PART 6 - EDDY CURRENT

MEASUREMENT OF RADOME THICKNESS

INSPECTION OF REPAIRED AREAS OF THE RADOME

1. NOTICE

A. Before the July 15, 2012 (747) or the November 15, 2012 (727, 737) revisions, this procedure, Part 6, 53-50-00, Procedure 1, was identified as Part 6, 53-50-00, Fig. 1. Because of a publishing system change, the term “Fig.” was changed to “Procedure”. The technical instructions were not changed.

2. Purpose

A. Use this procedure to measure the wall thickness in areas of the radome that have been repaired.

B. This procedure uses an impedance plane display instrument to examine the repaired areas of the radome.

C. Two people can be necessary to do this inspection if the repaired area is near the forward end of the radome; one person to hold the reflector plate and one person to do the inspection.

3. Equipment

A. General

(1) Use inspection equipment that can be calibrated on the reference standard as specified 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 in a frequency range of approximately 500 Hz to 4.0 kHz.

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

(a) 500D; Olympus NDT

(b) Phasec 2S/3D; GE

(c) 1000S/2000D; Nortec

C. Probes

(1) Use a ring probe that:

(a) Can operate in the frequency range specified in Paragraph 3.B.(1)(b).

(b) Has a minimum inside diameter of 0.5 inch (13 mm).

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

(a) RDP1.3/.78-500H; NDT Engineering

(b) RDP1.1-100H; NDT Engineering

(c) RR0510-6; NDT Engineering

(d) TEK4000A; Techna NDT

D. Reference Standard

(1) Use reference standard 130A, 130B or NDT706. See Figure 1 and Figure 2 for data about these reference standards.

(2) Use reflector disk 130C, NDT706P, or reference standard 4029. See Figure 3 for data about reflector disk 130C. Refer to Figure 1 in Part 4, 55-50-01 of the 747 NDT Manual for data about reference standard 4029.

NOTE: Reflector disk 130C is the same as reflector disk NDT706P that is used during the inspection of repairs made on radomes of different models of Boeing airplanes. If available, it is acceptable to use reflector disk NDT706P for this procedure.

4. Prepare for the Inspection

A. Identify the correct radome configuration for the aircraft model. See Figure 4.

B. Make sure that the inner and outer surfaces of the repaired area are clean and smooth to permit the probe and the reflector disk to sufficiently touch the repaired area.

5. Calibrate the Instrument

CAUTION: DO NOT BALANCE THE INSTRUMENT AFTER YOU DO THE CALIBRATION. IF YOU BALANCE THE INSTRUMENT AFTER THE CALIBRATION, IT WILL BE NECESSARY TO CALIBRATE THE INSTRUMENT AGAIN BEFORE YOU DO MORE INSPECTIONS.

NOTE: The instrument is calibrated to measure the lift-off between the probe and the reflector disk. The different steps of the reference standard must simulate and be equivalent to the nominal, the minimum and the maximum radome thicknesses that are permitted in a repair area.

A. Set the instrument frequency between 500 Hz and 4.0 kHz.

B. See Figure 4 to identify the usual wall thickness of the radome in the area where the repair occurs. This thickness is referred to as the "nominal" wall thickness in this procedure.

C. Find the step on reference standard 130A, 130B or NDT706 that has a thickness that is equivalent to the nominal thickness of the radome that was identified in Paragraph 5.B.

NOTE: If the reference standard does not have the equivalent thickness, add nonconductive shims or tape on the step to get the nominal thickness of the radome.

D. Put the reference standard on the curved side of reflector disk 130C or reference standard 4029. Make sure the reference standard step that is equivalent to the nominal thickness of the radome is centered on the reflector disk as shown in Figure 5.

E. Put the probe on the nominal thickness step and at the approximate center of the step.

F. Balance the instrument.

G. Set the balance point at 50% of full screen width (FSW) and 50% of full screen height (FSH).

H. Adjust the phase control so that the lift-off signal moves horizontally from right to left.

NOTE: You can tilt the probe and reference standard together while on the reflector disk to get a change in the lift-off signal.

I. Tilt the probe and reference standard to get a minimum lift-off signal and balance the instrument again. If necessary, adjust the balance point to the center of the screen again. See Figure 5, Screen Display 1.

NOTE: The lift-off signal is at a minimum when the signal is at the farthest position to the right of the screen display.

J. Move the probe to the reference standard step that is equivalent to the maximum thickness permitted for the repair area. See Figure 4 for the maximum thicknesses.

NOTE: If the reference standard does not have the equivalent thickness, add nonconductive shims or tape on the step to get the maximum thickness that is permitted for the radome.

K. Adjust the probe and reference standard to the center of the reflector disk.

L. Tilt the probe and reference standard as necessary to get a minimum lift-off signal and keep the probe at this position. This lift-off signal will be to the left of the balance point of the nominal thickness step because the lift-off has increased.

M. Adjust the gain so that the minimum lift-off signal from Paragraph 5.L. is 30% of FSW as shown in Figure 5, Screen Display 2.

NOTE: It is permitted to change the instrument frequency in the range specified in Paragraph 5.A. to get better sensitivity to changes in lift- off.

N. Do Paragraph 5.D. thru Paragraph 5.M. until the lift-off signal from Paragraph 5.L. is 30% of FSW. Make sure to balance the instrument on the nominal thickness step only.

O. Move the probe to the reference standard step that is equivalent to the minimum thickness permitted for the repair area. See Figure 4 for the minimum thicknesses.

NOTE: If the reference standard does not have the equivalent thickness, add nonconductive shims or tape on the step to get the minimum thickness that is permitted for the radome.

P. Adjust the probe and reference standard to the center of the reflector disk.

Q. Tilt the probe and reference standard to get a minimum lift-off signal and keep the probe at this position. This lift-off signal will be to the right of the balance point of the nominal thickness step because the lift-off has decreased. Do not adjust the gain.

R. Make a record of the horizontal position of the minimum lift-off signal from Paragraph 5.Q. or put a mark on the instrument screen that identifies the minimum lift-off signal.

NOTE: The instrument frequency is too high if the minimum lift-off signal is more than 90% of FSW.

(1) If the minimum lift-off signal is more than 90% of FSW, decrease the instrument frequency and calibrate the instrument again.

S. Monitor the instrument display for probe drift. Calibrate the instrument again if necessary.

6. Inspection Procedure

CAUTION: DO NOT BALANCE THE INSTRUMENT AFTER YOU DO THE CALIBRATION. IF YOU BALANCE THE INSTRUMENT AFTER THE CALIBRATION, IT WILL BE NECESSARY TO CALIBRATE THE INSTRUMENT AGAIN BEFORE YOU DO MORE INSPECTIONS.

A. Put the curved surface of the reflector disk against the inner surface of the radome at the location to be measured.

NOTE: Keep all conductive materials which can have an effect on the inspection results away from the inspection area.

B. Put the probe on the outer surface of the radome and opposite the reflector disk. Do not balance the instrument.

C. Make a scan above the reflector disk and get a minimum lift-off signal from the reflector disk.

D. Compare the horizontal positions of the minimum lift-off signals in the repair area to the horizontal positions for the maximum and minimum lift-off signals that you set in Paragraph 5.M. and Paragraph 5.Q.

(1) Monitor the instrument display for probe drift. Calibrate the instrument again when necessary.

E. Lift-off signals that are less than 30% of FSW or more than the FSW position recorded in Paragraph 5.R. shows that the repair thickness is out of tolerance.

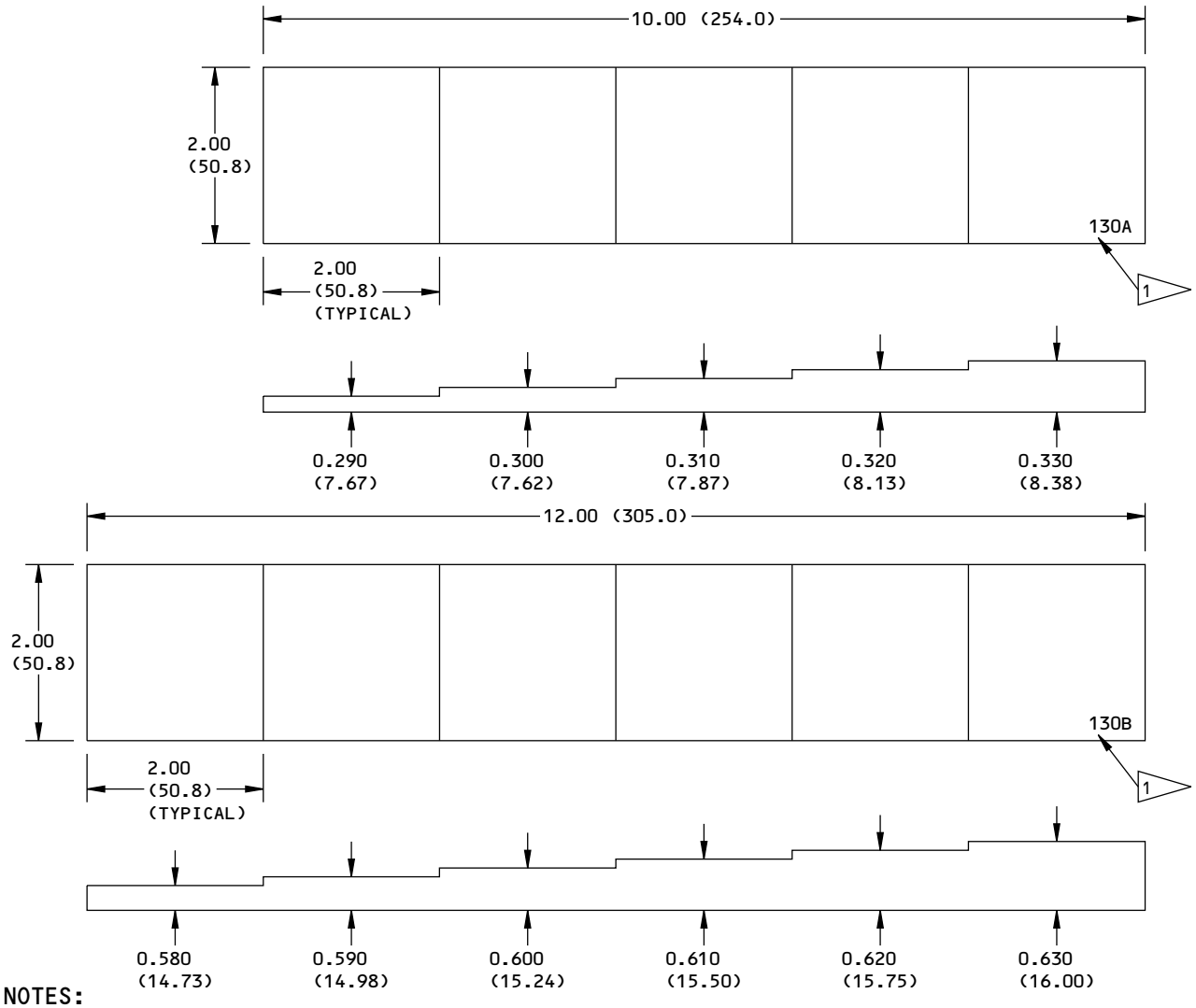
7. Inspection Results

A. Reject all repairs where, for an applicable repair area, the minimum lift-off signal you get during an inspection does not fall between the minimum lift-off signals you got from the minimum and maximum thickness steps of reference standard 130A, 130B or NDT706.

B. The conditions that follow can cause incorrect measurements.

(1) The reflector disk does not fit tightly against the radome. Move the reflector disk to get a better fit. If reflector disks 103C or NDT706P do not fit tightly on nose radome part numbers 1001002-5, -6, or -7, use reference standard 4029.

(2) The probe is not centered above the reflector disk. Move the probe or reflector disk to get a minimum lift-off signal.



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: LUCITE OR EQUIVALENT NONCONDUCTIVE MATERIAL
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.001	X.XX = ±0.03
X.XX = ±0.03	X.X = ±0.8
X.X = ±0.050	X = ±1

1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, 130A OR 130B, AS APPLICABLE, AT APPROXIMATELY THIS LOCATION

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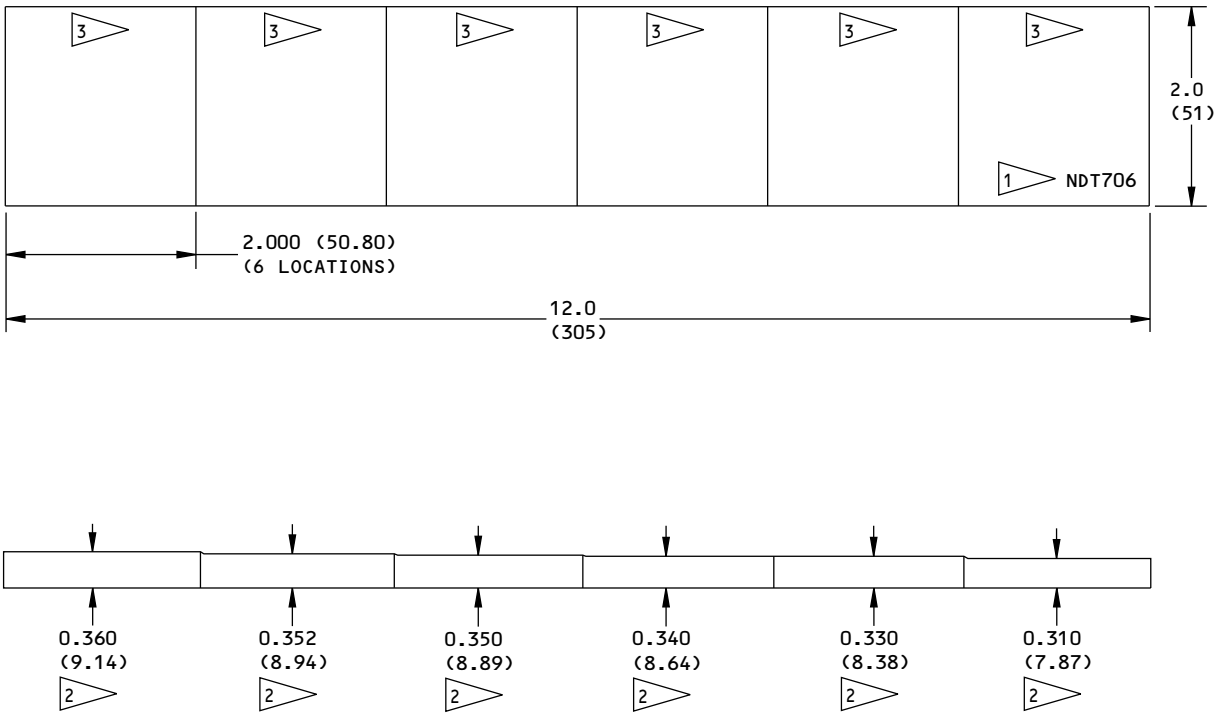
Reference Standards 130A and 130B
Figure 1



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: LUCITE OR EQUIVALENT NONCONDUCTIVE MATERIAL
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.001	X.XX = ±0.03
X.XX = ±0.03	X.X = ±0.8
X.X = ±0.050	X = ±1

1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT706, AT APPROXIMATELY THIS LOCATION

2 TOLERANCE: ±0.001 (0.03)

3 ETCH THE STEP THICKNESS AT APPROXIMATELY THIS LOCATION

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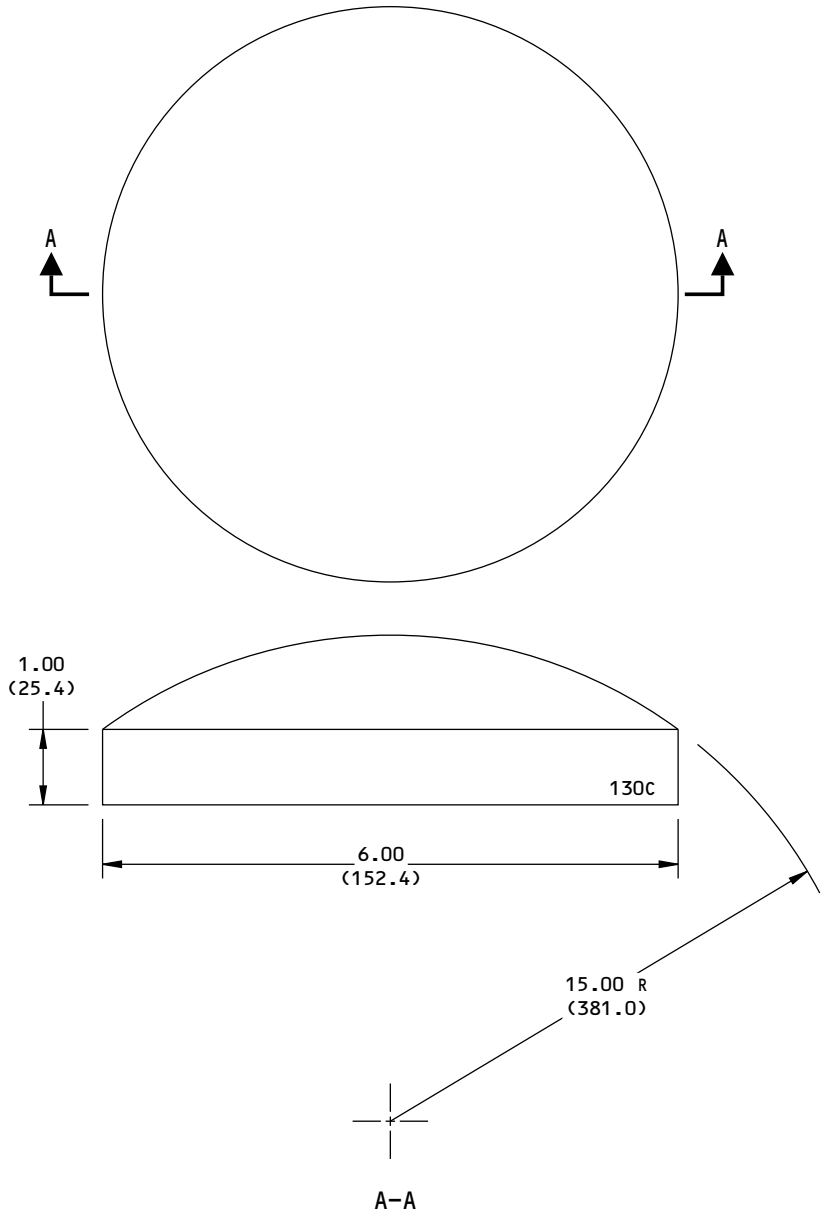
Reference Standard NDT706
Figure 2



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- DIMENSION TOLERANCES: ± 0.030 (0.76)
- MATERIAL: ALUMINUM, 2024, 7075 OR EQUIVALENT
- PART NUMBER: 130C

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Aluminum Reflector (Circular) Disk
Figure 3

Airplane and Radome Part Number	Thickness Range of the Radome (but not at Overlaps) [2]	Thickness Range of the Radome at Single Overlaps [2]	Thickness Range of the Radome at Double Overlaps [2]	Thickness Range of the Radome at the Nose Cone
707 x-band	0.290 0.310 [1] 0.330			
707 c-band	0.580 0.610 [1] 0.630			
727 65-2040-6, -12,-14	0.625 0.640 [1] 0.655	0.615 0.640 [1] 0.655		
727/737 65-54464-1,-3 65-73295-1	0.580 0.590 [1] 0.605	0.590 0.600 [1] 0.615	0.600 0.610 [1] 0.625	
727 65-2040-7,-17	0.365 0.380 [1] 0.395	0.355 0.380 [1] 0.405		0.315 0.330 [1] 0.345
727/737 65-73294-1,-2,-5, -6,-8 65-54463-1,-3	0.304 0.312 [1] 0.322	0.292 0.300 [1] 0.310	0.308 0.316 [1] 0.328	0.304 0.312 0.322
737 65-73294-7	0.39 ±0.006 [1]	0.38 ±0.006 [1]	0.409 ±0.006	0.39 ±0.006
737 65-73294-9	0.304 0.312 0.322	0.292 0.300 0.321	0.308 0.316 0.328	
737 1001002-5,-6,-7	0.310 0.330 0.350	0.320 0.340 0.360		0.310 0.330 0.350
747 65B07929-3	0.340 0.350 [1] 0.360	0.340 0.360 [1] 0.370		
747 65B07929-1,-2,-4, -5,-6	0.340 0.350 [1] 0.360	0.323 0.335 [1] 0.347	0.323 0.360	
757 284N1417	0.340 0.350 0.360			
767 284T0051	0.340 0.350 0.360			

NOTES

[1] NOMINAL INSPECTION THICKNESS - REFERENCE THICKNESS FOR CALIBRATION AND THE REFERENCE STANDARD.

[2] REFER TO THE RADOME DRAWINGS FOR THE LOCATION OF THE OVERLAPS.

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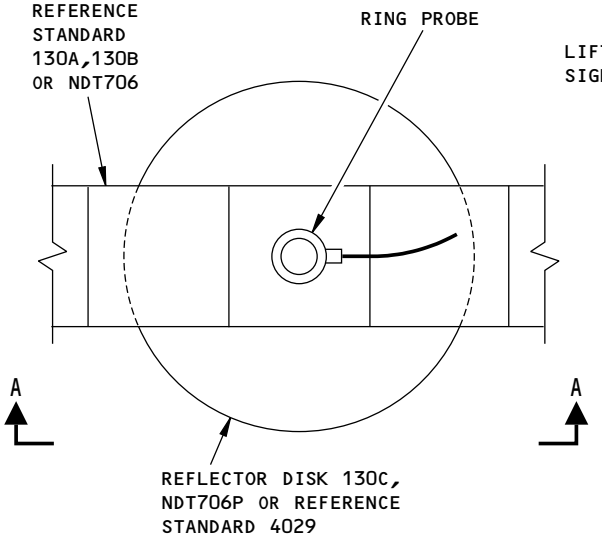
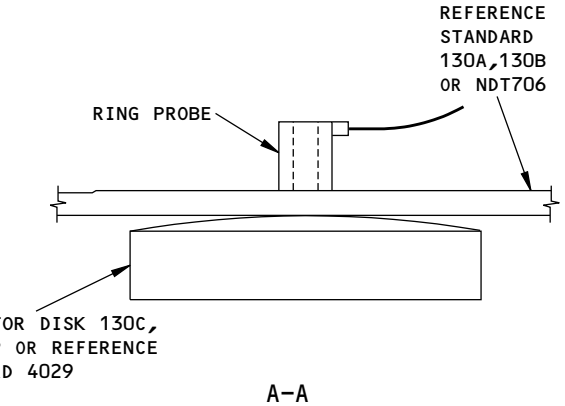
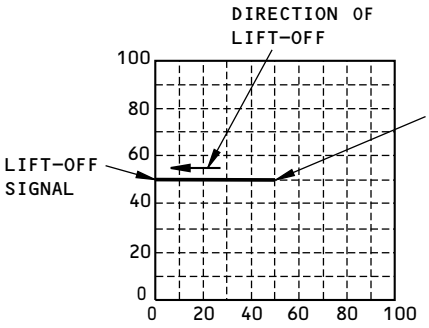
Radome Thickness Ranges
Figure 4



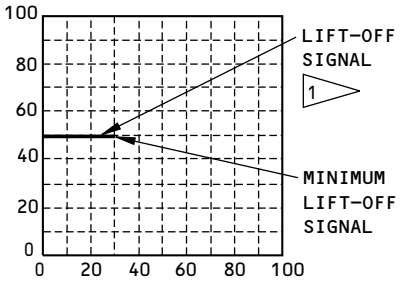


A-A



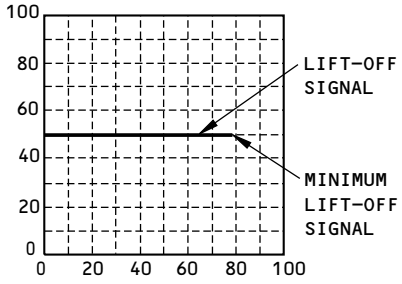
SCREEN DISPLAY 1

WITH THE PROBE ON THE NOMINAL THICKNESS STEP, SET THE BALANCE POINT AS SHOWN



SCREEN DISPLAY 2

WITH THE PROBE ON THE MAXIMUM THICKNESS STEP, USE THE HORIZONTAL GAIN TO PUT THE LIFT-OFF SIGNAL AT 30% OF FULL SCREEN WIDTH



SCREEN DISPLAY 3

SCREEN DISPLAY EXAMPLE WITH THE PROBE ON THE MINIMUM THICKNESS STEP 2

NOTES:

1. WITH AN INCREASE IN THE LIFT-OFF (THE PROBE IS ON THE MAXIMUM THICKNESS), THE LIFT-OFF SIGNAL WILL MOVE TO THE LEFT OF THE BALANCE POINT.
2. APPROXIMATE LIFT-OFF SIGNAL LOCATION. THE LOCATION WILL CHANGE WITH DIFFERENT STEP THICKNESSES.

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Instrument Calibration
Figure 5