Attachment 1

Inovision Qualification Report 950.366

INOVISION
Radiation Measurements, LLC

May 15, 2001

Rochester Gas and Electric Corporation
89 East Avenue
Rochester, NY 14649-0001

Reference: Purchase Order 4500008671

This is to certify the Qualification Test Report and Data is true and accurate to the best of my knowledge. In addition, it is further certified that the qualification requirements of the above referenced Purchase Order have been fulfilled. The Qualification Test Report, Data and Appendices are intended to substantiate these statements.

David P. Warner
Reliability Engineer

Zisimos Giatis
Manager, Quality Assurance

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1.0 Objectives

1.1 This report shall demonstrate that the Model 955A GM Area Monitor System is capable of operation prior to, during and after a Design Basis Event. This object will be accomplished using previously performed qualifications type tests on identical and equivalent equipment specimens.

1.2 This report shall demonstrate that the Model 955A GM Area Monitor System meets the contract specified environmental requirements. For the 956A-201 , previous qualification type tests will be used. In the case of the 897A-210 detector, temperature and humidity requirements exceed levels tested in prior qualification reports for this device. To meet these requirements, type testing will be performed on two of the three detectors to be supplied under the contract.

1.3 This report shall demonstrate that the Model 955A GM Area Monitor System meets the contract specified Electromagnetic Compliance in accordance with EPRI TR-102323-R1. This will be accomplished by type testing actual and equivalent equipment specimens.

1.4 To demonstrate that the combined 955A radiation rate dependency and energy dependency are within ± 20% of actual dose over the nominal rate range of the detector (0.01 – 1000 mR/h) from 80 keV to 1.5. Determination of low energy response shall be provided using X-ray techniques while upper energy response shall be determined using Cs-137 and Co-60. All X-ray and solid source techniques shall be NIST traceable.

1.5 To demonstrate stability of the detectors , ascending and descending plateaus shall be performed on all detectors to be supplied. In addition, repeated fixed voltage count rate tests shall be performed on all detectors.

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1.0 Customer Requirements

1.1 Seismic

The following six pages contain the Operating Basis Event and Safe Shut-Down Event seismic response spectra for elevation 289' of the Ginna Nuclear Power Station Control Building.

1.2 AC Power Supply

120 VAC ± 10%

1.3 Environmental

1.3.1 Control Room

104° F maximum, 0 PSIG, 60% RH , negligible background radiation.

1.3.2 Intake Duct

-10° F to 122° F, 0 PSIG , 0 – 100% RH

1.4 Electromagnetic Interference

EPRI TR-102323-R1 : Guidelines for Electromagnetic Interference Testing in Power Plants

1.5 Radiation Monitor Range

Gamma Radiation from 1.0E-2 mR/h to 1E3 mR/h over an energy range of 80 keV to 1500 keV

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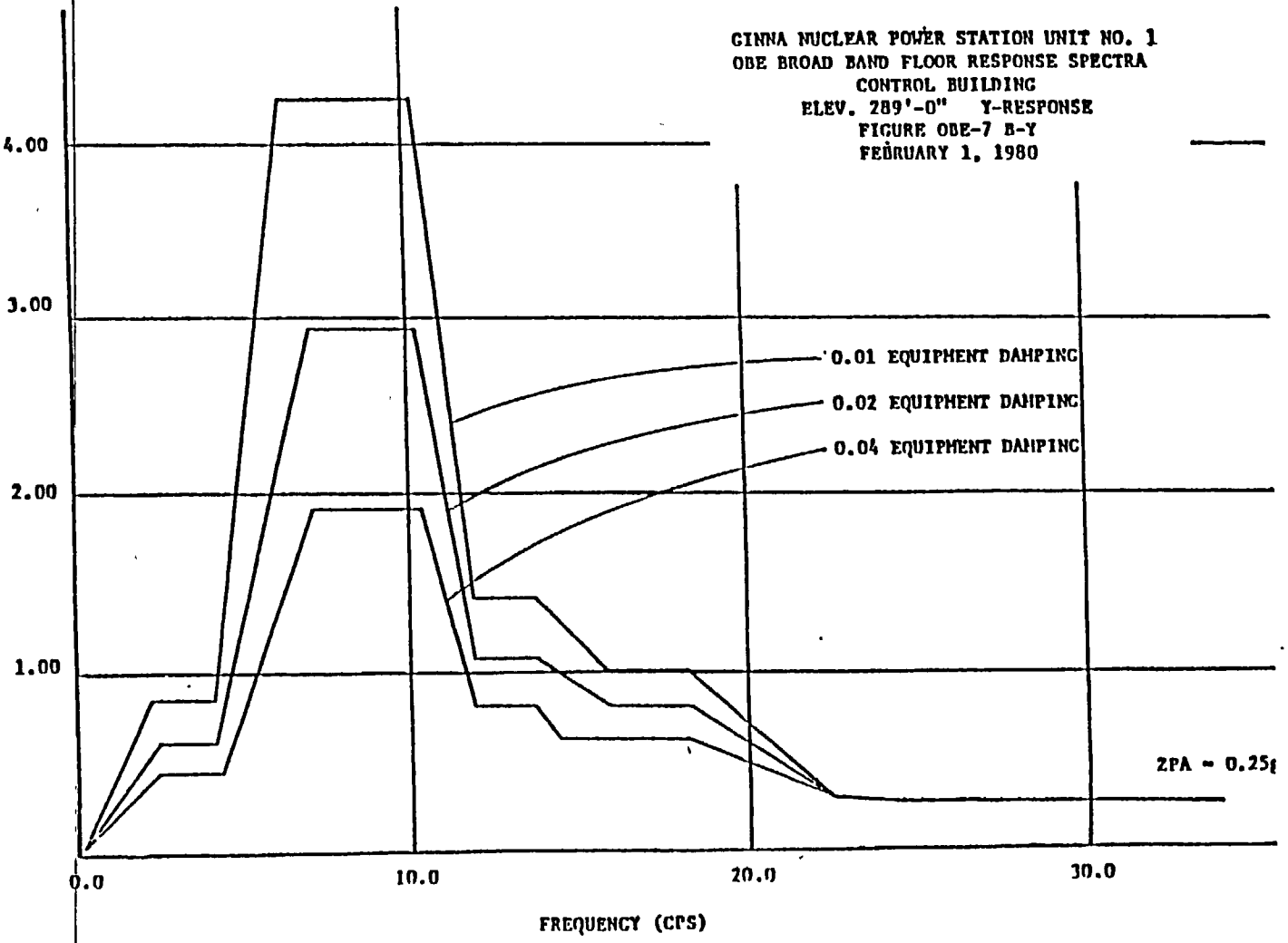
GINNA NUCLEAR POWER STATION UNIT NO. 1
OBE BROAD BAND FLOOR RESPONSE SPECTRA
CONTROL BUILDING
ELEV. 289'-0" Y-RESPONSE
FIGURE OBE-7 B-Y
FEBRUARY 1, 1980
4.00
3.00
2.00
1.00
ACCELERATION (G's)
0.01 EQUIPMENT DAMPING
0.02 EQUIPMENT DAMPING
0.04 EQUIPMENT DAMPING
ZPA = 0.25g
0.0
10.0
20.0
30.0
FREQUENCY (CPS)

Figure 2

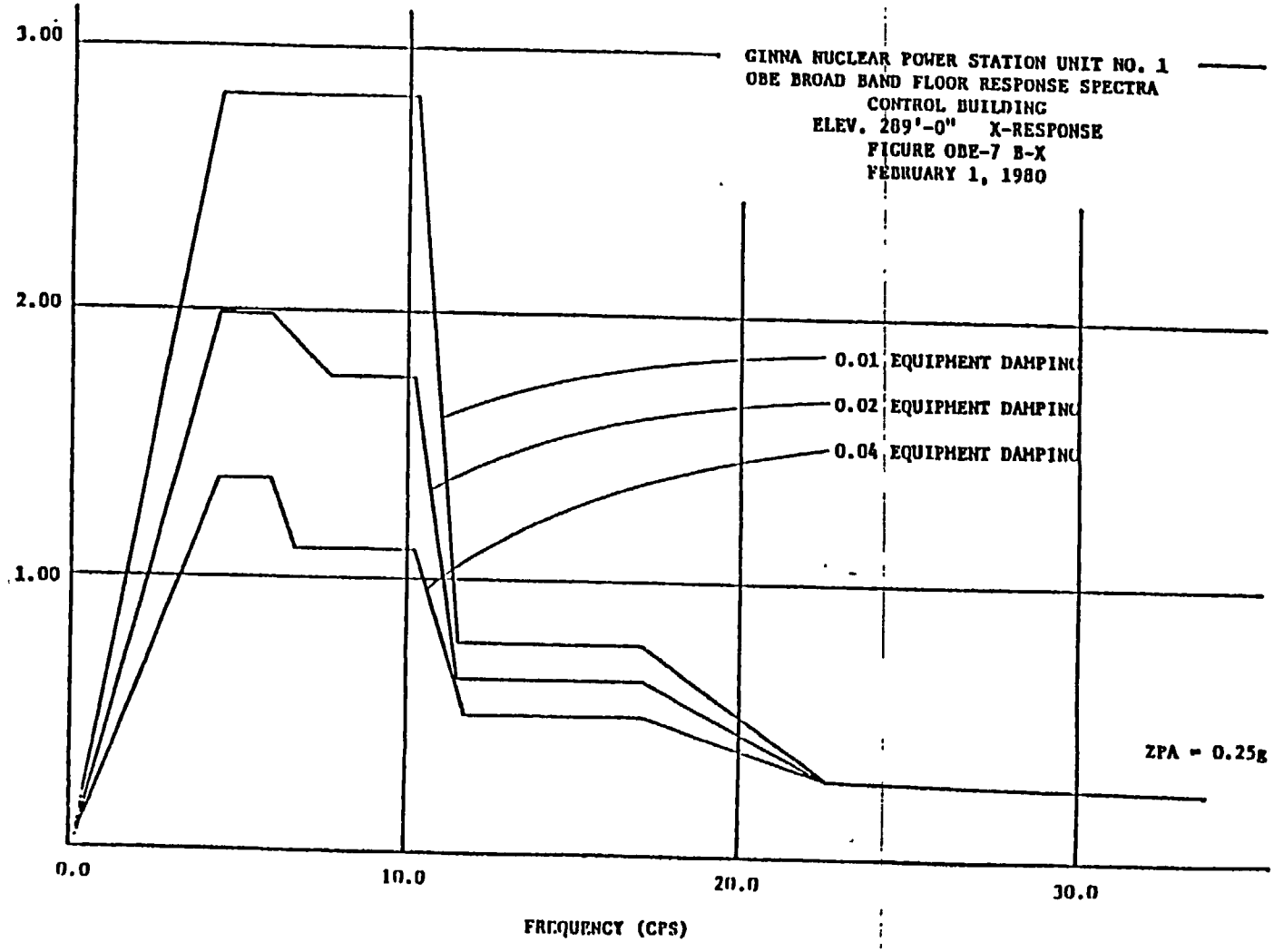
GINNA NUCLEAR POWER STATION UNIT NO. 1
OBE BROAD BAND FLOOR RESPONSE SPECTRA
CONTROL BUILDING
ELEV. 289'-0" X-RESPONSE
FIGURE OBE-7 B-X
FEBRUARY 1, 1980
3.00
2.00
1.00
0.0
10.0
20.0
30.0
ACCELERATION (G's)
FREQUENCY (CPS)
0.01 EQUIPMENT DAMPING
0.02 EQUIPMENT DAMPING
0.04 EQUIPMENT DAMPING
ZPA = 0.25g

Figure 1

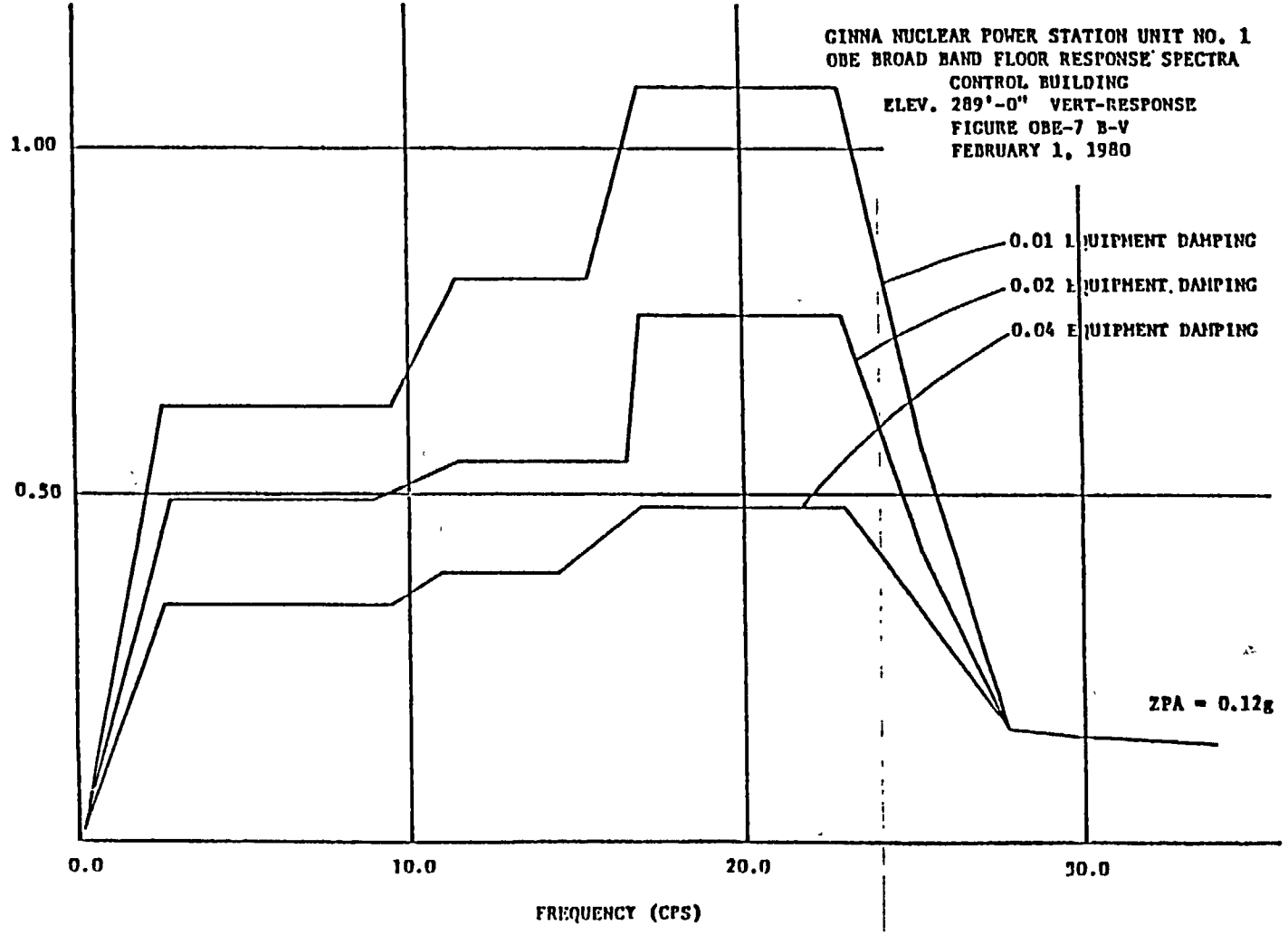
GINNA NUCLEAR POWER STATION UNIT NO. 1
OBE BROAD BAND FLOOR RESPONSE SPECTRA
CONTROL BUILDING
ELEV. 289'-0" VERT-RESPONSE
FIGURE OBE-7 B-V
FEBRUARY 1, 1980
0.01 EQUIPMENT DAMPING
0.02 EQUIPMENT DAMPING
0.04 EQUIPMENT DAMPING
ZPA = 0.12g
1.00
0.50
ACCELERATION (G's)
0.0
10.0
20.0
30.0
FREQUENCY (CPS)

Figure 3

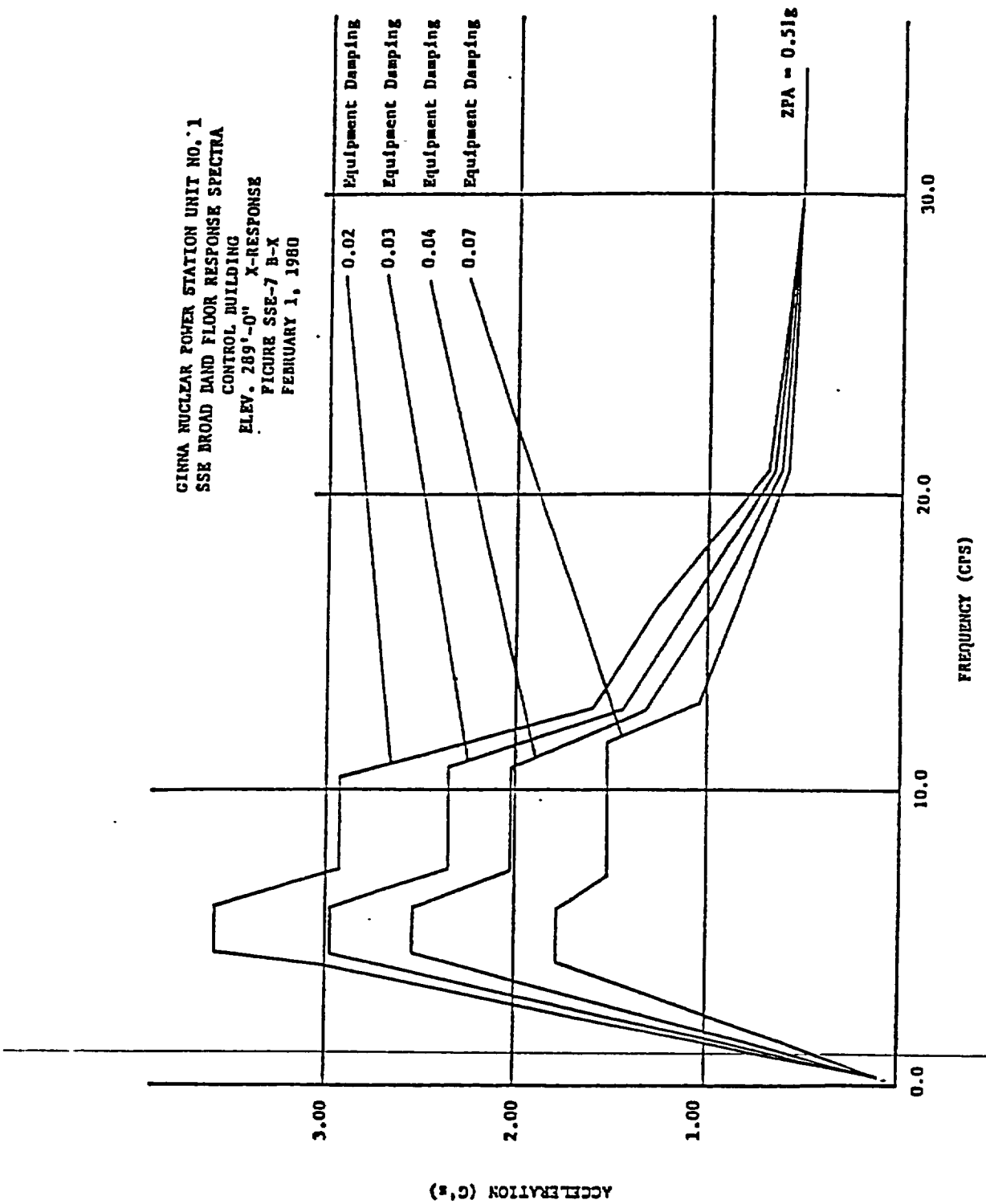
GINNA NUCLEAR POWER STATION UNIT NO. 1
SSE BROAD BAND FLOOR RESPONSE SPECTRA
CONTROL BUILDING
ELEV. 289'-0" X-RESPONSE
FIGURE SSE-7 B-X
FEBRUARY 1, 1980
Equipment Damping
0.02
Equipment Damping
0.03
Equipment Damping
0.04
Equipment Damping
0.07
ZPA = 0.51g
ACCELERATION (G's)
3.00
2.00
1.00
0.0
10.0
20.0
30.0
FREQUENCY (CPS)

Figure 4

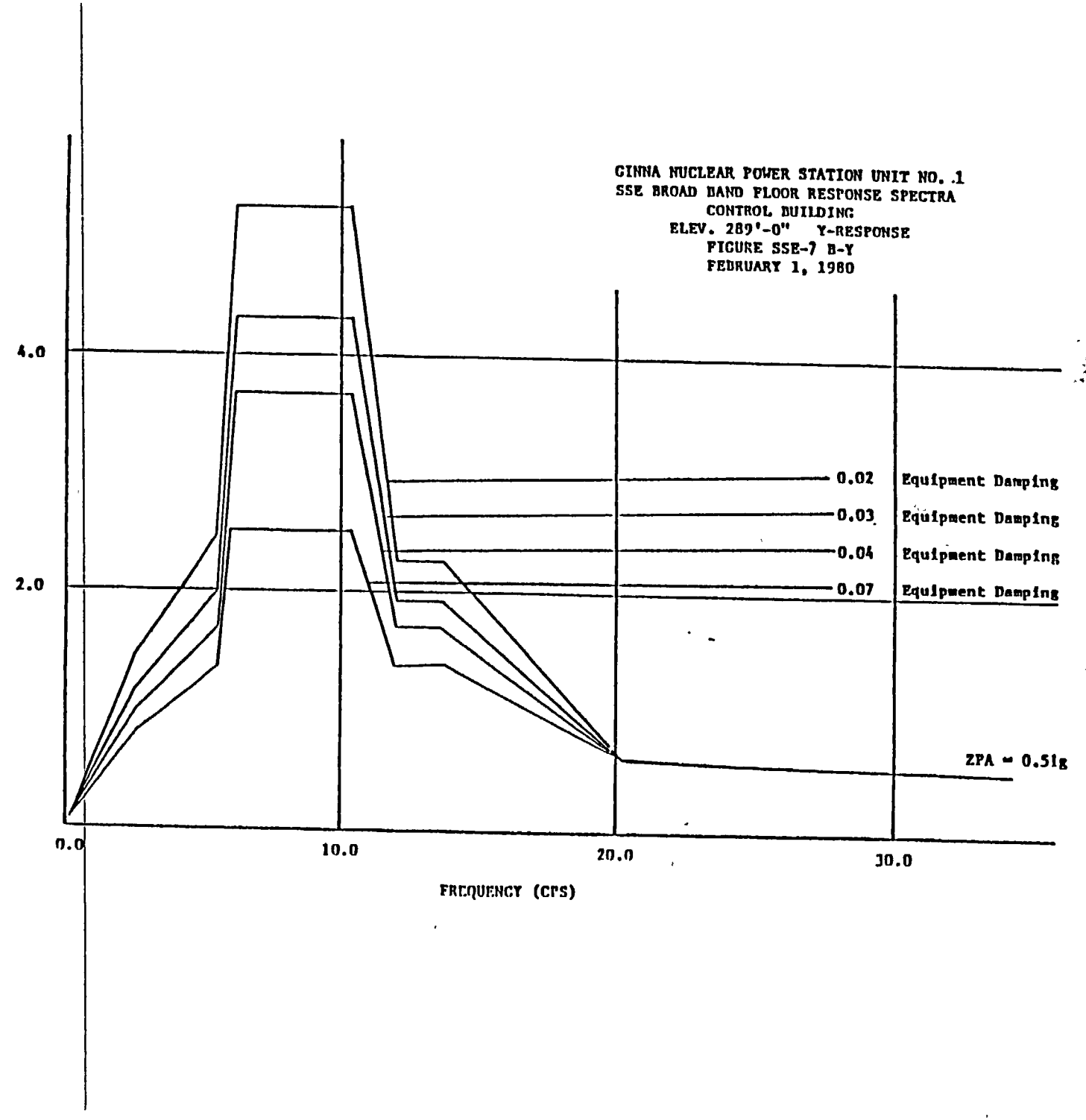
GINNA NUCLEAR POWER STATION UNIT NO. 1
SSE BROAD BAND FLOOR RESPONSE SPECTRA
CONTROL BUILDING
ELEV. 289'-0" Y-RESPONSE
FIGURE SSE-7 B-Y
FEBRUARY 1, 1980
4.0
2.0
ACCELERATION (G's)
0.02 Equipment Damping
0.03 Equipment Damping
0.04 Equipment Damping
0.07 Equipment Damping
ZPA = 0.51g
0.0
10.0
20.0
30.0
FREQUENCY (CPS)

Figure 5

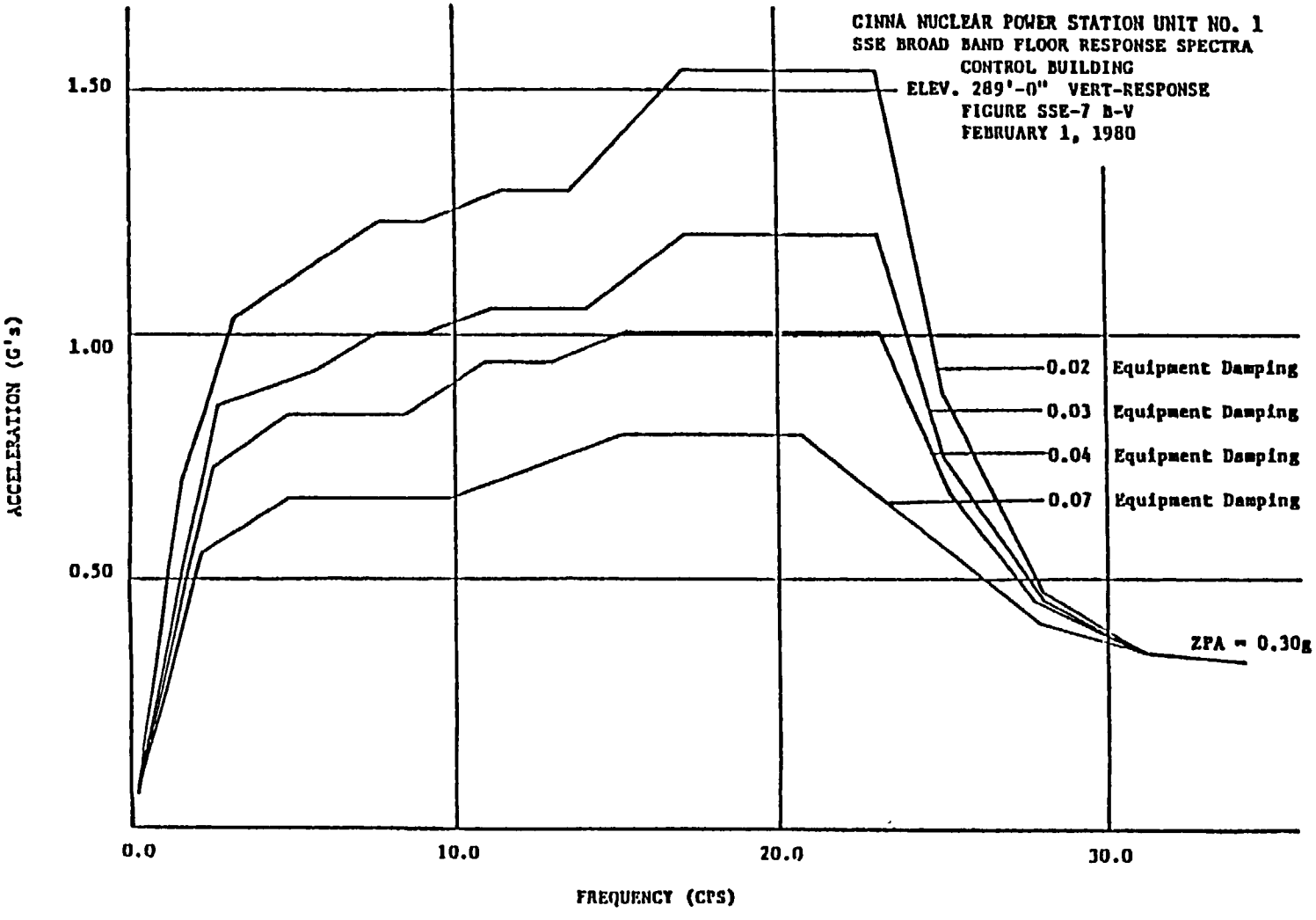
CINNA NUCLEAR POWER STATION UNIT NO. 1
SSE BROAD BAND FLOOR RESPONSE SPECTRA
CONTROL BUILDING
ELEV. 289'-0" VERT-RESPONSE
FIGURE SSE-7 B-V
FEBRUARY 1, 1980
1.50
1.00
0.50
0.02 Equipment Damping
0.03 Equipment Damping
0.04 Equipment Damping
0.07 Equipment Damping
ZPA = 0.30g
ACCELERATION (G's)
0.0
10.0
20.0
30.0
FREQUENCY (CPS)

Figure 6

1.0 Standards

The following Specification and Purchase Order apply to this report :

Rochester Gas & Electric Corporation Specification PCR 99- 004, EE-171 Revision 1 , dated 2/25/00

Rochester Gas & Electric Corporation Purchase Order 4500008671 , Revision 4 , 1/30/01

The preceding Specification and Purchase Order list the following Guidelines and Standards as requirements :

American National Standards Institute

ANSI N45.2.2 , 1972 : "Packing, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants"

ANSI N42.3 , 1969 : "ANSI/IEEE Standard Test Procedure for Geiger-Muller (GM) Counters"

Institute of Electrical and Electronic Engineers

IEEE 344 – 1975 : "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"

Additionally the following Regulatory Guide applies :

United States Nuclear Regulatory Commission

Regulatory Guide 1.100 , Revision 1, August 1977 : "Seismic Qualification of Electric Equipment for Nuclear Power Plants"

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1.0 Identification of Equipment

1.1 Equipment qualified under this report are listed below :

1.1.1 956A-201-M1 Universal Digital Ratemeter – modified

1.1.2 897A-210 Low Range Aluminum Housing GM Detector

1.1.3 948B-1-5 Rack Chassis

1.1.4 S157033A2 Surge Suppressor Assembly

Pages 3 through 10 of this section contain the Bills of Material which provide a detailed description of the equipment listed above.

1.2 The following paragraphs detail differences in equipment to be qualified under this report as compared to type tested specimens listed in referenced qualification type tests.

1.2.1 The 956A-201-M1 differs from the 956A-201 specimen qualified under Seismic Test Report 950.353 in that the K1 auxiliary alarm relay is utilized as an additional contact set in the –M1 version. No mass or assembly changes associated with this modification as this relay is also installed in the standard 956A-201 unit as a non-functional "spare".

The 956A-201-M1 differs from the 956A-200 specimen qualified under Environmental Test Report 950.360 in that the check source drive voltage is 15 VDC rather than 120 VAC as was used in the model 956A-200. The information in paragraph 1.2.1 also applies in that the K1 relay is not active in the 956A-200 unit. There are no weight or assembly differences between the 956A-201 and 956A-200.

1.2.2 The 897A-210 Detector differs from the 897A-220 specimen qualified under Seismic Test Report 950.353 in that it utilizes a low range rather than mid range GM tube. There is no difference mass or design.

1.2.3 The S157033A2 Surge Suppressor Assembly consists of sub-components of the Model 876A-1 High Range Containment Monitor and the 960PD-100-5 Power Distribution Assembly, a sub-assembly of the 960WM-203-5 Wall Mount Enclosure. Seismic Qualification of the Model 876A-1 is detailed in Seismic Test Report 950.352. Qualification of the 960WM-203-5 is detailed in Seismic Test Report 950.338.

Product Structure

Product No: 956A-201-M1 UDR W/AUXILARY HI ALARM OUTPUT
Rev: 001 ECN: 4JR8-96
Drawing Number:

Item No.	Product Number	DrawingNo.	Siz	Description	Quantity		ECN	Rev	Obs	Act
1	956A-201			RATEMETER DIGITAL AREA MONITOR	1.000 EA	PS	2CR7-97	5	N	Y
2	956A-201-M1MS			MODIFICATION SHEET FOR 956A-20	1.000 EA		1590	1	N	Y
3	200-135	200-135	B	NAME TAG	1.000 EA		1392	5	N	Y

*** END OF REPORT ***

Product No: 956A-201-5 ASSEMBLY, DIGITAL RATEMETER
Rev: 002 ECN: 10CR40-95
Drawing Number:

Item No.	Product Number	DrawingNo.	Siz	Description	Quantity			ECN	Rev	Obs	Act
1	956A-100-20			ASSY, FRONT PANEL	1.000	EA	PS	11CR10-89	2	N	Y
2	942A-100-30			ASSY, REAR PANEL	1.000	EA	PS	9CR23-93	2	N	Y
4	956A-201-55			ASSEMBLY, POWER SUPPLY	1.000	EA	PS	3JR4-95	1	N	Y
5	956-200-10			ASSEMBLY, MAIN PC 1E	1.000	EA	PS	8CR8-99	12	N	Y
6	942-200-60		C	ASSEMBLY, HIGH VOLTAGE BOARD	1.000	EA	PS	1379	2	N	Y
7	942A-100-24			TOP RAIL	2.000	EA		1590	1	N	Y
8	942-100-25			RAIL,BOTTOM	2.000	EA		1590	5	N	Y
9	5-532			SCREW, MACH, PH, 4-40 X .38,	4.000	EA		1590		N	Y
10	5-706			NUT, HEX, 4-40, NY, BO	1.000	EA		1590		N	Y
11	5-186			SCREW, MACH, PH, 4-40 X .31,	8.000	EA		1590		N	Y
12	5-836			WASHER, SPLIT, 4, SS	8.000	EA		1590		N	Y
13	200-135	200-135	B	NAME TAG	1.000	EA		1392	5	N	Y
14	5-710			WASHER, FLAT, 4, NY, BO	1.000	EA		1590		N	Y
16	92-9124-A			COUPLER, FEMALE	1.000	EA		1590	3	N	Y
18	50-89	50-89	B	COAXIAL CABLE	1.000	FT	PS	1709	4	N	Y
		Loc: 5" LONG									
19	30-91-1			PIN, COAX	1.000	EA		1590		N	Y
20	30-91-2			FERRULE	1.000	EA		1590		N	Y
21	67-83-1P			INSERT,CONNECTOR,M,24-20 WIRE	5.000	EA		1590	3	N	Y
22	92-9103-A			CONNECTOR, 4 POSITION, FEMALE	1.000	EA		1590	1	N	Y
25	MSB-0072-35			WIRE, HOOK-UP, 22 AWG, YEL/GRN	.001	FT		1590	5	N	Y
		Loc: 5" LONG									
26	MSB-0069			WIRE, HV, LEAD WIRE, 22, 10K V	.001	FT		1200		N	Y
		Loc: 3" LONG									
27	36-96-1			TERMINAL, LUG, SOLDER, FEMALE	1.000	EA		1590		N	Y
28	MSH-6222			TUBING, 3/16, BLACK	.001	FT		1590	1	N	Y
29	67-78-2	67-78-TAB	C	CONNECTOR, FEMALE (2 PIN)	1.000	EA		1585	7	N	Y
30	942-100-35A			HARNESS,POWER SUPPLY TO PCB	1.000	EA	PS	1590	1	N	Y
31	942-100-35B			HARNESS,MAIN PCB TO RELAY BOAR	1.000	EA	PS	3CR19-90	2	N	Y
32	942A-100-35C			HARNESS, MAIN PCB/ANALOG OUT	1.000	EA	PS	9CR5-90	2	N	Y
33	942-100-35D			HARNESS,DETECTOR POWER SUPPLY	1.000	EA	PS	1590	2	N	Y
34	942-100-35E			HARNESS	1.000	EA	PS	10CR10-94	3	N	Y
35	MSB-0072-31			WIRE, HOOK-UP, 22 AWG, YEL/BLK	.001	FT		1590	5	N	Y
		Loc: 5" LONG									
36	MSB-0072-32			WIRE, HOOK-UP, 22 AWG, YEL/BRN	.001	FT		1590	5	N	Y
		Loc: 5" LONG									
37	SM-2202			SLEEVE, SPIRAL-WRAP .06"-.5"OD	.001	FT		1590		N	Y
38	942-100-28			OPTION BOARD SUPPORT MOUNT	1.000	EA		9CR34-98	5	N	Y
39	5-953			SCREW,TYPE 25,#4X.44LG,FH,PHIL	2.000	EA		1590	1	N	Y
40	5-678			SCREW, MACH, RH, 4-40 X .31	1.000	EA		1590		N	Y
41	MSH-6228			TUBING, 1/4, BLACK	.001	FT		1590	1	N	Y
42	MSB-0072-2			WIRE, HOOK-UP, 22 AWG, BLACK	.001	FT		1590	5	N	Y

Product No: 956A-201-5 ASSEMBLY, DIGITAL RATEMETER
Rev: 002 ECN: 10CR40-95
Drawing Number:

Item No.	Product Number	DrawingNo.	Siz	Description	Quantity	ECN	Rev	Obs	Act
43	5-193			SCREW, MACH, FH, 4-40 X .38,	4.000 EA	1590		N	Y

*** END OF REPORT ***

Product No: 897A-210 DETECTOR,AREA MON.,GM,ALUM,LOW
Rev: 003 ECN: 4CR3-96
Drawing Number:

Item No.	Product Number	DrawingNo.	Siz	Description	Quantity			ECN	Rev	Obs	Act
	897A-210-5A			DET. MAIN ASSY,AL.HOUS.LOW RNG	1.000	EA	PS	2CR7-99	3	N	Y
	GEL897A-2X0			DETECTOR, DIMENSIONAL OUTLINE	.001	EA		1590	2	N	Y
	CAL-GM6			897A GM DET. CALIBRATION PROC.	.001	EA		1590	1	N	Y
	92-7005-9A	PER PRINT	D	CLAMP	1.000	EA		1587	8	N	Y
	92-7005-12A	PER PRINT	D	BUSHING	1.000	EA		1587	8	N	Y
	92-7005-17A	PER DWG	D	CONNECTOR, FEMALE	1.000	EA		1587	8	N	Y
	843-6-26			WALL SUPPORT, DETECTOR	1.000	EA		9CR34-98	2	N	Y
	MB95-1008			MAINTENANCE BULLETIN	.001	EA		1590	1	N	Y

*** END OF REPORT ***

Product No: 897A-210-5A DET. MAIN ASSY,AL.HOUS.LOW RNG
Rev: 003 ECN: 2CR7-99
Drawing Number:

Item No.	Product Number	DrawingNo.	Siz	Description	Quantity			ECN	Rev	Obs	Act
	GT3			TRAVELER FOR MECHANICAL ASSYS	1.000	EA		1590	2	N	Y
	TP897A			TEST PROCEDURE	.001	EA		1590	1	N	Y
1	857-210-18	857-210-18		HOUSING PROCESSED	1.000	EA	PS	12CR1-98	2	N	Y
2	857-10-25			COVER PLATE PROCESSED (SA)	1.000	EA	PS	2CR7-99	2	N	Y
3	897A-211-30			CHECK SOURCE MTG. ASSEMBLY	1.000	EA	PS	4CR8-96	2	N	Y
4	897A-210-10	PER DWG	B	ASSEMBLY DETECTOR PC BOARD	1.000	EA	PS	1795	3	N	Y
5	857-210-20	857-210-20	B	TUBE & SHIELD ASSEMBLY LOW	1.000	EA	PS	1629	6	N	Y
6	857-1-18			HOUSING INSULATOR PAD	1.000	EA		1590		N	Y
7	857-10-22			SCREW,SEEL,PH 6-32 SLOT .50 SS	4.000	EA		1590		N	Y
8	MSB-0072-2			WIRE, HOOK-UP, 22 AWG, BLACK	.001	FT		1590	5	N	Y
9	46-77			O-RING, 3.489ID,.07 THK	1.000	EA		1590	3	N	Y
10	200-135	200-135	B	NAME TAG	1.000	EA		1392	5	N	Y
11	92-7005-20A	PER PRINT	D	CONNECTOR, 12 PIN, MALE	1.000	EA		1587	8	N	Y
12	897-110-28			MOUNTING BLOCK	2.000	EA		1590		N	Y
13	36-3			TERM, LUG, SOLDER, LOCK EYELET	1.000	EA		1590		N	Y
14	5-837			WASHER, SPLIT, 6, SS	14.000	EA		1590		N	Y
15	5-288			SCREW, MACH, PH, 6-32 X .62,	6.000	EA		1590		N	Y
16	5-280			SCREW, MACH, PH, 6-32 X .50,	4.000	EA		1590		N	Y
17	5-838			WASHER, FLAT, 6, SS	4.000	EA		1590		N	Y
18	5-853			NUT, HEX, 6-32, SS	4.000	EA		1590		N	Y
19	5-1011			SCREW, SEEL, PH, 4-40 X .31	2.000	EA		1590		N	Y
21	MSA-0007			SOLDER, CORE, 60/40, .031 DIA	.001	LB		1303	2	N	Y
22	897A-210-13	PER PRINT	D	SCHEMATIC DIAGRAM, DETECTOR	.001	EA		1712	2	N	Y
23	857-10-7			GASKET, 2.0 SQ X .031 THK	1.000	EA		1590	2	N	Y
24	MSJ-4372			CEMENT, CONTACT, FASTBOND 10	.001	EA		1590		N	Y
27	MSH-6221	NONE	PN	TUBING, 1/8, BLK	.001	FT		1727	2	Y	Y
28	40-164			SPACER, .12, .14ID/.25OD, RND	2.000	EA		1590	1	N	Y
29	MSB-0072-16			WIRE, HOOK-UP, 22 AWG, WHT/GRN	.001	FT		1590	5	N	Y
30	MSB-0072-3			WIRE, HOOK-UP, 22 AWG, RED	.001	FT		1590	5	N	Y
31	MSB-0072-15			WIRE, HOOK-UP, 22 AWG, WHT/RED	.001	FT		1590	5	N	Y
32	MSB-0072-4			WIRE, HOOK-UP, 22 AWG, GREEN	.001	FT		1590	5	N	Y
33	MSB-0069			WIRE, HV, LEAD WIRE, 22, 10K V	.001	FT		1200		N	Y
34	200-122	200-122	A	"WIPE TEST" LABEL	.001	EA		1599	2	N	Y
35	200-53			LABEL,CAUTION	.001	EA		1590		N	Y
36	5-712			WASHER, FLAT, 6, NY, NAT	8.000	EA		1590		N	Y
37	5-852			NUT, HEX, 6-32, SS, SM	2.000	EA		1590		N	Y

*** END OF REPORT ***

14:58:53 300 VICTOREEN, INC. PAGE 1 of 1
TODAY: 5/17/94 COMPONENT BILL OF MATERIAL
PART: 9498-1 DESC: CHASSIS ASSY, UDR, 2 BAY, 3.5" REV: B
ECN: SCR18-94

ITEM NBR.	PART NUMBER	DESCRIPTION	QUANTITY	ECN
0	9485-1-S	ASSEMBLY, 2 BAY CHASSIS LOC:	1.000 EA	BM 6JR1-93
0	109-[illegible]	EXTENDED BACK PANEL SUPPORT LOC:	1.000 EA	SCR18-94

FILE COPY

DWN/DATE	CHK DATE	ENG. DATE	APP. DATE	QA DATE
5-23-94	N/A	5-2-94	N/A	5/24/94

14:35:08 300
TODAY: 11/17/92
PART: 948B-1-5

VICTOREEN. INC.
COMPONENT BILL OF MATERIAL
DESC: ASSEMBLY. 2 BAY CHASSIS

PAGE 1 of 1

REV: A
ECN: 11JR2-92

ITEM NBR.	PART NUMBER	DESCRIPTION	QUANTITY		ECN
1	948B-1-3	CHASSIS. 2 BAY. AREA MONITOR LOC:	1.000	EA	11JR2-92
2	844-7-7	GUIDE LOC:	4.000	EA	11JR2-92
3	5-189	SCREW. MACH. FH. 4-40 X .31. LOC:	8.000	EA	11JR2-92
4	846-1-33	BRACKET NUT LOC:	4.000	EA	11JR2-92
5	948-1-6	ADJUSTABLE WEDGE LOC:	2.000	EA	11JR2-92
6	5-261	SCREW. MACH. PH. 6-32 X .25. LOC:	2.000	EA	11JR2-92
7	5-837	WASHER. SPLIT. 6. SS LOC:	2.000	EA	11JR2-92
8	948-1-4	RACK CHASSIS REAR MOUNT BRACKE LOC:	2.000	EA	BM 11JR2-92
9	5-361	SCREW. MACH. PH. 8-32 X .38. LOC:	4.000	EA	11JR2-92
10	5-794	WASHER. SPLIT. 8. SS LOC:	4.000	EA	11JR2-92
11	5-825	NUT. HE.. 8-32. SS LOC:	4.000	EA	11JR2-92

DWN/DATE	CHK/DATE	ENG/DATE	APP/DATE	QA/DATE
11/18-92	N/A	11-30-92	N/A	

Product No: S157033A2 FILTER/SURGE SUPPRESSOR ASS'Y
Rev: 001 ECN: 1686
Drawing Number: S157033A2

Item No.	Product Number	DrawingNo.	Siz	Description	Quantity		ECN	Rev	Obs	Act
1	92-9015-A			FILTER POWER LINE	2.000 EA		1590	5	N	Y
2	960SS-200	PER BOM	BM	SURGE SUPPRESSOR	2.000 EA	PS	1744	3	N	Y
3	92-7041-2A	92-7041-2A	B	12 POLE BARRIER STRIP WITH	1.000 EA	PS	1625	3	N	Y
4	92-7044-A			FUSE BLOCK,2 POSITION	2.000 EA		1590	1	N	Y
5	S157033A21	S157033A21	D	CHASSIS, PROCESSED	1.000 EA		1686	1	N	Y
6	MSB-0071-1			WIRE, HOOK-UP, 18 AWG, WHITE	.000 FT		1590	1	N	Y
7	MSB-0071-2			WIRE, HOOK-UP, 18 GA, BLACK	.000 FT		1590	1	N	Y
8	MSB-0071-3			WIRE, HOOK-UP, 18 GA, RED, TFE	.000 FT		1590	1	N	Y
9	36-86			TERM, LUG, CRIMP, 22-16, #6-8	28.000 EA		1590	1	N	Y
10	19-2			FUSE, 2A 250V, 3AG	4.000 EA		1590	1	N	Y
11	57-112			TERMINAL STRIP, 6 POINT	1.000 EA		1590	1	Y	Y
12	S157033A-105	PER PRINT	C	SCHEMATIC, SURGE SUPPRESSOR	1.000 EA		1740	1	N	Y
13	5-277			SCREW, MACH, FH, 6-32 X .44,	4.000 EA		1590		N	Y
14	5-304			SCREW, MACH, PH, 6-32 X 1.00,	4.000 EA		1590		N	Y
15	5-261			SCREW, MACH, PH, 6-32 X .25,	8.000 EA		1590		N	Y
16	5-853			NUT, HEX, 6-32, SS	16.000 EA		1590		N	Y
17	39-48			STANDOFF, M/F, 6-32 X .38, HEX	4.000 EA		1590		N	Y
18	5-766			WASHER, INT, 6, SS	16.000 EA		1590		N	Y
19	14-235	NONE	PN	FERRITE CUBE	2.000 EA		1686	1	N	Y

*** END OF REPORT ***

1.0 Test Results

This section contains the test data required to substantiate that the objectives set forth in Section 2 have been met.

1.1 Seismic Qualification of 955A and S157033A2 Components

Appendix I, Qualification Type Test for Digital RMS Components , Report 950.353 details generic testing performed the 956A-201 Ratemeter, 897A-220 Detector and 948B-1 Rack Chassis. Pages 5 through 7 of this section show Ginna Required Response Spectra for SSE conditions plotted against Tested Response Spectra envelope from Report 950.353.

Appendix II , Seismic Qualification Type Test 950.338 for Containment Atmosphere Monitor ,for the Korea Electric Power Company's Kori 1, Kori 2 and Wolsung 1 Units. Report 950.338 details testing performed on the components of the S157033A2 Surge Suppressor Assembly. This report is applicable for all but the Line Filter (p/n 92-9015-A) sub-component of the S157033A2 assembly. Pages 8 through 10 of this section show Ginna Required Response Spectra for SSE conditions plotted against the Tested Response Spectra envelope from Report 950.338.

Appendix III , Seismic Qualification Type Test for Analog RMS Components, Report 950.352 detail generic testing performed on the Model 876A-1 HRCM Readout Module. This module contains the Line Filter sub-component (92-9015-A) of the S157033A2 assembly. Pages 11 through 13 of this section show Ginna Required Response Spectra for SSE conditions plotted against the Tested Response Spectra envelope from Report 950.352.

1.2 Temperature and Humidity Tests

1.2.1 956A-201-M1 Ratemeter

Appendix IV , Environmental Qualification Report for the Victoreen Digital Ratemeter , Report 950.360 details generic testing performed on 956A-200 series ratemeters. This report substantiates a qualified temperature range of –2.8° F to 125° F at 90% RH (non-condensing). In addition, Report 950.360 substantiates a qualified AC input power range of 90VAC/50Hz to 127VAC/63Hz for the 956A-200 series ratemeter.

1.2.2 897A-210 Detector

The temperature and relative humidity profile that the two specimen detectors were subjected to is shown in Figure 1, page 15 of this section. Both detectors were subjected to three 40-hour cycles of this profile. Detector performance was monitored via the analog output of its associated 956 series ratemeter and logged on a multichannel recorder along with the environmental chamber temperature and humidity. A Cs-137 solid source was placed equidistant between the detectors provided a nominal 2 mR/h rate. Pages 16 through 28 of this section contain the entire strip chart record on the detector temperature and humidity test. No change in count rate (drift) was noted for either of the detectors at any point in the test cycles. These recordings provide substantive evidence that the Model 897A-210 detector meets all contractual environmental requirements.

1.3 Electromagnetic Compliance

EMC testing, in accordance with EPRI Guide TR-102323-R1, was performed by an independent testing laboratory. The test specimen was an operating channel of 955A Area Monitor consisting of 75 feet of terminated 50-100 composite cable, 897A-210 Low Range GM Detector, 956A-201 Digital Ratemeter and the prototype S157033A2 Surge Suppressor. The ratemeter and surge suppressor were installed in a model 948B-1 rack chassis. A second non-operational ratemeter was installed in rack chassis to complete the equipment complement.

Pages 29 through 52 contain F-Squared Laboratories Report No. CLE 033100-01 R1 detailing EMC testing and test results. The equipment, as tested , complied with the requirements of MIL-STD-461D, CS 101, IEC 801-2, IEC 801-3, IEC 801-4, IEC 801-5 and IEC 801-6.

Drawing S157033A-104 defines the 50-100 composite cable shield grounding requirements that must be followed to achieve same level of electromagnetic immunity as tested. This configuration requires that the overall shield be grounded at both the control room and detector location.

1.4 Radiation Rate and Dose Dependency

Energy dependency tests were performed on two of the three 897A-210 detectors to be supplied under the purchase order. Serial numbers 131 and 132 were profiled in both the radial and axial modes using x-ray techniques equivalent to the following energies : 45, 68,100,148 and 180 keV. Solid sources were used for the 662 and 1200 keV. Page 53 through 58 provide the energy response curves as well as the raw data collected for both of the referenced detectors.

Rate dependency for all detectors is provided as part of the standard range calibration procedure CAL-GM1. Pages 59 through 64 contain the factory data sheets as well as raw range data.

1.5 Detector Stability

Ascending and descending plateaus for all contractually supplied detectors are provided. A graphical plot of this data is included for each detector's ascending plateau. Additionally, repeated counts were taken for each detector at a fixed high voltage to demonstrate the stability of the selected operating point. Pages 65 through 70 of this section contain the raw plateau data and the graphical representations of this data. Pages 71 through 74 contain the repetitive count tests performed at a fixed high voltage value of 575 VDC. Testing performed utilized the internal operation check source of the detector as the radiation source for both plateau and repetitive count tests.

The GM tube utilized in the 897A-210 detector (TGM ZP1320) has a manufacturer specified maximum slope of 8% over a 100 volt range from 525 to 625 VDC. The determination of % slope is obtained by the formula below :

$$\frac{(C_2 - C_1)}{(C_2 + C_1)/2} \times \frac{100}{(V_2 - V_1)} \times 100$$

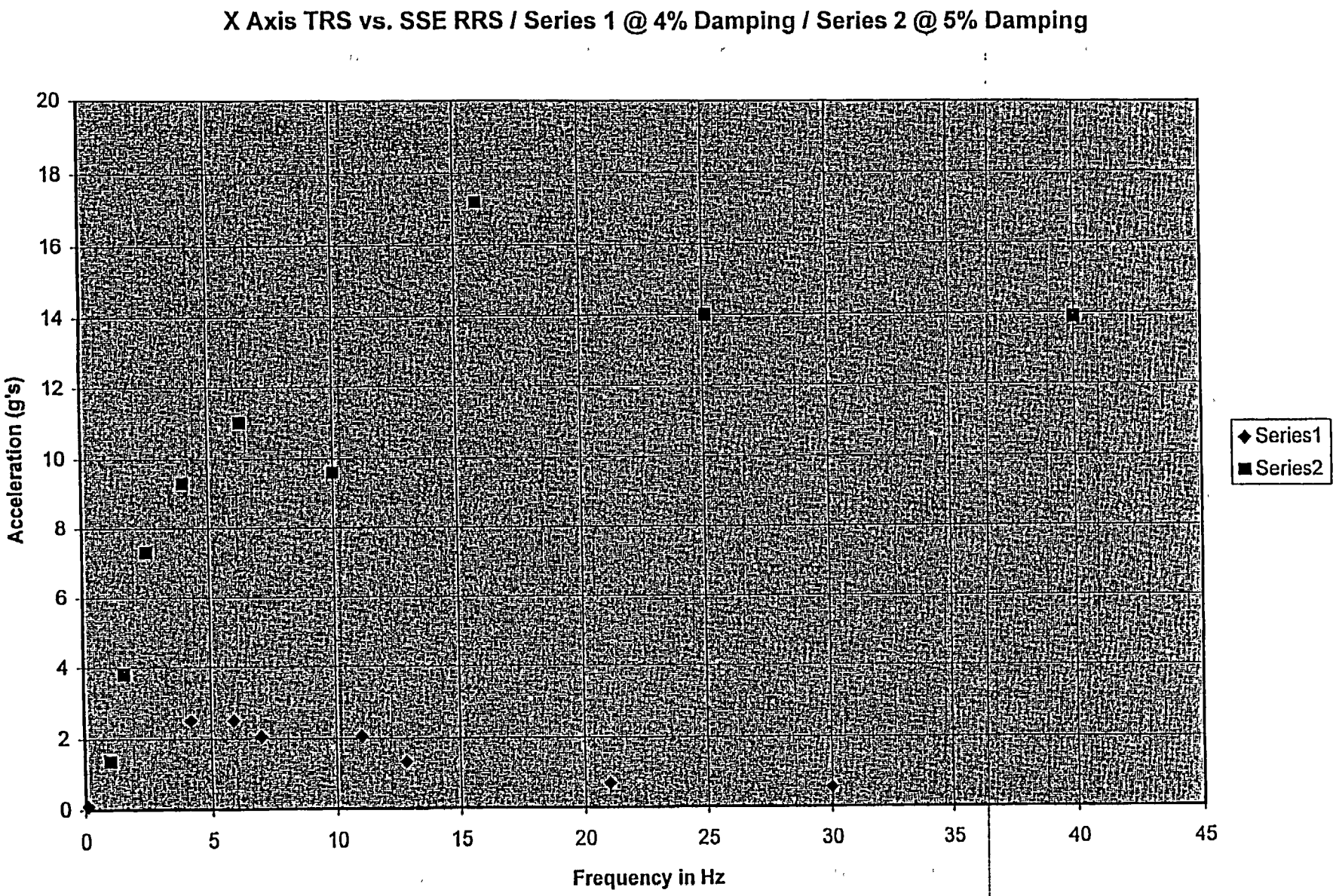
Where : V_1 and V_2 are the plateau end points

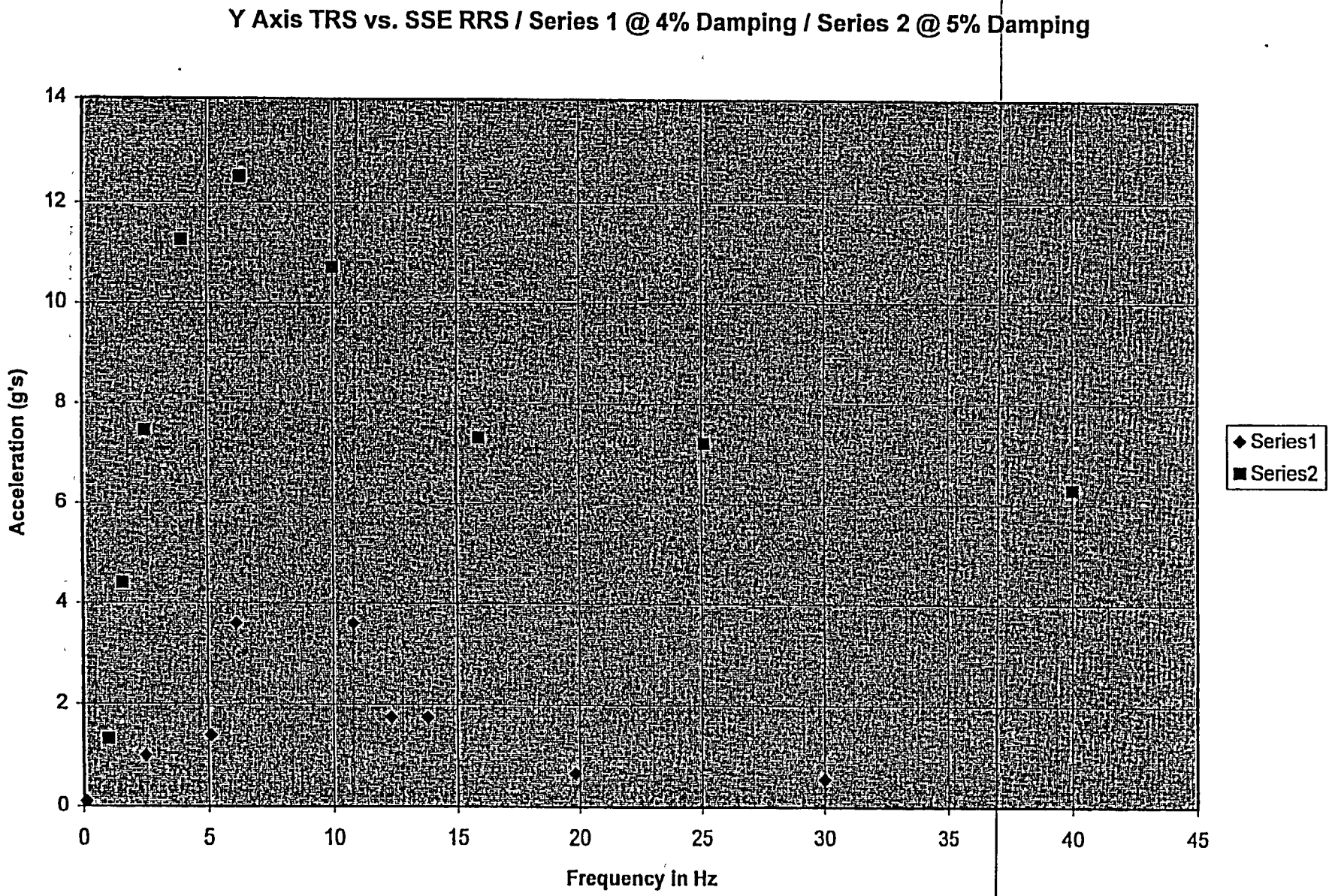
C_1 is the count rate at V_1

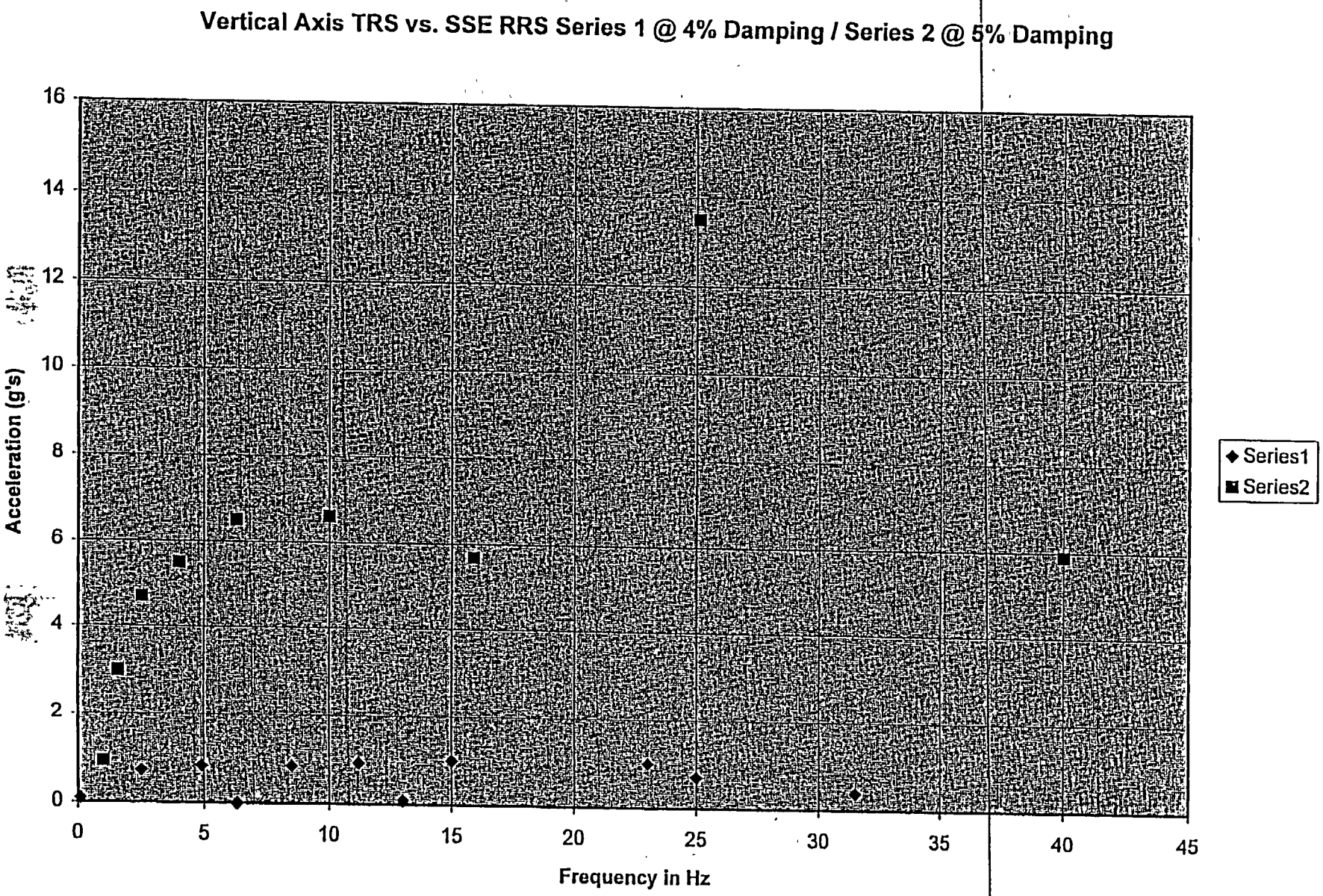
C_2 is the count rate at V_2

The results of testing are summarized in the Table below :

Detector Serial Number	% Slope of Ascending Plateau	% Slope of Descending Plateau	Standard Deviation for Repeated Counts at Fixed High Voltage
131	0.89%	0.45%	67.5
132	2.16%	1.73%	81.6
100762	0.84%	0%	42.2


X Axis TRS vs. SSE RRS / Series 1 @ 4% Damping / Series 2 @ 5% Damping
Acceleration (g's)
0
2
4
6
8
10
12
14
16
18
20
0
5
10
15
20
25
30
35
40
45
Frequency in Hz
Series1
Series2


Y Axis TRS vs. SSE RRS / Series 1 @ 4% Damping / Series 2 @ 5% Damping
Acceleration (g's)
0
2
4
6
8
10
12
14
0
5
10
15
20
25
30
35
40
45
Frequency in Hz
Series1
Series2


Vertical Axis TRS vs. SSE RRS Series 1 @ 4% Damping / Series 2 @ 5% Damping
Acceleration (g's)
16
14
12
10
8
6
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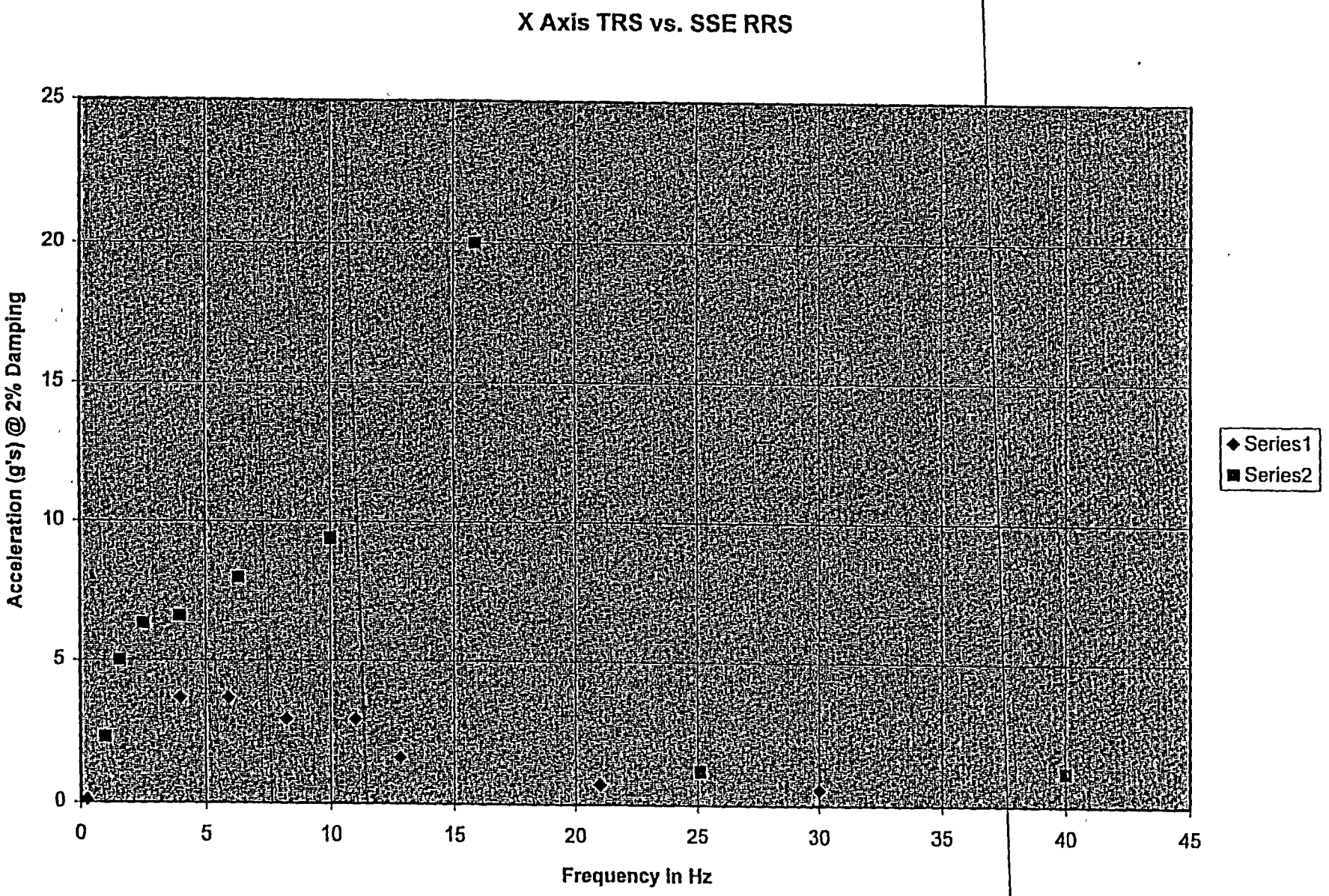
0
0
5
10
15
20
25
30
35
40
45
Frequency in Hz
Series1
Series2


X Axis TRS vs. SSE RRS
Acceleration (g's) @ 2% Damping
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20
15
10
5
0
0
5
10
15
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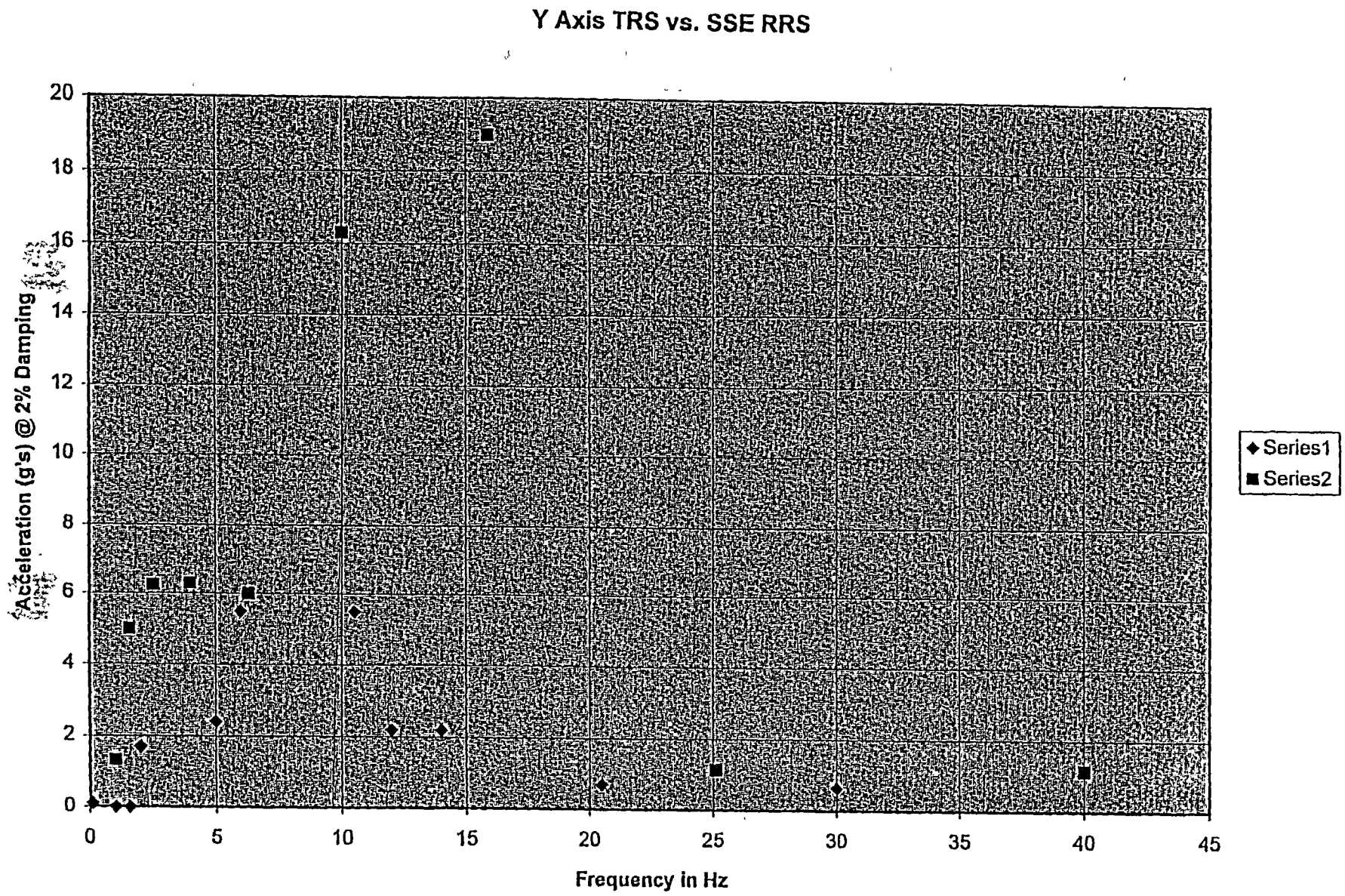
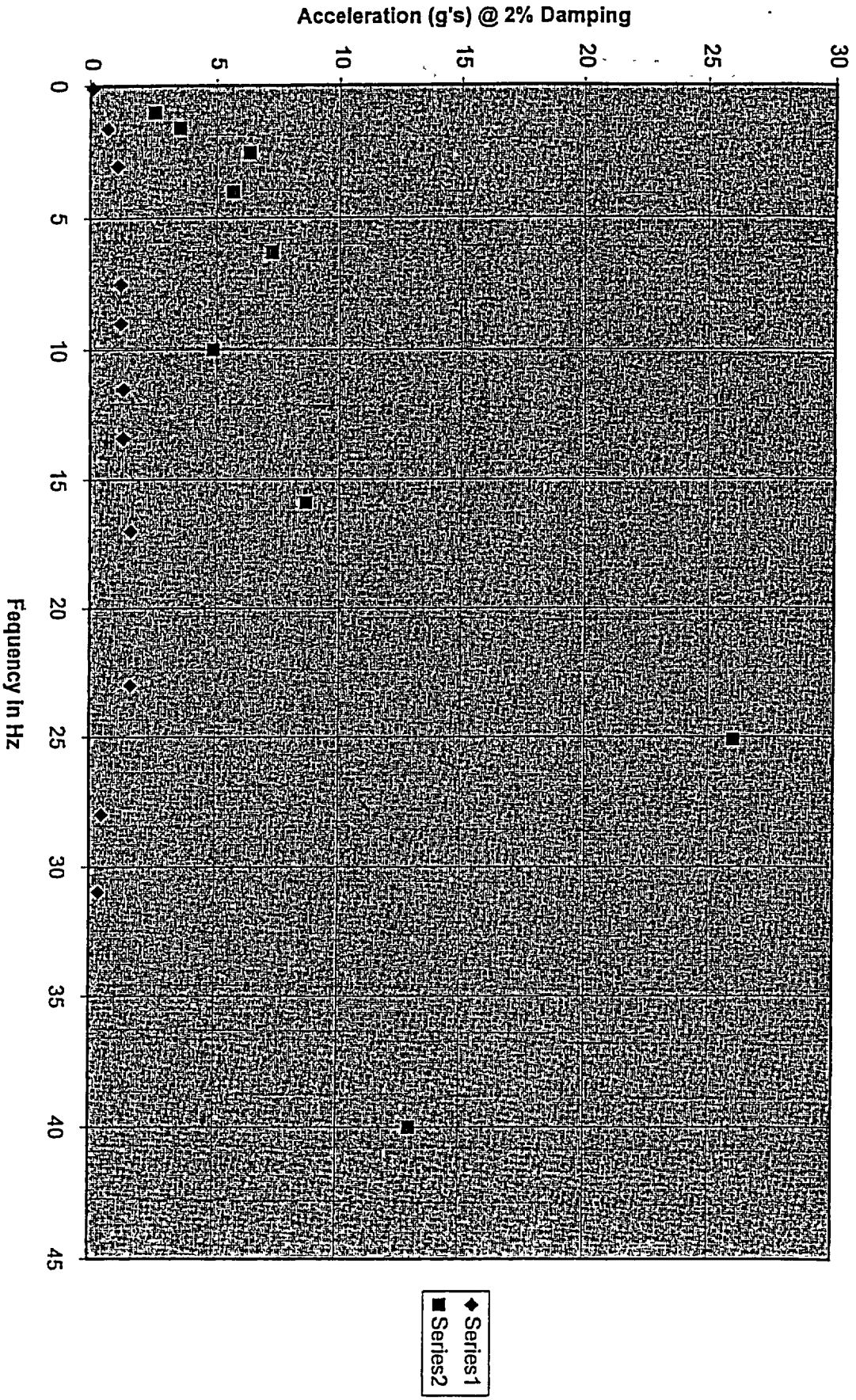
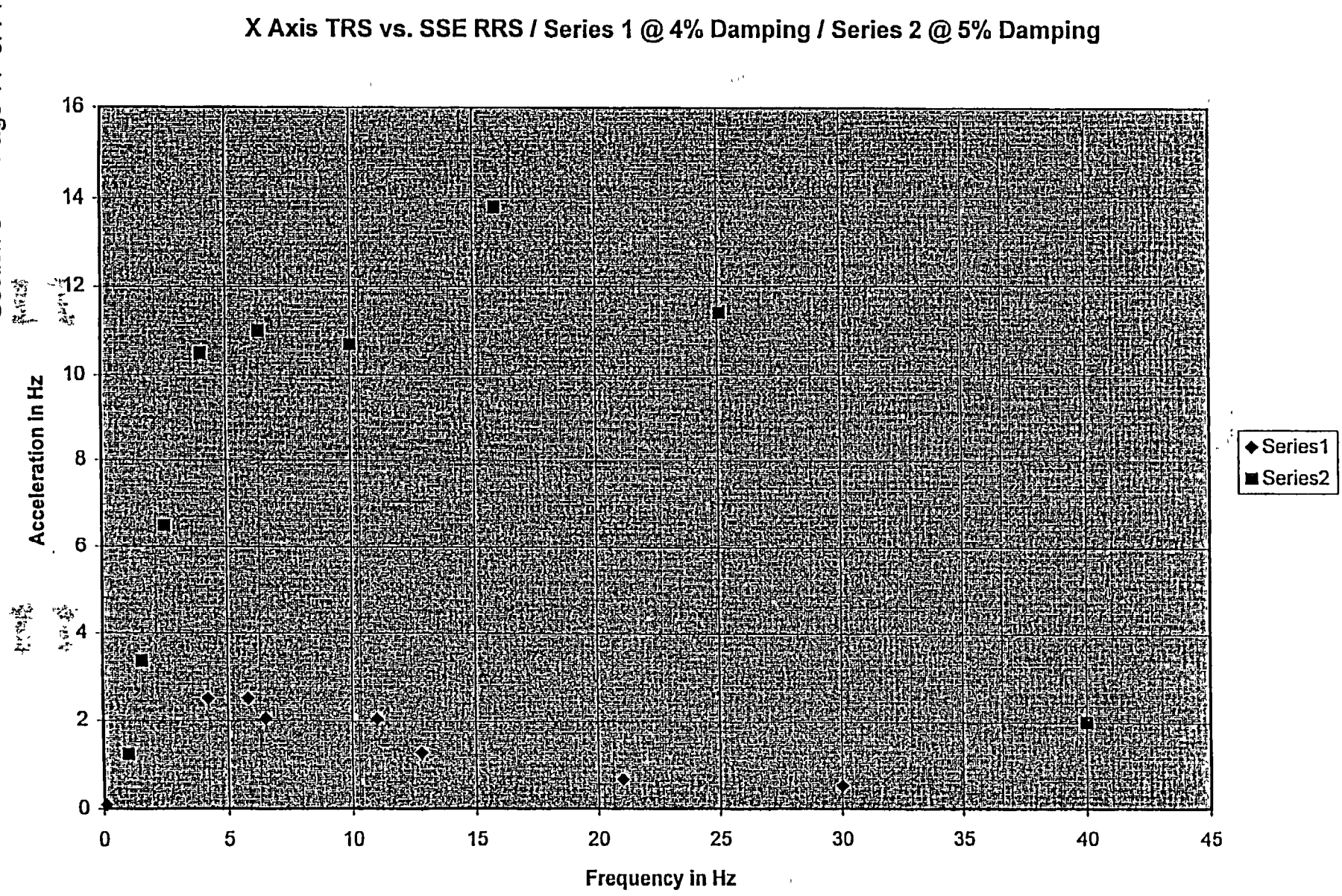
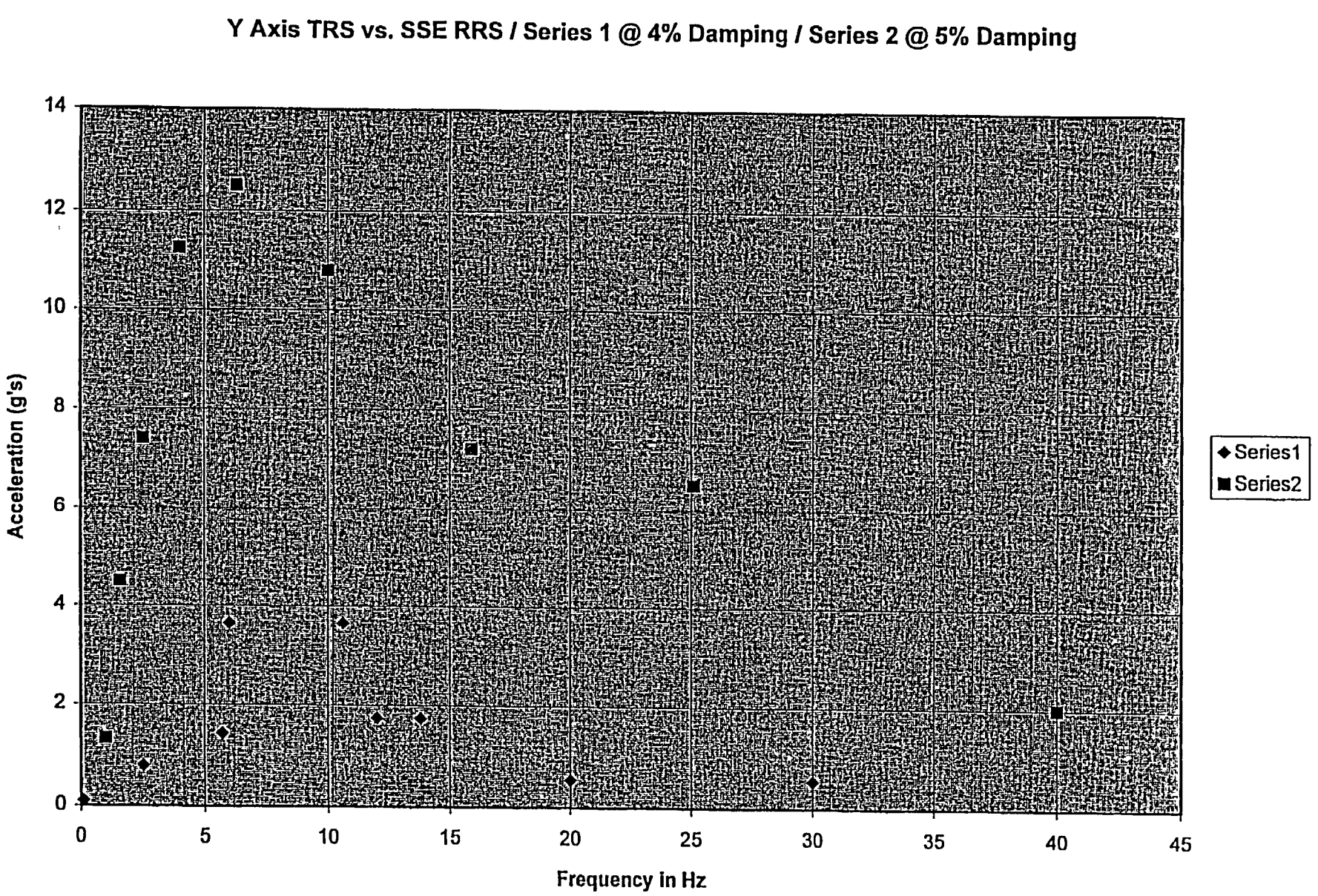
25
30
35
40
45
Frequency in Hz
Series1
Series2

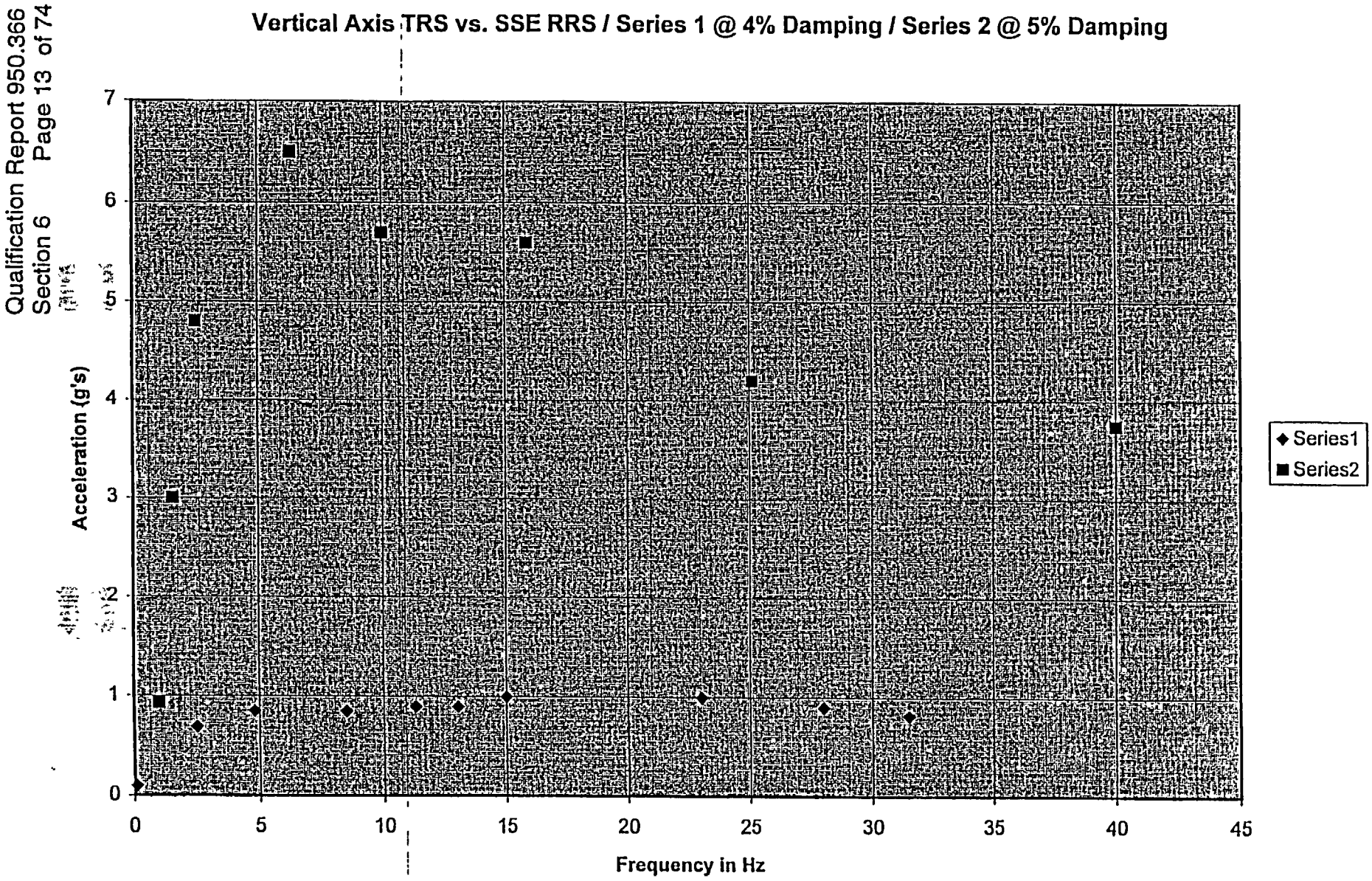

Y Axis TRS vs. SSE RRS
Acceleration (g's) @ 2% Damping
Frequency in Hz
0
2
4
6
8
10
12
14
16
18
20
0
5
10
15
20
25
30
35
40
45
Series1
Series2



Vertical Axis TRS vs. SSE RRS


X Axis TRS vs. SSE RRS / Series 1 @ 4% Damping / Series 2 @ 5% Damping
Acceleration in Hz
Frequency in Hz
0
2
4
6
8
10
12
14
16
0
5
10
15
20
25
30
35
40
45
Series1
Series2


Y Axis TRS vs. SSE RRS / Series 1 @ 4% Damping / Series 2 @ 5% Damping
Acceleration (g's)
0
2
4
6
8
10
12
14
0
5
10
15
20
25
30
35
40
45
Frequency in Hz
Series1
Series2


Vertical Axis TRS vs. SSE RRS / Series 1 @ 4% Damping / Series 2 @ 5% Damping
Acceleration (g's)
0
1
2
3
4
5
6
7
0
5
10
15
20
25
30
35
40
45
Frequency in Hz
Series1
Series2

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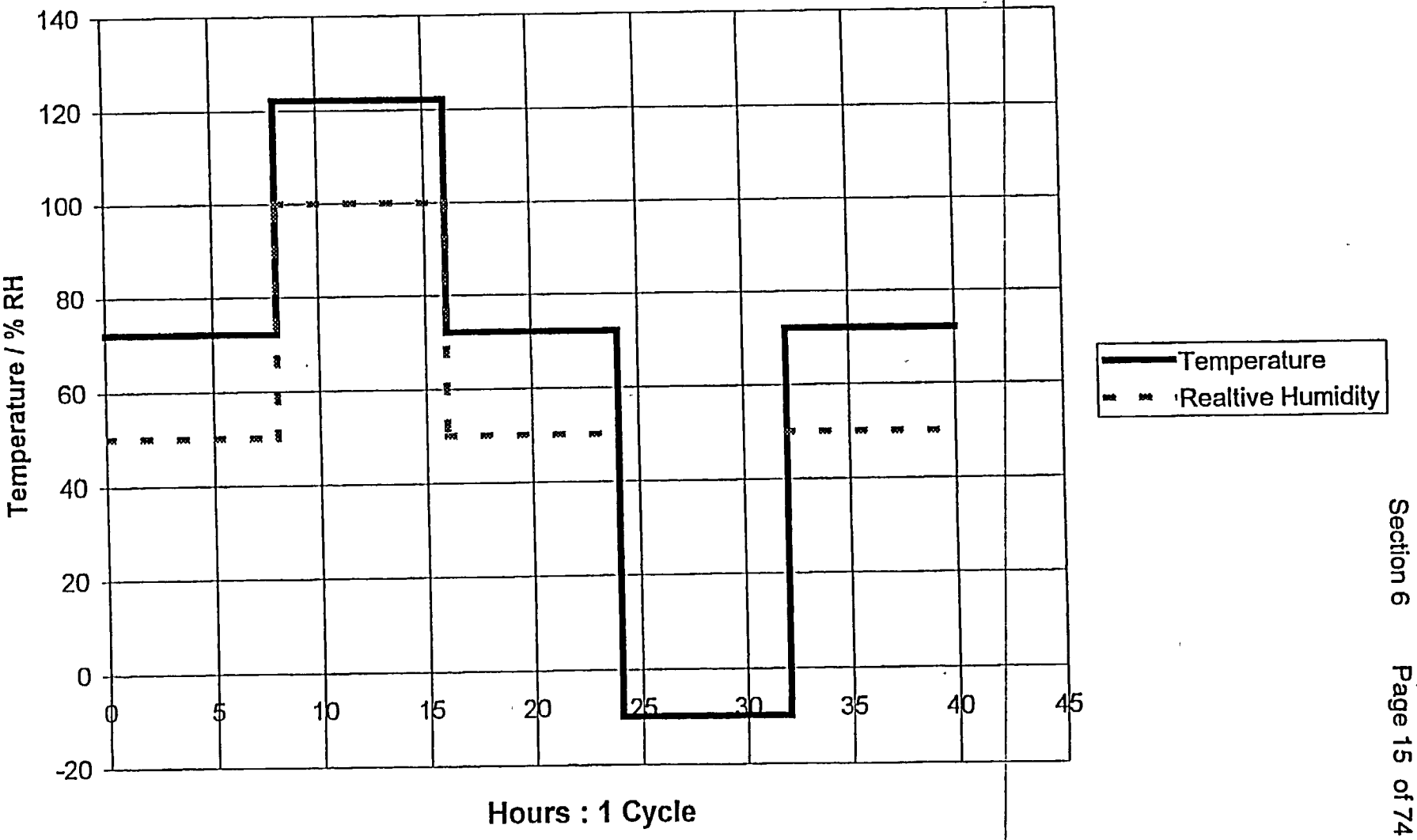
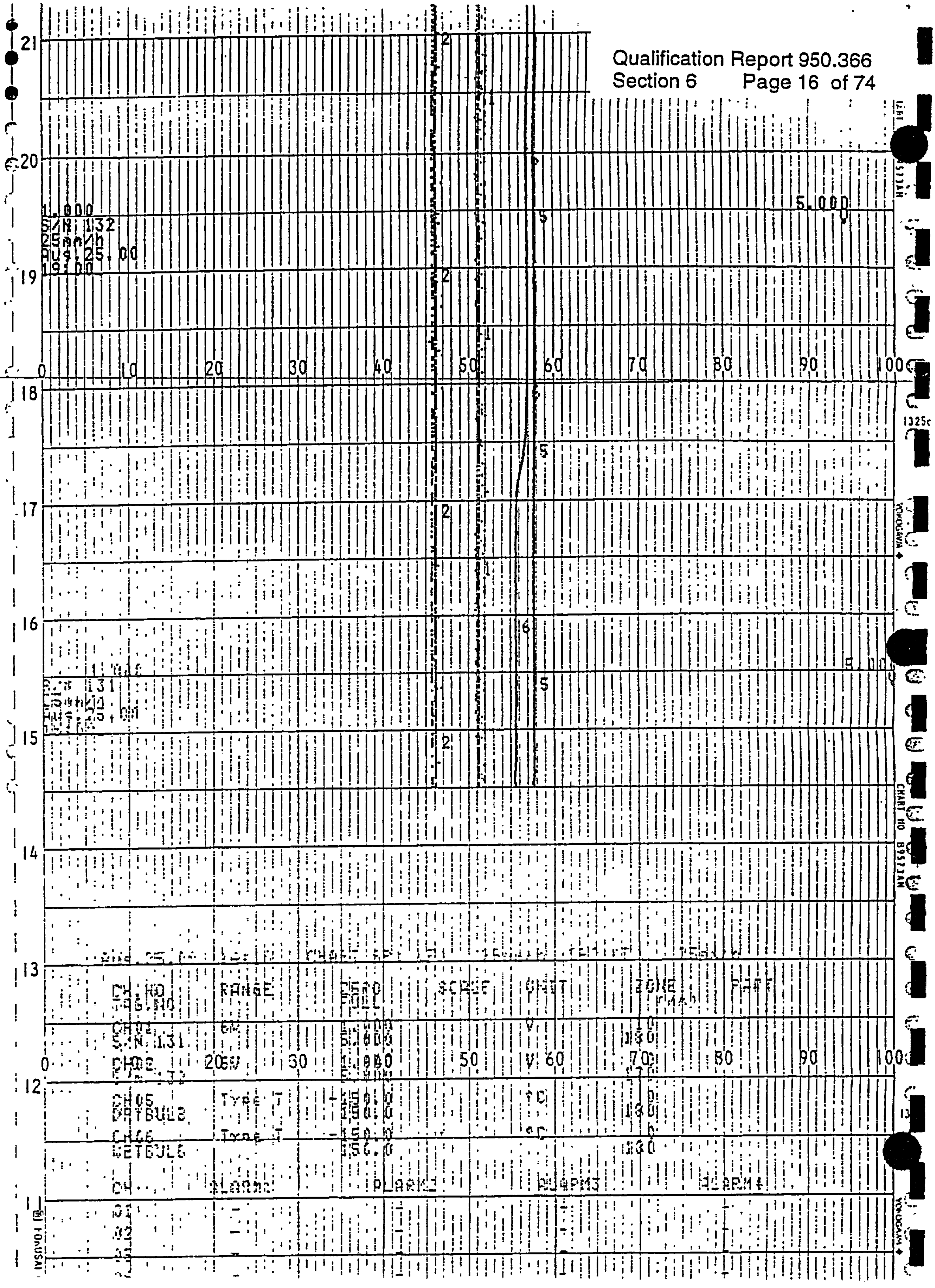
Temperature/Humidity Profile

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S/N 131
CH05
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CH06
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ALARM2
ALARM3
ALARM4
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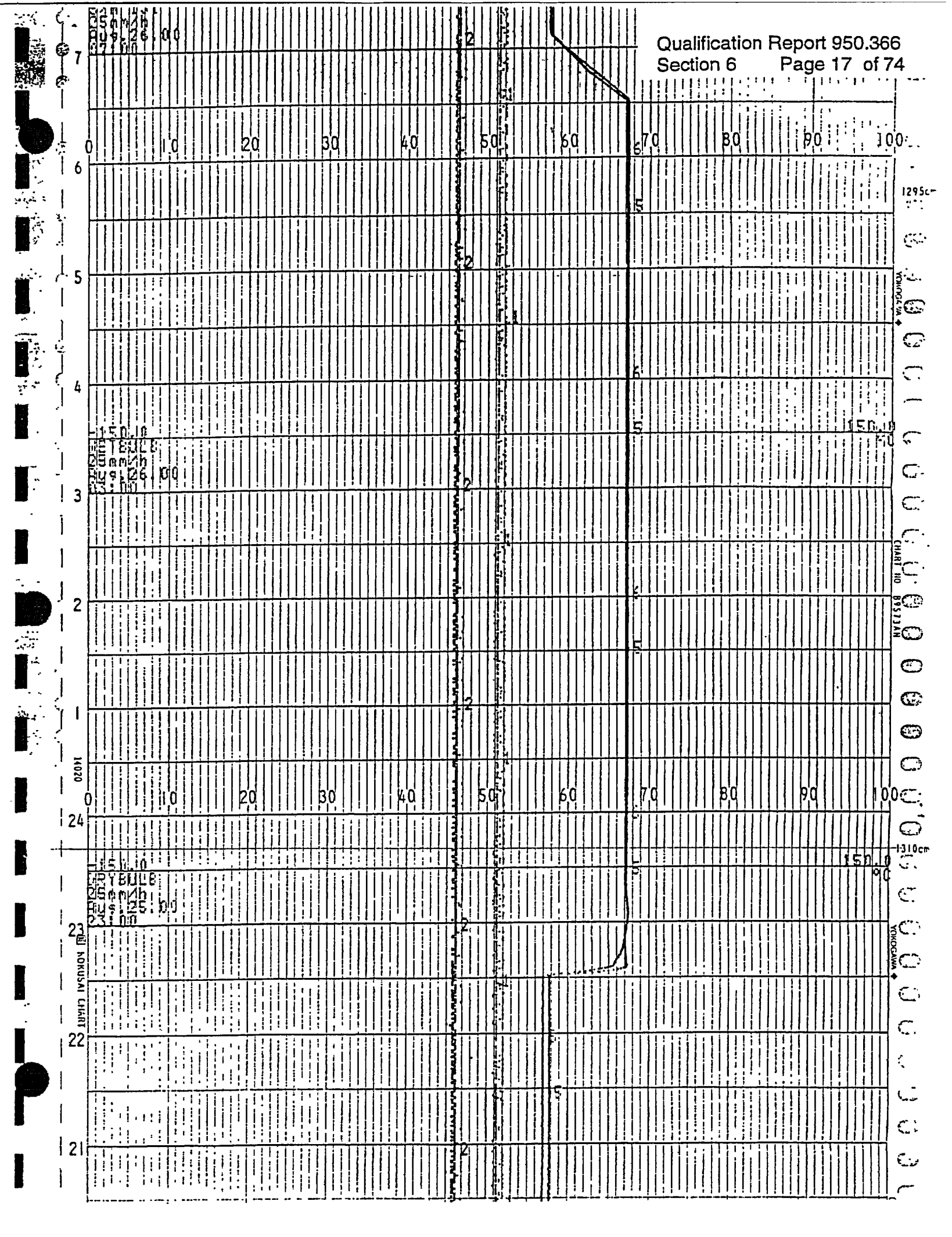
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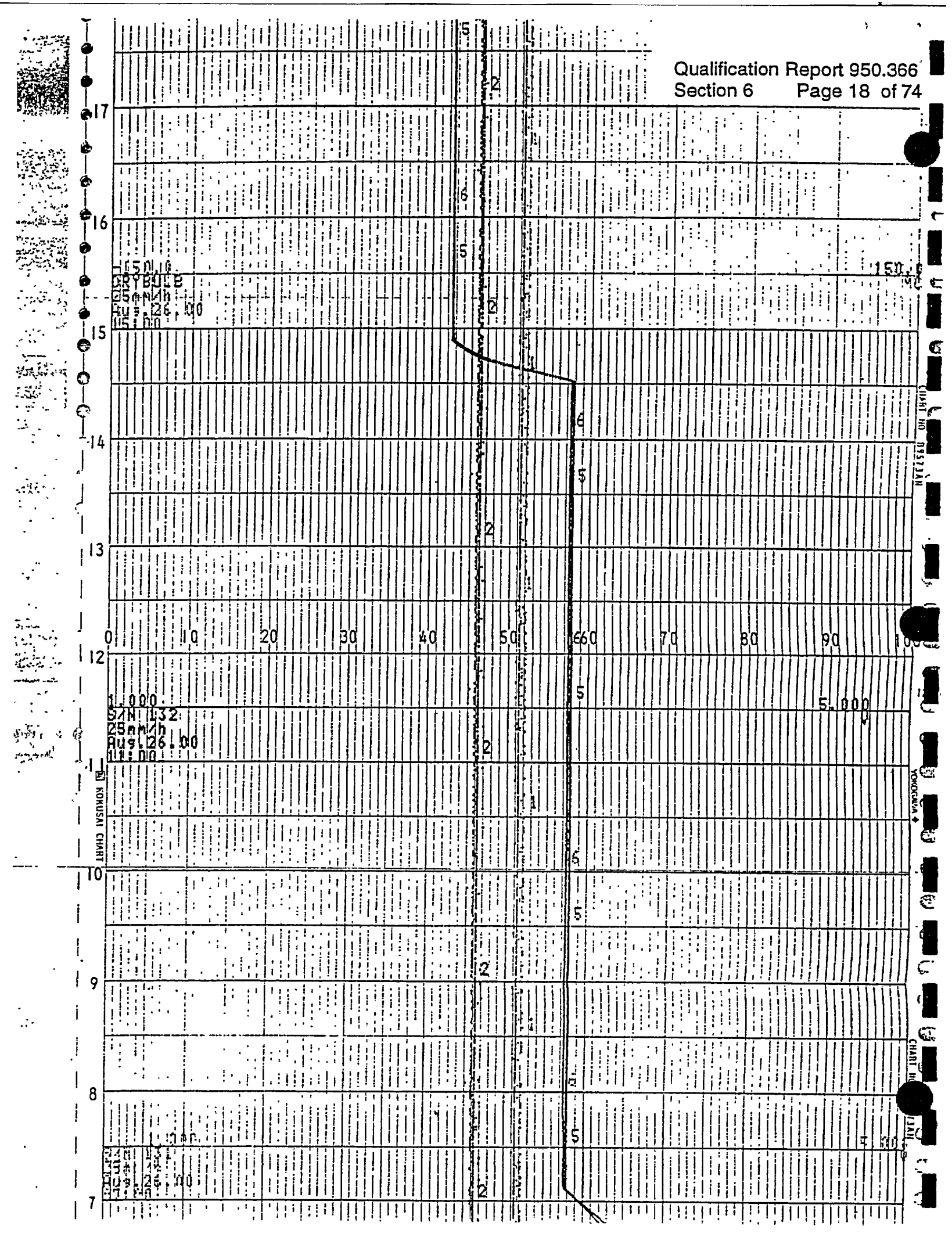
NOKUSAI CHART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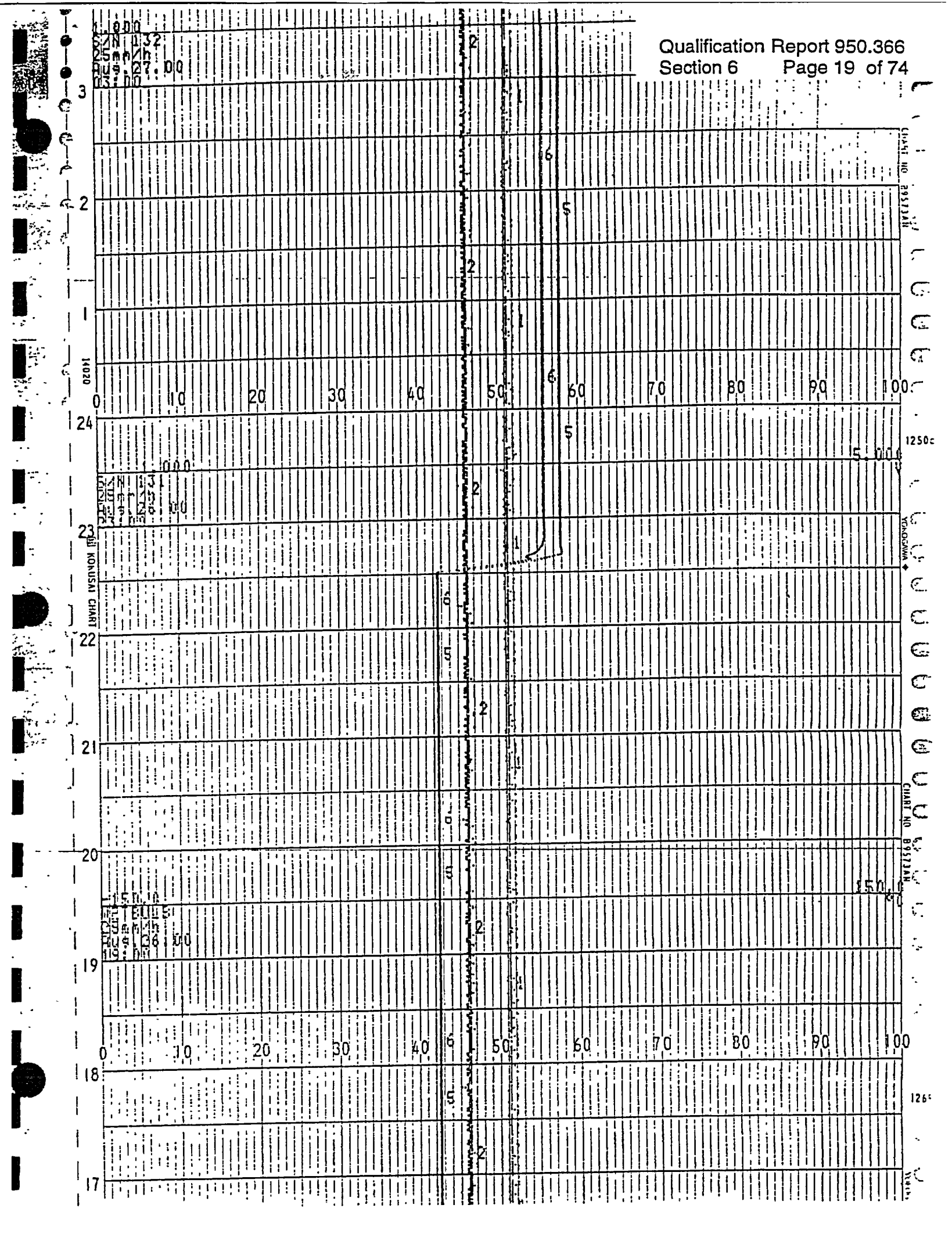
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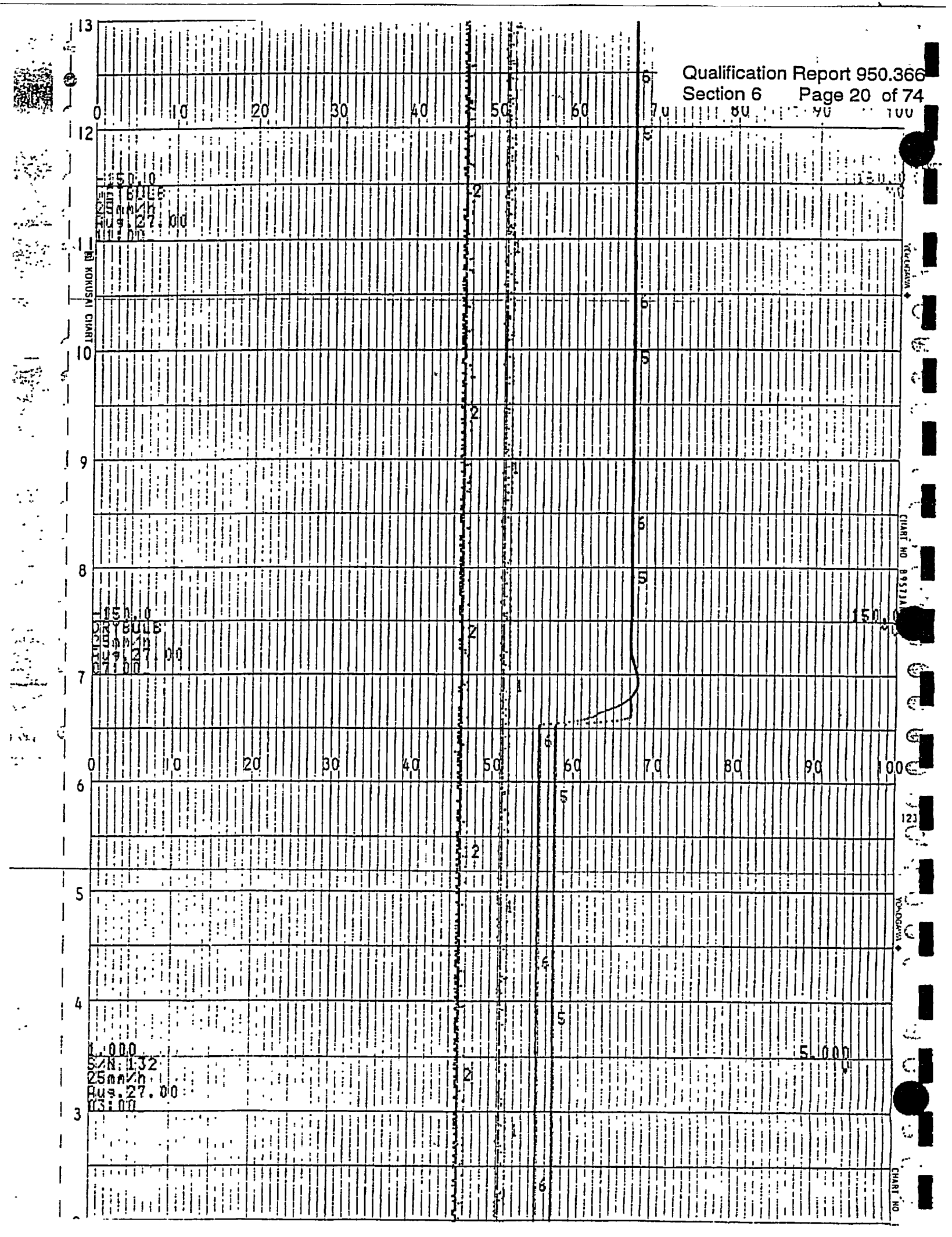
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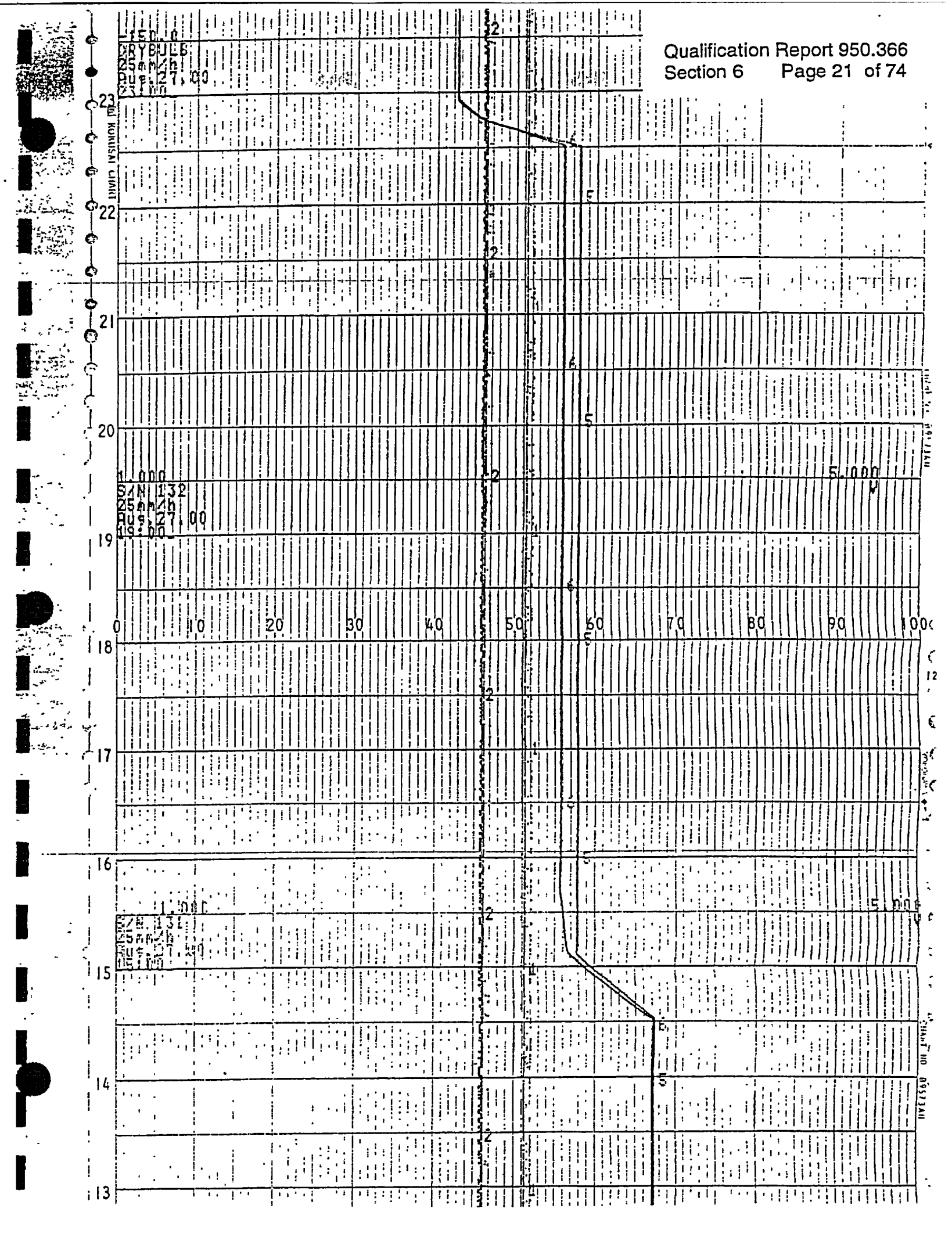
03:00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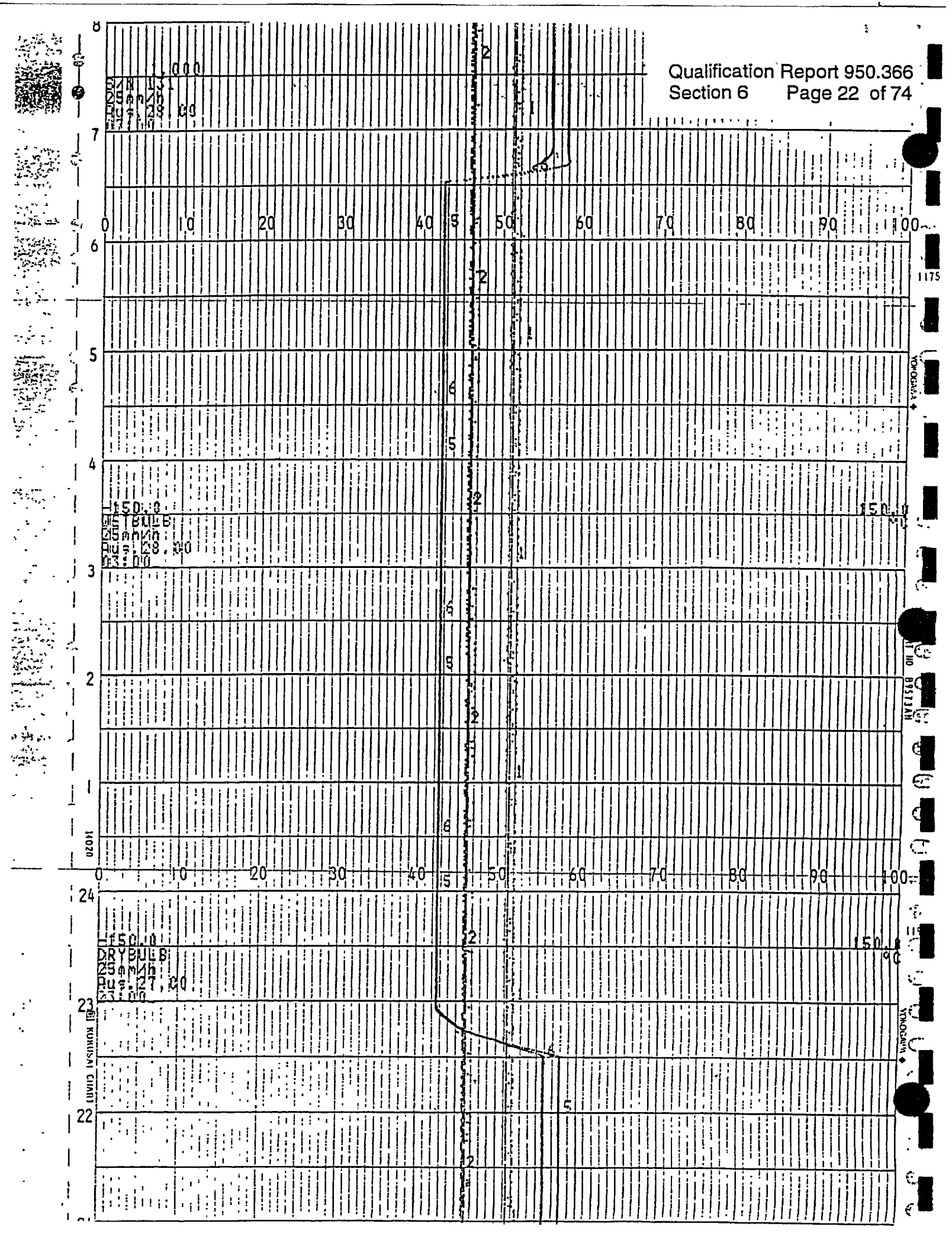
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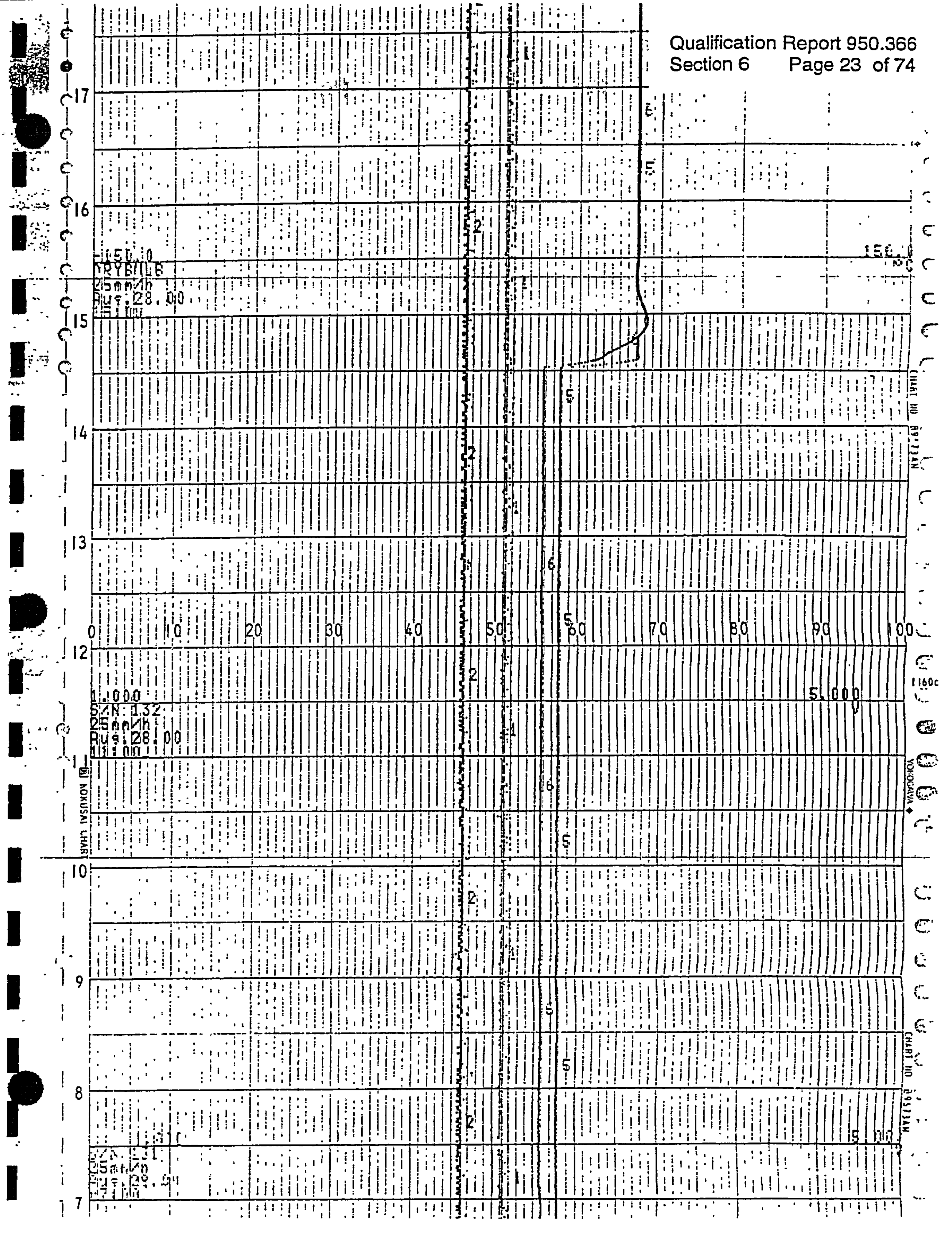
DRY BULB
YOKOGAWA
YOKOGAWA
MOLLIER H-X CHART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Aug.28.00
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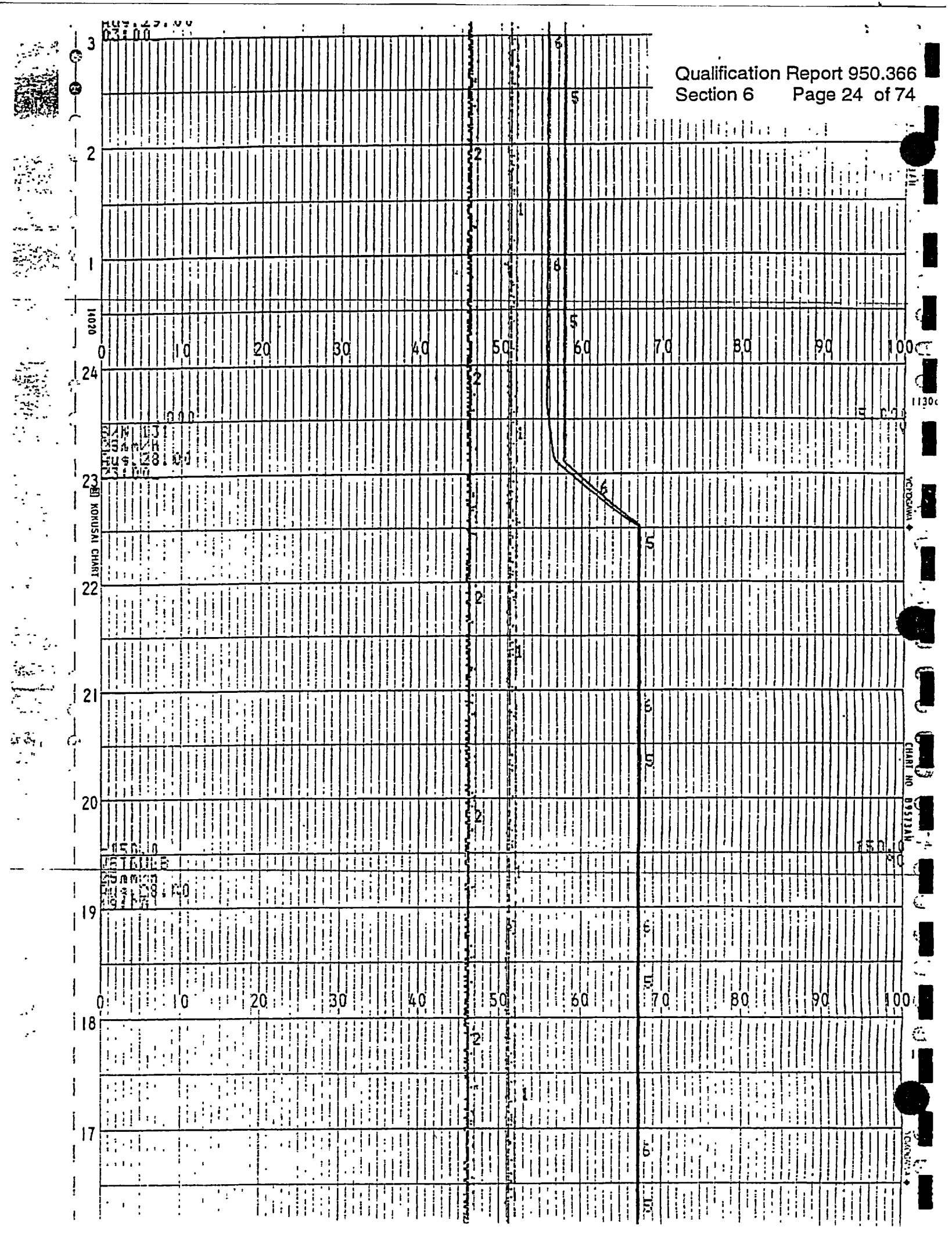
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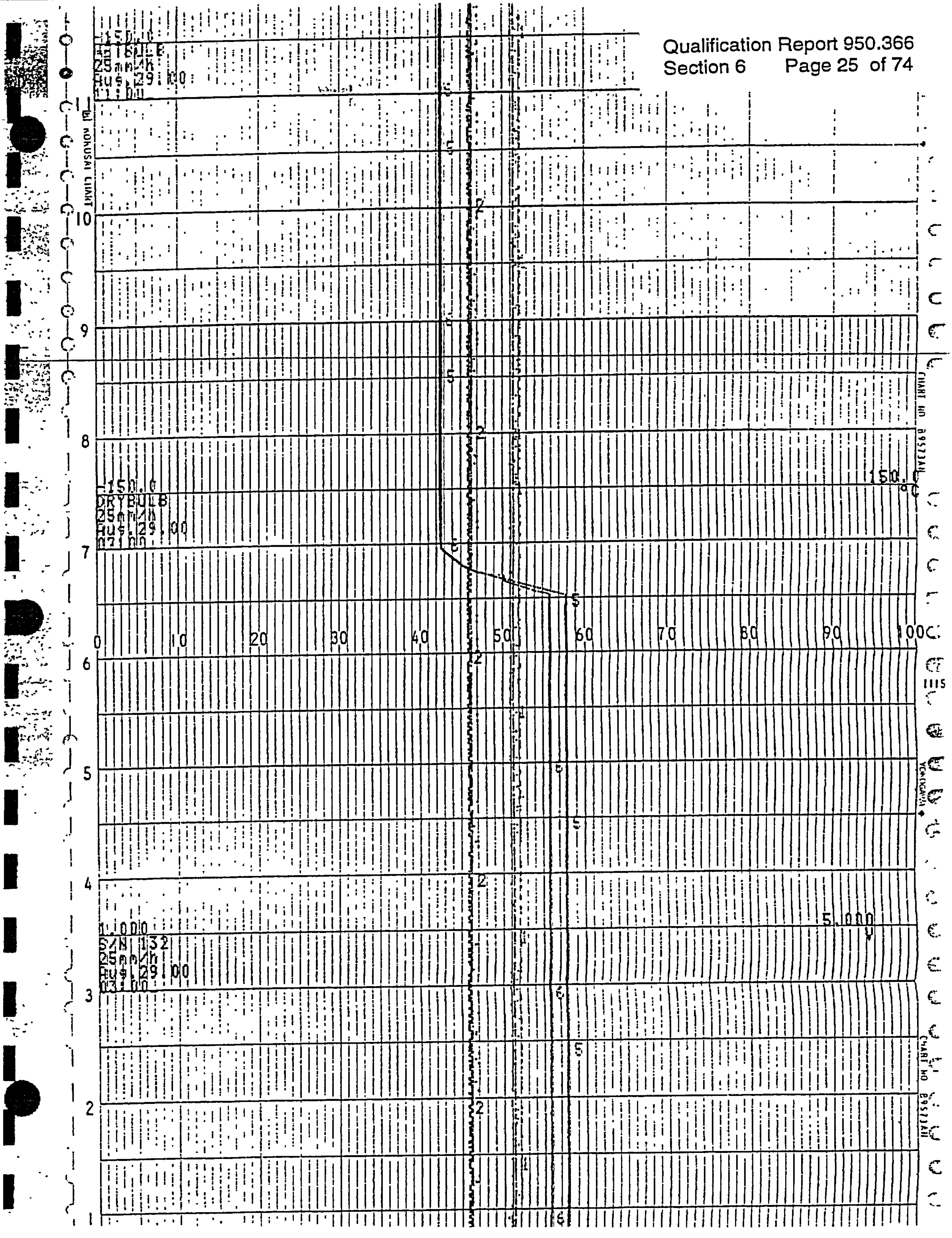
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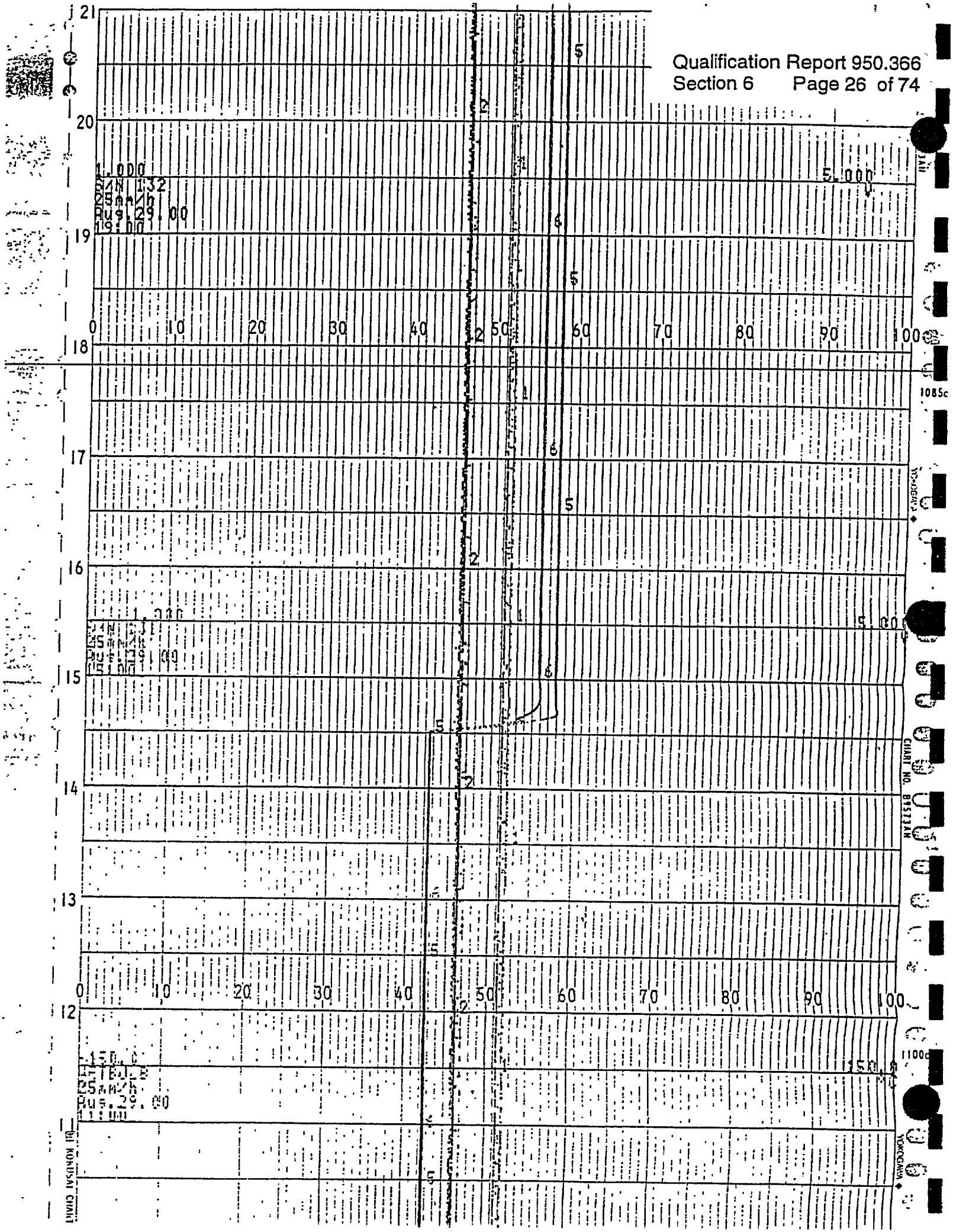
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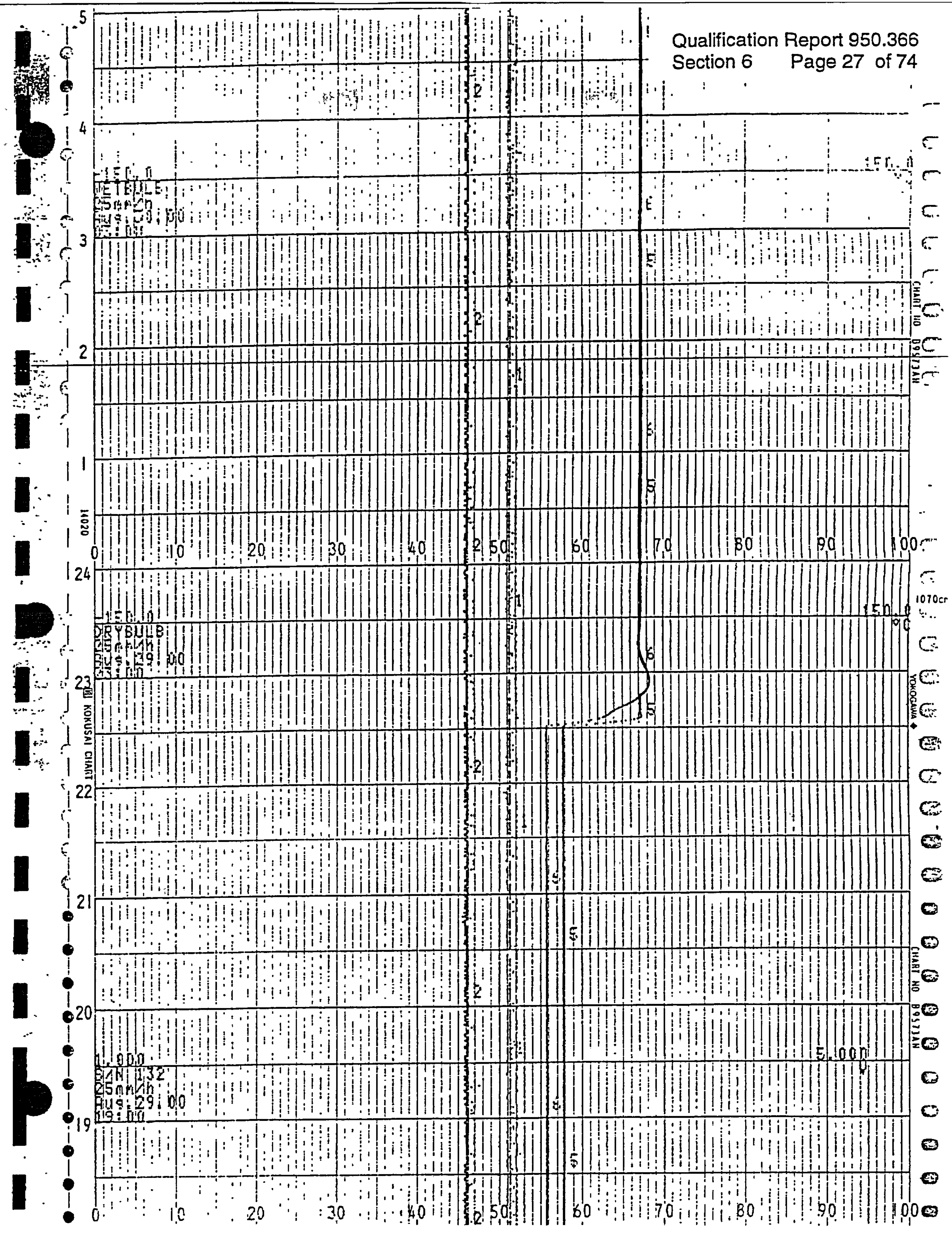
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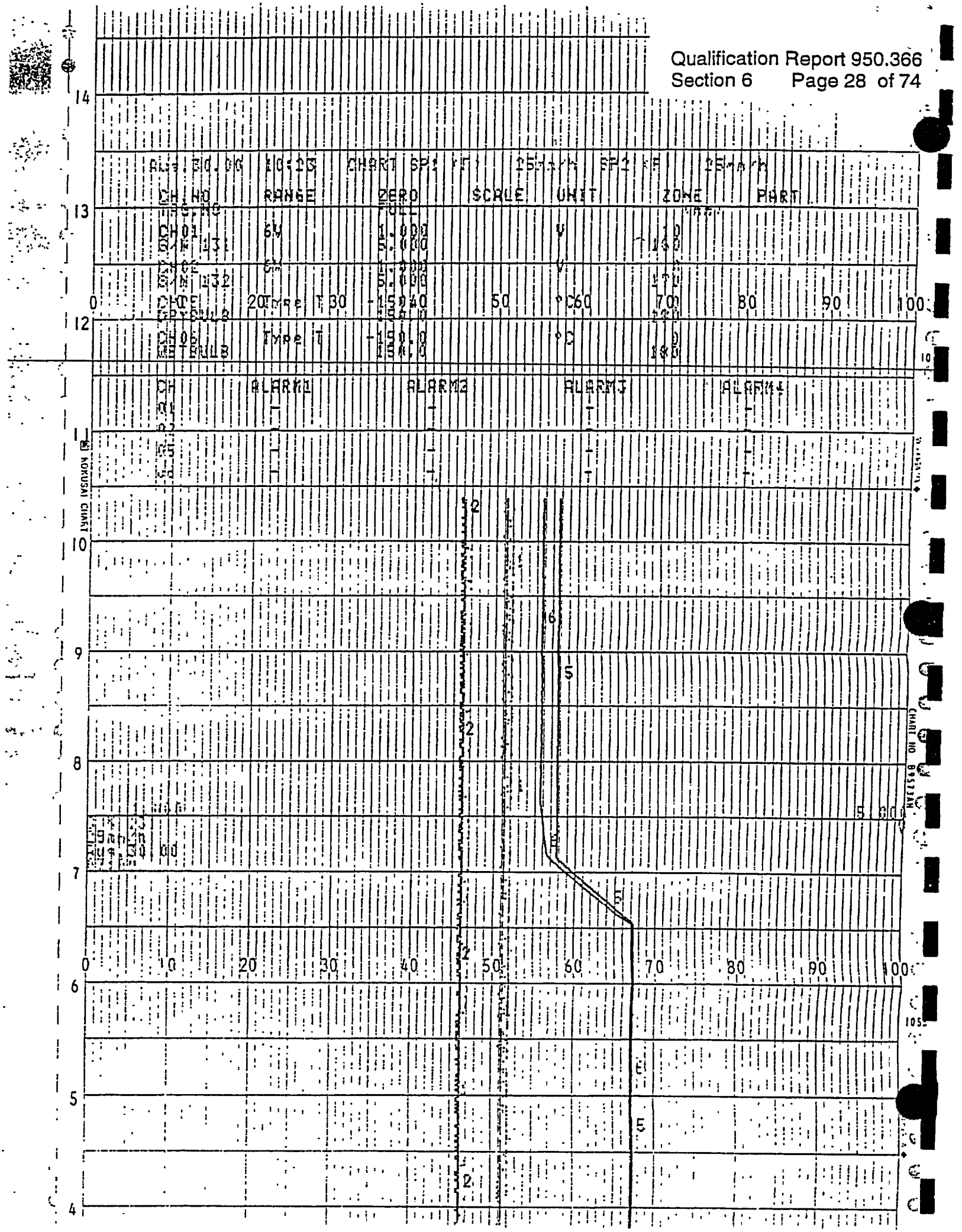
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ZERO
SCALE
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ZONE
PART
Type
ALARM
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ALARM
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20
30
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60
70
80
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100
14
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12
11
10
9
8
7
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5
4
NOKUSAI CHART

EMC TEST REPORT

For a

Digital Rate Meter, Detector and Cable Assembly

Manufacturer:
Inovision Radiation Measurements, LLC
6045 Cochran Road
Cleveland, OH 44139

Testing Facility:
F-Squared Laboratories
16740 Peters Road
Middlefield, OH 44062

The Digital Rate Meter, model 956A-201, Detector 897A-210 and Cable Assembly (consisting of 75 feet of 50-100 composite cable terminated at both ends) were tested to the following Standards and were found to be in compliance with the requirements. A line filter assembly, part number S157033A2, was utilized to achieve the required compliance. The testing commenced on 9/26/00 and was completed on 9/29/00.

Standards:

- Military Standard – Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility (MIL-STD-461D and CS 101)
- Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test, IEC 801-2
- Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test, IEC 801-3
- Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 4: Electrical Fast Transient/burst immunity test, IEC 801-4
- Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 5: Surge Immunity test, IEC 801-5
- Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 6: Conducted Immunity test, IEC 801-6

Evaluation Conducted by:

Tony Masone
EMC Manager

Report Reviewed by:

Robert Pellizze
General Manager

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

Report No.: CLE 033100-01 R1
Date: 12/15/00
Revision Date: 01/03/01

INDEX

GENERAL REPORT SUMMARY

This electromagnetic emission and immunity testing report was generated by F-Squared Laboratories. The test report is based on testing performed by F-Squared Laboratories personnel according to the measurement procedures described in the test specifications given below and in the Test Procedures section of this report.

SECTION	TEST	RESULTS
9	Electrostatic Discharge	Pass
10	Radiated Immunity	Pass
11	Electrical Fast Transient Burst	Pass
12	Power Surge Immunity	Pass
13	Conducted Immunity	Pass

1.0 ADMINISTRATIVE DATA

1.1 Management of Test Sample

The test sample was inventoried at the F-Squared Facility and returned to Inovision according to the agreement between F-Squared Laboratories and the client.

1.2 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document

AM	Amplitude Modulation
BCI	Bulk Current Injection
CDN	Coupling/Decoupling Network
EFT	Electrical Fast Transients
EMC	Electromagnetic Compatibility
EN	European Norm
ESD	Electrostatic Discharge
EUT	Equipment Under Test
GRP	Ground Reference Plane
HCP	Horizontal Coupling Plane
IEC	International Electrotechnical Commission
KHz	KiloHertz
LISN	Line Impedance Stabilization Network
MHz	MegaHertz
OATS	Open Area Test Site
RF	Radio Frequency
S/N	Serial Number
VCP	Vertical Coupling Plane

2.0 DESCRIPTION OF THE TEST CONFIGURATIONS

2.1 Performance Criteria

SPECIFICATION	PERFORMANCE CRITERIA
IEC 801-2	B
IEC 801-3	A
IEC 801-4	B
IEC 801-5	B
IEC 801-6	A
MIL STD 461D, CS 101	A

Performance criteria A: The apparatus shall continue to operate as intended both during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Performance criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

Report No.: CLE 033100-01 R1
Date: 12/13/00
Revision Date: 01/03/01

3.0 LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

3.1 Equipment Under Test (EUT)

Device	Manufacturer	Model #	Serial #
Digital Rate Meter	Inovision Radiation Measurements, LLC	956A-201	Calab 1
G M Area Monitor Detector	Inovision Radiation Measurements, LLC	897A-210	131
Cable Assembly	Inovision Radiation Measurements, LLC	50-100	N/A
Line Filter/Surge Suppressor Assembly	Inovision Radiation Measurements, LLC	S157033A2	Prototype
Rack Chassis	Inovision Radiation Measurements, LLC	948B-1	N/A

4.0 MODE OF OPERATION

The unit was fully operational in phases of the test.

5.0 METHOD OF MONITORING

The display of the EUT was visually monitored.

6.0 IMMUNITY PASS/FAIL CRITERIA

The unit was monitored and the following criteria was used to define a non-compliance:

1. Rate increase above 1 mR/hr and subsequent alarm (Alarm setpoint 1 mR/hr).
2. Microprocessor failure/lock-up indicated by fail alarm.
3. Loss of setpoints/Alteration of setpoints.
4. Failure to respond to Check Source command.

7.0 REQUIRED MODIFICATIONS

The grounds of the signal line were required to be terminated at both ends of the cable.

A ferrite bead, Corcom Filter. and a Surge Suppressor were added to the AC Power lines.

This assembly is identified as the prototype S157033A2 filter assembly.

8.0 EMC Test Equipment

Equipment Type	Manufacturer	Model	Serial Number	Cal. Due Date
Shield Room	Shielding Resources	3 meter	001	Mar. 2001
AC Power System	California Instruments	5001IX-CTS	52840	Oct. 2001
LISN	Fisher Custom Comm	50/250-25-4	9600	Aug. 2001
Antenna 1	EMC-Test Systems	3143 Biconilog	1229	Not required
OATS	Compliance Labs	NA	001	Aug. 2001
PLDCN	Fisher Custom Comm	801-M3-16A	97-12	Sept. 2001
Antenna 2	EMC Test Systems	3143 Biconilog	9609-1306	July 2001
ESD generator	Haefely Trench	PESD 1600	N/A	Dec. 2000
Humidity/Temp G	Thermo-Hygro	Radio Shack 100	N/A	Dec. 2000
Surge Generator	EM Test	VCS 500	21527	Dec. 2000
EFT generator	Haefely Trench	PEFT Junior	83818	Dec. 2000
Signal Generator	Giga-tronics	6061A	9618911	Jan. 2001
Field Probe	Chase	EMC 20	2244/29	Mar. 2001

9.0 ELECTROSTATIC DISCHARGE IMMUNITY TEST PROCEDURE

9.1 Electrostatic Discharge Immunity Test (ESD)

The ESD generator and discharge gun was used to conduct the tests outlined below. The waveform conforms to IEC 801-2. This generator was used to simulated electrostatic discharges to the EUT. The EUT was placed on a non-conductive material 0.5 mm above a horizontal coupling plane (HCP) conforming to the dimensions of IEC 801-2. The horizontal coupling plane and the vertical coupling plane were connected to the ground reference place through two 470 KOhm resistors. During the test, three different methods were used to determine if the equipment was susceptible to ESD. They consisted of Direct Contact, Air Discharge and Indirect discharge. The direct contact method was used on all exposed conductive surfaces. Each point was contacted 10 consecutive times in the positive polarity and 10 consecutive times in the negative polarity with an electrostatic discharge from the ESD Gun. The Indirect discharge method was used on one point of the horizontal coupling plane (HCP) and to one point on the vertical coupling plane (VCP) located 10 cm from the edge of the EUT on all four sides of the EUT. The Air Discharge method was used on all exposed non-conductive materials. These materials were scanned with the tip of the ESD gun. if the gun discharged at any point, 10 consecutive discharges in both positive and negative polarities were then made to that point.

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

Report No.: CLE 033100-01 R1
Date: 12/13/00
Revision Date: 01/03/01

9.2 Electrostatic Discharge Immunity Test Data Sheet

Test Date:	9/26/00	**Test Engineer:**	Tony Masone
Standard:	IEC 801-2	**Air Temperature:**	17°C
Performance Criteria:	B	**Relative Humidity:**	62%

Conductive Surfaces

Discharge Point	Level	Method	Pass / Fail
Vertical Coupling Plane – Right Side	±4 kV	Contact	Pass
Vertical Coupling Plane – Left Side	±4 kV	Contact	Pass
Vertical Coupling Plane – Front Side	±4 kV	Contact	Pass
Vertical Coupling Plane – Back Side	±4 kV	Contact	Pass
Horizontal Coupling Plane	±4 kV	Contact	Pass
Conductive Surfaces	±4 kV	Contact	Pass

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

Report No.: CLE 033100-01 R1
Date: 12/13/00
Revision Date: 01/03/01

2.0 DESCRIPTION OF THE TEST CONFIGURATIONS

2.1 Performance Criteria

SPECIFICATION	PERFORMANCE CRITERIA
IEC 801-2	B
IEC 801-3	A
IEC 801-4	B
IEC 801-5	B
IEC 801-6	A
MIL STD 461D, CS 101	A

Performance criteria A: The apparatus shall continue to operate as intended both during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Performance criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

3.0 LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

3.1 Equipment Under Test (EUT)

Device	Manufacturer	Model #	Serial #
Digital Rate Meter	Inovision Radiation Measurements, LLC	956A-201	Calab 1
G M Area Monitor Detector	Inovision Radiation Measurements, LLC	897A-210	131
Cable Assembly	Inovision Radiation Measurements, LLC	50-100	N/A
Line Filter/Surge Suppressor Assembly	Inovision Radiation Measurements, LLC	S157033A2	Prototype
Rack Chassis	Inovision Radiation Measurements, LLC	948B-1	N/A

4.0 MODE OF OPERATION

The unit was fully operational in phases of the test.

5.0 METHOD OF MONITORING

The display of the EUT was visually monitored.

6.0 IMMUNITY PASS/FAIL CRITERIA

The unit was monitored and the following criteria was used to define a non-compliance:

1. Rate increase above 1 mR/hr and subsequent alarm (Alarm setpoint 1 mR/hr).
2. Microprocessor failure/lock-up indicated by fail alarm.
3. Loss of setpoints/Alteration of setpoints.
4. Failure to respond to Check Source command.

7.0 REQUIRED MODIFICATIONS

The grounds of the signal line were required to be terminated at both ends of the cable.

A ferrite bead, Corcom Filter, and a Surge Suppressor were added to the AC Power lines.

This assembly is identified as the prototype S157033A2 filter assembly.

8.0 EMC Test Equipment

Equipment Type	Manufacturer	Model	Serial Number	Cal. Due Date
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LISN	Fisher Custom Comm	50/250-25-4	9600	Aug. 2001
Antenna 1	EMC Test Systems	3143 Biconilog	1229	Not required
OATS	Compliance Labs	NA	001	Aug. 2001
PLDCN	Fisher Custom Comm	801-M3-16A	97-12	Sept. 2001
Antenna 2	EMC Test Systems	3143 Biconilog	9609-1306	July 2001
ESD generator	Haefely Trench	PESD 1600	N/A	Dec. 2000
Humidity/Temp G	Thermo-Hygro	Radio Shack 100	N/A	Dec. 2000
Surge Generator	EM Test	VCS 500	21527	Dec. 2000
EFT generator	Haefely Trench	PEFT Junior	83818	Dec. 2000
Signal Generator	Giga-tronics	6061A	9618911	Jan. 2001
Field Probe	Chase	EMC 20	2244/29	Mar. 2001

9.0 ELECTROSTATIC DISCHARGE IMMUNITY TEST PROCEDURE

9.1 Electrostatic Discharge Immunity Test (ESD)

The ESD generator and discharge gun was used to conduct the tests outlined below. The waveform conforms to IEC 801-2. This generator was used to simulated electrostatic discharges to the EUT. The EUT was placed on a non-conductive material 0.5 mm above a horizontal coupling plane (HCP) conforming to the dimensions of IEC 801-2. The horizontal coupling plane and the vertical coupling plane were connected to the ground reference place through two 470 KOhm resistors. During the test, three different methods were used to determine if the equipment was susceptible to ESD. They consisted of Direct Contact, Air Discharge and Indirect discharge. The direct contact method was used on all exposed conductive surfaces. Each point was contacted 10 consecutive times in the positive polarity and 10 consecutive times in the negative polarity with an electrostatic discharge from the ESD Gun. The Indirect discharge method was used on one point of the horizontal coupling plane (HCP) and to one point on the vertical coupling plane (VCP) located 10 cm from the edge of the EUT on all four sides of the EUT. The Air Discharge method was used on all exposed non-conductive materials. These materials were scanned with the tip of the ESD gun, if the gun discharged at any point, 10 consecutive discharges in both positive and negative polarities were then made to that point.

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

Report No.: CLE 033100-01 R1
Date: 12/13/00
Revision Date: 01/03/01

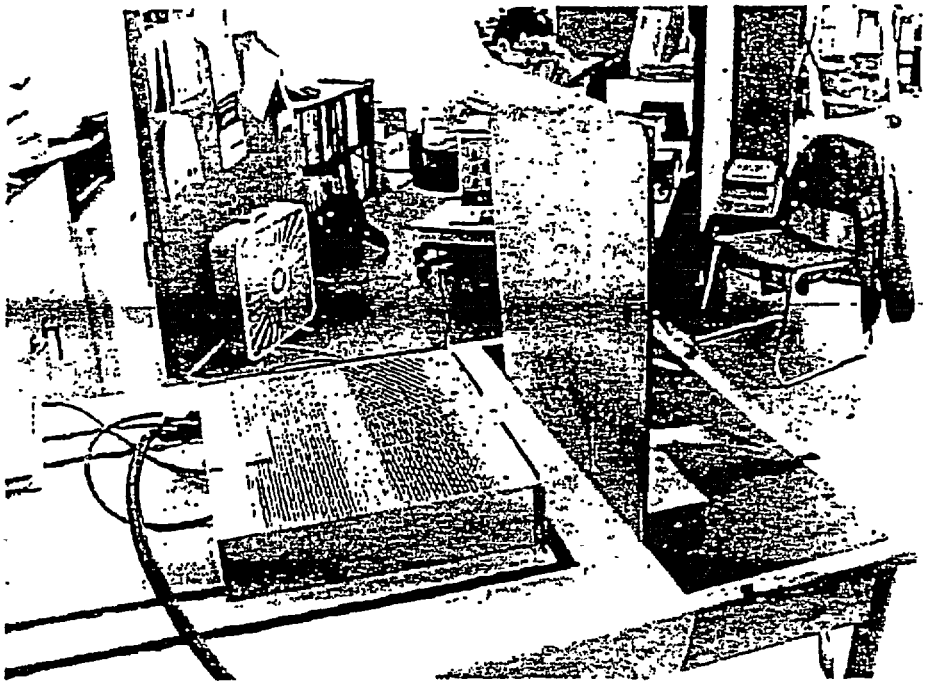
9.2 Electrostatic Discharge Immunity Test Data Sheet

Test Date:	9/26/00	**Test Engineer:**	Tony Masone
Standard:	IEC 801-2	**Air Temperature:**	17°C
Performance Criteria:	B	**Relative Humidity:**	62%

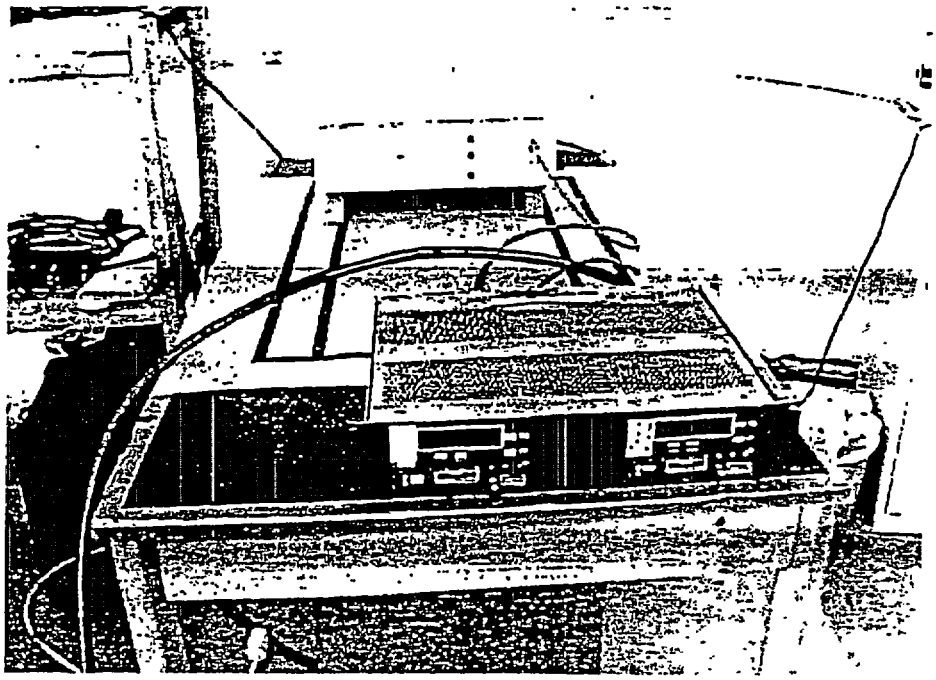
Conductive Surfaces

Discharge Point	Level	Method	Pass / Fail
Vertical Coupling Plane – Right Side	±4 kV	Contact	Pass
Vertical Coupling Plane – Left Side	±4 kV	Contact	Pass
Vertical Coupling Plane – Front Side	±4 kV	Contact	Pass
Vertical Coupling Plane – Back Side	±4 kV	Contact	Pass
Horizontal Coupling Plane	±4 kV	Contact	Pass
Conductive Surfaces	±4 kV	Contact	Pass

9.3 Photographs of the Electrostatic Discharge Test Set-Up



Front View of the EUT during the Electrostatic Discharge Test



10.0 Radiated Immunity Test

The Equipment Under Test (EUT) was placed in a fully anechoic chamber on a non-conductive turntable. A broadband antenna was placed three meters from the EUT and was used to radiate RF energy in both horizontal and vertical polarities at the EUT.

The RF energy consisted of a signal that was stepped at 1% increments through the frequency range of 80 MHz to 1000 MHz at a rate slower than the reaction time of the EUT. The signal was 80% AM modulated with a 1 KHz sine wave and had a minimum calibrated field strength of 3.0 volts/meter at the surface of the EUT. The signal was also pulsed modulated at 200 Hz in the frequency range of 895 MHz to 905 MHz. The EUT was exposed to the RF energy on four different surfaces (Front, Back, Left and Right sides).

The test set up conformed to figure 2 of IEC 801-3.

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

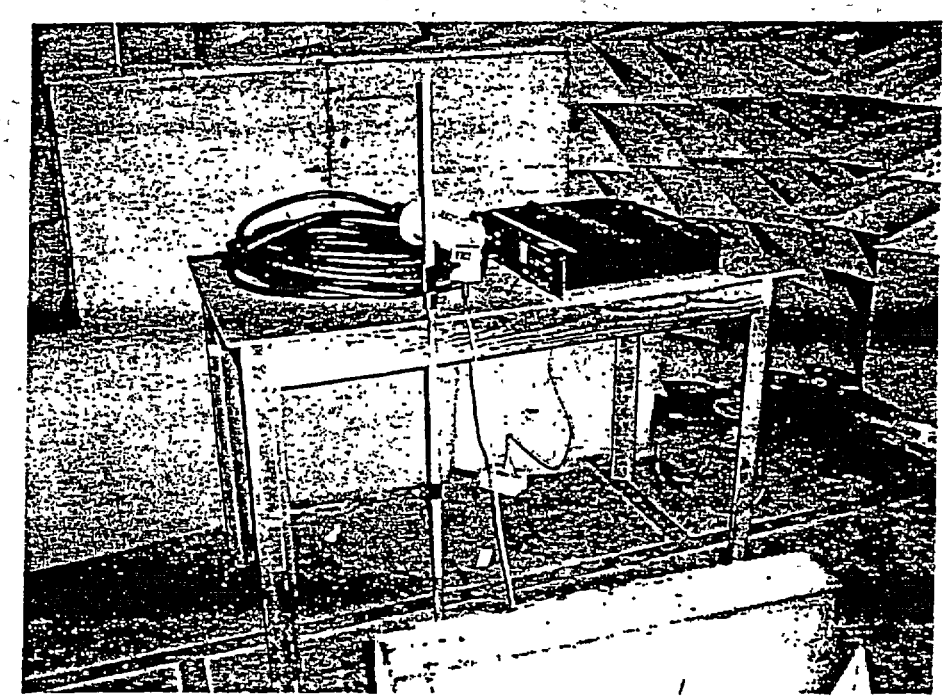
Report No.: CLE 033100-01 R1
Date: 12/13/00
Revision Date: 01/03/01

10.1 Radiated Immunity Test Data Sheet

Test Date:	9/26/00	**Test Engineer:**	Tony Masone
Standard:	IEC 801-3	**Performance Criteria:**	A

Side of EUT Exposed to Antenna	Antenna Polarization	Frequency Range	Minimum Calibrated RF Field Strength	Pass/Fail
Front	Horizontal	80 MHz to 1000 MHz	10.0 v/m	Pass
Right Side	Horizontal	80 MHz to 1000 MHz	10.0 v/m	Pass
Back	Horizontal	80 MHz to 1000 MHz	10.0 v/m	Pass
Left Side	Horizontal	80 MHz to 1000 MHz	10.0 v/m	Pass
Front	Vertical	80 MHz to 1000 MHz	10.0 v/m	Pass
Right Side	Vertical	80 MHz to 1000 MHz	10.0 v/m	Pass
Back	Vertical	80 MHz to 1000 MHz	10.0 v/m	Pass
Left Side	Vertical	80 MHz to 1000 MHz	10.0 v/m	Pass

10.2 Photograph of the Radiated Immunity Test Set-Up



11.0 Electrical Fast Transient/Burst Immunity Test

The Electrical Fast Transient Burst generator was used to conduct the tests outlined below. The waveform conforms to IEC 801-4. This generator was used to simulate RF energy coupled onto power and data cables from switches, relays, motors, and any other device that could produce a voltage "spike".

During the testing, the product was placed on a non-conductive table conforming to the dimensions of IEC 801-4. The set-up conformed to IEC 801-4, figure 7.

The transient energy (as defined in IEC 801-4) was coupled on the cables under test at various levels and polarities as defined by the standard. (Refer to the test page for the details of this test).

During the test, all data cables that may have a practical length greater than 3 meters, and all power mains cables were tested as outlined below.

Data Lines

The transient energy was coupled through a capacitive coupling clamp from the EFT generator to the data lines.

AC Mains

The transient energy was coupled through the EFT generator coupling/decoupling network to each conductor of the power mains cable with respect to ground.

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

Report No.: CLE 033100-01 R1
Date: 12/13/00
Revision Date: 01/03/01

11.1 EFT Immunity Test Data Sheet

Test Date:	9/26/00	**Test Engineer:**	Tony Masone
Standard:	IEC 801-4	**Air Temperature:**	20°C
Performance Criteria:	B	**Relative Humidity:**	52%

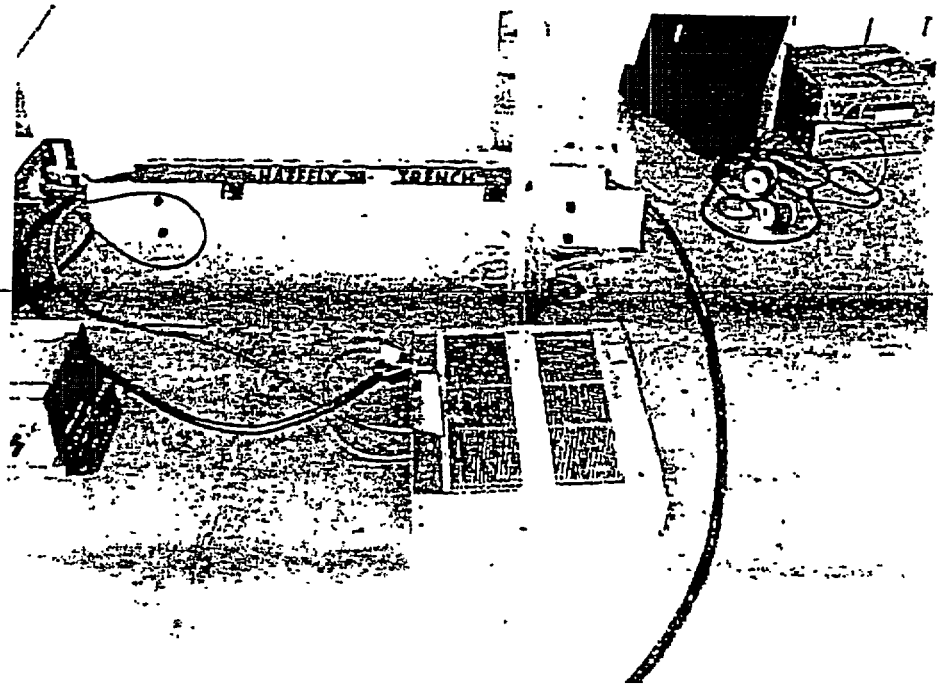
DATA LINES

Description of Data Line	Test Level	Polarity	Test duration	Pass/Fail
Signal Line	3.0 kV	+	1 minute	Pass
Signal Line	3.0 kV	-	1 minute	Pass

POWER LINES

Description of Power Line Conductor	Test Level	Polarity	Test duration	Pass/Fail
AC Power	3.0 kV	+	1 minute	Pass
AC Power	3.0 kV	-	1 minute	Pass

11.2 Photograph of the Electrical Fast Transient Immunity Test Set-Up



12.0 SURGE IMMUNITY TEST

12.1 Surge Immunity Test

The test was performed the unit as per IEC 801-5. The surge pulse duration from the combination wave generator was 1.2 x 50 µs voltage into an open circuit as high as 2kV and a 8 x 20 µs current pulse into a short circuit. Each pulse was injected 10 times in each polarity with a minimum of 60 second interval between each pulse. The unit set up was similar to the schematic shown in Figure 8 of IEC 801-5.

AC Mains

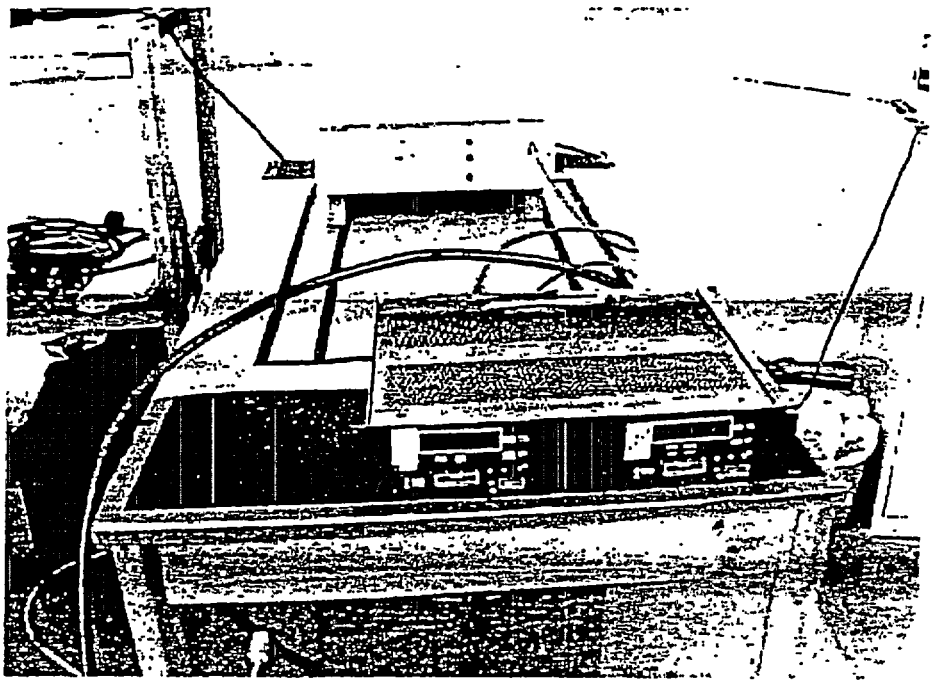
The AC Mains lines were coupled to the Surge/EFT generators coupling/decoupling network. Surges were applied to each AC line and protective earth in both common and differential mode injections.

12.2 Surge Immunity Test Data Sheet

Test Date:	9/26/00	**Test Engineer:**	Tony Masone
Standard:	IEC 801-5	**Performance Criteria:**	B

Cable Designation AC Port Testing	Level (kV)	Phase	Pass/Fail
Differential Mode Injection Tests			
Line 1 to Line 2	+3.0	0 - 360	Pass
Line 1 to Line 2	-3.0	0 - 360	Pass
Common Mode Injection Tests			
Line 1 to Earth	+3.0	0 - 360	Pass
Line 1 to Earth	-3.0	0 - 360	Pass
Line 2 to Earth	+3.0	0 - 360	Pass
Line 2 to Earth	-3.0	0 - 360	Pass

12.3 Photograph of Surge Immunity Test Set-Up



13.0 CONDUCTED IMMUNITY TEST PROCUDURE

13.1 Conducted Immunity Test

The Equipment Under Test (EUT) was placed in a fully anechoic chamber 10 cm above a GRP. A coupling/decoupling network was connected to the EUT's power cord and was used to couple RF energy onto all lines of the power to the EUT. A bulk current injection (BCI) was used to couple RF energy onto all data, control and I/O lines that may exceed 3 meters in length.

The RF energy consisted of a signal that was stepped at 1% increments through the frequency range of 150 KHz to 80 MHz at a rate slower than the reaction time of the EUT. The signal was 80% AM modulated with a 1 KHz sine wave and had a minimum calibrated level of 3.0 Volts.

The test set up conformed to figure 2 of IEC 801-6.

13.2 Conducted Immunity Test Data Sheet

Test Date:	9/26/00	**Test Engineer:**	Tony Masone
Standard:	IEC 801-6, MIL-STD 461D, CS 101	**Performance Criteria:**	A

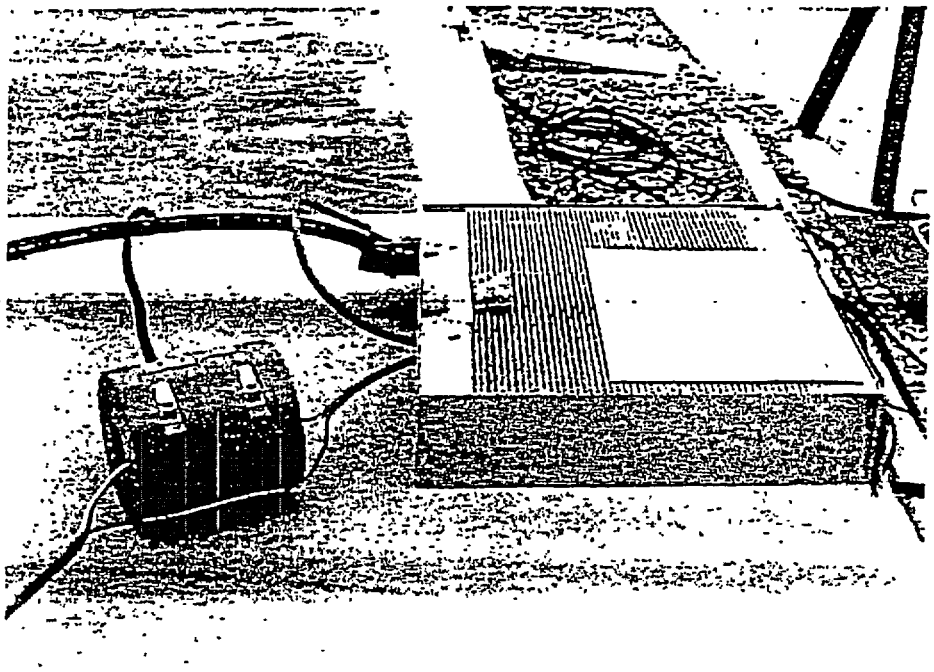
Line Tested	Frequency Range	Minimum Calibrated RF Level	Pass/Fail
AC Power lines	150 KHz to 80 MHz	6.3 Vrms	Pass
Signal Line	150 KHz to 80 MHz	6.3 Vrms	Pass

Line Tested	Frequency Range	Minimum Calibrated RF Level	Pass/Fail
AC Power lines	30 Hz to 50 kHz	136 dBµV	Pass

Client: Inovision Radiation Measurements, LLC
Model: 956A-201

Report No.: CLE 033100-01 R1
Date: 12/13/00
Revision Date: 01/03/01

13.3 Photograph of the Conducted Immunity Test Set-Up



14.0 ELECTROMAGNETIC IMMUNITY CONCLUSION

The Digital Rate Meter, model 956A-201, Detector 897A-210 and Cable Assembly (consisting of 75 feet of 50-100 composite cable terminated at both ends) complied with all of the requirements of the IEC 801-2, IEC-3, IEC 801-4, IEC 801-5, IEC 801-6, and MIL-STD-461D, CS 101.

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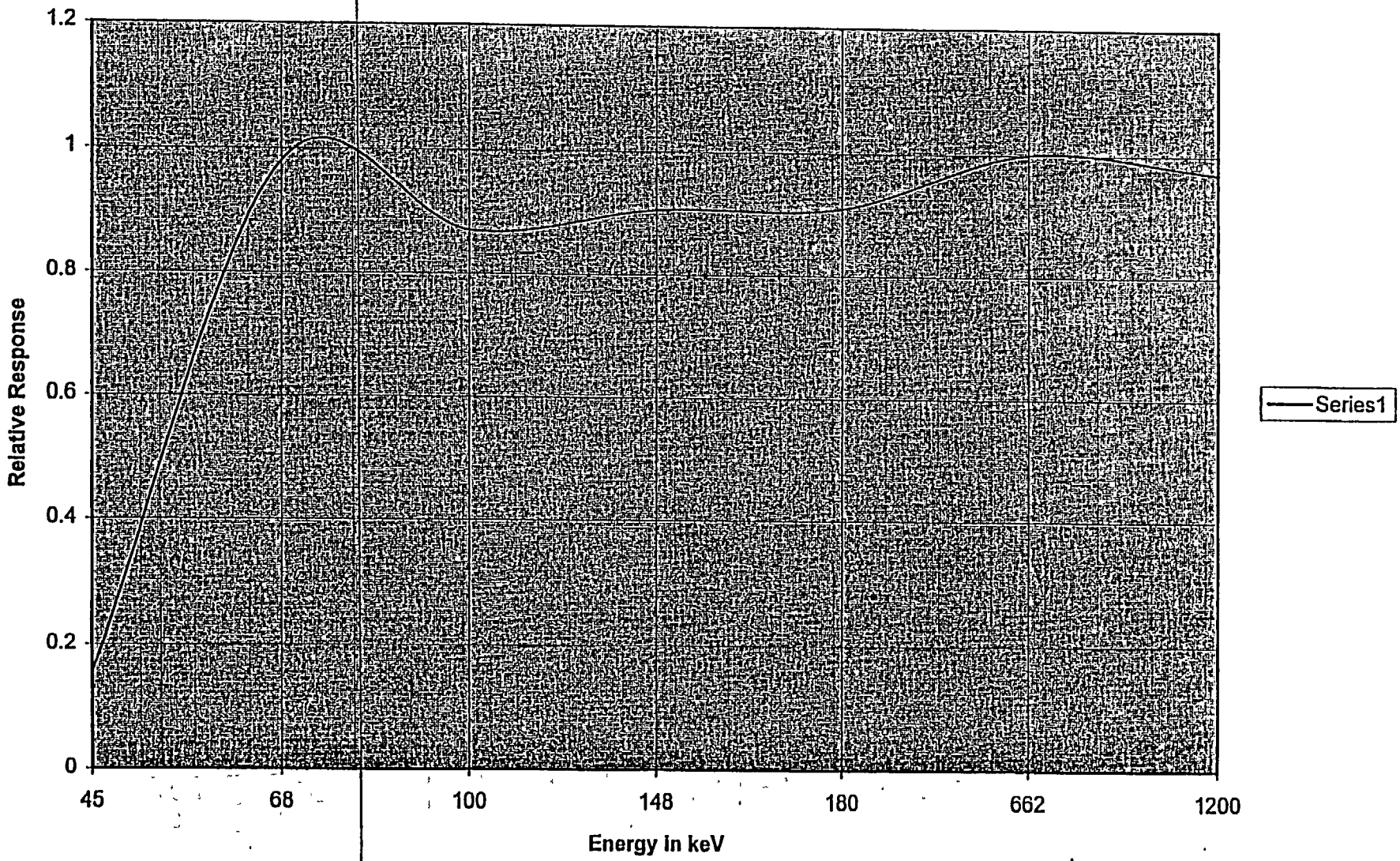
897Asn131grph

Energy Response : 897A-210 Serial Number 131



Date:	9/21/00									
	HVL	nC	857 Reading (mR/hr)	kV	mA	Time (min)	Dist. (cm)	R/TC	mR/hr	% Error
H60	6	2.852	14.1	60	5	1.5	300	1.750E-03	199.64	-92.94%
		2.851	14.2	60	5	1.5	300	1.750E-03	199.57	-92.88%
H100	13.5	0.9388	41	100	3	1.5	300	1.200E-03	45.0624	-9.02%
		0.9342	41	100	3	1.5	300	1.200E-03	44.8416	-8.57%
H150	17	5.735	225	150	3	1.5	300	1.160E-03	266.1346197	-15.46%
		5.721	226	150	3	1.5	300	1.160E-03	265.484945	-14.87%
H200	19.8	3.903	195	200	3	1.5	300	1.356E-03	211.69872	-7.89%
		3.902	195	200	3	1.5	300	1.356E-03	211.64448	-7.86%
H250	22	5.86	291	250	3	1.5	300	1.259E-03	295.1096	-1.39%
		5.877	291	250	3	1.5	300	1.259E-03	295.96572	-1.68%

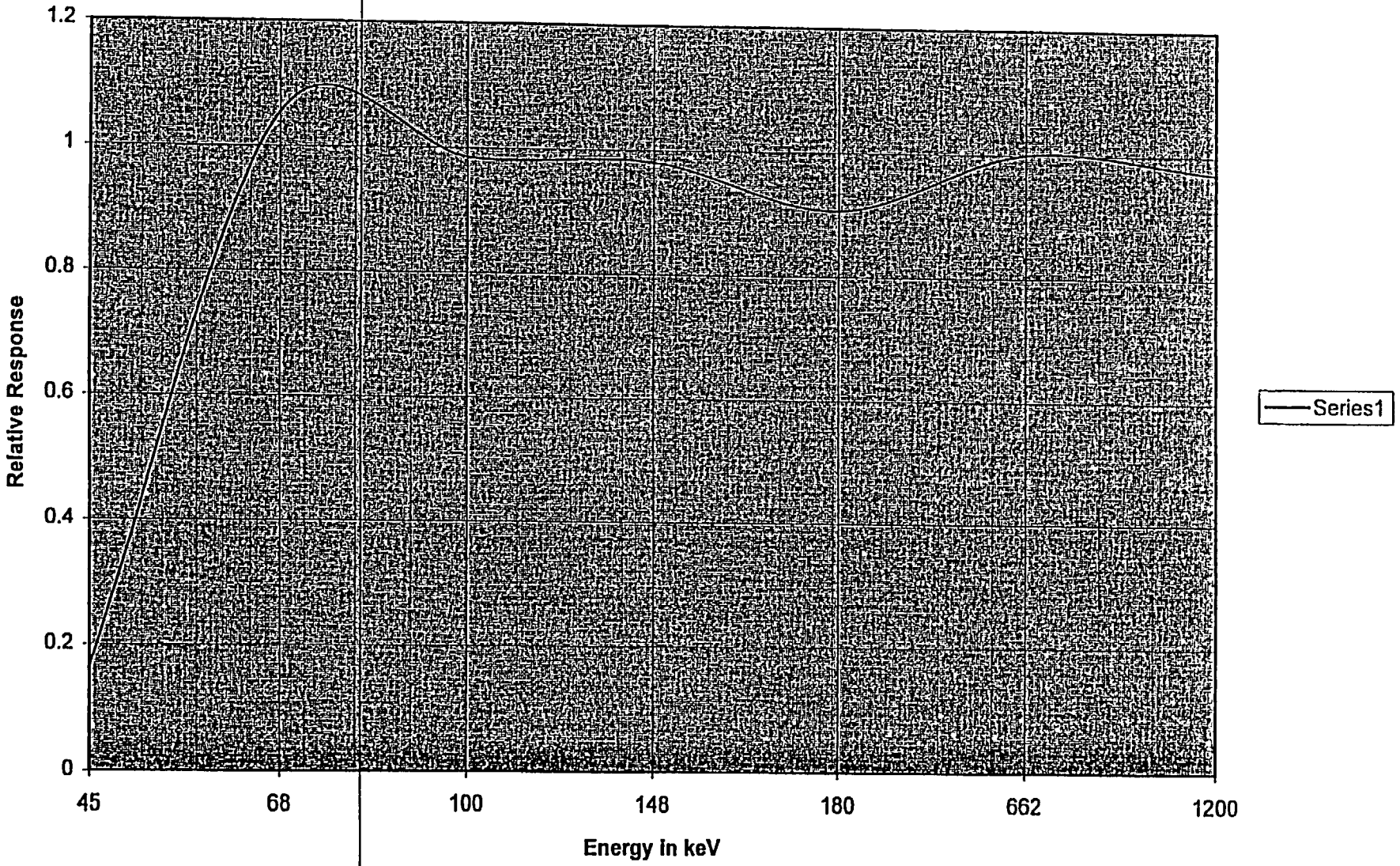
Energy	Relative Response
68	0.91
100	0.85
148	0.92
180	0.98
662	1
1200	0.99

Through Side

Date:	9/21/00								
	nC	897 Reading (mR/hr)	kV	mA	Time (min)	Dist. (cm)	R/TC	mR/hr	% Error
H60	2.82	29	60	5	1.5	300	1.750E-03	197.4	-85.31%
	2.835	29	60	5	1.5	300	1.750E-03	198.45	-85.39%
H100	0.9301	46.9	100	3	1.5	300	1.200E-03	44.6448	5.05%
	0.9409	47.4	100	3	1.5	300	1.200E-03	45.1632	4.95%
H150	5.844	242	150	3	1.5	300	1.160E-03	271.1928017	-10.76%
	5.847	242	150	3	1.5	300	1.160E-03	271.3320177	-10.81%
H200	3.856	186	200	3	1.5	300	1.356E-03	209.14944	-11.07%
	3.852	186	200	3	1.5	300	1.356E-03	208.93248	-10.98%
H250	6.224	263	250	3	1.5	300	1.259E-03	313.44064	-16.09%
	6.221	263	250	3	1.5	300	1.259E-03	313.28956	-16.05%

Energy	Relative Response
45	0.15
68	1.05
100	0.89
148	0.89
180	0.84
662	1
1200	0.95

Energy Response : 897A-210 Serial Number 132



Date:		9/21/00								
	HVL	nC	857 Reading (mR/hr)	kV	mA	Time (min)	Dist. (cm)	R/TC	mR/hr	% Error
H60	6	4.692	59.1	60	5	1.5	300	1.750E-03	328.44	-82.01%
		4.716	59.3	60	5	1.5	300	1.750E-03	330.12	-82.04%
H100	13.5	1.62	90.2	100	3	1.5	300	1.200E-03	77.76	16.00%
		1.5903	88.9	100	3	1.5	300	1.200E-03	76.3344	16.46%
H150	17	5.933	287	150	3	1.5	300	1.160E-03	275.3228769	4.24%
		5.96	287	150	3	1.5	300	1.160E-03	276.575821	3.77%
H200	19.8	3.863	220	200	3	1.5	300	1.356E-03	209.52912	5.00%
		3.84	219	200	3	1.5	300	1.356E-03	208.2816	5.15%
H250	22	6.435	322	250	3	1.5	300	1.259E-03	324.0666	-0.64%
		6.44	324	250	3	1.5	300	1.259E-03	324.3184	-0.10%

		Energy	Relative Response
		45	0.18
		68	1.16
		100	1.04
		148	1.05
		180	1.00
		662	1
		1200	0.984375

Through Side

Date:	9/21/00									
	HVL	nC	857 Reading (mR/hr)	kV	mA	Time (min)	Dist. (cm)	R/TC	mR/hr	% Error
H60	6	1.9015	20.5	60	5	1.5	300	1.750E-03	133.105	-84.60%
		1.91	20.5	60	5	1.5	300	1.750E-03	133.7	-84 67%
H100	13.5	0.7098	32.5	100	3	1.5	300	1.200E-03	34.0704	-4.61%
		0.7095	32.5	100	3	1.5	300	1.200E-03	34.056	-4.57%
H150	17	3.979	172	150	3	1.5	300	1.160E-03	184.6468443	-6.85%
		3.985	172	150	3	1.5	300	1.160E-03	184.9252763	-6.99%
H200	19.8	3.733	185	200	3	1.5	300	1.356E-03	202.47792	-8.63%
		3.7354	185	200	3	1.5	300	1.356E-03	202.608096	-8.69%
H250	22	6.378	259	250	3	1.5	300	1.259E-03	321.19608	-19.36%
		6.344	258	250	3	1.5	300	1.259E-03	319.48384	-19.24%
Co-60										
		Energy	Relative Response							
		45	0.15							
		68	0.95							
		100	0.93							
		148	0.91							
		180	0.81							
		662	1							
		1200	0.96484375							

INOVISION

Radiation Measurements

6045 Cochran Road
Cleveland OH 44139
Phone: 440 248-9300
FAX: 440-349-2307
www.inovision.com

TITLE: GM Detector Calibration for Area Monitoring Systems
DOCUMENT: CAL-GM6 REV. A ATTACHMENT A

897A-X1X DETECTOR DATA SHEET

Customer Rochester Gas & Electric P.O. # 4500008671

Project N/A S.O. # 157033 W.O. # N/A

Detector Model # 897A-210 Serial # 131 Tag # N/A

Readout Model # 956A-201 Serial # 117 Cal Date 10-Jan-01

6.3 Detector Discriminator N/A volts (897 ONLY)

6.5 Anti-Jam Duty Cycle Verification Pass (Pass/Fail)

TRI SOURCE CALIBRATION INFORMATION (20 Ci Cs-137)

Intensity (mR/h)	Position & No. Of Attenuaters	Count Time (sec)	Accumulated Counts	Gross Counts (cpm)	Net Count Rate (cpm)
BACKGROUND	200 cm & 6 Attn's	3.00E+02	8.30E+01	1.66E+01	N / A
1.04	200 cm & 6 Attn's	2.40E+02	1.15E+03	2.87E+02	271
3.21	250 cm & 5 Attn's	2.40E+02	3.29E+03	8.23E+02	806
9.56	200 cm & 4 Attn's	2.40E+02	9.85E+03	2.46E+03	2446
30.3	250 cm & 3 Attn's	1.20E+02	1.50E+04	7.50E+03	7483
91.6	200 cm & 2 Attn's	1.20E+02	4.38E+04	2.19E+04	21883
303	250 cm & 1 Attn's	1.20E+02	1.31E+05	6.55E+04	65483
971	200 cm & 0 Attn's	1.20E+02	3.66E+05	1.83E+05	182983
3107	300 cm & 2 Attn's	6.00E+01	Anti Jam	2.59E+06	N / A

6.10 Check Source Response 89.30 mR/h

Conversion Constant 3.98E-03

Dead Time Correction 1.43E-06

Conducted By [signature]

Q.A. Review By [signature]

Cal Date 01-Mar-01

Date 4/18/01

INOVISION
Radiation Measurements

6045 Cochran Road
Cleveland OH 44139
Phone: 440 248-9300
FAX: 440-349-2307
www.inovision.com

DETECTOR CURVE FIT PROGRAM - GM AREA MONITORS
94085701 Rev B

Model number is 897A-210
Serial number is 131

DATA FROM CALIBRATION RANGE

Field mR/hr	CPM	Calc field	% Deviation
1.04	271	1.07817	3.66997
3.21	806	3.20911	-0.0276075
9.56	2446	9.76178	2.1107
30.3	7483	30.0818	-0.720002
91.6	21883	89.8434	-1.91764
303	65483	287.377	-5.15603
971	182983	986.203	1.56567

CC1 = 0.00397693
TAU = 1.43242e-006
Root sum of the squares of the deviation is 7.15236

Background CPM: 17
Date Calibrated: 3/1/01
Calibrated by: Bruce Mahood
Customer: Rochester Gas & Electric
Sales order number: 157033
Customer tag number: N/A

INOVISION

Radiation Measurements

6045 Cochran Road
Cleveland OH 44139
Phone: 440 248-9300
FAX: 440-349-2307
www.inovision.com

TITLE: GM Detector Calibration for Area Monitoring Systems
DOCUMENT: CAL-GM6 REV. A ATTACHMENT A

897A-X1X DETECTOR DATA SHEET

Customer Rochester Gas & Electric P.O. # 4500008671

Project N/A S.O. # 157033 W.O. # N/A

Detector Model # 897A-210 Serial # 132 Tag # N/A

Readout Model # 956A-201 Serial # 117 Cal Date 10-Jan-01

6.3 Detector Discriminator N/A volts (897 ONLY)

6.5 Anti-Jam Duty Cycle Verification Pass (Pass/Fail)

TRI SOURCE CALIBRATION INFORMATION (20 Ci Cs-137)

Intensity (mR/h)	Position & No. Of Attenuaters	Count Time (sec)	Accumulated Counts	Gross Counts (cpm)	Net Count Rate (cpm)
BACKGROUND	200 cm & 6 Attn's	3.00E+02	9.30E+01	1.86E+01	N / A
1.04	200 cm & 6 Attn's	2.40E+02	1.21E+03	3.02E+02	284
3.21	250 cm & 5 Attn's	2.40E+02	3.60E+03	9.00E+02	881
9.56	200 cm & 4 Attn's	2.40E+02	1.07E+04	2.68E+03	2656
30.3	250 cm & 3 Attn's	1.20E+02	1.65E+04	8.25E+03	8231
91.6	200 cm & 2 Attn's	1.20E+02	4.79E+04	2.40E+04	23931
303	250 cm & 1 Attn's	1.20E+02	1.44E+05	7.20E+04	71981
971	200 cm & 0 Attn's	1.20E+02	4.01E+05	2.01E+05	200481
3107	300 cm & 2 Attn's	6.00E+01	Anti Jam	2.60E+06	N / A

6.10 Check Source Response 81.40 mR/h

Conversion Constant 3.67E-03 Dead Time Correction 1.26E-06

Conducted By W Mulord Q.A. Review By

Cal Date 01-Mar-01 Date 4/18/01

INOVISION

Radiation Measurements

6045 Cochran Road
Cleveland OH 44139
Phone: 440 248-9300
FAX: 440-349-2307
www.inovision.com

DETECTOR CURVE FIT PROGRAM - GM AREA MONITORS
94085701 Rev B

Model number is 897A-210
Serial number is 132

DATA FROM CALIBRATION RANGE

Field mR/hr	CPM	Calc field	% Deviation
1.04	284	1.04201	0.19305
3.21	881	3.23485	0.774222
9.56	2656	9.77411	2.23966
30.3	8231	30.5046	0.675126
91.6	23931	90.4933	-1.20814
303	71981	290.257	-4.20564
971	200481	982.883	1.22378

CC1 = 0.00366773
TAU = 1.2564e-006
Root sum of the squares of the deviation is 5.17235

Background CPM: 19
Date Calibrated: 3/1/01
Calibrated by: Bruce Mahood
Customer: Rochester Gas & Electric
Sales order number: 157033
Customer tag number: N/A

INOVISION

Radiation Measurements

6045 Cochran Road
Cleveland OH 44139
Phone: 440 248-9300
FAX: 440-349-2307
www.inovision.com

TITLE: GM Detector Calibration for Area Monitoring Systems
DOCUMENT: CAL-GM6 REV. A ATTACHMENT A

897A-X1X DETECTOR DATA SHEET

Customer Rochester Gas & Electric P.O. # 4500008671

Project N/A S.O. # 157033 W.O. # N/A

Detector Model # 897A-210 Serial # 100762 Tag # N/A

Readout Model # 956A-201 Serial # 117 Cal Date 10-Jan-01

6.3 Detector Discriminator N/A volts (897 ONLY)

6.5 Anti-Jam Duty Cycle Verification Pass (Pass/Fail)

Intensity (mR/h)	Position & No. Of Attenuaters	Count Time (sec)	Accumulated Counts	Gross Counts (cpm)	Net Count Rate (cpm)
TRI SOURCE CALIBRATION INFORMATION (20 Ci Cs-137)					
BACKGROUND	200 cm & 6 Attn's	3.00E+02	8.10E+01	1.62E+01	N / A
1.04	200 cm & 6 Attn's	2.40E+02	1.15E+03	2.87E+02	271
3.21	250 cm & 5 Attn's	2.40E+02	3.40E+03	8.50E+02	834
9.56	200 cm & 4 Attn's	2.40E+02	1.01E+04	2.53E+03	2509
30.3	250 cm & 3 Attn's	1.20E+02	1.56E+04	7.80E+03	7784
91.6	200 cm & 2 Attn's	1.20E+02	4.54E+04	2.27E+04	22684
303	250 cm & 1 Attn's	1.20E+02	1.36E+05	6.80E+04	67984
971	200 cm & 0 Attn's	1.20E+02	3.76E+05	1.88E+05	187984
3107	300 cm & 2 Attn's	6.00E+01	Anti Jam	2.60E+06	N / A

6.10 Check Source Response 43.40 mR/h

Conversion Constant 3.87E-03 Dead Time Correction 1.38E-06

Conducted By [signature] Q.A. Review By [signature]

Cal Date 02-Mar-01 Date 2/15/01

INOVISION

Radiation Measurements

6045 Cochran Road
Cleveland OH 44139
Phone: 440 248-9300
FAX: 440-349-2307
www.inovision.com

DETECTOR CURVE FIT PROGRAM - GM AREA MONITORS
94085701 Rev B

Model number is 897A-210
Serial number is 100762

DATA FROM CALIBRATION RANGE

Field mR/hr	CPM	Calc field	% Deviation
1.04	271	1.04907	0.872394
3.21	834	3.23103	0.655042
9.56	2509	9.74278	1.91191
30.3	7784	30.4491	0.491939
91.6	22684	90.6205	-1.06931
303	67984	290.356	-4.17282
971	187984	982.757	1.2108

CC1 = 0.00386967
TAU = 1.38204e-006
Root sum of the squares of the deviation is 5.01093

Background CPM: 16
Date Calibrated: 3/2/01
Calibrated by: Bruce Mahood
Customer: Rochester Gas & Electric
Sales order number: 157033
Customer tag number: N/A

Plateau Data

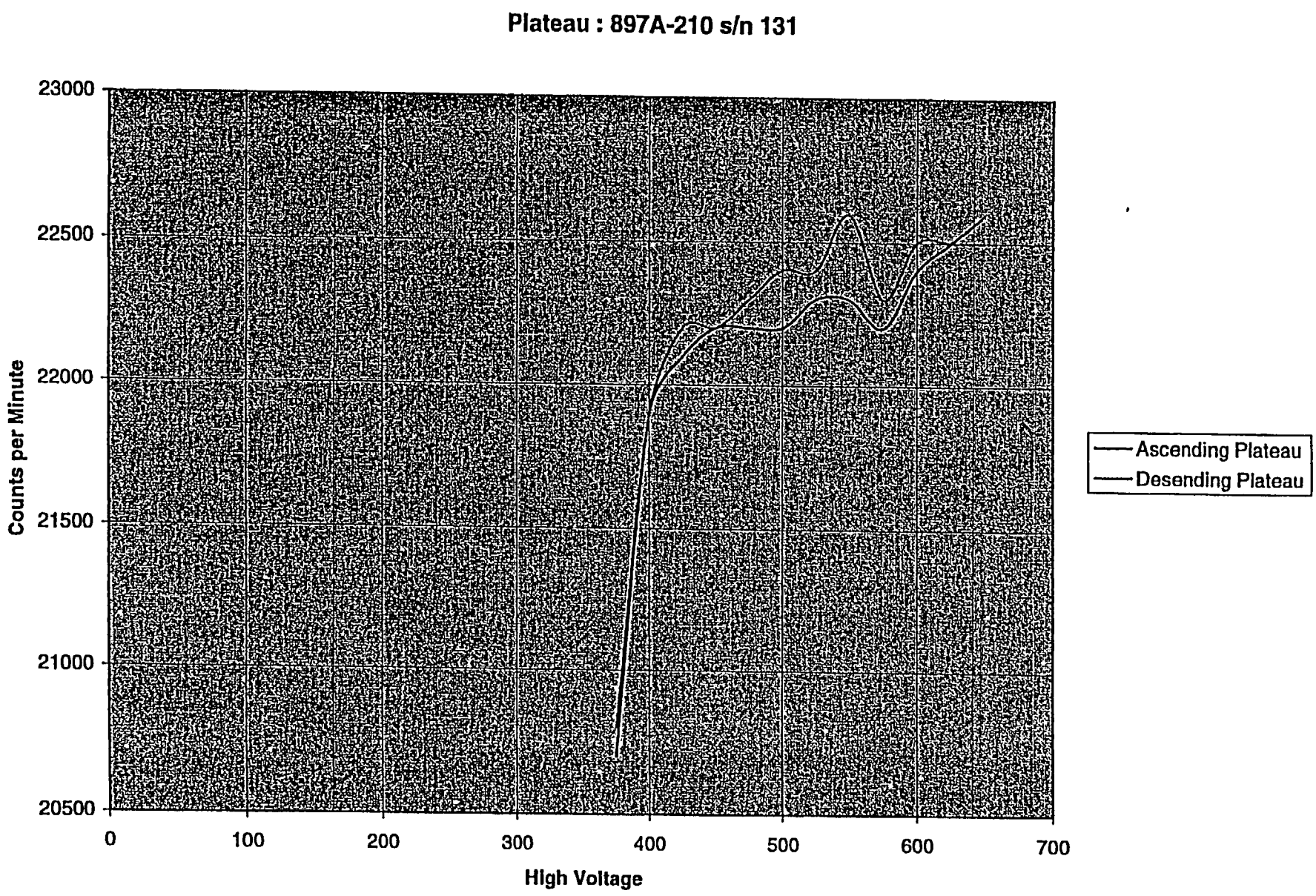
897A-210 Serial Number 131

Ascending Plateau				Desending Plateau			
time	H.V.	counts	CPM	time	H.V.	counts	CPM
9:49	375	4.13E+04	2.07E+04	10:26	650	4.50E+04	2.25E+04
9:52	400	4.37E+04	2.19E+04	10:29	625	4.50E+04	2.25E+04
9:55	425	4.42E+04	2.21E+04	10:32	600	4.50E+04	2.25E+04
9:58	450	4.44E+04	2.22E+04	10:36	575	4.46E+04	2.23E+04
10:01	475	4.44E+04	2.22E+04	10:45	550	4.51E+04	2.26E+04
10:05	500	4.43E+04	2.22E+04	10:48	525	4.47E+04	2.24E+04
10:07	525	4.46E+04	2.23E+04	10:51	500	4.47E+04	2.24E+04
10:10	550	4.46E+04	2.23E+04	10:54	475	4.46E+04	2.23E+04
10:13	575	4.44E+04	2.22E+04	10:57	450	4.43E+04	2.22E+04
10:16	600	4.48E+04	2.24E+04	11:01	425	4.43E+04	2.22E+04
10:18	625	4.50E+04	2.25E+04	11:04	400	4.37E+04	2.19E+04
10:20	650	4.52E+04	2.26E+04	11:07	375	4.15E+04	2.08E+04

All counts taken with the detector's operational check source activated.

Nominal Check Source response is 88 mR/h

Performed by D. Wu Date 02/09/01


Plateau : 897A-210 s/n 131
23000
22500
22000
21500
21000
20500
Counts per Minute
0
100
200
300
400
500
600
700
High Voltage
Ascending Plateau
Desending Plateau

Plateau Data

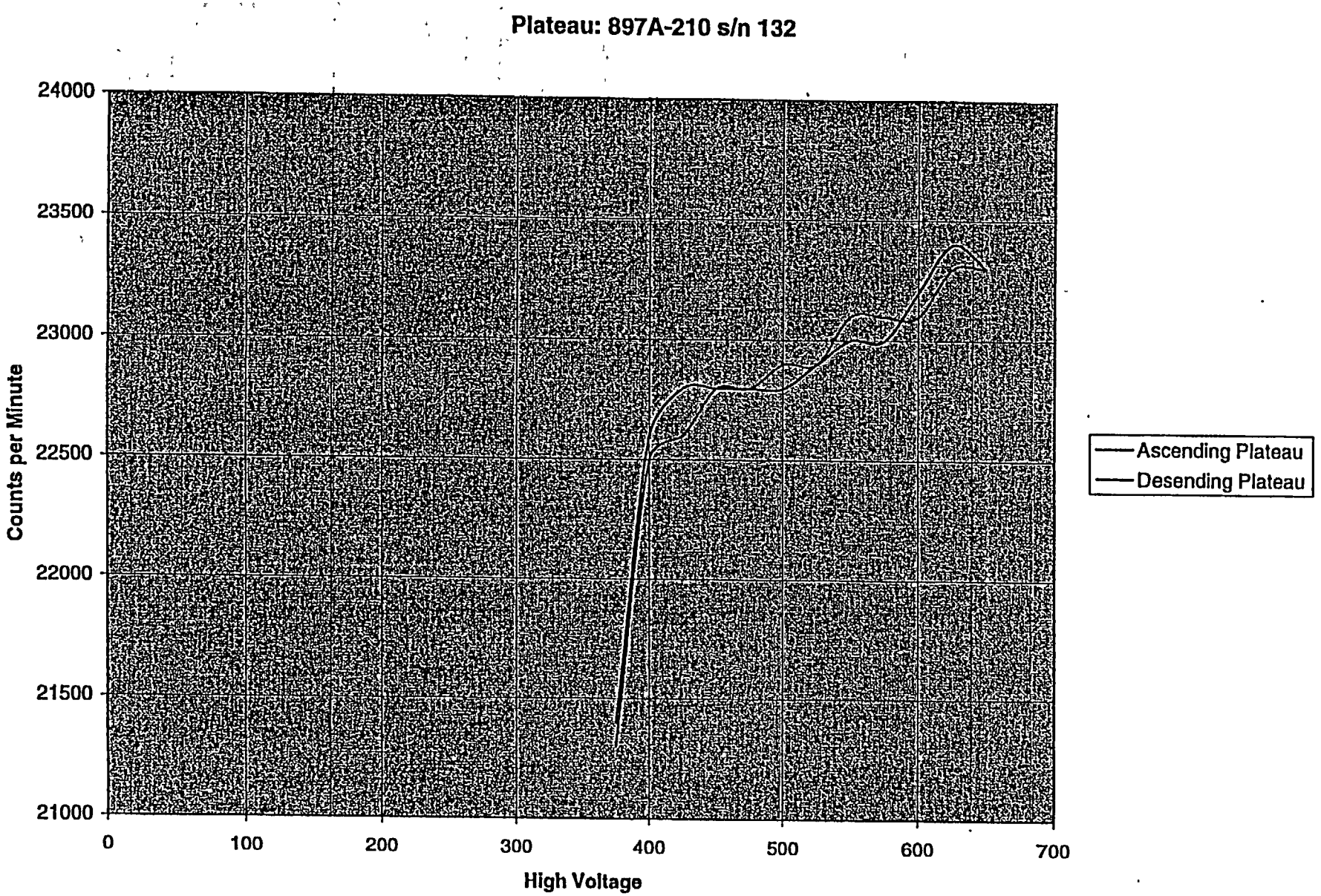
897A-210 Serial Number 132

Ascending Plateau				Desending Plateau			
time	H.V.	counts	CPM	time	H.V.	counts	CPM
13:14	375	4.28E+04	2.14E+04	13:51	650	4.66E+04	2.33E+04
13:17	400	4.51E+04	2.26E+04	13:54	625	4.65E+04	2.33E+04
13:20	425	4.55E+04	2.28E+04	13:56	600	4.61E+04	2.31E+04
13:23	450	4.56E+04	2.28E+04	13:59	575	4.61E+04	2.31E+04
13:26	475	4.56E+04	2.28E+04	14:01	550	4.62E+04	2.31E+04
13:30	500	4.56E+04	2.28E+04	14:04	525	4.58E+04	2.29E+04
13:33	525	4.58E+04	2.29E+04	14:07	500	4.57E+04	2.29E+04
13:35	550	4.60E+04	2.30E+04	14:10	475	4.55E+04	2.28E+04
13:40	575	4.60E+04	2.30E+04	14:12	450	4.56E+04	2.28E+04
13:43	600	4.64E+04	2.32E+04	14:14	425	4.52E+04	2.26E+04
13:46	625	4.67E+04	2.34E+04	14:17	400	4.50E+04	2.25E+04
13:49	650	4.65E+04	2.33E+04	14:19	375	4.26E+04	2.13E+04

All counts taken with the detector's operational check source activated.

Nominal Check Source response is 84 mR/h

Performed by _____ Date 02/09/01


Plateau: 897A-210 s/n 132
24000
23500
23000
22500
22000
21500
21000
Counts per Minute
0
100
200
300
400
500
600
700
High Voltage
Ascending Plateau
Desending Plateau

Plateau Data

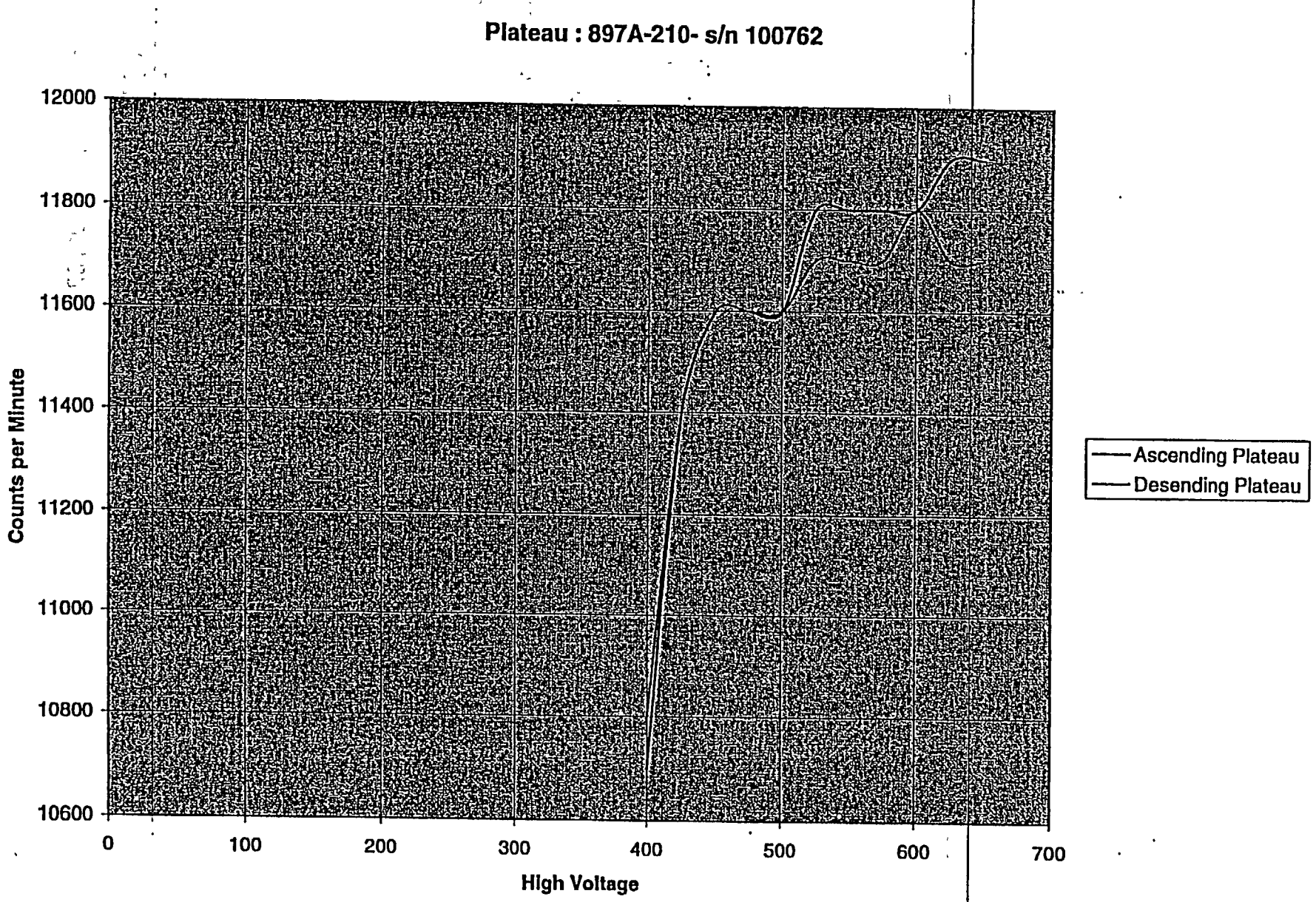
897A-210 Serial Number 100762

Ascending Plateau				Desending Plateau			
time	H.V.	counts	CPM	time	H.V.	counts	CPM
12:56	375	0.00E+00	0.00E+00	13:48	650	2.34E+04	1.17E+04
12:58	400	2.14E+04	1.07E+04	13:50	625	2.34E+04	1.17E+04
13:02	425	2.28E+04	1.14E+04	13:56	600	2.35E+04	1.18E+04
13:05	450	2.32E+04	1.16E+04	13:59	575	2.33E+04	1.17E+04
13:12	475	2.31E+04	1.16E+04	14:01	550	2.33E+04	1.17E+04
13:16	500	2.32E+04	1.16E+04	14:04	525	2.33E+04	1.17E+04
13:19	525	2.35E+04	1.18E+04	14:06	500	2.31E+04	1.16E+04
13:24	550	2.35E+04	1.18E+04	14:09	475	2.32E+04	1.16E+04
13:37	575	2.35E+04	1.18E+04	14:12	450	2.31E+04	1.16E+04
13:40	600	2.35E+04	1.18E+04	14:15	425	2.27E+04	1.14E+04
13:43	625	2.37E+04	1.19E+04	14:17	400	2.16E+04	1.08E+04
13:46	650	2.37E+04	1.19E+04	14:20	375	0.00E+00	0.00E+00

All counts taken with the detector's operational check source activated.

Nominal Check Source response is 45 mR/h

Performed by _____ Date 3/5/01


Plateau : 897A-210- s/n 100762
12000
11800
11600
11400
11200
11000
10800
10600
Counts per Minute
0
100
200
300
400
500
600
700
High Voltage
Ascending Plateau
Desending Plateau

Repeated Count Rate Data

897A-210 Serial Number 131

time	counts	CPM
9:05	4.45E+04	2.23E+04
9:08	4.43E+04	2.22E+04
9:10	4.42E+04	2.21E+04
9:12	4.43E+04	2.22E+04
9:15	4.45E+04	2.23E+04
9:26	4.44E+04	2.22E+04
9:30	4.44E+04	2.22E+04
9:33	4.46E+04	2.23E+04
9:42	4.44E+04	2.22E+04
9:45	4.45E+04	2.23E+04

All data taken at 575 VDC operating voltage

All data taken using detector's operational check source

Performed by D. Wm Date 2-9-01

Repeated Count Rate Data

897A-210 Serial Number 132

time	counts	CPM
11:14	4.66E+04	2.33E+04
11:17	4.67E+04	2.34E+04
11:20	4.63E+04	2.32E+04
11:23	4.67E+04	2.34E+04
11:27	4.66E+04	2.33E+04
11:32	4.66E+04	2.33E+04
11:35	4.63E+04	2.32E+04
11:38	4.63E+04	2.32E+04
11:40	4.67E+04	2.34E+04
11:43	4.66E+04	2.33E+04

All data taken at 575 VDC operating voltage

All data taken using detector's operational check source

Performed by D. Wm Date 2-9-01

Repeated Count Rate Data

897A-210 Serial Number 100762

time	counts	CPM
10:12	2.31E+04	1.16E+04
10:14	2.33E+04	1.17E+04
10:18	2.31E+04	1.16E+04
10:38	2.33E+04	1.17E+04
11:09	2.31E+04	1.16E+04
11:12	2.31E+04	1.16E+04
11:14	2.32E+04	1.16E+04
11:16	2.31E+04	1.16E+04
11:24	2.31E+04	1.16E+04
11:27	2.31E+04	1.16E+04

All data taken at 575 VDC operating voltage

All data taken using detector's operational check source

Performed by _____ Date 3/5/01

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Attachment 2

DA-EE-2001-009 Electrical Factors Analysis for PCR 99-004
(FMEA for CREATS Actuation Instrumentation)

D0960977

Design Analysis

Ginna Station

PCR 99-004 Electrical Factors Analysis

Rochester Gas & Electric Corporation

89 East Avenue

Rochester, New York 14649

DA-EE-2001- 009

Revision 2

5/2/02

Effective Date

Prepared By: Paul M Swift — **Design Engineer** — 5/1/02 **Date**

Reviewed By: Karen Cora — **Reviewer** — 5/1/02 **Date**

Revision Status Sheet

Revision Number	Affected Sections	Description of Revision
0	All	Original.
1	Throughout	Incorporate design changes, such as isolator addition, fuse addition, wire size changes. Additional technical detail added for single failure analysis, separation, and isolation.
2	Throughout	Incorporate design changes for PCR Revision 1.

1.0 Purpose

1.1 The purpose of this analysis is to demonstrate that electrical factors associated with the construction of PCR 99-004 meet the requirements for electrical design for Ginna Station and Generic Design Criteria Ref. 3.2. The following sections list the factors that will be analyzed in this document. PCR 99-004 Revision 1 changes are incorporated.

1.1.1 All circuits, existing and new, that are impacted by this design will be analyzed to show appropriate cable properties, including sizing, shielding, grounding, and insulation. (See Section 7.1)

1.1.2 Cable separation and isolation between Class 1E and non-Class 1E equipment will be shown to be appropriate for the related equipment. (See Section 7.2)

1.1.3 Conduit sizes will be shown to be adequate to meet the cable fill requirement specifications. (See Section 7.3)

1.1.4 The selection of relays to be used will be shown to have the proper electrical parameters, including coil voltage rating, contact voltage and current ratings, and adequate amount of contacts. (See Section 7.4)

1.1.5 Switches selected for use will be shown to have appropriate contact configuration and ratings for the applications. (See Section 7.5)

1.1.6 The instrumentation will be shown to have appropriate ratings for input and output parameters, including operating voltage, output contact ratings, and signal outputs. (See Section 7.6)

1.1.7 Overcurrent protection will be analyzed to show proper fusing and coordination with other protective devices. (See Section 7.7)

1.1.8 Panel loading will be evaluated to demonstrate that no load ratings will be exceeded, and any impact on the loading of upstream supplies is addressed. (See Section 7.8)

1.1.9 The design will be reviewed to ensure that there are no adverse effects from electrical noise on the performance of the equipment, including surge suppression requirements for relay coils. (See Section 7.9)

1.1.10 The control logic for the design will be reviewed to ensure that it fails in the safe position for postulated power failures. (See Section 7.10)

1.1.11 The electrical design will be reviewed to demonstrate that no single failure can cause the loss of both trains of isolation logic or prevent the system from isolating. (See Section 7.11)

2.0 Conclusions

2.1 The design and all electrical components specified in the design of the modification for PCR 99-004 Revision 0 with associated MDCNs, and Revision 1, are adequate and appropriate, consistent with design requirements for the electrical factors described in Section 1.0 of this analysis.

3.0 Design Inputs

3.1 PCR 99-004 Revision 1 and associated attachments, including circuit schedules issued for construction and Bill of Material.

3.2 Generic Design Criteria, Electrical/I&C Plant Changes, EWR 10275, Rev. 0.

4.0 Referenced Documents

4.1 Drawings

RG&E Drawings:

Drawing #	Sheet
SK21946-0546SH1	-1
SK21946-0546SH2	-1
SK33013-2784	-1
SK33013-1618SH1	-2
SK33013-2004	-1
SK33013-1860	-4

4.2 Circuit Schedules

C.S. #	C.S. #
R4522	R4523
C5529	C5530
C5545	C5551
C5552	AU0235
AU0235A	AU0235B
AU0239	AU0239A
AU0239B	C3505
	C2621

4.3 Codes And Standards

4.3.1 Ginna Station Updated Final Safety Analysis Report (UFSAR).

4.3.2 IEEE 141-1986, "Recommended Practice for Electric Power Distribution for Industrial Plants".

4.3.3 IEEE 384-1981, "Standard Criteria for Independence of Class 1E Equipment and Circuits".

4.3.4 IEEE 446-1980, "Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications".

4.3.5 IEEE 946-1985, "IEEE Recommended Practice for the Design of Safety-Related DC Auxiliary Power Systems for Nuclear Power Generating Stations".

4.4 Equipment Information

4.4.1 Vendor Manual, VTD-A4057-4001, Analytical Technology, Inc. vendor literature, publication SS-B14RC, (1/97), and O&M manuals Series B-14 Monitor System Rev. R, and UniSens Rev. G.

4.4.2 Vendor Manual, VTD-I2677- 4101 and VTD-V0115-4101 , Inovision (Victoreen), Model 956A-201 series Ratemeter and Model 897A series GM Detector.

4.4.3 Cutler-Hammer Quick Selector Catalog 25-000, Type BF and BFD Relays, July 1995.

4.4.4 Square D, Type KA-1, Class 9001 Auxiliary contacts for SE with Type K push-button switches.

4.4.5 Brand-Rex Industrial Wire and Cable, publication PC-8101.

4.4.6 Buss Fuses, Full-Line Condensed Catalog FLC, January, 1989.

4.4.7 OT2 Switches, Westinghouse Electric Catalog, 25-000, March 1977.

4.4.8 WESCO Lamp, information contained in DA-EE-99-047 Attachment 5, DC Load Survey.

4.4.9 Potter & Brumfield, attached data sheet (Attachment 5) from unidentified catalog.

4.4.10 NUS Instruments, Specifications for Analog Isolator Modules, Spec.: Data sheet attached (Attachment 6).

4.5 Correspondence

4.5.1 Letter from James P. Brozek of Bussmann to Joseph E. Pacher, "DC Voltage/AIC Rating of Fuses", dated 12/10/90.

4.5.2 Bussmann Correspondence, Steve Shaffer to John Kowal, "AC/DC Fuse Spec", dated 1/3/91.

4.6 Plant Procedures

4.6.1 GC-76.9, Installation and Inspection of Electrical Equipment, Raceway and Electrical Supports.

4.6.2 GC-76.10, Installation, Testing, and Inspection of Wire and Cable.

4.7 Miscellaneous References

4.7.1 National Electric Code, NFPA 70, 1999.

4.7.2 PCR 98-097, Control Room Radiation Monitor Noise Suppression, Rev. 0.

4.7.3 Design Analysis, DA-EE-98-157, Cable Sizing Criteria, Rev. 0.

4.7.4 Ginna Procedure PT-17.4, Control Room Radiation R-36, R-37, R-38 and Toxic Gas Monitor Operability Test.

4.7.5 Ginna Alarm Response Procedure AR-E-11, Control Room HVAC Isolation.

4.7.6 Design Analysis, DA-EE-99-063, PCR 99-001 Electrical Factors Analysis.

4.7.7 Design Analysis, DA-EE-2001-047, Instrument Bus Electrical System Evaluation.

4.7.8 Topical Design Basis - Electrical Independence, Rev. 0, 6/19/97.

4.7.9 Design Analysis, DA-EE-99-047, 125 VDC System Loads and Voltages, Rev. 1.

5.0 Assumptions

None

6.0 Computer Codes

6.1 None

7.0 Analysis

7.1 Cable Properties

Cable selection and sizing will be per Ref. 4.7.3, "Cable Sizing Criteria Design Analysis", which specifies the factors and derating amounts to consider in sizing and selecting conductors and routing through trays and conduits. Those factors will be

adhered to throughout section 7.1.

7.1.1 Power and Control Cables

The total power consumption requirements of all components in the new 120 vac circuits are tabulated in DA-EE-2001-047 on the appropriate Twinco Panel tables. Attachment 8 breaks out the loading to the portions of the circuits fed by each portion of the circuits shown on drawings SK21946-0546SH1-1 and SK21946-0546SH2-1. The maximum possible current to any individual portion of the circuit is 1.93 amps. The cable specified in the circuit schedules for power and control is #12 copper conductor. The new power cable is routed in conduit between the RMS rack and the Aux Benchboard. In accordance with reference 4.7.3 the tables in the National Electric Code shall be utilized for cables this size. In accordance with NEC Table 310-16 the rated ampacity for #12 AWG cable in a 104 degree F ambient is 27.3 amps (30 amps*0.91 temp derating factor). Therefore, the proposed new power cables have adequate ampacity for the expected current requirements.

To accommodate pin connectors on the back of the ratemeter, the control circuit to the output contacts of the ratemeter were changed to #16 awg SIS wire. Per NEC 310-16, the rated ampacity in 104 degree F ambient is 16.4 amps (18 amps *0.91 derating). This has adequate ampacity (above the 2 amp maximum current) for this circuit.

The existing power cables from the Twinco distribution panels to the RMS racks (Circuit Schedules C2621 and C3505) are #12 and #14 copper respectively. They are routed in tray and conduit, so must be derated by a factor of 0.35 per reference 4.7.3.

C2621 (#12 awg @ 30 amps*0.91 temp derating factor * 0.35 tray derating) results in an ampacity of 9.55 amps.

C3505 (#14 awg @ 25 amps*0.91 temp derating factor * 0.35 tray derating) results in an ampacity of 7.96 amps.

Per reference 4.7.7, the existing maximum load on either of these circuits is 5.7 amps, which already includes the above loads, except the isolators were upgraded from SCA100 to SCA300, resulting in 0.09 additional amps. The additional load of 0.09 amps results in a new total load of 5.8 amps, which is within the ampacity of the existing cables.

Grounding will be performed per procedure GC-76.9. The grounding has been reviewed and is consistent with the vendor recommendations.

All specified cables are rated 600 volts. All power and control circuits are 120 Vac or 125 VDC. Therefore, all cables have an adequate voltage rating for the specified applications.

7.1.2 Detector/Ratemeter Instrumentation and Power Cables

The cable used to provide power and signal between the ratemeter and the detector is a special cable supplied by the vendor, specifically for this equipment. It has been sized and tested by the vendor for use in this application. Installation and connections will be made per vendor instructions and drawings, to be included in the PCR package outputs.

7.1.3 PPCS Cables

All PPCS cables will be wired using #16 twisted shielded pair cable (#16TSP), including connections between isolators and ratemeters. This is adequate for the 4 - 20 mA currents that are carried by these cables from the instrument to the MUX connections. Internal RMS rack wiring requires the use of #22 awg for the pin connectors to P6, the ratemeter analog output connection. The #22 wire will go from the connector approximately three feet to the terminal deck where it transitions to the #16. The #22 wire is appropriate for use for a 4 - 20 ma signal.

Cables to PPCS will have the shields appropriately connected for analog points to ensure no impact on the 4-20 ma signal, consistent with plant computer wiring practices.

7.2 Cable Separation

7.2.1 A review of the design of the electrical systems associated with the proposed design has been performed to demonstrate that compliance with the requirements of IEEE Std 384, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits". A and B train components have been separated into separate compartments in the Auxiliary Benchboard and the RMS racks, so there is physical separation between A and B train redundant components.

7.2.2 Redundant trains of wiring are routed in separate train-specific conduits for the interconnection of all equipment where the cables have to route outside of cabinets. When cables enter enclosures, such as the Auxiliary Benchboard or Radiation Monitoring System (RMS) racks, wiring is installed to maintain physical separation between redundant trains of wiring. Where cables are routed through the cabinets to the compartments containing components of the opposite train, the minimum 6" separation is maintained. The "defense-in-depth" design concept that results in the cross-connection of the redundant trains has resulted in a number of cables that are associated with both trains. Separation is maintained up to the points of interconnection between the two logic circuits (relays and terminal blocks). In the RMS racks, the cables have been designated as being associated with the train in which they are logically connected to the isolation initiation relay (if in the R81A circuit, then A train cable). These cables are designated associated to that train and separation from the other train is maintained except at the point of termination at terminal blocks.

7.2.3 In the Auxiliary Benchboard, the cross train logic is encountered where contacts are

connected in series from R81A to R81B for signals to the individual isolation devices (dampers, fan, MCB annunciator). The connecting cables go directly from an A train device to a B train device, and since they are not train specific at those points, separation cannot be maintained, so the cables are routed together, separate from all other train specific cables. Since the points of connection between the two trains is the relay contacts, isolation can be credited since relay contacts are considered qualified isolators per IEEE 384 section 6.2.2.2).

7.2.4 There is no physical way to separate the wires to these non-train specific points at the contact terminals from the train specific wires to the relay coils. This has been determined to be acceptable per a review of the logic and the Auxiliary Benchboard layout as follows: The wiring in the Auxiliary Benchboard cabinet is for the logic to the isolation relays. A review of that logic wiring demonstrates that any fault in the cabinet that causes failure of a wire will result in an opening of the associated circuit. Any open circuit will result in the isolation relay to drop out, automatically causing the initiation of the safety function to perform and put the CREATS in isolation. This is true for either a single train failure or a failure that propagates between both trains due to less than optimal separation. There is not a credible failure mode that would result in a condition in which faulted or failed wires in the Auxiliary Benchboard would prevent the safety system from performing its execute function if an actuation signal was present. The only way to prevent the system from performing this function would be for 120 VAC being applied to the logic circuits of both trains within this cabinet, energizing the relays even after the output contacts of the initiating devices (ratemeter or manual pushbutton) have opened. There are only a few wires that are still energized after an initiation signal in a manner that could cause this type of unlikely "hot short" in either logic train, where a wire could be disconnected and contact the relay with 120 VAC. Since the two R81 relays are in separate compartments in the Auxiliary Benchboard, there are no points where such a condition could also cause a second wire of the other train to fail and energize the opposite train's R81 relay. In addition, failure of any wires in the Auxiliary Benchboard due to inadequate separation between the trains can not propagate back to the ratemeters and cause them to fail in a manner that would prevent the system from performing its safety function.

7.2.5 Wiring for the radiation monitoring cabling, for power to the ratemeters, and for signal wiring between detector and ratemeter, maintains the minimum separation criteria of IEEE 384 between wiring of redundant trains. Outside of enclosures, the cable is inside of conduits that provide the physical separation between trains. There are only A Train or B Train cables in any conduit, and any non-1E circuits are routed with either train in the conduits carrying safety related circuits are train specific associated circuits that are physically separated from or electrically isolated from the opposite train. In the RMS racks, the minimum 6 inches of physical separation is maintained between redundant trains for power and signal wiring.

7.2.6 No new power or control cables are run in cable tray. A Train components are powered from an A Train power supply (IBPDPCBE from INVTCVTA) and B Train components are powered from a B Train power supply (IBPDPCBC from

INVTCVTB). Existing cables from IBPDPCBC and IBPDPCBE to RMS racks were not moved, existing separation criteria for these cables remains.

7.2.7 New PPCS circuits will go through an optical isolator to provide isolation from SR to SS systems, but will be installed safety related from the RMS rack to the CREP panels in the Turbine Building. To that point, they will be meet the separation requirements of the Safety Related portion of the design as they will be treated as associated circuits for the train they are associated with. When these circuits reach the CREP panels, they will be terminated on fuses to provide electrical isolation so that the two trains can be run in the same conduit as non-Safety Related cables. The optical isolators are qualified safety related devices, and they are rated to protect the radiation monitors from damage due to fault, short circuit, or open circuit. The non-safety portion of the circuit downstream of the isolation devices to the MUX equipment share a common conduit. This is acceptable because they are beyond the fuses providing electrical isolation, and there is no requirement for redundancy to the PPCS equipment.

7.3 Conduit Fill

Conduit fill will meet the specifications in the National Electric Code Ref. 4.7.1, Chapter 9 Tables 1 and 4. Power and instrument cable diameters and areas are from vendor documentation Ref. 4.4.5. 10/C special cable provided by Inovision has 0.675" o.d. per reference 4.4.1.

Conduit Sizing / Fill Determinations

Conduit fill limits are listed in NEC Chapter 9 tables 1 and 4. In attachment 4 the calculated cable fill for each conduit being installed is calculated. Cable diameters were taken from Cabletrak database which lists cables used in the plant and specifications taken from purchase orders and vendor documentation.

Attachment 4 shows that all conduits are within the fill limits.

7.4 Relays

Two additional AC relays (R81A and R81B) will be installed in the control circuits for this modification. These relays require 120 VAC coils. The contacts from these relays will be installed in 125 VDC circuits and 120 VAC circuits, so their contacts need to be appropriately rated.

A review of the control logic demonstrates that the maximum DC load on the relay contacts will be on contact number 1, which supplies control power to MCC K position 1F circuit for the control room air handling unit supply fan. This circuit has a maximum DC load of 0.38 amps, consisting of a motor starter, solenoid, and a lamp (Load values taken from Reference 4.7.9). The AC relay contacts will be subjected to a maximum load of a single BF relay coil, with a

power requirement of 0.6 amps. Type BF relays have been selected for this application. The coils are rated for 120 VAC +10%/-15% and the contacts on these relays are rated for 1.1 amps at 125 VDC, and 6 amps at 120 VAC (reference 4.4.3, attachment 2). These rating are acceptable for the specified application.

Existing relay R80B will still have one contact in the 120 VAC circuit. A review of the control logic demonstrates that the maximum load on the relay contacts will now be 1 BF relay which has a power requirement of 72 VA (0.6 Amps) at 120 VAC. R80B is a Potter & Brumfield Type KRP11DY relay, with a contact rating of 5 Amps at 120 VAC (attachment 5). This rating is acceptable for the specified application.

7.5 Handswitch Ratings

The selected handswitches, , Westinghouse OT2 switches, have contacts rated for 6 amps at 120 VAC, and are rated up to 600 volts. As the table in 7.1 demonstrates, the maximum current on any circuit could be 2.07 amps. Therefore, these switch contacts are adequate for this application. See Reference 4.4.7.

7.6 Instrumentation Ratings

The A17 Power Supply modules being used to power the existing Toxic Gas System instrumentation has an input voltage range from 85 to 270 volts, AC or DC, per Ref. 4.4.1. This system will now be supplied from Instrument Bus power via the RMS racks, at 120 VAC, so the change in power source does not impact the Toxic Gas equipment.

The Radiation Monitoring equipment requires 120 VAC power, +/- 10% (108 - 132 VAC) per Attachment 1. That is within the regulation range of the Instrument Bus Twinco constant voltage power supplies, which by Tech Spec are required to have an output voltage of 115.6 to 124.4 VAC. Ref. 4.7.7 contains voltage drop calculations for the existing circuits. The voltage drop from the Twinco to the RMS racks is much less than 1 volt, and the small load being added by this modification will not significantly impact that calculation, so power supply voltage will remain appropriate for the connection of the new ratemeters.

Alarm relay contacts in Model 956A-201 ratemeters are rated 5 A at 120 volts AC, per attachment 1. These contacts will be subjected to a maximum possible load of 1 BF relay, which is 0.6 amps (see 7.4 above). Therefore, these contacts are adequately rated for their expected load.

The ratemeter analog outputs are rated 4-20 ma. Each of the two outputs on each ratemeter will drive a single input on the isolators RY-A and RY-B. Each isolator input channel has an input impedence of 249 ohms. The ratemeters are rated to

drive 500 ohms maximum load. Therefore, the ratemeters are adequately rated for the analog output devices they are connected to. The isolator outputs are rated to drive 1050 ohms on the 4-20 mA signals. The PPCS output point has a 250 ohm resistor at the MUXATP. The isolator is therefore adequately rated to drive the PPCS point. This is consistent with the existing connections to the PPCS in the MUX Auxiliary Terminal Panel.

7.7 Coordination / Isolation and Fuse Sizing

Safety related fuses will provide isolation between the safety related equipment (R-45, R-46, R-10A, R-11, R-12, R-29, R-30, RK-78) from non-safety/safety significant equipment (toxic gas, isolators RY-A and RY-B, plus radiation monitors R-10B, R-13, R-14 and associated isolators and relays). The fuse sizing was shown to be appropriately designed in reference 4.7.6, and the new power source does not change any of the analyzed characteristics. The 3 amp fuses used for each circuit and circuit section are adequately smaller than the next upstream protective device, the breakers in IBPDPCBC (15 amp) and IBPDPCBE (20 amp) supplying the new system, so there is coordination between these devices. The 3 amp fuses are also adequately sized to carry the loads as shown on Atttachment 8 (maximum load on any fused section is 1.93 amps, which is less than 80% of fuse size).

Attachment 3 shows the coordination of protective devices between the fuses, breaker, and conductors.

Isolation of the Safety Significant PPCS from the Safety Related Radiation Monitors, which are connected at the analog output port, will be provided by optical isolation devices rated to protect the radiation monitors from damage due to fault, short circuit, or open circuit. The power supplying the isolators is supplied by the instrument bus circuits described above, and are electrically isolated by fuses. The new fuses used for isolation of power to the PPCS isolation devices (RY-A and RY-B) are also rated 3 amps and will coordinate with the breakers and conductors as described above.

7.8 Panel Loading

Panel IBPDPCBC is supplied by 2.0 Kva Twinco voltage regulator MQ-400C, and panel IBPDPCBE is supplied by 2.0 Kva Twinco voltage regulator MQ-400E. Design analysis DA-EE-2001-047, reference 4.7.7, has detailed equipment rating and loading information, which already incorporates the loading added in Rev. 0 of the PCR. Rev. 1 of the PCR only adds more load due to RY-A and RY-B having 0.09 amps additional. The loading on Atttachment 8 shows the loads of each individual device, where it is supplied from, and the total loading to each fuse. MQ-400C and MQ-400E have maximum allowable loadings of 16.9 amps each. The existing load is 14.31 amps on MQ-400C, with 2.59 amps of margin.

There is 11.89 amps on MQ-400E, resulting in 5.01 amps margin. The addition of the new SCA300 isolator with an additional 0.09 amps of load will not exceed these margins.

DA-EE-2001-047 shows a maximum load of 1.72 amps to RMS-3 on breaker IBPDPCBC/11, and5.70 amps to RMS-1 on IBPDPCBE/1. With the addition of the new style SCA300 isolators, they remain well below the 15 and 20 amp breaker ratings of those positions.

7.9 Electrical Noise Reduction

Instrumentation cabling has been provided by the vendor. Per Electrical Specification EE-171, the system has been tested to meet the EMI/RFI testing in accordance with EPRI TR-102323-R1. The equipment will be shipped with a test report demonstrating the equipment with supplied cabling meets that standard. PCR package outputs reference the vendor documents which provide instructions for configuration and connection of all cables and shields to maintain the configuration used to meet these standards.

PPCS connections for analog signals will also use shielded cable and connections per normal construction practices utilized for PPCS inputs. These measures *should adequately address instrumentation noise issues.*

To avoid potential disturbances caused by the actuation of isolation signals, Quencharc surge suppressors will be installed across the coils of relays R81A and R81B in the control circuits to dissipate energy from relay coils when the contacts open. The Quencharcs across the contacts installed previously will be removed as the single Quencharc in each logic string on the relay coil will provide the appropriate surge suppression for each circuit. This is consistent with installation on related circuits in PCR 98-097, Ref. 4.7.2.

7.10 Control Circuit Logic

The overall control circuitry has been designed to maintain the fail-safe operability of the original Control Room HVAC Isolation system, including inputs from both the toxic gas monitors and the new radiation monitors. In all modes, failure of a component due to loss of power (which typically causes a component to return to its de-energized state) will result in the controlling contacts to open, resulting in de-energization of the controlled device, ultimately resulting in the CR isolation dampers returning to their de-energized position, which is in the isolation mode. Loss of power to any component, or to the total circuit, will result in a CR HVAC isolation being initiated.

7.11 Single Failure

Attachment 7 is a block diagram of the control logic for actuation of a control room isolation. The design incorporates both redundancy and cross-train initiation. In summary, there are two redundant trains of isolation logic, each with a manual and automatic isolation device. Any device (A or B manual or A or B automatic) will initiate a CR isolation in BOTH trains. In this way, for any actuation, if any downstream device fails, the opposite train will still receive an actuation signal. The following sections were taken from the document attached to the Tech Spec Amendment RAI, titled "Conformance to IEEE Std 603 for Modifications Associated with License Amendment Request", dated April 26, 2002.

7.11.1 Single Failure Criterion.

The proposed safety system will perform all required safety functions for a design basis event in the presence of (1) any single detectable failure within the safety systems concurrent with all identifiable but non-detectable failures; (2) all failures caused by the single failure; and (3) all failures and spurious system actions which cause or are caused by the design basis event requiring the safety functions. The guidance of Reg. Guide 1.53 and IEEE Std 379 was used to evaluate the system design for single-failure adherence.

7.11.2 The safety function reviewed under the scope of this modification is the initiation of a Control Room isolation signal. The portion of the system enveloped by this review is from the radiation detectors in the air intake duct through the output contacts on the isolation relays in the Auxiliary Benchboard. It includes the power supplies and all inter-connected non-Safety related components. It will not include the isolation dampers and charcoal filter units controlled by the isolation relays - they are beyond the scope of the modification and their design has not been changed by this modification. Final post-modification functional testing does include testing of these devices to ensure that they perform their safety function and were not impacted by the changes.

7.11.3 The protective action that is a result of the proper operation of this system is to provide initiating isolation signals to the isolation devices from the isolation relays upon detection of radiation levels above the setpoints.

7.11.4 There are two redundant safety groups, A train and B train, that are capable independently of performing that function. Each functioning component in each group has a redundant component in the other train. There are two detectors, two ratemeters, two initiation relays, and two manual isolation pushbuttons, with power provided by two separate power supplies. The redundant relays result in two separate output contacts to each of the isolation devices, each contact capable of providing the signal to the isolation device to go to the isolation position.

7.11.5 The design of the system demonstrates that independence between the two safety groups has been established. For initiation of the signals, there are no shared

components. Each train is powered by a separate power supply, cables run in separate train-dedicated conduits, each relay will operate irrespective of the state of the other relay, manual isolation pushbuttons will provide isolation signals irrespective of the other button or of the status of the automatic isolation signals.

7.11.6 The design of the logic includes cross-train signal connection so that an initiating event on A train (automatic or manual) will initiate an isolation signal to both relays, and likewise for B train. This was incorporated in the design to provide additional redundancy, so that failure of one relay would not prevent a high alarm from the detector of the other train from initiating an isolation. The points of train cross-connection only add redundancy , and there is no resultant single-failure point caused. The points of cross- connections are limited to the wiring of normally open device output contacts into the actuation circuit of the other train. There is no manner in which the normally open contacts can fail that will disable the opposite train's actuation logic.

7.11.7 Mounting of all redundant components in the same structures (such as both detectors in the duct, both trains of logic in Auxiliary Benchboard, both trains of conduit sharing conduit supports) has been performed in a manner to preclude a single component failure (mounting bolt, etc.) from causing both trains to fail, including design basis seismic events.

7.11.8 The power supplies to the separate trains are independent, separated, and highly reliable, being fed from completely independent UPS systems. There is no common wiring point from the ratemeter location back to the ultimate supply source. Electrical protection in the form of breakers and current limiting transformers have been analyzed in design analysis DA-EE-2001-047 to be appropriately sized to protect all equipment, further reducing the potential for failure on one train of power propagating to devices on the other train. DA-EE-2001-047 also demonstrates the capability of both power supplies to independently supply power adequate for the operation of all equipment required to perform the safety functions. For further protection, all devices powered by the power supplies are configured so that on a loss of power, the output of the devices goes to the isolation initiation state.

7.11.9 System Portions Analysis (section 6.2 of IEEE 379)

7.11.9.1 Both trains of equipment have outputs that supply a signal to the non-1E Plant Process Computer System (PPCS) and non-1E radiation recorders. These signals are analog outputs from each ratemeter to communicate radiation levels to the PPCS and the recorders, and this is a non-safety related function. A failure in either the PPCS or a recorder is prevented from causing a common failure in both ratemeters by insertion of independent qualified 1E optical isolators in the circuits that connect the ratemeters to PPCS and the recorders. The isolators themselves are isolated from the 1E power supply to them by putting 1E fuses in the supply

circuit.

7.11.9.2 Both trains of isolation actuation logic have signals from the non-1E toxic gas monitoring system (contacts from the toxic gas system processing modules). These signals and power to the toxic gas power supplies are all isolated from the safety related portion of the design by qualified fuses.

7.11.9.3 A review of the logic demonstrates that there is no single failure point in the circuitry. Refer to Attachment 7 for a block diagram of the system design. The conclusion is that there is no single failure in the system logic that will cause failure in the channels or actuation circuits that would cause loss of the safety functions.

7.11.9.4 Devices in the isolation logic circuits are configured to fail so that any de-energized equipment will fail to the position that provides an isolation actuation signal. Power cannot be maintained incorrectly on the actuator system terminals and cause a loss of safety function because multiple normally open contacts in series provide the actuation signal to the isolation relays, and the isolation relays output contacts likewise are normally open in the control circuits of the associated dampers.

7.11.9.5 SK21946-0546SH1-1 and SK21946-0546SH2-1 diagrams of this design, and the series of normally open contacts is apparent. This series of open contacts, coupled with the cross-train connection of the output contacts to each isolation device, provides assurance that even the mechanical failure of contacts to open upon a loss of power in one relay will not prevent the isolation function from occurring due to the opening of the contact in the other train of isolation initiation.

7.11.9.6 The connection of electrical power supplies is completely independent. The malfunction of a power supply in a manner that results in a high voltage would only impact a single train, again due to the cross connection only being via normally open contacts so that no voltage is being supplied from one train to the other.

7.11.10 All other systems or components that are coupled to these safety systems have been integrated so that they cannot fail in a manner to degrade the safety system. Maintenance bypass switches are designed and installed in the circuit so that a contact block failure will be detected by the indicating lamp associated with each switch. The bypass functions for each train have been connected with separation from the opposing train, and all components qualified and installed safety related.

7.11.11 SRP Appendix 7.1-C Section 6 contains discussion of scope of review beyond IEEE 603 Single Failure Criterion as it pertains specifically to digital I&C equipment. The concerns with digital equipment in that section are centered around the sharing of data, functions, and process equipment inputs such that a design using shared databases and process equipment has the potential to

propagate a common-mode failure of redundant equipment. This design feature is not applicable to the radiation monitors that are being installed as part of this modification. The redundant monitors do not share any data or process equipment inputs. The two monitors operate independently, with train-specific inputs from the detectors. The output alarm contacts that provide the protective functions will operate independently of the status or signals associated with the redundant train. Therefore, the digital nature of these monitors does not lead to the propagation of a common-mode failure of this type. The second concern of digital I&C systems is that software programming errors can defeat the redundancy achieved by the hardware architectural structure. In the application of digital technology for this installation, the software functions are very limited in how they impact the system. The digital functions that are part of the safety functions are 1) the calculation of a dose rate based on input signal from the detector, and 2) the signal to the alarm relay to operate to change output contact states, based on user-set alarm setpoint. These two functions have no other inputs or variables other than the dedicated detector signal for that ratemeter. Both of these functions are completely tested before installation by the manufacturer, at the time of installation by post-modification calibration and functional testing, and at normal operating intervals via Technical Specification required channel checks, channel operability tests, and scheduled calibrations. All of this monitoring and testing throughout the operating range of the unit provides assurance that the software functions utilized to initiate the protective functions are properly programmed and operating for each unit, and that there is not a software programming error that will occur that will prevent the equipment from performing its safety function in a manner to cause both units to fail at the same time.

8.0 Conclusions

8.1 The design shown in PCR 99-004 Revision 1 construction package as defined above meets technical operational requirements. The electrical factors described in section 1 above have been evaluated and have been demonstrated to be adequate and appropriate for installation and operation.

Specifications (Universal Digital Ratemeter)

The Victoreen Model 956A-201 Universal Digital Ratemeter (UDR), when connected to a Victoreen Model 897A-2XY Geiger-Mueller (GM) tube detector, comprises a monitoring system which operates over a five decade range. The UDR provides display, control, and annunciation functions for the monitoring system, and will display readings in the range of 10^{-2} to 10^{5} mR/h.

Standard features for the instrument consist of a three digit display of the radiation value and a multi-colored bargraph indicator which covers the entire range of the UDR. The bargraph will change color in the event of an alarm condition (green for normal, amber for warning, and red for high). Front panel alarm indicators and rear panel relay outputs for alarm annunciation are also included. Front panel pushbuttons are provided to apply power, display alarm limit set points, acknowledge alarms, and activate the check source.

Analog outputs of 0 - 10 Vdc (1) and 4 - 20 mA (2) are provided for recording and computer monitoring. The outputs may also be used to drive a remote meter or a local (i.e. near the detector) indicator.

All electronics required to interface with the VICTOREEN 897A series GM detector are included within the 956A-201 UDR. The electronics consist of a high voltage power supply, low voltage DC power supply and the hardware/software required for UDR operation. The system also includes an overrange indicator to preclude the possibility of on-scale readings when the radiation field is beyond the range of the detector.

Main Display	Three digits with backlighted radiation units display and floating decimal point. Three digits plus exponent for data entry/display.
Bargraph Display (Dynamic Range)	Three segments per decade, 10^{-2} to 10^{6} mR/h (24 segments), tri-color, indicating channel status.
Alarm Indicators	HIGH, WARN, FAIL, RANGE
Pushbuttons	HIGH, High Alarm limit WARN, Warn Alarm limit
Check Source	Activates radioactive Check Source and associated green LED indicator. "Momentary Non-Latching pushbutton operation"
Alarm Ack.	ATarm acknowledgment: causes alarm indicators to go to a steady on state after acknowledgment
Power ON/OFF	Alternate action pushbutton for AC power to the unit
Relay Outputs (Failsafe operation)	*HIGH Alarm* - 1 set. DPDT rated 5 A @ 120 Vac (one set 120 Vac powered for use with optional local alarm) *WARN Alarm* - 2 sets. DPDT rated 5 A @ 120 Vac *FAIL Alarm* - 2 sets. DPDT rated 5 A @ 120 Vac DC. Contact rating for all relays is 5 A @ 29 VDC
HV Output	300 Vdc - 1800 Vdc @ 0.4 mA
Check Source PWR	+15 Vdc @ 20 mA
Analog Outputs	4 to 20 mA (2) (500 ohms Max.) and 0 to 10 Vdc (1k ohm Min.), logarithmic. May be scaled for any one decade (Min.) to the full range of the unit (Max.)
Alarm Ack Input	Optically isolated DC input
Detector Input	Digital pulse, up to 2000 feet from UDR, 50 ohm input impedance
Accuracy (electronic)	± 1% digit (± 1% of the displayed value), exclusive of the detector energy response
Dimensions (H x W x D)	3.5 in. x 5.6 in. x 13.5 in. (8.9 cm x 14.2 cm x 34.3 cm)
Weight	Approximately 3.7 lb. (1.67 kg)
Power	120 Vac ±10%, 50/60 Hz, 28 watts (240 Vac optional)
Operating & Storage Temp.	32° F to 122° F (0° C to + 50° C)
Relative Humidity	0 to 95% non-condensing
Compatible Detector	897A Series, GM (Geiger Mueller tube)
Heat Loading	Approximately 96 BTU/h
Accessories & Aux. Equipment	Please Contact our Systems Sales Dept.

6000 Cochran Road • Cleveland, Ohio 44139 - 3395 • Phone 216 - 248-9300 • Fax 216 - 248-9301

Attachment 1

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The Model 897A GM Detector is designed to operate with the Victoreen Model 956A-201 Universal Digital Ratemeter (UDR) or with other Victoreen readouts. Each detector measures a five decade range. Three measurement ranges are available: low, medium, and high. The low range covers 10^{-2} to 10^{3} mR/h, the medium covers 10^{-1} to 10^{4} mR/h, and the high covers 10^{0} to 10^{5} mR/h. The Model 897A detector may also be used with the Victoreen Model 960 Digital Radiation Monitoring System equipment or the Victoreen Model 856 Analog Readout.

Detector

Dimensions	7 1/8 x 3 inches (18.1 x 7.6 cm)
Weight	1 lb. (0.45 kg)
Housing Material	
897A-210, 897A-220, 897A-230	Aluminum, weatherproof
897A-211, 897A-221, 897A-231	Stainless Steel, weatherproof
Fill Gas	
897A-210, 897A-211	Neon / Argon / Halogen
897A-220, 897A-221	Helium / Neon / Halogen
897A-230, 897A-231	Helium / Neon / Halogen
Wall Thickness (bare tube)	
897A-210, 897A-211	32-40 mg/cm^2
897A-220, 897A-221	80-100 mg/cm^2
897A-230, 897A-231	80-100 mg/cm^2
Mounting	Wall mount
Mating Connectors	897A-2x0: 92-7005-17A, 12 Pin Female 92-7005-12A, Bushing 92-7005-9A, Clamp 897A-2x1 (stainless steel): 92-7005-15A, 12 Pin Female 92-7005-12A, Bushing 92-7005-13A, Bushing
Required Cable	Victoreen P/N 50-100 or equivalent with two coaxial conductors, two twisted pairs, and overall shield.
External Pressure Limit	30 psig
Storage Temperature	-10° to 122°F (-23° to 50°C)
Operating Temperature	-10° to 122°F (-23° to 50°C)
Relative Humidity	0 to 95% non-condensing
Operating Voltage	500 - 650 Vdc (supplied by digital ratemeter)
Plateau Length	100 - 150 Vdc
Plateau Slope	
897A-210, 897A-211	0.1%/V
897A-220, 897A-221	0.2%/V
897A-230, 897A-231	0.3%/V
Dead Time (Approximate)	
897A-210, 897A-211	45 microseconds
897A-220, 897A-221	28 microseconds
897A-230, 897A-231	20 microseconds
Measurable Radiation	
897A-210, 897A-211	10^{-2} to 10^{3} mR/h
897A-220, 897A-221	10^{-1} to 10^{4} mR/h
897A-230, 897A-231	10^{0} to 10^{5} mR/h
Detector Element Life	Exceeds 1000 hours at full-scale
Energy Dependence of Reading	+/-15% from 100 keV to 1.5 MeV
Detector Accuracy	± 20% of actual dose for Cs-137
Radiation Detected	Gamma rays, X-rays

Preamplifier

Input Impedance	>100 k-ohms
Output Impedance	50 ohms
Output Pulse Polarity	Positive
Output Signal (50 ohm)	+5 Vdc square-wave
Low Voltage	+15 Vdc (Optional +10 Vdc is jumper selectable)
Power Requirements	+15 Vdc @ 20 mA
Maximum Cable Length	1700 feet
Electronic Exposure Life	Approximately 10^{5} rads
Discriminator Level	Adjustable from 0 to +2 Vdc (nominal value = 0.5 Vdc)
Anti-Jam Level	Adjustable from 0 to +3 Vdc
Anti-Jam Oscillator Freq.	Approximately 50 kHz
Analog & Digital Monitor Configuration	Divide by 2, square wave output
Optional Monitor Configuration	Raw pulse output (jumper selectable)

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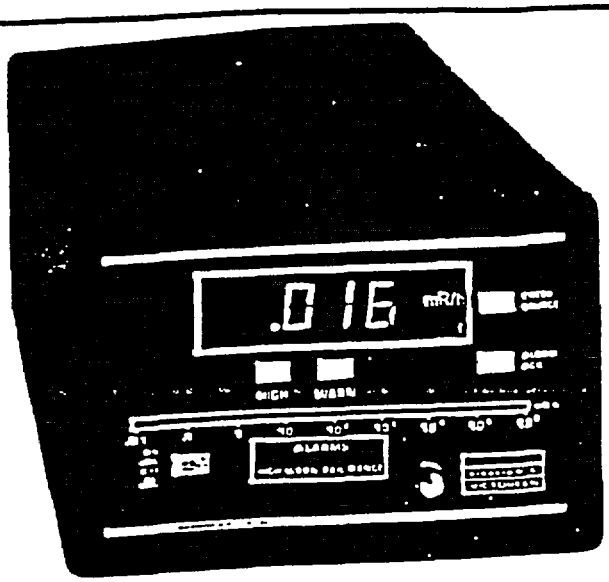
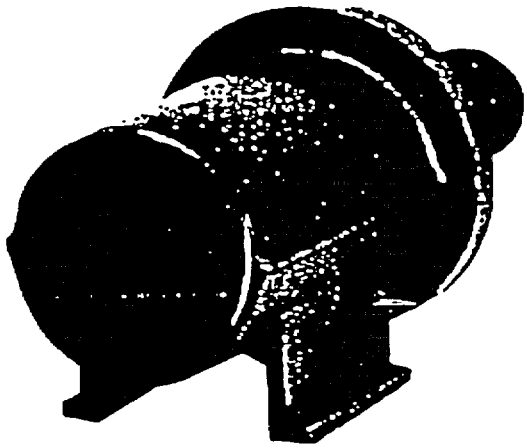
Area Radiation Monitor GM Detector Model 955A

VICTOREEN





Features

- Range: 5 decade between 10^{-2} and 10^{3} mR/h
- Energy Response: 15% from 100 keV to 1.5 MeV
- Life Expectancy: Up to 10^{5} Rads
- No external power needed at detector location
- Preamplifier integral with detector
- Seismic tested with high reliability
- Readout may be remotely located up to 1700 feet
- Single cable between readout & detector
- 8 micro Curie ^{36}Cl check source

Introduction

The Victoreen Model 955A is a single-channel area radiation monitoring system capable of operating over the ranges of 10^{-2} to 10^{3} mR/h, 10^{-1} to 10^{4} mR/h, or 10^{0} to 10^{5} mR/h, depending on the detector selected. The system monitors gamma radiation over a 5-decade range and provides indication when the radiation level decreases below a fail threshold, exceeds a warn set point, exceeds a high set point, or exceeds an overrange set point. The overrange feature provides two significant benefits. First, it prevents the system from displaying an on-scale, but inaccurate, reading should the detector become saturated. Second, it lessens the risk of damaging the detector by disabling it during an overrange condition. Relay outputs are available to activate alarm annunciators. Analog outputs are available for trend display on a strip chart recorder or computer. In addition, the monitoring system has an integral check source to verify operational integrity.

The system consists of a Model 897A series Geiger-Mueller (G-M) Tube Detector with integral preamplifier and the Model 956A-201 Universal Digital Ratemeter (UDR).

Application

Area monitoring is used for the detection of X-Ray or gamma radiation in a selected area. The monitor should be used in any area location where personnel may be exposed to an adverse amount of radiation. Applications include nuclear reactors, accelerators, hot cells, irradiators and any area where radiation sources are handled. These monitors can be used as single channel monitors or grouped together as a multi-channel area monitoring system.

Specifications (Ion Chamber & Preamplifier)

Victoreen 897A-series GM detectors use a thin walled Geiger-Mueller tube to detect ionizing radiation. Each 897A-series detector has a GM tube, a check source, and a preamplifier. The check source is a low-level radioactive source actuated by a +15VDC meter movement. The preamplifier provides the pulse conditioning and cable driving capability necessary to drive a Victoreen 956A-201 series digital ratemeter.

All 897A-series detectors are functionally identical. They differ only in housing material, tube type, and range. The 897A series detectors operate in the voltage range between 500 - 650 Vdc.

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Attachment 1

DA-EE-2001-009 Rev 2 PS 2 PS

Page 3 of 3

INDUSTRIAL CONTROL RELAYS
Fixed Contacts
Cat. Nos. BF and BFD

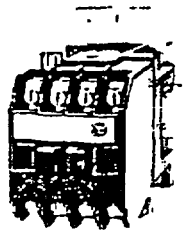
WHEN ORDERING SPECIFY

- Catalog number of basic relay.
- If a coil voltage other than listed is required, select the suffix code from the Coil Voltage Table and substitute it for the last letter in the catalog number.
  Example: BF80V for a 110/60 ac coil.

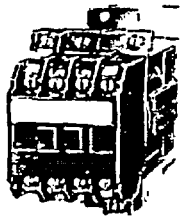
DESCRIPTION

Type BF and BFD relays are compact industrial control relays ideally suited for machine tool and similar applications where size is a factor. Type BF is ac operated, 300 volts maximum, and the BFD is dc operated, 250 volts. Fixed contact relays are available in any combination of NO and NC from two to twelve poles. The NO and NC contacts are electrically isolated and both can be used without regard to polarity.

BF and BFD relays have captive clamp terminals fully accessible from the front, a molded coil with low operating temperature, and silver alloy contacts suitable for low voltage circuits. Overlap contacts are available. All contacts feature the exclusive knife-edge design which provides a "self-wiping" action on every closure.



Type BF



Type BFD

UL/CSA

UR, UL File No. E19223
CSA certified, File No. LR39402-6, LR28548-10, 11

OPTIONS

Description	Code Letter or Catalog Number	Price Adder
FASTON Push-on Terminals — insert letter "F" after relay type designation in listed catalog number. Example. BFF20F or BFDF20S	F	$ 1.50 per pole
Overlapping contacts — NO contact closes before corresponding NC contact opens — supplied as NO/NC set(s) Insert letter "A" after relay type designation in listed catalog number. Example: BFA22F or BFDAF22S	A	18 per set
Filler Relay — empty relay case for mounting a timer on a BF mounting strip, Cat No. BFMS, when other relays cannot be used	BF00	18

COIL VOLTAGE TABLE

BF Coils			BFD Coils	
Volts Ac	Hz	Suffix Code	Volts Dc	Suffix Code
12	60	H	6	C
24	60	I	12	D
48	60	J	24	L
110	60	V	48	M
208	60	K	95	B
240/220	60/50	G	130	U
440	60	C	240	T

COMPLETE RELAY

Number of Poles	Type of Contact		BF 300 Volt Ac Basic Relays 120/60, 110/50 Ac Coil		BFD 250 Volt Dc Basic Relays 120 Dc Coil	
	NO (Form A)	NC (Form B)	Catalog Number	Price	Catalog Number	Price
2	2	0	BF20F	$ 72.	BFD20S	$ 102.
	1	1	11F	72.	11S	102.
	0	2	02F	72.	02S	102.
3	3	0	BF30F	84.	BFD30S	114.
	2	1	21F	84.	21S	114.
	1	2	12F	84.	12S	114.
	0	3	03F	84.	03S	114.
4	4	0	BF40F	96.	BFD40S	126.
	3	1	31F	96.	31S	126
	2	2	22F	84.	22S	114.
	1	3	13F	96.	13S	126.
	0	4	04F	96.	04S	126.
6	6	0	BF60F	108.	BFD60S	138.
	5	1	51F	108.	51S	138.
	4	2	42F	108.	42S	138.
	3	3	33F	96.	33S	126.
	2	4	24F	108.	24S	138.
	0	6	06F	108.	06S	138.
8	8	0	BF80F	132.	BFD80S	162.
	7	1	71F	132.	71S	162.
	6	2	62F	132.	62S	162.
	5	3	53F	132.	53S	162.
	4	4	44F	108.	44S	138.
	0	8	08F	132	08S	162.
10	10	0	BF100F	156.	BFD100S	186.
	8	2	82F	156.	82S	186
	7	3	73F	156.	73S	186.
	6	4	64F	132.	64S	162
	5	5	55F	132	55S	162
	4	6	46F	156	46S	186
	2	8	28F	156.	28S	186.
12	12	0	BF120F	180	BFD120S	210.
	8	4	84F	156	84S	186.
	7	5	75F	180.	75S	210.
	6	6	66F	156.	66S	186.
	5	7	57F	180	57S	210.
	4	8	48F	180.	48S	210.

NOTE Relays listed above with equal number of NO and NC contact poles are specially priced — 1 NO and 1 NC pole are supplied at no additional charge.

SPECIFICATIONS

BF RELAY ELECTRICAL RATINGS — NEMA A300

Volts	Maximum Current			Maximum VA	
	Cont.	Make	Break	Make	Break
120	10	60	6	7200	720
240	10	30	3	7200	720

HP RATINGS (UL RECOGNIZED)			DC RATING — NEMA P300				
Phase	Ac Volts		Volts	Maximum Current			Maximum Make or Break VA
	115	230		Cont.	Make	Break	
1	1/6	1/2	125	5.0	1.1	1.1	138
3	---	1	250	5.0	0.55	0.55	138

RESISTIVE RATING	COIL POWER REQUIREMENTS
125V dc: 3 amperes 250V dc: 1.5 amperes	Ac: 72 VA open, 12 VA closed Dc: 12 watts, 250 volts maximum

Attachment 2

CONTINUED NEXT PAGE

CONTACT ARRANGEMENTS FOR BF, BFD RELAYS

N.O. = Normally Open N.C. = Normally Closed

2 Poles

2 N.O. 2 N.C.	1 N.O. 1 N.C.	0 N.O. 2 N.C.
		

3 Poles

3 N.O. 0 N.C.	2 N.O. 1 N.C.	1 N.O. 2 N.C.	0 N.O. 3 N.C.
			

4 Poles

4 N.O. 0 N.C.	3 N.O. 1 N.C.	2 N.O. 2 N.C.	1 N.O. 3 N.C.	0 N.O. 4 N.C.
				

6 Poles

	6 N.O. 0 N.C.	5 N.O. 1 N.C.	4 N.O. 1 N.C.	3 N.O. 3 N.C.	2 N.O. 4 N.C.
Rear					
Front					

8 Poles

	8 N.O. 0 N.C.	7 N.O. 1 N.C.	6 N.O. 2 N.C.	5 N.O. 3 N.C.	4 N.O. 4 N.C.	0 N.O. 8 N.C.
Rear						
Front						

10 Poles

	6 N.O. 4 N.C.	5 N.O. 5 N.C.	4 N.O. 6 N.C.
Rear			
Center			
Front			

12 Poles

12 N.O. 0 N.C.	8 N.O. 4 N.C.	7 N.O. 5 N.C.	6 N.O. 6 N.C.	5 N.O. 7 N.C.	4 N.O. 8 N.C.

Attachment 2

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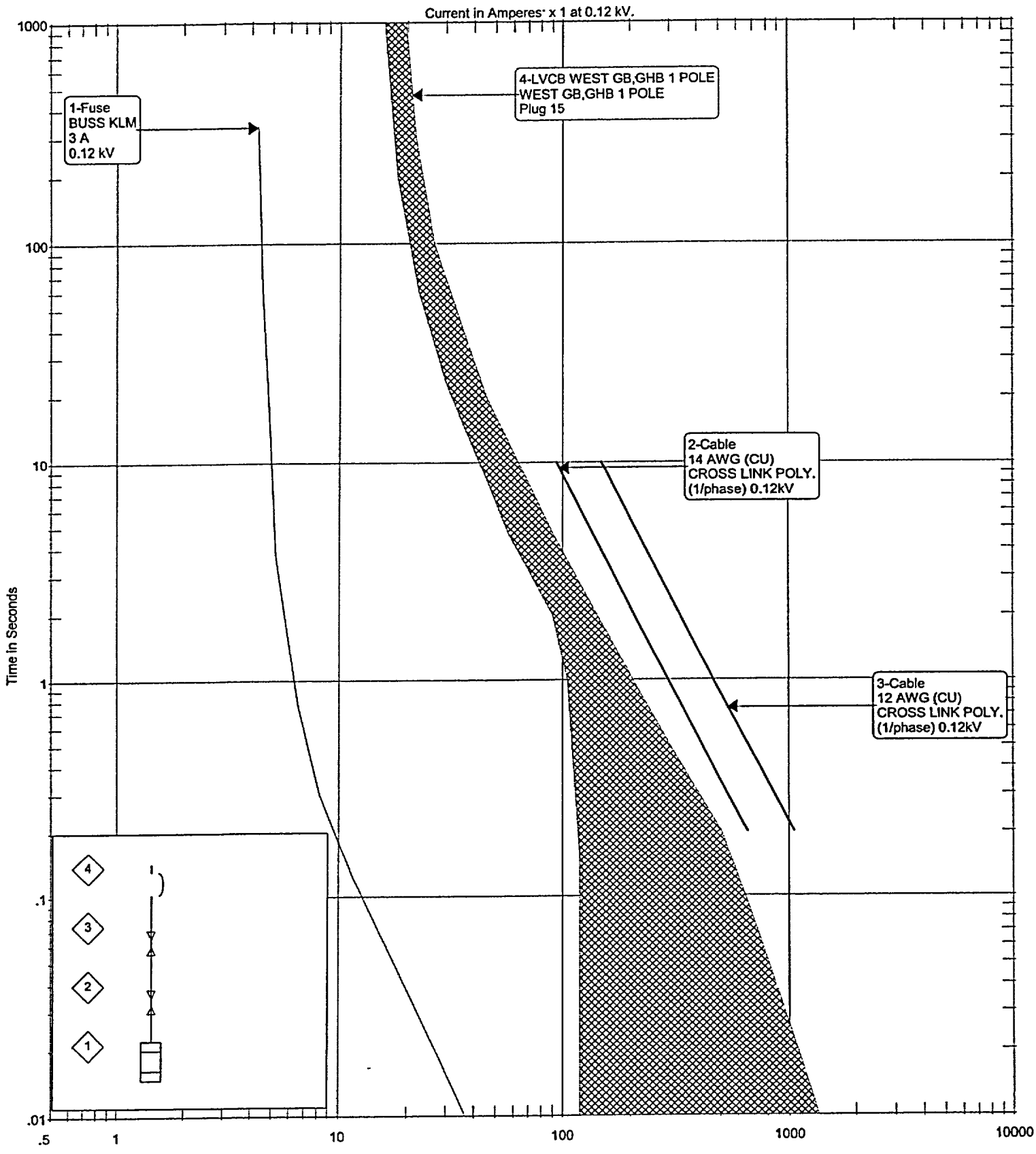
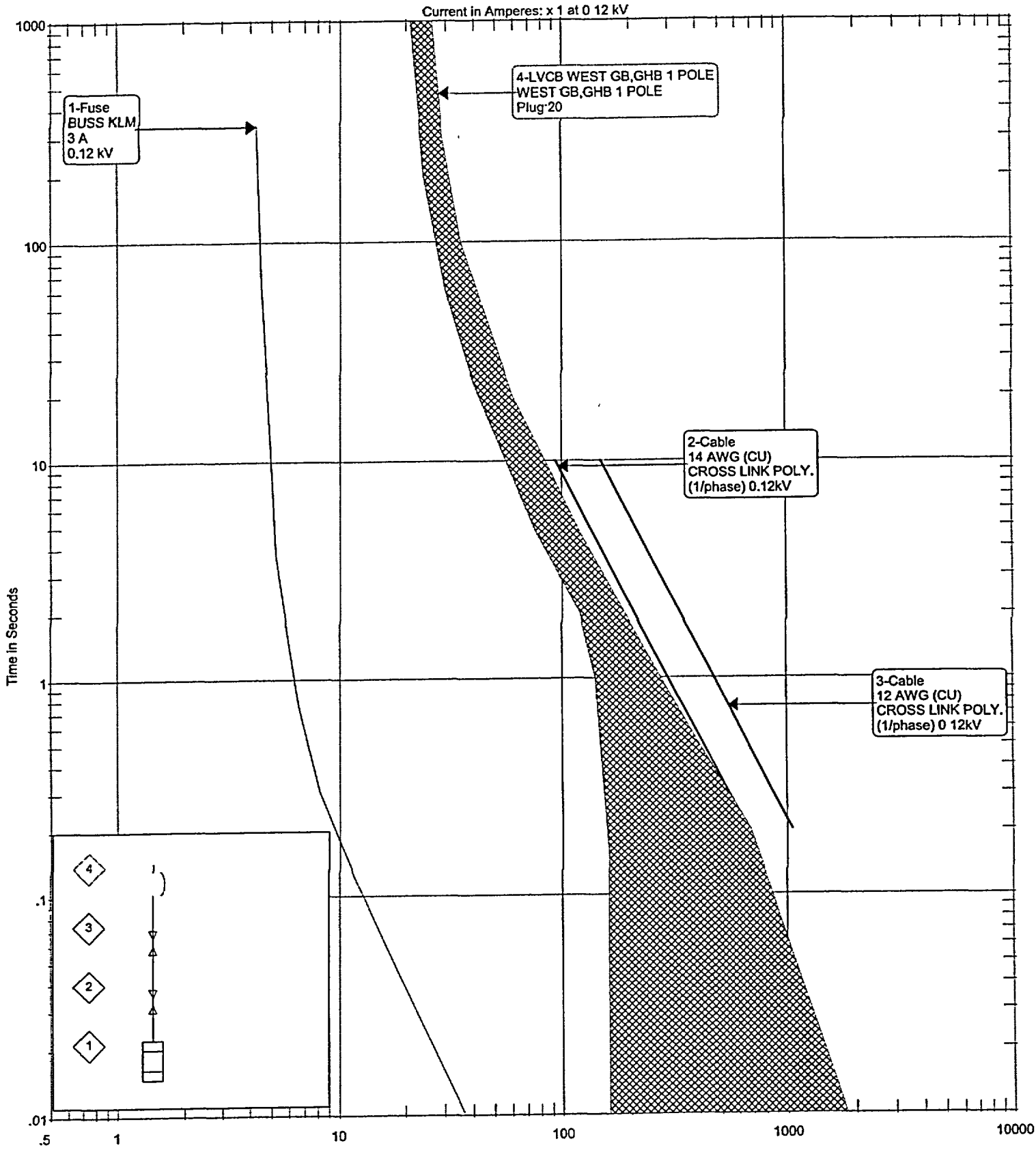


FUSE CURVE APPLIES TO
BUSS KTK OR KLM TYPE
DA-EE-2001-009 REV.2
ATTACHMENT 3

PLOTTING VOLTAGE 0 12 kV
BY: PS
PAGE 2 OF 2

NO. PCR 99-004 REV.1
DATE: 5-2-2002



FUSE CURVE APPLIES TO
BUSS. KTK OR KLM TYPE
DA-EE-2001-009 REV.2
ATTACHMENT 3

PLOTTING VOLTAGE 0 12 kV
BY:
PAGE 2 OF 2

NO: PCR 99-004 REV. 1
DATE: 5-2-2002

Attachment 4

Conduit	Conduit Size	Circuits Installed	Cable Size	Cable Area (sq. in.)	Total Fill (sq. in.)	Allowable Fill (sq. in)
Existing conduits with new cables in bold						
C5529	1 ½"	C5529 C5530 C5543 C5544	1-2-12 1-2-12 1-2-12 1-2-12	0.138 0.138 0.138 0.138	0..552"	0.814"
C5529_1	1 ½"	C5529 C5530 C5543 C5544	1-2-12 1-2-12 1-2-12 1-2-12	0.138 0.138 0.138 0.138	0.552"	0.814"
C5539	1 ½"	C5539 C5545 C5546	1-2-12 1-2-12 1-2-12	0.138 0.138 0.138	0.414"	0.814"
C5539_1	1 ½"	C5539 C5545 C5546	1-2-12 1-2-12 1-2-12	0.138 0.138 0.138	0.414"	0.814"
New Conduits and Cables						
C5551	2"	C5551 AU0235A R4522	1-4-12 1-2TSP-16 10/C special	0.185 0.078 0.358	0.621"	1.342"
C5552	2"	C5552 AU0239A R4523	1-4-12 1-2TSP-16 10/C special	0.185 0.078 0.358	0.621"	1.342"
R4522	1 ½"	R4522 AU0235A	10/C special 1-2TSP-16	0.358 0.078	0.436"	1.079"
R4522_1	1 ½"	R4522 AU0235A	10/C special 1-2TSP-16	0.358 0.078	0.436"	1.079"
R4522-2	1 ½"	R4522	10/C special	0.358	0.358	1.079
R4523	1 ½"	R4523 AU0239A	10/C special 1-2TSP-16	0.358 0.078	0.436	1.079"
R4523_1	1 ½"	R4523 AU0239A	10/C special 1-2TSP-16	0.358 0.078	0.436	1.079"
R4523_2	1 ½"	R4523	10/C special	0.358	0.358	1.079
AU0235A	1 ½"	A0235A	1-2TSP-16	0.078	0.078	1.079
AU0239	1 ½"	A0239A	1-2TSP-16	0.078	0.078	1.079

KRPA

KRP

KA

KRPA, KRP, KA, KR series

5 to 10 Amp
General Purpose Relay

File E29244, E22575, E81558 (KR Hermetic)

File LR15734

Features

- Industry standard octal-type termination for quick installation
- Contact arrangements from 1 Form A (SPST - NO) to 3 Form C (3PDT)
- Indicator lamp and push-to-test options available on certain models
- The KRPA series is the automated manufactured version of the KRP series
- Hermetically sealed option available with KR UL recognized for Class I Div 2 Hazardous locations, Groups A, B, C, D

Contact Data @ 25°C

Arrangements: See Ordering Information Table
Materials: Silver or silver-cadmium oxide, with or without gold flashing
Expected Life: 10 million operations min., mechanical, 100,000 operations min @ rated loads

KA, KRP, KRPA **UL/CSA Contact Ratings @ 25°C (Except KR)**

Contact Code	Arrangement	Contact Rating
Y&L (Silver)	1, 2, 3 Poles	5A @ 120VAC 3A @ 240VAC 1/10HP @ 120VAC 1/6HP @ 240VAC
G&N (Silver-Cad Oxide)	1, 2, 3 Poles	10A @ 240VAC 1/2 HP @ 240VAC 1/3HP @ 120VAC

KRP, KRPA **Factory Ratings**

Contact Code	Arrangement	Contact Rating
Y&L	1, 2, 3 Poles	5A @ 28VDC, 120VAC, 80% PF
G&N	1, 2, 3 Poles	10A @ 28VDC, 120VAC, 80% PF 6A @ 250VAC

KA UL Contact Ratings

Contact Code	Series	Contact Ratings
Y	KA[1]	5A @ 120VAC, 3A @ 240VAC, 1/10 HP @ 120VAC, 1/6 HP @ 240VAC
G	KA[2]	10A @ 120VAC, 6A @ 240VAC 1/6 HP @ 120VAC, 1/3 HP @ 240VAC

[1]Listed by C.S.A. for 5A @ 120VAC 80% PF
[2]Listed by C.S.A. for 10A @ 120VAC 80% PF

Initial Dielectric Strength

Between Open Contacts: 500V rms
Between All Elements: 1,500V rms

Note: See KRPA, KRP, KA, KR-E Ordering Information table on page 106

Coil Data @ 25°C

		Nominal Power	Maximum Power
KRP	AC	2VA	Open Models - 5VA Enclosed Models - 4VA
KRPA	DC	1.2W	Open Models - 4W Enclosed Models - 3W
KA	AC	2VA	Open Models - 4VA
	DC	125mW per movable arm	Open Models - 4W

Duty Cycle: Continuous
Initial Insulation Resistance: KRP, KRPA - 1000 Megohms, min
KA - 100 Megohms, min

Coil Data @ 25°C

	Nominal Voltage	DC Resistance (Ω) ±10%	Nominal Coil Current (mA)
DC Coils	6	32	188
	12	120	100
	24	472	51
	48	1,800	26.6
	110	10,000	11.5
	220	Use 110V relay with 10,000 Ω 5W Resistor in series	
AC Coils	6	8	335
	12	24	168
	24	85	84
	120	2,250	17.5
	240	9,110	8.75

Operate Data @ 25°C

Must-Operate Voltage:
DC: 75% or less of nominal voltage
AC: 85% or less of nominal voltage
Operate Time (Excluding Bounce):
15 milliseconds typical @ nominal voltage
Release Time (Excluding Bounce):
10 milliseconds typical @ nominal voltage

Environmental Data

Temperature Range:
Open Models: AC: -45°C to +70°C
DC: -45°C to +85°C
Enclosed Models: AC: -45°C to +55°C
DC: -45°C to +70°C

Mechanical Data

Open Models: Solder terminals
Enclosed Models: Octal-type plug
Enclosures: Transparent polycarbonate (except KR)
Hermetically sealed metal case available with KR only
Weight: KA: 1.7 oz (48.2g) approximately
KRPA, KRP: 3.0 oz (85g) approximately

Attachment 5 1/1

A-EE-2001-009 Rev. 04-25-2

NUS Instruments

SPECIFICATIONS FOR ANALOG ISOLATOR MODULES

The analog isolator module, model number as listed below, is a solid state signal conditioning and isolation module with one to eight inputs which provides from one to eight outputs electrically isolated from the inputs. All units use the same basic circuits for isolation and signal conditioning. All multi-channel FCA units use the same isolator PC board. The SCA and FIA use PC boards unique to their applications. The FIA has separate DC power supplies for each channel and therefore has electrical separation between the outputs.

MODELS AVAILABLE:

Model	Channels	Model	Channels	Model	Channels	Model	Channels	Model	Channels
SCA100	1	FCA300	4, 3, 2	FCA500	4, 3, 2	ECA600	8	FCA800	4, 3, 2
SCA101	1	FIA350	4, 3, 2	FIA500	4, 3, 2	FCA600	4	FIA800	4, 3, 2
SCA102	1	OCA300	1	OCA500	1	OCA600	1	OCA800	1
SCA103	1								

INPUT, OUTPUT AND POWER RANGE CODES

INPUT			OUTPUT			POWER SOURCE	
CODE XX	RANGE	IMPEDANCE YY	CODE	RANGE	IMPEDANCE ZZ	CODE	RANGE
00	Not Loaded		00	Not Loaded		00	Not Loaded
01	0 to 100 mVdc	100M ohms	01	0 to 100 mVdc	32.9 ohms	08	85-132Vac/125Vdc
02	0 to 51 mVdc	100M ohms	02	0 to 51 mVdc	17.3 ohms		
03	0 to 1 Vdc	100M ohms	03	0 to 1 Vdc	299 ohms		
04	0 to 5 Vdc	100M ohms	04	0 to 5 Vdc	825 ohms		
05	1 to 5 Vdc	5.2M ohms	05	1 to 5 Vdc	825 ohms		
06	0 to 10 Vdc	400k ohms	06	0 to 10 Vdc	1k ohms		
→ 07	4 to 20 mAdc	249 ohms	→07	4 to 20 mAdc	1050 ohms*		
08	10 to 50 mAdc	100 ohms	08	10 to 50 mAdc	660 ohms*		
09	0 to 1 mAdc	50 ohms	09	0 to 180 mVdc	59.3 ohms		
11	0 to 20 mAdc	249 ohms	11	0 to 20 mAdc	1050 ohms*		
12	0 to 50 mAdc	100 ohms	12	0 to 50 mAdc	660 ohms*		
13	50 to 10 mAdc	100 ohms	13	1 to 5 Vdc	249 ohms		
14	Variable	1M ohms	14	10 to 44.29 mAdc	660 ohms		
15	0 to 8 Vdc	428k ohms					
16	-10 to 10 Vdc	3.7M ohms	Notes:				
17	-2 to 15 Vdc	2.4M ohms					
18	5 to 1 Vdc	100M ohms	* These are not output impedances but the output drive capabilities of the current output modules.				
19	3.6 to 11.6 Vdc	177k ohms	1.) Some combinations may require alternate specification, consult NUS before ordering.				
20	2 to 10 Vdc	427k ohms	2.) Other input and output ranges may be available or can be engineered. Alternate terminal arrangements and multiple output models are also available.				
21	-2 to 2 Vdc	3.5M ohms	3.) This list is complete as of 05/98.				
22	-20 to 20 mAdc	249 ohms					
23	N/A						
24	1 to 2 Vdc	3.2M ohms					
25	0 to 4 Vdc	100M ohms					
26	10 to 32.4 mAdc	200 ohms					

ENVIRONMENTAL:

Ambient Temp.: 35 to 122°F (2 to 50°C) (Normal Operation - all specifications apply)
35 to 135°F (2 to 57°C) (No damage-Abnormal Operation for 200 hours, may operate outside performance specifications)
-40 to 185°F (-40 to 85°C) (Storage)

Relative Humidity: 0 to 95% non-condensing (Operating)
0 to 99% non-condensing (Storage)

Pressure: Atmospheric ±10 psig

Radiation Limits: 10^4 Rad TID gamma over forty years

Isolation: 3000 Vdc and 1000 Vac (RMS) from input to output,
(Each input is isolated from every other to these values)
1000 Vdc and 1000 Vac (RMS) from input to case

Fault Withstand: 480 Vac or 140 Vdc at 20 amps on any port, all ports provide isolation from any other on FIA versions. Same specification except output ports isolated from power port to 132 Vac only on all other versions.

Surge Withstand: No damage when the waveform of IEEE-472-1974 is applied in common or transverse mode to any port.

Electrical Class: Plant protection, qualified to IEEE 323-1974/1983 and IEEE 344-1975/1987.

POWER SUPPLY:

Power:		NORMAL OPERATION	PEAK AND INRUSH
1 Ch	Series 100, 500	3 W, 7 VA	5 W, 18 VA (maximum)
→ 4 Ch	Series 300, 350, 500, 800	8 W, 18 VA	12 W, 50 VA (maximum)
8 Ch	Series 600	15 W, 36 VA	24 W, 75 VA (maximum)

Supply Voltage: 85 to 132 Vac, 47 to 63 Hz or 110 to 170 Vdc. Harmonics of power line frequency, to the 21st harmonic, comprising up to 6% of the total voltage, present on the power supply port, have no effect on the module output.

TOLERANCES:

Temperature Effects: Less than 0.025% of output full scale change for a 1°C change in temperature.

Time Response: Less than 5 msec from application of a step change at the input to a change in the output (resistive load) of 63% of the final value. (Filters bypassed or not in the circuit.)

Accuracy: ±0.1% of output full scale, repeatable to 0.05%.

Linearity: 0.05% of output full scale

Freq. Response: DC to 20 Hz (120 Hz for ac inputs) or as specified (5 kHz maximum)

PHYSICAL:

Series 100 Version: (Encapsulated, surface mount, single channel model)
Size: 7.5"w x 6.0"h x 2.6"d
Weight: Approximately 6.8 lbs

→ Series 300 Version: (Encapsulated, surface mount, multi-channel model)
Size: 7.5"w x 8.0"h x 2.6"d
Weight: Approximately 9.4 lbs

Series 350 Version: (Encapsulated, surface mount, multi-channel independent output model)
Size: 8.5"w x 9.0"h x 2.6"d
Weight: Approximately 11.5 lbs

Series 500 Version: (Shelf or rack mount, single or multi-channel model)
Size: 2.78"w x 7.00"h x 13.75"d + 0.75" front clearance
Weight: Approximately 4.8 lbs

Series 600 Version: (19" rack mount, multi-channel model)
Size: 17.0"w x 1.72"h x 13.25"d
Weight: Approximately 9 lbs

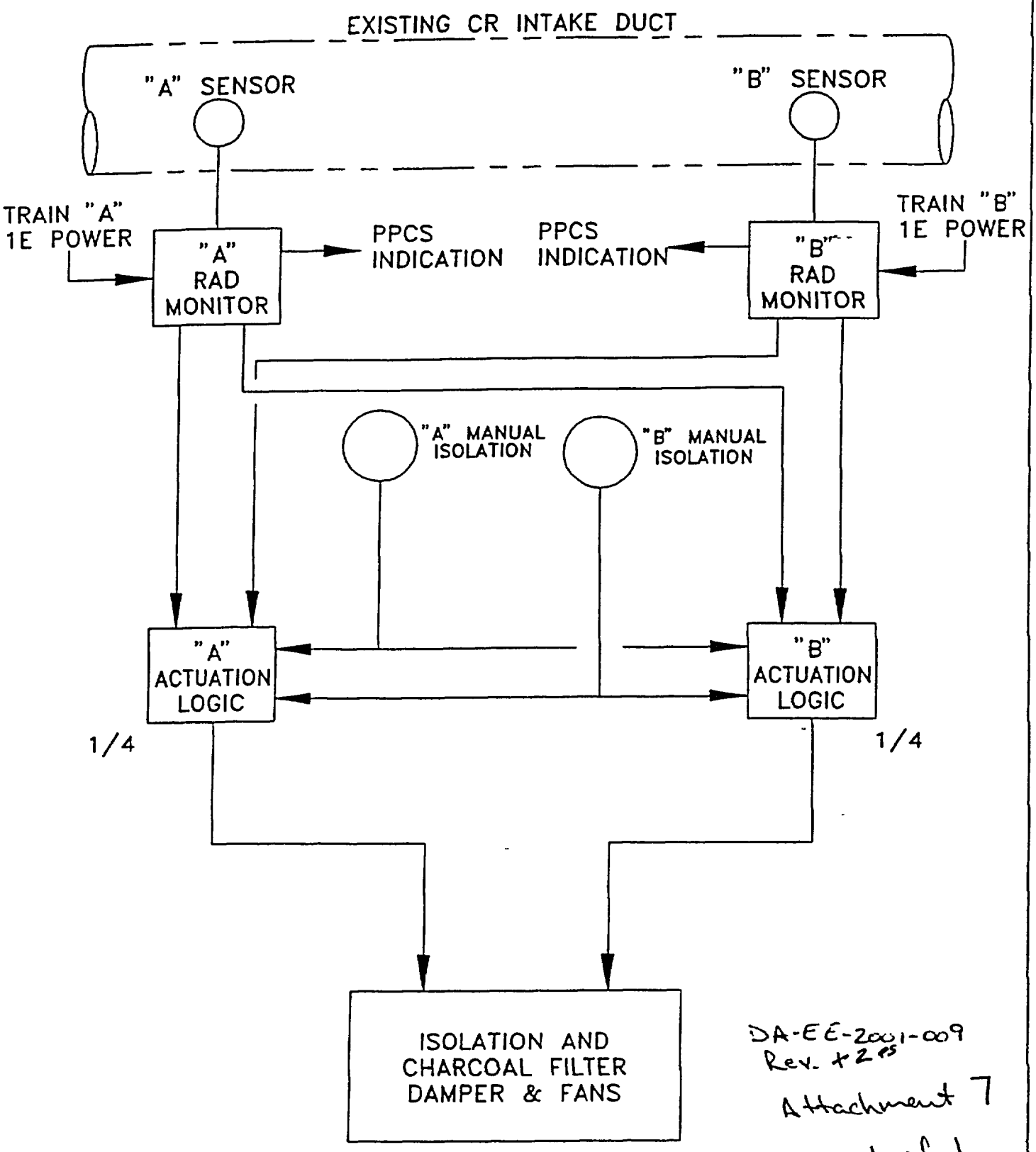
Series 800 Version: (Shelf or rack mount, single or multi-channel model)
Size: 3.37"w x 9.50"h x 15.25"d + 1.25" front clearance
Weight: Approximately 5.3 lbs
800: Yellow power LED and 0.080" pin style test jacks
801: Red power LED and banana style test jacks

FOR ADDITIONAL INFORMATION CONTACT:

NUS INSTRUMENTS, INC.
440 WEST BROADWAY
IDAHO FALLS, ID 83402
PHONE (208) 529-1000

CR RADIATION INTAKE MONITORING INSTRUMENTATION

(PROPOSED)



DA-EE-2001-009
Rev. +2

Attachment 7

p.1 of 1

TRAIN B (Twinco C)

IBPDPCBC/11 (C3505) This circuit also feeds CREPB instrumentation.

Safety Related:

R-30	40 VA		
R-46	40VA	80 VA	0.67 amps

Non Safety (FURMS5):

RK-79	50 VA		
RY-B	18VA	68 VA	0.57 amps

IBPDPCBD/05 (C2665) (Twinco D)

R-15	40VA		
R-16	40VA		
R-17	40VA		
R-18	40VA		
R-19	40VA		
R-20A	40VA	339 VA	2.83 amps
R-20B	40VA		
K850-R15	17VA		
K850-R16	17VA		
K850-R17	17VA		
K850-R18	17VA		
K850-R19	17VA		
K850-R120B	17VA		

TRAIN A (Twinco E)

IBPDPCBE/01 (C2621) This circuit also feeds CREPA instrumentation.

Safety Related:

R-29	40 VA	80 VA	0.67 amps
R-45	40 VA		

Safety Related: (FURMS4):

R-10A	40VA
R-11	40VA
R-12	40VA
K850-R10A	17VA
K850-R11	17VA
K850-R12	17VA
RK-78	50VA

221.0 VA 1.84 amps

Non Safety (FURMS3):

R-10B	40VA
R-13	40VA
R-14	40VA
K850-R10B	17VA
K850-R13	17VA
K850-R14	17VA
RY-10A	7.14VA
RY-11	7.14VA
RY-12	7.14VA
RY-10B	7.14VA
RY-13	7.14VA
RY-14	7.14VA
RY-A	18VA
	231.84 VA 1.93 amps

DA-EE-2001-009 Rev. 2

Attachment 8

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Attachment 3

RG&E Procurement Specification EE-171

D0819526

Control Room Radiation Monitor Specification

Ginna Station

PCR 99-004

Rochester Gas and Electric Corporation
89 East Avenue
Rochester, NY 14649

EE-171

Revision 1

February 25, 2000

RecType

DocType SPEC

Initial

Prepared by: Karen A. Cook Date: 2/25/00
Assigned Engineer

Reviewed by: Andrew Mio Date: 2/25/00
Independent Reviewer

Approved by: Joseph E Pinto Date: 2/25/00
Manager, I & C Electric

1.0 Scope

1.1 This specification defines the performance requirements, associated testing and documentation for two duct mounted control room air intake radiation monitors.

1.2 The monitors will be used to continuously monitor radiation levels in a 42 inch diameter control room air intake duct. They will be used to inform the control room when a predetermined limit is exceeded. They will provide an isolation signal to the control room dampers and a signal to initiate the control room air filtration system. The plant process computer system (PPCS) will receive an analog input from each monitor. A recorder will receive a voltage input from each monitor.

1.3 They are safety related and shall be supplied in accordance with the requirements of 10CFR50, Appendix B.

1.4 They shall be supplied new (not used or rebuilt).

2.0 Referenced Codes and Standards

2.1 ANSI N45.2.2 (1972), "Packing, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants." [ANSI/ASME NQA-2 (1989), "Quality Assurance Requirements for Nuclear Facility Applications:, Incorporates the technical requirements of ANSI N45.2.2]

2.2 ANSI/ANS-HPSSC-6.8.1 (1981), "Location and Design Criteria for Area Radiation Monitoring Systems for Light Water Nuclear Reactors"

2.3 ANSI N42.3 (1969), "American National Standard and IEEE Standard Test Procedure for Geiger-Muller (G/M) Counters"

2.4 Updated Final Safety Analysis Report (UFSAR) for R. E. Ginna Nuclear Power Plant

2.5 RG&E drawing 33013-0721, Control Building Ventilation Duct New Outside Supply

2.6 RG&E Design Analysis DA-EE-99-063, PCR 99-001 Electrical Factors Analysis

2.7 EPRI TR-192323-R1, Guidelines for Electromagnetic Interference Testing in Power Plants, 1997

2.8 EPRI TR-102348, Guideline on Licensing Digital Upgrades, 1993

3.0 Design Requirements

3.1 The power requirements for each monitor shall have a minimum allowable voltage range of 120 Vac ±10%. The maximum allowable operating voltage range and system power requirements (Watts and Volt Amps) shall be provided with the monitors.

3.2 Environmental

3.2.1 The ratemeter will be installed in RMS2 in the Control Room. Per Table 3.11.1 of reference 2.4, the normal ambient conditions in the Control Room are less than 104°F, 0 psig, 60% humidity, radiation is negligible.

3.2.2 The detectors will be mounted in the Control Room intake air duct which draws outside air and is located in the Turbine Building. Per Section 2.3.2.2 of reference 2.4, the ambient conditions in the air duct are 2°F to 91°F, 0 psig 100% humidity. To provide additional margin, the detectors should operate over a range of -10°F to 122°F.

3.2.3 The monitor shall meet the requirements of EPRI TR-103232-R1 and TR-102348. The testing shall verify that the monitors remain functional with an 8 dB margin over the generic emission measurement surveys in the guideline. (Per reference 2.7.)

3.3 Monitoring Range

3.3.1 In accordance with Section 4.3 and Table 2 of reference 2.2, the required radiation rate range expected during routine monitoring will be 1.0E-2 to 1.0E+3 mR/hr.

3.4 Indications and Alarms

3.4.1 Each channel shall have a panel mounted ratemeter with audible and visual alarms which will activate at a predetermined exposure rate.

3.4.2 All contact output logic shall be fail-safe and shall actuate on a loss of power.

Per Section 7.4 of reference 2.6, the high alarm contact outputs of each monitor will interface with Westinghouse BF relays which have 120 Vac coils and have a power requirements of 12 Volt Amps.

Each monitor shall have one double pole double throw (DPDT) high alarm output, two DPDT warning outputs, two DPDT fail outputs. The fail outputs will be activated upon the following conditions: no counts, loss of power, a hardware failure, or detector anti-jam occurs.

The DPDT relay output contacts shall be rated for 5 amps @ 120 Vac or 5 amps @ 29 Vdc.

In addition, each monitor shall have one 0-10 Vdc output and one 4-20 mA output that will drive a 250 ohm resistor.

3.5 Detector

3.5.1 Shall be a self quenched halogen G/M counter.

3.5.2 A plot of each detector plateau (count rate versus voltage) shall be supplied. The detector operating temperature limits shall be supplied. The affect of the entire temperature operating range on the detector accuracy shall be provided.

3.5.3 The range of the detector energy dependence of reading shall be 80 keV to 1.5 MeV. The documentation shall include the detector accuracy over this range.

3.5.4 Repeated count-rate measurements of a source at a fixed voltage should be made to determine if the counter has become stabilized. To test for hysteresis, the plateau voltage shall be traversed in an ascending and then a descending direction with a total elapsed time of less than one hour.

3.5.5 The photosensitivity shall be tested by measuring the background counting rate first with the counter operating in the dark and then with the counter exposed to a stated illumination. The results shall be included in the test report.

3.6 Power Supply Voltages

3.6.1 The high voltage power supply must be capable of delivering the maximum current demand and must do so without overloading or loss of regulation. The regulation against line and load variations should be one percent or better. The ripple should be less than 100 millivolts. (Per reference 2.3.)

3.7 Primary Calibration

3.7.1 This calibration shall be performed with a procedure that uses sources or instruments or both that are traceable to the National Institute of Standards and Technology (NIST).

3.7.2 The calibration shall include the response to Xe-133 , Cs-137 and the ratio of Xe-133 to Cs-137. Cobalt 60 shall be used as the gamma-ray sources in tests of count rate versus exposure rate and current versus exposure rate. Strontium 90 can be used for radial sensitivity measurements. The response shall be within ±20% of the actual exposure rate present at the detector location.

3.8 Functional Test

3.8.1 The monitor verification of operability shall utilize a check source mechanism that contains a Cs-137 radiological source of sufficient strength for a detector response that is greater than 5 mR/hr.

4.0 Materials

4.1 The detector housings shall be aluminum, weather proof.

4.2 Each detector shall be provided with 1700 feet of shielded cable and connectors. The cable and connectors shall provide the maximum resistance to electromagnetic interference (EMI).

5.0 Fabrication

5.1 The detectors shall be supplied with hardware suitable for mounting in a 42 inch steel pipe (API 5L, GR. B, 0.375" wall). Reference 2.5

5.2 The ratemeters shall be supplied with hardware that will allow them to be slid into and out of a 19 inch rack.

6.0 Optional Equipment

6.1 A G/M adapter for use in our Inovision (Victoreen) Model 848-8 field calibrator shall be supplied. This will be used during secondary calibrations.

6.2 Two non-safety related ratemeters shall be supplied with a 0-10 volt input for use in a simulator.

7.0 Quality Verification Requirements

7.1 RG&E will review the test procedures and the documentation. RG&E will provide a source surveillance of the primary calibration and the functional testing of the monitors.

8.0 Documentation

8.1 The documentation shall provide the accuracy and drift of the ratemeters (including high alarm setpoint) and the detectors. It shall include what effect changes in pressure, temperature and power supply aging over a 30 month period has on the ratemeters, high alarm setpoint and detectors. It shall include any random effects that may bias the monitor's output.

8.2 The ratemeter firmware documentation shall include revisions, functional descriptions and any supporting test data.

8.3 The documentation shall include system interconnection drawings with details for installing connectors and terminating, inspecting and testing cables. If applicable, include recommended cable separation and/or routing restrictions.

8.4 A report shall document the requirements of this specification and include the results of the primary calibration and the functional tests.

8.5 The ascending and descending detector plateau curves shall be supplied.

8.6 The high voltage power supply specifications shall be supplied.

8.7 The recommended periodic maintenance including but not limited to calibration practices and frequencies shall be supplied.

8.8 A Certificate of Compliance to this specification shall be supplied.

8.9 For each item, four copies of vendor manuals and drawings shall be supplied.

8.10 Four copies of vendor recommended spare parts list shall be supplied.

9.0 Markings and Identification

9.1 Each ratemeter, detector, calibration source and standard geometry shall include the manufacturer's name, a serial number.

Attachment 4

Certificate of Conformance (C of C)
Purchase Orders for Inovision Equipment

INOVISION
Radiation Measurements

6045 Cochran Road
Cleveland OH 44139
Phone: 440 248-9300
FAX: 440-349-2307
www.inovision.com
www.surveymeters.com

Date: May 3, 2001

Rochester Gas and Electric
Ginna Station
Ontario, NY 14519

Customer P.O.:4500008671
Inovision S.O.:157033

ITEM NUMBER	PART NUMBER	DESCRIPTION		QTY
00010	S157033A	Assy, Air Intake Radiation Monitor		Lot
		Consisting of:	**S/N**	
1a	897A-210	GM Detector	131, 132	2
1b	S157033A1	Mounting Hardware	N/A	2
1c	956A-201-M1	Ratemeter	104643, 104644	2
1d	948B-1	UDR Mounting HW	N/A	2 (1 rack assy)
00040	897A-210	GM Detector	100762	1
00050	956A-201-M1	Ratemeter	104645	1

CERTIFICATE OF CONFORMANCE

It is hereby certified that all articles herewith in the quantities as referenced by your purchase order were manufactured in accordance with the requirements of the purchase order and utilizing previously approved Quality Assurance Manual Version 003, dated 10/9/00, and specifications and drawings applicable to that order. These items are qualified for Class 1E Safty Related applications I.A.W. IEEE 344-1975 per Inovision Test Report 950.366 and appendices 950.353, 353, 338, and 360.

Sincerely,
Inovision RMD

Zis Giatis
QA Manager