

Attachment 1

Qualification Report 950.366, Rev. 2
(revised pages only)

QUALIFICATION REPORT 950.366
FOR GINNA PROJECT P.O. 4500008671

REV. LEVEL	ECN #	DESCRIPTION/PAGES AFFECTED				
2	3090	Add Table of Contents; Sect.1, Revise Certification; Sect. 2, Revised EMI report reference and added Detector discriminator level change; Sec. 6, Add new EMI test report; Add Sec. 7, EMI Test Plan 948.343				
1	2591	Initial Issue				
ENGINEERING		DATE 11-1-02				
MANUFACTURING		DATE 11-1-02				
QUALITY ASSURANCE		DATE 11-1-2002				
SYNCOR RADIATION MANAGEMENT		DATE 11/01/02				
		TITLE Qualification Report 950.366 for Ginna Project P.O. #4500008671				
REV 2	ECN NO. 3090	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 1 of 100	NO 950.366	SIZE PLN

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2	Objectives.....	2 pages
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5	Identification of Equipment.....	10 pages
6	Test Results.....	74 pages

Attachment 1**Test Plan 948.343**

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Date: November 1, 2002

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

Rochester Gas and Electric
Ginna Station
Ontario, NY 14519

Reference: Purchase Order 4500008671, Sales Order 157033
Subject: Report 950.366, Rev 2

This is to certify the Qualification Test Report and Data as 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.



Andrew Lasko
Project Manager
Syncor Radiation Management



Zisimos Giatis
Quality Assurance Manager
Syncor Radiation Management

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 was logged on a multichannel recorder along with the environmental chamber temperature and humidity. A Cs-137 solid source was placed equidistant between the detectors and provided a nominal 2 mR/h rate. Pages 16 through 28 of this section contain the entire strip chart record of the detector temperature and humidity test. No change in count rate (drift) was noted for either of the detectors at any point in the 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-1023230R1 and Test Plan 948.343, Rev. 1, was successfully performed by an independent testing laboratory. The test specimen was an operating channel of the 955A Area Monitor, consisting of a 75 feet of terminated P/N 50-100 multiconductor cable, 897A-210 Low Range GM Detector, 956A-201-M1 Digital Ratemeter, and the P/N S157033A2 Surge Suppressor. The ratemeter and surge suppressor were installed in a 948B-1-5 rack chassis. A second non-operational ratemeter was installed in the second slot in the rack chassis to complete the equipment complement.

Pages 29 through 51 have been replaced with new pages 29 through 58, which contain F-Squared Laboratories Report No. CLE100202-01-01E, detailing the EMC testing and test results. With exception to a low discriminator adjustment to the detector preamplifier, the equipment, as tested, complied with the test requirements.

To achieve the same level of performance in an EMI environment, the following criteria must be adhered to:

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

Detector Discriminator: The low discriminator of the detector preamplifier must be raised from the standard 0.5v setting, to a 1.0v setting to achieve compliance. This will prevent radiated fields above 80 MHz from penetrating the aluminum detector housing and causing a false alarm. The discriminator adjustment does not affect the calibration or energy response of the detector.

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Attachment 1

Test Plan 948.343

(Insert 948.343.pdf Test Plan)

FAX MEMO

Page 1 of 2

TO: Mr. Paul Swift
Company: RG&E
Phone: 585-771-3765
FAX: 585-771-3904

Date: 10/15/02

FROM: Andy Lasko
Company: INOVISION RMS
Phone: 440-542-3611
FAX: 440-349-1927

Subject: 94095603SDD Cover Page

Hi Paul:

Attached is the cover page for the SDD.

Will follow-up with a format transmittal.

Best regards,


Andy Lasko

Project Manager/Syncor

**ELECTROMAGNETIC INTERFERENCE TEST PLAN
FOR MODEL 956A-201 G-M AREA MONITOR**

REV. LEVEL	ECN #	DESCRIPTION/PAGES AFFECTED
1	3065	Initial Release

ENGINEERING	<i>Original signed by: A. Lishko</i>	DATE 10-10-02
MANUFACTURING	<i>Original signed by: D. Warner</i>	DATE 10-10-02
QUALITY ASSURANCE	<i>Original signed by: J. Gialis</i>	DATE 10-10-2002

SYNCOR RADIATION MANAGEMENT		DATE 10/9/02	TITLE ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-201
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1	3065	PRODUCTION	<i>PLN</i>	2 of 6	948.343	PLN		

1 Purpose

The purpose of this test is to demonstrate compliance of the Model 956A-201 digital ratemeter and Model 897A-210 G-M detector to the emissions and susceptibility requirements of EPRI TR-102323-R1, Guidelines for Electromagnetic Interference testing in Power Plants. Testing will be performed in accordance with the industry standards identified, to the specific levels required by ERPI.

2 Scope

2.1 The equipment to be tested will include:

- 1, 956A-201 Digital Ratemeter
- 1, 897A-210 G-M Detector
- 1, S157033A2 EMI Filter Assembly
- 1, 948B-1A-5 2 Bay Rack Chassis
- 75 ft, 50-100 cable
- 1, 942A-200 Ratemeter to serve as a filler for the unused chassis position

2.2 This unit will not be operational for the test.

2.3 A Syncor technical representative will be present during the testing. The Syncor representative will perform the electrical interconnections for the Syncor equipment, and will monitor the test equipment for proper operation during the testing.

3 Reference Standards:

3.1 EPRI TR-102323-R1, Guidelines for Electromagnetic Interference Testing in Power Plants, Revision 1, January, 1997

3.2 MIL-STD-461D, Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference, January, 1993

3.3 International Electrotechnical Commission (IEC) Standard 801, "Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment."

- Part 2, 1991, Electrostatic discharge requirements
- Part 3, 1991, Radiated Electromagnetic field requirements
- Part 4, 1991, Electrical fast transient/burst requirements
- Part 5, 1991, DRAFT, Surge immunity requirements
- Part 6, 1992, DRAFT, Immunity to conducted disturbances induced by radio frequency fields above 9kHz

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4 Measurement and Test Equipment

- 4.1 Measurement and Test Equipment will be identified and possess a current calibration certification with the calibration due date.
- 4.2 For software-controlled devices, the version of the software used will be identified.

5 Testing Requirements

- 5.1 The testing will include:
- Emissions Testing:
 - Conducted
 - Radiated
 - Susceptibility Testing
 - Radiated
 - Conducted
 - Surge Withstand
 - Fast Transient
 - Electrostatic Discharge
- 5.2 The test levels and methods will be as required by EPRI TR-102323-R1.

6 Test Set-up

- 6.1 To replicate the as-installed configuration, the 956A-201 Digital Ratemeter will be mounted in its Model 948B-1A rack chassis. A Model S157033A2 Surge Suppressor Assembly will be mounted in the center slot in the chassis. AC power will be tied directly into the S157033A2. An un-powered 942 series ratemeter will be installed in the unused chassis bay.
- 6.2 Electrical connections between the 956A-201 Ratemeter and the 897A-210 detector will be accomplished via a 75-foot length of P/N 50-100 cable, supplied by Syncor. Except for the Duct adaptor Bulkhead connector, the interconnections will be as shown on Syncor drawing S157033A-104.
- 6.3 The electrical connections will be performed by the Syncor representative.
- 6.4 The 948B-1A chassis and 50-100 cable drain conductor will be earth grounded
- 6.5 Verification of operation prior to the test will include powering up the unit and allowing approximately 15 minutes for the equipment to warm up. After the warm up, a visual verification that the digital display and bar graph are being updated.

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- 6.6 The check source will be actuated and the value recorded, and the channel set point settings will be verified. The Warn alarm set point will be set to 1.0 mR/h and the High alarm set point will be set to 2.5mR/h. The pre-test inspection results will be recorded on Attachment 1.
- 6.7 The equipment will be monitored by the Syncor representative during the test for normal operation.
- 6.8 After completion of the test, a post-test inspection will be performed, and the results will be recorded on Attachment 1.

7 Performance Criteria

- 7.1 For the Radiated and Conducted susceptibility tests, the device will be required to operate as intended both during and after the test (Criteria A).
- 7.2 For the Surge, Transient, and electrostatic discharge, the device will continue to operate as intended after the test (Criteria B).
- 7.3 The digital displays will be visually monitored throughout the testing for any anomalous behavior.

8 Report Requirements

A Formal Test Report will be required. The report will, as a minimum, include the following:

- 8.1 Report Summary and Certificate of Compliance
- Index
 - Test Result Summary
 - Identification of Test Facility
 - List of Reference Standards
 - Administrative Data
 - List of Abbreviations and Acronyms
 - Performance Criteria
 - List of Equipment tested
 - Mode of Operation
 - Monitoring Method
 - Pass/Fail Criteria used
 - Equipment Modifications required (as applicable)
 - List of Test Equipment with Calibration Dates
 - Complete Description of each test and test set-up, to include

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8.2 Test Summary Sheet

- Description of the test
- Orientation of input
- Input type
- Frequency ranges
- Test levels or field strengths
- Scan rates and modulation characteristics
- Grounding and coupling methods
- Test equipment used

8.3 Test Results Data Sheet

- Test Engineer and date of test
- Environmental conditions
- Reference Standard
- Performance Criteria
- Test type and input definition
- Test levels (e.g. Frequency, level, polarity, duration)
- Results (Pass/Fail)

8.4 Diagram or photographs of the test set-up

8.5 Conclusion

SYNCOR RADIATION MANAGEMENT

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10/9/02

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956A-201

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Attachment 1

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer _____

Customer P.O. No: _____

S.O. No.: _____

W.O. No.: _____

TEST TYPE: PRE-TEST: _____ POST TEST: _____

Digital Display Updating? _____ (Yes / No)

Bar Graph Updating? _____ (Yes / No)

Check Source Operational? _____ (Yes / No)

Check Source Reading: _____ mR/h

Set Point Values:

Switch Description:

Value (897A-210 Detector):

Position:

0	High Alarm	2.50E0_mR/h_____ (Yes / No)
1	Warn Alarm	1.00E0_mR/h_____ (Yes / No)
2	Resolving Time	* _____ minutes_____ (Yes / No)
3	Analog Full Scale	1.00E3_mR/h_____ (Yes / No)
4	Overrange Limit	1.00E3_mR/h_____ (Yes / No)
5	Conversion constant	1.00E0_mR/h_____ (Yes / No)
6	Not Used	Not Used_____ (Yes / No)
7	Analog Low Scale Value	1.00E-2_mR/h_____ (Yes / No)
8	Calibrate Mode/Timer	6.00E1_seconds_____ (Yes / No)
9	Underrange Limit	1.00E-2_mR/h_____ (Yes / No)
A-F	Not Used	Not Used_____ (Yes / No)

* = Detector Unique

Normal Status:

Digital Display updating once/second: _____ (Yes / No)

NO Alarm indicators lit _____ (Yes / No)

Bargraph display is green _____ (Yes / No)

Performed by: _____ Date: _____

Q.A. review by: _____ Date: _____

ENGINEERING		Original signed by <i>A. Lasho</i>			DATE 10-10-02	
MANUFACTURING		Original signed by <i>D. Warner</i>			DATE 10-10-02	
QUALITY ASSURANCE		Original signed by <i>J. Stalis</i>			DATE 10-10-2002	
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Attachment 2

TEST REQUIREMENTS

CONDUCTED EMISSIONS TEST REQUIREMENTS:

EPRI TR-102323 Reference: Page 7-2 through 7-4

Test Reference: MIL-STD-461D, CE101

Applicability: Power Conductors

Frequency Range: 30 Hz – 50 kHz (Low)

Emission Limits: 30 Hz – 1 kHz: 122 dBuA

1 kHz – 50 kHz 122 dBuA to 78 dBuA

Test Reference: MIL-STD-461D, CE102

Applicability: Power Conductors

Frequency Range: 50 kHz – 400 MHz (High)

Emission Limits: 50 kHz – 100 kHz: 78 to 60 dBuA

100 kHz – 1 MHz: 60 to 50 dBuA

1 MHz – 10 MHz: 50 to 40 dBuA

10 MHz – 400 MHz: 40 dBuA

Test Notes: _____

ENGINEERING		<i>Original signed by A. Lisho</i>			DATE 10-10-02	
MANUFACTURING		<i>Original signed by D. Warner</i>			DATE 10-10-02	
QUALITY ASSURANCE		<i>Original signed by J. Sialis</i>			DATE 10-10-2002	
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Attachment 2 (Continued)

RADIATED EMISSIONS TEST REQUIREMENTS:

EPRI TR-102323 Reference: Page 7-2 through 7-6

Test Reference: MIL-STD-461D, RE101

Frequency Range: 30 Hz – 100 kHz (Low)

Distance: 7 cm

Emission Limits: 30 Hz – 60 Hz: 160 dBpT

60 Hz – 100 kHz 160 dBpT to 96 dBpT

Test Reference: MIL-STD-461D, RE102

Frequency Range: 10 kHz – 1 GHz (High)

Distance: 7 cm

Emission Limits: 10 kHz – 1 MHz: 80 dBuV

1 MHz – 1 GHz: 80 to 60 dBvu

Test Notes: _____

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Attachment 2 (Continued)

RADIATED SUSCEPTIBILITY TEST REQUIREMENTS:

EPRI TR-102323 Reference: Appendix B, Section 3.1

Test Reference: MIL-STD-461D, RS103 or IEC 801-3

Frequency Range: 10 kHz – 1 GHz

Amplitude: 10 volts per meter (rms)

Additional requirements:

Modulation Frequency: 1 kHz

Modulation percent: >80%

Waveform: Amplitude modulated, 50% duty cycle

Sweep rate: Approx. 1.5E-3 decades per second

Optional Test: At the discretion of the Test Engineer, the frequency may be Increase to 10 GHz per ERPI-TR-102323-R2

Test Notes: _____

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956A-210

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Attachment 2 (Continued)

CONDUCTED SUSCEPTIBILITY TEST REQUIREMENTS:

EPRI TR-102323 Reference: Appendix B, Section 3.2

Test Reference: MIL-STD-461D, CS101 or
IEC 801-6
Applicability: Power Conductors
Frequency Range: 30 Hz – 50 kHz (Low)
Amplitude: 6.3 V (rms, Power conductors)
142 dBuA, 80 W source, 0.5 ohm load

Test Reference: MIL-STD-461D, CS114 or CS02
IEC 801-6
Applicability: Power and Signal Conductors
Frequency Range: 50 kHz – 400 MHz (High)
Amplitude: 103 dBuA, average, CS114
(95dBuA limit into cable; equivalent to 2.8V, 50 ohm)
or
7 volts (rms, average), CS02
(7v rms from 1 W, 50 ohm load)

Additional requirements:

Modulation Frequency: 1 kHz, starting at 50 kHz
Modulation percent: Greater than 80%
Waveform: Square wave, 50% duty cycle
Sweep rate: Approx. 1.5E-3 decades per second

Test Notes: _____

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SURGE TEST REQUIREMENTS:

EPRI TR-102323 Reference: Appendix B, Section 3.3

Test Reference: MIL-STD-462D, CS06 AND CS116 or
IEC 801-5

Applicability: Between Power Conductors and Power Conductors and
Ground

Wave shape: Open circuit, 1.2 usec rise time, 50 usec pulse width, double
exponential

Short circuit, 8 usec rise time, 20 usec width, double
exponential

Level: +/- 3kV

Repetition: Allow 30 to 120 seconds between tests

Test Notes: _____

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Attachment 2 (Continued)

FAST TRANSIENT TEST REQUIREMENTS:

EPRI TR-102323 Reference: Appendix B, Section 3.4

Test Reference: MIL-STD-462D, CS115 or
IEC 801-4

Applicability: Power and Signal Conductors

Wave shape: 5 nsec rise time, with a minimum 50 nsec pulse width at 50%
peak, double exponential

Amplitude: Bulk current: +/- 60 amperes peak into a 50 ohm load
Voltage: +/- 3 kV into a 50 ohm load

Repetition: Bursts will consist of individual transients generated at a rate
of 2.5 to 5 kHz. Bursts will be repeated at a rate of 3 to 4 Hz.

Test Notes: _____

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ELECTROSTATIC DISCHARGE TEST REQUIREMENTS:

EPRI TR-102323 Reference: Appendix B, Section 3.5

Test Reference: IEC 801-2

Wave shape: A current output from a 150 pF capacitor through a 330 ohm resistance, as specified in the reference standard

Pulse Rise Time: Equal to or less than 1 nanosecond

Pulse Decay Time: Approximately 30 nanoseconds at 50% height

Pulse Amplitude: Specified in terms of charge voltage to simulator. For uncontrolled ambient temperature, pressure and humidity.

Air Discharge: +/- 15 kV

Contact Discharge: +/- 8 kV

Repetition: 10 simulations (min) per polarity at each test point while the digital system is operating

Ambient Conditions: Test should be performed with the relative humidity between 30 and 60%

Test Notes: _____

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Attachment 1

- CONDUCTED EMISSIONS

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐

REDSUT:

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

✓ (Yes / No) 956A-201-M1
✓ (Yes / No) S/N 104643
✓ (Yes / No)
37.5 mR/h DETECTOR.

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

897A-210
S/N 100762

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	<u>*1.38E-6</u> minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

CLASSIF:

948B-1A-5SURGE SUPPRESSOR5157033A2S/N 104908

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm Indicators lit
 Bargraph display is green

✓ (Yes / No)
✓ (Yes / No)
✓ (Yes / No)

Performed by: P. Hadley Date: 10-30-02Q.A. review by: D. Smith Date: 11/4/02

ENGINEERING				DATE <u>10-10-02</u>	
MANUFACTURING				DATE <u>10-10-02</u>	
QUALITY ASSURANCE				DATE <u>10-10-2002</u>	
SYNCR RADIATION MANAGEMENT			DATE	TITLE	
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Attachment 1 - *CONDUCTED EMISSIONS*

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: _____ POST TEST: ☒

REMARKS:

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

✓ (Yes / No) 956A-201-M1
✓ (Yes / No) SN 104643
✓ (Yes / No)
37.5 mR/h DETECTOR.

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

897A-210
SN 100762

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	<u>*1.38E-6</u> minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	<u>3.87E-3</u> 1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

CHASSIS:

948B-1A-5SOURCE SUPPRESS5157033A2SN 104908

OK BASED ON
DATA RESPONSES
WITHIN LIMITS
AW

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm indicators lit
 Bargraph display is green

✓ (Yes / No)
✓ (Yes / No)
✓ (Yes / No)

Performed by: P. Harper Date: 10-30-02Q.A. review by: P. Harper Date: 11/1/02

ENGINEERING				DATE <u>10-10-02</u>	
MANUFACTURING				DATE <u>10-10-02</u>	
QUALITY ASSURANCE				DATE <u>10-10-2002</u>	
SYNCR RADIATION MANAGEMENT			DATE	TITLE	
			10/9/02	ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210	
REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.
1	3065	PRODUCTION		1 of 1	958.343
					SIZE
					PLN

Pg 2 of 8

EM/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐REXDT:956A-201-M1

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

✓ (Yes / No) S/N 104643
✓ (Yes / No)
✓ (Yes / No)
36.4 mR/h DETECTOR.

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

897A-210
S/N 100762

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	<u>*1.38E-6</u> minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

CHASSIS:948B-1A-5SOURCE SUPPRESSORS157033A.2S/N 10490830Hz -100KHz

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm indicators lit
 Bargraph display is green

✓ (Yes / No)
✓ (Yes / No)
✓ (Yes / No)

Performed by: A. Karko Date: 10-30-02Q.A. review by: [Signature] Date: 11/4/02

ENGINEERING					DATE <u>10-10-02</u>		
MANUFACTURING					DATE <u>10-10-02</u>		
QUALITY ASSURANCE					DATE <u>10-10-2002</u>		
SYNCR RADIATION MANAGEMENT				DATE	TITLE		
				10/9/02	ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210		
REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE	
1	3065	PRODUCTION		1 of 1	958.343	PLN	

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Attachment 1

PRINTED EMISSIONS *LOW FREQUENCY*

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: _____ POST TEST: ☒*RENOUIT.*

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

☒ (Yes / No)
☒ (Yes / No)
☒ (Yes / No)
36.4 mR/h

*956A-201-M1**S/N 104643**DETECTOR:**897A-210*

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

S/N 100762

0	High Alarm	2.50E0 mR/h	☒ (Yes / No)
1	Warn Alarm	1.00E0 mR/h	☒ (Yes / No)
2	Resolving Time	*1.38E-6 minutes	☒ (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	☒ (Yes / No)
4	Overrange Limit	1.00E3 mR/h	☒ (Yes / No)
5	Conversion constant	1.00E0 mR/h	☒ (Yes / No)
6	Not Used	Not Used	☒ (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	☒ (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	☒ (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	☒ (Yes / No)
A-F	Not Used	Not Used	☒ (Yes / No)

*CLASSIF:**948B-1A-5**SURGE SUPPRESSOR**S157033A2**S/N 104908**30 HZ -
100 KHZ*

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm indicators lit
 Bargraph display is green

☒ (Yes / No)
☒ (Yes / No)
☒ (Yes / No)

*OK - RAO
DATA BELOW
LIMITS
ALL*Performed by: *A. Chasler* Date: 10-30-02Q.A. review by: *[Signature]* Date: 11/04/02

ENGINEERING					DATE <u>10-10-02</u>	
MANUFACTURING					DATE <u>10-10-02</u>	
QUALITY ASSURANCE					DATE <u>10-10-2002</u>	
SYNCOR RADIATION MANAGEMENT			DATE	10/9/02	TITLE ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210	
REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

10-4-18

Attachment 1 - RADIATED EMISSIONS - HIGH FREQ

EMVRFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐

REMARKS:

956A-201-M1

Digital Display Updating?

☒ (Yes / No)S/N 104643

Bar Graph Updating?

☒ (Yes / No)

Check Source Operational?

☒ (Yes / No)

Check Source Reading:

39.4 mR/h

DETECTOR:

897A-210

Set Point Values:

Switch Description:
Position:

Value (897A-210 Detector):

S/N 100762

0	High Alarm	2.50E0 mR/h	☒ (Yes / No)
1	Warn Alarm	1.00E0 mR/h	☒ (Yes / No)
2	Resolving Time	* <u>1.38E-6</u> minutes	☒ (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	☒ (Yes / No)
4	Overrange Limit	1.00E3 mR/h	☒ (Yes / No)
5	Conversion constant	1.00E0 mR/h	☒ (Yes / No)
6	Not Used	Not Used	☒ (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	☒ (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	☒ (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	☒ (Yes / No)
A-F	Not Used	Not Used	☒ (Yes / No)

CHASSIS:

948B-1A-5SURGE SUPPRESSORS157033A2S/N 10490810KHz
- 1GHz

* = Detector Unique

Normal Status:

Digital Display updating once/second: ☒ (Yes / No)
 NO Alarm indicators lit ☒ (Yes / No)
 Bargraph display is green ☒ (Yes / No)

Performed by: A. Hanks Date: 10-30-02Q.A. review by: D. W. Hanks Date: 11-4-02

ENGINEERING				DATE <u>10-10-02</u>	
MANUFACTURING				DATE <u>10-10-02</u>	
QUALITY ASSURANCE				DATE <u>10-10-2002</u>	
SYNOR RADIATION MANAGEMENT			DATE <u>10/9/02</u>	TITLE <u>ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210</u>	
REV 1	ECO NO. 3065	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 1 of 1	NO. 958.343
					SIZE PLN

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Attachment 1 -

RADIATED EMISSIONS - HIGH FREQUENCY

EMVRFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: POST TEST: ☒

REASOUT:

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

✓ (Yes / No) 956A-201-M1
✓ (Yes / No) S/N 104643
✓ (Yes / No)
39.4 mR/h DETECTOR.

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

897A-210
S/N 100762

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	<u>*1.38E-6</u> minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

CLASSIS:

94BB-1A-5SURGE SUPPRESSORS157033A2S/N 10490810KHz-1G Hz

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm indicators lit
 Bargraph display is green

✓ (Yes / No)
✓ (Yes / No)
✓ (Yes / No)

OK Run Data
CH. 1 TEST
LIMITS OK

Performed by: A. Chacko Date: 10-30-02Q.A. review by: [Signature] Date: 11-4-02

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE 10-10-02DATE 10-10-02DATE 10-10-2002

SYNCR RADIATION MANAGEMENT

DATE 10/9/02

TITLE ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210

REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

DC 1-118

Attachment 1

- RADIATED SUSCEPTIBILITY - Low FREQ

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐

RENOXIT.

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

✓ (Yes / No)
✓ (Yes / No)
✓ (Yes / No)
36.2 mR/h

956A-201-M1

S/N 104643

DETECTOR:

897A-210

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

S/N 100762

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	*1.38E-6 minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

CHASSIS:

948B-1A-5

SURGE SUPPRESSOR

S157033A2

S/N 104908

10 kHz -

20 MHz

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm indicators lit
 Bargraph display is green

✓ (Yes / No)
✓ (Yes / No)
✓ (Yes / No)

Performed by: Phelps Date: 10-30-02Q.A. review by: [Signature] Date: 11/04/02

ENGINEERING				DATE 10-10-02			
MANUFACTURING				DATE 10-10-02			
QUALITY ASSURANCE				DATE 10-10-2002			
SYNCOR RADIATION MANAGEMENT				DATE 10/9/02		TITLE ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210	
REV 1	ECO NO. 3065	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 1 of 1	NO. 958.343	SIZE PLN	

0. 7418

EM/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RGIECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: _____ POST TEST: ✓

REASON:

956A-201-M1

Digital Display Updating?

✓ (Yes / No)S/N 104643

Bar Graph Updating?

✓ (Yes / No)

Check Source Operational?

✓ (Yes / No)

Check Source Reading:

35.6 mR/h

DETECTOR:

897A-210

Set Point Values:

Switch Description:

Value (897A-210 Detector):

S/N 100762

Position:

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	<u>*1.38E-6</u> minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

CLASSIS:

948B-1A-5SOURCE SUPPRESSS157033A2S/N 10490810KHz-20MHz

* = Detector Unique

Normal Status:

Digital Display updating once/second:

✓ (Yes / No)

NO Alarm indicators lit

✓ (Yes / No)

Bargraph display is green

✓ (Yes / No)OK
NO INDICATORS
litPerformed by: Chas Date: 10-30-02Q.A. review by: [Signature] Date: 11-4-02

ENGINEERING				<u>Chas</u>		DATE <u>10-10-02</u>	
MANUFACTURING				<u>D. W.</u>		DATE <u>10-10-02</u>	
QUALITY ASSURANCE				<u>[Signature]</u>		DATE <u>10-10-2002</u>	
SYNCOR RADIATION MANAGEMENT				DATE	10/9/02	TITLE ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210	
REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE	
1	3065	PRODUCTION		1 of 1	958.343	PLN	

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Attachment 1

RADIATED
SUSCEPTIBILITY
HIGH FREQUENCY

142

EM/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer R.G.E./GINNACustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐RADIATED
SUSCEPTIBILITYDigital Display Updating?
Bar Graph Updating?
Check Source Operational?
Check Source Reading:YES (Yes / No) 20MHz -
YES (Yes / No) 1GHz
YES (Yes / No)
36.7 mR/h

Set Point Values:

Switch Description:
Position:

Value (897A-210 Detector):

0	High Alarm	2.50E0 ☒ mR/h	<u>YES</u> (Yes / No)
1	Warn Alarm	1.00E0 ☒ mR/h	<u>YES</u> (Yes / No)
2	Resolving Time	* <u>1.30E-6</u> minutes	<u>YES</u> (Yes / No)
3	Analog Full Scale	1.00E3 ☒ mR/h	<u>YES</u> (Yes / No)
4	Overrange Limit	1.00E3 ☒ mR/h	<u>YES</u> (Yes / No)
5	Conversion constant	3.97E-3 1.00E0 ☒ mR/h	<u>YES</u> (Yes / No)
6	Not Used	Not Used	<u>N/A</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 ☒ mR/h	<u>YES</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 ☒ seconds	<u>YES</u> (Yes / No)
9	Underrange Limit	1.00E-2 ☒ mR/h	<u>YES</u> (Yes / No)
A-F	Not Used	Not Used	<u>N/A</u> (Yes / No)

* = Detector Unique

Normal Status:

Digital Display updating once/second:
NO Alarm indicators lit
Bargraph display is greenYES (Yes / No)
YES (Yes / No)
YES (Yes / No)Performed by: P. W.Date: 10/17/02Q.A. review by: P. W.Date: 11-4-02

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE 10-10-02DATE 10-10-02DATE 10-10-2002

SYNCR RADIATION MANAGEMENT

DATE 10/9/02

TITLE ELECTROMAGNETIC
INTERFERENCE TEST PLAN,
956A-210

REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

11-4-18

Attachment 1 -

RADIATED
SUSCEPTIBILITY
HIGH FREQUENCY

242

EMVRFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer R.L. E. GUNNACustomer P.O. No: 450000 8671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: POST TEST: ☒POST VERT. / HURZ.
SWEEPRADIATION SUSCEPTIBILITY

Digital Display Updating?

YES (Yes / No)

Bar Graph Updating?

YES (Yes / No)

Check Source Operational?

YES (Yes / No)

Check Source Reading:

37.7 mR/h

Set Point Values:

Switch Description:
Position:

Value (897A-210 Detector):

20M - 16Hz

0	High Alarm	2.50E0 <u>✓</u> mR/h	<u>YES</u> (Yes / No)
1	Warn Alarm	1.00E0 <u>✓</u> mR/h	<u>YES</u> (Yes / No)
2	Resolving Time	<u>1.38E-6</u> minutes	<u>YES</u> (Yes / No)
3	Analog Full Scale	1.00E3 <u>✓</u> mR/h	<u>YES</u> (Yes / No)
4	Overrange Limit	1.00E3 <u>✓</u> mR/h	<u>YES</u> (Yes / No)
5	Conversion constant $3.87E-3$	1.00E0 <u>✓</u> mR/h	<u>YES</u> (Yes / No)
6	Not Used	Not Used	<u>YES</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 <u>✓</u> mR/h	<u>YES</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 <u>✓</u> seconds	<u>YES</u> (Yes / No)
9	Underrange Limit	1.00E-2 <u>✓</u> mR/h	<u>YES</u> (Yes / No)
A-F	Not Used	Not Used	<u>N/A</u> (Yes / No)

RESET DETECTOR
PRE-AMP LOW
DISCRIMINATOR
TO 1.0V
KUL

* = Detector Unique

Normal Status:

Digital Display updating once/second:
NO Alarm indicators lit
Bargraph display is green

YES (Yes / No)
YES (Yes / No)
YES (Yes / No)

Performed by: [Signature] Date: 10-18-02

16:49

Q.A. review by: [Signature] Date: 11-07-02

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE 10-10-02DATE 10-10-02DATE 10-10-2002

SYNCOR RADIATION MANAGEMENT

DATE

10/9/02

TITLE

ELECTROMAGNETIC
INTERFERENCE TEST PLAN,
956A-210

REV

ECO NO.

RELEASED FOR

DOC CTRL

SHEET

NO.

SIZE

1

3065

PRODUCTION

1 of 1

958.343

PLN

02-1-110

Attachment 1 - *Conducted Susceptibility*
EM/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETERCustomer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐

REMARKS:

Digital Display Updating?
Bar Graph Updating?
Check Source Operational?
Check Source Reading:☒ (Yes / No)☒ (Yes / No)☒ (Yes / No)264.8167 mR/h

956A-201-M1

S/N 104643

DETECTOR:

897A-210

S/N 100762

Set Point Values:

Switch Description:
Position:

Value (897A-210 Detector):

0	High Alarm	2.50E0 mR/h	☒ (Yes / No)
1	Warn Alarm	1.00E0 mR/h	☒ (Yes / No)
2	Resolving Time	*1.38E-6 minutes	☒ (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	☒ (Yes / No)
4	Overrange Limit	1.00E3 mR/h	☒ (Yes / No)
5	Conversion constant	1.00E0 mR/h	☒ (Yes / No)
6	Not Used	Not Used	☒ (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	☒ (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	☒ (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	☒ (Yes / No)
A-F	Not Used	Not Used	☒ (Yes / No)

CHASSIS:

948B-1A-5

SOURCE SUPPRESSOR

S157033A.2

S/N 104908

* = Detector Unique

Normal Status:

Digital Display updating once/second:
NO Alarm indicators lit
Bargraph display is green☒ (Yes / No)☒ (Yes / No)☒ (Yes / No)Performed by: [Signature] Date: 10-31-2001Q.A. review by: [Signature] Date: 11-4-02

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE 10-10-02DATE 10-10-02DATE 10-10-2002

SYNCOR RADIATION MANAGEMENT

DATE

10/9/02

TITLE

ELECTROMAGNETIC
INTERFERENCE TEST PLAN,
956A-210

REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

Dr 11/18

Attachment 1

CONDUCTED S/E OFF/13/17

EM/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: _____ POST TEST: ✓

REDSUT:

956A-201-M1Digital Display Updating? ✓ (Yes / No) S/N 104643Bar Graph Updating? ✓ (Yes / No)Check Source Operational? ✓ (Yes / No)Check Source Reading: 96.736.7 mR/h

DETECTOR:

897A-210

Set Point Values:

Switch

Description:

Value (897A-210 Detector):

S/N 100762

Position:

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	<u>*1.38E-6</u> minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	<u>3.87E-3</u> 1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

CHASSIS:

948B-1A-5SOURCE SUPPRESSS157033A2S/N 104908

* = Detector Unique

Normal Status:

Digital Display updating once/second: ✓ (Yes / No)NO Alarm indicators lit ✓ (Yes / No)Bargraph display is green ✓ (Yes / No)Performed by: [Signature] Date: 10-31-2002Q.A. review by: [Signature] Date: 11-4-02

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE 10-10-02DATE 10-10-02DATE 10-10-2002

SYNCOR RADIATION MANAGEMENT

DATE

10/9/02

TITLE

ELECTROMAGNETIC
INTERFERENCE TEST PLAN,
956A-210

REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

VC 12 d 18

Attachment 1

- SURGE

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐

REMARKS:

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

☒ (Yes / No)
☒ (Yes / No)
☒ (Yes / No)
37.8 mR/h

956A-201-M1
 S/N 104643

DETECTOR:

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

897A-210
 S/N 100762

0	High Alarm	2.50E0 mR/h	☒ (Yes / No)
1	Warn Alarm	1.00E0 mR/h	☒ (Yes / No)
2	Resolving Time	*1.38E-6 minutes	☒ (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	☒ (Yes / No)
4	Overrange Limit	1.00E3 mR/h	☒ (Yes / No)
5	Conversion constant	1.00E0 mR/h	☒ (Yes / No)
6	Not Used	Not Used	☒ (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	☒ (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	☒ (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	☒ (Yes / No)
A-F	Not Used	Not Used	☒ (Yes / No)

CHASSIS:

94BB-1A-5

Source Suppressed

S157033A2

S/N 104908

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm Indicators lit
 Bargraph display is green

☒ (Yes / No)
☒ (Yes / No)
☒ (Yes / No)

Performed by: A. Chaske Date: 10-14-02Q.A. review by: D. W. W. Date: 11-04-02

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE 10-10-02DATE 10-10-02DATE 10-10-2002

SYNCOR RADIATION MANAGEMENT

DATE 10/9/02

TITLE ELECTROMAGNETIC
 INTERFERENCE TEST PLAN,
 956A-210

REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

11-12-18

Attachment 1

- SURGE

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: _____ POST TEST: ✓ RENDUT.

Digital Display Updating?

Bar Graph Updating?

Check Source Operational?

Check Source Reading:

✓ (Yes / No)✓ (Yes / No)✓ (Yes / No)37.4 mR/h

956A-201-M1

S/N 104643

DETECTOR:

897A-210

S/N 100762

Set Point Values:

Switch Description:

Value (897A-210 Detector):

Position:

0	High Alarm	2.50E0_mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0_mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	*1.38E-6 minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3_mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3_mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0_mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2_mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1_seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2_mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

* = Detector Unique

CHASSIS:

948B-1A-5

Source Suppressor

S157033A2

S/N 104908

Normal Status:

Digital Display updating once/second:

NO Alarm indicators lit

Bargraph display is green

✓ (Yes / No)✓ (Yes / No)✓ (Yes / No)Performed by: [Signature] Date: 10-14-02Q.A. review by: [Signature] Date: 11-04-02

ENGINEERING		DATE 10-10-02	
MANUFACTURING		DATE 10-10-02	
QUALITY ASSURANCE		DATE 10-10-2002	
SYNCR RADIATION MANAGEMENT		DATE 10/9/02	TITLE ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210
REV 1	ECO NO. 3065	RELEASED FOR PRODUCTION	DOC CTRL SHEET 1 of 1 NO. 958.343 SIZE PLN

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Attachment 1 - *FAST TRANSIENT*

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500006671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐*RENDUT.*

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

956A-201-M1
☒ (Yes / No) *S/N 104643*
☒ (Yes / No)
☒ (Yes / No)
37.4 mR/h *DETECTOR:*

Set Point Values:

Switch Description:
Position:

Value (897A-210 Detector):

*897A-210**S/N 100762*

0	High Alarm	2.50E0 mR/h	☒ (Yes / No)
1	Warn Alarm	1.00E0 mR/h	☒ (Yes / No)
2	Resolving Time	<i>*1.38E-6</i> minutes	☒ (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	☒ (Yes / No)
4	Overrange Limit	1.00E3 mR/h	☒ (Yes / No)
5	Conversion constant	1.00E0 mR/h	☒ (Yes / No)
6	Not Used	Not Used	☒ (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	☒ (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	☒ (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	☒ (Yes / No)
A-F	Not Used	Not Used	☒ (Yes / No)

*CHASSIS:**948B-1A-5**SURGE SUPPRESSOR**5157033A2**S/N 104908*

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm indicators lit
 Bargraph display is green

☒ (Yes / No)
☒ (Yes / No)
☒ (Yes / No)

Performed by: *Charles* Date: *10-11-02*Q.A. review by: *[Signature]* Date: *11-04-02*

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE *10-10-02*DATE *10-10-02*DATE *10-10-2002*

SYNCR RADIATION MANAGEMENT

DATE

10/9/02

TITLE

ELECTROMAGNETIC
 INTERFERENCE TEST PLAN,
 956A-210

REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

Pc 15 d 18

Attachment 1

FAST TRANSIENT

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: / N/ATEST TYPE: PRE-TEST: _____ POST TEST: ✓

RENDUIT:

956A-201-M1

Digital Display Updating?

Bar Graph Updating?

Check Source Operational?

Check Source Reading:

✓ (Yes / No)✓ (Yes / No)✓ (Yes / No)34.9 mR/h

S/N 104643

DETECTOR:

897A-210

Set Point Values:

Switch

Description:

Value (897A-210 Detector):

S/N 100762

Position:

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	*1.38E-6 minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

* = Detector Unique

CHASSIS:

948B-1A-5

SOURCE SUPPRESSOR

S157033A2

S/N 104908

Normal Status:

Digital Display updating once/second:

NO Alarm indicators lit

Bar graph display is green

✓ (Yes / No)✓ (Yes / No)✓ (Yes / No)NO
ANOMALIES
ASRPerformed by: G. Hacks Date: 10-14-02Q.A. review by: D. W. Hacks Date: 10-10-02

11-04-02

ENGINEERING

MANUFACTURING

QUALITY ASSURANCE

DATE 10-10-02DATE 10-10-02DATE 10-10-2002

SYNCOR RADIATION MANAGEMENT

DATE

10/9/02

TITLE

ELECTROMAGNETIC
INTERFERENCE TEST PLAN,
956A-210

REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3065	PRODUCTION		1 of 1	958.343	PLN

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Attachment 1 — ESD

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: ☒ POST TEST: ☐

REMARKS:

Digital Display Updating?
 Bar Graph Updating?
 Check Source Operational?
 Check Source Reading:

☒ (Yes / No) 956A-201-M1
☒ (Yes / No) S/N 104643
☒ (Yes / No)
37.7 mR/h

DETECTOR:

897A-210

Set Point Values:

Switch Description:
 Position:

Value (897A-210 Detector):

S/N 100762

0	High Alarm	2.50E0 mR/h	☒ (Yes / No)
1	Warn Alarm	1.00E0 mR/h	☒ (Yes / No)
2	Resolving Time	* <u>1.38E-6</u> minutes	☒ (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	☒ (Yes / No)
4	Overrange Limit	1.00E3 mR/h	☒ (Yes / No)
5	Conversion constant	1.00E0 mR/h	☒ (Yes / No)
6	Not Used	Not Used	☒ (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	☒ (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	☒ (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	☒ (Yes / No)
A-F	Not Used	Not Used	☒ (Yes / No)

CHASSIS:

9480-1A-5SOURCE SUPPLIED5157033A2S/N 104908

* = Detector Unique

Normal Status:

Digital Display updating once/second:
 NO Alarm Indicators lit
 Bargraph display is green

☒ (Yes / No)
☒ (Yes / No)
☒ (Yes / No)

Performed by: A. Hasko Date: 10-14-02Q.A. review by: [Signature] Date: 11-07-02

ENGINEERING				DATE <u>10-10-02</u>	
MANUFACTURING				DATE <u>10-10-02</u>	
QUALITY ASSURANCE				DATE <u>10-10-2002</u>	
SYNCRAD RADIATION MANAGEMENT			DATE	TITLE	
			10/9/02	ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210	
REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.
1	3065	PRODUCTION		1 of 1	958.343
					SIZE
					PLN

PC 17 of 18

EMI/RFI TEST DATA SHEET: 956A-201 DIGITAL RATEMETER

Customer RG+ECustomer P.O. No: 4500008671S.O. No.: 157033W.O. No.: N/ATEST TYPE: PRE-TEST: _____ POST TEST: ✓

RECOUNT:

956A-201-M1

Digital Display Updating? ✓ (Yes / No) S/N 104643Bar Graph Updating? ✓ (Yes / No)Check Source Operational? ✓ (Yes / No)Check Source Reading: 37.8 mR/h

DETECTOR:

897A-210

Set Point Values:

Switch Description:

Value (897A-210 Detector):

S/N 100762

Position:

0	High Alarm	2.50E0 mR/h	<u>✓</u> (Yes / No)
1	Warn Alarm	1.00E0 mR/h	<u>✓</u> (Yes / No)
2	Resolving Time	*1.38E-6 minutes	<u>✓</u> (Yes / No)
3	Analog Full Scale	1.00E3 mR/h	<u>✓</u> (Yes / No)
4	Overrange Limit	1.00E3 mR/h	<u>✓</u> (Yes / No)
5	Conversion constant	1.00E0 mR/h	<u>✓</u> (Yes / No)
6	Not Used	Not Used	<u>✓</u> (Yes / No)
7	Analog Low Scale Value	1.00E-2 mR/h	<u>✓</u> (Yes / No)
8	Calibrate Mode/Timer	6.00E1 seconds	<u>✓</u> (Yes / No)
9	Underrange Limit	1.00E-2 mR/h	<u>✓</u> (Yes / No)
A-F	Not Used	Not Used	<u>✓</u> (Yes / No)

* = Detector Unique

Normal Status:

Digital Display updating once/second: ✓ (Yes / No)NO Alarm Indicators lit ✓ (Yes / No)Bargraph display is green ✓ (Yes / No)Performed by: A. Pharis Date: 10-14-02Q.A. review by: [Signature] Date: 11/01/02OK
No
ANOMALIES

ENGINEERING				DATE <u>10-10-02</u>	
MANUFACTURING				DATE <u>10-10-02</u>	
QUALITY ASSURANCE				DATE <u>10-10-2002</u>	
SYNCR RADIATION MANAGEMENT			DATE	TITLE	
			10/9/02	ELECTROMAGNETIC INTERFERENCE TEST PLAN, 956A-210	
REV	ECO NO.	RELEASED FOR	DOC CTRL	SHEET	NO.
1	3065	PRODUCTION		1 of 1	958.343
					SIZE
					PLN

EMC TEST REPORT

For a

Digital Area Radiation Monitor

Manufacturer:
Syncon Radiation Management
6045 Cochran Road
Solon, Ohio 44139

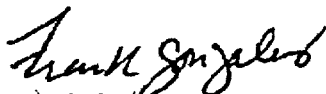
Testing Laboratory:
F-Squared Laboratories
14333 Kinsman Road
Burton, Ohio 44021

The Digital Rate Meter, Model Number 956A-201-M1, was tested to the following Standards and was found to be in compliance with the electromagnetic emissions and immunity requirements outlined in this report. The testing commenced on October 14, 2002 and was completed on October 31, 2002.

Reference Standards

- EPRI TR-102323-R1, 1997 edition: Guidelines for Electromagnetic Interference Testing and Power Plants
- MIL Standard 461D: Requirements for Control of Electromagnetic Interference Emissions and Susceptibility
- MIL Standard 462D: Test Method for Measurement of Electromagnetic Interference Characteristics
 - RE101: Radiated Emissions – 30Hz to 100kHz
 - RE102: Radiated Emissions – 100kHz to 1000MHz
 - CE101: Conducted Emissions – 30Hz to 50kHz
 - CE102: Conducted Emissions – 50Hz to 400 MHz
 - RS103: Radiated Immunity – 10kHz to 1000 MHz
- EN 61000-6-1:2001 – Generic Standards – Immunity for residential, Commercial and Light Industrial Environments. (Previously IEC Standard 801)
 - EN 61000-4-2:1995 edition (IEC 801-2) - Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test.
 - EN 61000-4-3:1995 edition (IEC 801-3) - Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test.
 - EN 61000-4-4:1995 edition (IEC 801-4) - Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 4: Electrical Fast Transient/burst immunity test.
 - EN 61000-4-5:1995 edition (IEC 801-5) - Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 5: Surge Immunity test.
 - EN 61000-4-6:1995 edition (IEC 801-6) - Electromagnetic Compatibility-Part 4: Testing and measurement techniques – Section 6: Conducted Immunity test.

Evaluation Conducted by:


Frank Gonzales
EMC Engineer

Report Reviewed by:

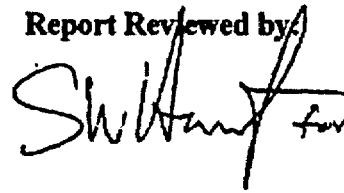

Robert Pellizze
Vice President

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GENERAL REPORT SUMMARY

This electromagnetic emission and immunity test 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
8	Electrostatic Discharge	Pass
9	Radiated Immunity	Pass
10	Electrical Fast Transient Burst	Pass
11	Power Surge	Pass
12	Conducted Immunity	Pass
13	Radiated Emissions	Pass
14	Conducted Emissions	Pass

1.0 ADMINISTRATIVE DATA

1.1 Management of Test Sample

The test sample was inventoried at the F-Squared facility and returned to Syncor Radiation Management, 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
VCP	Vertical Coupling Plane
mR/h	Milli-Roentgens per Hour

2.0 DESCRIPTION OF THE TEST CONFIGURATIONS

2.1 Performance Criteria

The following Performance Criteria is determined from the EPRI Standard EPRI TR-102323-R1.

SPECIFICATION	MINIMUM PERFORMANCE CRITERIA
EN 61000-4-2	B
EN 61000-4-3	A
EN 61000-4-4	B
EN 61000-4-5	B
EN 61000-4-6	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.

Performance Criteria C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

3.0 LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

3.1 Equipment Under Test (EUT):

Device	Manufacturer	Model Number	Serial Number
Digital Rate Meter	Syncor Radiation Management	956A-201-M1	104643

3.2 Accessories (Support Equipment):

Device	Manufacturer	Model Number
G-M Detector	Syncor Radiation Management	897A-210 Ser. No. 100762
Surge Suppressor	Syncor Radiation Management	S157033A2 Ser. No. 104908
Rack Chassis Enclosure	Syncor Radiation Management	948B-1A-5
Rate Meter	Syncor Radiation Management	942A-200
Software	Syncor Radiation Management	Version 2.0

3.3 Cables:

Cable Function	Length	Shielded (Yes/No)
Interconnection Cable, P/N 50-100	78 feet	Yes
120 VAC Power Cable	4 feet	No

4.0 MODE OF OPERATION

The EUT was mounted in the rack chassis enclosure along with the “dummy” rate meter that was used to occupy empty chassis enclosure space. The surge suppressor was mounted in the center chassis opening and was connected to a 120 Volt AC, 60 Hz power source and operated in the on mode. The ground conductor of the 50-100 interconnecting cable was grounded to earth ground.

Prior to each test, the detector check source was activated, the measurement value recorded, and the channel set-points were verified. The alarm set-point was set to 1.0 mR/h and the High alarm set-point was set to 2.5mR/h

5.0 METHOD OF MONITORING

The EUT was visually monitored via the equipment front panel displays. This included the High and Low Alarm LED indicators, the digital display and the bar-graph display. The Fail LED was also monitored for a Watchdog Timer time out, which would be indicative of a microprocessor lock-up, or failure.

6.0 IMMUNITY PASS/FAIL CRITERIA

If the Fail LED illuminated, this was considered a degradation of performance. If the High or Low Alarm LEDs illuminated, this was considered to be a degradation of performance. If the radiation measurement increased above the Warn or High alarm set point, this was considered to be a degradation of performance. If the channel set points changed, this was considered to be a degradation of performance. If the EUT shut down, this was considered to be a degradation of performance.

7.0 EMC TEST EQUIPMENT

Equipment Type	Manufacturer	Model	Serial Number	Calibration Due Date
Receiver	Dynamic Sciences	DSI-2020	604/002	07/26/03
Antenna 1	EMC Test Systems	3143 Biconilog	9603-1249	06/11/03
Antenna 2	EMC Test Systems	3143 Biconilog	9609-1306	07/10/03
Parallel Element Antenna	EMCO	3107	2123	10/01/03
Monopole Antenna	AH Systems	SAS-200/500-2	163	10/17/03
Loop Sensor	Solar Electronics	7334-1	002302	10/16/03
ESD Generator	Haefely Trench	PESD 1600	1600	01/17/03
Thermohygrometer	Oakton	32230-80	001	03/29/03
Signal Analyzer	Hewlett Packard	89410A	3416A02064	10/17/03
Spectrum Analyzer	Hewlett Packard	8591A	3149A02546	02/19/03
Surge Generator	EM Test	VCS 500	21527	01/15/03
EFT Generator	Haefely Trench	PEFT Junior	83818	01/14/03
Signal Generator	Giga-tronics	6061A	9618911	12/21/02
Oscilloscope	Goldstar	OS-90206	5091208	05/06/03
Oscilloscope	Tektronix	TDS3052	B014540	11/14/02
Amplifier	Instruments for Industry	SMX 100	1984-0796	Verified
Amplifier	Pioneer	GM-X962	BIPJ041850 UC	Verified
Injection Probe	Fisher Custom Communications	F-130-1	184	10/24/03
Injection Probe	Fisher Custom Communications	F-120-9A	68	Verified
LISN	Fisher Custom Communications	FCC-LISN-50-250-25-4	9600	08/11/03
Current Probe	Fisher Custom Communications	F-14	40	10/24/03
Digital Volt Meter	Goldstar	DM-333	S70603404	05/06/03
Isolation Transformer	Solar Electronics	6220-1A	01	Verified

8.0 ELECTROSTATIC DISCHARGE TEST PROCEDURE

8.1 Electrostatic Discharge Test (ESD)

The ESD generator and discharge gun were used to conduct the tests outlined below. The waveform conforms to EN 61000-4-2:1995. This generator was used to simulated electrostatic discharges to the EUT.

The EUT was placed on a non-conductive table 0.8 meter above the Ground Reference Plane (GRP). The EUT was placed on a non-conductive material 0.5 mm above a horizontal coupling plane (HCP) conforming to the dimensions of EN 61000-4-2:1995. The vertical coupling plane was 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: 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.

8.2 Electrostatic Discharge Test Data Sheet

Test Date:	10/14/02	Test Engineer:	M. Gonzales
Standard:	EN 61000-4-2:1995	Air Temperature:	20.2° C
Minimum Performance Criteria:	B	Relative Humidity:	37%

Conductive Surfaces

Discharge Point	Level	Method	Achieved Performance Criteria	Pass / Fail
Vertical Coupling Plane – Right Side	± 8 kV	Contact	A	Pass
Vertical Coupling Plane – Left Side	± 8 kV	Contact	A	Pass
Vertical Coupling Plane – Front Side	± 8 kV	Contact	A	Pass
Vertical Coupling Plane – Back Side	± 8 kV	Contact	A	Pass
Horizontal Coupling Plane	± 8 kV	Contact	A	Pass
Conductive Surfaces	± 8 kV	Contact	A	Pass

Non-Conductive Surfaces

Test Area	Level	Method	Achieved Performance Criteria	Pass / Fail
Front Panel Display	± 15 kV	Air	A	Pass

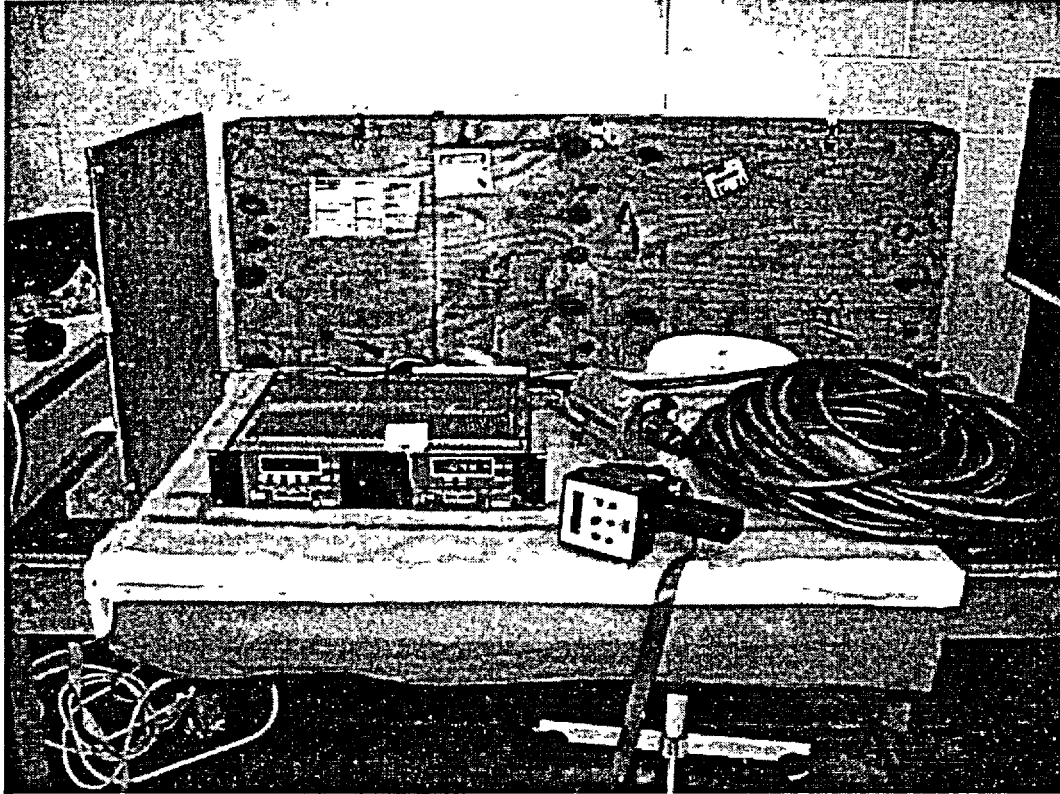
The EUT was scanned over the non-conductive surfaces with an ESD Gun.

Please refer to the photographs on pages 12-14 for details of actual test points.

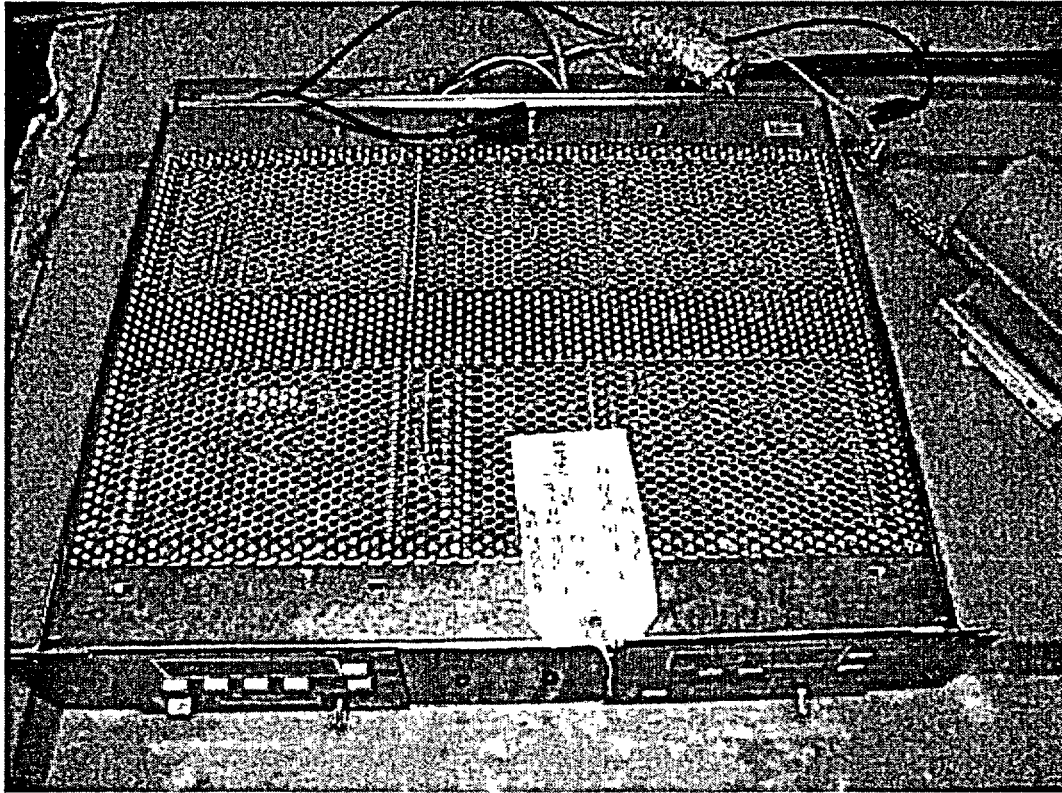
“C” denotes a contact discharge point.

“A” denotes a point where a discharge was observed during a scan of a non-conductive surface. Absence of any Air Discharge points indicate no arc was drawn through the insulated surfaces.

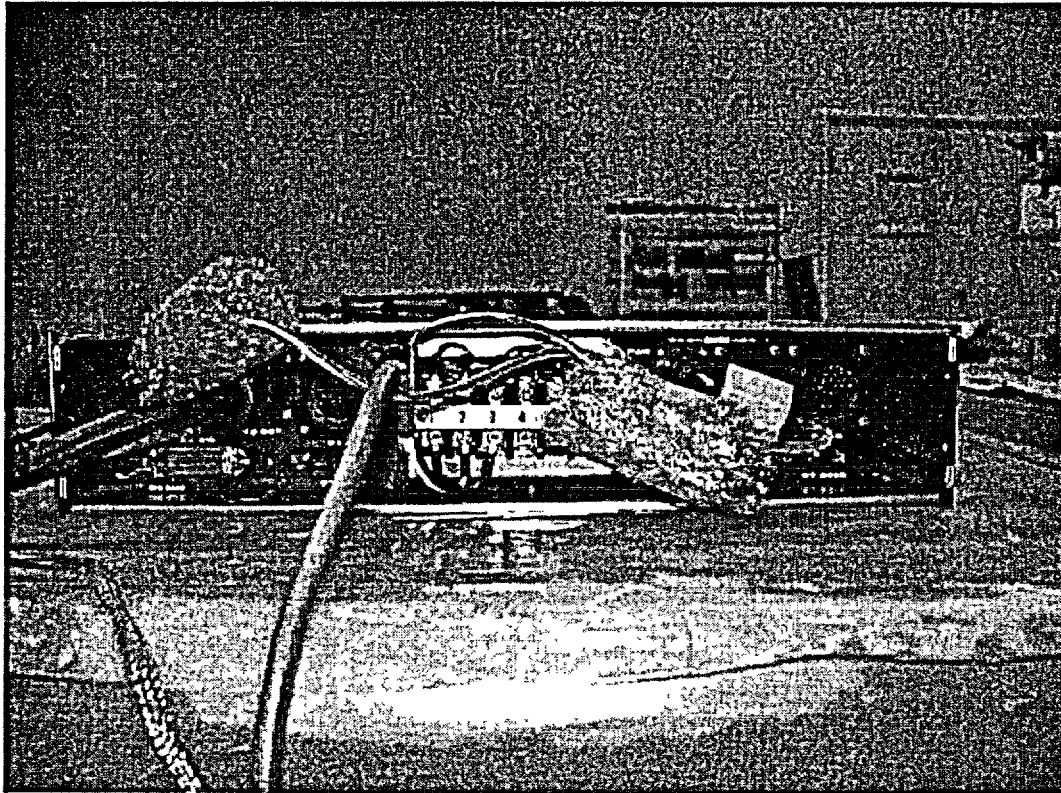
8.3 Photograph of the Electrostatic Discharge Test Setup



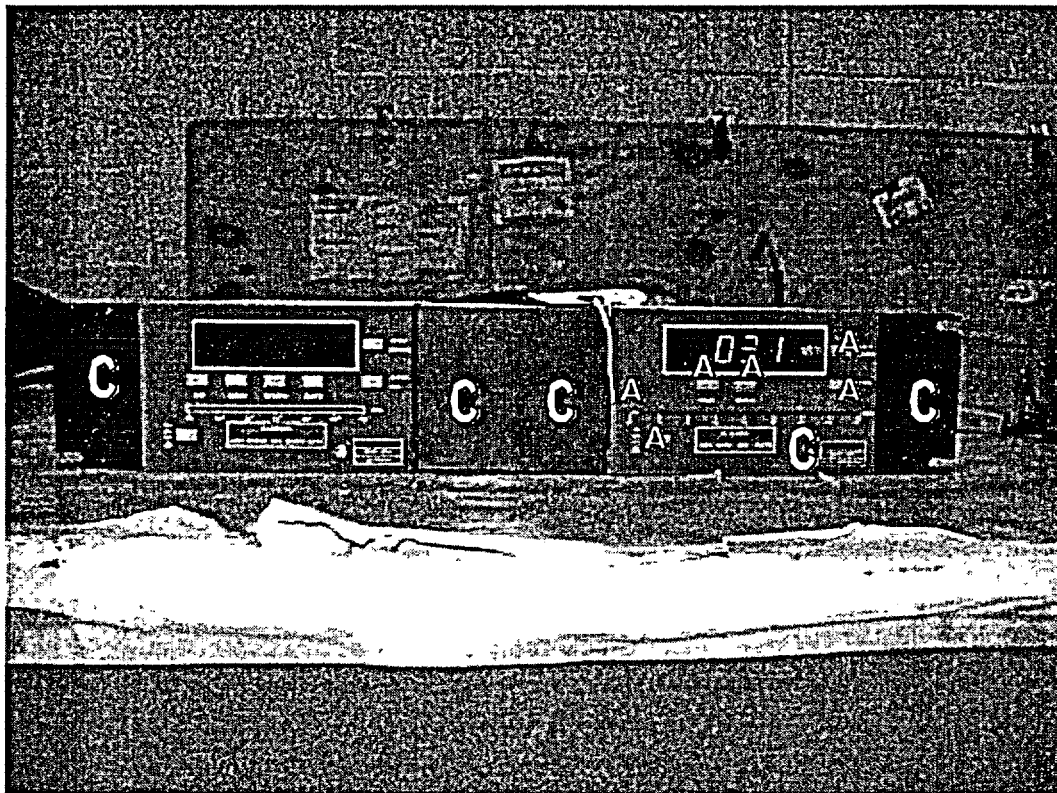
Top View of the EUT During the Electrostatic Discharge Test



Back View of the EUT During the Electrostatic Discharge Test



Front View of the EUT During the Electrostatic Discharge Test



9.0 RADIATED IMMUNITY TEST PROCEDURE

9.1 Radiated Immunity Test - 20 MHz to 1000 MHz

The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber.

For frequencies between 20 MHz to 1000 MHz, a Biconilog Antenna was located 1 meter from the EUT and was used to radiate RF energy at the EUT in both horizontal and vertical polarities. The test setup conformed to figure 2 of EN 61000-4-3:1995 (IEC801-3).

The RF energy consisted of a signal that was stepped at 1% increments through the frequency range of 20 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 10.0 volts/meter at the surface of the EUT. The EUT was exposed to the RF energy on the Front surfaces.

9.2 Radiated Immunity Test Data Sheet - 20 MHz to 1000 MHz

Test Date:	10/18/02	Test Engineer:	F. Gonzales
Standard:	EN 61000-4-3:1995	Air Temperature:	23.0° C
Minimum Performance Criteria:	A	Relative Humidity:	50%

Side of EUT Exposed to Antenna	Antenna Polarization	Frequency Range	Minimum Calibrated RF Field Strength	Achieved Performance Criteria	Pass/Fail
Front	Horizontal	20 MHz to 1000 MHz	10.0 V/m	A	Pass
Front	Vertical	20 MHz to 1000 MHz	10.0 V/m	A	Pass

9.3 Radiated Immunity Test - 10 kHz to 20 MHz

The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber.

For frequencies between 10 kHz to 20 MHz, an HAntenna was positioned above and below the EUT and was used to radiate RF energy at the EUT in the vertical polarity. The test setup conformed to MIL-STD-462D, RS103.

The RF energy consisted of a signal that was stepped at 1% increments through the frequency range of 10 kHz to 20 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 10.0 volts/meter at the surface of the EUT. The EUT was exposed to the RF energy on the Front surfaces.

9.4 Radiated Immunity Test Data Sheet - 10 kHz to 20 MHz

Test Date:	10/30/02	Test Engineer:	F. Gonzales
Standard:	EN 61000-4-3:1995	Air Temperature:	21.5° C
Minimum Performance Criteria:	A	Relative Humidity:	54%

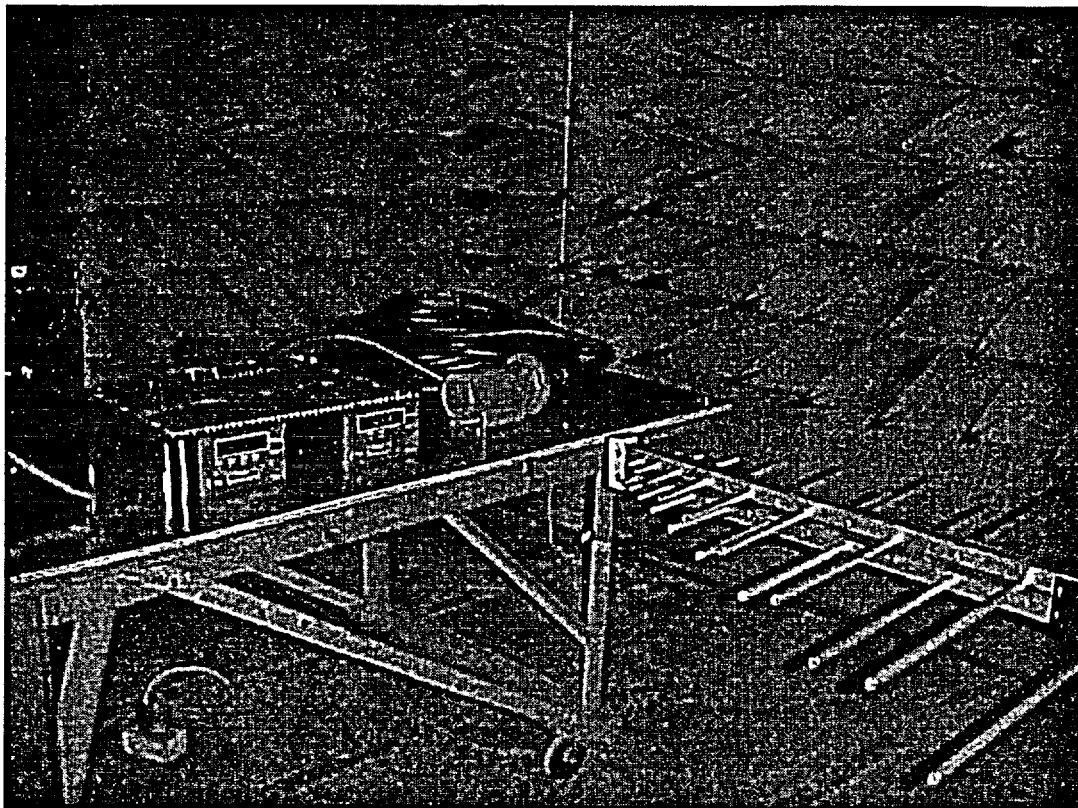
Side of EUT Exposed to Antenna	Antenna Polarization	Frequency Range	Minimum Calibrated RF Field Strength	Achieved Performance Criteria	Pass/Fail
Front	Vertical	10 kHz to 20 MHz	10.0 V/m	A	Pass

9.5 Photographs of the Radiated Immunity Test Setup

Radiated Immunity Test Setup: Front View – H Antenna



Radiated Immunity Test Setup: Front View – Biconilog



10.0 ELECTRICAL FAST TRANSIENT/BURST TEST PROCEDURE

10.1 Electrical Fast Transient/Burst Test

The Electrical Fast Transient Burst generator was used to conduct the tests outlined below. The waveform conforms to EN 61000-4-4:1995. 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 0.8-meter high non-conductive table. The setup conformed to EN 61000-4-4:1995, figure 7. The transient energy (as defined in EN 61000-4-4:1995) was coupled to the cables under test at various levels and polarities as defined by the standard. (Refer to the test data sheet for the details of this test.)

During the test, all data cables that may have a practical length greater than 3.0 meters, and all power mains cables were tested as outlined below.

Data Line

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

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.

10.2 EFT Test Data Sheet

Test Date:	10/14/02	Test Engineer:	M. Gonzales
Standard:	EN 61000-4-4:1995	Air Temperature:	21.5° C
Minimum Performance Criteria:	B	Relative Humidity:	38%

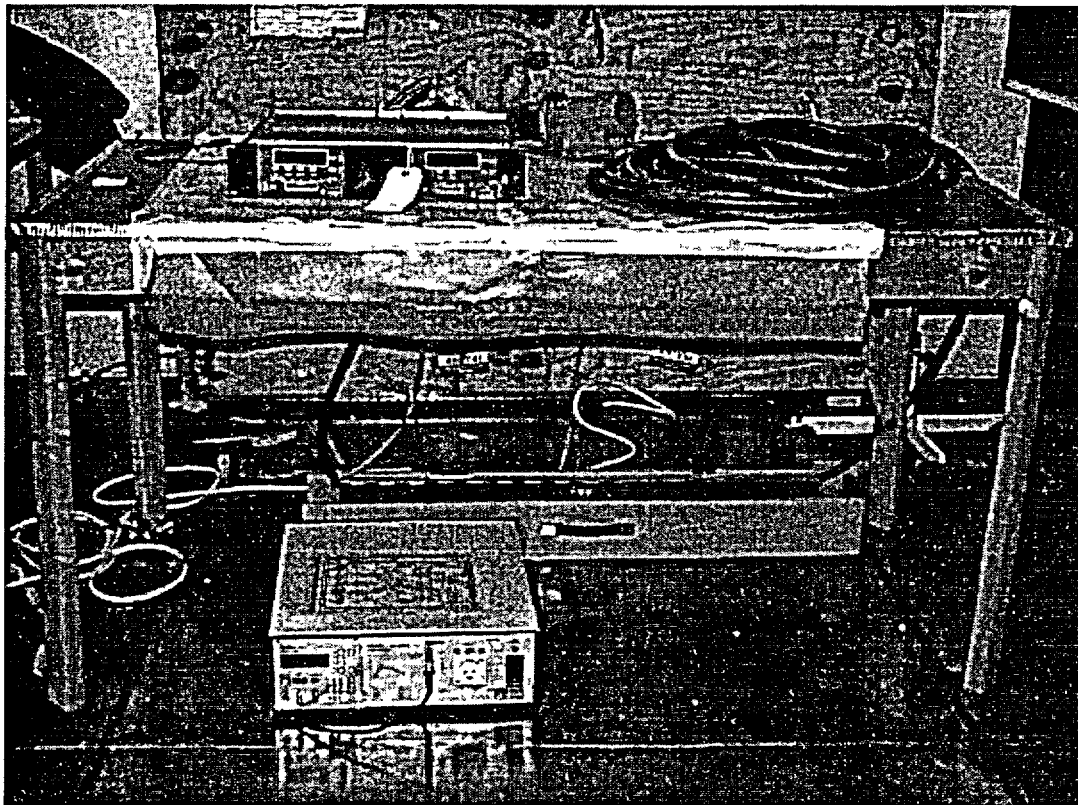
DATA LINE

Description of Data Line	Test Level	Polarity	Test Duration	Achieved Performance Criteria	Pass/Fail
Detector to Read-out Interface	3.0 kV	+	1 minute	A	Pass
Detector to Read-out Interface	3.0 kV	-	1 minute	A	Pass

AC POWER LINES

Description of Power Line Conductor	Test Level	Polarity	Test Duration	Achieved Performance Criteria	Pass/Fail
Line 1	3.0 kV	+	1 minute	A	Pass
Line 1	3.0 kV	-	1 minute	A	Pass
Line 2	3.0 kV	+	1 minute	A	Pass
Line 2	3.0 kV	-	1 minute	A	Pass

10.3 Photographs of the Electrical Fast Transient Test Setup



11.0 SURGE TEST

11.1 Surge Test

The test was performed on the unit as per EN 61000-4-5:1995. The surge pulse duration from the combination wave generator was 1.2 x 50 μ s voltage into an open circuit as high as 2.0kV and an 8 x 20 μ s current pulse into a short circuit. Each pulse was injected 10 times in each polarity with a minimum of 60 seconds interval between each pulse. The unit setup was similar to the schematic shown in Figure 8 of EN 61000-4-5:1995.

AC Mains

The AC Mains lines were coupled to the surge generator's coupling/decoupling network. Surges were applied to each AC line and protective earth in both common and differential mode.

11.2 Surge Test Data Sheet

Test Date:	10/14/02	Test Engineer:	M. Gonzales
Standard:	EN 61000-4-5:1995	Air Temperature:	20.7° C
Minimum Performance Criteria:	B	Relative Humidity:	38%

Cable Designation AC Port Testing	Level (kV)	Phase (Degrees)	Achieved Performance Criteria	Pass/Fail
<i>Differential Mode Injection Tests</i>				
Line 1 to Line 2	+3.0	0	A	Pass
Line 1 to Line 2	-3.0	0	A	Pass
<i>Common Mode Injection Tests</i>				
Line 1 to Earth	+3.0	0	A	Pass
Line 1 to Earth	-3.0	0	A	Pass
Line 2 to Earth	+3.0	0	A	Pass
Line 2 to Earth	-3.0	0	A	Pass

Cable Designation AC Port Testing	Level (kV)	Phase (Degrees)	Achieved Performance Criteria	Pass/Fail
<i>Differential Mode Injection Tests</i>				
Line 1 to Line 2	+3.0	90	A	Pass
Line 1 to Line 2	-3.0	90	A	Pass
<i>Common Mode Injection Tests</i>				
Line 1 to Earth	+3.0	90	A	Pass
Line 1 to Earth	-3.0	90	A	Pass
Line 2 to Earth	+3.0	90	A	Pass
Line 2 to Earth	-3.0	90	A	Pass

Cable Designation AC Port Testing	Level (kV)	Phase (Degrees)	Achieved Performance Criteria	Pass/Fail
<i>Differential Mode Injection Tests</i>				
Line 1 to Line 2	+3.0	270	A	Pass
Line 1 to Line 2	-3.0	270	A	Pass
<i>Common Mode Injection Tests</i>				
Line 1 to Earth	+3.0	270	A	Pass
Line 1 to Earth	-3.0	270	A	Pass
Line 2 to Earth	+3.0	270	A	Pass
Line 2 to Earth	-3.0	270	A	Pass

11.3 Photograph of Surge Test Setup



12.0 CONDUCTED IMMUNITY TEST PROCEDURE

12.1 Conducted Immunity Test – For Test Frequencies Between 30 Hz and 50 kHz

The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber.

The EUT was connected to a calibration circuit in accordance with MIL-STD-462D, figure CS101-1. The circuit voltage was adjusted until the voltage across the resistor was 6.3 volts RMS as specified in EPRI TR-102323-R1, 1997 edition. The entire test frequency range was scanned and the signal source values required to maintain the power level were recorded.

The EUT was then connected to the coupling transformer in place of the 0.5 ohm resistor as specified in MIL-STD-462D, figure CS101-2. The signal generator was set at the lowest test frequency and the signal level was increased until the calibration voltage of 6.3 volts RMS was achieved. While maintaining the required signal level, the EUT was tested throughout the frequency range as specified in EPRI TR-102323-R1, 1997 edition.

12.2 Conducted Immunity Test Data Sheet - Frequencies 30 Hz to 50 kHz

Test Date:	10/31/02	Test Engineer:	F. Gonzales
Standard:	EPRI TR-102323-R1	Air Temperature:	24.5° C
Minimum Performance Criteria:	A	Relative Humidity:	48%

Line Tested	Frequency Range	Minimum Calibrated RF Level	Achieved Performance Criteria	Pass/Fail
AC Mains Power	30 Hz to 50 kHz	6.3 volts	A	Pass

12.3 Conducted Immunity Test - For Frequencies Between 50 kHz and 400 MHz

The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber.

A bulk Current Injection Probe (BCI) was used to couple RF energy onto all data, control and I/O lines that may exceed 3.0 meters in length.

A bulk Current Injection Probe (BCI) was used to couple RF energy onto Power lines to the EUT.

The RF energy consisted of a signal that was stepped at 1% increments through the frequency range of 50 kHz to 400 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 7.0 Volts RMS.

The test setup conformed to EN 61000-4-6 (IEC801-6).

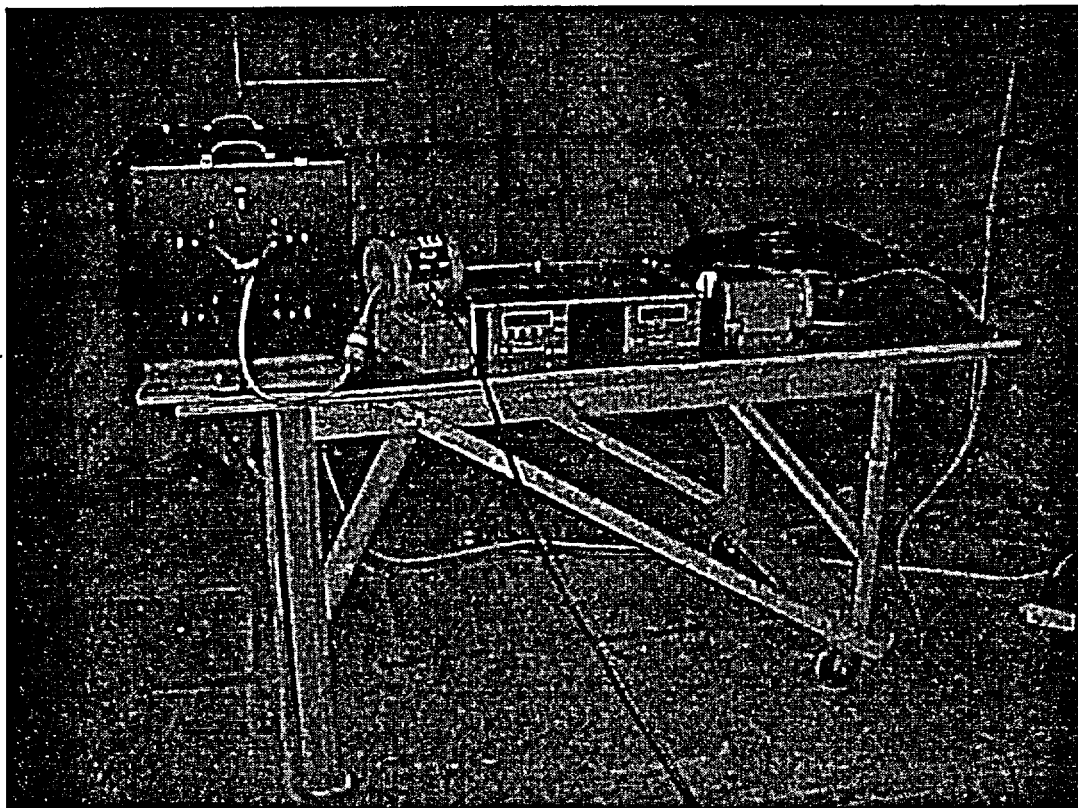
12.3 Conducted Immunity Test Data Sheet - For Frequencies Between 50 kHz and 400 MHz

Test Date:	10/31/02	Test Engineer:	F. Gonzales
Standard:	EPRI TR-102323-R1	Air Temperature:	24..5° C
Minimum Performance Criteria:	A	Relative Humidity:	48%

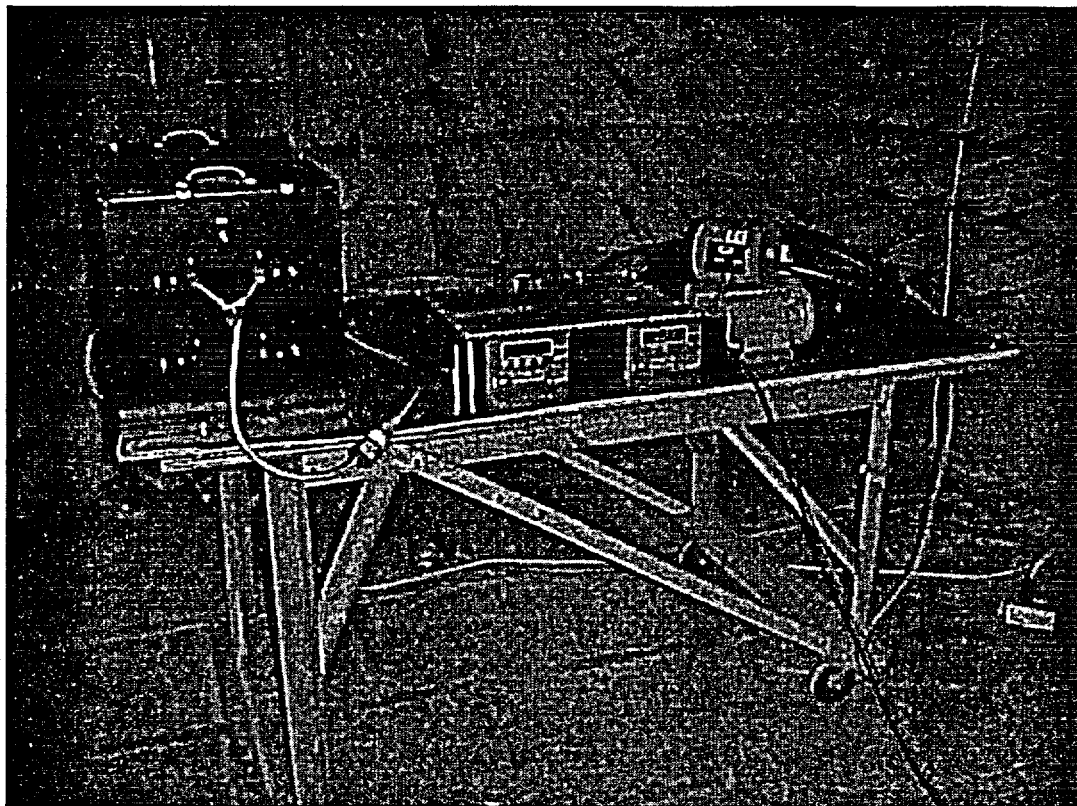
Line Tested	CDN/BCI	Frequency Range	Minimum Calibrated RF Level	Achieved Performance Criteria	Pass/Fail
AC Mains Power	BCI	50 kHz to 400 MHz	7.0 volts	A	Pass

12.3 Photographs of the Conducted Immunity Test Setup

Conducted Immunity Test Setup: Power Line - 50 kHz to 400MHz



Conducted Immunity Test Setup: Data Lines - 50 kHz to 400 kHz



Conducted Immunity Test Setup: Calibration Circuit – 30 Hz to 50 kHz



Conducted Immunity Test Setup: Power Line - 30 Hz to 50 kHz



13.0 RADIATED EMISSIONS TEST PROCUDURES

13.1 Radiated Emissions Test - For Frequencies Between 30 Hz and 100 kHz

The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber as described in MIL-STD-462D, RE101. A Loop Sensor was located 7.0 cm meter from the edge of the Equipment under Test (EUT).

The equipment was then fully exercised with all cabling attached to the EUT. A complete spectrum scan was made. The Loop Sensor was then positioned 0.5 m from the EUT. The test was then repeated. During the test, frequencies identified as being generated by the EUT in the frequency range of 30 Hz to 100 kHz were measured. The two highest levels measured below 200 Hz, and the three highest above 200 Hz. These levels were then compared to the limits specified in EPRI TR-102323-R1, 1997 edition.

13.2 Radiated Emissions Test Data Sheet - For Frequencies Between 30 Hz and 100 kHz

Test Date:	10/30/02	Test Engineer:	F. Gonzales
Standard:	MIL-STD-461D, RE101	Air Temperature:	23.0°C
Distance:	0.5 meters	Relative Humidity:	50%

Emissions Below 200 Hz

Frequency (kHz)	Antenna Position		Cable Loss (dB)	Antenna Factor (dB)	Reading @ 7 cm (dBμV)	Emission (dBpT)	EPRI TR-102323-R1 (dBpT)	Margins (dBμV/m)
	Polarization	Height (Meters)						
0.054	Loop	0.8	0.0	75.0	-0.9	74.1	160.0	-85.9
0.058	Loop	0.8	0.0	74.0	12.5	86.5	160.0	-73.5
0.059	Loop	0.8	0.0	73.0	20.6	93.6	160.0	-66.4

Emissions Above 200 Hz

Frequency (kHz)	Antenna Position		Cable Loss (dB)	Antenna Factor (dB)	Reading @ 7 cm (dBμV)	Emission (dBpT)	EPRI TR-102323-R1 (dBpT)	Margins (dBμV/m)
	Polarization	Height (Meters)						
15.300	Loop	0.8	0.0	26.0	13.9	39.9	112.2	-72.3
48.500	Loop	0.8	0.0	16.0	29.8	45.8	102.2	-56.4
97.300	Loop	0.8	0.0	10.5	23.2	33.7	96.2	-62.5

Emissions Below 200 Hz

Frequency (kHz)	Antenna Position		Cable Loss (dB)	Antenna Factor (dB)	Reading @ 50 cm (dBμV)	Emission (dBpT)	EPRI TR-102323-R1 (dBpT)	Margins (dBμV/m)
	Polarization	Height (Meters)						
0.054	Loop	0.8	0.0	75.0	-22.0	53.0	160.0	-107.0
0.058	Loop	0.8	0.0	74.0	-18.0	56.0	160.0	-104.0
0.059	Loop	0.8	0.0	73.0	-1.0	72.0	160.0	-88.0

Emissions Above 200 Hz

Frequency (kHz)	Antenna Position		Cable Loss (dB)	Antenna Factor (dB)	Reading @ 50 cm (dBμV)	Emission (dBpT)	EPRI TR-102323-R1 (dBpT)	Margins (dBμV/m)
	Polarization	Height (Meters)						
15.300	Loop	0.8	0.0	26.0	-10.0	16.0	112.2	-96.2
48.500	Loop	0.8	0.0	16.0	-1.0	15.0	102.2	-87.2
47.300	Loop	0.8	0.0	10.5	-9.0	1.5	96.2	-94.7

13.3 Radiated Emissions Test - For Frequencies Between 10 kHz and 1000 MHz

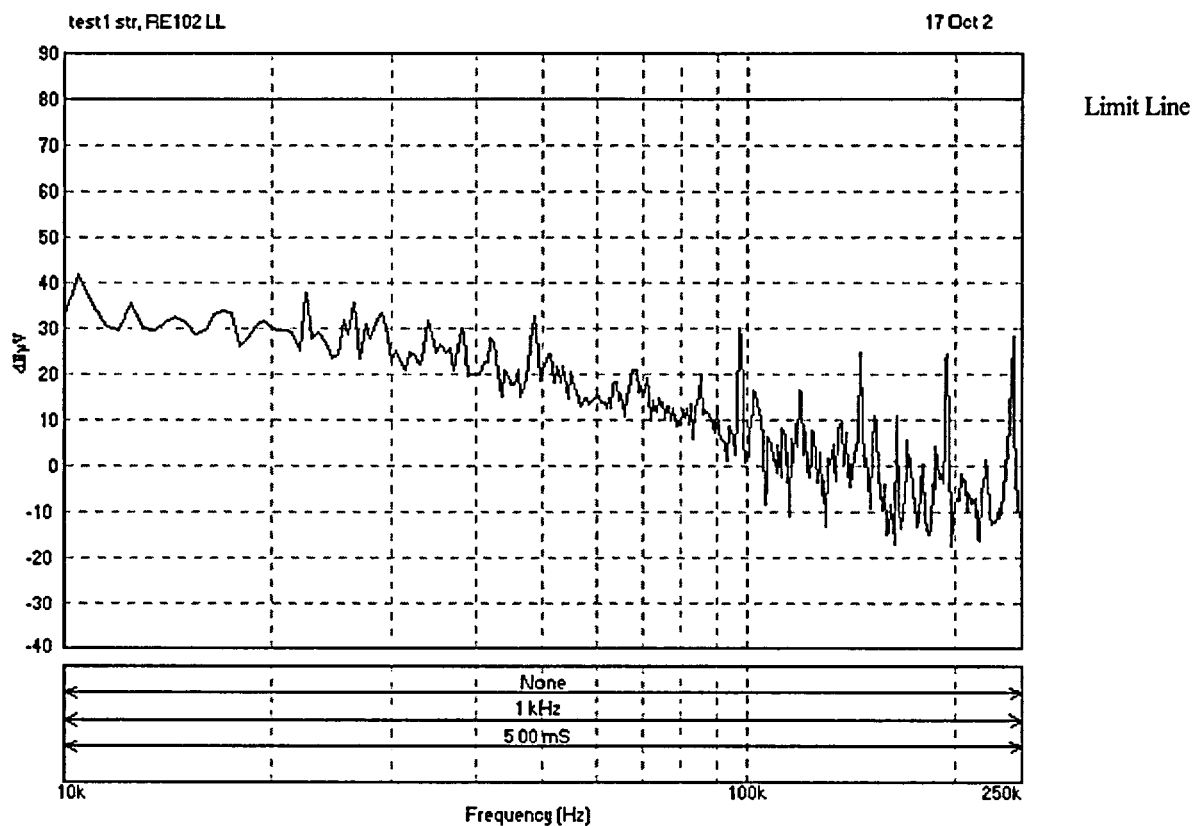
The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber as described in MIL-STD-462D, RE102. An Antenna was located 1.0 m meter from the edge of the Equipment under Test (EUT). A monopole antenna was used for frequencies of 10 kHz to 30 MHz, and a Biconilog Antenna was used from 30 MHz to 1000 MHz.

The equipment was then fully exercised with all cabling attached to the EUT. During the test, frequencies identified as being generated by the EUT in the frequency range of 10 kHz to 1000 MHz were measured. The highest six levels were recorded along with antenna polarity. These levels were then compared to the limits specified in EPRI TR-102323-R1, 1997 edition.

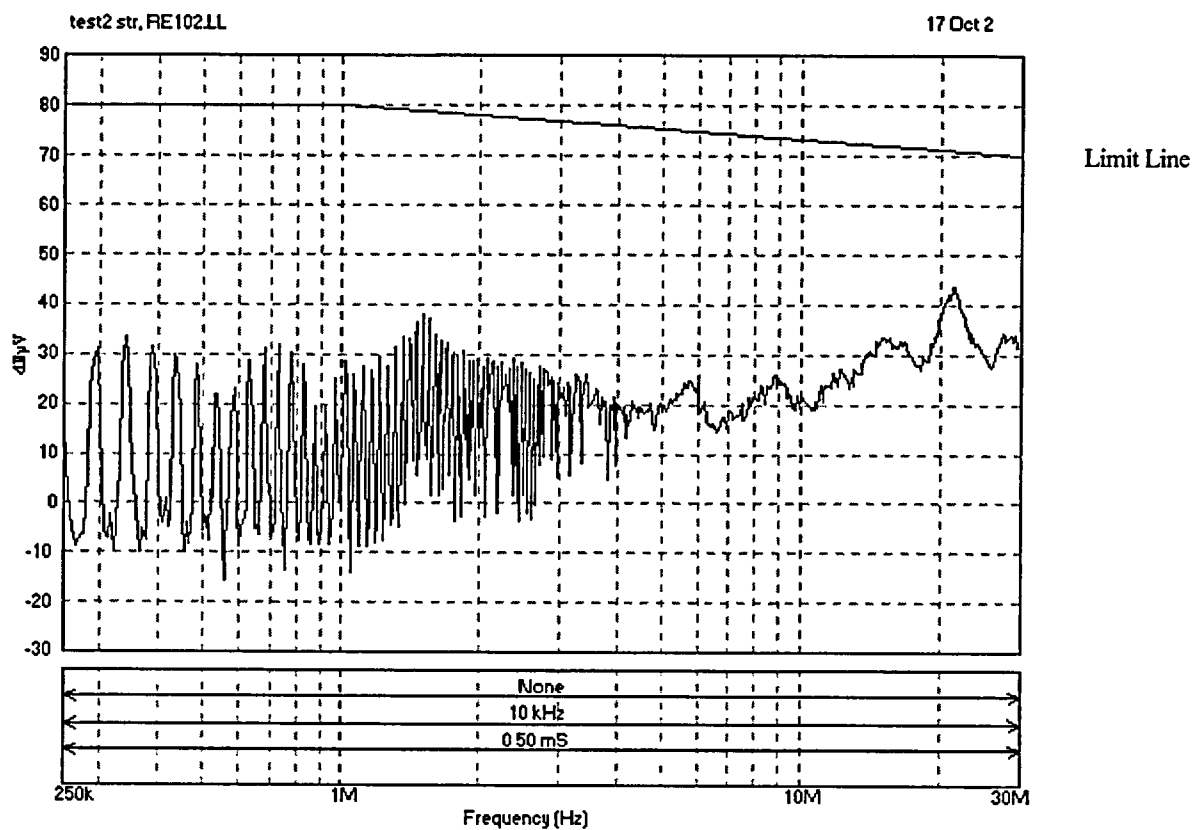
13.4 Radiated Emissions Test Data Sheet - For Frequencies Between 10 kHz and 1000 MHz

Test Date:	10/30/02	Test Engineer:	F. Gonzales
Standard:	MIL-STD-461D, RE102	Air Temperature:	23.0°C
Distance:	1 meter	Relative Humidity:	50%

Monopole Antenna – 10 kHz to 250 kHz



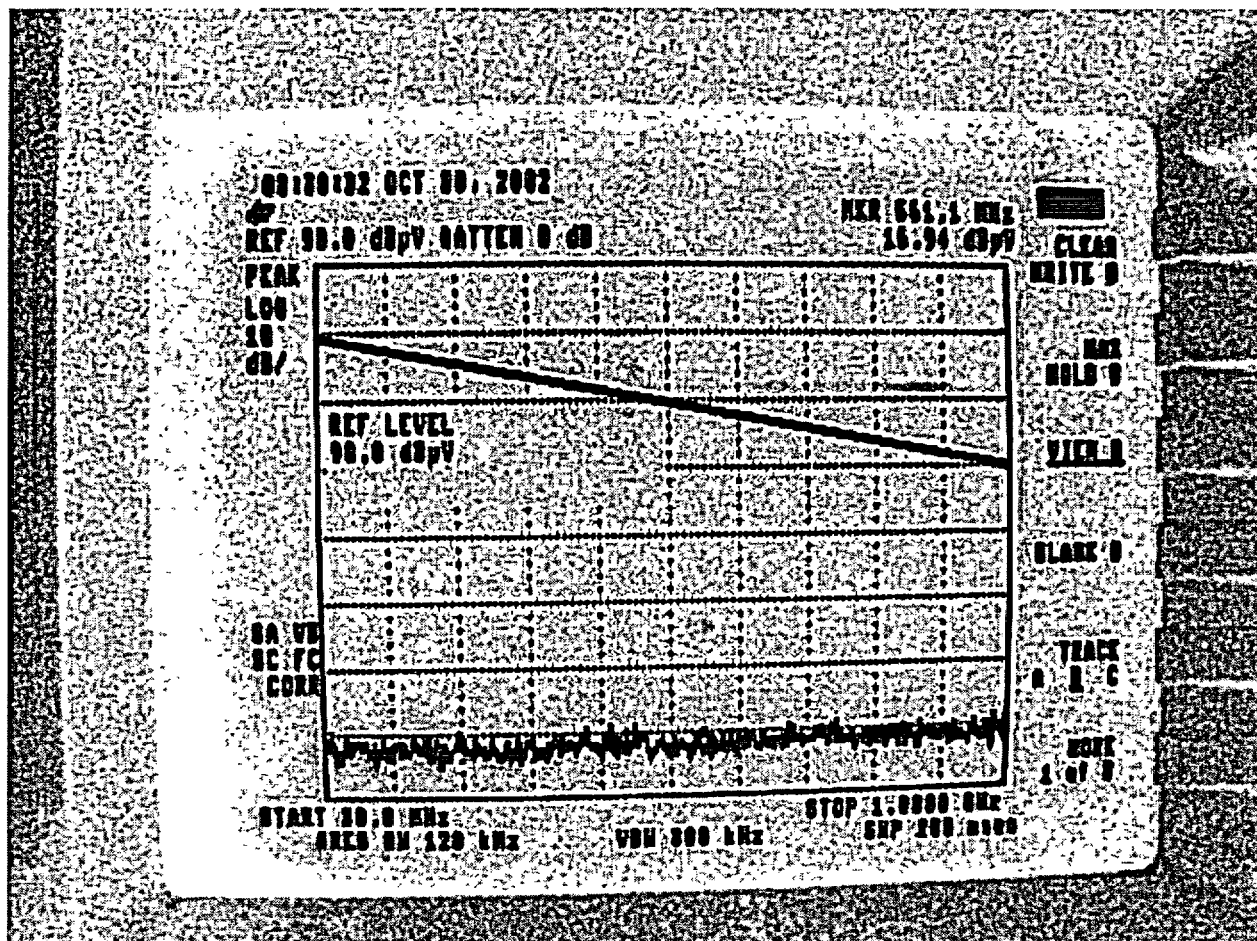
Monopole Antenna – 250 kHz to 30 MHz



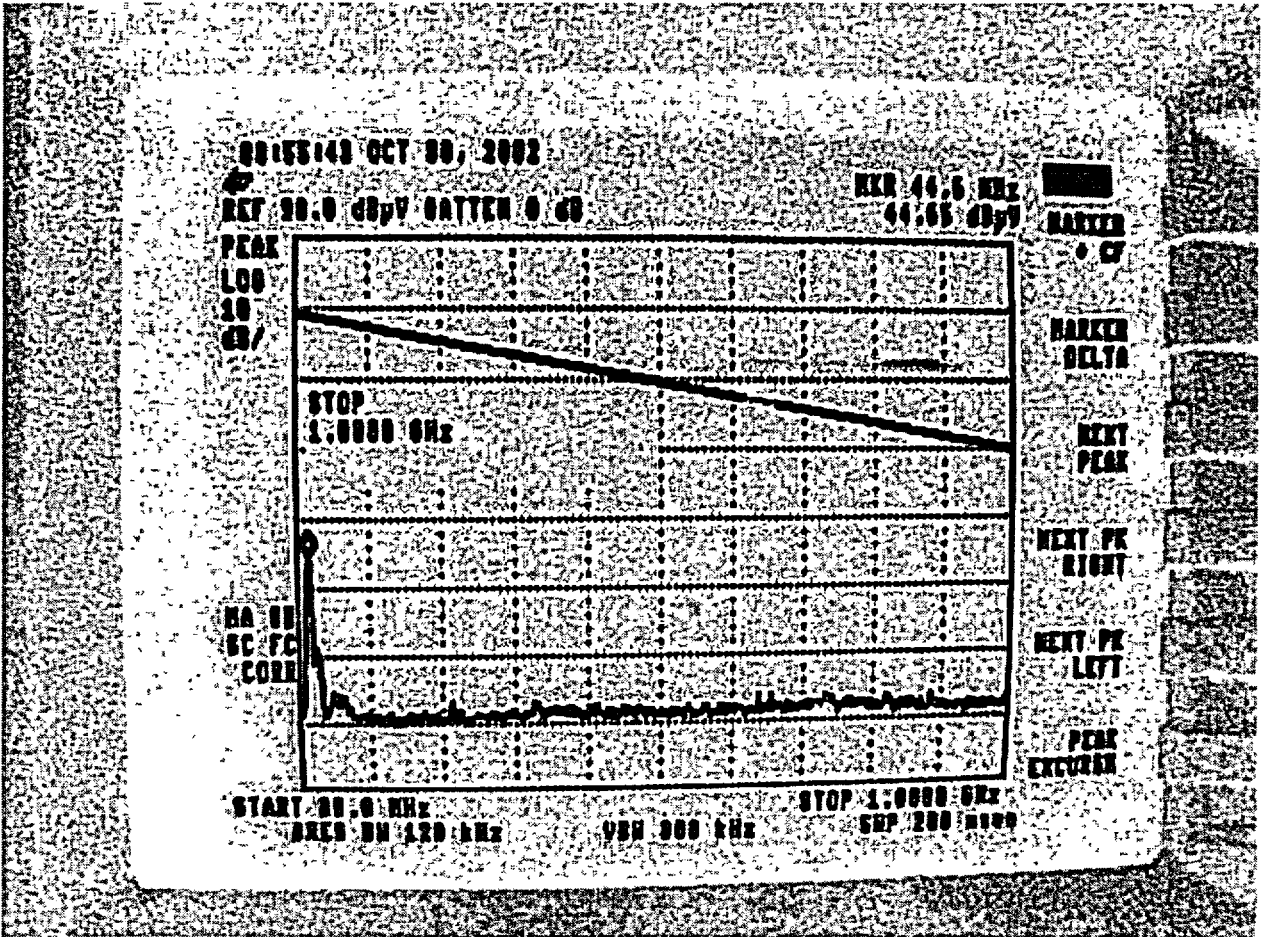
Biconilog Antenna – 30 MHz to 1000 MHz

Frequency (MHz)	Antenna Position		Turntable Azimuth (Degrees)	Cable Loss (dB)	Antenna Factor (dB)	Reading (dBμV)	Emission (dBμV/m)	EPRI TR- 102323-R1 Limits (dBμV/m)	Margins (dBμV/m)
	Polarization	Height (Meters)							
41.1	V	1.0	0	1.1	12.8	47.1	61.0	69.2	-8.2
54.3	V	1.0	0	1.4	9.0	33.3	43.7	68.4	-24.7
62.1	V	1.0	0	1.6	8.0	27.7	37.3	68.0	-30.7
72.9	V	1.0	0	1.7	12.5	35.7	49.9	67.6	-17.7
87.9	V	1.0	0	1.9	13.8	38.1	53.8	67.0	-13.2
90.0	V	1.0	0	1.9	13.3	38.2	53.4	67.0	-13.6
41.1	H	1.0	0	1.1	12.8	28.4	42.3	69.2	-26.9
54.3	H	1.0	0	1.4	9.0	27.9	38.3	68.4	-30.1
62.1	H	1.0	0	1.6	8.0	19.5	29.1	68.0	-38.9
72.9	H	1.0	0	1.7	12.5	21.2	35.4	67.6	-32.2
87.9	H	1.0	0	1.9	13.8	21.7	37.4	67.0	-29.6
90.0	H	1.0	0	1.9	13.3	23.8	39.0	67.0	-28.0

Vertical

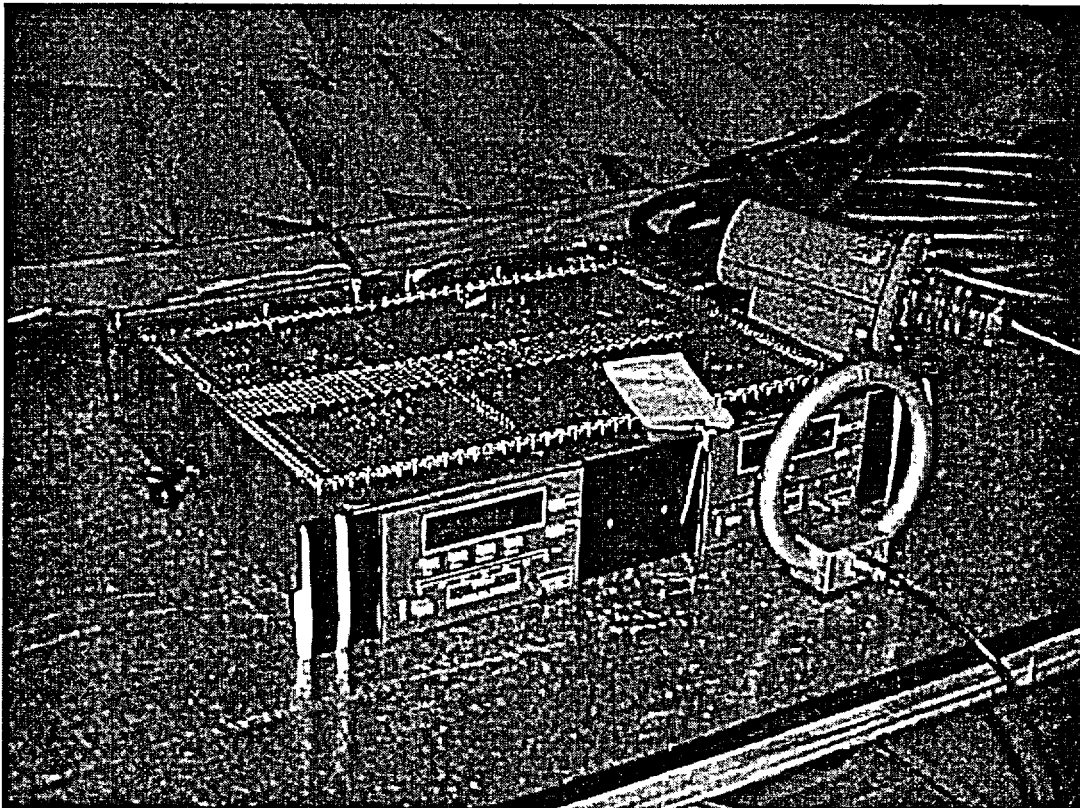


Horizontal

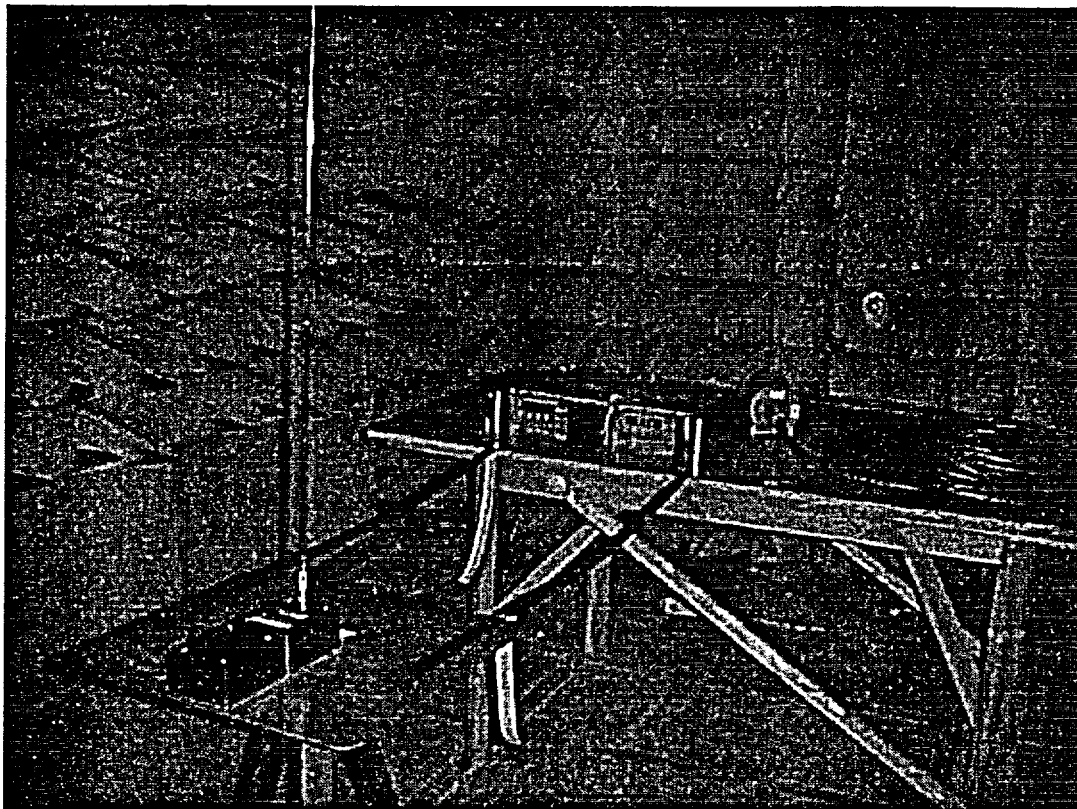


13.5 Photographs of the Radiated Emissions Test Setup

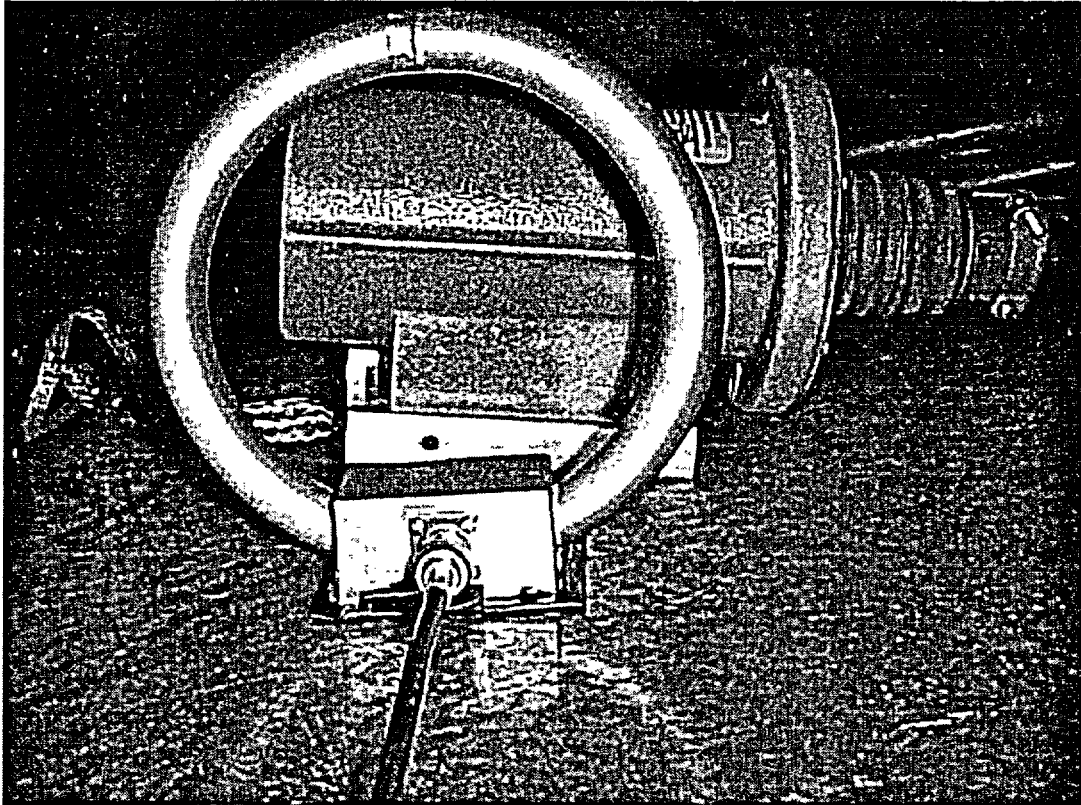
Radiated Emissions Test Setup: Loop Sensor @ 7.0 cm – EUT



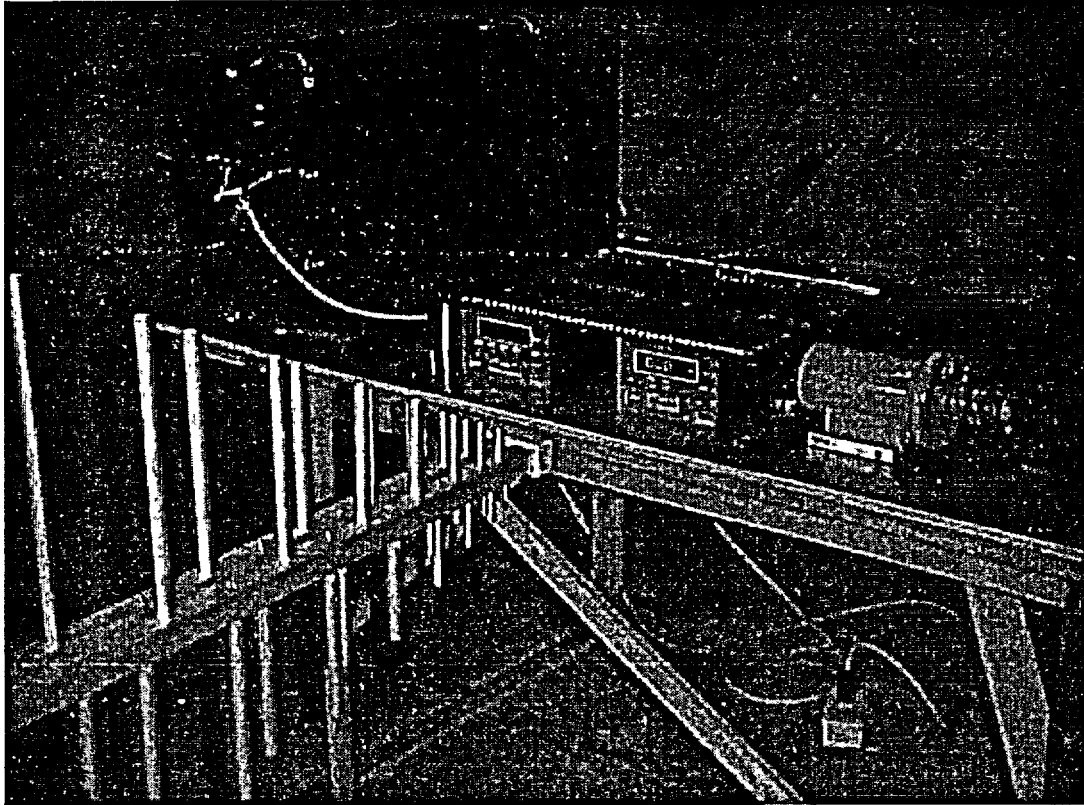
Radiated Emissions Test Setup: Monopole Antenna



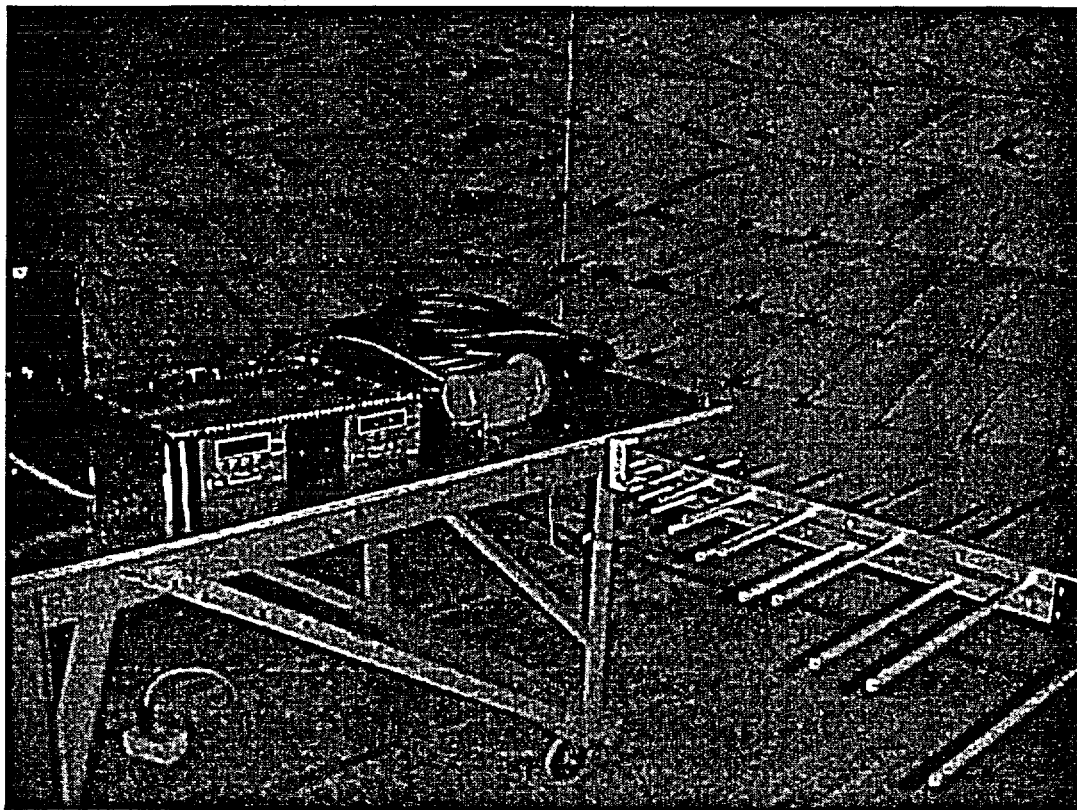
Radiated Emissions Test Setup: Loop Sensor @ 7.0 cm – Data Cables



Radiated Emissions Test Setup: Biconilog Antenna @ 1 M – Vertical



Radiated Emissions Test Setup: Biconilog Antenna @ 1 M – Horizontal



14.0 CONDUCTED EMISSIONS TEST PROCEDURE

14.1 Conducted Emissions Test - For Frequencies Between 30 Hz and 50 kHz

The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber as described in MIL-STD-462D, CE101. A Current Probe was used to measure the RF emissions on the power lines of the EUT. The EUT was fully exercised with all cabling attached. During the test, each conductor of the power mains was tested and emissions were measured over the frequency range of 30 Hz to 50 kHz. The emission levels were recorded for each conductor. These levels were compared to the limits specified in EPRI TR-102323-R1, 1997 edition.

14.2 Conducted Emissions Test Data Sheet - For Frequencies Between 30 Hz and 50kHz

Test Date:	10/30/02	Test Engineer:	F. Gonzales
Standard:	MIL-STD-461D, CE101	Air Temperature:	24.0° C
Pass / Fail:	Pass	Relative Humidity:	38%

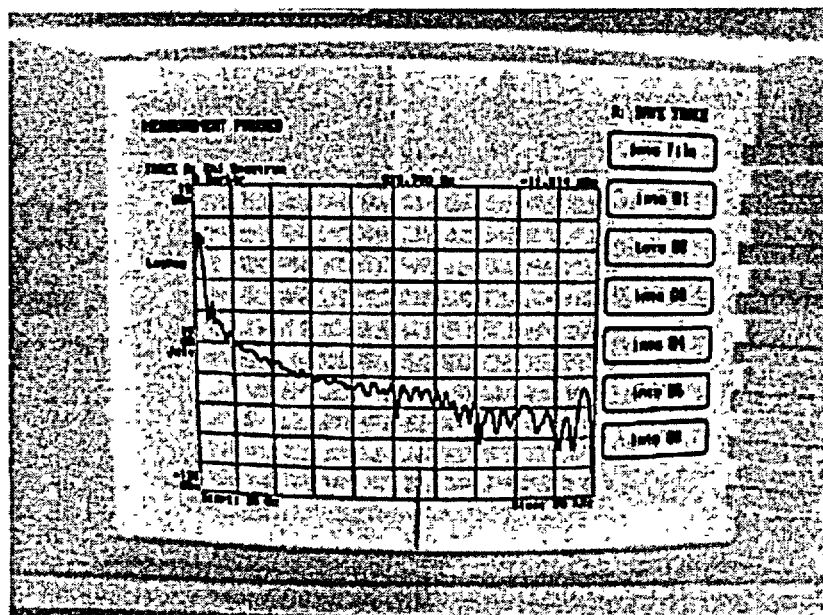
L1 from 50 kHz to 50 kHz

Frequency (kHz)	Reading (dBμV)	Probe Factor (dB)	Corrected Emission (dBμA)	EPRI TR-102323-R1 Limits (dBμA)	Margins (dBμV/m)
0.529	95.4	-13.5	108.9	122.0	-13.1
2.2	66.1	-12.4	78.5	113.1	-34.6
27.7	26.7	-12.3	39.0	84.6	-45.6
48.6	25.8	-12.3	38.1	78.3	-40.2
41.1	18.1	-12.3	30.4	80.2	-49.8

L2 from 50 kHz to 50 kHz

Frequency (kHz)	Reading (dBμV)	Probe Factor (dB)	Corrected Emission (dBμA)	EPRI TR-102323-R1 Limits (dBμA)	Margins (dBμV/m)
0.154	87.8	-19.0	106.8	122.0	-15.2
11.7	30.2	-12.3	42.5	94.3	-51.8
20.5	26.0	-12.3	38.3	88.0	-49.7
22.3	24.5	-12.3	36.8	87.1	-50.3
27.6	22.7	-12.3	35.0	84.6	-49.6
47.2	14.1	-12.3	26.4	78.6	-52.2

L1 from 50 kHz to 50 kHz



14.3 Conducted Emissions Test - For Frequencies Between 50 kHz and 400 MHz

The Equipment Under Test (EUT) was placed in a fully anechoic chamber, on a ground plane, on a table located 0.8m above the floor of the chamber as described in MIL-STD-462D, CE102. A Current Probe was used to measure the RF emissions on the power lines of the EUT. The EUT was fully exercised with all cabling attached. During the test, each conductor of the power mains was tested and emissions were measured over the frequency range of 50 kHz to 400 MHz. The emission levels were recorded for each conductor. These levels were compared to the limits specified in EPRI TR-102323-R1, 1997 edition.

14.4 Conducted Emissions Test Data Sheet - For Frequencies Between 50 kHz and 400 MHz

Test Date:	10/30/02	Test Engineer:	F. Gonzales
Standard:	MIL-STD-461D, CE102	Air Temperature:	24.0° C
Pass / Fail:	Pass	Relative Humidity:	38%

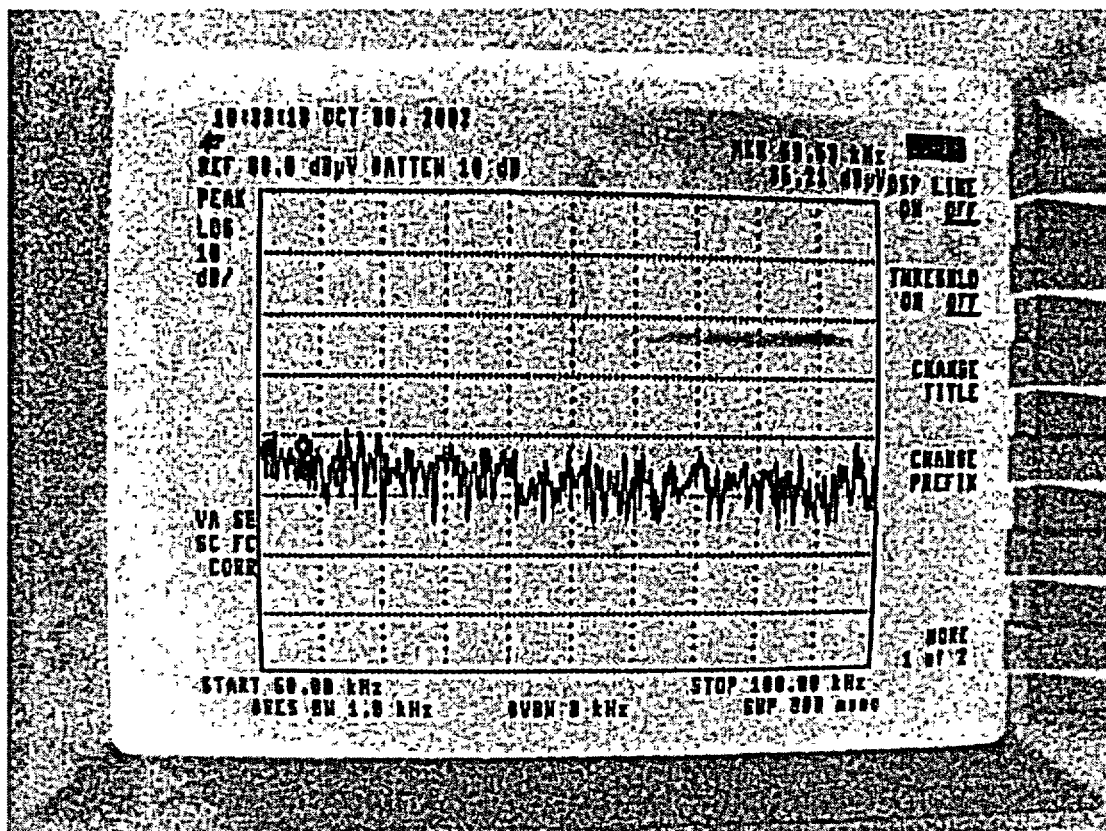
L1 from 50 Hz to 400 MHz

Frequency (kHz)	Reading (dBμV)	Probe Factor (dB)	Corrected Emission (dBμA)	EN 61326 Limits (dBμA)	Margins (dBμV/m)
0.163	32.4	-1.0	33.4	57.9	-24.5
0.219	29.4	1.0	28.4	56.6	-28.2
2.0	30.7	11.0	19.7	47.0	-27.3
2.3	27.9	11.2	16.7	46.4	-29.7
43.2	3.5	17.0	-13.5	40.0	-53.5
52.9	24.7	16.5	8.2	15.4	-7.2

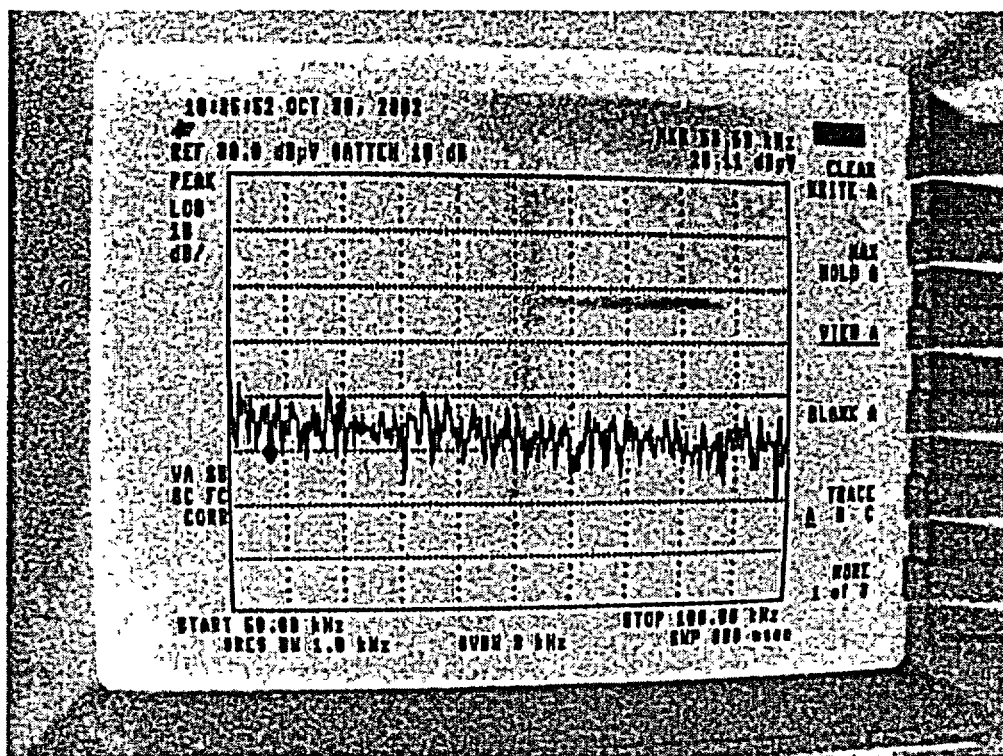
L2 from 50 Hz to 400 MHz

Frequency (kHz)	Reading (dBμV)	Probe Factor (dB)	Corrected Emission (dBμA)	EN 61326 Limits (dBμA)	Margins (dBμV/m)
0.120	35.6	-3.5	39.1	59.2	-20.1
0.140	33.9	-2.0	35.9	58.5	-22.6
0.2	31.0	-0.5	31.5	57.2	-25.7
2.0	27.4	11.0	16.4	47.0	-30.6
2.3	28.0	11.2	16.8	46.4	-29.6
43.2	30.6	17.0	13.6	40.0	-26.4

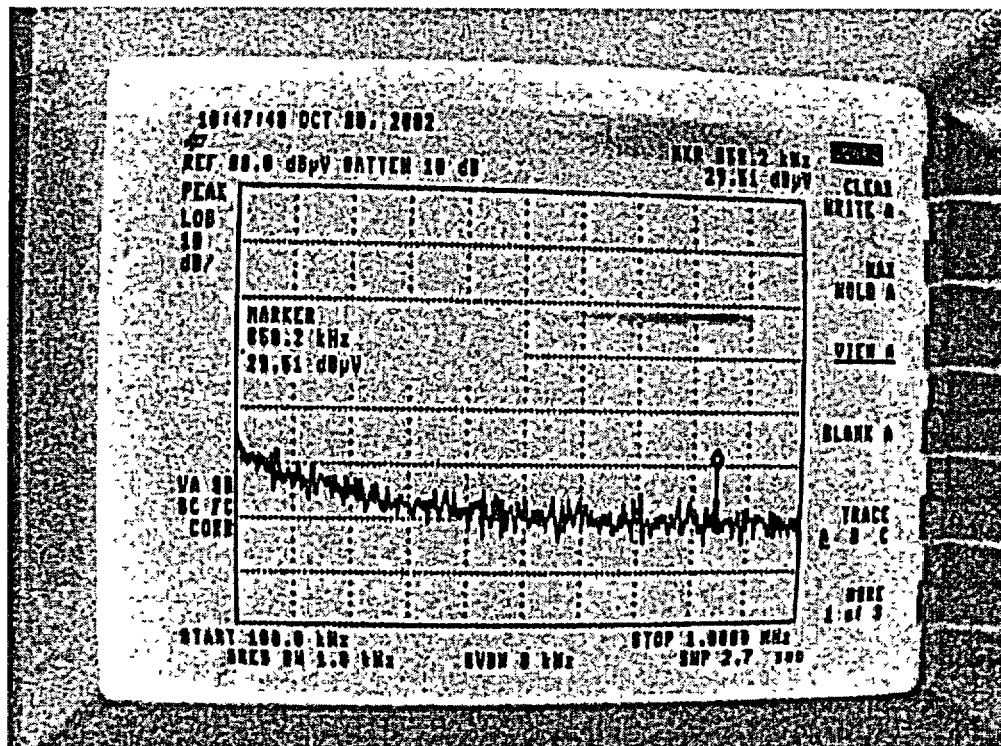
L1 from 50 Hz to 100 kHz



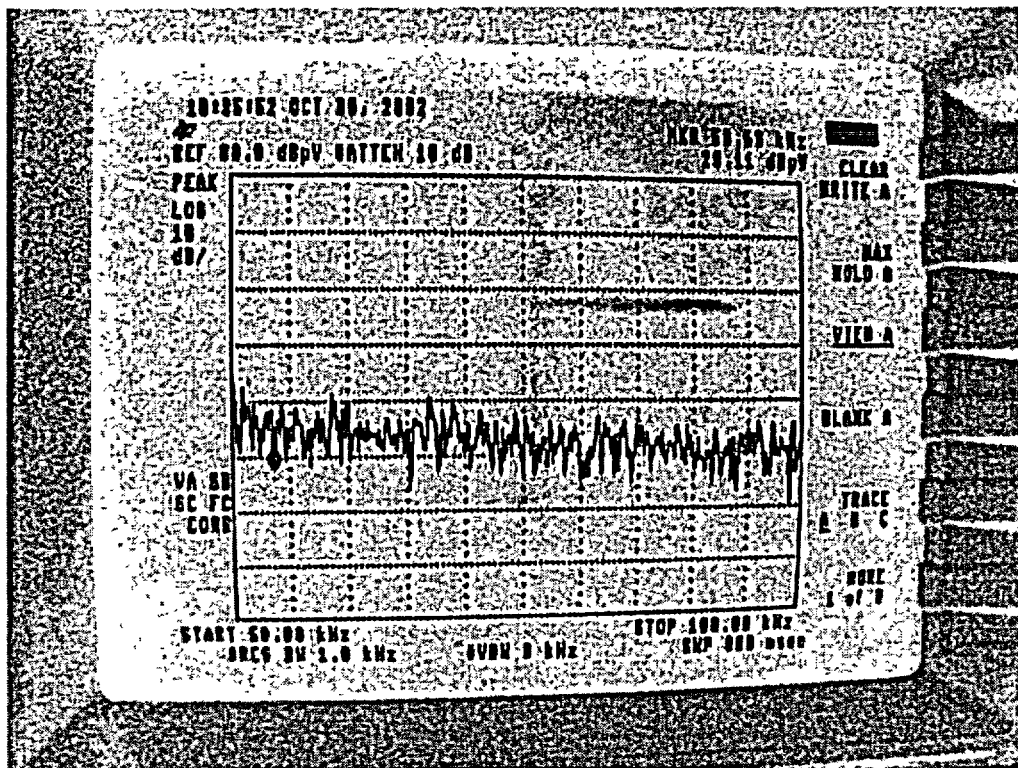
L2 from 50 Hz to 100 kHz



L1 from 100 kHz to 1 MHz

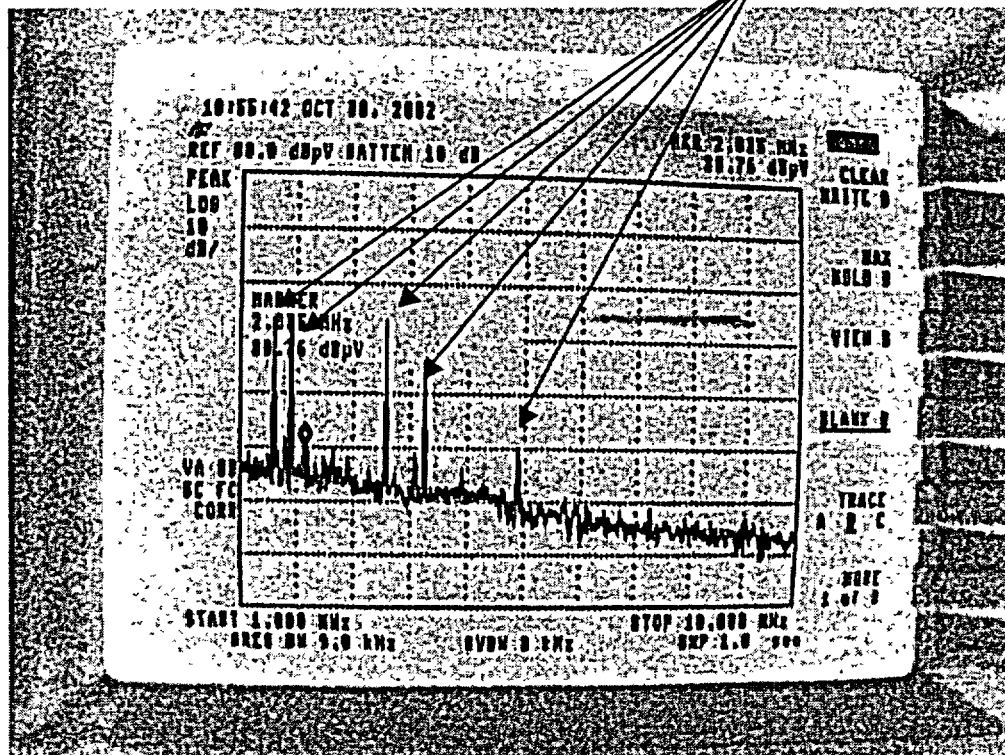


L2 from 100 kHz to 1 MHz



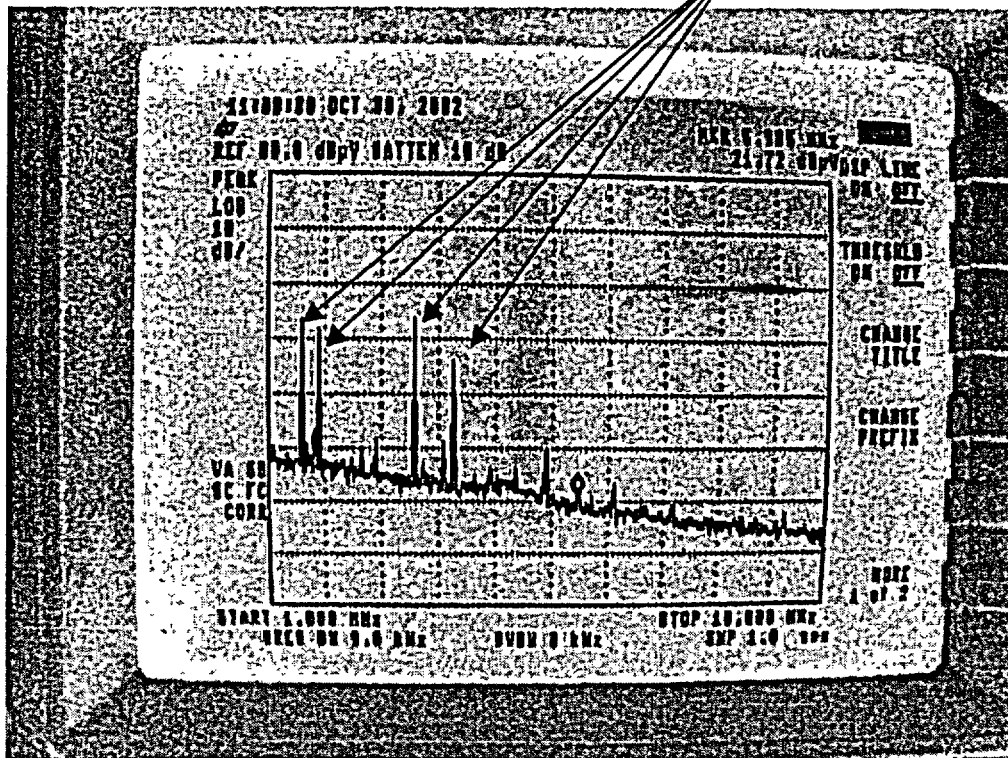
L1 from 1 MHz to 10 MHz

Note 1

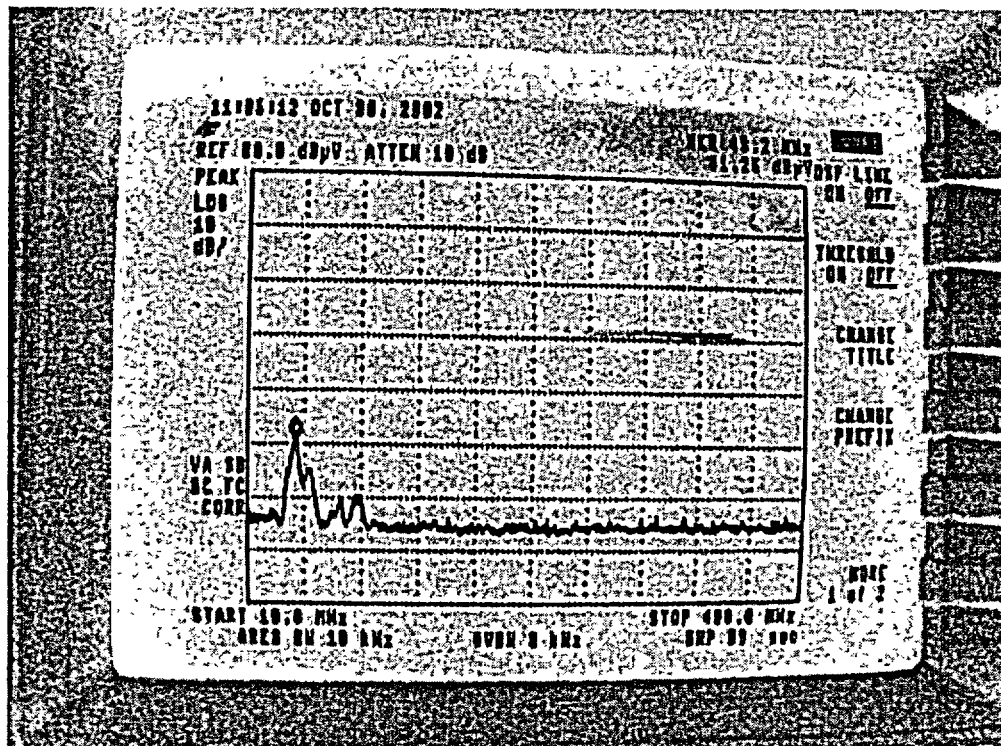


L2 from 1 MHz to 10 MHz

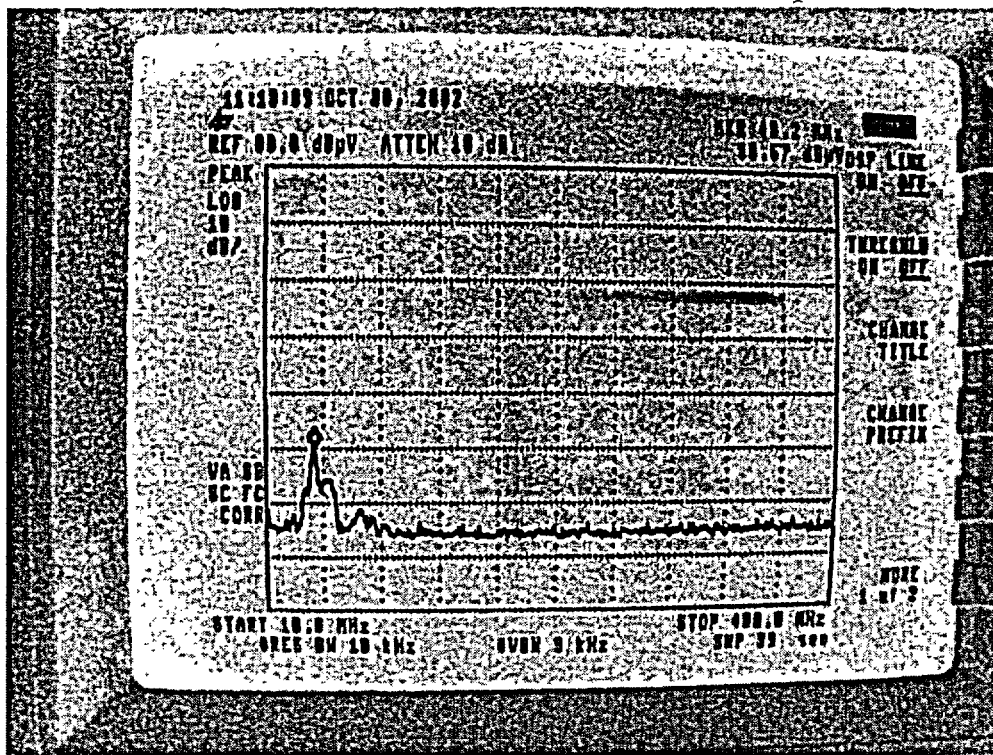
Note 1



L1 from 10 MHz to 400 MHz

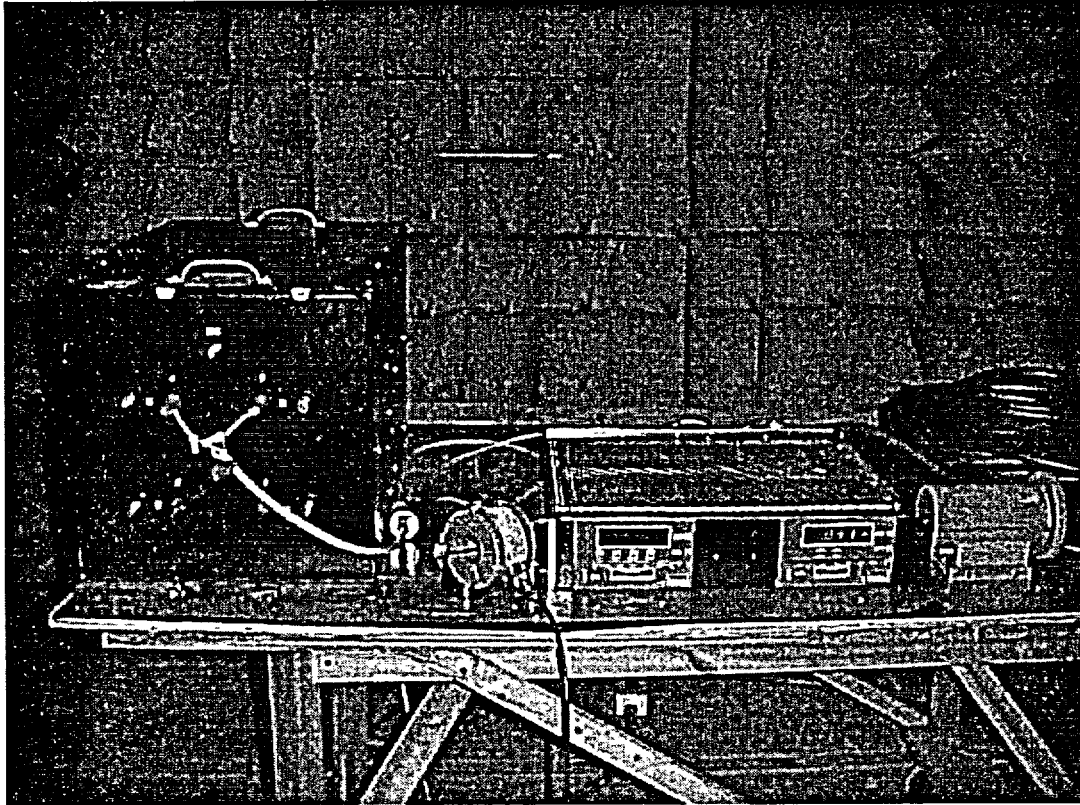


L2 from 10 MHz to 400 MHz



*Note 1: These emissions are not EUT-related.

14.5 Photographs of the Conducted Emissions Test Setup



15.0 OVERALL ELECTROMAGNETIC COMPATIBILITY CONCLUSION

The **Digital Rate Meter, Model Number 956A-201-M1**, was tested and found to be in compliance with the electromagnetic emissions requirements of EPRI TR-102323-R1, including the tests outlined in MIL Standard 462D - RE 101, RE 102, CE 101, and CE 102.

The **Digital Rate Meter, Model Number 956A-201-M1**, was tested and found to be in compliance with the electromagnetic immunity requirements of EPRI TR-102323-R1, including the tests outlined in MIL Standard 462D - RS 103, EN 61000-4-2:1995, EN 61000-4-3:1995, EN 61000-4-4:1995, EN 61000-4-5:1995, and EN 61000-4-6:1996.



November 5, 2002

Rochester Gas and Electric Corporation
Ginna Station
1503 Lake Rd.
Ontario, N.Y. 14519

6045 Cochran Road
Cleveland
Ohio 44139 USA

phone 440 248 9300
fax 440 349 2307
srm syncor.com

Attention: Mr. Paul Swift, Project Engineer

Reference: Rochester Gas and Electric Corp. P.O. No.: 4500008671
Ginna Station,
Syncor Radiation Management Sales Order No. 157033

Subject: Qualification Report Document Transmittal, 950.366, Rev. 2
List of Test Plan Deviations

Dear Paul:

In performing the EMI testing last month, a number of minor deviations to our EMI Test Plan, 948.343, Rev. 1, used in the EMI test reporting included in our Qualification Report 950.366, Rev. 2, were required.

These deviations are listed below.

1. Change Model 956A-201 to Model 956A-201-M1, as we will be testing the actual unit provided to Ginna. The 956A-201-M1 is the same as the 956A-201, except as follows:

-Auxiliary relay K1 is internally wired to HIGH Alarm relay K5 to provide additional HIGH Alarm contact outputs for customer use. Since the K1 relay is normally installed in both the 956A-201 and the 956A-201-M1, this change does not impact the testing to be performed.

2. In Section 6, Test Set up, in paragraph 3, note the 897A detector will also be grounded during the test. Since the detector ground is shown on the electrical drawing S157033A-104 referenced in paragraph 2, this change does not impact the testing performed.

3. Attachment 1 Data Sheet: Record the Model number and serial number of the 956A-201-M1, the 897A-210 detector, and the S157033A2 surge suppressor on the Attachment 1 data sheet. This information is needed to fully identify the equipment tested, and does not impact the testing performed.

4. Attachment 1 Data Sheet: Since the 897A-210 detector being used will be calibrated, enter the actual calibration Conversion Constant value set point into Function Switch position 5. This will permit the detector to display the actual radiation value, and does not impact the testing performed.

RG&E (continued)

5. IEC 801 vs IEC 61000. The IEC 800 series standards have been superseded by the IEC 61000 series in 1997. The testing requirements of the IEC 61000 series are essentially the same as the IEC 800 series. The following is a cross reference between the IEC standards:

IEC 801-2, ESD;	IEC 61000
IEC 801-3, Radiated Susceptibility;	IEC 61000
IEC 801-4, Fast Transient;	IEC 61000
IEC 801-5, Surge Tests;	IEC 61000
IEC 801-6, Conducted Susceptibility;	IEC 61000

Since the ERPI guideline requires that specific test limits are used in the testing, and allows the test facility the freedom to select the test methodology standard used, the use of the current IEC standards for specific tests does not impact the testing performed

6. Radiated Emissions Rest Requirements, Attachment 2, page 2 of 7; Correct typographical error for distance specified for the High Frequency test from 7 cm to 1 Meter, as required by MIL-STD-461D, RE102. This does not impact the testing performed.

Sincerely Yours,



Andrew Lasko

Project Manager

Phone: 440-542-3611

Fax: 440-542-3661

E-Mail. LaskoA@Syncor.com

Attachment 2

**Software Verification and Validation Report for PROM P/N 94095603
GM Area Monitor**



October 30, 2002

Rochester Gas and Electric Corporation
Ginna Station
1503 Lake Rd.
Ontario, N.Y. 14519

6045 Cochran Road
Cleveland
Ohio 44139 USA

phone 440 248 9300
fax 440 349.2307
srm syncor.com

Attention: Mr. Paul Swift, Project Engineer

Reference: Rochester Gas and Electric Corp. P.O. No.: 5000004880
Ginna Station,
Syncor Radiation Management Sales Order No. 183255

Subject: Document Transmittal

Dear Paul:

Enclosed is one (1) copy of the following document:

Drawing Number:

Rev.: Description:

94095603-TT03

N/A - Completed Software Test Data Sheets

94095603VTP-AN001

N/A Test Incident Report

Please advise if you have any questions or comments on the above.

Sincerely Yours,

Andrew Lasko
Project Manager
Phone: 440-542-3611
Fax: 440-542-3661
E-Mail: alasko@inovision.com

6 Test Log

6.1 Test Log Identifier: 94095603VTP

6.2 Description: 956A-201-M1 with 94095603 PROM

6.3 Activity and Event Entries: As noted in procedure 94095603VTP

6.4 Execution Description: As noted below

6.5 Procedure Results:

Procedure Reference #	Result Pass/Fail	Tester	Date
4.3.3.1.1	PASS	R. Honek	10-29-02
4.3.3.1.2			
4.3.3.1.3			
4.3.3.1.4			
4.3.3.1.5			
4.3.3.1.6			
4.3.3.1.7			
4.3.3.1.8			
4.3.3.1.9			
4.3.3.2.2			
4.3.3.2.3			
4.3.3.2.4.1			
4.3.3.2.4.2			
4.3.3.2.4.3			
4.3.3.2.4.4			
4.3.3.2.4.5			
4.3.3.2.4.6			
4.3.3.2.4.7			
4.3.3.2.4.8			
4.3.3.2.4.9			
4.3.3.2.4.10			
4.3.3.2.4.11			
4.3.3.2.4.12			
4.3.3.3.3			
4.3.3.3.6			
4.3.3.3.7			
4.3.3.3.10			
4.3.3.3.11			
4.3.3.3.14			
4.3.3.3.15			
4.3.3.3.18			

SYNOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 189 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.3.19					
4.3.3.3.22					
4.3.3.3.23					
4.3.3.3.26					
4.3.3.3.29					
4.3.3.3.30					
4.3.3.3.33					
4.3.3.3.34					
4.3.3.3.37					
4.3.3.3.38					
4.3.3.3.41					
4.3.3.3.44					
4.3.3.3.47					
4.3.3.3.50					
4.3.3.3.53					
4.3.3.3.56					
4.3.3.4.2					
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4.3.3.4.8					
4.3.3.4.9					
4.3.3.4.10					
4.3.3.4.11					
4.3.3.4.12					
4.3.3.4.13					
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4.3.3.4.15					
4.3.3.4.16					
4.3.3.4.17					
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4.3.3.5.1.2.7					
4.3.3.5.1.2.8					
4.3.3.5.1.2.9					
4.3.3.5.1.2.10					
4.3.3.5.1.2.11					
4.3.3.5.1.2.12					
4.3.3.5.1.2.13					
4.3.3.5.1.2.14					

SYNCOR RADIATION MANAGEMENT				DATE	10/23/02	TITLE	SOFTWARE VALIDATION TEST PROCEDURE, 9405603	
REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.		SIZE	
1	3076	PRODUCTION		190 of 246		94095603VTP	PLN	

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4.3.3.7.11					
4.3.3.7.12					
4.3.3.7.13					
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4.3.3.7.15					
4.3.3.7.16					
4.3.3.7.17					
4.3.3.7.18					
4.3.3.7.19					
4.3.3.8.1					
4.3.3.8.2					
4.3.3.8.3					
4.3.3.8.4					
4.3.3.8.5					
4.3.3.8.6					
4.3.3.8.7					
4.3.3.8.8					
4.3.3.8.9					
4.3.3.8.10					
4.3.3.8.11					

SYNCOR RADIATION MANAGEMENT				DATE 10/23/02	TITLE SOFTWARE VALIDATION TEST PROCEDURE, 9405603	
REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 191 of 246	NO. 94095603VTP	SIZE PLN

4.3.3.8.12					
4.3.3.8.13					
4.3.3.8.14					
4.3.3.8.15					
4.3.3.8.16					
4.3.3.8.17					
4.3.3.8.18					
4.3.3.8.19					
4.3.3.8.20	√				
4.3.3.9.1.1.1					
4.3.3.9.1.1.2					
4.3.3.9.1.1.3					
4.3.3.9.1.1.4					
4.3.3.9.1.1.5					
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4.3.3.9.1.1.7					
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4.3.3.9.1.1.10					
4.3.3.9.1.1.11					
4.3.3.9.1.1.12					
4.3.3.9.1.1.13					
4.3.3.9.1.1.14					
4.3.3.9.1.1.15					
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4.3.3.9.2.1.1					
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4.3.3.9.2.1.3					
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4.3.3.9.2.1.13					
4.3.3.9.2.1.14					
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4.3.3.9.2.3					
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4.3.3.9.2.5					
4.3.3.9.2.6					
4.3.3.9.2.7	√	√	√	√	√

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

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NO.

94095603VTP

SIZE

PLN

4.3.3.9.2.8					
4.3.3.9.2.9					
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4.3.3.9.2.14					
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4.3.3.9.2.20.3					
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4.3.3.9.2.20.5	* FAIL				
4.3.3.9.2.20.6	* FAIL				
4.3.3.9.2.20.7	PASS				
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4.3.3.9.2.20.13					
4.3.3.9.2.20.14					
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4.3.3.10.1.1.12					
4.3.3.10.1.1.13					
4.3.3.10.1.1.14					
4.3.3.10.1.1.15					
4.3.3.10.1.1.16	✓				
4.3.3.10.2.1.1					
4.3.3.10.2.1.2					
4.3.3.10.2.1.3	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

193 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.10.2.1.4					
4.3.3.10.2.1.5					
4.3.3.10.2.1.6					
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4.3.3.10.2.1.10					
4.3.3.10.2.1.11					
4.3.3.10.2.1.12					
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4.3.3.10.2.1.14					
4.3.3.10.2.1.15					
4.3.3.10.2.1.16	↓				
4.3.3.10.2.3					
4.3.3.10.2.4					
4.3.3.10.2.5					
4.3.3.10.2.6					
4.3.3.10.2.7					
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4.3.3.10.2.15					
4.3.3.10.2.16					
4.3.3.10.2.17					
4.3.3.10.2.18	↓				
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4.3.3.11.1.1.2					
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4.3.3.11.1.1.11					
4.3.3.11.1.1.12					
4.3.3.11.1.1.13					
4.3.3.11.1.1.14					
4.3.3.11.1.1.15					
4.3.3.11.1.1.16	↓				
4.3.3.11.1.3	↓		↓		↓

SYNCOR RADIATION MANAGEMENT				DATE 10/23/02	TITLE SOFTWARE VALIDATION TEST PROCEDURE, 9405603	
REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 194 of 246	NO. 94095603VTP	SIZE PLN

4.3.3.11.1.4					
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4.3.3.11.1.9					
4.3.3.11.1.10					
4.3.3.11.1.11					
4.3.3.11.1.12					
4.3.3.11.1.13					
4.3.3.11.1.14					
4.3.3.11.1.15					
4.3.3.11.1.16					
4.3.3.11.1.17					
4.3.3.11.1.18	✓				
4.3.3.11.3.1					
4.3.3.11.3.2					
4.3.3.11.3.3					
4.3.3.11.3.4					
4.3.3.11.3.5					
4.3.3.11.3.6					
4.3.3.11.3.7					
4.3.3.11.3.8					
4.3.3.11.3.9					
4.3.3.11.3.10					
4.3.3.11.3.11					
4.3.3.11.3.12					
4.3.3.11.3.13					
4.3.3.11.3.14					
4.3.3.11.3.15					
4.3.3.11.3.16	✓				
4.3.3.11.3.18					
4.3.3.11.3.19					
4.3.3.11.3.20					
4.3.3.11.3.21					
4.3.3.11.3.22					
4.3.3.11.3.23					
4.3.3.11.3.24					
4.3.3.11.3.25					
4.3.3.11.3.26					
4.3.3.11.3.27					
4.3.3.11.3.28					
4.3.3.11.3.29					
4.3.3.11.3.30					
4.3.3.11.3.31					
4.3.3.11.3.32	✓	✓	✓	✓	✓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 195 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.11.3.33					
4.3.3.11.5.1					
4.3.3.11.5.2					
4.3.3.11.5.3					
4.3.3.11.5.4					
4.3.3.11.5.5					
4.3.3.11.5.6					
4.3.3.11.5.7					
4.3.3.11.5.8					
4.3.3.11.5.9					
4.3.3.11.5.10					
4.3.3.11.5.11					
4.3.3.11.5.12					
4.3.3.11.5.13					
4.3.3.11.5.14					
4.3.3.11.5.15					
4.3.3.11.5.16					
4.3.3.12.2.1					
4.3.3.12.2.2					
4.3.3.12.2.3					
4.3.3.12.2.4					
4.3.3.12.2.5					
4.3.3.12.2.6					
4.3.3.12.2.7					
4.3.3.12.2.8					
4.3.3.12.2.9					
4.3.3.12.2.10					
4.3.3.12.2.11					
4.3.3.12.2.12					
4.3.3.12.2.13					
4.3.3.12.2.14					
4.3.3.12.2.15					
4.3.3.12.2.16					
4.3.3.12.4.1					
4.3.3.12.4.2					
4.3.3.12.4.3					
4.3.3.12.4.4					
4.3.3.12.4.5					
4.3.3.12.4.6					
4.3.3.12.4.7					
4.3.3.12.4.8					
4.3.3.12.4.9					
4.3.3.12.4.10					
4.3.3.12.4.11					
4.3.3.12.4.12					
4.3.3.12.4.13					

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR
PRODUCTION

DOC CTRL

SHEET

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NO.

94095603VTP

SIZE

PLN

4.3.3.12.4.14					
4.3.3.12.4.15					
4.3.3.12.4.16	↓				
4.3.3.12.4.17					
4.3.3.12.4.18					
4.3.3.12.4.19					
4.3.3.12.4.20					
4.3.3.12.4.21					
4.3.3.12.4.22					
4.3.3.12.4.23					
4.3.3.12.4.24					
4.3.3.12.4.25					
4.3.3.12.4.26					
4.3.3.12.4.27					
4.3.3.12.4.28					
4.3.3.12.4.29					
4.3.3.12.4.30					
4.3.3.12.4.31					
4.3.3.12.4.32					
4.3.3.12.4.33	↓				
4.3.3.12.6.1					
4.3.3.12.6.2					
4.3.3.12.6.3					
4.3.3.12.6.4					
4.3.3.12.6.5					
4.3.3.12.6.6					
4.3.3.12.6.7					
4.3.3.12.6.8					
4.3.3.12.6.9					
4.3.3.12.6.10					
4.3.3.12.6.11					
4.3.3.12.6.12					
4.3.3.12.6.13					
4.3.3.12.6.14					
4.3.3.12.6.15					
4.3.3.12.6.16	↓				
4.3.3.13.2.1					
4.3.3.13.2.2					
4.3.3.13.2.3					
4.3.3.13.2.4					
4.3.3.13.2.5					
4.3.3.13.2.6					
4.3.3.13.2.7					
4.3.3.13.2.8					
4.3.3.13.2.9					
4.3.3.13.2.10	↓	↓	↓	↓	↓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 197 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.13.2.11					
4.3.3.13.2.12					
4.3.3.13.2.13					
4.3.3.13.2.14					
4.3.3.13.2.15					
4.3.3.13.2.16	↓				
4.3.3.13.4.1					
4.3.3.13.4.2					
4.3.3.13.4.3					
4.3.3.13.4.4					
4.3.3.13.4.5					
4.3.3.13.4.6					
4.3.3.13.4.7					
4.3.3.13.4.8					
4.3.3.13.4.9					
4.3.3.13.4.10					
4.3.3.13.4.11					
4.3.3.13.4.12					
4.3.3.13.4.13					
4.3.3.13.4.14					
4.3.3.13.4.15					
4.3.3.13.4.16	↓				
4.3.3.13.6.1					
4.3.3.13.6.2					
4.3.3.13.6.3					
4.3.3.13.6.4					
4.3.3.13.6.5					
4.3.3.13.6.6					
4.3.3.13.6.7					
4.3.3.13.6.8					
4.3.3.13.6.9					
4.3.3.13.6.10					
4.3.3.13.6.11					
4.3.3.13.6.12					
4.3.3.13.6.13					
4.3.3.13.6.14					
4.3.3.13.6.15					
4.3.3.13.6.16	↓				
4.3.3.13.8					
4.3.3.13.9					
4.3.3.13.10					
4.3.3.13.11					
4.3.3.13.12					
4.3.3.13.13					
4.3.3.13.14					
4.3.3.13.15	↓	↓	↓	↓	↓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3076	PRODUCTION		198 of 246	94095603VTP	PLN

4.3.3.13.16					
4.3.3.13.17					
4.3.3.13.18					
4.3.3.13.19					
4.3.3.13.20					
4.3.3.13.21					
4.3.3.13.22					
4.3.3.13.23	✓				
4.3.3.14.2.1					
4.3.3.14.2.2					
4.3.3.14.2.3					
4.3.3.14.2.4					
4.3.3.14.2.5					
4.3.3.14.2.6					
4.3.3.14.2.7					
4.3.3.14.2.8					
4.3.3.14.2.9					
4.3.3.14.2.10					
4.3.3.14.2.11					
4.3.3.14.2.12					
4.3.3.14.2.13					
4.3.3.14.2.14					
4.3.3.14.2.15					
4.3.3.14.2.16	✓				
4.3.3.14.2.18					
4.3.3.14.2.19					
4.3.3.14.2.20					
4.3.3.14.2.21					
4.3.3.14.2.22					
4.3.3.14.2.23					
4.3.3.14.2.24					
4.3.3.14.2.25					
4.3.3.14.2.26					
4.3.3.14.2.27					
4.3.3.14.2.28					
4.3.3.14.2.29					
4.3.3.14.2.30					
4.3.3.14.2.31					
4.3.3.14.2.32					
4.3.3.14.2.33	✓				
4.3.3.14.4.1					
4.3.3.14.4.2					
4.3.3.14.4.3					
4.3.3.14.4.4					
4.3.3.14.4.5					
4.3.3.14.4.6	✓	✓	✓	✓	✓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 199 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.14.4.7					
4.3.3.14.4.8					
4.3.3.14.4.9					
4.3.3.14.4.10					
4.3.3.14.4.11					
4.3.3.14.4.12					
4.3.3.14.4.13					
4.3.3.14.4.14					
4.3.3.14.4.15					
4.3.3.14.4.16	✓				
4.3.3.15.2.1					
4.3.3.15.2.2					
4.3.3.15.2.3					
4.3.3.15.2.4					
4.3.3.15.2.5					
4.3.3.15.2.6					
4.3.3.15.2.7					
4.3.3.15.2.8					
4.3.3.15.2.9					
4.3.3.15.2.10					
4.3.3.15.2.11					
4.3.3.15.2.12					
4.3.3.15.2.13					
4.3.3.15.2.14					
4.3.3.15.2.15					
4.3.3.15.2.16	✓				
4.3.3.15.4.1					
4.3.3.15.4.2					
4.3.3.15.4.3					
4.3.3.15.4.4					
4.3.3.15.4.5					
4.3.3.15.4.6					
4.3.3.15.4.7					
4.3.3.15.4.8					
4.3.3.15.4.9					
4.3.3.15.4.10					
4.3.3.15.4.11					
4.3.3.15.4.12					
4.3.3.15.4.13					
4.3.3.15.4.14					
4.3.3.15.4.15					
4.3.3.15.4.16	✓				
4.3.3.15.4.18					
4.3.3.15.4.19					
4.3.3.15.4.20					
4.3.3.15.4.21	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

200 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.15.4.22					
4.3.3.15.4.23					
4.3.3.15.4.24					
4.3.3.15.4.25					
4.3.3.15.4.26					
4.3.3.15.4.27					
4.3.3.15.4.28					
4.3.3.15.4.29					
4.3.3.15.4.30					
4.3.3.15.4.31					
4.3.3.15.4.32					
4.3.3.15.4.33	✓				
4.3.3.16.2.1					
4.3.3.16.2.2					
4.3.3.16.2.3					
4.3.3.16.2.4					
4.3.3.16.2.5					
4.3.3.16.2.6					
4.3.3.16.2.7					
4.3.3.16.2.8					
4.3.3.16.2.9					
4.3.3.16.2.10					
4.3.3.16.2.11					
4.3.3.16.2.12					
4.3.3.16.2.13					
4.3.3.16.2.14					
4.3.3.16.2.15					
4.3.3.16.2.16	✓				
4.3.3.16.3					
4.3.3.16.4					
4.3.3.16.5					
4.3.3.16.6					
4.3.3.16.7					
4.3.3.16.8					
4.3.3.16.9					
4.3.3.16.10					
4.3.3.16.11					
4.3.3.16.12					
4.3.3.16.13					
4.3.3.16.14					
4.3.3.16.15					
4.3.3.16.16					
4.3.3.16.17					
4.3.3.16.18					
4.3.3.16.19					
4.3.3.16.21.1	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3076	PRODUCTION		201 of 246	94095603VTP	PLN

4.3.3.16.21.2					
4.3.3.16.21.3					
4.3.3.16.21.4					
4.3.3.16.21.5					
4.3.3.16.21.6					
4.3.3.16.21.7					
4.3.3.16.21.8					
4.3.3.16.21.9					
4.3.3.16.21.10					
4.3.3.16.21.11					
4.3.3.16.21.12					
4.3.3.16.21.13					
4.3.3.16.21.14					
4.3.3.16.21.15					
4.3.3.16.21.16	✓				
4.3.3.16.21.18					
4.3.3.16.21.19					
4.3.3.16.21.20					
4.3.3.16.21.21					
4.3.3.16.21.22					
4.3.3.16.21.23					
4.3.3.16.21.24					
4.3.3.16.21.25					
4.3.3.16.21.26					
4.3.3.16.21.27					
4.3.3.16.21.28					
4.3.3.16.21.29					
4.3.3.16.21.30					
4.3.3.16.21.31					
4.3.3.16.21.32					
4.3.3.16.21.33	✓				
4.3.3.16.23.1					
4.3.3.16.23.2					
4.3.3.16.23.3					
4.3.3.16.23.4					
4.3.3.16.23.5					
4.3.3.16.23.6					
4.3.3.16.23.7					
4.3.3.16.23.8					
4.3.3.16.23.9					
4.3.3.16.23.10					
4.3.3.16.23.11					
4.3.3.16.23.12					
4.3.3.16.23.13					
4.3.3.16.23.14					
4.3.3.16.23.15	✓	✓	✓	✓	✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

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NO.

94095603VTP

SIZE

PLN

4.3.3.16.23.16					
4.3.3.16.25.1					
4.3.3.16.25.2					
4.3.3.16.25.3					
4.3.3.16.25.4					
4.3.3.16.25.5					
4.3.3.16.25.6					
4.3.3.16.25.7					
4.3.3.16.25.8					
4.3.3.16.25.9					
4.3.3.16.25.10					
4.3.3.16.25.11					
4.3.3.16.25.12					
4.3.3.16.25.13					
4.3.3.16.25.14					
4.3.3.16.25.15					
4.3.3.16.25.16	✓				
4.3.3.17.2.1					
4.3.3.17.2.2					
4.3.3.17.2.3					
4.3.3.17.2.4					
4.3.3.17.2.5					
4.3.3.17.2.6					
4.3.3.17.2.7					
4.3.3.17.2.8					
4.3.3.17.2.9					
4.3.3.17.2.10					
4.3.3.17.2.11					
4.3.3.17.2.12					
4.3.3.17.2.13					
4.3.3.17.2.14					
4.3.3.17.2.15					
4.3.3.17.2.16	✓				
4.3.3.17.4.1					
4.3.3.17.4.2					
4.3.3.17.4.3					
4.3.3.17.4.4					
4.3.3.17.4.5					
4.3.3.17.4.6					
4.3.3.17.4.7					
4.3.3.17.4.8					
4.3.3.17.4.9					
4.3.3.17.4.10					
4.3.3.17.4.11					
4.3.3.17.4.12					
4.3.3.17.4.13	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

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NO.

94095603VTP

SIZE

PLN

4.3.3.17.4.14					
4.3.3.17.4.15					
4.3.3.17.4.16	↓				
4.3.3.17.4.18					
4.3.3.17.4.19					
4.3.3.17.4.20					
4.3.3.17.4.21					
4.3.3.17.4.22					
4.3.3.17.4.23					
4.3.3.17.4.24					
4.3.3.17.4.25					
4.3.3.17.4.26					
4.3.3.17.4.27					
4.3.3.17.4.28					
4.3.3.17.4.29					
4.3.3.17.4.30					
4.3.3.17.4.31					
4.3.3.17.4.32					
4.3.3.17.4.33	↓				
4.3.3.17.6.1					
4.3.3.17.6.2					
4.3.3.17.6.3					
4.3.3.17.6.4					
4.3.3.17.6.5					
4.3.3.17.6.6					
4.3.3.17.6.7					
4.3.3.17.6.8					
4.3.3.17.6.9					
4.3.3.17.6.10					
4.3.3.17.6.11					
4.3.3.17.6.12					
4.3.3.17.6.13					
4.3.3.17.6.14					
4.3.3.17.6.15					
4.3.3.17.6.16	↓				
4.3.3.17.8.1					
4.3.3.17.8.2					
4.3.3.17.8.3					
4.3.3.17.8.4					
4.3.3.17.8.5					
4.3.3.17.8.6					
4.3.3.17.8.7					
4.3.3.17.8.8					
4.3.3.17.8.9					
4.3.3.17.8.10					
4.3.3.17.8.11	↓	↓	↓	↓	↓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV
1.

ECN NO.
3076

RELEASED FOR
PRODUCTION

DOC CTRL

SHEET
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NO.

94095603VTP

SIZE
PLN

4.3.3.17.8.12					
4.3.3.17.8.13					
4.3.3.17.8.14					
4.3.3.17.8.15					
4.3.3.17.8.16	↓				
4.3.3.18.2.1					
4.3.3.18.2.2					
4.3.3.18.2.3					
4.3.3.18.2.4					
4.3.3.18.2.5					
4.3.3.18.2.6					
4.3.3.18.2.7					
4.3.3.18.2.8					
4.3.3.18.2.9					
4.3.3.18.2.10					
4.3.3.18.2.11					
4.3.3.18.2.12					
4.3.3.18.2.13					
4.3.3.18.2.14					
4.3.3.18.2.15					
4.3.3.18.2.16	↓				
4.3.3.18.4.1					
4.3.3.18.4.2					
4.3.3.18.4.3					
4.3.3.18.4.4					
4.3.3.18.4.5					
4.3.3.18.4.6					
4.3.3.18.4.7					
4.3.3.18.4.8					
4.3.3.18.4.9					
4.3.3.18.4.10					
4.3.3.18.4.11					
4.3.3.18.4.12					
4.3.3.18.4.13					
4.3.3.18.4.14					
4.3.3.18.4.15					
4.3.3.18.4.16	↓				
4.3.3.18.6.1					
4.3.3.18.6.2					
4.3.3.18.6.3					
4.3.3.18.6.4					
4.3.3.18.6.5					
4.3.3.18.6.6					
4.3.3.18.6.7					
4.3.3.18.6.8					
4.3.3.18.6.9	↓		↓		↓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 205 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.18.6.10					
4.3.3.18.6.11					
4.3.3.18.6.12					
4.3.3.18.6.13					
4.3.3.18.6.14					
4.3.3.18.6.15					
4.3.3.18.6.16	✓				
4.3.3.18.6.18					
4.3.3.18.6.19					
4.3.3.18.6.20					
4.3.3.18.6.21					
4.3.3.18.6.22					
4.3.3.18.6.23					
4.3.3.18.6.24					
4.3.3.18.6.25					
4.3.3.18.6.26					
4.3.3.18.6.27					
4.3.3.18.6.28					
4.3.3.18.6.29					
4.3.3.18.6.30					
4.3.3.18.6.31					
4.3.3.18.6.32					
4.3.3.18.6.33	✓				
4.3.3.18.8.1					
4.3.3.18.8.2					
4.3.3.18.8.3					
4.3.3.18.8.4					
4.3.3.18.8.5					
4.3.3.18.8.6					
4.3.3.18.8.7					
4.3.3.18.8.8					
4.3.3.18.8.9					
4.3.3.18.8.10					
4.3.3.18.8.11					
4.3.3.18.8.12					
4.3.3.18.8.13					
4.3.3.18.8.14					
4.3.3.18.8.15					
4.3.3.18.8.16	✓				
4.3.3.19.2.1					
4.3.3.19.2.2					
4.3.3.19.2.3					
4.3.3.19.2.4					
4.3.3.19.2.5					
4.3.3.19.2.6					
4.3.3.19.2.7					

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 206 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.19.2.8					
4.3.3.19.2.9					
4.3.3.19.2.10					
4.3.3.19.2.11					
4.3.3.19.2.12					
4.3.3.19.2.13					
4.3.3.19.2.14					
4.3.3.19.2.15					
4.3.3.19.2.16	✓				
4.3.3.19.4.1					
4.3.3.19.4.2					
4.3.3.19.4.3					
4.3.3.19.4.4					
4.3.3.19.4.5					
4.3.3.19.4.6					
4.3.3.19.4.7					
4.3.3.19.4.8					
4.3.3.19.4.9					
4.3.3.19.4.10					
4.3.3.19.4.11					
4.3.3.19.4.12					
4.3.3.19.4.13					
4.3.3.19.4.14					
4.3.3.19.4.15					
4.3.3.19.4.16	✓				
4.3.3.19.6.1					
4.3.3.19.6.2					
4.3.3.19.6.3					
4.3.3.19.6.4					
4.3.3.19.6.5					
4.3.3.19.6.6					
4.3.3.19.6.7					
4.3.3.19.6.8					
4.3.3.19.6.9					
4.3.3.19.6.10					
4.3.3.19.6.11					
4.3.3.19.6.12					
4.3.3.19.6.13					
4.3.3.19.6.14					
4.3.3.19.6.15					
4.3.3.19.6.16	✓				
4.3.3.19.8.1					
4.3.3.19.8.2					
4.3.3.19.8.3					
4.3.3.19.8.4					
4.3.3.19.8.5	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

207 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.19.8.6					
4.3.3.19.8.7					
4.3.3.19.8.8					
4.3.3.19.8.9					
4.3.3.19.8.10					
4.3.3.19.8.11					
4.3.3.19.8.12					
4.3.3.19.8.13					
4.3.3.19.8.14					
4.3.3.19.8.15					
4.3.3.19.8.16	↓				
4.3.3.19.10					
4.3.3.19.11					
4.3.3.19.12					
4.3.3.19.13					
4.3.3.19.14					
4.3.3.19.15					
4.3.3.19.16					
4.3.3.19.17					
4.3.3.19.18					
4.3.3.19.19					
4.3.3.19.20					
4.3.3.19.21					
4.3.3.19.22					
4.3.3.19.23					
4.3.3.19.24					
4.3.3.19.25	↓				
4.3.3.20.2.1					
4.3.3.20.2.2					
4.3.3.20.2.3					
4.3.3.20.2.4					
4.3.3.20.2.5					
4.3.3.20.2.6					
4.3.3.20.2.7					
4.3.3.20.2.8					
4.3.3.20.2.9					
4.3.3.20.2.10					
4.3.3.20.2.11					
4.3.3.20.2.12					
4.3.3.20.2.13					
4.3.3.20.2.14					
4.3.3.20.2.15					
4.3.3.20.2.16	↓				
4.3.3.20.4					
4.3.3.20.5					
4.3.3.20.6	↓		↓		↓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 208 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.20.7				
4.3.3.20.8				
4.3.3.20.9				
4.3.3.20.10				
4.3.3.20.11				
4.3.3.20.12				
4.3.3.20.13				
4.3.3.20.14				
4.3.3.20.15				
4.3.3.20.16				
4.3.3.20.17				
4.3.3.20.18				
4.3.3.20.19	↓			
4.3.3.20.21.1				
4.3.3.20.21.2				
4.3.3.20.21.3				
4.3.3.20.21.4				
4.3.3.20.21.5				
4.3.3.20.21.6				
4.3.3.20.21.7				
4.3.3.20.21.8				
4.3.3.20.21.9				
4.3.3.20.21.10				
4.3.3.20.21.11				
4.3.3.20.21.12				
4.3.3.20.21.13				
4.3.3.20.21.14				
4.3.3.20.21.15	↓			
4.3.3.20.21.16				
4.3.3.20.23.1				
4.3.3.20.23.2				
4.3.3.20.23.3				
4.3.3.20.23.4				
4.3.3.20.23.5				
4.3.3.20.23.6				
4.3.3.20.23.7				
4.3.3.20.23.8				
4.3.3.20.23.9				
4.3.3.20.23.10				
4.3.3.20.23.11				
4.3.3.20.23.12				
4.3.3.20.23.13				
4.3.3.20.23.14				
4.3.3.20.23.15				
4.3.3.20.23.16	↓		↓	↓
4.3.3.21.2.1	↓			

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 209 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.21.2.2					
4.3.3.21.2.3					
4.3.3.21.2.4					
4.3.3.21.2.5					
4.3.3.21.2.6					
4.3.3.21.2.7					
4.3.3.21.2.8					
4.3.3.21.2.9					
4.3.3.21.2.10					
4.3.3.21.2.11					
4.3.3.21.2.12					
4.3.3.21.2.13					
4.3.3.21.2.14					
4.3.3.21.2.15					
4.3.3.21.2.16	✓				
4.3.3.21.4.1					
4.3.3.21.4.2					
4.3.3.21.4.3					
4.3.3.21.4.4					
4.3.3.21.4.5					
4.3.3.21.4.6					
4.3.3.21.4.7					
4.3.3.21.4.8					
4.3.3.21.4.9					
4.3.3.21.4.10					
4.3.3.21.4.11					
4.3.3.21.4.12					
4.3.3.21.4.13					
4.3.3.21.4.14					
4.3.3.21.4.15					
4.3.3.21.4.16	✓				
4.3.3.21.6					
4.3.3.21.7					
4.3.3.21.8					
4.3.3.21.9					
4.3.3.21.10					
4.3.3.21.11					
4.3.3.21.12					
4.3.3.21.13					
4.3.3.21.14					
4.3.3.21.15					
4.3.3.21.16					
4.3.3.21.17					
4.3.3.21.18					
4.3.3.21.19					
4.3.3.21.20	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3076	PRODUCTION		210 of 246	94095603VTP	PLN

4.3.3.21.21					
4.3.3.21.23.1					
4.3.3.21.23.2					
4.3.3.21.23.3					
4.3.3.21.23.4					
4.3.3.21.23.5					
4.3.3.21.23.6					
4.3.3.21.23.7					
4.3.3.21.23.8					
4.3.3.21.23.9					
4.3.3.21.23.10					
4.3.3.21.23.11					
4.3.3.21.23.12					
4.3.3.21.23.13					
4.3.3.21.23.14					
4.3.3.21.23.15					
4.3.3.21.23.16	✓				
4.3.3.22.2.1					
4.3.3.22.2.2					
4.3.3.22.2.3					
4.3.3.22.2.4					
4.3.3.22.2.5					
4.3.3.22.2.6					
4.3.3.22.2.7					
4.3.3.22.2.8					
4.3.3.22.2.9					
4.3.3.22.2.10					
4.3.3.22.2.11					
4.3.3.22.2.12					
4.3.3.22.2.13					
4.3.3.22.2.14					
4.3.3.22.2.15					
4.3.3.22.2.16	✓				
4.3.3.22.4.1					
4.3.3.22.4.2					
4.3.3.22.4.3					
4.3.3.22.4.4					
4.3.3.22.4.5					
4.3.3.22.4.6					
4.3.3.22.4.7					
4.3.3.22.4.8					
4.3.3.22.4.9					
4.3.3.22.4.10					
4.3.3.22.4.11					
4.3.3.22.4.12					
4.3.3.22.4.13	✓	✓	✓	✓	✓

SYNCR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 211 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.22.4.14					
4.3.3.22.4.15					
4.3.3.22.4.16	↓				
4.3.3.22.6.1					
4.3.3.22.6.2					
4.3.3.22.6.3					
4.3.3.22.6.4					
4.3.3.22.6.5					
4.3.3.22.6.6					
4.3.3.22.6.7					
4.3.3.22.6.8					
4.3.3.22.6.9					
4.3.3.22.6.10					
4.3.3.22.6.11					
4.3.3.22.6.12					
4.3.3.22.6.13					
4.3.3.22.6.14					
4.3.3.22.6.15					
4.3.3.22.6.16	↓				
4.3.3.22.8					
4.3.3.22.9					
4.3.3.22.10					
4.3.3.22.11					
4.3.3.22.12					
4.3.3.22.13					
4.3.3.22.14					
4.3.3.22.15					
4.3.3.22.16					
4.3.3.22.17					
4.3.3.22.18					
4.3.3.22.19					
4.3.3.22.20					
4.3.3.22.21					
4.3.3.22.22					
4.3.3.22.23	↓				
4.3.3.23.2.1					
4.3.3.23.2.2					
4.3.3.23.2.3					
4.3.3.23.2.4					
4.3.3.23.2.5					
4.3.3.23.2.6					
4.3.3.23.2.7					
4.3.3.23.2.8					
4.3.3.23.2.9					
4.3.3.23.2.10					
4.3.3.23.2.11	↓	↓	↓	↓	↓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3076	PRODUCTION		212 of 246	94095603VTP	PLN

4.3.3.23.2.12					
4.3.3.23.2.13					
4.3.3.23.2.14					
4.3.3.23.2.15					
4.3.3.23.2.16	✓				
4.3.3.23.4.1					
4.3.3.23.4.2					
4.3.3.23.4.3					
4.3.3.23.4.4					
4.3.3.23.4.5					
4.3.3.23.4.6					
4.3.3.23.4.7					
4.3.3.23.4.8					
4.3.3.23.4.9					
4.3.3.23.4.10					
4.3.3.23.4.11					
4.3.3.23.4.12					
4.3.3.23.4.13					
4.3.3.23.4.14					
4.3.3.23.4.15					
4.3.3.23.4.16	✓				
4.3.3.23.5					
4.3.3.23.6.1					
4.3.3.23.6.2					
4.3.3.23.6.3					
4.3.3.23.6.4					
4.3.3.23.6.5					
4.3.3.23.6.6					
4.3.3.23.6.7					
4.3.3.23.6.8					
4.3.3.23.6.9					
4.3.3.23.6.10					
4.3.3.23.6.11					
4.3.3.23.6.12					
4.3.3.23.6.13					
4.3.3.23.6.14					
4.3.3.23.6.15					
4.3.3.23.6.16	✓				
4.3.3.23.8.1					
4.3.3.23.8.2					
4.3.3.23.8.2					
4.3.3.23.8.4					
4.3.3.23.8.5					
4.3.3.23.8.6	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 213 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.23.8.7					
4.3.3.23.8.8					
4.3.3.23.8.9					
4.3.3.23.8.10					
4.3.3.23.8.11					
4.3.3.23.8.12					
4.3.3.23.8.13					
4.3.3.23.8.14					
4.3.3.23.8.15					
4.3.3.23.8.16	✓				
4.3.3.24.2.1					
4.3.3.24.2.2					
4.3.3.24.2.3					
4.3.3.24.2.4					
4.3.3.24.2.5					
4.3.3.24.2.6					
4.3.3.24.2.7					
4.3.3.24.2.8					
4.3.3.24.2.9					
4.3.3.24.2.10					
4.3.3.24.2.11					
4.3.3.24.2.12					
4.3.3.24.2.13					
4.3.3.24.2.14					
4.3.3.24.2.15					
4.3.3.24.2.16	✓				
4.3.3.24.4					
4.3.3.24.5					
4.3.3.24.6					
4.3.3.24.7					
4.3.3.24.8					
4.3.3.24.9					
4.3.3.24.10					
4.3.3.24.11					
4.3.3.24.12					
4.3.3.24.13					
4.3.3.24.14					
4.3.3.24.15					
4.3.3.24.16					
4.3.3.24.17					
4.3.3.24.18					
4.3.3.24.19	✓				
4.3.3.24.22.1					
4.3.3.24.22.2					
4.3.3.24.22.3	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

214 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.24.22.4					
4.3.3.24.22.5					
4.3.3.24.22.6					
4.3.3.24.22.7					
4.3.3.24.22.8					
4.3.3.24.22.9					
4.3.3.24.22.10					
4.3.3.24.22.11					
4.3.3.24.22.12					
4.3.3.24.22.13					
4.3.3.24.22.14					
4.3.3.24.22.15					
4.3.3.24.22.16					
4.3.3.25.2.1					
4.3.3.25.2.2					
4.3.3.25.2.3					
4.3.3.25.2.4					
4.3.3.25.2.5					
4.3.3.25.2.6					
4.3.3.25.2.7					
4.3.3.25.2.8					
4.3.3.25.2.9					
4.3.3.25.2.10					
4.3.3.25.2.11					
4.3.3.25.2.12					
4.3.3.25.2.13					
4.3.3.25.2.14					
4.3.3.25.2.15					
4.3.3.25.2.16					
4.3.3.25.4.1					
4.3.3.25.4.2					
4.3.3.25.4.3					
4.3.3.25.4.4					
4.3.3.25.4.5					
4.3.3.25.4.6					
4.3.3.25.4.7					
4.3.3.25.4.8					
4.3.3.25.4.9					
4.3.3.25.4.10					
4.3.3.25.4.11					
4.3.3.25.4.12					
4.3.3.25.4.13					
4.3.3.25.4.14					
4.3.3.25.4.15					
4.3.3.25.4.16					
4.3.3.25.7					

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 215 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.25.8					
4.3.3.25.9					
4.3.3.25.10					
4.3.3.25.11					
4.3.3.25.12					
4.3.3.25.13					
4.3.3.25.14					
4.3.3.25.15					
4.3.3.25.16					
4.3.3.25.17					
4.3.3.25.18					
4.3.3.25.19					
4.3.3.25.20					
4.3.3.25.21					
4.3.3.25.22	✓				
4.3.3.26.2.1					
4.3.3.26.2.2					
4.3.3.26.2.3					
4.3.3.26.2.4					
4.3.3.26.2.5					
4.3.3.26.2.6					
4.3.3.26.2.7					
4.3.3.26.2.8					
4.3.3.26.2.9					
4.3.3.26.2.10					
4.3.3.26.2.11					
4.3.3.26.2.12					
4.3.3.26.2.13					
4.3.3.26.2.14					
4.3.3.26.2.15					
4.3.3.26.2.16	✓				
4.3.3.26.4.1					
4.3.3.26.4.2					
4.3.3.26.4.3					
4.3.3.26.4.4					
4.3.3.26.4.5					
4.3.3.26.4.6					
4.3.3.26.4.7					
4.3.3.26.4.8					
4.3.3.26.4.9					
4.3.3.26.4.10					
4.3.3.26.4.11					
4.3.3.26.4.12					
4.3.3.26.4.13					
4.3.3.26.4.14					
4.3.3.26.4.15	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

216 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.26.4.16					
4.3.3.26.6					
4.3.3.26.7					
4.3.3.26.8					
4.3.3.26.9					
4.3.3.26.10					
4.3.3.26.11					
4.3.3.26.12					
4.3.3.26.13					
4.3.3.26.14					
4.3.3.26.15					
4.3.3.26.16					
4.3.3.26.17					
4.3.3.26.18					
4.3.3.26.19					
4.3.3.26.20					
4.3.3.26.21		✓			
4.3.3.26.24.1					
4.3.3.26.24.2					
4.3.3.26.24.3					
4.3.3.26.24.4					
4.3.3.26.24.5					
4.3.3.26.24.6					
4.3.3.26.24.7					
4.3.3.26.24.8					
4.3.3.26.24.9					
4.3.3.26.24.10					
4.3.3.26.24.11					
4.3.3.26.24.12					
4.3.3.26.24.13					
4.3.3.26.24.14					
4.3.3.26.24.15					
4.3.3.26.24.16		✓			
4.3.3.27.2.1					
4.3.3.27.2.2					
4.3.3.27.2.3					
4.3.3.27.2.4					
4.3.3.27.2.5					
4.3.3.27.2.6					
4.3.3.27.2.7					
4.3.3.27.2.8					
4.3.3.27.2.9					
4.3.3.27.2.10					
4.3.3.27.2.11					
4.3.3.27.2.12					
4.3.3.27.2.13		✓	✓	✓	

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

217 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.27.2.14					
4.3.3.27.2.15					
4.3.3.27.2.16	✓				
4.3.3.27.4.1					
4.3.3.27.4.2					
4.3.3.27.4.3					
4.3.3.27.4.4					
4.3.3.27.4.5					
4.3.3.27.4.6					
4.3.3.27.4.7					
4.3.3.27.4.8					
4.3.3.27.4.9					
4.3.3.27.4.10					
4.3.3.27.4.11					
4.3.3.27.4.12					
4.3.3.27.4.13					
4.3.3.27.4.14					
4.3.3.27.4.15					
4.3.3.27.4.16	✓				
4.3.3.27.6.1					
4.3.3.27.6.2					
4.3.3.27.6.3					
4.3.3.27.6.4					
4.3.3.27.6.5					
4.3.3.27.6.6					
4.3.3.27.6.7					
4.3.3.27.6.8					
4.3.3.27.6.9					
4.3.3.27.6.10					
4.3.3.27.6.11					
4.3.3.27.6.12					
4.3.3.27.6.13					
4.3.3.27.6.14					
4.3.3.27.6.15					
4.3.3.27.6.16	✓				
4.3.3.27.9					
4.3.3.27.10					
4.3.3.27.11					
4.3.3.27.12					
4.3.3.27.13					
4.3.3.27.14					
4.3.3.27.15					
4.3.3.27.16					
4.3.3.27.17					
4.3.3.27.18					
4.3.3.27.19	✓		✓		✓

SYNCR RADIATION MANAGEMENT			DATE 10/23/02		TITLE SOFTWARE VALIDATION TEST PROCEDURE, 9405603	
REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 218 of 246	NO. 94095603VTP	SIZE PLN

4.3.3.27.20					
4.3.3.27.21					
4.3.3.27.22					
4.3.3.27.23					
4.3.3.27.24					
4.3.3.28.2.1					
4.3.3.28.2.2					
4.3.3.28.2.3					
4.3.3.28.2.4					
4.3.3.28.2.5					
4.3.3.28.2.6					
4.3.3.28.2.7					
4.3.3.28.2.8					
4.3.3.28.2.9					
4.3.3.28.2.10					
4.3.3.28.2.11					
4.3.3.28.2.12					
4.3.3.28.2.13					
4.3.3.28.2.14					
4.3.3.28.2.15					
4.3.3.28.2.16					
4.3.3.28.4.1					
4.3.3.28.4.2					
4.3.3.28.4.3					
4.3.3.28.4.4					
4.3.3.28.4.5					
4.3.3.28.4.6					
4.3.3.28.4.7					
4.3.3.28.4.8					
4.3.3.28.4.9					
4.3.3.28.4.10					
4.3.3.28.4.11					
4.3.3.28.4.12					
4.3.3.28.4.13					
4.3.3.28.4.14					
4.3.3.28.4.15					
4.3.3.28.4.16					
4.3.3.28.6.1					
4.3.3.28.6.2					
4.3.3.28.6.3					
4.3.3.28.6.4					
4.3.3.28.6.5					
4.3.3.28.6.6					
4.3.3.28.6.7					
4.3.3.28.6.8					
4.3.3.28.6.9					

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST PROCEDURE, 9405603

REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3076	PRODUCTION		219 of 246	94095603VTP	PLN

4.3.3.28.6.10				
4.3.3.28.6.11				
4.3.3.28.6.12				
4.3.3.28.6.13				
4.3.3.28.6.14				
4.3.3.28.6.15				
4.3.3.28.6.16	↓			
4.3.3.28.9				
4.3.3.28.10				
4.3.3.28.11				
4.3.3.28.12				
4.3.3.28.13				
4.3.3.28.14				
4.3.3.28.15				
4.3.3.28.16				
4.3.3.28.17				
4.3.3.28.18				
4.3.3.28.19				
4.3.3.28.20				
4.3.3.28.21				
4.3.3.28.22				
4.3.3.28.23				
4.3.3.28.24	↓			
4.3.3.28.27.1				
4.3.3.28.27.2				
4.3.3.28.27.3				
4.3.3.28.27.4				
4.3.3.28.27.5				
4.3.3.28.27.6				
4.3.3.28.27.7				
4.3.3.28.27.8				
4.3.3.28.27.9				
4.3.3.28.27.10				
4.3.3.28.27.11				
4.3.3.28.27.12				
4.3.3.28.27.13				
4.3.3.28.27.14				
4.3.3.28.27.15				
4.3.3.28.27.16	↓			
4.3.3.29.2.1				
4.3.3.29.2.2				
4.3.3.29.2.3				
4.3.3.29.2.4				
4.3.3.29.2.5				
4.3.3.29.2.6			↓	
4.3.3.29.2.7	↓		↓	↓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 220 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.29.2.8				
4.3.3.29.2.9				
4.3.3.29.2.10				
4.3.3.29.2.11				
4.3.3.29.2.12				
4.3.3.29.2.13				
4.3.3.29.2.14				
4.3.3.29.2.15				
4.3.3.29.2.16	✓			
4.3.3.29.4.1				
4.3.3.29.4.2				
4.3.3.29.4.3				
4.3.3.29.4.4				
4.3.3.29.4.5				
4.3.3.29.4.6				
4.3.3.29.4.7				
4.3.3.29.4.8				
4.3.3.29.4.9				
4.3.3.29.4.10				
4.3.3.29.4.11				
4.3.3.29.4.12				
4.3.3.29.4.13				
4.3.3.29.4.14				
4.3.3.29.4.15				
4.3.3.29.4.16	✓			
4.3.3.29.6.1				
4.3.3.29.6.2				
4.3.3.29.6.3				
4.3.3.29.6.4				
4.3.3.29.6.5				
4.3.3.29.6.6				
4.3.3.29.6.7				
4.3.3.29.6.8				
4.3.3.29.6.9				
4.3.3.29.6.10				
4.3.3.29.6.11				
4.3.3.29.6.12				
4.3.3.29.6.13				
4.3.3.29.6.14				
4.3.3.29.6.15				
4.3.3.29.6.16	✓			
4.3.3.29.8.1				
4.3.3.29.8.2				
4.3.3.29.8.3				
4.3.3.29.8.4				
4.3.3.29.8.5	✓	✓	✓	✓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3076	PRODUCTION		221 of 246	94095603VTP	PLN

4.3.3.29.8.6					
4.3.3.29.8.7					
4.3.3.29.8.8					
4.3.3.29.8.9					
4.3.3.29.8.10					
4.3.3.29.8.11					
4.3.3.29.8.12					
4.3.3.29.8.13					
4.3.3.29.8.14					
4.3.3.29.8.15					
4.3.3.29.8.16	↓				
4.3.3.29.11					
4.3.3.29.12					
4.3.3.29.13					
4.3.3.29.14					
4.3.3.29.15					
4.3.3.29.16					
4.3.3.29.17					
4.3.3.29.18					
4.3.3.29.19					
4.3.3.29.20					
4.3.3.29.21					
4.3.3.29.22					
4.3.3.29.23					
4.3.3.29.24					
4.3.3.29.25					
4.3.3.29.26	↓				
4.3.3.30.2.1					
4.3.3.30.2.2					
4.3.3.30.2.3					
4.3.3.30.2.4					
4.3.3.30.2.5					
4.3.3.30.2.6					
4.3.3.30.2.7					
4.3.3.30.2.8					
4.3.3.30.2.9					
4.3.3.30.2.10					
4.3.3.30.2.11					
4.3.3.30.2.12					
4.3.3.30.2.13					
4.3.3.30.2.14					
4.3.3.30.2.15					
4.3.3.30.2.16	↓				
4.3.3.30.4.1					
4.3.3.30.4.2					
4.3.3.30.4.3	↓		↓		↓

SYNCOR RADIATION MANAGEMENT				DATE 10/23/02	TITLE SOFTWARE VALIDATION TEST PROCEDURE, 9405603	
REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 222 of 246	NO. 94095603VTP	SIZE PLN

4.3.3.30.4.4					
4.3.3.30.4.5					
4.3.3.30.4.6					
4.3.3.30.4.7					
4.3.3.30.4.8					
4.3.3.30.4.9					
4.3.3.30.4.10					
4.3.3.30.4.11					
4.3.3.30.4.12					
4.3.3.30.4.13					
4.3.3.30.4.14					
4.3.3.30.4.15					
4.3.3.30.4.16	✓				
4.3.3.30.6	✓				
4.3.3.30.7					
4.3.3.30.8					
4.3.3.30.9					
4.3.3.30.10					
4.3.3.30.11					
4.3.3.30.12					
4.3.3.30.13					
4.3.3.30.14					
4.3.3.30.15					
4.3.3.30.16					
4.3.3.30.17					
4.3.3.30.18					
4.3.3.30.19					
4.3.3.30.20					
4.3.3.30.21	✓				
4.3.3.30.24.1					
4.3.3.30.24.2					
4.3.3.30.24.3					
4.3.3.30.24.4					
4.3.3.30.24.5					
4.3.3.30.24.6					
4.3.3.30.24.7					
4.3.3.30.24.8					
4.3.3.30.24.9					
4.3.3.30.24.10					
4.3.3.30.24.11					
4.3.3.30.24.12					
4.3.3.30.24.13					
4.3.3.30.24.14					
4.3.3.30.24.15					
4.3.3.30.24.16	✓				
4.3.3.31.2.1	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 223 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.31.2.2				
4.3.3.31.2.3				
4.3.3.31.2.4				
4.3.3.31.2.5				
4.3.3.31.2.6				
4.3.3.31.2.7				
4.3.3.31.2.8				
4.3.3.31.2.9				
4.3.3.31.2.10				
4.3.3.31.2.11				
4.3.3.31.2.12				
4.3.3.31.2.13				
4.3.3.31.2.14				
4.3.3.31.2.15				
4.3.3.31.2.16	↓			
4.3.3.31.4.1				
4.3.3.31.4.2				
4.3.3.31.4.3				
4.3.3.31.4.4				
4.3.3.31.4.5				
4.3.3.31.4.6				
4.3.3.31.4.7				
4.3.3.31.4.8				
4.3.3.31.4.9				
4.3.3.31.4.10				
4.3.3.31.4.11				
4.3.3.31.4.12				
4.3.3.31.4.13				
4.3.3.31.4.14				
4.3.3.31.4.15				
4.3.3.31.4.16	↓			
4.3.3.31.6.1				
4.3.3.31.6.2				
4.3.3.31.6.3				
4.3.3.31.6.4				
4.3.3.31.6.5				
4.3.3.31.6.6				
4.3.3.31.6.7				
4.3.3.31.6.8				
4.3.3.31.6.9				
4.3.3.31.6.10				
4.3.3.31.6.11				
4.3.3.31.6.12				
4.3.3.31.6.13				
4.3.3.31.6.14				
4.3.3.31.6.15	↓	↓	↓	

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

224 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.31.6.16					
4.3.3.31.9					
4.3.3.31.10					
4.3.3.31.11					
4.3.3.31.12					
4.3.3.31.13					
4.3.3.31.14					
4.3.3.31.15					
4.3.3.31.16					
4.3.3.31.17					
4.3.3.31.18					
4.3.3.31.19					
4.3.3.31.20					
4.3.3.31.21					
4.3.3.31.22					
4.3.3.31.23					
4.3.3.31.24					
4.3.3.32.3.1					
4.3.3.32.3.2					
4.3.3.32.3.3					
4.3.3.32.3.4					
4.3.3.32.3.5					
4.3.3.32.3.6					
4.3.3.32.3.7					
4.3.3.32.3.8					
4.3.3.32.3.9					
4.3.3.32.3.10					
4.3.3.32.3.11					
4.3.3.32.3.12					
4.3.3.32.3.13					
4.3.3.32.3.14					
4.3.3.32.3.15					
4.3.3.32.3.16					
4.3.3.32.5.1					
4.3.3.32.5.2					
4.3.3.32.5.3					
4.3.3.32.5.4					
4.3.3.32.5.5					
4.3.3.32.5.6					
4.3.3.32.5.7					
4.3.3.32.5.8					
4.3.3.32.5.9					
4.3.3.32.5.10					
4.3.3.32.5.11					
4.3.3.32.5.12					
4.3.3.32.5.13					

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 225 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.32.5.14					
4.3.3.32.5.15					
4.3.3.32.5.16	✓				
4.3.3.32.8.1					
4.3.3.32.8.2					
4.3.3.32.8.3					
4.3.3.32.8.4					
4.3.3.32.8.5					
4.3.3.32.8.6					
4.3.3.32.8.7					
4.3.3.32.8.8					
4.3.3.32.8.9					
4.3.3.32.8.10					
4.3.3.32.8.11					
4.3.3.32.8.12					
4.3.3.32.8.13					
4.3.3.32.8.14					
4.3.3.32.8.15					
4.3.3.32.8.16	✓				
4.3.3.33.2					
4.3.3.33.3					
4.3.3.33.4					
4.3.3.33.5					
4.3.3.33.6					
4.3.3.33.7					
4.3.3.33.8					
4.3.3.33.9					
4.3.3.33.10					
4.3.3.33.11					
4.3.3.33.12					
4.3.3.33.13					
4.3.3.33.14					
4.3.3.33.15					
4.3.3.33.16					
4.3.3.33.17	✓				
4.3.3.33.19					
4.3.3.33.20					
4.3.3.33.21					
4.3.3.33.22					
4.3.3.33.23					
4.3.3.33.24					
4.3.3.33.25					
4.3.3.33.26					
4.3.3.33.27					
4.3.3.33.28					
4.3.3.33.29					

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 226 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.33.30				
4.3.3.33.31				
4.3.3.33.32				
4.3.3.33.33				
4.3.3.33.34				
4.3.3.33.35				
4.3.3.33.36				
4.3.3.33.38				
4.3.3.33.39				
4.3.3.33.40				
4.3.3.33.41				
4.3.3.33.42				
4.3.3.33.43				
4.3.3.33.44				
4.3.3.33.45				
4.3.3.33.46				
4.3.3.33.47				
4.3.3.33.48				
4.3.3.33.49				
4.3.3.33.50				
4.3.3.33.51				
4.3.3.33.52				
4.3.3.33.53				
4.3.3.33.55				
4.3.3.33.57				
4.3.3.33.58				
4.3.3.33.59				
4.3.3.33.60				
4.3.3.33.61				
4.3.3.33.62				
4.3.3.33.63				
4.3.3.33.64				
4.3.3.33.65				
4.3.3.33.66				
4.3.3.33.67				
4.3.3.33.68				
4.3.3.33.69				
4.3.3.33.70				
4.3.3.33.71				
4.3.3.33.72				
4.3.3.33.74				
4.3.3.33.75				
4.3.3.33.76				
4.3.3.33.77				
4.3.3.33.78				
4.3.3.33.79				

SYNOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 227 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.33.80				
4.3.3.33.81				
4.3.3.33.82				
4.3.3.33.83				
4.3.3.33.84				
4.3.3.33.85				
4.3.3.33.86				
4.3.3.33.87				
4.3.3.33.88				
4.3.3.33.89	↓			
4.3.3.33.90.1				
4.3.3.33.90.2				
4.3.3.33.90.3				
4.3.3.33.90.4				
4.3.3.33.90.5				
4.3.3.33.90.6				
4.3.3.33.90.7				
4.3.3.33.90.8				
4.3.3.33.90.9				
4.3.3.33.90.10				
4.3.3.33.90.11				
4.3.3.33.90.12				
4.3.3.33.90.13				
4.3.3.33.90.14				
4.3.3.33.90.15				
4.3.3.33.90.16	↓			
4.3.3.33.92				
4.3.3.33.93				
4.3.3.33.94				
4.3.3.33.95				
4.3.3.33.96				
4.3.3.33.97				
4.3.3.33.98				
4.3.3.33.99				
4.3.3.33.100				
4.3.3.33.101				
4.3.3.33.102				
4.3.3.33.103				
4.3.3.33.104				
4.3.3.33.105				
4.3.3.33.106				
4.3.3.33.107	↓			
4.3.3.33.110				
4.3.3.33.111				
4.3.3.33.112				
4.3.3.33.113	↓	↓	↓	↓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECON NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 228 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.33.114					
4.3.3.33.115					
4.3.3.33.116					
4.3.3.33.117					
4.3.3.33.118					
4.3.3.33.119					
4.3.3.33.120					
4.3.3.33.121					
4.3.3.33.122					
4.3.3.33.123					
4.3.3.33.124					
4.3.3.33.125	✓				
4.3.3.33.128					
4.3.3.33.129					
4.3.3.33.130					
4.3.3.33.131					
4.3.3.33.132					
4.3.3.33.133					
4.3.3.33.134					
4.3.3.33.135					
4.3.3.33.136					
4.3.3.33.137					
4.3.3.33.138					
4.3.3.33.139					
4.3.3.33.140					
4.3.3.33.141					
4.3.3.33.142					
4.3.3.33.143	✓				
4.3.3.33.145					
4.3.3.33.146					
4.3.3.33.147					
4.3.3.33.148					
4.3.3.33.149					
4.3.3.33.150					
4.3.3.33.151					
4.3.3.33.152					
4.3.3.33.153					
4.3.3.33.154					
4.3.3.33.155					
4.3.3.33.156					
4.3.3.33.157					
4.3.3.33.158					
4.3.3.33.159					
4.3.3.33.160	✓		✓		✓
4.3.3.33.162	✓				

SYNCOR RADIATION MANAGEMENT				DATE	10/23/02	TITLE	SOFTWARE VALIDATION TEST PROCEDURE, 9405603	
REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE		
1	3076	PRODUCTION		229 of 246	94095603VTP	PLN		

4.3.3.33.163					
4.3.3.33.164					
4.3.3.33.165					
4.3.3.33.166					
4.3.3.33.167					
4.3.3.33.168					
4.3.3.33.169					
4.3.3.33.170					
4.3.3.33.171					
4.3.3.33.172					
4.3.3.33.173					
4.3.3.33.174					
4.3.3.33.175					
4.3.3.33.176					
4.3.3.33.177					
4.3.3.33.178	↓				
4.3.3.33.181					
4.3.3.33.182					
4.3.3.33.183					
4.3.3.33.184					
4.3.3.33.185					
4.3.3.33.186					
4.3.3.33.187					
4.3.3.33.188					
4.3.3.33.189					
4.3.3.33.190					
4.3.3.33.191					
4.3.3.33.192					
4.3.3.33.193					
4.3.3.33.194					
4.3.3.33.195					
4.3.3.33.196					
4.3.3.33.197	↓				
4.3.3.34.2					
4.3.3.34.3					
4.3.3.34.5					
4.3.3.34.7					
4.3.3.34.7.2					
4.3.3.34.7.3					
4.3.3.34.7.4					
4.3.3.34.7.5					
4.3.3.34.7.6					
4.3.3.34.7.7					
4.3.3.34.7.8					
4.3.3.34.7.9	↓		↓		↓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

230 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.34.7.10				
4.3.3.34.7.11				
4.3.3.34.7.12				
4.3.3.34.7.13				
4.3.3.34.7.14				
4.3.3.34.7.15				
4.3.3.34.7.16				
4.3.3.34.7.17	✓			
4.3.3.34.9				
4.3.3.34.10				
4.3.3.34.12				
4.3.3.34.13.1				
4.3.3.34.13.2				
4.3.3.34.13.3				
4.3.3.34.13.4				
4.3.3.34.13.5				
4.3.3.34.13.6				
4.3.3.34.13.7				
4.3.3.34.13.8				
4.3.3.34.13.9				
4.3.3.34.13.10				
4.3.3.34.13.11				
4.3.3.34.13.12				
4.3.3.34.13.13				
4.3.3.34.13.14				
4.3.3.34.13.15				
4.3.3.34.13.16	✓			
4.3.3.34.15				
4.3.3.34.17				
4.3.3.34.18				
4.3.3.34.21				
4.3.3.34.22				
4.3.3.34.24				
4.3.3.34.26				
4.3.3.34.26.2				
4.3.3.34.26.3				
4.3.3.34.26.4				
4.3.3.34.26.5				
4.3.3.34.26.6				
4.3.3.34.26.7				
4.3.3.34.26.8				
4.3.3.34.26.9				
4.3.3.34.26.10				
4.3.3.34.26.11				
4.3.3.34.26.12				
4.3.3.34.26.13				
4.3.3.34.26.14	✓	✓	✓	✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

231 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.34.26.15					
4.3.3.34.26.16					
4.3.3.34.26.17	↓				
4.3.3.34.28					
4.3.3.34.29					
4.3.3.34.31.					
4.3.3.34.32.1					
4.3.3.34.32.2					
4.3.3.34.32.3					
4.3.3.34.32.4					
4.3.3.34.32.5					
4.3.3.34.32.6					
4.3.3.34.32.7					
4.3.3.34.32.8					
4.3.3.34.32.9					
4.3.3.34.32.10					
4.3.3.34.32.11					
4.3.3.34.32.12					
4.3.3.34.32.13					
4.3.3.34.32.14					
4.3.3.34.32.15					
4.3.3.34.32.16	↓				
4.3.3.34.34					
4.3.3.34.36					
4.3.3.34.37					
4.3.3.34.39.1					
4.3.3.34.39.2					
4.3.3.34.39.3					
4.3.3.34.39.4					
4.3.3.34.39.5					
4.3.3.34.39.6					
4.3.3.34.39.7					
4.3.3.34.39.8					
4.3.3.34.39.9					
4.3.3.34.39.10					
4.3.3.34.39.11					
4.3.3.34.39.12					
4.3.3.34.39.13					
4.3.3.34.39.14					
4.3.3.34.39.15					
4.3.3.34.39.16	↓				
4.3.3.34.41					
4.3.3.34.42					
4.3.3.34.44					
4.3.3.34.46					
4.3.3.34.46.2	↓		↓		↓

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 232 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.34.46.3					
4.3.3.34.46.4					
4.3.3.34.46.5					
4.3.3.34.46.6					
4.3.3.34.46.7					
4.3.3.34.46.8					
4.3.3.34.46.9					
4.3.3.34.46.10					
4.3.3.34.46.11					
4.3.3.34.46.12					
4.3.3.34.46.13					
4.3.3.34.46.14					
4.3.3.34.46.15					
4.3.3.34.46.16					
4.3.3.34.46.17	✓				
4.3.3.34.48					
4.3.3.34.49					
4.3.3.34.51					
4.3.3.34.53					
4.3.3.34.54.1					
4.3.3.34.54.3					
4.3.3.34.54.4					
4.3.3.34.54.5					
4.3.3.34.54.6					
4.3.3.34.54.7					
4.3.3.34.54.8					
4.3.3.34.54.9					
4.3.3.34.54.10					
4.3.3.34.54.11					
4.3.3.34.54.12					
4.3.3.34.54.13					
4.3.3.34.54.14					
4.3.3.34.54.15					
4.3.3.34.54.16					
4.3.3.34.54.17					
4.3.3.34.54.18	✓				
4.3.3.34.56					
4.3.3.34.57					
4.3.3.34.59					
4.3.3.34.61					
4.3.3.34.61.2					
4.3.3.34.61.3					
4.3.3.34.61.4					
4.3.3.34.61.5					
4.3.3.34.61.6	✓		✓		✓

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

233 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.34.61.7					
4.3.3.34.61.8					
4.3.3.34.61.9					
4.3.3.34.61.10					
4.3.3.34.61.11					
4.3.3.34.61.12					
4.3.3.34.61.13					
4.3.3.34.61.14					
4.3.3.34.61.15					
4.3.3.34.61.16					
4.3.3.34.61.17					
4.3.3.34.63					
4.3.3.34.66					
4.3.3.34.68					
4.3.3.34.70					
4.3.3.34.71.1					
4.3.3.34.71.2					
4.3.3.34.71.3					
4.3.3.34.71.4					
4.3.3.34.71.5					
4.3.3.34.71.6					
4.3.3.34.71.7					
4.3.3.34.71.8					
4.3.3.34.71.9					
4.3.3.34.71.10					
4.3.3.34.71.11					
4.3.3.34.71.12					
4.3.3.34.71.13					
4.3.3.34.71.14					
4.3.3.34.71.15					
4.3.3.34.71.16					
4.3.3.34.73					
4.3.3.34.76					
4.3.3.34.77					
4.3.3.34.79					
4.3.3.34.81					
4.3.3.34.81.2					
4.3.3.34.81.3					
4.3.3.34.81.4					
4.3.3.34.81.5					
4.3.3.34.81.6					
4.3.3.34.81.7					
4.3.3.34.81.8					
4.3.3.34.81.9					
4.3.3.34.81.10					

SYNOR RADIATION MANAGEMENT			DATE	10/23/02	TITLE	SOFTWARE VALIDATION TEST PROCEDURE, 9405603	
REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE	
1	3076	PRODUCTION		234 of 246	94095603VTP	PLN	

4.3.3.34.81.11				
4.3.3.34.81.12				
4.3.3.34.81.13				
4.3.3.34.81.14				
4.3.3.34.81.15				
4.3.3.34.81.16				
4.3.3.34.81.17				
4.3.3.34.85				
4.3.3.34.86				
4.3.3.34.87.1				
4.3.3.34.87.2				
4.3.3.34.87.3				
4.3.3.34.87.4				
4.3.3.34.87.5				
4.3.3.34.87.6				
4.3.3.34.87.7				
4.3.3.34.87.8				
4.3.3.34.87.9				
4.3.3.34.87.10				
4.3.3.34.87.11				
4.3.3.34.87.12				
4.3.3.34.87.13				
4.3.3.34.87.14				
4.3.3.34.87.15				
4.3.3.34.87.16				
4.3.3.34.89				
4.3.3.34.92				
4.3.3.34.93				
4.3.3.34.95				
4.3.3.34.97				
4.3.3.34.97.2				
4.3.3.34.97.3				
4.3.3.34.97.4				
4.3.3.34.97.5				
4.3.3.34.97.6				
4.3.3.34.97.7				
4.3.3.34.97.8				
4.3.3.34.97.9				
4.3.3.34.97.10				
4.3.3.34.97.11				
4.3.3.34.97.12				
4.3.3.34.97.13				
4.3.3.34.97.14				
4.3.3.34.97.15				
4.3.3.34.97.16				
4.3.3.34.97.17				

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

235 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.34.99	↓				
4.3.3.34.102	↓				
4.3.3.34.103	↓				
4.3.3.34.105	↓				
4.3.3.34.108	↓				
4.3.3.34.108.2	↓				
4.3.3.34.108.3	↓				
4.3.3.34.108.4	↓				
4.3.3.34.108.5	↓				
4.3.3.34.108.6	↓				
4.3.3.34.108.7	↓				
4.3.3.34.108.8	↓				
4.3.3.34.108.9	↓				
4.3.3.34.108.10	↓				
4.3.3.34.108.11	↓				
4.3.3.34.108.12	↓				
4.3.3.34.108.13	↓				
4.3.3.34.108.14	↓				
4.3.3.34.108.15	↓				
4.3.3.34.108.16	↓				
4.3.3.34.108.17	↓				
4.3.3.34.109.1	↓				
4.3.3.34.109.2	↓				
4.3.3.34.109.3	↓				
4.3.3.34.109.4	↓				
4.3.3.34.109.5	↓				
4.3.3.34.109.6	↓				
4.3.3.34.109.7	↓				
4.3.3.34.109.8	↓				
4.3.3.34.109.9	↓				
4.3.3.34.109.10	↓				
4.3.3.34.109.11	↓				
4.3.3.34.109.12	↓				
4.3.3.34.109.13	↓				
4.3.3.34.109.14	↓				
4.3.3.34.109.15	↓				
4.3.3.34.109.16	↓				
4.3.3.34.112	↓				
4.3.3.34.113	↓				
4.3.3.34.115	↓				
4.3.3.34.117	↓				
4.3.3.34.117.2	↓				
4.3.3.34.117.3	↓				
4.3.3.34.117.4	↓				
4.3.3.34.117.5	↓		↓		↓

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 236 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.34.117.6					
4.3.3.34.117.7					
4.3.3.34.117.8					
4.3.3.34.117.9					
4.3.3.34.117.10					
4.3.3.34.117.11					
4.3.3.34.117.12					
4.3.3.34.117.13					
4.3.3.34.117.14					
4.3.3.34.117.15					
4.3.3.34.117.16					
4.3.3.34.117.17					
4.3.3.34.117.18					
4.3.3.34.119					
4.3.3.34.120					
4.3.3.34.122					
4.3.3.35.3					
4.3.3.35.4					
4.3.3.35.9					
4.3.3.35.10					
4.3.3.36.6					
4.3.3.36.7					
4.3.3.36.8					
4.3.3.36.9					
4.3.3.36.10					
4.3.3.36.11					
4.3.3.36.12					
4.3.3.36.13					
4.3.3.36.14					
4.3.3.36.15					
4.3.3.36.16					
4.3.3.36.17					
4.3.3.36.18					
4.3.3.36.19					
4.3.3.37.5.1					
4.3.3.37.5.2					
4.3.3.37.5.3					
4.3.3.37.5.4					
4.3.3.37.5.5					
4.3.3.37.5.6					
4.3.3.37.5.7					
4.3.3.37.5.8					
4.3.3.37.5.9					
4.3.3.37.5.10					
4.3.3.37.5.11					

SYNCOR RADIATION MANAGEMENT

DATE 10/23/02

TITLE SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV 1	ECN NO. 3076	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 237 of 246	NO. 94095603VTP	SIZE PLN
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4.3.3.37.5.12				
4.3.3.37.5.13				
4.3.3.37.5.14				
4.3.3.37.5.15				
4.3.3.37.5.16				
4.3.3.37.7.1				
4.3.3.37.7.2				
4.3.3.37.7.3				
4.3.3.37.7.4				
4.3.3.37.7.5				
4.3.3.37.7.6				
4.3.3.37.7.7				
4.3.3.37.7.8				
4.3.3.37.7.9				
4.3.3.37.7.10				
4.3.3.37.7.11				
4.3.3.37.7.12				
4.3.3.37.7.13				
4.3.3.37.7.14				
4.3.3.37.7.15				
4.3.3.37.7.16				
4.3.3.37.9.1				
4.3.3.37.9.2				
4.3.3.37.9.3				
4.3.3.37.9.4				
4.3.3.37.9.5				
4.3.3.37.9.6				
4.3.3.37.9.7				
4.3.3.37.9.8				
4.3.3.37.9.9				
4.3.3.37.9.10				
4.3.3.37.9.11				
4.3.3.37.9.12				
4.3.3.37.9.13				
4.3.3.37.9.14				
4.3.3.37.9.15				
4.3.3.37.9.16				
4.3.3.38.7.1				
4.3.3.38.7.2				
4.3.3.38.7.3				
4.3.3.38.7.4				
4.3.3.38.7.5				
4.3.3.38.7.6				
4.3.3.38.7.7				
4.3.3.38.7.8				

SYNCOR RADIATION MANAGEMENT

DATE
10/23/02

TITLE
SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV	ECN NO.	RELEASED FOR	DOC CTRL	SHEET	NO.	SIZE
1	3076	PRODUCTION		238 of 246	94095603VTP	PLN

4.3.3.38.7.9					
4.3.3.38.7.10					
4.3.3.38.7.11					
4.3.3.38.7.12					
4.3.3.38.7.13					
4.3.3.38.7.14					
4.3.3.38.7.15					
4.3.3.38.7.16					
4.3.3.38.11.1					
4.3.3.38.11.2					
4.3.3.38.11.3					
4.3.3.38.11.4					
4.3.3.38.11.5					
4.3.3.38.11.6					
4.3.3.38.11.7					
4.3.3.38.11.8					
4.3.3.38.11.9					
4.3.3.38.11.10					
4.3.3.38.11.11					
4.3.3.38.11.12					
4.3.3.38.11.13					
4.3.3.38.11.14					
4.3.3.38.11.15					
4.3.3.38.11.16					
4.3.3.38.13					
4.3.3.38.14					
4.3.3.38.15					
4.3.3.38.16					
4.3.3.38.17					
4.3.3.38.18					
4.3.3.38.19					
4.3.3.38.20					
4.3.3.38.21					
4.3.3.38.22					
4.3.3.38.23					
4.3.3.38.24					
4.3.3.38.25					
4.3.3.38.26					
4.3.3.38.27					
4.3.3.38.28					
4.3.3.38.31.1					
4.3.3.38.31.2					
4.3.3.38.31.3					
4.3.3.38.31.4					
4.3.3.38.31.5					

SYNCOR RADIATION MANAGEMENT

DATE

10/23/02

TITLE

SOFTWARE VALIDATION TEST
PROCEDURE, 9405603

REV

1

ECN NO.

3076

RELEASED FOR

PRODUCTION

DOC CTRL

SHEET

239 of 246

NO.

94095603VTP

SIZE

PLN

4.3.3.38.31.6					
4.3.3.38.31.7					
4.3.3.38.31.8					
4.3.3.38.31.9					
4.3.3.38.31.10					
4.3.3.38.31.11					
4.3.3.38.31.12					
4.3.3.38.31.13					
4.3.3.38.31.14					
4.3.3.38.31.15					
4.3.3.38.31.16					
4.3.3.39.7.1					
4.3.3.39.7.2					
4.3.3.39.7.3					
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4.3.3.39.7.5					
4.3.3.39.7.6					
4.3.3.39.7.7					
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4.3.3.39.7.16					
4.3.3.39.9.1					
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4.3.3.39.9.9					
4.3.3.39.9.10					
4.3.3.39.9.11					
4.3.3.39.9.12					
4.3.3.39.9.13					
4.3.3.39.9.14					
4.3.3.39.9.15					
4.3.3.39.9.16					
4.3.3.39.12.1					
4.3.3.39.12.2					

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4.3.3.39.12.3					
4.3.3.39.12.4					
4.3.3.39.12.5					
4.3.3.39.12.6					
4.3.3.39.12.7					
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4.3.3.39.12.9					
4.3.3.39.12.10					
4.3.3.39.12.11					
4.3.3.39.12.12					
4.3.3.39.12.13					
4.3.3.39.12.14					
4.3.3.39.12.15					
4.3.3.39.12.16					
4.3.3.40.8.1					
4.3.3.40.8.2					
4.3.3.40.8.3					
4.3.3.40.8.4					
4.3.3.40.8.5					
4.3.3.40.8.6					
4.3.3.40.8.7					
4.3.3.40.8.8					
4.3.3.40.8.9					
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4.3.3.40.10.13					
4.3.3.40.10.14					
4.3.3.40.10.15					

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4.3.3.40.22					
4.3.3.40.23					
4.3.3.40.24					
4.3.3.40.25					
4.3.3.40.26					
4.3.3.40.27					
4.3.3.40.28					
4.3.3.40.29					
4.3.3.41.3.1					
4.3.3.41.3.2					
4.3.3.41.3.3					
4.3.3.41.3.4					
4.3.3.41.3.5					
4.3.3.41.3.6					
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4.3.3.41.3.8					
4.3.3.41.3.9					
4.3.3.41.3.10					
4.3.3.41.3.11					
4.3.3.41.3.12					
4.3.3.41.3.13					

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4.3.3.41.3.14					
4.3.3.41.3.15					
4.3.3.41.3.16	✓				
4.3.3.42.4.1					
4.3.3.42.4.2					
4.3.3.42.4.3					
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4.3.3.42.4.5					
4.3.3.42.4.6					
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4.3.3.42.4.9					
4.3.3.42.4.10					
4.3.3.42.4.11					
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4.3.3.42.4.14					
4.3.3.42.4.15					
4.3.3.42.4.16	✓				
4.3.3.43.3					
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4.3.3.43.6					
4.3.3.43.7.1					
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4.3.3.43.10.6					
4.3.3.43.10.7					
4.3.3.43.10.8					

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7 Test Incident Report – Reference 94095603VTP

7.1 Test Incident Report Identifier: 94095603VTP-AN001

7.2 Summary: After the Warn alarm was tripped and acknowledged, the input frequency was reduced by 2 Hz, just below the trip point. Instead of remaining in the cleared condition, the Warn alarm turned back on, Flashing, indicating a new alarm condition had occurred. The anomaly occurred within the first minute after the frequency was changed. The unit operated normally thereafter.

7.3 Incident Description:

7.3.1 Inputs: Singal Generator, frequency 15.0 Hz

7.3.2 Expected results: Warn alarm led off; Warn relay energized

7.3.3 Anomalies: Warn alarm led turned on; Warn relay de-energized. After the incident (1 second later) the display continued to show the correct radiation value.

7.3.4 Date and time: 10/29/02; 09:30 AM

7.3.5 Procedure step: 4.3.3.9.2.20

7.3.6 Environments: Warn acknowledge and return to normal test, with a frequency change 2 Hz below the trip point and the unit updating once per second.

7.3.7 Attempts to repeat: Approximately 15 attempts; Anomaly was repeatable to the extent that an upscale indication would occur within one minute after the signal generator frequency change, but the value, and the number of seconds after the frequency change would vary from 20 to 50 seconds; The test equipment available could not identify the root cause of the anomaly.

7.3.8 Testers: R. Horvath

7.3.9 Observers: A. Lasko

7.4 Impact: The change in frequency is equivalent to a 0.12 mR/h change, and would result in a false alarm reported by the unit. In normal operation, however, the anomaly would be masked by the continually changing detector output. The anomaly has not been observed in Lab calibrations, and was observed only when a fixed, low frequency input is applied to the unit.

7.5 Resolution: By repeating the test step, it was shown that one incorrect value was reported and displayed while the unit was performing its once per second updates. After the first minute of operation, the unit operated flawlessly. It was noted that a fixed, low frequency, input signal is not a normal mode of operation for the unit. Normally, the G-M tube detector will be providing output pulses that continually vary, due to the statistical nature of radioactive isotope decay. In addition, the anomaly has not been observed in our factory calibrations, and may be considered to be within the accuracy specifications for the device. For this reason, we do not believe the anomaly will negatively affect the performance of the device in actual operation, and will not invalidate the testing performed.

Further testing, beyond the scope of this project, will be required to identify the root cause of the anomaly.

SOFTWARE REQUIREMENTS TRACEABILITY MATRIX

FOR

PROM P/N 94095603

G-M AREA MONITOR

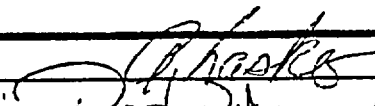
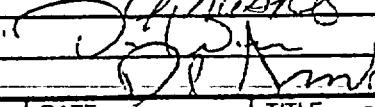
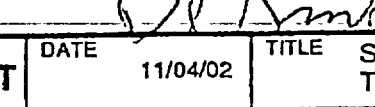
REV. LEVEL	ECN #	DESCRIPTION/PAGES AFFECTED				
ENGINEERING					DATE 11-4-02	
MANUFACTURING					DATE 11-4-02	
QUALITY ASSURANCE					DATE 11-7-02	
SYNCRAD RADIATION MANAGEMENT		DATE 11/04/02	TITLE SOFTWARE REQUIREMENTS TRACEABILITY MATRIX, 94095603			
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1 PURPOSE

The purpose of this document is to verify the functional requirements of the Software Requirements Specification have been implemented in the Software Design Description and the Software Test Plan. The requirements will be verified by the preparation of a matrix that correlates the requirements with the applicable design document.

2 REFERENCE DOCUMENTS

The reference standards used for guiding the preparation of this document are listed below:

- 2.1 IEEE Std 7-4.3.2-1993, Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations
- 2.2 IEEE Std 1012-1996, Standard for Software Verification and Validation Plans
- 2.3 EPRI Std TR-103291-CD Handbook for Verification and Validation of Digital Systems (12/1998)
- 2.4 Syncor Radiation Management Quality Assurance Manual, QSP-100, Version 004, Rev. 1/2/02, Implemented 3/14/02
- 2.5 Syncor Radiation Management Quality Procedure QSP-205, Document Control
- 2.6 Syncor Radiation Management Quality Procedure QSP-05-05, Engineering Change Notice

3 DEFINITIONS

3.1 Definitions

3.1.1 Acceptance testing – Formal testing conducted to determine whether or not the system satisfies its acceptance criteria and to enable the customer to determine whether or not to accept the system.

3.1.2 Anomaly – Anything observed in operation of the UDR that deviates from expectations based on previously verified software/firmware products or reference documents.

3.1.3 Fail Safe – A condition for a relay where in normal operation the relay is energized.

3.1.4 Firmware – The combination of software and data that reside in read-only memory

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3.1.5 Software – Computer programs and data pertaining to the operation of a computer system.

3.1.6 Traceability – The degree to which a relationship is established between two or more products of the development process, especially product having a predecessor-successor or master-subordinate relationship to one another; for example the degree to which the requirements and design of a given software component match.

3.1.7 Verification – The process of determining whether or not the products of a given phase of the software/firmware development cycle fulfill the requirements established during the previous phase.

3.2 Abbreviations

BTU/hr – British Thermal Units per hour

E000X – Error code identifier (X = an integer, 0 through 9)

EEEEEE – Error code identifying an overrange condition

JP – Jumper and jumper position identifier

F - Degrees Farenheit

kR/h – kiloRoentegens per hour

mR/h – milliRoentegens per hour

3.3 Acronyms & Notations

DPDT – Double pole double throw

ECN - Engineering Change Notice

EPROM – Erasable Programmable Read Only Memory

IEEE – Institute of Electrical and Electronics Engineers

QA – Quality Assurance

R/h – Roentegens per hour

RMS – Radiation Monitoring System

RTM – Requirements Traceability Matrix

SDD – Software Design Description

SPDT – Single pole double throw

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SRM – SYNCOR Radiation Management
 SRS – Software Requirements Specification
 UDR – Universal Digital Ratemeter
 VVTP – Verification and Validation Test Plan
 VVTR – Verification and Validation Test Report
 V&V - Verification and Validation

4 Overview

The Requirements Traceability Matrix below was prepared from a review of the following documents:

94095603SRS, Rev. 1 - Software Requirements Specification

94095603SDD, Rev. 1 – Software Design Description

94095603VVTP, Rev. 1 – Software Verification and Validation Test Procedure

Revisions to these documents will require a review to determine if a revision to the matrix is required.

4.1 Requirements Matrix

No.	Requirement Description:	Type of Requirement:	94095603SRS Paragraph:	94095603SDD Paragraph:	94095603SDD Paragraph:	Test Procedure:
1	Seven segment display	Hardware	3.1.1.1.1	4.2.17	N/A	4.3.3.2.4.1
2	Backlights	Hardware	3.1.1.1.2	4.2.34	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.2.4.2
3	Status indicators	Hardware	3.1.1.1.3	4.2.18	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.2.4.3
4	Bargraph	Hardware	3.1.1.1.4	4.2.13	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.2.4.4
5	Check Source Pushbutton	Hardware	3.1.1.1.5.1	3.1.3.1 4.2.28	6.2.1, 6.2.21, 6.2.24	4.3.3.2.4.5

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6	Alarm Acknowledge Pushbutton	Hardware	3.1.1.1.5.2	3.1.2.5.3, 3.1.2.6.3, 4.2.28	6.2.1, 6.2.21, 6.2.24	4.3.3.2.4.6
7	HIGH alarm set point display Pushbutton	Hardware	3.1.1.1.5.3	4.2.28	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.2.4.7
8	WARN alarm set point display Pushbutton	Hardware	3.1.1.1.5.4	4.2.28	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.2.4.8
9	Data entry switch	Hardware	3.1.1.2	4.3	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.2.4.9
10	Digit Data Entry pushbutton	Hardware	3.1.1.3.1	4.2.19	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.2.4.10
11	Value Data Entry pushbutton	Hardware	3.1.1.3.2	4.2.19	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.2.4.11
12	Enter Data Entry pushbutton	Hardware	3.1.1.3.3	4.3	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.2.4.12
13	Calibration Mode entered manually	Operation	3.1.1.4	3.1.4, 3.1.4.1	6.2.4, 6.2.21	4.3.3.33
14	Calibration Mode restarted by pressing enter	Operation	3.1.1.5	3.1.4.9	6.2.4, 6.2.21	4.3.3.33.37
15	System will display calibration time when calibration mode is re-entered.	Operation	3.1.1.5.1	3.1.4.2, 3.1.4.11.1	6.2.4, 6.2.21	4.3.3.33.38
16	Calibration in process stopped by pressing enter key.	Operation	3.1.1.6	3.1.4.10.2	6.2.4, 6.2.21	4.3.3.33.56

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17	Calibration in process stopped by moving rotary switch to position other than 8.	Operation	3.1.1.7	3.1.4.10.3, 3.1.4.12, 3.1.4.14.7	6.2.4, 6.2.21	4.3.3.33.73
18	Power on/off button	Hardware Interface	3.1.2.1	4.2.34	N/A	4.3.3.1.1
19	Provide 1 analog output of 0 – 10 Vdc	Hardware Interface	3.1.2.2	4.2.21	N/A	4.3.3.1.2
20	Provide 2 analog outputs of 4 – 20 mA	Hardware Interface	3.1.2.3	4.2.21	N/A	4.3.3.1.3
21	Monitor shall have one SPDT high alarm output	Hardware Interface	3.1.2.4	4.2.33	N/A	4.3.3.1.4
22	Monitor shall have one DPDT warning output	Hardware Interface	3.1.2.5	4.2.33	N/A	4.3.3.1.5
23	Monitor shall have one DPDT fail output	Hardware Interface	3.1.2.6	4.2.12, 4.2.33	N/A	4.3.3.1.6
24	Message queues (Option)	Software Interface	3.1.3.1	3.1.1.1.5.1	6.2.6, 6.2.8, 6.2.9, 6.2.11, 6.2.17, 6.2.24	1.5.1, 1.5.2, 1.5.3
25	Interrupts	Software Interface	3.1.3.2	3.1.1.1.5.2, 3.1.1.1.5.5.12, 4.2.2, 4.2.3, 4.2.4	6.2.6, 6.2.8, 6.2.9, 6.2.15, 6.2.18, 6.2.20, 6.2.21, 6.2.22, 6.2.24	4.3.3.5.1.2, 4.3.3.8.2, 4.3.3.9.1.1.1, 4.3.3.9.2.1, 4.3.3.9.2.20
26	RS-232 (optional)	Communications Interface	3.1.4.1	4.2.23, 4.2.36	6.2.8, 6.2.10, 6.2.11, 6.2.17, 6.2.19, 6.2.21, 6.2.23, 6.2.24	1.5.1, 4.3.3.1.7

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27	VICO loop (optional)	Communications Interface	3.1.4.2	4.2.23, 4.2.36	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	1.5.3, 4.3.3.1.8
28	RS-485 (optional)	Communications Interface	3.1.4.3	4.2.23, 4.2.36	6.2.9, 6.2.20, 6.2.24	1.5.2, 4.3.3.1.9
29	To inform the user as to the presence and level of radiation within the monitored equipment or area.	System Feature	3.2.1.1	3.1.1.1.5.5.2, 3.1.1.1.5.5.4, 3.1.1.1.5.5.7	6.1.1.14, 6.2.6, 6.2.7, 6.2.14, 6.2.15, 6.2.17, 6.2.19, 6.2.21, 6.2.24	4.3.3.4
30	The radiation value is displayed as a three digit number	System Feature	3.2.1.2.1.1	3.1.1.1.5.5.4	6.1.1.10, 6.2.14, 6.2.17, 6.2.19, 6.2.21, 6.2.23, 6.2.24	4.3.3.4.14
31	Backlit insert will display engineering units in mR/h, R/h, or kR/h	System Feature	3.2.1.2.1.2	4.2.34	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.33.19
32	The bar graph will display the value on the fixed mR/h scale	System Feature	3.2.1.2.1.3	3.1.5.1.5, 3.1.2.7.1.2	6.1.1.10, 6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.2.4.4
33	Any indicator lights that are on will be green in normal mode	System Feature	3.2.1.2.1.4	3.1.1.1.1.5	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.4.12
34	Analog outputs will track the displayed value.	System Feature	3.2.1.2.1.5	3.1.1.1.5.5.8, 3.1.5.1.6	6.2.2, 6.2.21, 6.2.24	4.3.3.4.15, 4.3.3.4.16, 4.3.3.4.17
35	Alarm outputs will be active in normal mode.	System Feature	3.2.1.2.1.6	3.1.1.1.4, 3.1.2.5.3.2.1	6.2.1, 6.2.21, 6.2.24	4.3.3.4.4, 4.3.3.4.5, 4.3.3.4.7, 4.3.3.4.9
36	The Warn relay will operate in Fail Safe Mode.	System Feature	3.2.1.2.1.7	3.1.1.1.4, 3.1.2.2.1	6.2.1, 6.2.21, 6.2.24	4.3.3.4.7, 4.3.3.9.2.1.6

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3090

RELEASED FOR
PRODUCTION

DOC CTRL

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37	The High relay will operate in Fail Safe Mode.	System Feature	3.2.1.2.1.8	3.1.2.2.1, 3.1.2.6.4.1	6.1.1.9	4.3.3.4.4, 4.3.3.11.3.3
38	The Fail relay will operate in Fail Safe Mode.	System Feature	3.2.1.2.1.9	3.1.2.1.1	6.1.1.9	4.3.3.4.9, 4.3.3.5.1.2.8
39	When no counts are received the fail outputs will be activated.(de-energized)	System Feature	3.2.1.3.1.1.1.1	3.1.2.1, 3.1.2.1.1, 4.2.29	6.2.1, 6.2.21, 6.2.24	4.3.3.5
40	When loss of power occurs, the fail outputs will be activated	System Feature	3.2.1.3.1.1.1.2	3.1.2.2, 3.1.2.2.1, 4.2.12	N/A	4.3.3.6
41	When there is a hardware failure, the fail outputs will be activated (de-energized).	System Feature	3.2.1.3.1.1.1.3	3.1.2.3.1, 3.1.2.3.2, 4.2.1, 4.2.12	6.2.6, 6.2.15, 6.2.21, 6.2.24	4.3.3.7
42	When detector anti-Jam occurs, the fail outputs will be activated (de-energized).	System Feature	3.2.1.3.1.1.1.4	3.1.2.4.1, 3.1.2.4.2, 4.2.31	6.2.1, 6.2.21, 6.2.24	4.3.3.8
43	Warn alarm condition is true when the display dose rate is greater than or equal to the WARN alarm set point.	System Feature	3.2.1.3.2.1.1.1	3.1.2, 3.1.2.5, 3.1.2.5.2, 3.1.2.5.2.1, 3.1.2.5.2.3	6.2.1, 6.2.21, 6.2.24	4.3.3.9, 4.3.3.10, 4.3.3.40.10.5
44	Warn alarm logic is fail-safe	System Feature	3.2.1.3.2.1.1.2	3.1.2.2.1, 3.1.2.5.3.2.1	6.2.1, 6.2.21, 6.2.24	4.3.3.4.7, 4.3.3.9.2.1.6
45	Warn alarm is manual reset	System Feature	3.2.1.3.2.1.1.3	3.1.2.5.3	6.2.1, 6.2.21, 6.2.24	4.3.3.9, 4.3.3.10

SYNCOR RADIATION MANAGEMENT

11/04/02

TITLE

SOFTWARE REQUIREMENTS
TRACEABILITY MATRIX, 94095603

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46	When warn alarm is tripped, amber WARN alarm indicator begins flashing.	System Feature	3.2.1.3.2.1.1.4.1	3.1.2.5.2.1	6.2.1, 6.2.21, 6.2.24	4.3.3.9.2.1.5 4.3.3.10.1.1.5
47	When warn alarm is tripped, bar graph goes to amber	System Feature	3.2.1.3.2.1.1.4.2	3.1.2.5.2.2	6.2.1, 6.2.21, 6.2.24	4.3.3.9.2.1.10 4.3.3.10.1.1.10
48	When warn alarm is tripped, WARN alarm relay coil is de-energized.	System Feature	3.2.1.3.2.1.1.4.3	3.1.2.5.2.3	6.2.1, 6.2.21, 6.2.24	4.3.3.9.2.8, 4.3.3.10.1.1.6
49	When warn alarm is acknowledged, WARN alarm indicator will be on steady.	System Feature	3.2.1.3.2.1.1.5.1	3.1.2.5.3.1	6.2.1, 6.2.21, 6.2.24	4.3.3.9.2.7
50	When warn alarm is acknowledged, relay will change state when the radiation value drops below the set point.	System Feature	3.2.1.3.2.1.1.5.2	3.1.2.5.3.2, 3.1.2.5.3.2.1, 3.1.2.5.3.2.2, 3.1.2.5.3.2.3	6.2.1, 6.2.21, 6.2.24	4.3.3.9.2.20.6
51	WARN alarm is normally inhibited in Check Source Mode.	System Feature	3.2.1.3.2.1.1.6	3.1.2.5.1, 3.1.3.1.4	6.2.1, 6.2.21, 6.2.24	4.3.3.32.3.5, 4.3.3.32.3.6
52	HIGH alarm condition is true when the display dose rate is greater than or equal to the HIGH alarm set point.	System Feature	3.2.1.3.2.1.2.1	3.1.2, 3.1.2.6, 3.1.2.6.2	6.2.1, 6.2.21, 6.2.24	4.3.3.11.3.2, 4.3.3.12.4.2, 4.3.3.13.4.2, 4.3.3.14.2.2, 4.3.3.15.2.2, 4.3.3.16.21.2, 4.3.3.17.4.2, 4.3.3.18.4.2, 4.3.3.19.4.2, 4.3.3.20.2.2, 4.3.3.21.2.2, 4.3.3.22.2.2, 4.3.3.40.10.2
53	High alarm	System Feature	3.2.1.3.2.1.2.2	3.1.2.6.2.3,	6.2.1,	4.3.3.4.4,

logic is fail safe	DATE	11/04/02	TITLE	SOFTWARE REQUIREMENTS TRACEABILITY MATRIX, 94095603
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REV 1	ECN NO. 3090	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 10 of 24	NO. 94095603RTM	SIZE
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54	High alarm is manual reset.	System Feature	3.2.1.3.2.1.2.3	3.1.2.6.3	6.2.1, 6.2.21, 6.2.24	4.3.3.11, 4.3.3.12, 4.3.3.13, 4.3.3.14, 4.3.3.15, 4.3.3.16, 4.3.3.17, 4.3.3.18, 4.3.3.19, 4.3.3.20, 4.3.3.21, 4.3.3.22
55	When HIGH alarm is tripped, red high alarm indicator flashes.	System Feature	3.2.1.3.2.1.2.4.1	3.1.2.6.2.1	6.2.1, 6.2.21, 6.2.24	4.3.3.11.3.2, 4.3.3.12.4.2, 4.3.3.13.4.2, 4.3.3.14.2.2, 4.3.3.15.2.2, 4.3.3.16.21.2, 4.3.3.17.4.2, 4.3.3.18.4.2, 4.3.3.19.4.2, 4.3.3.20.2.2, 4.3.3.21.2.2, 4.3.3.22.2.2
56	When HIGH alarm is tripped, the bar graph turns red.	System Feature	3.2.1.3.2.1.2.4.2	3.1.2.6.2.2	6.2.1, 6.2.21, 6.2.24	4.3.3.11.3.10, 4.3.3.12.4.10, 4.3.3.13.4.10, 4.3.3.14.2.10, 4.3.3.15.2.10, 4.3.3.16.21.10, 4.3.3.17.4.10, 4.3.3.18.4.10, 4.3.3.19.4.10, 4.3.3.20.2.10, 4.3.3.21.2.10, 4.3.3.22.2.10
57	When HIGH alarm is tripped, the high relay coil de-energizes.	System Feature	3.2.1.3.2.1.2.4.3	3.1.2.6.2.3	6.2.1, 6.2.21, 6.2.24	4.3.3.11.3.3, 4.3.3.12.4.3, 4.3.3.13.4.3, 4.3.3.14.2.3, 4.3.3.15.2.3, 4.3.3.16.21.3, 4.3.3.17.4.3, 4.3.3.18.4.3, 4.3.3.19.4.3, 4.3.3.20.2.3, 4.3.3.21.2.3, 4.3.3.22.2.3

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DATE 11/04/02

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SOFTWARE REQUIREMENTS
TRACEABILITY MATRIX, 94095603

REV 1	ECN NO. 3090	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 11 of 24	NO. 94095603RTM	SIZE
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58	When HIGH alarm is tripped, the UDR sets its auxiliary output high. (Auxiliary relay coil is de-energized)	System Feature	3.2.1.3.2.1.2.4.4	3.1.2.6.2.4	6.2.1, 6.2.21, 6.2.24	4.3.3.11.3.4, 4.3.3.12.4.4, 4.3.3.13.4.4, 4.3.3.14.2.4, 4.3.3.15.2.4, 4.3.3.16.21.4, 4.3.3.17.4.4, 4.3.3.18.4.4, 4.3.3.19.4.4, 4.3.3.20.2.4, 4.3.3.21.2.4, 4.3.3.22.2.4
59	When HIGH alarm is acknowledged, the HIGH alarm indicator goes steady on.	System Feature	3.2.1.3.2.1.2.5.1	3.1.2.6.3, 3.1.2.6.3.1	6.2.1, 6.2.21, 6.2.24	4.3.3.11.3.19, 4.3.3.12.4.19, 4.3.3.14.2.19, 4.3.3.16.21.19, 4.3.3.17.4.19, 4.3.3.20.5
60	When HIGH alarm is acknowledged, the UDR sets its auxiliary output low.	System Feature	3.2.1.3.2.1.2.5.2	3.1.2.6.3.2	6.2.1, 6.2.21, 6.2.24	4.3.3.11.3.21, 4.3.3.12.4.21, 4.3.3.14.2.21, 4.3.3.16.21.21, 4.3.3.17.4.21, 4.3.3.20.7
61	When HIGH alarm is acknowledged, the HIGH alarm relay will change state when the radiation value drops below HIGH alarm set point.	System Feature	3.2.1.3.2.1.2.5.3	3.1.2.6.4, 3.1.2.6.4.1, 3.1.2.6.4.2, 3.1.2.6.4.3	6.2.1, 6.2.21, 6.2.24	4.3.3.11.5.3, 4.3.3.12.6.3, 4.3.3.14.4.3, 4.3.3.16.23.3, 4.3.3.17.6.3, 4.3.3.19.12, 4.3.3.20.21.3
62	The HIGH alarm is normally inhibited in Check Source Mode.	System Feature	3.2.1.3.2.1.2.6	3.1.2.6.1, 3.1.3.1.4	6.2.1, 6.2.21, 6.2.24	4.3.3.32.5.2, 4.3.3.32.5.3, 4.3.3.32.5.4
63	When measured radiation is below under-range set point, the front panel display will indicate 0.00 mR/h.	System Feature	3.2.1.3.2.1.3.1.1	3.1.2, 3.1.2.7, 3.1.2.7.1, 3.1.2.7.1.1	6.2.1, 6.2.21, 6.2.24	4.3.3.23.2.13

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TRACEABILITY MATRIX, 94095603

REV 1	ECN NO. 3090	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 12 of 24	NO. 94095603RTM	SIZE
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64	When measured radiation is below under-range set point, the bar graph will indicate the actual radiation value.	System Feature	3.2.1.3.2.1.3.1.2	3.1.2, 3.1.2.7.1.2	6.2.1, 6.2.21, 6.2.24	4.3.3.23.2.11
65	When measured radiation is below under-range set point, the RANGE alarm indicator will illuminate in red.	System Feature	3.2.1.3.2.1.3.1.3	3.1.2, 3.1.2.7.1.3	6.2.1, 6.2.21, 6.2.24	4.3.3.23.2.9
66	When measured radiation is below under-range, the analog outputs are set to 0.00	System Feature	3.2.1.3.2.1.3.1.4	3.1.2, 3.1.2.7.1.1	6.2.1, 6.2.2, 6.2.21, 6.2.24	4.3.3.23.2.14, 4.3.3.23.2.15, 4.3.3.23.2.16
67	When measured radiation increases into the range of the detector, the RANGE alarm indicator will extinguish.	System Feature	3.2.1.3.2.1.3.2.1	3.1.2.7.1.3.1 3.1.2.7.1.3.2	6.2.1, 6.2.21, 6.2.24	4.3.3.23.4.9
68	When measured radiation increases into the range of the detector, normal mode will begin.	System Feature	3.2.1.3.2.1.3.2.2	3.1.2.7.1.3.2	6.2.1, 6.2.21, 6.2.24	4.3.3.23.4.1, 4.3.3.23.4.2, 4.3.3.23.4.4, 4.3.3.23.4.5, 4.3.3.23.4.6, 4.3.3.23.4.7, 4.3.3.23.4.8, 4.3.3.23.4.9, 4.3.3.23.4.10, 4.3.3.23.4.11, 4.3.3.23.4.12, 4.3.3.23.4.13, 4.3.3.23.4.14, 4.3.3.23.4.15, 4.3.3.23.4.16

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69	When measured radiation is above over-range set point, the WARN alarm is true.	System Feature	3.2.1.3.2.1.3.3.1	3.1.2, 3.1.2.7.2, 3.1.2.7.2.1	6.2.1, 6.2.21, 6.2.24	4.3.3.24.2.5, 4.3.3.25.2.5, 4.3.3.26.2.5, 4.3.3.27.2.5, 4.3.3.28.2.5, 4.3.3.29.2.5, 4.3.3.30.2.5, 4.3.3.31.2.5
70	When measured radiation is above over-range set point, the HIGH alarm is true.	System Feature	3.2.1.3.2.1.3.3.2	3.1.2, 3.1.2.7.2.2	6.2.1, 6.2.21, 6.2.24	4.3.3.24.2.2, 4.3.3.25.2.2, 4.3.3.26.2.2, 4.3.3.27.2.2, 4.3.3.28.2.2, 4.3.3.29.2.2, 4.3.3.30.2.2, 4.3.3.31.2.2
71	When measured radiation is above over-range set point, the red RANGE indicator is illuminated.	System Feature	3.2.1.3.2.1.3.3.3	3.1.2 3.1.2.7.2.3	6.2.1, 6.2.21, 6.2.24	4.3.3.24.2.9, 4.3.3.25.2.9, 4.3.3.26.2.9, 4.3.3.27.2.9, 4.3.3.28.2.9, 4.3.3.29.2.9, 4.3.3.30.2.9, 4.3.3.31.2.9
72	When measured radiation is above over-range set point, the bar graph illuminates in red.	System Feature	3.2.1.3.2.1.3.3.4	3.1.2.7.2.4	6.2.1, 6.2.21, 6.2.24	4.3.3.24.2.10, 4.3.3.25.2.10, 4.3.3.26.2.10, 4.3.3.27.2.10, 4.3.3.28.2.10, 4.3.3.29.2.10, 4.3.3.30.2.10, 4.3.3.31.2.10

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73	When measured radiation is above over-range set point, the analog output reads full scale.	System Feature	3.2.1.3.2.1.3.3.5	3.1.2.7.2.5	6.2.1, 6.2.21, 6.2.24	4.3.3.24.2.14, 4.3.3.24.2.15, 4.3.3.24.2.16, 4.3.3.25.2.14, 4.3.3.25.2.15, 4.3.3.25.2.16, 4.3.3.26.2.14, 4.3.3.26.2.15, 4.3.3.26.2.16, 4.3.3.27.2.14, 4.3.3.27.2.15, 4.3.3.27.2.16, 4.3.3.28.2.14, 4.3.3.28.2.15, 4.3.3.28.2.16, 4.3.3.29.2.14, 4.3.3.29.2.15, 4.3.3.29.2.16, 4.3.3.30.2.14, 4.3.3.30.2.15, 4.3.3.30.2.16, 4.3.3.31.2.14, 4.3.3.31.2.15, 4.3.3.31.2.16
74	When measured radiation is above over-range set point, the front panel display reads EEEEE.	System Feature	3.2.1.3.2.1.3.3.6	3.1.2, 3.1.2.7.2.6	6.2.1, 6.2.21, 6.2.24	4.3.3.24.2.13, 4.3.3.25.2.13, 4.3.3.26.2.13, 4.3.3.27.2.13, 4.3.3.28.2.13, 4.3.3.29.2.13, 4.3.3.30.2.13, 4.3.3.31.2.13
75	Over-range alarm is reset by pressing acknowledge pushbutton.	System Feature	3.2.1.3.2.1.3.3.7	3.1.2.7.2.7.1	6.2.1, 5.2.21, 6.2.24	4.3.3.24.2.1, 4.3.3.25.6, 4.3.3.26.2.3, 4.3.3.27.8, 4.3.3.28.8, 4.3.3.30.5, 4.3.3.31.7
76	Over-range alarm does not reset automatically.	System Feature	3.2.1.3.2.1.3.3.8	3.1.2.7.2.7	6.2.1, 6.2.21, 6.2.24	4.3.3.25.4.9, 4.3.3.25.15
77	When detector output is above the electronic anti-jam circuit threshold the anti-jam circuit will be activated.	System Feature	3.2.1.3.2.1.3.3.9	3.1.2.7.2.8, 4.2.24	6.2.1, 6.2.21, 6.2.24	4.3.3.8.20

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REV 1	ECN NO. 3090	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 15 of 24	NO. 94095603RTM	SIZE
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78	When check source pushbutton is held down, the check source relay is energized.	System Feature	3.2.1.4.1.1.1	3.1.3, 3.1.3.1, 3.1.3.1.1	6.2.5	4.3.3.32.3.1
79	When check source pushbutton is held down, the check source indicator will illuminate (green).	System Feature	3.2.1.4.1.1.2	3.1.3.1.2, 3.1.4.14.4	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.32.3.1
80	When check source pushbutton is held down, the radiation value will be displayed on the front panel.	System Feature	3.2.1.4.1.1.3	3.1.3.1.3	6.2.6, 6.2.14, 6.2.15, 6.2.17, 6.2.21, 6.2.24	4.3.3.32.3.13
81	When check source pushbutton is held down, the front panel HIGH and WARN alarms status indicators are disabled.	System Feature	3.2.1.4.1.1.4	3.1.3.1.4	6.2.1, 6.2.21, 6.2.24	4.3.3.32.3.5, 4.3.3.32.3.6, 4.3.3.32.5.2, 4.3.3.32.5.3, 4.3.3.32.5.4
82	When check source pushbutton is held down, the analog outputs are set to zero.	System Feature	3.2.1.4.1.1.5	3.1.3.1.5	6.2.2, 6.2.21, 6.2.24	4.3.3.32.3.14, 4.3.3.32.3.15, 4.3.3.32.3.16, 4.3.3.32.5.14, 4.3.3.32.5.15, 4.3.3.32.5.16
83	When check source pushbutton is released, the check source indicator will be extinguished.	System Feature	3.2.1.4.1.2.1	3.1.3.2, 3.1.3.2.3, 3.1.4.14.5, 3.1.4.14.5.1 3.1.4.14.5.2	6.2.5	4.3.3.32.8.1
84	When check source pushbutton is released, the normal operation will resume.	System Feature	3.2.1.4.1.2.2	3.1.3.2.1, 3.1.3.2.2, 3.1.3.2.3, 3.1.4.14.8	6.2.5	4.3.3.32.8

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85	In calibration mode, the current calibration time is displayed in seconds.	System Feature	3.2.1.5.1	3.1.4.2, 3.1.4.11.1	6.2.4, 6.2.21	4.3.3.33.2
86	In calibration mode, the first digit is flashing to indicate the edit mode.	System Feature	3.2.1.5.2	3.1.4.3, 3.1.4.3.1	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.33.3
87	In calibration mode, analog output is equal to last displayed radiation value.	System Feature		3.1.4.5	6.2.2, 6.2.21, 6.2.24	4.3.3.33.34, 4.3.3.33.35, 4.3.3.33.36
88	In calibration mode, the bar graph will turn off.	System Feature	3.2.1.5.3	3.1.4.4	6.2.4, 6.2.21	4.3.3.33.13
89	In calibration mode, the high condition will clear.	System Feature	3.2.1.5.4	3.1.4.6	6.2.4, 6.2.21	4.3.3.33.95, 4.3.3.33.96, 4.3.3.33.97
90	In calibration mode, the warn condition will clear.	System Feature	3.2.1.5.5	3.1.4.7	6.2.4, 6.2.21	4.3.3.33.98, 4.3.3.33.99
91	In calibration mode, the radiation backlight will turn off.	System Feature	3.2.1.5.6	3.1.4.8	6.2.4, 6.2.21	4.3.3.33.14
92	In calibration mode, the calibration set point may be edited.	System Feature	3.2.1.5.7	3.1.4.3.1, 3.1.4.11.2	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.101, 4.3.3.34.102, 4.3.3.34.103, 4.3.3.34.104, 4.3.3.34.105
93	The ENTER pushbutton will start the Calibrate timer	System Feature	3.2.1.5.8	3.1.4.9, 3.1.4.9.1, 3.1.4.11.3, 3.1.4.14.6	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.33.18
94	Whenever calibration is restarted the system will display the calibration time for editing.	System Feature	3.2.1.5.9	3.1.4.9.2	6.2.4, 6.2.21	4.3.3.33.38

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95	When the calibrate time expires, the backlight will be steady on	System Feature	3.2.1.5.10	3.1.4.10, 3.1.4.10.1, 3.1.4.10.5	6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.33.33
96	Once calibration mode is exited, the UDR will reset.	System Feature	3.2.1.5.11.1	3.1.4.10.4, 3.1.4.10.5, 3.1.4.13	6.2.4, 6.2.21	4.3.3.33.110
97	Once calibration mode is exited, the UDR will continue normal operation.	System Feature	3.2.1.5.11.2	3.1.4.13	6.2.4, 6.2.21	4.3.3.33.74, 4.3.3.33.75, 4.3.3.33.76
98	Calibration mode can be entered with UDR in CHECK SOURCE mode.	System Feature	3.2.1.5.12	3.1.4.14, 3.1.4.14.1, 3.1.4.14.2, 3.1.4.14.3	6.2.4, 6.2.5, 6.2.21	4.3.3.43
99	Data entry mode is selected by pressing ENTER pushbutton while the rotary FUNCTION switch is in valid set point position.	System Feature	3.2.1.6.1	3.1.5, 3.1.5.1	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34
100	In data entry mode, the selected set point is displayed in exponential format (e.g. 1.00E2)	System Feature	3.2.1.6.1.1	3.1.5.1.1	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34
101	When set point is selected for data entry, the left most digit will be flashing.	System Feature	3.2.1.6.1.2	3.1.5.1.2, 3.1.5.1.7	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.3

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102	In data entry mode, the selected set point is entered in exponential format (e.g. X.XXEN), where X is the mantissa and N is the exponent.	System Feature	3.2.1.6.1.3	3.1.5.1.3, 3.1.5.1.3.1, 3.1.5.1.3.3	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.2
103	In data entry mode, X value may be any integer value between 0 and 9.	System Feature	3.2.1.6.1.4	3.1.5.1.3.2	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.4
104	In data entry mode, the exponent may be positive or negative.	System Feature	3.2.1.6.1.5	3.1.5.1.3.4	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.4
105	In data entry mode, the exponent may be any integer between 0 and 9.	System Feature	3.2.1.6.1.6	3.1.5.1.3.5	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.4
106	In data entry mode, the function switch not on a valid set point has no effect.	System Feature	3.2.1.6.2	3.1.5.1.4	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.10
107	In data entry mode, the bar graph remains active.	System Feature	3.2.1.6.3	3.1.5.1.5	6.2.16, 6.2.13, 6.2.14, 6.2.17, 6.2.21, 6.2.24	4.3.3.34.7.11
108	In data entry mode, the analog outputs remain active.	System Feature	3.2.1.6.4	3.1.5.1.6	6.2.2 6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.34.7.15, 4.3.3.34.7.16, 4.3.3.34.7.17
109	Contact output logic shall be fail safe.	Performance	3.3.1	4.2.33	N/A (jumpers)	4.3.3.4.4, 4.3.3.4.7, 4.3.3.4.9, 4.3.3.5.1.2.8, 4.3.3.9.2.1.6, 4.3.3.11.3.3

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110	Response time of the system for a change in radiation value is 60 seconds.	Performance	3.3.2	6.2.3	6.2.3 6.2.6, 6.2.15, 6.2.21, 6.2.24	4.3.3.9.1.1.13, 4.3.3.9.2.1.13
111	Display is updated once per second.	Performance	3.3.3	3.1.1.1.5.5.4, 3.1.4.9.3	6.2.6, 6.2.14, 6.2.15, 6.2.17, 6.2.21, 6.2.24	4.3.3.2.3
112	Alarm is initiated within one second after the current one minute average exceeds the alarm set point.	Performance	3.3.4	3.1.1.1.5.5.7	6.2.6, 6.2.1, 6.2.14, 6.2.17, 6.2.15, 6.2.21, 6.2.24	4.3.3.9.2.1.5
113	After approximately 60 seconds the display value will indicate ambient radiation.	Performance	3.3.5	3.1.1.1.5.5.7	6.2.6, 6.2.14, 6.2.15, 6.2.17, 6.2.21, 6.2.24	4.3.3.9.1.1.13
114	Calibration mode will be reset to 60 seconds whenever unit is turned off.	Performance	3.3.6	3.1.1.1.1, 3.1.4.2	6.2.6, 6.2.4, 6.2.15, 6.2.21, 6.2.24	4.3.3.35.9
115	Calibration mode reset to 60 seconds when functional switch is moved from position 8.	Performance	3.3.7	3.1.4.10.3, 3.1.4.12, 3.1.4.13	6.2.4, 6.2.21	4.3.3.33.145
116	When check source button is held down the check source mechanism will expose the check source.	Performance	3.3.8	N/A (mechanical)	N/A (mechanical)	1.5.6
117	When check source button is released the source capsule will be returned	Performance	3.3.9	N/A (mechanical)	N/A (mechanical)	1.5.6

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118	Radiation rate range is 1.0E-2 to 1.0E+5 mR/hr	Design Constraint	3.4.1	4.2.31	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	1.5.8
119	Operating temperature is 32 degrees F to 122 degrees F.	Design Constraint	3.4.2	N/A (hardware)	N/A (hardware)	1.5.7
120	Relative humidity is 0 to 99% non-condensing	Design Constraint	3.4.3	N/A (hardware)	N/A (hardware)	1.5.7
121	Heat loading is approximately 96 BTU/hr.	Design Constraint	3.4.4	N/A (hardware)	N/A (hardware)	1.5.7
122	There is a HIGH alarm set point.	Other	3.6.1.1	3.1.6, 3.1.6.1, 3.3	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.2, 4.3.3.3.3, 4.3.3.34.1
123	There is a WARN alarm set point	Other	3.6.1.2	3.1.6, 3.1.6.2, 3.3	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.5, 4.3.3.34.20
124	There is resolving time detector dead time set point.	Other	3.6.1.3	3.1.6, 3.1.6.3, 3.3, 3.3.2	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.9, 4.3.3.34.40, 4.3.3.42.3
125	There is an analog full scale limit set point.	Other	3.6.1.4	3.1.6, 3.1.6.4, 3.3, 3.3.3	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.13, 4.3.3.34.55
126	There is an overrange limit set point.	Other	3.6.1.5	3.1.6, 3.1.6.5	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.17, 4.3.3.34.65
127	There is a conversion constant set point.	Other	3.6.1.6	3.1.6, 3.1.6.6, 3.3, 3.3.1	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.21, 4.3.3.34.75, 4.3.3.41.1
128	There is an analog low scale set point.	Other	3.6.1.7	3.1.6, 3.1.6.8	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.28, 4.3.3.34.91

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129	There is a calibration mode set point.	Other	3.6.1.8	3.1.6, 3.1.6.9	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.32, 4.3.3.34.101
130	There is an underrange value set point.	Other	3.6.1.9	3.1.6, 3.1.6.10	6.2.12, 6.2.15, 6.2.19, 6.2.23, 6.2.24	4.3.3.3.36, 4.3.3.34.111
131	Set points 6, A, B, C, D, E, and F report code E0007.	Other	3.6.3.2	3.1.6, 3.1.5.1.4, 3.1.6.7, 3.1.6.11, 3.1.6.12.3	6.2.16, 6.2.13, 6.2.21, 6.2.24	4.3.3.3.25 4.3.3.3.26, 4.3.3.3.40, 4.3.3.3.41, 4.3.3.3.43, 4.3.3.3.44, 4.3.3.3.46, 4.3.3.3.47, 4.3.3.3.49, 4.3.3.3.50, 4.3.3.3.52, 4.3.3.3.53, 4.3.3.3.55, 4.3.3.3.56
132	The UDR contains JP1 jumper for configuration purposes.	Other	3.6.2.1	4.2.37	N/A (hardware)	4.3.2.1
133	The UDR contains JP2 jumper for configuration purposes.	Other	3.6.2.2	4.2.37	N/A (hardware)	4.3.2.1
134	The UDR contains JP3-1 through JP3-5 jumpers for configuration purposes.	Other	3.6.2.3, 3.6.2.4, 3.6.2.5, 3.6.2.6	4.2.27, 4.2.37	N/A (hardware)	4.3.2.1
135	The UDR contains JP4 through JP7 jumpers for configuration purposes.	Other	3.6.2.7	4.2.25, 4.2.37	N/A (hardware)	4.3.2.1, 4.3.3.35.2, 4.3.3.37.2, 4.3.3.38.2, 4.3.3.39.2, 4.3.3.39.3
136	When display value is negative, error code E0001 is displayed.	Other	3.6.3.1	3.1.6.12.1	6.2.14, 6.2.17, 6.2.21, 6.2.24	1.5.9

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137	When specific function is not implemented, error code E0007 is displayed.	Other	3.6.3.2	3.1.5.1.4, 3.1.6.12.3	6.2.16, 6.2.21, 6.2.24	4.3.3.3.26, 4.3.3.3.41, 4.3.3.3.44, 4.3.3.3.47, 4.3.3.3.50, 4.3.3.3.53, 4.3.3.3.56
138	Error codes are cleared automatically when initiating event is corrected.	Other	3.6.4	3.1.6.12.6	6.2.16, 6.2.21, 6.2.24	4.3.3.3.29
139	Initialization will take place every time the system is powered up or reset.	Availability	3.5.2	3.1.1.1.1, 3.1.1.1.1.1, 3.1.1.1.1.2, 3.1.1.1.1.3, 3.1.1.1.1.4, 3.1.1.1.2, 3.1.1.1.3, 3.1.1.1.4, 3.1.1.1.5(entire section), 3.2, 4.2.16	6.2.6, 6.2.15, 6.2.21, 6.2.24	4.3.3.2.2, 4.3.3.2.3
140	Address Drivers	Hardware	N/A	4.2.5	N/A	N/A
141	PROM	Hardware	N/A	4.2.6	N/A	N/A
142	RAM	Hardware	N/A	4.2.7	N/A	N/A
143	EEPROM	Hardware	N/A	4.2.8	N/A	N/A
144	Data Transceivers	Hardware	N/A	4.2.9	N/A	N/A

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145	Control Signal Buffer	Hardware	N/A	4.2.10	N/A	N/A
146	Address Decoding	Hardware	N/A	4.2.11	N/A	N/A
147	Read-Write Cycles	Hardware	N/A	4.2.14	N/A	N/A
148	Write Register Decoding	Hardware	N/A	4.2.15	N/A	N/A
149	Gross Counter	Hardware	N/A	4.2.20	N/A	N/A
150	Read Register Decoding	Hardware	N/A	4.2.22	N/A	N/A
151	Discriminators	Hardware	N/A	4.2.26	N/A	N/A
152	Signal Multiplexer	Hardware	N/A	4.2.30	N/A	N/A
153	High Voltage Supply	Hardware	N/A	4.2.32	N/A	N/A
154	Power Supply	Hardware	N/A	4.2.35	N/A	N/A

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SOFTWARE VERIFICATION AND VALIDATION

TEST REPORT

FOR

PROM P/N 94095603

G-M AREA MONITOR

REV. LEVEL	ECN #	DESCRIPTION/PAGES AFFECTED				
ENGINEERING					DATE	11-4-02
MANUFACTURING					DATE	11-4-02
QUALITY ASSURANCE					DATE	11-4-02
SYNCOR RADIATION MANAGEMENT		DATE	11/04/02	TITLE SOFTWARE VERIFICATION AND VALIDATION TEST REPORT, 94095603		
REV 1	ECN NO. 3090	RELEASED FOR PRODUCTION	DOC CTRL	SHEET 1 of 16	NO. 94095603VVTR	SIZE PLN

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1 Introduction and Overview of Verification and Validation

The overall objective of the V&V Plan was defined in the Software Verification and Validation Plan, document number 94095603VVP, Rev. 2. The objective was to assure the firmware supports a highly reliable product, as verified by an independent process of technical review and evaluation. The plan was implemented under the Syncor Quality Assurance Manual QSP-100. This manual has been approved for ISO 9001 certification, and for 10CFR50, Appendix B applications by NUPIC. Copies of these approvals are available in the Syncor Quality Assurance department.

The V&V was performed to ensure the "legacy" firmware used Model 956A-201 microprocessor based Digital Ratemeter meets the design requirements for the RG&E Ginna plant Control Room Ventilation Radiation Monitor and exhibits the high degree of reliability required by IEEE 7-4.3.2-1993 and EPRI TR-102348, Rev. 1. The V&V was performed for Rochester Gas & Electric, Ginna Plant, P.O. No. 5000004880.

1.1 Organization

In order to ensure the program supported a high quality and reliability standards, a dedicated team was assigned to the V&V program. Details of this organization are available in the VVP. Management review of this final report was required by both Syncor and RG&E.

1.2 Master Schedule

The project was initiated in July, 2002, and completed at the end of October, 2002. Based on the complexity of the product, this time period was adequate for the tasks required.

1.3 Resources Summary

Resources required for the project included 7 management, engineering and technical personnel. To maintain independence of the V&V activities, an external software consultant was contracted to perform the software design description and to prepare the software validation test procedure. The software consultants conclusions and recommendations are included here-in.

1.4 Responsibilities

Throughout the project, the V&V project manager held periodic design review meetings with the project team to monitor progress and resolve technical issues. The notes of these meetings are available in the project history folder. The software engineer ensured the documents prepared were in accordance with the referenced IEEE and EPRI standards. The reliability engineer reviewed the V&V documents to ensure the performance requirements were consistent with product specifications and qualification test results. The test technician was responsible for performing the Validation Test Procedure. The project quality engineer maintained continual involvement in the project meetings and reviewed the V&V documents to ensure the requirements of the VVP were implemented.

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1.5 Tools, Techniques, and Methodologies

1.5.1 The tools that were used for the V&V process were as follows:

-Document Preparation:

- Networked PC, Microsoft Word for Windows

- The documentation provided was written on a PC using a word processor program; e.g., MicroSoft Word for Windows. Each page of the document has a page header/footer. The page header/footer includes the document name, document number, ECN release number, release date, revision level and page number.

-Target Hardware

- Model 956A-201-M1 Digital Ratemeter with 94095603, Rev. 2, EPROM

-Test Signal Generator, Frequency Counter, and Multimeters

- A complete listing of the test equipment, along with the control number and Calibration dates, was included with the Test Results Log

-Software Tools

- American Airium Assembler/Linker/Emulator

- DOS based Personal Computer

All third party software (e.g., Microsoft word, operating systems, compilers) received from suppliers was considered controlled by industry standards and required no further processing and handling. For this project, Third Party Software was limited to the word processing, assembly, emulation, linking and program development tools identified above. The Model 956A-201 firmware is programmed assembly language, and does not include an operating system.

1.5.2 The techniques used in the V&V included:

- Preparation of the V&V plan in accordance with the requirements of IEEE 7-4.3.2, EPRI TR-102348, Rev. 1, and EPRI TR-103291-CD, dated 12/1/98.

- Use of an independent software engineer was assigned to the project to prepare the required documents, based on the published specifications and Instruction manual.

- Review meetings were held by the project team to review and approve the documents, and to ensure the applicable requirements of the related IEEE standard were implemented. RG&E's project staff participated in the reviews, to ensure the requirements of the Control Room Ventilation monitor were implemented.

- Independent testing of the firmware by a test technician

1.5.3 The methods used in the V&V process included review by cognizant engineering personnel, independent verification, and formal reviews.

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2 Description of Qualified and Tested Product

2.1 Firmware Control and Operation

The PROM used in the Victoreen Model 956A-20-M1, microprocessor based, Digital Ratemeter (UDR), was configured for use as a remote radiation Area Monitor readout for a local Geiger-Mueller (G-M) tube detector. The PROM was assigned a unique part number, 94095603, Rev. 2, and was revision level controlled by QA procedure QSP-205, Document Control and QSP-05-05, Engineering Change Notice. The firmware was simple in nature, and did not contain an embedded operating system. The firmware operated on a continuous loop basis, with all required program functions performed once each second. The operating firmware resided in the 32k x 8 bit UV erasable EPROM memory. 8K x 8 bit of RAM memory was provided for microprocessor operation. 64 bytes of non-volatile EEPROM memory was provided for set point memory (maximum of 256 bytes). A 4MHz crystal was utilized with the internal clock circuitry to obtain 1 MHz operation.

2.2 Hardware Requirements

For non-software related items, the applicable product qualification report, data sheet, and instruction manual were referenced. Hardware environmental performance requirements for the application, as noted in SRS paragraphs 3.4.5 thru 3.4.13, were verified in Qualification Report 950.366. For microprocessor based requirements, the product parts list, instruction manual, and microprocessor vendor data sheet were referenced. The non-software related items are listed below:

- Operating temperature is 32 degrees F to 122 degrees F (0 degrees C to +50 degrees C)
- Relative humidity is 0 to 99% non-condensing
- Heat loading is approximately 96 BTU/hr
- 120Vac power requirement is approximately 28 watts
- MC6802 Microprocessor
- 8 bit word size
- Interrupt capability
- Software compatible with MC6800

2.3 Verified Range

The specific range for the unit verified was 0.01 mR/h to 1.0 R/h. The actual range to be tested was defined in the Verification Test Procedure, section 1.5.8.

2.4 Auxiliary Alarm Output

The base 956A-201 provided only one set of High alarm relay output contacts. The Control Room Ventilation application required a second set of High alarm output contacts. The 956A-201-M1 digital ratemeter, provided to RG&E, includes an internal wiring modification to wire a spare, auxiliary relay to operate at the same time the High alarm relay operates. The validation testing was done on a Victoreen Model 956A-201-M1 UDR. The -M1 suffix was used to identify the internal wiring modification to provide an auxiliary High alarm relay contact outputs.

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2.5 Software Configuration

This software in the 94095603, Rev. 2 PROM used in the 965A-201 and 956A-201-M1 digital ratemeter was configured for operation as follows:

- an integer display
- conversion constant set point
- no background subtraction
- no anti-jam
- fail safe relay operation

2.6 Testing Methodology

The firmware was designed, tested, controlled and maintained in accordance with the Verification and Validation Plan for PROM P/N 94095603 (paragraph 3.5.1 of SRS). It was noted that the modules require inputs and outputs from other modules to operate. Testing the modules individually would not be effective, as the input/output addresses used in testing would not be the same as those in the assembled PROM, and would not provide a valid test. For this reason, the firmware was assembled, and tested as a complete product. The impact of this method of testing was that some functions in the software description could not be tested directly (i.e. the transfer of a variable for floating point conversion). For these cases, the result of an input change was calculated, and the corresponding display value or output was verified.

2.7 User Modifications

To prevent accidental modifications of the program by the user, the operating program for the UDR resides on a factory programmed PROM. The software could not be accidentally modified by the user (paragraph 3.5.3 of SRS).

2.8 Program Language

The firmware was written in assembly language. It is modular by design. This is a simple system that does a limited set of predefined functions (paragraph 3.5.4 of SRS).

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2.9 Jumper Settings

The jumper settings on this unit were set up as follows:

Jumper	Function	Position	Operation
JP1	Microprocessor Reset	Out	Normal Operation (Factory setting)
JP2	PROM Type	2-3	PROM 27256 (Factory setting)
JP3-1 / JP3-2	Statistical Accuracy	In/In	Fixed one second display update (Factory setting)
JP3-3	Alarm Acknowledge	In	Manual Acknowledge (Factory setting)
JP3-4	Fail Alarm	In	Enable no counts fail alarm (Factory setting)
JP3-5	Check Source Alarm	In	Alarm Inhibited (factory setting)
JP4	Input Pulse Selection	2-3	Positive input pulse – GM Detectors (Factory setting)
JP5	Shield Polarity Selection	2-3	Shield for positive pulse (GM) (Factory setting)
JP6	Anti-Jam Fuse Selection	1-2	Enable for normal operation (Factory setting)
JP7	Detector Type for Anti-Jam circuit timing	2-3	GM Tube (Factory setting)

These were the settings that were used during the Validation Test Procedure. Jumpers JP3-3, 3-4 and 3-5 interface with the software, and their operation was verified in the Verification Test. JP3-1 and JP3-2 were in the fixed, one second update position throughout the testing.

2.10 Communications Options

Communication option circuit boards for RS-232, RS-485 or VICO loop are optional features in the 956A-201, and were not required for the Control Room Ventilation application. No communications option boards were installed in the unit tested, and were not verified in this V&V program (paragraph 3.2.1.2.1.10 and 3.2.1.2.1.11 of SRS).

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3 Summary of V & V Tasks Performed

3.1 Management

The PROM software, controlled by part number and revision level, was developed approximately 15 years ago. Since then, the product that matured incorporated user enhancements and improved hardware design elements. This evolutionary process was evaluated to ensure that the pre-developed (Legacy) software was sufficiently reliable for use in nuclear safety related applications.

As with other predeveloped software, it was necessary to understand how this predeveloped, or legacy, software matured with time into the quality product it became today. When the PROM P/N 94095603 firmware was conceived, there was little guidance in the way of industry standards to base the software development and design upon. Good programming practices were used, based on the objective of producing a highly reliable product, suitable for use in safety systems.

As expressed in SRP 0800, Appendix 7.0A, the use of digital I&C systems presented the concern that minor errors in design and implementation could cause them to exhibit unexpected behavior. To minimize this potential, the design qualification of digital systems needed to focus on a high quality development process that incorporated disciplined specification and implementation of design requirements. Potential common-mode failures caused by software errors were also a concern. One of the means to protect against common-mode software failures was to emphasize the quality process in the development.

In the development of the of the V&V plan, a process of independent technical reviews and evaluations was required to ensure the program supported high quality, repeatability, and reliability. The V&V plan was developed in accordance with the following industry standards:

- IEEE Std 7-4.3.2-1993, Standard Criteria for Digital Computers is Safety Systems of Nuclear Power Generating Stations
- IEEE Std 610.12-1990, Glossary of Software Engineering Terminology
- IEEE Std 729.1980, Standard Glossary of Software Engineering Terminology
- IEEE Std 829-1993, Standard for Software Test Documentation
- IEEE Std 830-1993, Recommended Practice for Software Requirements Specifications
- IEEE Std 1012-1996, Standard for Software Verification and Validation Plans
- IEEE Std 1016-1987, Recommended Practice for Software Descriptions
- IEEE Std 1074-1991, Standard for Developing Software Life Cycle Processes
- EPRI TR-103291 Handbook for Verification and Validation of Digital Systems (12/1998)
- EPRI TR-103348, Rev. 1, Guidelines on Licensing Digital Upgrades

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- 10CFR50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Jan. 20, 1975
- ANSI/ASME NQA1-1994, Quality Assurance Program Requirements for Nuclear Facility Applications
- SYNCOR QAM P/N QSP-100 Version 4.

The project was functionally organized under a Project Manager, who co-coordinated the V&V activities, scheduled formal reviews, and documented the results. A Reliability Engineer was used to review the documents generated, and participate in reviews to ensure the requirements and procedures generated were consistent with existing product qualification and operational documentation. A QA engineer also participated in the design reviews to ensure the requirements of the V&V plan were implemented.

The plan included design reviews by the project team for each design phase, and the preparation of a System Requirements Specification, a Software Design Description, a Validation Test Procedure, a Requirements Traceability Matrix, and a V&V Report. Reporting of anomalies in the testing phase was also required. In preparing the test procedure, it was determined that every UDR output would be monitored and recorded for each of the test cases established. By using this approach, it was possible to ensure that there were no undefined or inappropriate responses from the Udr in each test.

The software design analysis and test activities were strengthened by designating the responsibility for validation to an independent software V&V engineer and test technician.

3.2 Requirements Phase

The Software Requirements Specification (SRS) was developed from the customer contract and the Installation, Operation, and Maintenance Instruction Manual Area Monitoring System Model 955A – Part No. 955A-1 published 5/96 by VICTOREEN, INC. The SRS was prepared in accordance with the following reference documentation:

- IEEE Std 610.12-1990, Glossary of Software Engineering Terminology
- IEEE Std 830-1993, Recommended Practice for Software Requirements Specifications
- IEEE Std 1074-1991, Standard for Developing Software Life Cycle Processes
- EPRI TR-103291 Handbook for Verification and Validation of Digital Systems (12/1998)
- Software Verification and Validation Plan for Prom P/N 94095603, document number 94095603VVP
- SYNCOR QAM P/N QSP-100 Version 4.

All of the necessary functional requirements were included in the SRS along with the hardware specifications that affect the operation of the firmware.

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3.3 Design Phase

Since the 94095603 Rev. 2 PROM was an existing product, the Software Design Description Document (SDD) was developed from the actual code. It was prepared in accordance with the following documents:

- IEEE Std 610.12-1990, Glossary of Software Engineering Terminology
- ANSI/IEEE Std 1016-1987, Recommended Practice for Software Design Descriptions
- IEEE Std 1016.1-1993, Guide to Software Design Descriptions
- IEEE Std 1074-1991, Standard for Developing Software Life Cycle Processes
- IEEE Std 1219-1992, Standard for Software Maintenance
- EPRI TR-103291-CD, Handbook for Verification and Validation of Digital Systems
- EPRI TR-106439, Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications
- Software Requirement Specification for PROM P/N 94095603, P/N 94085603SRS
- Software Verification and Validation Plan for Prom P/N 94095603, P/N 94095603VVP
- SYNCOR QAM P/N QSP-100 Version 4.

The SDD was then reviewed against the SRS.

3.4 Implementation Phase

The hardware design and integration were performed in the early 1980's, prior to the introduction of the current V&V standards. In order to substantiate the continued operation of the UDR family of products, seven separate seismic and/or environmental Qualification tests were successfully performed. The reports describing these tests are available in Syncor's document control center for review or reference.

3.5 Test Phase

The Software Validation Test Procedure 94095603VTP was developed as a part of the V&V to provide a formal methodology for the testing of the software requirements. The VTP was prepared in accordance with the following documents:

- IEEE Std 610.12-1990, Glossary of Software Engineering Terminology
- ANSI/IEEE Std 1016-1987, Recommended Practice for Software Design Descriptions
- IEEE Std 829-1993, Standard for Software Test Documentation
- EPRI TR-103291-CD, Handbook for Verification and Validation of Digital Systems
- Software Requirement Specification for PROM P/N 94095603, P/N 94085603SRS
- Software Verification and Validation Plan for Prom P/N 94095603, P/N 94095603VVP

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- Software Design Description for Prom P/N 94095603, P/N 94095603SDD
- SYNCOR QAM P/N QSP-100 Version 4.

The VTP was then reviewed against the SRS and the SDD.

A Traceability Matrix, 94095603RTM, was then developed to track every item in the SRS to the SDD, the code, and VTP. The matrix referenced each requirement in the SRS to a paragraph in the SDD, SDD Code description (detail design section of SDD), and the Test Procedure.

The matrix also categorized the type of requirement as one of 9 types of requirements (Hardware, Hardware Interface, Software Interface, Communications Interface, Operational, System Feature, Performance, Design Constraint, or Other. The matrix was structured in tabular format, with the requirement description in the first column and the Type of requirement in the second column, and the SRS paragraph specifying the requirement in the third column. The matching SDD, SDD Code, and VTP paragraph numbers were then listed in the adjacent columns.

The RTM was then reviewed against the SRS, SDD and the VTP

3.6 Installation and Checkout Phase

Installation and Field Checkout will be performed by RG&E. Installation and operation are supported by the product instruction manual, P/N 955A-1, published 5/96. This manual is also controlled by QSP 205-05-05, requiring an ECO issued by a cognizant engineer to implement any change.

Any change to the firmware is controlled by QSP 205-05-05, requiring an ECO issued by a cognizant engineer and a V&V of the change prior to implementing any change.

In addition, project specific interconnection diagrams and functional test procedures were provided to assist in the installation and start-up. These drawings and documents are also controlled by QSP 205-05-05, requiring an ECO issued by a cognizant engineer to implement any change.

3.7 Operation Phase

To support field operation, Syncor provided a comprehensive Operator's Instruction manual 955A-1, published 5/96, with each G-M monitoring system. In addition, project specific interconnection diagrams and functional test procedures were provided to RG&E

Syncor also maintains a staff of Field Engineers, to assist with the installation and start-up of the system.

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Any changes to these drawings and documents, or the actual firmware, are controlled by QSP 205-05-05, requiring an ECO issued by a cognizant engineer to implement any change. In addition, any firmware change will require a V&V on the change prior to release.

3.8 Maintenance Phase

To monitor changes after the product is in operation, Customer Complaint Handling procedure QSP-00-00 has been implemented. This procedure requires logging and management review of customer problems with any of Syncor products. This procedure provides an effective method of monitoring and providing timely resolution of Field problems. In addition, the Customer Complaint Handling procedure also requires a review of the problem for potential 10CFR21 reporting.

All documents produced under the V&V program will be controlled and stored as any other engineering document, as described in QSP-05-08, Engineering/Document Change Notice procedure.

SRM classifies firmware as a drawing and therefore, follows SRM QSP-205 and QSP-05-08, Engineering/Document Change Notice Procedure, for its control. The PROM is controlled by both part number and revision level. Also, any changes to the firmware will require a V&V to be performed on the change, prior to release. To this extent, the problem is documented using the Engineering Change Notice (ECN) procedure and sent to the Project Manager. Upon evaluation, the ECN will: 1) Be approved and implemented; 2) Be forwarded to the appropriate department for further action or; 3) Be returned with an explanation. Upon resolving the problem, the applicable documentation will be revised, and the corrected firmware will be released using the Engineering Change Notice (ECN).

Problems relating to monitor operation must be formally directed to the cognizant project engineer or Project Manager in the form of a field problem report. The format of the field problem report is not critical; however sufficient information (i.e., tag number, description of problem, operating mode, results observed, etc.) must be provided to permit the problem to be reproduced. The project engineer, or manager, will be responsible for resolving the problem report and, if required, initiate an internal ECN (per QSP -05-08) to revise the applicable firmware and documentation as required in this SQAP. Testing of revised firmware will be performed on a similar hardware.

Repetition of the affected portion of the V&V program will be required for any change affecting software that has been formally subjected to a V&V program

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Overall Quality Statement

The Syncor Quality Assurance program is ISO 9001 certified and has been approved by NUPIC as a 10CFR50, Appendix B, supplier.

The UDR Product family has a history of successful operation in the nuclear utility industry. Although failures in the field have occurred, they have been satisfactorily resolved. There has been no glaring history of recurring hardware or software failures. This product has a solid reputation in the industry.

The use of high reliability, Mil-Spec electronics for critical components supports the lack of a significant number of field failures.

The 956A-201 supplied to RG&E utilizes fail safe relays to ensure that if a failure does occur, the safety related action will still occur. Although this may result in an inconvenience for the user, it will also prevent an unidentified failed condition from occurring. The 956A-201 also has a watch dog timer, that will result in a fail indication should the microprocessor fail, or the software "lock-up" and not complete it's required one second update cycle.

Conclusions

With the exception of one (1) incident (See 5.3, Summary of Results), PROM 94095603, Rev. 2, passed all of the tests required by the V&V. The tests were performed by a qualified person with Technicians Skill Level 1 as per QSP-18-01.

5.1 Variances

5.1.1 956A-201-M1: Testing was done on a Victoreen Model 956A-201-M1 UDR. The M1 suffix identifies an internal wiring modification to provide an auxiliary High alarm relay. The modification included wiring of the coil of the Auxiliary relay to follow the operation of the High alarm relay. In addition, a toggle switch was temporarily added to the input of U47 to prevent the microprocessor from resetting the watch dog timer and thereby verify its operation.

5.1.2 End Calibrate Mode: In the VTP, test 4.3.3.33 states all backlights are off. The SRS, however, requires the backlights to be steady on once the calibrate timer times out, Section 3.2.1.5.10. As written the VTP is accurate, but not complete. Immediately after the timer expires, the backlights turn off, providing an acceptable response to the VTP. After 1 second, however, the backlights turn back on, steady, as required by the SRS. The SRS response was incomplete for this response. Since this function is not critical to the safety related function of the device (i.e. to actuate an alarm when the radiation level exceeds a predetermined set point), the results of the V&V are not affected by this incomplete response statement.

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In addition, the following typographical errors were noted in the VTP:

Section:	Description:
4.3.3.17.4.30	Radiation value displayed; Change 101mR/h to .101 R/h
4.3.3.20.10	Change spelling from bargraphd to bargraph
4.3.3.38.31	Delete reference to JP3-3 as JP3-3 is re-installed in prior step
4.3.3.42.4.2 and	
4.3.3.42.4.5.1	Add Flashing to alarm indicator status, as the input signal will clearly place the unit into an alarm state
4.3.3.43.9.12 and	
4.3.3.43.9.13 and	
4.3.3.43.9.14	Change 10.25 ma to 4.0 ma and 3.91 v to 0.0 v as it has been shown in previous steps that the analog output values are set to zero during Check Source actuation

Since the result expected in the test is self explanatory, the nature of the typographical error is obvious, and does not affect the result of the V&V

5.1.3 Invalid Function: SRS paragraph 3.2.1.6.2 states "No effect" as the result of accessing an invalid set point function. In the 94095603, Rev. 2 PROM, error message E0007 is displayed when an invalid, or not used set point function is accessed. Since this function is not critical to the safety related function of the device (i.e. to actuate an alarm when the radiation level exceeds a predetermined set point), the results of the V&V are not affected by this additional information provided to the operator.

5.1.4 Testing Methodology: SRS paragraph 3.1.1 through 3.1.1.16 define module operational functions. Since the modules may only be tested in the assembled and linked PROM, testing of the individual modules by themselves is not possible. The result of any input change, however, can be, and is tested thoroughly in the VTP. For instances, where the actual step in the code cannot be verified directly, the result of the input change is verified, and is listed in the matrix.

5.1.5 In addition, because of the interrelationship of the assembled code, each output of the UDR is verified in each test. To maintain a manageable traceability matrix, only the first demonstration of the design description section is listed in the traceability matrix. Since this software operation is repetitive for each function, the results of the V&V are not affected by this elimination of repetitive use of the software description steps in the matrix. .

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5.2 Comprehensiveness Assessment

The completed test logs demonstrate that the minimum comprehensiveness requirements specified in the test procedure specification have been satisfied.

5.3 Summary of Results

All features passed their tests. There was one unresolved incident as reported in Incident Report 94095603VTP-AN001. It was noted that a fixed, low frequency, input signal is not a normal mode of operation for the unit. Normally, the G-M tube detector will be providing output pulses that continually vary, due to the statistical nature of radioactive isotope decay. In addition, the anomaly has not been observed in factory calibrations, and does not affect the calibration accuracy specifications for the system.

5.4 Evaluation

The 94095603, Rev 2, PROM passed comprehensive testing successfully. Even though there was one incident noted, it is believed that this anomaly will not have a negative affect on the performance of the device in actual operation and will not invalidate the testing performed.

6 Recommendations

The customer should not deviate from the qualified and approved configuration identified in Section 2 of this V&V report.

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APPENDIX A: List of all documents generated under the SVVP

Document Number: Description:

94095603VVP	Software Validation Plan
94095603SDD	Software Design Description
94095603SRS	Software Requirements Specification
94095603VVTP	Verification and Validation Test Procedure
94095603VTM	Verification Traceability Matrix
94095603VVTR	Verification and Validation Test Report

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