

APPENDIX F

TEST REPORT AND PROCEDURE FOR SEISMIC
VIBRATION TESTING OF ONE (1)
HYDROGEN ANALYZER ASSEMBLY

GE-SD PROCEDURE NO. 51750051
ACTION REPORT NO. 10950

STANDING INSTRUCTIONS

MISSILE AND SPACE DIVISION

SECURITY CLASS. UNCLASSIFIED		INITIALS JEM/	S.I. NO. 250852
REVISION NO. 0	DATE JULY 27, 1979	SUPERSEDES	SHEET NO. OF COVER

(FOR USE OF GENERAL ELECTRIC EMPLOYEES ONLY).

QUALIFICATION TEST

PROCEDURE

FOR

A HYDROGEN ANALYZER

DRAWING NO. 47E240609

PREPARED BY:

J. E. Murphy
J. E. MURPHY
QUALITY CONTROL ENGINEERDATE: 7-31-79

REVIEWED BY:

J. D. Fuller
J. D. FULLER, PROJECT ENGINEER
ANALYZER SYSTEMSDATE: 7-31-79

APPROVED BY:

R. J. Bernard
R. J. BERNARD, MANAGER
QUALITY CONTROL ENGINEERINGDATE: 7/31/79

APPROVED BY:

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P. E. REIS, MANAGER
COMPONENT TESTDATE: 8/3/79

ISSUED BY:

Hest
PRINT CONTROL & REPRODUCTIONDATE: 8-13-79

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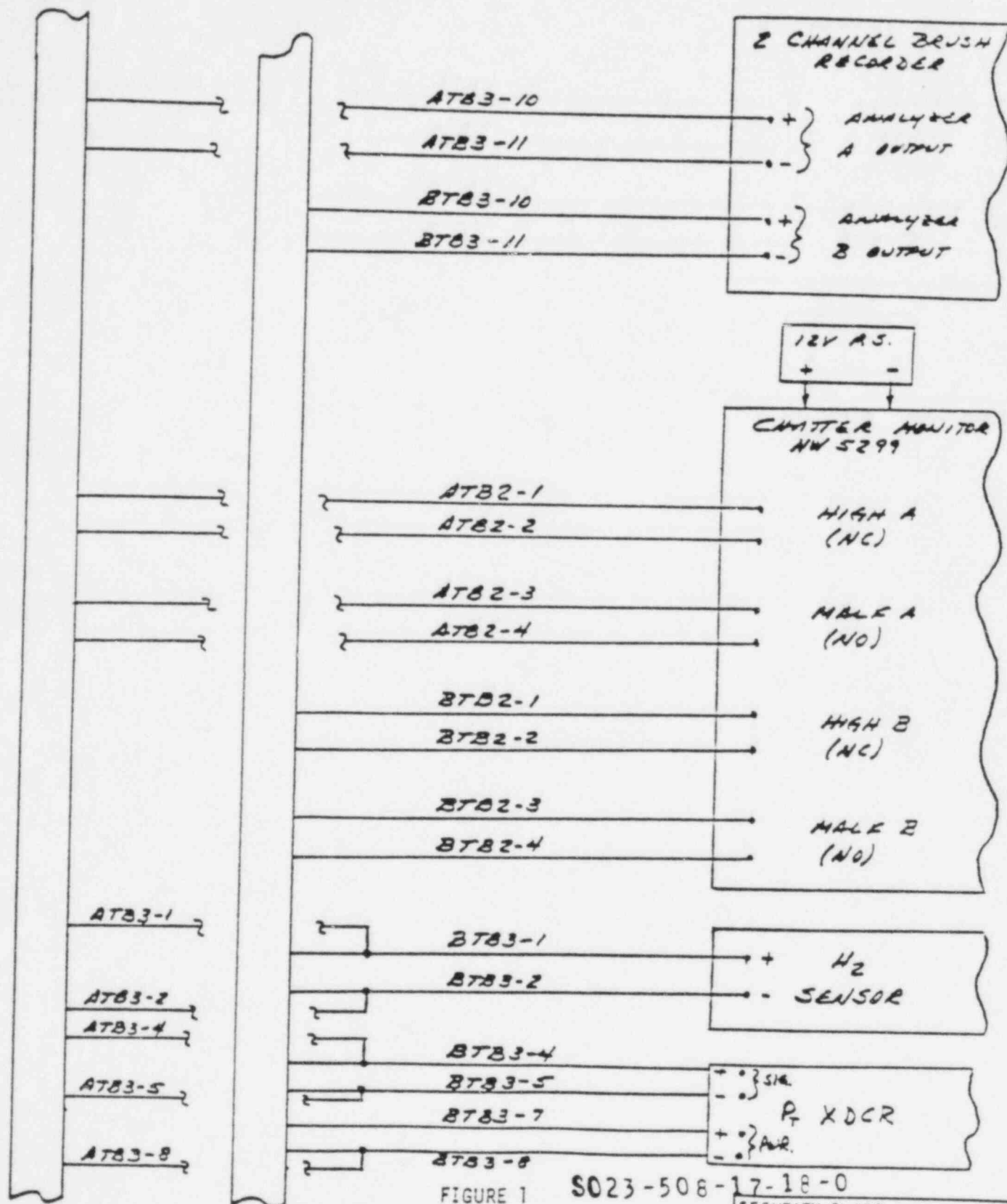
TRAIN A
CABLINGTRAIN B
CABLING

FIGURE 1

S023-508-17-18-0

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1.0 SCOPE

1.1 This Standing Instruction (S.I.) specified the procedure to be used for the Qualification testing of the Hydrogen Analyzer System Drawing Number 47E240609. Acceptance testing per S.I. 250851 shall have been completed prior to the testing defined in this S.I.

1.2 Applicable Drawings

47E240609	H2 Analyzer System
47E240610	H2 Sensor Assembly
47E240612	Schematic Logic Diagram
47E240613	Wiring Diagram
47C238207	H2 Analyzer Electronics
47E240608	Electronics Schematic Wiring Diagram

2.0 DESCRIPTION

The basic analyzer system is a dual channel unit each channel of which consists of a hydrogen sensor, pressure transducer, signal conditioning electronics, and a readout/ alarm panel. For Seismic Qualification testing, however, only one sensor and pressure transducer shall be used. The sensor output and transducer output shall each be paralleled to supply signals to both conditioning electronics units. This is accomplished by the installation of jumpers specified in this S.I.

3.0 TEST EQUIPMENT

- *AETC Seismic Test Facility
 - D.C. Power Supply
 - D.C. Milli-volt Source
 - Chatter Monitor (NW5299)
- *Brush Recorder (2 Channel Min.)
 - Test Box ER47D223519
- *Facility Power 120 Vac. 60 Hz
 - H2/N2 Compressed Gas Mix (0 to ~ 4% H2 Content)
 - Gas Regulator
 - Digital Voltmeter

*Supplied by Acton Environmental Testing Corporation

4.0 SEISMIC QUALIFICATION TEST

4.1 Post Shipment Inspection and Functional

4.1.1 Perform visual inspection for shipping damage. Verify that the following jumpers have been installed:

Upper Section - To - Lower Section

BT83-1	AT83-1
BT83-2	AT83-2
BT83-4	AT83-4
BT83-5	AT83-5
BT83-8	AT83-8

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REVISION NO. 0	DATE JULY 27, 1979	SUPERSEDES	SHEET NO. OF 3

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Also verify that a 250 Ω resistor is connected at the rear of each card cage assembly between A8TB8-4 and A8TB8-5. This resistor converts the 4 to 20 m Amp output signal to a 1 to 5 VDC output.

4.1.2 Connect the pressure transducer leads as follows:

Transducer	Connect To
Power (+)	ATB3-7
Power (-)	ATB3-8
Shield	ATB3-9
Signal (+)	ATB3-4
Signal (-)	ATB3-5
Shield	ATB3-6

Do not connect sensor leads to the analyzer system at this time: If they are connected, remove these leads and insulate them to prevent shorting.

4.1.3 Connect the millivolt source as follows:

- + To BTB3-1
- To BTB3-2

Verify that the source is OFF and set to minimum.

4.1.4 Place the analyzer function switch on each panel to the PRE-AMP ZERO position. Connect each power cord to an A.C. source (120 VAC, 60 Hz) and depress each power switch to the ON position. With a DVM measure the available voltage at the PRE-AMP OUT and ANALYZER OUT jacks on the front of each panel. Record the readings on the data sheet. (All readings must be 1.000 ± 0.040 VDC). This voltage shall also be measured and recorded at:

ATB3-10 (+) To ATB3-11 (-)
BTB3-10 (+) To ATB3-11 (-)

NOTE: These readings may be taken at either the terminal board or test cable ends if the cable is connected. Record the readings on the data sheets.

4.1.5 Using an ohm meter verify and record the following conditions:

Open Circuit ATB2-1 To ATB2-2
Open Circuit ATB2-3 To ATB2-4
Open Circuit BTB2-1 To BTB2-2
Open Circuit BTB2-3 To BTB2-4
(See Note In Paragraph 4.1.4)

4.1.6 Turn the millivolt source ON and verify it is set -0.5 mv, then place the analyzer function switch to the READ positions.

S023-506-17-18-0

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REVISION NO. 0	DATE JULY 27, 1979	SUPERSEDES	SHEET NO. OF 4

(FOR USE OF GENERAL ELECTRIC EMPLOYEES ONLY).

Repeat step 4.1.5 except the following conditions shall be varified:

Closed Circuit	ATB2-1	To	ATB2-2
Open Circuit	ATB2-3	To	ATB2-4
Closed Circuit	BTB2-1	To	BTB2-2
Open Circuit	BTB2-3	To	BTB2-4

Also verify and record PASS or FAIL for an ON condition of the MALF lamp on each panel.

4.1.7 Rotate the LEVEL ADJUST knob on each panel to full CCW and place the analyzer function switch to the SET ALARM position. Verify the following:

- METER increases with CW ROTATION of the LEVEL ADJUST knob.
- MALF lamp OFF above 0.0% indication.
- HIGH lamp ON above approximately 4%.

Record PASS or FAIL on the data sheet.

4.1.8 Set the millivolt source for 5.0 m VDC and place the analyzer function switch to the read position. The meter indication shall be $5.0 \pm 0.5\% H_2$. Verify and record the following for each panel:

Meter Indication	$5.0 \pm 0.5\%$
Pre-Amp Output	3.000 ± 0.040 VDC
Analyzer Output	3.000 ± 0.040 VDC

4.1.9 Vary the millivolt source and verify that the meter indication responds to source changes. Record PASS or FAIL on the data sheet. Place the analyzer function switch to the SET ALARM position and turn the source OFF.

4.1.10 Depress the power switch on each panel to OFF and remove both power cords from the A.C. source.

4.1.11 Disconnect and remove the millivolt source connections installed in paragraph 4.1.3, then connect the sensor lead as follows:

+ To BTB3-1
- To BTB3-2

4.1.12 Connect the line from the compressed hydrogen mix bottle regulator to the sensor assembly. Re-connect each power cord to the A.C. source and depress the power switch on each panel to the ON position.

4.1.13 Place the analyzer function switch to the READ position. RECORD the following for information only:

Meter Indication
Pre-Amp Output
Analyzer Output

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STANDING INSTRUCTIONS

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4.1.14 Turn the gas bottle on and set the gas regulator for 30-35 pounds. Allow the gas to flow for a minimum of 1 hour. Verify that the indicating meter on each panel has been increasing. Record the following for information only:

Time of Gas Application
Meter Indication
Pre-Amp Output
Analyzer Output

Terminate the gas application. Record Pass or Fail on the data sheet for gas response.

4.1.15 Depress the power switch on each panel to OFF, disconnect the gas line connection, remove both power cords from the A.C. source and proceed to the next test phase.

4.2 Seismic Vibration Qualification Test

This test is to be performed by Acton Environmental Testing Corporation to their approved procedure number 14950, on the 45° biaxial vibration table. GE personnel will monitor the analyzer performance as required by this S.I. during testing. (See Attachment A)

4.2.1 Test cabling shall be installed and connected to test equipment as defined by Figure 1 of this S.I.

4.2.2 During the resonance survey the analyzer system shall not be powered.

4.2.3 Power shall be applied to the analyzer system 1 minute prior to the start of each full level excitation, maintained during the excitation, and terminated 1 minute after completion. During each cycle, the following shall be monitored.

- a. Analyzer A & B Outputs: No sudden level shift or discontinuities allowed.
- b. High Alarm A & B: Chatter monitor shall not indicate discontinuity.

Each analyzer shall be in the READ mode for all excitation cycles.

NOTE: A.C. power connection may be removed for axis changes.

4.2.4 Record pass or fail on the data sheets for the monitor conditions specified in paragraph 4.2.3 above.

4.2.5 Upon completion of the seismic planes, remove the test connections installed per Figure 1. Depress the power switch on each panel to ON position and repeat paragraphs 4.1.12 through 4.1.14 of this S.I.

4.2.6 Depress the power switch on each panel to the OFF position and remove the sensor connections from BTB3-1 and BTB3-2. Tape or insulate the leads to prevent shorting together or to common structure.

S023-508-17-18-0

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4.2.7 Repeat paragraphs 4.1.3 through 4.1.10 of this S.I. Prepare the analyzer system for return to Valley Forge.

4.3 Return Shipment Inspection and Functional

4.3.1 Repeat paragraphs 4.1.1 through 4.1.15 of this S.I. The next test phase will be completion of an abbreviated performance test per S.I. 250851.

PERFORMANCE DATA SHEET (Continuation)

WIRAL ELECTRIC

MISSILE AND SPACE DIVISION

Page 2 of 6

REPORT NO.

WIRAL ELECTRIC

DRAWING NO.

REVISION

2 E SERIAL NO.

SECURITY CLASS

S.I. 250852 REV. 0
P.D.S. REV. 0

112 ANALYZER SYSTEM

47E240609

TRAIN A

TRAIN B

PARA.	TEST	SPEC.	ACTUAL	PARA.	TEST	SPEC.	ACTUAL
4.1.1	JUMPERS	PASS/FAIL		4.1.1	JUMPERS	PASS/FAIL	
	250 Ω RES.	PASS/FAIL			250 Ω RES.	PASS/FAIL	
4.1.4	PRE-AMP OUT	1.000 + 0.040 VDC		4.1.4	PRE-AMP OUT	1.000 + 0.040 VDC	
	ANALYZER OUT	1.000 + 0.040 VDC			ANALYZER OUT	1.000 + 0.040 VDC	
4.1.5	ATB2-1/ATB2-2	OPEN CKT.		4.1.5	BTB2-1/BTB2-2	OPEN CKT.	
	ATB2-3/ATB2-4	OPEN CKT.			BTB2-3/BTB2-4	OPEN CKT.	
4.1.6	ATB2-1/ATB2-2	CONTINUITY		4.1.6	BTB2-1/BTB2-3	CONTINUITY	
	ATB2-2/ATB2-4	OPEN CKT.			BTB2-3/BTB2-4	OPEN CKT.	
4.1.7	SET ALARM COND.	PASS/FAIL		4.1.7	SET ALARM COND.	PASS/FAIL	
4.1.8	METER IND.	5.0 + 0.5%		4.1.8	METER IND.	5.0 + 0.5%	
	PRE-AMP OUT	3.000 + 0.040 VDC			PRE-AMP OUT	3.000 + 0.040 VDC	
	ANALYZER OUT	3.000 + 0.040 VDC			ANALYZER OUT	3.000 + 0.040 VDC	

PERFORMANCE DATA SHEET (Continuation)

GENERAL ELECTRIC

MISSILE AND SPACE DIVISION

Page 3 Of

SECURITY CLASS

DRAWING NO. 47E240609

REVISION

CT SERIAL NO.

S.I. 250852 REV. 0
P.D.S. REV. 0

SYMBOL NO. H₂ ANALYZER SYSTEM

TRAIN A				TRAIN B			
PARA.	TEST	SPEC.	ACTUAL	PARA.	TEST	SPEC.	ACTUAL
4.1.9	MTR. RESP.	PASS/FAIL		4.1.9	MTR. RESP.	PASS/FAIL	
4.1.13	METER IND.	INFO ONLY		4.1.13	METER IND.	INFO ONLY	
	PRE-AMP OUT				PRE-AMP OUT		
	ANALYZER OUT	INFO ONLY			ANALYZER OUT	INFO ONLY	
4.1.14	GAS ON TIME	XXXX MINUTES		4.1.14	GAS ON TIME	XXXX MINUTES	
	METER IND.	INFO ONLY			METER IND.	INFO ONLY	
	PRE-AMP OUT				PRE-AMP OUT		
	ANALYZER OUT				ANALYZER OUT		
	GAS \times H ₂	INFO ONLY			GAS \times H ₂	INFO ONLY	
1.2.3		AXIS 1		4.2.3		AXIS 1	
	ANALYZER OUT	NO LEVEL SHIFT			ANALYZER OUT	NO LEVEL SHIFT	
	HIGH ALARM	NO DISCONTIN.			HIGH ALARM	NO DISCONTIN.	
	HALF ALARM	NO DISCONTIN.			HALF ALARM	NO DISCONTIN.	

PERFORMANCE DATA SHEET (Continuation)

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REVISION 22 SERIAL NO. SECURITY CLASS

DRAWING NO.

47E240609

S.I. 250852 REV. 0

P.O.S. REV. 0

NOMENCLATURE

H2 ANALYZER SYSTEM

TRAIN A

PARA.	TEST	SPEC.	ACTUAL.
4.2.3		AXIS 2	
	ANALYZER OUT	NO LEVEL SHIFT	
	HIGH ALARM	NO DISCONTIN.	
	HALF ALARM	NO DISCONTIN.	
4.2.3		AXIS 3	
	ANALYZER OUT	NO LEVEL SHIFT	
	HIGH ALARM	NO DISCONTIN.	
	HALF ALARM	NO DISCONTIN.	
4.2.3		AXIS 4	
	ANALYZER OUT	NO LEVEL SHIFT	
	HIGH ALARM	NO DISCONTIN.	
	HALF ALARM	NO DISCONTIN.	

TRAIN B

PARA.	TEST	SPEC.	ACTUAL.
4.2.3		AXIS 2	
	ANALYZER OUT	NO LEVEL SHIFT	
	HIGH ALARM	NO DISCONTIN.	
	HALF ALARM	NO DISCONTIN.	
4.2.3		AXIS 3	
	ANALYZER OUT	NO LEVEL SHIFT	
	HIGH ALARM	NO DISCONTIN.	
	HALF ALARM	NO DISCONTIN.	
4.2.3		AXIS 4	
	ANALYZER OUT	NO LEVEL SHIFT	
	HIGH ALARM	NO DISCONTIN.	
	HALF ALARM	NO DISCONTIN.	

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Page 5 of 5

REPORT NO.

SYMBOL

DRAWING NO.

REVISION

OF SERIAL NO.

SECURITY CLASS

H₂ ANALYZER SYSTEM

47E240609

S.I. 250852 REV. 0
P.D.S. REV. 0

TRAIN A				TRAIN B			
PARA.	TEST	SPEC.	ACTUAL	PARA.	TEST	SPEC.	ACTUAL
	POST VIB. 4.2.5				POST VIB. 4.2.5		
4.1.13	METER IND.	INFO ONLY		4.1.13	METER IND.	INFO ONLY	
	PRE-AMP OUT				PRE-AMP OUT		
	ANALYZER OUT	INFO ONLY			ANALYZER OUT	INFO ONLY	
4.1.14	GAS ON TIME	XXXX MINUTES		4.1.14	GAS ON TIME	XXXX MINUTES	
	METER IND.	INFO ONLY			METER IND.	INFO ONLY	
	PRE-AMP OUT				PRE-AMP OUT		
	ANALYZER OUT				ANALYZER OUT		
	GAS % H ₂	INFO ONLY			GAS % H ₂	INFO ONLY	
	POST VIB. 4.2.7				POST VIB. 4.2.7		
4.1.4	PRE-AMP OUT	1.000 ± 0.040 VDC		4.1.4	PRE-AMP OUT	1.000 ± 0.040 VDC	
	ANALYZER OUT	1.000 ± 0.040 VDC			ANALYZER OUT	1.000 ± 0.040 VDC	
4.1.5	ATB2-1/ATB2-2	OPEN CKT.		4.1.5	BTB2-1/BTB2-2	OPEN CKT.	
	ATB2-3/ATB2-4	OPEN CKT.			BTB2-3/BTB2-4	OPEN CKT.	

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F-13

FORM 7-5609B REV. (7-82)

STANDING INSTRUCTION REVISION

1 of 12

SECURITY CLASSIFICATION <i>NONE</i>	S.I.R. NO. <i>250852-1</i>	S.I.R. ISSUE DATE <i>8-23-79</i>
DRAWING NO. <i>47E240609</i>	COMPONENT NAME <i>H₂ ANALYZER</i>	PROGRAM <i>SONG 243</i>

THIS S.I.R. CONTAINS THE SEISMIC VIBRATION TEST PROCEDURE #14950, WHICH IS S.I. 250852, ATTACHMENT A.

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TRD/P:ER 8/23/79

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