TAI services inc.
Eddy Current Testing

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XYZ MMECHANICAL, INC.
1954 S. Cherokee Street
Denver, CO 80223

Report of Flux Leakage Inspection

Eclipse: STEAM BOILER

Serial: 47153

Location: USA SCHOOL
3355 First Steet
SOMEWHERE, US 00002

Inspected: August 10, 2009

Inspected By: JOHN J. SMITH, LEVEL III

Reviewed By: _____
TECHNICAL MANAGER, LEVEL III

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Table of Contents

Vessel Information

Manufacturer	Model	Style	Serial Number	Type
Eclipse	STEAM BOILER	Fire Tube	47153	Boiler

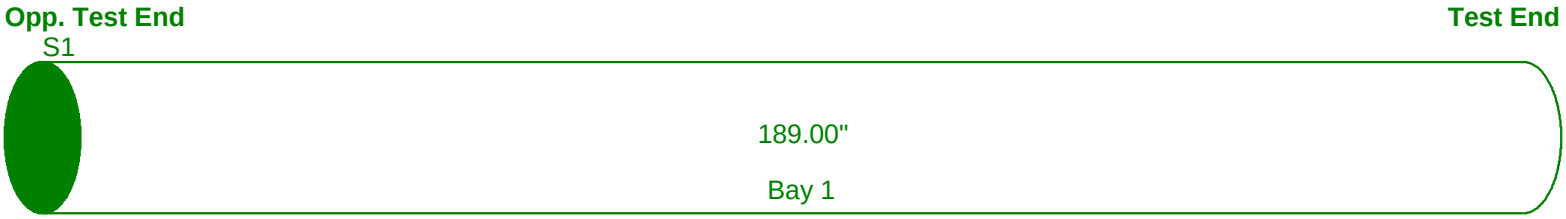
Boiler	
TestEnd	East End
Tube Count	170
Tube Type	Prime Surface
Tube Material	Carbon Steel
OD	3.00
*NWT	.120
#/Type Support	Non-Detectable
Tube Numbering	Left to Right
Row Numbering	Top to Bottom
Tube Length +- 2	189 Inches

Analyst: JOHN J. SMITH, LEVEL III

* Nominal Wall Thickness

Vessel Bay Length Information

Boiler (Length = 189 inches)
S = Intermediate Support

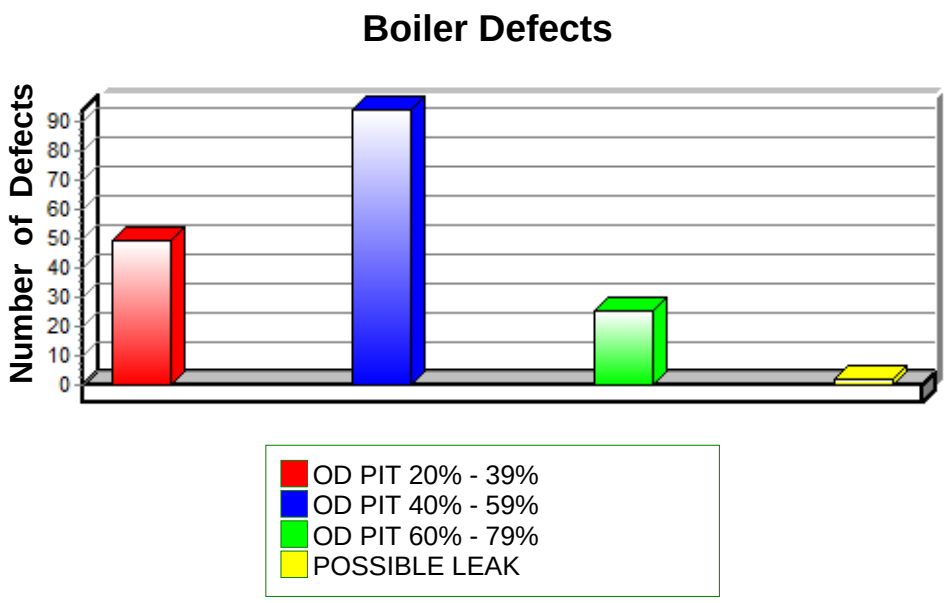


Bay 1	189.00"

Defect Summary/Comparison

Test Date

8/10/2009



Location	Model	Serial Number
USA SCHOOL	STEAM BOILER	47153

Note: The Graph will indicate a Comparison Analysis when the unit has been previously tested by TAI Services.

Summary of Inspection

Boiler: 170 Tubes		
Significant/Measurable Indications	Number of Tubes Tested	Percent of Bundle
OD PIT 20% - 39%	49	28.82
OD PIT 40% - 59%*	94	55.29
OD PIT 60% - 79%*	25	14.71
POSSIBLE LEAK*	2	1.18
Totals	**170**	**100.00**

* REQUIRES ACTION

A visual inspection was done on the welds at the tube sheet. Some were loose and had a gap between the weld and the tube sheet. The manhole cover on top was removed to inspect the outside of the tubes. Deposits were seen on the outside of the tubes. These deposits are believed to be O.D. oxidation which is causing the build up on the O.D of the tubes. The boiler is a backup and only gets used a few times a year.

Recommendations

A Magnetic Flux Leakage inspection was performed on the tubes in this vessel. This type inspection involves locally magnetizing the tube under inspection. Discontinuities in the tube wall and general wall thinning alter the magnetic field flowing through the tube wall. Changes in the magnetic field produce responses which are compared to notches and grooves milled into a Calibration Reference Standard of the same nominal dimension, material, and product form. It should be noted that the responses are relative to the volume of the discontinuity in question. Responses caused by natural discontinuities can differ from those caused by artificial discontinuities of the same depth. Also, damage located at or near the tube ends may not be detectable. If a leak is suspected, we recommend a pressure test be performed on this unit prior to placing this unit back in service. Also, if foreign material is present in the tubes, it can obscure or be interpreted as tube damage

The following repair actions are suggested after removing sample tubes to confirm the inspection results.

BOILER:

We recommend tubes indicating OD Pits of 40% or more be isolated from the system at this time. Tubes indicating OD Pits of less than 40% require no corrective action but should be monitored for defect growth.

We recommend tubes marked for leaks be isolated from the system at this time.

To insure against tube leaks that may have been undetectable, we recommend a pressure test be performed on the tubes in this bundle. If leaking tubes are found, we recommend they be isolated from the system prior to placing the unit back in service.

SUMMARY:

We recommend that a follow-up inspection be performed after 1 year of operation. A copy of this report should be retained in your files to be used for comparison at that time.

If you should have any questions concerning this report, or if we may be of further assistance, please feel free to call upon us.

Data Sheet

Location	Model	Serial Number	Date
USA SCHOOL	STEAM BOILER	47153	August 10, 2009
3355 First Steet			
SOMEWHERE, US 00002			

Row	Tube	Description	Area	Action Req.
SET UP CALIBRATE & STARTED				
BOILER 10/21/2011 08:26 am				
1	1	OD PIT 40% - 59%	B01	✓
1	2	OD PIT 20% - 39%	B01	
1	3	OD PIT 20% - 39%	B01	
1	4	OD PIT 40% - 59%	B01	✓
1	5	OD PIT 20% - 39%	B01	
1	6	OD PIT 40% - 59%	B01	✓
1	7	OD PIT 40% - 59%	B01	✓
1	8	OD PIT 40% - 59%	B01	✓
1	9	OD PIT 40% - 59%	B01	✓
1	10	OD PIT 40% - 59%	B01	✓
1	11	OD PIT 20% - 39%	B01	
1	12	OD PIT 20% - 39%	B01	
1	13	OD PIT 20% - 39%	B01	
1	14	OD PIT 20% - 39%	B01	
1	15	OD PIT 20% - 39%	B01	
1	16	OD PIT 20% - 39%	B01	
2	1	OD PIT 40% - 59%	B01	✓
2	2	OD PIT 40% - 59%	B01	✓
2	3	OD PIT 40% - 59%	B01	✓

Row	Tube	Description	Area	Action Req.
11	8	OD PIT 40% - 59%	B01	✓
11	9	OD PIT 60% - 79%	B01	✓
11	10	OD PIT 60% - 79%	B01	✓
12	1	OD PIT 40% - 59%	B01	✓
12	2	OD PIT 40% - 59%	B01	✓
12	3	OD PIT 40% - 59%	B01	✓
12	4	OD PIT 40% - 59%	B01	✓
12	5	OD PIT 40% - 59%	B01	✓
12	6	OD PIT 40% - 59%	B01	✓
12	7	OD PIT 40% - 59%	B01	✓
12	8	OD PIT 40% - 59%	B01	✓
13	1	OD PIT 60% - 79%	B01	✓
13	2	POSSIBLE LEAK	B01	✓
13	3	OD PIT 60% - 79%	B01	✓
13	4	OD PIT 60% - 79%	B01	✓
14	1	OD PIT 40% - 59%	B01	✓
14	2	OD PIT 40% - 59%	B01	✓
14	3	OD PIT 60% - 79%	B01	✓
14	4	OD PIT 20% - 39%	B01	
15	1	OD PIT 60% - 79%	B01	✓
15	2	OD PIT 60% - 79%	B01	✓
CALIBRATION CHECK & COMPLETED				
BOILER 10/21/2011 02:28 pm				

Boiler Section

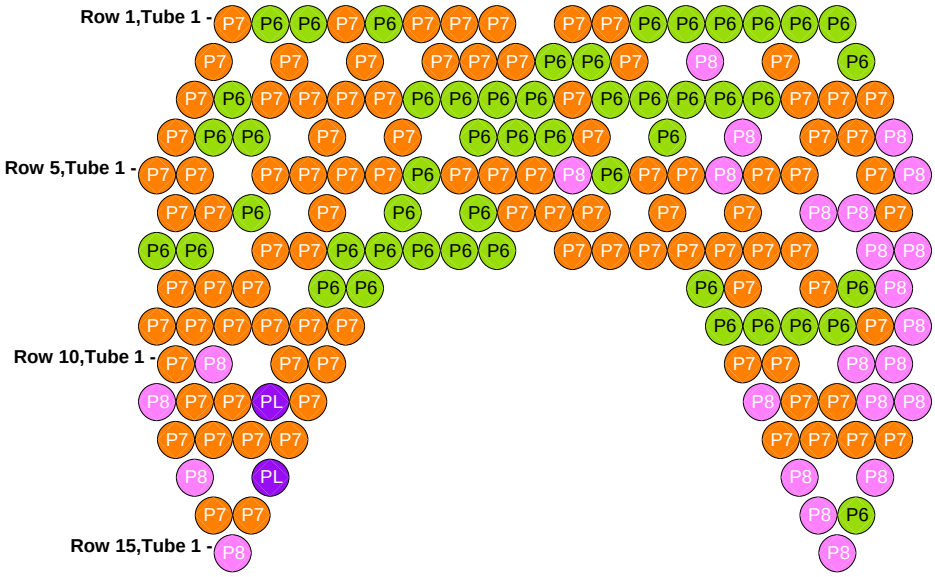
S/N 47153

East End

Tubes Numbered
Left to Right

Rows Numbered
Top to Bottom

Top of Vessel



P6	= OD PIT 20% - 39%	
P7	= OD PIT 40% - 59%	REQUIRES ACTION
P8	= OD PIT 60% - 79%	REQUIRES ACTION
PL	= POSSIBLE LEAK	REQUIRES ACTION

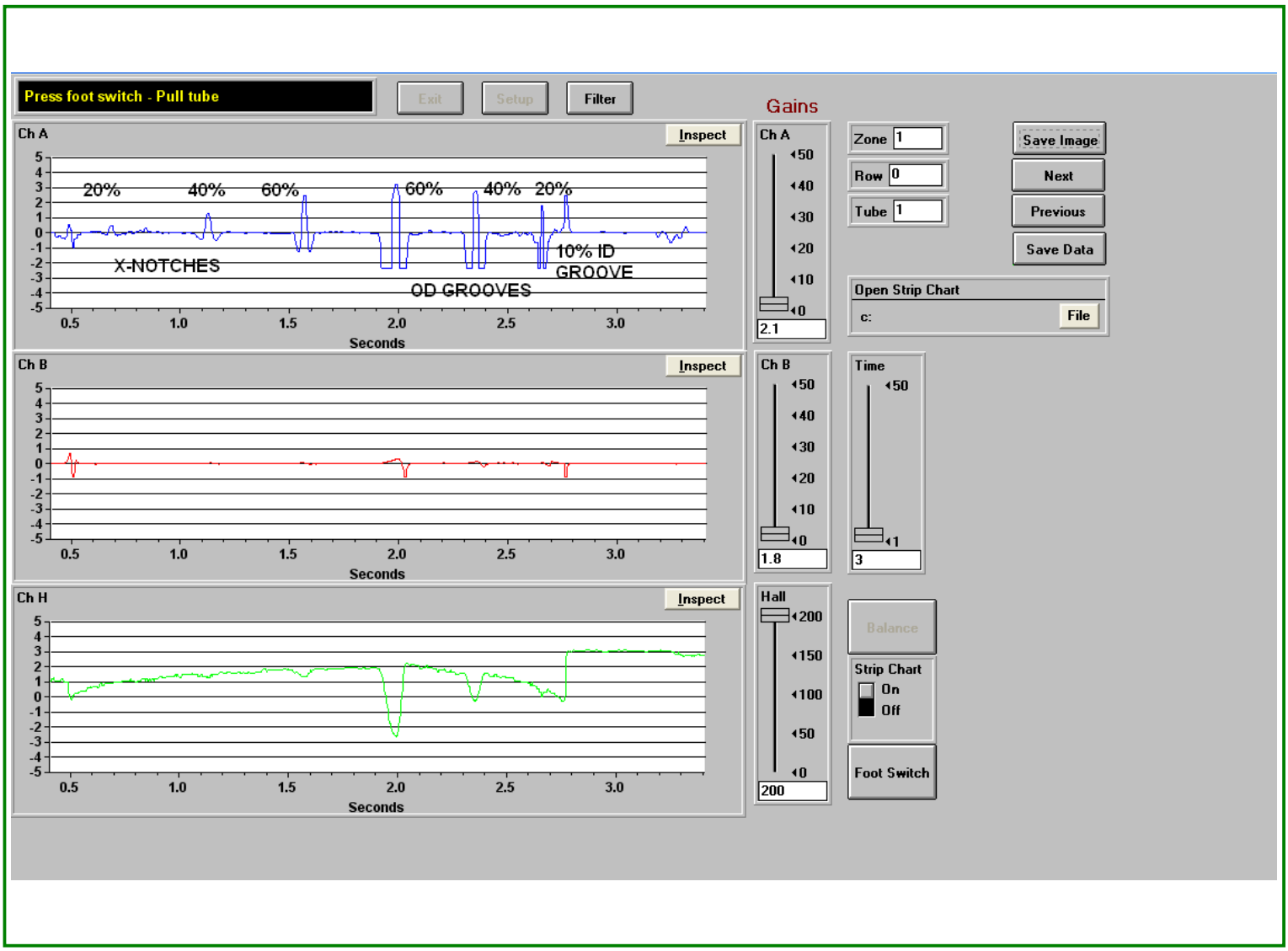
Test Instrument Used
Highline Automation, EC14

S/N 47153

Calibration Page

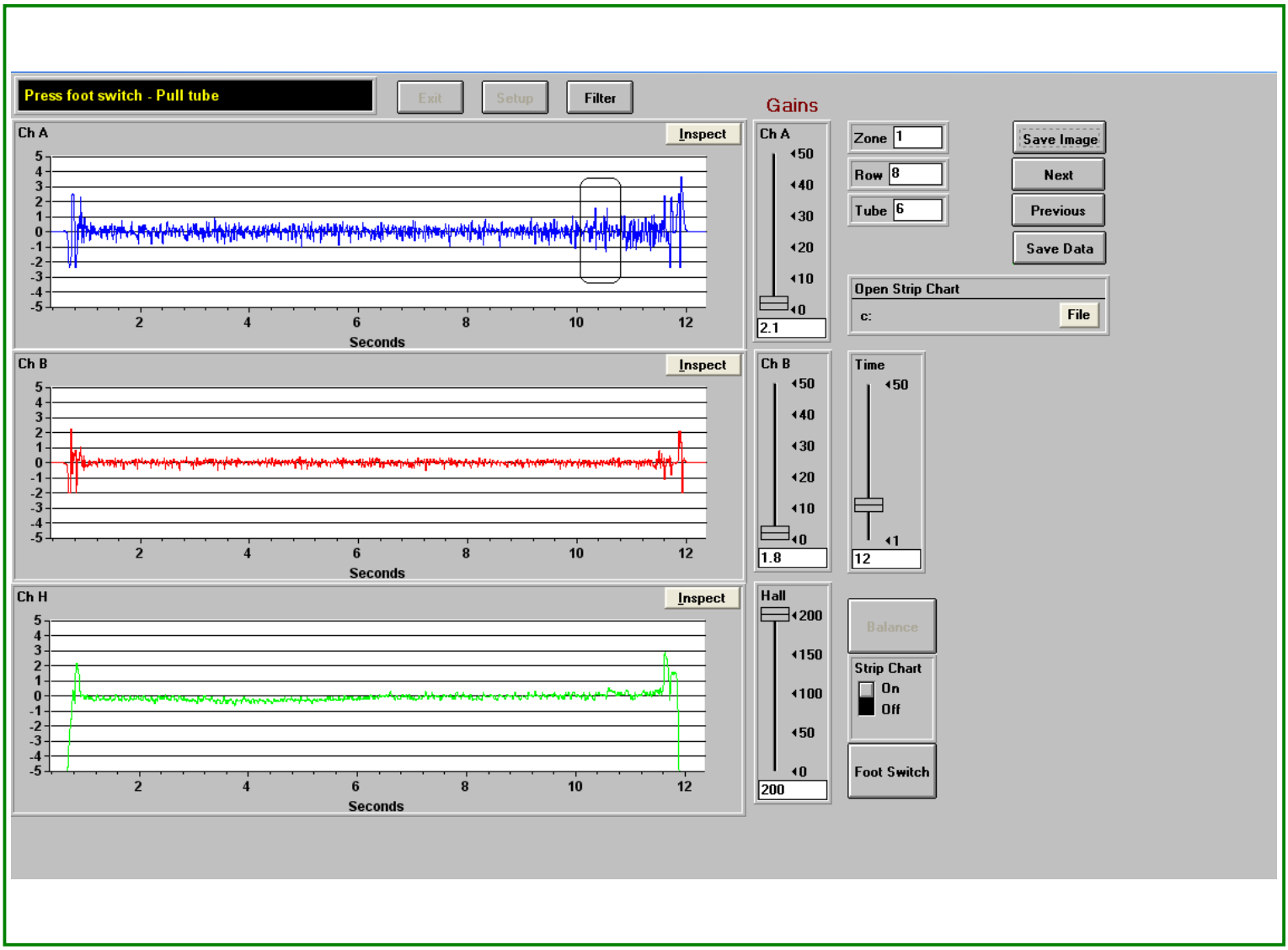
Tube Type	Material	Nom Wall Thick	OD	Test Type
Prime Surface	Carbon Steel	.120	3.00	MAG FLUX

Boiler



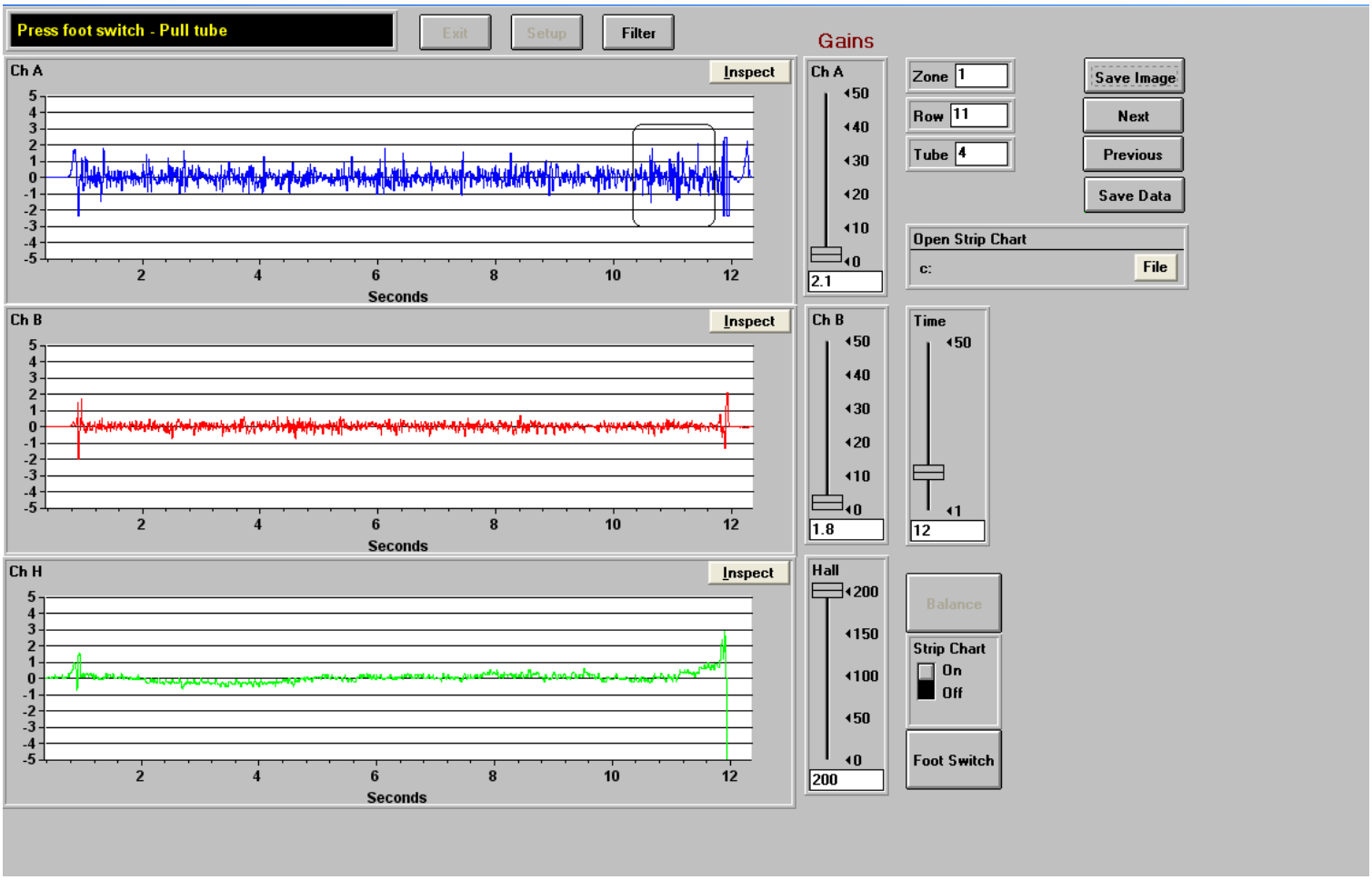
Note: Defects are compared to machined standards.
Actual Defect Geometry may differ.

Boiler Section



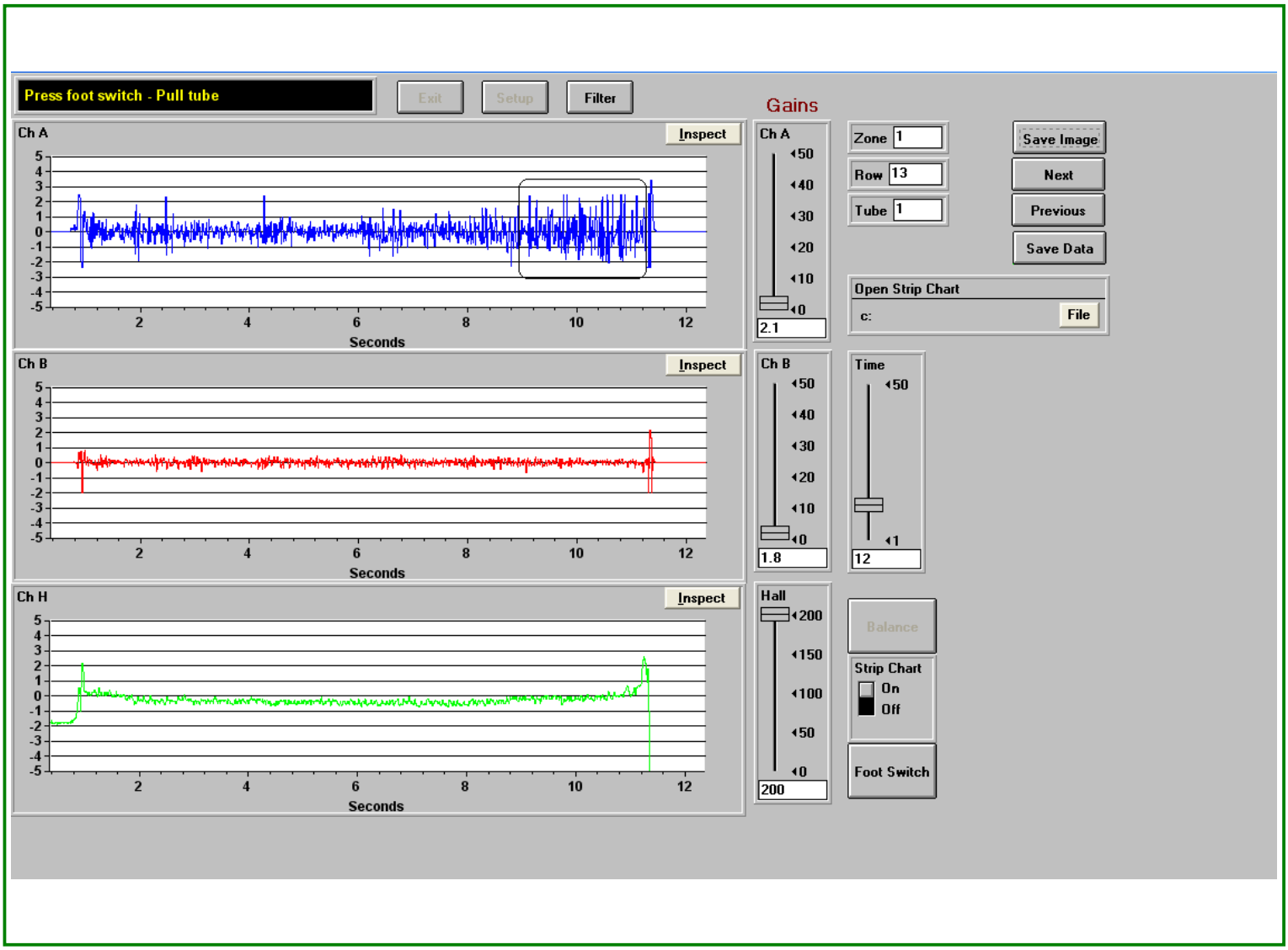
OD PIT 20% - 39% (Row 8 Tube 6)

Boiler Section



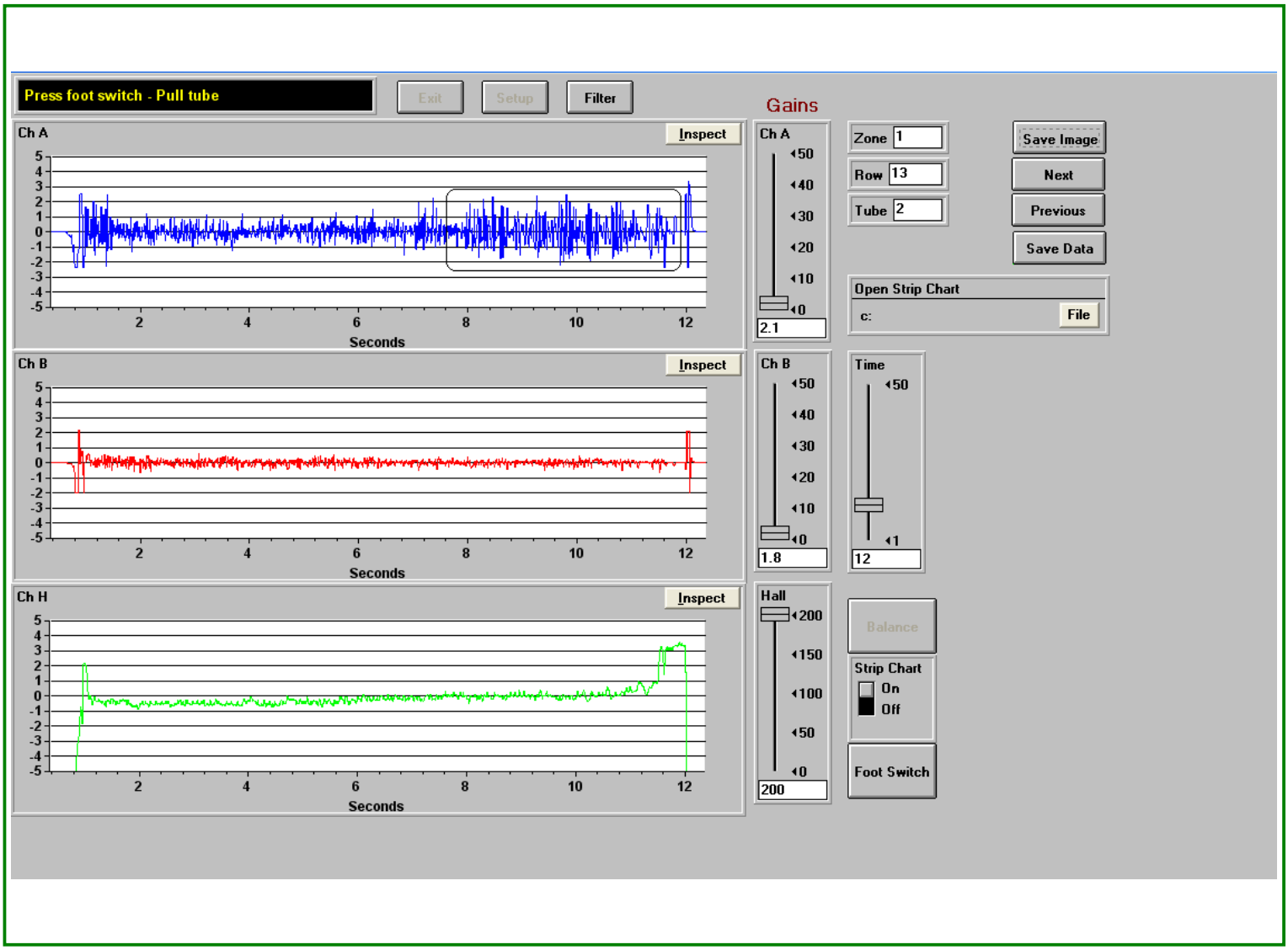
POSSIBLE LEAK (Row 11 Tube 4)

Boiler Section



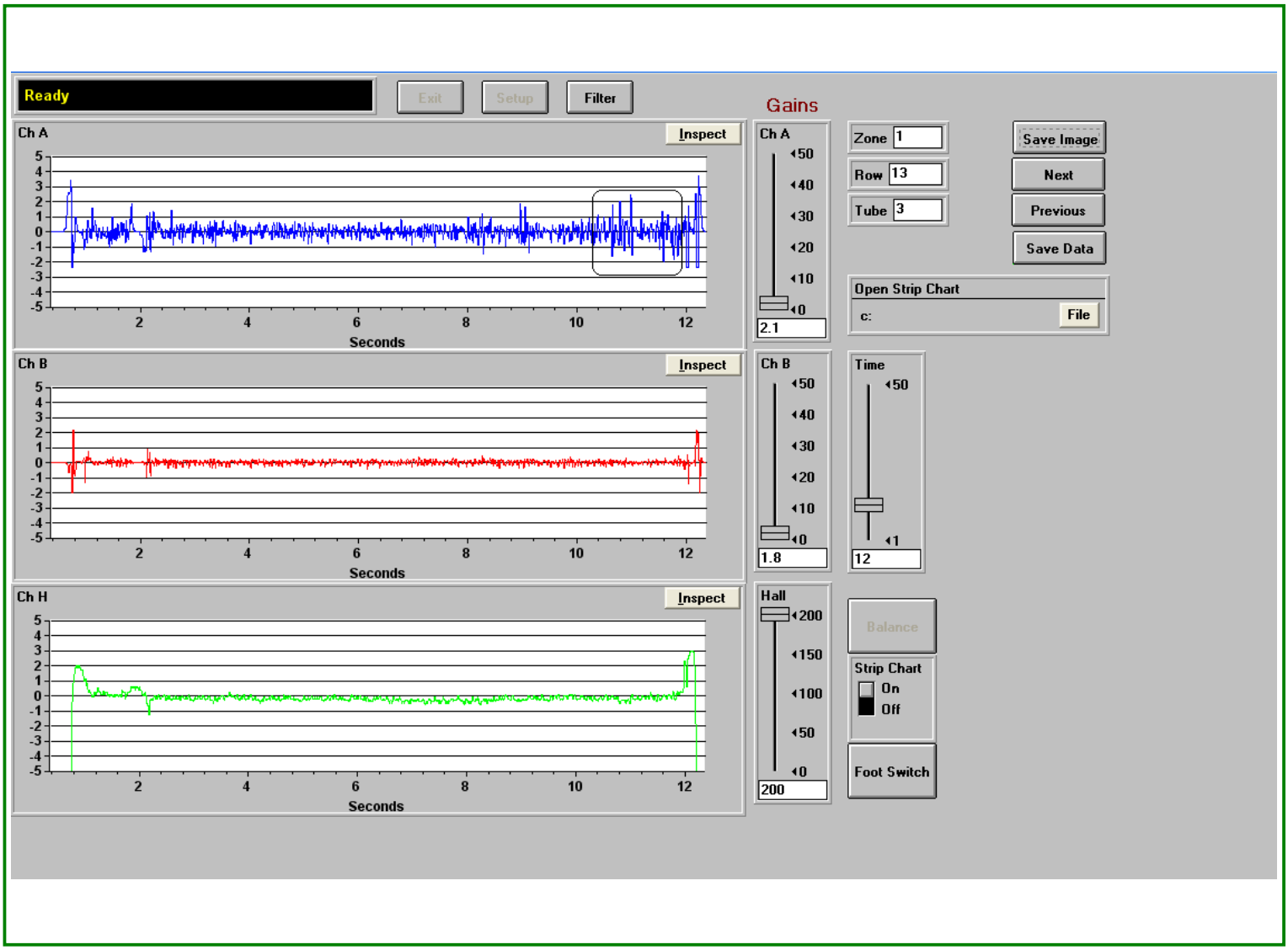
OD PIT 60% - 79% (Row 13 Tube 1)

Boiler Section



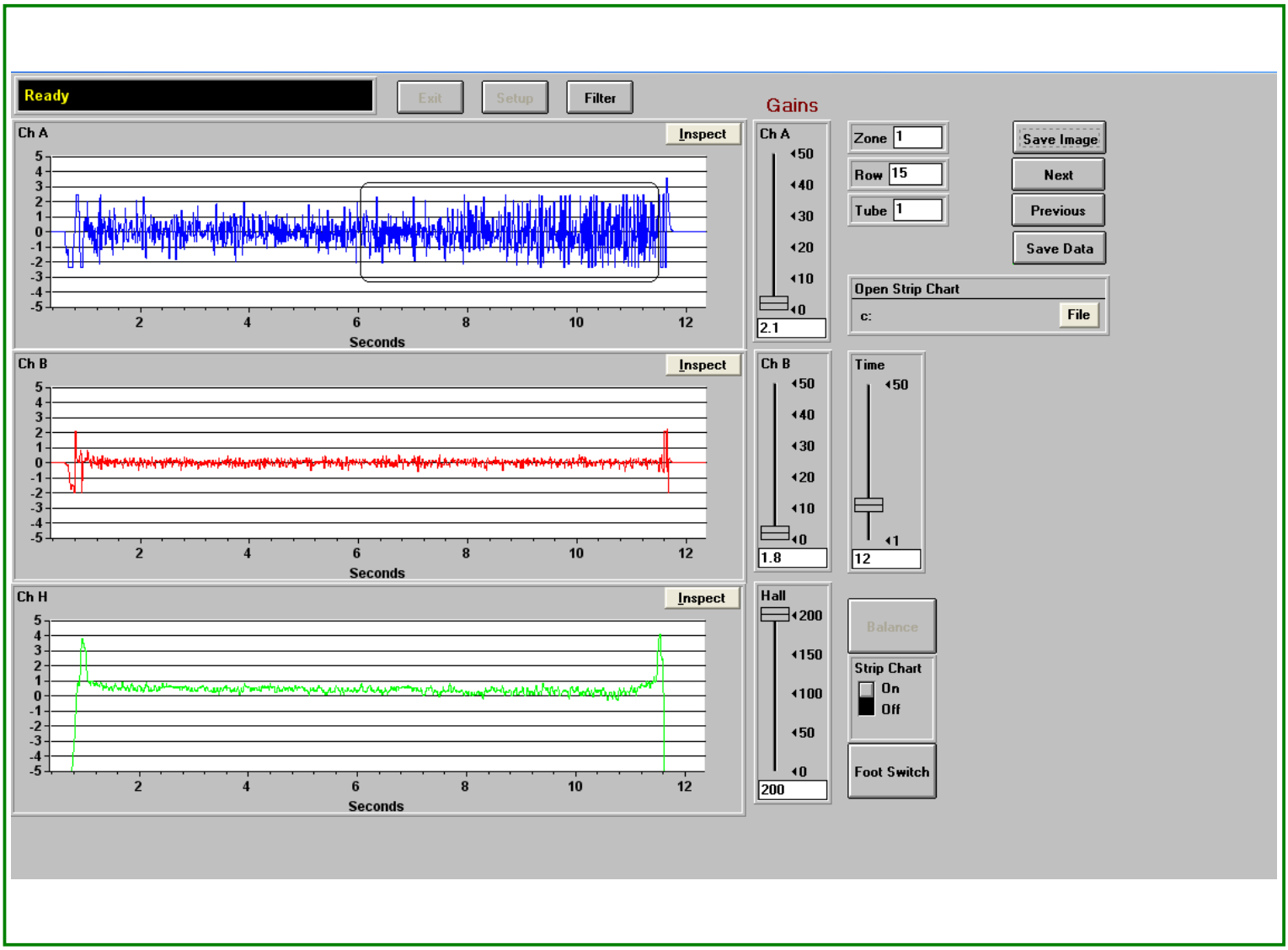
POSSIBLE LEAK (Row 13 Tube 2)

Boiler Section



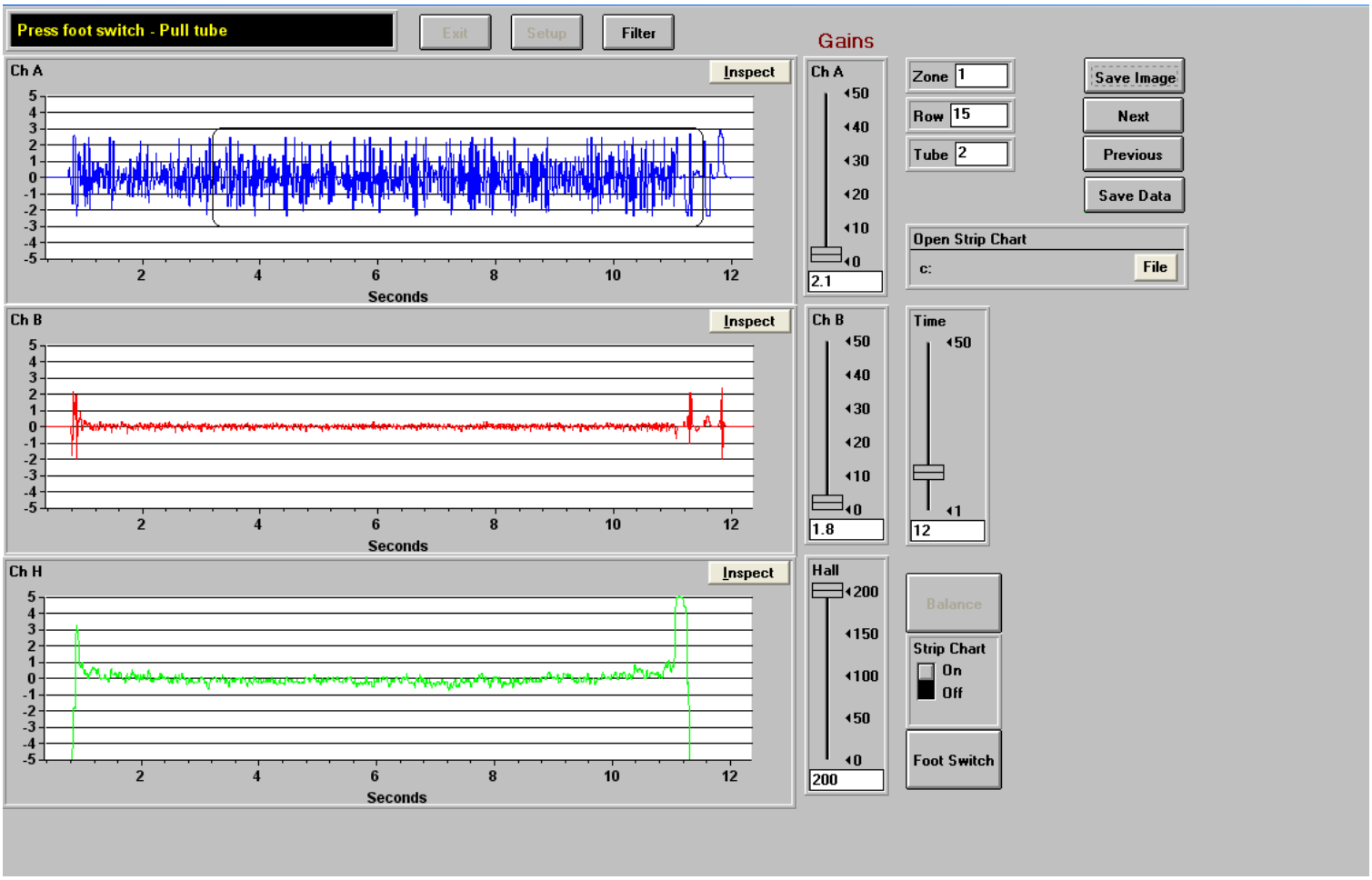
OD PIT 60% - 79% (Row 13 Tube 3)

Boiler Section



OD PIT 60% - 79% (Row 15 Tube 1)

Boiler Section



OD PIT 60% - 79% (Row 15 Tube 2)

Calibration Procedure

A calibration procedure is performed prior to each inspection. Calibration Procedures are repeated every 2 hours, or whenever improper operation of the test instrument is suspected. The calibration procedure is performed using a Calibration Reference Standard of the same nominal diameter, composition, wall-thickness and tube type being inspected.

The sensitivity of Channel A is adjusted to produce a one division response for the 40% OD Flat Bottom hole or notch milled into the Calibration Reference Standard. This establishes the response to the ID Groove on channel A. The sensitivity of Channel B is adjusted to match the ID Groove response on Channel A. The sensitivity of the Hall Channel is set to produce a 4 division Response for the 40% OD Groove. The degree of response may be modified as necessary to accommodate special needs.

Calibration Reference Standard

A Calibration Reference Standard used to establish system response. Artificial discontinuities are milled into the Calibration Reference Standard to simulate the types of damage typically found. The type and number of artificial and/or natural discontinuities may vary depending upon inspection criteria.

Inspection Procedure

One hundred percent (100%) of the tubes in a vessel are inspected unless otherwise specified in the purchase order. The full length of each tube is inspected by retracting the inspection probe at a constant rate to produce a strip chart. The strip chart is then evaluated for discontinuities. If discontinuities are detected, the tube will be identified in the final report. Tubes that do not show discontinuities are not identified. Sample strip charts of the damage detected, along with strip charts of good tubes are included in the final report. Not all tubes are recorded.

Channel A is displayed in Green and is used to detect sharp discontinuities such as cracks and pitting on the inside, the outside, and throughout the tube wall. Channel B, displayed in Red, is used to detect sharp discontinuities such as cracks and pitting. This channel is primarily sensitive to damage on the inside of the tube and is used to determine defect origin. The Hall Channel, displayed in Blue, is sensitive to large volume and gradual defects such as erosion both on the inside and outside diameter of the tube. This channel is also sensitive to dimensional changes such as freeze bulges.

Explanation of Abbreviations

Abbreviation	Explanation
ABN IND	Abnormal Indication
B	Bay
FB	Freeze Bulge
FBH	Flat Bottom Hole
FM	Foreign Material
ID	Internal Diameter
ID CORROSION	Internal Diameter, Corrosion
ID DEPOSIT	Internal Diameter, Deposit
ID PIT	Internal Diameter, Pit
IDML	Internal Diameter, Metal Loss
IE	Internally Enhanced
OD	Outside Diameter
ODML	Outside Diameter, Metal Loss
ODML@S	Outside Diameter Metal Loss at Support
OD DEPOSIT	Outside Diameter, Deposit
PLF	Possible Longitudinal Flaw
PRF	Possible Radial Flaw
PSC	Possible Stress Corrosion
S	Support
WAS	Wear at Support
>	Greater Than
<	Less Than
OTE	Opposite Test End
TE	Test End