



JOHNSON CONTROLS - BRANCH 260
812 First State Blvd
Delmarva Branch N28
Wilmington, DE 19804
(302)996-0275

Report of Eddy Current Inspection

Manufacturer: York

Model: OTT4G2-ZBES

Serial: GACM117864 #8

Location: DUPONT EXPERIMENTAL STATION
ROUTE 141 BETWEEN RTE.202 & 52
WILMINGTON, DE 19880

Inspected: November 29, 2007-November 30, 2007

Inspected By: TYLER J. KRIVAN, LEVEL II
TAI Services, Inc.

Reviewed By: 
TECHNICAL MANAGER, LEVEL III

Table of Contents

Section A	Inspection Report
Part I	Vessel Information
Part II	Summary of Inspection
Part III	Defect Summary
Part IV	Recommendations
Part V	Data Sheets
Part VI	Tube Chart Layout
Part VII	Tube Strip Charts
Section B	Calibration Settings and Graphs
	Calibration Procedures
Section C	Explanation of Abbreviations

Vessel Information

Manufacturer	Model	Style	Serial Number	Type
York	OTT4G2-ZBES	Hermetic	GACM117864 #8	Centrifugal

Condenser	
TestEnd	Inlet End
Tube Count	883
Tube Type	Skip Fin IE
Tube Material	Copper
OD	.750
*NWT/Under Fins	.028
*NWT/Bell/Land	.055
#/Type Support	4 Mild Steel
Tube Numbering	Left to Right
Row Numbering	Top to Bottom
Tube Length +/- 2	180 Inches

Evaporator	
TestEnd	Inlet/Outlet End
Tube Count	699
Tube Type	Skip Fin IE
Tube Material	Copper
OD	.750
*NWT/Under Fins	.028
*NWT/Bell/Land	.052
#/Type Support	4 Mild Steel
Tube Numbering	Left to Right
Row Numbering	Top to Bottom
Tube Length +/- 2	180 Inches

Analyst: TYLER J. KRIVAN, LEVEL II

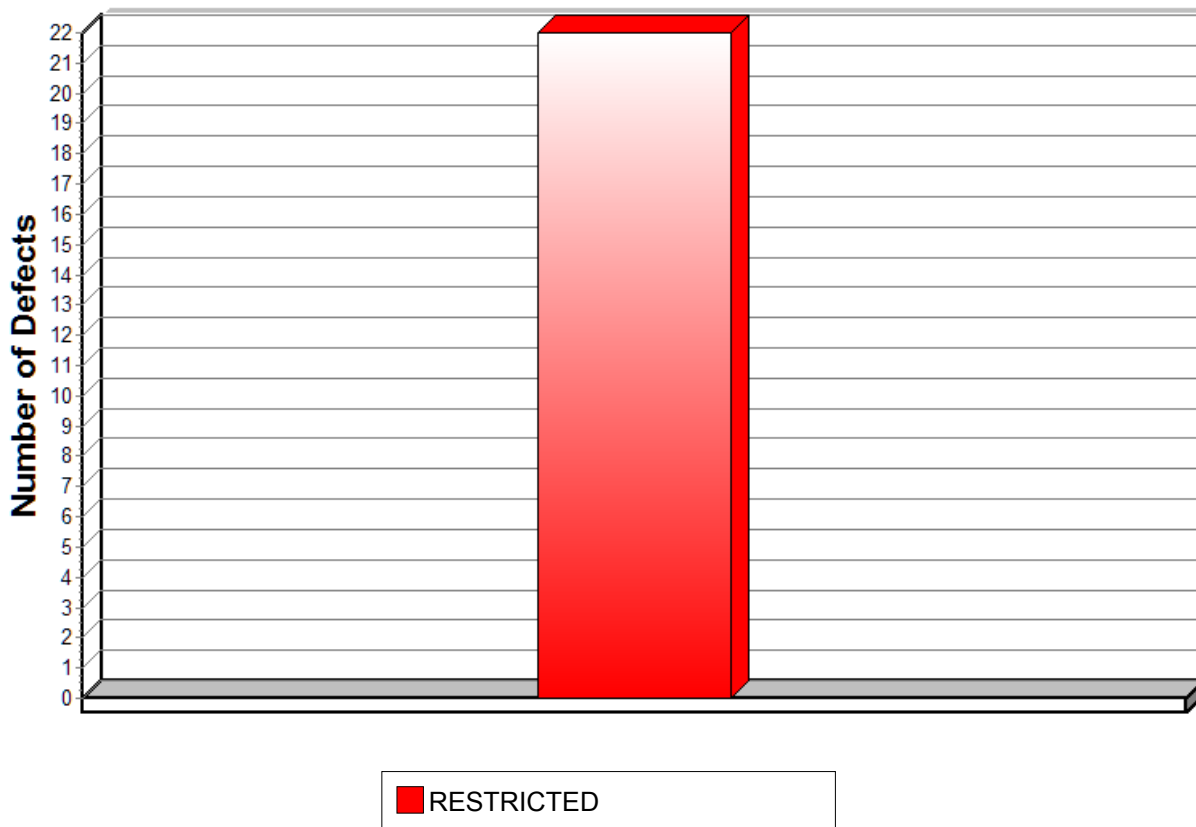
* Nominal Wall Thickness

Defect Summary/Comparison

Test Date

11/30/2007

Condenser Defects



Location	Model	Serial Number
DUPONT EXPERIMENTAL STATION	OTT4G2-ZBES	GACM117864 #8

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

Location	Model	Serial Number
DUPONT EXPERIMENTAL STATION	OTT4G2-ZBES	GACM117864 #8

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

Summary of Inspection

An eddy current tube inspection was performed as part of a preventive maintenance program with the following results.

Evaporator: 699 Tubes		
Tubes Tested: 0 Tubes		
Significant/Measurable Indications	Number of Tubes Marked	Percent of Bundle
NO MEASURABLE DEFECTS		
Totals	0	.00

Condenser: 883 Tubes		
Tubes Tested: 883 Tubes		
Significant/Measurable Indications	Number of Tubes Marked	Percent of Bundle
RESTRICTED	22	2.49
Totals	22	2.49

Recommendations

The tubes in this machine were tested for normal wear patterns using accepted test methods for eddy current inspections. The possibility does exist that tubes could contain defects and/or leaks which are not detectable, such as those at or near the tube end.

The following suggested repair actions are based on accepted industry standards. After removing sample tubes to confirm the inspection results, a determination of corrective action should be made by the repair agency and end user. Only these parties have knowledge of the critical applications and long-term use of the equipment. If plugging is selected over replacement, both efficiency and capacity should be considered.

EVAPORATOR:

There were no measurable defects noted during this inspection.

CONDENSER:

Tubes marked as Restricted contained defects, or foreign material which prevented the inspection probe from passing. The condition of these tubes at and beyond the obstruction remains unknown.

SUMMARY:

We recommend that a follow-up inspection be performed after 2 years 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
DUPONT EXPERIMENTAL STATION ROUTE 141 BETWEEN RTE.202 & 5 WILMINGTON, DE 19880	OTT4G2-ZBES	GACM117864 #8	November 29, 2007

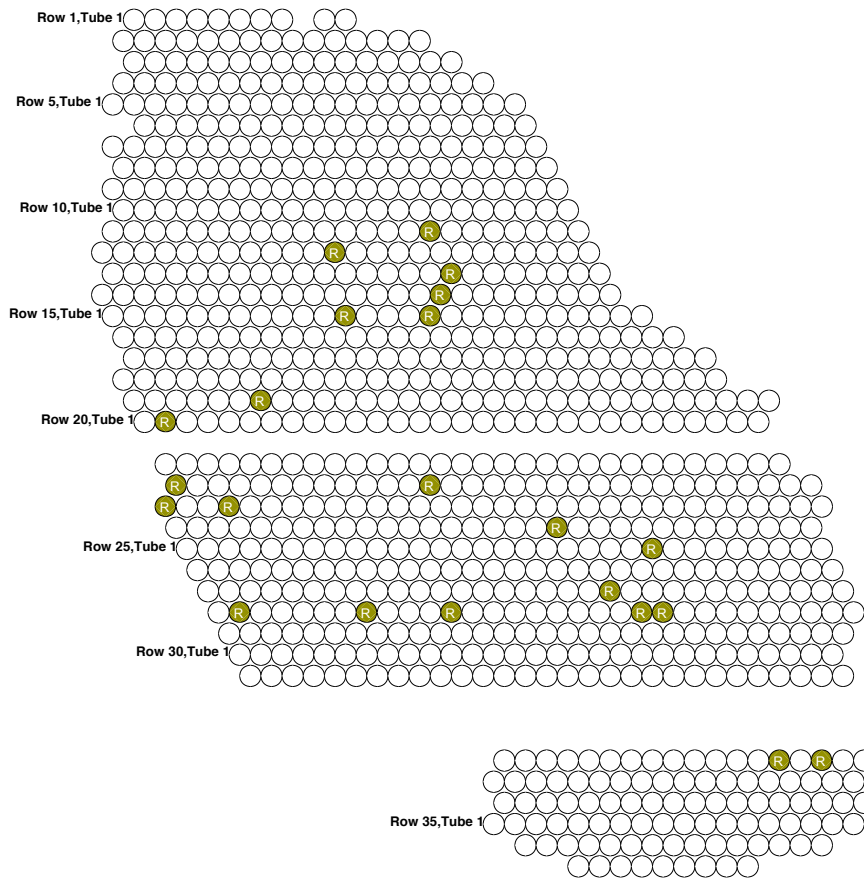
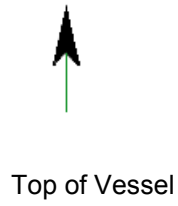
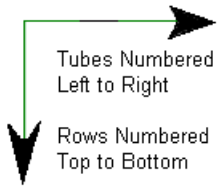
Row	Tube	Description	Area
SET UP CALIBRATE & STARTED			
EVAPORATOR 07:00 am			
NO MEASURABLE DEFECTS			
CALIBRATION CHECK & COMPLETED			
EVAPORATOR 10:30 am			
SET UP CALIBRATE & STARTED			
CONDENSER 08:00 am			
11	16	RESTRICTED	B01
12	12	RESTRICTED	B01
13	17	RESTRICTED	B01
14	17	RESTRICTED	B01
15	12	RESTRICTED	B01
15	16	RESTRICTED	B01
19	7	RESTRICTED	B01
20	2	RESTRICTED	B01
22	1	RESTRICTED	B01
22	13	RESTRICTED	B01
23	1	RESTRICTED	B01
23	4	RESTRICTED	B01
24	19	RESTRICTED	B01
25	23	RESTRICTED	B01

Row	Tube	Description	Area
27	20	RESTRICTED	B01
28	2	RESTRICTED	B01
28	8	RESTRICTED	B01
28	12	RESTRICTED	B01
28	21	RESTRICTED	B01
28	22	RESTRICTED	B01
32	14	RESTRICTED	B01
32	16	RESTRICTED	B01
CALIBRATION CHECK & COMPLETED			
CONDENSER 01:00 pm			

Condenser Section

S/N GACM117864 #8

Inlet End

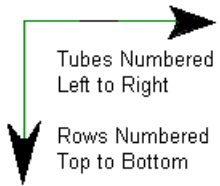


 = RESTRICTED

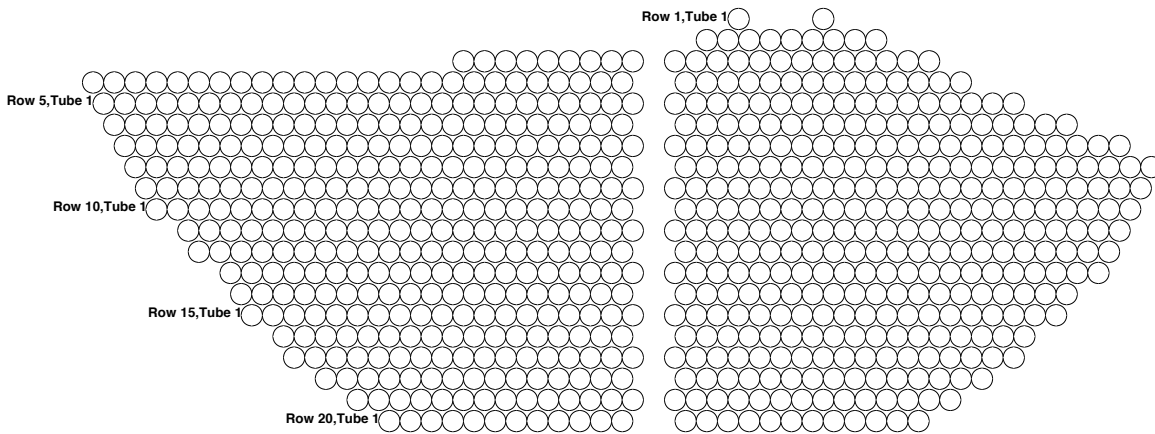
Evaporator Section

S/N GACM117864 #8

Inlet/Outlet End



Top of Vessel



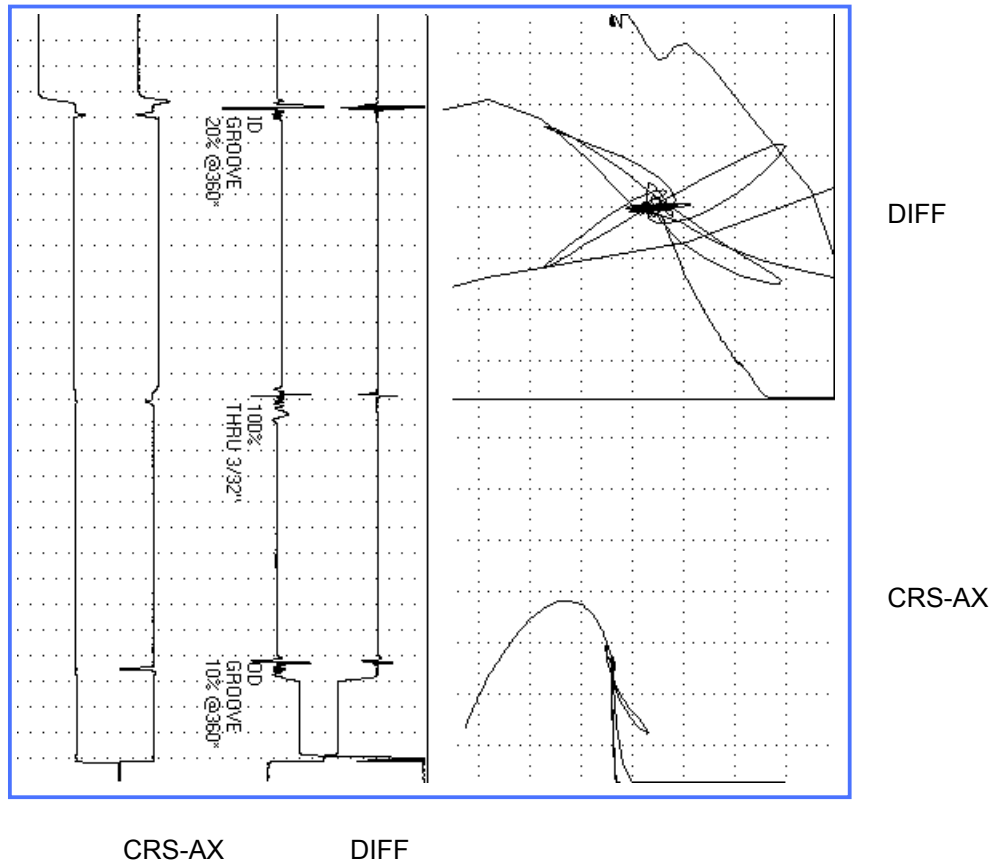
No Significant defects were found.

Calibration Page

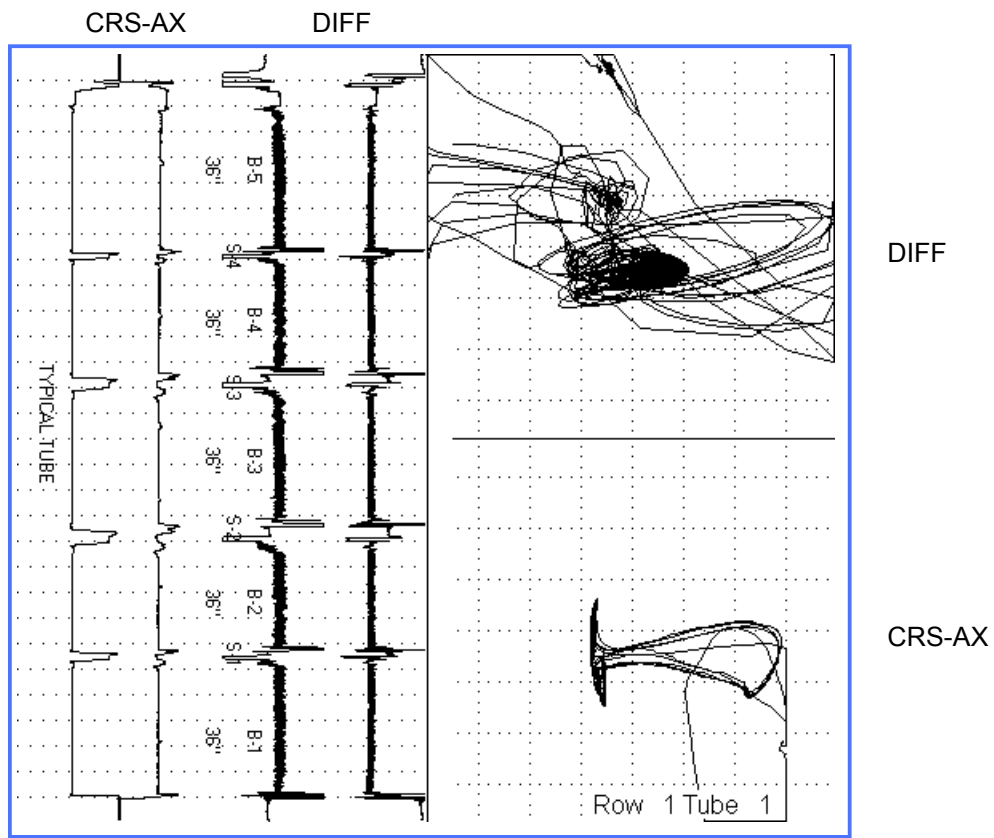
Tube Type	Material	Nom Wall Thick	End Wall Thick	OD	Test Type	Probe Diameter
Skip Fin IE	Copper	.028	.055	.750	Cross/Diff	

Condenser

Channel	Frequency	Gain	Phase	H/V/D	V/V/D	L P Filter	Angle Amp
Cross-Axial	3.0	38	245	2.00	.25	135	Off
Differential	12.0	25	213	1.00	.50	135	Off



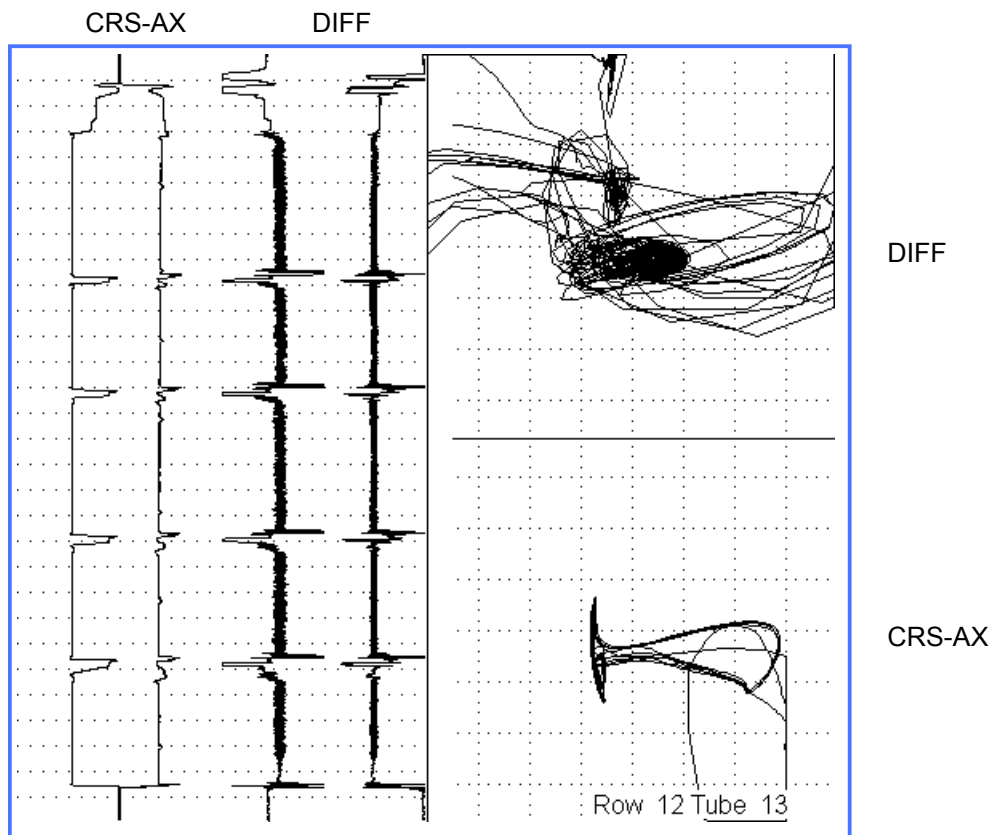
Condenser Section



TEST END

NO SIGNIFICANT DEFECTS (Row 1 Tube 1)

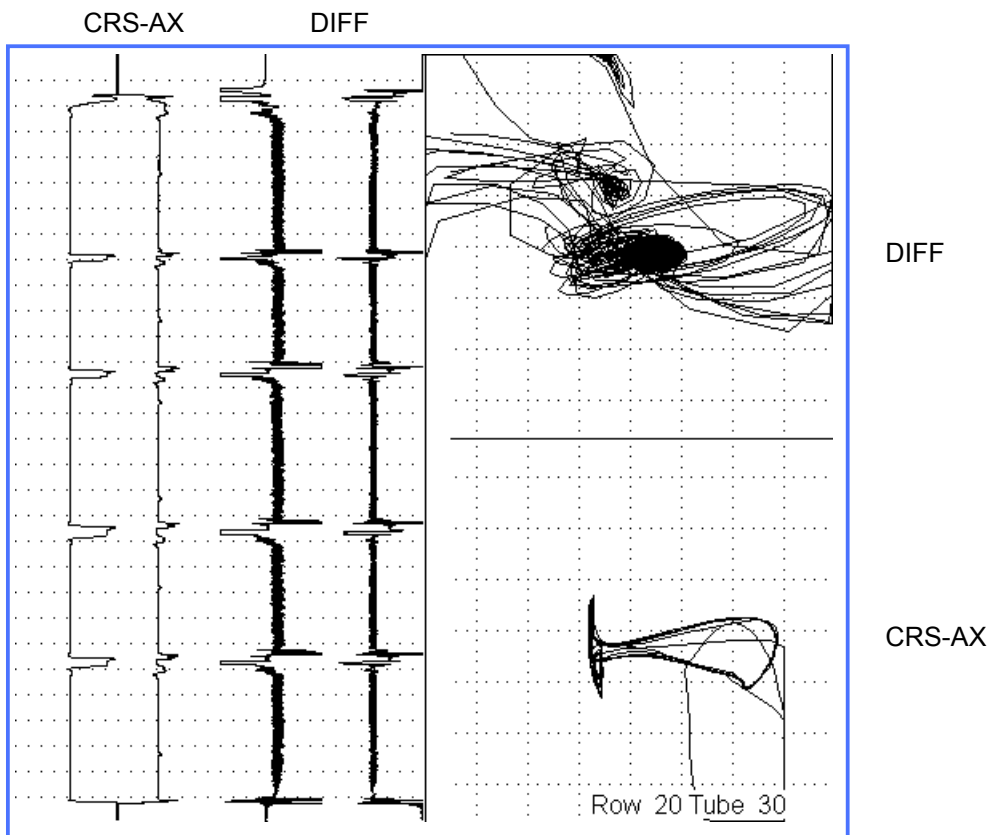
Condenser Section



TEST END

NO SIGNIFICANT DEFECTS (Row 12 Tube 13)

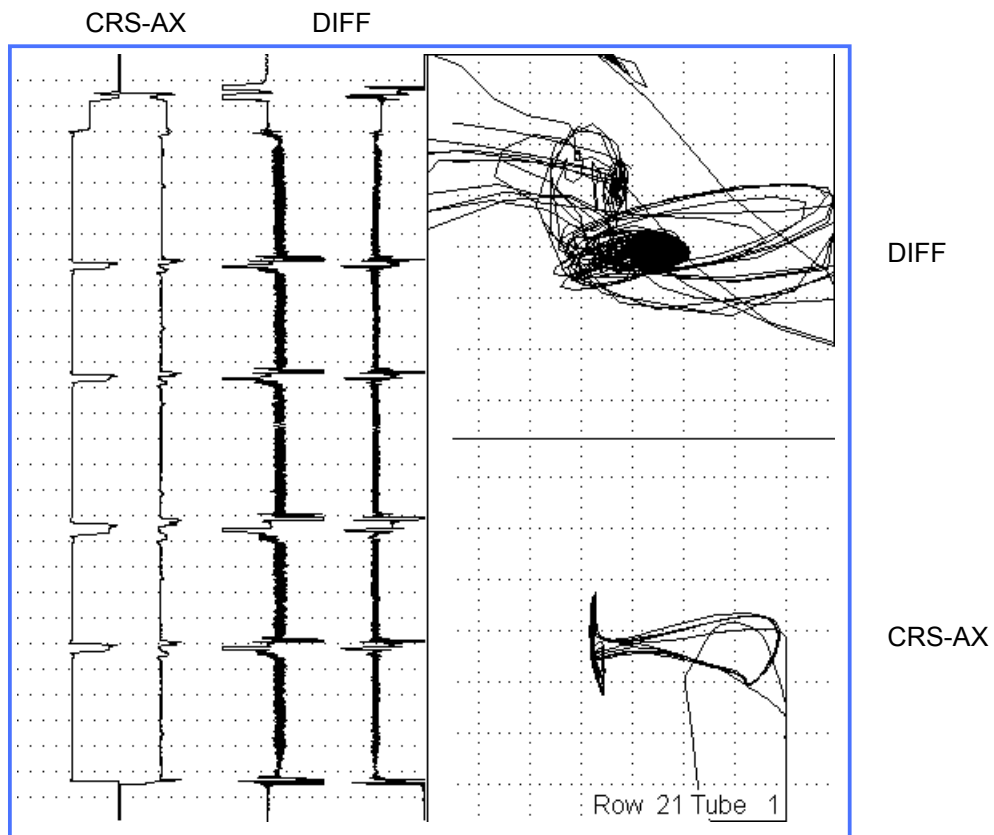
Condenser Section



TEST END

NO SIGNIFICANT DEFECTS (Row 20 Tube 30)

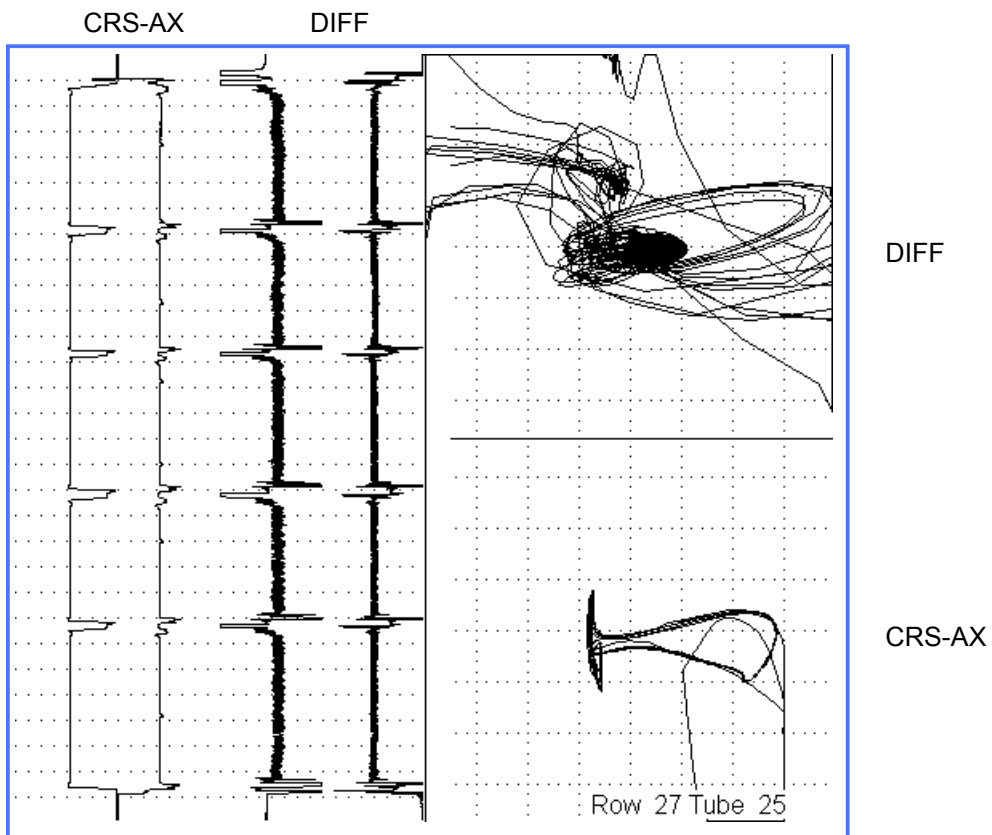
Condenser Section



TEST END

NO SIGNIFICANT DEFECTS (Row 21 Tube 1)

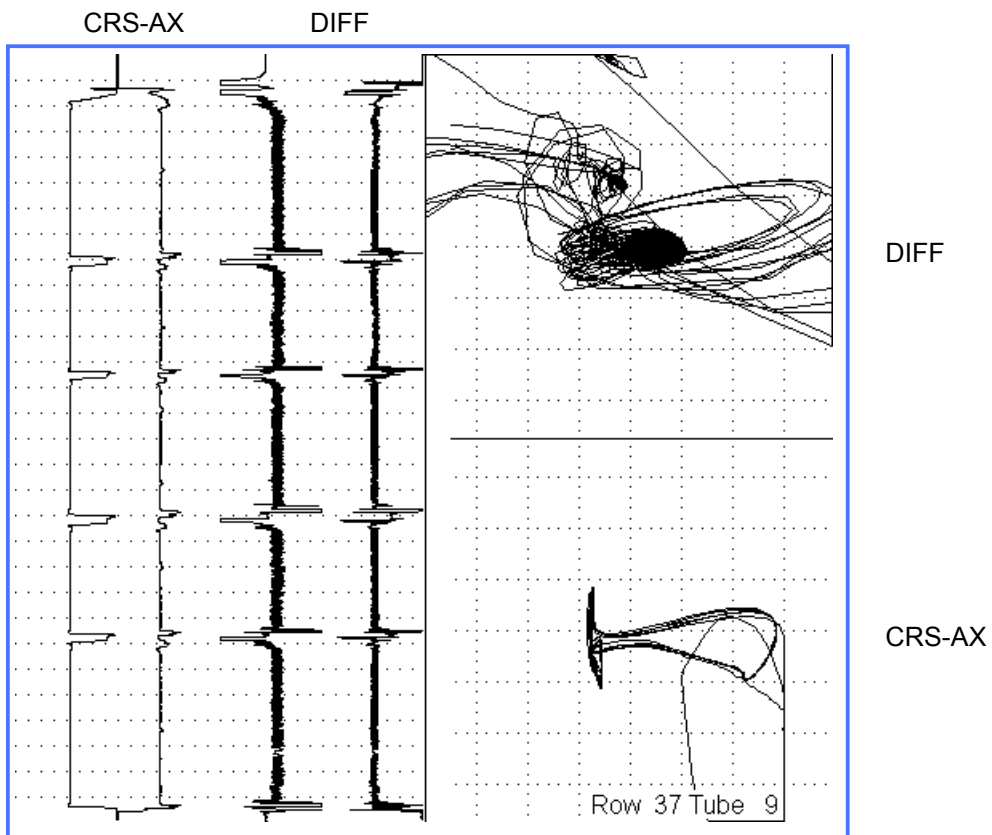
Condenser Section



TEST END

NO SIGNIFICANT DEFECTS (Row 27 Tube 25)

Condenser Section



TEST END

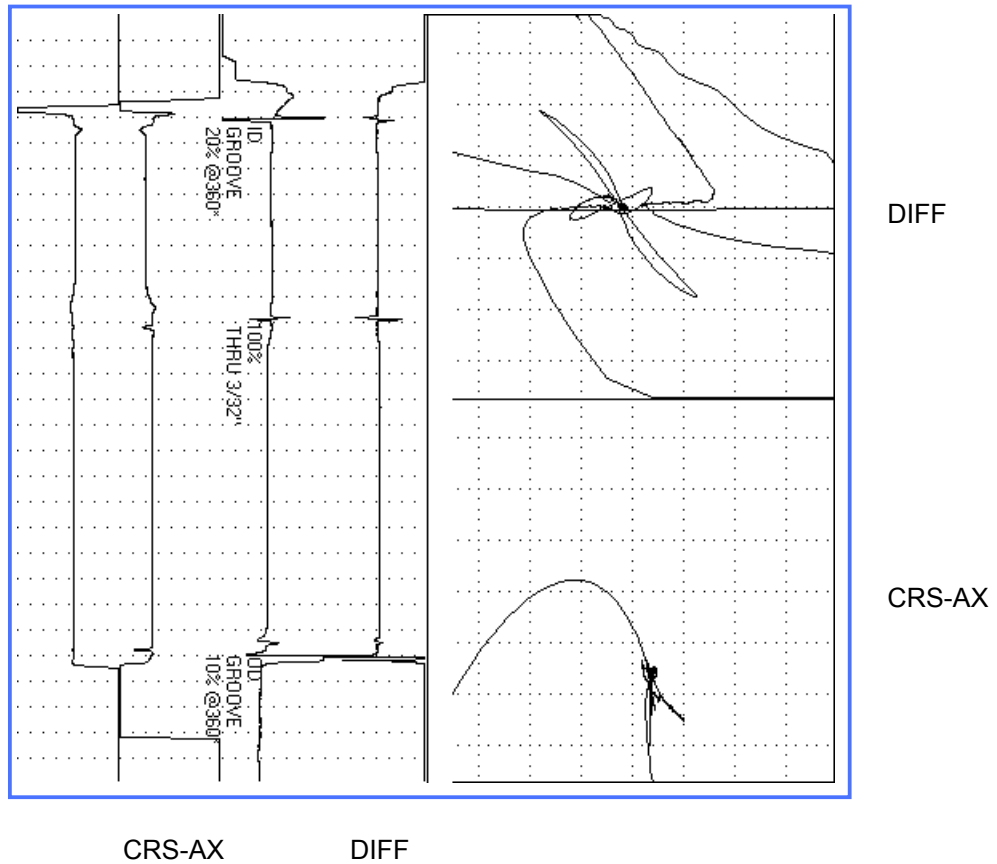
NO SIGNIFICANT DEFECTS (Row 37 Tube 9)

Calibration Page

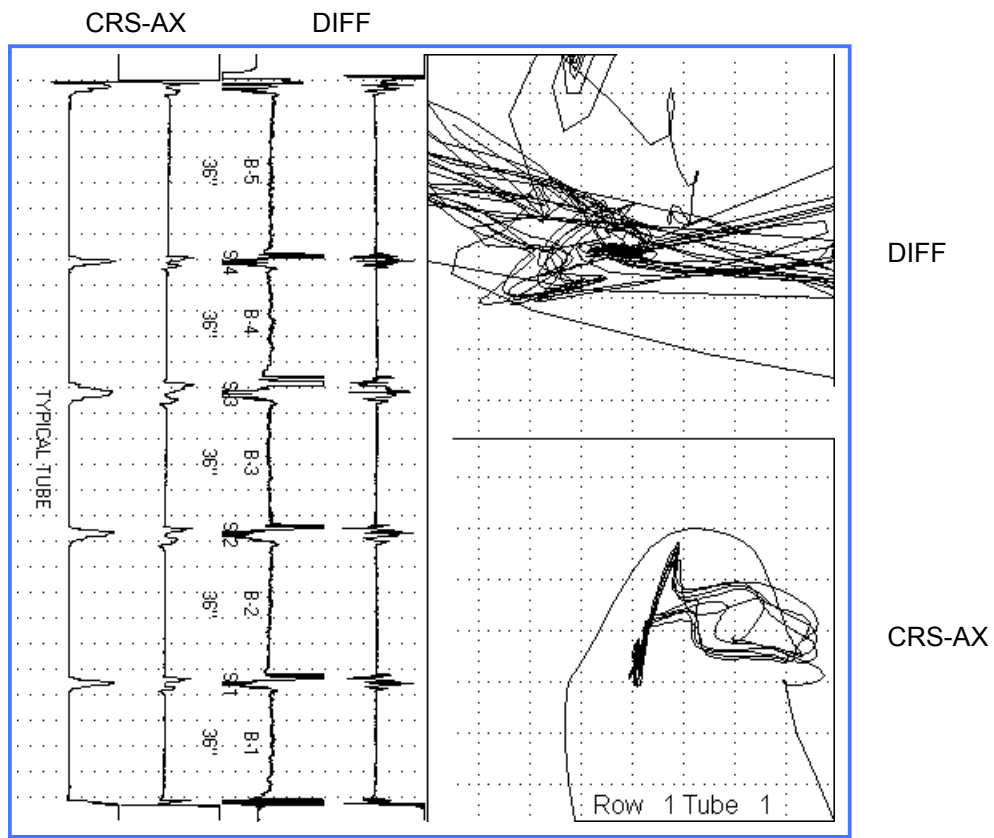
Tube Type	Material	Nom Wall Thick	End Wall Thick	OD	Test Type	Probe Diameter
Skip Fin IE	Copper	.028	.052	.750	Cross/Diff	

Evaporator

Channel	Frequency	Gain	Phase	H/V/D	V/V/D	L P Filter	Angle Amp
Cross-Axial	5.0	60	211	2.00	.25	135	Off
Differential	12.0	35	211	1.00	.50	135	Off



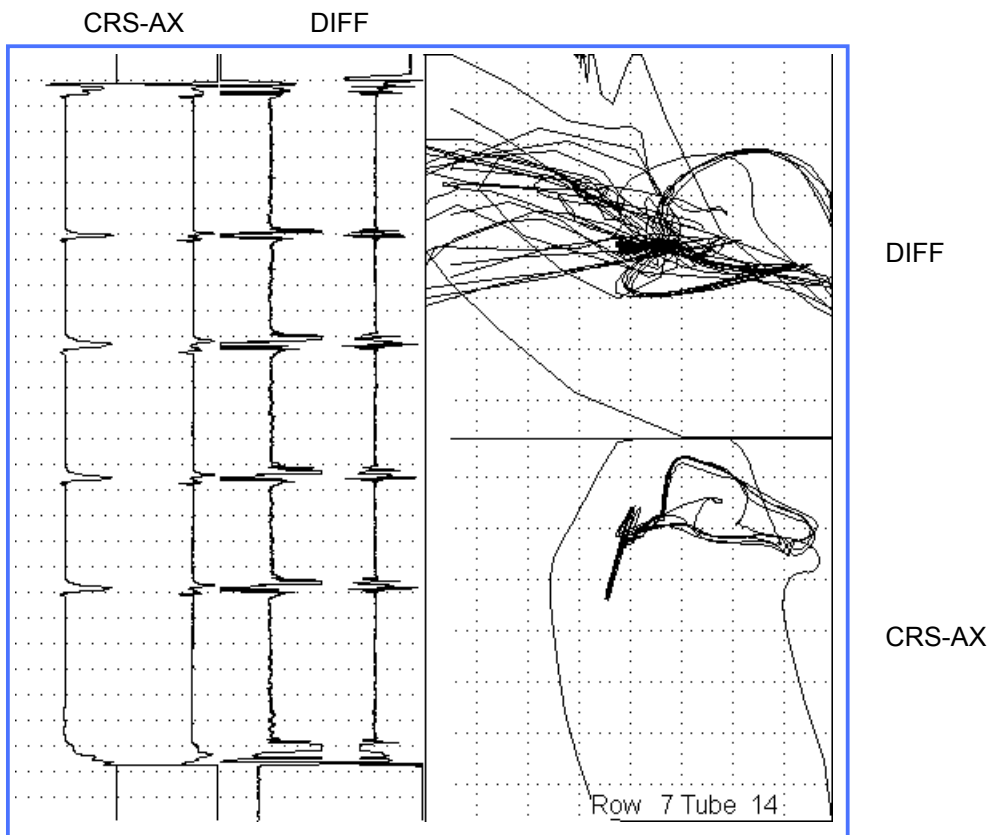
Evaporator Section



TEST END

NO SIGNIFICANT DEFECTS (Row 1 Tube 1)

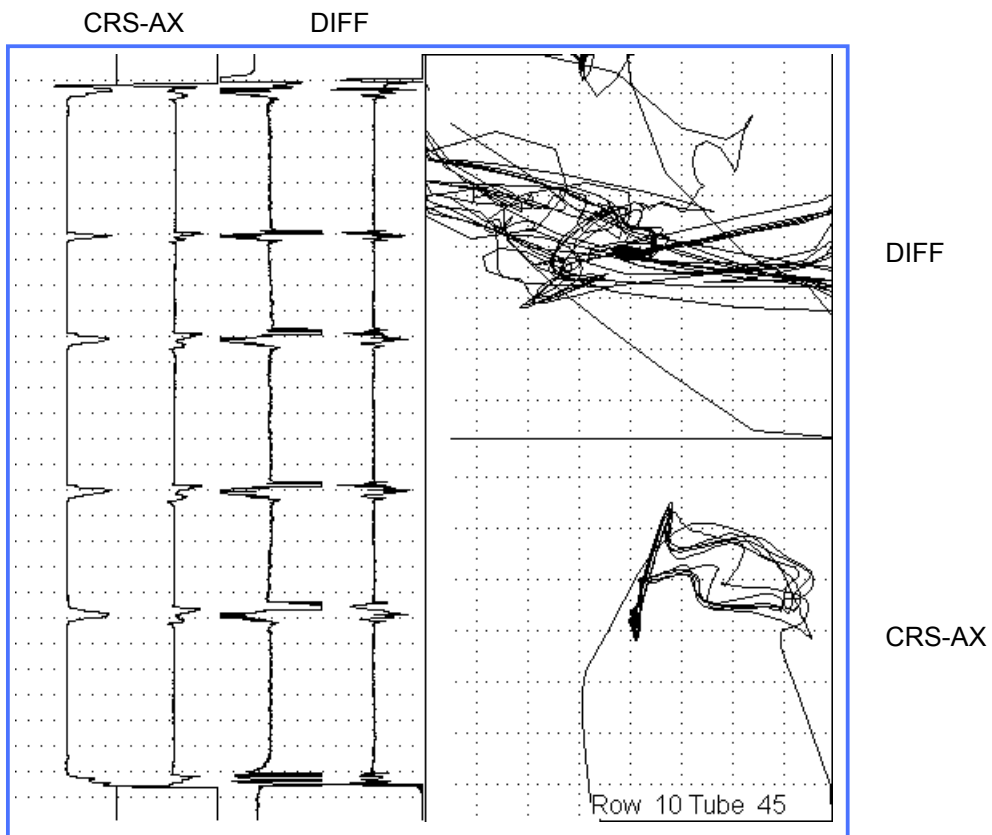
Evaporator Section



TEST END

NO SIGNIFICANT DEFECTS (Row 7 Tube 14)

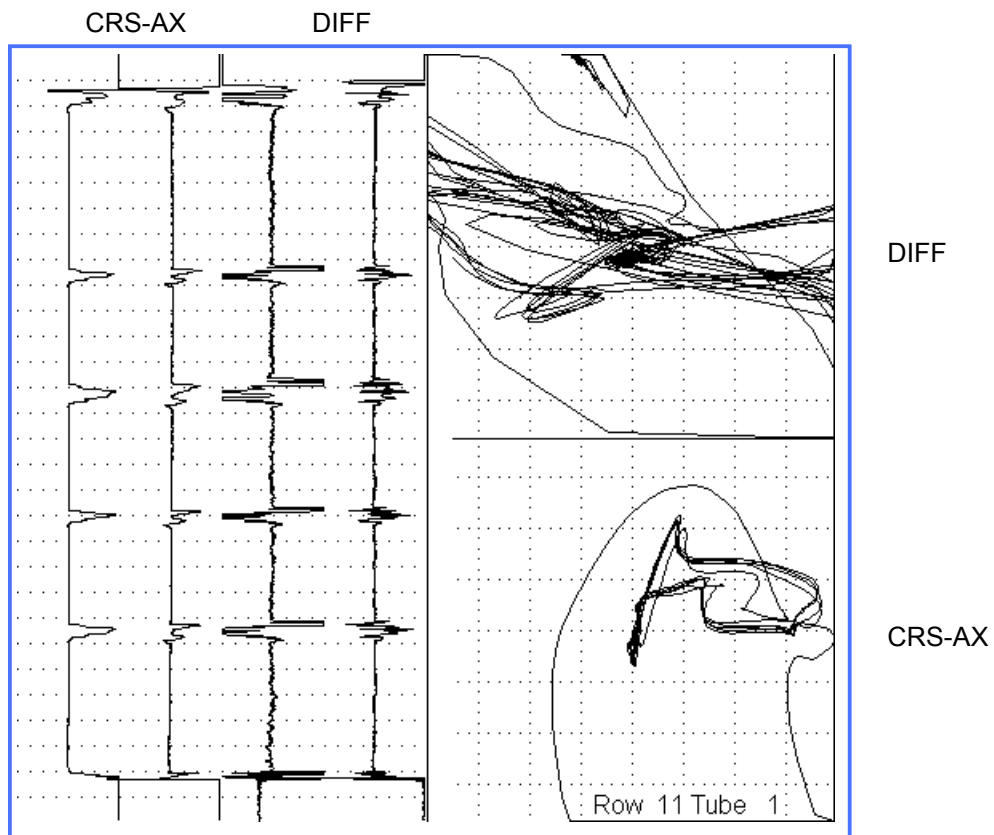
Evaporator Section



TEST END

NO SIGNIFICANT DEFECTS (Row 10 Tube 45)

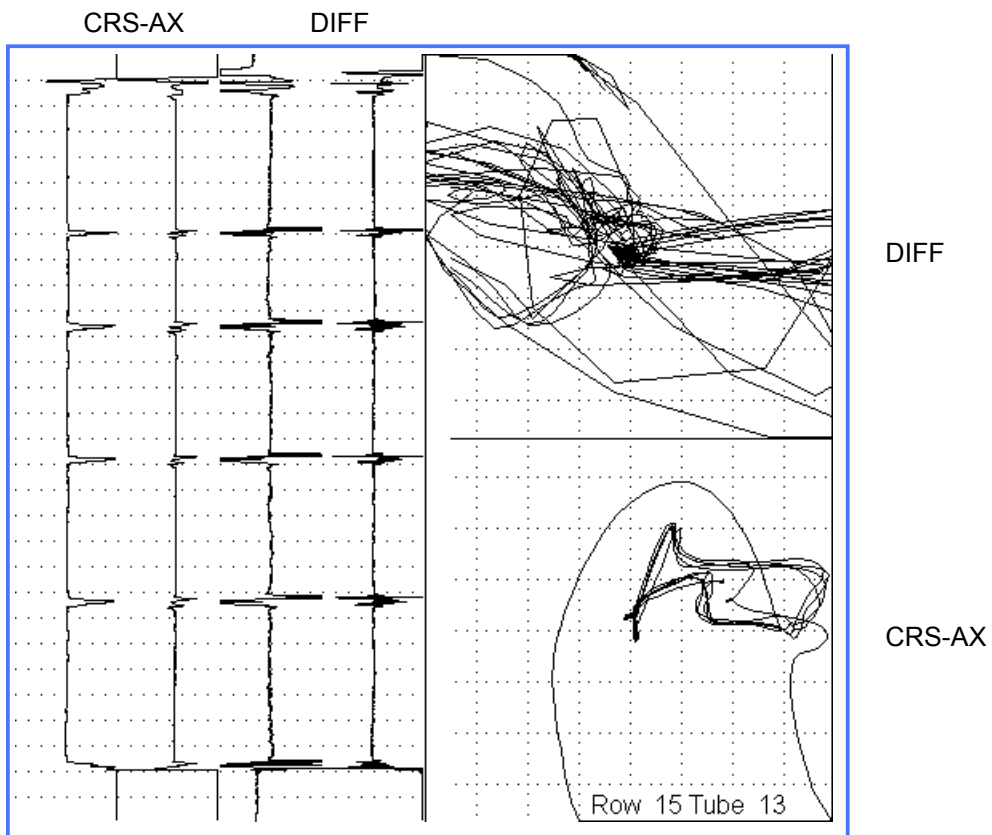
Evaporator Section



TEST END

NO SIGNIFICANT DEFECTS (Row 11 Tube 1)

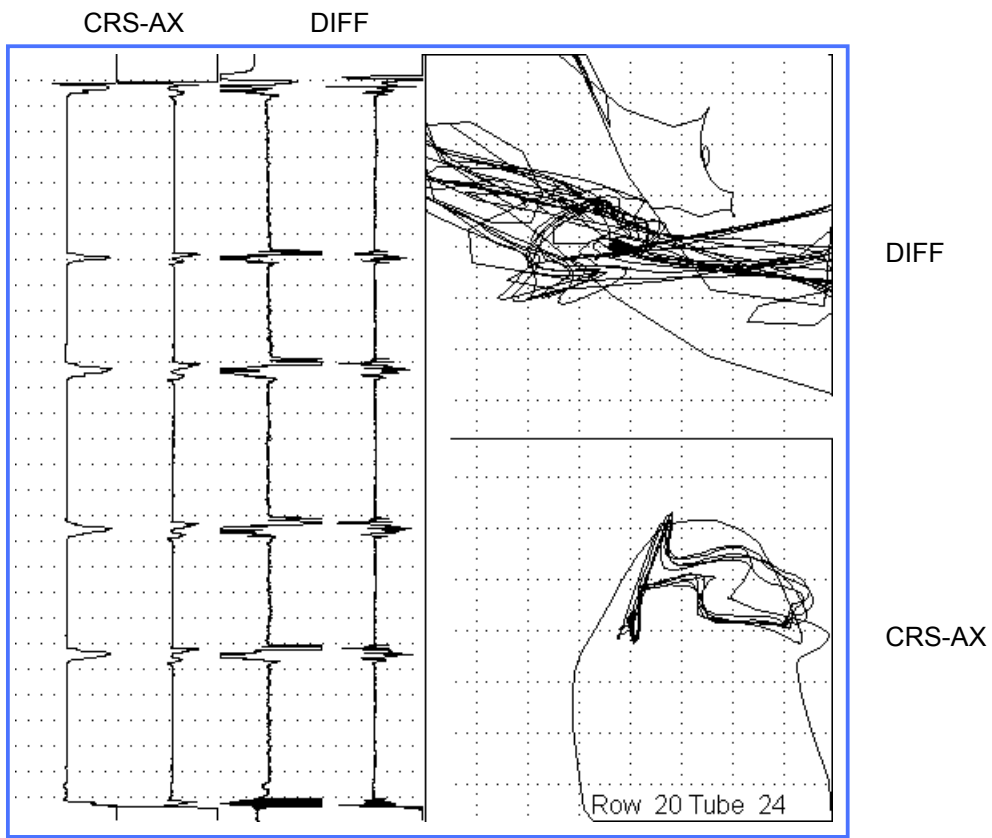
Evaporator Section



TEST END

NO SIGNIFICANT DEFECTS (Row 15 Tube 13)

Evaporator Section



TEST END

NO SIGNIFICANT DEFECTS (Row 20 Tube 24)

Calibration Procedure

A calibration procedure is performed prior to an inspection, and is repeated every 2 hours, or whenever improper operation of the test instrument is suspected. Test frequencies are selected prior to an inspection through experimentation to achieve optimum phase separation, and amplitude response for the tube type and alloy being inspected. An appropriate inspection probe is selected based on tube type, wall thickness, and alloy. The inspection probe will have a minimum fill factor of 80% through the smallest areas of the tubes being inspected. Instrument sensitivity is set high enough to determine background noise inherent in the tube and to produce a .05 Volt deflection for a .031 through wall hole at .25 V/Div.

Calibration Reference Standard

A Calibration Reference Standard representing a typical production run tube of the same alloy, tube type and nominal wall thickness is used to adjust test system response. The calibration reference standard used for the inspection of finned and internally enhanced tubing, has been milled in accordance with the American Society for Testing and Materials (ASTM). Standard Recommended Practices, E-243-80, E-426-76, and E571-76. The depth of the grooves and notches used for establishing instrument response are calculated to compensate for the influence of the fins and/or internal enhancements used on finned tubes. Where applicable, calibration reference standards are milled in accordance with the American Society of Mechanical Engineers (ASME), Section V, Article 8, Appendix I.

A strip chart recording of each calibration reference standard used for the inspection has been included in this report. Each artificial discontinuity has been identified on the strip chart recording.

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