



CARRIER COMMERCIAL SERVICE
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Report of Eddy Current Inspection

Manufacturer: Carrier

Model: 23XRV3737

Serial: 0214Q23208

Location: UNIVERSITY OF SOUTH CAROLINA
800 UNIVERSITY WAY
HODGE BUILDING
SPARTANBURG, SC 29303

Inspected: October 11, 2018

Inspected By: JAMES A. PAGE, LEVEL III
TAI Services, Inc.

Reviewed By:



TECHNICAL MANAGER, LEVEL III

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Vessel Information

Manufacturer	Model	Style	Serial Number	Type
Carrier	23XRV3737	Hermetic	0214Q23208	Screw

Condenser	
TestEnd	Right Hand Facing Controls
Tube Count	315
Tube Type	Skip Fin IE
Tube Material	Copper
OD	.750
*NWT/Under Fins	.028
*NWT/Bell/Land	.049
#/Type Support	4 Mild Steel
Tube Numbering	Top to Bottom
Row Numbering	Left to Right
Tube Length +- 2	168 Inches

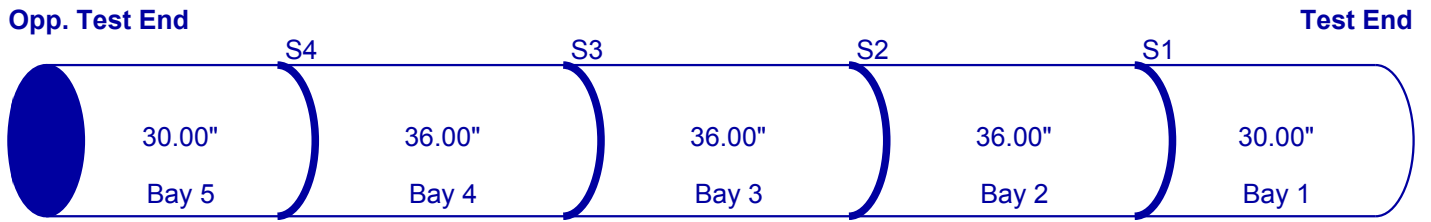
Evaporator	
TestEnd	Left Hand Facing Controls
Tube Count	282
Tube Type	Cont. Fin IE w/Land
Tube Material	Copper
OD	.750
*NWT/Under Fins	.028
*NWT/Bell/Land	.049
#/Type Support	4 Mild Steel
Tube Numbering	Top to Bottom
Row Numbering	Left to Right
Tube Length +- 2	168 Inches

Analyst: JAMES A. PAGE, LEVEL III

* Nominal Wall Thickness

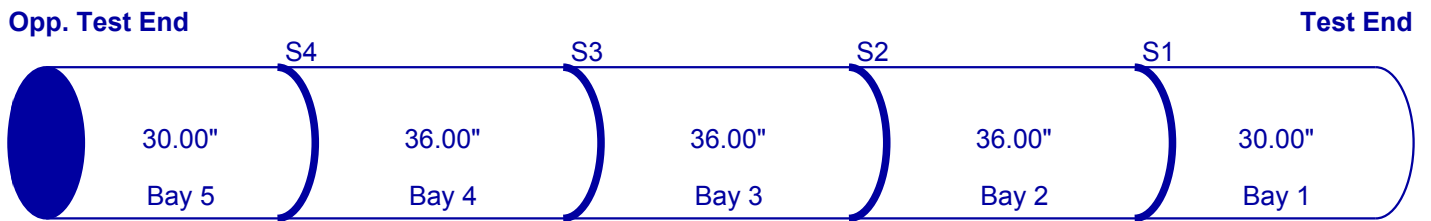
Vessel Bay Length Information

**Condenser (Length = 168 inches)
S = Intermediate Support**



Bay 5	30.00"
Bay 4	36.00"
Bay 3	36.00"
Bay 2	36.00"
Bay 1	30.00"

**Evaporator (Length = 168 inches)
S = Intermediate Support**



Bay 5	30.00"
Bay 4	36.00"
Bay 3	36.00"
Bay 2	36.00"
Bay 1	30.00"

Summary of Inspection

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

Condenser: 315 Tubes		
Tubes Tested: 315 Tubes		
Significant/Measurable Indications	Tubes Marked	Percent of Bundle
NO MEASURABLE DEFECTS		
Totals	0	.00

Evaporator: 282 Tubes		
Tubes Tested: 282 Tubes		
Significant/Measurable Indications	Tubes Marked	Percent of Bundle
NO MEASURABLE DEFECTS		
Totals	0	.00

Recommendations

An eddy current inspection was performed on the tubes in this machine. This test was performed using accepted eddy current test methods for the inspection of in-service tubing. It should be noted that Eddy Current is not a leak detection method. The possibility does exist that tubes could contain defects and/or leaks which are not detectable. If leaks are suspected, we recommend a pressure test be used to identify the leaking tubes.

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.

CONDENSER:

There were no measurable defects noted during this inspection.

EVAPORATOR:

There were no measurable defects noted during this inspection.

RE-INSPECTION RECOMMENDATIONS:

We recommend that a follow-up inspection be performed on these vessels as follows:

Condenser: 11 October 2021

Evaporator: 11 October 2021

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

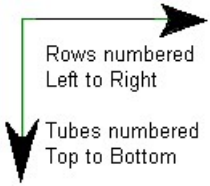
Location	Model	Serial Number	Date
UNIVERSITY OF SOUTH CAROLINA	23XRV3737	0214Q23208	October 11, 2018
800 UNIVERSITY WAY			
SPARTANBURG, SC 29303			

Row	Tube	Description	Area	Action Req.
		SET UP CALIBRATE & STARTED		
		CONDENSER 10/11/2018 09:04 am		
		NO MEASURABLE DEFECTS		
		CALIBRATION CHECK & COMPLETED		
		CONDENSER 10/11/2018 10:47 am		
		SET UP CALIBRATE & STARTED		
		EVAPORATOR 10/11/2018 11:02 am		
		NO MEASURABLE DEFECTS		
		CALIBRATION CHECK & COMPLETED		
		EVAPORATOR 10/11/2018 12:42 pm		

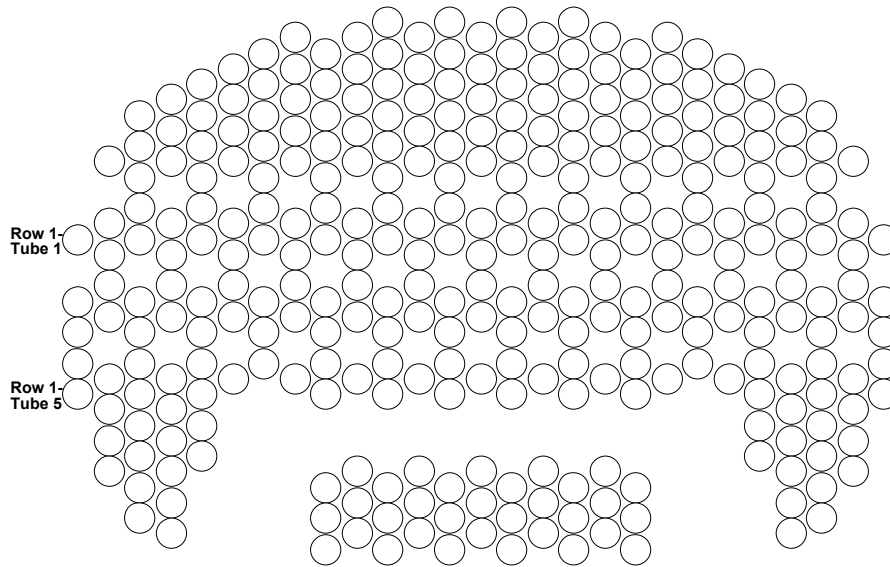
Condenser Section

S/N 0214Q23208

Right Hand Facing Controls



Top of Vessel

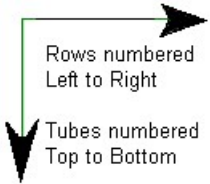


No Significant defects were found.

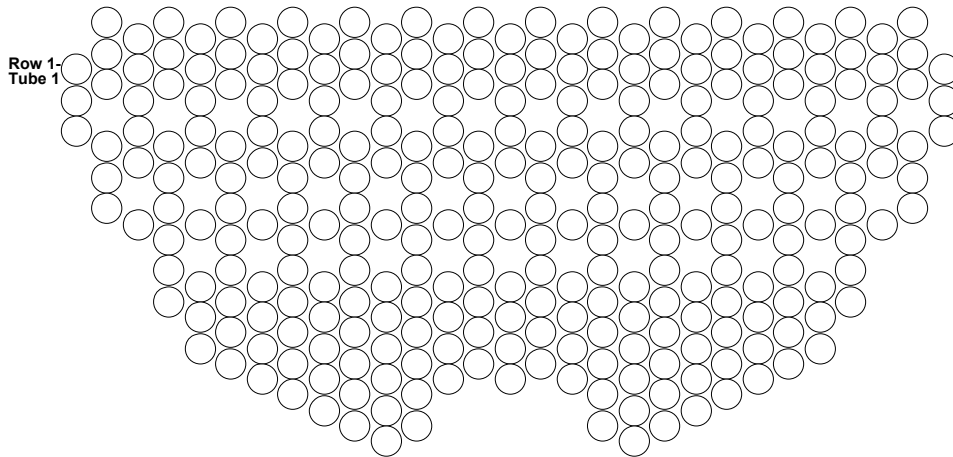
Evaporator Section

S/N 0214Q23208

Left Hand Facing Controls



Top of Vessel

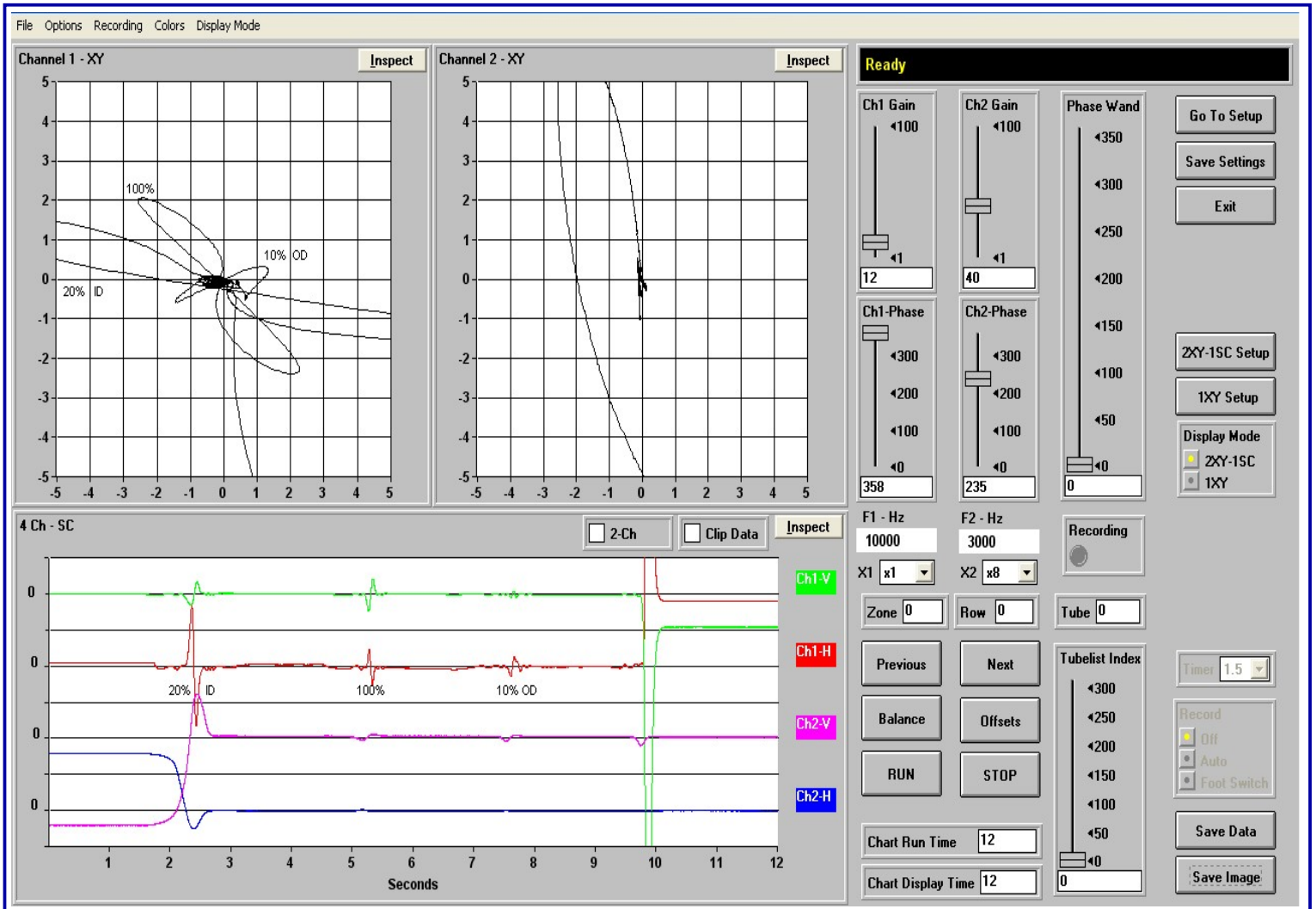


No Significant defects were found.

Calibration Page

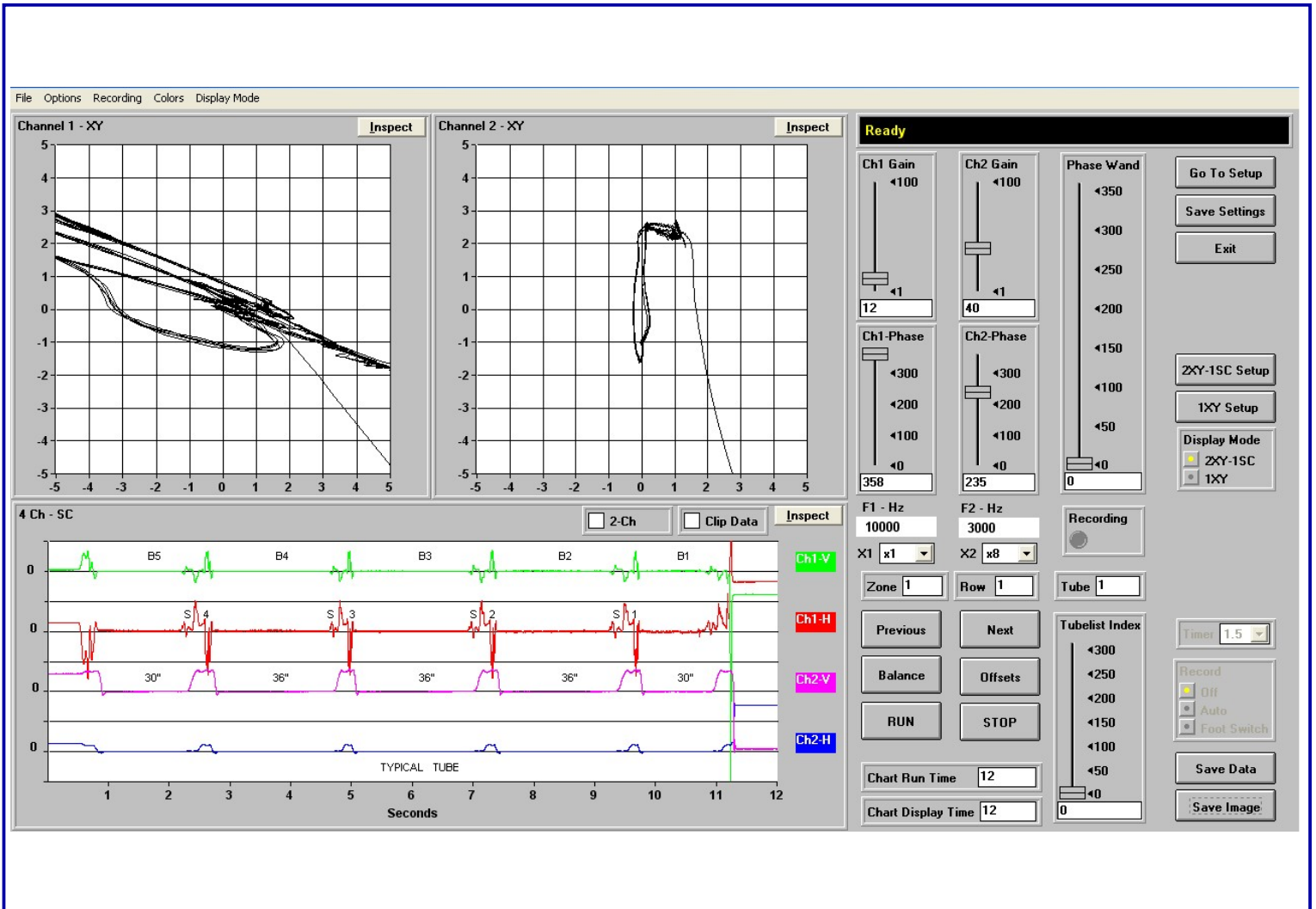
Tube Type	Material	Nom Wall Thick	End Wall Thick	OD	Test Type	Probe Diameter
Skip Fin IE	Copper	.028	.049	.750	Cross/Diff	.5625

Condenser



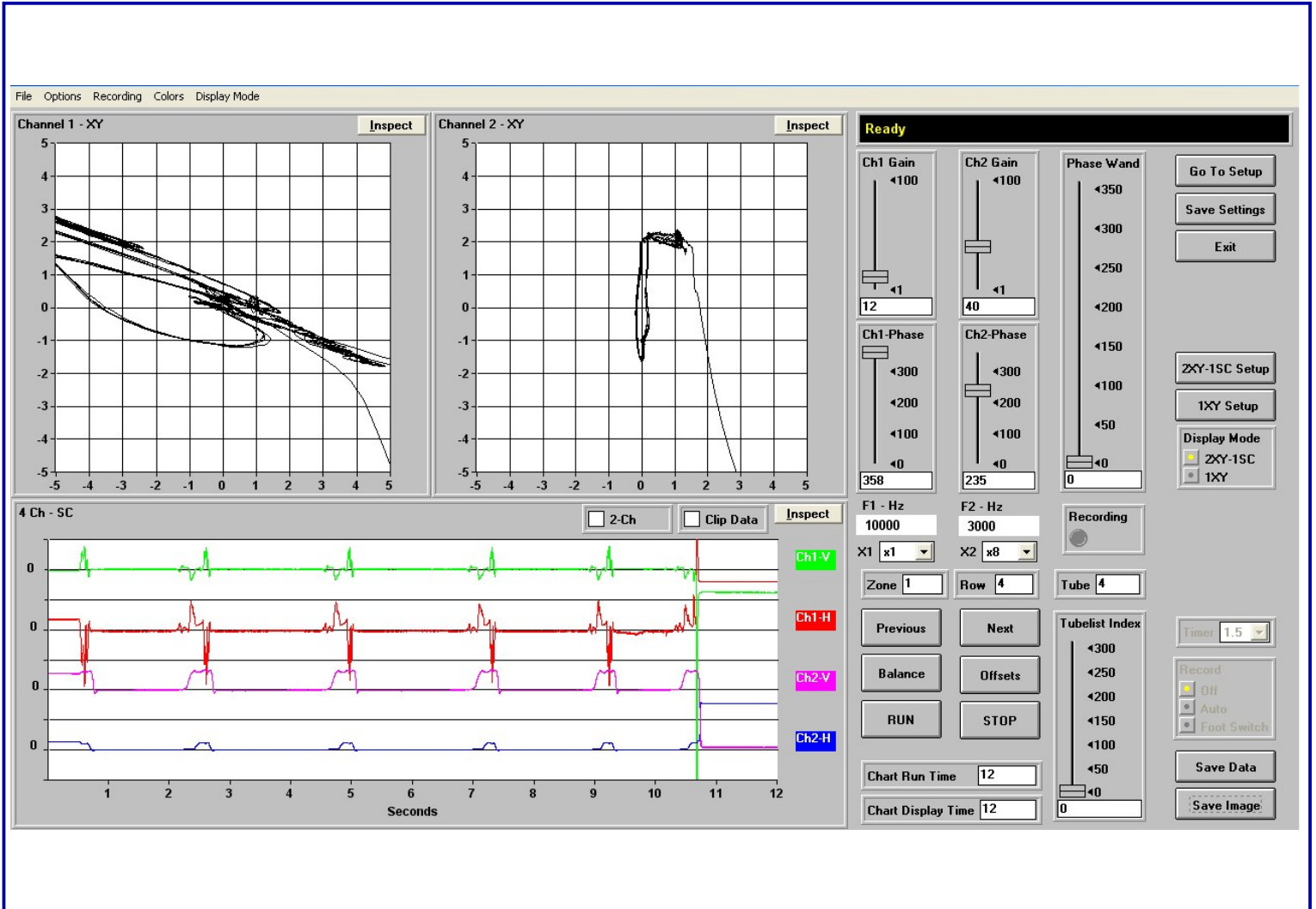
Note: Defects are compared to machined standards.
Actual Defect Geometry may differ.

Condenser Section



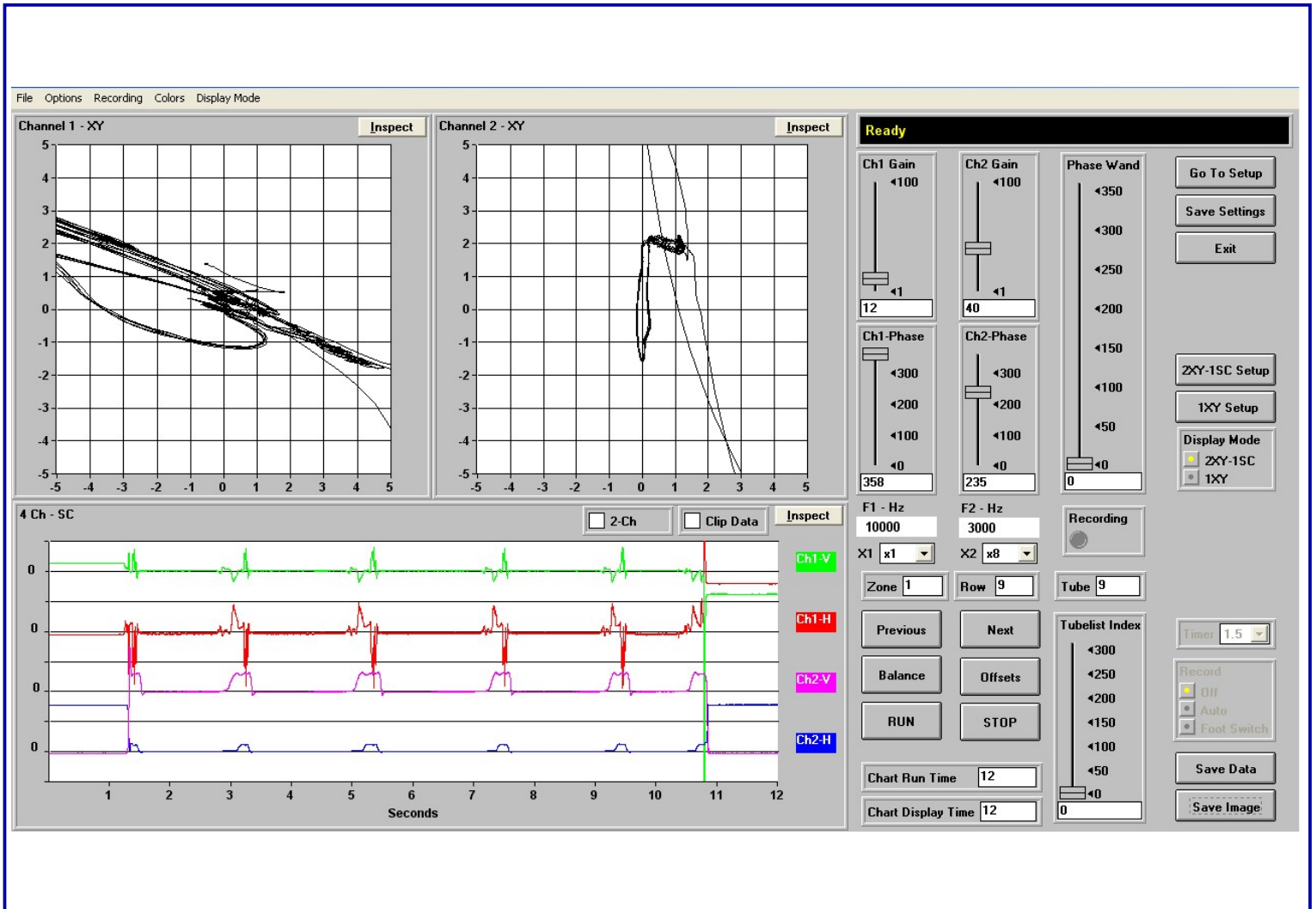
NO SIGNIFICANT DEFECTS (Row 1 Tube 1)

Condenser Section



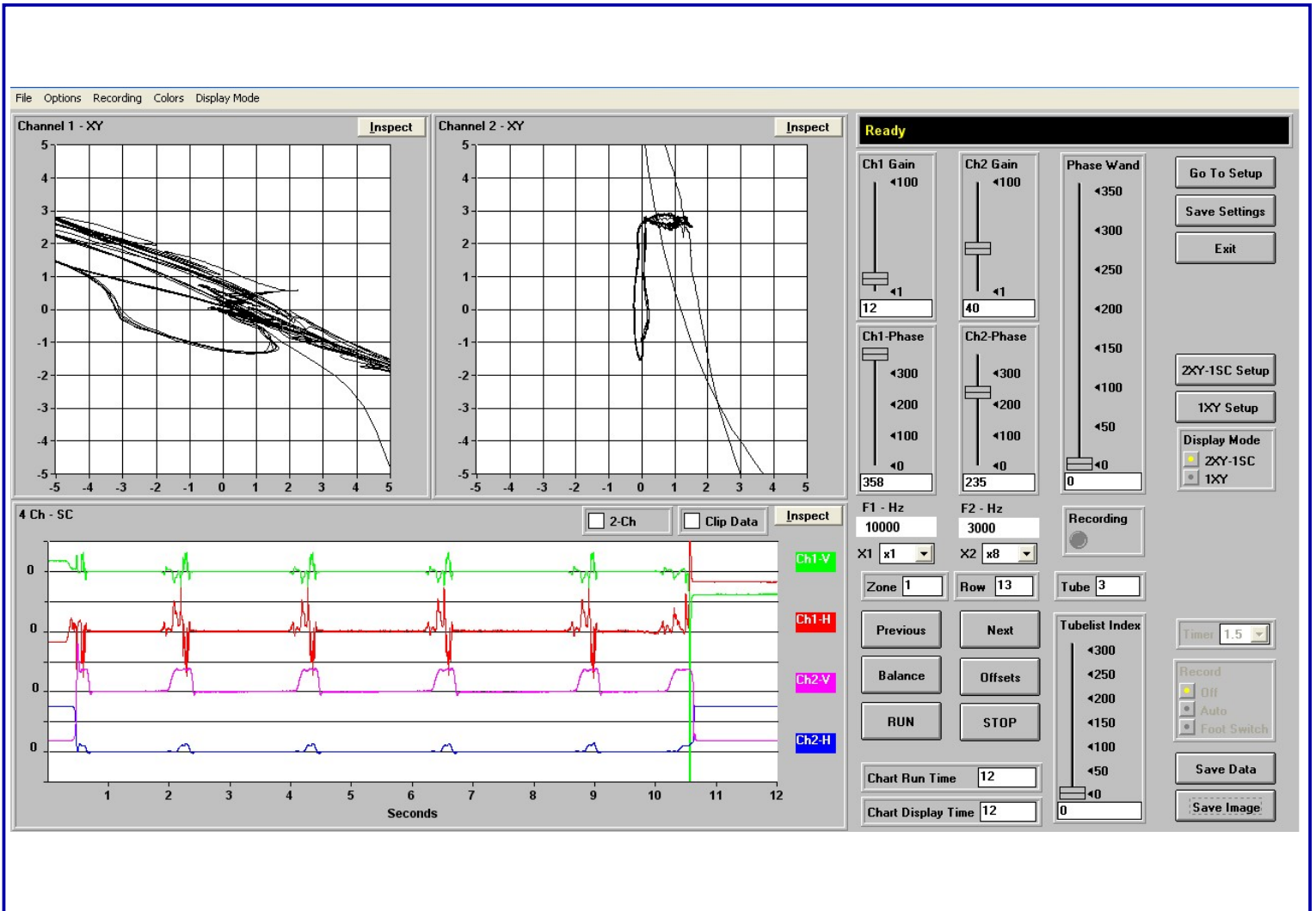
NO SIGNIFICANT DEFECTS (Row 4 Tube 4)

Condenser Section



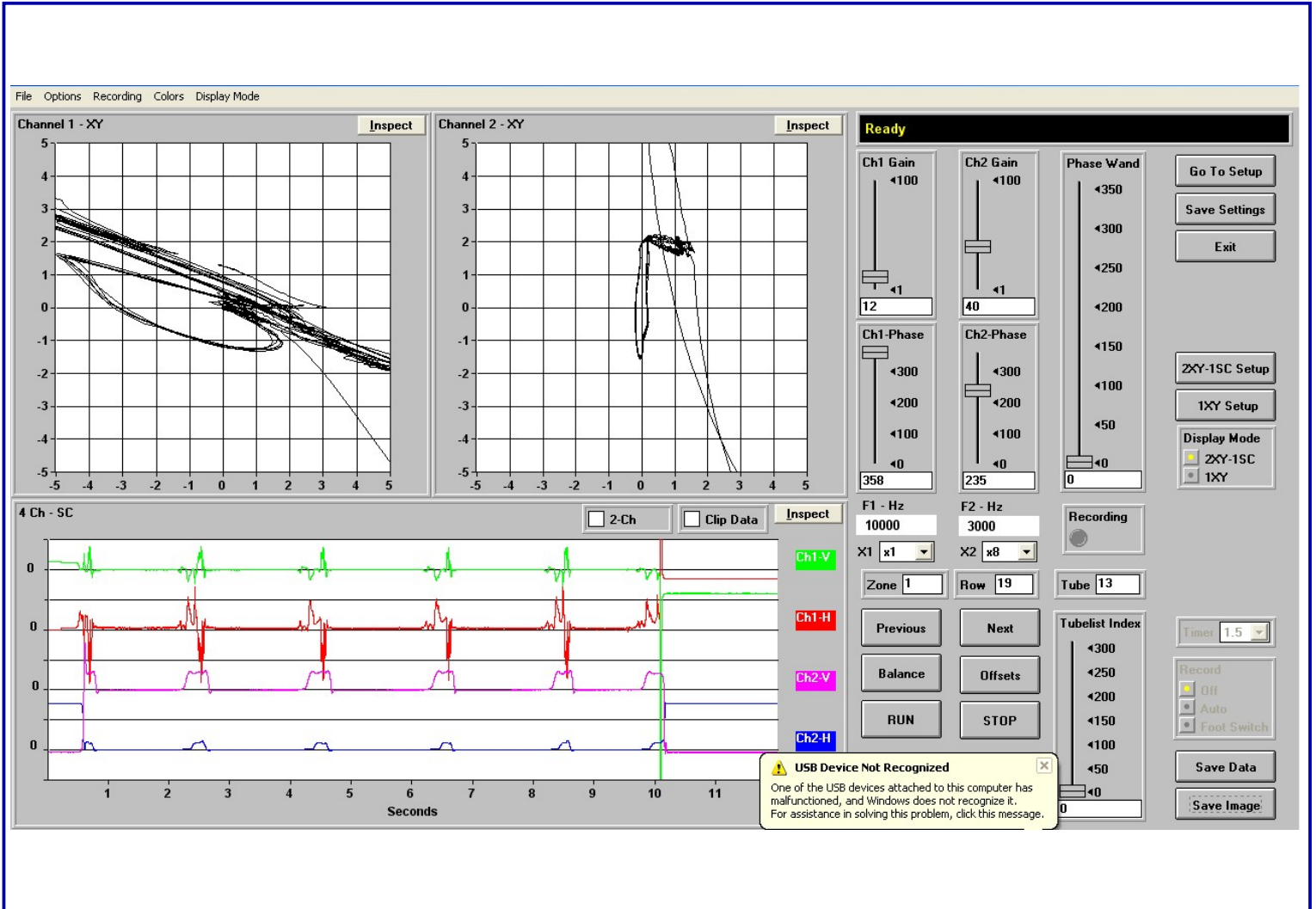
NO SIGNIFICANT DEFECTS (Row 9 Tube 9)

Condenser Section



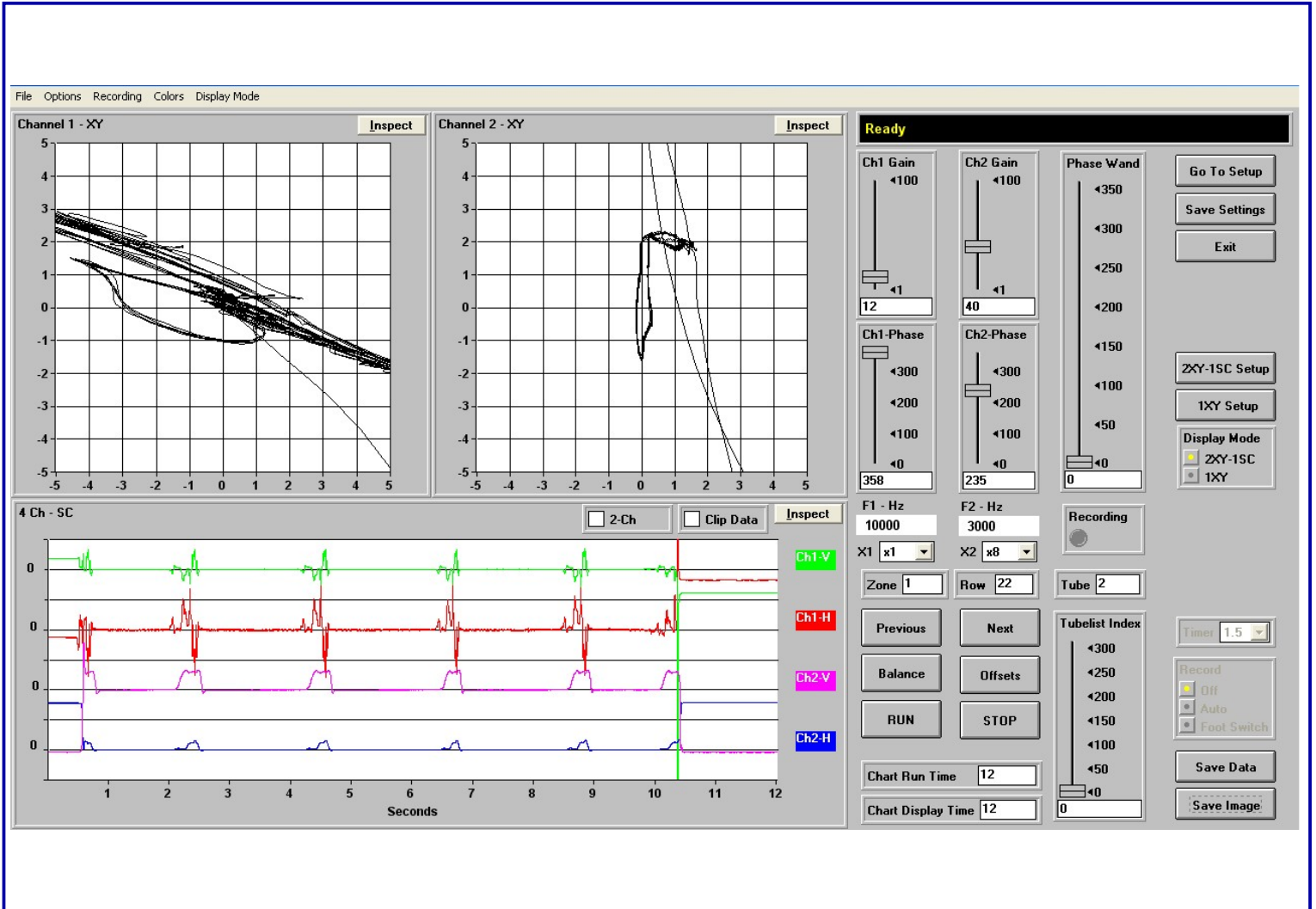
NO SIGNIFICANT DEFECTS (Row 13 Tube 3)

Condenser Section



NO SIGNIFICANT DEFECTS (Row 19 Tube 13)

Condenser Section

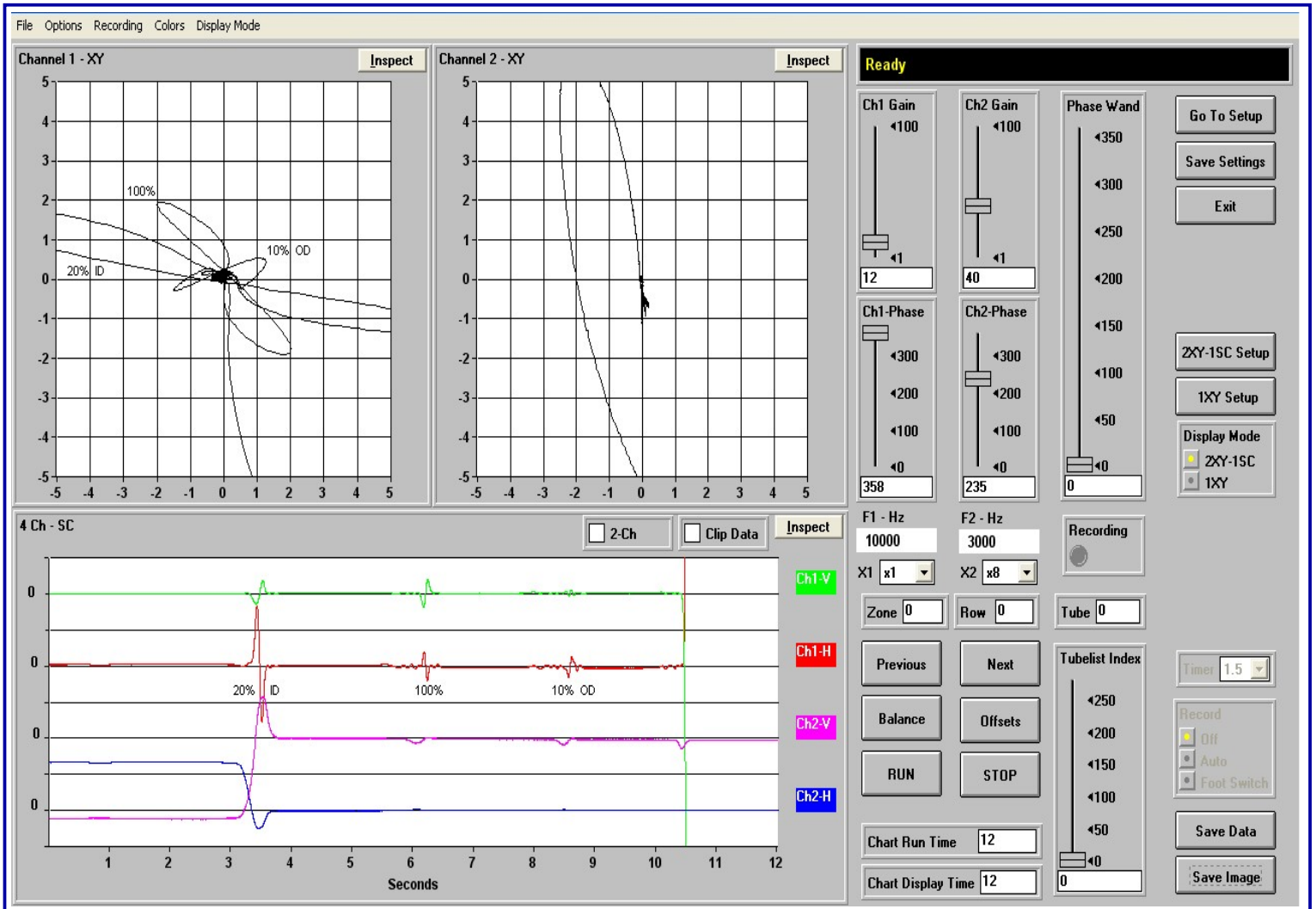


NO SIGNIFICANT DEFECTS (Row 22 Tube 2)

Calibration Page

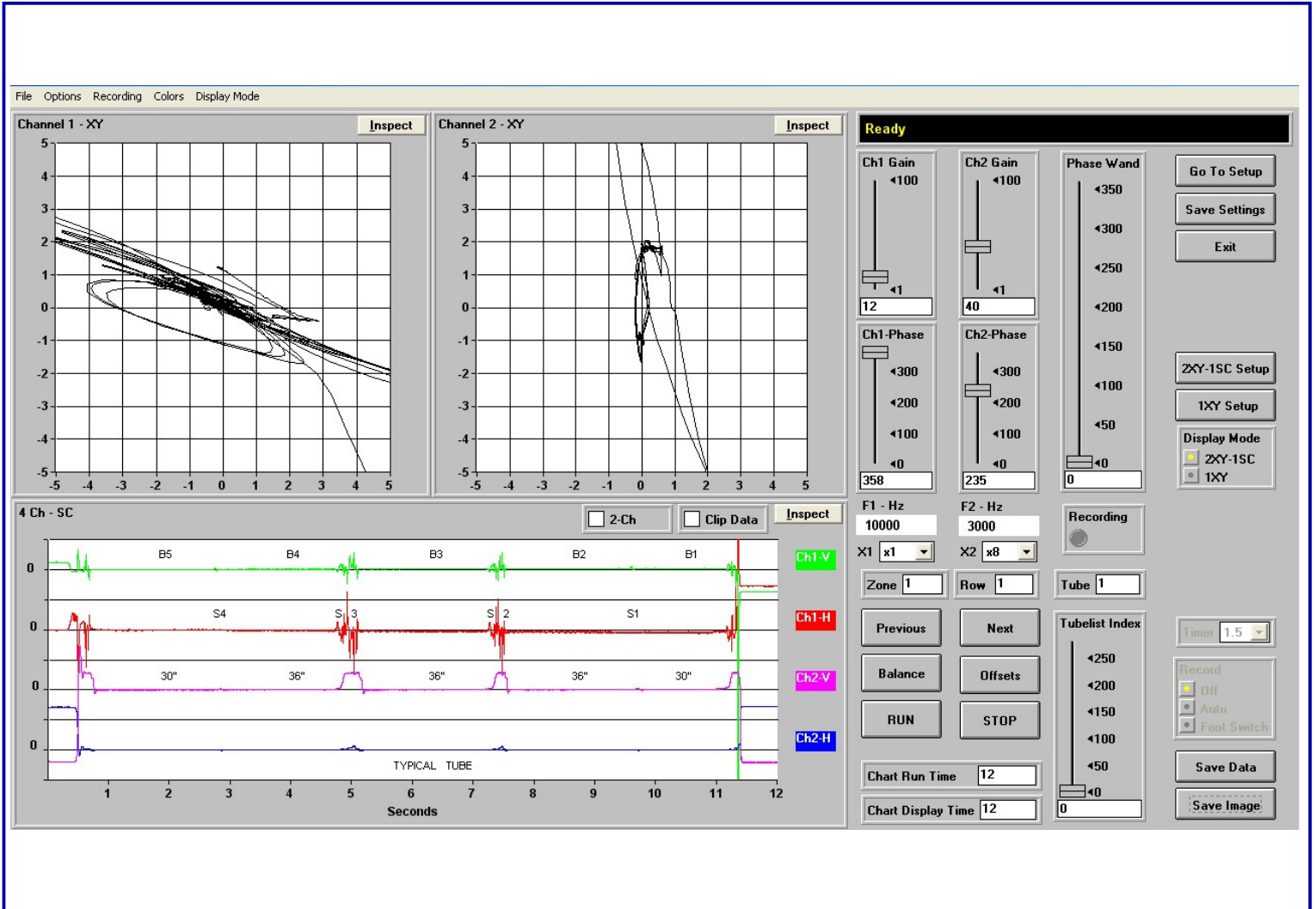
Tube Type	Material	Nom Wall Thick	End Wall Thick	OD	Test Type	Probe Diameter
Cont. Fin IE w/Lan	Copper	.028	.049	.750	Cross/Diff	.5625

Evaporator



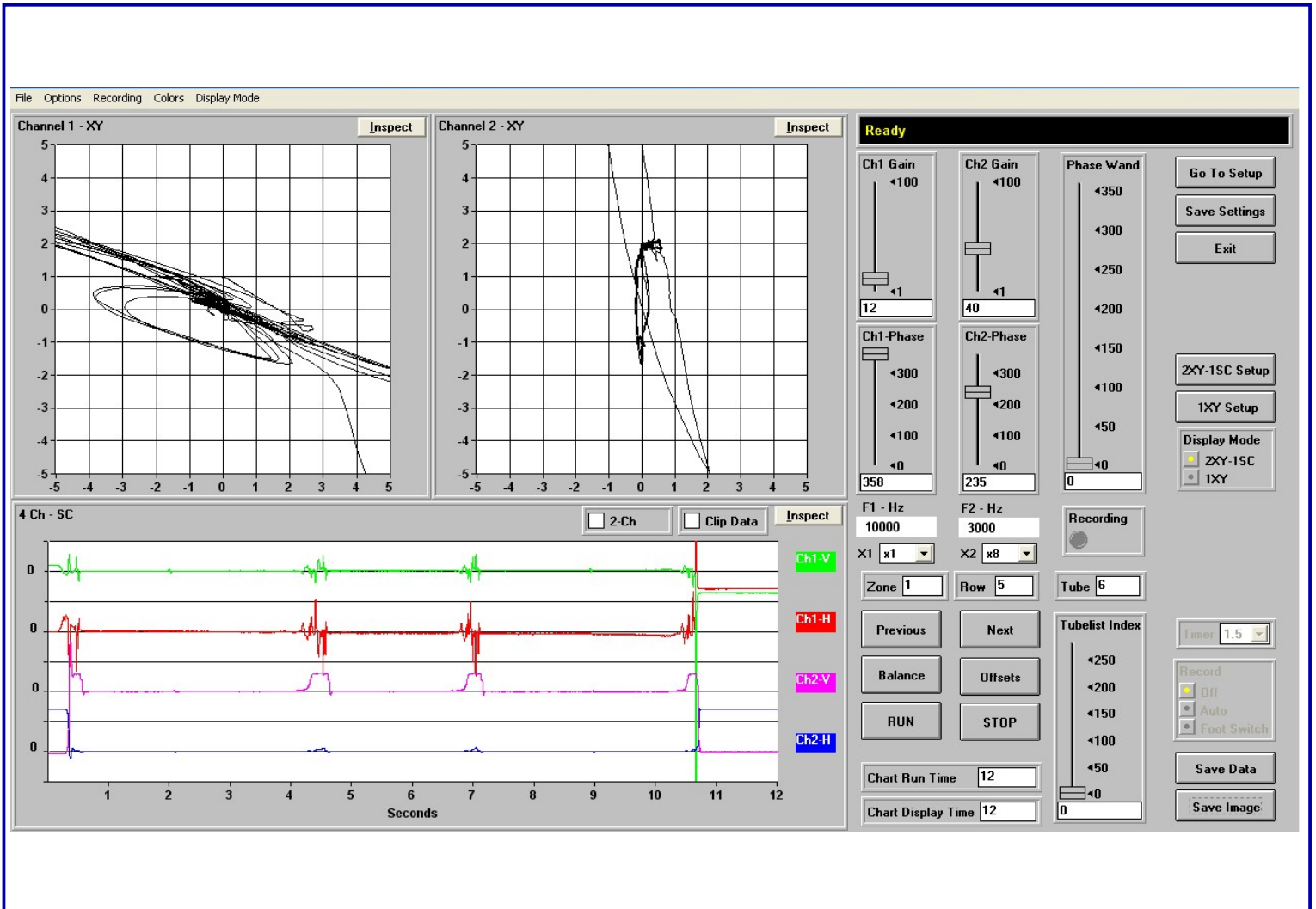
Note: Defects are compared to machined standards.
Actual Defect Geometry may differ.

Evaporator Section



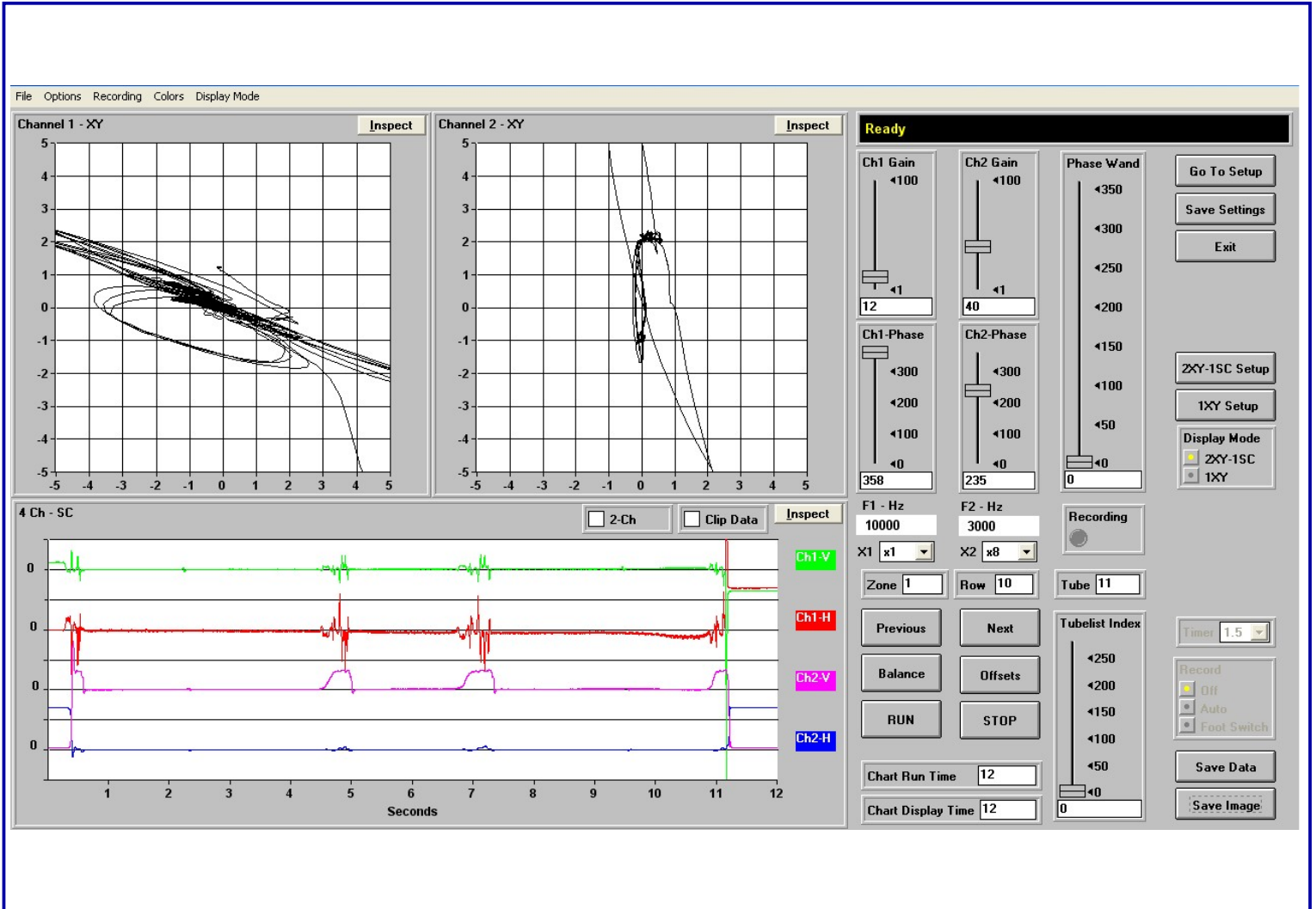
NO SIGNIFICANT DEFECTS (Row 1 Tube 1)

Evaporator Section



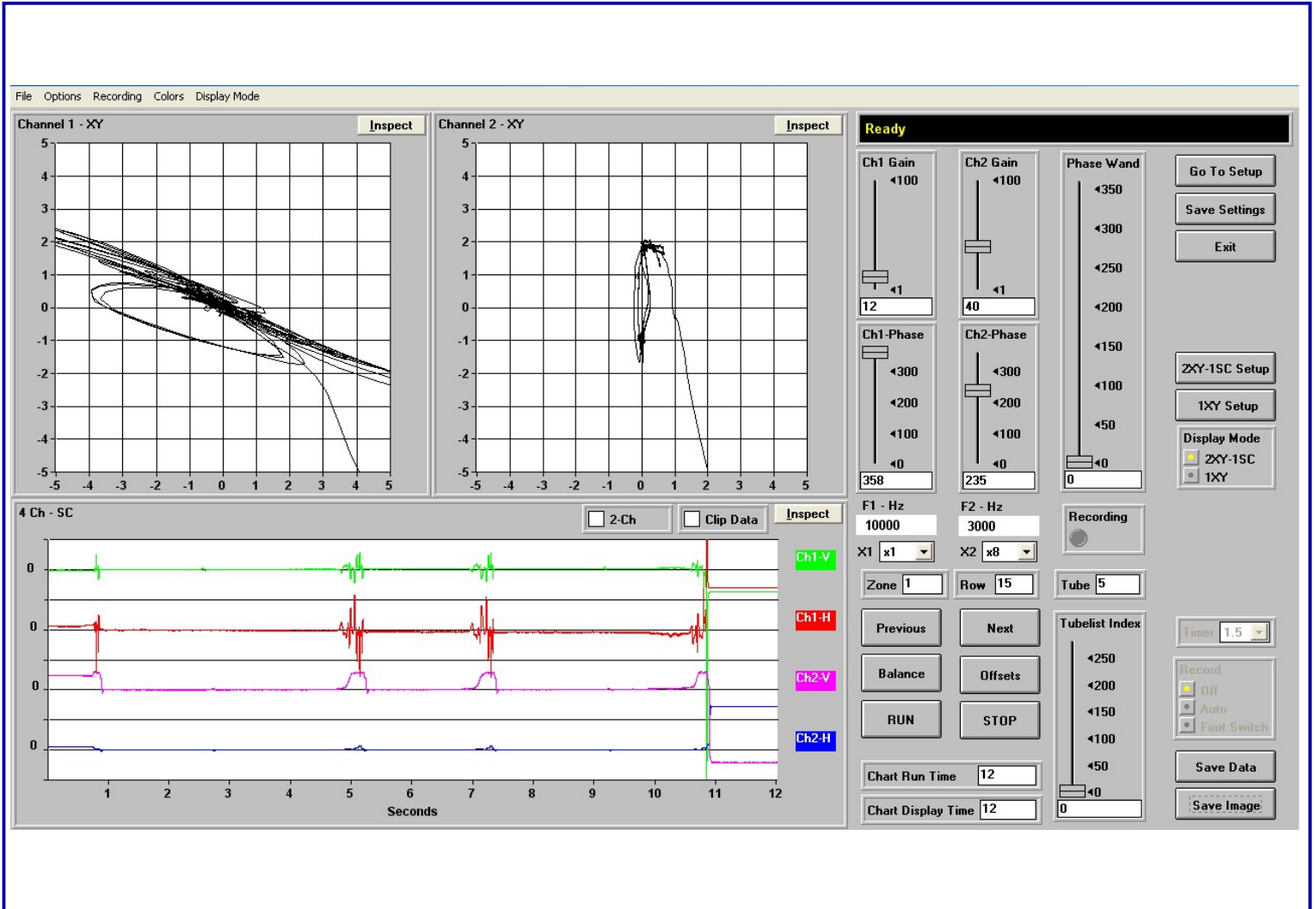
NO SIGNIFICANT DEFECTS (Row 5 Tube 6)

Evaporator Section



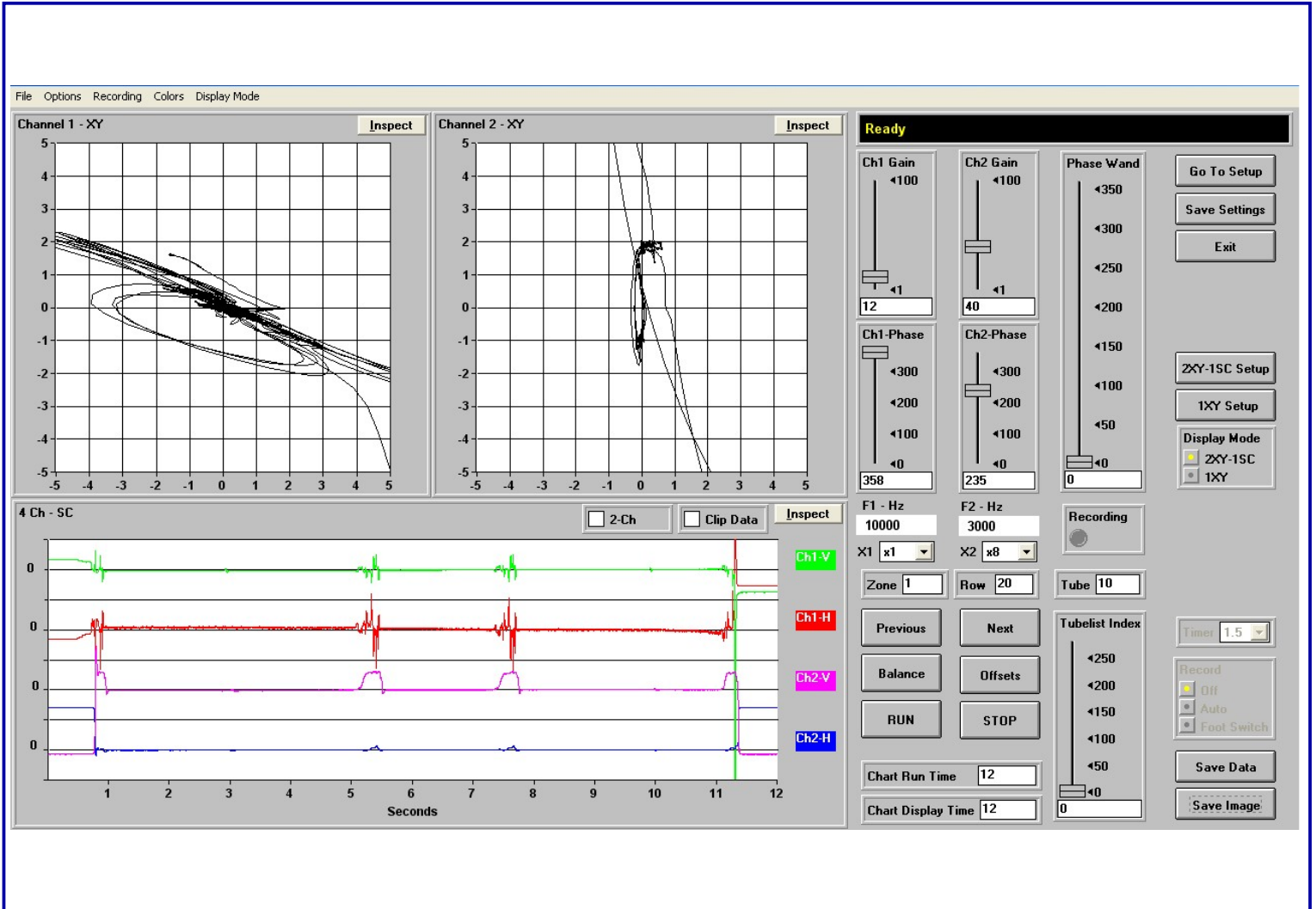
NO SIGNIFICANT DEFECTS (Row 10 Tube 11)

Evaporator Section



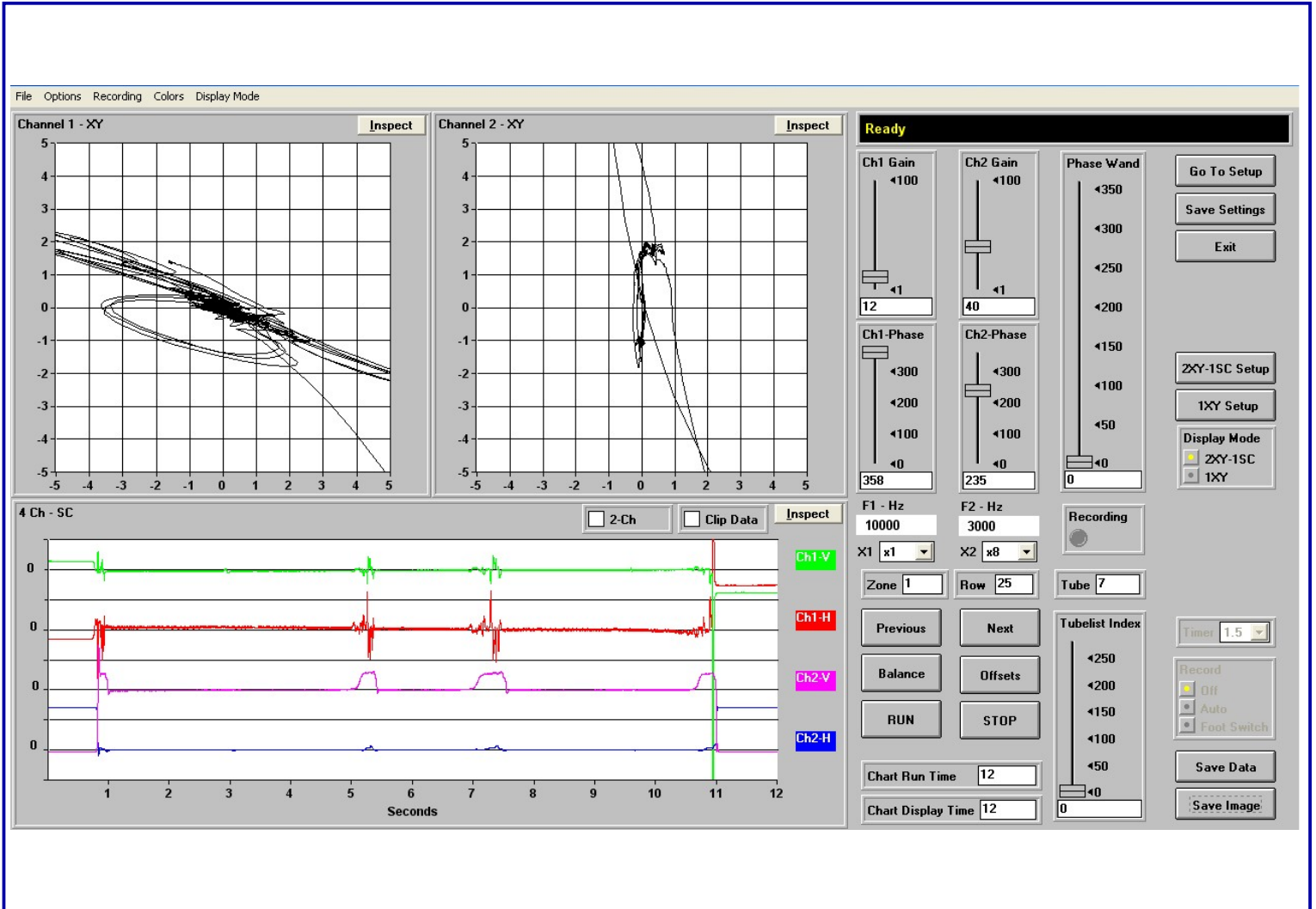
NO SIGNIFICANT DEFECTS (Row 15 Tube 5)

Evaporator Section



NO SIGNIFICANT DEFECTS (Row 20 Tube 10)

Evaporator Section



NO SIGNIFICANT DEFECTS (Row 25 Tube 7)

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