REPORT OF TE

on

MULTICODER

ENVIRONMENTAL

TESTS

for

FIFTH DIMENSION,

INC.

Test Report No. K1178-6396 No. of Pages 40

Report of Test on

MULTICODER

ENVIRONMENTAL TESTS

for

FIFTH DIMENSION INC.

Associated Testing Laboratories, Inc.

Wayne, New Jersey

Date January 21, 1966

	Prepared	Checked	Approved
By	J. McGall	M. Fitzgerald	A. Bunce
Signed	J. McGall	M. Fitzgerald	A. Bunce
Date	1-21-66	1-21-66	1-21-66

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Administrative Data

1.0 Purpose of Test:

To subject the submitted Multicoder to a series of Environmental Tests.

2.0 Manufacturer: Fifth Dimension Inc.
P.O. Box 483
Princeton, New Jersey

3.0 Manufacturer's Type or Model No.: Model HDA4M-839
Serial No. 7243

4.0 Drawing, Specification or Exhibit: Fifth Dimension Inc. "Acceptance Test Procedure for Fifth Dimension Multicoder Model HDA4M-839, NASA Contract No. NAS9-4590" dated September 26, 1965 and Military Specification MIL-STD-810A (USAF).

5.0 Quantity of Items Tested: One

6.0 Security Classification of Items: Unclassified

7.0 Date Test Completed: December 28, 1965

8.0 Test Conducted By: **Associated Testing Laboratories, Inc.**

9.0 Disposition of Specimens: Returned to Fifth Dimension Inc.

10.0 Abstract:

The submitted Multicoder was subjected to a series of Environmental Tests in accordance with the referenced documents. The following is a summary of the results.

10.0 Abstract (Continued)

The Multicoder completed all of the Environmental Tests with no evidence of physical damage, deterioration or corrosion. The sequence in which the Environmental Tests were conducted may be seen in the General section of this report.

The electrical test data recorded by Fifth Dimension Inc. personnel during the test program may be seen in Appendix C of this report. It should be noted that the Multicoder did not operate properly during the Humidity Test as indicated in Fifth Dimension Inc. Humidity Test Failure Analysis contained in Appendix B of this report. At the request of a representative of Fifth Dimension Inc., the Humidity Test was subsequently rerun.

LIST OF APPARATUS

Item	Manufacturer	Model No.	Calibration Date	Calibration Due Date
High Temperature-Low Temperature Humidity Test Chamber	Associated Testing Laboratories, Inc. Manufacturing Div.	LHH-6MR-LC	12-17-65	2-17-66
Vibration System consisting of:	Ling Electronics Corp.		12-2-65	1-2-66
Vibration Exciter		A275		
Power Cubicle		PP-60/100		
Remote Control Console		102		
Accelerometer	Endevco Corporation	2215C	11-27-65	2-27-66
True RMS Voltmeter	Ballantine Laboratories, Inc.	320A	12-2-65	1-2-66
Random Noise Control Console	Ling Electronics Corp.	R-1001-3	11-19-65	12-19-65
Random Noise Generator	General Radio Company	1390B	Calibration not required	
Timer	Dimco-Gray Company	165	7-16-65	1-16-66
Radial Accelerator	Associated Testing Laboratories, Inc. Manufacturing Div.	AC-10,000	Calibration not required	
Electronic Counter	Hewlett-Packard	521AR	10-2-65	1-2-66

Associated Testing Laboratories, Inc.
Wayne, New Jersey
Burlington, Massachusetts

LIST OF APPARATUS (Continued)

Item	Manufacturer	Model No.	Calibration Date	Calibration Due Date
Shock Machine	Associated Testing Laboratories, Inc. Manufacturing Div.	SH-150-400	10-16-65	4-16-66
Acoustic Noise Test Chamber	Associated Testing Laboratories, Inc. Manufacturing Div.	AN-RV-15	Calibration not required	
Acoustic Noise Control Console	Associated Testing Laboratories, Inc. Manufacturing Div.	ANCC-150	12-1-65	6-1-66
Oxygen Atmosphere Chamber	Bethlehem Corporation	——	10-8-65	1-8-66
Oxygen Analyzer	Beckman Instruments, Inc.	777	10-11-65	12-11-65
Altitude Chamber	NRC Equipment Corp.	——	Calibration not required	
Sand and Dust Chamber	Associated Testing Laboratories, Inc. Manufacturing Div.	SD-36-LC	10-28-65	12-28-65
Salt Spray Chamber	Associated Testing Laboratories, Inc. Manufacturing Div.	SS-3-4	11-30-65	1-30-66

Note: All equipment required to perform electrical measurements was supplied by Fifth Dimension Inc.

Associated Testing Laboratories, Inc.
Wayne, New Jersey
Burlington, Massachusetts

GENERAL

Specifications and Sequence of Testing

The Environmental Tests were conducted in accordance with Fifth Dimension Inc. "Acceptance Test Procedure for Fifth Dimension Multicoder Model HDA4M-839, NASA Contract No. NAS9-4590" dated September 26, 1965 and Military Specification MIL-STD-810A (USAF). The sequence of testing was as follows:

Environmental Test	Par. of Acceptance Test Procedure	Method of MIL-STD-810A
Humidity	9.0	507.1
Vibration	6.0	—
Acceleration	3.0	—
Shock	4.0	—
Acoustic Noise	5.0	—
Oxygen Atmosphere	7.0	—
Altitude	2.0	—
Sand and Dust	10.0	510.1
Salt Spray	8.0	509.1
Humidity (Rerun)	9.0	507.1

Electrical Measurements

When specified in the individual Environmental Test Procedures of this report, the Multicoder was monitored for proper operation and subjected to electrical measurements by Fifth Dimension Inc. personnel. At the request of a representative of Fifth Dimension Inc., all electrical test data is included in Appendix C of this report. However, no conclusions regarding the operation of the unit were made by Associated Testing Laboratories, Inc. personnel.

HUMIDITY TEST

TEST PROCEDURE

Prior to performing the Humidity Test, the Multicoder was subjected to electrical measurements (Bench Test). Following the electrical measurements, the Multicoder was placed in a Temperature-Humidity Test Chamber with all necessary electrical connections made through a sealed access port. The Multicoder was then subjected to ten continuous 24-hour temperature-humidity cycles. The relative humidity within the chamber was maintained between 95 and 100% throughout the entire test. The chamber temperature was varied as follows during each of the cycles:

Step 1 - The chamber temperature was increased to +160°F in a two-hour period.

Step 2 - The chamber temperature was maintained at +160°F for a period of six hours.

Step 3 - The chamber temperature was gradually decreased to +80°F in a sixteen-hour period.

The Multicoder was protected from any direct water condensation by means of a stainless steel sloping hood. The velocity of the air throughout the exposure area did not exceed 150 feet per minute and the test chamber was vented to the atmosphere in order to prevent the buildup of pressure. Demineralized water having a pH value of between 6.5 and 7.5 at a temperature of +77°F was used to obtain the desired humidity.

The Multicoder was continuously operated throughout the entire test and subjected to electrical measurements during the first and last hours. At the completion of the 240-hour Humidity Test, the Multicoder was removed from the chamber and visually examined for evidence of deterioration and corrosion. Following the visual examination, the Multicoder was again subjected to electrical measurements.

HUMIDITY TEST

TEST RESULTS

There was no evidence of any deterioration or corrosion of the Multicoder as a result of the Humidity Test.

VIBRATION TEST

TEST PROCEDURE

The Multicoder was mounted to a test fixture which was, in turn, secured to the table of a Vibration Machine. The Multicoder was then subjected to random frequency vibration and to sinusoidal frequency vibration along each of the three mutually perpendicular axes identified in Figure 1. The frequency ranges and applied vibration levels for each test condition are shown in Table I.

Table I

Test Condition	Frequency (cps)	Applied Vibration Level	Time per Axis
Random Vibration (15 g rms overall)	10	0.0573 g^2/cps	15 seconds
	10 - 75	Linear increase to 0.1607 g^2/cps	
	75 - 220	0.1607 g^2/cps	
	220 - 2000	Linear decrease to 0.0573 g^2/cps	
Random Vibration (12 g rms overall)	10	0.0367 g^2/cps	180 seconds
	10 - 75	Linear increase to 0.1028 g^2/cps	
	75 - 220	0.1028 g^2/cps	
	220 - 2000	Linear decrease to 0.0367 g^2/cps	
Sinusoidal Vibration	5 - 10	0.20 inch da	one 10-minute logarithmic sweep from 5 to 2000 to 5 cps
	10 - 18	±1 g peak	
	18 - 56	0.06 inch da	
	56 - 2000	±10 g peak	

VIBRATION TEST

TEST PROCEDURE (Continued)

Prior to performing each random vibration test condition, the test fixture and the Vibration Machine were equalized for the required random frequency vibration levels. The system used for equalization contains 44 parallel bandpass filters with individual attenuators for spectrum shaping. Each filter attenuator has a maximum bandwidth of 50 cycles. The system also contains 44 monitoring circuits which read directly in g^2/cps.

All three test conditions were conducted in one axis of vibration prior to proceeding to another axis. The Multicoder was monitored for proper operation during each axis of vibration. At the completion of each axis, the Multicoder was visually examined for evidence of physical damage. At the completion of the entire Vibration Test, the Multicoder was subjected to electrical measurements.

TEST RESULTS

There was no evidence of physical damage to the Multicoder as a result of the Vibration Test.

ACCELERATION TEST

TEST PROCEDURE

The Multicoder was mounted to a test fixture which was, in turn, secured to the beam of a Radial Accelerator. All necessary electrical connections were made through the slip ring assembly provided with the Accelerator. The Multicoder was then subjected to a sustained acceleration of 40 g for a period of three minutes in each direction of each of the three mutually perpendicular axes identified in Figure 1.

The specified acceleration level was obtained by increasing the speed of the radial accelerator until the required angular velocity was reached. The angular velocity was calculated from the following formula:

$$a = \frac{v^2 R}{32.16} = 1.2276 f^2 R$$

Where:

- a = Acceleration level (g)
- $v = 2\pi f$ = Angular velocity (radians per second)
- f = Frequency (rps)
- R = Distance from the center of the beam to the center of gravity of the unit (feet)

The frequency was determined by means of a magnetic pickup which produces a predetermined number of pulses for each revolution of the accelerator beam. The pulses were measured on an electronic counter.

The Multicoder was monitored for proper operation during each direction of acceleration. At the completion of each direction, the Multicoder was visually examined for evidence of physical damage. At the completion of the entire Acceleration Test, the Multicoder was subjected to electrical measurements.

ACCELERATION TEST

TEST RESULTS

There was no evidence of physical damage to the Multicoder as a result of the Acceleration Test.

SHOCK TEST

TEST PROCEDURE

The Multicoder was mounted to a test fixture which was, in turn, secured to the platform of a Shock Machine. The Multicoder was then subjected to a total of eighteen shock impacts, with three shock impacts being applied in each direction of each of the three mutually perpendicular axes identified in Figure 1. Each shock pulse approximated a one-half sine wave with a peak intensity of 50 g and a time duration of 11 ±1 milliseconds.

The Multicoder was monitored for proper operation during each direction of shock. At the completion of each shock impact, the Multicoder was visually examined for evidence of physical damage. At the completion of the entire Shock Test, the Multicoder was subjected to electrical measurements.

TEST RESULTS

There was no evidence of physical damage to the Multicoder as a result of the Shock Test.

ACOUSTIC NOISE TEST

TEST PROCEDURE

The Multicoder was suspended in an Acoustic Noise Chamber by means of an elastic medium. A calibrated microphone, which was suspended adjacent to the Multicoder, was used to monitor the sound pressure level within the test chamber. All necessary electrical connections were brought out through an access port located in the chamber ceiling. The chamber was then sealed and the Multicoder was subjected to an overall sound pressure level of 144 ±5 db (Reference: 0.0002 dynes per square centimeter) within the frequency range of 37.5 cps to 2000 cps. The noise level was maintained for a period of thirty minutes.

The Multicoder was monitored for proper operation throughout the entire test. At the completion of the Acoustic Noise Test, the Multicoder was removed from the chamber and visually examined for evidence of physical damage. Following the visual examination, the Multicoder was subjected to electrical measurements.

TEST RESULTS

There was no evidence of physical damage to the Multicoder as a result of the Acoustic Noise Test.

OXYGEN ATMOSPHERE TEST

TEST PROCEDURE

The Multicoder was placed in an Oxygen Atmosphere Test Chamber with all necessary electrical connections made through chamber feed-throughs. The chamber was then sealed and the atmosphere within the chamber was adjusted for 100 percent oxygen at a pressure of 7 psia. These conditions were maintained for a period of one hour.

The Multicoder was monitored for proper operation throughout the entire test. At the completion of the Oxygen Atmosphere Test, the Multicoder was removed from the chamber and visually examined for any evidence of physical damage, corrosion or arcing. Following the visual examination, the Multicoder was subjected to electrical measurements.

TEST RESULTS

Visual examination of the Multicoder at the completion of the Oxygen Atmosphere Test revealed no evidence of any physical damage, corrosion or arcing.

ALTITUDE TEST

TEST PROCEDURE

The Multicoder was placed in an Altitude Chamber with all necessary electrical connections made through chamber feedthroughs. The chamber was then sealed and the chamber pressure was reduced to a simulated altitude of 200,000 feet within a period of ten minutes. After reaching 200,000 feet altitude, the chamber pressure was further reduced to 1×10^{-6} millimeters of mercury. The Multicoder was operated throughout the test and subjected to electrical measurements upon reaching a pressure of 1×10^{-6} millimeters of mercury. After completion of the measurements, the chamber pressure was returned to room ambient conditions.

At the completion of the Altitude Test, the Multicoder was removed from the chamber and visually examined for evidence of physical damage. Following the visual examination, the Multicoder was again subjected to electrical measurements.

TEST RESULTS

There was no evidence of physical damage to the Multicoder as a result of the Altitude Test. It should be noted that the lowest chamber pressure obtainable was 1.2×10^{-6} millimeters of mercury. The electrical measurements were therefore performed at this pressure rather than at the required pressure of 1×10^{-6} millimeters of mercury.

The Multicoder was returned to Fifth Dimension Inc. at the completion of the Altitude Test for performance of a Temperature Test.

SAND AND DUST TEST

TEST PROCEDURE

The Multicoder was placed in a Sand and Dust Chamber with all necessary electrical connections made through an access port. The chamber was then sealed and the chamber temperature was increased to and maintained at +77°F for a period of six hours. At the completion of this six-hour period, the chamber temperature was increased to and maintained at +160°F for an additional six-hour period. The chamber temperature was then returned to room ambient temperature.

Throughout the entire Sand and Dust Test, the sand and dust density within the chamber was maintained between 0.1 and 0.25 grams per cubic foot, and the sand and dust velocity was maintained between 100 and 500 feet per minute. The sand and dust used in the test was of an angular structure having the characteristics described in Specification MIL-STD-810A (USAF).

The Multicoder was monitored for proper operation throughout the entire test. At the completion of the Sand and Dust Test, the Multicoder was removed from the chamber and allowed to cool to room ambient temperature. The Multicoder was then visually examined for evidence of physical damage. Following the visual examination, the Multicoder was subjected to electrical measurements.

TEST RESULTS

There was no evidence of physical damage to the Multicoder as a result of the Sand and Dust Test.

SALT SPRAY TEST

TEST PROCEDURE

The Multicoder was suspended in a Salt Spray Chamber by means of nylon cord. The chamber was sealed and the chamber temperature was increased to +95°F and maintained at that temperature for a period of 48 hours. During this 48-hour period, the Multicoder was subjected to the specified salt spray fog.

The salt spray fog was produced using a 5 percent salt solution prepared by dissolving 5 ±0.1 parts by weight of sodium chloride in 95 parts by weight of demineralized water. The sodium chloride contained on the dry basis not more than 0.1 percent of sodium iodide and not more than 0.2 percent of total impurities. The demineralized water contained less than 200 parts soluble solids per million. The solution was adjusted to and maintained at a specific gravity of between 1.023 and 1.037 and at a pH value between 6.5 and 7.2 when measured at a temperature of +95°F.

The Multicoder was continuously operated throughout the entire test and subjected to electrical measurements during the first and last hours. At the completion of the 48-hour Salt Spray Test, the Multicoder was removed from the chamber and all salt deposits were removed. The Multicoder was then visually examined for evidence of deterioration and corrosion. Following the visual examination, the Multicoder was subjected to electrical measurements.

TEST RESULTS

There was no evidence of any deterioration or corrosion of the Multicoder as a result of the Salt Spray Test.

HUMIDITY TEST (RERUN)

TEST PROCEDURE

The Humidity Test was conducted as previously described.

TEST RESULTS

There was no evidence of any deterioration or corrosion of the Multicoder as a result of the rerun of the Humidity Test.

APPENDIX A

FIGURE 1

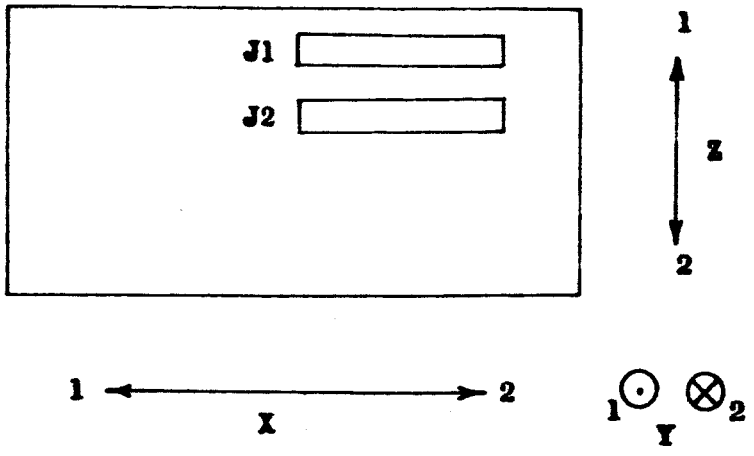

Figure 1

Identification of Axes of Vibration and Directions of Shock

APPENDIX B

HUMIDITY TEST FAILURE ANALYSIS

MEMO

6 January 1966

TO: Quality Control and Reliability Department

FROM: M. Norris

SUBJECT: HDA4M-839 S/N 7243 Humidity Test Failure Analysis

REF: M.O. 2427

The subject micro-miniature multicoder failed during the temperature and humidity cycling test as specified by Nasa Contract NAS9-4590. Improper operation was indicated by a reduction in the PDM output duration from the normal range to a narrow "spike". Since the DPDM circuit is activated by the PDM output, the DPDM output was also improper. The PAM output, however, was normal.

Subsequent investigation determined that comparator transistor Q4 (MCS-2138) in the Keyer circuit was the cause of the failure. This transistor was replaced to resume normal opefation.

Testing of the failed transistor indicated a complete loss of Beta and very high leakage. The transistor has been submitted to the manufacturer (Motorola) for failure analysis.

Myron Norris
Manager Telemetry
Products Officer

APPENDIX C

ELECTRICAL TEST DATA

Model No. HDA-101 S-3 Date 11-17-65

Serial No. 7243 Customer P.O. W15-7590

5-D Spec. P-27 5-D W.O. No. 3427

ELECTRICAL INSPECTION Bench Test

PARA. REF.	TEST	DATA	SPECS.
	System		
2S	Power Reversal Protection	OK	≷ 25 ma
3S	Warm Up Time	< 10 Sec.	≷ 60 Sec.
1S	Wiring: Power Connector	OK	Per. Dwg.
	Data Connectors	OK	Per. Dwg.
4S	Ripple: Sine Wave	< ± 1 %	≷ ± 1% FS
	Square Wave	< ± 1 %	≷ ± 1% FS
5S	Transient Susceptibility	OK	Check
6S	Sampling Rate & Stability	± 1.3 %	10 RPS ± 3%
7S	Input Current	165 ma	≷ 200 ma
8S	Power Noise Feedback	450 mv	≷ 30 mv P-P
9S	Input Impedance	> 1.5 mΩ	≷ 1.5 megohms
10S	Source Impedance	< ± 1 %	≷ ± 1% FS
11S	Overvoltage	< 10 %	≷ 10% Error
12S	Reverse Current	< 1.0 μa	≷ 1.0 μa
13S	Crosstalk	< 0.1 %	≷ 0.1% FS

PARA. REF.	TEST	DATA	SPECS.
	PAM		
14A	Waveform	OK	Check
17A	Duty Cycle	50.4 %	49 - 51%
18A	Pulse Spacing	± 56 μSec.	≷ ± 50μ sec.
19A	Channel Scatter	< 5 mv	≷ 10 mv
20A	Output Noise	< 5 mv	≷ 10 mv
21A	Pulse Spikes	2.6 %	≷ 3%
22A	Synchronization Pulse	5.1 VDC	4.9 - 5.1 VDC
23A	Off Time Voltage	± 35 mv	≷ ± 50 mv
24A	Pulse Rise & Decay Time	R 9.6 F 20.0 μSec.	≷ 30 μSec.
25A	Zero Data Pedestal	1.030 VDC	0.9 - 1.1 VDC
26A	Full Scale Output Amplitude	5.046 VDC	4.9 - 5.1 VDC
27A	Limiting: Positive	5.652 VDC	≷ 6.25 VDC
	Negative	0.770 VDC	≷ 0.5 VDC
28A	Linearity	0.08 %	≷ 0.25% FS
29A	Positive Pulse Stability	± 0.21 %	≷ ± 1% FS

PARA. REF.	TEST	DATA		SPECS.
	PDM			
15D	Waveform	OK		Check
30D	Pulse Amplitude	4.370	VDC	4.1 - 5.1 VDC
31D	Zero Data Pulse Width	112.1	μSec.	100 - 120 μSec.
32D	Full Scale Pulse Width	663.0	μSec.	650 - 670 μSec.
33D	Limiting: Positive	744.8	μSec.	≷ 825 μSec.
	Negative	71.0	μSec.	≷ 50 μSec.
34D	Pulse Width Jitter	0.8	μSec.	≷ 1.4μSec.
35D	Pulse Width Scatter	2.4	μSec.	≷ 1.4μSec.
36D	Pulse Rise Time	0.3	μSec.	≷ 5 μSec.
37D	Linearity	0.03	%	≷ 0.25% FS
38D	Pulse Width Stability	6.4	μSec.	≷ 10 μSec.
	DPDM			
16DP	Waveform	OK		Check
39DP	Output Current Amplitude	+13.6 −11.2	ma	12 - 20 ma.
40DP	Pulse Width	20.5	μSec.	10 - 20 μSec.
41DP	Pulse Rise Time	< 0.1	μSec.	≷ 8 μSec.
40 DP	Overshoot	< 30	%	≷ 30%
40DP	Decay Time	< 50	μSec.	≷ 50 μSec.

Report No. KL178-6396

ENVIRONMENTAL TEST DATA SHEET

Model No. HDMM-839

Serial No. 7243

Test Conducted By C. Mullane

Environment Humidity

Date 11-19-65 TO 11-29-65

Running Time 242

During Environment

PARA. REF.	TEST	DATA (1ST HR.)	240 HR.
2.2.1	Sampling Rate @ 28.0 VDC	100.7 ms	101.0
2.2.2	Input Current @ 28.0 VDC	161 ma	157 ma
2.2.3	PAM Noise	<10 mV	150 mV
2.2.4	PDM Jitter	<1 us	21 us
2.2.5	DPDM Amplitude	+18 ma -17 ma	+16 -15.5 ma
2.2.6	Channel Presence	OK	OK

After Environment

PARA. REF.	TEST	DATA
2.3.1	Sampling Rate @ 22.0 VDC	101.2 ms
	@ 24.0 VDC	101.0 ms
	@ 28.0 VDC	101.0 ms
	@ 32.0 VDC	100.9 ms
	@ 28.0 VDC	
2.3.2	Input Current @ 28.0 VDC	157 ma
2.3.3	PAM Output Amp: Zero	*
	Full Scale	*
2.3.4	PDM Pulse Width: Zero	*
	Full Scale	*
2.3.5	DPDM Amplitude	+15.9 -14.5
2.3.6	PAM Noise	150 mV
2.3.7	PDM Jitter	21 us
2.3.8	Channel Presence	OK

* Unable to check due to Noise and Jitter.

Report No K117B-696 ENVIRONMENTAL TEST DATA SHEET

Model No. HDU4M-837 Environment Random Vibration

Serial No. 7243 Date 12-6-65

Test Conducted By P. Malone Running Time

TEST	DURING ENVIRONMENT						AFTER
AXIS	* Y		* Z		X *		
PARA REF.							
2.3.1 Sampling Rate @ 28.0 VDC	[illegible]		< 10%		< 10%		
@ 22.0 VDC							
@ 24.0 VDC							
@ 32.0 VDC							
2.3.2 Input Current @ 28.0 VDC	172 mA		172 mA		172 mA		
2.3.3 PAM Noise	< 10 mV		< 10 mV		< 10 mV		
2.3.7 PDM Jitter	2.0 μs		1.6 μs		1.6 μs		
2.3.5 DPDM Amplitude	OK		OK		OK		
2.3.8 Channel Presence	OK		OK		OK		
2.3.3 PAM Output Amp: Zero							
Full Scale							
2.3.4 PDM Pulse Width: Zero							
Full Scale							

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ENVIRONMENTAL TEST DATA SHEET

Model No. HDDM-853 | Environment Sine Vibration

Serial No. | Date 12-6-65

Test Conducted By E. Hamilton | Running Time 3.0 HRS

TEST	DURING ENVIRONMENT						AFTER
AXIS	Y		Z		X		
PARA REF.							
3.3.1 Sampling Rate @ 28.0 VDC	< 1%		< 1%			< 1%	100.6 ms
@ 22.0 VDC							100.7 ms
@ 24.0 VDC							100.6 ms
@ 32.0 VDC							100.6 ms
3.3.2 Input Current @ 28.0 VDC	172 ma		172 ma			172 ma	172 ma
3.3.5 PAM Noise	< 10 mV		< 10 mV			< 10 mV	< 10 mV
3.3.7 PDM Jitter	1.2 μs		1.2 μs			1.2 μs	1.0 μs
3.3.3 DPDM Amplitude	OK		OK			OK	OK
3.3.8 Channel Presence	OK		OK			OK	OK
3.3.3 PAM Output Amp: Zero							1.031 VDC
Full Scale							5.012 VDC
3.3.4 PDM Pulse Width: Zero							111 μs
Full Scale							662 μs

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ENVIRONMENTAL TEST DATA SHEET

Model No. HDP4M-839

Serial No. 7243

Test Conducted By E. Pierce

Environment Acceleration

Date 12-7-65

Running Time 2.5 HRS.

TEST	DURING ENVIRONMENT						AFTER
AXIS	X		Y		Z		
PARA REF. Direction	1	2	1	2	1	2	
3.3.1 Sampling Rate @ 28.0 VDC	<1%	<1%	<1%	<1%	<1%	<1%	100.6 ms/div
@ 22.0 VDC							100.7 ms
@ 24.0 VDC							100.6 ms
@ 32.0 VDC							100.5 ms
3.3.2 Input Current @ 28.0 VDC	178 ma	172 ma	174 ma	174 ma	178 ma	176 ma	167 ma
3.3.5 PAM Noise	<10 mV	<10 mV	<10 mV	<10 mV	<10 mV	<10 mV	<10 mV
3.3.7 PDM Jitter	1.6 ms	1.6 ms	1.6 ms	1.6 ms	1.6 ms	1.6 ms	1.6 ms
3.3.3 DPDM Amplitude	OK	OK	OK	OK	OK	OK	OK
3.3.8 Channel Presence	OK	OK	OK	OK	OK	OK	OK
3.3.3 PAM Output Amp: Zero							1.035
Full Scale							5.045
3.3.4 PDM Pulse Width: Zero							112
Full Scale							661

No. K1178-6396

ENVIRONMENTAL TEST DATA SHEET

No. HDA4M-839 Environment Shock

I No. 7243 Date 12-7-65

Conducted By E. Newton Running Time 2.25 HRS.

TEST	DURING ENVIRONMENT						AFTER
AXIS	X		Y		Z		
Direction	1	2	1	2	1	2	
Sampling Rate @ 28.0 VDC	<1%	<1%	<1%	<1%	<1%	<1%	100.5 ms/pt
@ 22.0 VDC							100.6 ms
@ 24.0 VDC							100.5 ms
@ 32.0 VDC							100.5 ms
Input Current @ 28.0 VDC	[illegible]	173 ma	172 ma	170 ma	173 ma	172 ma	172 ma
PAM Noise	[illegible]	<10 mV	<10 mV	<10 mV	<10 mV	<10 mV	<10 mV
PDM Jitter	1.4 MS	1.4 MS	1.4 MS	1.4 MS	1.4 MS	1.4 MS	1.0 MS
PPDM Amplitude	OK	OK	OK	OK	OK	OK	OK
Channel Presence	OK	OK	OK	OK	OK	OK	OK
PAM Output Amp: Zero							1.040 VDC
Full Scale							5.055 VDC
PDM Pulse Width: Zero							111 µs
Full Scale							663 µs

Report No. K1178-0396

ENVIRONMENTAL TEST DATA SHEET

Model No. HDAUM-839 Environment Acoustic Noise

Serial No. 7243 Date 12-8-65

Test Conducted By E. Morrison Running Time 1.0 HRS.

During Environment			After Environment		
PARA. REF.	TEST	DATA	PARA. REF.	TEST	DATA
2.2.1	Sampling Rate @ 28.0 VDC	2 1/2 P-P	2.3.1	Sampling Rate @ 22.0 VDC	100.7ms
2.2.2	Input Current @ 28.0 VDC	176 mA		@ 24.0 VDC	100.7 ms
2.2.3	PAM Noise	<10 mV		@ 28.0 VDC	100.7ms
2.2.4	PDM Jitter	1.4ms		@ 32.0 VDC	100.7ms
2.2.5	DPDM Amplitude	OK		~~@ 28.0 VDC~~	
2.2.6	Channel Presence	OK	2.3.2	Input Current @ 28.0 VDC	170 mA
			2.3.3	PAM Output Amp: Zero	1,040
				Full Scale	5,052
			2.3.4	PDM Pulse Width: Zero	111.0 ms
				Full Scale	66.3 ms
			2.3.5	DPDM Amplitude	OK
			2.3.6	PAM Noise	<10 mV
			2.3.7	PDM Jitter	1.0 ms
			2.3.8	Channel Presence	OK

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Report No. K1178-596

ENVIRONMENTAL TEST DATA SHEET

Model No. HDMM-839

Serial No. 7243

Test Conducted By E. Newborn

Environment Oxygen Atmosphere

Date 12-8-65

Running Time 1.5 HRS.

During Environment

PARA. REF.	TEST	DATA
2.2.1	Sampling Rate @ 28.0 VDC	2 1/2 P-P
2.2.2	Input Current @ 28.0 VDC	170 ma
2.2.3	PAM Noise	<10MV
2.2.4	PDM Jitter	1.0 uS
2.2.5	DPDM Amplitude	OK
2.2.6	Channel Presence	OK

After Environment

PARA. REF.	TEST	DATA
2.3.1	Sampling Rate @ 22.0 VDC	100.6 ms/R.V.
	@ 24.0 VDC	100.5 ms
	@ 28.0 VDC	100.5 ms/REV.
	@ 32.0 VDC	100.4 ms
	~~@ 28.0 VDC~~	
2.3.2	Input Current @ 28.0 VDC	167 ma
2.3.3	PAM Output Amp: Zero	4.052 VDC
	Full Scale	5.053 VDC
2.3.4	PDM Pulse Width: Zero	111.0 uS
	Full Scale	660 uS
2.3.5	DPDM Amplitude	OK
2.3.6	PAM Noise	<10mV
2.3.7	PDM Jitter	1.0 uSec
2.3.9	Channel Presence	OK

Report No. KIL78-9396

ENVIRONMENTAL TEST DATA SHEET

Model No. HDA-M-839

Serial No. 7243

Test Conducted By P. Newburn

Environment Altitude

Date 12-8-65

Running Time 15.5 HRS

During Environment

PARA. REF.	TEST	DATA
2.2.1	Sampling Rate @ 28.0 VDC	100.0 msec
2.2.2	Input Current @ 28.0 VDC	155 ma
2.2.3	PAM Noise	<10mV
2.2.4	PDM Jitter	1.0 us
2.2.5	DPDM Amplitude	OK
2.2.6	Channel Presence	OK

After Environment

PARA. REF.	TEST	DATA
2.3.1	Sampling Rate @ 22.0 VDC	102.6 ms
	@ 24.0 VDC	101.3 ms
	@ 28.0 VDC	100.1 ms
	@ 32.0 VDC	100.4 ms
	~~@ 28.0 VDC~~	
2.3.2	Input Current @ 28.0 VDC	155 ma
2.3.3	PAM Output Amp: Zero	1.041 VDC
	Full Scale	5.03 VDC
2.3.4	PDM Pulse Width: Zero	111 us
	Full Scale	660 us
2.3.5	DPDM Amplitude	OK
2.3.6	PAM Noise	<10mV
2.3.7	PDM Jitter	1.0 us
2.3.8	Channel Presence	OK

12-11-65

PERFORMANCE DATA OVER TEMPERATURE

Frame Rate

Temp. Deg. F.	Frame Rate	Power Input Voltage In VDC 22.0	24.0	28.0	32.0	Current @ 28.0 VDC
+72	ms/Rev.	100.8	100.6	100.7	100.6	161
+160	ms/Rev.	101.4	101.3	101.3	101.2	168
+230	ms/Rev.	101.3	101.2	101.3	101.2	163
-30	ms/Rev.	100.0	100.0		99.9	110-220
+72	ms/Rev.	100.9	100.8	100.8	100.8	159

Parameter		Temp. Deg. F. +72	+160	+230	-30	+72	Power In VDC
PAM Noise	mv	<10mV	<10mV	<10mV	<10mV	<10mV	28.0
PDM Jitter	μSec.	0.8μs	0.9μs	0.8μs	0.8μs	0.8μs	28.0
DPDM Amp.	ma.	+11.2 -13.4	+11.3 -13.6	+11.4 -13.4	+11.2 -13.4	+11.4 -13.9	28.0

Running Time 1.5 HRS.

Electrical Inspection by [signature]

PERFORMANCE DATA OVER TEMPERATURE

PAM

Temp. Deg. F.	Pulse Amp..	Signal Input In VDC						Power In VDC
		0	1.0	2.0	3.0	4.0	5.0	
+ 72	VDC	1.030	1.835	2.638	3.437	4.246	5.045	28.0
+ 160	VDC	1.040	1.846	2.646	3.450	4.254	5.054	28.0
+ 230	VDC	1.035					5.052	28.0
- 30	VDC	1.019	1.820	2.621	3.425	4.230	5.030	28.0
+ 72	VDC	1.030	1.838	2.640	3.441	4.246	5.046	28.0

PDM

Temp. Deg.F.	Pulse Width	Signal Input In VDC						Power In VDC
		0	1.0	2.0	3.0	4.0	5.0	
+ 72	Sec.	112	222	332	442	552	662	28.0
+ 160	Sec.	113	224	335	446	557	668	28.0
+ 230	Sec.	113					670	28.0
- 30	Sec.	110	220	330	440	550	660	28.0
+ 72	Sec.	112	222	332	442	554	664	28.0

INSTRUMENT CALIBRATION

TYPE & MODEL	SERIAL NO.	DATE CAL. DUE	STANDARDIZED TOL.
Scope 535 A	26409	3-3-66	Vert. ± 3% H.T. ± 1%
Preamp Z	4137	1-7-66	± 0.3 5%
Counter 523DR	654	3-7-66	± 1 Count
Voltmeter C	905290	2-17-66	± 0.5%
Ammeter [illegible]	905290	2-17-66	± 0.5%
Voltmeter 801B	1739	1-7-66	± 0.05%

Mechanical Inspection

Outline Size

Finish

Mating Connectors

Total Running Time

Mechanical Inspection By _____

Final Acceptance By _____

Report No. E1178-6396

ENVIRONMENTAL TEST DATA SHEET

Model No. HDMM-839

Environment Sand & Dust

Serial No. 7243

Date 12-14-65

Test Conducted By P. Thurlow

Running Time 4.5 HRS.

During Environment

PARA. REF.	TEST	DATA
2.2.1	Sampling Rate @ 28.0 VDC	100.8 ms
2.2.2	Input Current @ 28.0 VDC	165 ma
2.2.3	PAM Noise	<10 mV
2.2.4	PDM Jitter	0.8 µs
2.2.5	DPDM Amplitude	OK
2.2.6	Channel Presence	OK

After Environment

PARA. REF.	TEST	DATA
2.3.1	Sampling Rate @ 22.0 VDC	100.8 ms
	@ 24.0 VDC	100.6 ms
	@ 28.0 VDC	100.6 ms
	@ 32.0 VDC	100.6 ms
	~~@ 28.0 VDC~~	
2.3.2	Input Current @ 28.0 VDC	165 ma
2.3.3	PAM Output Amp: Zero	1.037 VDC
	Full Scale	5.050 VDC
2.3.4	PDM Pulse Width: Zero	111.0 µs
	Full Scale	6.2 µs
2.3.5	DPDM Amplitude	OK
2.3.6	PAM Noise	<10 mV
2.3.7	PDM Jitter	0.8 µs
2.3.8	Channel Presence	OK

Report No. KI178-6396

ENVIRONMENTAL TEST DATA SHEET

Model No. HDA4M-839

Environment SALT FOG

Serial No. 7243

Date 12-14-65 TO 12-16-65

Test Conducted By P. Paulsen

Running Time 51.0 HRS.

During Environment

PARA. REF.	TEST	1st HR. DATA	48TH HR.
2.1	Sampling Rate @ 28.0 VDC	100.6	100.7
2.2	Input Current @ 28.0 VDC	165ma	156 ma
2.3	PAM Noise	<10 mV	<10mV
2.4	PDM Jitter	0.8 μs	0.8 μs
2.5	DPDM Amplitude	OK	OK
2.6	Channel Presence	OK	OK

After Environment

PARA. REF.	TEST	DATA
2.3.1	Sampling Rate @ 22.0 VDC	101.1 ms/REV
	@ 24.0 VDC	101.0 ms
	@ 28.0 VDC	100.1 ms
	@ 32.0 VDC	100.1 ms
	~~@ 28.0 VDC~~	
2.3.2	Input Current @ 28.0 VDC	156 ma.
2.3.3	PAM Output Amp: Zero	1.039 VDC
	Full Scale	5.054 VDC
2.3.4	PDM Pulse Width: Zero	112 μsec.
	Full Scale	650 μsec.
2.3.5	DPDM Amplitude	+10.4 ma -12.5 ma
2.3.6	PAM Noise	<10 mV
2.3.7	PDM Jitter	0.8 μsec
2.3.8	Channel Presence	OK

Report No. K1178-6396

ENVIRONMENTAL TEST DATA SHEET

Model No. HDMM-839

Serial No. 7243

Test Conducted By S. Mendoza

Environment Humidity

Date 12-17-85 To 12-27-85

Running Time 242 HRS.

During Environment

PARA. REF.	TEST	1ST. HR. DATA	240TH. HR.
2.2.1	Sampling Rate @ 28.0 VDC	100.5ms	100.4ms
2.2.2	Input Current @ 28.0 VDC	157ma	158ma
2.2.3	PAM Noise	<10 mV	<10 mV
2.2.4	PDM Jitter	0.8 us.	0.8 us.
2.2.5	DPDM Amplitude	ok	ok
2.2.6	Channel Presence	ok	ok

After Environment

PARA. REF.	TEST	DATA
2.3.1	Sampling Rate @ 22.0 VDC	100.5 ms
	@ 24.0 VDC	100.4 ms
	@ 28.0 VDC	100.4 ms
	@ 32.0 VDC	100.3 ms
	~~@ 28.0 VDC~~	
2.3.2	Input Current @ 28.0 VDC	157 ma
2.3.3	PAM Output Amp: Zero	1.040 VDC
	Full Scale	5.055 VDC
2.3.4	PDM Pulse Width: Zero	112 nSec.
	Full Scale	652 nSec.
2.3.5	DPDM Amplitude	+10.1 ma -13.0 ma
2.3.6	PAM Noise	<10 mV
2.3.7	PDM Jitter	1.0 us.
2.3.8	Channel Presence	OK