BSI-C-4000 / BSI-C-4002

12-inch Cold Leg SI Loop 2B

Dominion

Millstone Unit 2

UT Data Package Cover

Data Package No: 219-01-016

219-01-016

Reference ID: BSI-C-4000

BSI-C-40000

AWO: 53102184606

53102184606

Page #	Data Type	Exam Angle	Recordable	Limitations	Comments
1-5	C	0-85°	N/A	N/A	
6	E		NRI	Yes	CAST SS LIMITATION
7-9	C		N/A	N/A	
10	E		NRI	YES	CAST SS LIMITATION
11-15	C		N/A	N/A	
16	E		NRI	YES	CAST SS LIMITATION
17-19	C		N/A	N/A	
20	E		NRI	YES	CAST SS LIMITATION
21	P		N/A	N/A	
22	P		N/A	N/A	

% of Required Exam Area: 95.9 %

Final Disposition: ACCEPTABLE 11/2/09 III

Dominion Review: K. Hacker For Kevin Hacker Per Telecon 11/2/09

Level: III

Review Date: 11/2/09

Previous Data Review

UT ☑ N/A RT ☐

Legend: UT Data Type Reference

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

Comments: Data Pkg Forwarded To Kevin Hacker electronically For Review.

Dominion

Millstone Unit 2
UT Data Package Cover

Data Package No: 219-01-042

Reference ID: BSI-C-4002

AWO: 53102184606

Page #	Data Type	Exam Angle	Recordable	Limitations	Comments
1-5	C	0-85°	N/A	N/A	
6	E	↓	NRI	Yes	CAST SS LIMITATION
7-9	C		N/A	N/A	
10	E		NRI	Yes	CAST SS LIMITATION
11-15	C		N/A	N/A	
16	E		NRI	Yes	CAST SS LIMITATION
17-19	C		N/A	N/A	
20	E		NRI	Yes	CAST SS LIMITATION
21	P		N/A	N/A	
22	P	↓	N/A	N/A	

% of Required Exam Area: 91.9%

Previous Data Review
UT N/A RT ☐

Final Disposition: ACCEPTABLE [signature] III 11/2/09

Dominion Review: K. Hacker RA Juber For Kevin Hacker per Telecon 11/2/09

Level: III

Review Date: 11/2/09.

Data PKG Forwarded To Kevin Hacker electronically For Review. [initials]

Legend: UT Data Type Reference

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

Comments:

Dominion

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	
Manufacturer:	GEIT
Model:	360-152-079
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

Comments:
See attached EPRI correspondence for Probe, Wedge and Focal Law information.

Instrument	
Manufacturer:	Zetec
Model:	Omniscan 32/128 PR
PA Module Serial Number:	Omni-Z-6034
UT Mainframe Serial Number:	Omni-Z-1062
Software Revision:	1.4R3
Table 2 Instrument Settings:	See attached

Search Unit	
Manufacturer:	GEIT
Model:	115-000-631
Serial Number:	01Y28X-1/ 01Y28X-2

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

Calibration Reflector Data

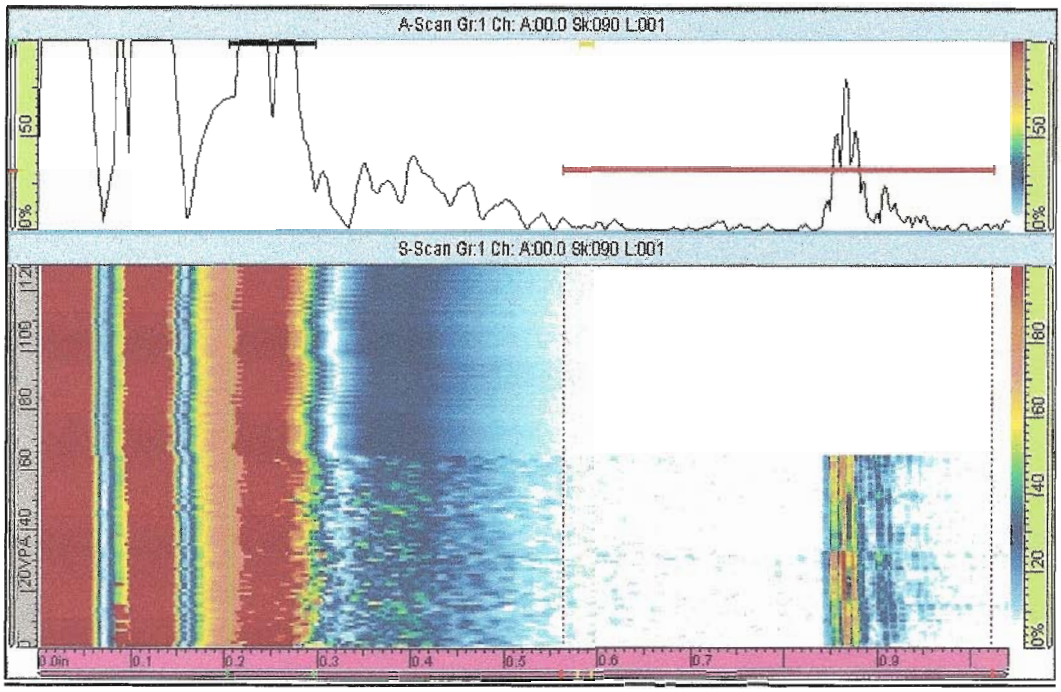
Calibration Block(s): M3-UT-52 N/A **Temperature:** 78°

Calibration Reflector		**Angle**	**% FSH**	**Ref. Sensitivity**	**UT 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

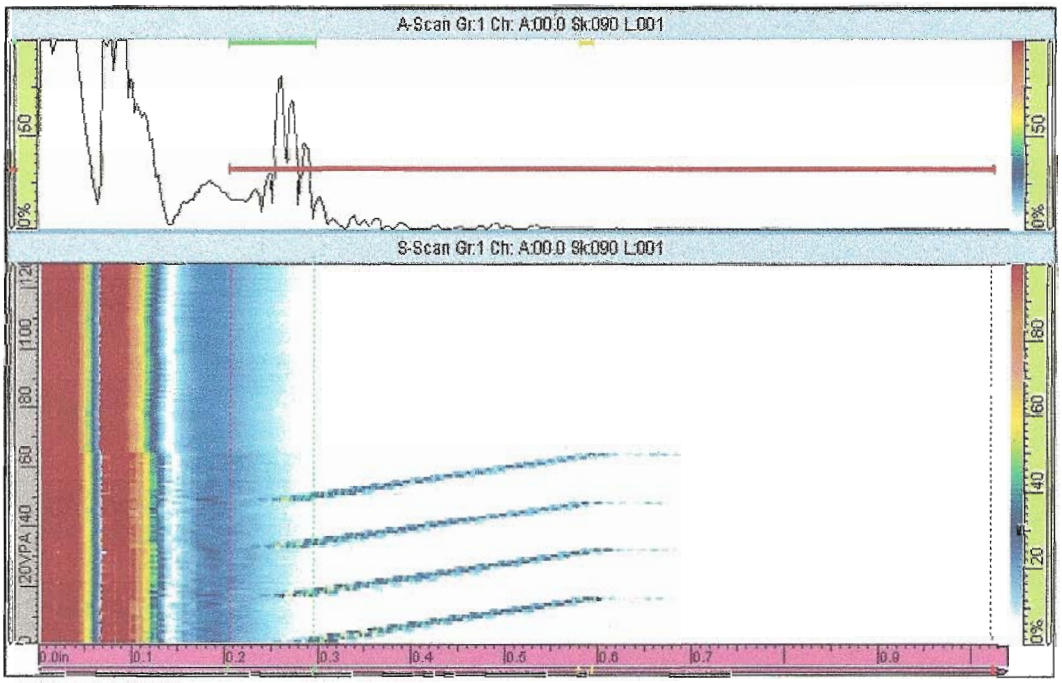
Channel Functional Checks **Pre Exam:** Acceptable **Post Exam:** Acceptable

Number of Inactive Channels/Elements: **Transmit:** 0 **Receive:** 0

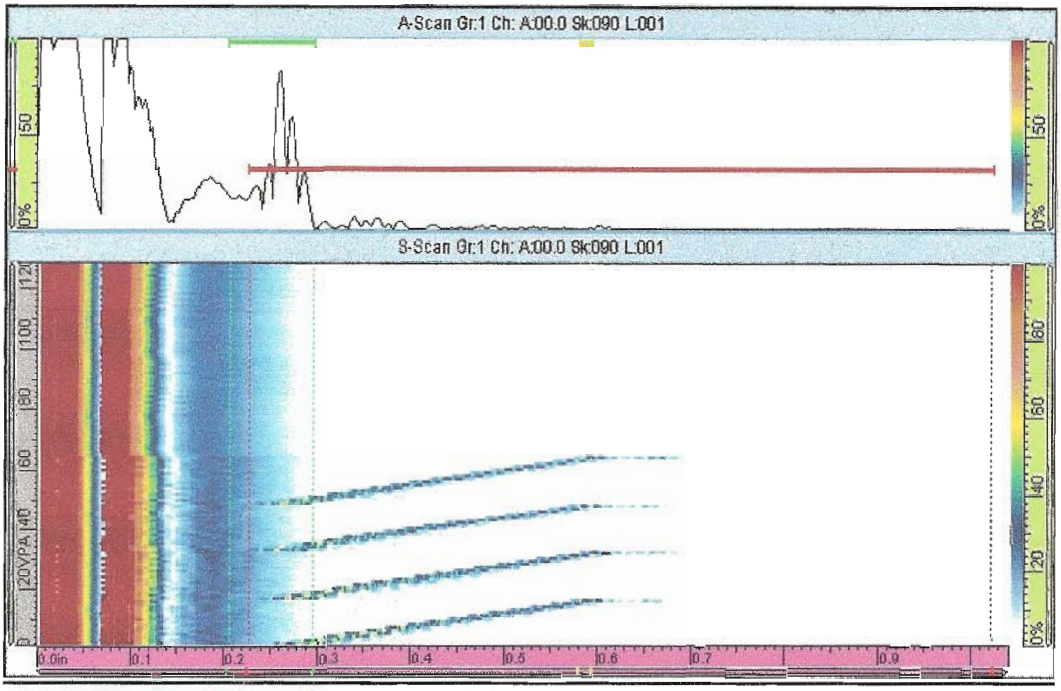
Calibration Performed	**Examiner 1**	**Examiner 2**	**Level(s)**	**Date**	**Time**
Initial:	Todd Blechinger	N/A	III	11/01/09	1310
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	III	11/01/09	1327



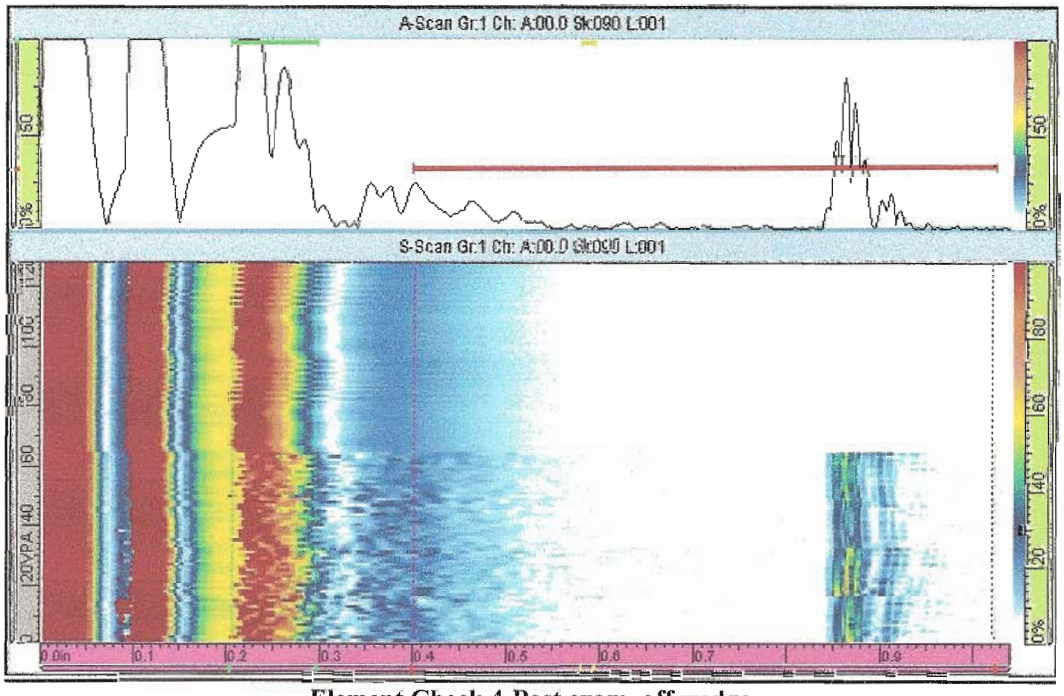
Element Check 1- Pre exam, off wedge



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	A%
		Field 2	A^
		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	31 dB
		Start	0.00 in
		Range	2.529 in
		Wedge Delay	.00 us
		Velocity	.2272 in/us
	Pulser		
		Pulser	1
		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
		Angle	52
		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			
	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		
		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

Dominion

ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sheet: 219-01-016 219-01-042		**Calibration Data Sheet:** 219-01-016 219-01-042	
Plant: Millstone	**Unit:** 2	**Procedure:** ER-MP-NDE-UT-816/Rev. 0	
Zones DM Weld: 1-14	**SS Weld:** 1-20		
Date: 11/01/09	**Exam Start:** 1310	**Exam Stop:** 1327	
WOR Identification **DM Weld:** BSI-C-4000		**SS Weld:** BSI-C-4002	
Component Configuration **DM Weld:** Safe End to Nozzle		**SS Weld:** Elbow to Safe End	
Weld Overlay Regions: Portions of overlay greater than .75" thickness			
Examination Surface: Surface of Weld Overlay		**Reviewed Previous Data:** N/A	
Temperature Gauge: PTC 312F	**Serial Number:** 268025	**Component Temp:** 87°	
Percent Of Coverage Obtained: see comments		**Examination Angles**	
Weld Overlay Thickness: **Minimum:** .75" **Maximum:** 1.00"		**Axial** 0° to 85°	**Circumferential** N/A
	Examination Sensitivity:	43 dB	N/A dB

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

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	T M P. Bl	11/01/09	Todd Blechinger	III	T M P. Bl	11/2/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III	R A Tiller For Kevin Hacker per Telecon	11/2/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A	York 45SCT	11/02/2009

Dominion

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	
Manufacturer:	GEIT
Model:	360-152-079
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

Comments:
See attached EPRI correspondence for Probe, Wedge and Focal Law information.

Instrument	
Manufacturer:	Zetec
Model:	Omniscan 32/128 PR
PA Module Serial Number:	Omni-Z-6034
UT Mainframe Serial Number:	Omni-Z-1062
Software Revision:	1.4R3
Table 2 Instrument Settings:	See attached

Search Unit	
Manufacturer:	GEIT
Model:	115-000-631
Serial Number:	01Y28X-1/ 01Y28X-2

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:	032NJDZ2079L0085R2M1Z4_1.125MP.LAW
Angles Generated:	0° to 85°
Wave Mode:	Longitudinal
Focal Sound Path:	1.125" MP

Calibration Reflector Data

Calibration Block(s): M3-UT-52 N/A **Temperature:** 78°

Calibration Reflector		**Angle**	**% FSH**	**Ref. Sensitivity**	**UT 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 Functional Checks **Pre Exam:** Acceptable **Post Exam:** Acceptable

Number of Inactive Channels/Elements: **Transmit:** 0 **Receive:** 0

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

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	A^
		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	29 dB
		Start	0.00 in
		Range	2.529 in
		Wedge Delay	0.0 us
		Velocity	.2272 in/us
	Pulser		
		Pulser	1
		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
		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			
	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		
		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

Dominion

ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sheet: 219-01-016 219-01-042		**Calibration Data Sheet:** 219-01-016 219-01-042	
Plant: Millstone	**Unit:** 2	**Procedure:** ER-MP-NDE-UT-816/Rev. 0	
Zones DM Weld: 1-14	**SS Weld:** 1-20		
Date: 11/01/09	**Exam Start:** 1328	**Exam Stop:** 1405	
WOR Identification **DM Weld:** BSI-C-4000		**SS Weld:** BSI-C-4002	
Component Configuration **DM Weld:** Safe End to Nozzle		**SS Weld:** Elbow to Safe End	
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:** 87°	
Percent Of Coverage Obtained: see comments		**Examination Angles**	

Weld Overlay Thickness:	**Axial**	**Circumferential**
Minimum: .45" **Maximum:** .749"	0° to 85°	N/A
Examination Sensitivity:	41 dB	N/A dB

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

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.

Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	III		11/01/09	Todd Blechinger	III		11/2/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III	For Kevin Hacker per Telecon	11/2/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A		11/02/2009

Dominion

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	
Manufacturer:	GEIT
Model:	360-152-078
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

Comments:
See attached EPRI correspondence for Probe, Wedge and Focal Law information.

Instrument	
Manufacturer:	Zetec
Model:	Omniscan 32/128 PR
PA Module Serial Number:	Omni-Z-6034
UT Mainframe Serial Number:	Omni-Z-1062
Software Revision:	1.4R3
Table 2 Instrument Settings:	See attached

Search Unit	
Manufacturer:	GEIT
Model:	115-000-631
Serial Number:	01Y28Y-1/ 01Y28Y-2

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

Calibration Reflector Data

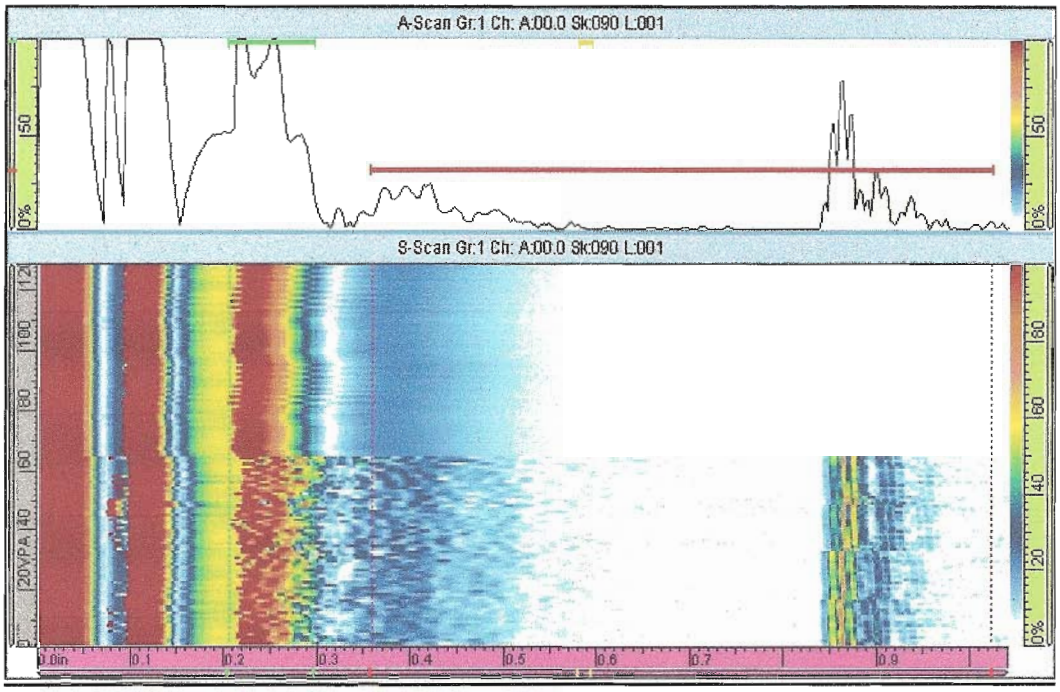
Calibration Block(s): M3-UT-51 N/A **Temperature:** 78°

Calibration Reflector		**Angle**	**% FSH**	**Ref. Sensitivity**	**UT 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

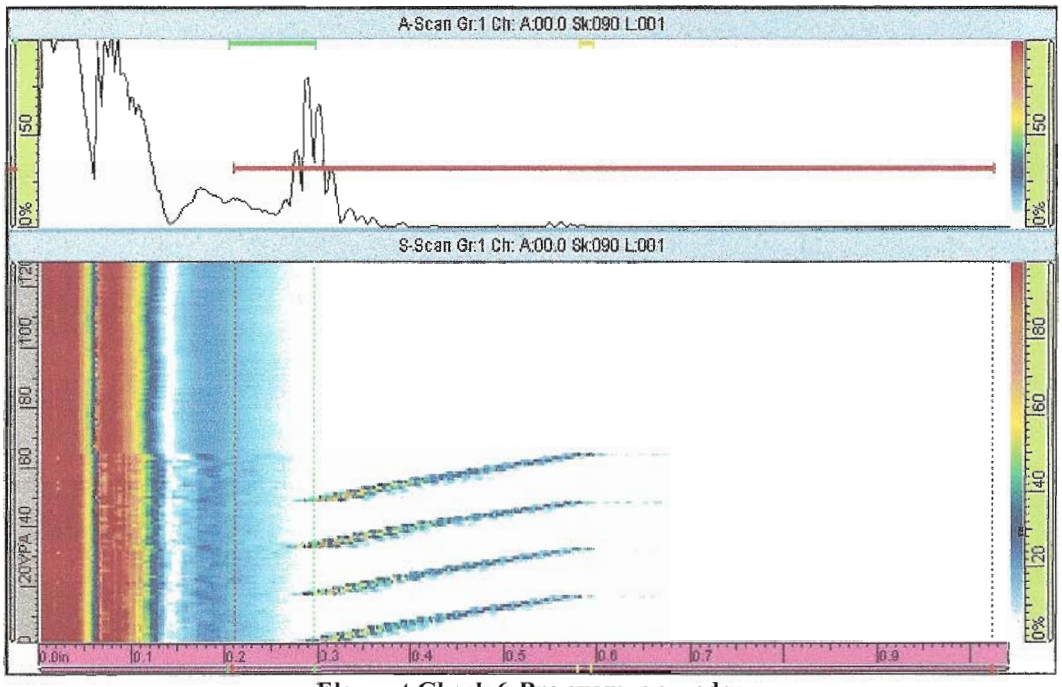
Channel Functional Checks **Pre Exam:** Acceptable **Post Exam:** Acceptable

Number of Inactive Channels/Elements: **Transmit:** 0 **Receive:** 0

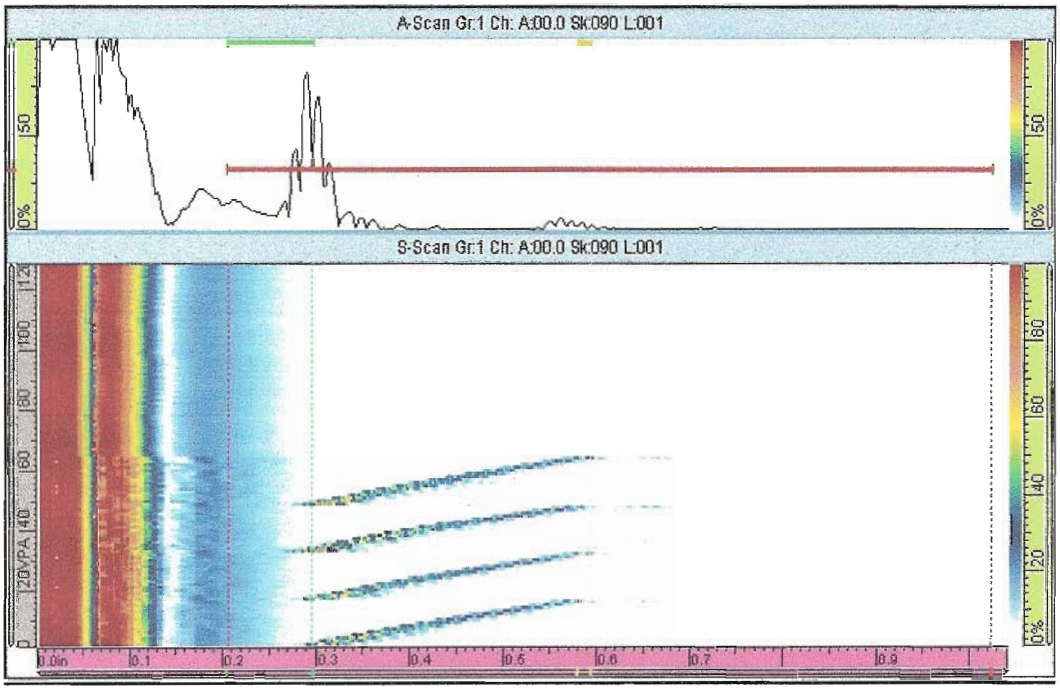
Calibration Performed	**Examiner 1**	**Examiner 2**	**Level(s)**	**Date**	**Time**
Initial:	Todd Blechinger	N/A	III	11/01/09	1410
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	III	11/01/09	1427



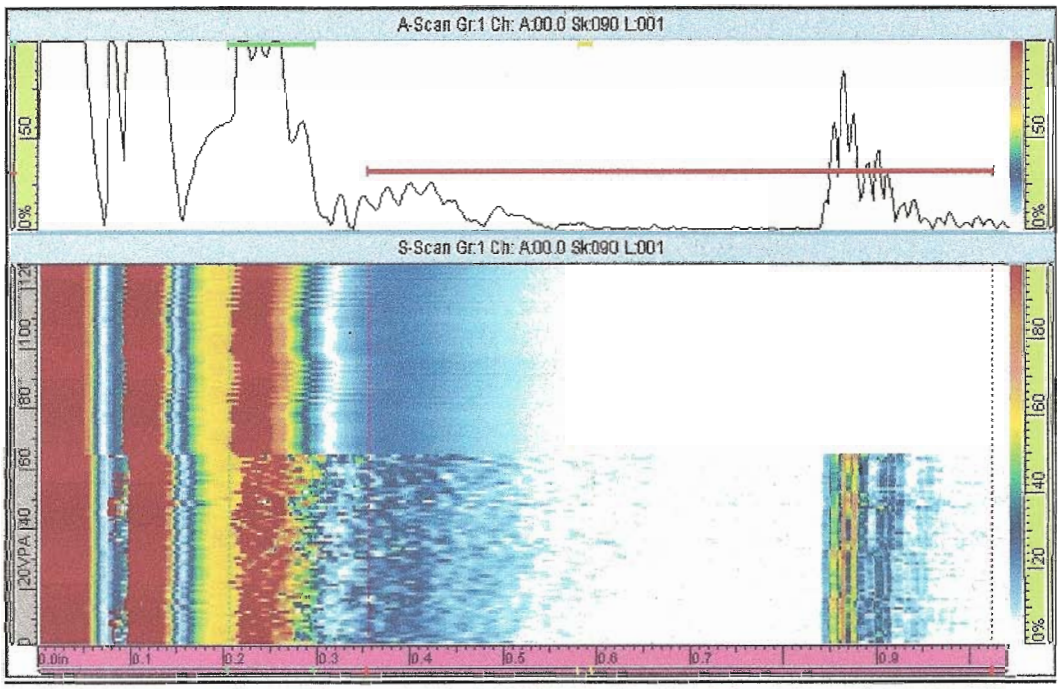
Element Check 5- Pre exam, off wedge



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	A^
		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		
		Pulser	1
		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	0.00 in
		Index Offset	-.064 in
		Angle	52
		Skew	0.0°
		Beam Delay	9.57 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			
	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		
		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

Dominion

ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sheet: 219-01-016 219-01-042		**Calibration Data Sheet:** 219-01-016 219-01-042	
Plant: Millstone	**Unit:** 2	**Procedure:** ER-MP-NDE-UT-816/Rev. 0	
Zones DM Weld: 1-14	**SS Weld:** 1-20		
Date: 11/01/09	**Exam Start:** 1410	**Exam Stop:** 1427	
WOR Identification **DM Weld:** BSI-C-4000		**SS Weld:** BSI-C-4002	
Component Configuration DM Weld: Nozzle to Safe End		**SS Weld:** Elbow to Safe End	
Weld Overlay Regions: Portions of overlay greater than .75" thickness			
Examination Surface: Surface of Weld Overlay		**Reviewed Previous Data:** N/A	
Temperature Gauge: PTC 312F	**Serial Number:** 268025	**Component Temp:** 87°	
Percent Of Coverage Obtained: see comments		**Examination Angles**	

Weld Overlay Thickness:	**Axial**	**Circumferential**
Minimum: .75" **Maximum:** 1.00"	N/A	0° to 85°
Examination Sensitivity:	N/A dB	43 dB

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

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	T.M.P. Bl	11/01/09	Todd Blechinger	III	T.M.P. Bl	11/2/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III	R.A. Zicko For Kevin Hacker per Telecon	11/2/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A	E York HPS CT	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	
Manufacturer:	GEIT
Model:	360-152-078
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

Comments:
See attached EPRI correspondence for Probe, Wedge and Focal Law information.

Instrument	
Manufacturer:	Zetec
Model:	Omniscan 32/128 PR
PA Module Serial Number:	Omni-Z-6034
UT Mainframe Serial Number:	Omni-Z-1062
Software Revision:	1.4R3
Table 2 Instrument Settings:	See attached

Search Unit	
Manufacturer:	GEIT
Model:	115-000-631
Serial Number:	01Y28Y-1/ 01Y28Y-2

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:	032NJDZ2078L0085R2M1Z4_1.125MP.LAW
Angles Generated:	0° to 85°
Wave Mode:	Longitudinal
Focal Sound Path:	1.125" MP

Calibration Reflector Data

Calibration Block(s): M3-UT-51 N/A **Temperature:** 78°

Calibration Reflector		**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 Functional Checks		**Pre Exam:** Acceptable		**Post Exam:** Acceptable		
Number of Inactive Channels/Elements:		**Transmit:** 0		**Receive:** 0		

Calibration Performed	**Examiner 1**	**Examiner 2**	**Level(s)**	**Date**	**Time**
Initial:	Todd Blechinger	N/A	III	11/01/09	1428
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	III	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	A^
		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	28 dB
		Start	0.00 in
		Range	2.529 in
		Wedge Delay	1.3 us
		Velocity	.2272 in/us
	Pulser		
		Pulser	1
		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	0.00 in
		Index Offset	-0.665 in
		Angle	52
		Skew	0.0°
		Beam Delay	9.59 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			
	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		
		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

Dominion

ULTRASONIC PHASED ARRAY WOR ULTRASONIC EXAMINATION RECORD

Exam Data Sheet: 219-01-016 219-01-042		**Calibration Data Sheet:** 219-01-016 219-01-042	
Plant: Millstone	**Unit:** 2	**Procedure:** ER-MP-NDE-UT-816/Rev. 0	
Zones DM Weld: 1-14	**SS Weld:** 1-20		
Date: 11/01/09	**Exam Start:** 1428	**Exam Stop:** 1515	
WOR Identification **DM Weld:** BSI-C-4000		**SS Weld:** BSI-C-4002	
Component Configuration DM Weld: Safe End to Nozzle		**SS Weld:** Elbow to Safe End	
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:** 87°	
Percent Of Coverage Obtained: see comments		**Examination Angles**	

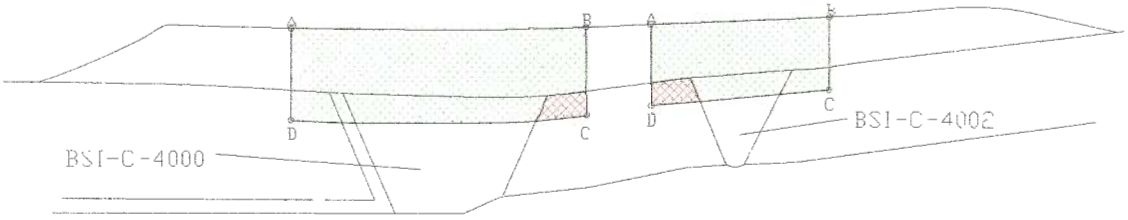
Weld Overlay Thickness:	**Axial**	**Circumferential**
Minimum: .45" **Maximum:** .749"	N/A	0° to 85°
Examination Sensitivity:	N/A dB	40 dB

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

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.

Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	III		11/01/09	Todd Blechinger	III		11/2/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III	For Kevin Hacker per Telecon	11/2/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A		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

Total area examined with non-qualified technique BSI-C-4000- .187 sq inches

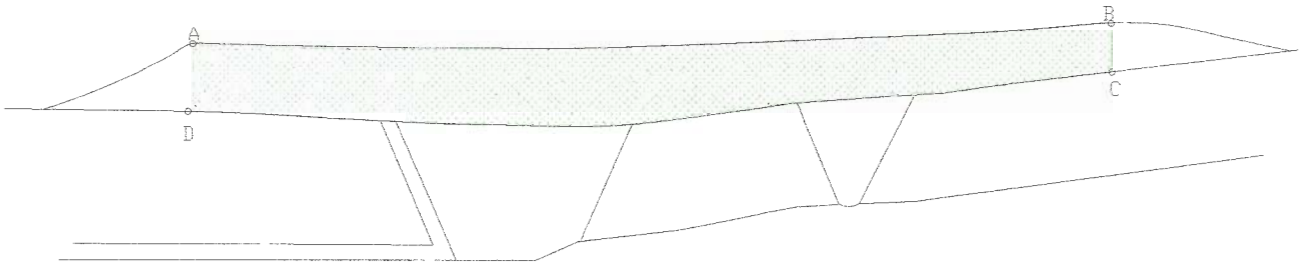
Total area examined with qualified technique BSI-C-4002- 2.125 sq inches
Required examination volume- 2.31 sq. inches

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

Scale: None

Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	III		11/1/09	Todd Blechinger	III		11/2/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III	For Kevin Hacker per Telecon	11/2/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A		11/02/2009

Coverage Plot



PSI Examination Volume A-B-C-D

Scale: None

Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	III		11/1/09	Todd Blechinger	III		11/2/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III	For Kevin Hacker per Telecon	11/2/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A		11/02/2009

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

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.

CHARLOTTE OFFICE
1300 West W.T. Harris Boulevard, Charlotte, NC 28262-8550 USA • 704.595.2000 • Fax 704.595.2860
Customer Service 800.313.3774 • www.epri.com

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

Attachment

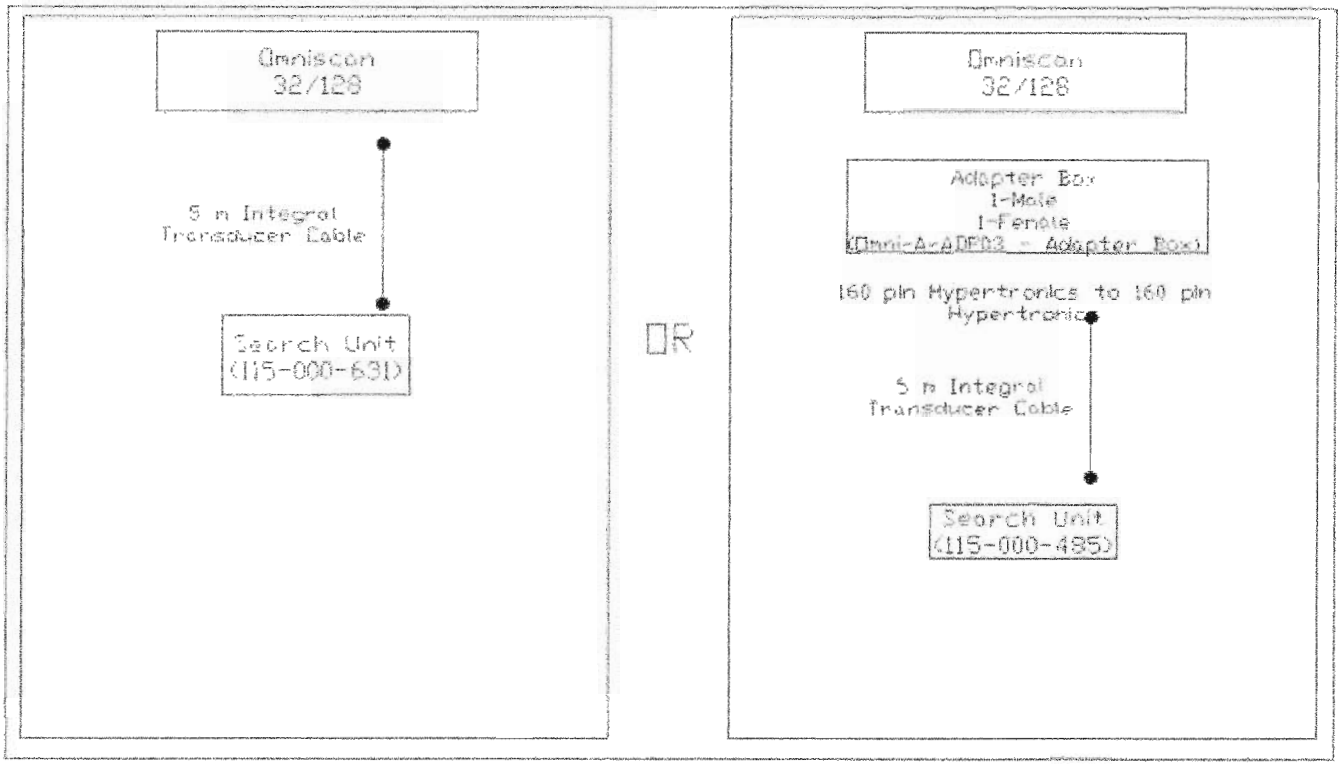


Figure 1. OmniScan 32-128 P/R Cable Diagram for EPRI-WOL-PA-1

Table A. GEIT Wedge Component Applicability

Zone	Weld Number	Location / Description	Wedge Contour Required Wedges	GEIT Axial Wedge Part #	GEIT Circ Wedge Part #
1-07	BPD-C-1017	2" Drain Line Loop 1A	4.125"	360-152-233	360-152-232
1-09	BPD-C-3000	2" Drain line Loop 1B			
1-11	BPD-C-2001	2" Drain line Loop 2A			
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			
1-08	BSI-C-1001	12" Safety Injection 1A	16.75"	360-152-079	360-152-078
1-10	BSI-C-3000	12" Safety Injection 1B			
1-14	BSI-C-4000	12" Safety Injection 2B			
1-05	BPS-C-1001	12" Hot leg Surge Line Loop 1			
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 Part #	Diameter (in)	Scanning Direction	Focal Metal Path (in)	CAL Filename	Weld Overlay Thickness (WOLT) Range
360-152-232	4.125	Circ.	0.5	O32NJDS2232L0085R2M1Z4	WOLT<=0.20in
360-152-233	4.125	Axial	0.5	O32NJDS2233L0085R2M1Z4	WOLT<=0.20in
360-152-232	4.125	Circ.	1.125	O32NJDZ2232L0079R2M1Z4	0.20in < WOLT < 0.75in
360-152-233	4.125	Axial	1.125	O32NJDZ2233L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-234	5.500	Circ.	1.125	O32NJDZ2234L0082R2M1Z4	0.20in < WOLT < 0.75in
360-152-235	5.500	Axial	1.125	O32NJDZ2235L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-078	16.750	Circ.	1.125	O32NJDZ2078L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-079	16.750	Axial	1.125	O32NJDZ2079L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-078	16.750	Circ.	1.5	O32NJDB2078L0085R2M1Z4	WOLT >= 0.75in
360-152-079	16.750	Axial	1.5	O32NJDB2079L0085R2M1Z4	WOLT >= 0.75in

September 23, 2009
Kevin Hacker
Page 5

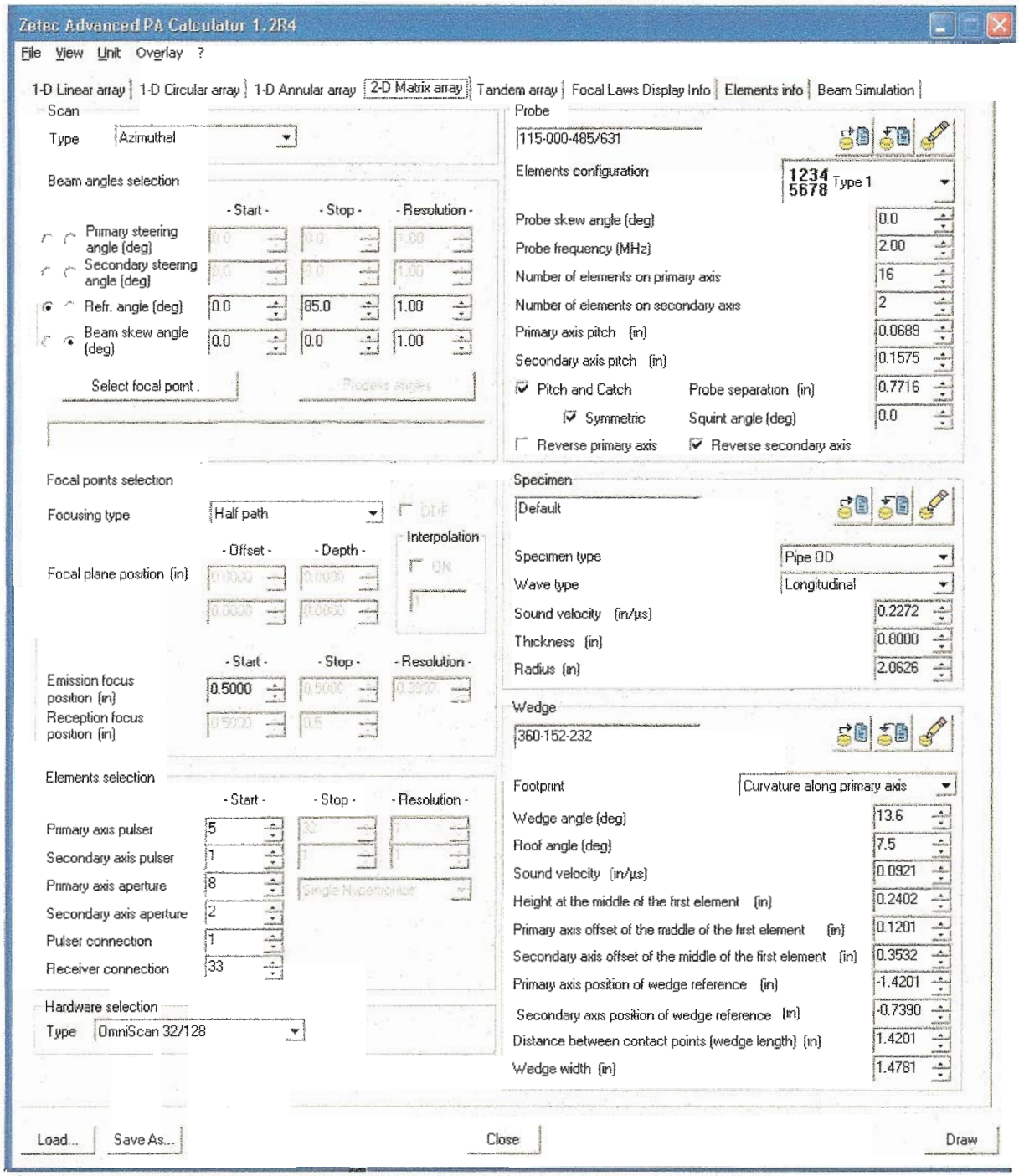


Figure 2.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 0.5

September 23, 2009
Kevin Hacker
Page 6

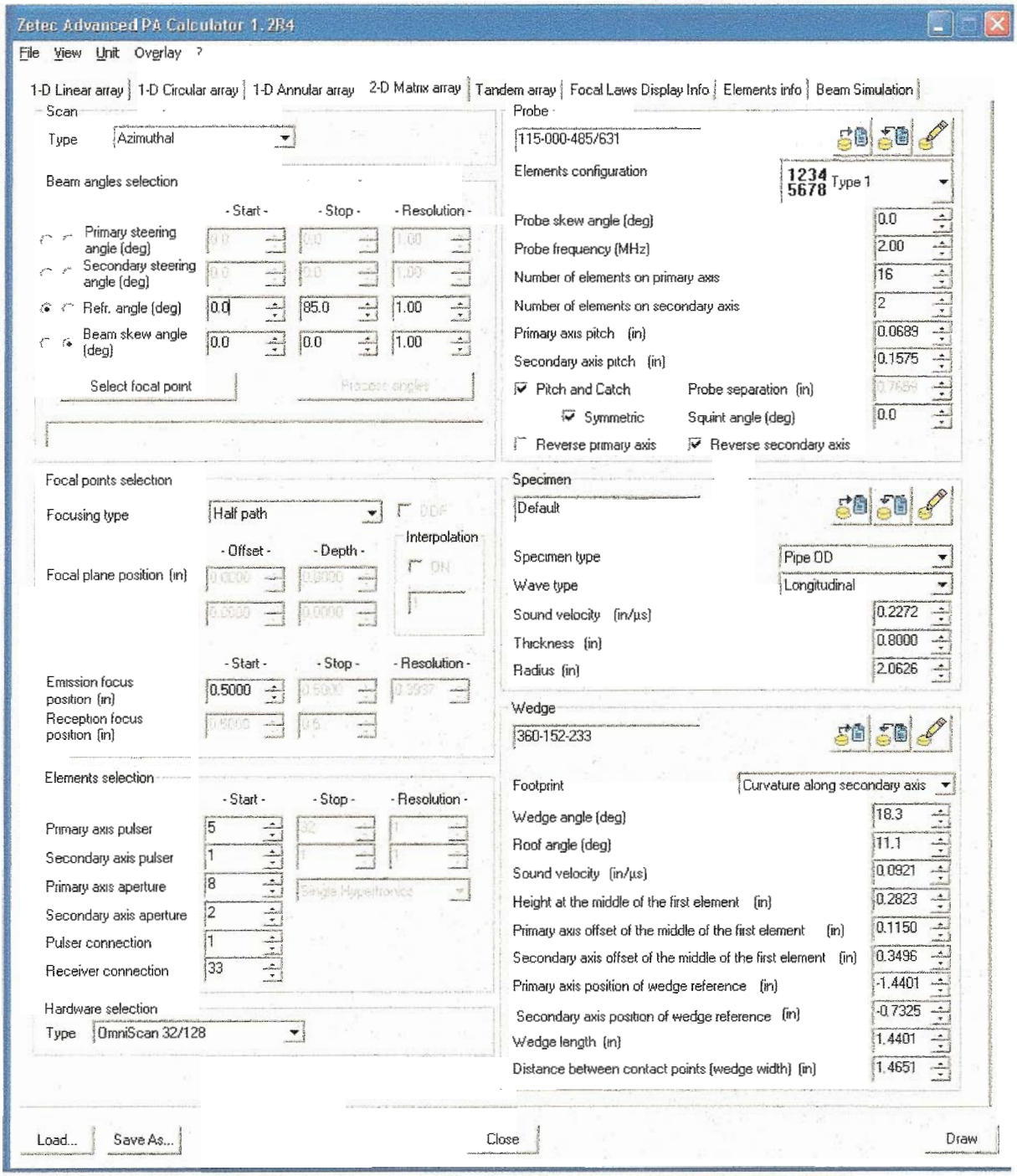


Figure 3.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in) = 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 0.5

September 23, 2009
Kevin Hacker
Page 7

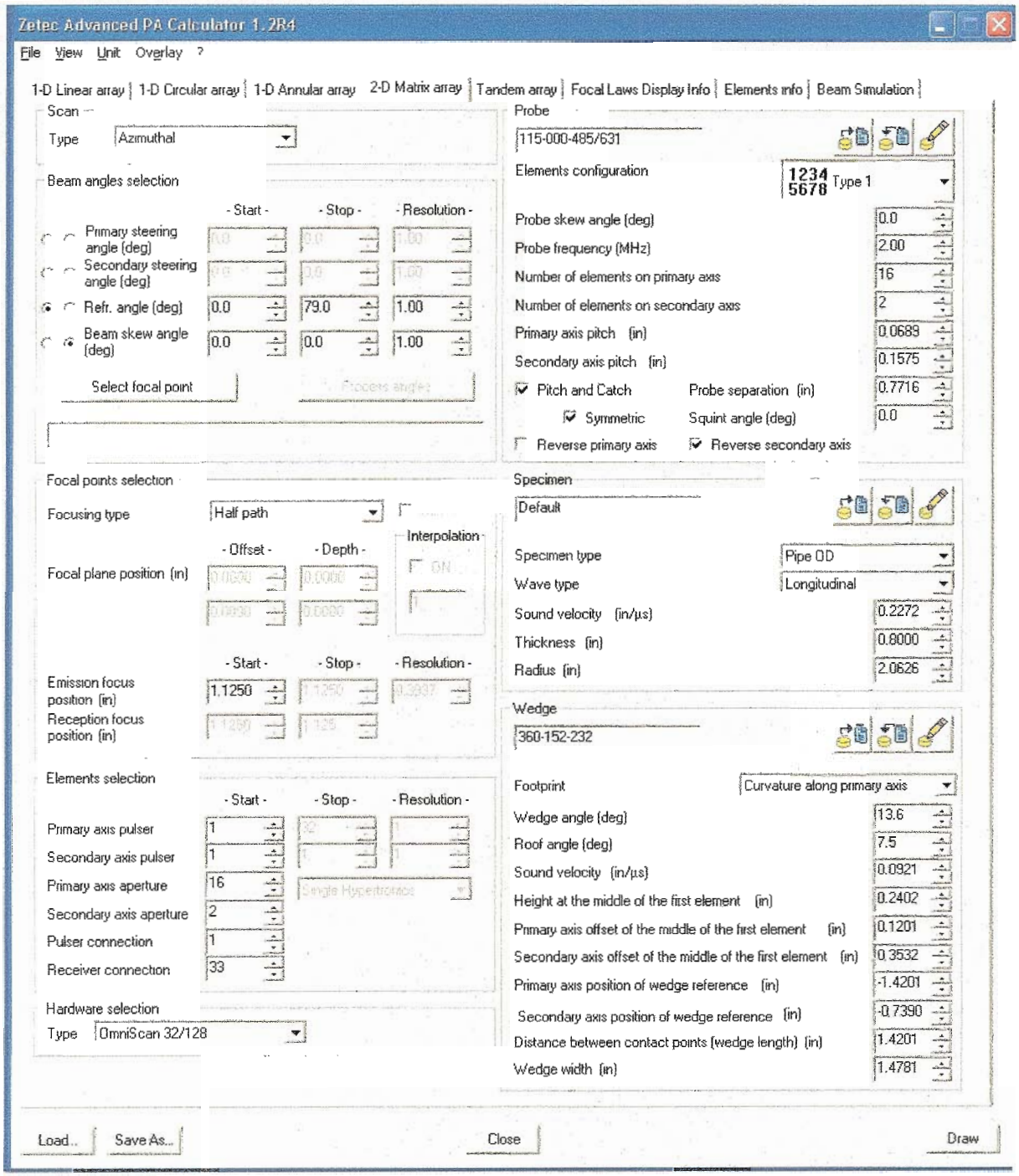


Figure 4.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 8

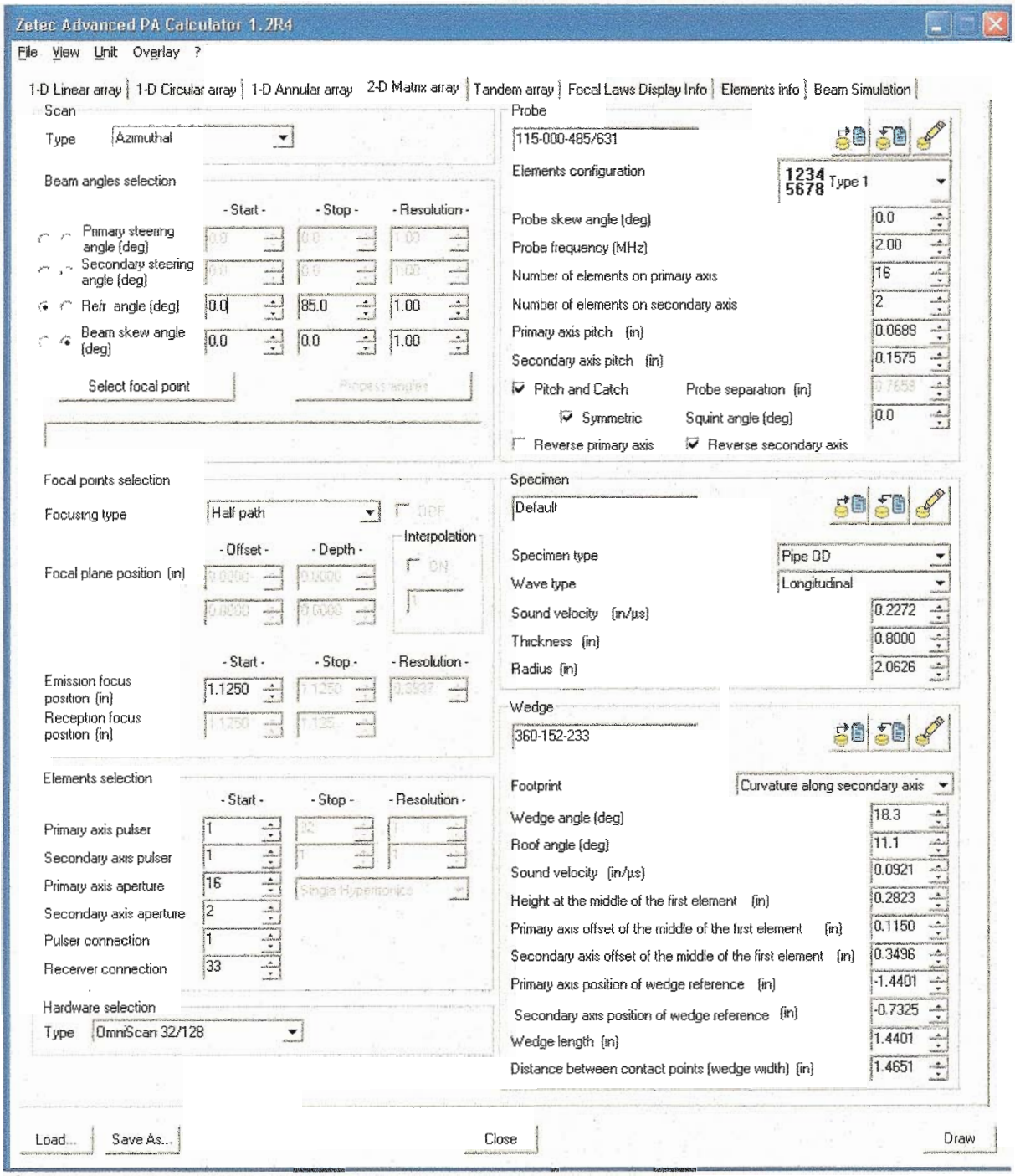


Figure 5.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in) = 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 9

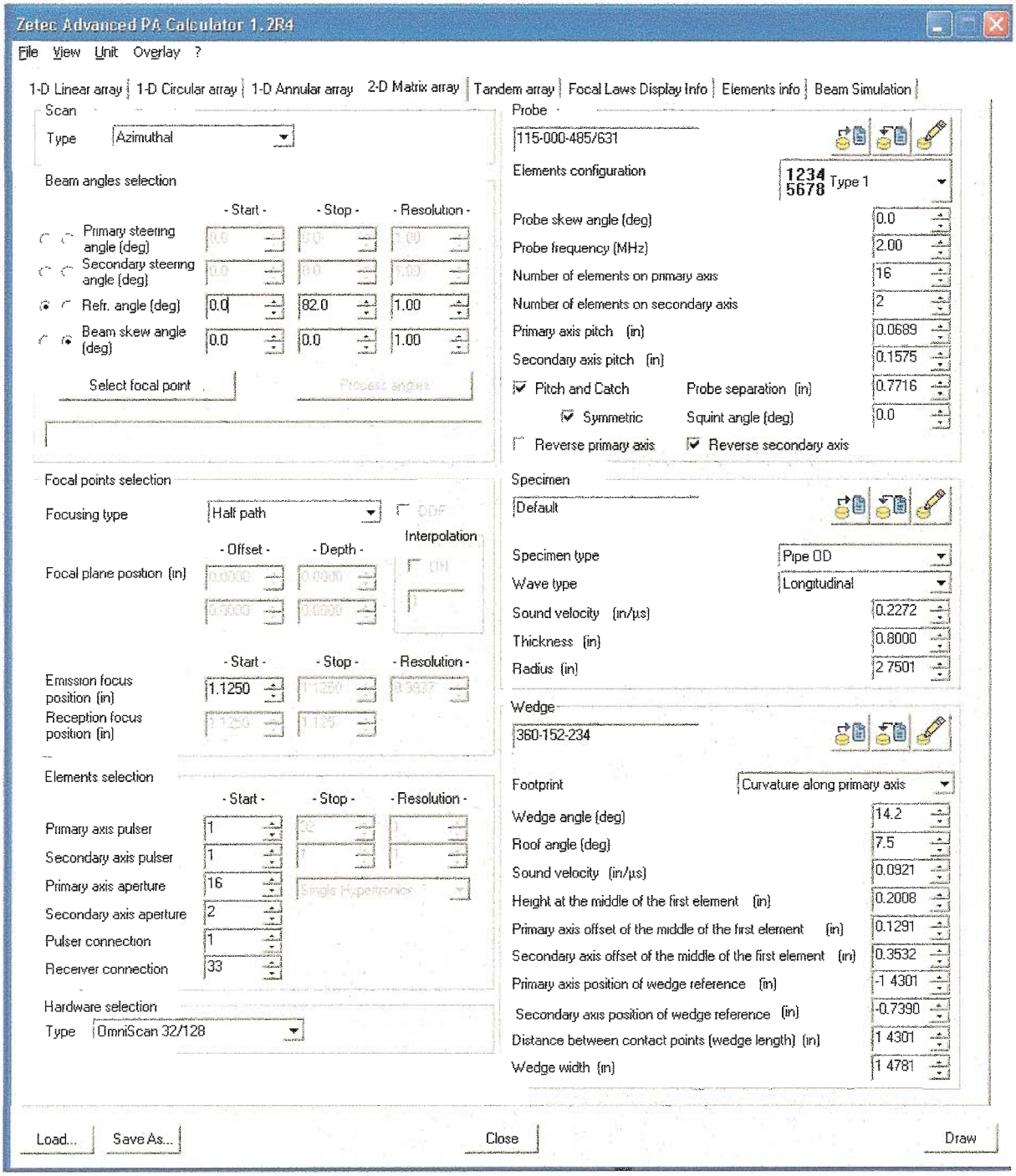


Figure 6.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-234; Diameter (in) = 5.5; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 10

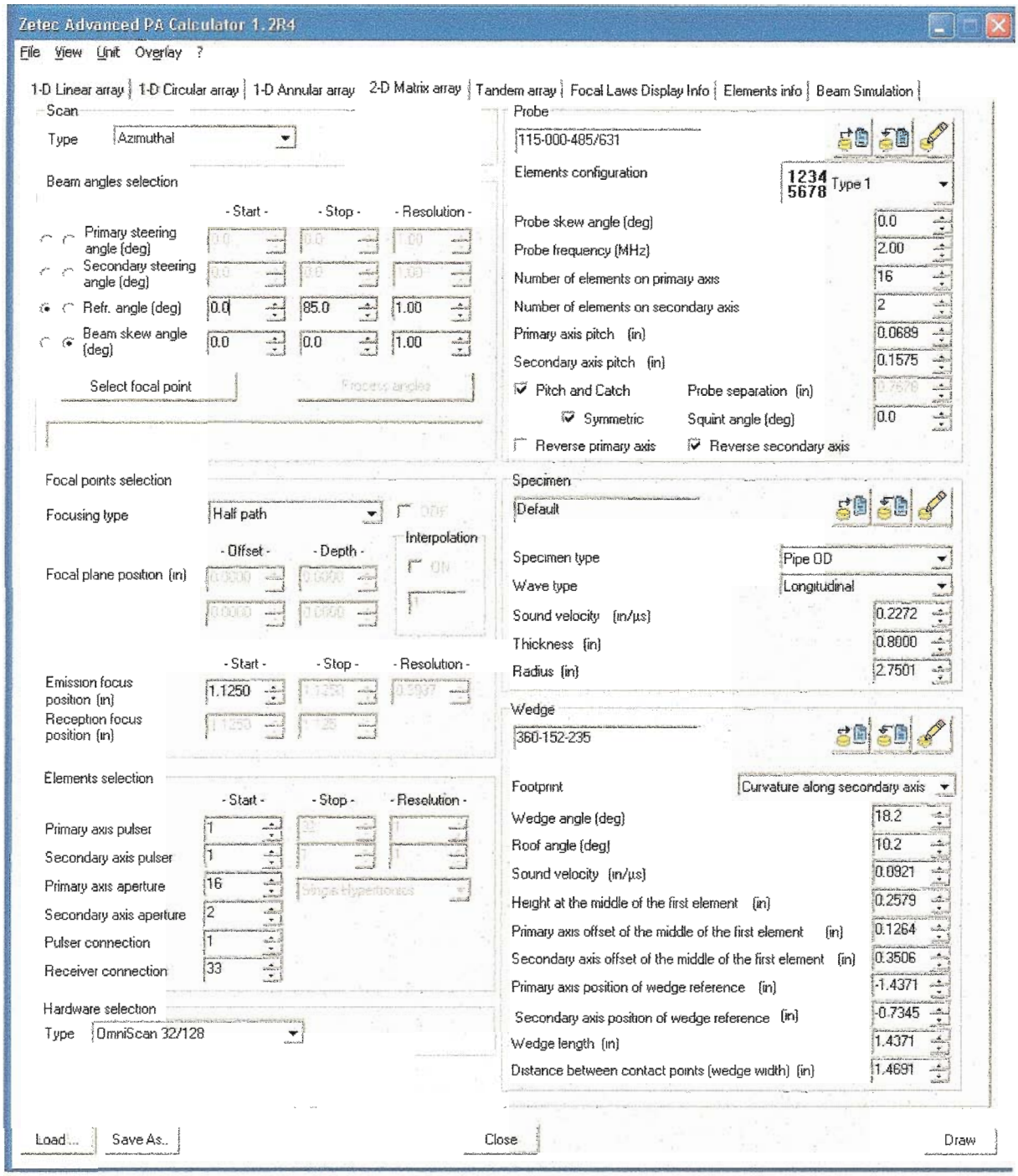


Figure 7.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-235; Diameter (in) = 5.5; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 11

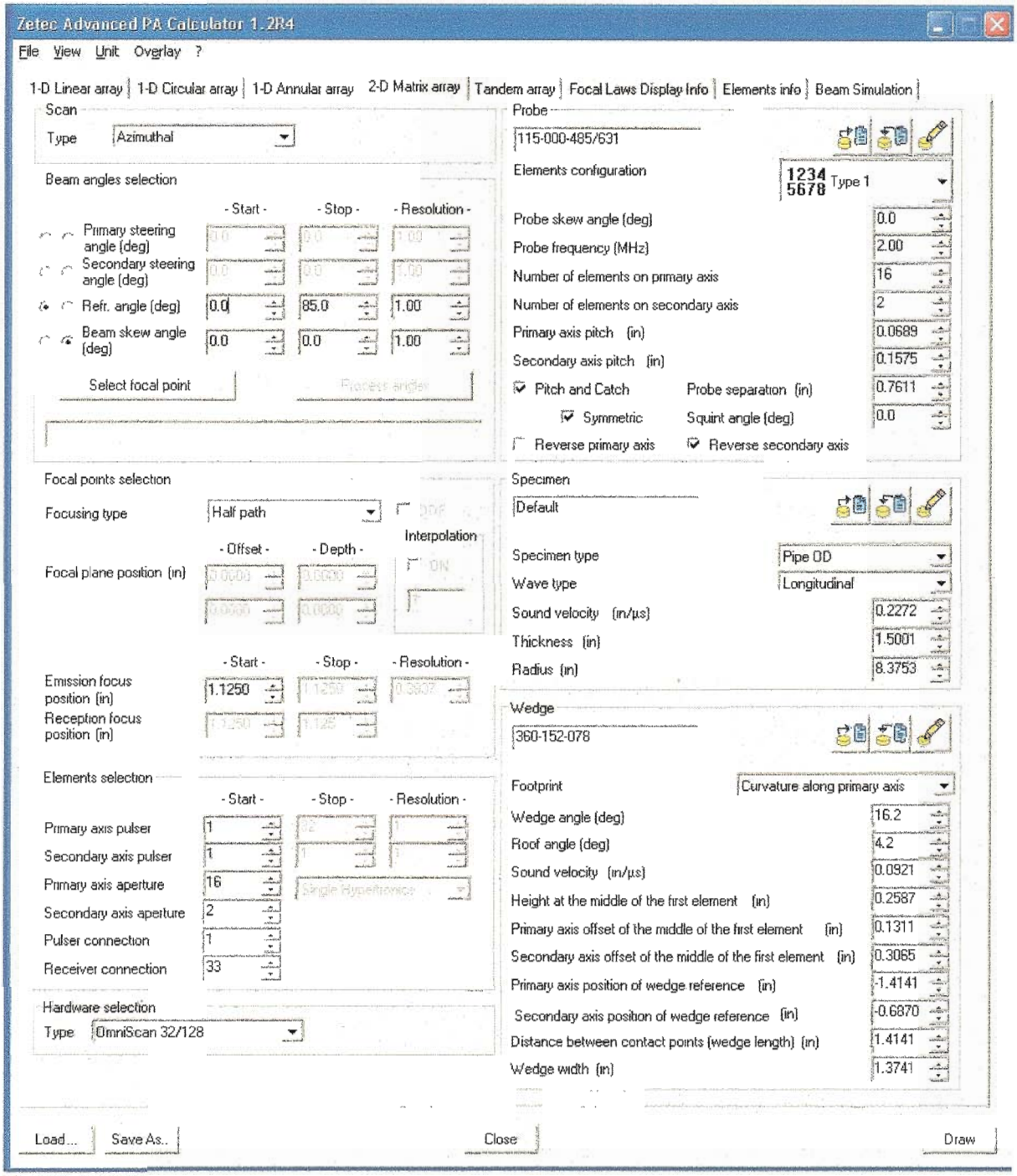


Figure 8.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 12

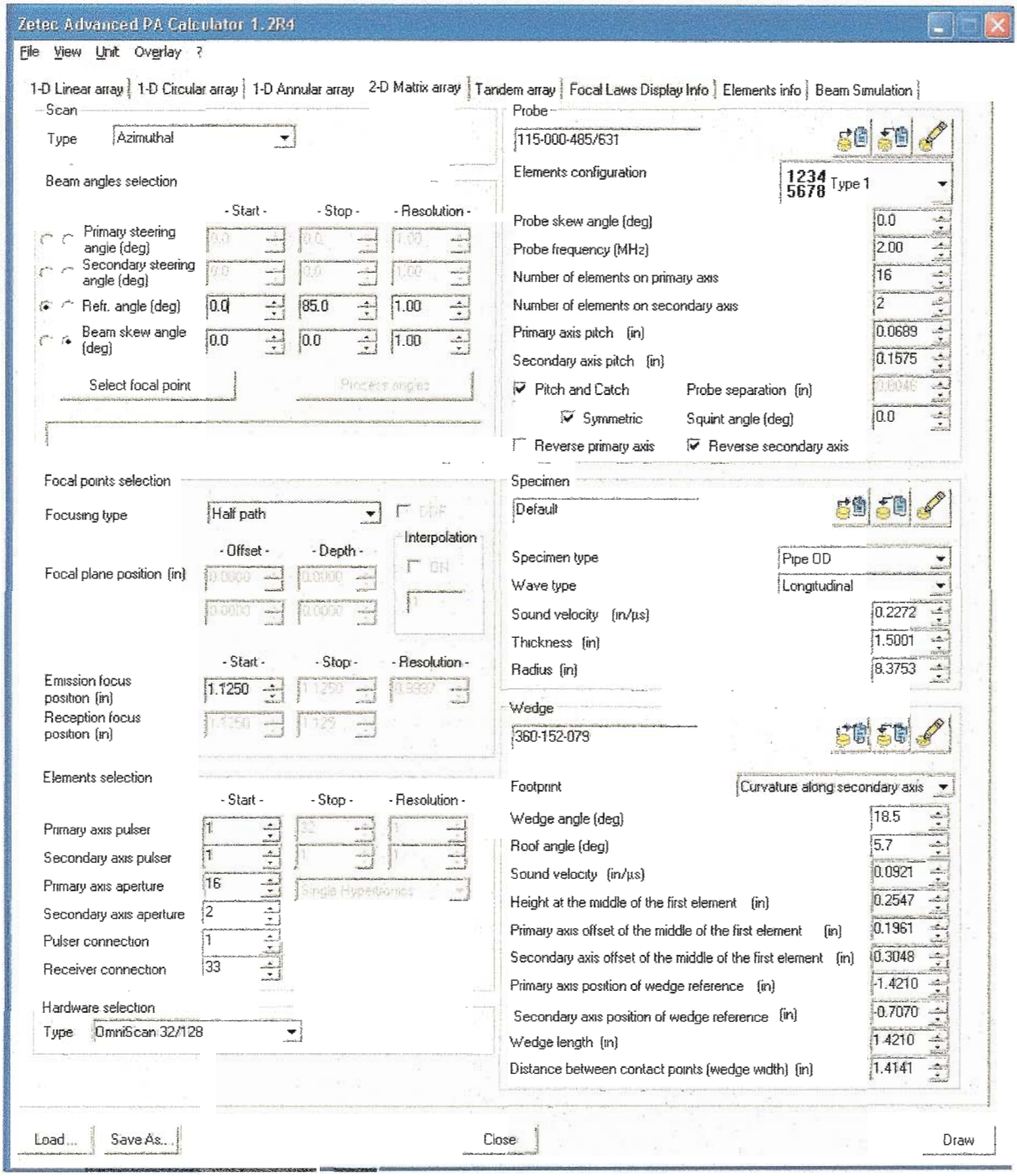


Figure 9.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 13

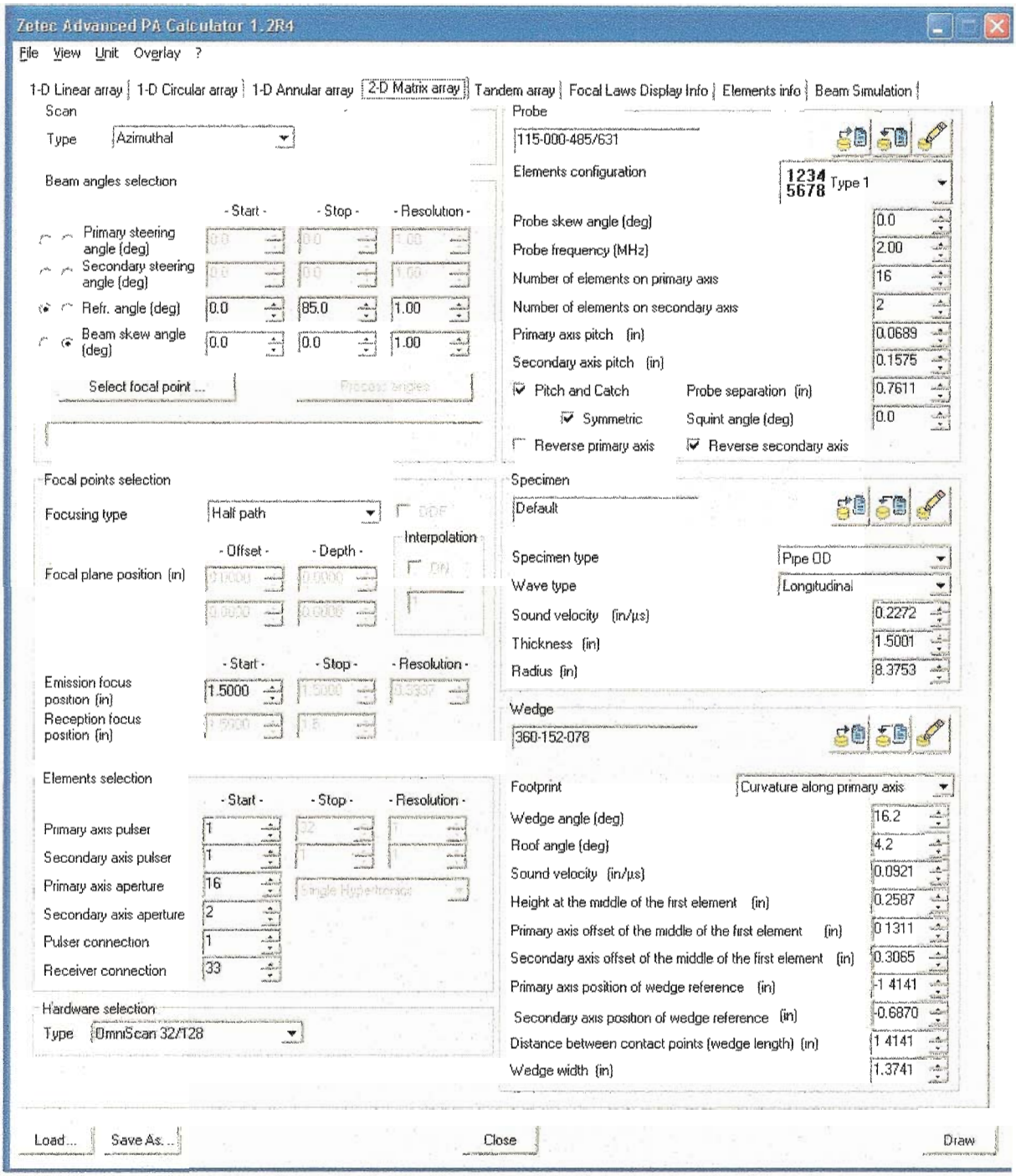


Figure 10.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.5

September 23, 2009
Kevin Hacker
Page 14

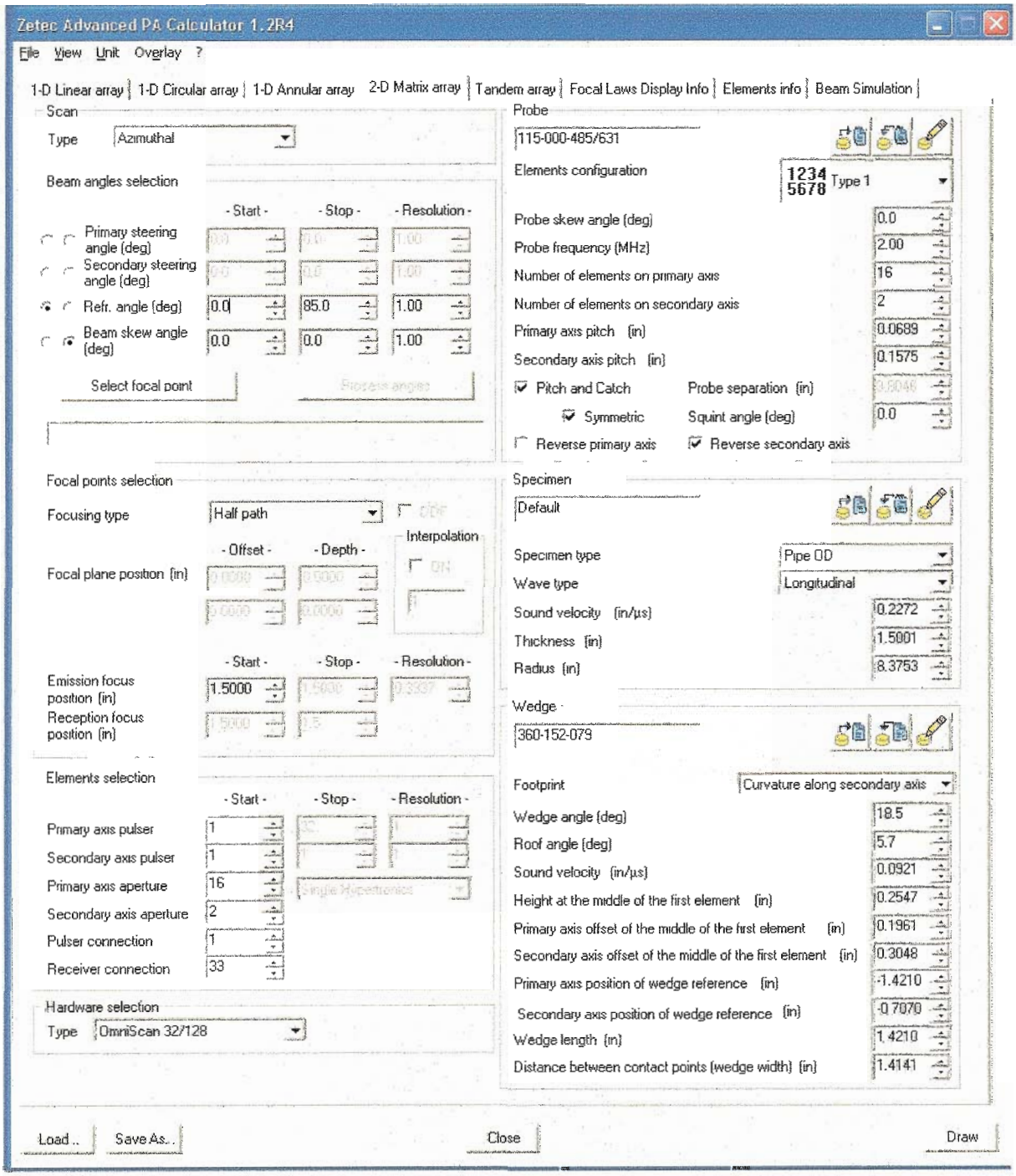


Figure 11.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.5

BCH-C-2001 / BCH-C-2003

2-inch Cold Leg Charging Loop 2A

Dominion

Millstone Unit 2
UT Data Package Cover

Data Package No: 219-01-013

219-01-013

Reference ID: BCH-C-2001

BCH-C-2001

AWO: 53102184596

53102184596

Page #	Data Type	Exam Angle	Recordable	Limitations	Comments
1	C	0-85°			
2	C	0-85°	N/A		
3	C	0-85°			
4	C	0-85°			
5	C	0-85°			
6	E	0-85°	NRI	NONE	
7	C	0-79°			
8	C	0-79°			
9	C	0-79°	N/A		
10	C	0-79°			
11	C	0-79°			
12	E	0-79°	NRI	NONE	
13	P	0-85°	N/A	N/A	

% of Required Exam Area: 100 %

Final Disposition: ACCEPTABLE — 10/20/09 III

Dominion Review: KJHacker KJHacker

Level: III

Review Date: 10/20/09

Previous Data Review

UT ☒ N/A RT ☐

Legend: UT Data Type Reference

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

Comments:

Dominion

Millstone Unit 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
1	C	0-85°			
2	C	0-85°			
3	C	0-85°	N	A	
4	C	0-85°			
5	C	0-85°			
6	E	0-85°	NRI	NONE	
7	C	0-79°			
8	C	0-79°			
9	C	0-79°	N	A	
10	C	0-79°			
11	C	0-79°			
12	E	0-79°	NRI	NONE	
13	P	0-85°	N/A	N/A	

% of Required Exam Area: 100%

Final Disposition: ACCEPTABLE 10/20/09 TCL

Dominion Review: KJHacker KJHacker

Level: III

Review Date: 10/20/09

Previous Data Review

UT ☒ N/A RT ☐

Legend: UT Data Type Reference

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

Comments:

Dominion

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	
Manufacturer:	GEIT
Model:	360-152-233
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

Comments:
See attached EPRI correspondence for Probe, Wedge and Focal Law information.

Instrument	
Manufacturer:	Zetec
Model:	Omniscan 32/128 PR
PA Module Serial Number:	Omni-Z-6034
UT Mainframe Serial Number:	Omni-Z-1062
Software Revision:	1.4R3
Table 2 Instrument Settings:	See attached

Search Unit	
Manufacturer:	GEIT
Model:	115-000-631
Serial Number:	01Y28X-1/ 01Y28X-2

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:	032NJDZ2233L0085R2M1Z4_1.125MP.LAW
Angles Generated:	0° to 85°
Wave Mode:	Longitudinal
Focal Sound Path:	1.125" MP

Calibration Reflector Data

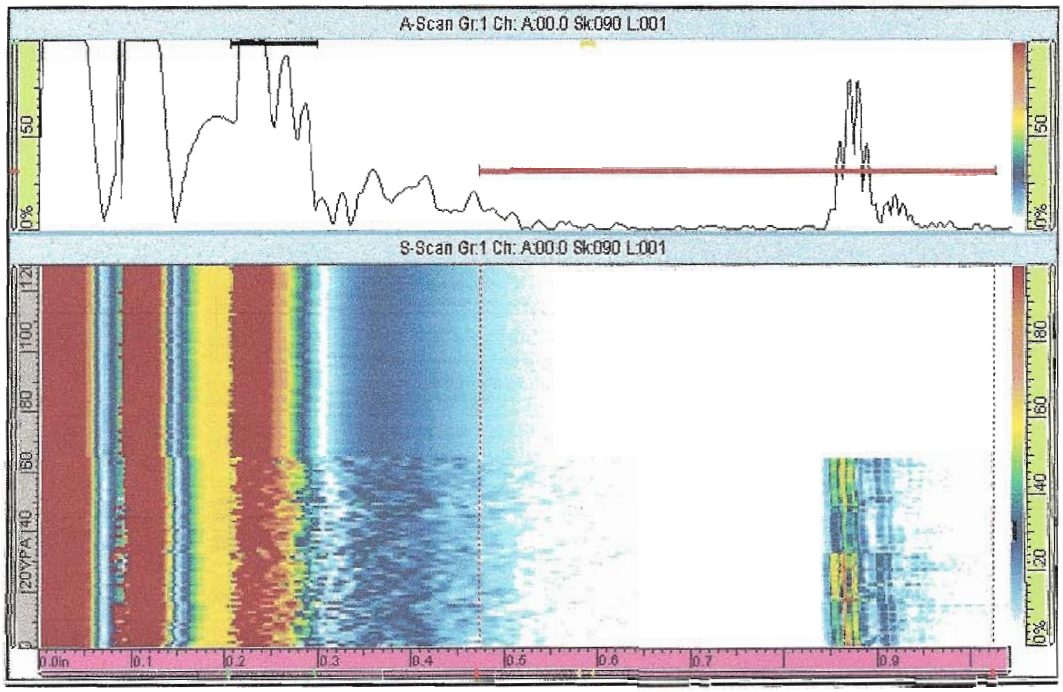
Calibration Block(s): CB-04-171 9C-041(.1" SDH only) **Temperature:** 80°

Calibration Reflector		**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

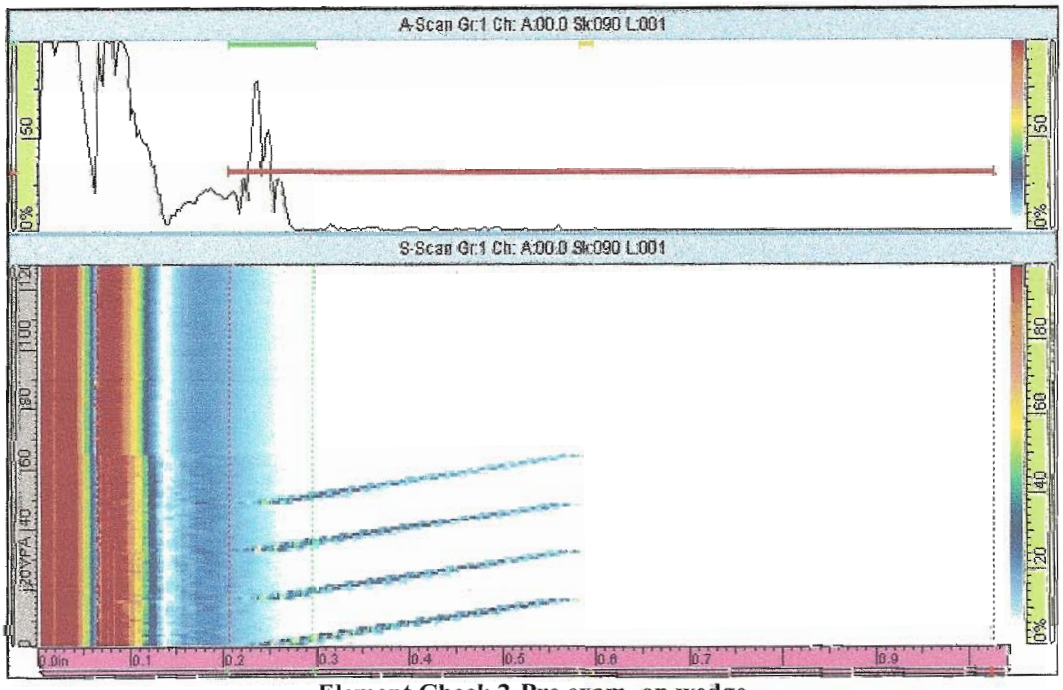
Channel Functional Checks **Pre Exam:** Acceptable **Post Exam:** Acceptable

Number of Inactive Channels/Elements: **Transmit:** 0 **Receive:** 0

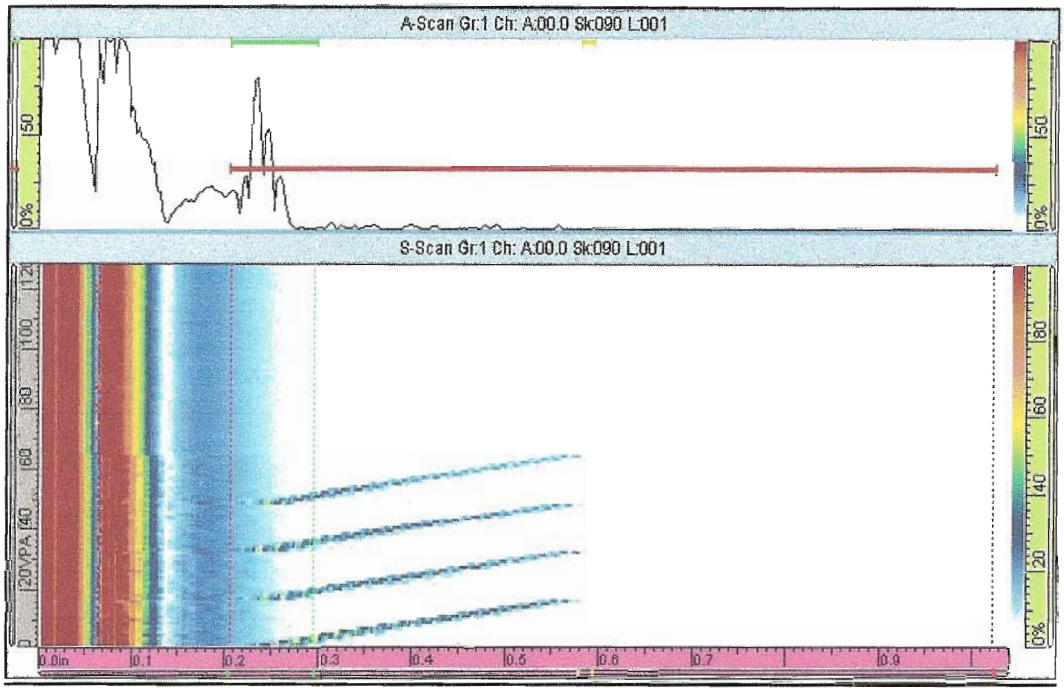
Calibration Performed	**Examiner 1**	**Examiner 2**	**Level(s)**	**Date**	**Time**
Initial:	Todd Blechinger	N/A	III	10/18/09	1310
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	III	10/18/09	1335



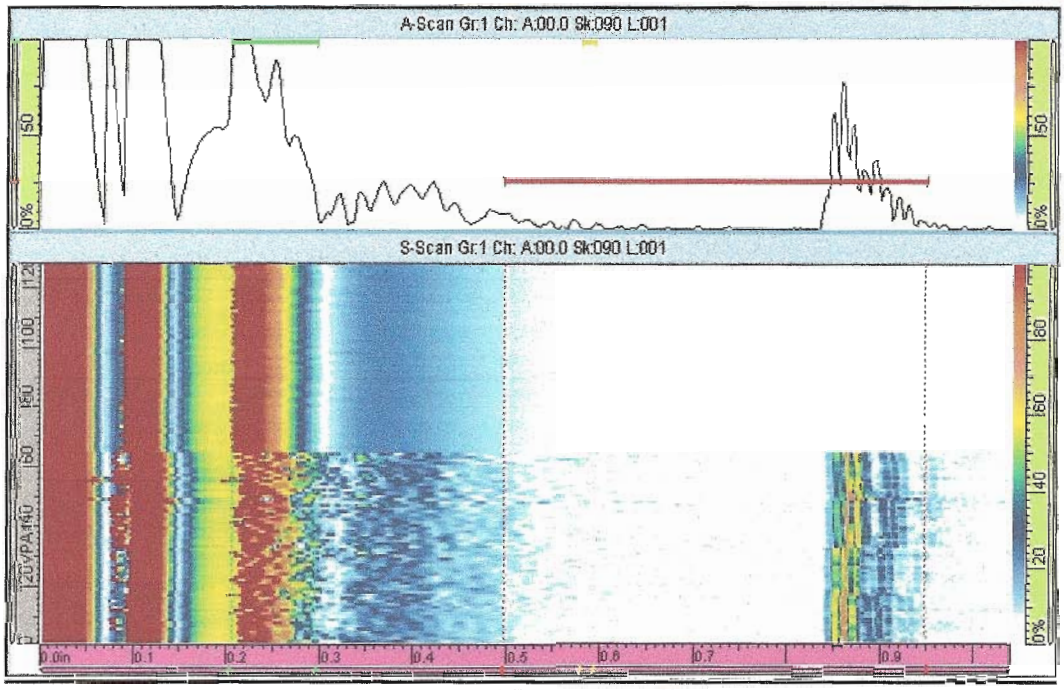
Element Check 1- Pre exam, off wedge



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

Major Menu Item	Menu Item	Sub-menu Item	Setting
Reading			
	Result		
		Selector	List 1
		Field 1	A%
		Field 2	A^
		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	25 dB
		Start	0.00 in
		Range	1.896 in
		Wedge Delay	1.40 us
		Velocity	.2272 in/us
	Pulser		
		Pulser	1
		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	-0.016 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
		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		
		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
		Connection P:	1
	Laws		
		Auto Program	Off
Gate Alarm			
	Gate		
		Gate Select	Gate A
		Gate A Synchro	Pulse

Dominion

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	
Zones DM Weld: 1-12	**SS Weld:** 1-38		
Date: 10/18/09	**Exam Start:** 1310	**Exam Stop:** 1335	
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	
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**	

Weld Overlay Thickness:	**Axial**	**Circumferential**
Minimum: .38" **Maximum:** .70"	0° to 85°	N/A
Examination Sensitivity:	37 dB	N/A dB

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

Comments: Maintained 5% to 20% average baseline noise level during examination. No suspected flaw indications were observed during examinations.

Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	III		10/18/09	Todd Blechinger	III		10/20/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III		10/20/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A		10-20-2009

Dominion

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	
Manufacturer:	GEIT
Model:	360-152-232
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

Comments:
See attached EPRI correspondence for Probe, Wedge and Focal Law information.

Instrument	
Manufacturer:	Zetec
Model:	Omniscan 32/128 PR
PA Module Serial Number:	Omni-Z-6034
UT Mainframe Serial Number:	Omni-Z-1062
Software Revision:	1.4R3
Table 2 Instrument Settings:	See attached

Search Unit	
Manufacturer:	GEIT
Model:	115-000-631
Serial Number:	01Y28Y-1/ 01Y28Y-2

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:	032NJDZ2232L0079R2M1Z4_1.125MP.LAW
Angles Generated:	0° to 79°
Wave Mode:	Longitudinal
Focal Sound Path:	1.125" MP

Calibration Reflector Data

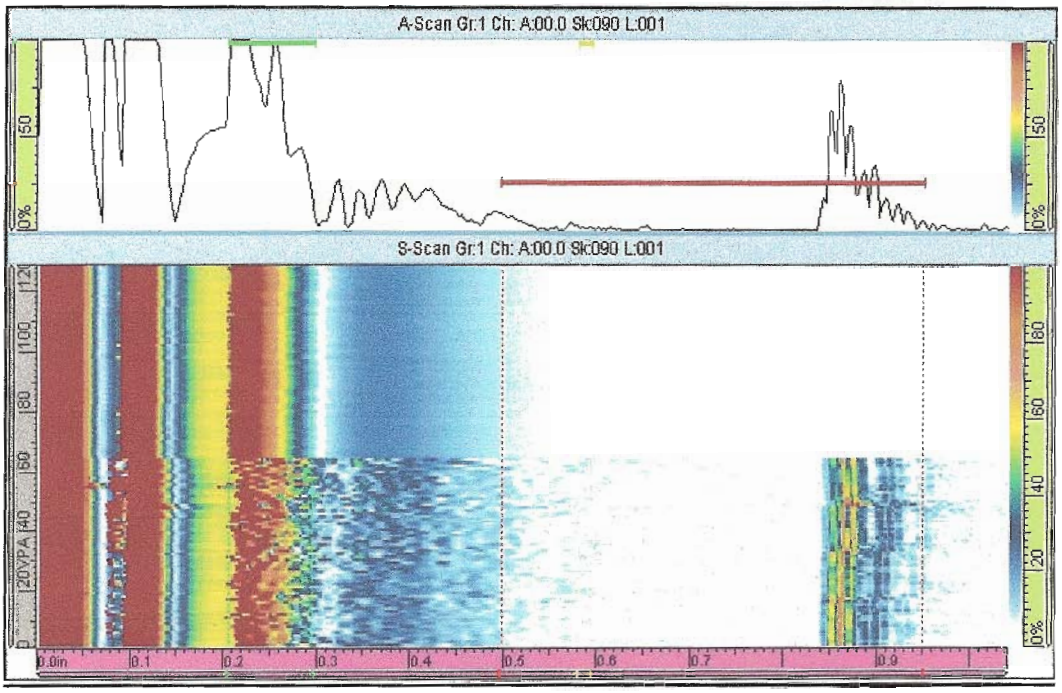
Calibration Block(s): MEUXE017A N/A **Temperature:** 80°

Calibration Reflector		**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

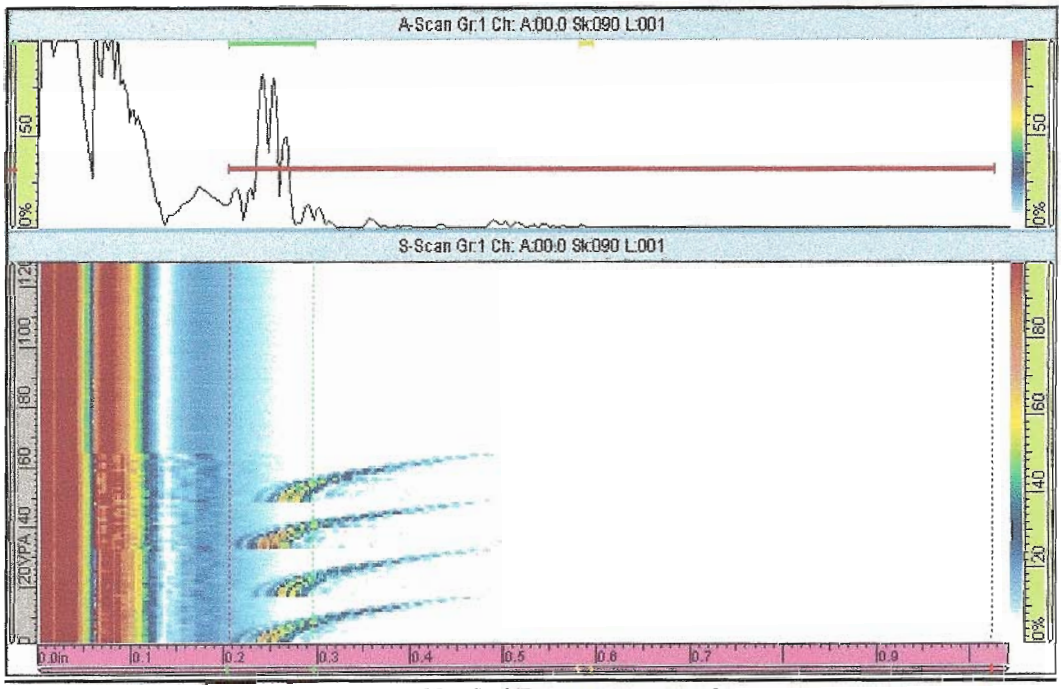
Channel Functional Checks **Pre Exam:** Acceptable **Post Exam:** Acceptable

Number of Inactive Channels/Elements: **Transmit:** 0 **Receive:** 0

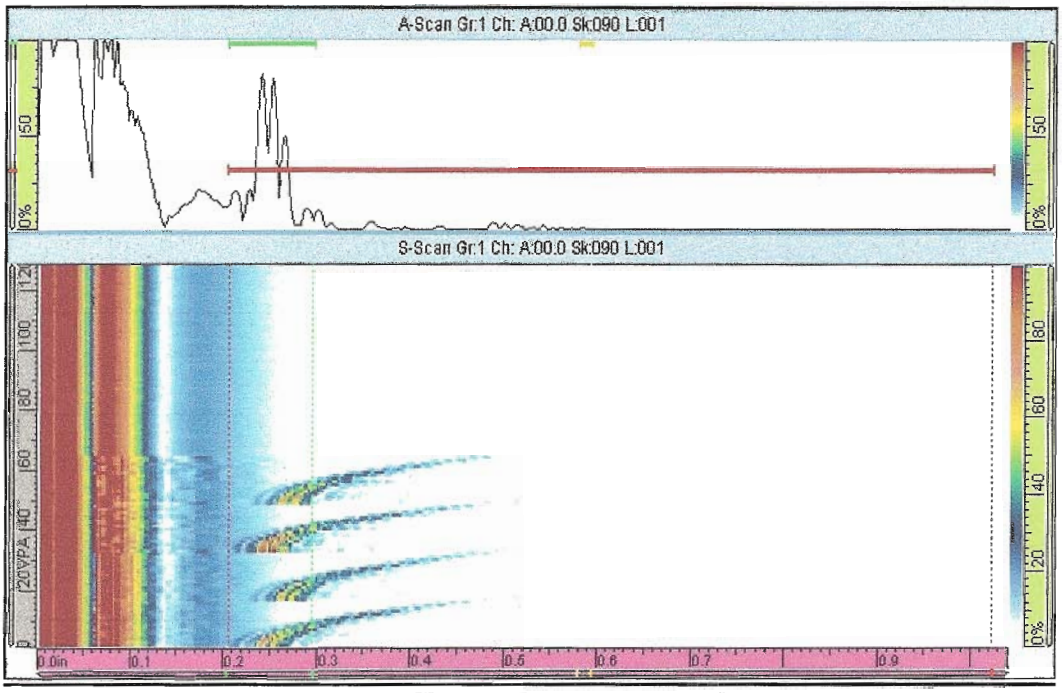
Calibration Performed	**Examiner 1**	**Examiner 2**	**Level(s)**	**Date**	**Time**
Initial:	Todd Blechinger	N/A	III	10/18/09	1335
Intermediate:	N/A	N/A	N/A	N/A	N/A
Final:	Todd Blechinger	N/A	III	10/18/09	1400



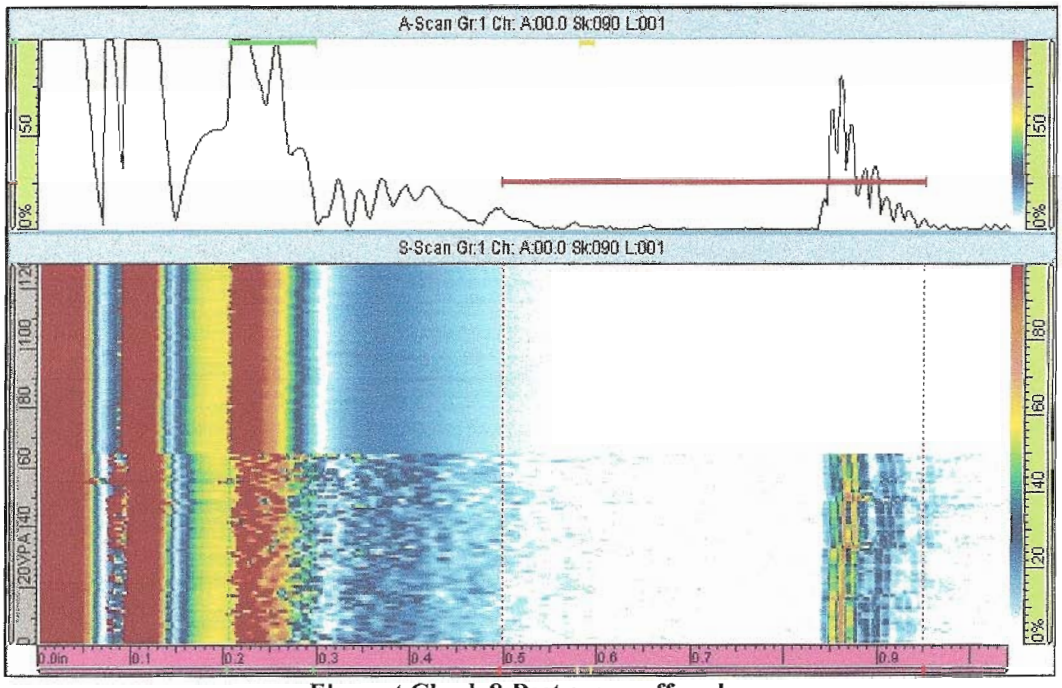
Element Check 5- Pre exam, off wedge



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

Major Menu Item	Menu Item	Sub-menu Item	Setting
Reading			
	Result		
		Selector	List 1
		Field 1	A%
		Field 2	A^
		Field 3	SA
		Field 4	PA
UT			
	General		
		Gain	23 dB
		Start	0.00 in
		Range	1.815 in
		Wedge Delay	1.90 us
		Velocity	.2272 in/us
	Pulser		
		Pulser	1
		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	-0.000 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	5
		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		
		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
		Connection P:	1
	Laws		
		Auto Program	Off
Gate Alarm			
	Gate		
		Gate Select	Gate A
		Gate A Synchro	Pulse

Dominion

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	
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	
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**	

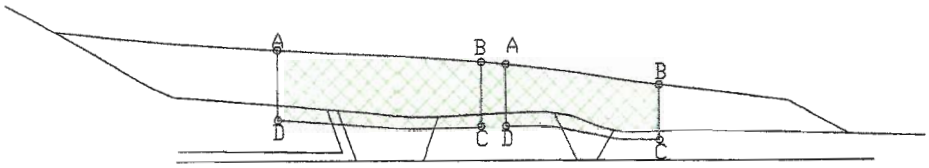
Weld Overlay Thickness:	**Axial**	**Circumferential**
Minimum: .38" **Maximum:** .70"	N/A	0° to 79°
Examination Sensitivity:	N/A dB	35 dB

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

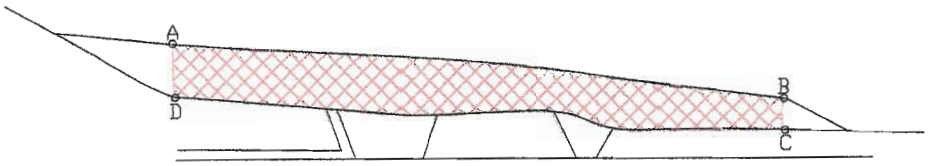
Comments: Maintained 5% to 20% average baseline noise level during examination. No suspected flaw indications were observed during examinations.

Examiner	Level	Signature	Date	LMT Review	Level	Signature	Date
Todd Blechinger	III		10/18/09	Todd Blechinger	III		10/20/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III		10/20/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A		CT 10/20/2009

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	III		10/18/09	Todd Blechinger	III		10/20/09
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Level**	**Signature**	**Date**
N/A	N/A			Kevin Hacker	III		10/20/09
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Level**	**Signature**	**Date**
N/A	N/A			E. York	N/A		10.20.09

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

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.

CHARLOTTE OFFICE
1300 West W.T. Harris Boulevard, Charlotte, NC 28262-8550 USA • 704.595.2000 • Fax 704.595.2860
Customer Service 800.313.3774 • www.epri.com

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

Attachment

September 23, 2009
Kevin Hacker
Page 3

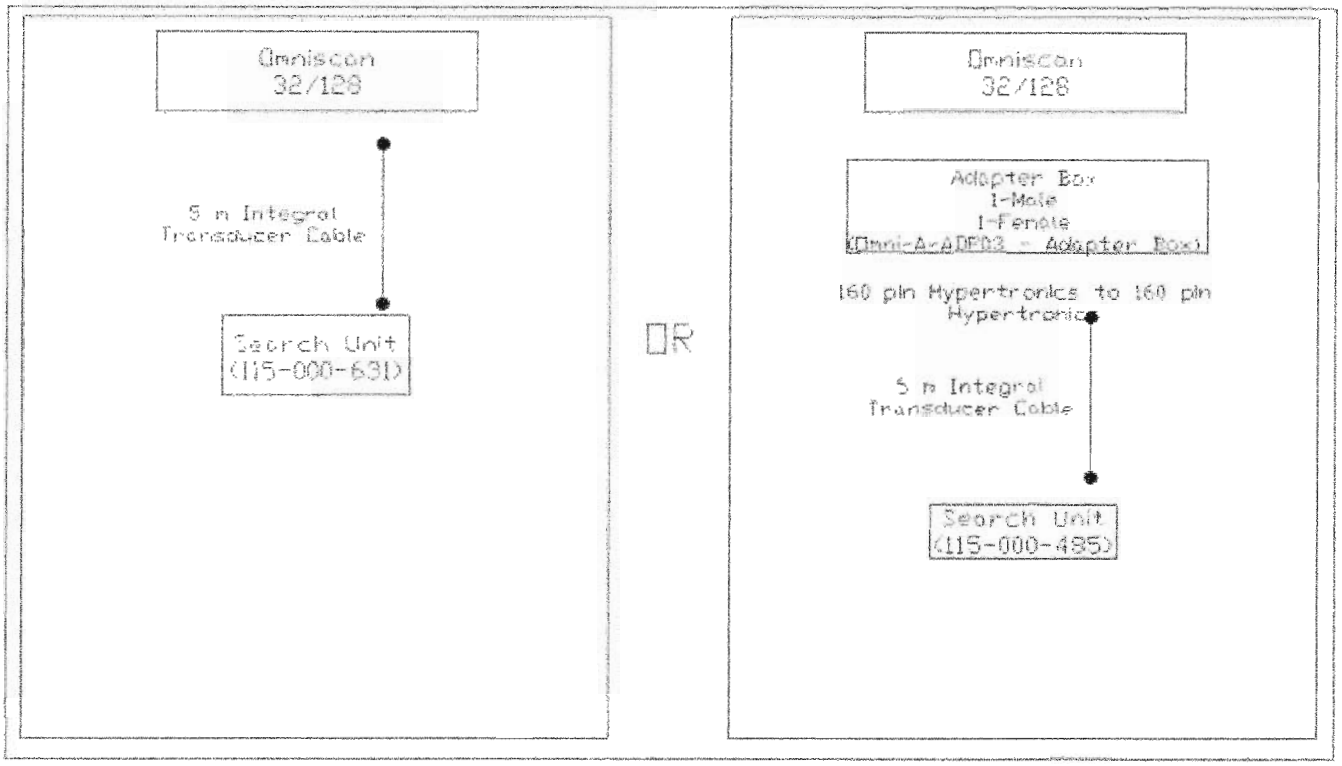


Figure 1. OmniScan 32-128 P/R Cable Diagram for EPRI-WOL-PA-1

Table A. GEIT Wedge Component Applicability

Zone	Weld Number	Location / Description	Wedge Contour Required Wedges	GEIT Axial Wedge Part #	GEIT Circ Wedge Part #
1-07	BPD-C-1017	2" Drain Line Loop 1A	4.125"	360-152-233	360-152-232
1-09	BPD-C-3000	2" Drain line Loop 1B			
1-11	BPD-C-2001	2" Drain line Loop 2A			
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			
1-08	BSI-C-1001	12" Safety Injection 1A	16.75"	360-152-079	360-152-078
1-10	BSI-C-3000	12" Safety Injection 1B			
1-14	BSI-C-4000	12" Safety Injection 2B			
1-05	BPS-C-1001	12" Hot leg Surge Line Loop 1			
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 Part #	Diameter (in)	Scanning Direction	Focal Metal Path (in)	CAL Filename	Weld Overlay Thickness (WOLT) Range
360-152-232	4.125	Circ.	0.5	O32NJDS2232L0085R2M1Z4	WOLT<=0.20in
360-152-233	4.125	Axial	0.5	O32NJDS2233L0085R2M1Z4	WOLT<=0.20in
360-152-232	4.125	Circ.	1.125	O32NJDZ2232L0079R2M1Z4	0.20in < WOLT < 0.75in
360-152-233	4.125	Axial	1.125	O32NJDZ2233L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-234	5.500	Circ.	1.125	O32NJDZ2234L0082R2M1Z4	0.20in < WOLT < 0.75in
360-152-235	5.500	Axial	1.125	O32NJDZ2235L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-078	16.750	Circ.	1.125	O32NJDZ2078L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-079	16.750	Axial	1.125	O32NJDZ2079L0085R2M1Z4	0.20in < WOLT < 0.75in
360-152-078	16.750	Circ.	1.5	O32NJDB2078L0085R2M1Z4	WOLT >= 0.75in
360-152-079	16.750	Axial	1.5	O32NJDB2079L0085R2M1Z4	WOLT >= 0.75in

September 23, 2009
Kevin Hacker
Page 5

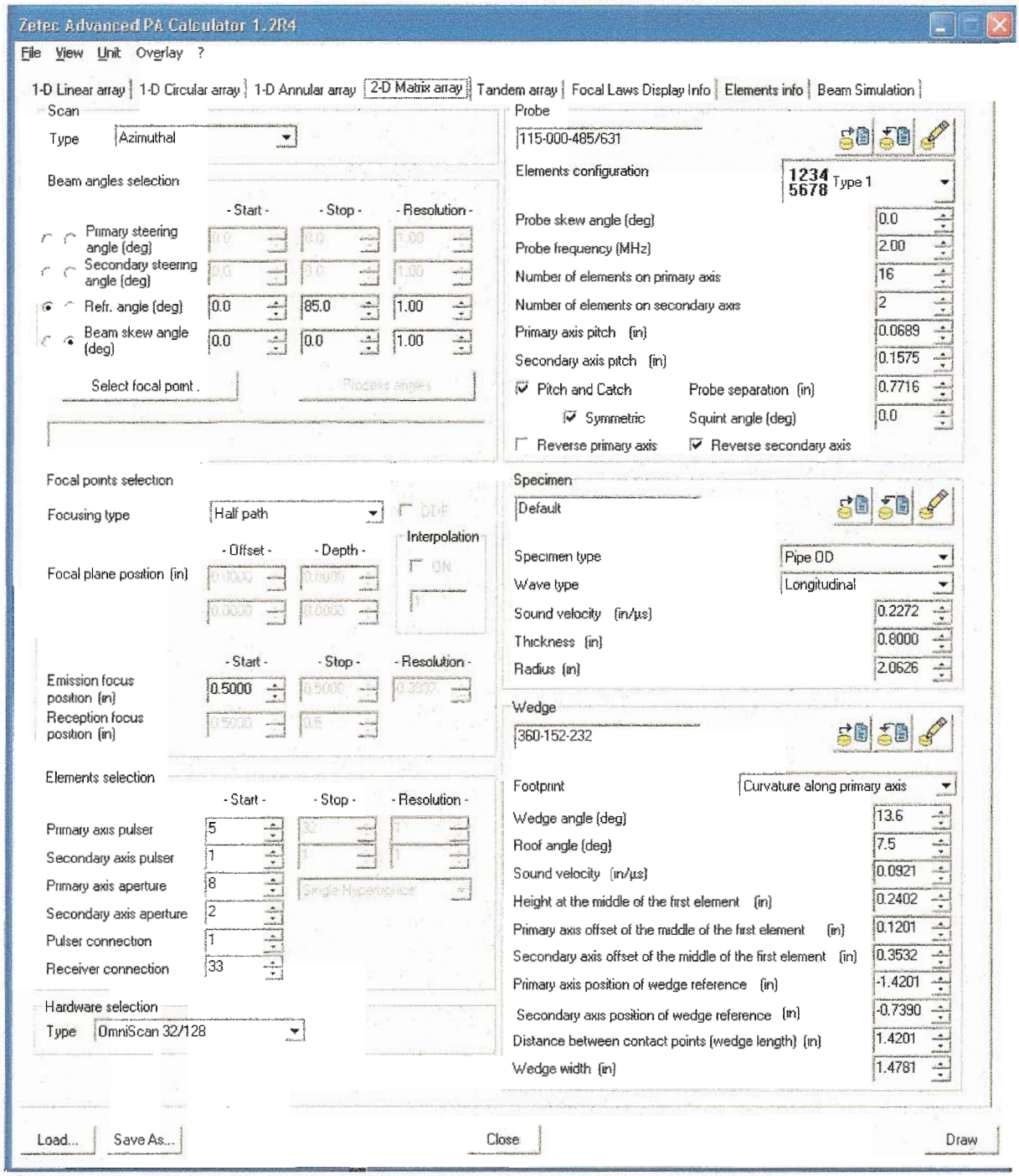


Figure 2.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 0.5

September 23, 2009
Kevin Hacker
Page 6

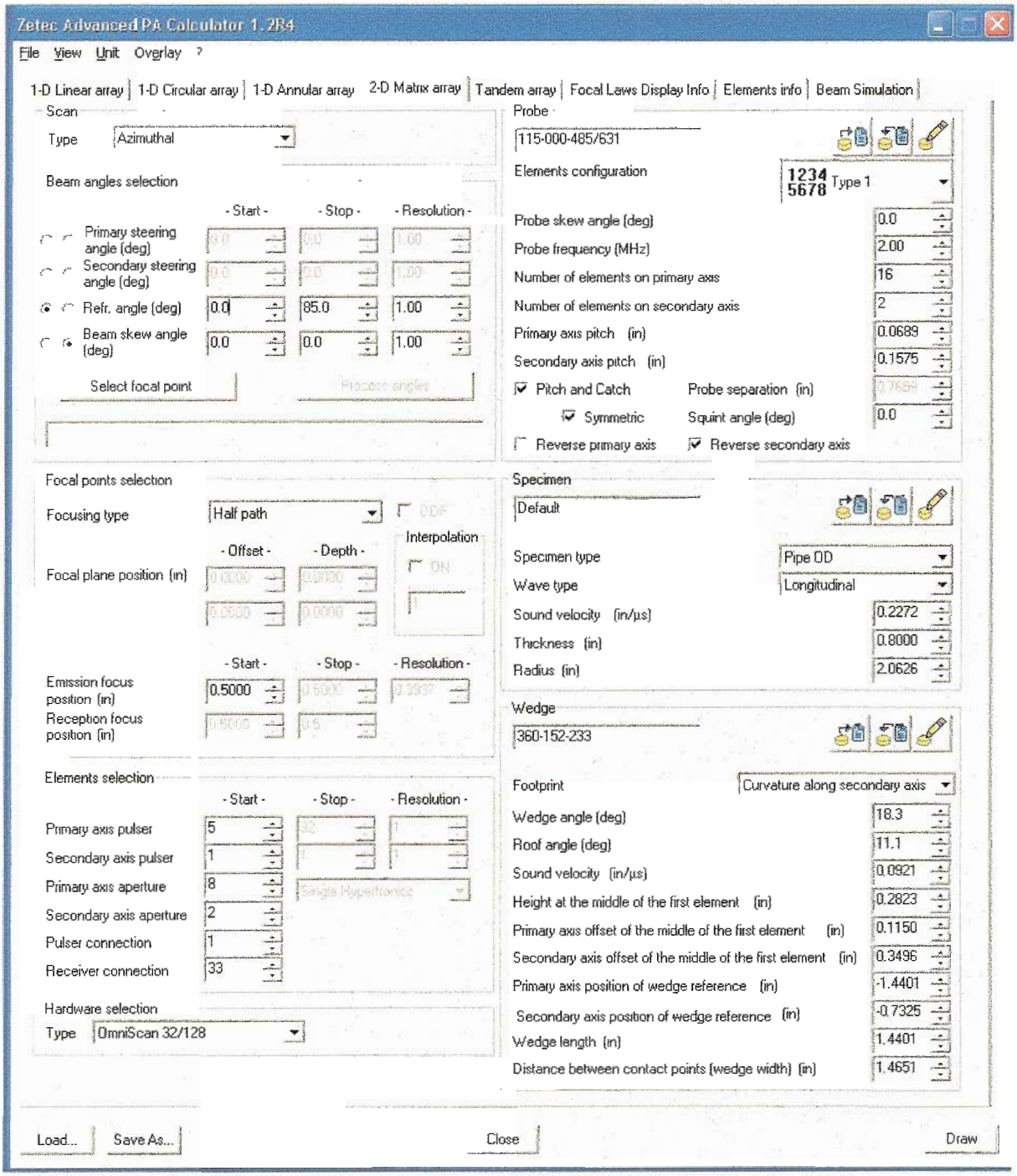


Figure 3.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in) = 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 0.5

September 23, 2009
Kevin Hacker
Page 7

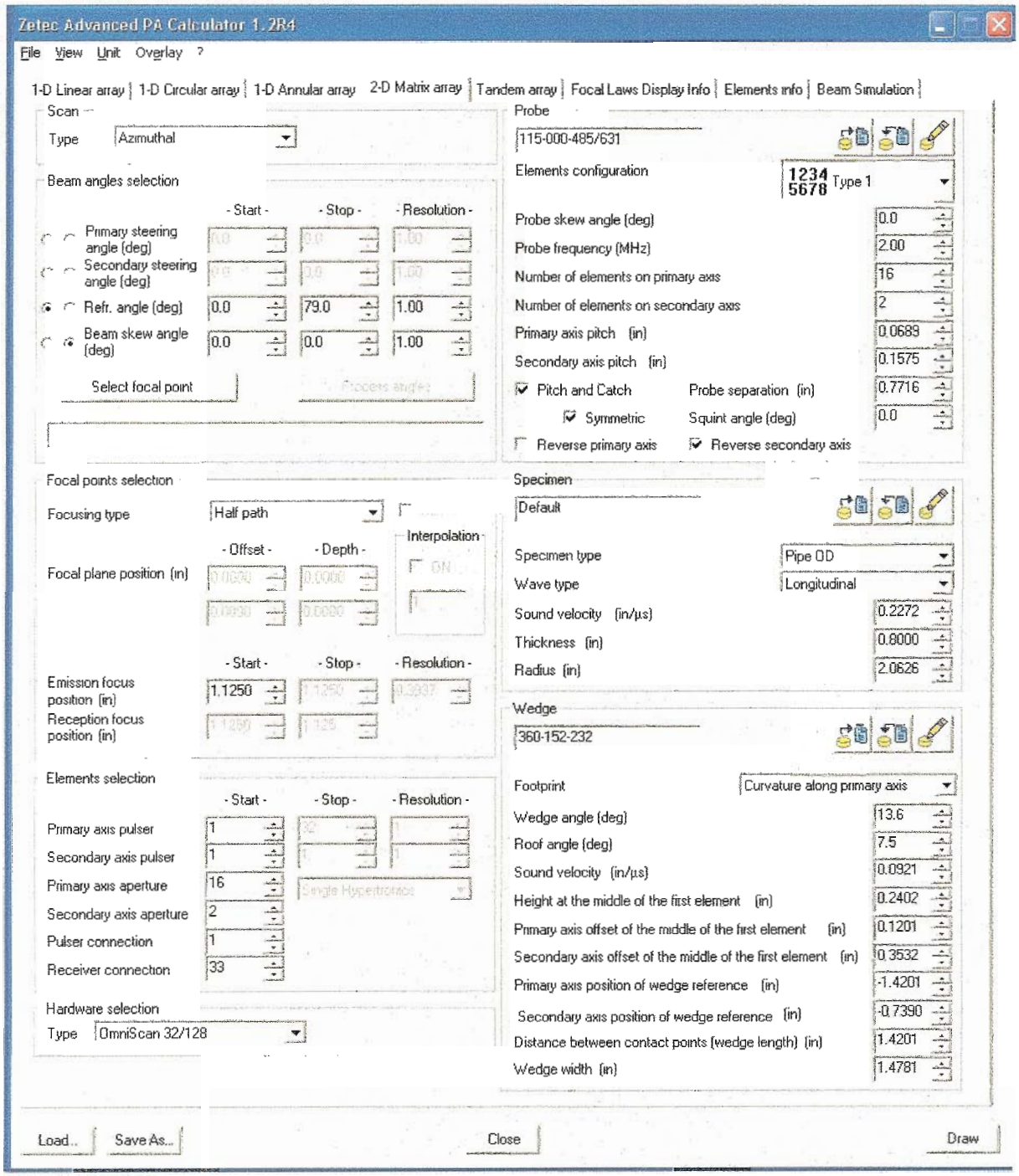


Figure 4.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-232; Diameter (in) = 4.125; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 8

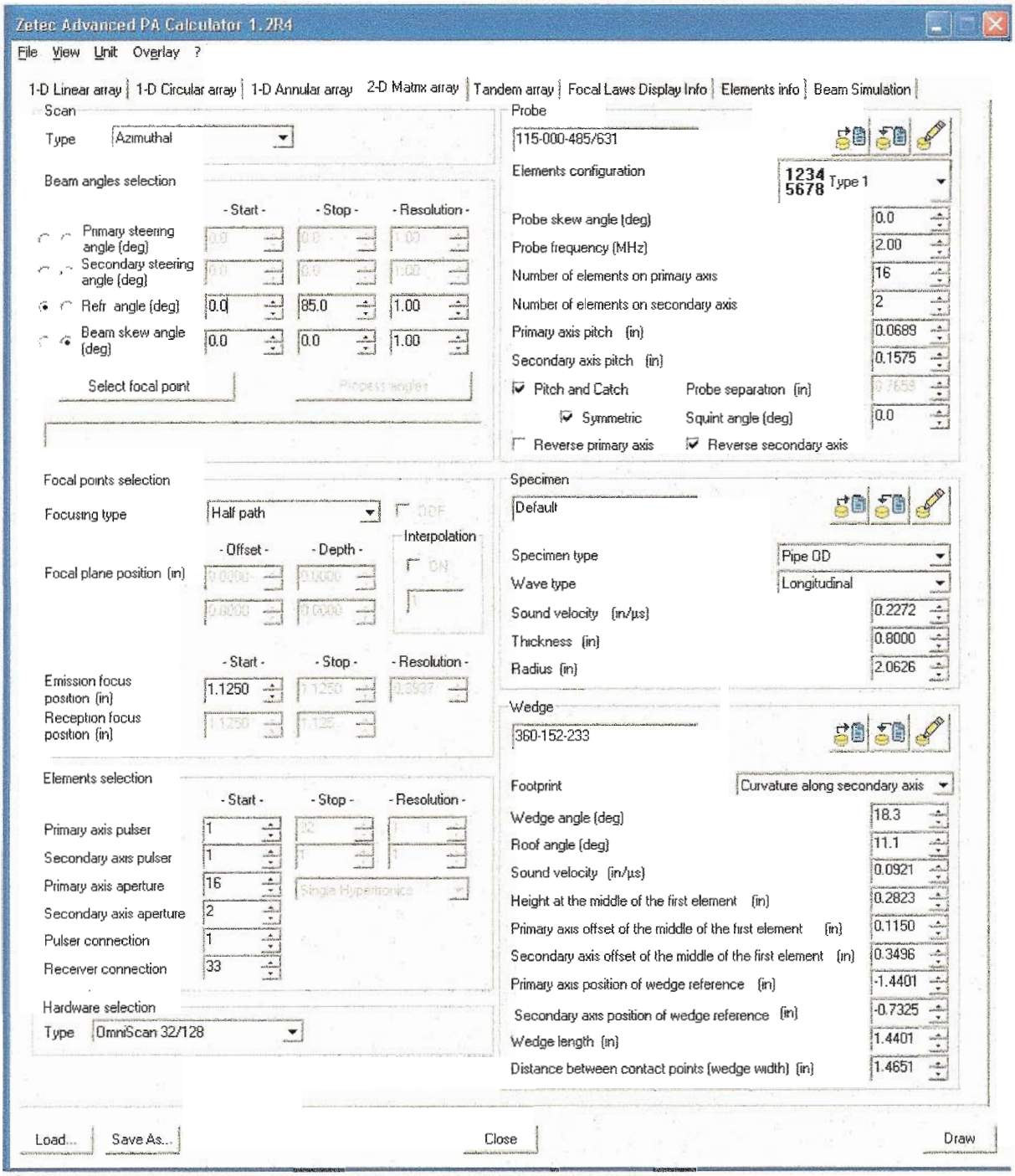


Figure 5.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-233; Diameter (in) = 4.125; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 9

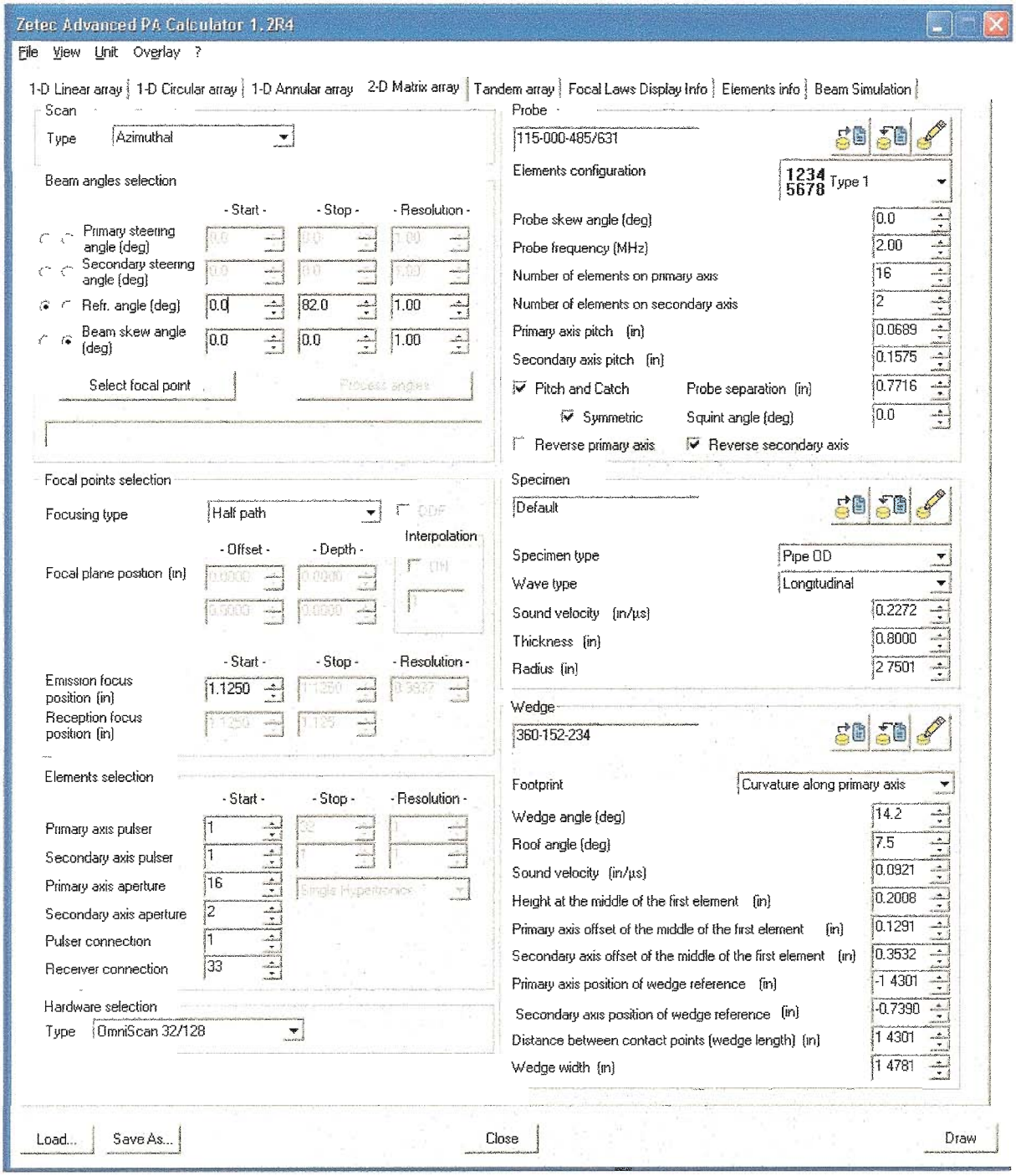


Figure 6.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-234; Diameter (in) = 5.5; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 10

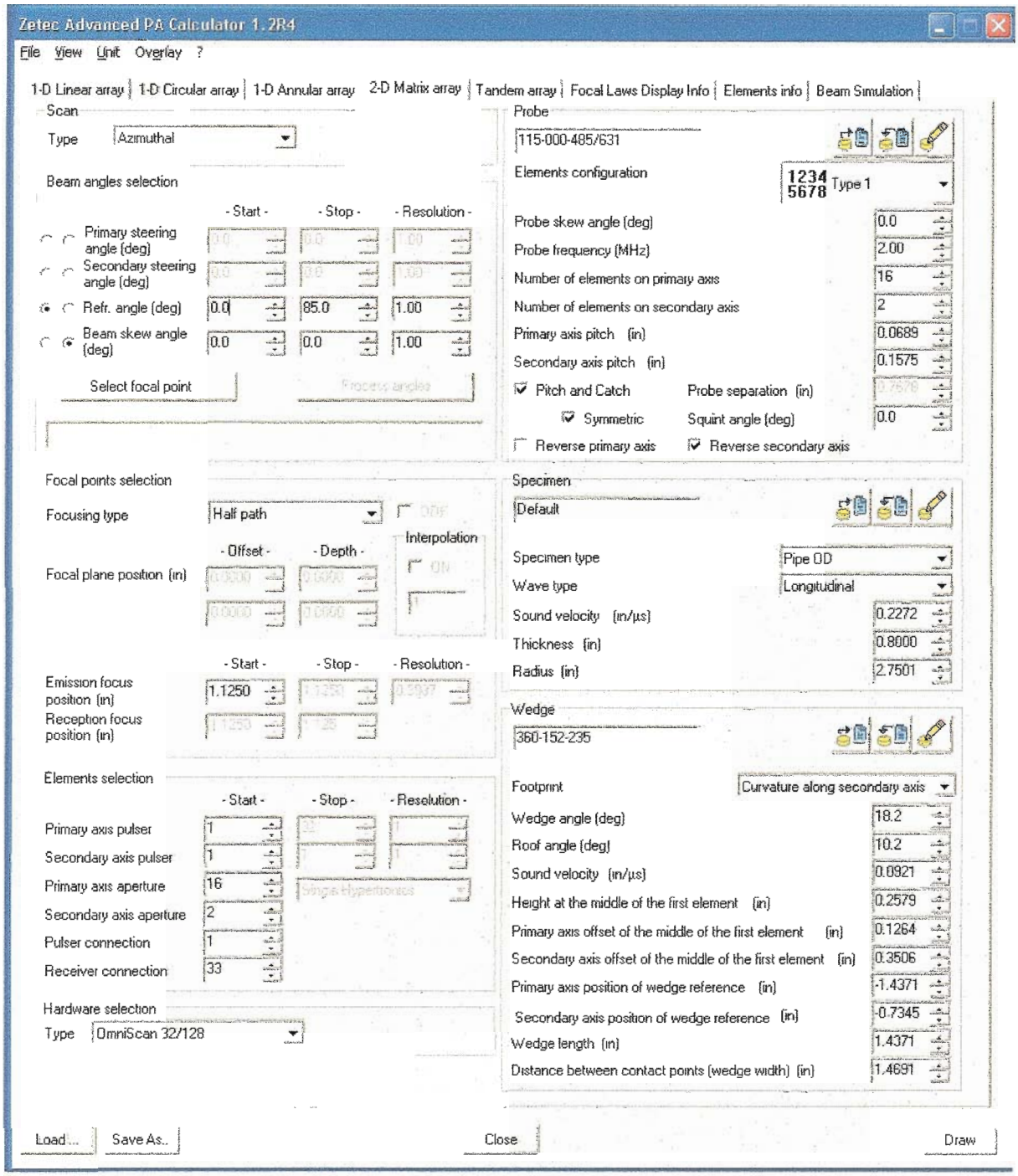


Figure 7.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-235; Diameter (in) = 5.5; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 11

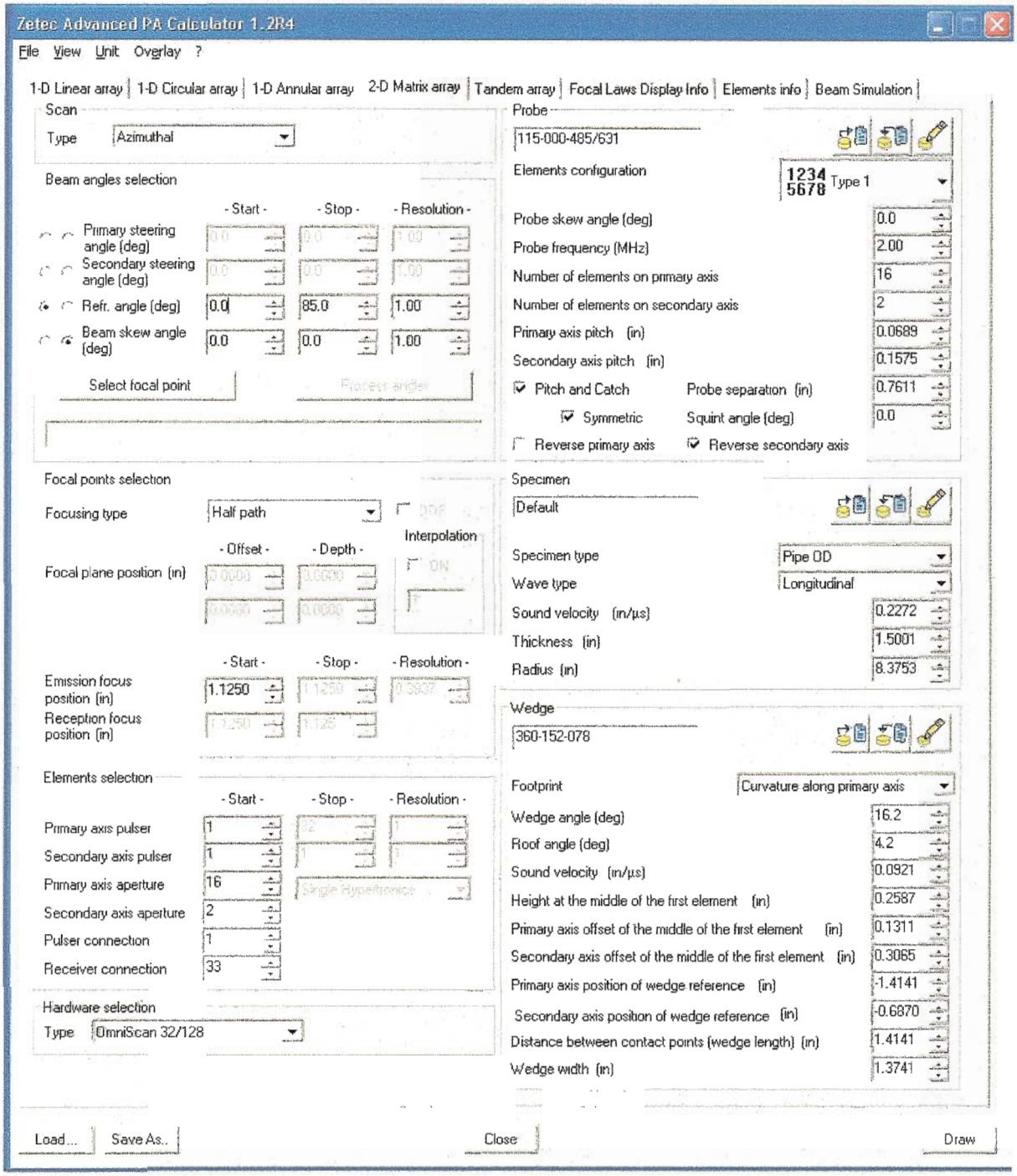


Figure 8.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.125

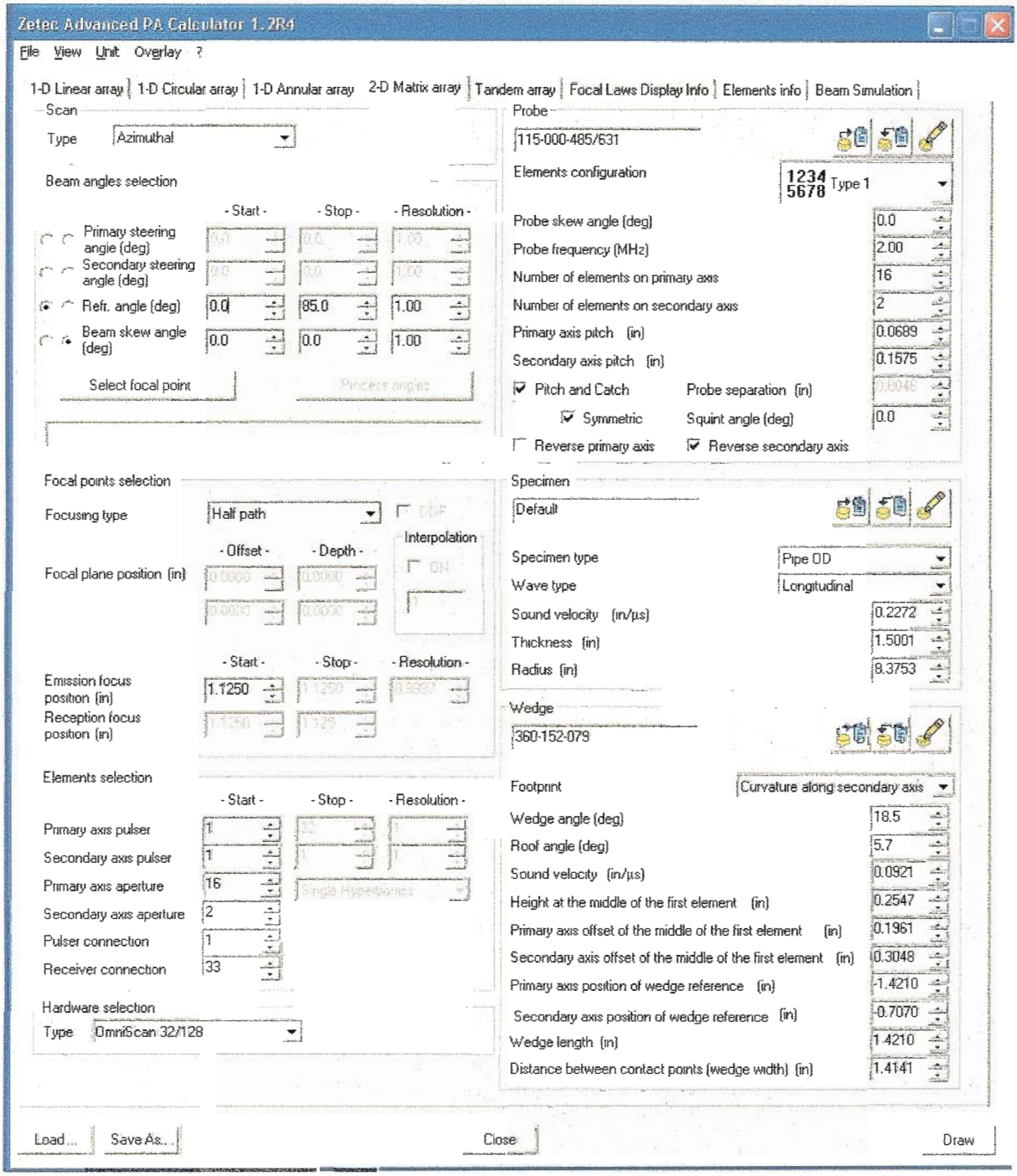


Figure 9.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.125

September 23, 2009
Kevin Hacker
Page 13

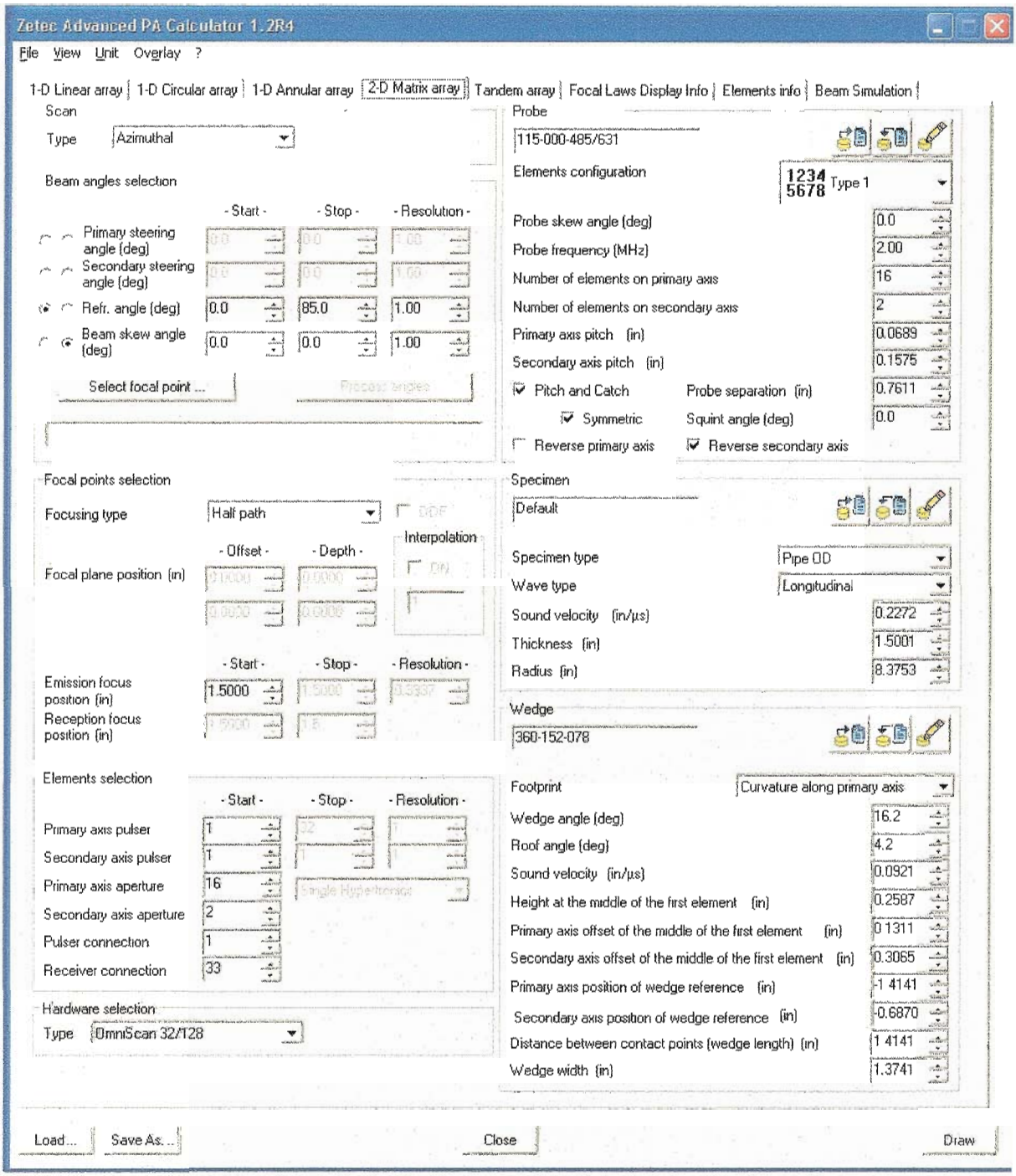


Figure 10.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-078; Diameter (in) = 16.75; Scanning Direction = Circumferential; Focal Metal Path (in) = 1.5

September 23, 2009
Kevin Hacker
Page 14

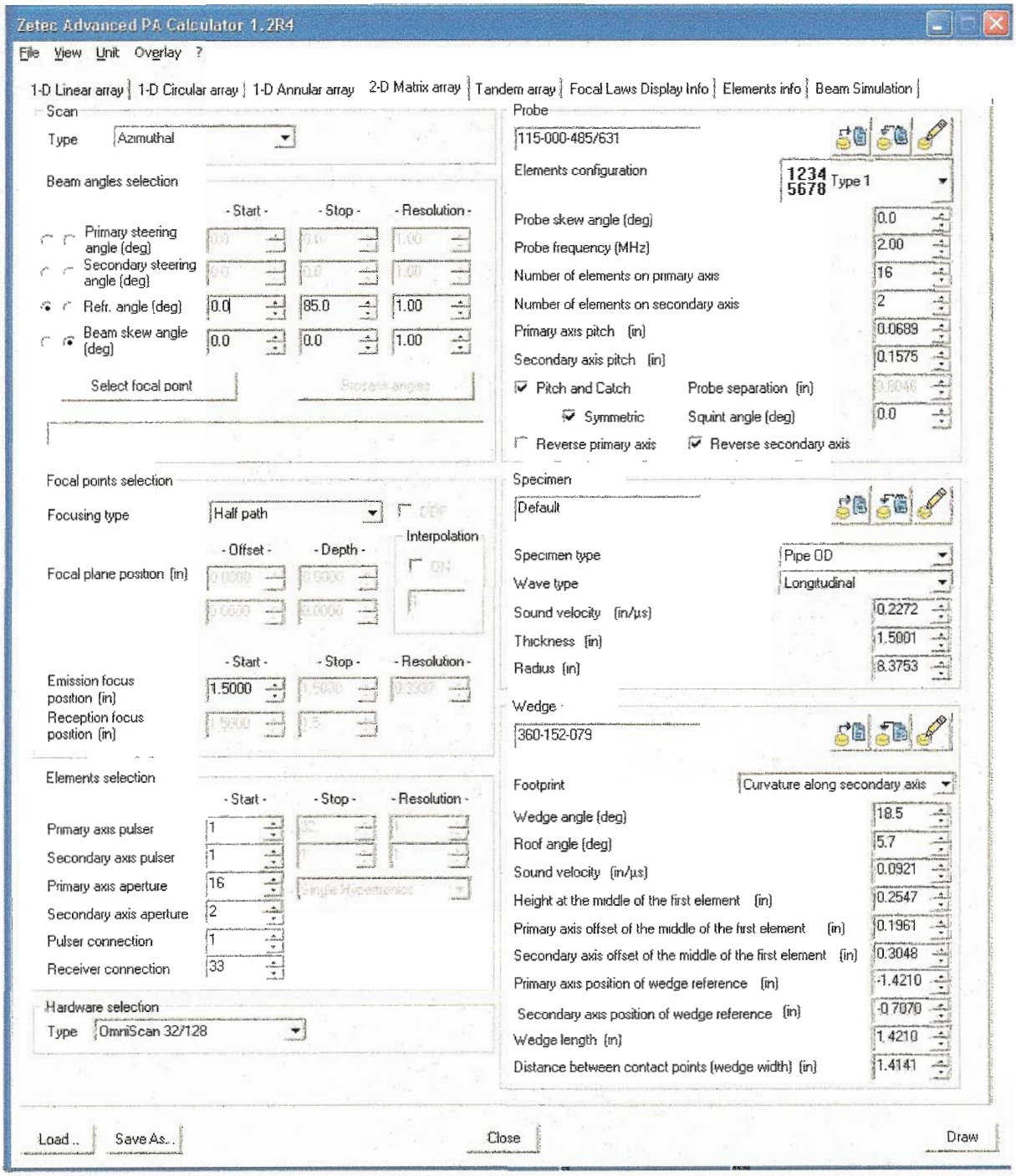


Figure 11.
ZAPAC Input for GEIT Array Part #115-000-485 or 115-000-631; GEIT Wedge Part #360-152-079; Diameter (in) = 16.75; Scanning Direction = Axial; Focal Metal Path (in) = 1.5