

APPENDIX 3

ACCEPTANCE TEST PROCEDURE

FDR HYDROGEN ANALYZER

5-1 250029

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PDR ADDCK 05000361
P PDR

STANDING INSTRUCTIONS

MISSILE AND SPACE DIVISION

SECURITY CLASS. Unclassified		INITIALS JEM	S.I. NO. 250029
REVISION NO. New	DATE 4-12-77	SUPERSEDES	SHEET NO. OF COVER

(FOR USE OF GENERAL ELECTRIC EMPLOYEES ONLY).

ACCEPTANCE TEST PROCEDURE

FOR

HYDROGEN ANALYZER

47C238807

PREPARED BY:

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QC ENGINEERINGDATE 4-12-77

REVIEWED BY:

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ANALYZER SYSTEMSDATE 4-19-77

APPROVED BY:

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QC ENGINEERINGDATE 4-28-77

APPROVED BY:

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COMPONENT TESTDATE 5-9-77

ISSUED BY:

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PRINT CONTROL & REPRODUCTION

DATE May 11, 1977

DISTRIBUTION

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508-17-18-2

STANDING INSTRUCTIONS

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(FOR USE OF GENERAL ELECTRIC EMPLOYEES ONLY).

1.0 SCOPE

1.1 This Standing Instruction (S.I.) specifies the procedure for the detailed acceptance testing of the JPM H₂ Sensor and electronics. The electronics may be acceptance tested with or without actual sensors supplying the input signals to the electronics. In the event the testing is to be performed without sensors, a simulated sensor signal is to be supplied by the test box.

1.2 Applicable Documents (G.E. Drawings)

- A) 47E238803 Display Panel
- B) 47C238804 Nameplates
- C) 47C238807 Analyzer Assembly
- D) 47E238805 Schematic/Wiring Diagram
- E) 47E238806 Card Cage Assembly
- F) ER47D223519 H₂/O₂ Containment Test Box

2.0 DESCRIPTION

Each test system consists of 1 sensor and 1 H₂ analyzer electronic unit. For the acceptance testing however, it is not necessary the sensor and electronic unit be tested together.

3.0 TEST CONFIGURATION

- 3.1 For the acceptance testing, the system shall be connected as shown in Figure 1, but do not connect P2 to the test box at this time.
- 3.2 The sequence of testing shall be as specified in this S.I.. The duration of the total test shall be 24 hours.
- 3.3 The test method is presented in two sections and shall be used as applicable.

- Section 4.0 H₂ Analyzer Electronics (No Sensor)
- Section 5.0 H₂ Sensor
- Section 6.0 H₂ Analyzer System

4.0 FUNCTIONAL TESTS OF ELECTRONICS UNITS4.1 Dielectric Test

- 4.1.1 Remove all the plug-in cards from the card cage assembly and store properly.
- 4.1.2 Connect the cage assembly and display assembly per Figure 1A. Remove the resistor connected between terminals A8-4 and A8-5.

CAUTION!! PRIOR TO CONDUCTING THE TESTS IN PARAGRAPH 4.1.3, ALL PLUG-IN CARDS MUST BE REMOVED AND S-2 MUST BE IN THE "OFF" POSITION OR EQUIPMENT MAY BE DAMAGED.

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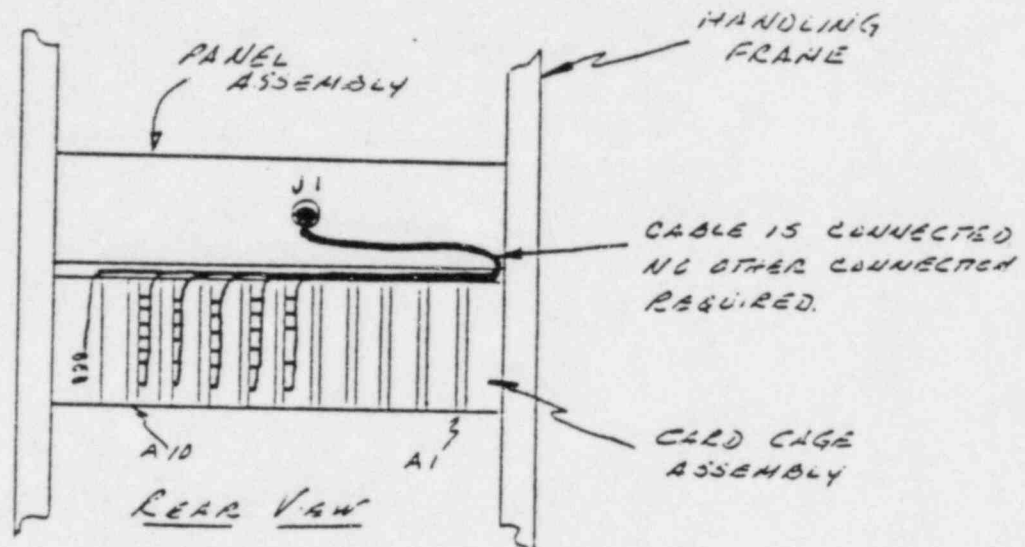


Figure 1A

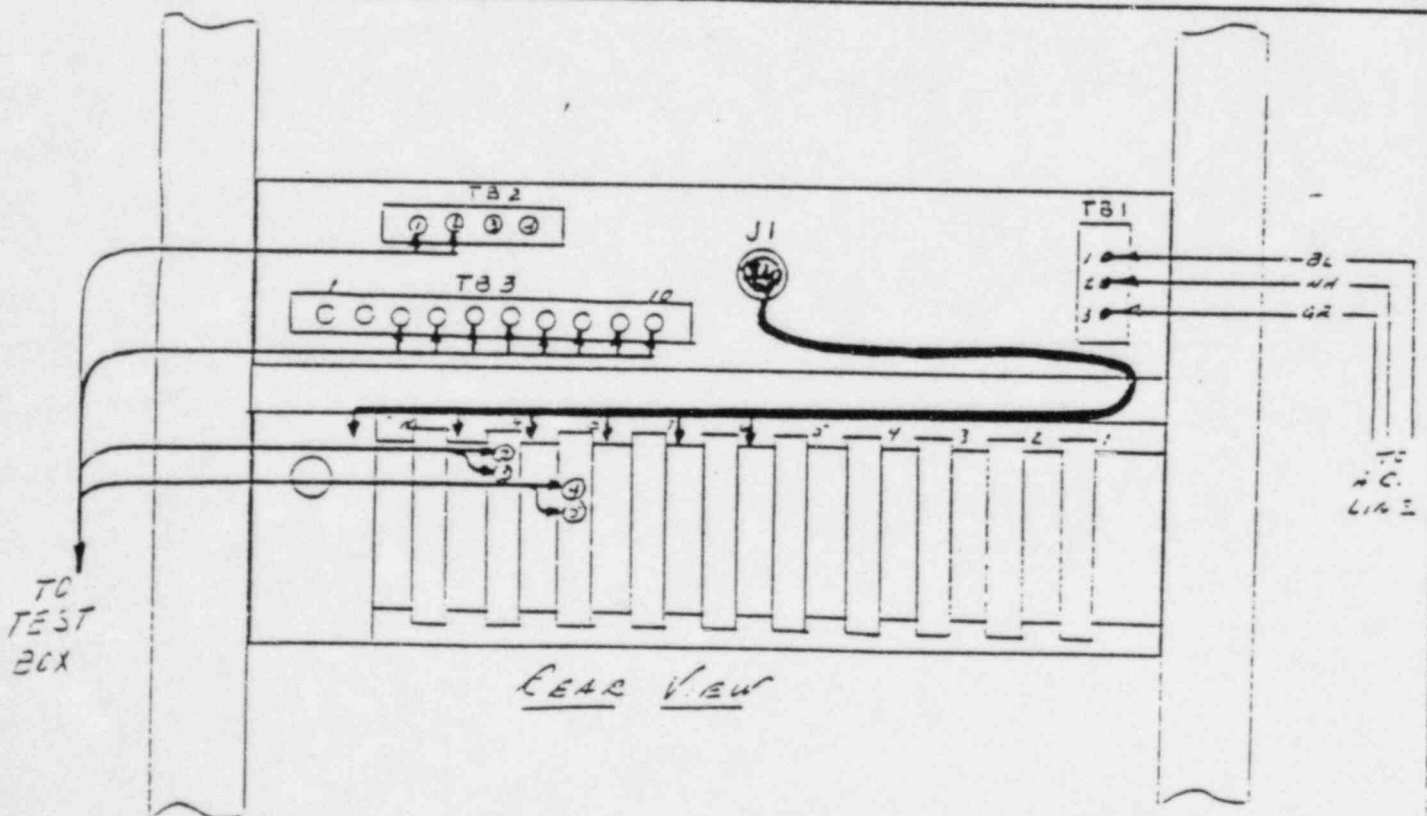


FIGURE 1B

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STANDING INSTRUCTIONS

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- 4.1.3 Connect the negative lead of the high potential tester to the chassis ground at TB1-3 of the display panel or the ground terminal of the cage assembly. The test voltage shall be 1225 ± 25 VAC and shall be applied to each of the following points individually for a minimum of 60 seconds:

- a) With S2 "Off" and S1 in the "Pre-Amp Zero" position:

Chassis To Cage Assembly Point

AC
A10-1
↓ -4
A10-5
A9-1
↑ -2
↓ -3
↓ -4
A9-5
A8-4
A8-5

A6-5
↑ -6
↓ -8
A6-9

To Display Panel Point

Chassis To TB2-1
TB2-2

- b) With S2 "Off" and S1 in the "Read" position:

Chassis To Display Panel Point

TB3-3
↑ -4
↓ -5
↓ -6
↓ -7
↓ -8
↓ -9
Chassis To TB3-10

- c) With S2 "Off" and S1 in the "Set" position:

Chassis to TB3-1 of the Display Panel.
Chassis to A7-1 of the Cage Assembly.

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- d) Turn off and disconnect the high potential tester. Re-install the removed boards per drawing 47E238806 and connect to the test box per Figure 1B. Leave all test box switches "Off". Connect the +15 VDC power supply as shown, and set it for approximately +15 V (this setting is not critical).

4.2 Alarm Adjustments

- 4.2.1 Connect the A.C. cord to TB1 as follows:

TB1-1	Black Lead
TB1-2	White Lead
TB1-3	Green Lead

Insert plug into the VARIAC and connect the VARIAC to an A.C. outlet. Measure the A.C. voltage at TB1-1 and TB1-2; adjust the VARIAC for a reading of 120 VAC at these terminals.

- 4.2.2 Depress S2 on the display assembly to "ON" (switch will illuminate when ON) and place S1 to the "SET ALARM" position. (This switch will be referred to as "Analyzer Function Switch" in this procedure).
- 4.2.3 Rotate the "Level Adjust" (R1) knob on the display panel to the full counter clockwise position and note that the % H₂ meter reads zero, then rotate clockwise for a meter indication of 4%.
- 4.2.4 Open the front panel of the card cage assembly and adjust the D.B. knob for relay #2 until the LED #2 extinguishes, then reverse the direction of rotation until the LED illuminates.
- 4.2.5 Vary the "Level Adjust" knob on the display panel slightly to verify that the "LOW" lamp on the display panel illuminates when the meter indicates less than 4% H₂ and extinguishes when the meter indicates greater than 4% H₂. Re-adjust D.B. #2 to provide a $\pm 1/2$ division indication about the 4% level.
- 4.2.6 Rotate the "Level Adjust" knob on the display panel for a reading of 8% H₂ on the panel meter. Adjust the D.B. knob for relay #1 (in the card cage assembly) until the LED #1 illuminates, then reverse the direction until the LED extinguishes.
- 4.2.7 Vary the "Level Adjust" knob on the display panel slightly to verify that the "HIGH" lamp on the display illuminates when the meter indicates greater than 8% H₂ and extinguishes when the meter indicates less than 8% H₂. Re-adjust D.B. #1 to provide a $\pm 1/2$ division indication about the 8% level.
- 4.2.8 If the settings of either the high or low alarm levels cannot be accomplished, contact the Q.C. Engineer or Project Engineer for assistance.

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4.3 Calibration and Span Test

- 4.3.1 Verify that all equipment is connected per Figure 18 and that the VARIAC output is set for 120.0 ± 0.1 VAC. (Refer to paragraphs 4.1.3d and 4.2.2). Verify that S2 is "ON".
- 4.3.2 Adjust the D.C. power supply for approximately +15 VDC (this is not a critical setting) and set the following controls on the test box as indicated below:

S-1	"ON"
Vins	Max. CCW
S-2	"ON"
Vinp	Max. CCW
S-3	"ON"
S-5	Vins
S-8	"OFF" (Center Position)
Rec. Load	IN

All other test box controls are not applicable for this analyzer system.

Depress the "PUSH TO TEST" lamps DS1 and DS2 (High and Low lamps). They shall illuminate when depressed only.

- 4.3.3 Connect a D.V.M. to TP7 (+) and TP8 (-) on the test box and adjust the Vins pot for 0.00 mVDC. Rotate S-5 to the Vinp position and adjust the Vinp pot for $+2.000 \pm 0.010$ VDC.
- 4.3.4 Rotate the analyzer function switch to the "Pre-Amp Zero" position. Note that the % meter indicates 0% ($\pm 1/2$ division). Measure with a D.V.M. the Pre-Amp output and analyzer output terminals to obtain the following:

Pre-Amp Out	=	1.000 ± 0.050 VDC
Analyzer Out	=	1.000 ± 0.050 VDC

Rotate the test box S-5 to Rec. Out 1 and measure TP7 (+) and TP8 (-) for:

Rec. Out 1	=	-1.000 ± 0.050 VDC
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If these values are not obtained contact the Q.C. Engineer or Project Engineer for further direction. Record the above outputs and meter readings. Place S-8 to #1, then to #2 positions; DS2 and DS3 on the test box shall not illuminate for either position of S-8. Record P or F for pass or fail on the data sheet.

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- 4.3.5 Place the analyzer function switch to the "READ" position and record the following on the data sheet:

% MTR	=	Per Data Sheet Req.
Pre-Amp Out	=	↑
Analyzer Out	=	
Rec. Out 1	=	Per Data Sheet Req.
DS2 (S-8-1 & 2)	=	ON
DS3 (S-8-1 & 2)	=	OFF

} Record P/F

- 4.3.6 Adjust Vins for 2.00 ± 0.01 mVDC while maintaining V_{inp} at 2.000 ± 0.010 VDC. Record the required items (Ref. para. 4.3.5) on the data sheet.
- 4.3.7 Adjust Vins for 4.00 ± 0.01 mVDC while maintaining V_{inp} at 2.000 ± 0.010 VDC. Record the required items (Ref. para. 4.3.5) on the data sheet. Note that DS2 may or may not be ON for both positions of S-8. Vary Vins slightly to determine the switch point of the "ON-OFF" state for DS2 and record the millivolt level of the Vins switch point (info only) on the data sheet.
- 4.3.8 Adjust Vins for 6.00 ± 0.01 mVDC while maintaining V_{inp} at 2.000 ± 0.010 VDC. Record the required items (Ref. para. 4.3.5) on the data sheet.
- 4.3.9 Adjust Vins for 8.00 ± 0.01 mVDC while maintaining V_{inp} at 2.000 ± 0.010 VDC. Record the required items (Ref. para. 4.3.5) on the data sheet. Note that DS3 may or may not be ON for both positions of S-8. Vary Vins slightly to determine the switch point of the "ON-OFF" state for DS3 and record the millivolt level of the Vins switch point (info only) on the data sheet.
- 4.3.10 Adjust Vins for 10.00 ± 0.01 mVDC while maintaining V_{inp} at 2.000 ± 0.010 VDC. Record the required items (Ref. para. 4.3.5) on the data sheet.
- 4.3.11 Adjust V_{inp} for 4.000 ± 0.010 VDC (3 atmosphere equivalent) while maintaining Vins at 10.00 ± 0.01 mVDC. Record the required items on the data sheet. (Refer to Figure 2 for approximate outputs).
- 4.3.12 Adjust V_{inp} for 6.000 ± 0.010 VDC (5 atmosphere equivalent) while maintaining Vins at 10.00 ± 0.01 mVDC. Record the required items on the data sheet. (Refer to Figure 2 for approximate outputs).
- 4.3.13 Repeat steps 4.3.3 through and including 4.3.12 except that the input A.C. voltage from the VARIAC shall be set for 90.0 ± 0.1 VAC.

NOTE: For low and high input voltage (4.3.14) steps 4.3.7, 4.3.9 and 4.3.11 are not required.

STANDING INSTRUCTIONS

MISSILE AND SPACE DIVISION

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- 4.3.14 Repeat steps 4.3.3 through and including 4.3.12 except that the input A.C. voltage from the VARIAC shall be set for 132.0 ± 0.1 VAC.
- 4.3.15 Upon completion of step 4.3.14, return the input A.C. voltage from the VARIAC to 120.0 ± 0.1 VAC and place the analyzer function switch to the "SET ALARM" position for the balance of the 24 hour period.
- 4.3.16 Upon completion of the 24 hour period, set V_{in} to 2.000 ± 0.010 VDC and the analyzer function switch to the "READ" position. Perform a 3 point verification check with V_{ins} set to $0.00m$ VDC, $5.00 \pm 0.01m$ VDC and $10.00 \pm 0.01m$ VDC respectively. Record the required items (Ref. para. 4.3.5) on the data sheet. Turn off all equipment and reinstall the resistor removed in step 4.1.2.

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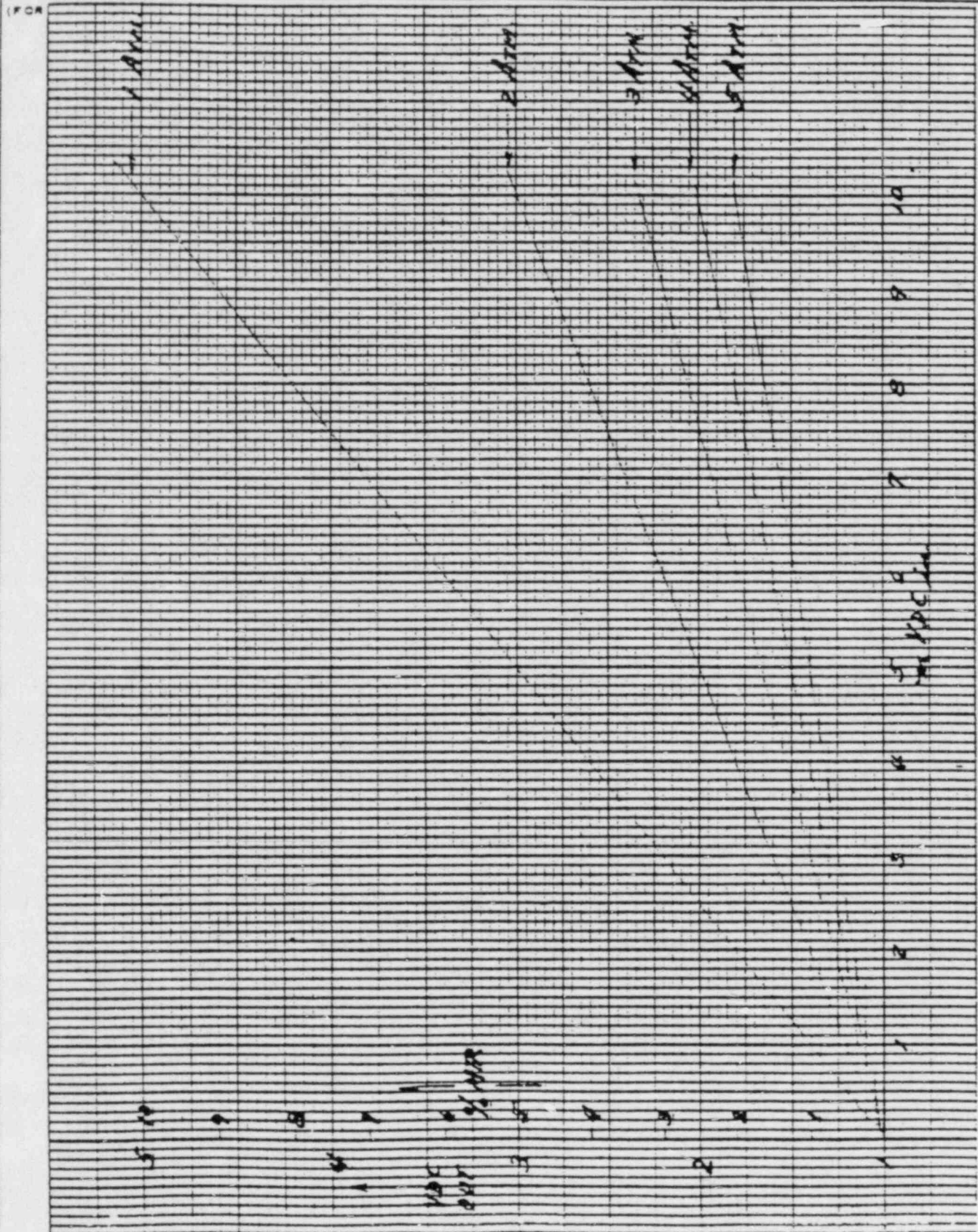


FIGURE 2

STANDING INSTRUCTIONS

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5.0 ACCEPTANCE TEST OF H₂ SENSOR

LATER

STANDING INSTRUCTIONS

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6.0 H₂ ANALYZER SYSTEM

L A T E R

FORM 100-1 (6-65)

SECURITY CLASS.
Unclassified

508-17-18-2

QUALITY CONTROL PERFORMANCE DATA SHEET

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MISSILE AND SPACE DIVISION

SITE RPT. NO. PART/TEST NOMENCLATURE 1 H2 ANALYZER				DRAWING NO. 2 47C238807G		REV/ANG. E. SER. NO.		A.P. VENDOR SER. NO. NA	
REF. RPT. NO.		LEV. TYPE		VEN. NO.		SCHEMATIC NO. 47E238805		REV/AN P.O. D'NO.	
SI/TR. NO. 250029		SI REV. 0		NCS/RVS. NO.		MAT'L LAB RT. MAT'L CERT.		MAT'L LOT	
P.O.S. REV. NEW		P.O.S. REV DT. 4-12-77		U.C.I. NO.		WEIGHT		REQUAL LOT NO. SECURITY CLASS	

TEST EQUIP. USED	EQUIPMENT NAME	21	MAKE	22	MODEL NO	23	IDENT. NO	24	SAL. D. E. DT.

DATE	PARA.	TEST	PASS	FAIL
	4.1	DIELECTRIC TEST		
	4.2	ALARM ADJUSTMENTS		
	4.3	CALIBRATION AND SPAN TEST		

GENERAL ELECTRIC

FORM 7-9407C REV. (7-62)

TESTER		DATE	Q. C. ENG.		DATE	ACC. REACT DATE TYPE	
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208-17-18-2

PERFORMANCE DATA SHEET (Continuation)

REPORT NO.

NOMENCLATURE

H2 ANALYZER

DRAWING NO.

47C238807G

REVISION

EX. SERIAL NO.

SECURITY CLASS

Unclassified

S.I. 250029, REV. New
P.D.S., Rev. New

PARAMETER	REQUIREMENT	120 VAC	90 VAC	132 VAC
4.3.3 Vin _s Setting	0.00±0.1 mVDC			
Vin _p Setting	2.000±0.010 VDC			
4.3.4 % Meter Indication	0% ± 1 Div.			
Pre-Amp Output	1.000±0.050VDC			
Analyzer Output	1.000±0.050VDC			
Rec. #1 Output	-1.000±0.050VDC			
DS2 OFF	Pass/Fail			
DS3 OFF	Pass/Fail			
4.3.5 % Meter Indication	0% ± 1 Div.			
Pre-Amp Output	1.000±0.050VDC			
Analyzer Output	1.000±0.050VDC			
Rec. #1 Output	-1.000±0.050VDC			
DS2 ON	Pass/Fail			
DS3 OFF	Pass/Fail			

PERFORMANCE DATA SHEET (Continuation)

GENERAL ELECTRIC

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REPORT NO.

MONUMENTAL

H2 ANALYZER

DRAWING NO. 47C238807G

REVISION

62 SERIAL NO.

SECURITY CLASS

Unclassified

S.I. 250029, Rev. New
P.O.S., Rev. New

PARAMETER	REQUIREMENT	120 VAC	90 VAC	132 VAC
4.3.6 V_{ins} Setting	2.00 ± 0.01 mVDC			
V_{inp} Setting	2.000 ± 0.010 VDC			
% Meter Indication	$2.0\% \pm 1$ Div.			
Pre-Amp Output	1.800 ± 0.050 VDC			
Analyzer Output	1.800 ± 0.050 VDC			
Rec. #1 Output	-1.800 ± 0.050 VDC			
DS2 ON	Pass/Fail			
DS3 OFF	Pass/Fail			
4.3.7 V_{ins} Setting	4.00 ± 0.01 mVDC		μA	μA
V_{inp} Setting	2.000 ± 0.010 VDC			
% Meter Indication	$4.0\% \pm 1$ Div.			
Pre-Amp Output	2.600 ± 0.050 VDC			
Analyzer Output	2.600 ± 0.050 VDC			
Rec. #1 Output	-2.600 ± 0.050 VDC			
DS3 OFF	Pass/Fail		μA	μA
On-Off Switch Point	Info Only			

W. K. & A. L. ELECTRIC

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SECURITY CLASS

Unclassified

MONTANA

CRAWFORD, M.D.
47C238867G

112 ANALYZER

S.I. 250029, Rev. New
P.D.S., Rev. New

PARAMETER	REQUIREMENT	120 VAC	90 VAC	132 VAC
4.3.8 V_{inS} Setting	6.00±0.01 mVDC			
V_{inP} Setting	2.000±0.010 VDC			
% Meter Indication	6.0% ± 1 Div.			
Pre-Amp Output	3.400±0.050VDC			
Analyzer Output	3.400±0.050VDC			
Rec. #1 Output	-3.400±0.050VDC			
DS2 OFF	Pass/Fail			
DS3 OFF	Pass/Fail			
4.3.9 V_{inS} Setting	8.00±0.01 mVDC			
V_{inP} Setting	2.000±0.010 VDC			
% Meter Indication	8.0% ± 1 Div.			
Pre-Amp Output	4.200±0.050VDC			
Analyzer Output	4.200±0.050VDC			
Rec. #1 Output	-4.200±0.050VDC			
DS2 OFF	Pass/Fail			
ON-OFF Switch Point	Info Only			

PERFORMANCE DATA SHEET (Continuation)

KORAL ELECTRIC
MISSILE AND SPACE DIVISION

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REPORT NO.	INSTRUMENT .H2 ANALYZER	DRAWING NO. 47C238b07G	REVISION	CF SERIAL NO.	SECURITY CLASS Unclassified
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S.I. 250029, Rev. New
P.D.S., Rev. New

PARAMETER	REQUIREMENT	120 VAC	90 VAC	132 VAC
4.3.10 V _{inS} Setting	10.00±0.01 mVDC			
V _{inP} Setting	2.000±0.010 VDC			
% Meter Indication	10.0% ± 1 Div.			
Pre-Amp Output	5.000±0.050VDC			
Analyzer Output	5.000±0.050VDC			
Rec. #1 Output	-5.000±0.050VDC			
DS2 OFF	Pass/Fail			
DS3 ON	Pass/Fail			
4.3.11 V _{inS} Setting	10.00±0.01 mVDC		N/A	N/A
V _{inP} Setting (3 Atm.)	4.000±0.010 VDC			
% Meter Indication	3.3% ± 1 Div.			
Pre-Amp Output	5.000±0.050VDC			
Analyzer Output	2.333±0.050VDC			
Rec. #1 Output	-2.333±0.050VDC			
DS2 ON	Pass/Fail			
DS3 OFF	Pass/Fail		N/A	N/A

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PERFORMANCE DATA SHEET (Continuation)

MILITARY AND SPACE DIVISION

REVISION

SECURITY CLASS

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DRAWING NO.
471238076NOMENCLATURE
112 ANALYZERS.I. 250029, Rev. New
P.D.S., Rev. New

PARAMETER	REQUIREMENT	120 VAC	90 VAC	132 VAC
4.3.12 V_{ins} Setting	10.00 \pm 0.01 mVDC			
V_{inp} Setting (5 atm.)	6.000 \pm 0.01 VDC			
% Meter Indication	2.0% \pm 1 Div.			
Pre-Amp Output	5.000 \pm 0.050VDC			
Analyzer Output	1.800 \pm 0.050VDC			
Rec. #1 Output	-1.800 \pm 0.050VDC			
DS2 ON	Pass/Fail			
DS3 OFF	Pass/Fail			
4.3.16 V_{ins} Setting	0.00 \pm 0.1 mVDC		N/A	N/A
V_{inp} Setting (1 atm.)	2.000 \pm 0.010 VDC			
% Meter Indication	0% \pm 1 Div.			
Pre-Amp Output	1.000 \pm 0.050VDC			
Analyzer Output	1.000 \pm 0.050VDC			
Rec. #1 Output	-1.000 \pm 0.050VDC			
DS2 ON	Pass/Fail			
DS3 OFF	Pass/Fail		N/A	N/A

PERFORMANCE DATA SHEET (Continuation)

S.I. 250029, Rev. New
P.D.S., Rev. New

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INSTRUMENT
H2 ANALYZER

DRAWING NO.

47123080/G

REVISION

G.E. SERIAL NO.

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SECURITY CLASS

Unclassified

PARAMETER	REQUIREMENT	120 VAC	90 VAC	132 VAC
4.3.16 (Cont'd) Vins Setting	5.00±0.01 mVDC		N/A	N/A
Vinp Setting (1 atm.)	2.000±0.010 VDC		↑	↑
% Meter Indication	5% ± 1 Div.			
Pre-Amp Output	3.000±0.050VDC			
Analyzer Output	3.000±0.050VDC			
Rec. #1 Output	-3.000±0.050VDC			
DS2 OFF	Pass/Fail			
DS3 OFF	Pass/Fail			
Vins Setting	10.00±0.01 mVDC			
Vinp Setting (1 atm.)	2.000±0.010 VDC			
% Meter Indication	10% ± 1 Div.			
Pre-Amp Output	5.000±0.050VDC			
Analyzer Output	5.000±0.050VDC			
Rec. #1 Output	-5.000±0.050VDC			
DS2 OFF	Pass/Fail		↓	↓
DS3 ON	Pass/Fail		N/A	N/A