Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-15-179

September 4, 2015

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-001

Watts Bar Nuclear Plant, Unit 2
Construction Permit No. CPPR-92
NRC Docket No. 50-391

Subject: **WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING REQUEST FOR RELIEF WBN-2/PSI-3 FOR INACCESSIBLE STEAM GENERATOR LOWER SHELL-TO-CONE WELD SG-4B-5-2 (TAC No. MF6474)**

References:

1. TVA Letter to NRC, "Watts Bar Nuclear Plant (WBN) Unit 2 - Request For Relief WBN-2/PSI-3 For Inaccessible Steam Generator Lower Shell-To-Cone Weld SG-4B-5-2," dated July 10, 2015 [ADAMS Accession No. ML15196A455]

2. Email from NRC to TVA, "FINAL RAIs - Watts Bar 2 Relief Request SG Welds (TAC No. MF6474)," dated August 17, 2015 [ADAMS Accession No. ML15229B008]

The purpose of this letter is to respond to a request for additional information (RAI) received from the Nuclear Regulatory Commission (NRC) concerning the Tennessee Valley Authority's July 10, 2015 Request for Relief provided in Reference 1. The NRC RAI was received by email on August 6, 2015 (Reference 2).

The enclosure to this letter provides the response to each of the RAI questions.

There are no new regulatory commitments made in this letter. Should you have questions regarding this submittal, please contact Gordon Arent at (423) 365-2004.

Respectfully,

J. W. Shea

Digitally signed by J. W. Shea
DN: cn=J. W. Shea, o=Tennessee Valley Authority, ou=Nuclear Licensing, email=jwshea@tva.gov, c=US
Date: 2015.09.04 20:59:29 -04'00'

J. W. Shea
Vice President, Nuclear Licensing

Enclosure
cc: See Page 2

Enclosure: TVA Response to Request for Additional Information (RAI)

cc (Enclosure):

NRC Regional Administrator, Region II
NRC Project Manager - Watts Bar Nuclear Plant, Unit 2
NRC Senior Resident Inspector - Watts Bar Nuclear Plant, Unit 2

ENCLOSURE

TVA Response to Request for Additional Information (RAI)

RAI-1

Relief Request WBN-2/PSI-3 states that, "Circumferential shell weld on steam generator number 2 (Weld SG-4B-5-2 – lower shell-to-cone weld) is partially inaccessible for examination because of the upper steam generator support bracket." Describe what it takes to increase the volumetric examination coverage beyond 24 percent reported in the relief request. Also, without explanation, it is hard to confirm from Drawing ISI-2001-E-03 that your best effort will result in a coverage of only 24 percent. Please provide this explanation.

TVA Response

Both the original Watts Bar Nuclear Plant (WBN) Unit 1 steam generators and the existing WBN Unit 2 steam generators were fabricated at approximately the same time in 1975 and contain the same weld configurations. These welds were examined volumetrically by radiography during fabrication in accordance with ASME Code Section III requirements.

WBN Unit 2 steam generator weld identification no. SG-4B-5-2 is classified in ASME Section XI as Code Class 2, Code Category C-A, item C1.10, Shell Circumferential Weld. The examination volume requirements are shown in ASME Section XI, Figure IWC-2500-1. This volume consists of the full weld thickness plus an additional 1/2 inch of base material on each side of the weld as measured from the weld to base metal interface (i.e., weld toe).

WBN Unit 2 steam generator weld SG-4B-5-2 consists of SA-533 Grade A, class 2 carbon steel material. The weld joint is configured as a transition from a conical shell to a cylindrical shell with the weld wholly located on the cylindrical shell side. The base metal and weldment for Weld SG-4B-5-2 are ferritic materials (carbon steel) which are known to exhibit favorable ultrasonic transmission qualities due to their small, isotropic grain structures. Additionally, located over the weld is the steam generator upper lateral support ring. This configuration presents an annular gap of approximately 1.5 inches between the cone outer surface and the interior of the lateral support ring and restricts access to the weld. (See Attachment 1.)

This configuration results in access to the exam volume from only the conical side of the weld joint. Scans in the axial direction were conducted from the accessible (conical) side of the joint. Circumferential scans from the conical shell did not provide for coverage of the required volume. Increased coverage can only be realized by the removal or repositioning of the upper lateral support ring, which is not practical.

The examination was performed to the maximum extent practical and resulted in an initial calculation coverage of 24.88% of the required volume. Code requirements for scan directions are two opposing axial and two circumferential directions (i.e., clockwise and counterclockwise) for a total of four (4) scan directions. After review of the initial report (R-P2431), 24% coverage was achieved from the conical shell side of the joint (one axial scan direction) only. Since only one of the required scans was completed due to the lateral support ring interference, the total exam volume achieved when combining all scan directions is 6.57%. There were no recordable indications detected.

The capability to physically access the applicable WBN Unit 2 steam generator weld has not changed since the WBN Unit 1 welds were examined in 1979 due to the similar lateral support ring configuration on the steam generators. The technique for determining the examination coverage has changed since 1979. In 1979, calculations were not preformed to determine a percentage as they are today. The amount of coverage was simply the physical area that was achieved by the scans. Thus, there is not a comparable percent of coverage for the WBN Unit 1 steam generators. Based on the similar configurations of the steam generators (e.g., the lateral support rings), similar coverage would be expected.

Condition Report 1076002 was generated to document the error in coverage calculation in the original report R-P2431 and track the condition in the Corrective Action Program. The report has been revised and the coverage calculation corrected.

The examination was conducted in accordance with ASME Section XI, IWA-2232, Appendix I and I-2120 which implements ASME Section V, Article 4. Additionally, the requirements of Table I-2000-1 and applicable supplements apply. This examination was performed using a procedure, equipment and personnel that meet the requirements of the referenced ASME Code Sections and applicable Appendix, Article and Supplements.

Based on the above information (i.e., material properties of the weld area, recently completed volumetric examinations, vendor performed radiography under ASME Section III, no recordable indications detected, and similar coverage between WBN Unit 1 and Unit 2 welds, there is reasonable assurance of the continued structural integrity of the WBN Unit 2 steam generator shell welds.

RAI-2

Provide the preservice inspection results and disposition of indications for Weld SG-4B-5-2 for Unit 2. If the steam generator of Unit 1 was fabricated by the same manufacturer around the similar time as Unit 2, provide corresponding information of Unit 1 to supplement the limited inspection information for Unit 2.

TVA Response:

See Attachment 2 for WBN Unit 1 results (Report Nos. R523L dated July 30, 1979, R523 dated July 31, 1979, and R531 dated August 3, 1979). These reports document the best effort examinations and acknowledge the interference from the permanent support ring. These reports also document that no apparent discrepancies were found during these examinations.

See Attachment 3 for the WBN Unit 2 results (Report No. R-P2431 approved on June 6, 2015 (revised on August 28, 2015)). This report documents scan limitations were due to the permanent support ring. Further, the report states that no recordable indications were observed during this examination.

RAI-3

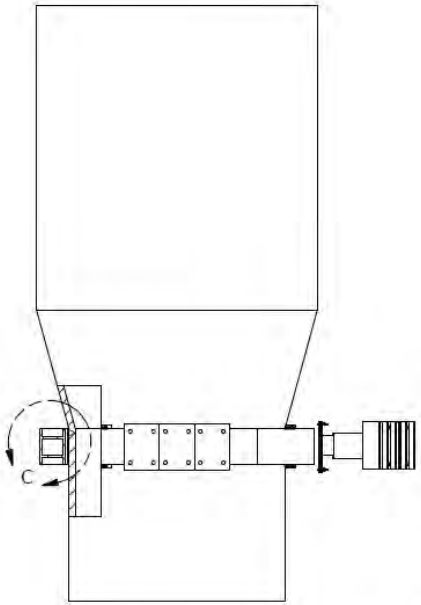
Provide one or two more industry precedents regarding inspection of IWC-2500-1 Category C-A or C-B items for multiple vessels in a unit, with examination coverage less than 50 %.

TVA Response:

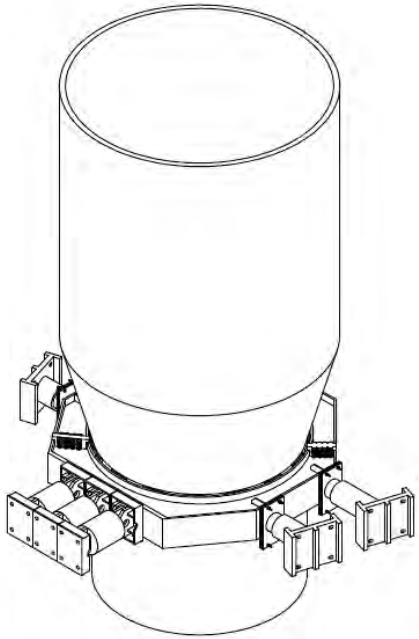
WBN's sister plant, Sequoyah Nuclear Plant, Units 1 and 2, submitted relief request 2-ISI-21, on August 10, 2001 (ML012700124, ML012700162). The staff subsequently approved this request on August 8, 2003 (ML032200460).

In addition, Millstone Unit 3 submitted a similar relief request on July 30, 2015 (ML15216A363) in regards to limited volumetric examination involving steam generator welds due to cone section geometry. This relief request differs from WBN Unit 2 in that Millstone Unit 3 does not have the amount of obstruction encountered at WBN, which allows for greater than 50% examination coverage.

ATTACHMENT 1

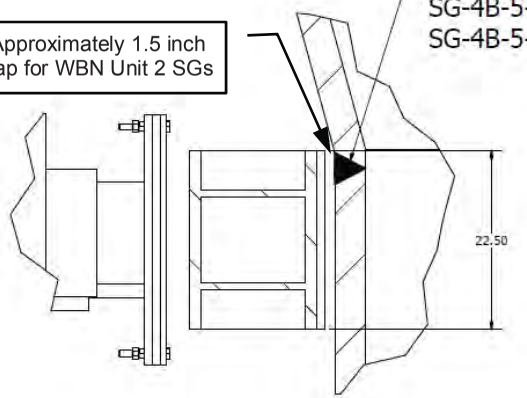


WATTS BAR UNIT 2
STEAM GENERATORS



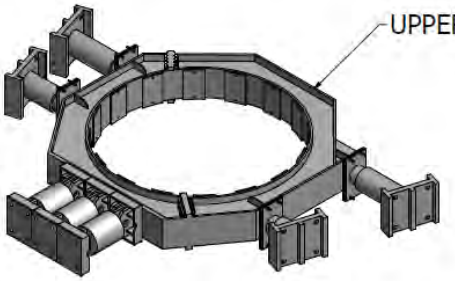
SG-4B-5-1
SG-4B-5-2
SG-4B-5-3
SG-4B-5-4

Approximately 1.5 inch gap for WBN Unit 2 SGs



DETAIL C

UPPER LATERAL SUPPORT



ATTACHMENT 2

WBN Unit 1 Report Nos. R523L, R523, R531

LMT-UTX2 3/77

Lambert • MacGill • Thomas, Inc.

Testing • Engineering • Service • Training

771 East Brokaw Road
San Jose, Ca. 95112
408-297-8766

Location WBNP #1
Report No. R5231
Cal. No. C156 Time 1500
Job No. TUA-022
Date 7/30/79
Page 1 of 1

REPORT OF VISUAL AND ULTRASONIC EXAMINATION

ITEM

Description St. Gen. I Size 5" Material C/S S/N(s) SG-4B-5-1

Location Unit 1 Cont. Preparation Ground Temp. 100°F

SIGN

Examiner/Level R.W. Pochnert / II Examiner/Level M. Boschert / II Review/Level [signature]

Authorized Inspector [signature] Customer D. Tuley 4-3-0684

EQUIPMENT

Tester 1 NORTEC 131D S/N 269 2 N/A S/N N/A

Recorder 1 N/A S/N N/A 2 N/A S/N N/A

Transducer 1 Panimetrics L/W 2.25 .75 dia S/N 5290

3 N/A 4 N/A

Couplant 111778 LMT Cable 6' BNC/BNC Marker N/A Photo N/A

PROC

Calibration Procedure LMT-UT-2 Rev. 13

Examination Procedure LMT-UT-2 Rev. 13

Record Procedure LMT-UT-2 Rev. 13

CALIB

Calib. Blk. ~~16-55-2201~~ BNP-82 L.E. 6-10-92 Temp. 85°F Ref. T/4 SDH Amp. 80% Swp. 2.0 div

Ref. Gain 94 dbg Damp min Reject min Gate 2.0-10 div

Alarm N/A Mag. Tape Count N/A Chart N/A Cal. Check Time 1518

EXAMINATION

Cal. Ref. Blk. Rompas 13 Ref. Rfl. SDH Amp. 55% Sweep Position 1.5 div

Scan Gain 100 dbg Ref. Dwg. 2660-B Reject Level ASME XI Report Level ASME XI

NAD = No apparent disc. L = Linear G = Geometry S = Spot M = Multiples

Scan	Type	Disp.	Scan	Type	Disp.	Scan	Type	Disp.
0	PT							
1	Visual		7			13		
2	Base Metal	NAD	8			14		
3			9			15	on weld	NAD
4			10			16		
5			11			17		
6			12			18		

See 45° Report

Scan	Description of Indications
Thickness	up. 3.94", dn. 3.99" dn - N/A

Best effort exam on weld and NO EXAM downstream due to permenant support ring.

See RFR ISI.5

CY	SYS	EXAM AREA	R
00	SG	SG4B-5-00000011	A

DT 8-9-10

LMT-UTX2 3/77

Lambert • MacGill • Thomas, Inc.

Testing • Engineering • Service • Training

771 East Brokaw Road
San Jose, Ca. 95112
408-297-8766

Location WBNP #1
Report No. R523
Cal. No. C160 Time 1210
Job No. TVA-022
Date 7-31-79
Page 1 of 24

REPORT OF VISUAL AND ULTRASONIC EXAMINATION

ITEM

Description STM. GEN #1 Size 5' Material C.S. S/N(s) SG-4B-5-1

Location UNIT 1 CONT. Preparation BUFFED Temp. 100°F

SIGN

Examiner/Level E. Lake/II Examiner/Level R. Pocacak/II M. Boschert/II Review/Level E. J. Thom/III

Authorized Inspector [illegible] Customer D. Tuley 7-31-79

EQUIPMENT

Tester 1 NARTEC 131 D S/N 111 2 N/A S/N N/A

Recorder 1 Gulton S/N 71147 2 N/A S/N N/A

Transducer 1 Hasonic 2.25 MHz 47° 2 S/N P362

3 N/A 4 N/A

Couplant LMT Gel #111778 Cable 6' BNC/BNC Marker N/A Photo N/A

PROC

Calibration Procedure LMT-UT-2 Rev. 13

Examination Procedure LMT-UT-2 Rev. 13

Record Procedure LMT-UT-2 Rev. 13

BNP-B2 L.E. 6-10-92 [illegible]

CALIB

Calib. Blk 4-55-22-1 Temp. 85°F Ref. T/4 SDH Amp. 80% Swp. 2 div

Ref. Gain 53 dBG Damp MIN Reject MIN Gate 1.5-10 div

Alarm N/A Mag. Tape Count N/A Chart Attached Cal. Check Time 1615 APS

EXAMINATION

Cal. Ref. Blk. 17 Ref. Rfl. SDH Amp. 55% Sweep Position 1.5 div

Scan Gain 59 dBG Ref. Dwg. 2660-B Reject Level ASME XI Report Level ASME XI

NAD = No apparent disc. L = Linear G = Geometry S = Spot M = Multiples

Scan	Type	Disp.	Scan	Type	Disp.	Scan	Type	Disp.
0	PT	N/A						
1	Visual	NAD	7	N/A		13	N/A	
2	Base Metal	N/A	8			14		
3		N/A	9			15		
4	⊥	✓	10			16		
5	∥ CW	NAD	11			17		
6	∥ CCW	NAD	12			18		

Scan	Description of Indications
4	ID geometry max AMP. 200% Dac 13" to 15 26⅔ to 29⅓ Intermittent partial due to support ring
5	
6	

(4)

(5) → ⊼ — — — ← (6)

Ring

CY	SYS	EXAM AREA	R
00	SG	SG4B-5-0000 01	A

NO SCV3 due to Permanent support ring

See R.F.R. ISI 5

technirite ELECTRONICS INC.

Pechacek II
Lake II
Boschert TR

weld #
SG-4B-5-1

DATE 7/31/79

RPT. NO. R-523

TIME 1210

CAL. NO. C-160

TEMP 100°F

SIZE 5'

SYSTEM St Gen I

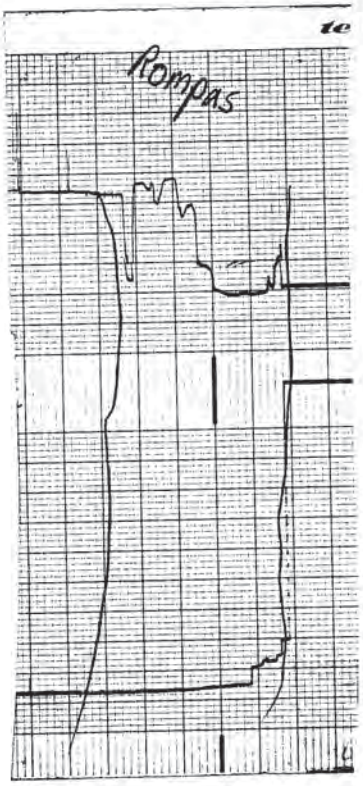
TEST BLOCK NO. 16-55-22-1

LOCATION Unit Cont

VISUAL NAD

strip chart speed - 5mm/sec

Best effort EXAM on weld and no EXAM downstream due to Permenant support Ring.



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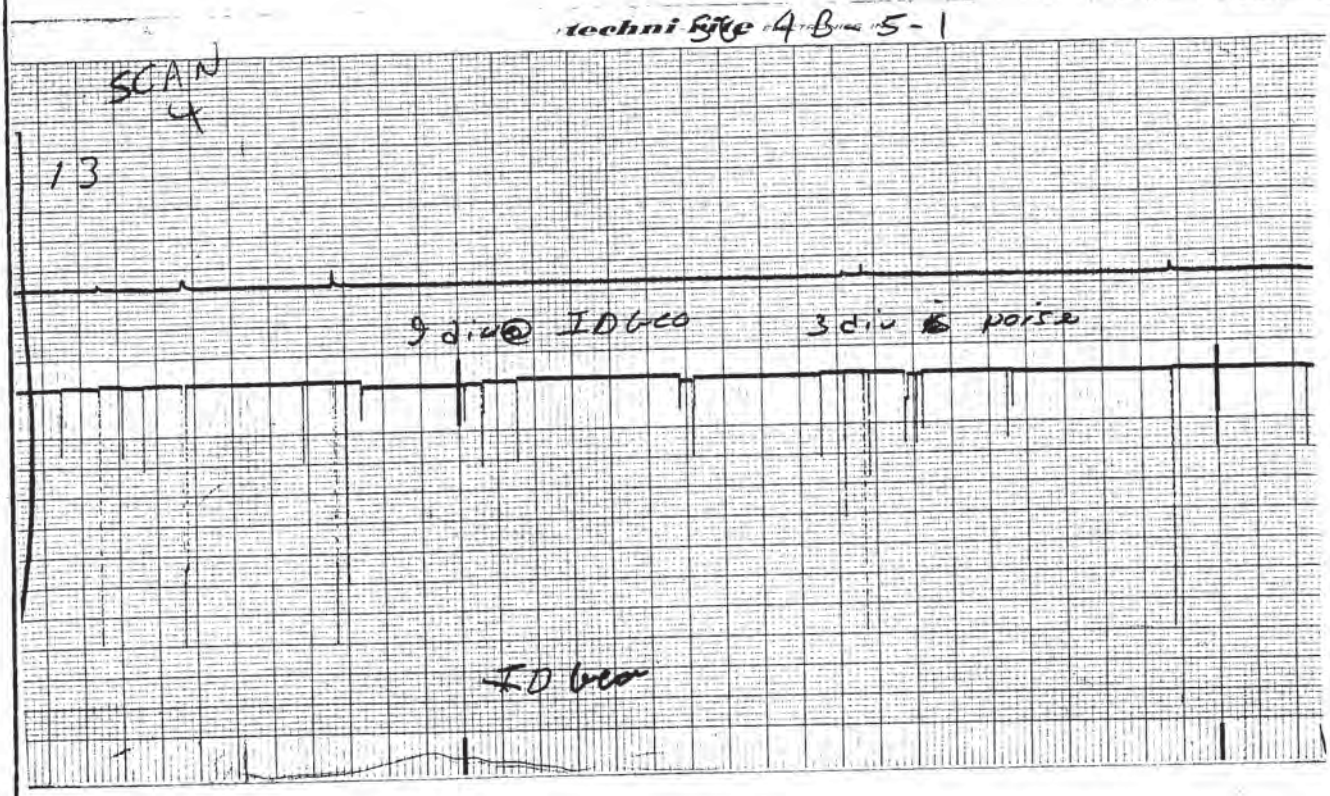
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SCAN
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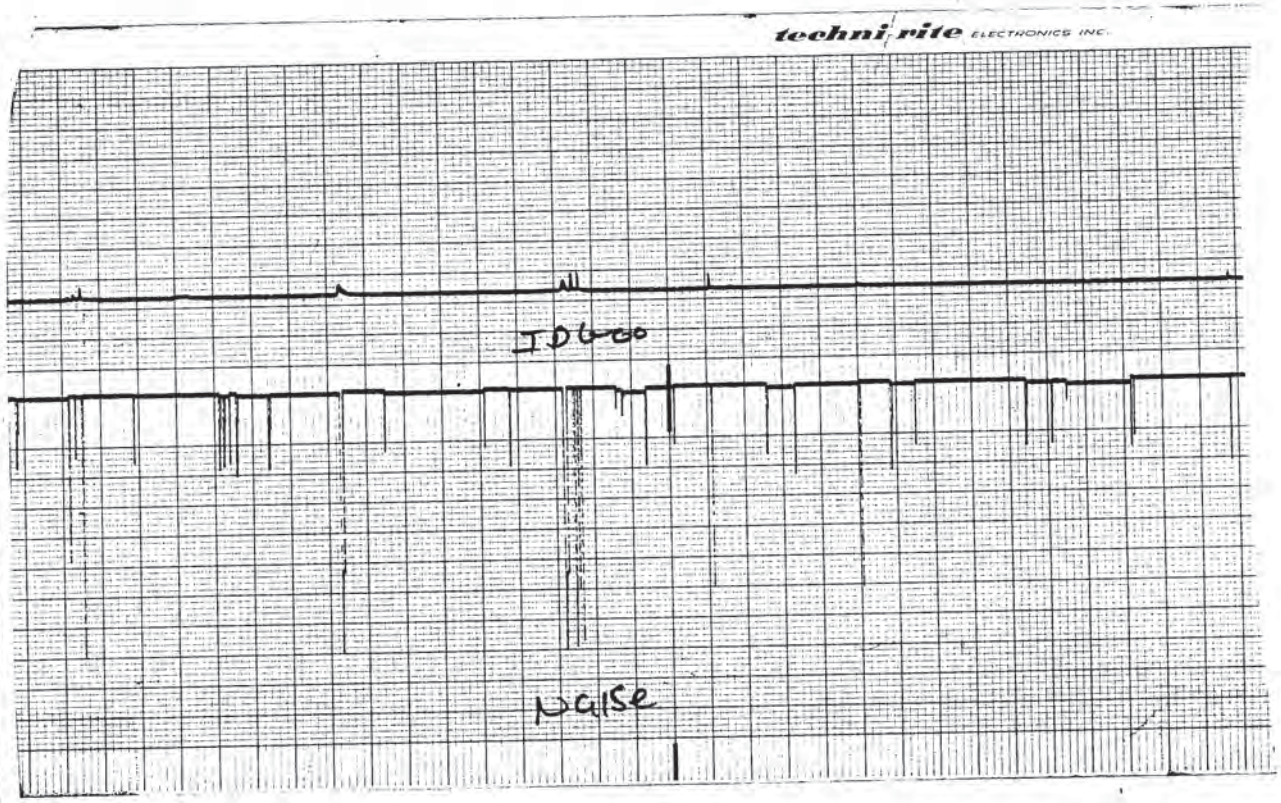
9 div @ ID bco
3 div @ noise
ID bco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ID bco
Noise

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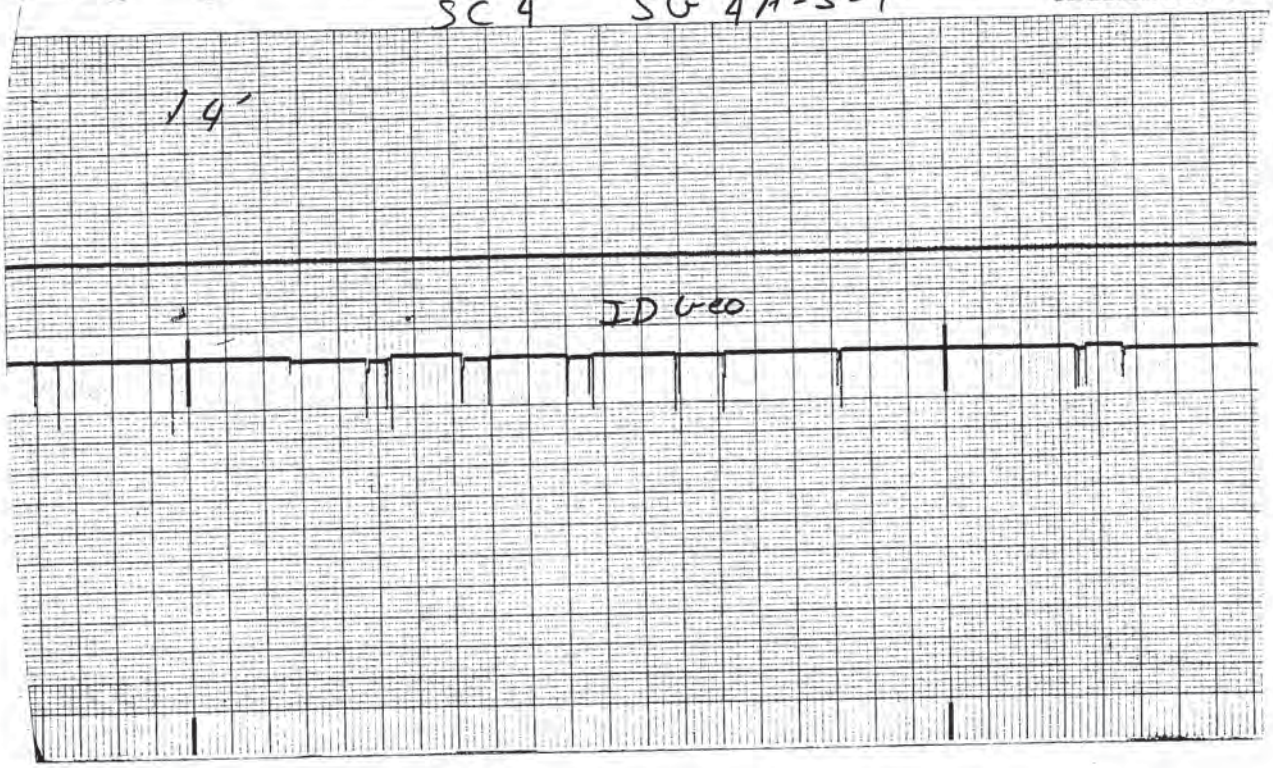

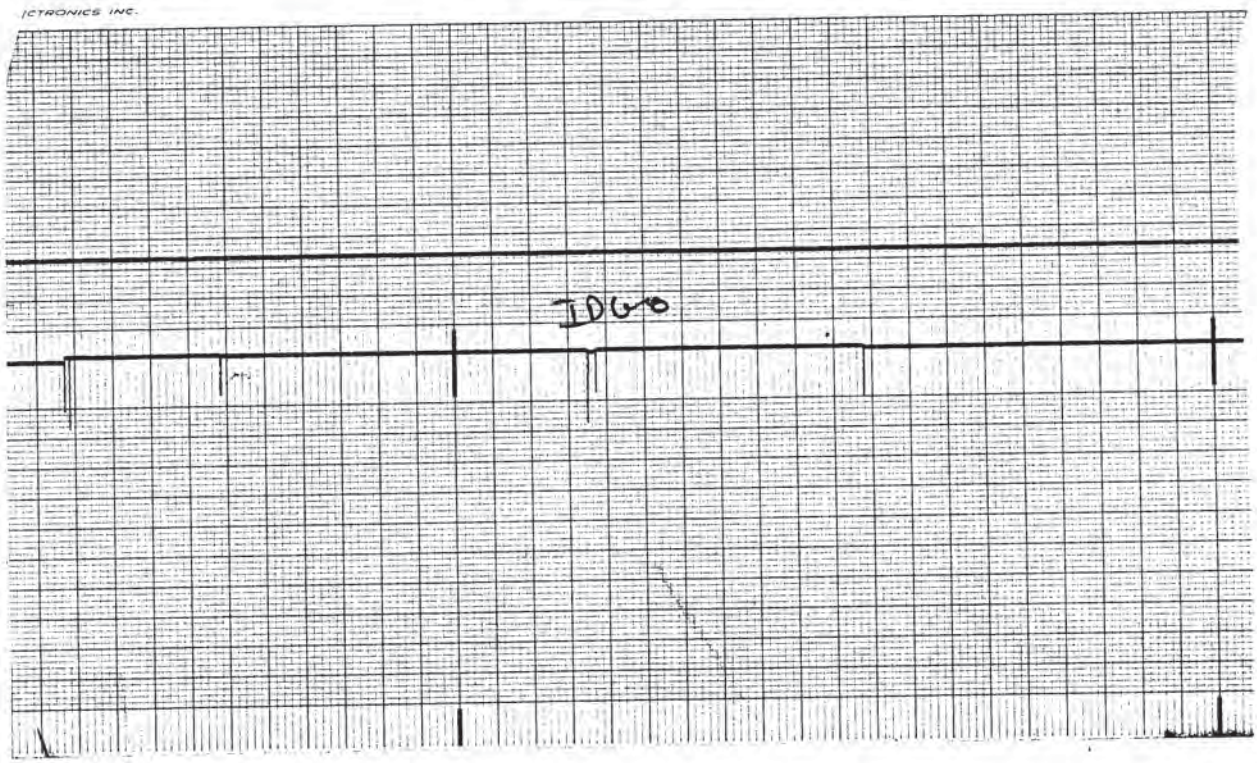

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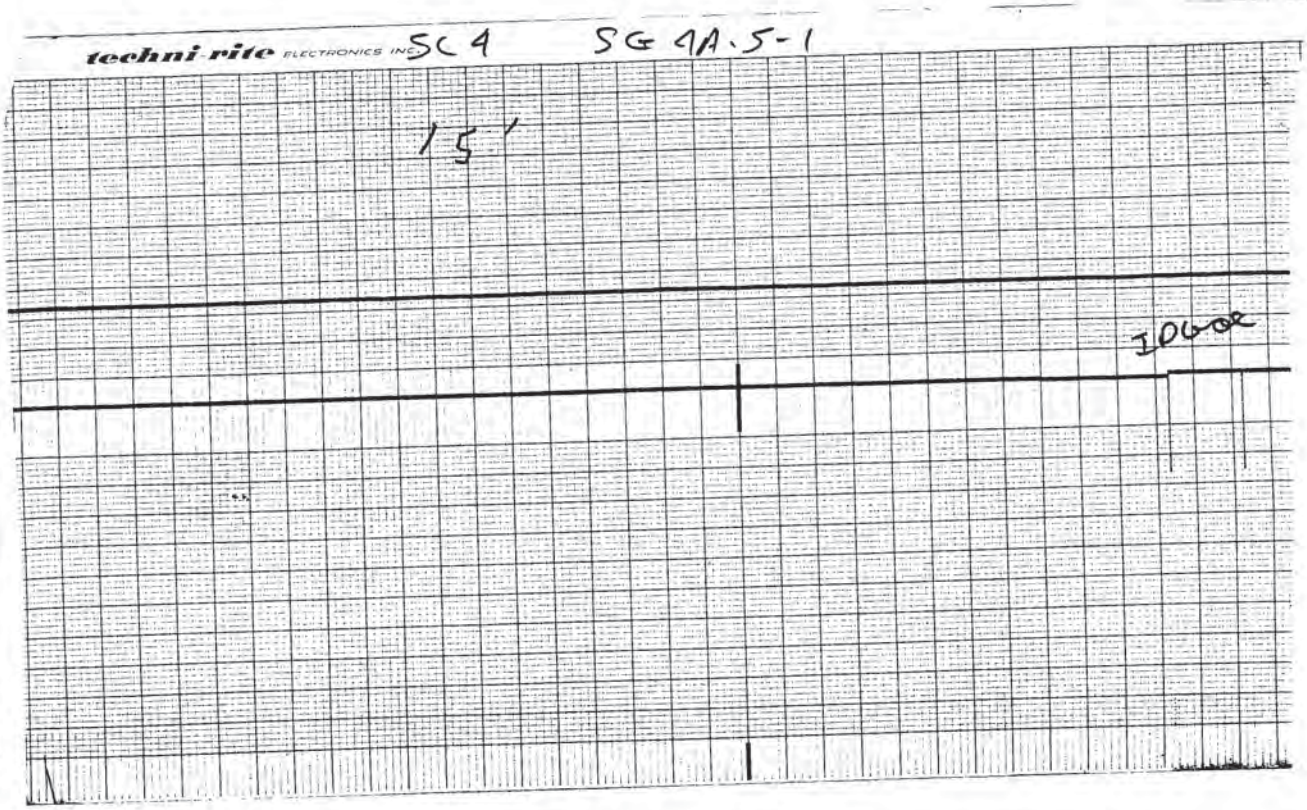
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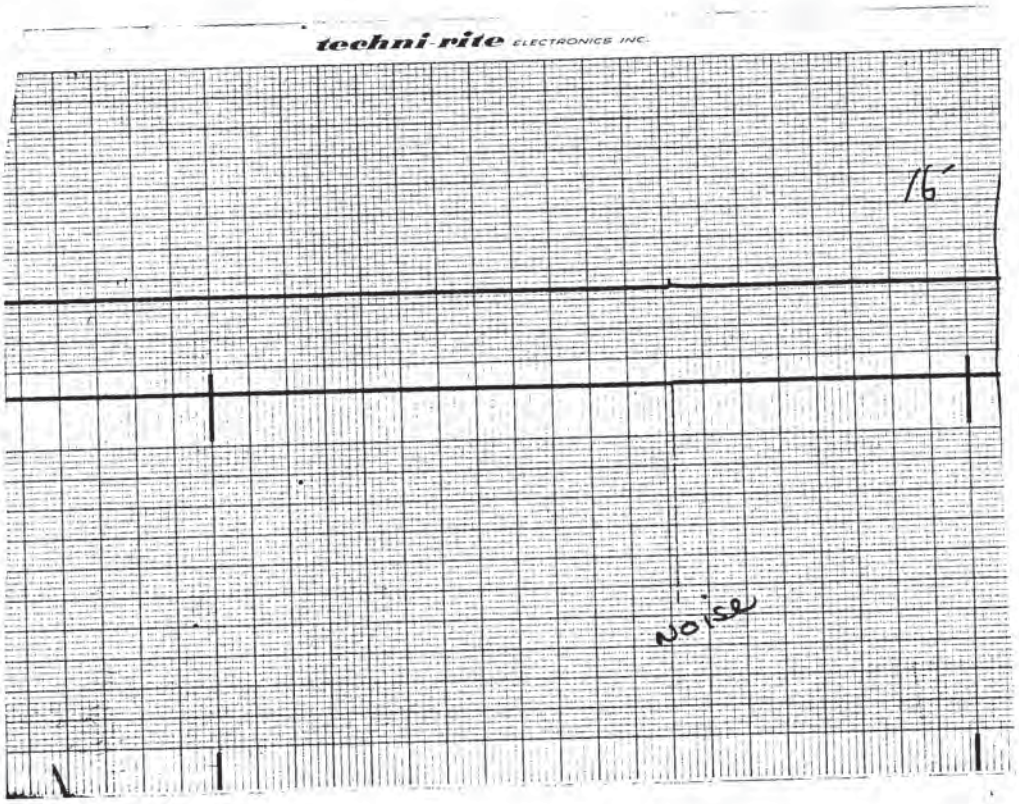
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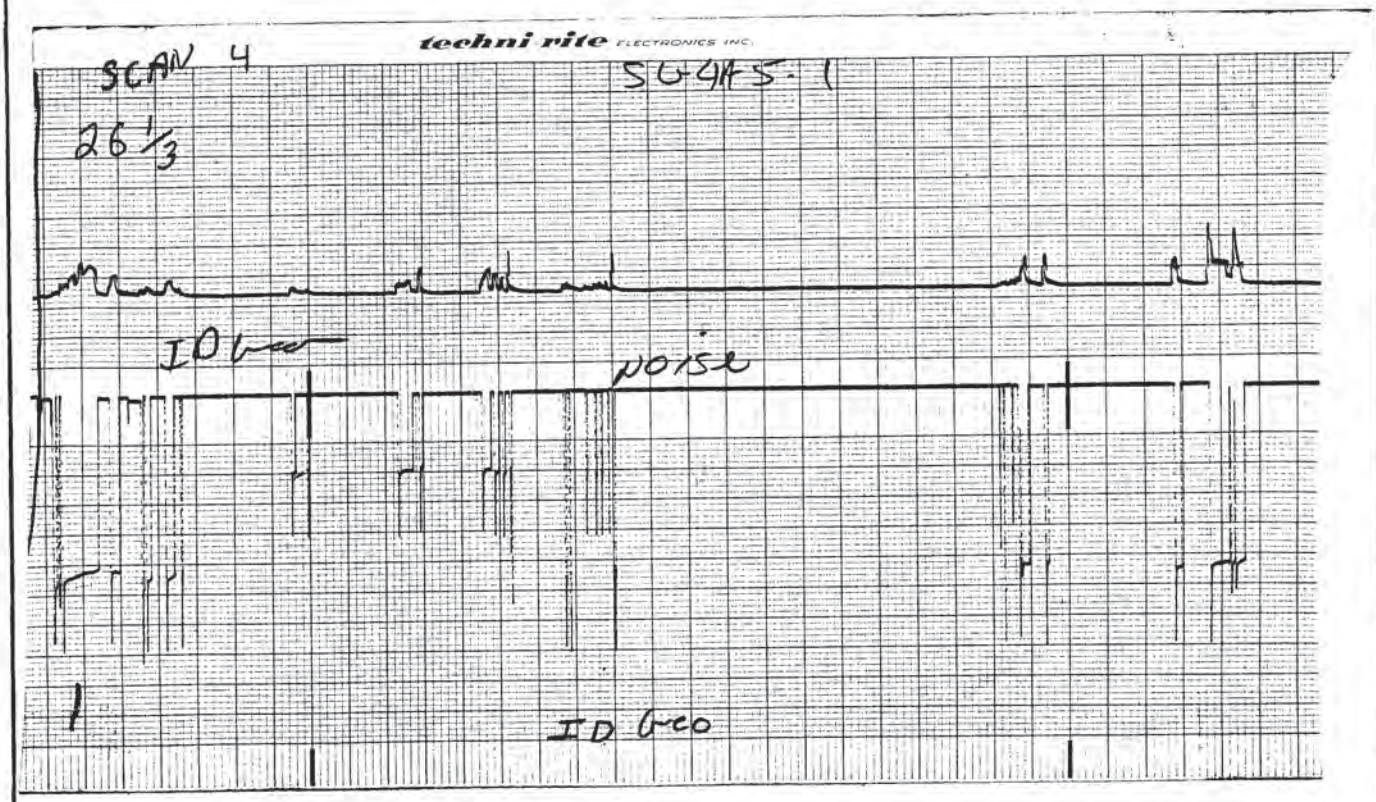

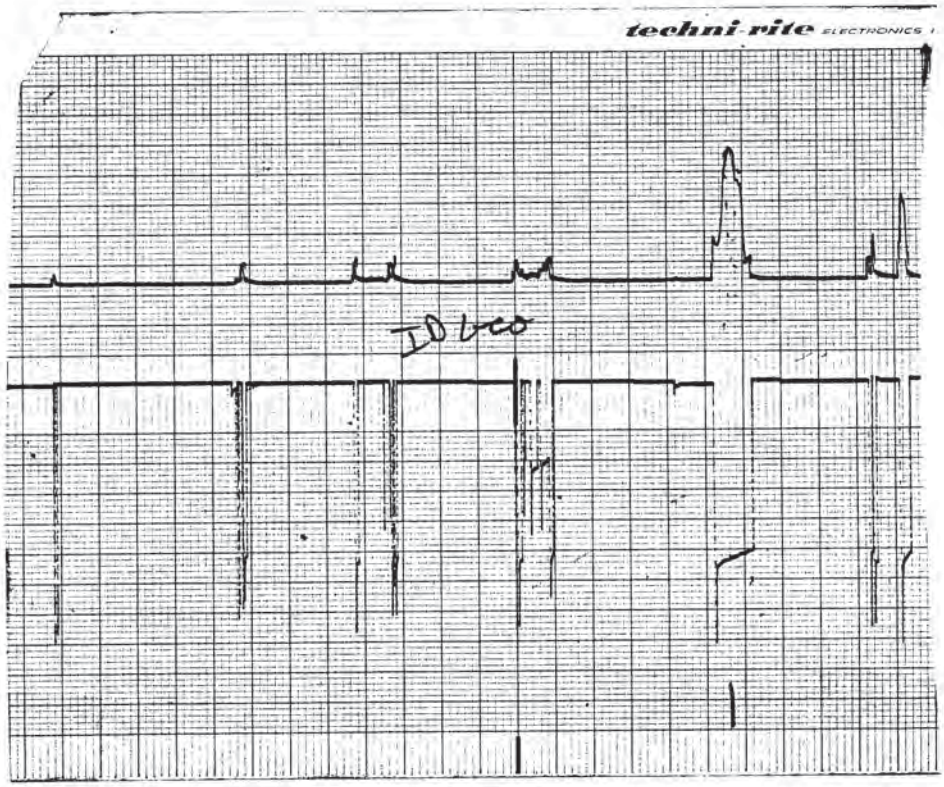

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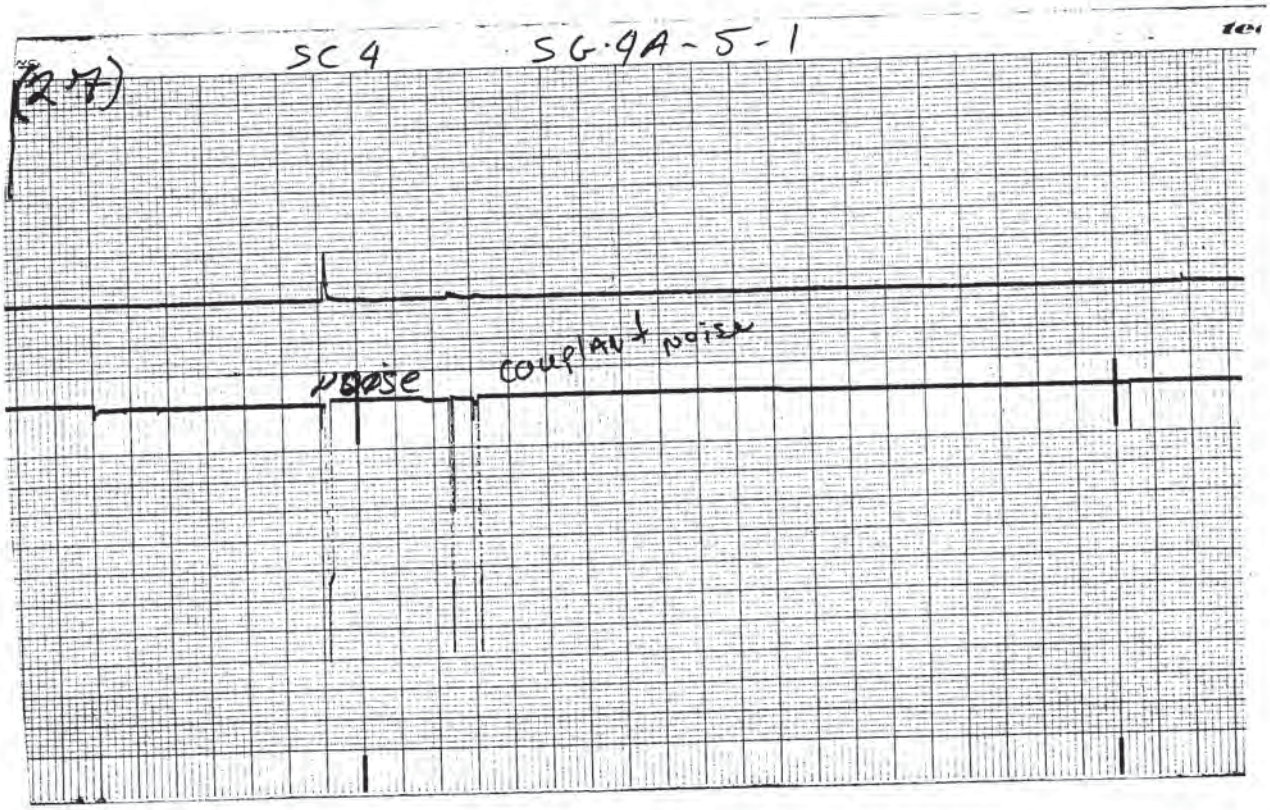
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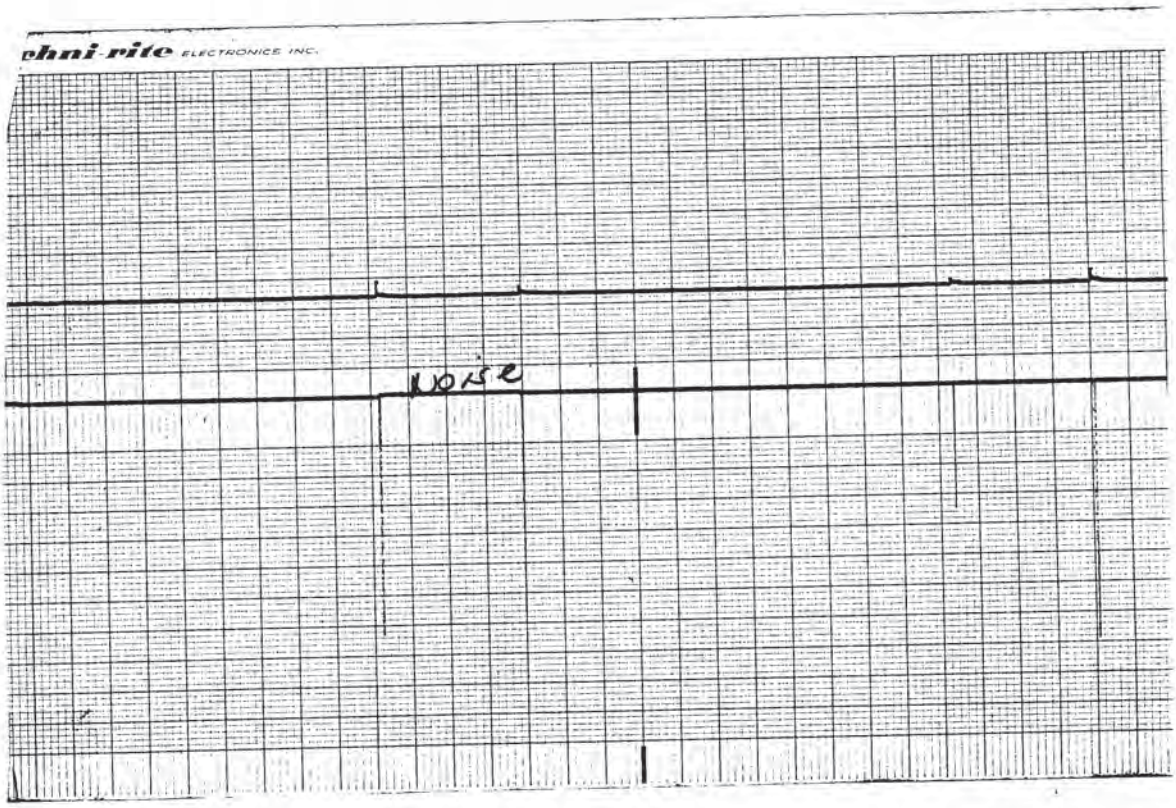
SG-9A-5-1
(2 of)
noise
coupling + noise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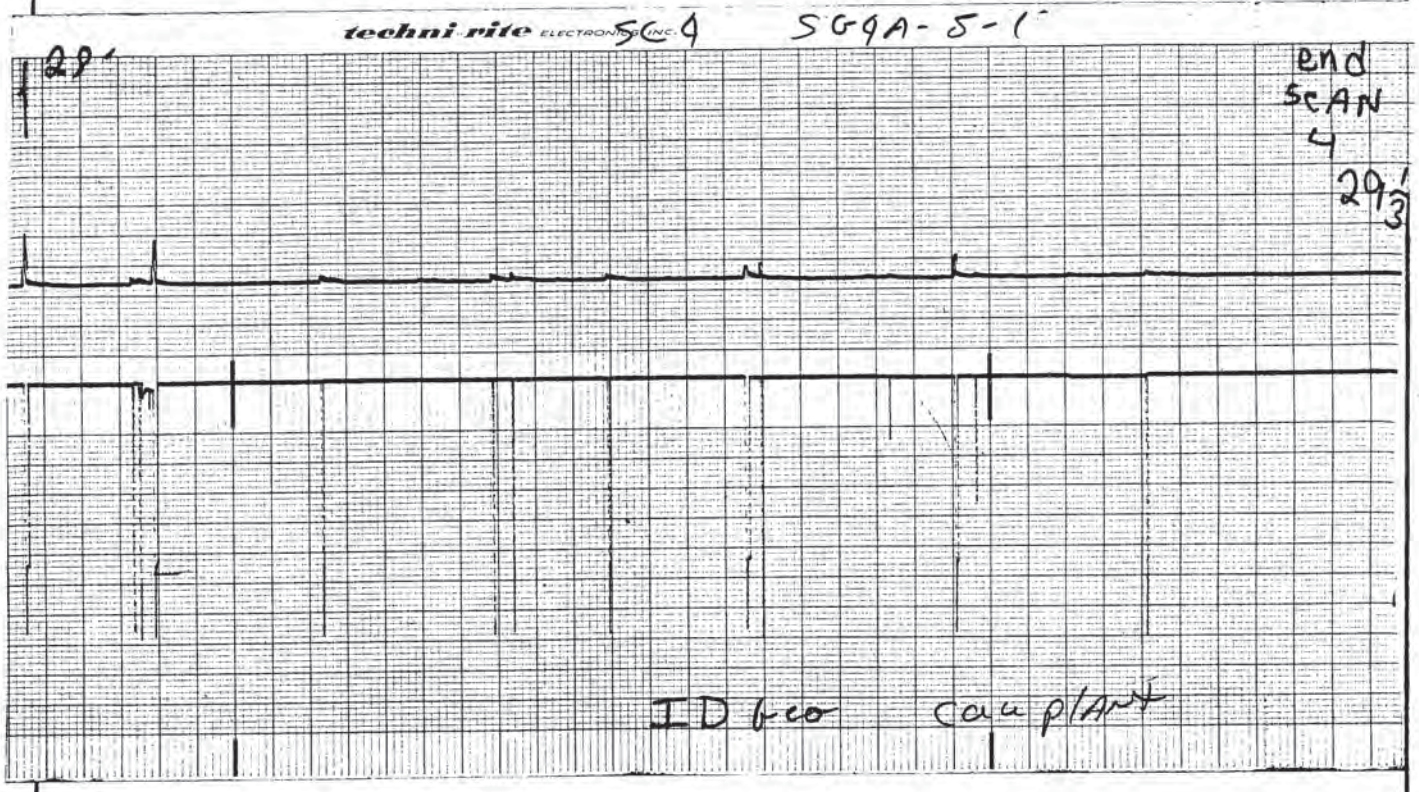
LMT



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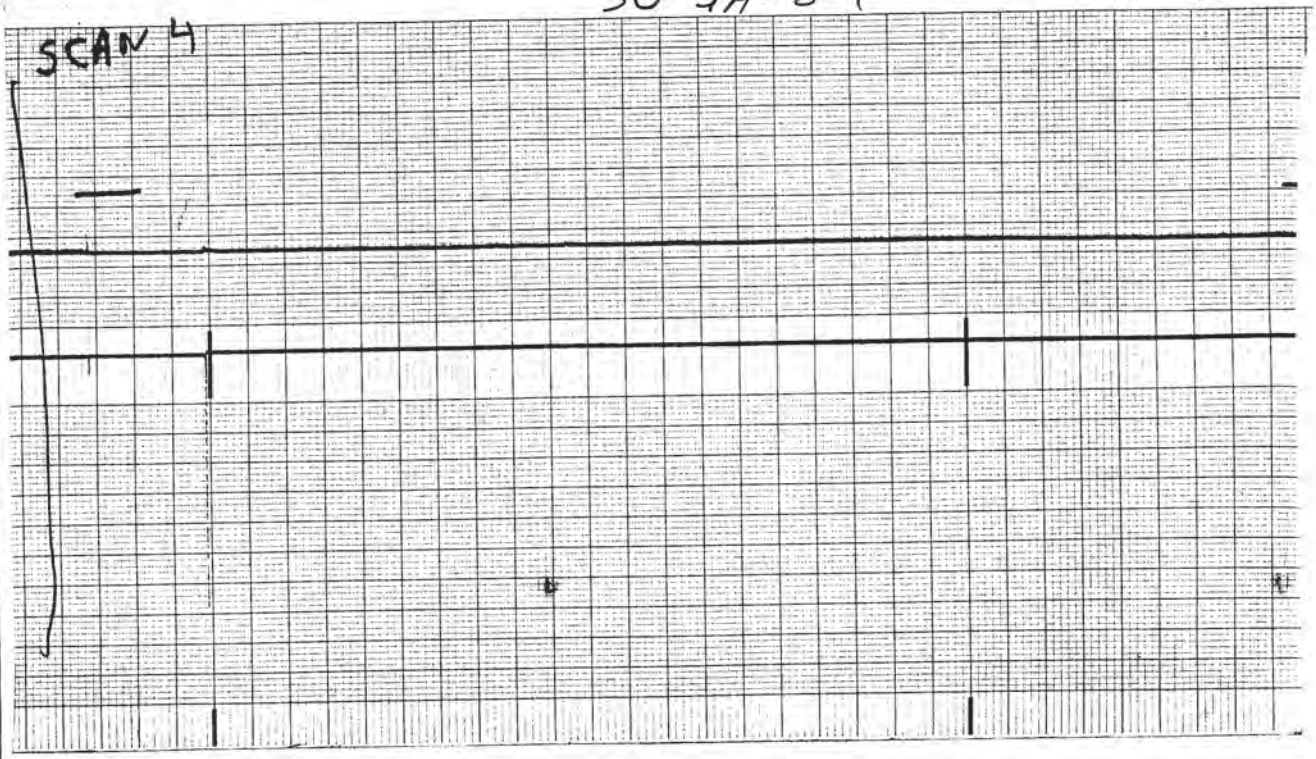
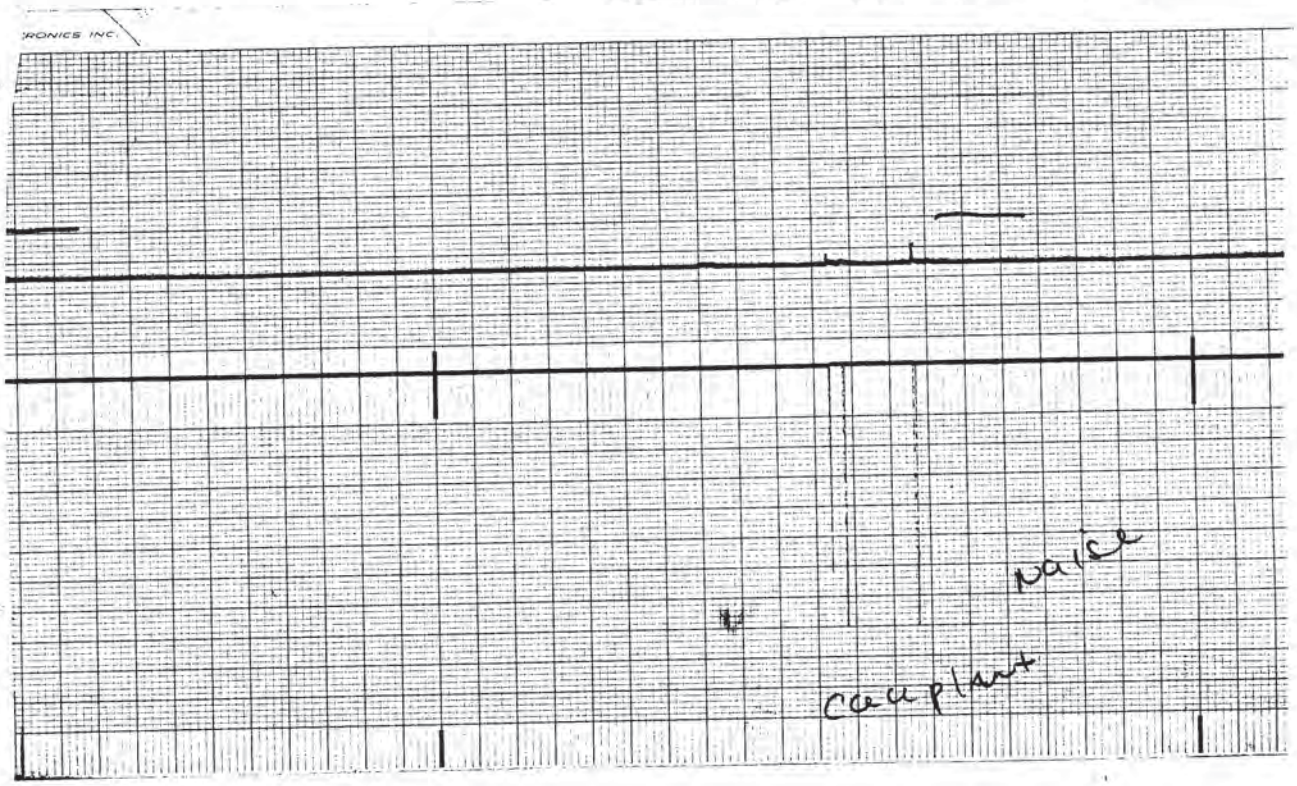
LMT

SG 9A-5-1

techni rite

SCAN 4





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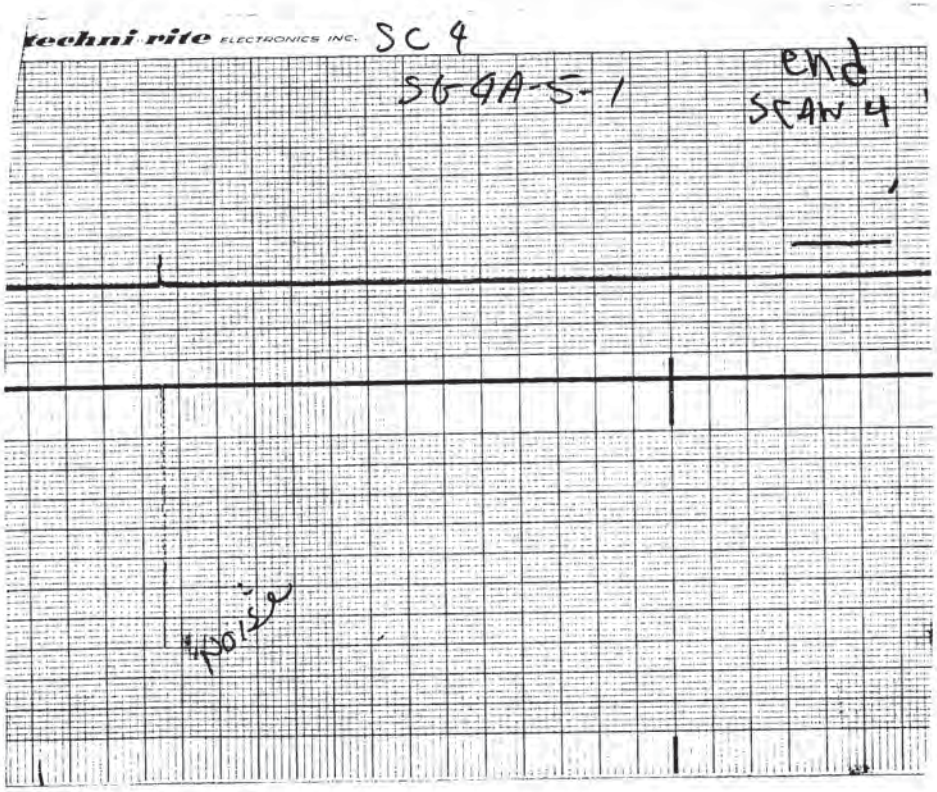
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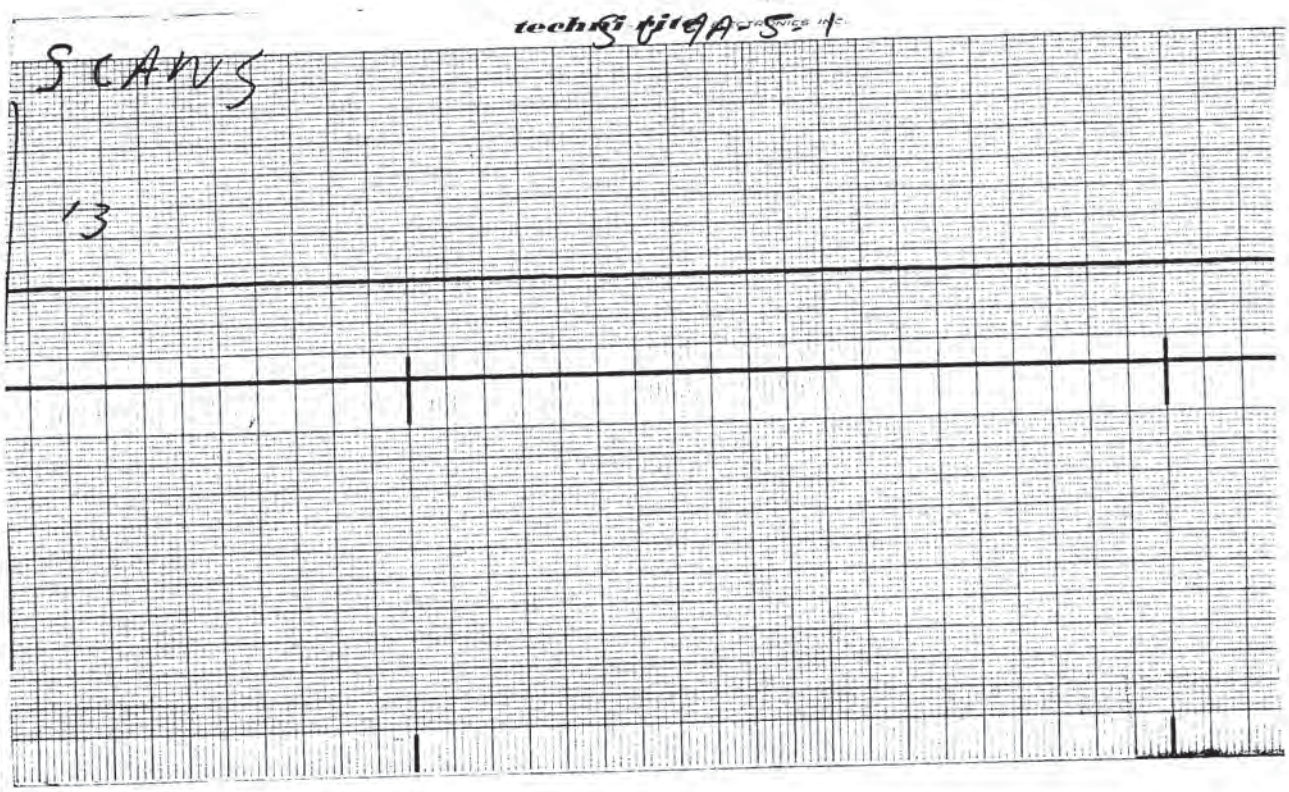
SCAN 4
noise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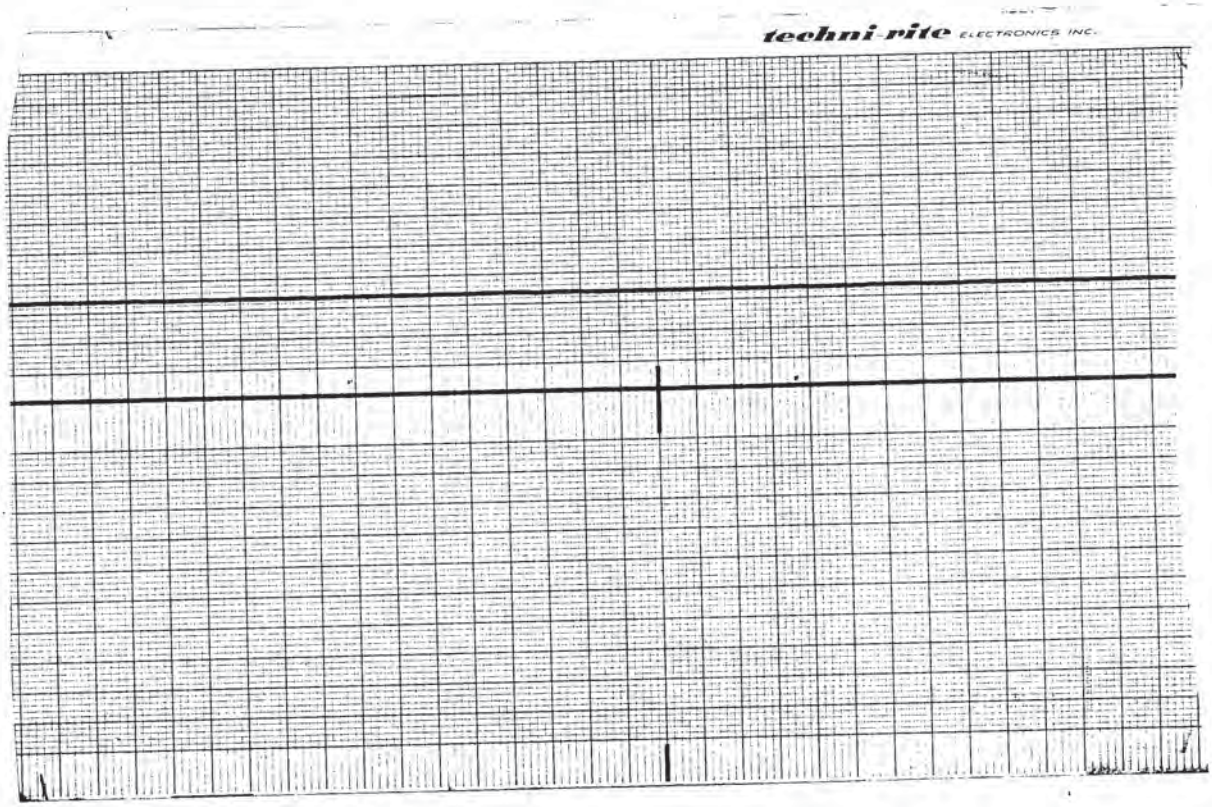
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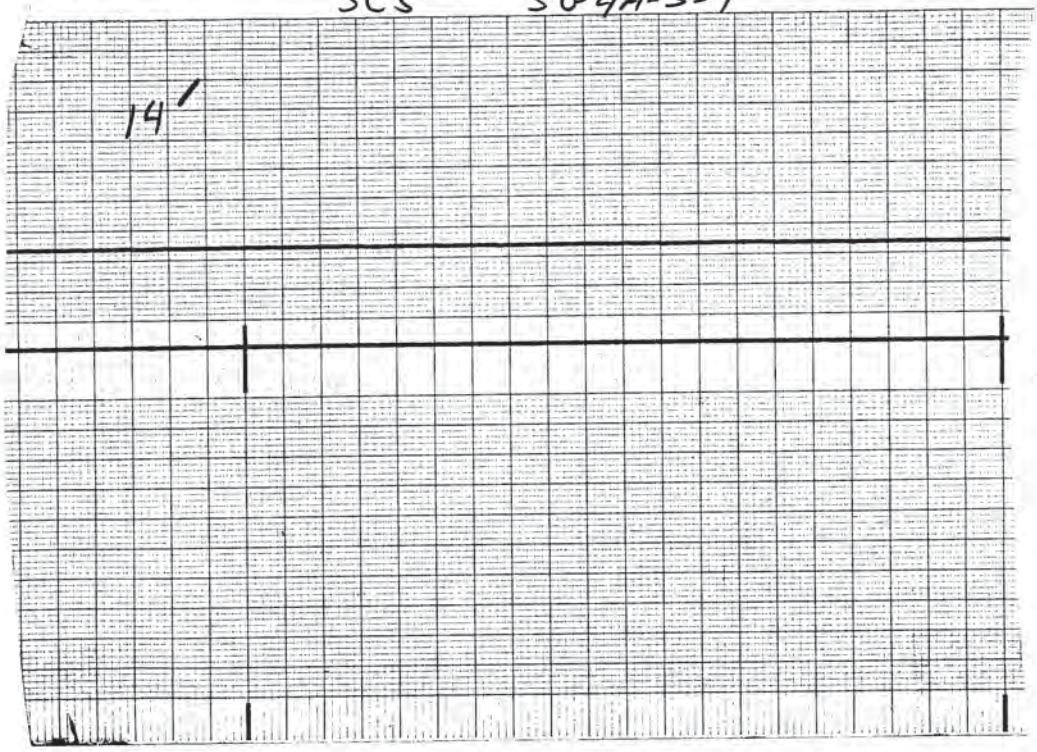

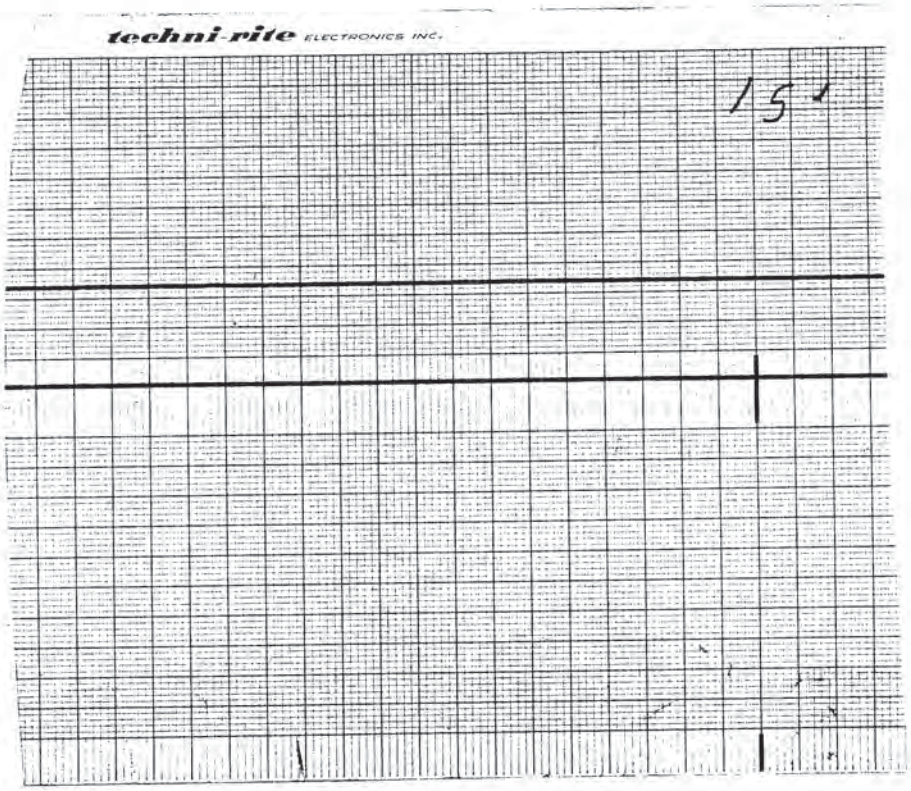

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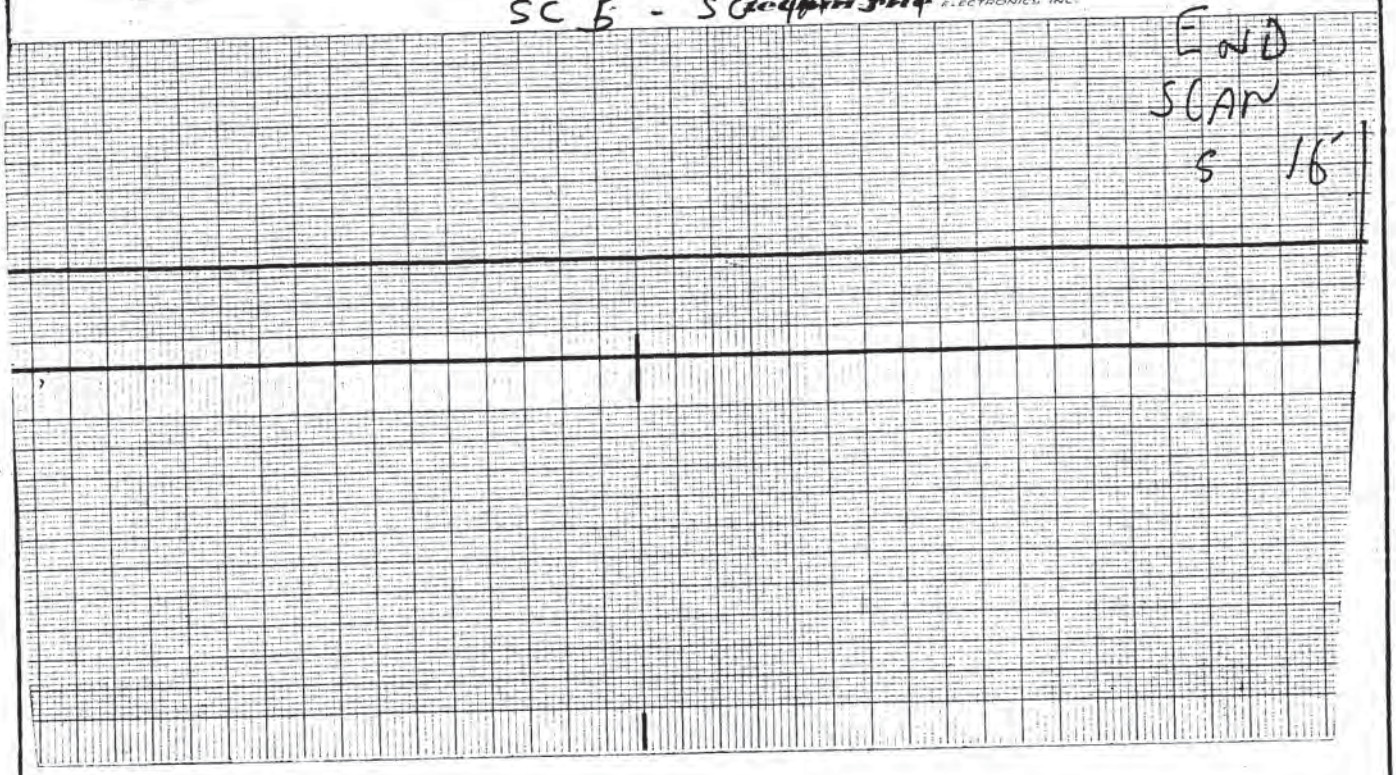

SG 4A-5-1

SCAN 5

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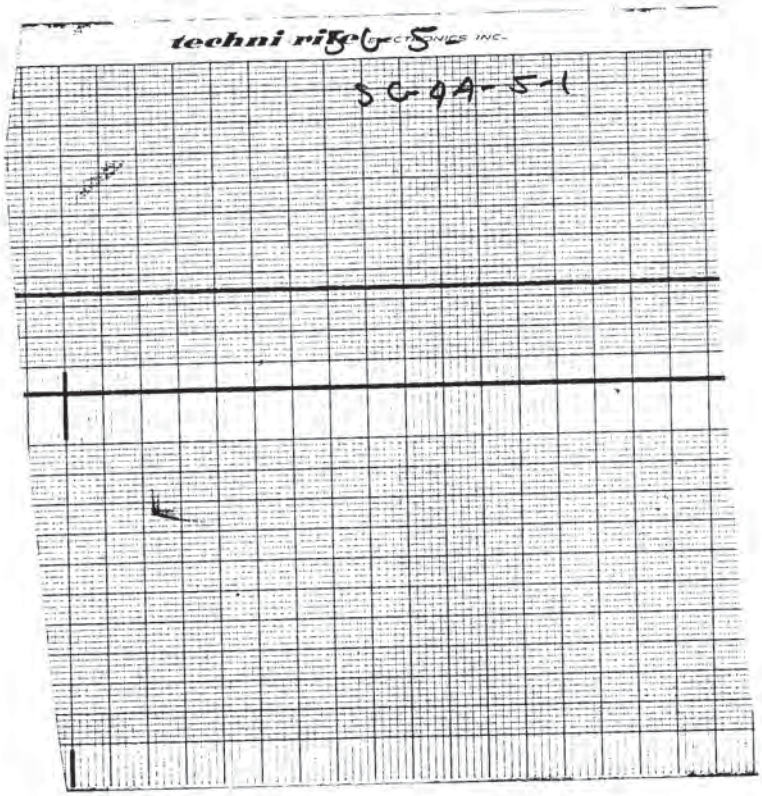
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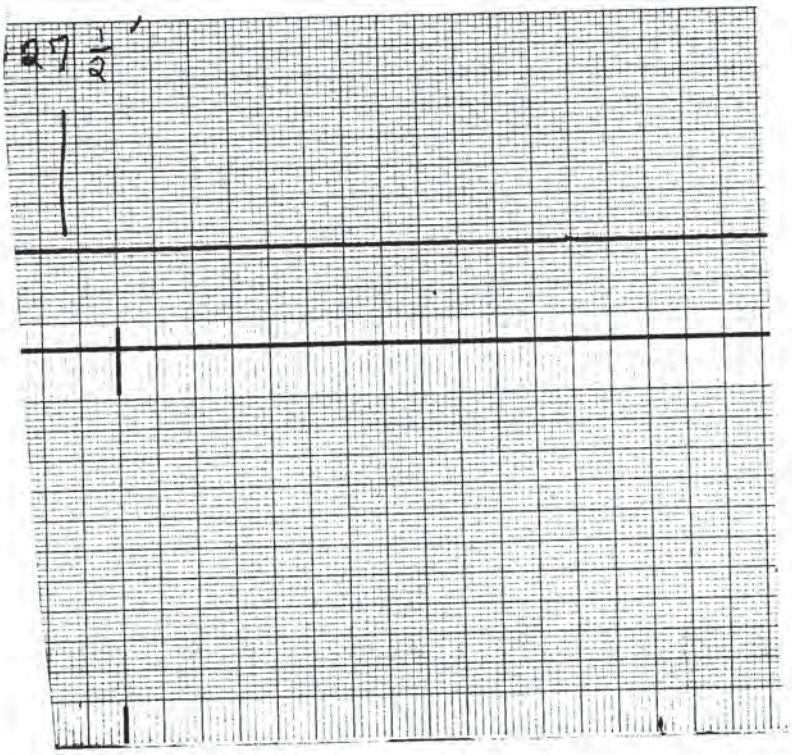
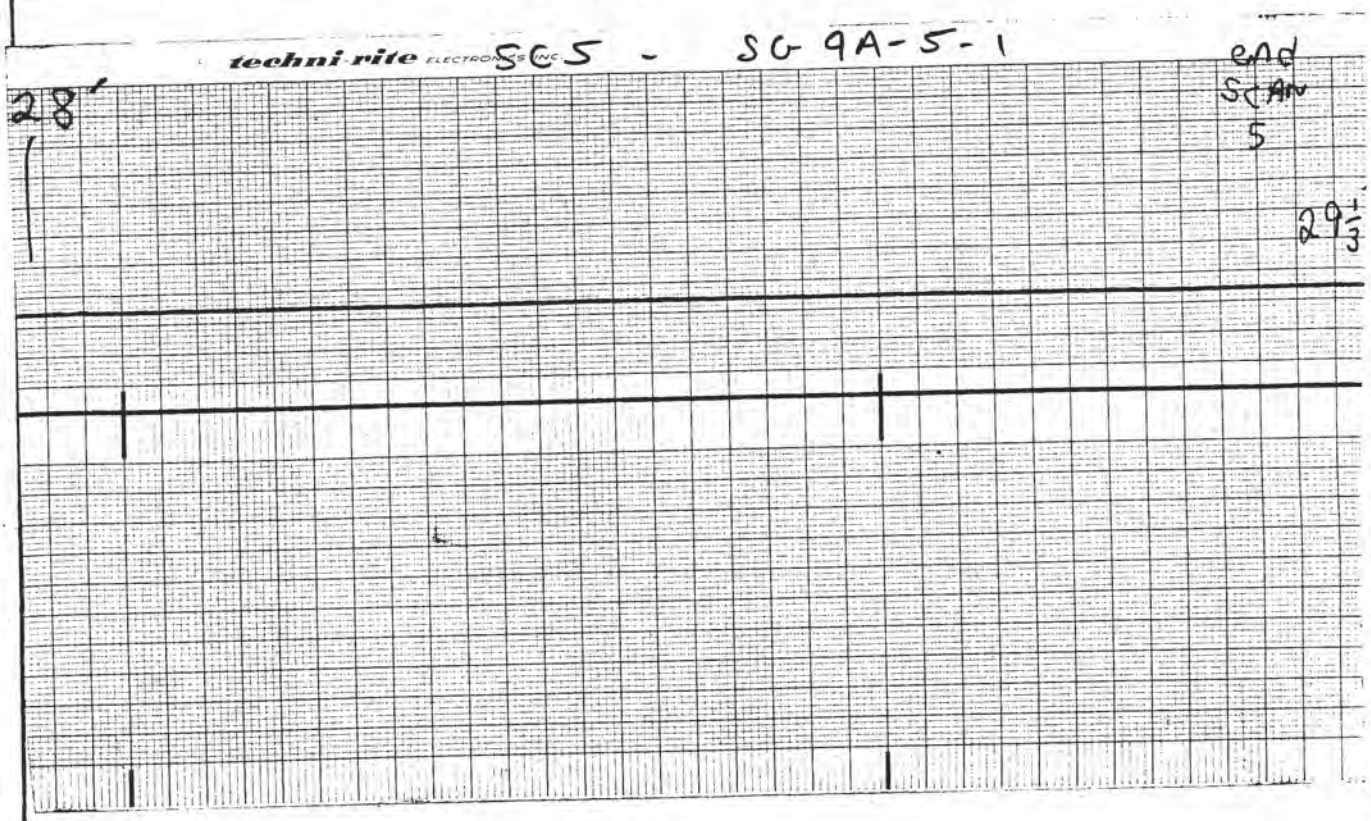
SC-9A-5-1

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SC5 - SG 9A-5-1
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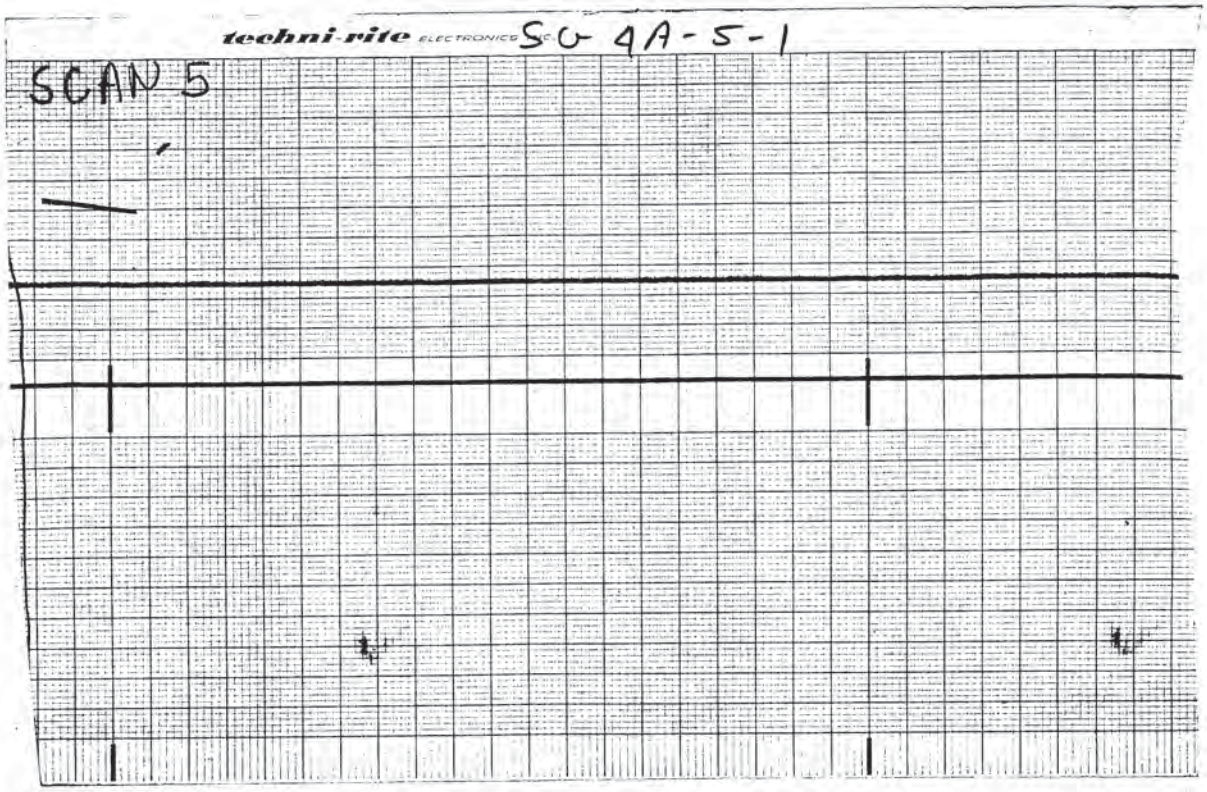
29 1/3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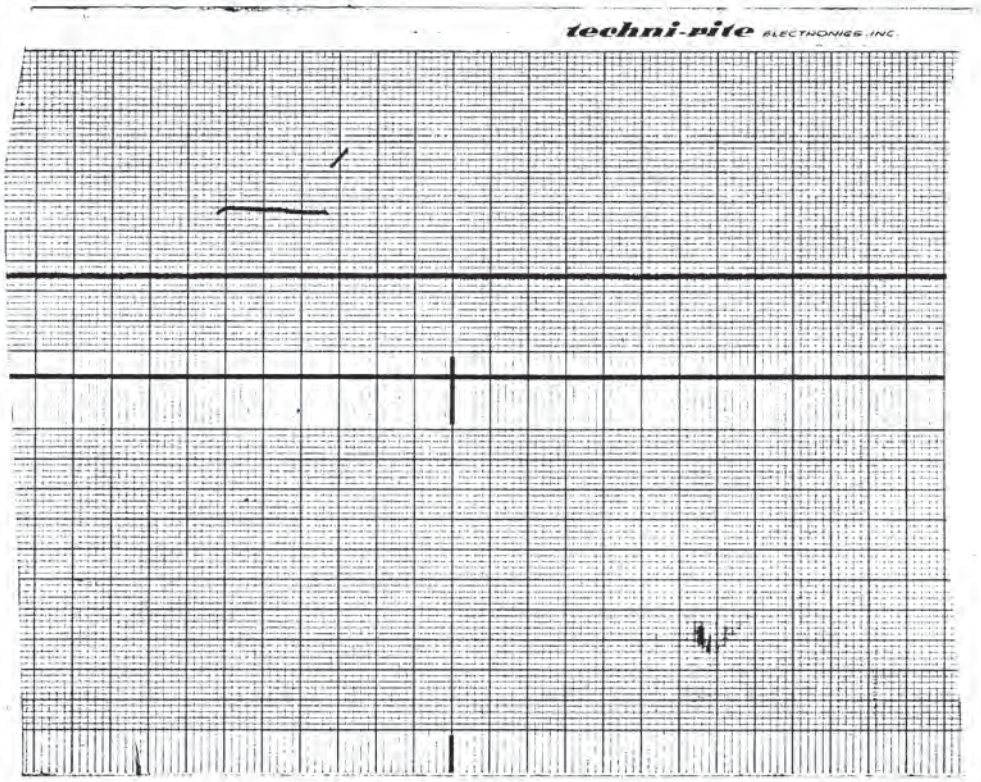
SCAN 5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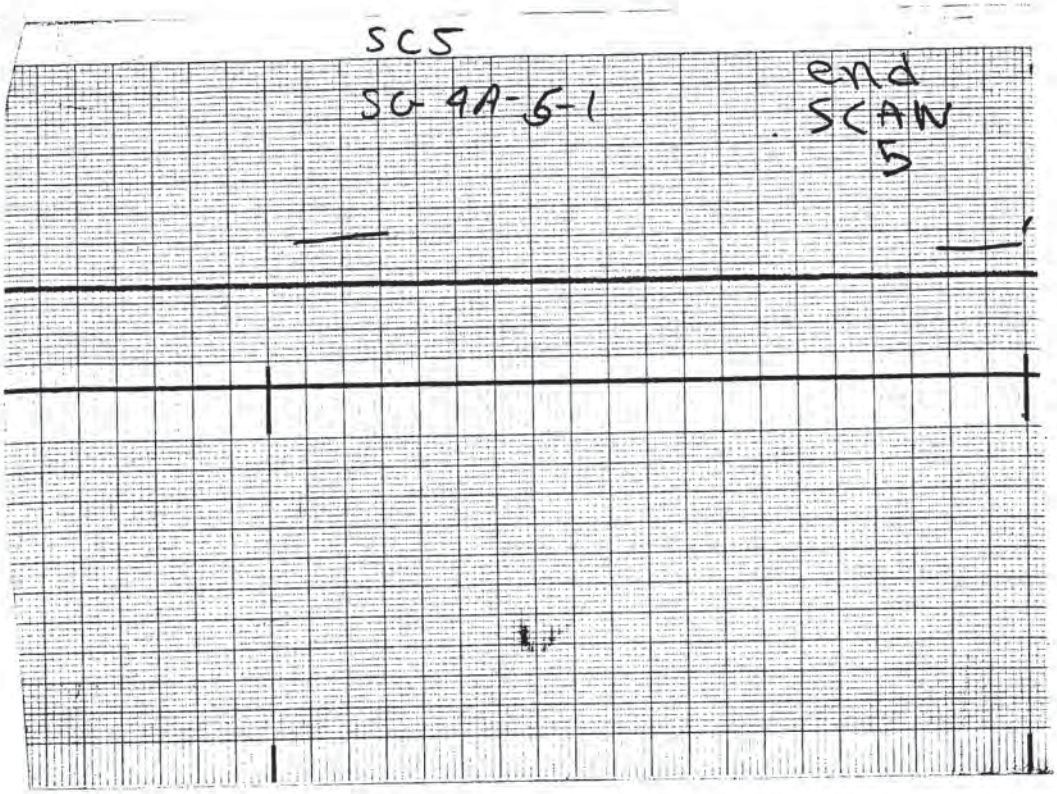
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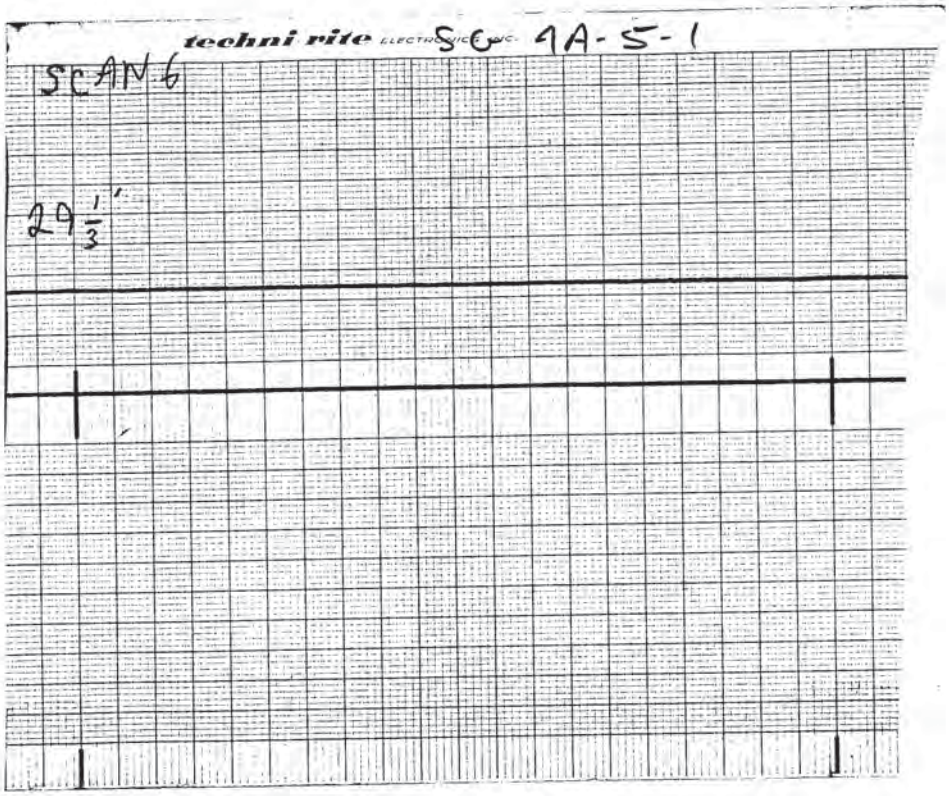

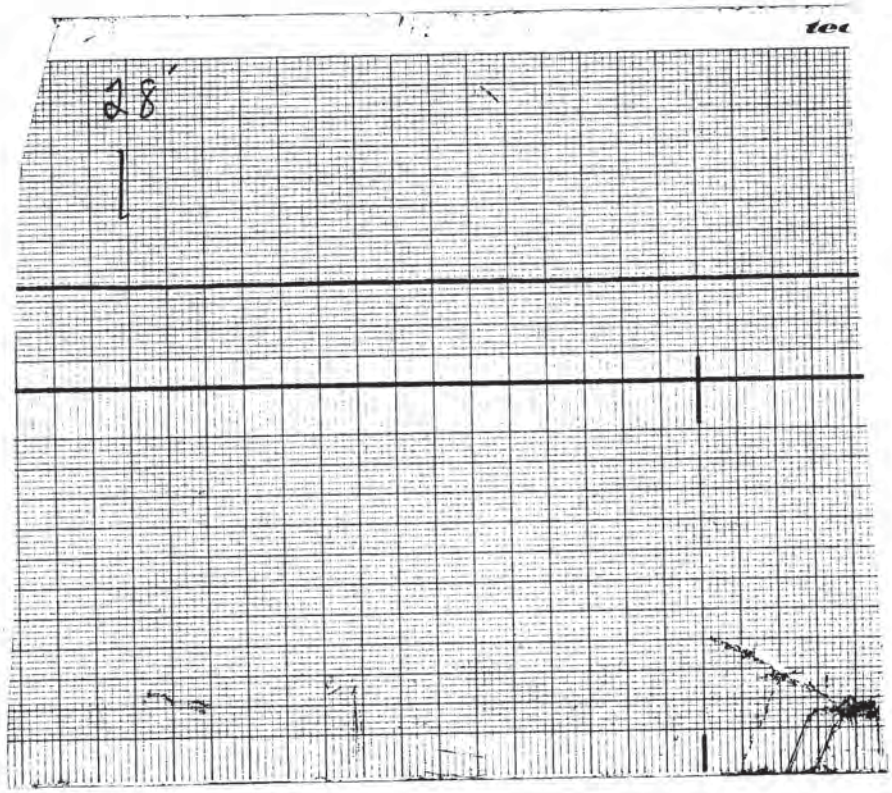

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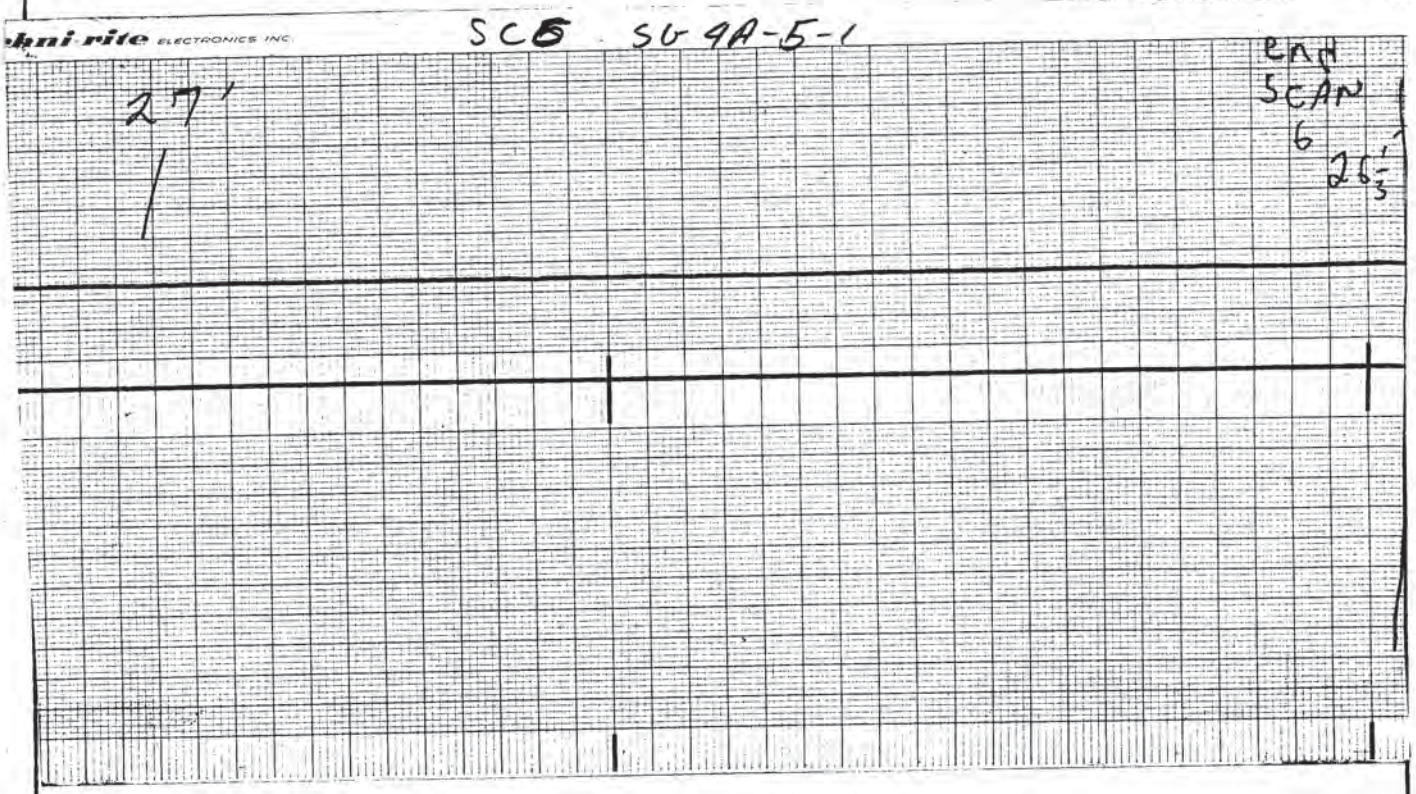
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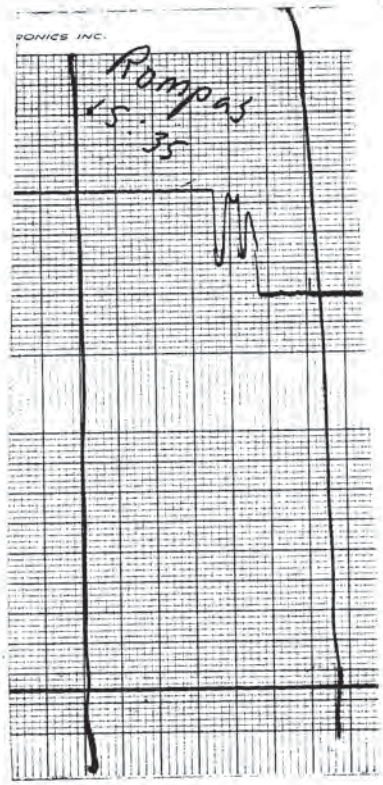
END SCAN 6
26 1/3'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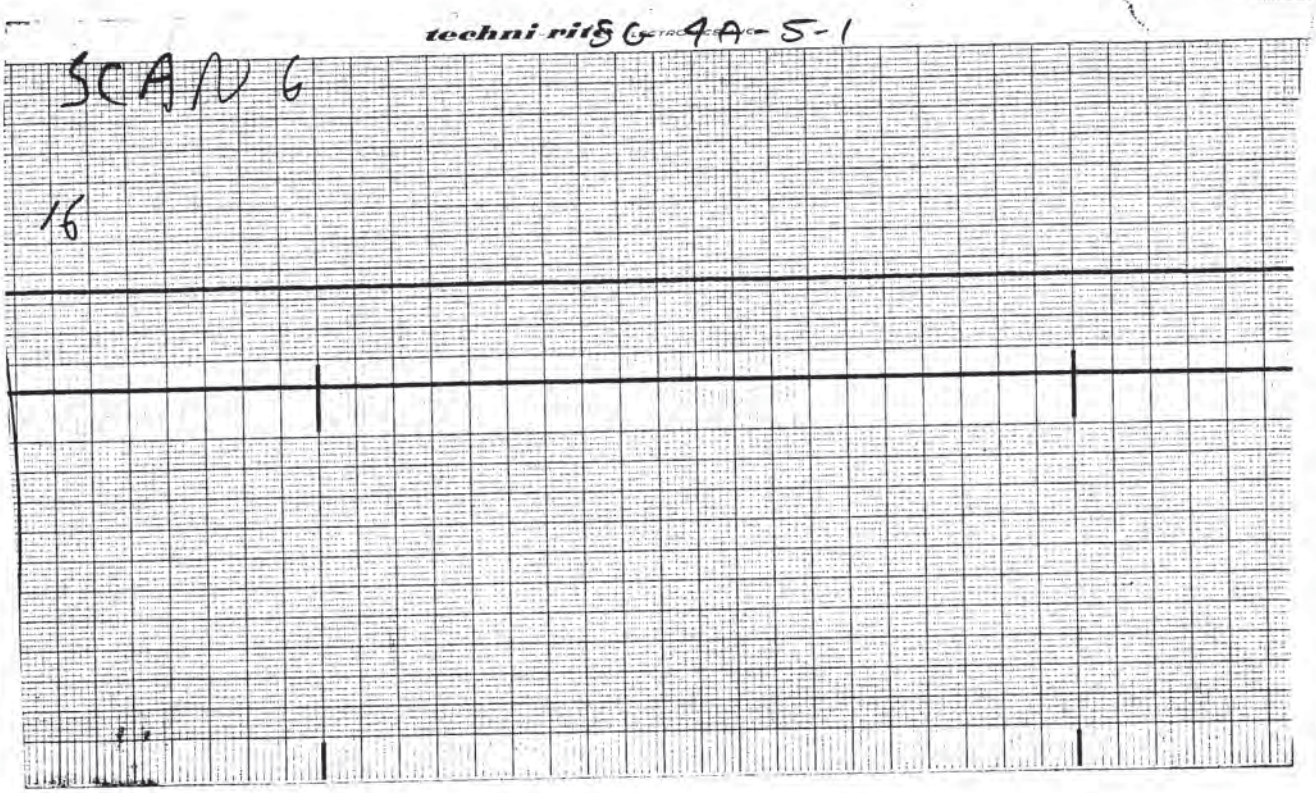

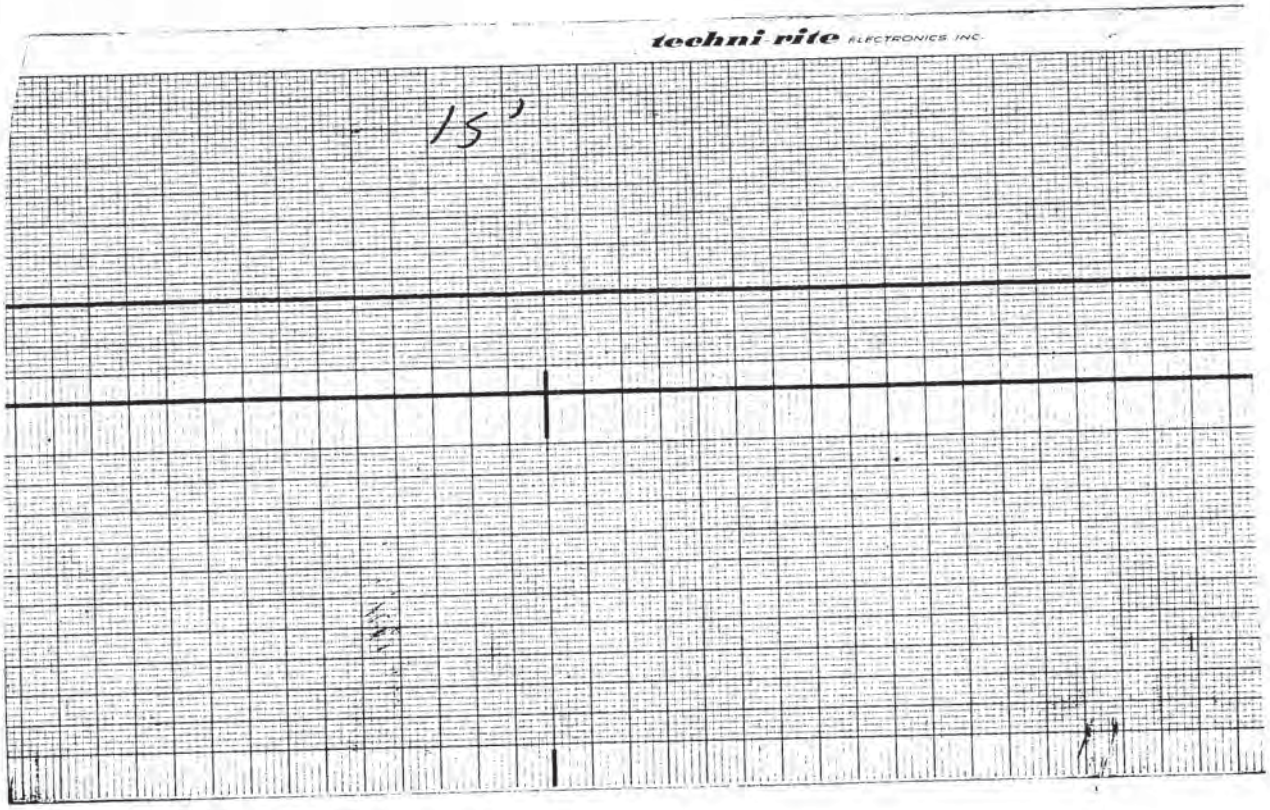

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SC6-SU 9A-5-1

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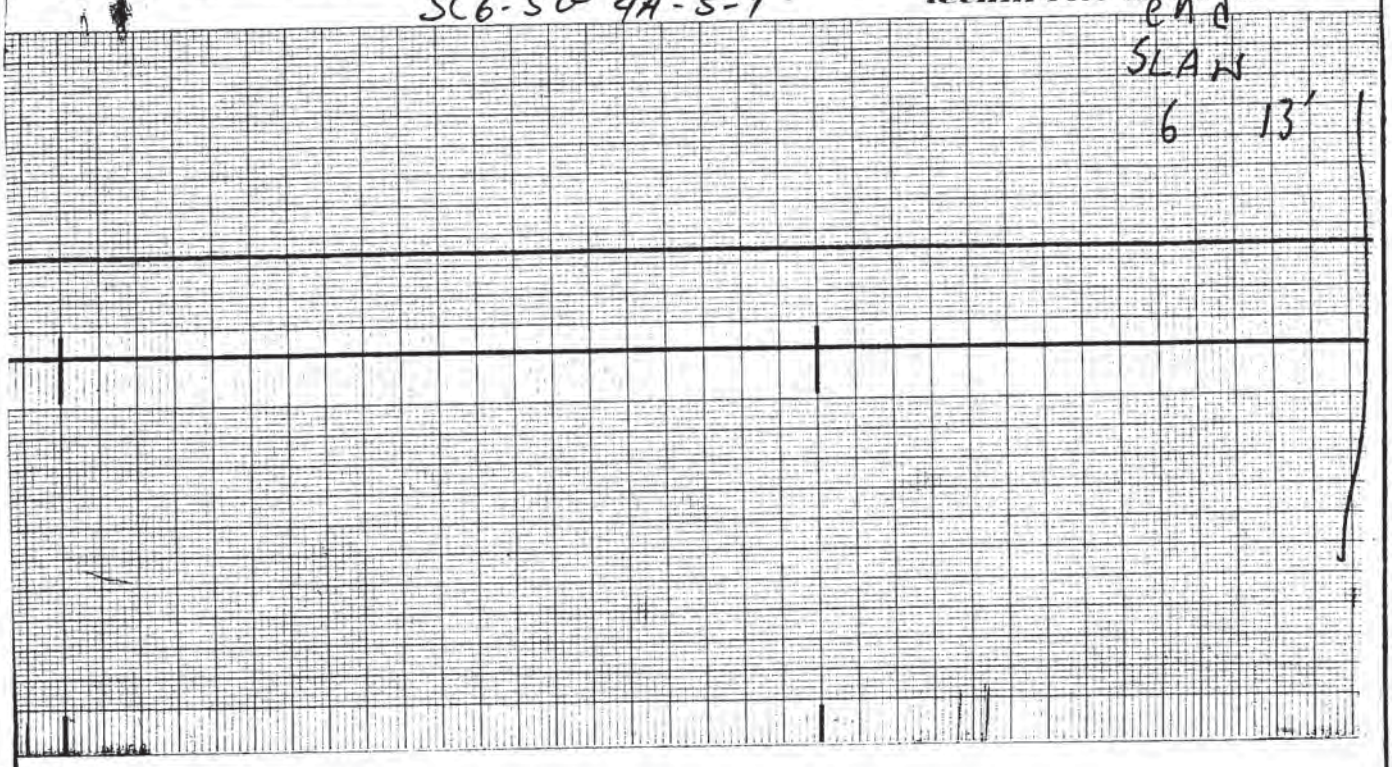

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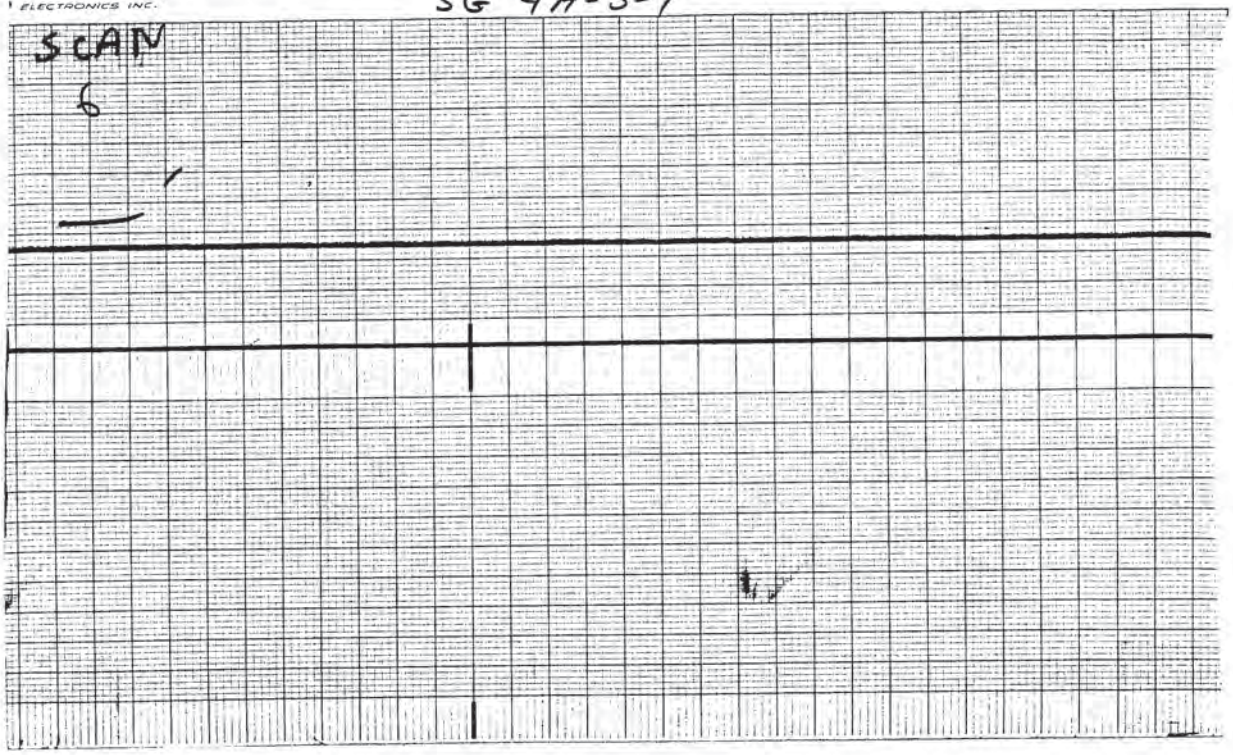
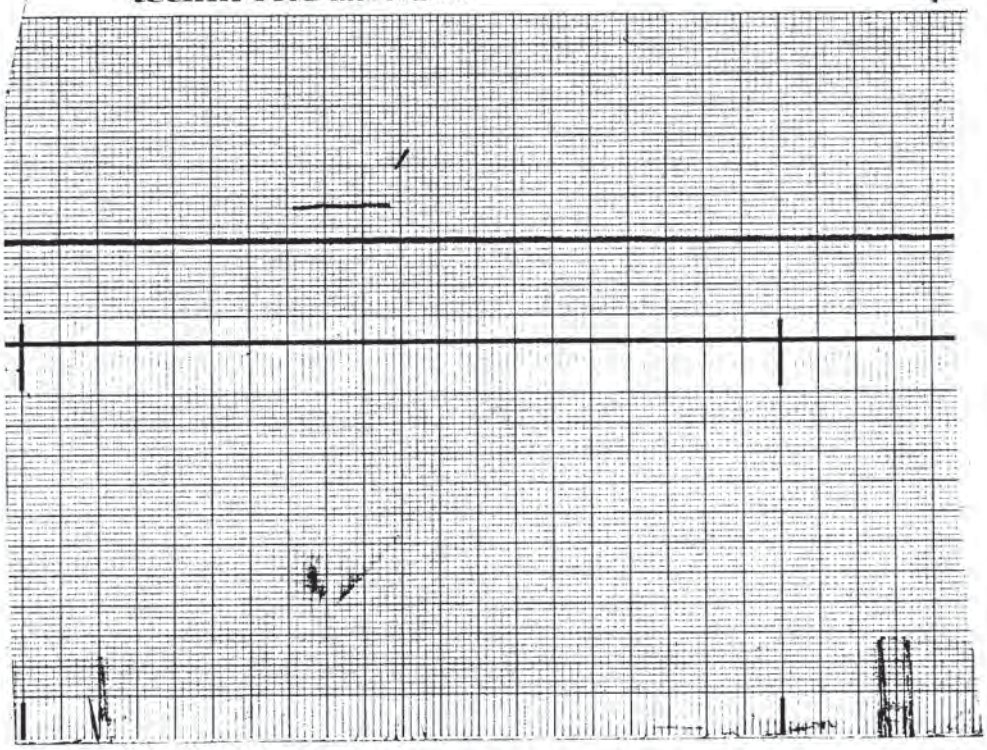
ELECTRONICS INC.

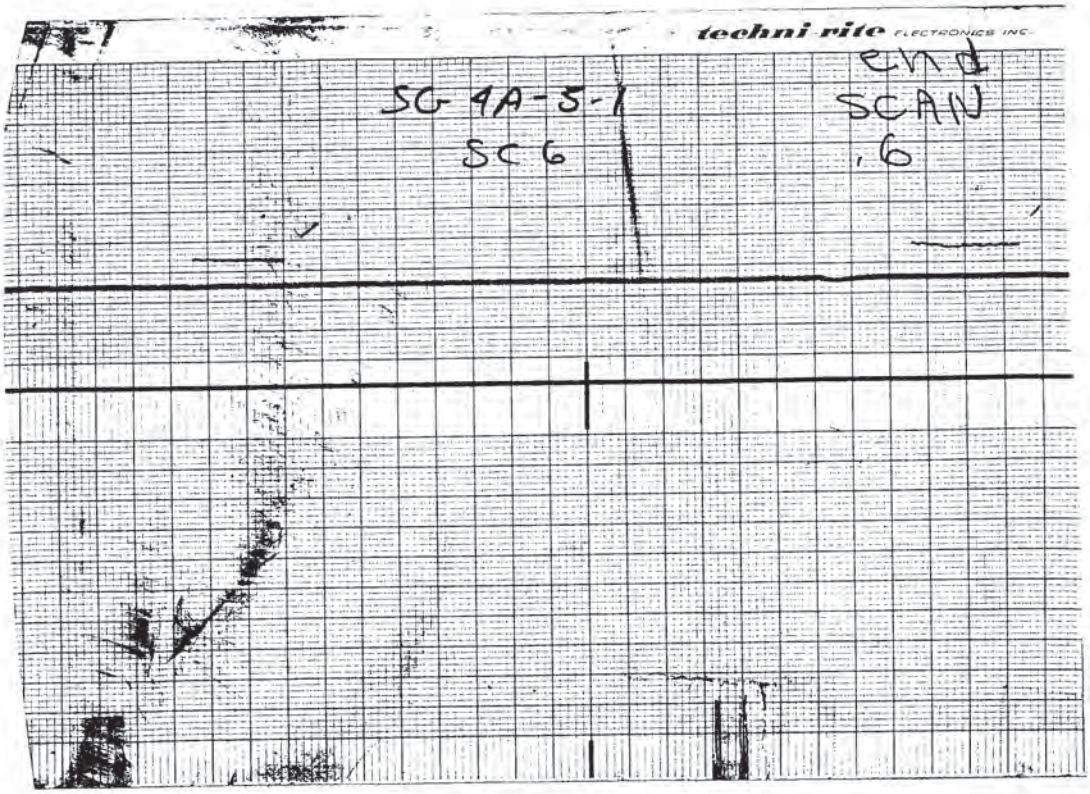
SG 9A-5-1

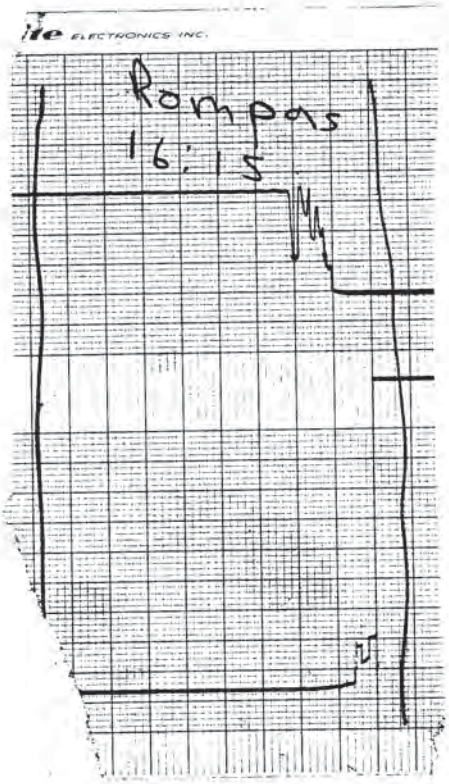
SCAN 6



techni rite ELECTRONICS INC.







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LMT-UTX2 3/77

Lambert • MacGill • Thomas, Inc.

Testing • Engineering • Service • Training

771 East Brokaw Road
San Jose, Ca. 95112
408-297-8766

Location WBNP 1
Report No. R531
Cal.No. C166 Time 13:31
Job No. TUA-022
Date 8-3-79
Page 1 of 20

REPORT OF VISUAL AND ULTRASONIC EXAMINATION

ITEM

Description SG 1 weld Size ≈5" T Material CS S/N(s) SG4B-5-1

Location St. Gen 1 Preparation Buffed Temp. 105°

SIGN

Examiner/Level LAKE/II Examiner/Level Smith/I Review/Level [illegible]

Authorized Inspector [illegible] Customer [illegible] 13-2734

EQUIPMENT

Tester 1 Nortec 131-D S/N ~~289~~ 269 2 N/A S/N N/A

Recorder 1 Gulton S/N 71197 2 S/N

Transducer 1 P362 61° 2

3 N/A 4

111778

Couplant LMT Gel Cable 6' BNC/BNC Marker N/A Photo N/A

PROC

Calibration Procedure LMT-UT-2 Rev. 13

Examination Procedure LMT-UT-2 Rev. 13

Record Procedure LMT-UT-2 Rev. 13

BNP-B2-1.2 6-10-92

CALIB

Calib. Blk. ~~16-88-224~~ Temp. 80°F Ref. 1/4T SDH Amp. 80% Swp. 2div

Ref. Gain 59dBg Damp min Reject min Gate 1-10div

Alarm N/A Mag. Tape Count N/A Chart ATTACHED Cal. Check Time 1439

EXAMINATION

Cal. Ref. Blk. 17 Ref. Rfl. SDH Amp. ~~85%~~ 35% DBM Sweep Position 1.5

Scan Gain 60dBg Ref. Dwg. 2660-B Reject Level ASME XI Report Level ASME XI

NAD = No apparent disc. L = Linear G = Geometry S = Spot M = Multiples

Scan	Type	Disp.	Scan	Type	Disp.	Scan	Type	Disp.
0	PT	N/A						
1	Visual	NAD	7	N/A		13	N/A	
2	Base Metal	N/A	8			14		
3	No Scan	N/A	9			15		
4	1	G	10			16		
5	11 cw	NAD	11			17		
6	11 ccw	NAD	12			18		

Scan	Description of Indications
④	ID Geometry 15% Dac.

④ ↓

⑤ → ← ⑥

CY	SYS	EXAM AREA	R
00	SG	SG4B5-0001	A

② NOSC due to support ring.

RFR ISI 5

LAKE II Smith I

DATE 8-3-79

TIME 13:30

TEMP 105°F

SYSTEM SG 4

LOCATION SG 1

SG 4B-5-1

RPT. NO. R-531

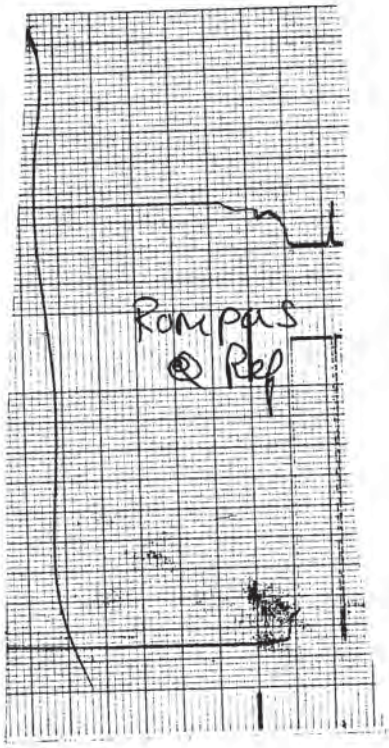
CAL. NO. C166

SIZE 5T

TEST BLOCK NO. 16-55-22-1

VISUAL NAD

pre due to SG support.
O SC 5, 6
NO SC 3



techni-rite ELECTRONICS INC.

SC4

13

SC-4B-5-1
SC4

techni-rite ELECTRONICS INC.

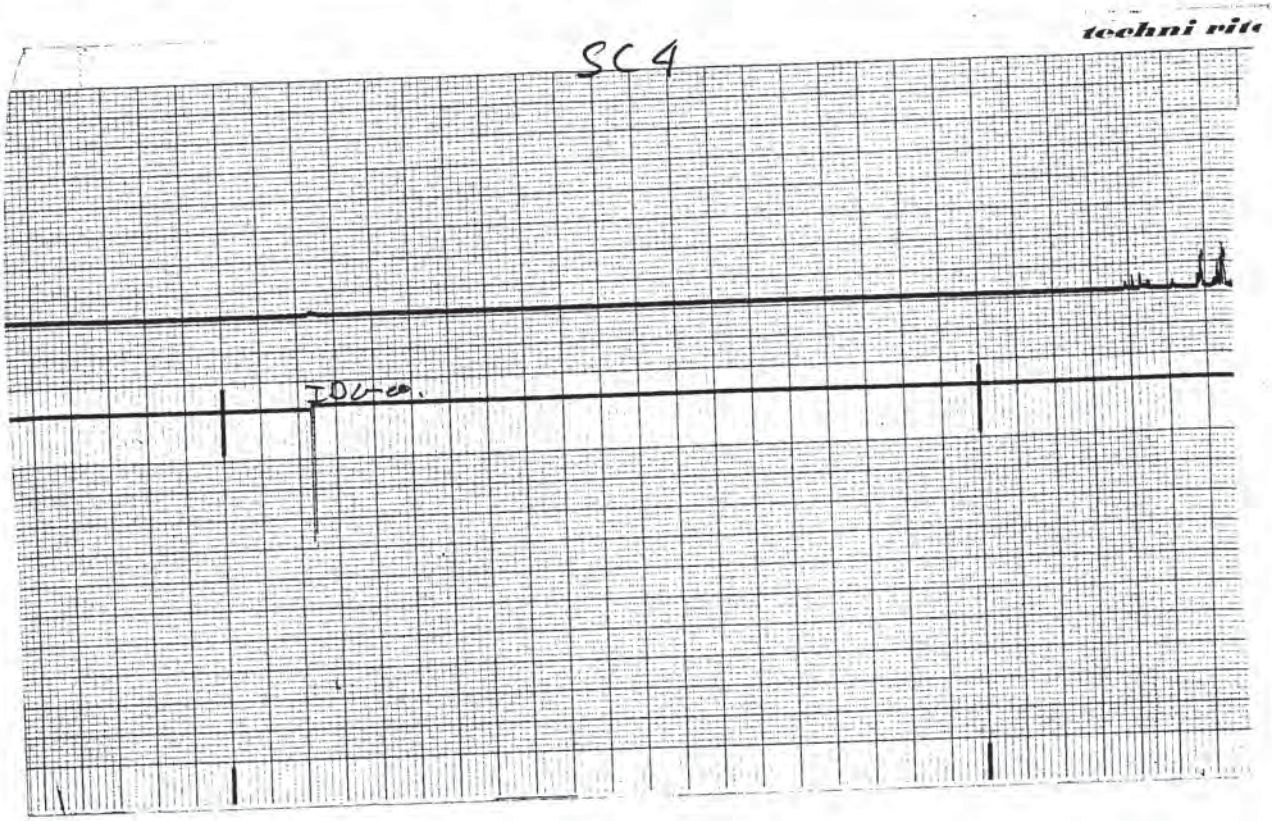
SC-4B-5-1
SC4

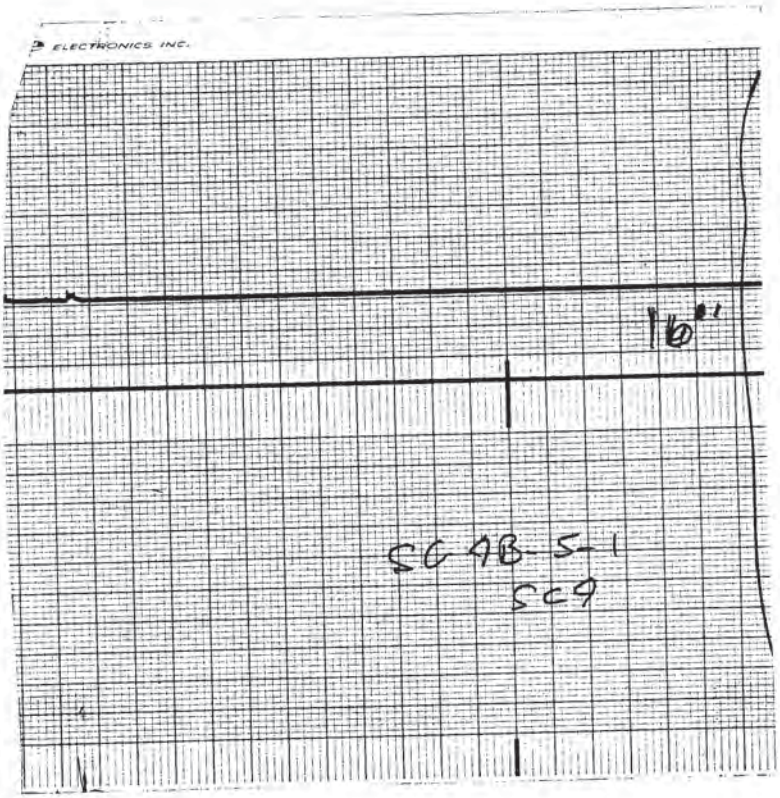
Steelpi rite ELECTRONICS INC.

SG 4B-5-1
SC 4

techni-rite ELECTRONICS INC.

SG 4B-5-1
SC 4





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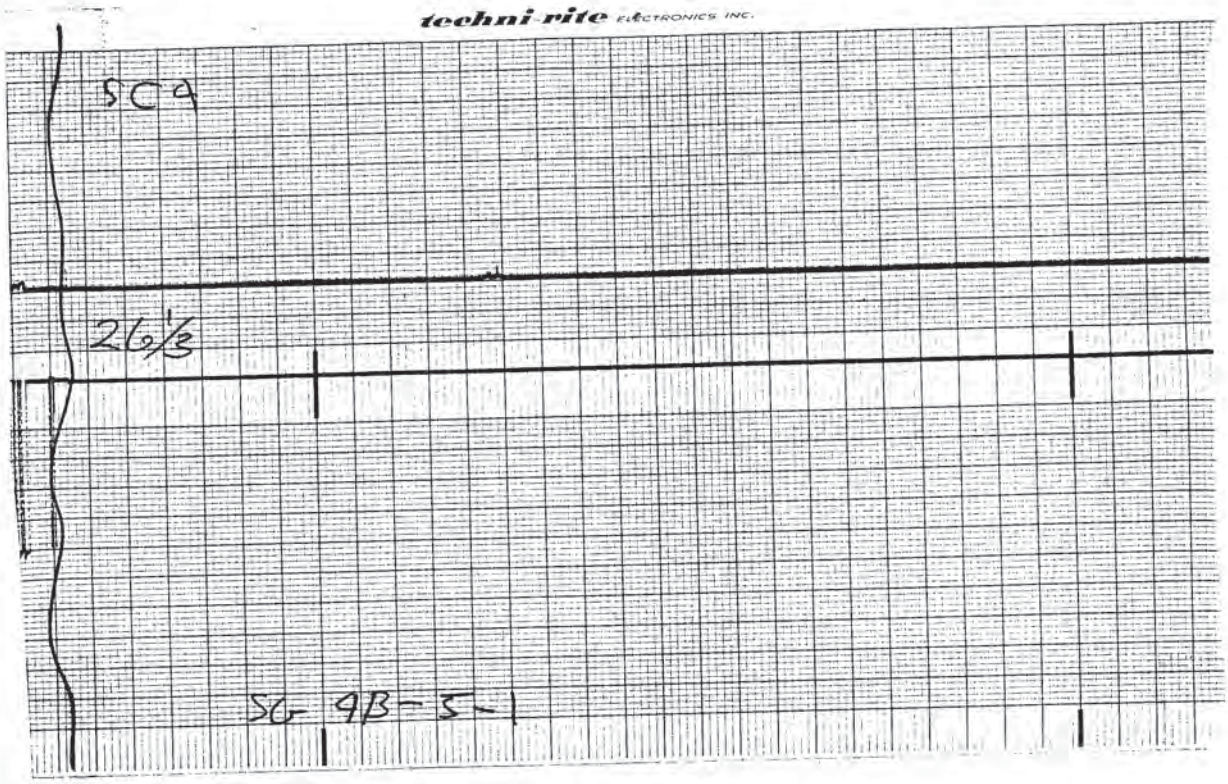
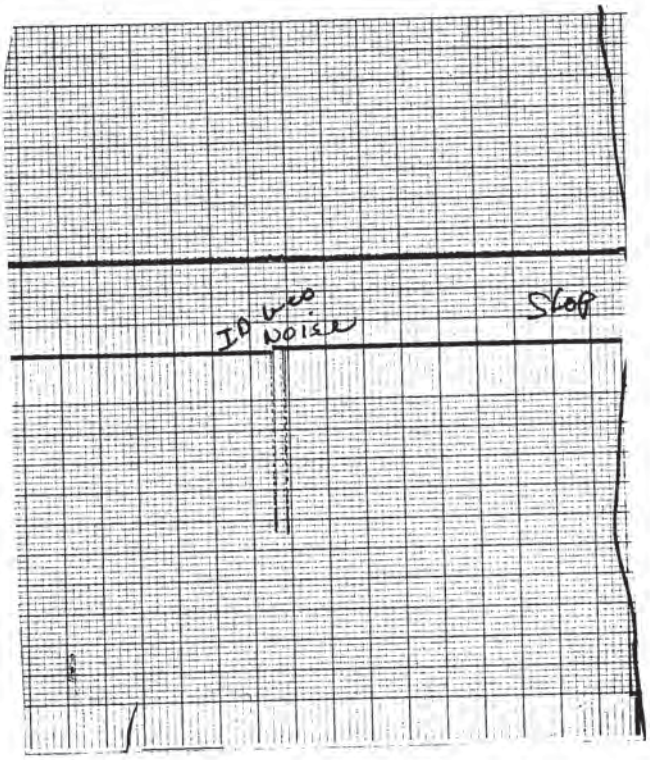
LMT





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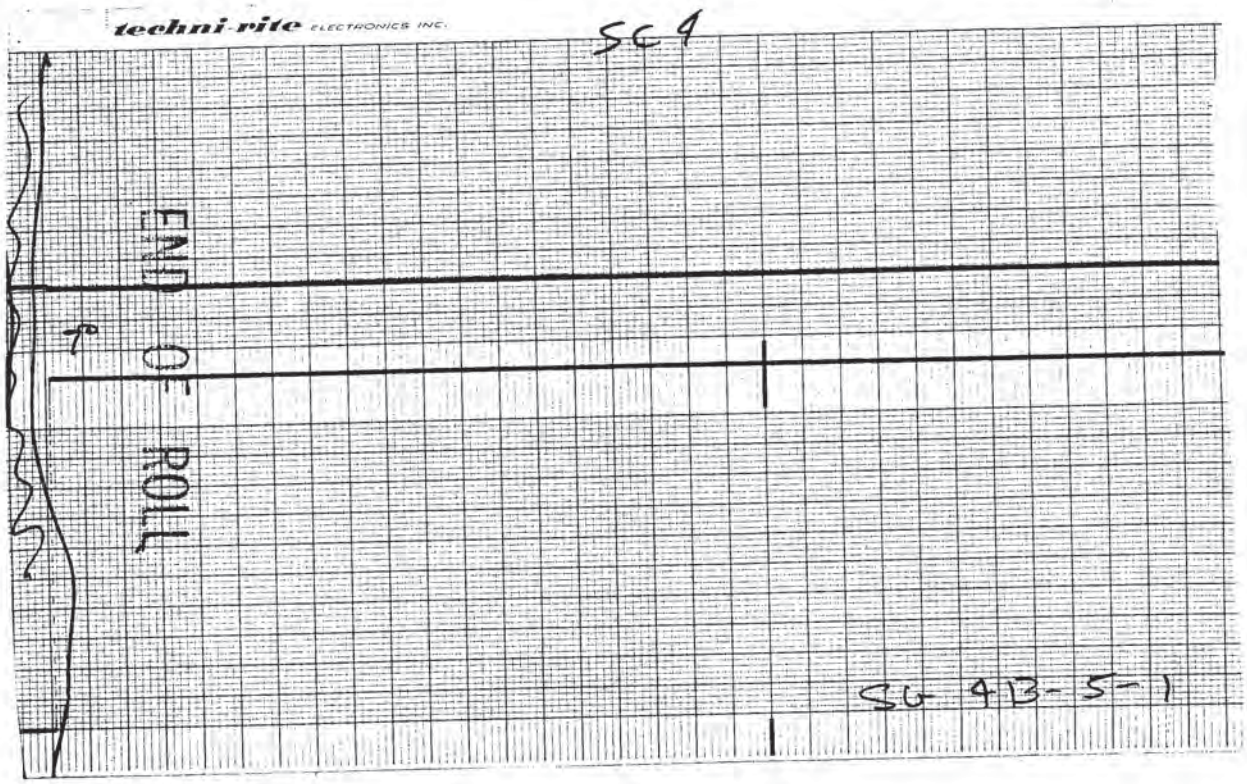

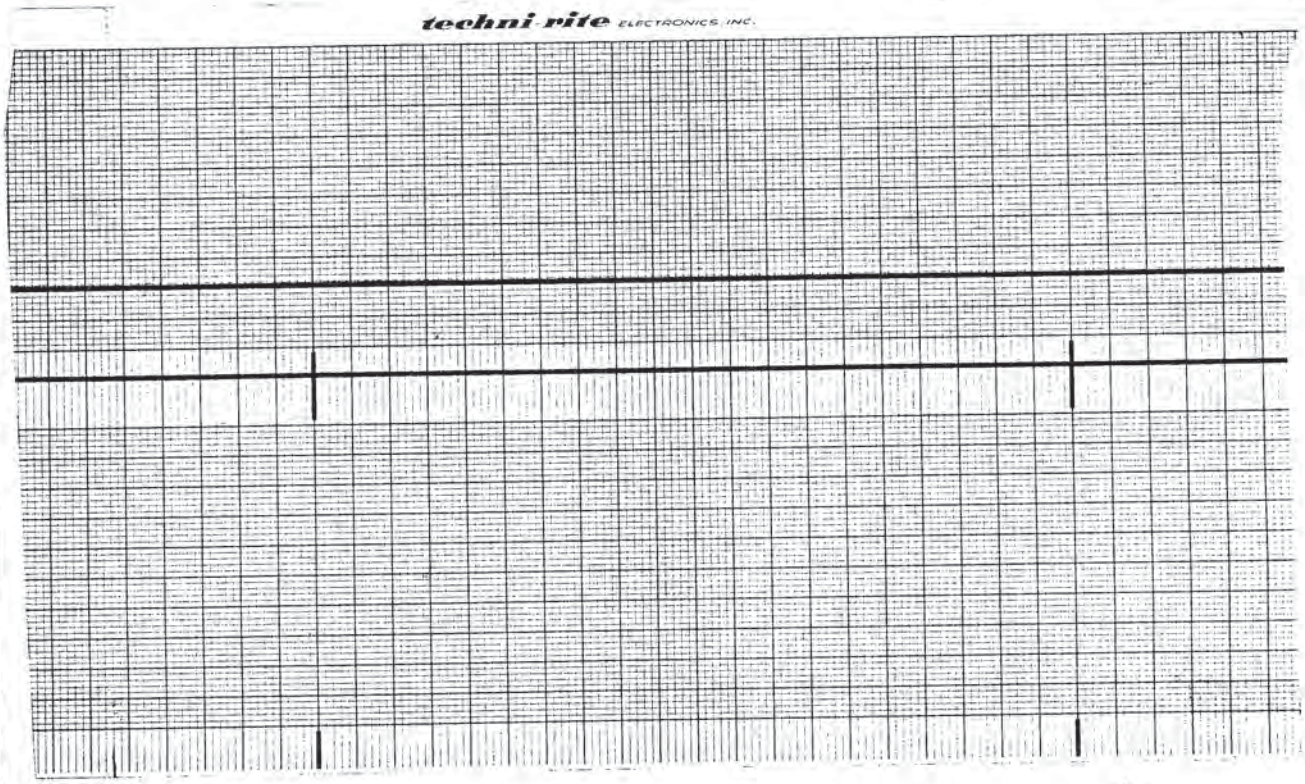

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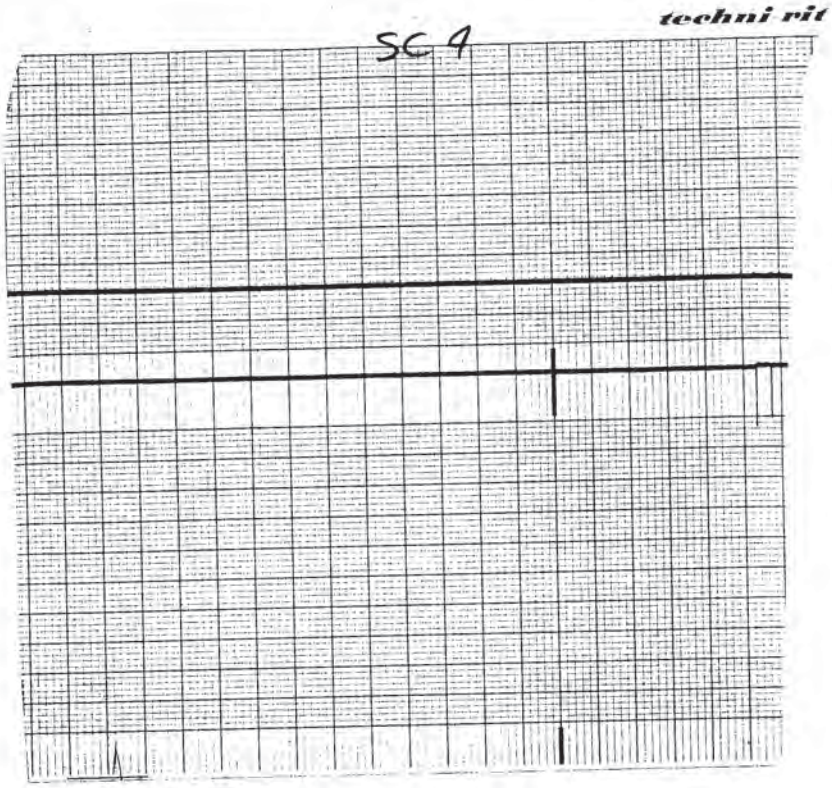
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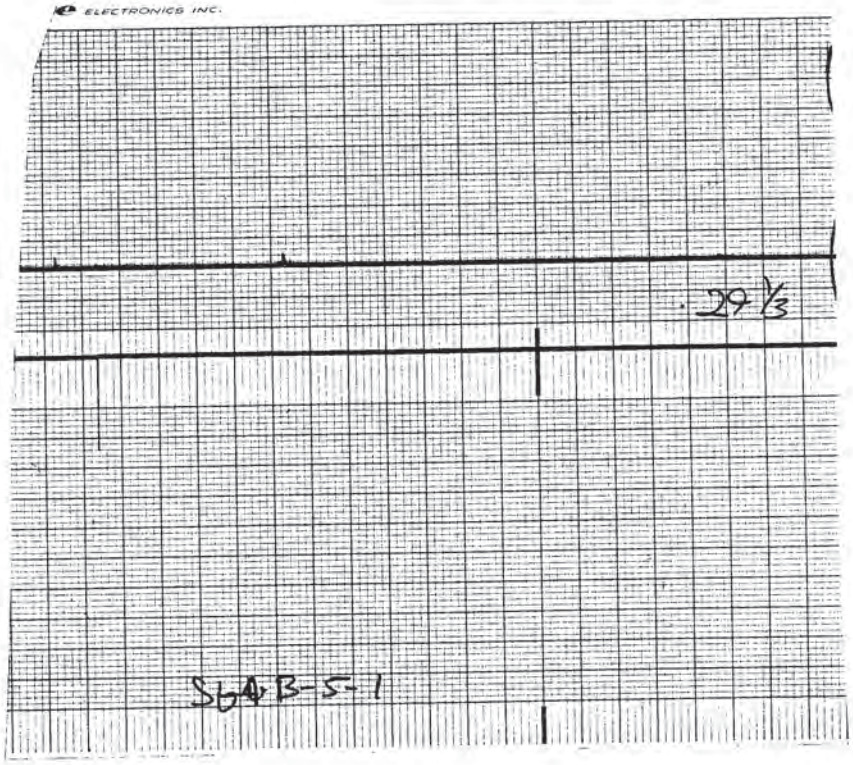
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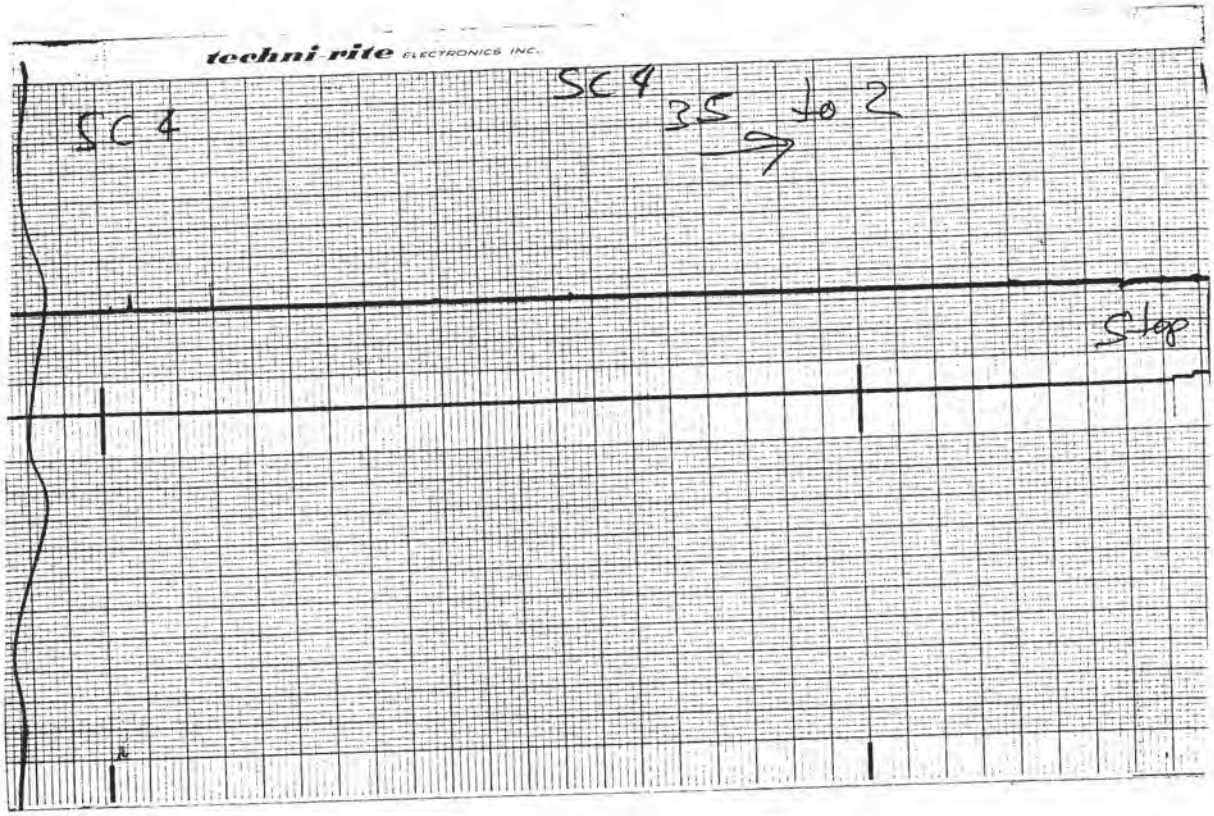
29 1/3
S64B-5-1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SC 4
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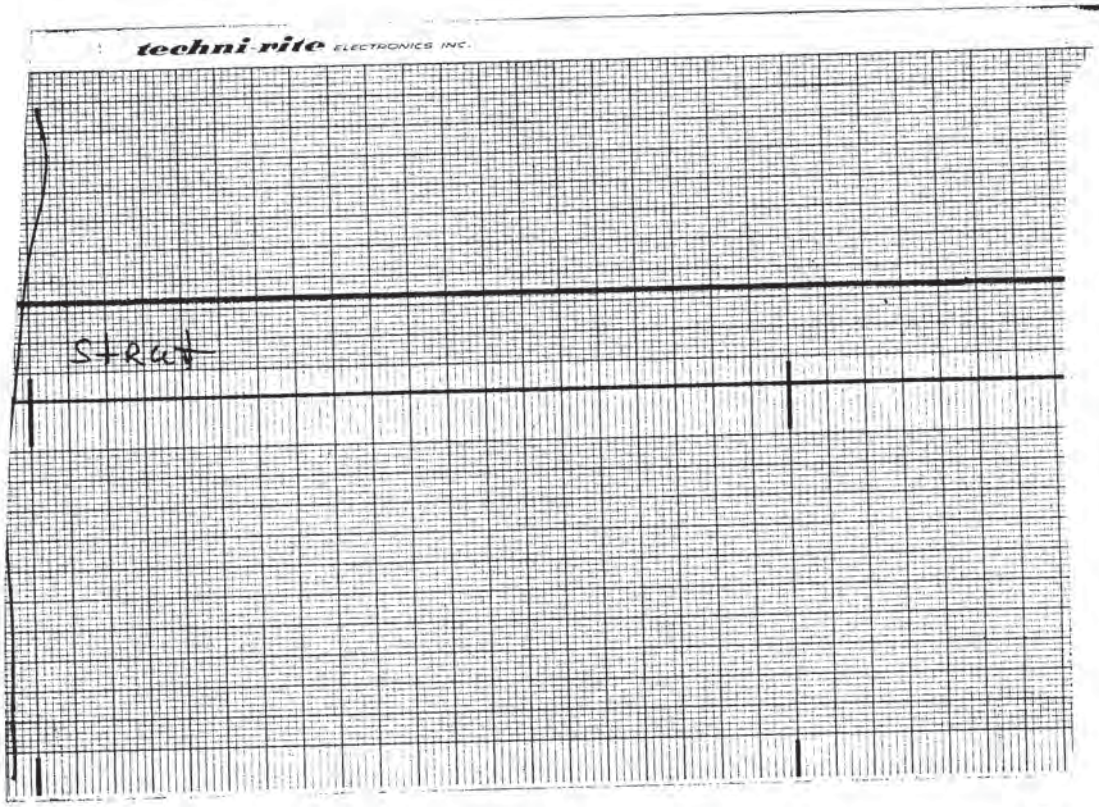
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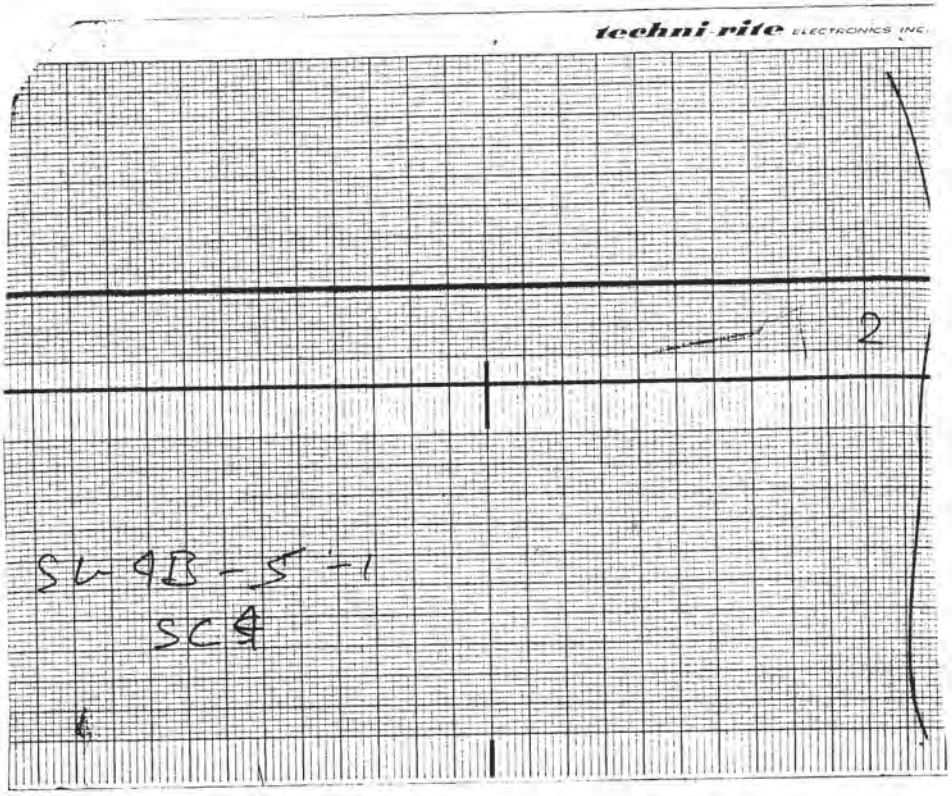
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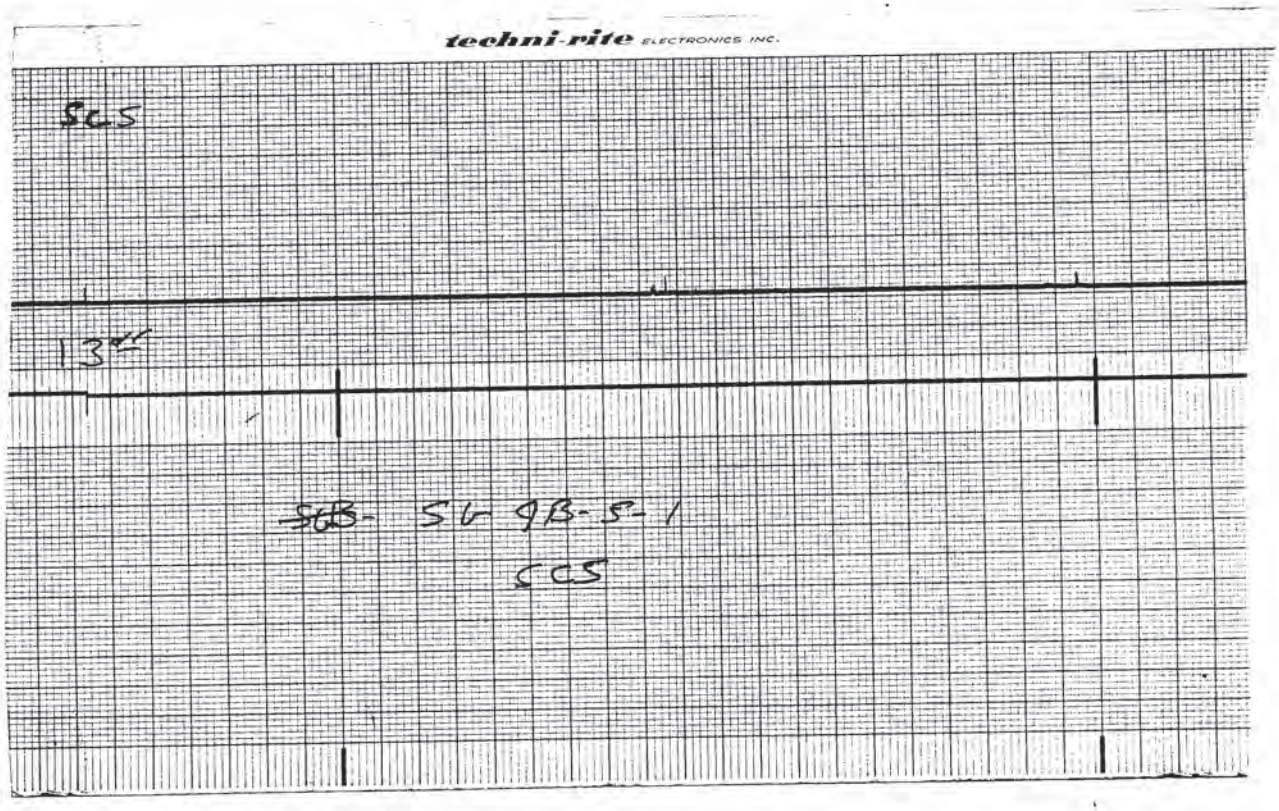
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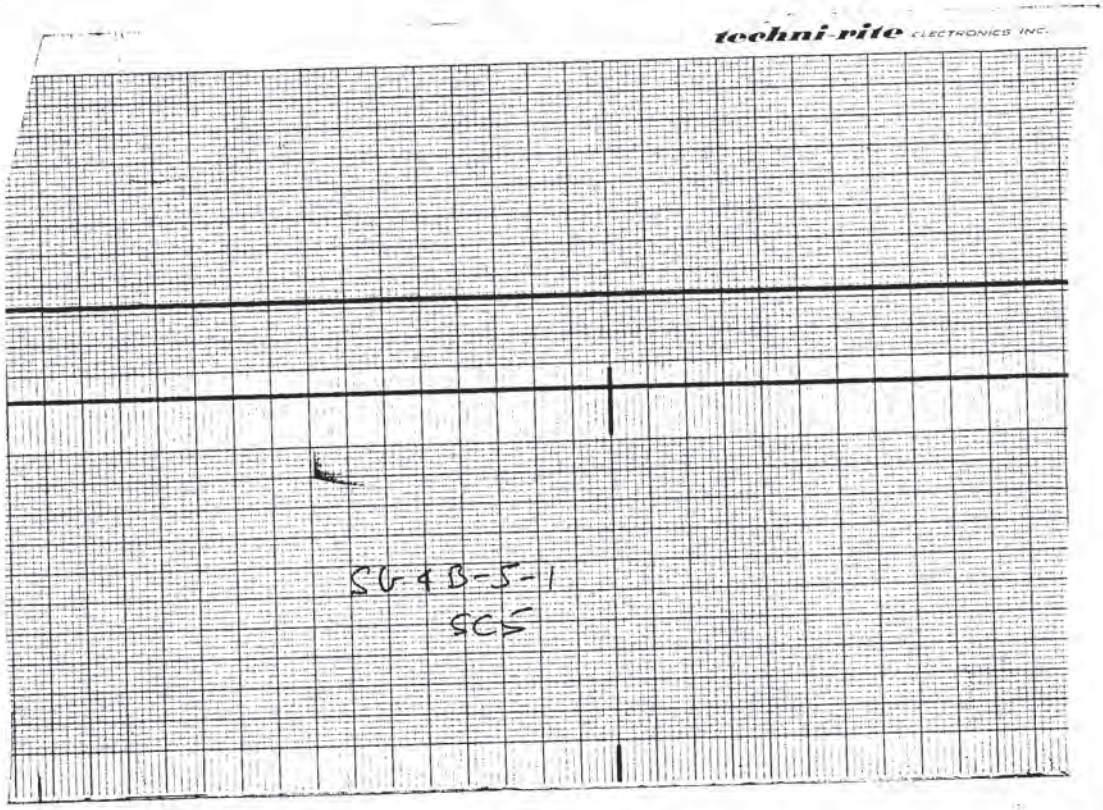
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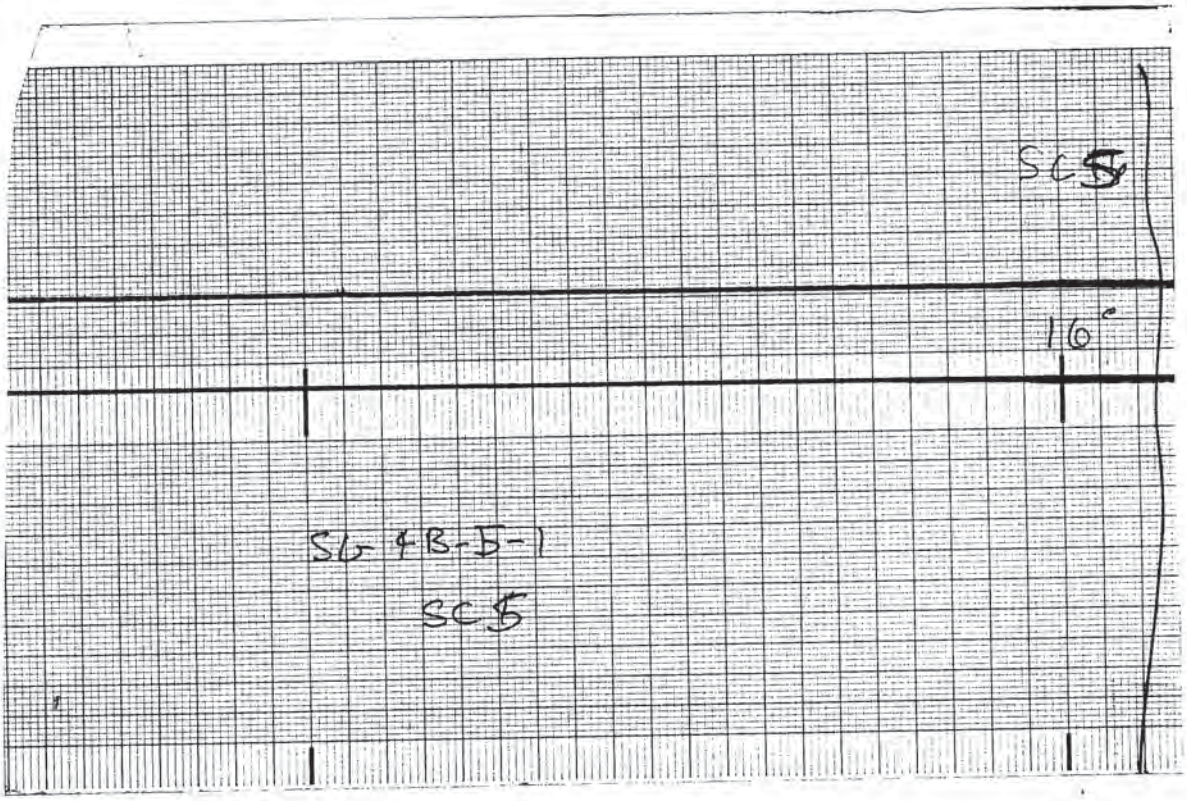
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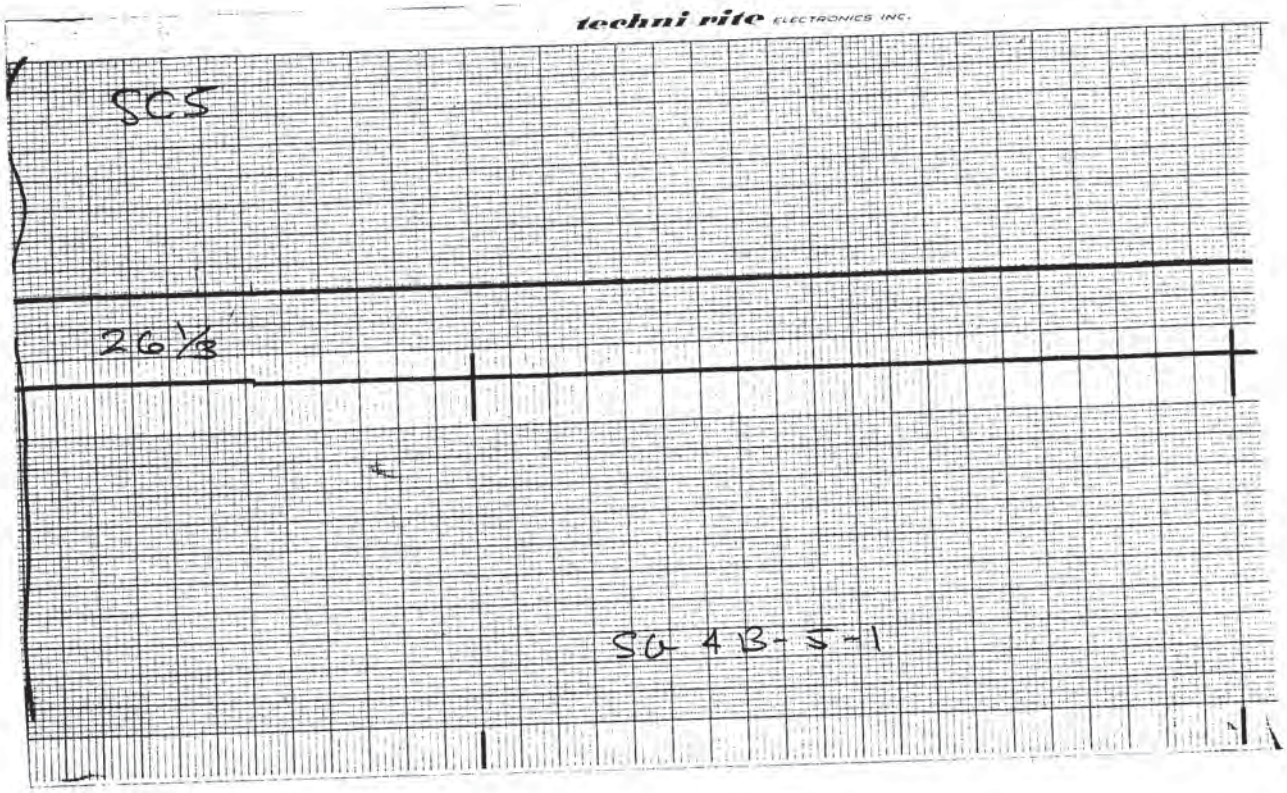
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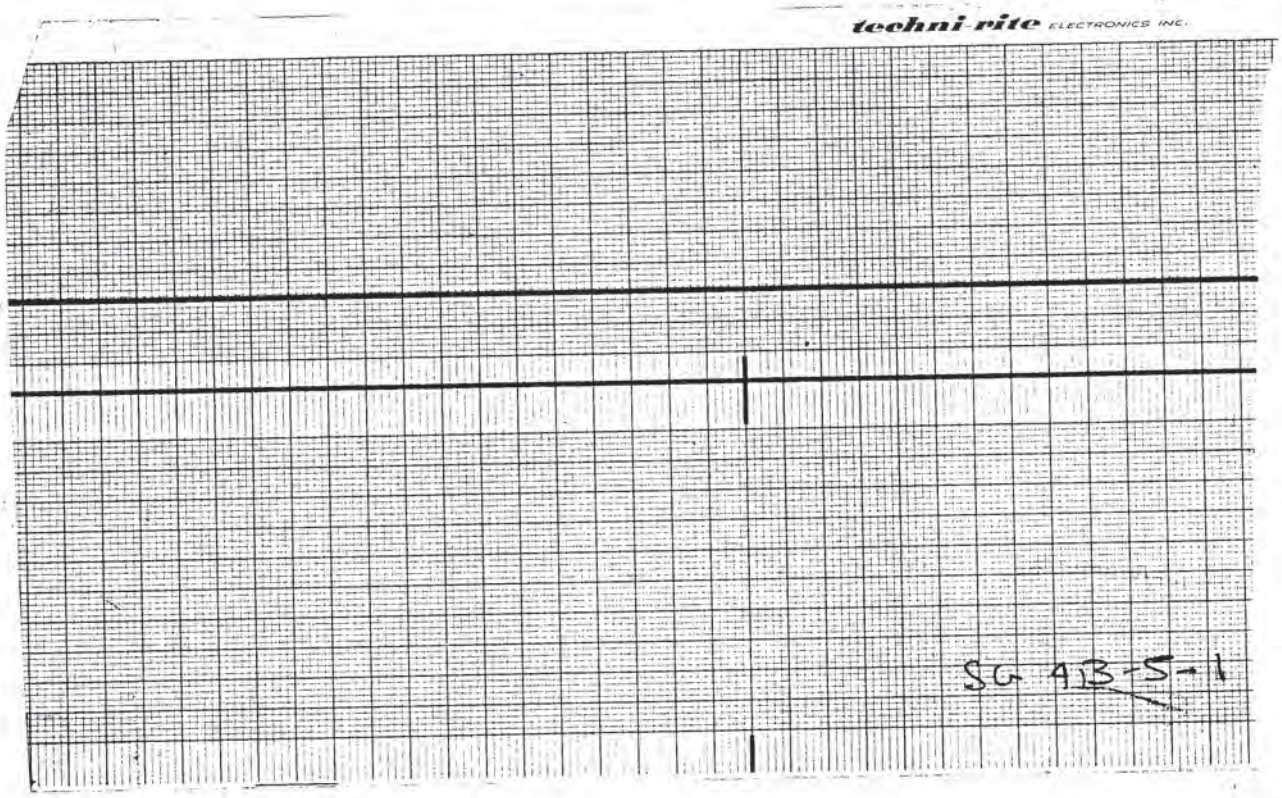
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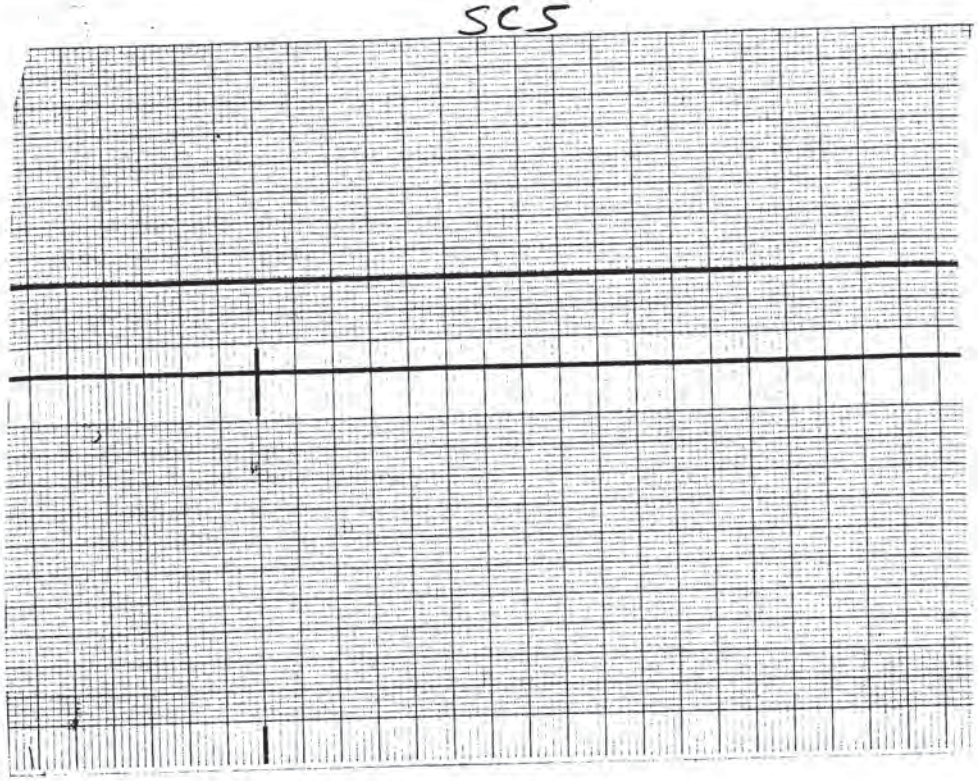

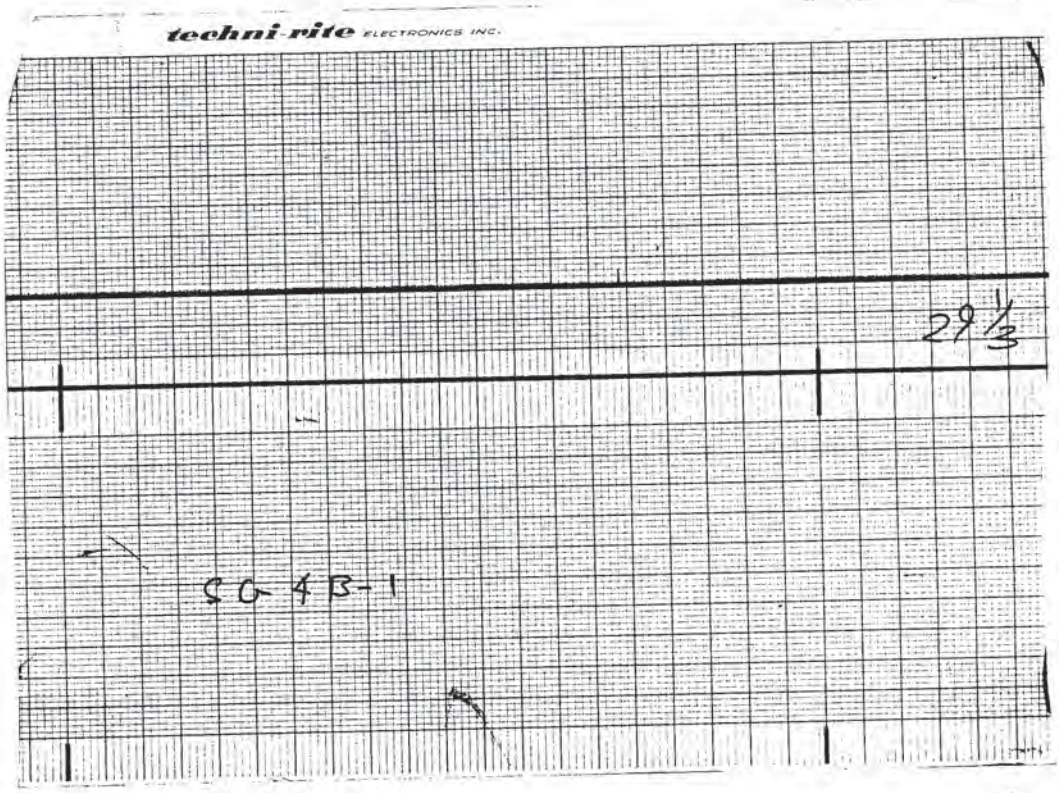

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SG 4B-5-1

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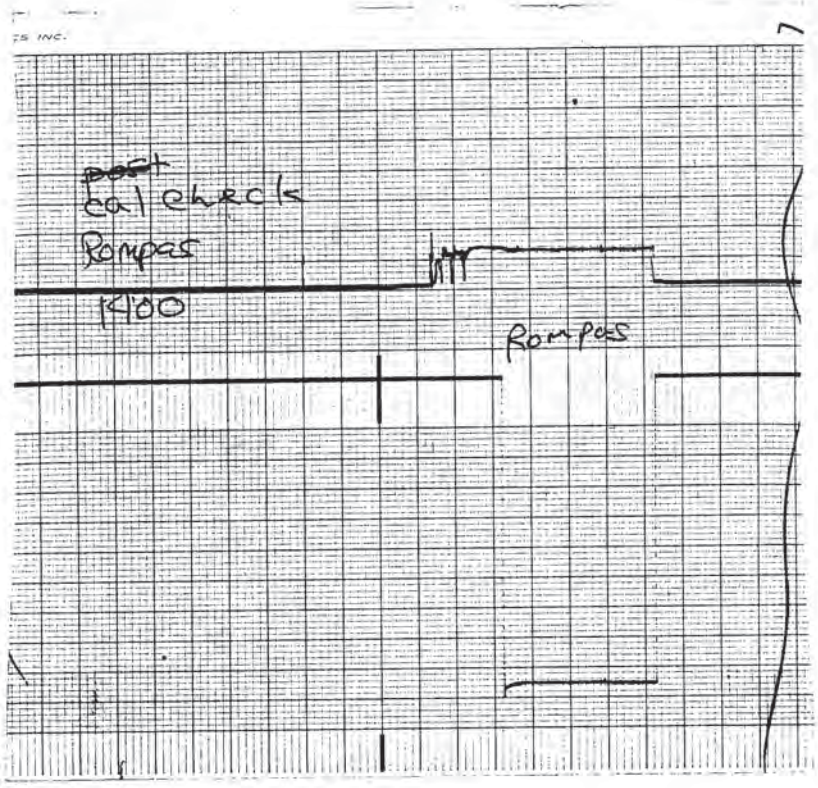

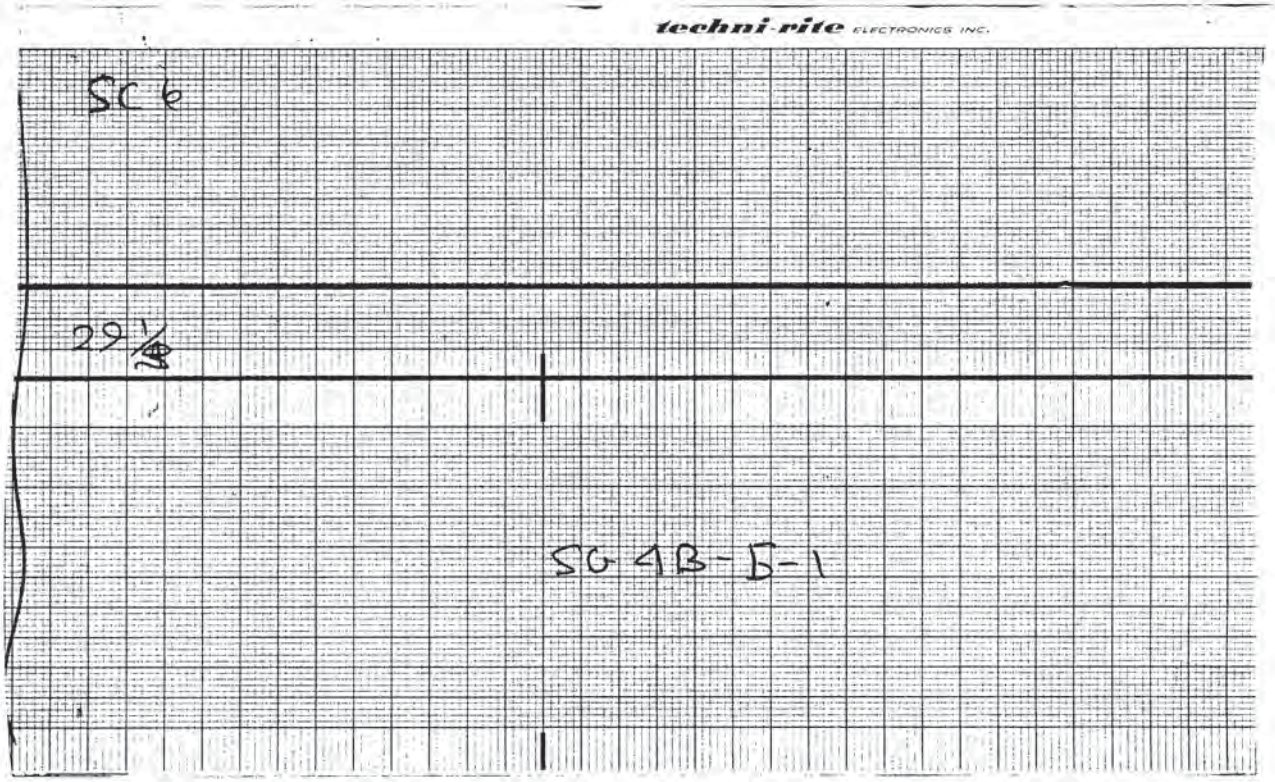

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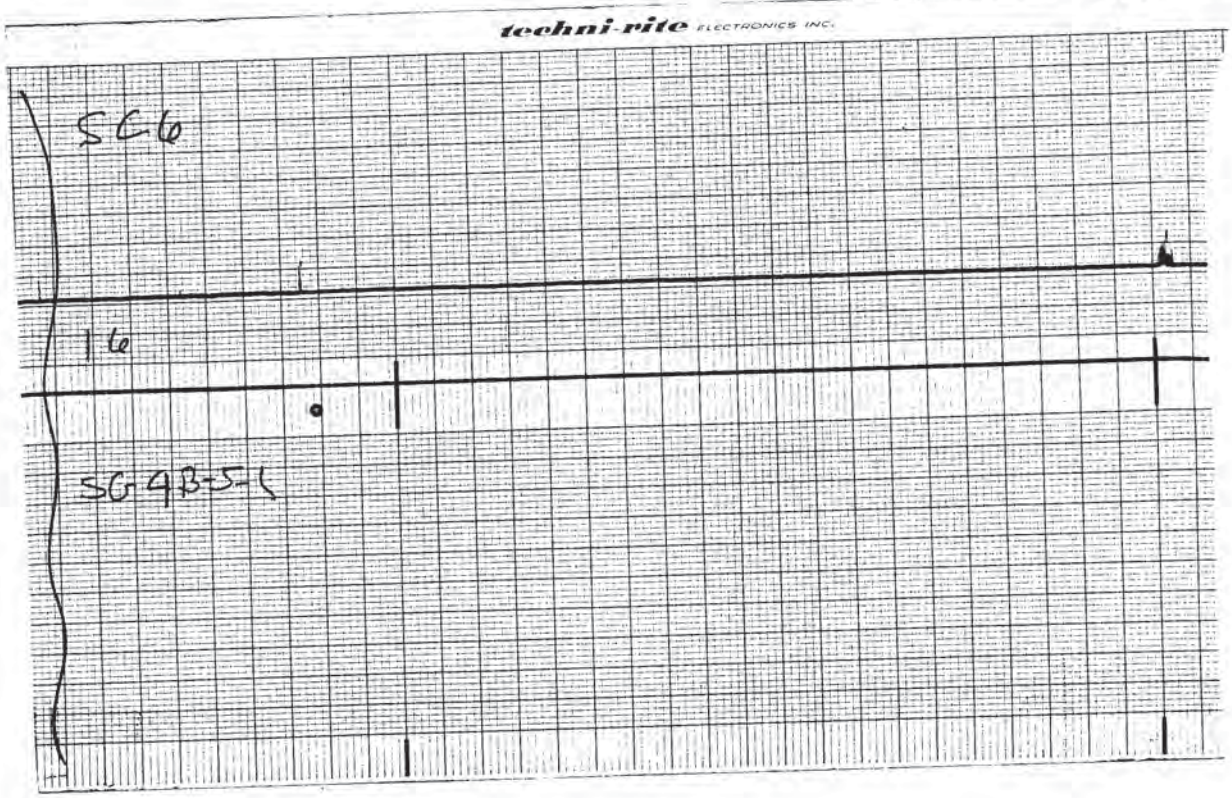
SG 4B-5-1
SC 6

techni-rite ELECTRONI

26 1/3

SG-4B-5-1
SC 6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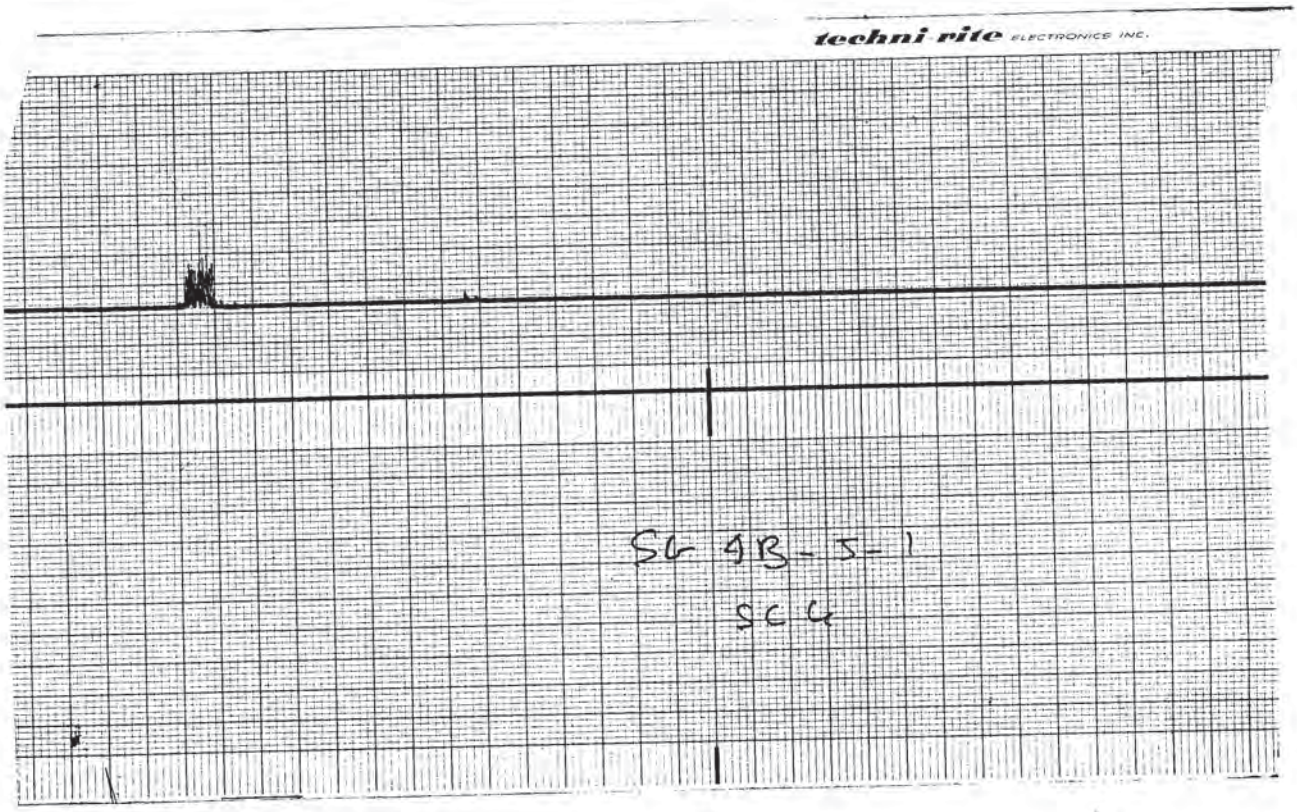
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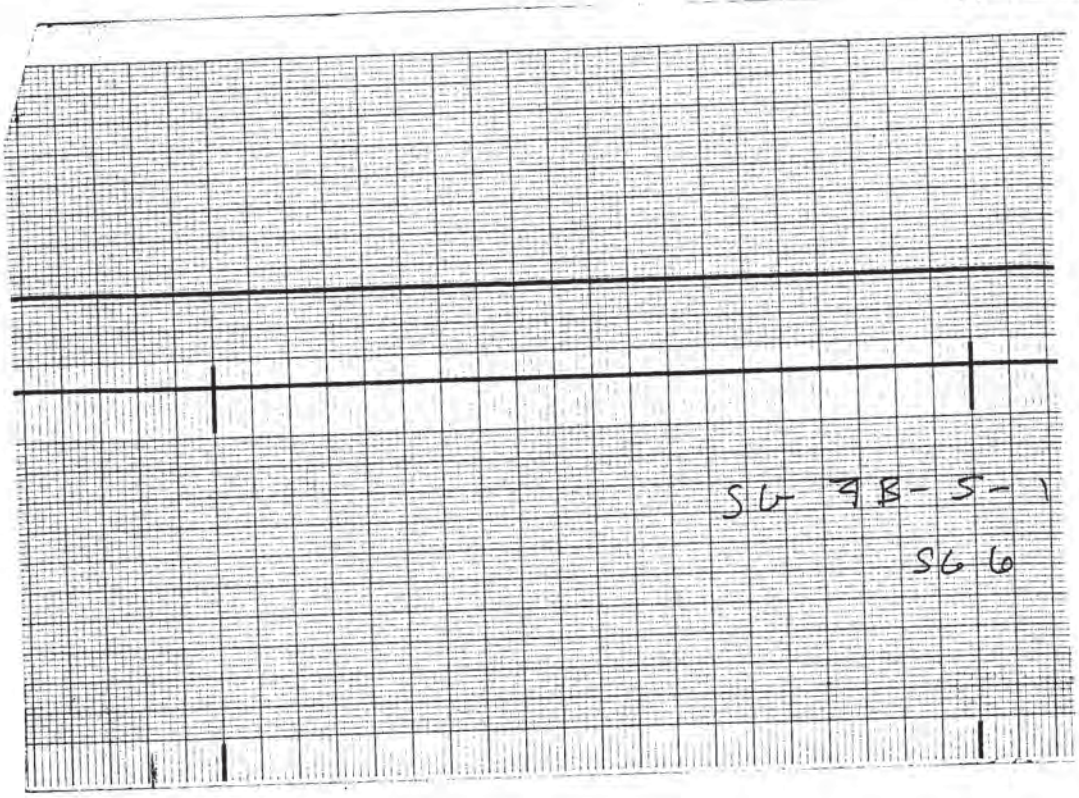
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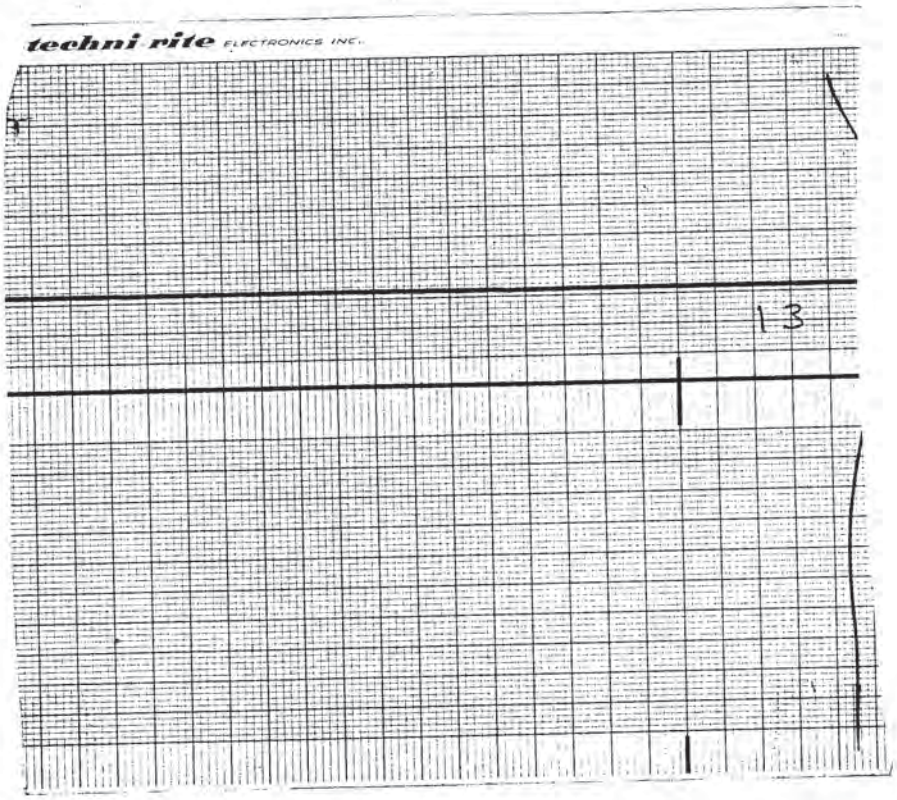
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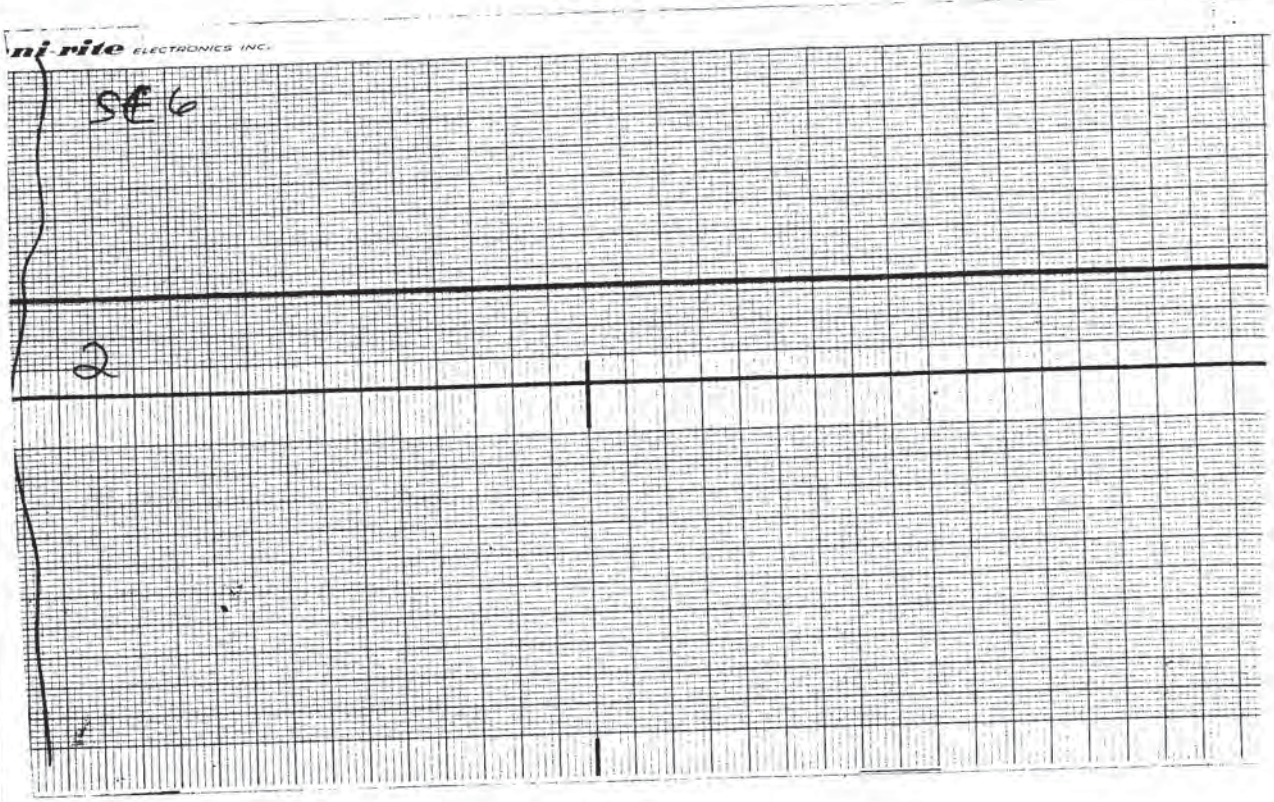

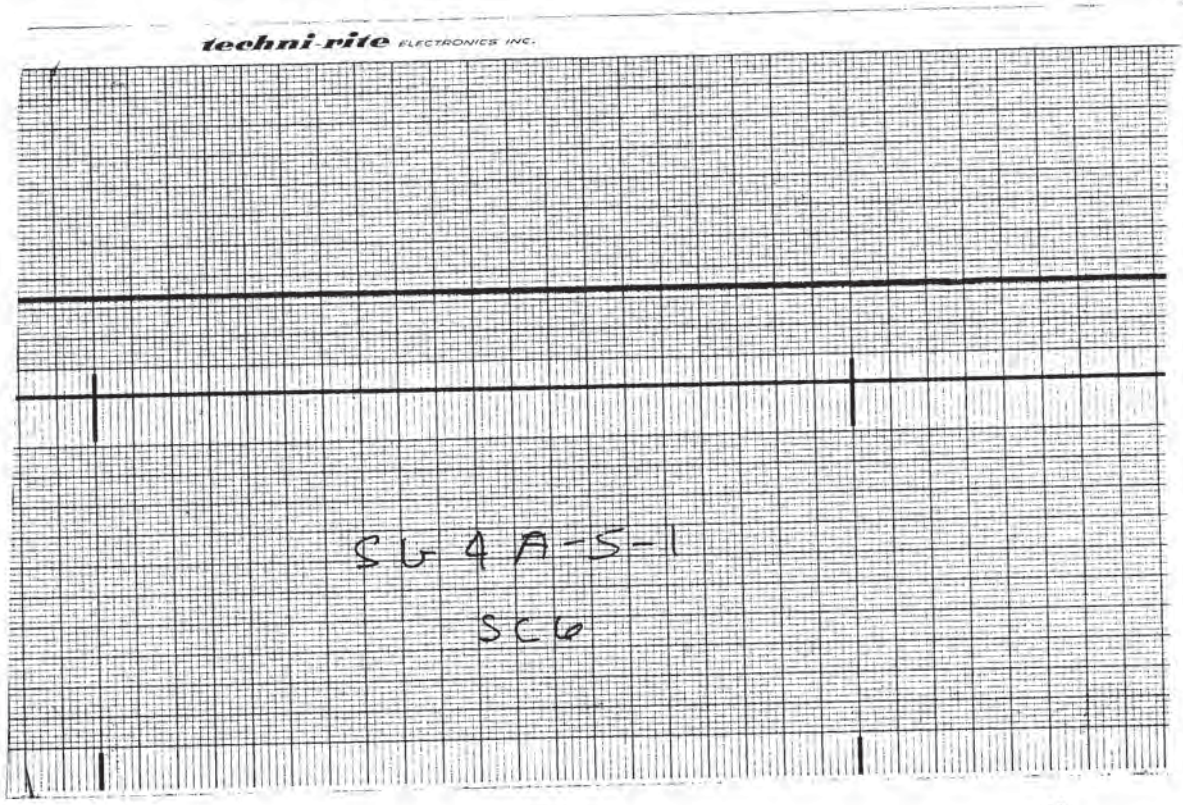

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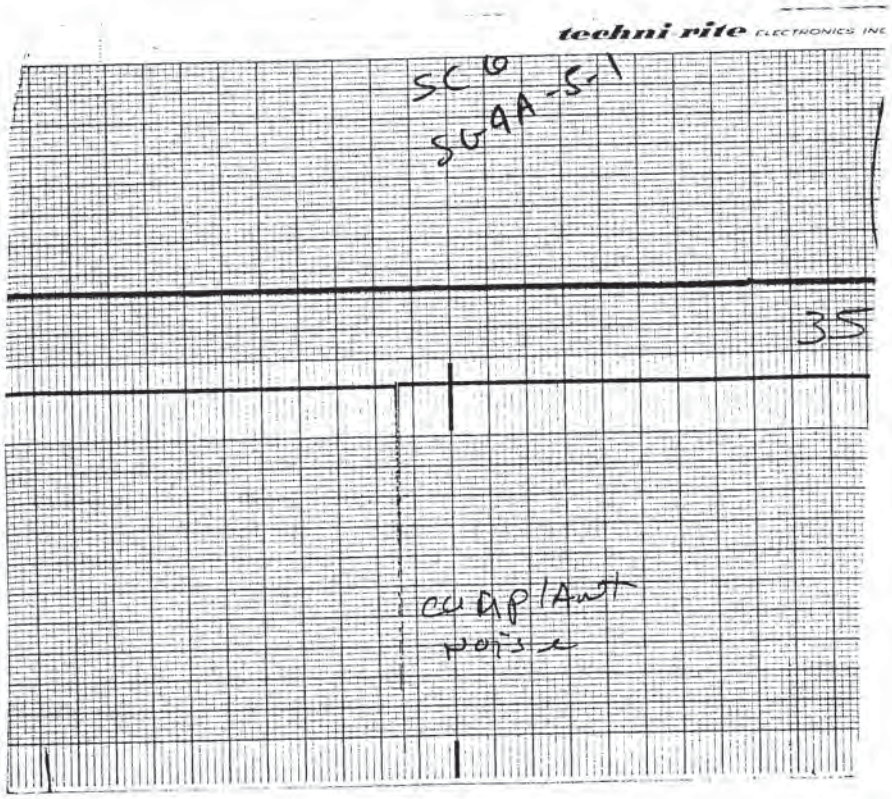
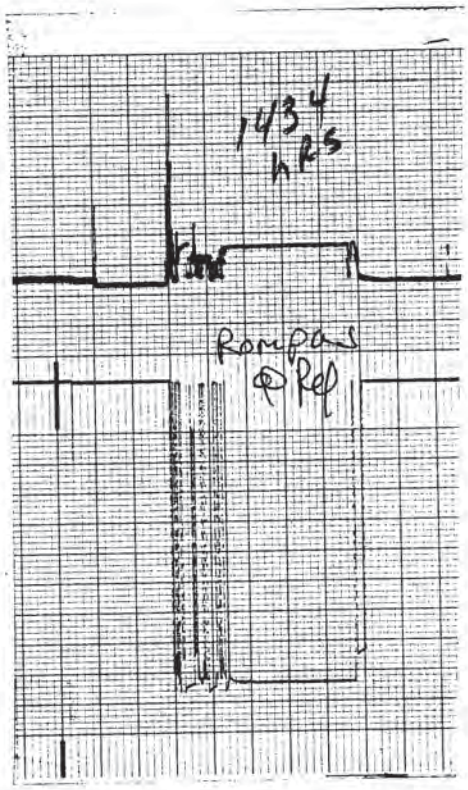




Page No: 4F
Following Page No: N/A
Report No: R531

ATTACHMENT 3

WBN Unit 2 Report No. R-P2431

TENNESSEE VALLEY AUTHORITY	EXAMINATION SUMMARY AND RESOLUTION SHEET	REPORT NUMBER: RP2431

PROJECT: *WBN* UNIT: *2* CYCLE *00*				COMPONENT ID: *SG-4B-5-2*	
EXAMINATION METHOD				SYSTEM: SG	ISI DWG NO: *ISI-2001-E-01*
MT ☐	PT ☐	UT ☑	VT ☐	CONFIGURATION:	CATEGORY
PROCEDURE: *N-UT-19*		REV 18	TC: N/A	LOWER *SHL* TO CONE	*C-A*

EXAMINER:	EXAMINER:	EXAMINER:	EXAMINER:
Andrew Kelleher ANDREW Kelleher	Jose Alejandro	N / A	N / A
LEVEL: II	LEVEL: II	LEVEL:	LEVEL:

Total coverage calculated to be approximately 24.88% ▲ BM 8/28/15

AN ULTRASONIC EXAMINATION WAS PERFORMED ON THIS LOWER SHELL TO CONE WELD CONFIGURATION. THIS EXAMINATION WAS PERFORMED TO MEET THE REQUIREMENTS OF ASME SECTION XI. PRESERVICE INSPECTION.

A 45 DEGREE SHEAR WAVE MODE WAS CALIBRATED AND USED TO PERFORM THE AXIAL SCAN.

A 60 DEGREE SHEAR WAVE MODE WAS CALIBRATED AND USED TO PERFORM THE AXIAL SCAN.

A 0 DEGREE MODE WAS CALIBRATED AND USED TO PERFORM THE BASELINE LAMINATION SCAN.

SCAN LIMITATIONS DUE TO RING GIRDER. NO SCAN 1, 3, OR 4.

NO RECORDABLE INDICATIONS OBSERVED.

24.88% EXAMINATION VOLUME COVERAGE ACHIEVED.

CODE ITEM: C1.10

▲ - EXAM COVERAGE REVISED TO 6.57%. REF. CR 1076021

BM 8/28/15

Andrew Kelleher 8-28-15

RESOLUTION BY:	REVIEWED BY: MATT WELCH	ANII: Joe C. HAIR
Andrew Kelleher ANDREW Kelleher	Matt Welch	Joe C. Hair DATE: 06/06/2015
LEVEL II DATE: 1-22-15	LEVEL: III DATE: 2/20/15	Page: 1 OF 11

ACCESS. FORMS DATABASE R-10/04/01

BM 8/28/15

TENNESSEE VALLEY AUTHORITY	DIGITAL ULTRASONIC CALIBRATION DATA SHEET	REPORT NUMBER R P 2431

PROJECT *WBN* UNIT/CYCLE *2/ 00*
PROCEDURE: *N-UT-19* REV: 18 TC: N/A

TRANSDUCER

MANUFAC HARISONIC MODEL: CM0216
ELEMENTS: 1 SHAPE: ROUND
S/N V12505 SIZE: 1.0 FREQ: 2.25 MHz
CONTOUR: N/A FOCUS: N/A
CABLE TYPE RG 174 LENGTH: 6' # CNT: 0
CONFIG ☐ D-SBS ☐ D-TANDEM ☒ SINGLE
MODE: ☐ SHEAR ☒ LONG ☐ RL

CALIBRATION DATE: 1-21-15
CALIBRATION BLOCK NO. SQ 57 TEMP: 72 °F
SIMULATOR BLOCK: 790916
THERMOMETER S/N: E39055 DUE DATE: 6-23-15
COUPLANT: ULTRAGEL II BATCH: 14H010

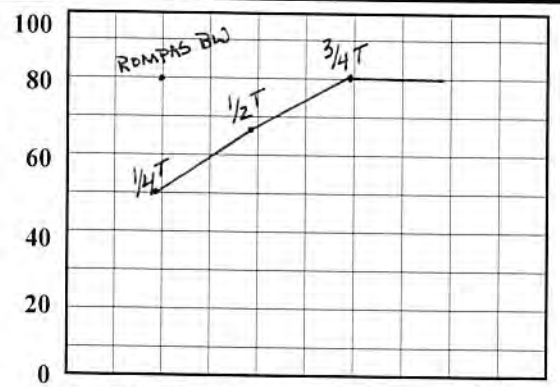
ANGLE VERIFICATION

BLOCK TYPE N/A S/N: N/A
NOMINAL ANGLE: 0° ACTUAL ANGLE: 0 °

INSTRUMENT

MANUFACTURER: KRAUTKRAMER DUE DATE: 8-5-15
MODEL NO.: USN 60 S/N: E36308

DAC



DISPLAY WIDTH 5.00 inches

REFLECTOR			REFERENCE SENSITIVITY	MEMORY NUMBER
SCAN DIRECT.	NTC	SDH		
AXIAL	N/A	X	23.2 dB	0 2-25MHZ
CIRC.	N/A	N/A	N/A dB	N/A

RANGE: 5.00 inches
PROBE DELAY: .7847 msec
VELOCITY: .2322 msec
DISP DELAY: 0.000
ENERGY: HIGH
*DAMPING: 1K ohms
*PRR/PRF: AUTO HIGH
*ANGLE: OFF deg
ZERO: N/A msec
VOLTAGE: N/A

* FREQ: 2.25 MHz
* RECTIFY: FULLWAVE
DUAL: ☐ ON ☒ OFF
* REJECT: 0 %
* DISP. START: IP
DET: ☒ Peak ☐ Flank
TCG: ☐ ON ☒ OFF
* PULSER: SPIKE
PULSE WIDTH: N/A

REF. REFLECTOR: ROMPAS BW GAIN: 18.8 dB
AMPLITUDE: 80 % METAL PATH: 1.00

CALIBRATION TIMES

INITIAL TIME: 1222 FINAL TIME: 1501

VERIFICATION TIMES 1) 1319 2) N/A 3) N/A 4) N/A 5) N/A 6) N/A 7) N/A 8) N/A 9) N/A

***PDI QUALIFIED INSTRUMENT SETTINGS:**
VERIFY INSTRUMENT SETTINGS AND CALIBRATION SEQUENCE ARE IN ACCORDANCE WITH TABLE 2 OF THE APPLICABLE PDI QUALIFICATION IMPLEMENTATION PROCEDURE!

LINEARITY CHECK

VERTICAL											
	SIGNAL 1		100	90	80	70	60	50	40	30	20
	SIGNAL 2		50	45	40	35	30	25	20	15	10
ATTENUATOR	GAIN	SET	-6 dB		-12dB		SET		+12	SET	+6
	AMP	80%	32 TO 48		16 TO 24		20%		64 TO 96	40%	64 TO 96
			40		20				80		80

COMMENTS	WELD / ITEMS EXAMINED
	SG-4B-5-2

EXAMINER: Andrew Kelleher LVL.: II 1-22-15
EXAMINER: Jose Alejandro LVL.: II
REVIEWER: MATT WELCH LVL.: III DATE: 2/20/15

ANII: Joe C. Hair
DATE: 06/06/2015
PAGE 2 OF 11

ACCESS FORMS DATABASE 06-14-11

BM 8/28/15

TENNESSEE VALLEY AUTHORITY	DIGITAL ULTRASONIC CALIBRATION DATA SHEET	REPORT NUMBER R.PJ431

PROJECT *WBN* UNIT/CYCLE *2/ 00*
PROCEDURE: *N-UT-19* REV: 18 TC: N/A

TRANSDUCER

MANUFAC HARISONIC MODEL: A2
ELEMENTS: 1 SHAPE: RECTANGLE
S/N T7432 SIZE: .5 x 1.0 FREQ: 2.25 MHz
CONTOUR: N/A FOCUS: N/A
CABLE TYPE RG 174 LENGTH: 6' # CNT: 0
CONFIG ☐ D-SBS ☐ D-TANDEM ☒ SINGLE
MODE: ☒ SHEAR ☐ LONG ☐ RL

CALIBRATION DATE: 1-21-15
CALIBRATION BLOCK NO. SQ 57 TEMP: 72 °F
SIMULATOR BLOCK: 790916
THERMOMETER S/N: E39055 DUE DATE: 6-23-15
COUPLANT: ULTRAGEL II BATCH: 14H010

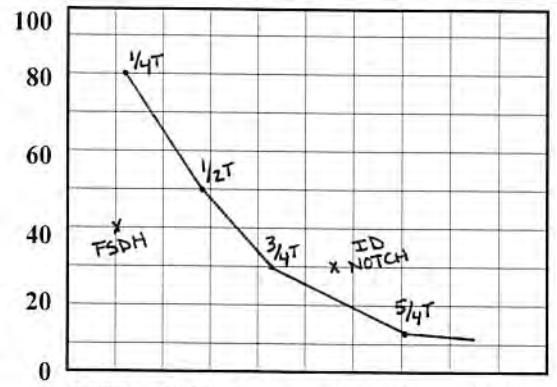
ANGLE VERIFICATION

BLOCK TYPE ROMPAS S/N: 790916
NOMINAL ANGLE: 45° ACTUAL ANGLE: 45 °

INSTRUMENT

MANUFACTURER: KRAUTKRAMER DUE DATE: 8-5-15
MODEL NO.: USN 60 S/N: E36308

DAC



DISPLAY WIDTH 10.00 inches

REFLECTOR SCAN DIRECT.	NTC	SDH	REFERENCE SENSITIVITY	MEMORY NUMBER
AXIAL	N/A	X	36.1 dB	45 4IN SG
CIRC.	N/A	X	36.1 dB	45 4IN SG

RANGE: 10.00 inches
PROBE DELAY: 12.0162 msec
VELOCITY: .1266 msec
DISP DELAY: 0.000
ENERGY: HIGH
*DAMPING: 1K ohms
*PRR/PRF: AUTO HIGH
*ANGLE: 45 deg
ZERO: N/A msec
VOLTAGE: N/A

* FREQ: 2.25 MHz
* RECTIFY: FULLWAVE
DUAL: ☐ ON ☒ OFF
* REJECT: 0 %
* DISP. START: IP
DET: ☒ Peak ☐ Flank
TCG: ☐ ON ☒ OFF
* PULSER: SPIKE
PULSE WIDTH: N/A

REF. REFLECTOR: ROMPAS FSDH GAIN: 36.1 dB
AMPLITUDE: 40 % METAL PATH: 1.070

CALIBRATION TIMES

INITIAL TIME: 1234 FINAL TIME: 1509

VERIFICATION TIMES 1) 1321 2) N/A 3) N/A 4) N/A 5) N/A 6) N/A 7) N/A 8) N/A 9) N/A

***PDI QUALIFIED INSTRUMENT SETTINGS:**
VERIFY INSTRUMENT SETTINGS AND CALIBRATION SEQUENCE ARE IN ACCORDANCE WITH TABLE 2 OF THE APPLICABLE PDI QUALIFICATION IMPLEMENTATION PROCEDURE!

LINEARITY CHECK

VERTICAL	SIGNAL 1		100	90	80	70	60	50	40	30	20
	SIGNAL 2		50	45	40	35	30	25	20	15	10
ATTENUATOR	GAIN	SET	-6 dB		-12dB		SET	+12		SET	+6
	AMP	80%	32 TO 48		16 TO 24		20%	64 TO 96		40%	64 TO 96
			40		20			80			80

COMMENTS	WELD / ITEMS EXAMINED
	SG-4B-5-2

EXAMINER: Andrew Kelleher ANDREW Kelleher LVL.: II 1-22-15
EXAMINER: Jose Alejandro Jose Alejandro LVL.: II
REVIEWER: MATT WELCH LVL.: III DATE: 2/20/15

ANII: JOE C. HAIR Joe C. Hair
DATE: 06/06/2015
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ACCESS: FORMS DATABASE 06-14-11

BM 8/28/15

TENNESSEE VALLEY AUTHORITY	DIGITAL ULTRASONIC CALIBRATION DATA SHEET	REPORT NUMBER R P243/

PROJECT *WBN* UNIT/CYCLE *2/ 00*
PROCEDURE: *N-UT-19* REV: 18 TC: N/A

TRANSDUCER

MANUFAC AEROTECH MODEL: GAMMA
ELEMENTS: 1 SHAPE: RECTANGLE
S/N J15205 SIZE: .5 x 1.0 FREQ: 2.25 MHz
CONTOUR: N/A FOCUS: N/A
CABLE TYPE RG 174 LENGTH: 12' # CNT: 0
CONFIG ☐ D-SBS ☐ D-TANDEM ☒ SINGLE
MODE: ☒ SHEAR ☐ LONG ☐ RL

CALIBRATION DATE: 1-21-15
CALIBRATION BLOCK NO. SQ 57 TEMP: 72 °F
SIMULATOR BLOCK: 790916
THERMOMETER S/N: E39055 DUE DATE: 6-23-15
COUPLANT: ULTRAGEL II BATCH: 14H010

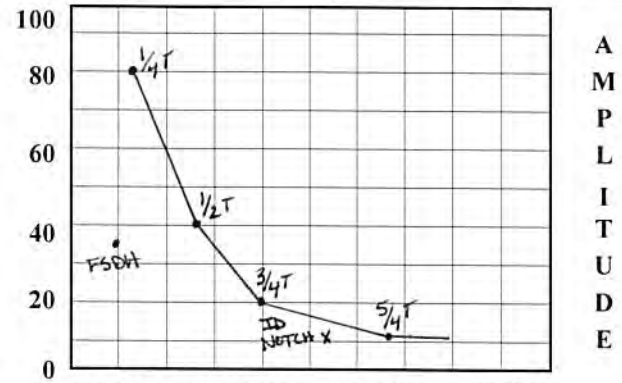
ANGLE VERIFICATION

BLOCK TYPE ROMPAS S/N: 790916
NOMINAL ANGLE: 60° ACTUAL ANGLE: 60 °

INSTRUMENT

MANUFACTURER: KRAUTKRAMER DUE DATE: 8-5-15
MODEL NO.: USN 60 S/N: E36308

DAC



DISPLAY WIDTH 15.00 inches

REFLECTOR			REFERENCE SENSITIVITY	MEMORY NUMBER
SCAN DIRECT.	NTC	SDH		
AXIAL	N/A	X	50.8 dB	60 4IN SG
CIRC.	N/A	X	50.8 dB	60 4IN SG

RANGE: 15.00 inches
PROBE DELAY: 16.7591 msec
VELOCITY: .1274 msec
DISP DELAY: 0.000
ENERGY: HIGH
*DAMPING: 1K ohms
*PRR/PRF: AUTO HIGH
*ANGLE: 60 deg
ZERO: N/A msec
VOLTAGE: N/A

* FREQ: 2.25 MHz
* RECTIFY: FULLWAVE
DUAL: ☐ ON ☒ OFF
* REJECT: 0 %
* DISP. START: IP
DET: ☒ Peak ☐ Flank
TCG: ☐ ON ☒ OFF
* PULSER: SPIKE
PULSE WIDTH: N/A

REF. REFLECTOR: ROMPAS FSDH GAIN: 50.8 dB
AMPLITUDE: 35 % METAL PATH: 1.459

CALIBRATION TIMES

INITIAL TIME: 1229 FINAL TIME: 1507

VERIFICATION TIMES 1) 1320 2) N/A 3) N/A 4) N/A 5) N/A 6) N/A 7) N/A 8) N/A 9) N/A

***PDI QUALIFIED INSTRUMENT SETTINGS:**
VERIFY INSTRUMENT SETTINGS AND CALIBRATION SEQUENCE ARE IN ACCORDANCE WITH TABLE 2 OF THE APPLICABLE PDI QUALIFICATION IMPLEMENTATION PROCEDURE!

LINEARITY CHECK

VERTICAL											
	SIGNAL 1		100	90	80	70	60	50	40	30	20
	SIGNAL 2		50	45	40	35	30	25	20	15	10
ATTENUATOR	GAIN	SET	-6 dB		-12dB		SET		+12	SET	+6
	AMP	80%	32 TO 48		16 TO 24		20%		64 TO 96	40%	64 TO 96
			40		20				80		80

COMMENTS	WELD / ITEMS EXAMINED
	SG-4B-5-2

EXAMINER: Andrew Kelleher LVL.: II 1-22-15
EXAMINER: Jose Alejandro LVL.: II
REVIEWER: MATT WELCH LVL.: III DATE: 2/20/15

ANII: JOE C. HAIR Joe C. Hair
DATE: 06/06/2015
PAGE 4 OF ~~6~~ 11

ACCESS: FORMS DATABASE 06-14-11

BH 8/28/15

TENNESSEE VALLEY AUTHORITY	MANUAL ULTRASONIC VESSEL EXAMINATION DATA SHEET	REPORT NO. R-P2431

PROJECT: WBN UNIT: 2
SYSTEM: STEAM GENERATOR
WELD I.D.: SG-4B-5-2
CONFIG: LOWER SHELL TO: CONE
PROCEDURE: N-UT- 19 REV. 18 TC: N/A

Wo REFERENCE: ℄ OF WELD
Lo REFERENCE: IN LINE AUX. FEED WATER NOZZLE
SURFACE TEMP: 90° F
PYRO. SERIAL NO. E39055

EXAMINATION DATE: 1-21-15
START TIME: 1321 END TIME: 1450

CAL. SHT. NO.	ANGLE	SCAN SENSITIVITY
N/A	0°	40.3 dB
	45°	61.1 dB
	60°	81.1 dB

RESULTS: (SCAN NUMBER)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
INDICATION RECORDED (Y/N)		N																	

IND NO	MAX AMP	SCAN NO	ANG	100% (1/2 MAX)			50%			20%			MAX			20%			50%			100% (1/2 MAX)		
				Mp1	W1	L1	Mp1	W1	L1	Mp1	W1	L1	Mp	W	L	Mp2	W2	L2	Mp2	W2	L2	Mp2	W2	L2
			0°			NO	RECORDABLE INDICATIONS																	
		2	45°			NO	RECORDABLE INDICATIONS																	
		2	60°			NO	RECORDABLE INDICATIONS																	

REMARKS/LIMITATIONS: PERFORMED BASELINE LAMINATION AND WELD SCANS. SCAN LIMITATIONS DUE TO PROXIMITY OF RING GIRDER. NO SCANS 1, 3, OR 4. (SEE ATTACHED SKETCH)

EXAMINER: Andrew Kelleher LEVEL: II 1-22-15
EXAMINER: Jose Alejandro LEVEL: II

MATT WELCH
REVIEWED BY: Matt Welch
LEVEL: III DATE: 2/20/15

ANII Joe C. Hairo
PAGE 5 OF 6

TVA 19670B (NP 7/92)

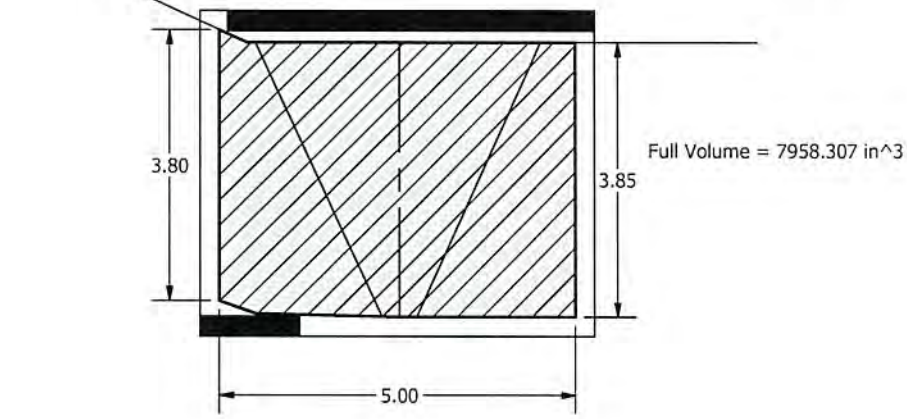
BM 8/23/15

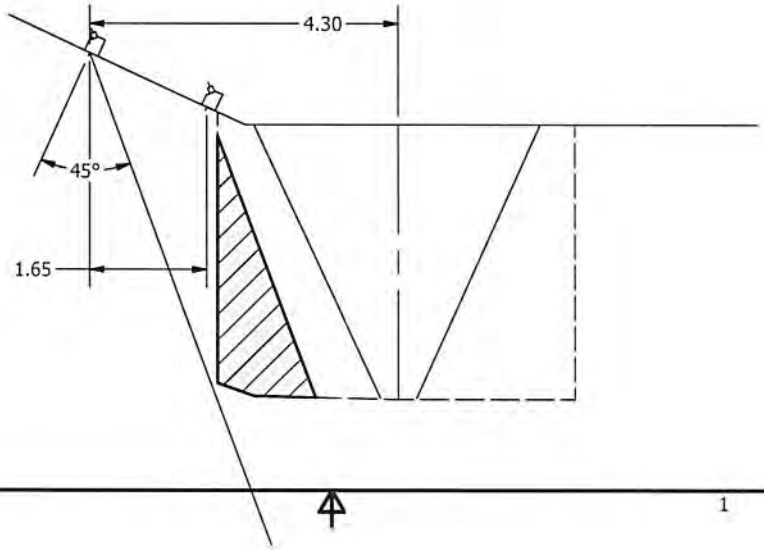
Full Volume=	7958.3	in^3
	Coverage	
Scan1	2090.10	in^3
Scan2	0.00	in^3
Scan3	0.00	in^3
Scan4	0.00	in^3
	522.53	Avg of all scans
	6.57	Percent Coverage

R-P2431
SG-413-5-2
pg. 7 of 11

R-P2431
SG-4B-5-2
pg. 8 of 11

TVA	PROFILE SHEET			Report No.	
Project: WBN	Unit:	Cycle:	System:	Weld No.:	FullVol
	Crown Height:	Crown Width:	Diameter:	Weld Length:	





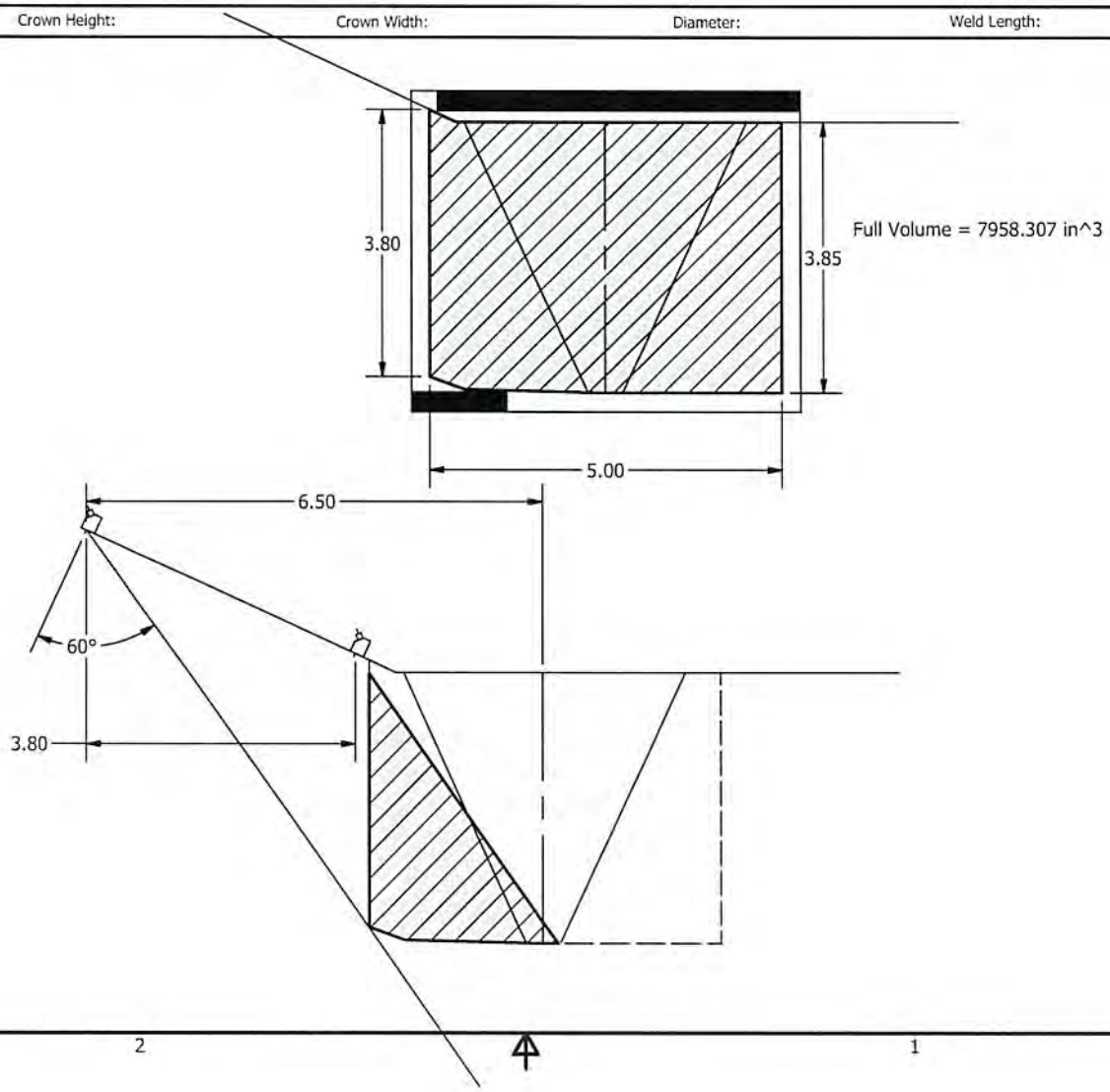
R-P2431
SG-4B-5-2
pg. 9 of 11

TVA	PROFILE SHEET			Report No.	
Project: WBN	Unit:	Cycle:	System:	Weld No.:	FullVol
	Crown Height:	Crown Width:	Diameter:	Weld Length:	

PARTS LIST	
Name	VOLUME
Exam Volume	7958.31 in^3
Scan1 Volume Ang45	990.17 in^3
Scan2 Volume	.00 in^3
Scan3 cw	.00 in^3
Scan4 ccw	.00 in^3

R-P2431
SG-4B-5-2
pg. 10 of 11

TVA	PROFILE SHEET			Report No.	
Project: WBN	Unit:	Cycle:	System:	Weld No.:	FullVol
	Crown Height:	Crown Width:	Diameter:	Weld Length:	



R-P2431
SG-4B-5.2
PG. 11 OF 11

TVA | PROFILE SHEET | Report No.

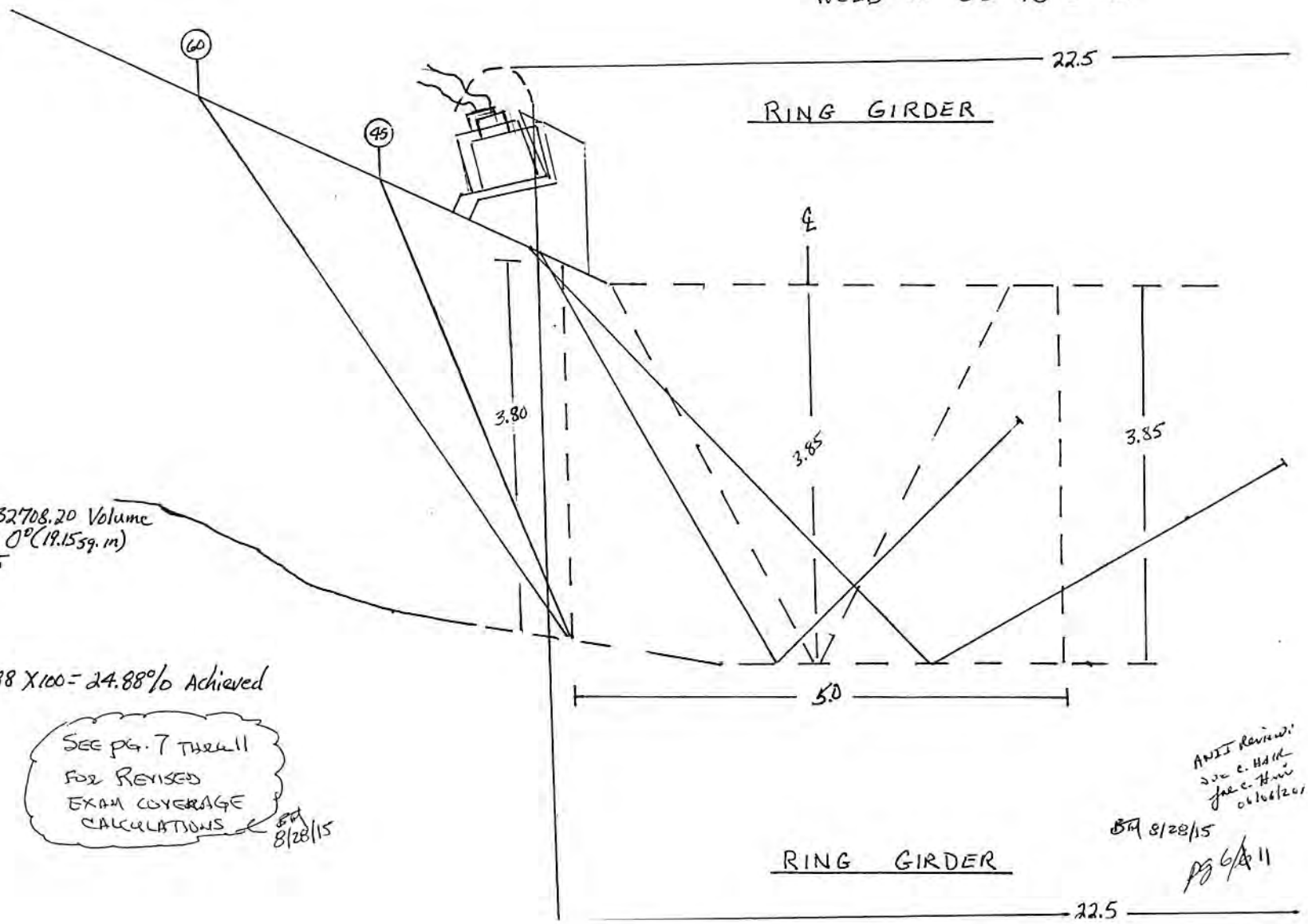
Project: WBN | Unit: | Cycle: | System: | Weld No.: FullVol

Crown Height: | Crown Width: | Diameter: | Weld Length:

PARTS LIST	
Name	VOLUME
Exam Volume	7958.31 in^3
Scan1 Volume Ang60	2090.12 in^3
Scan2 Volume	.00 in^3
Scan3 cw	.00 in^3
Scan4 ccw	.00 in^3

R. P343

WBN Unit 2
STEAM GENERATOR # 2
WELD # SG-4B-5-2



WX HX L
5.0 X 3.83 X 427 = 8177.05 X4 = 32708.20 Volume
45° (11.07 sq. in) 60° (6.9975 sq. in) 0° (19.15 sq. in)
8177.05 − 37.2175 = 8139.8325
Scan 1 = 8139.8325
Scan 2 = 0
Scan 3 = 0
Scan 4 = 0
8139.8325 ÷ 32708.20 = .2488 X100 = 24.88% Achieved

SEE pg. 7 THRU 11 FOR REVISED EXAM COVERAGE CALCULATIONS BM 8/28/15

ANII Review: Joe C. Hall 06/06/2001

BM 8/28/15

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