK INSPECTION OF ALUMINUM PARTS (IMPEDANCE PLANE DISPLAY)

1. **NOTICE**

   A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 4, was identified as Part 6, 53-30-00, Fig. 4. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. **Purpose**

   A. To find cracks that extend across the countersink surface with the fasteners removed. Refer to Figure 1 for an illustration of a usual crack.

   B. Part 6, 53-30-00, Procedure 1 or Part 6, 53-30-00, Procedure 3 can be used as an alternative to this procedure.

3. **Equipment**

   A. This procedure uses an impedance-plane-display eddy current instrument with a countersink probe which can operate between 100 and 500 kHz. All impedance-plane-display instrument and countersink probe combinations that meet the necessary calibration conditions of this procedure can be used.

   The following equipment was used to develop this procedure:

   (1) Instrument

   (a) AV100L; Hocking Instruments

   (b) NDT 19; Staveley Instruments

   (2) Probe

   (a) Use a probe that:

   1) Operates at a frequency range of 100 to 500 kHz.

   2) Has an external diameter that fits in the countersunk hole that is shown in Figure 3 or Figure 4, or counterbore hole that is shown in Figure 5.

   NOTE: A 100 degree countersunk probe can be used in the counterbore hole shown in Figure 5.

   (b) The probes specified below were used to help prepare this procedure.

   1) CSM-100-10 (0.156 inch diameter)
   CSM-100-12 (0.187 inch diameter)
   CSM-100-14 (0.218 inch diameter)
   CSM-100-16 (0.250 inch diameter)
   NDT Engineering Corporation

   2) VM103C 5/32 inch (0.156 inch diameter)
   VM103C 3/16 inch (0.187 inch diameter)
   VM103C 7/32 inch (0.218 inch diameter)
   VM103C 1/4 inch (0.250 inch diameter)
   VM Products

   (3) Reference Standard

   (a) Use reference standard 194 and 194A to examine 100 degree countersunk holes. See Figure 3 or Figure 4 for data about the reference standard.

(b) Use reference standard NDT194B to examine 120 degree counterbore holes. See Figure 5 for data about the reference standard.

NOTE: Refer to Part 1, 51-01-00, for data about the equipment and reference standard manufacturers.

4. Prepare for the Inspection

A. Remove the fasteners.

B. Make sure inspection surface is clean.

NOTE: Be careful not to cause damage to or to make the countersink larger when the fasteners are removed. Only deburr and rub the surface clean.

5. Instrument Calibration

A. Get the correct probe and set the instrument frequency between 100 and 500 kHz.

NOTE: The reference standard and the eddy current probe must be the same size as the countersink hole that will be inspected.

B. Put the probe in the countersink hole of the reference standard with the coil installed opposite of the notch. Adjust the probe collar to keep the probe 90 degrees to the reference standard surface. Refer to Figure 2.

C. Balance the instrument and adjust the instrument controls until the "flying dot" is in the center of the screen.

D. Adjust the phase rotation control until the "flying dot" moves horizontally and to the left side of the screen when the probe coil is lifted off of the reference standard surface. Refer to Figure 5.

E. Turn the probe coil over the notch and adjust the instrument sensitivity to cause a crack indication signal with a 20-degree-minimum-angle separation from the horizontal lift-off and a two division minimum horizontal or vertical separation from the instrument balance point. Refer to Figure 5.

NOTE: Adjustment of the instrument's X/Y ratio or independent vertical gain controls can make the crack signal angle better. A signal from the calibration notch must not be greater than the horizontal or vertical limits of the screen.

F. Do a check of the lift-off again. If an adjustment is made, do a check of the sensitivity as specified in Paragraph 5.E. and adjust again if necessary.

G. Make a note of the instrument signal as the probe is turned over the notch to find the maximum or best scan speed.

NOTE: The use of an audible or visual alarm is recommended and can increase the scan speed. Set the alarm to operate to signals that are 80 percent of the reference standard notch signal.

6. Inspection Procedure

A. Put the probe into the countersink and adjust the probe collar to keep the probe vertical to the surface.

B. Balance the instrument and if necessary, adjust the "flying dot" to the calibration reference position.

C. Scan the countersink. The probe must be turned more than 360 degrees to make sure the complete countersink is covered. Keep the probe vertical to the inspection surface during the inspection. Refer to Figure 7. Keep a scan speed that is almost the same as the calibration scan speed.

NOTE: The eddy current instrument will find cracks by a rapid deflection over a short probe scan distance that is almost the same as the reference standard signal. For some fastener holes that are out of round, the eddy current instrument can show a slow upward "flying dot" movement over a large-probe-scan distance. This is not a crack indication.

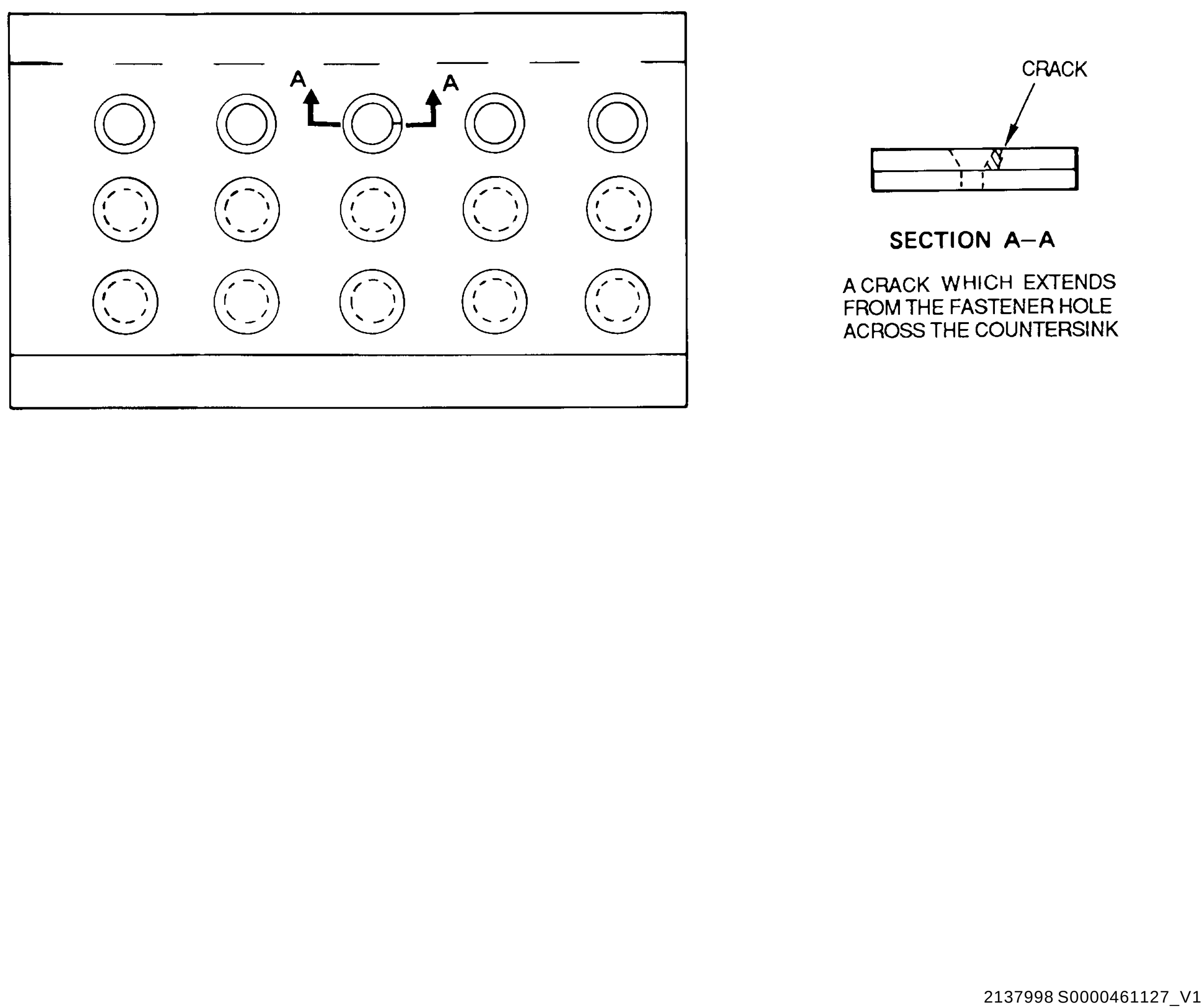
D. Compare all crack indications with the reference-standard-notch signal.

E. At regular times during the inspection, do a check of the instrument calibration as specified in Paragraph 5.B. thru Paragraph 5.G. and adjust if necessary.

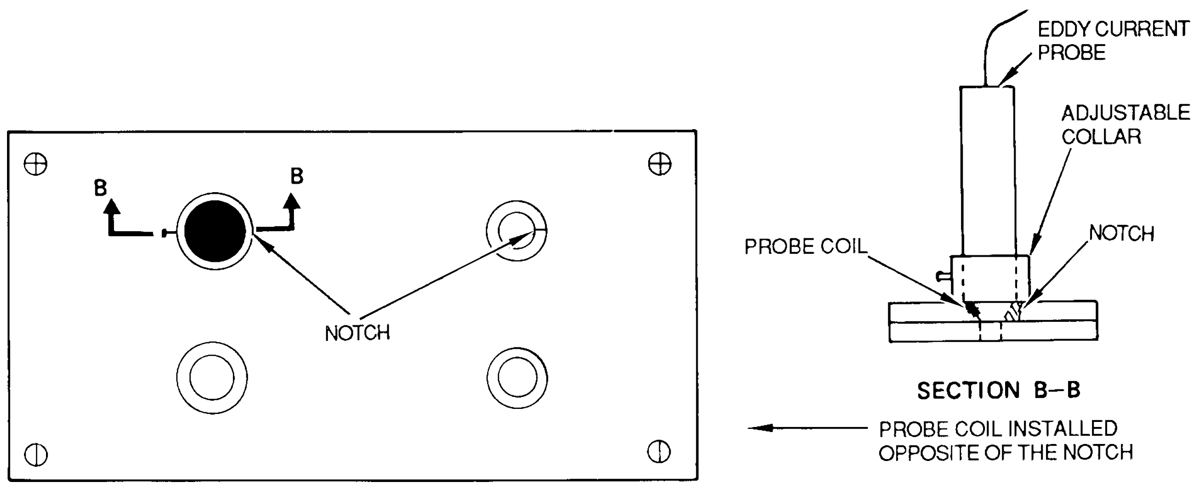
7. Inspection Results

A. A signal with a pattern which is almost the same as and is equal to or greater than the reference-standard-notch signal, which occurs over a short-probe-scan distance, is a possible crack indication and more inspection is necessary.

B. Part 6, 51-00-00, Procedure 4 can be used to make sure the indication is a crack.

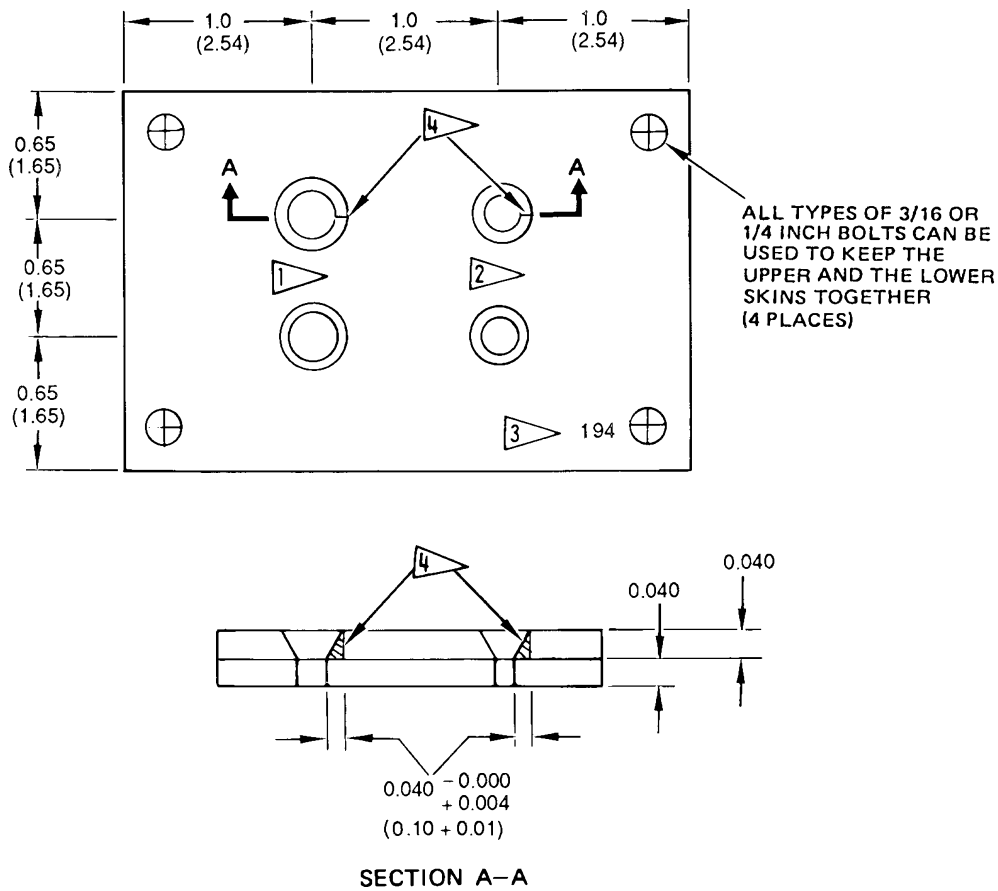


Usual Crack
Figure 1



2138000 S0000461128_V1

Calibration - Reference Standard
Figure 2

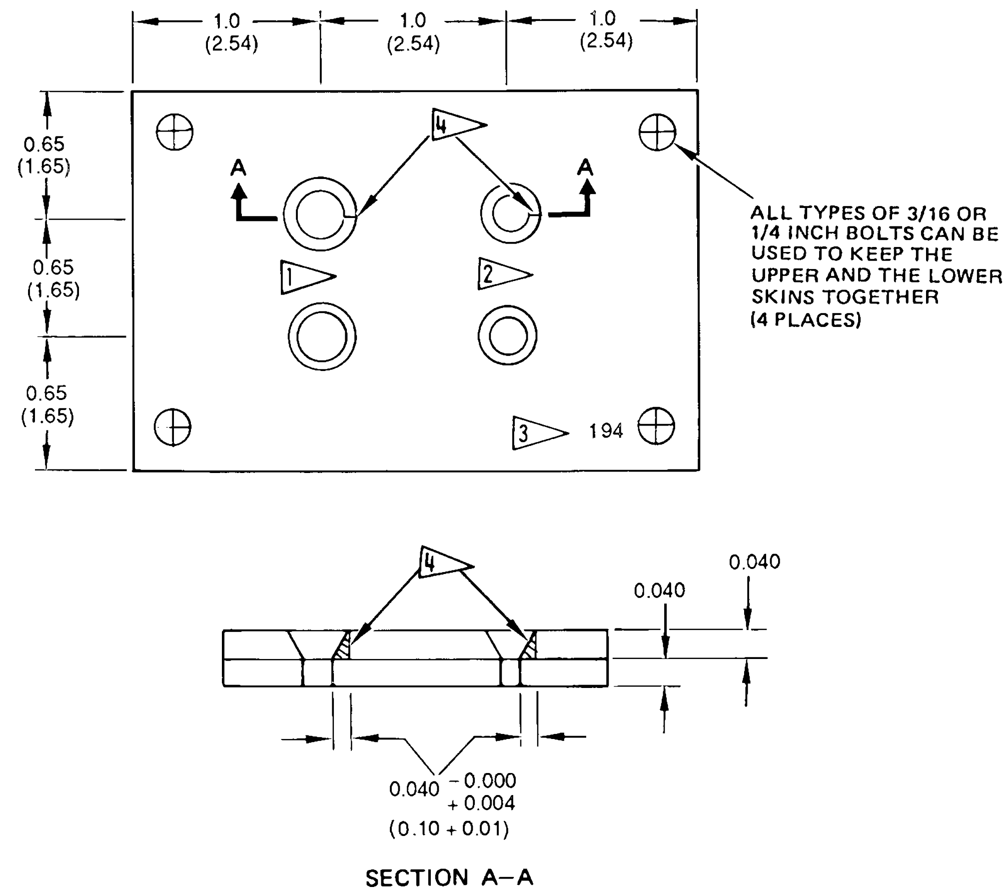


ALL DIMENSIONS ARE IN INCHES (CENTIMETERS IN PARENTHESES)
TOLERANCE: X.X±0.05 (0.13) X.XXX±0.005 (0.013) (UNLESS NOTED)
MATERIAL: 2024 T3 OR T4 CLAD ALUMINUM

1. FOR A 3/16 INCH HOLE SIZE, DRILL A 0.191 INCH DIA HOLE AND COUNTERSINK 100°-TOP SHEET
2. FOR A 5/32 INCH HOLE SIZE, DRILL A 0.161 INCH DIA HOLE AND COUNTERSINK 100°-TOP SHEET
3. ETCH OR STAMP PART NUMBER 194.
4. EDM NOTCH OR EQUIVALENT 0.007 (0.018) MAXIMUM WIDTH

2138001 S0000461129_V1

Reference Standard 194
Figure 3



ALL DIMENSIONS ARE IN INCHES (CENTIMETERS IN PARENTHESES)
TOLERANCE: X.X±0.05 (0.13) X.XXX±0.005 (0.013) (UNLESS NOTED)
MATERIAL: 2024 T3 OR T4 CLAD ALUMINUM

1 FOR A 3/16 INCH HOLE SIZE, DRILL A 0.191 INCH DIA HOLE AND COUNTERSINK 100°-TOP SHEET

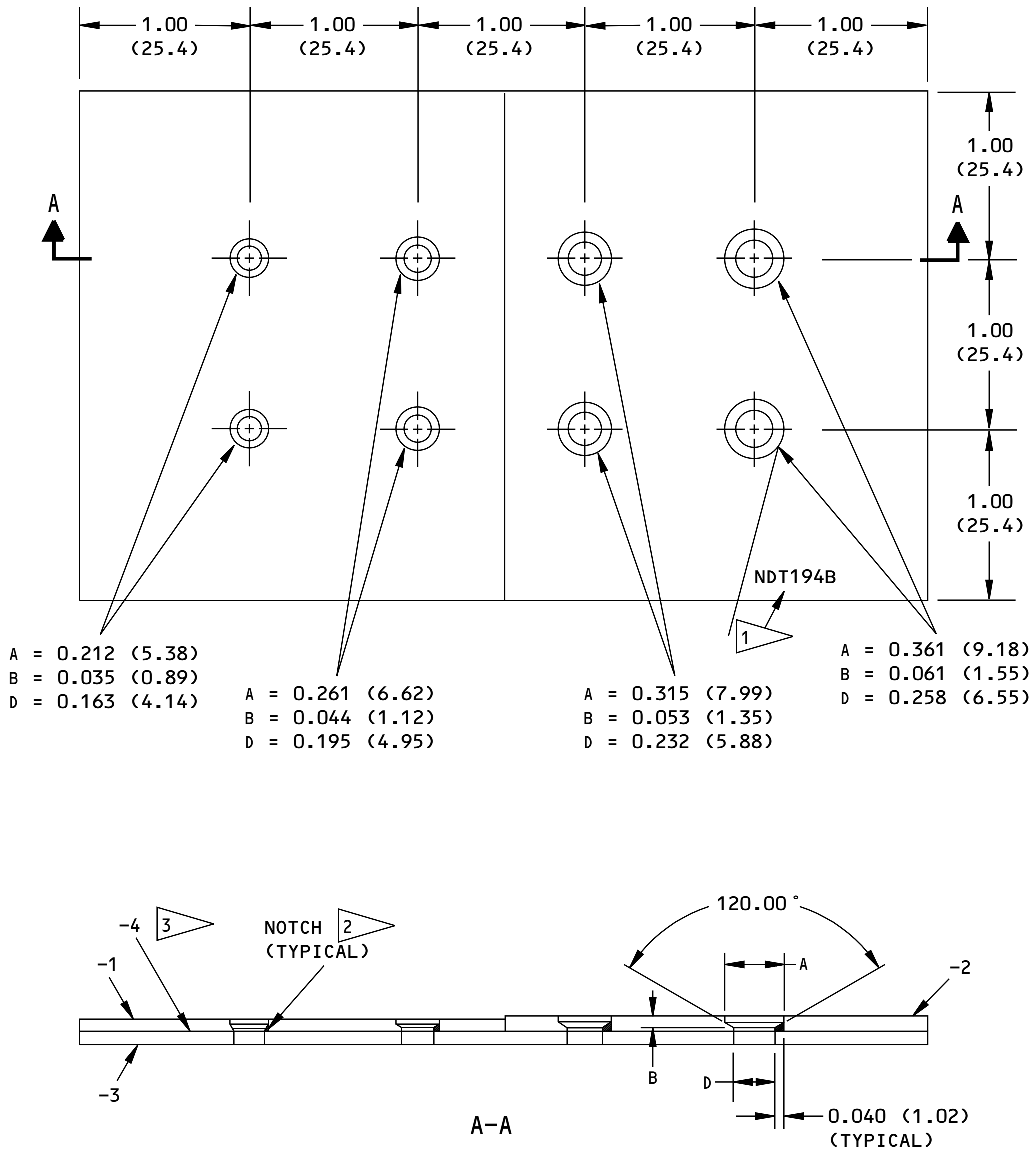
2 FOR A 5/32 INCH HOLE SIZE, DRILL A 0.161 INCH DIA HOLE AND COUNTERSINK 100°-TOP SHEET

3 ETCH OR STAMP PART NUMBER 194.

4 EDM NOTCH OR EQUIVALENT 0.007 (0.018) MAXIMUM WIDTH

2138002 S0000461130_V1

Reference Standard 194A
Figure 4



2138003 S0000461131_V1

Reference Standard NDT194B
Figure 5 (Sheet 1 of 2)

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

- ANGULAR TOLERANCE: ±1.0 DEGREE
- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL:

ID NO.	QUANTITY	DIMENSIONS	MATERIAL
-1	1	0.056 X 3.0 X 2.5 (1.42 X 76 X 64)	2024-T3 OR -T4 CLAD ALUMINUM
-2	1	0.081 X 3.0 X 2.5 (2.06 X 76 X 64)	2024-T3 OR -T2 CLAD ALUMINUM
-3	1	0.081 X 3.0 X 5.0 (2.06 X 76 X 127)	2024-T3 OR -T3 CLAD ALUMINUM
-4	1	0.010 X 3.0 X 5.0 (0.25 X 76 X 127)	ADHESIVE LAYER (USE A WATER RESISTANT ADHESIVE)

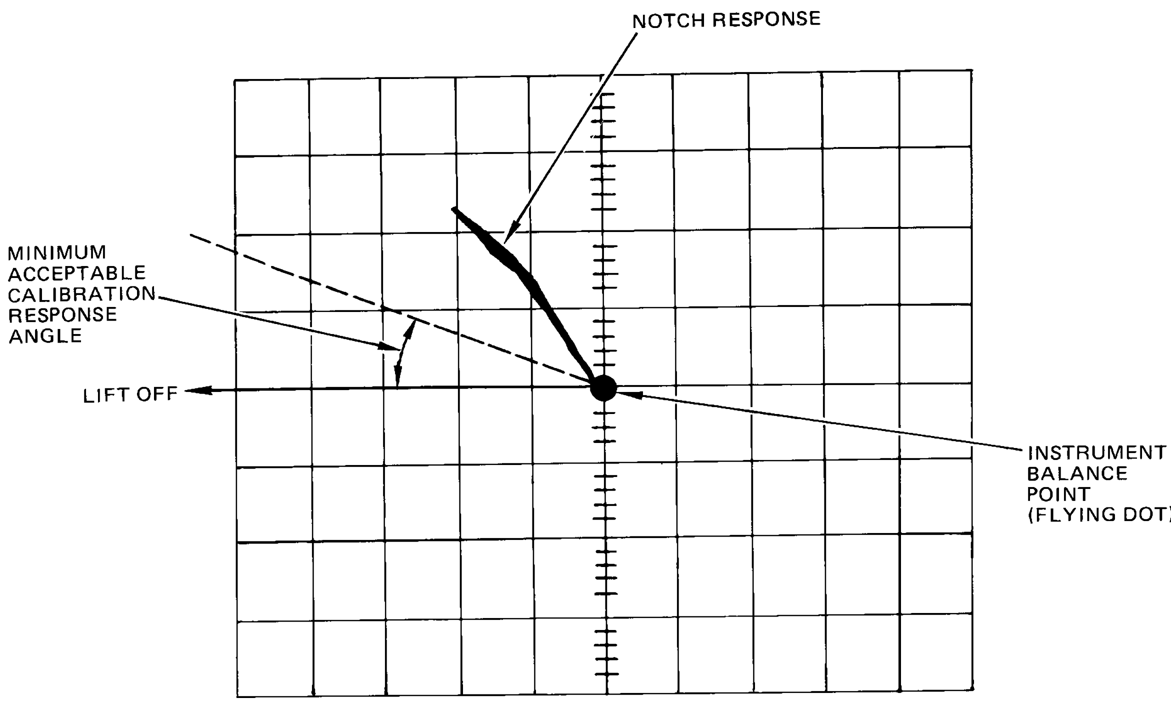
1 ETCH OR STEEL STAMP THE NUMBER "NDT194B" ON THE REFERENCE STANDARD.

2 EDM NOTCH: THE LENGTH OF THE NOTCH IS 0.040 (1.02) ±10% FROM THE FASTENER SHANK. THE DEPTH OF THE NOTCH IS THROUGH THE TOP LAYER. THE NOTCH WIDTH IS 0.005 ±0.002 (0.13 ±0.05). THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTER OF THE HOLE.

3 APPLY AN EVEN LAYER OF ADHESIVE BETWEEN THE TOP AND BOTTOM LAYERS (-1 AND -3) (-2 AND -3).

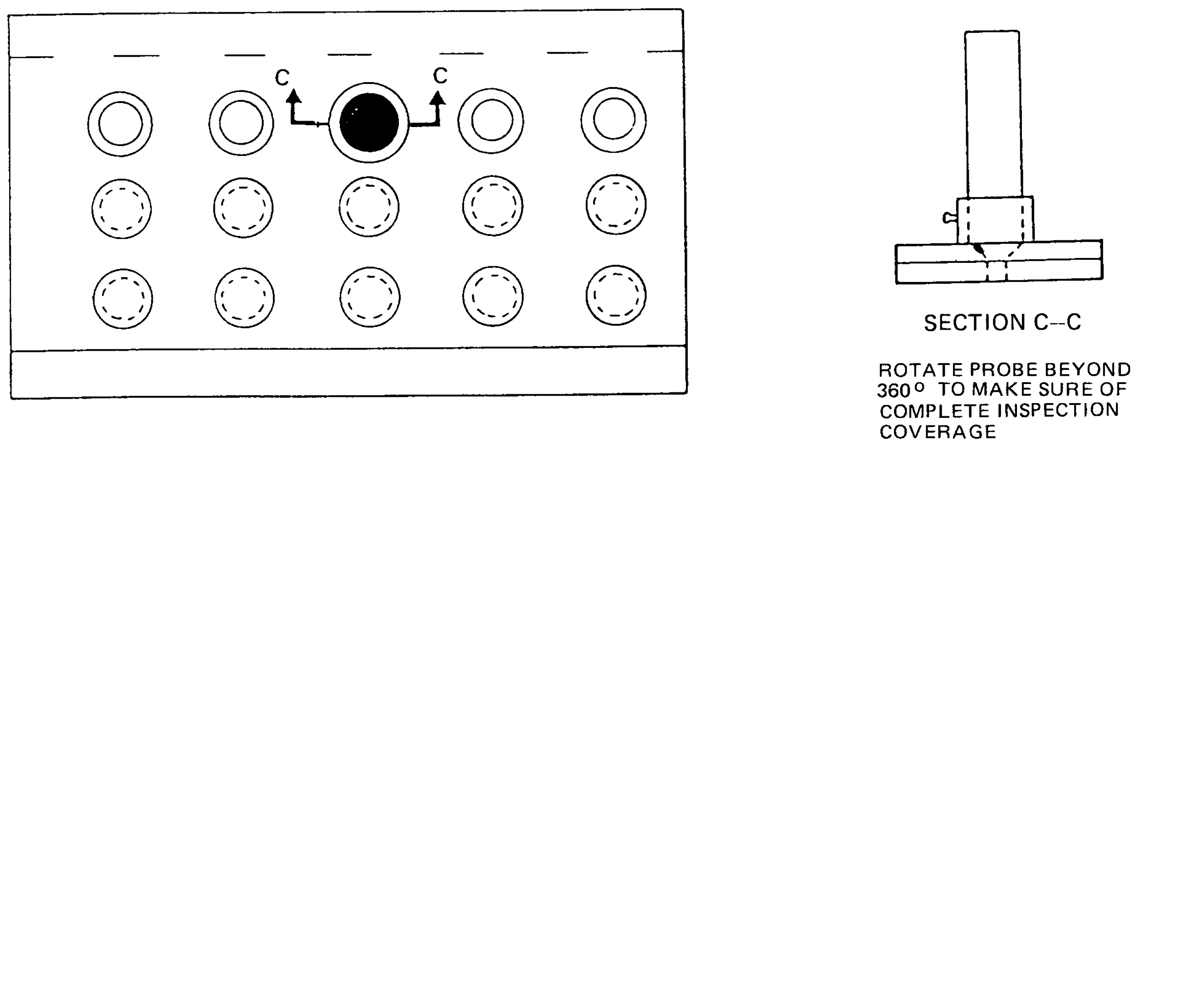
2138005 S0000461132_V1

Reference Standard NDT194B
Figure 5 (Sheet 2 of 2)



2138007 S0000461135_V1

General Impedance Plane Response from Reference Standard
Figure 6



Inspection Procedure
Figure 7

PART 6 - EDDY CURRENT

INSPECTION OF EXTERNAL FUSELAGE REPAIRS

1. **NOTICE**

   A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 5, was identified as Part 6, 53-30-00, Fig. 5. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. **Purpose**

   A. To find cracks in fuselage skins or the skins of a lap splice which are covered by external aluminum repairs. The thickness of the repair must be in one of the thickness ranges specified in Figure 7.

3. **Equipment**

   A. Instruments - It is necessary to use an impedance plane instrument to do this procedure. The instruments that follow were used to help prepare this procedure:

      (1) Nortec; NDT 19

      (2) Nortec; NDT 19e

      (3) Zetec; MIZ 20A

      (4) Hocking; Phasec 1.1SD

   B. Probes - Use flat, shielded spot probes to do this procedure. Probes with small diameters are recommended for use on thin repair materials (See Figure 7). The probes that follow were used to help prepare this procedure.

Table 1:

PROBE NUMBER	DIAMETER (inches)	PROBE TYPE	FREQUENCY RANGE	MANUFACTURER
P905-40-5K	0.25	DIFFERENTIAL	3 kHz to 9 kHz	NDT ENGINEERING
SPO-5327	0.31	REFLECTION	700 Hz to 80 kHz	STAVELEY/NORTEC
SPO-5328	0.44	REFLECTION	500 Hz to 60 kHz	STAVELEY/NORTEC
RS1005-2/TF	0.50	REFLECTION	1 kHz to 40 kHz	NDT ENGINEERING
SPO-5330	0.62	REFLECTION	100 Hz to 20 kHz	STAVELEY/NORTEC

Use a probe that can operate at the necessary inspection frequency. The necessary inspection frequency is specified in Figure 7 and changes when the thickness of the material above the skin to be examined changes.

CAUTION: IN SOME INSPECTION AREAS, DIFFERENT MATERIAL THICKNESSES CAN OCCUR ABOVE THE SKIN TO BE EXAMINED (AS A RESULT OF THE REPAIR). IT IS IMPORTANT THAT YOU USE THE CORRECT FREQUENCY AND REFERENCE STANDARD FOR THE THICKNESS OF MATERIAL THAT IS ABOVE THE SKIN TO BE EXAMINED. FAILURE TO USE THE CORRECT FREQUENCY AND REFERENCE STANDARD WILL DECREASE THE SENSITIVITY OF THE INSPECTION AND CRACKS WILL NOT ALWAYS BE FOUND.

C. Reference Standard - Make the applicable reference standards as specified in Figure 1 and Figure 7.

NOTE: Reference standards ANDT1049 thru ANDT1057 replace reference standards NDT1006 thru NDT1014. If you have reference standards NDT1006 thru NDT1009, it is not necessary to replace them with ANDT1049 thru ANDT1052 if they have Alodined rivets. See flagnote 2 in Figure 7.

4. Prepare for the Inspection

A. Clean the inspection area. If necessary, remove paint from the inspection area if the fastener heads cannot be seen or if the probe cannot be easily moved around the fastener.

5. Instrument Calibration

A. Do a check in the repair area to find:

(1) The thickness of the material above the skin to be examined and

(2) The type of fasteners that are used.

B. Refer to Figure 1 and Figure 7 with the data of Paragraph 5.A. to identify the necessary reference standard to use during the inspection.

NOTE: Two reference standards are necessary to do the inspection of some repairs, for example lap splices, because of changes in the thickness of the repair. The thickness of the material above the inspection skin must be in the thickness range that is specified in Figure 7 for the reference standard.

C. Get a flat surface probe that can operate at the frequency identified in Figure 7.

NOTE: Use the smallest diameter probe possible that will give a smooth scan inspection around the fastener and the best separation of notch signal from the edge effect signal.

D. Set the instrument frequency in the range specified in Figure 7 for the applicable inspection conditions.

E. If the inspection area is painted, put a shim that is not conductive on top of the reference standard. Use a shim that is approximately 0.003 inch (0.08 mm) of the thickness of the paint.

F. Put the probe on the reference standard at probe position 1 adjacent to the same type of fastener as in the repair. See Figure 2.

G. Balance the instrument.

H. Set the balance point in the lower center of the screen display as shown in Figure 3.

I. Adjust the phase control so that the lift off signal moves horizontally to the left as shown in Figure 3.

J. Move the probe to probe position 2 on the reference standard as shown in Figure 2.

K. Adjust the position of the probe to get a maximum signal from the notch in the reference standard.

L. If necessary adjust the frequency to get approximately a 90 degree separation between the lift-off line and the notch signal. See Figure 3 for an example of a calibration screen display.

NOTE: If you adjust the frequency, do Paragraph 5.F. thru Paragraph 5.K. again.

M. Adjust the gain to get a signal that is 40 percent of full screen height as shown in Figure 3. Use a vertical to horizontal ratio of 1 to 1.

N. Put the probe at probe position 3 on the reference standard as shown in Figure 2 and balance the instrument.

O. Move the probe around each side of the fastener to the edge of the reference standard until you see the edge effect signal. Monitor the location of the probe above the notch (probe position that gives the maximum signal) and when you first see the edge effect signal, to identify the limits of the inspection around the fastener.

NOTE: (1) Separation of the notch signal from the edge effect signal will decrease as the thickness of the repair material increases. See Figure 4 for examples of screen displays of reference standards ANDT1055 and ANDT1057.

NOTE: (2) It can be possible to increase the separation of the notch signal from the edge effect signal. A change to a smaller diameter probe can help increase the separation. Use a probe that will operate in the frequency range in Figure 7, if one is available and do Paragraph 5.K. thru Paragraph 5.O. again. See Figure 5 for examples of screen displays of reference standard ANDT1057.

P. If the repair has an edge that is square (not beveled), move the probe from the fastener location to the square edge of the reference standard. Compare this signal to the signals from a beveled edge and the notch.

Q. If flush head fasteners (aluminum or steel) are used, move the probe so it is on the fastener and compare the edge effect signal to the notch signal.

R. If the screen display dot is not stable when a high instrument gain is necessary for the calibration, change the vertical to horizontal gain ratio. Decrease the horizontal gain to help keep the dot more stable. If a change of the vertical to horizontal gain ratio is made, do Paragraph 5.F. thru Paragraph 5.Q. again.

NOTE: If you decrease the horizontal gain, make sure there is sufficient separation of the notch signal from the edge effect signal. Try not to use more than a 2 to 1 vertical to horizontal gain ratio.

6. Inspection Procedure

A. Put the probe on the repair surface adjacent to and above the fastener head for the fastener type to be examined.

B. Balance the instrument.

C. Do a scan slowly around the fastener and monitor the instrument screen display at the same time. During the scan:

(1) For protruding head fasteners, keep the probe adjacent to the fastener head during the scan.

(2) For flush head fasteners, use a circle template to keep the probe an equal distance from the flush head fastener during the scan.

(3) For fasteners close to the edge, move the probe around to the edge of the skin panel until the edge effect signal goes off the screen display.

(4) Make a mark at the locations where you get a signal that is 20 percent or more of full screen height and looks almost the same as the notch signal from the reference standard.

D. Frequently do a calibration test of the instrument as follows:

NOTE: Do not adjust the gain.

(1) Put the probe on the reference standard to get the maximum signal from the notch. Make sure to put the probe adjacent to the fastener on the reference standard that is the same type as the inspection.

(2) Compare the signal you got from the notch during calibration with the signal you get now.

(3) If the signal from the notch in the reference standard has changed 10 percent or more from the signal you got during calibration, do the calibration and inspection again for all of the fasteners examined since the last calibration test.

7. Inspection Results

A. Signals that are 20 percent or more of full screen height and look almost the same as the notch signal from the reference standard are signs of possible cracks.

B. Compare the signals to the signals you got from the reference standard.

C. The types of conditions that can occur during the inspection are as follows:

(1) A crack on the lower edge of the fastener hole near the edge of the repair.

(a) If a crack occurs on the lower edge of the fastener hole near the edge of the repair, the signal will go up as the probe is moved above the crack but will not go down to the baseline because of the edge effect condition from the repair. See Figure 6 for an example of a crack signal that is near an edge.

NOTE: The separation of the crack signal from the edge effect signal will be more with the inspection on thin repair materials. As the thickness of the repair material increases, the separation of the crack signal from the edge effect signal will decrease. Be careful when you examine near the edge of the repair.

(2) A subsurface edge effect signal from a repair cut-out in the skin (below the repair material).

(a) If an inspection is necessary for fasteners near a repair cut-out, it is possible to get a subsurface edge effect signal from the edge of the cut-out in the skin. This condition can occur if there is not a sufficient amount of edge margin.

(b) Be careful when you examine fasteners that are near the edge of a cut-out because a crack can occur near the edge. Monitor the location of the probe around each fastener, because an edge effect condition will usually occur at the same location.

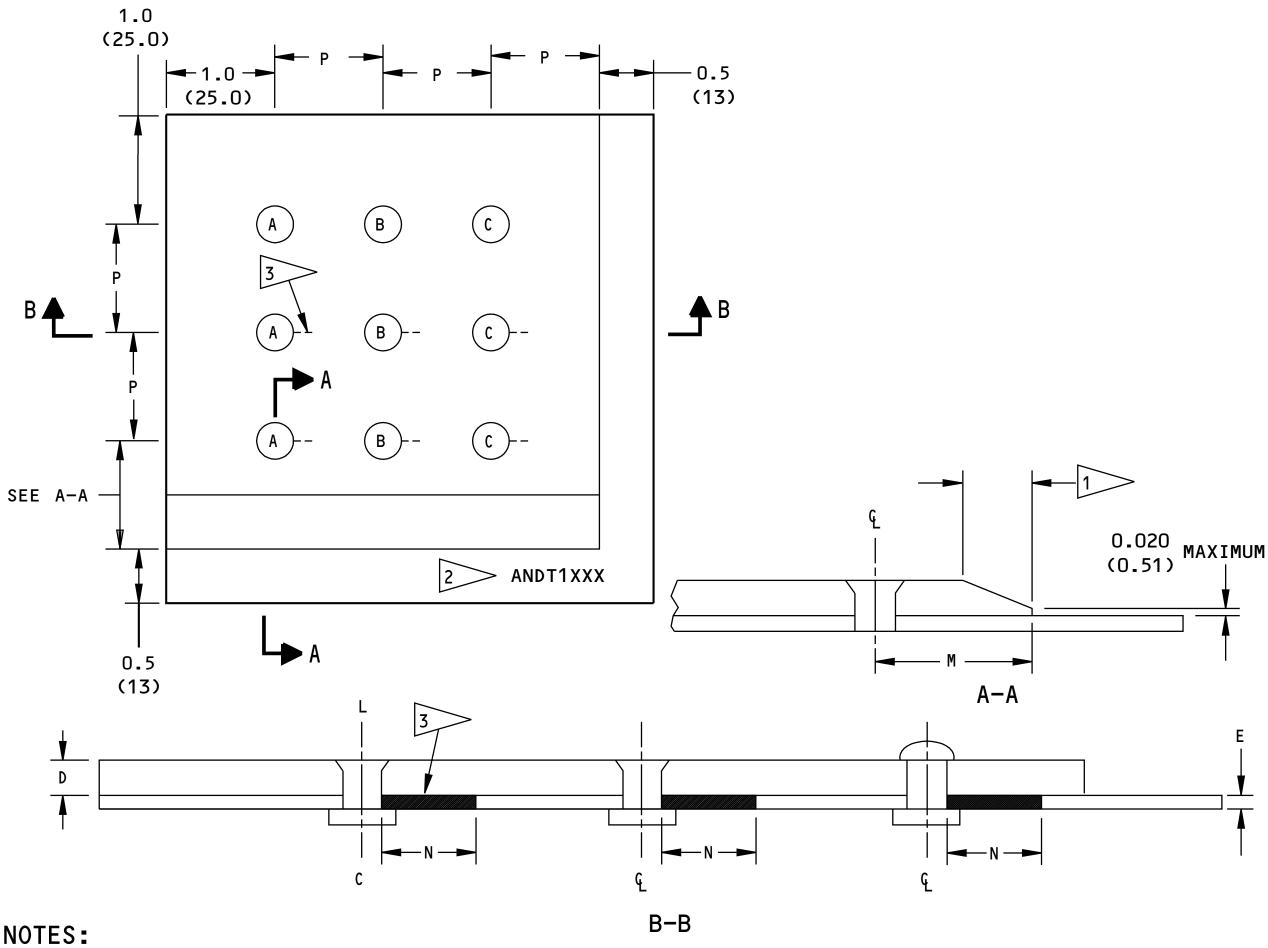
(3) Space (gap) between skins.

(a) This condition can cause the balance point to go up. The balance point signal will go up slowly during the scan as the space between the skins increases.

(4) A thickness change of the material below the inspection skin.

(a) If the thickness of the material below the inspection skin changes, it can cause the balance point to change. Do a check of the balance point signal regularly and balance the instrument as necessary.

D. If you want to make sure of the results, do the fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16. If you can get access to the inside surface of the skin, do the surface inspection procedure specified in Part 6, 53-30-00, Procedure 6.



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SEE FIGURE 7 FOR THE REFERENCE STANDARD SPECIFICATIONS AND DIMENSIONS IDENTIFIED IN THIS FIGURE AS LETTERS A THRU E, M, N AND P.
- MATERIAL: USE BARE OR CLAD 2024-T3 OR T4 OR 7075-T6.
- BE CAREFUL WHEN YOU INSTALL THE RIVETS. THE BOTTOM PIECE CAN BECOME DAMAGED IF INSTALLED TOO TIGHT.

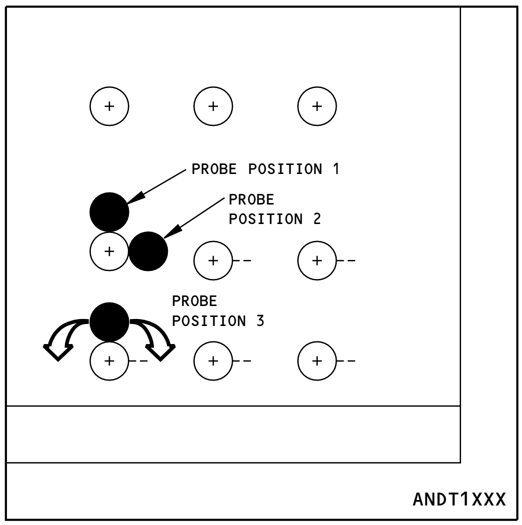
1 THE CHAMFER WIDTH IS 0.16 INCH FOR ANDT1049 THRU ANDT1052, ANDT1056 AND ANDT1077; 0.10 INCH FOR ANDT1053; 0.13 INCH FOR ANDT1054; 0.14 INCH FOR ANDT1055; 0.20 INCH FOR ANDT1057 AND ANDT1015.

2 ETCH OR STAMP THE PART NUMBER ANDT1XXX AS SPECIFIED IN FIGURE 7. PUT A LETTER "A" IN FRONT OF THE REFERENCE STANDARD NUMBER TO SHOW THAT IT HAS ALODINED RIVETS. REFER TO FIGURE 7, FLAGNOTE 2.

3 REFERENCE NOTCH. SIX LOCATIONS. MAKE THE NOTCH LESS THAN 0.030 (0.76) WIDE LENGTH - SEE FIGURE 7 DIMENSION N.

2138580 S0000461139_V1

Reference Standards ANDT1015, ANDT1049 thru ANDT1057 and ANDT1077
Figure 1

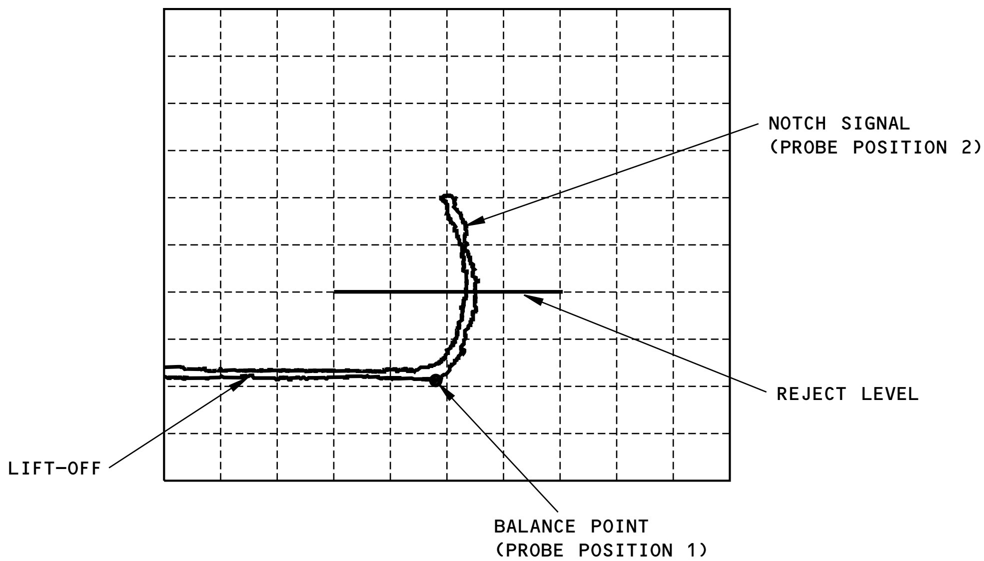


NOTES:

- PROBE POSITIONS 1 THRU 3, ARE THE PROBE POSITIONS DURING INSTRUMENT CALIBRATION FOR ALL FASTENER TYPES.
- THE SCREEN DISPLAY IN FIGURE 3 IS AN EXAMPLE OF THE CALIBRATION SIGNALS AT PROBE POSITIONS 1 AND 2. THE NOTCH SIGNAL CAN LOOK DIFFERENT WITH DIFFERENT PROBES AND INSTUMENTS.

2138586 S0000461140_V1

Probe Positions on the Reference Standard during Instrument Calibration
Figure 2

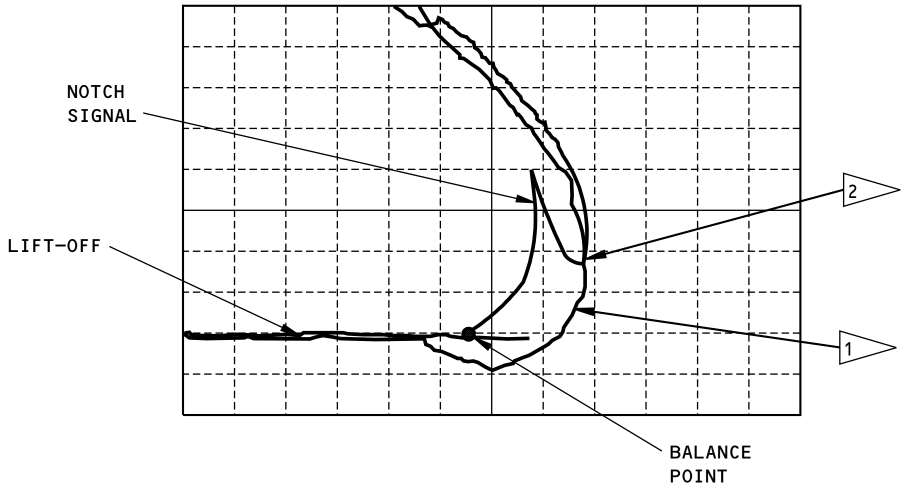


NOTES

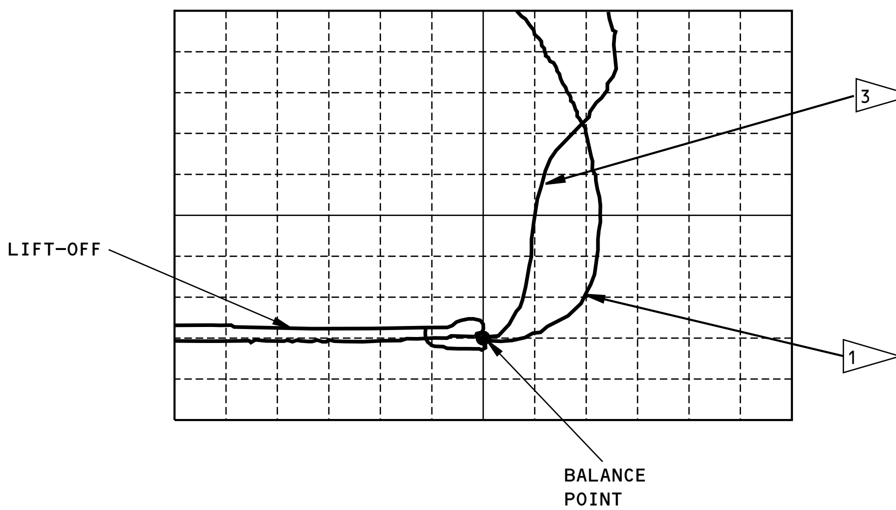
- THIS SCREEN DISPLAY IS AN EXAMPLE OF THE CALIBRATION SIGNALS WHEN THE PROBE IS AT PROBE POSITIONS 1 AND 2 (AS SHOWN IN FIGURE 2). THE NOTCH SIGNAL CAN LOOK DIFFERENT WITH DIFFERENT PROBES AND INSTRUMENTS.

2138609 S0000461141_V1

Calibration Screen Display
Figure 3



REFERENCE STANDARD ANDT1055 WITH PROBE
NUMBER SPO-5330



REFERENCE STANDARD ANDT1057 WITH PROBE
NUMBER SPO-5330

NOTES:

- THE SCREEN DISPLAYS ABOVE ARE SIGNALS WITH THE PROBE ADJACENT TO THE TYPE "C" FASTENER (SEE FIGURE 7).

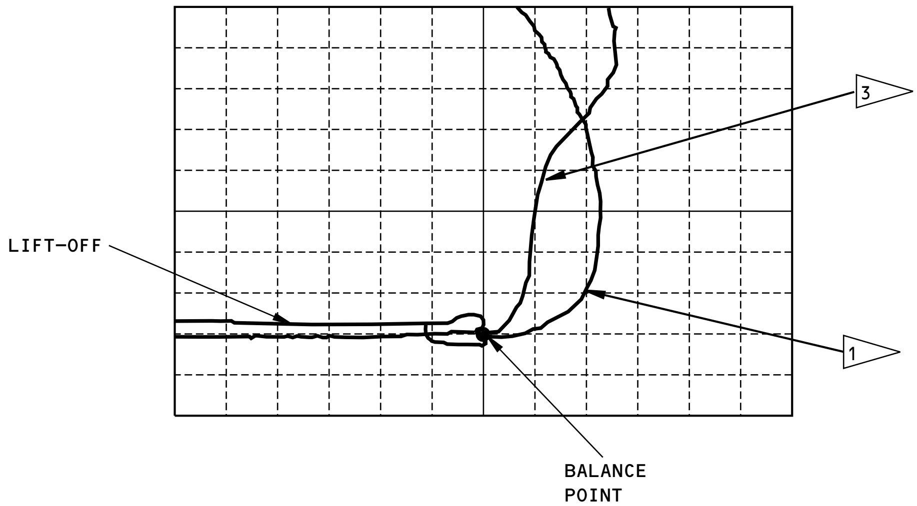
1 EDGE EFFECT SIGNAL FROM THE SIDE OF THE FASTENER WITH NO NOTCH.

2 START OF THE EDGE EFFECT SIGNAL FROM THE SIDE OF THE FASTENER WITH THE NOTCH.

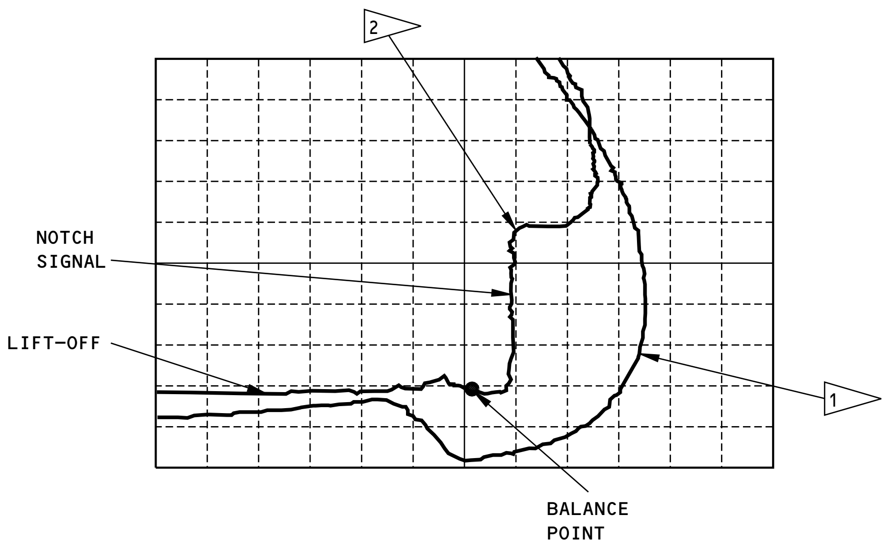
3 NOTCH SIGNAL WITH THE EDGE EFFECT SIGNAL.

2138591 S0000461142_V1

Screen Display Examples to Show the Separation Between the Notch Signal and the Edge Effect Signal with an Increase of Repair Material
Figure 4



REFERENCE STANDARD ANDT1057 WITH
PROBE NUMBER SPO-5330



REFERENCE STANDARD ANDT1057 WITH
PROBE NUMBER RS1005-2/TF

NOTES:

- THE SCREEN DISPLAYS ABOVE ARE SIGNALS WITH THE PROBE ADJACENT TO THE TYPE "C" FASTENER (SEE FIGURE 7).

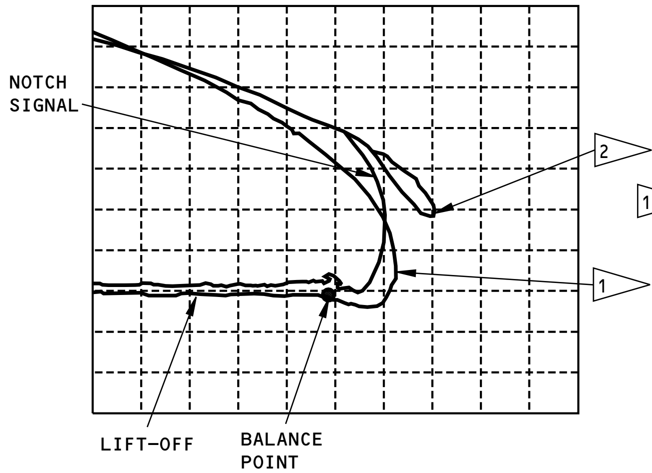
1 EDGE EFFECT SIGNAL FROM THE SIDE OF THE FASTENER WITH NO NOTCH.

2 START OF THE EDGE EFFECT SIGNAL FROM THE SIDE OF THE FASTENER WITH THE NOTCH.

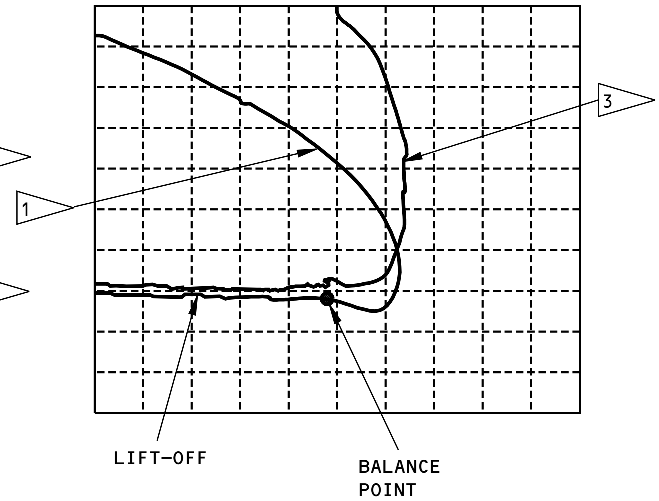
3 NOTCH SIGNAL WITH THE EDGE EFFECT SIGNAL.

2138592 S0000461143_V1

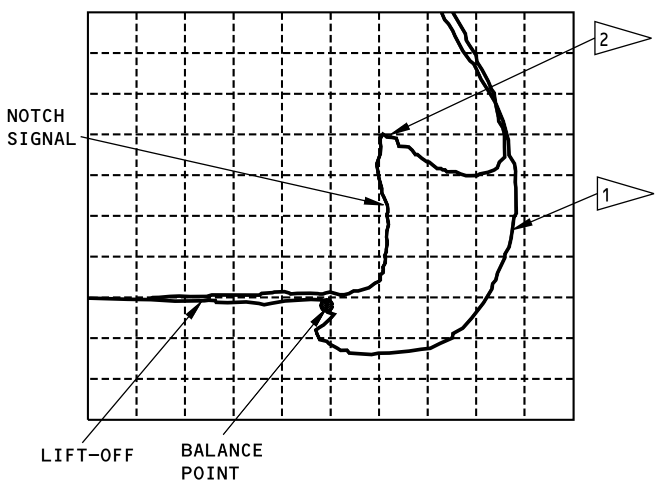
Screen Display Examples to Show the Separation Between the Notch Signal and the Edge Effect Signal with a Change to a Smaller Diameter Probe
Figure 5



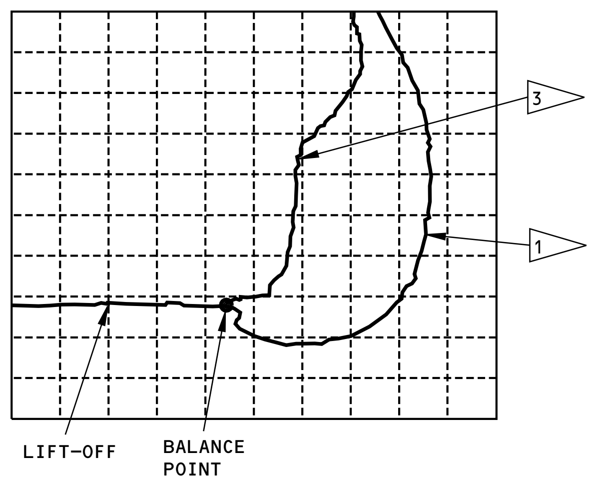
SIGNALS AT PROBE POSITION 3 ON
REFERENCE STANDARD ANDT1052



TEST PIECE THAT IS THE SAME AS
REFERENCE STANDARD ANDT1052 WITH
A 0.25 (6) LONG NOTCH AT THE
LOWER EDGE OF THE FASTENER HOLE



SIGNALS AT PROBE POSITION 3 ON
REFERENCE STANDARD ANDT1056



TEST PIECE THAT IS THE SAME AS
REFERENCE STANDARD ANDT1056 WITH
A 0.55 (14) LONG NOTCH

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- THE SCREEN DISPLAYS ABOVE ARE SIGNALS WITH THE PROBE ADJACENT TO THE TYPE "C" FASTENER (SEE FIGURE 7).

1 EDGE EFFECT SIGNAL FROM THE SIDE OF THE FASTENER WITH NO NOTCH.

2 START OF THE EDGE EFFECT SIGNAL FROM THE SIDE OF THE FASTENER WITH THE NOTCH

3 NOTCH SIGNAL WITH THE EDGE EFFECT SIGNAL

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Screen Display Examples to Compare the Notch Signal at Probe Position 3 to a Notch at the Lower Edge of the Fastener Hole Near the Edge of the Repair
Figure 6

THICKNESS RANGE OF MATERIAL ABOVE INSPECTION SKIN	REFERENCE STANDARD NUMBER	MINIMUM AIRPLANE SKIN THICKNESS	INSPECTION FREQUENCY (KhZ)	REFERENCE NOTCH LENGTH N	REFERENCE STANDARD REPAIR THICKNESS D	REFERENCE STANDARD SKIN THICKNESS E	EDGE MARGIN M	FASTENER SPACING P	FASTENER TYPE [1] A	FASTENER TYPE [1] [2] B	FASTENER TYPE [1] [2] C
0.040 AND LESS	ANDT1049	0.032	6.0-9.0	0.25	0.040	0.040	0.39	1.0	BACB30FN5	BACR15CE5D	BACR15ET7D
0.041-0.050	ANDT1050	0.036	5.0-7.0	0.25	0.050	0.040	0.39	1.0	BACB30FN5	BACR15CE5D	BACR15ET7D
0.051-0.056	ANDT1077	0.036	4.0-6.0	0.25	0.056	0.040	0.39	1.0	BACB30FN5	BACR15CE5D	BACR15ET7D
0.057-0.075	ANDT1051	0.036	2.0-4.0	0.25	0.071	0.040	0.45	1.3	BACB30FN6	BACR15CE6D	BACR15BB8D
0.076-0.090	ANDT1052	0.036	1.0-3.0	0.25	0.089	0.040	0.45	1.3	BACB30FN8	BACR15CE8D	BACR15BB8D
0.091-0.110	ANDT1053	0.050	0.9-2.0	0.30	0.11	0.050	0.57	1.4	BACB30FN8	BACR15CE8D	BACR15BB8D
0.111-0.125	ANDT1054	0.063	0.9-1.5	0.35	0.125	0.063	0.57	1.4	BACB30FN8	BACR15CE8D	BACR15BB8D
0.126-0.160	ANDT1055	0.071	0.8-1.0	0.45	0.16	0.071	0.63	1.75	BACB30FN8	BACR15CE8D	BACR15BB8D
0.161-0.200	ANDT1056	0.080	0.5-0.7	0.55	0.20	0.080	0.63	1.75	BACB30FN8	BACR15CE8D	BACR15BB8D
0.201-0.220	ANDT1057	0.100	0.4-0.6	0.65	0.22	0.100	0.63	1.75	BACB30FN8	BACR15CE8D	BACR15BB8D
0.221-0.250	ANDT1015	0.100	0.3-0.5	0.8	0.25	0.100	0.65	1.75	BACB30FN8	BACR15CE8D	BACR15BB8D

ALL DIMENSIONS ARE IN INCHES

[1] OR EQUIVALENT

[2] THESE RIVETS MUST HAVE A CONVERSION COATED (ALODINED) FINISH. TO MAKE SURE THE FINISH IS ALODINE, REFER TO PART 1, 51-06-01. INSTALL THE RIVETS AS SPECIFIED IN PART 1, 51-01-04.

NOTE: REFERENCE STANDARDS ANDT1049 THRU ANDT1057 REPLACE NDT1006 THRU NDT1014. IF YOU HAVE REFERENCE STANDARDS NDT1006 THRU NDT1009, IT IS NOT NECESSARY TO REPLACE THEM WITH ANDT1049 THRU ANDT1052 IF THEY HAVE ALODINED RIVETS. SEE FLAGNOTE 2.

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Reference Standard Specifications
Figure 7

PART 6 - EDDY CURRENT

SUBSURFACE CRACK INSPECTION OF FAYING SURFACES

1. **NOTICE**

   A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 6, was identified as Part 6, 53-30-00, Fig. 6. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. **Purpose**

   A. This procedure uses medium frequency eddy currect (MFEC) to do an inspection for subsurface cracks that:

      (1) Are adjacent to fastener holes.

      (2) Are near the external surface of the first layer of aluminum fuselage structures.

      (3) Start at the internal (faying) surface.

   B. This procedure can be used to find:

      (1) Cracks that start at fastener holes and move out in a radial direction.

      (2) Cracks that start away from the fastener hole and are along side the hole (eyebrow cracks).

3. **Equipment**

   A. General

      (1) Use inspection equipment that can be calibrated on the reference standard as specified in Paragraph 5.

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

   B. Instruments

      (1) Use an impedance plane instrument that:

         (a) Has an impedance plane display.

         (b) Operates in a frequency range of 10 to 50 kHz.

      (2) The instruments identified below were used to prepare this procedure:

         (a) NDT 19; Staveley Instruments

         (b) MIZ 22; Zetec Inc.

   C. Probes

      (1) Use a probe that can operate in a frequency range of 30 to 50 kHz.

      (2) If you make an order for a probe, make sure to give the instrument or connector type.

      (3) The probes identified below were used to prepare this procedure:

         (a) MT-30/50K; NDT Engineering Corp.

         (b) P/50-100K/A/0.0/3; Staveley Instruments

         (c) LS905-50B; NDT Engineering Corp.

   D. Reference Standards

      (1) Use reference standard ANDT4126. See Figure 1 for data about the reference standard.

4. **Prepare for the Inspection**

A. Identify the location of the inspection areas.

B. Get access to the inspection areas.

C. Remove loose paint, dirt, and sealant from the surfaces of the inspection area.

D. Make the inspection surfaces smooth if they are rough.

5. **Instrument Calibration**

A. Set the frequency between 30 and 50 kHz.

B. If the inspection area is painted, put a non-conductive shim on top of the reference standard. The thickness of the non-conductive shim must be within ±0.003 inch (0.08 mm) of the paint thickness.

C. Put the probe on reference standard ANDT4126 at position 1, Figure 2, on the side of the reference standard opposite the fastener heads (see Figure 2).

D. Balance the instrument.

E. Adjust the instrument phase to get a lift-off signal that moves horizontally to the left as shown in Figure 2.

F. Adjust the horizontal gain or vertical to horizontal gain ratio to get a lift-off signal of less than 20% of full screen width when the probe is lifted off the reference standard 0.003 inch (0.08 mm) (one sheet of paper is approximately 0.003 inch, 0.08 mm).

G. Move the balance point to the position shown in Figure 2.

H. Move the probe above the reference standard notch at probe position 2 as shown in Figure 2.

NOTE: This notch is used to calibrate the equipment to do an inspection for cracks along the side of the fastener hole.

I. Adjust the instrument gain to get a signal amplitude of 80 percent of full screen height as shown in Figure 2.

J. It will be necessary to use a different frequency between 10 and 50 kHz and do Paragraph 5.E. thru Paragraph 5.I. again if:

(1) The signal to noise ratio is less than 3:1 or,

(2) The notch signal is not vertical to the lift-off line.

K. Move the probe above the reference standard notch at probe position 3 as shown in Figure 2. This notch causes a radial crack signal to occur on the screen display. Monitor the signal as you move the probe above the notch. The radial crack signal must occur in the shaded area shown in Figure 2.

6. **Inspection Procedure**

A. Put the probe on the inspection surface adjacent to a fastener.

NOTE: After the instrument is calibrated from the tail side of a fastener, the inspection can be done from the head or the tail side of a fastener. Refer to the document that specified to use this procedure to identify the correct inspection surface.

B. Balance the instrument.

C. Do a scan of the inspection area as follows:

(1) Use a scan pattern that will permit you to find subsurface cracks that are 0.25 inch (6.4 mm) or more in length. Figure 3 shows a possible scan pattern.

(a) Use the end of the fastener as a probe guide and do the scan completely around the fastener.

(b) Make a second scan completely around the fastener with the probe moved a distance of 0.25 inch (6.4 mm) from the fastener.

(2) Keep the probe vertical to the part surface to decrease the balance point movement.

(3) Frequently do a check of the instrument/probe calibration during the inspection as follows:

(a) Put the probe on the reference standard to get a signal from the notch.

(b) Compare the signal you got from the notch during calibration with the signal you get now.

(c) If the signal has changed 10% or more, do the calibration and inspection again on all areas examined since the last calibration check.

(4) Monitor all areas for fast upscale signals that are almost the same as the signals you got from the reference standard notches.

7. Inspection Results

A. Indications of possible cracks are as follows:

(1) Signals more than 40 percent of the display.

(2) Fast upscale signals that occur when the probe is moved a small angular distance (signals such as those you got during calibration).

B. Some cracks follow a circumferential path around the fastener and do not always end at the fastener hole. These type of cracks cause a fast upscale signal that will keep the same signal amplitude as the probe is moved around the fastener head for the length of the crack.

C. To find the length, or the ends, of a crack, do a scan across the length of the crack until a signal does not occur.

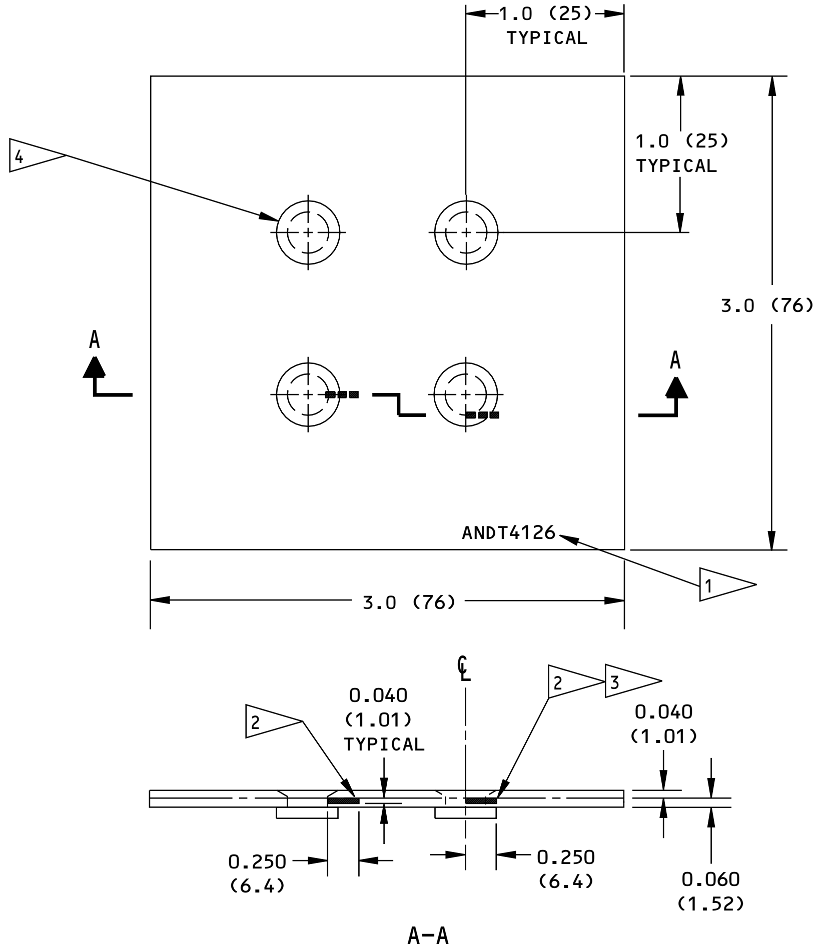
D. You can do more examination to make sure a crack signal is the result of a crack as follows:

(1) For cracks that start at fastener holes, use a high frequency inspection procedure as specified in the "Fastener Hole Inspection" column of Table 1.

(2) To examine the external side of the fuselage, use a low frequency eddy current procedure as specified in the "Repair Inspection" column of Table 1.

Table 1: Crack Inspection Procedures

AIRPLANE MODEL	FASTENER HOLE INSPECTION		REPAIR INSPECTION
	MANUAL PROBE	ROTATING PROBE	
707	Part 6, 51-00-00, Procedure 11	Part 6, 51-00-00, Procedure 16	Part 6, 53-30-00, Procedure 5
727	Part 6, 51-00-00, Procedure 11	Part 6, 51-00-00, Procedure 16	Part 6, 53-30-00, Procedure 5
737	Part 6, 51-00-00, Procedure 11	Part 6, 51-00-00, Procedure 16	Part 6, 53-30-00, Procedure 5
747	Part 6, 51-00-00, Procedure 11	Part 6, 51-00-00, Procedure 16	Part 6, 53-30-00, Procedure 5
757	Part 6, 51-00-11	Part 6, 51-00-16	Part 6, 53-00-06
767	Part 6, 51-00-11	Part 6, 51-00-16	Part 6, 53-00-06



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES (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

ANGULAR: = ±1.0 DEGREE

- SURFACE ROUGHNESS = 125 R_a OR BETTER
- MATERIAL: 2024-T3, T4

1 ETCH OR STEEL STAMP "ANDT4126" ON THE REFERENCE STANDARD. PUT A LETTER "A" IN FRONT OF THE REFERENCE STANDARD NUMBER TO SHOW THAT IT HAS ALODINED RIVETS. SEE FLAGNOTE 4.

2 EDM NOTCH: PUT THE NOTCH ADJACENT TO THE HOLE EDGE WITHIN ±0.005 (±0.10)

NOTCH DIMENSIONS AND TOLERANCES:

DEPTH: 0.040 (1.01) ±10% AS SHOWN
WIDTH: 0.025 (0.75) MAXIMUM
LENGTH: 0.250 (6.4)

3 THIS NOTCH STARTS AT THE HOLE CENTERLINE AND IS TANGENT TO THE HOLE

4 FASTENERS: BACR15CE6 OR EQUIVALENT (4 LOCATIONS). RIVETS MUST HAVE A CONVERSION COATED (ALODINED) FINISH. TO MAKE SURE THE FINISH IS ALODINE, REFER TO PART 1, 51-06-01. INSTALL RIVETS AS SPECIFIED IN PART 1, 51-01-04.

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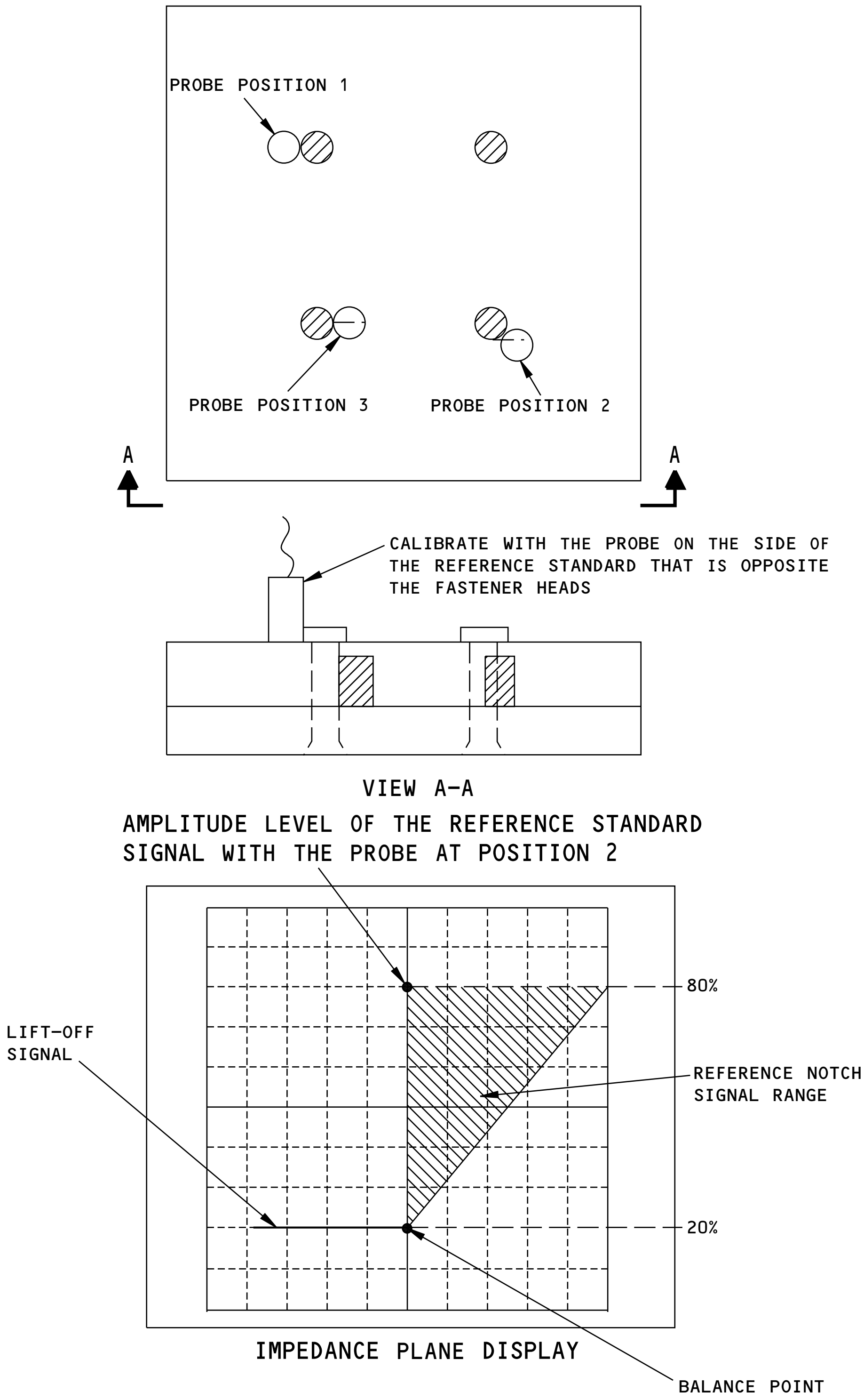
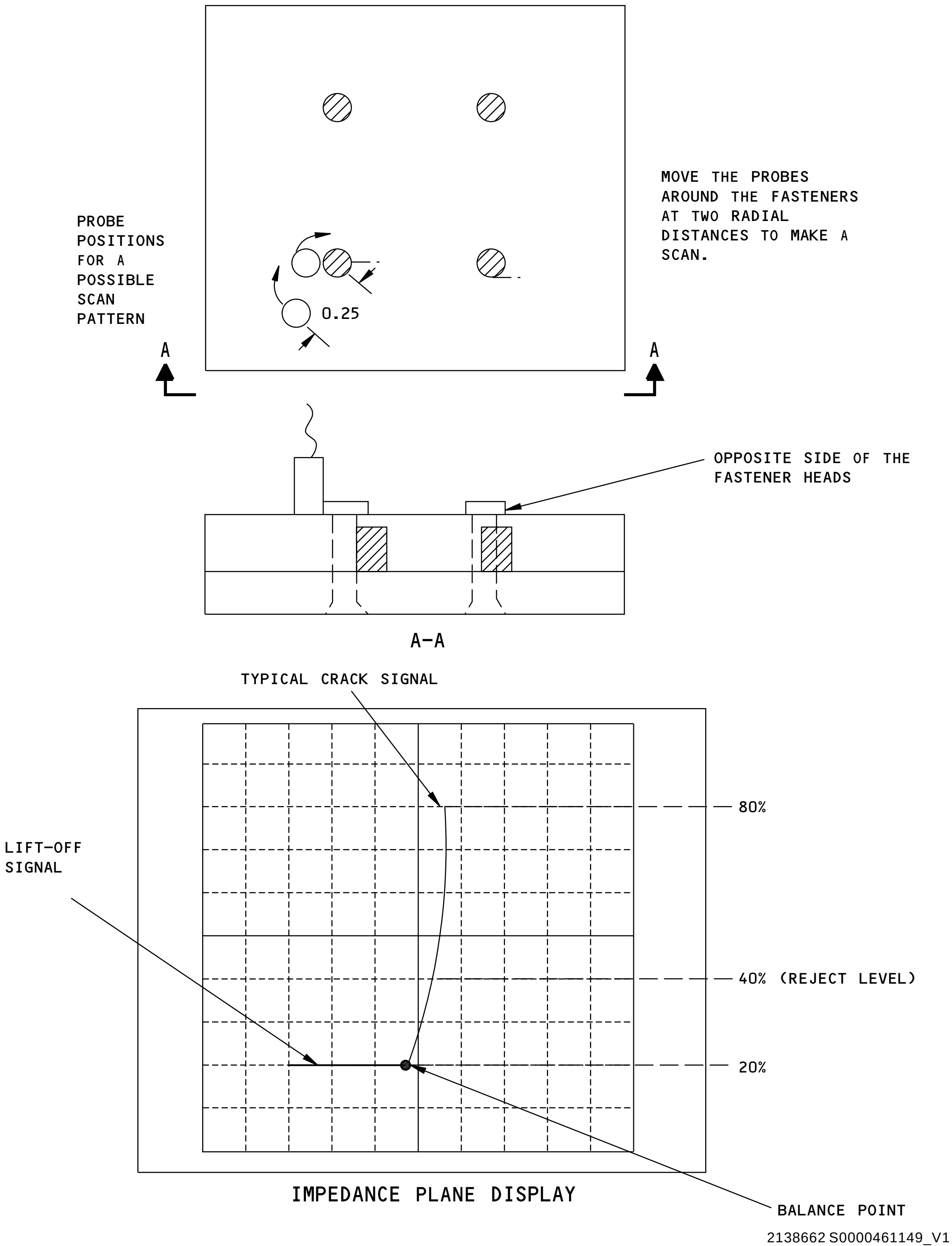
Reference Standard ANDT4126
Figure 1



Instrument Calibration
Figure 2



Inspection Scan Pattern and Defect Indications
Figure 3

SUBSURFACE CRACKS THAT START AT THE FAYING SURFACES OF THE AIRPLANE SKINS - INTERNAL INSPECTION

1. NOTICE

A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 7, was identified as Part 6, 53-30-00, Fig. 7. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. Purpose

A. Use this procedure to do an inspection to find subsurface cracks in the inboard skin, at the fastener rows of the lap splice and fuselage repairs. Figure 1 shows the inspection as it is done on the lower fastener row of the lap splice.

B. This procedure examines the fuselage inboard skin with the probe on the internal surface of the skin. This procedure examines a skin thickness range of 0.036 inches (0.91 mm) to 0.120 inches (3.05 mm) and uses Medium Frequency Eddy Current (MFEC).

C. This procedure uses a spot probe that is not fully shielded to look for cracks that:

(1) Are as much as 3 times longer than they are deep.

(2) Are adjacent to the fastener hole.

(3) Start at the outboard surface of the inboard skin panel (faying surface).

3. Equipment

A. General

(1) Use inspection equipment that can be calibrated on the reference standard as specified in Paragraph 5.

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

B. Instrument

(1) Use an eddy current instrument that:

(a) Has an impedance plane or a meter display.

(b) Operates at a frequency between 10 and 30 kHz.

(2) The instruments specified below were used to help prepare this procedure.

(a) Miz, 10A/B (Meter display); Zetec, Inc.

(b) Phasec 2200 (Impedance display); Hocking/Krautkramer

(c) Nortec 1000/2000 (Impedance display); Staveley, Inc.

(d) NDT 19e (Impedance display); Staveley, Inc.

C. Probes

(1) Use a spot probe with these properties:

NOTE: A reflection type probe is recommended.

(a) Use a probe with an end diameter of no larger than 0.190 inch (4.83 mm) and a probe height of no more than 0.50 (12.7 mm).

(b) Operates at a frequency between 10 and 30 kHz.

(c) Is at a right angle.

(d) During a probe scan around a reference standard fastener without a notch, the balance point signal must not change more than 5% of full screen height (FSH). Paragraph 5.H. will test the probe for this property.

(2) The probes specified below were used to help prepare this procedure.

NOTE: Probes different from those identified below can be used if they have the properties identified in Paragraph 3.C.(1).

(a) NEC-1084; NDT Engineering

(b) SPO 6464; Staveley, Inc.

(c) SPC-4TF-105-1R; EC/NDT Company.

D. Reference Standards

(1) To examine a skin thickness range between 0.036 inch (0.91 mm) to 0.120 inch (3.05 mm), four reference standards are necessary.

(2) Use the reference standards that follow for the applicable thickness range to examine:

(a) ANDT1079 to examine the thickness range of 0.036 inch (0.91 mm) to 0.045 inch (1.14 mm).

(b) ANDT1080 to examine the thickness range of 0.046 inch (1.17 mm) to 0.055 inch (1.40 mm).

(c) ANDT1081 to examine the thickness range of 0.056 inch (1.42 mm) to 0.067 inch (1.70 mm).

(d) ANDT1082 to examine the thickness range of 0.068 inch (1.73 mm) to 0.120 inch (3.05 mm).

(3) See Figure 2 for the data about the reference standards.

(4) Reference standards NDT10XX can be used to make reference standards ANDT10XX if you remove the anodized rivets from NDT10XX and install Alodine rivets as specified in Figure 2.

4. Prepare for the Inspection

A. Remove all the necessary interior panels and insulation blankets to get access to the inside surface of the inboard skin.

B. Remove loose material and sealant from the inspection surface. It is not necessary to remove the corrosion inhibiting compound if it is evenly coated and at a thickness of 0.010 inches (0.25 mm) or less.

C. If tape is used on the probe, make sure that it is on the tip of the coil, not on the outside edges. It is critical that the probe be as near as possible to the fastener. Tape on the outside edge of the probe can cause the distance to change between the probe and the fastener, if the tape is not applied correctly.

5. Instrument Calibration

A. Determine the skin thickness from the Structural Repair Manual (SRM), Service Bulletin, or other sources for calibration. See Table 1 for the calibration specifications that identify:

(1) The skin thickness range.

(2) The reference standard to use for the skin thickness range.

(3) The instrument frequency to use.

Table 1: Instrument Calibration Table

Skin thickness range to be examined	0.036 inch (0.91 mm) to 0.045 inch (1.14 mm)	0.046 inch (1.17 mm) to 0.055 inch (1.40 mm)	0.056 inch (1.42 mm) to 0.067 inch (1.70 mm)	0.068 inch (1.73 mm) to 0.120 inch (3.05 mm)
Reference standard to use	ANDT1079	ANDT1080	ANDT1081	ANDT1082
Instrument frequency to use	25 kHz	20 kHz	15 kHz	10 kHz

B. Put the probe at probe position 1 (adjacent to the machined fastener head) of the applicable reference standard and fastener. See Figure 3.

C. Balance the instrument.

D. If an impedance plane display instrument is used, adjust the vertical gain 14 to 20 dB higher than the horizontal gain or between 5:1 and 10:1 vertical to horizontal gain ratio.

NOTE: The gain ratios in Paragraph 5.D. are necessary to keep the balance point on the screen during the scan. Changes in the thickness of the finish can cause the balance point to move off of the screen display.

E. Set the lift-off as follows:

(1) If a meter display instrument is used: adjust the phase control so that the meter needle moves no more than 5 percent of full scale for probe-to-part distances of up to 0.006 inch (0.15 mm). This is the thickness of two sheets of paper (approximately).

(2) If an impedance plane instrument is used: adjust the phase control so that the lift-off signal moves horizontally to the left as shown in Figure 3, View C.

F. Adjust the balance point to the position shown in Figure 3. See View B for the meter display and View C for the impedance plane display.

NOTE: Some probes do not have the coil accurately positioned in the center of the probe body, which can cause the balance point to move during the scan around the fastener.

G. Adjust the instrument sensitivity as follows:

(1) Put the probe at probe position 2 (adjacent to the same diameter fastener used for probe position 1) on the reference standard, above the notch to get a maximum signal. See Figure 3, View A.

(2) If a meter instrument is used:

(a) Adjust the instrument sensitivity to get a notch signal that is 60 percent of full scale (40 percent of full scale higher than the balance point). See Figure 3, View B.

(3) If an impedance plane instrument is used:

(a) Adjust the instrument sensitivity to put the notch signal at 60 percent of full screen height (40 percent higher than the balance point). See Figure 3, View C.

H. Make a complete scan around the fastener at probe position 1 on Figure 3 and monitor the display for movement of the balance point. If the balance point moves more than 5% of the signal display, use a different probe.

I. Set the instrument alarm to 50% of the notch signal set in Paragraph 5.G.

6. Inspection Procedure

A. Examine the internal skin surface, around the driven button end of the fastener as follows:

(1) Calibrate the instrument as specified in Paragraph 5.

(2) Put the probe on the skin surface and adjacent to the driven button end of the fastener.

(3) Balance the instrument.

(4) Do a complete scan inspection around the fastener. During the scan:

(a) Keep the probe adjacent to the fastener at all times.

(b) Keep the probe as vertical as possible to the part surface to decrease the balance point movement.

(c) Make a mark at the fastener locations that cause signals to occur that are 20% (or more) above the balance point and are almost the same as the signal you got from the reference standard notch.

(d) Frequently do a check of the instrument calibration during the inspection as follows:

1) Put the probe on the reference standard at probe position 2 (see Figure 3) to get the signal from the notch.

2) If the signal has changed 10% or more, do the calibration and inspection again on all the areas examined since the last calibration check.

7. Inspection Results

A. Inspection results for meter display instruments:

(1) An upscale needle movement that is 40% (or more) of full scale (20% higher than the balance position) is a possible crack signal. A crack signal occurs during a short scan.

B. Inspection results for impedance plane display instruments:

(1) Vertical signals that are 40% (or more) of full screen height (20% higher than the balance point) are possible crack signals. A crack signal occurs during a short scan.

C. Signals can occur at different locations as a scan is made around the fastener. This can be caused by an edge effect signal from the fastener hole caused by an out-of-round condition of the driven button end during installation of the fastener. If the signal is more than that referred to in Paragraph 7.A.(1) or Paragraph 7.B.(1) do more analysis as follows:

(1) Get local engineering approval and remove the fastener.

(2) Do a detailed visual inspection of the hole to look for surface conditions such as burrs, galling, corrosion and out-of-round holes. If one or more of the conditions above are found, get local engineering approval and do a clean-up ream to remove the condition.

(3) Do the fastener hole inspection as specified in Part 6, 51-00-00, Procedure 16.

CAUTION: IT IS POSSIBLE TO GET A CRACK SIGNAL WHEN YOU DO THIS PROCEDURE, BUT NOT WHEN YOU DO THE PART 6, 51-00-00, PROCEDURE 16, FASTENER HOLE INSPECTION. THIS CAN OCCUR IF THERE ARE CRACKS THAT DO NOT GO INTO THE HOLE. THE PART 6, 51-00-00, PROCEDURE 16, FASTENER HOLE INSPECTION WILL ONLY IDENTIFY CRACKS THAT GO INTO THE HOLE.

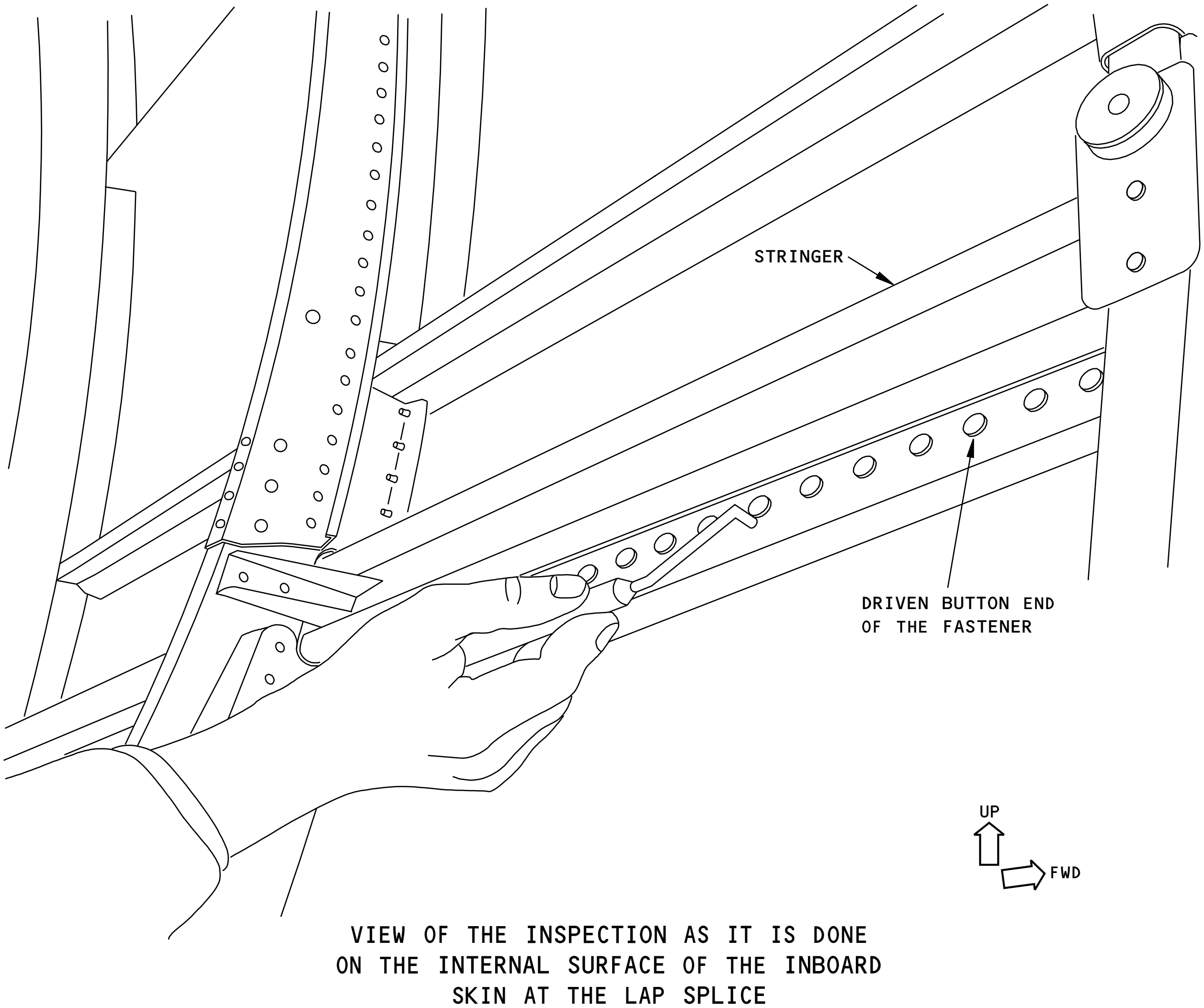
(4) If a crack signal does not occur when the fastener hole inspection procedure (specified in Paragraph 7.C.(3)) is done, do as follows:

(a) Put an aluminum rivet back into the hole. Make sure the rivet fits tight in the hole and has a sufficient shank length to be used as a probe guide.

(b) Make a scan around the shank of the rivet as specified in Paragraph 6.A.(4).

(c) If the crack signal occurs again, reject the hole.

D. Refer to the flow chart in Figure 4 that shows the sequence of steps identified in Paragraph 7.C.(1) thru Paragraph 7.C.(3) for more analysis of a signal that is 20% or more of the balance point.



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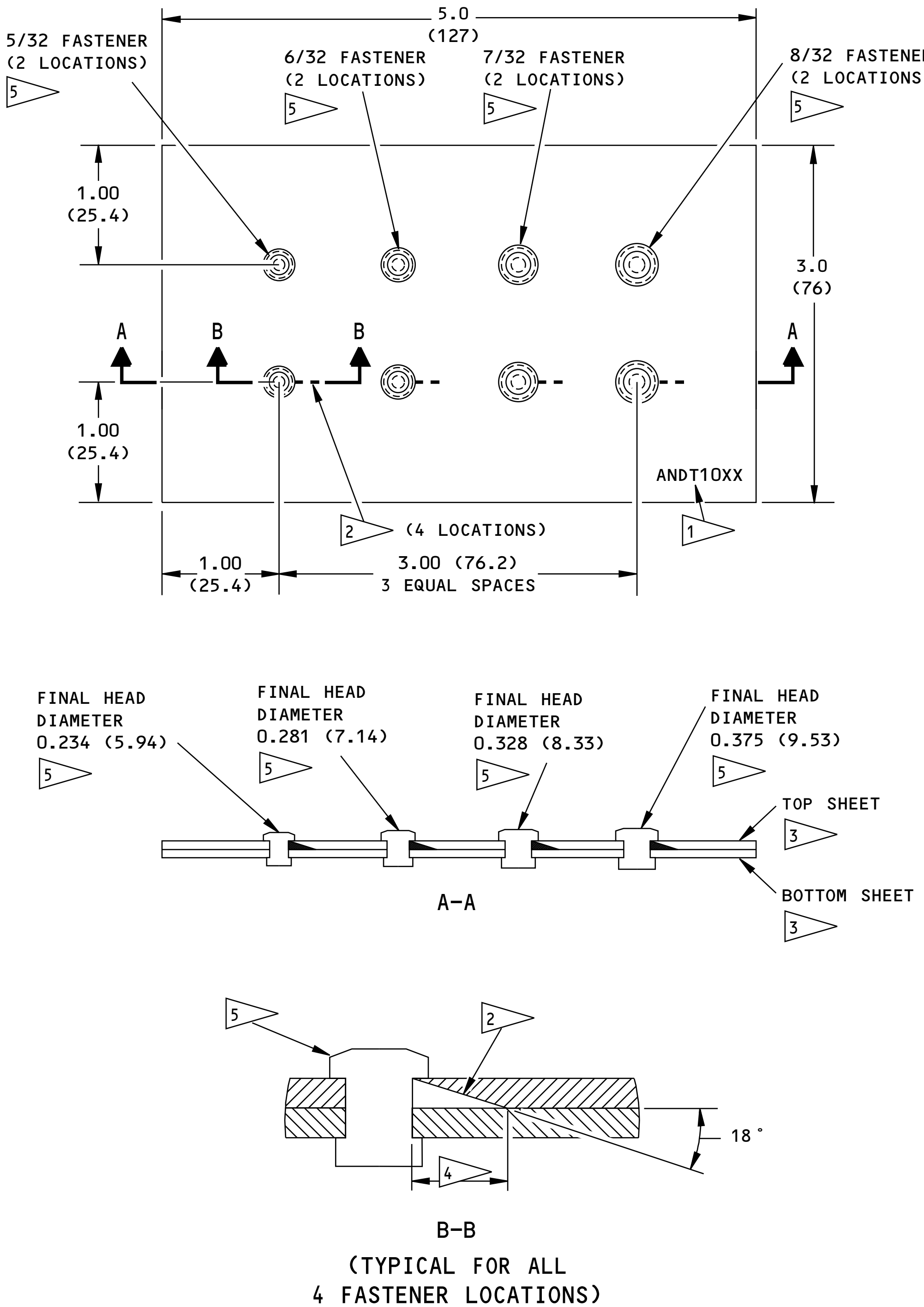
Typical Inspection Area
Figure 1



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Reference Standards
Figure 2 (Sheet 1 of 3)

REFERENCE STANDARD NUMBER		ANDT1079	ANDT1080	ANDT1081	ANDT1082
MATERIAL THICKNESS [3]	TOP SHEET	0.040 (1.02)	0.050 (1.27)	0.063 (1.60)	0.070 (1.78)
	BOTTOM SHEET	0.040 (1.02)	0.050 (1.27)	0.063 (1.60)	0.070 (1.78)
NOTCH LENGTH AT THE FASTENER LOCATION [4]	5/32 FASTENER	0.142 (3.61)	0.172 (4.37)	0.211 (5.36)	0.232 (5.89)
	6/32 FASTENER	0.150 (3.81)	0.180 (4.57)	0.219 (5.56)	0.240 (6.10)
	7/32 FASTENER	0.158 (4.01)	0.188 (4.78)	0.227 (5.77)	0.248 (6.30)
	8/32 FASTENER	0.166 (4.22)	0.196 (4.98)	0.235 (5.97)	0.256 (6.50)

TABLE I

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES (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

- ANGULAR TOLERANCE: ±1.0 DEGREE
- NOTCH LOCATION TOLERANCES:

  THE NOTCH LOCATION MUST BE WITHIN ±0.005 (±0.10) OF THE CENTERLINE OF THE HOLE AS SHOWN.
- MATERIAL: 2024-T3 OR T4 CLAD ALUMINUM
- FASTENERS: USE ONLY ALODINED RIVETS

  QUANTITY (2) BACR15BB5AD---C
  (2) BACR15BB6AD---C
  (2) BACR15BB7AD---C
  (2) BACR15BB8AD---C
- SURFACE ROUGHNESS: 63 Ra OR BETTER

[1] ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER TO THE APPLICABLE REFERENCE STANDARD AS SPECIFIED IN TABLE I.

[2] TAPERED EDM NOTCH:
MAXIMUM WIDTH: 0.010 (0.25)
LENGTH: SEE TABLE I

[5] INSTALL THE RIVETS AS FOLLOWS:

- MAKE SURE THE TAIL END OF THE RIVETS HAVE A "C" STAMP THAT IDENTIFIES THAT THE RIVETS ARE ALODINED.
- MACHINE THE FASTENER HEADS TO SIMULATE THE DRIVEN BUTTON DIAMETER.
  5/32 0.231 ±0.002 (5.87 ±0.05)
  6/32 0.278 ±0.002 (7.06 ±0.05)
  7/32 0.325 ±0.002 (8.26 ±0.05)
  8/32 0.372 ±0.002 (9.45 ±0.05)
- CLEAN THE RIVETS, HOLES, COUNTERSINKS AND ALL SURFACES OF THE REFERENCE STANDARDS WITH SOLVENT.
- PUT THE APPLICABLE DIAMETER HOLE OF THE RIVET TOOL AROUND THE RIVET HEAD SO THAT THE SURFACE OF THE TOOL TOUCHES THE TOP SHEET OF THE REFERENCE STANDARD.
- COMPRESS THE RIVET TO GET A BUTTON DIAMETER ON THE TAIL END THAT IS 1.3 TO 1.5 TIMES THE SHANK DIAMETER.

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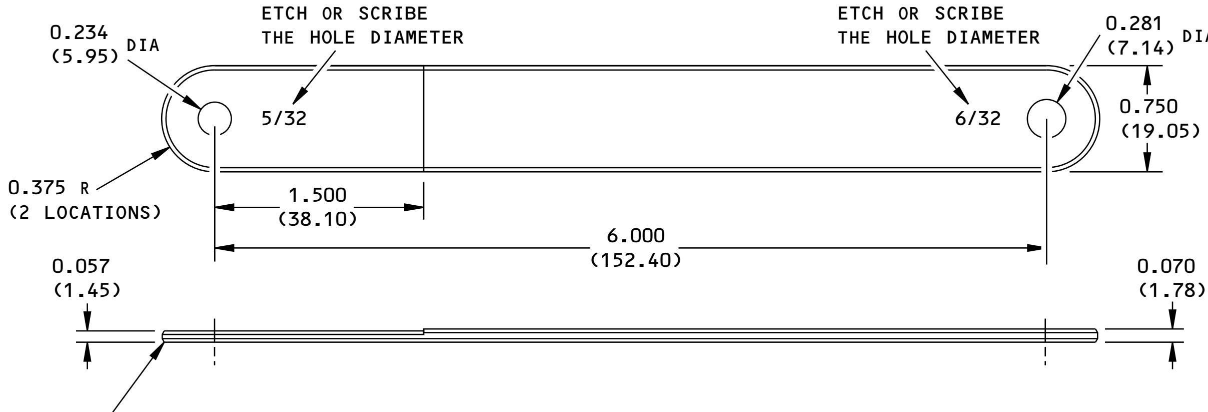
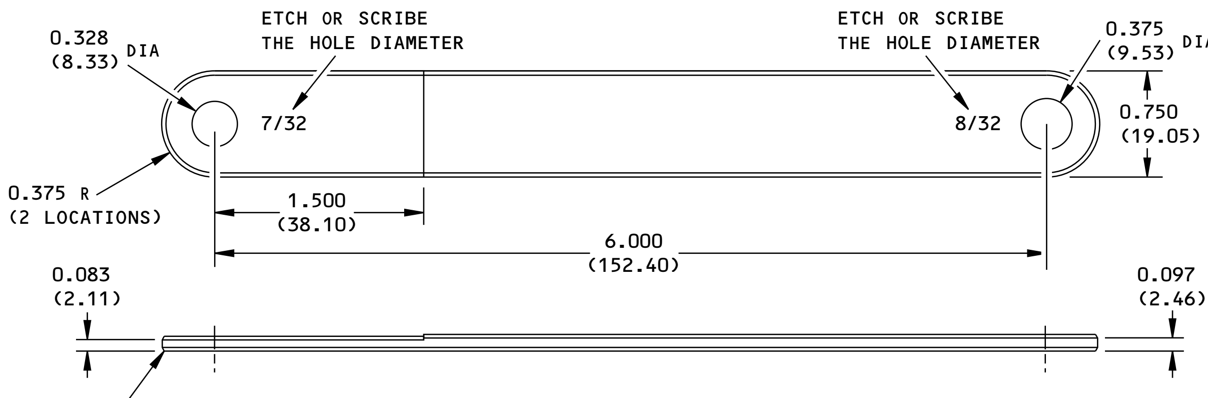
Reference Standards
Figure 2 (Sheet 2 of 3)



5/32 AND 6/32 RIVET TOOL



7/32 AND 8/32 RIVET TOOL

NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: STEEL OR STAINLESS STEEL; 40 KSI (OR MORE) YIELD STRENGTH
- USE: THIS TOOL IS PUT AROUND THE RIVET HEAD TO PREVENT EXPANSION OF THE RIVET HEAD AS THE RIVETS ARE COMPRESSED TO FORM THE BUTTON ON THE TAIL END.

  THE RIVET TOOLS CAN BE USED AS LONG AS THE FINAL RIVET HEAD DIAMETERS ARE AS SPECIFIED ON SHEET 1.

6 BREAK ALL EXTERNAL EDGES TO A 0.020 RADIUS. DO NOT BREAK HOLE EDGES.

TOOLS TO PREVENT RIVET HEAD EXPANSION

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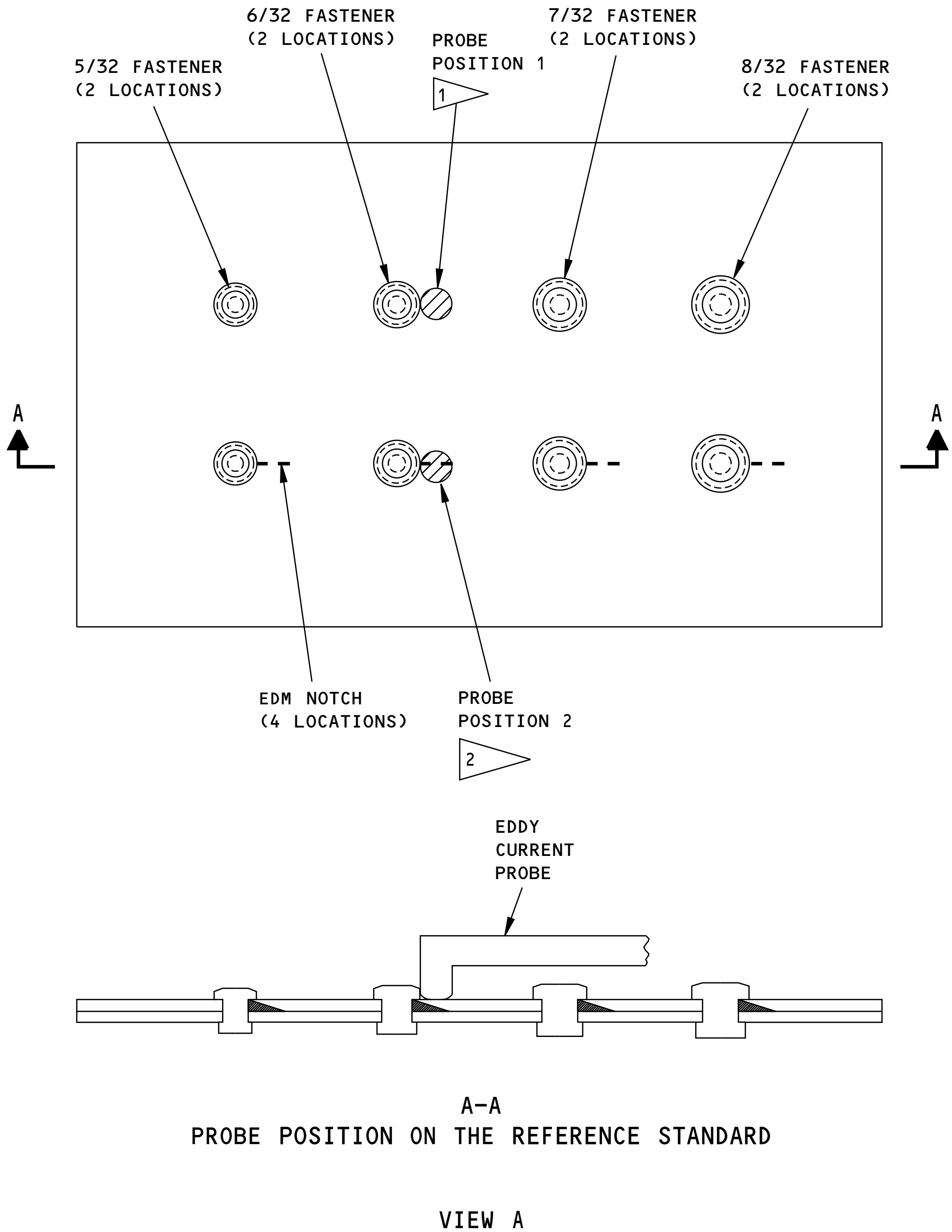
Reference Standards
Figure 2 (Sheet 3 of 3)



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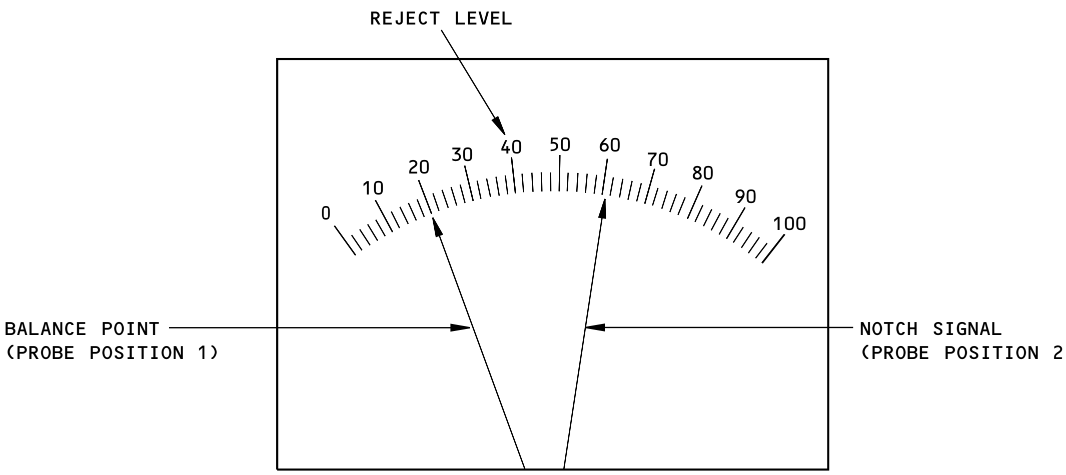
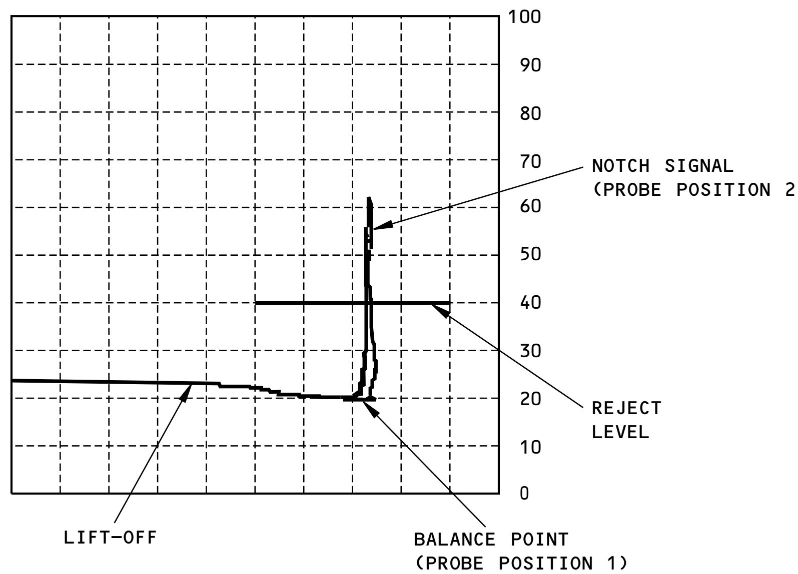
Calibration and Probe Positions
Figure 3 (Sheet 1 of 2)



METER DISPLAY
VIEW B



IMPEDENCE PLANE DISPLAY
VIEW C

NOTES:

- THE CALIBRATION IS DONE WITH THE PROBE ADJACENT TO THE MACHINED FASTENER HEADS AS SHOWN IN VIEW A. THE INSPECTION ON THE AIRPLANE IS DONE WITH THE PROBE ADJACENT TO THE DRIVEN BUTTON END (TAIL SIDE) OF THE FASTENER.

1 TYPICAL PROBE POSITION 1 FOR ALL (4) FASTENER LOCATIONS WITHOUT A NOTCH

2 TYPICAL PROBE POSITION 2 FOR ALL (4) FASTENER LOCATIONS WITH A NOTCH

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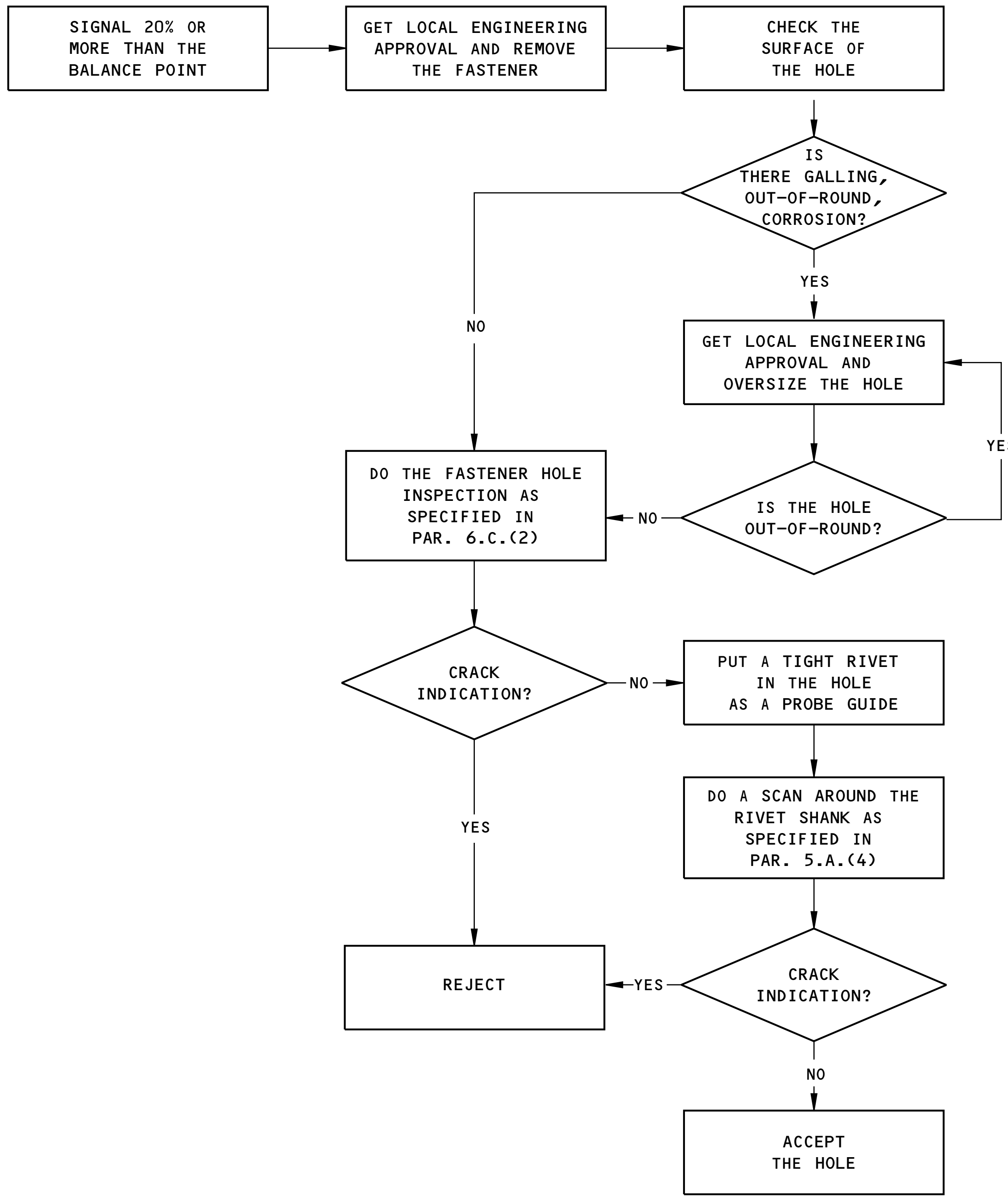
Calibration and Probe Positions
Figure 3 (Sheet 2 of 2)



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Signal Analysis Flowchart
Figure 4

PART 6 - EDDY CURRENT

SLIDING PROBE INSPECTION PROCEDURE FOR FASTENER LOCATIONS WITH DECALS

1. **NOTICE**

   A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 8, was identified as Part 6, 53-30-00, Fig. 8. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. **Purpose**

   A. Use this eddy current procedure to help find cracks that extend from a fastener location in fuselage skins where the fastener head can not be seen because of decals.

   B. This procedure specifies a scan procedure only. Refer to the sliding probe procedure that references this procedure for the equipment data, calibration data, and to do the inspection result analysis.

3. **Equipment**

   A. Refer to the procedure that references this procedure for the equipment data.

4. **Prepare for the Inspection**

   A. Identify the distance between the fastener row to be examined and the skin edge as follows:

      (1) Identify a visible fastener at each end of the decal.

      (2) Measure the distance from the fastener centerline to the skin edge.

      (3) Make marks along the decal that are the distance that was measured in Paragraph 4.A.(2) from the skin edge. Make these marks at intervals that are almost the length of the straightedge (see Figure 1).

      (4) Use a straightedge to connect the marks from Paragraph 4.A.(3) and make a line on the skin from the centerline marks or the visible fastener across the decal. This line will identify the approximate position of the hidden inspection fasteners (see Figure 1).

5. **Instrument Calibration**

   A. Put a shim or tape that is not transparent on the fasteners of the reference standard to simulate the decal. The shim or tape thickness must be the same (± 0.005 inch (0.13 mm)) as the decal to be simulated. If the thickness is unknown, use an eddy current instrument that can identify the thickness of the decal.

   B. Continue instrument calibration as specified in the procedure that referenced this procedure.

6. **Inspection Procedure**

   A. Put the probe at one end of the decal so that it is centered on the line you marked on the skin.

   B. Move the probe along the line to find the first hidden fastener. Use a “scrubbing” procedure to help find these fasteners (see Figure 1). The “scrubbing procedure” is as follows:

      (1) Slide the probe forward and backward in short strokes in the fastener area while you monitor the signal.

(2) The maximum signal will occur when the probe is moved across the fastener centerline (see Figure 2).

NOTE: It is important to fully scrub the fastener area to identify the maximum signal. Fasteners not fully scrubbed can cause reject condition and/or rivet location errors to occur.

NOTE: When you make a scan, keep the permanent screen adjustment “ON” so that the signals can be compared on the screen. Do a manual erase after each fastener location has been examined.

C. Monitor the instrument signal pattern. Compare the signals with the signal patterns shown in the procedure that referenced this procedure. Make a mark at all fastener locations that cause signals to occur that are above the reject level of the procedure that referenced this procedure.

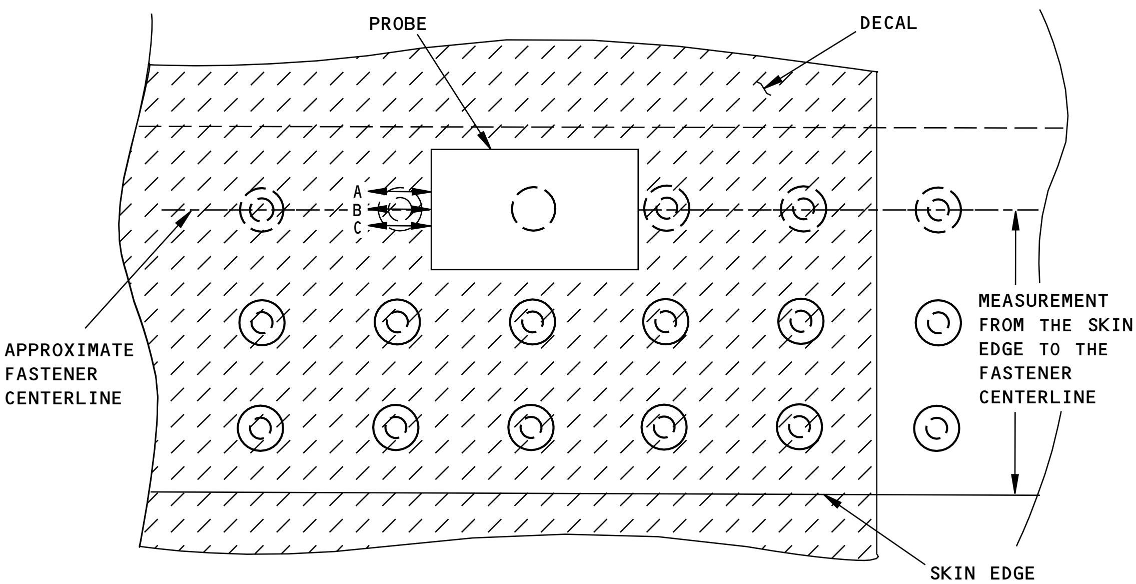
D. Erase the screen and move the probe to the adjacent fastener location.

E. Do Paragraph 6.B. again.

F. Continue to move the probe along the line and do Paragraph 6.B. thru Paragraph 6.E. until each hidden fastener location in the decal has been examined.

7. Inspection Results

A. Refer to the procedure that referenced this procedure to help make an analysis of the inspection results.



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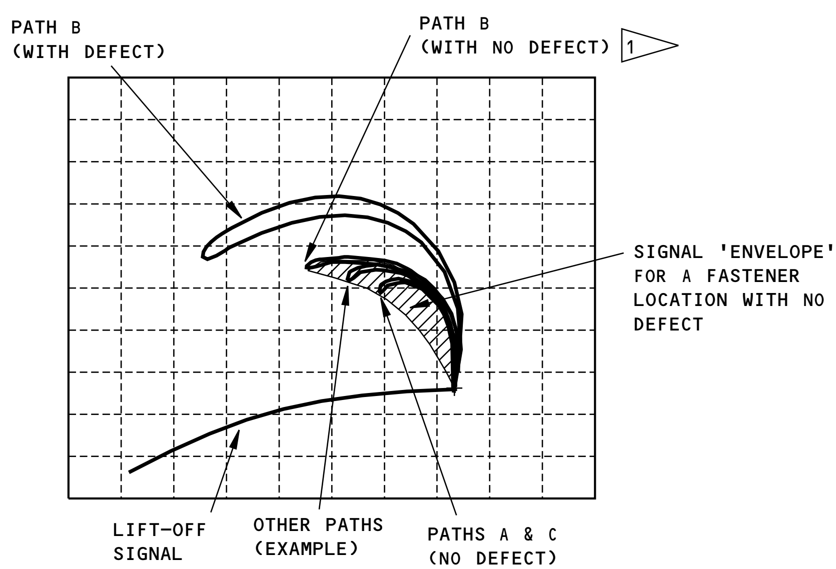
Example Scrubbing Procedure
Figure 1



NOTES:

1 MAXIMUM SIGNAL AT THE FASTENER CENTERLINE

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Example Scrubbing Signals
Figure 2

PART 6 - EDDY CURRENT

SLIDING PROBE INSPECTION OF THE INBOARD SKIN OF THE LAP SPLICE

1. **NOTICE**

   A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-30-00, Procedure 9, was identified as Part 6, 53-30-00, Fig. 9. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. **Purpose**

   A. Use this procedure to do an inspection for cracks in the inboard skin along the lower row of fasteners in the lap splice.

   B. This inspection procedure can be used on fuselage skins with Alodine fasteners, anodized fasteners or titanium fasteners.

   C. This procedure is done from the external side of the airplane at the lap splices. See Figure 1 for the typical inspection areas along the lower row of fasteners. This procedure will find cracks at tear strap locations and between tear straps.

   D. This procedure uses a sliding probe and an impedance plane display instrument that can operate in a dual frequency mode.

   E. You cannot do this procedure at a location where the fastener is magnetic (steel) or if a fastener has a protruding head. At locations where the fastener is magnetic or protruding, you must do one of the procedures that follow:

      (1) Do an inspection as follows:

         (a) For 727 SSID airplanes, refer to Part 6, 53-30-00, Procedure 5, and Part 6, 53-30-27, Procedure 18 for SB 727-53A0222 airplanes.

         (b) For 737 airplanes, refer to Part 6, 53-30-12 or Part 6, 53-30-16.

         (c) For 747 airplanes, refer to Part 6, 53-30-00, Procedure 5.

      (2) Do an open hole inspection as shown in Part 6, 51-00-00, Procedure 16.

   F. The probe must be accurately aligned with the fastener centerline to do this procedure correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

   G. The upper skin thickness on the airplane must be between 0.036 inch (0.91 mm) and 0.100 inch (2.54 mm) to use this procedure.

3. **Equipment**

   A. General

      (1) Use inspection equipment that can be calibrated on the reference standard as specified in Paragraph 5.

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

   B. Instrument

      (1) Use an eddy current instrument that:

         (a) Can operate in a dual frequency mode.

         (b) Has an impedance plane display.

         (c) Operates at a frequency range of 1 kHz to 20 kHz.

(d) Has a permanent screen adjustment (screen persistence). The permanent screen adjustment is necessary so that signals stay on the screen until manually erased.

(2) The instruments that follow were used to help prepare this procedure.

(a) Phasec 2D, D-60 and D-62; Hocking Krautkramer

(b) Nortec 19e; Staveley Instruments

(c) Nortec 2000D and Nortec 2000D+; Staveley Instruments

(d) Nortec Workstation; Staveley Instruments

(e) Phasec 2200 (dual frequency model); Hocking Krautkramer

(f) US-454; Uniwest

(g) Elotest B300; Rohmann GmbH

(h) Elotest M2V3; Rohmann GmbH

C. Probes

(1) Use a reflection sliding probe that operates at a frequency range from 1 kHz to 20 kHz.

(2) Some probes give unusual signals on the airplane because of the distance between fasteners and other structure conditions. To get the correct results from this procedure, it is necessary to use one of the probes that follow.

(a) NEC-4039; NDT Engineering Corp

(b) TEK-1504; TECHNA NDT

(c) SPO-367 DF; EC NDT

(d) 379-010-300 (1-100 kHz); GE Inspection Technologies

(e) PKA-52 H-1835; Rohmann

D. Reference Standard

(1) See Figure 2 for data about the probe guides and reference standards that are applicable to your lap splice inspection.

E. Special Tools

(1) Use a nonconductive probe guide to align the centerline of the probe with the centerline of the fasteners. See Figure 3 for data about the probe guide.

NOTE: Monitor the probe guide position on the centerline of the fasteners during the scans and adjust it if necessary. It is possible that adjacent fasteners on the airplane are not aligned with each other.

(2) Use a magnet to identify magnetic steel fasteners.

(3) Use Teflon (or equivalent) tape on the reference standard before calibration if there is paint on the airplane. The thickness of the tape applied to the reference standard must be almost equivalent to the estimated paint thickness on the airplane. Paragraph 4.D. specifies how to measure the paint thickness with an eddy current instrument.

4. Prepare for the Inspection

A. Identify all the inspection areas. Refer to the applicable service bulletin or the specific NDT procedure.

B. Remove loose paint, dirt, and sealant from the surface of the inspection area.

C. If you cannot see the fasteners because the paint is too thick, remove a sufficient amount of paint so that you can see the fasteners.

D. For airplanes that are painted: Make an estimate of the paint thickness on the skin. You can use calibrated nonconductive shims with an eddy current procedure (lift-off measurement) that uses a direct reading or an indirect reading. Apply Teflon tape or clear tape layers to the reference standard, before calibration, so the thickness of the tape layer is approximately equivalent to the thickest paint on the airplane.

NOTE: You can also refer to the paint thickness instructions in the McDonnell Douglas Nondestructive Testing Standard Practice Manual, Part 6, 06-10-01.002, to measure paint thickness on the airplane.

5. Instrument Calibration

A. Refer to the specific NDT procedure to identify the applicable reference standard(s) necessary for calibration. Table 1 shows the allowable skin thickness ranges permitted for use with each reference standard.

B. Refer to Table 1 to identify the applicable frequencies necessary to calibrate the equipment on the reference standard(s) identified in Paragraph 5.A.

C. Make initial adjustments to your instrument as follows:

NOTE: See Figure 14 for the initial adjustments to make for your instrument.

(1) Set the operation mode to “dual frequency”.

(2) Set the probe drive to its highest level.

(3) Set the low pass filter to 50 Hz.

(4) Set the high pass filter to 0 or “off”.

(5) Set the screen persistence to “permanent” or “manual erase”.

(6) Set Frequency 1 (F1) to the value identified in Table 1 for the applicable reference standard.

(7) Set Frequency 2 (F2) to the value identified in Table 1 for the applicable reference standard.

NOTE: Frequency 2 must be one quarter of Frequency 1. It is permitted to set Frequency 2 to a value that is within 100 Hz of the value specified in Table 1. Some instruments will not allow Frequency 2 settings that are exactly four times less than Frequency 1.

D. Adjust the nonconductive probe guides (NDT1087-P1 positioners) on the reference standard so that the probe is centered when you make a scan on each fastener row.

E. Calibrate your dual frequency eddy current instrument as specified in Figure 5 thru Figure 12. Refer to Figure 4 for a flowchart that shows the calibration procedure.

NOTE: All of the steps must be done carefully to do the calibration for dual frequency eddy current. This procedure shows typical screen displays for each step. We recommend that you use an instrument that can keep your adjustments in memory, and save them at the middle and end of the calibration procedure.

6. Inspection Procedure

A. Put the probe on the outer skin of the lap splice between two fasteners in the upper fastener row, away from a tear strap location.

NOTE: Always balance the probe between fasteners in the upper fastener row before you examine the fasteners in the lower row, to make sure you do not balance on a crack location.

B. Use the nonconductive probe guide to align the probe between the fasteners in the upper row of the lap splice so that the centerline of the probe will move across the center of the fasteners.

C. Move the probe left and right between two fasteners while you monitor the signal. The signal will be at its highest vertical screen position when the probe is centered between two fasteners.

D. Balance the instrument at the location where the probe is centered between two fasteners. Do not balance the probe on the signal “dip” that can occur as the probe gets near each fastener. See Figure 6, View C.

E. Move the probe to the lower row of the lap splice. Use the nonconductive probe guide to align the probe with the centerline of the fasteners. Move the probe slowly along the centerline of the fasteners in the lower row. See Figure 1. As you move the probe, do the steps that follow:

(1) Monitor the instrument display for signals that are higher than the alarm level set in Paragraph 5. (see Figure 11, View B). Make a record of signals that are higher than the alarm level.

(2) Keep the permanent screen adjustment “on” so that the signals can be compared on the screen. Do a manual erase after 5 to 10 fastener signals have been compared on the screen.

(3) Monitor the instrument display for large downscale signals. These signals are indications of tear straps or doublers. On tear straps or doublers the signal can move off of the bottom of the screen. Visually identify the location of the tear straps. To examine signals at tear strap locations, do the steps that follow:

(a) While you continue to make a scan across the tear strap, monitor the instrument baseline (the same vertical screen height as the balance point). A signal that goes across the baseline while you are above a tear strap must be examined some more. See Figure 13.

(b) To examine signals that go across the baseline when you are on a tear strap, balance the probe between the two fasteners on the upper row of the lap splice that go through the tear strap. Then make a scan of the fasteners in the lower row that go through the tear strap. Make a record of signals that are higher than the alarm level set in Paragraph 5. (see Figure 11, View B).

F. Magnetic fasteners will cause unusual signals. Use a magnet to identify magnetic fasteners. Refer to the applicable alternative procedures that follow to examine areas around magnetic fasteners.

(1) For 727 SSID airplanes, refer to Part 6, 53-30-00, Procedure 5, and Part 6, 53-30-27, Procedure 18 for SB 727-53A0222 airplanes.

(2) For 737 airplanes, refer to Part 6, 53-30-14.

(3) For 747 airplanes, refer to Part 6, 53-30-00, Procedure 5.

7. Inspection Results

A. Signals at fastener locations between tear straps or doublers, if they are higher than the alarm level, are crack indications.

B. Signals at fastener locations above tear straps or doublers, if they are higher than the balance point, or higher than the alarm level when the instrument is balanced at the tear strap, are crack indications.

C. Use the procedures that follow to examine crack indications.

(1) Inspection from the internal surface of the airplane skin.

(a) For 727 airplanes, refer to Part 6, 53-30-27, Procedure 17.

(b) For 737 airplanes, refer to Part 6, 53-30-16.

(c) For 747 airplanes, refer to Part 6, 51-00-00, Procedure 23.

(2) Low frequency inspection from the internal surface of the airplane at tear strap or doubler locations.

(a) For 727 and 747 airplanes, refer to Part 6, 53-30-00, Procedure 5.

(b) For 737 airplanes, refer to Part 6, 53-30-12.

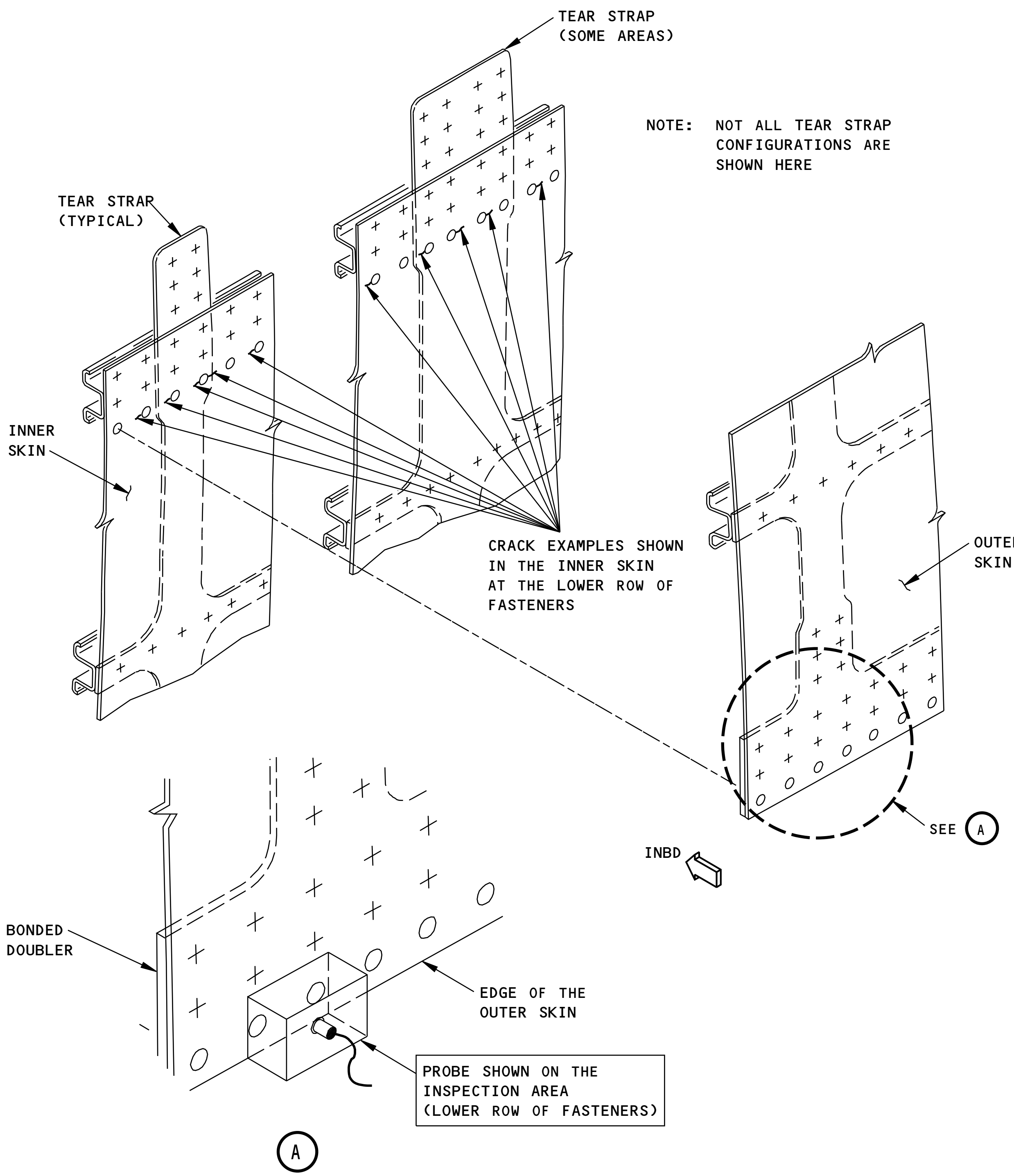
(3) High frequency open hole inspection after removal of fasteners.

(a) For 727 thru 747 airplanes, refer to Part 1, 51-00-00, Procedure 16.

Table 1: Reference Standard and Frequency Selection for Applicable Skin Thicknesses

UPPER "SKIN" THICKNESS RANGE *[1]	MINIMUM LOWER SKIN THICKNESS *[1]	EDM NOTCH LENGTH	REFERENCE STANDARD NUMBER	FREQ 1 [kHz]	FREQ 2 [kHz]
0.040 - 0.062 (1.00 - 1.58)	0.036 (1.00)	0.200	NDT1087-1	14	3.4
0.063 - 0.070 (1.60 - 1.78)	0.036 (1.00)	0.200	NDT1087-2	12	3
0.071 - 0.080 (1.80 - 2.03)	0.036 (1.00)	0.180	NDT1087-3	11	2.7
0.081 - 0.089 (2.06 - 2.26)	0.036 (1.00)	0.200	NDT1087-4	9	2.25
0.090 - 0.100 (2.29 - 2.54)	0.05 (1.27)	0.200	NDT1087-5	8	2
0.063 - 0.079 (1.60 - 2.00)	0.05 (1.27)	0.250	NDT1087-6	12	3
0.080 - 0.089 (2.03 - 2.26)	0.05 (1.27)	0.250	NDT1087-7	9	2.25
0.090 - 0.100 (2.29 - 2.54)	0.06 (1.52)	0.250	NDT1087-8	8	2

*[1] "Skin" thickness refers to the total thickness of all layers above the lower skin.



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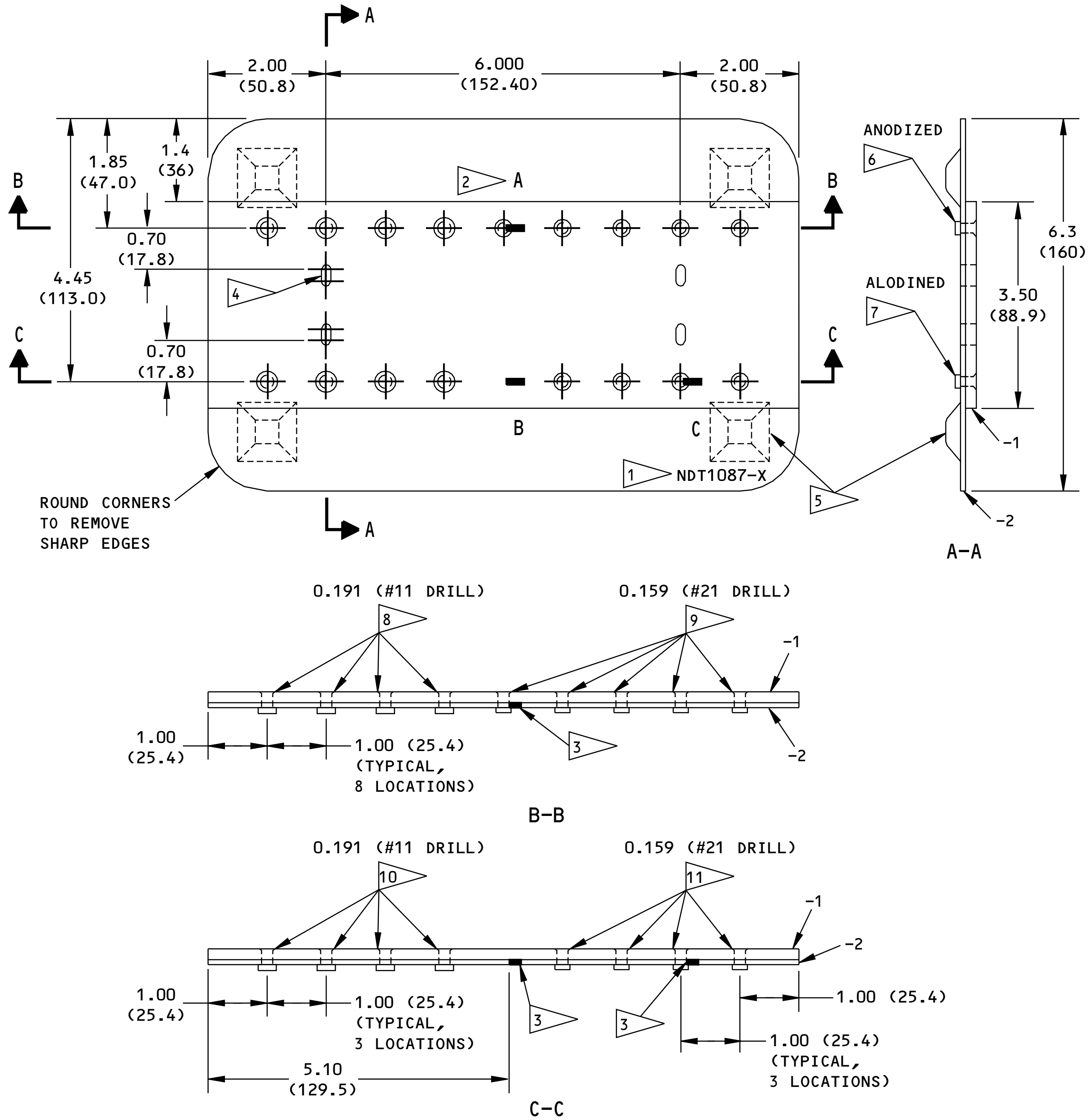
Typical Inspection Areas - External Inspection
Figure 1



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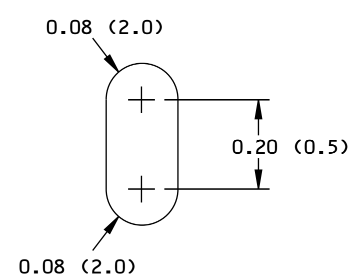
Reference Standard NDT1087-X
Figure 2 (Sheet 1 of 3)

REFERENCE STANDARD NUMBER	UPPER-1 SHEET THICKNESS	LOWER-2 SHEET THICKNESS	EDM NOTCH LENGTH	UPPER (ANODIZED) RIVET ROW 6		LOWER (ALODINED) RIVET ROW 7	
				LEFT SIDE 8	RIGHT SIDE 9	LEFT SIDE 10	RIGHT SIDE 11
NDT1087-1	0.050 (1.27)	0.040 (1.00)	0.200 (5.00)	***6D5 (SEE TABLE 2)	***5D4 (SEE TABLE 2)	BACR15GF6D5	BACR15GF5D4
NDT1087-2	0.071 (1.80)	0.040 (1.00)	0.200 (5.00)	***6D5 (SEE TABLE 2)	***5D5 (SEE TABLE 2)	BACR15GF6D5	BACR15GF5D5
NDT1087-3	0.080 (2.00)	0.040 (1.00)	0.180 (4.57)	***6D5 (SEE TABLE 2)	***5D5 (SEE TABLE 2)	BACR15GF6D5	BACR15GF5D5
NDT1087-4	0.090 (2.29)	0.040 (1.00)	0.200 (5.00)	***6D5 (SEE TABLE 2)	***5D5 (SEE TABLE 2)	BACR15GF6D5	BACR15GF5D5
NDT1087-5	0.100 (2.54)	0.050 (1.27)	0.200 (5.00)	***6D6 (SEE TABLE 2)	***5D5 (SEE TABLE 2)	BACR15GF6D6	BACR15GF5D5
NDT1087-6	0.071 (1.80)	0.063 (1.60)	0.250 (6.35)	***6D6 (SEE TABLE 2)	***5D6 (SEE TABLE 2)	BACR15GF6D6	BACR15GF5D6
NDT1087-7	0.090 (2.29)	0.080 (2.00)	0.250 (6.35)	***6D6 (SEE TABLE 2)	***5D6 (SEE TABLE 2)	BACR15GF6D6	BACR15GF5D6
NDT1087-8	0.100 (2.54)	0.090 (2.29)	0.250 (6.35)	***6D6 (SEE TABLE 2)	***5D6 (SEE TABLE 2)	BACR15GF6D7	BACR15GF5D6

REFERENCE STANDARD DATA
TABLE 1

RIVET CODE	ALLFAST FASTENING SYSTEMS INC. PART NUMBER	SIERRA PACIFIC SUPPLY CO. PART NUMBER
***5D4	AF1049U1D5C4	NAS1097D5-4D
***5D5	AF1049U1D5C5	NAS1097D5-5D
***5D6	AF1049U1D5C6	NAS1097D5-6D
***6D5	AF1049U1D6C5	NAS1097D6-5D
***6D6	AF1049U1D6C6	NAS1097D6-6D
***6D7	AF1049U1D6C7	NAS1097D6-7D

ANODIZED FASTENER DATA
TABLE 2



VIEW A

2138785 S0000461166_V1

Reference Standard NDT1087-X
Figure 2 (Sheet 2 of 3)

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES (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

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE (SEE TABLE 1 FOR THE THICKNESS)

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT1087-X.

2 ETCH OR STEEL STAMP THE NOTCH LOCATIONS AS SHOWN.

3 EDM NOTCH ALONG FASTENER CENTERLINE (3 LOCATIONS)
MAXIMUM WIDTH: 0.007 (0.17)
DEPTH: THROUGH-THICKNESS
NOTCH LENGTH: SEE TABLE 1

4 SLOT FOR THE PROBE GUIDES (TYPICAL, 4 LOCATIONS) SEE VIEW A.

5 BOND 4 RUBBER FEET TO THE PART IN THE APPROXIMATE LOCATIONS SHOWN.

6 INSTALL ANODIZED RIVETS AS SPECIFIED IN PART 1, 51-01-04.

7 INSTALL ALODINED RIVETS AS FOLLOWS:
- SOLVENT CLEAN EACH RIVET AND RIVET HOLE BEFORE INSTALLATION
- COUNTERSINK DEPTH:
  0.033 (0.84) FOR 5/32 RIVETS +0.000/-0.002 (+0.00/-0.05).
  0.041 (1.04) FOR 6/32 RIVETS +0.000/-0.002 (+0.00/-0.05)
- MINIMUM BUTTON DIAMETER:
  0.230 (5.8) FOR 5/32 RIVETS
  0.276 (7.0) FOR 6/32 RIVETS
  0.368 (9.3) FOR 8/32 RIVETS
- ALL OTHER INSTALLATION DATA AS SPECIFIED IN PART 1, 51-01-04

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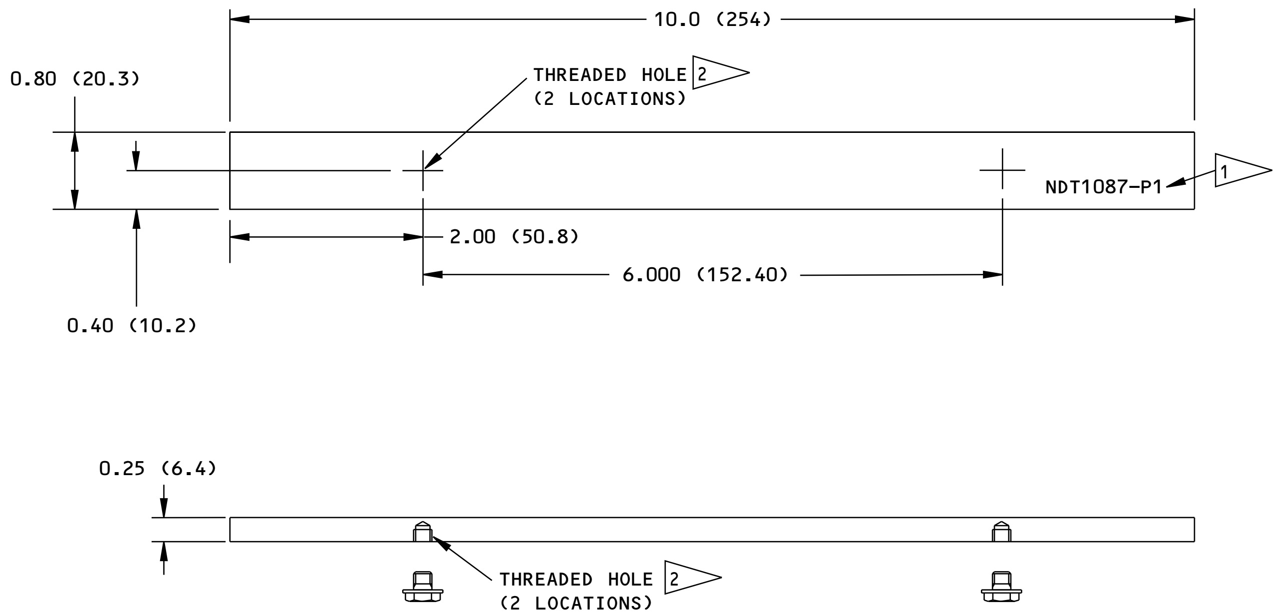
Reference Standard NDT1087-X
Figure 2 (Sheet 3 of 3)



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES (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

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL: PLEXIGLASS OR PLASTIC MATERIAL THAT IS ALMOST THE SAME AS PLEXIGLASS
- MAKE TWO PROBE GUIDES FOR EACH REFERENCE STANDARD

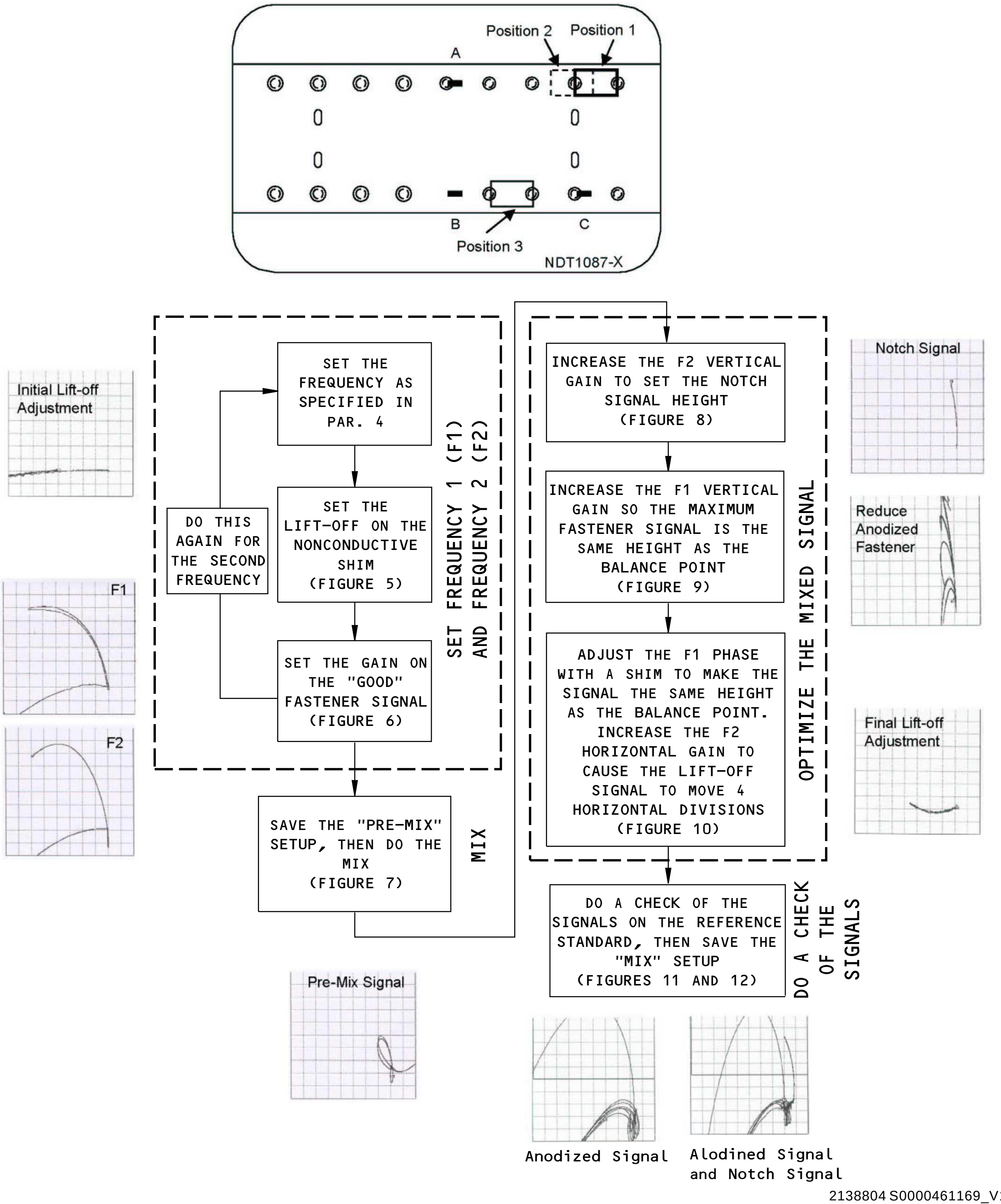
1 ETCH THE PROBE GUIDE NUMBER NDT1087-P1 IN THE LOCATION SHOWN

2 DRILL AND TAP A HOLE FOR 8-32 THUMBSCREWS (OR METRIC EQUIVALENT)

- HOLE DEPTH: 0.18 (4.7)
- THE SCREW GRIP LENGTH MUST MATCH THE REFERENCE STANDARD THICKNESS
- THE SCREW SHANK DIAMETER MUST MATCH THE REFERENCE STANDARD SLOT WIDTH

2138800 S0000461168_V1

Probe Guide NDT1087-P1
Figure 3

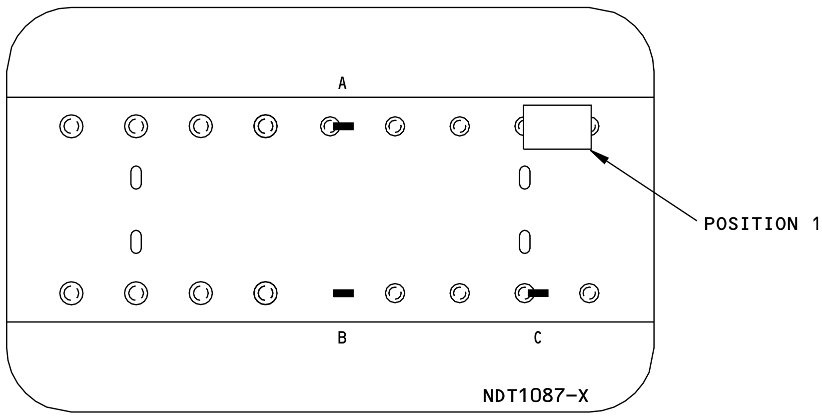


Calibration Flow Chart
Figure 4

DO THE LIFT-OFF CALIBRATION FOR FREQUENCY 1 AND FREQUENCY 2:

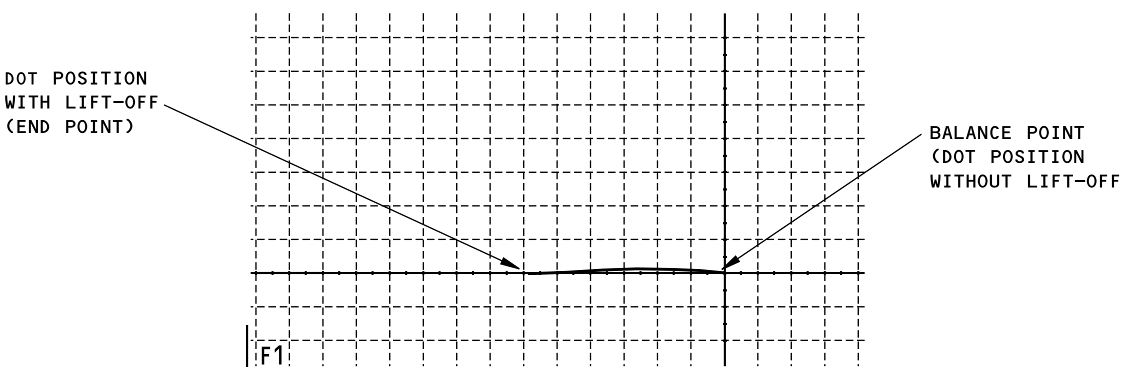
1. SET YOUR INSTRUMENT TO VIEW THE DISPLAY FOR FREQUENCY 1. MAKE SURE THE HORIZONTAL AND VERTICAL GAINS ARE EQUAL OR THE X:Y RATIOS ARE AT 0.0 dB.
2. PUT THE PROBE AT POSITION 1 ON THE APPLICABLE REFERENCE STANDARD AND BALANCE THE INSTRUMENT. SEE VIEW A.

   NOTE: ALWAYS BALANCE THE INSTRUMENT WHEN THE PROBE IS CENTERED BETWEEN FASTENERS. DO NOT BALANCE THE INSTRUMENT ON THE DOWNSCALE "DIP" THAT OCCURS NEAR EACH FASTENER AT SOME FREQUENCIES. SEE FIGURE 6, VIEW C. IT IS RECOMMENDED TO MARK THE LOCATION WHERE THE PROBE IS CENTERED AT THE CORRECT POSITION ON THE REFERENCE STANDARD.



PROBE POSITION TO BALANCE THE INSTRUMENT AND
DO THE LIFT-OFF ADJUSTMENT
VIEW A

3. SET THE BALANCE POINT. USE THE POSITION CONTROLS TO SET THE GRATICULE LOCATION APPROXIMATELY 30% OF FULL SCREEN HEIGHT AND 80% OF FULL SCREEN WIDTH. SEE VIEW B.



F1 LIFT-OFF SET POINT (F2 SET POINT
IS ALMOST THE SAME)
VIEW B

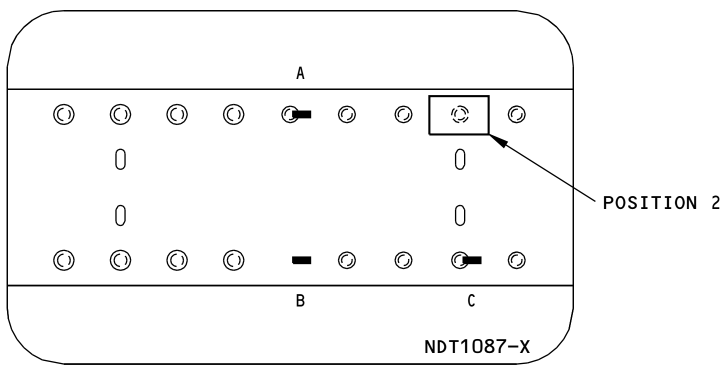
4. PUT A 0.024 TO 0.032 INCH (0.61 TO 0.81 MM) NONCONDUCTIVE SHIM UNDER THE PROBE AT POSITION 1. TWO BUSINESS CARDS CAN BE USED AS SHIMS.
5. ADJUST THE PHASE AND GAIN CONTROLS UNTIL THE SIGNALS WITH AND WITHOUT THE SHIMS ARE THE SAME SCREEN HEIGHT AND WIDTH (APPROXIMATELY 6 HORIZONTAL DIVISIONS TO THE LEFT). SEE VIEW B.
6. DO STEPS 1 THRU 5 FOR FREQUENCY 2.

2138807 S0000461170_V1

Lift-Off Calibration for Frequency 1 and Frequency 2
Figure 5

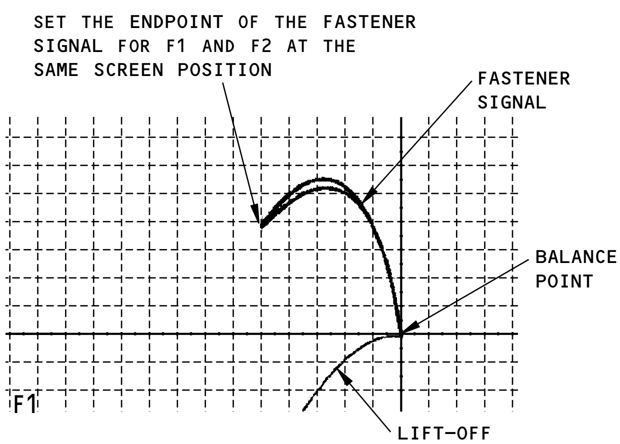
DO THE GAIN ADJUSTMENT FOR FREQUENCY 1 (F1) AND FREQUENCY 2 (F2):

1. SET THE INSTRUMENT TO FREQUENCY 1
2. MOVE THE PROBE ABOVE A "GOOD" FASTENER AT POSITION 2. SEE VIEW A. ADJUST THE PROBE POSITION UNTIL THE SIGNAL IS AT ITS MAXIMUM LENGTH.

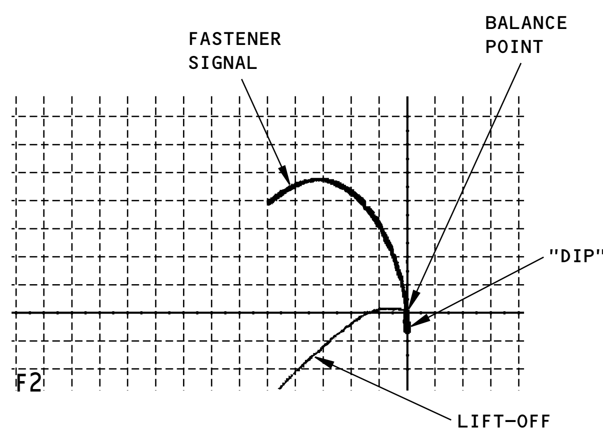


PROBE POSITION FOR FREQUENCY 1 AND FREQUENCY 2 GAIN ADJUSTMENT
VIEW A

3. ADJUST THE GAIN CONTROLS (AND THE X:Y RATIOS, IF APPLICABLE) TO SET THE END POINT OF THE SIGNAL AT 4 VERTICAL DIVISIONS AND 5 HORIZONTAL DIVISIONS FROM THE BALANCE POINT. SEE VIEW B FOR FREQUENCY 1 AND VIEW C FOR FREQUENCY 2.



F1 CALIBRATION SCREEN DISPLAY
VIEW B



F2 CALIBRATION SCREEN DISPLAY
VIEW C

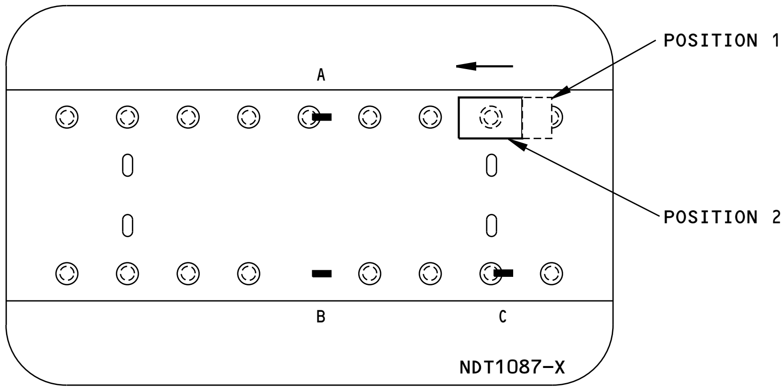
4. SET THE INSTRUMENT TO FREQUENCY 2 AND DO STEPS 1 THRU 3.
5. SAVE THE PRE-MIX SET-UP IN THE INSTRUMENT MEMORY WHEN YOU HAVE SET THE CALIBRATION GAINS FOR FREQUENCY 1 AND FREQUENCY 2. WE RECOMMEND YOU DO THIS SO THAT YOU WILL NOT HAVE TO DO THIS PROCEDURE AGAIN IF YOUR SIGNALS ARE NOT SUFFICIENT AFTER YOU HAVE DONE THE OPTIMIZATION PROCEDURE OF FIGURES 8 THRU 12.

2138809 S0000461171_V1

Gain Adjustment for Frequency 1 and Frequency 2
Figure 6

DO A CHECK OF THE MIXED SIGNAL FROM FREQUENCY 1 AND FREQUENCY 2:

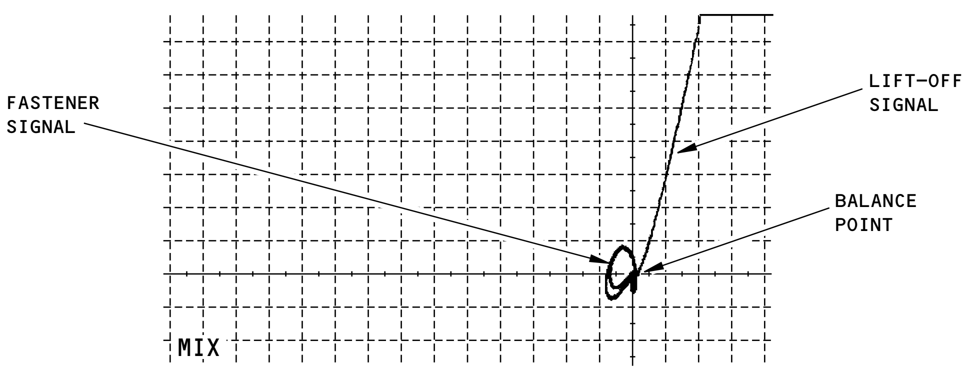
1. CHANGE THE INSTRUMENT DISPLAY TO VIEW THE "MIX" SIGNAL ("F1-F2" OR "SUM" ON SOME INSTRUMENTS).
2. PUT THE PROBE AT POSITION 1 (VIEW A) AND BALANCE THE INSTRUMENT.
3. GET THE LIFT-OFF SIGNAL TO SHOW ON THE SCREEN DISPLAY AND MOVE THE PROBE ACROSS THE "GOOD" FASTENER AT POSITION 2 (SEE VIEW A). THE SIGNALS MUST LOOK ALMOST THE SAME AS THE SIGNAL SHOWN IN VIEW B. THE PHASE ANGLE OF THE LIFT-OFF SIGNAL IS NOT CRITICAL, BUT IT MUST MOVE TO THE RIGHT.



PROBE POSITION TO DO A CHECK OF THE MIXED SIGNAL
VIEW A

NOTE: THE CORRECT FREQUENCY MIX FOR THIS PROCEDURE IS F2-F1.
SOME INSTRUMENTS, LIKE THE NDT 19E OR NORTEC 2000D USE F1-F2 FOR THE MIX. YOU MUST ADD 180 DEGREES TO THE PHASE VALUES OF FREQUENCY 1 AND FREQUENCY 2 TO GET THE CORRECT MIX SIGNAL.

4. KEEP THE INSTRUMENT DISPLAY IN THE "MIX" MODE WHEN YOU CALIBRATE THE INSTRUMENT IN THE FIGURES THAT FOLLOW.



MIX DISPLAY SIGNAL
VIEW B

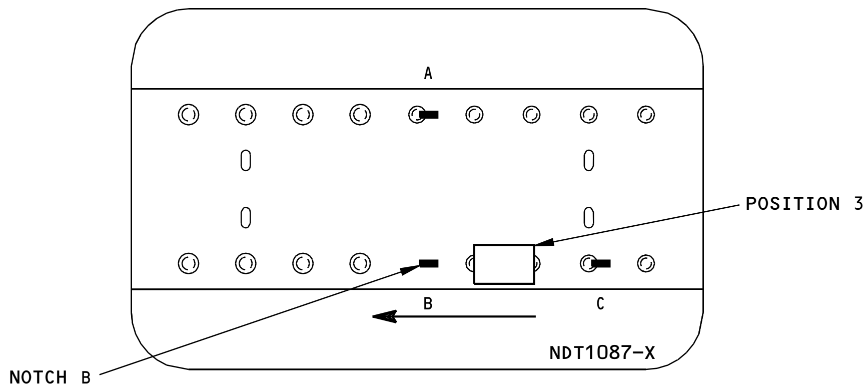
NOTE: THE FASTENER SIGNAL CAN BE LARGER WITH SOME INSTRUMENTS AND THE LIFT-OFF SIGNAL ANGLE CAN BE DIFFERENT, BUT THE INSTRUMENT CAN STILL BE CALIBRATED WITH THIS PROCEDURE

2138814 S0000461172_V1

Mix Display Signal
Figure 7

ADJUST THE MIXED SIGNAL AMPLITUDE FOR THE EDM NOTCH B SIGNAL

1. PUT THE PROBE AT POSITION 3 ON THE APPLICABLE REFERENCE STANDARD AND BALANCE THE INSTRUMENT. SEE VIEW A.

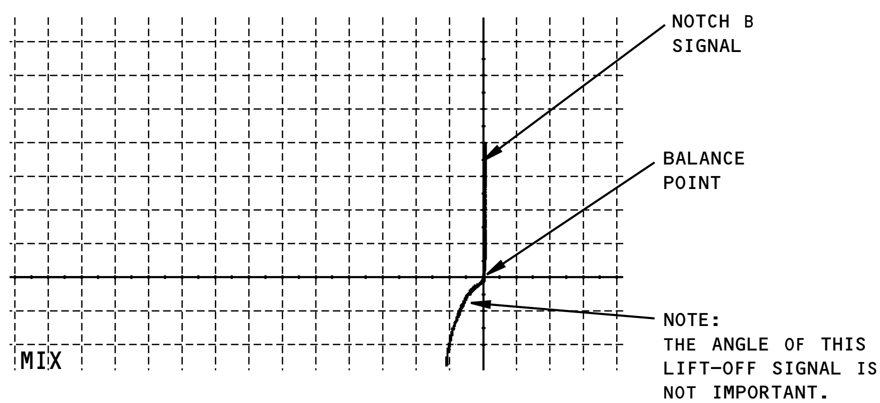


PROBE POSITION FOR INITIAL NOTCH B SIGNAL HEIGHT ADJUSTMENT
VIEW A

2. PUT THE PROBE AT NOTCH B AND MAXIMIZE THE SIGNAL.
3. HOLD THE PROBE AT THE LOCATION WHERE THE SIGNAL FROM NOTCH B IS AT ITS MAXIMUM SCREEN HEIGHT.
4. ADJUST THE FREQUENCY 2 VERTICAL GAIN WHILE YOU MONITOR THE "MIX" SIGNAL UNTIL THE NOTCH SIGNAL IS 4 SCREEN DIVISIONS ABOVE THE BALANCE POINT ON THE SCREEN. SEE VIEW B.

   NOTE: FOR INSTRUMENTS WITHOUT SEPARATE HORIZONTAL AND VERTICAL GAIN CONTROLS (LIKE THE HOCKING 2200) INCREASE THE FREQUENCY 2 GAIN.

5. TURN THE PROBE 180 DEGREES AND DO A CHECK OF THE NOTCH SIGNAL. IF IT IS LOWER THAN BEFORE, ADJUST THE GAIN AGAIN TO GET THE SIGNAL UP TO 4 SCREEN DIVISIONS.



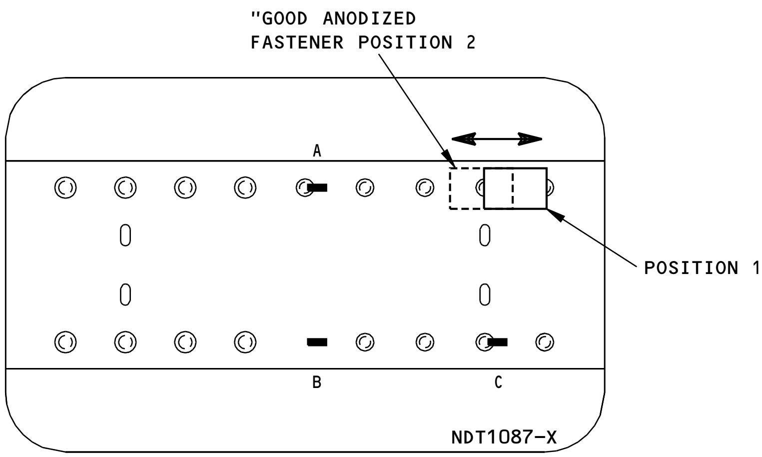
SIGNAL FROM NOTCH B
VIEW B

2138837 S0000461173_V1

Mixed Signal Optimization - Adjustment of Notch B Signal Height
Figure 8

ADJUST THE MIXED SIGNAL TO DECREASE THE FASTENER SIGNAL:

1. PUT THE PROBE AT POSITION 1 ON THE APPLICABLE REFERENCE STANDARD AND BALANCE THE INSTRUMENT. SEE VIEW A.



PROBE POSITION FOR FASTENER SIGNAL SUPPRESSION
VIEW A

2. MOVE THE PROBE ACROSS A "GOOD" ANODIZED FASTENER AND MONITOR THE SIGNAL.

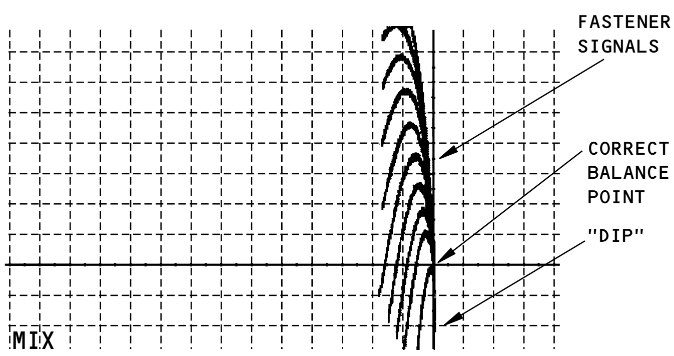
   NOTE: THE SIGNAL CAN MOVE ABOVE THE TOP OF THE SCREEN

3. HOLD THE PROBE AT THE LOCATION WHERE THE FASTENER SIGNAL IS AT THE MAXIMUM SCREEN HEIGHT (OR OFF THE SCREEN).

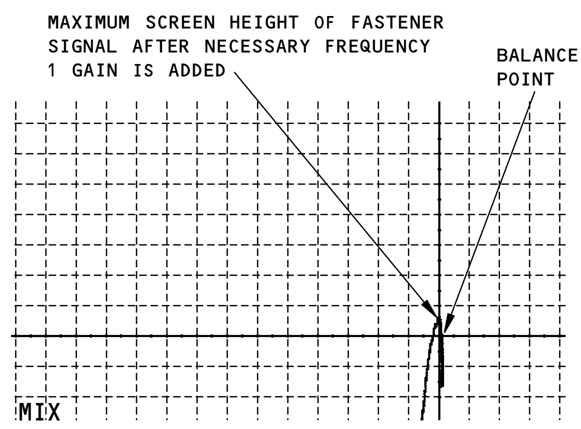
4. INCREASE THE FREQUENCY 1 VERTICAL GAIN IN 1 DB INCREMENTS WHILE YOU MONITOR THE "MIX" DISPLAY UNTIL THE MAXIMUM ANODIZED FASTENER SIGNAL BEGINS TO DECREASE TOWARD THE BALANCE POINT. SEE VIEW B.

5. MOVE THE PROBE BACK AND THEN ACROSS THE "GOOD" FASTENER AGAIN.

6. CONTINUE TO DO STEP 5 AND INCREASE THE FREQUENCY 1 VERTICAL GAIN OR CH. 1 GAIN UNTIL THE MAXIMUM SIGNAL FROM A "GOOD" ANODIZED FASTENER IS WITHIN 1 VERTICAL DIVISION FROM THE BALANCE POINT. SEE VIEW C.



FASTENER SIGNAL DISPLAY AS THE GAIN
IS INCREASED
VIEW B



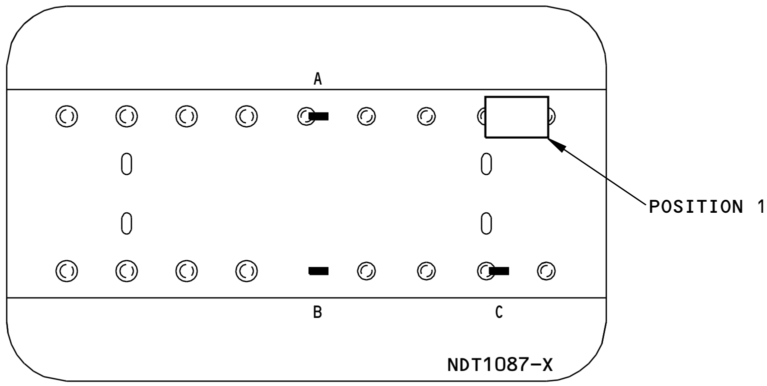
FINAL FASTENER SIGNAL
VIEW C

2138923 S0000461174_V1

Mixed Signal Optimization - Suppression of the Fastener Signal
Figure 9

ADJUST THE LIFT-OFF SIGNAL:

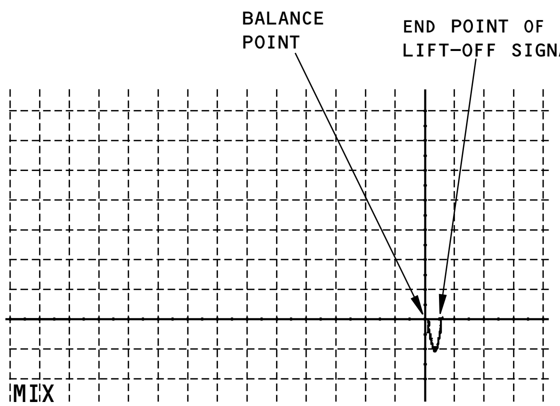
1. PUT THE PROBE AT POSITION 1 ON THE APPLICABLE REFERENCE STANDARD AND BALANCE THE INSTRUMENT. SEE VIEW A.



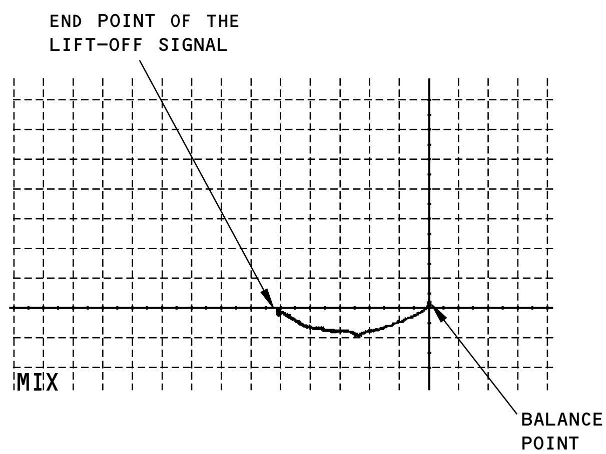
PROBE POSITION FOR THE FINAL LIFT-OFF ADJUSTMENT
VIEW A

2. PUT A 0.012 TO 0.016 INCH (0.30 TO 0.41 MM) NONCONDUCTIVE SHIM UNDER THE PROBE AT POSITION 1. A BUSINESS CARD CAN BE USED AS A SHIM. KEEP THE BUSINESS CARD UNDER THE PROBE TO CAUSE THE LIFT-OFF SIGNAL. DO NOT BALANCE AGAIN WHEN YOU DO STEP 3 AND 4 BELOW.

3. ADJUST THE FREQUENCY 1 PHASE CONTROL WHILE YOU MONITOR THE "MIX" DISPLAY UNTIL THE END POINT OF THE LIFT-OFF SIGNAL IS AT THE SAME VERTICAL SCREEN HEIGHT AS THE BALANCE POINT. SEE VIEW B.



INITIAL LIFT-OFF SIGNAL SET POINT
VIEW B



FINAL LIFT-OFF SIGNAL SET POINT
VIEW C

NOTE: LIFT-OFF IS TO THE LEFT FOR ALL INSTRUMENTS BUT THE HOCKING 2200, FOR WHICH LIFT-OFF IS TO THE RIGHT

4. INCREASE THE FREQUENCY 2 HORIZONTAL GAIN WHILE YOU MONITOR THE "MIX" DISPLAY UNTIL THE END POINT OF THE LIFT-OFF SIGNAL MOVES ABOUT ONE QUARTER OF THE SCREEN WIDTH TO THE LEFT OF THE BALANCE POINT. SEE VIEW C.

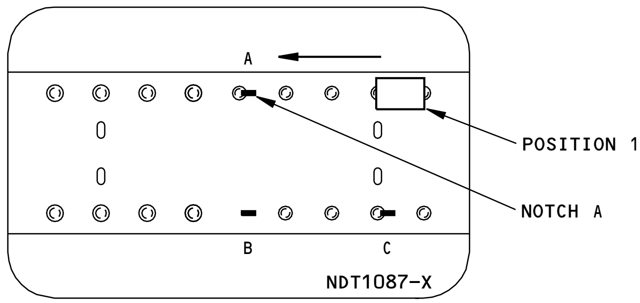
2138936 S0000461175_V1

Mixed Signal Optimization - Final Lift-Off Adjustment
Figure 10

FINAL SIGNAL CHECK ON THE REFERENCE STANDARD FOR ANODIZED FASTENERS:

1. PUT THE PROBE AT POSITION 1 ON THE APPLICABLE REFERENCE STANDARD AND BALANCE THE INSTRUMENT. SEE VIEW A.

   NOTE: ALWAYS BALANCE THE INSTRUMENT WHEN THE PROBE IS CENTERED BETWEEN THE FASTENERS. DO NOT BALANCE THE INSTRUMENT ON THE DOWNSCALE "DIP" THAT OCCURS NEAR EACH FASTENER. SEE VIEW B.

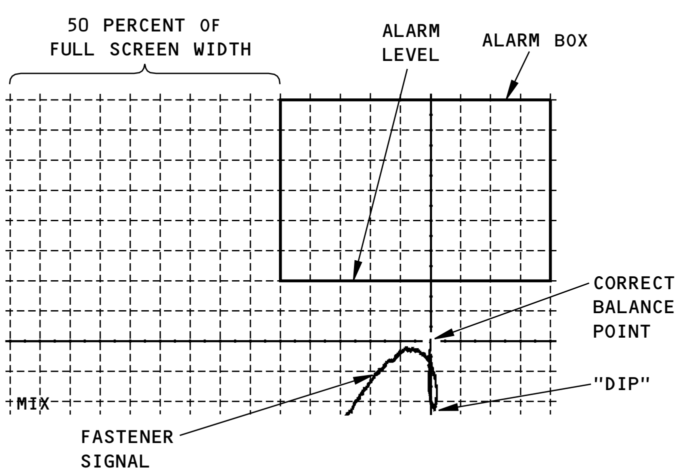


PROBE POSITION FOR AN ANODIZED FASTENER NOTCH SIGNAL
VIEW A

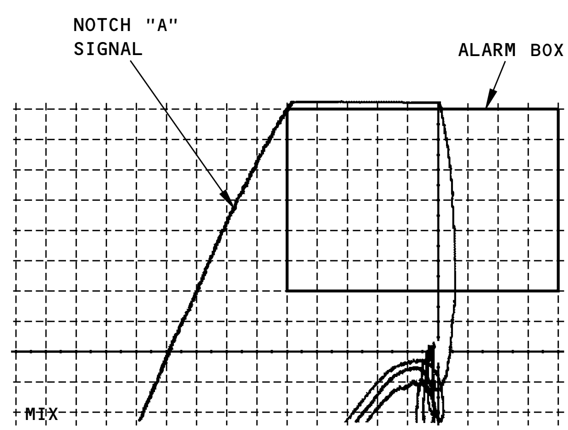
2. SET UP AN ALARM BOX AS SHOWN IN FIGURE 11, VIEW B, SO THAT IT ALARMS WHEN THE SIGNAL IS 2 SCREEN DIVISIONS ABOVE THE BALANCE POINT. SET THE LEFT SIDE OF THE ALARM BOX AT 50% OF FULL SCREEN WIDTH.

3. MOVE THE PROBE ALONG THE UPPER ROW OF FASTENERS IN THE REFERENCE STANDARD, ACROSS NOTCH A, AND MONITOR THE SIGNAL FROM THE NOTCH. IT IS POSSIBLE THAT THE NOTCH "A" SIGNAL WILL NOT GO OFF THE SCREEN DISPLAY, AS SHOWN IN VIEW C, FOR SOME INSTRUMENTS.

NOTE: IT IS POSSIBLE THAT THE END POINT SIGNAL OF A GOOD FASTENER CAN OCCUR ON THE LEFT SIDE OF THE SCREEN DISPLAY. SIGNALS FROM CRACKS ALWAYS BEGIN OR END ON THE BALANCE POINT.



CORRECT BALANCE POINT AND "DIP"
VIEW B



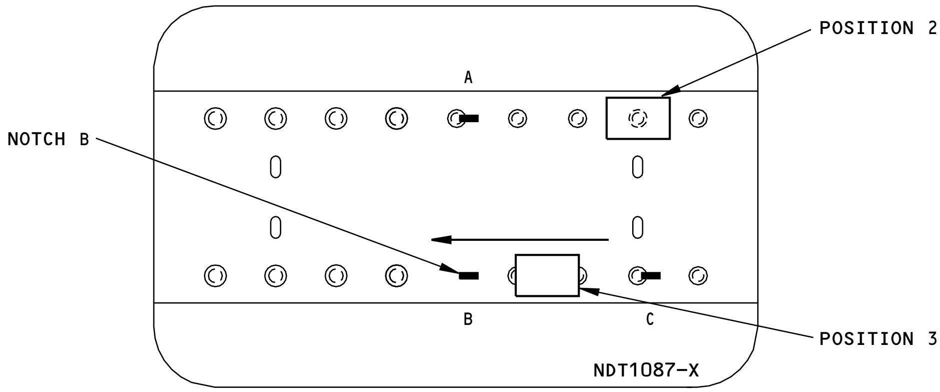
NOTCH "A" SIGNAL AT THE
ANODIZED FASTENER
VIEW C

2138967 S0000461176_V1

Signal Check on the Reference Standard - Anodized Fasteners
Figure 11

FINAL SIGNAL CHECK ON THE REFERENCE STANDARD FOR ALODINED FASTENERS:

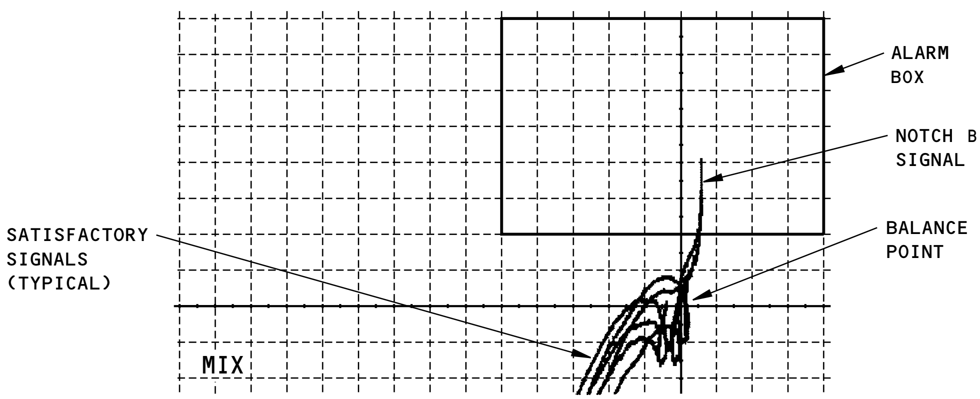
1. PUT THE PROBE AT POSITION 3 ON THE APPLICABLE REFERENCE STANDARD AND BALANCE THE INSTRUMENT. SEE VIEW A



PROBE POSITION FOR AN ALODINED FASTENER NOTCH SIGNAL
VIEW A

2. MOVE THE PROBE ALONG THE LOWER ROW OF FASTENERS IN THE REFERENCE STANDARD, ACROSS NOTCH B, AND MONITOR THE SIGNAL FROM THE NOTCH. THE SIGNAL FROM NOTCH B MUST BE ALMOST THE SAME AS THE SIGNAL SHOWN IN VIEW B.

3. IF THE NOTCH "B" SIGNAL IS NOT 4 DIVISIONS ABOVE THE BALANCE POINT, THEN:
   - (a) PUT THE PROBE AT POSITION 3 AND BALANCE THE INSTRUMENT. MOVE THE PROBE ABOVE NOTCH "B" AND MAXIMIZE THE NOTCH SIGNAL. ADJUST THE FREQUENCY 2 VERTICAL GAIN UNTIL THE SIGNAL NOTCH B SIGNAL IS 4 VERTICAL DIVISIONS ABOVE THE BALANCE POINT.
   - (b) PUT THE PROBE AT POSITION 2 AND INCREASE THE FREQUENCY 1 VERTICAL GAIN UNTIL THE MAXIMUM ANODIZED FASTENER SIGNAL IS WITHIN 1 VERTICAL DIVISION FROM THE BALANCE POINT.



ALODINED FASTENER NOTCH B SIGNALS
VIEW B

4. AS A FINAL CHECK, MONITOR THE SIGNAL FROM NOTCH C. THIS NOTCH CAN GIVE DIFFERENT SIGNALS THAT ARE RELATED TO THE INSTALLATION FIT OF THE FASTENER IN YOUR REFERENCE STANDARD. THIS NOTCH SIGNAL IS FOR REFERENCE ONLY. DO NOT USE THIS NOTCH SIGNAL FOR CALIBRATION.

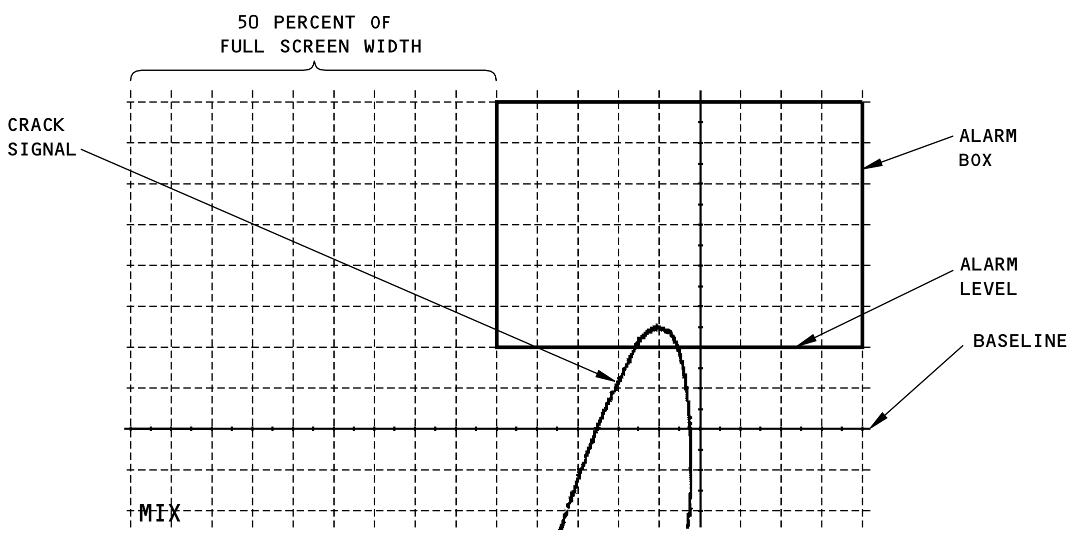
5. SAVE YOUR FINAL CALIBRATION IN THE INSTRUMENT MEMORY.

2138980 S0000461177_V2

Signal Check on the Reference Standard - Alodined Fasteners
Figure 12

SIGNALS AT TEAR STRAP LOCATIONS THAT ARE HIGHER THAN THE BASELINE (AS SHOWN IN VIEW A) ARE POSSIBLE CRACKS. TO EXAMINE THESE SIGNALS, DO THE STEPS THAT FOLLOW:

1. BALANCE YOUR INSTRUMENT ABOVE THE TEAR STRAP ON THE UPPER FASTENER ROW AS SPECIFIED IN PAR. 5
2. EXAMINE THE LOWER ROW OF FASTENERS THAT GO THROUGH THE TEAR STRAP.
3. MAKE A RECORD OF A SIGNAL THAT IS HIGHER THAN THE ALARM LEVEL SET IN PAR. 4. THESE SIGNALS ARE CRACK INDICATIONS.



SCREEN DISPLAY OF A CRACK SIGNAL AT A TEAR STRAP LOCATION
VIEW A

NOTE: THIS IS AN EXAMPLE OF A CRACK SIGNAL AT A TEAR STRAP LOCATION IF YOU DO NOT BALANCE THE INSTRUMENT AT A TEAR STRAP LOCATION. THE BALANCE POINT IS OFF THE BOTTOM OF THE SCREEN DISPLAY.

2138999 S0000461178_V1

Crack Signals at a Tear Strap Location
Figure 13

PHASEC 2D

1. Press “Menu” button.
2. Set mode to Normal Dual.
3. Set Drive dB to +8
4. Set probe inductance to 82 (LOAD MH = 82)
5. Set probe1 and probe2 to “reflection”.
6. Set Filter1 and Filter2 to “BP LOCK”
7. Set HP/LP1 and HP/LP2 to DC/50.0.
8. Set input gains for frequency 1 and frequency 2 to “high”
9. Set GAINMIX to “0.0/0.0”
10. Set PHASEMIX to “0.0”
11. Set DISPLAY to “Spot”
12. Set Graticule to Grid 2 (fine graticules)
13. Set View to “Frequency 1”
14. Set SPOT XY to 138/-19
15. Set View to “Frequency 2”
16. Set SPOT XY to 138/-19
17. Set View to “mix”
18. Set SPOT XY to 138/-19
19. Set Active to Mix
20. Set Shape to Box
21. Set Top/Btm to 69/19
22. Set Lft/Rght to -50/39
23. Set persistence to permanent

PHASE 2D INITIAL INSTRUMENT ADJUSTMENT

2138985 S0000461180_V1

Equipment Initial Adjustments
Figure 14 (Sheet 1 of 8)

PHASEC 2200

1. Press Menu button
2. Set probe to “Standard”
3. Set probe drive to “+10dB”
4. Set graticule to “Rect. C” (8 divisions vertically, 16 horizontally)
5. Press Menu again to enter operating mode
6. Select Mode at bottom of display.
7. Set <mode> to “Refl 2 Ch”
8. Set Display to “XY”
9. Set persistence to “Permn’t”
10. Set View to “Ch1”
11. Select Input function
12. Set Hi-Pass to “DC”
13. Set Lo-Pass to “50 Hz”
14. Set Inp. Gain to “0dB”
15. Select “PosXY” function
16. Set X-pos 1 at “+60”
17. Set Y-pos 1 at “-38”. Balanced dot should now lie on a graticule point two vertical divisions from the bottom of the screen and four horizontal divisions from the right edge.
18. Set the Mode to “Sum View” and select sum to set the values in step 19 and 20 below.
19. View “SUM”
20. Set SUM GAIN to 0.0dB.
21. Set SUM PHASE to 180 degrees

NOTE: The Phasec 2200 does not have independent vertical and horizontal gains. When the procedure specifies a horizontal or vertical gain adjustment, use the gain control for the applicable channel and the x:y ratio

NOTE: When you make the final lift-off adjustment as specified in Figure 10 with the Phasec 2200, the lift-off signal goes to the right. Decrease the frequency 2 “X” value in the X:Y mode (example -10 to -4 dB) until the lift-off signal moves to the **right** a similar but opposite distance from the balance point as shown in Figure 10, View C.

PHASE 2200 INITIAL INSTRUMENT ADJUSTMENT

2138987 S0000461181_V1

Equipment Initial Adjustments
Figure 14 (Sheet 2 of 8)

NORTEC 2000D, 2000D+ AND WORKSTATION

1) Push the Set-up button

2) Set the frequency mode to Dual Freq and the probe drive to high. Use the up-arrows and the smart knob to adjust the correct values.

3) Push the Display/Alarm button.

4) Highlight the dual function with the soft key. (Use the right up-arrow.)

5) Make sure that A/G tracking is set to off. Adjust it with the smart knob.

6) If available, make sure the auto mix function is set to off. Adjust with the smart knob.

7) Push the Display/Alarm button, then the dual soft key on the right side of the screen. Set the value to display F1 (frequency 1) with the smart knob.

   a) Set up an alarm box as shown in Figure 11, View B, so that it alarms when the signal is 2 screen divisions above the balance point.

8) Push the Main/filter button until the LP filter function shows on the top, right of the display. Use the smart knob to set 50 Hz. Set the high pass filter to "off"

9) Push the Main/filter button until the "FREQ" appears in the lower left of the display (this causes frequency 1 to be displayed). Make the necessary adjustments to frequency 1 as specified in the procedure.

10) Push the Main/filter button again to select FREQ 2 (frequency 2)

    NOTE: You must push Display, then Dual (right up arrow) and use the smart knob to set the display to F2 (frequency 2) or you will not be able to see the adjustments you make on the screen.

11) To see the mix mode, push Display/alarm, then dual soft key and use the smart knob to set the display to F1-F2. The display does not show a label that tells what signal is displayed on the screen. You must push Display, then dual, and monitor the upper right side of the screen to make sure that the correct display is shown on the screen.

12) You must add 180 degrees to the phase of channel 1 and channel 2 to cause the correct upscale signal.

NORTEC 2000D, 2000D+, AND WORKSTATION INITIAL INSTRUMENT ADJUSTMENT

2138990 S0000461182_V1

Equipment Initial Adjustments
Figure 14 (Sheet 3 of 8)

NOTE: The correct frequency mix for this procedure is F2 – F1

The mixed notch signal will move downscale for the Nortec (Staveley) instruments because the instruments use F1 – F2 to do the mix. To change the display to F2 – F1 you must add 180 degrees to the phase values for each frequency so that the notch signal moves upscale. If you add 180 degrees to a phase value and the result is more than 360, then subtract 360 degrees to get the correct phase value.

Examples: (1) Initial phase value is 280 degrees, 280 + 180 = 460,

460 – 360 = 100 degrees. Correct phase is 100 degrees

(2) Initial phase value is 30 degrees, 30 + 180 = 210,

less than 360 degrees. Correct phase is 210 degrees

13) Set the screen display to permanent persistence.

a) Set Persist to: Off

b) Set Display Erase to: Off

NORTEC 2000D, 2000D+, AND WORKSTATION INITIAL INSTRUMENT ADJUSTMENT (CONTINUED)

2138991 S0000461183_V1

Equipment Initial Adjustments
Figure 14 (Sheet 4 of 8)

ELOTEST M2V3

1) Adjust the parameters for channel 1 in the signal display mode as follows:
   a) With the F-key you can set the active channel.
   b) With the cursor Up and Down keys, you can set the parameter.
   c) With the + and - keys you can adjust all parameters to the necessary values:
      (1) Frequency: (11 kHz)
      (2) Preamplifier: 16 dB (Do not use the Auto-Preamp)
      (3) Total gain: 30,0 dB (This is the sum of Preamp+Mainamp+Y-Spread)
      (4) Spread Y: 0 dB
      (5) Phase: 355
      (6) Display: y/x low. rt.
      (7) Lowpass: 50 Hz
      (8) Amplitude: 100%
      (9) Attenuation: off
      (10) Additional Preamp: off

2) Adjust the parameters for channel 2 in the signal display mode as follows:
   a) With the F-key you can set the active channel.
   b) With the cursor Up and Down keys, you can set the parameter.
   c) With the + and - keys you can adjust all parameters to the necessary values:
      (1) Frequency: (2.7 kHz)
      (2) Total gain: 30,0 dB (This is the sum of Preamp+Mainamp+Y-Spread)
      (3) Spread Y: 0 dB
      (4) Phase: 58.5

      NOTE: The missing parameters Preamplifier, Display, Lowpass, Amplitude, Attenuation and Additional Preamp are already correctly set-up from channel 1.

ELOTEST M2V3 INITIAL INSTRUMENT ADJUSTMENT

2138992 S0000461184_V1

Equipment Initial Adjustments
Figure 14 (Sheet 5 of 8)

ELOTEST B 300

(1) Adjust the parameters for channel 1 in the Parameter Setup display mode as follows:

a) With the cursor Up and Down keys, you can set the parameter.

b) With the Smart knob or the cursor right (inc) and left (dec) keys you can adjust all parameters to the necessary values

(1) Frequency: 11 kHz

(2) Amplitude: 50%

(3) Preamplifier: 16 dB

(4) Mainamplifier: 18,5 dB

(5) Spread Y: 0 dB

(6) Phase: 358 °

(7) Lowpass: 50 HZ

(8) Highpass: off

(9) Dot Position Y: -59,4 %

(10) Dot Position X: 59,4 %

NOTE: When the Dot-Position X or Y is highlighted, you can call up pre-programmed Dot-Positions with the F1 key.

(2) Adjust the parameters for channel 2 in the Parameter Setup display mode as follows:

a) With the cursor Up and Down keys, you can set the parameter.

b) With the Smart knob or the cursor right (inc) and left (dec) keys you can adjust all parameters to the necessary values

(1) Frequency: 2.6 kHz

(2) Mainamplifier: 16,5 dB

(3) Phase: 358 °

NOTE: The missing parameters Amplitude, Preamplifier, Spread Y, Lowpass, Highpass, and Dot Positions X and Y, are already correctly set-up from channel 1.

ELOTEST B 300 INITIAL INSTRUMENT ADJUSTMENT

2138994 S0000461185_V1

Equipment Initial Adjustments
Figure 14 (Sheet 6 of 8)

TROUBLESHOOTING:

If you do not get the correct results, do the calibration again but refer to the items that follow that identify possible solutions.

1. The instrument in use does not have independent horizontal and vertical gain adjustments:

- Calibration on the anodized fasteners must be done so that the endpoints of the frequency 1 and frequency 2 signals move to the same vertical and horizontal position on the screen. For this adjustment, it is necessary to use independent horizontal and vertical gain controls or gain and X:Y ratio adjustments.
- If your instrument has a single gain control and an X:Y ratio adjustment, then:
    - To adjust the signal so the endpoint moves to the left, the "x" value must be changed from a larger to a smaller x value. For example, if you change the value from -10 dB to -4 dB, you will move the endpoint to the left. This is equivalent to an increase in the horizontal gain.

2. Mix Signal Does not look the same as Figure 7, View B

- Make sure the vertical and horizontal gains for each channel are equal (V:H ratio is 1:1) when you adjust the phase in Figure 5. If the lift-off signal moves upscale from the balance point, the mixed lift-off signal can move down and left. If you use a Nortec instrument, it is normal to get a downscale lift-off signal when the steps before the mix are done correctly. You must add 180 degrees of phase to each channel to move the lift-off signal to the right

- Monitor the F1 and F2 signals separately while you hold the probe at position 2 where you get the maximum signal from a good anodized fastener. The signals from frequency 1 and 2 must start from the same null point and end at the same screen position. If they do not, then adjust the signals so the endpoints occur at 4 vertical and 5 horizontal divisions from the balance point.

- Use an 0.012 inch (0.30 mm) shim (the thickness of a business card) when you set the lift-off in Figure 5. Adjust the phase control so that no part of the horizontal lift-off signal rises above the baseline.

- If the steps above do not correct the lift-off, do the calibration again.

TROUBLESHOOTING

2138996 S0000461186_V1

Equipment Initial Adjustments
Figure 14 (Sheet 7 of 8)

3. Signal From a Good Fastener Signal Gives a Large Upscale Signal:

- Make sure that the initial mix signal, shown in Figure 7, View B looks almost the same
- Adjust the Good fastener signal again
  - View the mix signal
  - Balance the probe at position 1. See Figure 9.
  - Move the probe above the Good fastener at position 2.
  - As you move the probe above the Good fastener so the signal amplitude is at its maximum, increase the Frequency 1 gain until the maximum signal (top of the signal arch) is within 1 vertical division of the balance point.
  - Do a check of the notch B signal. If it is not at least 4 vertical divisions from the balance point, then do the instructions in Figures 8 and 9 again.

4. Final Lift-off Signal Does Not Move to the Left:

- If you use a Phasec 2200:
  - The lift-off signal will move to the right when you calibrate the instrument with the instructions given in Figure 10.
  - It is acceptable for the lift-off signal to move to the right. The crack signal will still move upscale.
  - Adjust the channel 2 gain so that the lift-off signal moves to the right approximately 4 horizontal divisions.
  - Adjust the phase 1 control if the lift-off signal is not horizontal.
- For all other instruments specified in paragraph 2.B.(2):
  - Increase the Frequency 2 horizontal gain.

5. The Notch B signal is too high (much greater than 4 vertical divisions) after the final signal mix:

- Decrease the Frequency 2 vertical gain. Frequency 2 is the lower frequency and is most sensitive to the notch.

TROUBLESHOOTING

2139002 S0000461187_V1

Equipment Initial Adjustments
Figure 14 (Sheet 8 of 8)

PART 6 - EDDY CURRENT

FUSELAGE CRONW SKIN (HFEC)

1. **Purpose**

   A. To find cracks in the fuselage crown skin at all the stringer fasteners installed in the areas identified in Figure 1.

   B. 737 Supplemental Structural Inspection Document (D6-37089) Reference:

   (1) Item: F-39F

   (2) Item: F-39G

   (3) Item: F-39H

2. **Equipment**

   NOTE: Refer to Part 1, 51-01-00, for data about the equipment manufacturers.

   A. Use an eddy current instrument and probe combination that can be calibrated as specified in this procedure or you can use the MOI equipment and procedure specified in Part 6, 51-00-00, Procedure 15. The equipment specified below was used to help prepare this procedure.

   (1) Instrument - ED520; Magnaflux Corp. Refer to Part 6, 51-00-00, Procedure 4.

   (2) Probe - Shielded, right angle pencil probe per Part 6, 51-00-00, Procedure 4.

   (a) P/N MP 905-50B; NDT Product Engineering

   B. Reference Standard - Refer to Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 15 for reference standard data.

3. **Prepare for the Inspection**

   A. Remove the fin body fairing as necessary to get access.

   B. Clean the surfaces of the inspection areas.

4. **Instrument Calibration**

   A. Refer to Part 6, 51-00-00, Procedure 4 for the instrument and probe calibration instructions, or Part 6, 51-00-00, Procedure 15 for the MOI calibration instructions.

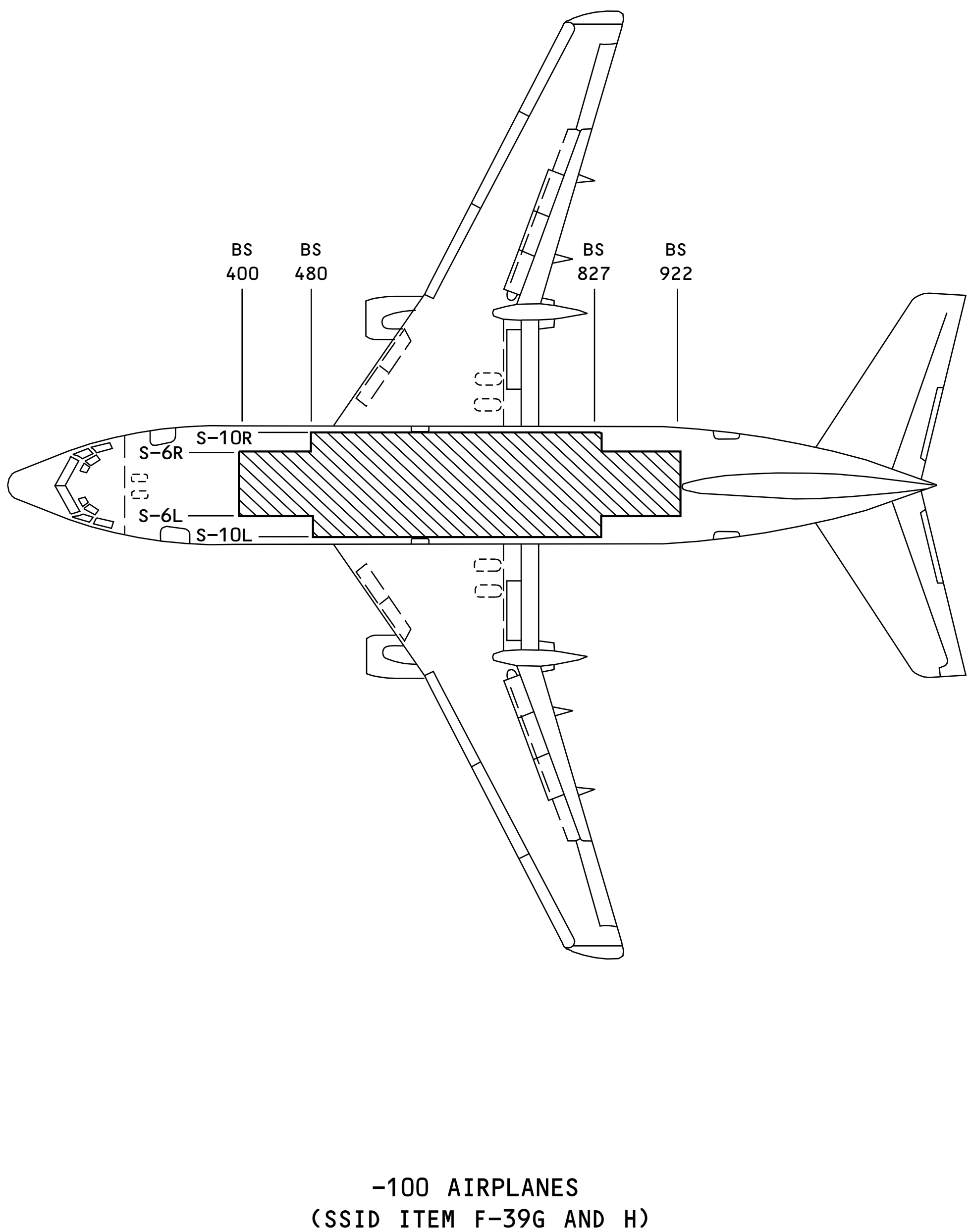
5. **Inspection Procedure**

   A. Examine the fuselage crown skin for cracks in the areas shown in Figure 1 as specified in Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 15.

6. **Inspection Results**

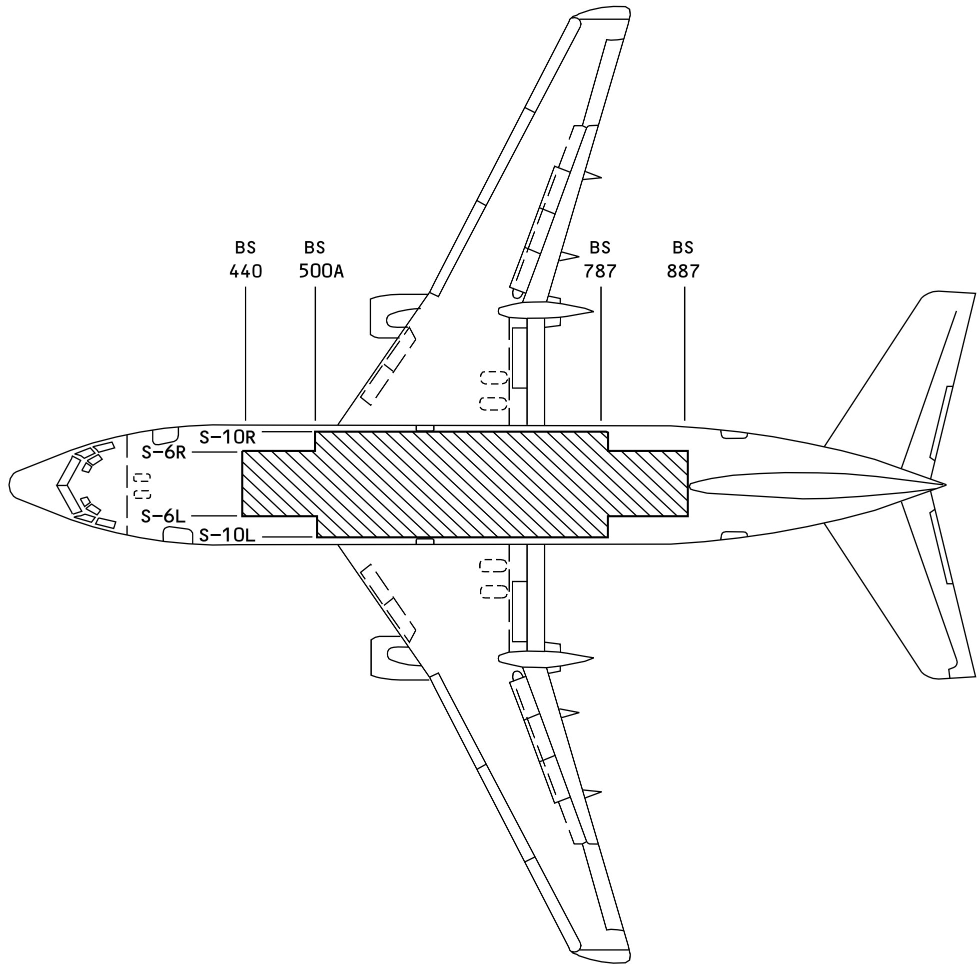
   A. A fast meter movement that occurs when the probe is moved a short distance is an indication of a possible crack. More inspections in these areas will be necessary.

   B. Refer to Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 15 for more inspection result data.



2161482 S0000472558_V1

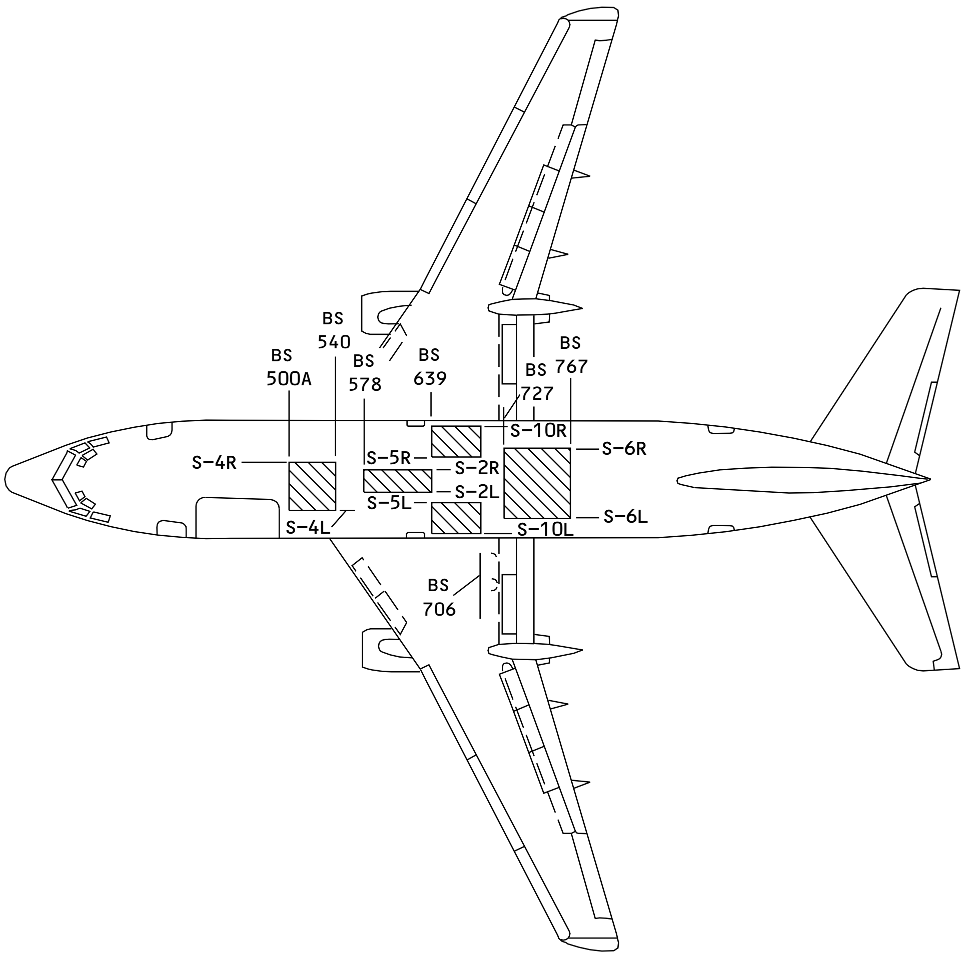
Fuselage Crown Skin Inspection Areas
Figure 1 (Sheet 1 of 3)



-200 AIRPLANES
(SSID ITEM F-39G AND H)

2161484 S0000472559_V1

Fuselage Crown Skin Inspection Areas
Figure 1 (Sheet 2 of 3)



2161485 S0000472560_V1

Fuselage Crown Skin Inspection Areas
Figure 1 (Sheet 3 of 3)

PART 6 - EDDY CURRENT

LONGITUDINAL LAP JOINTS - WITHOUT FASTENER REMOVAL

1. **Purpose**

   A. To find cracks in the critical (upper) row of fasteners of longitudinal skin lap joints using high frequency eddy current, without removal of fasteners.

   B. The cracks usually start on the inner surface of the outer skin at the edge of the countersink. From there they propagate out along the faying surface. See Figure 3 for an illustration of a typical crack. This inspection can find cracks 0.040 inch or longer beneath the countersunk fastener heads in skin of 0.036 inch and 0.040 inch thick.

   NOTE: (1) The procedures shown in Part 6, 53-30-05 can be used instead of this procedure. However, the repeat inspection interval may need to be modified.

   NOTE: (2) A procedure for use with fasteners removed is Part 6, 53-30-00, Procedure 1.

   C. Service Bulletin Reference: 737-53-1076, 737-53A1039

2. **Equipment**

   NOTE: Refer to Part 1, 51-01-00, for information on equipment manufacturers.

   A. Any eddy current instrument that can operate at 100 kHz and satisfy the performance requirements of this procedure may be used. The following equipment was used in the development of this procedure:

      (1) Magnatest ED-520; Magnaflux Corp.

      (2) MIZ-10A, MIZ-10B; Zetec Inc.

      (3) Locator UH; Hocking Instruments

   B. Probe -- Use one of the following or similar probe:

      (1) 0.125 inch diameter, 3 inch long shielded pencil probe, P/N MP-30; NDT Product Engineering

      (2) 0.187 inch diameter, 3 inch long unshielded pencil probe, P/N UP-30; NDT Product Engineering

      (3) Unshielded locator probe, P/N 29P101; Hocking Instruments

   C. Reference Standard -- Refer to Figure 1.

   D. Probe Guide -- Draftsman Circle Template. Refer to Figure 2.

3. **Prepare for the Inspection**

   A. Make sure the inspection area is clean.

   B. Locally remove thick paint as necessary only to find the rivet heads. Paint removal is not required to do the inspection.

4. **Instrument Calibration**

   A. Do the initial calibration. Refer to Part 6, 51-00-00, Procedure 4. Set Locator UH to inspect aluminum.

   B. If the area to be inspected is painted, put transparent tape, which is at least as thick as the paint, over the fastener heads in the reference standard.

   C. Put the probe guide on the reference standard.

D. Visually center one of the holes around the rivet head. Choose a hole that positions the pencil probe to scan the edge of the countersink. Refer to Figure 2. The hole chosen should give the best detection of the reference notch. Identify the hole selected on the probe guide.

E. With the probe guide held firmly in place, scan around the circumference of the rivet head. Monitor instrument response. The operator should be able to clearly identify between the sudden instrument response from the reference standard notch and the slow instrument response from an off center condition.

F. Set the instrument sensitivity to obtain a 30 to 60 percent of the full scale meter deflection when the probe is moved over the reference notch.

G. Recheck lift-off and sensitivity.

H. If the instrument has an alarm, set the alarm to respond to 50 percent of the reference standard notch signal amplitude.

5. Inspection Procedure

A. Identify the fastener location to be inspected.

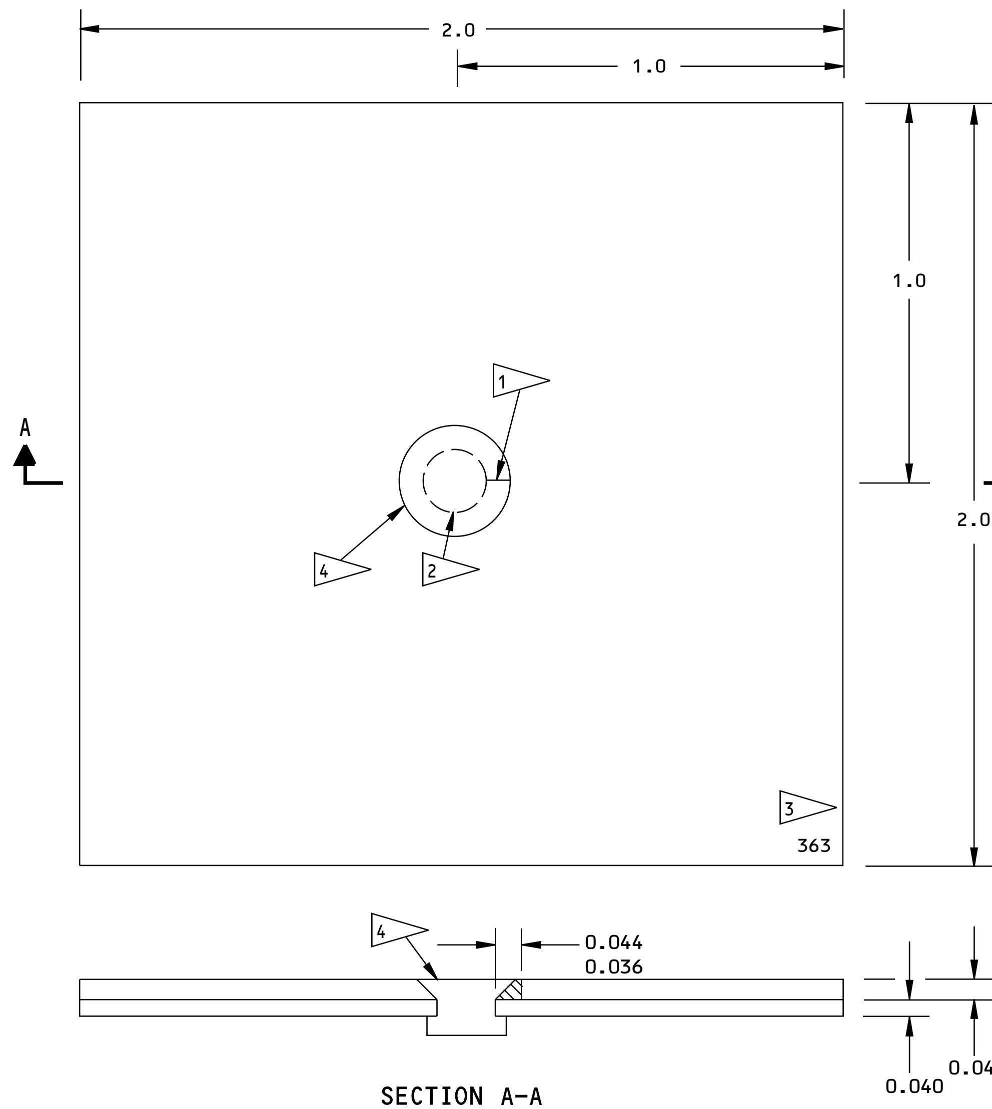
B. Center the probe guide hole from Paragraph 4.D. around the rivet head.

C. Scan around the head with the pencil probe while monitoring the eddy current instrument.

D. Identify on the fuselage any locations where a rapid meter deflection which is 50 percent or greater of the reference standard notch signal amplitude is obtained.

6. Inspection Results

A. Refer to Part 6, 51-00-00, Procedure 4.



NOTES

- ALL DIMENSIONS ARE IN INCHES
- MATERIAL: 2024-T3 OR T4 AL CLAD
- TOLERANCE: X.X ± 0.05
  X.XXX ± 0.005,
  EXCEPT AS NOTED

1 EDM NOTCH OR EQUIVALENT 0.003 TO 0.005 WIDE

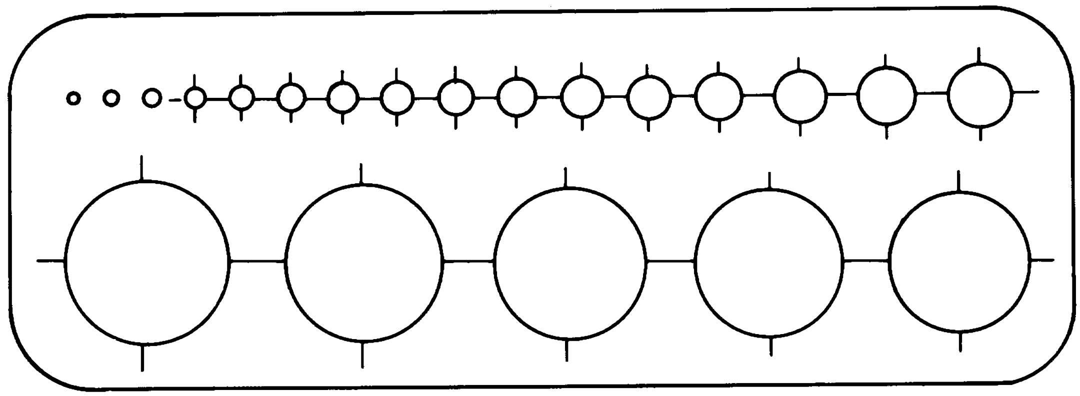
2 FOR 5/32 CRACK STANDARD DRILL NO. 20 (0.161 INCH DIA.) HOLE AND COUNTERSINK 100° TOP SHEET.

3 ETCH OR STEEL STAMP WITH 363

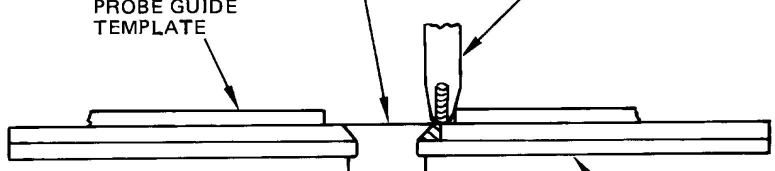
4 BACR15CE5D RIVET OR EQUIVALENT

2161486 S0000472562_V1

Reference Standard 363
Figure 1

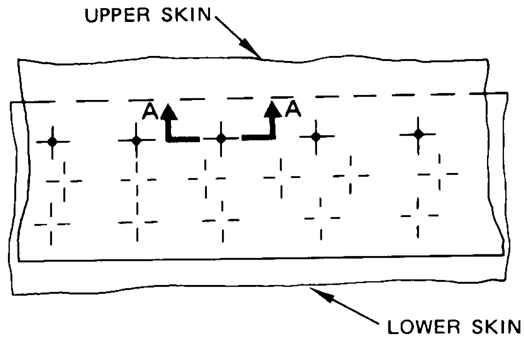


PROBE GUIDE
(DRAFTERS CIRCLE TEMPLATE)

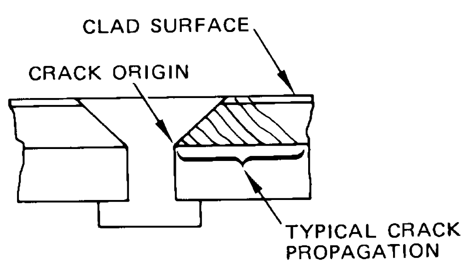


2161487 S0000472563_V1

Instrument Calibration
Figure 2



TYPICAL LAP JOINT



SECTION A–A

NOTES

- CRITICAL FASTENER ROW
- RIVET LOCATION (REF)

2161488 S0000472564_V1

Countersink in Longitudinal Lap Joints
Figure 3

PART 6 - EDDY CURRENT

RIVET EDGE DISTANCE FOR CHEM-MILL POCKETS

1. **Purpose**

   A. To determine the edge distances of fasteners adjacent to the edge of the chem-mill pockets, in the fuselage skin panel, between the stringers (Figure 3). This inspection applies to those pocket edges concealed by stringers whose fastener edge distances cannot be determined by visual inspection.

   B. Service Bulletin Reference: 737-53-1106, 737-53-1118

2. **Equipment**

   A. Any eddy current instrument and probe combination that satisfies the performance requirements of this procedure is suitable for this inspection. The following equipment was used to develop this procedure.

      (1) Instrument -- MIZ-10B; Zetec, Inc.

      (2) Probe -- ULS-40; NDT Product Engineering or any low-frequency, non-shielded-surface probe usable at 8 kHz and capable of detecting 0.022 inch of metal thinning from an overall thickness of 0.063 inch of aluminum.

      (3) Reference standard -- Refer to Figure 1. Reference Standard 356.

      (4) Tape -- Transparent tape 1.00 inch wide.

3. **Prepare for the Inspection**

   A. Identify the inspection area as defined by the applicable service bulletin.

   B. Clean inspection area and remove loose paint.

   C. If access is available, check along the stringer edges for metal chips, fasteners, nuts, washers, etc. and remove any foreign material. These materials can affect the eddy current results.

   D. Make a mark on the probe near the contact surface to identify its centerline location for marking the tape. Refer to Figure 2 for an example of a probe mark.

4. **Instrument Calibration**

   A. Do initial instrument adjustments.

      (1) Set the instrument frequency to 8 kHz.

      (2) Put the tape on the reference standard as shown (Figure 2).

      (3) Put probe on thick section of the reference standard (Figure 2, Position 1).

      (4) Balance instrument. Refer to manufacturer's instructions.

      (5) Adjust the lift-off to obtain less than 5 percent of the full scale needle movement when the probe is slid from a 0.005-0.010 inch (0.013-0.025 cm) non-conductive shim, placed on the tape, to the tape on the reference standard (Figure 2, Position 1).

      NOTE: One or two sheets of ordinary writing paper, approximately 0.003 inch (0.007 cm) thick each, can be used as the non-conductive shim.

      (6) Adjust the meter-needle-position control to get a baseline response of 20 percent of full scale (Figure 2).

   B. Sensitivity adjustment.

      (1) Put the probe on the thin section of the reference standard (Figure 2, Position 2).

(2) Adjust the sensitivity (gain control) to get an 80 percent of full scale needle deflection difference between Position 1 and Position 2.

(3) Recheck the balance and the lift-off. If adjustments are made, check the sensitivity.

(4) Slide the probe from Position 1 toward Position 2. When the needle deflection reaches 50 percent, stop and mark the centerline location of the probe on the tape, Figure 2.

(5) Slide the probe from Position 2 toward Position 1. When the needle deflection reaches 50 percent, stop and mark the centerline location of the probe on the tape.

(6) Repeat Paragraph 4.B.(4) and Paragraph 4.B.(5) using the second fastener location.

(7) Draw a line between marks to indicate the location of the chem-mill edge.

(8) The line drawn should be within ±0.030-inch (0.076 cm) of the simulated chem-mill edge.

5. Inspection Procedure

A. Put tape over the center of fastener row that is to be inspected (Figure 3). If the pocket edge is not approximately known, use the optional tape placement (Figure 3, View A).

B. Calibrate the instrument. Refer to Paragraph 4.

C. Put the probe on the surface of the taped skin, between the fasteners on the thick section away from the chem-mill pocket edge (Figure 3, Position 1). Check for a baseline response of 20 percent. If the baseline response is not 20 percent, rebalance the instrument.

D. Put the probe on the surface of the taped skin on the thin section (Figure 3, Position 2). Check that the meter reading is 80 percent of full scale. If the meter reading is not 80 percent, adjust the sensitivity, balance and lift-off to get an 80 percent meter deflection (60 percent above baseline) using the taped skin as a reference standard.

E. Put the probe back on the thick section of the taped skin, check baseline, and slide the probe toward the chem-mill pocket (thin section).

F. When the meter deflection reads 50 percent of full scale (30 percent above baseline) stop and mark the center line location of the probe on the tape (Figure 3, Position 3).

G. Put the probe on the taped thin section between fasteners (Figure 3, Position 2). Meter should read 80 percent (±3.0 percent) of full scale. If meter does not read 80 percent of full scale, put probe on the thick section and balance again. Put probe back on thin section if meter does not read 80 percent after balance, repeat Paragraph 5.D.

H. Slide probe from thin section toward thick section. When meter deflection reads 50 percent of full scale, stop (Figure 3, Position 3) and mark the centerline location of the probe on the tape.

I. Repeat Paragraph 5.C. thru Paragraph 5.H. between each fastener.

NOTE: Keep a minimum distance of 1.5 probe diameters from fastener heads to avoid edge effects on the readings.

J. Make a line on the tape that connects the marks from Paragraph 5.C. thru Paragraph 5.I. to show the chem-mill pocket edge.

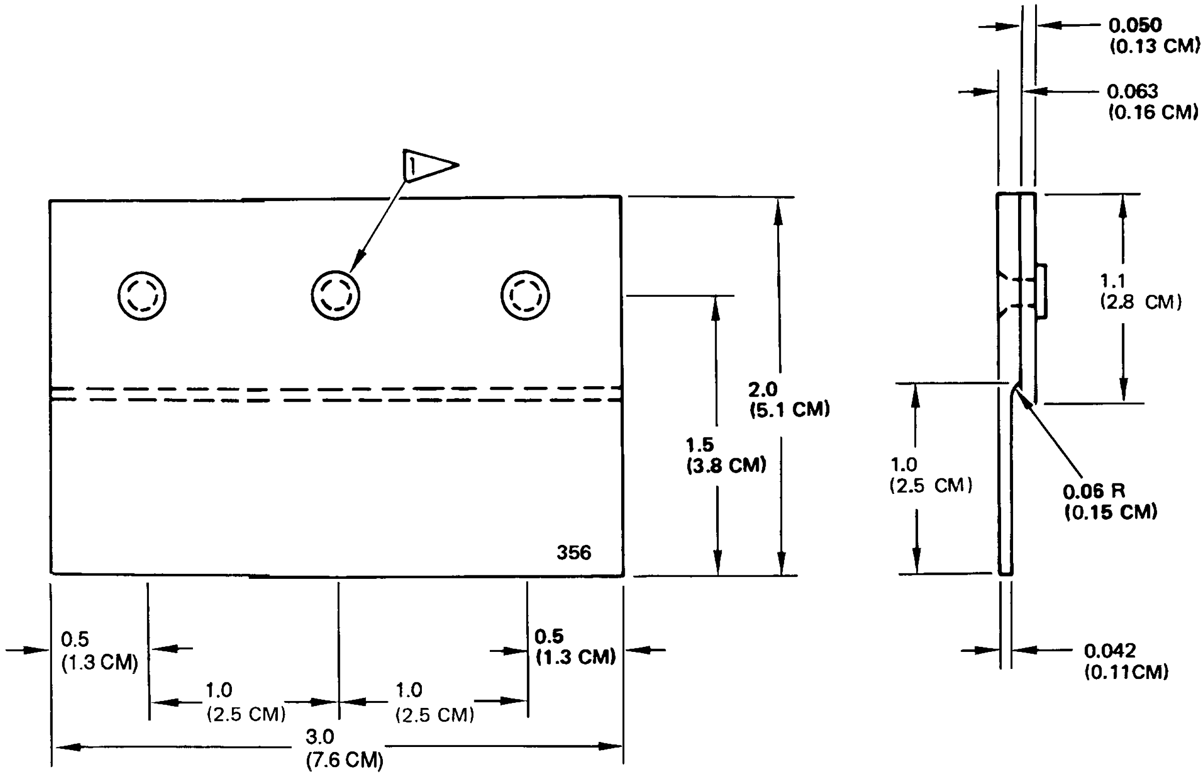
6. Inspection Results

A. Measure the distance from the line drawn (indicating the chem-mill edge) to the centerline of the fasteners.

B. Subtract 0.030-inch (0.076 cm) from this measurement.

C. Refer to the applicable service bulletin for the minimum allowable edge margin distance. Compare it to the value determined in Paragraph 6.B.

D. If short edge margins are detected, refer to the service bulletin for corrective action.



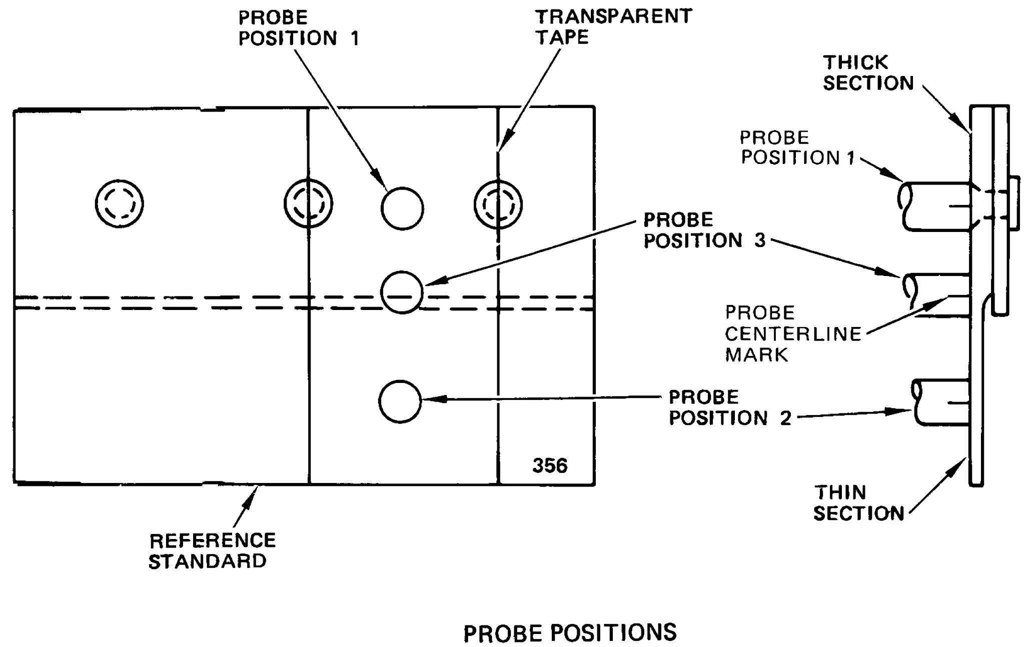
NOTES

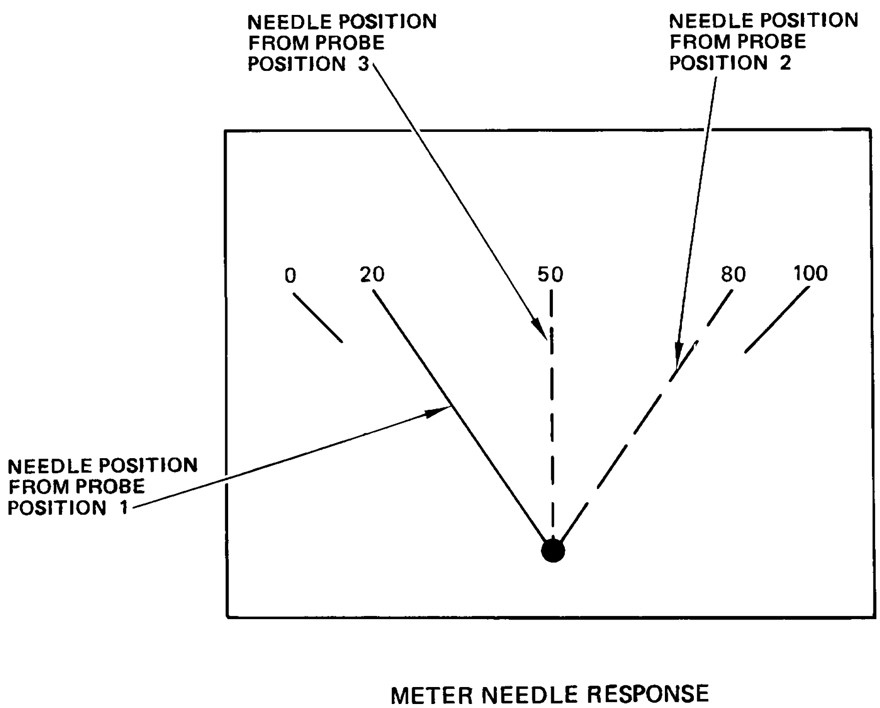
- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS IN PARENTHESES)
- TOLERANCE: X.X $\pm$ 0.05 (0.13 CM)
  X.XX $\pm$ 0.02 (0.05 CM),
  X.XXX $\pm$ 0.005 (0.013 CM)
- MATERIAL : 2024–T3 OR –T4 AL
- STEEL STAMP WITH 356

1 BACR15CE5D5 RIVET (3 PLACES)

2161489 S0000472566_V1

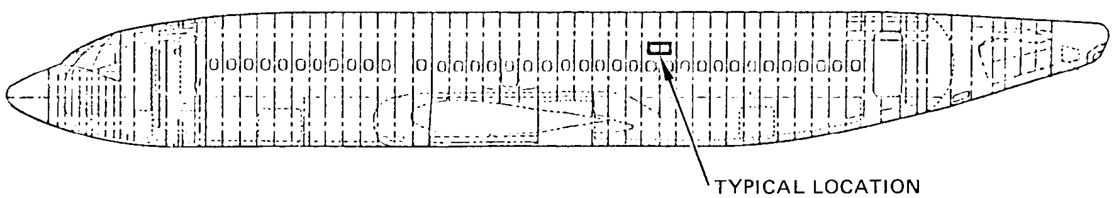
Reference Standard 356
Figure 1

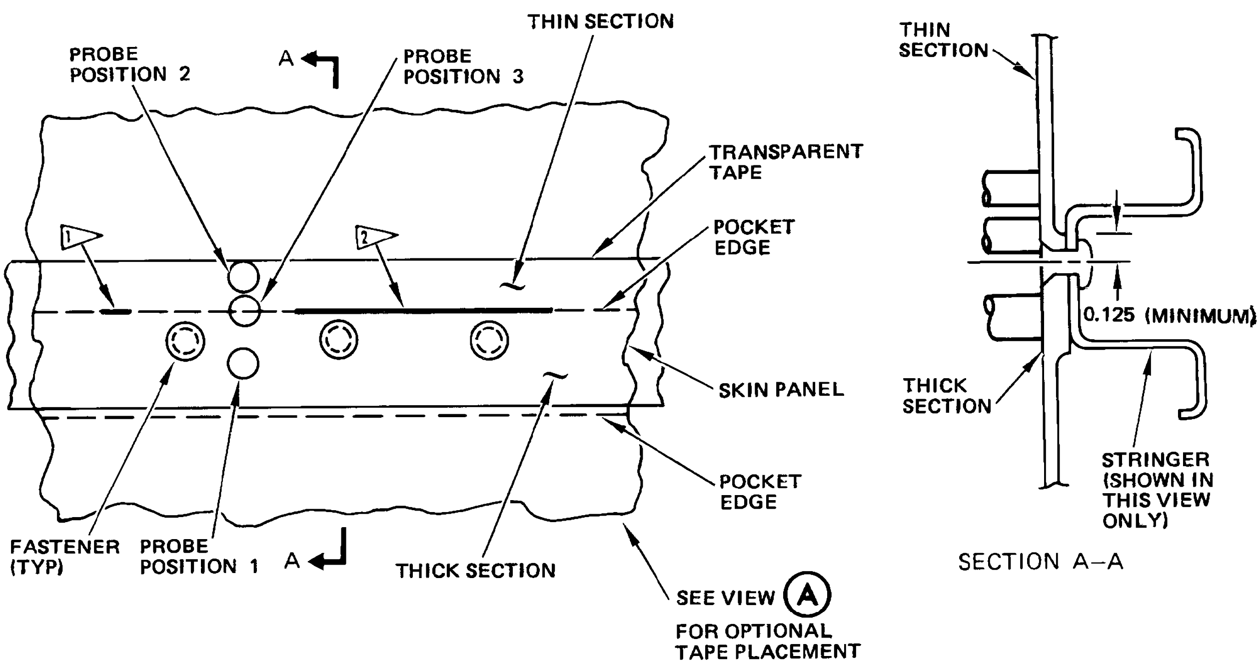




2161491 S0000472567_V1

Instrument Calibration
Figure 2





NOTES

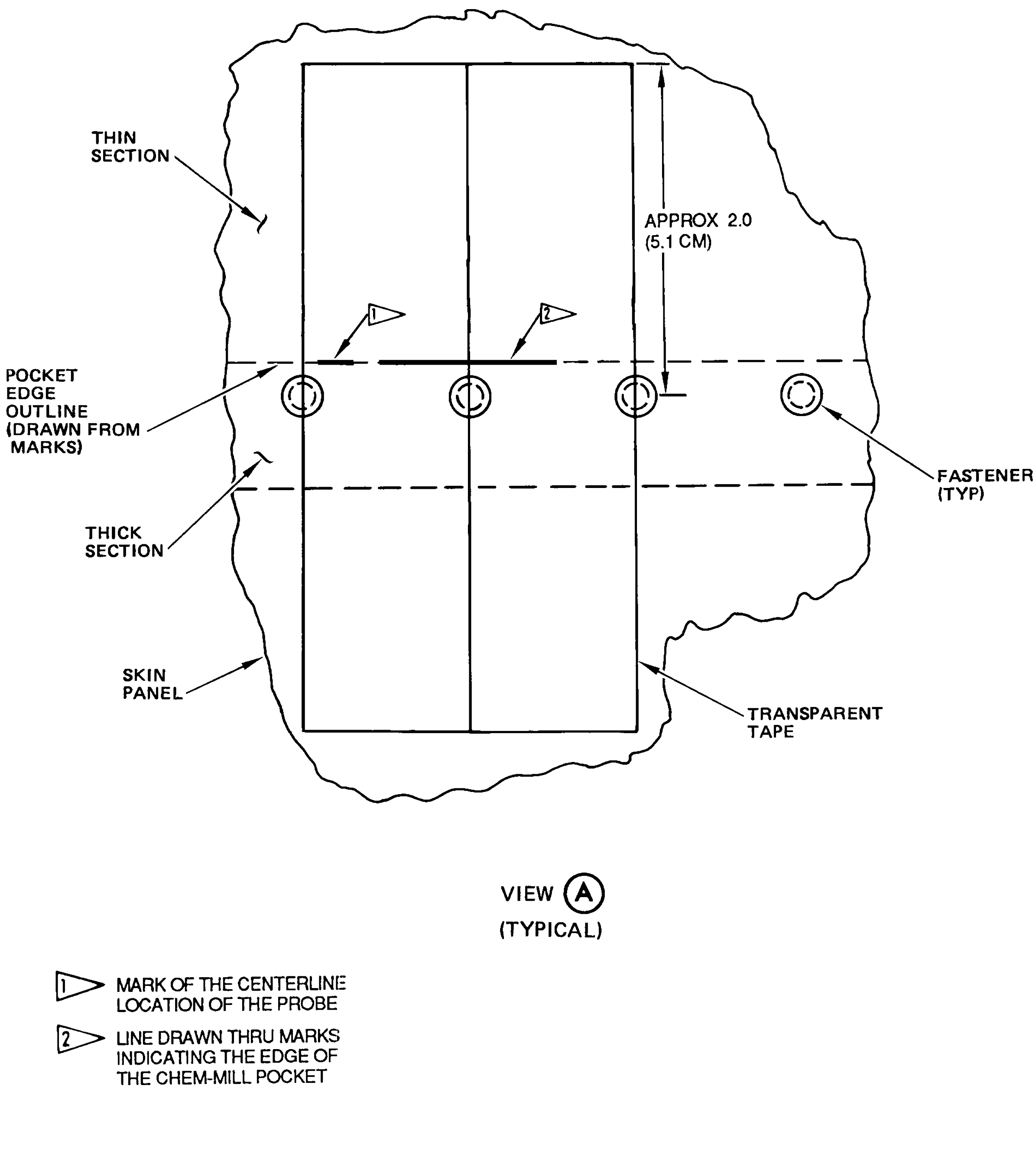
- ALL DIMENSIONS ARE IN INCHES

1 MARK OF THE CENTERLINE LOCATION OF THE PROBE

2 LINE DRAWN THRU MARKS INDICATING THE EDGE OF THE CHEM-MILL POCKET

2161492 S0000472568_V1

Fuselage Skin Panel - Typical
Figure 3 (Sheet 1 of 2)



Fuselage Skin Panel - Typical
Figure 3 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

EDDY CURRENT INSPECTION AT COUNTERSUNK FASTENER LOCATIONS

1. **NOTICE**

   A. Before the November 15, 2012 revision, this procedure, Part 6, 53-30-05, contained Procedure 1 (Sliding Probe Method), Procedure 2 (Oversize Template Method) and Procedure 3 (Rotating Surface Probe). Because of a publishing system change, the format of these three procedures in Part 6, 53-30-05 has been changed but the technical instructions are the same.

2. **Purpose**

   A. To detect cracks in the fuselage skin along the upper row of fasteners of longitudinal skin lap joints. These procedures may also be used to inspect for fuselage skin cracks at other countersunk fastener locations.

      (1) Cracks initiate on the inner surface of the outer skin at the edge of the countersink. From there they propagate up the countersink and out along the faying surface. See Figure 1 for an illustration of a typical crack in the fuselage joint.

      (2) This procedure describes three different eddy current inspection methods designed to detect cracks that extend beyond the edge of the countersink. The three procedures are optional to each other.

      (3) For inspection procedures for detecting cracks with the fasteners removed before the cracks extend beyond the countersink, refer to Part 6, 53-30-00, Procedure 1.

3. **Sliding Probe Method**

   A. Purpose

      (1) To detect cracks extending from the edge of the fastener hole at the base of the countersink out past the rivet head in the fuselage skins using a sliding probe and impedance plane instrument.

      NOTE: The sliding probe procedure is not recommended for inspecting the circumferential butt joints where the cracks may be at an angle of more than 45° to the scan direction (Figure 1).

      (2) This procedure can only be used where anodized rivets are installed. Anodized rivets have a nonconductive layer that does not permit electricity to flow between the skin and the rivets.

         (a) For airplane line numbers 1408 and higher, you must use Part 6, 53-30-21 (Fuselage lap splice - Sliding Probe Inspection) to identify Alodine rivets and then use Paragraph 3. (sliding probe) at rivets identified as non-Alodine coated rivets. At all Alodine fastener locations you must use one of the optional procedures that follow:

            1) Paragraph 4. (Oversized Template), or

            2) Paragraph 5. (Rotating Surface Probe), or

            3) Part 6, 51-00-00, Procedure 15 (General Surface Inspection of Aluminum with the Magneto Optic Imager (Turbo))

            4) Part 6, 53-30-40 (Eddy Current Array (ECA) Inspection of Fasteners in the Outboard Skin)

         (b) For 737-100 thru -500 airplane line numbers 1 thru 1407, it is satisfactory to use Paragraph 3. (sliding probe) unless Alodine signals are found as shown in Figure 5, Detail II. At locations where Alodine signals are found you must use one of the three optional procedures identified in Paragraph 3.A.(2)(a).

(c) For all airplane line numbers, it is satisfactory to use one of the three optional inspection procedures identified in Paragraph 3.A.(2)(a) at non-Alodine coated fastener locations as alternatives to the sliding probe procedure.

B. Equipment

NOTE: Refer to Part 1, 51-01-00, for information on equipment manufacturers.

(1) Instrument - This procedure requires an eddy-current impedance plane display instrument with a variable vertical and horizontal sensitivity control capability. The instrument should have reflection probe capability and be able to operate between a frequency of 20 kHz and 30 kHz. The impedance plane display instrument used for this procedure must have a permanent screen adjustment (screen persistence) so the signals stay on the screen until manually erased. The following instruments were used to develop this procedure.

(a) NDT 18; Nortec

(b) NDT 19; Nortec

(c) AV100; Hocking

(d) MIZ 20A; Zetec

(2) Probe - This procedure requires a reflection probe capable of operating between 20 and 30 kHz. The following probes were used to develop this procedure.

(a) SPO-3806; Nortec

(b) SPO-2210; Nortec

(3) Reference Standard - Reference Standard 369 - See Figure 2.

NOTE: To make sure that the reference standard is electrically equivalent to the airplane, use specially ordered rivets that have an anodize finish. These special anodized rivets are identified in Figure 2.

(4) Nonconductive Straight Edge

C. Prepare for the Inspection

(1) Ensure inspection area is clean.

(2) If the rivet heads can not be seen because of thick paint, remove the paint.

(3) If the rivet heads can not be seen because of a decal, remove the decal or use the probe scan procedure specified in Part 6, 53-30-00, Procedure 8.

D. Instrument Calibration

(1) Turn on instrument and carry out normal start-up procedures.

(2) Set frequency between 20 and 30 kHz.

(3) Place probe over uncracked fastener area on reference standard (Figure 3, position 1).

(4) Balance the instrument and adjust the flying dot to the lower right-hand quadrant as shown (Figure 3).

(5) Rock the probe from side-to-side and adjust the lift-off response to travel from right to left as shown (Figure 3).

(6) Using the non-conductive straight edge as a guide, slide the probe over the fasteners to the fastener with the simulated defect on the reference standard.

NOTE: If the probe is sensitive to the scan direction, ensure that the probe slides in the correct direction.

(7) Observe the instrument signal pattern and adjust the instrument controls to obtain a similar signal to that shown for a good fastener (Figure 3). Various probes may give patterns which differ slightly from (Figure 3).

(8) Ensure that the probe scans along the center of the fastener line. The probe center line must be within 0.050-inch (0.13 cm) from the fastener center line.

(9) Continue sliding the probe along the fastener row until passing the fastener with a simulated defect.

(10) The instrument signal pattern should resemble the defect signal shown in Figure 3. Various probes may give patterns which differ slightly from Figure 3. There should be at least a two vertical and/or horizontal division separation between the nondefect signal and the defect signal.

NOTE: If you get Alodine rivet signals from the reference standard that are almost equivalent to the Alodine signals shown in Figure 5, the calibration cannot be done. The rivets must be removed and anodized rivets must be installed in the reference standard. See the note in Paragraph 3.B.(3).

(11) If the instrument has an alarm, set the alarm to respond to the signals midway between the nondefect signal and the defect signal.

E. Inspection Procedure

(1) Place the non-conductive straight edge on the aircraft skin below the inspection row so that the probe slides over the center of each fastener head.

NOTE: Examine for non-aligned fasteners. These will have to be examined separately (Figure 4).

(2) Place the probe on the straight edge centered over the first inspection fastener and balance the instrument.

(3) Slide the probe over the row of fasteners. If the probe is sensitive to the scan direction, repeat the scan by sliding the probe in the same direction with the opposite end pointing forward.

NOTE: During the sliding probe scans, keep the permanent screen adjustment "ON" so that the signals can be compared on the screen. Do a manual erase after 5 to 10 rivet signals have been compared on the screen.

(4) Monitor the instrument signal pattern paying particular attention to any signals of increased vertical and/or horizontal separation.

NOTE: Fasteners that cause signals which are different from the reference standard signals but do not look the same as the defect signal must be examined visually. Look for a change in the fastener size or type. Do a check for steel fasteners with a magnet.

(5) Fasteners which are not aligned with the fastener row should be scanned separately, ensuring that the probe passes centrally over the fastener head. The probe center line must be within 0.050-inch (0.13 cm) from the fastener line.

(6) Alodined rivets will cause signals that are smaller than normal. Do not use the sliding probe to examine areas with alodined rivets because it is possible that cracks in areas with alodined rivets will not cause reject signals to occur. See Figure 5.

F. Inspection Results

(1) Any vertical and/or horizontal shift of one division or more indicates a defect condition and should be investigated further.

(2) Confirm the crack indication using Paragraph 4. - Oversize Template Method.

(3) Alodined rivets that are electrically conductive with the skin can cause incorrect inspection results. These rivets can be identified by the unusual sliding probe signals they cause (see Figure 5). If you find unusual eddy current signals as shown in Figure 5, do the steps that follow:

(a) Do Paragraph 3.F.(2) at the locations where the signals occurred.

(b) Tell Boeing where you got the Alodined rivet signals.

4. Oversize Template Method

A. Purpose

(1) To detect cracks extending from the edge of the fastener hole at the base of the countersink out past the rivet head in fuselage skins up to 0.045 inch thick using an oversize template.

B. Equipment

NOTE: Refer to Part 1, 51-01-00, for information on the equipment manufacturers.

(1) Any eddy current instrument that can operate between 100 and 500 kHz and satisfy the performance requirements of this procedure may be used. Instruments with visual and/or audible alarms are recommended. The following equipment was used in the development of this procedure:

(a) Locator UH; Hocking Instruments

(b) MIZ-10A, MIZ-10B; Zetec, Inc.

(c) Magnatest ED-520; Magnaflux Corp.

(2) Probe - Shielded probes are recommended. Shielded or unshielded probes may be used provided the calibration notch in the reference standard can be reliably detected. The following probes were used in the development of this procedure.

(a) 0.125-inch diameter, 3-inch long shielded pencil probe, P/N MP-30; NDT Product Engineering

(b) 0.187-inch diameter, 3-inch long unshielded pencil probe, P/N UP-30; NDT Product Engineering

(c) Unshielded Locator probe, P/N 29P101; Hocking Instruments

(3) Reference Standard - Reference Standard 369 (Figure 6).

(4) Probe Guide - Drafters Circle Template (Figure 7).

C. Prepare for the Inspection

(1) Make sure the inspection area is clean.

(2) Locally remove paint only if necessary to locate the rivet heads. Paint removal is not required to perform the inspection.

(3) Sand paint locally to remove rough spots only as necessary to facilitate the inspection.

D. Instrument Calibration

(1) Do the initial calibration and adjust for lift-off as specified in Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23.

(2) Put the probe guide on the reference standard.

(3) Visually center one of the holes around the rivet head. Choose a hole that positions the pencil probe to scan the edge of the countersink (Figure 7). The hole chosen should give the best detection of the reference notch in the countersink of the reference standard. Identify the hole selected on the probe guide.

(4) With the probe guide held firmly in place, scan around the circumference of the rivet head. Monitor the instrument response. The operator should be able to clearly identify between the sudden instrument response from the reference standard crack and the slow instrument response from an off-center condition.

(5) Set the instrument sensitivity to clearly identify the reference standard crack so that the needle does not move suddenly off scale as the probe is moved around the fastener head.

(6) If the instrument has an alarm, set the alarm to respond to 50% of the reference standard notch signal amplitude.

E. Inspection Procedure

(1) Identify the fastener location to be inspected.

(2) Center the probe guide hole from Paragraph 4.D.(3) around the rivet head.

(3) Scan around the head with the pencil probe while monitoring the eddy current instrument.

(4) Note all locations where a rapid meter deflection, similar to the response from the reference standard notch, is obtained.

F. Inspection Results

(1) Cracks can be confirmed by removing the paint and visually checking the crack signal location at 5x or 10x magnification.

5. Rotating Surface Probe

A. Purpose

(1) To detect cracks extending from the edge of the fastener hole at the base of the countersink out past the rivet head in fuselage skins up to 0.050 inch thick using a rotating surface probe and a specialized oscilloscope display instrument.

B. Equipment

NOTE: Refer to Part 1, 51-01-00, for information on equipment manufacturers.

(1) Instruments - Any rotating eddy current instrument with an oscilloscope display that meets the requirements of this procedure is acceptable. Instruments with an audio or visual alarm are preferred. The following instruments were used during the development of this procedure.

INSTRUMENT	MANUFACTURER
Defectoscope D2.831	Forster, Inc.
NDT 19	Nortec, Inc.
RECHII	Nortec, Inc.

(2) Probes - Any rotating surface probe that meets the requirements of this procedure is acceptable. Probes are designed so that the probe coil rotates just outside the edge of a particular fastener head size. The proper probe should be used for each fastener head size inspected. The following probes were used during the development of this procedure.

PROBE	MANUFACTURER	SCAN DIA.
RSPD 325	NDT Prod. Engr. (for Defectoscope)	0.325
SPO 2906	Nortec, Inc.	5/16"

(3) Probe Guide - Probe guides help in centering the probe over the fastener. If a guide is not supplied with the probe, one can be manufactured per Figure 8.

(4) Reference Standard - Reference Standard 369. See Figure 6.

C. Prepare for the Inspection

(1) Make sure inspection area is clean.

(2) Locally remove thick paint only if necessary to locate the rivet heads. Paint removal is not required to perform the inspection.

(3) Sand paint locally to remove rough spots only as necessary to facilitate the inspection.

D. Instrument Calibration

(1) Do the manufacturer's start-up procedure.

(2) Set scan baseline to center screen.

(3) If the area to be inspected is painted, put 0.006 (0.015 cm) inch of transparent tape over the fastener heads in the reference standard.

(4) Align probe guide over non-cracked skin in reference standard (Figure 9, probe position 1).

(5) Adjust instrument per manufacturer's instructions to achieve as flat a baseline as possible.

(6) Place probe guide and probe over the simulated defect cracked skin in the reference standard (Figure 9, probe position 2).

(7) Adjust instrument sensitivity to give a full wave height of 80% full screen (Figure 10).

NOTE: Signal to noise ratio should be a minimum of 3:1.

(8) Recheck baseline and readjust instrument phase if required to achieve flat baseline. Recheck instruments sensitivity if adjustments are made.

(9) Note the display change as the probe is moved slightly off center. (Refer to instruction manual, if necessary).

(10) Note effect of crack orientation on the screen display by rotating the probe driver. Be able to identify crack direction from the screen display.

E. Inspection Procedure

(1) Identify the fastener locations to be inspected.

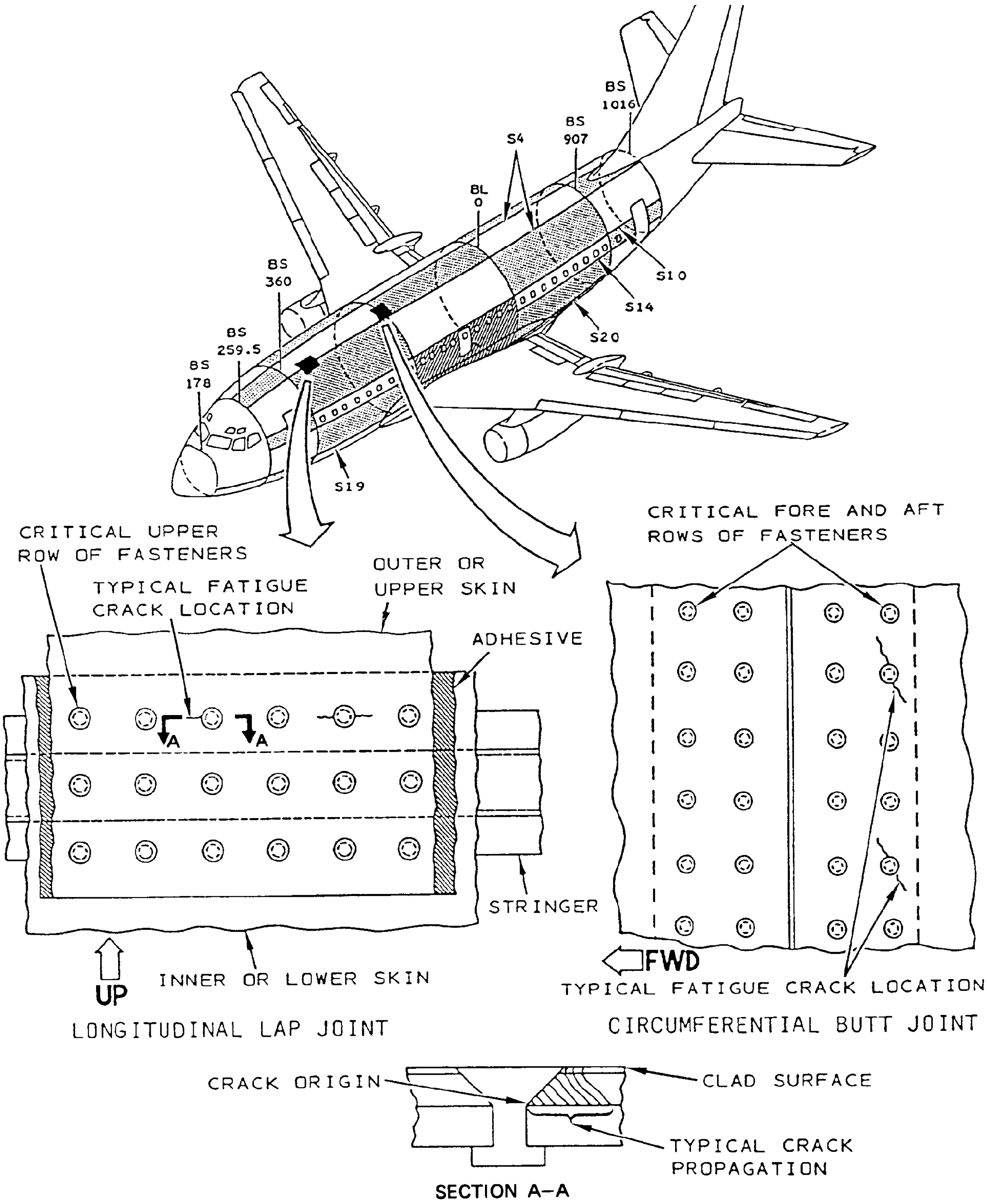
(2) Center the probe guide around fastener head.

(3) Scan around the fastener head while monitoring the instrument.

(4) Note any fastener location giving a similar indication to the reference notch calibration signal.

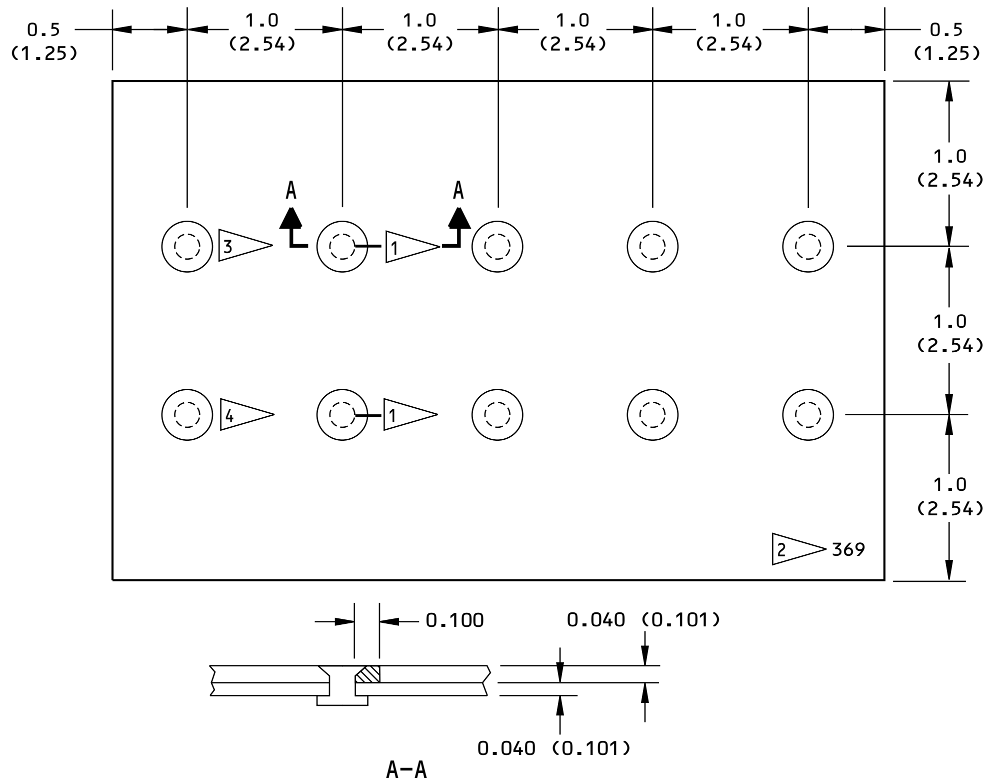
F. Inspection Results

(1) Any fastener location giving a signal similar to the reference notch calibration signal should be investigated with Paragraph 4. - Oversize Template Method.



2161567 S0000474375_V1

Typical Fuselage Skin Joint Configuration and Crack Orientation
Figure 1



NOTES:

- ALL DIMENSIONS ARE IN INCHES
  (CENTIMETERS ARE IN PARENTHESES).
- TOLERANCES (UNLESS SPECIFIED DIFFERENTLY):
  X.XXX = ±0.005 (0.013)
  X.X = ±0.05 (0.13)
- MATERIAL: 2024-T3 OR T4 AL CLAD
- RIVETS THAT HAVE GOOD ELECTRICAL CONTINUITY WITH THE SKIN CAN CAUSE INCORRECT EDDY CURRENT SIGNALS. USE SPECIALLY-ORDERED RIVETS WHICH HAVE AN ANODIZED FINISH. SEE TABLE I. REFER TO PART 1, 51-01-00, FOR DATA ABOUT THE FASTENER SUPPLIERS.

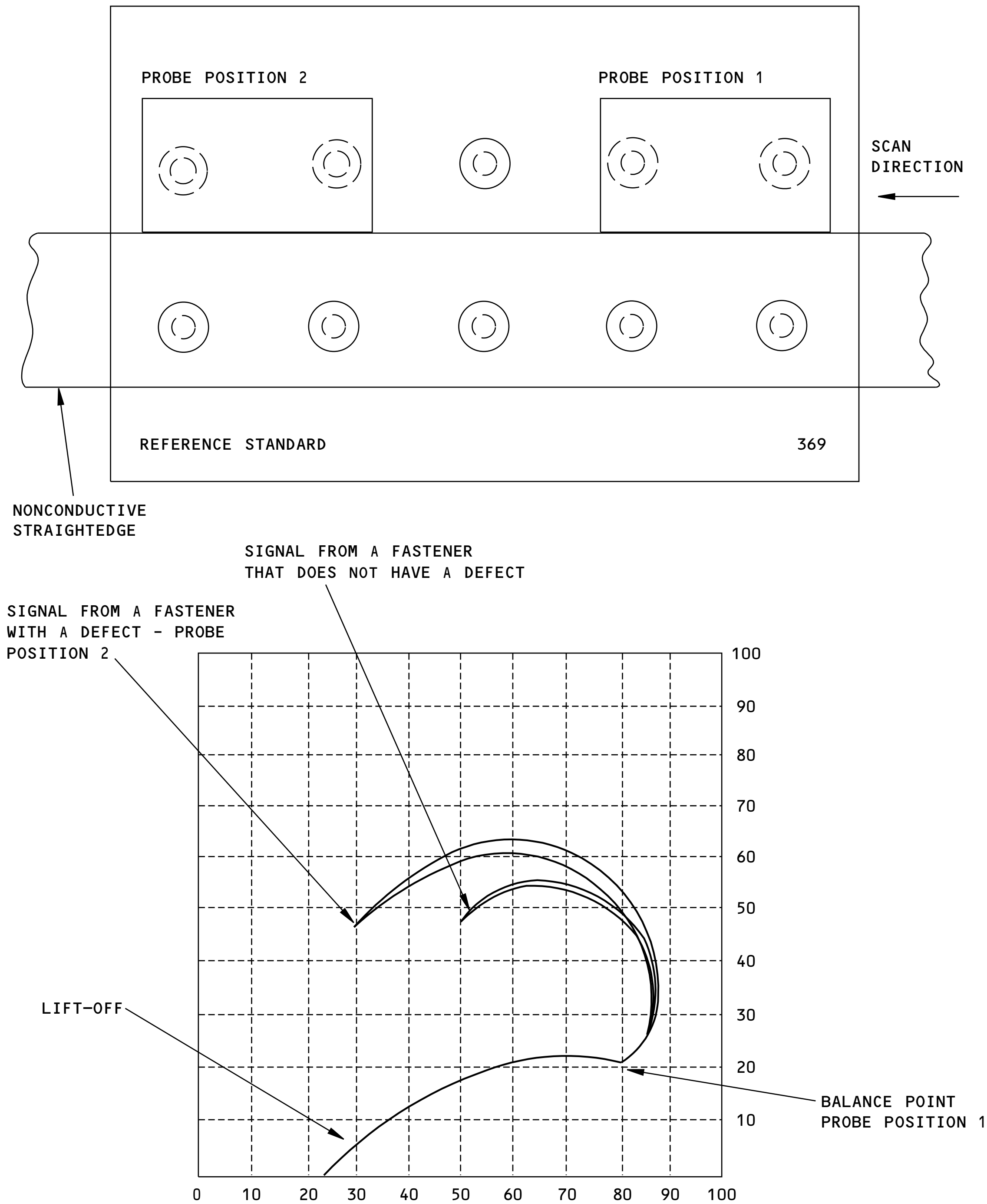
RIVET CODE	ALLFAST FASTENING SYSTEMS INC. PART NUMBER	SIERRA PACIFIC SUPPLY CO. PART NUMBER
3	AF1049U1D5C4	NAS1097D5-4D
4	AF1049U1D6C5	NAS1097D6-5D

ANODIZED RIVET DATA
TABLE I

1 EDM NOTCH OR EQUIVALENT 0.007 (0.018) WIDE
2 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER 369
3 5/32 INCH FASTENERS REQUIRED FOR INSPECTION OF LAP JOINTS (5 LOCATIONS)
4 3/16 INCH FASTENERS REQUIRED FOR INSPECTION OF CIRCUMFERENTIAL BUTT JOINTS (5 LOCATIONS)

2161568 S0000474376_V1

Reference Standard
Figure 2

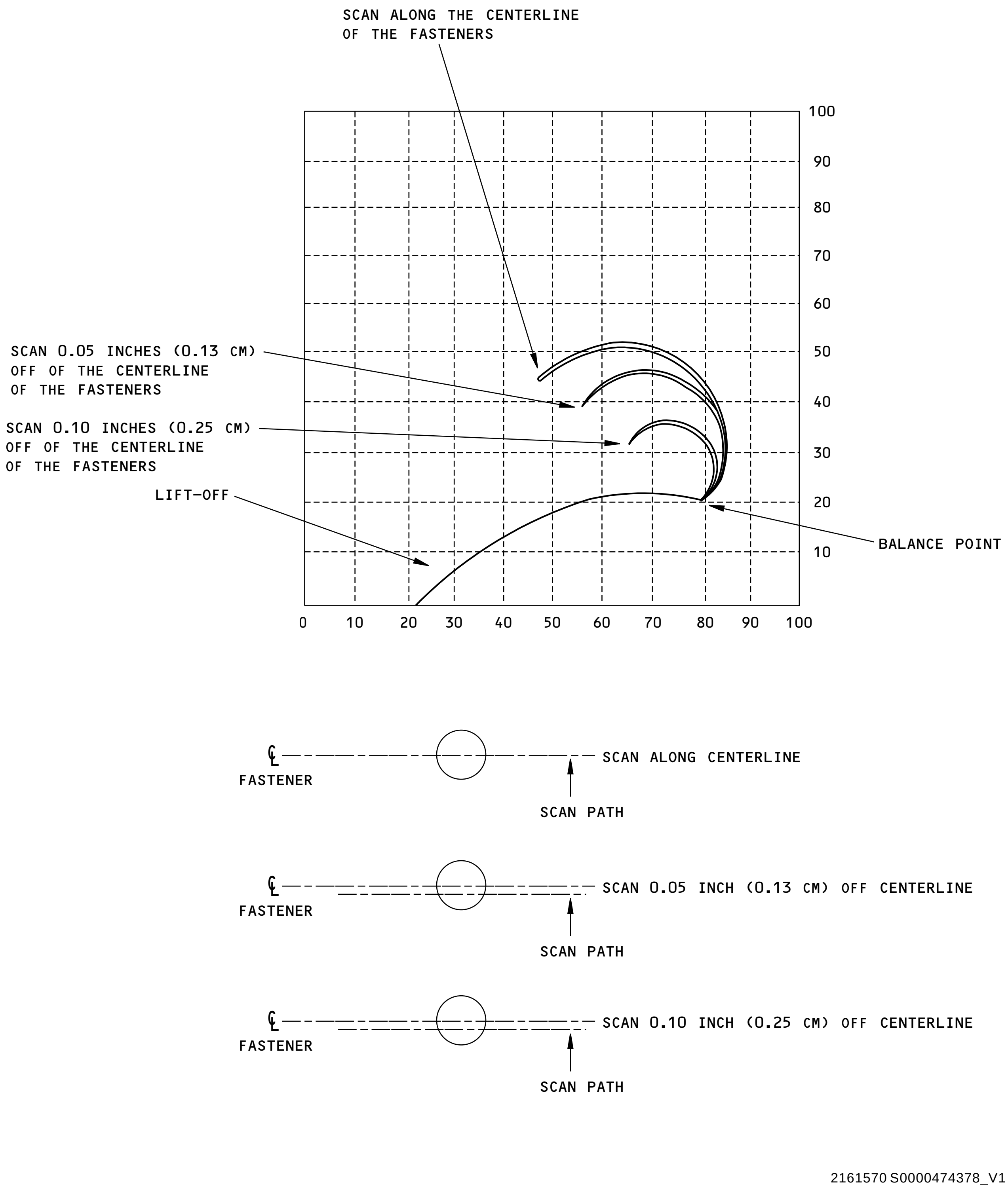


NOTE:

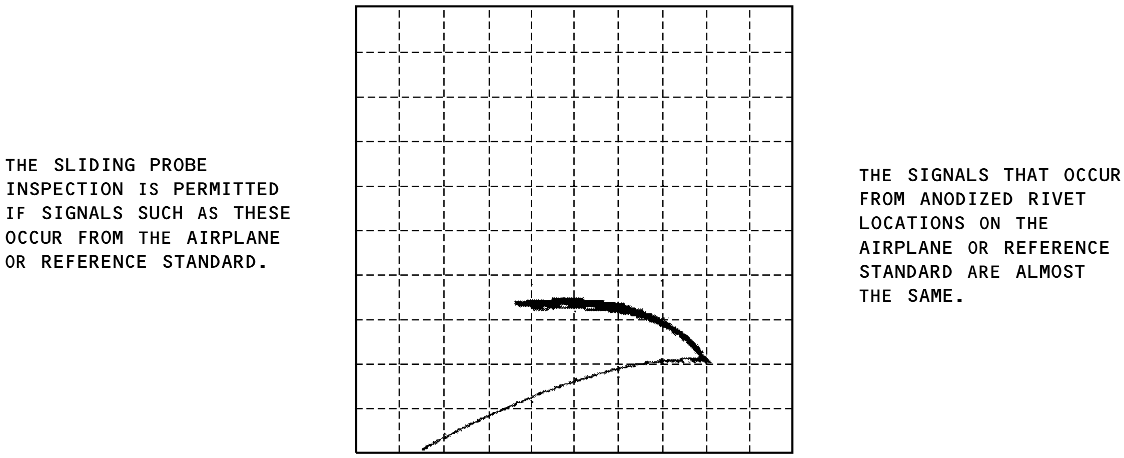
IT IS SATISFACTORY IF THE SIGNALS FROM YOUR INSTRUMENT AND PROBE ARE DIFFERENT THAN THE SIGNALS SHOWN ABOVE; IT IS IMPORTANT TO HAVE TWO VERTICAL AND/OR HORIZONTAL DIVISIONS OF SEPARATION BETWEEN THE RIVET SIGNAL AND THE NOTCH SIGNAL.

2161569 S0000474377_V1

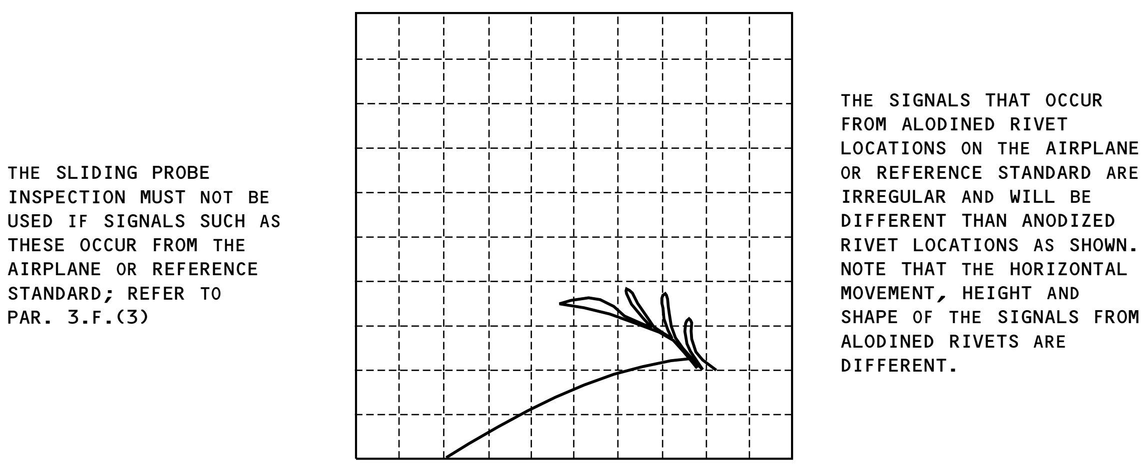
Examination Area
Figure 3



Scan Misalignment Effect
Figure 4



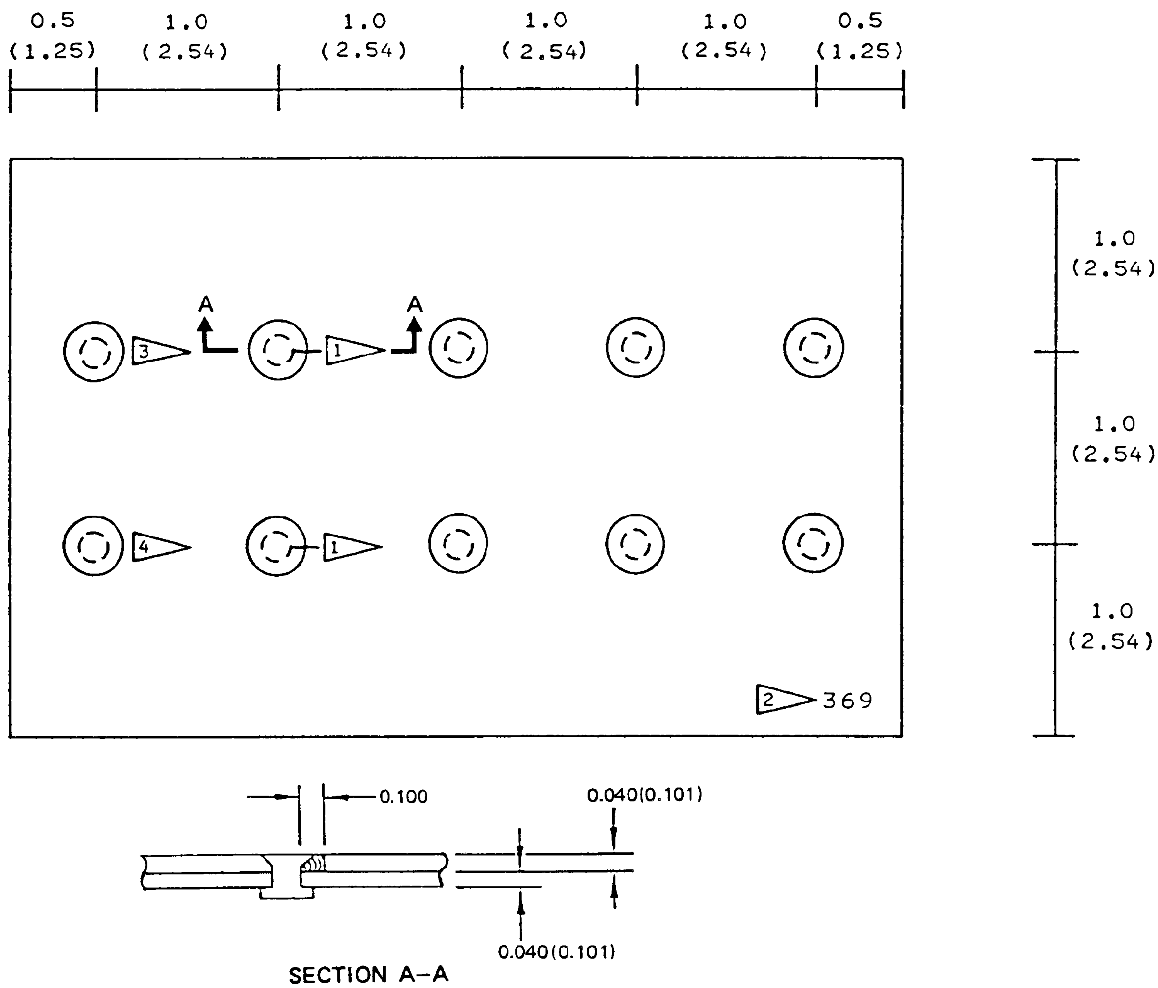
ANODIZED RIVET SIGNALS (TYPICAL)
DETAIL I



ALODINED RIVET SIGNALS (TYPICAL)
DETAIL II

2161572 S0000474379_V2

Example Signals from Anodized and Alodined Rivets
Figure 5



- ALL DIMENSIONS ARE IN INCHES (CM IN PARENTHESIS)
- TOLERANCE: X.X±0.05 (0.13)
  X.XXX±0.005 (0.013)
  EXCEPT AS NOTED
- MATERIAL: 2024-T3 OR T4 AL CLAD
- FASTENERS: BACR15CE5D OR BACC15CE6D

1 EDM NOTCH OR EQUIVALENT 0.007 (0.018) WIDE

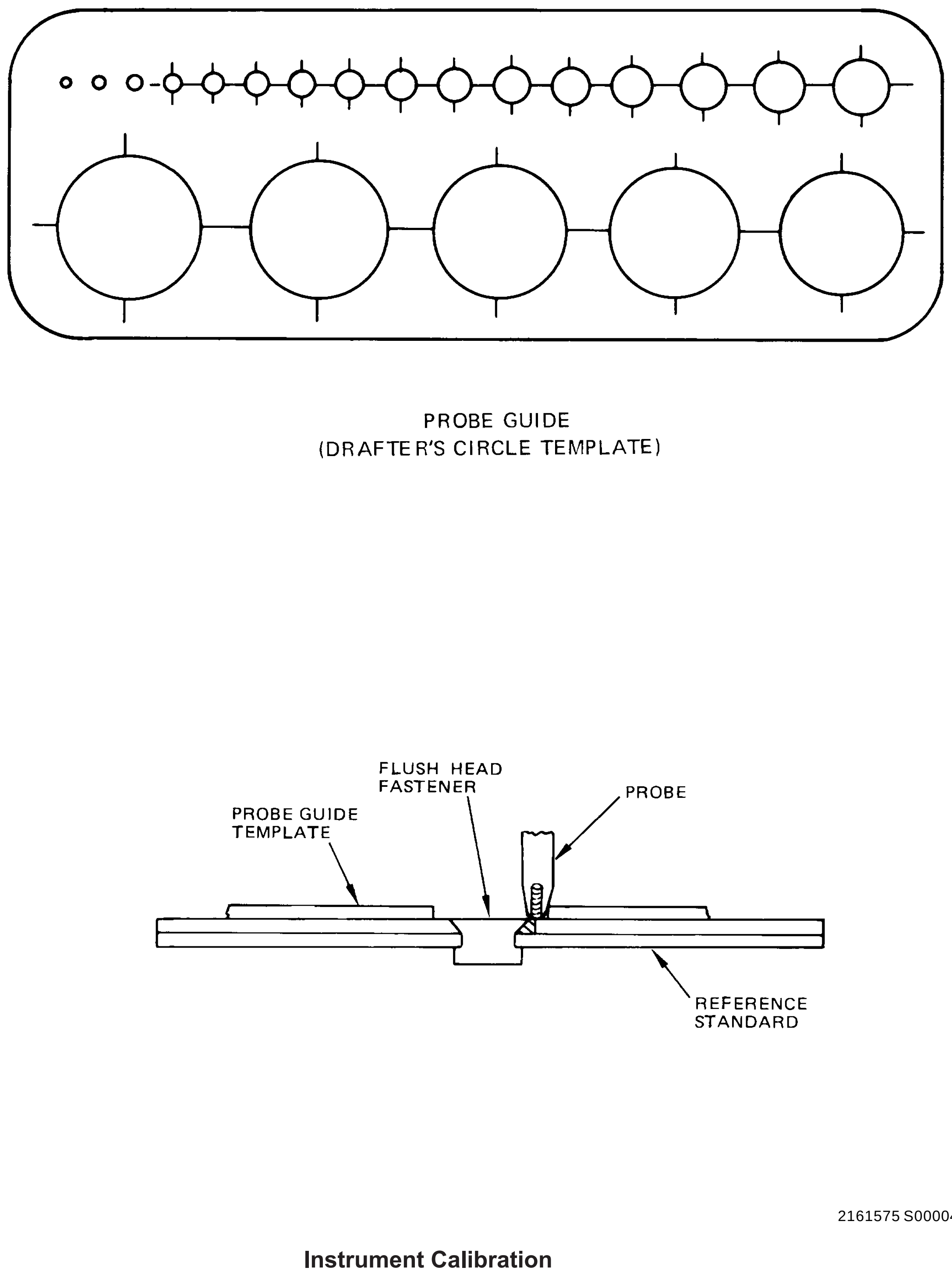
2 ETCH OR STEEL STAMP WITH PART I. D. NO.369

3 5/32 INCH FASTENERS REQUIRED FOR INSPECTION OF LAP JOINTS

4 3/16 INCH FASTENERS REQUIRED FOR INSPECTION OF CIRCUMFERENTIAL BUTT JOINTS

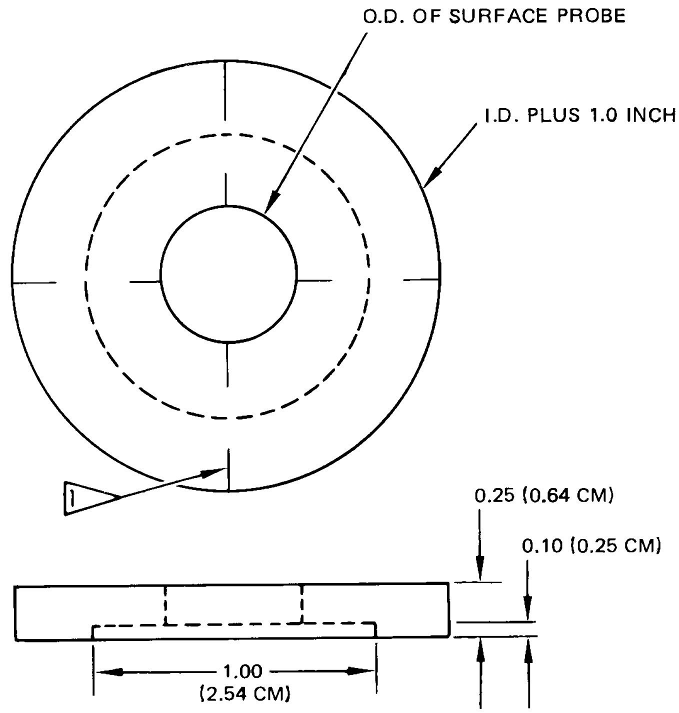
2161574 S0000474380_V1

Reference Standard
Figure 6



2161575 S0000474381_V1

Instrument Calibration
Figure 7



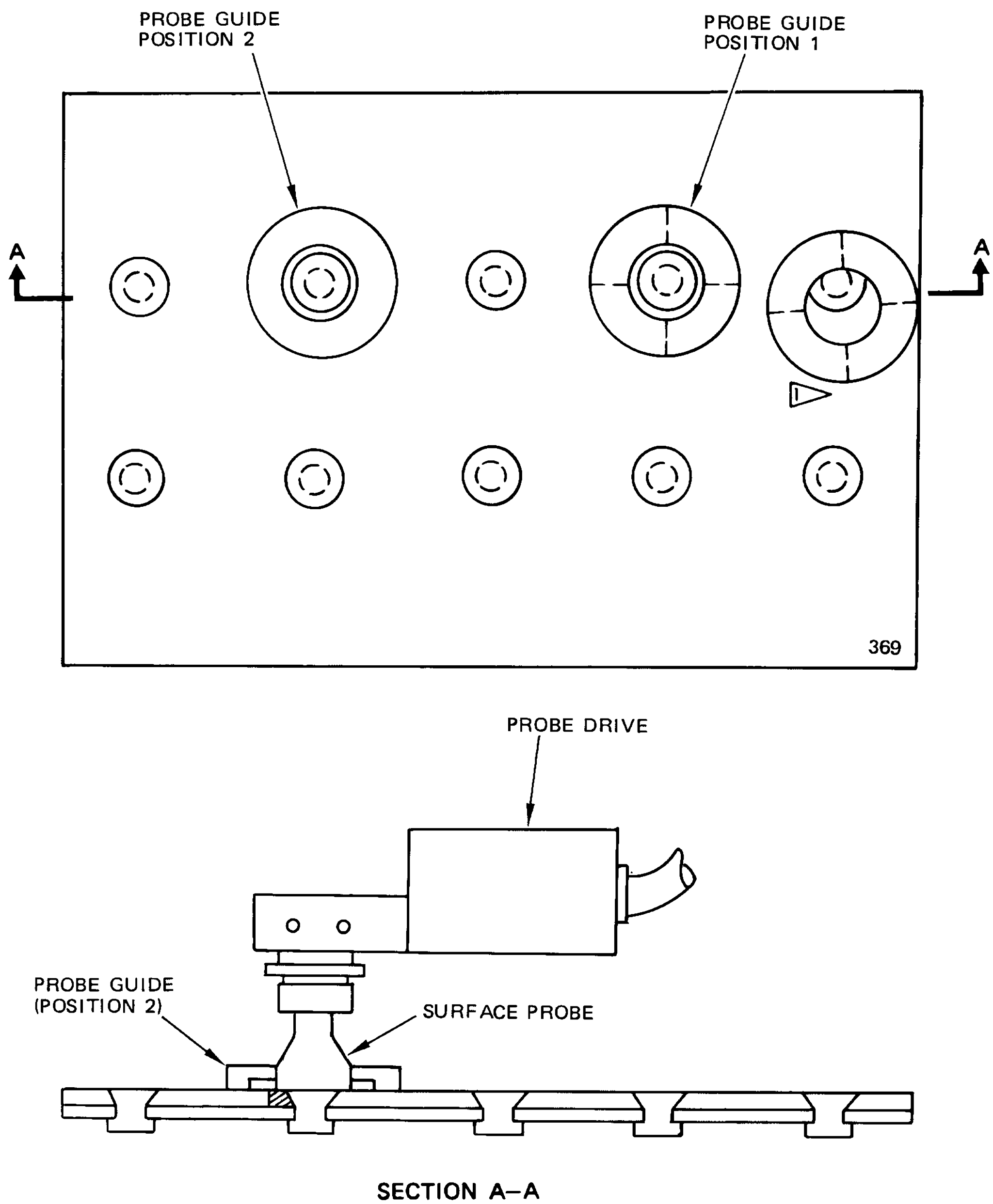
NOTES

- ALL DIMENSIONS ARE IN INCHES (CENTIMETERS IN PARENTHESES)
- TOLERANCE: ± 0.02 (0.05 CM)
- MATERIAL: LUCITE OR PLEXIGLASS

[1] SIGHT LINES – SCRIBE AND FILL WITH MARKER INK

2161576 S0000474382_V1

Probe Guide
Figure 8



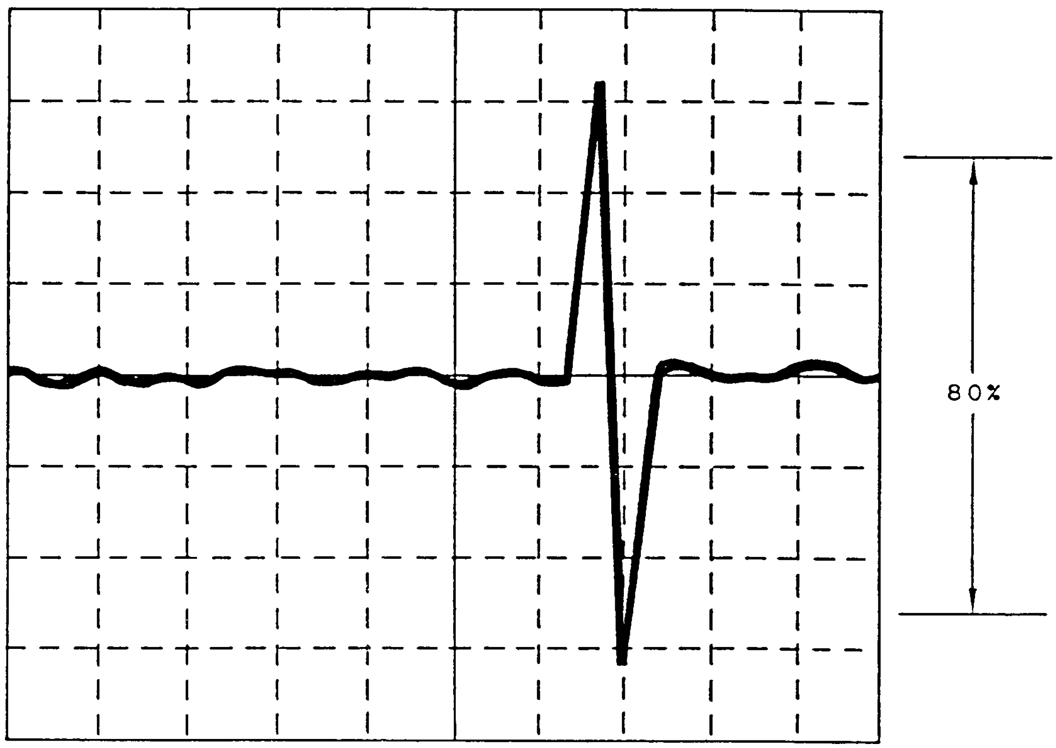
NOTES

- CENTER PROBE GUIDE OVER FASTENER USING SCRIBE AS A GUIDE

1 PROBE GUIDE THAT IS NOT ALIGNED MAY GIVE AN INCORRECT SCREEN DISPLAY

2161578 S0000474383_V2

Calibration Positions
Figure 9



2161580 S0000474384_V1

Rotating Surface Probe Typical Calibration Response
Figure 10

PART 6 - EDDY CURRENT

RIVET EDGE DISTANCE FOR LOWER SKIN PANEL STR. 10R LAP SPLICE B.S. 597 TO B.S. 663.65

1. **Purpose**

   A. To determine edge distances of fasteners adjacent to the lower skin edge in the fuselage skin panels. This inspection applies to those lower skin edges concealed by stringers whose fastener edge distances cannot be determined by visual inspection.

   B. Service Bulletin Reference: 737-53-1118

2. **Equipment**

   A. Any eddy current instrument and probe combination that satisfies the performance requirements of this procedure is suitable for this inspection. The following equipment was used to develop this procedure.

      (1) Instrument -- MIZ 10B; Zetec, Inc.

      (2) Probe -- P905-40/5. Manufactured by NDT Product Engineering. Any low frequency shielded spot probe capable of operating at 2 kHz may be used.

      (3) Reference Standard -- Reference Standard 371. Refer to Figure 1.

      (4) Tape -- Transparent tape 1.0-inch wide.

      NOTE: Refer to Part 1, 51-01-00, for information on equipment manufacturers.

3. **Prepare for the Inspection**

   A. Identify inspection area.

   B. Clean inspection area and remove loose paint.

4. **Instrument Calibration**

   A. Calibrate on reference standard.

      (1) Set instrument frequency to 2 kHz.

      (2) Put tape on reference standard as shown (Figure 2).

      (3) Put probe on the thick section of the reference standard (Figure 2, Position 1).

      (4) Balance the instrument. Refer to the manufacturer's instructions.

      (5) Adjust the lift-off to obtain less than 5 percent of the full scale needle movement when the probe is slid from a 0.005 to 0.010-inch (0.013 to 0.025 cm) nonconductive shim, placed on the tape, to the tape on the reference standard (Figure 2, Position 1).

      NOTE: Two or three sheets of ordinary writing paper, approximately 0.003-inch (0.007 cm) thick each can be used as the nonconductive shim.

      (6) Adjust the meter-needle-position control to obtain a baseline response of 20 percent of the full scale.

      (7) Put the probe on the thin section of the reference standard (Figure 2, Position 2).

      (8) Adjust the sensitivity (gain control) to obtain an 80 percent of the full scale indication or 60 percent of the full-scale-needle deflection difference between Position 1 and Position 2.

      (9) Recheck the balance and the lift-off. If adjustments are made, recheck the sensitivity.

(10) Slide the probe from the thick section toward the thin section.

(11) When the meter indication reaches 70 percent of the full scale, 50 percent above the baseline, slide probe in a sideways direction as shown in Figure 2. This will leave a pressure mark on the tape, which should align with the edge of the second layer.

B. Calibrate on Airplane

(1) Put transparent tape on the airplane between the frames at B.S. 616 and B.S. 639 (above overwing escape hatch) as shown in Figure 3.

(2) Put the probe on the surface of taped skin, between these fasteners, on the skin lap section below the lower skin edge (Figure 3, Position 1). Check for a baseline response of 20 percent. If the baseline response is not 20 percent, re-balance the instrument.

(3) Place the probe on the upper skin above the edge of the lower skin (Figure 3, Position 2). If the meter indication is not 60 percent of the full scale above the baseline response (Paragraph 4.B.(2)), adjust the instrument gain to achieve a 60 percent of full scale difference between Position 1 and Position 2.

5. Inspection Procedure

A. Inspect the area between the frames at B.S. 616 and B.S. 639.

(1) Place the probe on the tape in Position 1, Figure 3 (instrument response must be at 20 percent of the full scale - see calibration procedure).

(2) Slide the probe upwards toward Position 2. When the meter indication reaches 70 percent (50 percent above the baseline) stop and slide the probe sideways (as in calibration procedure - Paragraph 4.B.(1) thru Paragraph 4.B.(3) leaving pressure mark on tape (Figure 3, Position 3).

(3) Repeat Paragraph 5.A.(1) and Paragraph 5.A.(2) in four or more locations.

(4) Lay a straight-edge on the tape surface and mark a line connecting all of the points produced in the above procedure. If any of the points are out of alignment, repeat the process until an alignment is achieved. The line thus produced, corresponds to the edge of the lower skin.

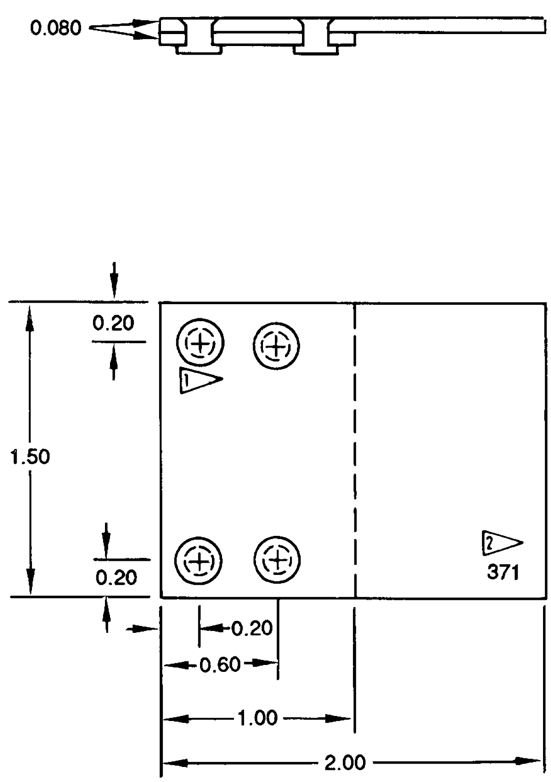
6. Inspection Results

A. Measure the distance from the line drawn (indicating the lower skin edge) to the centerline of the fasteners.

B. Subtract 0.050-inch (0.076 cm) from this measurement.

C. Refer to the Service Bulletin for the minimum allowable edge margin distance. Compare it to the value determined in Paragraph 6.B.

D. If short edge margins are detected, refer to the Service Bulletin for corrective action.



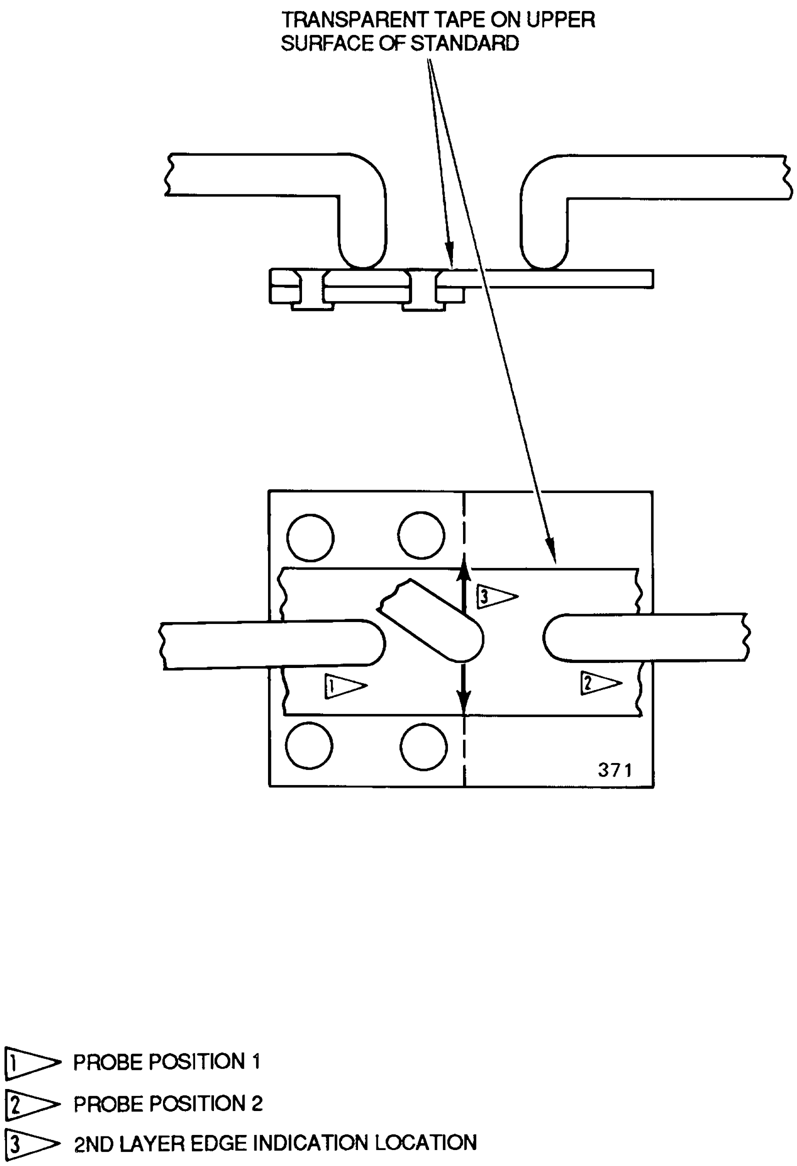
NOTES
- ALL DIMENSIONS ARE IN INCHES
- MAT: 2024-T3, -T4

1 BACR15C5D5 (4 PLACES)
2 ETCH OR STEEL STAMP 371

TOLERANCE: X.X ± 0.05
X.XX ± 0.02
X.XXX ± 0.005

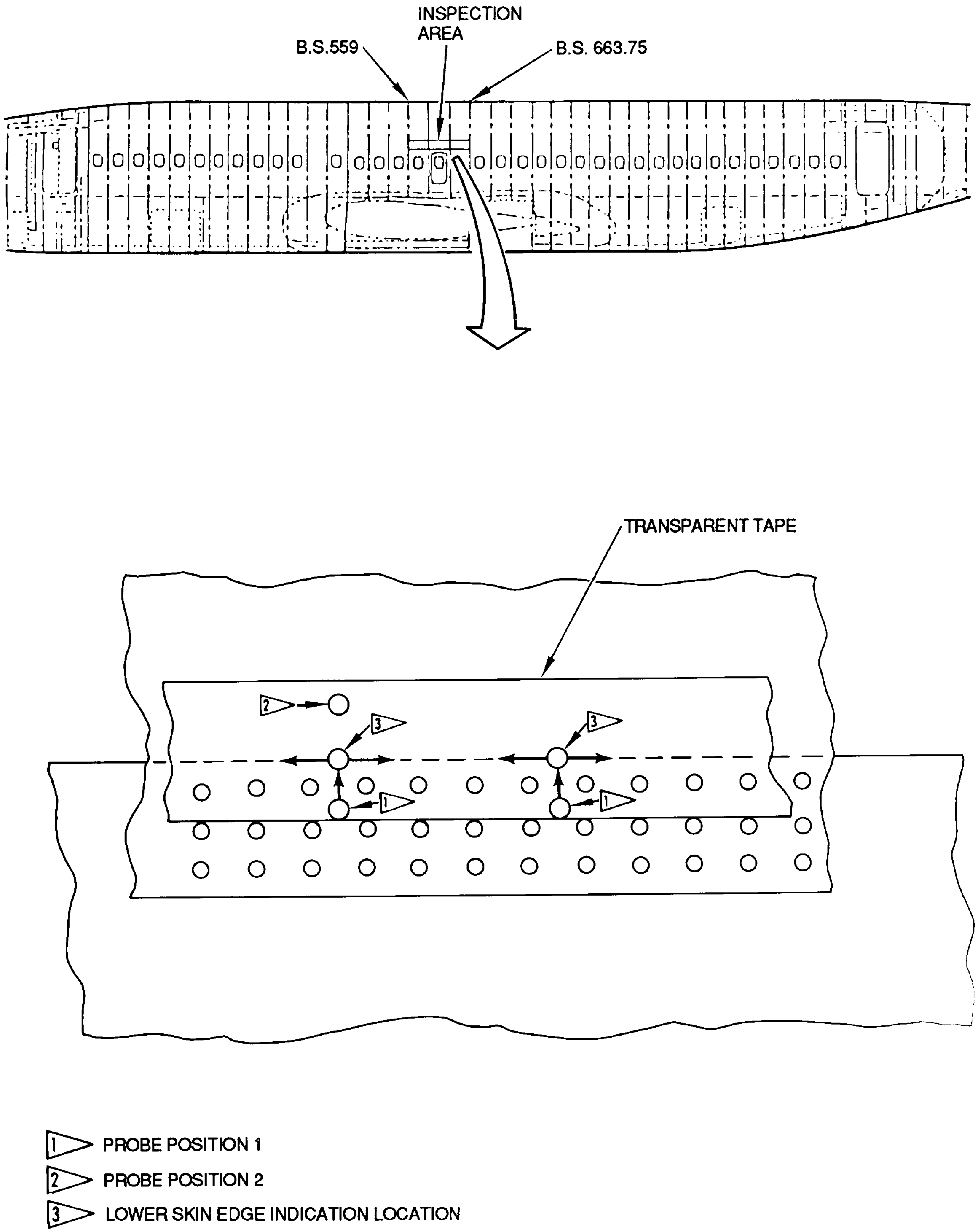
2161494 S0000472607_V1

Reference Standard 371
Figure 1



2161496 S0000472608_V1

Calibration
Figure 2



2161498 S0000472609_V1

Stringer 10 Lap Splice (Typical)
Figure 3

PART 6 - EDDY CURRENT

FUSELAGE-BONDED DOUBLER

1. **Purpose**

   A. This procedure is used to find cracks in the radius area and at fastener locations in the bonded doubler between stringer 14 and stringer 20 from BS 727.0 to BS 827.0.

   B. Service Bulletin Reference: 737-53-1065

2. **Equipment**

   NOTE: Refer to Part 1, 51-01-00, for information about the equipment manufacturers.

   A. Instrument - Use an eddy-current instrument that can do the inspection correctly. These instruments were used to make this inspection procedure:

      (1) Model NDT 19; Nortec/Staveley

      (2) Model AV100; Hocking

   B. Probes - Two probes are necessary to do this inspection. Use eddy-current probes of the same size and electrical properties that can do the inspection correctly. These probes were used to make this inspection procedure:

      (1) Spot Probe (can operate at 20 kHz)

         (a) L-32-35-1K; NDT Product Engineering

            1) 0.35-inch diameter

         (b) SNG 0.375/3L/25K; NDT Product Engineering

            1) 0.30-inch diameter

         (c) SNG 0.375/3L/20K; NDT Product Engineering

            1) 0.30-inch diameter

         (d) SPO 1598; Nortec/Staveley

            1) 0.325-inch diameter

      (2) Ring Probe (can operate at 8 kHz)

         (a) SP0996; Nortec/Staveley

            1) 0.75-inch outer diameter

            2) 0.30-inch inner diameter

   C. Reference Standard - Make reference standard 383 as shown in Figure 2.

   D. Probe positioning templates - Make probe positioning templates 383P1.0, 383P2.25, 383P2.5 and 383P3.0 as shown in Figure 3.

3. **Prepare for the Inspection**

   A. Find the inspection area. Refer to Figure 1, Figure 10, and Figure 11.

   B. Remove the wing-to-body fairing.

   C. Clean the inspection area.

   D. Remove paint from fasteners of the inspection if the fastener heads are not clearly visible. The inspection area is shown in Figure 11.

4. **Instrument Calibration**

A. Calibrate the instrument to find cracks in the radius areas of the bonded doubler.

NOTE: This is a three-part calibration procedure.

(1) Initial calibration

(a) Connect a spot probe to the instrument.

(b) Set the instrument frequency at 20 kHz.

(c) If the area of the inspection is painted, put a non-conductive shim on top of the reference standard. The non-conductive shim must be ± 0.003 inch the thickness of the paint. Put the probe on the reference standard at probe position 1 as shown in Figure 4.

(d) Balance the instrument as specified by the instrument's instructions.

(e) Adjust the phase control so that lift-off is to the left as shown in Figure 6.

(f) Put the flying dot at 20 percent of full scale as shown in Figure 6.

(g) Put the probe in position 2 as shown in Figure 4. The instrument response will be upscale.

(h) Adjust the instrument sensitivity so that when the probe is in position 2, the flying dot goes to 80 percent of full scale as shown in Figure 6.

(2) Calibrate the instrument to find each radius of the bonded doubler. See Figure 4 and Figure 6.

(a) Make a mark at the centerline of the probe on each side as shown in Figure 4.

(b) Calibrate the instrument as specified in Paragraph 4.A.(1).

(c) Put the probe at position 3 as shown in Figure 4. Slowly move the probe along the reference standard to position 4 until the flying dot gets to 65 percent of full-screen height. See Figure 6.

(d) Make a pencil mark on the reference standard at this point which is aligned with the pencil marks on the probe.

(e) Move the probe to position 5 and do Paragraph 4.A.(2)(c) and Paragraph 4.A.(2)(d) again. Use positions 5 and 6.

(f) Use a pencil to make a line that connects the marks on the reference standard. This line must align with the edge of the second layer. Refer to Figure 4. If the line does not align with the second layer edge, do Paragraph 4.A.(2) again.

(3) Calibrate the instrument to find cracks that are along each radius of the bonded doubler.

(a) Put a straight edge on the reference standard so it is aligned with the pencil line (second layer edge). See Figure 5.

(b) Put the probe at position A1 as shown in Figure 5. Move the probe along the reference standard to position A2. The instrument response will be approximately 30 percent of full-screen height more than when the probe was at position A1. Refer to Figure 7.

B. Calibrate the instrument to find cracks at the fastener locations of the bonded doubler. Refer to Figure 5.

(1) Calibrate the equipment to do a crack inspection at 5/32-inch aluminum rivet locations.

(a) Attach the ring probe (SP0996 or equivalent) to the instrument.

(b) Set the instrument frequency at 8 kHz.

(c) Put the ring probe at location B1, Figure 5.

(d) Balance the instrument as specified by the manufacturer's instructions.

(e) Adjust the phase control so that lift-off is to the left. Refer to Figure 8.

(f) Put the ring probe above the center of the fastener head. Move the ring probe around to get a minimum instrument response. Balance the instrument again.

(g) Put the ring probe at location B2 (Figure 5). The instrument response will be upscale (refer to Figure 8).

(h) Adjust the instrument sensitivity to get an instrument response (flying dot) that is 30 percent of the full-screen height more than when the probe was at position B1. Refer to Figure 8.

(2) Calibrate the equipment to do a crack inspection at 3/16-inch aluminum rivet locations.

(a) Do Paragraph 4.B.(1) again at probe positions C1 and C2.

(3) Calibrate the equipment to do a crack inspection at 3/16-inch steel bolt locations.

(a) Do Paragraph 4.B.(1) again at probe positions D1 and D2.

5. Inspection Procedure

A. Inspection for cracks in the radius areas of the bonded doubler.

(1) Find the inspection area. Refer to Figure 1, Figure 10, and Figure 11.

(2) Calibrate the instrument as specified in Paragraph 4.A.

(3) Put the probe on the fuselage skin. The position of the probe must be as shown in Figure 9, position 1 (for the applicable radius as specified in Figure 11).

(4) If the instrument response is more than 5 percent of full-screen height different than the response from the reference standard, balance the instrument with the probe on the skin.

(5) Put the probe at a position on the fuselage skin near the position shown in Figure 9, position 2.

(6) The instrument response must be 80 percent of full-screen height. If the response is less, make sure that the non-conductive shim on the reference standard is ± 0.003 inch of the paint thickness.

(7) Put the probe on the fuselage skin near the position shown in Figure 9, position 1 again.

(8) Move the probe slowly along the surface of the skin to the doubler radius area as shown in Figure 9, locations 1 and 3.

(9) When the instrument response is 65 percent of full scale as it was in Paragraph 4.A.(2), make a mark on the skin with an approved marker.

(10) Do this procedure again on the fuselage skin at the areas identified in Figure 9 as positions 4 and 5 and positions 6 and 7.

(11) Put the probe positioning template on the skin and make a line to connect the marks. Refer to Figure 9.

(12) Put the probe positioning template on the skin so that the line made in Paragraph 5.A.(11) is located at the radius edge of the probe positioning template. Refer to Figure 10.

(13) Put the probe in position against the positioning template radius. If the instrument response is more than 10 percent of full scale higher than the response when the probe is at position B1, C1, or D1, Figure 8, do Paragraph 5.A.(1) thru Paragraph 5.A.(12) again.

(14) Move the probe on the surface of the skin around the arc of the positioning template. A sudden vertical flying dot movement is an indication of a possible crack and more inspection must be done.

B. Inspection for cracks at the fastener locations of the bonded doubler.

NOTE: Use the correct fastener type on the reference standard during calibration for this inspection.

(1) Inspection of 5/32-inch rivet locations.

(a) Calibrate the instrument to do the inspection at 5/32-inch aluminum rivet locations as specified in Paragraph 4.B.(1).

(b) Find the 5/32-inch aluminum rivets as shown in Figure 9 and Figure 10.

(c) Center the probe above a 5/32-inch fastener head in the inspection area. Move the probe around until you get a minimum instrument response.

(d) Do Paragraph 5.B.(1)(c) again at three or more 5/32-inch inspection fasteners in the same area as the fastener done in Paragraph 5.B.(1)(c).

(e) Use one of these fasteners as the airplane baseline response. If the instrument response is 10 percent of full-screen height more than the instrument response with the probe on the reference standard, balance the instrument with the probe on the skin. Refer to this fastener regularly to make sure that the instrument response does not change because of instrument drift or temperature changes.

(f) Do an inspection for cracks at all 5/32-inch aluminum rivet locations as shown in Figure 9 and Figure 10.

(2) Inspection of 3/16-inch rivet locations.

(a) Calibrate the instrument to do an inspection for cracks at 3/16-inch aluminum rivet locations as specified in Paragraph 4.B.(2).

(b) Find the 3/16-inch aluminum rivets.

(c) Put the probe above the center of the 3/16-inch fastener head in the inspection area. Move the probe around until you get a minimum instrument response.

(d) Do Paragraph 5.B.(2)(c) again at three or more 3/16-inch inspection fasteners in the same area as the fastener done in Paragraph 5.B.(2)(c).

(e) Use one of these fasteners as the airplane baseline response. If the instrument response is 10 percent of full-screen height more than the instrument response with the probe on the reference standard, balance the instrument with the probe on the skin. Refer to this fastener regularly to make sure that the instrument response does not change because of instrument drift or temperature changes.

(f) Do the inspection of all 3/16-inch aluminum rivet locations as shown in Figure 9 and Figure 10.

(3) Inspection of 3/16-inch steel bolt locations.

(a) Calibrate the instrument to do an inspection for cracks at 3/16-inch steel bolt locations as specified in Paragraph 4.B.(3).

(b) Find the 3/16-inch steel bolts in the inspection area.

(c) Put the probe above the center of the fastener head in the inspection area. Move the probe around until you get a minimum instrument response.

(d) Do Paragraph 5.B.(3)(c) again at three or more 3/16-inch (steel) inspection fasteners in the same area as the fastener done in Paragraph 5.B.(3)(c).

(e) Use one of these fasteners as the airplane baseline response. If the instrument response is 10 percent of full-screen height more than the instrument response with the probe on the reference standard, balance the instrument with the probe on the skin. Refer to this fastener regularly to make sure that the instrument response does not change because of instrument drift or temperature changes.

(f) Do the inspection of all 3/16-inch steel bolt locations as shown in Figure 9 and Figure 10.

6. **Inspection Results**

A. Inspection of the radius areas of the bonded doubler.

(1) Sudden vertical movement of the flying dot is a crack indication. If you get a sudden vertical flying dot, do more inspection as follows:

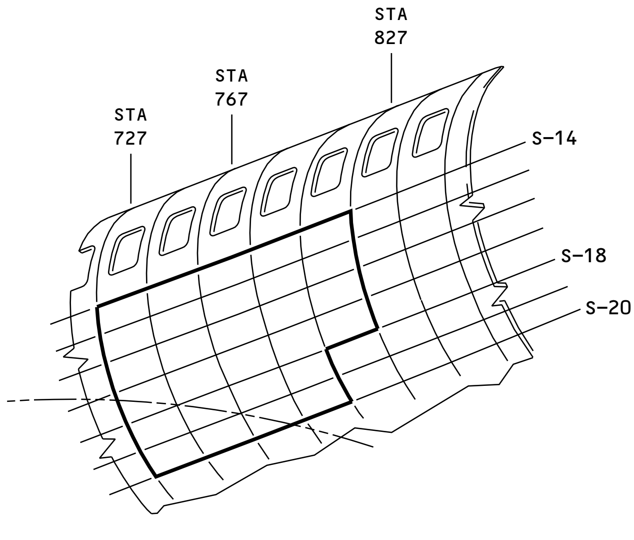
(a) Remove the sidewall panels as necessary to get access to the inner surface.

(b) Do a close visual or surface eddy-current inspection to make sure of the crack indication. Refer to Part 6, 51-00-00, Procedure 4 for instructions to do the surface eddy-current inspection.

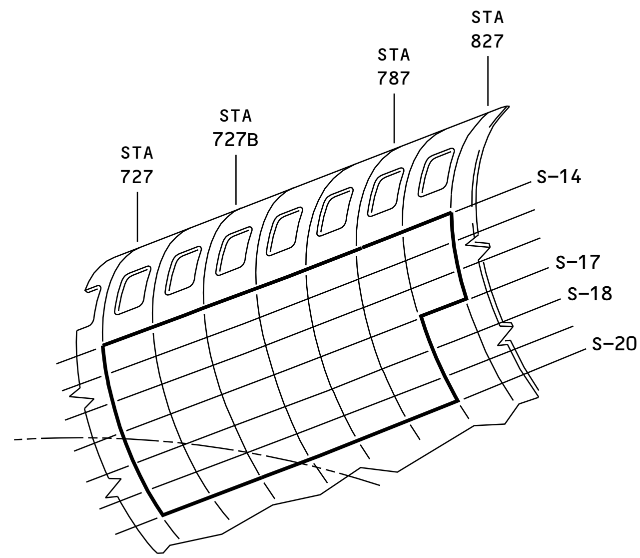
B. Inspection of fastener locations.

(1) A vertical movement of the flying dot which is 15 percent of full-screen height more than the calibration response is a crack indication. If this occurs, do more inspection as follows:

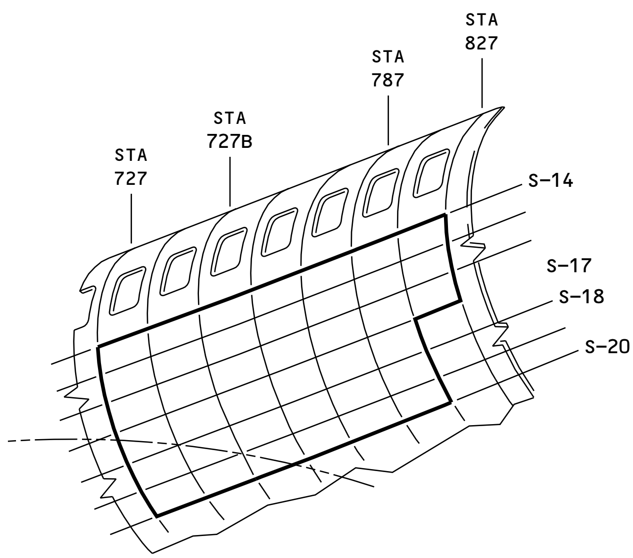
(a) Remove the fastener and do a hole inspection. Refer to Part 6, 51-00-00, Procedure 1 or Part 6, 51-00-00, Procedure 11 to do the hole inspection.



GROUP 1 AIRPLANES



GROUP 2 AIRPLANES



GROUP 3 AIRPLANES

NOTES

- THIS INSPECTION IS DONE ON ALL 737 AIRPLANES, LINE NUMBERS 1 THRU 920. THERE ARE THREE GROUPS (REFER TO SERVICE BULLETIN 737-53-1065).
  GROUP 1: 737-100 AIRPLANES
  GROUP 2: 737-200 AIRPLANES
  GROUP 3: 737-200C AIRPLANES
- THE INSPECTION IS DONE IN THE AREAS IDENTIFIED BY THE BOLD LINES.

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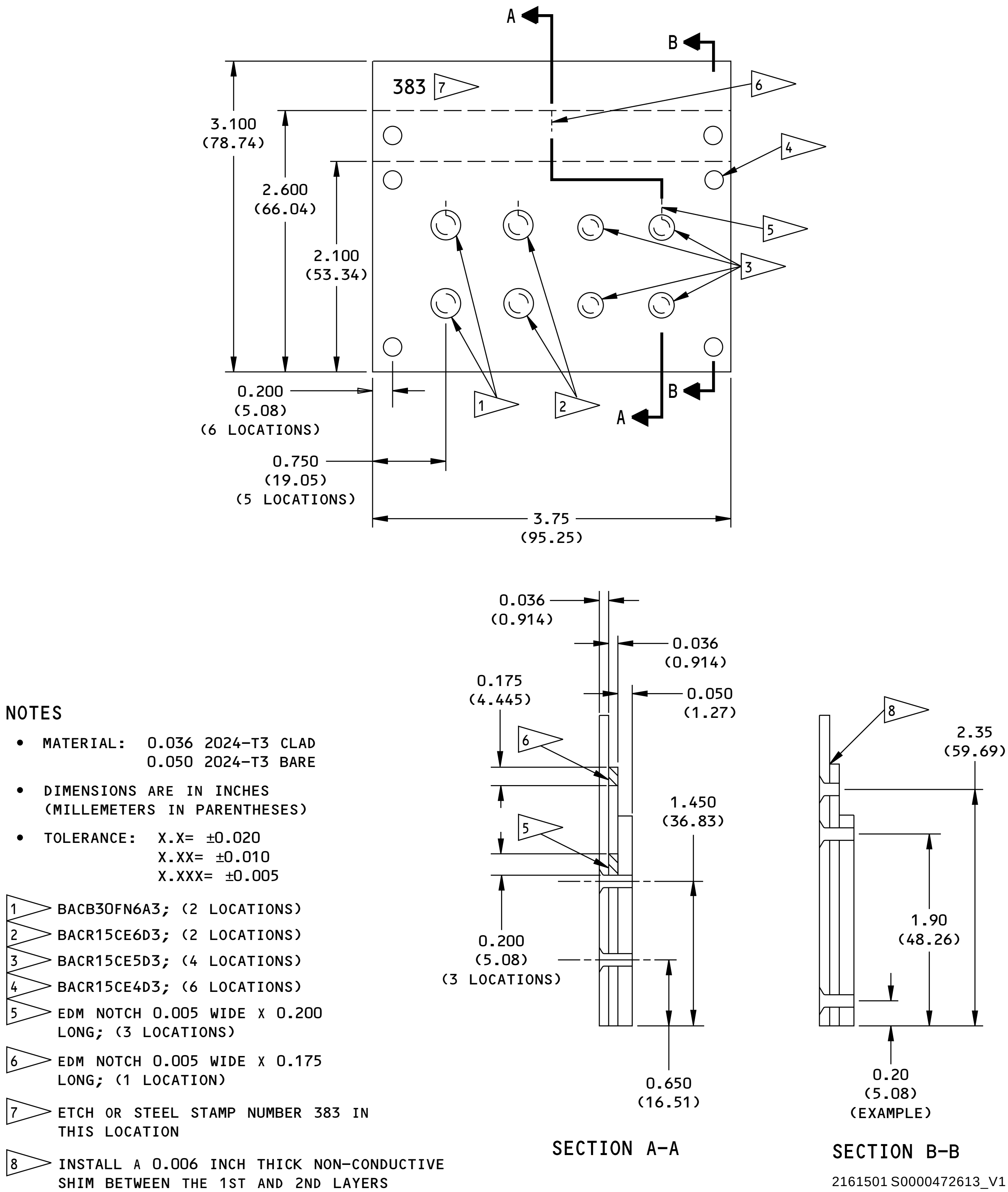
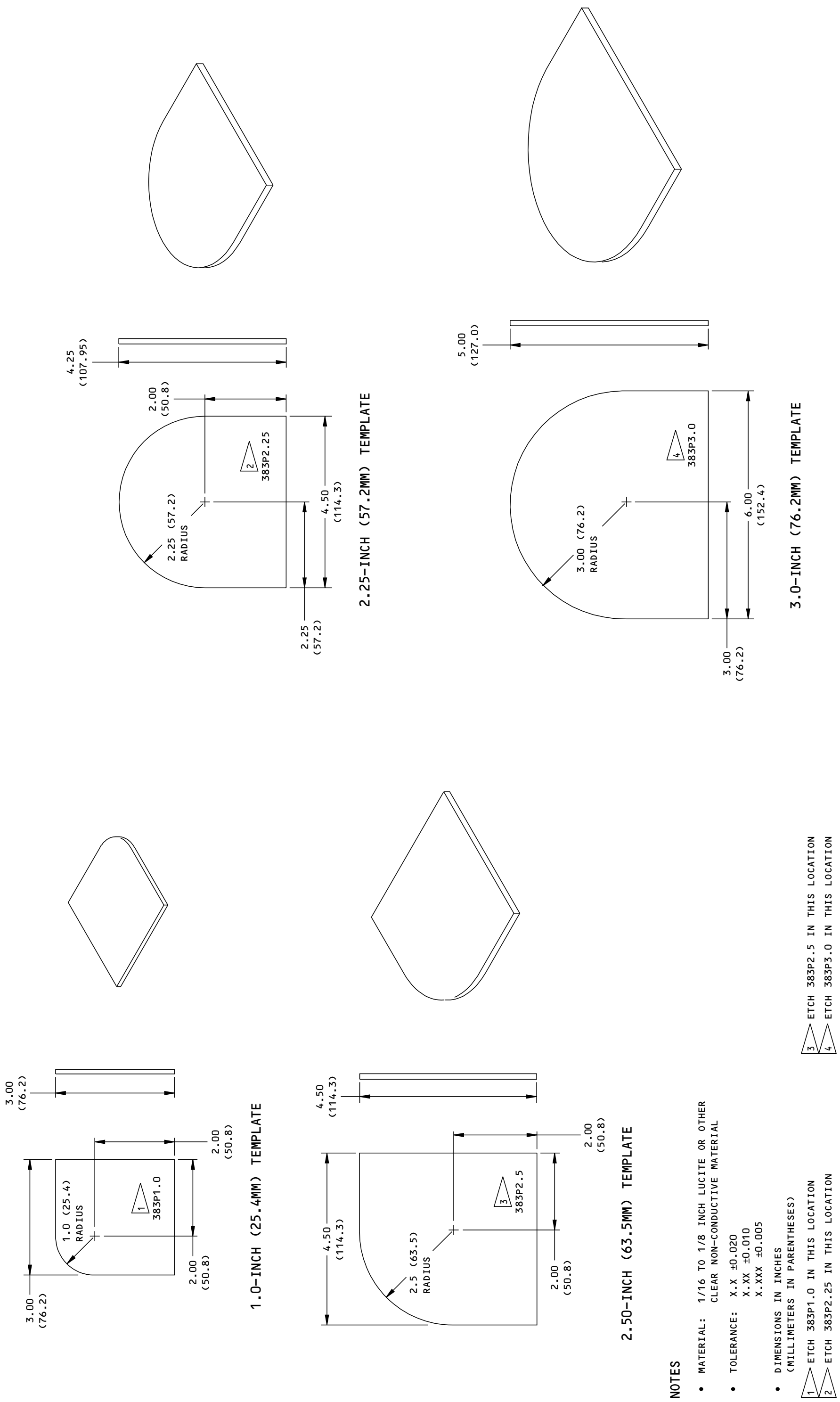
Inspection Location
Figure 1

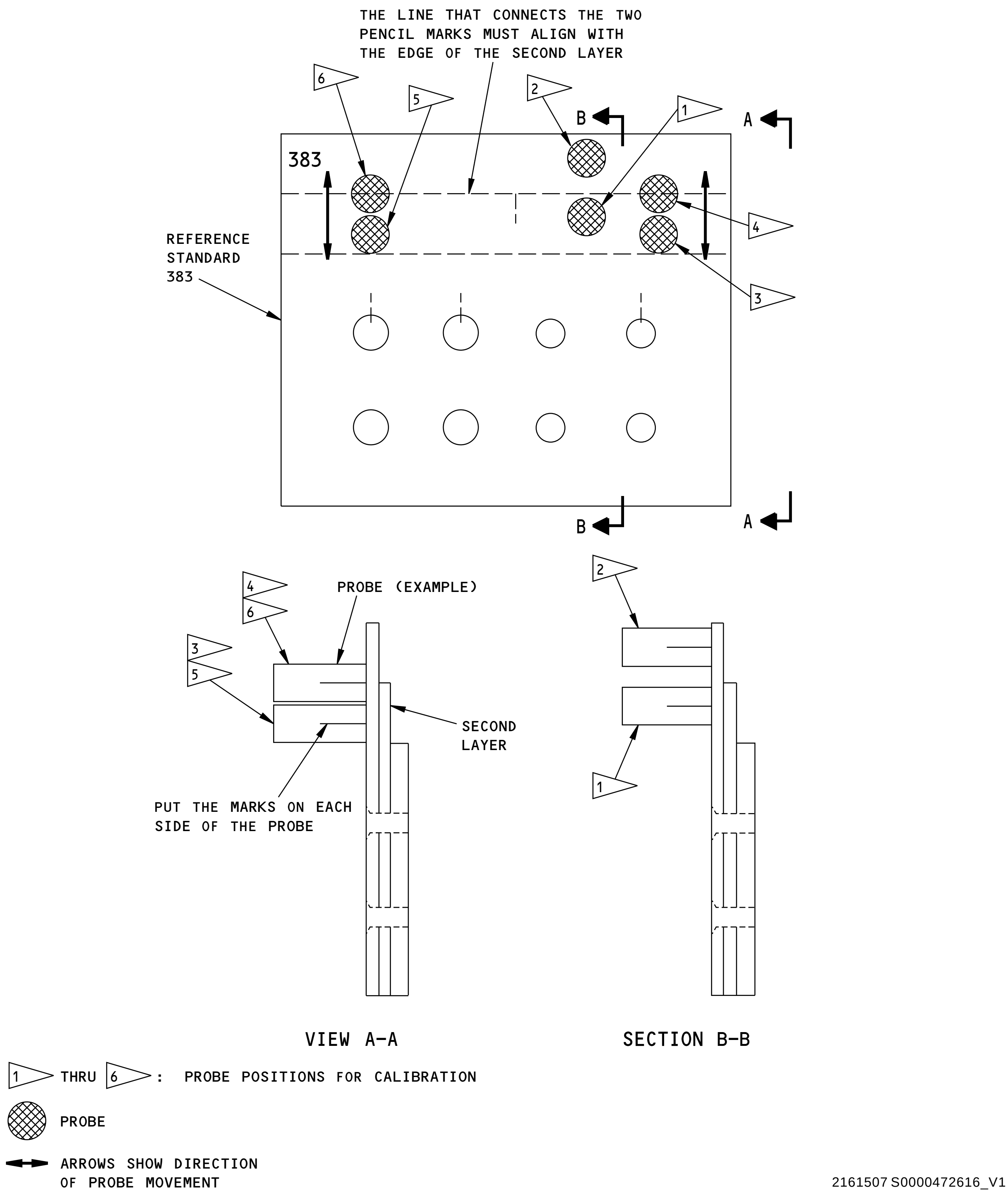


Reference Standard 383
Figure 2

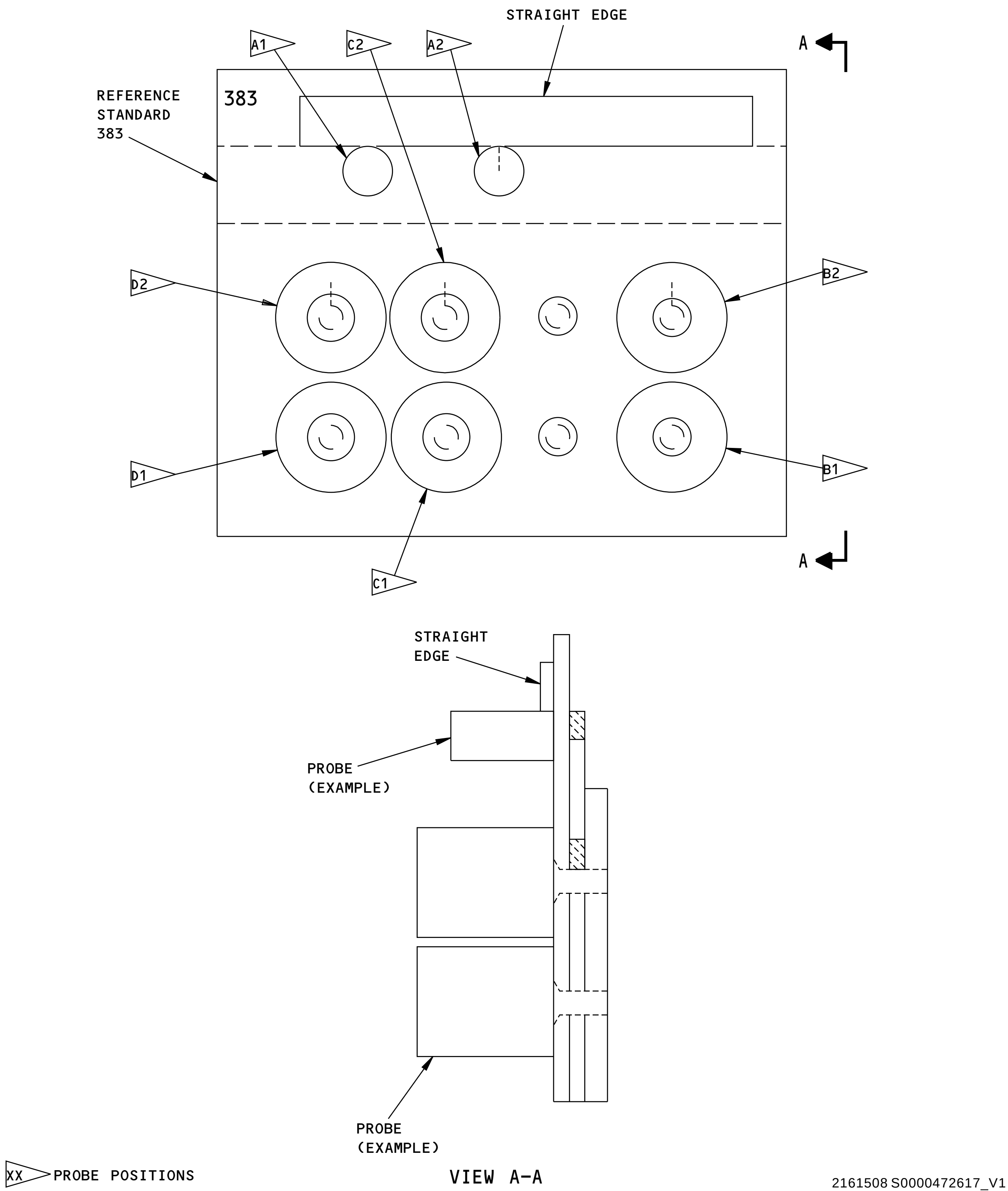
2161503 S0000472615_V1



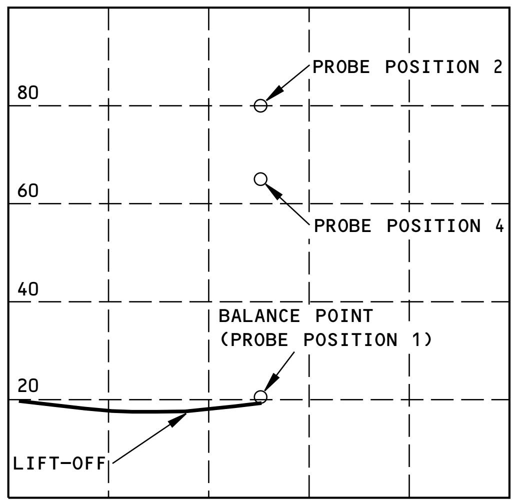
Probe Positioning Templates
Figure 3



Instrument Calibration
Figure 4

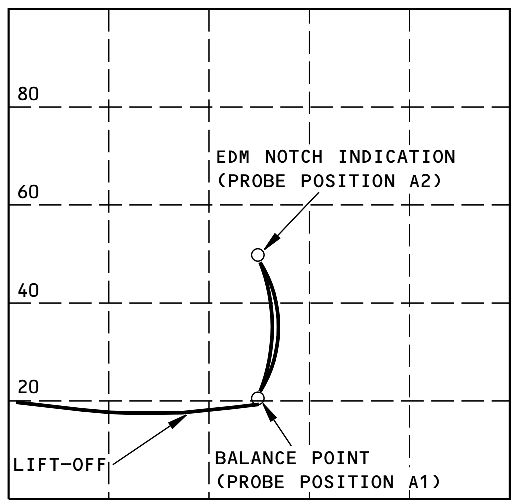


Probe Positions for Calibration
Figure 5



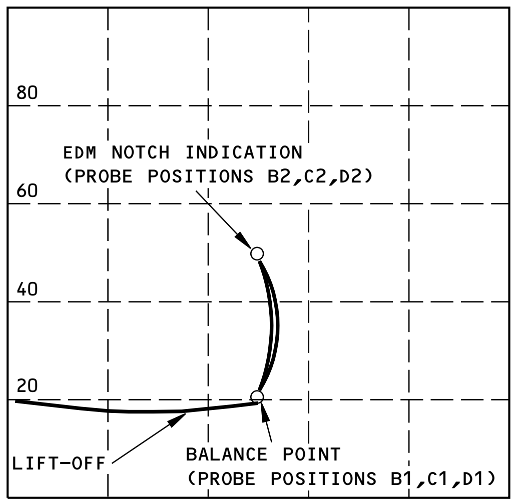
2161509 S0000472618_V1

Calibration to find each Radius of the Bonded Doubler
Figure 6



2161512 S0000472619_V1

Calibration to find Cracks that are along each Radius of the Bonded Doubler
Figure 7



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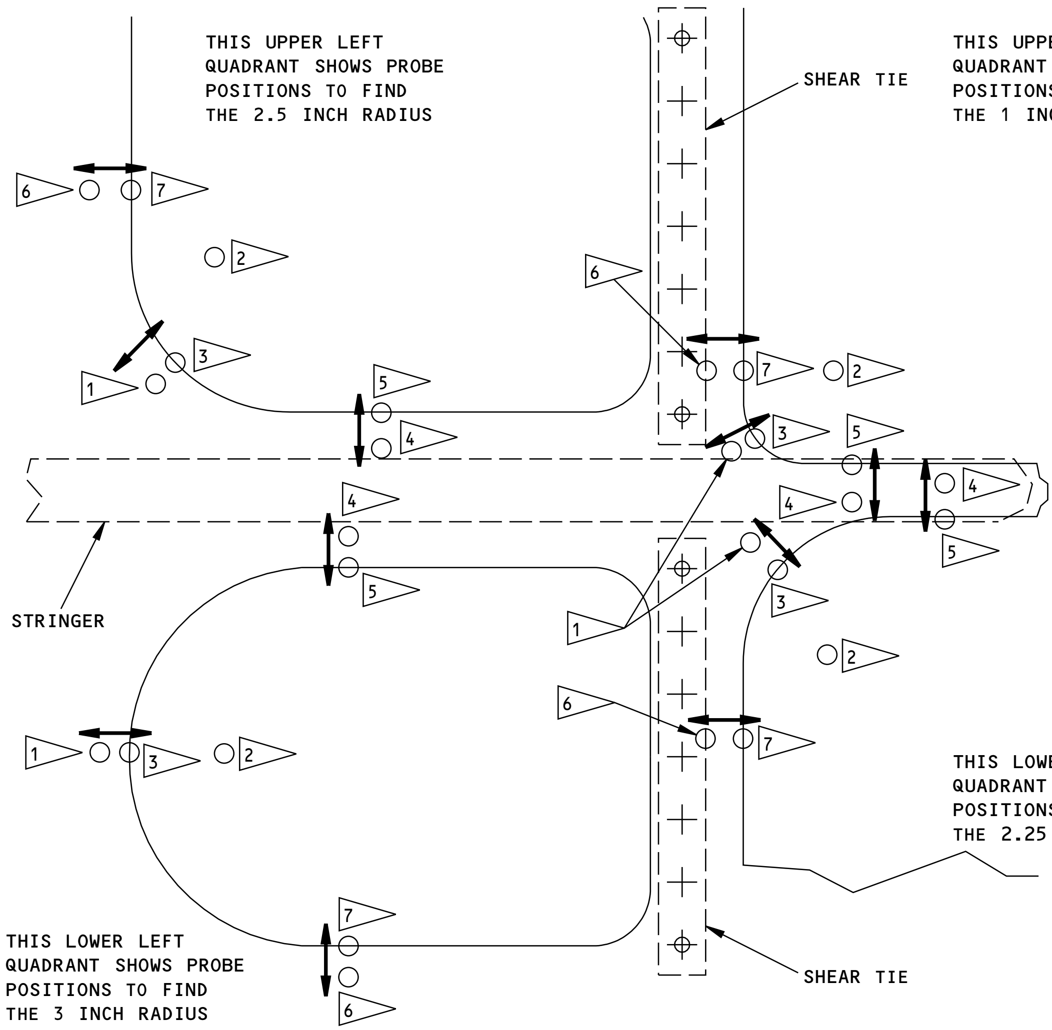
Calibration to find Cracks in Fastener Holes of the Bonded Doubler
Figure 8



NOTES

- THE BONDED DOUBLER IS SHOWN IN SOLID LINES
- THIS FIGURE SHOWS THE FOUR POSSIBLE RADIUS TYPES IN THE INSPECTION AREA OF THE BONDED DOUBLER

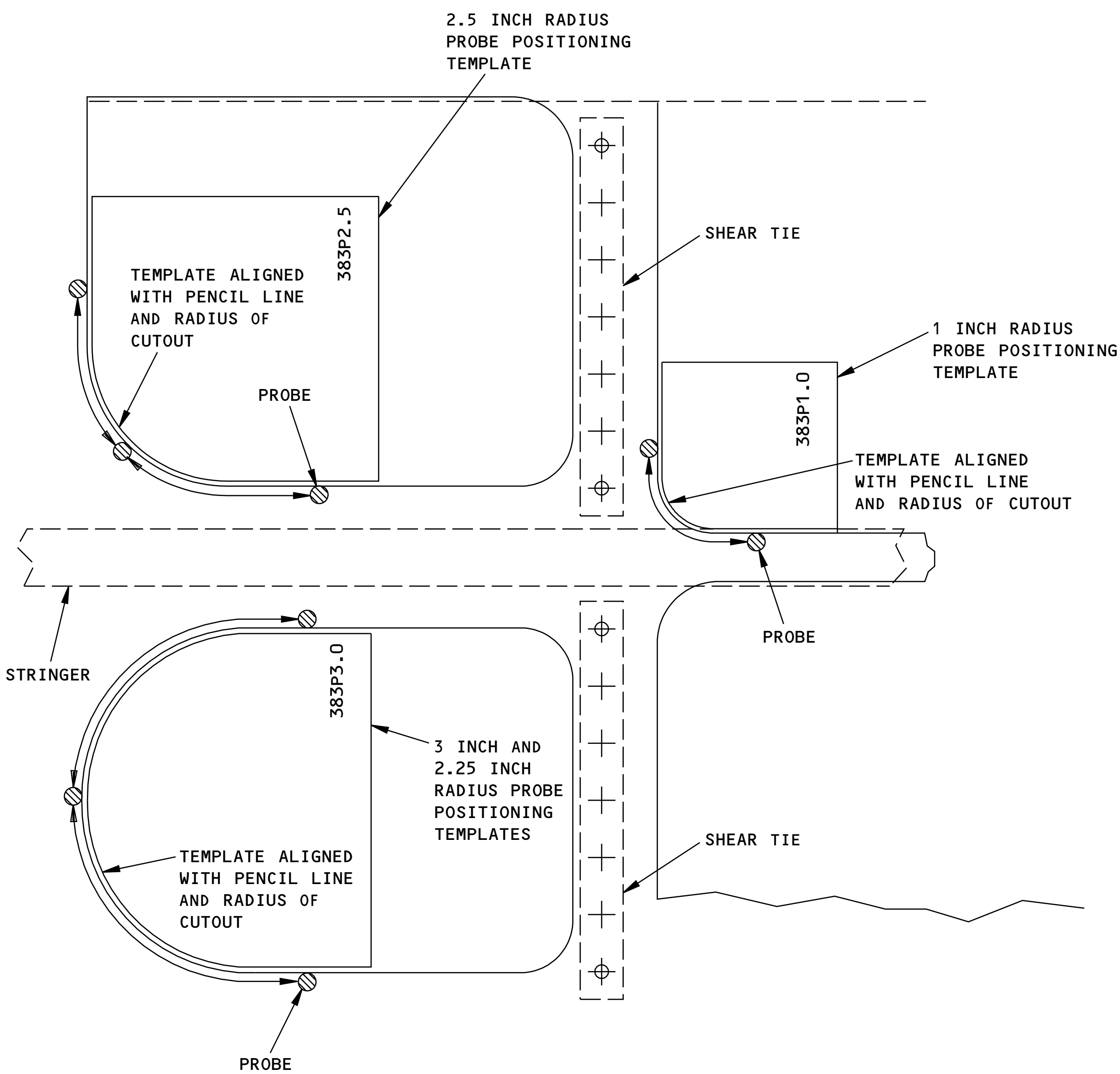
1 THRU 7: PROBE POSITIONS TO FIND THE RADIUS LOCATIONS OF THE BONDED DOUBLER

INSPECTION FASTENERS

ARROWS SHOW DIRECTION OF PROBE MOVEMENT

2161515 S0000472621_V1

Procedure to find the Radius Locations of the Bonded Doubler
Figure 9



NOTES

- THE BONDED DOUBLER IS SHOWN IN SOLID LINES
- DO AN INSPECTION OF ALL RADII SHOWN ON FIGURE 11

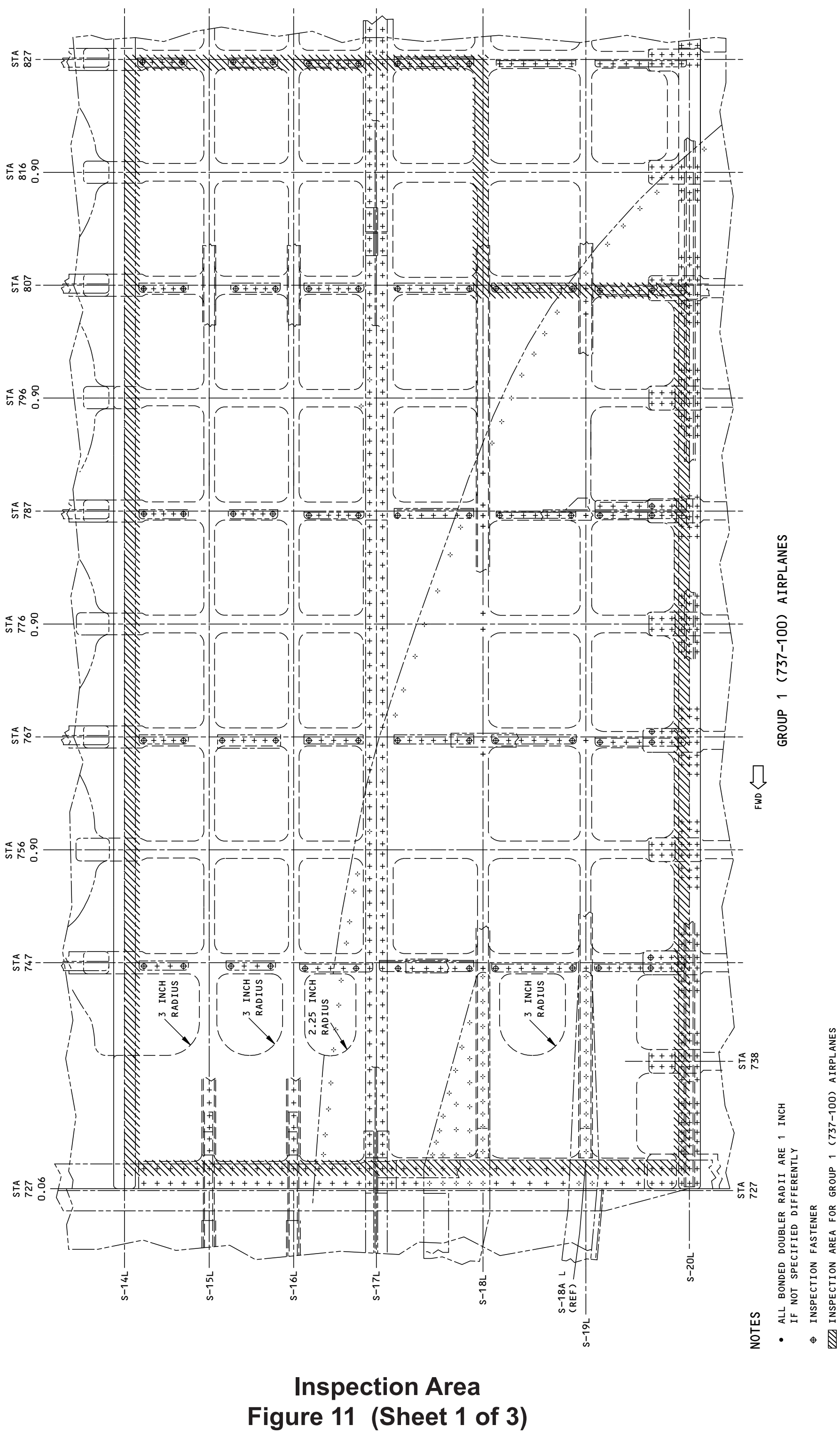
⌖ INSPECTION FASTENER - SEE FIGURE 11

⊘ PROBE

2161516 S0000472622_V1

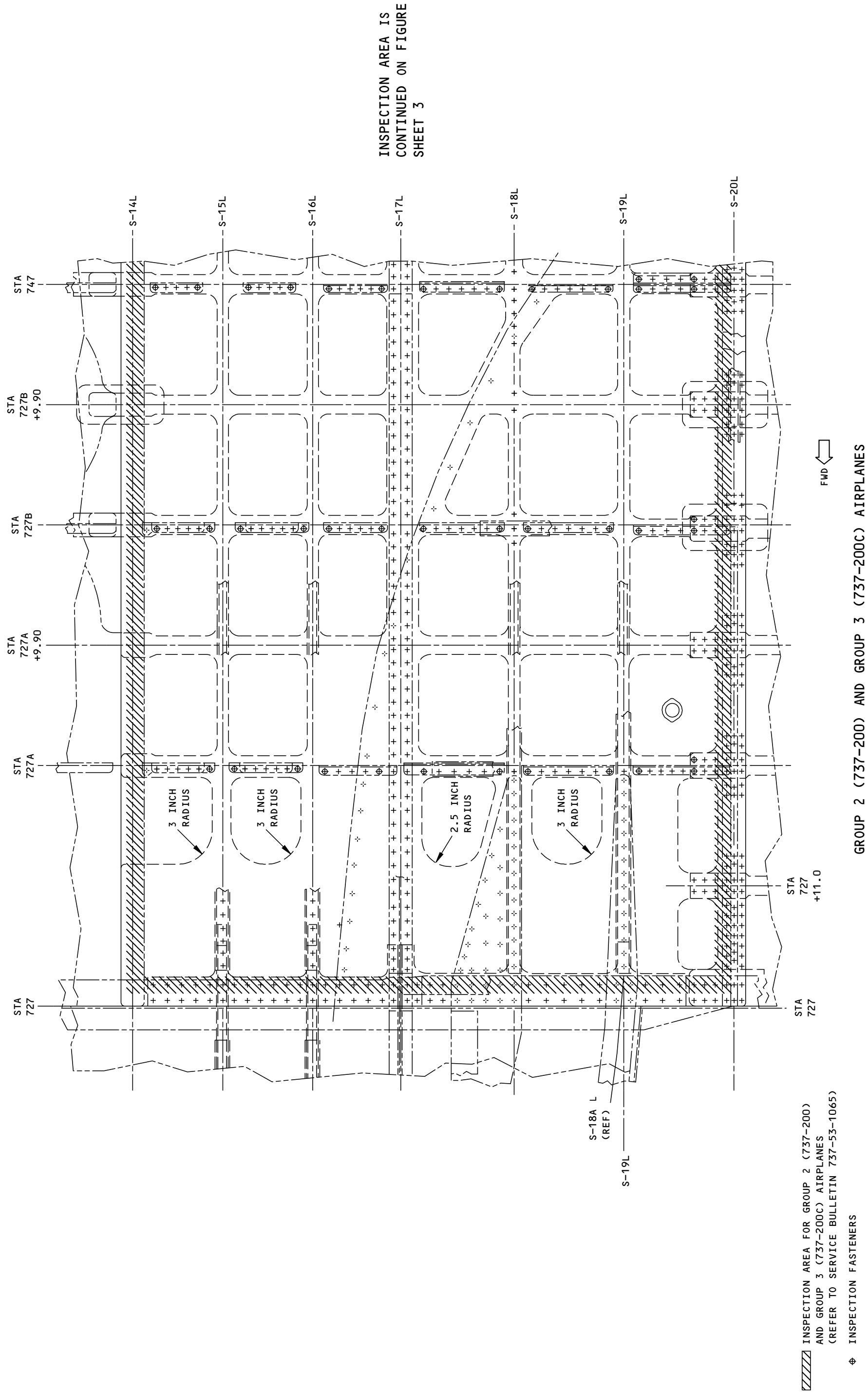
Skin (Bonded) Doubler - Example Section
Figure 10

2161518 S0000472623_V1



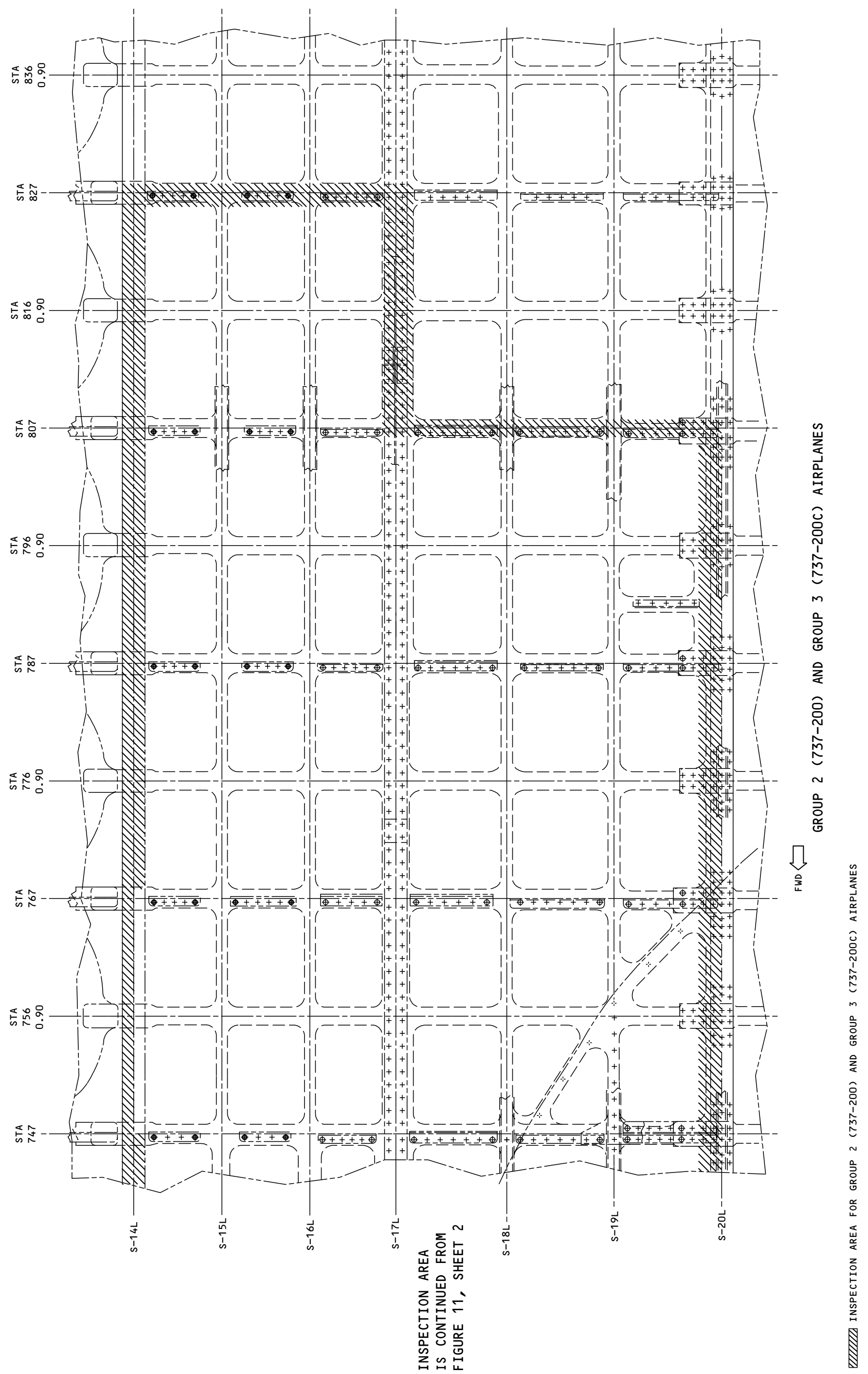
Inspection Area
Figure 11 (Sheet 1 of 3)

2161519 S0000472624_V1



Inspection Area
Figure 11 (Sheet 2 of 3)

2161521 S0000472625_V1



Inspection Area
Figure 11 (Sheet 3 of 3)

PART 6 - EDDY CURRENT

FUSELAGE SECTION 41 - SKIN CRACK INSPECTION FROM BS 188 THRU 251.6 - DUAL FREQUENCY MODE

1. **Purpose**

   A. Use this procedure to examine the skin that is behind the external straps for cracks. The external straps are from body station (BS) 188 to BS 251.6 in fuselage Section 41. See Figure 1 for the inspection areas. The cracks are within 30 degrees of vertical.

   B. This inspection procedure can be used on external straps and skins with Alodine or anodized fasteners or nonmagnetic fasteners.

   C. This procedure is done from the external side of the airplane. See Figure 1 for the inspection locations.

   D. This procedure will find cracks in the skin that start at the fastener holes.

   E. This procedure uses a sliding probe and an impedance plane display instrument that can operate in a dual frequency mode.

   F. You cannot do this procedure at a location where the fastener is magnetic (steel) or if a fastener has a protruding head. If a fastener is magnetic or has a protruding head, you must do one of the procedures that follows:

      (1) Do an external inspection as specified in Part 6, 53-30-00, Procedure 5.

      (2) Do an open hole inspection as specified in Part 6, 51-00-00, Procedure 16.

   G. The probe must be accurately aligned with the fastener centerline to do this inspection correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

   H. Service Bulletin Reference: 737-53-1111

2. **Equipment**

   A. Refer to Part 6, 53-30-00, Procedure 9, par. 3 for the instruments, probes and special tools to use to do this procedure.

      NOTE: Although the title of Part 6, 53-30-00, Procedure 9, identifies that it is for the "Inboard Skin of the Lap Splice", it can also be used to examine the skin behind the external straps.

   B. Reference Standard

      (1) Use reference standard NDT1087-1 with probe guide NDT1087-P1. Refer to Part 6, 53-30-00, Procedure 9 for data about the reference standard and probe guide.

3. **Prepare for the Inspection**

   A. Prepare for the subsurface inspection of the skin in Section 41 as follows:

      (1) Get access to the inspection area on the external side of the airplane from Station 188 thru 251.6. See Figure 1.

      (2) Refer to Part 6, 53-30-00, Procedure 9, par. 4 for the inspection preparation instructions.

4. **Instrument Calibration**

   A. Refer to Part 6, 53-30-00, Procedure 9, par. 5 for the instrument calibration instructions.

5. **Inspection Procedure**

A. Examine the skin behind the external straps for cracks as specified in Part 6, 53-30-00, Procedure 9, par. 6 and the steps that follow:

(1) See Figure 1 in this procedure for the inspection area on the external straps.

(2) Put a nonconductive straightedge along a vertical row of fasteners in the inspection area. Adjust the straightedge so that the center line of the probe will go across the center line of the fasteners during a scan.

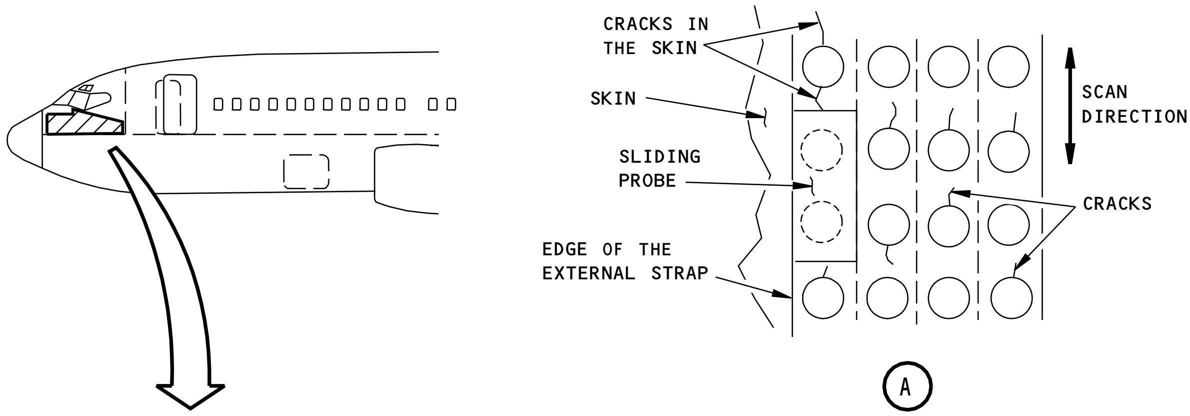
(3) Put the probe between two fasteners in the inspection area and balance the instrument.

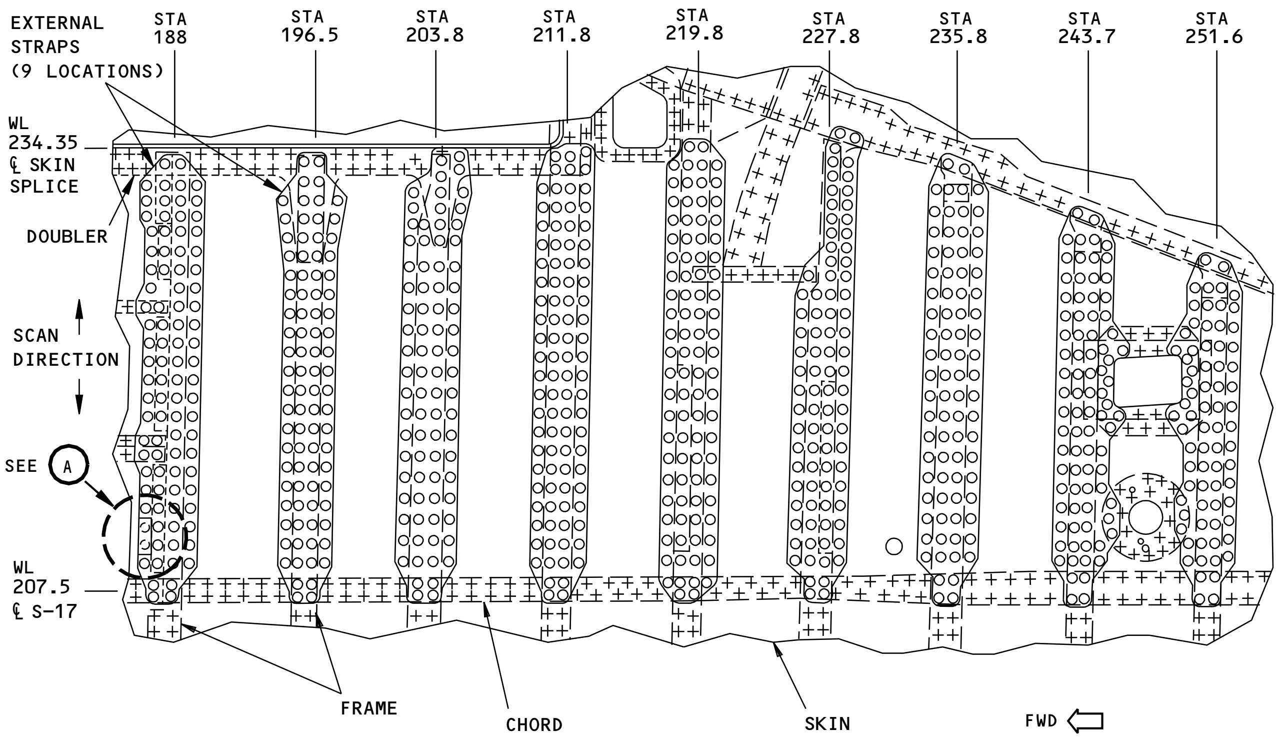
(4) Move the probe in a vertical direction across the fasteners in the inspection area (see Figure 1).

(5) Make sure the inspection is done on each side of the airplane.

6. **Inspection Results**

A. Refer to Part 6, 53-30-00, Procedure 9, par. 7 for the instructions related to the inspection results.





NOTES:

- BALANCE THE PROBE ON THE EXTERNAL STRAPS BEFORE YOU DO A SCAN
- DO A VERTICAL PROBE SCAN ACROSS THE INSPECTION FASTENERS ON ALL OF THE EXTERNAL STRAPS SHOWN ABOVE

○ = INSPECTION FASTENERS

2161522 S0000472628_V1

Inspection Areas at the External Straps from Station 188 to 251.6
Figure 1

PART 6 - EDDY CURRENT

FUSELAGE SKIN CRACK INSPECTION ALONG SUBSURFACE EDGES

1. **Purpose**

   A. This subsurface eddy current inspection can be used to examine the skin for cracks that occur on the inner surface of the skin. The inspection is done on the outer surface of the skin. See the Service Bulletin for data on the inspection area for your airplane group.

   B. The inspection is done with a subsurface eddy current probe and an impedance plane instrument. The probe scan is done perpendicular to the horizontal subsurface edges of the bonded doublers or the horizontal chem-mill edges. Cracks in the skin that are along the horizontal edges of the bonded doubler or chem-mill pockets can be found with this inspection procedure. See Figure 1.

   C. This inspection is for skins that are 0.036 or 0.040 inches (0.91 or 1.01 mm) thick.

2. **Equipment**

   NOTE: Refer to Part 1, 51-01-00, for data about the equipment manufacturers.

   A. Instruments

      (1) All eddy current instruments that have an impedance plane display are permitted if they:

         (a) Can operate between frequencies of 12 kHz and 40 kHz. The frequency must be adjustable by 1 kHz.

         (b) Can find the reference notch in the reference standard as specified in the calibration instructions of this procedure.

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

         (a) NDT 19e; Nortec/Staveley

         (b) Phasec 2200; Hocking/Krautkramer

   B. Probes

      (1) It is necessary to use a spot probe to do this inspection. The probe must operate at a frequency that is between 12 kHz and 40 kHz. The probe diameter must not be more than 0.50 inch (12.7 mm).

      (2) The spot probes specified below operated satisfactorily when this procedure was made. Other probes can be used if they can find the notch in the reference standard as specified in the calibration instructions of this procedure:

         (a) SPO-5328; Nortec/Staveley (Reflection probe)

         (b) SPO-5327; Nortec/Staveley (Reflection probe)

         (c) SNG 0.375/31/25K; NDT Engineering (this probe has a spring loaded collar)

         (d) NEC1005; NDT Engineering (Reflection probe)

         (e) SPO-5329; Nortec/Staveley (Reflection probe)

         NOTE: For smaller diameter probes, a collar attached around the probe will make the probe scan more stable. If a collar is used, it must be adjusted so that the probe satisfactorily touches the airplane skin. Also, during the inspection, make sure the increments between each probe scan are the diameter of the probe and not the outer diameter of the collar.

   C. Reference Standard

(1) Make reference standard NDT396 as specified in Figure 2.

3. **Prepare for the Inspection**

A. Prepare for the subsurface inspection of the skin as follows:

(1) Make sure that the instrument, probe, reference standard, and the inspection areas are at the same temperature.

(2) Get access to the inspection area on the external side of the airplane shown in Figure 1. Refer to the Service Bulletin to get more data on the inspection areas for your airplane group number.

(3) Remove the wing fairings on the inspection area.

(4) Make sure the skin is clean and has no rough paint in the inspection areas.

(5) Teflon tape not more than 0.004 inch (0.10 mm) thick on the end of the probe, will make it easier to do the scans, but it is not necessary. The probe can possibly scratch the airplane if the scans are done without Teflon tape on the probe. If you make a decision to use the Teflon tape on the probe, make sure it is put on the probe before the calibration.

4. **Instrument Calibration**

NOTE: Refer to the equipment instruction manual as necessary for operation instructions.

NOTE: If the skin is painted, put approximately 0.006 inch (0.15 mm) of transparent, nonconductive tape on the reference standard before calibration.

A. Set the instrument frequency to 26 kHz.

NOTE: The frequency for the calibration could possibly be higher or lower than 26 kHz. Start with 26 kHz and, if necessary, adjust the frequency up or down as shown in Figure 3.

NOTE: The high pass (HP) filter must be set to off (0 Hz). The low pass (LP) filter must be set to the minimum value that does not decrease the amplitude of the signals at normal scan speeds. If the low pass filter is too low, and the scan speed is increased during the inspection, it is possible to not see a crack indication.

B. Put the probe at position 1 (double layer) on reference standard NDT396. See Detail A in Figure 3.

C. Balance the instrument.

D. Adjust the balance point so that it is at approximately 30 percent of full screen height (FSH).

NOTE: The vertical gain must be approximately 14 to 20 dB higher than the horizontal gain.

E. Set lift-off so that the signal moves (approximately) in a horizontal direction to the left. See Detail B in Figure 3.

F. Move the probe across the edge of the second layer from probe position 1 to probe position 2. As you move the probe, monitor the signal on the screen display and stop the probe when it is on the single layer. See Detail A, probe positions 1 and 2 and Detail B in Figure 3.

G. If the end point of the single layer signal is higher than the balance point of the double layer signal, increase the frequency and adjust the phase to get the signals to look equivalent to Detail B in Figure 3. See Details A, B, and E in Figure 3.

H. If the end point of the single layer signal is lower than the balance point of the double layer signal, decrease the frequency and adjust the phase to get the signals to look equivalent to Detail B in Figure 3. See Details A, B, and D in Figure 3.

I. Do a probe scan as specified in Paragraph 4.F. and monitor the signal on the display. Make sure there is less than a 5 percent of full screen height difference between the balance point of the double layer signal and the end point of the single layer signal.

J. If necessary, continue to adjust the frequency and lift-off angle so that the balance point of the double layer signal and the end point of the single layer signal are almost equivalent to the signals shown in Detail B in Figure 3.

K. Put the probe at position 3 and do a minimum of three probe scans across the reference notch and monitor the notch signal (probe position 3 to 4 and back). See Details A and C in Figure 3.

L. Adjust the gain so that the signal from the reference standard notch is 30 percent of full screen height above the balance point as shown in Detail C in Figure 3.

M. Make sure the lift-off is horizontal and to the left.

N. Do a scan across the notch and make a small increase in the scan speed to see if the signal from the notch decreases. If the notch signal decreases, increase the value for the low pass filter a small quantity.

5. Inspection Procedure

A. See the Service Bulletin for the inspection areas in the 46 section.

B. Calibrate the instrument as specified in Paragraph 4.

C. Put the probe on the skin in the inspection area where the skin is bonded to the horizontal doubler or an area that has not been chem-milled (double layer area). See Figure 1 for the probe scan pattern.

D. Balance the instrument and make sure the lift-off goes horizontally to the left as shown in Detail B in Figure 3.

E. Do approximately 4 scans so that the probe moves across the horizontal subsurface edge of the bonded doubler or the horizontal edge of the chem-milled area. During the scan:

(1) Make sure the scan direction is perpendicular to the horizontal subsurface edge as it moves across the subsurface edge.

(2) Monitor the horizontal subsurface edge signal. Make sure the signal looks almost the same as the signal shown in Detail B in Figure 3.

(a) If necessary, adjust the frequency and lift-off to get the single layer signal and the double layer signal at the same, or almost the same, screen height, as the signal shown in Detail B in Figure 3. Refer to Details B, D, and E in Figure 3 to help make the signal equivalent to the signal shown in Detail B.

CAUTION: DO NOT CHANGE THE GAIN ADJUSTMENT THAT WAS SET DURING THE CALIBRATION. IF THE GAIN IS CHANGED DURING THE INSPECTION, THIS WILL MAKE THE INSPECTION UNSATISFACTORY.

F. Continue to do probe scans across the horizontal and diagonal subsurface edges of the bonded doubler or chem-mill edge and monitor the display. Make sure the signals from the horizontal subsurface edges show on the screen display at each probe scan as shown in Detail B in Figure 3. Continue the scan into the radius of the subsurface edge, but stop the scan one inch (25.4 mm) above the tangent point in the radius. See Figure 1. Do this, and the steps that follow, for all of the horizontal subsurface edges in the inspection area.

(1) Monitor the screen display for signals that are almost equivalent to the EDM notch signal shown in Detail C in Figure 3. See Details A, B and C in Figure 4 for signals that can occur during the inspection.

(2) Make sure the probe scans are one probe diameter or less from each other for the inspection areas on each side of the airplane.

NOTE: If a collar is used on the probe, make sure each probe scan is the diameter of the probe and not the diameter of the collar. Make sure the scans are done along all of the horizontal and diagonal subsurface edges of the bonded doublers or chem-mill areas and the radii as shown in Paragraph 5.F. and Figure 1.

6. Inspection Results

A. All signals that are almost the same as the notch signal from the reference standard are crack indications.

(1) Crack signals must be 15 percent of full screen height (or more) above the single layer end point.

(2) A crack signal must increase and decrease when the probe is moved approximately 2 probe diameters.

B. See Figure 3 thru Figure 6 for signals that can occur during the inspection.

NOTE: Conductivity or thickness changes can cause large signals that are not crack indications. If signals increase and decrease as the probe is moved more than 3 probe diameters, then the signal is not caused by a crack.

NOTE: Cracks that occur approximately 1 probe diameter away from the doubler edge can cause signals to start to the right of the balance point. See Figure 6.

C. For skins that are between 0.032 inch (0.81 mm) and 0.045 inch (1.14 mm) thick you can do the steps that follow to make an analysis of the possible crack indication.

(1) You can use the ultrasonic phased array inspection procedure, Part 4, 53-30-07, and examine the indication from the external side of the airplane or use the ultrasonic phased array procedure specified in Paragraph 6.C.(2).

(2) You can use the ultrasonic phased array inspection procedure, Part 4, 53-30-06, and examine the indication from the external side of the airplane as follows:

(a) Use the applicable probe wedge for the skin thickness and open a setup file. If a file has not been stored, use the instructions in Part 4, 53-30-06 to create a file.

(b) Get reference standard NDT1094-040 or NDT1094-040-A (see Part 4, 53-30-06) to help calibrate the equipment.

(c) Use the back side of the reference standard (the side of the reference standard that does not have the 0.072 inch (1.83 mm) doubler) and draw a line on the surface to show the edge of the top piece.

(d) Put couplant on the back surface of the reference standard at the notch “A” location.

(e) Put the probe on the back surface with the front of the wedge flush with the line.

(f) Calibrate the instrument as specified in par. 4 of Part 4, 53-30-06. Only use notch “A” during calibration.

(g) Add 12 dB of gain if the external surface of the airplane is painted.

(h) Move the full length of the probe across the top of the “A’ notch location on the reference standard and monitor the screen display to make sure that the red indication occurs before the C/L line on the S-Scan display screen.

(3) Identify the location of the crack indication along the edge of the doubler on the external airplane skin and make a mark to the surface with a grease pencil or felt tip pen. Do not use a graphite pencil or ball point pen or damage the part. A graphite pencil mark can cause corrosion and a ball point pen tip can damage the part.

(4) Put ultrasonic couplant on the skin inspection surface.

(5) Put the probe on the single skin area of the skin with the front of the probe pointed in the direction of the doubler and with the front edge of the wedge flush with the mark.

(6) Move the full length of the probe across the top of the marked area and monitor the screen display for a red image to occur to the left or right of the C/L line on the S-scan of the screen. Do the scan again with one half a probe width index. Move the probe to do a scan across all of the eddy current indication areas.

(7) Areas that cause a red indication to occur on the S-Scan display that is not from a fastener signal must be examined as follows:

(a) Remove the paint from the external skin surface of the airplane in the area that gives the crack indication.

(b) Remove the added 12 dB from the gain setting. Make sure the indication from the “A” notch on the reference standard is red on the S-scan screen with the front edge of the wedge flush with the mark on the back side of the reference standard.

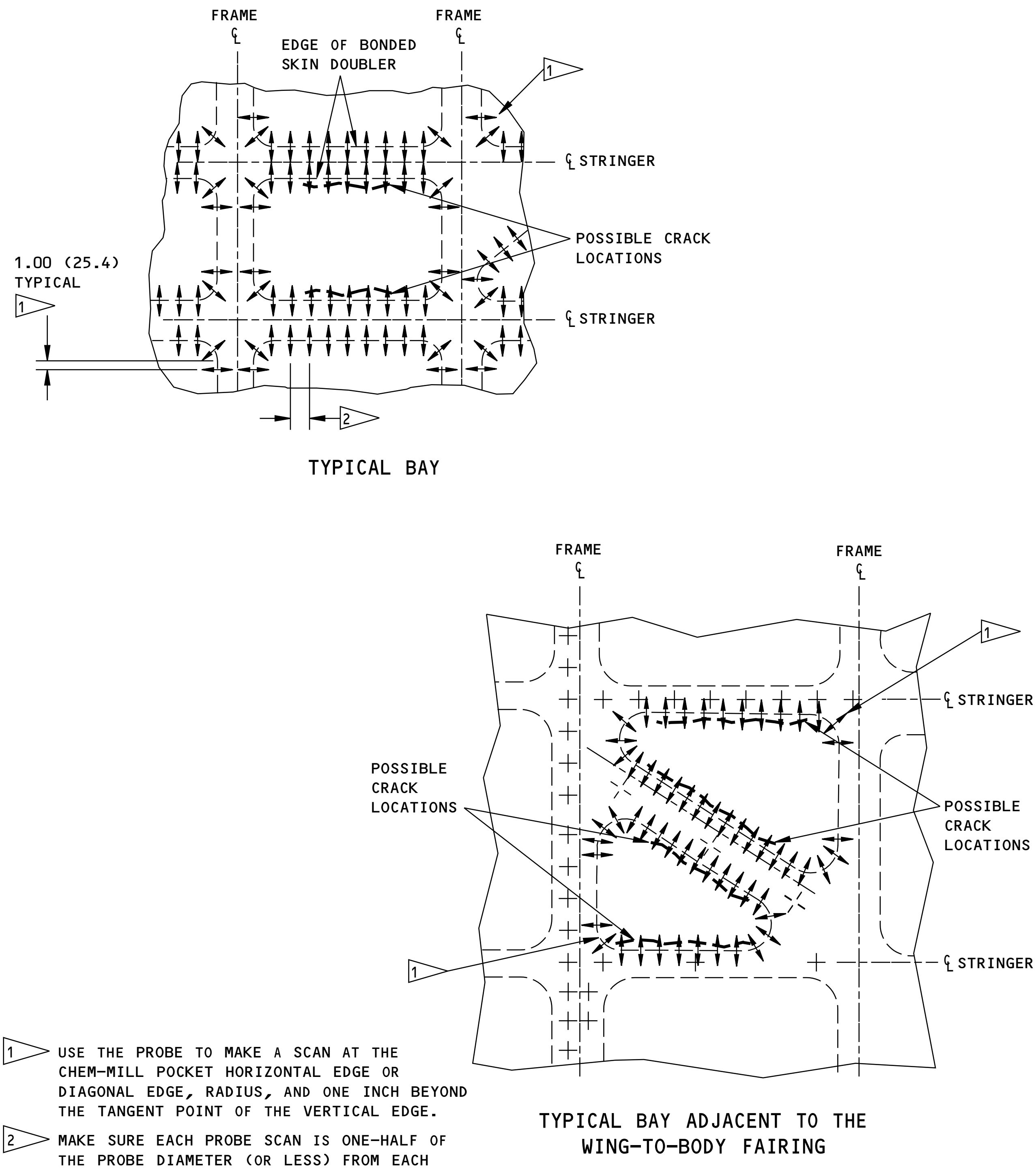
(c) Do the inspection of the indication area on the airplane again as specified in Paragraph 6.C.(5) and Paragraph 6.C.(6) above.

1) A red indication on the S-Scan that is not from a fastener signal is a crack indication.

2) If the indication area is not red then it is not a crack indication and the eddy current indication is also not a crack indication.

(8) You can use Part 4, 53-30-09 to examine the indication from the external side of the airplane.

D. Refer to the Service Bulletin for more instructions about what to do at crack locations.

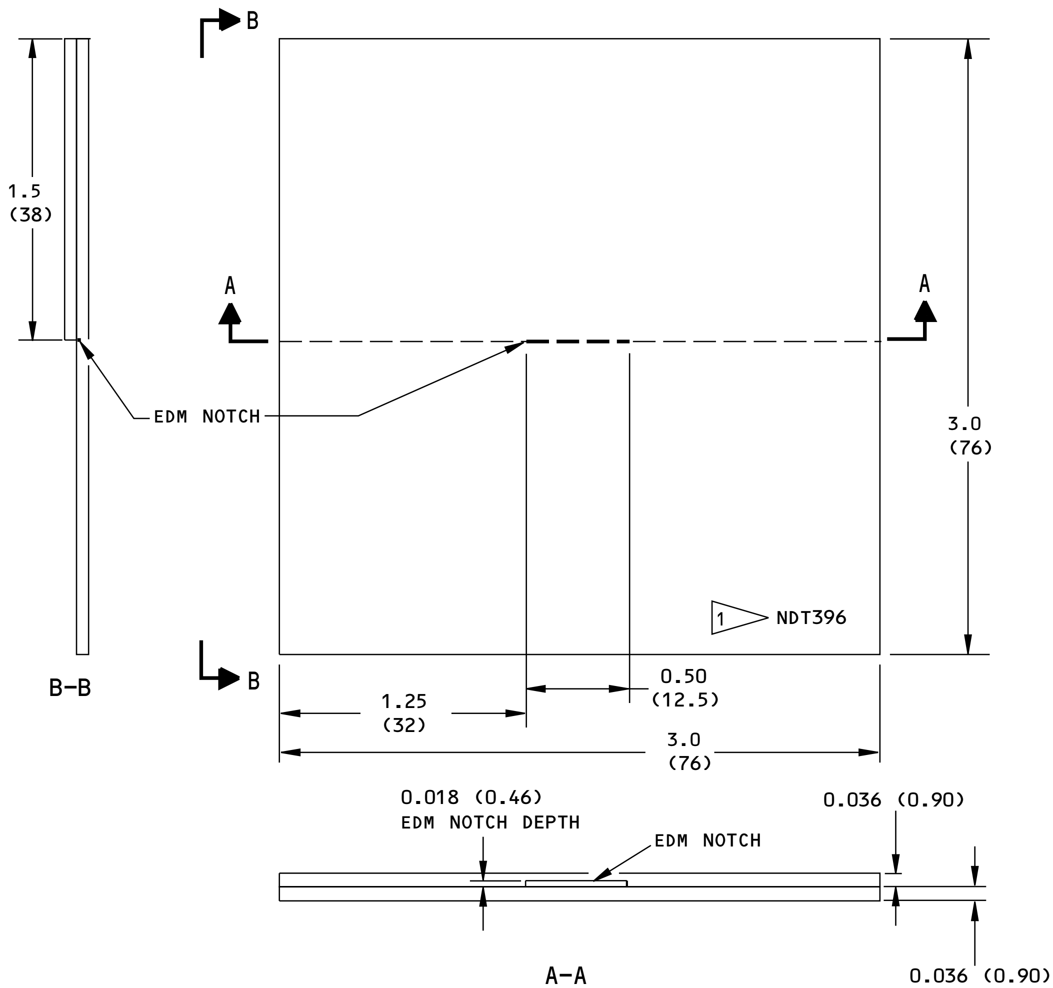


1 USE THE PROBE TO MAKE A SCAN AT THE CHEM-MILL POCKET HORIZONTAL EDGE OR DIAGONAL EDGE, RADIUS, AND ONE INCH BEYOND THE TANGENT POINT OF THE VERTICAL EDGE.

2 MAKE SURE EACH PROBE SCAN IS ONE-HALF OF THE PROBE DIAMETER (OR LESS) FROM EACH OTHER.

2161523 S0000472631_V1

Scan Pattern for Typical Inspection Areas
Figure 1



NOTES:

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

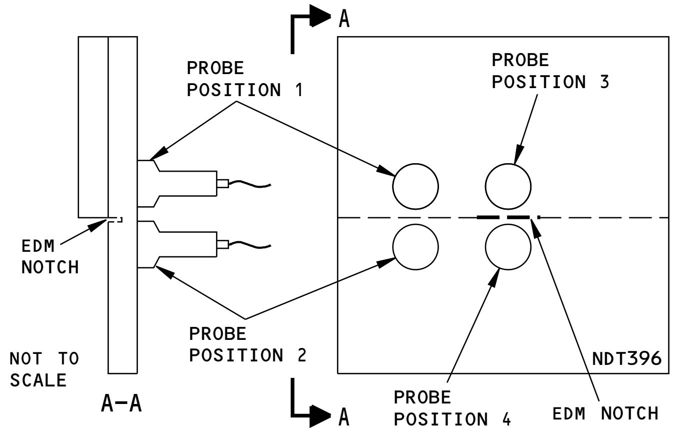
INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- MATERIAL: 2024-T3 CLAD (TWO SKINS)
- APPLY ADHESIVE OR EPOXY, NO MORE THAN 0.005 (0.13) THICK TO SKINS AND CLAMP TOGETHER.
- MAKE SURE THE 2ND LAYER EDGE IS IMMEDIATELY ABOVE THE EDM NOTCH BEFORE THE CLAMPS ARE APPLIED.
- EDGE OF SKIN TO NOTCH TOLERANCE: 0.010 (0.2)
- EDM NOTCH: LENGTH 0.50 (12.5)
  DEPTH 0.018 (0.46) ±0.002 (0.05)
  WIDTH 0.007 (0.18)

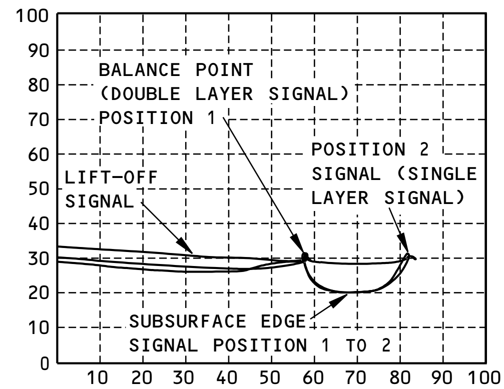
1 STAMP OR ETCH NDT396

2161524 S0000472632_V1

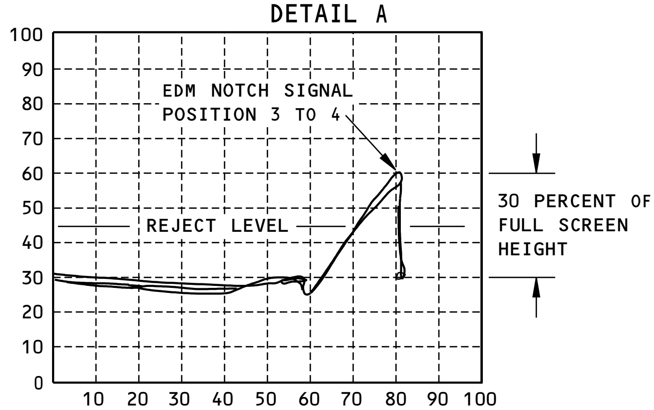
Reference Standard NDT396
Figure 2



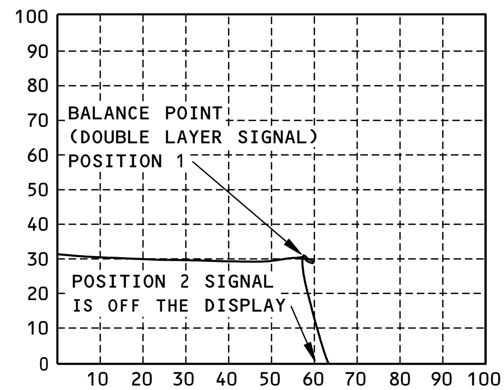
CALIBRATION PROBE POSITIONS FOR INSPECTION OF SUBSURFACE CRACKS IN THE SKIN
DETAIL A



DETAIL B

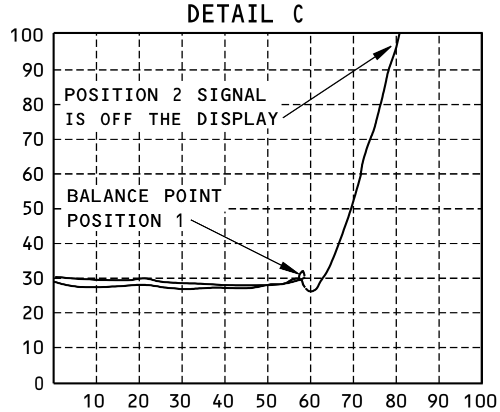


DETAIL C



DETAIL D

HERE THE FREQUENCY IS TOO HIGH. DECREASE THE FREQUENCY UNTIL THE POSITION 1 AND 2 SIGNALS LOOK EQUIVALENT TO THE SIGNALS SHOWN IN DETAIL B



DETAIL E

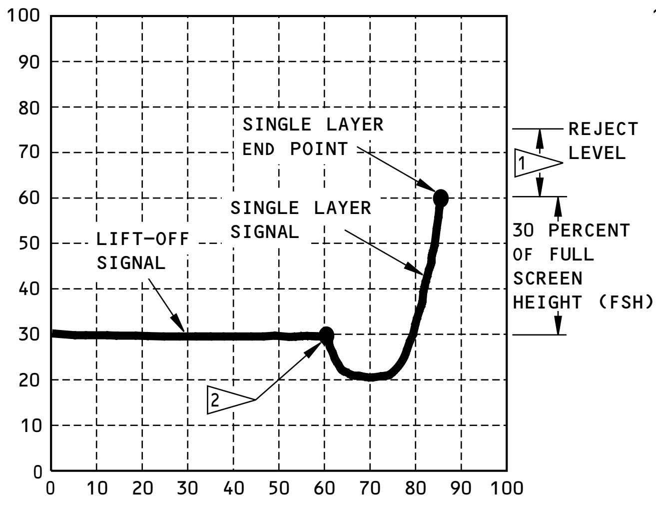
HERE THE FREQUENCY IS TOO LOW. INCREASE THE FREQUENCY UNTIL THE POSITION 1 AND 2 SIGNALS LOOK EQUIVALENT TO THE SIGNALS SHOWN IN DETAIL B

NOTES:

- SET THE VERTICAL GAIN SO IT IS 14 TO 20 dB HIGHER THAN THE HORIZONTAL GAIN.
- SET THE FREQUENCY (BETWEEN 23 AND 40 KHZ) SO THAT THE DIFFERENCE BETWEEN THE DOUBLE LAYER SIGNAL (POSITION 1) AND THE SINGLE LAYER SIGNAL (POSITION 2) IS LESS THAN 5 PERCENT OF FULL SCREEN HEIGHT. SEE DETAILS A AND B.
- SEE DETAILS A, B, D AND E TO SEE HOW TO ADJUST THE FREQUENCY AND PHASE TO DO THE CALIBRATION.
- ADJUST THE GAIN SO THAT THE NOTCH SIGNAL GOES TO 30 PERCENT OF FULL SCREEN HEIGHT ABOVE THE BALANCE POINT. SEE DETAILS A AND C.

2161528 S0000472633_V1

Calibration Positions with Impedance Plane Signals
Figure 3

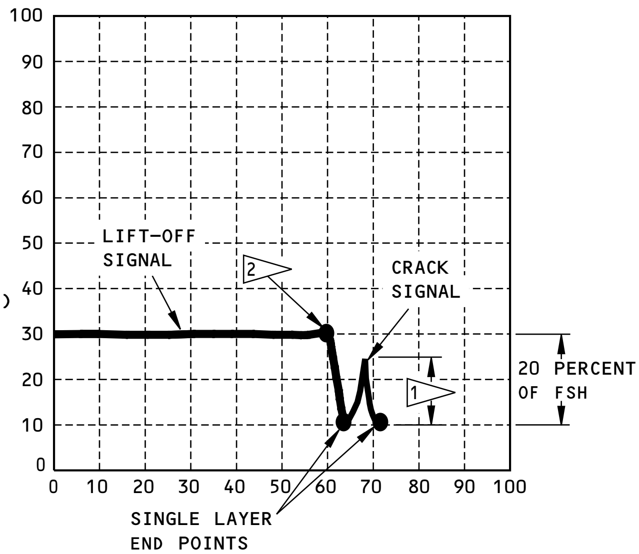


DETAIL A

THIS IS NOT A CRACK SIGNAL. IT IS A SIGNAL CAUSED BY ONE OR MORE OF THE CONDITIONS THAT FOLLOW:

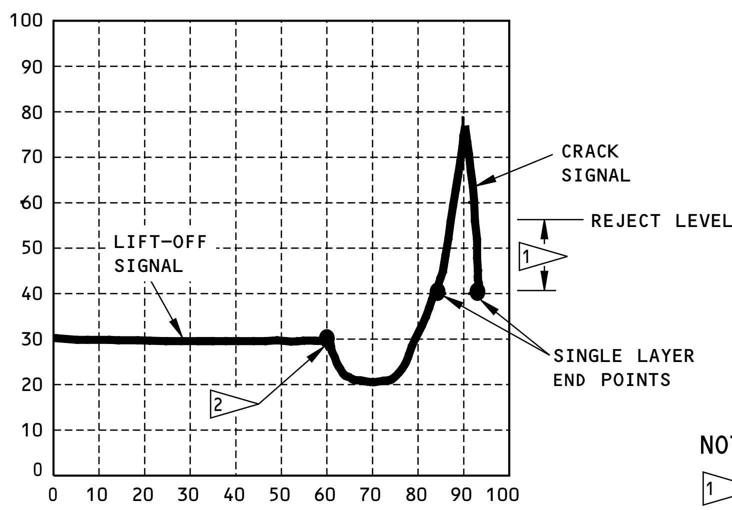
- AN AREA ON THE SKIN OF LOWER CONDUCTIVITY
- A THIN CLAD AREA
- THE SKIN IS THINNER.

WHEN THIS SIGNAL IS AT 30 PERCENT OF FSH OR HIGHER, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL B

WHEN THIS SINGLE LAYER SIGNAL GOES DOWN SCREEN BY 20 PERCENT OF FSH OR MORE, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL C

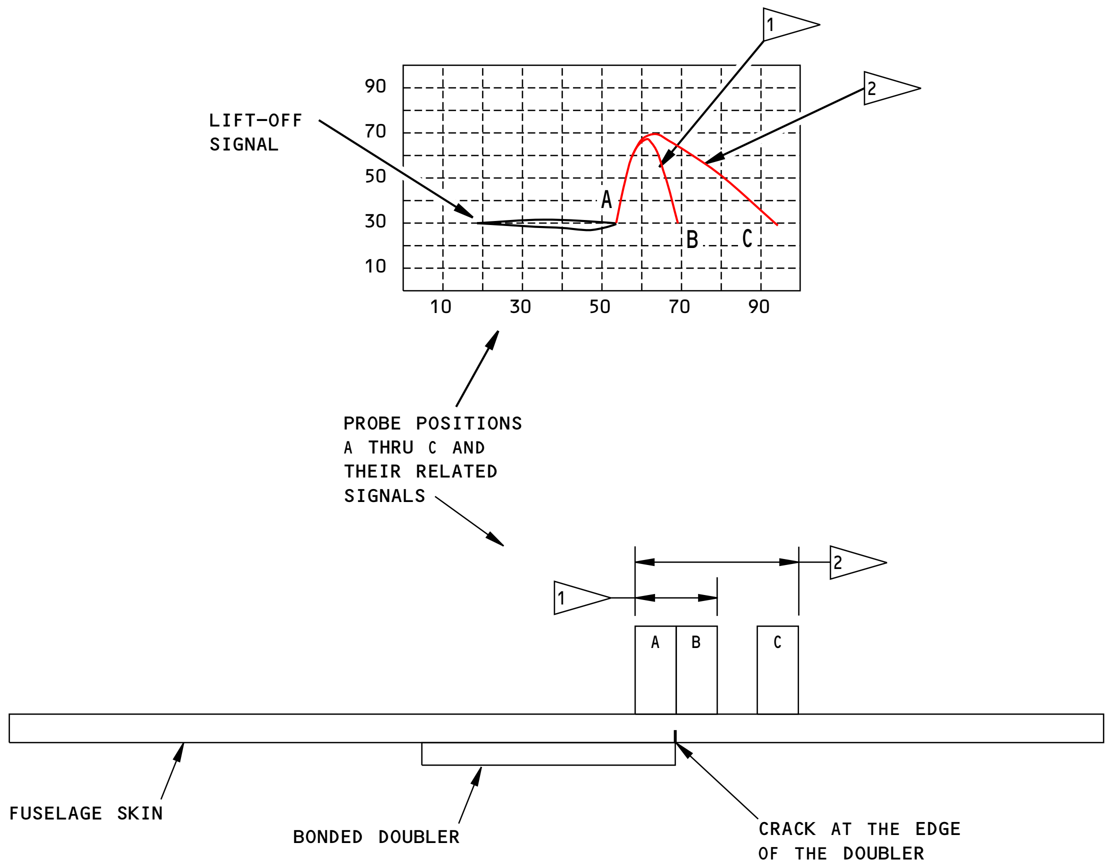
THIS CRACK SIGNAL HAS OCCURRED WITH THE CONDITIONS SPECIFIED IN DETAIL A. THE SIGNAL STARTED AS THE SIGNAL IN DETAIL A STARTED, BUT THEN A CRACK SIGNAL OCCURRED WITHIN A SHORT SCAN. SEE HOW THIS SIGNAL IS DIFFERENT THAN THE SIGNAL SHOWN IN DETAIL A.

NOTES:

1. FOR THE CONDITIONS SPECIFIED IN DETAIL A, THE REJECT LEVEL IS 15 PERCENT OF FSH ABOVE THE SINGLE LAYER END POINTS.
2. THIS IS THE BALANCE POINT ON THE DOUBLE LAYER. MAKE SURE THAT THE PROBE IS ON THE DOUBLE LAYER WHEN YOU BALANCE THE INSTRUMENT.

2161529 S0000472634_V1

Signals that can occur on the Airplane during the Inspection
Figure 4



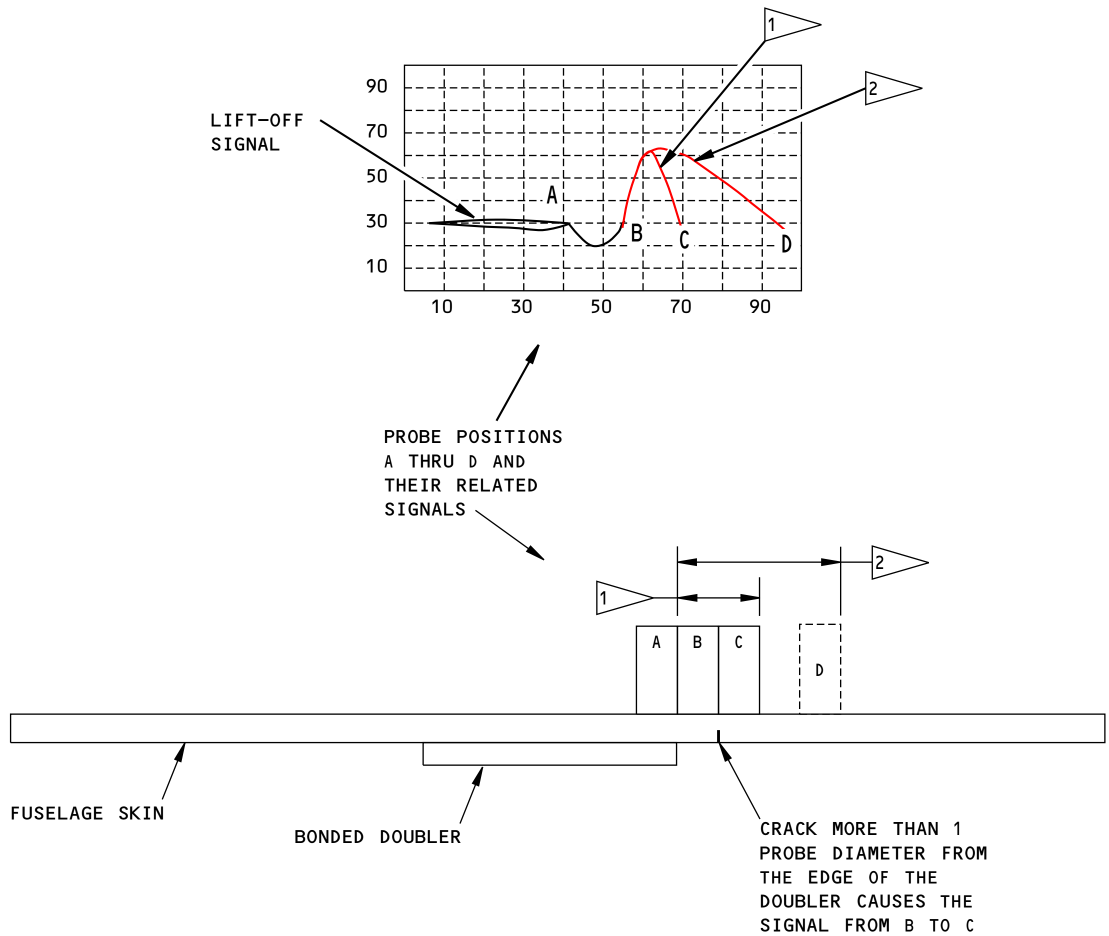
NOTES

1. SIGNALS THAT OCCUR WHEN THE PROBE MOVES APPROXIMATELY TWO OR LESS PROBE DIAMETERS IS A CRACK INDICATION.

2. SIGNALS THAT OCCUR WHEN THE PROBE MOVES MORE THAN FOUR PROBE DIAMETERS IS NOT A CRACK INDICATION. THE INDICATION CAN BE CAUSED BY CONDUCTIVITY OR SKIN THICKNESS CHANGES

2232129 S0000497694_V1

**Crack Signal from a Crack at the Doubler Edge (and an Incorrect Crack Indication)
Figure 5**



NOTES

1. SIGNALS THAT OCCUR WHEN THE PROBE MOVES APPROXIMATELY TWO OR LESS PROBE DIAMETERS IS A CRACK INDICATION.
2. SIGNALS THAT OCCUR WHEN THE PROBE MOVES MORE THAN FOUR PROBE DIAMETERS IS NOT A CRACK INDICATION. THE INDICATION CAN BE CAUSED BY CONDUCTIVITY OR SKIN THICKNESS CHANGES

2232128 S0000497697_V1

Crack Signal from a Crack that is Away From the Doubler Edge (and an Incorrect Crack Indication)
Figure 6

PART 6 - EDDY CURRENT

SLIDING PROBE INSPECTION OF THE INBOARD SKIN OF THE LAP SPLICE

1. **Purpose**

   A. Use this procedure to do an inspection for cracks, that are within 30 degrees of longitudinal, in the inboard skin along the lower row of fasteners in the lap splices. This procedure can only be used where nonconductive anodized rivets are installed in the lap joint.

   B. This procedure is done from the external side of the airplane. See Figure 1 for the location of the typical inspection areas.

   C. The total thickness of the outer skins and doublers at the lap splice must be between 0.036 inch (0.91 mm) and 0.086 inch (2.18 mm) thick.

   D. This procedure uses a sliding probe and an impedance plane display instrument.

   E. You cannot do this procedure at a location where the fastener is magnetic (steel) or if a fastener has a protruding head. If a fastener is magnetic or if a fastener has a protruding head, then you must do one of the procedures that follow:

      (1) Do an external inspection as shown in Part 6, 53-30-14, but only if the fastener has been oversized from the size shown in the production drawings.

      NOTE: For airplane line numbers 1 thru 291, use Part 6, 53-30-00, Procedure 5 and reference standard NDT1049.

      (2) Do an internal inspection as shown in Part 6, 53-30-12 and Part 6, 53-30-13.

      (3) Do an open hole inspection as shown in Part 6, 51-00-00, Procedure 16.

   F. The probe must be accurately aligned with the fastener centerline to do this procedure correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

   G. You cannot do this procedure at a location where the fastener is an alodined rivet. Alodined rivets can be identified by the irregular signals they cause. Refer to Paragraph 6.E.

   H. 737 Supplemental Structural Inspection Document (D6-37089) Reference:

      (1) Item: F-48A

      (2) Item: F-48B

      (3) Item: F-48C

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 an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates at a frequency range of 6 kHz to 20 kHz.

(c) Has a permanent screen adjustment (screen persistence). The permanent screen adjustment (screen persistence) is necessary so the signals stay on the screen until manually erased.

(2) The instruments specified below were used to prepare this procedure.

(a) NDT 19e; Nortec-Staveley

(b) Phasec 1.1; Hocking/Krautkramer

C. Probes

(1) Use a reflection sliding probe that operates at a frequency range from 6 kHz to 20 kHz.

(2) The probe specified below was used to prepare this procedure.

(a) SPO 3806; Nortec-Staveley

D. Reference Standards

(1) Use reference standard NDT3004 or NDT3011. See Figure 2 for data about the reference standard.

NOTE: The rivet-to-skin interface on in-service airplanes is nonconductive to eddy currents if anodized rivets are installed. On the reference standard, good electrical flow between the skin and the rivets will give an incorrect and smaller fastener signal in the instrument display. To make sure that the reference standard is electrically equivalent to the airplane, use specially ordered rivets that have an anodize finish. Reference standards made before the April 15, 2001 revision of this procedure that have a nonconductive paint or primer on the countersunk surfaces of the reference standard are permitted if they cause the correct signals specified in this procedure.

E. Special Tools

(1) Use a non-conductive probe guide to align the centerline of the probe with the center of the fasteners.

NOTE: Adjust the probe guide so the probe is on the centerline of the rivets during the scans. It is possible that adjacent rivets are not aligned with each other.

(2) A magnet can be used to identify magnetic fasteners.

3. Prepare for the Inspection

A. Get access to the inspection areas.

B. Remove loose paint, dirt and sealant from the surface of the inspection area.

C. If you cannot see the fasteners because the paint is too thick, remove the paint so that you can see the fasteners.

4. Instrument Calibration

NOTE: If you get alodine rivet signals from the reference standard(s) that are almost the same as the alodine signals shown in Detail II in Figure 10, the calibration cannot be done. The rivets must be removed and anodized rivets must be installed in the reference standard. See Figure 2 for reference standard data.

A. For airplanes with a line number above 291, use reference standard NDT3004 and calibrate your instruments as follows:

(1) Set the frequency between 6 kHz and 8 kHz.

(2) Adjust the instrument as follows:

(a) Set the vertical to horizontal gain ratio at 2:1 or less.

(b) Set the instrument for permanent screen display (screen persistence).

(3) Set the instrument filters as follows:

(a) Set the high pass filter to off or zero Hz.

(b) If the instrument has a low pass filter:

1) Set the low pass filter to its highest value.

2) If the dot is not stable, decrease the filter value to get a stable dot or until the signal from the notch in the reference standard starts to decrease.

(4) Put the probe (with the probe guide) on the reference standard at Position 1 (to do inspections of 5/32 diameter fasteners) as shown in Figure 3. To calibrate the equipment to do inspections of 3/16 diameter fasteners, put the probe above the row of 3/16 diameter fasteners adjacent to Position 1.

(5) Balance the instrument.

(6) Adjust the balance point to 80 percent from the left side of the horizontal display and 30 percent of the vertical display as shown in Figure 4.

(7) Lift the probe off the surface of the reference standard. Adjust the phase control so that the lift-off signal moves horizontally to the left of the balance point as shown in Figure 4.

(8) Adjust the probe guide so that it will keep the centerline of the probe aligned with the center of the fastener row.

(9) Move the probe across the fastener row from Position 1 to Position 2 on the reference standard as shown in Figure 3.

(10) Adjust the vertical and horizontal gains so that the notch signal is as shown in Figure 5. Make sure that the height of the signal from the notch is at 80 percent of the display and the signals from the good fastener holes are at approximately 60 percent.

NOTE: Some "sliding probes" are sensitive to probe direction when a scan is made.

(11) Identify the probe direction that gives the smaller notch signal as follows:

(a) Put the probe on the reference standard at Position 1 (to do inspections of 5/32 diameter fasteners) as shown in Figure 3. To calibrate the equipment to do inspections of 3/16 diameter fasteners, put the probe above the row of 3/16 diameter fasteners adjacent to Position 1.

(b) Move the probe across the applicable fastener row to Position 2 on the reference standard as shown in Figure 3.

(c) Turn the probe 180 degrees and do Paragraph 4.A.(11)(a) and Paragraph 4.A.(11)(b) again to identify the direction of probe movement that results in the smaller notch signal.

(12) Calibrate the equipment as specified in Paragraph 4.A.(8), Paragraph 4.A.(9), and Paragraph 4.A.(10) again as you move the probe in the direction that gives the smaller notch signal.

B. For airplanes with a line number less than 292, use reference standard NDT3011 and calibrate your instruments as follows:

(1) Set the frequency between 15 and 20 kHz.

(2) Follow Paragraph 4.A.(2) thru Paragraph 4.A.(12) above.

5. **Inspection Procedure**

A. Use the nonconductive probe guide to align the probe on the lap splice so that the centerline of the probe will follow the center (±0.050 inch (1.27 mm)) of the lower row of fasteners. See Figure 9 for an example of a scan with the probe centerline away from the center of the fastener row.

NOTE: You can use a probe guide to help keep the center line of the probe aligned with the center of the fastener row.

B. Put the probe on the lap splice with the center of the probe between two fasteners.

C. Balance the instrument.

NOTE: Do not adjust the gain. Gain adjustments will make the instrument calibration unsatisfactory.

D. Use the nonconductive probe guide to move the probe slowly along the row of fasteners and monitor the instrument display at the same time. Make sure that the centerline of the probe will move across the center (±0.050 inch (1.27 mm)) of the fasteners. During the inspection:

(1) Make a mark on fasteners that are not aligned with the fastener row. Go back to these fasteners and do the inspection with the probe correctly aligned.

(2) Make a mark at the locations that cause signals that are at or above the reject level shown in Figure 5.

(3) Make a mark at the locations where the opening in the signal loop is more than 15 percent of the display height.

NOTE: If there are two cracks in an area, the vertical width in the loop of the signal will decrease but the vertical height of the signal will increase.

(4) Be careful and look for alodined rivets. Alodined rivets will cause signals that are smaller than normal. Do not use the sliding probe to examine areas with alodined rivets because it is possible that cracks in areas with alodined rivets will not cause reject signals to occur. See Paragraph 6.E.

(5) Keep the permanent screen adjustment "on" so that the signals can be compared on the screen. Do a manual erase after 5 to 10 rivet signals have been compared on the screen.

E. Do a calibration test of the instrument after you examine each skin panel as follows:

NOTE: Do not adjust the gain.

(1) Put the probe on the reference standard to get the maximum signal from the notch.

(2) Compare the signal you got from the notch during calibration with the signal you get now.

(3) If the maximum signal from the notch in the reference standard has decreased 5 percent or more from the signal you got during calibration, do the calibration and the inspection again for all of the fasteners done since the last calibration test.

F. Do Paragraph 5. again for the remaining lap splices.

6. Inspection Results

A. Signals that are more than 70 percent of the display height or that have openings in the signal loop that are 15 percent or more of the display height are signs of cracks.

NOTE: An edge of a tear strap that is too close to a fastener can cause a signal with an opening in the loop that looks almost the same as a crack signal. But, the signal will have a display height that is lower than the signals from the areas without a tear strap as shown in Figure 7.

NOTE: To identify if a signal is the result of a tear strap or a crack, do an inspection of a fastener in the top row of the lap splice. The fastener in the top row must be of the same size and material, and be aligned vertically with the lower fastener. If the signals are the same, the signal is caused by a tear strap.

B. Magnetic and larger diameter fasteners will cause a large signal as shown in Figure 8. Use a magnet to identify magnetic fasteners. Refer to Part 6, 53-30-14, for an alternative procedure for magnetic fasteners.

C. To make sure of the results, you can do the internal inspection procedure specified in Part 6, 53-30-12 at the tear strap locations or Part 6, 53-30-13 between the tear straps. The open fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16, can also be used to make sure of the results.

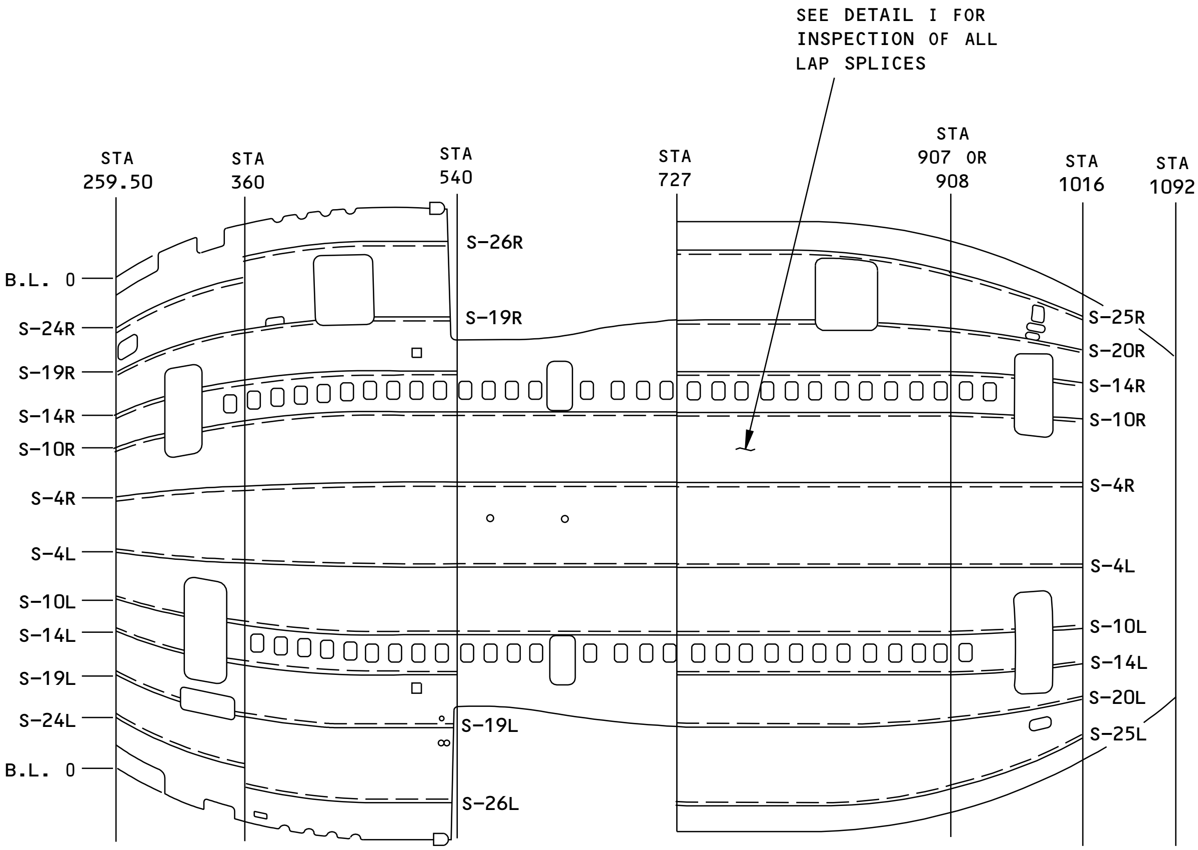
NOTE: It is possible to get a crack indication when you do an external eddy current inspection but not when you do the Part 6, 51-00-00, Procedure 16 fastener hole inspection. This can occur if there are cracks that do not go into the hole. The Part 6, 51-00-00, Procedure 16 fastener hole inspection will only identify cracks that go into the hole. The cracks that do not go into the hole are referred to as eyebrow cracks. Eyebrow cracks can be found with an internal spot probe procedure, Part 6, 53-30-12.

D. Fasteners spaced near each other can cause signals as shown in Figure 6.

E. Alodined rivets that have conductivity with the skin can cause incorrect inspection results. These rivets can be identified by the unusual sliding probe signals they cause (See Figure 10). It is possible to have alodined rivets in reference standards and also on airplanes. If you find unusual eddy current signals as shown in Figure 10, do the steps that follow:

(1) If the unusual signals occur from the reference standard, remove the rivets from the locations that cause the unusual signals and install anodized rivets. See Figure 2 for anodized rivet suppliers.

(2) If the unusual signals occur from the airplane, tell Boeing.



NOTE

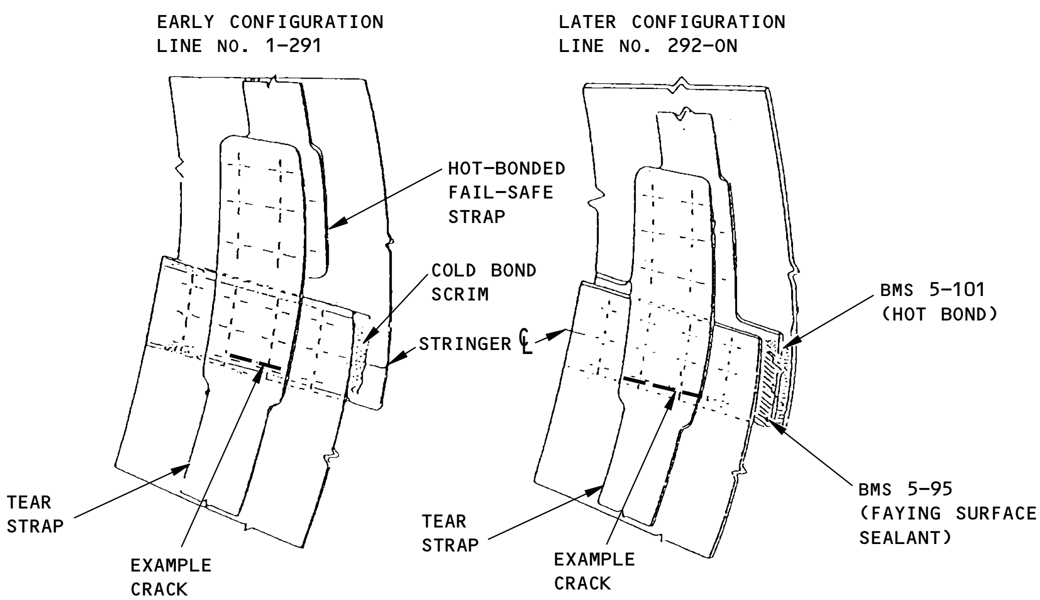
- ═══ & ═══ ARE THE INSPECTION AREAS

737-200P AIRPLANE SHOWN
737-100P & 200C AIRPLANES
ARE ALMOST THE SAME

2161532 S0000472636_V1

Typical Inspection Areas - External Inspection
Figure 1 (Sheet 1 of 2)

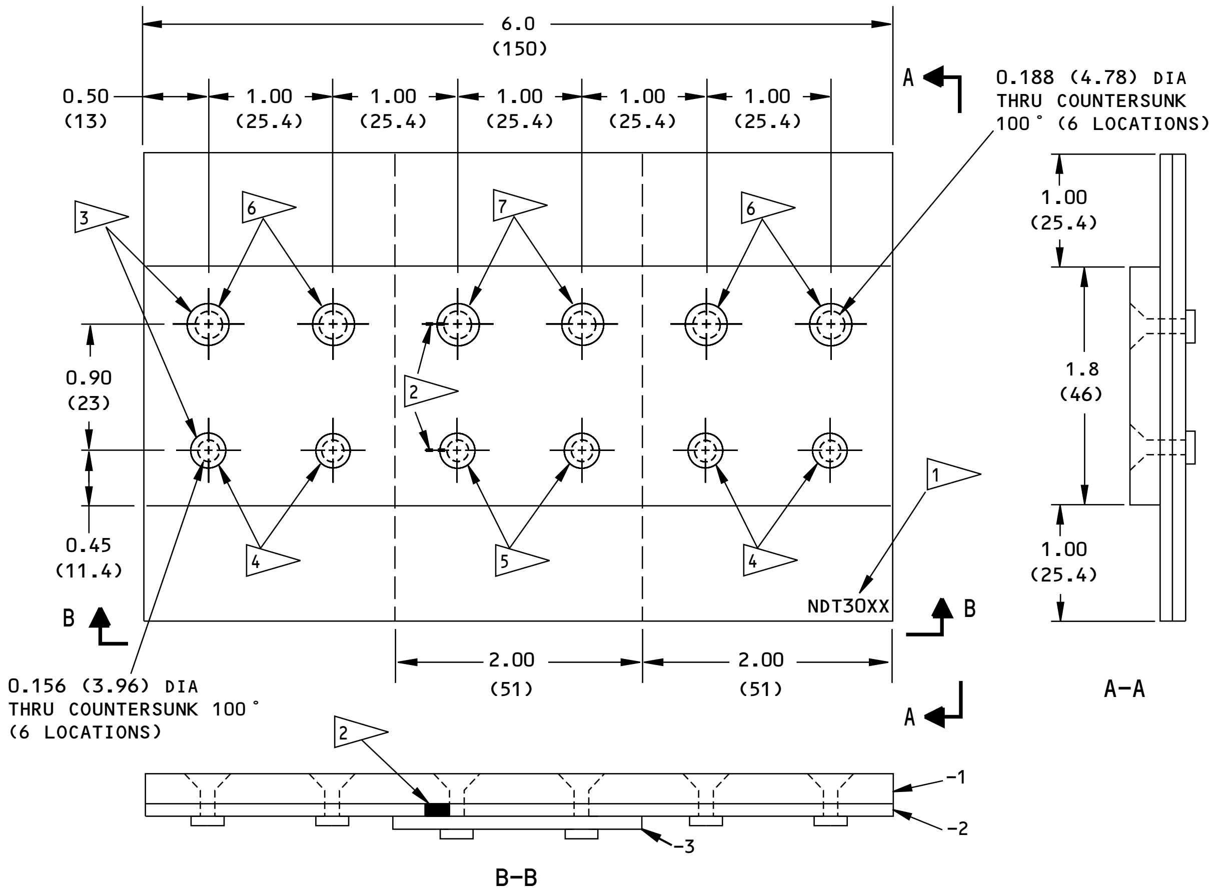
737 LAP JOINT CONFIGURATIONS



DETAIL I

2161533 S0000472637_V1

Typical Inspection Areas - External Inspection
Figure 1 (Sheet 2 of 2)



RIVET CODE	ALLFAST FASTENING SYSTEMS INC. PART NUMBER	SIERRA PACIFIC SUPPLY CO. PART NUMBER
***5D4	AF1049U1D5C4	NAS1097D5-4D
***5D5	AF1049U1D5C5	NAS1097D5-5D
***5D6	AF1049U1D5C6	NAS1097D5-6D
***6D5	AF1049U1D6C5	NAS1097D6-5D
***6D6	AF1049U1D6C6	NAS1097D6-6D

ANODIZED RIVET DATA
TABLE I 4

2161536 S0000472638_V1

Reference Standard NDT3004 and NDT3011
Figure 2 (Sheet 1 of 2)

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES:

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- RIVETS: [3]

QUANTITY	NDT3004	NDT3011
4	***5D5 [4] (ANODIZED)	***5D4 (ANODIZED)
2	***5D6 [5] (ANODIZED)	***5D5 (ANODIZED)
4	***6D5 [6] (ANODIZED)	***6D5 (ANODIZED)
2	***6D6 [7] (ANODIZED)	***6D5 (ANODIZED)

- DRIVE ALL 5/32 RIVETS TO A MINIMUM BUTTON DIAMETER OF 0.219 (5.56).
- DRIVE ALL 3/16 RIVETS TO A MINIMUM BUTTON DIAMETER OF 0.264 (6.71).
- MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE

NDT3004
-1 0.080 X 1.80 X 6.00 (2.03 X 45.7 X 152.4)
-2 0.036 X 3.80 X 6.00 (0.91 X 96.5 X 152.4)
-3 0.036 X 3.80 X 2.00 (0.91 X 96.5 X 50.8)

NDT3011
-1 0.036 X 1.80 X 6.00 (0.91 X 45.7 X 152.4)
-2 SAME AS NDT3004
-3 SAME AS NDT3004

[1] ETCH OR STEEL STAMP REFERENCE STANDARD NUMBER NDT3004 OR NDT3011

[2] EDM NOTCHES: (MAKE NOTCHES IN THE -2 PART)
LENGTH: 0.200 (5.0) ±0.020 (0.50)
DEPTH: 0.036 (0.90)
WIDTH: 0.025 (0.64) MAXIMUM

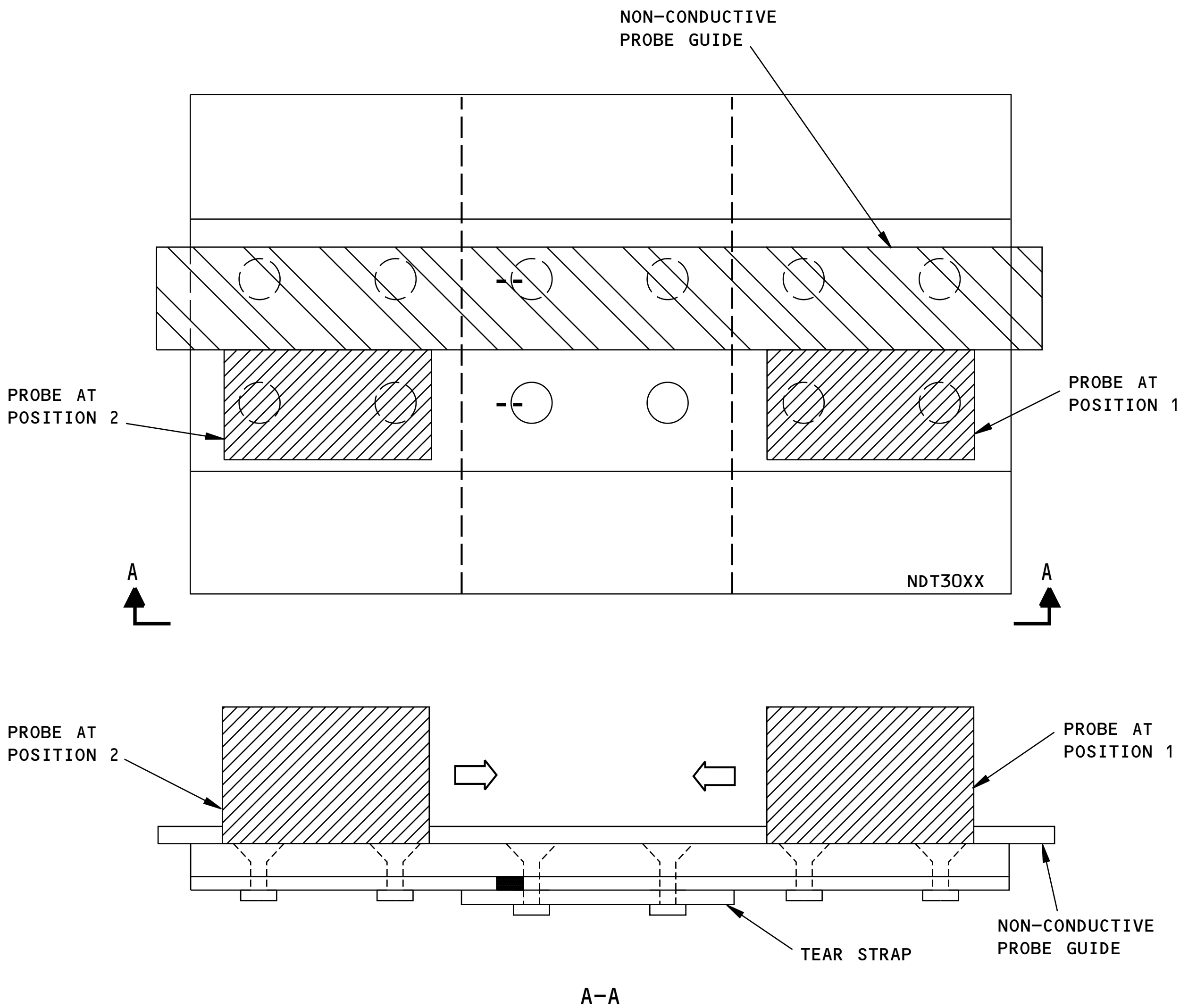
THE NOTCH LENGTH IS FROM THE EDGE OF THE HOLE OUTWARD. MAKE SURE THE NOTCH IS WITHIN ±0.005 (0.10) OF THE CENTER OF THE HOLE AS SHOWN.

[3] RIVETS THAT HAVE CONDUCTIVITY WITH THE SKIN CAUSE INCORRECT EDDY CURRENT SIGNALS. USE SPECIALLY-ORDERED RIVETS THAT HAVE AN ANODIZE FINISH TO PREVENT RIVET CONDUCTIVITY. SEE TABLE I. REFER TO PART 1, 51-01-00 FOR DATA ABOUT THE FASTENER SUPPLIERS.

[4] ALTERNATIVELY, YOU CAN MAKE EQUIVALENT RIVETS BY ANODIZING BACR15CE*D* OR BACR15GF*D* RIVETS AT A LOCAL ANODIZE SHOP.

2161537 S0000472639_V1

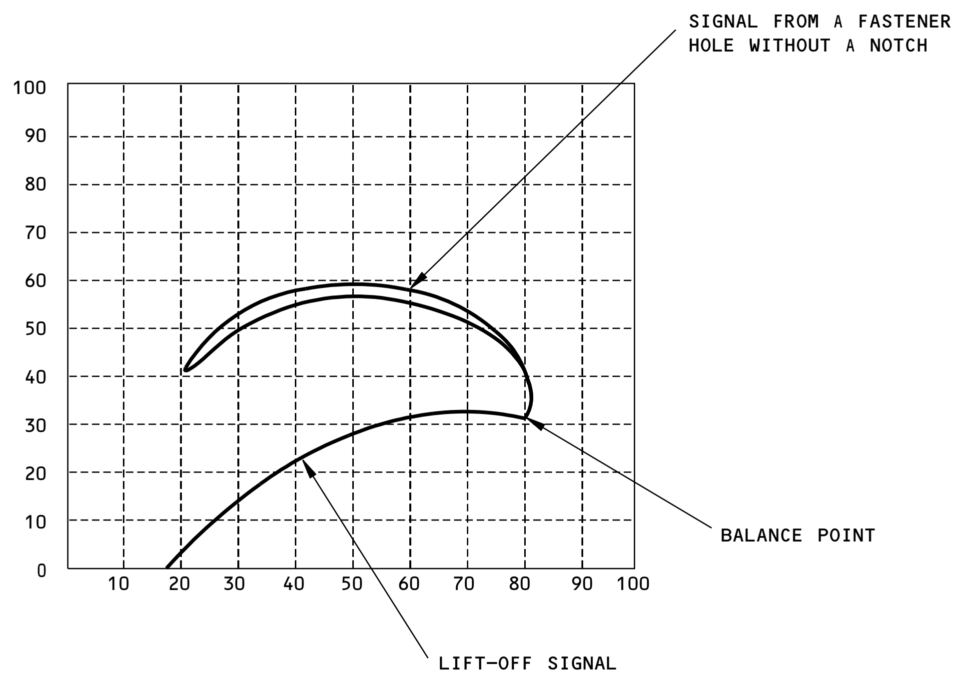
Reference Standard NDT3004 and NDT3011
Figure 2 (Sheet 2 of 2)



THE PROBE POSITION SHOWN IS FOR THE INSPECTION OF 5/32 FASTENERS.
USE THE UPPER ROW FOR THE INSPECTION OF 3/16 FASTENERS.

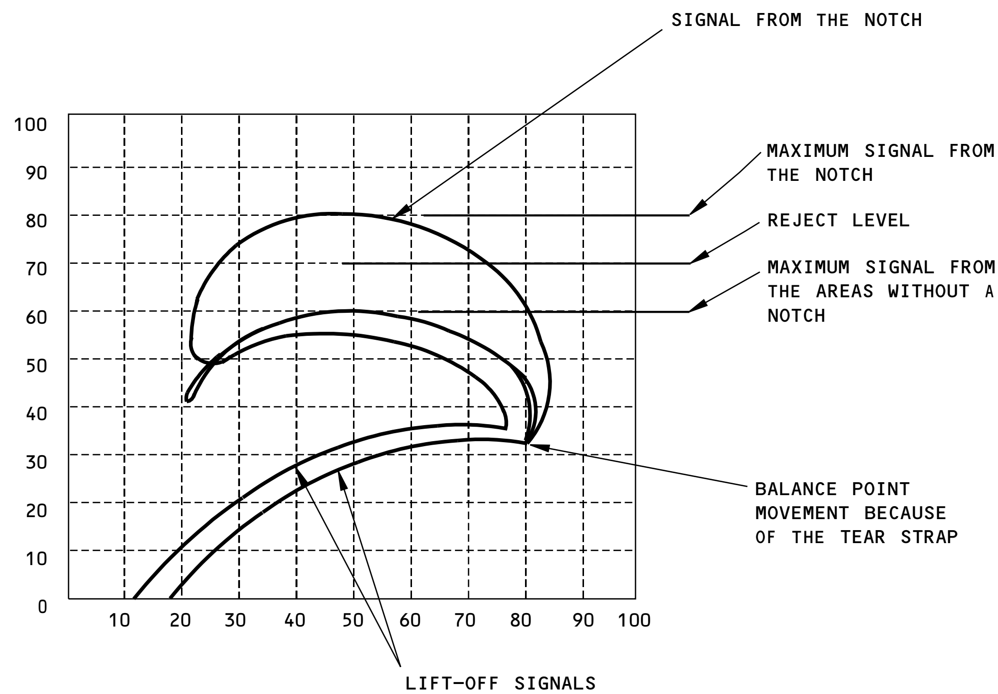
2161538 S0000472640_V1

Probe Positions for Calibration
Figure 3



2161539 S0000472641_V1

Calibration Signals
Figure 4



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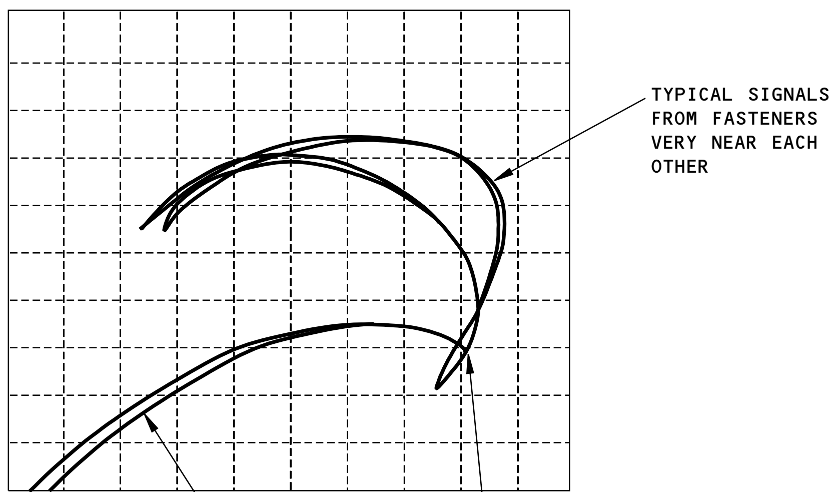
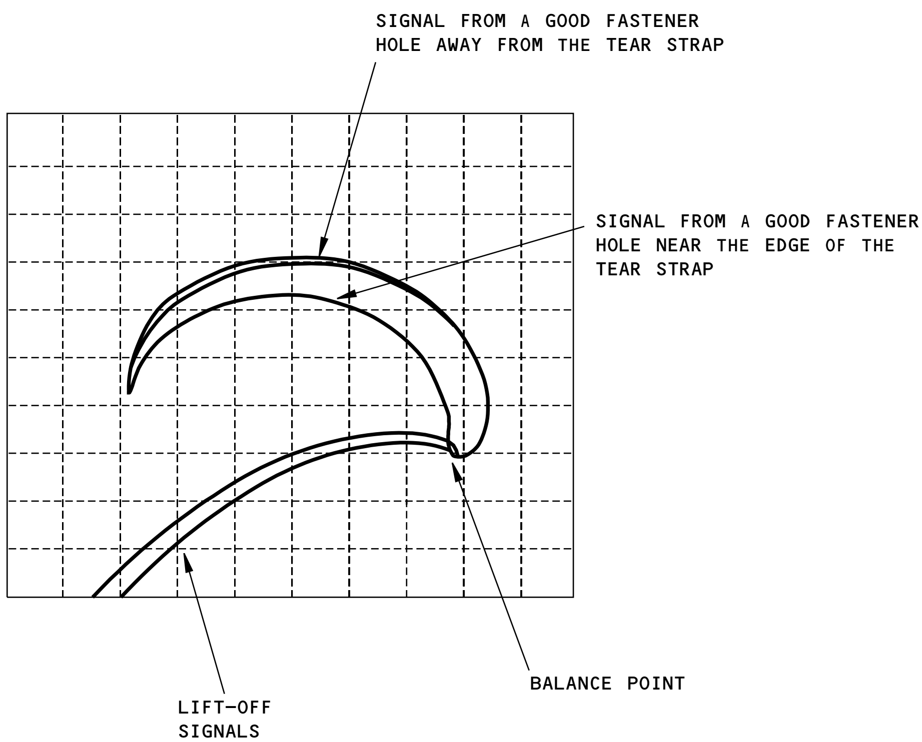
Calibration Signals
Figure 5



NOTE: THE LOOPS IN THE SIGNALS FROM FASTENERS THAT ARE LESS THAN 0.65 INCHES (17mm) APART WILL BE LARGER THAN SHOWN IN THIS FIGURE.

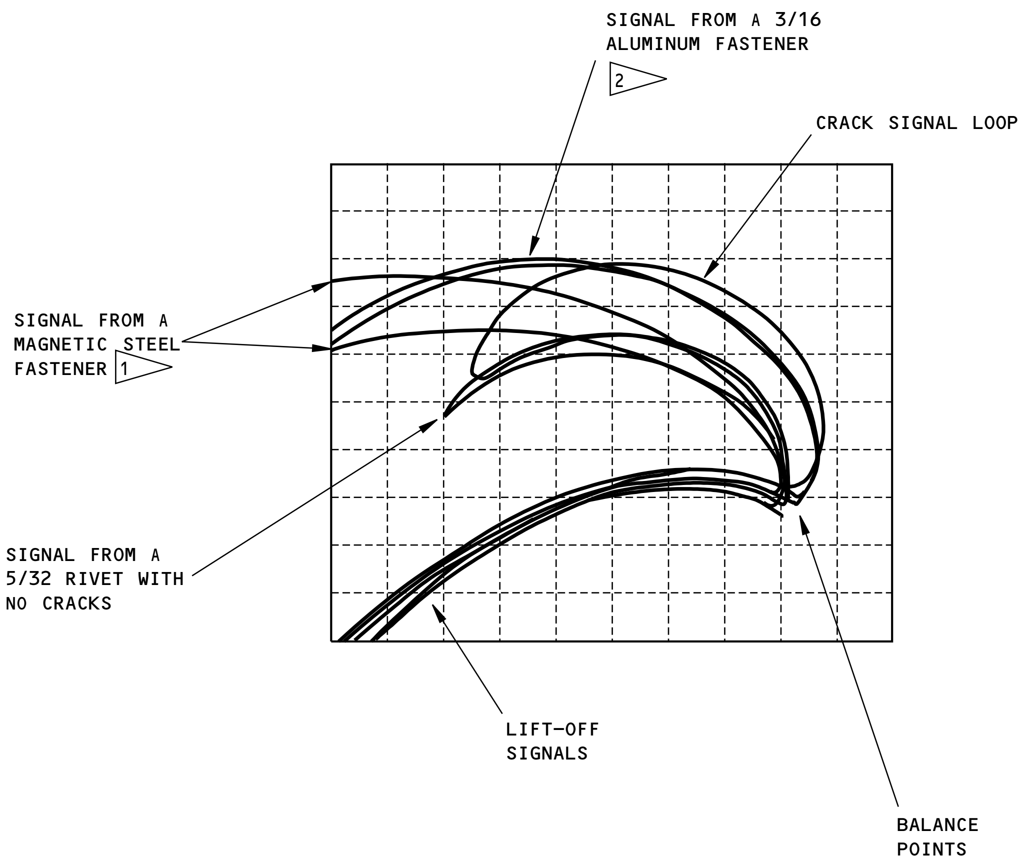
2161543 S0000472643_V1

Signal from Fasteners 0.65 Inches (17mm) Apart
Figure 6



2161544 S0000472644_V1

Example Signals Related to the Tear Straps
Figure 7

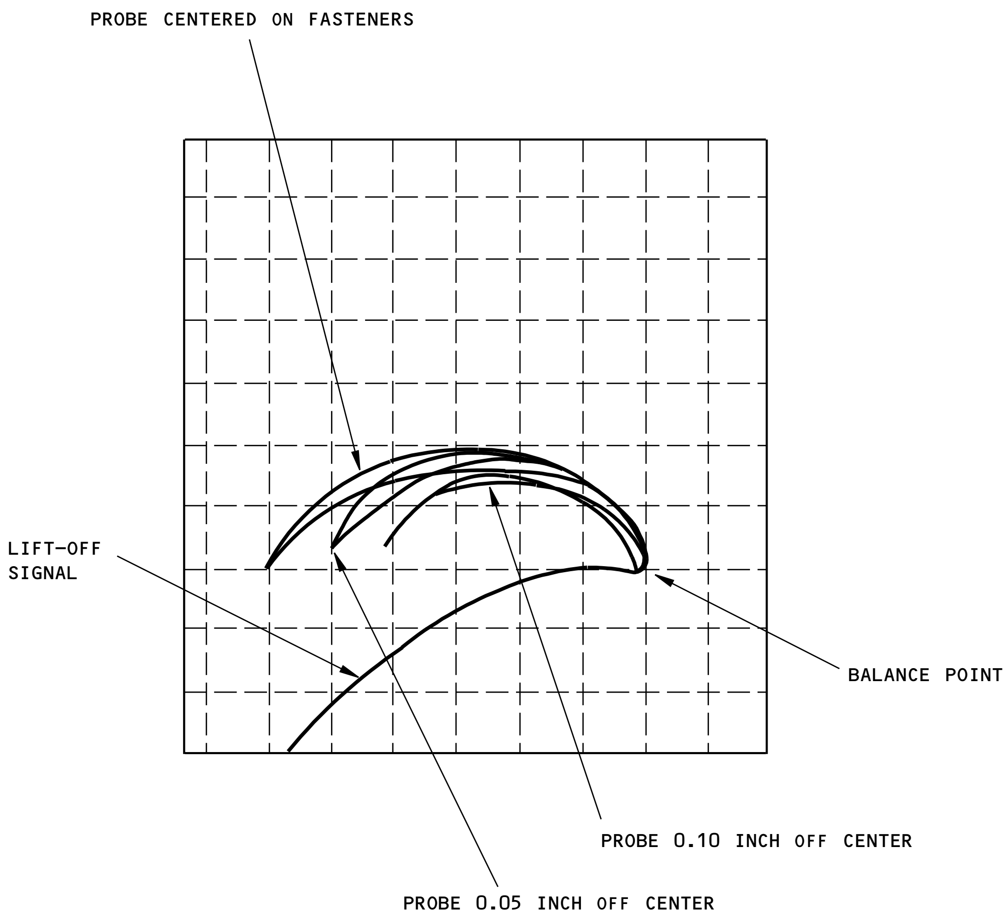


1 USE A MAGNET TO IDENTIFY MAGNETIC FASTENERS

2 IDENTIFY FASTENER SIZES VISUALLY

2161547 S0000472645_V1

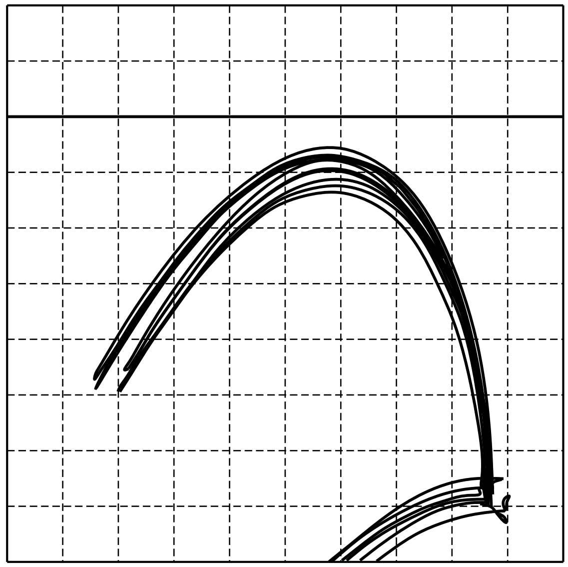
Typical Signals from Magnetic Fasteners and 3/16 Fasteners
Figure 8



2161548 S0000472646_V1

Inspection Signal Examples - Probe Off Center
Figure 9

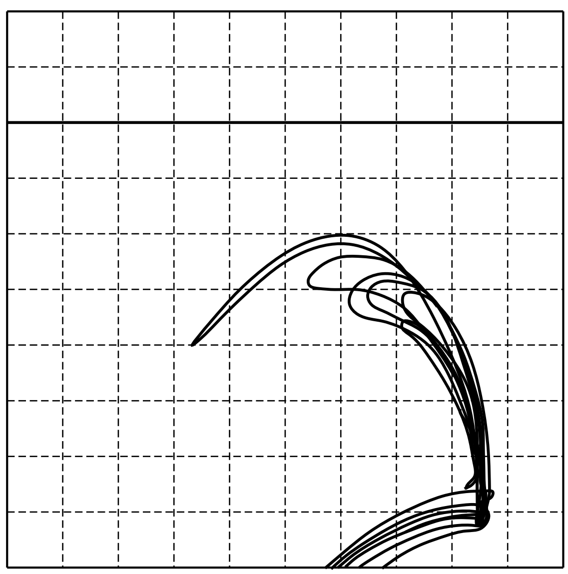
THE SLIDING PROBE INSPECTION IS PERMITTED IF SIGNALS SUCH AS THESE OCCUR FROM THE AIRPLANE OR REFERENCE STANDARD.



THE SIGNALS THAT OCCUR FROM ANODIZED RIVET LOCATIONS ON THE AIRPLANE OR REFERENCE STANDARD ARE ALMOST THE SAME.

ANODIZED RIVET SIGNALS (TYPICAL)
DETAIL I

THE SLIDING PROBE INSPECTION CANNOT BE USED IF SIGNALS SUCH AS THESE OCCUR FROM THE AIRPLANE OR REFERENCE STANDARD; REFER TO PAR. 6.E.



THE SIGNALS THAT OCCUR FROM ALODINED RIVET LOCATIONS ON THE AIRPLANE OR REFERENCE STANDARD ARE IRREGULAR AND WILL BE DIFFERENT THAN ANODIZED RIVET LOCATIONS AS SHOWN. NOTE THAT THE HORIZONTAL MOVEMENT, HEIGHT AND SHAPE OF THE SIGNALS FROM ALODINED RIVETS ARE DIFFERENT.

ALODINED RIVET SIGNALS (TYPICAL)
DETAIL II

2161549 S0000472647_V1

Example Signals from Anodized and Alodined Rivets
Figure 10

PART 6 - EDDY CURRENT

SLIDING PROBE INSPECTION OF THE INBOARD SKIN OF THE LAP SPLICE

1. **Purpose**

   A. Use this procedure to do an inspection for cracks, that are within 30 degrees of longitudinal, in the inboard skin along the lower row of fasteners in the lap splices.

   B. This procedure is done from the external side of the airplane. See Figure 1 for the location of the typical inspection areas. The applicable Service Bulletin identifies the necessary inspection locations.

   C. The total thickness of the outer skins and doublers at the lap splice must be between 0.068 inch (1.73 mm) and 0.086 inch (2.18 mm) thick.

   D. This procedure uses a sliding probe and an impedance plane display instrument.

   E. You cannot do this procedure at a location where the fastener is magnetic (steel) or if a fastener has a protruding head. If a fastener is magnetic or if a fastener has a protruding head, then you must do one of the procedures that follow:

      (1) Do an external inspection as shown in Part 6, 53-30-14, but only if the fastener has been oversized from the size shown in the production drawings.

      (2) Do an internal inspection as shown in Part 6, 53-30-12 and Part 6, 53-30-13.

      (3) Do an open hole inspection as shown in Part 6, 51-00-00, Procedure 16.

   F. The probe must be accurately aligned with the fastener centerline to do this procedure correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

   G. Service Bulletin Reference: 737-53A1177

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 an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates at a frequency range of 6 kHz to 8 kHz.

      (2) The instruments specified below were used to prepare this procedure.

         (a) NDT 19e; Nortec-Staveley

         (b) Phasec 1.1; Hocking/Krautkramer

   C. Probes

      (1) Use a reflection sliding probe that operates at a frequency range from 6 kHz to 8 kHz.

      (2) The probe specified below was used to prepare this procedure.

         (a) SPO3806; Nortec-Staveley

   D. Reference Standards

(1) Use reference standard NDT3004. See Figure 2 for data about the reference standard.

NOTE: The rivet-to-skin interface on in-service airplanes is non-conductive to eddy currents. On the reference standard, good electrical flow between the skin and the rivets will give an incorrect and smaller fastener signal in the instrument display. To make sure that the reference standard is electrically equivalent to the airplane, use specially ordered rivets that have an anodize finish. Reference standards made before the April 5, 2001 revision of this procedure that have a non-conductive paint or primer on the countersunk surfaces of the reference standard are permitted.

E. Special Tools

(1) Use a non-conductive probe guide to align the centerline of the probe with the center of the fasteners.

NOTE: Adjust the probe guide so the probe is on the centerline of the rivets during the scans. It is possible that adjacent rivets are not aligned with each other.

(2) A magnet can be used to identify magnetic fasteners.

3. Prepare for the Inspection

A. Get access to the inspection areas.

B. Remove loose paint, dirt and sealant from the surface of the inspection area.

C. If you cannot see the fasteners because the paint is too thick, remove the paint so that you can see the fasteners.

4. Instrument Calibration

A. Set a frequency from 6 kHz to 8 kHz.

B. Set the vertical to horizontal gain to 1:1.

C. Set the instrument filters as follows:

(1) Set the high pass filter to off or zero Hz.

(2) If the instrument has a low pass filter:

(a) Set the low pass filter to its highest value.

(b) If the dot is not stable, decrease the filter value to get a stable dot or until the signal from the notch in the reference standard starts to decrease.

D. Put the probe (with the probe guide) on the reference standard at Position 1 (to do inspections of 5/32 diameter fasteners) as shown in Figure 3. To calibrate the equipment to do inspections of 3/16 diameter fasteners, put the probe above the row of 3/16 diameter fasteners adjacent to Position 1.

E. Balance the instrument.

F. Adjust the balance point to 80 percent from the left side of the horizontal display and 30 percent of the vertical display as shown in Figure 4.

G. Lift the probe off the surface of the reference standard. Adjust the phase control so that the lift-off signal moves horizontally to the left of the balance point as shown in Figure 4.

H. Adjust the probe guide so that it will keep the centerline of the probe aligned with the center of the fastener row.

I. Move the probe across the applicable fastener row from Position 1 to Position 2 on the reference standard as shown in Figure 3.

J. Adjust the vertical and horizontal gains so that the notch signal is as shown in Figure 5. Make sure that the height of the signal from the notch is at 80 percent of the display and the signals from the good fastener holes are at approximately 60 percent.

NOTE: Some "sliding probes" are sensitive to probe direction when a scan is made.

K. Identify the probe direction that gives the smaller notch signal as follows:

(1) Put the probe on the reference standard at Position 1 (to do inspections of 5/32 diameter fasteners) as shown in Figure 3. To calibrate the equipment to do inspections of 3/16 diameter fasteners, put the probe above the row of 3/16 diameter fasteners adjacent to Position 1.

(2) Move the probe across the applicable fastener row to Position 2 on the reference standard as shown in Figure 3.

(3) Turn the probe 180 degrees and do Paragraph 4.K.(1) and Paragraph 4.K.(2) above, again to identify the direction of probe movement that results in the smaller notch signal.

L. Calibrate the equipment as specified in steps Paragraph 4.H., Paragraph 4.I., and Paragraph 4.J. again as you move the probe in the direction that gives the smaller notch signal.

5. Inspection Procedure

A. Use the nonconductive probe guide to align the probe on the lap splice so that the centerline of the probe will follow the center (±0.050 inch (1.27 mm)) of the lower row of fasteners. If the probe is not correctly aligned, you will get incorrect signals. See Figure 9 for an example of a scan with the probe centerline away from the center of the fastener row.

B. Put the probe on the lap splice with the center of the probe between two fasteners.

C. Balance the instrument.

NOTE: Do not adjust the gain. Gain adjustments will make the instrument calibration unsatisfactory.

D. Use the nonconductive probe guide and move the probe slowly along the row of fasteners and monitor the instrument display at the same time. Make sure that the centerline of the probe will move across the center (±0.050 inch (1.27 mm)) of the fasteners. During the inspection:

(1) Make a mark on fasteners that are not aligned with the fastener row. Go back to these fasteners and do the inspection with the probe correctly aligned.

(2) Make a mark at the locations that cause signals that are at or above the reject level shown in Figure 5.

(3) Make a mark at the locations where the opening in the signal loop is more than 15 percent of the display height.

NOTE: If there are two cracks in an area, the vertical width in the loop of the signal will decrease but the vertical height of the signal will increase.

E. Do a calibration test of the instrument after you examine each skin panel as follows:

NOTE: Do not adjust the gain.

(1) Put the probe on the reference standard to get the maximum signal from the notch.

(2) Compare the signal you got from the notch during calibration with the signal you get now.

(3) If the maximum signal from the notch in the reference standard has decreased 5 percent or more from the signal you got during calibration, do the calibration and the inspection again for all of the fasteners done since the last calibration test.

F. Do Paragraph 5. again for the remaining lap splices.

6. **Inspection Results**

A. Signals that are more than 70 percent of the display height or that have openings in the signal loop that are 15 percent or more of the display height are signs of cracks.

NOTE: An edge of a tear strap that is too close to a fastener can cause a signal with an opening in the loop that looks almost the same as a crack signal. But, the signal will have a display height that is lower than the signals from the areas without a tear strap as shown in Figure 7.

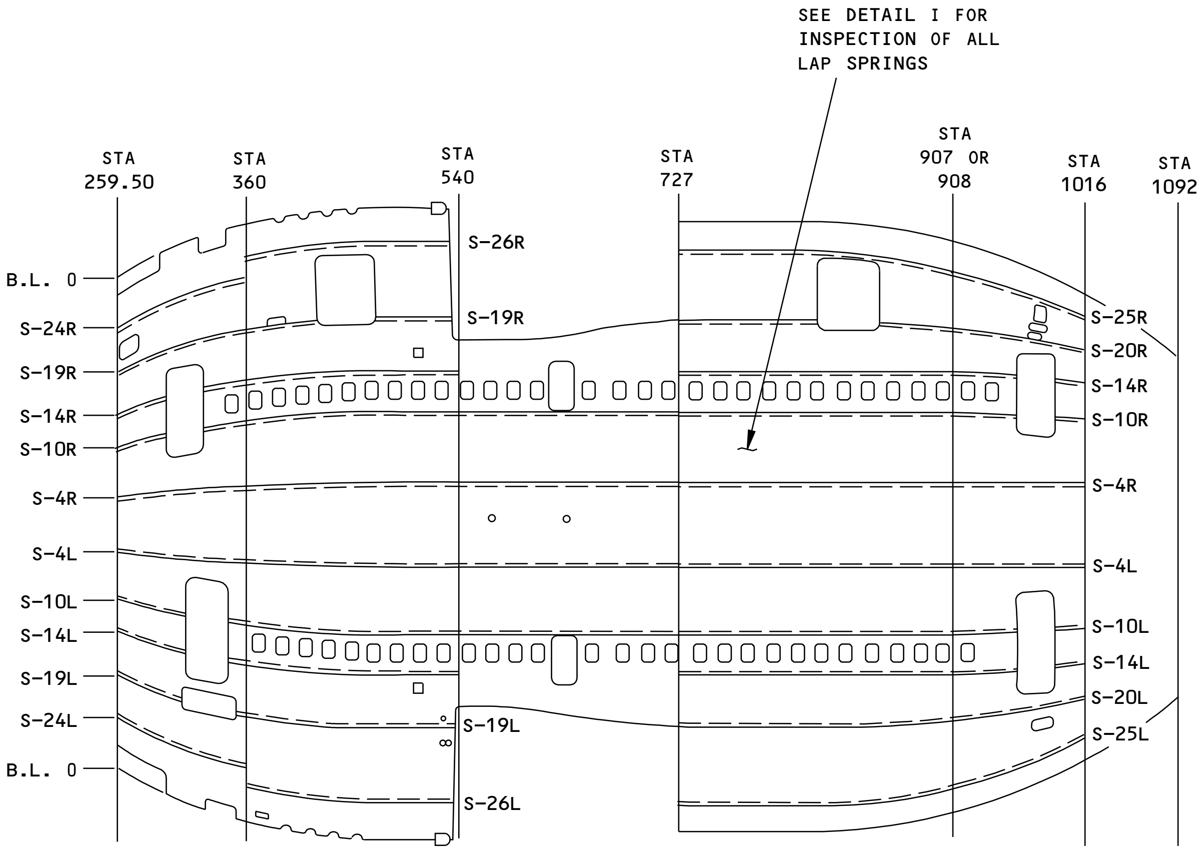
NOTE: To identify if a signal is the result of a tear strap or a crack, do an inspection of a fastener in the top row of the lap splice. The fastener in the top row must be of the same size and material, and be aligned vertically with the lower fastener. If the signals are the same, the signal is caused by a tear strap.

B. Magnetic and larger diameter fasteners will cause a large signal as shown in Figure 8. Use a magnet to identify magnetic fasteners. Refer to Part 6, 53-30-14 for an alternative procedure for magnetic fasteners.

C. To make sure of the results, you can do the internal inspection procedure specified in Part 6, 53-30-12 at the tear strap locations or Part 6, 53-30-13 between the tear straps. The open fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16 can also be used to make sure of the results.

NOTE: It is possible to get a crack indication when you do an external eddy current inspection but not when you do the Part 6, 51-00-00, Procedure 16 fastener hole inspection. This can occur if there are cracks that do not go into the hole. The Part 6, 51-00-00, Procedure 16 fastener hole inspection will only identify cracks that go into the hole. The cracks that do not go into the hole are referred to as eyebrow cracks. Eyebrow cracks can be found with an internal spot probe procedure, Part 6, 53-30-12.

D. Fasteners spaced near each other can cause signals as shown in Figure 6.



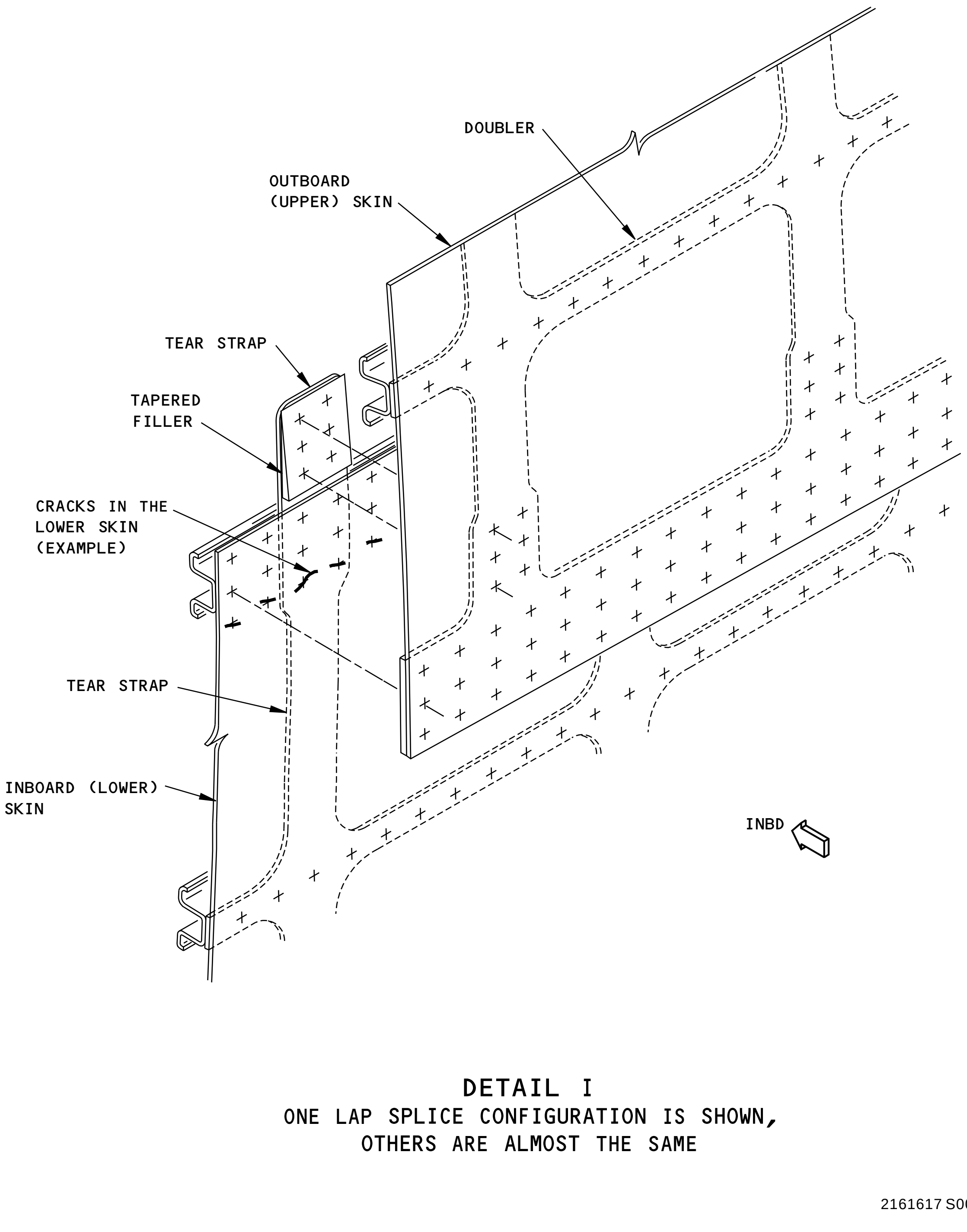
NOTE

- SEE SERVICE BULLETIN 737-53A1177 FOR SPECIFIC LAP SPLICE LOCATIONS TO BE EXAMINED

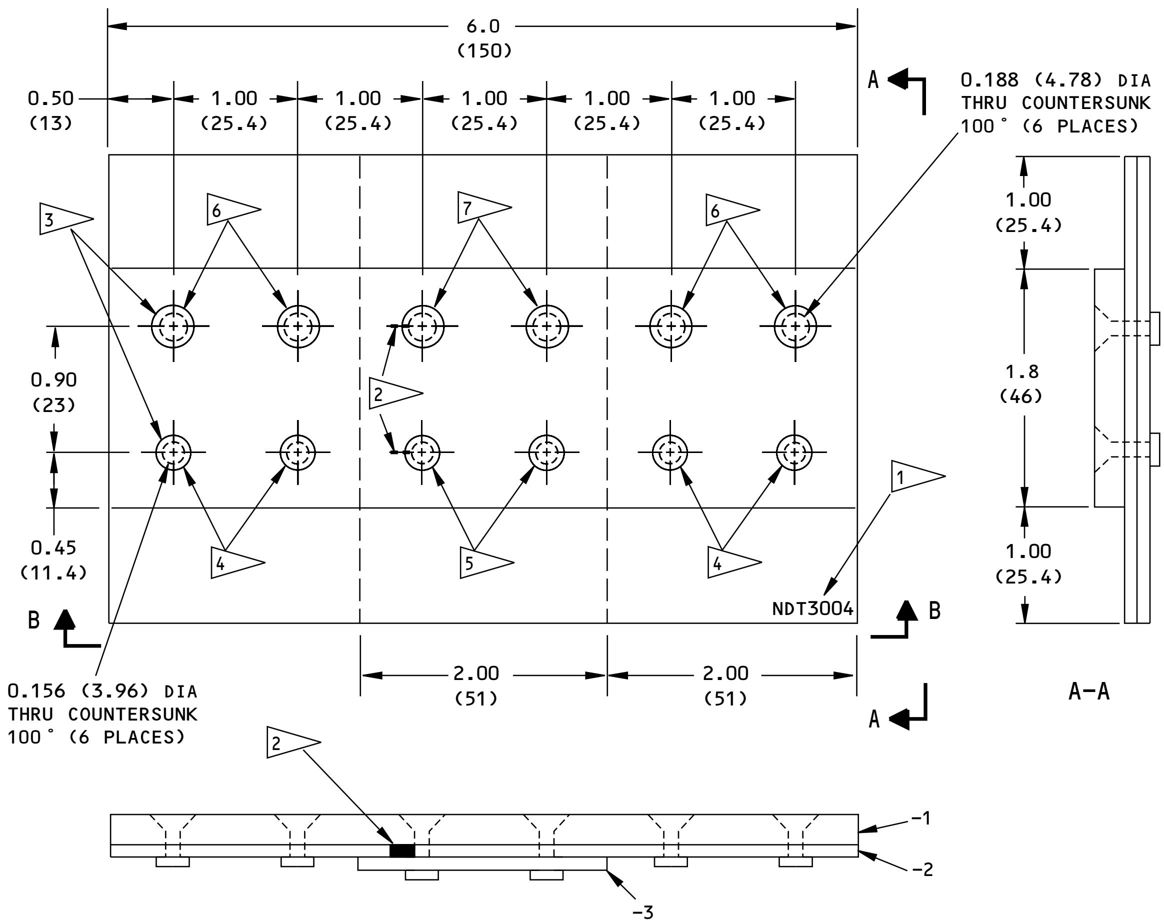
737-200P AIRPLANE SHOWN
737-300,-400,-500 AIRPLANES
ARE ALMOST THE SAME

2161608 S0000472649_V1

Typical Inspection Areas - External Inspection
Figure 1 (Sheet 1 of 2)



Typical Inspection Areas - External Inspection
Figure 1 (Sheet 2 of 2)



RIVET CODE	ALLFAST FASTENING SYSTEMS INC. PART NUMBER	SIERRA PACIFIC SUPPLY CO. PART NUMBER
***5D5	AF1049U1D5C5	NAS1097D5-5D
***5D6	AF1049U1D5C6	NAS1097D5-6D
***6D5	AF1049U1D6C5	NAS1097D6-5D
***6D6	AF1049U1D6C6	NAS1097D6-6D

ANODIZED RIVET DATA 4
TABLE I

2161619 S0000472651_V1

Reference Standard NDT3004
Figure 2 (Sheet 1 of 2)

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES:

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- RIVETS: 3

QUANTITY	4 ***5D5 4 (ANODIZED)	4 ***6D5 6 (ANODIZED)
	2 ***5D6 5 (ANODIZED)	2 ***6D6 7 (ANODIZED)

- MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE

-1 0.080 X 1.80 X 6.00 (2.03 X 45.7 X 152.4)
-2 0.036 X 3.80 X 6.00 (0.91 X 96.5 X 152.4)
-3 0.036 X 3.80 X 2.00 (0.91 X 96.5 X 50.8)

- DRIVE ALL 5/32 RIVETS TO A MINIMUM BUTTON DIAMETER OF 0.219 (5.56).
- DRIVE ALL 3/16 RIVETS TO A MINIMUM BUTTON DIAMETER OF 0.264 (6.71).

1 ETCH OR STEEL STAMP REFERENCE STANDARD NUMBER NDT3004

2 EDM NOTCHES: (MAKE NOTCHES IN THE -2 PART)
LENGTH: 0.200 (5.0) ±0.020 (0.50)
DEPTH: 0.036 (0.90)
WIDTH: 0.025 (0.64) MAXIMUM

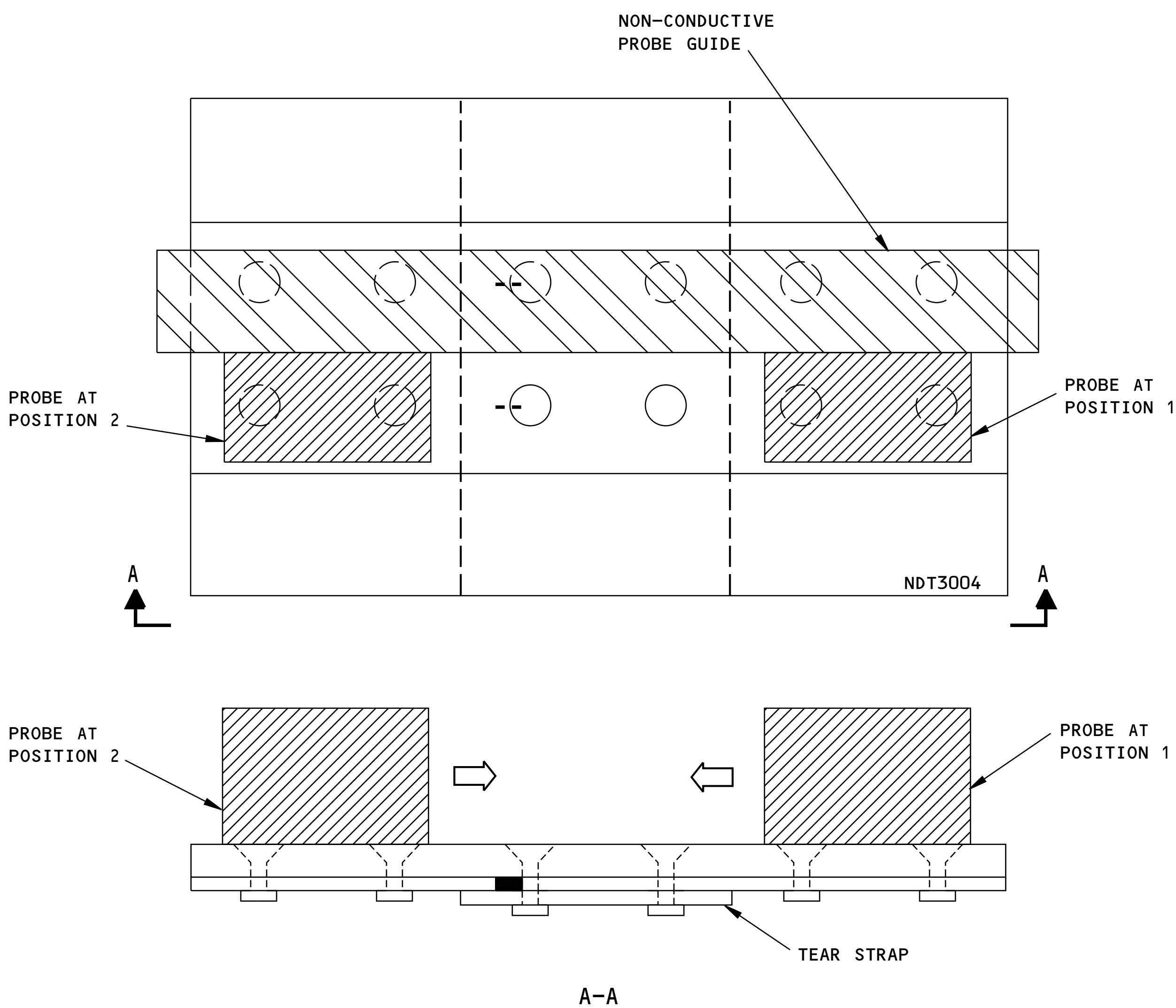
THE NOTCH LENGTH IS FROM THE EDGE OF THE HOLE OUTWARD. MAKE SURE THE NOTCH IS WITHIN ±0.005 (0.10) OF THE CENTER OF THE HOLE AS SHOWN.

3 RIVETS THAT HAVE CONDUCTIVITY WITH THE SKIN CAUSE INCORRECT EDDY CURRENT SIGNALS. USE SPECIALLY-ORDERED RIVETS THAT HAVE AN ANODIZE FINISH TO PREVENT RIVET CONDUCTIVITY. SEE TABLE I. REFER TO PART 1, 51-01-00 FOR DATA ABOUT THE FASTENER SUPPLIERS.

4 ALTERNATIVELY, YOU CAN MAKE EQUIVALENT RIVETS BY ANODIZING BACR15CE*D* OR BACR15GF*D* RIVETS AT A LOCAL ANODIZE SHOP.

2161621 S0000472653_V1

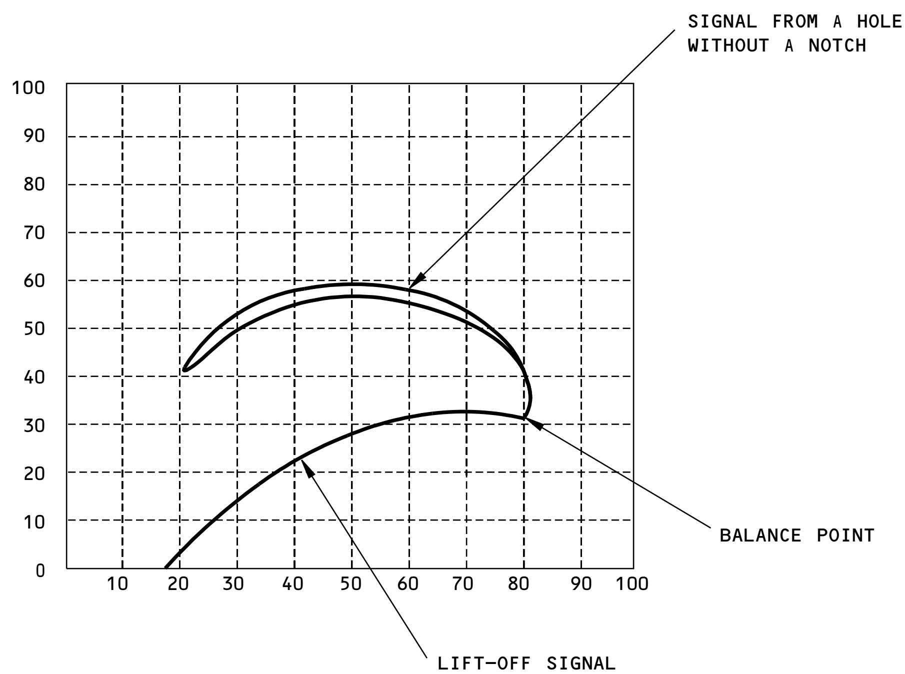
Reference Standard NDT3004
Figure 2 (Sheet 2 of 2)



THE PROBE POSITION SHOWN IS FOR THE INSPECTION OF 5/32 FASTENERS.
USE THE UPPER ROW FOR THE INSPECTION OF 3/16 FASTENERS.

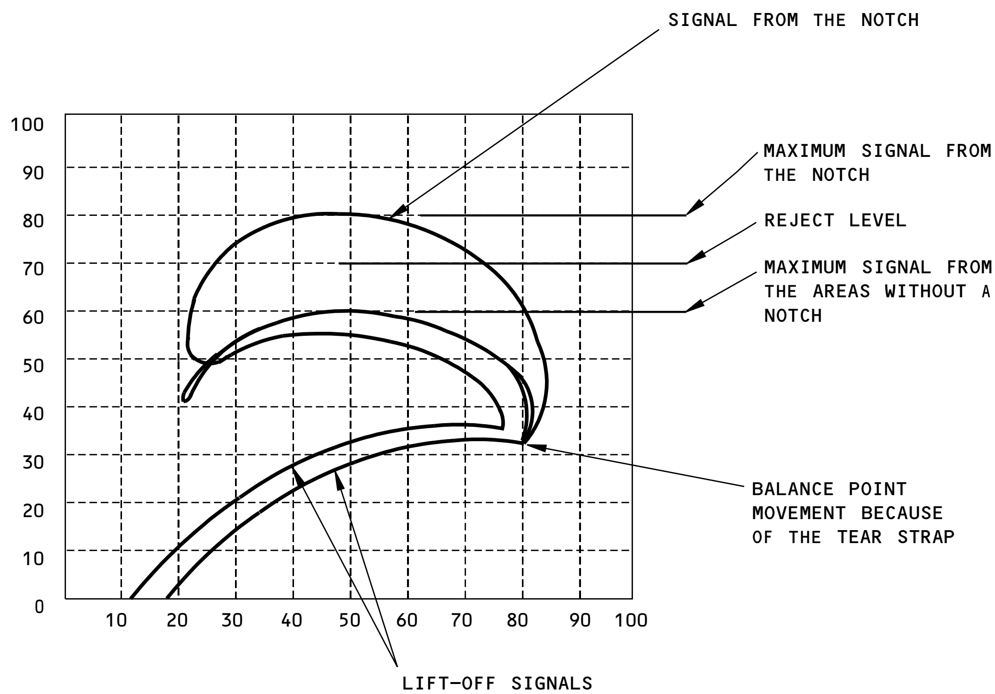
2161622 S0000472654_V1

Probe Positions for Calibration
Figure 3



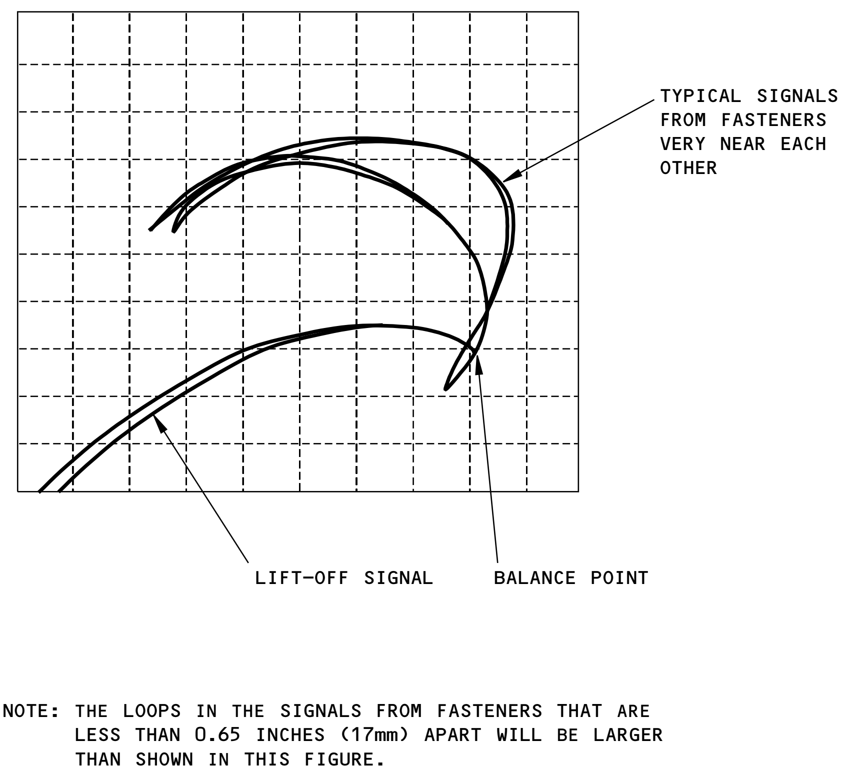
2161623 S0000472655_V1

Calibration Signals
Figure 4



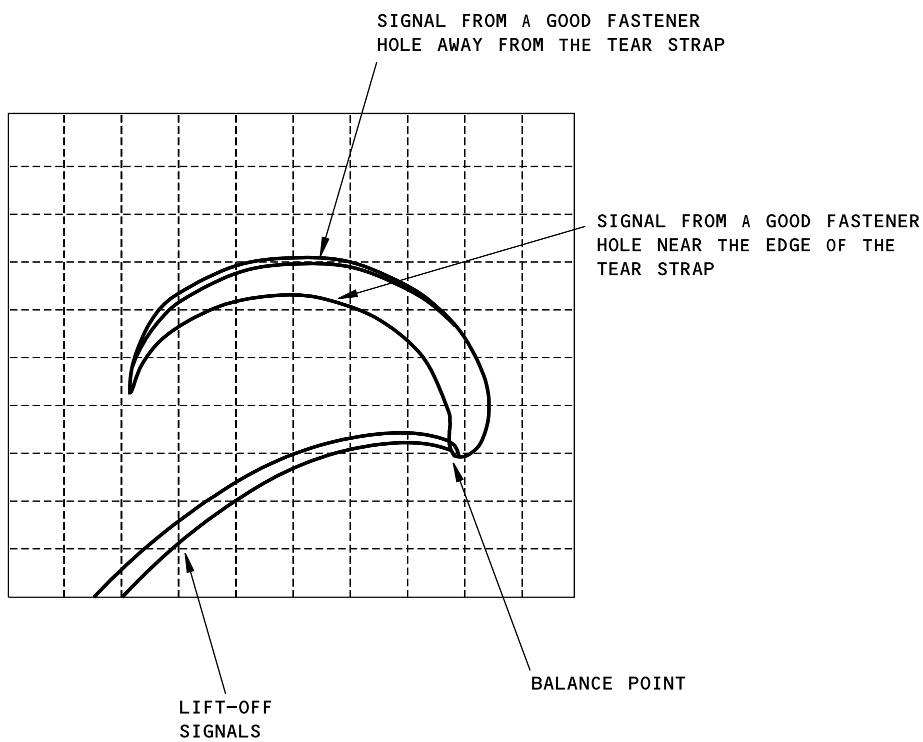
2161624 S0000472656_V1

Calibration Signals
Figure 5



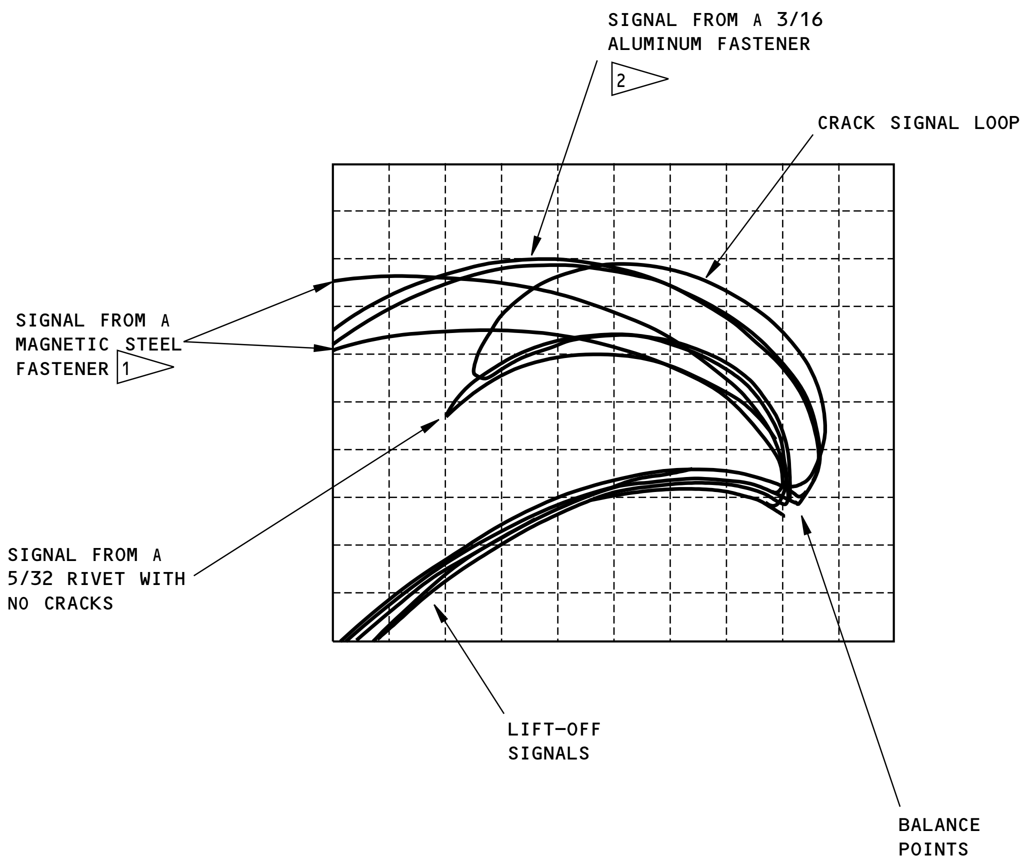
2161625 S0000472659_V1

Signal from Fasteners 0.65 Inches (17mm) Apart
Figure 6



2161626 S0000472660_V1

Example Signals Related to the Tear Straps
Figure 7

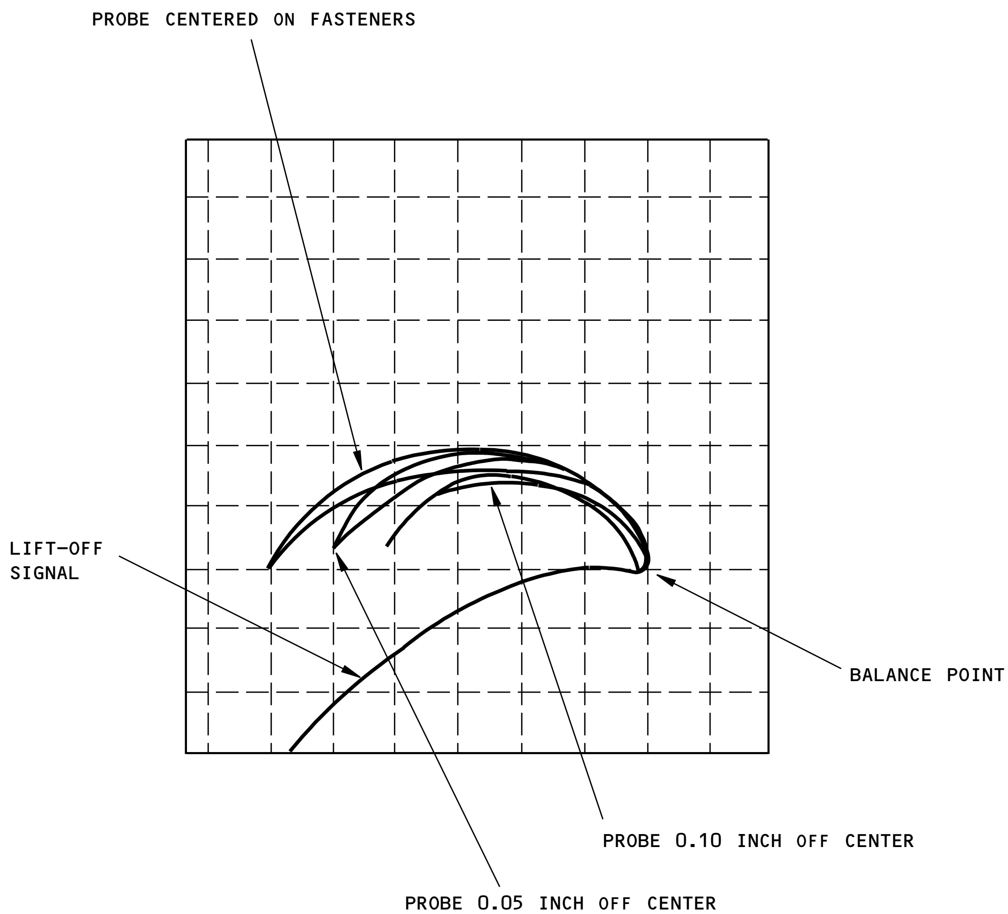


1 USE A MAGNET TO IDENTIFY MAGNETIC FASTENERS

2 IDENTIFY FASTENER SIZES VISUALLY

2161645 S0000472661_V1

Typical Signals from Magnetic Fasteners and 3/16 Fasteners
Figure 8



2161648 S0000472662_V1

Inspection Signal Examples - Probe Off Center
Figure 9

PART 6 - EDDY CURRENT

LAP SPLICE INSPECTION OF THE INBOARD SKIN BEHIND TEAR STRAPS - INTERNAL

1. **Purpose**

   A. Use this procedure to do an inspection for cracks in the inboard skin along the lower row of fasteners in the lap splices. This inspection is done from inside the airplane.

   B. This inspection procedure is for the inboard skin areas of the lap splice that are behind the tear straps. See Figure 1 for the location of the inspection areas.

   C. The tear straps must have a thickness between 0.032 inch (0.81 mm) and 0.040 inch (1.02 mm).

   D. There must be a distance of 0.23 inch (5.8 mm) or more between the edge of the tear strap and the edge of the driven head or collar.

   E. This procedure uses an impedance plane or a meter display instrument.

   F. You cannot do this inspection when the distance between the fastener and the edge of the tear strap effects the eddy current signals. This condition is called a short edge margin. If a short edge margin condition occurs, then you must do the fastener hole inspection specified in Part 6, 51-00-00, Procedure 16.

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 an eddy current instrument that:

         (a) Has an impedance plane or a meter display.

         (b) Operates at a frequency range of 8 to 10 kHz.

      (2) The instruments specified below were used to prepare this procedure.

         (a) Phasec 1.1; Hocking Krautkramer

         (b) NDT 19e; Nortec-Staveley

         (c) MIZ-10B; Zetec, Inc.

   C. Probes

      (1) Use a 90 degree probe that:

         (a) Operates at a frequency range between 8 and 10 kHz.

         (b) Has a maximum external diameter of 0.230 inch (5.84 mm).

         (c) Has a drop of approximately 0.5 inch (13 mm).

         (d) Is shielded.

         (e) Operates as specified in Part 6, 51-00-00, Procedure 1.

      (2) The probe specified below was used to prepare this procedure.

         (a) LP903-50B/2-12K; NDT Engineering

   D. Reference Standards

(1) Use reference standard ANDT3004. See Figure 2 for data about the reference standard.

3. Prepare for the Inspection

A. Get access to the inboard side of the skin lap splices.

B. Remove loose paint, dirt and sealant from the surface of the inspection area.

4. Instrument Calibration

A. Set a frequency between 8 and 10 kHz.

B. For an instrument with an impedance plane display, set the vertical to horizontal gain to 1:1.

C. For an instrument with an impedance plane display, set the filters as follows:

(1) Set the high pass filter to off or zero Hz.

(2) If the instrument has a low pass filter:

(a) Set the low pass filter to its highest value.

(b) Decrease the filter value to get a stable dot or until the signal from the notch in the reference standard starts to decrease.

D. Put a non-conductive shim on the reference standard. The thickness of the shim must be equivalent (±0.003 inch (0.08 mm)) to the paint thickness on the airplane.

E. Put the probe at Position 1 on the reference standard as shown in Figure 3.

F. Balance the instrument.

G. Adjust the balance point to 20 percent of the display as shown in Figure 4.

H. Adjust the instrument for lift-off with a 0.003 inch (0.08 mm) non-conductive shim. Adjust the phase control so that the lift-off signal moves horizontally to the left for impedance plane displays, or no more than 5 percent of the display for meter displays.

I. Move the probe to Position 2 on the reference standard as shown in Figure 3.

J. Move the probe at Position 2 to get a maximum signal from the notch in the reference standard.

K. Adjust the vertical and horizontal gains to get a signal that is approximately 80 percent of the display as shown in Figure 4.

L. Do a test of the balance and lift-off. If it is necessary to adjust the balance or lift-off, do the calibration again.

5. Inspection Procedure

A. Put the probe on the inboard side of the lap splices adjacent to and above the driven head of a fastener in the lower row of fasteners.

B. Balance the instrument.

C. Adjust the balance point to 20 percent of the display as shown in Figure 4.

NOTE: Do not adjust the gain. Gain adjustments will make the instrument calibration unsatisfactory.

D. Move the probe slowly 360 degrees around the driven head of the fastener and monitor the instrument display at the same time. During the inspection:

(1) Make sure that the edge of the probe does not go across the edge of the tear strap.

NOTE: Tear strap edges that are near the fastener can cause a signal to be more than 40 percent of the display height.

(2) Make a mark at the locations where you get a signal that is more than 40 percent of the display.

(3) Frequently do a check of the instrument/probe calibration during the inspection as follows:

NOTE: Do not adjust the gain.

(a) Put the probe on the reference standard to get a signal from the notch.

(b) Compare the signal you got from the notch during calibration with the signal you get now.

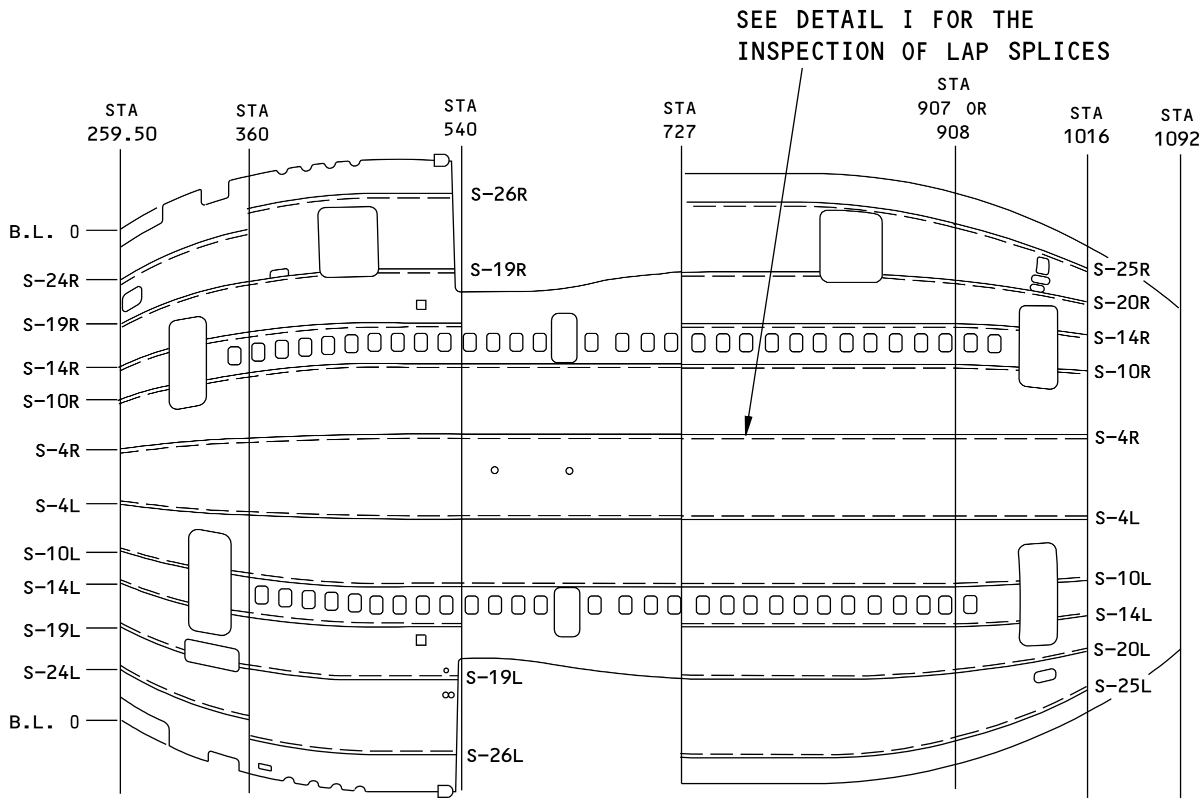
(c) If the signal from the notch in the reference standard has changed 10 percent or more from the signal you got during calibration, do the calibration and inspection again.

6. Inspection Results

A. Signals that are more than 40 percent of the display are signs of cracks.

B. Compare the signals that occur during the inspection with the signals you got on the reference standard during calibration.

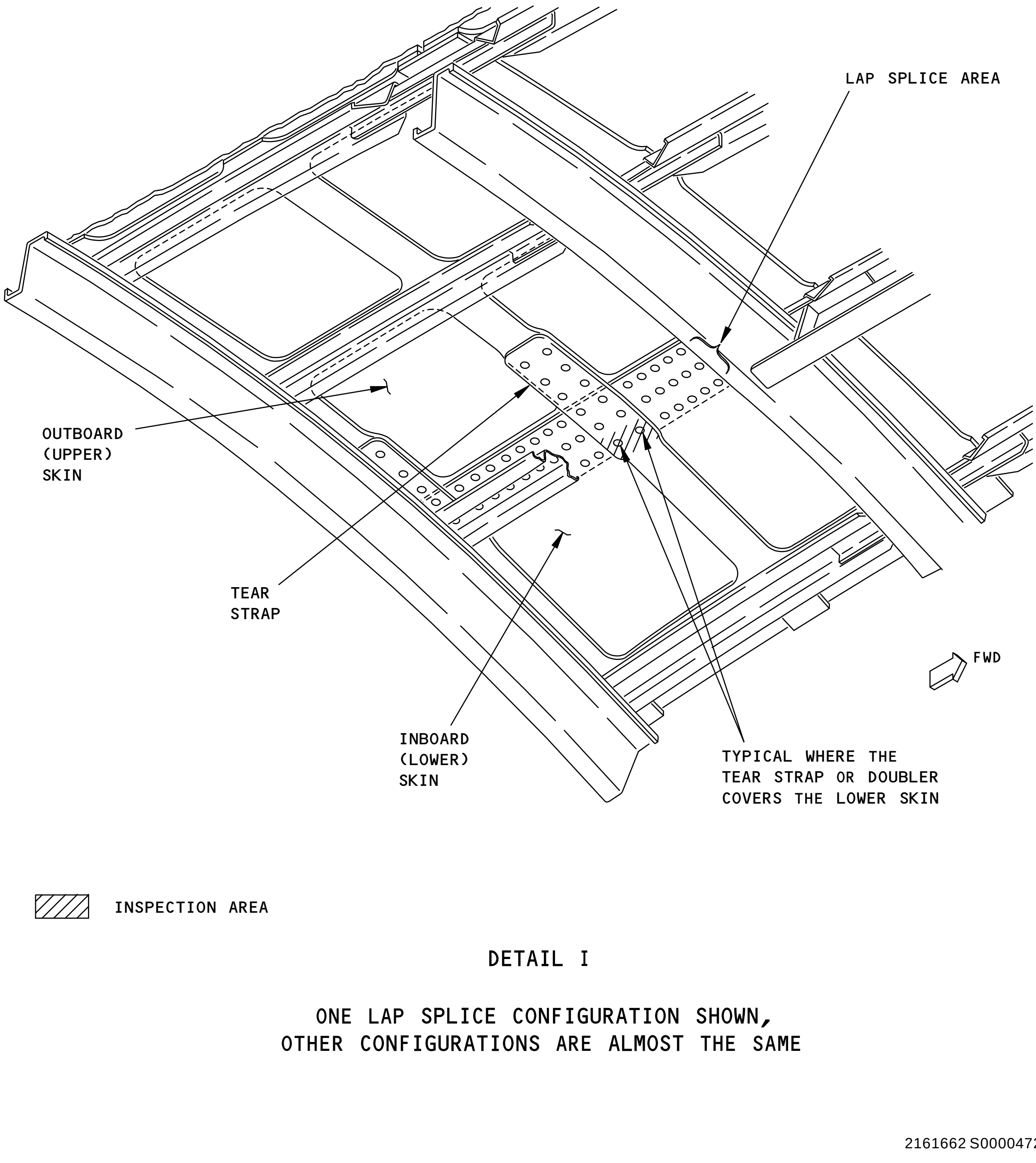
C. If you want to make sure of the results, do the fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16.



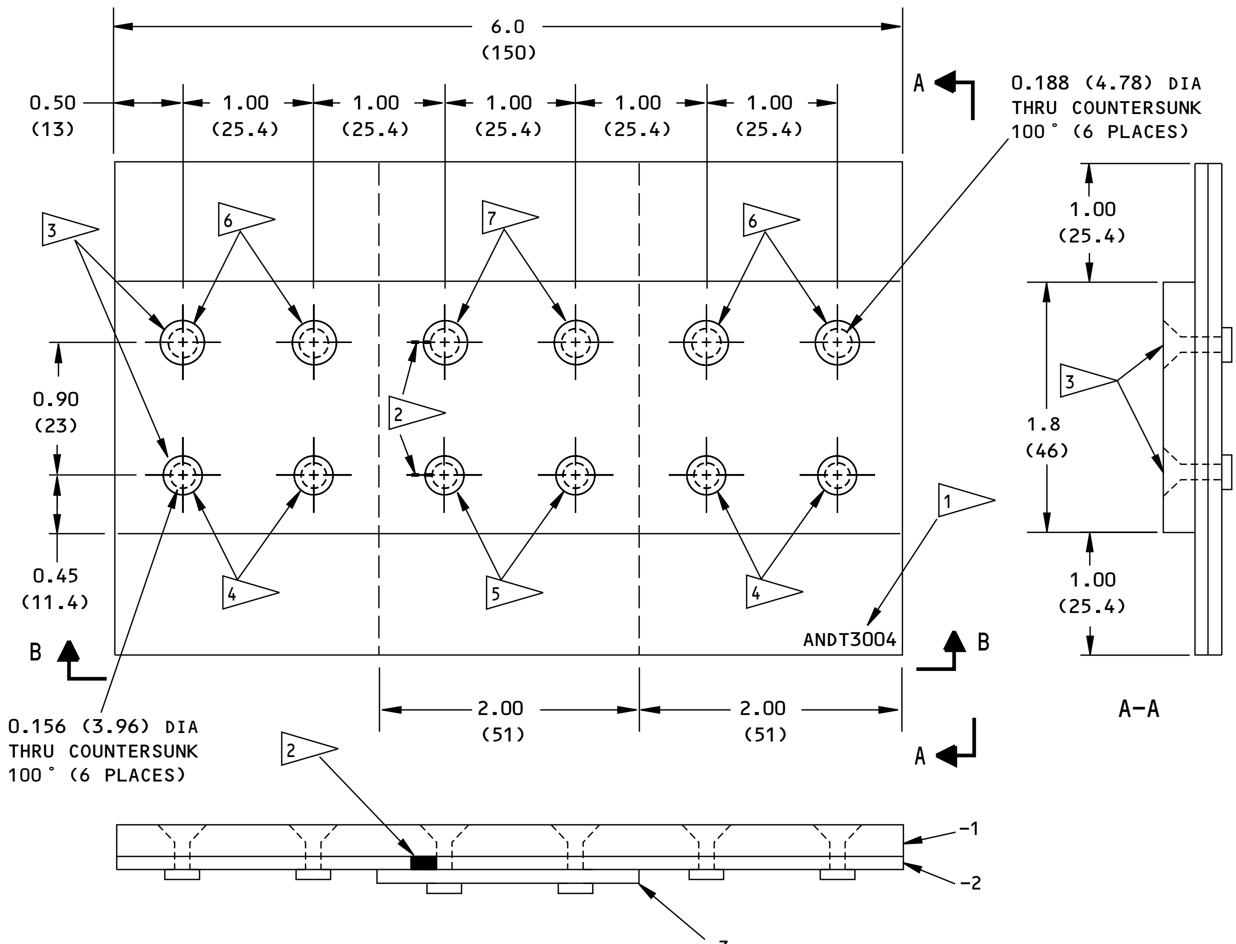
737-200P AIRPLANE SHOWN
737-300,-400,-500 AIRPLANES ARE
ALMOST THE SAME

2161652 S0000472664_V1

Typical Inspection Areas - Internal Inspection
Figure 1 (Sheet 1 of 2)



Typical Inspection Areas - Internal Inspection
Figure 1 (Sheet 2 of 2)



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS IN PARENTHESES)
- TOLERANCES:

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS = 125 R_a OR BETTER
- RIVETS: QUANTITY
  - 4 BACR15CE5D5 [4]
  - 2 BACR15CE5D6 [5]
  - 4 BACR15CE6D5 [6]
  - 2 BACR15CE6D6 [7]
- MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE

-1	0.080 X 1.80 X 6.00	(2.03 X 45.7 X 152.4)
-2	0.036 X 3.80 X 6.00	(0.91 X 96.5 X 152.4)
-3	0.036 X 3.80 X 2.00	(0.91 X 96.5 X 50.8)

[1] ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER ANDT3004. PUT A LETTER "A" IN FRONT OF THE REFERENCE STANDARD NUMBER TO SHOW THAT IT HAS ALODINED RIVETS. SEE FLAGNOTE 3.

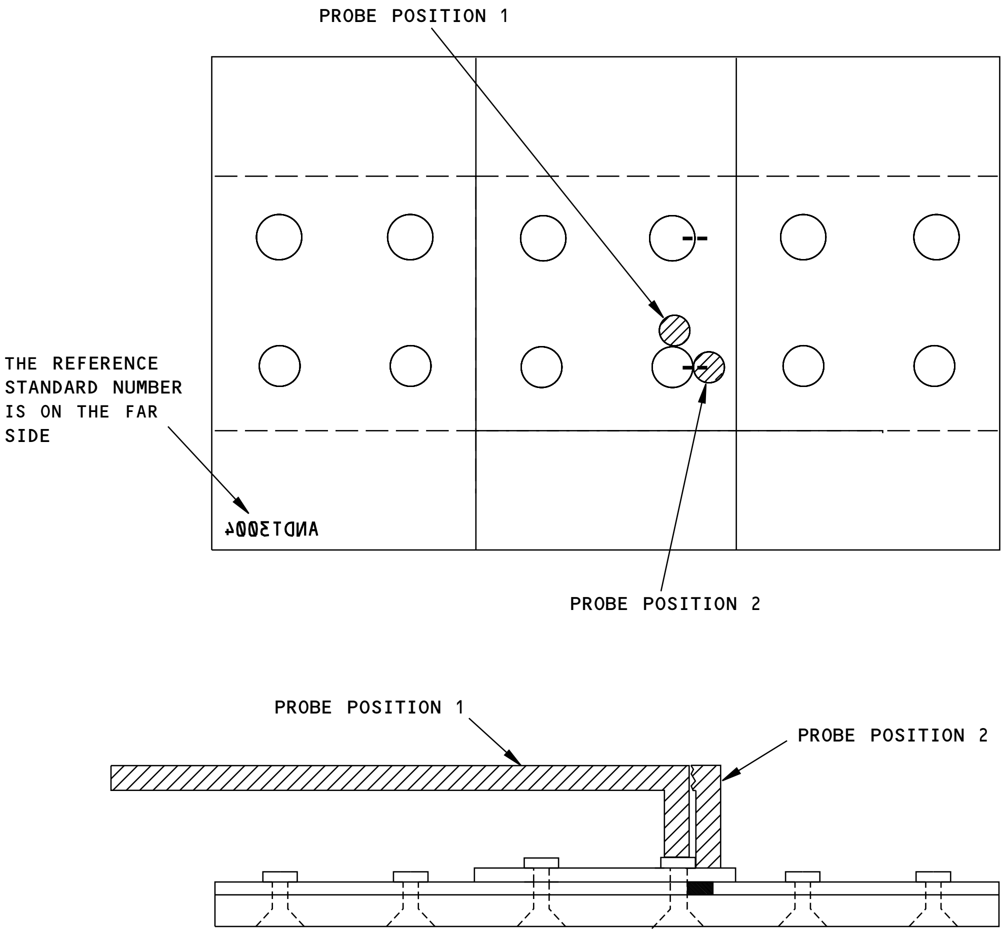
[2] EDM NOTCHES: (MAKE NOTCHES IN THE -2 PART)
LENGTH: 0.200 (5.00) ±0.020 (0.50)
DEPTH: 0.036 (0.90)
WIDTH: 0.025 (0.64) MAXIMUM

THE NOTCH LENGTH IS FROM THE EDGE OF THE HOLE OUTWARD. MAKE SURE THE NOTCH IS WITHIN ±0.005 (0.10) OF THE CENTER OF THE HOLE.

[3] ALL RIVETS IN THIS REFERENCE STANDARD MUST HAVE A CONVERSION COATED (ALODINED) FINISH. TO MAKE SURE THE FINISH IS ALODINE, REFER TO PART 1, 51-06-01. INSTALL THE RIVETS AS SPECIFIED IN PART 1, 51-01-04.

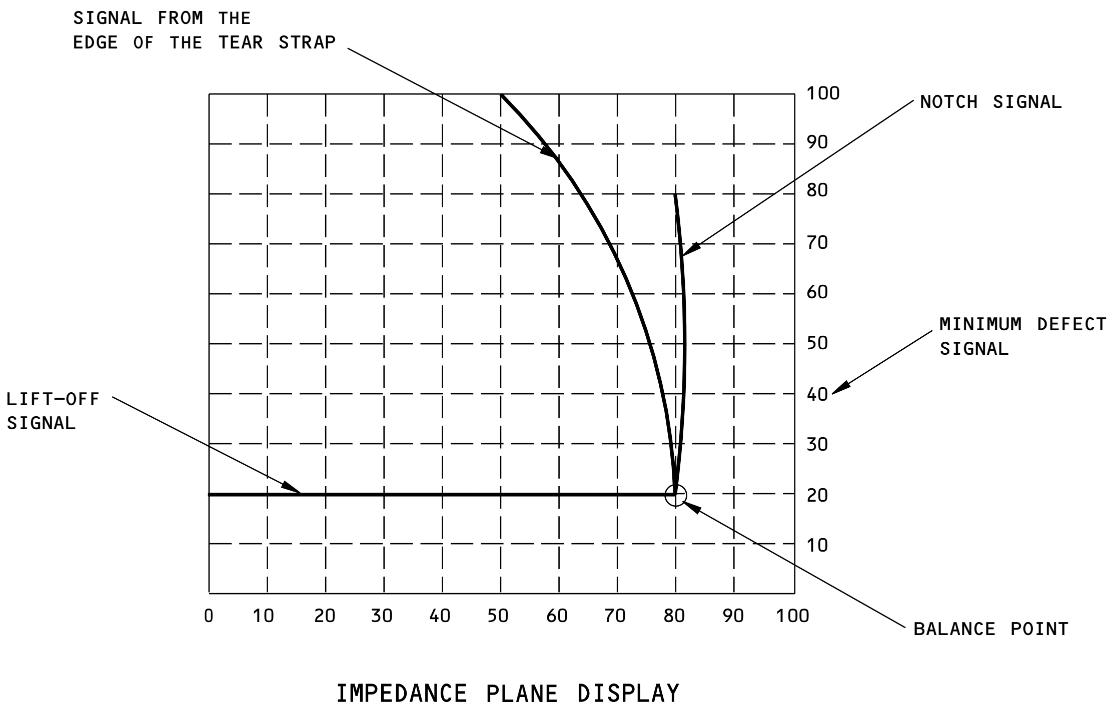
2161670 S0000472667_V1

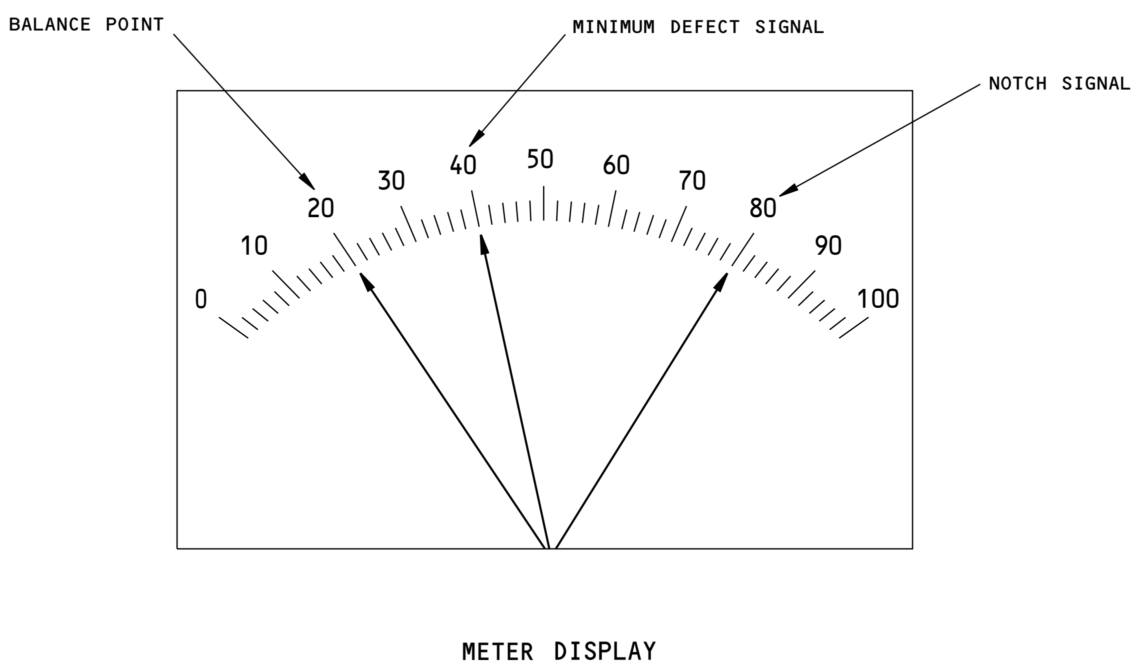
Reference Standard ANDT3004
Figure 2



2161673 S0000472668_V1

Probe Positions for Calibration
Figure 3





2161674 S0000472669_V1

Calibration Signals
Figure 4

PART 6 - EDDY CURRENT

LAP SPLICE INSPECTION OF THE INBOARD SKIN FOR SUB-SURFACE CRACKS THAT ARE WITHIN 0.010 INCH (0.25 MM) OF THE SURFACE - INTERNAL

1. Purpose

A. Use this procedure to do an inspection for sub-surface cracks in the inboard skin along the lower row of fasteners in the lap splices. This inspection is done from inside the airplane.

B. This inspection procedure is for the inboard skin areas of the lap splice that are between the tear straps.

C. This procedure will find subsurface cracks that are within 0.010 inch (0.25 mm) of the inspection surface and:

(1) Are adjacent to fastener holes.

(2) Start at the internal (faying) surface.

D. Service Bulletin Reference: 737-53A1177

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. Instruments

(1) Use an impedance plane or meter instrument that operates at a frequency range of 30 to 50 kHz.

(2) The instruments identified below were used to prepare this procedure:

(a) NDT 19; Staveley Instruments

(b) MIZ 22; Zetec Inc.

(c) MIZ 10B; Zetec Inc.

C. Probes

(1) Use a probe that operates in a frequency range of 30 to 50 kHz.

(2) The probes identified below were used to prepare this procedure:

(a) P905-50B/30-50 kHz; NDT Engineering Corp.

(b) LS905-50B/30-50 kHz; NDT Engineering Corp.

D. Reference Standards

(1) Use reference standard NDT3005. See Figure 1 for data about the reference standard.

3. Prepare for the Inspection

A. Identify the location of the inspection areas.

B. Get access to the inspection areas.

C. Remove loose paint, dirt and sealant from the surfaces of the inspection area.

D. Make the inspection surfaces smooth if they are rough.

4. **Instrument Calibration**

A. Set a frequency between 30 and 50 kHz.

B. Put a non-conductive shim on top of the reference standard. The thickness of the non-conductive shim must be within 0.003 inch (0.08 mm) of the paint thickness.

C. Identify the fastener type in the inspection area.

D. Put the probe on reference standard NDT3005, adjacent to the applicable fastener type (steel or aluminum) at position 1 or 2 as shown in Figure 2. Make sure the probe is on the side of the reference standard that is opposite the fastener heads (see Figure 2).

E. Balance the instrument.

F. Adjust the instrument for lift-off.

(1) If a meter display is used, adjust the phase control so that the signal is the same when the probe is on a bare surface as when the probe is lifted off the part by 0.006 inch.

(2) If an impedance plane instrument is used, adjust the phase control so that the signal moves horizontally and to the left when the probe is lifted off of the part surface.

G. If a meter instrument is used, set the needle at 20 percent of the display. If an impedance plane instrument is used, set the balance point in the lower center of the display (see Figure 3).

H. Move the probe above the reference standard notch that is adjacent to the applicable steel or aluminum fastener at probe position 3 or 4 as shown in Figure 2.

I. Adjust the instrument gain to get a signal from the notch that is 80 percent of the display as shown in Figure 3.

J. It will be necessary to use a different frequency between 30 and 50 kHz and do Paragraph 4.E. thru Paragraph 4.I. again if the signal to noise ratio is less than 3:1.

K. Move the probe around the fastener and above the applicable reference standard notch at probe position 3 or 4 as shown in Figure 2. Monitor the signal as you move the probe above the notch.

5. **Inspection Procedure**

A. Put the probe on the inspection surface adjacent to the fastener.

B. Balance the instrument.

C. Do a scan around each fastener. Use the end of the fastener as a guide. During the scan:

(1) Keep the probe vertical to the part surface to decrease the balance point movement.

(2) Frequently do a check of the instrument/probe calibration during the inspection as follows:

(a) Put the probe on the reference standard to get a signal from the notch.

(b) Compare the signal you got from the notch during calibration with the signal you get now.

(c) If the signal has changed 10 percent or more, do the calibration and inspection again on all areas examined since the last calibration check.

(3) Monitor all areas for fast upscale signals that are almost the same as the signals you got from the reference standard notch.

6. **Inspection Results**

A. Indications of possible cracks are as follows:

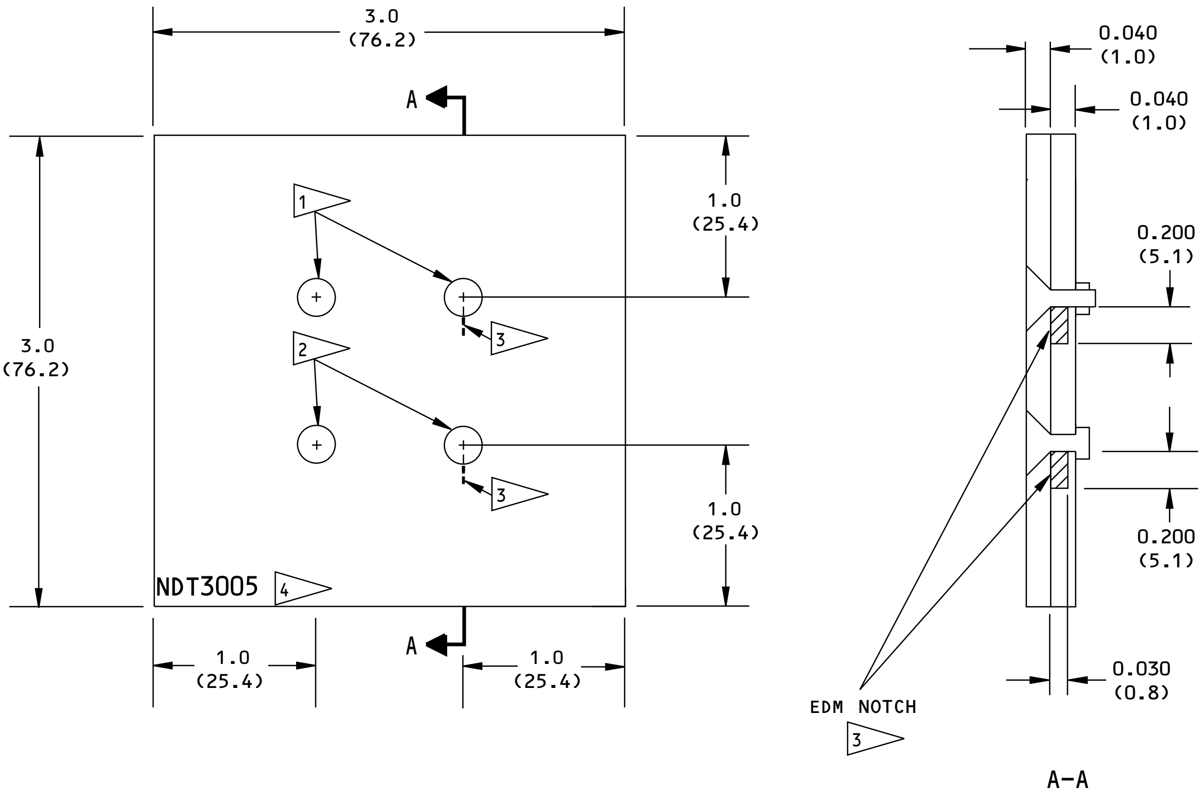
(1) Signals that are more than 40 percent of the display.

(2) Fast upscale signals that occur when the probe is moved a small angular distance (signals such as those you got during calibration).

B. To find the length, or the ends, of a crack, do a scan across the length of the crack until a signal does not occur.

C. If you want to make sure of the results, do the fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16.

NOTE: It is possible to get a crack indication when you do an internal eddy current inspection but not when you do the Part 6, 51-00-00, Procedure 16 fastener hole inspection. This can occur if there are cracks that do not go into the hole. The Part 6, 51-00-00, Procedure 16 fastener hole inspection will only identify cracks that go into the hole.



NOTE:

- MATERIAL: 2024-T3 OR T4 ALUMINUM
- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS IN PARENTHESES)
- TOLERANCES:

	INCHES	MILLIMETERS
	X.X = ±0.050	X.X = ±1
	X.XXX = ±0.005	X.XX = ±0.10

1 STEEL HI-LOK BACB30JC5-1 OR EQUIVALENT WITH COLLAR BACC30M-5 OR EQUIVALENT

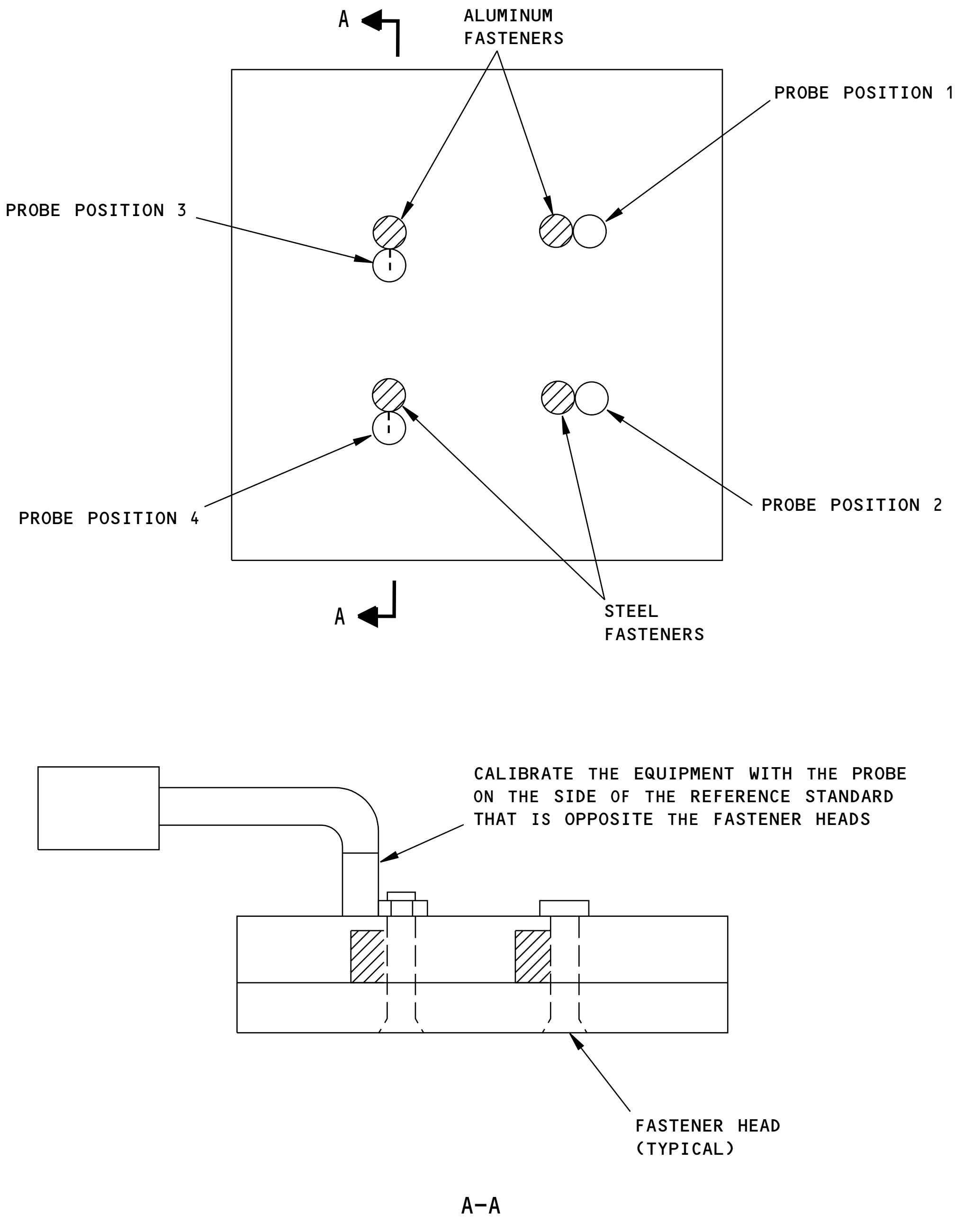
2 ALUMINUM RIVET BACR15CE5D3

3 ELECTRICAL DISCHARGE MACHINE (EDM) NOTCH:
0.20 INCH (5.1 MM) LONG; MAXIMUM WIDTH IS 0.0070 INCH (0.178 MM)

4 ETCH OR STAMP NDT3005 WHERE SHOWN

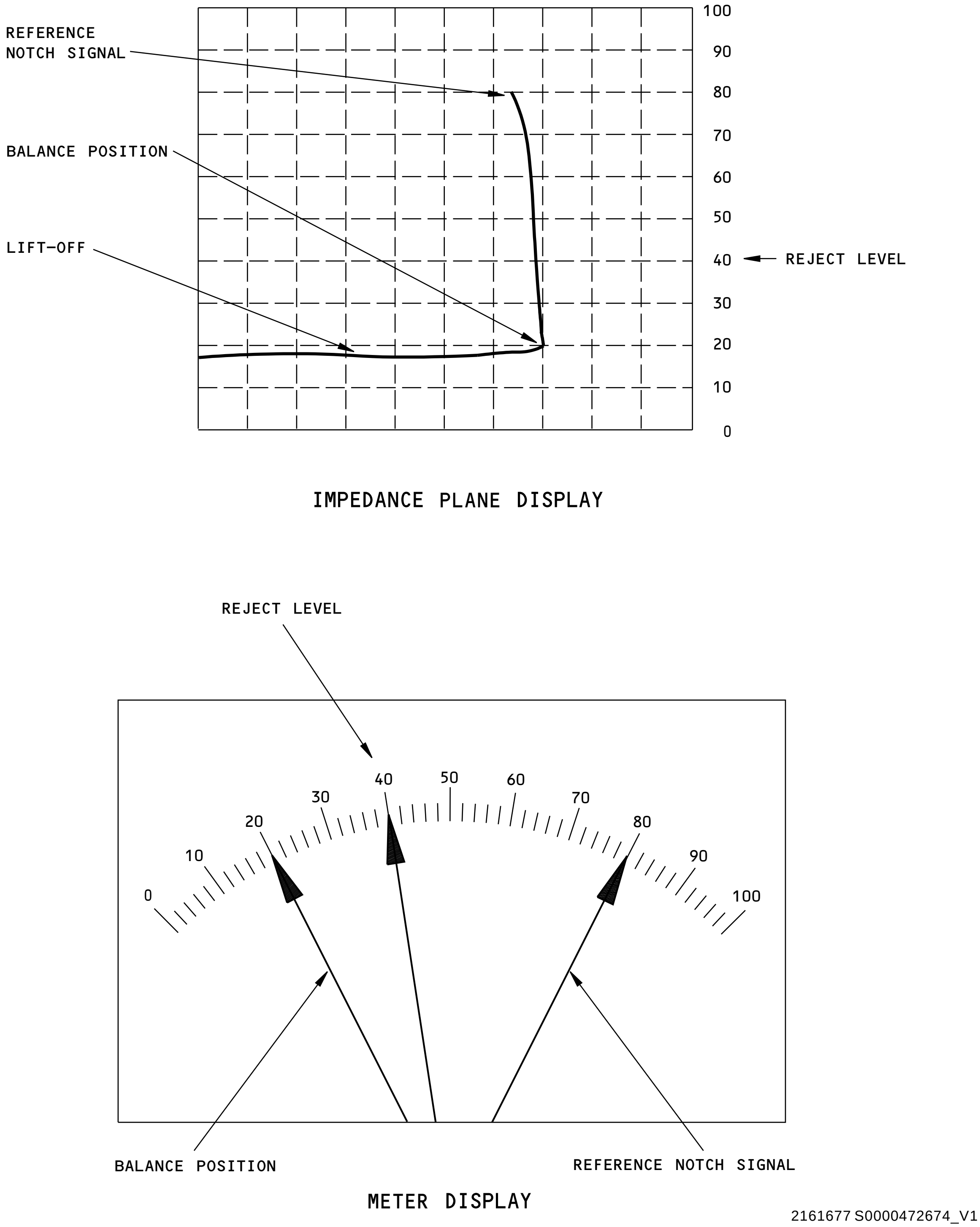
2161675 S0000472672_V1

Reference Standard NDT3005
Figure 1



2161676 S0000472673_V1

Subsurface Crack Inspection of Faying Surfaces
Figure 2



Instrument Displays of Notch Signals
Figure 3

PART 6 - EDDY CURRENT

LAP SPLICE INSPECTION OF THE INBOARD SKIN AT LOCATIONS WITH STEEL FLUSH-HEAD FASTENERS OR OVERSIZE PROTRUDING-HEAD FASTENERS

1. Purpose

A. Use this procedure to do an inspection for cracks in the inboard (lower) skin along the lower row of fasteners in the lap splices. The inspection is done from the outer surface of the airplane. See Figure 1 for an example of a lap splice inspection area.

B. Use this inspection procedure to examine areas in the lap splice that have oversize aluminum protruding-head rivets, titanium protruding-head bolts, or steel flush-head fasteners. Use this procedure to examine areas where there are oversize protruding-head rivets only when you do not have access (for example, fasteners behind a galley) to examine these areas as specified in Part 6, 53-30-12 or Part 6, 53-30-13.

C. The total thickness of the outer skin and doublers at the lap splice must be between 0.068 inch (1.73 mm) and 0.086 inch (2.18 mm).

D. This procedure uses a reflection spot probe and an impedance plane display instrument.

E. Part 6, 51-00-00, Procedure 16 is an alternative inspection procedure.

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 an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates at a frequency of 3 kHz.

(2) The instruments specified below were used to prepare this procedure:

(a) Phasec 1.1; Hocking Krautkramer

(b) NDT 19e; Nortec-Staveley

C. Probes

(1) Use a probe that:

(a) Operates at a frequency of 3 kHz.

(b) Has a maximum external diameter of 0.31 inch (0.87 mm).

(c) Is a shielded, reflection type.

(2) The probes specified below were used to prepare this procedure:

(a) SPO-5327; Nortec-Staveley

(b) RS-203-1; NDT Engineering Corp.

D. Reference Standards

(1) Use reference standard ANDT3006. See Figure 2 for data about the reference standard.

E. Special tool

(1) Non-conductive circle template.

3. Prepare for the Inspection

A. Get access to the lap splices from outside the airplane.

B. Remove loose paint, dirt and sealant from the surface of the inspection area.

4. Instrument Calibration

A. Set the frequency to 3 kHz.

B. Set the vertical to horizontal gain 2:1.

C. Set the filters as follows:

(1) Set the high pass filter to off or zero Hz.

(2) If the instrument has a low pass filter:

(a) Set the low pass filter to its highest value.

(b) Decrease the filter value to get a stable dot or until the signal from the notch in the reference standard starts to decrease.

D. Put the probe at Position 1 on the reference standard so that it is adjacent to the fastener type to be examined as follows (See Figure 2 and Detail I of Figure 3):

(1) To examine structure with 1/4 inch (6.35 mm) diameter aluminum protruding head rivets, put the probe adjacent to the BACR15BB8D aluminum protruding-head rivet.

(2) To examine structure with 5/32, 3/16 or 7/32 inch (3.97, 4.76 or 5.56 mm) diameter aluminum protruding-head rivets, put the probe adjacent to the BACR15ET7D aluminum protruding-head rivet.

(3) To examine structure with 5/32 or 3/16 inch (3.97 or 4.76 mm) diameter flush-head bolts, put the probe adjacent to the BACB30FN5-3 steel flush-head bolt.

(4) To examine structure with 5/32, 3/16, 7/32 or 1/4 inch (3.97, 4.76, 5.56 or 6.35 mm) diameter titanium protruding-head bolts, put the probe adjacent to the BACR15ET7D aluminum protruding-head rivet.

E. Balance the instrument.

F. Adjust the balance point to 30 percent of the display as shown in Detail II of Figure 3.

G. Adjust the phase control so that the lift-off signal moves horizontally to the left.

H. Move the probe to Position 2 (for the applicable fastener type) on the reference standard as shown in Detail I of Figure 3.

NOTE: Use a non-conductive circle template as a probe guide to aid inspections around steel flush-head fasteners.

I. Move the probe at Position 2 to get a maximum signal from the notch in the reference standard.

J. Adjust the gain to get a signal that is 70 percent of the display as shown in Detail II of Figure 3.

K. Move the probe around the fastener to the edge of the reference standard until you see the edge effect signal. Monitor the location of the probe to identify the limits of the inspection around the fastener. See Detail II of Figure 3 for the edge effect signal.

L. If you are to examine steel flush-head fasteners, move the probe so it touches the steel flush-head fastener and compare the signal to the notch signal. See Detail II of Figure 3.

5. Inspection Procedure

A. Put the probe on the outer skin surface of the lap splice adjacent to and above the fastener head for the fastener type to be examined.

B. Balance the instrument.

C. Move the probe slowly around each side of the fastener and monitor the instrument display at the same time. Do the steps that follow during the inspection:

(1) For protruding-head fasteners, keep the probe adjacent to the fastener head when you move it around the fastener.

(2) For flush-head fasteners, use a non-conductive circle template to keep the probe a constant distance from the fastener as you move it around the fastener.

(3) Move the probe around the fastener to the edge of the skin panel until the edge effect signal goes off the screen display. See Figure 4, flagnote 2, for the usual edge effect signal.

(4) Make a mark at the locations where you get a signal that is 50 percent or more of the display.

(5) Frequently do a calibration test of the instrument as follows:

NOTE: Do not adjust the gain.

(a) Put the probe on the reference standard to get the maximum signal from the notch. Make sure to put the probe adjacent to the fastener on the reference standard that is the same type as the inspection.

(b) Compare the signal you got from the notch during calibration with the signal you get now.

(c) If the signal from the notch in the reference standard has changed 10 percent or more from the signal you got during calibration, do the calibration and inspection again for all of the fasteners examined since the last calibration test.

6. Inspection Results

A. Signals that are 50 percent or more of the display are signs of possible cracks.

B. Compare the signals that occur during the inspection to the notch signals you got on the reference standard during calibration.

C. It is possible for a crack to be on the lower edge of a fastener hole in the inboard (lower) skin. If this occurs, a crack signal will go up as the probe is moved above the crack but will not go back down to the baseline because of the edge effect from the upper skin panel. Look for the edge effect signal to move to the right of the balance point position. See Figure 4, flagnote 1, for an example of a signal from a crack that is near an edge.

NOTE: A crack signal and the edge effect signal can have the same phase angle. Be careful when you examine near the edge of the upper skin.

D. The conditions that follow can cause a change to the baseline signal.

(1) Space (gap) between skins.

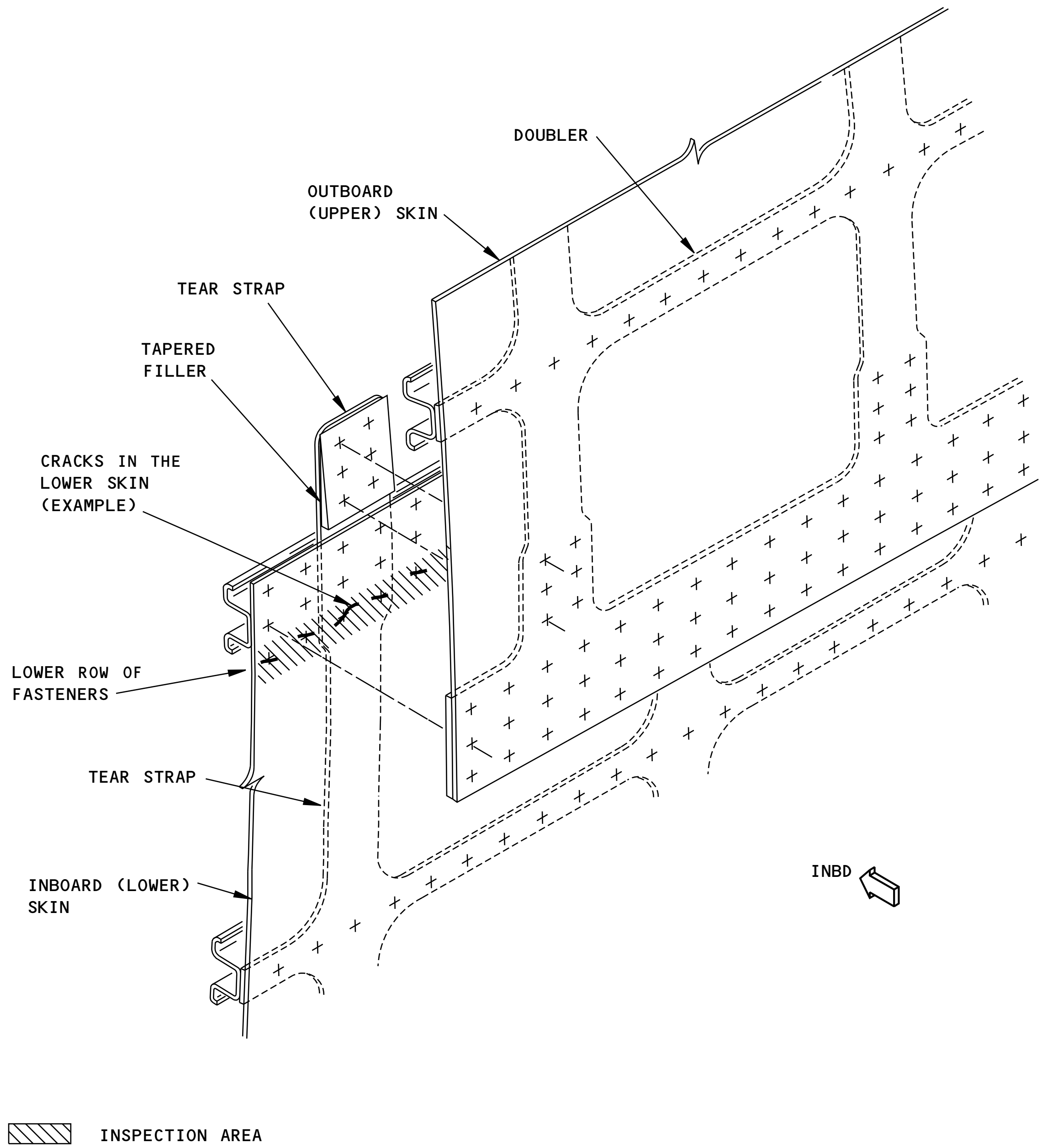
(a) This can cause the baseline signal to go up. The baseline signal will go up slowly during the scan as the space between the skins increases.

(2) A material thickness change (tear straps and doublers).

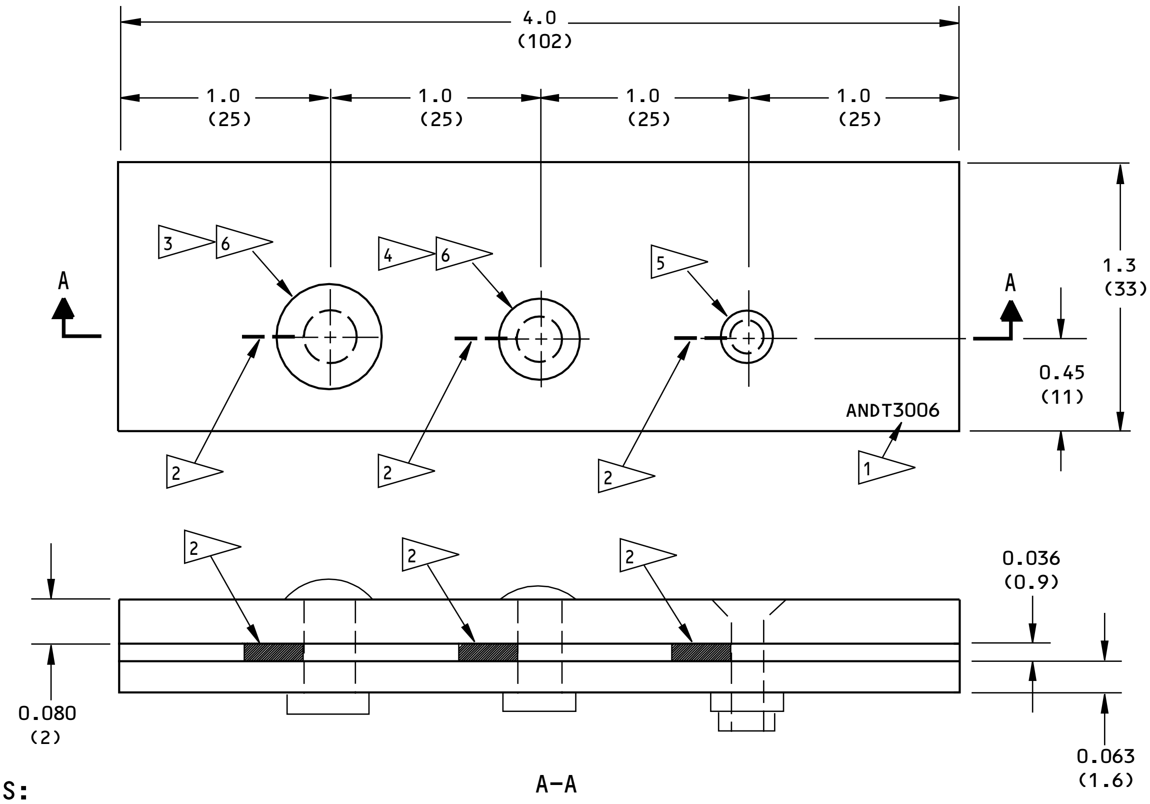
(a) A small material thickness change can occur along a row of fasteners that are to be examined. This can cause the baseline signal to change. Monitor the baseline signal regularly and balance the instrument as necessary.

E. If you want to make sure of the results, do the fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16.

NOTE: It is possible to get a crack indication when you do an internal eddy current inspection but not when you do the Part 6, 51-00-00, Procedure 16 fastener hole inspection. This can occur if there are cracks that do not go into the hole. The Part 6, 51-00-00, Procedure 16 fastener hole inspection will only identify cracks that go into the hole.



Typical Lap Splice Inspection Area - External Inspection
Figure 1



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS 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

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL: 2024-T3 OR T4 CLAD OR BARE

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER. PUT A LETTER "A" IN FRONT OF THE REFERENCE STANDARD NUMBER TO SHOW THAT IT HAS ALODINED RIVETS. SEE FLAGNOTE 6.

2 EDM NOTCHES:
LENGTH: 0.300 (7.60) ±0.030 (0.76)
DEPTH: THROUGH THICKNESS
WIDTH: 0.025 (0.64) MAXIMUM

MAKE SURE THE NOTCH IS WITHIN ±0.005 (0.10) OF THE HORIZONTAL CENTERLINE OF THE HOLE.

3 BACR15BB8D-7 - ALUMINUM PROTRUDING-HEAD RIVET

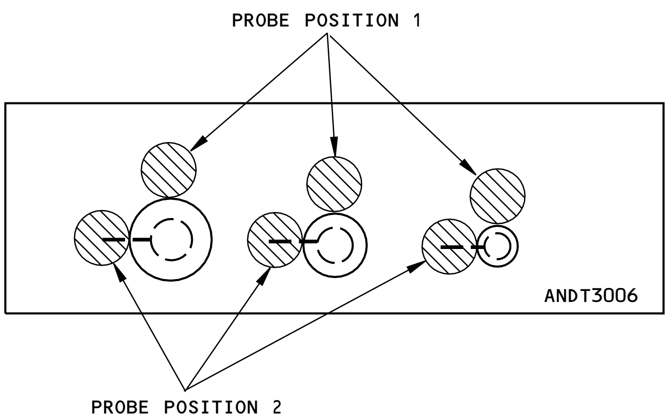
4 BACR15ET7D-7 - ALUMINUM PROTRUDING-HEAD RIVET

5 BACB30FN5-3 - STEEL FLUSH-HEAD HI-LOK
BACC30M-5 - ALUMINUM COLLAR

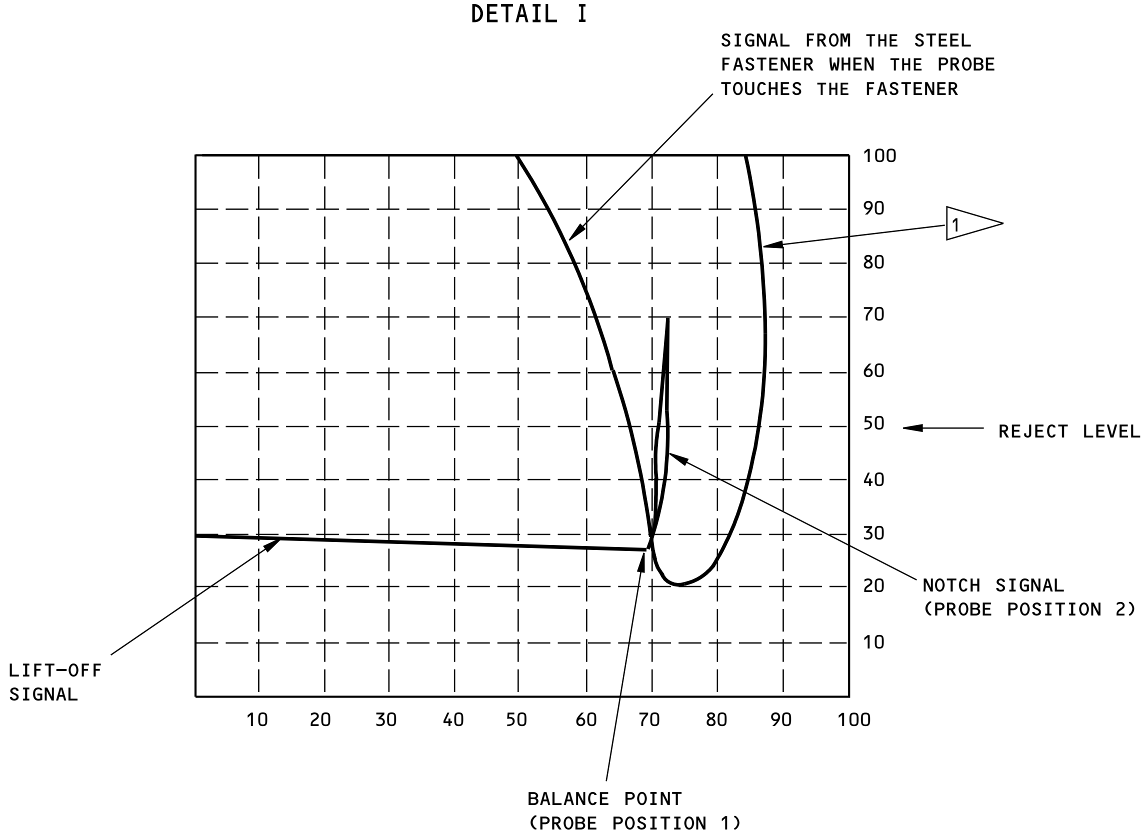
6 THESE RIVETS MUST HAVE A CONVERSION COATED (ALODINED) FINISH. TO MAKE SURE THE FINISH IS ALODINE, REFER TO PART 1, 51-06-01. INSTALL THE RIVETS AS SPECIFIED IN PART 1, 51-01-04.

2161681 S0000472703_V1

Reference Standard ANDT3006
Figure 2



DETAIL I



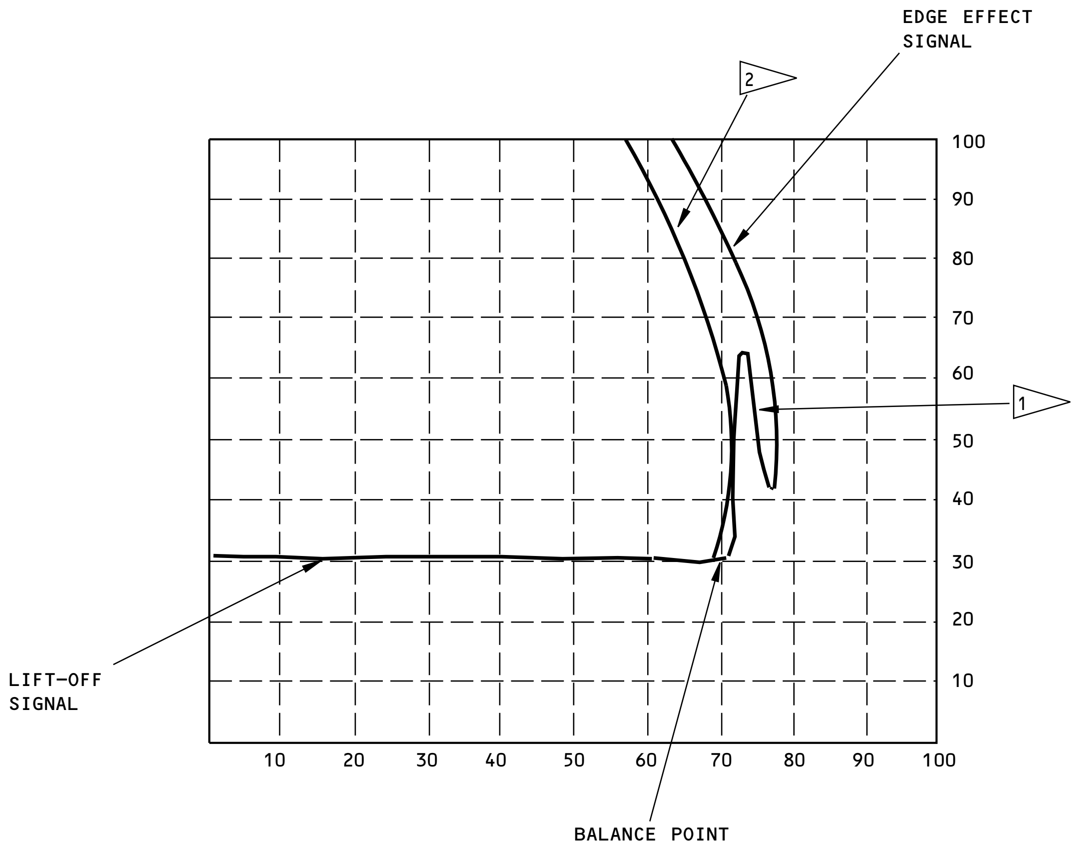
NOTE:

1 EDGE EFFECT SIGNAL WHEN THE PROBE IS MOVED TO THE EDGE OF THE REFERENCE STANDARD

DETAIL II

2161682 S0000472704_V1

Calibration Probe Positions
Figure 3



NOTE:

1. SIGNAL FOR A CRACK THAT IS AT THE LOWER EDGE OF THE FASTENER HOLE AND APPROXIMATELY 0.25" (6 mm) FROM THE EDGE OF THE UPPER SKIN PANEL
2. USUAL EDGE EFFECT SIGNAL FROM THE UPPER SKIN OF THE AIRPLANE.

2161684 S0000472705_V1

Screen Display Example
Figure 4

PART 6 - EDDY CURRENT

SLIDING PROBE INSPECTION OF THE INBOARD SKIN OF THE LAP SPLICE AT TEAR STRAP LOCATIONS

1. **Purpose**

   A. Use this procedure to do an inspection for cracks (that are within 30 degrees of longitudinal) in the inboard skin along the lower row of fasteners in the lap splices. Use this procedure only at tear strap locations where titanium fasteners were installed as specified in Service Bulletin 737-53A1177.

   B. This procedure is done from the external side of the airplane. See Figure 1 for the typical inspection areas at the tear strap locations.

   C. The total thickness of the outer skin and doublers at the lap splice must be between 0.068 inch (1.73 mm) and 0.086 inch (2.18 mm) thick.

   D. This procedure uses a sliding probe and an impedance plane display instrument.

   E. You cannot do this procedure at a location where the fastener is magnetic (steel) or if the fastener head extends above the skin. If a fastener is magnetic or if a fastener head extends above the skin, then you must do one of the procedures that follows:

      (1) Do an external inspection as specified in Part 6, 53-30-14, but only if the fastener is larger than the fastener specified in the production drawings.

      (2) Do an open hole inspection as specified in Part 6, 51-00-00, Procedure 16.

   F. The probe must be accurately aligned with the fastener centerline to do this procedure correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

   G. Service Bulletin Reference: 737-53A1177

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 an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates at a frequency range of 4 kHz to 5 kHz.

      (2) The instruments specified below were used to prepare this procedure.

         (a) NDT 19e; Nortec-Staveley

         (b) Phasec 1.1; Hocking/Krautkramer

   C. Probes

      (1) Use a reflection sliding probe that operates at a frequency range of 4 kHz to 5 kHz.

      (2) The probes specified below were used to prepare this procedure.

         (a) SPO 3806; Nortec-Staveley

(b) NEC-4039, 1-100 kHz; NDT Engineering Corp.

D. Reference Standards

(1) Use reference standard NDT3015. See Figure 2 for data about the reference standard.

E. Special Tools

(1) Use a non-conductive probe guide to align the centerline of the probe with the centerline of the fastener row.

NOTE: Adjust the probe guide so the probe is on the centerline of the rivets during the scans. It is possible that adjacent rivets are not aligned with each other.

(2) A magnet can be used to identify magnetic fasteners.

3. Prepare for the Inspection

A. Get access to the skin inspection areas from the external side of the airplane.

B. Remove loose paint, dirt, and sealant from the surface of the inspection area.

C. If you cannot see the fasteners because the paint is too thick, remove the paint so that you can see the fasteners.

4. Instrument Calibration

A. Set the frequency from 4 kHz to 5 kHz.

B. Set the vertical to horizontal gain to 1:1.

C. Set the instrument filters as follows:

(1) Set the high pass filter to off or zero Hz.

(2) If the instrument has a low pass filter:

(a) Set the low pass filter to its highest value.

(b) If the dot is not stable, decrease the filter value to get a stable dot or until the signal from the notch in the reference standard starts to decrease.

D. Put the probe (with the probe guide) on the reference standard at Position 1 (to do the inspections of the 7/32 inch diameter fasteners) as shown in Figure 3. To calibrate the equipment to do inspections of 1/4 inch diameter fasteners, put the probe on the fastener row that includes the 1/4 inch diameter fasteners adjacent to Position 1. Make sure you center the probe between the titanium fastener and the rivet as shown in Figure 3.

E. Balance the instrument. Do not balance the probe between the two titanium fasteners.

F. Adjust the balance point to 80 percent of the horizontal display and approximately 30 percent of the vertical display as shown in Figure 3.

G. Lift the probe off the surface of the reference standard. Adjust the phase control so that the lift off signal moves horizontally to the left of the balance point as shown in Figure 3.

H. Lightly move the probe left and right between the titanium fastener and the rivet until the balance point is at its lowest position. Balance the instrument.

I. Adjust the probe guide so that it will keep the centerline of the probe aligned with the centerline of the fastener row.

J. Move the probe across the applicable fastener row from Position 1 to Position 2 on the reference standard as shown in Figure 3.

K. Adjust the vertical and horizontal gains so that the notch signal is almost the same as the signal shown in Figure 3. Make sure that there is a 20 percent vertical separation between the signal from the notch and the signal from the good fastener hole. If necessary, adjust the vertical position of the balance point so the signals touch the horizontal lines on the screen display to get the 20 percent vertical separation.

NOTE: Figure 3 shows the signal from the notch at 90 percent full screen height and the signal from the good fastener hole at 70 percent full screen height. It will be satisfactory if the signals that occur during your calibration are at different screen heights only if there is a 20 percent separation between the two calibration signals.

L. Identify the probe direction that gives the smaller notch signal as follows:

NOTE: Some “sliding probes” are sensitive to probe direction when a scan is made.

(1) Put the probe on the reference standard at Position 1 (to do inspections of 7/32 inch diameter fasteners) as shown in Figure 3. To calibrate the equipment to do inspections of 1/4 inch diameter fasteners, put the probe on the fastener row that includes the 1/4 inch diameter fasteners adjacent to Position 1.

(2) Move the probe across the applicable fastener row to Position 2 on the reference standard as shown in Figure 3.

(3) Turn the probe 180 degrees and do Paragraph 4.L.(1) and Paragraph 4.L.(2) above again to identify the direction of probe movement that results in the smaller notch signal.

M. Calibrate the equipment as specified in Paragraph 4.I., Paragraph 4.J., and Paragraph 4.K. again as you move the probe in the direction that gives the smaller notch signal.

5. Inspection Procedure

NOTE: Make sure that the titanium fasteners at each tear strap area are the same size as the fasteners that were used during the calibration.

A. Put the probe on the outer skin of the lap splice adjacent to a tear strap location. Make sure the probe is between a rivet and a titanium fastener at the tear strap as shown in Figure 1 (this probe position is equivalent to probe position 1 that is shown in Figure 3 that was used during calibration).

B. Lightly move the probe left and right between the titanium fastener and the rivet until the balance point is at its lowest position on the screen display. Make sure the probe is aligned on the lap splice so that the centerline of the probe will follow the centerline (± 0.050 inch (1.27 mm) of the lower row of fasteners. See Figure 4 for examples of the signals that can occur during a scan where the probe centerline is away from the centerline of the fastener row.

NOTE: Use a probe guide to help keep the centerline of the probe aligned with the centerline of the lower fastener row.

C. Balance the instrument. Do not balance the probe between the two titanium fasteners.

NOTE: Do not adjust the gain. Gain adjustments will make the instrument calibration unsatisfactory.

D. Move the probe slowly along the two titanium fasteners at each tear strap location and monitor the instrument display at the same time. During the inspection:

(1) Make sure the centerline of the probe moves along the centerline (± 0.050 inch (1.27 mm)) of the fastener row.

(2) Do not do a scan across an aluminum rivet.

(3) Make a mark at the locations that cause signals that are at or above the reject level shown in Figure 3.

NOTE: If there are two cracks in an area, the vertical separation in the loop of the signal will decrease but the vertical height of the signal will increase.

E. Do a calibration test of the instrument after you examine each skin panel as follows:

NOTE: Do not adjust the gain.

(1) Put the probe on the reference standard to get the maximum signal from the notch that was used during calibration.

(2) Compare the signal you got from the notch during calibration with the signal you get now.

(3) If the maximum signal from the notch in the reference standard has decreased 5 percent or more from the signal you got during calibration, do the calibration and inspection again for all of the fasteners done since the last calibration test.

F. Do Paragraph 5. again for the remaining lap splices at the tear strap locations.

6. Inspection Results

A. A signal that is more than 10 percent of the display above the signal from a good fastener hole is a crack indication. Do the steps that follow if you get a crack indication:

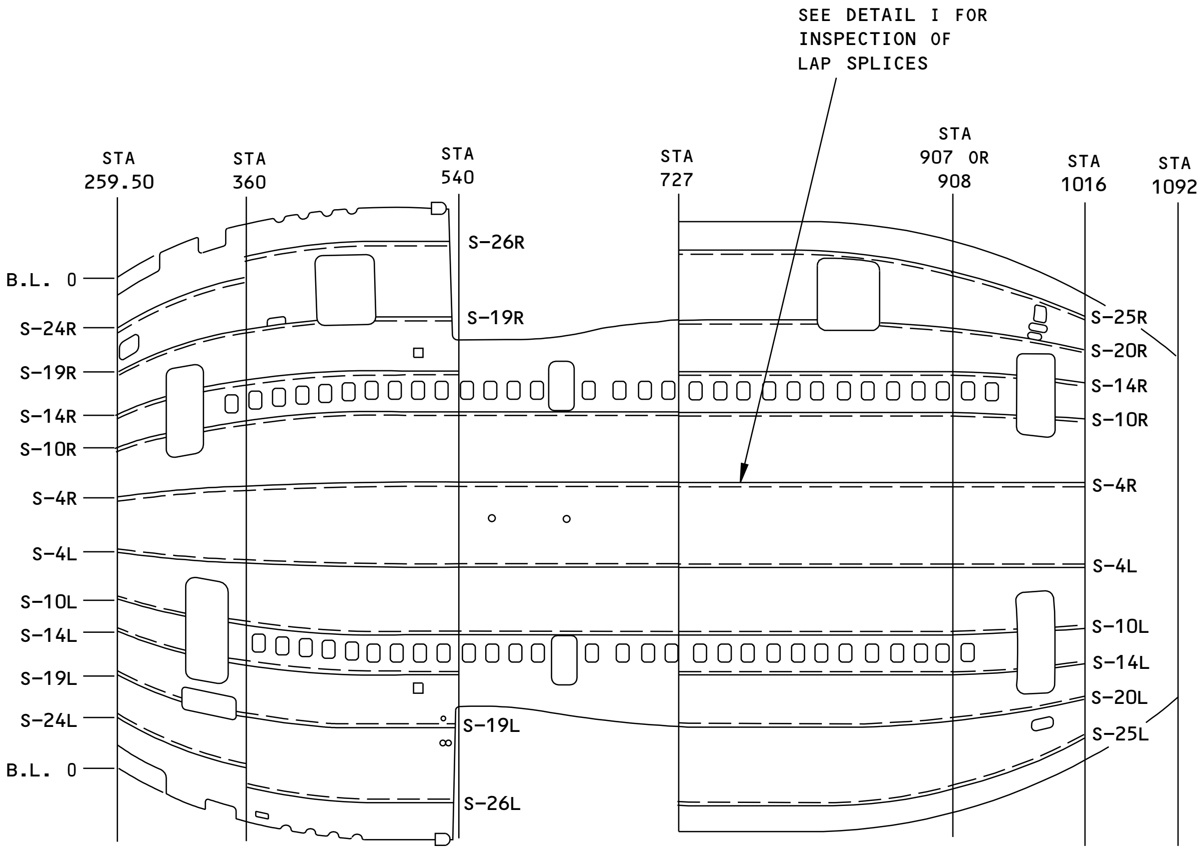
(1) Make sure the balance point was at a minimum height as specified in Paragraph 5.B. before the instrument was balanced in Paragraph 5.C.

(2) Do the probe scan again at the location that caused the crack indication. Figure 3 shows a signal from a good fastener hole and a signal from a fastener hole with a crack.

B. Magnetic and larger diameter fasteners will cause signals that are almost the same as crack signals. Use a magnet to identify magnetic fasteners. Part 6, 53-30-14 is an alternative procedure that can be used to examine the inboard skin for cracks in areas that have magnetic fasteners.

C. To make sure of crack indications, you can do the internal inspection procedure specified in Part 6, 53-30-12 at the tear strap locations or Part 6, 53-30-13 between the tear straps. The open fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16 can also be used to make sure of crack indications.

NOTE: It is possible to get a crack indication when you do an external eddy current inspection but not when you do the Part 6, 51-00-00, Procedure 16 fastener hole inspection. This can occur if there are cracks that do not go into the hole. The Part 6, 51-00-00, Procedure 16 fastener hole inspection will only identify cracks that go into the hole. The cracks that do not go into the hole are referred to as eyebrow cracks. Eyebrow cracks can be found with an internal spot probe procedure (Part 6, 53-30-12).



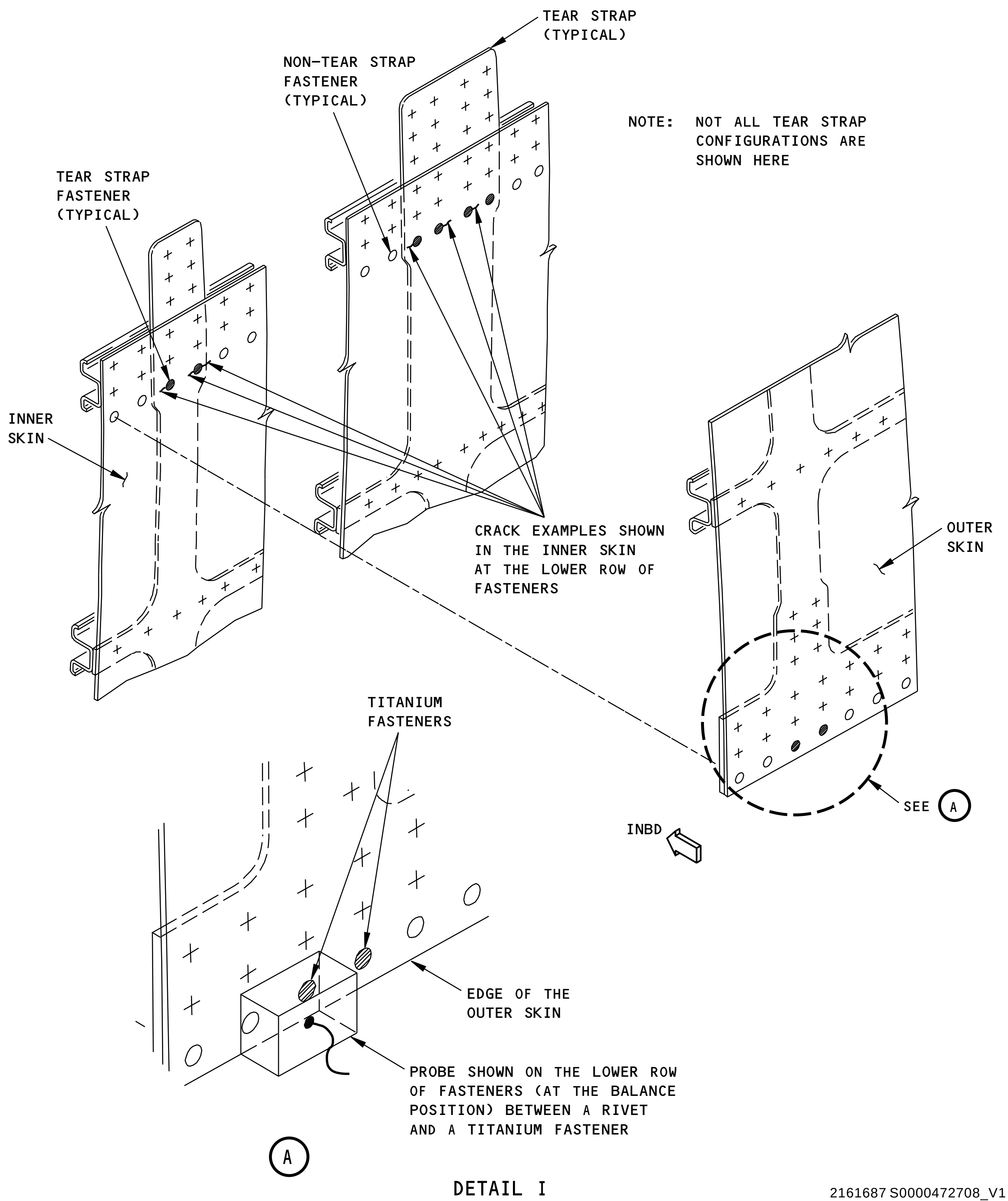
NOTE

- SEE SERVICE BULLETIN 737-53A1177 FOR SPECIFIC LAP SPLICE LOCATIONS TO BE EXAMINED

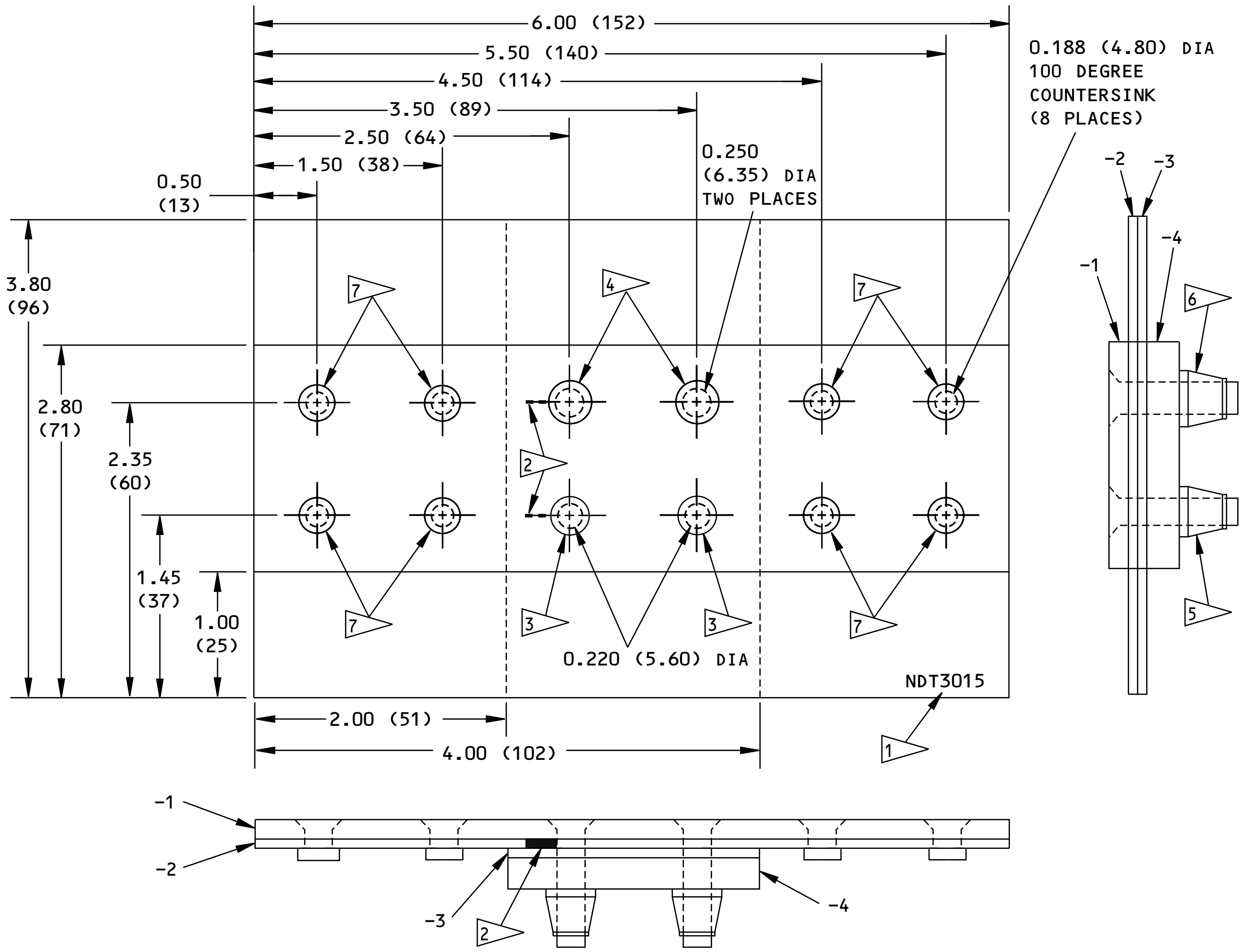
737-200P AIRPLANE SHOWN
737-300,-400,-500 AIRPLANES
ARE ALMOST THE SAME

2161686 S0000472707_V1

Typical Inspection Areas - External Inspection
Figure 1 (Sheet 1 of 2)



Typical Inspection Areas - External Inspection
Figure 1 (Sheet 2 of 2)



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS IN PARENTHESES)
- TOLERANCES:

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS = 125 R_a OR BETTER
- BOLTS (TITANIUM): QUANTITY 2 BACB30NW6K5Y [3]
  QUANTITY 2 BACB30VU8K5 [4]
- COLLARS: QUANTITY 2 BACC30R6 [5]
  QUANTITY 2 BACC30BL8 [6]
- RIVETS (ALUMINUM): QUANTITY 8 BACR15CE6D6 OR BACR15GF6D6 [7]
- MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE

-1	0.080 X 1.80 X 6.00	(2.0 X 46.0 X 152.0)
-2	0.036 X 3.80 X 6.00	(0.9 X 97.0 X 152.0)
-3	0.036 X 3.80 X 2.00	(0.9 X 97.0 X 51.0)
-4	0.125 X 1.80 X 2.00	(3.2 X 46.0 X 51.0)

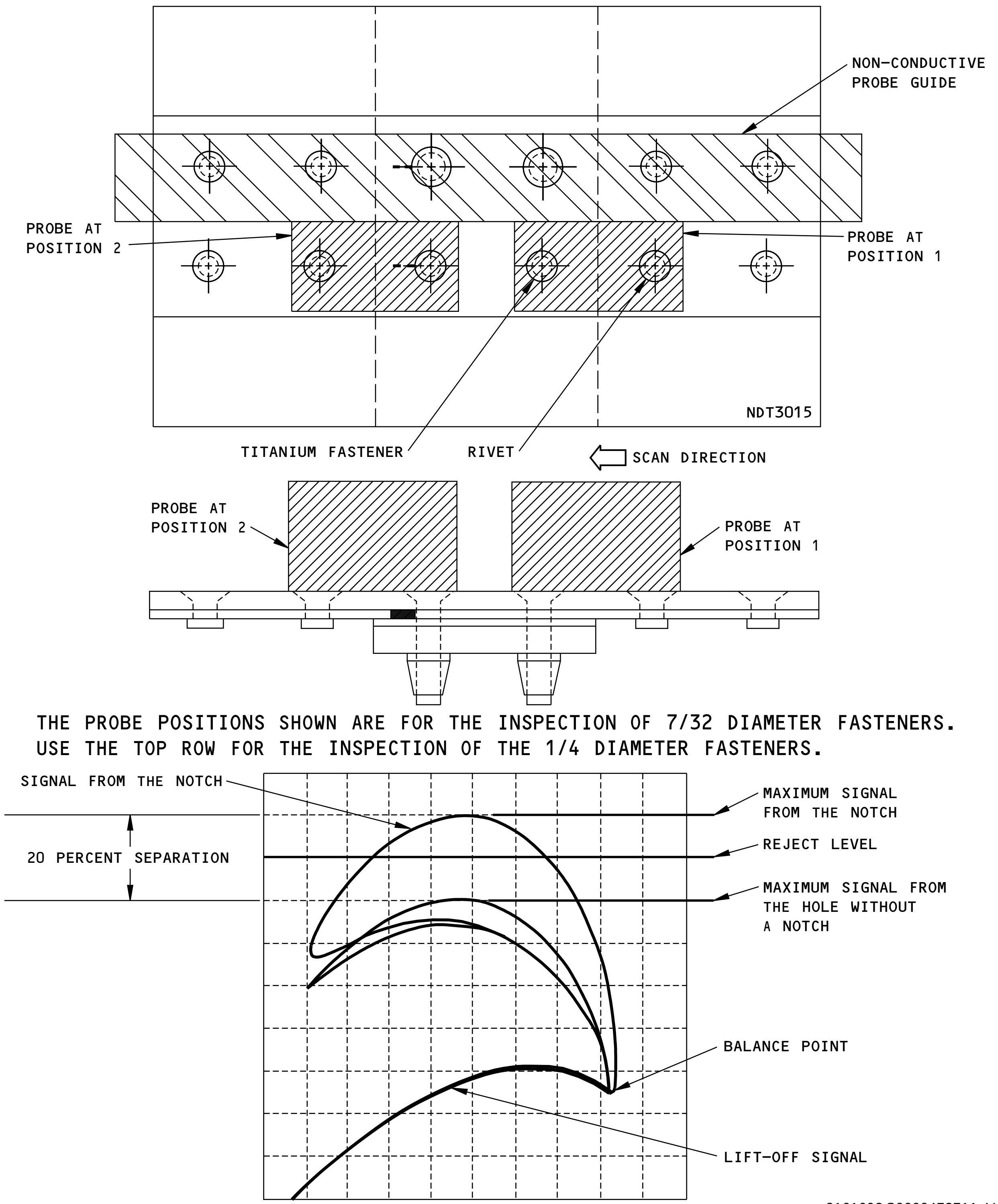
[1] ETCH OR STEEL STAMP REFERENCE STANDARD NUMBER NDT3015

[2] EDM NOTCHES: (MAKE NOTCHES IN THE -2 PART)
LENGTH: 0.20 (5.0) ±0.020 (0.50)
DEPTH: 0.036 (0.90)
WIDTH: 0.025 (0.64) MAXIMUM

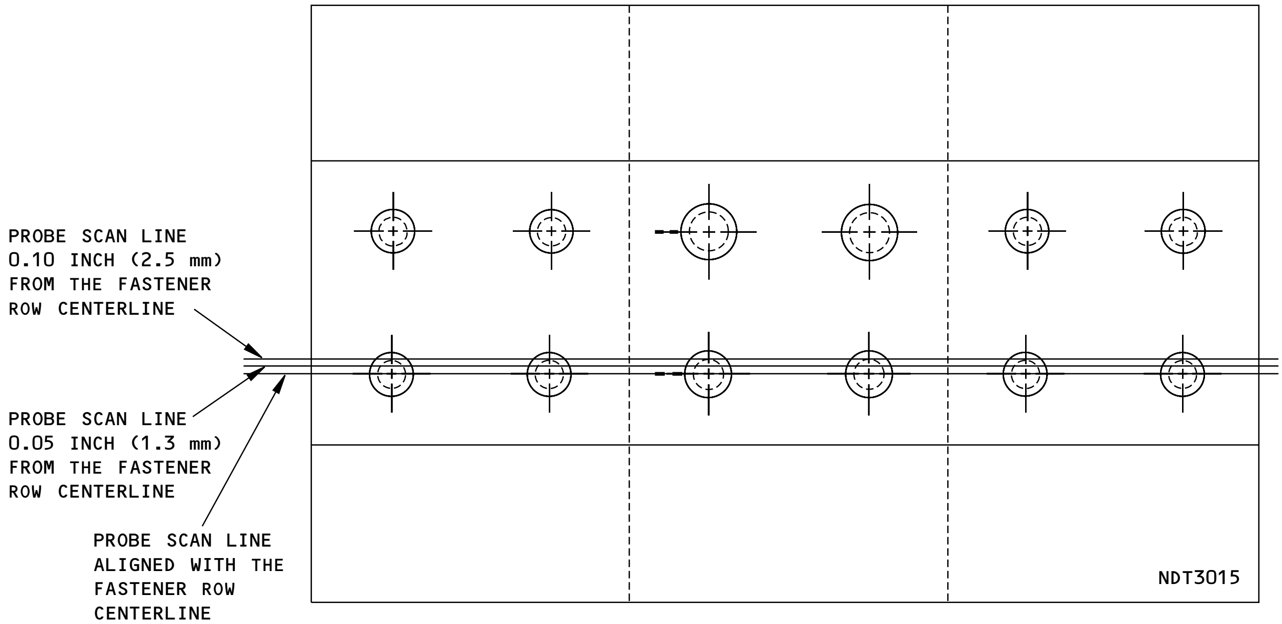
THE NOTCH LENGTH IS FROM THE EDGE OF THE HOLE. MAKE SURE THE NOTCH IS WITHIN ±0.005 (0.10) OF THE CENTERLINE OF THE HOLE AS SHOWN.

2161689 S0000472709_V1

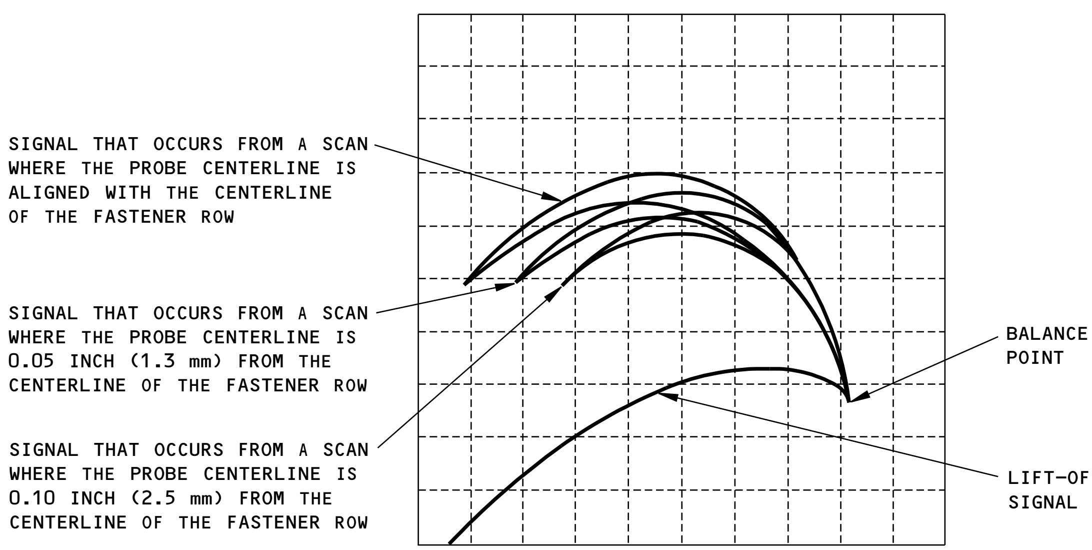
Reference Standard NDT3015
Figure 2



Probe Positions for Calibration
Figure 3



NOTE: THE CENTER LINE OF THE PROBE MUST BE ALIGNED WITH THE CENTER LINE OF THE FASTENERS.



NOTE: ALL OF THE ABOVE SIGNALS ARE FROM THE TITANIUM FASTENER WITHOUT A NOTCH.

2161693 S0000472712_V1

Inspection Signal Examples
Figure 4

PART 6 - EDDY CURRENT

LAP SPLICE AND LAP SPLICE REPAIR INSPECTION OF THE INBOARD SKIN FOR SUB-SURFACE CRACKS THAT START AT THE FAYING SURFACE - INTERNAL

1. **Purpose**

A. Use this procedure to do a Medium Frequency Eddy Current (MFEC) inspection for sub surface cracks in the inboard skin along the row of fasteners in the lap splices (see Figure 3). This inspection is done from inside the airplane.

B. This internal inspection is for the inboard skin areas of the lap splice or lap splice repair that are between the tear straps and other internal doublers that prevent access to the inspection surface.

C. This procedure will find sub surface cracks that:

(1) Are as much as 3 times longer than they are deep.

(2) Are adjacent to fastener holes.

(3) Start at the outboard surface of the inboard skin panel (faying surface).

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. Instruments

(1) Use an impedance plane display instrument that operates at a frequency from 25 to 30 kHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) NDT 19e; Staveley Instruments

(b) PHASEC 1.1sd; Hocking/Krautkramer

(c) MIZ 21A; Zetec, Inc.

C. Probes

(1) Use a probe that operates in a frequency range of 25 to 30 kHz.

(2) After calibration has been done as specified in Paragraph 4., the balance point signal must not change more than 5% of full screen height (FSH) during a probe scan around the reference standard fastener without a notch (see Figure 2, probe position 1 or 2).

(3) The probes that follow were used to help prepare this procedure:

(a) NEC-1083; NDT Engineering

(b) NEC-1084; NDT Engineering

(c) SPC-4TF-105-2; EC/NDT Company

(d) SPC-4TF-105; EC/NDT Company

D. Reference Standards

(1) Use reference standard ANDT3019. See Figure 1 for data about the reference standard. Reference standard NDT3019 can be used to make reference standard ANDT3019 if you remove the anodized rivets from NDT3019 and install Alodine rivets as specified in Figure 1.

3. **Prepare for the Inspection**

   A. Refer to Service Bulletin 737-53A1177 for the inspection areas.

   B. Remove all of the internal panels and insulation blankets in the fuselage that prevent access to the inspection areas.

   C. Remove loose paint, dirt and sealant from the surfaces of the inspection area.

   D. Make sure the eddy current probe does not have Teflon tape. The edges that occur in the tape on the side of the probe prevent a constant inspection around the fastener.

4. **Instrument Calibration**

   A. Set the instrument frequency to a frequency that is between 25 and 30 kHz.

   B. Identify the fastener size in the inspection area.

   C. Put the probe on reference standard ANDT3019, adjacent to the applicable fastener size at position 1 or 2 as shown in Figure 2. Make sure the probe is on the side of the reference standard that has the fastener heads (see Figure 2).

   NOTE: The calibration is done on the side of the reference standard that has the rivet heads. The inspection is done on the tail side of the rivet.

   D. Balance the instrument.

   E. Adjust the vertical to horizontal gain so it is between 2:1 and 4:1.

   F. Adjust the instrument for lift off.

      (1) Adjust the phase control so that the signal moves horizontally and to the left when the probe is lifted off the part surface.

   G. Set the balance point in the lower right side of the display (see Figure 2).

   NOTE: If the balance point moves when you make a scan around the fastener without a notch, balance the instrument at the location where the balance point is the lowest.

   H. Move the probe above the reference standard notch that is adjacent to the applicable size fastener at probe position 3 or 4 as shown in Figure 2.

   I. Adjust the instrument gain to get a signal from the notch that is 80 percent of the display as shown in Figure 2.

   J. If the instrument has an alarm, you can adjust it to 50 percent screen height.

5. **Inspection Procedure**

   A. Put the probe on the inspection surface adjacent to the fastener.

   NOTE: The inspection surface is on the tail side of the fastener.

   B. Balance the instrument.

   C. Do a scan around each fastener. During the scan:

      (1) Use the end of the fastener as a guide (see Detail I in Figure 3).

      (2) Keep the probe vertical to the part surface to decrease the balance point movement.

      (3) Frequently do a check of the instrument/probe calibration during the inspection as follows:

         (a) Put the probe on the reference standard to get a signal from the notch.

(b) If the signal has changed 10 percent or more, do the calibration and inspection again on all areas examined since the last calibration check.

(4) Make a mark at fasteners that cause fast vertical signals to occur that are almost the same as the signals you got from the reference standard notch.

6. Inspection Results

A. Indications of cracks must have the two conditions that follow:

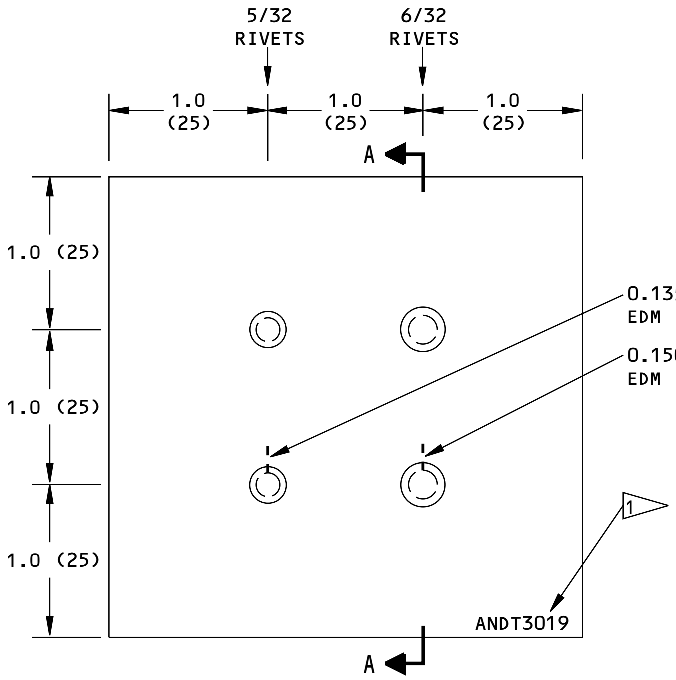
(1) Signals that are more than 50 percent of the height of the signal from the notch of the reference standard.

and

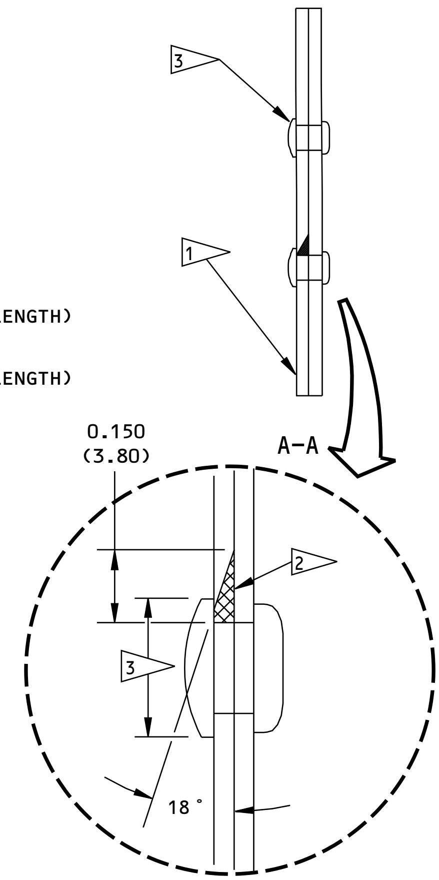
(2) Fast vertical signals that occur when the probe is moved a small angular distance (signals such as those you got during calibration).

B. To find the length, or the ends, of a crack, do a scan across the length of the crack until a signal does not occur.

C. To examine crack signals more, remove the rivet and do the fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16.



VIEW AS YOU LOOK AT THE MACHINED HEADS OF THE BUTTON HEAD RIVETS



DETAIL OF A RIVET, THE SCALE IS 1:1

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES).
- TOLERANCES (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

- ANGULAR TOLERANCE: ±1.0 DEGREE
- NOTCH LOCATION TOLERANCES: THE NOTCH LOCATION MUST BE WITHIN ±0.005 (±0.10) OF THE CENTERLINE OF THE HOLE AS SHOWN.
- MATERIAL: MAKE FROM TWO PIECES OF 0.040 (1.02) THICK 2024-T3 OR T4 CLAD ALUMINUM.
- FASTENERS: USE ONLY ALODINED RIVETS.
  BACR15BB5AD---C (2 EACH)
  BACR15BB6AD---C (2 EACH)
- SURFACE ROUGHNESS = 63 Ra OR BETTER

1 ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER.

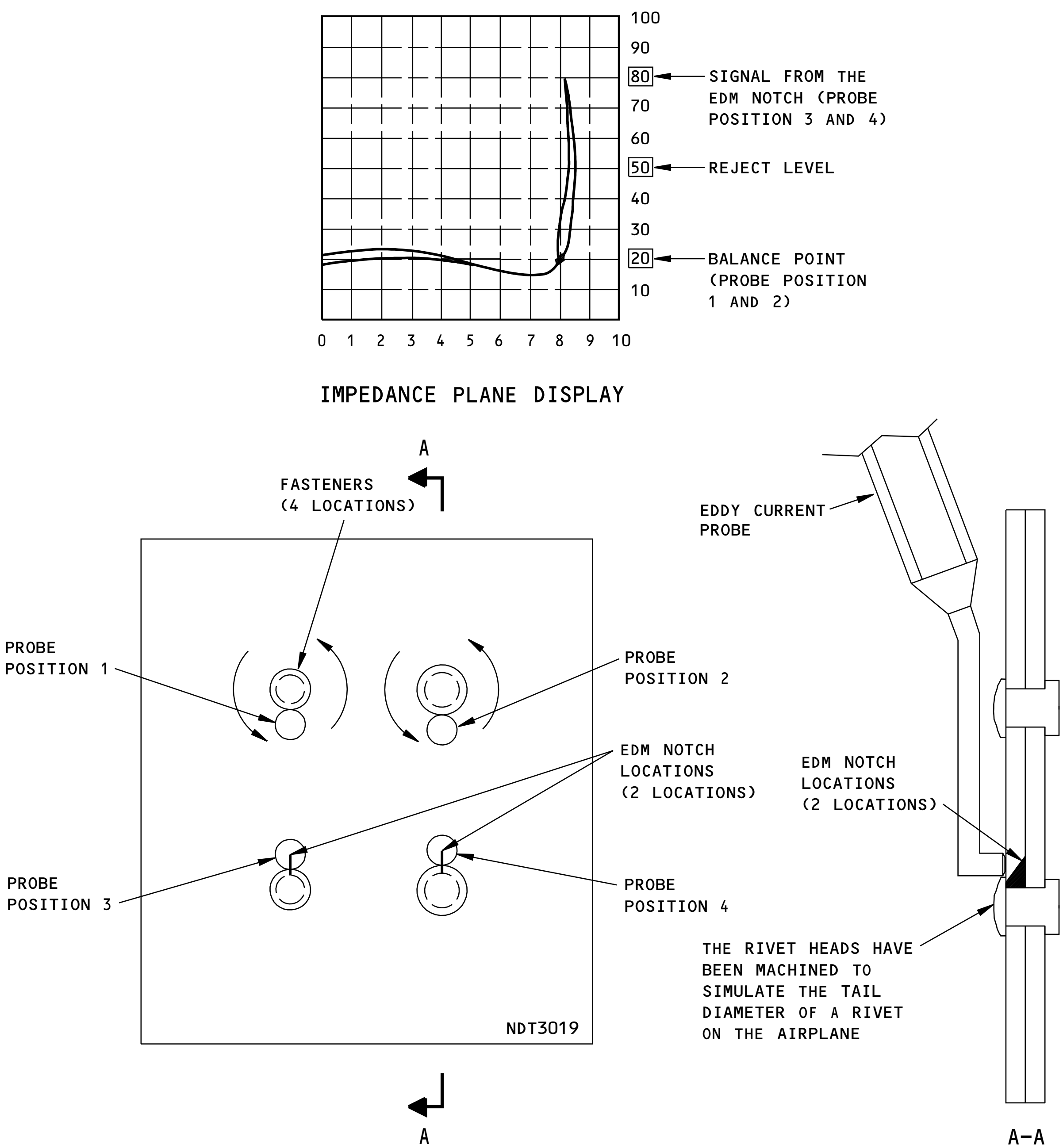
2 TAPERED EDM NOTCH:
MAXIMUM WIDTH: 0.010 (0.25)
LENGTH: 0.135 (3.43) OR 0.150 (3.80) AS SHOWN
ANGLE: 18 DEGREES TO FAYING SURFACE AS SHOWN

3 INSTALL THE RIVETS AS FOLLOWS:

- MAKE SURE THE TAIL END OF THE RIVETS HAVE A "C" STAMP THAT IDENTIFIES THAT THE RIVETS ARE ALODINED.
- MACHINE THE FASTENER HEADS TO SIMULATE THE DRIVEN BUTTON DIAMETER.
  5/32 0.231 ±0.002 (5.87 ±0.05)
  6/32 0.278 ±0.002 (7.06 ±0.05)
- CLEAN THE RIVETS, HOLES, COUNTERSINKS AND ALL SURFACES OF THE REFERENCE STANDARD WITH SOLVENT.
- PUT THE APPLICABLE DIAMETER HOLE OF THE RIVET TOOL (SEE PART 6, 53-30-00, PROCEDURE 7, FIGURE 2 (SHEET 3)) AROUND THE RIVET HEAD SO THAT THE SURFACE OF THE TOOL TOUCHES THE TOP SHEET OF THE REFERENCE STANDARD.
- COMPRESS THE RIVET TO GET A BUTTON DIAMETER ON THE TAIL END THAT IS 1.3 TO 1.5 TIMES THE SHANK DIAMETER.

2161700 S0000472716_V2

Reference Standard ANDT3019
Figure 1

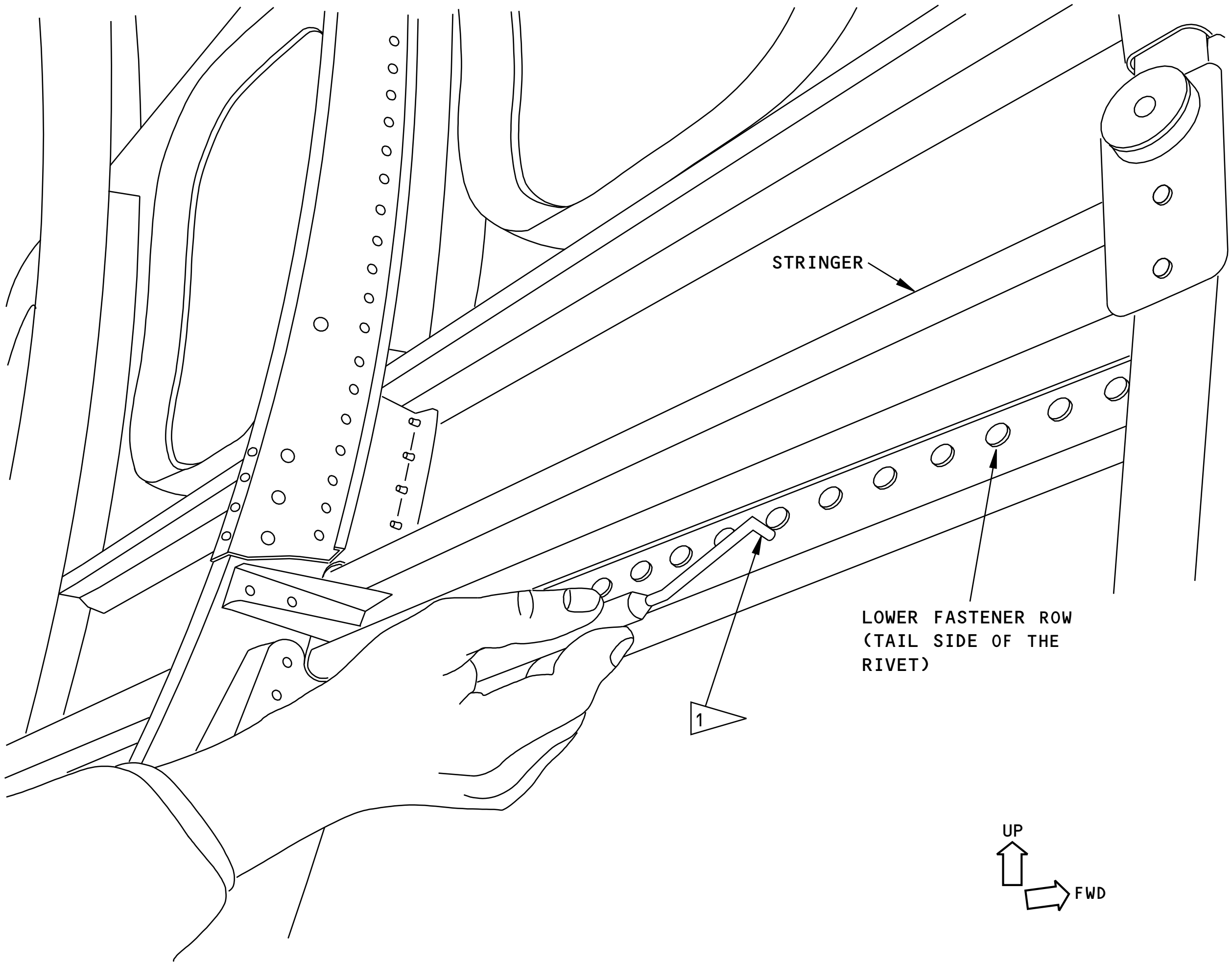


NOTES:

- MOVE THE PROBE AROUND THE FASTENER HOLE THAT DOES NOT HAVE A NOTCH (PROBE POSITION 1 OR 2).
- SET THE SIGNAL FROM THE FASTENER HOLE THAT HAS A NOTCH AT 80 PERCENT OF THE DISPLAY.
- THE CALIBRATION IS DONE ON THE SIDE OF THE REFERENCE STANDARD THAT HAS THE RIVET HEADS. THE INSPECTION IS DONE ON THE TAIL SIDE OF THE RIVET.

2161701 S0000472717_V1

Calibration and Probe Positions
Figure 2



VIEW OF THE INSPECTION AS IT IS DONE
ON STRINGER 14L

DETAIL I

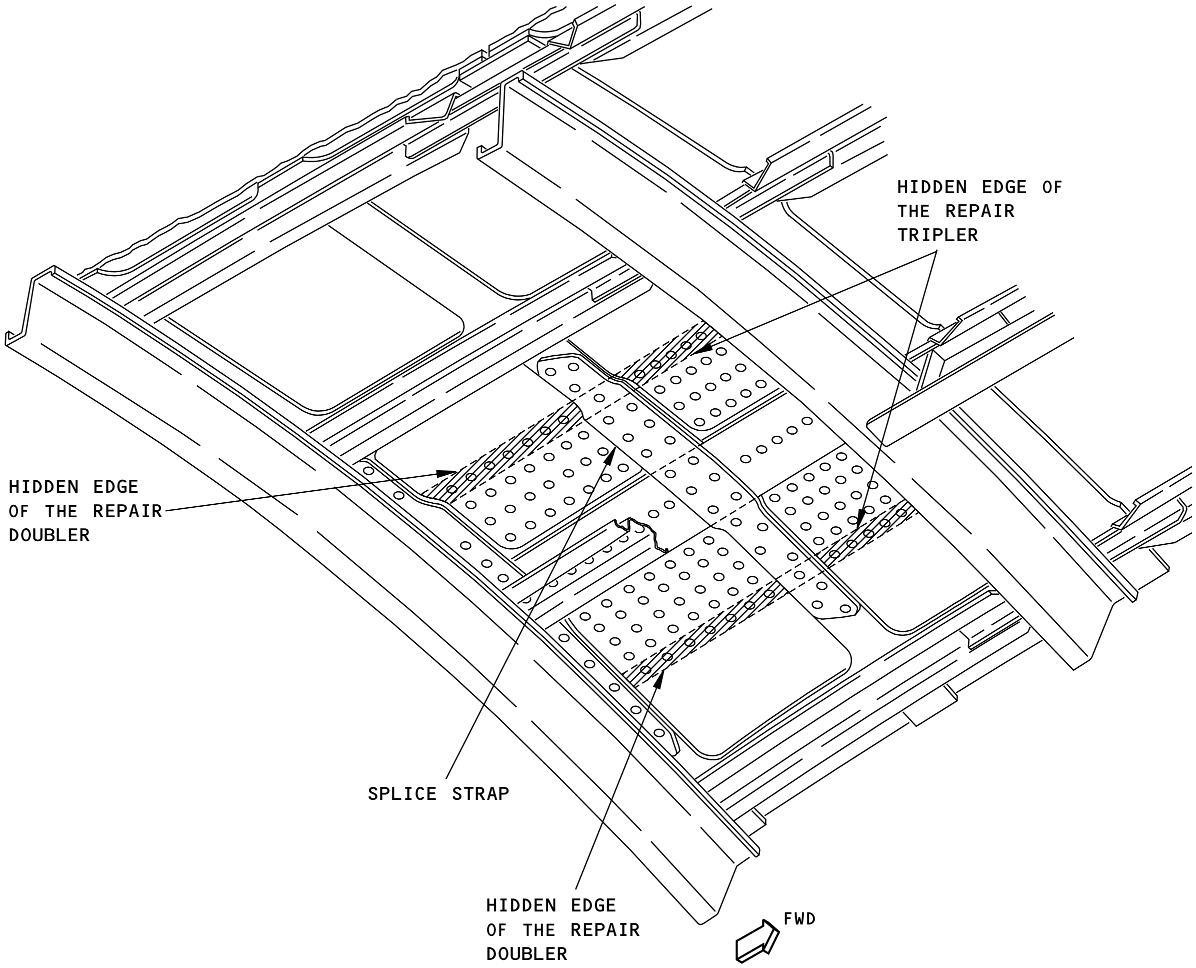
NOTES:

- MAKE A MARK AT THE FASTENERS THAT CAUSE A FAST VERTICAL SIGNAL TO OCCUR THAT IS ALMOST THE SAME AS THE SIGNAL YOU GOT FROM THE REFERENCE STANDARD NOTCH.

1 MAKE SURE THE EDDY CURRENT PROBE DOES NOT HAVE TEFLON TAPE. THE EDGES THAT OCCUR IN THE TAPE ON THE SIDE OF THE PROBE PREVENT A CONSTANT INSPECTION AROUND THE FASTENER.

2161702 S0000472718_V1

Typical Inspection Area
Figure 3 (Sheet 1 of 2)



ONE LAP JOINT REPAIR CONFIGURATION SHOWN,
OTHER CONFIGURATIONS ARE ALMOST THE SAME

DETAIL II

EXAMINE THE SKIN AROUND AND BETWEEN THIS ROW OF FASTENERS

2161704 S0000472719_V1

Typical Inspection Area
Figure 3 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

SLIDING PROBE INSPECTION OF THE INBOARD SKIN OF THE LAP SPLICE - DUAL FREQUENCY MODE METHOD

1. Purpose

A. Use this procedure to do an inspection for cracks in the inboard skin along the lower row of fasteners in the lap splice.

B. This inspection procedure can be used on fuselage skins with Alodine or anodized fasteners.

C. This procedure is done from the external side of the airplane at the lap splices. See Figure 1 for the location of typical inspection areas along the lower row of fasteners. This procedure will find cracks at tear strap locations and between tear straps.

D. This procedure uses a sliding probe and an impedance plane display instrument that can operate in a dual frequency mode.

E. You cannot do this procedure at a location where the fastener is magnetic (steel) or if a fastener has a protruding head. If a fastener is magnetic or has a protruding head, you must do one of the procedures that follow:

(1) Do an external inspection as shown in Part 6, 53-30-14, but only if the fastener has been oversized from the size shown in the production drawings.

(2) Do an open hole inspection as shown in Part 6, 51-00-00, Procedure 16.

F. The probe must be accurately aligned with the fastener centerline to do this procedure correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

G. This NDT procedure initially contained a low frequency eddy current (LFEC) procedure. The low frequency procedure has been replaced with a dual-frequency eddy current procedure. The dual frequency eddy current procedure is better to use to find cracks at locations with Alodine coated rivets.

(1) For service documents that specify the low frequency eddy current (LFEC) procedure, the dual frequency eddy current procedure must now be used.

H. Service Bulletin Reference: 737-53A1177, 737-53A1255, 737-53-1273

2. Equipment

A. Refer to Part 6, 53-30-00, Procedure 9, par. 3, for instruments, probes and special tools.

B. Reference Standard

(1) Use reference standard NDT1087-3 with the probe guides NDT1087-P1. Refer to Part 6, 53-30-00, Procedure 9 for data about the reference standard and probe guides.

3. Prepare for the Inspection

A. Refer to Part 6, 53-30-00, Procedure 9, par. 4 for inspection preparation instructions.

4. Instrument Calibration

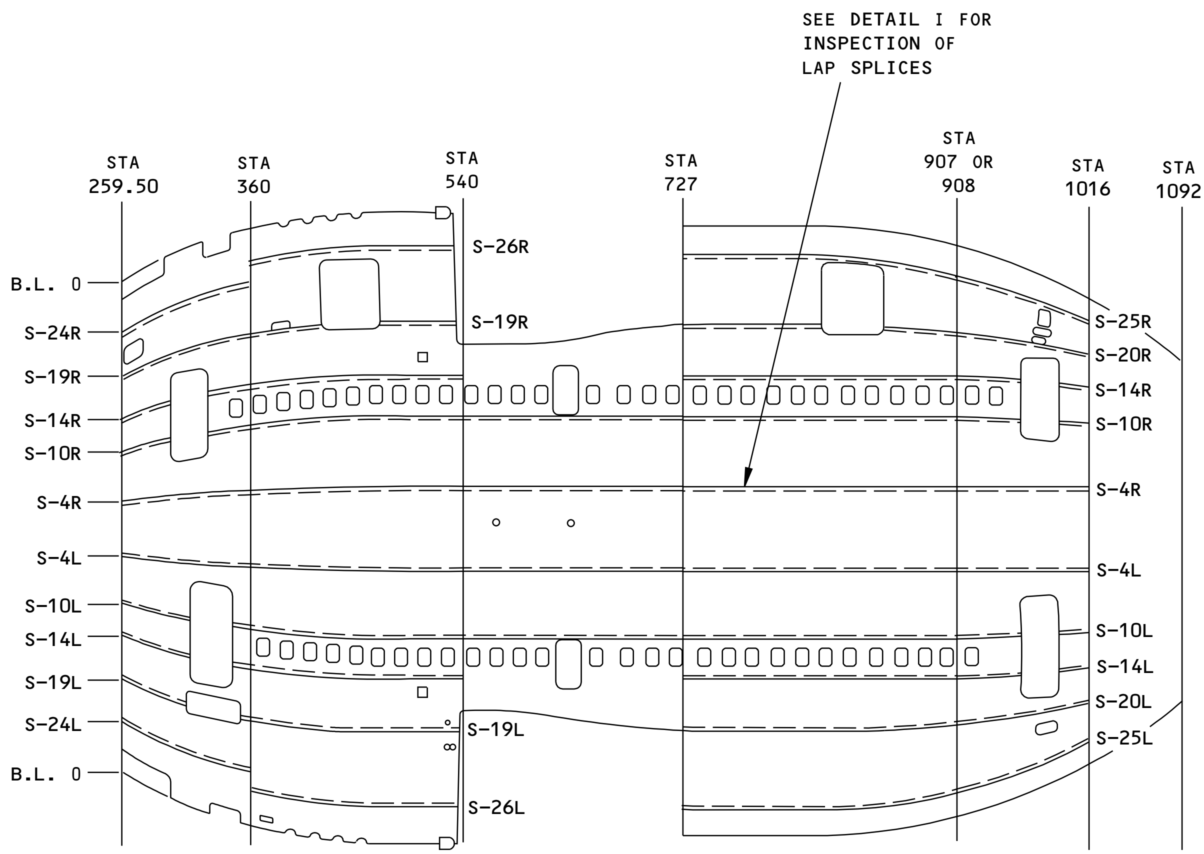
A. Refer to Part 6, 53-30-00, Procedure 9, par. 5 for instrument calibration instructions.

5. Inspection Procedure

A. Refer to Part 6, 53-30-00, Procedure 9, par. 6 for the inspection procedure.

6. <u>Inspection Results</u>

A. Refer to Part 6, 53-30-00, Procedure 9, par. 7 for instructions related to the inspection results.



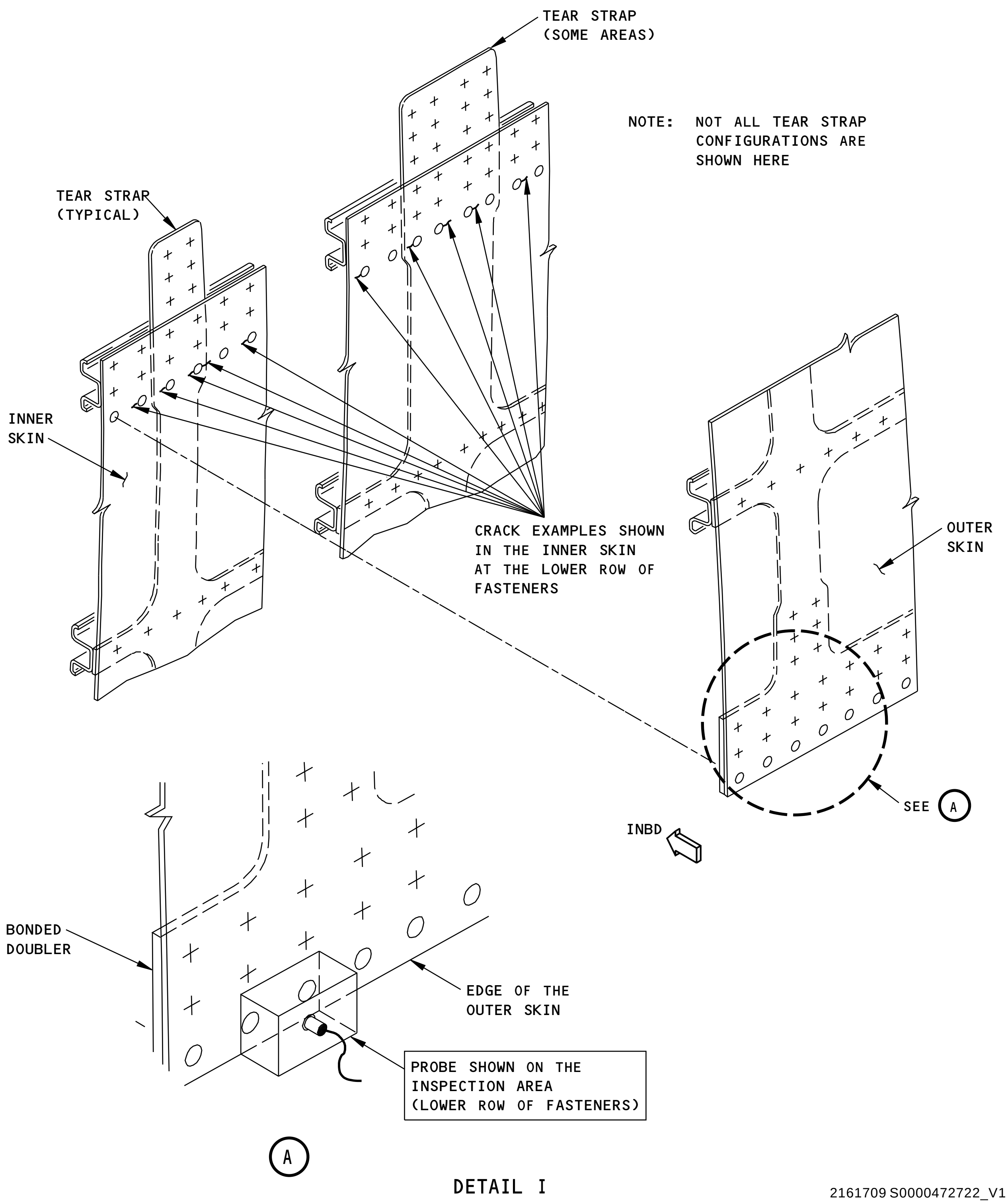
NOTE

- SEE SERVICE BULLETIN 737-53A1177 FOR SPECIFIC LAP SPLICE LOCATIONS TO BE EXAMINED

737-200P AIRPLANE SHOWN
737-300,-400,-500 AIRPLANES
ARE ALMOST THE SAME

2161708 S0000472721_V1

Typical Inspection Areas - External Inspection
Figure 1 (Sheet 1 of 2)



Typical Inspection Areas - External Inspection
Figure 1 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

FUSELAGE CROWN SKIN - CRACK INSPECTION OF OUTER SKIN AT SUBSURFACE EDGES

1. **Purpose**

   A. This subsurface eddy current inspection can be used to examine the skin for cracks that occur on the inner surface of the outer skin. The inspection is done from the outer surface of the skin. See the applicable Service Bulletin for more data about the inspection areas for your airplane group number.

   B. This inspection is done with a subsurface eddy current probe and an impedance plane instrument. The scan is done perpendicular to the subsurface edge of the bonded doubler or the edge of the chem-milled pockets. Cracks in the skin that are along the edge of the bonded doubler or chem-milled pockets can be found with this inspection procedure. See Figure 1.

   C. This procedure looks for cracks in the skin panels that are 0.50 inch (12.7 mm) long (or more) and 0.018 inch (0.46 mm) deep (or more).

   D. This procedure looks for cracks in the skin panels that are from 0.005 inch (0.127 mm) under the edge of the doubler to one half of a probe diameter beyond the edge of the doubler.

2. **Equipment**

   NOTE: Refer to Part 1, 51-01-00, for data about the equipment manufacturers.

   A. Instruments

      (1) All eddy current instruments that have impedance plane display are permitted for use if they:

         (a) Can operate between frequencies of 12 and 40 kHz. The frequency must be adjustable by 1 kHz increments.

         (b) Can find the reference notch in the reference standard as specified in the calibration instructions of this procedure.

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

         (a) NDT 19e; Nortec/Staveley

         (b) Phasec 2200; Hocking/Krautkramer

   B. Probes

      (1) It is necessary to use a spot probe to do this inspection. The probe must operate at a frequency that is between 12 and 40 kHz. The probe diameter must not be more than 0.50 inch (12.7 mm).

      (2) The spot probes that follow operated satisfactorily when this procedure was made. Other probes can be used if they can find the notch in the reference standard as specified in the calibration instructions of this procedure:

         (a) SPO-5328; Nortec/Staveley (Reflection probe)

         (b) SPO-5327; Nortec/Staveley (Reflection probe)

         (c) SNG 0.375/31/25K; NDT Engineering (this probe has a spring loaded collar)

         (d) NEC1005; NDT Engineering (Reflection probe)

         (e) SPO-5329; Nortec/Staveley (Reflection probe)

         NOTE: For smaller diameter probes, a probe collar will make the probe scan more stable. If a collar is used, it must be adjusted so that the probe satisfactorily touches the airplane skin. Also, during the inspection, make sure the increments between each probe scan are the diameter of the probe and not the outer diameter of the collar.

C. Reference Standard

(1) Make Reference Standard NDT396 as specified in Figure 2.

3. Prepare for the Inspection

A. Prepare for the subsurface inspection of the skin as follows:

(1) Make sure that the instrument, probe, reference standard and the inspection areas are at the same temperature.

(2) Get access to the inspection locations on the external side of the airplane shown in Figure 1. Refer to the applicable Service Bulletin to get more data on the inspection areas for your airplane group number.

(3) Make sure the skin is clean and has no rough paint in the inspection areas.

(4) Teflon tape, not more than 0.004 inch (0.10 mm) thick on the end of the probe, will make it easier to do the scans, but it is not necessary. The probe can possibly scratch the airplane if the scans are done without Teflon tape on the probe. If you make a decision to use the Teflon tape on the probe, make sure it is put on the probe before the calibration.

4. Instrument Calibration

NOTE: Refer to the equipment instruction manual as necessary for operation instructions.

NOTE: If the skin is painted, put approximately 0.006 inch (0.15 mm) of transparent, nonconductive tape on the reference standard before calibration.

A. Set the instrument frequency to 26 kHz.

NOTE: The frequency for the calibration could possibly be higher or lower than 26 kHz. Start with 26 kHz and, if necessary, adjust the frequency up or down as shown in Figure 3.

NOTE: The high pass (HP) filter must be set to off (0 Hz). The low pass (LP) filter must be set to the minimum value that does not decrease the amplitude of the signals at normal scan speeds. If the low pass filter is too low and the scan speed is increased during the inspection, it is possible to not see a crack indication.

B. Put the probe at probe position 1 (double layer) on reference standard NDT396. See Detail A in Figure 3.

C. Balance the instrument.

D. Adjust the balance point so that it is at approximately 30 percent of full screen height.

NOTE: The vertical gain must be approximately 14 to 20 dB higher than the horizontal gain.

E. Set lift-off so that the signal moves (approximately) in a horizontal direction to the left. See Detail B in Figure 3.

F. Move the probe across the edge of the second layer from probe position 1 to probe position 2. As you move the probe, monitor the signal on the screen display and stop the probe when it is on the single layer. See Detail A, probe positions 1 and 2 and Detail B in Figure 3.

G. If the end point of the single layer signal is higher than the balance point of the double layer signal, increase the frequency and adjust the phase to get the signals to look equivalent to Detail B in Figure 3. See Details A, B, and E in Figure 3.

H. If the end point of the single layer signal is lower than the balance point of the double layer signal, decrease the frequency and adjust the phase to get the signals to look equivalent to Detail B in Figure 3. See Details A, B, and D in Figure 3.

I. Do a probe scan as specified in Paragraph 4.F. and monitor the signal on the display. Make sure there is less than a 5 percent of full screen height difference between the balance point of the double layer signal and the end point of the single layer signal.

J. If necessary, continue to adjust the frequency and lift-off angle so that the balance point of the double layer signal and the end point of the single layer signal are almost equivalent to the signals shown in Detail B of Figure 3.

K. Put the probe at position 3 and do a minimum of three probe scans across the reference notch and monitor the notch signal (probe position 3 to 4 and back). See Details A and C in Figure 3.

L. Adjust the gain so that the signal from the reference standard notch is 30 percent of full screen height above the balance point as shown in Detail C in Figure 3.

M. Make sure the lift-off is horizontal and to the left.

N. Do a scan across the notch and make a small increase in the scan speed to see if the signal from the notch decreases. If the notch signal decreases, increase the setting for the low pass filter a small quantity.

5. Inspection Procedure

A. Examine the outer (upper) skin, immediately above the lap splices or immediately adjacent to a bonded doubler or an area that has not been chem-milled (doubler layer area), for cracks as follows:

(1) See the applicable Service Bulletin for the inspection areas.

(2) Calibrate the instrument as specified in Paragraph 4.

(3) Put the probe on the skin in the inspection area so that the probe is immediately above the upper row of fasteners on the lap splice or immediately adjacent to a bonded doubler or an area that has not been chem-milled (doubler layer area). See Figure 1 for the probe scan pattern.

(4) Balance the instrument and make sure that the lift-off goes horizontally to the left as shown in Detail B of Figure 3.

(5) Do approximately 4 scans so that the probe moves across the subsurface edge of the bonded doubler or the edge of the chem-milled area. During the scan:

(a) Make sure the scan direction is perpendicular to the subsurface edge as it moves across the subsurface edge.

(b) Monitor the subsurface edge signal. Make sure the signal looks almost the same as the signal shown in Detail B of Figure 3.

1) If necessary, adjust the frequency and lift-off to get the single layer signal and the double layer signal at the same screen height, or almost the same screen height, as the signal shown in Detail B of Figure 3. Refer to Details B, D and E in Figure 3 to help make the signal equivalent to the signal shown in Detail B.

a) Do not change the gain adjustment during the inspection.

(c) See Details A, B and C in Figure 4 for signals that can occur during the inspection.

(6) Continue to do probe scans across all of the subsurface edges of the bonded doubler or chem-milled edges that are in the inspection areas identified by the applicable Service Bulletin. During the scan:

(a) Make sure the scan direction is perpendicular to the subsurface edge as it moves across the subsurface edge.

(b) Monitor the instrument display to make sure the signals from the subsurface edges look as shown in Detail B of Figure 3.

(c) Monitor the instrument display for signals that are almost the same as the EDM notch signal shown in Detail C of Figure 3.

(d) Make sure the distance between each probe scan is one probe diameter (or less).

NOTE: If a collar is used, make sure the distance between each probe scan is the diameter of the probe and not the diameter of the collar.

6. Inspection Results

A. All signals that are almost the same as the notch signal from the reference standard are crack indications.

(1) Crack signals must be 15 percent of full screen height (or more) above the single layer end point.

(2) A crack signal must increase and decrease when the probe is moved approximately 2 probe diameters.

B. See Figure 3 thru Figure 6 for signals that can occur during the inspection.

NOTE: Conductivity or thickness changes can cause large signals that are not crack indications. If signals increase and decrease as the probe is moved more than 3 probe diameters, then the signal is not caused by a crack.

NOTE: Cracks that occur approximately 1 probe diameter away from the doubler edge can cause signals to start to the right of the balance point. See Figure 6.

C. For skins that are between 0.032 inch (0.81 mm) and 0.045 inch (1.14 mm) thick you can do the steps that follow to make an analysis of the possible crack indication.

(1) You can use the ultrasonic phased array inspection procedure, Part 4, 53-30-07, and examine the indication from the external side of the airplane or use the ultrasonic phased array procedure specified in Paragraph 6.C.(2).

(2) You can use the ultrasonic phased array inspection procedure, Part 4, 53-30-06, and examine the indication from the external side of the airplane as follows:

(a) Use the applicable probe wedge for the skin thickness and open a setup file. If a file has not been stored, use the instructions in Part 4, 53-30-06 to create a file.

(b) Get reference standard NDT1094-040 or NDT1094-040-A (see Part 4, 53-30-06) to help calibrate the equipment.

(c) Use the back side of the reference standard (the side of the reference standard that does not have the 0.072 inch (1.83 mm) doubler) and draw a line on the surface to show the edge of the top piece.

(d) Put couplant on the back surface of the reference standard at the notch “A” location.

(e) Put the probe on the back surface with the front of the wedge flush with the line.

(f) Calibrate the instrument as specified in par. 4 of Part 4, 53-30-06. Only use notch “A” during calibration.

(g) Add 12 dB of gain if the external surface of the airplane is painted.

(h) Move the full length of the probe across the top of the “A’ notch location on the reference standard and monitor the screen display to make sure that the red indication occurs before the C/L line on the S-Scan display screen.

(3) Identify the location of the crack indication along the edge of the doubler on the external airplane skin and make a mark to the surface with a grease pencil or felt tip pen. Do not use a graphite pencil or ball point pen or damage the part. A graphite pencil mark can cause corrosion and a ball point pen tip can damage the part.

(4) Put ultrasonic couplant on the skin inspection surface.

(5) Put the probe on the single skin area of the skin with the front of the probe pointed in the direction of the doubler and with the front edge of the wedge flush with the mark.

(6) Move the full length of the probe across the top of the marked area and monitor the screen display for a red image to occur to the left or right of the C/L line on the S-scan of the screen. Do the scan again with one half a probe width index. Move the probe to do a scan across all of the eddy current indication areas.

(7) Areas that cause a red indication to occur on the S-Scan display that is not from a fastener signal must be examined as follows:

(a) Remove the paint from the external skin surface of the airplane in the area that gives the crack indication.

(b) Remove the added 12 dB from the gain setting. Make sure the indication from the “A” notch on the reference standard is red on the S-scan screen with the front edge of the wedge flush with the mark on the back side of the reference standard.

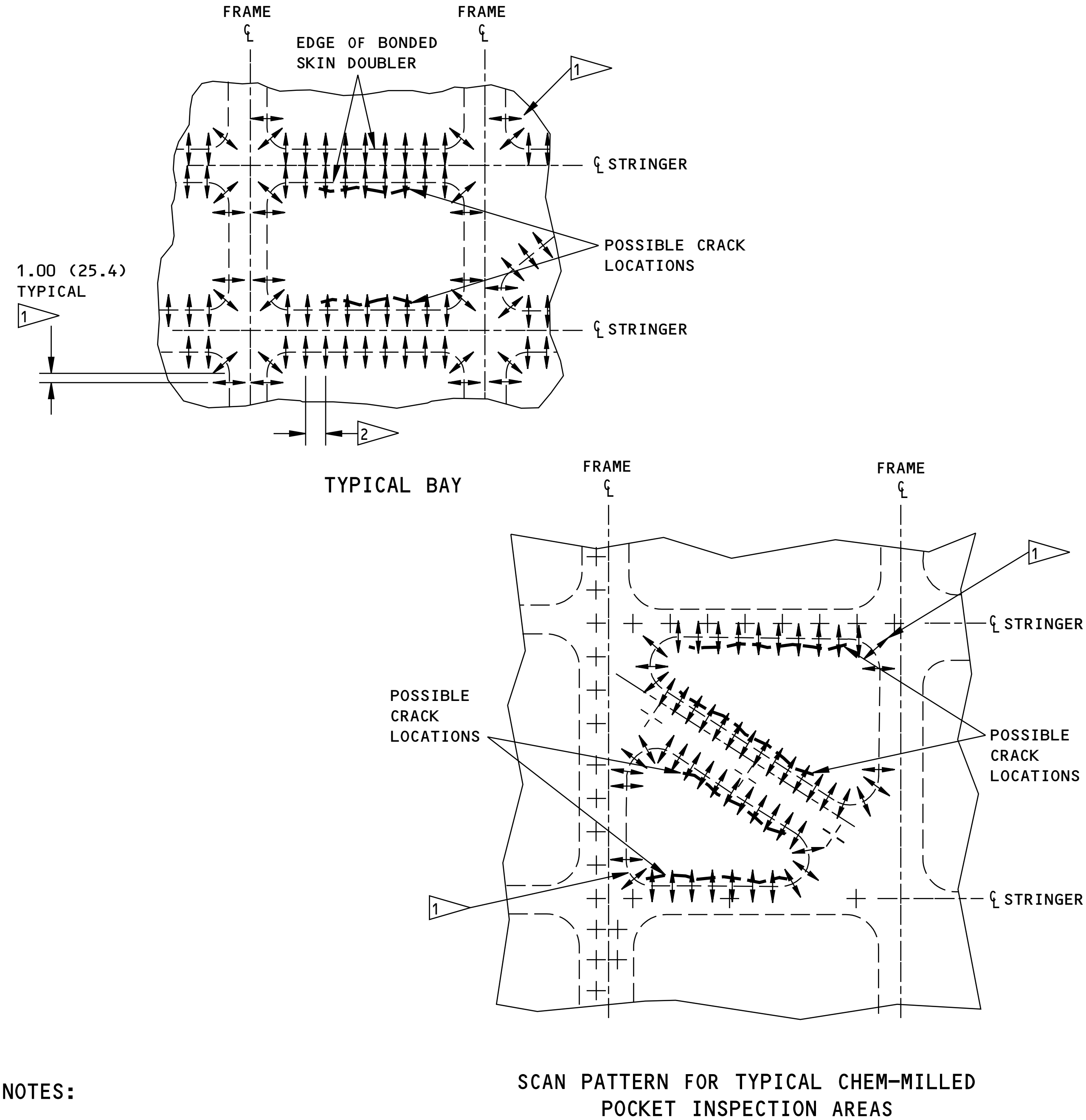
(c) Do the inspection of the indication area on the airplane again as specified in Paragraph 6.C.(5) and Paragraph 6.C.(6) above.

1) A red indication on the S-Scan that is not from a fastener signal is a crack indication.

2) If the indication area is not red then it is not a crack indication and the eddy current indication is also not a crack indication.

(8) You can use Part 4, 53-30-09 to examine the indication from the external side of the airplane.

D. Refer to the applicable Service Bulletin for more instructions about what to do at crack locations.



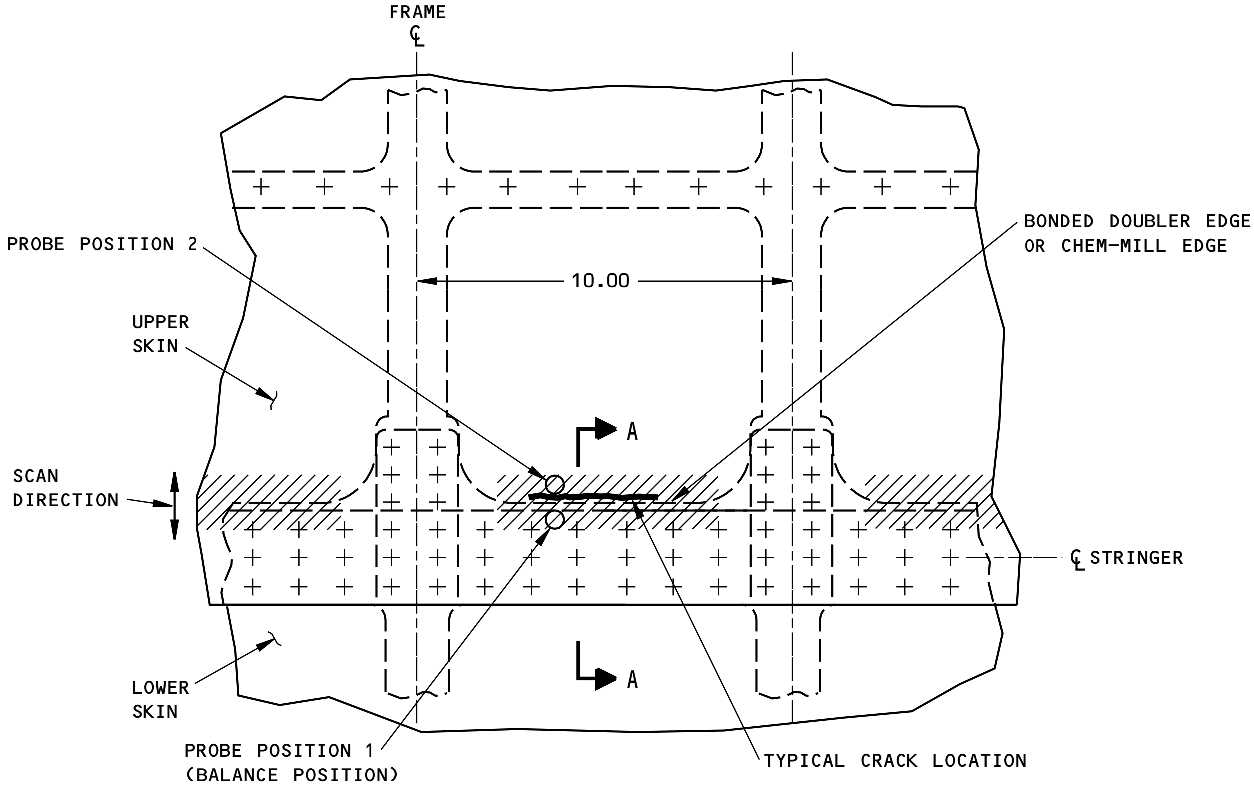
NOTES:

1 USE THE PROBE TO MAKE A SCAN AT THE CHEM-MILL POCKET HORIZONTAL EDGE OR DIAGONAL EDGE, RADIUS, AND ONE INCH BEYOND THE TANGENT POINT OF THE VERTICAL EDGE.

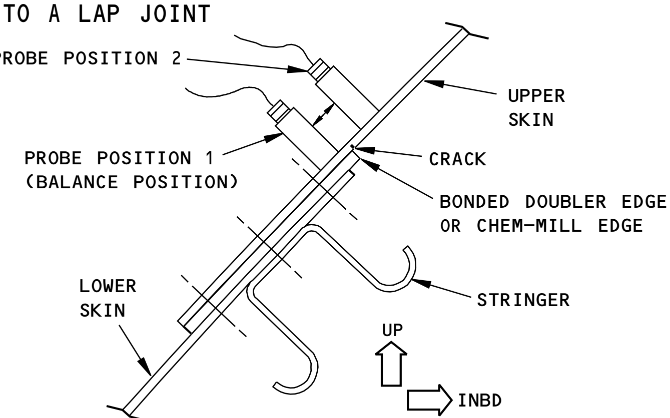
2 MAKE SURE EACH PROBE SCAN IS ONE-HALF OF THE PROBE DIAMETER (OR LESS) FROM EACH OTHER.

2161711 S0000472724_V1

Typical Inspection Areas and Scan Patterns
Figure 1 (Sheet 1 of 2)



TYPICAL CHEM-MILLED EDGE INSPECTION AREA
ADJACENT TO A LAP JOINT



A-A

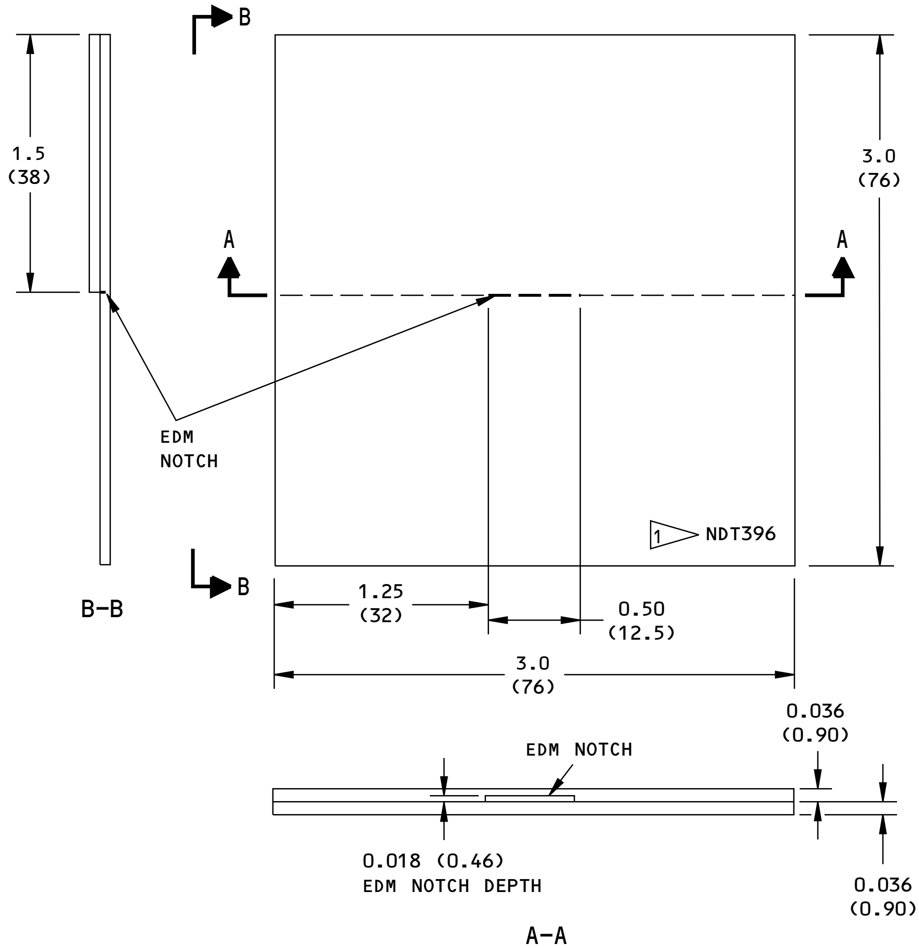
NOTES:

- DO THE PROBE SCANS IN A VERTICAL DIRECTION ALONG THE SUBSURFACE DOUBLER EDGE OR CHEM-MILL EDGE IN THE INSPECTION AREAS. MAKE SURE THE DISTANCE BETWEEN EACH PROBE SCAN IS ONE PROBE DIAMETER (OR LESS).
- REFER TO FIGURE 3 TO SEE HOW THE SIGNALS MUST LOOK WHEN THE SCAN IS DONE PERPENDICULAR TO THE SUBSURFACE DOUBLER EDGE OR CHEM-MILL EDGE. IF NECESSARY, ADJUST THE FREQUENCY AND PHASE ONLY DURING INSPECTION. DO NOT ADJUST THE GAIN.

INSPECTION AREAS

2161712 S0000472725_V2

Typical Inspection Areas and Scan Patterns
Figure 1 (Sheet 2 of 2)



NOTES:

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

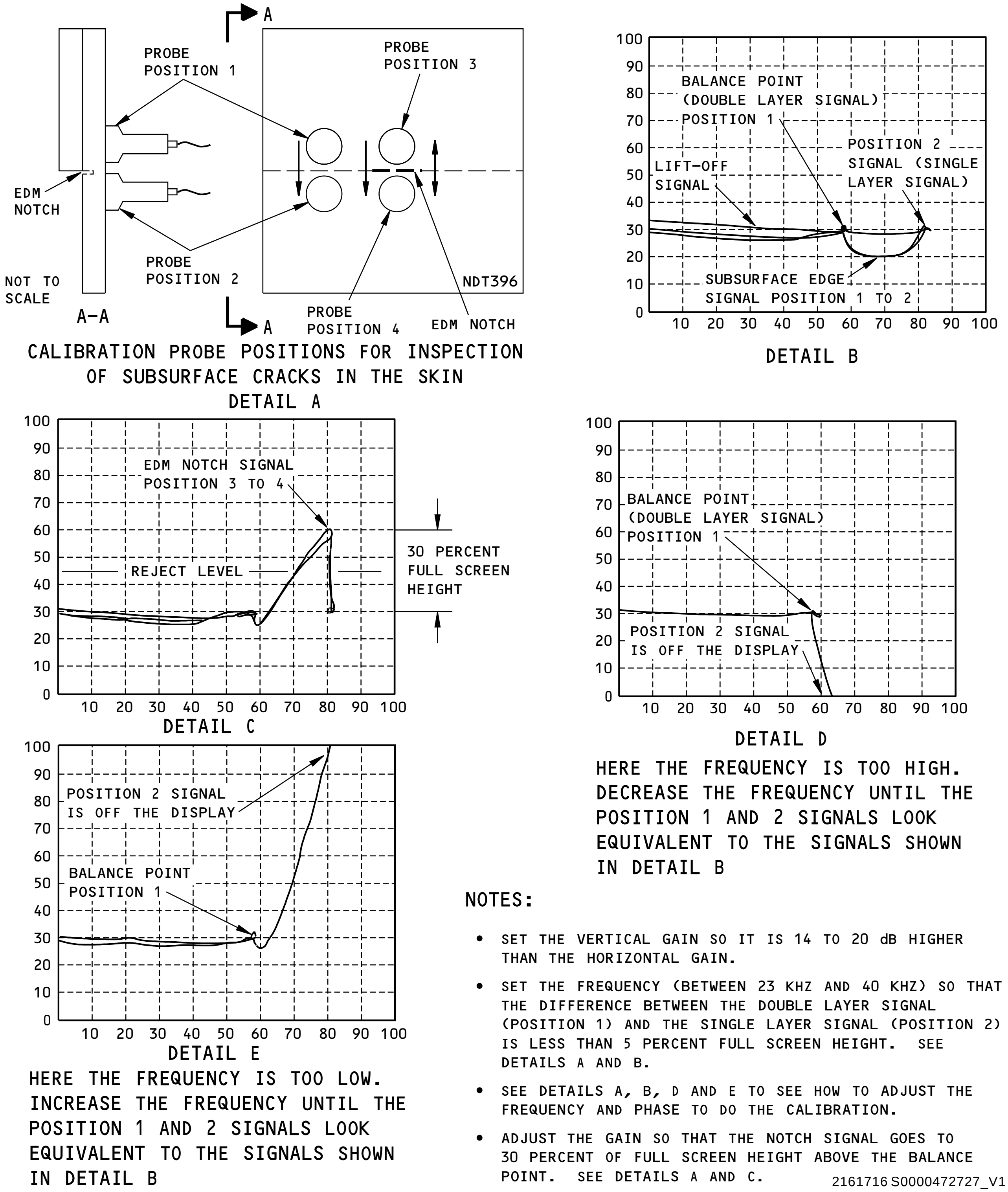
INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- MATERIAL: 2024-T3 CLAD (TWO SKINS)
- APPLY ADHESIVE OR EPOXY NO MORE THAN 0.005 (0.13) THICK TO SKINS AND CLAMP TOGETHER.
- MAKE SURE THE 2ND LAYER EDGE IS IMMEDIATELY ABOVE THE EDM NOTCH BEFORE THE CLAMPS ARE APPLIED.
- EDGE OF SKIN TO NOTCH TOLERANCE: 0.010 (0.2)
- EDM NOTCH: LENGTH 0.50 (12.5)
  DEPTH 0.018 (0.46) ±0.002 (0.05)
  WIDTH 0.007 (0.18)

1 STAMP OR ETCH NDT396

2161713 S0000472726_V1

Reference Standard NDT396
Figure 2

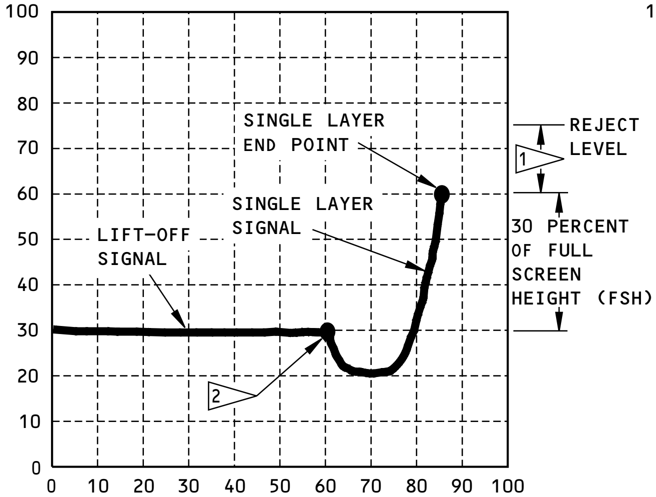


NOTES:

- SET THE VERTICAL GAIN SO IT IS 14 TO 20 dB HIGHER THAN THE HORIZONTAL GAIN.
- SET THE FREQUENCY (BETWEEN 23 KHZ AND 40 KHZ) SO THAT THE DIFFERENCE BETWEEN THE DOUBLE LAYER SIGNAL (POSITION 1) AND THE SINGLE LAYER SIGNAL (POSITION 2) IS LESS THAN 5 PERCENT FULL SCREEN HEIGHT. SEE DETAILS A AND B.
- SEE DETAILS A, B, D AND E TO SEE HOW TO ADJUST THE FREQUENCY AND PHASE TO DO THE CALIBRATION.
- ADJUST THE GAIN SO THAT THE NOTCH SIGNAL GOES TO 30 PERCENT OF FULL SCREEN HEIGHT ABOVE THE BALANCE POINT. SEE DETAILS A AND C.

2161716 S0000472727_V1

Calibration Positions with Impedance Plane Signals
Figure 3

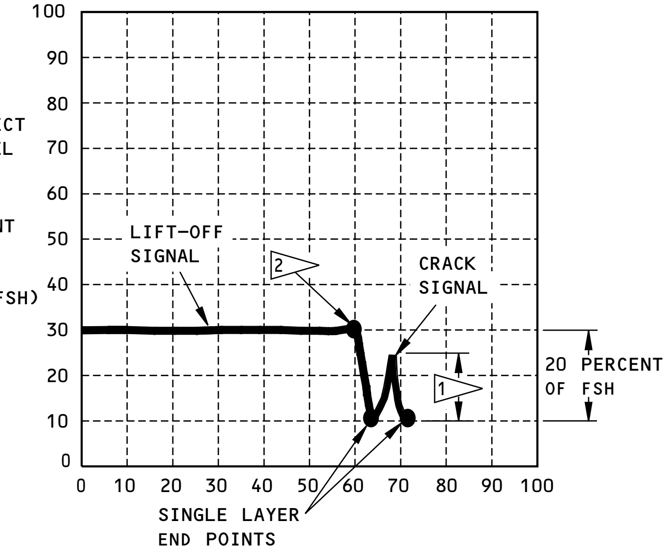


DETAIL A

THIS IS NOT A CRACK SIGNAL. IT IS A SIGNAL CAUSED BY ONE OR MORE OF THE CONDITIONS THAT FOLLOW:

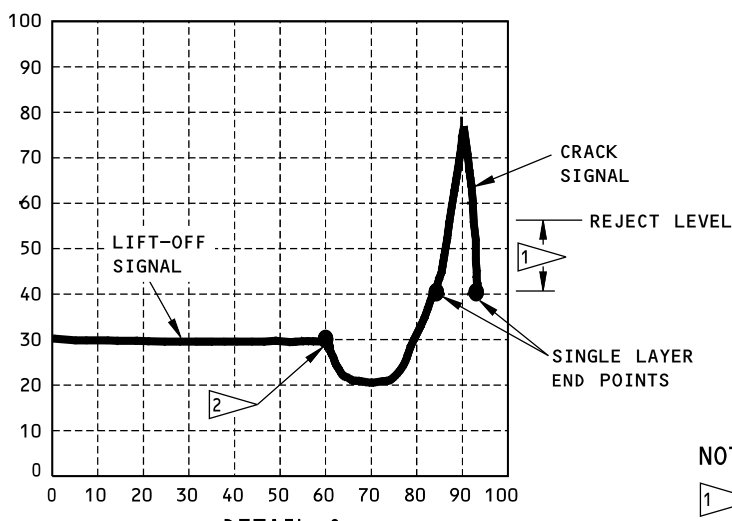
- AN AREA ON THE SKIN OF LOWER CONDUCTIVITY
- A THIN CLAD AREA
- THE SKIN IS THINNER.

WHEN THIS SIGNAL IS AT 30 PERCENT OF FSH OR HIGHER, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL B

WHEN THIS SINGLE LAYER SIGNAL GOES DOWN SCREEN BY 20 PERCENT OF FSH OR MORE, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL C

THIS CRACK SIGNAL HAS OCCURRED WITH THE CONDITIONS SPECIFIED IN DETAIL A. THE SIGNAL STARTED AS THE SIGNAL IN DETAIL A STARTED, BUT THEN A CRACK SIGNAL OCCURRED WITHIN A SHORT SCAN. SEE HOW THIS SIGNAL IS DIFFERENT THAN THE SIGNAL SHOWN IN DETAIL A.

NOTES:

1. FOR THE CONDITIONS SPECIFIED IN DETAIL A, THE REJECT LEVEL IS 15 PERCENT OF FSH ABOVE THE SINGLE LAYER END POINTS.
2. THIS IS THE BALANCE POINT ON THE DOUBLE LAYER. MAKE SURE THAT THE PROBE IS ON THE DOUBLE LAYER WHEN YOU BALANCE THE INSTRUMENT.

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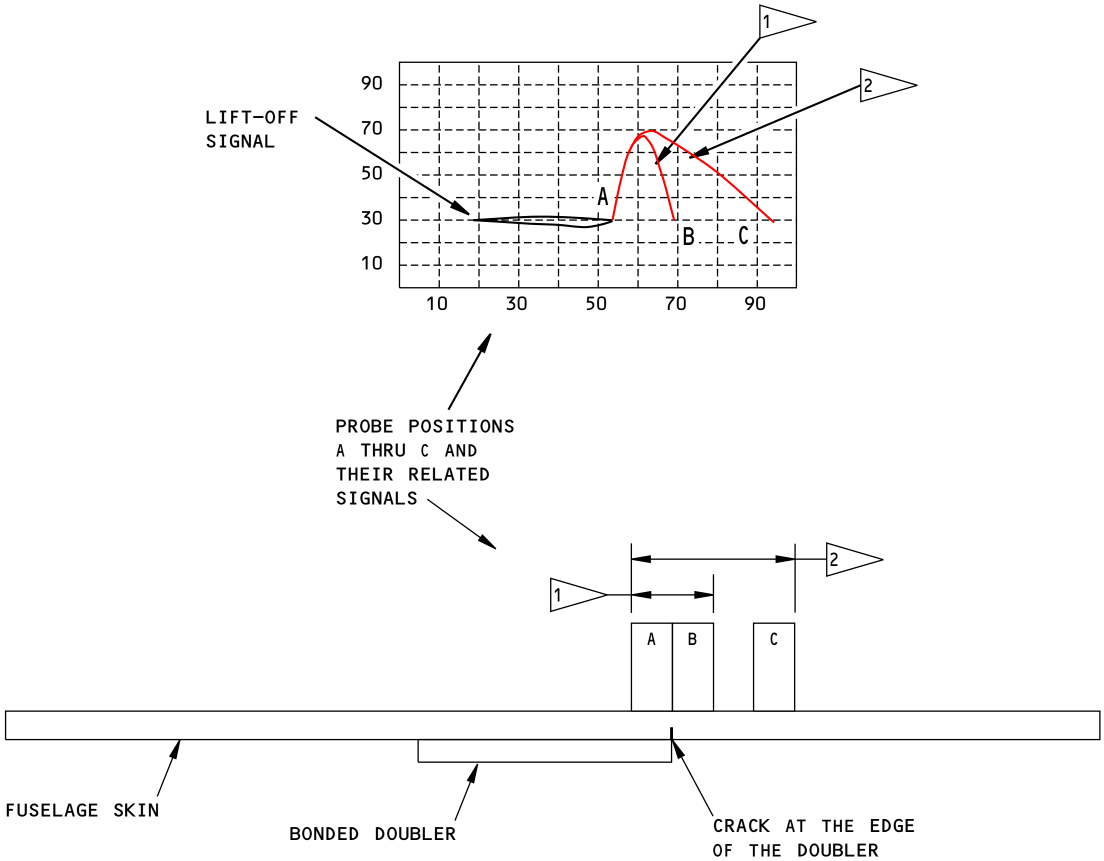
Signals that can occur on the Airplane during Inspection
Figure 4



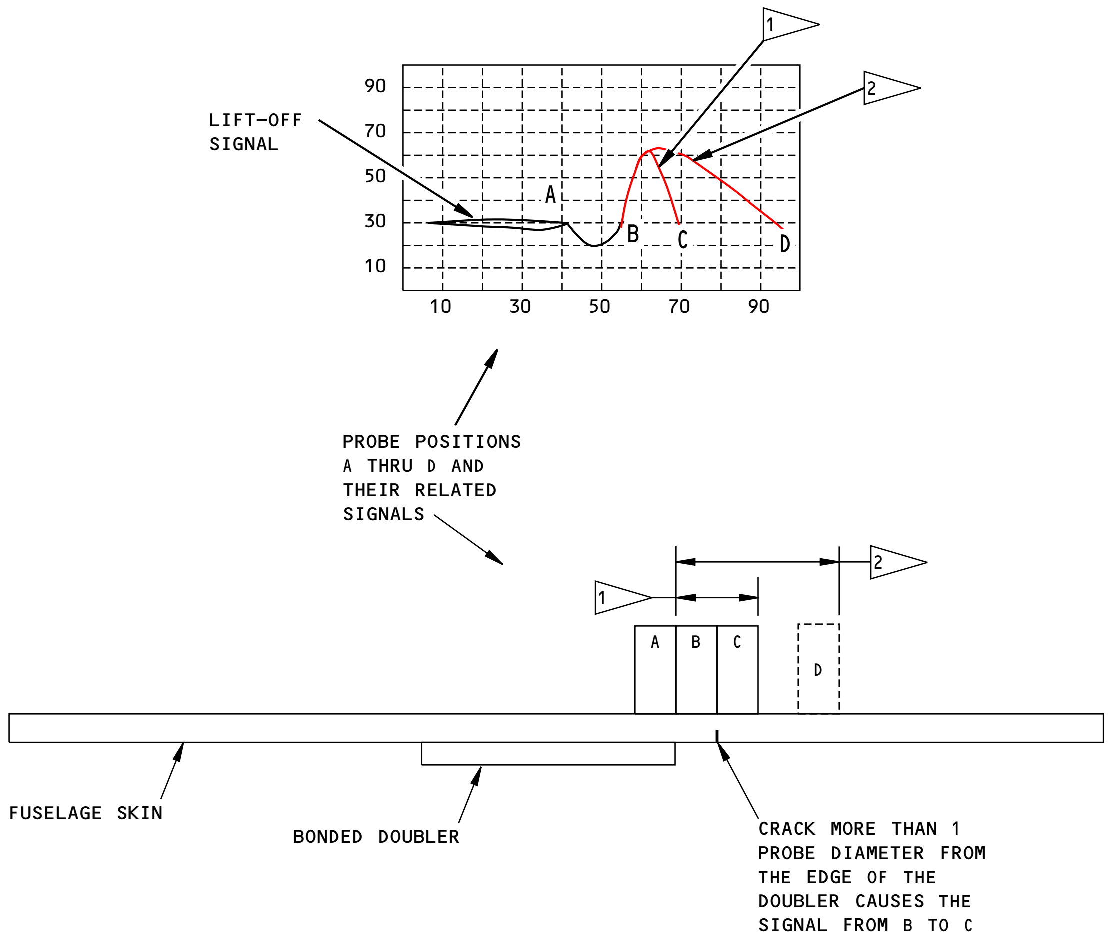
NOTES

1 SIGNALS THAT OCCUR WHEN THE PROBE MOVES APPROXIMATELY TWO OR LESS PROBE DIAMETERS IS A CRACK INDICATION.

2 SIGNALS THAT OCCUR WHEN THE PROBE MOVES MORE THAN FOUR PROBE DIAMETERS IS NOT A CRACK INDICATION. THE INDICATION CAN BE CAUSED BY CONDUCTIVITY OR SKIN THICKNESS CHANGES

2232130 S0000497706_V1

Crack Signal from a Crack at the Doubler Edge (and an Incorrect Crack Indication)
Figure 5



NOTES

1. SIGNALS THAT OCCUR WHEN THE PROBE MOVES APPROXIMATELY TWO OR LESS PROBE DIAMETERS IS A CRACK INDICATION.
2. SIGNALS THAT OCCUR WHEN THE PROBE MOVES MORE THAN FOUR PROBE DIAMETERS IS NOT A CRACK INDICATION. THE INDICATION CAN BE CAUSED BY CONDUCTIVITY OR SKIN THICKNESS CHANGES

2232131 S0000497707_V1

Crack Signal from a Crack that is Away From the Doubler Edge (and an Incorrect Crack Indication)
Figure 6

PART 6 - EDDY CURRENT

MAGNETO OPTIC IMAGER (MOI) INSPECTION OF SKIN CRACKS AT DOUBLER EDGES

1. **Purpose**

   A. Use this procedure to find cracks in the internal surface of the skin at the edge of a sub-surface doubler. The procedure is done from the external surface. See Figure 1.

   B. This procedure uses a Magneto Optic Imager (MOI).

   C. We recommend that only inspectors who are trained with the MOI instrument do this procedure.

2. **Equipment**

   A. Use a Magneto Optic Imaging System, Model 303, 308 or 308TDF, which is made by QUEST Integrated, with the equipment components that follow:

      NOTE: The 308 imager system operates with a 303 imager head or a 307 imager head. We recommend that you use the large 303 imager head. The 303 imager head has a larger field of view and it makes the inspection easier.

      (1) Power supply control unit.

      (2) Video monitor or heads-up display set.

      (3) Video recorder.

      (4) Imager head (model 303 or 307).

      (5) Five-inch (125 mm) wide tape (protective surface).

         NOTE: The video recorder is necessary only to record the inspection results.

   B. Reference Standard

      (1) Use reference standard NDT1069A or B as specified in Figure 2. See Figure 3 for drawings of the reference standards.

3. **Prepare for the Inspection**

   A. Identify the inspection location.

   B. Do a check of the structure for magnetic steel fasteners and protruding head fasteners. Do not use this procedure to examine the areas around these fasteners. Use an alternative inspection procedure.

4. **Instrument Calibration**

   CAUTION: THE EARTH'S MAGNETIC FIELD HAS AN EFFECT ON THE IMAGER. WHEN YOU CHANGE THE POSITION OF THE IMAGER HEAD IT CAN BE NECESSARY TO ADJUST THE BIAS CONTROL. THUS YOU MUST DO THE CALIBRATION WITH THE REFERENCE STANDARD IN THE SAME POSITION AS THE INSPECTION SURFACE. FOR EXAMPLE, IF YOU EXAMINE THE SKIN BELOW THE FUSELAGE, YOU MUST HOLD THE REFERENCE STANDARD IN AN OVERHEAD POSITION EQUIVALENT TO THE SKIN SURFACE.

   ALSO, STEEL STRUCTURE NEAR THE INSPECTION AREA WILL HAVE AN EFFECT ON THE IMAGE QUALITY OF THE INSTRUMENT. IF IT IS NECESSARY TO ADJUST THE BIAS CONTROL TO IMPROVE THE IMAGE, CALIBRATE AGAIN WITH THE REFERENCE STANDARD IN THE SAME LOCATION AND POSITION AS THE INSPECTION SURFACE. SEE THE CALIBRATION INSTRUCTIONS.

   A. Connect the different components of the instrument. Refer to the manufacturer's instructions.

B. Supply power to the instrument control unit and external monitor.

C. Set the excitation mode to “rotate”.

D. Set the instrument at the recommended frequency for the inspection area. See Figure 2. You can use other frequencies if you get satisfactory results on the applicable reference standard.

E. Set the excitation level to “high”.

F. Get the correct reference standard for the inspection area. See Figure 2.

CAUTION: DO NOT DO THE CALIBRATION WHEN THE REFERENCE STANDARD IS ON A METAL SURFACE. YOU WILL GET AN INCORRECT CALIBRATION BECAUSE OF THE EFFECTS OF THE METAL.

G. Put the reference standard on a wood bench or other non-metal surface.

H. Put the MOI imager head tightly against the surface of the reference standard on the un-notched area of the reference standard. See calibration position A in Detail I of Figure 4 and Detail I of Figure 5.

I. Adjust the MOI bias control with the buttons on the imager handle until you see a dark line against a bright background. The dark line shows the sub-surface doubler edge. See Detail I of Figure 4 and Detail I of Figure 5.

J. Adjust the bias control again until the dark line begins to go out of view. Then adjust the bias control in the opposite direction until the line just begins to come into view again. This is the correct adjustment point. The dark line must be narrow and clear, not wide and fuzzy.

K. Put the imager head with the center of the imager on the EDM notch at calibration position B. See Detail II in Figure 4 and Detail II in Figure 5.

L. You will see a dark line that identifies the doubler edge with a dark bulge that identifies the end of the notch. There can also be a light area at the other end of the notch. Move the imager from side to side. The indications will move from side to side in the image display. See Detail II in Figure 4 and Detail II in Figure 5.

M. Make a note of the display.

NOTE: Do not adjust the bias control after this step. You will make more adjustments only when you are on the airplane.

N. Hold the reference standard against the imager head and turn them until they are in an overhead position. Monitor the change in the display while you do this. The change in the display is caused by the earth’s magnetic field.

O. Put the imager head and the reference standard on the bench or non-metal surface again with the imager on the long EDM notch at calibration position C. See Detail III in Figure 4 and Detail III in Figure 5.

P. Look at the image. It will look almost the same as Detail III in Figure 4 if you have a 303 imager. It will look almost the same as Detail III in Figure 5 if you have a 307 imager. You will see a dark line that identifies the doubler edge with a dark bulge that identifies the end of the notch. There can be a lighter area at the other end of the notch. Make a note of these indications. It is important to know that long cracks cause signals only at the ends of the crack.

Q. Set up the instrument and reference standard on the airplane, in the applicable inspection area from Figure 2.

R. Put the applicable reference standard (from Figure 2) adjacent to the inspection surface, in the same position as the surface you will examine (for example: flat, vertical, or overhead). Do not put the reference standard on the airplane skin or you will get an incorrect calibration because of the effects of the skin. See Figure 6.

S. Put the MOI imager head against the surface of the reference standard, with the center of the imager on the EDM notch at calibration position B. See Detail II in Figure 4 and Detail II in Figure 5.

T. Adjust the MOI bias control again to get the best image quality on the EDM notch when the reference standard is in the same position as the surface to be examined. Adjust the bias control until the image looks the same as it did when you calibrated on a bench. The image must look almost the same as the images in Detail II of Figure 4 and Detail II of Figure 5.

U. Put the imager head on the inspection surface. The doubler edges and tear straps below the surface will show when you move the imager head around. Examine the doubler edge indication and do the steps below if necessary:

(1) If the doubler edge indication is lighter than the doubler edge indication on the reference standard, the structure is too thick and you must calibrate again with a thicker reference standard. Do not adjust the bias control to make the image darker.

(2) If the doubler edge indication is darker than the doubler edge indication on the reference standard, make a small adjustment to the bias control to make the image lighter.

5. Inspection Procedure

A. Calibrate as specified in Paragraph 4.

B. Make a scan of the inspection area with the center of the imager above the sub-surface doubler edge. Monitor the MOI viewer for:

(1) Dark bulges or gaps in the doubler edge signal.

(2) Images that look almost the same as the images of the defects from the reference standard.

(3) A change in the doubler edge image.

C. There is a foil liner inside the fuselage in some areas of the airplane. The edge of the foil can cause signals to occur on the MOI that look as if it is a doubler edge, so that it looks as if there are two doubler edge signals. To correctly identify the signal from the foil liner, see Figure 7 and do the steps below:

(1) Follow the signals to an adjacent doubler splice. The doubler edge signal will be nearer to the fasteners in the splice. The foil edge will be farther from the fasteners.

(2) If the interiors are removed, look inside the fuselage at the inspection location. You can see the foil edge from inside the fuselage.

D. The scan rate must be slow to identify cracks. Do not do a scan faster than 1 inch (25 mm) for each second.

E. The image quality can change while you move down the airplane because of the magnetic properties of the building or equipment near the inspection area. If the display changes, calibrate again as specified in Paragraph 4.R. thru Paragraph 4.T. with the reference standard adjacent to the inspection area.

F. All doubler edges in the inspection area that can not be examined with MOI must be examined with a different NDT procedure. The conditions that follow prevent inspection with MOI:

(1) Magnetic steel fasteners in the inspection area. MOI inspection is possible if the magnetic fasteners are removed.

(2) Protruding head fasteners in the inspection area.

(3) Doublers, repairs or other structure that interfere with the inspection.

(4) Fairing support frames or other structure that does not let you put the center of the MOI imager on the inspection area.

(5) A concave surface in the inspection area.

(6) Surface corrosion in the inspection area. Remove surface corrosion to do the inspection.

G. Temperature effects can have an important effect on the performance of the MOI. They can cause the image quality (contrast) to decrease. Monitor these conditions during the inspection:

(1) Imager head temperature build-up. During use, the imager head becomes warm. A good procedure is to turn the imager head off when you are not doing an inspection.

(2) High air temperature. High imager head temperatures become more of a problem when the air temperature is 90°F (32°C) or higher. If the air temperatures are too high, do the inspection when the air temperature is lower.

(3) High aircraft skin temperature. Do not do the inspection if sunlight makes the surface of the airplane too hot.

H. Areas that cause images that look almost the same as the images of the defects from the reference standard, or images that are unusual, must be examined some more. Refer to Paragraph 6.

6. Inspection Results

A. These signals are indications of cracks:

(1) A small bulge along the doubler edge signal. When you move the imager from side to side the bulge will move from side to side in the image.

(2) Two small bulges along the doubler edge signal. Long cracks can have two bulges, one at each end of the crack. Or they can have a bulge at one end and a gap at the other end. When you move the imager from side to side these indications will move from side to side in the image.

(3) A very large, dark bulge along the doubler edge signal. Large cracks that have broken or have almost broken the skin will cause very large signals.

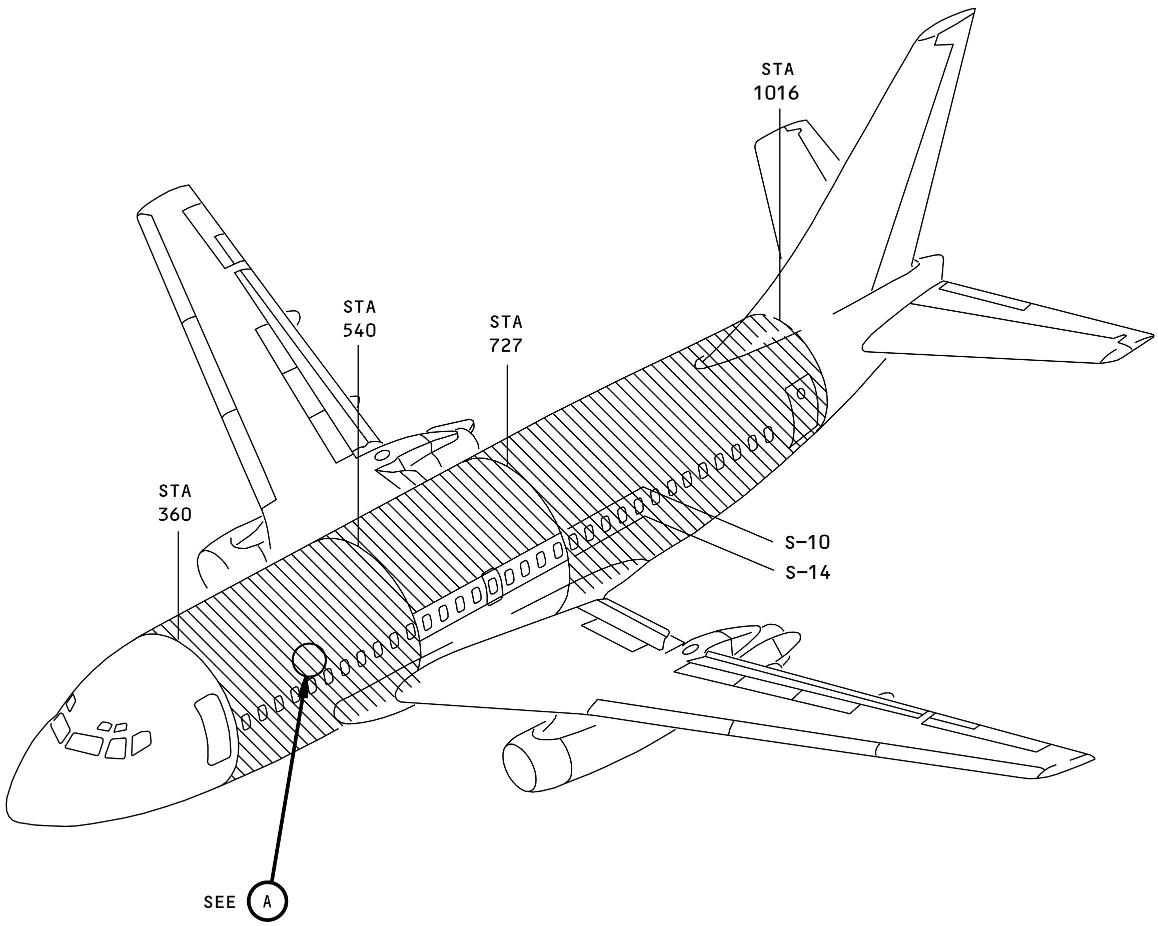
B. For an example of a crack indication recorded from an airplane, see Figure 8.

C. Do one of the procedures that follow to make sure a crack indication is from a crack:

(1) 737 Part 6, 53-30-18 (mid frequency spot probe)

(2) 737 Part 4, 53-30-09 (ultrasonic single element)

(3) 737 Part 4, 53-30-07 (ultrasonic phased array)



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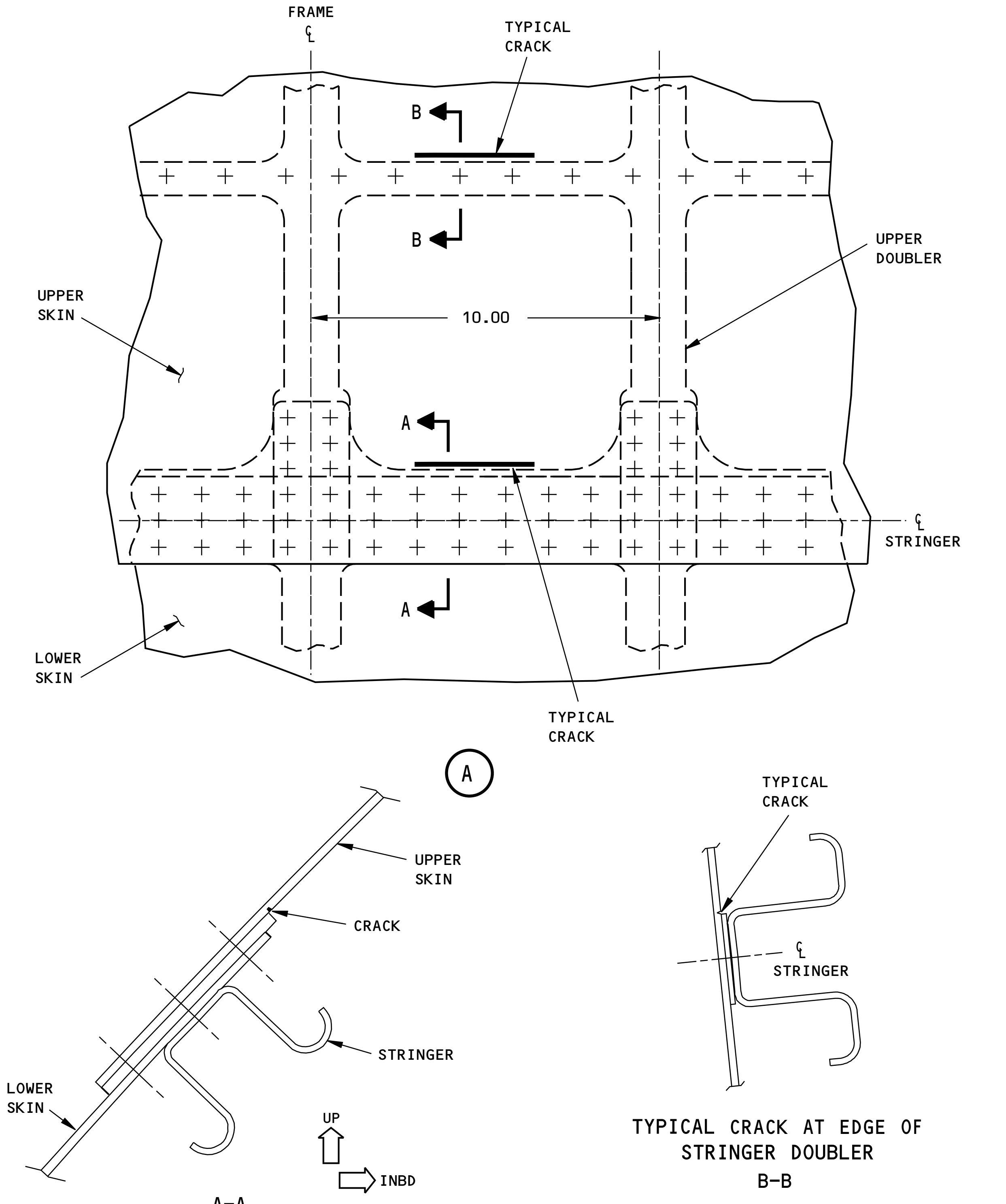
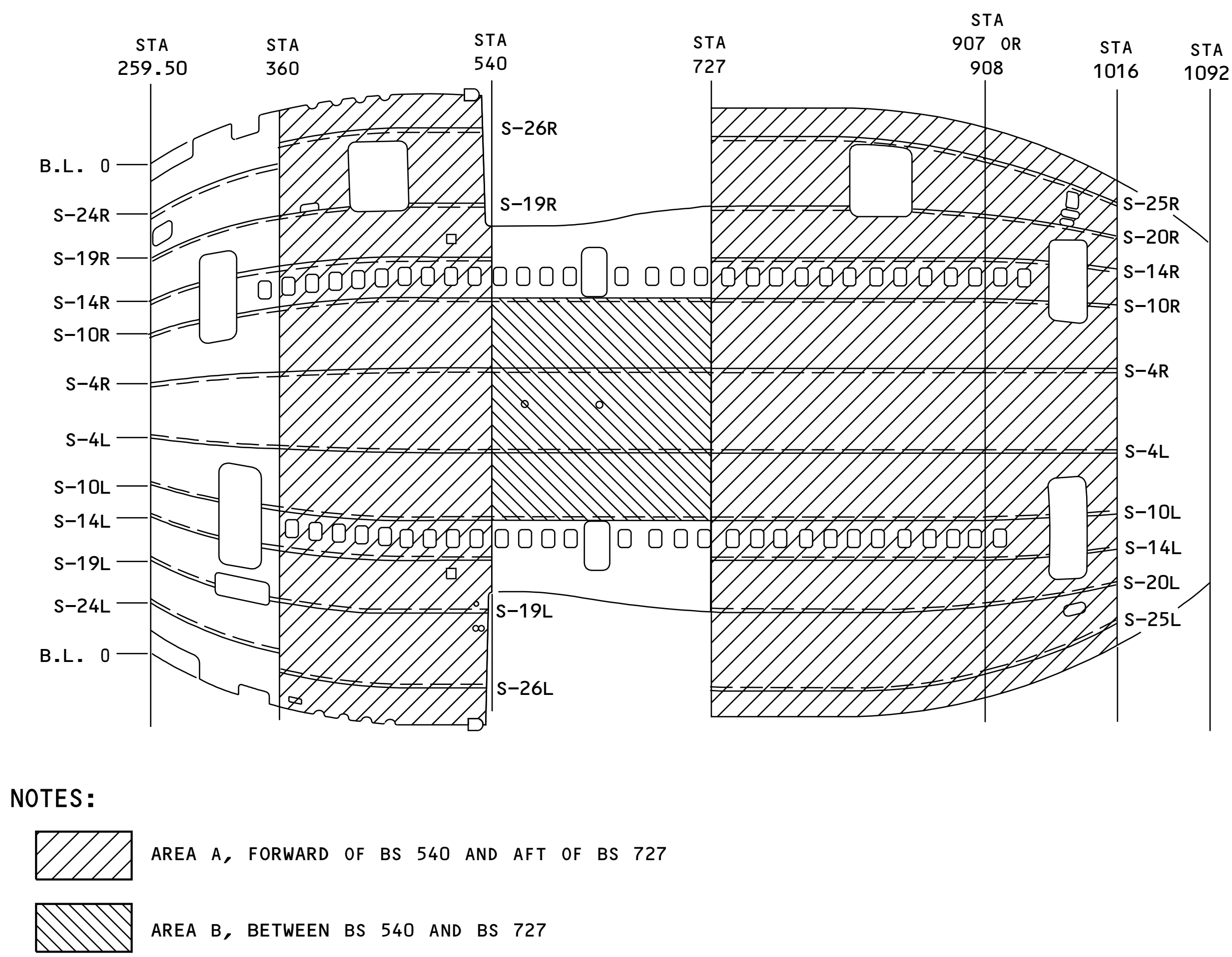
Inspection Areas
Figure 1 (Sheet 1 of 2)



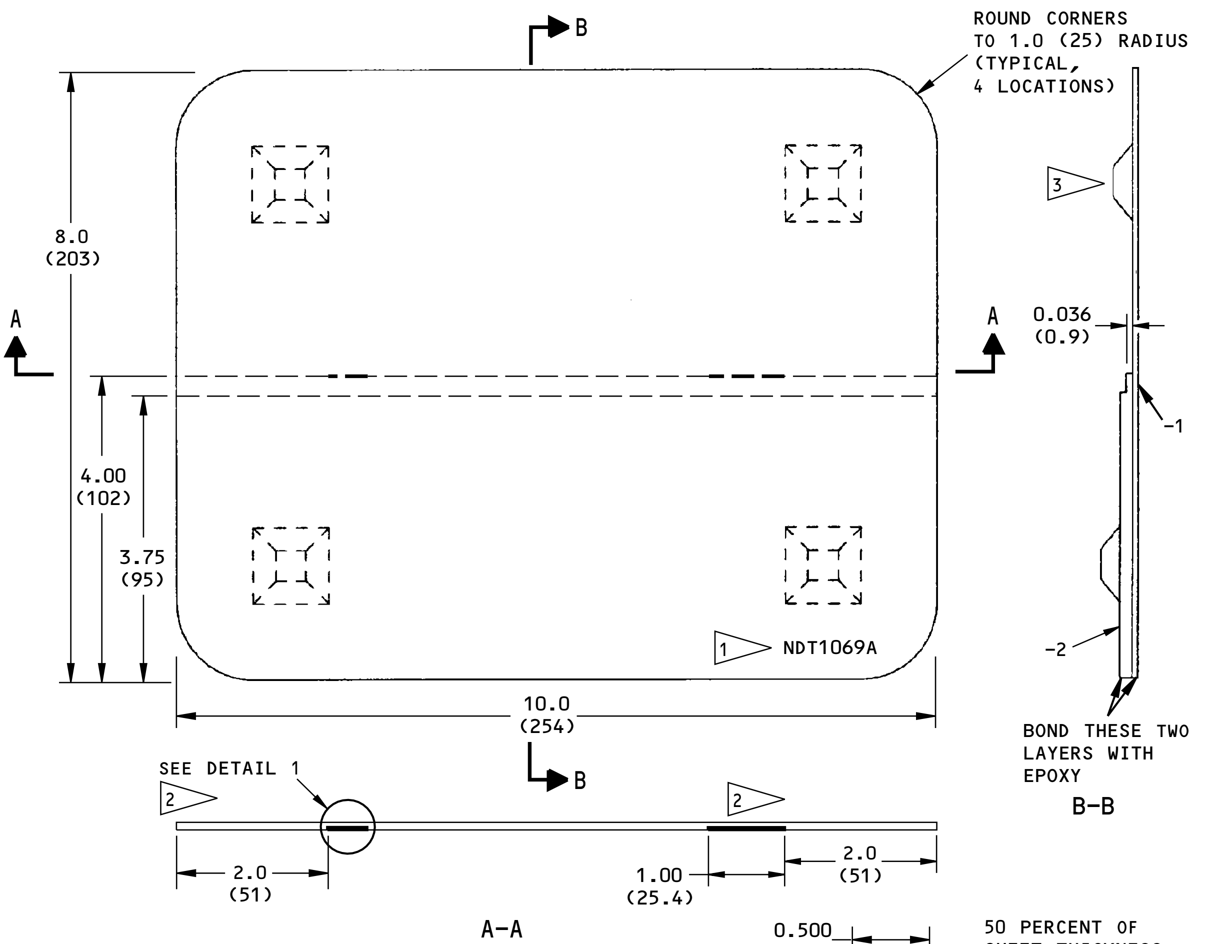
Inspection Areas
Figure 1 (Sheet 2 of 2)

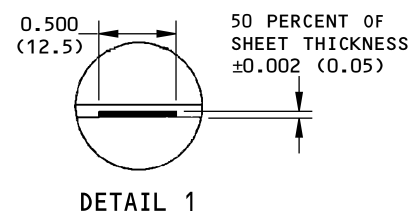


INSPECTION AREA	APPLICABLE REFERENCE STANDARD	RECOMMENDED FREQUENCY SETTING FOR 303 IMAGER	RECOMMENDED FREQUENCY SETTING FOR 307 IMAGER
A	NDT1069A	5 KHZ	10 KHZ
B	NDT1069B	3 KHZ	5 KHZ

2164107 S0000472734_V1

Reference Standards and Instrument Frequencies for the Inspection Area
Figure 2





NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS IN PARENTHESES).
- TOLERANCES (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

- SURFACE ROUGHNESS = 125 Ra OR BETTER.
- MAKE SURE THE 2ND LAYER EDGE IS IMMEDIATELY ABOVE (WITHIN 0.010 (0.2)) THE EDM NOTCH BEFORE THE PARTS ARE BONDED.
- MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE
  -1 0.040 (1.0) THICK
  -2 0.080 (2.0) THICK

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER, NDT1069A.

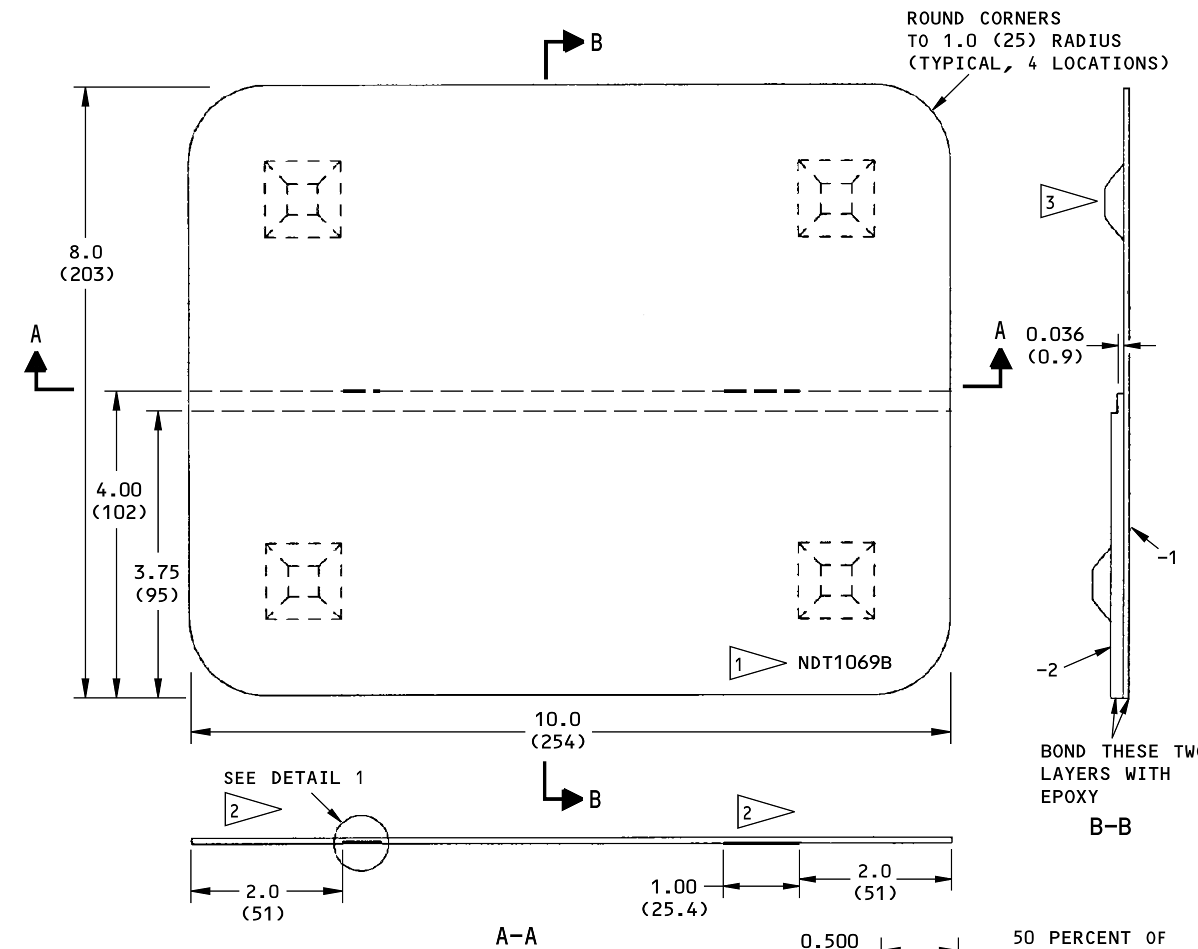
2 EDM NOTCHES:
DEPTH: 50 PERCENT OF SHEET THICKNESS ±0.002 (0.1)
WIDTH: 0.007 (0.18)
LENGTHS: AS SHOWN

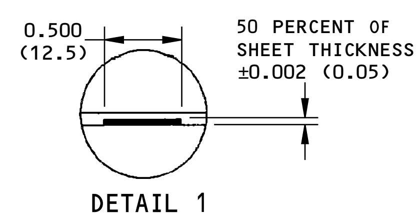
- THE TOLERANCE FOR THE DEPTH OF THE EDM NOTCH WAS INITIALLY SPECIFIED TO BE ±0.005 (0.10). IT IS NOT NECESSARY TO REPLACE OR CHANGE A REFERENCE STANDARD THAT HAS AN EDM NOTCH THAT IS WITHIN THIS INITIAL TOLERANCE.

3 BOND 4 RUBBER FEET TO THE REFERENCE STANDARD IN THE APPROXIMATE POSITIONS SHOWN.

2164113 S0000472735_V1

Reference Standard NDT1069
Figure 3 (Sheet 1 of 2)





NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS IN PARENTHESES).
- TOLERANCES (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

- SURFACE ROUGHNESS = 125 Ra OR BETTER.
- MAKE SURE THE 2ND LAYER EDGE IS IMMEDIATELY ABOVE (WITHIN 0.010 (0.2)) THE EDM NOTCH BEFORE THE PARTS ARE BONDED.
- MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE
  -1 0.050 (1.3) THICK
  -2 0.100 (2.5) THICK

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER, NDT1069B.

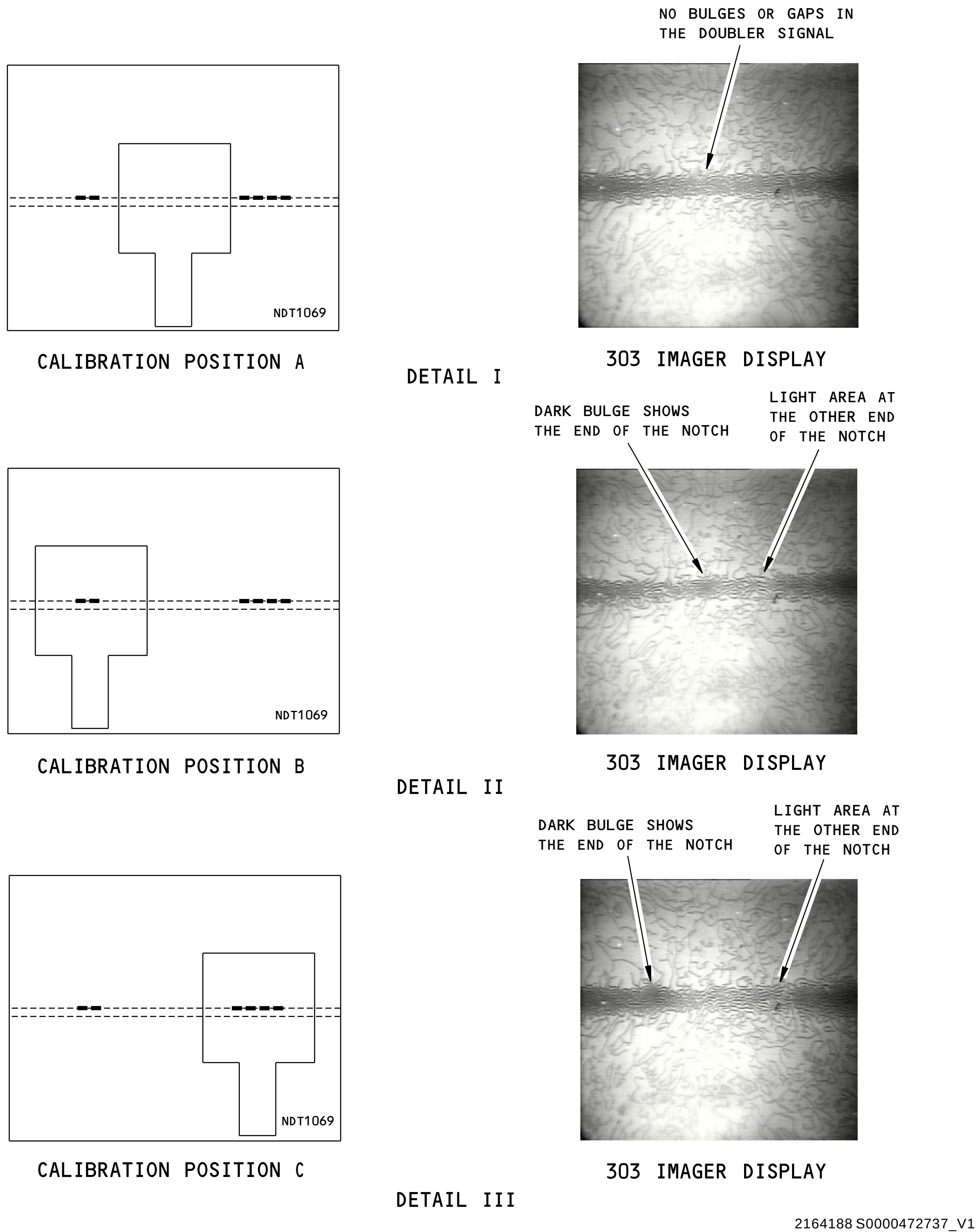
2 EDM NOTCHES:
DEPTH: 50 PERCENT OF SHEET THICKNESS ±0.002 (0.1)
WIDTH: 0.007 (0.18)
LENGTHS: AS SHOWN

- THE TOLERANCE FOR THE DEPTH OF THE EDM NOTCH WAS INITIALLY SPECIFIED TO BE ±0.005 (0.10). IT IS NOT NECESSARY TO REPLACE OR CHANGE A REFERENCE STANDARD THAT HAS AN EDM NOTCH THAT IS WITHIN THIS INITIAL TOLERANCE.

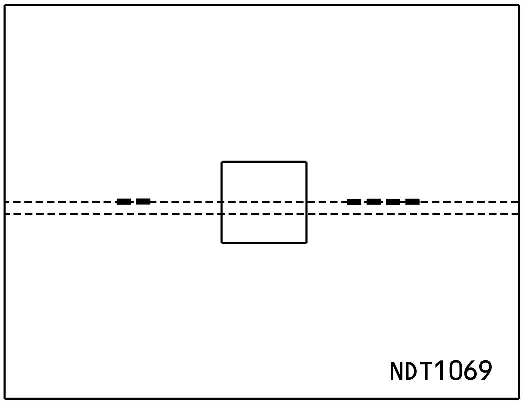
3 BOND 4 RUBBER FEET TO THE REFERENCE STANDARD IN THE APPROXIMATE POSITIONS SHOWN.

2164122 S0000472736_V1

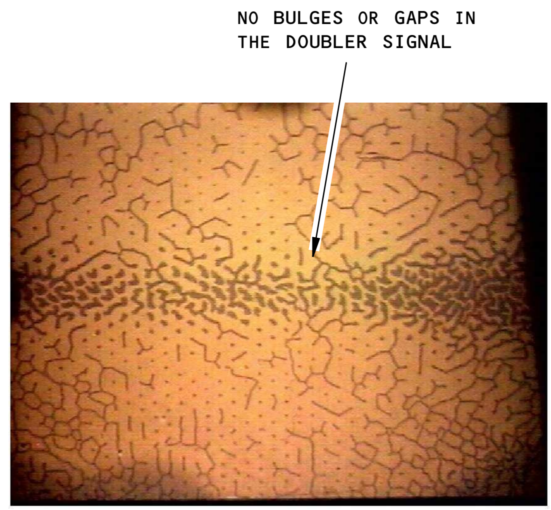
Reference Standard NDT1069
Figure 3 (Sheet 2 of 2)



Calibration Positions and Imager Displays - 303 Imager Display
Figure 4

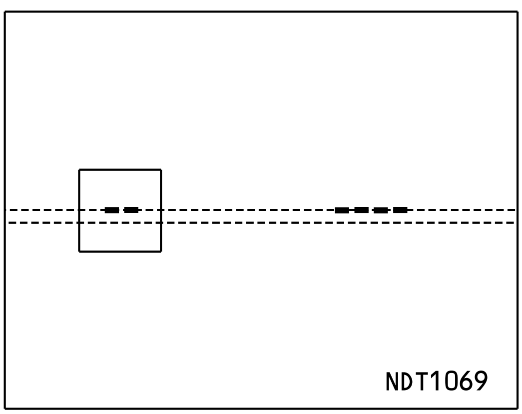


CALIBRATION POSITION A

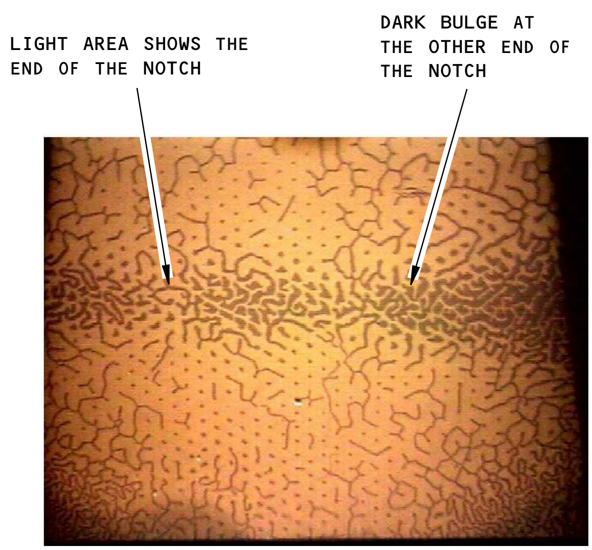


307 IMAGER DISPLAY

DETAIL I



CALIBRATION POSITION B

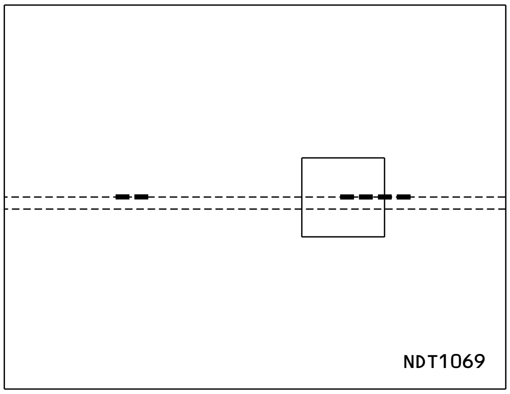


307 IMAGER DISPLAY

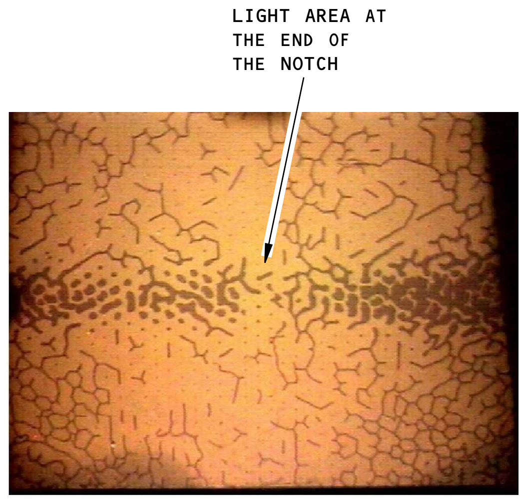
DETAIL II

2164207 S0000472739_V1

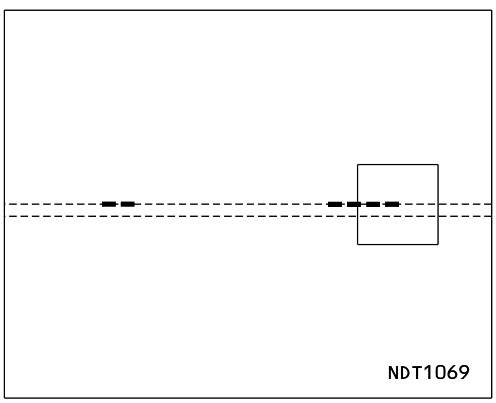
Calibration Positions and Imager Displays - 307 Imager Display
Figure 5 (Sheet 1 of 2)



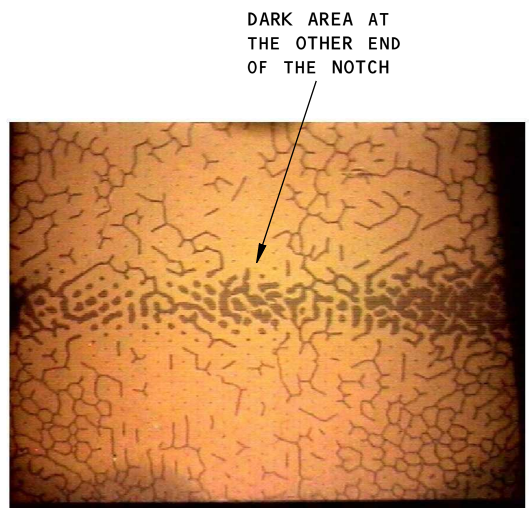
CALIBRATION POSITION C
(IMAGER ABOVE ONE END OF NOTCH)



307 IMAGER DISPLAY



CALIBRATION POSITION C
(IMAGER ABOVE OTHER END OF NOTCH)



307 IMAGER DISPLAY

DETAIL III

NOTE:

- BOTH ENDS OF A LONG NOTCH WILL NOT SHOW AT THE SAME TIME

2164270 S0000472740_V1

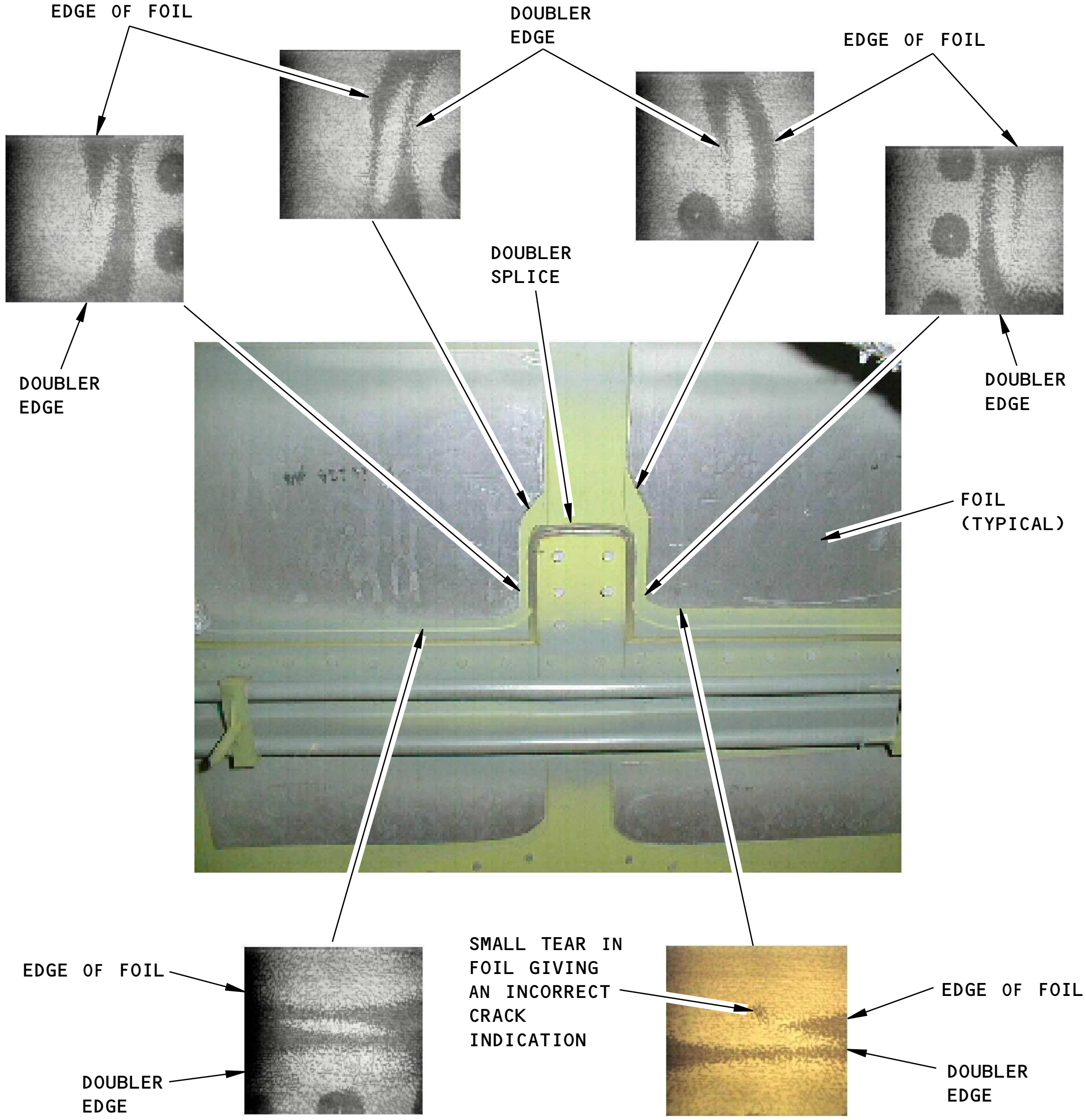
Calibration Positions and Imager Displays - 307 Imager Display
Figure 5 (Sheet 2 of 2)

NOTES:

- THE LAST CALIBRATION STEP IS TO CALIBRATE WITH THE REFERENCE STANDARD IN THE SAME LOCATION AND POSITION AS THE INSPECTION AREA.
- DO NOT PUT THE REFERENCE STANDARD ON THE SKIN. YOU WILL GET AN INCORRECT CALIBRATION BECAUSE OF THE EFFECTS OF THE SKIN.

2164298 S0000472741_V1

Correct Calibration Position (307 Imager is shown)
Figure 6

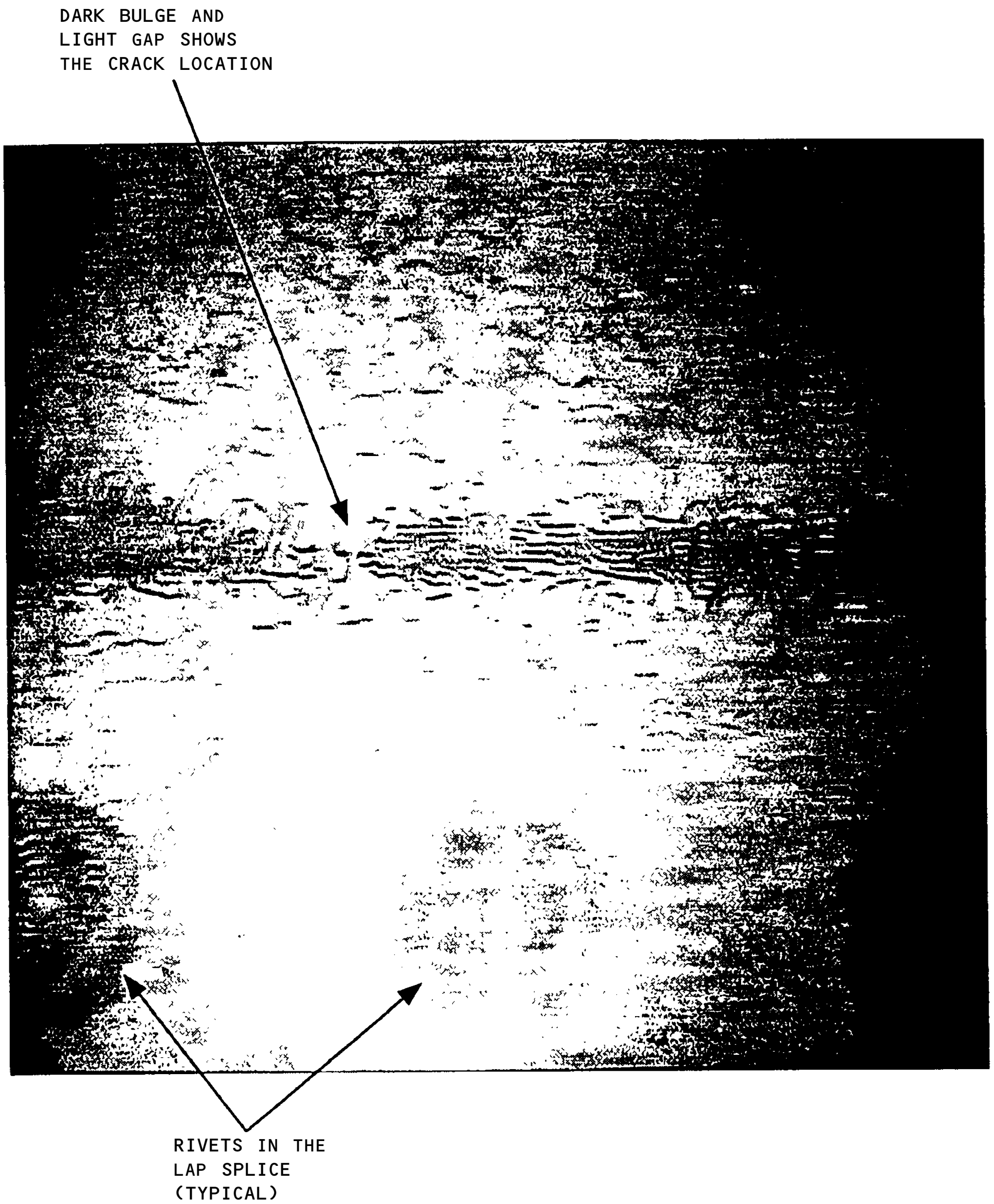


NOTES:

- A FOIL LINER CAN CAUSE SIGNALS IN SOME INSPECTION AREAS.
- TO CORRECTLY IDENTIFY THE SIGNAL FROM THE FOIL LINER EDGE, FOLLOW THE SIGNAL TO THE DOUBLER SPLICE. THE FOIL EDGE SIGNAL WILL BE FARTHER FROM THE SPLICE FASTENERS THAN THE DOUBLER EDGE SIGNAL. YOU CAN ALSO LOOK INSIDE THE FUSELAGE TO SEE THE FOIL.
- A TEAR IN THE FOIL CAN CAUSE A CRACK-TYPE INDICATION. IF YOU ARE NOT SURE THAT THE INDICATION IS IN THE FOIL LINER, EXAMINE THE INDICATION WITH A MID-FREQUENCY SPOT PROBE AS SPECIFIED IN PARAGRAPH 6.C. TEARS IN THE FOIL WILL NOT CAUSE CRACK INDICATIONS WITH THE SPOT PROBE BECAUSE OF THE HIGHER INSPECTION FREQUENCY.

2172514 S0000472742_V1

Correct Signal Identification in Areas with a Foil Liner
Figure 7



Example of a Crack Indication Recorded from an Airplane
Figure 8

PART 6 - EDDY CURRENT

INSPECTION FOR INTERNAL SKIN CRACKS AT DOUBLER EDGES

1. **Purpose**

   A. Use this procedure to find cracks in the internal surface of the skin at the edge of a doubler. This inspection is done from inside the airplane. See Figure 1 for a typical inspection area.

   B. This procedure can find cracks that are behind the doubler edge. These cracks cannot be seen with visual inspection.

   C. This procedure will only find cracks that are fully through the skin.

   D. This procedure uses an instrument with an impedance plane display.

   E. Service Bulletin Reference: 737-53-1065, 737-53-1168, 737-53-1187

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 an eddy current instrument that:

         (a) Has an impedance plane display or a meter display.

         (b) Operates at a frequency of 10 to 100 kHz.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) Phasec 2 (impedance plane display); Hocking Krautkramer

         (b) Nortec 19e, 1000, 2000 (impedance plane display); Staveley Instruments

         (c) Elotest M2 (impedance plane display); Rohman GmbH

   C. Probes

      (1) Use an un-shielded, 0.125 inch (3.17 mm) or 0.187 inch (4.75 mm) diameter, right-angle, pencil probe. Refer to Part 6, 51-00-00, Procedure 4, par. 3.B for data about probe selection.

      (2) All probes that can do the calibration specified in this procedure can be used. The probe that follows was used to help prepare this procedure and it gave satisfactory results:

         (a) NEC-1089 (reflection); NDT Engineering Corp.

   D. Reference Standard

      (1) Use reference standard NDT3050. See Figure 2 for data about the reference standard.

3. **Prepare for the Inspection**

   A. Identify all the inspection areas. Refer to the applicable service bulletin.

   B. Remove all of the internal panels and insulation blankets in the fuselage that prevent access to the inspection areas.

   C. Remove contamination and corrosion inhibiting compounds from the inspection area

CAUTION: DO NOT USE A METAL SCRAPING TOOL TO REMOVE THE FILLET SEALANT. A METAL SCRAPING TOOL CAN CAUSE SCRATCHES THAT COULD BECOME CRACKS.

D. Remove the fillet sealant from the internal doubler edges with a plastic scraping tool.

4. Instrument Calibration

A. Set the frequency to 50 kHz.

B. Put the probe on reference standard NDT3050 at Position 1. See Details I and II in Figure 3.

C. Balance the instrument.

D. Set the balance point in the lower right side of the display, to a position of 20 percent of full screen height.

E. Adjust the instrument for lift-off. Adjust the phase control so that the signal moves horizontally and to the left when the probe is lifted off the reference standard.

F. Set the vertical-to-horizontal gain to a value between 4:1 and 10:1. The vertical gain must be between 12 and 20 dB higher than the horizontal gain.

G. Put the probe on reference standard NDT3050 at Position 2. See Details I and II in Figure 3.

H. Balance the instrument.

I. Move the probe along the edge of the doubler on reference standard NDT3050 until it is centered on the EDM notch. See Position 3 in Details I and II of Figure 3.

J. Adjust the probe to get the maximum signal from the EDM notch.

K. Adjust the instrument gain so that the maximum signal from the notch is 40 percent of the display as shown in Detail III of Figure 3.

L. If the instrument has an alarm, adjust it to alarm for signals that are 50 percent of the height of the EDM notch signal.

5. Inspection Procedure

A. Calibrate the instrument as specified in Paragraph 4.

B. Move the probe along the doubler edges to find cracks in the Figure 1 inspection areas that are specified by the applicable service bulletin.

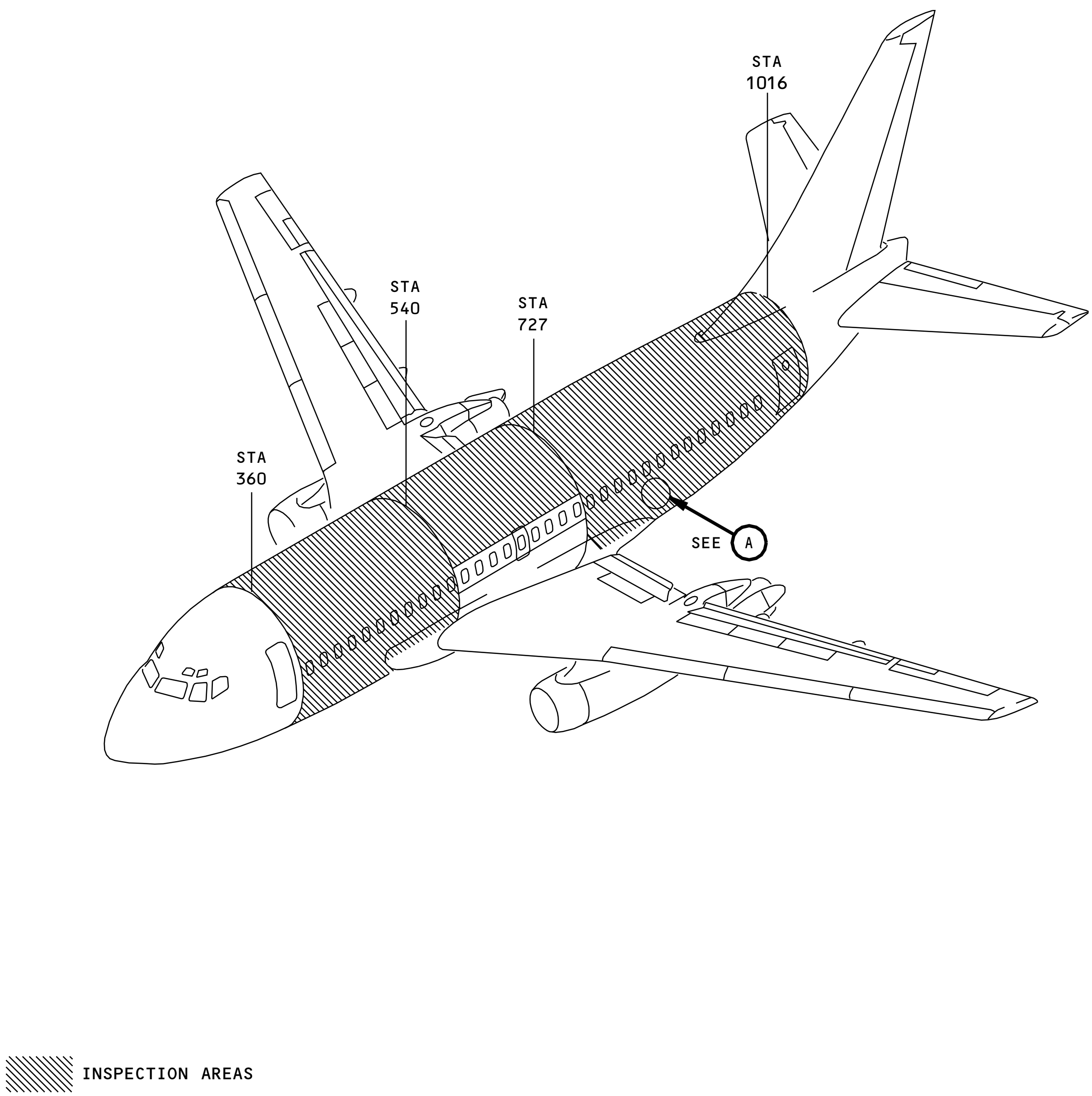
(1) If there is corrosion inhibiting compound or contamination along the doubler edge, remove it before you do an inspection in these areas.

6. Inspection Results

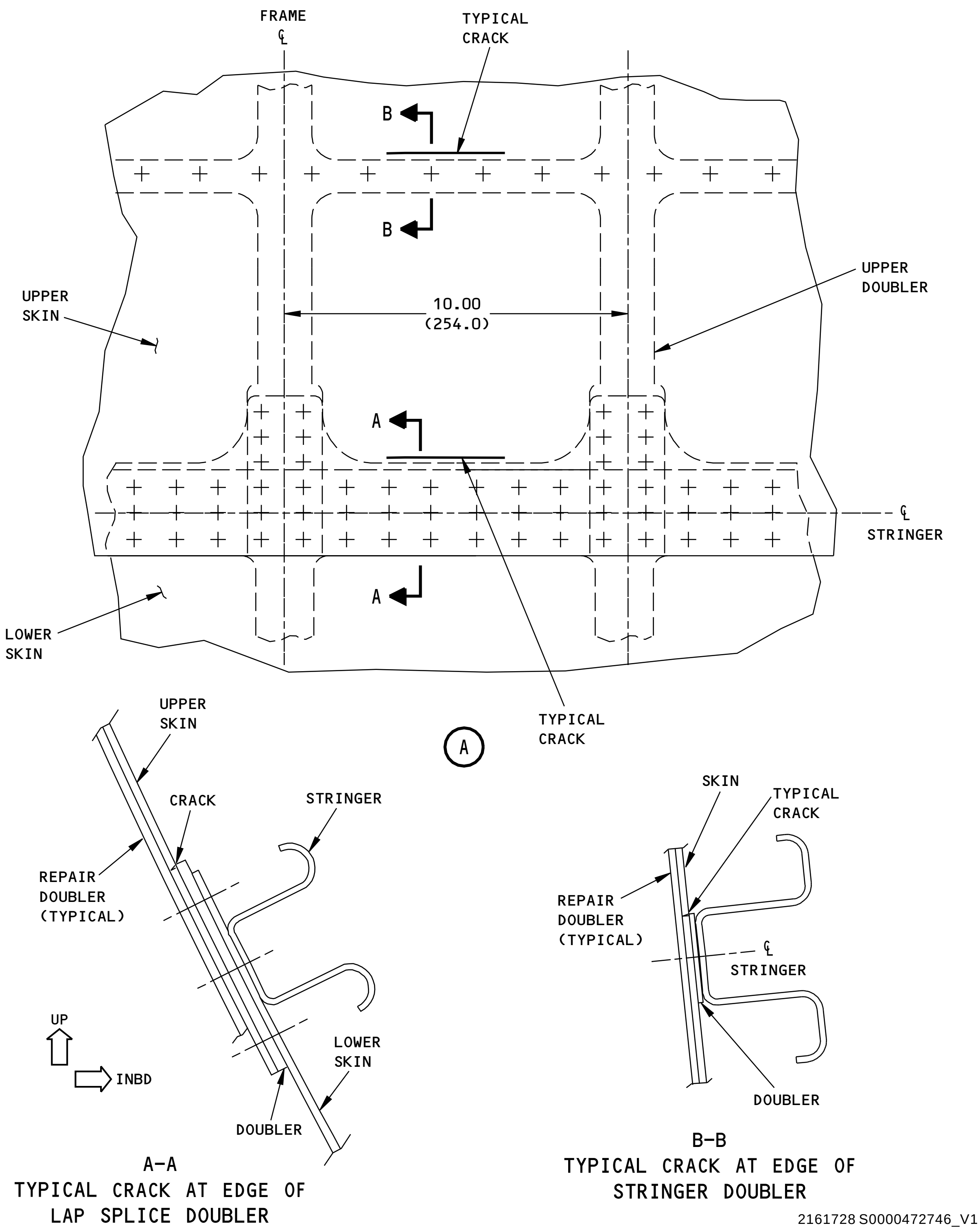
A. As you scan along the doubler edge, signals that are more than 50 percent of the height of the signal you got from the EDM notch on the reference standard are indications of possible cracks and must be examined further. See Figure 4 for an example of an actual crack signal.

NOTE: Crack signals can increase in height slowly while you scan because, for some cracks, the depth of the crack is more at the center than at the ends of the crack.

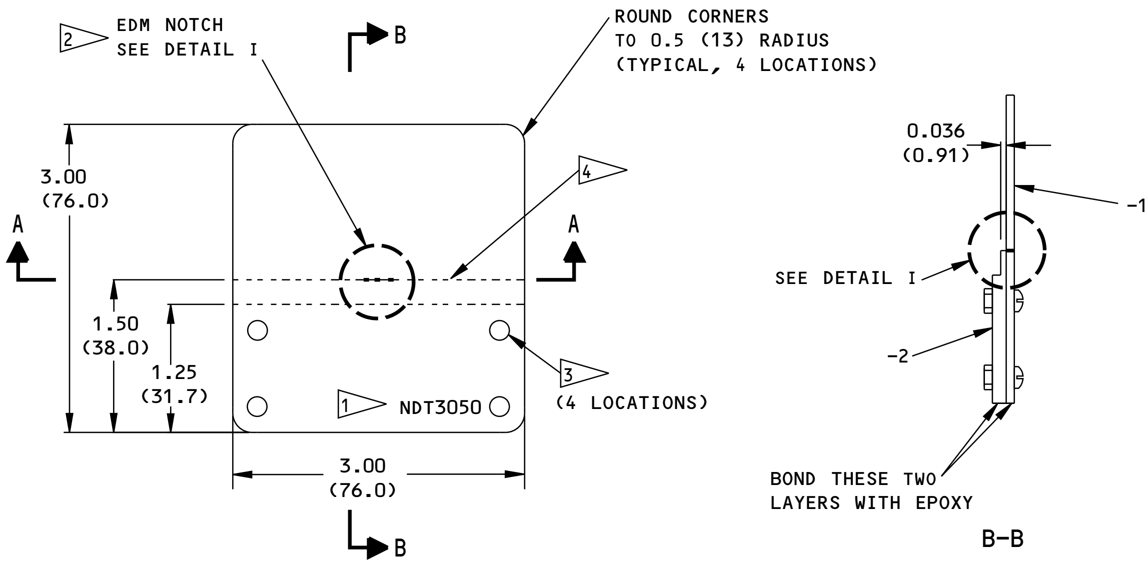
B. Areas that cause crack signals to occur can be examined from the external surface of the airplane; see Part 6, 53-30-18 and Part 6, 53-30-19. These procedures can be used if a repair doubler is not on the outside of the airplane.

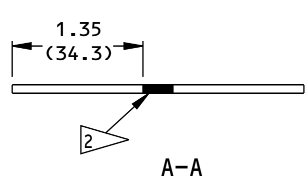


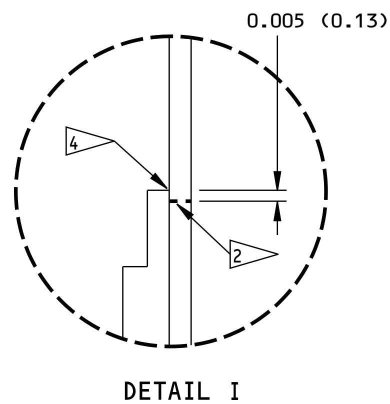
Inspection Areas
Figure 1 (Sheet 1 of 2)



Inspection Areas
Figure 1 (Sheet 2 of 2)







NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES: (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

- SURFACE ROUGHNESS = 125 Ra OR BETTER

MAKE SURE THE -2 PART EDGE IS THE CORRECT DISTANCE FROM THE EDM NOTCH BEFORE THE PARTS ARE ASSEMBLED. USE THE PROCEDURE SPECIFIED BELOW:

1. DRY-ASSEMBLE THE REFERENCE STANDARD AND TIGHTEN THE BOLTS
2. MAKE A SCRIBE LINE ON THE -1 PART AT THE EDGE OF THE -2 PART
3. DISASSEMBLE THE REFERENCE STANDARD AND CUT THE EDM NOTCH 0.005 (0.13) FROM THE SCRIBE LINE (TOLERANCE: +0.003/-0.000 INCHES, +0.08/-0.00 MILLIMETERS)
4. BOND THE -1 AND -2 PARTS WITH EPOXY AND USE THE BOLTS TO POSITION THE PARTS.

MATERIAL: 2024-T3 ALUMINUM; CLAD OR BARE
-1 0.040 (1.0)
-2 0.080 (2.0)

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT3050

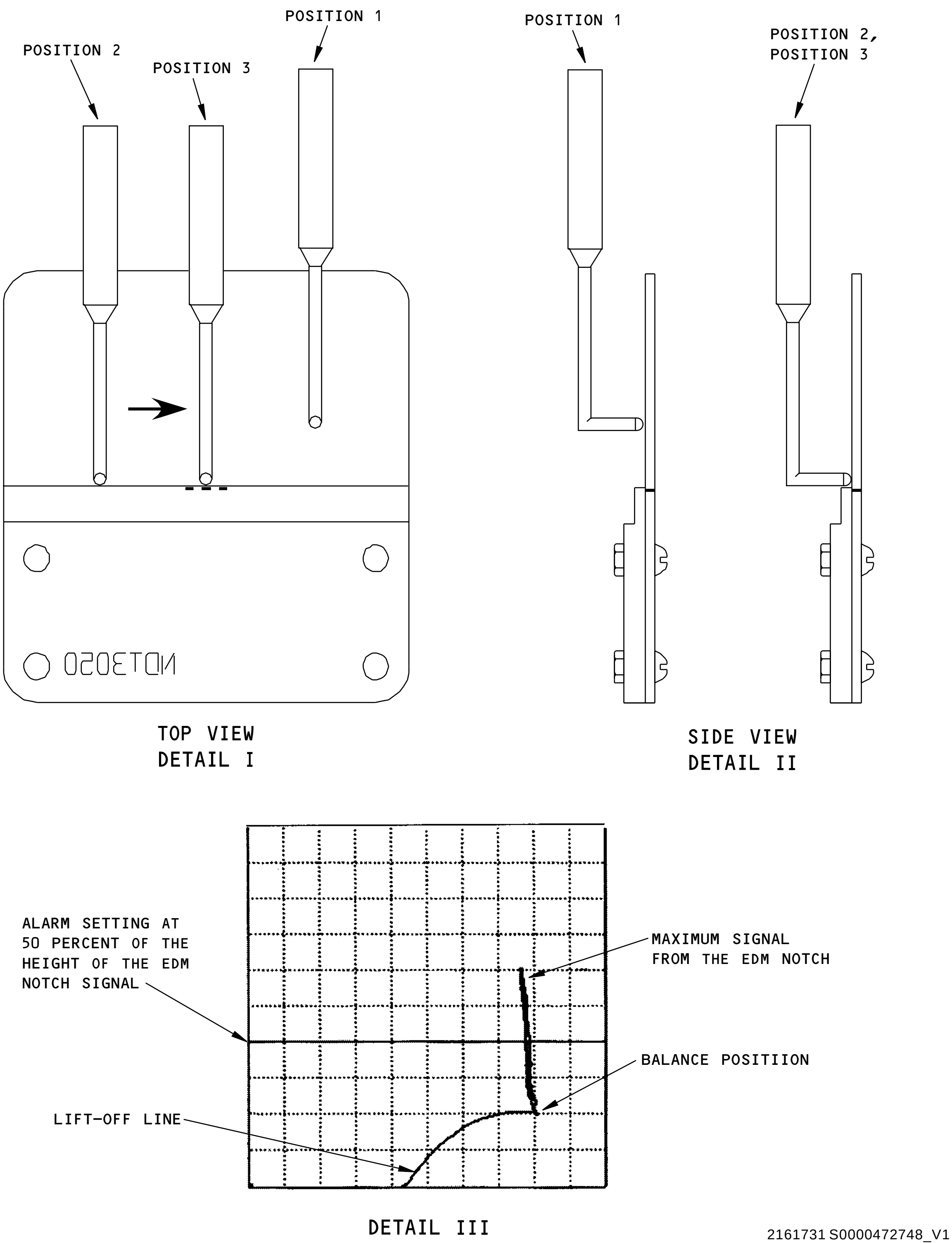
2 EDM NOTCH:
DEPTH: THROUGH THE THICKNESS
WIDTH: 0.007 (0.18)
LENGTH: 0.30 (7.6)

3 DRILL HOLES FOR 3/16 (5) OR 1/4 (6) DIAMETER FASTENERS IN THE APPROXIMATE LOCATIONS SHOWN TO POSITION THE TWO PARTS.

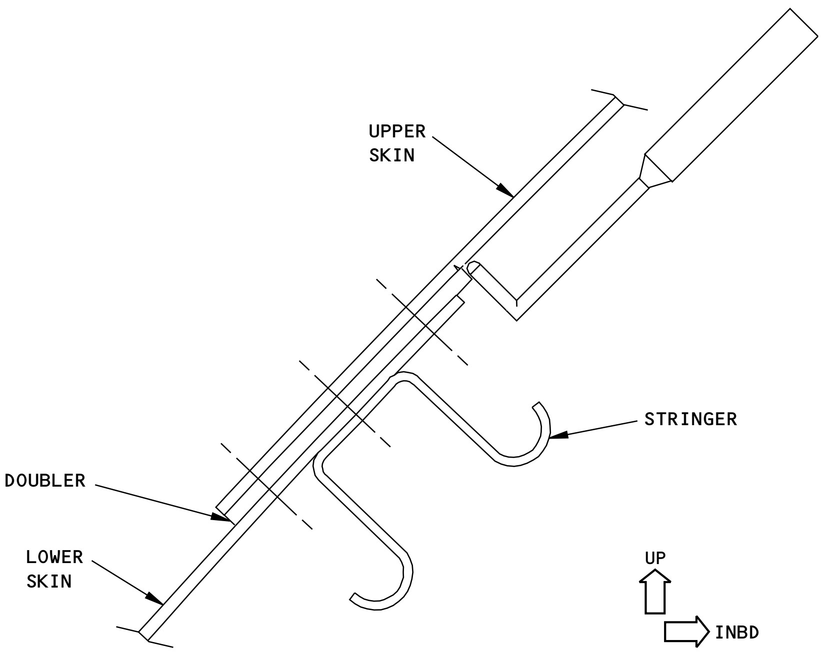
4 REMOVE EPOXY THAT COMES OUT FROM UNDER THIS EDGE WHEN THE LAYERS ARE FASTENED TOGETHER.

2161730 S0000472747_V1

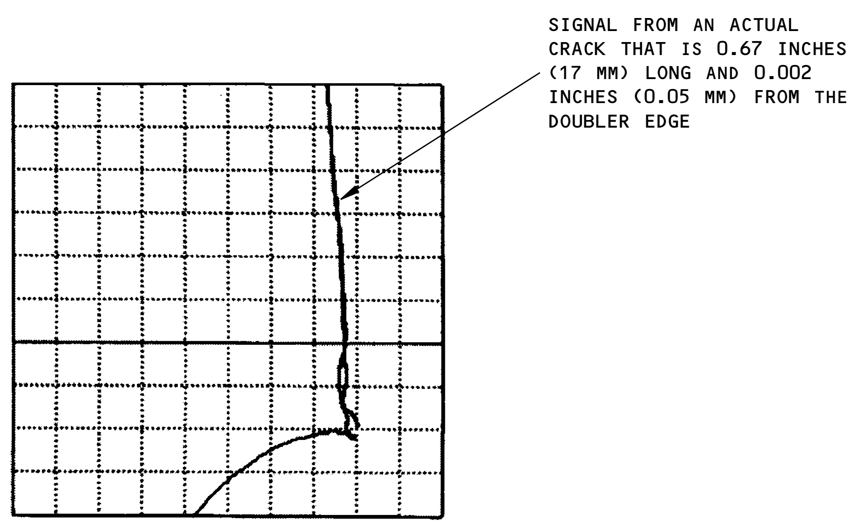
Reference Standard NDT3050
Figure 2



Calibration Positions
Figure 3



CRACK LOCATION



CRACK SIGNAL

2161735 S0000472749_V1

Crack Signal Display
Figure 4

PART 6 - EDDY CURRENT

FUSELAGE LAP SPLICES - SLIDING PROBE INSPECTION TO IDENTIFY ALODINED RIVETS

1. **Purpose**

   A. Use this procedure to find Alodined rivets installed in fuselage longitudinal lap splices. These rivets have a conductive coating unlike anodized rivets used in older airplanes. See Figure 1 for the inspection areas.

   B. This procedure uses a sliding probe and an impedance plane display instrument.

   C. The probe must be accurately aligned with the fastener centerline to do this procedure correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

   D. Service Bulletin Reference: 737-53A1177, 737-53A1255

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 an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates in the frequency range of 20 to 50 kHz

      (2) The instruments specified below were used to help prepare this procedure.

         (a) Nortec 19e, 1000, 2000; Staveley Instruments

         (b) Phasec 2200, 2; Hocking/Krautkramer

   C. Probe

      (1) Use a reflection sliding probe that operates in the frequency range of 20 kHz to 50 kHz.

      (2) The probe specified below was used to help prepare this procedure and is the recommended probe to use. If you use a different probe, make sure that it can cause fastener hole signals to look almost the same as shown in Figure 3.

         (a) NEC 4039; NDT Engineering Corporation

   D. Reference Standard

      (1) Use reference standard NDT3053 as specified in Figure 2. You can make this reference standard or get one from a reference standard manufacturer.

   E. Probe Guide – All nonconductive, flexible materials that can follow the contours of the airplane can be used as a straightedge for this inspection.

   F. Nonconductive Shim – use a nonconductive material that is 0.020 inches (0.51 mm) thick to set the lift-off signal on the instrument screen display.

3. **Prepare for the Inspection**

   A. Identify all the inspection areas. See Figure 1.

B. If the rivet heads can not be seen because of thick paint, remove the paint.

C. If the rivet heads can not be seen because of a decal, remove the decal or use the probe scan procedure specified in Part 6, 53-30-00, Procedure 8.

4. **Instrument Calibration**

A. Set the instrument frequency to 30 kHz.

B. Set the vertical to horizontal gain ratio to 2:1; an increase of 6 dB of vertical gain higher than the horizontal gain.

C. If the airplane has more than 0.010 inches (0.25 mm) of paint, put a nonconductive shim that is equal to the thickness of the paint, ± 0.003 inches (0.08 mm), on the reference standard.

D. Put the probe on the reference standard at position 1 (to do the inspections of 5/32 diameter fastener holes) as shown in Detail I of Figure 3. To calibrate the instrument to examine 3/16 diameter fastener holes, put the probe on the row of 3/16 diameter fastener holes adjacent to position 1. Make sure that the probe is centered between the fastener holes and the centerline is aligned with the center of the rivet row.

E. Put the probe guide on the reference standard in the position shown in Detail I of Figure 3 to calibrate for 5/32 diameter fastener holes. Put the probe guide above the row of 3/16 diameter fasteners to calibrate on those fastener holes.

F. Balance the instrument.

G. Adjust the balance point to 80 percent of full screen width (FSW) and 20 percent of full screen height (FSH) (see Detail II in Figure 3).

H. Set the lift-off signal as follows:

(1) Adjust the instrument phase control as necessary to get the signal to go from left to right of the screen.

(2) Put the 0.020 inch (0.5 mm) shim between the probe and the reference standard.

(3) Adjust the gain and phase control, as necessary, to set the dot at the same vertical height (20% FSH) as the original balance point (zero lift-off). See Detail II in Figure 3.

I. Move the probe along the applicable fastener row to position 2 as shown in Detail I of Figure 3.

J. Adjust the instrument gain, as necessary, to set the end point of the signal to 20 percent FSW as shown in Detail II of Figure 3. If necessary, adjust the phase control to make sure the lift-off signal has changed from that set in Paragraph 4.H.(3).

K. Identify the probe direction that gives the smaller fastener signal as follows:

NOTE: Some sliding probes are sensitive to probe direction when a scan is made.

(1) Put the probe on the applicable fastener row of the reference standard at position 1 as shown in Detail I of Figure 3.

(2) Move the probe across the applicable fastener row to position 2 as shown in Detail I of Figure 3.

(3) Turn the probe 180 degrees and do Paragraph 4.K.(1) and Paragraph 4.K.(2) again to identify the direction of probe movement that results in the smaller signal.

(4) Mark an arrow on the probe in the direction that caused the smallest signal.

(5) Move the probe in the direction of the arrow during calibration and inspection.

L. Set an alarm so that a signal that falls from 0 to 30 percent of full screen width (the left half of the screen) causes the alarm to sound.

5. **Inspection Procedure**

A. Put the probe on the lap splice with the center of the probe between two fasteners and align the probe so that the centerline of the probe will follow the center of the row of fasteners.

NOTE: Use the probe guide to help keep the centerline of the probe aligned with the center of the fastener row.

B. Balance the instrument. Do not adjust the gain.

C. Move the probe slowly along the row of fasteners and monitor the instrument display at the same time. Make sure that the centerline of the probe will move across the center of the fasteners. During the inspection:

(1) Make a mark at fastener locations where the fastener signal does not cross the alarm threshold to the left half of the screen.

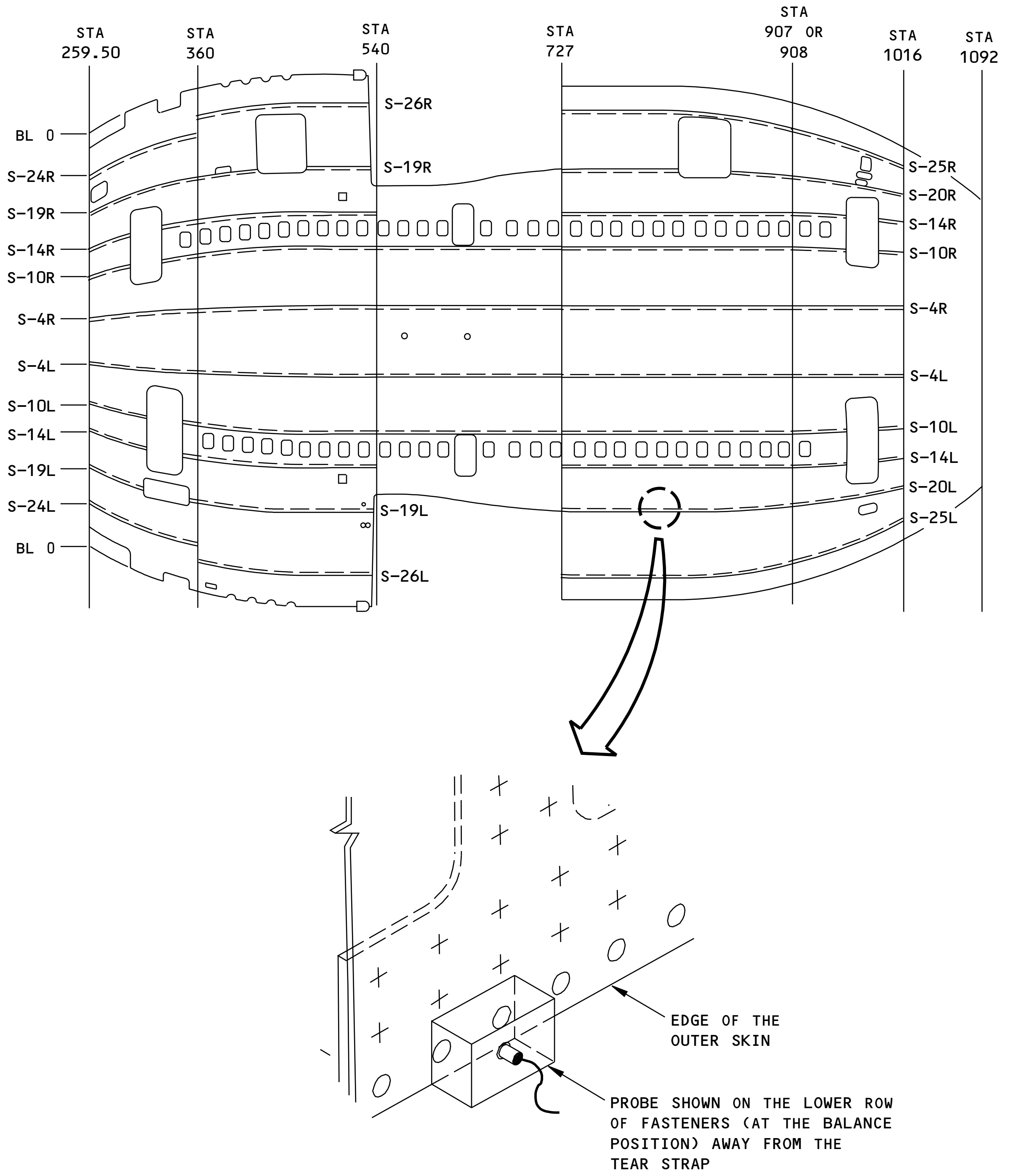
(2) Make a mark on fastener(s) that are not aligned with the fastener row. Go back to these fasteners and do the inspection again with the probe correctly aligned.

6. **Inspection Results**

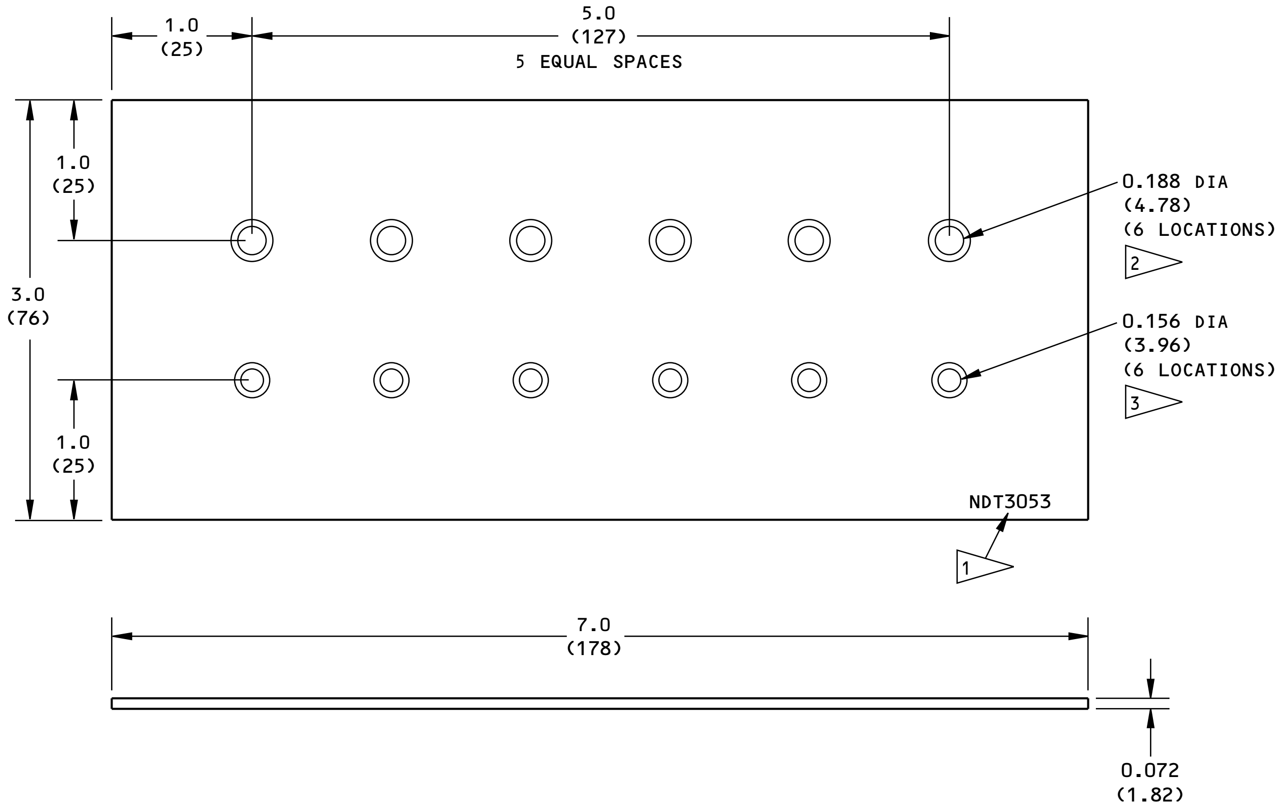
A. Fastener signals that do not cross the alarm bar on the left half of the screen are signs of an Alodined rivet. The alarm will not sound when you cross these fasteners with the sliding probe. See Figure 4 for examples of typical signals from alodined and anodized rivets.

B. Some fasteners will cause unusual signals but still cross the alarm bar. Do not reject these fasteners. Some Alodined rivets will cause large signals if they have poor contact with the countersink. This procedure cannot identify this type of fastener but will find most Alodined rivets.

C. If Alodine rivets are found at 5 or more locations in one frame bay or at 20 or more locations in one lap joint section (butt joint to butt joint), then an internal inspection of the lap joint as specified in Service Bulletin 737-53A1255, Figure 1, is recommended 10 inches forward and 10 inches aft of the Alodine rivets.



Typical Inspection Areas - External Inspection
Figure 1



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES).
- TOLERANCES (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

- SURFACE ROUGHNESS = 125 Ra OR BETTER.
- THIS REFERENCE STANDARD CONTAINS NO FASTENERS
- MATERIAL: 2024-T3 ALUMINUM; CLAD

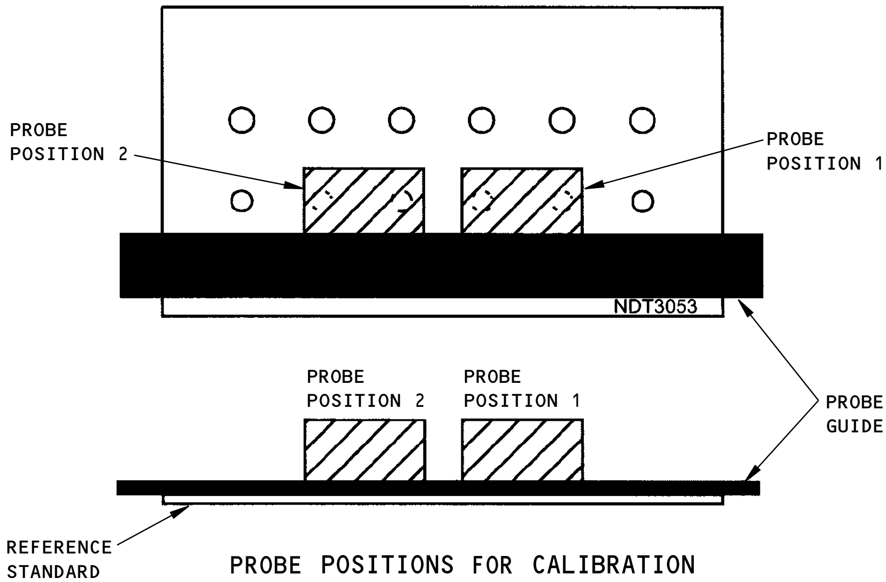
1 ETCH OR STEEL STAMP REFERENCE STANDARD NUMBER NDT3053.

2 COUNTERSINK THE HOLE TO A BACR15CE RIVET (100 DEGREE COUNTERSINK), TO A DEPTH OF 0.048 (1.22)

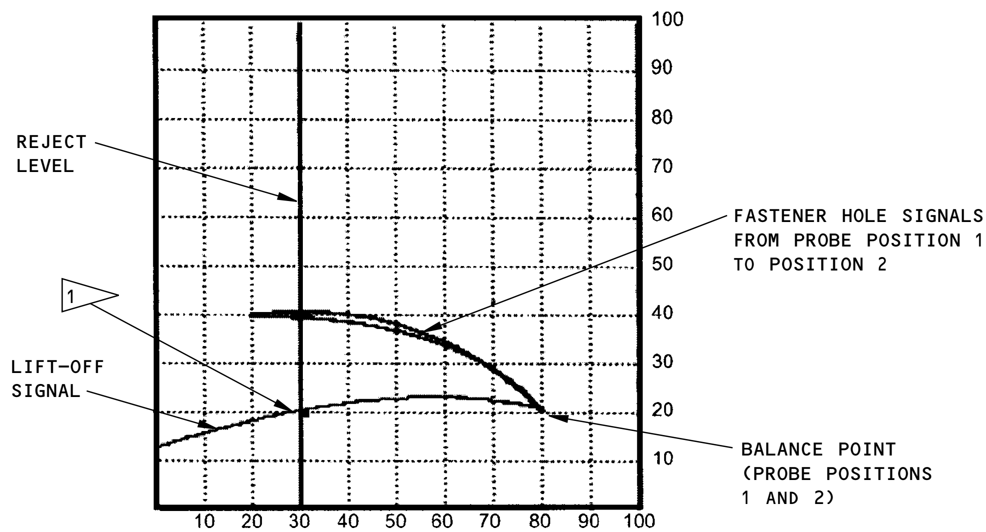
3 COUNTERSINK THE HOLE TO A BACR15CE RIVET (100 DEGREE COUNTERSINK), TO A DEPTH OF 0.039 (1.00)

2161745 S0000472752_V1

Reference Standard NDT3053
Figure 2



PROBE POSITIONS FOR CALIBRATION
DETAIL I



SCREEN DISPLAY OF TYPICAL FASTENER
HOLE SIGNALS FROM THE REFERENCE STANDARD
DETAIL II

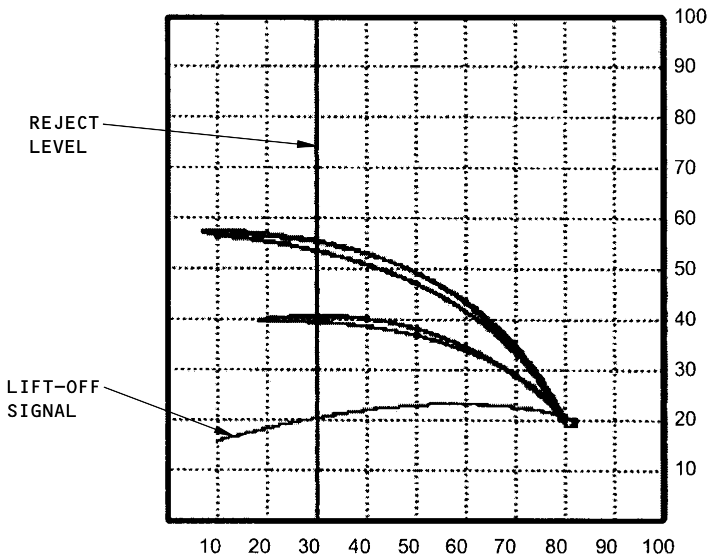
NOTES:

- THE PROBE POSITIONS SHOWN ARE SET ON THE ROW OF 5/32 FASTENER HOLES TO SHOW THE TYPICAL PROBE POSITIONS USED FOR CALIBRATION. USE THE UPPER ROW OF 3/16 FASTENER HOLES TO CALIBRATE FOR 3/16 FASTENERS.
- THE SCREEN DISPLAY SHOWN IN DETAIL II IS AN EXAMPLE OF FASTENER HOLE SIGNALS WITH THE VERTICAL GAIN SET TO 6 DB HIGHER THAN THE HORIZONTAL GAIN (2:1 VERTICAL-TO- HORIZONTAL RATIO). FASTENER SIGNALS CAN LOOK DIFFERENT WITH OTHER INSTRUMENT/PROBE COMBINATIONS.

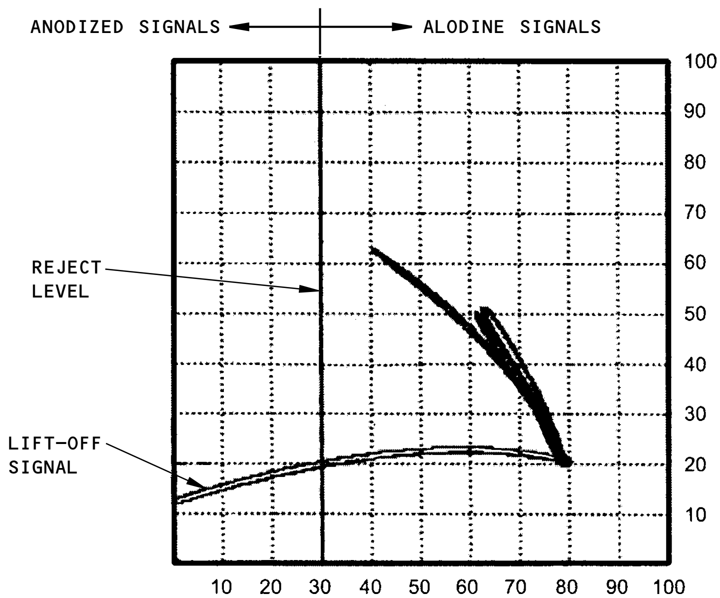
1 DOT POSITION ALONG THE LIFT-OFF SIGNAL WITH THE PROBE LIFT-OFF OF 0.020 INCH (0.51 MM).

2161746 S0000472753_V1

Instrument Calibration
Figure 3



NUMEROUS ANODIZED FASTENER SIGNALS
DETAIL I



NUMEROUS ALODINE FASTENER SIGNALS
DETAIL II

NOTES:

- THE SIGNALS FROM ANODIZED FASTENERS SHOWN IN DETAIL I OCCUR WITH THE SAME PATTERN; THIS IS TYPICAL OF ANODIZED FASTENERS. THE SIGNALS FROM ALODINE FASTENERS CAN GIVE A DIFFERENT PATTERN BETWEEN FASTENERS.

2161747 S0000472754_V1

Signals from Anodized and Alodined Fasteners
Figure 4

PART 6 - EDDY CURRENT

FUSELAGE SKIN SCRIBE LINE CRACK INSPECTION - LOWER SKIN AT THE EDGES OF LAP JOINTS, EXTERNAL DOUBLERS AND STRUCTURE

1. **Purpose**

A. Use this surface inspection procedure to find cracks in the lower skin panels of the fuselage at the lap joints. This procedure looks for cracks that can occur from scribe lines on the outside surface of the skin. This procedure looks for cracks in the lower skin panels that are:

(1) 0.200 inch (5.08 mm) long (or more).

(2) Are in the forward and aft direction.

B. This procedure can also be used to find cracks in fuselage skins at the edges of external doublers.

C. This is a high frequency eddy current (HFEC) inspection.

D. The inspection area to examine is an area that begins at the edge of the upper skin of the lap joint or external doubler and extends to 0.063 inch (1.60 mm) from the edge. See Figure 1 for the inspection area.

E. This inspection uses three specially designed, optional probes on the outside surface of the lower skin.

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 an eddy current instrument that:

(a) Operates at a frequency from 50 to 70 kHz.

(b) Has an impedance plane display.

(2) The instruments that follow were used to help prepare this procedure.

(a) Phasec 2200, Phasec 2; Hocking

(b) Elotest B1; Rohmann GmbH

(c) Nortec 1000/2000; Staveley Instruments

C. Probe

(1) The probes that follow can be used to do inspections at the edges of aluminum structure.

(a) SPC-345, which is made by EC/NDT. This is a sliding probe that is specially designed to do this procedure on all areas but the butt joint gaps and areas with steel doublers.

(b) NEC-1006, which is made by NDT Engineering Corp. This is a specially designed, right angle, shielded, pencil probe that can be used as an alternative to the sliding probe. This pencil probe can be used to examine all areas but the edges of steel structure.

(2) Use a specially designed sliding probe, SPC-520B (0.125 inch (3.18 mm) wide), to do inspections at the edges of steel structure.

D. Reference Standard

(1) Use reference standard NDT3065 to calibrate for inspections at the edge of aluminum structure. See Figure 2.

(2) Use reference standard NDT3065-STL to calibrate for inspections at the edge of steel structure. See Figure 3.

3. Prepare for the Inspection

CAUTION: REMOVE SEALANT CAREFULLY TO PREVENT DAMAGE TO THE SURFACE OF THE SKIN. SEE THE STANDARD OVERHAUL PRACTICES MANUAL (SOPM) FOR MORE INSTRUCTIONS IF NECESSARY.

A. Remove the sealant from the inspection surface at the lower skin of the lap joint and doubler edges before inspection.

B. Service experience has shown that crack indications can be missed because of human-factors such as:

- Not fully understanding the inspection procedures.
- Incorrect or defective NDT reference standards.
- Incorrect equipment set-up and calibration before the inspection.
- Incorrect monitoring of the NDT instrument display.
- Not sufficient time permitted to do the inspections.
- Not sufficient access to the inspection areas.
- Incorrect records made of areas not examined or remaining to be examined because of work shift changes or breaks during the inspection that result in areas missed.
- Incorrect records made of inspection results.

Take steps to make sure that the human factors specified above, as well as other human factors, do not occur during this inspection.

C. Get sufficient access to the inspection area. The inspector must keep the probe in touch with the inspection surface at the correct angle.

4. Instrument Calibration

A. Set the instrument frequency to 50 to 70 kHz.

B. Set the vertical gain 12 to 16 dB higher than the horizontal gain.

C. If the inspection area is painted, put a nonconductive shim on the reference standard (See NOTE). The thickness of the shim must be equivalent (±0.003 inch (0.08 mm)) to the paint thickness on the inspection area.

NOTE: Use reference standard NDT3065 to do this procedure at lap joints and aluminum doublers. Use NDT3065-STL to do this procedure at the edges of 301 (1/2 hard) CRES doublers.

D. Put a piece of thin tape on the tip of the probe to prevent scratches to the surface.

E. Put the probe on the inspection surface (lower piece) of reference standard NDT3065 or NDT3065-STL between notch locations identified as “A” and “B”. See Detail I in Figure 4 for probe NEC-1006, Detail III for probe SPC-345 and Detail IV for probe SPC-520B. Make sure the side of the SPC-345 probe that has the line is against the edge of the reference standard. Make sure the line on the side of the SPC-520B probe is aligned as shown in Figure 4, flagnote 3.

NOTE: Only the SPC-345 and SPC-520B probes have a line. The line on the probe identifies the eddy current coil location.

F. Make sure the probe is against the edge of the upper piece and is perpendicular to the inspection surface at all times during the calibration.

G. Balance the instrument.

H. Set the instrument balance point to the lower center area of the screen display as shown in Detail II in Figure 4 for SPC-345 and NEC-1006 probes and Detail V for SPC-520B probes.

I. Lift the probe off the surface and adjust the instrument phase control to get the lift-off signal to move horizontally from right to left. Make sure the probe is against the top piece during the lift-off adjustment.

J. Move the probe across the notch identified as “B” in the reference standard.

K. Find the probe position on the notch that gives the maximum signal height and adjust the instrument gain to get the signal to 40% of full screen height (FSH) higher than the balance point. See Detail II in Figure 4 for SPC-345 and NEC-1006 probes and Detail V for SPC-520B probes.

L. For probe NEC-1006, turn the probe 180 degrees and do Paragraph 4.J. and Paragraph 4.K. again. If the signal is less than 40% of FSH, do the calibration again. If there is a difference in the signal heights when the probe is turned, make sure you position the probe for calibration that gives the lowest signal. Use the same probe position to do the scan inspection on the airplane that you used during the calibration.

M. For SPC-345 and NEC-1006 probes, set the audible alarm to 50% of the signal height (20% of FSH higher than the balance point) as shown in Detail II in Figure 4. For SPC-520B probes, set the alarm level to 70% of FSH as shown in Detail V in Figure 4.

N. Move the probe across the notch in the reference standard to find the maximum scan speed. The speed is too fast if the signal decreases more than 10% of the signal height or the alarm does not operate.

O. Move the probe across the notch identified as ”A” and monitor the signal. The signal must be equal to or more than the signal from notch “B”.

P. The EDM notches identified as “C” and “D” are not used for this inspection procedure.

5. Inspection Procedure

A. Calibrate as specified in Paragraph 4.

B. Put the probe against the edge of the upper skin of the lap splice or external doubler at a location where there is no visible scribe line and balance the instrument. See Figure 1 for a typical probe position. For the SPC-345 or SPC-520B probes, make sure the side of the probe that has a line is aligned with the edge of the structure as shown in Figure 1. If there is no location on the skin panel to be examined where there is no visible scribe line, do the steps that follow:

NOTE: Only the SPC-345 and SPC-520B probes have a line. The line on the probe identifies the eddy current coil location.

(1) Put the probe approximately 0.50 inch (13 mm) away from the edge of the upper skin or doubler.

(2) Balance the instrument.

(3) Move the probe to the edge of the upper skin or doubler and monitor the signal on the screen display.

(a) If the signal does not move in the upward direction, balance the instrument again and go to Paragraph 5.C. Use this location to balance the instrument when you examine the skin panel.

(b) If the signal moves in the upward direction as the probe is moved to the edge of the upper skin or doubler, do Paragraph 5.B.(1) thru Paragraph 5.B.(3) again at a different location. Continue to do Paragraph 5.B.(1) thru Paragraph 5.B.(3) until the signal does not move in the upward direction. If there is no location where the signal does not move in the upward direction as the probe is moved toward the edge of the skin or doubler, use a balance point that is away from the skin edge when you examine the skin panel.

C. Keep the probe against the edge of the upper skin of the lap splice or the external doubler and perpendicular to the surface at all times during the inspection scan.

D. Make a scan of the areas specified by the applicable service bulletin or inspection instructions.

E. Move the probe to do a scan at all visual scribe lines found that are 1.0 inch (25 mm) or less from the edge of the lap joint or external doubler.

6. Inspection Results

A. When the SPC-345 or NEC-1006 probes are used, signals that are 20% of FSH (or higher) than the balance point, are possible crack indications. When the SPC-520B probe is used, signals that are 40% of FSH (or higher) than the balance point, are possible crack indications. Make a mark on the skin surface of all possible crack indications with a grease pencil, felt pen or wax pencil.

B. Compare the signal that occurs during the inspection to the signal you got from the notch in the reference standard.

C. Do more analysis of signals that are possible cracks as follows:

(1) Put the probe on the lower skin, away from the area of the possible crack and approximately 0.50 inch (13 mm) away from the edge of the upper skin.

(2) Balance the instrument.

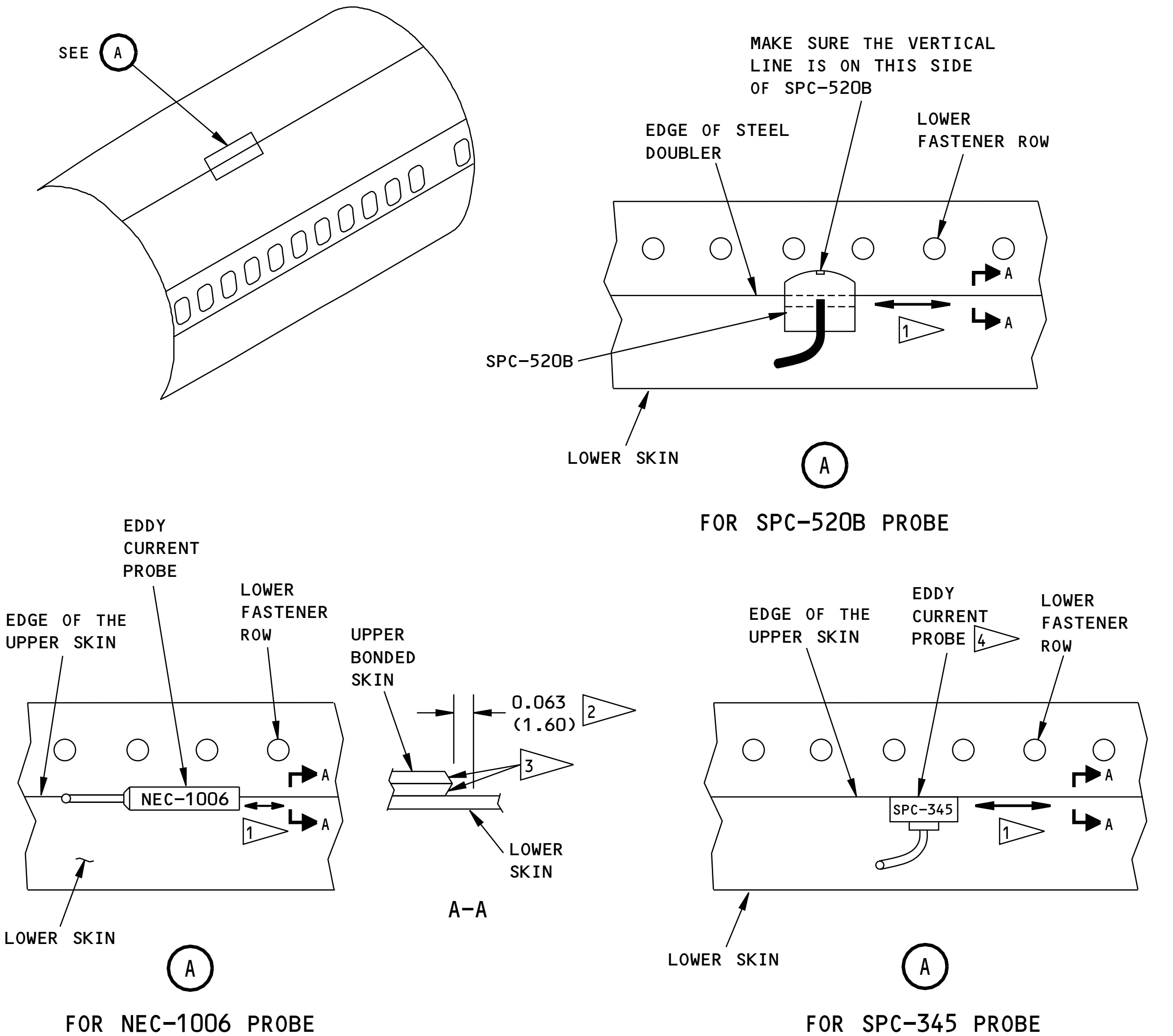
(3) Move the probe to the edge of the upper skin in an area away from the possible crack location and monitor the signal on the screen display. The edge of the upper skin will cause the signal (edge effect) to go in the downward direction from the balance point.

(4) Move the probe to and from the edge of the upper skin as you move the probe into the area of the possible crack signal and monitor the signal on the screen display. A possible crack will cause the signal to go in the upward direction.

D. If the crack indication is at a scribe line that is 0.063 inch (1.60 mm) or less below the edge of the upper skin, do an ultrasonic phased array inspection to make sure there is a crack. Refer to Part 4, 53-30-06.

(1) If a crack indication occurs during the phased array inspection, refer to the applicable Service Bulletin for instructions. If a crack indication does not occur during the phased array inspection, accept the eddy current crack indication as false.

NOTE: False eddy current indications can be caused by a decrease in the conductive clad material.



NOTES:

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)

1. POSSIBLE CRACK DIRECTION IN THE LOWER SKIN.
2. APPROXIMATE INSPECTION AREA.
3. CHAMFER LOCATION, SIZE AND SHAPE CAN BE DIFFERENT
4. MAKE SURE THE VERTICAL LINE ON THE SPC-345 PROBE IS AGAINST THE EDGE OF THE UPPER SKIN.

PROBE ON THE LOWER SKIN OF THE LAP SPLICE

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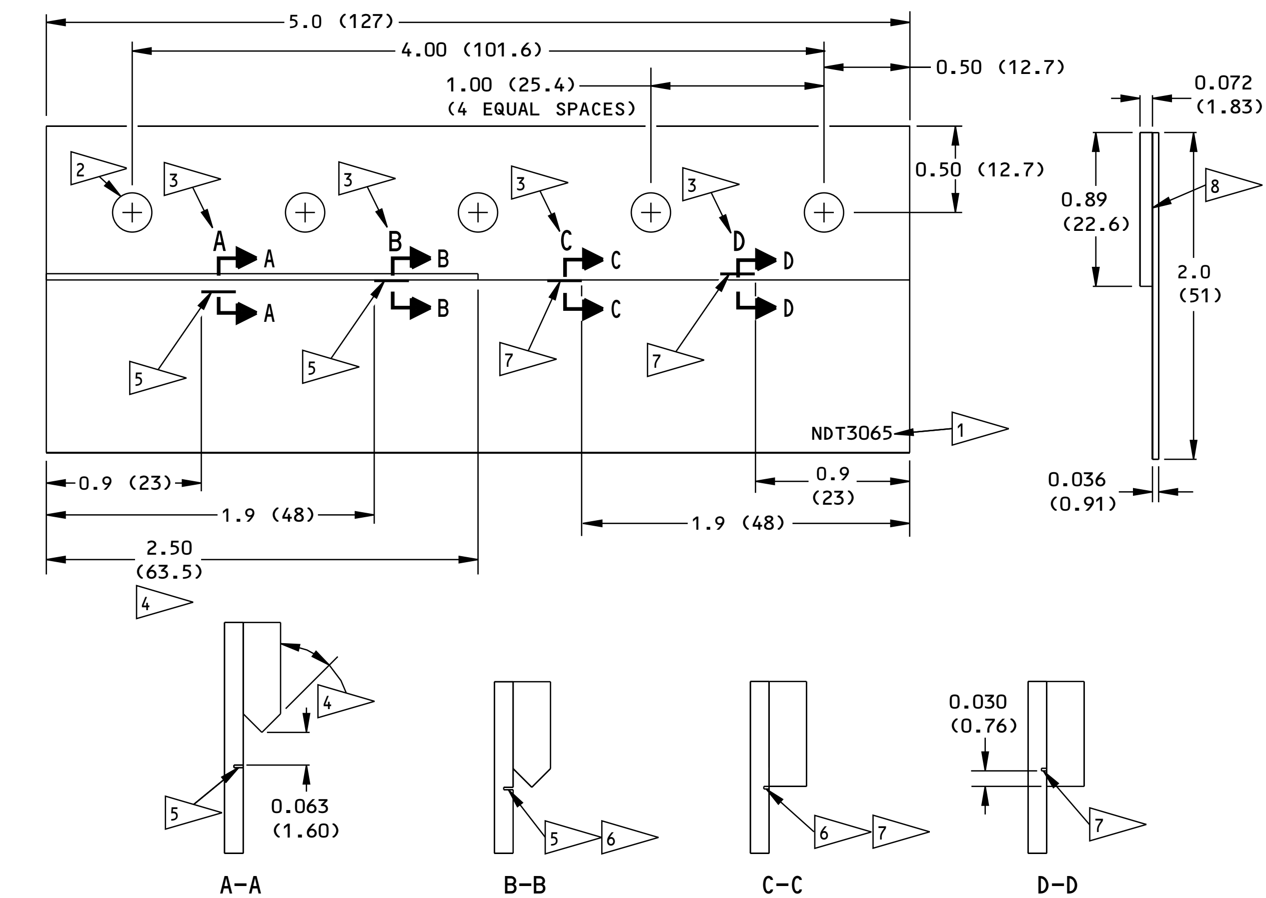
Inspection Areas
Figure 1



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS: 63 Ra OR BETTER
- MATERIAL: ALUMINUM (CLAD OR BARE)

1. ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT3065
2. BACR15CE5D4 OR BACR15GF5D4 (5 LOCATIONS).
3. ETCH OR SCRIBE THE LETTER ON THE SURFACE OF THE TOP PIECE TO IDENTIFY THE LOCATION OF THE EDM NOTCH AND THE PROBE POSITION FOR THE INSTRUMENT CALIBRATION.
4. 45 DEGREE DOUBLE BEVEL WITH THE END OF THE BEVEL AT THE CENTER OF THE THICKNESS OF THE PIECE.
5. EDM NOTCH:
   LENGTH: 0.200 (5.08) ±0.010 (0.25)
   DEPTH: 0.018 (0.46) ±0.002 (0.05)
   WIDTH: 0.005 (0.13) ±0.002 (0.05)
6. PUT THE EDM NOTCH FLUSH (±0.005 (0.13)) WITH THE END OF THE BEVEL AS SHOWN IN SECTION B-B AND FLUSH (±0.005 (0.13)) WITH THE END OF THE SQUARE EDGE AS SHOWN IN SECTION C-C.
7. EDM NOTCH:
   LENGTH: 0.200 (5.08) ±0.010 (0.25)
   DEPTH: 0.010 (0.25) ±0.002 (0.05)
   WIDTH: 0.005 (0.13) ±0.002 (0.05)
8. APPLY FAY SURFACE SEALANT, BMS 5-95, CLASS B BETWEEN THE TOP AND BOTTOM PIECES AS SPECIFIED IN BAC 5000. MAKE SURE THE SEALANT DOES NOT EXTEND BEYOND THE FAYING SURFACE.

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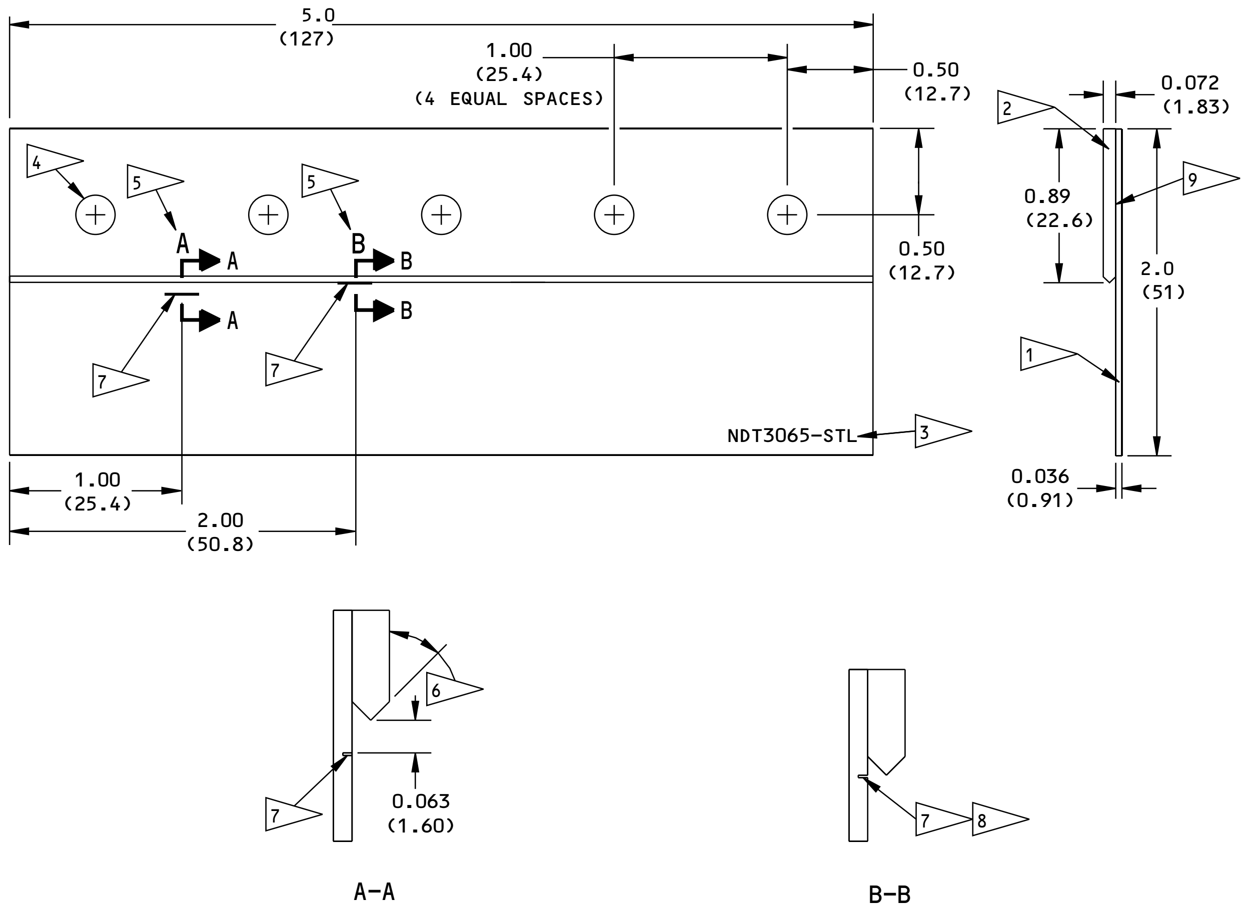
Reference Standard NDT3065
Figure 2



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS: 63 Ra OR BETTER

1 ALUMINUM (CLAD OR BARE)

2 301 (1/2 HARD) CRES

3 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT3065-STL

4 BACR15CE5D4 (5 LOCATIONS)

5 ETCH OR SCRIBE THE LETTER ON THE SURFACE OF THE TOP PIECE TO IDENTIFY THE LOCATION OF THE EDM NOTCH AND THE PROBE POSITION FOR THE INSTRUMENT CALIBRATION.

6 45 DEGREE DOUBLE BEVEL ALONG THE FULL LENGTH

7 EDM NOTCH:
LENGTH: 0.200 (5.08) ±0.010 (0.25)
DEPTH: 0.018 (0.46) ±0.002 (0.05)
WIDTH: 0.005 (0.13) ±0.002 (0.05)

8 PUT THE EDM NOTCH FLUSH WITH THE END OF THE BEVEL AS SHOWN IN SECTION B-B TO 0.003 (0.076) BEYOND THE EDGE OF THE BEVEL.

9 APPLY FAY SURFACE SEALANT, BMS 5-95, CLASS B BETWEEN THE TOP AND BOTTOM PIECES AS SPECIFIED IN BAC 5000. MAKE SURE THE SEALANT DOES NOT EXTEND BEYOND THE FAYING SURFACE.

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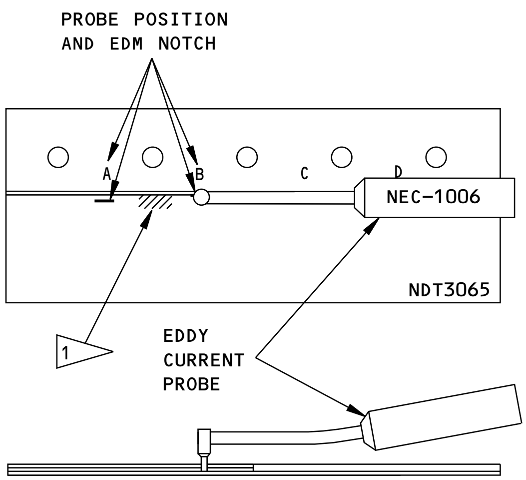
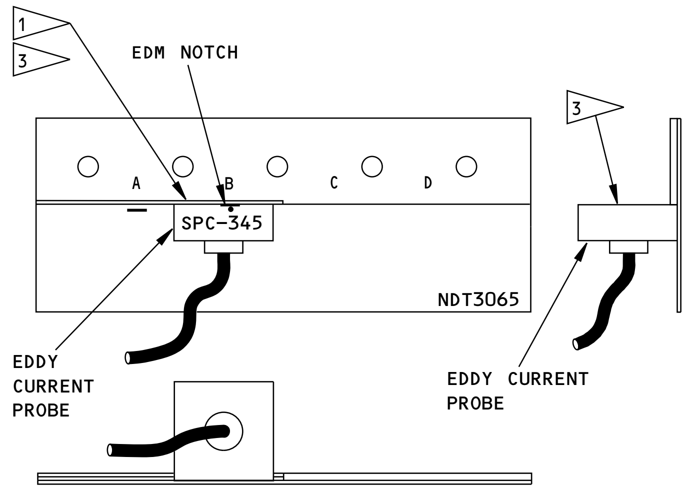
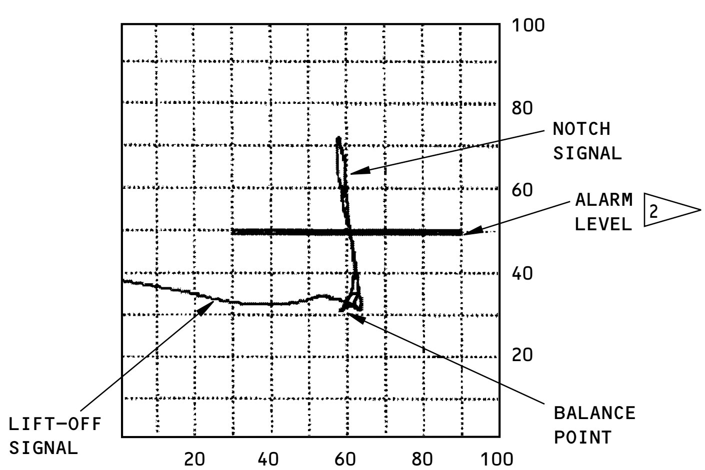
Reference Standard NDT3065-STL
Figure 3



NEC-1006 PROBE POSITION ON THE
REFERENCE STANDARD
DETAIL I



SPC-345 PROBE POSITION ON THE
REFERENCE STANDARD
DETAIL III



SCREEN DISPLAY
DETAIL II

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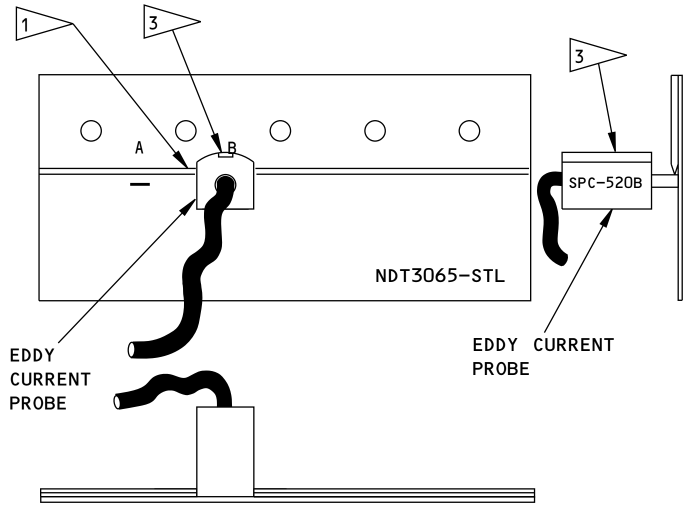
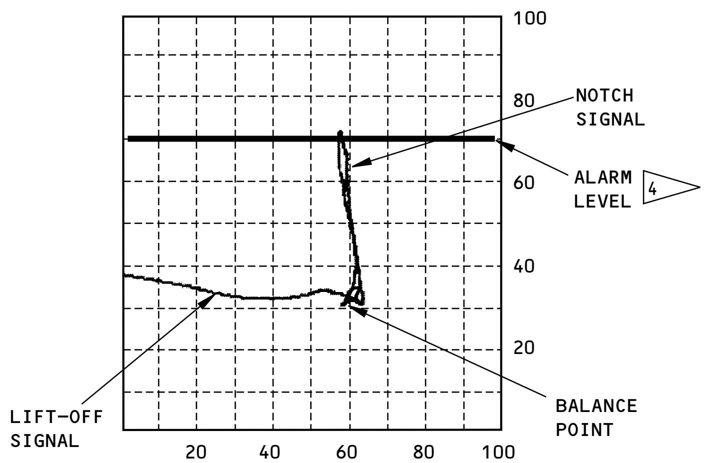
Instrument Calibration
Figure 4 (Sheet 1 of 2)



SPC-520B PROBE POSITION ON THE
REFERENCE STANDARD
DETAIL IV



SCREEN DISPLAY
DETAIL V

NOTES:

- THE SCREEN DISPLAY SHOWN IN DETAILS II AND V ARE EXAMPLES. DIFFERENT INSTRUMENTS AND PROBES CAN CAUSE DIFFERENT DISPLAYS.

1 PROBE POSITION TO SET LIFT-OFF AND BALANCE THE INSTRUMENT

2 THE ALARM LEVEL SHOWN IN DETAIL II IS SET TO 50% OF FULL SCREEN HEIGHT (FSH) (20% OF FSH HIGHER THAN THE BALANCE POINT).

3 THE LINE ON THE SIDE OF THE EDDY CURRENT PROBE IDENTIFIES THE LOCATION OF THE COIL. BALANCE THE INSTRUMENT WITH THE LINE AT THIS LOCATION.

4 THE ALARM LEVEL SHOWN IN DETAIL V IS SET TO 70% OF FULL SCREEN HEIGHT (FSH) (40% OF FSH HIGHER THAN THE BALANCE POINT).

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Instrument Calibration
Figure 4 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

INSPECTION FOR CRACKS THAT ARE ON THE BACK SIDE AND NOT FULLY THROUGH THE THICKNESS OF AN ALUMINUM PART

1. **Purpose**

   A. This subsurface eddy current inspection can be used to examine aluminum parts for cracks that occur on the back side and do not go through the full thickness. The part can be a skin, doubler, web or equivalent type of part.

   B. This inspection is done with a subsurface eddy current probe and an impedance plane display instrument. Scans must be done perpendicular to a subsurface edge to find cracks that are along the subsurface edge.

   C. The thickness of the part to be examined must be known before this inspection can be done.

2. **Equipment**

   A. Instruments

   (1) All eddy current instruments that have an impedance plane display are permitted for use if they:

   (a) Can operate between 2 and 40 kHz. The frequency must be adjustable in 1 kHz increments.

   (b) Can find the reference notch in the reference standard as specified in the calibration instructions of this procedure.

   (2) The instruments that follow were used to help prepare this procedure.

   (a) NDT 19e; Nortec/Staveley

   (b) Phasec 2200; Hocking/Krautkramer

   B. Probes

   (1) It is necessary to use a spot probe to do this inspection. The spot probe must operate between 2 and 40 kHz. The spot probe diameter must not be more than 0.50 inch (12.7 mm). When this procedure is used internally at lap joint locations, use a 90 degree angle probe.

   (2) The spot probes that follow operated satisfactorily when this procedure was made. Other probes can be used if they can find the notch in the reference standard as specified in the calibration instructions of this procedure.

   (a) SPO-5328; Nortec/Staveley (Reflection probe)

   (b) SPO-5327; Nortec/Staveley (Reflection probe)

   (c) SNG 0.375/31/25K; NDT Engineering (this probe has a spring loaded collar)

   (d) NEC1005; NDT Engineering (Reflection probe, 90 degree angle)

   (e) SPO-5329; Nortec/Staveley (Reflection probe)

   (f) NEC1084; NDT Engineering (Reflection probe, 90 degree angle)

   (g) NEC1095; NDT Engineering (Reflection probe, 90 degree angle)

   (h) SPC-4TF-105-2R; EC/NDT (Reflection probe, 90 degree angle)

   (i) NEC1089; NDT Engineering (Reflection probe, 90 degree angle)

   NOTE: For smaller diameter probes, a collar attached around the probe will make the probe scan more stable. If a collar is used, it must be adjusted so that the probe satisfactorily touches the part.

   C. Reference Standard

(1) Make reference standard(s) NDT1085-XXX. The reference standard drawing shown in Figure 2 shows 10 reference standards with different upper layer thicknesses. Make the reference standard(s) that will be nearest the thickness of the part to be examined (within ± 0.007 inch (0.18 mm)).

NOTE: If you have reference standard NDT396, then you do not have to make reference standard NDT1085-036. Reference standard NDT396 can be used to examine parts that are 0.033 to 0.040 inch (0.84 to 1.0 mm) thick.

3. Prepare for the Inspection

A. Make sure that the instrument, probe, reference standard and the inspection area are at the same temperature.

B. Get access to the inspection area on the side of the part where the scans will be done.

C. Make sure the part is clean and has no rough paint in the inspection area.

D. Teflon tape on the end of the probe that is not more than 0.004 inch (0.10 mm) thick will make it easier to do the scans, but it is not necessary. The probe can possibly scratch the part if the scans are done without Teflon tape on the probe. If you make a decision to use the Teflon tape on the probe, make sure it is put on the probe before calibration.

NOTE: Some airplanes have sound dampening aluminum foil installed in some areas on the internal side of the airplane. Do not do this inspection through the aluminum foil. Move the aluminum foil from the inspection area before you do the inspection from the internal side of the skin. Do not scratch, scribe or damage the airplane when you move the aluminum foil. Also, remove the adhesive from the skin. Make sure you install the aluminum foil after the inspection.

4. Instrument Calibration

NOTE: (1) Refer to the equipment instruction manual as necessary for equipment operation instructions.

(2) If the part to be examined is painted, put approximately 0.006 inch (0.15 mm) of transparent, nonconductive tape on the reference standard before calibration.

(3) If the part has a nonconductive finish that is 0.003 inch (0.076 mm) thick or less, such as primer, it is not necessary to put nonconductive tape on the reference standard before calibration.

A. Identify the thickness of the part that will be examined.

B. Go to Table 1 in Figure 3 to identify the correct reference standard to use and the instrument frequency for the calibration and inspection. Use the reference standard that is in the range of thicknesses specified in Table 1.

(1) Set the instrument to the applicable frequency specified in Table 1.

NOTE: During calibration, the calibration frequency can be adjusted higher or lower than the frequency specified in Table 1 (see Figure 3).

(2) Set the high pass (HP) filter to off (0 Hz).

(3) Set the low pass (LP) filter to the minimum value that does not decrease the amplitude of the signals at normal scan speeds. If the low pass filter is too low, and the scan speed is increased during the inspection, it is possible to not see a crack indication.

C. Put the probe at position 1 (double layer) on the reference standard that you identified in Paragraph 4.B. See Figure 3, Detail A.

D. Balance the instrument.

E. Adjust the balance point so that it is approximately 30 percent of full screen height.

NOTE: The vertical gain must be approximately 14 to 20 dB higher than the horizontal gain.

F. Set lift-off so that the signal moves in a horizontal direction to the left. See Figure 3, Detail B.

G. Move the probe across the edge of the second layer from probe position 1 to probe position 2. As you move the probe, monitor the signals on the screen display and stop the probe when it is on the single layer. See Figure 3, Detail A, probe positions 1 and 2 and Detail B.

(1) If the end point of the single layer signal is higher than the balance point of the double layer signal, (as shown in in Figure 3, Detail E) increase the frequency and adjust the phase to get the signals to look equivalent to Figure 3, Detail B.

(2) If the end point of the single layer signal is lower than the balance point of the double layer signal (as shown in Figure 3, Detail D), decrease the frequency and adjust the lift-off to get the signals to look equivalent to Figure 3, Detail B.

H. Do a probe scan as specified in Paragraph 4.G. and monitor the signal on the display. Make sure there is less than a 5 percent of full screen height difference between the balance point of the double layer signal and the end point of the single layer signal.

I. If necessary, continue to adjust the frequency and lift-off angle so that the balance point of the double layer signal and the end point of the single layer signal are almost equivalent to the signals shown in Figure 3, Detail B.

J. Put the probe at position 3 and do a minimum of three probe scans across the reference notch (probe position 3 to 4 and back) and monitor the notch signal. See Figure 3, Details A and C.

K. Adjust the gain so that the signal from the reference standard notch is 30 percent of full screen height above the balance point as shown in Figure 3, Detail C.

L. Make sure the lift-off is horizontal and to the left.

M. Do a scan across the notch and make small increases in the scan speed to see if the notch signal decreases. If the notch signal decreases, increase the value for the low pass filter a small quantity.

5. Inspection Procedure

A. Calibrate the instrument as specified in Paragraph 4.

B. Put the probe on the part in the inspection area.

C. Balance the instrument and make sure the lift-off goes horizontally to the left as shown in Figure 3, Detail B.

D. Do the probe scans in the inspection area so that the probe scans are at 90 degrees to the direction of possible cracks. During the probe scans:

NOTE: It is important to know the direction that the subsurface cracks can occur before you do the probe scans.

(1) If necessary, make small adjustments to the frequency and lift-off to get the single layer signal and the double layer signal at the same screen heights, or almost the same screen heights, as the signal shown in Figure 3, Detail B. Do not adjust the gain.

(2) It is not necessary to calibrate on the reference standard again after you adjust the frequency for the airplane if the skin thickness is within the range of Table 1 specified in Figure 3.

(3) Monitor the instrument for crack signals. Make sure you can identify subsurface edge signals as compared to crack signals. See Figure 3 for these different signals.

NOTE: It is possible that the inspection area that you examine does not have a second layer edge to scan across. This would prevent the adjustments in Paragraph 5.D.(1). This will be permitted, however, it is important to make sure the lift-off goes horizontally to the left while you do the scans.

CAUTION: DO NOT CHANGE THE GAIN ADJUSTMENT THAT WAS SET DURING THE CALIBRATION. IF THE GAIN IS CHANGED DURING THE INSPECTION, THE INSPECTION WILL BE UNSATISFACTORY.

(4) Make sure the probe scans are one probe diameter or less from each other during the inspection.

NOTE: If a collar is used on a probe, make sure each probe scan is the diameter of the probe and not the diameter of the collar.

(5) See Figure 4, Details A, B and C, for signals that can occur during the inspection.

6. Inspection Results

A. All signals that are almost the same as the notch signal from the reference standard are crack indications.

(1) Crack signals must be 15 percent of full screen height (or more) above the single layer end point.

(2) A crack signal must increase and decrease when the probe is moved approximately 2 probe diameters.

B. See Figure 4 thru Figure 6 for signals that can occur during the inspection.

NOTE: Conductivity or thickness changes can cause large signals that are not crack indications. If signals increase and decrease as the probe is moved more than 3 probe diameters, then the signal is not caused by a crack.

NOTE: Cracks that occur approximately 1 probe diameter away from the doubler edge can cause signals to start to the right of the balance point. See Figure 6.

C. Some signals can go up on the screen display and stay there during the scan. These types of signals can occur if material has been removed.

D. If signals equivalent to those specified in Paragraph 6.A. occur, you can do the steps that follow:

(1) You can do Part 4, 53-30-07 (phased-array transducer and instrument) or Part 4, 53-30-09 (standard ultrasonic transducer and instrument) from the external surface of the part to help make an analysis of the signals.

(2) If the crack signals are from a solid skin, get access to the back side of the skin in the area where the indication was found. It can be necessary to remove structure to get access to the back side of the skin.

NOTE: A high frequency eddy current (HFEC) procedure cannot be used to make sure there is a crack in a skin with a bonded doubler because the crack can be the area between the skin and the doubler.

(a) Do a surface eddy current inspection on the back side of the skin as specified in Part 6, 51-00-00, Procedure 23.

(b) Make sure the probe scans are done in the same direction that caused the indication to occur with the subsurface probe.

E. If signals equivalent to those specified in Paragraph 6.C. are found, you can do the steps that follow or you can do Part 4, 53-30-07 (phased-array transducer and instrument) or Part 4, 53-30-09 (standard ultrasonic transducer and instrument) from the external surface of the part to help make an analysis of the signals.

(1) Get access to the back side of the part where the indication was found. It can be necessary to remove structure to get access to the back side of the part.

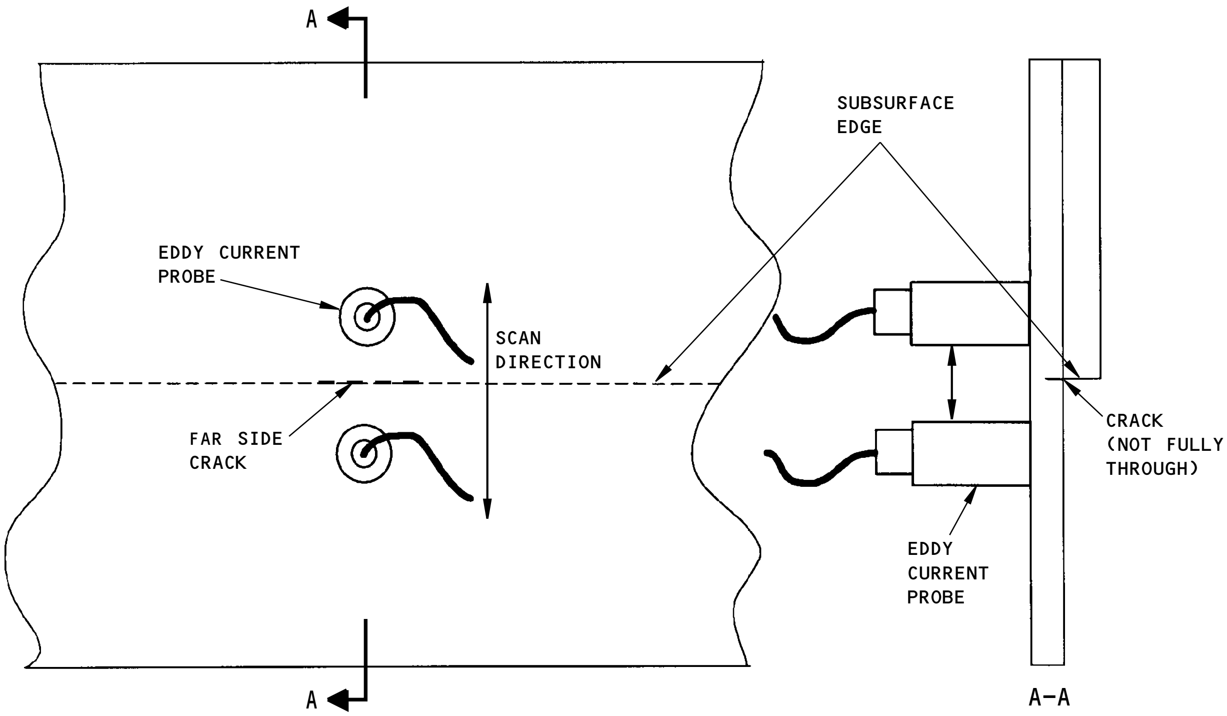
(2) Use one or more of the instruments that follow to find the thickness of the part that caused the crack indication to occur:

(a) Micrometer (if possible)

(b) Magna-Mike made by Panametrics

(c) Ultrasonic Thickness gauge

(3) Tell engineering if a thickness is found to be less than the allowables specified in the Structural Repair Manual (SRM).



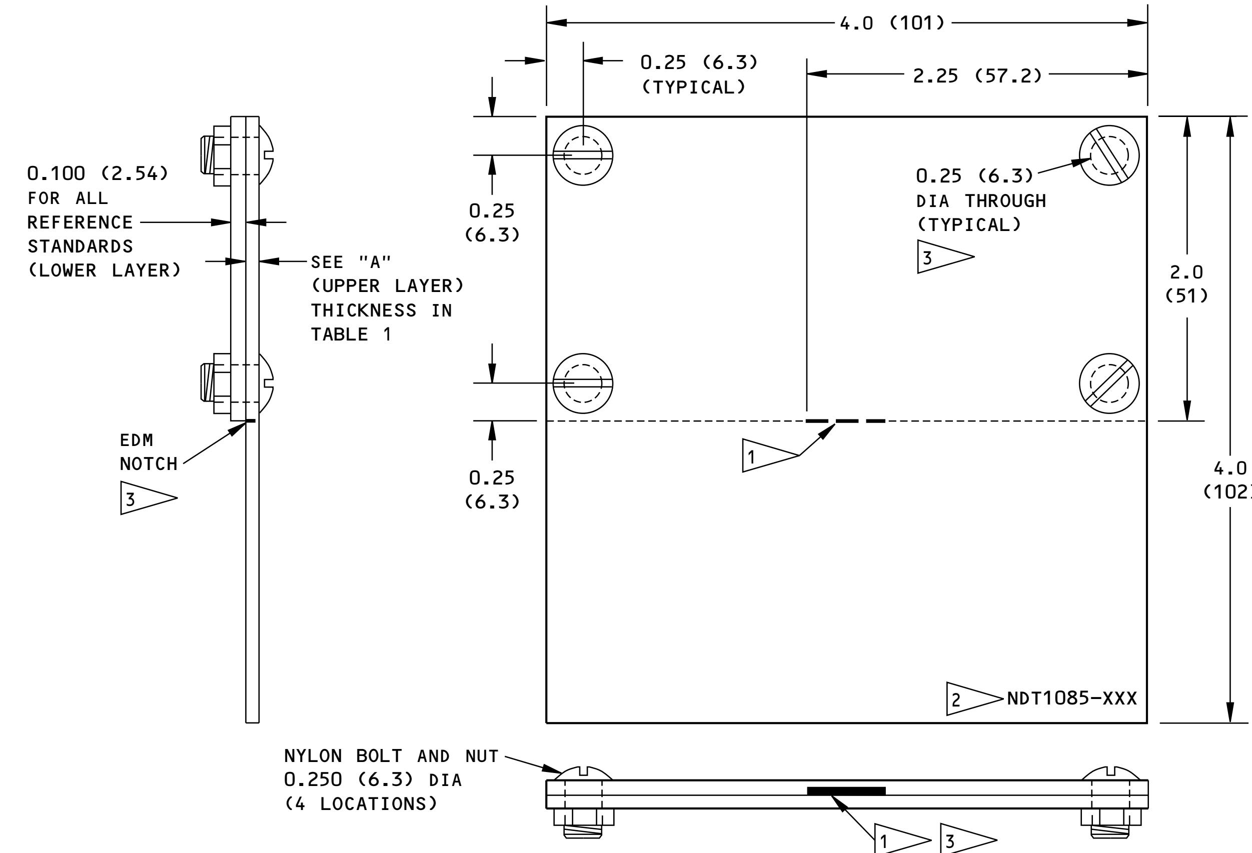
EXAMPLES OF A PART WITH A SUBSURFACE EDGE THAT IS EXAMINED WITH A SUBSURFACE EDDY CURRENT PROBE. THE PART THAT YOU EXAMINE COULD BE DIFFERENT.

NOTES:

- DO THE PROBE SCANS AT 90 DEGREES ACROSS THE SUBSURFACE EDGE OF THE PART WHERE THE CRACKS CAN OCCUR.

2139512 S0000461365_V1

Typical Probe Scans on an Aluminum Part
Figure 1



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = 1

- MATERIAL: 2024-T3 CLAD (TWO SKINS)

1. EDM NOTCH DIMENSIONS IN ALL REFERENCE STANDARDS:
   LENGTH: 0.50 (12.7)
   DEPTH: 50% THROUGH THE "A" THICKNESS
   WIDTH: 0.007 (0.18) MAXIMUM WIDTH

2. STAMP OR ETCH THE APPLICABLE REFERENCE STANDARD NUMBER. REPLACE XXX WITH THE APPLICABLE "A" THICKNESS AS SPECIFIED IN TABLE 1.

3. MAKE SURE THE 2ND LAYER EDGE IS IMMEDIATELY ABOVE THE EDM NOTCH BEFORE THE 4 BOLT HOLES ARE DRILLED. THE EDGE OF THE SKIN TO THE NOTCH CENTERLINE TOLERANCE IS 0.010 (0.25).

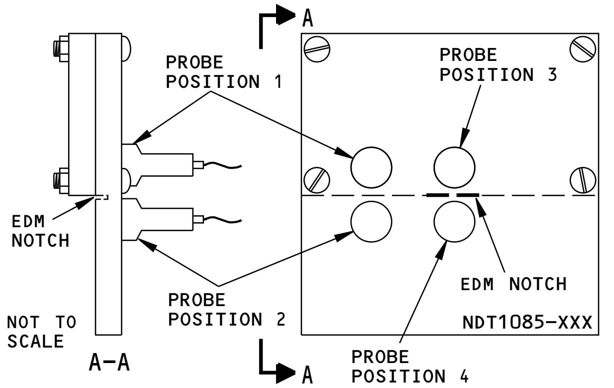
REFERENCE STANDARD NUMBER	"A" (UPPER LAYER) THICKNESS
NDT1085-032	0.032 (0.81)
NDT1085-036 4	0.036 (0.91)
NDT1085-050	0.050 (1.3)
NDT1085-063	0.063 (1.6)
NDT1085-071	0.071 (1.8)
NDT1085-080	0.080 (2.0)
NDT1085-090	0.090 (2.3)
NDT1085-100	0.100 (2.5)
NDT1085-112	0.112 (2.8)
NDT1085-125	0.125 (3.2)

TABLE 1

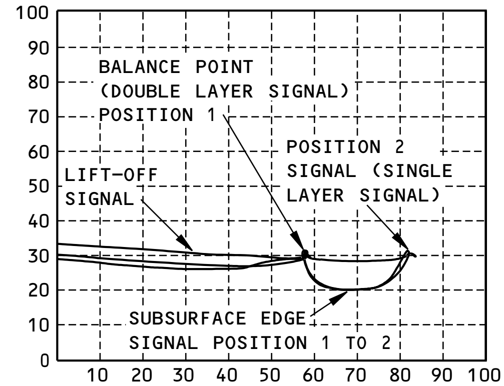
4. IF YOU HAVE REFERENCE STANDARD NDT396, THEN YOU DO NOT HAVE TO MAKE REFERENCE STANDARD NDT1085-036.

2139515 S0000461366_V1

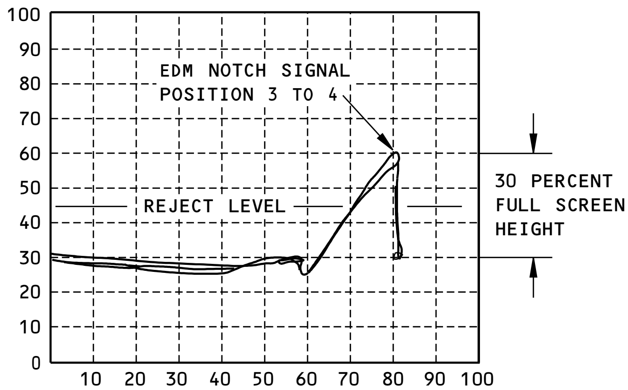
Reference Standards NDT1085-XXX
Figure 2



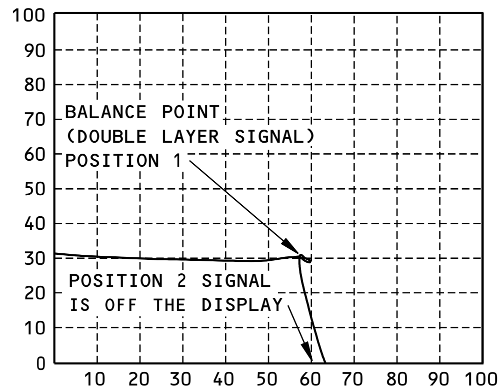
CALIBRATION PROBE POSITIONS FOR THE
INSPECTION OF SUBSURFACE CRACKS
DETAIL A



DETAIL B

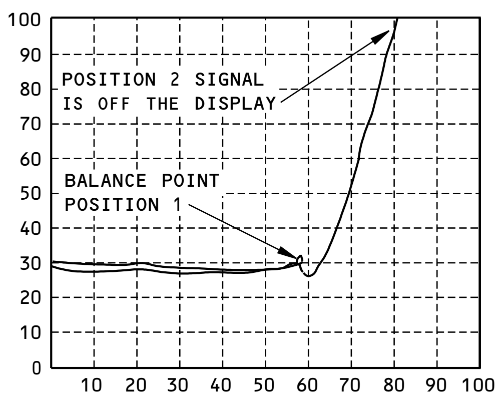


DETAIL C



DETAIL D

HERE THE FREQUENCY IS TOO HIGH.
DECREASE THE FREQUENCY UNTIL THE
POSITION 1 AND 2 SIGNALS LOOK
EQUIVALENT TO THE SIGNALS SHOWN
IN DETAIL B



DETAIL E

HERE THE FREQUENCY IS TOO LOW.
INCREASE THE FREQUENCY UNTIL THE
POSITION 1 AND 2 SIGNALS LOOK
EQUIVALENT TO THE SIGNALS SHOWN
IN DETAIL B

NOTES:

- SET THE VERTICAL GAIN SO IT IS 14 TO 20 dB HIGHER THAN THE HORIZONTAL GAIN.
- SET THE FREQUENCY AS SPECIFIED IN TABLE 1 SO THAT THE DIFFERENCE BETWEEN THE DOUBLE LAYER SIGNAL (POSITION 1) AND THE SINGLE LAYER SIGNAL (POSITION 2) IS LESS THAN 5 PERCENT OF FULL SCREEN HEIGHT. SEE DETAILS A AND B.
- SEE DETAILS A, B, D AND E TO SEE HOW TO ADJUST THE FREQUENCY AND PHASE TO DO THE CALIBRATION.
- ADJUST THE GAIN SO THAT THE NOTCH SIGNAL GOES TO 30 PERCENT OF FULL SCREEN HEIGHT ABOVE THE BALANCE POINT. SEE DETAILS A AND C.

2139519 S0000461367_V1

Calibration Positions with Impedance Plane Signals
Figure 3 (Sheet 1 of 2)

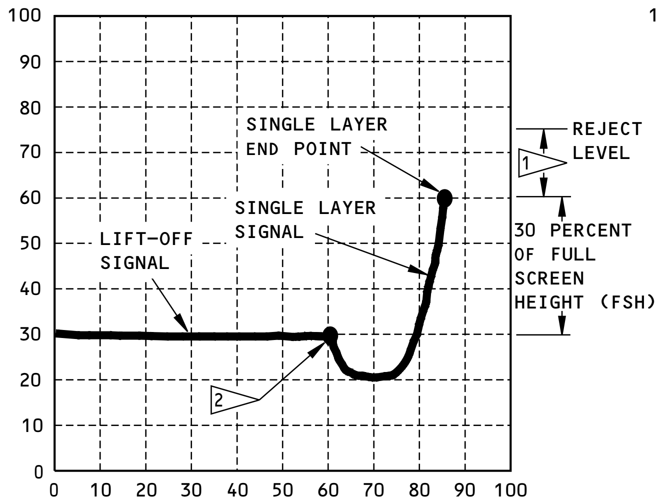
UPPER LAYER THICKNESS INCH (mm)	REFERENCE STANDARD NUMBER	FREQUENCY AT THE START OF THE CALIBRATION
0.025 TO 0.032 (0.64 TO 0.81)	NDT1085-032	40 KHz
0.033 TO 0.040 (0.84 TO 1.00)	NDT1085-036	34 KHz
0.041 TO 0.050 (1.04 TO 1.27)	NDT1085-050	18 KHz
0.051 TO 0.063 (1.29 TO 1.60)	NDT1085-063	12 KHz
0.064 TO 0.071 (1.62 TO 1.80)	NDT1085-071	10 KHz
0.072 TO 0.080 (1.82 TO 2.03)	NDT1085-080	7 KHz
0.081 TO 0.090 (2.05 TO 2.28)	NDT1085-090	6 KHz
0.091 TO 0.100 (2.31 TO 2.54)	NDT1085-100	4 KHz
0.101 TO 0.112 (2.56 TO 2.84)	NDT1085-112	3 KHz
0.113 TO 0.125 (2.87 TO 3.17)	NDT1085-125	2 KHz

INSTRUMENT FREQUENCIES FOR THE REFERENCE STANDARDS
TABLE 1

NOTE: The instrument frequencies shown above are used at the start of the calibration. It can be necessary to adjust the frequency higher or lower during the calibration to get the signals shown in Details B and C. The best frequency for each reference standard can be different with different probes.

2139524 S0000461368_V1

Calibration Positions with Impedance Plane Signals
Figure 3 (Sheet 2 of 2)

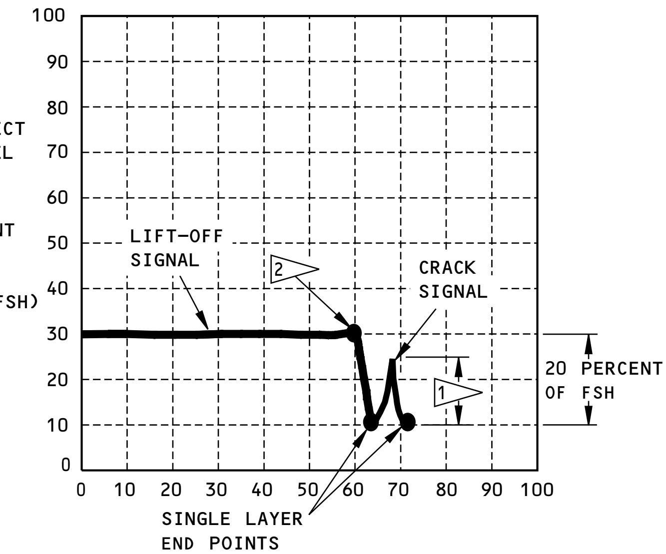


DETAIL A

THIS IS NOT A CRACK SIGNAL. IT IS A SIGNAL CAUSED BY ONE OR MORE OF THE CONDITIONS THAT FOLLOW:

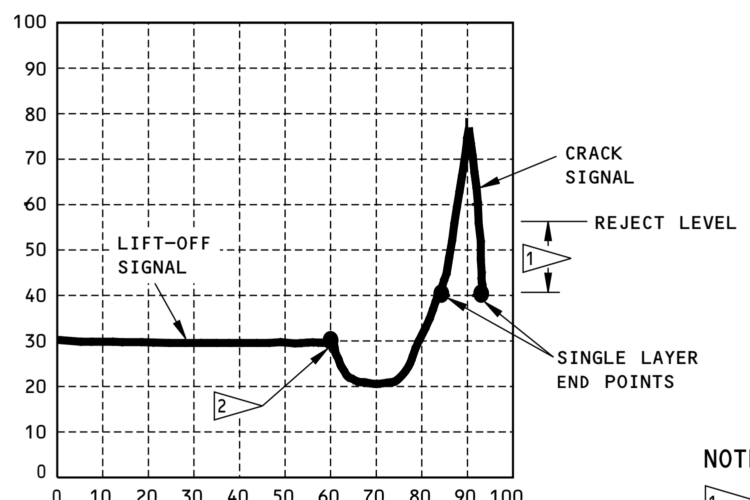
- AN AREA ON THE SKIN OF LOWER CONDUCTIVITY
- A THIN CLAD AREA
- THE SKIN IS THINNER.

WHEN THIS SIGNAL IS AT 30 PERCENT OF FSH OR HIGHER, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL B

WHEN THIS SINGLE LAYER SIGNAL GOES DOWN SCREEN BY 20 PERCENT OF FSH OR MORE, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL C

THIS CRACK SIGNAL HAS OCCURRED WITH THE CONDITIONS SPECIFIED IN DETAIL A. THE SIGNAL STARTED AS THE SIGNAL IN DETAIL A STARTED, BUT THEN A CRACK SIGNAL OCCURRED WITHIN A SHORT SCAN. SEE HOW THIS SIGNAL IS DIFFERENT THAN THE SIGNAL SHOWN IN DETAIL A.

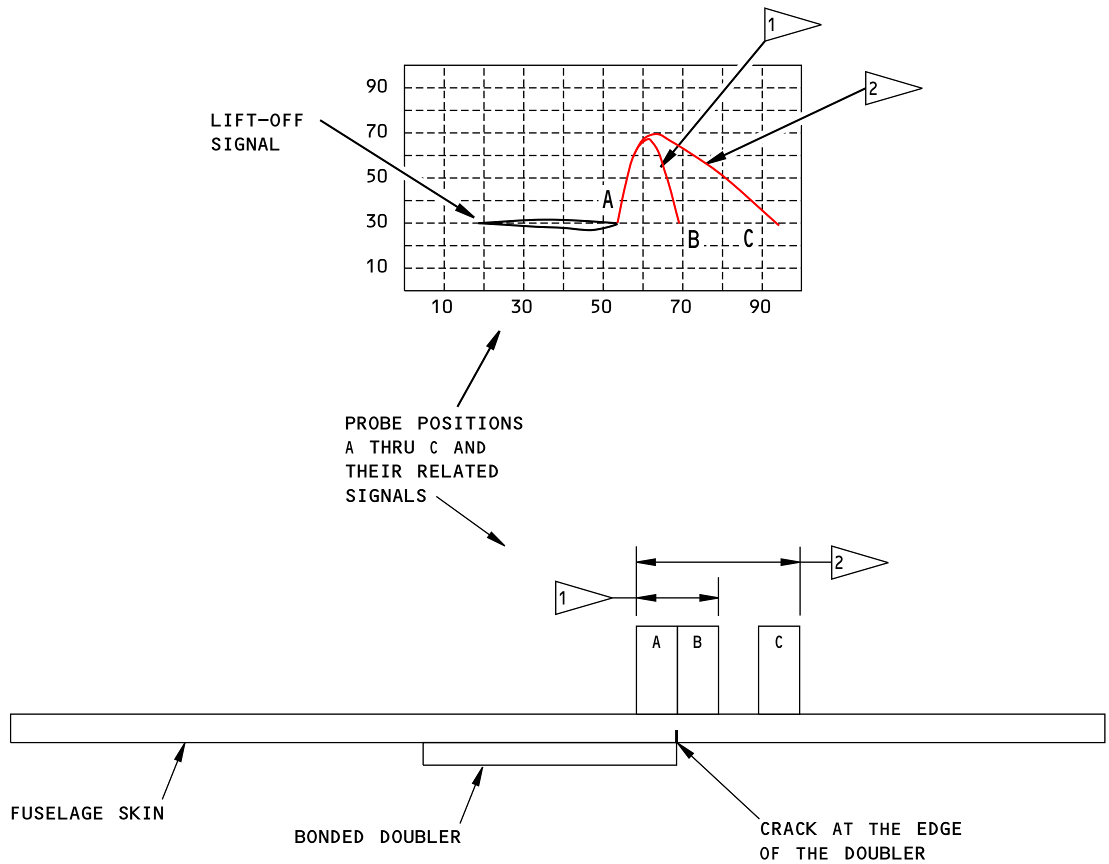
NOTES:

1 FOR THE CONDITIONS SPECIFIED IN DETAIL A, THE REJECT LEVEL IS 15 PERCENT OF FSH ABOVE THE SINGLE LAYER END POINTS.

2 THIS IS THE BALANCE POINT ON THE DOUBLE LAYER. MAKE SURE THAT THE PROBE IS ON THE DOUBLE LAYER WHEN YOU BALANCE THE INSTRUMENT.

2139525 S0000461369_V1

Signals That Can Occur on the Airplane During Inspection
Figure 4

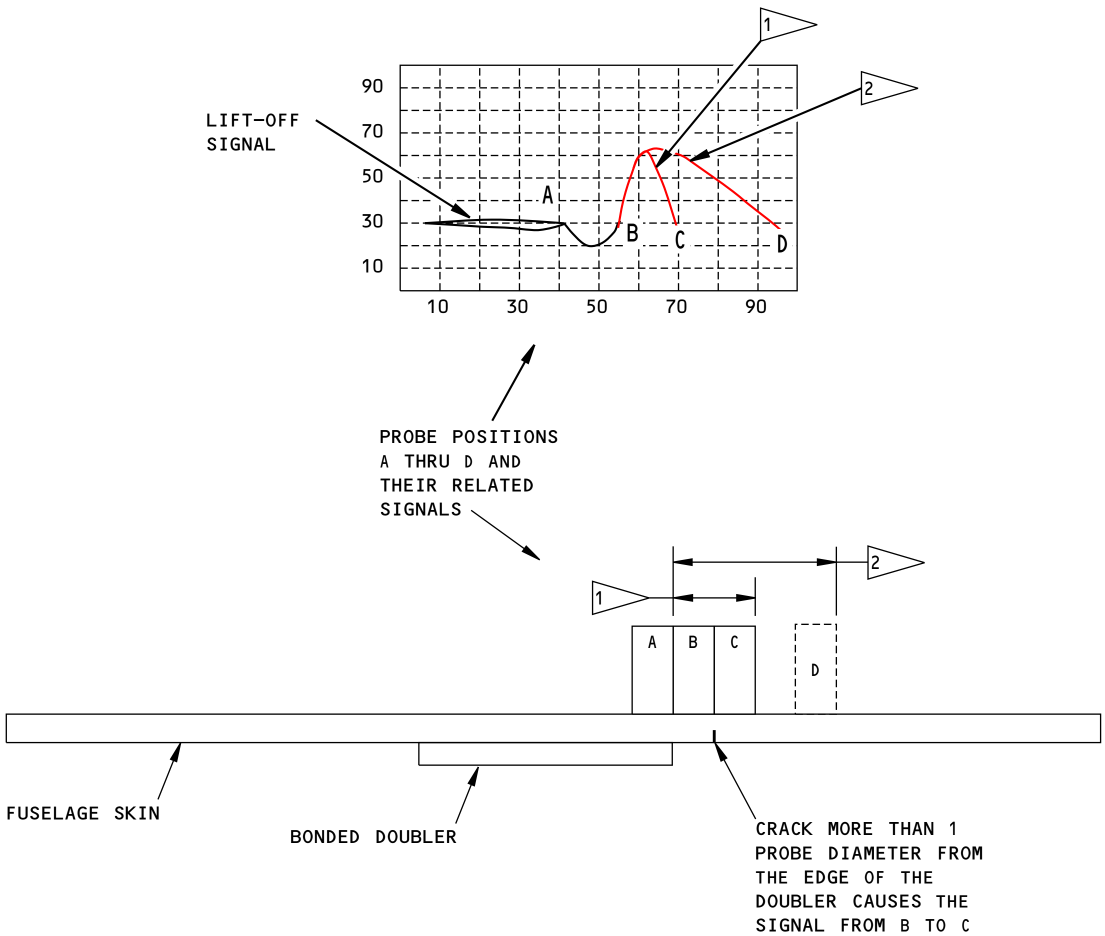


NOTES

1. SIGNALS THAT OCCUR WHEN THE PROBE MOVES APPROXIMATELY TWO OR LESS PROBE DIAMETERS IS A CRACK INDICATION.
2. SIGNALS THAT OCCUR WHEN THE PROBE MOVES MORE THAN FOUR PROBE DIAMETERS IS NOT A CRACK INDICATION. THE INDICATION CAN BE CAUSED BY CONDUCTIVITY OR SKIN THICKNESS CHANGES

2265195 S0000508420_V1

Crack Signal from a Crack at the Doubler Edge (and an Incorrect Crack Indication)
Figure 5



NOTES

1. SIGNALS THAT OCCUR WHEN THE PROBE MOVES APPROXIMATELY TWO OR LESS PROBE DIAMETERS IS A CRACK INDICATION.
2. SIGNALS THAT OCCUR WHEN THE PROBE MOVES MORE THAN FOUR PROBE DIAMETERS IS NOT A CRACK INDICATION. THE INDICATION CAN BE CAUSED BY CONDUCTIVITY OR SKIN THICKNESS CHANGES

2265196 S0000508421_V1

Crack Signal from a Crack that is Away From the Doubler Edge (and an Incorrect Crack Indication)
Figure 6

PART 6 - EDDY CURRENT

INSPECTION OF SPLICE STRAPS AT THE SKIN BUTT-SPLICES

1. **Purpose**

   A. Use this procedure to find cracks in the splice straps at the circumferential-butt-splices of fuselage skin panels. This procedure examines the splice straps for possible through-thickness cracks that are 0.5 inches (13 mm) long (or more), and grow in the circumferential direction. The inspection is done from the outer surface of the airplane.

   B. This procedure examines splice straps that are from 0.045 to 0.080 inch (1.14 to 2.03 mm) thick through fuselage skins that are from 0.050 to 0.100 inch (1.27 to 2.54 mm) thick. This procedure can be used only if the distance between the skins at the butt-splices are from 0.030 to 0.080 inch (0.76 to 2.03 mm). Tell Boeing about structure that is different from that specified for this procedure.

      NOTE: At the butt-splice and lap-joint intersection locations, the range of skin thicknesses (total) that this procedure can be used for is 0.100 to 0.185 inch (2.54 to 4.70 mm).

   C. This procedure uses an impedance plane display instrument and a specially designed sliding probe.

      NOTE: This procedure cannot be used when there are repair doublers installed at the butt-splice locations. Tell Boeing if there is a repair doubler at the butt-splice.

   D. Service Bulletin Reference: 737-53A1262

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. Instruments

      (1) Use an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates at a frequency of 50 kHz.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) NDT-19e; Nortec/Staveley Instruments

         (b) Phasec 1.1 SD; Hocking Krautkramer (GE)

   C. Probe

      (1) The two probes that follow were used to help prepare this procedure. Use one of the two probes to do this inspection.

         (a) NEC-4170; NDT Engineering Corp.

         (b) SPC-335-4; EC NDT

   D. Reference Standards

      (1) Make reference standard NDT1088-072/050 as identified in Figure 1.

      (2) Make reference standard NDT1088-144/050 as identified in Figure 2.

   E. Probe Guide

(1) A nonconductive straightedge is necessary for this inspection.

NOTE: The use of a thin nonconductive straightedge is recommended to more easily fit the curved surface of the fuselage.

3. **Prepare for the Inspection**

A. Get access to the inspection areas.

B. Remove loose paint and dirt from the surface of the inspection area.

C. Remove sealant that extends above the outer surface of the fuselage skin that causes the probe to lift off of the fuselage skin surface.

NOTE: Sealant in the space (gap) between the skins at the butt-splices does not have to be removed.

4. **Instrument Calibration**

NOTE: It is very important to keep the probe aligned with the centerline of the gap between the skins at the butt-splices during the instrument calibration and the airplane inspection. A nonconductive straightedge or other probe alignment tool is necessary to keep the probe correctly aligned with the gap centerline.

A. Get the reference standard that is necessary for the location to be examined. Use the correct reference standard for the skin conditions that follow:

(1) Use reference standard NDT1088-072/050 for butt-splices that are away from the lap splices.

(2) Use reference standard NDT1088-144/50 for butt-splices at lap splice locations.

B. Set the instrument frequency to 50 kHz.

C. If the inspection area is painted, put a nonconductive shim (paper, tape, etc.) on top of the reference standard. The shim thickness must be within 0.006 inch (0.15 mm) of the thickness of the paint.

D. Set the instrument’s vertical and horizontal gain controls or gain ratio to 1:1.

E. Put the probe on the reference standard at probe position 1 (P1).

(1) Make sure the probe centerline is aligned with the centerline of the gap as shown in Figure 3.

F. Set the nonconductive straightedge lightly against the probe.

(1) Adjust the straightedge as necessary so that it will keep the probe centerline aligned with the centerline of the gap during a scan.

G. Balance the instrument with the probe at the P1 position.

H. Set the balance point to 30% of full screen height (FSH) and 60% of full screen width (FSW) as shown in Figure 3. Balance the instrument again to be sure the dot location is set correctly.

I. Make a scan to probe position 2 (P2) and adjust the probe to get a maximum signal from the reference notch as shown in Figure 3. Be sure to keep the probe against the straightedge at all times.

J. Adjust the instruments phase and gain controls to set the maximum signal from the reference notch at 40% of full screen height above the balance point. It can be necessary to increase the vertical gain or the V/H gain ratio to get the necessary signal from the reference notch.

(1) If you are to examine a lap splice area where the (total) skin thickness above the splice plate is between 0.170 and 0.185 inch (4.30 and 4.70 mm) thick, use reference standard NDT1088-144/050, and adjust the gain so the reference notch signal is 50% of full screen height above the balance point.

K. Make two or more scans across the reference notch to make sure the notch signal is set correctly. Adjust the phase and gain as necessary to get a signal that looks almost the same as the reference notch signal shown in Figure 3.

L. Put the probe at position P1 and lift the probe off of the reference standard a small distance to identify the lift-off signal and the direction that it moves. Do not adjust the direction of lift-off. This step is only to identify the direction that the lift-off signal travels.

5. **Inspection Procedure**

A. Identify the areas to be examined. See the Limited Return to Service plan (LRTS) for specific locations. Make sure the applicable reference standard is used for the skin conditions that are on the airplane.

NOTE: On some airplanes (737-300, -400, and -500) there is no skin lap joint on the forward side of BS 360. On airplanes where this occurs, the forward and aft skins near stringer 10L and 10R are not aligned and thus a good inspection is not possible. It is not necessary to examine these areas. This area begins at approximately 6 inches above the lap joint.

B. Put the probe on the skins in the butt-splice inspection area.

(1) Make sure the probe centerline is aligned with the centerline of the gap as shown in Figure 3.

C. Set the nonconductive straightedge lightly against the probe and align it so that the probe will stay correctly aligned during a scan.

D. Balance the instrument. Make sure there are no scribe marks in the splice strap where you balance the instrument. If all of the inspection area has scribe marks, then balance the instrument at a minimum of three locations to get a standard (baseline) signal. Or, if the depth of the scribe marks has been recorded, put the probe across a scribed area where the depth is at a minimum and then balance the instrument.

E. Make a scan along the butt-splice for the full inspection area. During the inspection, do the steps that follow:

(1) Make sure the probe stays aligned during the scan.

(a) If the probe is not kept aligned with the butt-splice, the balance point signal will move down-screen as the probe moves nearer to one of the two skins. Adjust the probe guide as necessary to keep the signal near the balance point location.

(2) At all butt-splice and lap-joint intersection locations, there is a subsurface shim that is used to fill the gap area caused by the lap. The edges of these shims will cause a signal to occur on the screen. Do the steps that follow to make sure that this signal is caused by the shim and not a crack in the splice strap:

(a) Put the probe on the butt-splice, approximately 12 inches (305 mm) or more from the edge of the upper skin of the lap joint and balance the instrument.

1) Make sure the probe centerline is aligned with the centerline of the gap.

(b) Make a scan along the butt-splice in the direction of the skin lap joint and continue the scan until the probe is on the lap joint area.

1) An up-screen crack-type signal will occur when the probe is near the lap joint. Put a mark on the fuselage skin at the probe location where this crack-type signal occurs.

(c) Put the probe in the center of the lap joint area, between the second and third fastener rows from the edge of the upper skin and balance the instrument.

(d) Make a scan along the butt-splice in the direction of the mark made on the skin in Paragraph 5.E.(2)(b)1).

1) A down-screen signal will occur from the shim at approximately the same probe location that was marked on the skin in Paragraph 5.E.(2)(b)1). If the signal was caused by a crack in this area and not the shim, the signal will move up-screen when scanned from this direction.

(3) Make a mark at all the locations where you get a signal that is 20 percent (or more) of full screen height above the balance point.

(4) Frequently do a test of the instrument calibration as follows:

NOTE: Do not adjust the gain during this test.

NOTE: Refer to the manufacturer's instrument manual for recommended time intervals to do this test.

(a) Put the probe at position P1 on the reference standard and balance the instrument. Make sure the probe centerline is aligned with the centerline of the gap.

(b) Move the probe to position P2 and compare the signal you got from the notch during the initial calibration with the signal from the notch that you get now.

(c) If the signal from the notch in the reference standard has changed 10 percent or more from the signal you got during calibration, do the calibration and inspection again for all locations that were examined since the last calibration test.

(5) Refer to Paragraph 6. to make an analysis of all locations that cause signals to occur that are 20% (or more) of FSH above the balance point.

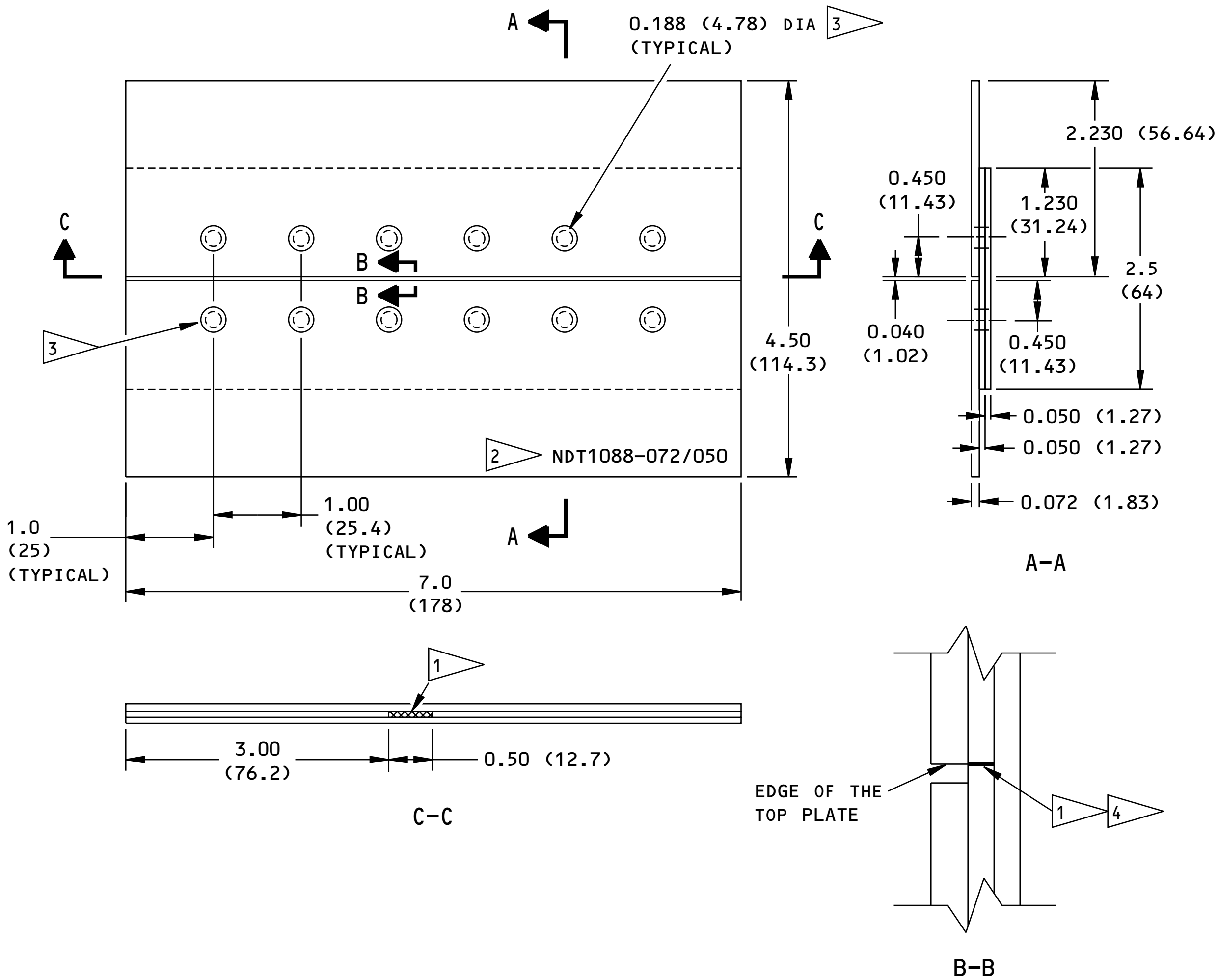
6. Inspection Results

A. Locations must be examined more fully if they cause signals to occur that are 20 percent (or more) of FSH above the balance point and look almost the same as the notch signal from the reference standard.

B. See Paragraph 5.E.(2) for indications that occur near the skin lap joints. Refer to Figure 4 for more data.

C. Compare the signals that occur during the inspection on the airplane to the signals you get from the reference standard. Also compare to the same location on the opposite side of the airplane to see if the signal occurs at this location too. If the signal occurs at the same location on the two sides and is approximately the same amplitude and phase, the signal is caused by substructure and can be ignored.

D. At all locations where crack-type signals occur, and where there is internal access, do an eddy current inspection as specified in Part 6, 53-30-23.



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: 2024-T3,-T4. OPTIONAL: AN AIRPLANE QUALITY ALUMINUM WITH AN ELECTRICAL CONDUCTIVITY BETWEEN 28.5% IACS AND 32% IACS CAN BE USED.
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCES: (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

1 EDM NOTCH: 0.50 (12.7) LONG X 0.007 (0.18) MAXIMUM WIDTH X THROUGH THE THICKNESS

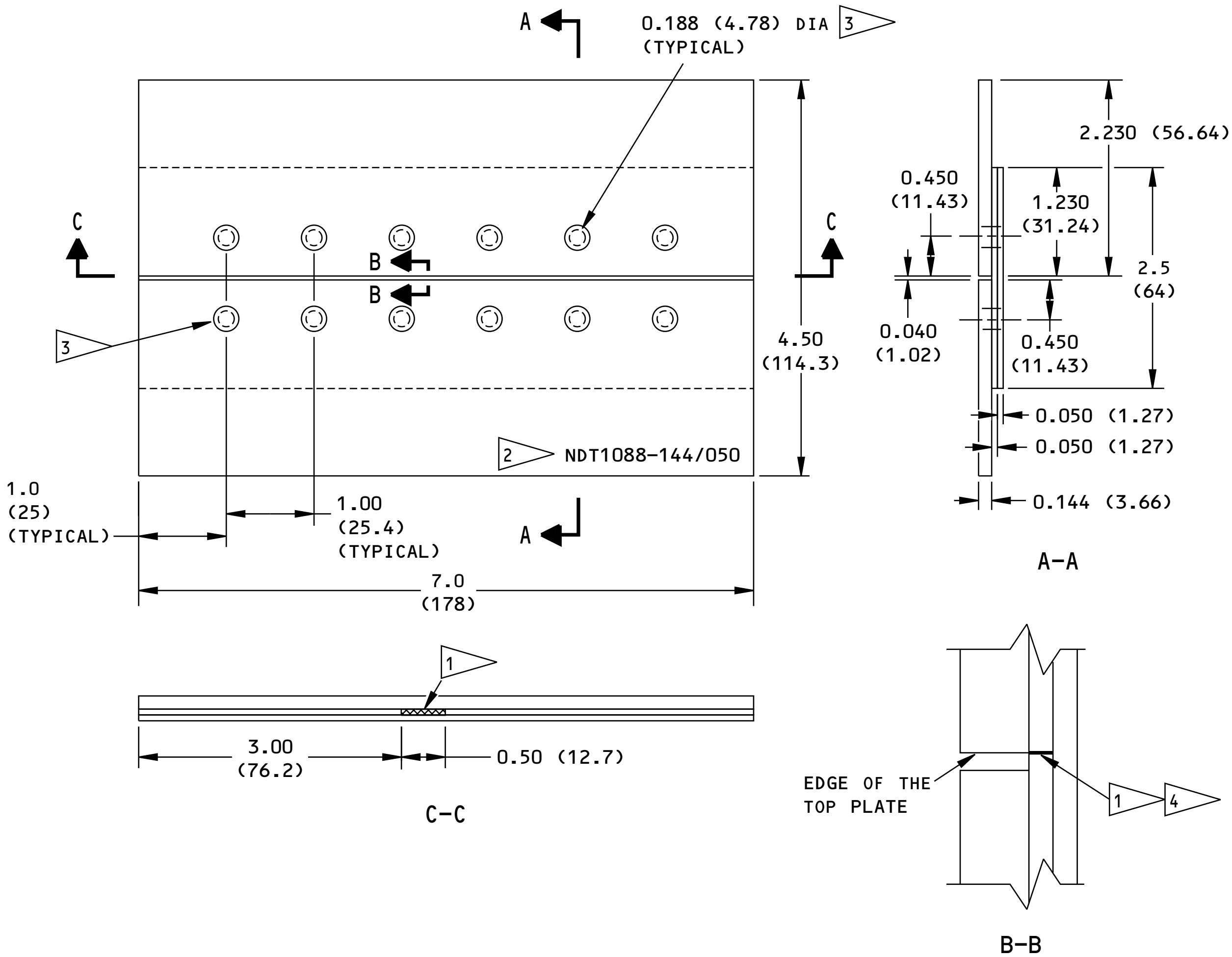
2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER NDT1088-072/050 AT APPROXIMATELY THIS LOCATION

3 INSTALL BACR15CE6D4 OR BACR15GF6D4 FASTENERS. OTHER FASTENERS CAN BE USED AS ALTERNATIVES TO THESE.

4 THE EDM NOTCH MUST BE FLUSH TO + 0.005 INCHES (0.13) FROM THE EDGE OF THE TOP PLATE. (NOTE: NO PART OF THE EDM NOTCH CAN BE UNDER THE TOP PLATE.)

2161749 S0000472756_V1

Reference Standard NDT1088-072/050
Figure 1



NOTES:

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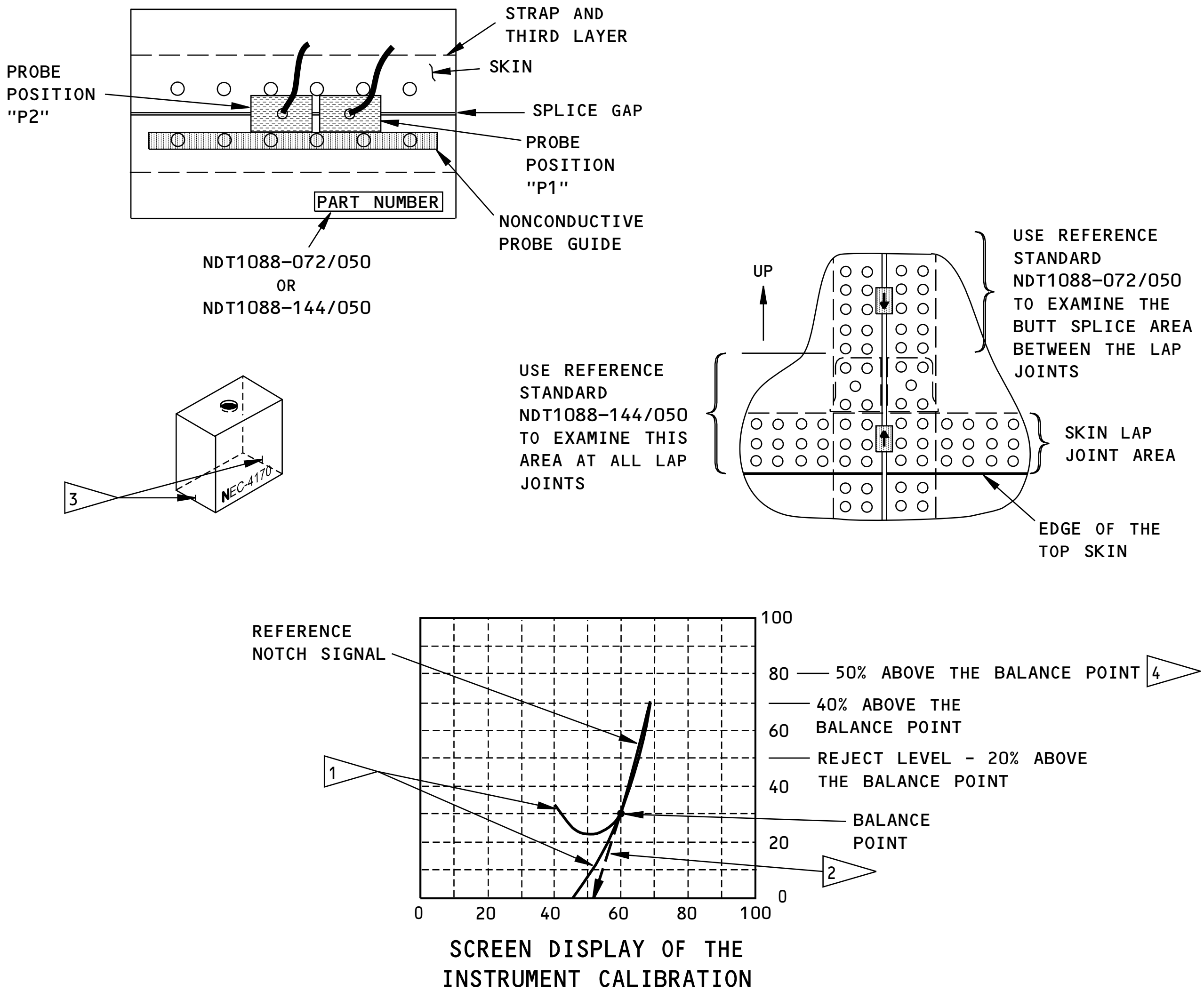
- MATERIAL: 2024-T3,-T4. OPTIONAL: AN AIRPLANE QUALITY ALUMINUM WITH AN ELECTRICAL CONDUCTIVITY BETWEEN 28.5% IACS AND 32% IACS CAN BE USED.
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCES: (UNLESS SPECIFIED DIFFERENTLY)

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

1. EDM NOTCH: 0.50 (12.7) LONG X 0.007 (0.18) MAXIMUM WIDTH X THROUGH THE THICKNESS
2. ETCH OR STAMP THE REFERENCE STANDARD NUMBER NDT1088-144/050 AT APPROXIMATELY THIS LOCATION
3. INSTALL BACR15CE6D4 OR BACR15GF6D4 FASTENERS. OTHER FASTENERS CAN BE USED AS ALTERNATIVES TO THESE.
4. THE EDM NOTCH MUST BE FLUSH TO + 0.005 INCHES (0.13) FROM THE EDGE OF THE TOP PLATE. (NOTE: NO PART OF THE EDM NOTCH CAN BE UNDER THE TOP PLATE.)

2161750 S0000472757_V1

Reference Standard NDT1088-144/050
Figure 2

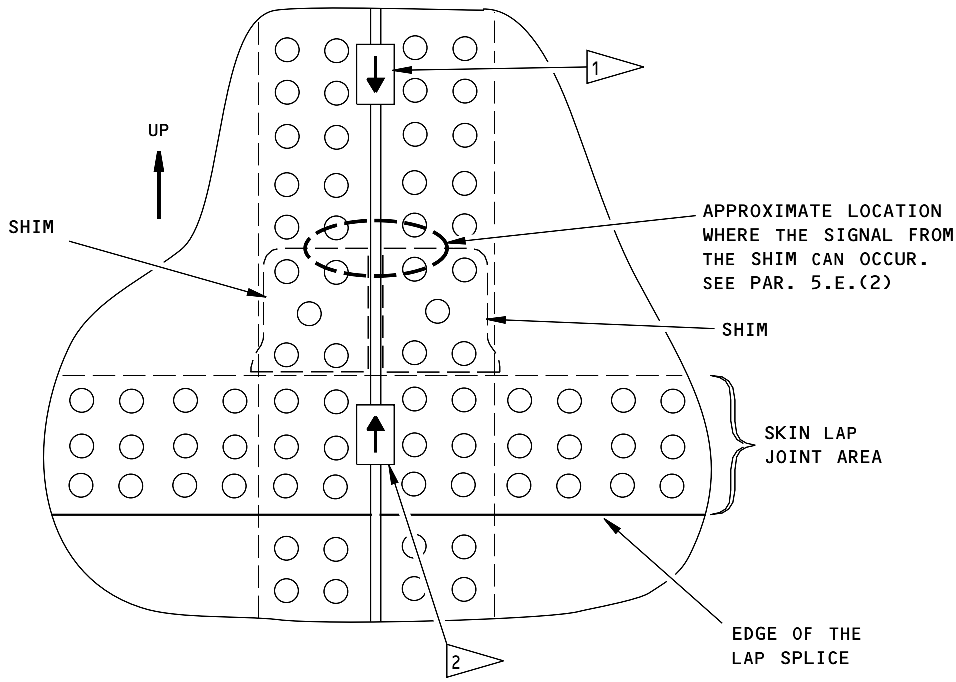


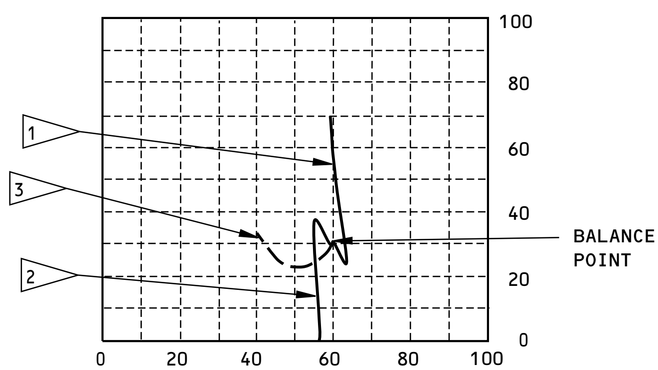
NOTES:

1. LIFT-OFF SIGNALS FROM THE TWO REFERENCE STANDARDS. THE DIRECTION OF LIFT-OFF CAN BE DIFFERENT FOR DIFFERENT PROBES AND REFERENCE STANDARDS.
2. THE BALANCE POINT WILL MOVE IN THIS DIRECTION IF THE PROBE GUIDE (AND PROBE) IS NOT KEPT PARALLEL WITH THE CENTERLINE OF THE BUTT SPLICE GAP. ADJUST THE PROBE GUIDE AS NECESSARY TO KEEP THE BALANCE POINT MOVEMENT TO A MINIMUM.
3. USE THESE MARKS ON THE PROBE TO HELP KEEP THE PROBE ALIGNED WITH THE GAP CENTERLINE
4. SET THE NOTCH SIGNAL TO 50% OF FULL SCREEN HEIGHT ABOVE THE BALANCE POINT ONLY IF THE (TOTAL) SKIN THICKNESS ABOVE THE SPLICE PLATE AT THE LAP SPLICE LOCATION IS BETWEEN 0.170 AND 0.185 INCH (4.30 AND 4.70 mm). USE REFERENCE STANDARD NDT1088-144/050 FOR THIS CONDITION.

2161751 S0000472758_V1

Instrument Calibration
Figure 3





EXAMPLE OF THE SIGNAL FROM THE EDGE OF SHIMS NEAR THE LAP SPLICES. (REFER TO PAR. 5.E.(2))

NOTES:

1. A CRACK-TYPE SIGNAL FROM THE SUBSURFACE SHIM WILL COME INTO VIEW WHEN THE INSTRUMENT IS BALANCED IN AN AREA OTHER THAN THE LAP JOINT AND THE SCAN IS DONE IN THE DIRECTION SHOWN. (NOTE: THE SIGNAL CAN LOOK DIFFERENT FROM THE ONE SHOWN HERE)
2. IF THE INSTRUMENT IS BALANCED ON THE LAP JOINT AND A SCAN IS MADE IN THE DIRECTION AS SHOWN ON THE PROBE, A SIGNAL FROM THE SHIM WILL MOVE DOWN-SCREEN AS SHOWN (NOTE: THE SIGNAL CAN LOOK DIFFERENT FROM THE ONE SHOWN HERE)
3. LIFT-OFF SIGNAL. THE LIFT-OFF SIGNAL CAN LOOK DIFFERENT FROM THE ONE SHOWN HERE.

2161752 S0000472759_V1

Inspection Details
Figure 4

PART 6 - EDDY CURRENT

C-SCAN INSPECTION OF SKIN CRACKS AT DOUBLER EDGES

1. **Purpose**

   A. Use this procedure to find cracks in the internal surface of the skin at the edge of a sub-surface doubler. This procedure is done from the external surface of the airplane. See Figure 1.

   B. This procedure uses a low frequency eddy current array.

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 an eddy current C-scan instrument that:

         (a) Has a multi-channel probe head that can scan an area of at least 1.5 inches (37 mm) in width.

         (b) Has a linear position encoder.

         (c) Operates from 10 kHz to 40 kHz.

         (d) Has a C-Scan display mode.

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

         (a) OmniScan MX with Eddy Current Array Module, Software Revision MXE-2.1R1; made by Olympus NDT.

   C. Probes

      (1) Use an array probe that operates from 10 kHz to 40 kHz.

      (2) The Olympus NDT array probe assembly that follows was used to help prepare this procedure and is the only probe that can be used:

         (a) SAB-064-030-032; ECT Array probe

         (b) ENC1-K-ECA; linear encoder with a resolution of 12 counts for each millimeter.

   D. Reference Standard

      (1) Use reference standard NDT1097-A, NDT1097-B or NDT1097-C, as applicable, as specified in Figure 2.

   E. Special Tools

      (1) Use a computer mouse with a USB connector when you calibrate the Omniscan instrument for this inspection.

      (2) We recommend that you use a compact keyboard with a USB connector to record data and file names in the Omniscan instrument.

3. **Prepare for the Inspection**

   A. Identify the inspection area. Refer to the applicable service bulletin.

   B. Remove loose paint, dirt, and sealant from the surface of the inspection area.

C. For airplanes that are painted: Make an estimate of the paint thickness on the skin. You can use calibrated, nonconductive shims with an eddy current procedure (lift-off measurement) that uses a direct or an indirect paint thickness display. Apply Teflon tape or clear tape layers, as thick as the thickest paint on the airplane, to the reference standard before calibration.

NOTE: You can also refer to the paint thickness instructions in the McDonnell Douglas Nondestructive Testing Standard Practice Manual, Part 6, 06-10-01.002, to measure paint thickness on the airplane.

4. Instrument Calibration

NOTE: The calibration instructions that follow are for the OmniScan eddy current array instrument. Other eddy current array or C-Scan instruments can be used if the results on the reference standards of Paragraph 2.D. are almost the same as the result specified in this calibration procedure. Refer to the manufacturer's operation instructions if you use a different eddy current array instrument.

A. Attach the eddy current module and array probe instrumentation to the instrument as specified in the manufacturer's instructions.

NOTE: The OmniScan instrument has key pad commands that make the set-up easier. This procedure references key pad numbers where they are applicable.

B. Go to the File menu and set up the instrument as follows:

(1) Open the Open (F2) sub-menu.

(2) Open the Open (F8) sub-sub-menu.

(3) If the correct calibration file is in storage, open the file and go to Paragraph 5.

(4) If the correct calibration file is not in storage.

(a) Download the applicable set-up file found in MyBoeingFleet in Part 6 of the 737 NDT manual.

1) Go to the disk icon and the applicable set-up.

2) Do Paragraph 4.J. thru Paragraph 4.K. to normalize the lift-off signal and adjust the correct gain value for the calibration notch.

(b) If you do not download the set up file to help the calibration process, close the menu and continue with the calibration instructions that follow.

C. Open the Probe menu

(1) Press the F7 Default Config button.

(2) Press Yes to continue.

D. Make sure that the freeze mode is set to off when you make the adjustments that follow.

E. Go to the Preferences menu and set up the instrument as follows:

NOTE: To make sure that numerical entries are accepted, push the Accept Key after the entry is completed.

(1) Open the Instrument (F4) sub-menu.

(a) Open the Category (F7) sub-sub-menu and set to unit.

(b) Open the Units (F8) sub-sub-menu and set the measurement units (inches or millimeters) to the correct settings for your work area.

F. Go to the EC Settings menu and set up the adjustments as follows:

(1) Open the Settings (F3) sub-menu:

(a) Open the Frequency (F7) sub-sub-menu and set the frequency to 26 kHz.

(b) Open the probe Drive (F8) sub-sub-menu and set to 4.0 Volts Peak.

(c) Open the Gain (F9) sub-sub-menu and set to 50 dB.

(d) Open the Rotation (F10) sub-sub-menu and set to 90°.

(e) Open the Vertical Gain (F11) sub-sub-menu and set to 6 dB.

G. Go to the Scan menu and set up the adjustments as follows:

(1) Open the Inspection (F2) sub-menu:

(a) Open the Scan (F8) sub-sub-menu and set to Encoder 1.

(b) Open the Acq. Rate (F9) sub-sub menu and set to 500 Hz.

NOTE: The software will automatically adjust the acquisition rate to reach the highest value it can if it was not able to get the selected value.

(2) Open the Encoder (F3) sub-menu:

(a) Open the Resolution (F10) sub-sub menu and set to 304.8 steps/inch (12 steps/mm).

(3) Open the Area sub-menu:

(a) Open the Scan End (F8) sub-sub-menu and set the value that best applies to your inspection.

NOTE: The Scan End limits the quantity of scan data (length of scan) that can collected. The instrument will not receive more data when the length of the probe scan is more than the Scan End value. It will be necessary to press the Start Key to reset the instrument encoder and data to start a new scan.

(b) Open the Scan Res. (F9) sub-sub-menu and set to 0.020 inches (0.50 mm).

H. Go to the Display menu and make the adjustments that follow:

(1) Open the Properties (F3) sub-menu:

(a) Open the Display (F7) sub-sub-menu and set to C-Scan.

(b) Open the Display Range (F11) sub-sub-menu and set to 11.8 inches (300 mm).

(2) Open the Color (F6) sub-menu:

NOTE: Do not enter the zero when you enter the numbers specified in Paragraph 4.H.(2)(a) and Paragraph 4.H.(2)(b) in the instrument.

(a) Open the Start (F7) sub-sub-menu and set to -0.5V.

(b) Open the End (F8) sub-sub-menu and set to 0.5V.

(c) Open the Load (F9) sub-sub-menu.

1) Move thru the list and highlight to select the Alarm-Inverted.pal file.

2) Push the F7 Open button.

I. Go to the Measurement menu and set up the instrument as follows:

(1) Open the Reading (F2) sub-menu:

(a) Open the Analysis (F8) sub-sub-menu and press Reading 1 to set V Max (Maximum Vertical Amplitude).

(b) Energize the Freeze mode.

(c) Set the PP Cursor (F9) sub-sub-menu to On.

(d) Set the Max Cursor (F10) sub-sub-menu to On.

(e) De-energize the Freeze mode.

J. Open the wizard menu to set the lift-off signal horizontally.

(1) Open the (F3) Calibration menu.

(a) Set Type (F9) to Normalization.

(b) Press (F8) Start.

(c) Press (F9) and set the angle to 0 degrees.

(d) Press (F10) and set the Amplitude to 5 Volts.

(2) Put the probe at probe position A, on the applicable reference standard, as shown in Detail I of Figure 3.

(a) Press (F8) Next.

(b) Press (F11) to balance the instrument.

(c) Press (F9) Start.

(d) Make a scan across the nonconductive shim to probe position B, as shown in Detail I of Figure 3.

(e) Press (F10) Stop. The screen display in the Freeze mode is shown in Detail II in Figure 3.

(3) Do the steps that follow to set the correct signal phase used to remove the effect of the lift-off signal.

(a) Double click the left mouse button in an area to the left of the signal caused by the nonconductive shim (green area) to create the vertical cursors. See Detail II, Cursor Position A in Figure 3.

(b) Double click the right mouse button on the center of the nonconductive shim image caused by the nonconductive shim (red area). See Detail II, Cursor Position B in Figure 3.

(c) Press (F8) two times.

(d) Press (F9) Normalize Angle.

(e) Press OK to reset the Y-Spread value to zero.

(f) See Detail III in Figure 3, for the correct lift-off display.

(g) Press (F8) Finish.

K. Use the steps that follow to adjust the correct gain level.

(1) Open the Eddy Current Settings menu.

(a) Set the Vertical Gain (F11) to an initial value of 16 dB.

NOTE: Accept the change to the vertical gain.

(2) Put the probe at Position A on the applicable reference standard and balance the instrument. See Detail I in Figure 4.

(3) Put the probe at Position B and make a scan toward position C. See Detail I in Figure 4.

(4) Monitor the display to identify the red image caused by the calibration notch. See Detail II in Figure 4.

(5) Continue to make a scans across the notch location until you continue to get the same red notch image.

(6) When you get the best notch image, do the steps that follow:

(a) Press the Freeze button to show the impedance plane and C-scan display.

(b) Put the two vertical cursors together and align them above the notch image (approximately in the center) as shown in Detail III in Figure 4.

(c) Put the two horizontal cursors, one above and the other below the notch image as shown in Detail III in Figure 4.

(d) Press the best fit button on the key pad to maximize the notch signal on the impedance plane display.

(e) Monitor the V Max value, displayed in Reading 1, in the upper left corner of the display.

(f) Adjust the vertical gain so that the value shown in V Max is approximately 1 volt.

(g) Press the Freeze button to de-energize the Freeze mode.

(h) Do Paragraph 4.K.(3) thru Paragraph 4.K.(6)(g) again until you continue to get the same image with a V Max value of 1 volt (± 0.2 volts). Adjust the vertical gain if necessary.

L. Save your final calibration set-up in the instrument memory. Identify the reference standard skin thickness used for the calibration in the file name.

5. Inspection Procedure

A. Identify the correct reference standard for the area of the airplane you will examine. See Figure 1.

CAUTION: MAKE SURE YOU DO NOT PUT A CALIBRATION FILE FOR A THIN SKIN AREA IN THE INSTRUMENT MEMORY WHEN YOU ARE TO EXAMINE AREAS WITH THICKER SKINS.

B. Put the correct calibration file in the instrument memory.

C. Make a scan of reference standard NDT1097-A, B or C, as applicable, to do a check of the calibration. See Paragraph 4.

D. Balance the array probe on the on the applicable reference standard at probe position A identified in Detail I of Figure 4.

NOTE: Do not balance the eddy current array on the airplane.

E. Make a scan along the sub-surface doubler edge on the airplane as shown in Detail I of Figure 5 and examine the C-scan display.

(1) If you have balanced the instrument on a reference standard with the incorrect thickness, the areas with foil will be light green and the bare skin areas will be dark green to red. See Detail II in Figure 5 for an example display.

(2) If you have balanced the instrument on a reference standard with the correct thickness, the areas with foil will be light green and the bare skin areas will be dark green. See Detail II in Figure 6 for an example display.

F. Refer to the service bulletin to identify the sub-surface doubler edges that must be examined. See Figure 7 for some typical scan directions.

G. Make scans along the sub-surface doubler edges and look for red areas on the C-scan display. For examples of crack signals recorded on airplane structure, see Figure 8.

6. Inspection Results

A. Areas on the C-scan display that have a vertical signal that is more than 0.5 volts (red areas on the scan) are possible cracks. These areas must be examined some more.

B. If you get a red area on the scan at the location of a doubler edge, do the steps that follow:

(1) Make sure you calibrated on a reference standard that is the same thickness as the airplane skin.

(2) Do a check of the paint thickness on your airplane. If the paint thickness on the airplane is thinner than the nonconductive layer on the reference standard, the inspection can be too sensitive.

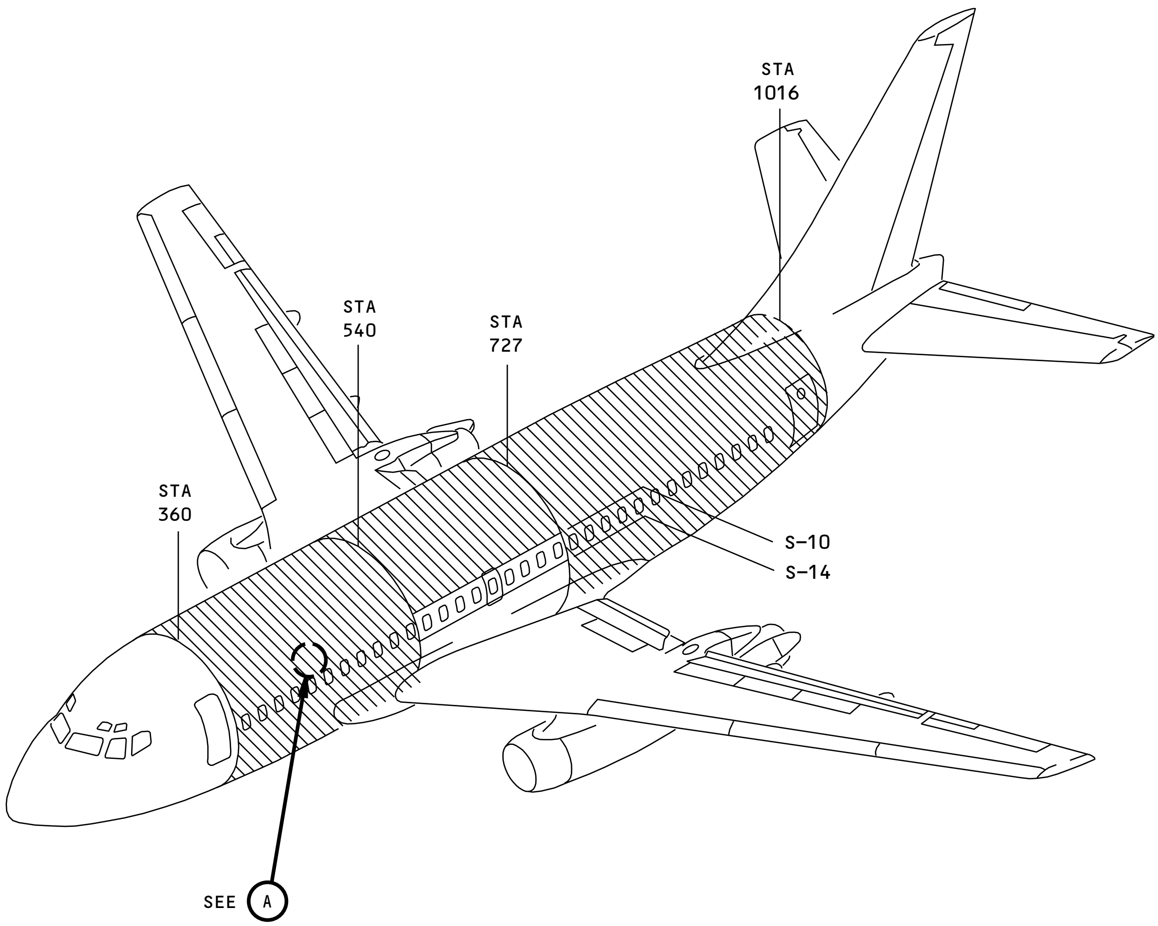
(3) Do a check of your gain setting. A gain setting that is too high can cause incorrect crack indications at the doubler edge. Do the calibration of Paragraph 4. again and make sure that the gain is set to the correct level.

(4) Do one of the procedures that follows to make sure that a crack indication is from a crack:

(a) 737 Part 6, 53-30-18 (medium frequency eddy current)

(b) 737 Part 4, 53-30-09 (ultrasonic single element)

(c) 737 Part 4, 53-30-07 (ultrasonic phased array)



NOTES:

= INSPECTION LOCATIONS

- DIMENSIONS ARE IN INCHES
  (MILLIMETERS ARE IN PARENTHESES)

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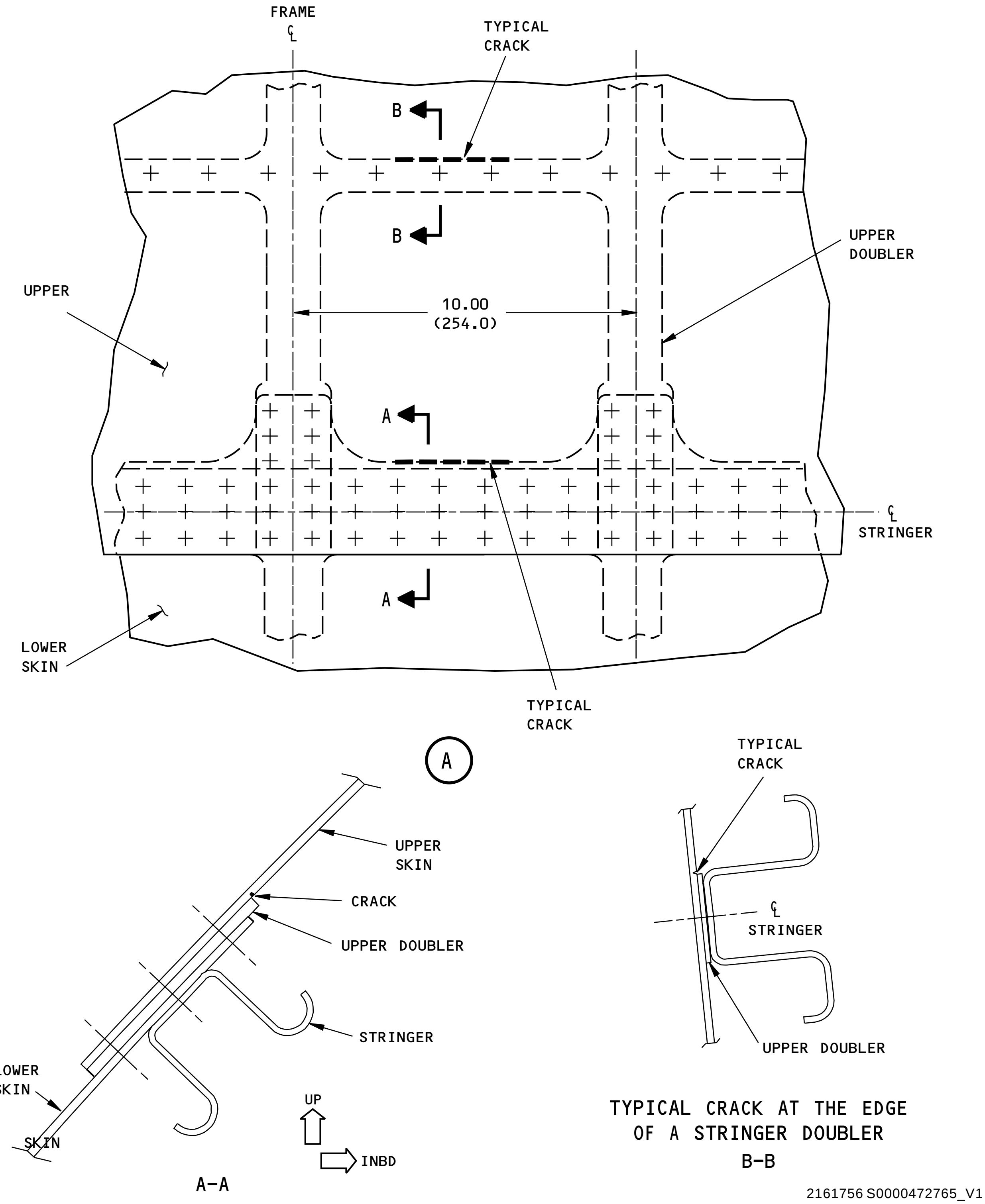
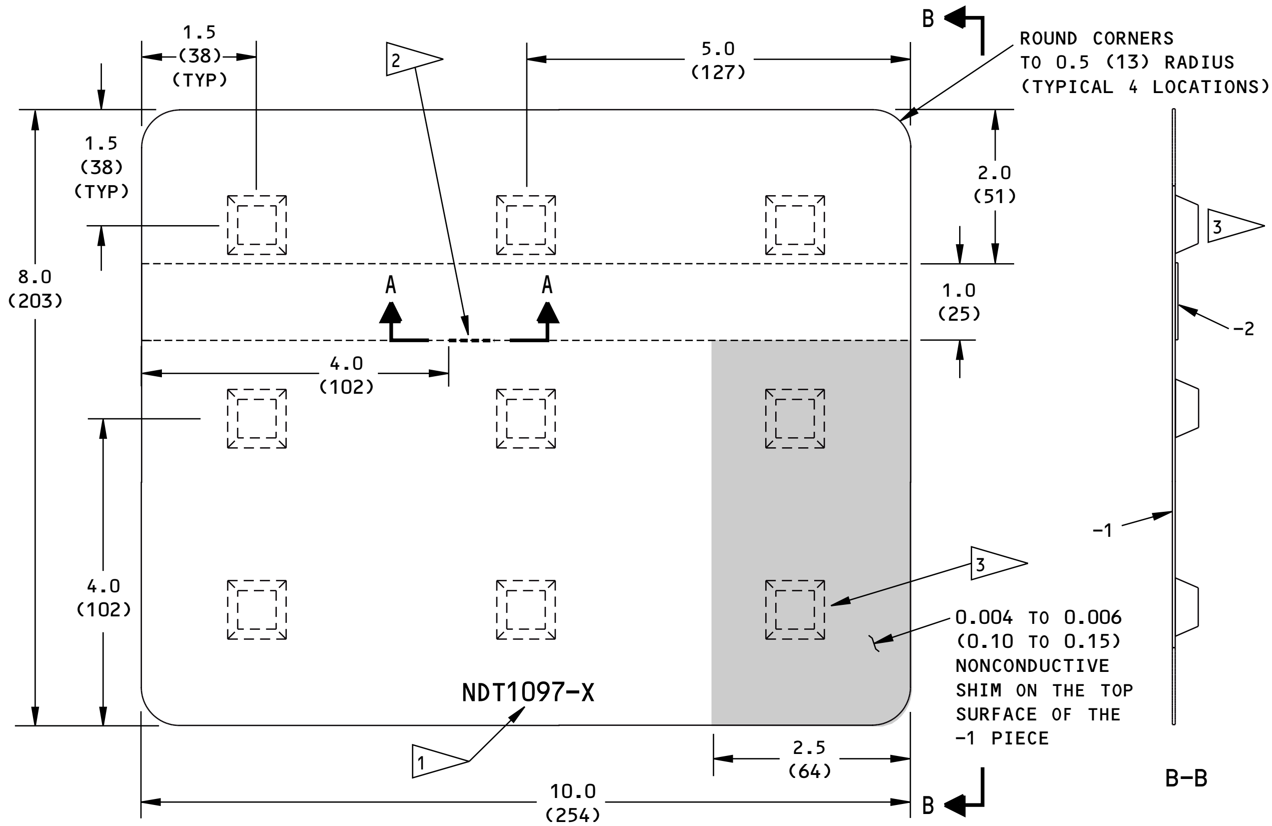
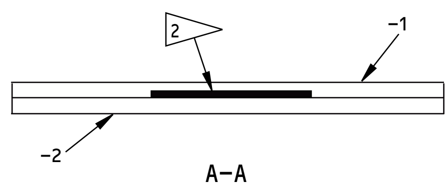
Inspection Areas
Figure 1 (Sheet 1 of 2)



2161756 S0000472765_V1

Inspection Areas
Figure 1 (Sheet 2 of 2)





REFERENCE STANDARD NUMBER	-1 MATERIAL	-2 MATERIAL
NDT1097-A	0.036 (0.91) ±0.002 (0.1)	0.036 (0.91) ±0.002 (0.1)
NDT1097-B	0.040 (1.00) ±0.002 (0.1)	0.040 (1.00) ±0.002 (0.1)
NDT1097-C	0.045 (1.14) ±0.002 (0.1)	0.040 (1.00) ±0.002 (0.1)

TABLE I

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

- SURFACE ROUGHNESS = 125 Ra OR BETTER.
- BOND THE -1 AND -2 PIECES TOGETHER. MAKE SURE THE EDGE OF THE -2 PIECE IS IMMEDIATELY ABOVE (WITHIN 0.010 (0.2)) THE EDM NOTCH BEFORE THE PIECES ARE BONDED.
- MATERIAL: 2024-T3 OR T4 ALUMINUM; CLAD

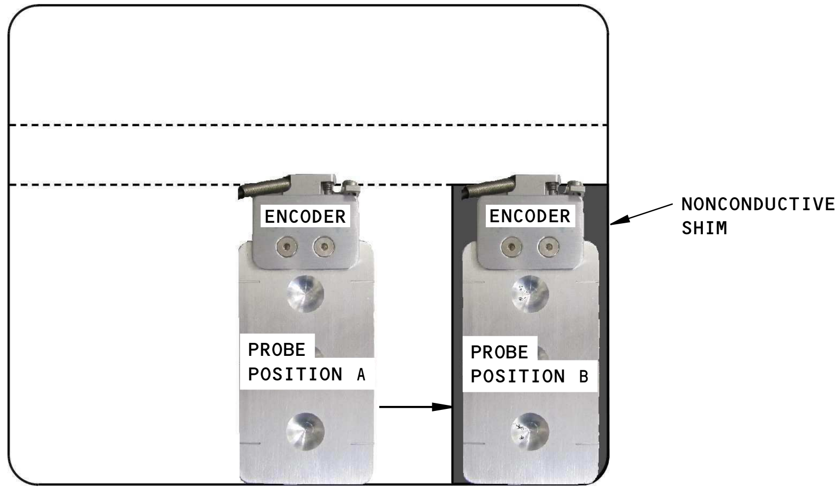
1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT1097-X. THE "X" IDENTIFIES THE APPLICABLE REFERENCE STANDARD NUMBER FOR THE -1 AND -2 MATERIAL THICKNESSES. SEE TABLE I.

2 EDM NOTCH:
DEPTH: 0.018 (0.46) ±0.002 (0.1) (BOTTOM SIDE OF -1 PIECE)
WIDTH: 0.007 (0.18) ±0.002 (0.1)
LENGTH: 0.500 (12.7)

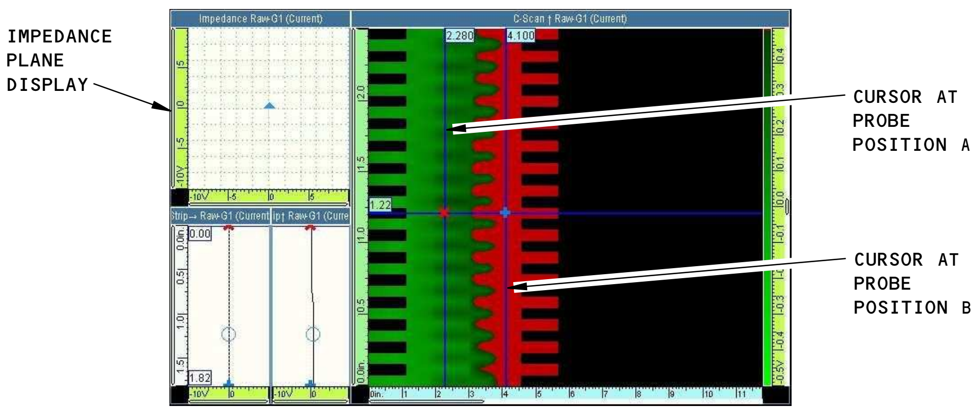
3 BOND 9 RUBBER FEET TO THE REFERENCE STANDARD IN THE APPROXIMATE POSITIONS SHOWN.

2161767 S0000472766_V1

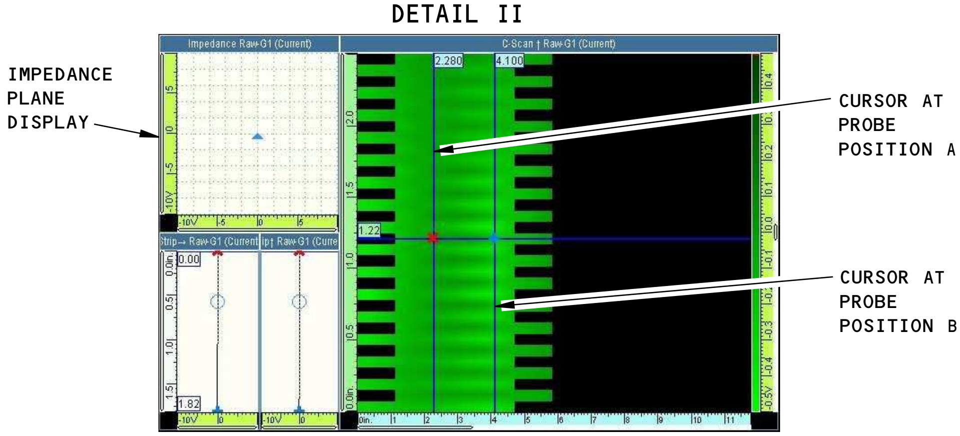
Reference Standard NDT1097-X
Figure 2



PROBE POSITION ON THE REFERENCE STANDARD
DETAIL I



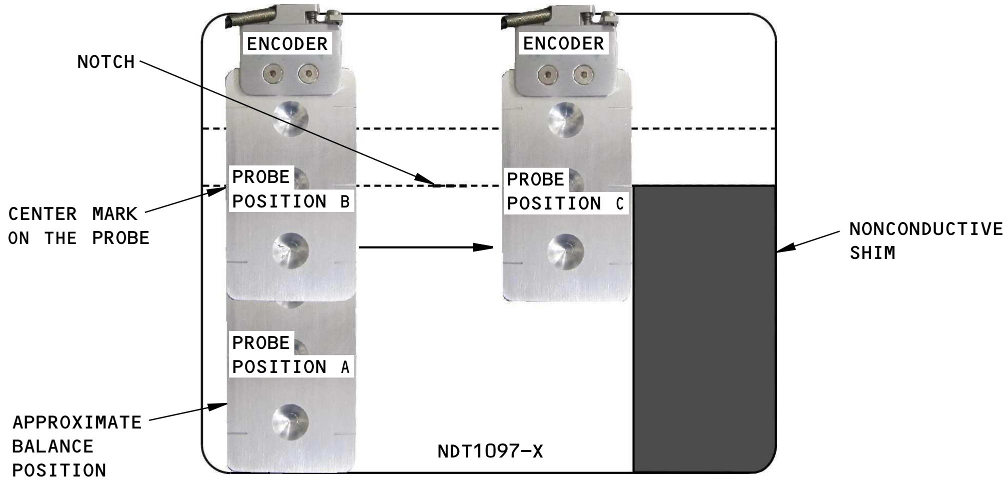
LIFT-OFF - BEFORE NORMALIZATION
DETAIL II



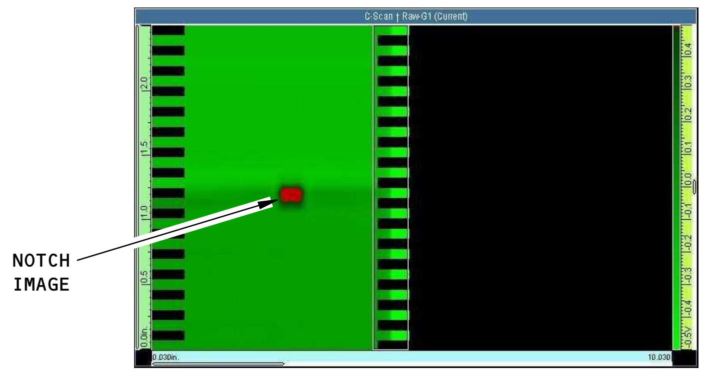
LIFT-OFF - AFTER NORMALIZATION
DETAIL III

2161821 S0000472768_V1

Instrument Calibration - Setting Lift-Off
Figure 3



PROBE POSITION ON THE REFERENCE STANDARD
DETAIL I



SCAN FROM PROBE POSITION B TO POSITION C
DETAIL II

GAIN LEVEL ADJUSTMENT
DETAIL III

NOTES:

1. THE TWO VERTICAL CURSORS ARE TOGETHER, ABOVE THE CENTER OF THE NOTCH IMAGE.
2. HORIZONTAL CURSOR, APPROXIMATE LOCATION

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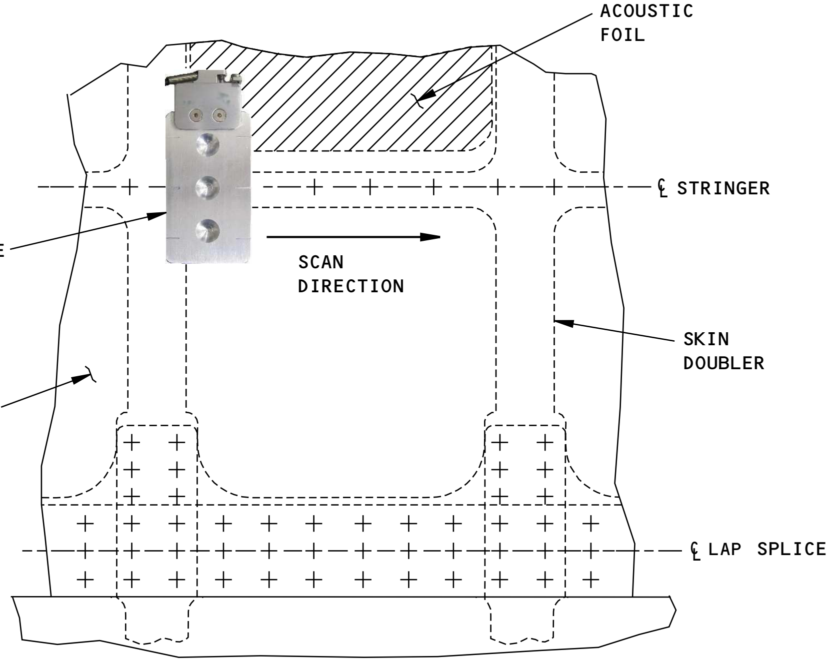
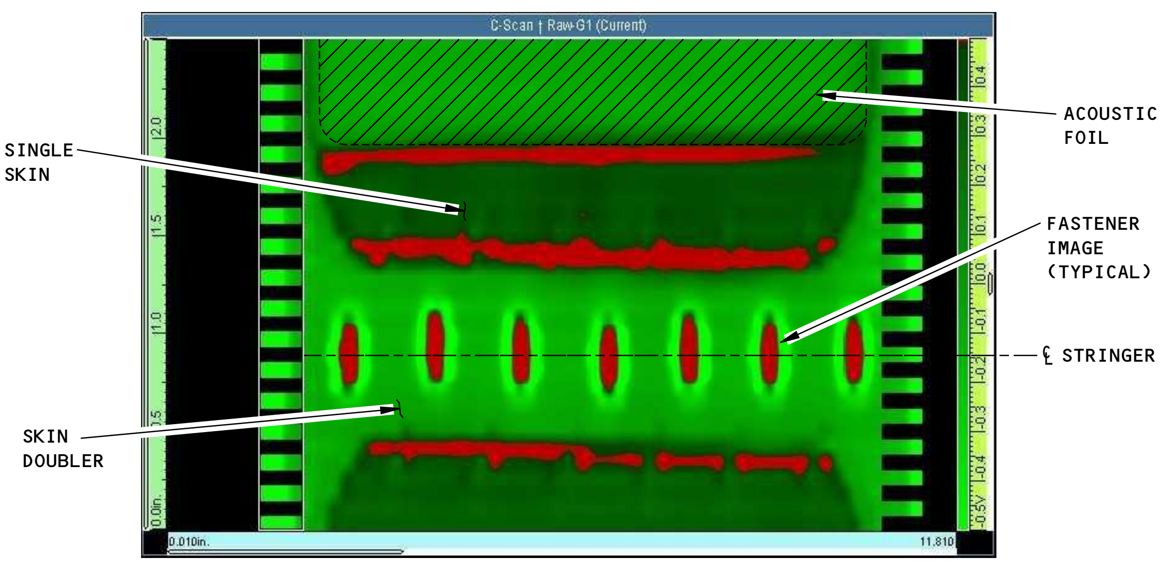
Instrument Calibration - Setting Correct Gain Level
Figure 4



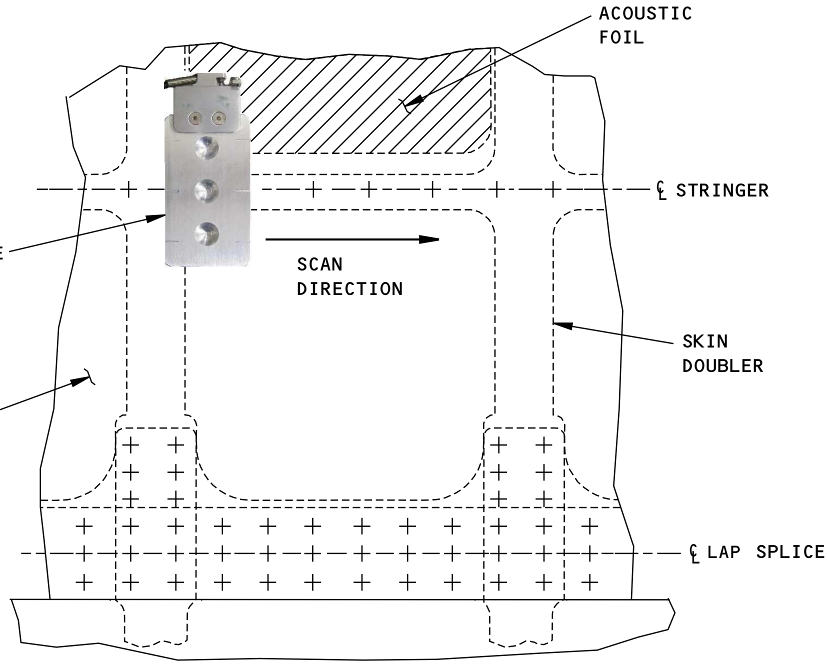
SCAN AREA
DETAIL I



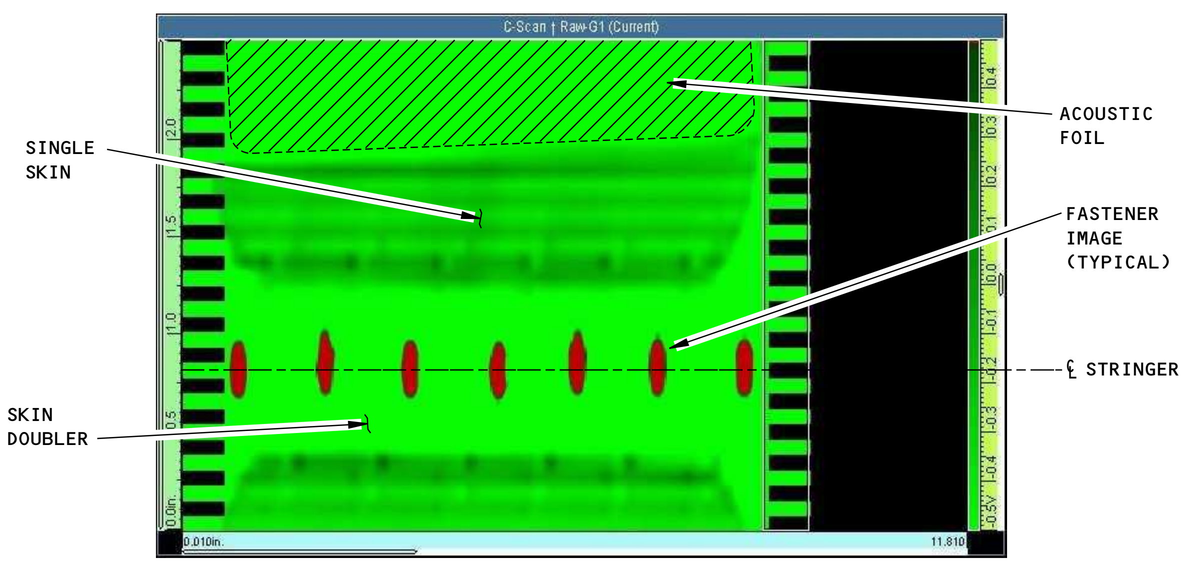
C-SCAN DISPLAY CAUSED BY INCORRECT BALANCE POSITION
DETAIL II

2161823 S0000472770_V1

Signals Caused by Incorrect Balance Position
Figure 5



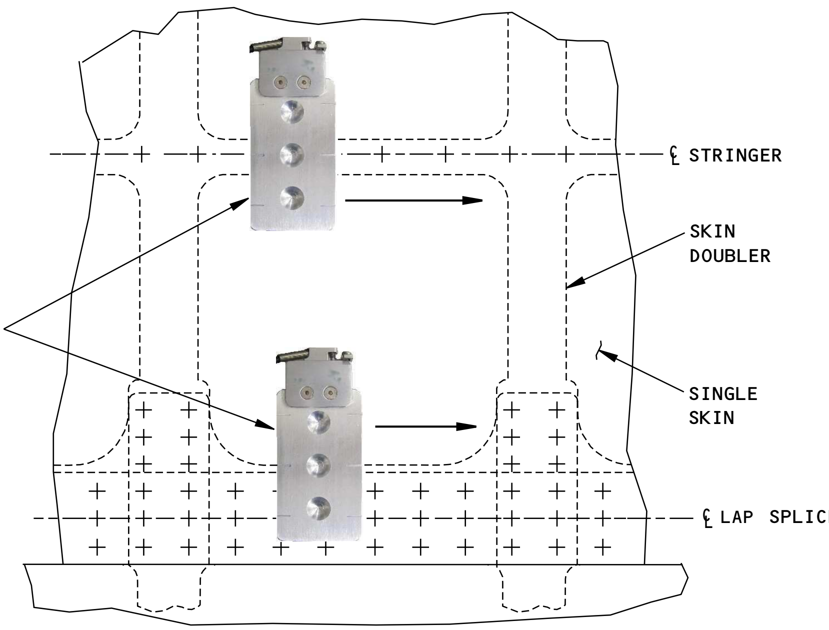
SCAN AREA
DETAIL I

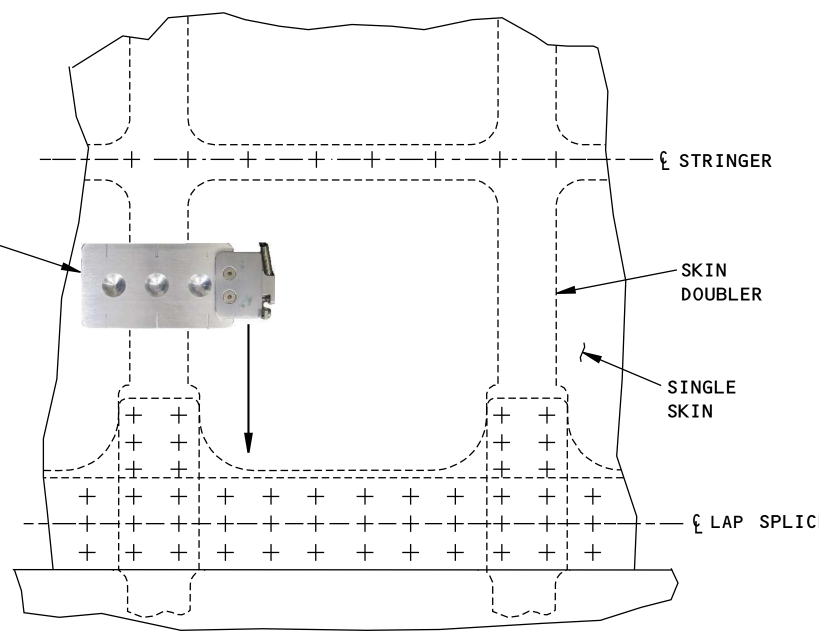


C-SCAN DISPLAY CAUSED BY CORRECT BALANCE POSITION
DETAIL II

2161824 S0000472771_V1

Signals Caused by Correct Balance Position
Figure 6





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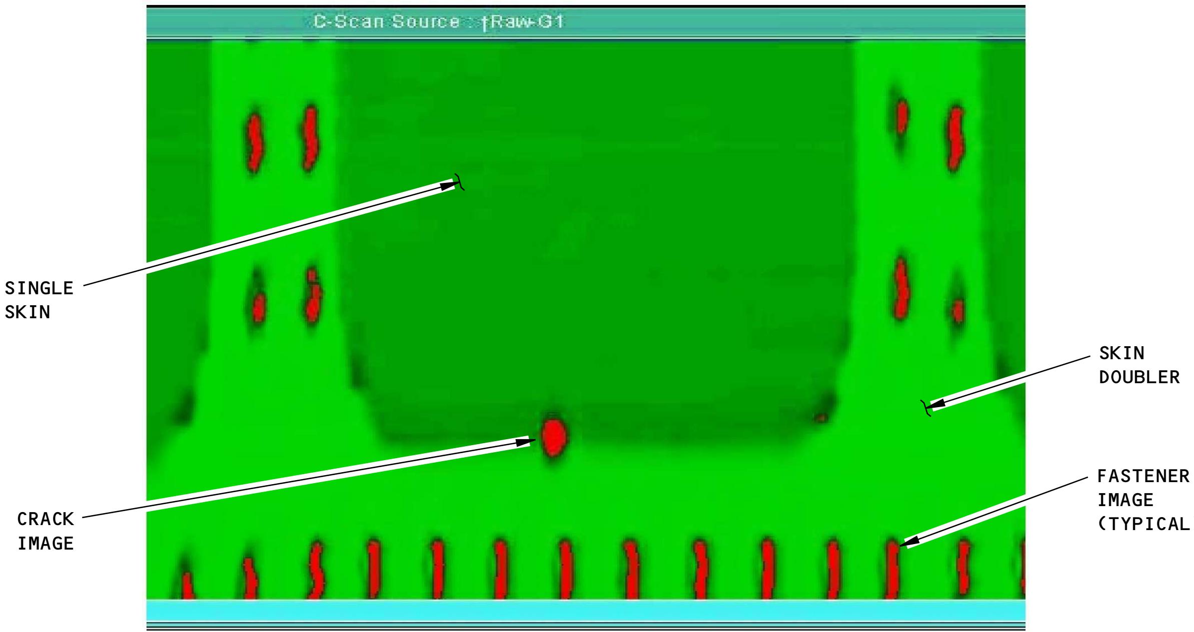
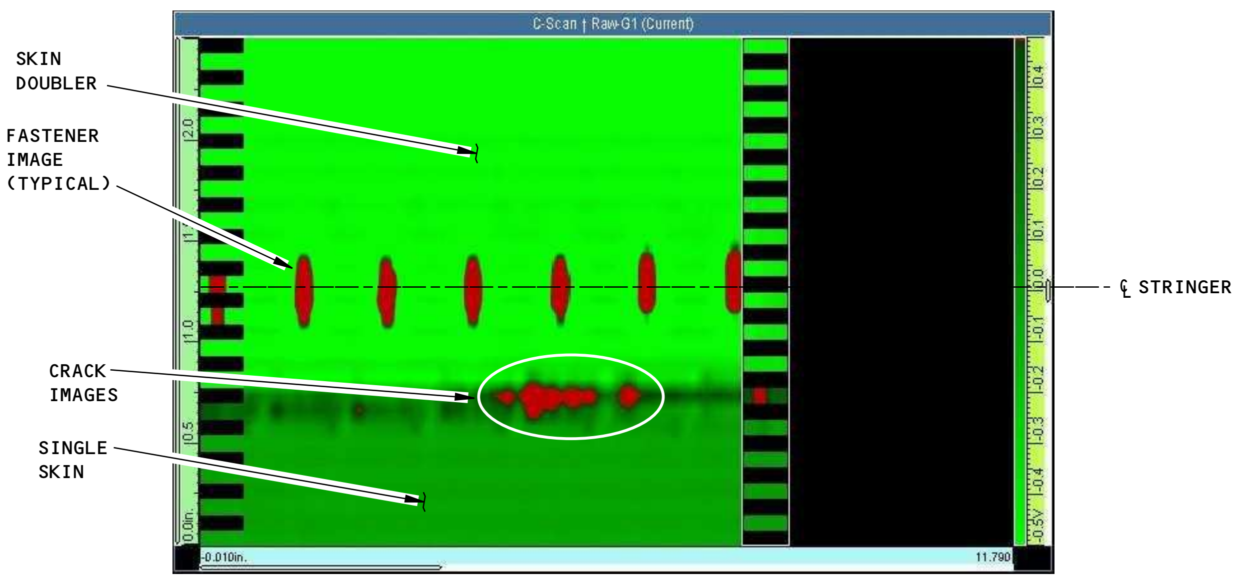
Typical Scan Directions
Figure 7



SCAN AT A LAP SPLICE
DETAIL I



SCAN AT A STRINGER
DETAIL II

2161826 S0000472773_V1

Example of Crack Signals on an Airplane Structure
Figure 8

PART 6 - EDDY CURRENT

FUSELAGE SKIN SCRIBE LINE CRACK INSPECTION - LOWER SKIN AT THE LAP JOINTS - ROTARY PROBE

1. **Purpose**

   A. Use this surface inspection procedure to find cracks in the lower skin panels of the fuselage at the lap joints. This procedure looks for cracks that can occur from scribe lines on the outside surface of the skin. This procedure looks for cracks in the lower skin panels that are:

      (1) 0.200 inch (5.08 mm) long, tapered to 0.018 inch (0.46 mm) deep at the center.

      (2) Aligned in the forward and aft direction.

   B. The inspection area of this procedure is between 0.050 inch and 1.00 inch (1.27 and 25.4 mm) below the edge of the lap splice on the outboard surface of the lower skin. See Figure 1 for the inspection area.

   C. The inspection procedure for the area between the edge of the lap and 0.063 inch (1.60 mm) below the lap is Part 6, 53-30-22.

   D. This is a high frequency eddy current (HFEC) inspection that uses a rotary scanner and a specially designed rotary probe.

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 an eddy current instrument that:

         (a) Has an impedance plane display and a rotary scanner.

         (b) Operates at a frequency between 300 kHz to 500 kHz.

      (2) The rotary scanner must have a scan speed of 1000 RPM or more.

      (3) The instruments that follow were used to help prepare this procedure.

         (a) Phasec 2; Hocking

         (b) Nortec 2000; Staveley Instruments

   C. Probe

      (1) This procedure uses a specially designed rotary probe with the properties that follow:

         (a) The center of the coils must spin about an axis with a radius of 0.625 inch (15.88 mm) or larger.

         (b) The distance between the bottom of the coils to the part surface shall not change more than 0.003 inch (0.08 mm) as the probe turns through 360 degrees.

         (c) When calibrated as specified in Paragraph 4., the signal from the lap edge must not be more than 1/5 of the signal you get from the notch that is 0.063 inch (1.60 mm) from the lap edge.

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

(a) NEC-3152/U-3; NDT Engineering Corp.

D. Reference Standard

(1) Use reference standard NDT3091. See Figure 2. If you have reference standard NDT3075, it can be used as an alternative to NDT3091 to do the calibration.

3. Prepare for the Inspection

A. Clean the inspection areas and areas adjacent to the inspection areas.

NOTE: Dirty surfaces are abrasive and will scratch the skins and wear out the eddy current probe.

B. Get sufficient access to the inspection areas.

4. Instrument Calibration

A. Set the instrument to a frequency between 300 kHz and 500 kHz.

B. If the inspection surface has more than 0.003 inch (0.08 mm) of paint, put a nonconductive layer on the reference standard. The thickness of the nonconductive layer must be within 0.003 inch (0.08 mm) of the actual paint thickness in the inspection area.

C. If the inspection surface is bare, put a piece of thin Teflon tape on the probe to help prevent scratches to the skin surface.

D. Set the instrument to the impedance plane display mode (X/Y display).

E. Set the filters to their initial position as follows:

(1) Set the high pass filter as low as possible (to zero or DC).

(2) Set the low pass filter to the maximum position.

F. Put the probe on the inspection surface of the reference standard between the notch locations identified as “A” and “B”. See Detail I in Figure 3.

G. Balance the instrument and adjust the balance point to the center of the screen, as shown in Detail II of Figure 3.

H. Start the rotary scanner and set the speed to 1000 RPM or more.

I. Tilt the probe slightly and adjust the instrument phase control to get the lift-off signal to move horizontally.

J. Set the instrument display to the time base mode (Y/T display).

K. Set the height of the sweep to the center of the screen or 50% of full screen height (FSH).

L. Set the sweep so that one rotation of the probe is displayed as one scan across the display.

M. Move the probe across the notch identified as “A” on the reference standard.

N. Adjust the probe position on the notch to get the maximum signal height.

O. Adjust the instrument gain to get the maximum peak of the signal to 80% of FSH or the minimum peak of the signal to 20% of FSH. See Detail II in Figure 3.

P. Set the filters as follows:

(1) Increase the high-pass filter until the signal decreases by 50%.

(2) Decrease the low-pass filter until the signal becomes stable or until the signal begins to decrease, whichever happens first.

Q. Adjust the instrument gain to get the maximum peak of the signal to 80% of FSH or the minimum peak of the signal to 20% of FSH. See Detail II in Figure 3.

R. Set the top audible alarm to 65% of FSH (15% above the balance point) and set the bottom audible alarm to 35% of FSH (15% below the balance point), as shown in Detail II of Figure 3.

S. Move the probe across all three notches, identified as “A”, “B” and “C”, and make sure that the signal of each notch is equal to or more than 80% of FSH or equal to or less than 20% of FSH.

NOTE: Since the probe can move across the same notch twice in one rotation, two separate signals can be given by a single notch.

T. Move the probe across the notch identified as “A” to find the maximum scan speed. The speed is too fast if the signal decreases more than 5% of FSH. The audible alarm must still operate.

5. Inspection Procedure

A. Calibrate as specified in Paragraph 4.

B. Put the probe on the inspection surface and balance the instrument. See Figure 1 for the typical probe position on the inspection area.

C. Start the rotary scanner.

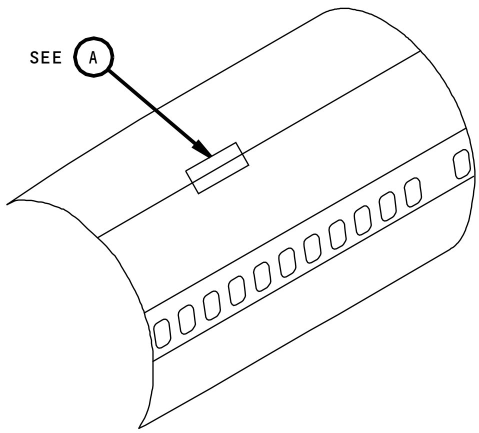
D. Make a scan of the lap joints specified by the local engineering authority within the inspection area identified in Figure 1.

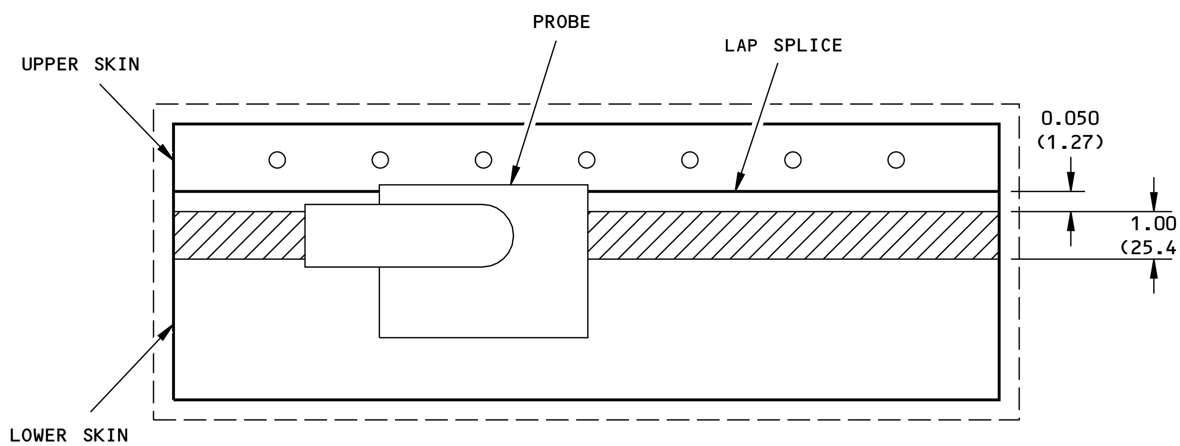
(1) Keep the probe against the edge of the upper skin of the lap splice and perpendicular to the inspection surface at all times during the inspection scan.

6. Inspection Results

A. Areas that cause signals to occur that are more than 65% of FSH and less than 35% of FSH must be visually examined to help identify the causes of the crack signals. Then examine the areas as specified in Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23.

B. Make a mark with an approved marker on the skin surface at the locations of all possible crack indications.





PROBE ON THE LOWER SKIN OF THE LAP SPLICE

A

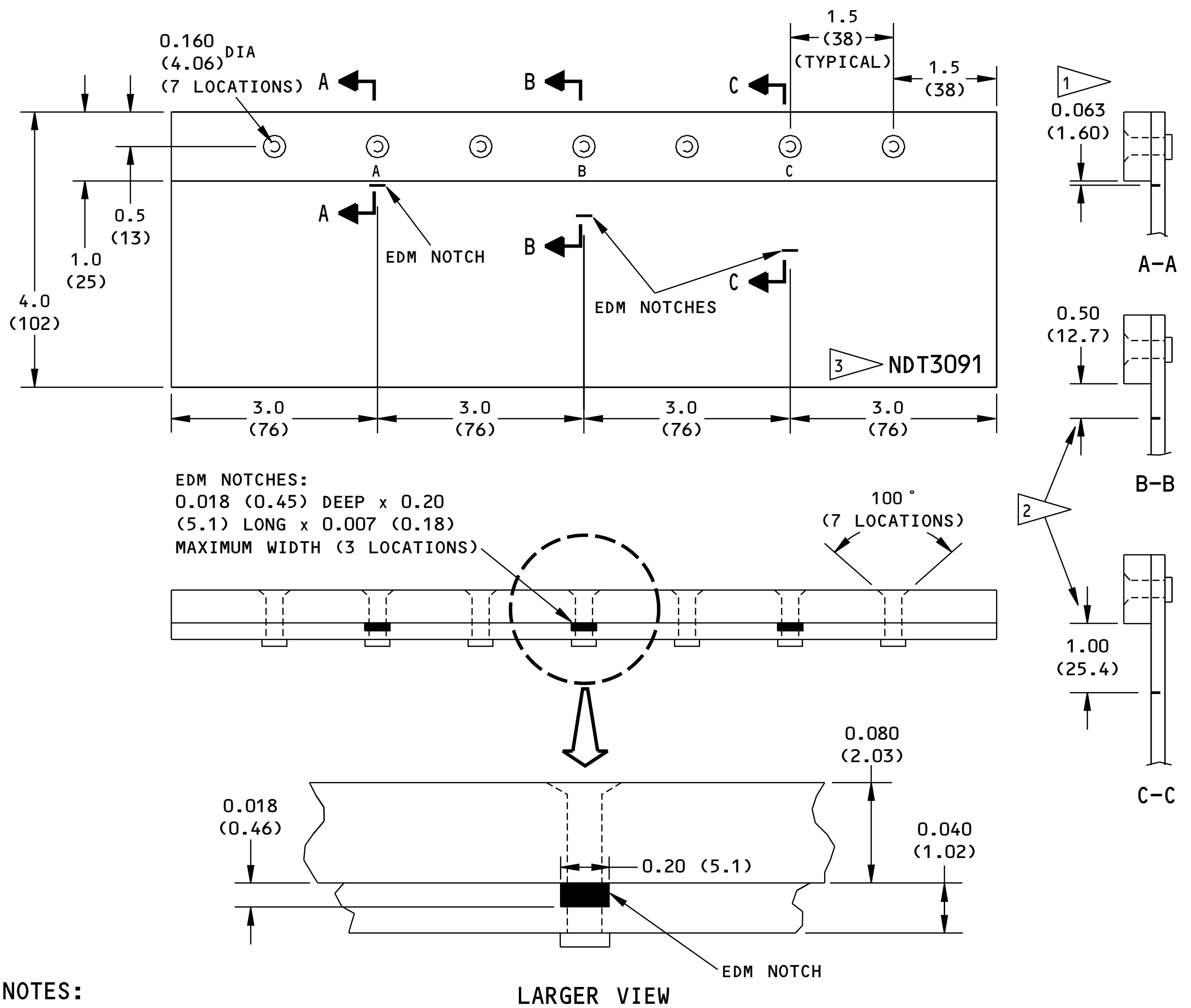
NOTES:

INSPECTION AREA

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)

2161827 S0000472777_V2

Inspection Areas
Figure 1



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- NOTCH DEPTH TOLERANCE: ±0.002 (0.05).
  NOTCH LENGTH TOLERANCE: ±0.010 (0.25)
- MATERIAL: 2024-T3 CLAD
  BOTTOM LAYER: 12.0 (304) x 4.0 (102) x 0.040 (1.0)
  TOP LAYER: 12.0 (304) x 1.0 (25) x 0.080 (2.03)
- RIVETS: BACR15GF5D5 OR BACR15CE5D5. QUANTITY 7.

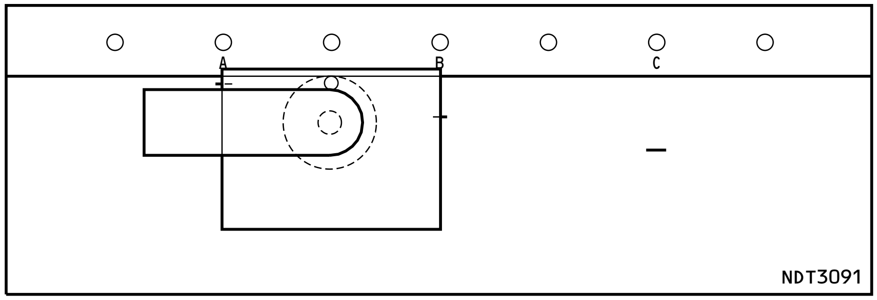
1 THE NOTCH LOCATION TOLERANCE (FROM THE EDGE) FOR THIS NOTCH IS ±0.003 (0.08)

2 THE NOTCH LOCATION TOLERANCE (FROM THE EDGE) FOR THESE TWO NOTCH LOCATIONS IS ±0.005 (0.13).

3 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT3091

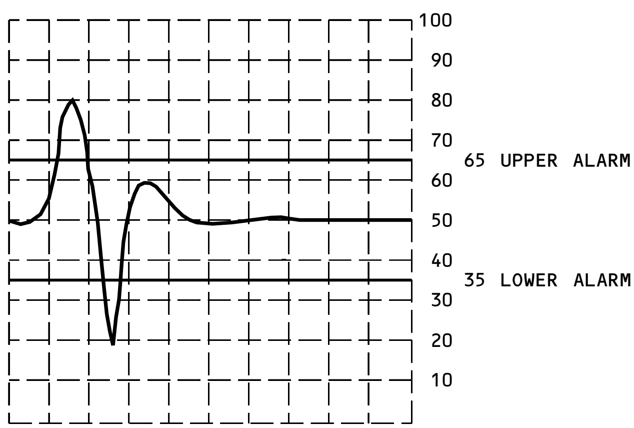
2161828 S0000472778_V1

Reference Standard NDT3091
Figure 2



PROBE POSITION ON THE
REFERENCE STANDARD

DETAIL I



TIME BASED SCREEN DISPLAY
OF THE NOTCH SIGNAL

DETAIL II

NOTES:

- THE SCREEN DISPLAY SHOWN IN DETAIL II IS AN EXAMPLE. DIFFERENT INSTRUMENTS, PROBES AND FILTER COMBINATIONS CAN GIVE DIFFERENT SIGNAL SHAPES.
- THE ALARM LEVEL SHOWN IN DETAIL II IS SET TO 35% AND 65% OF FULL SCREEN HEIGHT (FSH), OR 15% HIGHER AND LOWER THAN THE BALANCE POINT.

2161829 S0000472779_V1

Instrument Calibration
Figure 3

PART 6 - EDDY CURRENT

FUSELAGE SKIN SCRIBE LINE CRACK INSPECTION - VERTICAL SCANS OF THE LOWER SKINS AT THE LAP JOINTS

1. **Purpose**

   A. Use this surface inspection procedure to find cracks in the lower skin panels of the fuselage at the lap joints. This procedure looks for cracks that can occur from scribe lines on the outside surface of the skin. This procedure looks for cracks in the lower skin panels that are:

      (1) 0.20 inch (5.1 mm) long (or more) and are not fully through the skin panel.

      (2) Are in the forward and aft direction.

   B. This is a high frequency eddy current (HFEC) inspection (surface inspection).

   C. This procedure examines the lower skin panels for cracks in an area that is from 0.063 to 1.0 inch (1.60 to 25.4 mm) from the outer skin edge of the lap joint.

   D. This inspection uses a spot probe. The probe scans are done in a vertical direction. See Figure 1 for the inspection area.

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 an eddy current instrument that:

         (a) Operates at a frequency of 70 kHz.

         (b) Has an impedance plane display.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) Phasec 2200; Hocking

         (b) Nortec 1000, 2000; Staveley Instruments

   C. Probes

      (1) It is necessary to use a spot probe to do this inspection. The probe must operate at a frequency of 70 kHz. The probe diameter must not be less than 0.24 inch (6.1 mm) and not more than 0.26 inch (6.6 mm).

      (2) The spot probes that follow operated satisfactorily when this procedure was made. Other probes can be used if they can find the notches in the reference standard as specified in the calibration instructions of this procedure.

         (a) SPO-5164; Nortec/Staveley (diameter = 0.25 inch (6.4 mm))

         (b) SPC-354/.25; EC-NDT (diameter = 0.25 inch (6.4 mm))

         (c) NEC1087; NDT Engineering (diameter = 0.25 inch (6.4 mm))

         (d) NEC-1090; NDT Engineering (diameter = 0.25 inch (6.4 mm))

         (e) RS902-50B/20K/2D; NDT Engineering (diameter = 0.25 inch (6.4 mm))

D. Reference Standard

(1) Use reference standard NDT3091. See Figure 2. If you have reference standard NDT3075, it can be used as an alternative to NDT3091 to do the calibration.

E. Chalk line reel - Use a carpenter's type of chalk line reel to make a linear mark on the airplane 1.2 inches (30 mm) below the outer skin edge. It is not mandatory to use a chalk line to make the line, but it does make it faster to show the inspection area. See Figure 1, Sheet 2, to see how to show the inspection area.

3. Prepare for the Inspection

CAUTION: IF THERE IS SEALANT AT THE INTERFACE OF THE LOWER SKIN AND THE EDGE OF THE OUTER SKIN, CAREFULLY REMOVE THE SEALANT TO PREVENT DAMAGE TO THE SURFACE OF THE SKIN. REFER TO THE AIRPLANE MAINTENANCE MANUAL (AMM) FOR MORE INSTRUCTIONS IF NECESSARY.

A. If there is sealant in the inspection area, carefully remove it. See Figure 1 for the inspection area that is 1.2 inches (30 mm) from the edge of the outer skin.

B. Make sure the inspection area is clean and made smooth if the paint is rough.

C. Make a marker line on the lower skin that is 1.2 inches (30 mm) below the edge of the outer skin.

4. Instrument Calibration

A. Set the instrument frequency to 70 kHz.

B. Set the vertical gain 12 to 18 dB higher than the horizontal gain.

C. Set the instrument for permanent screen display (screen persistence).

D. Set the instrument filters as follows:

(1) Set the high filter to off or zero Hz.

(2) If the instrument has a low pass filter:

(a) Set the low pass filter to its highest value.

(b) If the dot is not stable, decrease the low pass filter value to get a stable dot or until the signal from the notch in the reference standard starts to decrease.

NOTE: If the low pass filter is set too low, it is possible that a crack will not be found if the scan speed during the inspection is faster than the scan speed during the calibration.

E. Put the probe at probe position 1 on reference standard NDT3091 as shown in Detail I of Figure 3.

NOTE: If there is paint on the inspection area, put a nonconductive shim on the reference standard. The thickness of the shim must be equivalent (±0.003 inch (0.08 mm)) to the paint thickness on the airplane.

F. Balance the instrument.

G. Set the instrument balance point to the lower center area of the screen display as shown in Detail III of Figure 3.

H. Lift the probe off the surface and adjust the instrument phase control to get the lift-off signal to move horizontally from right to left.

I. Move the probe to the top edge so the probe goes on notch A at probe position 2. The probe will not be able to go across this notch, but make sure the probe is aligned with the center of the notch. See Detail I and II in Figure 3 for this probe position.

J. Adjust the instrument gain to get the signal to 25% of full screen height (FSH) higher than the balance point. See Detail III in Figure 3 for this signal.

K. Put the probe at probe position 3 and balance the instrument.

L. Move the probe to probe position 4 (at notch B).

M. If this signal from notch B occurs at 40% of FSH or higher above the balance point, no more gain adjustment is necessary. If this signal is less than 40% of FSH above the balance point, increase the gain until the signal is at 40% of FSH above the balance point. See Detail IV in Figure 3.

N. Do a test to see if the probe has sufficient shielding. If the probe does not have sufficient shielding, a false indication can occur when the probe touches the edge of the outer skin (or the top edge of the reference standard). Do this shielding test as follows:

(1) Put the probe on the reference standard (lower skin) approximately 0.5 inch (12.7 mm) from the top edge, and away from a reference notch.

(2) Balance the instrument.

(3) Move the probe so it touches the top edge and move it back to the initial position.

(4) Monitor the screen display.

(5) If the balance point moves up or down 10% of FSH or more, use a probe with better shielding and calibrate again as specified in Paragraph 4.E. thru Paragraph 4.N.

NOTE: A probe with too much shielding cannot find the notch at probe position 2 (the notch that is the nearest to the outer edge).

O. See Figure 3 for instructions on where to put the line on the reference standard before you start the simulated probe scans.

P. See Figure 3 for instructions on how to do a probe scan on the reference standard that is equivalent to the scan pattern on the airplane (as shown in Figure 1). Put the probe at approximately probe position 5 to start the simulated probe scans on the reference standard.

(1) The signal from notch A must be a minimum of 25% of FSH above the balance point.

(2) The signals from notches B and C must be a minimum of 40% of FSH above the balance point.

5. Inspection Procedure

A. Calibrate as specified in Paragraph 4.

B. Put the probe on the lower skin of the airplane so the probe edge touches the marker line that is 1.2 inches (30 mm) away from the edge of the outer skin. See flagnotes 1 and 2 in Figure 1.

C. Balance the instrument.

D. Move the probe up to the outer skin edge and monitor the screen display.

E. Move the probe to the left or right a distance that is 1 probe diameter. See flagnotes 1, 2 and 3 in Figure 1 to see the scan pattern for this inspection.

F. Move the probe down to the marker line and monitor the screen display.

G. Do Paragraph 5.B. thru Paragraph 5.F. again to make sure the probe scans overlap in the inspection area.

NOTE: It can be necessary to balance the instrument again during the inspection because of balance point movement during the scan.

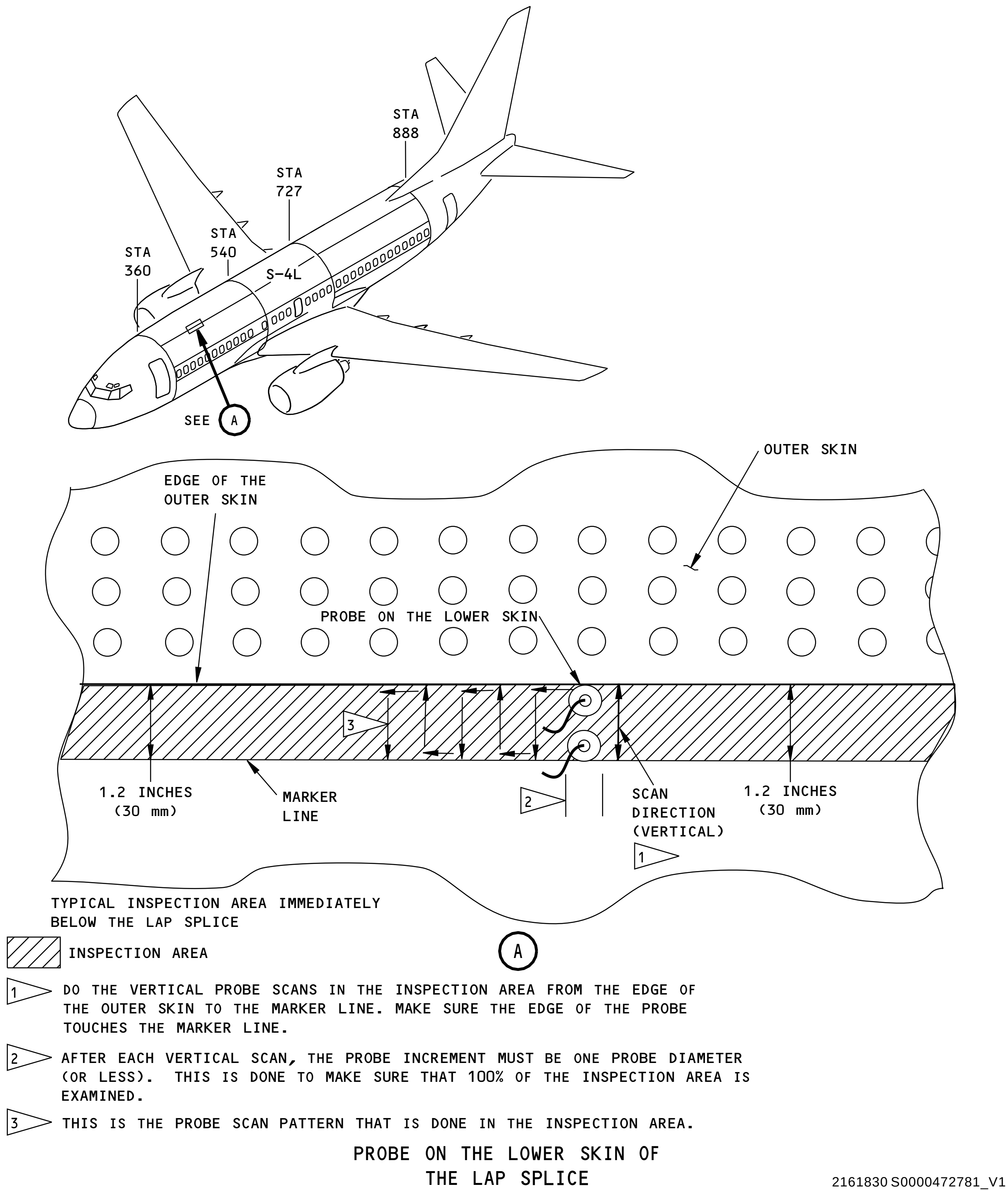
6. Inspection Results

A. Signals that are 20% of FSH (or more) than the balance point are possible crack indications. Make a mark on the skin surface of all possible crack indications with a grease pencil, felt pen or wax pencil.

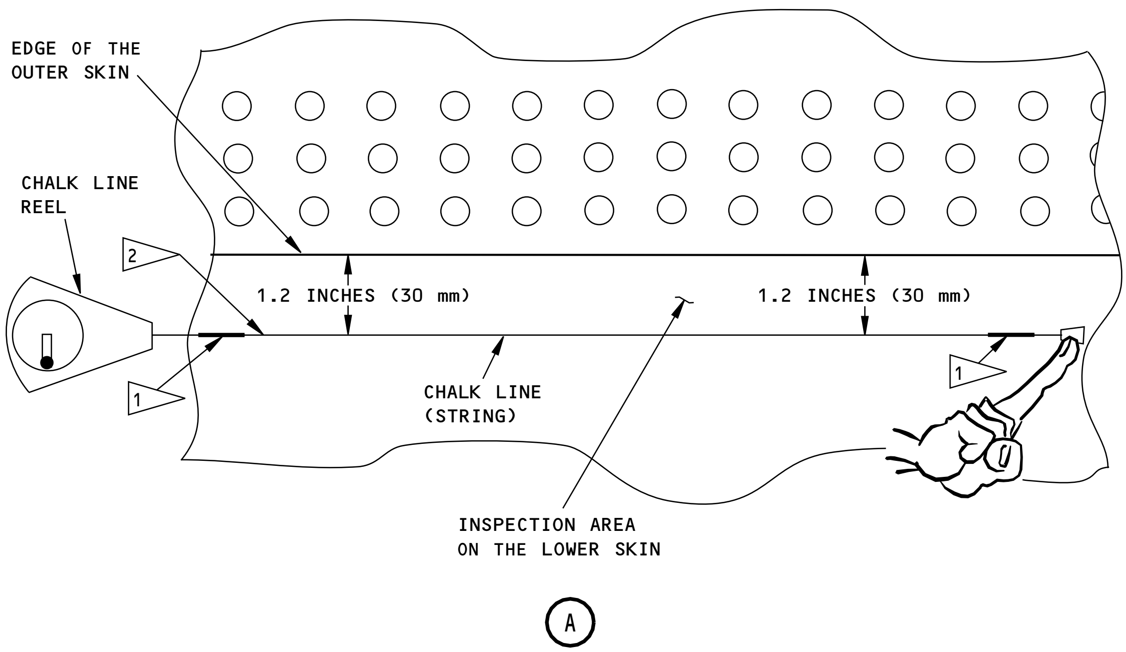
B. Compare the signal that occurs during the inspection to the signal you got from the notch in the reference standard.

C. A crack indication can occur if there is clad removed or worn down in a small area.

D. If a crack indication is found, use a small diameter pencil probe (maximum diameter 0.13 inch (3.3 mm)) to scan the area where the indication was found. Refer to the inspection procedure in Part 6, 51-00-00, Procedure 23, for the calibration and inspection instructions.



Inspection Areas
Figure 1 (Sheet 1 of 2)



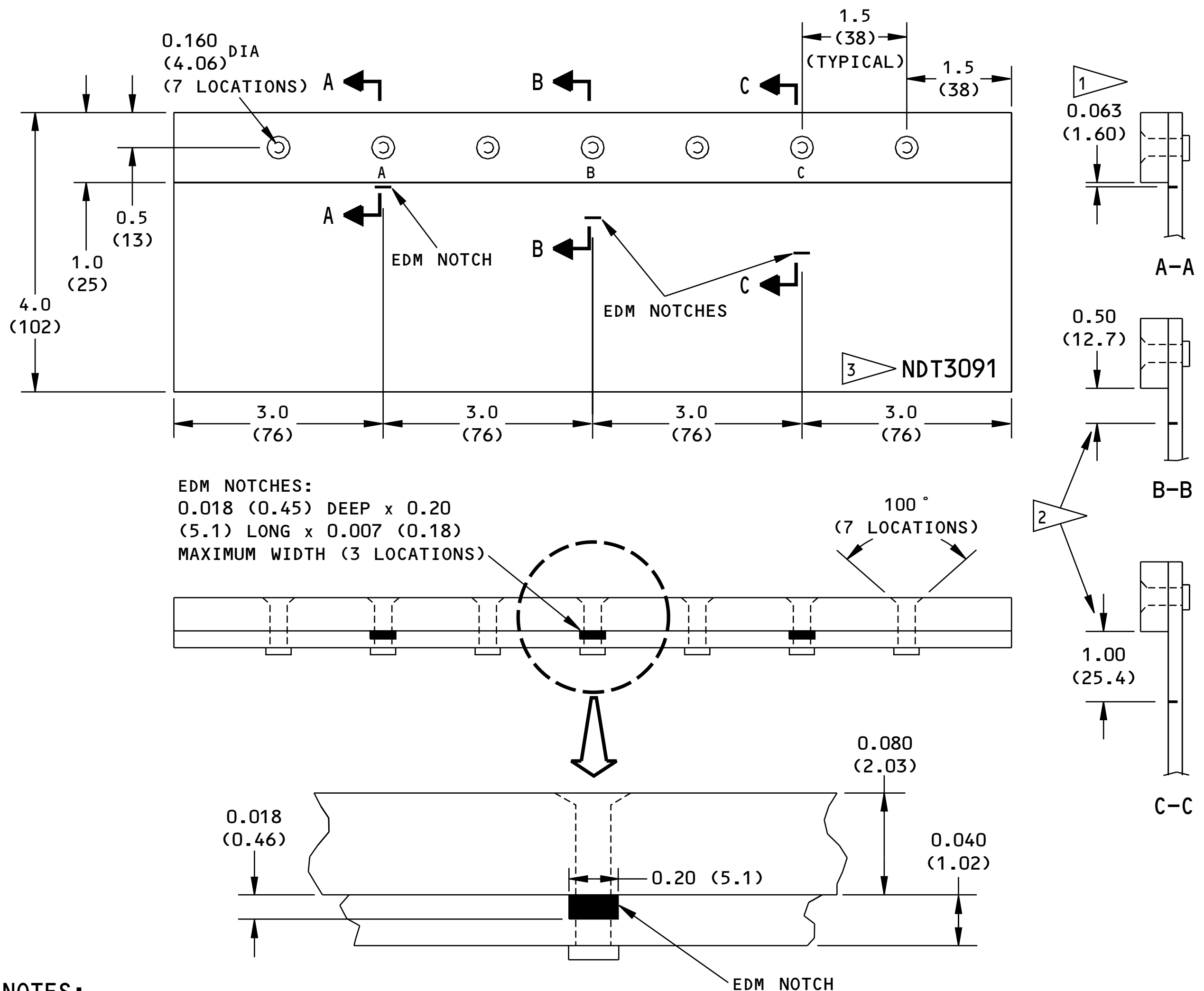
PROCEDURE TO IDENTIFY THE INSPECTION AREA

1. MEASURE 1.2 INCHES (30 mm) FROM THE EDGE OF THE OUTER SKIN AND MAKE SHORT MARKS ON THE LOWER SKIN WITH AN INK MARKER OR A GREASE PENCIL.
2. USE A STRAIGHTEDGE OR A CHALK LINE TO MAKE A LINE BETWEEN THE TWO MARKS.

MAKE A LINE FOR THE INSPECTION AREA

2161832 S0000472782_V1

Inspection Areas
Figure 1 (Sheet 2 of 2)



NOTES:

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

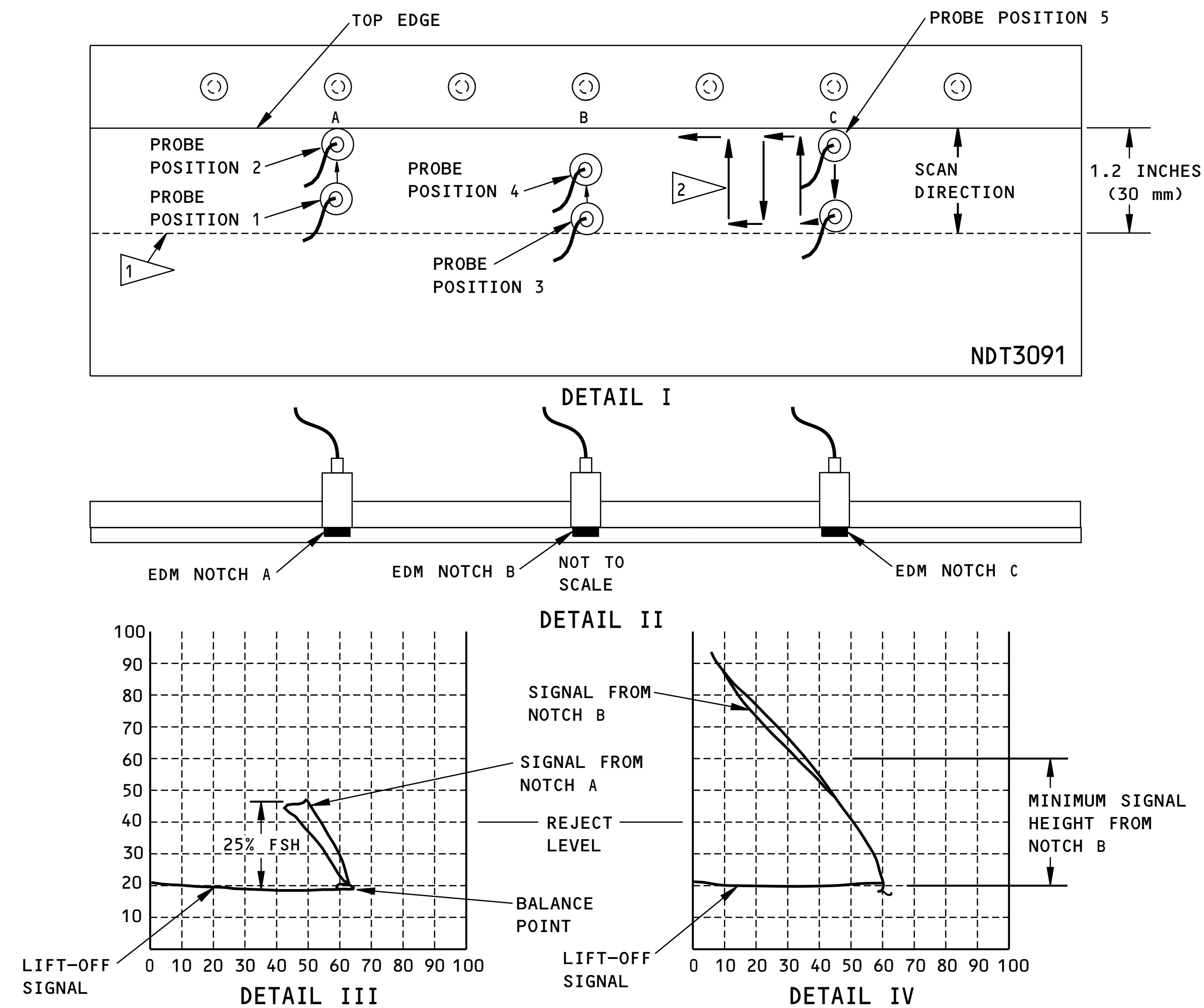
INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- NOTCH DEPTH TOLERANCE: ±0.002 (0.05).
  NOTCH LENGTH TOLERANCE: ±0.010 (0.25)
- MATERIAL: 2024-T3 CLAD
  BOTTOM LAYER: 12.0 (304) x 4.0 (102) x 0.040 (1.0)
  TOP LAYER: 12.0 (304) x 1.0 (25) x 0.080 (2.03)
- RIVETS: BACR15GF5D5 OR BACR15CE5D5. QUANTITY 7.

1. THE NOTCH LOCATION TOLERANCE (FROM THE EDGE) FOR THIS NOTCH IS +0.003 (0.08), -0
2. THE NOTCH LOCATION TOLERANCE (FROM THE EDGE) FOR THESE TWO NOTCH LOCATIONS IS ±0.005 (0.13).
3. ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT3091

2161833 S0000472783_V1

Reference Standard NDT3091
Figure 2



NOTES:

- ALL PROBE SCANS ARE DONE PERPENDICULAR TO THE NOTCHES.
- SET THE SIGNAL HEIGHT FROM NOTCH A SO IT IS 25% OF FULL SCREEN HEIGHT HIGHER THAN THE BALANCE POINT. MAKE SURE THE PROBE GOES TO THE TOP EDGE AND IS ON THE CENTER OF NOTCH 1 AS SHOWN ABOVE IN DETAIL II.
- DO THE SCAN AT NOTCH B TO SEE IF THIS NOTCH SIGNAL OCCURS AT 40% (OR HIGHER) OF FULL SCREEN HEIGHT (FSH) ABOVE THE BALANCE POINT.
- SET THE REJECT LEVEL TO 40% OF FULL SCREEN HEIGHT (20% OF FSH HIGHER THAN THE BALANCE POINT).

1 MAKE A LINE ON THE REFERENCE STANDARD WITH A MARKER OR A CHALK LINE. THIS IS TO SIMULATE THE INSPECTION AREA THAT WAS MADE ON THE AIRPLANE IN FIGURE 1.

2 DO THIS SCAN PATTERN ON THE REFERENCE STANDARD TO SEE HOW ALL NOTCH SIGNALS OCCUR ON THE DISPLAY. SEE FIGURE 1 FOR MORE PROBE SCAN INSTRUCTIONS.

2161835 S0000472784_V1

Instrument Calibration and Probe Positions
Figure 3

PART 6 - EDDY CURRENT

SURFACE INSPECTION OF THE FUSELAGE SKIN AT THE UPPER RIB PLUS CHORD

1. **Purpose**
   A. This procedure is used to look for cracks in the fuselage skin that is adjacent to the upper rib plus chord from station 578 to 639. The inspection is done internally to find horizontal cracks in the skin that are along the upper edge of the upper rib plus chord. See Figure 1 for the inspection area.
   B. This procedure uses an impedance plane display instrument or a meter display instrument.
   C. 737 Supplemental Structural Inspection Document (D6-82669) Reference:
      (1) Item: F-55
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 an eddy current instrument that:
         (a) Has an impedance plane display or a meter display.
         (b) Operates at a frequency between 50 kHz and 200 kHz.
      (2) The instruments that follow were used to help prepare this procedure.
         (a) Phasec 1.1; Hocking Krautkramer
         (b) NDT 19; Staveley Instruments
         (c) Locator UHB; Hocking Inc.
   C. Probes
      (1) It is necessary to use one straight or angled pencil probe to do this procedure. The probe must:
         (a) Operate at a frequency between 50 kHz and 200 kHz.
         (b) Have a maximum external diameter of 0.125 inch (3.18 mm).
         (c) Be shielded.
         (d) Operate as specified in Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23.
      (2) The probes that follow were used to help prepare this procedure. Other probes can be used to do this inspection if they can be calibrated as specified in Paragraph 4.
         (a) MTF902-50FX/50K-300K; NDT Engineering Corp.
         (b) PAB90C402; EC-NDT LLC.
   D. Reference Standards
      (1) Use reference standard 126 to do this inspection. Refer to Figure 4 in Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23, to make this reference standard.

3. **Prepare for the Inspection**

   A. Remove the internal wall panels between stations 578 and 639 to get access to the inspection area at stringer 18A on the left and right sides of the airplane.

   B. Make sure the internal surface of the skin is clean in the probe scan area between stations 578 and 639 on the left and right sides of the airplane. The vertical scan distance is from the bottom of the upper row of rivets to one inch (25.4 mm) above the bottom of the rivets. Remove sealant if it is in the inspection area. See Figure 1 for the inspection area.

4. **Instrument Calibration**

   A. Use reference standard 126 to do a calibration for this inspection. Refer to Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23 for the calibration instructions.

5. **Inspection Procedure**

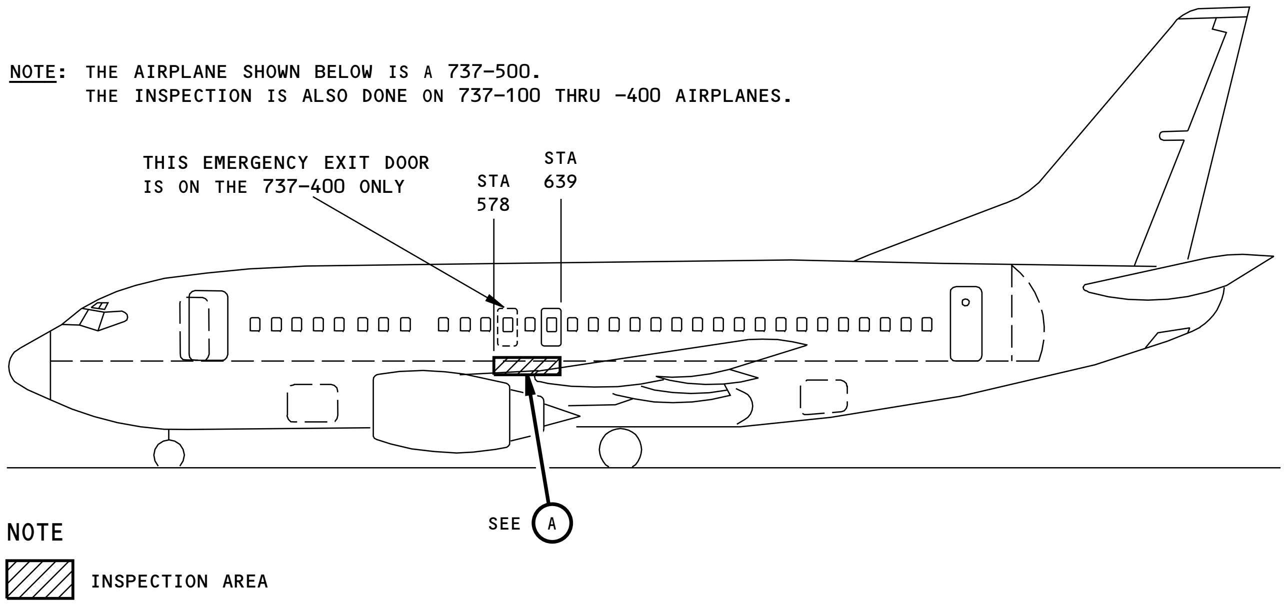
   A. Do the calibration as specified in Paragraph 4.

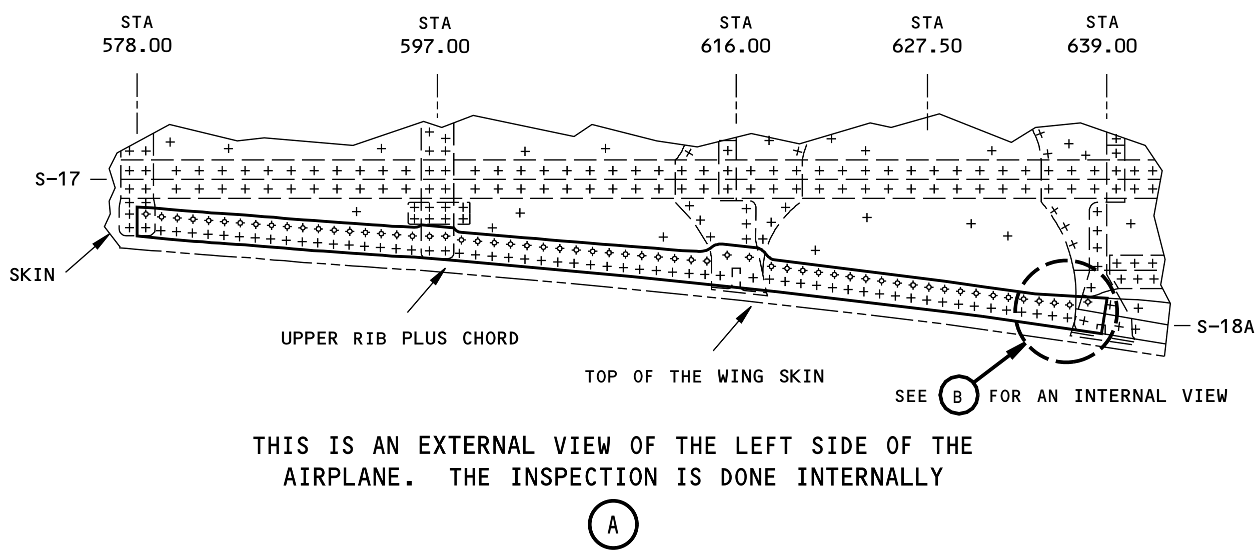
   B. Put the probe in the inspection area as shown in Figure 1 to do vertical probe scans in the inspection area. The vertical scan distance is from the bottom of the upper row of rivets to one inch (25.4 mm) above the bottom of the rivets as shown in Figure 1. Refer to par. 6 in Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23 for more inspection and probe scan instructions.

   C. Make sure the inspection is done on the left and right sides of the airplane.

6. **Inspection Results**

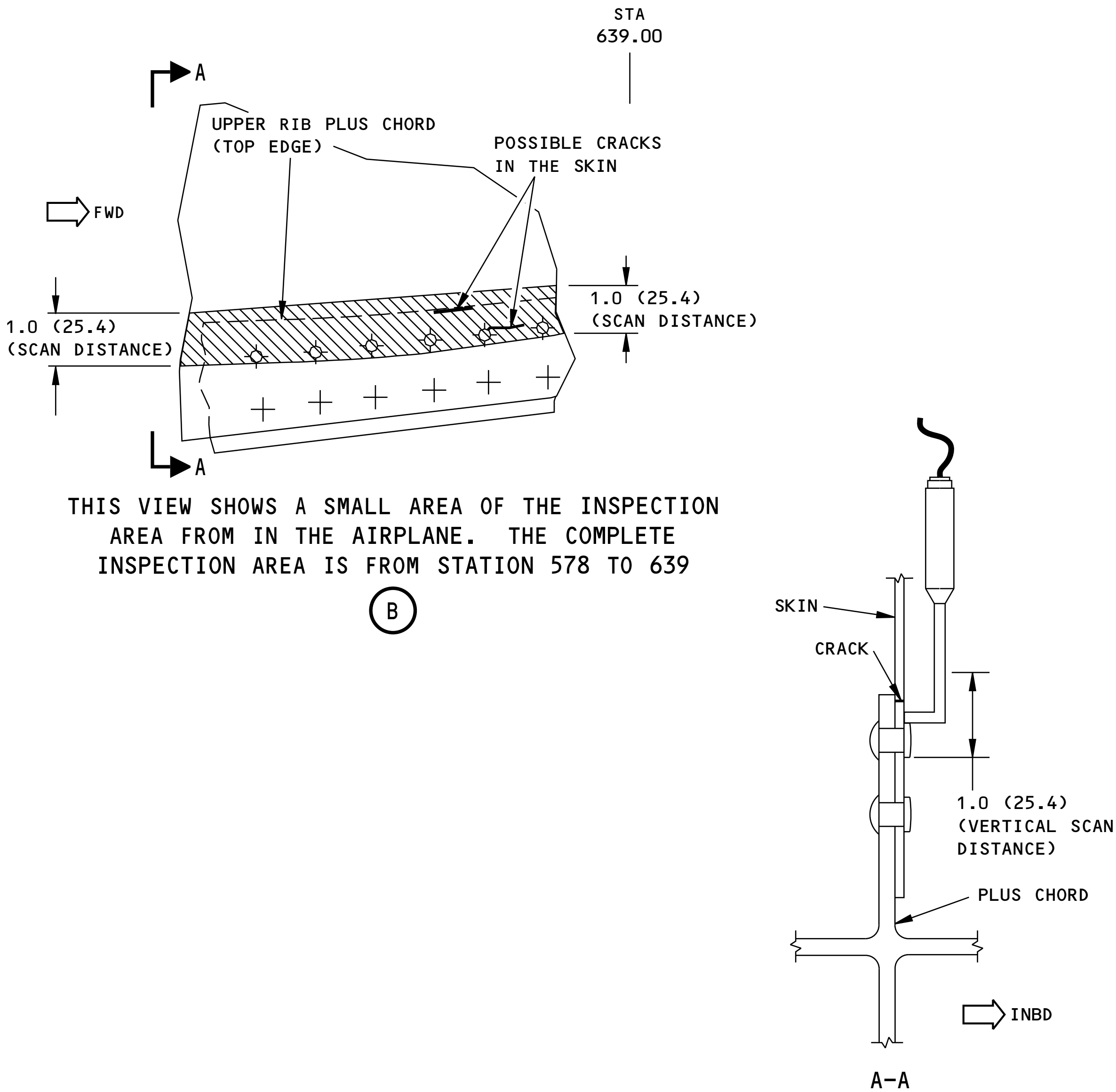
   A. Refer to Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23, par. 7, to make an analysis of possible crack signals.





2161837 S0000472787_V1

Inspection of the Fuselage Skin Adjacent to the Upper Rib Plus Chord
Figure 1 (Sheet 1 of 2)



NOTES:

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- DO VERTICAL PROBE SCANS IN THE INSPECTION AREA BETWEEN STATIONS 578 AND 639

2161838 S0000472788_V1

Inspection of the Fuselage Skin Adjacent to the Upper Rib Plus Chord
Figure 1 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

INSPECTION OF SPLICE STRAPS AT BUTT-SPLICES WITH A SMALL DIAMETER PENCIL PROBE

1. **Purpose**

   A. Use this procedure to find cracks in the splice straps at the circumferential butt-splices of fuselage skin panels. This procedure examines the splice straps for possible through-thickness cracks that are 0.5 inches (13 mm) long (or more) and grow in the circumferential direction. This inspection is done from the outer surface of the airplane.

   B. This procedure examines splice straps that can be seen between the butt-splice gap (between the skin edges and or doubler edges and skin edges). This procedure can be used only if the distance between the skin edges at the butt-splices is 0.050 inch (1.27 mm) or more. Tell Boeing about structure that is different from that specified for this procedure.

   C. This procedure uses an impedance plane display instrument and a specially designed, small diameter probe that touches the splice strap during the scan.

   D. This inspection cannot be done if the doubler edge goes 0.020 inch (0.51 mm) or more beyond the skin edge (over the gap).

   NOTE: To do this inspection, it is necessary to remove all of the sealant from the butt-splice gap (as specified in Service Bulletin (SB) 737-53A1262, Appendix A) so the splice plate can be seen.

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. Instruments

   (1) Use an eddy current instrument that:

   (a) Has an impedance plane display.

   (b) Operates at a frequency of 70 kHz.

   (2) The instruments that follow were used to help prepare this procedure.

   (a) NDT-19e; Nortec/Staveley Instruments

   (b) Phasec 2200; Hocking Krautkramer (GE)

   C. Probe

   (1) The three probes that follow were used to help prepare this procedure. You must use one of the three probes that follow to do this inspection.

   NOTE: The probes that follow are specially made for this inspection procedure. They also have an outer diameter that is 0.050 inch (1.27 mm).

   (a) SPC-377B; EC NDT

   (b) MXTF-40 (straight probe); NDT Engineering

   (c) MXTF902-40B (angled probe); NDT Engineering

   D. Reference Standard

   (1) Make reference standard NDT3050 as identified in Part 6, 53-30-20, Fig. 2.

E. Probe Guide/Shim

(1) A nonconductive probe guide that is 0.020 inch (0.51 mm) is necessary when the butt splice gap is 0.091 inch (2.31 mm) or more. See flagnote 3 in Figure 3 to see how this probe guide is used.

F. Teflon tape or other thin tape

(1) This tape is for the probe tip so that it will allow the probe to scan smoothly. It is also used so the probe tip will not scratch the splice plate during the scan. The probe tape thickness must be 0.0035 inch (0.09 mm) or less. See Figure 2 to see how to apply the tape strip on the coil so that two sides of the probe do not have tape.

3. Prepare for the Inspection

A. Get access to the inspection areas.

B. Remove all the sealant that is in the butt-splice gap (in the inspection area) so that the splice strap can be seen. Use a soft tool or soft sealant removal wheel that will not cause damage to the splice plate.

NOTE: It is important to remove all of the sealant in the butt-splice gap. If there is sealant in the butt-splice gap, a lift-off signal will occur during the probe scan and it is possible a crack will not be found.

4. Instrument Calibration

A. Get reference standard NDT3050 to use for the calibration.

B. Put thin Teflon tape or other thin tape on the probe tip. See Paragraph 2.F. for data on this tape. See Figure 2 for directions on how to apply tape on the probe coil so that opposite sides of the shaft do not have tape. Tape must be on the probe tip for all probe scans.

C. Set the instrument frequency to 70 kHz.

D. Put the probe on reference standard NDT3050 at probe position 1. See Details I and II in Figure 1.

E. Balance the instrument.

F. Set the balance point in the lower right side of the display, to a position of 20 percent of full screen height.

G. Adjust the instrument for lift-off. Adjust the phase control so that the signal moves horizontally and to the left when the probe is lifted off the reference standard.

H. Set the vertical gain 10 to 12 dB higher than the horizontal gain.

I. Put the probe on reference standard NDT3050 at Position 2. See Details I and II in Figure 1.

J. Balance the instrument.

K. Move the probe along the upper skin edge on reference standard NDT3050 until it is centered on the EDM notch. See Position 3 in Details I and II of Figure 1.

L. See Figure 1 and do the 4 scans as shown in View “A” so that 4 sides of the coil go along the notch. Record the notch signal height for each one of the scans and relate each signal with each side of the probe.

M. Identify the side of the probe that gives the weakest notch signal.

N. Keep the side of the coil that gives the weakest notch signal against the upper skin edge of reference standard NDT3050.

O. Do a probe scan again along the EDM notch and adjust the notch signal so that it is at 40% of full screen height above the balance point. See Detail III in Figure 1.

P. If the instrument has an alarm, adjust it to alarm for signals that are 50% of the height of the EDM notch signal. 50 percent of the height of the EDM notch signal is 20 percent of full screen height above the balance point.

5. Inspection Procedure

A. Calibrate the instrument as specified in Paragraph 4.

B. Put the probe in the butt-splice gap and balance the instrument.

C. Move the probe along the skin and/or doubler edge to find cracks. During the inspection, do the steps that follow:

(1) Refer to Figure 3 to see how many probe scans are necessary for the butt-splice gap to be examined.

(2) If you see a horizontal lift-off signal that is 20 percent (or more) of full screen width during the probe scan, this could be caused by sealant on the splice strap. Remove sealant in this area (as specified in Service Bulletin (SB) 737-53A1262, Appendix A) and do the probe scan again.

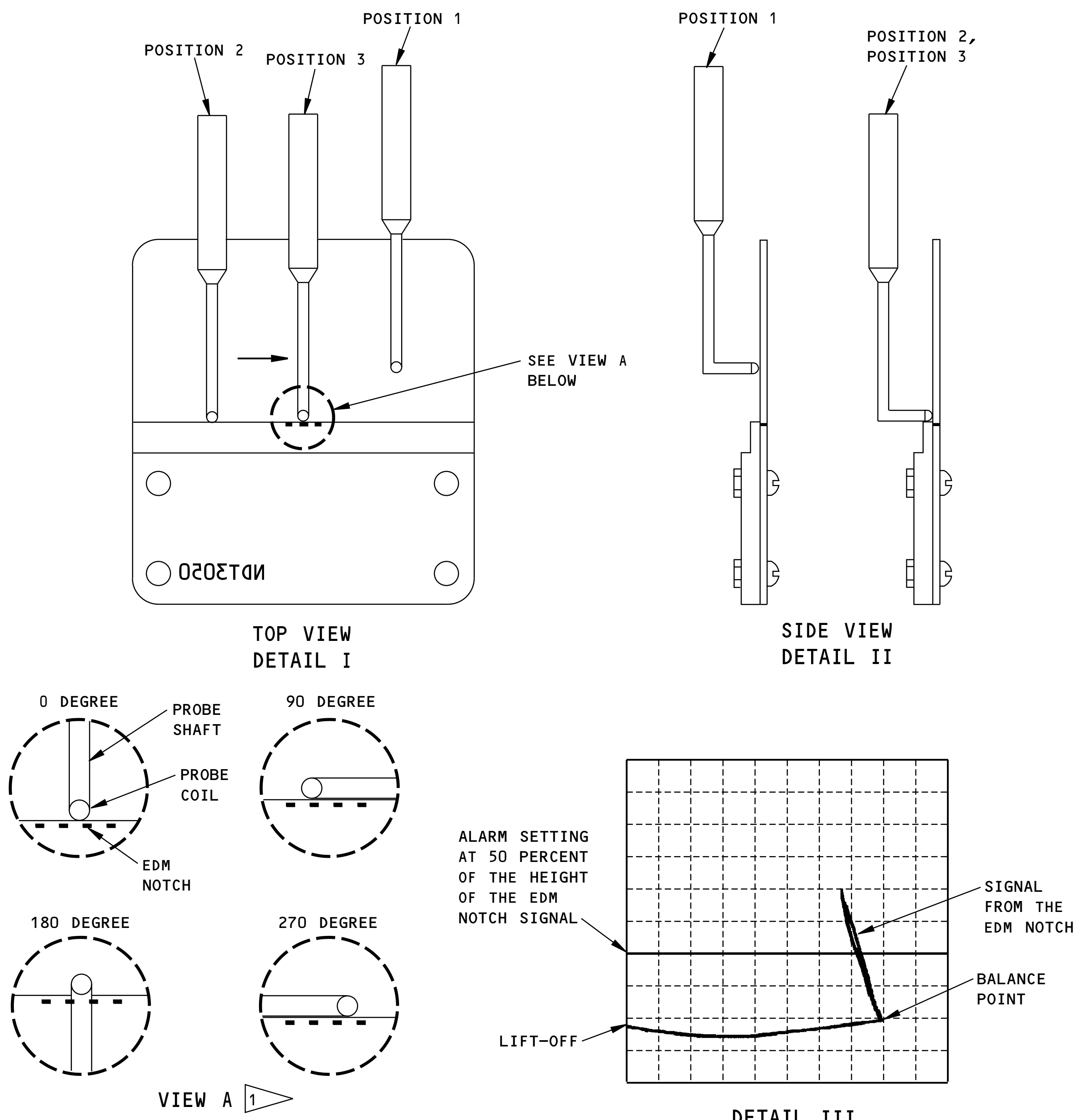
(3) Do not do a probe scan in an aft to forward direction (from skin/doubler edge to skin/doubler edge). This type of scan will cause a crack-type indication because the probe coil has weak shielding. Only do probe scans that are parallel with the skin/doubler edges.

6. Inspection Results

A. Areas that cause signals to occur that are 20 percent (or more) of full screen height above the balance point and look almost the same as the notch signal must be examined more fully.

B. At all locations where crack-type signals occur, and where there is internal access, do an eddy current inspection as specified in Part 6, 53-30-23. If no crack indications are found with the internal eddy current inspection, the indications can be ignored.

C. A crack-type signal can occur at each edge of the fillers installed by SB 737-53A1177. The filler edges are in the forward and aft direction and go across the butt-splice gap. They can cause sudden crack-type signals when the side of the probe crosses these locations. These crack indications can be ignored. Refer to SB 737-53A1177 for more about the repair structure.



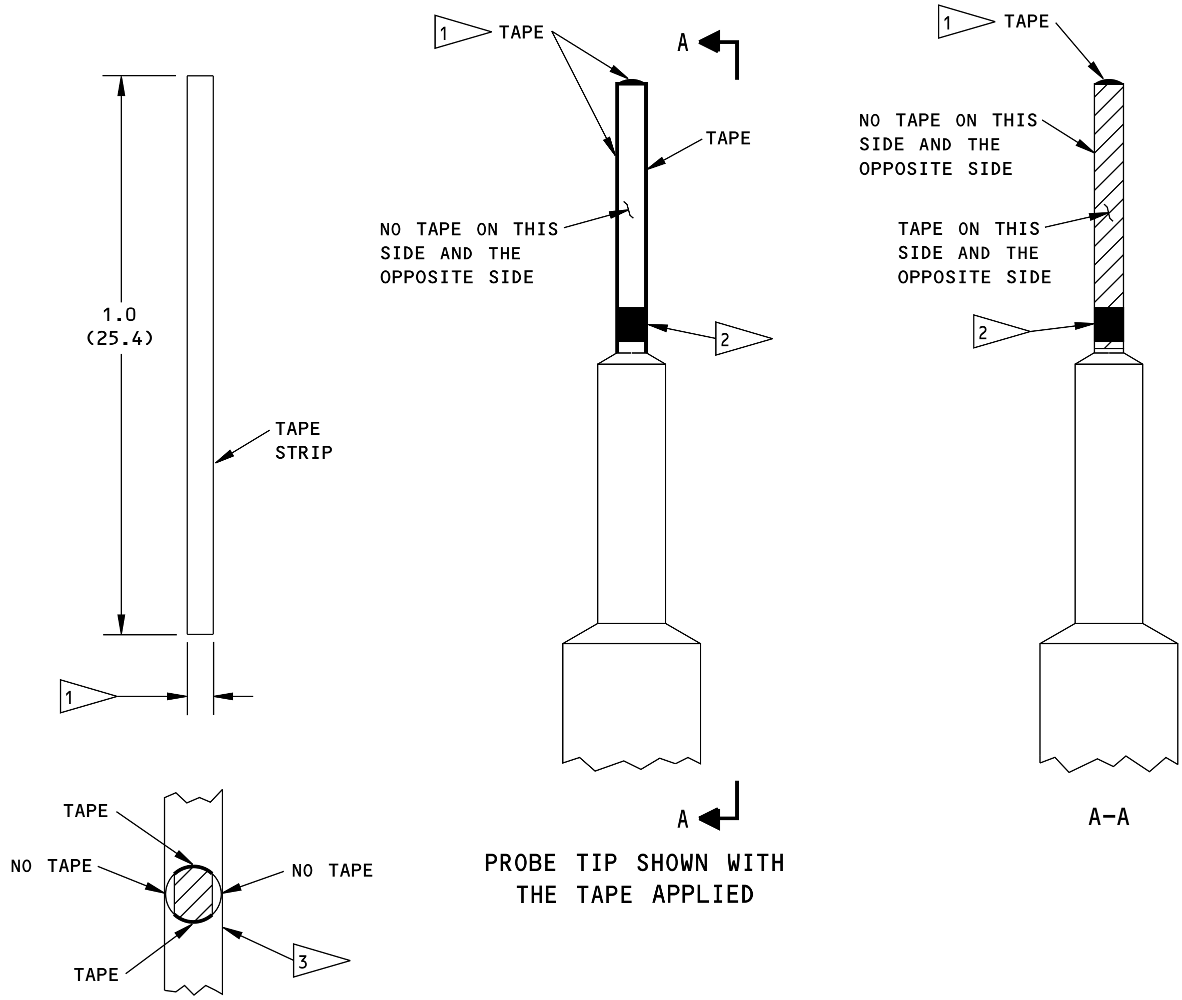
NOTES:

1 DO THE PROBE SCANS AT EACH PROBE POSITION SHOWN IN VIEW A TO SEE WHICH SIDE OF THE PROBE COIL GIVES THE WEAKEST SIGNAL.

- DO THE CALIBRATION WITH THE PROBE POSITION THAT GIVES THE WEAKEST SIGNAL.
- THE CALIBRATION IS SHOWN WITH AN ANGLED PROBE. THE CALIBRATION CAN ALSO BE DONE WITH A STRAIGHT PROBE.

2161839 S0000472791_V1

Instrument Calibration
Figure 1



NOTES:

- DIMENSIONS ARE IN INCHES
  (MILLIMETERS ARE IN PARENTHESES)

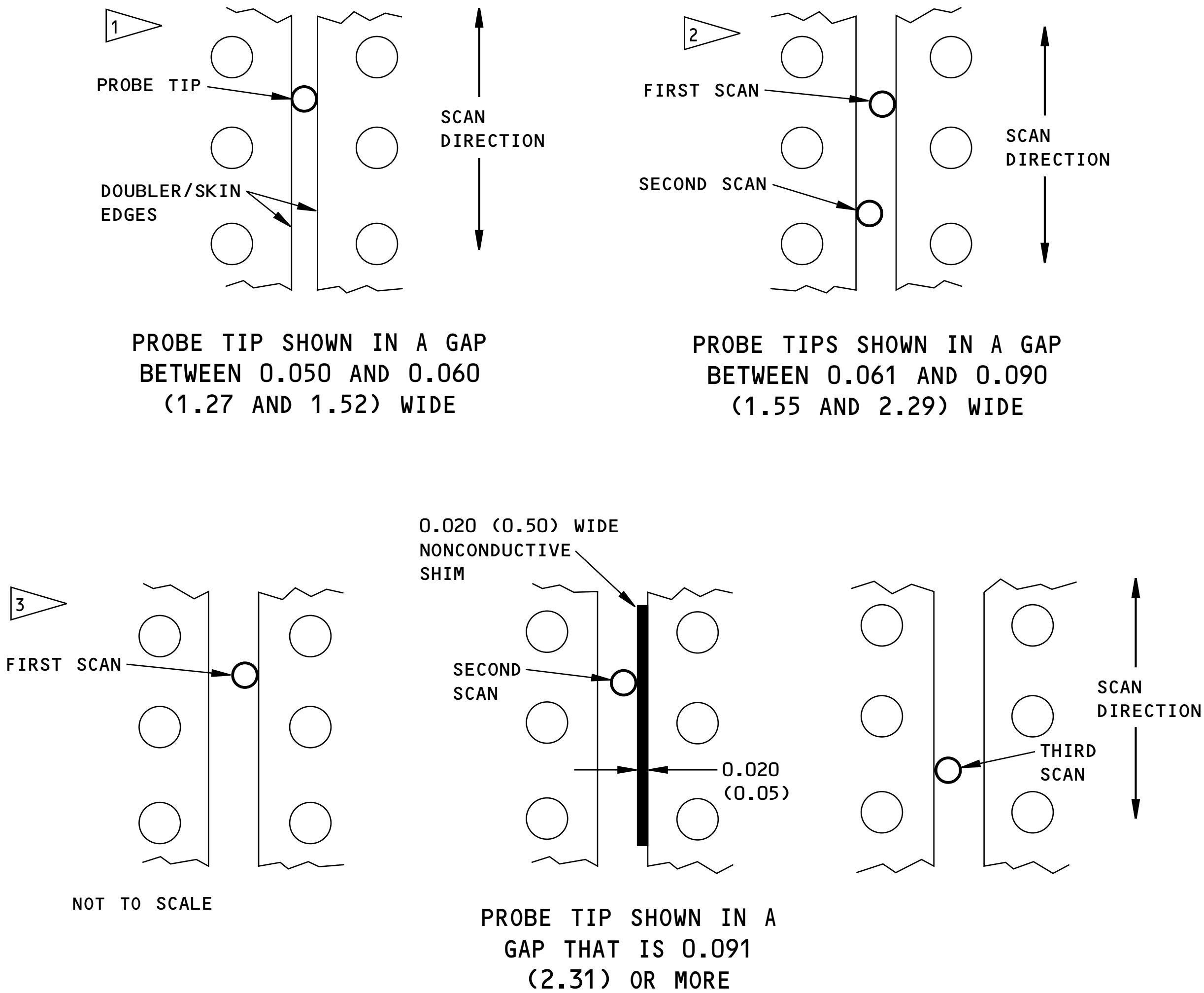
1. TEFLON TAPE (OR EQUIVALENT) WITH A MAXIMUM THICKNESS OF 0.0035 (0.09). CUT THE TAPE STRIP WIDTH TO 0.040 TO 0.045 (1.00 TO 1.14). APPLY THE TAPE TO THE COIL AND TWO SIDES OF THE PROBE AS SHOWN.

2. APPLY MORE TAPE AROUND THE CIRCUMFERENCE OF THE PROBE TO HELP HOLD THE TAPE STRIP ON THE PROBE.

3. THIS IS A VIEW OF THE PROBE TIP IN A SMALL BUTT-SPLICE GAP WITH THE TAPE CORRECTLY APPLIED FOR SMALL GAPS. SEE HOW NO TAPE IS APPLIED TO THE SIDE OF THE PROBE THAT TOUCHES THE SKIN EDGES. WITH THE TAPE APPLIED AS SHOWN ABOVE, IT WILL HELP THE PROBE FIT IN GAPS THAT ARE 0.050 INCH (1.27) OR MORE.

2161840 S0000472792_V1

Procedure to Apply Tape to the Probe Tip
Figure 2



NOTES:

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

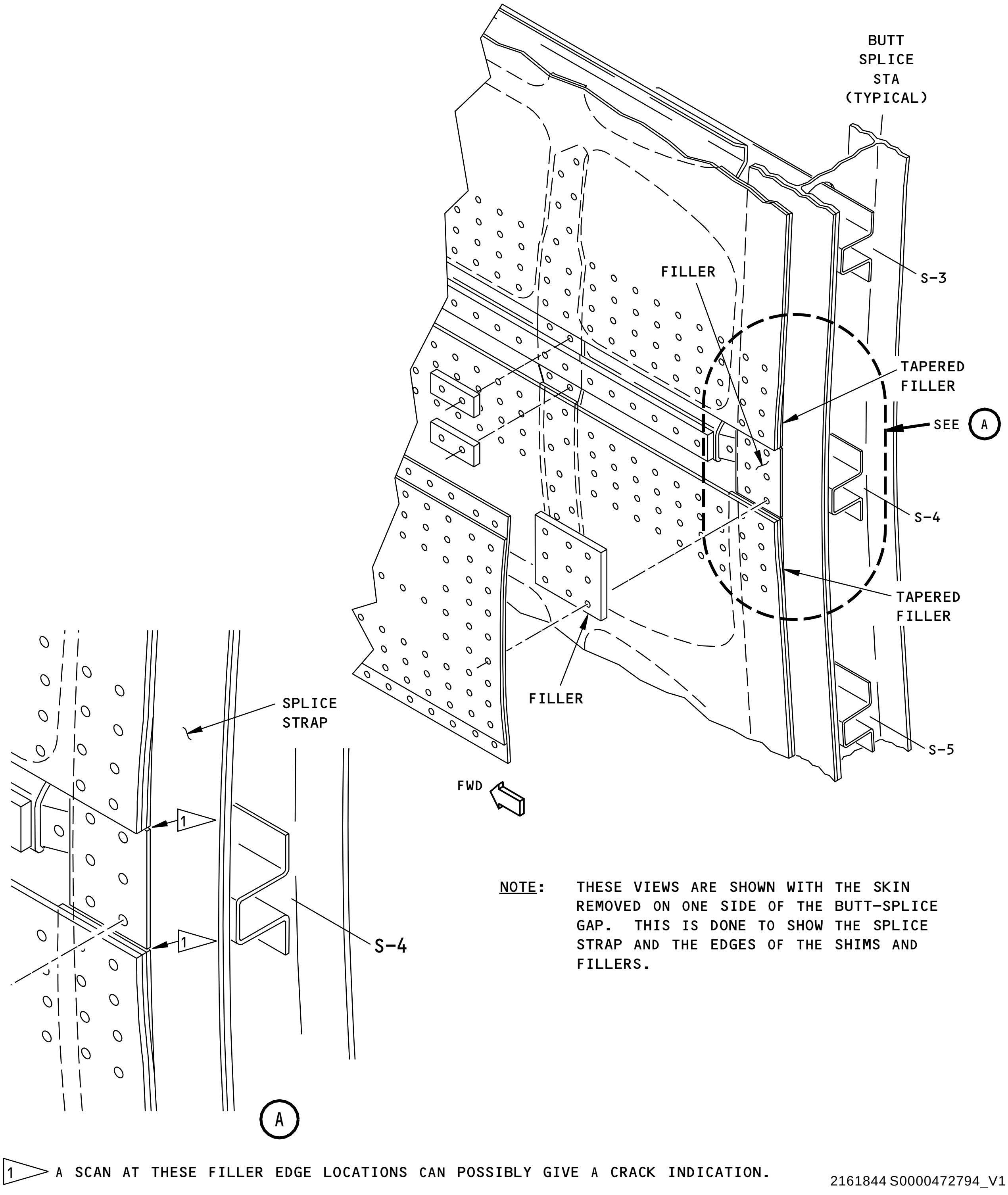
1 ONE SCAN IS NECESSARY IF THE GAP IS BETWEEN 0.050 AND 0.060 (1.27 AND 1.52).

2 TWO SCANS ARE NECESSARY IF THE GAP IS BETWEEN 0.061 AND 0.090 (1.55 AND 2.29). MAKE SURE THE PROBE IS AGAINST EACH EDGE DURING EACH SCAN AS SHOWN ABOVE.

3 THREE SCANS ARE NECESSARY IF THE GAP IS 0.091 (2.31) OR MORE. USE THE NONCONDUCTIVE SHIM FOR THE SECOND SCAN AS SHOWN.

2161841 S0000472793_V1

Probe Scan Data for Butt-Splice Gaps of Different Dimensions
Figure 3



Areas that can cause a Crack-type Indication
Figure 4

PART 6 - EDDY CURRENT

FUSELAGE LOWER SKIN SCRIBE LINE CRACK EDDY CURRENT ARRAY INSPECTION

1. **Purpose**

   A. Use this surface inspection procedure to find cracks in the lower skin panels of the fuselage at the lap joints. This procedure looks for cracks that can occur from scribe lines on the outside surface of the skin. This procedure looks for cracks in the lower skin panels that are:

      (1) 0.20 inch (5.1 mm) (or more) long and 0.018 inch (0.46 mm) (or more) deep.

      (2) In the forward and aft direction.

   B. This procedure examines the lower skin for cracks in an area that is from 0.063 to 1 inch (1.60 to 25.4 mm) from the outer skin edge of the lap joint.

   C. This procedure uses a high frequency eddy current array.

   D. This procedure was written for the OmniScan MX with Eddy Current Array Module, Software Revision MXE-2.0ROT4; made by Olympus.

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 high frequency, eddy current array instrument that:

         (a) Has at least a 32 channel probe that can scan an area that is at least 1 inch (25 mm) but less than 1.5 inches (37 mm) in width.

         (b) Operates at a frequency range of 200 kHz to 400 kHz.

         (c) Has a C-Scan display mode.

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

         (a) OmniScan MX with Eddy Current Array Module, Software Revision MXE-2.0ROT4; made by Olympus.

   C. Probes

      (1) Use an array probe that operates from 200 kHz to 400 kHz.

      (2) The OmniScan MX array probes that follow were used to help prepare this procedure.

         (a) SBBR-022-300-032 ECT Array probe.

         (b) SBBR-026-300-032 ECT Array probe.

   D. Reference Standard

      (1) Use reference standard NDT1095. See Figure 1 for the reference standard.

   E. Special Tools

      (1) We recommend that you use a computer mouse with a USB connector when you calibrate the OmniScan MX instrument for this inspection.

(2) We recommend that you use a compact keyboard with a USB connector to record notes and file names in the OmniScan MX instrument.

(3) Teflon tape.

3. Prepare for the Inspection

A. Identify the inspection area. Refer to the applicable service bulletin.

B. Remove loose paint, dirt, and sealant from the surface of the inspection area.

C. For airplanes that are painted, make an estimate of the paint thickness and record the results. You can use calibrated nonconductive shims with an eddy current procedure (lift-off measurement) that uses a direct reading or an indirect reading instrument.

NOTE: You can also refer to the paint thickness instructions in the McDonnell Douglas Nondestructive Testing Standard Practice Manual, Part 6, 06-10-01.002, to measure paint thickness on the airplane.

4. Instrument Calibration

NOTE: The calibration instructions that follow are for the OmniScan eddy current array instrument. Other eddy current array or C-Scan instruments can be used if they can be calibrated on reference standard NDT1095 and get the same calibration results specified in Paragraph 4. Refer to the manufacturer's operation instructions if you use a different eddy current array instrument.

A. Attach the eddy current module and the eddy current array to the instrument as specified in the manufacturer's instructions.

NOTE: The OmniScan MX instrument has key pad commands that make the set-up easier.

B. Go to the File menu and set up the instrument as follows:

(1) Open the Open (F2) sub-menu.

(2) Open the Open (F8) sub-sub menu.

(3) If the correct calibration file is in storage, open the file and go to Paragraph 5. If the correct calibration file is not in storage, close the menu and continue with the calibration instructions that follow.

C. Go to the Measurement menu and set up the instrument as follows:

NOTE: To make sure that numerical entries are accepted, push the Accept Key after the entry is completed.

(1) Open the Reading (F2) sub-menu:

(a) Make sure the Freeze mode is Off.

NOTE: Push the Freeze Key to toggle the instrument in and out of the freeze mode. The orange LED light will flash when the Freeze mode is On.

1) Open the Acquisition (F7) sub-sub-menu and set Reading 1 to AMax

2) Open the Acquisition (F7) sub-sub-menu and set Reading 2 to 0AMax.

3) Open the Acquisition (F7) sub-sub-menu and set Reading 3 to SAMax.

4) Open the Acquisition (F7) sub-sub-menu and set Reading 4 to IAMax.

(b) Make sure the Freeze mode is on.

1) Open the Analysis (F8) sub-sub-menu and set Reading 1 to APP.

2) Open the Analysis (F8) sub-sub-menu and set Reading 2 to 0PP.

3) Open the Analysis (F8) sub-sub-menu and set Reading 3 to SPPP.

4) Open the Analysis (F8) sub-sub-menu and set Reading 4 to IPPP.

5) Select the PP Cursor (F9) sub-sub-menu and set to ON.

(2) Open the Subtraction (F4) sub-menu:

(a) Make sure the Freeze mode is on.

1) Open the Type (F7) sub-sub-menu and set to Column.

2) Open the Activate (F8) sub-sub-menu and set to Off.

(3) Open the Signal Reference (F5) sub-menu:

(a) Set the Signal Ref. 1 (F7) sub-sub-menu to ON.

D. Go to the Preferences menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Instrument (F4) sub-menu.

(a) Open the Category (F7) sub-sub-menu and set to unit.

(b) Open the Units (F8) sub-sub-menu and set to millimeters.

(c) Open the Angle Units (F9) sub-sub-menu and set to ASME.

(d) Open the Ampl Units (F10) sub-sub-menu and set to Voltage.

E. Go to the EC Settings menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Settings (F3) sub-menu:

(a) Open the Frequency (F7) sub-sub-menu and set to 300 kHz ±100 kHz.

(b) Open the Probe Drive (F8) sub-sub-menu and set to 2.0 Volts.

(c) Open the Gain (F9) sub-sub-menu and set to 40 dB ±5 dB.

(d) Open the Rotation (F10) sub-sub-menu and set to 325° ±25°.

(e) Open the Vertical Gain (F11) sub-sub-menu and set to 10.0 dB.

(3) Open the Filter (F4) sub-menu:

(a) Open the Select (F7) sub-sub-menu and set to Filter 1.

(b) Open the Type (F8) sub-sub-menu and set to None.

(4) Open the Channel (F5) sub-menu:

(a) Open the Select (F7) sub-sub-menu and set to Channel 1.

(b) Open the Enable (F8) sub-sub-menu and set to ON.

(c) Do Paragraph 4.E.(4)(a) and Paragraph 4.E.(4)(b) again to set Elements 2 thru 32 to ON.

F. Go to the Scan menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Inspection (F2) sub-menu:

(a) Open the Type (F7) sub-sub-menu and set to One Line Scan.

(b) Open the Scan (F8) sub-sub-menu and set to Time.

(c) Open the Acq. Rate sub-sub menu and set to 200 Hz.

G. Go to the Display menu and make the adjustments that follow:

(1) Open the Set-Up (F2) sub-menu:

(a) Make sure the Freeze mode is Off.

1) Open the Acquisition (F7) sub-sub-menu and set to C.

2) Open the Analysis (F8) sub-sub-menu and set to CSI.

(2) Open the Properties (F3) sub-menu:

(a) Make sure the Freeze mode is Off.

(b) Open the Display (F7) sub-sub-menu and set to C-Scan.

1) Open the Component (F8) sub-sub-menu and set to Y|.

2) Open the Interpolation (F10) sub-sub-menu and set to ON.

3) Open the Display Range (F11) sub-sub-menu and set to 3.

(c) Open the Display (F7) sub-sub-menu and set to Strip.

1) Open the Component (F8) sub-sub-menu and set to Y|.

2) Open the Direction (F10) sub-sub-menu and set to Top-Bottom.

(3) Open the Color (F6) sub-menu:

(a) Make sure the Freeze mode is Off.

1) Open the Start (F7) sub-sub-menu and set to -1.00v.

2) Open the End (F8) sub-sub-menu and set to 1.00v.

3) Open the Load (F9) sub-sub-menu, select and load the Alarm.pal file to set the C-Scan colors as follows:

a) Scroll through the list and select the Alarm.pal file.

b) Push the Accept Key.

H. Go to the Alarm/Output menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Alarm Output (F2) sub-menu:

(a) Open the Select (F7) sub-sub-menu and set to Alarm 1.

(b) Open the Output (F8) sub-sub-menu and set to None.

I. If you want to keep the settings, save the settings to a file as follows:

(1) Make sure the Freeze mode is Off.

(2) Go to the File menu, then open the File (F3) sub-menu, then open the Save Setup As (F8) sub-sub-menu.

(a) Go to Filename (F9) and change the file name to the name you want to use for this procedure.

(b) Push the Save button (F7).

J. Put a nonconductive layer (Teflon tape), that is within ± 0.003 inch (0.08 mm) of the thickness of the paint on the inspection area, on the surface of the reference standard.

K. Put an additional nonconductive layer (Teflon tape) with a thickness of about 0.003 inch (0.08 mm) at Probe Position B on the reference standard as shown in Figure 2.

L. Put the probe at Position A on reference standard NDT1095 as shown in Figure 2.

M. Push the Balance/Calibration Key to balance the probe.

N. Put the probe on the nonconductive layer at Position B in Figure 2 and make a scan along the lap until the probe is fully on the bare metal surface. The scan must be a minimum of 0.5 inches (12.7 mm) long on the Teflon tape area and a minimum of 0.5 inches (12.7 mm) long on the bare area.

O. Push the Freeze Key to put the instrument in freeze mode. The display will change from a C-Scan in a single window to a three window CSI Display and the orange LED light will flash slowly.

P. Make sure that the C-scan display does not contain horizontal black lines. A black line is an indication that an eddy current element is bad. If black lines occur, do the steps that follow:

(1) Do Paragraph 4.E.(4) to make sure that all eddy current elements are energized.

(2) Use a different eddy current array probe.

Q. If the arrow in the impedance plane display is small and not easy to see, go to the Display menu, then to the Autofit sub-menu and push the Best Fit Key.

R. If the arrow in the impedance plane display is large and off screen, go to the Display menu, then to the Autofit sub-menu and push the Full Scale Key.

S. Use the procedure that follows to set the lift-off phase angle:

(1) Go to the EC Settings menu, then open the Settings (F3) sub-menu and make the adjustments that follow:

(a) Put the mouse cursor on the C-Scan display in the area that shows the bare area scan at Position A in Figure 2 of the reference standard.

(b) Push the left mouse button two times. A red X must occur on the C-Scan at an area that shows the bare area of the reference standard. See the C-Scan display on Figure 3 for an example.

(c) Put the mouse cursor at the location on the C-Scan display that shows the area scanned at the Teflon tape covered position on the reference standard at Position B in Figure 2.

(d) Push the right mouse button two times. A blue + must occur on the C-Scan at an area that shows the tape covered area of the reference standard. See the C-Scan display on Figure 3 for an example.

(e) If the blue + is on a horizontal line that is different from the horizontal line that the red X is on, put the mouse cursor on the horizontal line that goes through the blue +. A double arrow must be displayed.

(f) Push and hold the left mouse button, and pull the horizontal line until it is on top of the horizontal line that goes through the red X. See the C-Scan display on Figure 3 for an example.

(g) Release the left mouse button when the line goes through the red X.

(h) Press the Rotation Key (F10).

(i) Look at the impedance display at the upper left side of the screen and adjust the rotation parameter (phase) until the pink arrow points horizontally to the left side of the impedance display. See the impedance display on Figure 3 for an example.

NOTE: The Full Size or Best Fit Key can be used to keep the arrow on the impedance plane display.

(j) Push the Accept Key.

(k) The two scans, one on the Teflon tape area and the other on the bare area of the reference standard, for the two areas must be about the same shade of green. See the impedance display on Figure 3 for an example.

T. Set the EDM notch signal as follows:

(1) Push the Freeze Key to put the instrument in scan mode. The orange LED light will go out.

(2) Put the probe at Probe Position A on the reference standard as shown in Figure 2. Make sure the probe is aligned with the edge of the lap and push the Balance/Calibration Key to balance the instrument.

(3) Move the probe from Probe Position A to Probe Position C in Figure 2 along the edge of the lap on reference standard NDT1095 as shown in Figure 2 to make an initial scan.

(4) Do a check of the C-scan display to make sure that all three EDM notches show clearly. The typical crack display is a red indication on a green background, as shown in Details A thru C of Figure 4.

(5) Adjust the gain setting, if necessary, so that the EDM notch shows as a red indication as shown in Details A thru C of Figure 4. See Detail II in Figure 5 for an example when there is not sufficient gain.

(6) Move the probe from Probe Position C to Probe Position D along the edge of the lap on reference standard NDT1095 as shown in Figure 2 to identify if there is too much gain.

(a) If the notch on the reference standard between Probe Position C and Probe Position D shows as a red indication then there is too much gain. Remove some gain and do Paragraph 4.T.(3) thru Paragraph 4.T.(6) again until the notch between Probe Position C and Probe Position D on the reference standard does not show a red indication.

NOTE: The gain setting must cause the notch locations between Probe Position A and Probe Position C to show as red indications.

U. Save your final calibration set-up in the instrument memory. The file name must identify this procedure number.

5. Inspection Procedure

A. Load the correct calibration file for this inspection into the instrument's memory, and make sure that the selections of Paragraph 4. are correct.

B. Put the array probe on reference standard NDT1095 so that it is on the lower skin inspection area below the lap splice and make a scan from Probe Position B to Probe Position C in Figure 2 to do a check of the calibration.

(1) Do Paragraph 4. again, if the calibration is not sufficient to identify the EDM notches.

C. Balance the array probe on the lower skin. Make sure that the array probe touches the edge of the lap splice. See Figure 6 for the correct probe position.

D. Make a scan of the lower skin along the edge of the lap splice, as shown in Figure 6. During the scan:

(1) Make sure that the probe touches the lap joint for the full scan.

(2) Monitor the C-scan display. In areas without cracks a green background will be seen. See Figure 4 for examples of crack indications in the skin.

(3) Mark all locations that cause red crack indications to occur on the eddy current array display. Mark the locations as follows:

(a) Move the probe toward one end of the crack until the red crack signal is shown on the display.

NOTE: When the probe is stopped above a crack, a red horizontal stripe indication will occur on the display.

(b) Make a mark on the airplane with an approved marker. Align the mark with the location of the eddy current coils on the probe.

(c) Move the probe to find the other end of the crack.

(d) Make a mark on the airplane with an approved marker. Align the mark with the location of the eddy current coils on the probe.

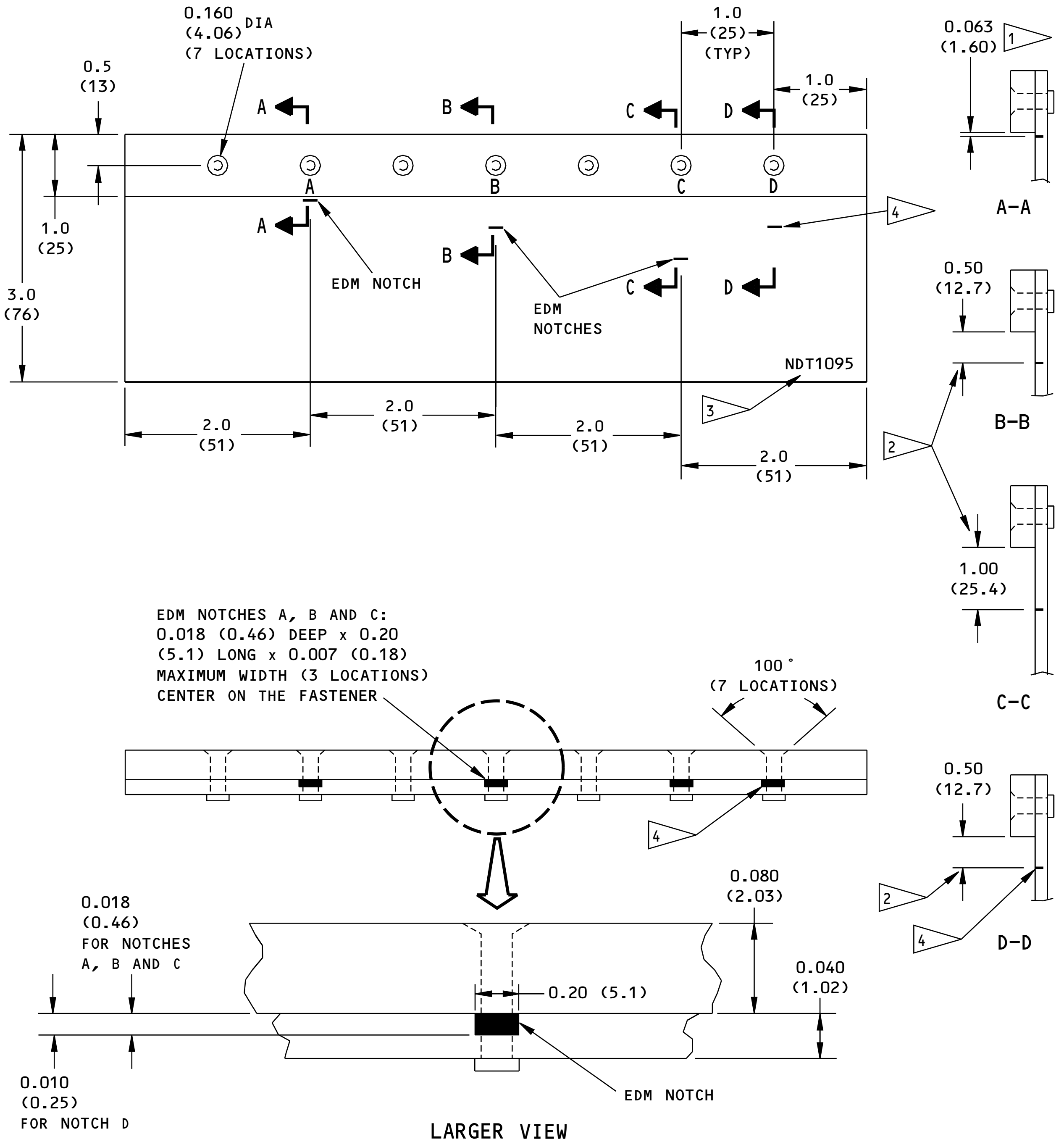
6. Inspection Results

A. Red indications on the C-scan display are possible cracks. These areas must be examined some more.

(1) Do a check of the paint thickness on your airplane. If the paint thickness on the airplane is thinner than the nonconductive coating on the reference standard, the inspection can be too sensitive.

(2) Do a check of your gain setting. A gain setting that is too high can cause incorrect crack indications. See Paragraph 4.

B. You can use Part 6, 51-00-00, Procedure 23 to help make sure that the indications are from cracks.



2161880 S0000472796_V1

Reference Standard NDT1095
Figure 1 (Sheet 1 of 2)

NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- NOTCH DEPTH TOLERANCE: ±0.002 (0.05).
  NOTCH LENGTH TOLERANCE: ±0.010 (0.25)
- MATERIAL: 2024-T3 CLAD
  BOTTOM LAYER: 8.0 (203) x 3.0 (76.0) x 0.040 (1.0)
  TOP LAYER: 8.0 (203) x 1.0 (25) x 0.080 (2.03)
- RIVETS: BACR15GF5D5 OR BACR15CE5D5.
  QUANTITY 7.

1 THE NOTCH LOCATION TOLERANCE (FROM THE EDGE) FOR THIS NOTCH IS +0.003 (0.08), -0

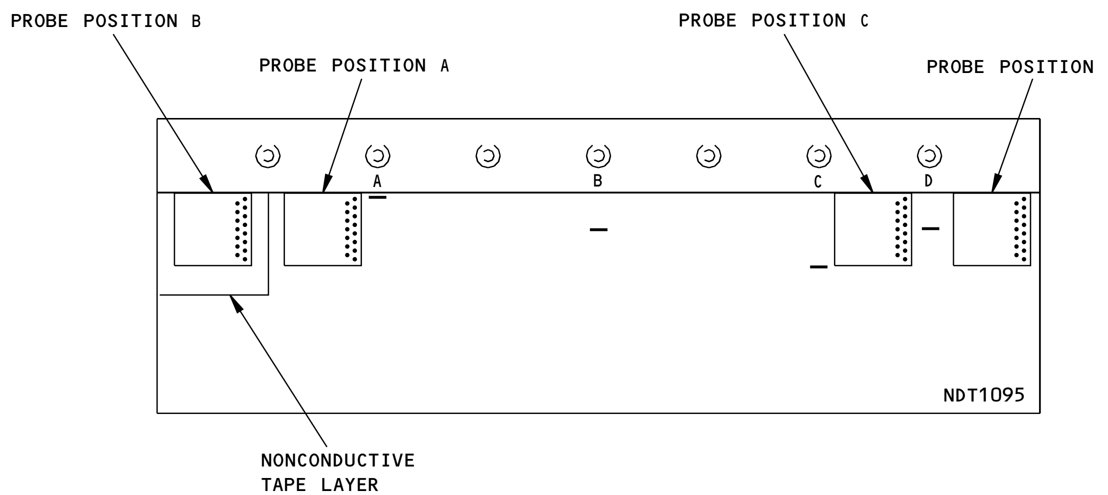
2 THE NOTCH LOCATION TOLERANCE (FROM THE EDGE) FOR THESE THREE NOTCH LOCATIONS IS ±0.005 (0.13).

3 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT1095

4 EDM NOTCH D: 0.010 (0.25) DEEP X 0.20 (5.1) LONG X 0.007 (0.18) MAXIMUM WIDTH. CENTER ON THE FASTENER

2161881 S0000472797_V1

Reference Standard NDT1095
Figure 1 (Sheet 2 of 2)



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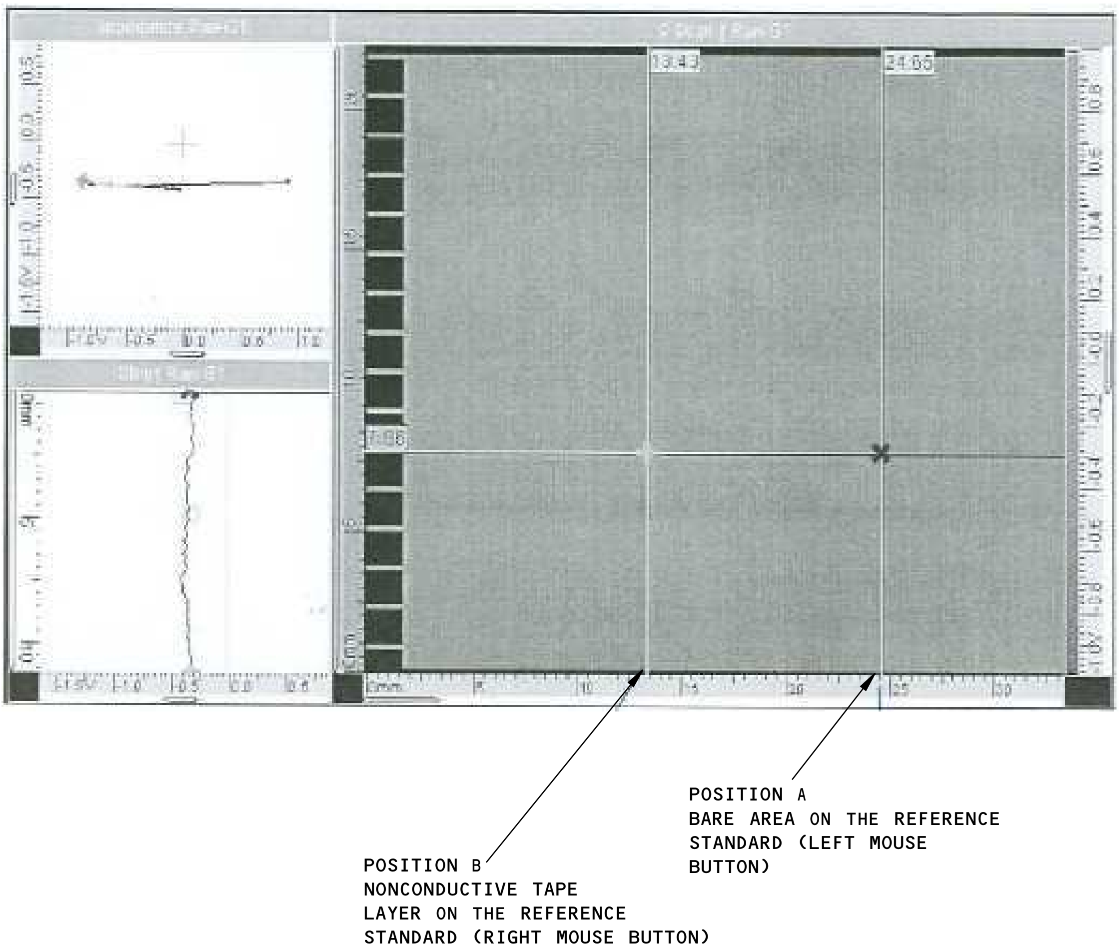
Calibration Probe Positions
Figure 2



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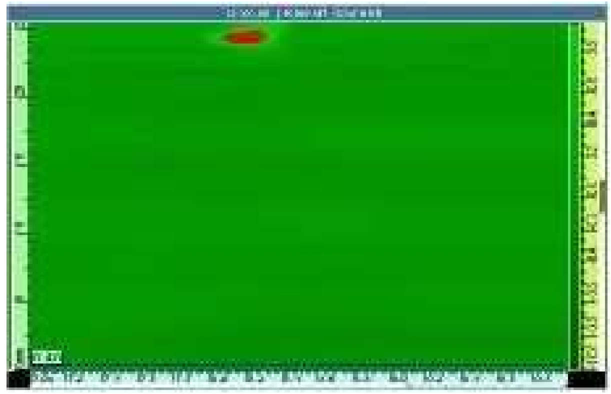
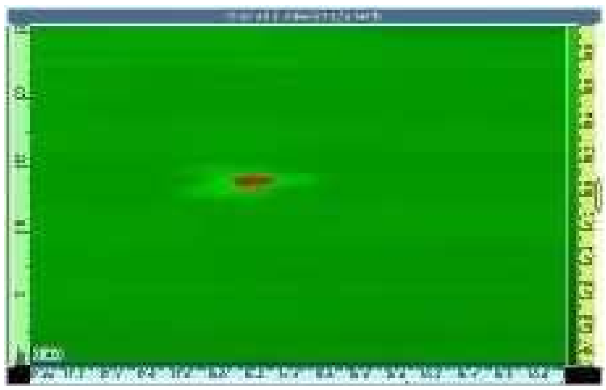
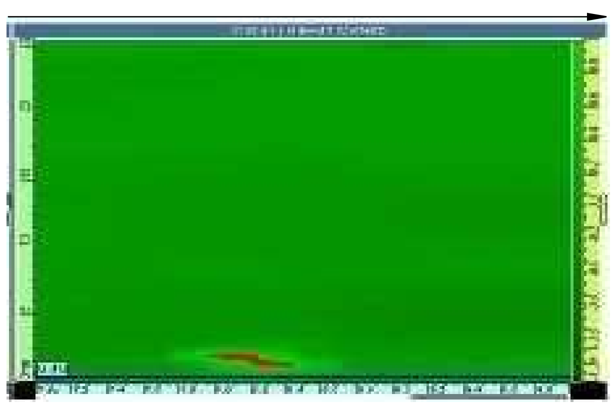
Lift-off Adjustment
Figure 3



NOTCH A SIGNAL
DETAIL A



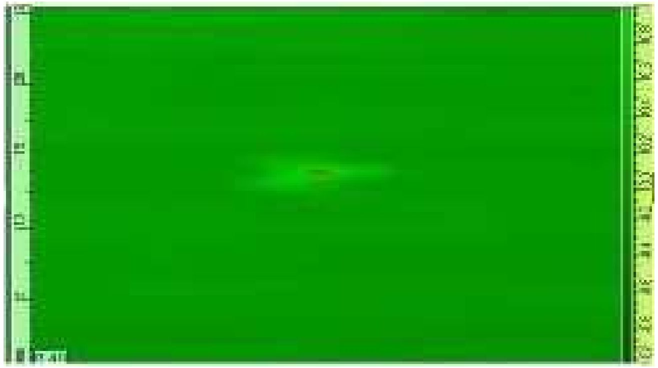
NOTCH B SIGNAL
DETAIL B



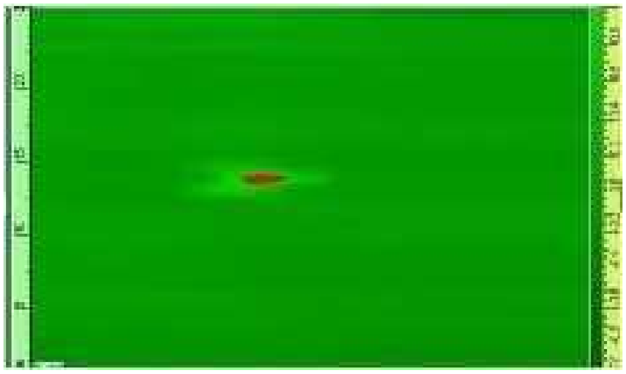
NOTCH C SIGNAL
DETAIL C

2161885 S0000472800_V1

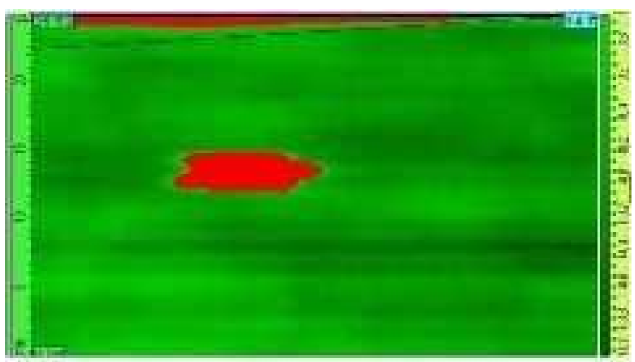
Reference Standard Notch Position
Figure 4



NOT SUFFICIENT GAIN
DETAIL A



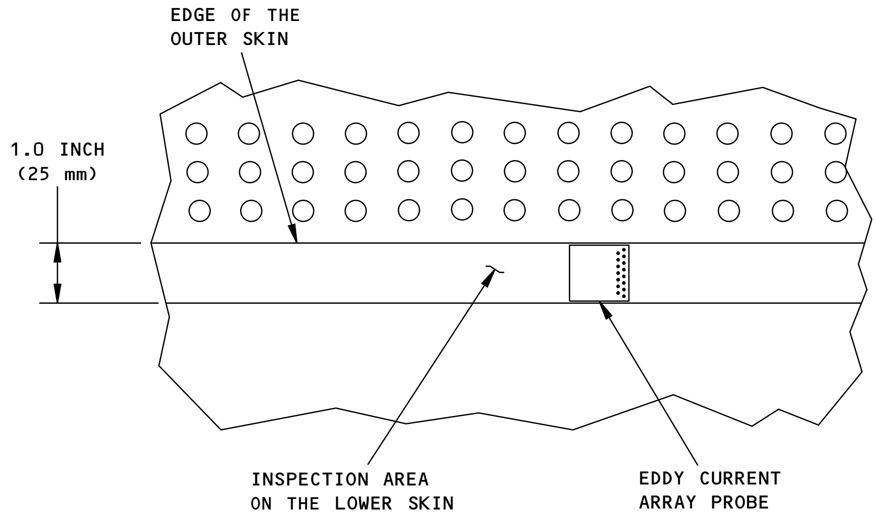
CORRECT GAIN
DETAIL B



TOO MUCH GAIN
DETAIL C

2161886 S0000472801_V1

Gain Settings
Figure 5



2161887 S0000472803_V1

Inspection Areas
Figure 6

PART 6 - EDDY CURRENT

MEASUREMENT OF THE DISTANCE BETWEEN TWO PARTS

1. **Purpose**

   A. Use this procedure to measure the distance between a 0.032 inch (0.81 mm) thick external doubler and a 0.036 inch (0.91 mm) thick fuselage skin. See Detail I in Figure 4 for the inspection location.

   B. This procedure can also be used to measure the distance between two layers of 0.080 inch (2.0 mm) thick fuselage skins. See Detail II in Figure 4 for this inspection location.

2. **Equipment**

   A. Instrument

      (1) Use a Phasec 2D or 3D instrument made by Hocking Krautkramer

   B. Probe

      (1) Use a Techna SDP.4-K 500 Hz to 2 kHz probe.

      NOTE: The probe will be used at a higher operation range than is specified on the probe.

   C. Reference Standards

      (1) Use reference standard NDT3114 or NDT3115. See Figure 1.

3. **Prepare for the Inspection**

   A. Refer to the maintenance document for the inspection locations on the airplane.

   B. Get access to the inspection area.

      (1) Wipe the inspection surface clean to remove dust and dirt.

   C. Print the template shown in Figure 3 for the part thickness that you will examine on a transparent material (view foil).

      (1) Use a paper shear to cut out the template along the dashed line shown in Figure 3.

4. **Instrument Calibration**

   A. Energize the instrument for a minimum of 10 minutes before calibration.

   B. Get the applicable reference standard and make sure it is at the same temperature as the part to be examined.

      (1) For locations with 0.032 inch (0.81 mm) thick doublers and a 0.036 inch (0.91 mm) thick skin, use reference standard NDT3114. See Figure 1.

      (2) For locations with a 0.080 inch (2.0 mm) thick skin on top of a 0.080 inch (2.0 mm) thick skin, use reference standard NDT3115. See Figure 1.

   C. If the airplane is painted, use a nonconductive thickness gage to find the paint thickness on each skin panel. You can also use a conductivity instrument with a nonconductive thickness gage function to find the paint thickness. Follow the manufacturers' instructions to calibrate the conductivity instrument for lift-off thickness settings.

   D. Find the paint thickness at three typical inspection locations on the part to be examined.

   E. If the paint is more than 0.003 inches (0.08 mm) thick, put nonconductive tape on the reference standard at probe position 1 and position 2 (see Detail I in Figure 2). The total tape thickness must be equal to the paint thickness within 0.003 inches (0.08 mm).

F. Set the instrument frequency as follows:

(1) To examine 0.032/0.036 inch (0.81/0.91 mm) configuration locations, set the instrument frequency to 10 kHz.

(2) To examine 0.080/0.080 inch (2.0/2.0 mm) configuration locations, set the instrument frequency to 4 kHz.

G. Push the MENU button.

H. Adjust the instrument as follows:

(1) Set graticule to grid 2.

(2) Set spot x/y to 10/0.

(3) Set the instrument persistence to Permanent.

(4) Set the input gain to High.

(5) Set probe 1 to reflection.

(6) Set HP/LP1 to DC/1500.

(7) Set Display to Spot.

(8) Set trace enhance to off.

(9) Push the Menu button.

I. Set the horizontal and vertical gain as follows:

(1) To examine the 0.032/0.036 inch (0.81/0.91 mm) part configurations, set the horizontal gain to 34 dB to start. Set the vertical gain to 14 dB. The vertical gain must stay at 14 dB for this procedure. If you cannot change the vertical gain to 14 dB, decrease the probe drive.

(2) To examine the 0.080/0.080 inch (2.0/2.0 mm) part configurations set the horizontal gain to 48 dB to start. Set the vertical gain to 14 dB. The vertical gain must stay at 14 dB during this procedure. If you cannot change the vertical gain to 14 dB, decrease the probe drive.

J. Put the probe at Probe Position 1 as shown in Detail I of Figure 2 and balance the instrument.

K. Set the balance point as shown in Detail II of Figure 2. Adjust the balance point so that it is at 10% of full screen width and 50% of full screen height on the menu screen.

L. Put the 0.032/0.036 inch (0.81/0.91 mm) or the 0.080/0.080 inch (2.0/2.0 mm) template, as applicable, on the instrument screen. Adjust the template balance point so that it is at 10 percent of full screen width on the instrument screen.

M. Tape the template to the instrument screen to prevent template movement. Refer to Figure 3.

N. Adjust the lift-off line on the instrument screen so that it is almost the same as the template lift-off line.

O. Put the probe at Probe Position 2 as shown in Figure 2.

P. Adjust the horizontal gain so that the dot is at the zero gap point as shown in Detail II of Figure 2. The zero gap point must be at the 0.000 thickness location on the template.

Q. Put the probe at Probe Position 1 and balance the instrument again.

R. Do a lift-off check at Probe Position 1 to make sure that the lift-off angle is almost the same as the lift-off angle of the template. See Detail II in Figure 2.

S. Do Paragraph 4.K. thru Paragraph 4.R. again to make sure that the last calibration adjustments are satisfactory.

5. **Inspection Procedure**

A. Balance the instrument before each measurement. See Figure 4 for balance locations.

B. Put the probe on the inspection locations and record the distance (gap) between the layers.

(1) See Figure 5 for examples of how to read what the distance is between the layers.

(a) Indications to the right of zero on the template must be recorded as zero distance.

(b) Record the value above the dot on the template as the distance between the layers as shown in Figure 5.

(2) See Figure 6 for an example of a spread sheet that can be used to record the data.

6. **Inspection Results**

A. Make sure the part thicknesses are as specified in Paragraph 1. If they are not, do not do this inspection.

B. Make sure the correct reference standard was used. If not, do the inspection again with the correct reference standard.

C. Measure the distance between the layers at a different location if:

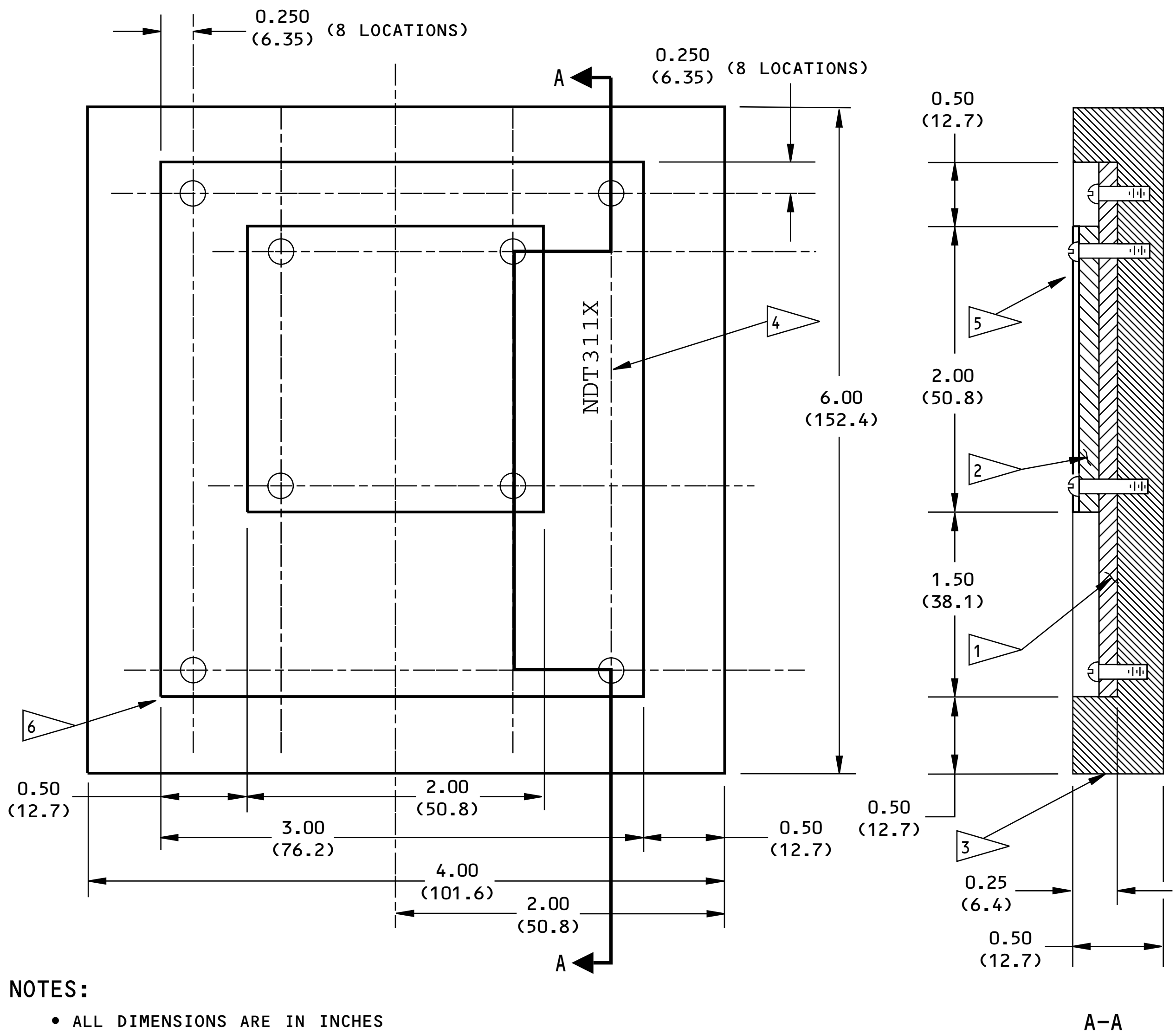
(1) The probe was put near a magnetic fastener.

(2) The probe was put on top of a fastener.

(3) A welding operation was within 50 feet (15 M).

(4) The clad layer has been removed or decreased in thickness at the inspection location.

(5) There is a conductivity change caused by a lightning strike or other heat source.



NOTES:

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

1 FOR NDT3114: 2024-T3 CLAD EACH SIDE; 0.036 (0.91) THICK.
FOR NDT3115: 2024-T3 CLAD EACH SIDE; 0.080 (2.03) THICK.

2 FOR NDT3114: 2024-T3 CLAD EACH SIDE; 0.032 (0.81) THICK.
FOR NDT3115: 2024-T3 CLAD EACH SIDE; 0.080 (2.03) THICK.

3 BLACK DELRIN BASE

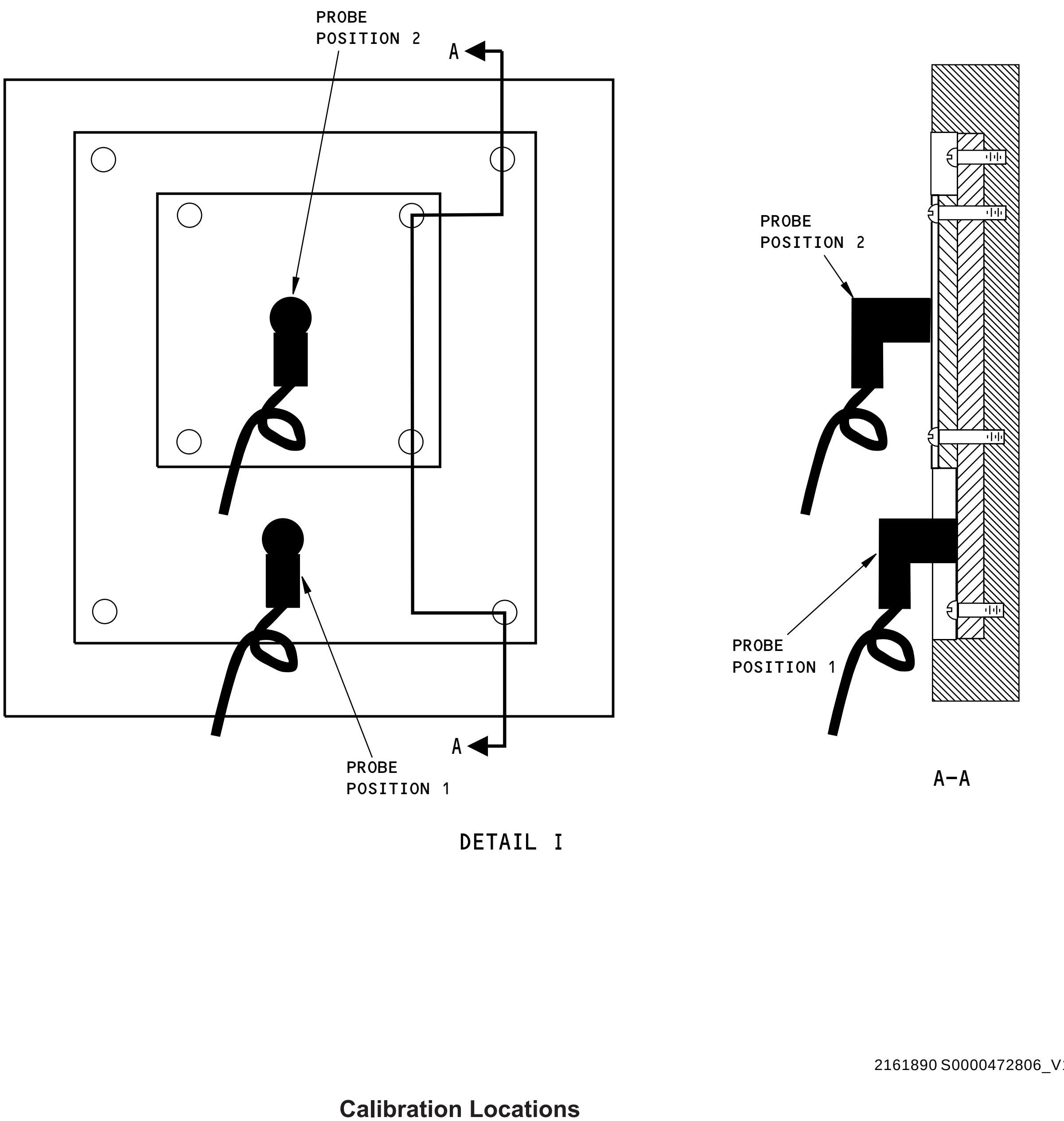
4 ETCH THE REFERENCE STANDARD NUMBER

5 DRILL EIGHT 0.201 (5.10) DIAMETER CLEARANCE HOLES THROUGH THE ALUMINUM STACK UP AND TAP THE HOLES WITH 10-32 OR 10-24 THREADS IN BLACK OR WHITE DELRIN. INSTALL 10-32 OR 10-24 TRUSS HEAD OR PHILLIPS FINISHING WASHER HEAD SCREWS WITH LOCK TIGHT. DO NOT OVER TIGHTEN.

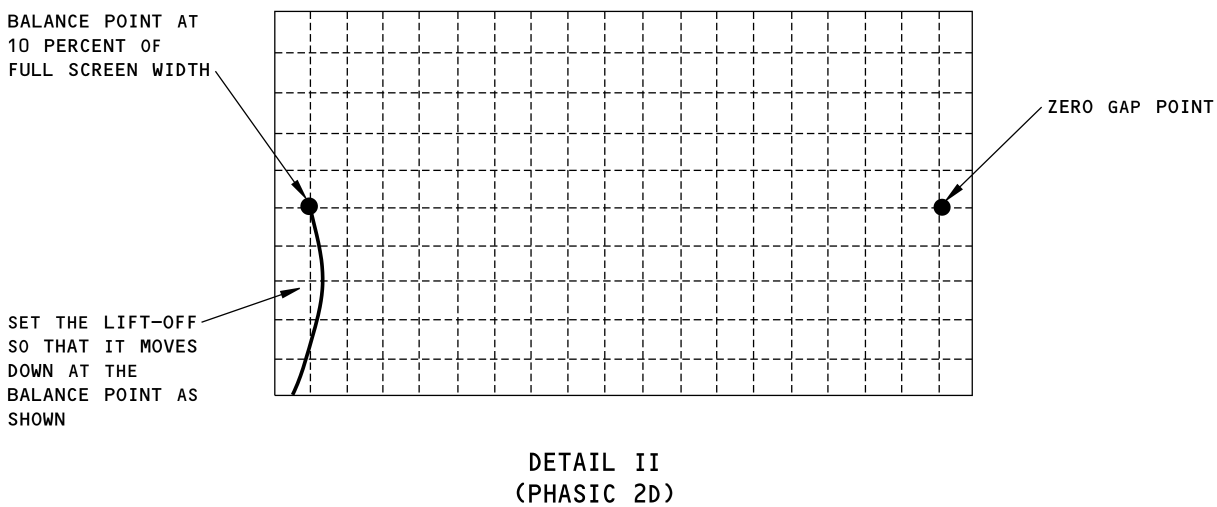
6 1/8 (3.2) RADIUS CORNER TO MATCH THE DELRIN BASE

2161889 S0000472805_V1

Reference Standards NDT3114 and NDT3115
Figure 1

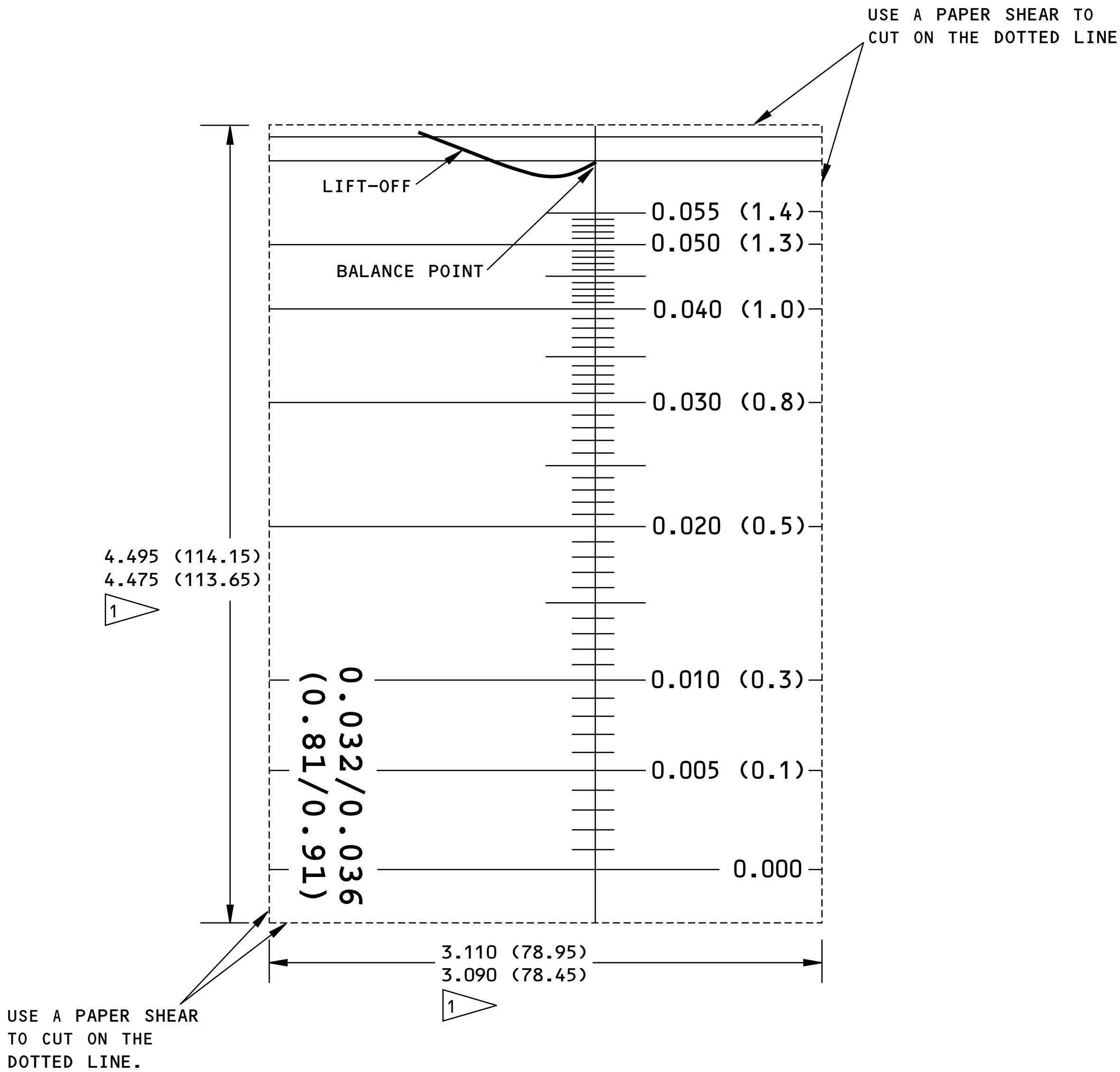


Calibration Locations
Figure 2 (Sheet 1 of 2)



2161892 S0000472807_V1

Calibration Locations
Figure 2 (Sheet 2 of 2)



DETAIL I (PHASIC 2D)
0.032/0.036 (0.81/0.91)
THICKNESS TEMPLATE

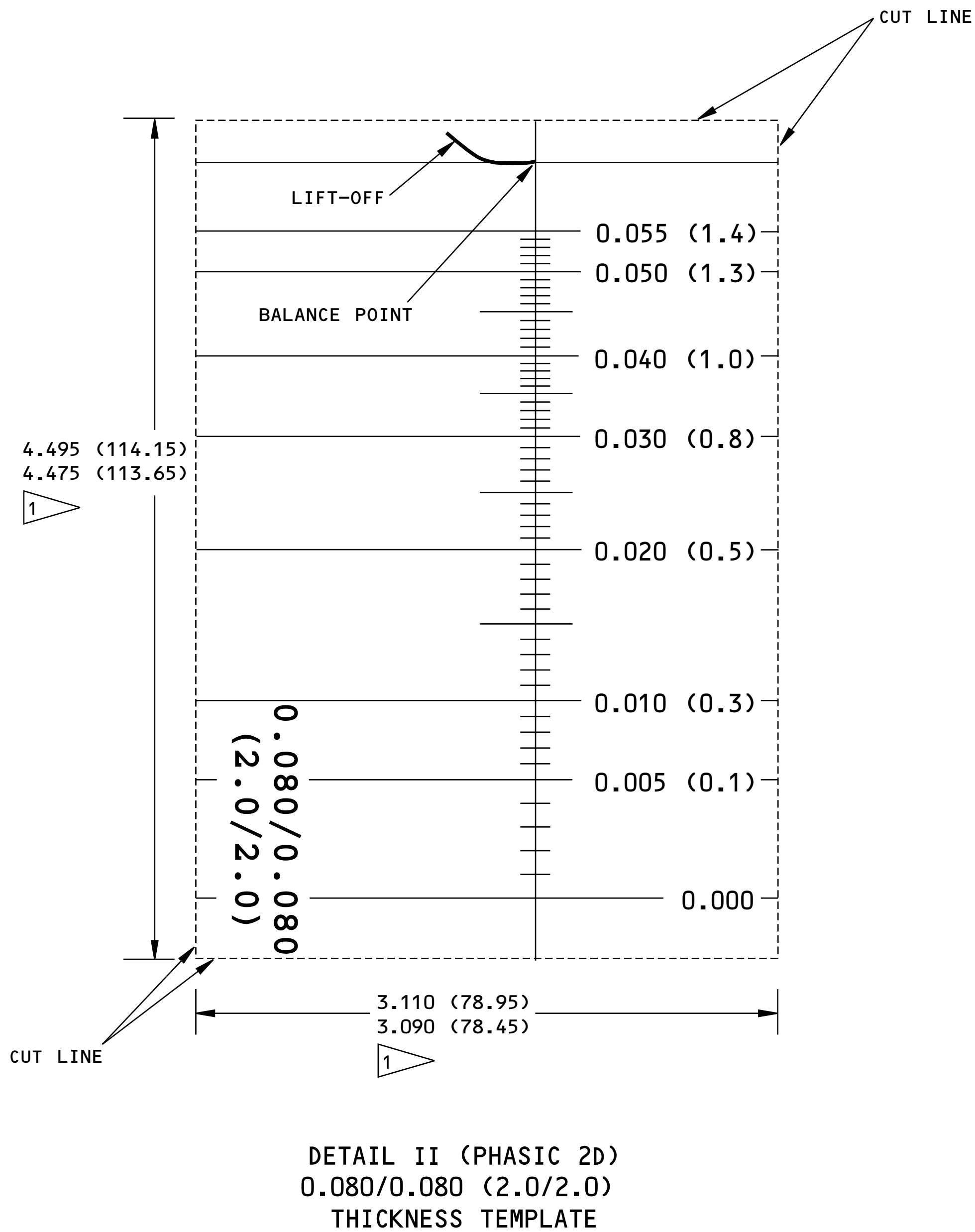
NOTES:

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

1 AFTER THIS PAGE IS PRINTED ON A TRANSPARENT MATERIAL, THE MEASURED DISTANCE MUST BE WITHIN THE SPECIFIED DIMENSIONS.

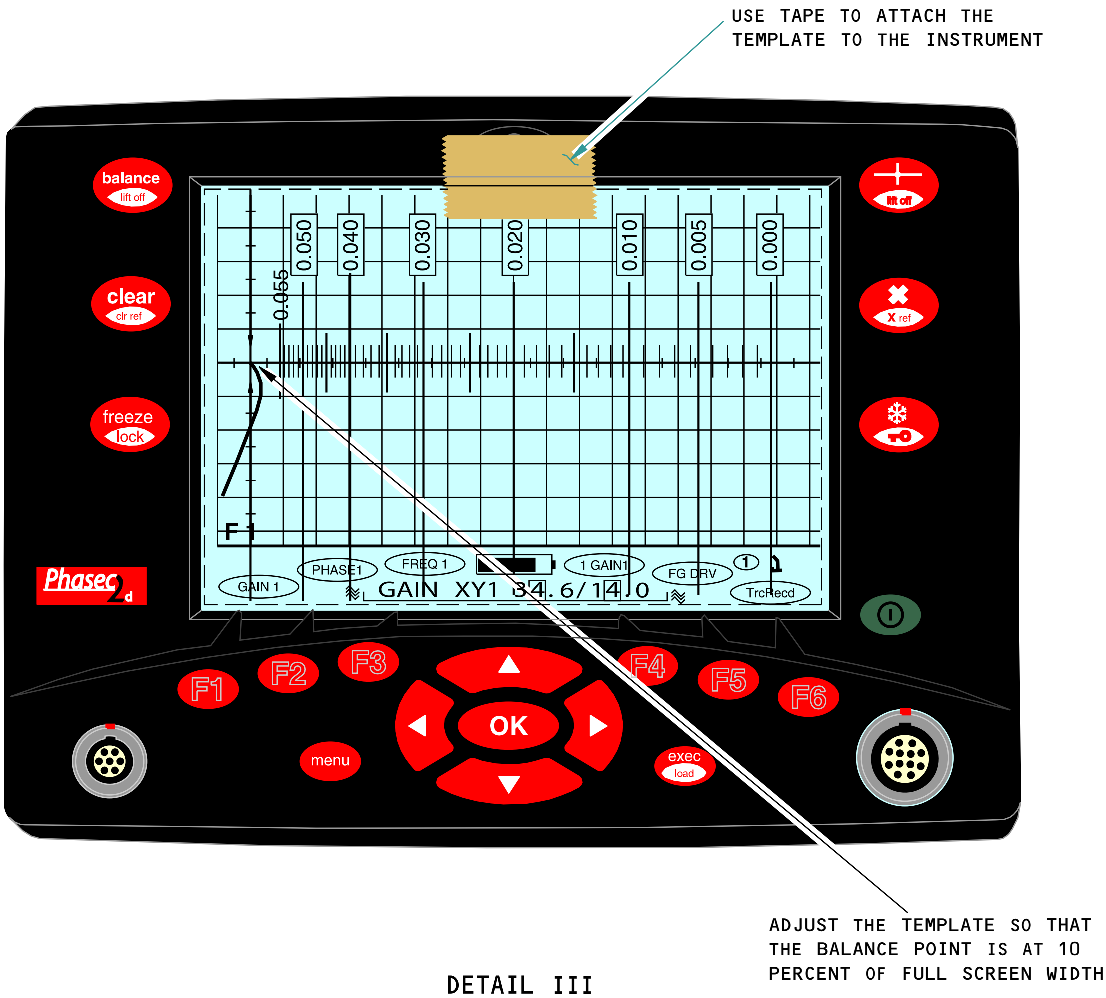
2161894 S0000472808_V1

Template
Figure 3 (Sheet 1 of 3)



2161897 S0000472809_V1

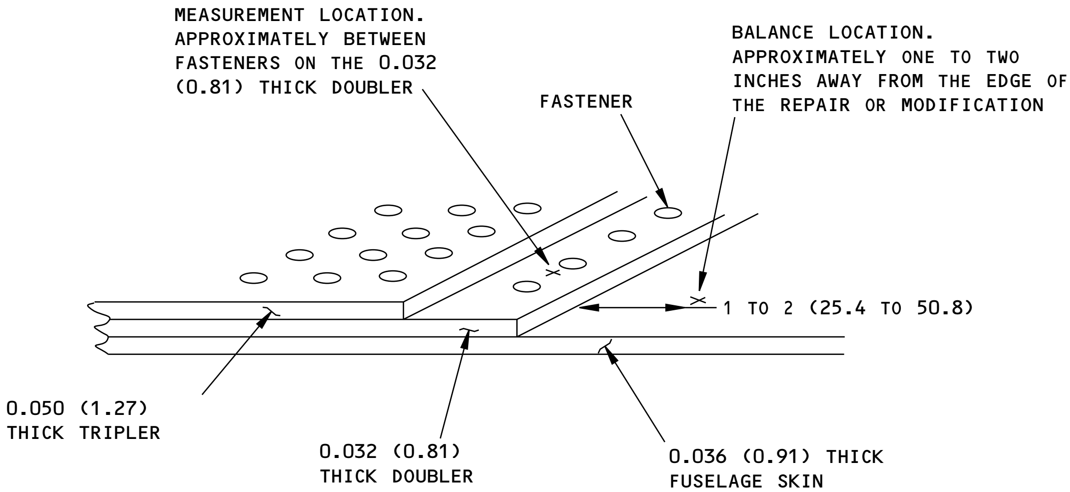
Template
Figure 3 (Sheet 2 of 3)



DETAIL III
(PHASIC 2D)
APPLICATION OF TEMPLATE

2161898 S0000472811_V1

Template
Figure 3 (Sheet 3 of 3)



DETAIL I

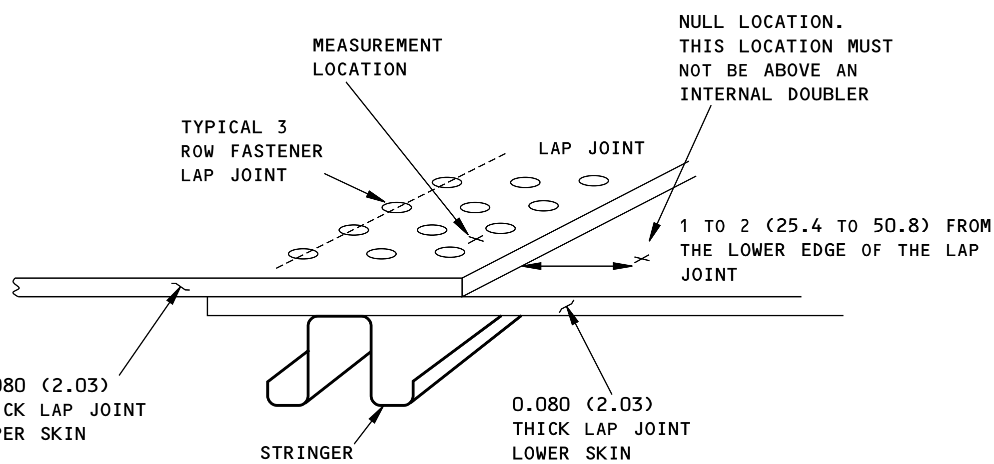
BALANCE AND MEASUREMENT LOCATIONS ON A REPAIR WITH A 0.032 (0.81) THICK DOUBLER AND A 0.036 (0.91) THICK SKIN

NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- BEFORE YOU MAKE A MEASUREMENT, MAKE SURE THE CALIBRATION WAS DONE WITH TAPE ON THE REFERENCE STANDARD THAT HAS THE SAME THICKNESS (WITHIN 0.003 INCH (0.08 mm)) AS THE PAINT ON THE PART TO BE MEASURED.

2161900 S0000472812_V1

Balance and Measurement Locations
Figure 4 (Sheet 1 of 2)

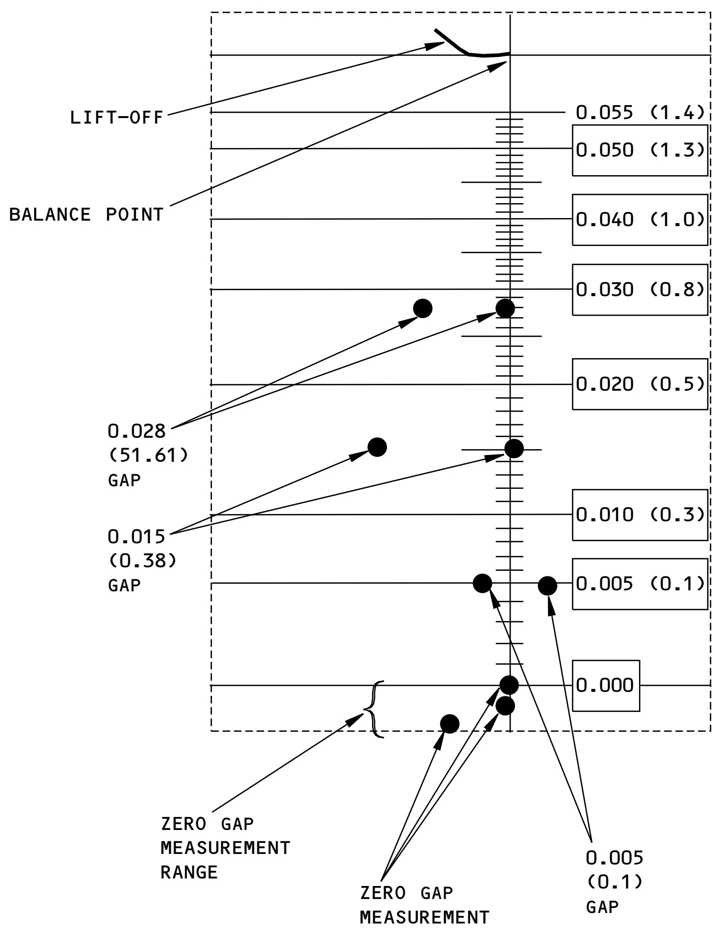


DETAIL II

BALANCE AND MEASUREMENT LOCATIONS ON A 0.080/0.080
(2.03)/2.03) THICK LAP JOINT

2161901 S0000472813_V1

Balance and Measurement Locations
Figure 4 (Sheet 2 of 2)



NOTES:

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

2161903 S0000472814_V1

Phasic 2D Measurement Examples
Figure 5

Airplane ID ________ Date ________ Paint thickness ________

Inspector ________

Stringer Location	Gap Measurement	Stringer Location	Gap Measurement

2161904 S0000472815_V1

Example Spread Sheet
Figure 6

PART 6 - EDDY CURRENT

OUTER CHORD SURFACE INSPECTION AT THE LOWER MAIN SILL OF THE FORWARD CARGO DOOR

1. **Purpose**

   A. Use this procedure to examine the surface of the aluminum outer chord at the lower main sill of the forward cargo door. See Figure 1 for the inspection areas for the applicable 737 airplanes.

   B. A linear probe scan is done on the outer chord at the lower main sill of the forward cargo door. See Figure 1.

   C. Use an impedance plane display instrument, a pencil probe, and a straightedge to do this inspection.

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

      (1) Item: 53-30-08-12

2. **Equipment**

   A. General

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

   B. Instruments

      (1) Refer to Part 6, 51-00-00, Procedure 23, for instrument data and the instruments that were used to help prepare this procedure.

   C. Probes

      (1) Refer to Part 6, 51-00-00, Procedure 23, for probe data.

      (2) Use a straight or angled pencil probe that:

         (a) has a maximum probe diameter of 0.130 inch (3.3 mm).

         (b) can operate between 200 and 300 kHz.

      (3) The probe that follows was used to help prepare this procedure.

         (a) TPEN915-5B; Techna NDT

   D. Reference Standard

      (1) Refer to Part 6, 51-00-00, Procedure 23, for data about reference standard 126 or 188A.

3. **Prepare for the Inspection**

   A. Open the forward cargo door to get access to the lower main sill along the cargo door opening.

   B. Remove the scuff plate that is on the lower sill. See Figure 1.

   C. Identify the inspection areas on the lower main sill of the forward cargo door shown in Figure 1.

   D. Make sure the outer chord is clean and sealant is removed from the scan area on the outer chord in the inspection areas that follow:

      (1) For 737-600 airplanes, the inspection area is from station 421 to 438. See flagnote 2 in Figure 1.

      (2) For 737-700 thru -900 airplanes, the inspection area is from station 461 to 478. See flagnote 3 in Figure 1.

4. **Instrument Calibration**

A. Calibrate the instrument as specified in Part 6, 51-00-00, Procedure 23, paragraph 5.

(1) Use reference standard 126 or 188A during the calibration.

5. **Inspection Procedure**

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 6, for the general data on surface eddy current inspection procedures.

B. Put the edge of the straightedge along the edge of the web of the lower sill as shown in Figure 1.

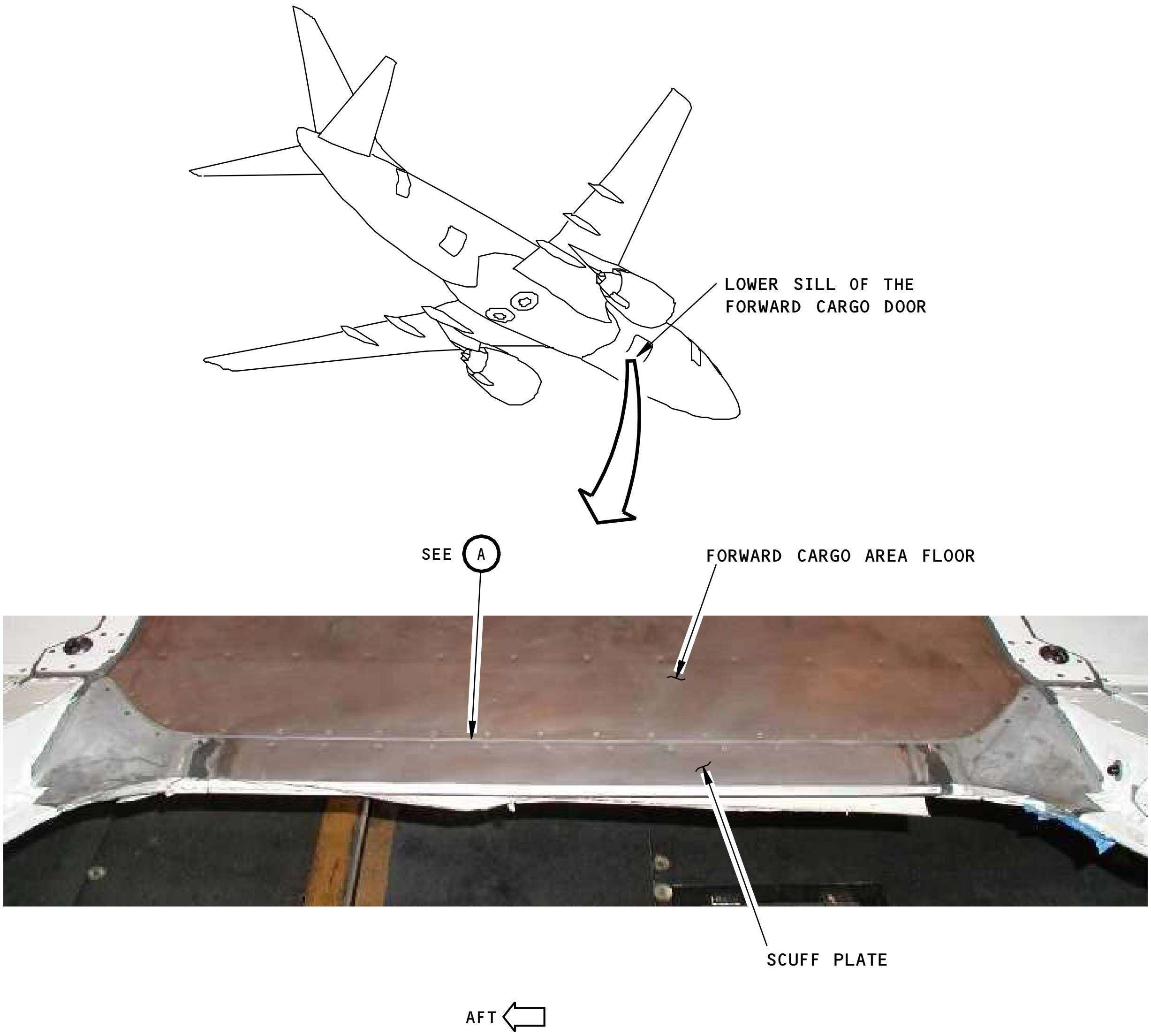
C. Put the probe on the outer chord in the inspection area so the probe is against the straightedge.

D. Balance the instrument.

E. Do a linear probe scan in the aft and forward directions in the inspection area. See Figure 1 for the inspection area for the applicable airplane model.

6. **Inspection Results**

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of possible crack indications.

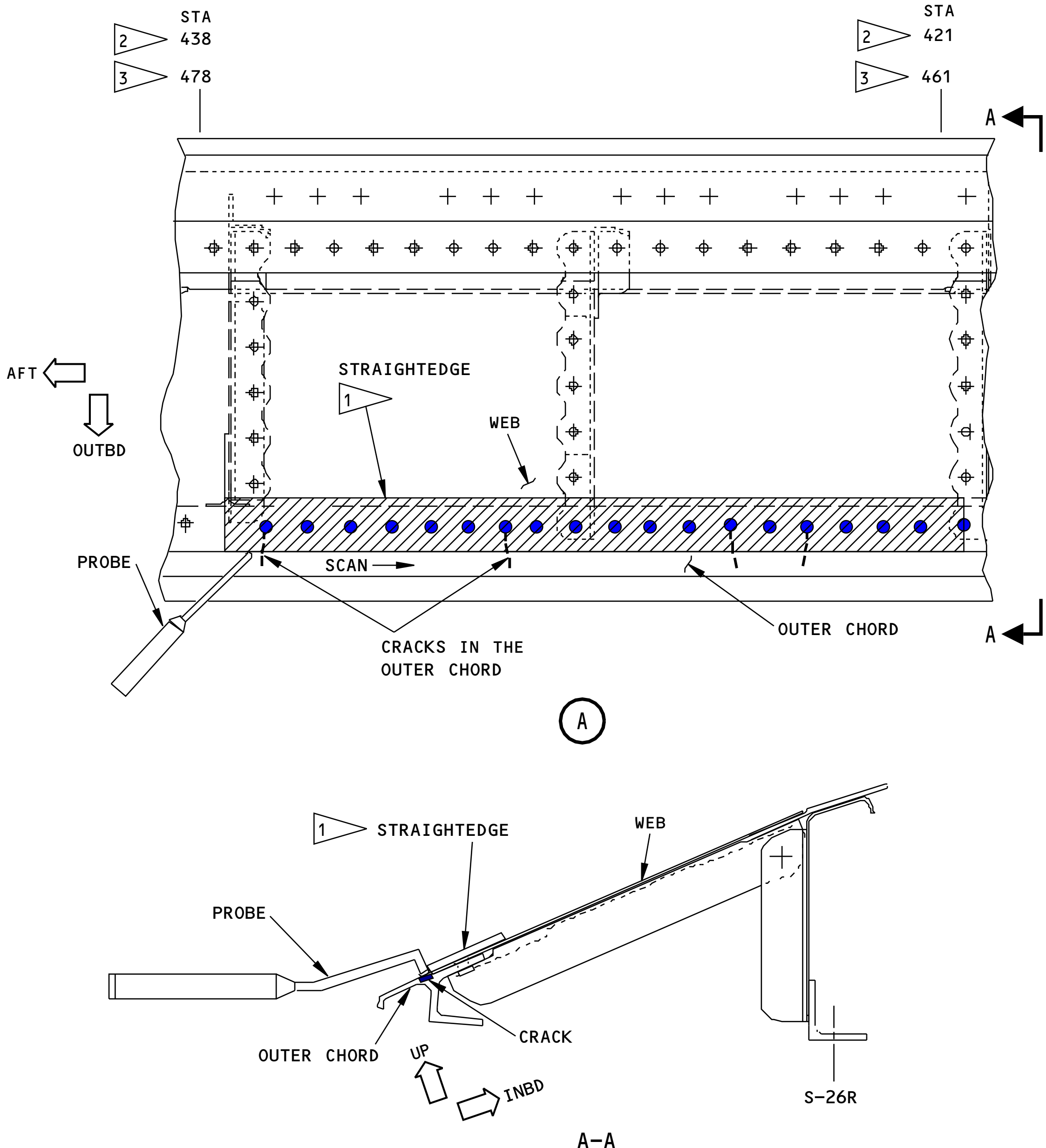


NOTES:

- THE LOWER MAIN SILL OF THE FORWARD CARGO DOOR IS SHOWN (THE CARGO DOOR IS OPEN TO SHOW THIS AREA)
- REMOVE THE SCUFF PLATE TO GET ACCESS TO THE INSPECTION AREA ON THE LOWER MAIN SILL. SEE (A) FOR THE SILL WITHOUT THE SCUFF PLATE.
- SEE VIEW (A) TO SEE THE INSPECTION AREA ON THE OUTER CHORD.

2161907 S0000472820_V1

Inspection Area
Figure 1 (Sheet 1 of 2)



NOTES:

- VIEW OF THE LOWER CARGO DOOR SILL AS YOU LOOK DOWN AND THE SCUFF PLATE HAS BEEN REMOVED

1 PUT THE STRAIGHTEDGE ALONG THE OUTBOARD EDGE OF THE WEB. PUT THE PROBE ALONG THE EDGE OF THE STRAIGHTEDGE AND DO A PROBE SCAN ON THE OUTER CHORD IN THE AFT AND FORWARD DIRECTIONS.

2 THE INSPECTION AREA FOR 737-600 AIRPLANES IS FROM STATION 421 TO 438.

3 THE INSPECTION AREA FOR 737-700 THRU -900 AIRPLANES IS FROM STATION 461 TO 478.

2161909 S0000472821_V1

Inspection Area
Figure 1 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

OUTER CHORD AT THE LOWER MAIN SILL OF THE FORWARD CARGO DOOR - SUBSURFACE (LFEC)

1. Purpose

A. Use this procedure to do an inspection for subsurface cracks in the outer chord (T-chord) of the lower main sill of the forward cargo door. The inspection is done on the web of the sill to find cracks in the outer chord. The web and outer chord are made from aluminum. See Figure 1.

B. A spot probe and an impedance plane instrument are used to do this inspection.

C. 737 Damage Tolerance Rating (D626A001-DTR):

(1) Item: 53-30-08-12

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 an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates at 4 kHz.

(c) The instruments that follow were used to help prepare this procedure.

1) Phasec 2200; GE Inspection Technologies

2) Nortec 1000; Olympus NDT

C. Probes

(1) Use a spot probe that:

(a) Operates at 4 kHz.

(b) Has a maximum diameter of 0.25 inch (6.35 mm).

(c) Is shielded.

(2) The probes that follow were used to help prepare this procedure.

(a) RS902-50B/20K/2D; Olympus NDT Inc.

(b) NEC-1087; Olympus NDT Inc.

NOTE: A spot probe with equivalent dimensions can be used if the calibration in Paragraph 4. can be done.

D. Reference Standard

(1) Use reference standard ANDT1049. See Part 6, 53-30-00, Procedure 5, for this reference standard. Reference standard NDT1049 can be used as an alternative.

E. Special Tools

(1) Use a nonconductive straightedge to do linear probe scans.

3. **Prepare for the Inspection**

   A. Open the forward cargo door to get access to the lower main sill along the cargo door opening.

   B. Remove the scuff plate that is on the lower main sill. See Figure 1.

   C. Identify the inspection areas on the lower main sill of the forward cargo door shown in Figure 1.

   D. Make sure the web is clean and sealant is removed from the inboard and outboard sides of the rivets in the inspection areas that follow:

      (1) For 737-600 airplanes, the inspection area is from station 421 to 438. See Figure 1.

      (2) For 737-700 thru -900 airplanes, the inspection area is from station 461 to 478. See Figure 1.

4. **Instrument Calibration**

   A. Connect the probe to the instrument and set the instrument frequency to 4 kHz.

   B. Calibrate the instrument as specified in Part 6, 53-30-00, Procedure 5, paragraph 5.

      (1) Use reference standard ANDT1049 or NDT1049 during calibration. See Part 6, 53-30-00, Procedure 5, Figures 1 and 7 to make reference standard ANDT1049.

5. **Inspection Procedure**

   NOTE: The inspection area for 737-600 airplanes is from station 421 to 438. The inspection area for 737-700 thru -900 airplanes is from station 461 to 478. Make sure you do the inspection in the correct inspection area for the airplane model that you examine.

   A. Put the straightedge along the inboard edge of the rivets in the inspection area. See Figure 1.

   B. Put the probe on the web in the inspection area so that it is against the straightedge.

   C. Balance the instrument.

   D. Do a check of the lift-off signal and, if necessary, adjust the lift-off signal so the signal moves horizontally to the left. Do not adjust the gain.

   E. Move the probe in a forward and aft direction along the edge of the straightedge to look for cracks.

      (1) Adjust the straightedge, as necessary, as you move the probe along the edge of the rivets that remain in the inspection area. See Figure 1.

      (2) Make sure the probe scans are done for the full inspection area. See Figure 1.

   F. Put the straightedge along the outboard edge of the rivets in the inspection area. See Figure 1.

   G. Do Paragraph 5.B. thru Paragraph 5.E. to look for cracks along the outboard side of the rivets in the inspection area. See Figure 1.

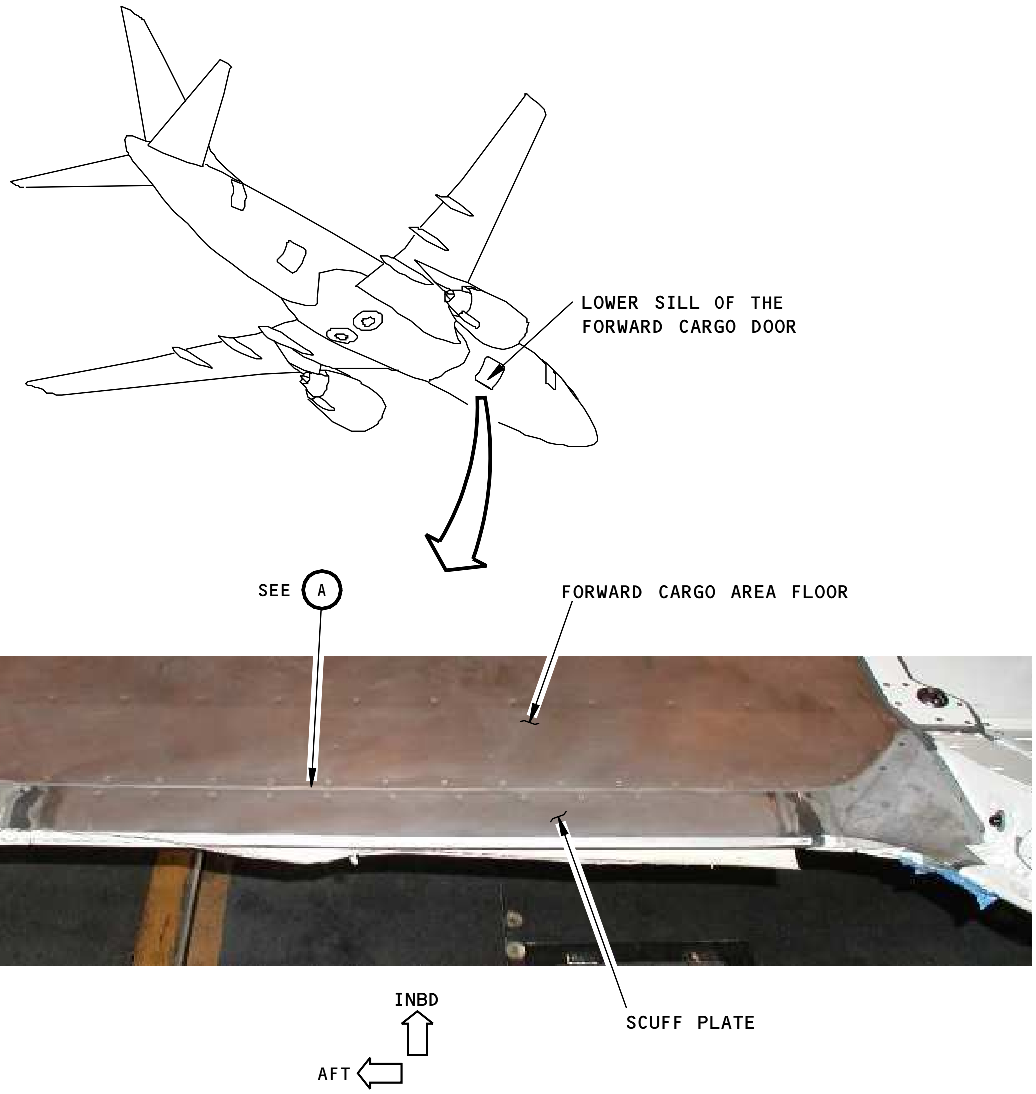
6. **Inspection Results**

   A. Signals that are 20 percent (or more) of full screen height above the balance point are possible crack indications. See Part 6, 53-30-00, Procedure 5, paragraph 7, for more data on inspection results.

   B. Make sure the cause of the indication is not because the probe was on a rivet edge.

   C. Make sure the indication was not caused by the edge of the web or the subsurface edge of the outer chord. A probe scan done in an inboard to outboard direction will give an edge effect signal.

   D. To make sure of the results, remove the rivet(s) where a crack indication was found and do the fastener hole inspection procedure specified in Part 6, 51-00-00, Procedure 16.

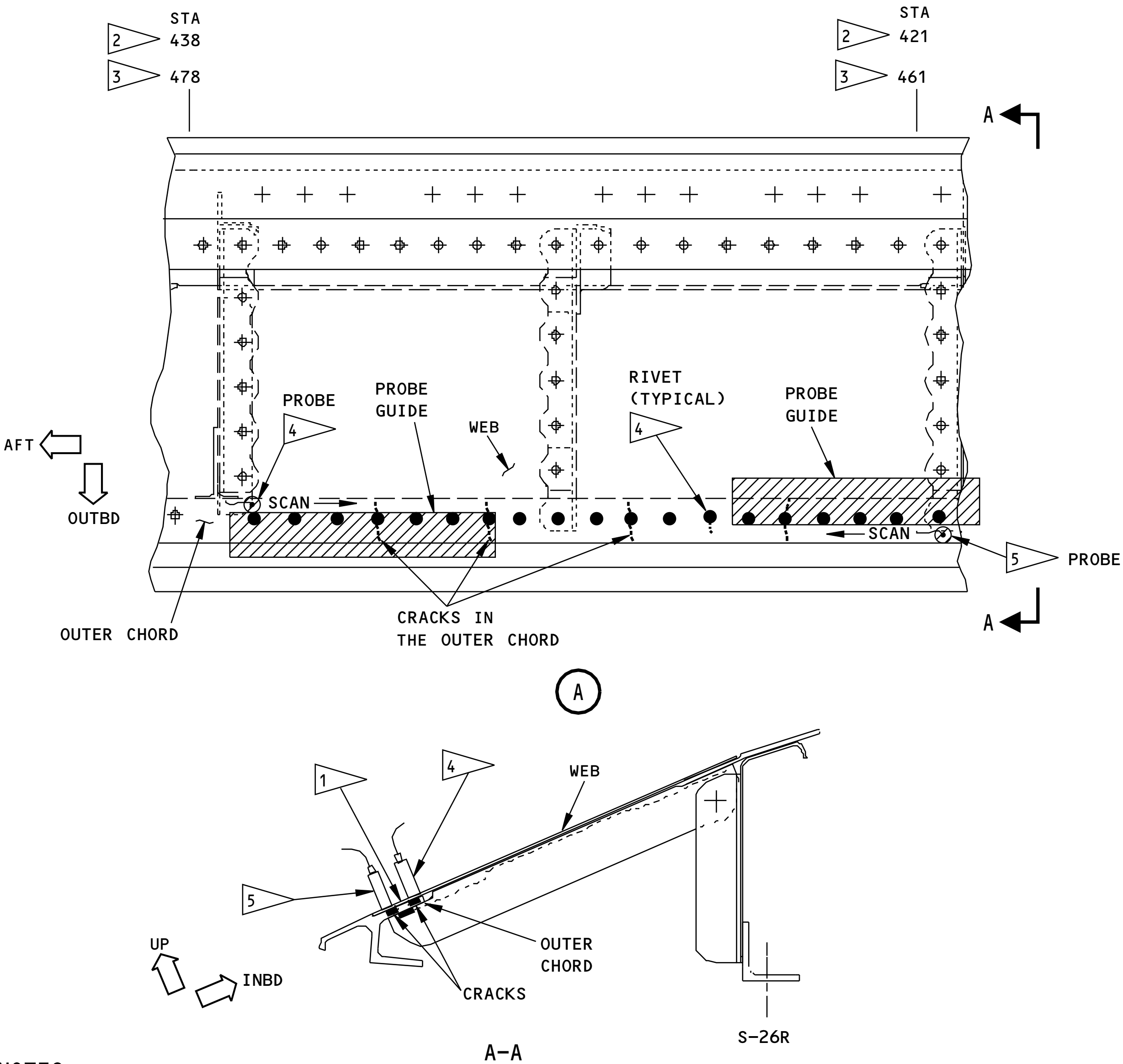


NOTES:

- THE LOWER MAIN SILL OF THE FORWARD CARGO DOOR IS SHOWN (THE CARGO DOOR IS OPEN TO SHOW THIS AREA)
- REMOVE THE SCUFF PLATE TO GET ACCESS TO THE INSPECTION AREA ON THE LOWER MAIN SILL. SEE VIEW A FOR THE LOWER MAIN SILL WITHOUT THE SCUFF PLATE AND TO SEE THE RIVETS TO EXAMINE ADJACENT TO IN THE INSPECTION AREAS

2161919 S0000472825_V1

Inspection Area
Figure 1 (Sheet 1 of 2)



NOTES:

- VIEW OF THE LOWER CARGO DOOR SILL AS YOU LOOK DOWN AND THE SCUFF PLATE HAS BEEN REMOVED

1 EXAMINE THE AREAS ADJACENT TO THE RIVETS SHOWN FOR CRACKS IN THE INSPECTION AREA.

2 THE INSPECTION AREA FOR 737-600 AIRPLANES IS FROM STATION 421 TO 438.

3 THE INSPECTION AREA FOR 737-700 THRU -900 AIRPLANES IS FROM STATION 461 TO 478.

4 DO A LINEAR PROBE SCAN ALONG THE INBOARD EDGES OF THE RIVETS.

5 DO A LINEAR PROBE SCAN ALONG THE OUTBOARD EDGES OF THE RIVETS.

2161921 S0000472826_V1

Inspection Area
Figure 1 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

SKIN INSPECTION AT THE SCUFF PLATE ON THE LOWER SILL OF THE AFT ENTRY AND GALLEY DOORS (HFEC)

1. **Purpose**

   A. Use this procedure to examine the aluminum skin for cracks around the edge of the scuff plate. Also, use this procedure to examine the fastener holes in the skin after the screws and scuff plate are removed. See Figure 1 for the inspection locations.

   B. Use a surface probe to make a scan on the skin around the edge of the scuff plate on the lower sill. Use a surface probe to make a scan on the skin around the open holes after the scuff plate is removed. See Figure 1 for these inspection areas.

   C. Use an impedance plane display instrument and a pencil probe to do this inspection.

   D. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

      (1) Item: 53-70-07-6

      (2) Item: 53-70-08-6

2. **Equipment**

   A. General

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

   B. Instruments

      (1) Refer to Part 6, 51-00-00, Procedure 23, for instrument data and instruments that were used to help prepare this procedure.

   C. Probes

      (1) Refer to Part 6, 51-00-00, Procedure 23, for probe data.

      (2) Use a pencil probe that:

         (a) Can be calibrated as specified in Paragraph 4.

         (b) Has a maximum diameter of 0.13 inch (3.3 mm) at the probe coil.

         (c) Is shielded.

      (3) The surface probes that follow were used to help prepare this procedure.

         (a) TPEN925-5B; Techna NDT LLC

         (b) MTF902-50B; Olympus NDT

      (4) Reference Standard

         (a) Refer to Part 6, 51-00-00, Procedure 23, for data about reference standard 126.

      (5) Special Tools

         (a) Use a nonconductive circle template to do a circular scan on the skin around all of the open holes after the scuff plate is removed.

3. **Prepare for the Inspection**

A. Remove the sealant that is on the skin from around the edge of the scuff plate on the lower sill. Refer to the Airplane Maintenance Manual (AMM) for the sealant removal instructions. Also remove loose paint or dirt from the probe scan area around the scuff plate. See Figure 1.

B. Do not remove the scuff plate on the lower sill until the probe scan is done on the skin around the scuff plate. The scuff plate will be removed at the correct time as specified in Paragraph 5.

4. **Instrument Calibration**

A. Calibrate the instrument for the surface inspection as specified in Part 6, 51-00-00, Procedure 23.

(1) Use reference standard 126 for the calibration for all inspection areas.

5. **Inspection Procedure**

A. Examine the skin for cracks around the edge of the scuff plate at the lower sill of the aft entry door as follows:

(1) Refer to Part 6, 51-00-00, Procedure 23, paragraph 6, for general data on surface eddy current inspection procedures.

(2) Put the probe on the skin so it is adjacent to the edge of the scuff plate. See Figure 1.

(3) Balance the instrument.

(4) Do a scan on the skin around the edge of the scuff plate. Use the scuff plate edge as a probe guide. Figure 1 shows the scan area with the arrows around the edge of the scuff plate.

B. Remove the scuff plate and examine the skin for cracks around the open fastener holes as follows:

(1) Remove the scuff plate.

(2) Remove loose paint, dirt and sealant from the scan areas on the skin that are around all of the open holes where the screws were removed. Refer to the AMM for the sealant removal instructions. See Figure 1.

(3) Refer to Part 6, 51-00-00, Procedure 23, paragraph 6.E.(3)(b), for general data on the surface inspection. This paragraph gives instructions on a probe scan with a circle template around a flush head rivet. Use these same instructions to do a scan around the open holes.

(4) Put the circle template on the skin around one of the fastener holes in the inspection area. See Figure 1 for the screw hole locations.

(5) Put the probe along the edge of the fastener hole so that it is against the circle template hole.

(6) Balance the instrument.

(7) Do a 360 degree probe scan around the open hole in the skin.

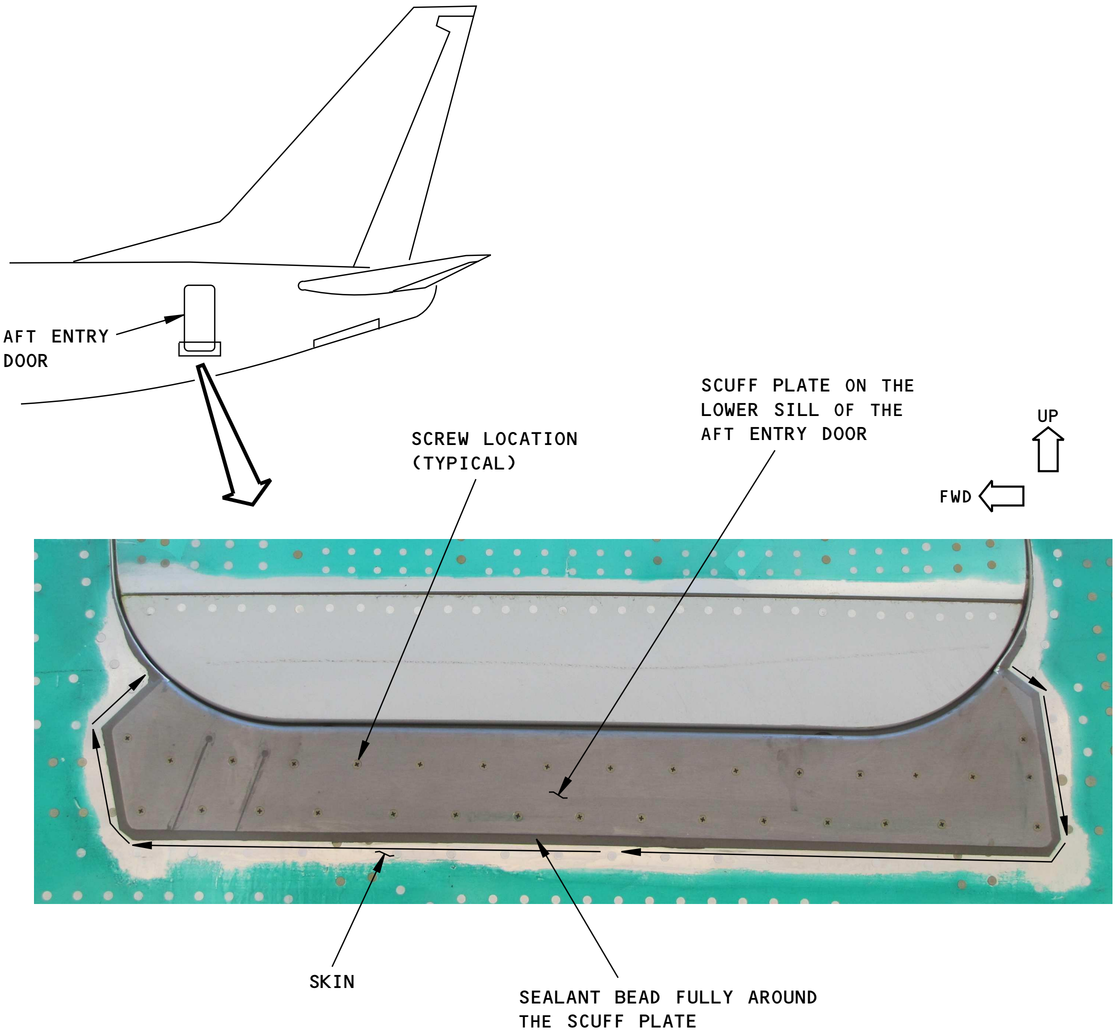
(8) Do Paragraph 5.B.(4) thru Paragraph 5.B.(7) on the remaining open holes in the inspection area.

C. Do Paragraph 5.A. and Paragraph 5.B. again to examine the inspection area on the lower sill of the aft galley door for cracks.

6. **Inspection Results**

A. Inspection Results for the Surface Inspection

(1) Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of possible crack indications.



NOTES:

- THE LOWER SILL AT THE AFT ENTRY DOOR IS SHOWN; THE LOWER SILL AT THE AFT GALLEY DOOR IS THE SAME
- REMOVE THE SEALANT BEAD ON THE SKIN THAT IS IMMEDIATELY AROUND THE SCUFF PLATE.
- DO A PROBE SCAN ON THE SKIN AROUND THE PERIMETER OF THE SCUFF PLATE. USE THE EDGE OF THE SCUFF PLATE AS A PROBE GUIDE. SEE THE ARROWS THAT SHOW THE SCAN AREA ON THE SKIN.
- REMOVE THE SCUFF PLATE AND CLEAN THE SKIN THAT WAS BEHIND THE SCUFF PLATE.
- DO CIRCULAR PROBE SCANS ON THE SKIN AROUND ALL OF THE OPEN HOLES WHERE THE SCREWS WERE INSTALLED. USE A CIRCLE TEMPLATE FOR THE SCANS.

2161923 S0000472829_V2

Inspection Areas
Figure 1

PART 6 - EDDY CURRENT

STRAPS AT THE FORWARD FRAME OF THE AFT ENTRY DOOR OPENING AT DOOR STOPS 1, 2, 6 AND 7 (HFEC)

1. **Purpose**

   A. Use this procedure to examine the straps at the forward frame of the aft entry door opening. The straps to be examined are forward of door stops 1, 2, 6 and 7 at station 951. The straps are aluminum. See Figure 1 for the inspection locations.

   B. Use a surface probe to make a scan around 4 fasteners at each of the inspection locations at door stops 1, 2, 6 and 7. There is a total of 16 fasteners to examine for this inspection.

   C. Use an impedance plane display instrument and a pencil probe to do this procedure.

   D. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

      (1) Item: 53-70-07-3

2. **Equipment**

   A. General

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

   B. Instruments

      (1) Refer to Part 6, 51-00-00, Procedure 23, for instrument data and instruments that were used to help prepare this procedure.

   C. Probes

      (1) Refer to Part 6, 51-00-00, Procedure 23, for probe data.

      (2) Use a pencil probe that:

         (a) Can be calibrated as specified in Paragraph 4.

         (b) Is straight or angled.

         (c) Has a maximum diameter of 0.13 inch (3.3 mm) at the probe coil.

         (d) Is shielded.

      (3) The surface probes that follow were used to help prepare this procedure.

         (a) TPEN925-5B; Techna NDT LLC

         (b) MTF902-50B; Olympus NDT

   D. Reference Standard

      (1) Refer to Part 6, 51-00-00, Procedure 23, for data about reference standard 188A.

3. **Prepare for the Inspection**

   A. Remove the internal panels and insulation from the inspection areas immediately forward of the aft entry door opening. See Figure 1.

   B. Remove loose paint, dirt, corrosion inhibiting compound (CIC) or sealant from the scan areas on the straps shown in Figure 1.

4. **Instrument Calibration**

A. Refer to Part 6, 51-00-00, Procedure 23, for the calibration instructions for the surface inspection.

(1) Use reference standard 188A for the calibration. Do the calibration around the protruding head rivet on reference standard 188A.

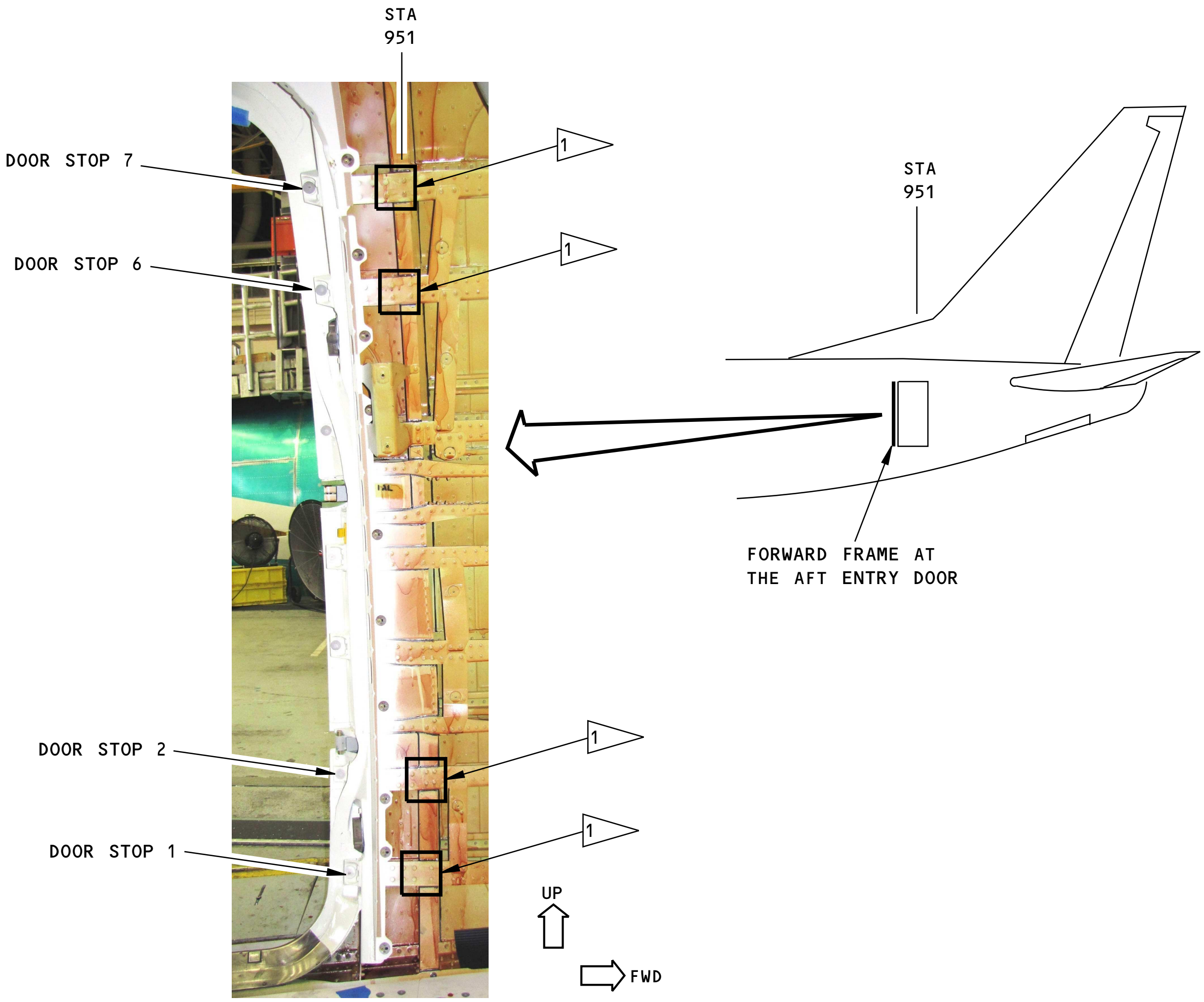
5. **Inspection Procedure**

A. Calibrate the instrument for the surface inspection as specified in Part 6, 51-00-00, Procedure 23, paragraph 6.

B. Do circular probe scans to look for cracks around the fastener heads of the straps that are forward of door stops 1, 2, 6 and 7 at the aft entry door. See Figure 1. There are a total of 16 fastener locations to examine.

6. **Inspection Results**

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of possible crack indications.



VIEW OF THE FORWARD FRAME OF THE AFT
ENTRY DOOR OPENING AS YOU LOOK OUTBOARD

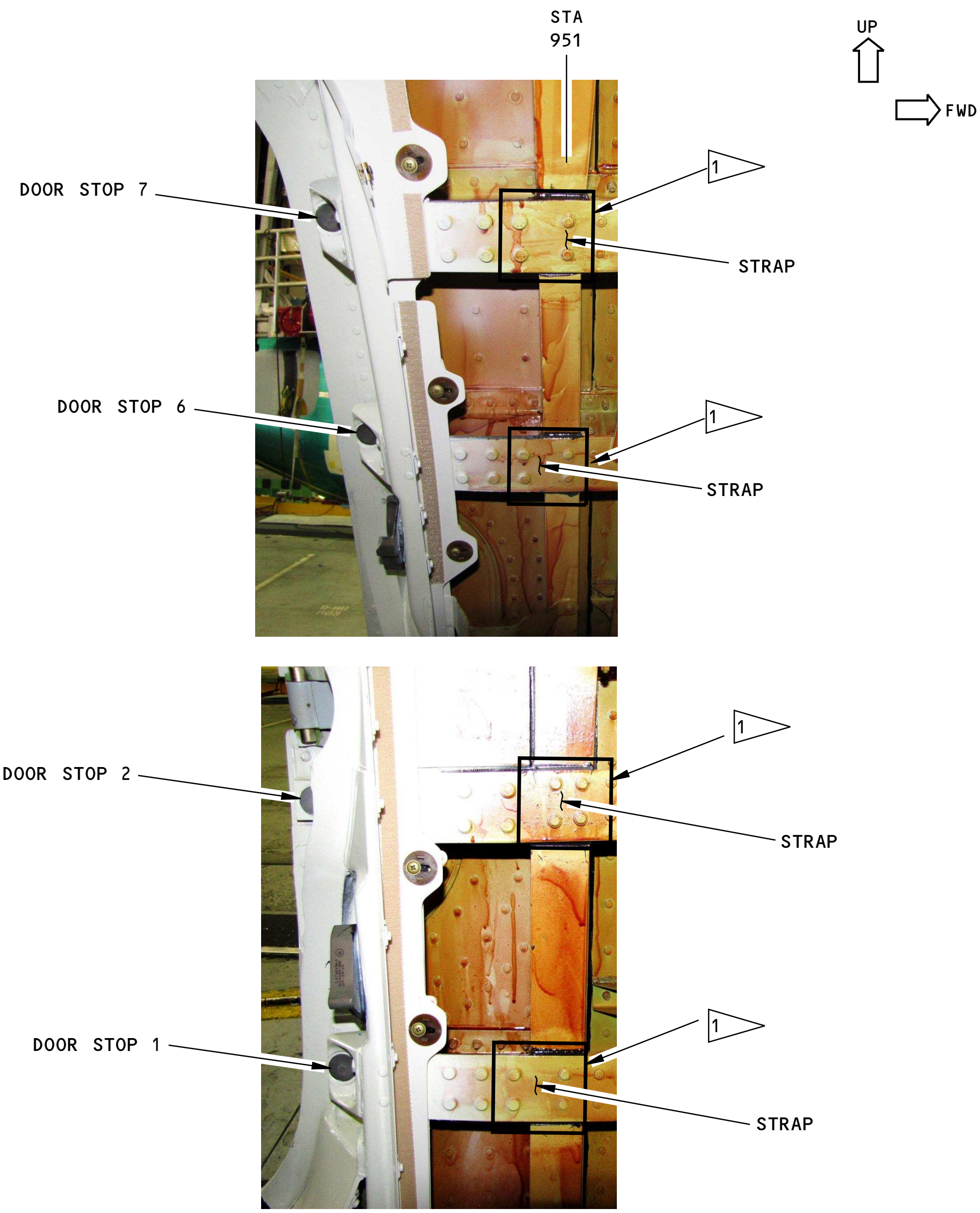
NOTES:

☐ INSPECTION LOCATIONS ON THE STRAPS AT DOOR STOP LOCATIONS 1, 2, 6 AND 7 AND STATION 951. SEE VIEW A FOR LARGER VIEWS OF THE INSPECTION LOCATIONS.

- THERE ARE 4 INSPECTION LOCATIONS AT STATION 951. EACH INSPECTION LOCATION HAS 4 FASTENERS TO EXAMINE ON EACH STRAP.

2161924 S0000472834_V1

Inspection Areas
Figure 1 (Sheet 1 of 2)



FORWARD FRAME OF THE AFT ENTRY DOOR OPENING

NOTES:

- DOOR STOPS 3, 4 AND 5 ARE NOT SHOWN AND ARE NOT INCLUDED IN THIS INSPECTION.

1 DO A 360 DEGREE PROBE SCAN ON THE STRAPS AROUND THE FASTENERS AT THESE INSPECTION LOCATIONS. THERE ARE 4 FASTENERS AT EACH INSPECTION LOCATION.

2161925 S0000472836_V1

Inspection Areas
Figure 1 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

INTERCOSTALS AT THE AFT FRAME OF THE AFT ENTRY DOOR OPENING AT DOOR STOPS 1, 2, 6 AND 7 (HFEC)

1. **Purpose**

   A. Use this procedure to examine the intercostals at the aft frame of the aft entry door opening. The intercostals to be examined are aft of door stops 1, 2, 6 and 7 at station 992. The intercostals are aluminum. See Figure 1 for the inspection locations.

   B. Use a surface probe to make a scan around 2 rivets at each of the inspection locations on the intercostals at door stops 1, 2, 6 and 7. There is a total of 8 rivet locations to examine for this inspection.

   C. Use an impedance plane display instrument and a pencil probe to do this procedure.

   D. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

      (1) Item: 53-70-07-4

2. **Equipment**

   A. General

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

   B. Instruments

      (1) Refer to Part 6, 51-00-00, Procedure 23, for instrument data and instruments that were used to help prepare this procedure.

   C. Probes

      (1) Refer to Part 6, 51-00-00, Procedure 23, for probe data.

      (2) Use a pencil probe that:

         (a) Can be calibrated as specified in Paragraph 4.

         (b) Is straight or angled.

         (c) Has a maximum diameter of 0.13 inch (3.3 mm) at the probe coil.

         (d) Is shielded.

      (3) The surface probes that follow were used to help prepare this procedure.

         (a) TPEN925-5B; Techna NDT LLC

         (b) MTF902-50B; Olympus NDT

   D. Reference Standard

      (1) For the surface inspection, use reference standard 188A. Refer to Part 6, 51-00-00, Procedure 23 for data about reference standard 188A.

   E. Special Tools

      (1) Use a mirror to help see the inspection area on the lower surface of the intercostal at door stop 1.

3. **Prepare for the Inspection**

   A. Remove the internal panels and insulation from the inspection areas immediately aft of the aft frame of the aft entry door opening (immediately aft of station 992). See Figure 1.

B. Get access to the inspection areas on the intercostals at door stops 1, 6 and 7 from the lower surface of the intercostals. Get access to the inspection areas on the intercostal at door stop 2 from the top surface of the intercostal. See Figure 1 for the rivet locations to examine.

C. Remove loose paint, dirt, corrosion inhibiting compound (CIC) or sealant from the scan areas on the web of the intercostals shown in Figure 1.

4. Instrument Calibration

A. Calibrate the instrument to do a surface inspection as specified in Part 6, 51-00-00, Procedure 23.

(1) Use reference standard 188A for the calibration. Do the calibration around the protruding head rivet on reference standard 188A.

5. Inspection Procedure

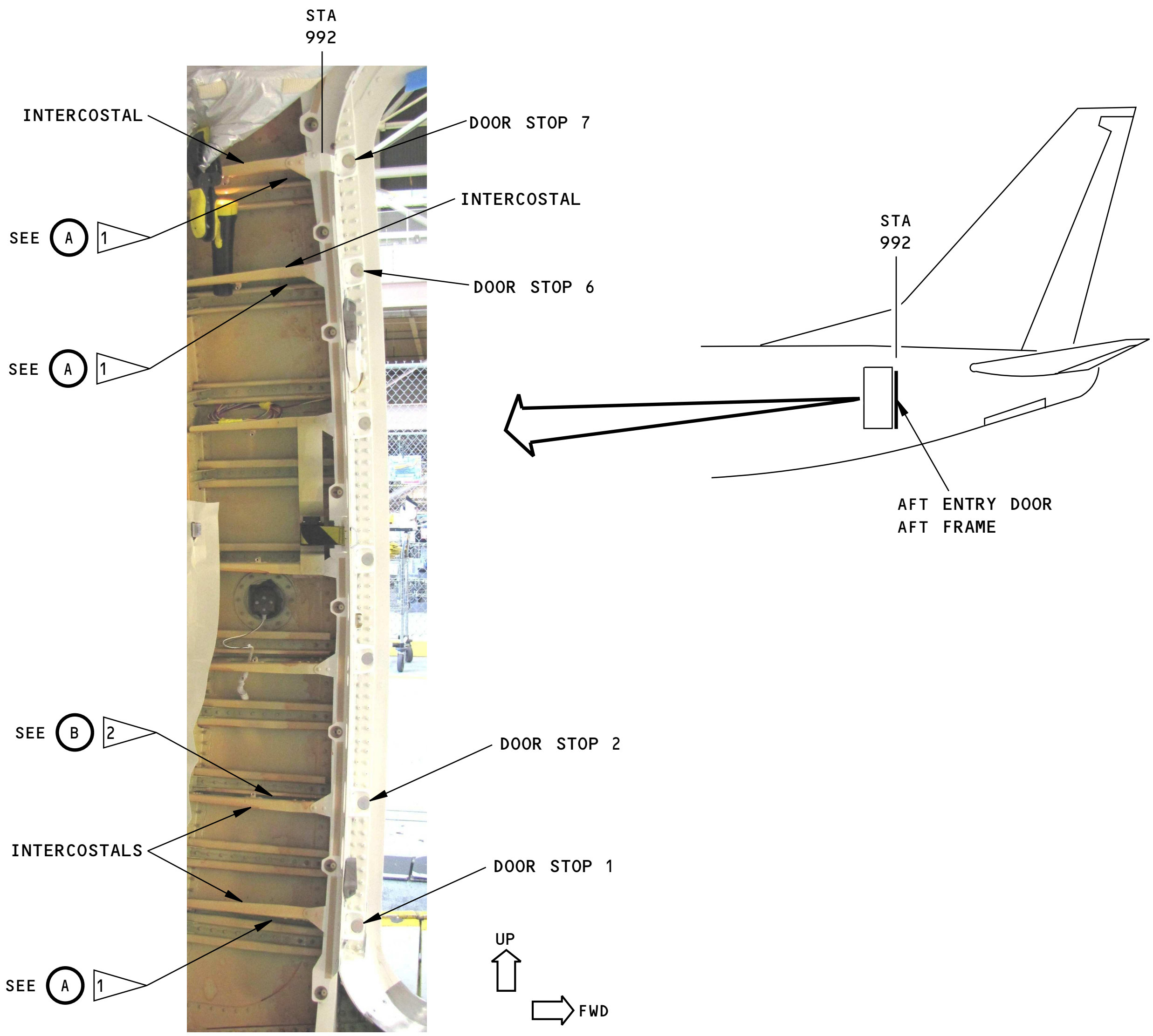
A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 6, for general data on surface eddy current inspection procedures.

NOTE: Access to the inspection areas on the intercostals at door stops 1, 6 and 7 is from the lower surface of the intercostals. Access to the inspection areas on the intercostal at door stop 2 is from the top surface of the intercostal.

B. Do circular probe scans around the rivet heads on the intercostals immediately aft of station 992. See Figure 1 for the rivet locations to examine and to identify the surface to examine. At each door stop inspection location, there are two rivets to examine. There are a total of 8 rivet locations to examine for this inspection. All of the rivets to be examined are near the inboard edge of the intercostals.

6. Inspection Results

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of possible crack indications.



VIEW OF THE AFT FRAME OF THE AFT ENTRY DOOR
OPENING AT STATION 992 AS YOU LOOK OUTBOARD

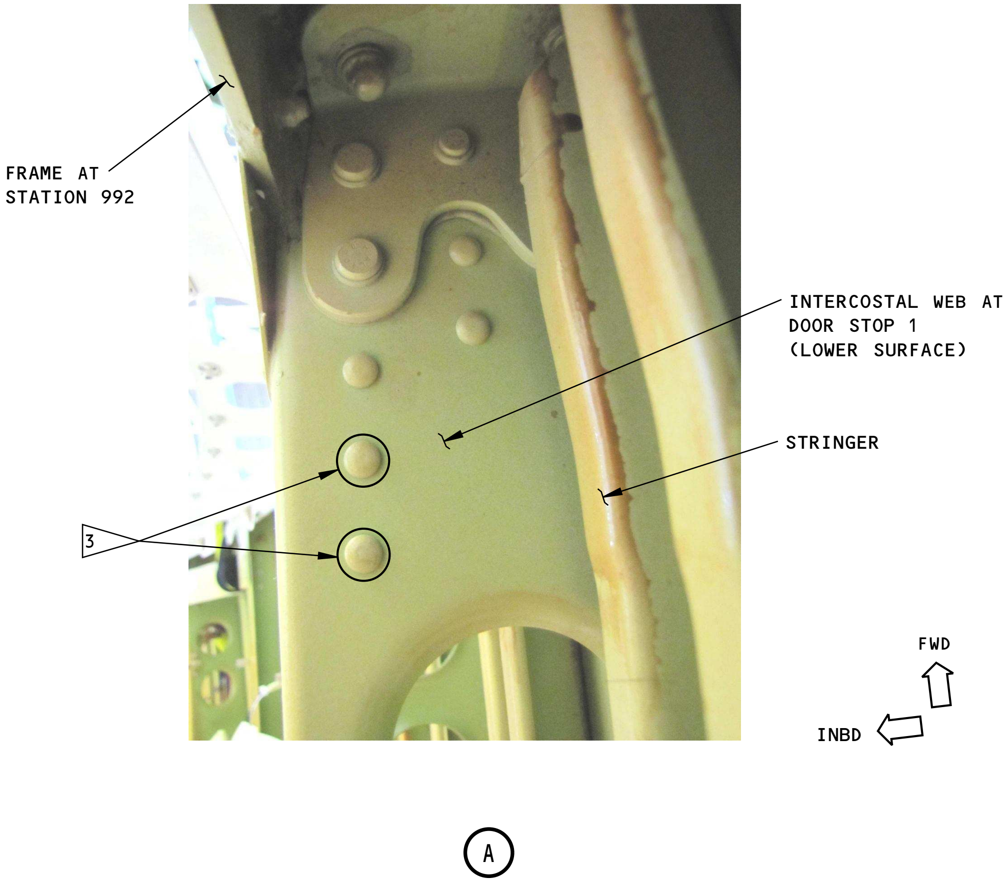
NOTES:

1 THE INSPECTION AREAS ON THE LOWER SURFACE OF THE INTERCOSTALS AT DOOR STOPS 1, 6 AND 7 CANNOT BE SEEN HERE. SEE VIEW A FOR THE FASTENERS TO EXAMINE ON THE LOWER SURFACE OF THE INTERCOSTAL WEBS AT DOOR STOPS 1, 6 AND 7.

2 THE INSPECTION AREA ON THE TOP SURFACE OF THE INTERCOSTAL AT DOOR STOP 2 CANNOT BE SEEN HERE. SEE VIEW B FOR THE FASTENERS TO EXAMINE ON THE TOP SURFACE OF THE INTERCOSTAL WEB AT DOOR STOP 2.

2161926 S0000472840_V1

Inspection Areas
Figure 1 (Sheet 1 of 3)



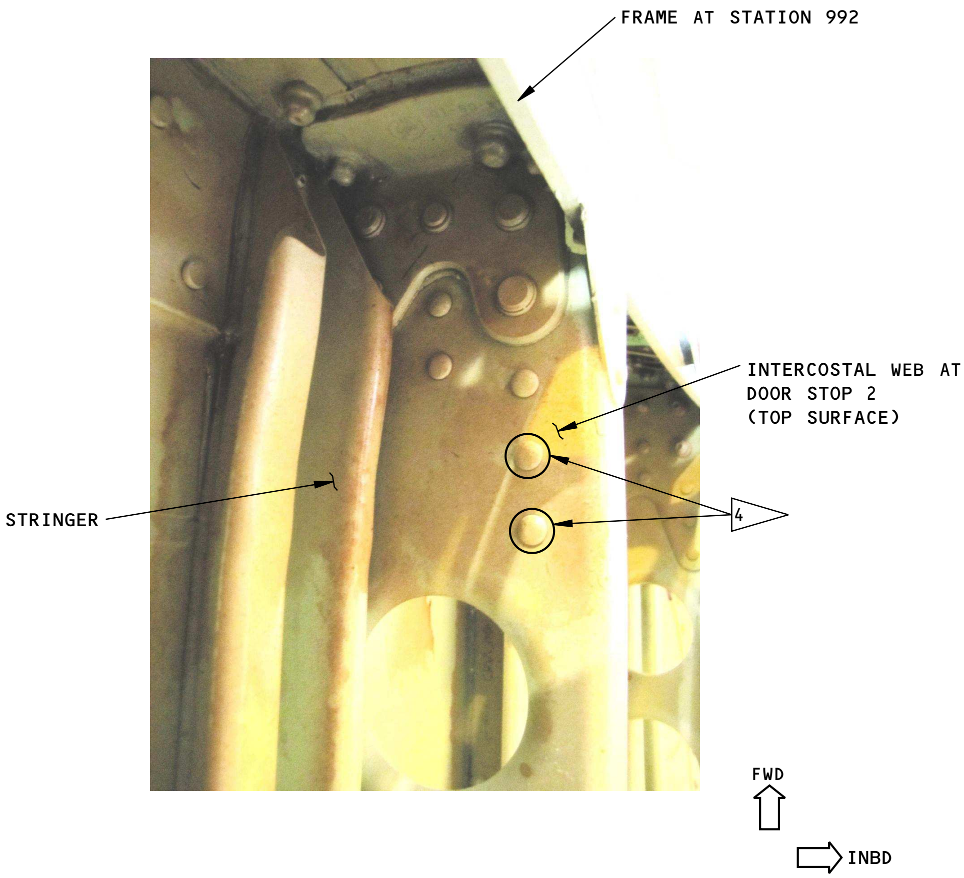
NOTES:

- THIS IS A VIEW OF THE LOWER SURFACE OF THE INTERCOSTAL AT DOOR STOP 1. THIS VIEW IS AS YOU LOOK UP FROM BELOW THE INTERCOSTAL. USE A MIRROR TO SEE THIS INSPECTION AREA. THE VIEW OF THE LOWER SURFACE OF THE INTERCOSTAL AND INSPECTION AREA AT DOOR STOPS 6 AND 7 (NOT SHOWN) IS EQUIVALENT.

3 PUT THE PROBE ON THIS LOWER SURFACE OF THE INTERCOSTAL WEB AT DOOR STOP 1 AND DO A CIRCULAR PROBE SCAN AROUND THE TWO RIVETS SHOWN. ALSO DO THE CIRCULAR SCAN AROUND THESE RIVETS ON THE LOWER SURFACE OF THE INTERCOSTALS AT DOOR STOPS 6 AND 7.

2161927 S0000472841_V1

Inspection Areas
Figure 1 (Sheet 2 of 3)



THIS IS A VIEW OF THE TOP SURFACE OF THE
INTERCOSTAL AT DOOR STOP 2 AS YOU LOOK DOWN
B

NOTES:

4 PUT THE PROBE ON THIS TOP SURFACE OF THE INTERCOSTAL WEB AT DOOR STOP 2 AND DO A CIRCULAR PROBE SCAN AROUND THE TWO RIVETS SHOWN.

2161930 S0000472843_V1

Inspection Areas
Figure 1 (Sheet 3 of 3)

PART 6 - EDDY CURRENT

DOUBLER (BEAR STRAP) AT THE CUTOUT FOR THE OVERWING EMERGENCY EXIT FOR 737-700/-700C/-700GW AIRPLAINES (LFEC)

1. **Purpose**

   A. Use this procedure to examine the doubler (bear strap) for cracks at the cutout of the overwing emergency exit. The inspection area is between stringers 10 and 15 and between BS 616 and BS 639. The locations to examine are the locations where the fasteners go through the doubler, the inner doubler (cub strap) and the frame outer chord. See Figure 1 for the inspection locations.

   B. The doubler (bear strap) is made of aluminum.

   C. This procedure uses low frequency eddy current (LFEC) to examine the doubler from outside the airplane.

   D. This procedure uses an eddy current instrument with an impedance plane display.

   E. 737 Damage Tolerance Rating (D626A001-DTR):

      (1) Item: 53-40-22-2

      (2) Item: 53-40-22-5

      (3) Item: 53-40-22-8

      (4) Item: 53-40-22-8a

      (5) Item: 53-40-22-10

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 - Use an eddy current instrument with an impedance plane display. Use an instrument that:

      (1) Can operate at a frequency between 800 Hz and 1.0 kHz.

      (2) Can be calibrated as specified in the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

         (a) NDT 19e; Olympus NDT

         (b) Phasec 2S/2D/2200; GE Inspection Technologies

   C. Probes

      (1) Use a reflection type ring probe with a minimum inner diameter of 0.40 inch (10.2 mm) and a maximum outer diameter of 0.80 inch (20.3 mm) that can operate at a frequency between 800 Hz and 1.0 kHz. The probe that follows was used to help prepare this procedure.

         (a) RDP.75-500H-5; Techna NDT

   D. Reference Standard

      (1) Use reference standard NDT3130 as specified in Figure 2.

3. **Prepare for the Inspection**

   A. Identify the inspection area shown in Figure 1.

   B. Get access to the inspection area.

   C. Clean the inspection surface if necessary. Remove paint only if it is loose.

4. **Instrument Calibration**

   A. Set the instrument frequency between 800 Hz and 1.0 kHz.

   B. Put the probe on the reference standard at probe position 1 as shown in Detail II of Figure 3.

   C. Balance the instrument.

   D. Move the probe above the fastener as necessary until the height of the signal is at its minimum and balance the instrument again.

   E. Set the balance point at approximately 20 percent of full screen height (FSH) and approximately 60 percent of full screen width (FSW) as shown in Detail I of Figure 3.

   F. Adjust the phase control so that the signal moves horizontally from right to left when the probe is lifted off the reference standard. See Detail I in Figure 3.

   G. Put the probe on the reference standard at probe position 2 as shown in Detail II of Figure 3.

   NOTE: Make sure the fastener is in the center of the probe.

   H. Move the probe above the fastener as necessary until the height of the signal is at its minimum.

   I. Adjust the instrument gain so the maximum signal from the reference notch is 60 percent of FSH as shown in Detail I of Figure 3.

   J. Do Paragraph 4.B., Paragraph 4.C., Paragraph 4.D., Paragraph 4.G. and Paragraph 4.H. again, as necessary, to make sure that the notch signal is 60 percent of FSH.

      (1) Do Paragraph 4.B. thru Paragraph 4.J. again if the signal from the fastener hole with a notch is not approximately 60 percent of FSH.

5. **Inspection Procedure**

   A. Calibrate the instrument as specified in Paragraph 4.

   B. Set the airplane baseline signal for an acceptable fastener location as follows:

      (1) Put the probe above the center of one of the fasteners in the area to be examined. Move the probe above the fastener to get the minimum signal from the instrument.

      (2) Balance the instrument.

      (3) Compare the signal of three or more additional fasteners in this group with the signal from the first fastener.

      NOTE: Do not change the instrument sensitivity when you set the airplane baseline signal.

      (4) Use the fastener from this group which has the smallest signal as the baseline signal of the airplane.

      NOTE: Examine this fastener frequently during the inspection to make sure the instrument baseline has not changed.

   C. Balance the instrument on the fastener which has the smallest signal. Refer to Paragraph 5.B.(4).

D. Move the probe above the fastener as necessary until the height of the signal is at its minimum and balance the instrument.

E. Put the ring probe above each fastener in the inspection area and monitor the instrument for crack signals. See Figure 1 for the inspection area. During the inspection:

(1) Make a mark at all the locations where signals occur that are 40 percent (or more) of FSH.

(2) Do a calibration check when the inspection is completed as follows:

NOTE: Do not adjust the instrument gain.

(a) Put the probe on the reference standard at probe position 1.

(b) Move the probe above the fastener as necessary until the height of the signal is at its minimum.

(c) Balance the instrument.

(d) Put the probe on the reference standard at probe position 2 and make sure the fastener is in the center of the probe. Compare the signal you got from the notch during calibration with the signal you get now.

(e) If the signal you now get from the notch has decreased in FSH by 10 percent or more, do the calibration and inspection again on the fastener locations you have examined since the last satisfactory calibration check.

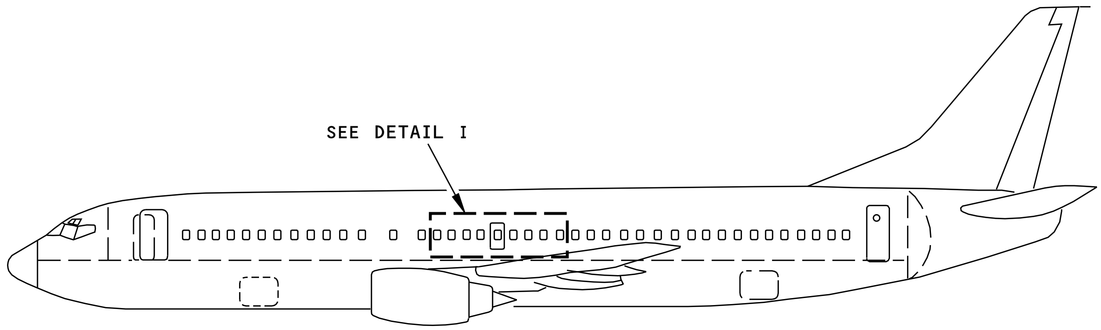
F. Do Paragraph 5.A. thru Paragraph 5.E. again on the other side of the airplane.

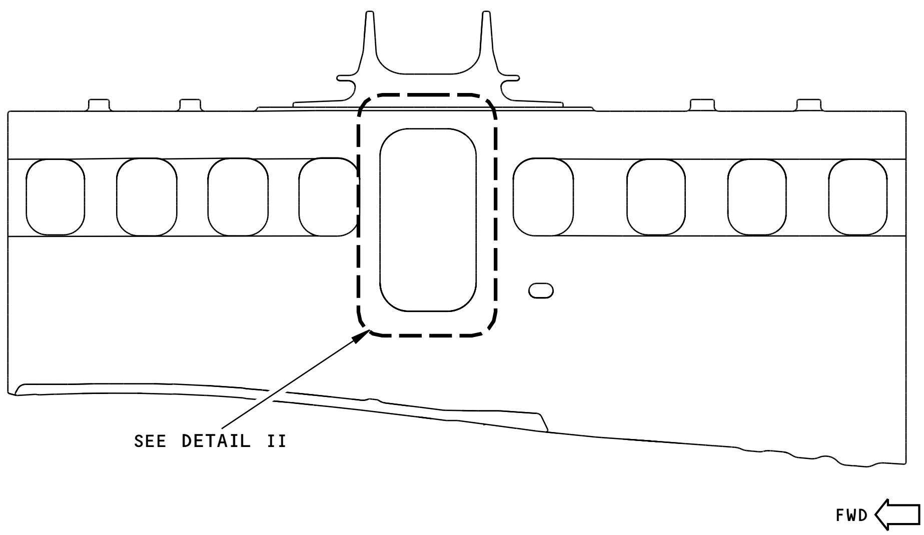
6. Inspection Results

A. A signal that is more than 40% of FSH is a sign of a crack and the location must be rejected. More analysis is necessary at locations that cause crack type signals to occur.

B. Compare the signal that occurs during the inspection to the signal you got from the notch in the reference standard during calibration.

C. If crack indications are found, do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 16.





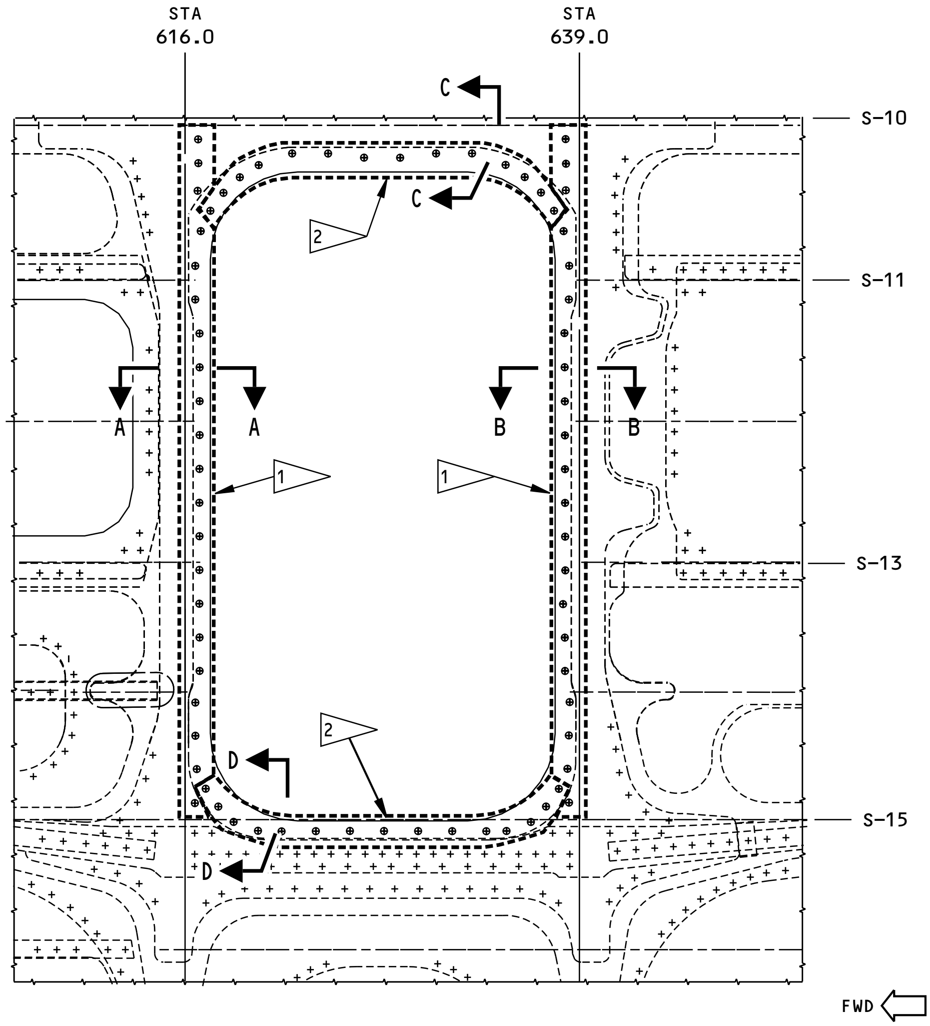
OVERWING EMERGENCY EXIT CUTOUT
DETAIL I

NOTES:

- THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS OPPOSITE

2161932 S0000472848_V1

Inspection Location
Figure 1 (Sheet 1 of 4)



OVERWING EMERGENCY EXIT CUTOUT
DETAIL II

NOTES:

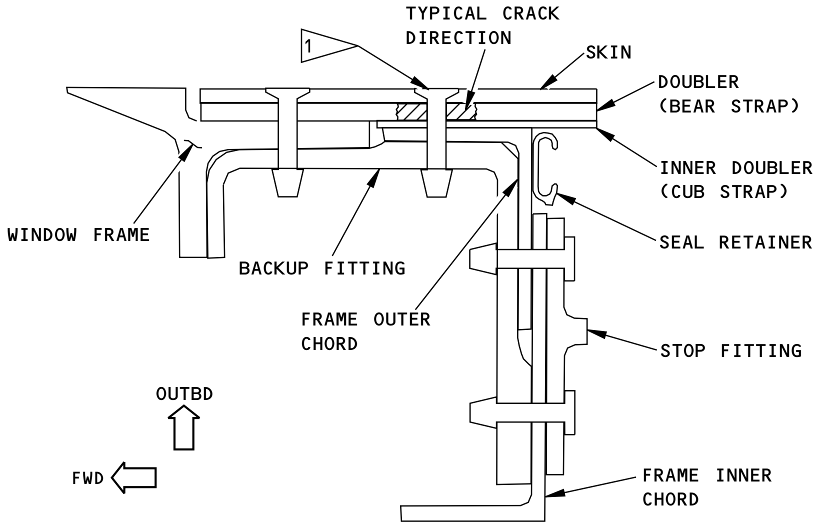
⊕ FASTENER LOCATIONS TO EXAMINE

1 EXAMINE THE FASTENER LOCATIONS AT THE EDGE OF THE OVERWING EMERGENCY EXIT CUTOUT AT BS 616 AND BS 639, BETWEEN S-10 AND S-15. THE FASTENERS GO THROUGH THE DOUBLER (BEAR STRAP), THE INNER DOUBLER (CUB STRAP) AND THE FRAME OUTER CHORD.

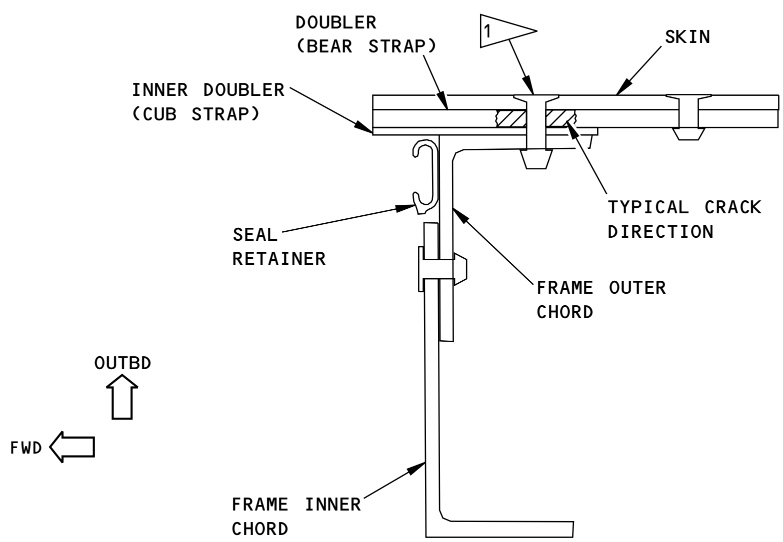
2 EXAMINE THE FASTENER LOCATIONS AT THE OVERWING EMERGENCY EXIT CUTOUT AT THE UPPER AND LOWER CORNERS AND THE UPPER AND LOWER SILLS BETWEEN BS 616 AND BS 639. THE FASTENERS GO THROUGH THE DOUBLER (BEAR STRAP) AND THE INNER DOUBLER (CUB STRAP).

2161936 S0000472849_V1

Inspection Location
Figure 1 (Sheet 2 of 4)



A-A



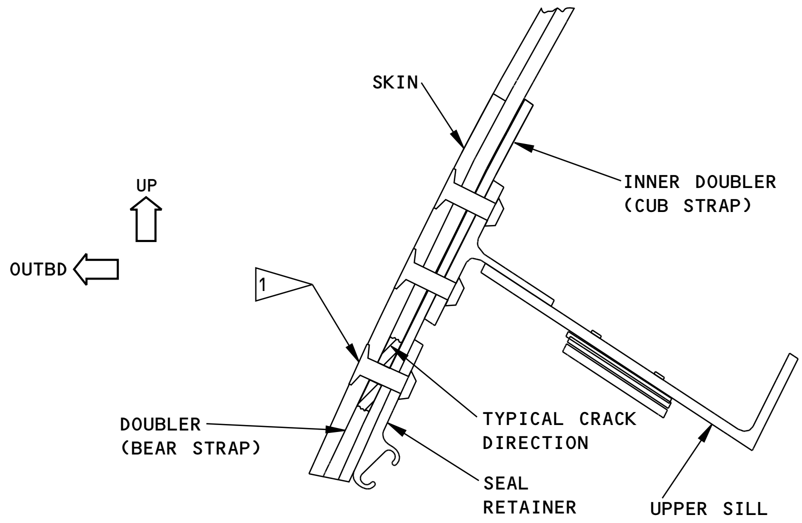
B-B

NOTES

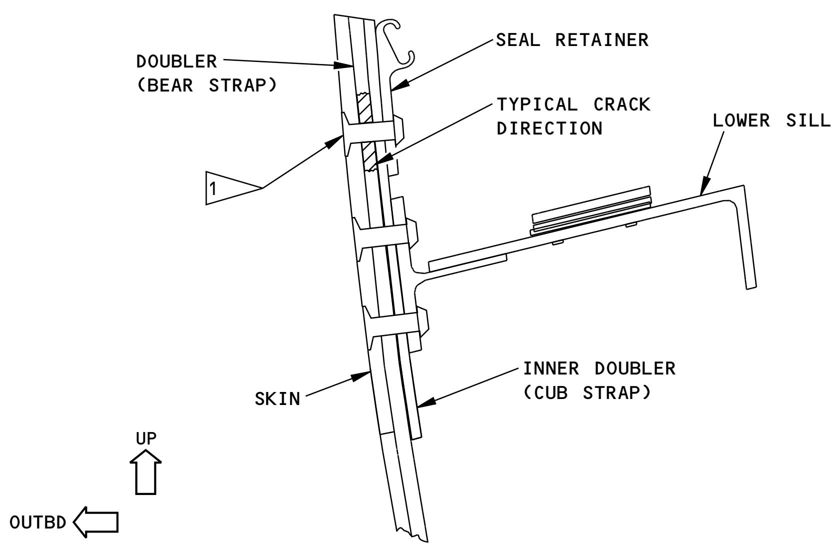
1 EXAMINE THE DOUBLER (BEAR STRAP) FOR CRACKS AT THE FASTENER LOCATION IDENTIFIED

2161939 S0000472850_V1

Inspection Location
Figure 1 (Sheet 3 of 4)



C-C



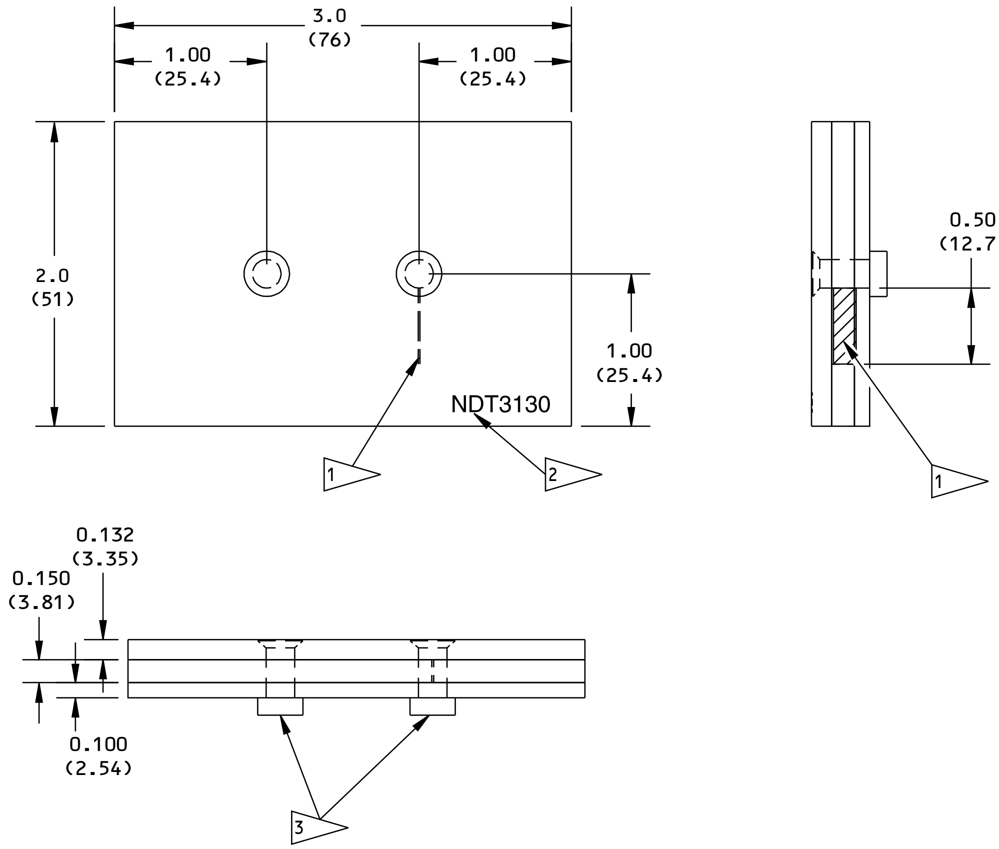
D-D

NOTES:

1 EXAMINE THE DOUBLER (BEAR STRAP) FOR CRACKS AT THE FASTENER LOCATION IDENTIFIED

2161941 S0000472851_V1

Inspection Location
Figure 1 (Sheet 4 of 4)



NOTES:

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

- MATERIAL: 2024-T3 AIRCRAFT ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER

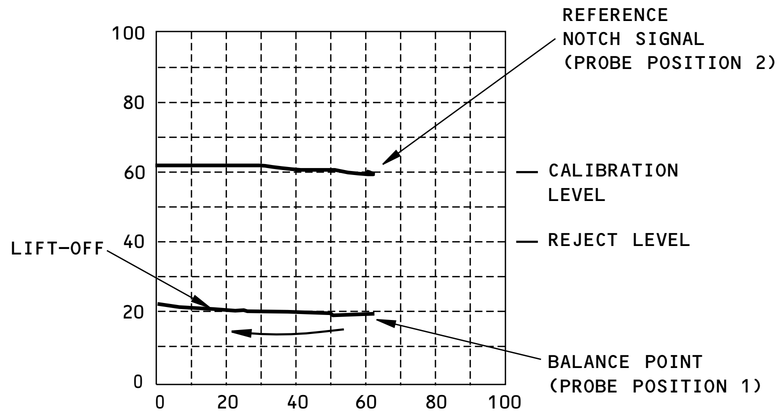
1 EDM NOTCH:
LENGTH - 0.50 (12.7) FROM THE FASTENER SHANK
DEPTH - THROUGH THE THICKNESS
WIDTH - 0.012 (0.30) MAXIMUM WIDTH

2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3130, AT THE APPROXIMATE LOCATION SHOWN

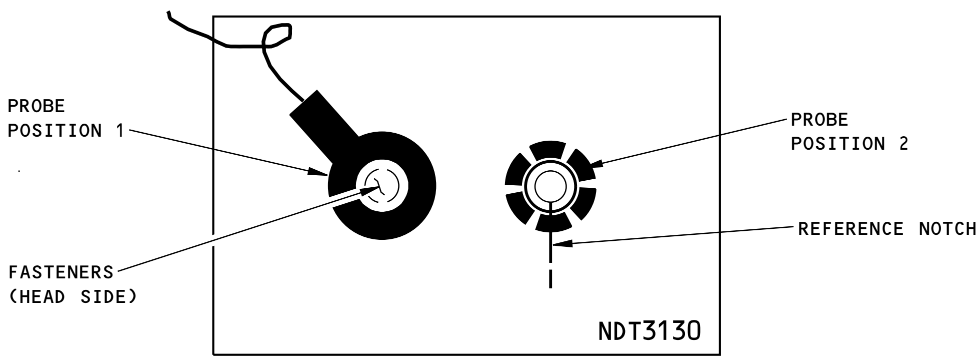
3 USE BACB30VU8K* BOLTS WITH BACC30BL8 COLLARS AT ALL LOCATIONS

2161943 S0000472852_V1

Reference Standard NDT3130
Figure 2



IMPEDANCE PLANE DISPLAY
DETAIL I



PROBE POSITIONS FOR CALIBRATION
ON REFERENCE STANDARD NDT3130
DETAIL II

2161944 S0000472853_V1

Probe Positions for Calibration
Figure 3

PART 6 - EDDY CURRENT

DOUBLER (BEAR STRAP) AT THE CUTOUT FOR THE OVERWING EMERGENCY EXIT FOR 737-600 AIRPLANES (LFEC)

1. **Purpose**

   A. Use this procedure to examine the doubler (bear strap) for cracks at the cutout of the overwing emergency exit. The inspection area is between stringers 10 and 15 and between BS 616 and BS 639. The locations to examine are the locations where the fasteners go through the doubler, the inner doubler (cub strap) and the frame outer chord. See Figure 1 for the inspection locations.

   B. The doubler (bear strap) is made of aluminum.

   C. This procedure uses low frequency eddy current (LFEC) to examine the doubler from outside the airplane.

   D. This procedure uses an eddy current instrument with an impedance plane display.

   E. 737 Damage Tolerance Rating (D626A001-DTR):

      (1) Item: 53-40-22-1

      (2) Item: 53-40-22-5

      (3) Item: 53-40-22-8

      (4) Item: 53-40-22-10

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 - Use an eddy current instrument with an impedance plane display. Use an instrument that:

      (1) Can operate at a frequency between 900 Hz and 1.5 kHz.

      (2) Can be calibrated as specified in the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

         (a) NDT 19e; Olympus NDT

         (b) Phasec 2S/2D/2200; GE Inspection Technologies

   C. Probes

      (1) Use a reflection type ring probe with a minimum inner diameter of 0.40 inch (10.2 mm) and a maximum outer diameter of 0.80 inch (20.3 mm) that can operate at a frequency between 900 Hz and 1.5 kHz. The probe that follows was used to help prepare this procedure.

         (a) RDP.75-500H-5; Techna NDT

   D. Reference Standard

      (1) Use reference standard NDT3129 as specified in Figure 2.

3. **Prepare for the Inspection**

   A. Identify the inspection area shown in Figure 1.

B. Get access to the inspection area.

C. Clean the inspection surface if necessary. Remove paint only if it is loose.

4. **Instrument Calibration**

A. Set the instrument frequency between 900 Hz and 1.5 kHz.

B. Put the probe on the reference standard at probe position 1 as shown in Detail II of Figure 3.

C. Balance the instrument.

D. Move the probe above the fastener as necessary until the height of the signal is at its minimum and balance the instrument again.

E. Set the balance point at approximately 20 percent of full screen height (FSH) and approximately 60 percent of full screen width (FSW) as shown in Detail I of Figure 3.

F. Adjust the phase control so that the signal moves horizontally from right to left when the probe is lifted off the reference standard. See Detail I in Figure 3.

G. Put the probe on the reference standard at probe position 2 as shown in Detail II of Figure 3.

NOTE: Make sure the fastener is in the center of the probe.

H. Move the probe above the fastener as necessary until the height of the signal is at its minimum.

I. Adjust the instrument gain so the maximum signal from the reference notch is 60 percent of FSH as shown in Detail I of Figure 3.

J. Do Paragraph 4.B., Paragraph 4.C., Paragraph 4.D., Paragraph 4.G. and Paragraph 4.H. again, as necessary, to make sure that the notch signal is 60 percent of FSH.

(1) Do Paragraph 4.B. thru Paragraph 4.J. again if the signal from the fastener hole with a notch is not approximately 60 percent of FSH.

5. **Inspection Procedure**

A. Calibrate the instrument as specified in Paragraph 4.

B. Set the airplane baseline signal for an acceptable fastener location as follows:

(1) Put the probe above the center of one of the fasteners in the area to be examined. Move the probe above the fastener to get the minimum signal from the instrument.

(2) Balance the instrument.

(3) Compare the signal of three or more additional fasteners in this group with the signal from the first fastener.

NOTE: Do not change the instrument sensitivity when you set the airplane baseline signal.

(4) Use the fastener from this group which has the smallest signal as the baseline signal of the airplane.

NOTE: Examine this fastener frequently during the inspection to make sure the instrument baseline has not changed.

C. Balance the instrument on the fastener which has the smallest signal. Refer to Paragraph 5.B.(4).

D. Move the probe above the fastener as necessary until the height of the signal is at its minimum and balance the instrument.

E. Put the ring probe above each fastener in the inspection area and monitor the instrument for crack signals. See Figure 1 for the inspection area. During the inspection:

(1) Make a mark at all the locations where signals occur that are 40 percent (or more) of FSH.

(2) Do a calibration check when the inspection is completed as follows:

NOTE: Do not adjust the instrument gain.

(a) Put the probe on the reference standard at probe position 1.

(b) Move the probe above the fastener as necessary until the height of the signal is at its minimum.

(c) Balance the instrument.

(d) Put the probe on the reference standard at probe position 2 and make sure the fastener is in the center of the probe. Compare the signal you got from the notch during calibration with the signal you get now.

(e) If the signal you now get from the notch has decreased in FSH by 10 percent or more, do the calibration and inspection again on the fastener locations you have examined since the last satisfactory calibration check.

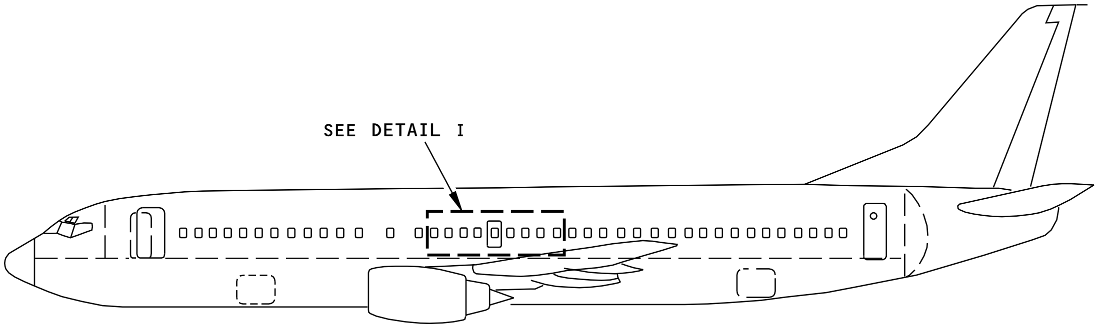
F. Do Paragraph 5.A. thru Paragraph 5.E. again on the other side of the airplane.

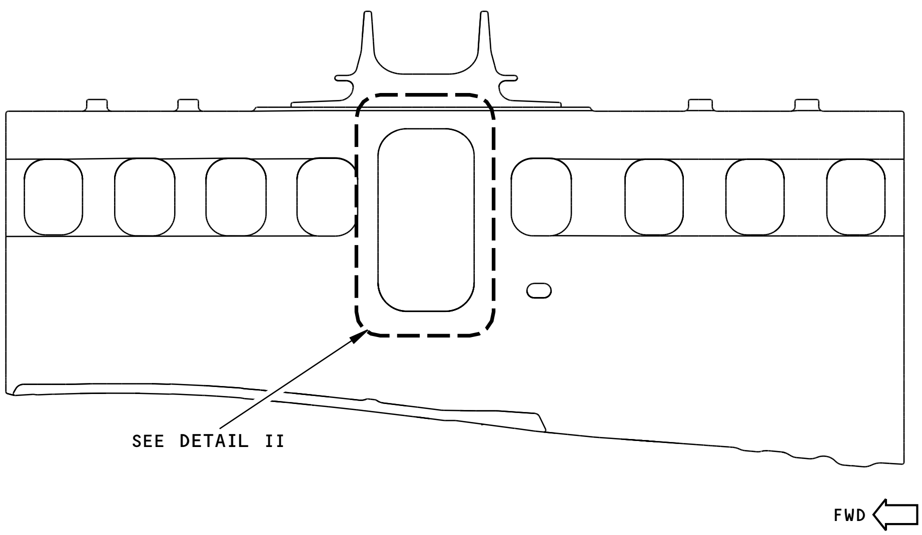
6. Inspection Results

A. A signal that is more than 40% of FSH is a sign of a crack and the location must be rejected. More analysis is necessary at locations that cause crack type signals to occur.

B. Compare the signal that occurs during the inspection to the signal you got from the notch in the reference standard during calibration.

C. If crack indications are found, do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 16.





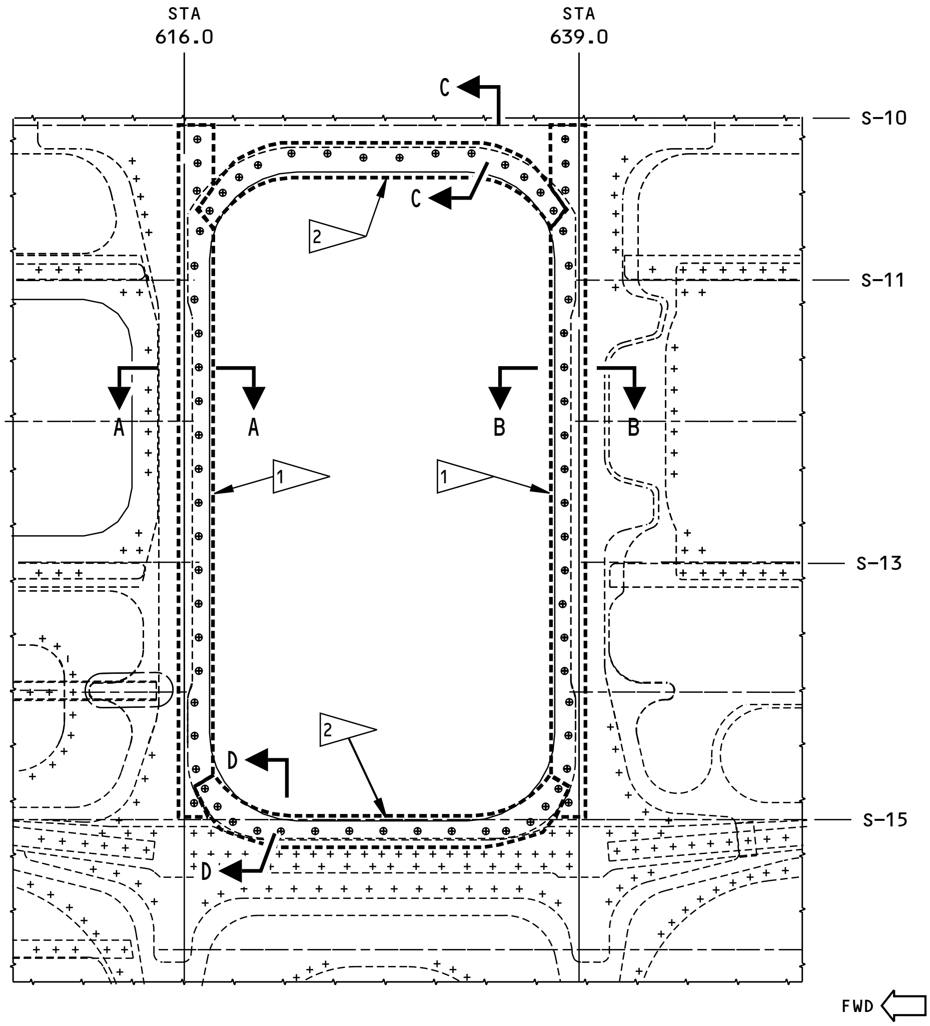
OVERWING EMERGENCY EXIT CUTOUT
DETAIL I

NOTES:

- THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS OPPOSITE

2161948 S0000472855_V1

Inspection Location
Figure 1 (Sheet 1 of 4)



OVERWING EMERGENCY EXIT CUTOUT
DETAIL II

NOTES:

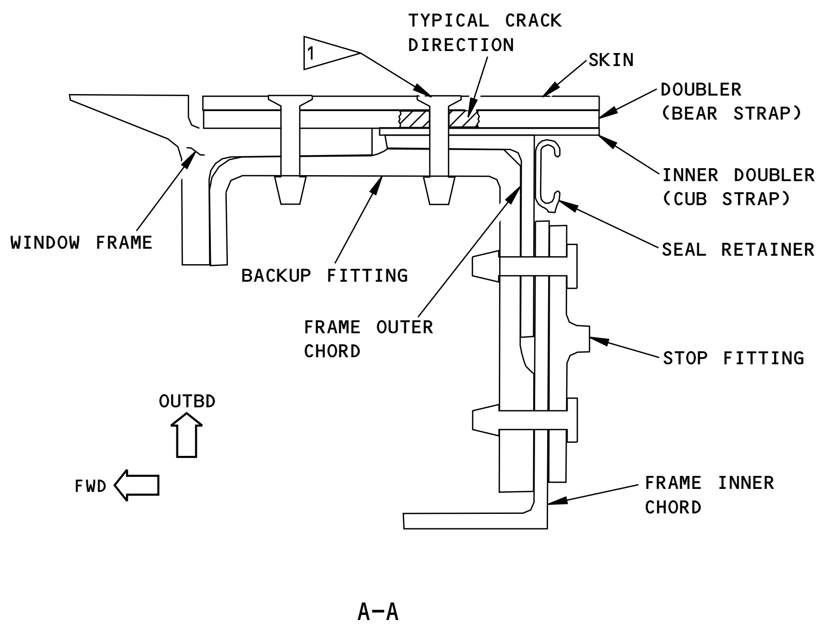
⊕ FASTENER LOCATIONS TO EXAMINE

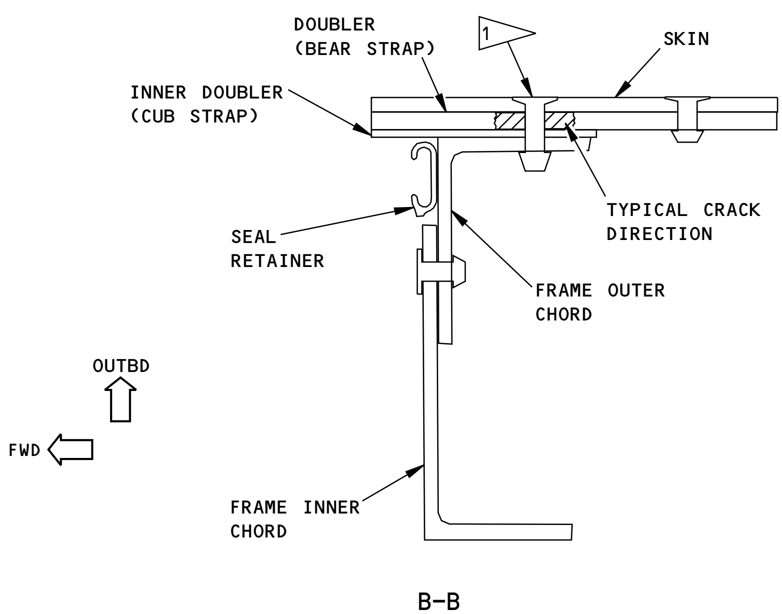
1 EXAMINE THE FASTENER LOCATIONS AT THE EDGE OF THE OVERWING EMERGENCY EXIT CUTOUT AT BS 616 AND BS 639, BETWEEN S-10 AND S-15. THE FASTENERS GO THROUGH THE DOUBLER (BEAR STRAP), THE INNER DOUBLER (CUB STRAP) AND THE FRAME OUTER CHORD.

2 EXAMINE THE FASTENER LOCATIONS AT THE OVERWING EMERGENCY EXIT CUTOUT AT THE UPPER AND LOWER CORNERS AND THE UPPER AND LOWER SILLS BETWEEN BS 616 AND BS 639. THE FASTENERS GO THROUGH THE DOUBLER (BEAR STRAP) AND THE INNER DOUBLER (CUB STRAP).

2161950 S0000472856_V1

Inspection Location
Figure 1 (Sheet 2 of 4)



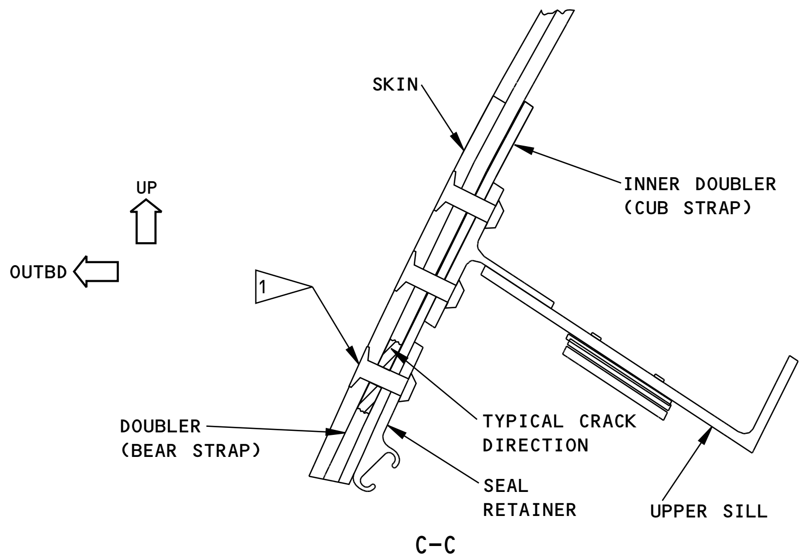


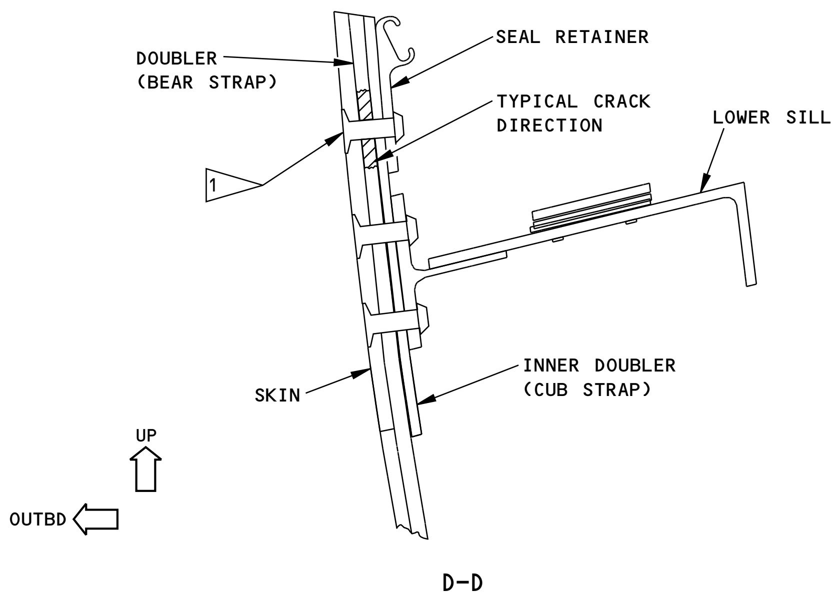
NOTES

1 EXAMINE THE DOUBLER (BEAR STRAP) FOR CRACKS AT THE FASTENER LOCATION IDENTIFIED

2161951 S0000472857_V1

Inspection Location
Figure 1 (Sheet 3 of 4)



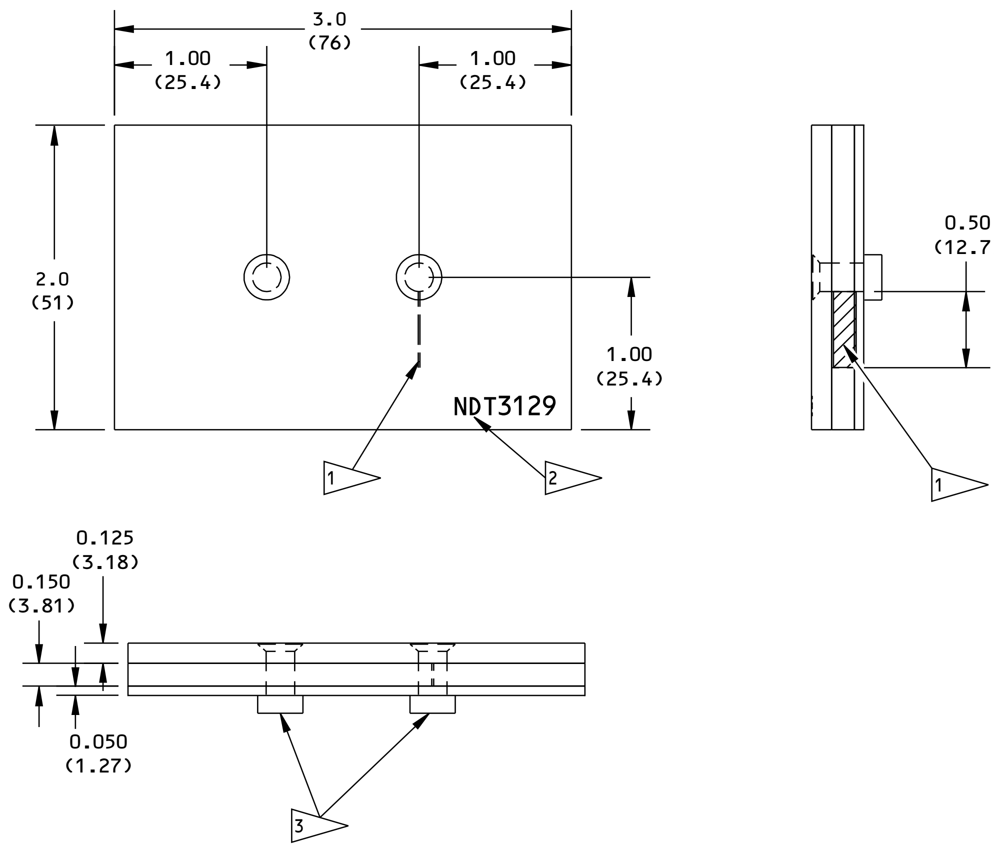


NOTES:

1 EXAMINE THE DOUBLER (BEAR STRAP) FOR CRACKS AT THE FASTENER LOCATION IDENTIFIED

2161953 S0000472858_V1

Inspection Location
Figure 1 (Sheet 4 of 4)



NOTES:

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

- MATERIAL: 2024-T3 AIRCRAFT ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER

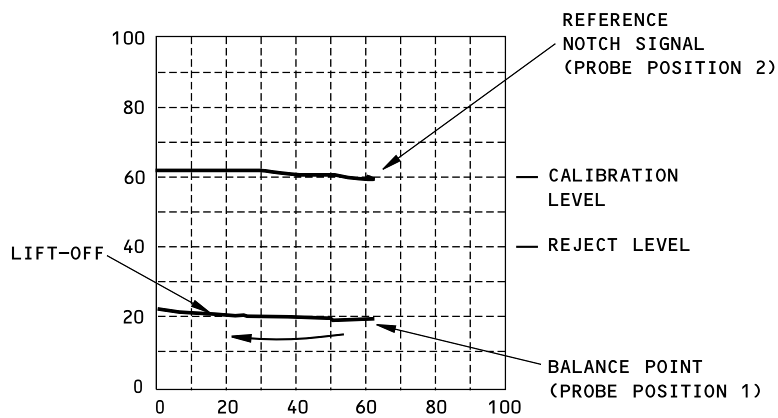
1 EDM NOTCH:
LENGTH - 0.50 (12.7) FROM THE FASTENER SHANK
DEPTH - THROUGH THE THICKNESS
WIDTH - 0.012 (0.30) MAXIMUM WIDTH

2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3129, AT THE APPROXIMATE LOCATION SHOWN

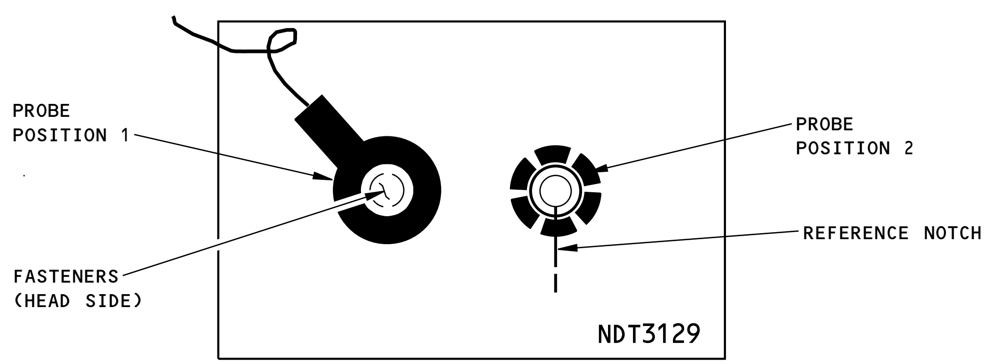
3 USE BACB30VU8K* BOLTS WITH BACC30BL8 COLLARS AT ALL LOCATIONS

2161956 S0000472859_V1

Reference Standard NDT3129
Figure 2



IMPEDANCE PLANE DISPLAY
DETAIL I



PROBE POSITIONS FOR CALIBRATION
ON REFERENCE STANDARD NDT3129
DETAIL II

2161957 S0000472860_V1

Probe Positions for Calibration
Figure 3

PART 6 - EDDY CURRENT

SLIDING PROBE FOR CHEM-MILL EDGE CRACK DETECTION

1. **Purpose**

   A. Use this procedure to find cracks in the internal surface of the aluminum skin at a chem-mill edge. The procedure is done from the external surface of the airplane.

   B. This procedure can find cracks in bonded skin panels with skin that are from 0.036 to 0.045 inches (0.91 to 1.14 mm) thick and bonded doublers that are from 0.036 to 0.040 inches (0.91 to 1.02 mm) thick.

   C. This procedure can find cracks in solid skin panels that are from 0.071 to 0.090 inches (1.81 to 2.29 mm) thick that have chem-milled recess areas that are from 0.036 to 0.045 inches (0.91 to 1.14 mm) thick.

   D. This procedure can be used at locations with 0.156 inch (3.96 mm) or 0.187 inch (4.74 mm) diameter countersink rivets.

   E. Refer to the applicable service bulletin to identify the inspection area.

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 an eddy current instrument that:

         (a) Operates from 5 to 30 kHz.

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

         (a) Phasec 2D; made by General Electric

   C. Probes

      (1) Use the wide area reflection sliding probe specified in Paragraph 2.C.(2) that operates from 5 to 30 kHz.

      (2) The reflection sliding probe that follows must be used to do this procedure.

         (a) SPC-555C; made by EC NDT

   D. Reference Standard

      (1) Use reference standard NDT3179-X. See Figure 1.

   E. Special Tools

      (1) It is optional to use a nonconductive straightedge to align the edge of the probe when you make a scan.

      (2) It is optional to use two-sided tape to hold down the straightedge.

3. **Prepare for the Inspection**

   A. Identify the inspection area. Refer to the applicable service bulletin.

B. Remove loose paint, dirt, and sealant from the surface of the inspection area.

C. For airplanes that are painted: Make an estimate of the paint thickness on the skin. You can use calibrated, nonconductive shims with an eddy current procedure (lift-off measurement) that uses a direct or an indirect paint thickness display.

NOTE: You can also refer to the McDonnell Douglas Nondestructive Testing Standard Practice Manual, Part 6, 06-10-01.002, or the Boeing Specification Support Standard, BSS 7413, for instructions to help measure the paint thickness on the airplane.

D. Before calibration, apply Teflon tape or clear tape layers to the reference standard until it is within ±0.003 inch (0.08 mm) of the thickest paint in the inspection area.

4. Instrument Calibration

A. Identify the thickness of the airplane skin in the area to be examined and get the applicable reference standard. See Table 1 in Figure 1.

B. Set the instrument frequency from 7 to 15 kHz. Adjust the frequency to get the best signal.

C. Adjust the instrument phase to set the lift-off signal so that it is as shown in Detail I in Figure 2. Since a reflection probe is used, the lift-off signal will move to the right and left as an edge of the probe is lifted at an angle from the surface. Make sure to use the front or back probe edge to set the lift-off.

NOTE: The front or back probe edges are the edges that are in the direction of probe movement and the edges that the arrows point to. See Detail II in Figure 2. If one of the side probe edges are used to set the direction of lift-off, the calibration will not be correct.

D. Set the balance point to 50% of full screen height (FSH) and 50% of full screen width (FSW). See Detail I in Figure 2.

E. Put the probe on the reference standard at probe position A as shown in Figure 2 and balance the instrument. Make sure that the side edge of the probe is aligned with the top edge of the countersunk hole on the reference standard. See Detail II in Figure 2.

NOTE: It is optional to use a nonconductive straightedge to help keep the probe aligned correctly.

F. Make a scan from probe position A to probe position B and monitor the instrument display.

G. Adjust the instrument phase control to get the notch signal to be vertical.

H. Adjust the probe to get the maximum upscale signal from the notch.

NOTE: The probe for this procedure is a reflection probe so the notch causes positive (upscale) and negative (downscale) signals from the balance point as the probe is moved above the full length of the notch.

I. Adjust the gain so that the upscale signal is 90% of FSH (4 divisions above the balance point).

NOTE: It is permitted to set the horizontal gain from 12 to 18 dB less than the vertical gain.

J. Make a scan from probe position A to probe position C and monitor the signal. See Details I and II in Figure 2.

K. Adjust the gain, if necessary, to set the maximum upscale notch signal to 90% of FSH as shown in Detail I of Figure 2.

NOTE: The probe drive is usually set to HIGH.

5. Inspection Procedure

A. Calibrate the instrument as specified in Paragraph 4.

B. Make a scan of reference standard NDT3179-X to do a check of the calibration. See Paragraph 4.

C. Refer to the applicable service bulletin to identify the inspection area.

D. It is optional to use a nonconductive straightedge to align the edge of the probe with the edge of the fastener row on the chem-mill edge you will examine. See Detail II in Figure 3.

E. Balance the probe on the airplane above the chem-mill edge.

NOTE: If the probe is above a crack when the instrument is balanced, the signal will move up or down from the set balance point when the probe moves away from the crack location. If this occurs, balance the instrument again at a different location. If the probe is balanced on the center of a crack, a crack signal will occur, but will return to the balance point after the probe is scanned across the end of the crack.

F. Make a scan along the chem-mill edge to look for cracks on the airplane as shown in Detail II of Figure 3.

G. If it is necessary to identify the position of the chem-mill edge because of thick paint or because the chem-mill edge is a radius, use the instructions that follow:

(1) Align the probe so that the arrows are perpendicular to the chem-mill edge that you want to find. See Figure 4.

(2) Balance the probe near the chem-mill edge that you want to find. See probe position 1 in Figure 4.

(3) Move the probe to the chem-mill edge and monitor the display. See probe position 2 in Figure 4.

(4) Use an approved marker to make a mark on the surface of the airplane at the location where the signal is 10% of FSH above or below the balance point. Make the mark at the front edge of the probe. See Detail III in Figure 4.

(5) Do Paragraph 5.G.(4) again at different locations to fully identify the chem-mill edge.

(6) Use the marker to connect the marks you have made to show the location of the chem-mill edge.

(7) Make a scan along the chem-mill edge you have identified.

6. Inspection Results

A. Signals that occur on the impedance plane display that are more than 20% of FSH above or below the balance point and are not caused by the chem-mill edge at the radius area as shown in Detail II of Figure 4 are indications of possible cracks.

(1) The chem-mill edge radius can cause crack type signals to occur. See Figure 5.

B. The steps that follow are optional and can be used to help make sure that an indication is from a crack.

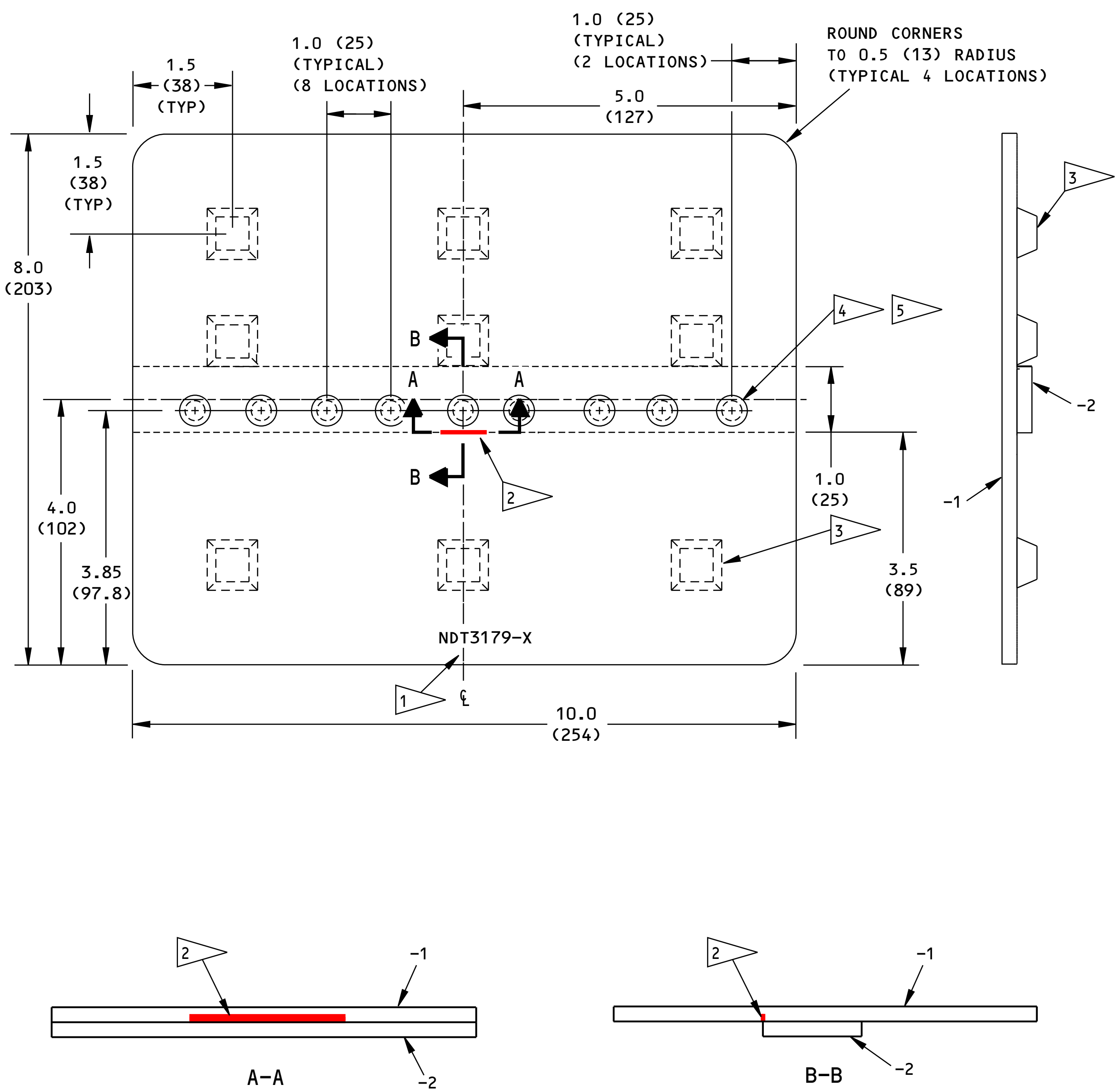
(1) Do a check of the paint thickness. If the paint thickness on the airplane is thinner than the nonconductive layer on the reference standard, the inspection can be too sensitive.

(a) Adjust the tape layer thickness on the reference standard to be equivalent (within ±0.003 inch (0.08 mm)) to the paint thickness in the area to be examined.

(b) Do Paragraph 4. again to calibrate the instrument, and examine the area again.

(2) Do the calibration of Paragraph 4. again to make sure that the gain is set to the correct level and do the inspection again. If the signal goes away, the indication is not a crack. No more inspection is necessary.

(3) It is optional to do an ultrasonic inspection as specified in Part 4, 53-30-07 or Part 4, 53-30-09 in the areas where possible crack signals have occurred. If no ultrasonic crack signals occur, then the eddy current indication is not a crack and no more inspection is necessary.



2161958 S0000472862_V1

Reference Standard NDT3179-X
Figure 1 (Sheet 1 of 2)

REFERENCE STANDARD NUMBER	-1 MATERIAL (AIRPLANE SKIN THICKNESS)	-2 MATERIAL (DOUBLER THICKNESS)
NDT3179-A	0.036 (0.91) ±0.002 (0.1)	0.036 (0.91) ±0.002 (0.1)
NDT3179-B	0.040 (1.02) ±0.002 (0.1)	0.040 (1.02) ±0.002 (0.1)
NDT3179-C	0.045 (1.14) ±0.002 (0.1)	0.040 (1.02) ±0.002 (0.1)

TABLE I

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

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL: 2024-T3 CLAD OR BARE

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT3179-X. THE "X" IDENTIFIES THE APPLICABLE REFERENCE STANDARD NUMBER FOR THE -1 AND -2 MATERIAL THICKNESSES. SEE TABLE I.

2 EDM NOTCH:
DEPTH: 0.018 (0.46) ±0.002 (0.1) (BOTTOM SIDE OF THE -1 PIECE)
WIDTH: 0.005 (0.13) ±0.002 (0.1)
LENGTH: 0.500 (12.7)

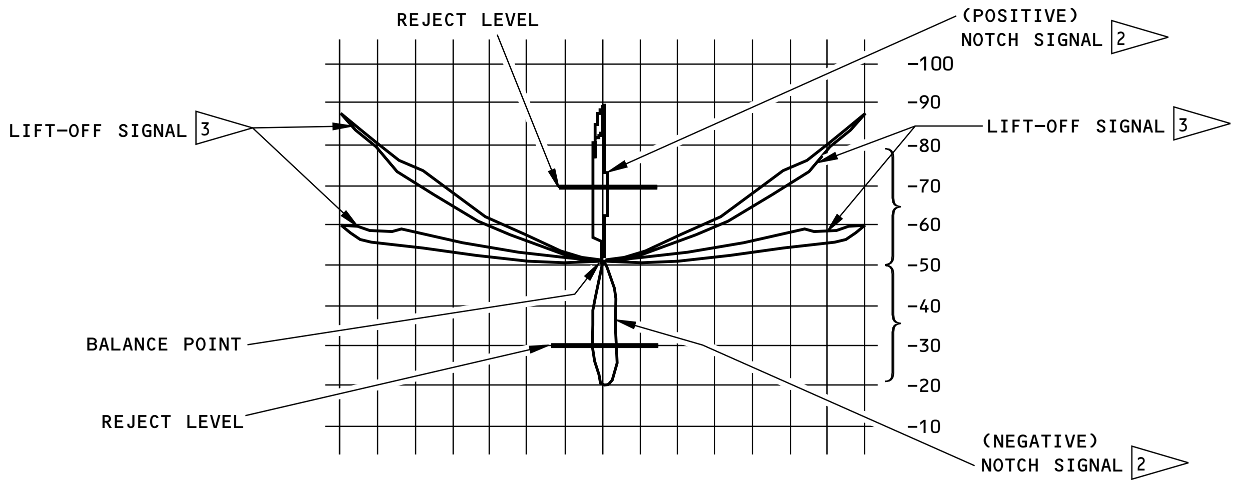
3 BOND NINE RUBBER FEET TO THE REFERENCE STANDARD IN THE APPROXIMATE POSITIONS SHOWN.

4 BACR15GF6D RIVET (9 LOCATIONS) OR EQUIVALENT 100 DEGREE ALUMINUM RIVET. USE A -4 RIVET LENGTH. THE HEAD OF THE RIVET MUST BE FLUSH WITH THE REFERENCE STANDARD AFTER INSTALLATION.

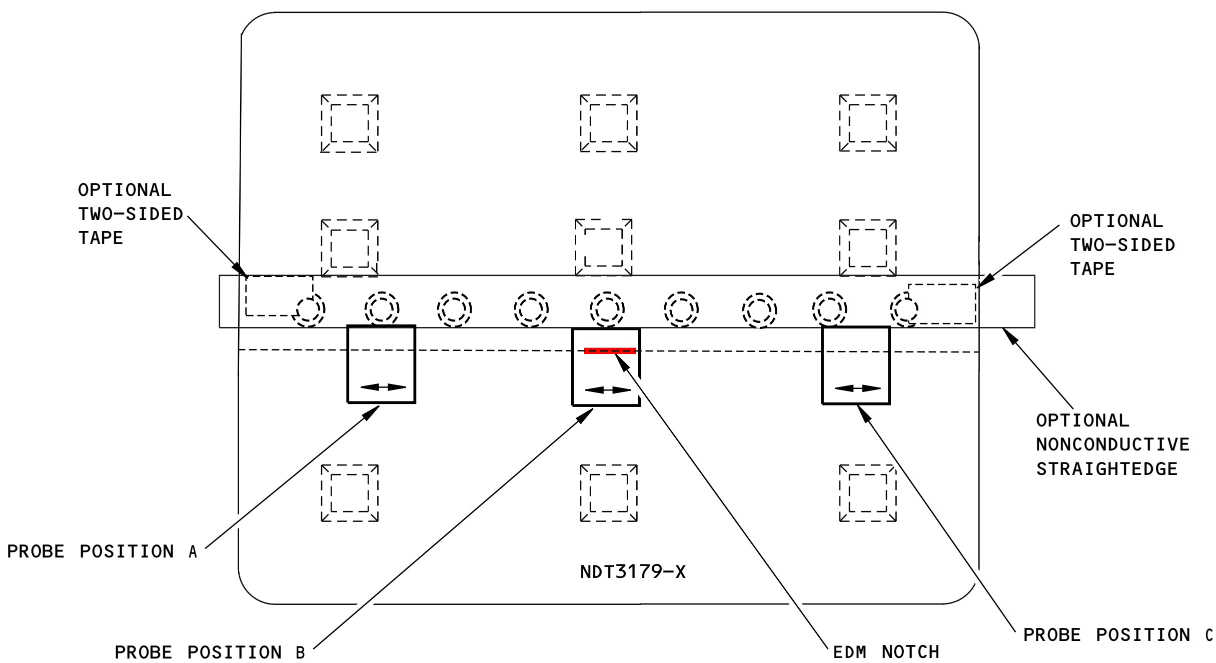
5 THE DIAMETER OF THE 100 DEGREE COUNTERSINK ON THE -1 PIECE MUST BE 0.295 TO 0.300 (7.49 TO 7.62) (9 LOCATIONS).

2179849 S0000481470_V3

Reference Standard NDT3179-X
Figure 1 (Sheet 2 of 2)



SCREEN DISPLAY
DETAIL I 1



PROBE POSITIONS FOR CALIBRATION
DETAIL II

NOTES

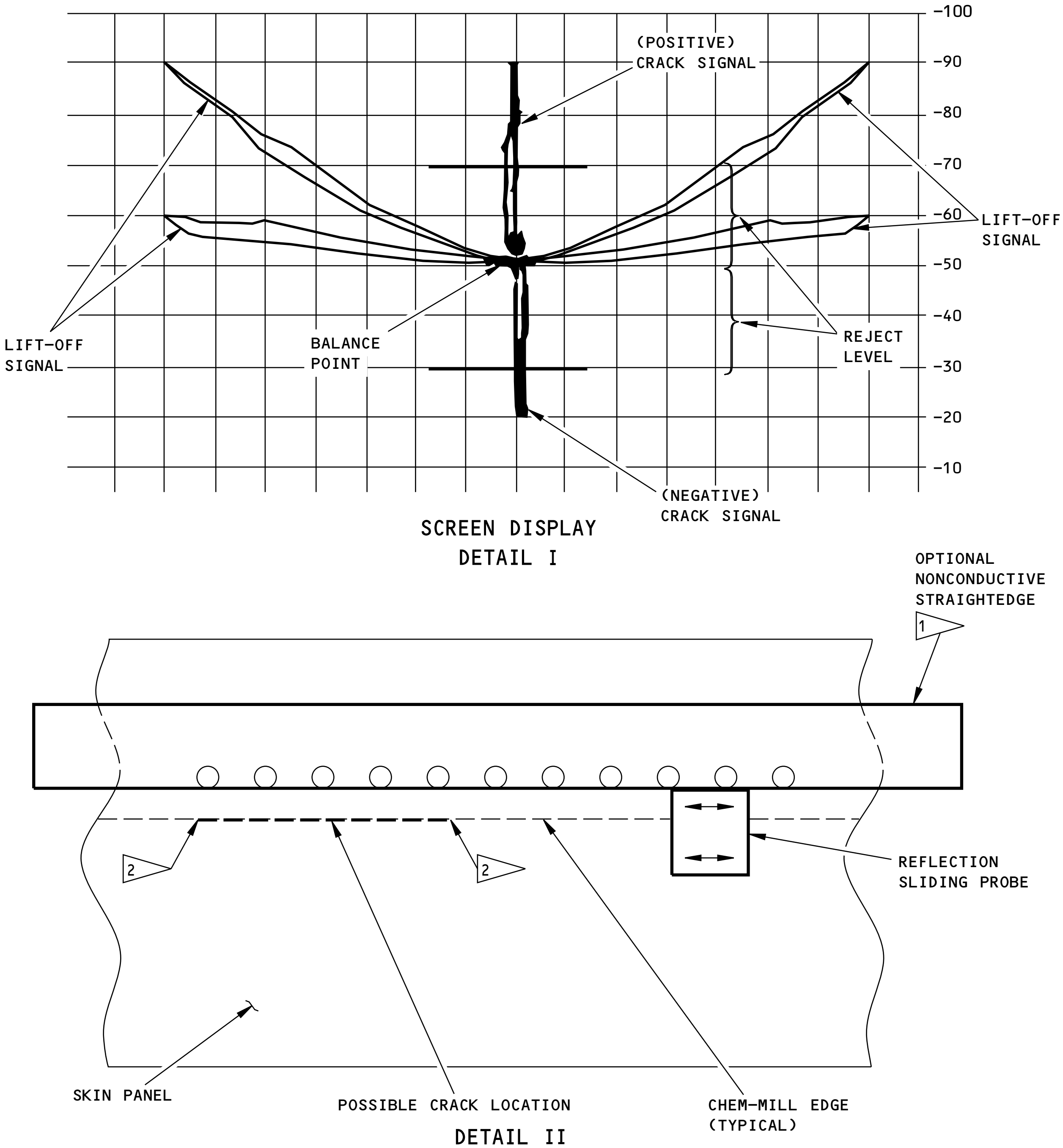
1 THE PROBE DRIVE IS USUALLY SET TO HIGH. IT IS PERMITTED TO SET THE HORIZONTAL GAIN FROM 12 TO 18 DB LESS THAN THE VERTICAL GAIN.

2 SET THE NOTCH SIGNAL SO THAT IT IS VERTICAL.

3 THE ANGLE OF THE LIFT-OFF SIGNAL CAN CHANGE AS A FUNCTION OF THE INSTRUMENT FREQUENCY THAT IS USED.

2161960 S0000472863_V3

Instrument Calibration
Figure 2

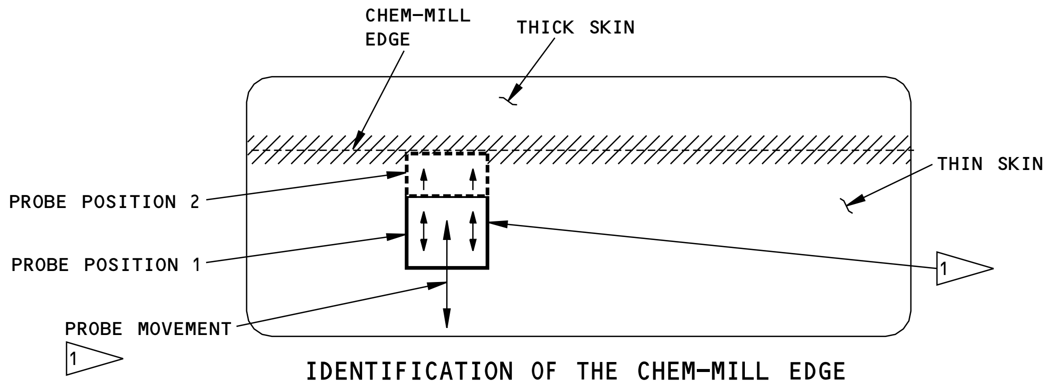


1 YOU CAN USE TWO-SIDED TAPE TO HOLD DOWN THE STRAIGHTEDGE.

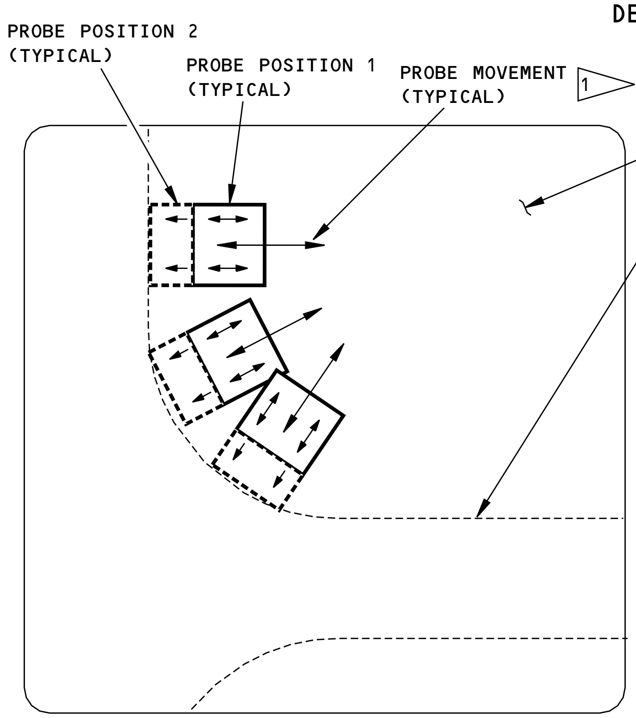
2 IF A CRACK IS LONGER THAN THE SENSITIVE AREA OF THE PROBE, A CRACK SIGNAL WILL ONLY BE POSITIVE ON ONE END OF THE CRACK AND NEGATIVE ON THE OTHER END OF THE CRACK. NO CRACK SIGNALS WILL OCCUR IN THE MIDDLE OF THE CRACK.

2161961 S0000472865_V3

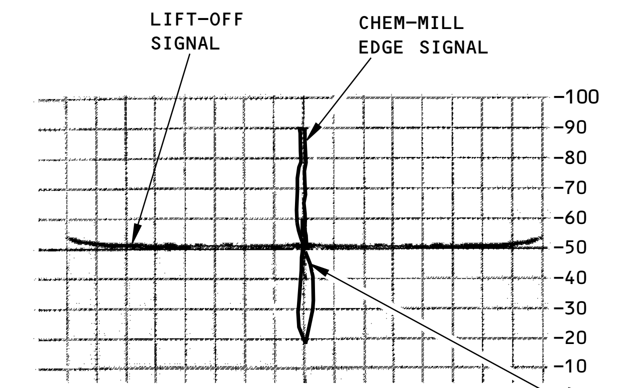
Inspection
Figure 3



IDENTIFICATION OF THE CHEM-MILL EDGE
DETAIL I



IDENTIFICATION OF THE CHEM-MILL EDGE AT THE RADIUS
DETAIL II



EXAMPLE SCREEN DISPLAY FOR IDENTIFICATION OF THE CHEM-MILL EDGE
DETAIL III

NOTES:

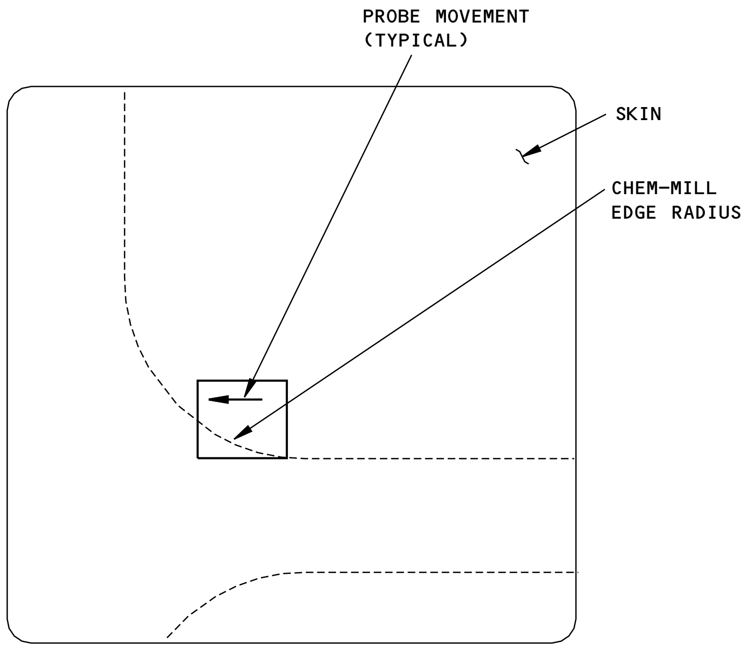
TYPICAL INSPECTION AREA ALONG THE CHEM-MILL EDGE

1 PUT THE PROBE ON THE SKIN AWAY FROM THE CHEM-MILL EDGE AT PROBE POSITION 1. MAKE SURE THE PROBE ARROWS ARE POINTED TOWARD THE CHEM-MILL EDGE. MOVE THE PROBE FROM PROBE POSITION 1 TO PROBE POSITION 2 AND MONITOR THE SCREEN DISPLAY. WHEN THE SIGNAL ON THE SCREEN DISPLAY IS EQUAL TO 10% OF FULL SCREEN HEIGHT, MAKE A MARK ON THE SKIN AT THE FRONT EDGE OF THE PROBE. THIS MARK WILL IDENTIFY THE APPROXIMATE LOCATION OF THE CHEM-MILL EDGE. DO THESE STEPS AGAIN AS NECESSARY TO SUFFICIENTLY IDENTIFY THE CHEM-MILL EDGES.

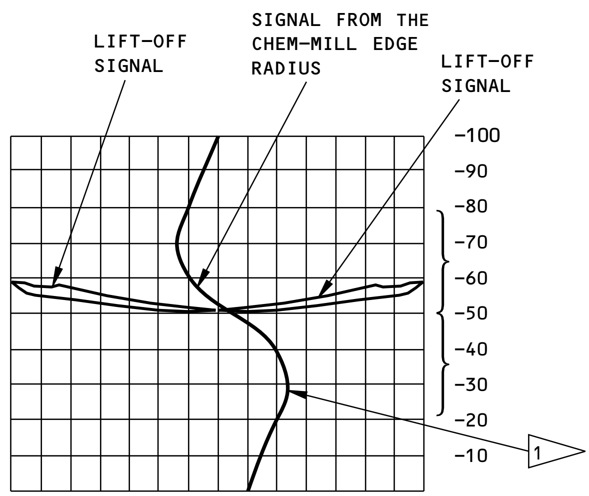
2 THE SIGNAL FROM THE CHEM-MILL EDGE CAN BE UPSCALE OR DOWNSCALE. THE POSITION OF THE PROBE WILL HAVE AN EFFECT ON THE DIRECTION OF THE SIGNAL.

2161964 S0000472866_V2

Identification of Chem-Mill Edges
Figure 4



IDENTIFICATION OF THE
CHEM-MILL EDGE RADIUS
DETAIL I



EXAMPLE SCREEN DISPLAY FOR IDENTIFICATION
OF THE CHEM-MILL EDGE RADIUS
DETAIL II

1 THE SIGNAL FROM THE CHEM-MILL EDGE RADIUS CAN BE UPSCALE OR DOWNSCALE.

2179932 S0000481278_V2

Identification of Chem-Mill Edge Radius Signals
Figure 5

PART 6 - EDDY CURRENT

EDDY CURRENT ARRAY (ECA) INSPECTION OF FASTENERS IN THE OUTBOARD SKIN

1. **Purpose**

   A. Use this procedure to find near surface cracks that are in the outboard skin along the upper row of fasteners of the skin lap splices or at other fastener row locations.

   B. This procedure can be used on anodized or alodine coated fasteners.

   C. Do this procedure on the external surface of the airplane.

   D. This procedure uses a high frequency eddy current array with an encoder wheel.

   E. Do not use this procedure at locations where the fastener is magnetic (steel) or if the fastener is not flush within 0.005 inch (0.13 mm) of the skin surface. For magnetic or raised head fasteners, use Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23.

   F. This procedure was written for the OmniScan MX with Eddy Current Array Module, Software Revision 1.3R3; made by Olympus.

   NOTE: If you have a higher revision of software, it is not necessary to use revision 1.3R3.

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 high frequency, eddy current array instrument that:

   (a) Has at least a 32 channel probe that can scan an area larger than 0.87 inch (22 mm) but less than 1.5 inches (37 mm) in width.

   (b) Has a linear position encoder.

   (c) Operates at a frequency range of 200 to 400 kHz.

   (d) Has a C-Scan display mode.

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

   (a) OmniScan MX with Eddy Current Array Module, Software Revision 1.3R3 or higher; made by Olympus.

   C. Probes

   (1) Use an array probe that operates from 200 to 400 kHz.

   (2) The OmniScan MX array probes that follow were used to help prepare this procedure.

   (a) SBBR-022-300-032 ECT Array probe.

   (b) SBBR-026-300-032 ECT Array probe.

   D. Encoders

   (1) Use a linear encoder that has a minimum of 10 counts for each mm.

   (2) The OmniScan MX encoder that follows was used to help prepare this procedure.

(a) ENC1-2.5-DE (12 counts for each mm)

E. Reference Standard

(1) Use reference standard NDT558. See Figure 1 for the reference standard.

F. Special Tools

(1) We recommend that you use a computer mouse with a USB connector when you calibrate the OmniScan MX instrument for this inspection.

(2) We recommend that you use a compact keyboard with a USB connector to record notes and file names in the OmniScan MX instrument.

(3) Teflon tape that is 0.006 inch (0.15 mm) thick.

3. Prepare for the Inspection

A. Identify the inspection area. Refer to the applicable maintenance documents.

B. Remove loose paint, dirt, and sealant from the surface of the inspection area.

C. For airplanes that are painted, make an estimate of the paint thickness and record the results. You can use calibrated nonconductive shims with an eddy current procedure (lift-off measurement) that uses a direct reading or an indirect reading instrument.

NOTE: You can also refer to the McDonnell Douglas Nondestructive Testing Standard Practice Manual, Part 6, 06-10-01.002, or the Boeing Specification Support Standard, BSS 7413, for instructions to help measure the paint thickness on the airplane.

D. For probes with flat bottoms, make two 0.125 x 1.0 inch (3.0 x 25 mm) strips from 0.006 inch (0.15 mm) thick Teflon tape. Put one strip on the bottom of the probe adjacent to the left side of the probe and put the other strip on the bottom of the probe adjacent to the right side of the probe. These two strips of tape will let the probe move freely across fasteners that are slightly above flush. See Figure 2 for the locations of the Teflon tape on the probe.

4. Instrument Calibration

NOTE: The calibration instructions that follow are for the OmniScan eddy current array instrument. Other eddy current array or C-Scan instruments can be used if they can be calibrated on reference standard NDT558 and get the same calibration results specified in Paragraph 4. Refer to the manufacturer’s operation instructions if you use a different eddy current array instrument.

A. Attach the eddy current module, the array probe and the encoder to the instrument as specified in the manufacturer’s instructions.

NOTE: The OmniScan instrument has key pad commands that make the set-up easier. This procedure references key pad icons where they are applicable.

B. Go to the File menu and set up the instrument as follows:

(1) Open the File (F2) sub-menu.

(2) Open the Open (F8) sub-sub menu.

(3) If the correct calibration file is in storage, open the file and go to Paragraph 5. If the correct calibration file is not in storage, continue with the calibration instructions that follow.

C. Go to the Reading menu and set up the instrument as follows:

NOTE: To make sure that numerical entries are accepted, push the Accept Key after the entry is completed.

(1) Open the Result (F2) sub-menu:

(a) Make sure the Freeze mode is Off.

NOTE: Push the Freeze Key to toggle the instrument in and out of the freeze mode. The orange LED light will flash when the Freeze mode is On.

1) Open the Field 1 (F7) sub-sub-menu and set to AMax.
2) Open the Field 2 (F8) sub-sub-menu and set to ØAMax.
3) Open the Field 3 (F9) sub-sub-menu and set to SAMax.
4) Open the Field 4 (F10) sub-sub-menu and set to IAMax.

(b) Make sure the Freeze mode is on.

1) Open the Field 1 (F7) sub-sub-menu and set to APP.
2) Open the Field 2 (F8) sub-sub-menu and set to ØPP.
3) Open the Field 3 (F9) sub-sub-menu and set to SPPP.
4) Open the Field 4 (F10) sub-sub-menu and set to IPPP.
5) Open the Select (F11) sub-sub-menu and set to PP.
6) Open the Show (F12) sub-sub-menu and set to On.

(2) Open the Measure (F4) sub-menu:

(a) Make sure the Freeze mode is on.

1) Open the Start A→ (F7) sub-sub-menu and set to -10.00.
2) Open the Length A→ (F8) sub-sub-menu and set to 20.00.
3) Open the Start A↑ (F9) sub-sub-menu and set to -10.00.
4) Open the Length A↑ (F10) sub-sub-menu and set to 20.00.
5) Open the Start Data (F11) sub-sub-menu and set to 0.00.

D. Go to the Utilities menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Pref. (F2) sub-menu.

(a) Open the Units (F7) sub-sub-menu and set to millimeters.
(b) Open the Angle Units (F11) sub-sub-menu and set to ASME.
(c) Open the Ampl Units (F12) sub-sub-menu and set to Voltage.

E. Go to the ET menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Group (F2) sub-menu:

(a) Open the Gain (F8) sub-sub-menu and set to 45 dB - 5 dB to +35 dB.
(b) Open the Rotation (F9) sub-sub-menu and set to 325° ± 25°.
(c) Open the Y-Spread (F10) sub-sub-menu and set to 10.0 dB.

(3) Open the Frequency (F3) sub-menu:

(a) Open the Frequency (F9) sub-sub-menu and set to 300 kHz ± 100 kHz.
(b) Open the Probe Drive (F11) sub-sub-menu and set to 2.0 Volts.

(4) Open the Filter (F4) sub-menu:

(a) Open the Select (F7) sub-sub-menu and set to Filter 1.

(b) Open the Type (F8) sub-sub-menu and set to None.

F. Go to the Scan menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Encoder (F2) sub-menu:

(a) Open the Encoder (F7) sub-sub-menu and set to 1.

(b) Open the Polarity (F8) sub-sub-menu and set to Inverse.

(c) Open the Type (F9) sub-sub-menu and set to Quad.

(d) Open the Resolution (F10) sub-sub-menu and set to the resolution defined by the manufacturer of the encoder (12 steps/mm for the ENC1-2.5-DE encoder).

(e) Open the Origin (F11) sub-sub-menu and set to 0.00.

(3) Open the Synchro (F3) sub-menu:

(a) Open the Source (F7) sub-sub-menu and set to One Axis.

(b) Open the Scan (F8) sub-sub-menu and set to Encoder 1.

(4) Open the Area (F4) sub-menu:

(a) Open the Scan Start (F7) sub-sub-menu and set to 0.00.

(b) Open the Scan End (F8) sub-sub-menu and set to 500 ± 10 mm.

(c) Open the Scan Resolution (F9) sub-sub-menu and set to 0.17 mm ± 0.05 mm.

(d) Open the Index Start (F10) sub-sub-menu and set to 0.00 mm.

(e) Open the Index End (F11) sub-sub-menu and set to 22.40 mm for the SBBR-022-300-032 probe or 25.60 mm for the SBBR-026-300-032 probe.

(f) Open the Index resolution (F12) sub-sub-menu and set to 0.17 mm ± 0.05 mm.

(5) Open the Start (F5) sub-menu:

(a) Open the Start Mode (F7) sub-sub-menu and set to Reset Data & Encoder.

G. Go to the Display menu and make the adjustments that follow:

(1) Open the Selection (F2) sub-menu:

(a) Make sure the Freeze mode is Off.

1) Open the Display (F7) sub-sub-menu and set to C.

2) Open the Keep Layout (F8) sub-sub-menu and set to Off.

(b) Make sure the Freeze mode is On.

1) Open the Display (F7) sub-sub-menu and set to CSI.

2) Open the Keep Layout (F8) sub-sub-menu and set to Off.

(2) Open the Ruler (F3) sub-menu:

(a) Make sure the Freeze mode is On.

1) Open the Sel Cursors (F7) sub-sub-menu and set to Display Text.

2) Open the Man Cursors (F8) sub-sub-menu and set to Off.

(3) Open the Color (F5) sub-menu:

(a) Make sure the Freeze mode is Off.

1) Open the Start (F8) sub-sub-menu and set to -1.00v.

2) Open the End (F9) sub-sub-menu and set to 1.00v.

3) Open the Load (F10) sub-sub-menu, select and load the Alarm.pal file to set the C-Scan colors as follows:

a) Scroll through the list and select the Alarm.pal file.

b) Push the Accept Key.

4) Open the Palette (F12) sub-sub-menu and set to 125%.

(4) Open the Properties (F6) sub-menu:

(a) Make sure the Freeze mode is Off.

(b) Open the Display (F7) sub-sub-menu and set to C-Scan.

1) Open the Component (F8) sub-sub-menu and set to Y↑.

2) Open the Scan Persist (F10) sub-sub-menu and set to 50 ± 1.

(c) Open the Display (F7) sub-sub-menu and set to Strip.

1) Open the Component (F8) sub-sub-menu and set to Y↑.

2) Open the Direction (F12) sub-sub-menu and set to Top-Bottom.

H. Go to the Probe menu and make the adjustments that follow:

(1) Make sure the Freeze mode is Off.

(2) Open the Select (F2) sub-menu:

(a) Open the Element (F9) sub-sub-menu and set to Element 1.

(b) Open the Enable (F10) sub-sub-menu and set to On.

(c) Do Paragraph 4.H.(2)(a) and Paragraph 4.H.(2)(b) again to set Elements 2 thru 32 to On.

(3) Open the Position (F3) sub-menu:

(a) Open the Skew (F9) sub-sub-menu and set to 0.

I. Go to the Zone/Alarm menu and set up the instrument as follows:

(1) Make sure the Freeze mode is Off.

(2) Open the Zone (F2) sub-menu:

(a) Open the Shape (F8) sub-sub-menu and set to None.

(3) Open the Output (F4) sub-menu:

(a) Open the Alarm # (F8) sub-sub-menu and set to None.

(b) Open the Buzzer (F10) sub-sub-menu and set to Off.

J. Go to the Tools menu and make the adjustments that follow:

(1) Make sure the Freeze mode is On.

(2) Open the Subtraction (F2) sub-menu:

(a) Open the Type (F7) sub-sub-menu and set to Column.

(b) Open the Activate (F8) sub-sub-menu and set to Off.

K. If you want to keep the settings, save the settings to a file as follows:

(1) Make sure the Freeze mode is Off.

(2) Go to the File menu, then open the File (F2) sub-menu, then open the Save Setup As (F9) sub-sub-menu.

(a) Go to Filename (F9) and change the file name to the name you want to use for this procedure.

(b) Push the Save button (F7).

L. Put a nonconductive layer, with a thickness within ± 0.003 inch (0.08 mm) of the thickness of the paint on the inspection area, on the surface of the reference standard.

M. Put an additional nonconductive layer with a thickness of about 0.003 inch (0.08 mm) at Probe Position B on the reference standard as shown in Figure 3.

N. Put the probe at Position A on reference standard NDT558 as shown in Figure 3.

O. Push the Balance/Calibration Key to balance the instrument.

P. Push the Start/Stop Key to start the scan.

Q. Put the probe on the nonconductive layer at Position B and make a scan to the bare area at Position A. The scan must be a minimum of 0.5 inches (12.7 mm) long on the Teflon tape area and a minimum of 0.5 inches (12.7 mm) long on the bare area.

R. Push the Freeze Key to put the instrument in freeze mode. The display will change from a C-Scan in a single window to a three window CSI Display and the orange LED light will flash slowly.

S. If the arrow in the Impedance plane display is small and difficult to see, push the Best Fit Key.

T. If the arrow in the Impedance plane display is large and off screen, push the Full Scale Key.

U. Use the procedure that follows to set the lift-off phase angle:

(1) Go to the Flaw Detect menu, then open the Gain-Rotation (F3) sub-menu and make the adjustments that follow:

(a) Put the mouse cursor on the C-Scan display in the area that shows the bare area scan at Position A of the reference standard.

(b) Push the left mouse button two times. A red X must occur on the C-Scan at an area that shows the bare area of the reference standard. See the C-Scan display on Figure 4 for an example.

(c) Put the mouse cursor on the C-Scan display in the area that shows the area scanned at the Teflon tape covered area of the reference standard at Position B.

(d) Push the right mouse button two times. A blue + must occur on the C-Scan at an area that shows the tape covered area of the reference standard. See the C-Scan display on Figure 4 for an example.

(e) If the blue + is on a horizontal line that is different from the horizontal line that the red X is on, put the mouse cursor on the horizontal line that goes through the blue +. A double arrow must be displayed.

(f) Push and hold the left mouse button, and pull the horizontal line until it is on top of the horizontal line that goes through the red X. See the C-Scan display on Figure 4 for an example.

(g) Release the left mouse button when the line goes through the red X.

(h) Go to the Flaw Detect menu, then to the Ref Signal (F5) sub-menu and push the Best Fit Key (F9).

(i) Press the Phase Rotation/Display Delay Key.

(j) Look at the impedance display at the upper left side of the screen and adjust the phase until the pink arrow points horizontally to the left side of the impedance display. See the Impedance display on Figure 4 for an example.

NOTE: The Full Size or Best Fit Key can be used to keep the arrow on the impedance plane display.

(k) Push the Accept Key.

(l) The two scans, one on the Teflon tape area and the other on the bare area of the reference standard, for the two areas must be about the same shade of green. See the Impedance display on Figure 4 for an example.

V. Use the procedure that follows to set the EDM notch signal:

(1) Push the Freeze Key to put the instrument in scan mode. The orange LED light will go out.

(2) Put the probe at the left side of the reference standard so that it is aligned with the centerline of the applicable rivet row and push the Balance/Calibration Key to balance the instrument.

(3) Push the Start/Stop Key to start the C-scan display.

(4) Move the probe from Probe Position A to Probe Position C along the applicable fastener row on reference standard NDT558 as shown in Figure 3 to make an initial scan.

(5) Do a check of the C-scan display to make sure that the EDM notch shows clearly. The typical fastener display is a symmetrical red ring on a green background. The notch will show as a red bulge on the outside of the red ring against a green background, as shown in Figure 5, Detail I.

(6) Adjust the gain setting, if necessary, so that the EDM notch shows as a red bulge on the fastener ring and there is a small green or black area in the center of the fastener ring as shown in Figure 5, Detail I. See Figure 5, Detail II for an example of insufficient gain and see Figure 5, Detail III for an example of too much gain.

(7) If it is difficult to see the bulge from the EDM notch, make sure that the Scan Persist is set to 50.00 mm. See Paragraph 4.G.(1)(b)2) for the adjustment of the Scan Persist.

W. Save your final calibration set-up in the instrument memory. The file name must identify this procedure number.

5. Inspection Procedure

A. Load the correct calibration file for this inspection into the instrument's memory, and make sure that the selections of Paragraph 4. are correct.

B. Make a scan of the applicable fastener row on reference standard NDT558 to do a check of the calibration. See Paragraph 4.

C. Balance the array probe between fasteners. See Figure 6 for the correct balance position.

D. Press the Start/Stop Key to start a new scan.

E. Make a scan along the row of fasteners, as shown in Figure 6. During the scan:

(1) Monitor the C-scan display. In areas without cracks, the fasteners will be complete red rings with a green background. See Figure 5, Detail I for an example of a good hole and a cracked hole.

(2) Mark all fastener locations that have a bulge on the outside of the red fastener ring. See Figure 5, Detail I for an example of a good hole and a cracked hole.

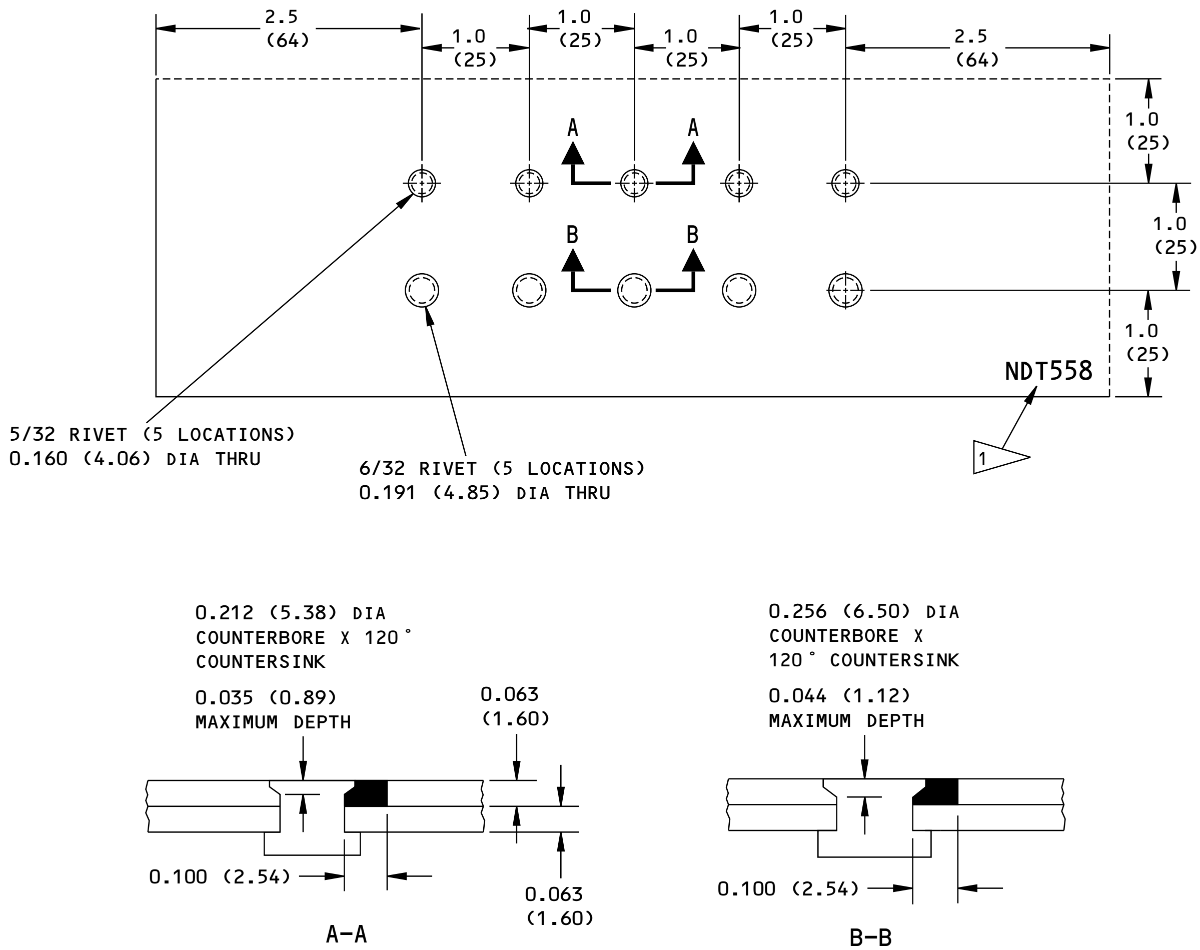
6. Inspection Results

A. Red fastener rings on the C-scan display that have a bulge are possible cracks. These areas must be examined some more.

(1) Do a check of the paint thickness on your airplane. If the paint thickness on the airplane is thinner than the nonconductive coating on the reference standard, the inspection can be too sensitive.

(2) Do a check of your gain setting. A gain setting that is too high can cause incorrect crack indications. See Paragraph 4.

B. You can use the procedures of Part 6, 51-00-00, Procedure 4 or Part 6, 51-00-00, Procedure 23 to make sure that the indications are from cracks.



NOTES

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

INCHES	MILLIMETERS
X.XXX = ± 0.005	X.XX = ± 0.13
X.XX = ± 0.025	X.X = ± 0.5
X.X = ± 0.05	X = ± 1.3

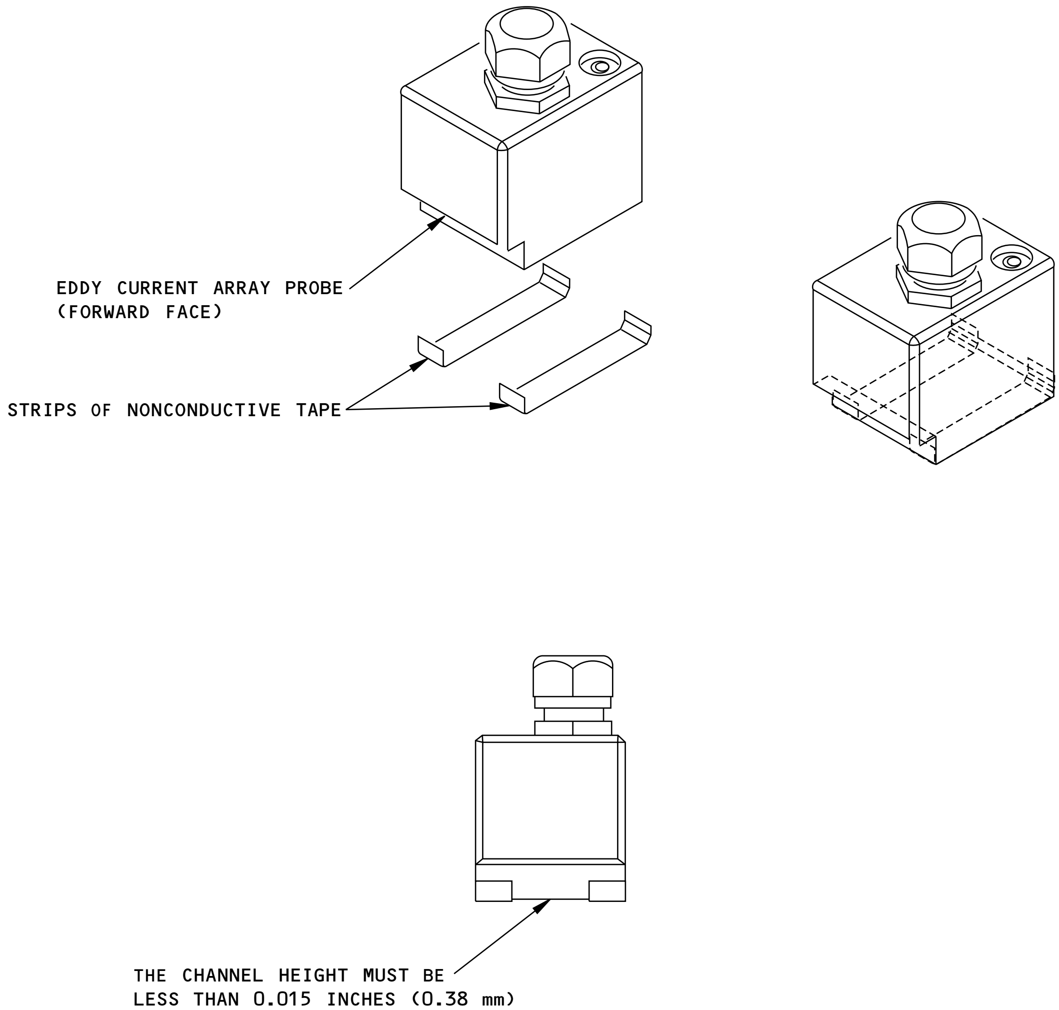
- SURFACE ROUGHNESS: 63 RA OR BETTER
- MATERIAL:
  SKINS: 2024-T3 OR T4 CLAD
  RIVETS: 5/32 RIVET; USE BACR15FV5KE5
  6/32 RIVET; USE BACR15FV6KE6
- EDM NOTCH DIMENSIONS:
  LENGTH: MEASURED FROM THE RIVET SHANK
  DEPTH: THROUGH THE UPPER SKIN
  WIDTH: 0.007 (0.18) MAXIMUM

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER, NDT558, IN THE LOWER RIGHT CORNER OF THE REFERENCE STANDARD.

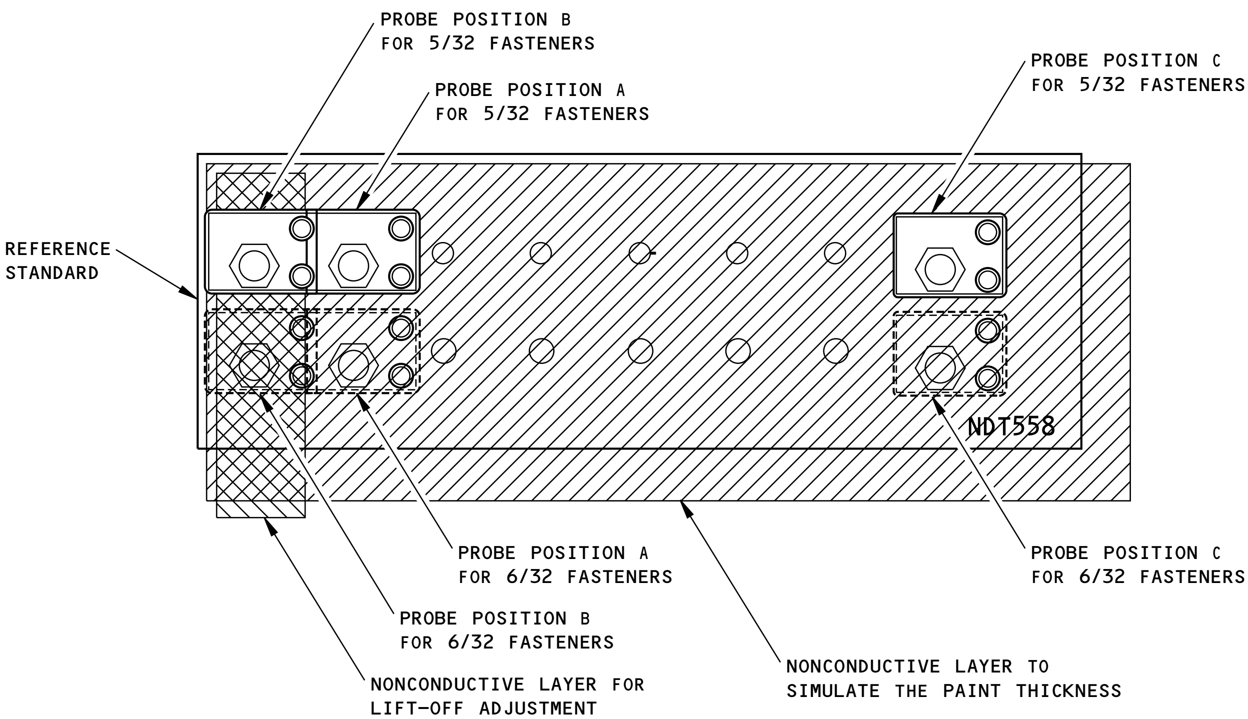
- RIVET HOLES:
  WITH THE RIVETS SEATED IN THE COUNTERBORE AND DRIVEN, THE HEAD OF THE RIVETS MUST EXTEND FROM 0.001 (0.03) TO 0.005 (0.13) ABOVE THE TOP SURFACE OF THE REFERENCE STANDARD.

2219480 S0000494183_V2

Reference Standard NDT558
Figure 1

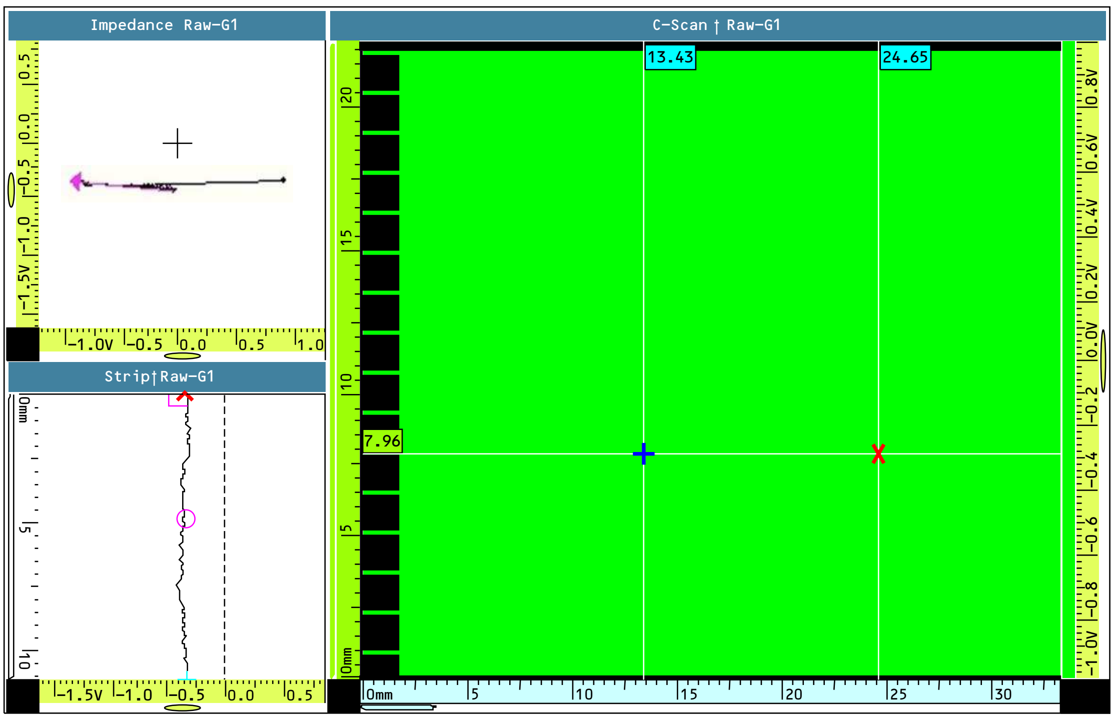


Application of Tape to Make a Channel to Move the Probe Across Rivet Heads
Figure 2



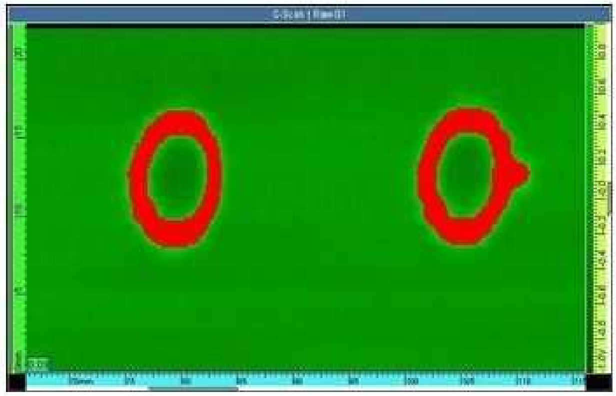
2219507 S0000494185_V1

Calibration Probe Positions
Figure 3

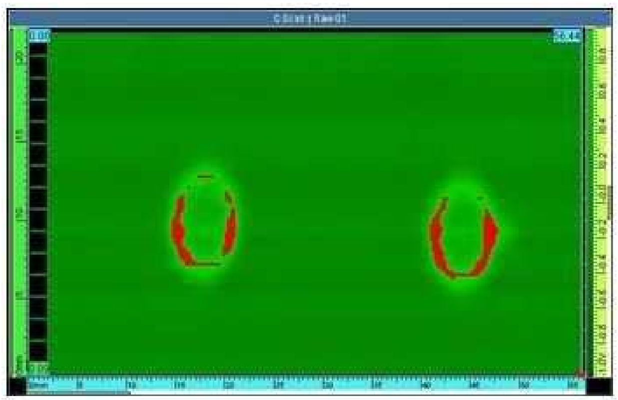


2219534 S0000494186_V1

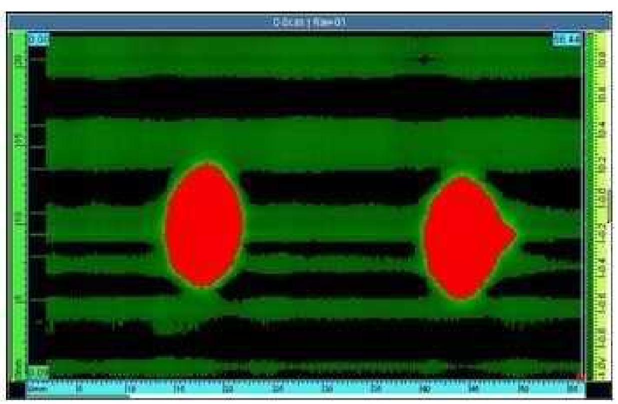
Lift-off Adjustment Detail
Figure 4



DISPLAY WITH THE CORRECT GAIN SETTING
DETAIL I



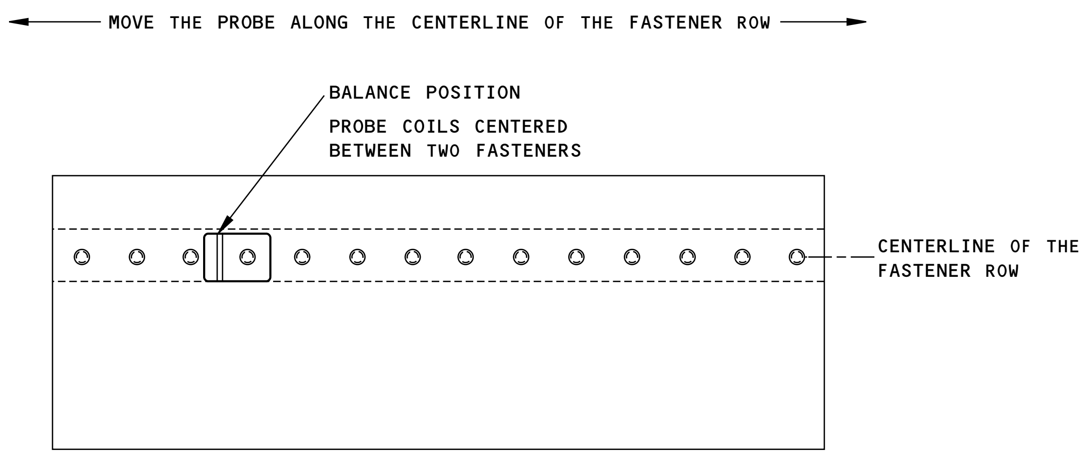
DISPLAY WITH TOO LITTLE GAIN
DETAIL II



DISPLAY WITH TOO MUCH GAIN
DETAIL III

2219546 S0000494187_V1

Calibration Screen Display
Figure 5



2219548 S0000494189_V1

Probe Balance Position and Scan Direction
Figure 6

PART 6 - EDDY CURRENT

LAP SPLICE INSPECTION AT THE UPPER ROW OF FASTENERS IN THE OUTBOARD SKIN (HFEC)

1. **Purpose**

   A. Use this procedure to find surface cracks that are in the outer skin along the upper row of fasteners of the longitudinal lap splice joints.

   B. The inspection areas for 737-600/700/700C/700IGW/800/900/900ER airplanes are:

      (1) At stringers 4 and 10, between BS 259.5 and BS 1016.

      (2) At stringer 14L between BS 259.5 and BS 294.5 and between BS 350 and BS 360.

      (3) At stringer 14R between BS 259.5 and BS 277 and between BS 344 and BS 360.

      (4) For 737-700C airplanes, there are more inspection areas:

         (a) At S-7L between BS 500 and BS 540.

         (b) At S-8 between BS 259.5 and BS 294.5 and between BS 350 and BS 360.

   C. Do this procedure from the external skin surface. See Figure 1 for the inspection areas.

   D. This procedure uses an eddy current probe and an impedance plane display instrument.

   E. 737 Damage Tolerance Rating, D622N001-DTR:

      (1) Item: 53-10-03-1

      (2) Item: 53-10-03-1a

      (3) Item: 53-10-03-3

      (4) Item: 53-30-04-1

      (5) Item: 53-30-04-1a

      (6) Item: 53-30-04-3

      (7) Item: 53-30-04-3a

      (8) Item: 53-40-03-1

      (9) Item: 53-40-03-1a

      (10) Item: 53-40-03-3

      (11) Item: 53-40-03-3a

      (12) Item: 53-60-04-1

      (13) Item: 53-60-04-1a

      (14) Item: 53-60-04-3

      (15) Item: 53-60-04-3a

      (16) Item: 53-70-03-1

      (17) Item: 53-70-03-1a

   F. Part 6, 53-30-05 is an optional procedure to this procedure.

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 an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates at a frequency range of 50 to 500 kHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) Phasec 2D/3D; GE Inspection Technologies

(b) NDT 19e; Nortec-Staveley

C. Probes

(1) Use a 0.125 inch (3.18 mm) diameter pencil probe that operates at a frequency range from 50 to 500 kHz.

(2) The probes that follow were used to help prepare this procedure.

(a) TPEN92-5B; Techna NDT

(b) MTF902-50B; NDT Engineering

D. Reference Standard

(1) Use reference standard NDT3149. Reference standard NDT3149 is shown in Figure 2.

(2) It is acceptable to use reference standard 369 as an alternative to NDT3149.

E. Special Tools

(1) A nonconductive circle template can be used to help move the probe around the edge of the flush head fasteners.

(2) A magnet can be used to identify magnetic fasteners.

3. **Prepare for the Inspection**

A. Get access to the inspection areas shown in Figure 1.

B. Remove loose paint, dirt and sealant from the inspection surfaces.

C. Remove paint and decals, if necessary, to see the fasteners.

4. **Instrument Calibration**

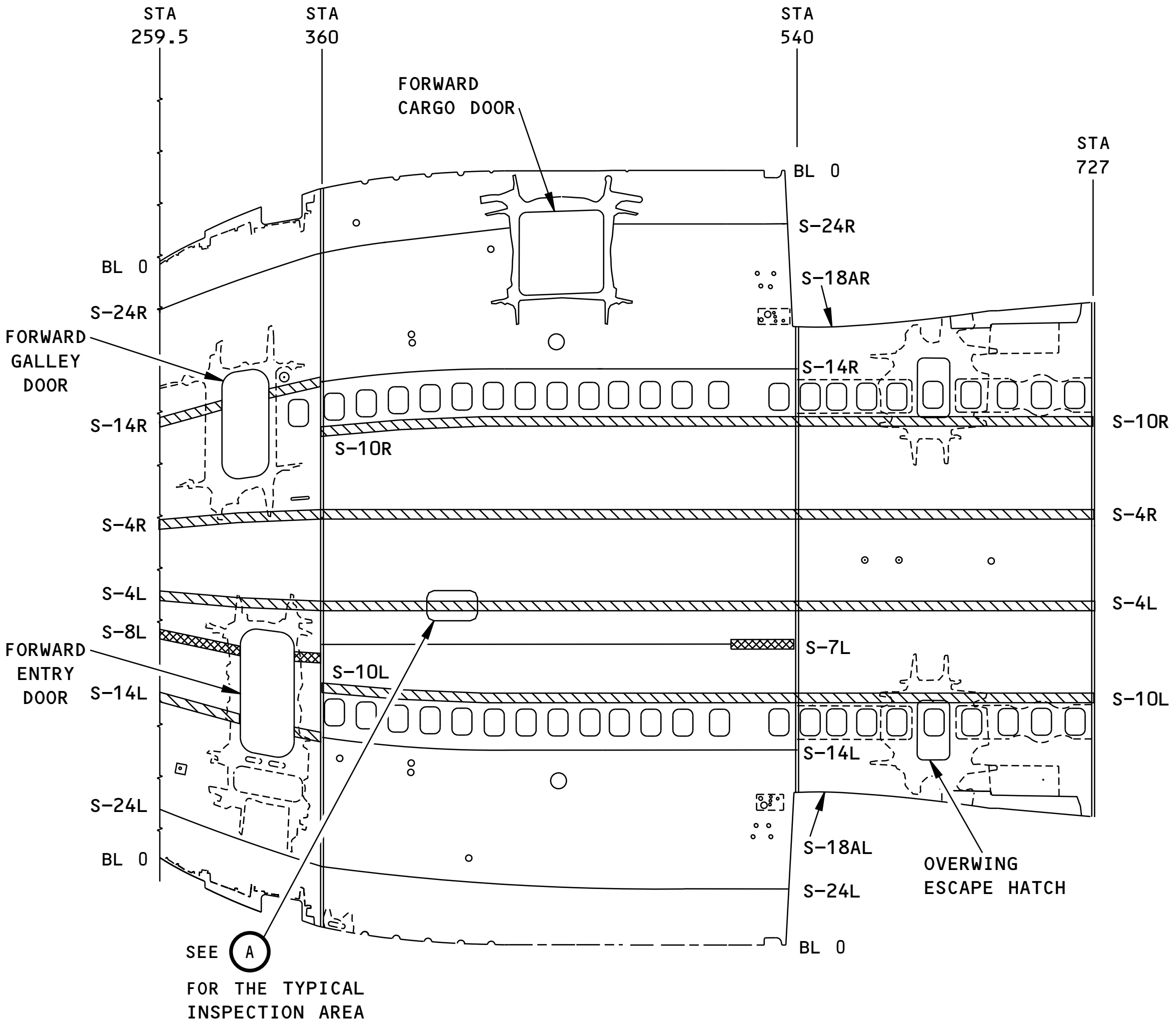
A. Calibrate the instrument as specified in Part 6, 51-00-00, Procedure 23, paragraph 5, to examine around flush head fasteners. Use reference standard NDT3149 (or 369) during calibration.

5. **Inspection Procedure**

A. Examine the outer skin for cracks along the upper row of fasteners of the longitudinal lap splice joints as specified in Part 6, 51-00-00, Procedure 23, paragraph 6.

6. Inspection Results

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of the indications that occur during the inspection.



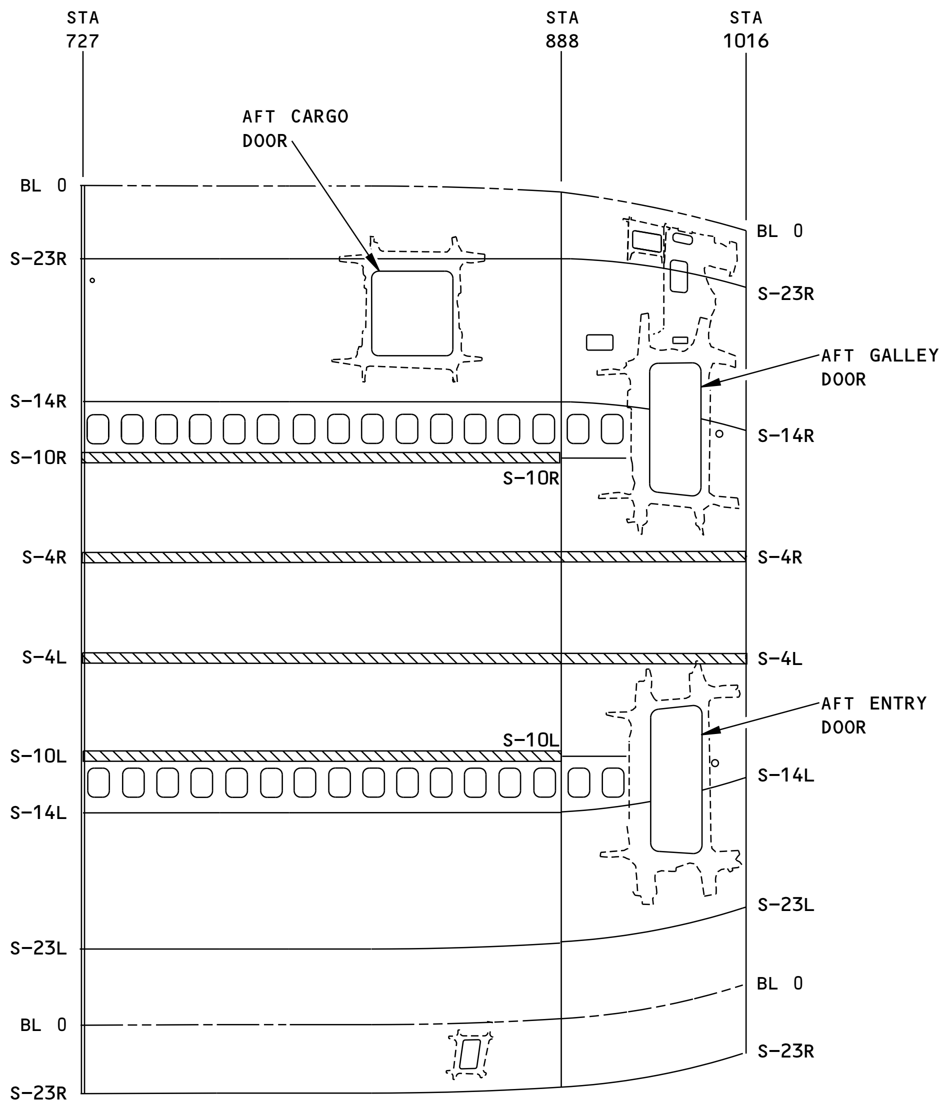
PLAN VIEW
737 FUSELAGE SKIN LAPS FROM BS 259.5 TO BS 727
THE 737-700 IS SHOWN; THE 737-600/-800/-900
ARE ALMOST THE SAME

NOTES

- INSPECTION AREAS AT S-4, S-10 AND S-14 FOR AIRPLANE MODELS 737-600/700/700IGW/700C/800/900/900ER
- ADDITIONAL INSPECTION AREAS AT S-7L AND S-8L FOR AIRPLANE MODEL 737-700C
- THE INSPECTIONS ARE DONE FROM OUTSIDE THE AIRPLANE

2218918 S0000494969_V1

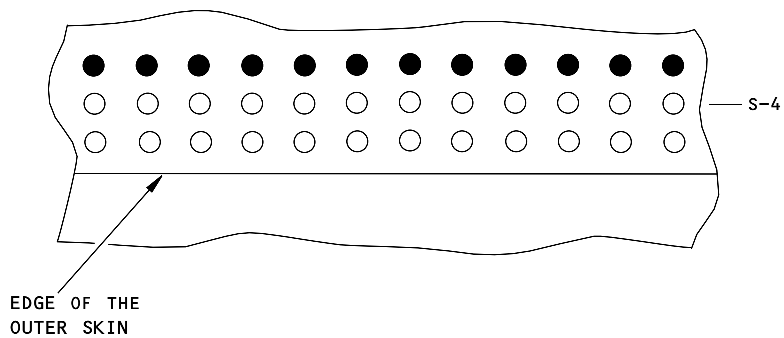
Inspection Areas
Figure 1 (Sheet 1 of 3)



PLAN VIEW
737 FUSELAGE SKIN LAPS FROM BS 727 TO BS 1016
THE 737-700 IS SHOWN; THE 737-600/-800/-900
ARE ALMOST THE SAME

2218926 S0000494970_V1

Inspection Areas
Figure 1 (Sheet 2 of 3)



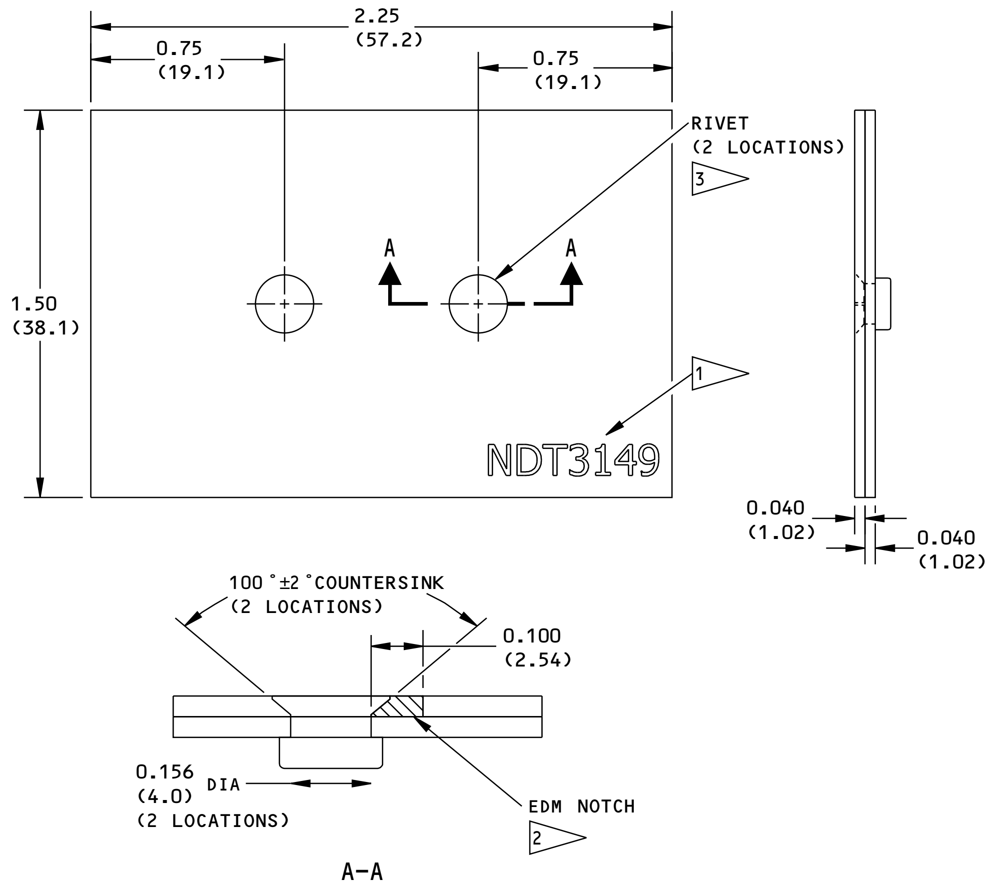
TYPICAL INSPECTION AREA
OF THE UPPER SKIN
A

NOTES

- ● TYPICAL FASTENER LOCATIONS TO EXAMINE
- A TYPICAL INSPECTION AREA AT S-4 IS SHOWN; THE INSPECTION AREA AT OTHER STRINGER LOCATIONS ARE ALMOST THE SAME

2218929 S0000494971_V1

Inspection Areas
Figure 1 (Sheet 3 of 3)



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 = ±0.05
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS = 63 Ra OR BETTER
- MATERIAL: 2024-T3 CLAD AIRCRAFT ALUMINUM

1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3149, AT APPROXIMATELY THIS LOCATION

2 EDM NOTCH:
WIDTH - 0.010 (0.25) MAXIMUM
LENGTH - 0.100 (2.54) LENGTH (MEASURED FROM THE RIVET SHANK)
DEPTH - 0.040 (1.02) (THROUGH THE THICKNESS)

3 FASTENERS: BACR15CE5 (2 LOCATIONS)

2218966 S0000494972_V1

Reference Standard NDT3149
Figure 2

SURFACE INSPECTION OF THE OUTER SKIN AT STA 203.8 OF THE FORWARD ACCESS DOOR (HFEC)

1. Purpose

A. Use this procedure to help find surface cracks in the outer skin at the forward edge of the cutout for the forward access door. The outer skin is examined for cracks around the fasteners that connect the skin, bear strap, and edge frame at STA 203.8, from LBL 16 to RBL 16. The inspection area is shown in Figure 1.

B. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

(1) Item: 53-10-12-1

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 an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates at a frequency range of 50 to 500 kHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) Nortec 1000; Staveley (Olympus)

(b) Locator 2d; Hocking (General Electric)

C. Probes

(1) A shielded, straight or right-angle probe is necessary to use to do this inspection.

(2) Refer to Part 6, 51-00-00, Procedure 23, paragraph 3.C, for data about probe selection.

(3) The probe that follows was used to help prepare this procedure.

(a) MTF905-50; NDT Engineering Corp. (Olympus)

D. Reference Standards

(1) Use reference standard NDT1048, or an equivalent, as given in Part 6, 51-00-00, Procedure 23, paragraph 3.D.

E. Circle Template

(1) Use a nonconductive circle template as a probe guide to help find 0.10 inch (2.5 mm) long cracks from the edge of the fastener holes.

3. Prepare for the Inspection

A. Identify the inspection locations shown in Figure 1.

B. Lightly sand rough surfaces and sharp edges of chipped paint to make the inspection surfaces smooth.

C. Fully clean the inspection area.

4. **Instrument Calibration**

A. Calibrate the equipment as specified in Part 6, 51-00-00, Procedure 23, paragraph 5. Use reference standard NDT1048, or an equivalent, for the calibration.

5. **Inspection Procedure**

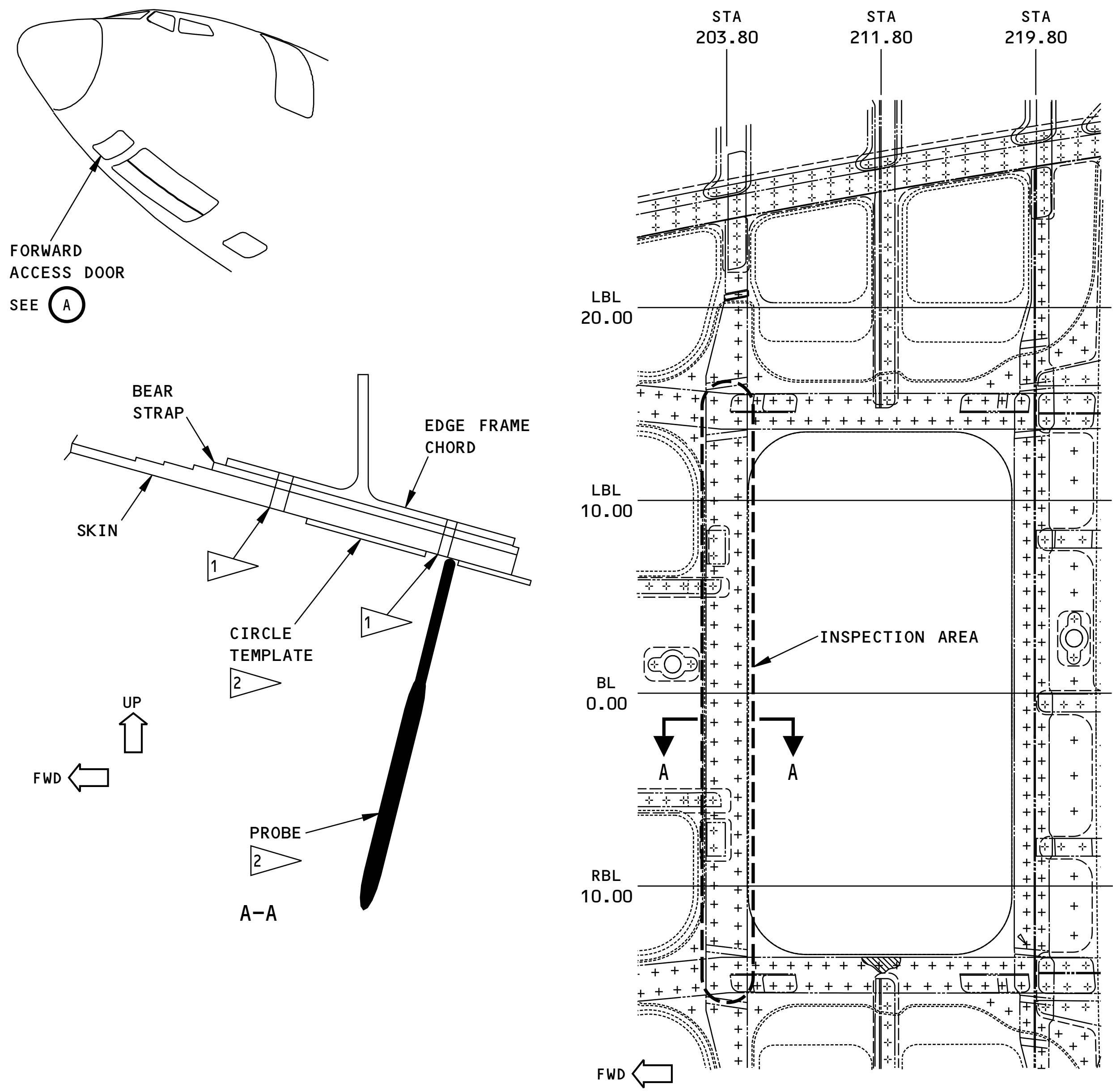
A. Examine the outer skin for cracks at the fastener locations shown in Figure 1 as follows:

(1) Refer to Part 6, 51-00-00, Procedure 23, paragraph 6, for the inspection procedure.

(2) Use a nonconductive circle template as a probe guide to help find 0.10 inch (2.5 mm) long cracks from the edge of the fastener holes.

6. **Inspection Results**

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of indications that occur during the inspection.



NOTE

— — FASTENER LOCATIONS TO EXAMINE ALONG THE CUTOUT FOR THE FORWARD ACCESS DOOR.

1 TYPICAL FASTENER LOCATIONS TO EXAMINE.

2 USE A NONCONDUCTIVE CIRCLE TEMPLATE TO HELP FIND 0.10 INCH (2.5 MM) LONG CRACKS FROM THE EDGE OF THE FASTENER HOLES AS SHOWN.

2216140 S0000494204_V1

Inspection Area
Figure 1

PART 6 - EDDY CURRENT

SURFACE INSPECTION OF THE SKIN BEHIND THE SCUFF PLATES AT THE CUTOUT FOR THE FORWARD ENTRY DOOR (HFEC)

1. **Purpose**

A. Use this procedure to help find surface cracks in the skin that is behind the scuff plates at the cutout for the forward entry door. This inspection looks for cracks that are along the edge of the skin and around the fastener holes that are used to attach the scuff plates to the skin. The inspection area is between STA 303 and STA 350. See Figure 1 for the inspection area.

B. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

(1) Item: 53-10-14-12

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 an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates at a frequency range of 50 to 500 kHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) Nortec 1000; Staveley (Olympus)

(b) Locator 2d; Hocking (General Electric)

C. Probes

(1) A shielded straight or right-angle probe is necessary to use for this inspection.

(2) Refer to Part 6, 51-00-00, Procedure 23, paragraph 3.C, for instructions about probe selection.

(3) The probe that follows was used to help prepare this procedure.

(a) MTF905-50; NDT Engineering Corp (Olympus)

D. Reference Standards

(1) To examine the skin around the fastener holes, use reference standard NDT1048, or an equivalent, as given in Part 6, 51-00-00, Procedure 23, paragraph 3.D.

(2) To examine the skin along the edge of the cutout, use reference standard 126, or an equivalent, as given in Part 6, 51-00-00, Procedure 23, paragraph 3.D.

E. Special Tools

(1) Use a nonconductive circle template as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the fastener hole.

(2) Use a nonconductive straightedge as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the skin.

3. **Prepare for the Inspection**

   A. Identify the inspection areas shown in Figure 1.

   B. Remove the scuff plates to get access to the inspection locations. Refer to Figure 1.

   C. Lightly sand rough surfaces and sharp edges of chipped paint to make the inspection surfaces smooth.

   D. Fully clean the inspection area.

4. **Instrument Calibration**

   A. To examine the skin around the fastener holes, calibrate the equipment as specified in Part 6, 51-00-00, Procedure 23, paragraph 5. Use reference standard NDT1048, or an equivalent, during calibration.

   B. To examine the skin at the edge of the cutout, calibrate the equipment as specified in Part 6, 51-00-00, Procedure 23, paragraph 5. Use reference standard 126, or an equivalent, during calibration.

5. **Inspection Procedure**

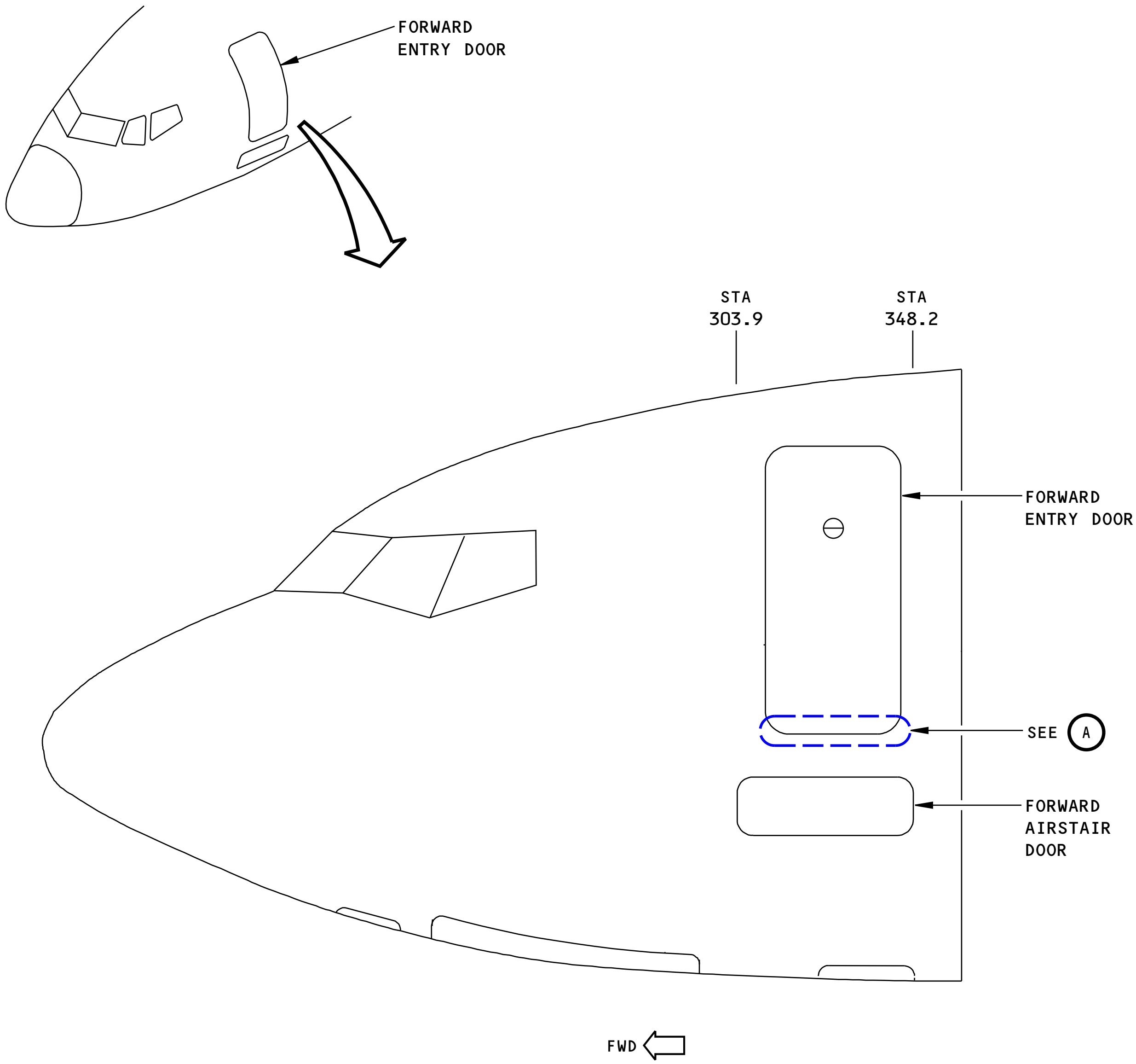
   A. Examine the skin at the cutout of the forward entry door for cracks as specified in Part 6, 51-00-00, Procedure 23, paragraph 6, and the steps that follow:

      (1) Examine the skin around the fastener holes that are used to attach the scuff plates of the forward entry door as shown in Figure 1. Use a nonconductive circle template as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the fastener holes.

      (2) Examine the skin along the edge of the cutout of the forward entry door as shown in Figure 1. Use a nonconductive straightedge as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the cutout.

6. **Inspection Results**

   A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of indications that occur during the inspection.



NOTES

— — INSPECTION AREA AT THE LOWER EDGE CUTOUT OF THE FORWARD ENTRY DOOR

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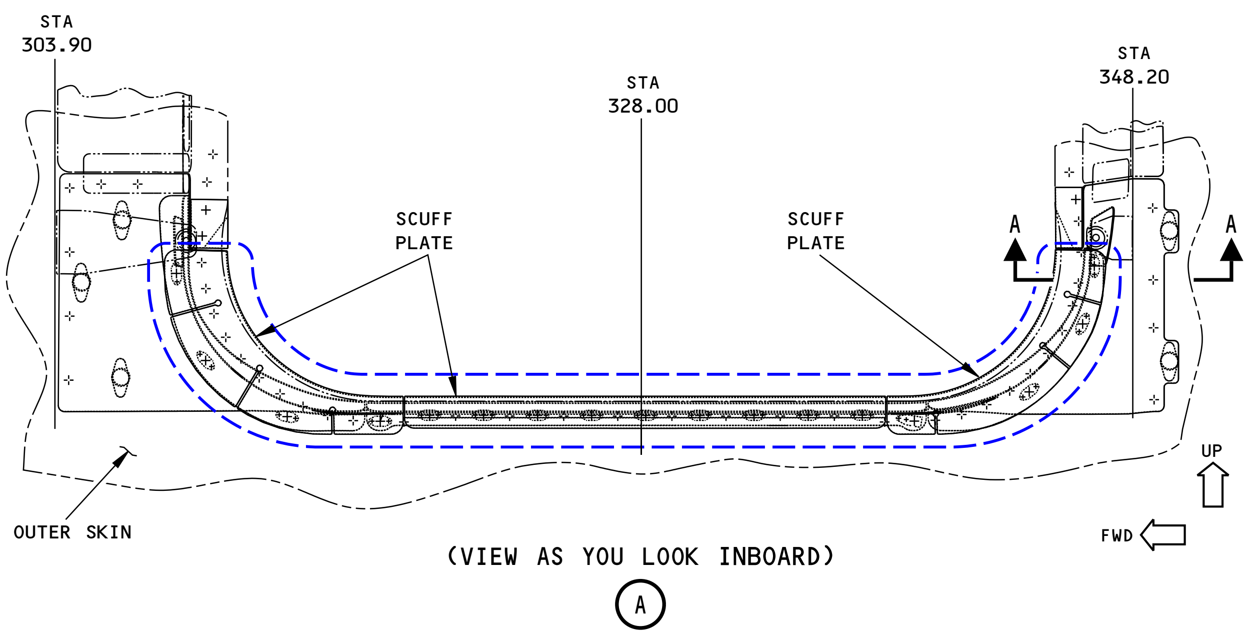
Forward Entry Door Inspection Area
Figure 1 (Sheet 1 of 3)



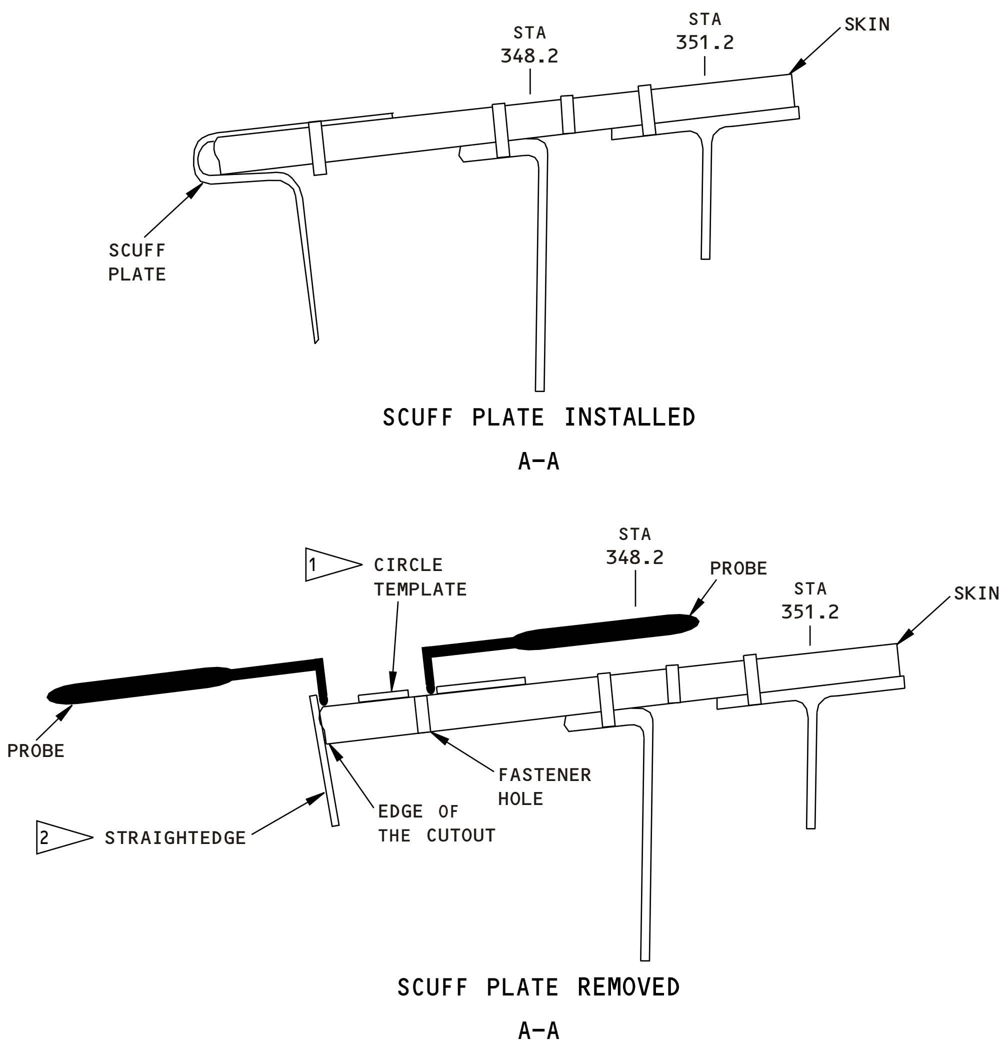
NOTES

INSPECTION AREA AT THE LOWER EDGE CUTOUT OF THE FORWARD ENTRY DOOR

- THE SCUFF PLATES MUST BE REMOVED TO EXAMINE THE SKIN AROUND THE FASTENER HOLES USED TO ATTACH THE SCUFF PLATES AND ALONG THE EDGE OF THE CUTOUT.

2230777 S0000497300_V1

Forward Entry Door Inspection Area
Figure 1 (Sheet 2 of 3)



NOTES

- MAKE A SCAN OF THE SKIN AROUND THE FASTENER HOLES USED TO ATTACH THE SCUFF PLATES AND ALONG THE EDGE OF THE CUTOUT OF THE FORWARD ENTRY DOOR AS SHOWN

1 USE A NONCONDUCTIVE CIRCLE TEMPLATE AS A PROBE GUIDE TO HELP FIND 0.10 INCH (2.5 MM) LONG CRACKS FROM THE EDGE OF THE FASTENER HOLES.

2 USE A NONCONDUCTIVE STRAIGHTEDGE AS A PROBE GUIDE TO HELP FIND 0.10 INCH (2.5 MM) LONG CRACKS FROM THE EDGE OF THE CUTOUT.

2230798 S0000497301_V1

Forward Entry Door Inspection Area
Figure 1 (Sheet 3 of 3)

PART 6 - EDDY CURRENT

FUSELAGE SKIN CRACK OR TROUGH INSPECTION ALONG SUBSURFACE EDGES

1. **Purpose**

   A. This subsurface eddy current inspection can be used to examine the skin for cracks that occur on the inner surface of the skin. The inspection is done on the outer surface of the skin.

   B. The inspection is done with a subsurface eddy current probe and an impedance plane instrument. The probe scan is done perpendicular to the subsurface edges of the bonded doublers. Cracks in the skin that are along the edges of the bonded doubler or chem-mill pockets can be found with this inspection procedure. See Figure 1.

   C. This inspection is for skins that are 0.036, 0.040, 0.045, 0.050, or 0.056 inch (0.91, 1.01, 1.14, 1.27, or 1.42 mm) thick.

2. **Equipment**

   NOTE: Refer to Part 1, 51-01-00, for data about the equipment manufacturers.

   A. Instruments

      (1) All eddy current instruments that have an impedance plane display are permitted if they:

         (a) Can operate between 12 and 40 kHz. The frequency must be adjustable by 1 kHz.

         (b) Can find the reference notch in the reference standard as specified in the calibration instructions of this procedure.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) NDT 19e; Nortec/Staveley

         (b) Phasec 2200; Hocking/Krautkramer

   B. Probes

      (1) It is necessary to use a spot probe to do this inspection. The probe must operate between 12 and 40 kHz. The probe diameter must not be less than 0.30 inch (7.6 mm) and not more than 0.50 inch (12.7 mm).

      (2) The spot probes that follow operated satisfactorily when this procedure was made. Other probes can be used if they can find the notch in the reference standard as specified in the calibration instructions of this procedure.

         (a) SPO-5328; Nortec/Staveley (Reflection probe)

         (b) SPO-5327; Nortec/Staveley (Reflection probe)

         (c) SNG 0.375/31/25K; NDT Engineering (this probe has a spring loaded collar)

         (d) NEC1005; NDT Engineering (Reflection probe)

         (e) SPO-5329; Nortec/Staveley (Reflection probe)

         NOTE: For smaller diameter probes, a collar attached around the probe will make the probe scan more stable. If a collar is used, it must be adjusted so that the probe satisfactorily touches the airplane skin. Also, during the inspection, make sure the increments between each probe scan are the diameter of the probe and not the outer diameter of the collar.

   C. Reference Standard

(1) Make reference standard(s) NDT396-XX/XX as specified in Figure 2. Figure 2 shows reference standards with different thicknesses for the upper and lower layers. Refer to the applicable drawing(s) to identify the skin thickness to be examined for your airplane group.

3. Prepare for the Inspection

A. Prepare for the subsurface inspection of the skin as follows:

(1) Make sure that the instrument, probe, reference standard, and the inspection areas are at the same temperature.

(2) Get access to the inspection area on the external side of the airplane shown in Figure 1. Refer to the Service Bulletin to get more data on the inspection areas for your airplane group number.

(3) Remove the wing fairings on the inspection area.

(4) Make sure the skin is clean and has no rough paint in the inspection areas.

(5) Teflon tape not more than 0.004 inch (0.10 mm) thick on the end of the probe will make it easier to do the scans, but it is not necessary. The probe can possibly scratch the airplane if the scans are done without Teflon tape on the probe. If you make a decision to use the Teflon tape on the probe, make sure it is put on the probe before the calibration.

4. Instrument Calibration

NOTE: Refer to the equipment instruction manual, as necessary, for operation instructions.

NOTE: If the skin is painted, put approximately an equal thickness of transparent, nonconductive tape on the reference standard before calibration. You can refer to McDonnell Douglas Nondestructive Testing Standard Practice Manual, Part 6, 06-10-01.002 or the Boeing Specification Support Standard, BSS 7413, for instructions to help measure the paint thickness on the airplane.

A. Set the instrument frequency.

NOTE: The frequency for the calibration can be higher or lower than the frequency values specified in Paragraph 4.A.(1). Start with the frequency values specified in Paragraph 4.A.(1) and, if necessary, adjust the frequency up or down as shown in Figure 3.

(1) Identify the upper layer skin thickness of the panel that you will examine:

(a) If the skin thickness is 0.036 inch (0.91 mm) then use approximately 32 kHz.

(b) If the skin thickness is 0.040 inch (1.02 mm) then use approximately 23 kHz.

(c) If the skin thickness is 0.045 inch (1.14 mm) then use approximately 19 kHz.

(d) If the skin thickness is 0.050 inch (1.27 mm) then use approximately 17 kHz.

(e) If the skin thickness is 0.056 inch (1.42 mm) then use approximately 16 kHz.

NOTE: The high pass (HP) filter must be set to off (0 Hz). The low pass (LP) filter must be set to the minimum value that does not decrease the amplitude of the signals at typical scan speeds. If the low pass filter is too low, and the scan speed is increased during the inspection, it is possible to not see a crack indication.

B. Put the probe at position 1 (double layer) on reference standard NDT396-XX/XX. See Figure 3, Detail A.

C. Balance the instrument.

D. Adjust the balance point so that it is at approximately 30 percent of full screen height (FSH).

NOTE: The vertical gain must be approximately 14 to 20 dB higher than the horizontal gain.

E. Set lift-off so that the signal moves (approximately) in a horizontal direction to the left. See Figure 3, Detail B.

F. Move the probe across the edge of the second layer from probe position 1 to probe position 2. As you move the probe, monitor the signal on the screen display and stop the probe when it is on the single layer. See Figure 3, Detail A, probe positions 1 and 2 and Detail B.

G. If the end point of the single layer signal is higher than the balance point of the double layer signal, increase the frequency and adjust the phase to get the signals to look equivalent to Figure 3, Detail B. See Figure 3, Details A, B, and E.

H. If the end point of the single layer signal is lower than the balance point of the double layer signal, decrease the frequency and adjust the phase to get the signals to look equivalent to Figure 3, Detail B. See Figure 3, Details A, B, and D.

I. Do a probe scan as specified in Paragraph 4.F. and monitor the signal on the display. Make sure there is less than a 5 percent of full screen height difference between the balance point of the double layer signal and the end point of the single layer signal.

J. If necessary, continue to adjust the frequency and lift-off angle so that the balance point of the double layer signal and the end point of the single layer signal are almost equivalent to the signals shown in Figure 3, Detail B.

K. Put the probe at position 3 and do a minimum of three probe scans across the reference notch and monitor the notch signal (probe position 3 to 4 and back). See Figure 3, Details A and C.

L. Adjust the gain so that the signal from the reference standard notch is 50 percent of full screen height (5 divisions) above the balance point as shown in Figure 3, Detail C.

M. Make sure the lift-off is horizontal and to the left.

N. Do a scan across the notch and make a small increase in the scan speed to see if the signal from the notch decreases. If the notch signal decreases, increase the value for the low pass filter a small quantity.

5. Inspection Procedure

NOTE: Make sure that you know what kind of chem-mill pocket is in the skin panel you will examine. There are two types of pockets. The first type of pocket has a doubler that keeps its full thickness to the edge of the pocket. The second type contains a doubler with an area that is thinner than the full doubler thickness. The width of the thinner area is not the same at all pocket locations.

NOTE: If the pocket has different thicknesses before it gets to the full pocket depth, make sure that the full probe diameter touches the thinnest pocket area during the scan. If a crack occurs it will start in the thinnest area of the pocket.

A. See the Service Bulletin for the inspection areas.

B. Calibrate the instrument as specified in Paragraph 4. for the applicable skin thickness to be examined.

C. Put the probe on the skin in the inspection area where the skin is bonded to the doubler or an area that has not been chem-milled (double layer area). See Figure 1 for the probe scan pattern.

D. Balance the instrument in a chem-mill pocket on the skin that is not bonded. Make sure the lift-off goes horizontally to the left as shown in Figure 3, Detail B.

E. Do approximately 4 scans so that the probe moves across the subsurface edge of the bonded doubler at the edge of the chem-milled area. During the scan:

(1) Make sure the scan direction is perpendicular to the subsurface edge as it moves across the subsurface edge.

(2) Monitor the subsurface edge signal.

(a) If the signal looks almost the same as the signals shown in Figure 3, Detail B, or Figure 4, Details B or C, then no instrument adjustment is necessary.

(b) If the signal looks like the signals shown in Figure 3, Details D or E, then:

1) Adjust the frequency and lift-off to get the single layer signal and the double layer signal at the same, or almost the same, screen height, as the signal shown in Figure 3, Detail B. Refer to Figure 3, Details B, D, and E, to help make the signal equivalent to the signal shown in Detail B.

(c) If the signal you get looks like the signals shown in Figure 4, Details B or C, where the single layer end point is above or below the balance point and the signal makes an arch, then the panel has a trough and/or a crack.

CAUTION: DO NOT CHANGE THE GAIN ADJUSTMENT THAT WAS SET DURING THE CALIBRATION. IF THE GAIN IS CHANGED DURING THE INSPECTION, THE INSPECTION WILL BE UNSATISFACTORY.

F. Continue to do probe scans across the subsurface edges of the bonded doubler or chem-mill edge and monitor the display. Make sure the signals from the subsurface edges show on the screen display during each probe scan as shown in Figure 3, Detail B, or Figure 4, Details B or C. Continue the scan into the radius of the subsurface edge. Do the inspection completely around the chem-mill pocket. See Figure 1. Do this, and the steps that follow, for all of the subsurface edges in the inspection area.

(1) Monitor the screen display for signals that are 5 divisions (or more) above the single skin balance point and are almost equivalent to the EDM notch signal shown in Figure 3, Detail C.

(2) Make sure the probe scans are one probe diameter or less from each other for the inspection areas on each side of the airplane.

NOTE: If a collar is used on the probe, make sure each probe scan is the diameter of the probe and not the diameter of the collar. Make sure the scans are done along all of the horizontal, vertical, and diagonal subsurface edges of the bonded doublers or chem-mill areas and the radii as shown in Paragraph 5.F. and Figure 1.

6. Inspection Results

A. All signals that are almost the same as the notch signal from the reference standard are indications. Also, signals that are 50 percent of full screen height (5 divisions)(or more) above the single layer end point are crack indications. See Figure 3, Detail C, for the reject level.

B. See Figure 4, Details A, B and C, for signals that can occur during the inspection.

C. For skins that are between 0.032 inch (0.81 mm) and 0.056 inch (1.42 mm) thick you can do the steps that follow to make an analysis of the possible crack indication.

(1) Use the ultrasonic phased array inspection procedure, Part 4, 53-30-06, and examine the indication from the external side of the airplane as follows:

(a) Use the applicable probe wedge for the skin thickness and open a setup file. If a file has not been stored, use the instructions in Part 4, 53-30-06 to create a file.

(b) Get reference standard NDT1094-040 or NDT1094-040-A (see Part 4, 53-30-06) to help calibrate the equipment.

(c) Use the back side of the reference standard (the side of the reference standard that does not have the 0.072 inch (1.83 mm) doubler) and draw a line on the surface to show the edge of the top piece.

(d) Put couplant on the back surface of the reference standard at the notch “A” location.

(e) Put the probe on the back surface with the front of the wedge flush with the line.

(f) Calibrate the instrument as specified in paragraph 4 of Part 4, 53-30-06. Only use notch "A" during calibration.

(g) Add 12 dB of gain if the external surface of the airplane is painted.

(h) Move the full length of the probe across the top of the "A' notch location on the reference standard and monitor the screen display to make sure that the red indication occurs before the C/L line on the S-Scan display screen.

(2) Identify the location of the crack indication along the edge of the doubler on the external airplane skin and make a mark on the surface with a grease pencil or felt tip pen. Do not use a graphite pencil or ball point pen or damage the part. A graphite pencil mark can cause corrosion and a ball point pen tip can damage the part.

(3) Put ultrasonic couplant on the skin inspection surface.

(4) Put the probe on the single skin area of the skin with the front of the probe pointed in the direction of the doubler and with the front edge of the wedge flush with the mark.

(5) Move the full length of the probe across the top of the marked area and monitor the screen display for a red image to occur to the left or right of the C/L line on the S-scan of the screen. Do the scan again with one half a probe width index. Move the probe to do a scan across all of the eddy current indication areas.

(6) Areas that cause a red indication to occur on the S-Scan display that is not from a fastener signal must be examined as follows:

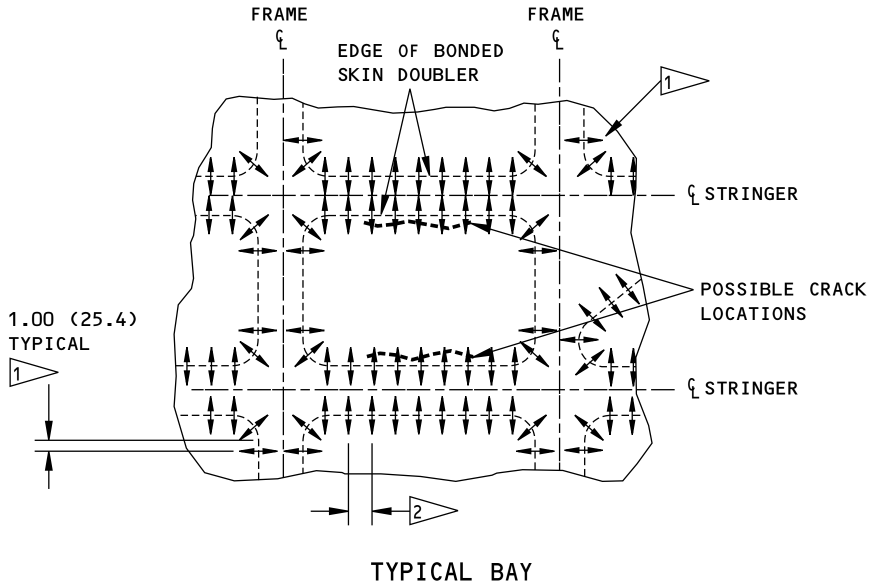
(a) Remove the paint from the external skin surface of the airplane in the area that gives the crack indication.

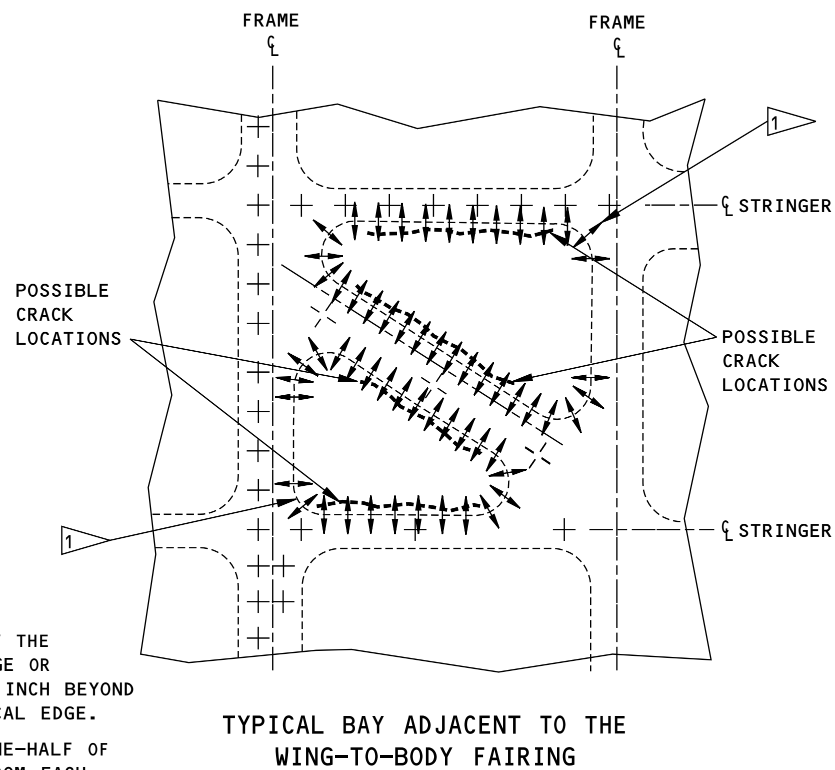
(b) Remove the added 12 dB from the gain setting. Make sure the indication from the "A" notch on the reference standard is red on the S-scan screen when the front edge of the wedge is flush with the mark on the back side of the reference standard.

(c) Do the inspection of the indication area on the airplane again as specified in Paragraph 6.C.(4) and Paragraph 6.C.(5).

1) A red indication on the S-Scan that is not from a fastener signal is a crack indication.

2) If the indication area is not red then it is not a crack indication and the eddy current indication is also not a crack indication.





1 USE THE PROBE TO MAKE A SCAN AT THE CHEM-MILL POCKET HORIZONTAL EDGE OR DIAGONAL EDGE, RADIUS, AND ONE INCH BEYOND THE TANGENT POINT OF THE VERTICAL EDGE.

2 MAKE SURE EACH PROBE SCAN IS ONE-HALF OF THE PROBE DIAMETER (OR LESS) FROM EACH OTHER.

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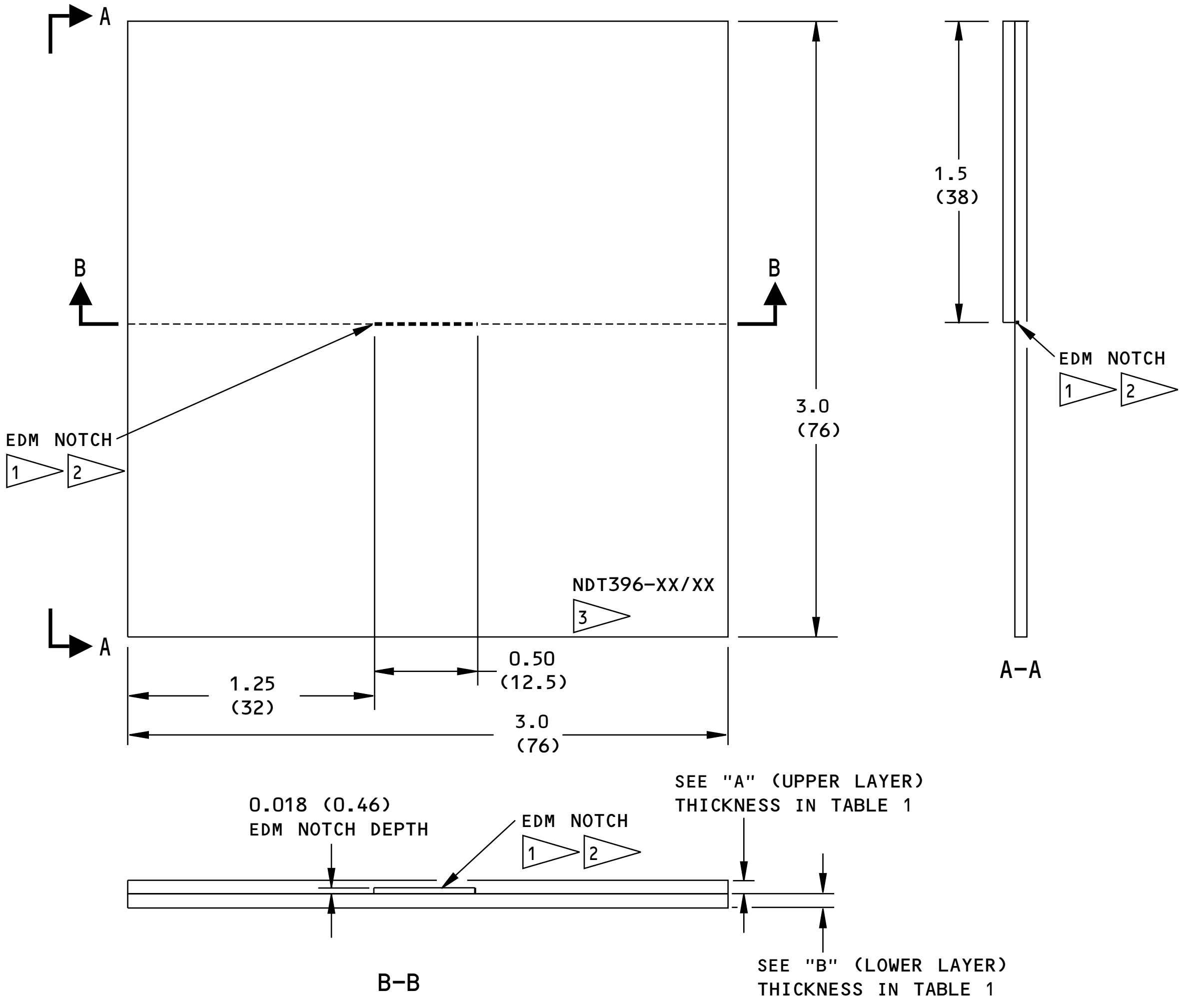
Scan Pattern for Typical Inspection Areas
Figure 1



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- MATERIAL: 2024-T3 CLAD (TWO SKINS)
- APPLY ADHESIVE OR EPOXY, NO MORE THAN 0.005 (0.13) THICK, TO THE SKINS AND CLAMP TOGETHER.

1 MAKE SURE THE EDGE OF THE UPPER LAYER IS IMMEDIATELY ABOVE (±0.010 (±0.02)) THE EDM NOTCH BEFORE THE CLAMPS ARE APPLIED.

2 EDM NOTCH: LENGTH: 0.50 (12.5)
DEPTH: 0.018 (0.46) ±0.002 (0.05)
WIDTH: 0.007 (0.18)

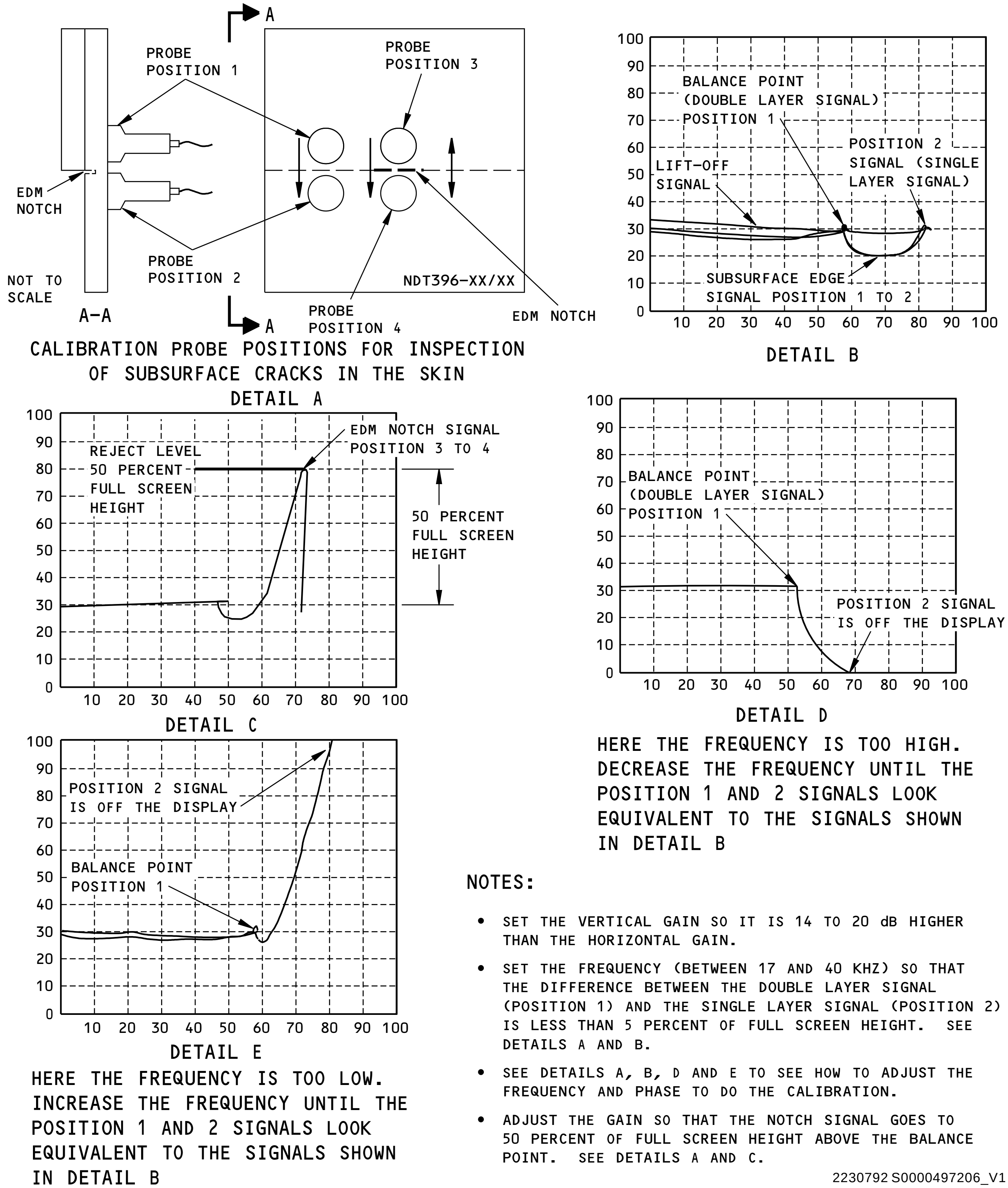
REFERENCE STANDARD NUMBER	"A" (UPPER LAYER) THICKNESS	"B" (LOWER LAYER) THICKNESS
NDT396-36/36	0.036 (0.91)	0.036 (0.91)
NDT396-40/40	0.040 (1.01)	0.040 (1.01)
NDT396-45/40	0.045 (1.14)	0.040 (1.01)
NDT396-50/40	0.050 (1.27)	0.040 (1.01)
NDT396-56/40	0.056 (1.42)	0.040 (1.01)

TABLE 1

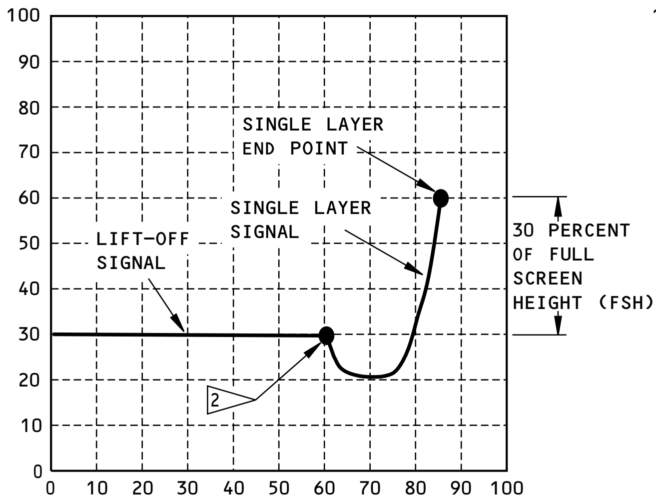
3 STAMP OR ETCH THE APPLICABLE REFERENCE STANDARD NUMBER, NDT396-XX/XX, AT APPROXIMATELY THIS LOCATION. REPLACE XX/XX WITH THE APPLICABLE "A" AND "B" THICKNESS AS SPECIFIED IN TABLE 1

2230390 S0000497205_V2

Reference Standard NDT396-XX/XX
Figure 2



Calibration Positions with Impedance Plane Signals
Figure 3

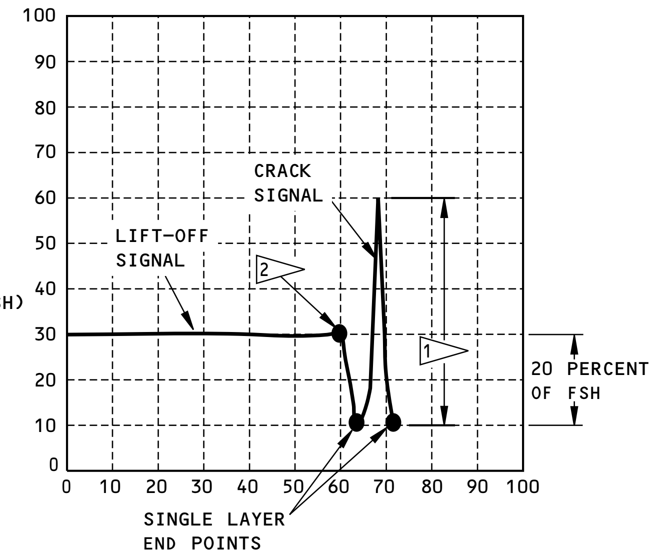


DETAIL A

THIS IS NOT A CRACK SIGNAL. IT IS A SIGNAL CAUSED BY ONE OR MORE OF THE CONDITIONS THAT FOLLOW:

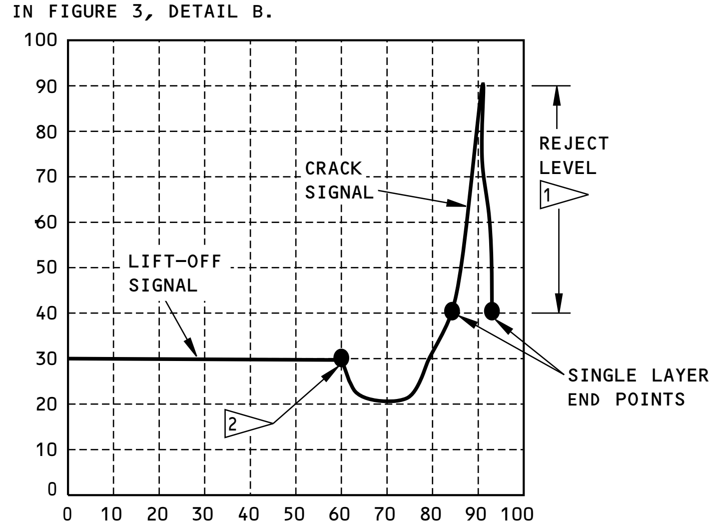
- AN AREA ON THE SKIN OF LOWER CONDUCTIVITY
- A THIN CLAD AREA
- THE SKIN IS THINNER.

WHEN THIS SIGNAL IS AT 30 PERCENT OF FSH OR HIGHER, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL B

WHEN THIS SINGLE LAYER SIGNAL GOES DOWN SCREEN BY 20 PERCENT OF FSH OR MORE, ADJUST THE FREQUENCY AND LIFT-OFF ON THE AIRPLANE SO THE SIGNALS OCCUR AS SHOWN IN FIGURE 3, DETAIL B.



DETAIL C

THIS CRACK SIGNAL HAS OCCURRED WITH THE CONDITIONS SPECIFIED IN DETAIL A. THE SIGNAL STARTED AS THE SIGNAL IN DETAIL A STARTED, BUT THEN A CRACK SIGNAL OCCURRED WITHIN A SHORT SCAN. SEE HOW THIS SIGNAL IS DIFFERENT THAN THE SIGNAL SHOWN IN DETAIL A.

NOTES:

1. FOR THE CONDITIONS SPECIFIED IN DETAILS B AND C, THE REJECT LEVEL IS 50 PERCENT (5 DIVISIONS) OF FSH ABOVE THE SINGLE LAYER END POINTS.
2. THIS IS THE BALANCE POINT ON THE DOUBLE LAYER. MAKE SURE THAT THE PROBE IS ON THE DOUBLE LAYER WHEN YOU BALANCE THE INSTRUMENT.

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Signals That Can Occur on the Airplane During the Inspection
Figure 4

PART 6 - EDDY CURRENT

FUSELAGE SKIN CRACK C-SCAN INSPECTION ALONG SUBSURFACE EDGES

1. **Purpose**

A. This subsurface, eddy current array, inspection can be used to examine the skin for cracks that occur on the inner surface of the skin. The inspection is done from the external surface of the airplane. See the Service Bulletin for data on the inspection area for your airplane group.

B. This procedure uses a low frequency eddy current array.

C. This inspection is for skins that are 0.036, 0.040, 0.045, or 0.050 inch (0.91, 1.01, 1.14 or 1.27 mm) thick.

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 an eddy current C-Scan instrument that:

(a) Has a multi-channel probe head that can scan an area that is a minimum of 1.5 inches (37 mm) wide.

(b) Has a linear position encoder.

(c) Operates from 10 to 40 kHz.

(d) Has a C-Scan display mode.

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

(a) OmniScan MX with Eddy Current Array Module, Software Revision MXE-2.1R1; made by Olympus NDT.

C. Probes

(1) Use an array probe that operates from 10 to 40 kHz.

(2) The Olympus NDT array probe assembly that follows was used to help prepare this procedure and is the only probe that can be used.

(a) SAB-064-030-032; ECT Array probe

(b) ENC1-K-ECA; linear encoder with a resolution of 12 counts for each millimeter.

D. Reference Standard

(1) Use reference standard NDT3194-XX/XX as specified in Figure 1. The reference standard drawing shown in Figure 1 shows four reference standards with different thicknesses for the upper and lower layers. Refer to the applicable drawing(s) to identify the skin thickness to be examined for your airplane group.

E. Special Tools

(1) Use a computer mouse with a USB connector when you calibrate the OmniScan instrument for this inspection.

(2) We recommend that you use a compact keyboard with a USB connector to record data and file names in the OmniScan instrument.

(3) Teflon or transparent tape.

3. Prepare for the Inspection

A. Identify the inspection area. Refer to the applicable service bulletin.

B. Remove loose paint, dirt, and sealant from the surface of the inspection area.

C. For airplanes that are painted, make an estimate of the paint thickness on the skin. You can use calibrated, nonconductive shims with an eddy current procedure (lift-off measurement) that uses a direct or an indirect paint thickness display. Apply Teflon tape or transparent tape to the reference standard before calibration. Apply the tap until it is the same thickness as the thickest paint on the airplane.

NOTE: You can also refer to the McDonnell Douglas Nondestructive Testing Standard Practice Manual, Part 6, 06-10-01.002, or the Boeing Specification Support Standard, BSS 7413, for instructions to help measure the paint thickness on the airplane.

4. Instrument Calibration

NOTE: The calibration instructions that follow are for the OmniScan eddy current array instrument. Other eddy current array or C-Scan instruments can be used if the results on the reference standards of Paragraph 2.D. are almost the same as the results specified in this calibration procedure. Refer to the manufacturer's operation instructions if you use a different eddy current array instrument.

A. Attach the eddy current module and array probe instrumentation to the instrument as specified in the manufacturer's instructions.

NOTE: The OmniScan Instrument has key pad commands that make the set-up easier. This procedure references key pad numbers where they are applicable.

B. Go to the File menu and set up the instrument as follows:

(1) Open the Open (F2) sub-menu.

(2) Open the Open (F8) sub-sub-menu.

(3) If the correct calibration file is in storage, open the file and go to Paragraph 5.

(4) If the correct calibration file is not in storage:

(a) Download the applicable set-up file found in MyBoeingFleet in Part 6 of the 737 NDT manual.

1) Go to the disk icon and the applicable set-up.

2) Go to Paragraph 4.J. to continue calibration.

(b) If you do not download the set-up file to help the calibration process, close the menu and continue with the calibration instructions that follow.

C. Open the Probe menu

(1) Push the F7 Default Config button.

(2) Push Yes to continue.

D. Make sure that the freeze mode is set to off when you make the adjustments that follow.

E. Go to the Preferences menu and prepare the instrument as follows:

NOTE: To make sure that numerical entries are accepted, push the Accept Key after the entry is completed.

(1) Open the Instrument (F4) sub-menu.

(a) Open the Category (F7) sub-sub-menu and set to unit.

(b) Open the Units (F8) sub-sub-menu and set the measurement units (inches or millimeters) to the correct settings for your work area.

F. Go to the EC Settings menu and make the adjustments that follow:

(1) Open the Settings (F3) sub-menu:

(a) Open the Frequency (F7) sub-sub-menu and set the frequency as follows.

NOTE: Refer to the applicable drawing(s) to help identify the outer skin thickness for your airplane group.

1) If the top layer thickness is 0.036 inch (0.91 mm), then set the frequency at 23 kHz and use reference standard NDT3194-36/36.

2) If the top layer thickness is 0.040 inch (1.02 mm), then set the frequency at 20 kHz and use reference standard NDT3194-40/40.

3) If the top layer thickness is 0.045 inch (1.14 mm), then set the frequency at 16 kHz and use reference standard NDT3194-45/40.

4) If the top layer thickness is 0.050 inch (1.27 mm), then set the frequency at 13 kHz and use reference standard NDT3194-50/40.

(b) Open the probe Drive (F8) sub-sub-menu and set to 4.0 Volts Peak.

(c) Open the Gain (F9) sub-sub-menu and set to 50 dB.

(d) Open the Rotation (F10) sub-sub-menu and set to 90°.

(e) Open the Vertical Gain (F11) sub-sub-menu and set to 6 dB.

G. Go to the Scan menu and make the adjustments that follow:

(1) Open the Inspection (F2) sub-menu:

(a) Open the Scan (F8) sub-sub-menu and set to Encoder 1.

(b) Open the Acq. Rate (F9) sub-sub menu and set to 500 Hz.

NOTE: The software will automatically adjust the acquisition rate to reach the highest value it can if it was not able to get the selected value.

(2) Open the Encoder (F3) sub-menu:

(a) Open the Resolution (F10) sub-sub menu and set to 304.8 steps/inch (12 steps/mm).

(3) Open the Area sub-menu:

(a) Open the Scan End (F8) sub-sub-menu and set the value that best applies to your inspection.

NOTE: The Scan End limits the quantity of scan data (length of scan) that can be collected. The instrument will not receive more data when the length of the probe scan is more than the Scan End value. It will be necessary to push the Start Key to reset the instrument encoder and data to start a new scan.

(b) Open the Scan Res. (F9) sub-sub-menu and set to 0.020 inches (0.50 mm).

H. Go to the Display menu and make the adjustments that follow:

(1) Open the Properties (F3) sub-menu:

(a) Open the Display (F7) sub-sub-menu and set to C-Scan.

(b) Open the Display Range (F11) sub-sub-menu and set to 11.8 inches (300 mm).

(2) Open the Color (F6) sub-menu:

NOTE: Do not enter the zero when you enter the numbers specified in Paragraph 4.H.(2)(a) and Paragraph 4.H.(2)(b) in the instrument.

(a) Open the Start (F7) sub-sub-menu and set to -0.5V.

(b) Open the End (F8) sub-sub-menu and set to 0.5V.

(c) Open the Load (F9) sub-sub-menu.

1) Move thru the list and highlight to select the Alarm-Inverted.pal file.

2) Push the F7 Open button.

I. Go to the Measurement menu and prepare the instrument as follows:

(1) Open the Reading (F2) sub-menu:

(a) Open the Analysis (F8) sub-sub-menu and push Reading 1 to set V Max (Maximum Vertical Amplitude).

(b) Push the freeze button to energize the Freeze mode.

(c) Set the PP Cursor (F9) sub-sub-menu to On.

(d) Set the Max Cursor (F10) sub-sub-menu to On.

(e) Push the freeze button to de-energize the Freeze mode.

J. Open the wizard menu to set the lift-off signal horizontally.

(1) Open the (F3) Calibration menu.

(a) Set Type (F9) to Normalization.

(b) Push (F8) Start.

(c) Push (F9) and set the angle to 0 degrees.

(d) Push (F10) and set the Amplitude to 5 Volts.

(2) Put the probe at probe position A, on the applicable reference standard, as shown in Figure 2, Detail I.

(a) Push (F8) Next.

(b) Push (F11) to balance the instrument.

(c) Push (F9) Start.

(d) Make a scan across the nonconductive shim to probe position B, as shown in Figure 2, Detail I.

(e) Push (F10) Stop. The screen display in the Freeze mode is shown in Figure 2, Detail II.

(3) Do the steps that follow to set the correct signal phase used to remove the effect of the lift-off signal.

(a) Double click the left mouse button in an area to the left of the signal caused by the nonconductive shim (green area) to create the vertical cursors. See Figure 2, Detail II, Cursor Position A.

(b) Double click the right mouse button on the center of the nonconductive shim image caused by the nonconductive shim (red area). See Figure 2, Detail II, Cursor Position B.

(c) Push (F8) two times.

(d) Push (F9) Normalize Angle.

(e) Push OK to reset the Y-Spread value to zero.

(f) See Figure 2, Detail III for the correct lift-off display.

(g) Push (F8) Finish.

K. Do the steps that follow to adjust the gain.

(1) Open the Eddy Current Settings menu.

(a) Set the Vertical Gain (F11) to an initial value of 16 dB.

NOTE: Accept the change to the vertical gain.

(2) Put the probe at Position A on the applicable reference standard and balance the instrument. See Figure 3, Detail I.

(3) Put the probe at Position B and make a scan toward position C. See Figure 3, Detail I.

(4) Monitor the display to identify the red image caused by the calibration notch. See Figure 3, Detail II.

(5) Continue to make scans across the notch location until you continue to get the same red notch image.

(6) When you get the best notch image, do the steps that follow:

(a) Push the Freeze button to show the impedance plane and C-scan display.

(b) Put the two vertical cursors together and align them above the notch image (approximately in the center) as shown in Figure 3, Detail III.

(c) Put the two horizontal cursors, one above and the other below the notch image as shown in Figure 3, Detail III.

(d) Push the best fit button on the key pad to get the maximum notch signal on the impedance plane display.

(e) Monitor the V Max value, displayed in Reading 1, in the upper left corner of the display.

(f) Adjust the vertical gain so that the value shown in V Max is approximately 1 volt (+/- 0.2 volts).

(g) Push the Freeze button to de-energize the Freeze mode and exit the impedance plane and C-scan display.

(h) Do Paragraph 4.K.(3) thru Paragraph 4.K.(6)(g) again until you continue to get the same image with a V Max value of 1 volt (+/- 0.2 volts). Adjust the vertical gain if necessary.

L. Save your final calibration set-up in the instrument memory. Identify the reference standard skin thickness used for the calibration in the file name.

5. Inspection Procedure

A. Identify the correct reference standard for the area of the airplane you will examine. See Figure 1.

CAUTION: MAKE SURE YOU DO NOT PUT A CALIBRATION FILE FOR A THIN SKIN AREA IN THE INSTRUMENT MEMORY WHEN YOU ARE TO EXAMINE AREAS WITH THICKER SKINS.

B. Calibrate the instrument as specified in Paragraph 4.

C. Make a scan of reference standard NDT3194-XX/XX, as applicable, to do a check of the calibration. See Paragraph 4.

D. Balance the array probe on the applicable reference standard at probe position A identified in Figure 3, Detail I.

NOTE: Do not balance the eddy current array on the airplane.

E. Make a scan of the skin and examine the C-scan display.

F. Refer to the applicable service bulletin to identify the inspection areas that must be examined.

G. Make scans of the inspection areas and look for red areas on the C-scan display.

6. Inspection Results

A. Areas on the C-scan display that have a vertical signal that is more than 0.5 volts (red areas on the scan) are indications of possible cracks. Areas that cause red areas to occur must be examined some more.

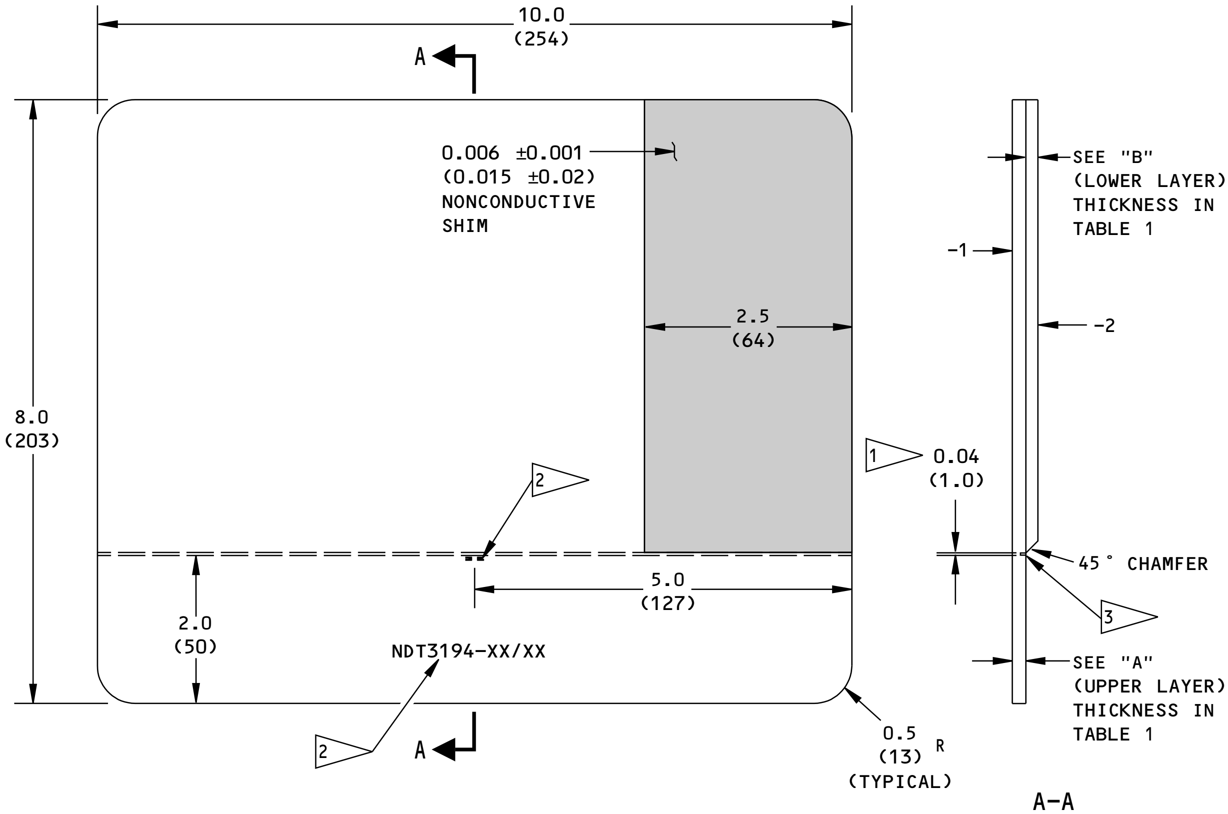
B. If you get a red area on the scan display do the steps that follow:

(1) Make sure you calibrated on a reference standard that is the same thickness as the airplane skin.

(2) Do a check of the paint thickness on your airplane. If the paint thickness on the airplane is thinner than the nonconductive layer on the reference standard, the inspection can be too sensitive.

(3) Do a check of your gain setting. If the gain is set too high, it can cause incorrect crack indications. Do the calibration of Paragraph 4. again and make sure that the gain is set to the correct level.

(4) Do Part 6, 53-30-09, to help make sure a crack indication is from a crack.



REFERENCE STANDARD NUMBER	"A" (UPPER LAYER) THICKNESS	"B" (LOWER LAYER) THICKNESS
NDT3194-36/36	0.036 (0.91)	0.036 (0.91)
NDT3194-40/40	0.040 (1.01)	0.040 (1.01)
NDT3194-45/40	0.045 (1.14)	0.040 (1.01)
NDT3194-50/40	0.050 (1.27)	0.040 (1.01)

TABLE 1

NOTES:

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

INCHES	MILLIMETERS	ANGLES
X.XXX = ±0.005	X.XX = ±0.10	±2°
X.XX = ±0.025	X.X = ±0.5	
X.X = ±0.050	X = ±1	

- MATERIAL: 2024-T3 OR T4 ALUMINUM; CLAD
- SURFACE ROUGHNESS = 125 Ra OR BETTER

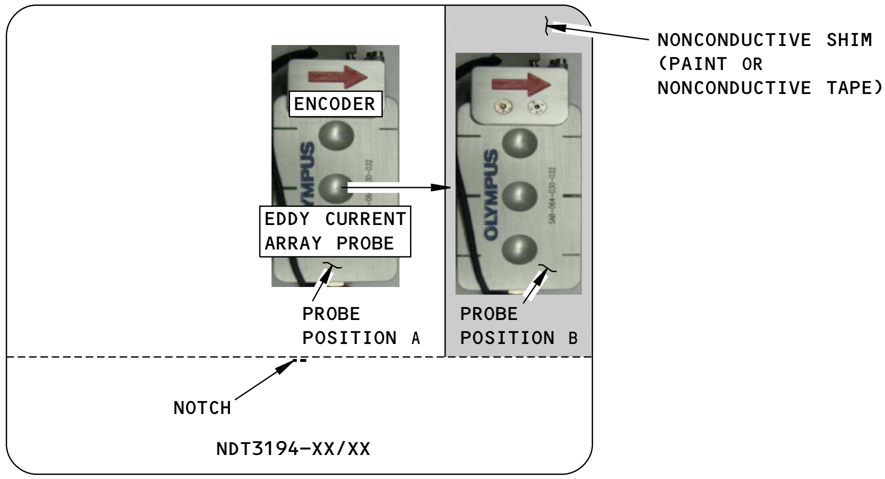
1 BOND THE -1 AND -2 PARTS TOGETHER. MAKE SURE THE EDGE OF THE -2 PART IS 0.04 (1.0) ABOVE THE EDM NOTCH BEFORE THE PARTS ARE BONDED.

2 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER, NDT3194-XX/XX, AT APPROXIMATELY THIS LOCATION. REPLACE XX/XX WITH THE APPLICABLE "A" AND "B" THICKNESSES AS SPECIFIED IN TABLE 1.

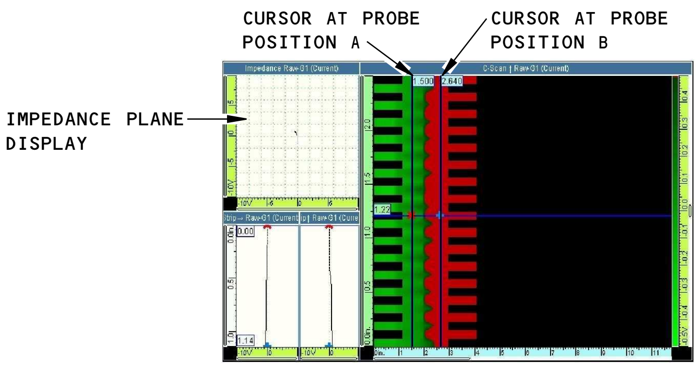
3 EDM NOTCH: LENGTH 0.2 (5)
DEPTH 0.018 (0.45) ±0.001 (0.02)
WIDTH 0.007 (0.18) ±0.001 (0.02)

2231070 S0000497209_V1

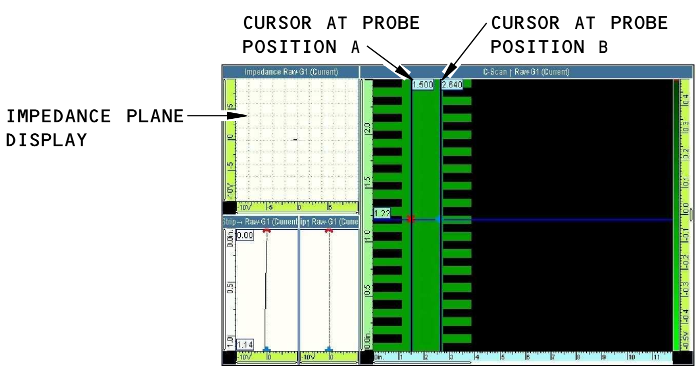
Reference Standard NDT3194-XX/XX
Figure 1



PROBE POSITIONS ON THE REFERENCE STANDARD
DETAIL I



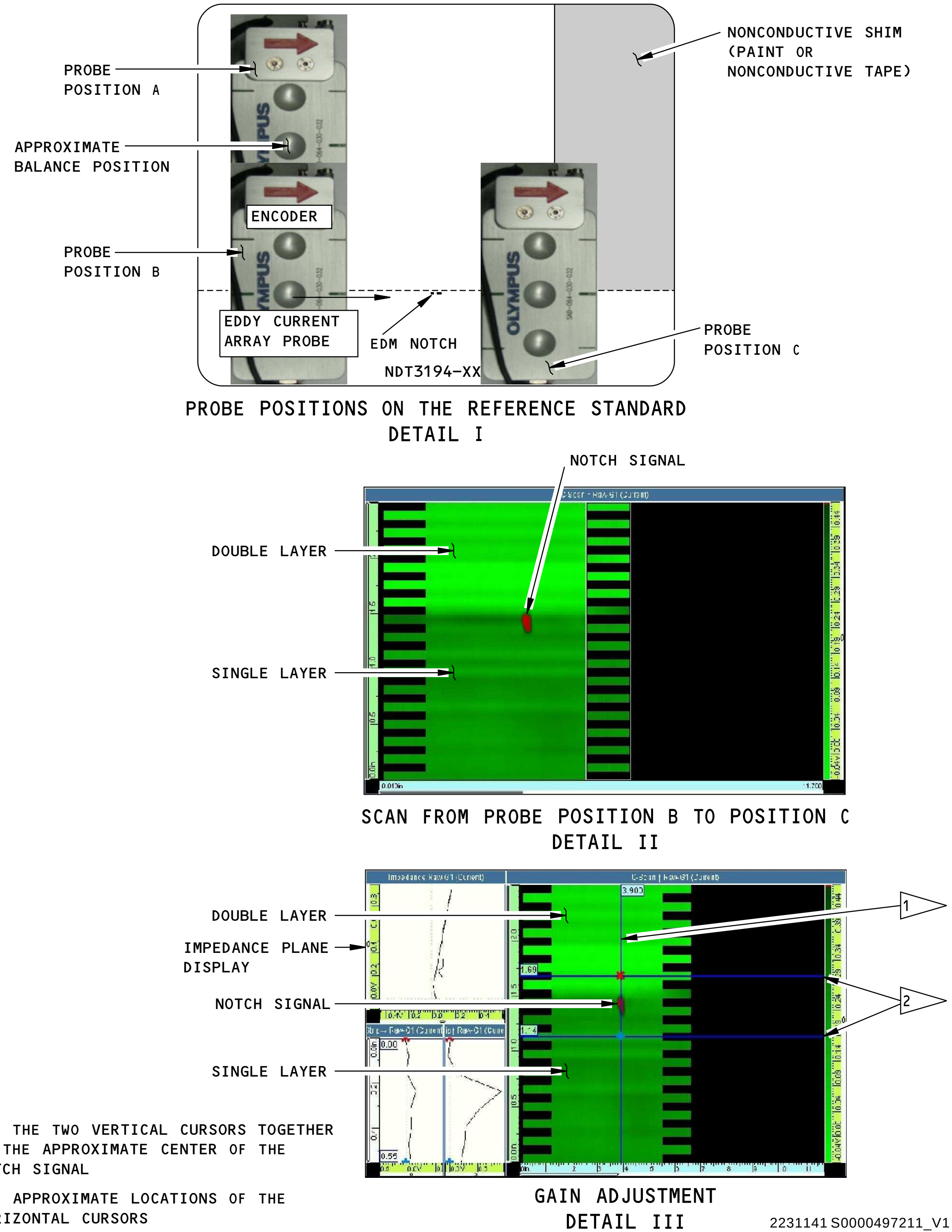
LIFT-OFF - BEFORE NORMALIZATION
DETAIL II



LIFT-OFF - AFTER NORMALIZATION
DETAIL III

2231112 S0000497210_V1

Instrument Calibration - Lift-off Adjustment
Figure 2



NOTES:

1 PUT THE TWO VERTICAL CURSORS TOGETHER IN THE APPROXIMATE CENTER OF THE NOTCH SIGNAL

2 THE APPROXIMATE LOCATIONS OF THE HORIZONTAL CURSORS

2231141 S0000497211_V1

Instrument Calibration - Gain Adjustment
Figure 3

PART 6 - EDDY CURRENT

FUSELAGE SKIN AT THE SECTION 48 BUTT SPLICE FROM BS 1016 TO BS 1042 AT S-9L AND S-9R (LFEC)

1. **Purpose**

   A. Use this low frequency eddy current (LFEC) procedure to examine the fuselage skin for cracks at the Section 48 butt splice. This inspection examines the fuselage skin above and below the butt splice between BS 1016 and BS 1042 at S-9L and S-9R. The fuselage skin is examined for cracks at the 0.1875 inch (4.76 mm) diameter fasteners that are directly above and below the butt splice. See Figure 1 for the inspection areas.

   B. The fuselage skin is aluminum.

   C. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

      (1) Item: 53-80-18-9

      (2) Item: 53-80-18-10

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 an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates from 1 to 3 kHz.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) Phasec 2D/3D; GE Inspection Technologies

         (b) Nortec 500/2000D; Staveley/Olympus

   C. Probes

      (1) Use a reflection type ring probe that:

         (a) Operates from 1 to 3 kHz.

         (b) Has an inner diameter of 0.3 inch (7.6 mm).

         (c) Has a maximum outer diameter of 1.5 inch (38.1 mm).

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

         (a) TEK-4059-08A-TF; Techna NDT

            NOTE: Other probes can be used if they can be calibrated with the reference standard specified in Paragraph 2.D.

            NOTE: Shielded probes are recommended.

   D. Reference Standard

(1) Use reference standard NDT3151, or an equivalent, to help calibrate the instrument. See Figure 2 for data about reference standard NDT3151.

3. Prepare for the Inspection

A. Identify and get access to all of the inspection areas shown in Figure 1.

B. Clean the inspection surfaces.

(1) Remove dirt or grease from the inspection surfaces.

(2) Remove paint only if it is loose.

4. Instrument Calibration

A. Identify the 0.1875 inch (4.76 mm) diameter fastener locations to be examined (see Figure 1).

B. Identify the reference standard and the ring probe positions to use during calibration from Table 1 in Figure 1.

C. Set the instrument frequency between 1 and 3 kHz.

D. Put the ring probe on the reference standard at probe position 1 or 3, as applicable, as shown in Figure 3, Detail II. Adjust the center of the ring probe so it is above the center of the fastener hole.

E. Balance the instrument.

F. Move the center of the ring probe above the fastener as necessary until the height of the signal is at its minimum.

G. Set the balance point at approximately 20% of full screen height (FSH) and 60% of full screen width (FSW) as shown in Figure 3, Detail I.

H. Set the lift-off (phase) so that the signal moves horizontally from right to left when the ring probe is lifted off the reference standard as shown in Figure 3, Detail I.

I. Put the ring probe at probe position 2 or 4, as applicable, as shown in Figure 3, Detail II. Make sure the center of the ring probe is above the center of the fastener.

J. Move the ring probe above the fastener as necessary until the height of the notch signal is at its minimum.

K. Adjust the instrument gain to get a notch signal that is approximately 60% of FSH as shown in Figure 3, Detail I.

L. Make sure the instrument is calibrated correctly:

(1) Put the ring probe on the reference standard at probe position 1 or 3, as applicable, as shown in Figure 3, Detail II.

(2) Move the ring probe above the fastener as necessary until the height of the notch signal is at its minimum.

(3) Balance the instrument.

(4) Put the ring probe on the reference standard at probe position 2 or 4, as applicable, as shown in Figure 3, Detail II.

(5) Move the ring probe above the fastener as necessary until the height of the signal is at its minimum.

M. Do the calibration again, if the signal from the notch is not 60% of FSH.

5. **Inspection Procedure**

A. Calibrate the instrument as specified in Paragraph 4. for the fastener locations to be examined. Figure 1 identifies the fastener locations and Table 1 in Figure 1 identifies the reference standard and probe positions to use during calibration to examine the upper and lower fastener rows.

NOTE: There are two conditions that make it necessary to balance the instrument during the inspection:

(1) When the balance point moves upscale or downscale by 10% of FSH because of a change in the material thickness.

(2) When you start the inspection at the first fastener location after you do a new calibration.

NOTE: Material thickness changes in the inspection area will cause the balance point to gradually increase or decrease during the inspection. Monitor the balance point carefully during the inspection. It is necessary to examine fasteners in sequence that are adjacent to each other to monitor the gradual change to the balance point. If the balance point increases or decreases by 10% of FSH, it is necessary to balance the instrument again.

B. Move the ring probe above the center of the first fastener in the inspection area to be examined.

C. Move the ring probe above the fastener to get the minimum signal from the instrument.

D. Balance the instrument.

E. Put the ring probe above each fastener in the same row that the instrument has been calibrated to examine and monitor the instrument for crack signals. See Figure 1 for the inspection area. During the inspection:

(1) Make a mark at all fastener locations where signals occur that are 40 percent (or more) of FSH.

(2) Monitor the screen display for a possible downscale signal. A downscale signal can occur if you balance the instrument on a crack. If you get a downscale signal from a fastener location, balance the instrument on an adjacent fastener with the same fastener code in the same row and examine the fasteners again.

(3) Do a calibration check as follows if the equipment is changed (a different reference standard is used, for example) or when the inspection is completed.

NOTE: Do not adjust the instrument gain.

(a) Put the ring probe on the reference standard at probe position 1 to examine the upper skin or probe position 3 to examine the lower skin as shown in Figure 3, Detail II.

(b) Move the ring probe above the fastener as necessary until the height of the signal is at its minimum.

(c) Balance the instrument.

(d) Put the ring probe on the reference standard at probe position 2 to examine the upper skin or probe position 4 to examine the lower skin and make sure that the fastener is in the center of the ring probe. Compare the signal you got from the notch during calibration with the signal that you get now.

(e) If the signal you get from the notch has decreased in FSH by 10 percent or more, do the calibration and the inspection again on the fastener locations you have examined since the last calibration check.

F. Do Paragraph 5.A. thru Paragraph 5.E. again to examine the fuselage skin for cracks at the other fastener row of the butt splice.

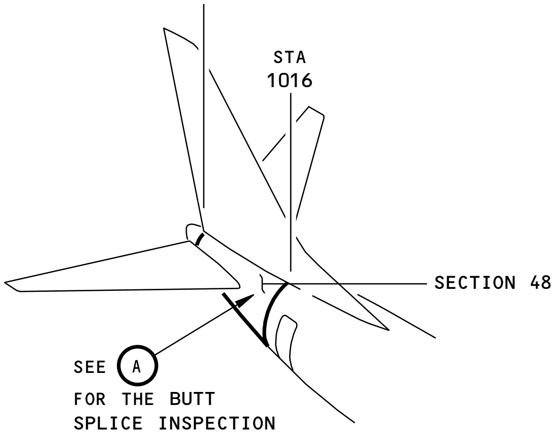
G. Do Paragraph 5.A. thru Paragraph 5.F. again to examine the fuselage skin for cracks at the fastener locations of the butt splice on the opposite side of the airplane.

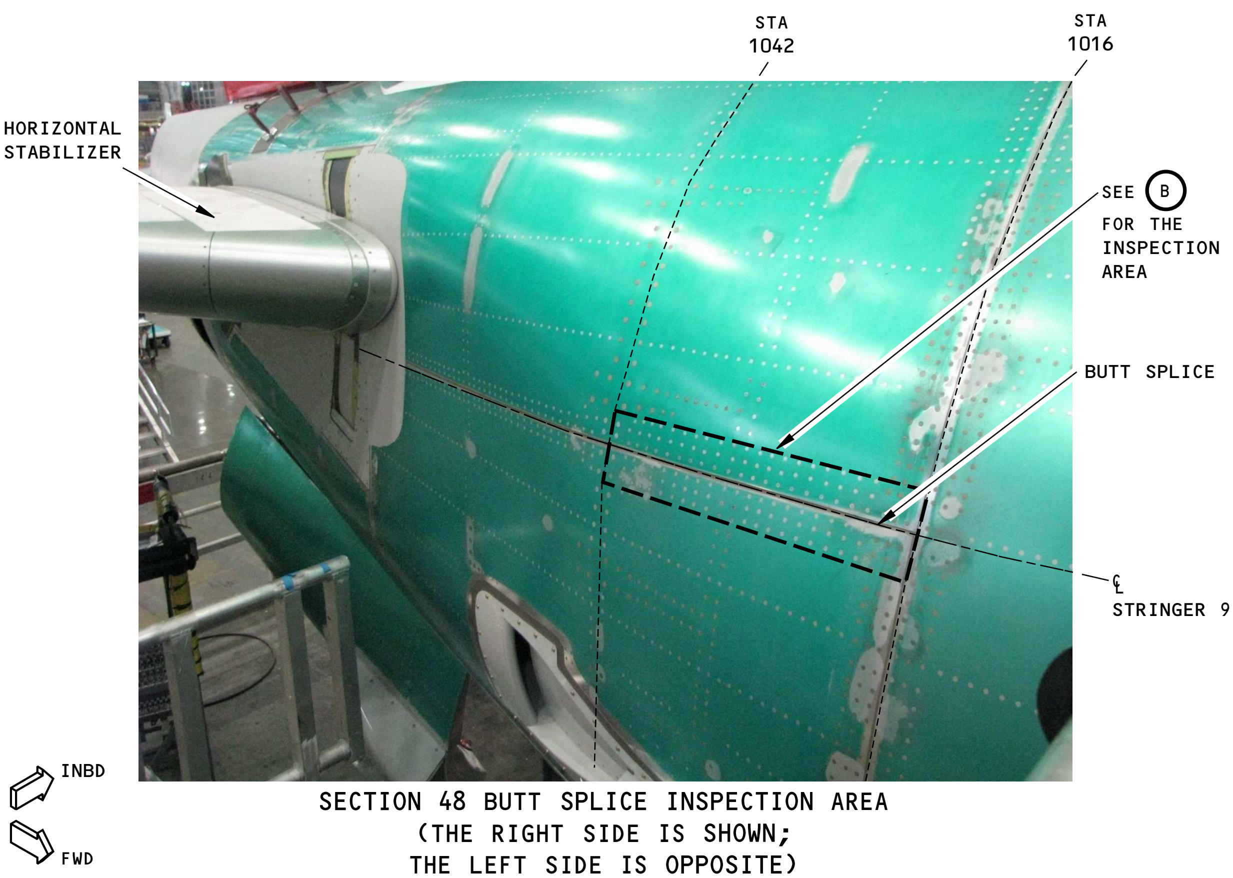
6. Inspection Results

A. A signal that is more than 40 percent of FSH is a sign of a crack. The location that causes this signal to occur must be rejected and more analysis is necessary.

B. Compare the signal that occurs during the inspection to the signal you got from the notch in the reference standard during calibration.

C. Do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 16, at the locations that cause crack signals to occur.



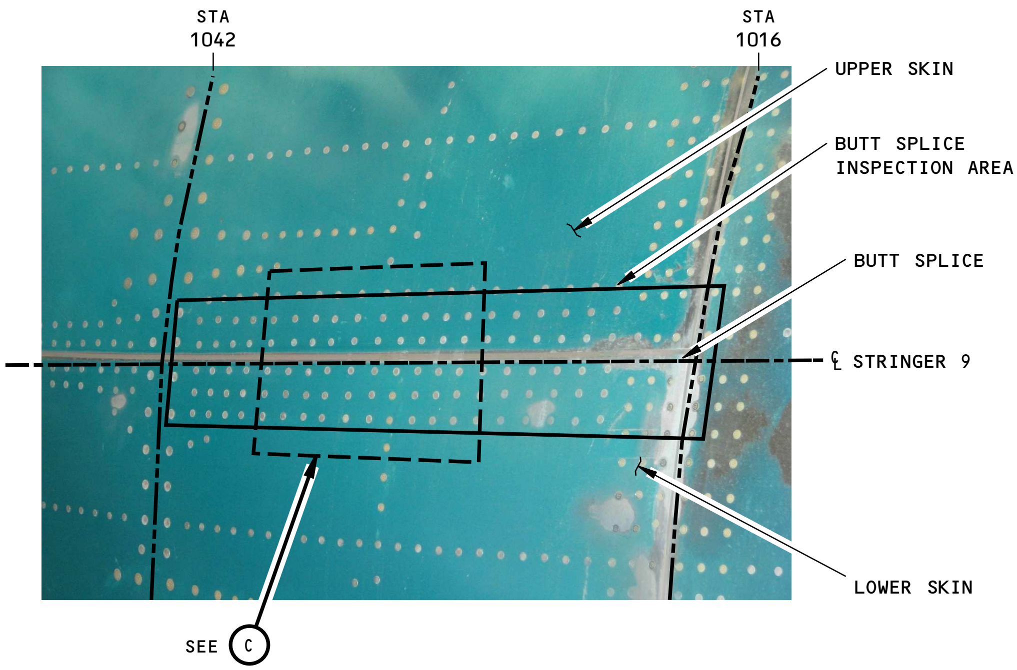


SECTION 48 BUTT SPLICE INSPECTION AREA
(THE RIGHT SIDE IS SHOWN;
THE LEFT SIDE IS OPPOSITE)

A

2283862 S0000515989_V1

Inspection Area
Figure 1 (Sheet 1 of 2)

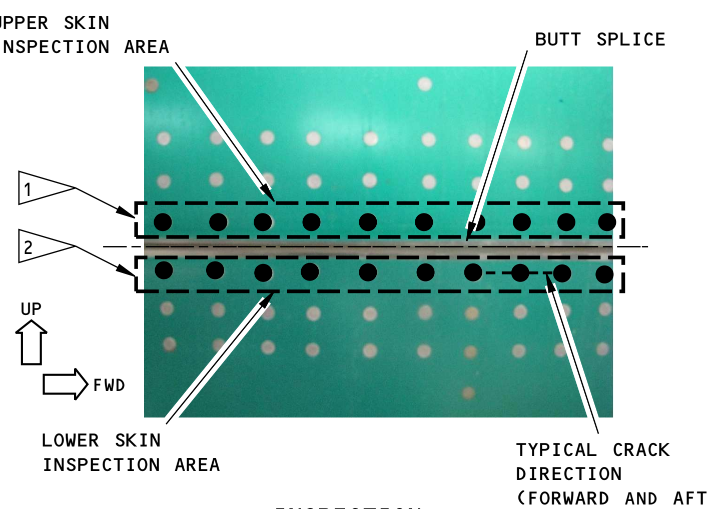


SECTION 48 BUTT SPLICE INSPECTION AREA
(THE RIGHT SIDE IS SHOWN; THE LEFT SIDE IS OPPOSITE)

B

SKIN	UPPER	LOWER
REFERENCE STANDARD	NDT3151	NDT3151
REFERENCE STANDARD PROBE POSITIONS	1 AND 2	3 AND 4

TABLE 1



INSPECTION AREA

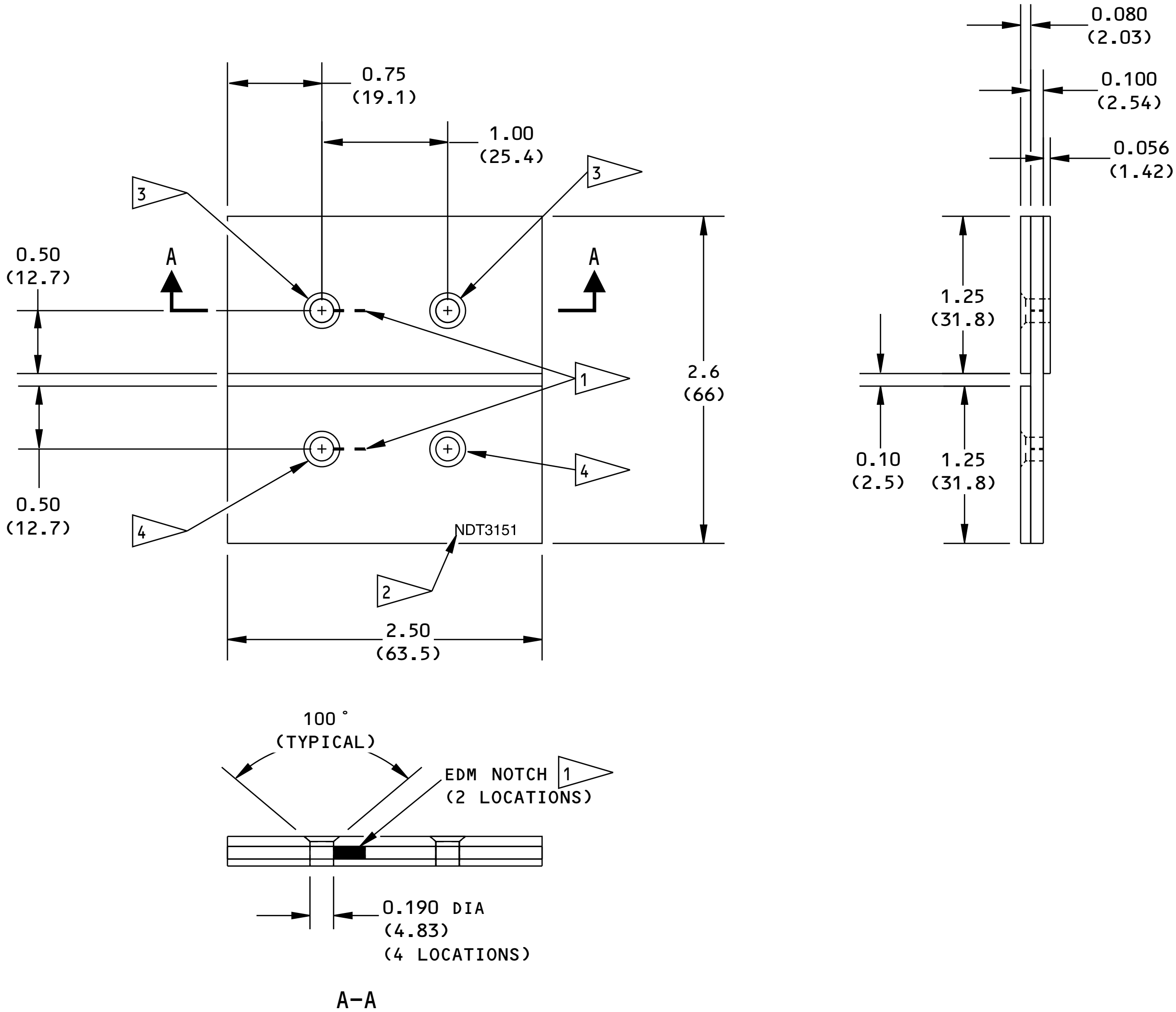
C

NOTES

- ● INSPECTION LOCATION AT THE 0.1875 INCH (4.76 mm) DIAMETER FASTENERS BETWEEN BS 1016 AND BS 1042
- 1 EXAMINE THE UPPER SKIN FOR CRACKS AT THE LOWER FASTENER ROW FROM BS 1016 TO BS 1042
- 2 EXAMINE THE LOWER SKIN FOR CRACKS AT THE UPPER FASTENER ROW FROM BS 1016 TO BS 1042

2284301 S0000515990_V1

Inspection Area
Figure 1 (Sheet 2 of 2)



NOTES

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

INCHES	MILLIMETERS	ANGLES
X.XXX = ±0.005	X.XX = ±0.10	±2 °
X.XX = ±0.025	X.X = ±0.5	
X.X = ±0.050	X = ±1	

- MATERIAL: 2024-T3, T-4 (OPTIONAL: AN AIRPLANE QUALITY ALUMINUM WITH AN ELECTRICAL CONDUCTIVITY BETWEEN 28.5 AND 32% IACS CAN BE USED.)
- SURFACE ROUGHNESS: 63 Ra OR BETTER

1 EDM NOTCH: 0.250 (6.35) LONG X 0.010 (0.254) MAXIMUM WIDTH; THROUGH THE THICKNESS

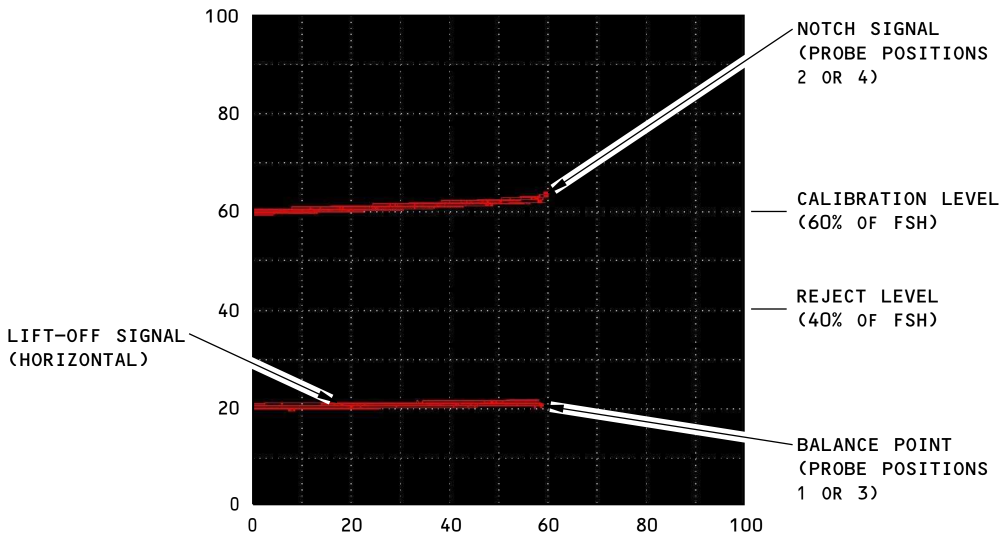
2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3151, AT APPROXIMATELY THIS LOCATION

3 INSTALL A BACR15GF6D6 RIVET IN THIS HOLE

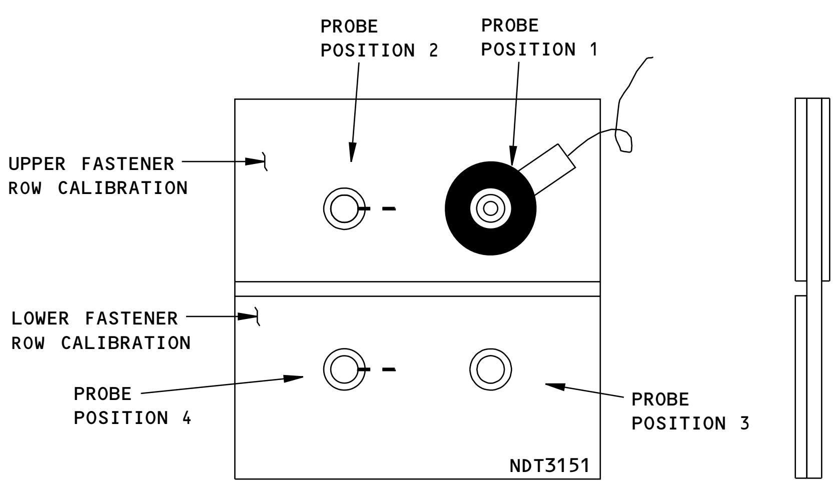
4 INSTALL A BACR15F6D4 RIVET IN THIS HOLE

2284340 S0000515991_V1

Reference Standard NDT3151
Figure 2



IMPEDANCE PLANE DISPLAY
DETAIL I



PROBE POSITIONS FOR CALIBRATION
ON REFERENCE STANDARD NDT3151
DETAIL II

2284460 S0000515992_V1

Instrument Calibration
Figure 3

PART 6 - EDDY CURRENT

WING TO BODY - UPPER AND LOWER DRAG ANGLE ASSEMBLIES (HFEC)

1. **Purpose**

   A. Use this procedure to do surface inspections to find cracks in the upper and lower drag angle assemblies in the wing to body area. See Figure 1 thru Figure 3 for the inspection areas.

      (1) The upper drag angle assembly is between BS 500 and BS 550 and stringers 21 and 22. It is attached to the fuselage in the area that is forward of BS 536 and to the lower skin of the wing center section in the area that is aft of BS 536. The upper drag angle assembly has two titanium angles that are attached together. See Figure 2.

      (2) The lower drag angle assembly is between BS 518 and BS 555 and above stringer 24. It is attached to the fuselage in the area that is forward of BS 536 and to the lower beam of the wing center section in the area that is aft of BS 536. The drag angle assembly has three aluminum angles that are attached together. See Figure 3.

   B. This inspection examines the upper drag angle assembly at the areas that follow:

      (1) Around the fastener heads on the outboard angle and on the outer edge of the inboard angle, where the assembly is attached to the fuselage skin on the forward side of BS 536. See Figure 2, Detail I.

      (2) Around the fastener heads and on the outer radius of the inboard angle, adjacent to the fuselage skin, on the forward side of BS 536. See Figure 2, View A.

      (3) Around the fastener heads on the outboard angle and on the outer edge of the inboard angle, where the assembly is attached to the lower skin of the wing center section, aft of BS 536. See Figure 2, Detail II.

      (4) Around the fastener heads and on the outer radius of the inboard angle, adjacent to the wing skin of the wing center section, on the aft side of BS 536. See Figure 2, View B.

   C. This inspection examines the lower drag angle assembly at the areas that follow:

      (1) Around the fastener heads on the most outboard and middle angles, where the assembly is attached to the fuselage skin, on the forward side of BS 536. See Figure 3, Detail I.

      (2) Around the fastener heads on the most outboard and middle angles, where the assembly is attached to the lower skin of the wing center section, on the aft side of BS 536. See Figure 3, Detail II.

   D. This procedure uses two shielded, right-angle, pencil probes to examine all of the inspection areas shown in Figure 2 and Figure 3 as follows:

      (1) Use a probe with a drop of 0.10 inches (2.5 mm) to examine the outer radius of the inboard angle of the upper drag angle assembly, on the forward and aft sides of BS 536.

      (2) Use a probe with a drop of 0.20 inches (5 mm) to examine around all the fastener heads on the upper and lower drag angle assemblies.

      (3) Use one of the two probes to examine the outer edge of the inboard angle of the upper drag angle assembly.

      (4) Use probes that have a flexible shaft and a length of 5 to 7 inches (127 to 178 mm).

   E. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

(1) Item: 53-30-11-1

(2) Item: 53-30-11-2

(3) Item: 53-30-11-3

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 an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates at a frequency range between 50 kHz and 2 MHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) Phasec 2d; GE Inspection Technologies

(b) Nortec 2000D; Olympus NDT

C. Probes

(1) Use two shielded, right-angle, pencil probes that have a maximum diameter of 0.13 inches (3.2 mm). See Paragraph 1.D. for the correct probe to use for the inspection area to be examined. Refer to Part 6, 51-00-00, Procedure 14 or Part 6, 51-00-00, Procedure 23, paragraph 3, for data about probe selection.

(a) The 0.10 inch (2.5 mm) drop probes that follow were used to help prepare this procedure.

1) TPENFLX91-6/200K-1M; Techna NDT

2) MTF901-60FX-200K-1M; Olympus NDT

(b) The 0.20 inch (5 mm) drop probes that follow were used to help prepare this procedure.

1) TPENFLX920-6/200K-1M; Techna NDT

2) MTF902-60FX-200K-1M; Olympus NDT

D. Reference Standards

(1) To examine the upper drag angle assembly, use reference standards 1002 and 1004 (or an equivalent) as given in Part 6, 51-00-00, Procedure 14, paragraph 3.C.

(2) To examine the lower drag angle assembly, use reference standard 188A (or an equivalent) as given in Part 6, 51-00-00, Procedure 23, paragraph 3.D.

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1 thru Figure 3.

B. Get access to the inspection areas.

(1) Remove the applicable body fairings.

(2) Remove the ram air inlet assemblies and the air ducts that prevent access.

C. Clean the inspection areas. Remove all of the sealant and corrosion preventative coating from around all of the fastener heads, the outer radius and the outer edge of the inboard angle of the upper drag angle assembly.

D. If the surface is rough, make it smooth by approved procedures. It is not necessary to remove paint unless it is loose.

4. Instrument Calibration

A. Calibrate the equipment to examine the upper drag angle assembly as follows:

(1) Refer to Part 6, 51-00-00, Procedure 14, paragraph 5, for the calibration instructions.

(2) Use reference standard 1002 (or an equivalent) and the probe with the 0.10 inch (2.5 mm) drop to examine the outer radius of the inboard angle. To examine the outer edge of the inboard angle, use the probe with the 0.10 inch (2.5 mm) or the probe with the 0.20 inch (5 mm) drop.

(3) Use reference standard 1004 and the titanium bolt (or an equivalent) and the probe with the 0.20 inch (5 mm) drop to examine around all of the fastener heads on the inboard and outboard angles.

B. Calibrate the equipment to examine the lower drag angle assembly as follows:

(1) Refer to Part 6, 51-00-00, Procedure 23, paragraph 5, for the calibration instructions.

(2) Use reference standard 188A and the rivet (or an equivalent) and the probe with the 0.20 inch (5 mm) drop to examine around all of the fastener heads.

5. Inspection Procedure

A. Examine the upper drag angle assembly for cracks at the inspection areas shown in Figure 2 as follows:

(1) To examine the outer radius and the outer edge of the inboard angle, do as follows:

(a) Calibrate the instrument as specified in Paragraph 4.A.(1) and Paragraph 4.A.(2).

(b) Make a complete scan of the outer radius and the outer edge of the inboard angle to examine the inner angle for cracks. Use the fuselage skin as a probe guide as you examine the area forward of BS 536. Use the lower wing skin of the wing center section as a probe guide as you examine the area aft of BS 536.

(c) Refer to Part 6, 51-00-00, Procedure 14, paragraph 6, for the inspection procedure. Refer to paragraph 6.D.(1)(e) to examine near and on the edge of titanium structures.

(2) To examine around all the fastener heads on the inboard and outboard angles, do as follows:

(a) Calibrate the instrument as specified in Paragraph 4.A.(1) and Paragraph 4.A.(3).

(b) Make a complete scan around each fastener head.

(c) Refer to Part 6, 51-00-00, Procedure 14, paragraph 6, for the inspection procedure. Refer to paragraph 6.D.(1)(c) to examine around protruding head fasteners.

B. Examine the lower drag angle assembly at the inspection areas shown in Figure 3 as follows:

(1) Calibrate the instrument as specified in Paragraph 4.B.(1) and Paragraph 4.B.(2).

(2) Make a complete scan around the fastener head.

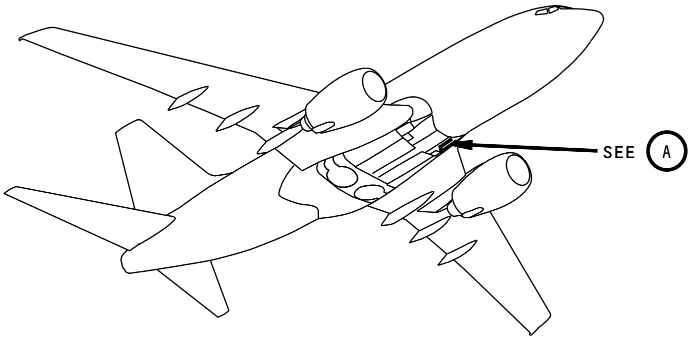
(3) Refer to Part 6, 51-00-00, Procedure 23, paragraph 6, for the inspection procedure. Refer to paragraph 6.E.(3)(c) to examine around protruding head fasteners.

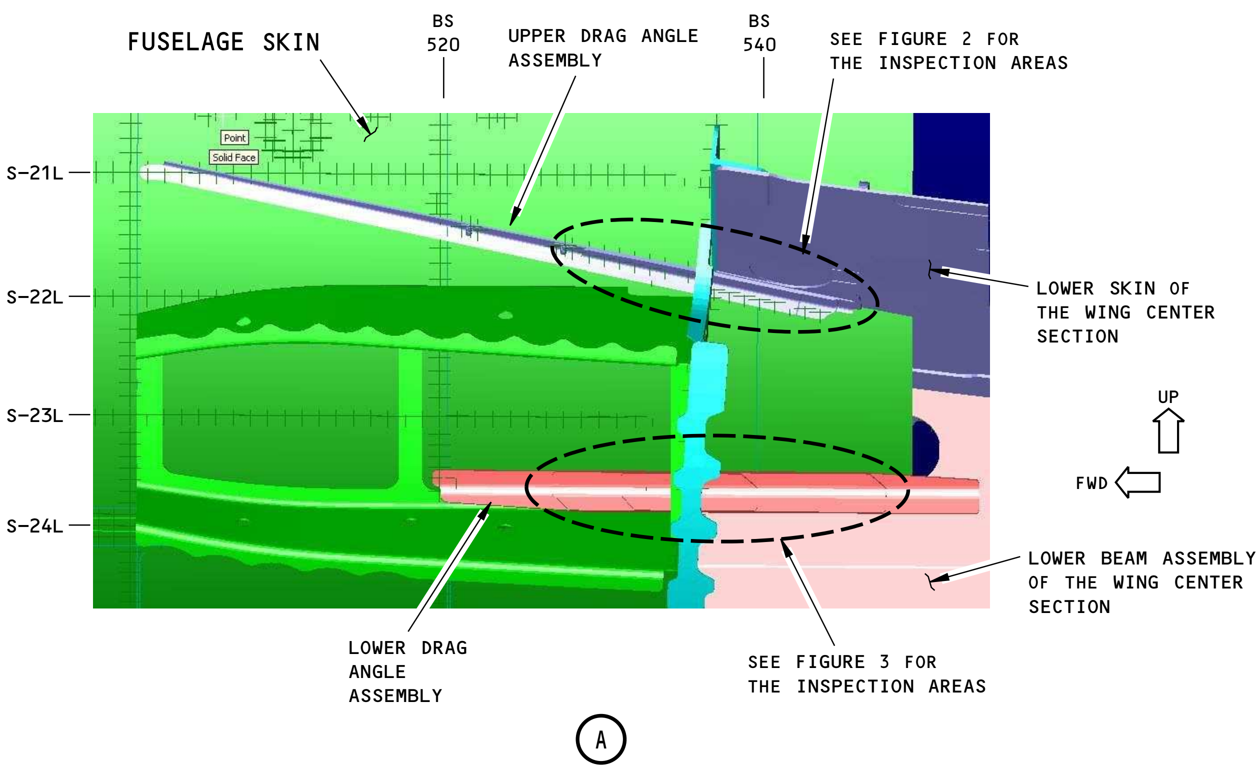
C. Examine the upper and lower drag angle assemblies for cracks on the opposite side of the airplane.

6. **Inspection Results**

A. Refer to Part 6, 51-00-00, Procedure 14, paragraph 7, for instructions to help make an analysis of indications that occur during the inspection of the upper drag angle assembly.

B. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of indications that occur during the inspection of the lower drag angle assembly.





NOTES
- THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS OPPOSITE

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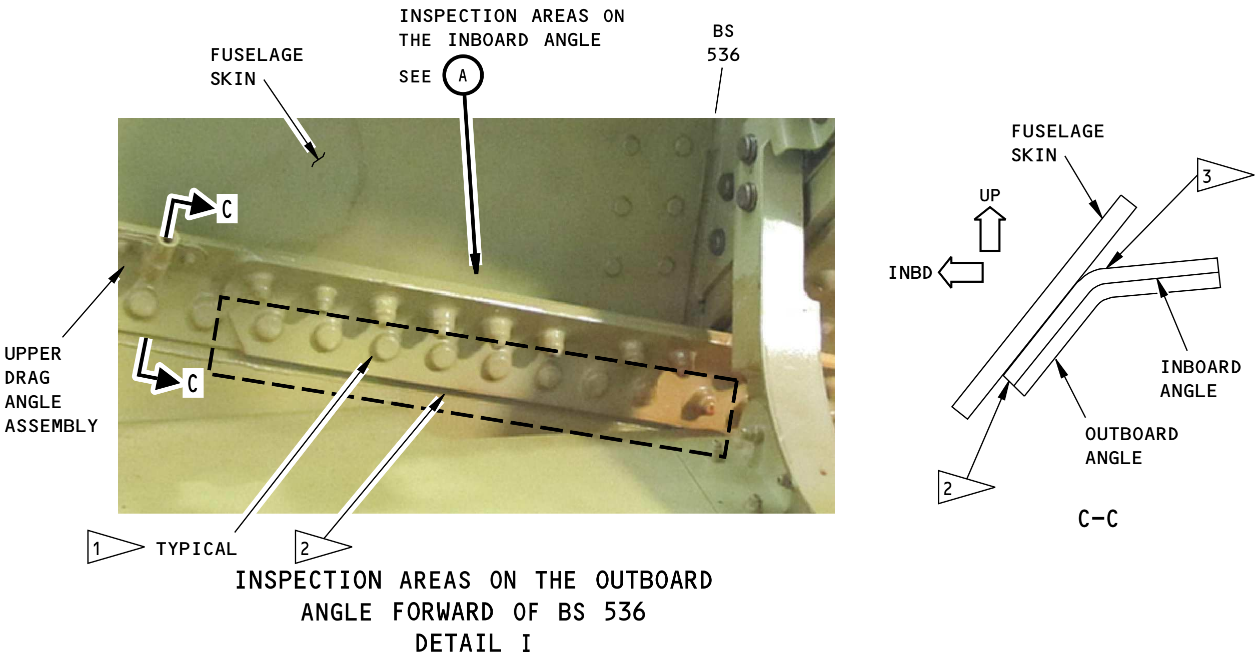
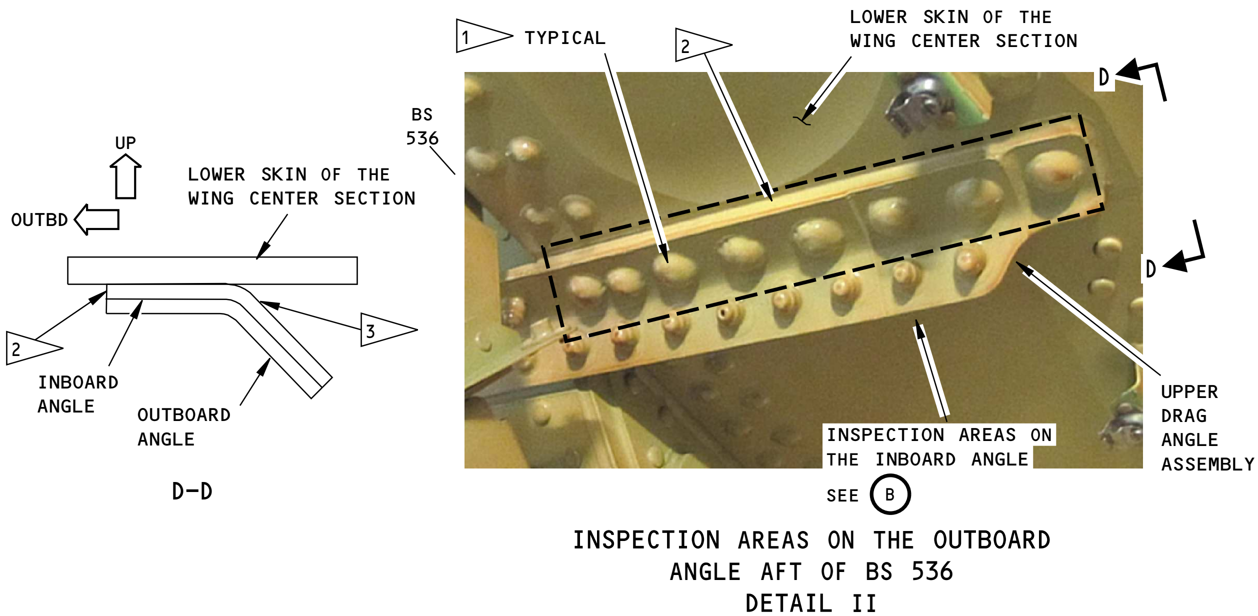
Wing to Body - Upper and Lower Drag Angle Assemblies
Figure 1





NOTES

- INSPECTION AREAS ON THE INBOARD AND OUTBOARD ANGLES OF THE ASSEMBLY.
- 1 MAKE A SCAN AROUND THE FASTENER HEAD.
- 2 MAKE A SCAN ON THE EDGE OF THE INBOARD ANGLE IN THE INSPECTION AREA.
- 3 MAKE A SCAN ON THE OUTER RADIUS OF THE INBOARD ANGLE IN THE INSPECTION AREA.

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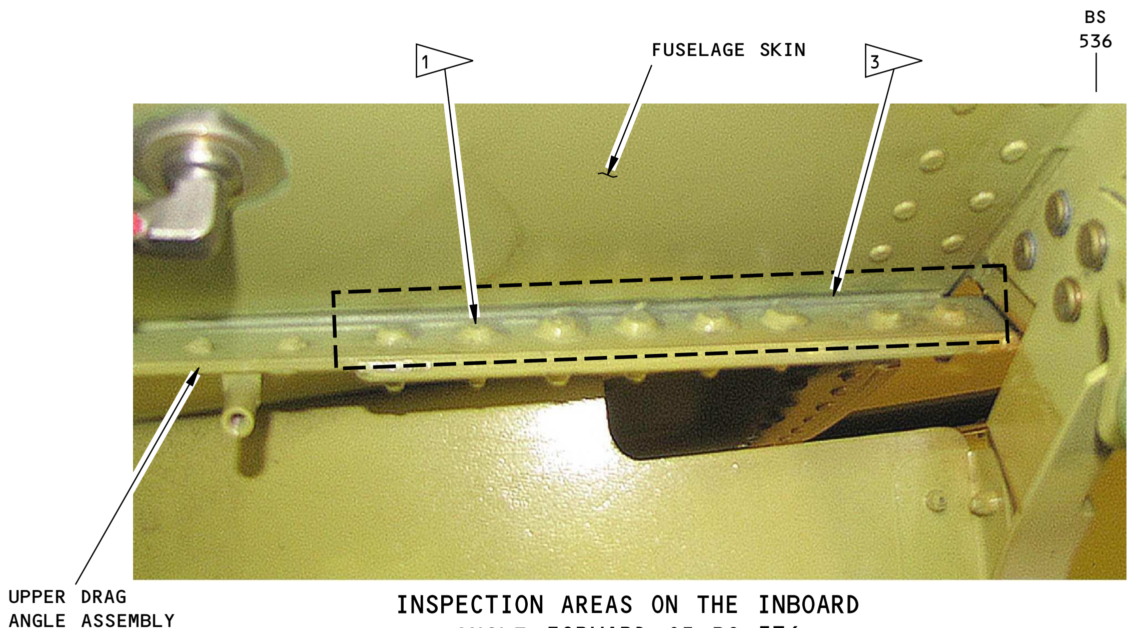
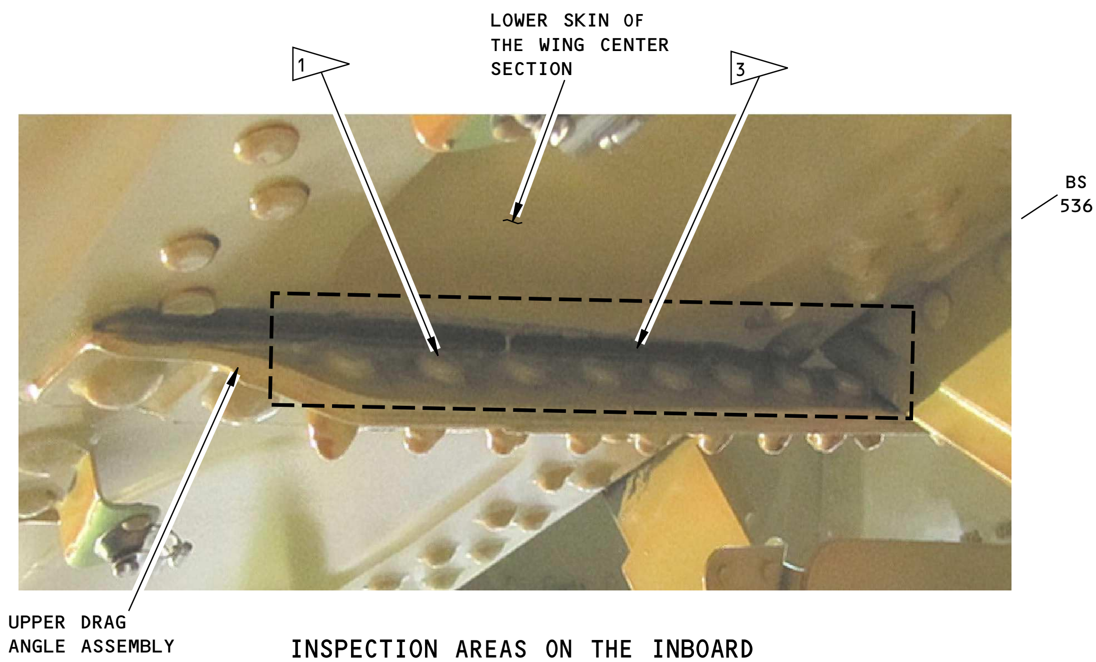
Upper Drag Angle Assembly Inspection Areas
Figure 2 (Sheet 1 of 2)



INSPECTION AREAS ON THE INBOARD
ANGLE FORWARD OF BS 536

A

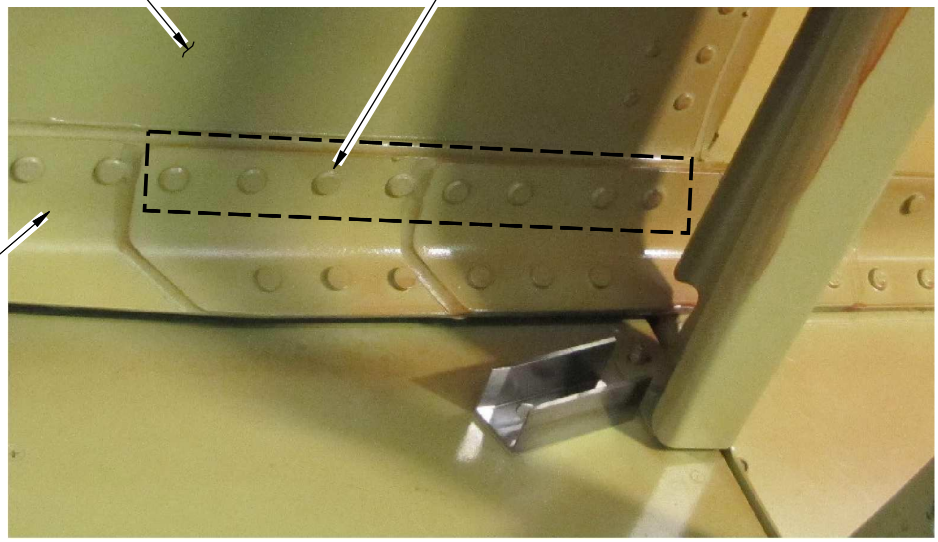


INSPECTION AREAS ON THE INBOARD
ANGLE AFT OF BS 536

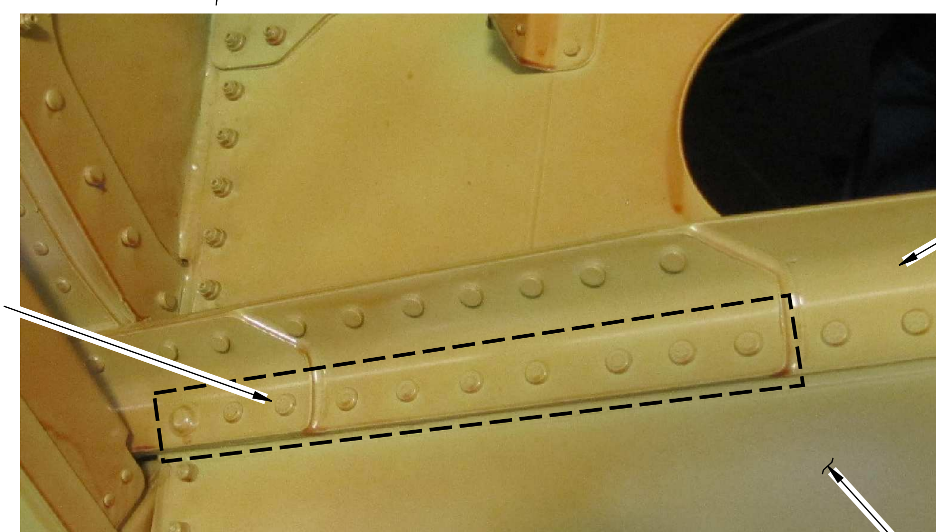
B

2351198 S0000536537_V1

Upper Drag Angle Assembly Inspection Areas
Figure 2 (Sheet 2 of 2)



INSPECTION AREAS FORWARD OF BS 536
DETAIL I



INSPECTION AREAS AFT OF BS 536
DETAIL II

NOTES

- INSPECTION AREAS
- 1 MAKE A SCAN AROUND THE FASTENER HEAD.

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Lower Drag Angle Inspection Areas
Figure 3

PART 6 - EDDY CURRENT

SURFACE INSPECTION OF THE SKIN BEHIND THE SCUFF PLATE AT THE CUTOUT FOR THE FORWARD GALLEY DOOR (HFEC)

1. **Purpose**

   A. Use this procedure to help find surface cracks in the skin that is behind the scuff plate at the cutout for the forward galley door. Also, the skin is examined for cracks around 4 rivets that are adjacent to each end of the scuff plate. The inspection looks for cracks that are along the edge of the skin, around fastener heads, and around open holes. The inspection area is between STA 299 and STA 330. It is necessary to remove the scuff plate to do this inspection. See Figure 1 for the inspection area.

   B. 737 Maintenance Planning Data (MPD) Primary Structural Element (PSE) Reference:

      (1) Item: 53-10-15

   C. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Form Reference:

      (1) Item: 53-10-14-12

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 an eddy current instrument that:

         (a) Has an impedance plane display

         (b) Operates at a frequency range of 50 to 500 kHz.

   C. Probes

      (1) A shielded, straight or right-angled probe is necessary to use to do this inspection.

      (2) The probe diameter at the coil must be 0.130 inch (3.3 mm) or less.

      (3) Refer to Part 6, 51-00-00, Procedure 23, paragraph 3.C, for instructions about probe selection.

      (4) The probe that follows was used to help prepare this procedure.

         (a) MTF905-50; NDT Engineering Corp. (Olympus)

   D. Reference Standards

      (1) To examine the skin around the fastener holes, use reference standard NDT1048, or an equivalent, as given in Part 6, 51-00-00, Procedure 23, paragraph 3.D.

      (2) To examine the skin along the edge of the cutout, use reference standard 126, or an equivalent, as given in Part 6, 51-00-00, Procedure 23, paragraph 3.D.

   E. Special Tools

      (1) Use a nonconductive circle template as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the fastener hole.

      (2) Use a flexible, nonconductive straightedge as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the skin.

3. **Prepare for the Inspection**

A. Identify the inspection areas shown in Figure 1.

CAUTION: BE CAREFUL WHEN YOU REMOVE THE SCUFF PLATES FROM THE AIRPLANE SKIN. TOO MUCH FORCE APPLIED TO THE SCUFF PLATE CAN CAUSE DAMAGE TO THE SKIN.

B. Remove the scuff plate at the galley door cutout to get access to the inspection locations shown in Figure 1. Do not use a tool that could scratch, gouge or damage the skin during removal of the scuff plate.

C. If necessary, lightly sand rough surfaces and sharp edges of chipped paint to make the inspection surfaces smooth. Remove sealant from the inspection area.

D. Fully clean the inspection area.

4. **Instrument Calibration**

A. To examine the skin around the fasteners and fastener holes, calibrate the equipment as specified in Part 6, 51-00-00, Procedure 23, paragraph 5. Use reference standard NDT1048, or an equivalent, during calibration.

B. To examine the skin edge of the cutout, calibrate the equipment as specified in Part 6, 51-00-00, Procedure 23, paragraph 5. Use reference standard 126, or an equivalent, during calibration.

5. **Inspection Procedure**

A. Examine the skin at the cutout of the forward galley door for cracks as specified in Part 6, 51-00-00, Procedure 23, paragraph 6, and the steps that follow:

(1) Examine the skin around the open holes (in the upper row only) where the bolts were removed from the scuff plate. Use a nonconductive circle template as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the fastener hole. During the circular scan, do not let the probe go near the edge of the hole or you can get an edge effect signal. See Figure 1.

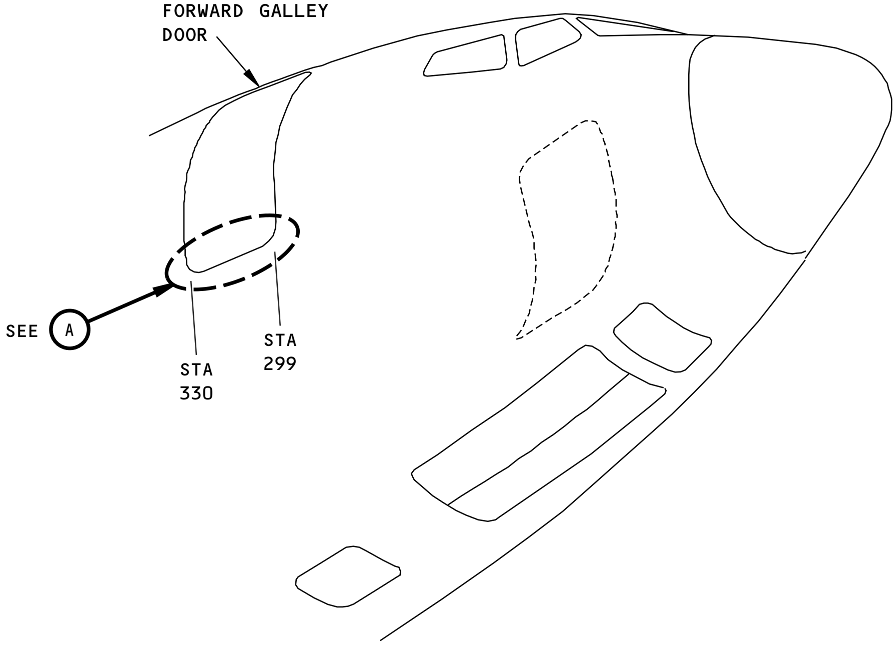
(2) Examine the skin around the fastener heads in the upper row only. Use a nonconductive template as a probe guide to help find 0.10 inch (2.5 mm) long cracks that extend from the edge of the fasteners. See Figure 1.

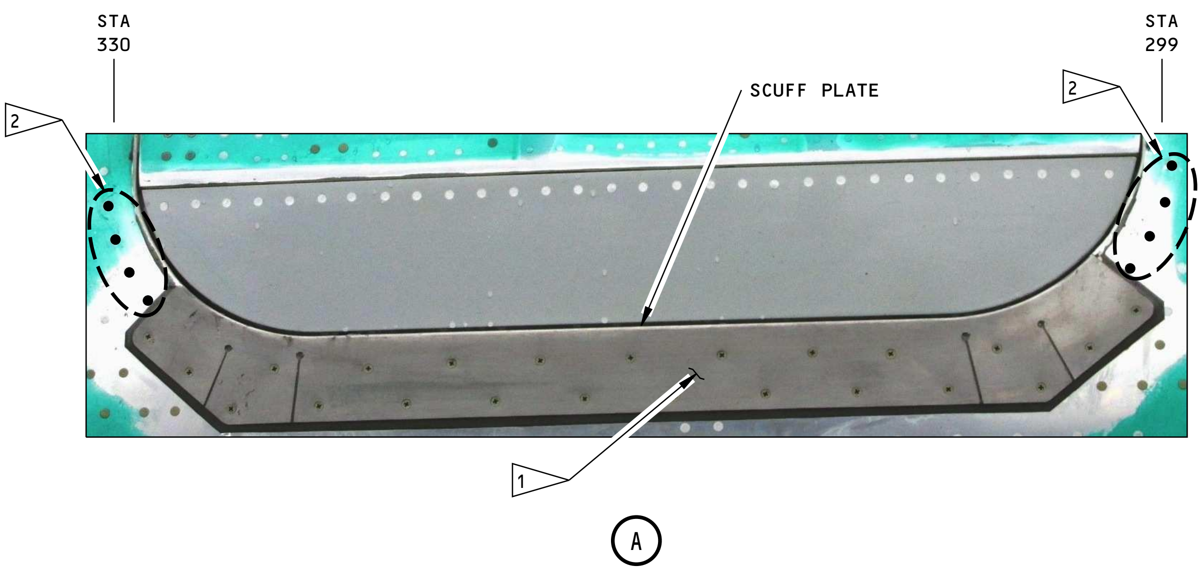
(3) Examine the skin around the rivets that are adjacent to and above the ends of the scuff plate where it was installed. There are 4 rivets above each end of the scuff plate. See Figure 1 and Paragraph 5.A.(2) for scan instructions.

(4) Examine the edge of the skin where the scuff plate was installed. Use a nonconductive, flexible straightedge as a probe guide to keep the probe near the edge of the skin during the scan. See Figure 1 for this inspection location at the edge of the skin.

6. **Inspection Results**

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of indications that occur during the inspection.





NOTES

1 REMOVE THE SCUFF PLATE TO SEE ALL OF THE INSPECTION LOCATIONS IN THE UPPER FASTENER ROW. SEE DETAIL 1 FOR ALL OF THE FASTENERS AND HOLES TO DO A PROBE SCAN AROUND AFTER THE SCUFF PLATE IS REMOVED.

2 DO A PROBE SCAN AROUND THESE 8 RIVETS THAT ARE IMMEDIATELY ABOVE THE ENDS OF THE SCUFF PLATE.

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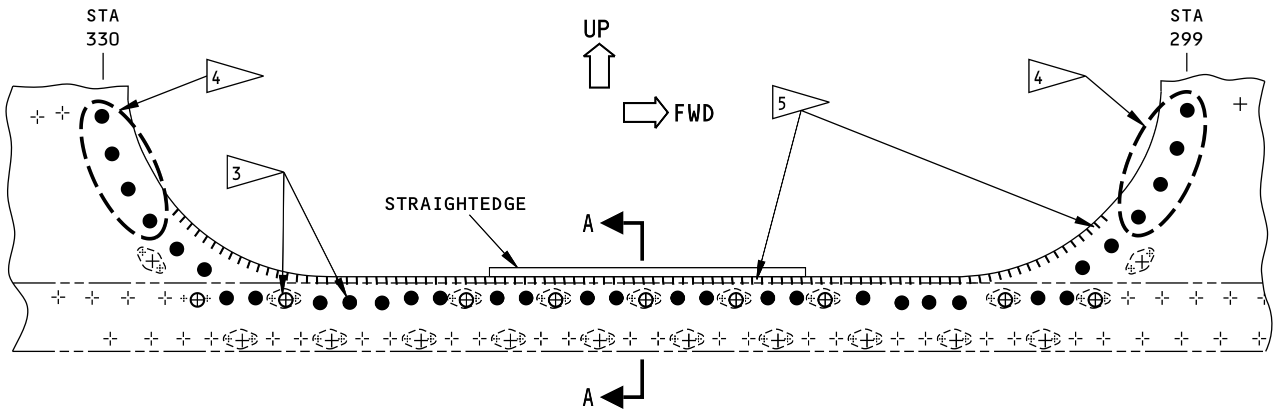
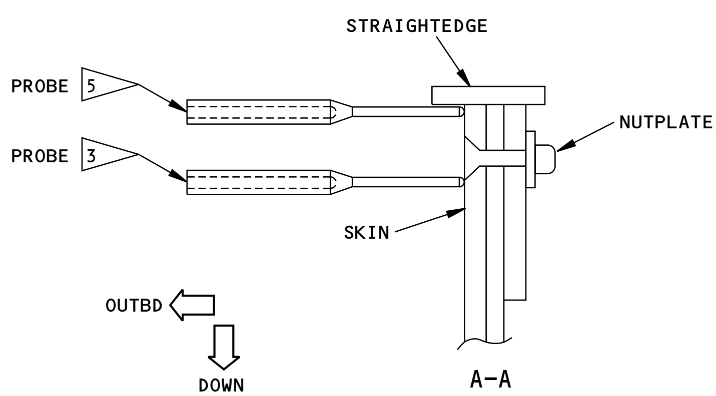
Inspection Area
Figure 1 (Sheet 1 of 2)



DETAIL 1

THIS IS A VIEW OF THE INSPECTION AREA AT THE LOWER GALLEY DOOR CUTOUT WITH THE SCUFF PLATE REMOVED



A-A

NOTES

- FASTENER INSPECTION LOCATIONS
- NUTPLATE INSPECTION LOCATION (NINE LOCATIONS) - EXAMINE AROUND THE OPEN HOLES FOR CRACKS AT THESE LOCATIONS
- NUTPLATE LOCATION NOT EXAMINED

3 DO A CIRCULAR PROBE SCAN AROUND ALL OF THE FASTENER HEADS (SHOWN BY BLACK DOTS) AND AROUND ALL OF THE OPEN HOLES AT THE NUTPLATE INSPECTION LOCATIONS. USE A CIRCLE TEMPLATE DURING THE CIRCULAR PROBE SCANS. THE LOWER ROW OF FASTENERS ARE NOT INCLUDED IN THE INSPECTION AREA.

4 DO A CIRCULAR SCAN AROUND THESE 8 RIVET HEADS THAT ARE IMMEDIATELY ABOVE THE ENDS OF WHERE THE SCUFF PLATE WAS INSTALLED.

5 PUT THE PROBE AT THE EDGE OF THE SKIN AT THE CUTOUT AND USE A FLEXIBLE STRAIGHTEDGE TO DO A SCAN ALONG THE EDGE OF THE SKIN. THIS INSPECTION AREA IS SHOWN BY THE DASH MARKS. THE COMPLETE SCAN LENGTH IS ALONG THE SKIN EDGE WHERE THE SCUFF PLATE WAS INSTALLED.

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Inspection Area
Figure 1 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

FUSELAGE SKIN BEHIND THE STRAP AT THE SIDE OF BODY (LFEC)

1. **Purpose**

   A. Use this low frequency eddy current (LFEC) procedure to examine the skin that is behind the strap at stringer 18 for subsurface cracks. The skin is examined at the side of body area, from BS 717 thru BS 727, for subsurface cracks that can start at fastener holes. See Figure 1 for the inspection area.

   B. This procedure uses an impedance plane display instrument.

   C. The skin is aluminum.

   D. 737 Maintenance Planning Data (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

      (1) Item: 53-40-11-1

2. **Equipment**

   A. General

      (1) Use inspection equipment that can be calibrated on the reference standard as specified in Part 6, 51-00-26.

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

   B. Instrument

      (1) Use an eddy current instrument that has an impedance plane display.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) 500D; Olympus NDT

         (b) Phasec 2D/3D; GE Inspection Technologies.

   C. Probes

      (1) Use a reflection spot probe with a maximum diameter of 0.35 inch (8.9 mm) that can operate between 400 Hz and 2 kHz.

   D. Reference Standard

      (1) Use reference standard ANDT1053 and ANDT1056 as shown in Part 6, 51-00-26, Table 2.

3. **Prepare for the inspection**

   A. Identify the inspection area shown in Figure 1.

   B. Remove the wing-to-body fairings.

   C. Clean the inspection area as necessary.

      (1) Remove paint only if it is loose.

      (2) Remove sealant between the fasteners as necessary.

4. **Instrument Calibration**

   A. To examine the different areas of the skin that are behind the strap, it is necessary to use two different probe frequencies and calibrations.

   B. Calibrate the instrument to examine the fuselage skin that is behind the strap at stringer 18 from BS 717 to BS 719 as follows. See Figure 1, flagnote 1, for the inspection area.

(1) Use reference standard ANDT1056.

(a) Use fastener C on the reference standard.

(2) Set the instrument frequency to 400 Hz.

(3) Calibrate the instrument as specified in Part 6, 51-00-26, paragraph 4.

C. Calibrate the instrument to examine the fuselage skin that is behind the strap at stringer 18 from BS 720 to BS 727 as follows. See Figure 1, flagnote 2, for the inspection area.

(1) Use reference standard ANDT1053.

(a) Use fastener C on the reference standard.

(2) Set the instrument frequency to 1.3 kHz.

(3) Calibrate the instrument as specified in Part 6, 51-00-26, paragraph 4.

5. Inspection Procedure

A. Examine the fuselage skin behind the strap at stringer 18 for cracks from BS 717 to 719 as specified in Part 6, 51-00-26, paragraph 5, and the steps that follow:

(1) Calibrate the instrument as specified in Paragraph 4.B.

(2) Make a scan between the fasteners as shown in Figure 1, flagnote 1.

(a) Remove sealant if the sealant does not let the probe touch the strap.

B. Examine the fuselage skin behind the strap at stringer 18 for cracks from BS 720 to 727 as specified in Part 6, 51-00-26, paragraph 5, and the steps that follow:

(1) Calibrate the instrument as specified in Paragraph 4.C.

(2) Make a scan between the fasteners as shown Figure 1, flagnote 2.

(a) Remove sealant if the sealant does not let the probe touch the strap.

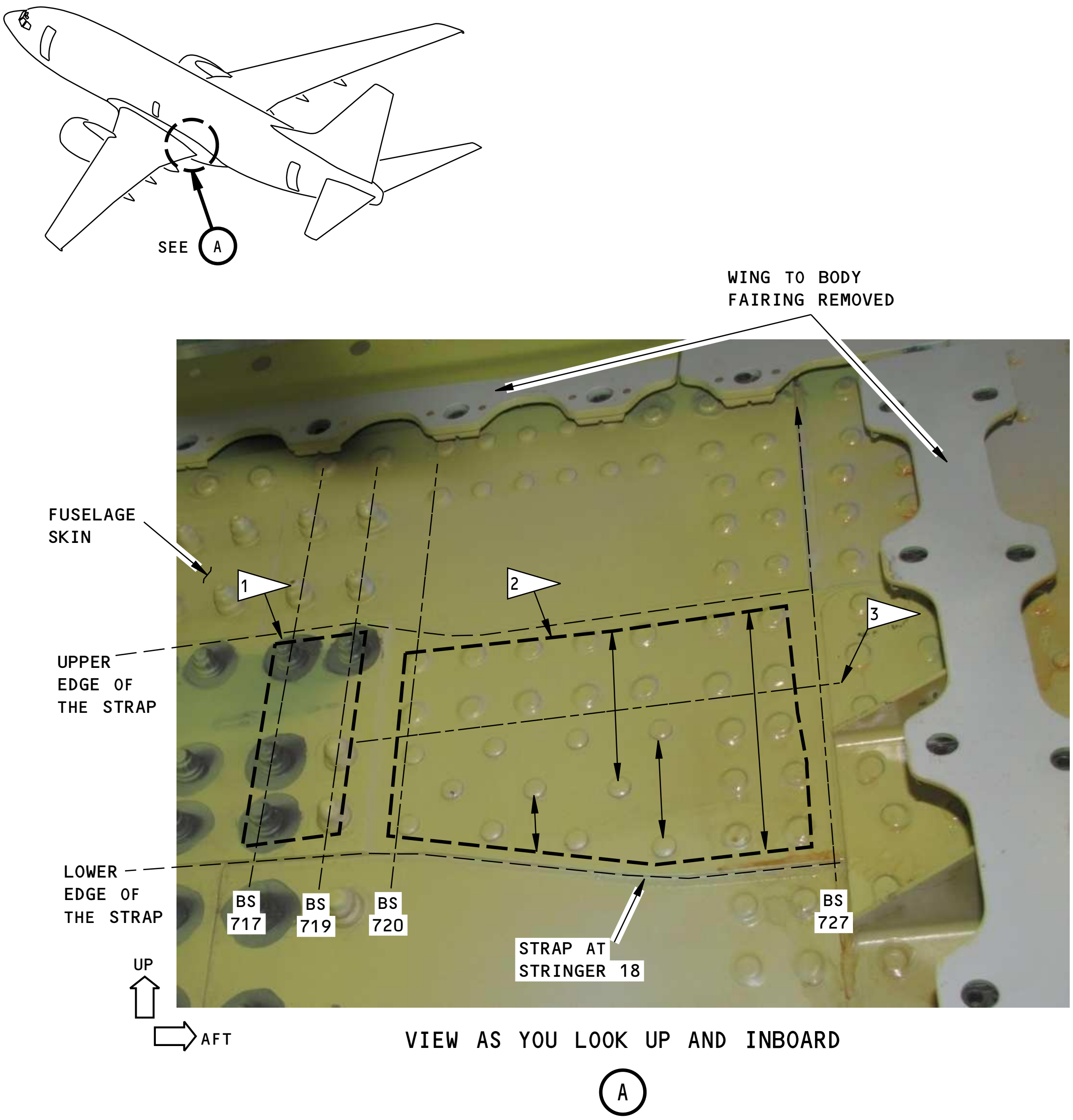
C. Do Paragraph 5.A. and Paragraph 5.B. again to examine the skin for cracks on the other side of the fuselage.

6. Inspection Results

A. Signals that are 40% (or more) of full screen height are indications of cracks.

B. Refer to Part 6, 51-00-26, paragraph 6, for instructions to help make an analysis of the indications that occur during the inspection.

C. To make sure a crack signal is from a crack, do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 1, Part 6, 51-00-00, Procedure 11, or Part 6, 51-00-00, Procedure 16, at the fastener locations that cause these signals to occur.



NOTES

- SCAN DIRECTION
- THE STRAP ON THE LEFT SIDE OF THE AIRPLANE IS SHOWN; THE STRAP ON THE RIGHT SIDE OF THE AIRPLANE IS THE SAME.

1 INSPECTION AREA. MAKE A SCAN BETWEEN ALL FASTENERS IN THIS AREA WITH A 400 HZ PROBE AND INSTRUMENT FREQUENCY. DO THE SCANS IN THE DIRECTION OF THE ARROWS.

2 INSPECTION AREA. MAKE A SCAN BETWEEN ALL FASTENERS IN THIS AREA WITH A 1.3 KHZ PROBE AND INSTRUMENT FREQUENCY. DO THE SCANS IN THE DIRECTION OF THE ARROWS.

3 LOWER EDGE OF THE STIFFENER THAT IS BELOW THE FUSELAGE SKIN.

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Inspection Area
Figure 1

PART 6 - EDDY CURRENT

INSPECTION OF THE INBOARD SKIN OF THE LAP SPLICE (LFEC)

1. **Purpose**

A. Use this procedure to examine the inboard skin of the lap splice along the lower row of fasteners.

B. This procedure can be used to examine inboard skins with Alodine or anodized fasteners.

C. This procedure is done from the external side of the airplane at the lap splices. See Figure 1 for the typical inspection areas along the lower row of fasteners. This procedure will find cracks at tear strap locations and between tear straps.

D. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

(1) Item: 53-10-03-2

(2) Item: 53-10-03-2a

(3) Item: 53-10-03-4

(4) Item: 53-10-03-5

(5) Item: 53-30-04-2

(6) Item: 53-30-04-2a

(7) Item: 53-30-04-6

(8) Item: 53-30-04-6a

(9) Item: 53-30-04-7

(10) Item: 53-40-03-2

(11) Item: 53-40-03-2a

(12) Item: 53-60-04-2

(13) Item: 53-60-04-2a

(14) Item: 53-60-04-6

(15) Item: 53-60-04-6a

(16) Item: 53-60-04-7

(17) Item: 53-70-03-2

(18) Item: 53-70-03-4

E. This procedure uses a sliding probe and an impedance plane display instrument that can operate in a dual frequency mode (see Part 6, 53-30-00, Procedure 9). In some inspection areas it is necessary to use a low frequency eddy current (LFEC) ring probe.

F. You cannot do this procedure at a location where the fastener is magnetic (steel) or if a fastener has a protruding head. If a fastener is magnetic or has a protruding head, you must do one of the procedures that follow:

(1) Do an external inspection as shown in Part 6, 53-30-14, but only if the fastener has been oversized from the size specified in the production drawings.

(2) Do an open hole inspection as specified in Part 6, 51-00-00, Procedure 16.

G. The sliding probe must be accurately aligned with the fastener centerline to do this procedure correctly. For accurate alignment, the use of a probe guide is mandatory. If two inspectors do the inspection, a probe guide is not mandatory if one inspector carefully monitors the probe alignment.

H. This procedure applies to many airplane models. Table 1 identifies the Figure 1 sheet numbers that are applicable to each airplane model to be examined.

2. Equipment

A. For the inspection areas that use dual frequency with a sliding probe:

(1) Refer to Part 6, 53-30-00, Procedure 9, paragraph 3, for the instruments, probes and special tools to use.

(2) Reference Standard

(a) Use the applicable NDT1087-X reference standard with probe guide NDT1087-P1. Figure 1 identifies the reference standard to use for the different inspection locations. Refer to Part 6, 53-30-00, Procedure 9, for data about the reference standards and probe guide.

B. For the inspection areas that use low frequency with a ring probe:

(1) General

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

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

(2) Instrument

(a) Use an eddy current instrument that:

1) Has an impedance plane display.

2) Operates from 600 Hz to 1.5 kHz.

(b) The instruments that follow were used to help prepare this procedure.

1) Phasec 2D/3D; GE Inspection Technologies

2) Olympus 500D/600D; Olympus NDT

(3) Probes

(a) Use a reflection type ring probe that:

1) Operates from 600 Hz to 1.5 kHz.

2) Has a minimum inner diameter of 0.30 inch (7.6 mm).

3) Has a maximum inner diameter of 0.45 inch (11.4 mm).

(b) The ring probes that follow were used to help prepare this procedure.

NOTE: Other probes can be used if they can be calibrated with the reference standard specified in Paragraph 2.B.(4)(a).

NOTE: Shielded probes are recommended.

1) ARP-.37-.84/2KHz; Aerofab NDT

2) RDP .8/.4-200H; Techna NDT

(4) Reference Standard

(a) Use reference standard NDT3229 to help calibrate the instrument. See Figure 2 for data about reference standard NDT3229.

3. **Prepare for the Inspection**

A. For the inspection areas that use dual frequency with a sliding probe:

(1) Refer to Part 6, 53-30-00, Procedure 9, paragraph 4, for the instructions to help prepare for the inspection.

B. For the inspection areas that use low frequency with a ring probe:

(1) Identify and get access to all of the inspection areas shown in Figure 1.

(2) Clean the inspection surfaces.

(a) Remove dirt or grease from the inspection surface.

(b) Remove paint only if it is loose.

4. **Instrument Calibration**

A. For the inspection areas that use dual frequency with a sliding probe:

(1) Refer to Part 6, 53-30-00, Procedure 9, paragraph 5, for the instrument calibration instructions.

B. For the inspection areas that use low frequency with a ring probe:

(1) Set the instrument frequency to 1 kHz.

(2) Put the ring probe on the reference standard at probe position 1 as shown in Figure 3, Detail II. Adjust the center of the probe so that it is above the center of the fastener hole.

(3) Balance the instrument.

(4) Move the center of the probe above the fastener hole as necessary until the height of the signal is at its minimum.

(5) Set the balance point at approximately 20% of full screen height (FSH) and 60% of full screen width (FSW) as shown in Figure 3, Detail I.

(6) Set the lift-off (phase) so that the signal moves horizontally from right to left when the probe is lifted off the reference standard as shown in Figure 3, Detail I.

(7) Put the ring probe at probe position 2 as shown in Figure 3, Detail II. Make sure the center of the probe is above the center of the fastener hole.

(8) Move the center of the probe above the fastener hole as necessary until the height of the notch signal is at its minimum.

(9) Adjust the instrument gain to get a notch signal that is approximately 60% of FSH as shown in Figure 3, Detail I.

(10) Make sure the instrument is calibrated correctly:

(a) Put the probe on the reference standard at probe position 1 as shown in Figure 3, Detail II.

(b) Move the probe above the fastener hole as necessary until the height of the notch signal is at its minimum.

(c) Balance the instrument.

(d) Put the probe on the reference standard at probe position 2 as shown in Figure 3, Detail II.

(e) Move the probe above the fastener hole as necessary until the height of the signal is at its minimum.

(f) If the minimum signal from the notch is not 60% of FSH then do the calibration again.

5. **Inspection Procedure**

A. For the inspection areas that use dual frequency with a sliding probe:

(1) Calibrate the instrument as specified in Part 6, 53-30-00, Procedure 9, paragraph 5.

(2) Examine the applicable inspection areas as specified in Part 6, 53-30-00, Procedure 9, paragraph 6.

B. For the inspection areas that use low frequency with a ring probe:

(1) Calibrate the instrument as specified in paragraph 4 for inspection areas where use of the ring probe is necessary. Figure 1 identifies the inspection areas where use of the ring probe is necessary.

NOTE: Make sure to balance the instrument each time you examine fastener locations in a different fuselage section.

(2) Move the center of the probe above the center of the first fastener in the inspection area to be examined.

(3) Move the probe above the fastener to get the minimum signal from the instrument.

(4) Balance the instrument.

(5) Put the ring probe above each fastener in the same inspection area and monitor the instrument for crack signals. See Figure 1 for the inspection area. During the inspection:

(a) Make a mark at all fastener locations where signals occur that are 40 percent (or more) of FSH.

(b) Do a calibration check as follows if the equipment is changed or when the inspection for an area has been completed.

NOTE: Do not adjust the instrument gain.

1) Put the probe on the reference standard at probe position 1 as shown in Figure 3, Detail II.

2) Move the center of the probe above the fastener hole as necessary until the height of the signal is at its minimum.

3) Balance the instrument.

4) Put the probe on the reference standard at probe position 2 and make sure that the fastener is in the center of the probe. Compare the signal you got from the notch during calibration with the signal that you get now.

5) If the signal you get from the notch has decreased in FSH by 10 percent or more, do the calibration and the inspection again on the fastener locations you have examined since the last calibration check.

(6) Do Paragraph 5.B.(1) thru Paragraph 5.B.(5) again for each inspection area to be examined.

6. **Inspection Results**

A. For the inspection areas that use dual frequency with a sliding probe:

(1) Refer to Part 6, 53-30-00, Procedure 9, paragraph 7, for instructions to help make an analysis of indications that occur during the inspection.

B. For the inspection areas that use low frequency with a ring probe:

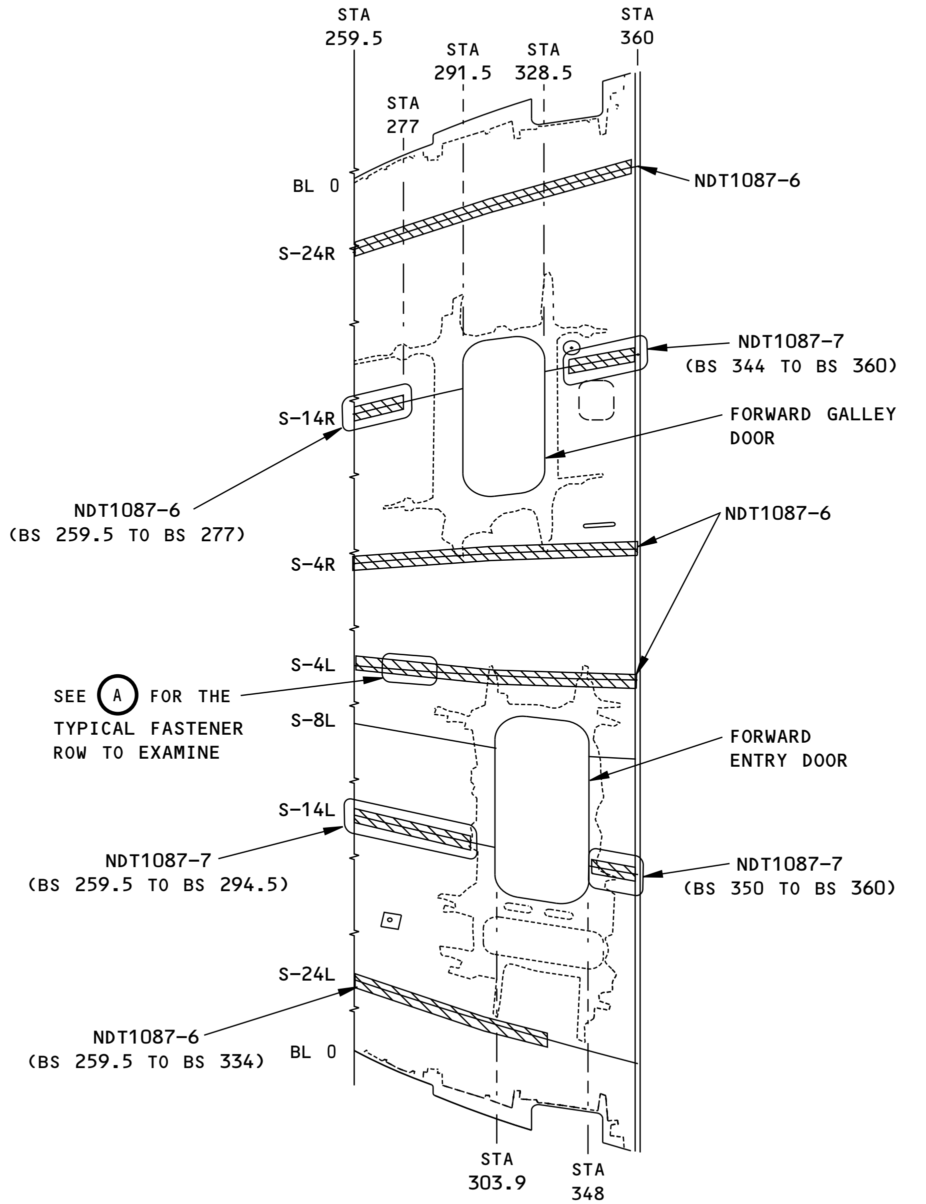
(1) A signal that is more than 40 percent of FSH is a sign of a crack. An area that causes this signal to occur must be rejected and more analysis is necessary.

(2) Compare the signal that occurs during the inspection to the signal you got from the notch in the reference standard during calibration.

(3) If crack indications are found, do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 16.

Table 1: FIGURE 1 SHEET NUMBERS APPLICABLE TO AIRPLANE MODELS

MODEL	41 Section	43/44 Sections	46/47 Sections
737-600	Sheet 1	Sheet 5	Sheets 11, 14, 15
737-700	Sheet 1	Sheet 5	Sheets 11, 14, 15
737-700IGW	Sheet 1	Sheet 5	Sheets 12, 14, 15
737-700C	Sheets 2, 3, 4	Sheets 7, 9, 10	Sheets 13, 14, 15
737-800	Sheet 1	Sheets 6, 8	Sheets 12, 14, 15
737-900	Sheet 1	Sheets 6, 8	Sheets 12, 14, 15
737-900ER	Sheet 1	Sheets 6, 8	Sheets 12, 14, 15



SECTION 41
737-600/700/700IGW/800/900/900ER
FUSELAGE SKIN LAP SPLICE LOCATIONS FROM BS 259.5 TO BS 360
(PLAN VIEW)

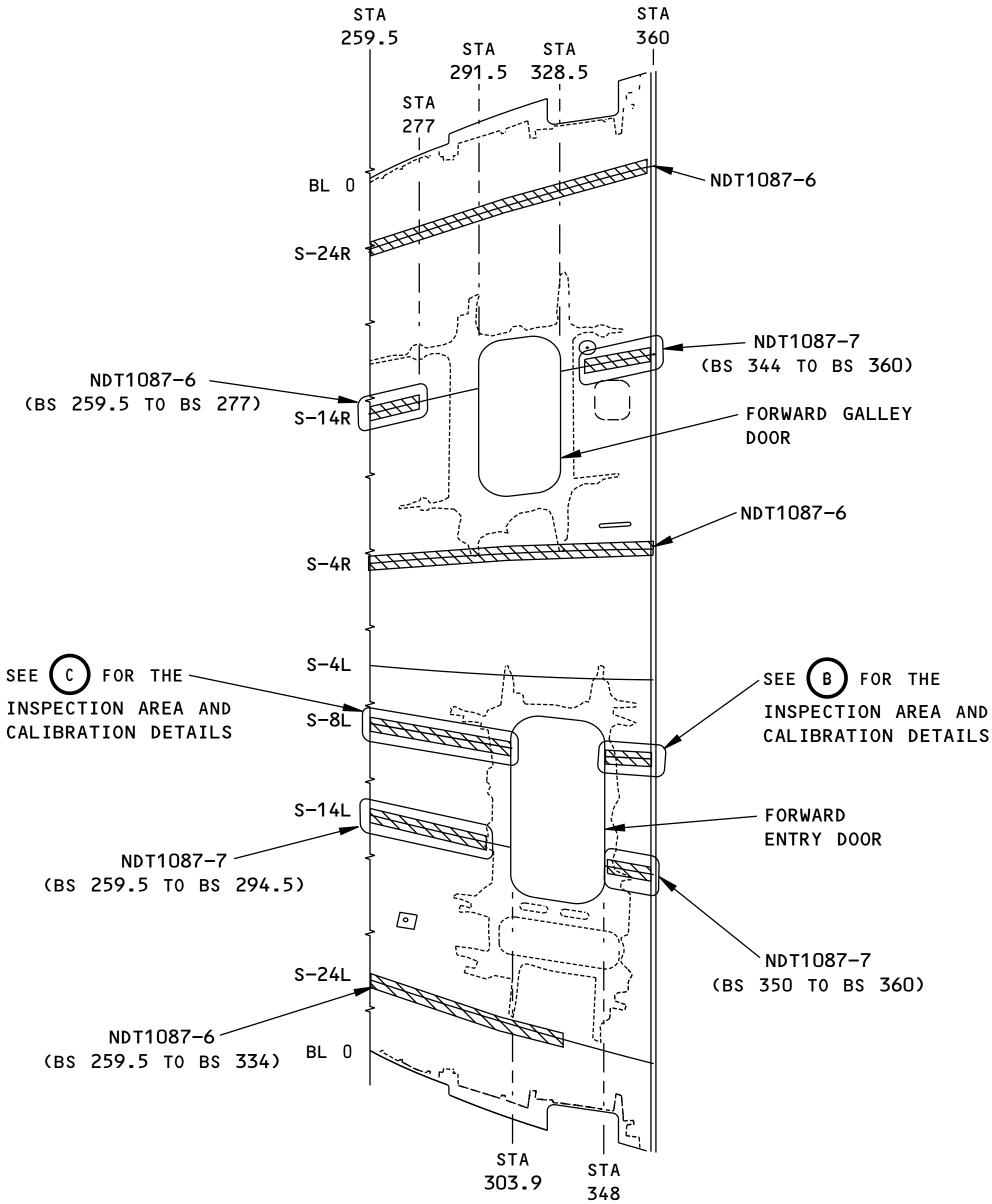
NOTES

INSPECTION AREA TO BE EXAMINED

- DO THIS INSPECTION FROM THE EXTERNAL SIDE OF THE AIRPLANE
- THE INSPECTION AREAS ARE IDENTIFIED WITH THE REFERENCE STANDARD TO USE FOR CALIBRATION

2347572 S0000535435_V1

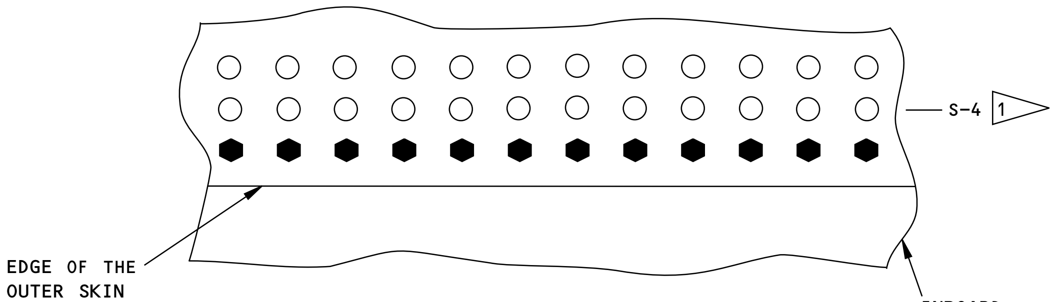
Inspection Areas
Figure 1 (Sheet 1 of 15)



SECTION 41
737-700C
FUSELAGE SKIN LAP SPLICE LOCATIONS
FROM BS 259.5 TO BS 360
(PLAN VIEW)

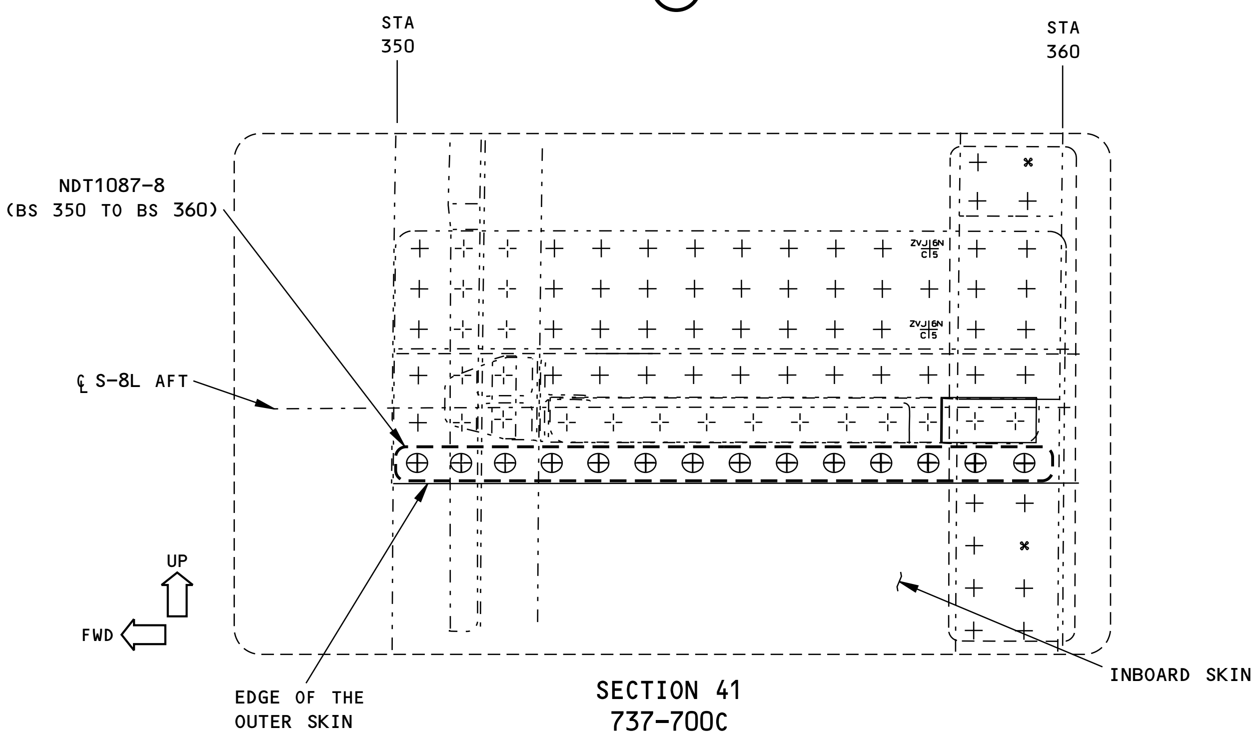
2347580 S0000535436_V1

Inspection Areas
Figure 1 (Sheet 2 of 15)



TYPICAL INSPECTION AREA OF THE INBOARD SKIN FOR ALL INSPECTION AREAS

A



SECTION 41
737-700C
FUSELAGE SKIN LAP SPLICE AT S-8L
FROM BS 350 TO BS 360
(PLAN VIEW)

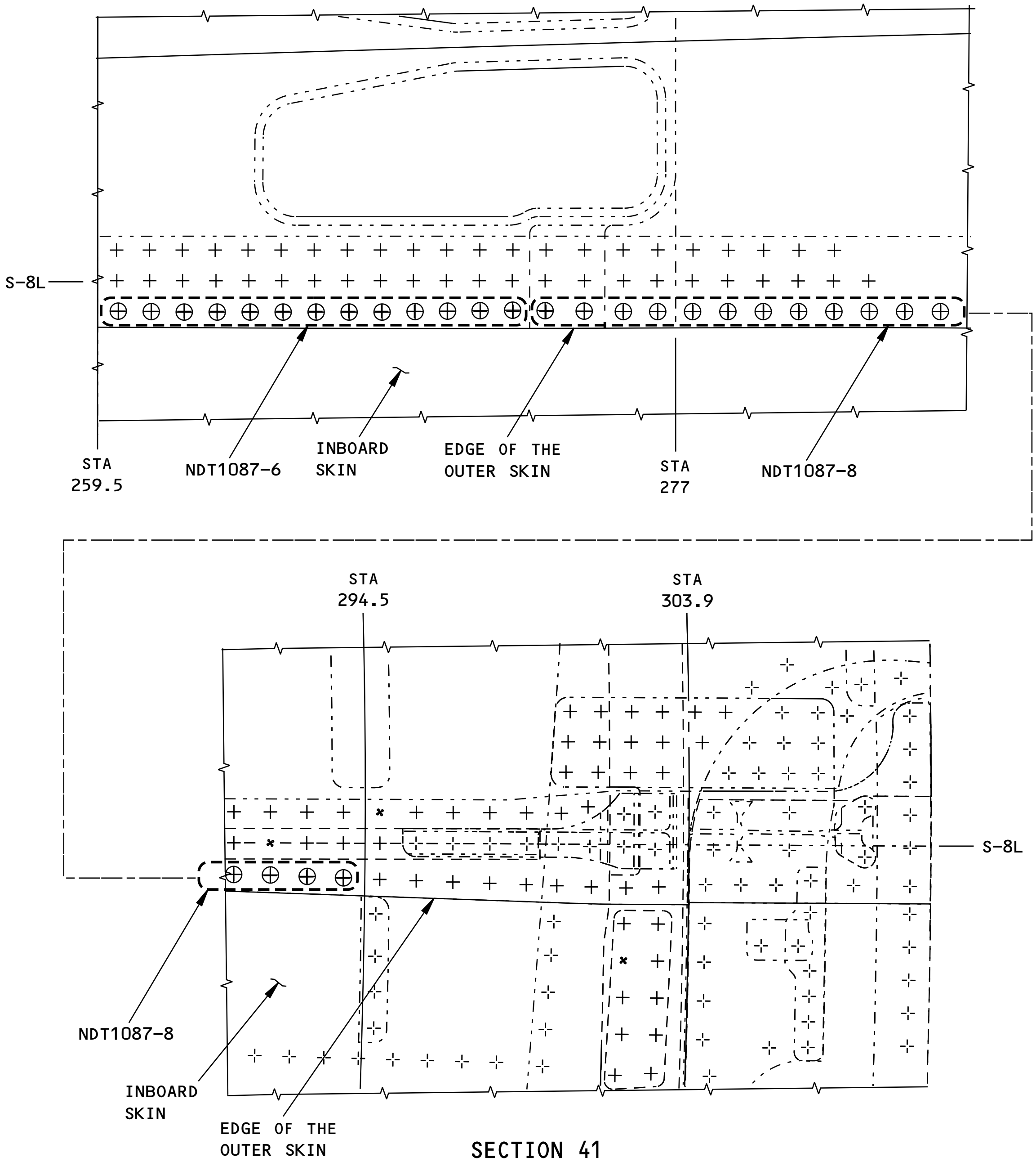
B

NOTES

- ⬢ TYPICAL FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS
- ⊕ FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A SLIDING PROBE
- 1 A TYPICAL INSPECTION AREA AT S-4 IS SHOWN; OTHER STRINGER LOCATIONS ARE THE SAME

2347604 S0000535438_V1

Inspection Areas
Figure 1 (Sheet 3 of 15)

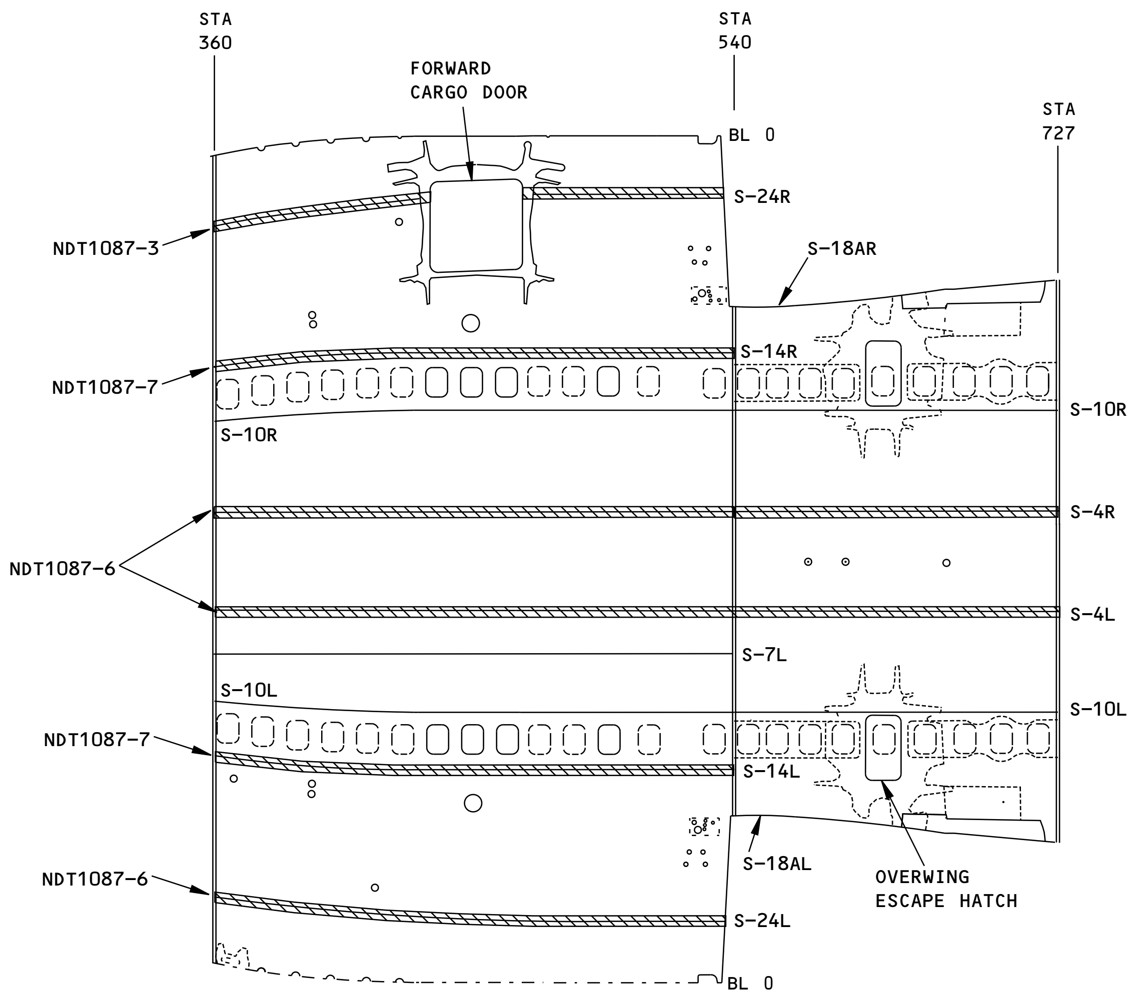


SECTION 41
737-700C
FUSELAGE SKIN LAP SPLICE AT S-8L
FROM BS 259.5 TO BS 303.9
(PLAN VIEW)

C

2347678 S0000535439_V1

Inspection Areas
Figure 1 (Sheet 4 of 15)

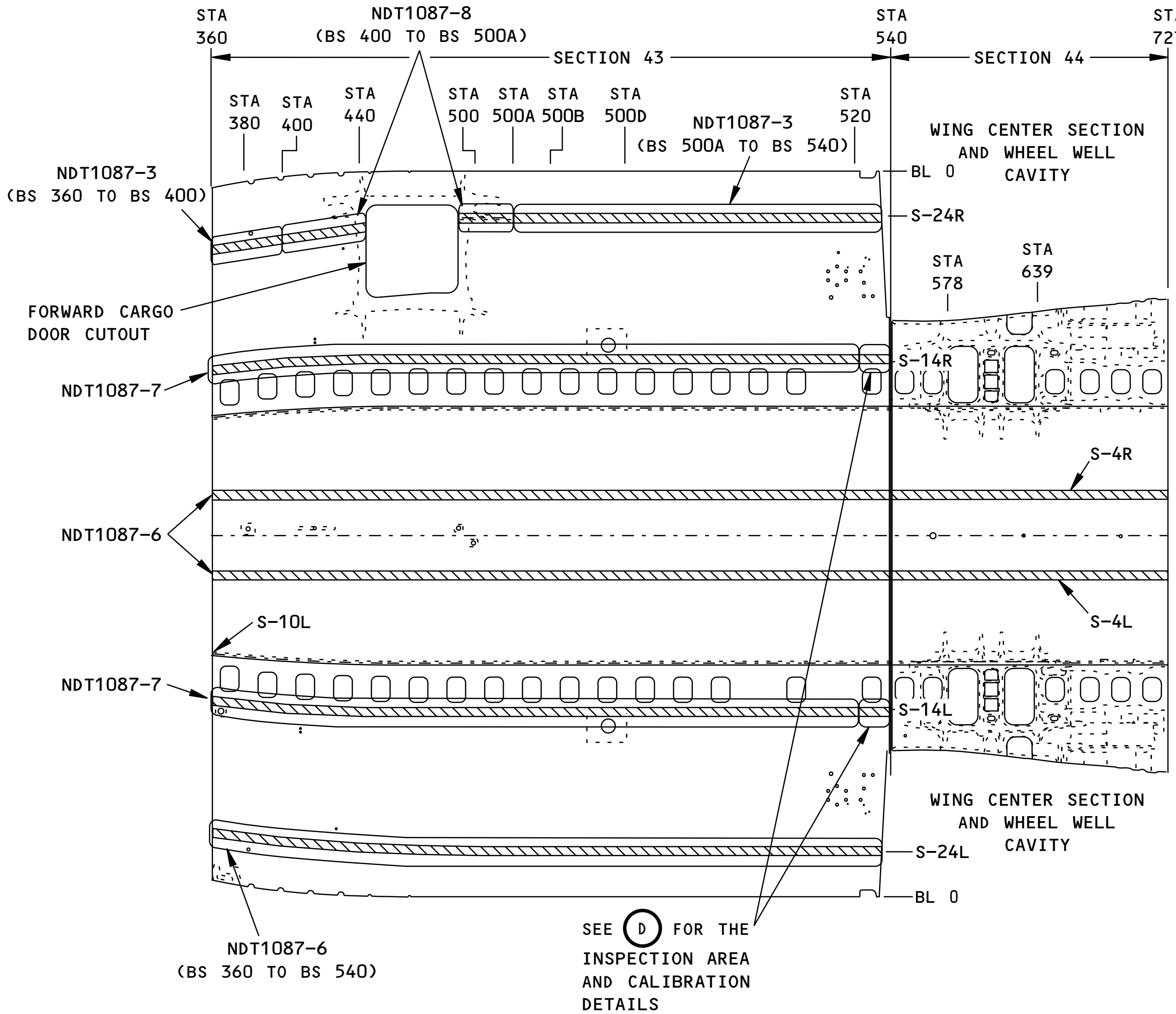


SECTION 43/44
737-600/700/700IGW
FUSELAGE SKIN LAP SPLICE LOCATIONS
FROM BS 360 TO BS 727
(PLAN VIEW)

NOTES
- THE 737-700 IS SHOWN; THE 737-600 AND 737-700IGW MODELS ARE ALMOST THE SAME

2347680 S0000535441_V1

Inspection Areas
Figure 1 (Sheet 5 of 15)



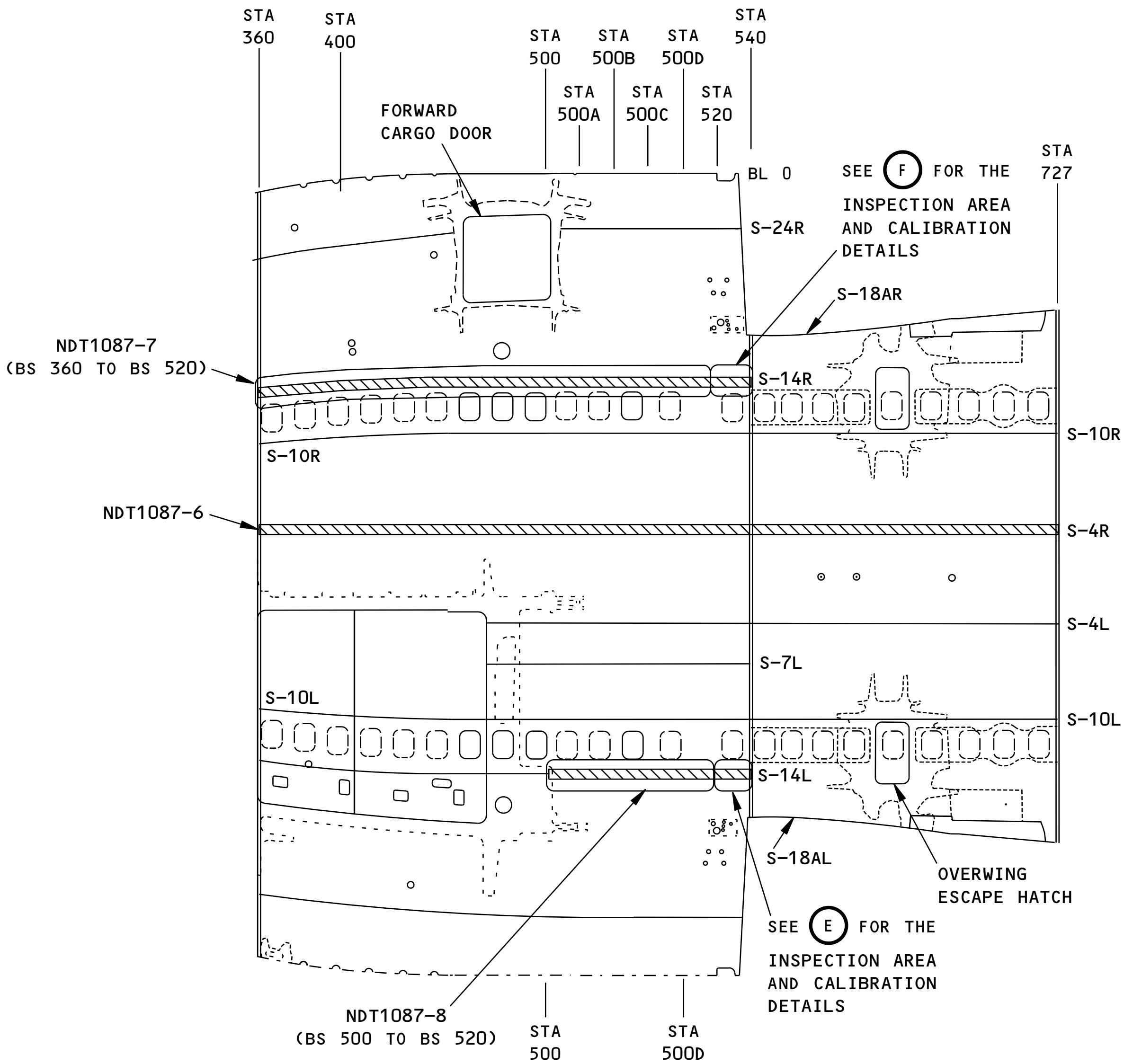
SECTION 43/44
737-800/900/900ER
FUSELAGE SKIN LAP SPLICE LOCATIONS
FROM BS 360 TO BS 727
(PLAN VIEW)

NOTES

- THE 737-800 IS SHOWN; THE 737-900/900ER MODELS ARE ALMOST THE SAME

2347685 S0000535442_V1

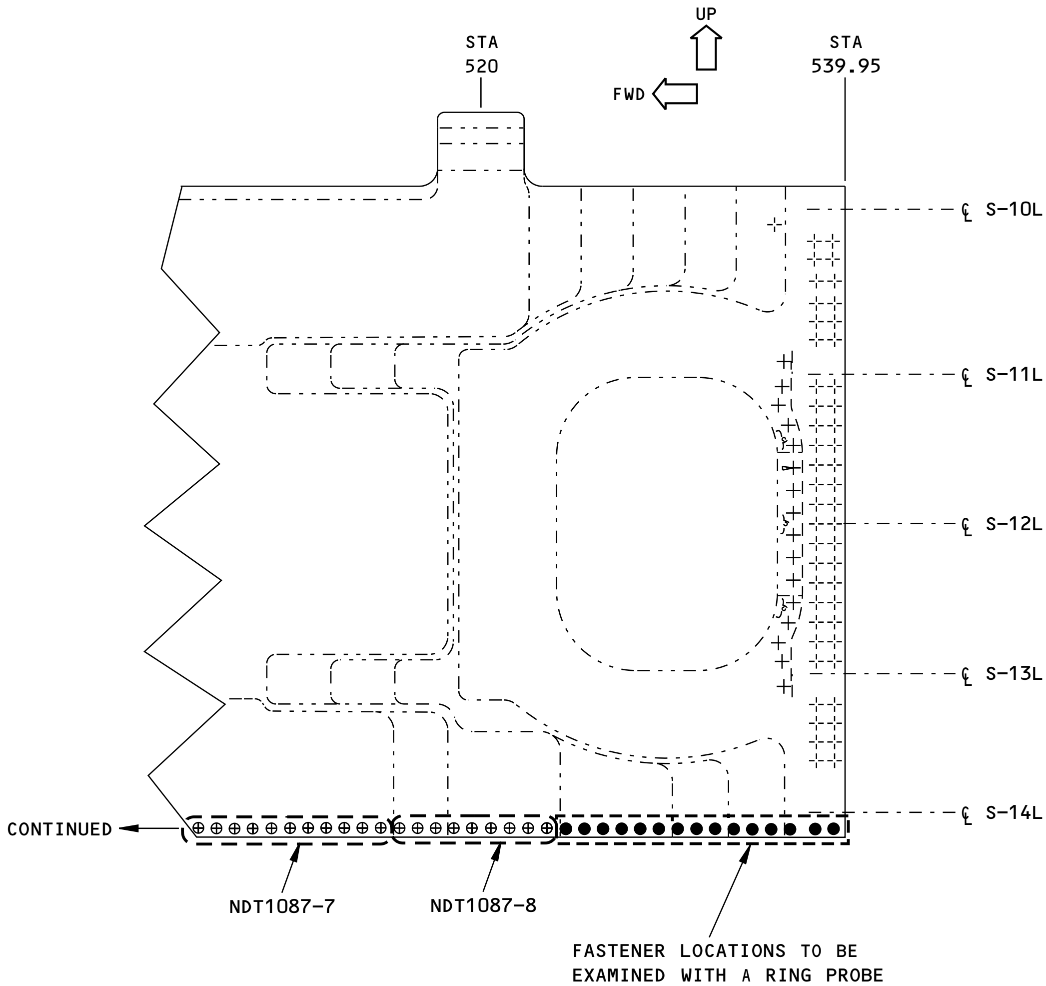
Inspection Areas
Figure 1 (Sheet 6 of 15)



SECTION 43/44
737-700C
FUSELAGE SKIN LAP SPLICE LOCATIONS
FROM BS 360 TO BS 727
(PLAN VIEW)

2347692 S0000535443_V1

Inspection Areas
Figure 1 (Sheet 7 of 15)



SECTION 43
737-800/900/900ER
S-14 BETWEEN BS 520 AND BS 540

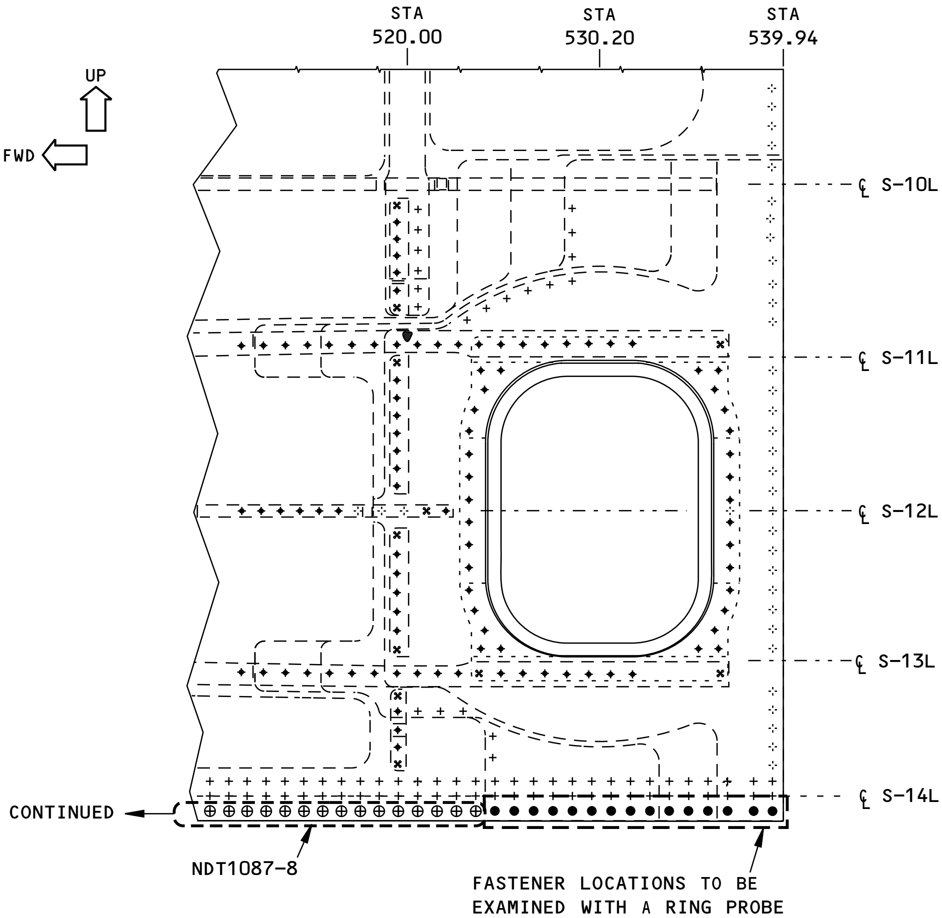
D

NOTES

- S-14L IS SHOWN; S-14R IS OPPOSITE
- THE 737-800 IS SHOWN; THE 737-900/900ER MODELS ARE ALMOST THE SAME
- ● FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A LOW FREQUENCY RING PROBE
- ⊕ FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A DUAL FREQUENCY SLIDING PROBE

2347703 S0000535445_V1

Inspection Areas
Figure 1 (Sheet 8 of 15)



SECTION 43
737-700C
S-14L BETWEEN BS 520 AND BS 540

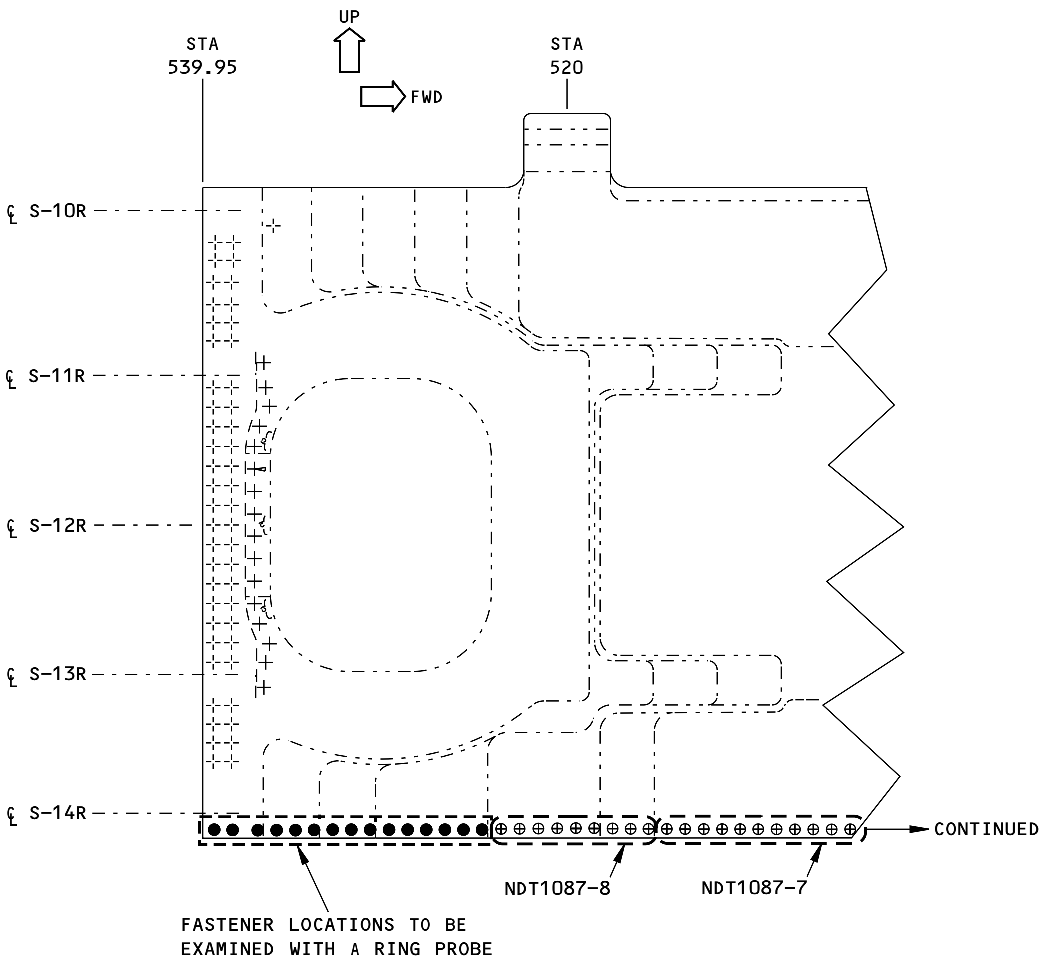
E

NOTES

- S-14L IS SHOWN; S-14R IS DIFFERENT
- ● FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A LOW FREQUENCY RING PROBE
- ⊕ FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A DUAL FREQUENCY SLIDING PROBE

2347720 S0000535446_V1

Inspection Areas
Figure 1 (Sheet 9 of 15)

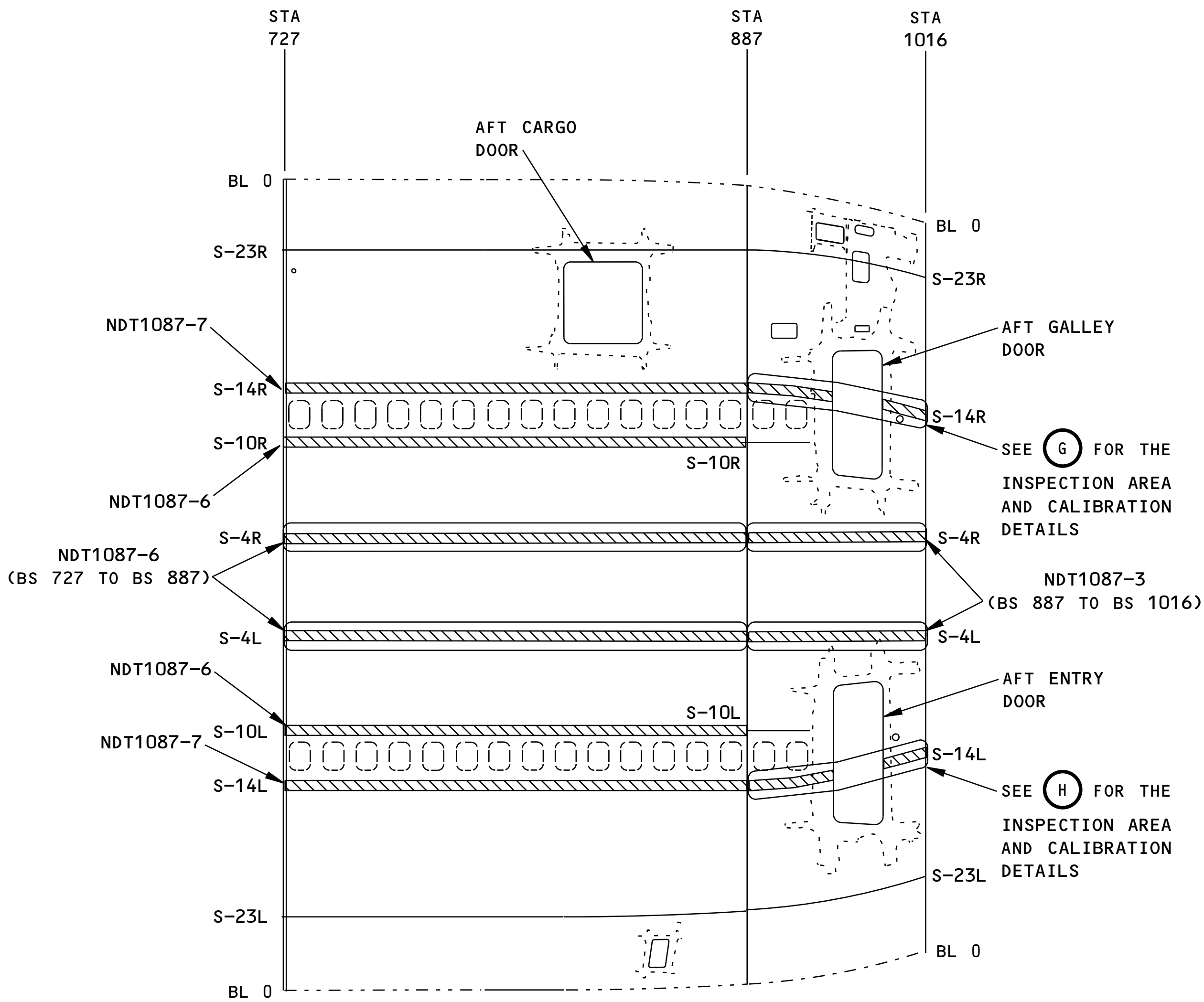


SECTION 43
737-700C
S-14R BETWEEN BS 520 AND BS 540
F

NOTES
- S-14R IS SHOWN; S-14L IS DIFFERENT
- ● FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A LOW FREQUENCY RING PROBE
- ⊕ FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A DUAL FREQUENCY SLIDING PROBE

2347725 S0000535447_V1

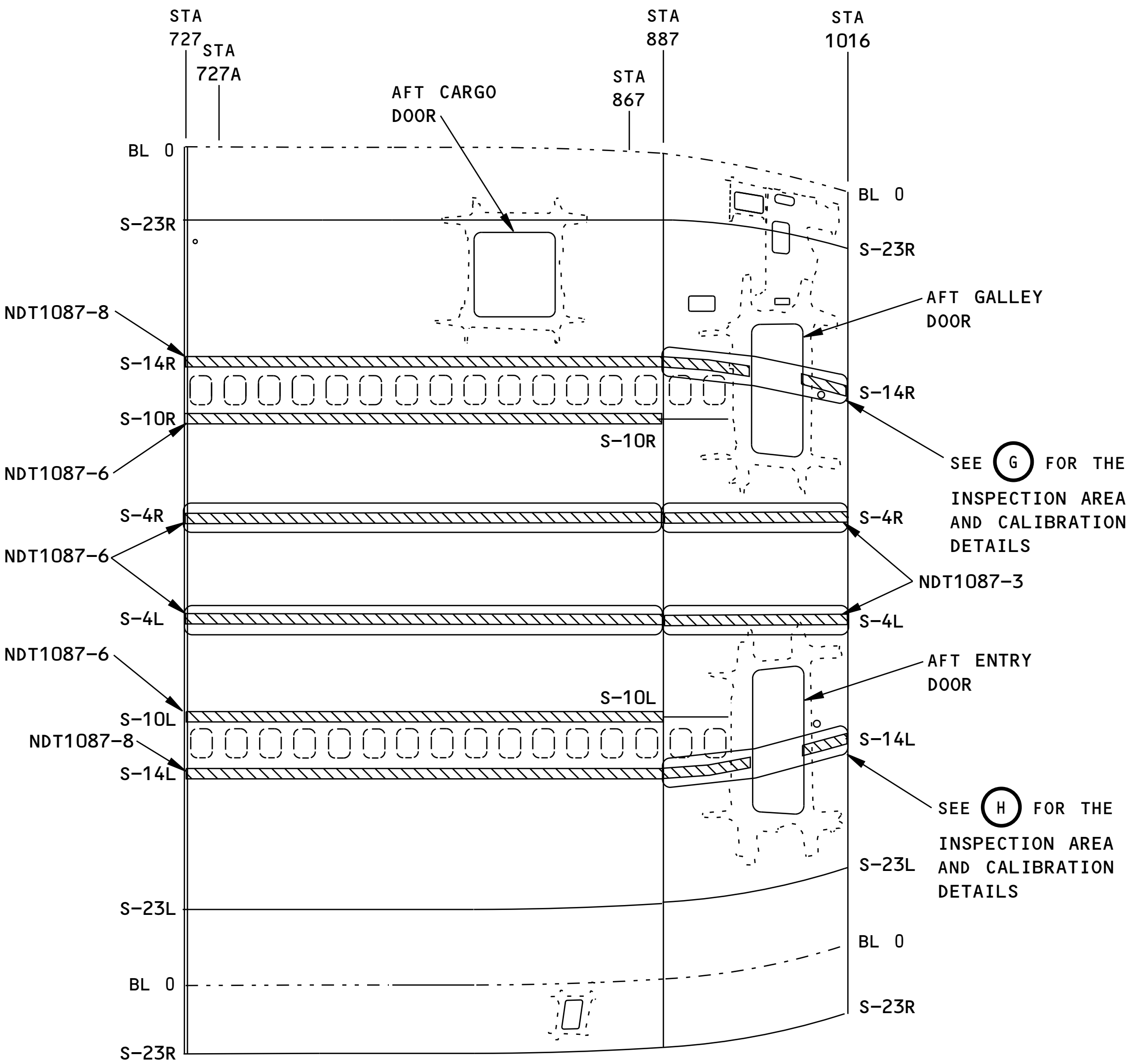
Inspection Areas
Figure 1 (Sheet 10 of 15)



SECTION 46/47
737-600/700
FUSELAGE SKIN LIP SPLICE LOCATIONS
FROM BS 727 TO BS 1016
(PLAN VIEW)

2347738 S0000535448_V1

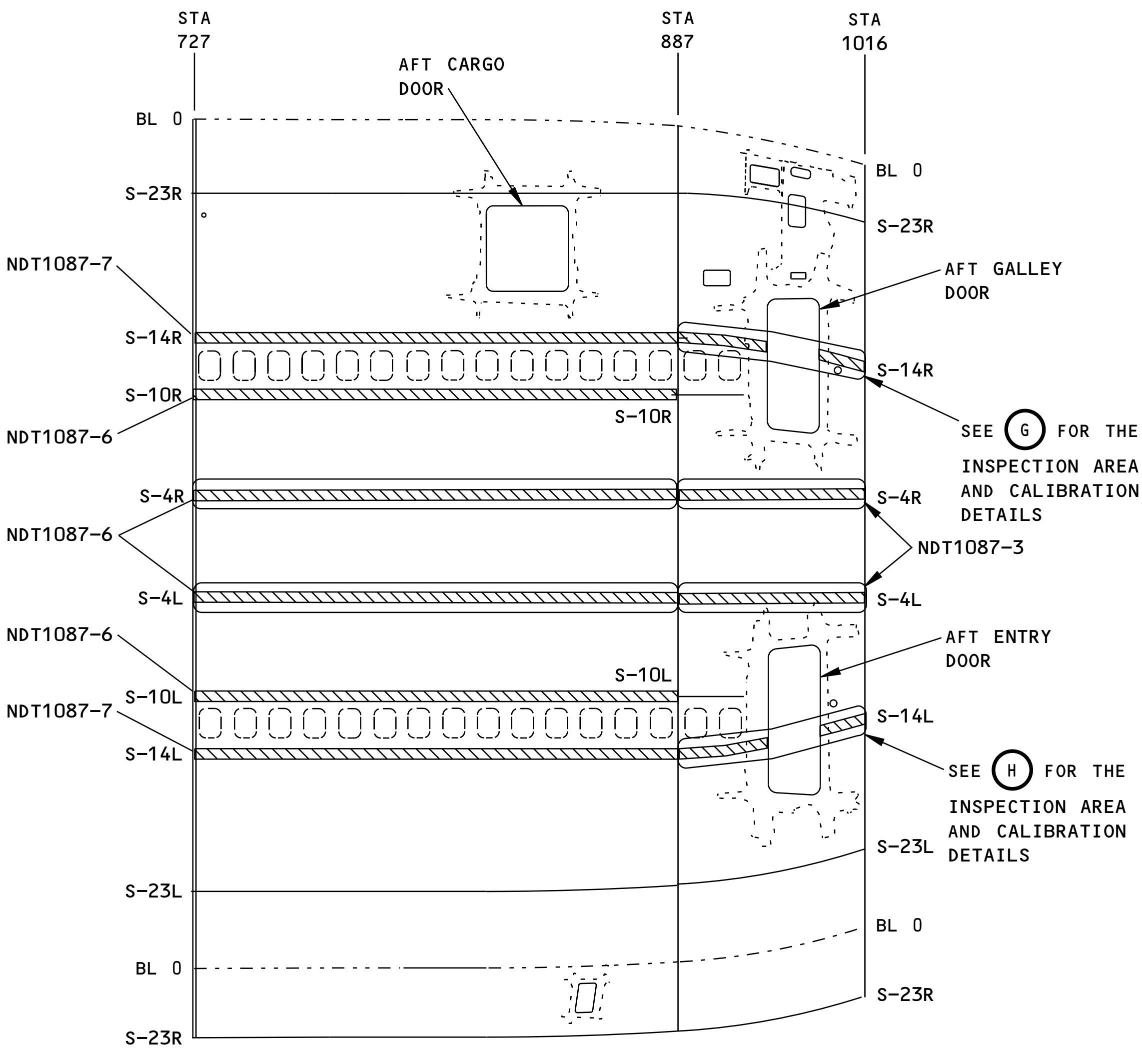
Inspection Areas
Figure 1 (Sheet 11 of 15)



SECTION 46/47
737-700IGW/800/900/900ER
FUSELAGE SKIN LAP SPLICE LOCATIONS
FROM BS 727 TO BS 1016
(PLAN VIEW)

2347746 S0000535449_V1

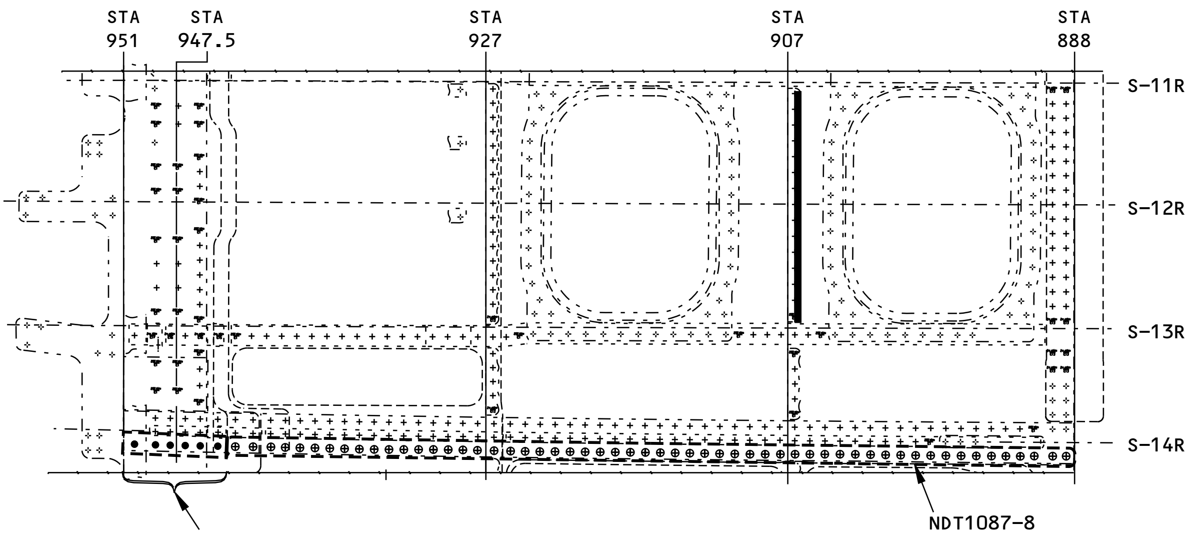
Inspection Areas
Figure 1 (Sheet 12 of 15)



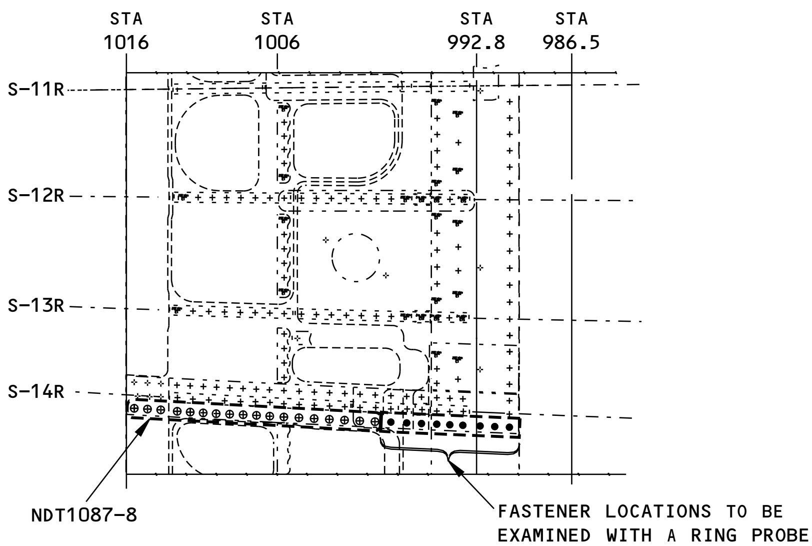
SECTION 46/47
737-700C
FUSELAGE SKIN LAP SPLICE LOCATIONS
FROM BS 727 TO BS 1016
(PLAN VIEW)

2347772 S0000535450_V1

Inspection Areas
Figure 1 (Sheet 13 of 15)



SECTION 47 STRINGER 14R
BS 888 TO BS 951



SECTION 47 STRINGER 14R
BS 992.8 TO BS 1016

SECTION 47
737-600/700/700IGW/700C/800/900/900ER
S-14R BETWEEN BS 887 AND BS 1016

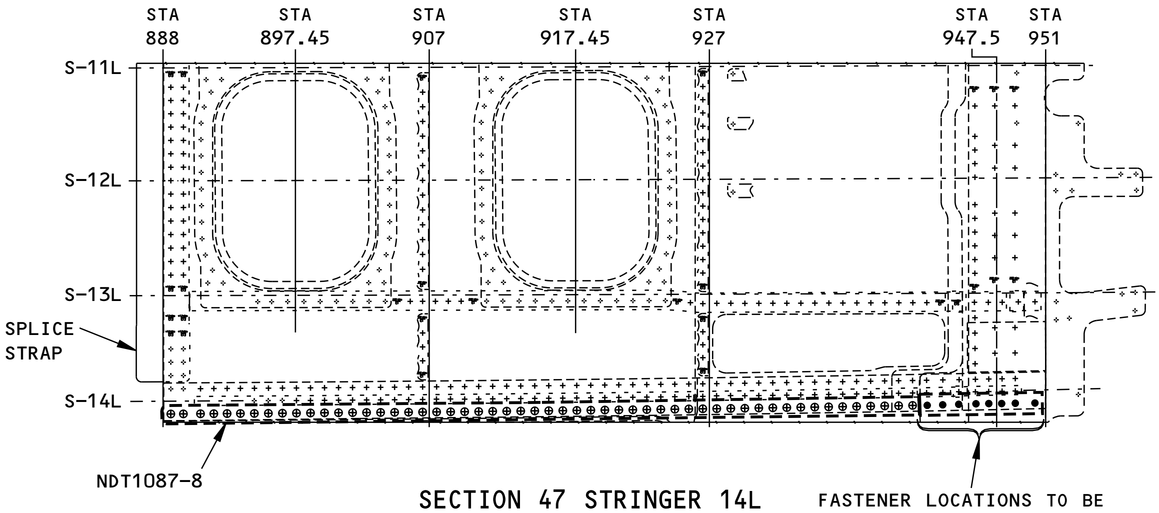
G

NOTES

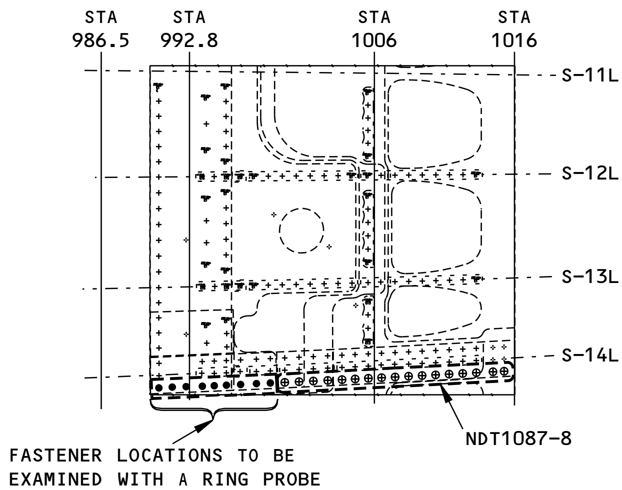
- S-14R IS SHOWN; S-14L IS DIFFERENT
- ● FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A LOW FREQUENCY RING PROBE
- ⊕ FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A DUAL FREQUENCY SLIDING PROBE

2347782 S0000535451_V1

Inspection Areas
Figure 1 (Sheet 14 of 15)



SECTION 47 STRINGER 14L
BS 888 TO BS 951



SECTION 47 STRINGER 14L
BS 992.8 TO BS 1016

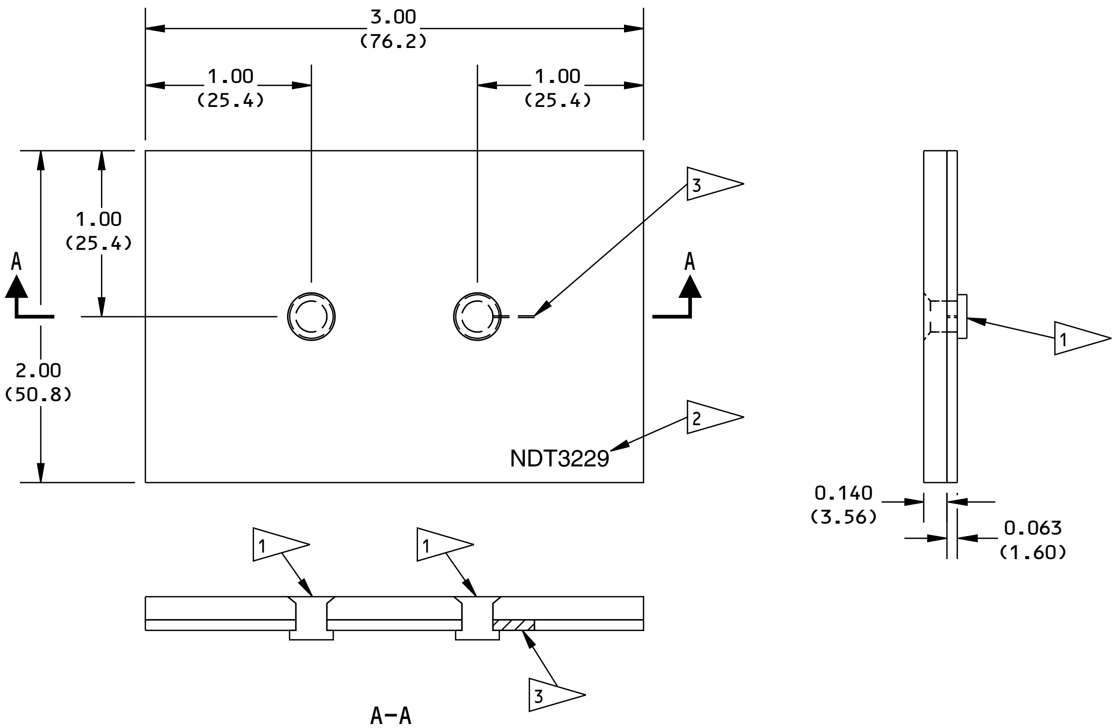
SECTION 47
737-600/700/700IGW/700C/800/900/900ER
S-14L BETWEEN BS 887 AND BS 1016

H

NOTES
- S-14L IS SHOWN; S-14R IS DIFFERENT
- ● FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A LOW FREQUENCY RING PROBE
- ⊕ FASTENER LOCATIONS TO EXAMINE THE INBOARD SKIN FOR CRACKS WITH A DUAL FREQUENCY SLIDING PROBE

2347812 S0000535452_V1

Inspection Areas
Figure 1 (Sheet 15 of 15)



NOTES

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

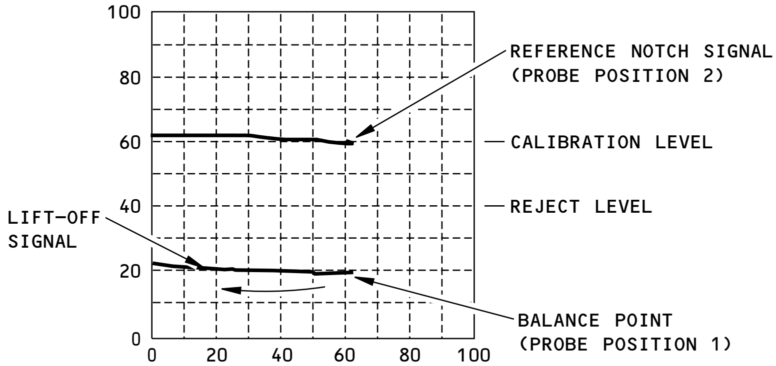
INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.50
X.X = ±0.050	X = ±1

- MATERIAL: 2024-T3 OR 2024-T6 ALUMINUM (CLAD OR BARE)
- SURFACE ROUGHNESS: 63 Ra OR BETTER

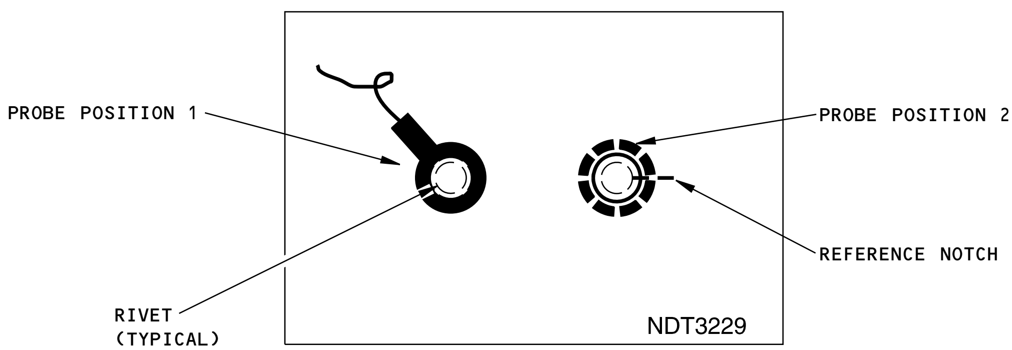
1. INSTALL BACR15GF6* RIVETS
2. ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3229, AT APPROXIMATELY THIS LOCATION
3. EDM NOTCH: WIDTH: 0.010 (0.25) MAXIMUM
   DEPTH: THROUGH THE THICKNESS
   LENGTH: 0.250 OUT FROM THE RIVET SHANK

2347826 S0000535454_V1

Reference Standard NDT3229
Figure 2



IMPEDANCE PLANE DISPLAY
DETAIL I



PROBE POSITIONS FOR CALIBRATION
ON REFERENCE STANDARD NDT3229
DETAIL II

2347907 S0000535455_V1

Instrument Calibration
Figure 3

PART 6 - EDDY CURRENT

FUSELAGE SKIN AT THE SECTION 48 BUTT SPLICE FROM BS 1016 TO BS 1042 AT S-9L AND S-9R (HFEC)

1. Purpose

A. Use this high frequency eddy current (HFEC) procedure to examine the upper and lower skins for cracks at the S-9L and S-9R butt splices in Section 48. The upper skin is examined along the upper fastener row and the lower skin is examined along the lower fastener row from BS 1016 to BS 1042. See Figure 1 for the inspection areas.

B. This procedure uses an impedance plane display instrument.

C. The upper and lower skins are aluminum.

D. 737 Maintenance Planning Data (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 53-80-18-7

2. Equipment

A. General

(1) Use inspection equipment that can be calibrated on the reference standard as specified in Part 6, 51-00-00, Procedure 23, paragraph 5.

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

B. Instrument

(1) Use an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates between 50 and 500 kHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) Phasec 2D/3D; GE Inspection Technologies

(b) Nortec 500/2000D; Olympus

C. Probes

(1) Use a probe that:

(a) Operates between 50 and 500 kHz.

(b) Has a maximum diameter of 0.13 inch (3.3 mm).

(2) The probes that follow were used to help prepare this procedure.

(a) MTF905-60fx 50-500 kHz; NDT Engineering/Olympus

(b) MTF-40/50-500 kHz; NDT Engineering/Olympus

D. Reference Standards

(1) Use reference standard NDT1048, or an equivalent, to help calibrate the instrument. Refer to Part 6, 51-00-00, Procedure 23, for data about reference standard NDT1048.

E. Special Tools

(1) Use a nonconductive circle template as a probe guide to help make a scan around the fasteners at the S-9L and S-9R butt splices.

3. **Prepare for the Inspection**

   A. Identify and get access to the inspection areas shown in Figure 1.

   B. Remove dirt or grease from the inspection surfaces.

   C. Remove paint only if it is loose.

4. **Instrument Calibration**

   A. Calibrate the instrument to examine the upper and lower skins for cracks at the S-9L and S-9R butt splices as specified in Part 6, 51-00-00, Procedure 23, paragraph 5.

      (1) Use reference standard NDT1048, or an equivalent, to help calibrate the instrument.

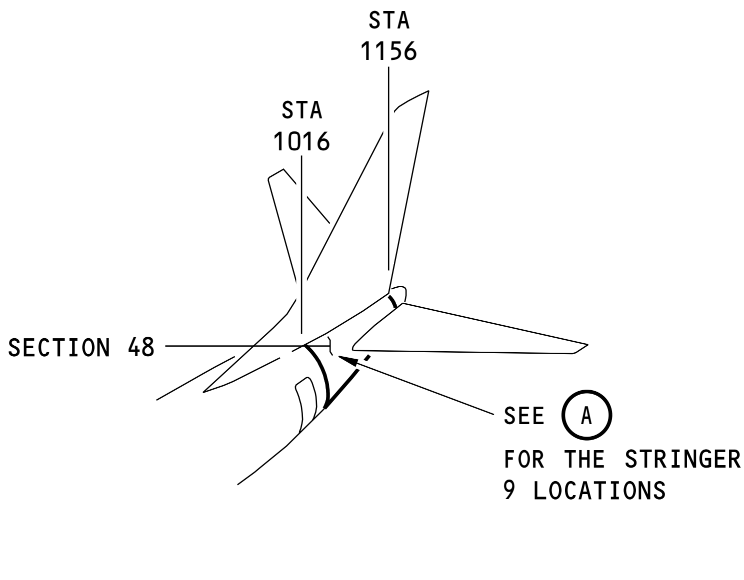
5. **Inspection Procedure**

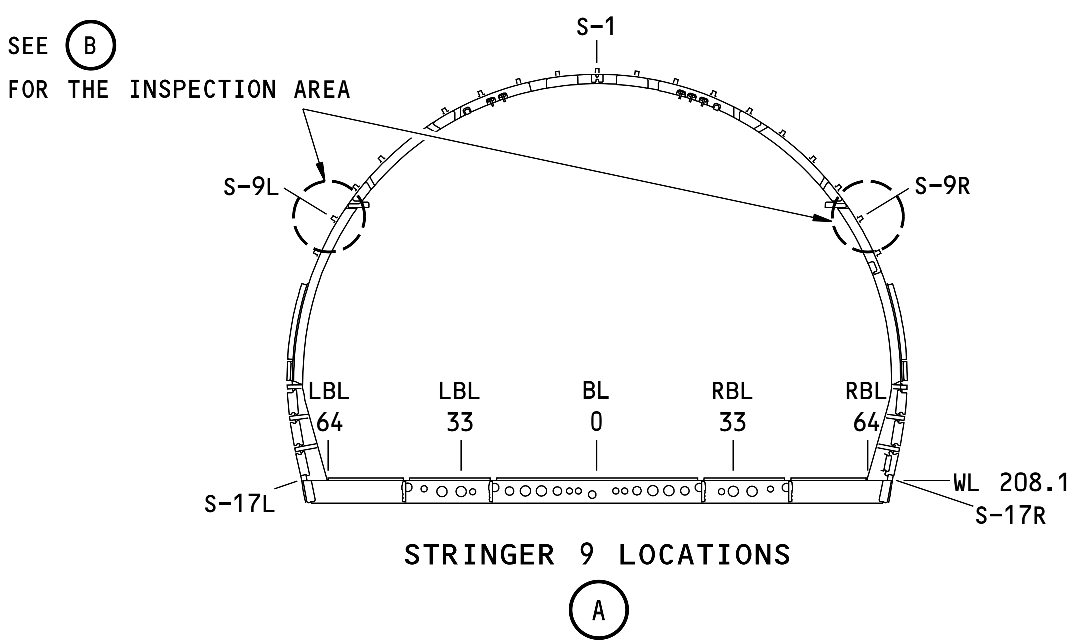
   A. Examine the upper and lower skins for cracks at the S-9L and S-9R butt splices as specified in Part 6, 51-00-00, Procedure 23, paragraph 6. Examine the areas that follow:

      (1) Examine the upper skin along the upper fastener row and the lower skin along the lower fastener row from BS 1016 to BS 1042 (see Figure 1).

6. **Inspection Results**

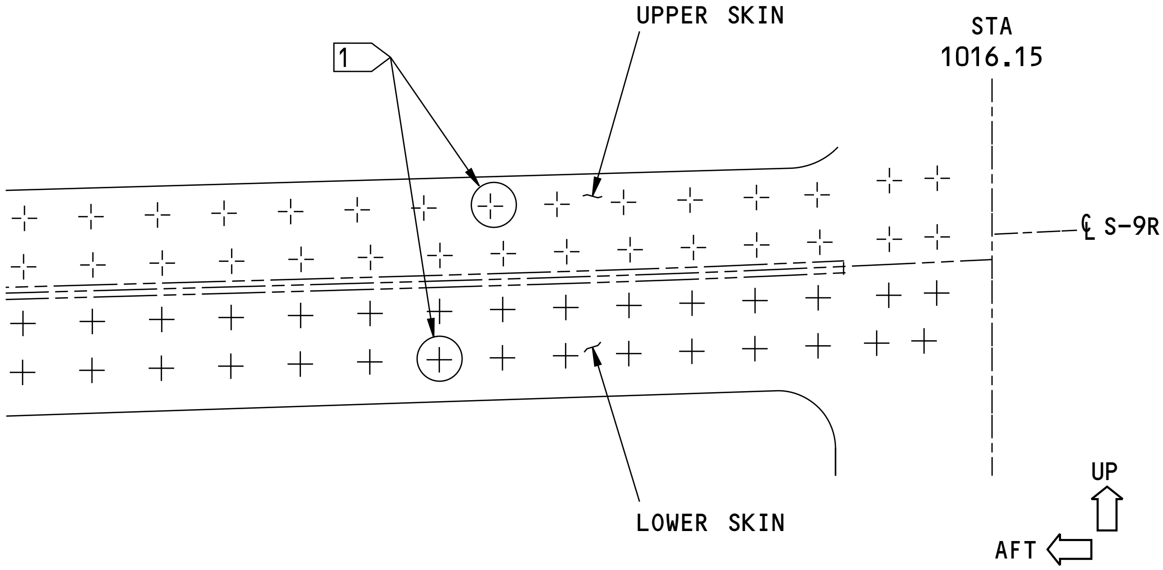
   A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of the indications that occur during the inspection.





2404302 S0000556252_V1

Inspection Area
Figure 1 (Sheet 1 of 2)



TYPICAL STRINGER 9 INSPECTION AREA
(THE RIGHT SIDE IS SHOWN; THE LEFT SIDE IS OPPOSITE)

B

NOTES

1 EXAMINE THE UPPER ROW OF FASTENERS IN THE UPPER SKIN, AND THE LOWER ROW OF FASTENERS IN THE LOWER SKIN FROM BS 1016 TO BS 1042

2404309 S0000556254_V1

Inspection Area
Figure 1 (Sheet 2 of 2)

PART 6 - EDDY CURRENT

FUSELAGE CROWN SKIN PANELS IN SECTIONS 41, 43, 44, 46 AND 47, BETWEEN STA 259.5 AND STA 1016 AND FROM S-10L TO S-10R (HFEC)

1. **Purpose**

   A. Use this procedure to help find surface cracks in the fuselage crown skin panels. The crown skin panels in fuselage sections 41, 43, 44, 46, and 47 are examined from stringers S-10L to S-10R and between STA 259.5 and STA 1016. All areas around the fasteners that go through the crown skin panel and the stringers are examined but not the fasteners at the lap splice and antenna areas. See Figure 1 for the inspection areas.

   NOTE: The lap splices at stringers 10L, 4L, 4R, and 10R are not examined with this procedure.

   B. The fuselage crown skin panels are aluminum.

   C. You can also use one of these optional inspection procedures to examine the crown skin panels for cracks:

      (1) Rotating Surface Probe as given in Part 6, 53-30-05, paragraph 5.

      (2) Turbo Magneto Optic Imager (MOI) as given in Part 6, 51-00-00, Procedure 15 (General Surface Inspection of Aluminum with the Magneto Optic Imager (MOI)).

      (3) Eddy Current Array (ECA) as given in Part 6, 53-30-40 (Eddy Current Array (ECA) Inspection of Fasteners in the Outboard Skin).

      NOTE: The sliding probe procedure cannot be used to do this inspection.

   D. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

      (1) Item: 53-30-01-2

   E. 737 Maintenance Planning Data (MPD) Primary Structural Element (PSE) Reference:

      (1) Item: PSE 53-10-08-1

      (2) Item: PSE 53-40-01-1

      (3) Item: PSE 53-60-01-2

      (4) Item: PSE 53-70-04-1

2. **Equipment**

   A. General

      (1) All eddy current instruments that have an impedance plane display are permitted for use if they 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 an eddy current instrument that can operate from 50 to 500 kHz.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) Nortec 500D; Olympus NDT

         (b) Phasec 3D; GE Inspection Technologies

   C. Probes

(1) A shielded, straight or right-angle probe is used to do this inspection.

(2) Refer to Part 6, 51-00-00, Procedure 23, paragraph 3.C, for data about probe selection.

(3) The probe that follows was used to help prepare this procedure.

(a) MP-30; Olympus NDT

D. Reference Standards

(1) Use reference standard NDT1048, or an equivalent, as given in Part 6, 51-00-00, Procedure 23, paragraph 3.D. If a protruding-head fastener is found in the inspection area, then use reference standard 188A (also in paragraph 3.D) and the applicable fastener (steel or aluminum).

E. Special Tools

(1) Use a nonconductive circle template as given in Part 6, 51-00-00, Procedure 23, paragraph 3.E and Figure 9.

3. Prepare for Inspection

A. Identify the inspection areas shown in Figure 1.

B. Remove the dorsal fin to do this inspection. Remove the dorsal fin bracket if necessary to get access to an inspection area. Refer to Aircraft Maintenance Manual (AMM) 55-32-11 for the removal and installation instructions. Install the dorsal fin after the inspection has been completed.

C. Get access to the inspection area.

D. Clean the inspection area as necessary. Smooth all paint that causes unwanted signals to occur.

4. Instrument Calibration

A. Calibrate the instrument as specified in Part 6, 51-00-00, Procedure 23, paragraph 5.

(1) Use reference standard NDT1048, or an equivalent, to help calibrate the instrument.

5. Inspection Procedure

A. Examine the fuselage crown skin panels for cracks at all fastener locations as specified in Part 6, 51-00-00, Procedure 23, paragraph 6, and the steps that follow. See Figure 1 for the inspection areas.

NOTE: Lap splices and antenna areas are not examined with this procedure.

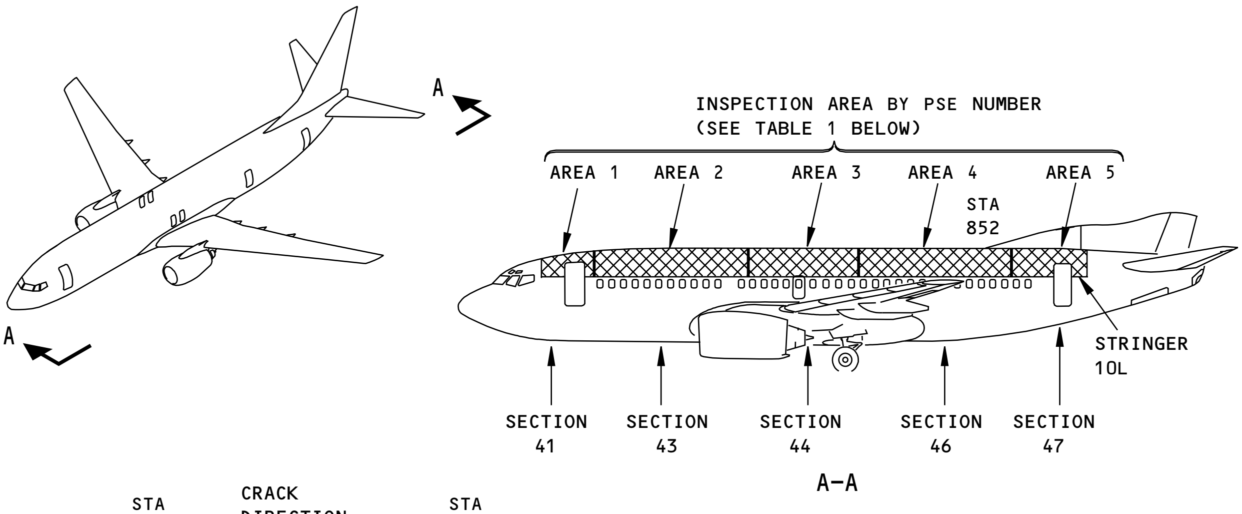
(1) Use a circle template to keep the probe an equal distance from the flush head fastener during each scan.

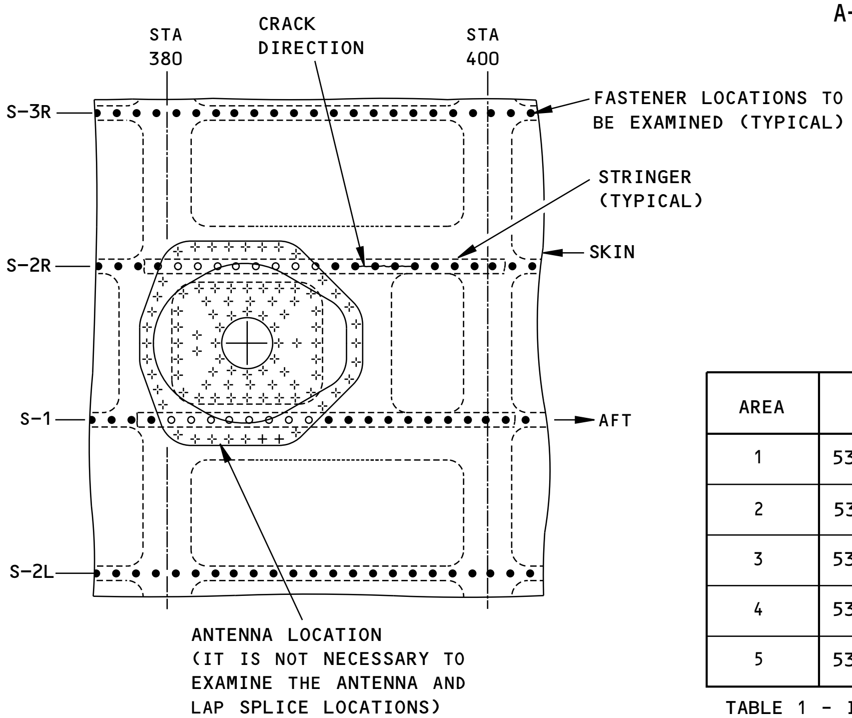
(2) For all 737NG airplanes but the 737-700C, examine all fastener locations in the crown skin panels between STA 259.5 and STA 1016, from stringers S-10L to S-10R. See Figure 1, Table 1, for the inspection areas that are applicable for each PSE or DTR identified in Paragraph 1.D. and Paragraph 1.E.

(3) For the 737-700C airplanes, examine all fastener locations in the crown skin between STA 259.5 to STA 360 and STA 540 to STA 1016 from stringers S-10L to S-10R. From STA 360 to STA 540, examine all fastener locations in the crown skin panels from stringers S-4R to S-10R.

6. Inspection Results

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of all possible crack signals.





TYPICAL INSPECTION AREA
(VIEW AS YOU LOOK DOWN)

AREA	PSE/DTR NUMBER	INSPECTION LOCATION [1]
1	53-10-08-1	STA 259.5 TO 360
2	53-30-01-2	STA 360 TO 540 [2]
3	53-40-01-1	STA 540 TO 727
4	53-60-01-2	STA 727 TO 887
5	53-70-04-1	STA 887 TO 1016 [3]

TABLE 1 - INSPECTION AREA BY PSE/DTR NUMBER

[1] STRINGERS S-10L TO S-10R (ALL LOCATIONS UNLESS SPECIFIED DIFFERENTLY)

[2] FOR THE 737-700C, THIS INSPECTION LOCATION IS FROM S-4R TO S-10R

[3] THE DORSAL FIN MUST BE REMOVED TO EXAMINE THE FASTENERS BELOW THE DORSAL FIN AREA

2436366 S0000565549_V1

Inspection Area
Figure 1

PART 6 - EDDY CURRENT

FUSELAGE SKIN AT THE SATCOM ANTENNA INSTALLATION FROM BS 748 TO BS 778 AT S-1 AND S-2L (LFEC)

1. Purpose

A. Use this low frequency eddy current (LFEC) procedure to examine the fuselage skin for cracks at the SATCOM antenna installation. The fuselage skin inspection area is between the adaptor plate and stringers S-1 and S-2L from STA 748 to STA 778. See Figure 1 for the inspection areas.

B. This inspection is done while in the airplane. The probe is put in the stringer.

C. This procedure uses an impedance plane display instrument.

D. The stringers and fuselage skin are aluminum.

E. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 53-60-01-6 (LFEC)

2. Equipment

A. General

(1) Use inspection equipment that can be calibrated on the reference standard as specified in Part 6, 51-00-26, paragraph 4.

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

B. Instrument

(1) Use an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates from 2 to 4 kHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) Phasec 2D/3D; GE Inspection Technologies

(b) Nortec 600D; Olympus NDT

C. Probes

(1) Use a probe that:

(a) Operates from 2 to 4 kHz.

(b) Has a maximum diameter of 0.35 inch (8.9 mm).

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

(a) SDP.35-1K; Techna NDT

D. Reference Standards

(1) Use reference standard ANDT1051, or an equivalent, to help calibrate the instrument. Refer to Table 2 and Figure 1 in Part 6, 51-00-26 for data about reference standard ANDT1051.

3. Prepare for the Inspection

A. Identify and get access to the inspection areas shown in Figure 1.

B. Clean the inspection surfaces.

(1) Remove dirt or grease from the inspection surfaces.

(2) Remove paint only if it is loose.

4. **Instrument Calibration**

NOTE: All references to Figures in the steps that follow refer to the Figures in Part 6, 51-00-26.

A. Set the instrument frequency between 2 and 4 kHz.

B. Set the horizontal gain equal with the vertical gain.

C. Put the probe on the reference standard ANDT1051 at probe position 1, adjacent to the fastener head as shown in Figure 2.

D. Balance the instrument.

E. Set the balance point in the lower center of the instrument screen display and at 20 percent of full screen height (FSH) as shown in Figure 3.

F. Adjust the instrument for lift-off:

(1) Adjust the phase control to make the lift-off signal move horizontally to the left as shown in Figure 3 when the probe is lifted off the reference standard

G. Move the probe above the notch of the reference standard as shown by probe position 2 in Figure 2. Adjust the position of the probe above the notch to get a maximum notch signal.

H. Make sure the notch signal is 90 degrees from the lift-off signal (see Figure 3). Adjust the frequency to get a 90 degree separation between the lift-off signal and the notch signal.

NOTE: If the notch signal is left of vertical (90 degree phase), then increase the frequency. If the notch signal is right of vertical, then decrease the frequency. The frequency must stay between 2 and 4 kHz.

I. Adjust the sensitivity of the instrument to get a signal from the reference standard notch that is 40 percent of FSH as shown in Figure 3.

5. **Inspection Procedure**

A. Examine the fuselage skin for cracks at the SATCOM antenna installation as follows:

(1) Calibrate the instrument as specified in Paragraph 4.

(2) Put the probe on the stringer at one of the fastener locations to be examined.

(a) The fastener locations are at stringers S-1 and S-2L and between STA 748 and STA 778. The fuselage skin is between the adaptor plate and the stringers at these fastener locations. See Figure 1 for the inspection area.

(3) Balance the instrument.

(4) Make a full scan around each fastener in the inspection area and monitor the instrument for crack signals. See Figure 1 for the inspection area. During the inspection:

(a) Make a mark at all the locations where signals occur that are 40 percent (or more) of FSH.

(b) Do a calibration check when the inspection is completed as follows:

1) Put the probe on reference standard ANDT1051 at probe position 1, adjacent to the fastener head as shown in Part 6, 51-00-26, Figure 2.

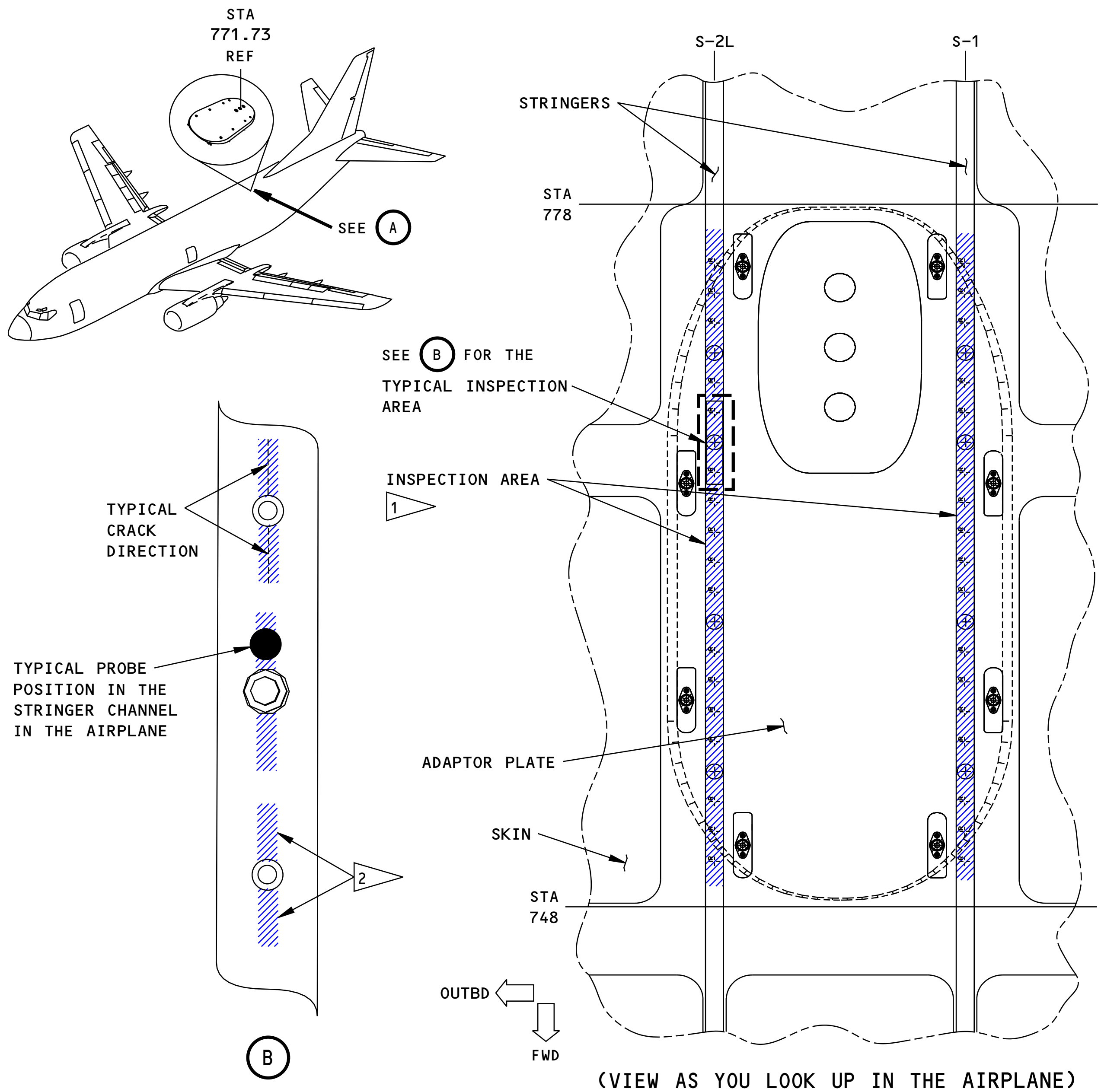
2) Balance the instrument.

3) Move the probe above the notch of the reference standard as shown by probe position 2 in Part 6, 51-00-26, Figure 2. Adjust the position of the probe above the notch to get a maximum notch signal. Compare the signal you got from the notch during calibration with the signal you get now.

4) If the signal you now get from the notch has decreased in FSH by 10 percent or more, do the calibration and inspection again on the fastener locations you have examined since the last satisfactory calibration.

6. Inspection Results

A. Refer to Part 6, 51-00-26, paragraph 6, for instructions to help make an analysis of the indications that occur during the inspection.



NOTES:

INSPECTION AREA

1 EXAMINE THE FUSELAGE SKIN THAT IS BETWEEN THE ADAPTOR PLATE AND STRINGERS S-1 AND S-2L FOR CRACKS FROM STA 748 TO STA 778.

2 EXAMINE THE FUSELAGE SKIN FOR CRACKS FROM THE FORWARD AND AFT SIDES OF THE FASTENERS THAT GO THROUGH THE STRINGERS AND THE FUSELAGE SKIN. THESE FASTENER LOCATIONS ARE EXTERNALLY BLOCKED BY THE ADAPTOR PLATE.

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Inspection Area
Figure 1

PART 6 - EDDY CURRENT

FUSELAGE SKIN AT THE AERO I SATCOM ANTENNA INSTALLATION (CANADIAN MARCONI AND HONEYWELL) FROM BS 747 TO BS 777 AT S-1 AND S-2L (LFEC)

1. Purpose

A. Use this low frequency eddy current (LFEC) procedure to examine the fuselage skin for cracks at the AERO I SATCOM antenna installation (Canadian Marconi and Honeywell). The fuselage skin inspection area is between the adaptor plate and stringers S-1 and S-2L from STA 747 to STA 777. See Figure 1 for the inspection areas.

B. This inspection is done while in the airplane. The probe is put in the stringers.

C. This procedure uses an impedance plane display instrument.

D. The stringers and fuselage skin are aluminum.

E. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 53-60-01-5 (LFEC)

2. Equipment

A. General

(1) Use inspection equipment that can be calibrated on the reference standard as specified in Part 6, 51-00-26, paragraph 4.

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

B. Instrument

(1) Use an eddy current instrument that:

(a) Has an impedance plane display.

(b) Operates from 2 to 4 kHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) Phasec 2D/3D; GE Inspection Technologies

(b) Nortec 600D; Olympus NDT

C. Probes

(1) Use a probe that:

(a) Operates from 2 to 4 kHz.

(b) Has a maximum diameter of 0.35 inch (8.9 mm).

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

(a) SDP.35-1K; Techna NDT

D. Reference Standards

(1) Use reference standard ANDT1051, or an equivalent, to help calibrate the instrument. Refer to Table 2 and Figure 1 in Part 6, 51-00-26 for data about reference standard ANDT1051.

3. Prepare for the Inspection

A. Identify and get access to the inspection areas shown in Figure 1.

B. Clean the inspection surfaces.

(1) Remove dirt or grease from the inspection surfaces.

(2) Remove paint only if it is loose.

4. Instrument Calibration

NOTE: All references to Figures in the steps that follow refer to the Figures in Part 6, 51-00-26.

A. Set the instrument frequency between 2 and 4 kHz.

B. Set the horizontal gain equal with the vertical gain.

C. Put the probe on the reference standard ANDT1051 at probe position 1, adjacent to the fastener head as shown in Figure 2.

D. Balance the instrument.

E. Set the balance point in the lower center of the instrument screen display and at 20 percent of full screen height (FSH) as shown in Figure 3.

F. Adjust the instrument for lift-off:

(1) Adjust the phase control to make the lift-off signal move horizontally to the left as shown in Figure 3 when the probe is lifted off the reference standard

G. Move the probe above the notch of the reference standard as shown by probe position 2 in Figure 2. Adjust the position of the probe above the notch to get a maximum notch signal.

H. Make sure the notch signal is 90 degrees from the lift-off signal (see Figure 3). Adjust the frequency to get a 90 degree separation between the lift-off signal and the notch signal.

NOTE: If the notch signal is left of vertical (90 degree phase), then increase the frequency. If the notch signal is right of vertical, then decrease the frequency. The frequency must stay between 2 and 4 kHz.

I. Adjust the sensitivity of the instrument to get a signal from the reference standard notch that is 40 percent of FSH as shown in Figure 3.

5. Inspection Procedure

A. Examine the fuselage skin for cracks at the AERO I SATCOM antenna installation (Canadian Marconi and Honeywell) as follows:

(1) Calibrate the instrument as specified in Paragraph 4.

(2) Put the probe on the stringer at one of the fastener locations to be examined.

(a) The fastener locations are at stringers S-1 and S-2L and between STA 747 and STA 777. The fuselage skin is between the adaptor plate and the stringers at these fastener locations. See Figure 1 for the inspection area.

(3) Balance the instrument.

(4) Make a full scan around each fastener in the inspection area and monitor the instrument for crack signals. See Figure 1 for the inspection area. During the inspection:

(a) Make a mark at all the locations where signals occur that are 40 percent (or more) of FSH.

(b) Do a calibration check when the inspection is completed as follows:

1) Put the probe on reference standard ANDT1051 at probe position 1, adjacent to the fastener head as shown in Part 6, 51-00-26, Figure 2.

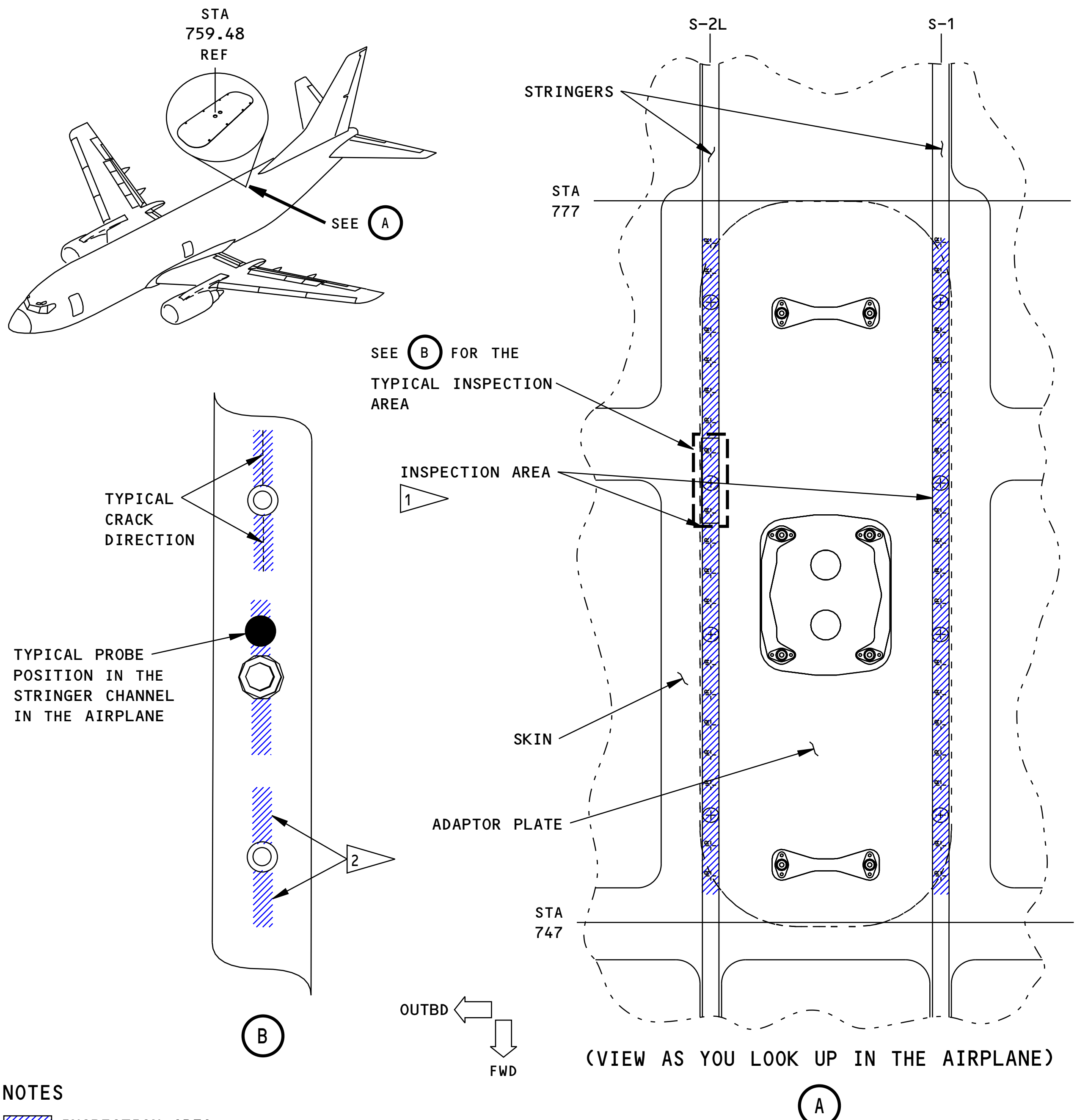
2) Balance the instrument.

3) Move the probe above the notch of the reference standard as shown by probe position 2 in Part 6, 51-00-26, Figure 2. Adjust the position of the probe above the notch to get a maximum notch signal. Compare the signal you got from the notch during calibration with the signal you get now.

4) If the signal you now get from the notch has decreased in FSH by 10 percent or more, do the calibration and inspection again on the fastener locations you have examined since the last satisfactory calibration.

6. Inspection Results

A. Refer to Part 6, 51-00-26, paragraph 6, for instructions to help make an analysis of the indications that occur during the inspection.



NOTES

INSPECTION AREA

1. EXAMINE THE FUSELAGE SKIN THAT IS BETWEEN THE ADAPTOR PLATE AND STRINGERS S-1 AND S-2L FOR CRACKS FROM STA 747 TO STA 777.

2. EXAMINE THE FUSELAGE SKIN FOR CRACKS FROM THE FORWARD AND AFT SIDES OF THE FASTENERS THAT GO THROUGH THE STRINGERS AND THE FUSELAGE SKIN. THESE FASTENER LOCATIONS ARE EXTERNALLY BLOCKED BY THE ADAPTOR PLATE.

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Inspection Area
Figure 1

PART 6 - EDDY CURRENT

FUSELAGE SKIN AT THE CUTOUT FOR THE FORWARD GALLEY DOOR AT THE STA 291 AND STA 328 FRAMES FROM S-8R TO S-14R (HFEC)

1. **General**

   A. Use this procedure to examine the fuselage skin for surface cracks at the cutout for the forward galley door. The fuselage skin is examined around the fasteners that go through the fuselage skin and the chords in the areas between stringers S-8R and S-14R at the STA 291 and STA 328 forward and aft edge frames. See Figure 1 for the inspection areas.

   B. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

      (1) Item: 53-10-15-4 (HFEC).

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 an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates at a frequency range of 50 to 500 kHz.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) Nortec 1000; Staveley

         (b) Locator 2d; Hocking

   C. Probes

      (1) A shielded, straight or right-angle probe is necessary to do this inspection.

      (2) Refer to Part 6, 51-00-00, Procedure 23, paragraph 3.C, for data about probe selection.

      (3) The probe that follows was used to help prepare this procedure.

         (a) MTF905-50; NDT Engineering Corp (Olympus)

   D. Reference Standards

      (1) Use reference standard NDT1048, or an equivalent, to help calibrate the instrument. Refer to Part 6, 51-00-00, Procedure 23, paragraph 3.D, for data about reference standard NDT1048.

   E. Circle Template

      (1) Use a nonconductive circle template as a probe guide to help find a 0.10 inch (2.5 mm) long crack from the edge of a fastener hole.

3. **Prepare for the Inspection**

   A. Identify the inspection areas shown in Figure 1.

   B. Remove the rain gutter to get access to the inspection areas.

   C. Lightly smooth rough surfaces and sharp edges of chipped paint.

D. Fully clean the inspection area.

4. Instrument Calibration

A. Calibrate the equipment as specified in Part 6, 51-00-00, Procedure 23, paragraph 5. Use reference standard NDT1048, or an equivalent, during the calibration.

5. Inspection Procedure

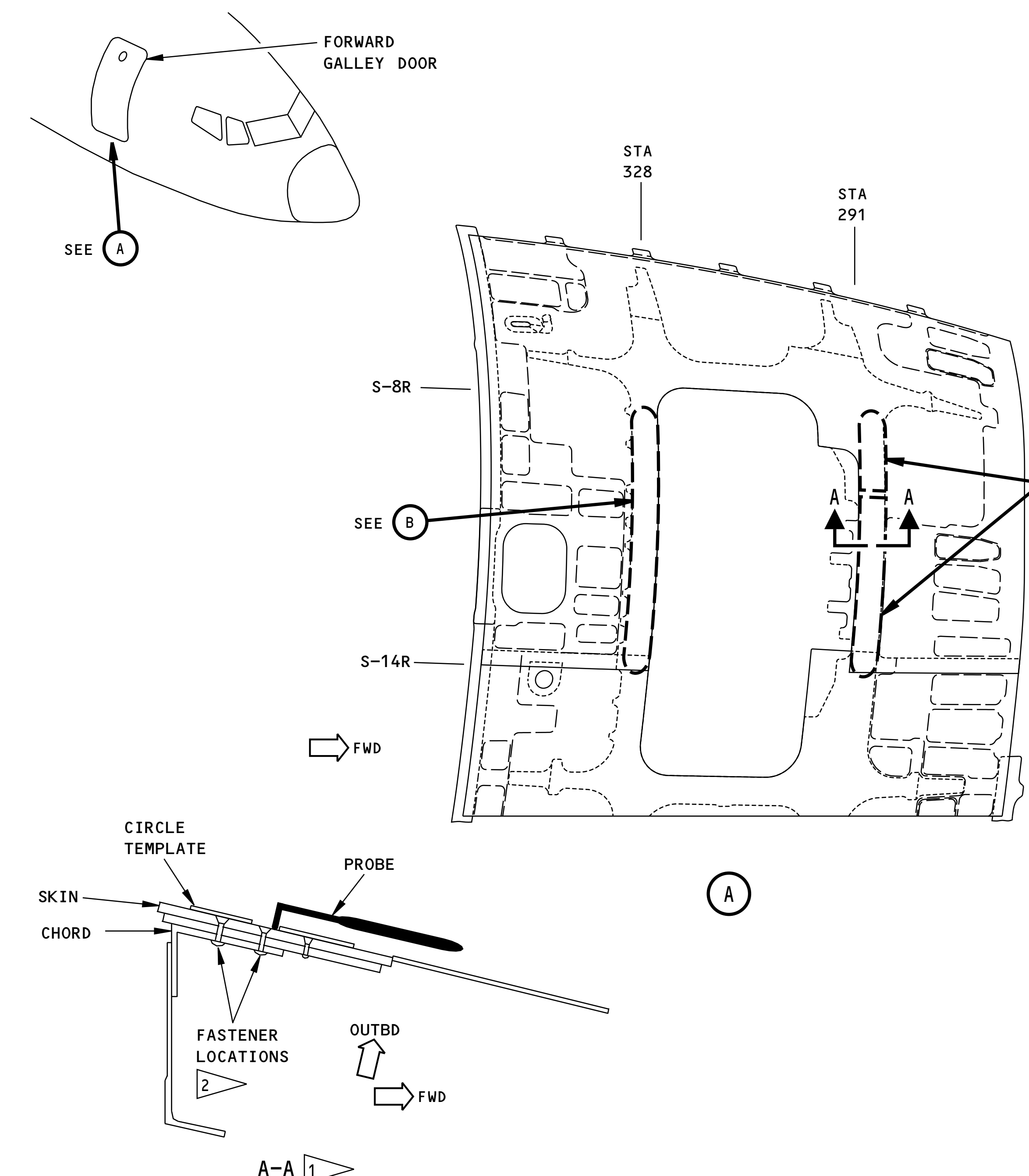
A. Examine the fuselage skin for surface cracks at the cutout for the forward galley door as specified in Part 6, 51-00-00, Procedure 23, paragraph 6, and the steps that follow:

(1) Examine the fuselage skin around the fasteners that go through the fuselage skin and the chords in the areas between stringers S-8R and S-14R at the STA 291 and STA 328 forward and aft edge frames. See Figure 1 for the inspection areas.

(2) Use a nonconductive circle template as a probe guide to help find 0.10 inch (2.5 mm) long cracks at the edges of the fastener holes.

6. Inspection Results

A. Refer to Part 6, 51-00-00, Procedure 23, paragraph 7, for instructions to help make an analysis of indications that occur during the inspection.



NOTES

1 THE FORWARD EDGE FRAME IS SHOWN; THE AFT EDGE FRAME IS ALMOST THE SAME

2 USE A CIRCLE TEMPLATE TO HELP FIND CRACKS AROUND THE FASTENERS AT THESE LOCATIONS FROM S-8 TO S-14

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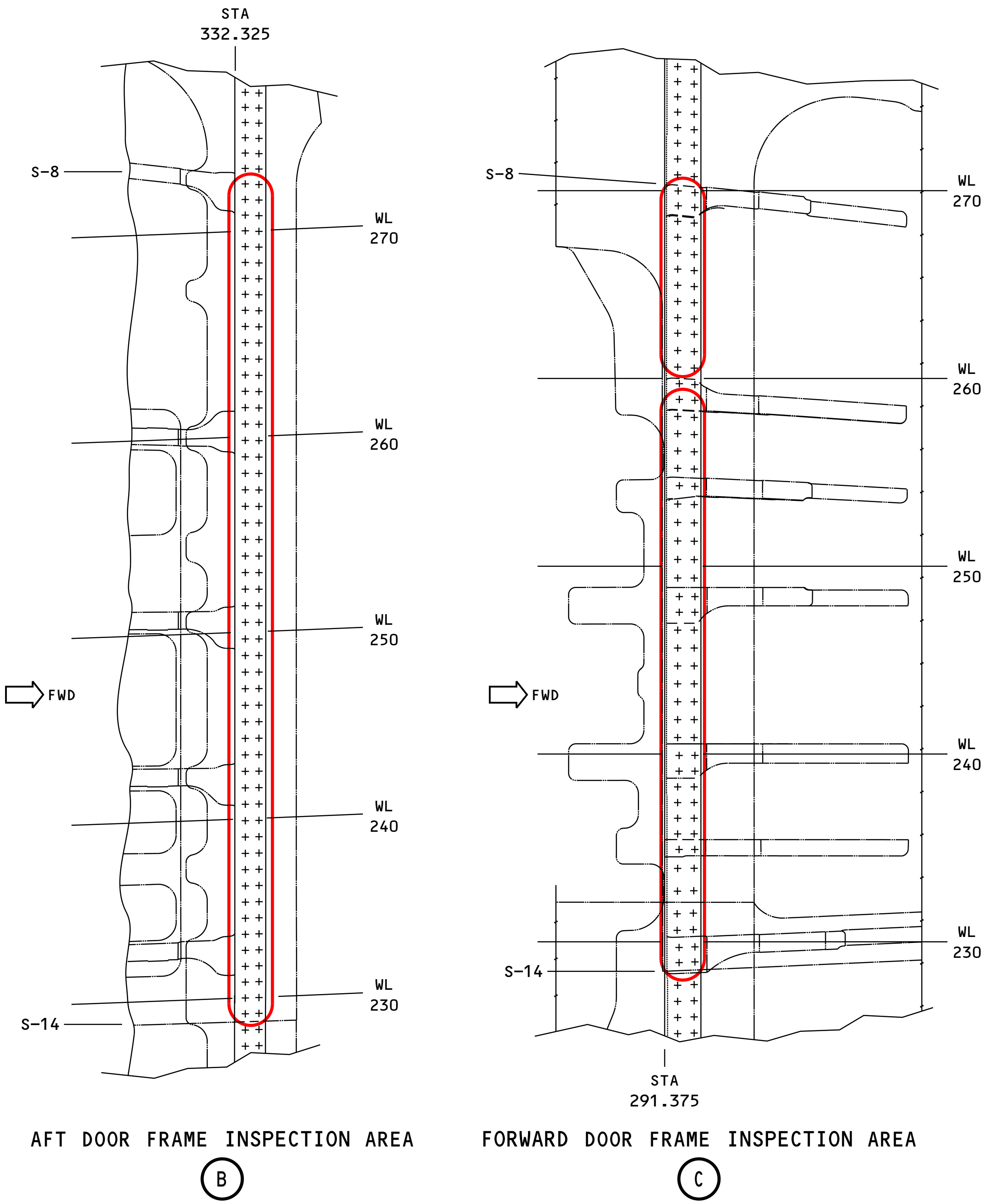
Inspection Area
Figure 1 (Sheet 1 of 2)



NOTES

- USE A CIRCLE TEMPLATE TO HELP FIND CRACKS AROUND THE FASTENERS AT THESE LOCATIONS FROM S-8 TO S-14

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Inspection Area
Figure 1 (Sheet 2 of 2)

INNER FUSELAGE SKIN AT THE S-4R LAP SPLICE FROM STA 1016 TO 1042 (LFEC)

1. Purpose

A. Use this procedure to examine the inner fuselage skin at the S-4R lap splice for cracks from STA 1016 to STA 1042. See Figure 1 for the inspection area.

B. Use a sliding probe to make a linear scan along the lower row of rivets at the S-4R lap splice to find cracks in the inner fuselage skin. The cracks can start at the fastener holes and are in the forward to aft direction. See Figure 1 for the inspection area.

C. This procedure uses an impedance plane display instrument that can operate in a dual frequency mode.

D. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 53-80-18-2

2. Equipment

A. General

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

B. Instruments

(1) Refer to Part 6, 53-30-00, Procedure 9, paragraph 3, for instrument data and for the instruments that were used to help prepare this procedure.

C. Probes

(1) Refer to Part 6, 53-30-00, Procedure 9, paragraph 3, for sliding probe data.

D. Reference Standard

(1) Use reference standard NDT1087-6 to help calibrate the instrument. See Part 6, 53-30-00, Procedure 9, paragraph 3, for more data about this reference standard.

E. Special Tools

(1) Use a nonconductive probe guide to align the centerline of the sliding probe with the centerline of the rivets.

3. Prepare for the Inspection

A. Prepare for the inspection as specified in Part 6, 53-30-00, Procedure 9, paragraph 4. The inspection area is along the lower row of rivets at the S-4R lap slice from STA 1016 to 1042.

4. Instrument Calibration

A. Calibrate the instrument with reference standard NDT1087-6 as specified in Part 6, 53-30-00, Procedure 9, paragraph 5.

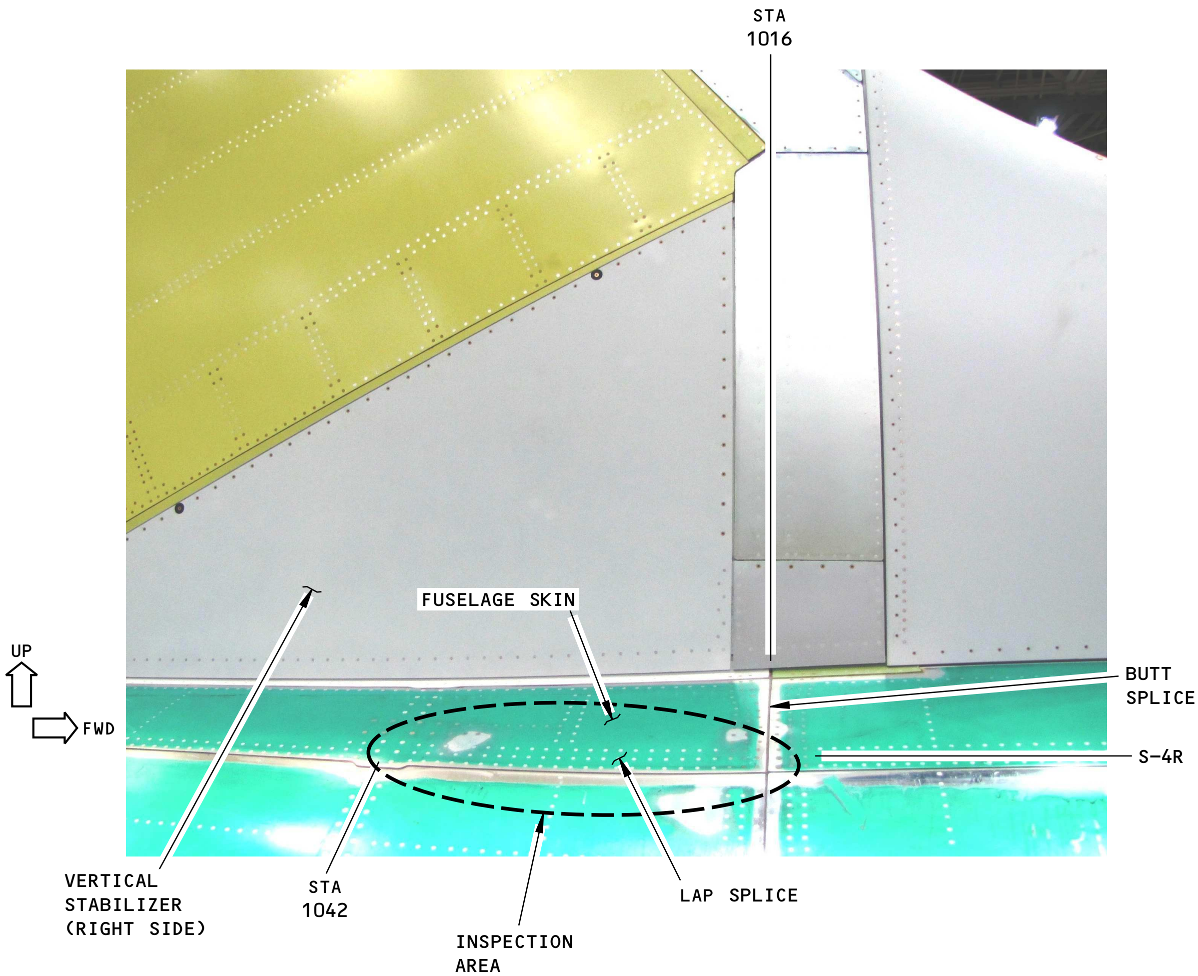
5. Inspection Procedure

A. Do a sliding probe inspection as specified in Part 6, 53-30-00, Procedure 9, paragraph 6, to examine the inner fuselage skin for cracks at the S-4R lap splice. Do the probe scans along the lower row of rivets of the lap splice between STA 1016 and 1042. See Figure 1 for the inspection area.

NOTE: There is no equivalent inspection to do on the left side of the airplane.

6. **Inspection Results**

A. Refer to Part 6, 53-30-00, Procedure 9, paragraph 7, for instructions to help make an analysis of possible crack indications.



NOTES

- THE INSPECTION AREA IS THE S-4 LAP SPLICE ON THE RIGHT SIDE OF THE AIRPLANE FROM STA 1016 TO STA 1042.
- MOVE THE SLIDING PROBE ALONG THE LOWER ROW OF RIVETS OF THE S-4R LAP SPLICE TO FIND POSSIBLE CRACKS IN THE INNER (LOWER) SKIN.
- REFER TO PART 6, 53-30-00, PROCEDURE 9, FOR INSTRUCTIONS ABOUT HOW TO DO THE SLIDING PROBE INSPECTION ON LAP SPLICES WITH A DUAL FREQUENCY INSTRUMENT.
- THIS INSPECTION IS DONE ON THE RIGHT SIDE OF THE AIRPLANE ONLY.

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Inspection Area
Figure 1

PART 6 - EDDY CURRENT

DOUBLERS BELOW THE CROWN SKIN PANELS FROM STA 203 TO STA 259.5 (LFEC)

1. **Purpose**

   A. Use this low frequency eddy current (LFEC) procedure to examine the doubler between the crown skin panels and the beam for cracks. The doublers are examined for cracks at the first fastener rows on the left and right sides of BL 0, from STA 259.5 to the cab window cutout at STA 203. See Figure 1 for the inspection areas.

   B. This inspection is done externally to the airplane.

   C. This procedure uses an impedance plane display instrument.

   D. The stringers and skin are aluminum.

   E. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

      (1) Item: 53-10-05-1 (LFEC)

2. **Equipment**

   A. General

      (1) Use inspection equipment that can be calibrated on the reference standard as specified in Part 6, 51-00-26, paragraph 4.

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

   B. Instrument

      (1) Use an eddy current instrument that:

         (a) Has an impedance plane display.

         (b) Operates from 50 to 500 kHz.

      (2) The instruments that follow were used to help prepare this procedure.

         (a) Phasec 2D/3D; GE Inspection Technologies

         (b) Nortec 600D; Olympus NDT

   C. Probes

      (1) Use a probe that:

         (a) Operates from 2 to 4 kHz.

         (b) Has a maximum diameter of 0.35 inch (8.9 mm).

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

         (a) SDP.35-1K; Techna NDT

   D. Reference Standards

      (1) Use reference standard ANDT1051, to help calibrate the instrument. Refer to Part 6, 51-00-26, Table 2 and Figure 1 for data about reference standard ANDT1051.

3. **Prepare for the Inspection**

   A. Identify and get access to the inspection areas shown in Figure 1.

   B. Clean the inspection surfaces.

      (1) Remove dirt or grease from the inspection surfaces.

(2) Remove paint only if it is loose.

4. **Instrument Calibration**

NOTE: All references to Figures in the steps that follow refer to the Figures in Part 6, 51-00-26.

A. Set the instrument frequency between 2 and 4 kHz.

B. Set the horizontal gain equal with the vertical gain.

C. Put the probe on the reference standard ANDT1051 at probe position 1, adjacent to the fastener head as shown in Figure 2.

D. Balance the instrument.

E. Set the balance point in the lower center of the instrument screen display and at 20 percent of full screen height (FSH) as shown in Figure 3.

F. Adjust the instrument for lift-off:

(1) Adjust the phase control to make the lift-off signal move horizontally to the left as shown in Figure 3 when the probe is lifted off the reference standard.

G. Move the probe above the notch of the reference standard as shown by probe position 2 in Figure 2. Adjust the position of the probe above the notch to get a maximum notch signal.

H. Make sure the notch signal is 90 degrees from the lift-off signal (see Figure 3). Adjust the frequency to get a 90 degree separation between the lift-off signal and the notch signal.

NOTE: If the notch signal is left of vertical (90 degree phase), then increase the frequency. If the notch signal is right of vertical, then decrease the frequency. The frequency must stay between 2 and 4 kHz.

I. Adjust the sensitivity of the instrument to get a signal from the reference standard notch that is 60 percent of FSH as shown in Figure 3.

5. **Inspection Procedure**

A. Examine the doubler between the crown skin panels and the beam for cracks at the first row of fasteners on each side of BL 0 and from STA 203 to STA 259.5 as follows:

(1) Calibrate the instrument as specified in Paragraph 4.

(2) Set the airplane baseline signal for a satisfactory fastener location as follows:

(a) Put the probe on the stringer at one of the fastener locations to be examined.

(b) Balance the instrument.

(c) Compare the signal of three (or more) different fastener locations in the area to be examined with the signal from the first fastener.

(d) Identify the fastener location from this group that has the smallest signal as the baseline signal of the airplane. The smallest signal is the one with the lowest height.

(e) Balance the instrument on the fastener location that gives the smallest signal.

(3) Examine each fastener location in the inspection area and monitor the instrument for crack signals. See Figure 1 for the inspection area. During the inspection:

(a) Make a mark at all the locations where signals occur that are 40 percent (or more) of FSH.

(b) Do a calibration check when the inspection is completed as follows:

1) Put the probe on reference standard ANDT1051 at probe position 1, adjacent to the fastener head as shown in Part 6, 51-00-26, Figure 2.

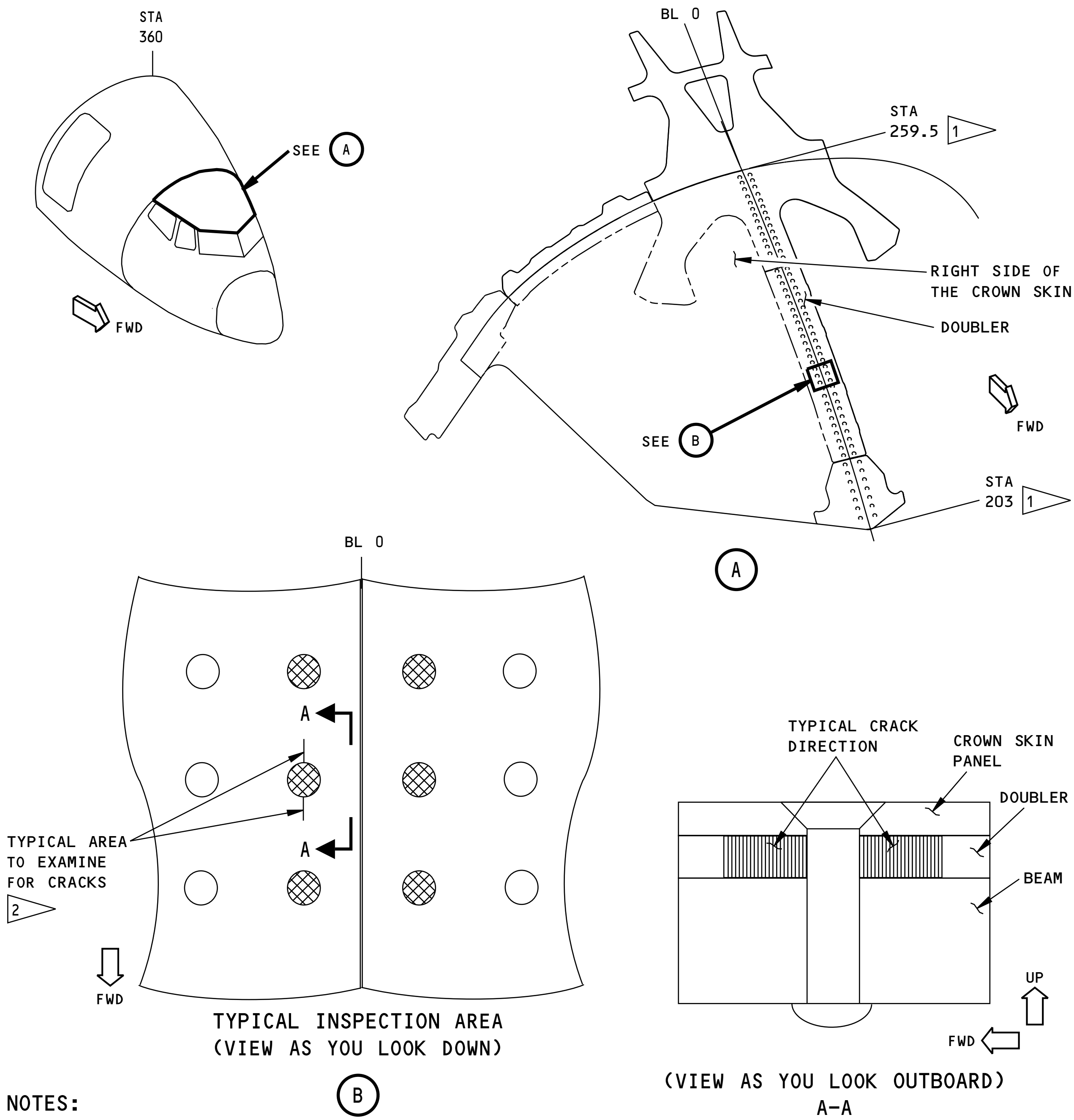
2) Balance the instrument.

3) Move the probe above the notch of the reference standard as shown by probe position 2 in Part 6, 51-00-26, Figure 2. Adjust the position of the probe above the notch to get a maximum notch signal. Compare the signal you got from the notch during calibration with the signal you get now.

4) If the signal you now get from the notch has decreased in FSH by 10 percent or more, do the calibration and inspection again on the fastener locations you have examined since the last satisfactory calibration.

6. Inspection Results

A. Refer to Part 6, 51-00-26, paragraph 6, for instructions to help make an analysis of the indications that occur during the inspection.



NOTES:

- INSPECTION FASTENER LOCATIONS
- 1 EXAMINE THE DOUBLER BELOW THE CROWN SKIN PANEL FOR CRACKS AT ALL FASTENER LOCATIONS IN THE FIRST ROW TO THE LEFT AND RIGHT OF BL 0 FROM STA 259.5 TO THE CAB WINDOW CUTOUT AT STA 203
- 2 EXAMINE THE DOUBLER BELOW THE CROWN SKIN PANEL FOR CRACKS IN THE AREAS AROUND EACH FASTENER.

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Inspection Area
Figure 1

PART 6 - EDDY CURRENT

INBOARD SKIN AT THE S-24L LAP SPLICE FROM BS 1016 TO BS 1042 ON THE LEFT SIDE OF THE AIRPLANE (LFEC)

1. **Purpose**
   A. Use this procedure to examine the inboard skin for cracks at the S-24L lap splice, from BS 1016 to BS 1042. This inspection is done on the left side of the airplane only. See Figure 1 for the inspection area.
   B. Use a sliding probe to make a linear scan along the lower row of rivets at the S-24L lap splice to find cracks in the inboard skin. The cracks can start at the fastener holes and be in the forward to aft direction. See Figure 1.
   C. This procedure uses an impedance plane display instrument that can operate in a dual frequency mode.
   D. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:
      (1) Item: 53-80-18-6

2. **Equipment**
   A. General
      (1) Refer to Part 1, 51-01-00, for data about the equipment manufacturers.
   B. Instruments
      (1) Refer to Part 6, 53-30-00, Procedure 9, for instrument data and the instruments that were used to help prepare this procedure.
   C. Probes
      (1) Refer to Part 6, 53-30-00, Procedure 9, for sliding probe data.
   D. Reference Standard
      (1) Use reference standard NDT1087-8 to help calibrate the instrument. Refer to Part 6, 53-30-00, Procedure 9, paragraph 3, for data about reference standard NDT1087-8.
   E. Special Tools
      (1) Use a nonconductive probe guide to align the centerline of the sliding probe with the centerline of the rivets.

3. **Prepare for Inspection**
   A. Refer to Part 6, 53-30-00, Procedure 9, paragraph 4, for instructions to help prepare for the inspection. The inspection area is the lower row of rivets at the S-24L lap slice, from BS 1016 to BS 1042.

4. **Instrument Calibration**
   A. Calibrate the instrument with reference standard NDT1087-8 as specified in Part 6, 53-30-00, Procedure 9, paragraph 5.

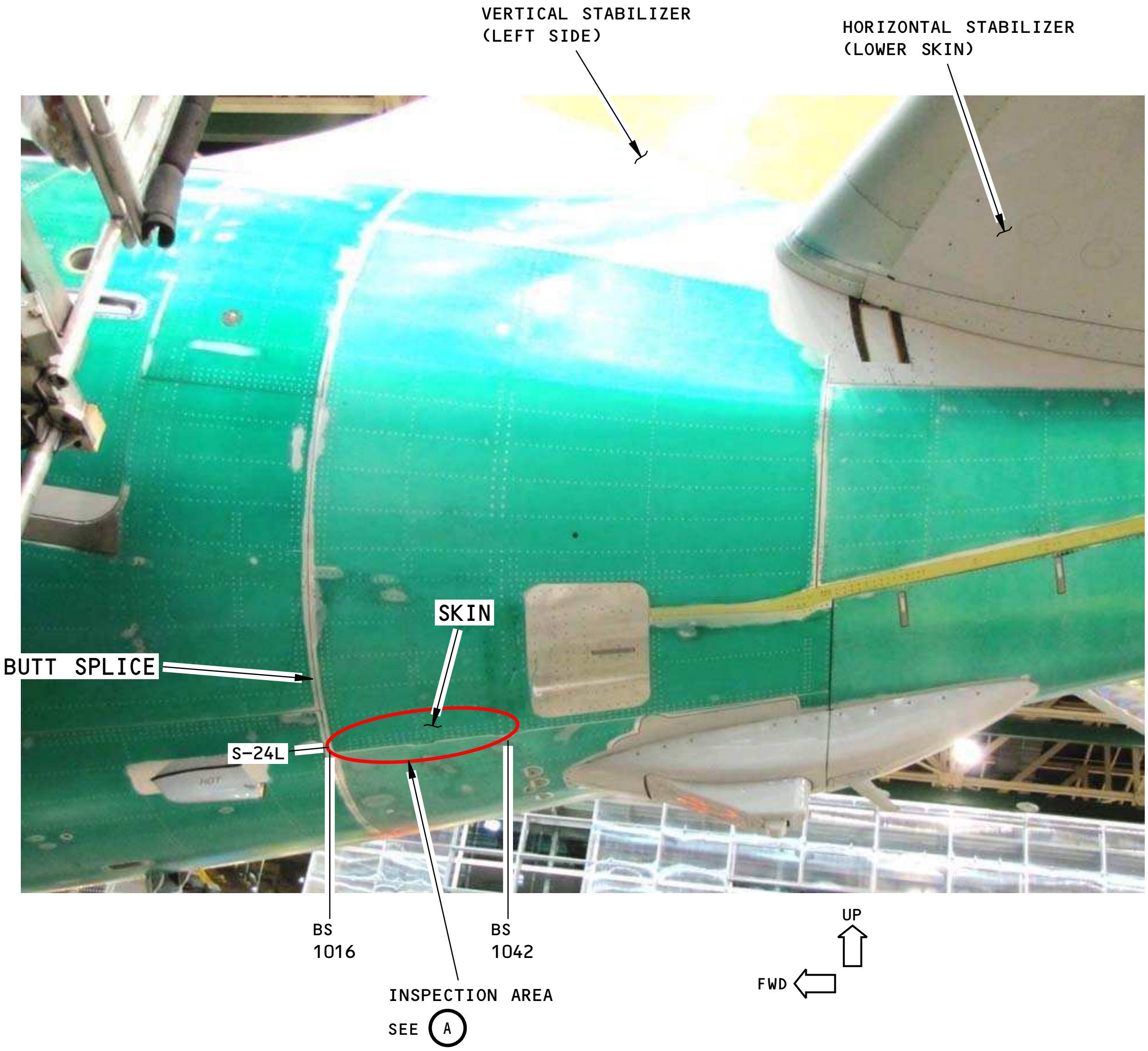
5. **Inspection Procedure**
   A. Examine the inboard skin for cracks at the S-24L lap splice, from BS 1016 to BS 1042, as specified in Part 6, 53-30-00, Procedure 9, paragraph 6, and the step that follows. See Figure 1 for the inspection area.

      NOTE: This inspection is only done on the left side of the airplane.

(1) Do the sliding probe scans along the lower row of rivets at the S-24L lap splice. See Figure 1.

6. **Inspection Results**

A. Refer to Part 6, 53-30-00, Procedure 9, paragraph 7, for instructions to help make an analysis of possible crack indications.



NOTES

- THE INSPECTION AREA IS AT THE S-24 LAP SPLICE ON THE LEFT SIDE OF THE AIRPLANE FROM BS 1016 TO BS 1042.

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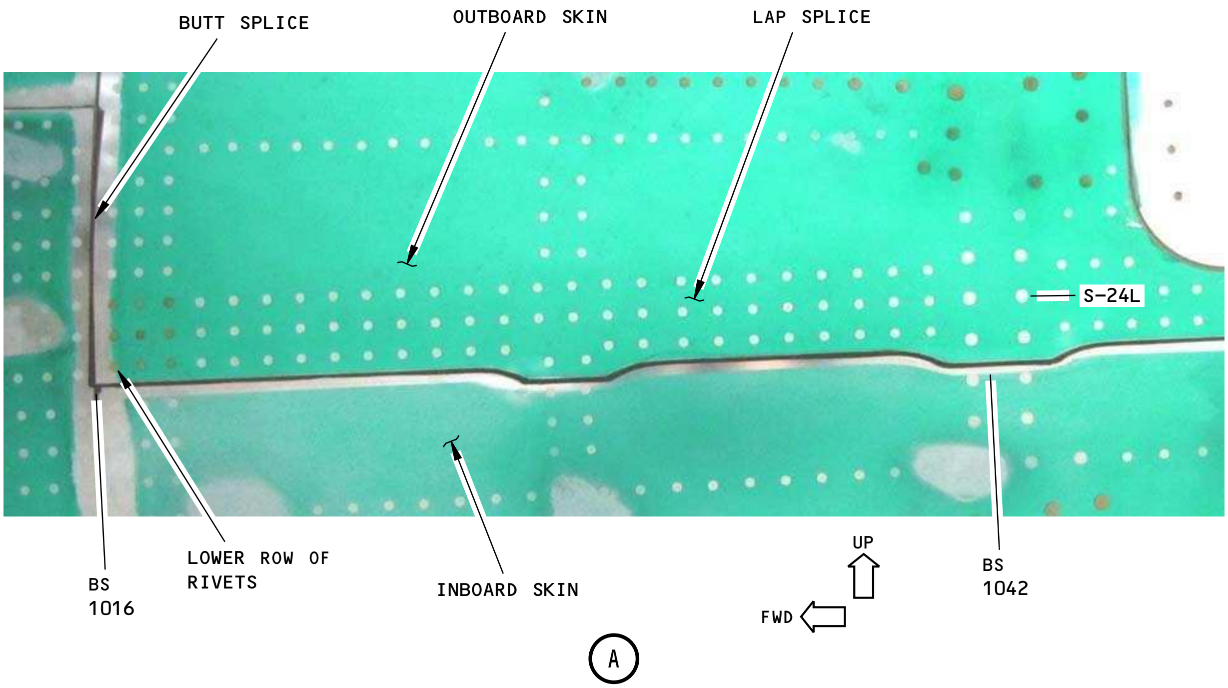
Inspection Area
Figure 1 (Sheet 1 of 2)



NOTES

- DO THE INSPECTION ALONG THE LOWER ROW OF RIVETS AT THE S-24L LAP SPLICE FROM BS 1016 TO BS 1042
- REFER TO PART 6, 53-30-00, PROCEDURE 9, FOR INSTRUCTIONS ABOUT SLIDING PROBE INSPECTIONS ON LAP SPLICES WITH A DUAL FREQUENCY INSTRUMENT.
- THIS INSPECTION IS DONE ON THE LEFT SIDE OF THE AIRPLANE ONLY

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Inspection Area
Figure 1 (Sheet 2 of 2)