BOEING

CAGE CODE 81205

THIS DOCUMENT IS:

CONTROLLED BY PHM ENGINEERING TECHNICAL STAFF, W-7830
ALL REVISIONS TO THIS DOCUMENT SHALL BE APPROVED BY THE ABOVE ORGANIZATION PRIOR TO RELEASE.

PREPARED UNDER [X] CONTRACT NO. N00024-91-C-2202
[ ] IR&D
[ ] OTHER

PREPARED ON WORD 5.0 FILED UNDER 809981

DOCUMENT NO. D312-80998-1 MODEL PHM

TITLE EFFECT OF GRIT BLAST PROFILE, PAINT AND ER347 WELDS ON SURFACE WAVE ULTRASONIC INSPECTION OF 17-4PH/15-5PH CRES PHM STRUT/FOIL STRUCTURES

ORIGINAL RELEASE DATE 4-27-93

ISSUE NO. TO DATE

[X] THE INFORMATION CONTAINED HEREIN IS NOT PROPRIETARY.

[ ] THE INFORMATION CONTAINED HEREIN IS **PROPRIETARY** TO THE BOEING COMPANY AND SHALL NOT BE REPRODUCED OR DISCLOSED IN WHOLE OR IN PART OR USED FOR ANY DESIGN OR MANUFACTURE EXCEPT WHEN SUCH USER POSSESSES DIRECT, WRITTEN AUTHORIZATION FROM **THE BOEING COMPANY.**

ANY ADDITIONAL LIMITATIONS IMPOSED ON THIS DOCUMENT WILL BE FOUND ON A SEPARATE LIMITATIONS PAGE.

	SIGNATURE	ORGN	DATE
PREPARED BY	H. J. Schlichtmann	9-5576	4-22-93
CHECKED BY	R. C. Eng	W-7840	4-22-93
SUPERVISED BY	L. F. Ahearn	W-7830	4/22/93
APPROVED BY	R. G. Hass	W-7850	4/22/93

ABSTRACT

Tests were conducted to determine the effects of grit blast profile, paint thickness and ER347 welds on the ability to detect fatigue flaw growth in 17-4PH/15-5PH structures by surface wave ultrasonic inspection (UT) techniques. PHM reference notch calibration standards were selected for use in the profile and paint evaluation. These standards were blast finished and painted within the range of blast profiles and paint thicknesses anticipated for PHM strut and foil structures. Additional standards were fabricated with EDM notches located in the 17-4PH base metal and at varying distances from the fusion line of ER347 welds. The results indicated that these structures can be inspected for weld and base metal flaws at the surface using a 1.0 MHz transducer.

KEY WORD LIST

ULTRASONIC INSPECTION (UT)
SURFACE WAVE
REFERENCE NOTCH CALIBRATION STANDARD
BLAST PROFILE
PAINT
ER347 WELD

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

1.0 INTRODUCTION

Current nondestructive test and inspection plans call for penetrant and/or magnetic particle inspection of PHM strut and foil structures on 2 year intervals. With the implementation of Shipalt 104, which painted PHM strut and foil structures, and the plan to dry dock ships at 4 year intervals, there is a need to develop an alternate inspection method which does not necessitate removal of paint. This alternate inspection method should also be capable of detecting flaws in ER347 CRES welds as well as in 17-4PH/15-5PH CRES base metal and welds.

A program was established to evaluate the effects of grit blast profiles, paint thickness and ER347 welds on the detection of fatigue flaw growth by surface wave UT techniques.

2.0 TEST DETAILS

2.1 PROFILE AND PAINT EVALUATION

2.1.1 TEST MATERIALS

Seven certified PHM reference calibration standards were selected for use in this evaluation. The base material was 17-4PH CRES in the H1100 condition. Each of the standards contained two 0.020 inch deep reference notches; one 0.276 inch long, the other 0.402 inch long.

2.1.2 TEST PROCEDURES

A test plan was prepared to have the seven selected notch calibration standards finished to various blast profiles and paint thicknesses to cover the ranges anticipated for in-service PHM strut and foil structures. See Table I.

Prior to finishing the standards in accordance with the Table I test matrix, each of the selected notch calibration standards was scanned by three technicians. Scans were performed using 1.0 MHz, 2.25 MHz and 5.0 MHz transducers. The results of these scans are given in Tables II, III and IV.

The selected notch standards were then grit blast finished and painted in accordance with Table I and SK-W7830-0176. Finish profile and paint thickness were measured in accordance with Steel Structures Painting Council (SSPC) procedures. Paint thickness measurements are documented in Figure 1. Measured blast finish profiles are recorded in Tables VIII through XI.

After finishing, the selected notch standards were scanned by four technicians, three of whom had also scanned the standards prior to finishing. These data are recorded in Tables V, VI and VII.

All decibel (dB) gain data in Tables II through VII were adjusted to 80% full screen height (FSH) and also for differences in test instruments used. These data were then averaged for all scans on all standards, before and after finishing.

2.1.3 TEST RESULTS

Test results with regard to the effects of blast profile and paint thickness are summarized in Tables VIII, IX, X and XI for all scans conducted. Figures 2 and 3 depict the effects of finish profile and paint thickness for scans conducted with a 1.0 MHz transducer only and provide the basis for a workable surface wave inspection procedure.

2.2 ER347 WELD EVALUATION

2.2.1 TEST MATERIAL

Two electrical discharge machined (EDM) notch standards were fabricated. The base material was 17-4PH CRES in the H1100 condition. Welds were deposited using ER347 filler metal per AWS A5.9. EDM notches were machined in the base metal and weld. See sketches SK-W7830-0168, Rev. A and SK-W7830-0187.

Notches on the -0187 notch standard were assigned a numerical designation from 1 to 11 for easy identification. An inadvertent machining error resulted in notch depths less than the nominal 0.020 inch specified by sketch. See Boeing Metrology Laboratory Test Report No. 9-4794-TR-2199. It was determined that these notches were suitable for the purposes of this investigation.

2.2.2 TEST PROCEDURES

During the feasibility phase of this evaluation, scans were run by one technician on notch standard SK-W7830-0168. Scans were performed using 0.5 MHz, 1.0 MHz, 2.25 MHz and 5.0 MHz transducers. These data, which were corrected from that previously reported by BAO letter W-7800-AFH-1104 dated 05 May 1992, are recorded in Tables XII, XIII, XIV and XV.

Work with the 0.5 MHz frequency was discontinued because the return signals were difficult to read and duplicate. The widely spaced individual cycles resulting from the long wave length caused these problems with all combinations of equipment available.

Four technicians conducted scans on notch standard SK-W7830-0187 using 1.0 MHZ, 2.25 MHz and 5.0 MHz transducers. These data are recorded in Tables XVI, XVII and XVIII.

2.2.3 TEST RESULTS

Test results on the effects of ER347 welds are summarized in Tables XII, XIII, XIV, XV, XIX, XX and XXI, and, for the 1.0 MHz frequency only, Figure 4.

2.3 NOTCH SIZE EVALUATION

2.3.1 TEST MATERIALS

Notch standards SK-W7830-0168 and SK-W7830-0187 were used for evaluating signal response as a function of notch size.

2.3.2 TEST PROCEDURES

During the feasibility phase of this evaluation, scans were run by one technician on notch standard SK-W7830-0168. Scans were performed using 0.5 MHz, 1.0 MHz, 2.25 MHz and 5.0 MHz transducers. These data are recorded in Table XXII.

Scans on notch standard SK-W7830-0187 were conducted by four technicians using surface wave frequencies of 1.0 MHZ, 2.25 MHz and 5.0 MHz. These data are recorded in Tables XXIII, XXIV and XXV.

2.3.3 TEST RESULTS

Relative signal response, as a function of notch size and transducer frequency, is summarized in Tables XXII and XXVI and, for a 1.0 MHz frequency, is shown in Figure 5.

3.0 DISCUSSION OF PHM FLAW GROWTH ANALYSES

Previous work done on shear wave inspection of PHM strut and foil structures included a review of the flaw growth propagation and life at required inspection sites. This review showed that initial propagation of assumed standard weld and blind weld flaws was primarily in the depth direction, with very little increase in length. On this basis, it was determined that use of a 0.070 inch deep notch was suitable for standardization for in-service shear wave inspection for flaws located at the inner mold line of welds in strut and foil structure.

It is probable that a review of flaw growth propagation and life at sites requiring inspection for surface flaws would show similar trends based on an assumed initial standard weld flaw size (0.060 inch deep by 0.500 inch long). If this hypothesis is true, then use of a 0.070 inch deep notch would also be suitable for standardization provided the depth of the notch does not exceed the depth of surface wave penetration.

Some additional scans were performed on notch standard SK-W7830-0187 to confirm if this would be the case. Scans were taken on 0.250, 0.375 and 0.500 inch long notches, and the end of the standard (infinity). The correlation with previous scans was reasonable and indicated that the differential in gain (dB) between the 0.500 inch long notch and the end of standard was 4 dB.

Figure 6 is a theoretical exponential curve of signal response as a function of notch size (area in square inches). The correlation of this curve with the data from the scans taken on notch standard SK-W7830-0187 is excellent. Extrapolating 4 to 6 dB from the area associated with the 0.500 inch long notch (0.006366 square inches), the maximum depth of surface wave penetration appears to be on the order of 0.020-0.025 inch deep when using a 1.0 MHz transducer. This would preclude the ability to standardize on a 0.070 inch deep notch utilizing 1.0 MHz surface waves.

A real surface flaw in service is not likely to emanate from an initial flaw size of 0.060 inch deep by 0.500 inch long however. The strut and foil surfaces have all been inspected to criteria based on rejection of any linear indication greater than 1/16 inch long. More likely, a real surface flaw would probably propagate from a pit or other small mechanical stress riser which would be more consistent with the assumed initial flaw size for base metal (0.050 inch deep by 0.170 inch long).

Some sample flaw growth analyses were conducted for areas previously analyzed utilizing standard weld and blind weld criteria. Base metal flaw sizes were assumed with the following results. First,

the flaw growth life was dramatically increased. Second, the initial propagation of the flaw increased twice as fast in the length direction as in the depth direction. Thus, surface wave inspection with a 1.0 MHz transducer is feasible with the establishment of appropriate length criteria based on flaw growth analyses.

4.0 CONCLUSIONS

4.1 GENERAL

a. Surface wave ultrasonic inspection of painted and unpainted strut and foil structures is feasible using a 1.0 MHz transducer.

b. Using a 1.0 MHz transducer, acceptance criteria must be based on an appropriate indication length consistent with flaw growth life analyses.

4.2 EFFECT OF PROFILE

Blast finish profile has a significant effect on shear wave signal transmission. After calibrating to a bare notch standard having a smooth finish, add 1 dB of gain for each 1 mil profile up to 3 mils maximum.

4.3 EFFECT OF PAINT THICKNESS

a. When using a 1.0 MHz surface wave, the addition of paint has no effect on signal response based on finish profile within the range of 1 to 3 mils profile.

b. After calibrating to a bare notch standard having a smooth finish, add 1 dB of gain for each mil of paint thickness up to 3 mils. Add no compensation for finish profile.

c. For paint thicknesses in the range of 4-8 mils, add 3 dB plus 1 additional dB for each additional mil of paint thickness over 4 mils.

4.4 EFFECT OF ER347 WELD

a. When using a 1.0 MHz surface wave, it is not possible to detect the presence of an ER347 weld in a 15-5PH/17-4PH matrix. The presence of an ER347 weld and the location of the fusion line are clearly discernible using a 2.25 MHz or 5.0 MHz surface wave.

b. When inspecting for flaws located in an ER347 weld using a 1.0 MHz surface wave:

   (1) Add no gain compensation for flaws located within 1/8 inch of the fusion line.

   (2) Add 1.0 dB for laws located from 1/8 to 1/4 inch of the fusion line.

   (3) For each additional 1/4 inch beyond 1/4 inch from the fusion line, add 3 db proportionately up to a maximum of 3/4 inch.

4.0 RECOMMENDATIONS

a. A search should be conducted for an instrument/transducer combination which would allow the use of 0.5 MHz for inspection. This would reduce the compensation required for all variables and could permit inspection criteria to be established based on depth of flaws as well as length, as appropriate.

b. Flaw growth analyses should be conducted on a sufficient number of lower life areas of PHM strut and foil structure to permit the establishment of appropriate inspection criteria. Analyses should assume an initial flaw size of 0.050 inch deep by 0.170 inch long. Establishment of an appropriate EDM notch size to be used for equipment calibration should be based on the calculated flaw growth size at 1/3 of the calculated flaw growth life and the assumption that 1/2 of the flaw size will not be detected by the inspection method.

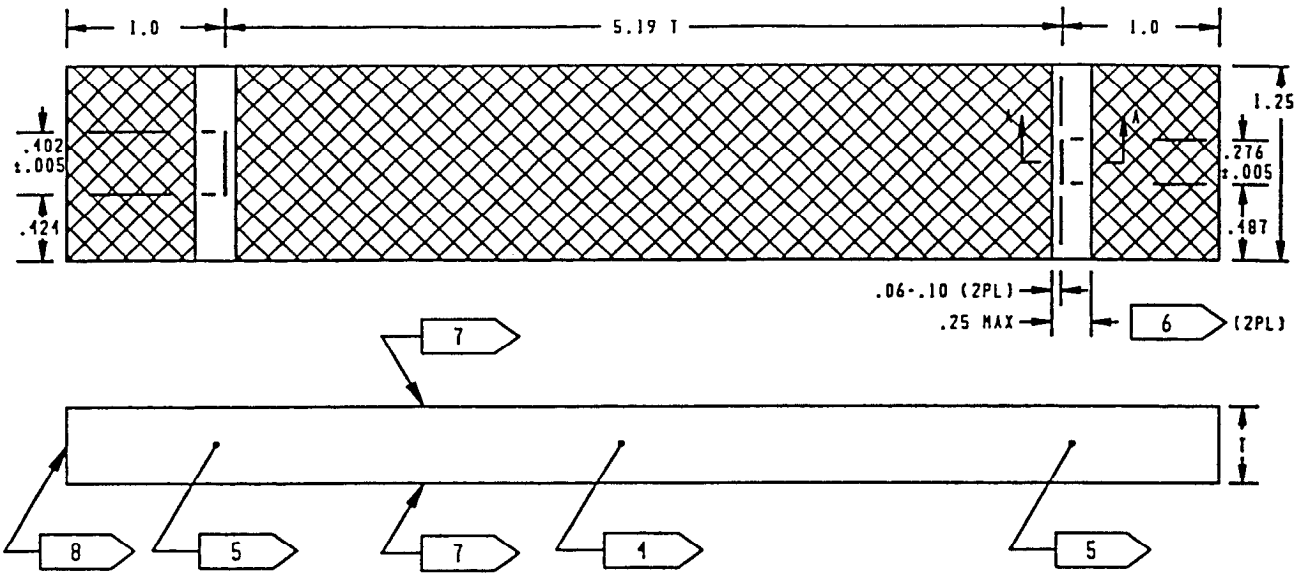
c. A new EDM notch standard should be fabricated from 17-4PH CRES material in the H1100 condition. A minimum of eight EDM notches should be machined into this standard. These notches should be of a length consistent with the inspection criteria established by the flaw growth analyses above and the depths of these notches should be varied at 0.010 inch increments, starting at a depth of 0.010 inch. This will confirm the depth of surface wave penetration afforded and enable a decision to be made relative to the use of depth or length criteria for the in-service inspections.

TABLE I

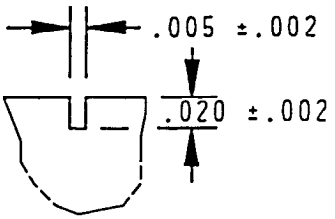
STANDARD TEST MATRIX

STANDARD			PREPARATION		
TYPE	ID	SIZE	BLAST FINISH MILS	EPOXY PRIMER DFT	BMS 10-60 TOPCOAT TOTAL DFT**
Notch	F1P3	0.43T x 1.25W x 4.25L (11 mm)	1.0	1.5-2.0	3.0-4.0
	F3P3	0.43T x 1.25W x 4.25L (11 mm)	3.0	1.5-2.0	3.0-4.0
	F1P6	0.47T x 1.25W x 4.50L (12 mm)	1.0	1.5-2.0	6.0-7.0
	F1P11	0.47T x 1.25W x 4.50L (12 mm)	1.0	1.5-2.0	11.0-12.0
	F0P0	0.51T x 1.25W x 4.66L (13 mm)	None	None	None
	F1P0	0.59T x 1.25W x 5.06L (15 mm)	1.0	None	None
	F3P0	0.59T x 1.25W x 5.06L (15 mm)	3.0	None	None

** Total dry film thickness of primer and topcoat.



NOTES:
1. MATERIAL IS 17-4PH CRES PLATE, CONDITION H1100.
2. DIMENSIONS ARE IN INCHES.
3. TOLERANCE: ±.030 EXCEPT AS NOTED.



SECTION AA
TYPICAL EDM NOTCH

4 IDENTIFY SPECIMEN SERIAL NO. IN THIS LOCATION.

5 IDENTIFY NOTCH SIZE IN THIS LOCATION.

6 MASK ENDS, SIDES AND THIS AREA PRIOR TO ABRASIVE BLAST AND PAINTING.

7 BLAST FINISH AND PAINT THIS SURFACE.

8 IDENTIFY FINISH AND PAINT CODE IN THIS LOCATION.

PAINTED EDM NOTCH STANDARD
SK-W7830-0176

D0-6000-4520 ORIG. 12/87

4.0	|	3.0	3.25	| 4.0
4.0	|	4.5	4.0	| 5.0

TOP: 4.0 AVERAGE

4.0	3.5	3.0	3.0
4.0	3.0	4.0	4.5

BOTTOM: 3.6 AVERAGE
F1P3

3.0	|	3.0	4.0	| 3.0
3.0	|	4.5	3.5	| 3.0

TOP: 3.4 AVERAGE

4.5	3.5	3.0	4.5
4.0	3.0	3.5	4.5

BOTTOM: 3.8 AVERAGE
F3P3

6.25	|	6.25	6.0	| 6.0
7.0	|	6.0	7.0	| 6.5

TOP: 6.4 AVERAGE

7.5	8.0	7.5	7.5
7.0	7.0	7.0	8.0

BOTTOM: 7.4 AVERAGE
F1P6

13.5	|	12.0	14.0	| 13.0
11.0	|	11.0	11.0	| 11.0

TOP: 12.1 AVERAGE

13.0	14.0	12.0	16.0
12.0	12.0	11.0	13.0

BOTTOM: 12.9 AVERAGE
F1P11

FIGURE 1

PAINT THICKNESS OF NOTCH STANDARDS (N x .001 INCH)

TABLE II: SURFACE WAVE DATA BEFORE FINISHING
1.0 MHz FREQUENCY

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B4	GFD	F3P0	1.0	(74) 74	(80) 80	(72) 72	(80) 83
	GFD			(74) 74	(80) 80	(70) 71	(80) 86
	BB			(75) 75	(80) 80	(72) 72	(80) 80
				(74.33) AVG		(71.33) AVG	
A4	GFD	F1P0	1.0	(76) 76	(80) 82	(72) 73	(80) 85
	GFD			(75) 75	(80) 80	(72) 72	(80) 82
	BB			(75) 75	(80) 80	(72) 72	(80) 82
				(75.33) AVG		(72.00) AVG	
B7	GFD	F1P11	1.0	(75) 75	(80) 80	(72) 73	(80) 85
	GFD			(73) 73	(80) 82	(72) 72	(80) 84
	BB			(76) 76	(80) 80	(72) 72	(80) 80
				(74.67) AVG		(72.00) AVG	
A7	GFD	F1P6	1.0	(76) 76	(80) 82	(72) 72	(80) 82
	GFD			(76) 77	(80) 86	(71) 71	(80) 84
	BB			(76) 76	(80) 80	(72) 72	(80) 80
				(76.00) AVG		(71.67) AVG	
B8	GFD	F3P3	1.0	(77) 77	(80) 80	(74) 74	(80) 80
	GFD			(75) 75	(80) 80	(72) 72	(80) 80
	BB			(74) 74	(80) 80	(73) 73	(80) 80
				(75.33) AVG		(73.00) AVG	

TABLE II: SURFACE WAVE DATA BEFORE FINISHING
1.0 MHz FREQUENCY (Continued)

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
A8	GFD	F1P3	1.0	(76) 76	(80) 80	(72) 73	(80) 85
	GFD			(74) 74	(80) 80	(71) 71	(80) 80
	BB			(74) 74	(80) 80	(72) 72	(80) 80
				(74.67) AVG		(71.67) AVG	
B6	GFD	F0P0	1.0	(76) 76	(80) 80	(72) 73	(80) 85
	GFD			(76) 76	(80) 84	(72) 72	(80) 80
	BB			(77) 77	(80) 80	(73) 73	(80) 80
				(76.33) AVG		(72.33) AVG	

NOTES:
1. Instrument = Krautkramer, Model USIP 12.
2. Transducer: Panametrics Model V402, 1/2 inch diameter.
3. Transducer Frequency = 1.0 MHz.
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.
6. Notch width = .005 ± .002; notch depth = .020 ± .002.

TABLE III: SURFACE WAVE DATA BEFORE FINISHING
2.25 MHz FREQUENCY

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B4	GFD	F3P0	2.25	(40) 40	(80) 80	(39) 39	(80) 80
	GFD			(40) 40	(80) 80	(40) 40	(80) 80
	BB			(40) 40	(80) 80	(38) 38	(80) 80
				(40.00) AVG		(39.00) AVG	
A4	GFD	F1P0	2.25	(40) 40	(80) 80	(38) 38	(80) 80
	GFD			(42) 42	(80) 80	(40) 40	(0) 84
	BB			(40) 40	(80) 80	(41) 41	(80) 80
				(40.67) AVG		(39.67) AVG	
B7	GFD	F1P11	2.25	(39) 40	(80) 85	(38) 39	(80) 85
	GFD			(46) 46	(80) 80	(39) 39	(80) 82
	BB			(42) 42	(80) 80	(40) 40	(80) 80
				(42.33) AVG		(39.00) AVG	
A7	GFD	F1P6	2.25	(41) 41	(80) 80	(38) 38	(80) 80
	GFD			(41) 41	(80) 84	(40) 40	(0) 84
	BB			(40) 40	(80) 80	(37) 37	(80) 80
				(40.67) AVG		(38.33) AVG	
B8	GFD	F3P3	2.25	(40) 40	(80) 82	(39) 40	(80) 85
	GFD			(41) 41	(80) 80	(40) 40	(80) 80
	BB			(42) 42	(80) 80	(40) 40	(80) 80
				(41.00) AVG		(39.67) AVG	

TABLE III: SURFACE WAVE DATA BEFORE FINISHING
2.25 MHz FREQUENCY (Continued)

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
A8	GFD	F1P3	2.25	(39) 40	(80) 85	(39) 39	(80) 80
	GFD			(42) 42	(80) 80	(39) 39	(80) 80
	BB			(42) 42	(80) 80	(39) 39	(80) 80
				(41.00) AVG		(39.00) AVG	
B6	GFD	F0P0	2.25	(40) 40	(80) 80	(38) 39	(80) 85
	GFD			(40) 40	(80) 80	(39) 40	(80) 86
	BB			(39) 39	(80) 80	(39) 39	(80) 80
				(39.67) AVG		(38.67) AVG	

NOTES:
1. Instrument = Krautkramer, Model USIP 12.
2. Transducer: Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
3. Transducer Frequency = 2.25 MHz.
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.
6. Notch width = .005 ± .002; notch depth = .020 ± .002

TABLE IV: SURFACE WAVE DATA BEFORE FINISHING
5.0 MHz FREQUENCY

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B4	GFD	F3P0	5.0	(57) 57	(80) 80	(53) 53	(80) 80
	GFD			(59) 59	(80) 84	(58) 58	(80) 82
	BB			(58) 58	(80) 80	(58) 58	(80) 80
				(58.00) AVG		(56.33) AVG	
A4	GFD	F1P0	5.0	(56) 56	(80) 80	(55) 55	(80) 80
	GFD			(60) 60	(80) 80	(57) 58	(80) 86
	BB			(57) 57	(80) 80	(57) 57	(80) 80
				(57.67) AVG		(56.33) AVG	
B7	GFD	F1P11	5.0	(58) 58	(80) 80	(54) 54	(80) 80
	GFD			(60) 60	(80) 80	(58) 58	(80) 80
	BB			(60) 60	(80) 80	(56) 56	(80) 80
				(59.33) AVG		(56.00) AVG	
A7	GFD	F1P6	5.0	(56) 56	(80) 80	(54) 54	(80) 80
	GFD			(57) 57	(80) 80	(57) 57	(80) 80
	BB			(56) 56	(80) 80	(56) 56	(80) 80
				(56.33) AVG		(55.67) AVG	
B8	GFD	F3P3	5.0	(58) 58	(80) 80	(58) 58	(80) 80
	GFD			(59) 59	(80) 80	(59) 59	(80) 80
	BB			(59) 59	(80) 80	(58) 58	(80) 82
				(58.67) AVG		(58.33) AVG	

TABLE IV: SURFACE WAVE DATA BEFORE FINISHING
5.0 MHz FREQUENCY (Continued)

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
A8	GFD	F1P3	5.0	(61) 61	(80) 82	(56) 57	(80) 85
	GFD			(60) 61	(80) 86	(60) 60	(80) 84
	BB			(61) 61	(80) 80	(60) 60	(80) 80
				(60.67) AVG		(58.67) AVG	
B6	GFD	F0P0	5.0	(54) 54	(80) 80	(53) 53	(80) 81
	GFD			(59) 59	(80) 84	(58) 58	(80) 80
	BB			(59) 59	(80) 80	(57) 57	(80) 80
				(57.33) AVG		(56.00) AVG	

NOTES:
1. Instrument = Krautkramer, Model USIP 12.
2. Transducer: Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
3. Transducer Frequency = 5.0 MHz.
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.
6. Notch width = .005 ± .002; notch depth = .020 ± .002.

TABLE V: SURFACE WAVE DATA AFTER FINISHING
1.0 MHz FREQUENCY

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B4	GFD	F3P0	1.0	(75) 75	(80) 80	(74) 74	(80) 84
	GNR			(72) 72	(80) 80	(71) 71	(80) 82
	BB			(71) 71	(80) 80	(72) 72	(80) 80
				(72.67) AVG		(72.33) AVG	
A4	GFD	F1P0	1.0	(73) 73	(80) 79	(71) 71	(80) 80
	GNR			(72) 72	(80) 82	(69) 69	(80) 76
	BB			(70) 70	(80) 80	(69) 69	(80) 80
	GAN			(72) 72	(80) 80	(69) 69	(80) 80
				(71.75) AVG		(69.50) AVG	
B7	GFD	F1P11	1.0	NR		NR	
	GNR			(92) 92	(80) 80	(94) 94	(80) 84
	BB			(94) 94	(80) 80	(94) 94	(80) 80
	GAN			(92) 92	(80) 80	(94) 94	(80) 82
				(92.67) AVG		(94.00) AVG	
A7	GFD	F1P6	1.0	(77) 77	(80) 83	(76) 76	(80) 82
	GNR			(78) 78	(80) 80	(75) 75	(80) 80
	BB			(75) 75	(80) 80	(72) 72	(80) 80
	GAN			(78) 78	(80) 80	(75) 75	(80) 80
				(77.00) AVG		(74.50) AVG	

TABLE V: SURFACE WAVE DATA AFTER FINISHING
1.0 MHz FREQUENCY (Continued)

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B8	GFD	F3P3	1.0	(75) 75	(80) 80	(74) 74	(80) 80
	GNR			(75) 75	(80) 77	(72) 72	(80) 83
	BB			(74) 74	(80) 80	(70) 70	(80) 80
	GAN			(75) 75	(80) 80	(73) 73	(80) 80
				(74.75) AVG		(72.25) AVG	
A8	GFD	F1P3	1.0	(76) 76	(80) 84	(74) 74	(80) 84
	GNR			(76) 76	(80) 80	(73) 73	(80) 82
	BB			(76) 76	(80) 80	(72) 72	(80) 80
	GAN			(75) 75	(80) 80	(72) 72	(80) 80
				(75.75) AVG		(72.75) AVG	
B6	GFD	F0P0	1.0	(73) 73	(80) 80	(70) 70	(80) 79
	GNR			(73) 73	(80) 82	(68) 68	(80) 77
	BB			(70) 70	(80) 80	(68) 68	(80) 80
	GAN			(75) 75	(80) 80	(69) 69	(80) 77
				(72.75) AVG		(68.75) AVG	

NOTES:
1. Instrument = Krautkramer, Model USIP 12.
2. Transducer: Panametrics Model V402, 1/2 inch diameter.
3. Transducer Frequency = 1.0 MHz.
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.
6. Notch width = .005 ± .002; notch depth = .020 ± .002.

NR = Not able to resolve notch.

TABLE VI: SURFACE WAVE DATA AFTER FINISHING
2.25 MHz FREQUENCY

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B4	GFD	F3P0	2.25	(51) 51	(80) 80	(49) 49	(80) 78
	GNR			(52) 52	(80) 78	(50) 50	(80) 82
	BB			(50) 50	(80) 80	(49) 49	(80) 80
	GAN			(52) 52	(80) 80	(49) 49	(80) 80
				(51.25) AVG		(49.25) AVG	
A4	GFD	F1P0	2.25	(47) 47	(80) 84	(44) 44	(80) 78
	GNR			(47) 47	(80) 78	(45) 45	(80) 79
	BB			(48) 48	(80) 80	(47) 47	(80) 82
	GAN			(49) 49	(80) 80	(47) 47	(80) 80
				(47.75) AVG		(45.75) AVG	
B7	GFD	F1P11	2.25	(81) 81^{n}	(80) 80	(79) 79^{n}	(80) 80
	GNR			(76) 76^{n}	(80) 78	(77) 77^{n}	(80) 79
	BB			(77) 77	(80) 80	(77) 77	(80) 80
	GAN			(74) 74	(80) 81	(76) 76	(80) 80
				(77.00) AVG		(77.25) AVG	
A7	GFD	F1P6	2.25	(75) 75	(80) 82	(72) 72	(80) 80
	GNR			(77) 77	(80) 82	(73) 73	(80) 81
	BB			(76) 76	(80) 80	(72) 72	(80) 80
	GAN			(75) 75	(80) 80	(73) 73	(80) 80
				(75.75) AVG		(72.50) AVG	

TABLE VI: SURFACE WAVE DATA AFTER FINISHING
2.25 MHz FREQUENCY (Continued)

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B8	GFD	F3P3	2.25	(50) 51	(80) 86	(51) 51	(80) 80
	GNR			(51) 51	(80) 80	(52) 52	(80) 80
	BB			(52) 52	(80) 80	(52) 52	(80) 80
	GAN			(53) 53	(80) 81	(53) 53	(80) 82
				(51.50) AVG		(52.00) AVG	
A8	GFD	F1P3	2.25	(52) 52	(80) 80	(51) 51	(80) 80
	GNR			(55) 55	(80) 82	(54) 54	(80) 80
	BB			(53) 53	(80) 80	(50) 50	(80) 80
	GAN			(54) 54	(80) 77	(51) 51	(80) 77
				(53.50) AVG		(51.50) AVG	
B6	GFD	F0P0	2.25	(46) 46	(80) 80	(45) 45	(80) 82
	GNR			(49) 49	(80) 80	(46) 46	(80) 80
	BB			(47) 47	(80) 80	(46) 46	(80) 80
	GAN			(51) 51	(80) 80	(46) 46	(80) 80
				(48.25) AVG		(45.75) AVG	

NOTES:
1. Instrument = Krautkramer, Model USIP 12.
2. Transducer: Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
3. Transducer Frequency = 2.25 MHz.
4. Shoe = Panametrics, 90°, Models ABWSL-1 & ABWSL-2
5. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.
6. Notch width = .005 ± .002; notch depth = .020 ± .002

n. Noisy screen.

TABLE VII: SURFACE WAVE DATA AFTER FINISHING
5.0 MHz FREQUENCY

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B4	GFD	F3P0	5.0	(73) 73	(80) 82	(71) 71	(80) 83
	GNR			(69) 69	(80) 77	(67) 67	(80) 82
	BB			(65) 65	(80) 80	(65) 65	(80) 82
	GAN			(65) 65	(80) 78	(64) 64	(80) 82
				(68.00) AVG		(66.75) AVG	
A4	GFD	F1P0	5.0	(59) 59	(80) 84	(58) 59	(80) 86
	GNR			(59) 59	(80) 79	(57) 57	(80) 81
	BB			(60) 60	(80) 80	(58) 58	(80) 82
	GAN			(59) 59	(80) 80	(56) 56	(80) 80
				(59.25) AVG		(57.25) AVG	
B7	GFD	F1P11	5.0	(103) 102^{n}	(80) 70	(103) 102^{n}	(80) 75
	GNR			(95) 95^{n}	(80) 80	(96) 96^{n}	(80) 80
	BB			(94) 94^{n}	(80) 79	(94) 94^{n}	(80) 80
	GAN			(95) 95^{n}	(80) 80	(96) 96^{n}	(80) 80
				(96.75) AVG		(97.25) AVG	
A7	GFD	F1P6	5.0	(99) 99^{n}	(80) 80	(94) 94^{n}	(80) 80
	GNR			(89) 89	(80) 78	(88) 88	(80) 80
	BB			(90) 90	(80) 80	(91) 91	(80) 80
	GAN			(88) 88	(80) 80	(90) 90	(80) 80
				(91.50) AVG		(90.75) AVG	

TABLE VII: SURFACE WAVE DATA AFTER FINISHING
5.0 MHz FREQUENCY (Continued)

STD S/N	TECH INITIALS	PAINT CODE	FREQ (MHz)	.276 LONG NOTCH		.402 LONG NOTCH	
				GAIN (dB)	AMPLITUDE (% FSH)	GAIN (dB)	AMPLITUDE (% FSH)
B8	GFD	F3P3	5.0	(72) 72	(80) 82	(72) 72	(80) 80
	GNR			(72) 72	(80) 78	(70) 70	(80) 78
	BB			(76) 76	(80) 80	(72) 72	(80) 80
	GAN			(75) 75	(80) 80	(73) 73	(80) 79
				(73.75) AVG		(71.75) AVG	
A8	GFD	F1P3	5.0	(76) 76	(80) 79	(75) 75	(80) 82
	GNR			(75) 75	(80) 80	(74) 74	(80) 80
	BB			(72) 72	(80) 80	(72) 72	(80) 80
	GAN			(75) 75	(80) 80	(74) 74	(80) 80
				(74.50) AVG		(73.75) AVG	
B6	GFD	F0P0	5.0	(57) 57	(80) 80	(55) 55	(80) 80
	GNR			(56) 56	(80) 78	(56) 56	(80) 80
	BB			(60) 60	(80) 78	(58) 58	(80) 82
	GAN			(56) 56	(80) 80	(58) 58	(80) 80
				(57.25) AVG		(56.75) AVG	

NOTES:
1. Instrument = Krautkramer, Model USIP 12.
2. Transducer: Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
3. Transducer Frequency = 5.0 MHz.
4. Shoe = Panametrics, 90°, Models ABWSL-1 & ABWSL-2
5. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.
6. Notch width = .005 ± .002; notch depth = .020 ± .002.

n. Very noisy screen.

TABLE VIII
EFFECT OF FINISH PROFILE

STD S/N	PAINT CODE	PROFILE (MILS)	PAINT THKNS (MILS)	FREQ	GAIN (dB)				Δ dB (BFR & AFT FINISH)			
					.276 NOTCH		.402 NOTCH		.276 NOTCH	.402 NOTCH	AVG	ADJ AVG
					BFR	AFTER	BFR	AFTER				
B6	F0P0	NONE	NONE	1.0	76.33	72.75	72.33	68.75	-3.58	-3.58	-3.58	0
A4	F1P0	1.1	NONE	1.0	75.33	71.75	72.00	69.50	-3.58	-2.50	-3.04	+0.54
B4	F3P0	3.2	NONE	1.0	74.33	72.67	71.33	72.33	-1.66	+1.00	-0.33	+3.25
B6	F0P0	NONE	NONE	2.25	39.67	48.25	38.67	45.75	+8.58	+7.08	+7.83	0
A4	F1P0	1.1	NONE	2.25	40.67	47.75	39.67	45.75	+7.08	+6.08	+6.58	-1.25
B4	F3P0	3.2	NONE	2.25	40.00	51.25	39.00	49.25	+11.25	+10.25	+10.75	+2.92
B6	F0P0	NONE	NONE	5.0	57.33	57.25	56.00	56.75	-0.08	+0.75	+0.41	0
A4	F1P0	1.1	NONE	5.0	57.67	59.25	56.33	57.25	+1.58	+0.92	+1.25	+0.84
B4	F3P0	3.2	NONE	5.0	58.00	68.00	56.33	66.75	+10.00	+10.42	+10.21	+9.80

TABLE IX

EFFECT OF PAINT THICKNESS - 1.0 MHz

STD S/N	PAINT CODE	PROFILE (MILS)	PAINT THKNS (MILS)	FREQ	GAIN (dB)				△dB BEFORE & AFTER FINISH			
					.276 NOTCH		.402 NOTCH		.276 NOTCH	.402 NOTCH	AVG	ADJ AVG
					BFR	AFTER	BFR	AFTER				
B6	F0P0	NONE	NONE	1.0	76.33	72.75	72.33	68.75	-3.58	-3.58	-3.58	0
A4	F1P0	1.1	NONE	1.0	75.33	71.75	72.00	69.50	-3.58	-2.50	-3.04	+0.54
A8	F1P3	1.0	3.6	1.0	74.67	75.75	71.67	72.75	+1.08	+1.08	+1.08	+4.66
			(3.0-4.5)									
A7	F1P6	1.1	7.4	1.0	76.00	77.00	71.67	74.50	+1.00	+2.88	+1.94	+5.52
			(7.0-8.0)									
B7	F1P11	1.0	12.9	1.0	74.67	92.67	72.00	94.00	+18.00	+22.00	+20.00	+23.58
			(11.0-16.0)									
B4	F3P0	3.2	NONE	1.0	74.33	72.67	71.33	72.33	-1.66	+1.00	-0.33	+3.25
B8	F3P3	3.1	3.8	1.0	75.33	74.75	73.00	72.25	-0.58	-0.75	-0.66	+2.92
			(3.0-4.5)									

BOEING

TABLE X

EFFECT OF PAINT THICKNESS - 2.25 MHz

STD S/N	PAINT CODE	PROFILE (MILS)	PAINT THKNS (MILS)	FREQ	GAIN (dB)				ΔdB BEFORE & AFTER FINISH			
					.276 NOTCH		.402 NOTCH		.276 NOTCH	.402 NOTCH	AVG	ADJ AVG
					BFR	AFTER	BFR	AFTER				
B6	F0P0	NONE	NONE	2.25	39.67	48.25	38.67	45.75	+8.58	+7.08	+7.83	0
A4	F1P0	1.1	NONE	2.25	40.67	47.75	39.67	45.75	+7.08	+6.08	+6.53	-1.30
A8	F1P3	1.0	3.6	2.25	41.00	53.50	39.00	51.50	+12.50	+12.50	+12.50	+4.67
			(3.0-4.5)									
A7	F1P6	1.1	7.4	2.25	40.67	75.75	38.33	75.75	+35.08	+37.42	+36.25	+28.42
			(7.0-8.0)									
B7	F1P11	1.0	12.9	2.25	42.33	77.00	39.00	77.25	+34.67	+38.25	+36.46	+28.63
			(11.0-16.0)									
B4	F3P0	3.2	NONE	2.25	40.00	51.25	39.00	49.25	+11.25	+10.25	+10.75	+2.92
B8	F3P3	3.1	3.8	2.25	41.00	51.50	39.67	52.00	+10.50	+12.33	+11.41	+3.58
			(3.0-4.5)									

BOEING

TABLE XI

EFFECT OF PAINT THICKNESS - 5.0 MHz

STD S/N	PAINT CODE	PROFILE (MILS)	PAINT THKNS (MILS)	FREQ	GAIN (dB)				△dB BEFORE & AFTER FINISH			
					.276 NOTCH		.402 NOTCH		.276 NOTCH	.402 NOTCH	AVG	ADJ AVG
					BFR	AFTER	BFR	AFTER				
B6	F0P0	NONE	NONE	5.0	57.33	57.25	56.00	56.75	-0.08	+0.75	+0.33	0
A4	F1P0	1.1	NONE	5.0	57.67	59.25	56.33	57.25	+1.58	+0.92	+1.25	+0.92
A8	F1P3	1.0	3.6	5.0	60.67	74.50	58.67	73.75	+13.83	+15.08	+14.45	+14.12
			(3.0-4.5)									
A7	F1P6	1.1	7.4	5.0	56.33	91.50	55.67	90.75	+35.17	+35.08	+35.12	+34.79
			(7.0-8.0)									
B7	F1P11	1.0	12.9	5.0	59.33	96.75	56.00	97.25	+37.42	+41.25	+39.33	+39.00
			(11.0-16.0)									
B4	F3P0	3.2	NONE	5.0	58.00	68.00	56.33	66.75	+10.00	+10.42	+10.21	+9.88
B8	F3P3	3.1	3.8	5.0	58.67	73.75	58.33	71.75	+15.08	+13.42	+14.25	+13.92
			(3.0-4.5)									

BOEING

D0-6000-4520 ORIG. 12/87

NOTES:

1. BASE METAL SHALL BE 17-4PH, TYPE I CRES PLATE PER XBMS 7-239. MATERIAL SHALL BE IN THE H1100 CONDITION.

2. ALL DIMENSIONS IN INCHES. ALL DIMENSIONS SHOWN IN PLAN VIEW ARE NET AFTER MACHINING.

3. TOLERANCES: .XX = $\pm$.030, .XXX = $\pm$.010

4. SEQUENCE OF OPERATIONS:

   A. MACHINE -A- DATUM TO 64 AA FINISH.

   B. MACHINE .31 DEEP BY 1.00 WIDE GROOVE IN 1.0 THICK PLATE PER SKETCH.

   C. GTAW WELD FILL GROOVE USING ER347 FILLER METAL PER AWS A5.9.

   D. MACHINE ALL REMAINING SURFACES TO 64 AA FINISH.

   E. PENETRANT INSPECT WELD PER MIL-STD-271. NO RELEVANT INDICATIONS PERMITTED WITHIN .50 INCH OF EDM NOTCH LOCATIONS.

   F. EDM NOTCHES PER SKETCH.

   G. DIMENSIONALLY INSPECT.

34
D312-80998-1

BOEING

SK-W7830-0168, REV. A

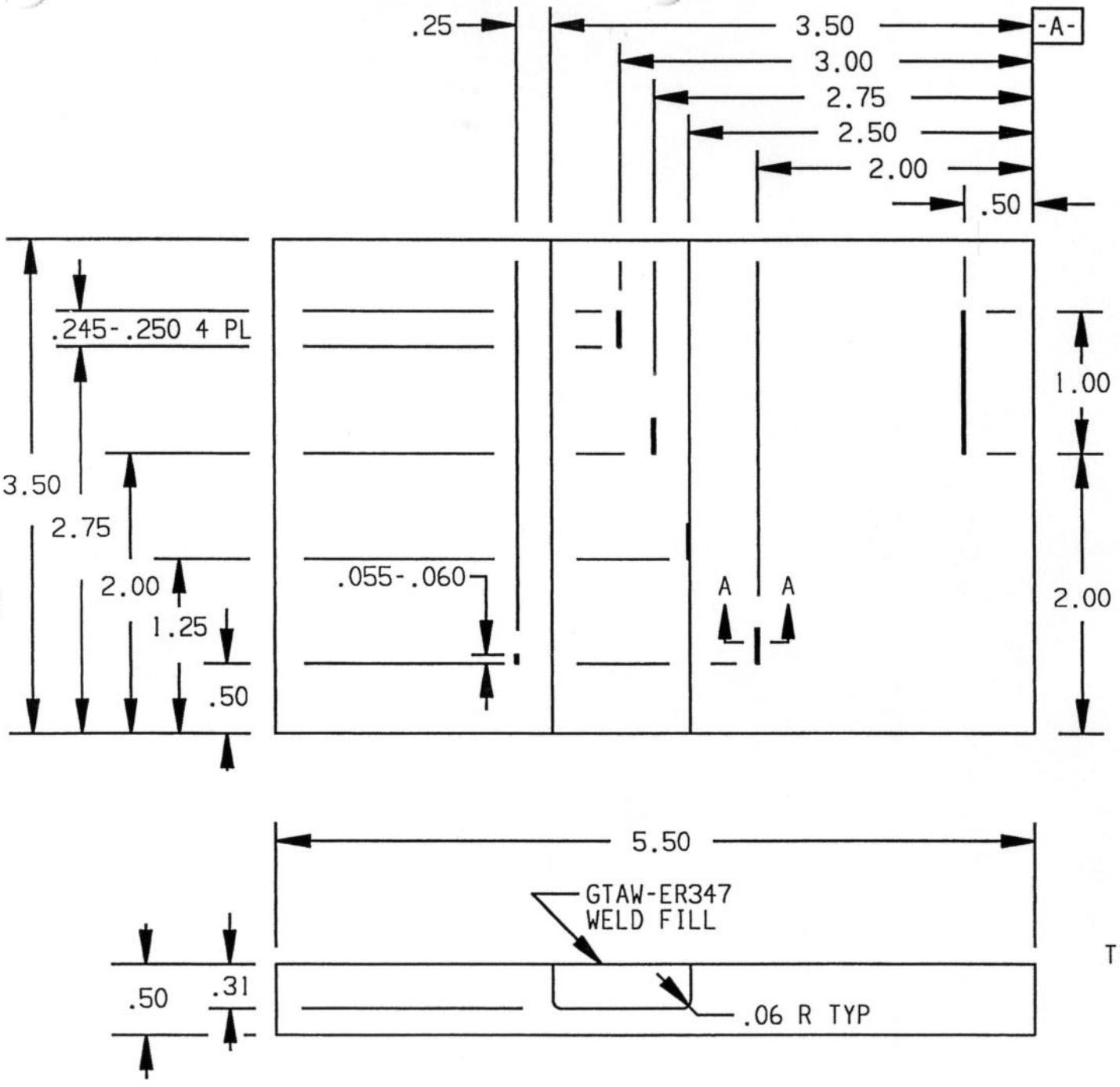
EDM NOTCH STANDARD, SURFACE WAVE UT

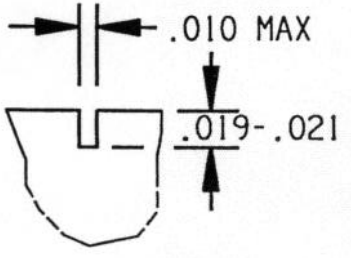
DWN: R. GEHRING

ENGR: T. J. Schlichtemann 92/3/9

CHECK: R. C. Eng 92/3/9

APPV: [signature] 3/9/92





SECTION AA
TYPICAL EDM NOTCH

35
D312-80998-1

BOEING

SK-W7830-0168.A
SHT 2

D0-6000-4520 ORIG. 12/87

NOTES:

1. BASE METAL SHALL BE 17-4PH, TYPE I CRES PLATE PER XBMS 7-239. MATERIAL SHALL BE IN THE H1100 CONDITION.

2. ALL DIMENSIONS IN INCHES. ALL DIMENSIONS SHOWN IN PLAN VIEW ARE NET AFTER MACHINING.

3. TOLERANCES: .XX = ±.030, .XXX = ±.010, UNLESS OTHERWISE SPECIFIED.

4. SEQUENCE OF OPERATIONS:

   A. MACHINE -A- DATUM TO 64 AA FINISH.

   B. MACHINE TWO .31 DEEP BY 1.010 WIDE GROOVES (ONE EACH SIDE) PER SKETCH IN PLATE PROVIDED.

   C. GTAW WELD FILL GROOVES USING ER347 FILLER METAL PER AWS A5.9. USE LOW HEAT INPUT STRINGER BEADS. MAINTAIN 150°F MAXIMUM INTERPASS TEMPERATURE. ALTERNATE DIRECTION OF PASSES AND ALTERNATE PASSES FROM SIDE TO SIDE TO MINIMIZE DISTORTION AND MAINTAIN PLATE FLATNESS.

   D. MACHINE ALL REMAINING SURFACES TO 64 AA FINISH.

   E. PENETRANT INSPECT WELD PER MIL-STD-271. NO RELEVANT INDICATIONS PERMITTED WITHIN .50 INCH OF EDM NOTCH LOCATIONS.

   F. EDM NOTCHES PER SKETCH.

   G. DIMENSIONALLY INSPECT.

36
D312-80998-1

BOEING

SK-W7830-0187

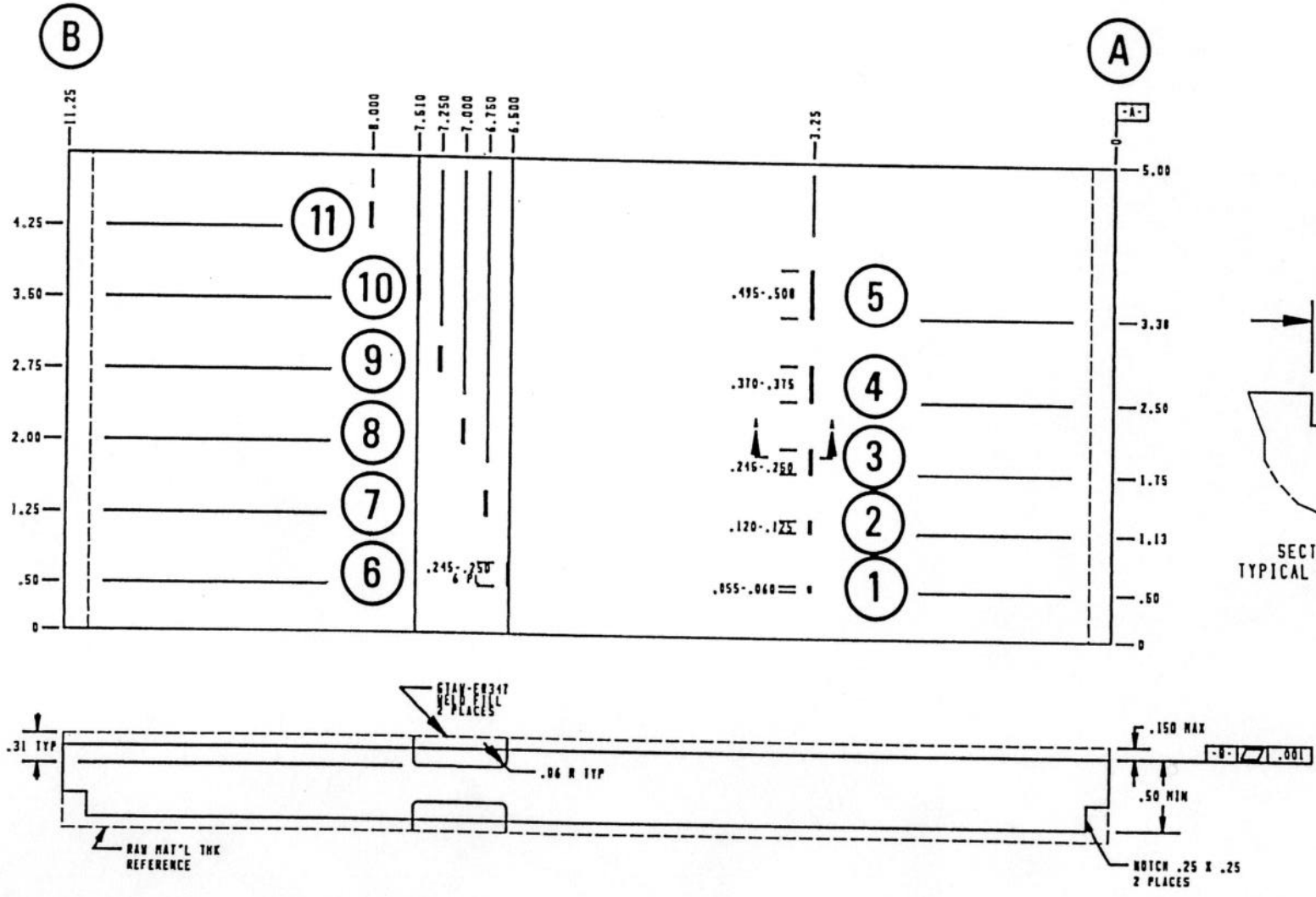
EDM NOTCH STANDARD, SURFACE WAVE UT

DWN: R. GEHRING

ENGR: L. J. Schlachtmann 8/5/92

CHECK: C. W. FAY 92/8/5

APPV: L. F. [illegible] 8/5/92



BOEING

SK-W7830-0187
SHT 2

BOEING METROLOGY LABORATORY

TEST REPORT

FOR

NOTCH TEST BLOCK

Manuf: Boeing
Model: Multiple Notches

Prop. No.: 53-923315
Serial No: 01 thru 11

SUBMITTED BY:
Name: G. Dokken
Orgn: 9-4882
M/S: 4F-12

TEST REQUESTED: Measure length, width, and depth of notches found on test block.

Statements of uncertainty in the body of this report pertain only to the test results unless otherwise specified.

RESULTS: The test results are listed below reflecting the values **at the time of the measurement.**

NOTCH I.D.#	LENGTH	WIDTH	DEPTH
1	0.05673	0.00834	0.01367
2	0.12107	0.01022	0.01332
3	0.24714	0.00723	0.01295
4	0.37226	0.00739	0.01161
5	0.49739	0.00798	0.01280
6	0.25021	0.00863	0.01417
7	0.25049	0.01145	0.01312
8	0.25033	0.01047	0.01385
9	0.24999	0.00744	0.01307
10	0.24989	0.00717	0.01302
11	0.24965	0.00734	0.01278

Test Report Ref. No.: 9-4794-TR-2199
Ambient Temperature: 68° ±0.4° F.
Ambient Humidity: DNA
Test Date: 11 November

Prepared by: Boeing Metrology Lab 544-8365
Approved by:

TABLE XII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 0.50 MHz

Scan From (Ref)	Notch Location (.250 long)	Frequency	Gain (dB)	Amplitude (% FSH)	Relative Gain (dB)
A	Base Metal	0.50 MHz	(63) 63	(80) 80	--
A	Fusion Line	0.50 MHz	(63) 63	(80) 80	0
A	1/4 Weld	0.50 MHz	(63) 63	(80) 84	0
A	1/2 Weld	0.50 MHz	(68) 68	(80) 80	+5
B	1/2 Weld	0.50 MHz	(63) 63	(80) 80	+5**
B	3/4 Weld	0.50 MHz	(71) 72	(80) 86	+13**
B	1.0 Weld	0.50 MHz	(66) 66	(80) 80	+8**
B	Base Metal (Thru Weld)	0.50 MHz	(68) 68	(80) 80	+10**

NOTES:

1. Reference SK-W7830-0168, Rev. A, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Panametrics Model A413S, 1 inch x 1/2 inch, 0.50 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

** Signal response greater from "B" side (side opposite -A- reference). Values adjusted based on comparitive signal responses from notch located in center of weld (1/2 weld).

TABLE XIII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 1.00 MHz

Scan From (Ref)	Notch Location (.250 long)	Frequency	Gain (dB)	Amplitude (% FSH)	Relative Gain (dB)
A	Base Metal	1.00 MHz	(87) 87	(80) 80	--
A	Fusion Line	1.00 MHz	(87) 87	(80) 80	0
A	1/4 Weld	1.00 MHz	(88) 88	(80) 82	+1
A	1/2 Weld	1.00 MHz	(91) 91	(80) 80	+4
B	1/2 Weld	1.00 MHz	(85) 85	(80) 80	+4**
B	3/4 Weld	1.00 MHz	(92) 92	(80) 80	+11**
B	1.0 Weld	1.00 MHz	(91) 92	(80) 86	+10**
B	Base Metal (Thru Weld)	1.00 MHz	(94) 94	(80) 82	+13**

NOTES:

1. Reference SK-W7830-0168, Rev. A, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Panametrics Model V402S, 1/2 inch diameter, 1.00 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

** Signal response greater from "B" side (side opposite -A- reference). Values adjusted based on comparitive signal responses from notch located in center of weld (1/2 weld).

TABLE XIV: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 2.25 MHz

Scan From (Ref)	Notch Location (.250 long)	Frequency	Gain (dB)	Amplitude (% FSH)	Relative Gain (dB)
A	Base Metal	2.25 MHz	(49) 49	(80) 80	--
A	Fusion Line	2.25 MHz	(51) 51	(80) 80	+2
A	1/4 Weld	2.25 MHz	(56) 56	(80) 80	+7
A	1/2 Weld	2.25 MHz	(70) 70	(80) 80	+21
B	1/2 Weld	2.25 MHz	(63) 63	(80) 80	+21**
B	3/4 Weld	2.25 MHz	(63) 63	(80) 80	+27**
B	1.0 Weld	2.25 MHz	(69) 70	(80) 86	+27**
B	Base Metal (Thru Weld)	2.25 MHz	(66) 66	(80) 80	+24**

NOTES:

1. Reference SK-W7830-0168, Rev. A, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 2.25 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

** Signal response greater from "B" side (side opposite -A- reference). Values adjusted based on comparitive signal responses from notch located in center of weld (1/2 weld).

TABLE XV: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 5.00 MHz

Scan From (Ref)	Notch Location (.250 long)	Frequency	Gain (dB)	Amplitude (% FSH)	Relative Gain (dB)
A	Base Metal	5.00 MHz	(55) 55	(80) 84	--
A	Fusion Line	5.00 MHz	(59) 59	(80) 84	+4
A	1/4 Weld	5.00 MHz	(73) 73	(80) 84	+18
A	1/2 Weld	5.00 MHz	(87) 87	(80) 80	+32
B	1/2 Weld	5.00 MHz	(82) 82	(80) 80	+32**
B	3/4 Weld	5.00 MHz	(87) 87	(80) 80	+37**
B	1.0 Weld	5.00 MHz	(88) 89	(80) 90	+38**
B	Base Metal (Thru Weld)	5.00 MHz	(87) 87	(80) 80	+37**

NOTES:

1. Reference SK-W7830-0168, Rev. A, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 5.0 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

** Signal response greater from "B" side (side opposite -A- reference). Values adjusted based on comparitive signal responses from notch located in center of weld (1/2 weld).

TABLE XVI: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 1.0 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
Base Metal (.250 long)	3 A	GFD	(76) 76	(80) 80
		RCF	(75) 75	(80) 80
		BB	(78) 78	(80) 82
		GN	(80) 80	(80) 82
		AVERAGE	(77.25)	
	3 B	GFD	(75) 76	(80) 86
		RCF	(75) 75	(80) 80
		BB	(74) 74	(80) 80
		GN	(76) 76	(80) 80
	11 B	GFD	(75) 75	(80) 84
		RCF	(74) 74	(80) 80
		BB	(76) 76	(80) 80
		GN	(78) 78	(80) 80
		AVERAGE	(75.38)	
Fusion Line	6 A	GFD	(75) 75	(80) 82
		RCF	(75) 75	(80) 80
		BB	(76) 76	(80) 82
		GN	(76) 76	(80) 80
		AVERAGE	(75.50)	
	10 B	GFD	(75) 75	(80) 80
		RCF	(74) 74	(80) 82
		BB	(75) 75	(80) 80
		GN	(74) 74	(80) 80
		AVERAGE	(74.50)	

TABLE XVI: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 1.0 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
1/4 Weld	7 A	GFD	(81) 81	(80) 80
		RCF	(77) 77	(80) 80
		BB	(79) 79	(80) 80
		GN	(79) 79	(80) 80
		AVERAGE	(79.00)	
	9 B	GFD	(77) 77	(80) 80
		RCF	(72) 72	(80) 82
		BB	(77) 77	(80) 80
		GN	(77) 77	(80) 80
		AVERAGE	(75.75)	
1/2 Weld	8 A	GFD	(78) 78	(80) 78
		RCF	(78) 78	(80) 80
		BB	(79) 79	(80) 80
		GN	(79) 79	(80) 80
		AVERAGE	(78.50)	
	8 B	GFD	(76) 76	(80) 80
		RCF	(75) 75	(80) 80
		BB	(75) 75	(80) 80
		GN	(76) 76	(80) 80
		AVERAGE	(75.50)	
3/4 Weld	9 A	GFD	(77) 77	(80) 84
		RCF	(79) 79	(80) 80
		BB	(78) 78	(80) 80
		GN	(80) 80	(80) 80
		AVERAGE	(78.50)	

TABLE XVI: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 1.0 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
3/4 Weld	7 B	GFD	(81) 81	(80) 80
		RCF	(80) 80	(80) 81
		BB	(83) 83	(80) 80
		GN	(84) 84	(80) 80
		AVERAGE	(82.00)	
1.0 Weld	10 A	GFD	(83) 84	(80) 86
		RCF	(85) 85	(80) 80
		BB	(87) 87	(80) 80
		GN	(87) 87	(80) 80
		AVERAGE	(85.50)	
	6 B	GFD	(88) 88	(80) 80
		RCF	(84) 84	(80) 80
		BB	(86) 86	(80) 80
		GN	(84) 84	(80) 80
		AVERAGE	(85.50)	
Base Metal (Thru Weld)	11 A	GFD	(81) 81	(80) 80
		RCF	(80) 80	(80) 80
		BB	(82) 82	(80) 80
		GN	(84) 84	(80) 82
		AVERAGE	(81.75)	

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Panametrics Model V402S, 1/2 inch diameter, 1.00 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XVII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 2.25 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
Base Metal (.250 Long)	3 A	GFD	(38) 38	(80) 80
		RCF	(37) 37	(80) 78
		BB	(38) 38	(80) 79
		GN	(42) 42	(80) 82
		AVERAGE	(38.75)	
	3 B	GFD	(38) 38	(80) 81
		RCF	(38) 38	(80) 78
		BB	(40) 40	(80) 84
		GN	(40) 40	(80) 82
	11 B	GFD	(38) 38	(80) 84
		RCF	(37) 37	(80) 80
		BB	(38) 38	(80) 79
		GN	(39) 39	(80) 82
		AVERAGE	(38.50)	
Fusion Line	6 A	GFD	(38) 38	(80) 80
		RCF	(38) 38	(80) 81
		BB	(38) 38	(80) 82
		GN	(40) 40	(80) 78
		AVERAGE	(38.50)	
	10 B	GFD	(37) 37	(80) 78
		RCF	(37) 37	(80) 80
		BB	(38) 38	(80) 80
		GN	(44) 44	(80) 80
		AVERAGE	(39.00)	

TABLE XVII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 2.25 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
1/4 Weld	7 A	GFD	(41) 41	(80) 80
		RCF	(41) 41	(80) 78
		BB	(42) 42	(80) 80
		GN	(46) 46	(80) 82
		AVERAGE	(42.50)	
	9 B	GFD	(49) 49	(80) 80
		RCF	(49) 49	(80) 82
		BB	(49) 49	(80) 80
		GN	(49) 49	(80) 80
		AVERAGE	(49.00)	
1/2 Weld	8 A	GFD	(61) 61	(80) 84
		RCF	(61) 61	(80) 80
		BB	(61) 61	(80) 82
		GN	(58) 58	(80) 82
		AVERAGE	(60.75)	
	8 B	GFD	(51) 51	(80) 81
		RCF	(51) 51	(80) 82
		BB	(52) 52	(80) 80
		GN	(52) 52	(80) 80
		AVERAGE	(51.50)	
3/4 Weld	9 A	GFD	(60) 60	(80) 80
		RCF	(58) 58	(80) 80
		BB	(59) 59	(80) 80
		GN	(57) 57	(80) 82
		AVERAGE	(58.50)	

TABLE XVII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 2.25 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
3/4 Weld	7 B	GFD	(57) 58	(80) 86
		RCF	(57) 57	(80) 78
		BB	(58) 58	(80) 80
		GN	(58) 58	(80) 80
		AVERAGE	(57.50)	
1.0 Weld	10 A	GFD	(64) 64	(80) 80
		RCF	(64) 64	(80) 80
		BB	(63) 63	(80) 80
		AVERAGE	(63.67)	
	6 B	GFD	(60) 60	(80) 84
		RCF	(59) 59	(80) 82
		BB	(60) 60	(80) 80
		GN	(60) 60	(80) 80
		AVERAGE	(59.75)	
Base Metal (Thru Weld)	11 A	GFD	(63) 63	(80) 80
		RCF	(61) 61	(80) 79
		BB	(61) 61	(80) 80
		AVERAGE	(61.67)	

NOTES:
1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 2.25 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XVIII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 5.0 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
Base Metal (.250 Long)	3 A	GFD	(53) 53	(80) 80
		RCF	(53) 53	(80) 80
		BB	(50) 50	(80) 80
		GN	(50) 50	(80) 80
		AVERAGE	(51.50)	
	3 B	GFD	(54) 54	(80) 84
		RCF	(50) 50	(80) 80
		BB	(54) 54	(80) 80
		GN	(52) 52	(80) 80
	11 B	GFD	(52) 53	(80) 86
		RCF	(54) 54	(80) 80
		BB	(51) 51	(80) 80
		GN	(52) 52	(80) 80
		AVERAGE	(52.38)	
Fusion Line	6 A	GFD	(52) 52	(80) 84
		RCF	(53) 53	(80) 80
		BB	(52) 52	(80) 82
		GN	(52) 52	(80) 80
		AVERAGE	(52.25)	
	10 B	GFD	(52) 53	(80) 86
		RCF	(54) 54	(80) 78
		BB	(50) 50	(80) 80
		GN	(50) 50	(80) 80
		AVERAGE	(52.38)	

TABLE XVIII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 5.0 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
1/4 Weld	7 A	RCF	(64) 64	(80) 81
		BB	(64) 64	(80) 80
		GN	(64) 64	(80) 80
		AVERAGE	(64.00)	
	9 B	GFD	(70) 70	(80) 80
		RCF	(70) 70	(80) 80
		BB	(70) 70	(80) 80
		GN	(68) 68	(80) 84
		AVERAGE	(69.50)	
1/2 Weld	8 A	GFD	(78) 78	(80) 84
		RCF	(80) 80	(80) 80
		BB	(80) 80	(80) 80
		GN	(82) 82	(80) 80
		AVERAGE	(80.00)	
	8 B	GFD	(75) 76	(80) 86
		RCF	(76) 76	(80) 80
		BB	(77) 77	(80) 80
		GN	(77) 77	(80) 80
		AVERAGE	(76.25)	
3/4 Weld	9 A	GFD	(82) 82	(80) 80
		RCF	(81) 81	(80) 80
		BB	(81) 81	(80) 80
		GN	(82) 82	(80) 80
		AVERAGE	(81.50)	

TABLE XVIII: EFFECT OF ER347 WELD ON SURFACE WAVE UT - 5.0 MHz

Notch Location	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
3/4 Weld	7 B	GFD	(80) 80	(80) 82
		RCF	(81) 81	(80) 80
		BB	(80) 80	(80) 80
		GN	(82) 82	(80) 80
		AVERAGE	(80.75)	
1.0 Weld	10 A	GFD	(84) 84	(80) 80
		RCF	(86) 86	(80) 80
		BB	(84) 84	(80) 80
		GN	(84) 84	(80) 80
		AVERAGE	(84.50)	
	6 B	GFD	(82) 83	(80) 85
		RCF	(80) 80	(80) 78
		BB	(82) 82	(80) 80
		GN	(80) 80	(80) 80
		AVERAGE	(81.00)	
Base Metal (Thru Weld)	11 A	GFD	(81) 81	(80) 80
		RCF	(84) 84	(80) 80
		BB	(82) 82	(80) 80
		GN	(82) 82	(80) 80
		AVERAGE	(82.25)	

NOTES:
1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 5.0 MHz
4. Shoe = Panametrics, 90°, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XIX: SUMMARY - EFFECT OF ER347 WELD ON SURFACE WAVE UT (1.0 MHz)

Notch Location (.250 long)	Scan From (Ref)	Gain (dB)	Relative Gain (dB)
Base Metal	A	(77.25)	0
	B	(75.38)	
Fusion Line	A	(75.50)	-1.00
	B	(74.50)	
1/4 Weld	A	(79.00)	+1.38
	B	(75.75)	
1/2 Weld	A	(78.50)	+1.00
	B	(75.50)	
3/4 Weld	A	(78.50)	+4.25
	B	(82.00)	
1.0 Weld	A	(85.50)	+9.50
	B	(85.50)	
Base Metal (Thru Weld)	A	(81.75)	+5.75

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Panametrics Model V402S, 1/2 inch diameter, 1.00 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XX: SUMMARY - EFFECT OF ER347 WELD ON SURFACE WAVE UT (2.25 MHz)

Notch Location (.250 long)	Scan From (Ref)	Gain (dB)	Relative Gain (dB)
Base Metal	A	(38.75)	0
	B	(38.50)	
Fusion Line	A	(38.50)	+0.42
	B	(39.50)	
1/4 Weld	A	(42.50)	+7.17
	B	(49.00)	
1/2 Weld	A	(60.75)	+17.54
	B	(51.50)	
3/4 Weld	A	(58.50)	+19.42
	B	(57.50)	
1.0 Weld	A	(63.67)	+23.13
	B	(59.75)	
Base Metal (Thru Weld)	A	(61.67)	+23.09

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 2.25 MHz
4. Shoe = Panametrics, 90°, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XXI: SUMMARY - EFFECT OF ER347 WELD ON SURFACE WAVE UT (5.0 MHz)

Notch Location (.250 long)	Scan From (Ref)	Gain (dB)	Relative Gain (dB)
Base Metal	A	(51.50)	0
	B	(52.38)	
Fusion Line	A	(52.25)	+0.37
	B	(52.38)	
1/4 Weld	A	(64.00)	+14.81
	B	(69.50)	
1/2 Weld	A	(80.00)	+26.18
	B	(76.25)	
3/4 Weld	A	(81.50)	+29.18
	B	(80.75)	
1.0 Weld	A	(84.50)	+30.81
	B	(81.00)	
Base Metal (Thru Weld)	A	(82.25)	

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 5.0 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XXII: SIGNAL RESPONSE AS A FUNCTION OF NOTCH SIZE AND TRANSDUCER FREQUENCY

	Notch Size (Length)								
	0.060			0.250			1.00		
Transducer Frequency	Gain (dB)	Amplitude (% FSH)	Relative dB	Gain (dB)	Amplitude (% FSH)	Relative dB	Gain (dB)	Amplitude (% FSH)	Relative dB
0.50 MHz	**	**	--	(53) 54	(80) 86	0	(51) 51	(80) 80	-2
1.00 MHz	(81) 81	(80) 80	+11	(70) 71	(80) 86	0	(66) 66	(80) 84	-5
2.25 MHz	(51) 51	(80) 80	+12	(39) 39	(80) 84	0	(34) 34	(80) 80	-5
5.00 MHz	(61) 61	(80) 80	+14	(47) 47	(80) 80	0	(46) 46	(80) 82	-1

NOTES:

1. Reference SK-W7830-0168, Rev. A, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12.
3. Shoe = Panametrics, 90°, Models ABWSL-1 & ABWSL-2.
4. Transducers: 0.50 MHz = Panametrics Model V413S, 1 inch x 1/2 inch.
   1.00 MHz = Panametrics Model V402, 1/2 inch diameter.
   2.25 MHz = Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
   5.00 MHz = Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

** Unable to resolve notch.

BOEING

TABLE XXIII: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 1.0 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.060	1 A	GFD	(86) 86	(80) 81
		RCF	(86) 86	(80) 82
		BB	(88) 88	(80) 80
		GN	(92) 92	(80) 80
		AVERAGE	(88.00)	
	1 B	GFD	(88) 88	(80) 84
		RCF	(86) 86	(80) 79
		BB	(86) 86	(80) 80
		GN	(88) 88	(80) 80
		AVERAGE	(87.00)	
0.125	2 A	GFD	(81) 81	(80) 81
		RCF	(80) 80	(80) 82
		BB	(84) 84	(80) 80
		GN	(86) 86	(80) 82
		AVERAGE	(82.75)	
	2 B	GFD	(82) 82	(80) 80
		RCF	(82) 82	(80) 80
		BB	(84) 84	(80) 80
		GN	(84) 84	(80) 80
		AVERAGE	(83.00)	

TABLE XXIII: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 1.0 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.250	3 A	GFD	(76) 76	(80) 80
		RCF	(75) 75	(80) 80
		BB	(78) 78	(80) 82
		GN	(80) 80	(80) 82
		AVERAGE	(77.25)	
	3 B	GFD	(75) 76	(80) 86
		RCF	(75) 75	(80) 80
		BB	(74) 74	(80) 80
		GN	(76) 76	(80) 80
	11 B	GFD	(75) 75	(80) 84
		RCF	(74) 74	(80) 80
		BB	(76) 76	(80) 80
		GN	(78) 78	(80) 80
		AVERAGE	(75.38)	
0.375	4 A	GFD	(73) 73	(80) 80
		RCF	(70) 70	(80) 80
		BB	(74) 74	(80) 82
		GN	(74) 74	(80) 80
		AVERAGE	(72.75)	
	4 B	GFD	(72) 72	(80) 80
		RCF	(72) 72	(80) 78
		BB	(73) 73	(80) 80
		GN	(74) 74	(80) 80
		AVERAGE	(72.75)	

TABLE XXIII: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 1.0 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.500	5 A	GFD	(70) 70	(80) 81
		RCF	(70) 70	(80) 82
		BB	(70) 70	(80) 80
		GN	(72) 72	(80) 80
		AVERAGE	(70.50)	
	5 B	GFD	(70) 70	(80) 80
		RCF	(71) 71	(80) 80
		BB	(71) 71	(80) 80
		GN	(70) 70	(80) 80
		AVERAGE	(70.50)	

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Panametrics Model V402S, 1/2 inch diameter, 1.00 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XXIV: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 2.25 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.060	1 A	GFD	(48) 49	(80) 86
		RCF	(49) 49	(80) 80
		BB	(49) 49	(80) 80
		GN	(48) 48	(80) 80
		AVERAGE	(48.50)	
	1 B	GFD	(48) 48	(80) 78
		RCF	(49) 49	(80) 80
		BB	(49) 49	(80) 80
		GN	(50) 50	(80) 80
		AVERAGE	(49.00)	
0.125	2 A	GFD	(43) 43	(80) 80
		RCF	(42) 42	(80) 80
		BB	(45) 45	(80) 80
		GN	(43) 43	(80) 80
		AVERAGE	(43.25)	
	2 B	GFD	(42) 42	(80) 80
		RCF	(42) 42	(80) 78
		BB	(41) 41	(80) 80
		GN	(42) 42	(80) 80
		AVERAGE	(41.75)	

TABLE XXIV: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 2.25 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.250	3 A	GFD	(38) 38	(80) 80
		RCF	(37) 37	(80) 78
		BB	(38) 38	(80) 79
		GN	(42) 42	(80) 82
		AVERAGE	(38.75)	
	3 B	GFD	(38) 38	(80) 81
		RCF	(38) 38	(80) 78
		BB	(40) 40	(80) 84
		GN	(40) 40	(80) 82
	11 B	GFD	(38) 38	(80) 84
		RCF	(37) 37	(80) 80
		BB	(38) 38	(80) 79
		GN	(39) 39	(80) 82
		AVERAGE	(38.50)	
0.375	4 A	GFD	(37) 37	(80) 84
		RCF	(36) 36	(80) 82
		BB	(37) 37	(80) 82
		GN	(39) 39	(80) 81
		AVERAGE	(37.25)	
	4 B	GFD	(36) 37	(80) 85
		RCF	(37) 37	(80) 78
		BB	(38) 38	(80) 82
		GN	(38) 38	(80) 80
		AVERAGE	(37.25)	

TABLE XXIV: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 2.25 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.500	5 A	GFD	(36) 36	(80) 80
		RCF	(35) 35	(80) 80
		BB	(35) 35	(80) 80
		GN	(37) 37	(80) 80
		AVERAGE	(35.75)	
	5 B	GFD	(35) 36	(80) 85
		RCF	(35) 35	(80) 78
		BB	(35) 35	(80) 80
		GN	(35) 35	(80) 80
		AVERAGE	(35.00)	

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 2.25 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XXV: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 5.0 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.060	1 A	GFD	(61) 61	(80) 80
		RCF	(62) 62	(80) 80
		BB	(59) 59	(80) 80
		GN	(60) 60	(80) 80
		AVERAGE	(60.50)	
	1 B	GFD	(60) 60	(80) 80
		RCF	(61) 61	(80) 80
		BB	(60) 60	(80) 80
		GN	(62) 62	(80) 80
		AVERAGE	(60.75)	
0.125	2 A	GFD	(57) 57	(80) 84
		RCF	(58) 58	(80) 82
		BB	(54) 54	(80) 80
		GN	(54) 54	(80) 80
		AVERAGE	(55.75)	
	2 B	GFD	(57) 57	(80) 80
		RCF	(57) 57	(80) 80
		BB	(57) 57	(80) 80
		GN	(57) 57	(80) 80
		AVERAGE	(57.00)	

TABLE XXV: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 5.0 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.250	3 A	GFD	(53) 53	(80) 80
		RCF	(53) 53	(80) 80
		BB	(50) 50	(80) 80
		GN	(50) 50	(80) 80
		AVERAGE	(51.50)	
	3 B	GFD	(54) 54	(80) 84
		RCF	(50) 50	(80) 80
		BB	(54) 54	(80) 80
		GN	(52) 52	(80) 80
	11 B	GFD	(52) 53	(80) 86
		RCF	(54) 54	(80) 80
		BB	(51) 51	(80) 80
		GN	(52) 52	(80) 80
		AVERAGE	(52.38)	
0.375	4 A	GFD	(50) 51	(80) 86
		RCF	(52) 52	(80) 80
		BB	(48) 48	(80) 82
		GN	(46) 46	(80) 80
		AVERAGE	(49.00)	
	4 B	GFD	(50) 50	(80) 80
		RCF	(50) 50	(80) 80
		BB	(50) 50	(80) 80
		GN	(52) 52	(80) 80
		AVERAGE	(50.50)	

TABLE XXV: EFFECT OF NOTCH LENGTH ON SURFACE WAVE UT - 5.0 MHz

Notch Length	Scan From	Tech Initials	Gain (dB)	Amplitude (% FSH)
0.500	5 A	GFD	(49) 49	(80) 80
		RCF	(50) 50	(80) 80
		BB	(49) 49	(80) 82
		GN	(48) 48	(80) 80
		AVERAGE	(49.00)	
	5 B	GFD	(49) 49	(80) 84
		RCF	(50) 50	(80) 80
		BB	(47) 47	(80) 80
		GN	(48) 48	(80) 80
		AVERAGE	(48.50)	

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12
3. Transducer: Nortec Model A413S, 1/2 inch x 1/2 inch, 5.0 MHz
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2
5. All comparisons made from 1" metal travel.
6. Decibel (dB) values in parentheses are adjusted to the nearest dB based on uniform 80% amplitude.

TABLE XXVI: SIGNAL RESPONSE AS A FUNCTION OF NOTCH SIZE AND TRANSDUCER FREQUENCY

	Notch Size (Length)									
	0.060		0.125		0.250		0.375		0.500	
Frequency	Gain (dB)	Relative dB	Gain (dB)	Relative dB	Gain (dB)	Relative dB	Gain (dB)	Relative dB	Gain (dB)	Relative dB
1.00 MHz	87.50	+11.50	82.87	+6.87	76.00	0	72.75	-3.25	70.50	-5.50
2.25 MHz	48.75	+10.17	42.50	+3.92	38.58	0	37.25	-1.33	35.38	-3.20
5.00 MHz	60.62	+8.53	56.37	+4.28	52.09	0	49.74	-2.35	48.75	-3.34

NOTES:

1. Reference SK-W7830-0187, EDM Notch Standard, Surface Wave UT.
2. Instrument = Krautkramer, Model USIP 12.
3. Transducers: 1.00 MHz = Panametrics Model V402, 1/2 inch diameter.
   2.25 MHz = Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
   5.00 MHz = Nortec Model Z1-Z, 1/2 inch x 1/2 inch.
4. Shoe = Panametrics, 90^{o}, Models ABWSL-1 & ABWSL-2.
5. All comparisons made from 1" metal travel.
6. All decibel (dB) values are adjusted to the nearest dB based on uniform 80% amplitude.

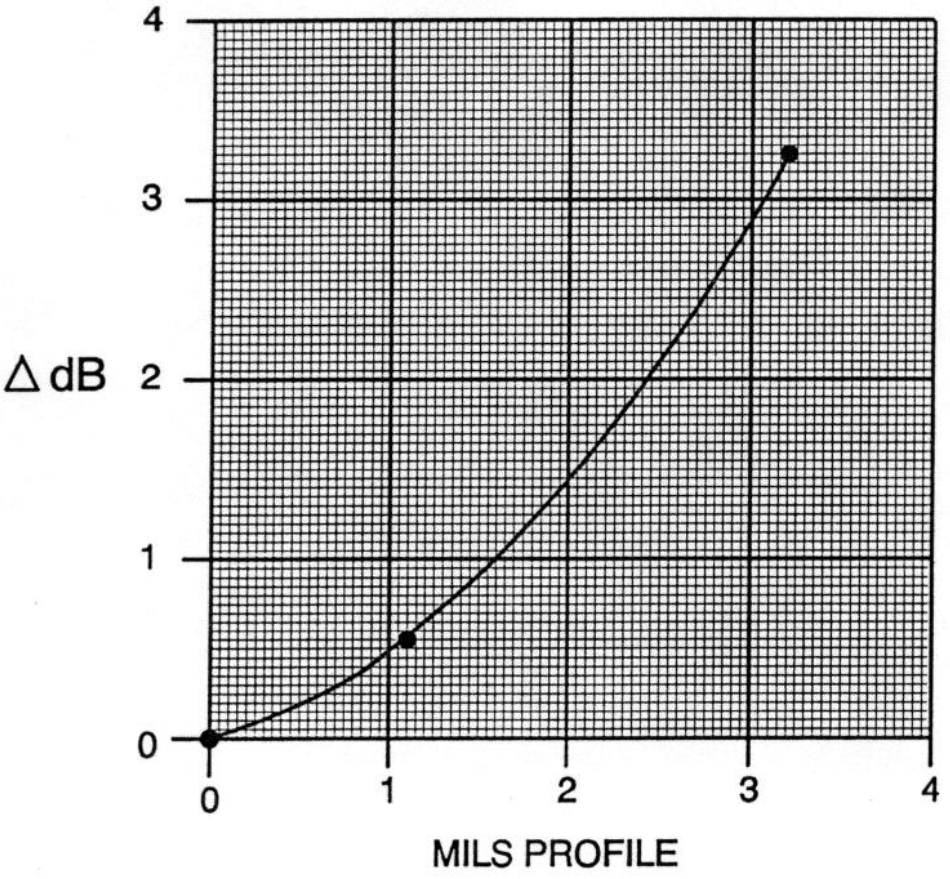


FIGURE 2: EFFECT OF FINISH PROFILE - 1.0 MHz

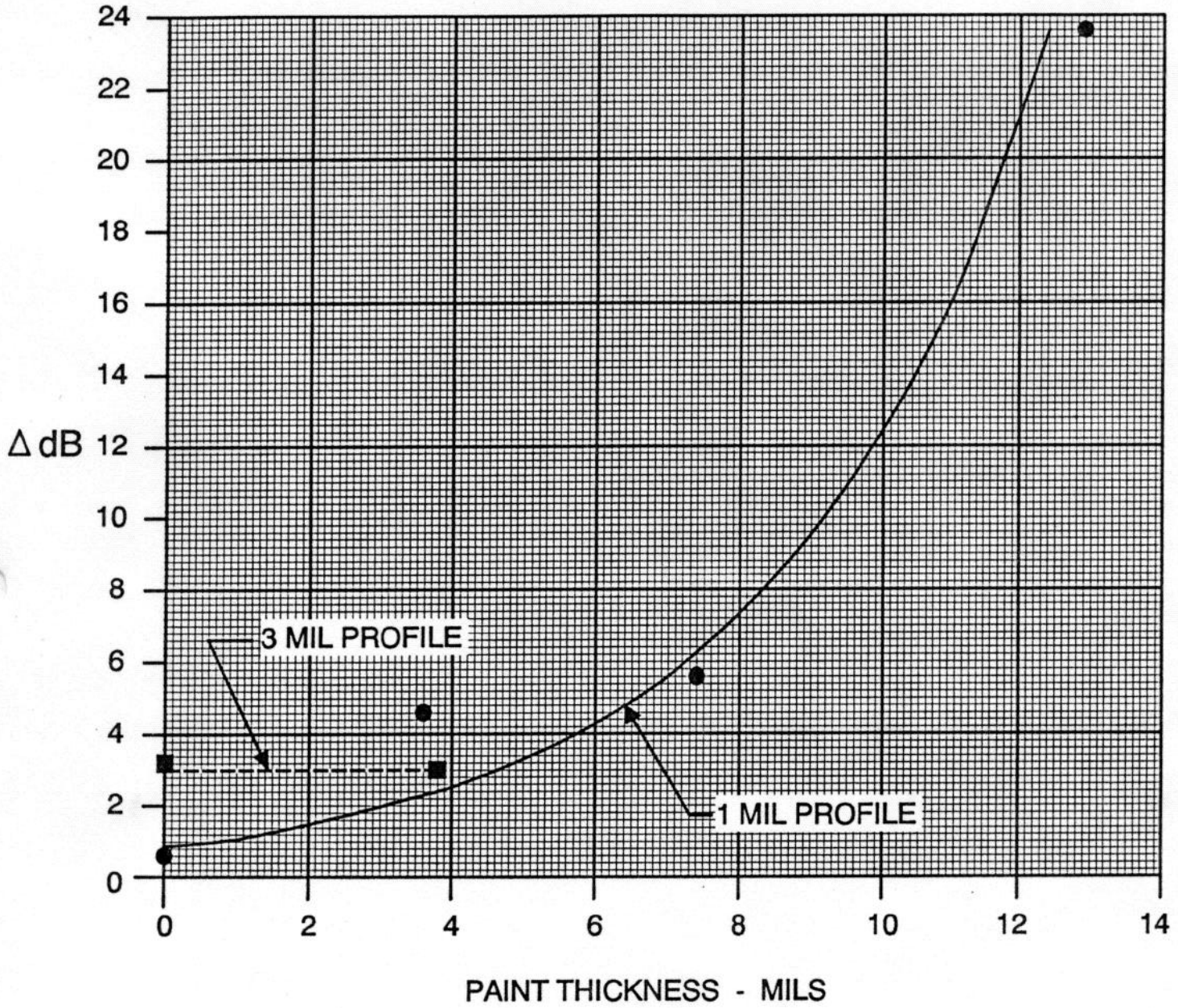


FIGURE 3: EFFECT OF PAINT - 1.0 MHz

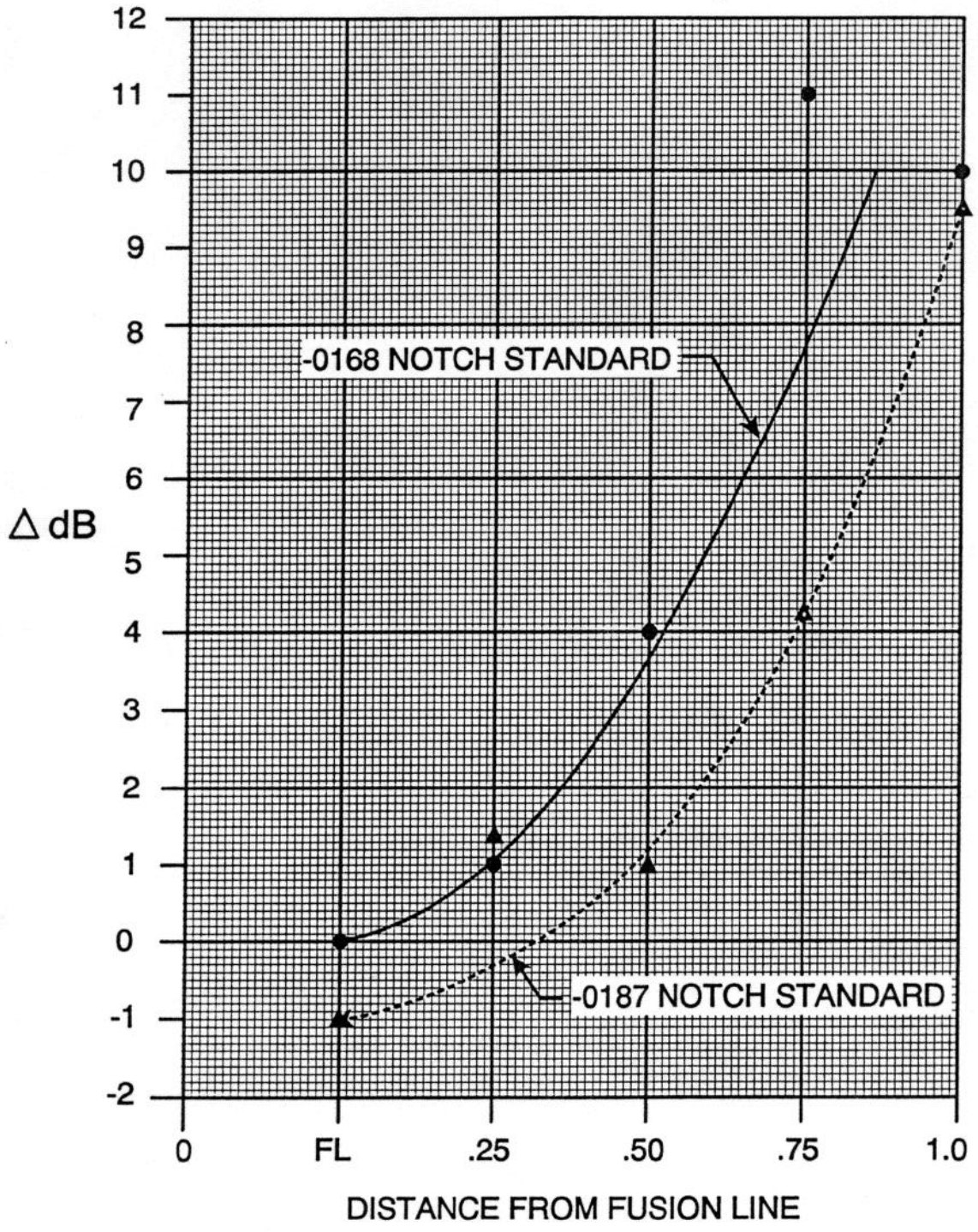


FIGURE 4: EFFECT OF ER347 WELD - 1.0 MHz

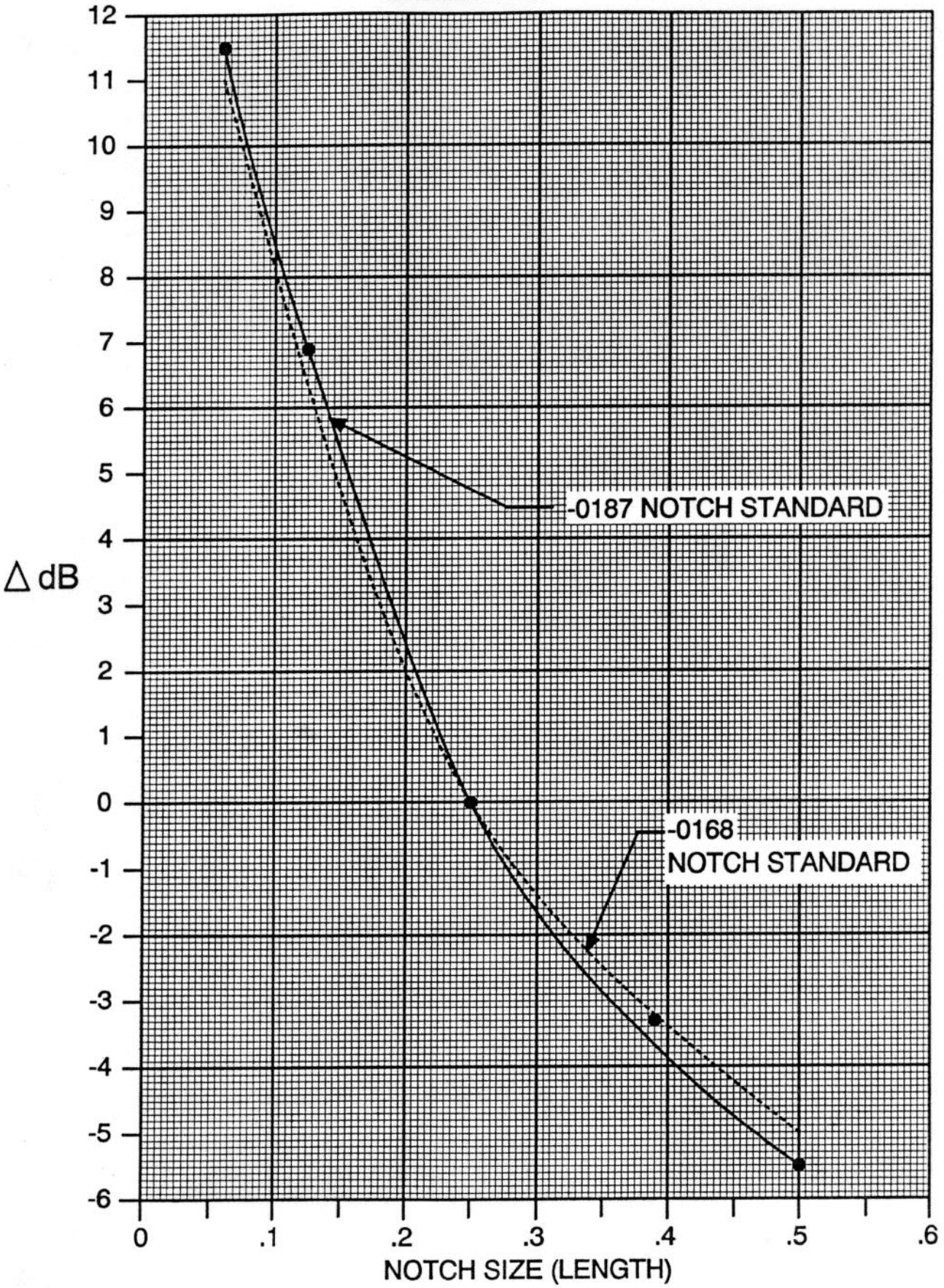


FIGURE 5: SIGNAL RESPONSE AS A FUNCTION OF NOTCH SIZE - 1.0 MHz

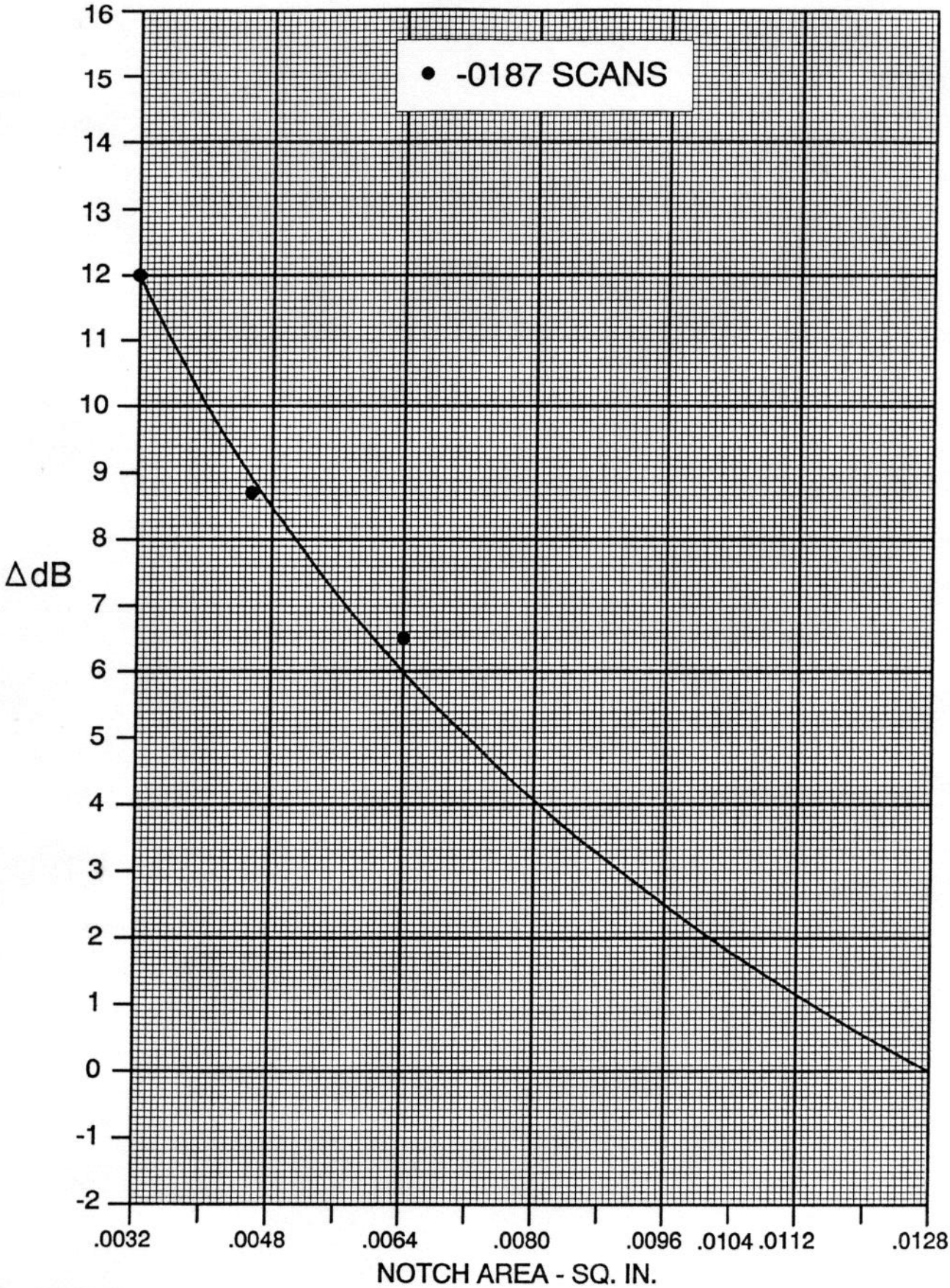


FIGURE 6: SIGNAL RESPONSE AS A FUNCTION OF NOTCH AREA - 1.0 MHz

ACTIVE SHEET RECORD

SHEET NO.	REV LTR	ADDED SHEETS				SHEET NO.	REV LTR	ADDED SHEETS			
		SHEET NO.	REV LTR	SHEET NO.	REV LTR			SHEET NO.	REV LTR	SHEET NO.	REV LTR
1						45					
2						46					
3						47					
4						48					
5						49					
6						50					
7						51					
8						52					
9						53					
10						54					
11						55					
12						56					
13						57					
14						58					
15						59					
16						60					
17						61					
18						62					
19						63					
20						64					
21						65					
22						66					
23						67					
24						68					
25						69					
26						70					
27						71					
28						72					
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVAL
-	Original release.	4-27-93	