Commonwealth Edison Company
1400 Opus Place
Downers Grove, IL 60515-5701

ComEd

March 13, 1996

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: Meeting Held March 6, 1996, between Commonwealth Edison Company (ComEd)and Office of Nuclear Reactor Regulation (NRR) Byron Station Units 1 and 2, Braidwood Station Units 1 and 2
NRC Docket Nos. 50-454/455; 50-456/457

The enclosed document contains all non-proprietary information discussed March 6, 1996, between ComEd and NRR regarding ABB/Combustion Engineering Nuclear Operations Welded Sleeves for disclosure in the Public Document Room.

If you have any questions regarding this correspondence, please contact this office.

Sincerely,

Marcia T. Lesniak
Nuclear Licensing Administrator

cc: H. Miller, Regional Administrator-RIII
G. Dick, Byron Project Manager-NRR
H. Peterson, Senior Resident Inspector-Byron
Illinois Department of Nuclear Safety-IDNS

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ComEd/NRR

MARCH 6, 1996

ABB
COMBUSTION ENGINEERING NUCLEAR OPERATIONS
WELDED SLEEVES

AGENDA

- INTRODUCTION/OBJECTIVES
  [J. BLOMGREN]
- ABB CENO SLEEVE DESIGN AND EXPERIENCE
  [D. STEPNICK]
- RECENT EVENTS
  - PRAIRIE ISLAND OBSERVATION/PROCESS
    [R. PEARSON]
  - PRAIRIE ISLAND TUBE PULL RESULTS
    [W. GAHWILLER/J. LAREAU]
  - INSTALLATION PROCESS/INSPECTION CHANGES
    [J. LAREAU]

AGENDA

- OPERATING UNITS
  [D. AYRES]
- BASIS FOR BYRON BRAIDWOOD SLEEVE APPROVAL
  [J. BLOMGREN]
- CONCLUSIONS
  [J. BLOMGREN]

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INTRODUCTION/OBJECTIVES

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OBJECTIVES

- GET NRC CONCURRENCE FOR USE OF ABB CENO SLEEVES AT BYRON/BRAIDWOOD
- PRESENT ABB CENO INFORMATION ON RESULTS OF PI TUBE PULLS
- ABB CENO PLAN AND SCHEDULE FOR RESOLUTION OF SLEEVE ISSUES

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OUTAGE SCHEDULE
BYRON STATION

- TS CHANGE BYRON 1 SUBMITTED 5/19/95
  —REQUIRED APPROVAL 2/96
- UNIT OFF-LINE APRIL 5
- ECT APRIL 11 TO APRIL 18
- SLEEVING APRIL 22 TO MAY 5
- MANWAY INSTALLATION MAY 2 TO MAY 7
- MODE 4 MAY 14
- UNIT ON-LINE MAY 20

ComEd/NRR
SLEEVE MEETING

REQUEST FOR ADDITIONAL INFORMATION

- ABB CENO SLEEVING HISTORY
- PI RECENT EVENTS
- INSTALLATION PROCESS ISSUES
- NDE TECHNIQUES
- PROCESS CHANGES
- OPERATING SLEEVES

PRAIRIE ISLAND UNIT 1
PRELIMINARY CONCLUSIONS

- WELD INDICATIONS ARE PROCESS INDUCED
- PROCESS INDUCED FLAWS CAUSED BY INADEQUATE CLEANING
  - OXIDES PRESENT IN ALL CASES
  - NO INTERGRANULAR NATURE
  - NO GROWTH INDICATED BY I COIL
- OXIDE INDUCED WELD INDICATIONS DETECTED BY NDE
- STRUCTURAL INTEGRITY IS ADEQUATE
- LEAK RATE SMALL

BYRON/BRAIDWOOD
BASIS FOR ACCEPTANCE

- HISTORICAL PERFORMANCE OF SLEEVES
- PROCESS CONTROLS
- IMPROVED INSPECTION
  - ENHANCED UT PROCESSING
  - ADDING VISUAL OF CLEANED TUBE (PROCESS INSPECTION)
  - + POINT EXAM

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ABB CENO SLEEVE DESIGN

&

EXPERIENCE

ABB WELDED SLEEVE DESIGN CRITERIA

- LEAKTIGHT TO > 6500 psi
- LOW RESIDUAL STRESS
- CORROSION RESISTANT
- INSPECTABLE (100% U.T./V.T./ECT)
- REPAIRABLE (REWELD)
- STRUCTURAL REQUIREMENTS
- MAXIMUM TUBESHEET COVERAGE
- MINIMUM EFFECT ON HEAT TRANSFER
- PLUGGABLE

CENO SLEEVING EXPERIENCE

DATE	PLANT	STANDARD	PERIPHERAL	ETZ/RTZ	TSP
1/96	PRAIRIE ISLAND 1	253	0	0	0
10/95	ANO2	0	0	627	0
10/95	ZION 1	911	0	0	0
1/95	ZION 2	162	0	0	0
5/94	PRAIRIE ISLAND 1	117	0	0	0
11/93	ZION 1	61	0	0	0
6/93	KRSKO	0	0	164	16
4/93	GINNA	51	0	0	0
11/92	PRAIRIE ISLAND 1	158	0	0	0
11/92	ZION 2	170	0	0	0
6/92	ASCO 1	0	0	49	5
4/92	GINNA	178	63	0	0
4/92	ZION 1	124	0	0	0
3/92	KEWAUNEE	0	16	0	0
7/91	RINGHALS 3	0	0	46	22
4/91	GINNA	183	29	0	NA
4/90	ZION 2	82	0	0	-
4/90	GINNA	198	48	0	-
31/90	PRAIRIE ISLAND 1	62	0	NA	-
4/89	GINNA	408	107	-	-
10/89	ZION 1	445	0	-	-
9/88	PRAIRIE ISLAND 1	73	0	-	-
5/87	RINGHALS 2	571	NA	-	-
4/87	PRAIRIE ISLAND 1	27	-	-	-
2/87	GINNA	104	-	-	-
10/86	ZION 1	128	-	-	-
5/86	RINGHALS 2	539	-	-	-
2/86	GINNA	36	-	-	-
5/85	RINGHALS 2	59	-	-	-
4/84	RINGHALS 2	18	-	-	-
		5178	263	886	43

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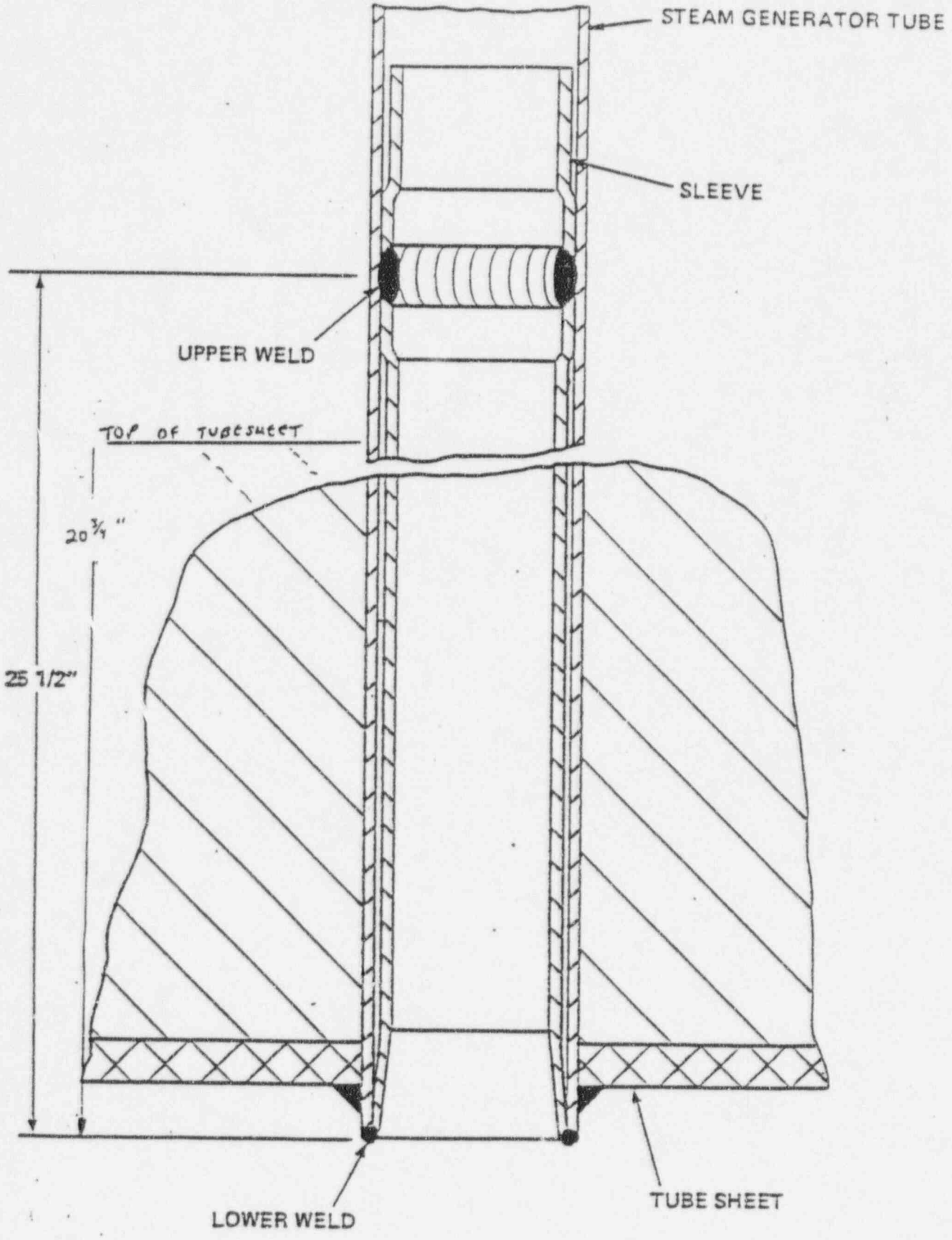
RECENT EVENTS

PRAIRIE ISLAND SLEEVING HISTORY

Date	Installed	Plugged	In Service
8704	27	0	27
8808	74	1	100
9001	63	0	163
9106	0	1	162
9210	158	1	319
9405	118	1	436
9601	285	41	680

SLEEVE INDICATIONS FROM EDDY CURRENT

- Volumetric Indications at Upper Sleeve Weld
  - —25 old sleeves (no change over one 20 month cycle based on I-coil and 3 coil RPC)
  - —26 new sleeves
- Circumferential Indications at Upper Sleeve Weld
  - —4 old sleeves (no change over 20 month cycle based on I-coil and 3 -coil RPC)
  - —6 new sleeves
- No indications in parent tubing or sleeve away from the sleeve weld



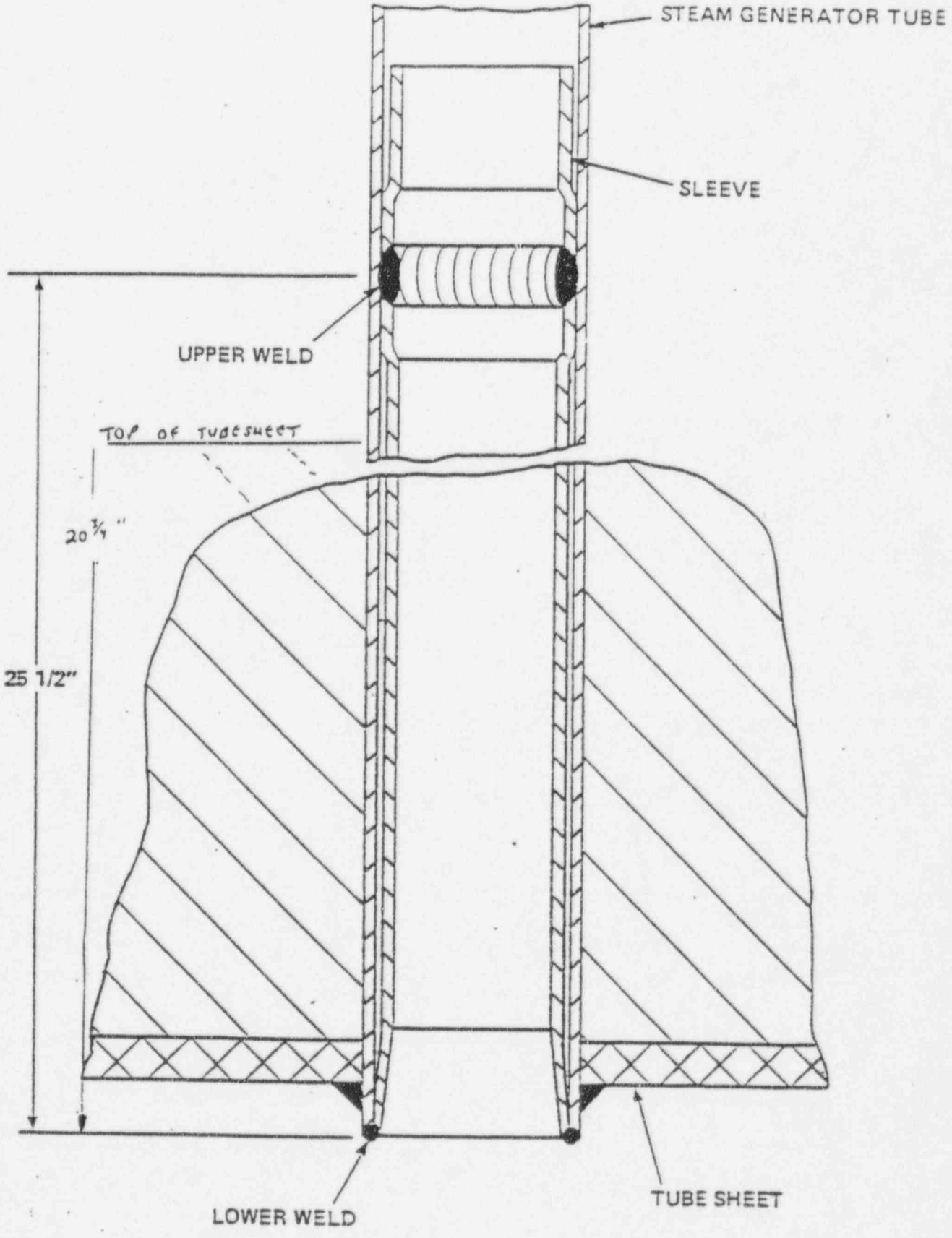
COMBUSTION ENGINEERING	SLEEVE INSTALLATION	Figure 2

SLEEVE PULL - PURPOSE

- Identify physical condition which is source of ET Indications
- Evaluate Effect on Structural Integrity
- Identify Root Cause (Service or Process)
- Evaluate Leak Tightness
  - Plant developed a 23 GPD(max) leak on 11/17/96
  - One Sleeve, R7C63, leaked 1 drop per 6 minutes under 750# Secondary Pressure
- Received Encouragement from NRC

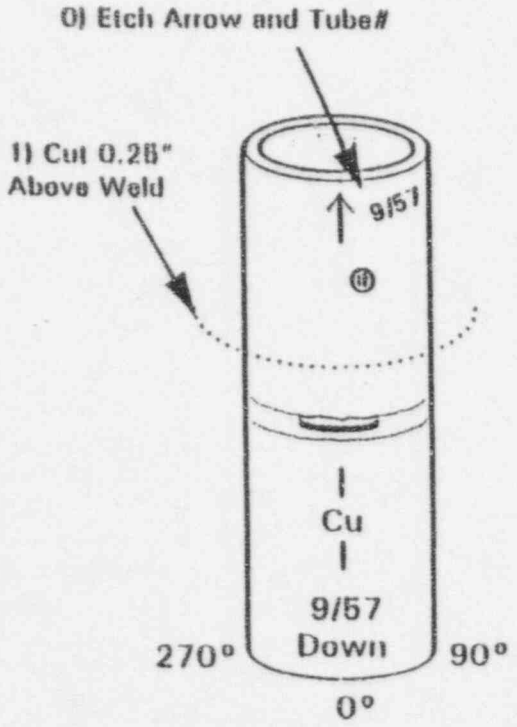
SLEEVE PULL - TUBE SELECTION

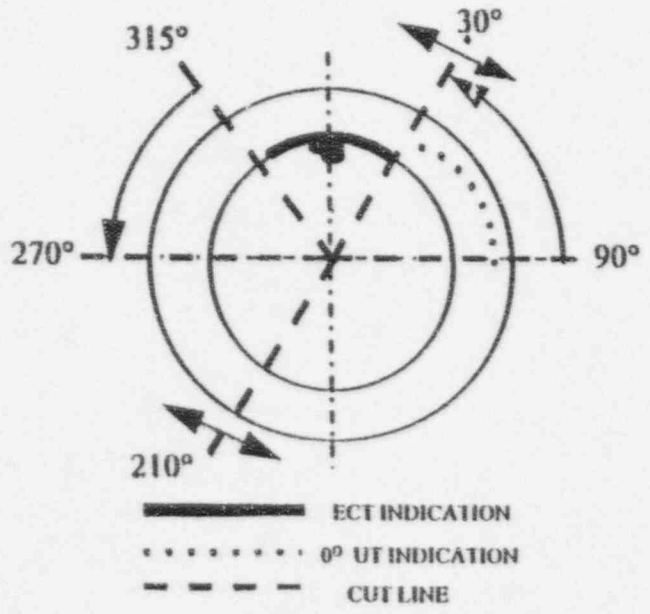
• R5C48 Installed 9210	Single Circumferential Indication 1 Weld
• R7C52 Installed 9405	Multiple Circumferential Indication 4 Welds
• R9C57 Installed 9210	Single Circumferential Indication 1 Weld
• R7C63 Installed 9210	Volumetric Indication 2 Welds
• R5C74 Installed 9601	Multiple Circumferential Indication 2 Welds



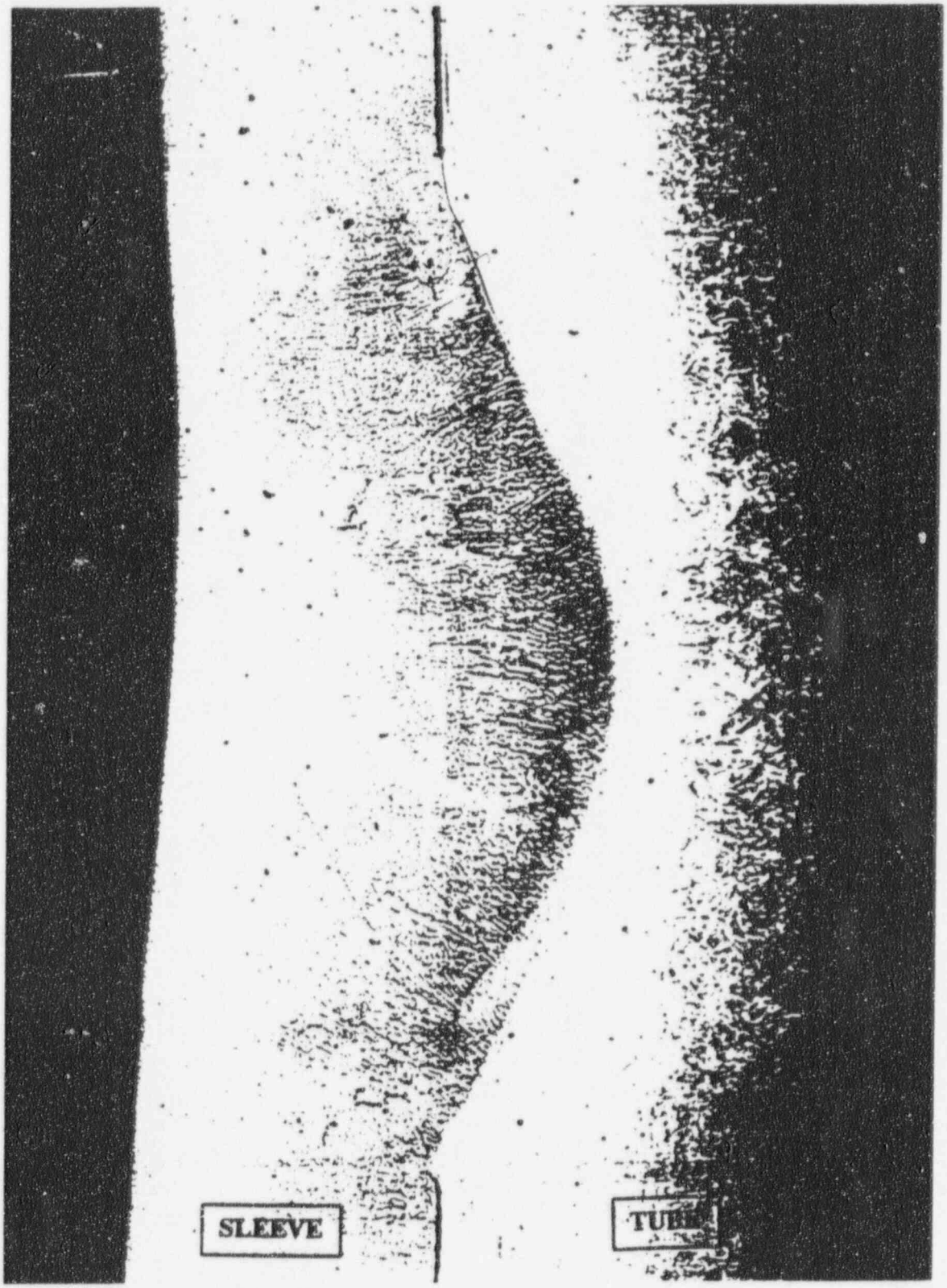
COMBUSTION ENGINEERING	SLEEVE INSTALLATION	Figure 2

PRAIRIE ISLAND TUBE/SLEEVE
TYPICAL CUT PLAN



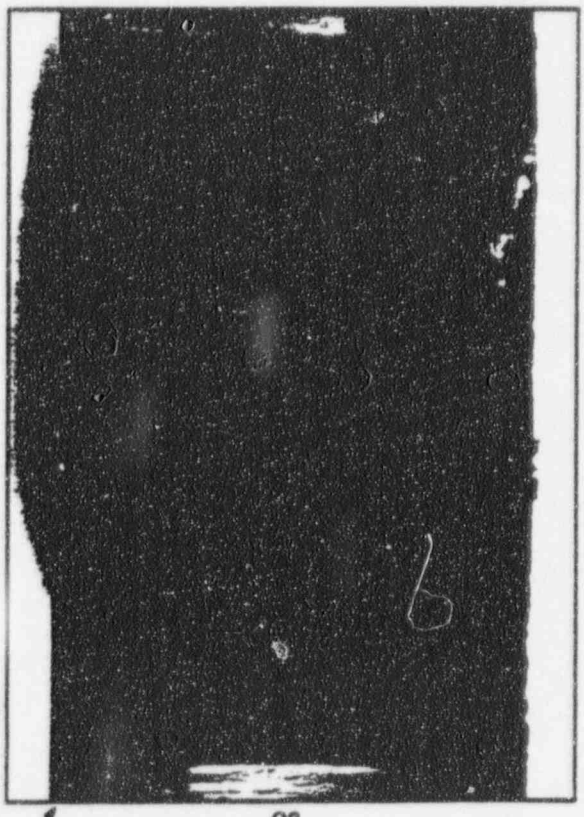


TUBE R 9 C 57
ACCEPTABLE WELD

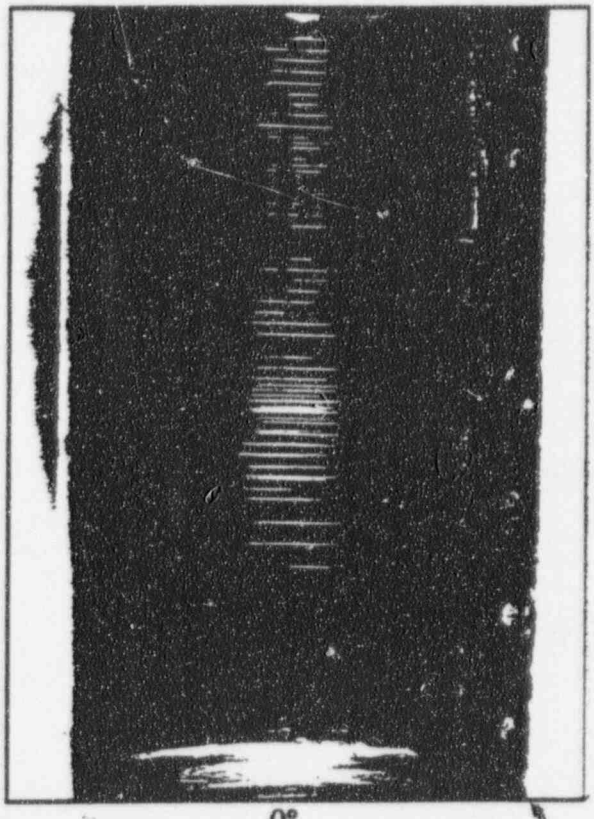


PRAIRIE ISLAND UNIT 1
STEAM GENERATOR 1 2
TUBE R 5 C 74

Tube I.D. Surface
(5/8" Below Sleeve Weld)

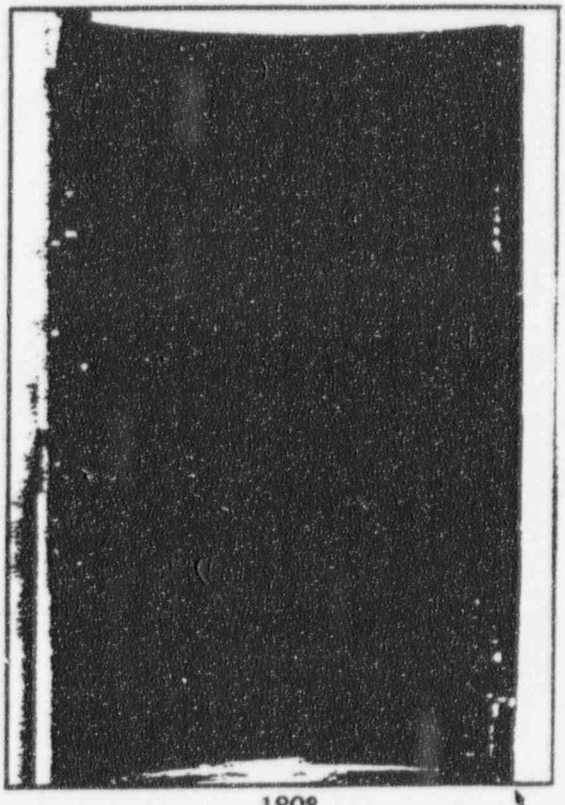


90° 0° HALF



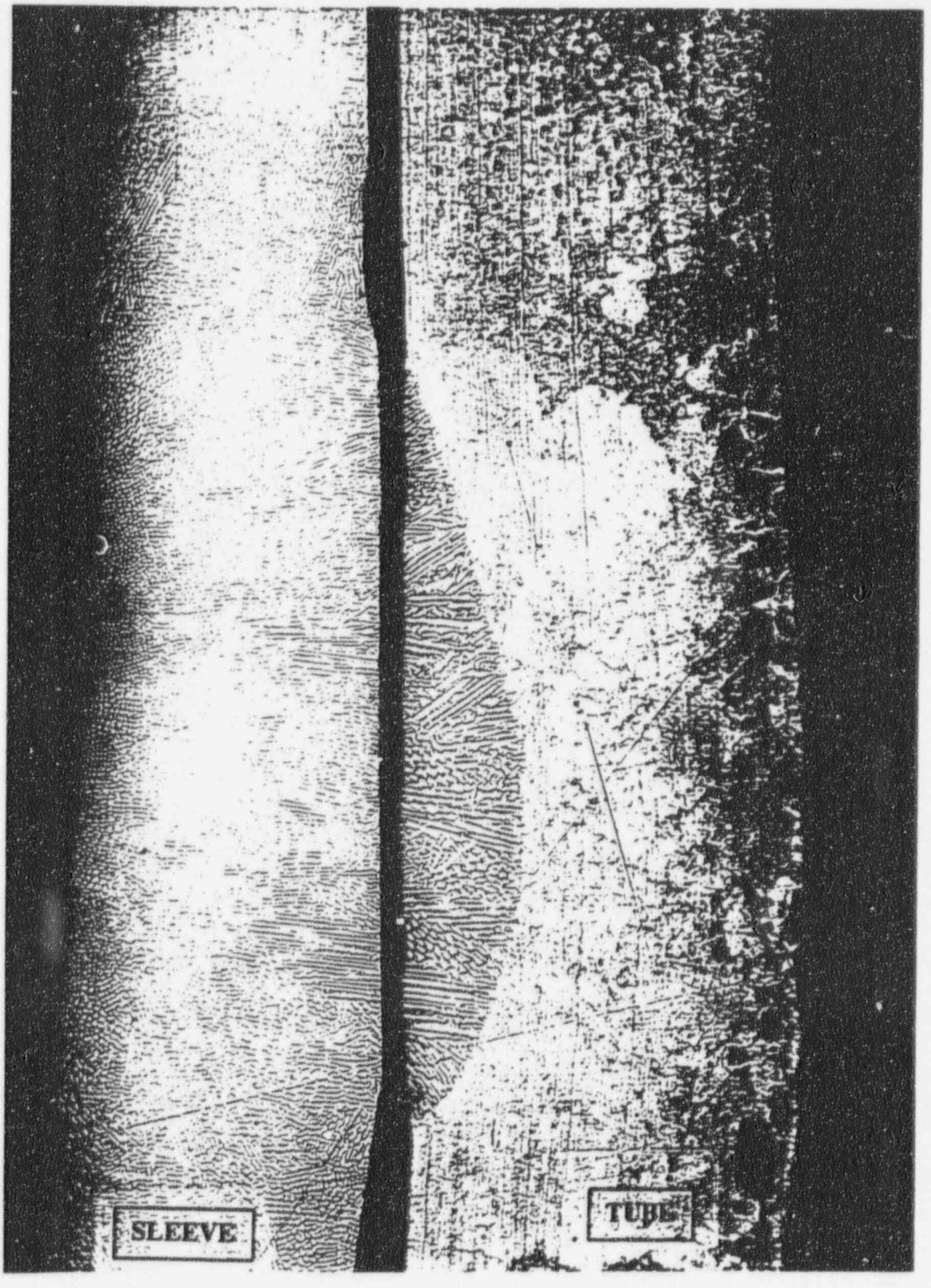
0° HALF 270°

270° 180° HALF

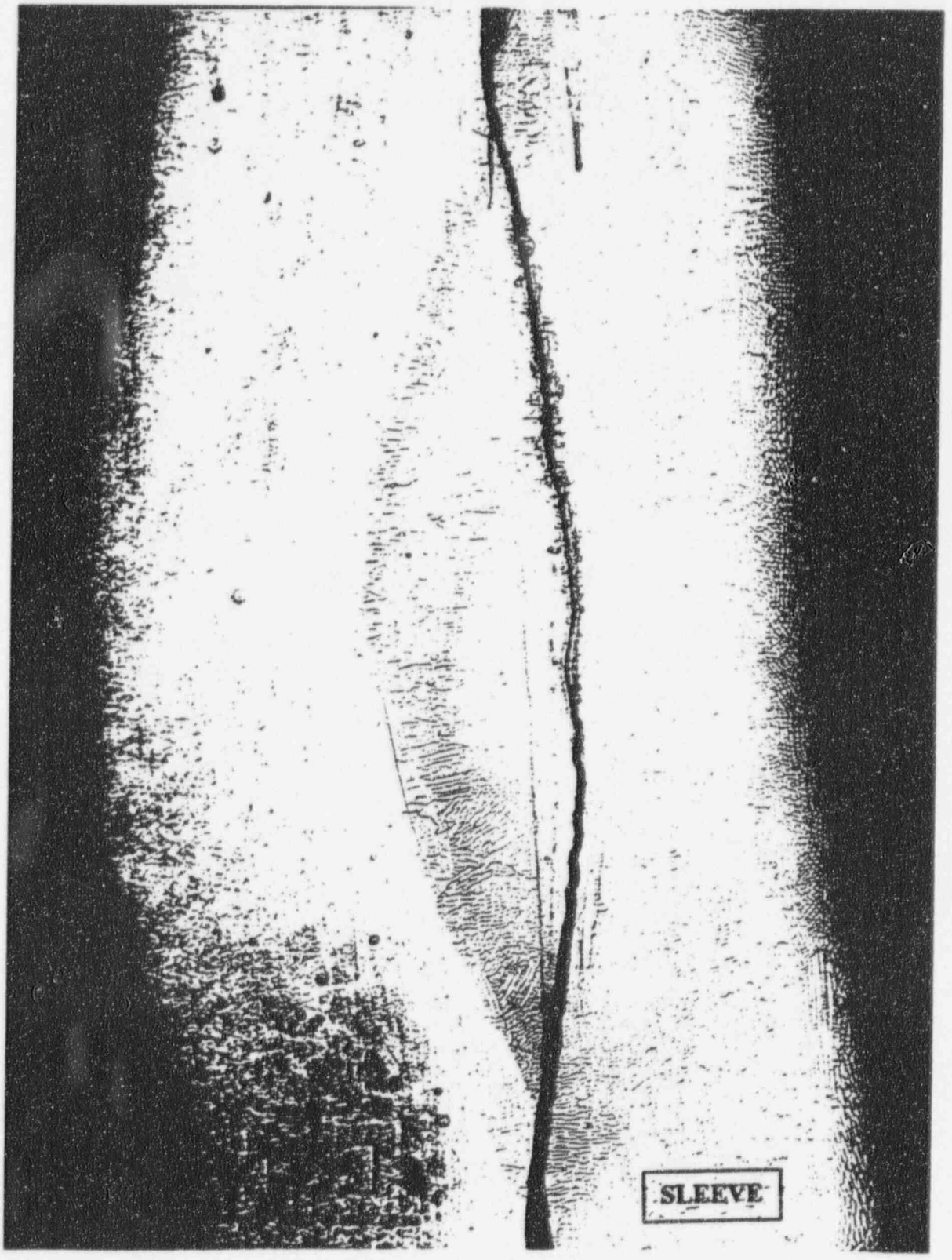


180° HALF 90°

TUBE R 7 C 63
LACK OF FUSION



TUBE R 7 C 52
OXIDE INCLUSION / FILM



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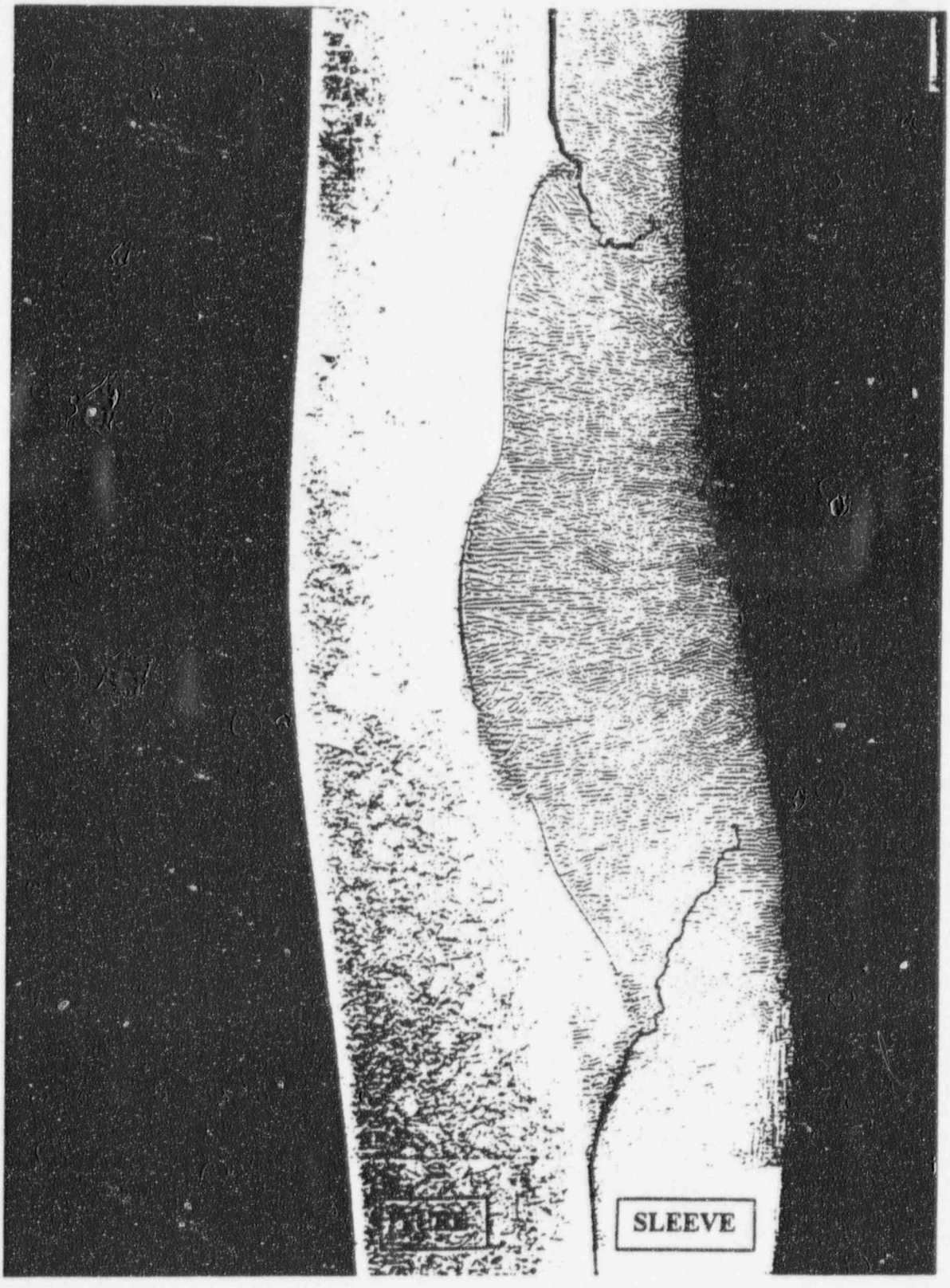
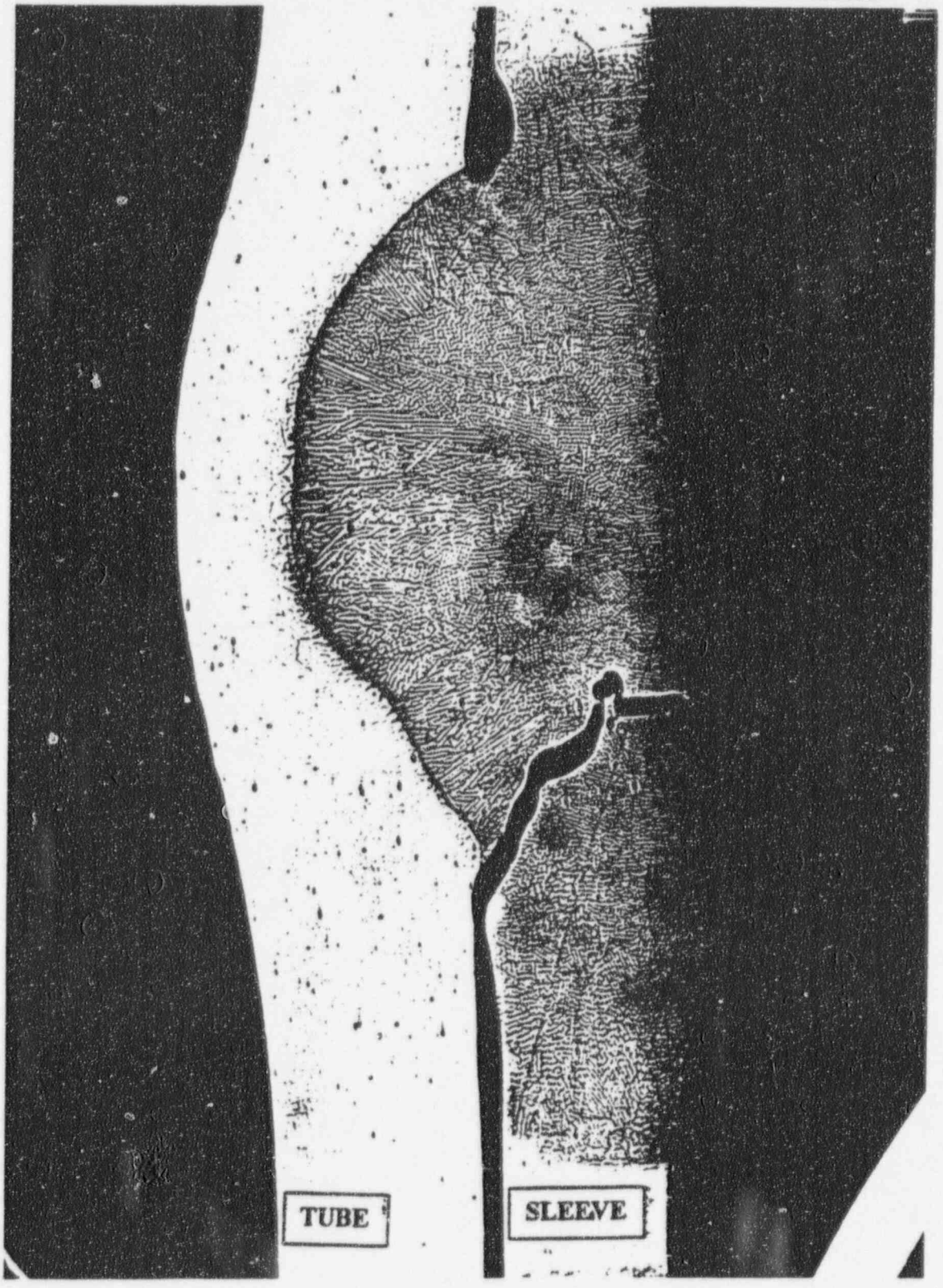


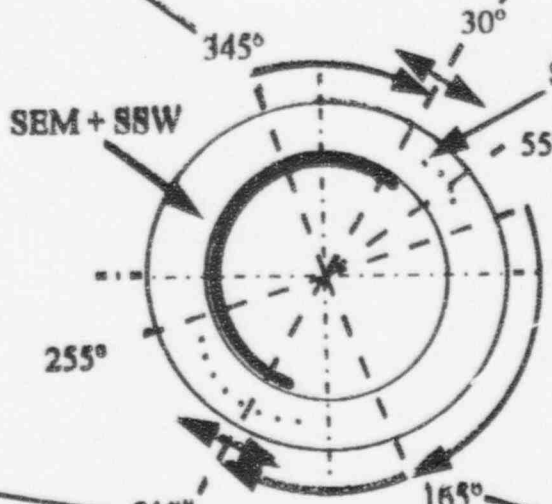
TUBE R 7 C 52
SEPARATED OXIDE INCLUSION / FILM

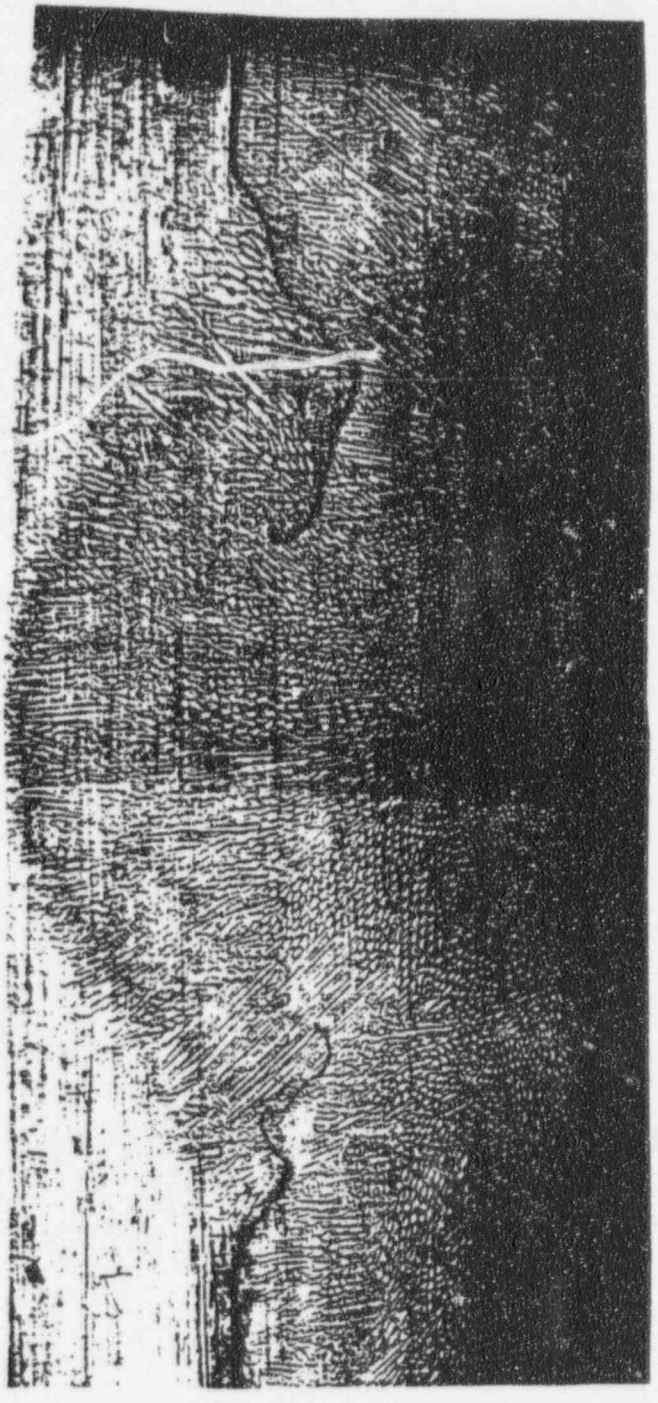


PRAIRIE ISLAND UNIT 1 S/G 1 2

TUBE R 7 C 52

(View from tubeshcet up)



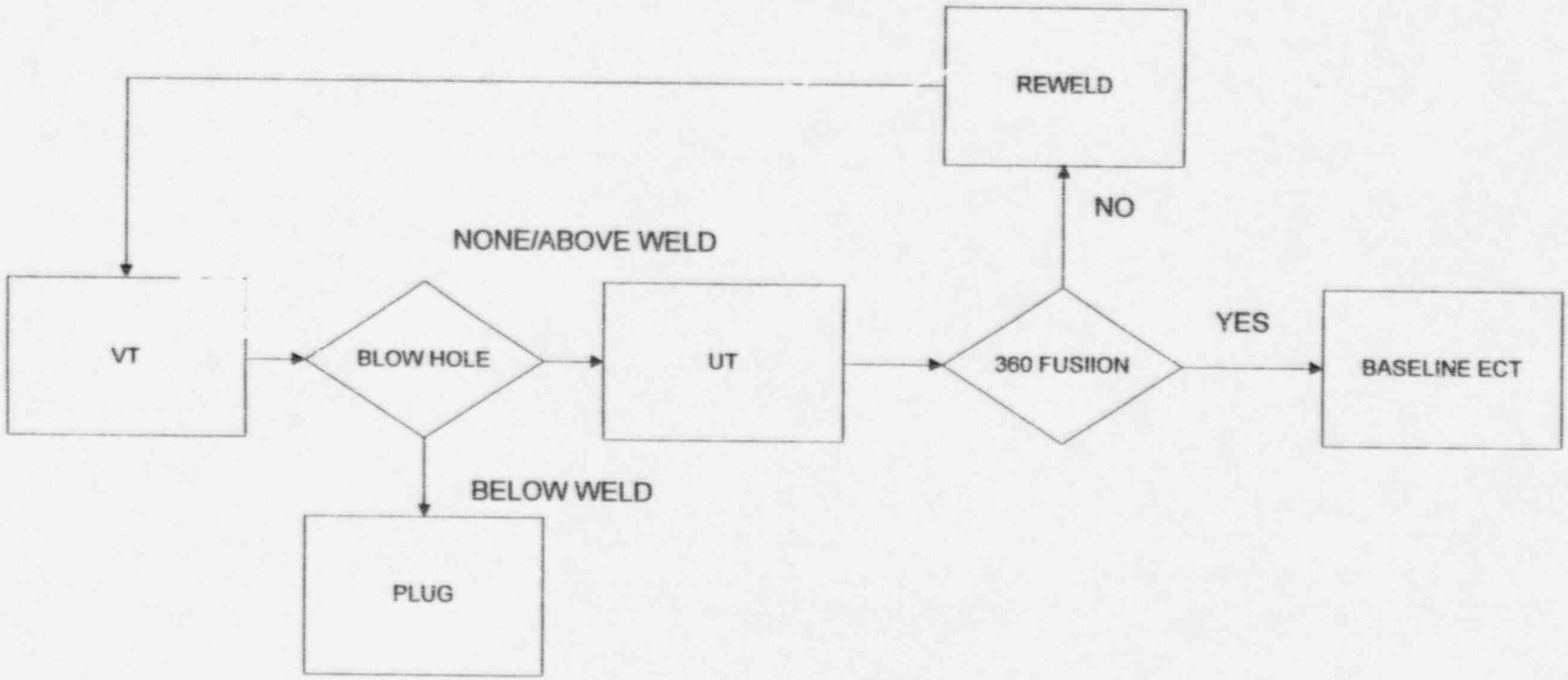


45X

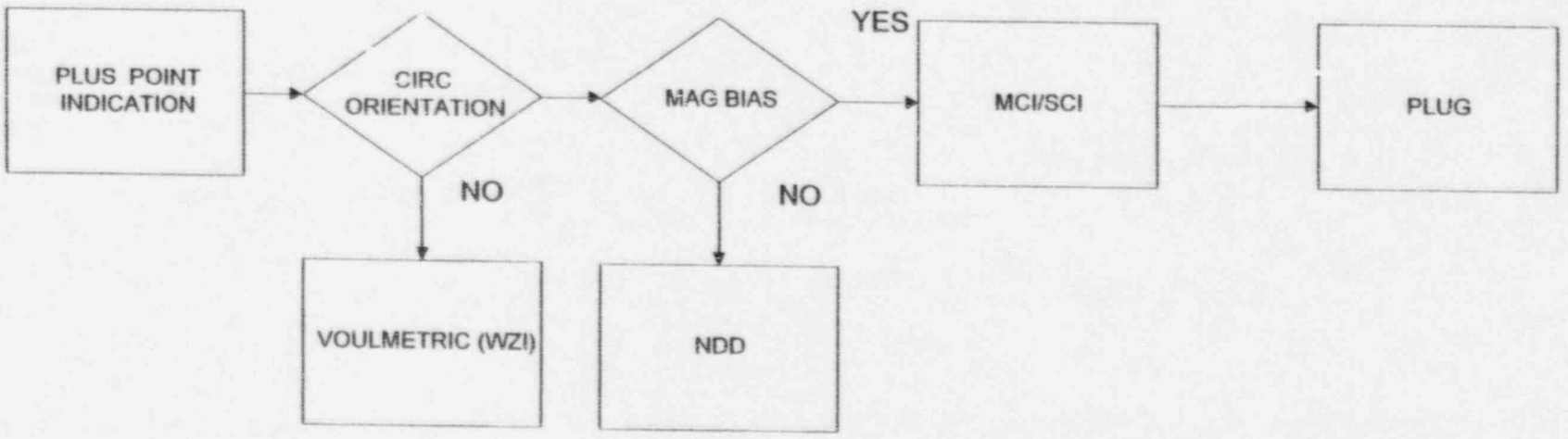
LONGITUDINAL VIEW OF TUBE
R26C39 AT 90° POSITION.

FIGURE 5

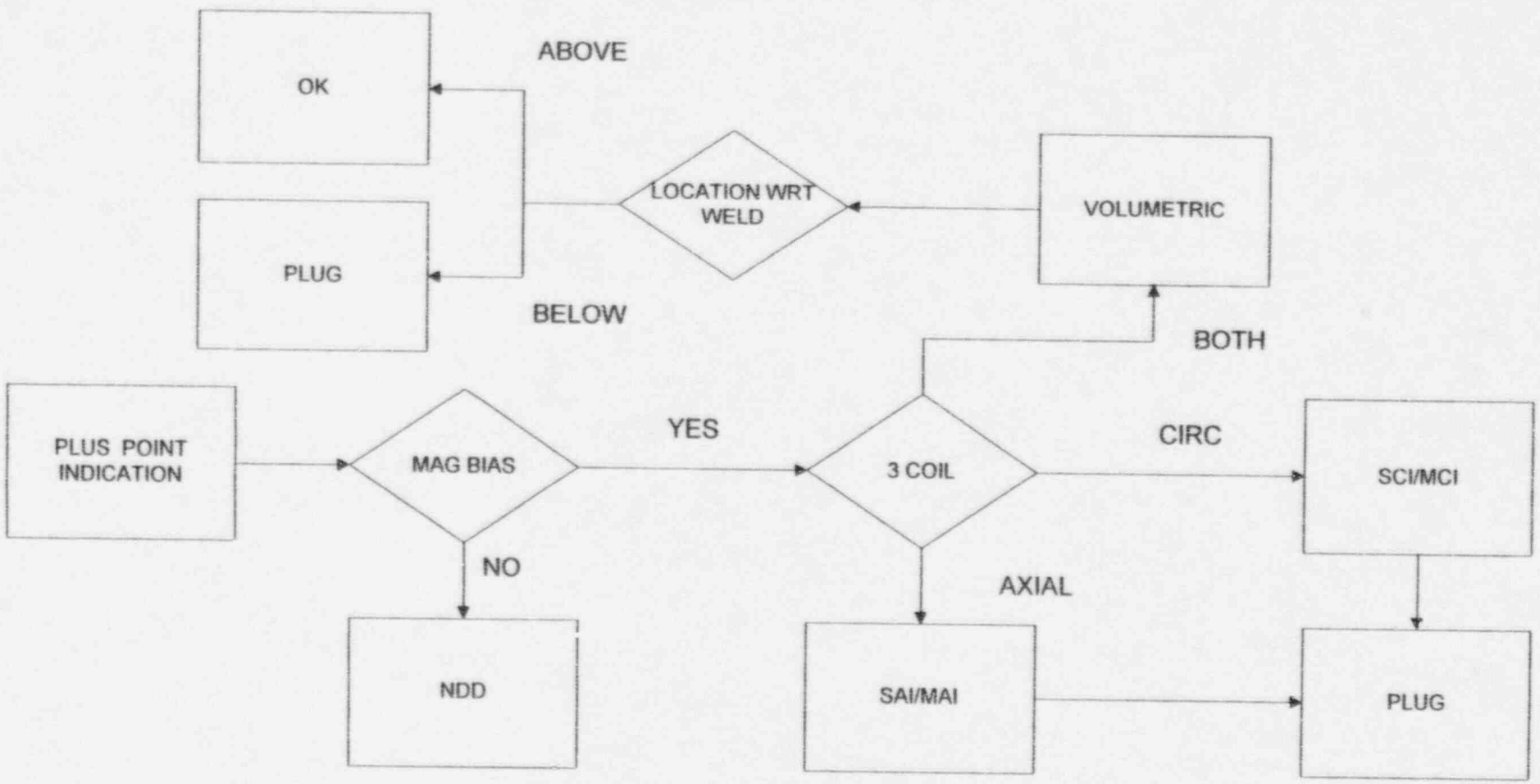
INSPECTION PROGRAM
POST WELDING

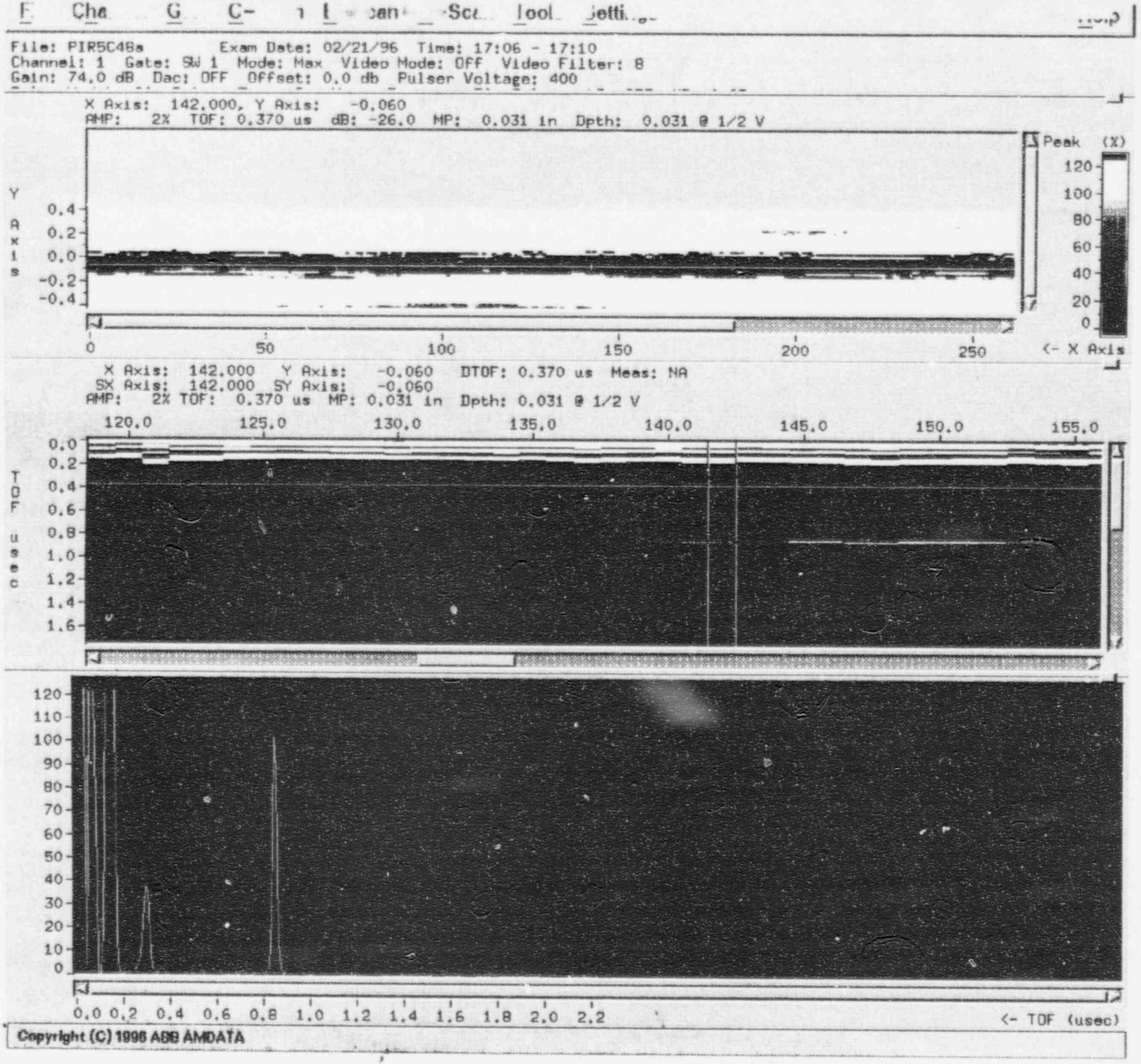


ECT BASELINE
PREVIOUS PRACTICE



ECT BASELINE
NEW PRACTICE

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Channel: 1 Gate: SW 1 Mode: Max Video Mode: Off Video Filter: 8
Gain: 74.0 dB Dac: OFF Offset: 0.0 db Pulser Voltage: 400
X Axis: 142.000, Y Axis: -0.060
AMP: 2% TOF: 0.370 us dB: -26.0 MP: 0.031 in Dpth: 0.031 @ 1/2 V
Y Axis
Peak (X)
<- X Axis
X Axis: 142.000 Y Axis: -0.060 DTOF: 0.370 us Meas: NA
SX Axis: 142.000 SY Axis: -0.060
AMP: 2% TOF: 0.370 us MP: 0.031 in Dpth: 0.031 @ 1/2 V
TOF usec
<- TOF (usec)
Copyright (C) 1996 ABB AMDATA

File Channel Gate C-Scan B-Scan A-Scan Tools Settings Help

File: PIR5C48a Exam Date: 02/21/96 Time: 17:06 - 17:10
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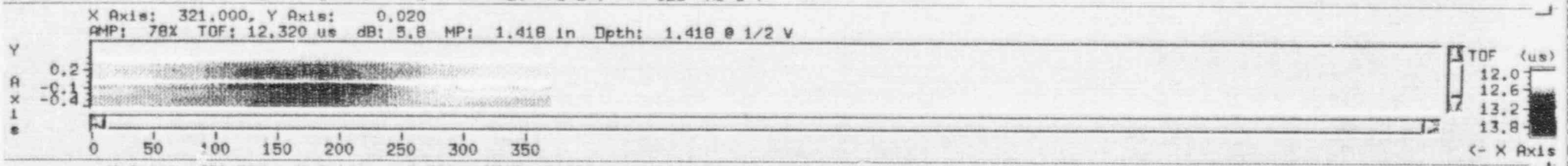

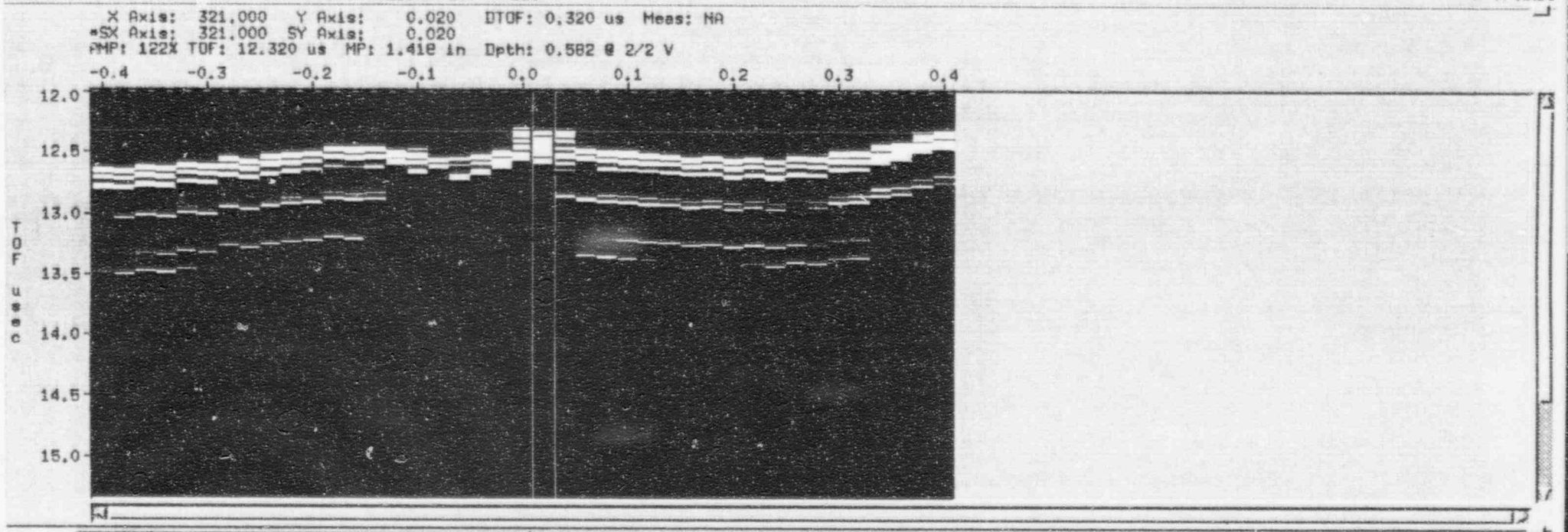

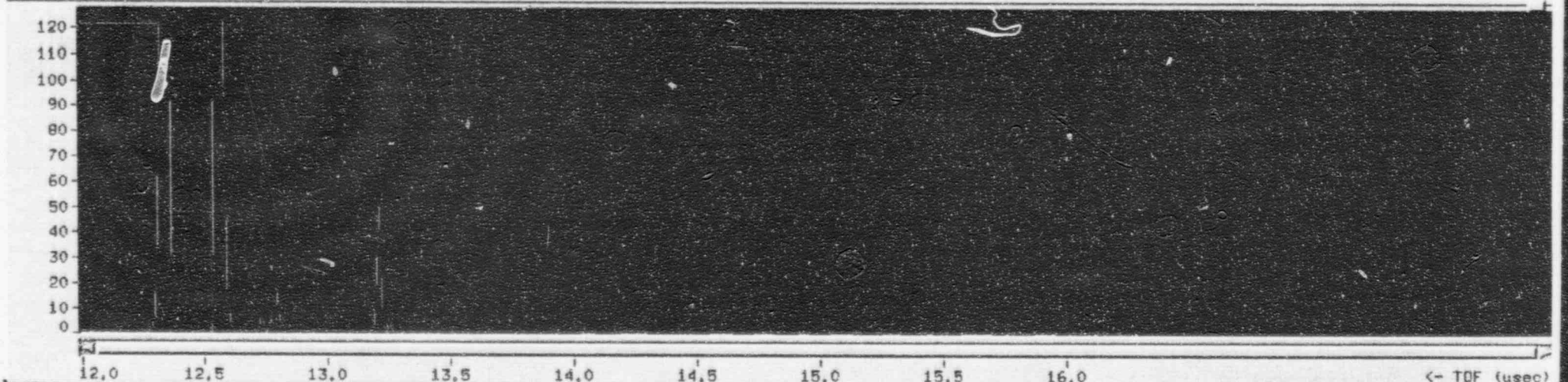

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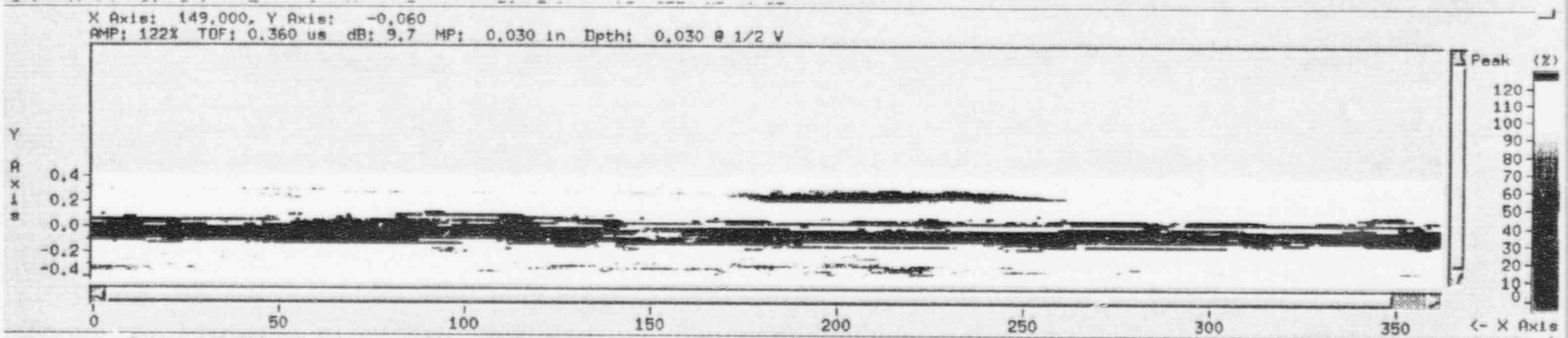

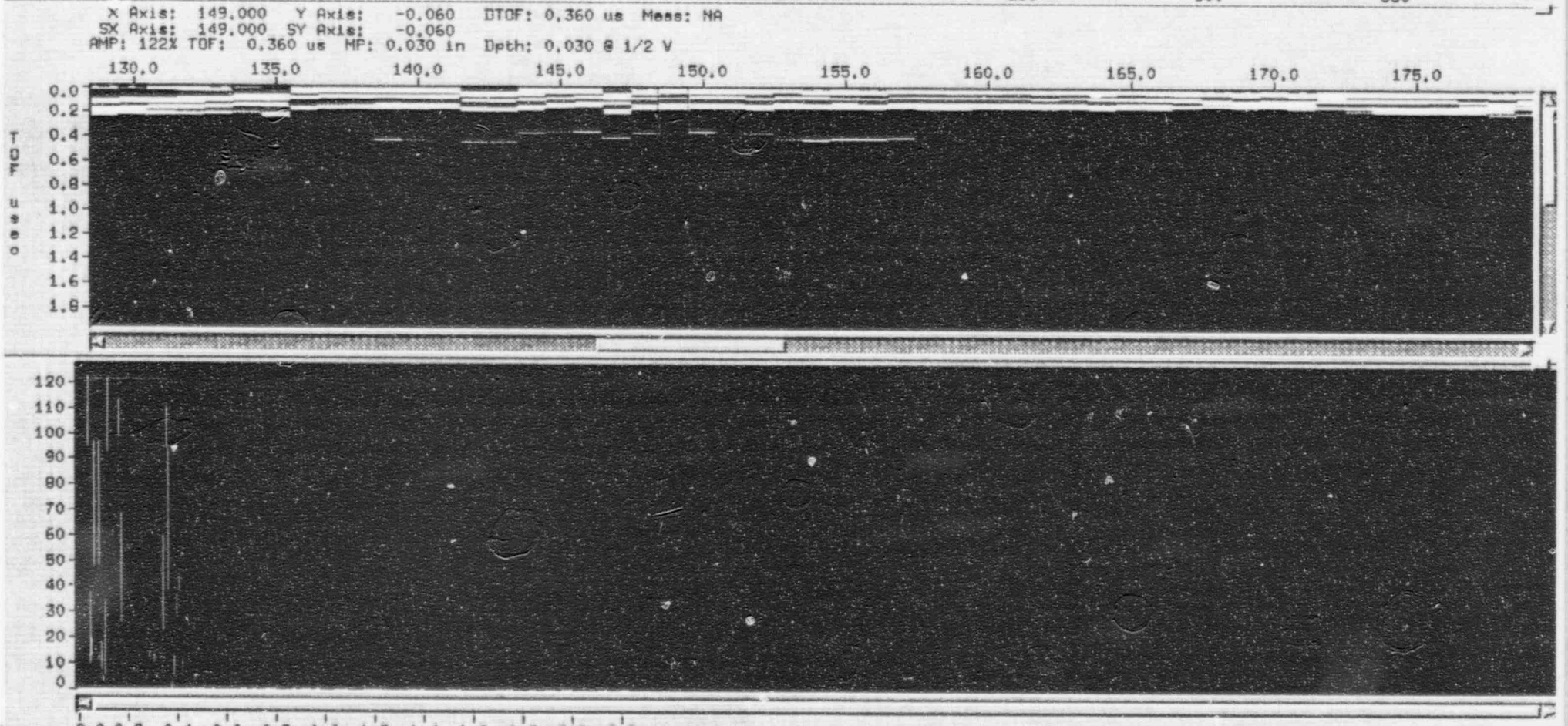

File Channel Gate C-Scan B-Scan A-Scan Tools Settings Help

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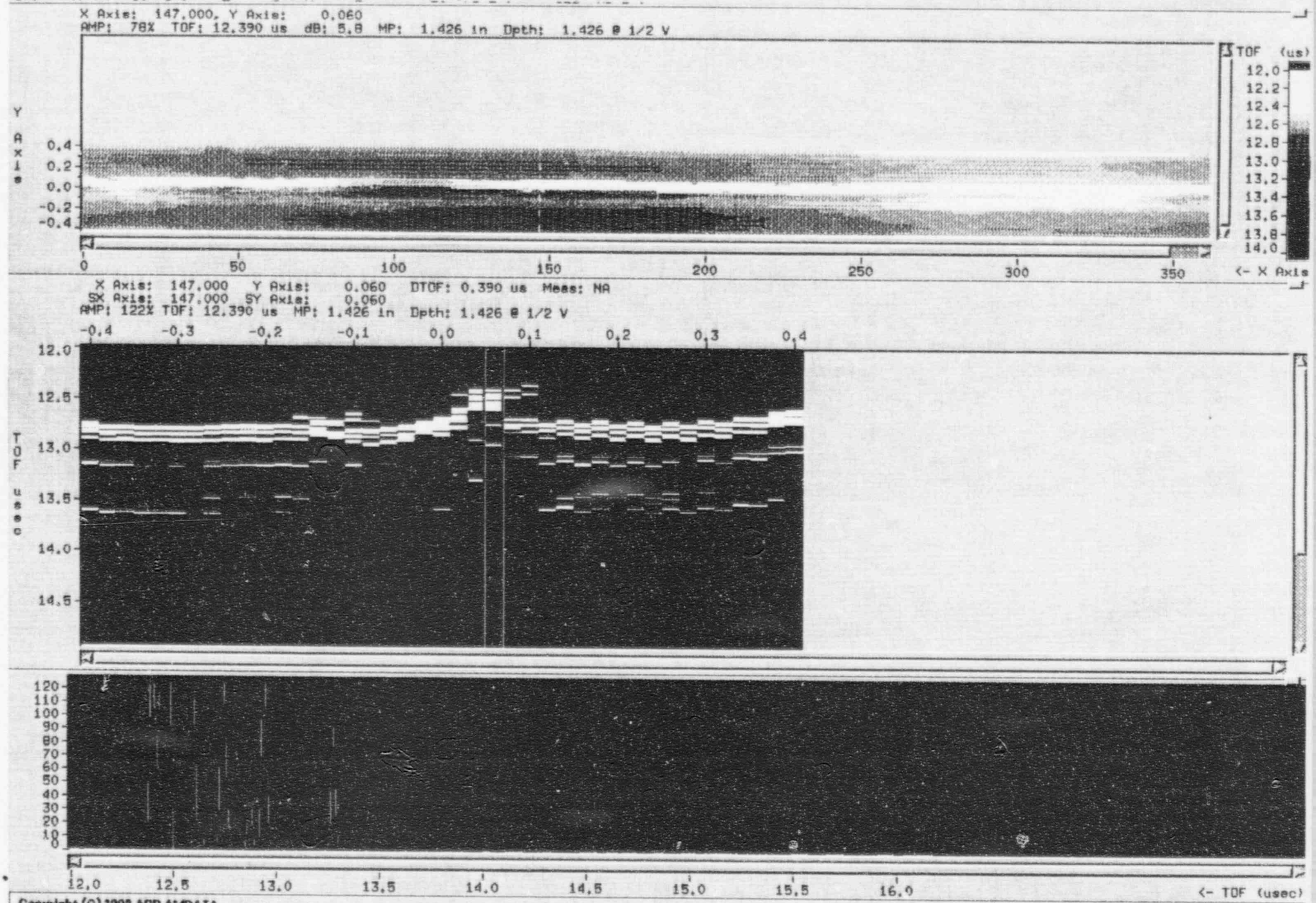

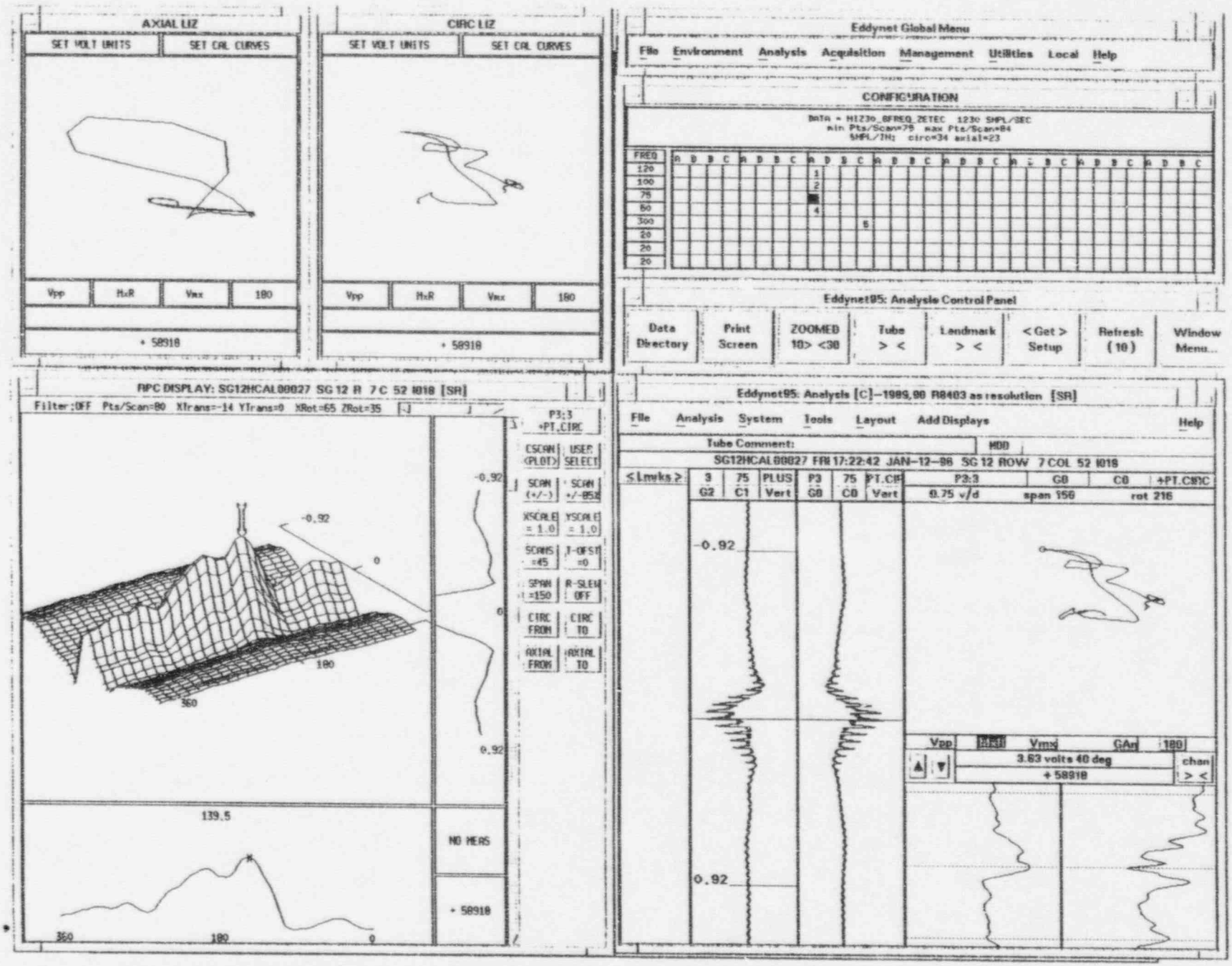
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MxR
Vmx
180
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MxR
Vmx
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+ 58918
Eddynet Global Menu
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CONFIGURATION
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FREQ
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100
75
60
300
20
20
20
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Print Screen
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< Get > Setup
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USER SELECT
SCAN (+/-)
SCAN +/-B52
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YSCALE = 1.0
SCANS =45
T-OFST =0
SPAN =150
R-SLEW OFF
CIRC FROM
CIRC TO
AXIAL FROM
AXIAL TO
-0.92
0
180
360
0.92
139.5
NO MEAS
+ 58918
Eddynet95: Analysis [C]--1989,90 R8403 as resolution [SR]
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Tube Comment:
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3 G2
75 C1
PLUS Vert
P3 G0
75 C0
PT.CIR Vert
P3:3
G0
C0
+PT.CIRC
0.75 v/d
span 150
rot 216
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0.92
Vpp
MxR
Vmx
GAn
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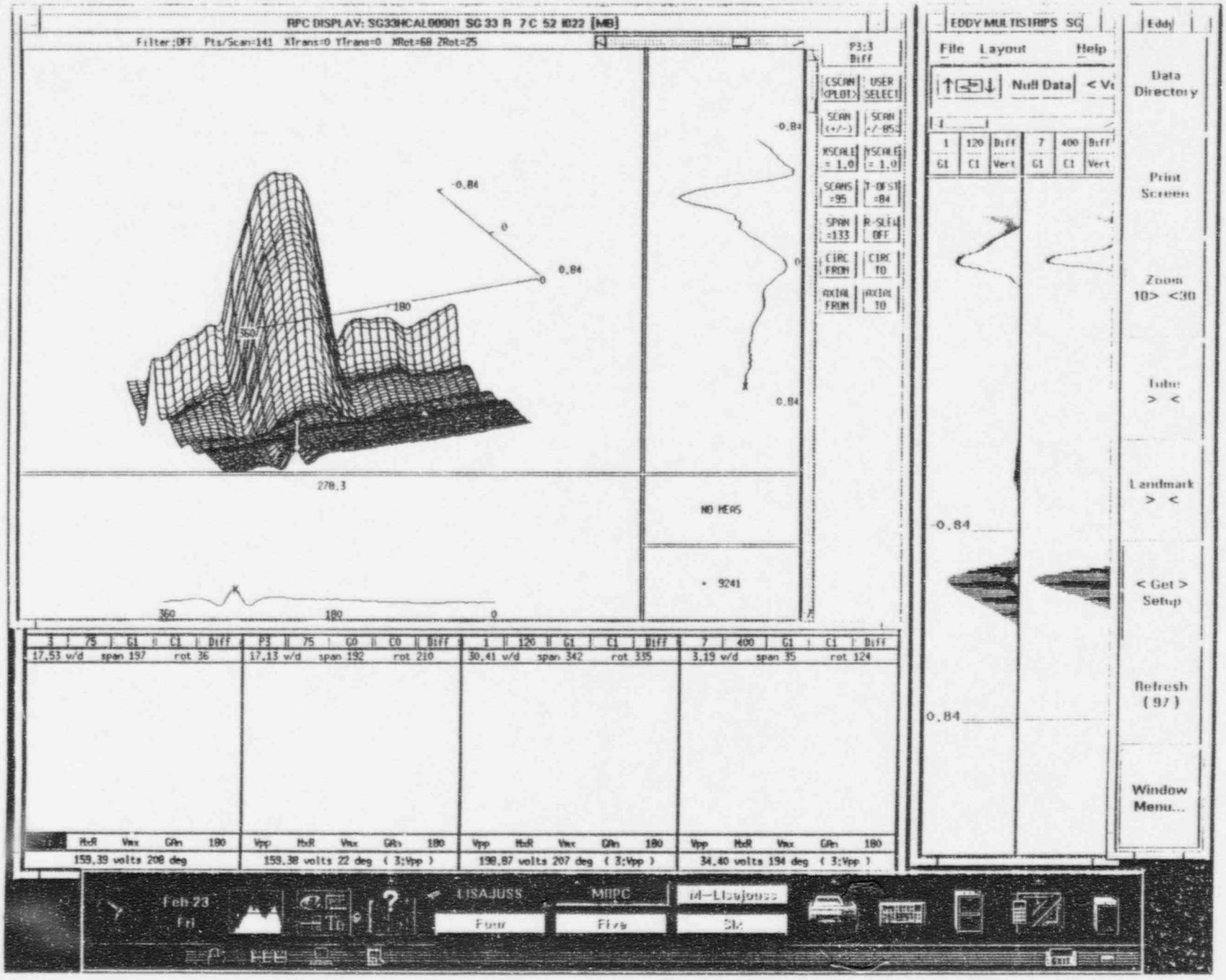
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SCAN (+/-)
SCAN +/-85
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SPAN =133
R-SCAN OFF
CIRC FROM
CIRC TO
AXIAL FROM
AXIAL TO
EDDY MULTISTRIPS SG
File
Layout
Help
Null Data
Data Directory
Print Screen
Zoom 10> <30
Tube > <
Landmark > <
< Get > Setup
Refresh (97)
Window Menu...
17,53 v/d span 197 rot 36
17,13 v/d span 192 rot 210
30,41 v/d span 342 rot 335
3,19 v/d span 35 rot 124
159,39 volts 208 deg
159,38 volts 22 deg (3:Vpp)
198,87 volts 207 deg (3:Vpp)
34,40 volts 194 deg (3:Vpp)
Feb 23
Fri

ComEd/NRR

CONCLUSIONS

- ROOT CAUSE
  - —INADEQUATE CLEANING
- CORRECTIVE ACTION
  - —CLEANING PROCESS CHANGED
  - —IMPROVED INSPECTION

BYRON/BRAIDWOOD
BASIS FOR ACCEPTANCE

- HISTORICAL PERFORMANCE OF SLEEVES
- PROCESS CONTROLS
- IMPROVED INSPECTION
  - ENHANCED UT PROCESSING
  - ADDING VISUAL OF CLEANED TUBE (PROCESS INSPECTION)
  - + POINT EXAM

ACRONYMS

• SCI/MCI	Single/Multiple circumferential indications
• SAI/MAI	Single/Multiple axial indications
• PV	Permeability variation
• VOL	Volumetric indication
• WZI	Weld zone indication
• +PT	Plus point probe design
• C SCAN	Plan view of data
• B SCAN	0 - 360 degree cross section view
• B' SCAN	Axial cross section
• SEM	Scanning electron microscope
• UET	Upper expansion transition

ABB-CENO S/G Sleeve Operating History (to January 1996)

Plant	Hot Leg Temp (F)	Sleeve Type (1)	Estimated EFPY of Sleeve Operation (2) <1	1	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	TOTAL
Ringhals 2	610	STAW			16													
	600	STAW				571	599		59	16								1245
Ringhals 3	601	STAW				51	178		183	198		408			104		36	1158
		PTAW					63		29	48		107						247
Prairie Island 1 (4)	590	STAW													73		27	100
		STHT	253		117		158					62						590
Kewaunee (4)	590	PTAW					16											16
Zion 1 (4)	594	STAW	911		61	124			445				128					1669
Zion 2 (4)	594	STAW		162	170				82									414
ANO 2 (4)	611	RTHT	627															627
Ringhals 3 (4)	610	RTHT							46									46
		SPHT							22									22
KRSKO (4)	619	RTHT			164													164
		SPHT			16													16
Total			1791	162	528	746	1014	0	866	262	0	577	128	0	177	0	63	6314
Cumulative Total			6314	4523	4361 (3)	3833	3087	2073	2073	1207	945	945	368	240	240	63	63	

Notes:

(1) Sleeve Type designations and their totals are as follows:

		Totals
STAW	Standard Tubesheet sleeves where the welds are in the As Welded condition	4586
PTAW	Peripheral (Initially Curved) Tubesheet sleeves where the welds are in the As Welded condition	263
STHT	Standard Tubesheet sleeves where the upper weld has been Post Weld Heat Treated	590
RTHT	Roll Transition sleeves where the weld has been Post Weld Heat Treated	837
SPHT	Support Plate sleeves where the welds have been Post Weld Heat Treated	38

(2) EFPY of operation is based either on data received from the plant or calculated from the load factor published in Nuclear Engineering International for the period during which the sleeves have been in place. Operating time is rounded to the nearest 0.1 EFPY as of 1 July 1995

(3) 16 Sleeves which ran for a year at Ringhals 3 before T hot was reduced are included in totals for 600 F

(4) Plants inspected with I-coil or Plus Point ECT probe