WESTINGHOUSE CLASS 3

WCAP-8587-
SUPP 2-E18A

EQUIPMENT QUALIFICATION
TEST REPORT
INSTRUMENT BUS POWER SUPPLY
(STATIC INVERTER)
(NORMAL AND ABNORMAL TEMPERATURE AND HUMIDITY TESTING)

BY

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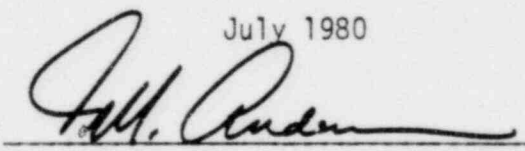
APPROVED: 

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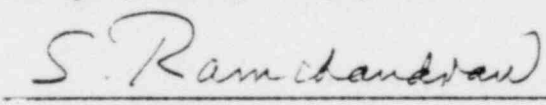

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TABLE OF CONTENTS

TABLES

LIST OF FIGURES

1.0 OBJECTIVE

The objective of this qualification program is to demonstrate that the Static Inverter meets or exceeds its safety-related performance requirements while subjected to the normal and simulated abnormal service conditions specified in Figure 1. A qualification test was performed on one typical Static Inverter.

2.0 EQUIPMENT TESTED

The equipment tested was a production model Static Inverter manufactured by Westinghouse PED, Buffalo, N.Y. which is a static type model 7.5 KVA Instrument Bus Power Supply, [

]a,c.

3.0 PERFORMANCE SPECIFICATION

The Static Inverter was tested to verify its functional operability as defined below:

3.1 Twelve hours continuous operation at the extreme temperature and humidity conditions of Figure 1 (condition 3 - loss of ventilation or Non-Class 1E air conditioning).

3.2 The following output characteristics.

3.2.1 Voltage: 118 VAC $\pm$ 2%

3.2.2 Frequency: 60 Hz $\pm$ 1.0 Hz

3.2.3 Distortion: Less than 5% total harmonic distortion

3.2.4 Power factor of 0.8

4.0 DESCRIPTION OF THE TEST FACILITY

The environmental qualification of the Static Inverter was performed at Westinghouse Power Electric & Drive Systems (PEDS), Buffalo, N. Y., which is also the manufacturer of the equipment.

4.1 Test Equipment

4.1.1 The environmental test chamber with a temperature capability of [ ]^{a,b,c} and reaching a relative humidity of [ ]^{a,b,c} with integral controlling thermocouple and temperature recorders.

4.1.2 Other associated test equipment are listed in Table II. Calibrations are traceable to National Bureau of Standards.

4.2 Mounting

4.2.1 With this being a temperature and humidity test, the equipment was free standing. No bolting or fastening to the floor was specified since this was not germane to this test sequence.

4.3 Connections

4.3.1 Connectors were used for all connections requiring them. Terminal board connections were made using ring tongue terminals. Interconnecting cabling between various assemblies were typical prefabricated cables (with connectors) as indicated in Figure 3.

5.0 TEST PROCEDURES

5.1 Normal Environmental Testing

A number of performance checks (i.e. burn-in, systems calibration, etc.) are carried out by Westinghouse to verify capability to meet performance requirements under ambient conditions. These normal environmental tests are performed on all production units prior to release and, as a consequence, are not reported in this generic test report, which is limited to reporting the results of abnormal environmental testing of a representative unit. However, the results of these normal environmental production unit tests are maintained by Westinghouse and are available for audit for any particular project. The generic abnormal environmental testing described in this report do, furthermore, cover a range of temperature and humidity parameters that encompass the specified range of these parameters for the normal environment (Figure 1).

5.2 Abnormal Environmental Testing

5.2.1 Service Conditions

The safety-related functions of the Static Inverter were tested while subject to simulated service conditions specified in Table I. During the same testing period, the input voltage and frequency were varied above and below the normal values as also shown in Table I.

5.2.2 Monitored Functions

The Inverter output performance of AC voltage, current, frequency and total harmonic distortion were monitored during each abnormal service condition cycle.

6.0 TEST DATA

The test data summarized below demonstrates that the equipment under test met or exceeded the specifications of Section 3.2 (See Table III for detailed results).

6.1 Output voltage remained within specified limits, maximum deviations ranged between [ ]b,c,e volts at the worst, and usually staying between [ ]b,c,e volts.

6.2 Output frequency varied between [ ]b,c,e Hz.

6.3 Total harmonic distortion varied from [ ]b,c,e meeting the 5% requirement.

6.4 Output current was a nominal [ ]b,c,e Amps (ranging between [ ]b,c,e Amps) with power factor held to [ ]b,c,e.

7.0 SUMMARY

7.1 The Static Inverter was tested under normal and simulated abnormal service conditions (environmental, input voltage, and frequency) to demonstrate its capability to perform its safety-related function under these conditions. The test results show the equipment remained within the output specification of Section 3.2 while subjected to the environmental and supply extremes shown in Table I.

7.2 The specified performance requirements for functions are 12 hours at abnormal conditions. EQDP-ESE-18, Section 2.6, requires a test of four (two for margin) 12 hour cycles of temperature, humidity, voltage and frequency extremes. The conditions for all four cycles are presented in Table III.

7.3 Figures 3 through 9 are included to show the test configuration.

TABLE I

SPECIFIED SERVICE CONDITIONS

Cycle	Time Hrs.	Temp (^{o}F)	Humid. (% RH)	Line VAC	Line Freq. (Hz)
1	12	[			] b,c,e
2	12				
3	12				
4	12	]			

TABLE II

TEST EQUIPMENT

Parameter	Instrument	Serial Number
Temperature	Fisher Mercury	None
	Fisher Thermometer	None
Input Voltage	Westinghouse Voltmeter PY5	1431220
	Westinghouse Voltmeter PY5	23230
	Westinghouse Voltmeter PA5	2485271
Input Frequency	Weschler Freq. Meter QA5 & Westinghouse Transducer	None
Output Voltage	Westinghouse Voltmeter PA5	274848
Output Current	Westinghouse Ammeter Style 682166-A	3718
Output Watts	Westinghouse Wattmeter PY5	6982
Current Transformer	Westinghouse Current Transformer Type GCI-101 100/5 Ratio	00757
Output Total Harmonic Distortion	Hewlett Packard Distortion Analyzer Model 330D	246-09943
Output Frequency	Hewlett Packard Interval/ Frequency Counter Model 522B	125-05464

TABLE III

TEST DATA

Cycle	Ambient Temp (^{o}F)	Ambient Humidity (% RH)	Supply Voltage V12/V23/V31	Supply Freq (Hz)	Output Voltage (Volts)	Output Current (Amps)	Power Factor (%)	Output Freq (Hz)	Total Harmonic Distortion (%)	
1	[									b,c,e
2										
3										
4									]	

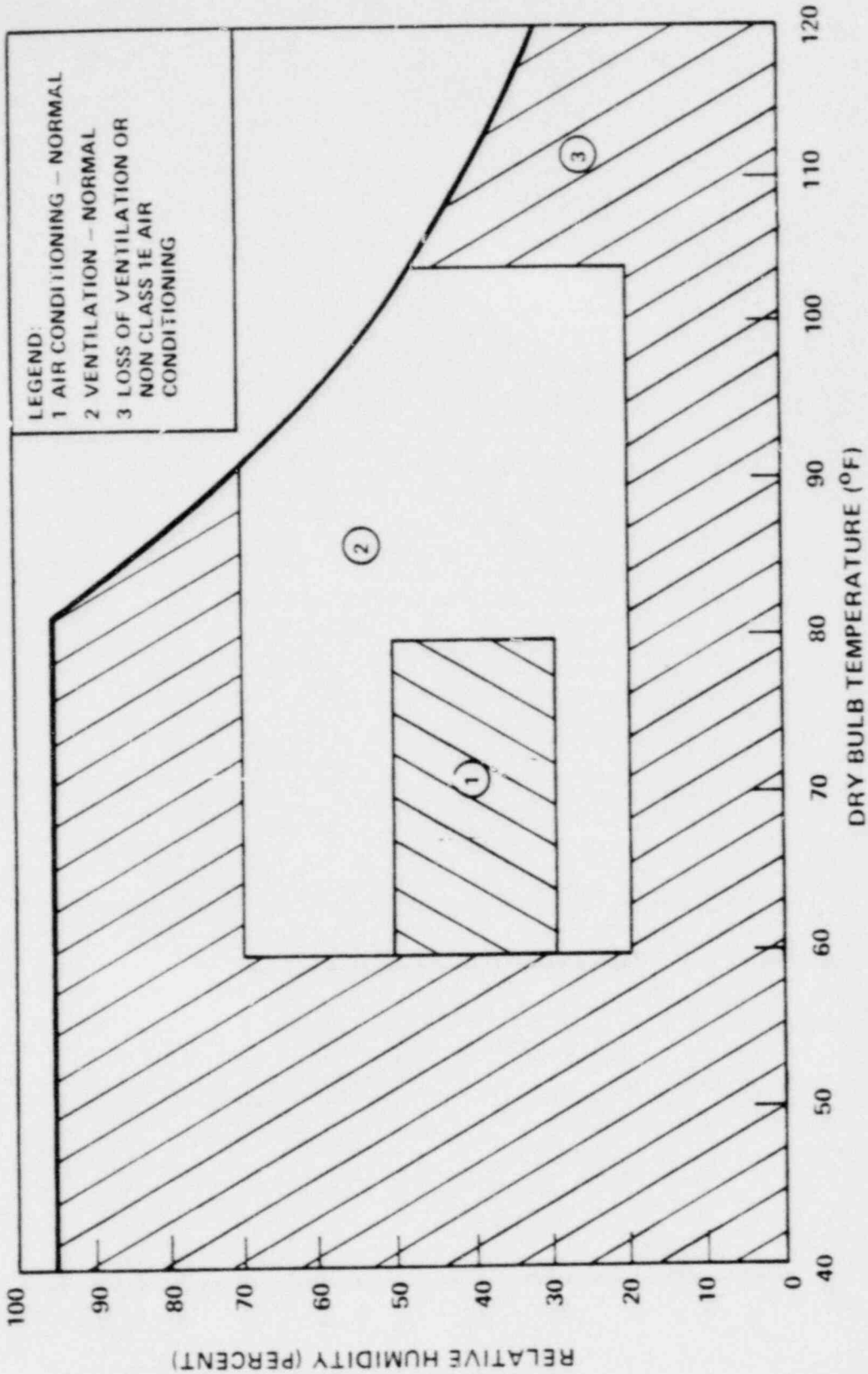

Figure 1. Temperature Versus Humidity - Enclosed Environments Outside Containment

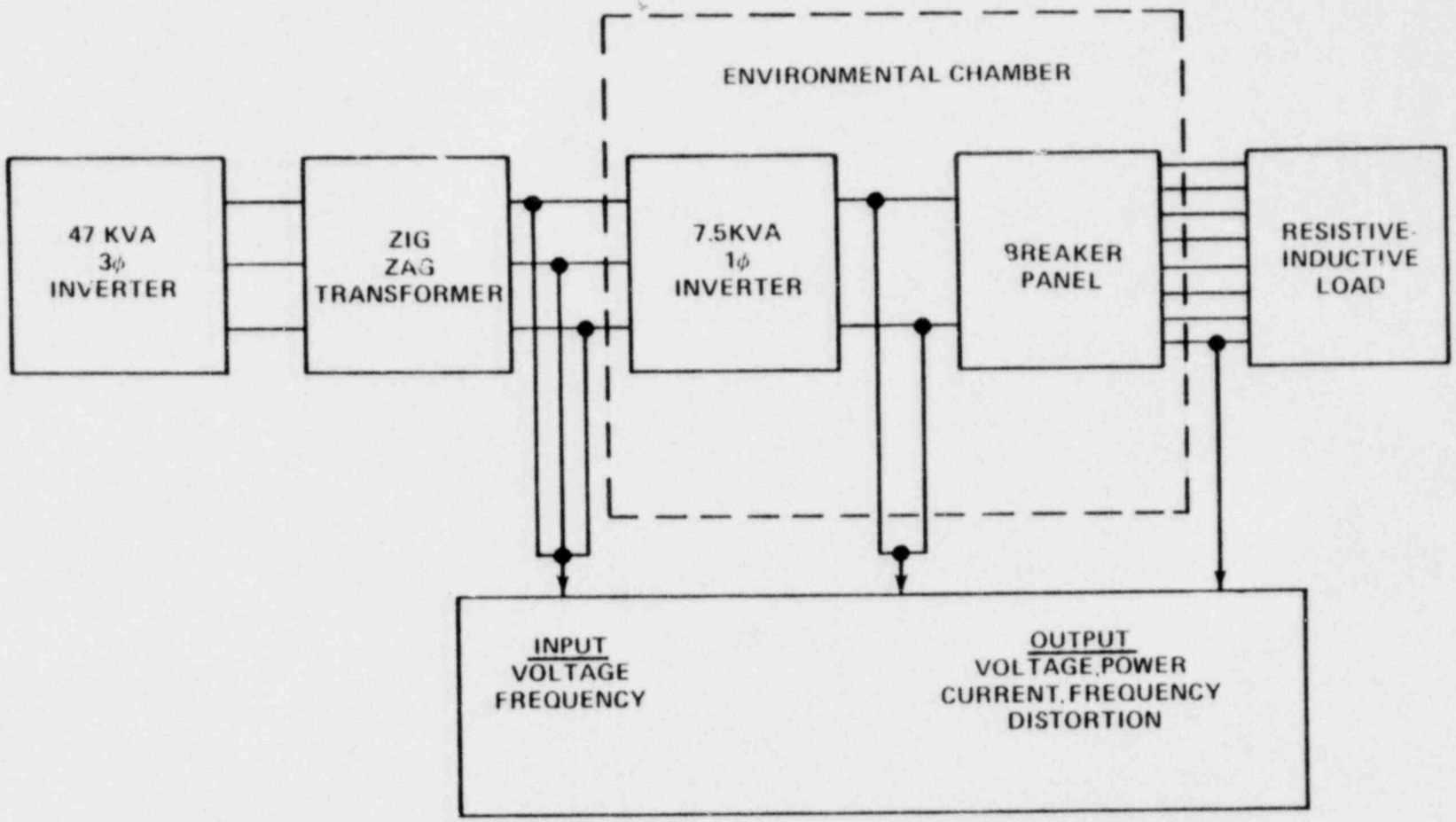

Figure 2. Test Set-Up for Static Inverter Environmental Test

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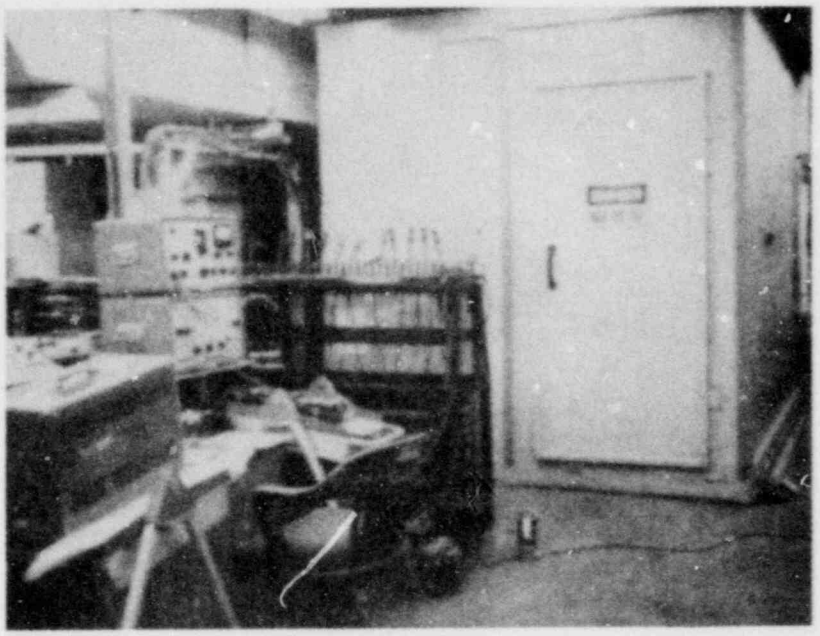

Figure 3. Environmental Chamber in Background, Load Rack and Instruments in Foreground

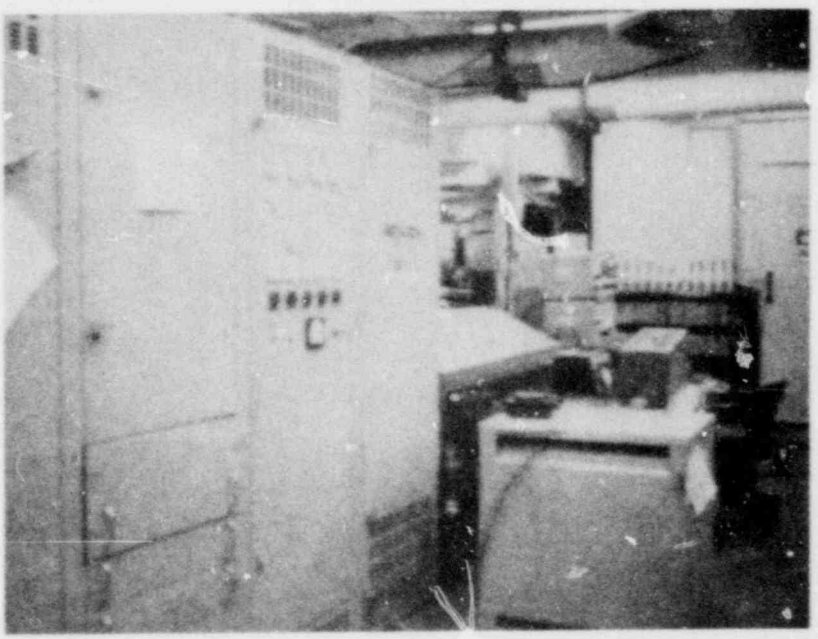

Figure 4. Three Phase Static Inverter Which Supplied Source Power to the Inverter Under Test

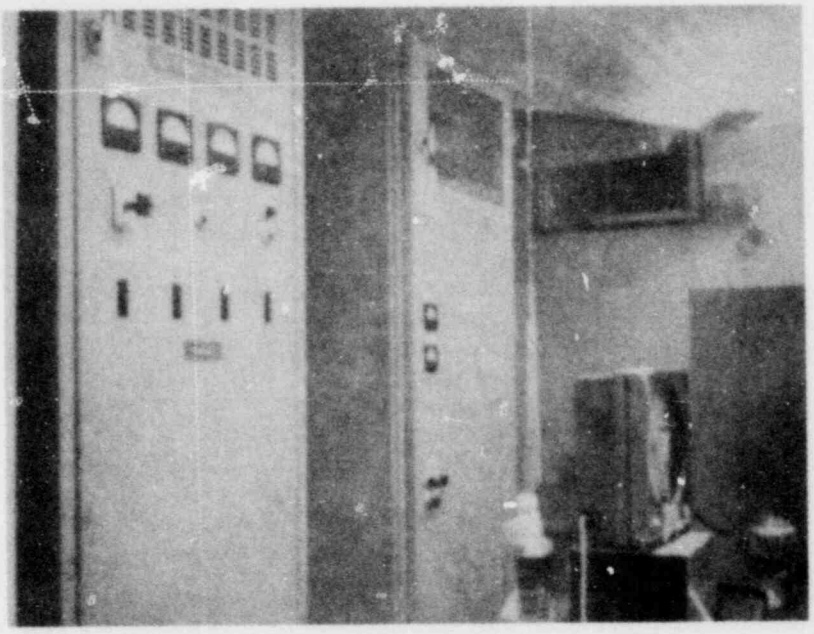

Figure 5. Inverter Under Test at Left. (Unit to the Right is a MOD 80 Undergoing Life Test. (Not Included in this Report)

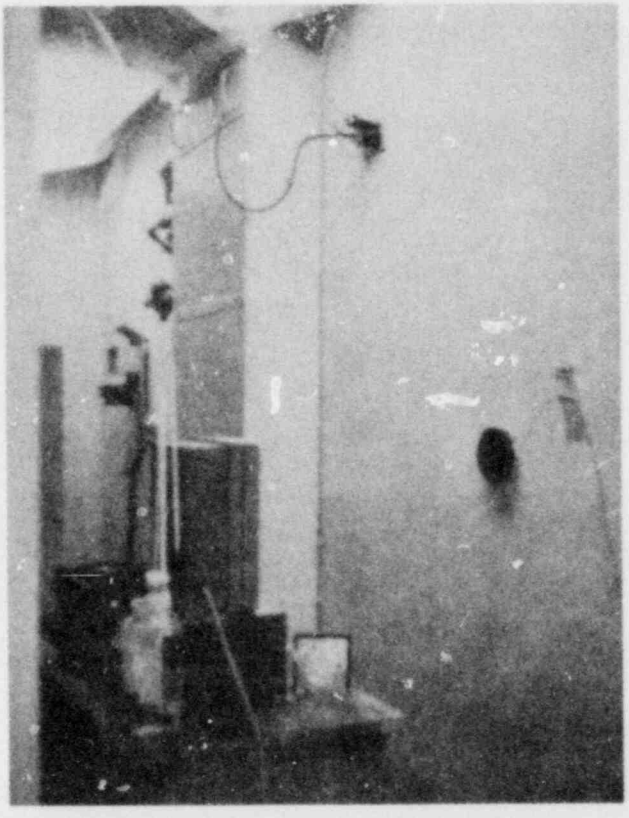

Figure 6. Instruments Used to Monitor Temperature and Humidity

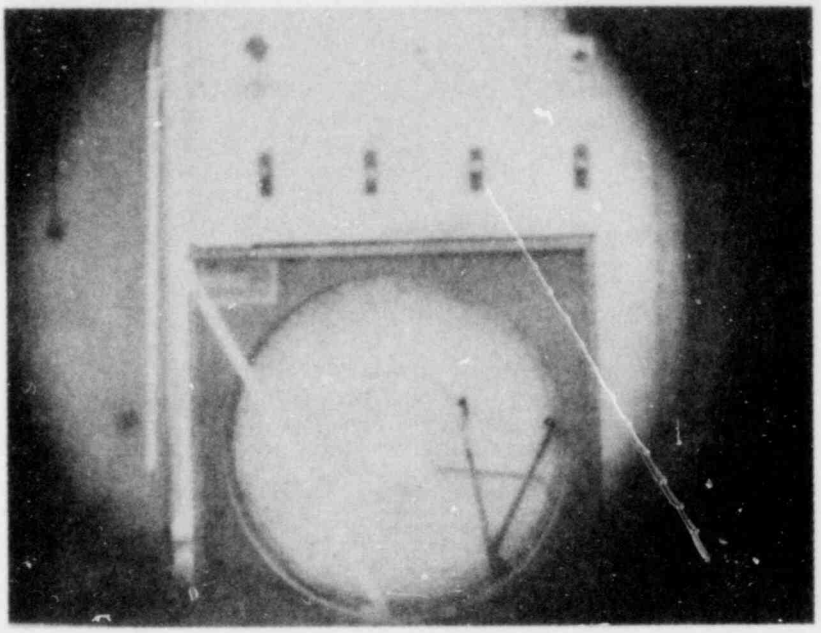

Figure 7. Temperature and Humidity Recorder as Seen Through a Port Hole, Inverter is in the Background

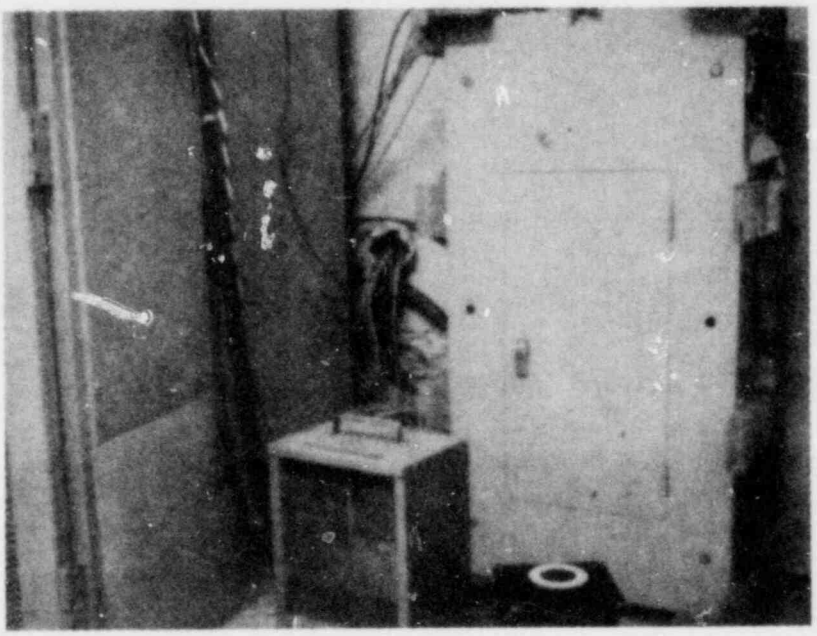

Figure 8. Breaker Panel Located in Environmental Chamber. Door Was Closed During Test

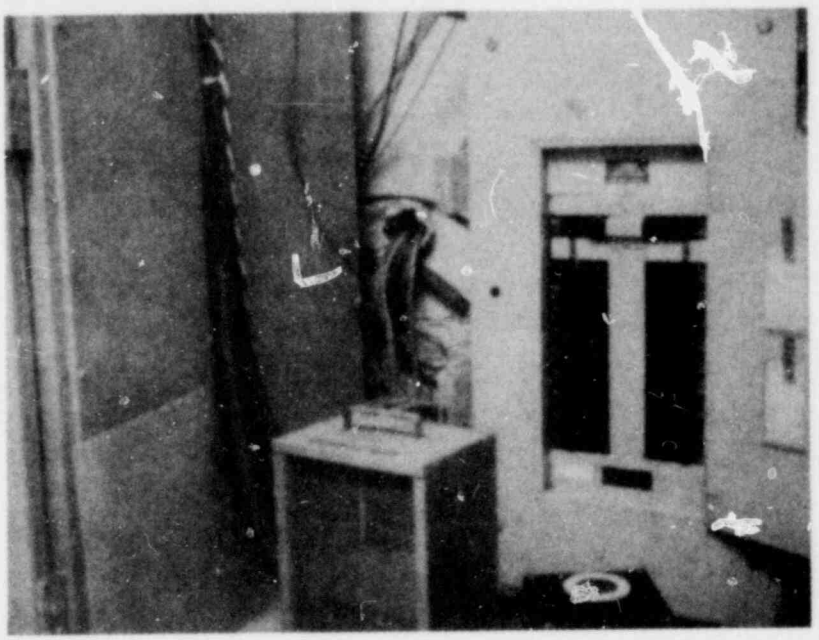

Figure 9. Breaker Panel With Door Open to Show Breakers