# BSI-C-4000 / BSI-C-4002 12-inch Cold Leg SI Loop 2B



C = Calibration Data E = Examination Data

L = LinearityP = Coverage PlotS = SketchT = Thickness

# 2R19 WM illasticotion Report t 2 Page 82 of 299 UT Data Package Cover

Data Package No: 219-01-016

2 1 9 - 0 1 - 0 1 6

Reference ID: BSI-C-4000

B S I - C - 4 0 0 0

AWO: 53102184606

5 3 1 0 2 1 8 4 6 0 6

Page #	Data Type	Exam Angle	Recordable	Limitations	Comments
1-5	C	0-85	Ala	NA	
6	E		NRI	Yes	CAST SS LIMITATION
7-9	<u></u>		NRI	NIA	
10	E			YES	CAST SS LIMITATION
11-15			NIA	NIA	
16	E		NRI	YES	CAST SS LIMITATION
17-19	C		NA	NA	
20	E		NRI	YES	CAST SS LIMITATION
21	Y		NIA	NIA	
22		V	NIA	NA	
		,			
				-	

% of Required Exam Are	ea: 95.9 %	Final Disposition: ACCEPTABLE 11/2/09
Previous Data R UT 대A R	Review	Dominion Review: K. Hacker PA - riche  Level: III. Per Telecon 11/2/09  Review Date: 11/2/09
Legend: UT Data Type Reference  A = Additional Info  B = Beam Spread	Comments:	Data PKG Forwarded TO Kevin Hacker electronically For Review. The



# <sup>2R19</sup> White Printing Report 2 UT Data Package Cover

Data Package No: 219-01-042

2 1 9 - 0 1 - 0 4 2

Reference ID: BSI-C-4002

B S I - C - 4 0 0 2

AWO: 53102184606

5 3 1 0 2 1 8 4 6 0 6

Page #	Data Type	Exam Angle	Recordable	Limitations	Comments
1-5	С	0-850	NA	~lA	
6	E	1	NRI	Yes	CAST SS LIMITATION
7-9	C		NIA	NA	
10	£		NRI	Yes	CAST SS LIMITATION
11-15	C		NIA	N/A	
16	٤		NRI	Yes	CAST SS LIMITATION
17-19	C		NIA	NIA	
20	E		NRI	Yes	CAST SS LIMITATION
21	P		NIA	NIA	
22	P	V	~/A	MA	
		,			
					***

% of Required Exam Area	a: 91.9%	Final Disposition: ACCEPTABLE (1)2/09
Previous Data Ro UT 🕍 RT		Dominion Review: K. Hacker RA Juba Hacker  Level: III per Telecon 11/2/09  Review Date: 11/2/09.
egend: UT Data Type Reference	Comments:	Data PKG Forwarded to Kevin Hocker electronically for Review.

Legend: UT Data Type Reference

A = Additional Info
B = Beam Spread
C = Calibration Data
E = Examination Data
L = Linearity
P = Coverage Plot

P = Coverage Plot S = Sketch T = Thickness



## **ULTRASONIC PHASED ARRAY WOR CALIBRATION REPORT**

WOR Identification DM Weld:	BSI-C-4000	Calibration Data Sheet:	219-01-016
WOR Identification SS Weld:	BSI-C-4002	Calibration Data Sheet:	219-01-042
Plant/Unit:	Millstone / 2	Procedure No. / Rev:	ER-MP-NDE-UT-816/ Rev.0

Wedge		Comments:
Manufacturer:	GEIT	See attached EPRI correspondence for Probe, Wedge
Model:	360-152-079	and Focal Law information.
Nominal Wedge Angle:	52°	
Measured Wedge Angle:	52°	
Contour Diameter:	16.75" AX OD	
Scan Direction:	Axial	
Nominal Index Location:	.60"	
Zero Reference:	Front of Probe	

Instrume	nt	Search Unit		
Manufacturer:	Zetec	Manufacturer:	GEIT	
Model:	Omniscan 32/128 PR	Model:	115-000-631	
PA Module Serial Number:	Omni-Z-6034	Serial Number:	01Y28X-1/ 01Y28X-2	
<b>UT Mainframe Serial Number:</b>	Omni-Z-1062			
Software Revision:	1.4R3			
Table 2 Instrument Settings:	See attached			
		Search Unit Integral Cable		
		Type:	See cable diagram	
		Length:	See cable diagram	
		Connector Type #:	See cable diagram	

Couplant:	Soundsafe	Temperature Gauge:	PTC 312F
Manufacturer:	Sonotech Inc.	Serial Number:	268025
Batch Number:	07220H		

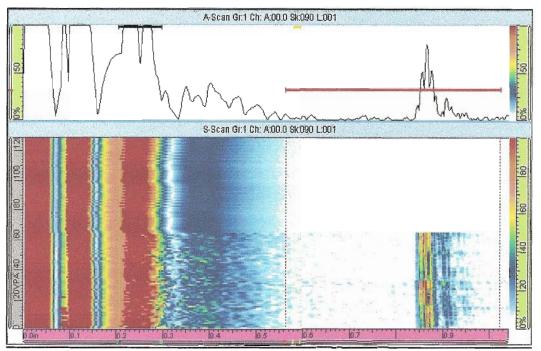
Calibration Data Files
Focal Law: 032NJDB2079L0085R2M1Z4\_1.5MP.LAW

Angles Generated: 0° to 85°
Wave Mode: Longitudinal
Focal Sound Path: 1.50" MP

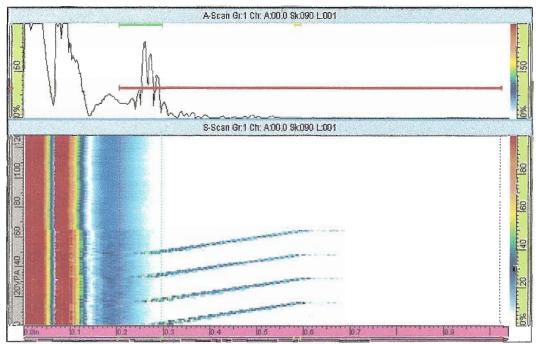
		C	alibration Refl	ector Data	-	
Calibration B	lock(s): M3-UT-5	2	N/A		Temperature	e: 78°
Calibration R	eflector	Angle	% FSH	Ref. Sensitivity	דט	Response
(70°-85°)	0.1" SDH	75°	80	38 dB	.729"	Sound Path
(25°-60°)	1.2" SDH	52°	80	31 dB	1.949"	Sound Path
(0°-25°)	1.2" SDH	0°	80	31 dB	1.20"	Sound Path
Channel Fund	ctional Checks	Pre Exam	: Acceptable	Post Exam:	Acceptable	
Number of Inc	active Channels/E	lements:	Transmit: 0	Receive: 0		

Calibration Performed	Examiner 1	Examiner 2	Level(s)	Date	Time
Initial:	Todd Blechinger	N/A	111	11/01/09	1310
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	[1]	11/01/09	1327



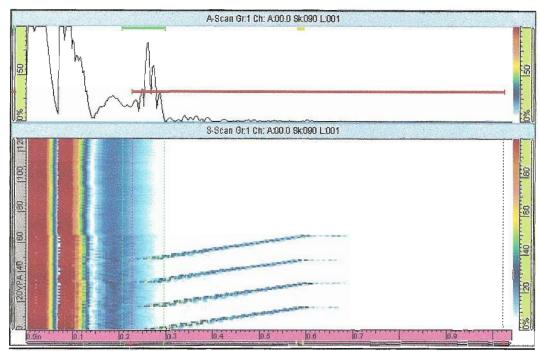


Element Check 1- Pre exam, off wedge

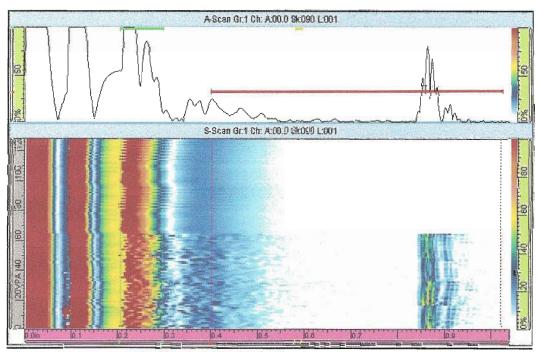


Element Check 2-Pre exam, on wedge





Element Check 3- Post exam, on wedge



Element Check 4-Post exam, off wedge



## Phased Array Instrument Table 2 Essential Settings

Major Menu Item	Menu Item	Sub-menu Item	Setting
Reading			
	Result		
		Selector	List 1
		Field 1	Α%
		Field 2	Α^
		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	31 dB
		Start	0.00 in
		Range	2.529 in
	74	Wedge Delay	.00 us
		Velocity	.2272 in/us
	Pulser		
		Pulser	1
	1,000	Tx/Rx Mode	PE
		Frequency	2
		Voltage	High
		PW	250ns (Auto)
		PRF	Optimum
	Receiver		
		Receiver	1
		Filter	None
		Rectifier	FW
		Video Filter	Off
		Averaging	1
		Reject	0
	Beam		
		Gain Offset	0.0 dB
		Scan Offset	-0.001 in
		Index Offset	-0.605 in
	17788	Angle	52
1000		Skew	0.0°
		Beam Delay	9.66 us
	Advanced		
		dB Ref	Off
		Points Qty	452
		Scale Factor	8
		Sum Gain	22.0



## Phased Array Instrument Table 2 Essential Settings (cont.)

Major Menu Item	Menu Item	Sub-menu Item	Setting
Display			V
	Selection		
		Display	A-S-[C]
		C-Scan 1	Off
		Group	Current
		Projection	On
	Rulers		
		UT Unit	True Depth
		% Ruler	Linear (%)
		DAC/TCG	Off
		Gate	On
		Cursor	Off
	Color		
		Select	Amplitude
		Start (%)	0.0
		End (%)	100.0
	Properties		
		Display	A-Scan
		Source	Normal
Probe Part			
	Select		
		Select	Select Tx/Rx
		Auto Detect	Off
	Position		
		Scan Offset (in)	0
		Index Offset (in)	0
	Parts		
12.01.01		Geometry	Plate
		Thickness (in)	3.0 in
PGM Probe			
	Configuration		
		Scan Type	Sectorial
		Connection P:	1
	Laws		
		Auto Program	Off
Gate Alarm			
	Gate		
		Gate Select	Gate A
		Gate A Synchro	Pulse



### ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

<b>Exam Data Sheet:</b> 219-01-016 21	19-01-042	Calibratio	n Data S	heet: 219-01-	-016 219-01-042	
Plant: Millstone Unit: 2			Proce	dure: ER-MF	P-NDE-UT-816/Rev. 0	
Zones DM Weld: 1-14 SS Weld:	1-20					
Date: 11/01/09	Exam Star	rt: 1310		Exam Stop	: 1327	
WOR Identification DM Weld: BSI-	C-4000	SS Weld	d: BSI-C-4	1002		
Component Configuration DM Weld	d: Safe En	d to Nozzle	SS	Weld: Elbo	ow to Safe End	
Weld Overlay Regions: Portions of o	verlay grea	ater than .75	5" thickne	SS		
Examination Surface: Surface of We	eld Overlay	/	Reviewed Previous Data: N/A			
Temperature Gauge: PTC 312F	Serial N	lumber: 26	Component Temp: 87°			
Percent Of Coverage Obtained: see	comments	3	Examination Angles			
Weld Overlay Thickr	ness:		1	\xial	Circumferential	
Minimum: .75"						
Maximum: 1.00"			0°	to 85°	N/A	
Exar	nination S	ensitivity:	4	3 dB	N/A dB	

Examination Scans Performed	Yes	No	N/A
(1) Axial (Downstream)			
(2) Axial (Upstream)	$\boxtimes$		
(3) Circumferential (Clockwise)			$\boxtimes$
(4) Circumferential (Counterclockwise)			$\boxtimes$

**Comments:** Maintained 5% to 20% average baseline noise level during examination. No suspected flaw indications were observed during examinations. DM weld BSI-C-4000 achieved 95.9% coverage of required examination volume. 4.1% not examined due to lack of qualified technique for Cast SS components. SS weld BSI-C-4002 achieved 91.9% coverage of required examination volume. 8.1% not examined due to lack of qualified technique for Cast SS components. The examination of the Cast SS material was performed as a "Best Effort" examination using current technology. Examined areas of greater than 0.75" WOR thickness only, to satisfy focusing requirements of procedure.

						·-··	
Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	· III	JUP.BY	11/01/09	Todd Blechinger		JUP. REG	11/2/09
Examiner	Level	Signature	Date	Site Review	Level	Signature	Date ///2/09
N/A	N/A			Kevin Hacker	111	For Kevin How per Teleco	ker "
Other	Level	Signature	Date	ANII Review	Level	Signature	Date
N/A	N/A			E. York	N/A	Hark HISC	11/02/2009



## **ULTRASONIC PHASED ARRAY WOR CALIBRATION REPORT**

WOR Identification DM Weld:	BSI-C-4000	Calibration Data Sheet:	219-01-016
WOR Identification SS Weld:	BSI-C-4002	Calibration Data Sheet:	219-01-042
Plant/Unit:	Millstone / 2	Procedure No. / Rev:	ER-MP-NDE-UT-816/ Rev.0

Wedge		Comments:
Manufacturer:	GEIT	See attached EPRI correspondence for Probe, Wedge
Model:	360-152-079	and Focal Law information.
Nominal Wedge Angle:	52°	
Measured Wedge Angle:	52°	
Contour Diameter:	16.75" AX OD	
Scan Direction:	Axial	
Nominal Index Location:	.60"	
Zero Reference:	Front of Probe	

Instrume	nt	Search Unit			
Manufacturer:	Zetec	Manufacturer:	GEIT		
Model:	Omniscan 32/128 PR	Model:	115-000-631		
PA Module Serial Number:	Omni-Z-6034	Serial Number:	01Y28X-1/ 01Y28X-2		
UT Mainframe Serial Number:	Omni-Z-1062				
Software Revision:	1.4R3				
Table 2 Instrument Settings:	See attached				
		Search Unit I	ntegral Cable		
		Type:	See cable diagram		
		Length:	See cable diagram		
		Connector Type #:	See cable diagram		

Couplant:	Soundsafe	Temperature Gauge:	PTC 312F
Manufacturer:	Sonotech Inc.	Serial Number:	268025
Batch Number:	07220H	-	

## Calibration Data Files

Focal Law: 032NJDZ2079L0085R2M1Z4\_1.125MP.LAW
Angles Generated: 0° to 85°

Angles Generated: 0° to 85°
Wave Mode: Longitudinal
Focal Sound Path: 1.125" MP

		Ca	alibration Refl	ector Data			
Calibration Bl	ock(s): M3-UT-5	2	N/A		Temperature:	: 78°	
Calibration Re	flector	Angle	% FSH			Response	
(70°-85°)	0.1" SDH	75°	80	36 dB	.735"	Sound Path	
(25°-60°)	1.0" SDH	52°	80	29 dB	1.601"	Sound Path	
(0°-25°)	1.0" SDH	0°	80	29 dB	1.085"	Sound Path	
Channel Func	tional Checks	Pre Exam	: Acceptable	Post Exam:	Acceptable		
Number of Ina	ctive Channels/I	Elements:	Transmit: 0	Receive: 0			

Calibration Performed	Examiner 1	Examiner 2	Level(s)	Date	Time
Initial:	Todd Blechinger	N/A	Parties and Partie	11/01/09	1328
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	111	11/01/09	1405



# Phased Array Instrument Table 2 Essential Settings

Major Menu Item	Menu Item	Sub-menu Item	Setting
Reading			
	Result		
	rtodate	Selector	List 1
		Field 1	A%
-		Field 2	A^
		Field 3	SA
		Field 4	PA
UT		T loid 1	177
<u> </u>	General		
	Jonoral	Gain	29 dB
		Start	0.00 in
		Range	2.529 in
		Wedge Delay	0.0 us
		Velocity	.2272 in/us
	Pulser	Volodity	.2272 11700
	1 41001	Pulser	1
		Tx/Rx Mode	PE
		Frequency	2
		Voltage	High
		PW	250ns (Auto)
		PRF	Optimum
	Receiver		Оринин
	110001101	Receiver	1
		Filter	None
		Rectifier	FW
		Video Filter	Off
		Averaging	1
		Reject	0
	Beam		
		Gain Offset	0.0 dB
		Scan Offset	-0.001 in
		Index Offset	-0.605 in
		Angle	52
		Skew	0.0°
		Beam Delay	9.90 us
	Advanced	•	
		dB Ref	Off
		Points Qty	452
		Scale Factor	8
		Sum Gain	22.0



# Phased Array Instrument Table 2 Essential Settings (cont.)

Major Menu Item	Menu Item	Sub-menu Item	Setting
Display			
w to procy	Selection		
	00.000.01	Display	A-S-[C]
		C-Scan 1	Off
		Group	Current
		Projection	On
· · · · · · · · · · · · · · · · · · ·	Rulers		
		UT Unit	True Depth
		% Ruler	Linear (%)
		DAC/TCG	Off
		Gate	On
		Cursor	Off
	Color		
		Select	Amplitude
		Start (%)	0.0
		End (%)	100.0
	Properties		
		Display	A-Scan
		Source	Normal
Probe Part			
	Select		
		Select	Select Tx/Rx
		Auto Detect	Off
	Position		
		Scan Offset (in)	0
		Index Offset (in)	0
	Parts		5.
		Geometry	Plate
2011 2		Thickness (in)	3.0 in
PGM Probe	0 5		
	Configuration		
		Scan Type	Sectorial
	N	Connection P:	1
	Laws	A. 4- D	
Onto Ala		Auto Program	Off
Gate Alarm	0.4		
	Gate	Onto Onlant	0-4-4
		Gate Select	Gate A
		Gate A Synchro	Pulse



## ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sh	200 C	24.046 24	9-01-042	Calibratia	- D-4- (	Chast	219-01-016	040 04 040
Plant: Millston		- wron	9-01-042	Cambration		-		219-01-042 -UT-816/Rev. 0
Zones DM We			1-20		FIOC	euure.	CK-MIP-NDE	-01-616/Rev. 0
Date: 11/01/09			Exam Start:	1328		Fyar	n Stop: 1405	5
WOR Identific		M Weld: BSI-0		SS Weld	l: BSI-C		11 Otop: 1400	,
Component C							d: Elbow to	Safe End
Weld Overlay					4			
Examination S					Review	ved Pro	evious Data:	N/A
Temperature	Gauge: P	TC 312F	Serial Nu	mber: 268	3025	Con	nponent Ten	np: 87°
Percent Of Coverage Obtained: see comments						Exa	amination A	ngles
	Weld O	verlay Thickn	ess:	ì		<u>Axial</u>	Cir	cumferential
Minimum: .4	-							
Maximum: .74	49"				0	° to 85	•	N/A
		Exan	nination Se	nsitivity:		41 dB		N/A dB
E	xaminatio	on Scans Per	formed		Ye	es	No	N/A
	(1) Axi	al (Downstrea	m)		×	1		
		xial (Upstream		-	$\triangleright$			
(	3) Circum	ferential (Cloc	kwise)			]		
(4) (	Circumfere	ential (Counter	clockwise)			]		$\boxtimes$
flaw indication of required exa components. not examined	Comments: Maintained 5% to 20% average baseline noise level during examination. No suspected flaw indications were observed during examinations. DM weld BSI-C-4000 achieved 95.9% coverage of required examination volume. 4.1% not examined due to lack of qualified technique for Cast SS components. SS weld BSI-C-4002 achieved 91.9% coverage of required examination volume. 8.1% not examined due to lack of qualified technique for Cast SS components. The examination of the Cast SS material was performed as a "Best Effort" examination using current technology.							
			<u> </u>					
Examiner	Level	Signature	Date	LMT Rev	view	Level	Signature	Date
Todd Blechinge	r III	flp. (2/4)	11/01/09	Todd Blec	hinger	III	JUP 15	11/2/09
Examiner	Level	Signature	Date	Site Rev	iew	Level	Signature	Date
N/A	N/A			Kevin Ha	cker	111	For Kevin per Tel	Hacker
Other	Level	Signature	Date	ANII Rev	riew	Level	Signature	Date
N/A	N/A			E. Yor	k	N/A	G. L.11	Vulan what



## **ULTRASONIC PHASED ARRAY WOR CALIBRATION REPORT**

WOR Identification DM Weld:	BSI-C-4000	Calibration Data Sheet:	219-01-016
WOR Identification SS Weld:	BSI-C-4002	Calibration Data Sheet:	219-01-042
Plant/Unit:	Millstone / 2	Procedure No. / Rev:	ER-MP-NDE-UT-816/ Rev.0

Wedge		Comments:
Manufacturer:	GEIT	See attached EPRI correspondence for Probe, Wedge
Model:	360-152-078	and Focal Law information.
Nominal Wedge Angle:	52°	
Measured Wedge Angle:	52°	
Contour Diameter:	16.75" CIRC OD	
Scan Direction:	Circumferential	
Nominal Index Location:	.70"	
Zero Reference:	Front of Probe	

Instrume	nt	Search Unit		
Manufacturer:	Zetec	Manufacturer:	GEIT	
Model:	Omniscan 32/128 PR	Model:	115-000-631	
PA Module Serial Number:	Omni-Z-6034	Serial Number:	01Y28Y-1/ 01Y28Y-2	
<b>UT Mainframe Serial Number:</b>	Omni-Z-1062			
Software Revision:	1.4R3			
Table 2 Instrument Settings:	See attached			
		Search Unit Integral Cable		
		Type:	See cable diagram	
		Length:	See cable diagram	
		Connector Type #:	See cable diagram	

Couplant:	Soundsafe	Temperature Gauge:	PTC 312F
Manufacturer:	Sonotech Inc.	Serial Number:	268025
Batch Number:	07220H		

#### Calibration Data Files

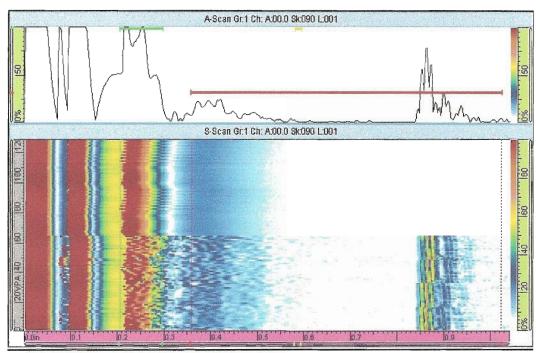
Focal Law: 032NJDB2078L0085R2M1Z4\_1.5MP.LAW

Angles Generated: 0° to 85°
Wave Mode: Longitudinal
Focal Sound Path: 1.50" MP

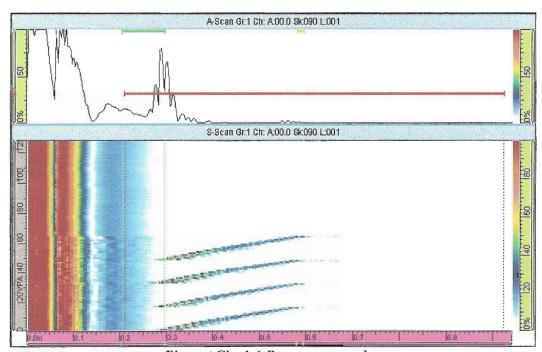
		C	alibration Refl	ector Data		
Calibration Bl	ock(s): M3-UT-51		N/A		Temperatu	re: 78°
Calibration Re	eflector	Angle	% FSH	Ref. Sensitivity	U	T Response
(70°-85°)	0.1" SDH	75°	80	34 dB	.625"	Sound Path
(25°-60°)	1.2" SDH	52°	80	31 dB	1.949"	Sound Path
(0°-25°)	1.2" SDH	0°	80	26 dB	1.2"	Sound Path
Channel Func	tional Checks	Pre Exam	: Acceptable	Post Exam:	Acceptable	
Number of Ina	ctive Channels/E	ements:	Transmit: 0	Receive: 0		

Calibration Performed	Examiner 1	Examiner 2	Level(s)	Date	Time
Initial:	Todd Blechinger	N/A	111	11/01/09	1410
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	Ш	11/01/09	1427



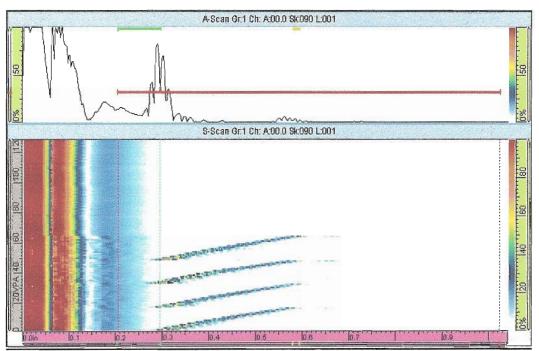


Element Check 5- Pre exam, off wedge

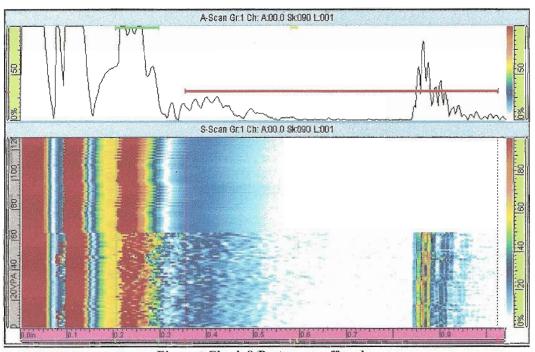


Element Check 6-Pre exam, on wedge





Element Check 7- Post exam, on wedge



Element Check 8-Post exam, off wedge



# Phased Array Instrument Table 2 Essential Settings

Major Menu Item	Menu Item	Sub-menu Item	Setting
Reading			
	Result		
		Selector	List 1
		Field 1	A%
		Field 2	Α^
		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	31 dB
		Start	0.00 in
		Range	2.529 in
		Wedge Delay	2.50 us
		Velocity	.2272 in/us
	Pulser	- Constant	
1 10.0000000000		Pulser	1
		Tx/Rx Mode	PE
		Frequency	2
		Voltage	High
		PW	250ns (Auto)
		PRF	Optimum
	Receiver	110	Optimum
	110001101	Receiver	1
		Filter	None
		Rectifier	FW
		Video Filter	Off
		Averaging	1
		Reject	0
	Beam		
		Gain Offset	0.0 dB
		Scan Offset	0.00 in
		Index Offset	064 in
		Angle	52
		Skew	0.0°
		Beam Delay	9.57 us
	Advanced	Douin Doing	0.0. 40
	7107011000	dB Ref	Off
		Points Qty	452
		Scale Factor	8
		Sum Gain	22.0



## Phased Array Instrument Table 2 Essential Settings (cont.)

Major Menu Item	Menu Item	Sub-menu Item	Setting
Display			The state of the s
	Selection		
		Display	A-S-[C]
- MAI		C-Scan 1	Off
Control of the contro		Group	Current
		Projection	On
an annual anguage y data datahasar ta			
	Rulers		
		UT Unit	True Depth
		% Ruler	Linear (%)
		DAC/TCG	Off
		Gate	On
		Cursor	Off
	Color		
		Select	Amplitude
		Start (%)	0.0
		End (%)	100.0
	Properties		
		Display	A-Scan
		Source	Normal
Probe Part			
	Select		
		Select	Select Tx/Rx
		Auto Detect	Off
	Position		
		Scan Offset (in)	0
		Index Offset (in)	0
	Parts		
		Geometry	Plate
		Thickness (in)	3.0 in
PGM Probe			
	Configuration		
		Scan Type	Sectorial
	- ALVARANCE A	Connection P:	1
	Laws		
		Auto Program	Off
Gate Alarm			
	Gate		
		Gate Select	Gate A
		Gate A Synchro	Pulse



#### ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sheet: 219-01-016	219-01-042 Calibra	tion Data S	heet: 219-01	1-016 219-01-042
Plant: Millstone Unit: 2	Pro	cedure: EF	R-MP-NDE-UT	r-816/Rev. 0
Zones DM Weld: 1-14 SS	<b>Weld:</b> 1-20			
Date: 11/01/09	Exam Start: 1410		Exam Stop	<b>):</b> 1427
WOR Identification DM We	ld: BSI-C-4000 SS W	eld: BSI-C-	4002	
Component Configuration D	M Weld: Nozzle to Safe E	nd SS	Weld: Elbov	w to Safe End
Weld Overlay Regions: Portion	ons of overlay greater than	.75" thickne	ess	
Examination Surface: Surface	ce of Weld Overlay	Review	ed Previous	Data: N/A
Temperature Gauge: PTC 31	2F Serial Number:	268025	Compone	nt Temp: 87°
Percent Of Coverage Obtain	ed: see comments		Examinat	tion Angles
Weld Overlay	Thickness:		<u> Axial</u>	Circumferential
Minimum: .75"				
Maximum: 1.00"			N/A	0° to 85°
	Examination Sensitivit	y: 1	N/A dB	43 dB
	Examination Sensitivit	y; 1	N/A dB	43 dB

<b>Examination Scans Performed</b>	Yes	No	N/A
(1) Axial (Downstream)			$\boxtimes$
(2) Axial (Upstream)			$\boxtimes$
(3) Circumferential (Clockwise)	$\boxtimes$		
(4) Circumferential (Counterclockwise)	$\boxtimes$		

Comments: Maintained 5% to 20% average baseline noise level during examination. No suspected flaw indications were observed during examinations. DM weld BSI-C-4000 achieved 95.9% coverage of required examination volume. 4.1% not examined due to lack of qualified technique for Cast SS components. SS weld BSI-C-4002 achieved 91.9% coverage of required examination volume. 8.1% not examined due to lack of qualified technique for Cast SS components. The examination of the Cast SS material was performed as a "Best Effort" examination using current technology. Examined areas of greater than 0.75" WOR thickness only, to satisfy focusing requirements of procedure.

Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	Ш	JMP. 1829	11/01/09	Todd Blechinger	0	JUP. BUY	11/2/09
Examiner	Level	Signature	Date	Site Review	Level	Signature	Date
N/A	N/A			Kevin Hacker	111	RATICALLY FOR KEDIN HOLE NETTELECO	11/2/09 Ler as
Other	Level	Signature	Date	ANII Review	Level	Signature	Date
N/A	N/A			E. York	N/A	Jank His co	11/02/2009



## **ULTRASONIC PHASED ARRAY WOR CALIBRATION REPORT**

WOR Identification DM Weld:	BSI-C-4000	Calibration Data Sheet: 219	-01-016
WOR Identification SS Weld:	BSI-C-4002	Calibration Data Sheet: 219	-01-042
Plant/Unit:	Millstone / 2	Procedure No. / Rev: ER	R-MP-NDE-UT-816/ Rev.0

Wedge		Comments:
Manufacturer:	GEIT	See attached EPRI correspondence for Probe, Wedge
Model:	360-152-078	and Focal Law information.
Nominal Wedge Angle:	52°	
Measured Wedge Angle:	52°	
Contour Diameter:	16.75" CIRC OD	
Scan Direction:	Circumferential	
Nominal Index Location:	.70"	
Zero Reference:	Front of Probe	

Instrume	nt	Search Unit		
Manufacturer:	Zetec	Manufacturer:	GEIT	
Model:	Omniscan 32/128 PR	Model:	115-000-631	
PA Module Serial Number:	Omni-Z-6034	Serial Number:	01Y28Y-1/ 01Y28Y-2	
UT Mainframe Serial Number:	Omni-Z-1062			
Software Revision:	1.4R3			
Table 2 Instrument Settings:	See attached			
		Search Unit I	ntegral Cable	
		Type:	See cable diagram	
		Length:	See cable diagram	
		Connector Type #:	See cable diagram	

Couplant:	Soundsafe	Temperature Gauge:	PTC 312F
Manufacturer:	Sonotech Inc.	Serial Number:	268025
Batch Number:	07220H		

Calibration Data Files

Focal Law: 032NJDZ2078L0085R2M1Z4\_1.125MP.LAW

Angles Generated: 0° to 85°
Wave Mode: Longitudinal
Focal Sound Path: 1.125" MP

		C	alibration Refle	ector Data			
Calibration Bl	ock(s): M3-UT-51		N/A	Temperature: 78°			
Calibration Re	eflector	Angle	% FSH	Ref. Sensitivity	UT Response		
(70°-85°)	0.1" SDH	75°	80	33 dB	.740"	Sound Path	
(25°-60°)	1.0" SDH	52°	80	28 dB	1.628"	Sound Path	
(0°-25°)	1.0" SDH	0°	80	22 dB	.999"	Sound Path	
Channel Fund	tional Checks	Pre Exam	: Acceptable	Post Exam:	Acceptable		
Number of Ina	active Channels/El	ements:	Receive: 0				

Calibration Performed	Examiner 1	Examiner 2	Level(s)	Date	Time
Initial:	Todd Blechinger	N/A	111	11/01/09	1428
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	111	11/01/09	1515



## Phased Array Instrument Table 2 Essential Settings

Major Menu Item	Menu Item	Sub-menu Item	Setting
Reading			
	Result		
		Selector	List 1
		Field 1	A%
		Field 2	Α^
-100000		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	28 dB
		Start	0.00 in
		Range	2.529 in
The state of the s		Wedge Delay	1.3 us
		Velocity	.2272 in/us
-WATA	Pulser	. c.comy	LANGE AND LETT WAY
	1 01001	Pulser	1
		Tx/Rx Mode	PE
		Frequency	2
		Voltage	High
		PW	250ns (Auto)
		PRF	Optimum
	Receiver		Optimient
72.4	110001101	Receiver	1
		Filter	None
		Rectifier	FW
		Video Filter	Off
		Averaging	1
		Reject	0
	Beam		
		Gain Offset	0.0 dB
		Scan Offset	0.00 in
		Index Offset	-0.665 in
		Angle	52
		Skew	0.0°
		Beam Delay	9.59 us
	Advanced	Dodin Dolay	J.00 ug
	Adranova	dB Ref	Off
		Points Qty	452
100000000000000000000000000000000000000		Scale Factor	8
		Sum Gain	22.0



# Phased Array Instrument Table 2 Essential Settings (cont.)

Major Menu Item	Menu Item	Sub-menu Item	Setting
Display			
	Selection		
		Display	A-S-[C]
		C-Scan 1	Off
		Group	Current
		Projection	On
	Rulers		
	Raioro	UT Unit	True Depth
		% Ruler	Linear (%)
		DAC/TCG	Off
		Gate	On
		Cursor	Off
	Color	Ouisoi	Oil Oil
	00101	Select	Amplitude
		Start (%)	0.0
		End (%)	100.0
	Properties	2110 (70)	
	1100011100	Display	A-Scan
		Source	Normal
Probe Part			
110001000	Select		
		Select	Select Tx/Rx
		Auto Detect	Off
	Position		
		Scan Offset (in)	0
		Index Offset (in)	0
	Parts		
		Geometry	Plate
		Thickness (in)	3.0 in
PGM Probe			
	Configuration		
		Scan Type	Sectorial
		Connection P:	1
	Laws		
		Auto Program	Off
Gate Alarm			
	Gate		
		Gate Select	Gate A
		Gate A Synchro	Pulse

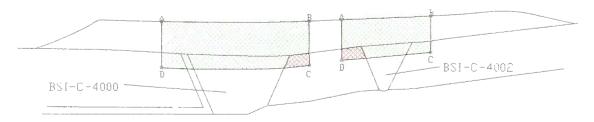


# ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sh			19-01-042	Calibration				219-01-042	
				dure: ER-MP-NDE-UT-816/Rev. 0					
Zones DM Weld: 1-14 SS Weld: 1-20									
Date: 11/01/09			Exam Star			xam Stop	: 1515		
WOR Identific		M Weld: BSI-			I: BSI-C-400				
Component C				d to Nozzle	SS We	eld: Elbov	v to Saf	e End	
Weld Overlay									
Examination S					Reviewed				
Temperature (				umber: 26		ompone			
Percent Of Co				•		Examinat	ion Ang	jles	
		verlay Thick	ness:		Axi	al	Circ	<u>umferential</u>	
Minimum: .45						_			
Maximum: .74	19"				N/A	A		0° to 85°	
,		Exa	nination S	ensitivity:	N/A	dB		40 dB	
		SEL / COL		ooy.				-10 GB	
E	xaminati	on Scans Pe	rformed		Yes		lo	N/A	
	(1) Ax	rial (Downstrea	am)						
	(2) A	xial (Upstrear	n)					$\boxtimes$	
(:	3) Circun	nferential (Clo	ckwise)		$\boxtimes$	]			
(4) C	ircumfere	ential (Counte	rclockwise)		$\boxtimes$				
flaw indications of required exa components. S not examined of	Comments: Maintained 5% to 20% average baseline noise level during examination. No suspected flaw indications were observed during examinations. DM weld BSI-C-4000 achieved 95.9% coverage of required examination volume. 4.1% not examined due to lack of qualified technique for Cast SS components. SS weld BSI-C-4002 achieved 91.9% coverage of required examination volume. 8.1% not examined due to lack of qualified technique for Cast SS components. The examination of the Cast SS material was performed as a "Best Effort" examination using current technology.								
								N/	
Examiner	Level	Signature	Date	LMT Rev	view Lev	el Sign	ature	Date	
Todd Blechinger		IMP BY	11/01/09	Todd Blec	hinger III	111	1144	(11/2/09	
Examiner	Level	Signature	Date	Site Rev	iew Lev	el Sign	ature	Date	
N/A	N/A			Kevin Ha	cker III	Fork	EVIN Ha Teles	cker 1/2/03	
Other	Level	Signature	Date	ANII Rev	riew Lev	el Sign	ature	Date	
N/A	N/A			E. Yor	k N/A	Harl	NSK G	11/02/2009	



## **Coverage Plot**



ISI Examination Volume A-B-C-D



Total area examined with qualified technique BSI-C-4000- 4.414 sq inches Required examination volume- 4.601 sq inches



Iotal oreo examined with non-qualified technique BSI-C-4000- .187 sq inches



Total area examined with qualified technique BSI-C-4002- 2.125 sq inches Required examination volume-  $2.31~{\rm sq}$ , inches

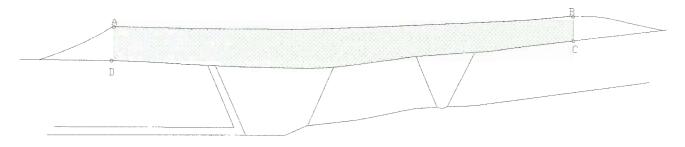
Total area examined with non-qualified technique BSI-C-4002- .185 sq. inches

Scale: None

g-11a			$\mathcal{A}$				4
Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	Ш	JUP. 129	11/1/09	Todd Blechinger		JUP. DE	11/2/07
Examiner	Level	Signature	Date	Site Review	Level	Signature	Date
N/A	N/A			Kevin Hacker	111	For Levis Had Per Teleco	dcer 11/2/69 w
Other	Level	Signature	Date	ANII Review	Level	Signature	Date
N/A	N/A			E. York	N/A	Ya-K NSLCT	॥१०/४०९
						/	



# **Coverage Plot**



PSI Examination Volume A-B-C-D

Scale: None

							<del>( )</del>
Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger		JUP BY	11/1/09	Todd Blechinger	111	JUP. Rot	1/2/09
Examiner	Level	Signature	Date	Site Review	Level	Signature	Date
N/A	N/A			Kevin Hacker		MA July For Kevis Ha Der Teleco	de- 11/2/09
Other	Level	Signature	Date	ANII Review	Level	/ Signature	Date
N/A	N/A			E. York	N/A	Hork HSECT	11/02/2009



September 23, 2009

Kevin Hacker Dominion Corporate NDE Level III Dominion Generation Innsbrook Technical Center (M/S 3NE) 5000 Dominion Blvd Glen Allen, VA 23060-3308

Subject: Phased Array Wedge Designs for Weld Overlay Examinations at Millstone 2 (Fall 2009)

Dear Mr. Hacker:

As requested, please find included with this letter the ultrasonic phased array wedge information for use with the EPRI Procedure for Manual Phased Array Ultrasonic Examination of Weld Overlaid Similar and Dissimilar Metal Welds (EPRI-WOL-PA-1) at Dominion's Millstone Power Station Unit 2 in the fall of 2009. These weld overlay inspections will require the use of one 2.0 MHz 2x16 ultrasonic phased array dual transducer with six wedges all manufactured by General Electric Inspection Technologies (GEIT) with the Zetec OmniScan 32-128 P/R phased array instrument (See Figure 1).

Table A indicates which GEIT wedge shall be used for each weld overlaid component while Table B contains the Zetec Advanced Phased Array Calculator 1.2R4 (ZAPAC 1.2R4) CAL file for each corresponding GEIT wedge and focal metal path distance. While these CAL files are attached to this letter, each should be loaded into ZAPAC 1.2R4 and verified with the settings contained in the EPRI report: Nondestructive Evaluation: Procedure for Manual Phased Array UT of Weld Overlays (Product ID 1015134). Figures 2 through 11 contain screen captures of the ZAPAC 1.2R4 for each CAL file. The user shall verify all of the parameters in the ZAPAC 1.2R4 for each CAL file with those found in the 1015134 EPRI report prior to generating a corresponding LAW file for field use.

It is important to note that the "O32NJDZ2232L0079R2M1Z4" and "O32NJDZ2234L0082R2M1Z4" CAL files only allow the user to generate a maximum angle range of 0° to 79° and 0° to 82° respectively instead of the 0° to 85° recommended in the procedure. These smaller angle ranges were formally demonstrated through the Performance Demonstration Initiative (PDI) Program for use with the OmniScan instruments and are acceptable for use (see EPRI-WOL-PA-1).

For your convenience, I have attached two OmniScan 32-128 P/R setup files (WOLPA1.ops - for basic setup, WOLPA1\_ChannelCheck.ops - for channel/element checks) as a starting point for you to build your own setup files for the examination. You will need to verify all the parameters in the attached files prior to field use.

Please note that ZAPAC 1.2R4 is a standalone program that is also embedded in the Zetec UltraVision 1.2R4 software. The ZAPAC 1.2R4 standalone and embedded programs are equivalent for LAW file generation. Please let us know if you have any comments or questions.

Sincerely,

Mark Dennis

EPRI Senior Project Manager

gral D

Attachment

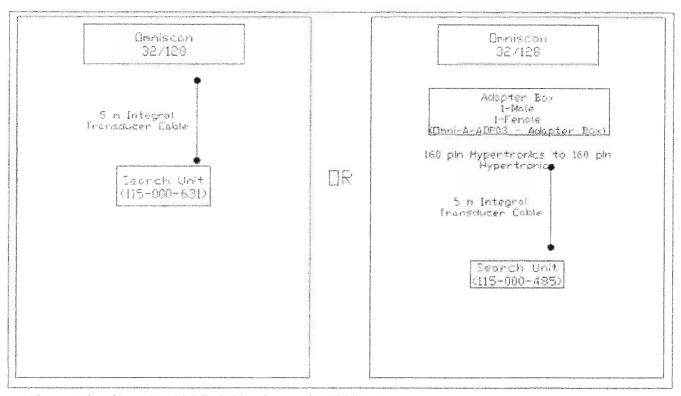


Figure 1. OmniScan 32-128 P/R Cable Diagram for EPRI-WOL-PA-1

Table A. GEIT Wedge Component Applicability

Zone	Weld	Location / Description	Wedge	GEIT Axial	GEIT Circ	
	Number	_	Contour	Wedge Part #	Wedge Part#	
			Required			
			Wedges			
1-07	BPD-C-1017	2" Drain Line Loop 1A				
1-09	BPD-C-3000	2" Drain line Loop 1B				
1-11	BPD-C-2001	2" Drain line Loop 2A	4.125"	360-152-233	360-152-232	
1-12	BCH-C-2001	2" Charging line Loop 2A				
1-08	BCH-C-1001	2" Charging Line Loop 1A				
1-08	BPY-C-1001	3" Spray line Loop 1A	5.50"	360-152-235	360-152-234	
1-10	BPY-C-3000	3" Spray Line Loop 1B	3.30	300-132-233	300-132-234	
1-08	BSI-C-1001	12" Safety Injection 1A				
1-10	BSI-C-3000	12" Safety Injection 1B				
1-14	BSI-C-4000	12" Safety Injection 2B	16.75"	360-152-079	360-152-078	
1-05	BPS-C-1001	12" Hot leg Surge Line Loop 1	10.75   360-132-079   360-15		300~132-076	
1-06	BSD-C-2001	12" SDC line Loop 1				
1-12	BSI-C-2001	12" Safety Injection Loop 2A				

Table B. GEIT Wedge CAL File Applicability

GEIT	Diameter	Scanning	Focal	CAL Filename	Weld Overlay Thickness
Part #	(in)	Direction	Metal		(WOLT) Range
			Path		
			(in)		
360-	4.125	Circ.	0.5	O32NJDS2232L0085R2M1Z4	WOLT<=0.20in
152-232					
360-	4.125	Axial	0.5	O32NJDS2233L0085R2M1Z4	WOLT<=0.20in
152-233					
360-	4.125	Circ.	1.125	O32NJDZ2232L0079R2M1Z4	0.20 in < WOLT < 0.75 in
152-232					
360-	4.125	Axial	1.125	O32NJDZ2233L0085R2M1Z4	0.20 in < WOLT < 0.75 in
152-233					
360-	5.500	Circ.	1.125	O32NJDZ2234L0082R2M1Z4	0.20 in < WOLT < 0.75 in
152-234					
360-	5.500	Axial	1.125	O32NJDZ2235L0085R2M1Z4	0.20in < WOLT < 0.75in
152-235					
360-	16.750	Circ.	1.125	O32NJDZ2078L0085R2M1Z4	0.20in < WOLT < 0.75in
152-078					
360-	16.750	Axial	1.125	O32NJDZ2079L0085R2M1Z4	0.20 in < WOLT < 0.75 in
152-079					
360-	16.750	Circ.	1.5	O32NJDB2078L0085R2M1Z4	WOLT >= 0.75in
152-078					
360-	16.750	Axial	1.5	O32NJDB2079L0085R2M1Z4	WOLT >= 0.75in
152-079					

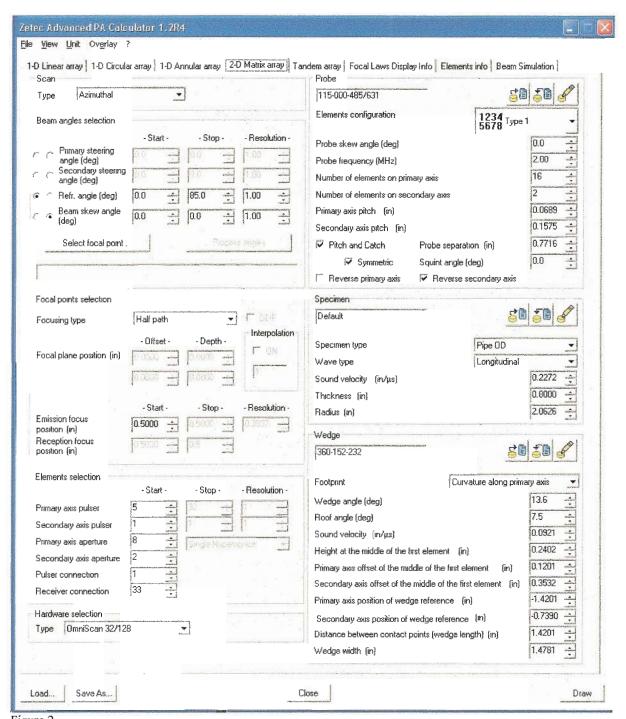


Figure 2.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 0.5

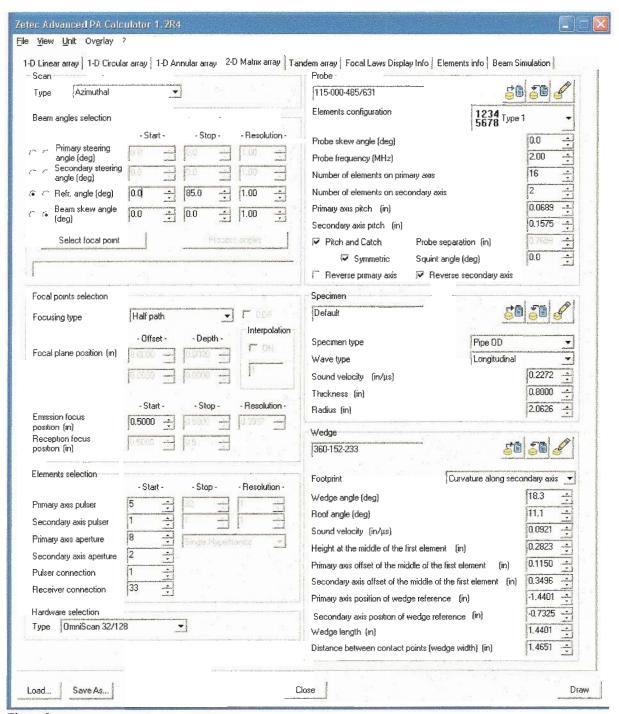


Figure 3.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in) = 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 0.5

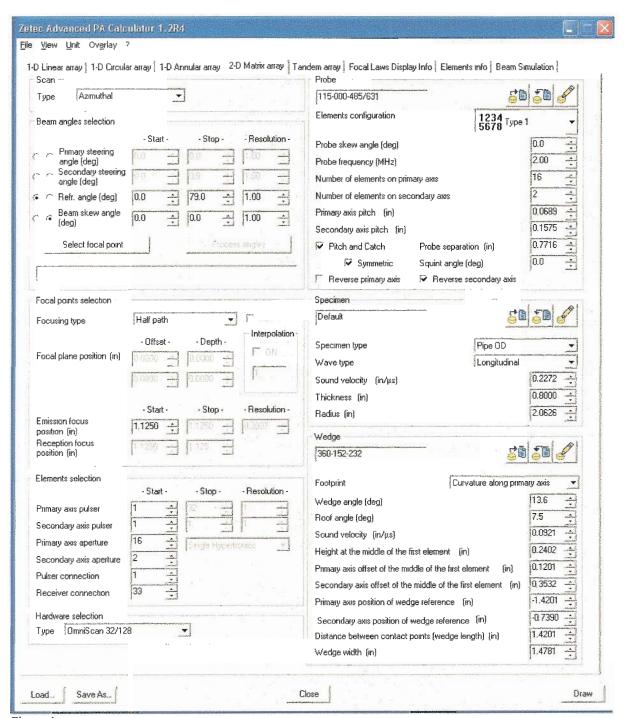


Figure 4.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

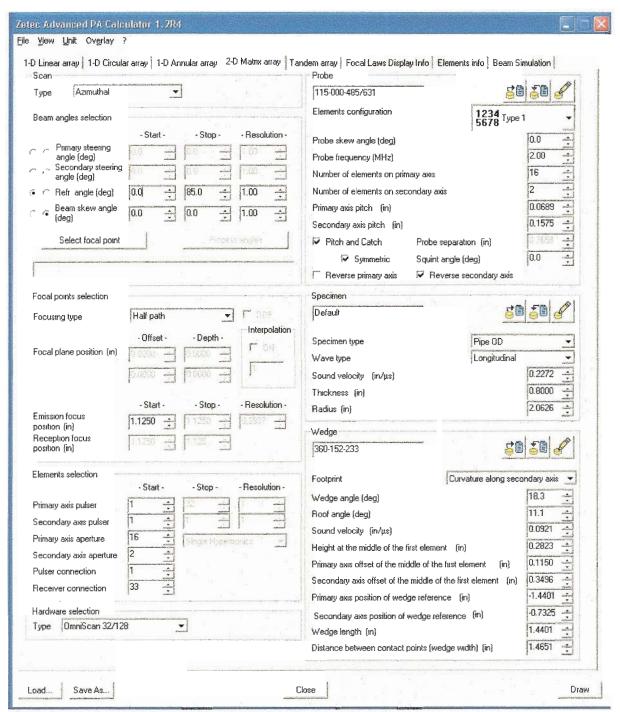


Figure 5.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in)

= 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

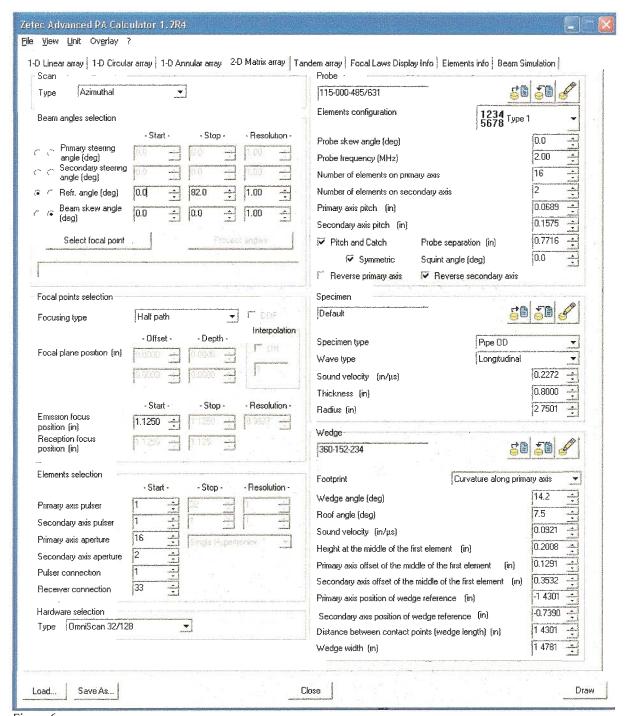


Figure 6. ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-234; Diameter (in) = 5.5; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

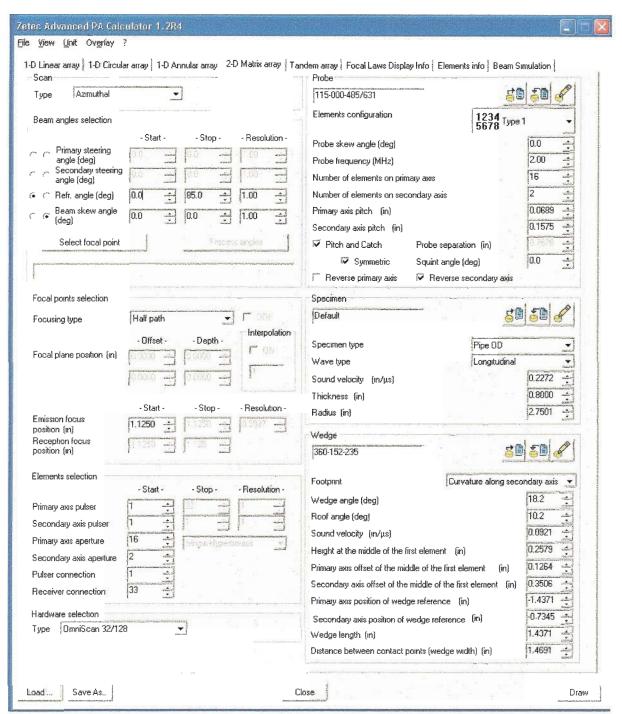


Figure 7.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-235; Diameter (in) = 5.5; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

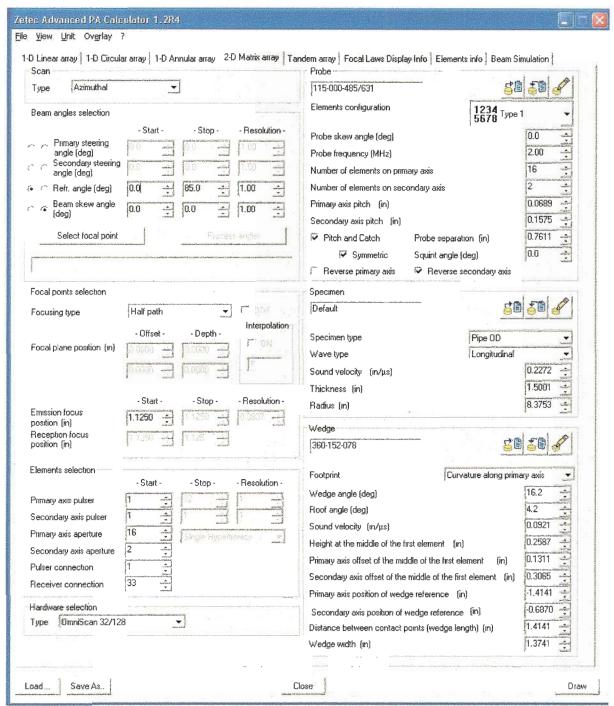


Figure 8.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

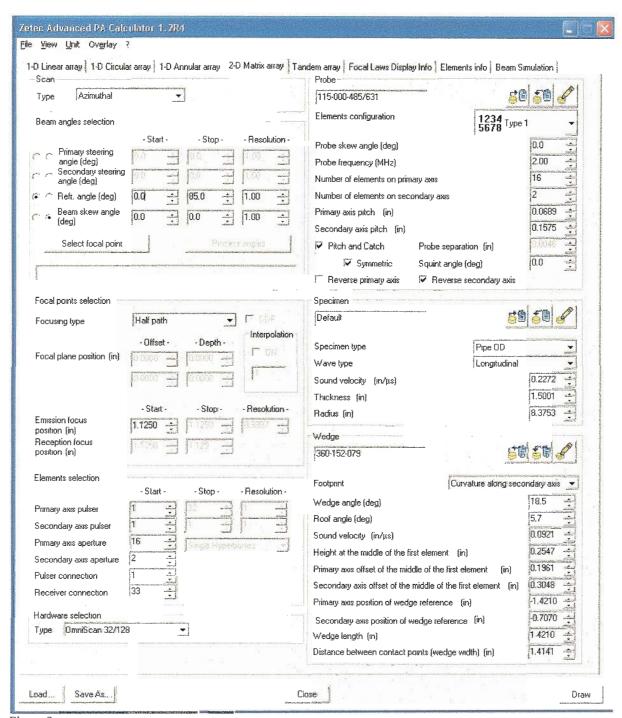
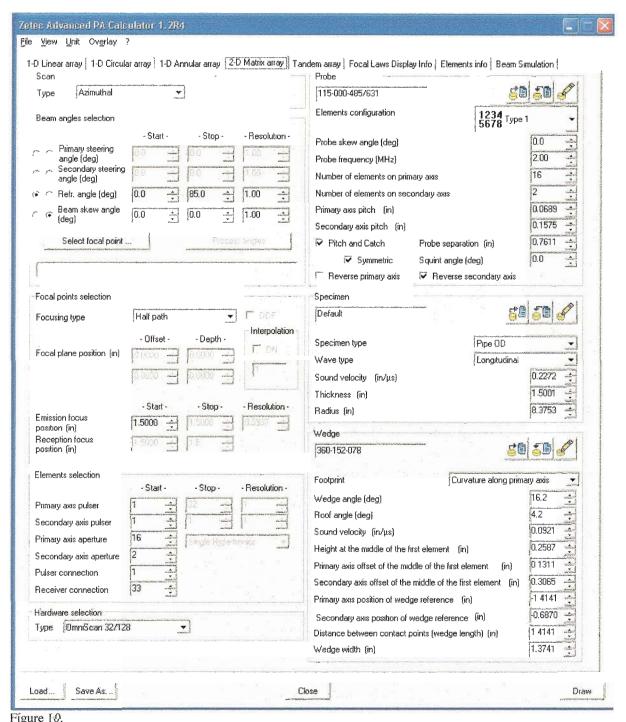


Figure 9.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.125



ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.5

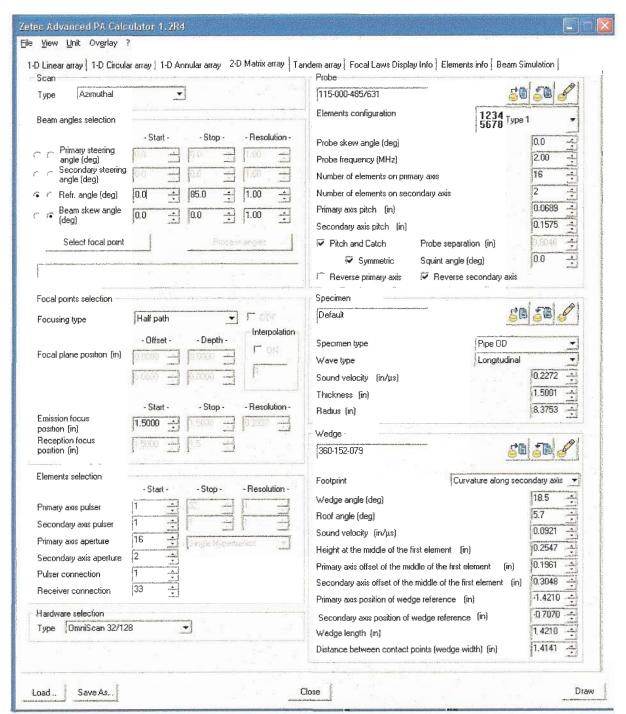


Figure 11.

ZAPAC Input for GETT Array Part #115-000-485 or 115-000-631; GETT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.5

# BCH-C-2001 / BCH-C-2003

2-inch Cold Leg Charging Loop 2A



#### <sup>2R19</sup> Will Psyring 1999 t 2 Page 121 of 299 t 2 UT Data Package Cover

2 1 9 - 0 1 - 0 1 3

Reference ID: BCH-C-2001

B C H - C - 2 0 0 1

AWO: 53102184596

5 3 1 0 2 1 8 4 5 9 6

Page #	Data Type	Exam Angle	Recordable	Limitations	Comments
	C	0-150			
2	C	0-850	^	1/	
3	C	0-85		A	
4	C	0-850			
5	<u>e</u>	0-850			
6	E	6-85	NRI	NONE	
7	C	0-790			
8	C	0.79			
9	(	0-790			
10	C	0-790		F	
- 11		0-790			
12	E	0-79	NRI	NINE	
13	P	0-850	~ /A	N/A	

% of Required Exam Area:	Final Disposition: ALLEPTABLE TOPOLOGE
Previous Data Review	Dominion Review: Alfacter KJ Hacker  Level: TE
UT™⁄⁄⁄⁄⁄⁄⁄⁄⁄⁄ RT □	Review Date: 10/30/09

Lege	nd:	UT Data Type Reference	Comments
Α	=	Additional Info	
В	=	Beam Spread	
С	=	Calibration Data	
E	=	Examination Data	
L	=	Linearity	
Р	=	Coverage Plot	
S	=	Sketch	
T	=	Thickness	

Comments:				



# <sup>2R19</sup> Will Psyripation Report 2 UT Data Package Cover

Data Package No: 219-01-034

2 1 9 - 0 1 - 0 3 4

Reference ID: BCH-C-2003

B C H - C - 2 0 0 3

AWO: 53102184596

5 3 1 0 2 1 8 4 5 9 6

Page #	Data Type	Exam Angle	Recordable	Limitations	Comments
4	e	0.850			
2	c	0-850	^	1/	
3	C	0-850		P	
4	C	0-850			
_ 5	C	0.850			
6	E	0.850	NRI	NONE	
7		0-790			
8		0-790		The state of the s	
9	(	0-790	N		
13	<u></u>	0-790		A	
11_		n-79°			
12	E	0-79	NRI	NONE	
13	P	0-850	NA	MA	
	<u>,                                      </u>				

% of Required Exam Area: しゅん	Final Disposition: ACCEPTAGLE 10/20/7
	Dominion Review: Klacker Kottacker
Previous Data Review  UT BA RT □	Level:
UI MA RIL	Review Date: 1/0/20/09

Lege	end:	UT Data Type Reference	Comments:	
Α	=	Additional Info		
В	=	Beam Spread		
С	=	Calibration Data		
E	=	Examination Data		
L	=	Linearity		
Р	=	Coverage Plot		
S	=	Sketch		
Т	=	Thickness		



#### **ULTRASONIC PHASED ARRAY WOR CALIBRATION REPORT**

WOR Identification DM Weld:	BCH-C-2001	Calibration Data Sheet:	219-01-013
WOR Identification SS Weld:	BCH-C-2003	<b>Calibration Data Sheet:</b>	219-01-034
Plant/Unit:	Millstone / 2	Procedure No. / Rev:	ER-MP-NDE-UT-816/ Rev.0

Wedge		Comments:
Manufacturer:	GEIT	See attached EPRI correspondence for Probe, Wedge
Model:	360-152-233	and Focal Law information.
Nominal Wedge Angle:	52°	
Measured Wedge Angle:	52°	
Contour Diameter:	4.125" AX OD	
Scan Direction:	Axial	
Nominal Index Location:	.70"	
Zero Reference:	Front of Probe	

Instrume	nt	Search Unit		
Manufacturer:	Zetec	Manufacturer:	GEIT	
Model:	Omniscan 32/128 PR	Model:	115-000-631	
PA Module Serial Number:	Omni-Z-6034	Serial Number:	01Y28X-1/ 01Y28X-2	
<b>UT Mainframe Serial Number:</b>	Omni-Z-1062			
Software Revision:	1.4R3			
Table 2 Instrument Settings:	See attached			
		Search Unit I	ntegral Cable	
		Type:	See cable diagram	
		Length:	See cable diagram	
		Connector Type #:	See cable diagram	

Couplant:	Soundsafe	Temperature Gauge:	PTC 312F
Manufacturer:	Sonotech Inc.	Serial Number:	268025
Batch Number:	07220H		

#### Calibration Data Files

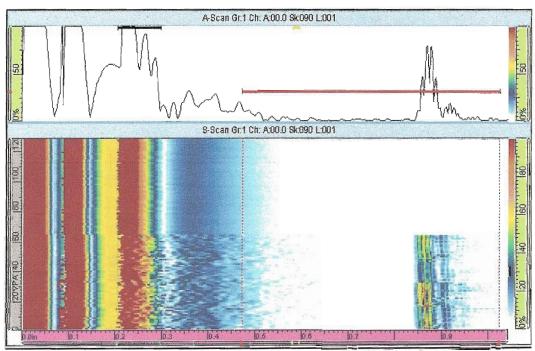
Focal Law: 032NJDZ2233L0085R2M1Z4\_1.125MP.LAW

Angles Generated: 0° to 85°
Wave Mode: Longitudinal
Focal Sound Path: 1.125" MP

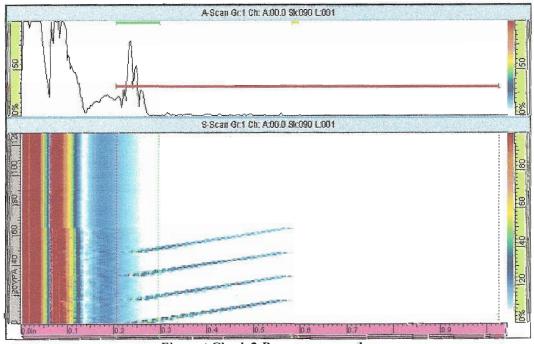
		С	alibration Refl	ector Data		
Calibration B	lock(s): CB-04-17	1	9C-041(.1" S	DH only)	Temperature	: 80°
Calibration R	eflector	Angle	% FSH	Ref. Sensitivity	UT	Response
(70°-85°)	0.1" SDH	75°	80	38 dB	.603"	Sound Path
(25°-60°)	0.5" SDH	52°	80	25 dB	.816"	Sound Path
(0°-25°)	0.5" SDH	0°	80	36 dB	.491"	Sound Path
Channel Fund	tional Checks	Pre Exam	: Acceptable	Post Exam:	Acceptable	
Number of Inc	active Channels/E	lements:	Transmit: 0	Receive: 0		

Calibration Performed	Examiner 1	Examiner 2	Level(s)	Date	Time
Initial:	Todd Blechinger	N/A		10/18/09	1310
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	111	10/18/09	1335



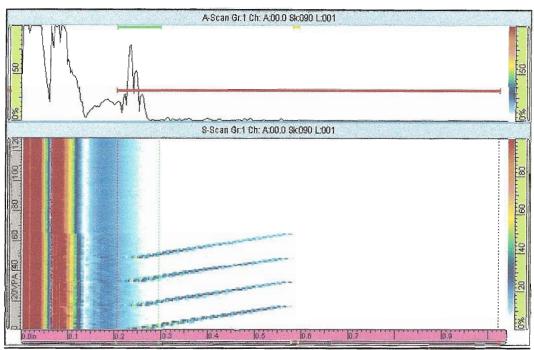


Element Check 1- Pre exam, off wedge

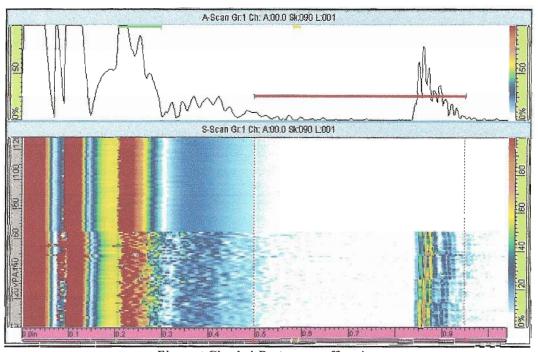


Element Check 2-Pre exam, on wedge





Element Check 3- Post exam, on wedge



Element Check 4-Post exam, off wedge



### Phased Array Instrument Table 2 Essential Settings

Result   Selector	Major Menu Item	Menu Item	Sub-menu Item	Setting
Selector				
Selector	<u> </u>	Result		
Field 1			Selector	List 1
Field 2				
Field 3	W.W.			
Field 4				
General   Gain   25 dB	\U_			
General   Gain   25 dB     Start   0.00 in     Range   1.896 in     Wedge Delay   1.40 us     Velocity   .2272 in/us     Pulser   1     Tx/Rx Mode   PE     Frequency   2     Voltage   High     PW   250ns (Auto)     PRF   Optimum     Receiver   1     Filter   None     Rectifier   FW     Video Filter   Off     Averaging   1     Reject   0     Beam     Gain Offset   0.0 dB     Scan Offset   -0.016 in     Index Offset   -0.725 in     Angle   52     Skew   0.0°     Beam Delay   8.43 us     Advanced     Gain Fet   Off     Points Qty   452     Scale Factor   6	UT		11010	
Gain   25 dB     Start   0.00 in     Range   1.896 in     Wedge Delay   1.40 us     Velocity   .2272 in/us     Pulser   1     Tx/Rx Mode   PE     Frequency   2     Voltage   High     PW   250ns (Auto)     PRF   Optimum     Receiver   1     Filter   None     Rectifier   FW     Video Filter   Off     Averaging   1     Reject   0     Beam     Gain Offset   0.0 dB     Scan Offset   -0.016 in     Index Offset   -0.725 in     Angle   52     Skew   0.0°     Beam Delay   8.43 us     Advanced     dB Ref   Off     Points Qty   452     Scale Factor   6		General		
Start		- Jonoran	Gain	25 dB
Range				
Wedge Delay				
Velocity   .2272 in/us				
Pulser         1           Tx/Rx Mode         PE           Frequency         2           Voltage         High           PW         250ns (Auto)           PRF         Optimum           Receiver           1         Filter           None         Rectifier           Rectifier         FW           Video Filter         Off           Averaging         1           Reject         0           Beam         Gain Offset         0.0 dB           Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         dB Ref         Off           Points Qty         452           Scale Factor         6				
Pulser		Pulsor	VOICOILY	.2412 111/00
Tx/Rx Mode		1 41361	Pulser	1
Frequency   2   Voltage   High				
Voltage         High           PW         250ns (Auto)           PRF         Optimum           Receiver           Receiver         1           Filter         None           Rectifier         FW           Video Filter         Off           Averaging         1           Reject         0           Beam         Gain Offset         0.0 dB           Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         dB Ref         Off           Points Qty         452           Scale Factor         6				
PW         250ns (Auto)           PRF         Optimum           Receiver           1         Filter         None           Rectifier         FW           Video Filter         Off           Averaging         1           Reject         0           Beam         Gain Offset         0.0 dB           Scan Offset         -0.016 in         1           Index Offset         -0.725 in         2           Angle         52         3           Skew         0.0°         3           Beam Delay         8.43 us           Advanced         dB Ref         Off           Points Qty         452           Scale Factor         6				
PRF         Optimum           Receiver         1           Filter         None           Rectifier         FW           Video Filter         Off           Averaging         1           Reject         0           Beam         Gain Offset           Scan Offset         -0.0 dB           Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         dB Ref         Off           Points Qty         452           Scale Factor         6				
Receiver         1           Filter         None           Rectifier         FW           Video Filter         Off           Averaging         1           Reject         0           Beam         Gain Offset           Gain Offset         0.0 dB           Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         dB Ref         Off           Points Qty         452           Scale Factor         6				
Receiver   1   Filter   None   Rectifier   FW   Video Filter   Off   Averaging   1   Reject   0   0   Beam   Gain Offset   0.0 dB   Scan Offset   -0.016 in   Index Offset   -0.725 in   Angle   52   Skew   0.0°   Beam Delay   8.43 us   Advanced   dB Ref   Off   Points Qty   452   Scale Factor   6		Receiver	110	Оринин
Filter   None     Rectifier   FW     Video Filter   Off     Averaging   1     Reject   0     Beam     Gain Offset   0.0 dB     Scan Offset   -0.016 in     Index Offset   -0.725 in     Angle   52     Skew   0.0°     Beam Delay   8.43 us     Advanced     dB Ref   Off     Points Qty   452     Scale Factor   6		TROOCIVOI	Receiver	1
Rectifier   FW     Video Filter   Off     Averaging				
Video Filter         Off           Averaging         1           Reject         0           Beam         Gain Offset         0.0 dB           Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         Off           Points Qty         452           Scale Factor         6				
Averaging   1				
Reject   0				
Beam           Gain Offset         0.0 dB           Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         Off           Points Qty         452           Scale Factor         6				
Gain Offset         0.0 dB           Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         Off           Points Qty         452           Scale Factor         6		Ream	roject	
Scan Offset         -0.016 in           Index Offset         -0.725 in           Angle         52           Skew         0.0°           Beam Delay         8.43 us           Advanced         Off           Points Qty         452           Scale Factor         6	144	- VIII	Gain Offset	0.0 dB
Index Offset				
Angle 52				
Skew         0.0°           Beam Delay         8.43 us           Advanced         Off           Points Qty         452           Scale Factor         6				
Beam Delay 8.43 us				
Advanced         dB Ref         Off           Points Qty         452           Scale Factor         6				
dB Ref         Off           Points Qty         452           Scale Factor         6		Advanced	Dodn. Dolay	0.10 40
Points Qty 452 Scale Factor 6			dB Ref	Off
Scale Factor 6				
	(4)			
			Sum Gain	22.0



# Phased Array Instrument Table 2 Essential Settings (cont.)

Major Menu Item	Menu Item	Sub-menu Item	Setting
Display			A 441
Diopidy	Selection		
A	00700000	Display	A-S-[C]
		C-Scan 1	Off
		Group	Current
	73.5	Projection	On
	Rulers		
		UT Unit	True Depth
		% Ruler	Linear (%)
		DAC/TCG	Off
		Gate	On
		Cursor	Off
	Color		
		Select	Amplitude
		Start (%)	0.0
		End (%)	100.0
	Properties		
	_	Display	A-Scan
		Source	Normal
Probe Part			
10	Select		
		Select	Select Tx/Rx
		Auto Detect	Off
	Position		
		Scan Offset (in)	0
		Index Offset (in)	0
	Parts		
		Geometry	Plate
1		Thickness (in)	3.0 in
PGM Probe			
	Configuration		944
		Scan Type	Sectorial
		Connection P:	1
	Laws		
		Auto Program	Off
Gate Alarm			
	Gate		
		Gate Select	Gate A
		Gate A Synchro	Pulse



## ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sheet: 219-01		-01-034	Calibration	n Data	Sheet	: 219-01-013	219-01-034
Plant: Millstone Unit: 2				Proc	edure	ER-MP-NDE-U	JT-816/Rev. 0
Zones DM Weld: 1-12	SS Weld: 1						
Date: 10/18/09		cam Start:				m Stop: 1335	
	Weld: BCH-C		SS Weld				
Component Configuration			to Nozzie		SS We	ld: Pipe to Safe	e End
Weld Overlay Regions: E Examination Surface: S				Povio	wod Dr	revious Data: N	Ι/Λ
Temperature Gauge: PT			mber: 268			mponent Temp	
Percent Of Coverage Ob			miber. 200	3023		amination Ang	
	erlay Thickne				Axial		umferential
Minimum: .38"	may imonic	33.			AXIGI	3110	armerentia.
Maximum: .70"				(	0° to 85	5°	N/A
	Exami	nation Se	nsitivity:		37 dB		N/A dB
Examination	n Scans Perfo	ormed		Υ	es	No	N/A
(1) Axial	(Downstrean	1)			X		
(2) Axi	al (Upstream)				<b>3</b>		
(3) Circumfe	erential (Clock	wise)					$\boxtimes$
(4) Circumferen	tial (Counterc	lockwise)					$\boxtimes$
Comments: Maintained states flaw indications were observed.		-		level o	during (	examination. N	o suspected
Examiner Level S	Signature /	Date	LMT Rev	riew	Level	Signature	Date
Todd Blechinger III	UP. Buf	10/18/09	Todd Bleck	ninger	Ш	JULAN	10/20/09
Examiner Level S	Signature	Date	Site Rev	iew	Level	Signature	Date
N/A N/A			Kevin Ha	cker	III ,	SHack	10/20/09
Other Level \$	Signature	Date	ANII Rev	iew	Level	Signature	Date
N/A N/A			E. Yor	k	N/A	lig wood fort	- 10-20-200 } HT& CT



### ULTRASONIC PHASED ARRAY WOR CALIBRATION REPORT

WOR Identification DM Weld:	BCH-C-2001	Calibration Data Sheet: 219-01-013
WOR Identification SS Weld:	BCH-C-2003	Calibration Data Sheet: 219-01-034
Plant/Unit:	Millstone / 2	Procedure No. / Rev: ER-MP-NDE-UT-816/ Rev.0

Wedge		Comments:
Manufacturer:	GEIT	See attached EPRI correspondence for Probe, Wedge
Model:	360-152-232	and Focal Law information.
Nominal Wedge Angle:	52°	
Measured Wedge Angle:	52°	
Contour Diameter:	4.125" CIRC OD	
Scan Direction:	Circumferential	
Nominal Index Location:	.75"	
Zero Reference:	Front of Probe	

Instrume	Instrument		h Unit
Manufacturer:	Zetec	Manufacturer:	GEIT
Model:	Omniscan 32/128 PR	Model:	115-000-631
PA Module Serial Number:	Omni-Z-6034	Serial Number:	01Y28Y-1/ 01Y28Y-2
<b>UT Mainframe Serial Number:</b>	Omni-Z-1062		
Software Revision:	1.4R3		
Table 2 Instrument Settings:	See attached		
		Search Unit I	ntegral Cable
		Type:	See cable diagram
		Length:	See cable diagram
		Connector Type #:	See cable diagram

Couplant:	Soundsafe	Temperature Gauge:	PTC 312F
Manufacturer:	Sonotech Inc.	Serial Number:	268025
Batch Number:	07220H		

#### Calibration Data Files

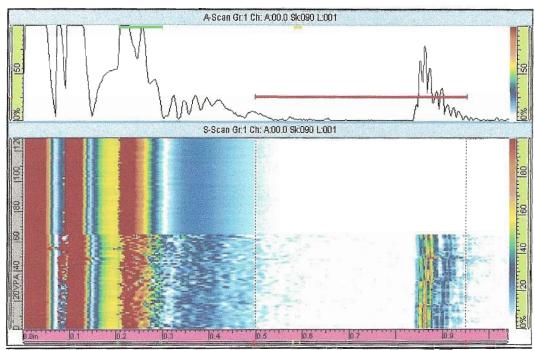
Focal Law: 032NJDZ2232L0079R2M1Z4\_1.125MP.LAW
Angles Generated: 0° to 79°

Wave Mode: Longitudinal Focal Sound Path: 1.125" MP

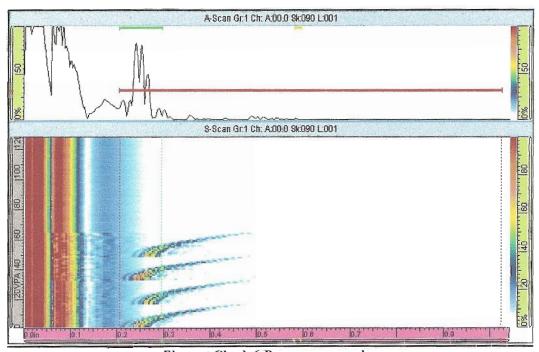
		C	alibration Refl	ector Data		
Calibration Blo	ock(s): MEUXE0	17A	N/A		Temperature	e: 80°
Calibration Re	flector	Angle	% FSH	Ref. Sensitivity	UT	Response
(70°-85°)	0.1" SDH	70°	80	32 dB	.597"	Sound Path
(25°-60°)	0.5" SDH	45°	80	23 dB	.916"	Sound Path
(0°-25°)	0.5" SDH	0°.	80	33 dB	.481"	Sound Path
<b>Channel Func</b>	tional Checks	Pre Exam	: Acceptable	Post Exam:	Acceptable	
Number of Ina	ctive Channels/	Elements:	Transmit: 0	Receive: 0		

Calibration Performed	Examiner 1	Examiner 2	Level(s)	Date	Time
Initial:	Todd Blechinger	N/A	111	10/18/09	1335
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	- 111	10/18/09	1400



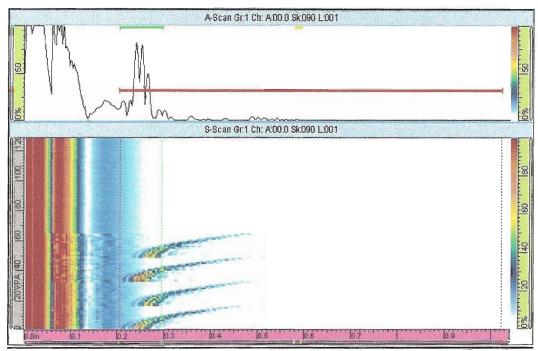


Element Check 5- Pre exam, off wedge

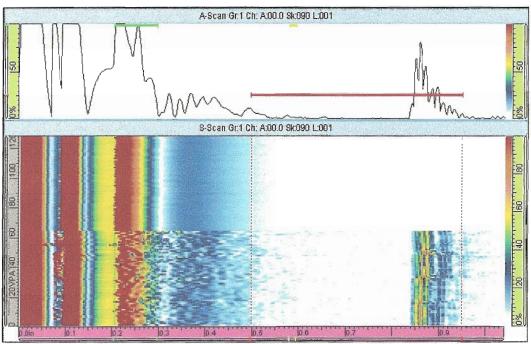


Element Check 6-Pre exam, on wedge





Element Check 7- Post exam, on wedge



Element Check 8-Post exam, off wedge



## Phased Array Instrument Table 2 Essential Settings

Pulser Pulser Tx/Rx Mode Frequency Voltage	
Selector   Field 1   Field 2   Field 3   Field 4	
Selector   Field 1   Field 2   Field 3   Field 4     UT   General   Gain   Start   Range   Wedge Delay   Velocity   .   Pulser   Tx/Rx Mode   Frequency   Voltage	
Field 1   Field 2   Field 3   Field 4	List 1
Field 2   Field 3   Field 4	A%
Field 3   Field 4	Α^
Field 4	SA
General   Gain   Start   Range   Wedge Delay   Velocity   Pulser   Tx/Rx Mode   Frequency   Voltage   Vo	PA
General   Gain   Start   Range   Wedge Delay   Velocity   .	
Gain Start Range Wedge Delay Velocity Pulser Pulser Tx/Rx Mode Frequency Voltage	
Start Range Wedge Delay Velocity Pulser Pulser Tx/Rx Mode Frequency Voltage	23 dB
Range Wedge Delay Velocity . Pulser Pulser Tx/Rx Mode Frequency Voltage	0.00 in
Wedge Delay Velocity . Pulser Pulser Tx/Rx Mode Frequency Voltage	1.815 in
Pulser Pulser Tx/Rx Mode Frequency Voltage	1.90 us
Pulser Pulser Tx/Rx Mode Frequency Voltage	2272 in/us
Pulser Tx/Rx Mode Frequency Voltage	
Tx/Rx Mode Frequency Voltage	1
Frequency Voltage	PE
Voltage	2
	High
PW 2	50ns (Auto)
PRF	Optimum
Receiver	Оринан
Receiver	1
Filter	None
Rectifier	FW
Video Filter	Off
Averaging	1
Reject	0
Beam	
Gain Offset	0.0 dB
Scan Offset	-0.000 in
Index Offset	-0.704 in
Angle	45
Skew	0.0°
Beam Delay	7.62 us
Advanced	
dB Ref	Off
Points Qty	452
Scale Factor	
Sum Gain	5



### Phased Array Instrument Table 2 Essential Settings (cont.)

Major Menu Item	Menu Item	Sub-menu Item	Setting
Display			
	Selection		
		Display	A-S-[C]
· · · · · · · · · · · · · · · · · · ·		C-Scan 1	Off
		Group	Current
		Projection	On
Ps	Rulers		
		UT Unit	True Depth
		% Ruler	Linear (%)
		DAC/TCG	Off
1100		Gate	On
		Cursor	Off
	Color		
		Select	Amplitude
		Start (%)	0.0
		End (%)	100.0
	Properties		
		Display	A-Scan
		Source	Normal
Probe Part			
	Select		
		Select	Select Tx/Rx
		Auto Detect	Off
	Position		
	-	Scan Offset (in)	0
		Index Offset (in)	0
	Parts		
MAN date of		Geometry	Plate
		Thickness (in)	3.0 in
PGM Probe		()	
	Configuration		
17/101/16		Scan Type	Sectorial
		Connection P:	1
	Laws		
, , , , , , , , , , , , , , , , , , , ,		Auto Program	Off
Gate Alarm		3	
	Gate		
		Gate Select	Gate A
		Gate A Synchro	Pulse

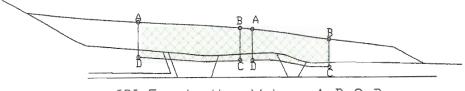


### ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

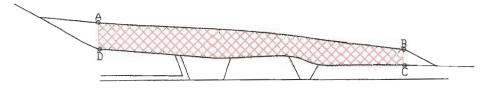
Exam Data Sheet: 219-01-013 219-01-034 Calibration Data Sheet: 219-01-013 219-01-034									
Plant: Millstone Unit: 2 Procedure: ER-MP-NDE-UT-816/Rev. 0							<i>r.</i> 0		
Zones DM Weld: 1-12 SS Weld: 1-38									
Date: 10/18/09 Exam Start: 1335 Exam Stop: 1400									
WOR Identification DM Weld: BCH-C-2001 SS Weld: BCH-C-2003									
Component Configuration DM Weld: Safe End to Nozzle SS Weld: Pipe to Safe End Wold Overlay Regions: Entire everlay surface									
	Weld Overlay Regions: Entire overlay surface  Examination Surface: Surface of Weld Overlay  Reviewed Previous Data: N/A								
Temperature Gauge: PTC 312F Serial Number: 268025 Component Temp: 80°									
Percent Of Coverage Obtained: 100% Examination Angles									
	erlay Thickne			Ax	cial		umferential		
Minimum: .38"	,			2.03		<u> </u>	arritor oritical		
Maximum: .70"				N	/A		0° to 79°		
	Exam	ination Se	ensitivity:	N/A	A dB		35 dB		
Examination	n Scans Perf	ormed		Yes	1	No	N/A		
(1) Axia	l (Downstrear	n)							
(2) Axi	ial (Upstream	)							
(3) Circumferential (Clockwise)									
(4) Circumferen	itial (Counterd	clockwise)		$\boxtimes$					
Comments: Maintained 5% to 20% average baseline noise level during examination. No suspected flaw indications were observed during examinations.									
	- V	)	l				N7		
Examiner Level	Signature	Date	LMT Rev	iew Le	vel Sign	ature	Date		
Todd Blechinger III	Mr. y	10/18/09	Todd Bleck	ninger III	11	urang	10/20/08		
Examiner Level	Signature	Date	Site Rev	iew Le	vel Sign	ature	Date		
N/A N/A			Kevin Ha	cker III	Allac	L	10/20/09		
Other Level S	Signature	Date	ANII Rev	iew Le	vel  Sign	ature	Date		
N/A N/A			E. Yor	k N/A	Mixaho	leber Z	Hist cr 10/20/2		



#### **Coverage Plot**



ISI Examination Volume A-B-C-D



PSI Examination Volume A-B-C-D

Scale: NOT TO SCALE

Examiner	Level	Signature	> Date	LMT Review	Level	Signature	Date
Todd Blechinger		SUPE	10/18/09	Todd Blechinger		Illy Rug	(0/20/09
Examiner	Level	Signature	Date	Site Review	Level	Signature	Date
N/A	N/A			Kevin Hacker	111	SHack_	10/20/09
Other	Level	Signature	Date	ANII Review	Level	Signature	Date
N/A	N/A			E. York	N/A	intervalent rise	CT 10.20.09



September 23, 2009

Kevin Hacker Dominion Corporate NDE Level III Dominion Generation Innsbrook Technical Center (M/S 3NE) 5000 Dominion Blvd Glen Allen, VA 23060-3308

Subject: Phased Array Wedge Designs for Weld Overlay Examinations at Millstone 2 (Fall 2009)

Dear Mr. Hacker:

As requested, please find included with this letter the ultrasonic phased array wedge information for use with the EPRI Procedure for Manual Phased Array Ultrasonic Examination of Weld Overlaid Similar and Dissimilar Metal Welds (EPRI-WOL-PA-1) at Dominion's Millstone Power Station Unit 2 in the fall of 2009. These weld overlay inspections will require the use of one 2.0 MHz 2x16 ultrasonic phased array dual transducer with six wedges all manufactured by General Electric Inspection Technologies (GEIT) with the Zetec OmniScan 32-128 P/R phased array instrument (See Figure 1).

Table A indicates which GEIT wedge shall be used for each weld overlaid component while Table B contains the Zetec Advanced Phased Array Calculator 1.2R4 (ZAPAC 1.2R4) CAL file for each corresponding GEIT wedge and focal metal path distance. While these CAL files are attached to this letter, each should be loaded into ZAPAC 1.2R4 and verified with the settings contained in the EPRI report: Nondestructive Evaluation: Procedure for Manual Phased Array UT of Weld Overlays (Product ID 1015134). Figures 2 through 11 contain screen captures of the ZAPAC 1.2R4 for each CAL file. The user shall verify all of the parameters in the ZAPAC 1.2R4 for each CAL file with those found in the 1015134 EPRI report prior to generating a corresponding LAW file for field use.

It is important to note that the "O32NJDZ2232L0079R2M1Z4" and "O32NJDZ2234L0082R2M1Z4" CAL files only allow the user to generate a maximum angle range of 0° to 79° and 0° to 82° respectively instead of the 0° to 85° recommended in the procedure. These smaller angle ranges were formally demonstrated through the Performance Demonstration Initiative (PDI) Program for use with the OmniScan instruments and are acceptable for use (see EPRI-WOL-PA-1).

For your convenience, I have attached two OmniScan 32-128 P/R setup files (WOLPA1.ops - for basic setup, WOLPA1\_ChannelCheck.ops - for channel/element checks) as a starting point for you to build your own setup files for the examination. You will need to verify all the parameters in the attached files prior to field use.

Please note that ZAPAC 1.2R4 is a standalone program that is also embedded in the Zetec UltraVision 1.2R4 software. The ZAPAC 1.2R4 standalone and embedded programs are equivalent for LAW file generation. Please let us know if you have any comments or questions.

Sincerely,

Mark Dennis

EPRI Senior Project Manager

gral D

Attachment

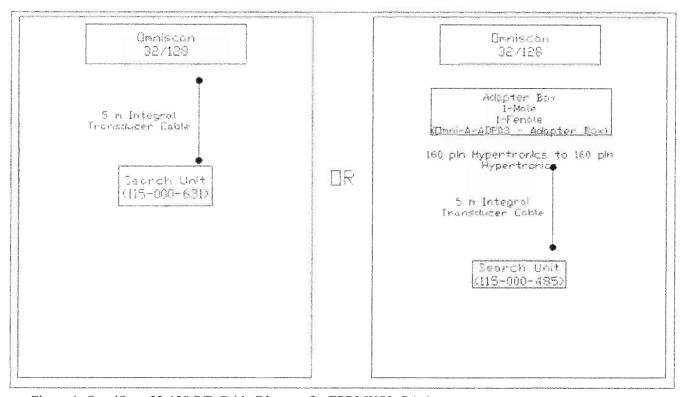


Figure 1. OmniScan 32-128 P/R Cable Diagram for EPRI-WOL-PA-1

Table A. GEIT Wedge Component Applicability

Zone	Weld	Location / Description	Wedge	GEIT Axial	GEIT Circ
	Number		Contour	Wedge Part #	Wedge Part #
			Required		
			Wedges		
1-07	BPD-C-1017	2" Drain Line Loop 1A			
1-09	BPD-C-3000	2" Drain line Loop 1B			
1-11	BPD-C-2001	2" Drain line Loop 2A	4.125"	360-152-233	360-152-232
1-12	BCH-C-2001	2" Charging line Loop 2A			
1-08	BCH-C-1001	2" Charging Line Loop 1A			
1-08	BPY-C-1001	3" Spray line Loop 1A	5.50"	360-152-235	360-152-234
1-10	BPY-C-3000	3" Spray Line Loop 1B	3.30	300-132-233	300-132-234
1-08	BSI-C-1001	12" Safety Injection 1A			
1-10	BSI-C-3000	12" Safety Injection 1B			
1-14	BSI-C-4000	12" Safety Injection 2B	16.75"	360-152-079	360-152-078
1-05	BPS-C-1001	12" Hot leg Surge Line Loop 1	10.75	300-132-079	300~132-076
1-06	BSD-C-2001	12" SDC line Loop 1			
1-12	BSI-C-2001	12" Safety Injection Loop 2A			

Table B. GEIT Wedge CAL File Applicability

Diameter	Scanning	Food	CAI Filanama	Weld Overlay Thickness
	_	í	CAL Fliename	
(m)	Direction			(WOLT) Range
		<del>- ` ´ -</del>		
4.125	Circ.	0.5	O32NJDS2232L0085R2M1Z4	WOLT<=0.20in
4.125	Axial	0.5	O32NJDS2233L0085R2M1Z4	WOLT<=0.20in
4.125	Circ.	1.125	O32NJDZ2232L0079R2M1Z4	0,20in < WOLT < 0,75in
4.125	Axial	1.125	O32NJDZ2233L0085R2M1Z4	0.20in < WOLT < 0.75in
5,500	Circ.	1.125	O32NJDZ2234L0082R2M1Z4	0.20in < WOLT < 0.75in
5.500	Axial	1.125	O32NJDZ2235L0085R2M1Z4	0.20in < WOLT < 0.75in
16.750	Circ.	1.125	O32NJDZ2078L0085R2M1Z4	0.20in < WOLT < 0.75in
1				
16.750	Axial	1.125	O32NJDZ2079L0085R2M1Z4	0.20in < WOLT < 0.75in
101/20				
16,750	Circ.	1.5	O32NJDB2078L0085R2M1Z4	WOLT >= 0.75in
	****			
16.750	Axial	15	O32NJDB2079L0085R2M174	WOLT >= 0.75in
10.750	1 Milli	1	OSE WEST TO THE TOTAL THE TENTE OF THE TENTE	
	4.125 4.125 5.500	(in)         Direction           4.125         Circ.           4.125         Axial           4.125         Circ.           4.125         Axial           5.500         Circ.           5.500         Axial           16.750         Circ.           16.750         Circ.           16.750         Circ.	(in)         Direction         Metal Path (in)           4.125         Circ.         0.5           4.125         Axial         0.5           4.125         Circ.         1.125           4.125         Axial         1.125           5.500         Circ.         1.125           5.500         Axial         1.125           16.750         Circ.         1.125           16.750         Axial         1.125           16.750         Circ.         1.5	(in)         Direction         Metal Path (in)           4.125         Circ.         0.5         O32NJDS2232L0085R2M1Z4           4.125         Axial         0.5         O32NJDS2233L0085R2M1Z4           4.125         Circ.         1.125         O32NJDZ2233L0085R2M1Z4           4.125         Axial         1.125         O32NJDZ2233L0085R2M1Z4           5.500         Circ.         1.125         O32NJDZ2234L0082R2M1Z4           5.500         Axial         1.125         O32NJDZ2235L0085R2M1Z4           16.750         Circ.         1.125         O32NJDZ2078L0085R2M1Z4           16.750         Axial         1.125         O32NJDZ2079L0085R2M1Z4           16.750         Circ.         1.5         O32NJDB2078L0085R2M1Z4

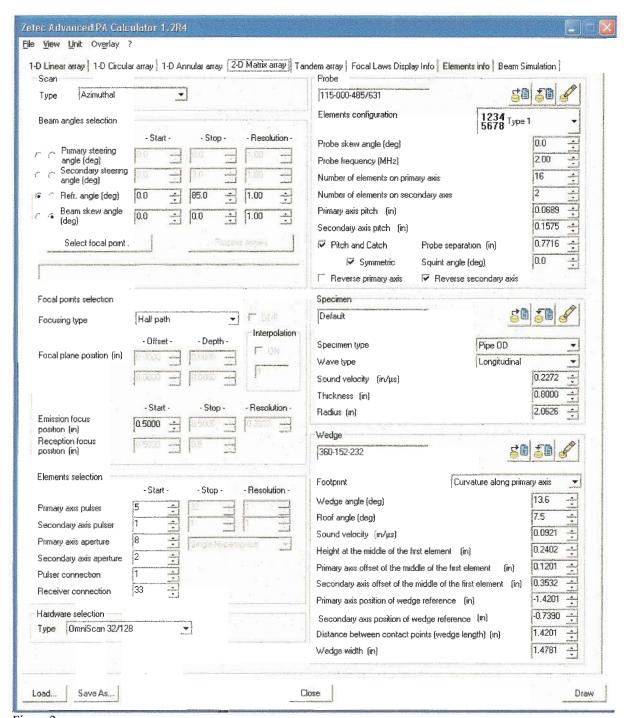


Figure 2.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 0.5

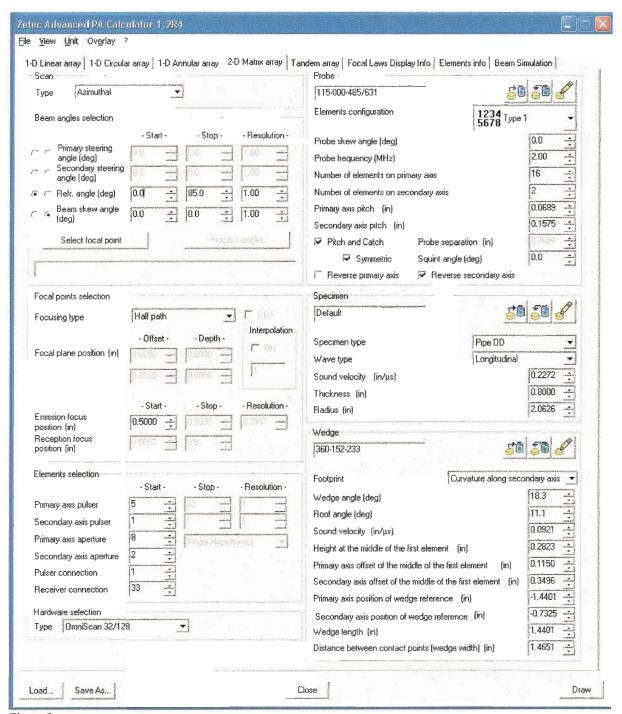


Figure 3.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in) = 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 0.5

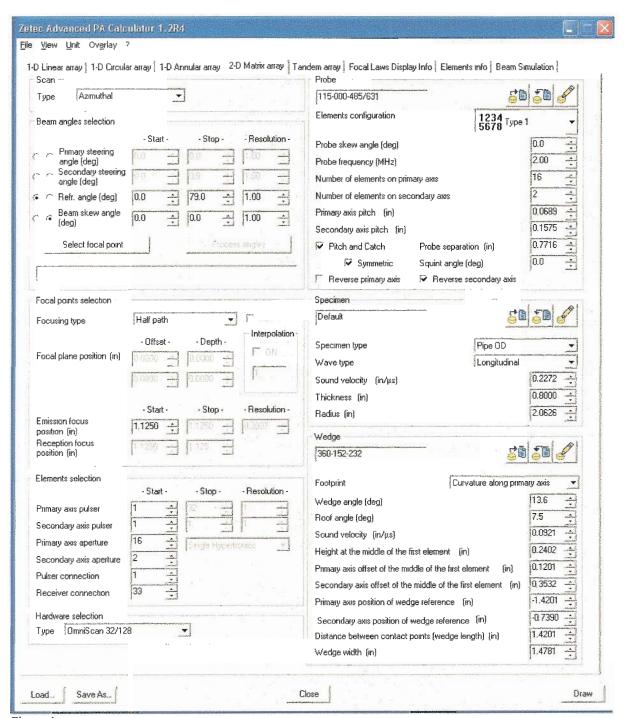


Figure 4.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

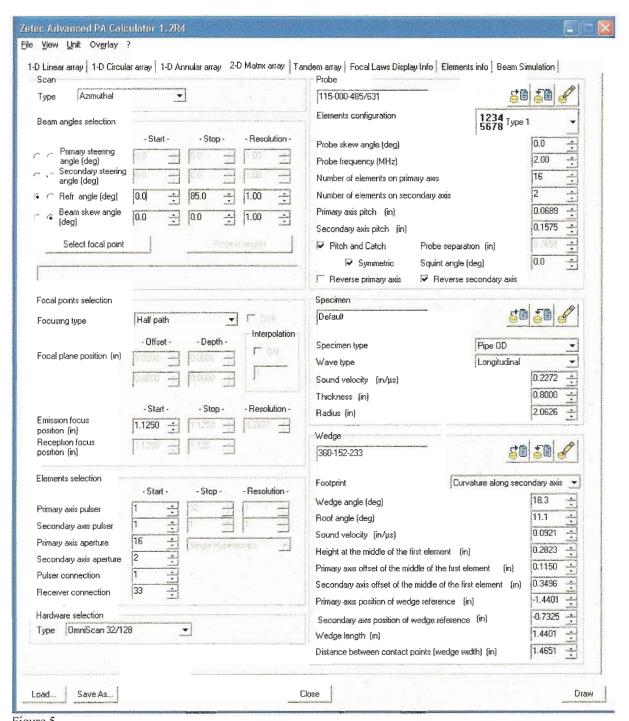


Figure 5.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in) = 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

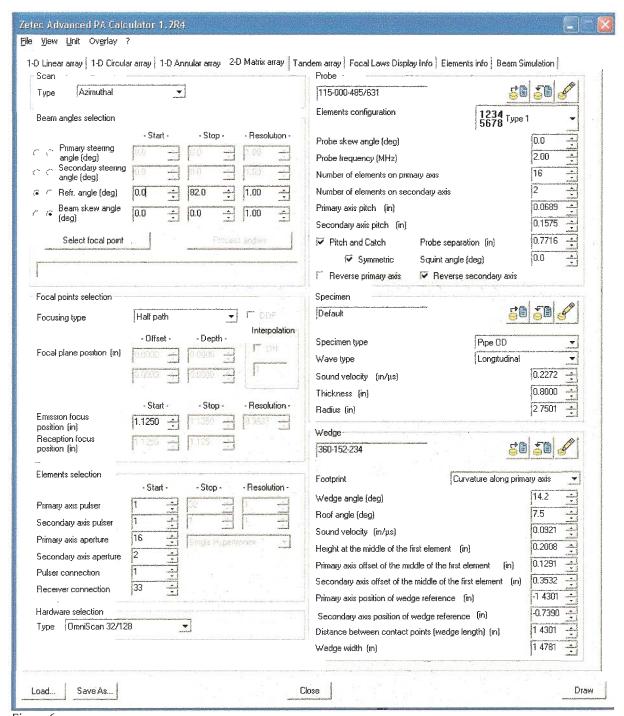
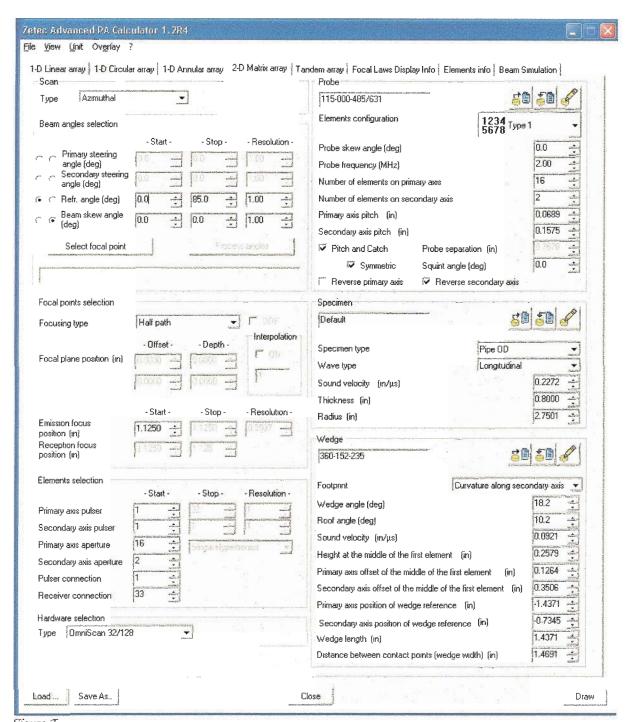


Figure 6. ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-234; Diameter (in) = 5.5; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125



ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-235; Diameter (in) = 5.5; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

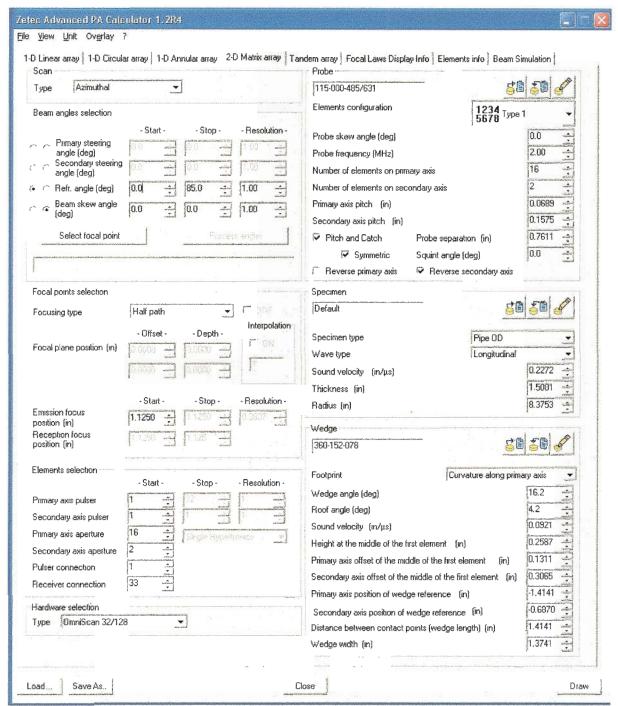


Figure 8.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

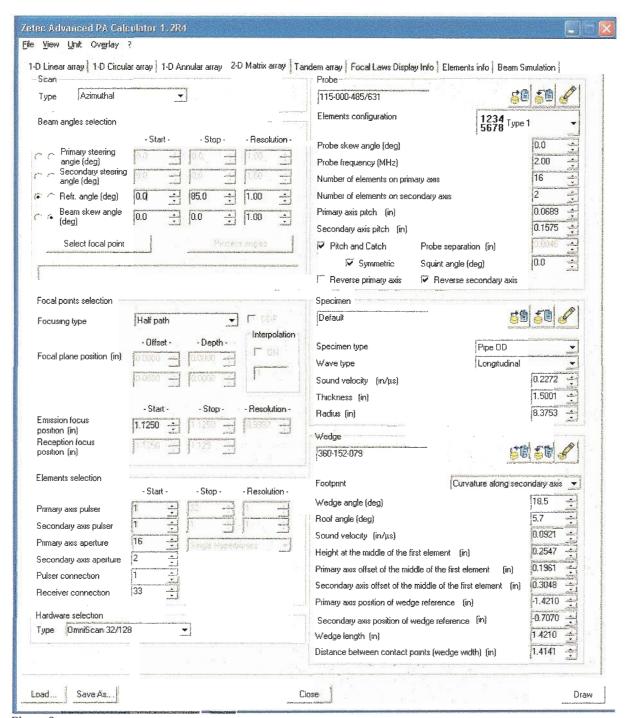
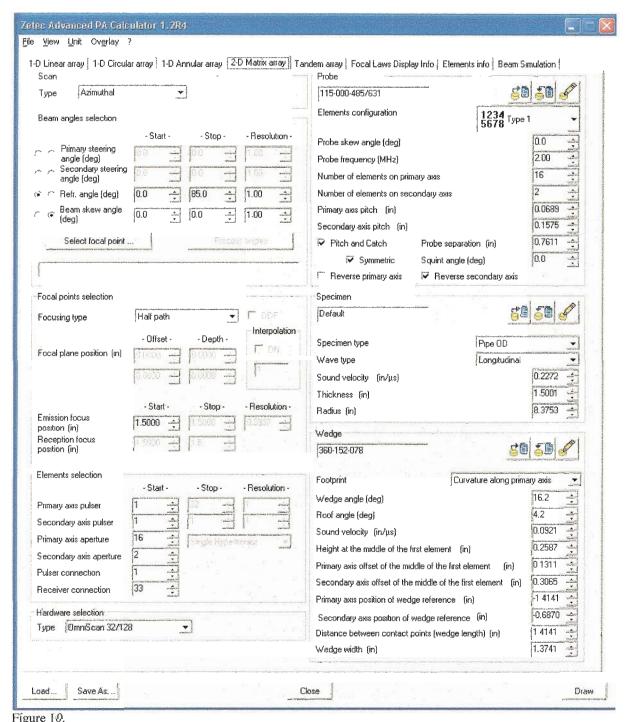


Figure 9.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.125



ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.5

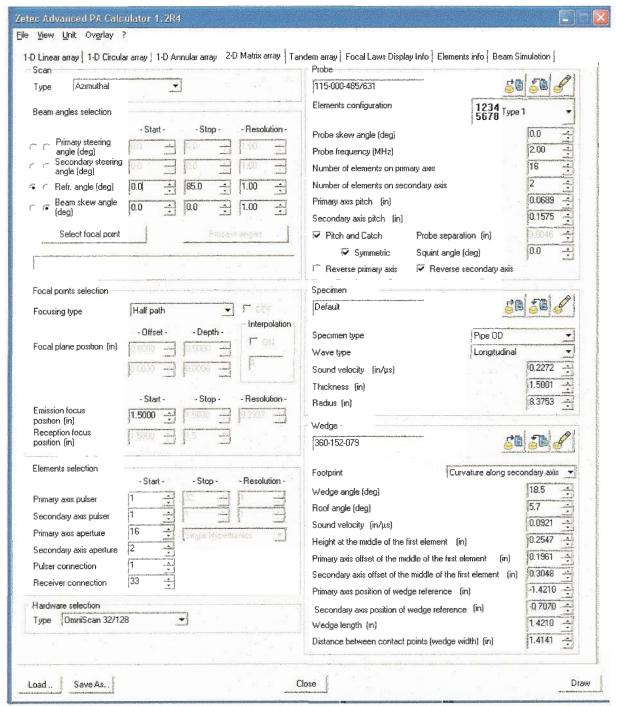


Figure 11.

ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.5