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DOUGLAS

MISSILE & SPACE SYSTEMS DIVISION
DOUGLAS AIRCRAFT CO. INC

ENGINEERING LABORATORIES & SERVICES
TECHNICAL MEMORANDUM

CATALOG NO. PDL 58756

REPORT NO. TM-DSV48-ENV-R5130-1

DATE 11-23-65

REQUESTED BY R. M. Gunn, A3-860

F.W.O. 27394 T.O. 1T00621

TEST PLAN & ITEM NO. W43B 41432

ATLS ORDER 5769-6504

CLASSIFICATION OR RESTRICTION: UNCLASSIFIED

TO: H. T. Sorensen, A-290

FROM: T. J. Sereno, A-270; ext. 2461

SUBJECT: LH_2 CHILLDOWN FLOWMETER VIBRATION AND SHOCK TESTS

COPIES TO: R. M. Gunn, A3-860; W. L. Woodcock, A3-860; C. Hansen, A3-KCDA; N. Mincks, A3-KABC; H. B. Mitchell, A3-VCL; J. Hilmann, A3-KADO; F. Sellers, A2-263; C. J. Wilson A3-KEDO NASA

INTRODUCTION

Sinusoidal sweeps, random vibration, and shock tests were conducted at low temperatures for qualification testing of a partial section of the liquid hydrogen chilldown system. The test specimen included the following test plan items (TPI); chilldown system shutoff valve (TPI F-14), LH_2 chilldown flowmeter (TPI W-43B), and recirculation duct assembly (TPI F-8). Testing of TPI W-43B is covered in this technical memorandum; testing of TPI F14 and F8 is covered in separate technical memoranda.

The tests were conducted by United Aerotest Laboratories Corporation, at the remote test facility, Jack Rabbit Trail, Beaumont, California, from July 2 through July 23, 1965.

PURPOSE

The purpose of the tests was to determine the ability of the test specimen to withstand vibration, shock and low temperature environments.

The purposes of this technical memorandum are to describe and document the vibration and shock portions of the test and to transmit the vibration and shock data obtained from the tests.

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FORM 850-2 (9-66)

DOUGLAS	DOUGLAS AIRCRAFT CO., INC. MISSILE & SPACE SYSTEMS DIVISION SANTA MONICA, CALIFORNIA	QUALIFICATION STATEMENT	[X] DE/Q TEST [ ] FORMAL QUAL

PROGRAM SATURN S-IVB	MODEL DSV-4B	TEST PLAN LINE ITEM NUMBER W-43B

TEST PLAN LINE ITEM TITLE: LH_2 CHILLDOWN FLOWMETER

PART NO. 1A89104-503.

TECHNICAL MEMORANDUM NUMBER(S): DSV4B-PL-R5180
DSV4B-ENV-R5180-1

REFERENCE TECHNICAL MEMO. NUMBER(S): NONE

FAILURE AND REJECTION REPORT (FARR) TAG NUMBER(S) AND DISPOSITION

(USE CONTINUATION SHEET AS NECESSARY)

ENGINEERING RESOLUTIONS AND CONCLUSIONS

1. That nominal out-of-tolerance pressure drop measurements during LH_2 calibration, are acceptable in view of the total drop and pump-to-pump variations in the pressure developed.

2. That variations in flow measurements between facility flowmeter and UUT, obtained during vibration and shock tests, are not sufficient cause for failure, retest, or redesign in view of service conditions.

(USE CONTINUATION SHEET AS NECESSARY)

STATEMENT OF QUALIFICATION

Based on the results of design qualification tests presented in the attached report, it is the conclusion of the Douglas Aircraft Company, Inc., that the above item is qualified for use on Saturn S-IVB.

ORIGINATOR R. Ferreira RF. TITLE	DESIGN TECHNOLOGY BRANCH CHIEF	DESIGN TECHNOLOGY CHIEF ENGINEER
RELIABILITY ENGINEERING 11/21/66	PROJECT OFFICE TEST BRANCH	

EQUIPMENT

Test Specimen

The test specimen is described on page A8.

Test Equipment

The test equipment used is described on pages A46 through A51.

Accelerometer locations are shown on page A23. All accelerometers were oriented in the direction of excitation except accelerometer 6, which was oriented in the radial direction during thrust axis excitation and was oriented in the thrust direction during tangential and radial axes excitation.

PROCEDURE

Testing was performed at United Aerotest Laboratories, Beaumont, California, per the procedures described on the following pages:

Vibration and Shock Test Sequence . . . . . Page A8
Pre-Vibration Operational Test . . . . . Pages A9 through A12
Vibration Test . . . . . Pages A20 through A22
Shock Test . . . . . Pages A42 through A43

Data recorded during the tests were reduced by the Analytical Services Section, group AGC1, at Douglas Aircraft Company, Santa Monica, California.

RESULTS AND DISCUSSION

Test results are presented as follows:

1. Attachment A contains United Aerotest Laboratories Test Report No. 40965-T-1, dated August 1965, and includes the following:

CONTENTS	PAGE NO.		
Front Matter and Administrative Data	A1	through	A5
References, Requirements, and General Test Notes	A6	through	A8
Pre-Vibration Operational Tests	A9	through	A12
Operational Test Diagrams and Graphs	A13	through	A19
Vibration Tests	A20	through	A22
Accelerometer Locations, Test Data and X-Y Plots	A23	through	A30

RESULTS AND DISCUSSION (continued)

CONTENTS	PAGE NO.
Vibration Test Photographs	A31 through A41
Shock Tests	A42 through A43
Shock Pulses	A44 through A45
Test Equipment List	A46 through A51
Signature Page and Proprietary Note	A52 through A53

2. Attachment B contains the vibration test data which were reduced by group AGCI, and includes the following:

TEST	AXIS	PAGE NO.
Sinusoidal	Thrust	B1 through B22
Sinusoidal	Tangential	B23 through B42
Sinusoidal	Radial	B43 through B65
Random	Thrust	B66 through B75
Random	Tangential	B76 through B85
Random	Radial	B86 through B95

Sinusoidal data consists of plots of acceleration versus frequency and plots of amplification factor versus frequency; random data consists of plots of power spectral density versus frequency.

ORIGINATOR W. M. Slack

W. M. Slack

T. J. Sereno, Section Chief
Acoustics and Dynamics
Environmental Laboratories

ATTACHMENTS

Pages A1 through A53

Pages B1 through B95

Test Report No. 40965-I-1

TEST REPORT
of
VIBRATION AND SHOCK TESTS
conducted on
PARTIAL SECTION OF LH_2 CHILLDOWN SYSTEM
INCLUDING
TURBINE FLOWMETER P/N 1A89104-503
SHUT-OFF VALVE P/N 1A49965-503
RECIRCULATION DUCT ASSEMBLY P/N 1A49966-501
to
DOUGLAS AIRCRAFT COMPANY
SPECIFICATION NUMBER 1T00137 REVISION B

for

DOUGLAS AIRCRAFT COMPANY, INCORPORATED
SANTA MONICA, CALIFORNIA

REFERENCE: PO T & M 03047A-270EF Lot 009

by

UNITED AEROTEST LABORATORIES CORPORATION
973 MONTEREY PASS ROAD
MONTEREY PARK CALIFORNIA

AUGUST 1965

UNITED AEROTEST LABORATORIES

Test Report No. 40965-T-1

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ADMINISTRATIVE DATA

PURPOSE OF TEST	The purpose of this Test Series was to subject a partial Section of the LH_2 Chilldown System to the Vibration and Shock Tests as described in the detail specifications forwarded to United Aerotest Laboratories by Douglas Aircraft Company.
MANUFACTURER	Douglas Aircraft Company, Incorporated 3000 Ocean Park Boulevard Santa Monica, California
MANUFACTURER'S PART NUMBER	Turbine Flowmeter P/N 1A89104-503 Shut-Off Valve P/N 1A49965-503 Recirculation Duct Assembly P/N 1A49966-501
SPECIFICATION REFERENCES	1. Douglas Aircraft Company Shop Order Number 5769-6406, 5769-6504, Purchase Order Number ToM 0304A, Work Order Number A-270-EF-Lot 009 2. S. O. 5769-6406, EWO 27080, TCD 1T00137, Rev. B, dated December 4, 1964 3. S. O. 5769-6406, EWO 27085, TCD 1T00142, Rev. A, dated December 3, 1964 4. S. O. 5769-6504, EWO 23794, TCD 1T00621, "New" dated December 7, 1964 5. U. S. Government Contract No. NAS 7-101
SECURITY CLASSIFICATION OF ITEM TESTED	Unclassified
QUANTITY OF ITEMS TESTED	One Partial Section of LH_2 System, consisting of: One Turbine Flowmeter P/N 1A89104-503 One Shut-Off Valve P/N 1A49965-503 One Recirculation Duct Assembly P/N 1A49966-501 None of the above items were identified with Serial Numbers
TESTS CONDUCTED BY	United Aerotest Laboratories Corporation 573 Monterey Pass Road Monterey Park, California

UNITED AEROTEST LABORATORIES

Test Report No. 40965-T-1

ADMINISTRATIVE DATA
(continued)

TESTS CONDUCTED AT

United Aerotest Laboratories Corporation
Remote Test Facility
Jack Rabbit Trail
Beaumont, California

DISPOSITION OF SPECIMEN

Upon completion of the tests described in this Test Report, the specimen was forwarded to Douglas Aircraft Company, in Santa Monica, California, along with the Test Fixture, the Aft Skirt Assembly, and the associated Mounting Brackets and Piping.

NOTICE

Page 1 (of 2) of Work Order Number A-270-EF-Lot-009 identifies the test specimen(s) as follows:

1A 49996-501, Recirculation Duct Assembly
1A 49965-503, Shut-Off Valve
1A 89104-503, Chilldown Flowmeter

All applicable documents with the exception of the stated Work Order identify the Recirculation Duct Assembly as 1A 49966-501, and this Test Report includes this designation, on the assumption that the Work Order contains a typographical error.

UNITED AEROTEST LABORATORIES

1.0 SPECIFICATION REFERENCES AND REQUIREMENTS

In accordance with the authority issued to United Aerotest Laboratories Corporation with Purchase Order Number I & M 0304A, Work Order Number A-270-EF-Lot 009, and Shop Order Number 5769-6404, 5769-6504, Vibration and Shock Tests were conducted on one partial section of the LH_2 (Liquid Hydrogen) Chilldown System, consisting of:

One Turbine Flowmeter, P/N 1A89104-503

One Shut-off Valve P/N 1A49965-503

One Recirculation Duct Assembly, P/N 1A49966-501

Forwarded with the above items was a Test Fixture, DAC No. 1T01062, and an Aft Skirt Assembly, P/N 1A58638-1, with associated mounting brackets and piping, for use during the installation of the test specimen during the applied environments.

UNITED AEROTEST LABORATORIES

2.0 GENERAL NOTES

2.1 AMBIENT CONDITIONS

Unless otherwise stated in the body of this Report, "Ambient Conditions" are defined as room ambient temperature of 78° ± 18°F, relative humidity of less than 90 percent and atmospheric pressure of 32.0 ± 2.0 inches of mercury.

2.2 TEST EQUIPMENT

All test equipment and apparatus used during the performance of tests as described herein is calibrated at intervals sufficient to assure continued accuracy and repeatability of recorded measurements. Calibration records are maintained in accordance with good engineering practice and are available to authorized personnel for study on request.

All Vibration and Shock Systems are calibrated immediately before each successive use.

All calibration standards are traceable to the National Bureau of Standards, and certifications are retained on file for study by authorized personnel on request.

2.3 TOLERANCES ON TEST CONDITIONS AND INSTRUMENTATION

During the tests as described in this Report, tolerances on test conditions and instrumentation did not, at any time, exceed the following parameters:

	Conditions	Instruments
Temperature (-65° to 165°F)	± 3.0°F	± 2.0°F
Temperature (-65° or less)	± 10.0°F	± 10.0°F
Vibration, Sinusoidal		
Frequency	-------	± 2.0% (or one cycle)
Intensity	-------	± 10.0%
Vibration, Random		
Spectral Density	± 10.0%	± 10.0%
Shock, Magnitude	-------	± 10.0%
Time (milliseconds)	-------	± 10.0%

2.4 TEST SPECIMEN

The test specimen submitted to United Aerotest Laboratories Corporation was identified as a Partial Section of the LH_2 (Liquid Hydrogen) Chilldown System, and consisted of the following identified items:

One Turbine Flowmeter	P/N 1A89104-503
One Shut-Off Valve	P/N 1A49965-503
One Recirculation Duct Assembly	P/N 1A49966-501

The specimen was not identified with a specific Part Number, and will be referenced in this Test Report as the "Specimen".

Forwarded with the Specimen was a Test Fixture (DAC No. 1T01062), and an Aft Skirt Assembly (DAC No. 1A58638-1), with associated mounting brackets and piping, for use during the installation of the Specimen for the environmental exposures.

There was no evidence of pre-test damage to or deformation of any portion of the specimen or associated material when the assembly was received at United Aerotest Laboratories Remote Test Facility at Beaumont, California.

2.5 VIBRATION AND SHOCK TEST SEQUENCE

Vibration and Shock Tests were conducted in sequence as follows:

Vibration - Sinusoidal - Thrust Axis
Vibration - Random - Thrust Axis
Shock - Thrust Axis
Vibration - Sinusoidal - Tangential Axis
Vibration - Random - Tangential Axis
Shock - Tangential Axis
Vibration - Sinusoidal - Radial Axis
Vibration - Random - Radial Axis
Shock - Radial Axis
Vibration - Random - Thrust Axis - Re-test
Vibration - Random - Tangential Axis - Re-test

3.0 DISCUSSION OF TESTS

3.1 PRE-VIBRATION OPERATIONAL TEST

3.1.1 REQUIREMENT

Reference: Memo dated 5-14-65 from E. C. See, A-293 to D. A. Forge, A-293

The specimen shall be subjected to environmental conditions as described in the referenced Memorandum, and all data and observations shall be noted and recorded.

3.1.2 TEST PROCEDURE

The specimen was installed in the Test System illustrated in Figure No. 1 and mounted on the head of an electro-dynamic vibration exciter.

The Liquid Hydrogen (LH_2) flow lines and associated equipment was installed and connected to the shut-off valve inlet and the Specimen outlet. A 10 micron filter was installed in the LH_2 inlet line, immediately upstream of the shut-off valve, and a turbine type Flowmeter installed in the System (identified as "Secondary Flow Meter" in Figure No. 1).

The DAC furnished indicating panel was electrically connected to the connector on the shut-off valve. A regulated pressure helium supply was provided (at 475 + 25 psig) to the 3-way solenoid valve, to provide closure of the shutoff valve.

Flexible lines were attached to all conoseal flange leak check ports, and during all subsequent vibration and shock tests, these lines were continuously monitored for evidence of leakage (by the water displacement method), and all observations noted and recorded.

The frequency output signal from the primary coil of the specimen flowmeter was displayed on the face of an oscilloscope during the imposed vibration and shock tests, and photographically recorded by means of a Polaroid Camera during critical phases of the tests.

3.1.2 Test Procedure - Pre-Vibration Operational Tests - continued

The output signal from the coil was also presented to an AC to DC signal converter, and the output signal from the Converter continuously recorded on a strip-chart recorder.

The Secondary Flow Meter was installed in the test system to indicate LH_2 flow rate and the output from this Flow Meter was also presented to an AC to DC signal converter and recorded as described immediately above.

All temperature transducers illustrated in Figure No. 1 were electrically connected to circuitry which permitted continuous recording of the temperature levels, and means were established to permit correlation of time to temperature during all periods when the temperature level was -423° ± 10°F.

A signal generator was used to provide a test signal into the secondary coil (Pins A and B) of the specimen flowmeter, and the output signal from the primary coil (Pins C and D) continuously recorded during the subsequent environmental exposures.

With conditions established as described herein, gaseous Helium was applied to the test system and the pressure increased to 60 ± 5 psig, and the complete System carefully checked for external leakage, by means of a Helium Leak Detector, and a Soap Bubble solution.

When it was established that the system included no leaks, the Test System was purged with gaseous Helium, and care was taken to assure control of the flow through the system so as not to overspeed the turbine flowmeter.

Figure No. 2 included with this Report further illustrates the Test System and associated instrumentation during the test as described herein.

3.1.2 Test Procedure - Pre-Vibration Operational Tests - continued

Immediately prior to the Vibration and Shock Tests, the following steps were conducted in the sequence listed:

1. The shut-off valve was energized to the Closed Position, and the valve position on the Shut-Off Valve Indicating Panel Display noted.
2. The LH_2 Inlet Line up to the Shut-Off Valve Inlet was chilled.
3. The Shut-Off Valve was de-energized to the Open Position, and the Valve position on the Shut-Off Valve Indicating Panel Display noted.

During the above steps, care was exercised to assure that the turbine flowmeter was not subjected to excessive speed.

During the Vibration and Shock Tests, the following steps were conducted;

1. Liquid Hydrogen was permitted to flow through the LH_2 System and the associated test assembly at a controlled rate of 160 gpm.
2. During the flow of LH_2 the conoseal flanges were continuously monitored for evidence of hydrogen leakage, and all observations noted and recorded.
3. The Shut-Off Valve was cycled five times during the application of vibration along each of the three respective axes, and the valve-positioning and micro-switch operation displayed on the Shut-Off Valve Indicating Panel continuously monitored.
4. Vibration and Shock was applied to the specimen as described in Sections 3.2 and 3.3 of this Report, and all observations noted and recorded.
5. During all vibration and shock periods, the output signals from the turbine flowmeter and the line flowmeter (Secondary Flow Meter) were continuously monitored and recorded.

3.1.2 Test Procedure - Pre-Vibration Operational Tests - continued

6 The turbine flowmeter body temperature was continuously monitored and recorded during all periods when the temperature of the specimen was at -423° ± 10°F.

7 The output sinusoidal wave form during all critical phases of the test was photographed by means of a Polaroid Camera.

3.1.3 RESULTS OF TEST

All recordings generated during the test periods are presented with Copy Number 1 of this Test Report.

Reproductions of the oscilloscope presentations of the sinusoidal wave forms are presented with this Test Report.

The thermocouples were located as follows during the flow periods

1 Outlet of the LH_2 Pump, upstream of the LH_2
2 Skin (temperature) of the Specimen Valve
3 Skin (temperature) of the Specimen Flow Meter
4 Skin (temperature) of extreme Outlet of the Specimen Duct Assembly

It was noted that the data from Thermocouples No. 1, 2, and 3 (above) was recorded as approximately -420°F, and Thermocouple No. 4 was noted as approximately -400°F during all of the vibration and shock test periods, and remained constant at these levels.

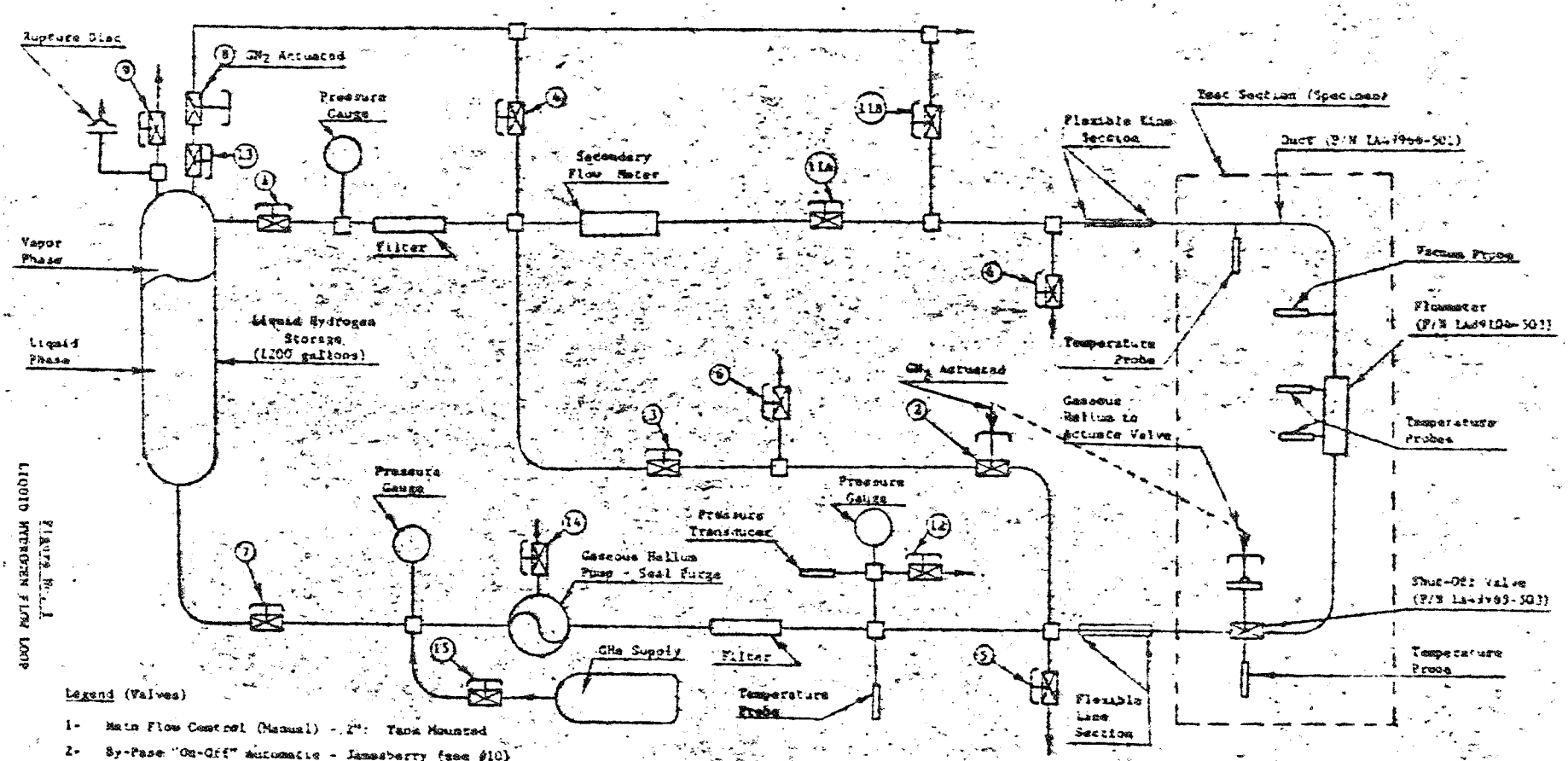


Figure B-1 LIQUID NITROGEN FLOW LOOP

Legend (Valves)

1- Main Flow Control (Manual) - 2": Tank Mounted
2- By-Pass "On-Off" Automatic - Jamesberry (see #10)
3- By-Pass Flow Control - Manual 2" Anein
4- Surplus Vapor Dump - Manual 2" Powell
5- Line Relief - 2" Set at 50 psig Consolidated
6- Line Relief - 1" Set at 50 psig Consolidated
7- Pump Suction - Manual - 2" Tank Mounted
8- Main Tank Vent - Automatic - Jamesberry
9- Tank Pressure Relief - as fitted
10- Common Switch w/Delay for Pump Protection
11A/B Vent and Line Valves - Manual 2" Lunkenheimer (For Flow Meter Protection)
12- Pump Priming Valve - Manual 1/4" Needle Valve
13- Tank Vent - 2" - as fitted
14- G He Pump Seal Purge - Manual 1/4" Needle Valve
15- G He Line Purge - Manual 1/4" Needle Valve

Note: Lines from LH_2 Storage to Test Section are Vacuum Jacketed, and all joints Foam Pour Packed

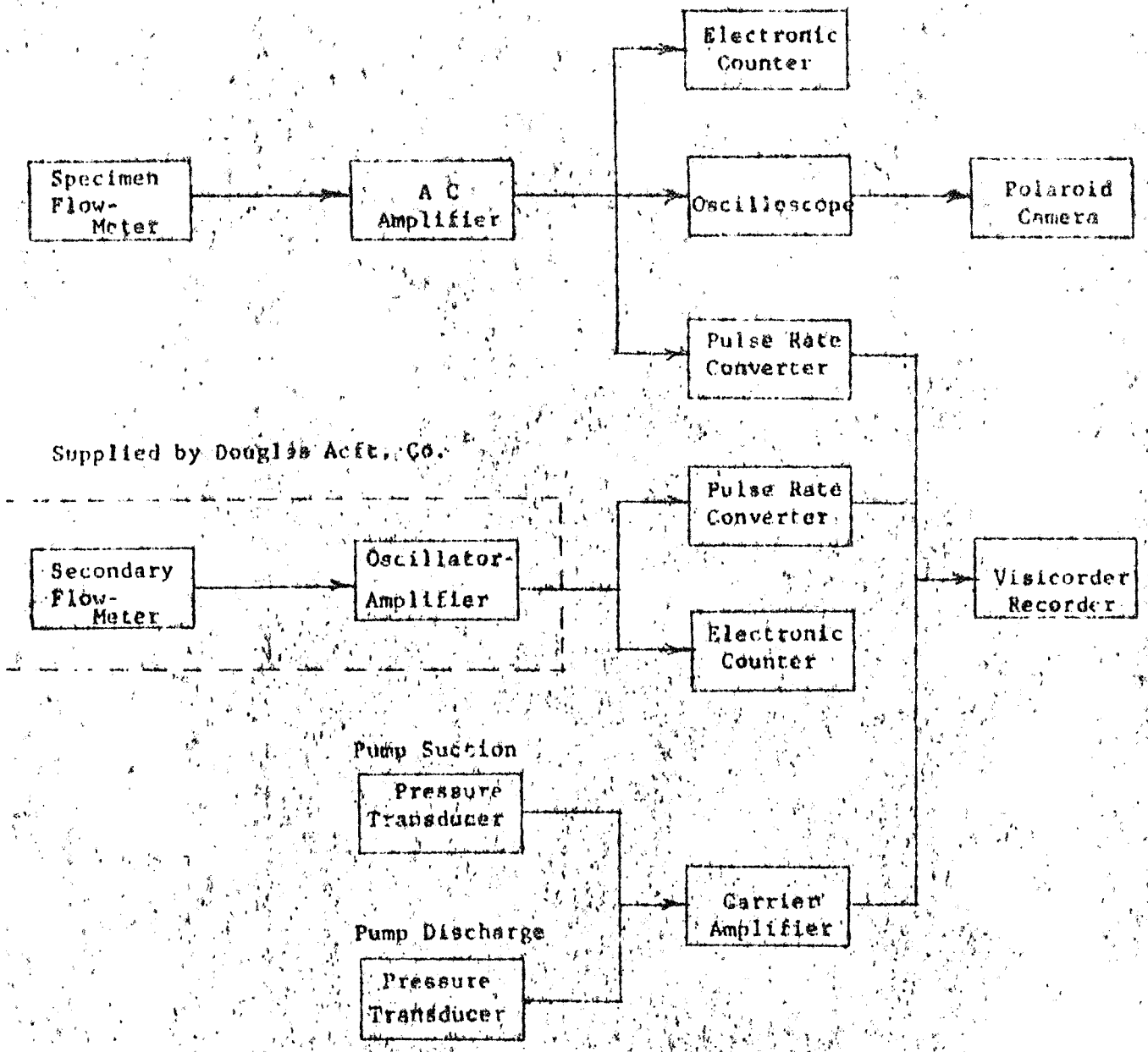
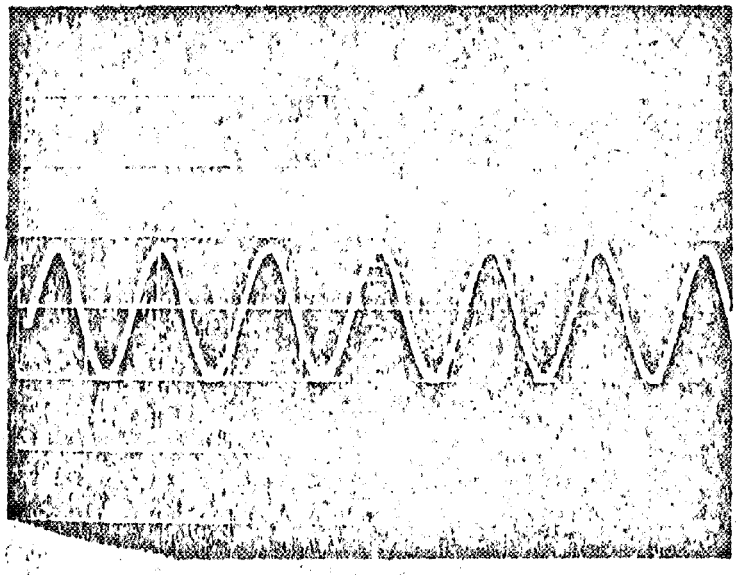


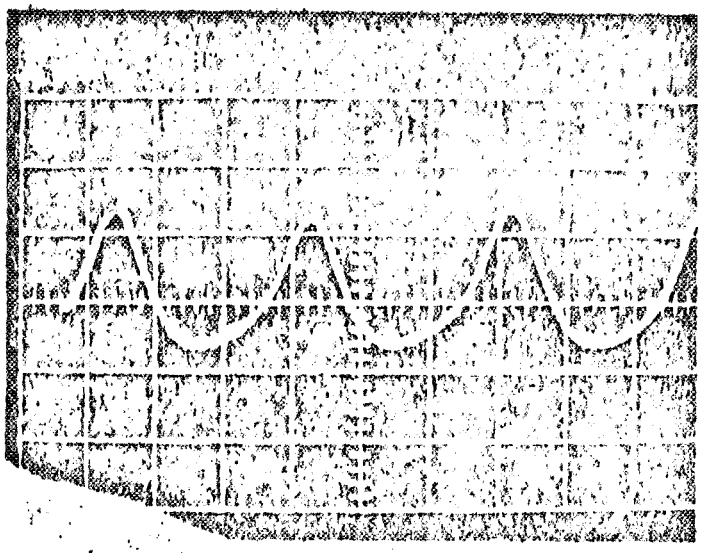
Figure No. 2

INSTRUMENTATION DURING ENVIRONMENTAL TESTS

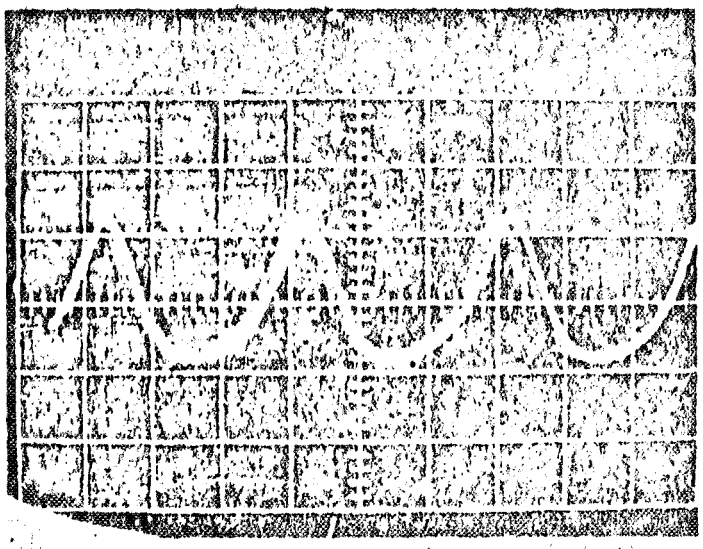


Graph Number 1

Output Waveform From Pins C and D
with
1 vrms at 400 cps applied to Pins A and B



Output Waveform During Sinusoidal Vibration Along Radial Axis

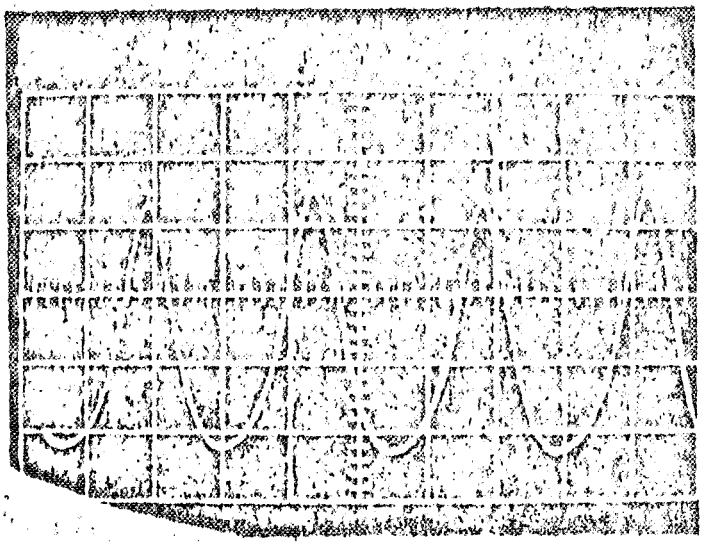


Output Waveform During Random Vibration Along Radial Axis

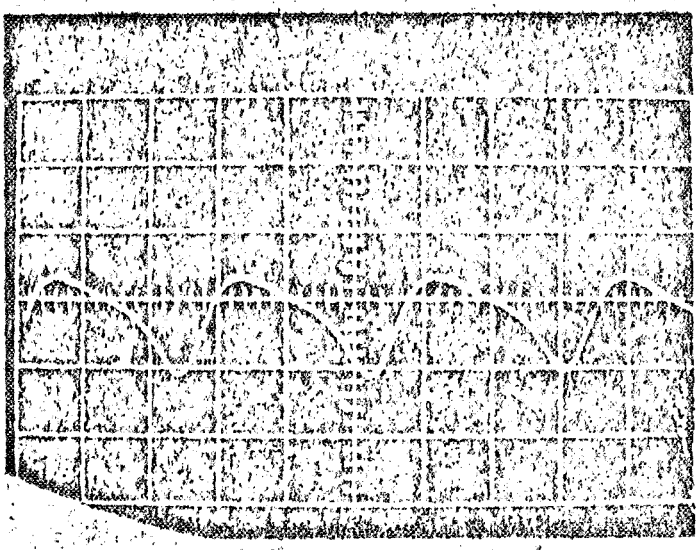
Calibration: 1.0 millisecond per centimeter (both Graphs)

Graphs Number 2 and 3

Output Waveforms During Radial Axis Vibration



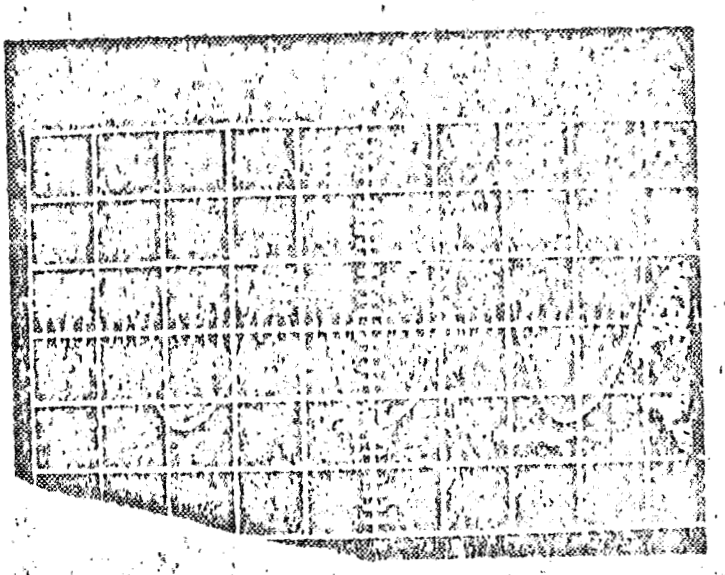
Output Waveform During Sinusoidal Vibration Along Thrust Axis
(as seen through an AC Amplifier)



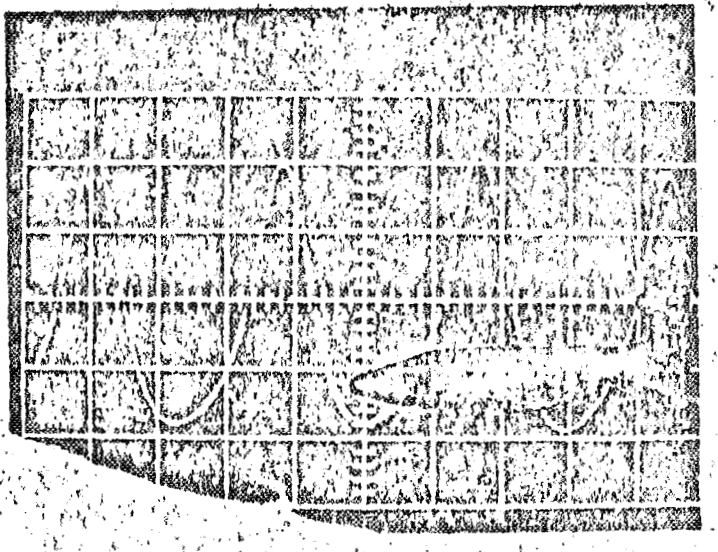
Output Waveform During Random Vibration Along Thrust Axis
Calibration: 1.0 millisecond per centimeter (both Graphs)

Graphs Number 4 and 5

Output Waveforms During Thrust Axis Vibration



Output Waveform During Sinusoidal Vibration Along Tangential Axis
(as seen through an AC Amplifier)

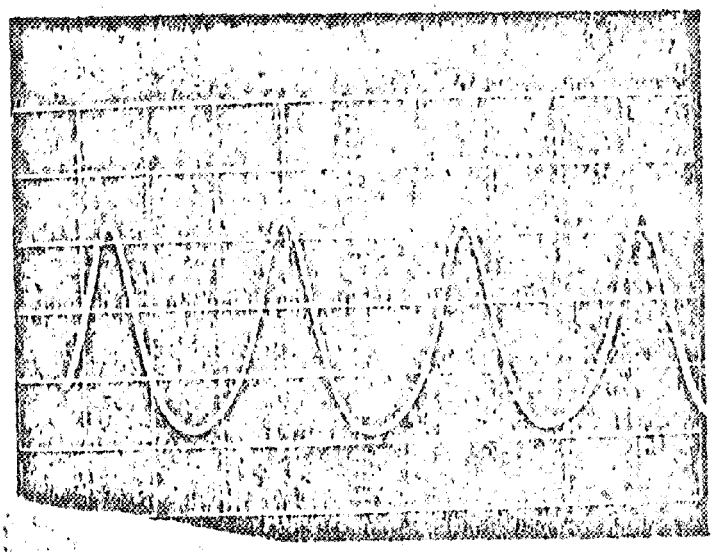


Output Waveform During Random Vibration Along Tangential Axis

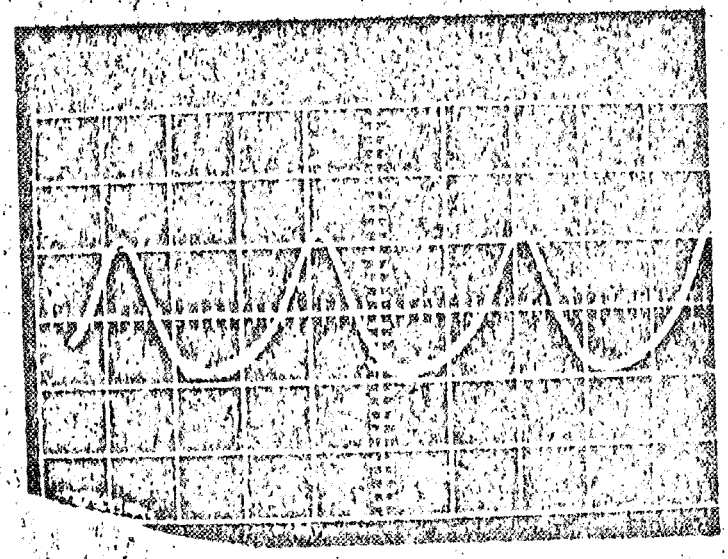
Calibration: 1.0 millisecond per centimeter (both Graphs)

Graphs Number 6 and 7

Output Waveforms During Tangential Axis Vibration



Output Waveform During Rerun of Random Vibration Along Tangential Axis



Output Waveform During Rerun of Random Vibration Along Thrust Axis

Calibration: 1.0 millisecond per centimeter (both Graphs)

Graphs Number 8 and 9

Output Waveforms During Reruns of Vibration

3.2 VIBRATION

3.2.1 REQUIREMENT

Reference: TCD 1T00137, Pages 7 and 8

There shall be no evidence of structural failure or distortion as a result of conditions imposed during the Vibration Test as described in the detail specification.

3.2.2 TEST PROCEDURE

The test specimen was installed in the Test System as described in Section 3.1.2 of this Report, while mounted on the head of an electro-dynamic vibration exciter.

The axes of applied Vibration (and Shock) are illustrated in Figure No. 3 presented with this Report.

Figure Number 3 also illustrates the locations of the accelerometers during the imposed Vibration environment.

The accelerometers were attached to or mounted on the specimen at the locations indicated in the detail specification, and as illustrated, and the output signals from all accelerometers were continuously monitored and recorded during all phases of the sinusoidal vibration.

The original Recordings generated during the sinusoidal vibration are presented with Copy No. 1 of this Test Report.

Sinusoidal Vibration was applied to the specimen through the frequency range from 5 to 2000 to 5 cycles per second, with the sweep rate (rate of change of frequency) varied logarithmically at 1.0 octave per minute through the complete range as stated herein, so that a single excursion through the frequency range from 5 to 2000 to 5 cycles per second was completed in a 17-minute period.

The sinusoidal sweep test was conducted along each of the three respective axes of the specimen as illustrated in Figure No. 3.

3.2.2 Test Procedure - Vibration - continued

During the sinusoidal sweep test, the applied vibration intensity was controlled at the following levels:

Frequency (cps)	Applied Double Amplitudes or Vibratory Accelerations
5 to 48	0.05 inch double amplitude
48 to 226	± 6.0 g vibratory acceleration
226 to 295	0.0022 inch double amplitude
295 to 2000	± 10.0 g vibratory acceleration
2000 to 295	± 10.0 g vibratory acceleration
295 to 226	0.0022 inch double amplitude
226 to 48	± 6.0 g vibratory acceleration
48 to 5	0.05 inch double amplitude

(Note: Where the applied vibration intensity varied from the information presented above, it is discussed in detail in Section 3.2.3 of this Report.)

Upon completion of the Sinusoidal Vibration Sweep Test, Random Vibration was applied to the specimen for a period of 12 minutes along each of the three respective axes as illustrated in Figure No. 3. During the Random Vibration, the applied vibration intensity was controlled at the following limits:

Frequency Bandwidth (cps)	Applied Spectral Density
20 to 85	$0.065g^2$/cps
85 to 280	Increasing at 12 db/octave from $0.065g^2$/cps at 85 cps to $0.8g^2$/cps at 280 cps
280 to 1000	$0.8g^2$/cps
1000 to 2000	Decreasing at 12 db/octave from $0.8g^2$/cps at 1000 cps to 2000 cps

3.2.2 Test Procedure - Vibration - continued

All of the Random Vibration was plotted, using an XY-Plotter, and reproductions of the Graphs generated during the test period are presented with this Test Report.

During all of the Vibration as described in this Section of this Test Report, the specimen was pressurized and operating as described in Section 3.1.2, and all data recorded.

3.2.3 RESULTS OF TEST

There was no apparent damage to or deformation of the specimen as a result of conditions imposed during the Vibration Test as described in this Test Report.

Random Plots generated during the test are presented with this Report.

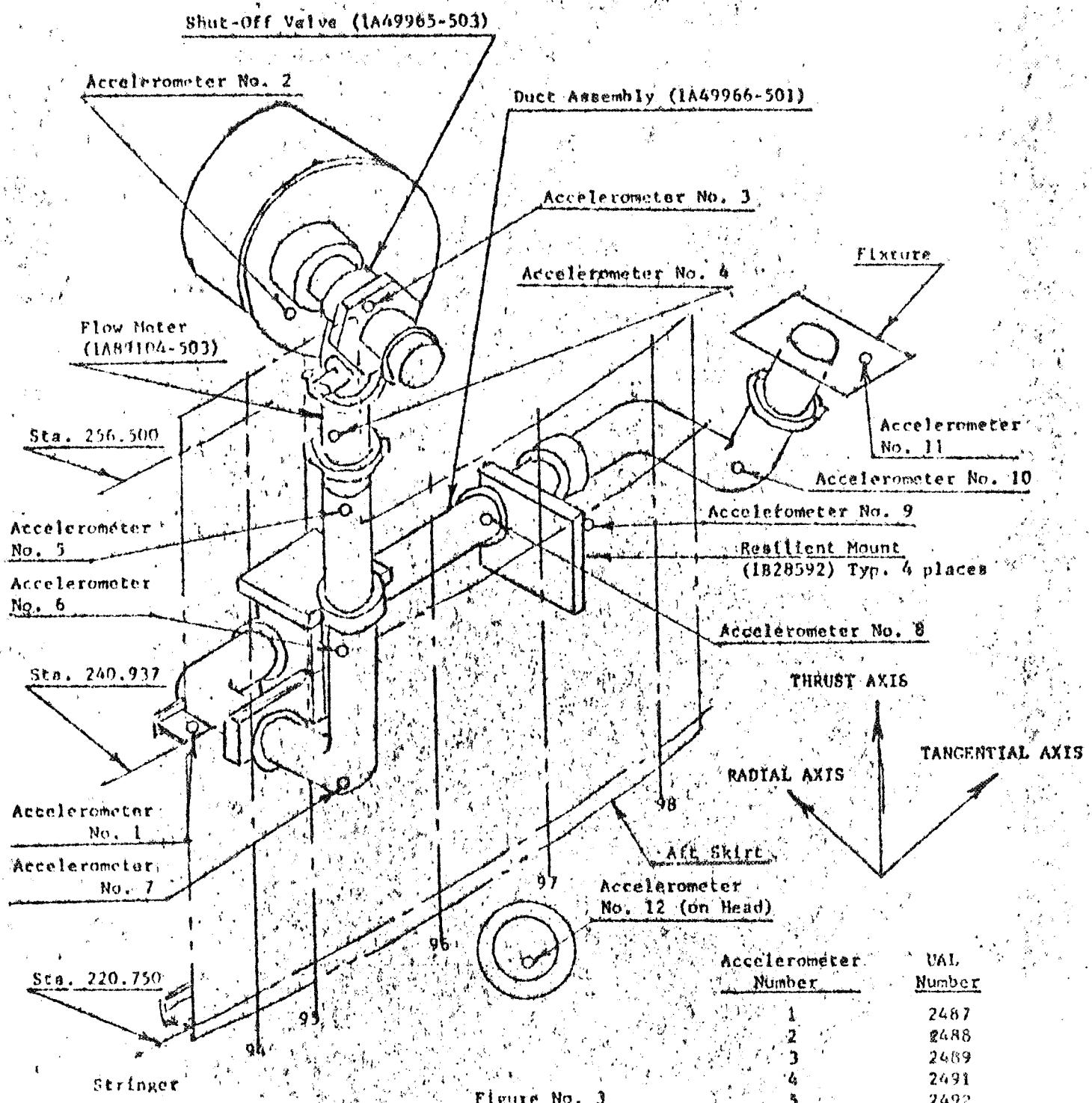
The original recordings of the output signals from the accelerometers are presented with Copy No. 1 of this Test Report.

Observations recorded during the Vibration Test are presented in Table No. 1 included with this Document.

Photographs No. 1 through 11 illustrate the mounting of the specimen for the applied vibration along each of the three respective axes, and further illustrate the locations of some of the accelerometers during the test period.

The associated cabling, piping, and portions of the test system are included in some of the referenced Photographs.

UNITED AEROTEST LABORATORIES



Accelerometer Number	UAL Number
1	2487
2	2488
3	2489
4	2491
5	2492
6	2493
7	24
8	1328
9	1727
10	1725
11	937
12	1726

Figure No. 3

Illustrating Locations of Accelerometers During Vibration

US TRD AEROTEST LABORATORIES

Test Report No. [illegible]

Table No. [illegible]

DATA AND OBSERVATIONS RECORDED DURING [illegible]

Frequency (cps)	Applied Vibration Intensity (± g or inch da)	Visicorder Recording Number	Magnetic Tape Number	Observations or Test Conditions Recorded
5-48	0.05 inch	THRUST AXIS		Vibration sweep conducted [illegible]
48-216	± 6.0 g			[illegible]
216-295	0.0022 inch			minutes. Test conducted July [illegible]
295-2000	± 10.0 g			
1000-[illegible]	± 10.0 g			Liquid Hydrogen flow through [illegible] during test period did not exhibit evidence of leakage or malfunction.
295-226	0.0022 inch			
226-48	± 6.0 g			
48-5	0.05 inch			Input control Accelerometer [illegible] to 30 mv/peak g.
20-85	0.065 g^2/cps	THRUST AXIS		Random Vibration [illegible] minutes. Test conducted July 16, 196[illegible]
85-280	+ 6.3 db/oct.			
280-1000	0.8 g^2/cps			Spectral Density as applied was [illegible] below the specification requirement as presented. This condition was noted in "Notice of Specification Deviation" forwarded to Douglas Aircraft Company and was accepted by DAC as an authorized deviation, with approvals by J. Carlson and D. Morgan.
1000-2000	- 12.0 db/octave			
Specification Requirement				
20-85	0.065 g^2/cps			
85-280	+ 12.0 db/octave			
280-1000	0.8 g^2/cps			
1000-2000	- 12.0 db/octave			
		THRUST AXIS		Refer to Graph Number 10 for the reproduction of the XY Plot generated during the Random Vibration Test period, in which the deviation is illustrated.

Three Successive Shocks were applied (immediately following the Vibration as presented above), each Shock having a magnitude of 20 g and a time duration of 10.0 ± 2.0 milliseconds. Shock Pulse was half sinusoidal.

5-48	0.05 inch	TANGENTIAL AXIS		Vibration sweep from 5 to 2000 to 5 cycles completed in 17 minutes. Test conducted July 17, 1965.
48-216	± 6.0 g			
216-295	0.0022 inch			
295-2000	± 10.0 g			Liquid Hydrogen through test system during test period was normal, with no evidence of leakage or malfunction.
2000-295	± 10.0 g			
295-226	0.0022 inch			
226-48	± 6.0 g			
48-5	0.05 inch			Input control Accelerometer (only) was set to 30 peak mv/peak g.
20-85	0.065 g^2/cps	TANGENTIAL AXIS		Random Vibration applied for a period of 12 minutes. Test conducted July 17, 1965.
85-280	+ 6.3 db/octave			
280-1000	0.8 g^2/cps			Deviations from specification were authorized by "Notice of Specification Deviation" forwarded to Douglas Aircraft Company and signed by J. Carlson and D. Morgan. Deviations are illustrated in Graph No. 11, the reproduction of the XY-Plot generated during the test period and included with this Test Report.
1000-2000	- 12.0 db/octave			
Specification Requirement				
20-85	0.065 g^2/cps	TANGENTIAL AXIS		
85-280	+ 6.3 db/octave			
280-1000	0.8 g^2/cps			
1000-2000	- 12.0 db/octave			
				Actual recorded deviations were - 3.0 decibels down from the required Spectral Density.

Three successive Shocks were applied (immediately following the Vibration as described herein), each shock having a magnitude of 20 g and a time duration of 10.0 ± 2.0 milliseconds. The shock waves were half-sinusoidal in characteristic.

5-48	0.05 inch	RADIAL AXIS		Vibration sweep from 5 to 2000 to 5 cps completed in 17 minutes. Test conducted July 20, 1965.
48-216	± 6.0 g			
216-295	0.0022 inch			
295-2000	± 10.0 g			Liquid Hydrogen flow through Test System during test period was normal, and there was no evidence of leakage or malfunction.
2000-295	± 10.0 g			
295-226	0.0022			
226-48	± 6.0 g			
48-5	0.05 inch			Input control Accelerometer was set to 30 peak mv/peak g.
20-85	0.065 g^2/cps	RADIAL AXIS		Random Vibration was applied for a period of 12 minutes. Test conducted July 20, 1965.
85-280	+ 6.3 db/octave			
280-1000	0.8 g^2/cps			Spectral Density limit was exceeded during the test period, and the deviation was authorized by Mr. J. Carlson and Mr. D. Morgan after the "Notice of Specification Deviation" was forwarded to Douglas Aircraft Company.
1000-2000	- 12.0 db/octave			
				The out-of-tolerance condition is illustrated in Graph No. 12, the reproduction of the XY-Plot generated during the Random Vibration period [illegible]

Three successive Shocks were applied (immediately following the Vibration as presented above), each shock having a magnitude of 20 g and a time duration of 10.0 ± 2.0 milliseconds. The shock waves were half-sinusoidal in characteristic.

Reissued - Corrected Oct. 18, 1965.

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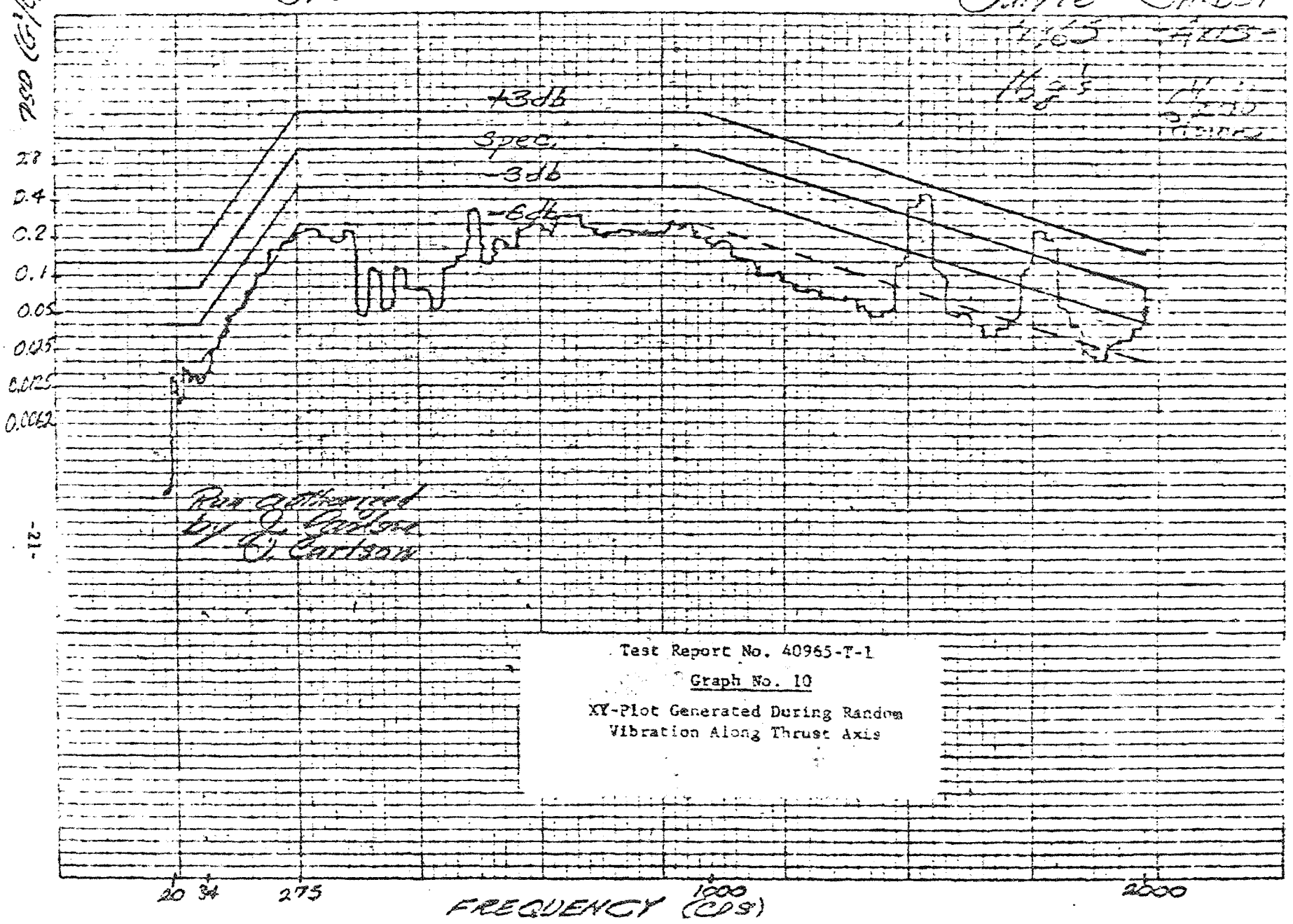
Test Report No. 60965-T-1

Table No. 1
(continued)

DATA AND OBSERVATIONS RECORDED DURING VIBRATION RESUME TESTS

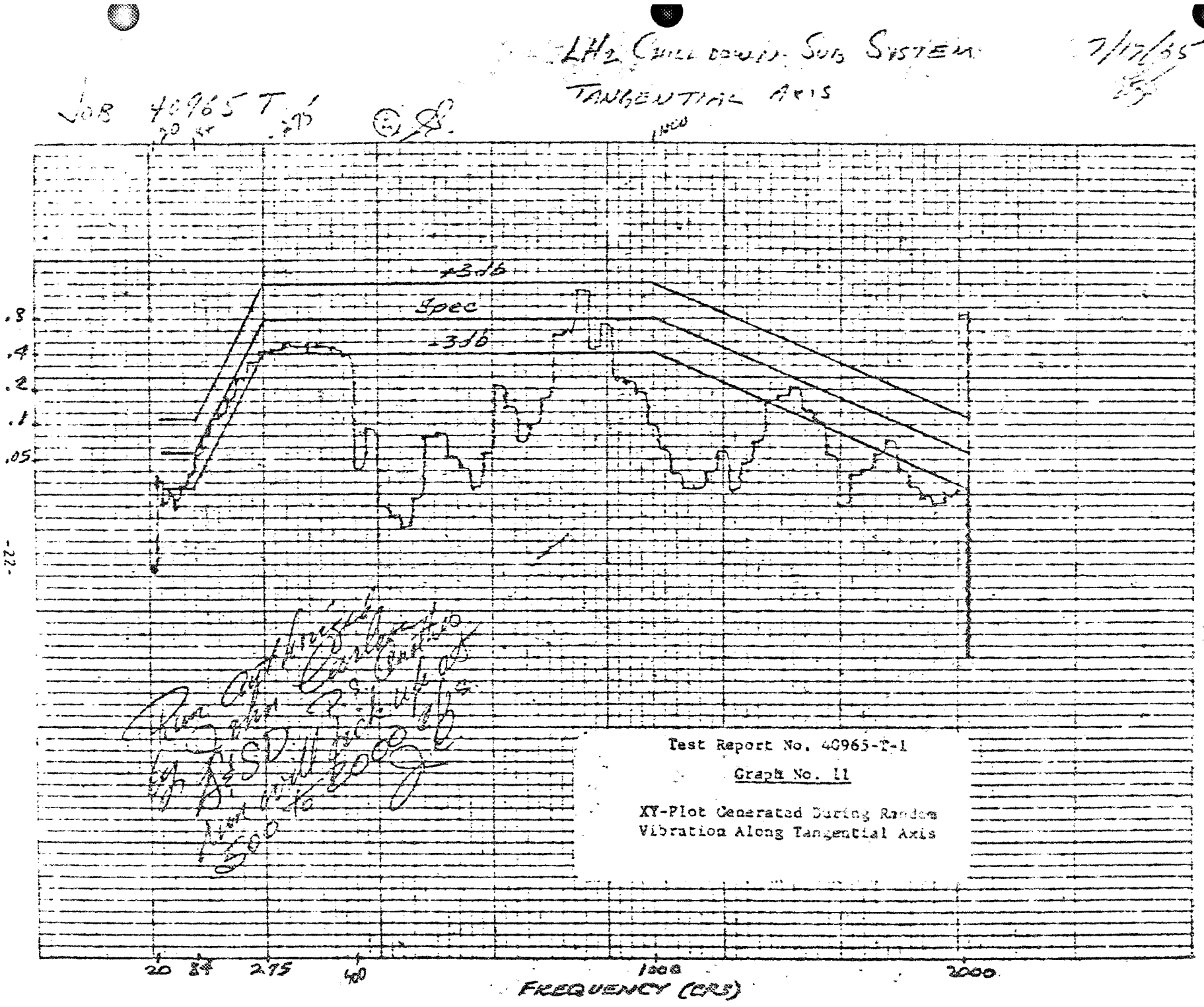
Frequency (cps)	Applied Vibration Intensity (° g at inch dia)	Visicorder Recording Number	Magnetic Tape Number	Observations or Test Conditions Recorded
		THRUST AXIS		
20-85 85-280 280-1000 1000-2000	0.065g²/cps + 6.3 db/octave 0.8g²/cps - 12.0 db/octave		7	Random vibration applied for a period of 12 minutes. Re-test authorized by DAC Engineering Personnel. Test Conducted July 22, 196[illegible]. Actual applied Spectral Density was 2.0 db down from the levels as presented above. Refer to Graph No. 13 for the reproduction of the XY-Plot generated during the Random Vibration Period, in which the test condition is illustrated. "Notice of Specification Deviation" was forwarded to Douglas Aircraft Company, and authorization to accept the deviations were returned to UAL signed by Mr. J. Carlson and Mr. D. Morgan.
		TANGENTIAL AXIS		
20-85 85-280 280-1000 1000-2000	0.065g²/cps + 6.3 db/octave 0.8g²/cps - 12.0 db/octave		8	Random Vibration allied for a period of 12 minutes. This is a re-run of the Random Vibration described in detail on Page 13 of this Report. (Magnetic Tape Recording Number 6) The upper portion of the frequency spectrum (over 500 cps) of the initial Random Vibration was noted as "...no signal input to Shaker above 500 cps....". The initial run was also conducted at 3.0 db below the required level. Random vibration as applied (Magnetic Tape Number 8) was noted as 1-1/2 db down from the required level. "Notice of Specification Deviation" was forwarded to Douglas Aircraft Company, and authorization to accept the deviations was returned signed by Mr. J. Carlson and Mr. D. Morgan. Refer to Graph No. 14 for the reproduction of the XY-Plot generated during the Random Vibration period.



Test Report No. 40965-T-1

Graph No. 10

XY-Plot Generated During Random Vibration Along Thrust Axis



Test Report No. 40965-T-1

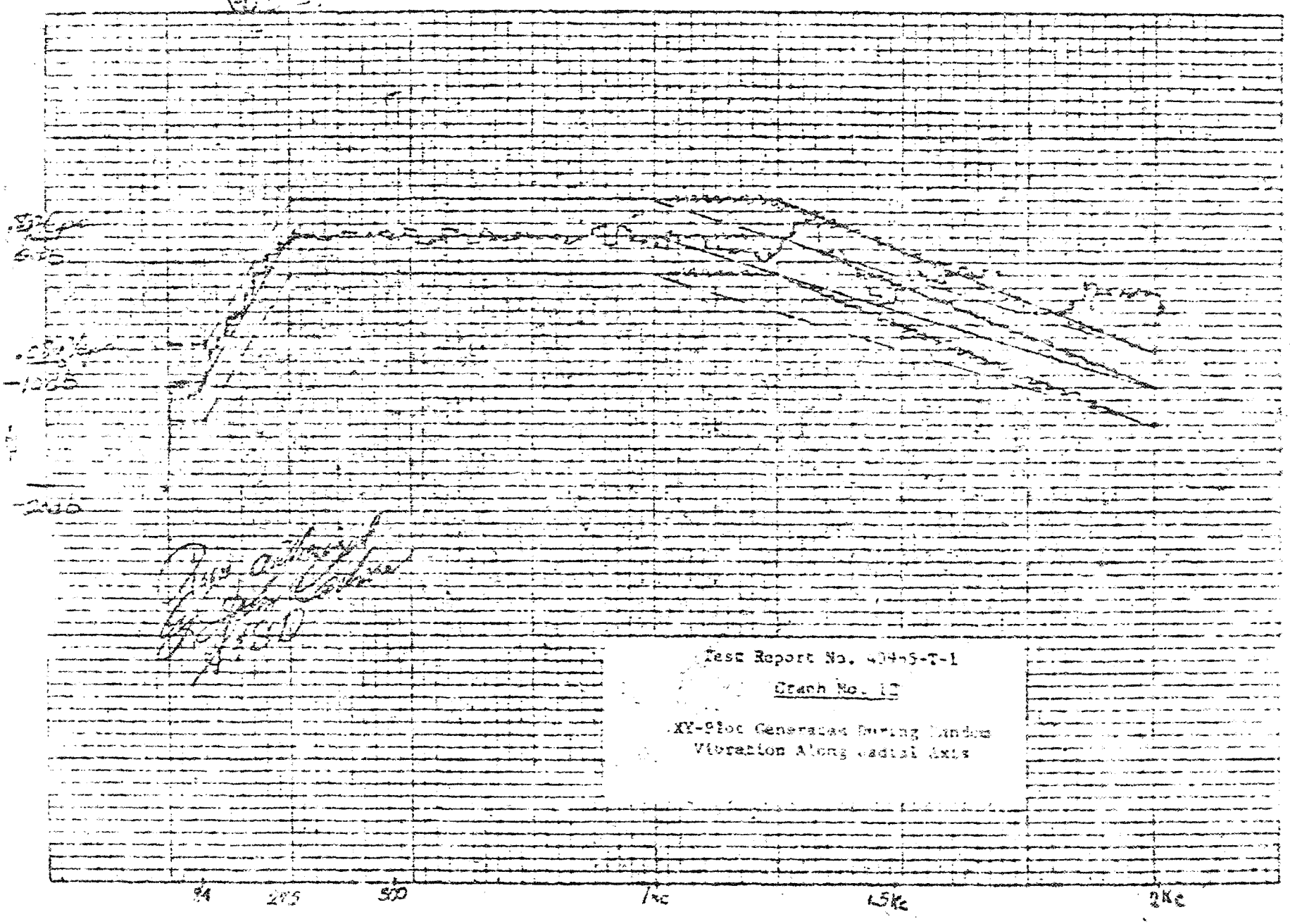
Graph No. 11

XY-Plot Generated During Random Vibration Along Tangential Axis

Job 43965T

LH2 Chilldown Subsystem
Radial axis

7/20/65

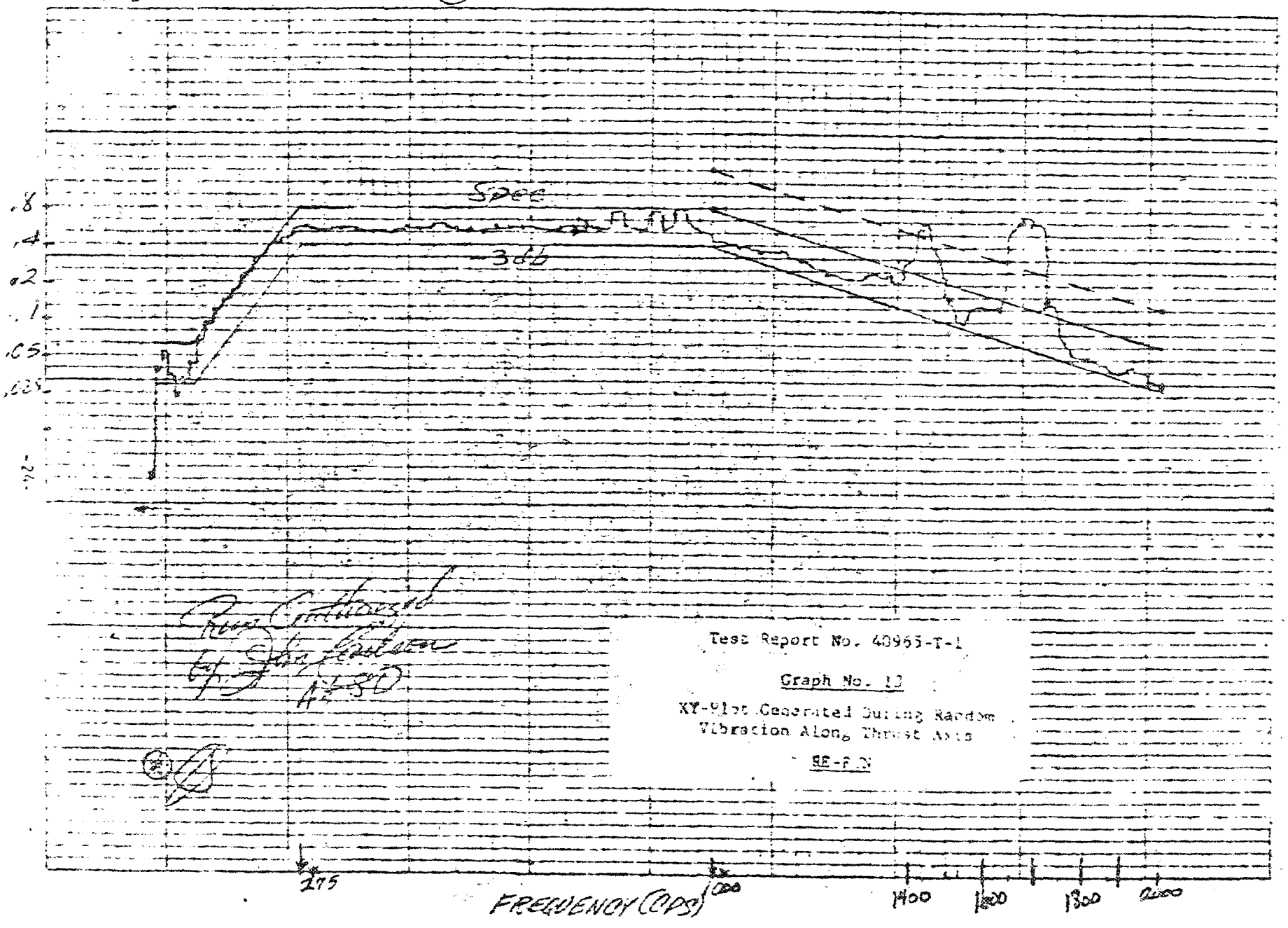


A28

Job 40965T
Control
Thrust Axis Rerun @ -2db

LH_2 Chilldown Subsystem
Thrust axis

7/22/65



Test Report No. 40965-T-1

Graph No. 13

XY-Plot Generated During Random Vibration Along Thrust Axis

RE-RUN

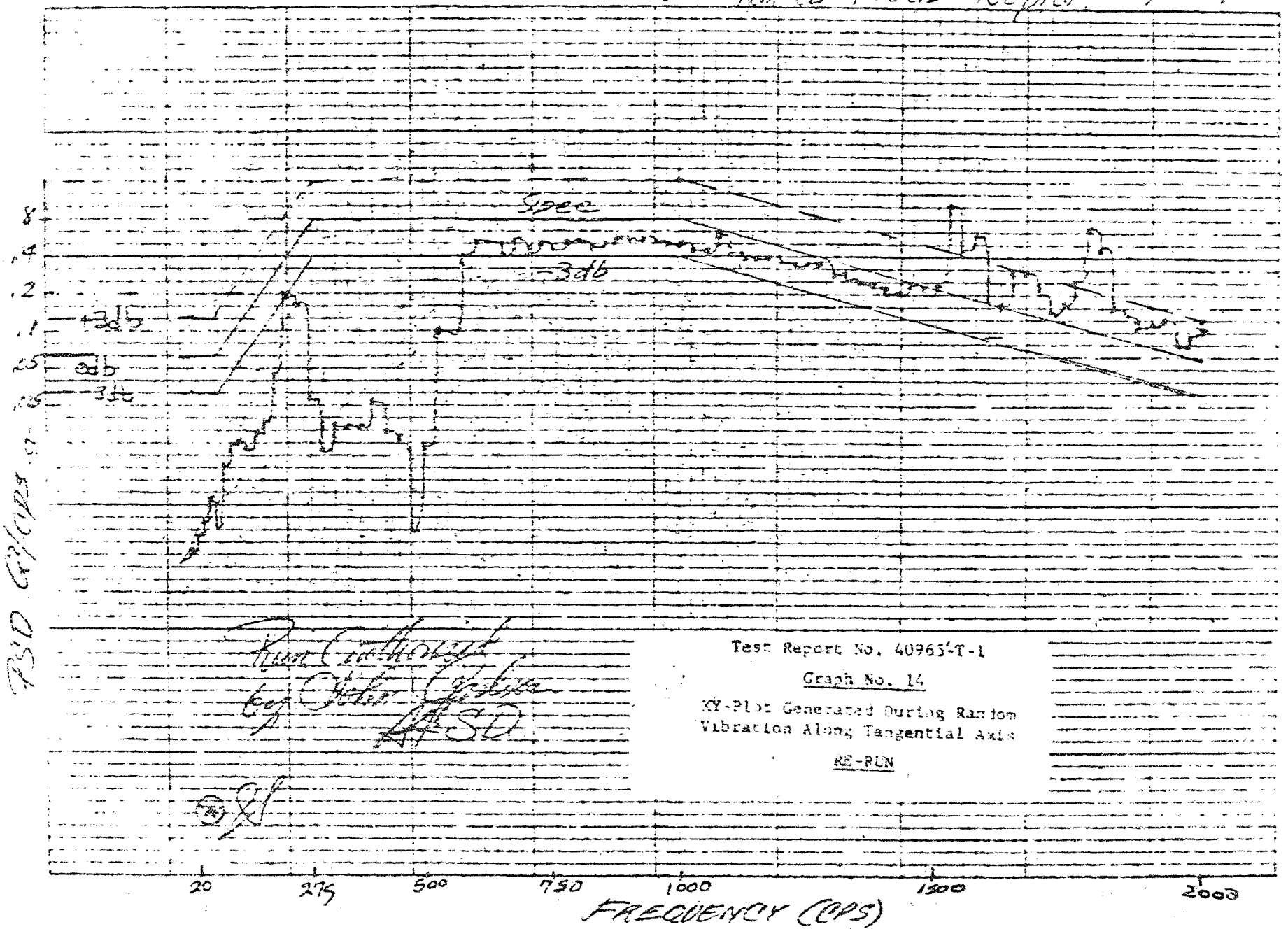
Run Authorized by John Eastson AF-80

Job 40965T

1 Hz Chilldown subsystem 7/23/63

Tangential axis rerun (Upper part of split spec)

Ran at 1½ db for plot



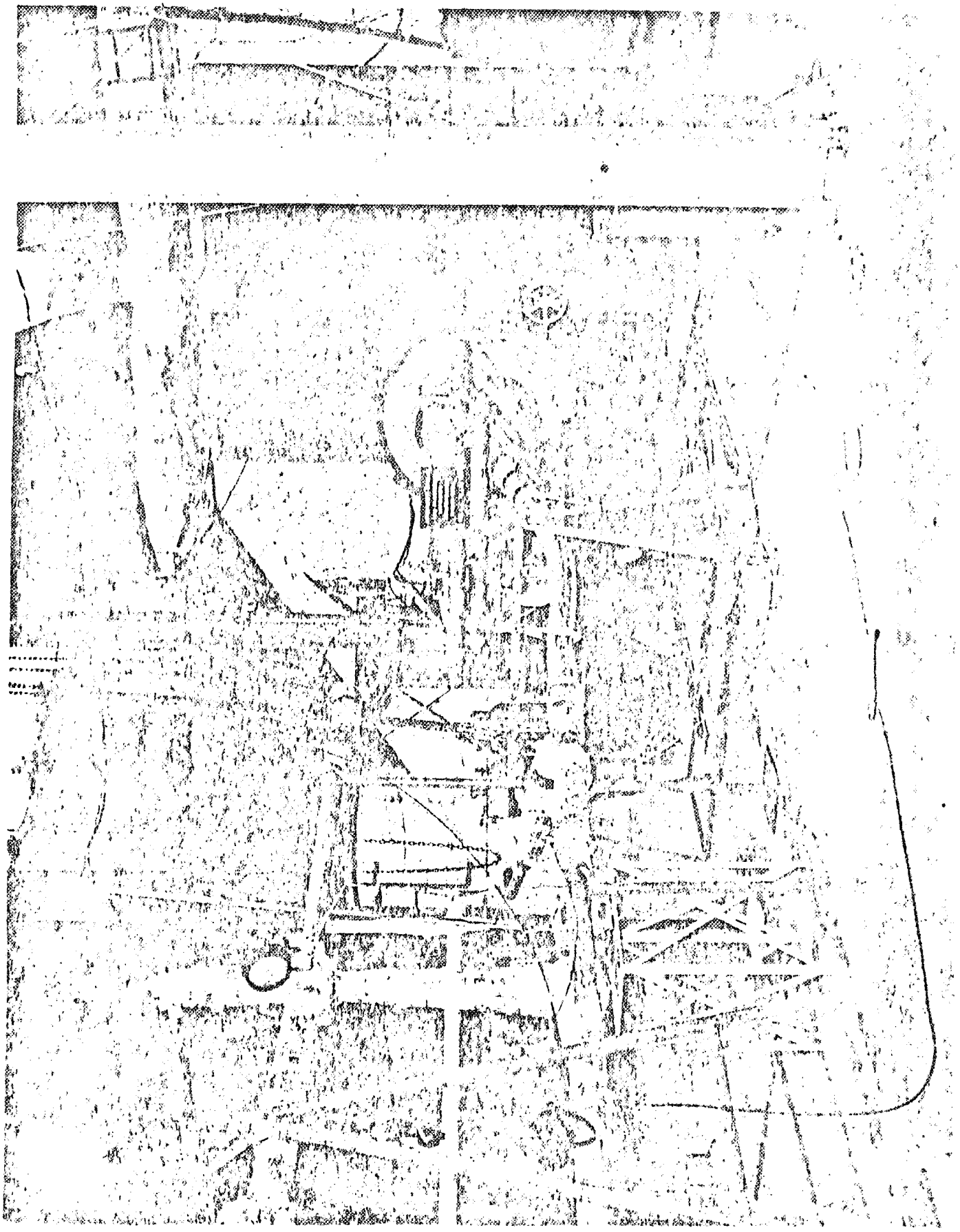
Run Authorized by John Gordon AASD

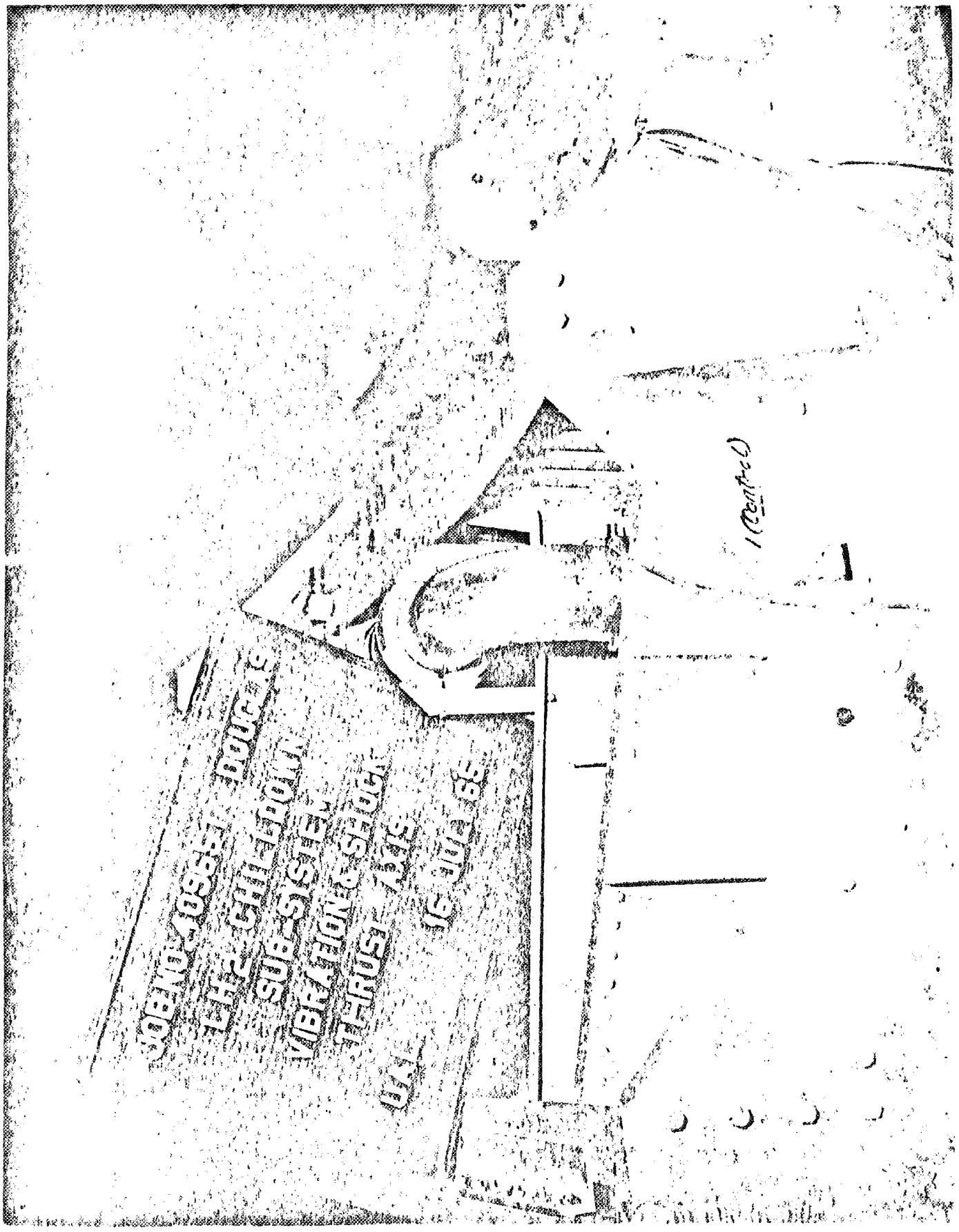
Test Report No. 40965-T-1

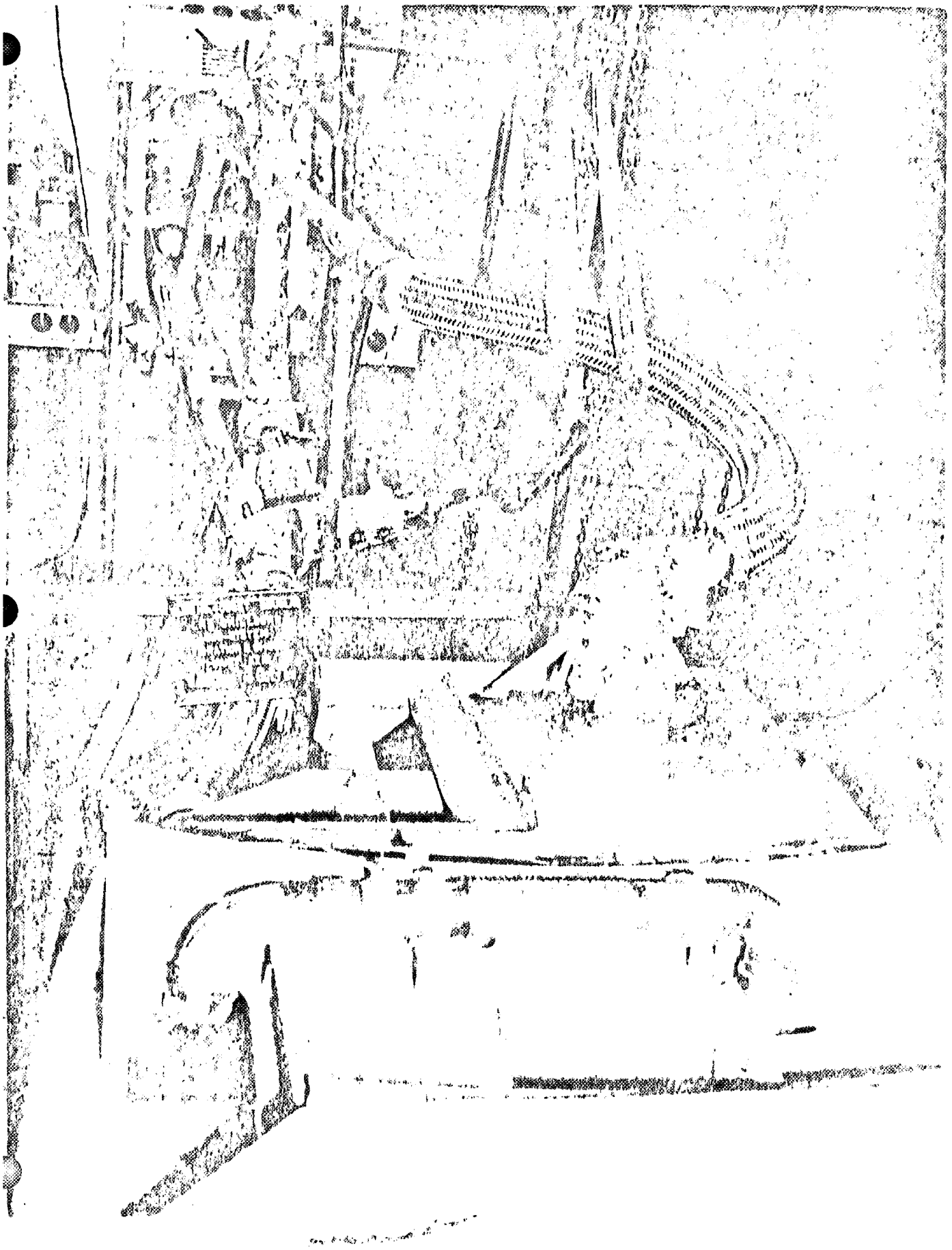
Graph No. 14

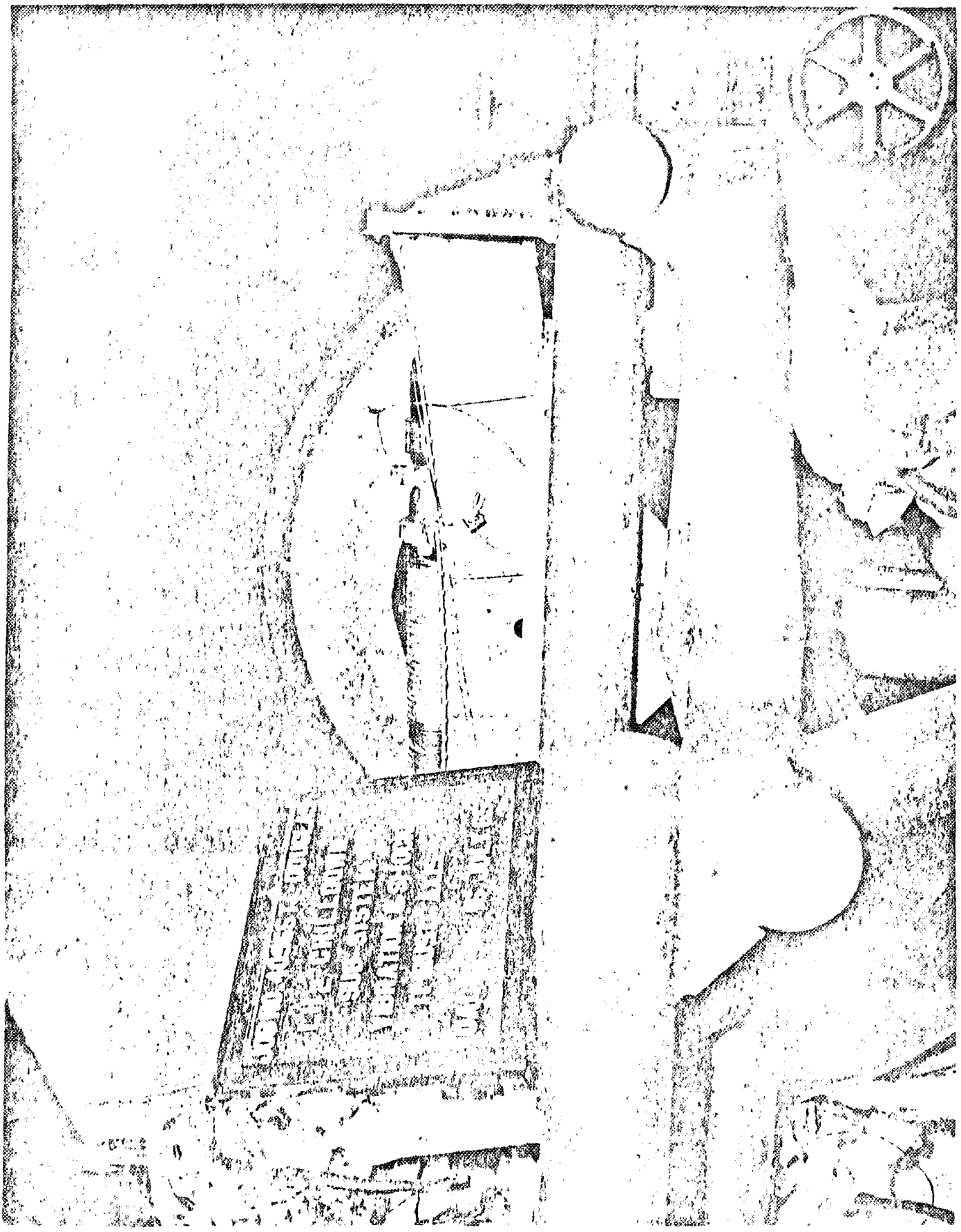
XY-Plot Generated During Random Vibration Along Tangential Axis

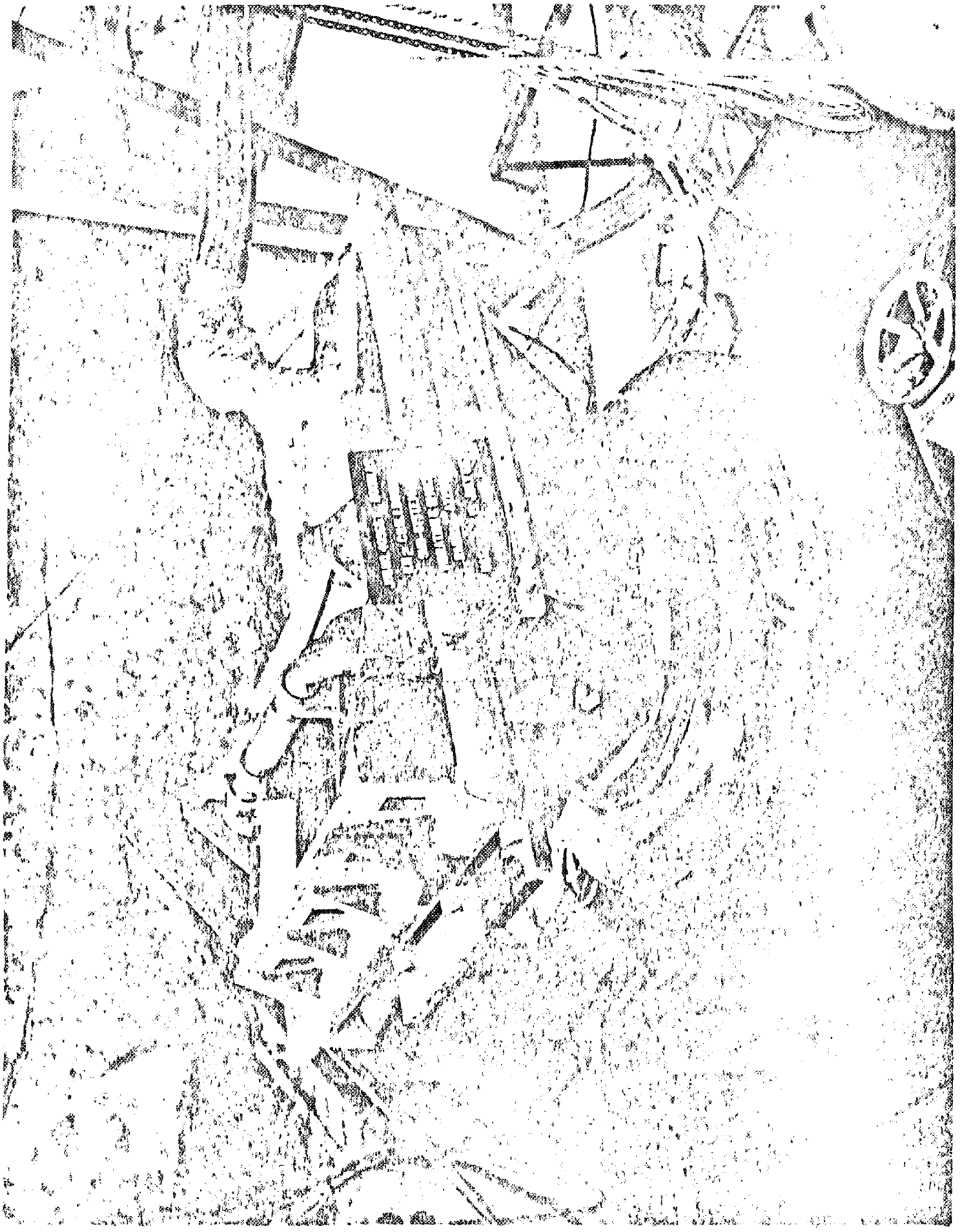
RE-RUN

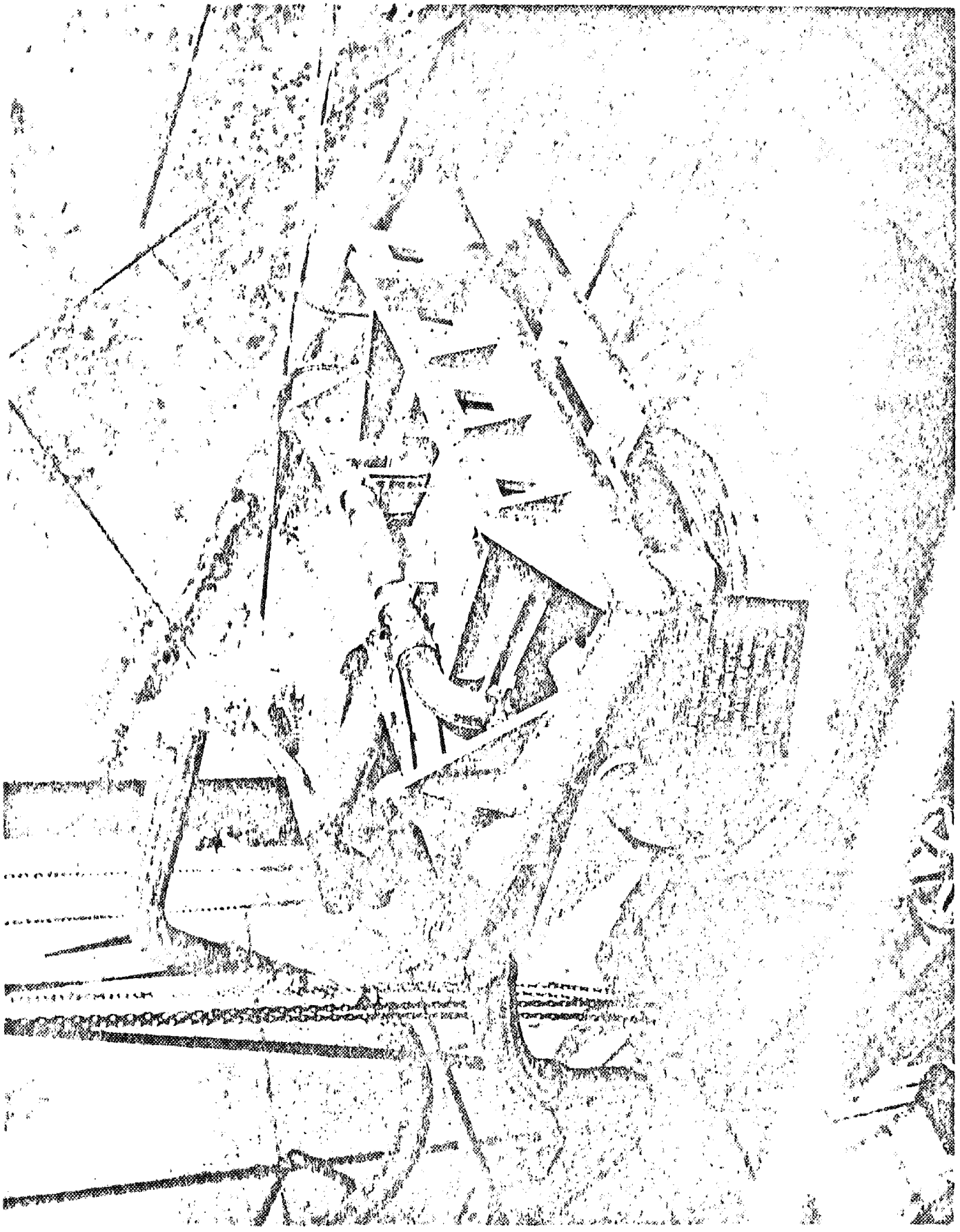


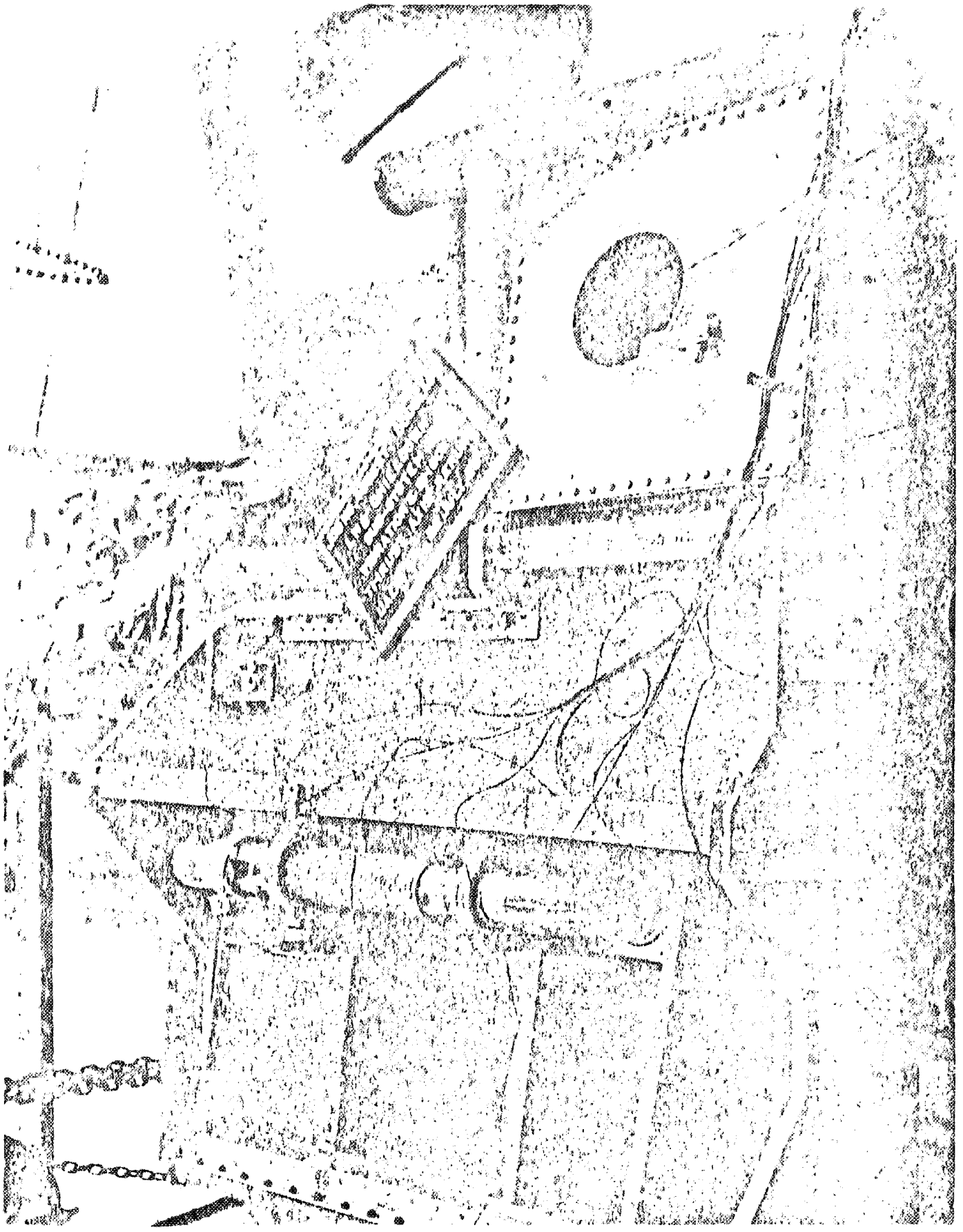

JOB NO. 10965 DOUG 19
LH2 CHILLDOWN
SUB-SYSTEM
VIBRATION & SHOCK
THRUST AXIS
UA 16 JUL 65
1 (Control)

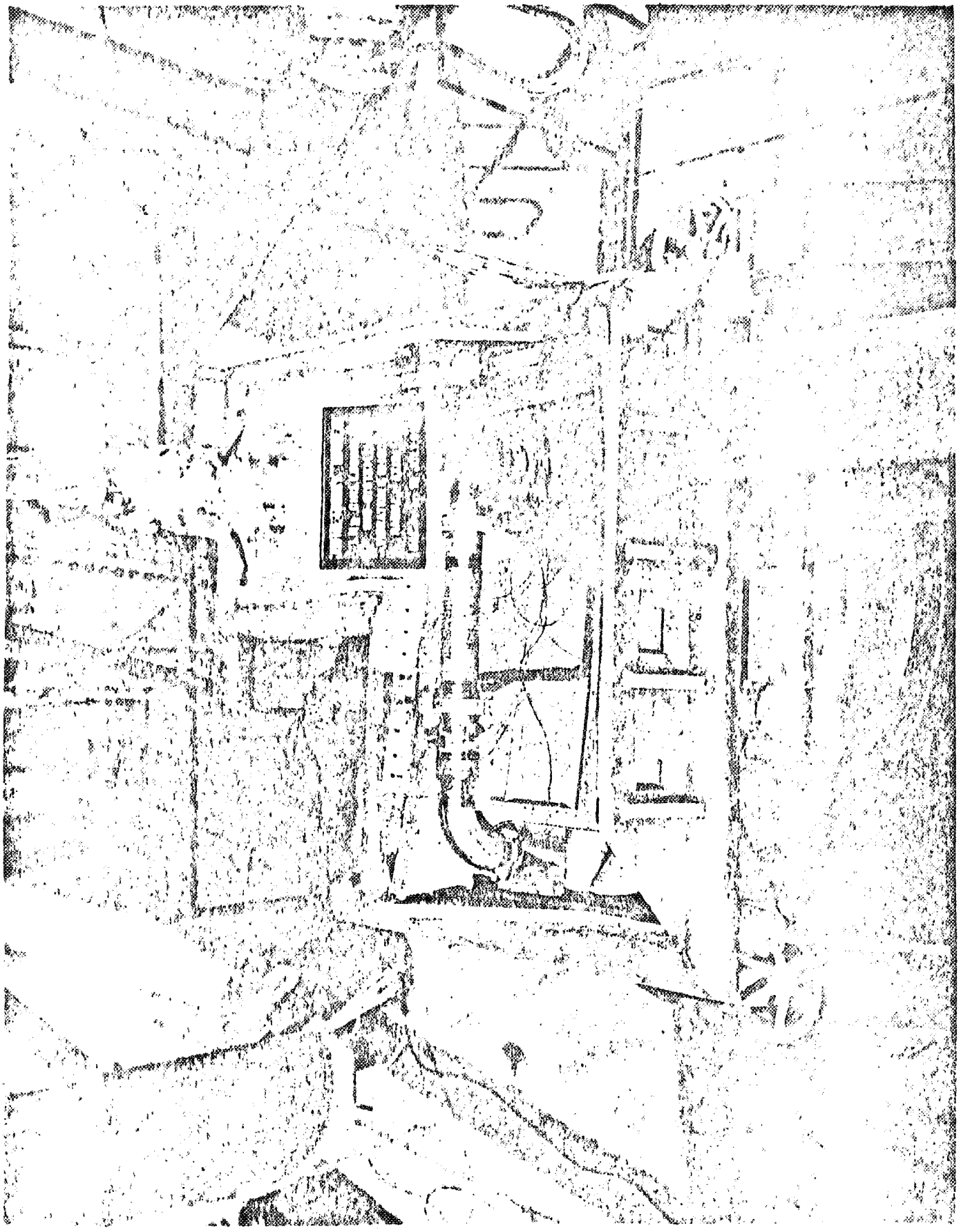


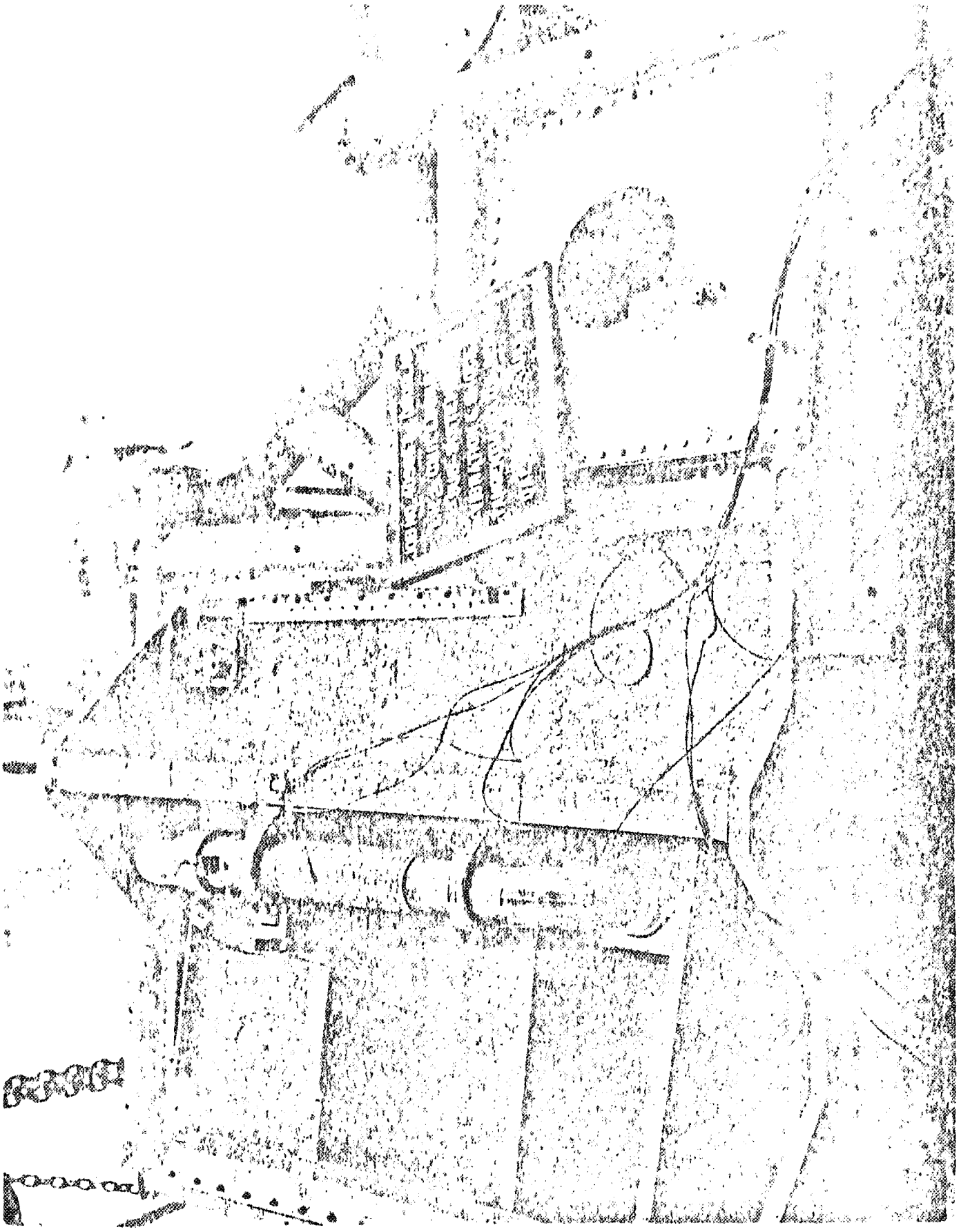


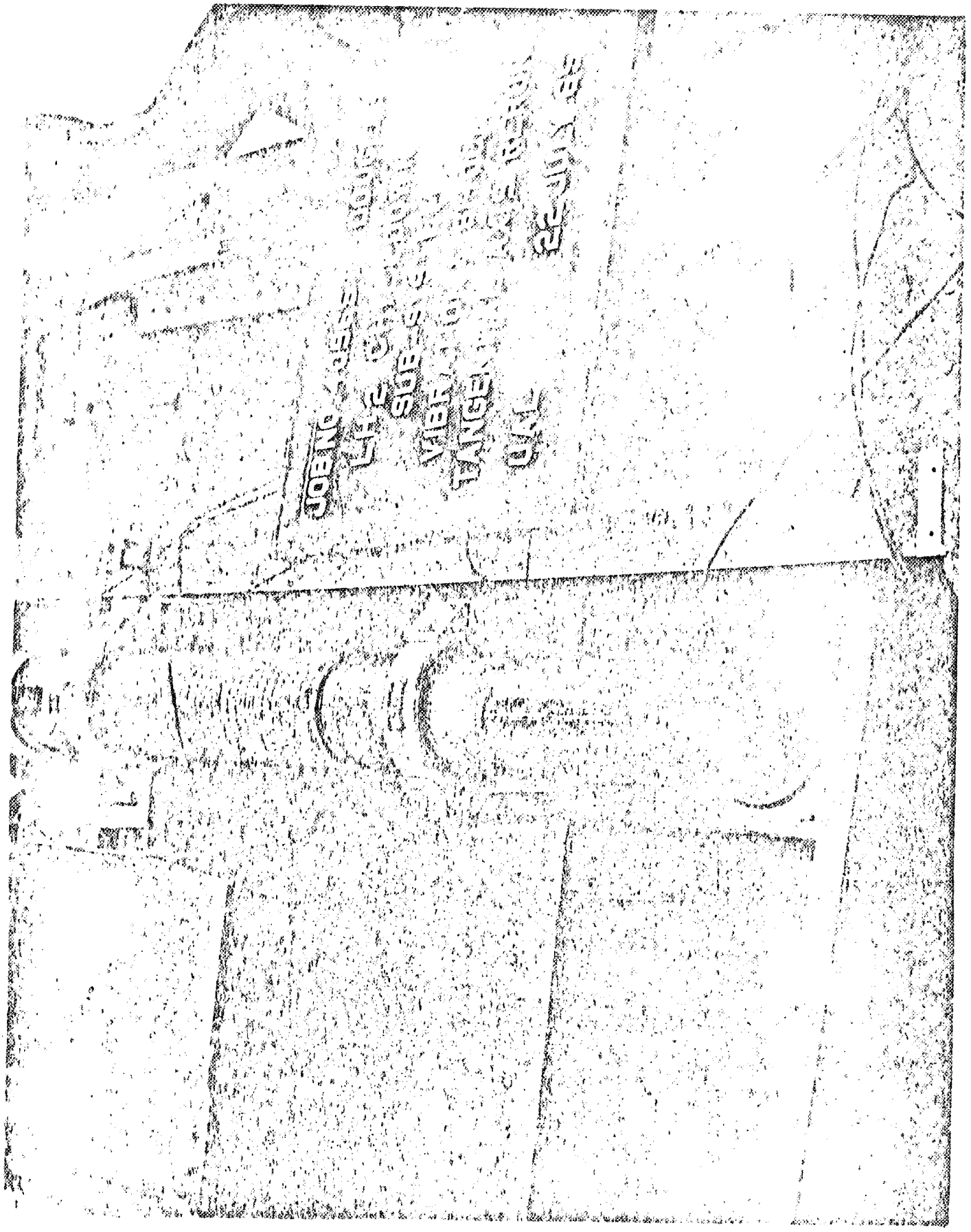












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3.3 SHOCK

3.3.1 REQUIREMENT

Reference: UCT 1700137 Page 8

There shall be no evidence of structural failure or disruption as a result of conditions imposed during the Shock Test as described in the detail specification.

3.3.2 TEST PROCEDURE

Immediately following the Random Vibration along each successive axis and prior to changing the mounting of the specimen for the next successive phase of the vibration environment, the vibration equipment was programmed to apply the required shocks to the specimen in accordance with the detailed specification.

Three successive shocks were applied to the specimen along each of the three respective axes as illustrated in Figure No. 3.

Each shock had a magnitude of 20.0 g ± 2.0 g and a time duration of 10.0 ± 2.0 milliseconds. The applied shock impulse was half sinusoidal in wave characteristic, the peak of the shock being attained in 5.0 ± 2.0 milliseconds.

Each impact shock was recorded on a Visicorder Recorder with the paper speed through the equipment controlled at approximately 10 inches per second. Maximum trace deviation was established as 90 g per inch during the test period.

Where practicable, the trace was photographed from the face of the oscilloscope by means of a Polaroid Camera and a permanent record established.

Upon completion of each successive shock, the specimen was carefully examined for evidence of damage or deformation, and all such conditions noted and described in detail where encountered.

3.3.3 RESULTS OF TEST

There was no evidence of damage to or deformation of the specimen as a result of conditions imposed during the Shock Test as described in this Test Report.

During the test period, liquid Hydrogen was flowed through the test system as described in Section 3.1, and there was no evidence of leakage or malfunction during the flow of the test medium.

At the conclusion of each successive axis of applied shock the specimen was re-positioned on the head of the vibration exciter and the next successive axis of Vibration applied, prior to conducting the next successive phase of the Shock Test.

Reproductions of the oscilloscope presentations of the three applied impact shocks along the Radial Axis, and Shock Number 2 applied along the Tangential Axis are included with this Test Report as Graphs Numbered 15 through 18, respectively. These reproductions presented are the only reproducable Graphs generated during the application of the shock environment to the specimen.

The original Visicorder Recordings generated during the test period(s) are retained at United Aerotest Laboratories and will be forwarded to authorized personnel for study on request. These recordings cannot be reproduced for inclusion in this Report with any acceptable degree of clarity.

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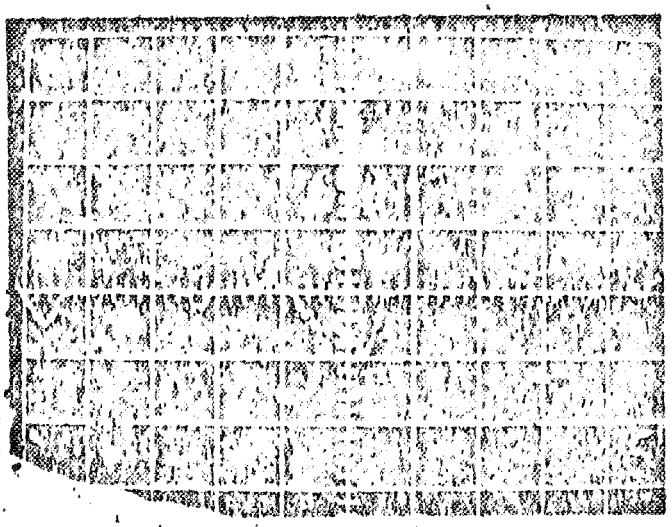
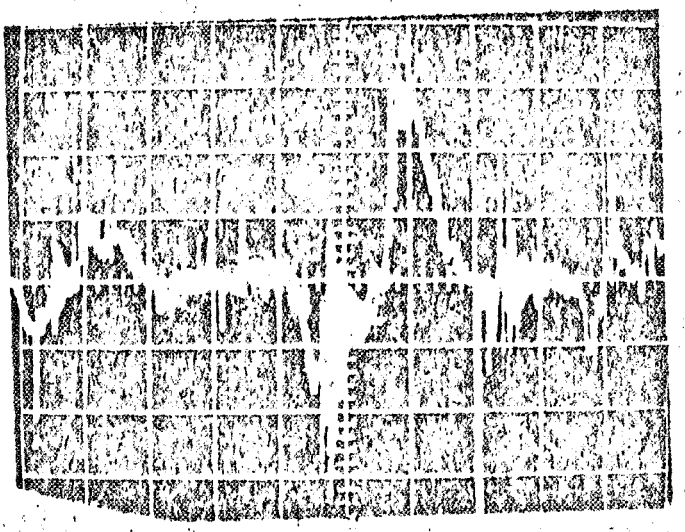


Graph No. 15

Shock Number 1 Along Radial Axis



Graph No. 16

Shock Number 2 Along Radial Axis

Calibration (Both presentations) - 10 g/centimeter vertical deflection
5 milliseconds/centimeter horizontal deflection

Graphs No. 15 and 16

Oscilloscope Presentations of Shock Pulses

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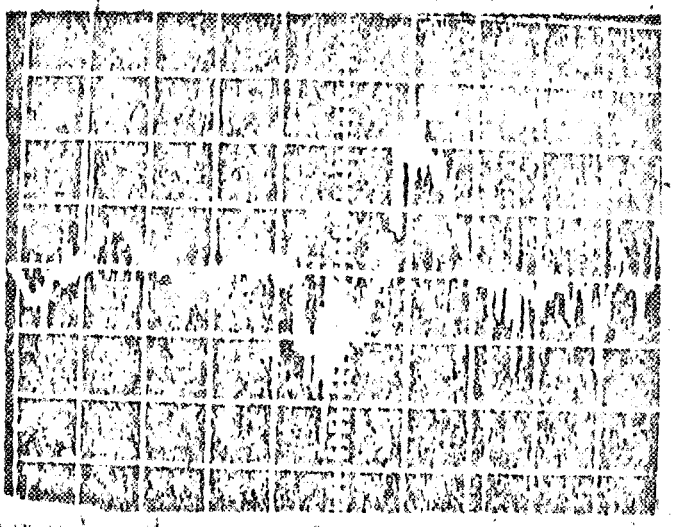
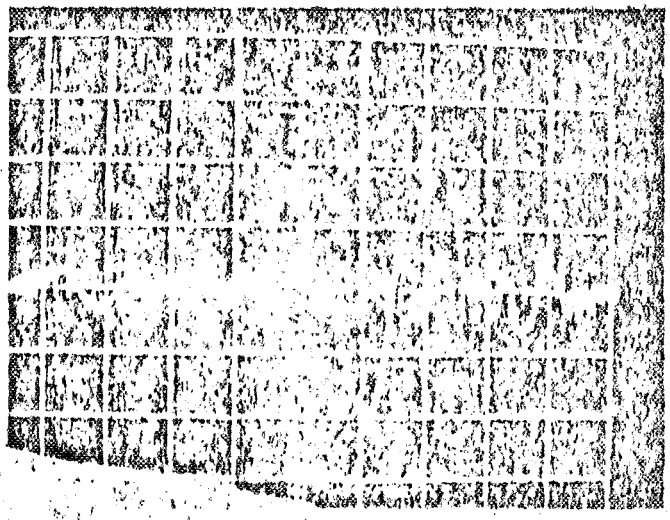


Graph No. 17

Shock Number 3 Along Radial Axis



Graph No. 18

Shock Number 2 Along Tangential Axis

Graphs No. 17 and 18

Oscilloscope Presentations of Shock Pulses

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4.0 TEST EQUIPMENT

4.1	Accelerometer	Endevco Model 2242M4-288 S/N 8815	UAL 2487
4.2	Accelerometer	Endevco Model 2242M4-288 S/N A429	UAL 2488
4.3	Accelerometer	Endevco Model 224M4-288 S/N 8823	UAL 2489
4.4	Accelerometer	Endevco Model 2242 M-4 S/N 8825	UAL 2491
4.5	Accelerometer	Endevco Model 2242 M-4 S/N 8816	UAL 2492
4.6	Accelerometer	Endevco Model 2242 M-4 S/N AA31	UAL 2493
4.7	Accelerometer		UAL 24
4.8	Accelerometer Range: 0-10,000 g	Endevco Model 2242	UAL 1328
4.9	Accelerometer		UAL 1727
4.10	Accelerometer		UAL 1725

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4.11	Accelerometer Range: Peak mV/Peak g 9.90 Rms mv/Peak g 7.00	Endevco	UAL 937
4.12	Accelerometer		UAL 1726
4.13	Source Follower	Ling Model SFA-100 S/N 88	UAL 2478
4.14	Source Follower	Ling Model SFA-100 S/N 100	UAL 2479
4.15	Source Follower	Ling Model SFA-100 S/N 104	UAL 2480
4.16	Source Follower	Ling Model SFA-100 S/N 109	UAL 2481
4.17	Source Follower	Ling Model SFA-100 S/N 59	UAL 2495
4.18	Source Follower	Ling Model SFA-100 S/N 95	UAL 2496
4.19	Source Follower	Ling Model SFA-100 S/N 101	UAL 2497
4.20	Source Follower	Ling Model SFA-100 S/N 93	UAL 2498
4.21	Source Follower	Ling Model SFA-100 S/N 108	UAL 2499

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4.22	Source Follower	Ling Model SFA-10Q S/N 106	UAL 2500
4.23	Vibration Exciter	Ling	UAL A-249
4.24	Oscillator Range	Hewlett Packard Model 122AR S/N 320-05009	UAL 2121
4.25	VTVM	B & K Manufacturing Model 2416 S/N 116211	UAL 2122
4.26	XY-Plotter	Moseley Model 135 S/N 2132	UAL 2123
4.27	Log Converter	Moseley Model 50D S/N 1063	UAL 2124
4.28	Clipper	Ling Model CMA-10-A S/N 136	UAL 2125
4.29	Equalizer	Ling Model CP-1C-A S/N 079	UAL 2102
4.30	Recorder Calibration Frequency:	Sanborn Model 2600 90 days	UAL DI-404
4.31	Oscilloscope Range: 5/3,000 cps 7,500 force lbs. 1" DA	M. B. Manufacturing Model C-125	UAL 946/10

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Test Report No. 40965-T-1

4.32	Plug-In Unit		UAL 946/11
4.33	Wave Form Synthesizer		UAL 2029
4.34	Plug-In Range: 3.3 US/75 Accuracy: 2% STAB	S/N 202	UAL 2030
4.35	Band Pass		UAL 946/9
4.36	Dekavider Accuracy: 0.005% lin.	Electro Measurements Model DV411	UAL 284
4.37	Accelerometer Meter Amplifier	Ling Model AMA 100 S/N 13	UAL 2475
4.38	Accelerometer Meter Amplifier	Ling Model AMA 100 S/N 12	UAL 2501
4.39	Accelerometer Normalying Amplifier	Ling Model ANA 100 S/N 31	UAL 2502
4.40	Accelerometer Normalying Amplifier	Ling Model ANA 100 S/N 42	UAL 2503
4.41	Source Follower	Ling Model SFA-100 S/N 76	UAL
4.42	Source Follower	Ling Model SFA-100 S/N 85	UAL

4.43	Oscilloscope Range: dc/10mc	Tektronix Model 535	UAL 670
4.44	Plug-In Range: 0.05/20 v/cm	Tektronix Model B	UAL 983
4.45	Counter	Hewlett Packard Model 522B	UAL 902
4.46	Counter	Hewlett Packard Model 524D	UAL 891
4.47	Oscillator Range: 5 cps/600 kc Accuracy: ±2%	Hewlett Packard Model 200 CD	UAL 225
4.48	Carrier Amplifier Range: Osc: 3 kc; 5 v rms Sens: 1.875	Consolidated Electrodyamics Model 1-118	UAL 913
4.49	Visicorder Range: 12 + 2 Ch 0/3,000 cps	Minneapolis-Honeywell Model 906B	UAL 928
4.50	Visicorder	Minneapolis-Honeywell Model 906B	UAL 1491
4.51	Temperature Recorder Accuracy: -100 to +300 F	Barber-Colman Model 8061-27000 S/N 46G0076	UAL 2189
4.52	Power Supply Range: 40V 25 A	Harrison Laboratories Model 520A S/N 860	UAL 1771
4.53	Pulse Rate Converter Calibration Frequency:	Waugh S/N 2623 150 days	UAL
4.54	Pulse Rate Converter Calibration Frequency:	Waugh 120 days S/N 3454	UAL

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4.55	DC voltmeter Range: 0/500 v Accuracy: ±0.05%	Fluke Manufacturing Model 801	UAL 326
4.56	Amplifier Range: 3-10K Accuracy: 4%	Unholtz-Dickie Model 607-RMG-3 S/N 118	UAL 2021
4.57	Temperature Potentiometer Accuracy: ±0.1% fs	Minneapolis-Honeywell Model 126W-V	UAL 889
4.58	Camera, Oscillotron with Polaroid Back Range: 75 mm 1.9 lens	Beattie Coleman Model 12445	UAL 971
4.59	Transducer, Pressure Range: 0-100 psi	Statham Model PG246TCe	UAL 1287
4.60	Transducer, Pressure		
4.61	Switching and Indicating Circuit Panel	Supplied by Douglas Aircraft Company	

UNITED AEROTEST LABORATORIES

Test Report No. 40965-T-1

SIGNATURE PAGE

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) ss:

W. R. Byars, being duly sworn, deposes and says: That the information contained in this Test Report is the result of complete and carefully conducted tests, and is, to the best of his knowledge, true and correct in all respects.

W R Byars
W. R. Byars, Operations Manager

SUBSCRIBED and sworn to before me this 18th day of August 1965

Blanche C. Allison
NOTARY PUBLIC in and for the County of Los Angeles, State of California

My Commission Expires Feb. 26, 1966

for [signature]
Gordon N. Adams, Testing Manager
(Beaumont Remote Facility)

G. Holmes
G. Holmes, Acting Testing Supervisor

F. L. Siegl
F. L. Siegl, Technical Writer

J. Serrantino
J. Serrantino AFQAR
Reference: U. S. Government Contract NAS 7-101

UNITED AEROTEST LABORATORIES

N-O-T-E

These results are furnished solely for your private uses and the private uses of your customers. The use of this report or any information contained therein, or the use of the name United Aerotest Laboratories, for advertising or general promotional purposes, without the prior written approval of United Aerotest Laboratories, is expressly prohibited, and these results are furnished on the condition that no such use will be made thereof.

SERIAL NO 303047 PAGE 5

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B 1
REPORT NO. R5180-

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

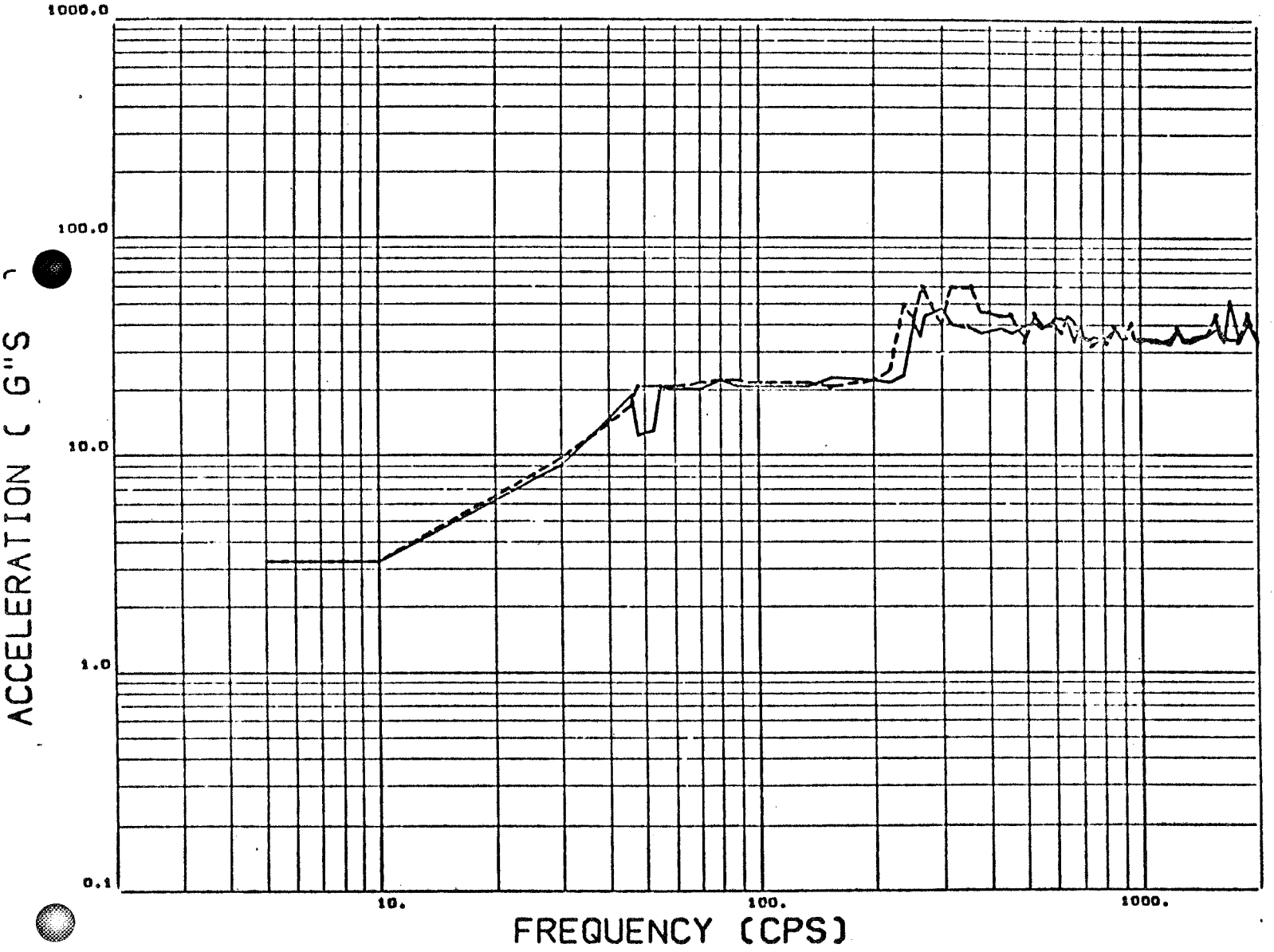
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE 1
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE.....	08/05/65
AXIS OF EXCITATION....	THRUST
PICK UP NUMBER (1)...	ACCEL (1)
PICK UP RESPONSE.....	
INPUT ACCEL.PER PAGE..	



SERIAL NO 303047 PAGE

PAGE NO. B2

REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FILLER

CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

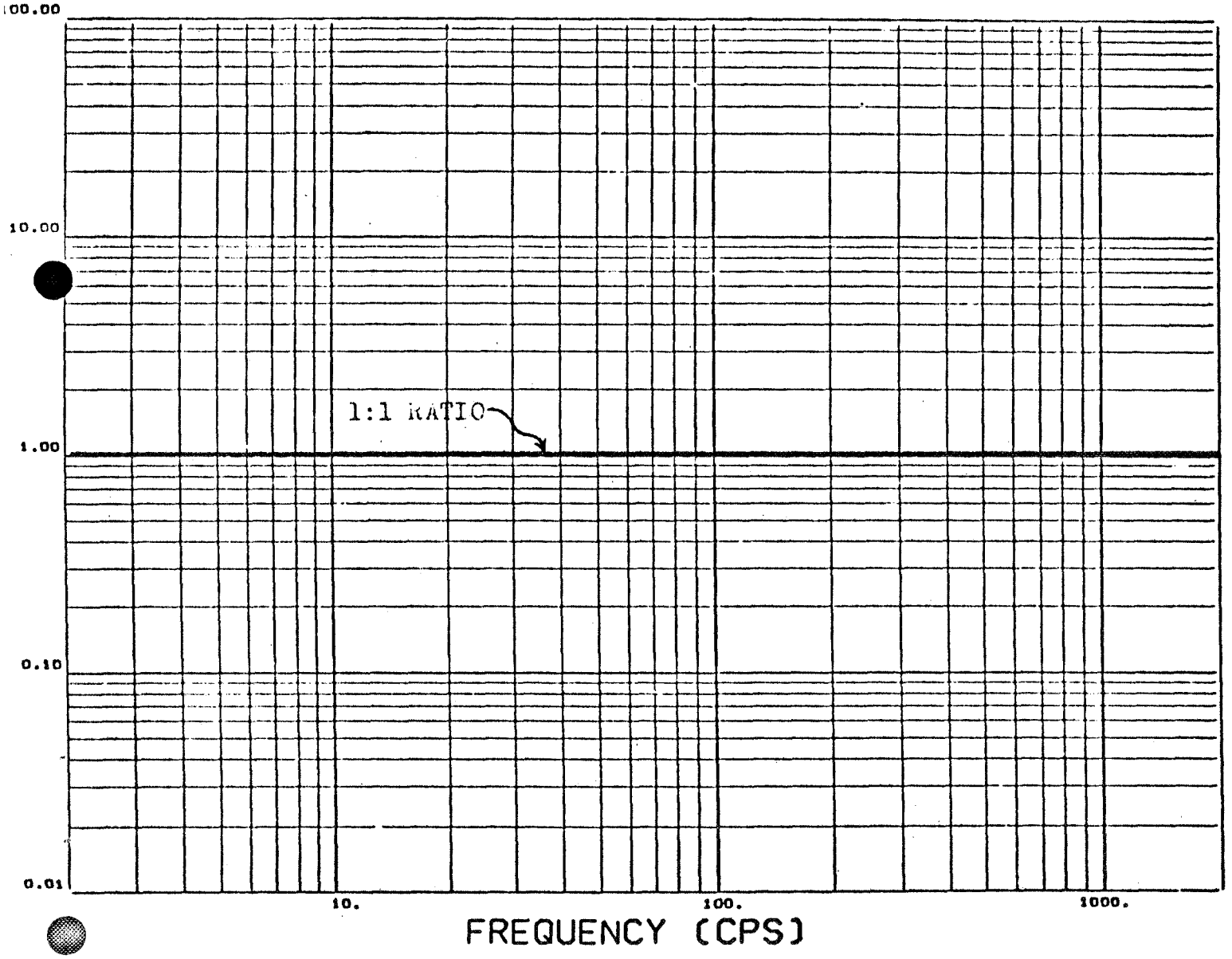
TEST DATE..... 08/05/65

AXIS OF EXCITATION.... THRUST

PICK UP NUMBER (1/ 1) ACCEL.1

PICK UP RESPONSE.....

INPUT ACCEL.PER PAGE..



SERIAL NO 303047 PAGE 11

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B3

REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 SHUTDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE [illegible]
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (2)... ACCEL.2
PICK UP RESPONSE..... [illegible]
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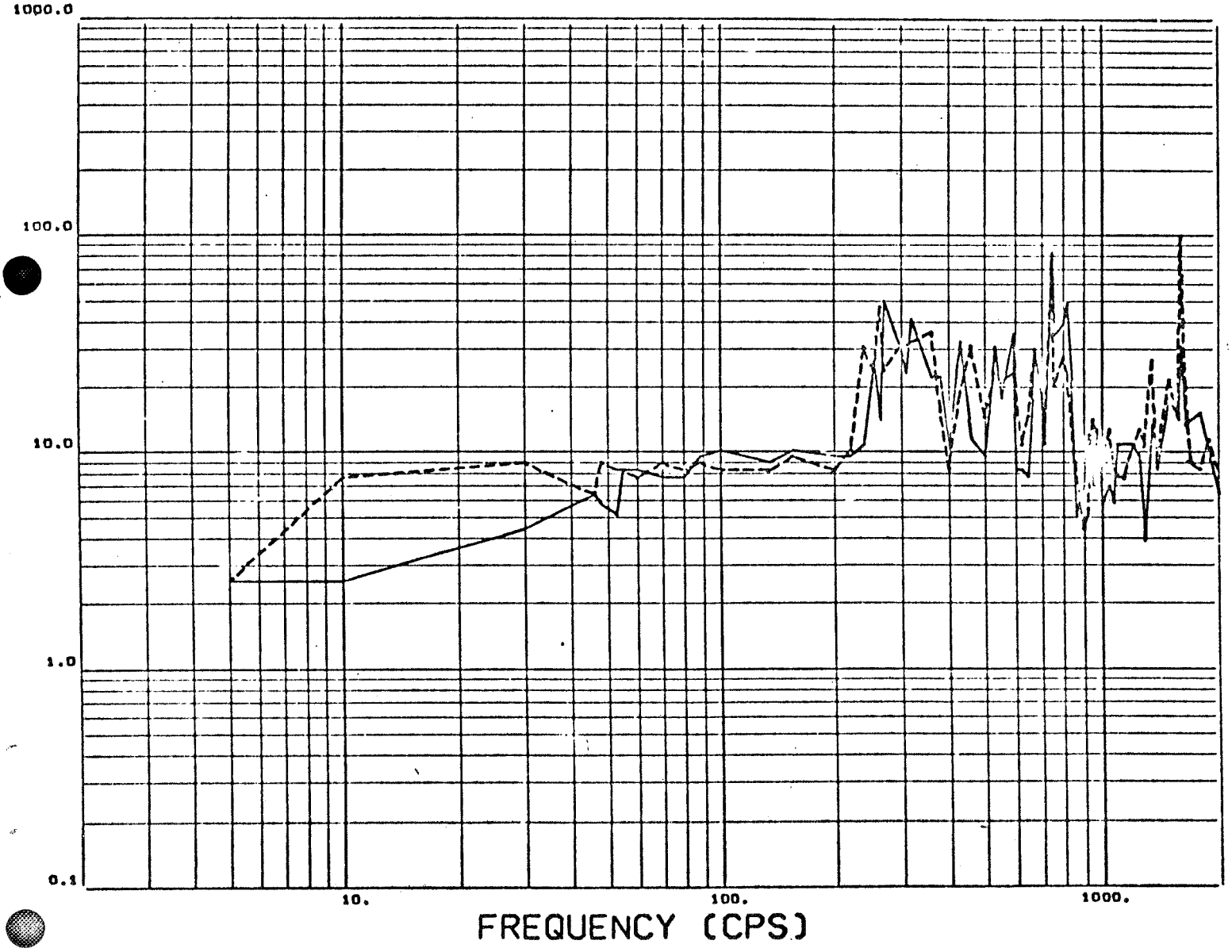


SERIAL NO 303047 PAGE 12

PAGE NO. B4
REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

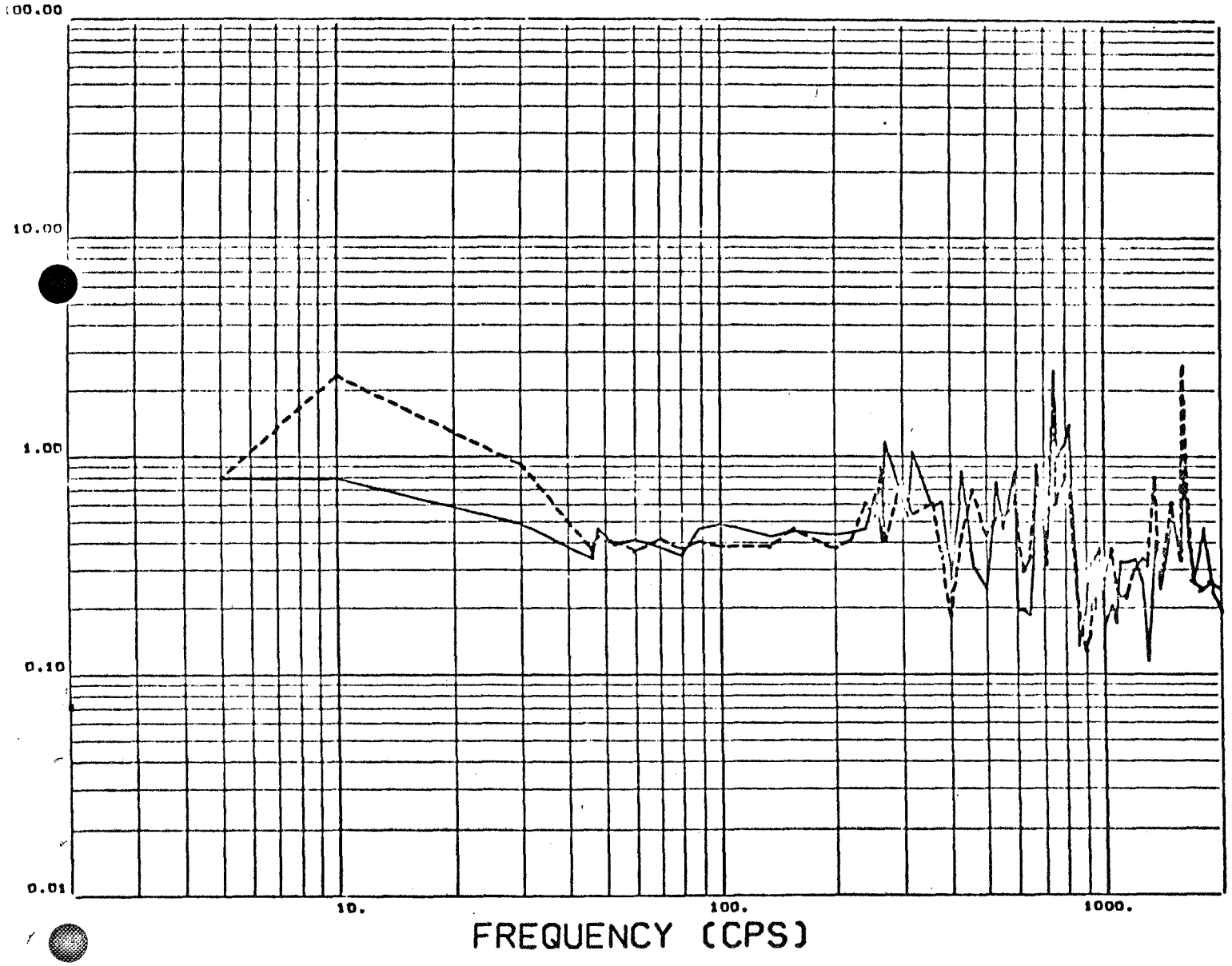
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (2/ 1) ACCEL.2
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE.. ____



SERIAL NO 303047 PAGE 23

PAGE NO. 65

REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOW RATE

CONFIGURATION ---

NOTE... SEE PAGE ____

FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65

AXIS OF EXCITATION.... THRUST

PICK UP NUMBER (4)... ACCEL.4

PICK UP RESPONSE.....

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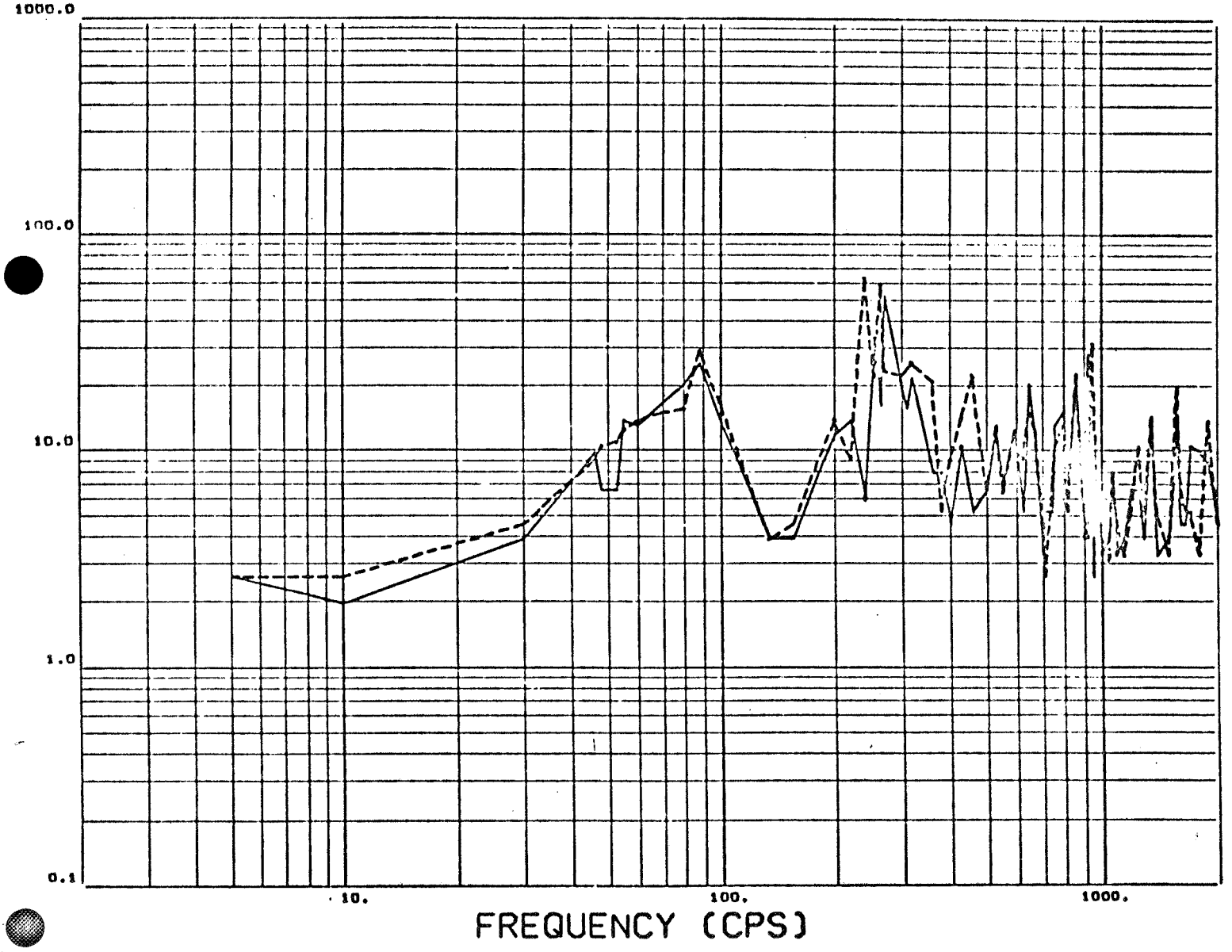


SERIAL NO 303047 PAGE 24

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B6

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...:

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

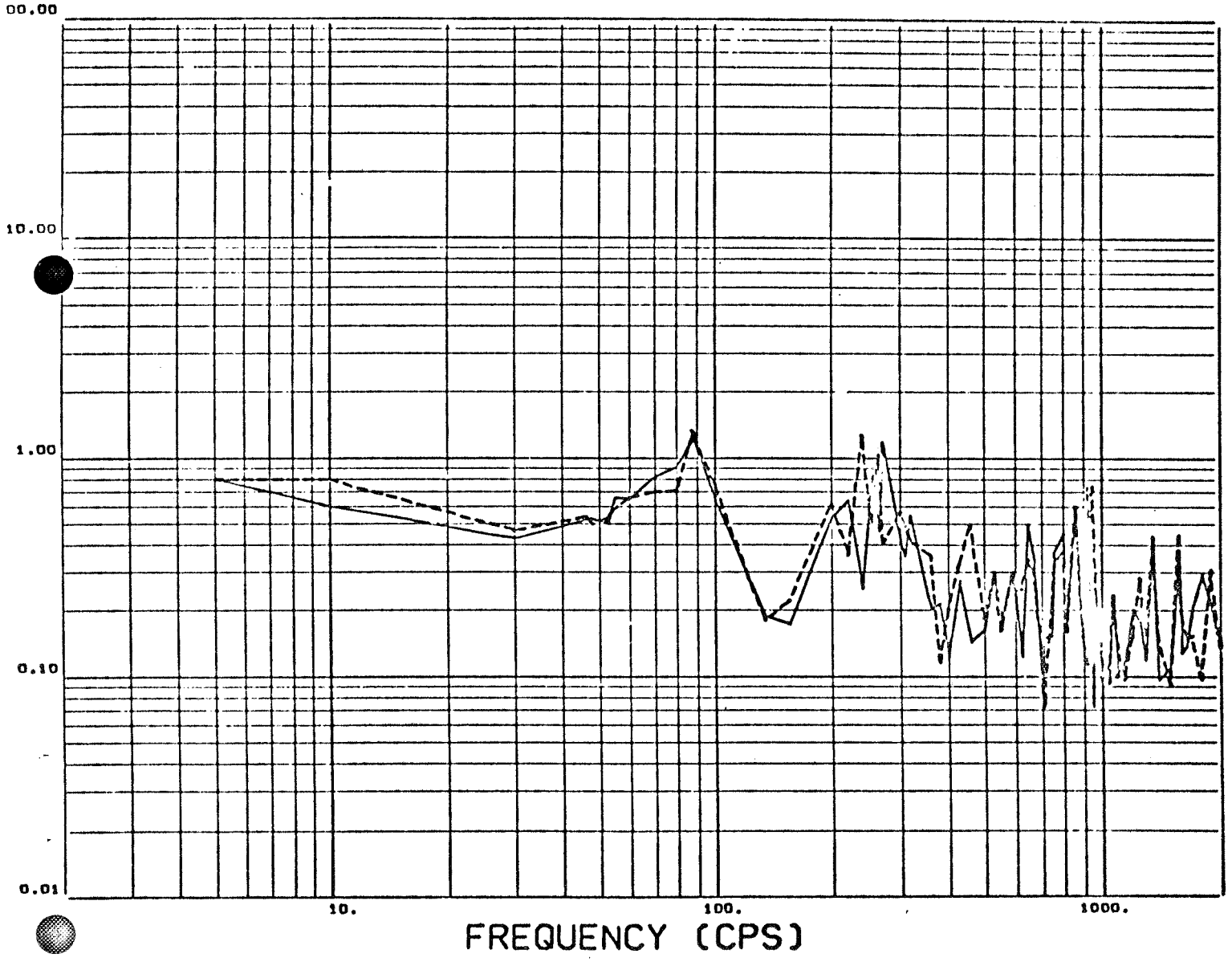
TEST DATE..... 08/05/65

AXIS OF EXCITATION.... THRUST

PICK UP NUMBER (4/ 1) ACCEL.4

PICK UP RESPONSE..... ____

INPUT ACCEL.PER PAGE.. ____



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN [illegible]

CONFIGURATION ---
NOTE... SEE PAGE ____
- FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (5)... ACCEL.5
PICK UP RESPONSE..... ____
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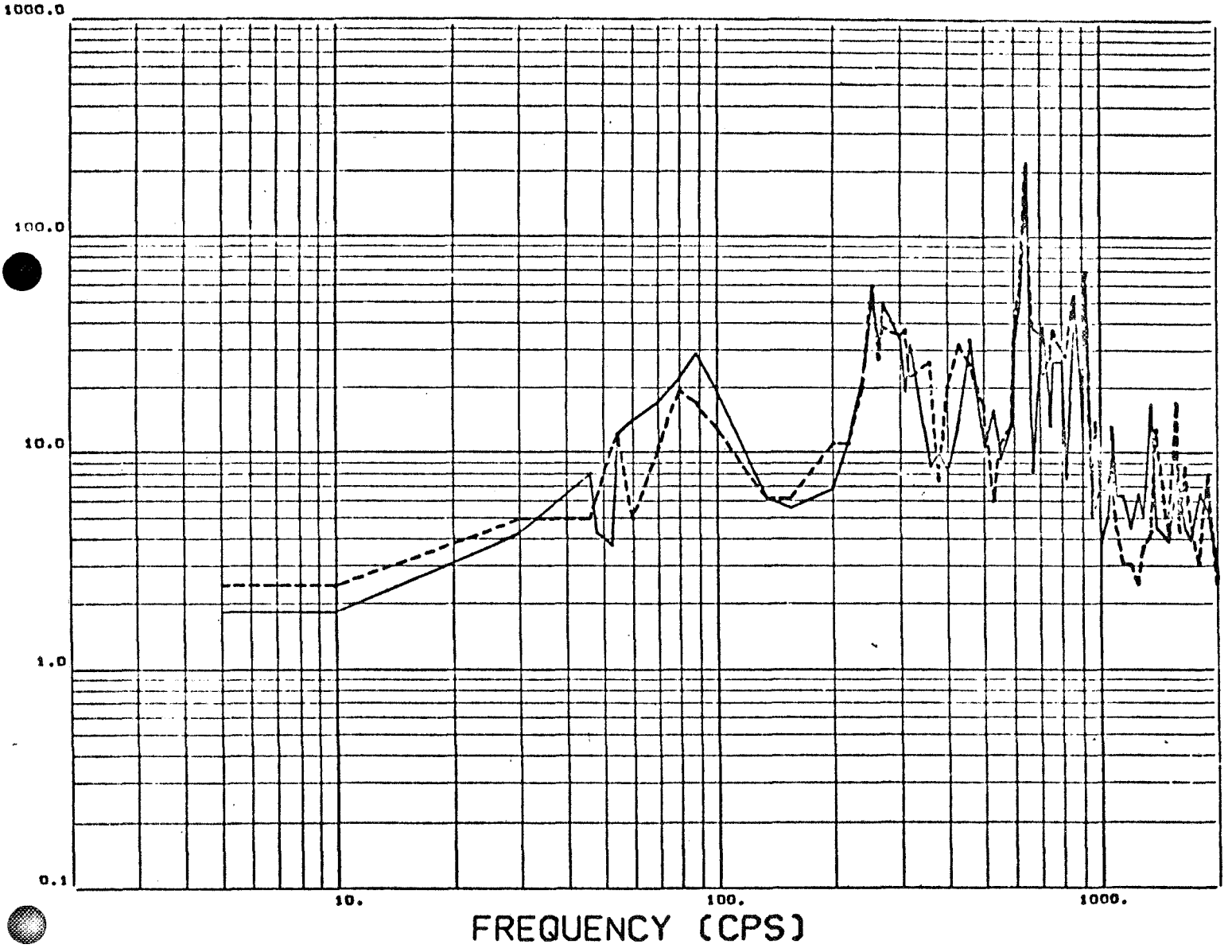


DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

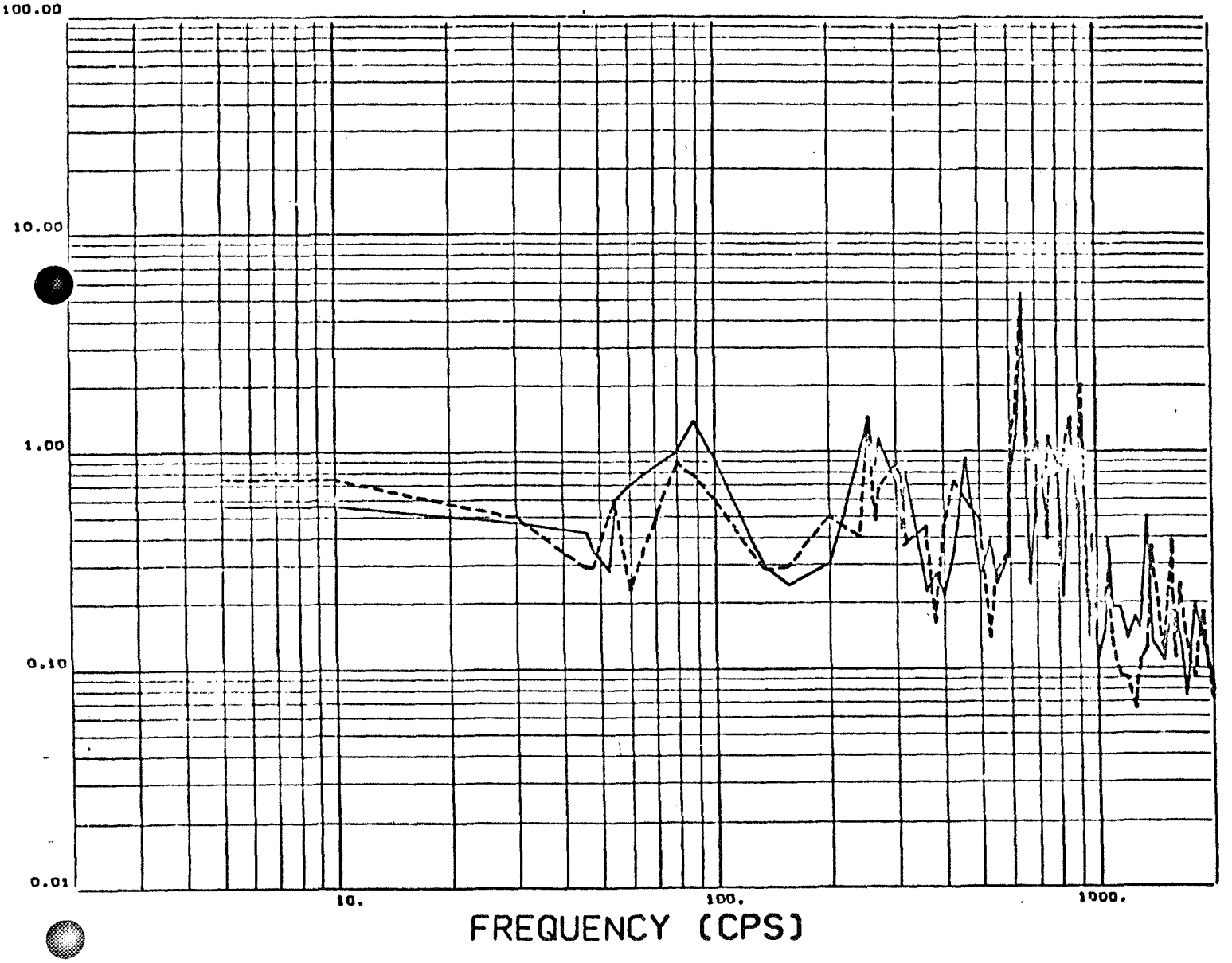
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOW TEST

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (5/ 1) ACCEL.5
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE.. ____



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DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B9

REPORT NO. [redacted]

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH2 CHILDOWN FLOWRATE

CONFIGURATION ---

NOTE... SEE PAGE ____

FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65

AXIS OF EXCITATION.... THRUST

PICK UP NUMBER (6)... ACCEL.6

PICK UP RESPONSE.....

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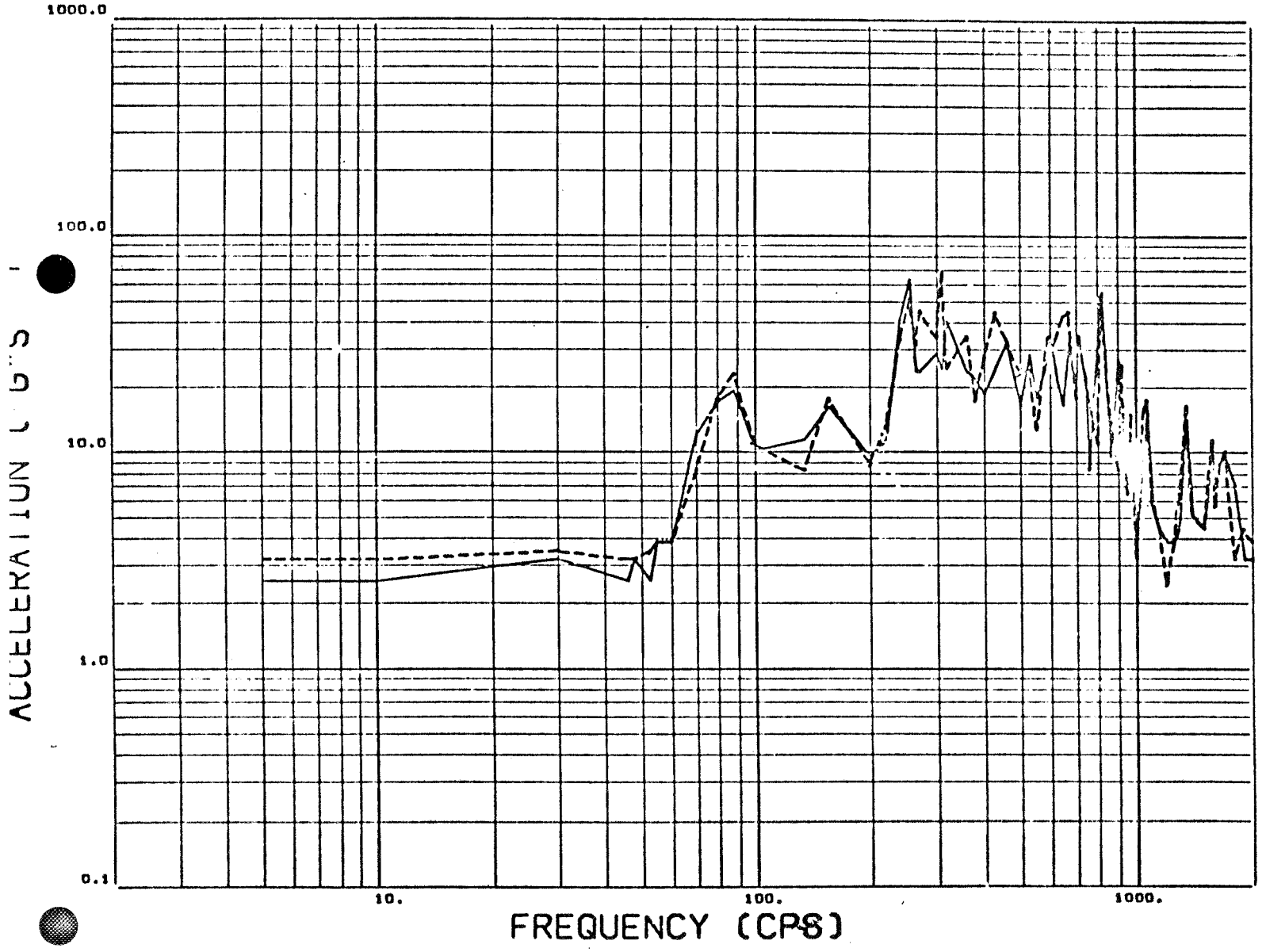

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PAGE NO. 810
REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

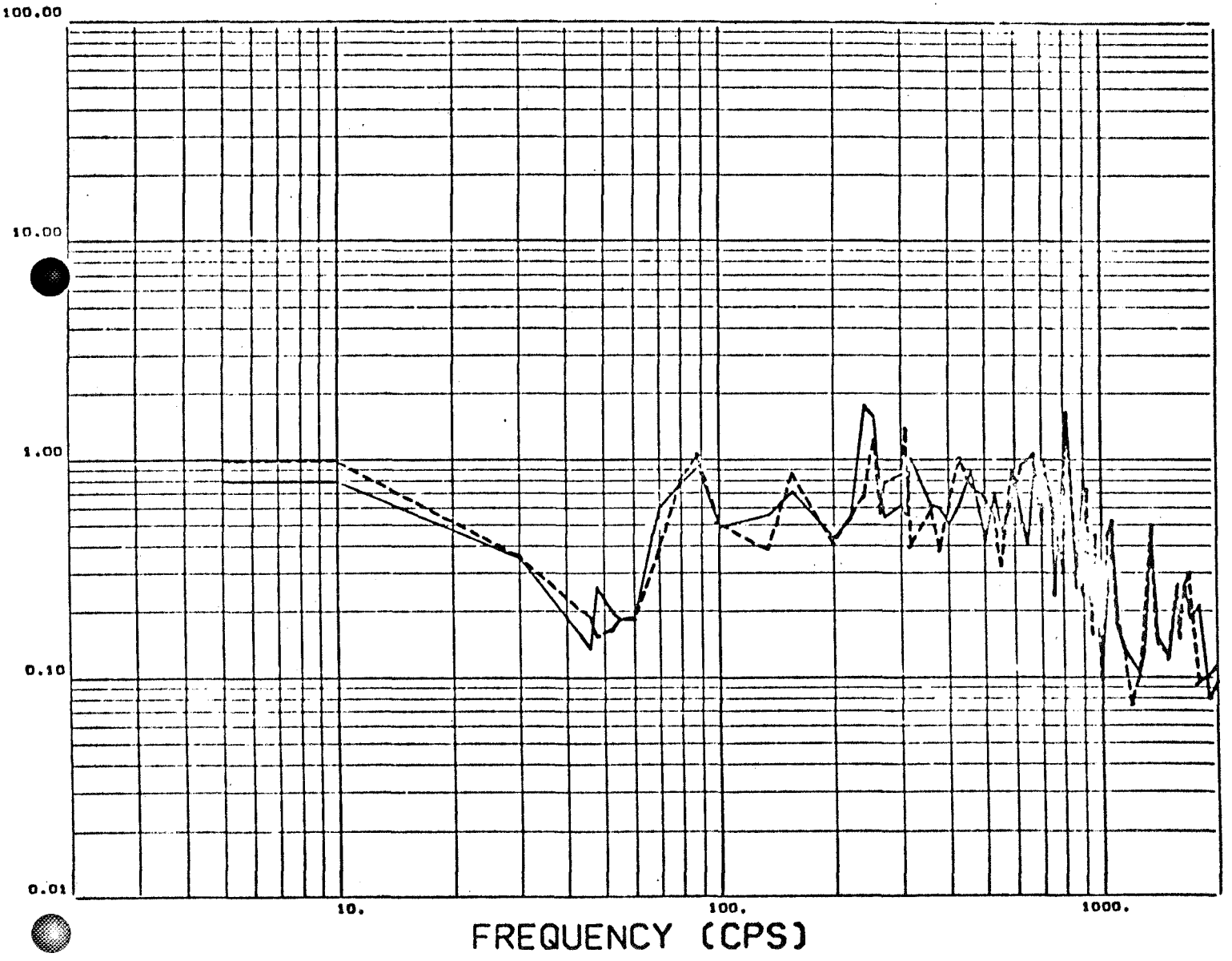
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/05/63
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (6/ 1) ACCEL.6
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



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DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B 11
REPORT NO. P5180-1

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

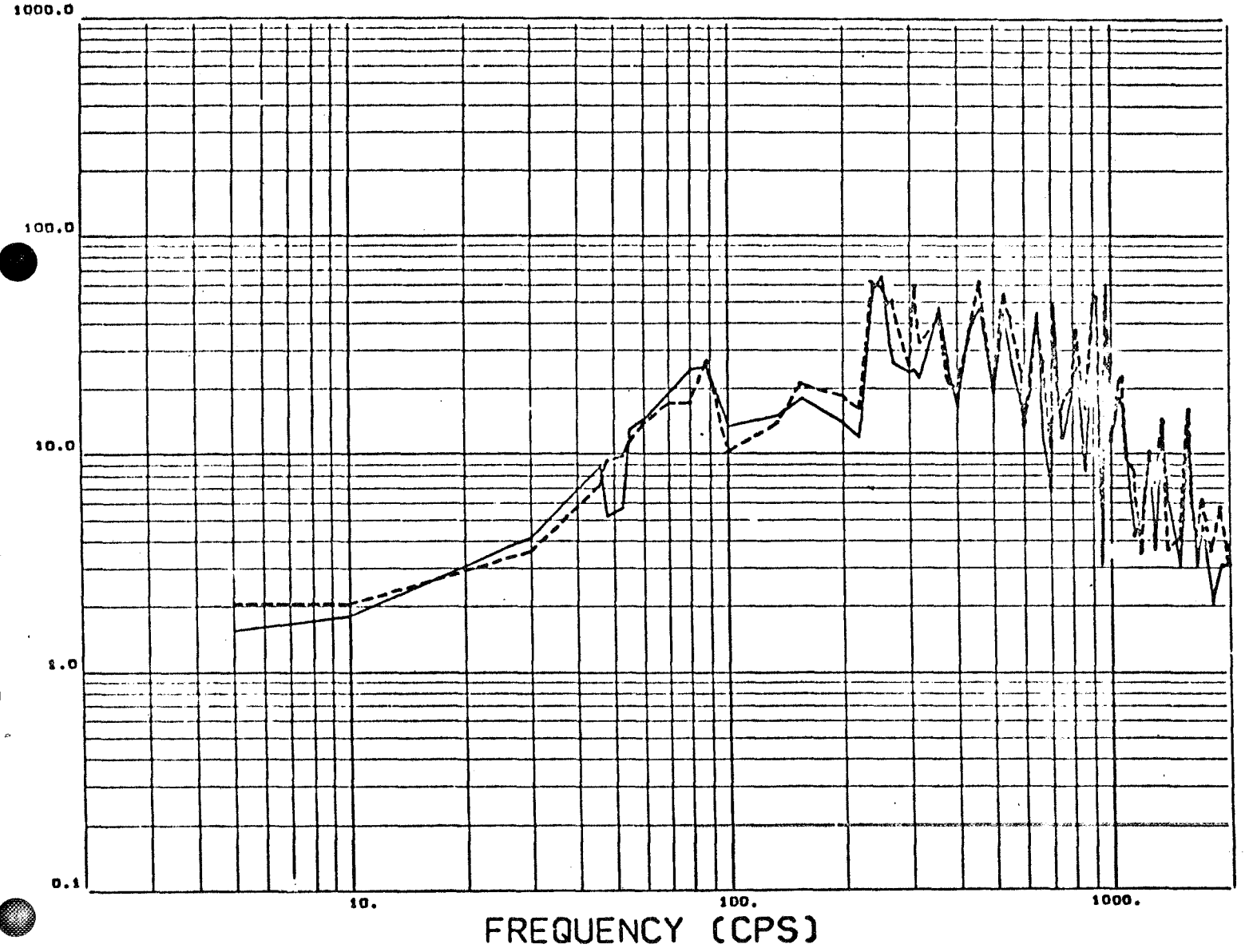
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (7)... ACCEL.7
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

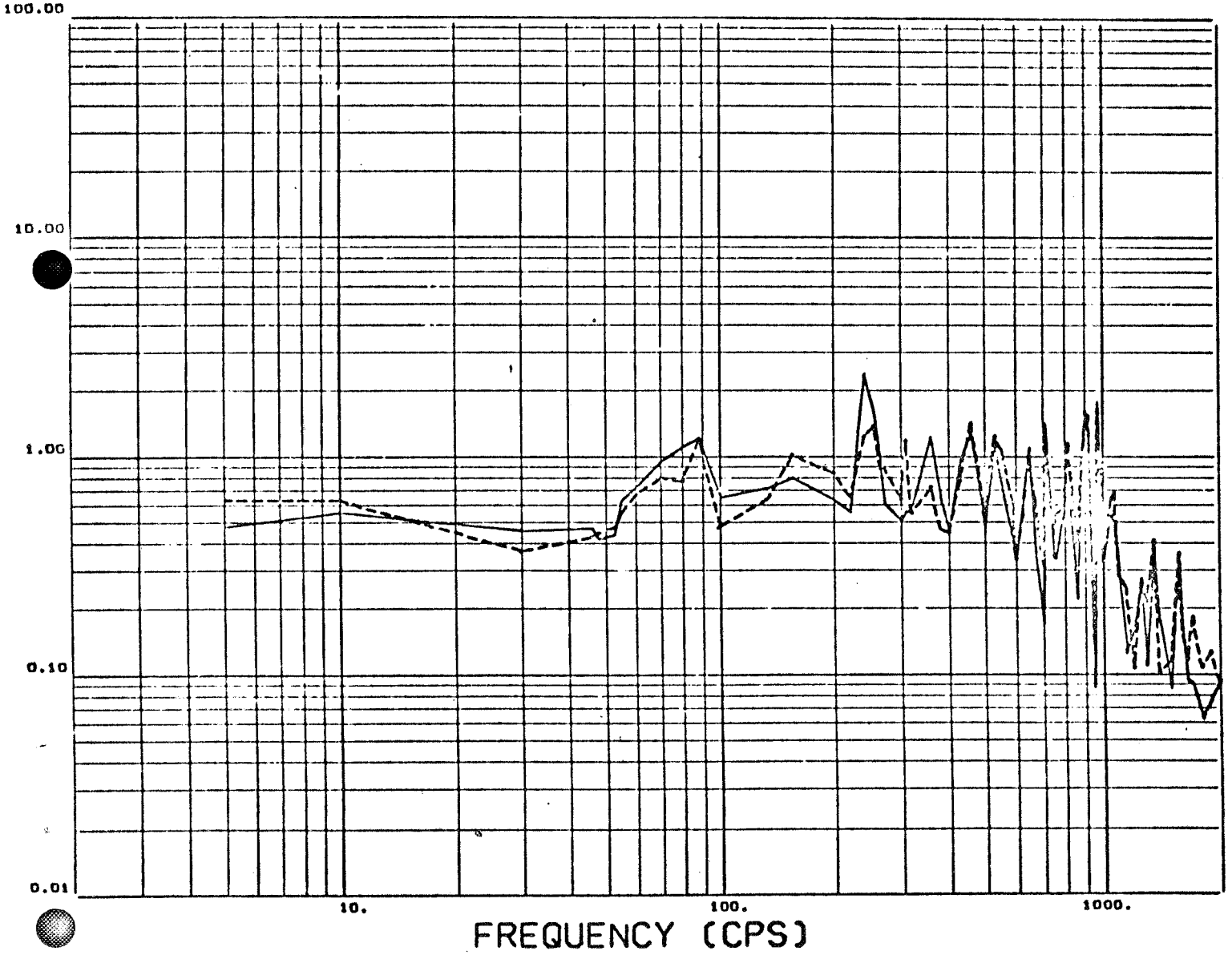
LH2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
*FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE.....	08/05/65
AXIS OF EXCITATION....	THRUST
PICK UP NUMBER (7/ 1)	ACCEL.7
PICK UP RESPONSE.....	____
INPUT ACCEL.PER PAGE..	____



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DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B-3
REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

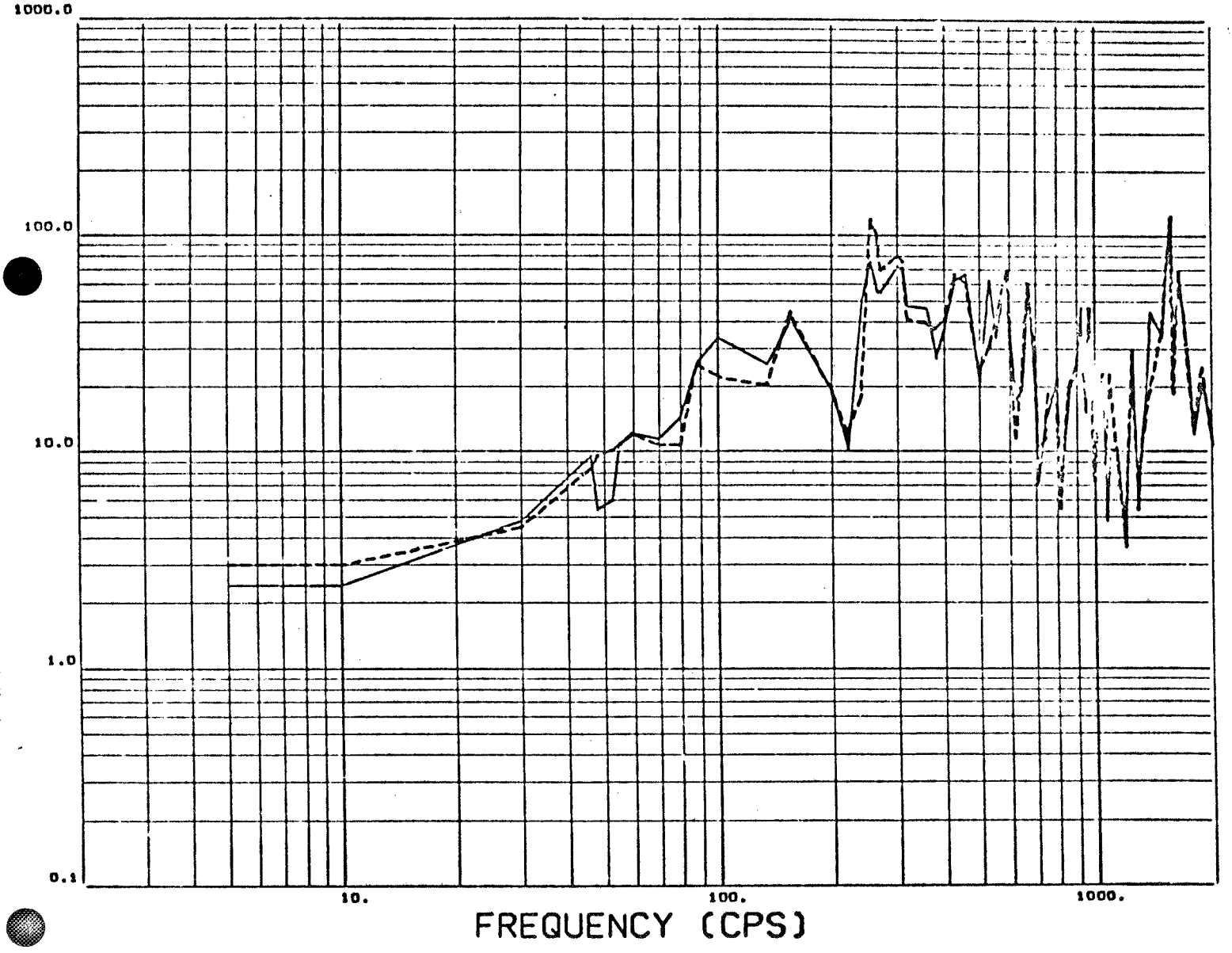
LH_2 CHILLDOWN FLOW [illegible]

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (8)... ACCEL.8
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



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DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B/4

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN PROCEDURE

CONFIGURATION ---

NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (8/ 1) ACCEL.8
PICK UP RESPONSE..... _____
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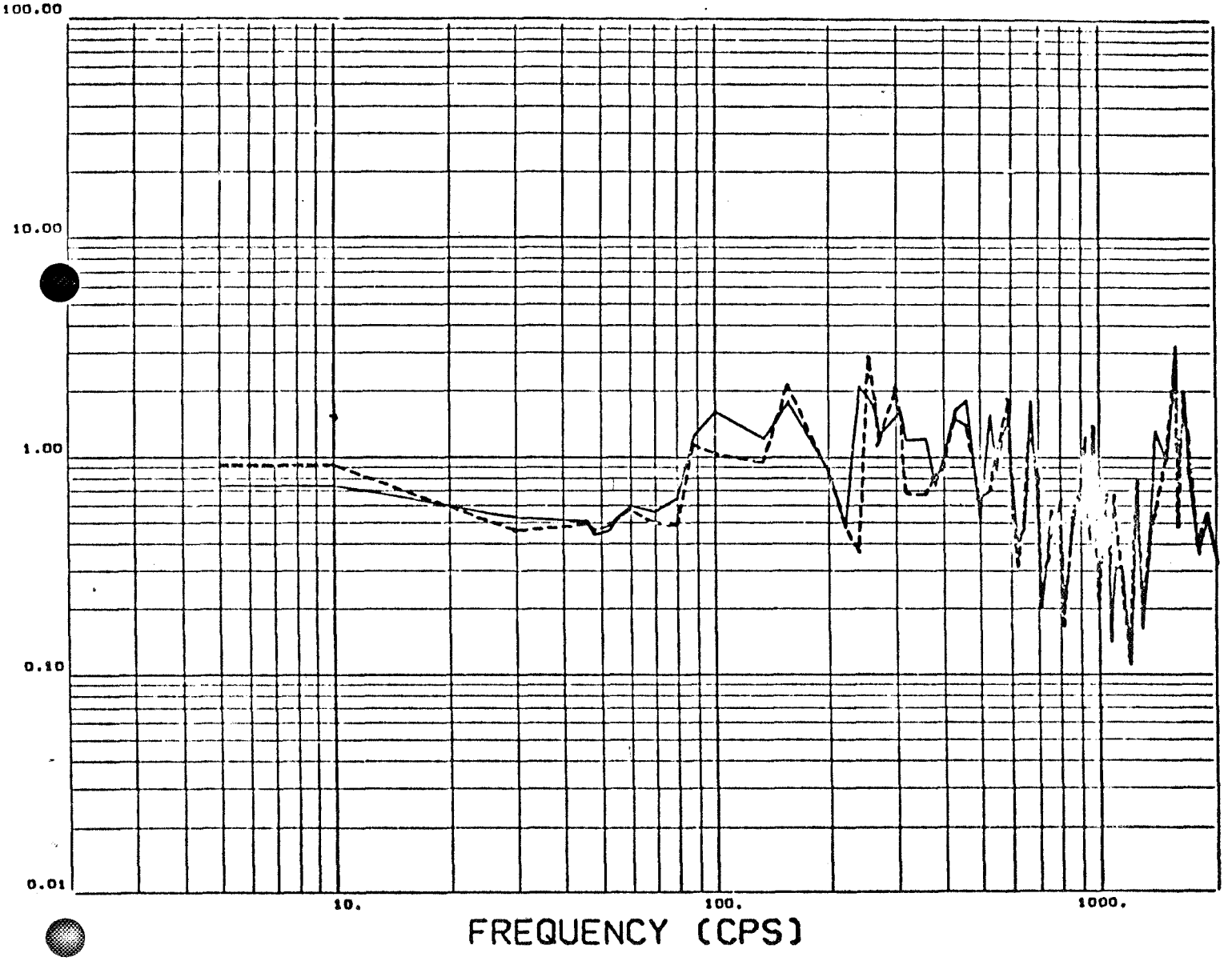


DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 303047 PAGE 53

PAGE NO. B/T

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

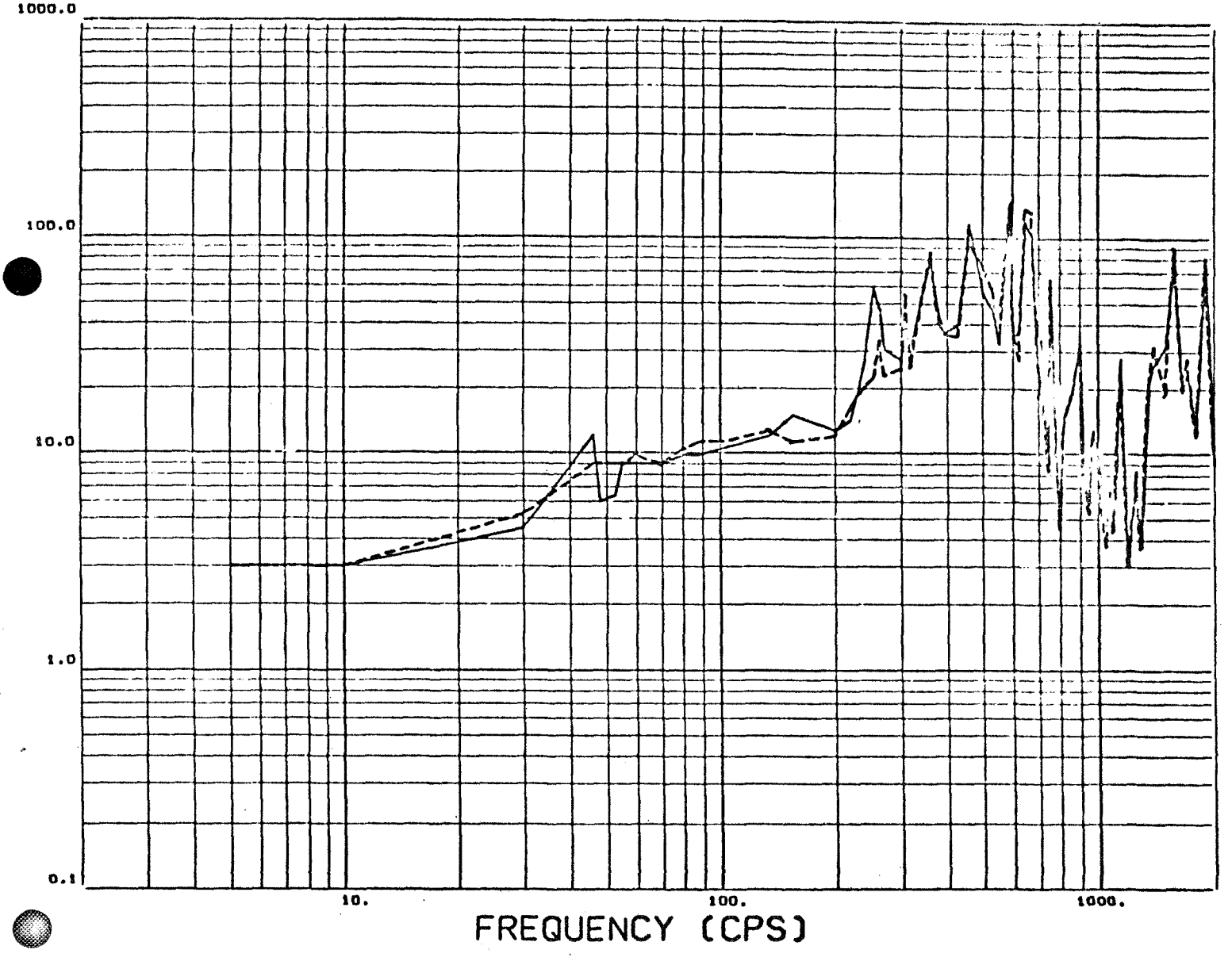
CONFIGURATION ---

NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (9)... ACCEL.9
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE.. ____



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PAGE NO. B16

REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FI[illegible]

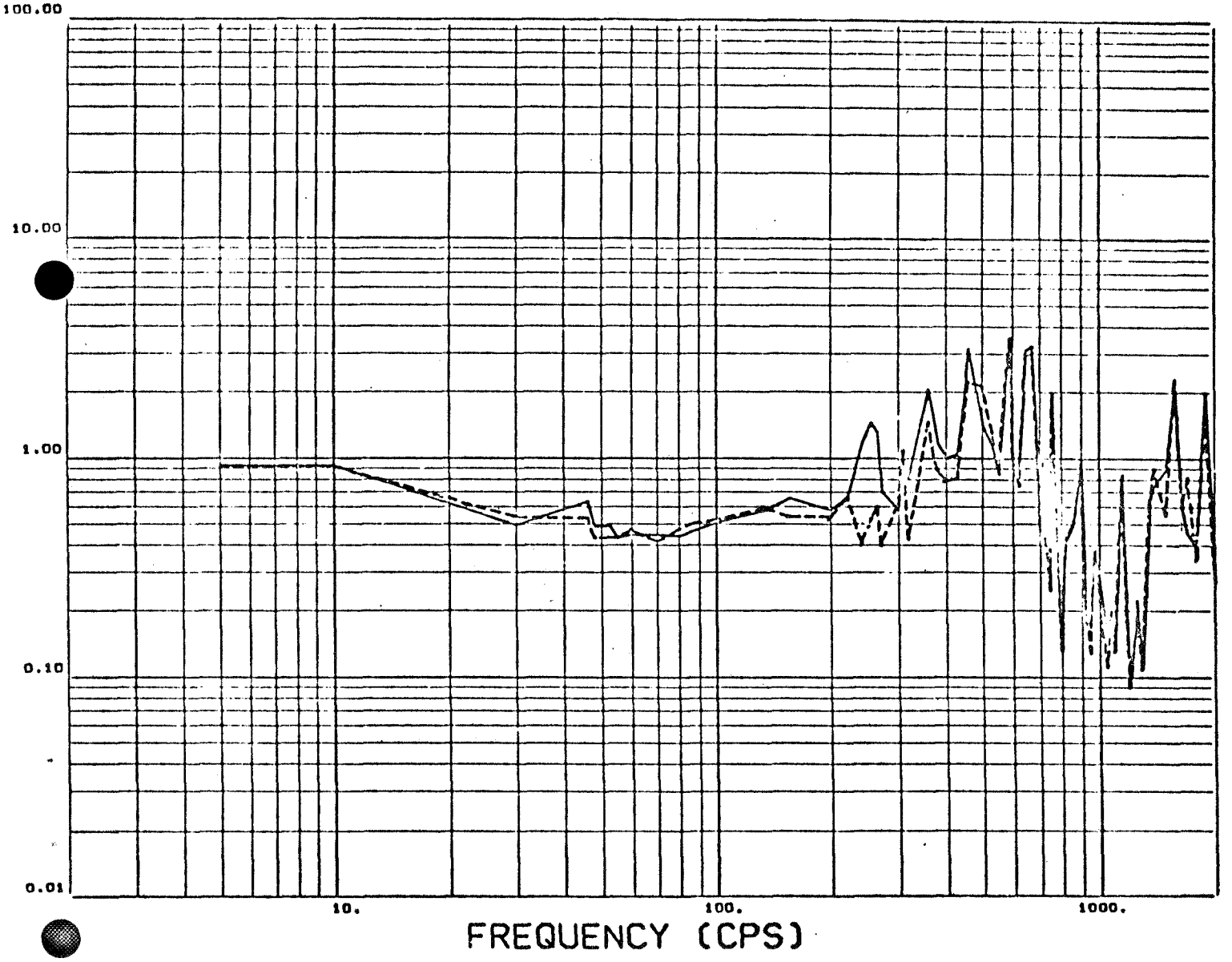
CONFIGURATION ---

NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (9/ 1) ACCEL.9
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



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DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B17
REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

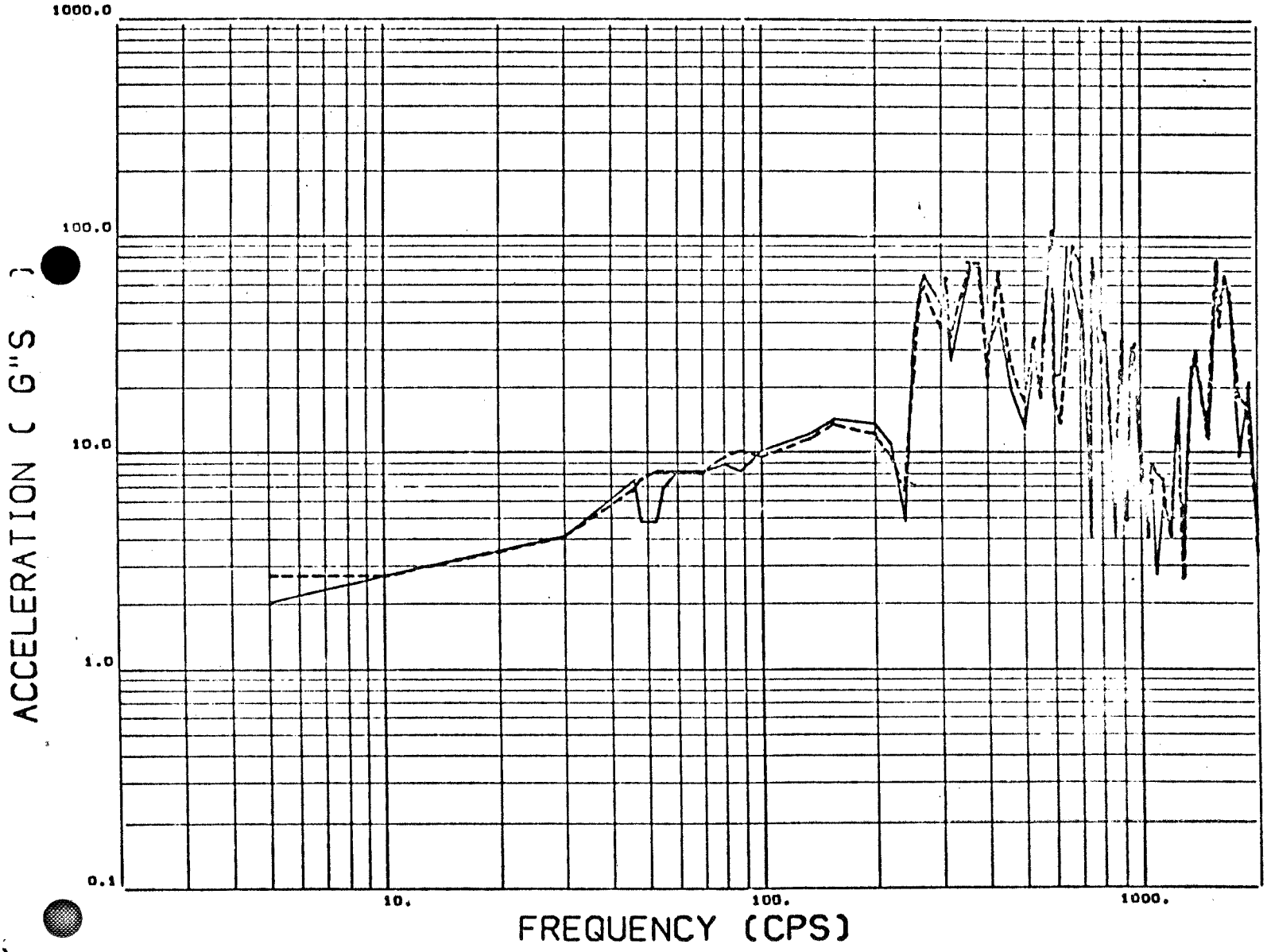
LH2 CHILLDOWN PARAMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE.....	08/05/65
AXIS OF EXCITATION....	THRUST
PICK UP NUMBER (10)...	ACCEL.10
PICK UP RESPONSE.....	
INPUT ACCEL.PER PAGE..	



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DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B18
REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FILTER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ____
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE.....	08/05/65
AXIS OF EXCITATION....	THRUST
PICK UP NUMBER (10/ 1)	ACCEL.10
PICK UP RESPONSE.....	____
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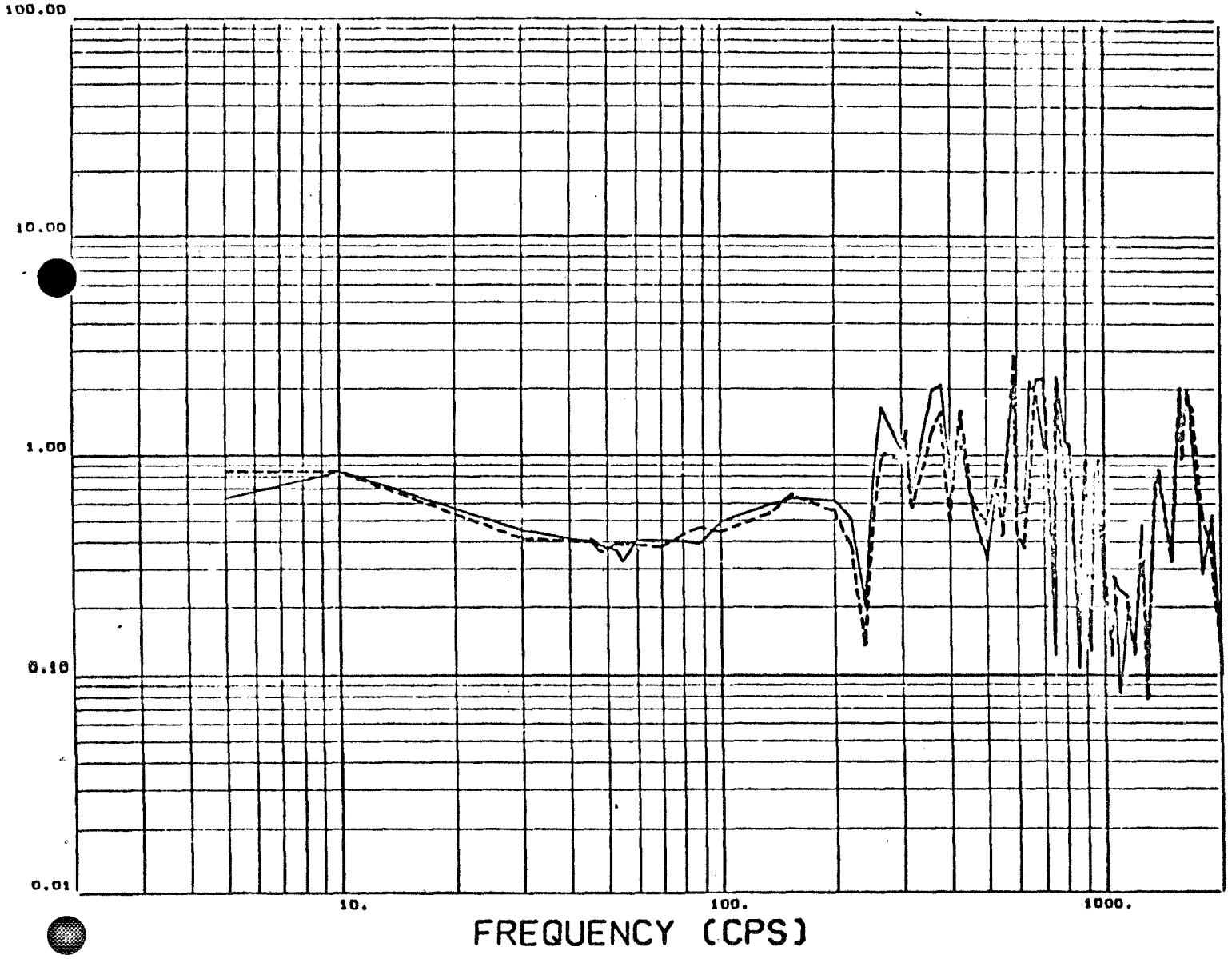


SERIAL NO 303047 PAGE 65L

PAGE NO. B19

REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

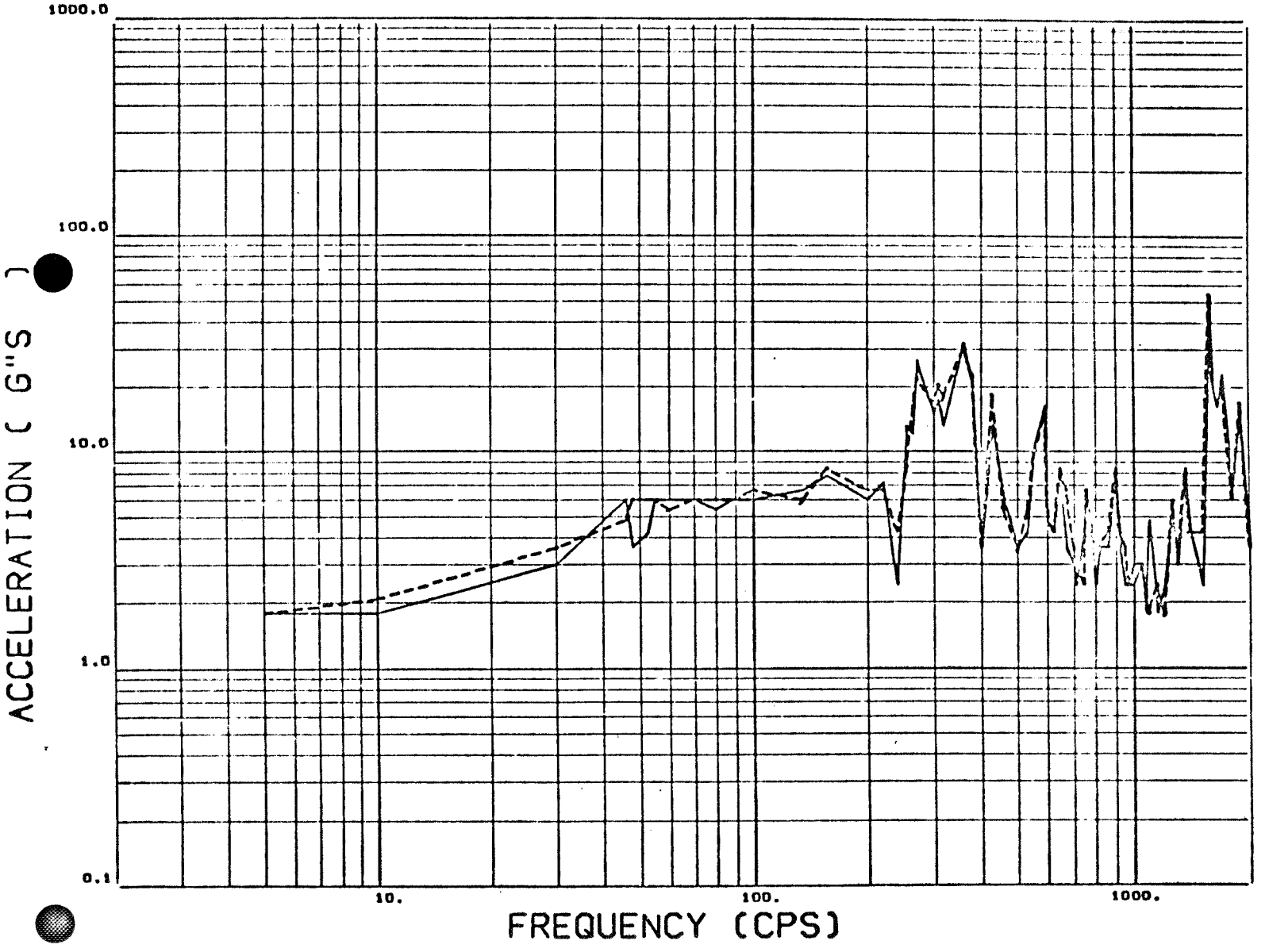
CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND..,
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (11)... ACCEL.11
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



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PAGE NO. B20

REPORT NO. [redacted]

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

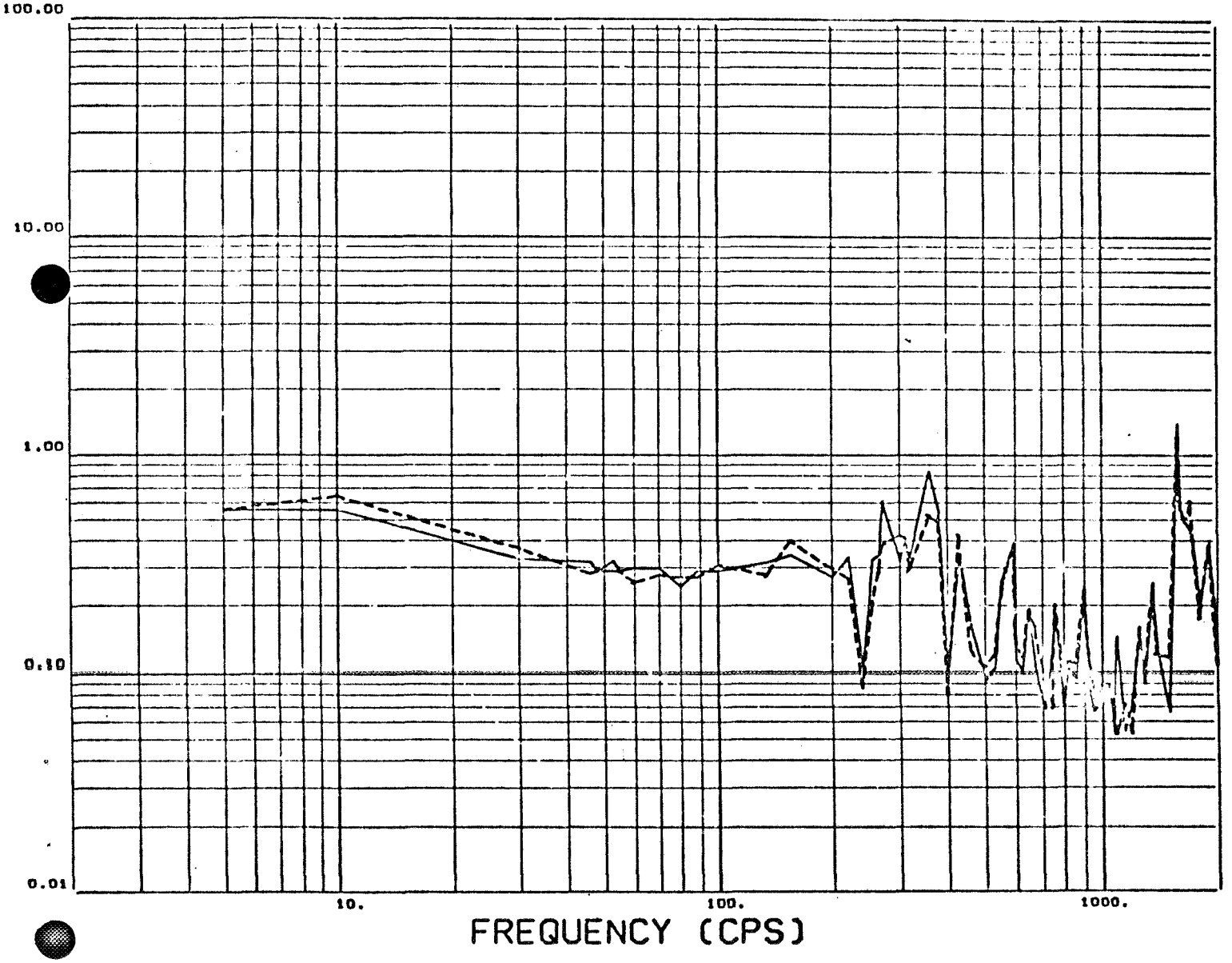
CONFIGURATION ---

NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/05/65
AXIS OF EXCITATION.... THRUST
PICK UP NUMBER (11/ 1) ACCEL.11
PICK UP RESPONSE..... _____
INPUT ACCEL. PAGE.. _____



DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 303047 PAGE 71

PAGE NO. B21

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH2 CHILLDOWN PROGRAM

CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND..,

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

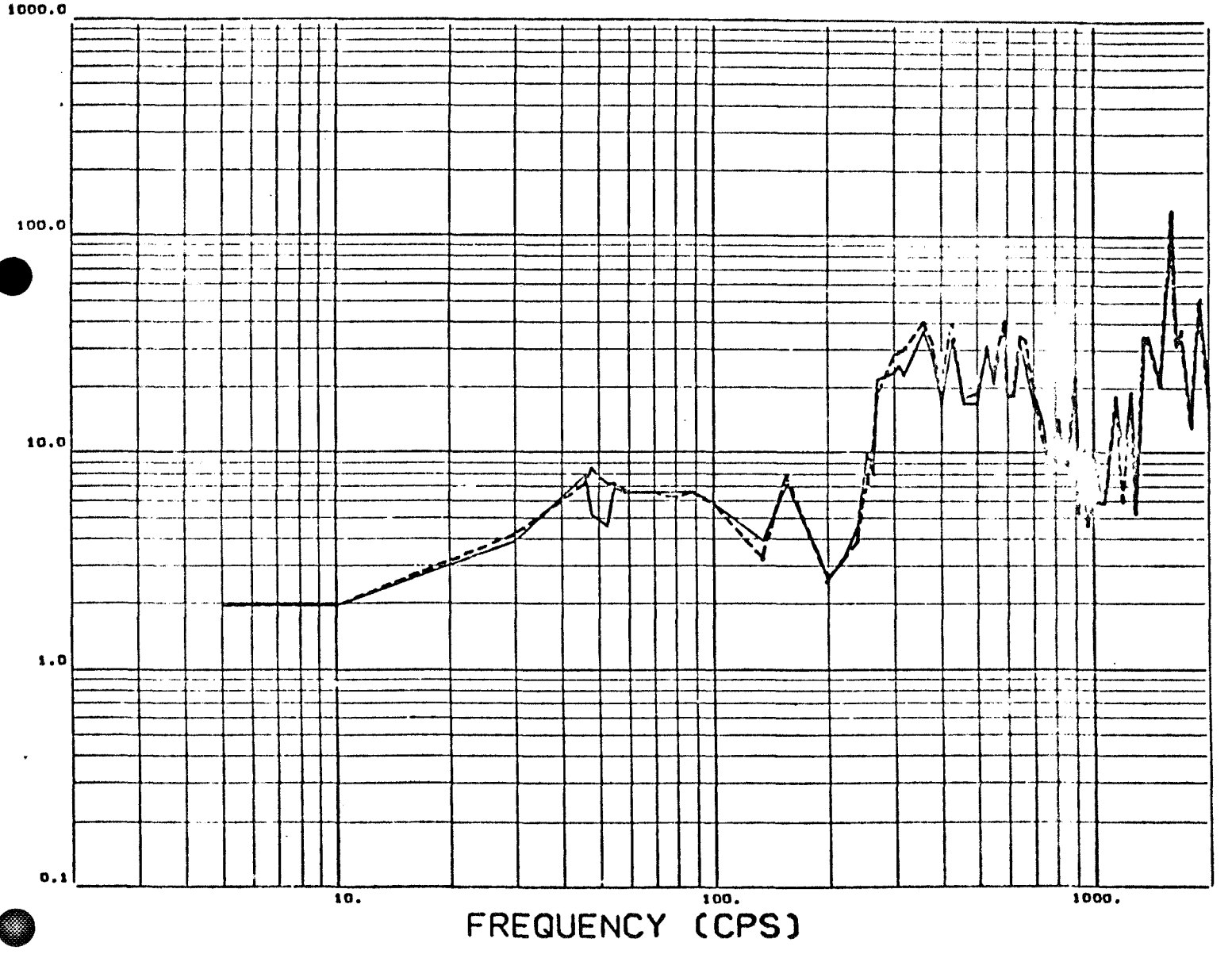
TEST DATE..... 08/05/65

AXIS OF EXCITATION.... THRUST

PICK UP NUMBER (12)... ACCEL.12

PICK UP RESPONSE.....

INPUT ACCEL.PER PAGE..



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PAGE NO. B22

REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

ONFIGURATION ---

OTE... SEE PAGE ____

FOR PICK UP LOCATION

GEND...

UPSWEEP ———

OWNSWEEP ------

TEST CONDITIONS....

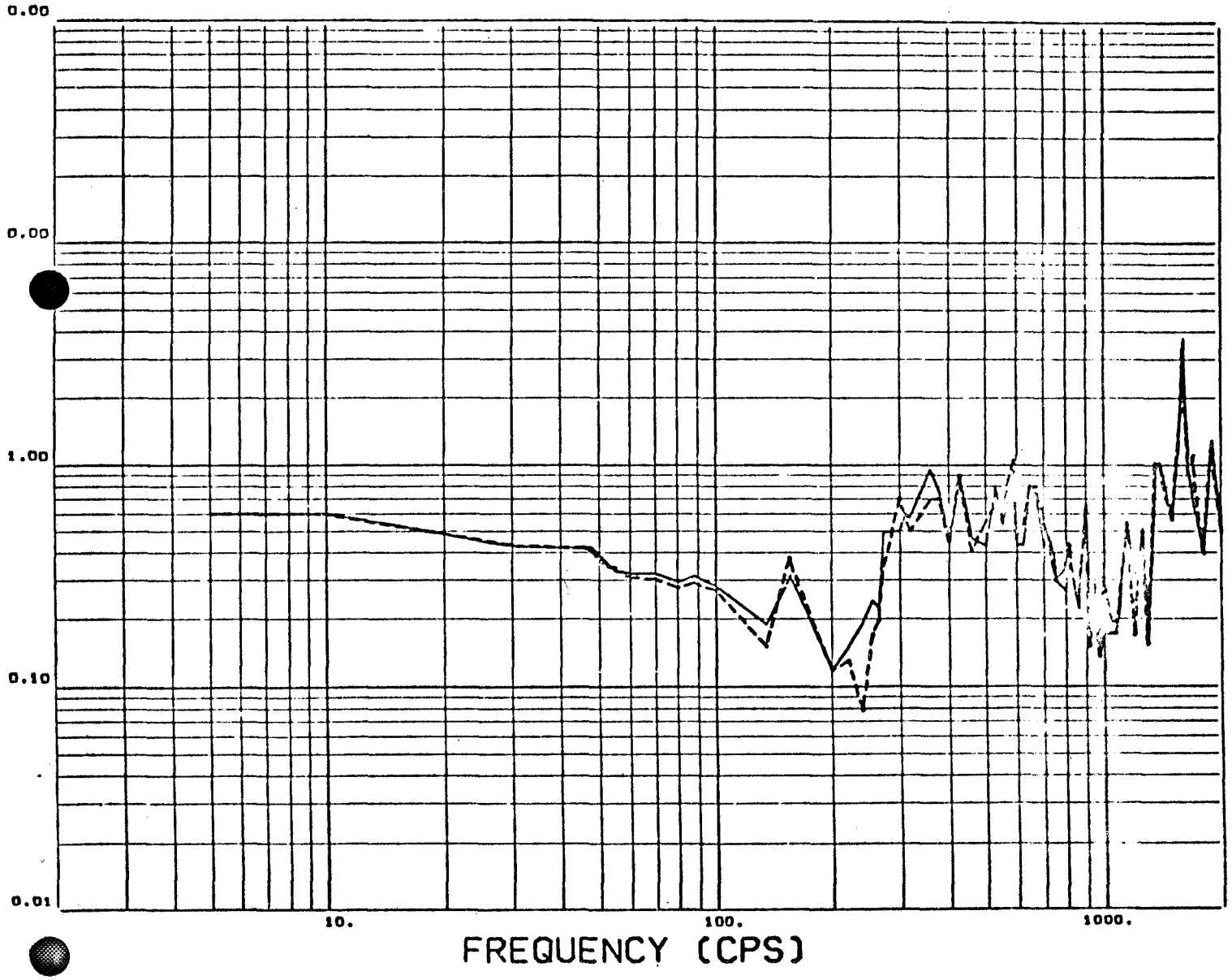
TEST DATE..... 08/05/69

AXIS OF EXCITATION.... THRUST

PICK UP NUMBER (12/ 1) ACCEL 12

PICK UP RESPONSE.....

INPUT ACCEL.PER PAGE..



SERIAL NO 302728 PAGE 5L

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B 23
REPORT NO. 2180-1

SINUSOIDAL FREQUENCY SWEEP

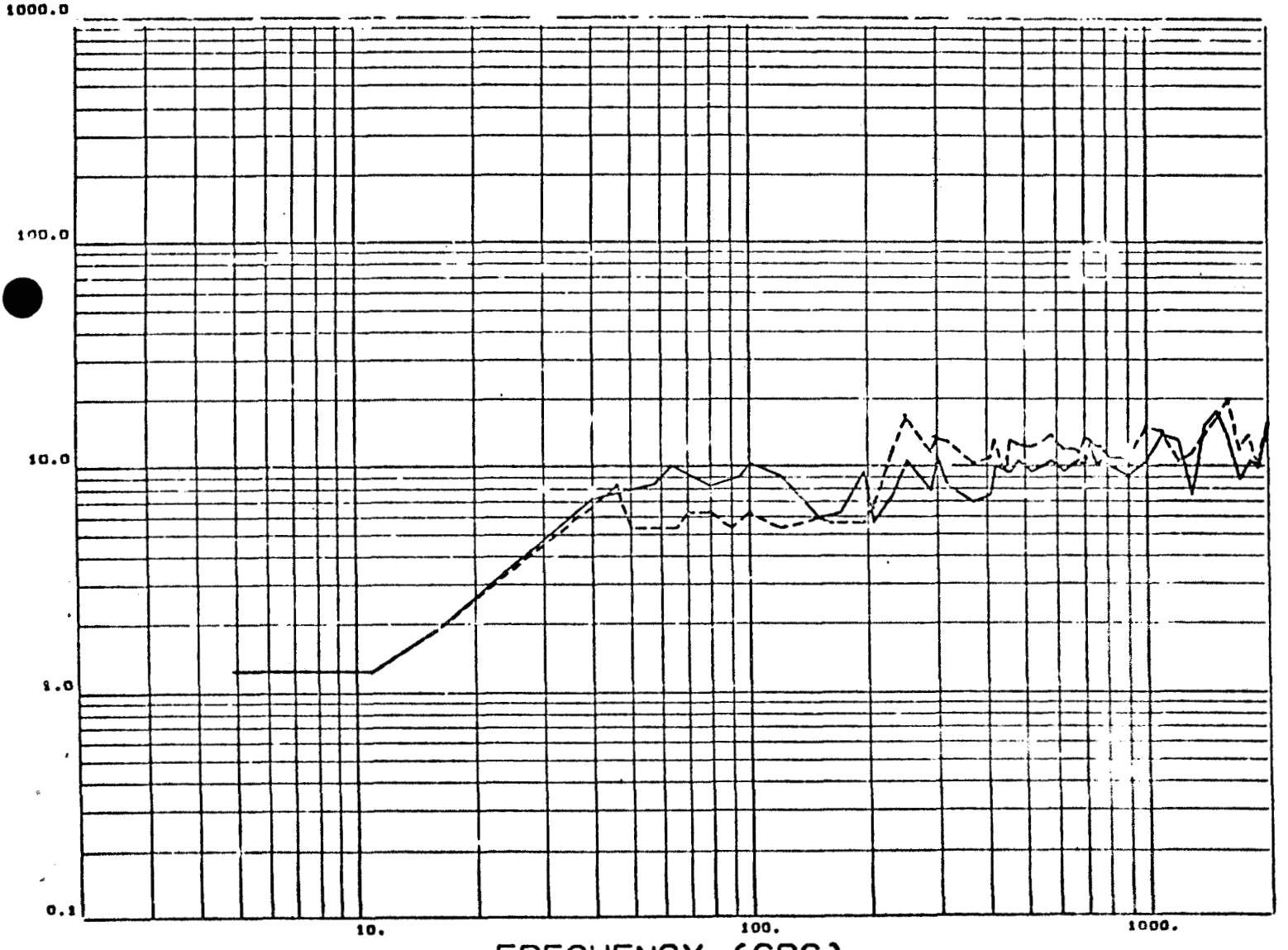
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE 12
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ——
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (1)... ACCEL.1
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 302728 PAGE

PAGE NO. B24

REPORT NO. R5150

SINUSOIDAL FREQUENCY SWEEP

[redacted]

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE A2

FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

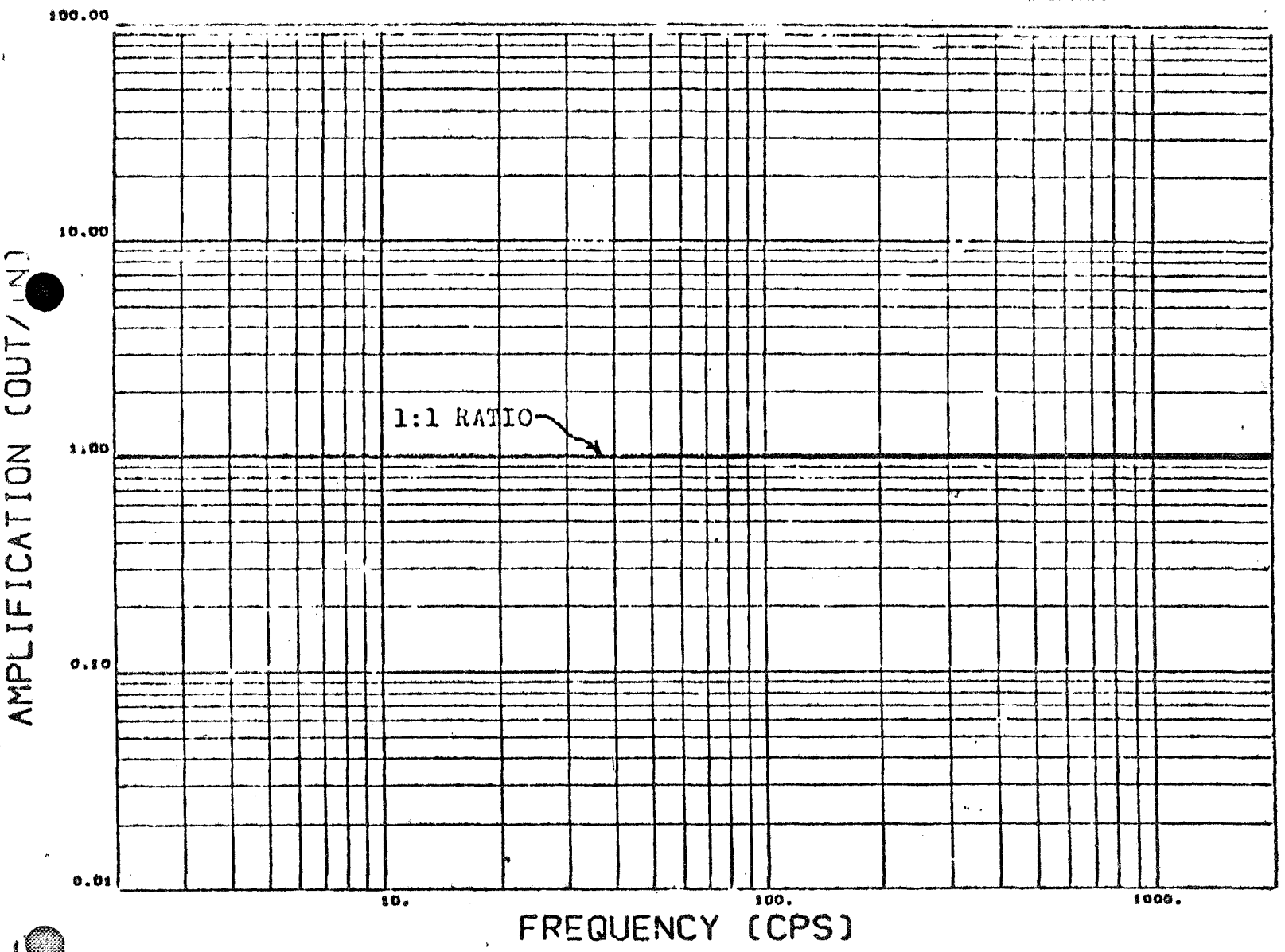
TEST DATE..... 08/3/69

AXIS OF EXCITATION.... TANGENTIAL

PICK UP NUMBER (1/ 1) ACCEL 1

PICK UP RESPONSE.....

INPUT ACCEL.PER PAGE..



SERIAL NO 302728 PAGE 11L

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B25

REPORT NO. [redacted]

SINUSOIDAL FREQUENCY SWEEP

[redacted]

LH_2 CHILDOWN FLOWMETER

CONFIGURATION --- 523

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/3/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (2)... ACCEL.2
PICK UP RESPONSE.....
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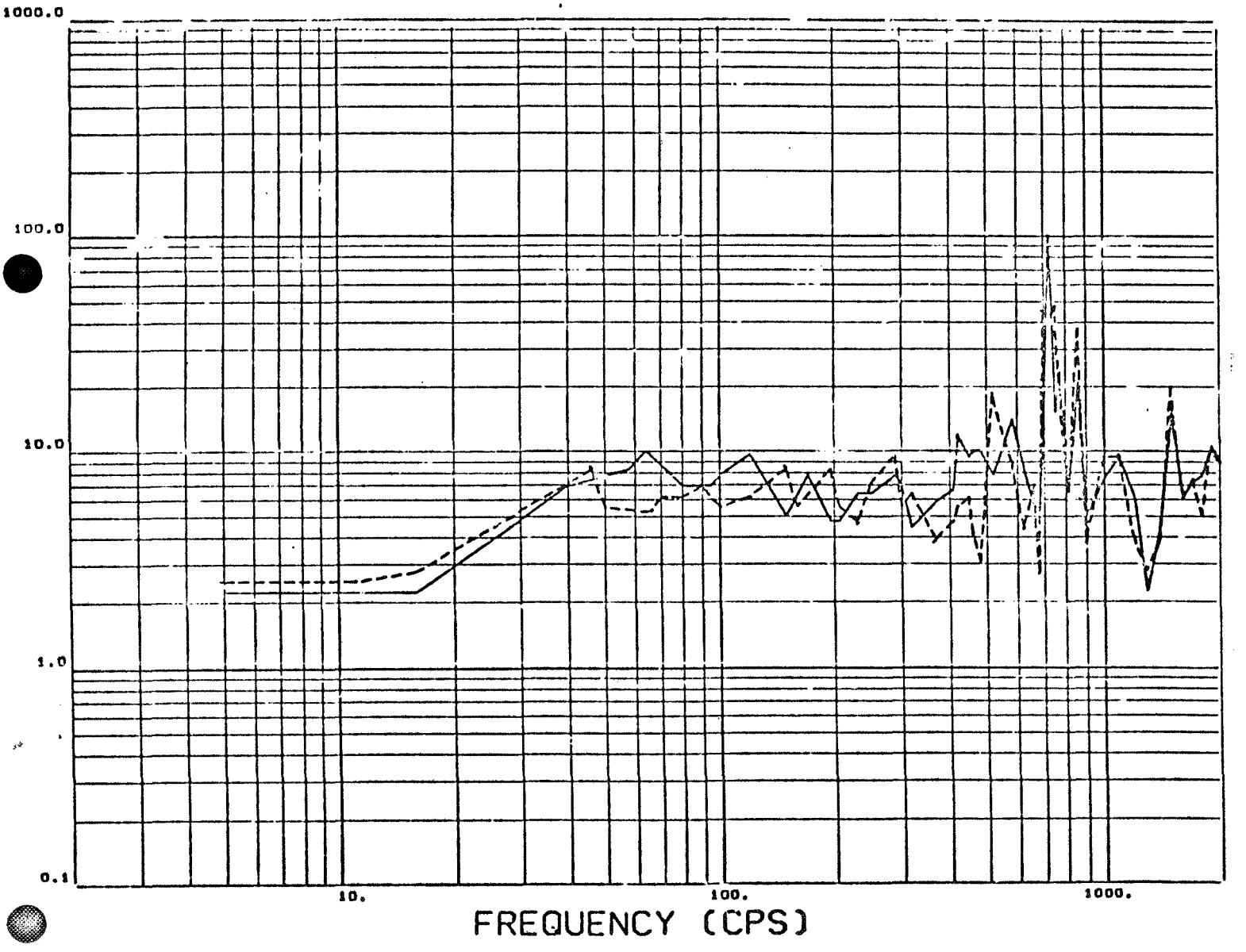


SERIAL NO 302728 PAGE 12

PAGE NO. B26

REPORT NO. [illegible]

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH2 CHILLDOWN FLOWRATE

CONFIGURATION ---

NOTE... SEE PAGE _____ FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

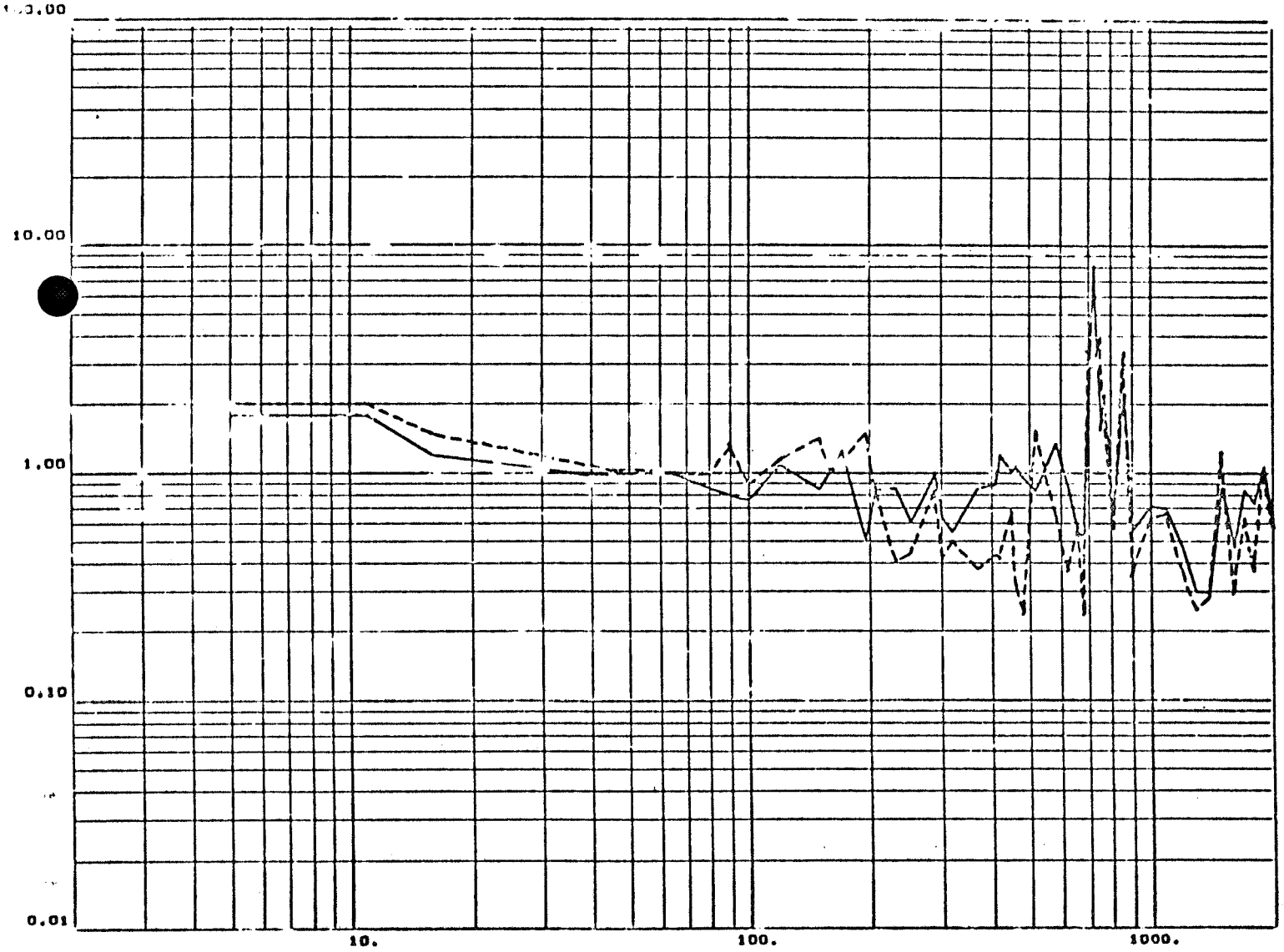
TEST DATE..... 08/5/63

AXIS OF EXCITATION.... TANGENTIAL

PICK UP NUMBER (2/ 1) ACCEL.2

PICK UP RESPONSE..... [illegible]

INPUT ACCEL.PER PAGE.. _____



SERIAL NO 302728 PAGE 17

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B27
REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

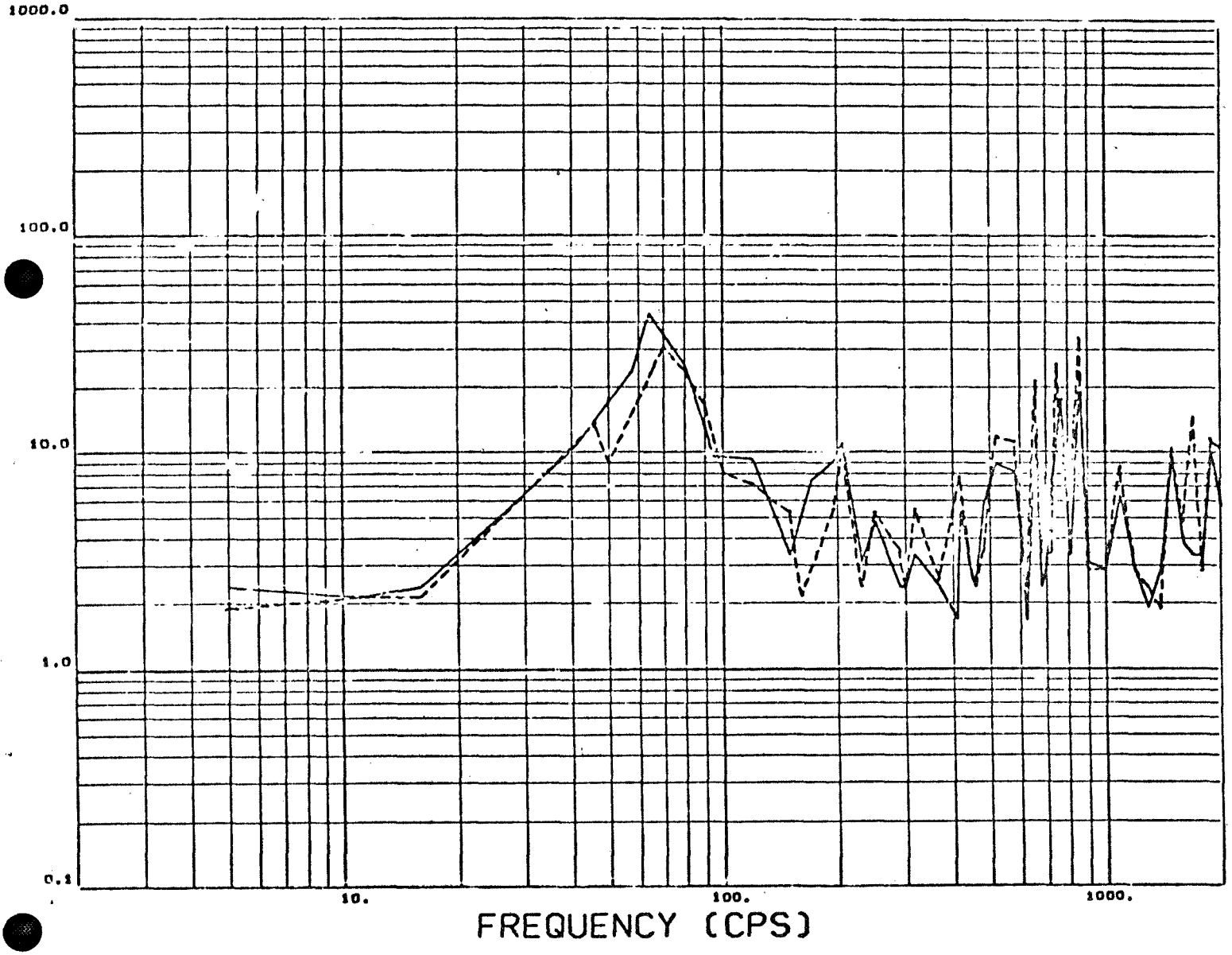
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FILLMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (3)... ACCEL.4
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 302720 PAGE 18

PAGE NO. B28

REPORT NO. [illegible]

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN ELIMINATOR

CONFIGURATION ---

NOTE... SEE PAGE _____ FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

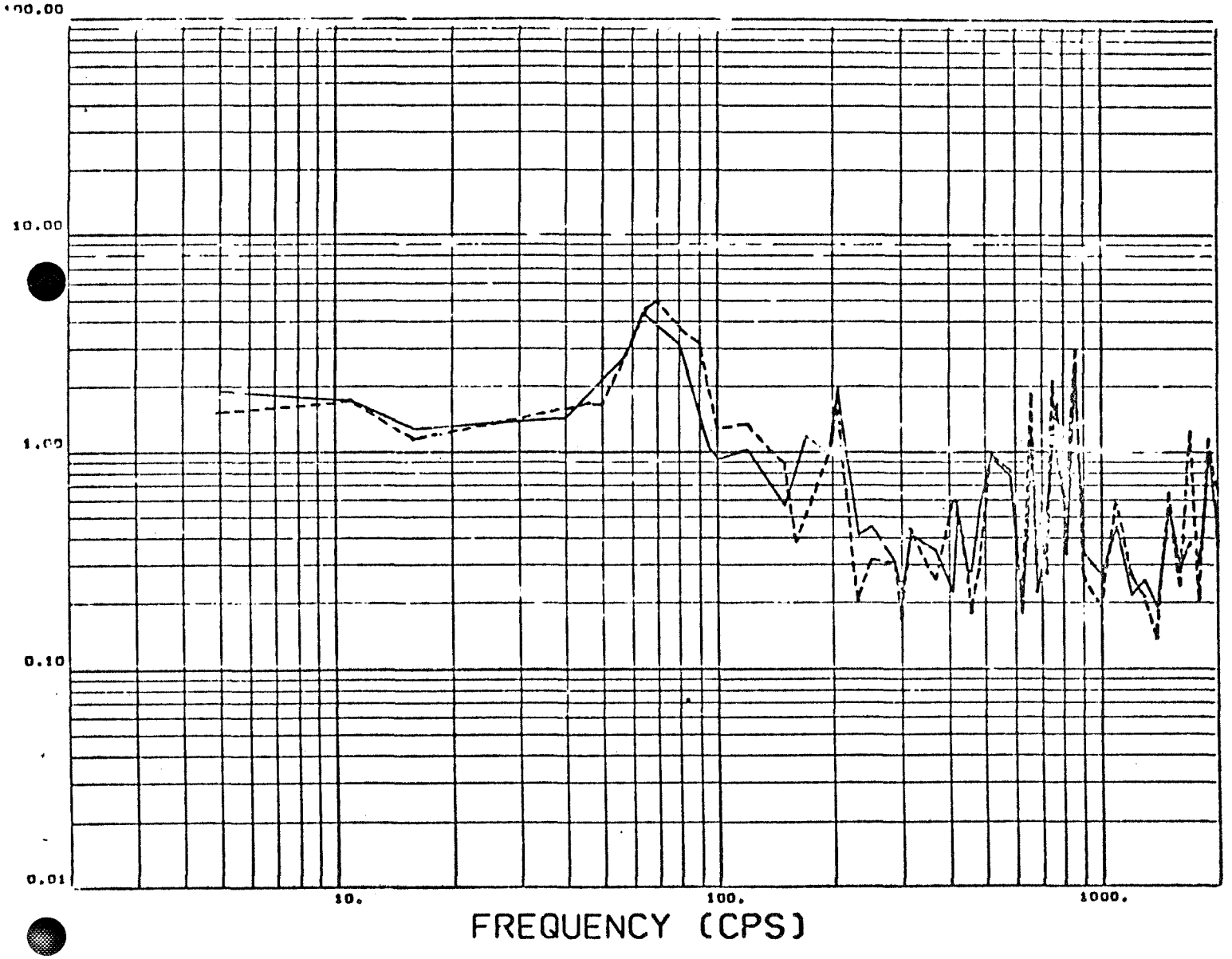
TEST DATE..... 08/5/65

AXIS OF EXCITATION.... TANGENTIAL

PICK UP NUMBER (3/ 1) ACCEL.4

PICK UP RESPONSE..... _____

INPUT ACCEL.PER PAGE.. _____



DOUGLAS AIRCRAFT COMPANY , INC.

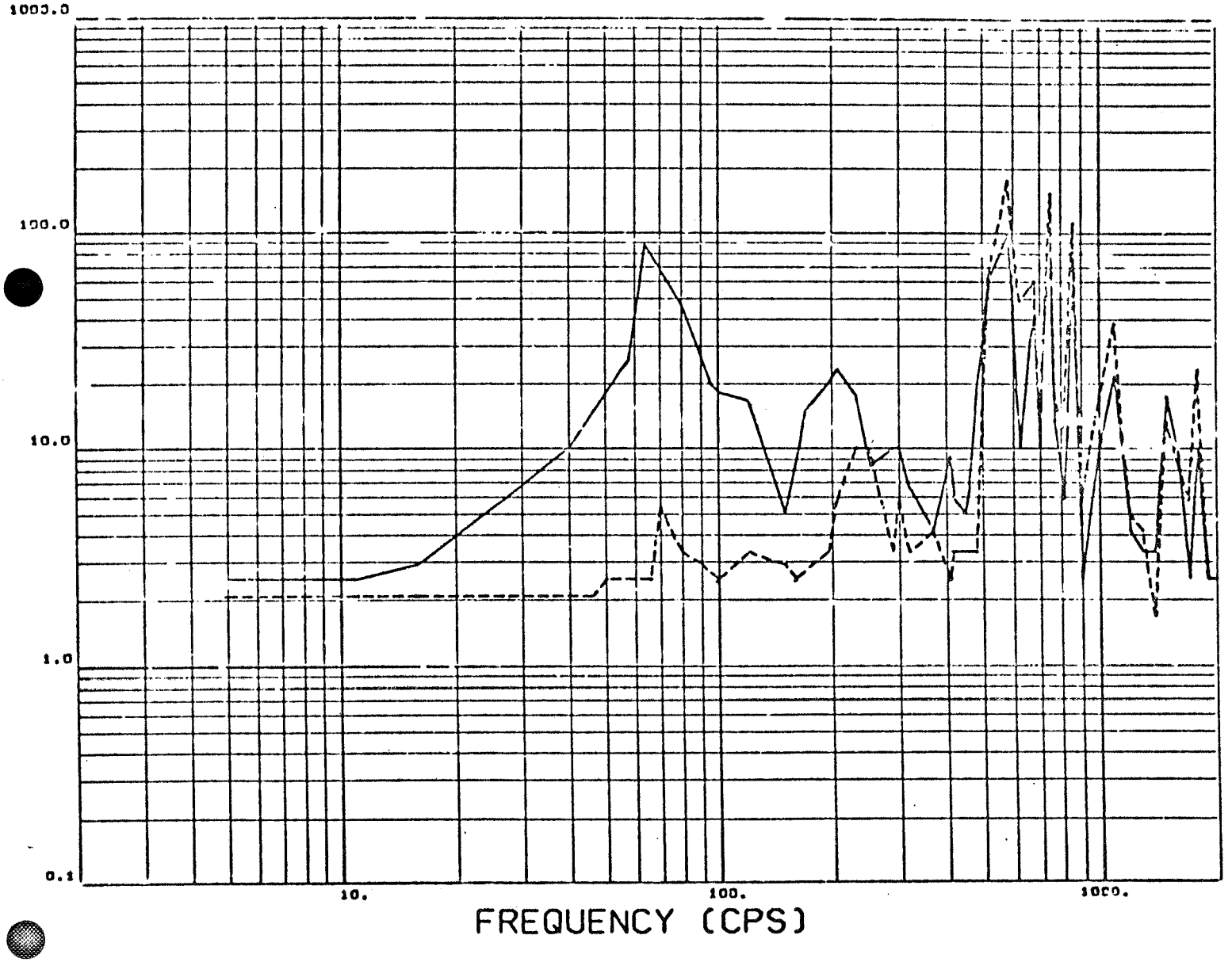
SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (4)... ACCEL.5
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO [illegible] PAGE

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL [illegible]

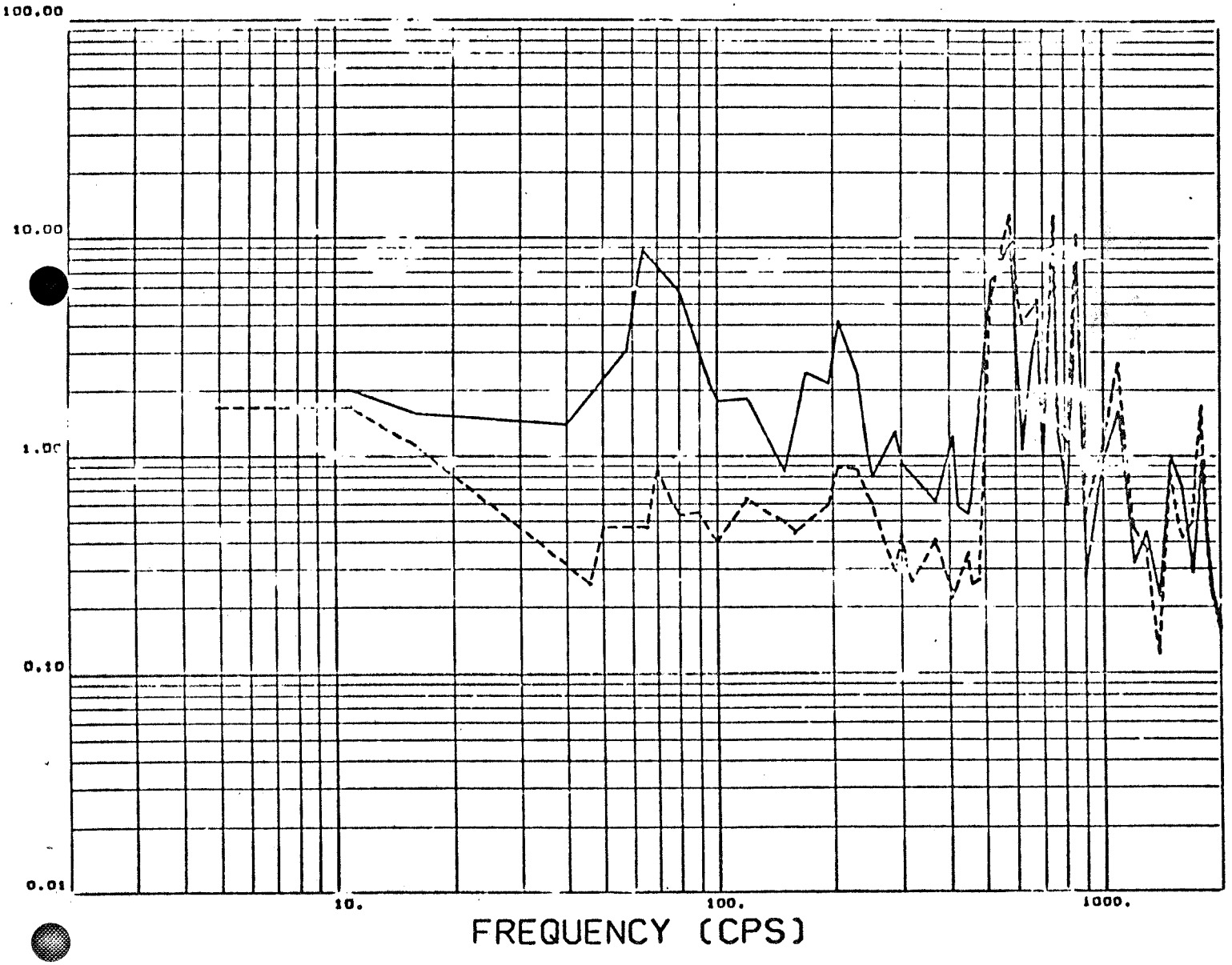
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/63
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (4/ 1) ACCEL.5
PICK UP RESPONSE..... _____
INPUT ACCEL.PER PAGE.. _____



SERIAL NO 302728 PAGE 29

DOUGLAS AIRCRAFT COMPANY . INC.

PAGE NO. B31

REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH2 CHILLDOWN [illegible]

CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

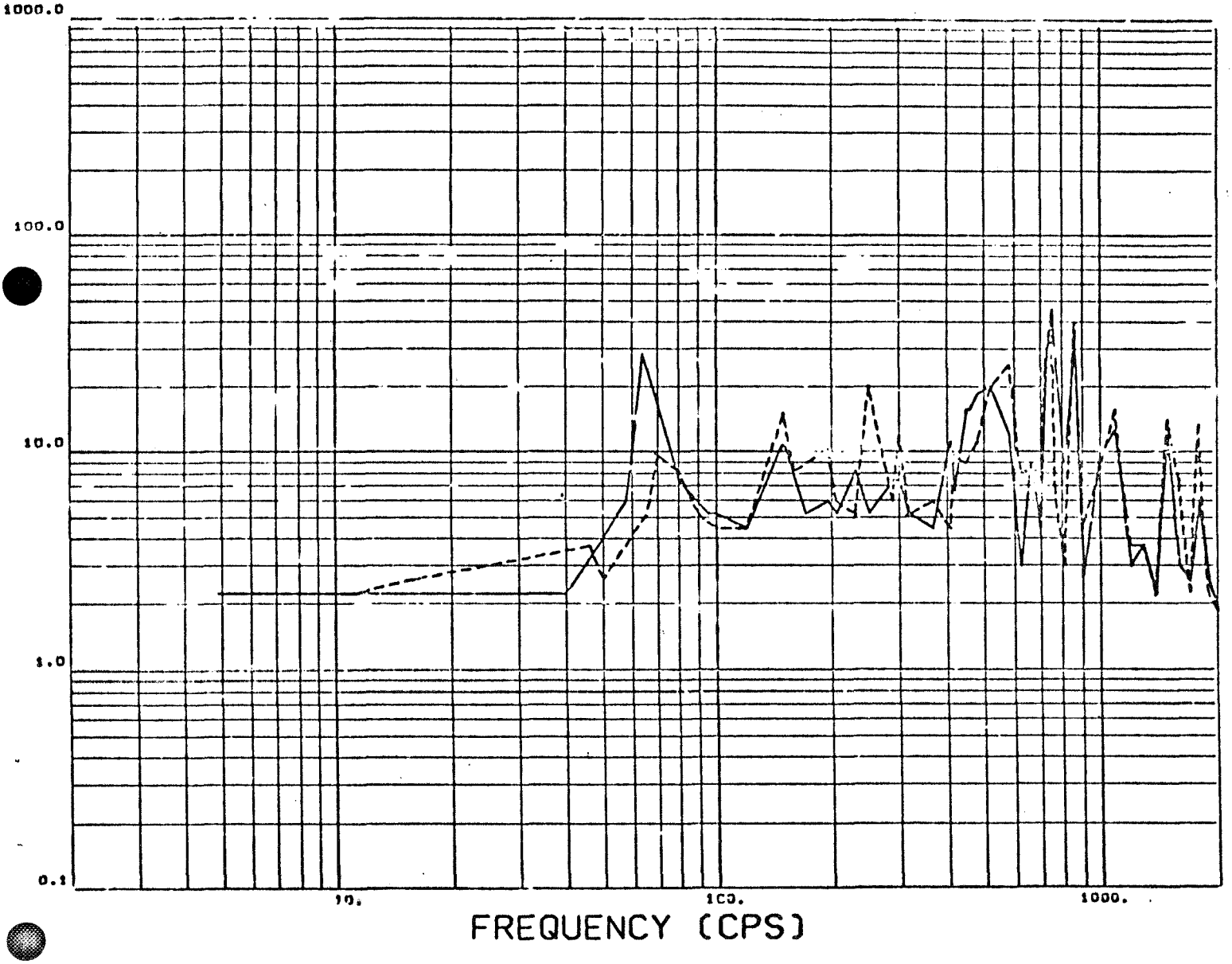
TEST DATE..... 08/5/65

AXIS OF EXCITATION.... TANGENTIAL

PICK UP NUMBER (5)... ACCEL.6

PICK UP RESPONSE..... [illegible]

INPUT ACCEL.PER PAGE.. [illegible]



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

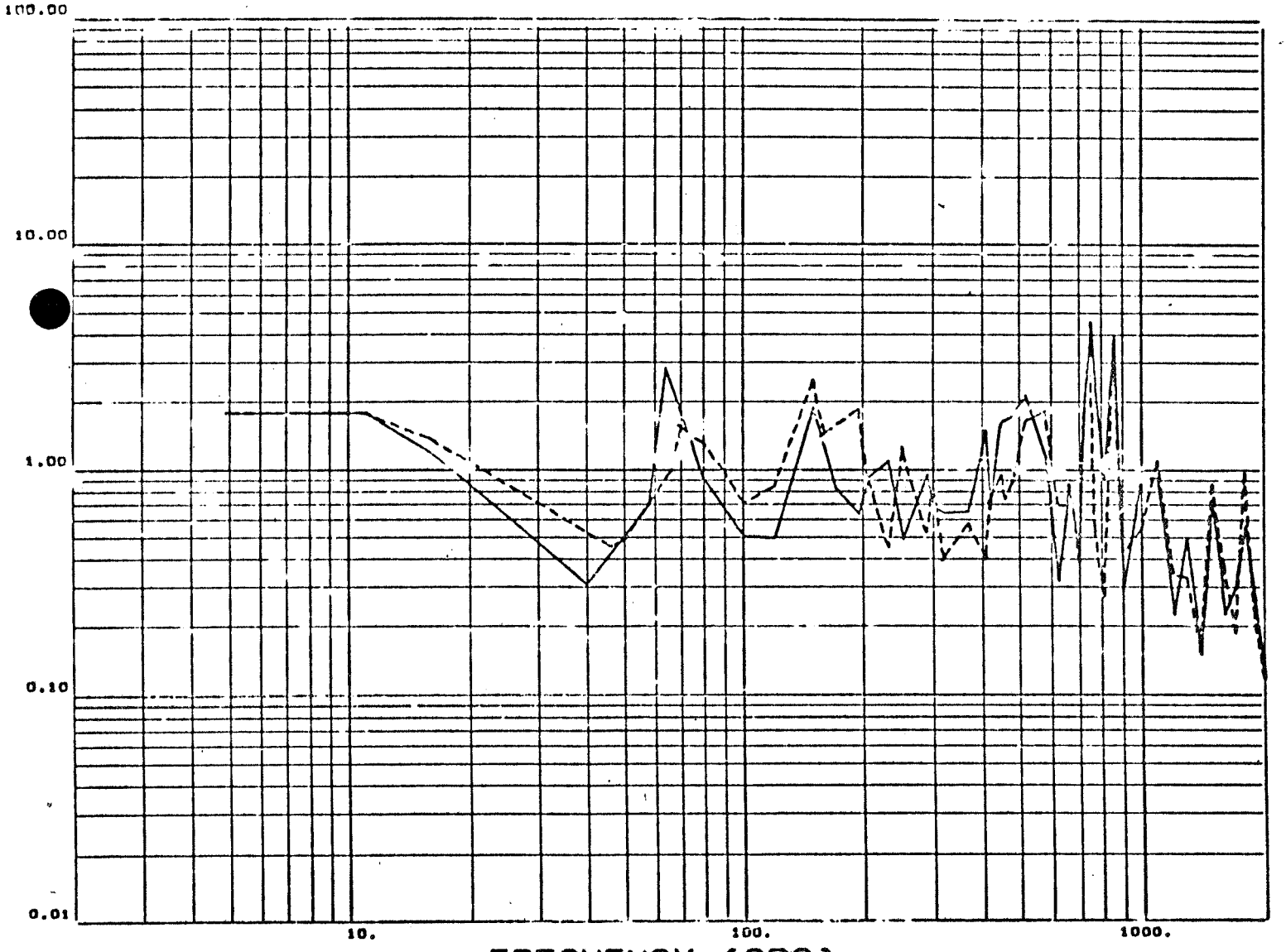
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOW TEST

CONFIGURATION ---
NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (5/ 1) ACCEL.6
PICK UP RESPONSE..... _____
INPUT ACCEL.PER PAGE.. _____



FREQUENCY (CPS)

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B33
REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

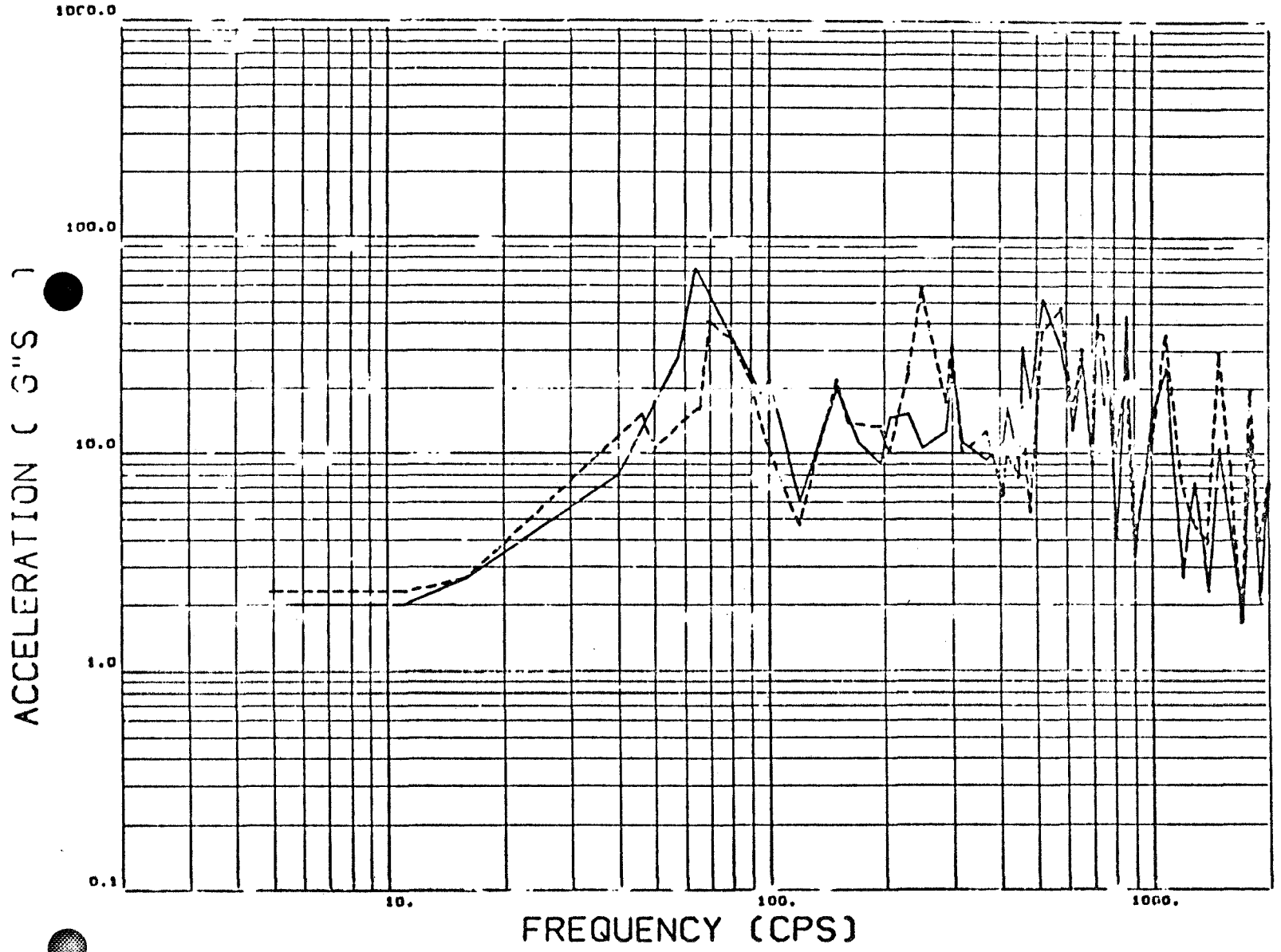
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILDOWN FLOW METER

CONFIGURATION ---
NOTE... SEE PAGE N/A
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (6)... ACCEL.7
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 302723 PAGE 36

PAGE NO. B34

REPORT NO.

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOW EXPA

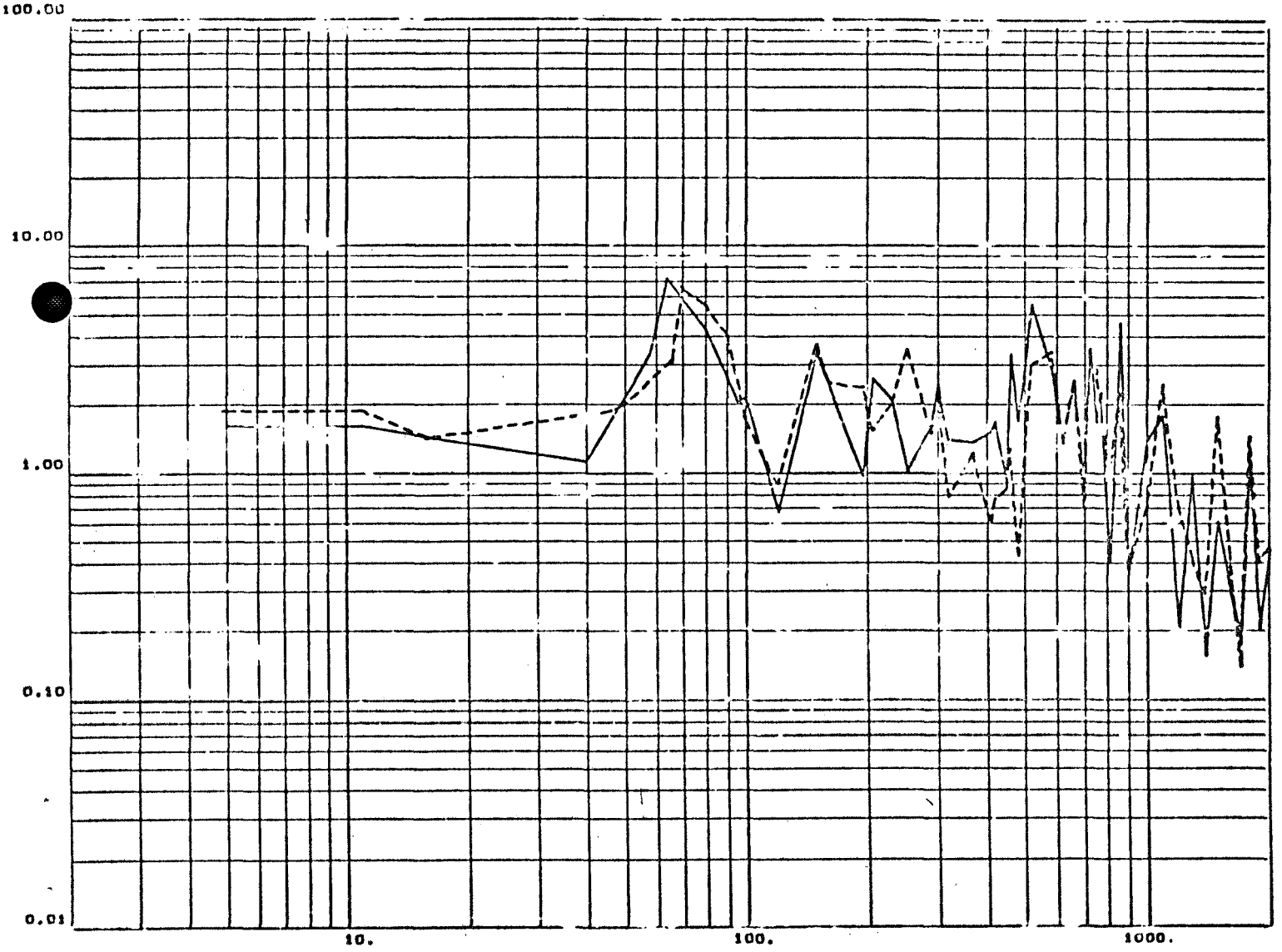
CONFIGURATION ---

NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (6/ 1) ACCEL.7
PICK UP RESPONSE..... _____
INPUT ACCEL.PER PAGE.. _____



FREQUENCY (CPS)

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

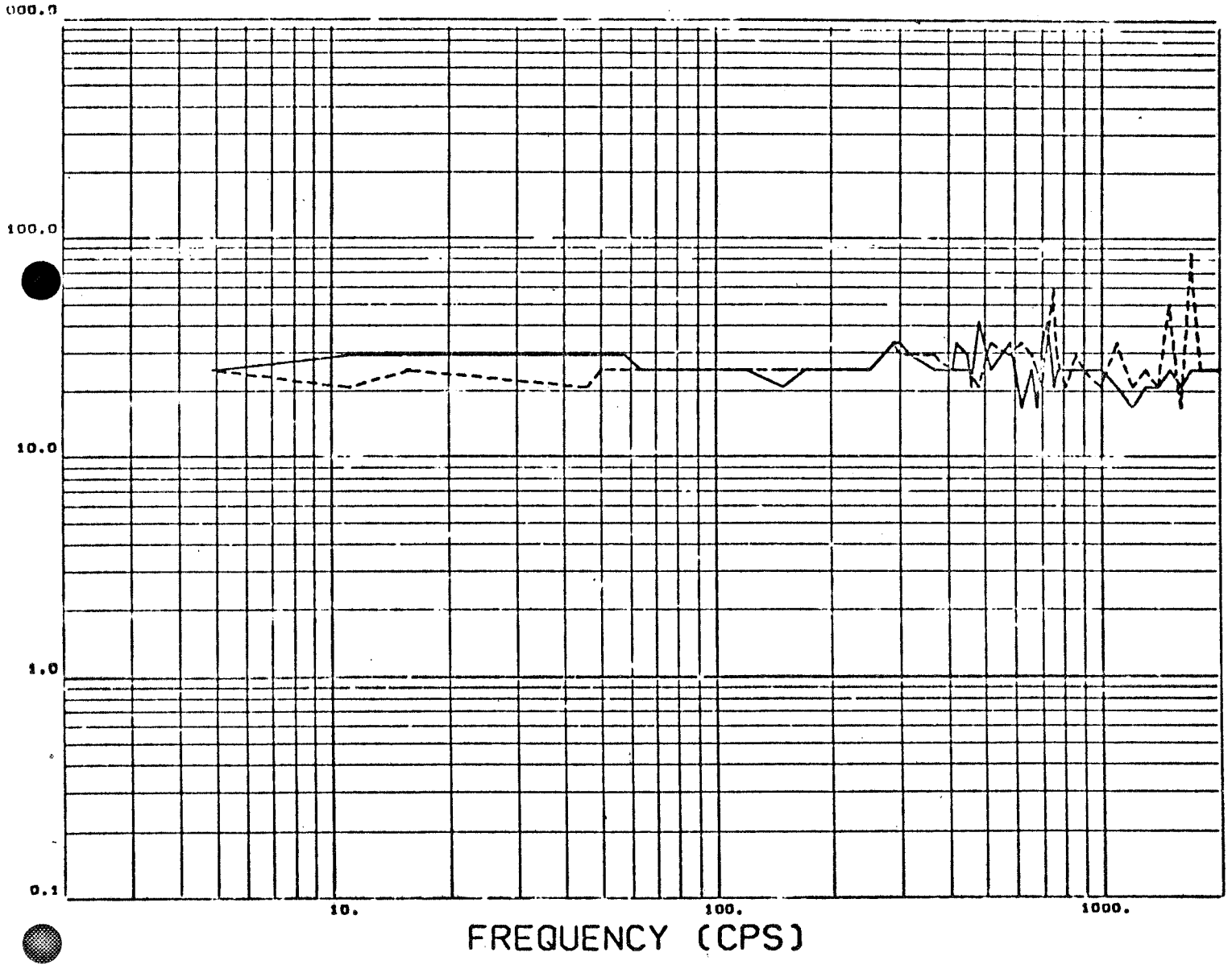
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (7)... ACCEL.9
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

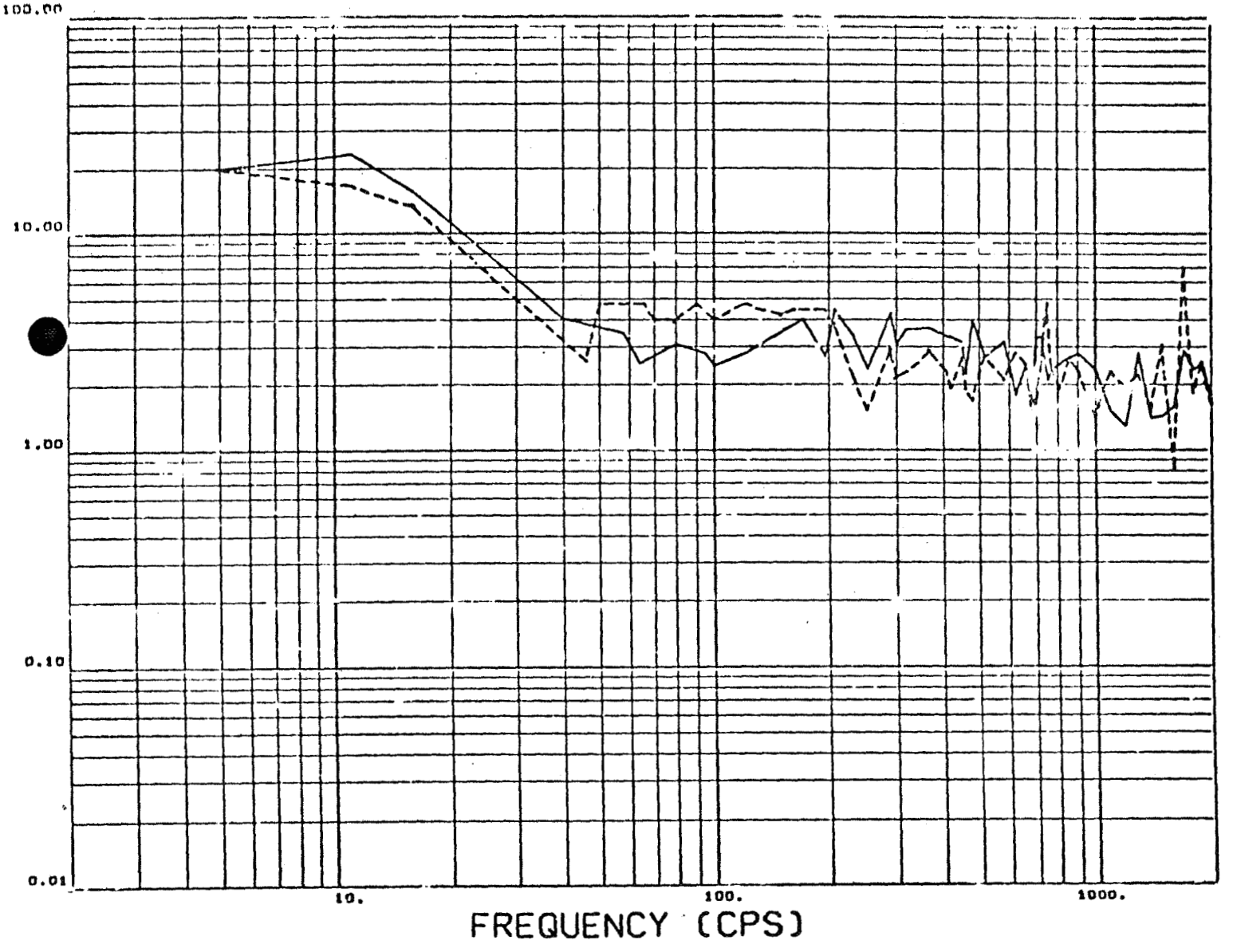
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOW STUDY

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (7/ 1) ACCEL.9
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 302728 PAGE 47

PAGE NO. B37

REPORT NO. B[illegible]

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 SHIELDED FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE ____

FOR PICK UP LOCATION

LEGEND...

UPSWEEP ____

DOWNSWEEP ------

TEST CONDITIONS....

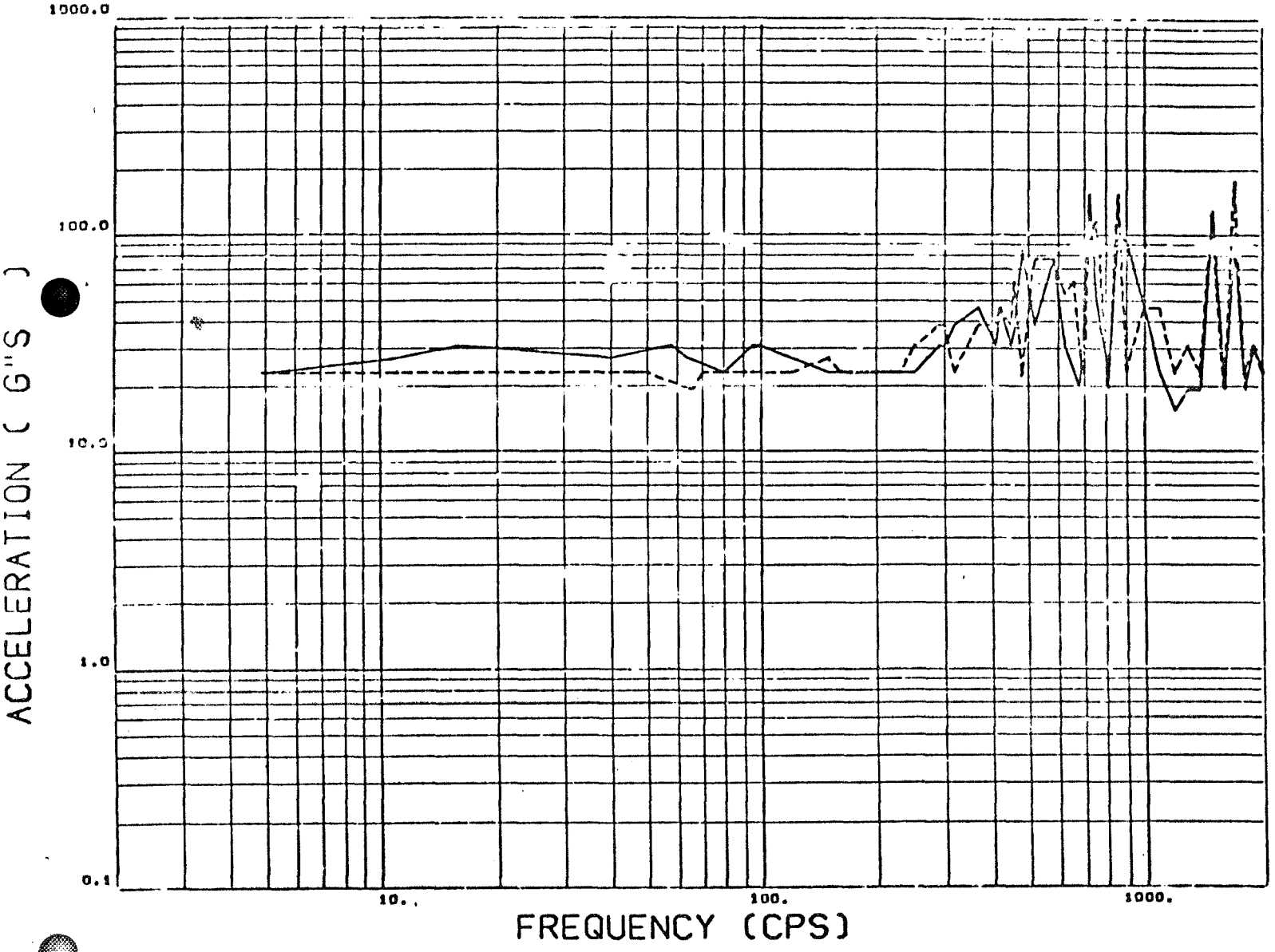
TEST DATE..... 08/5/65

AXIS OF EXCITATION.... TANGENTIAL

PICK UP NUMBER (8)... ACCEL.10

PICK UP RESPONSE..... ____

INPUT ACCEL.PER PAGE.. ____



SERIAL NO 302728 PAGE 48

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B38
REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

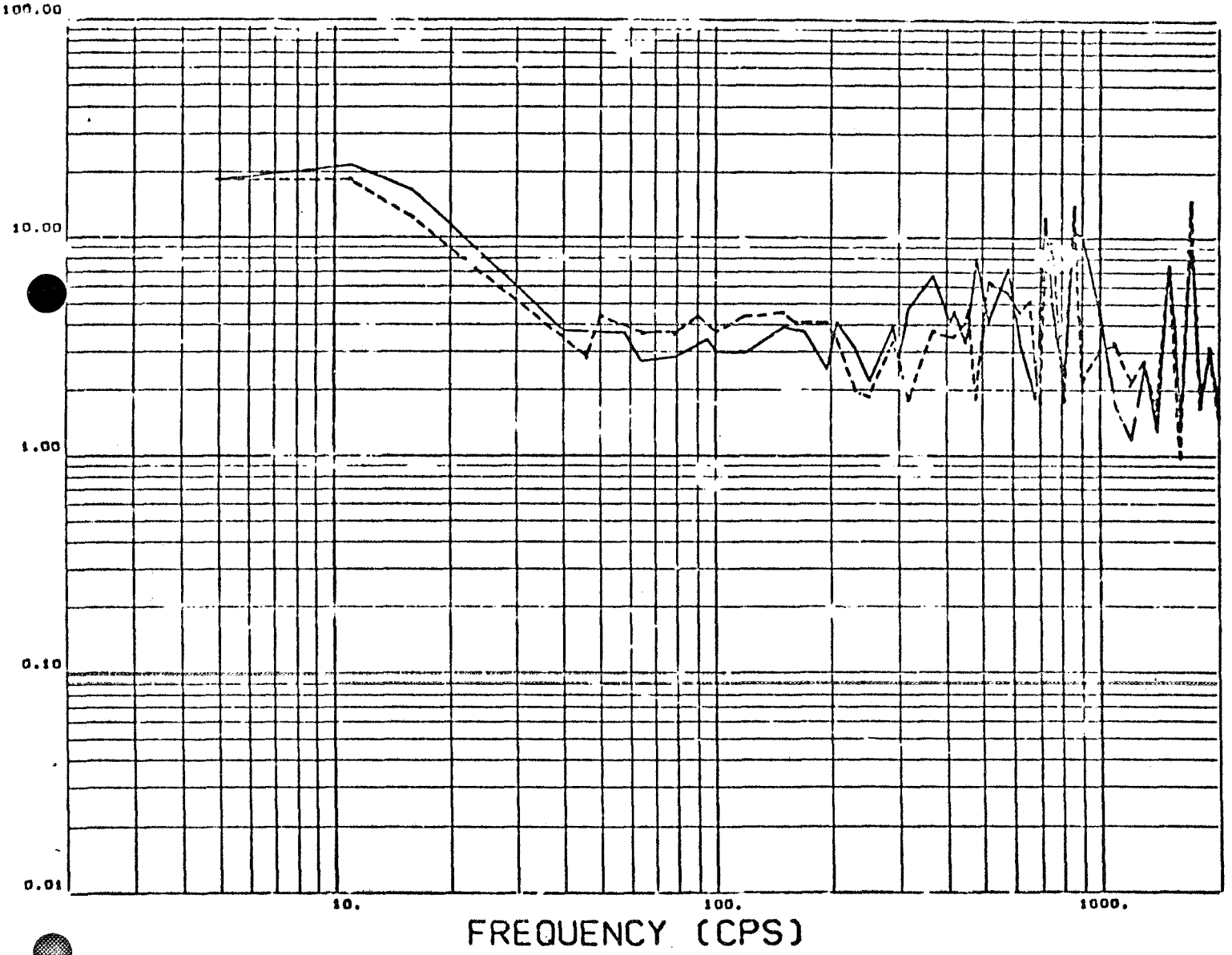
LH2 RECIRCULATION DUCT ASSEMBLY

LH2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (8/ 1) ACCEL.10
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

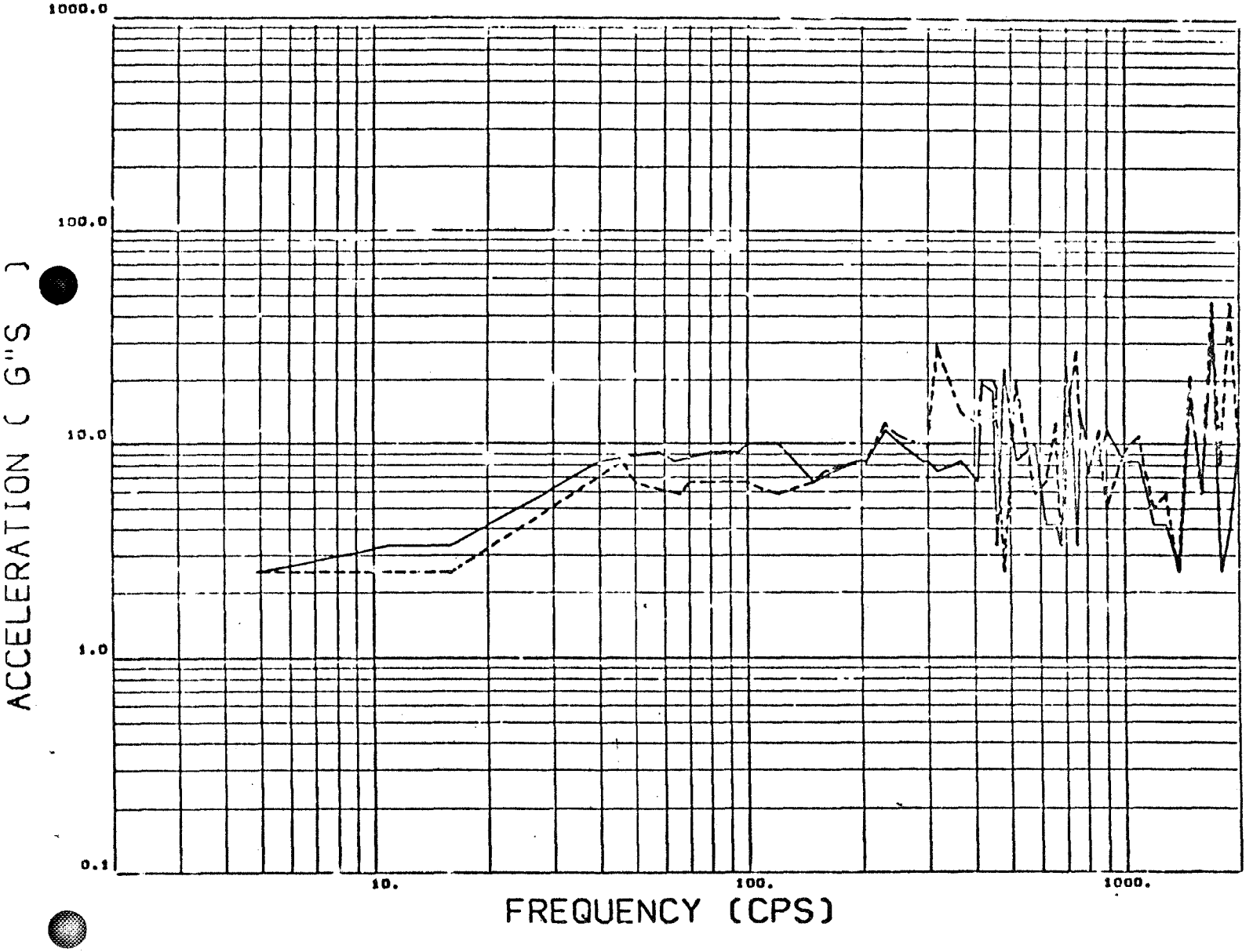
LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILDOWN FLOWMETER

CONFIGURATION --- A
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (9)... ACCEL.11
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE. ____



DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 302728 PAGE 54

PAGE NO. 840

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWRATE

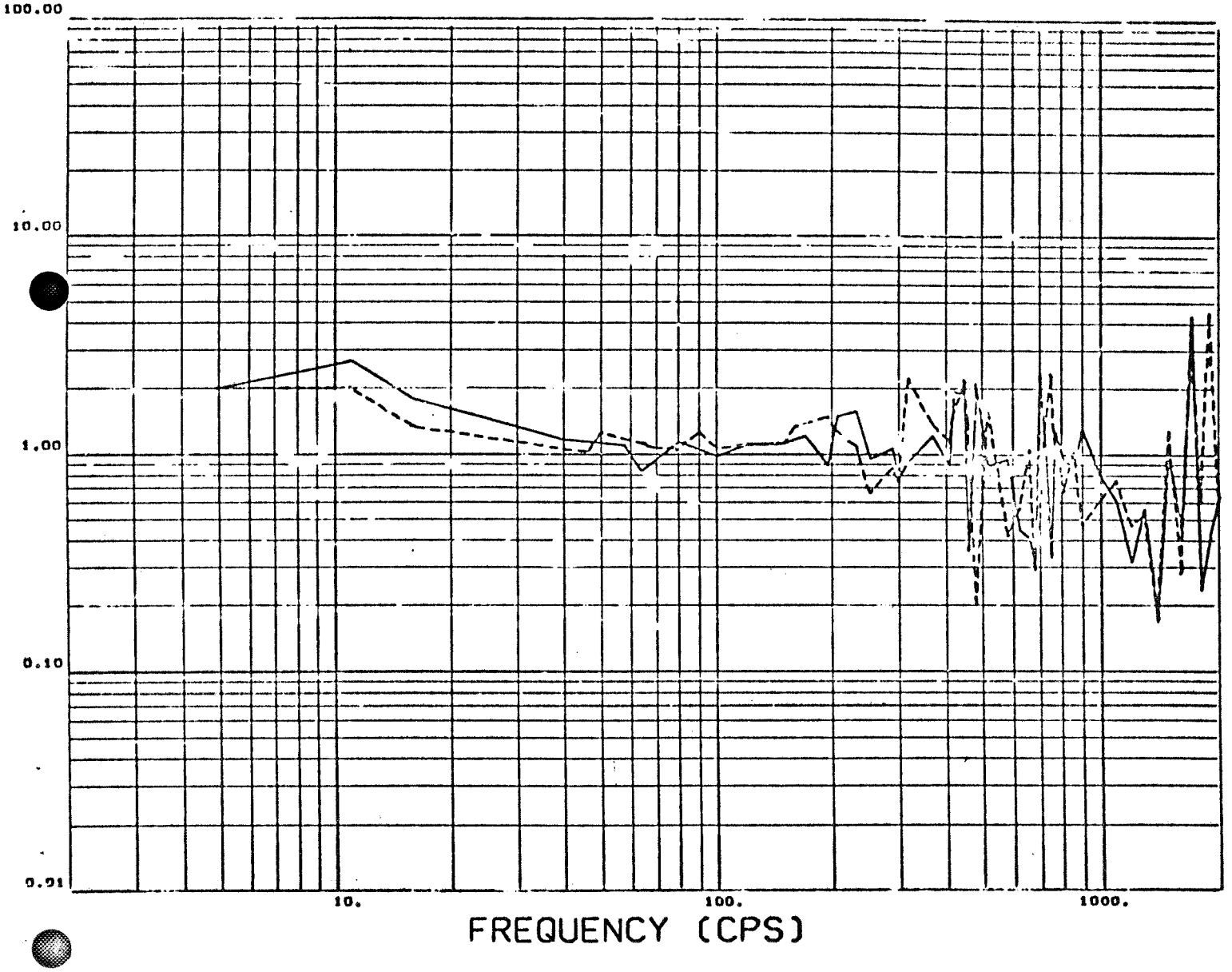
CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/5/69
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (9/ 1) ACCEL.11
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 302728 PAGE

PAGE NO. B41

REPORT NO. [illegible]

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH2 CHILLDOWN FLOWTEST

CONFIGURATION ---

NOTE... SEE PAGE [illegible]

FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

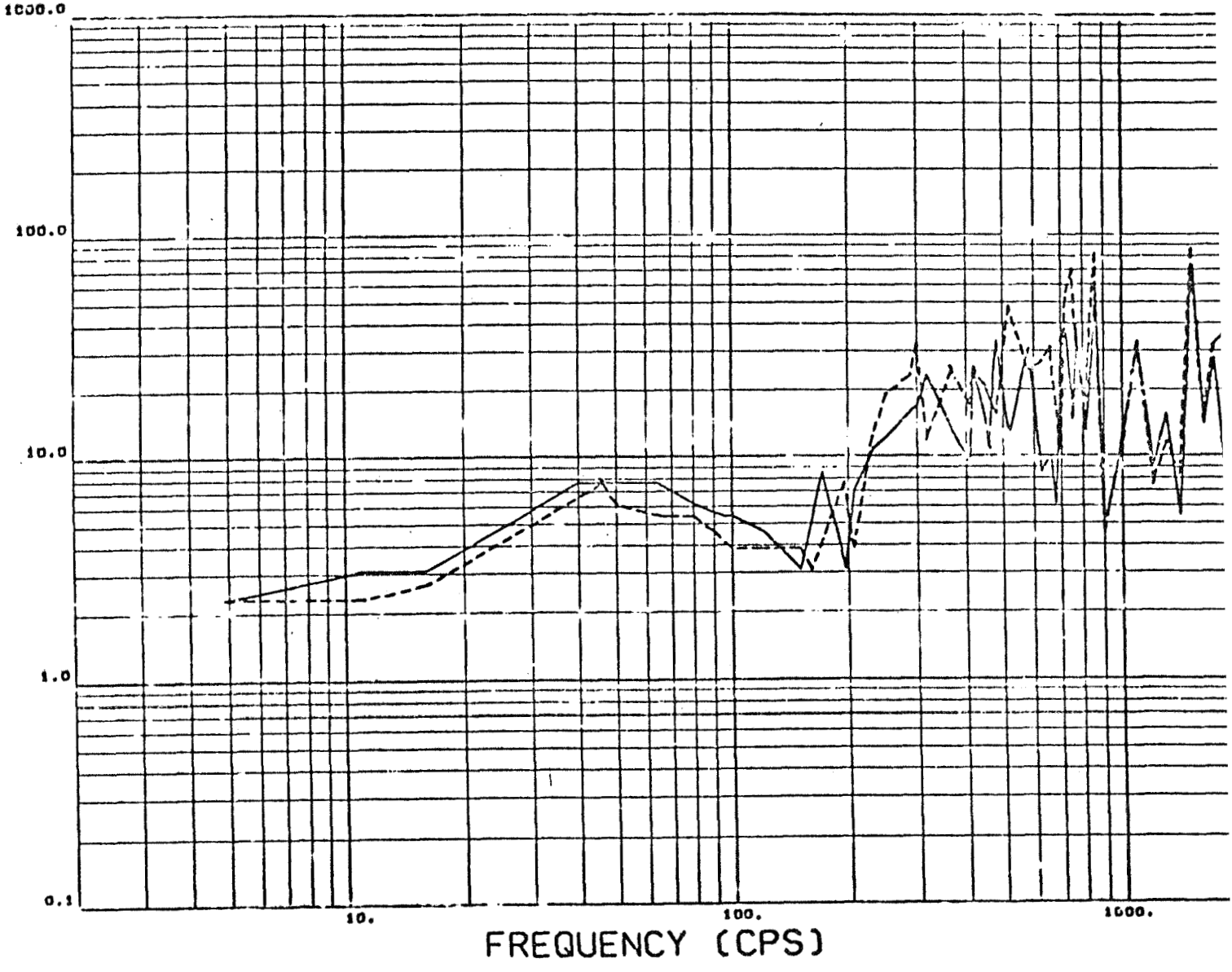
TEST DATE..... 08/5/63

AXIS OF EXCITATION.... TANGENTIAL

PICK UP NUMBER (10)... ACCEL.12

PICK UP RESPONSE..... ———

INPUT ACCEL.PER PAGE.. ———



DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 302728 PAGE

PAGE NO. B4

REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

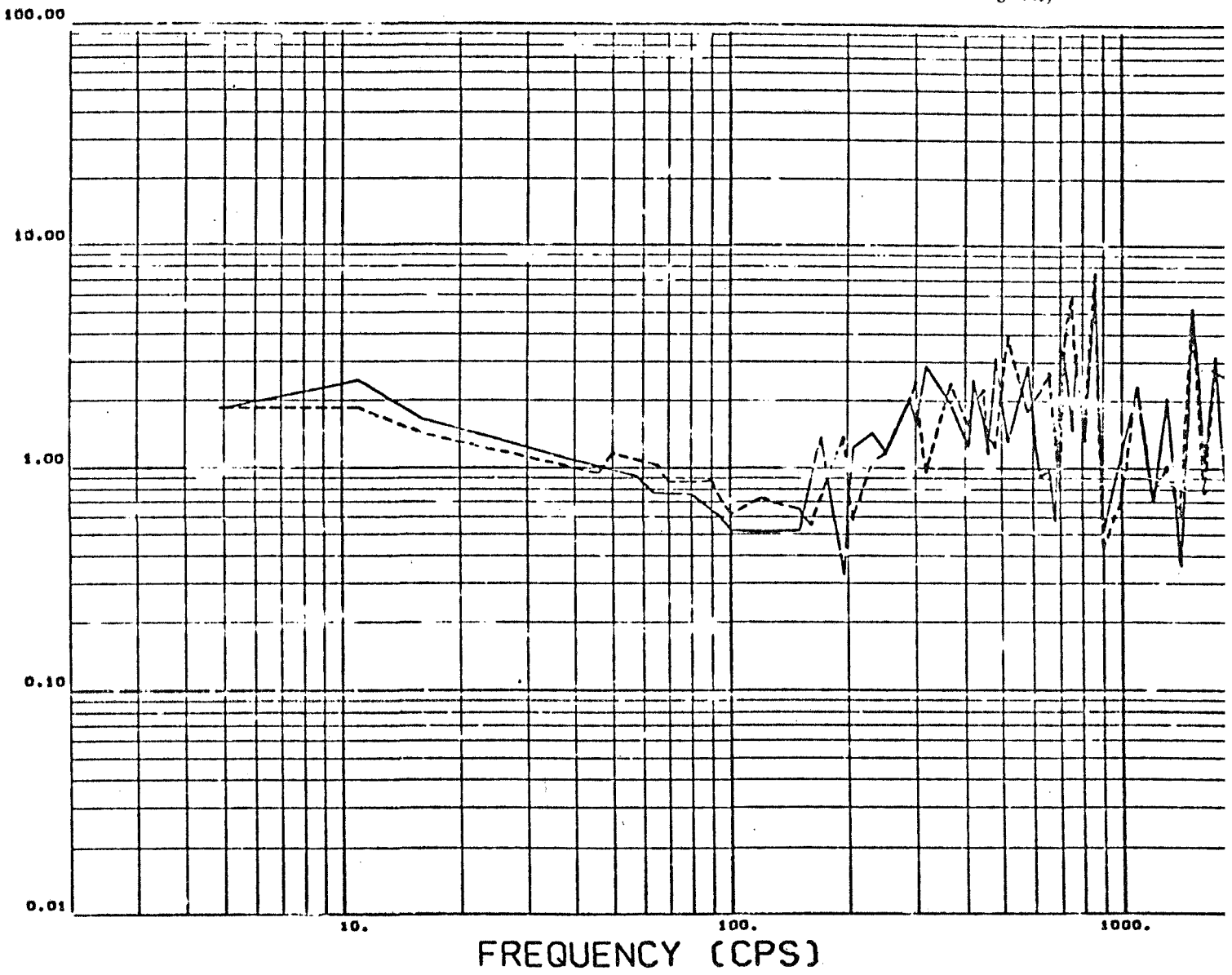
CONFIGURATION ---

NOTE... SEE PAGE A20 FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 08/5/65
AXIS OF EXCITATION.... TANGENTIAL
PICK UP NUMBER (10/ 1) ACCEL.12
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 303405 PAGE

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO.
REPORT NO. R5160

SINUSOIDAL FREQUENCY SWEEP

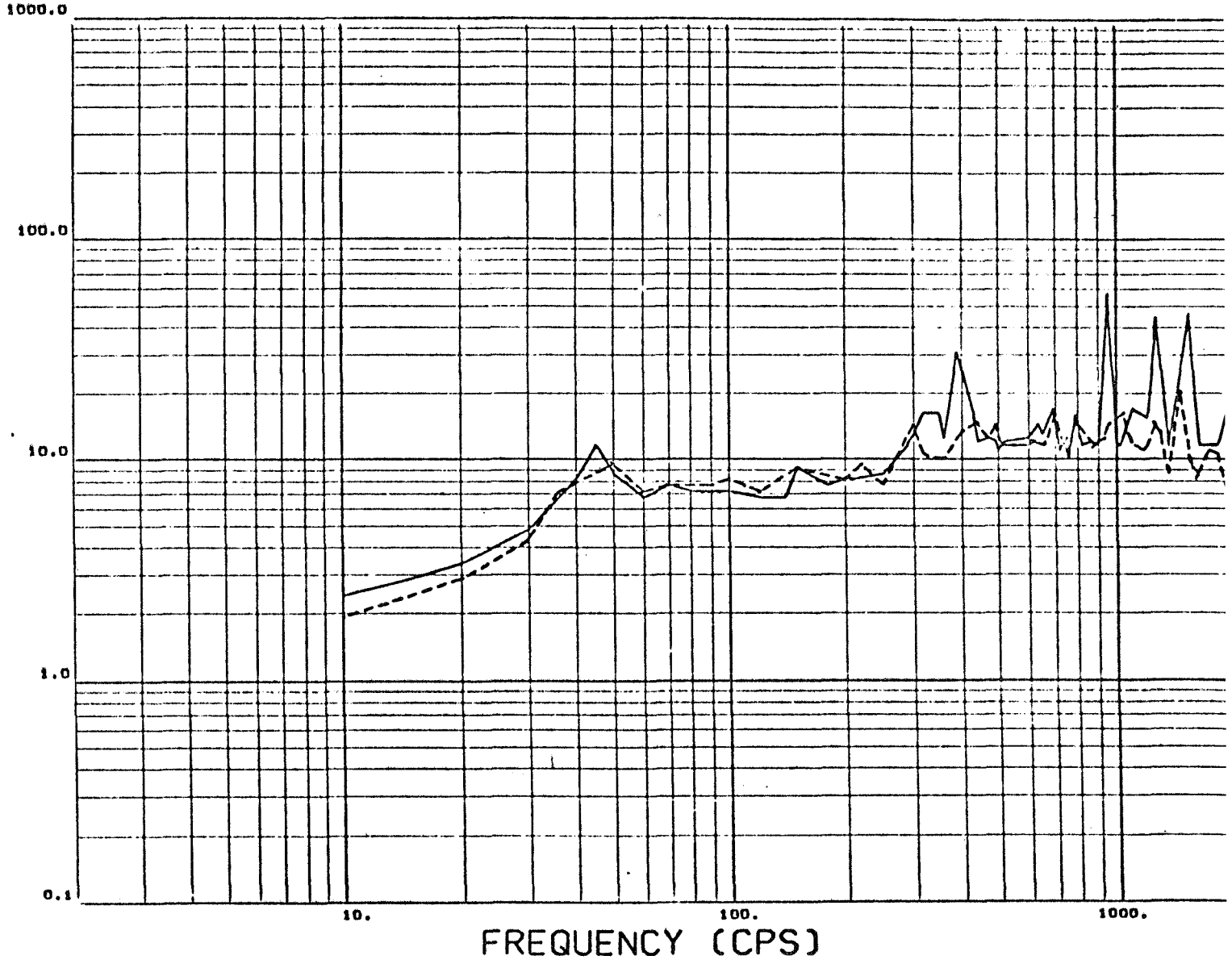
SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN PROGRAM

CONFIGURATION ---
NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (1)... ACCEL. 1
PICK UP RESPONSE..... _____
INPUT ACCEL.PER PAGE.. _____



SERIAL NO 305405 PAGE

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B44

REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

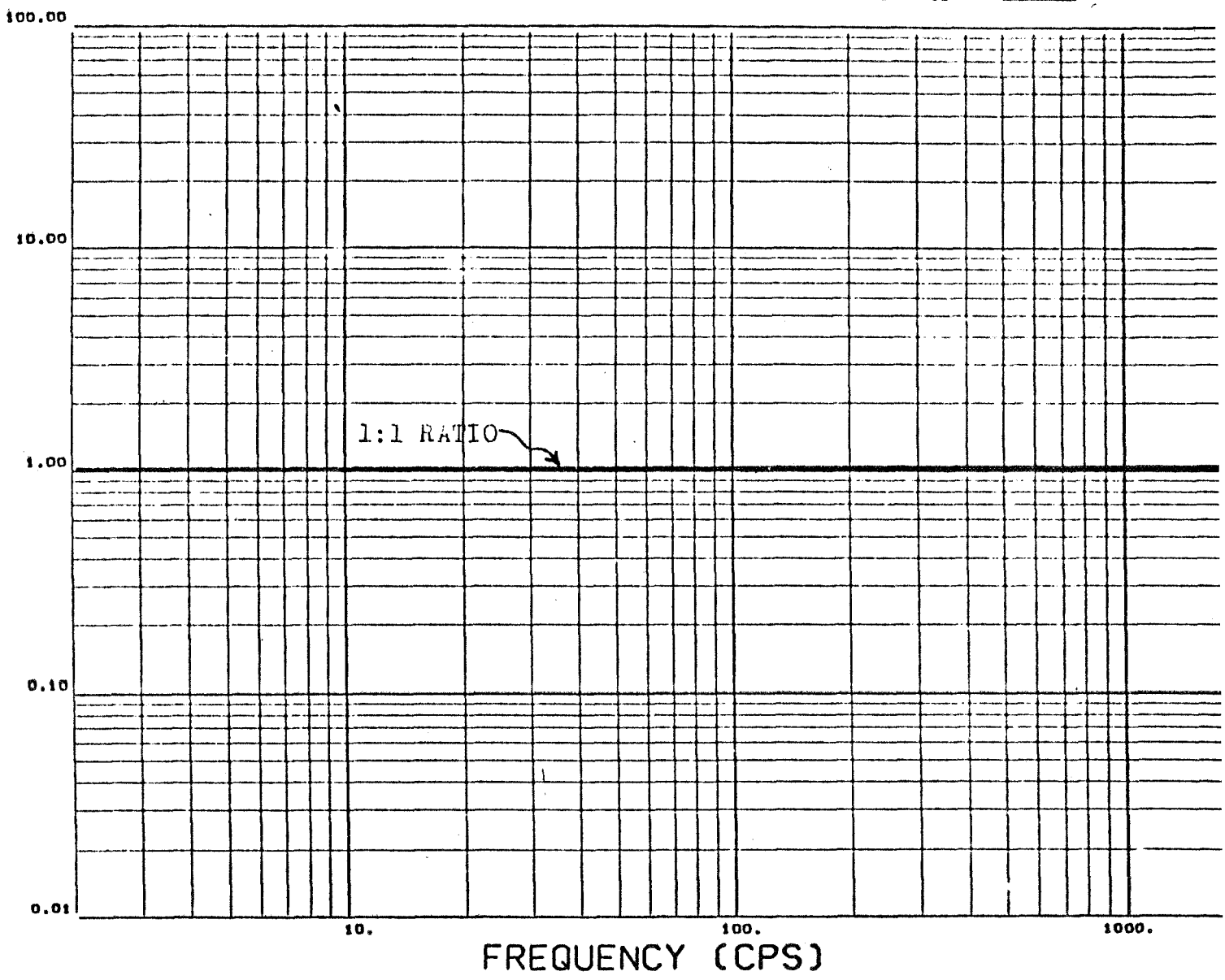
TEST DATE..... 8/6/65

AXIS OF EXCITATION.... RADIAL

PICK UP NUMBER (1/ 1) ACCEL. 1

PICK UP RESPONSE..... [illegible]

INPUT ACCEL.PER PAGE.. ____



SERIAL NO 305405 PAGE

PAGE NO. 845
REPORT NO. B

DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

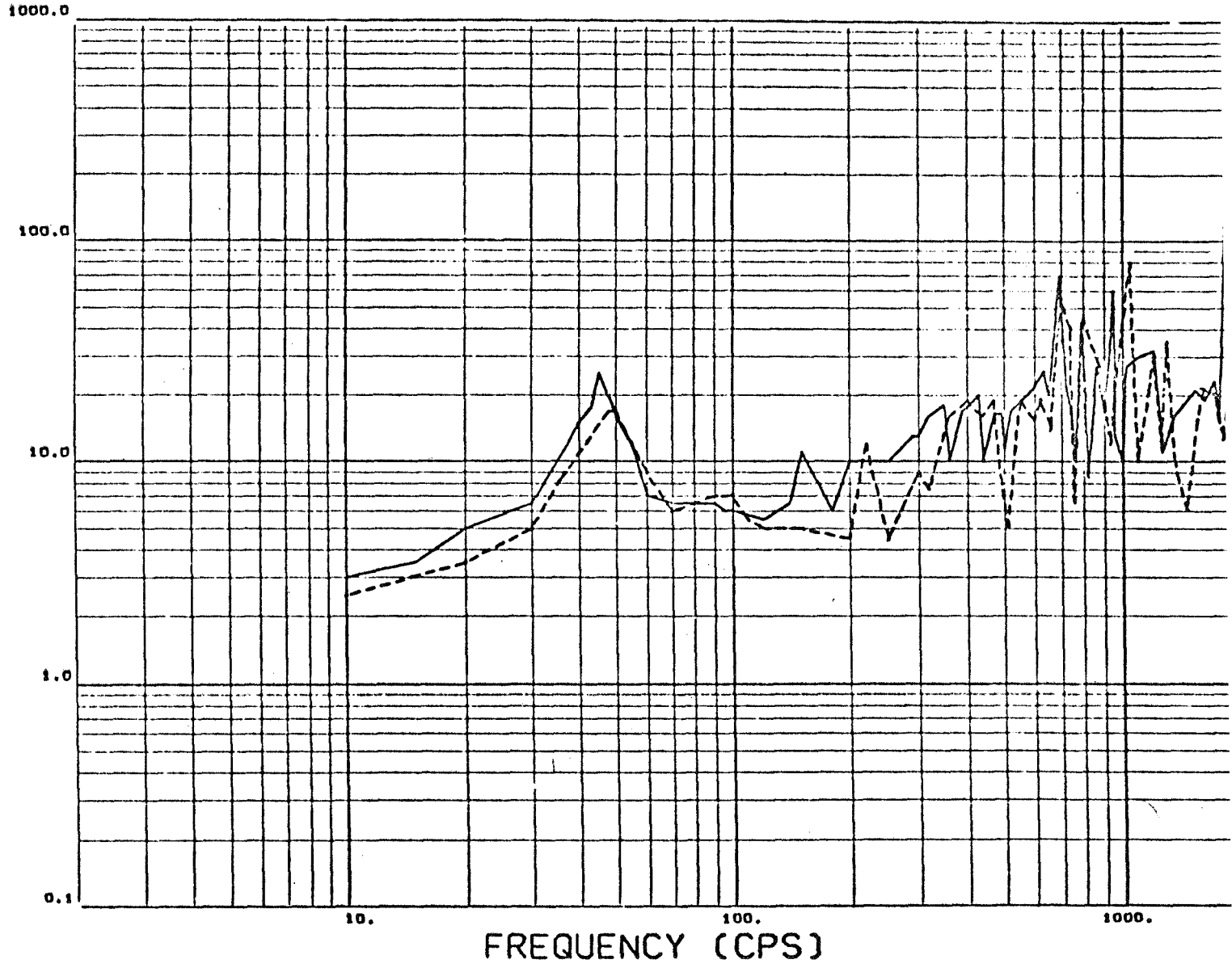
USAB

LH_2 CHILDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ____
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/8/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (2)... ACCEL. 2
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE.. ____



DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 305409 PAGE

PAGE NO. B 4

REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION --- A 23

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (2/ 1) ACCEL. 2
PICK UP RESPONSE.....
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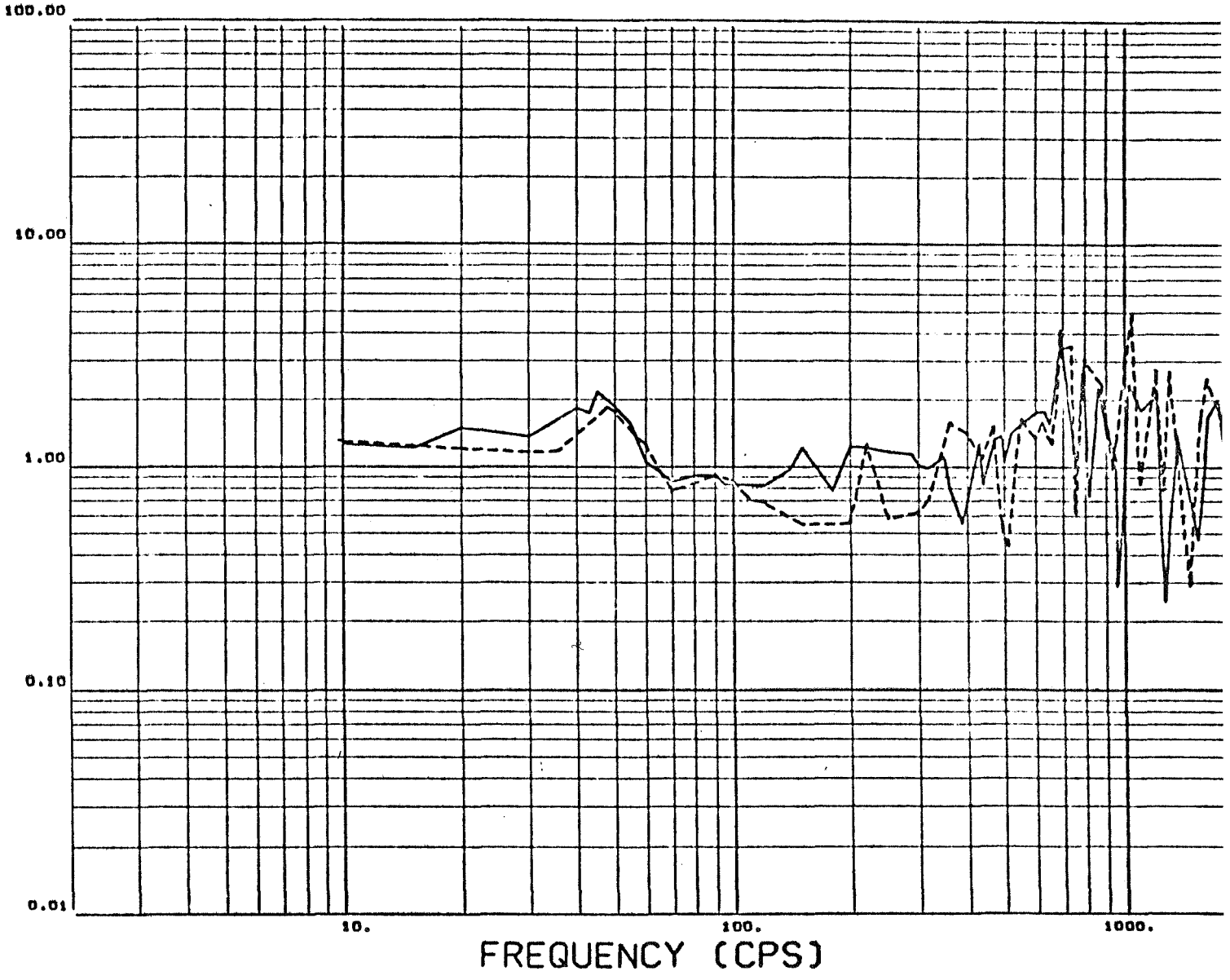


DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 305808 PAGE

PAGE NO. B47

REPORT NO. D5140

SINUSOIDAL FREQUENCY SWEEP

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE A23 FOR PICK UP LOCATION

LEGEND...

UP SWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

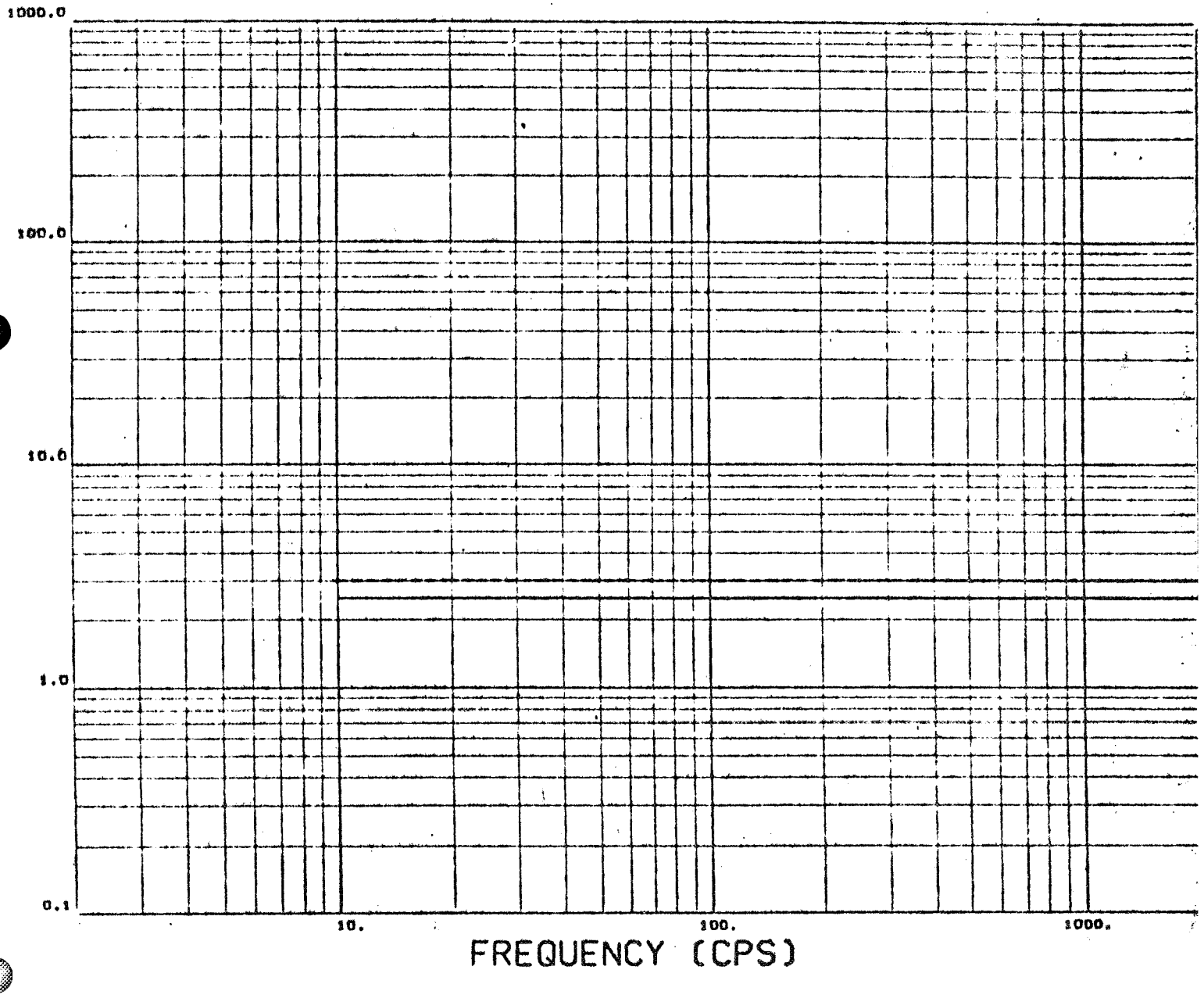
TEST DATE..... 8/6/65

AXIS OF EXCITATION.... RADIAL

PICK UP NUMBER (3)... ACCEL. 3 INOPER.

PICK UP RESPONSE..... RADIAL

INPUT ACCEL.PER PAGE.. B43



SERIAL NO 305405 PAGE 23

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B48

REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE ____

- FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 8/6/65

AXIS OF EXCITATION.... RADIAL

PICK UP NUMBER (4)... ACCEL. 4

PICK UP RESPONSE.....

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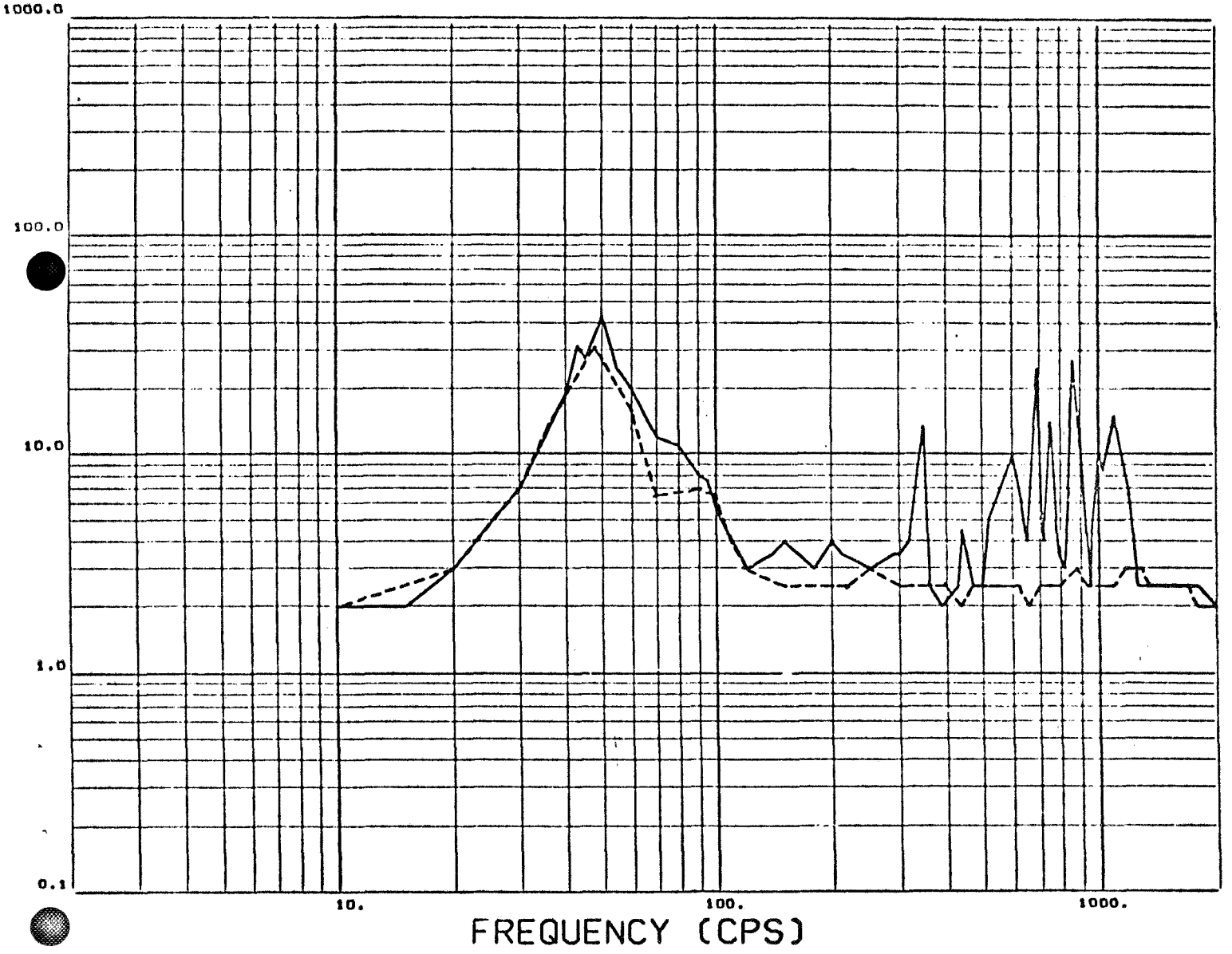


SERIAL NO 365405 PAGE 24

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B49

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

STV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...

UP SWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

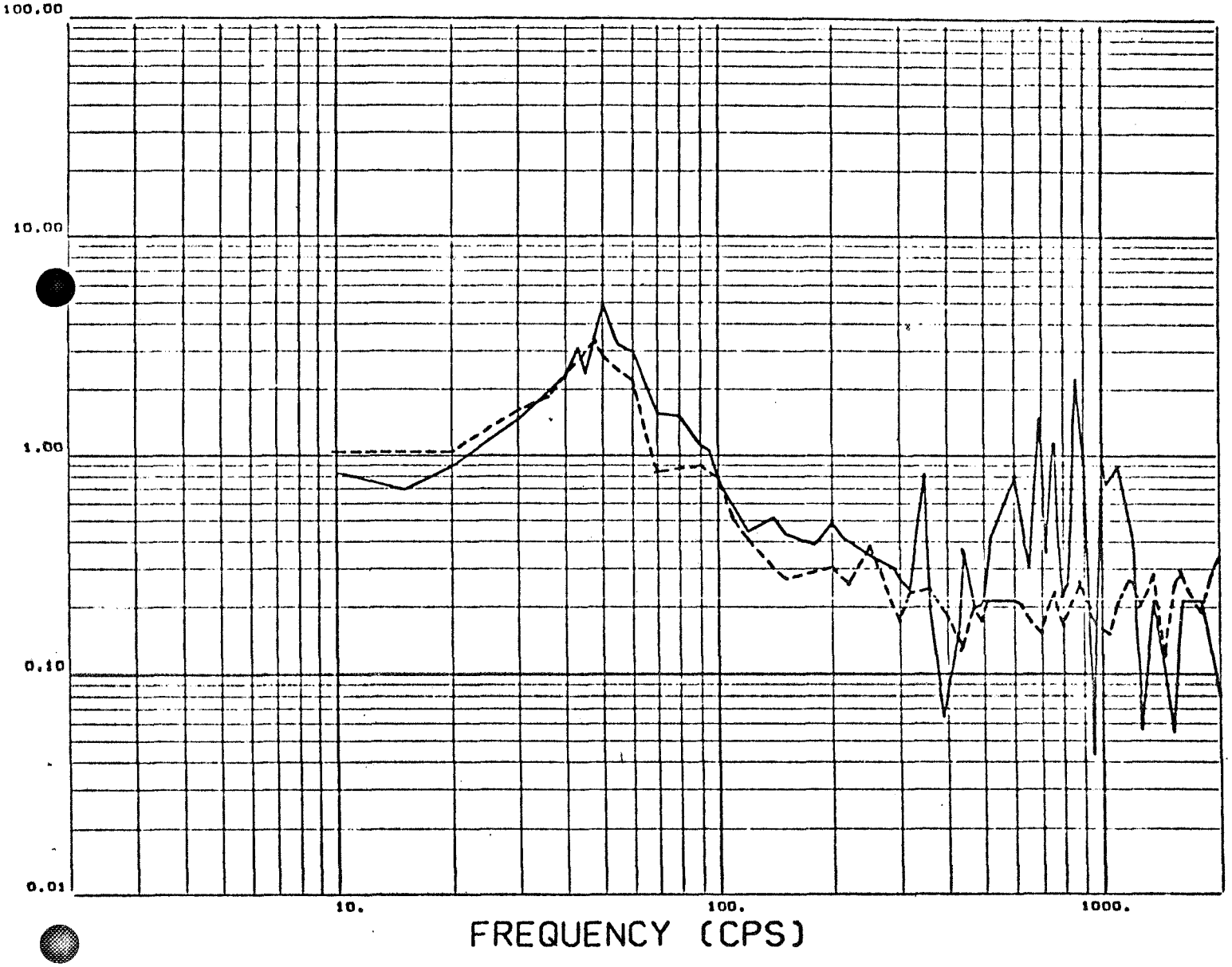
TEST DATE..... 8/6/65

AXIS OF EXCITATION.... RADIAL

PICK UP NUMBER (4/ 1) ACCEL. 4

PICK UP RESPONSE.....

INPUT ACCEL.PER PAGE..



SERIAL NO 305405 PAGE 29

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B5D

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

STV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

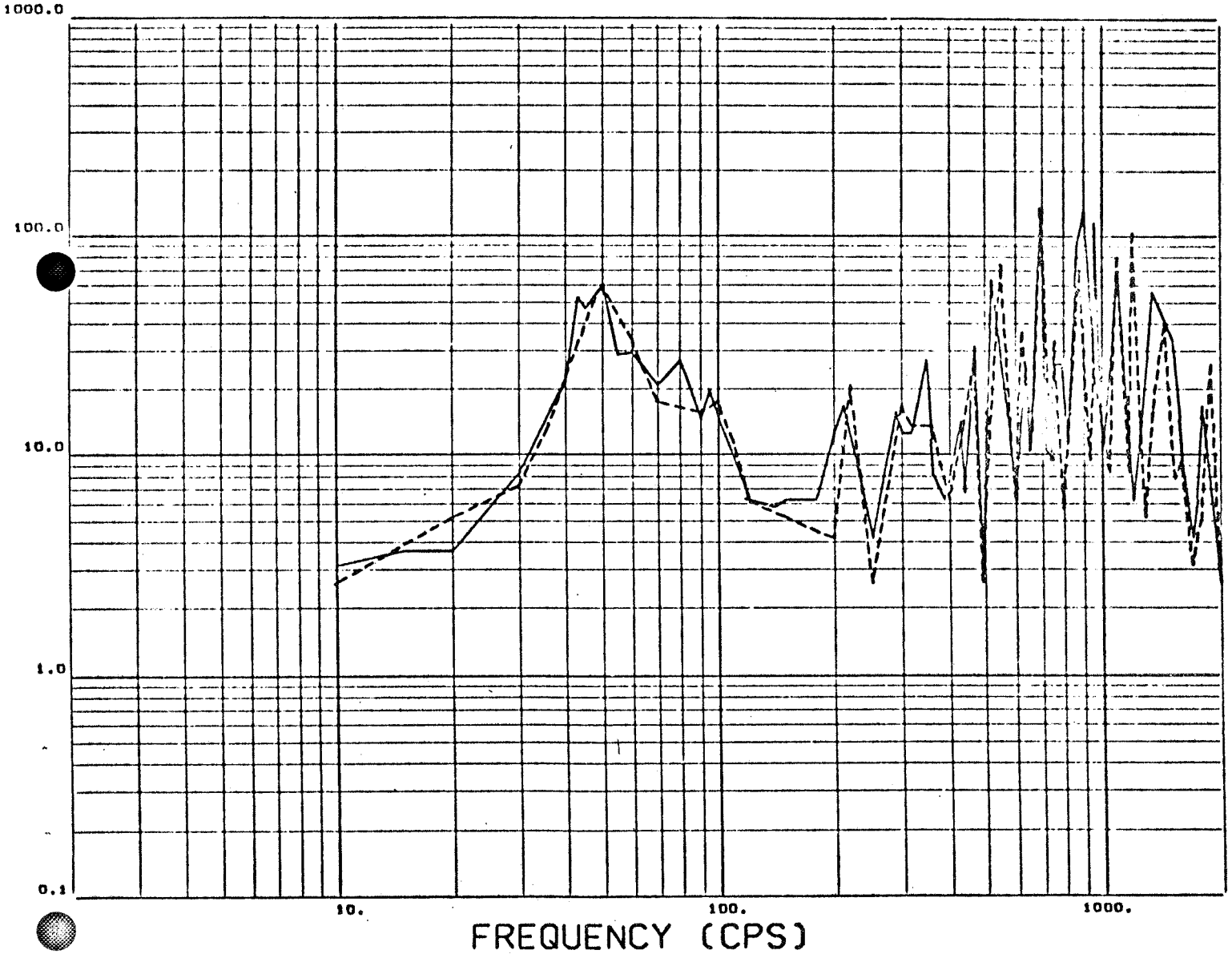
CONFIGURATION ---

NOTE... SEE PAGE _____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP _____
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (5)... ACCEL. 5
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

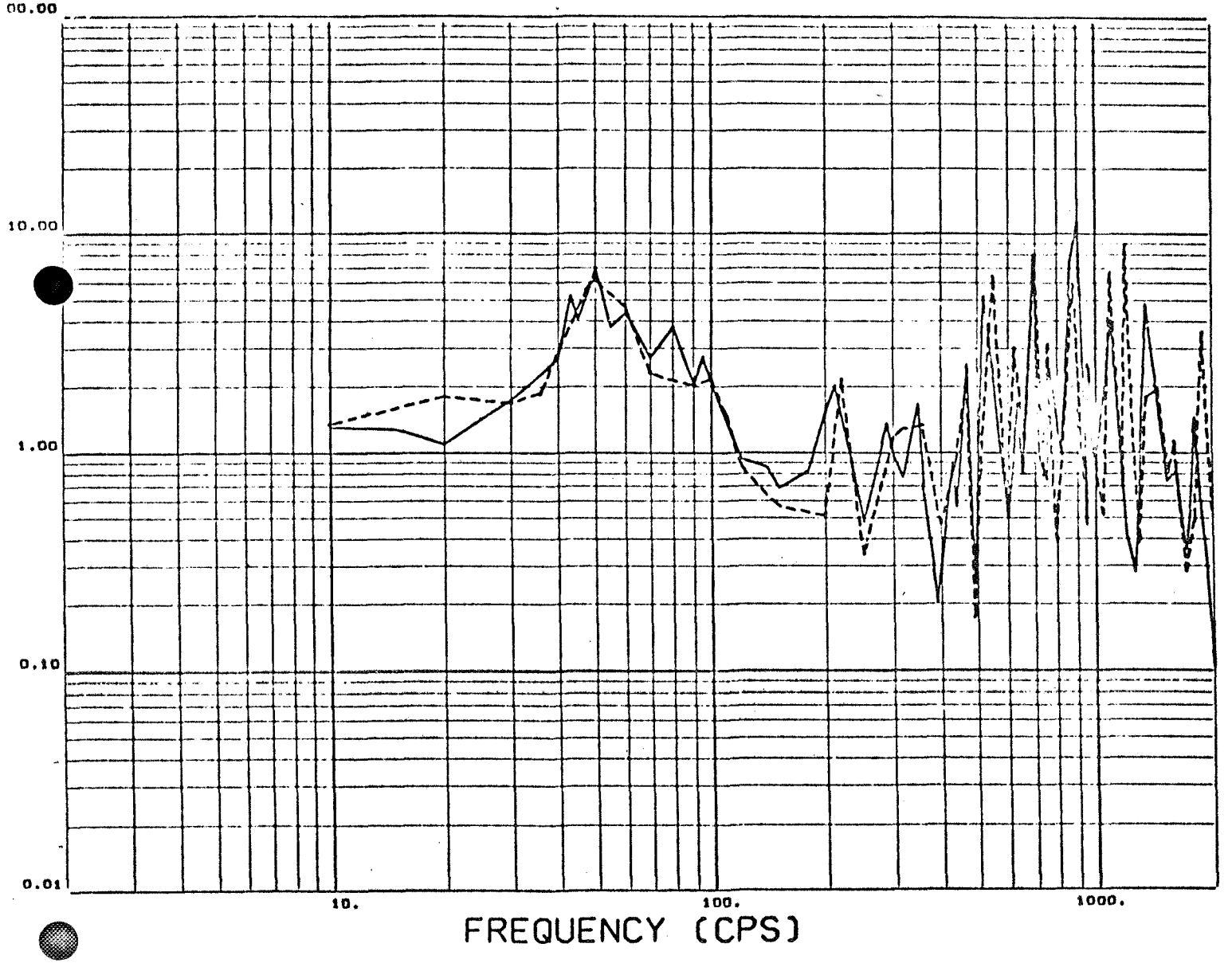
S1V4B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN PROGRAM

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (5/ 1) ACCEL. 5
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 305405 PAGE 35

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B-2
REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

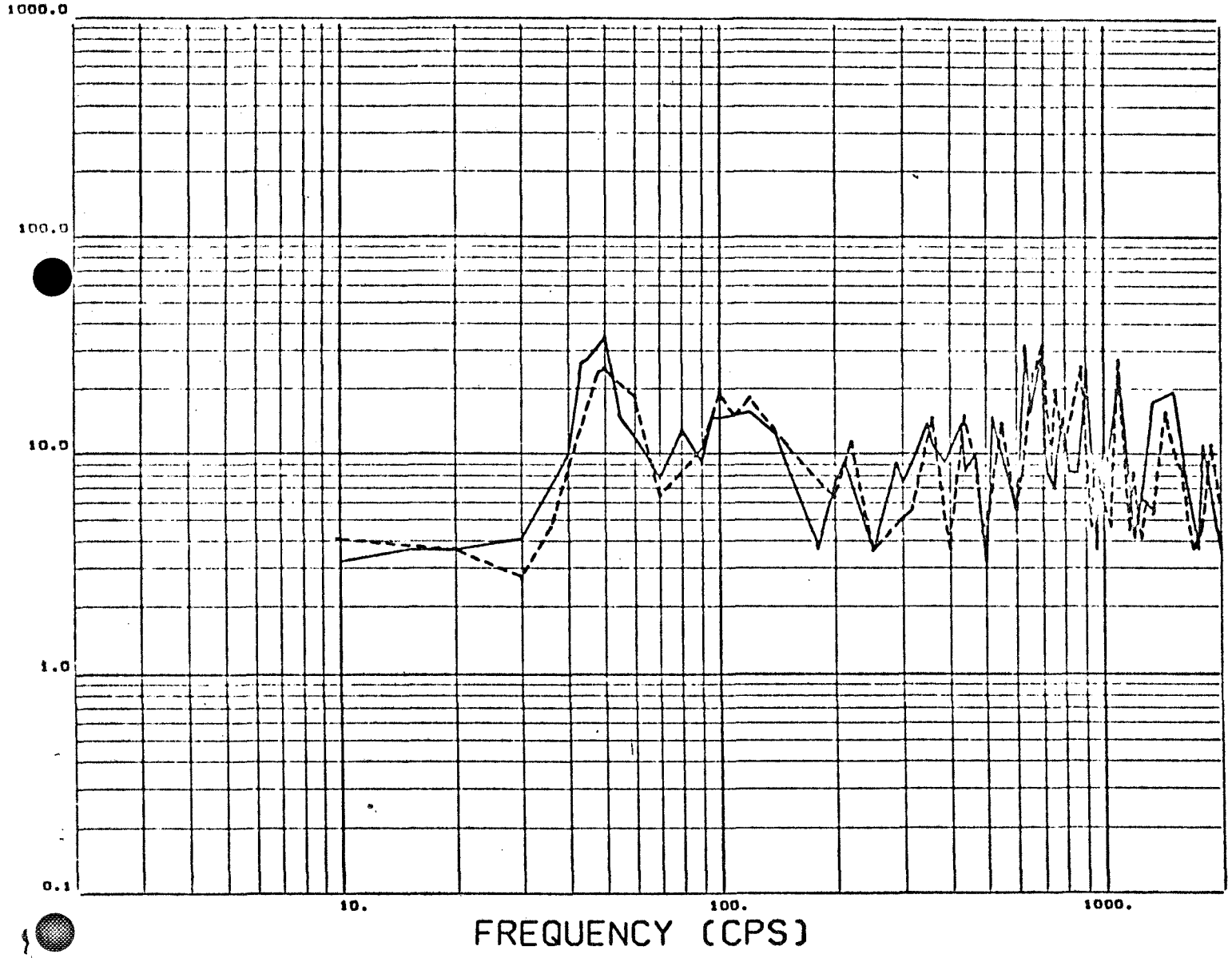
SIVB LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ____
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (6)... ACCEL. 6
PICK UP RESPONSE..... [illegible]
INPUT ACCEL.PER PAGE.. ____



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

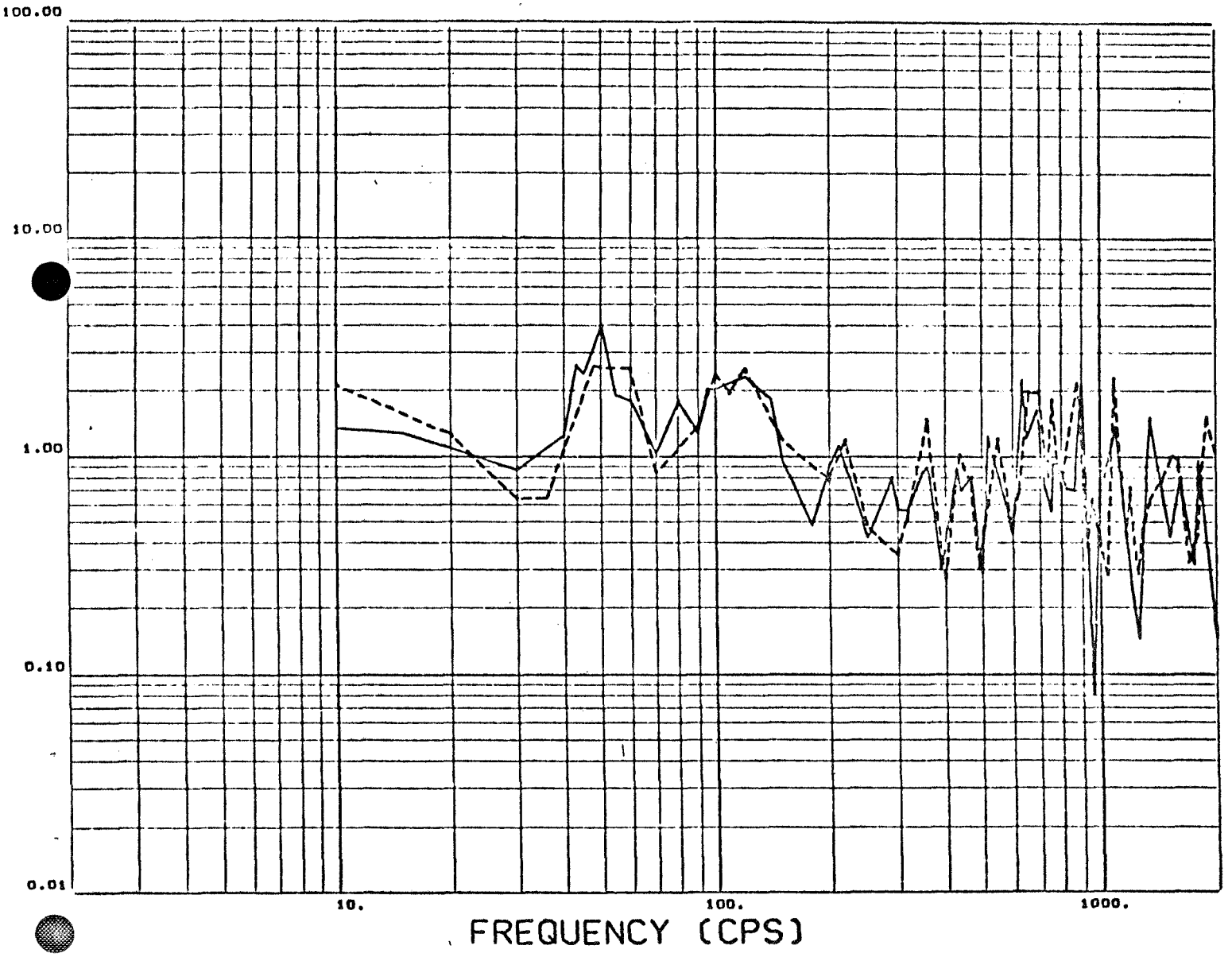
SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UP SWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (6/ 1) ACCEL. 8
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE.. ____



DOUGLAS AIRCRAFT COMPANY , INC.

SERIAL NO 305405 PAGE 41

PAGE NO. 854

REPORT NO. D180

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

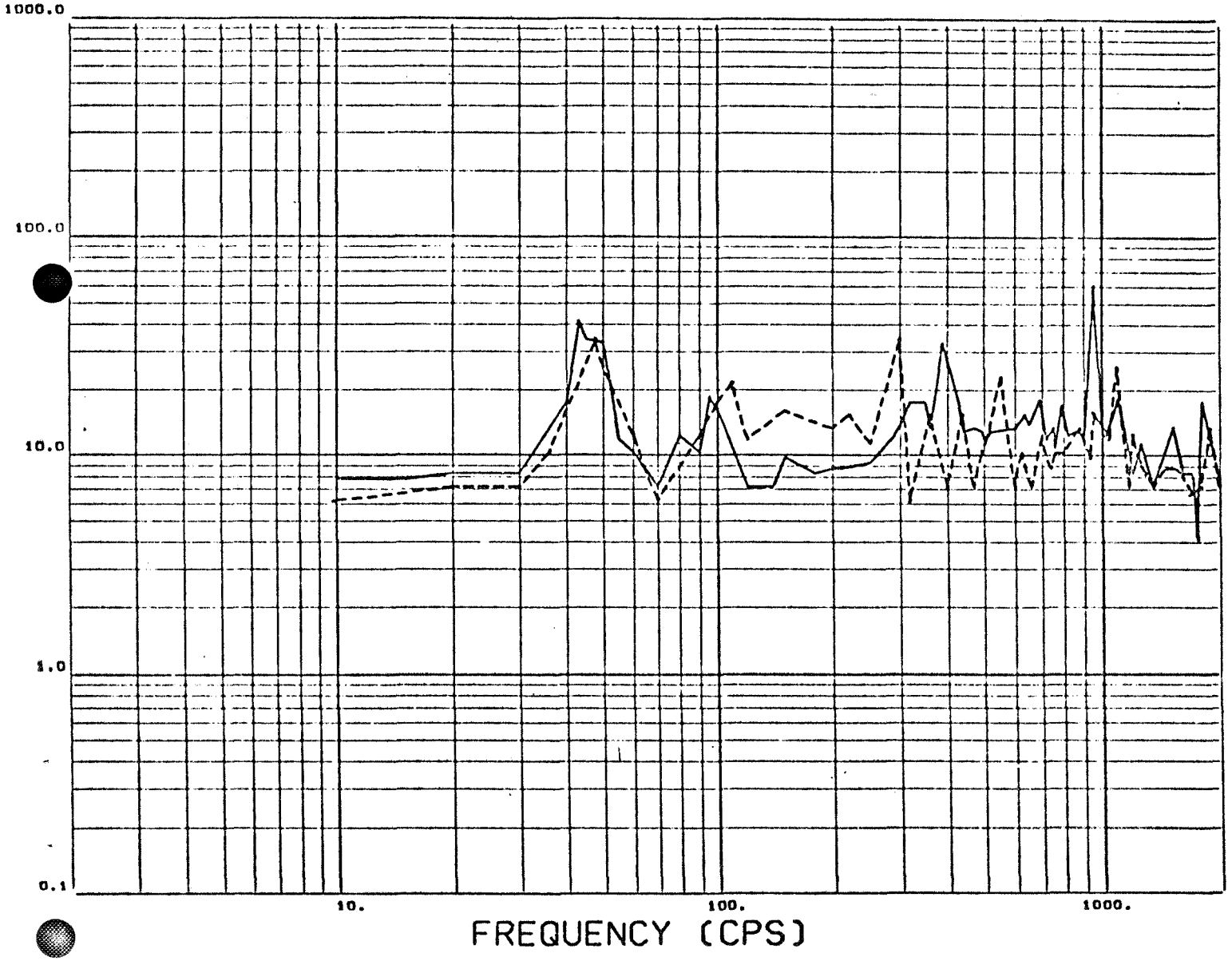
TEST DATE..... 8/6/69

AXIS OF EXCITATION.... RADIAL

PICK UP NUMBER (7)... ACCEL. 7

PICK UP RESPONSE.....

INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

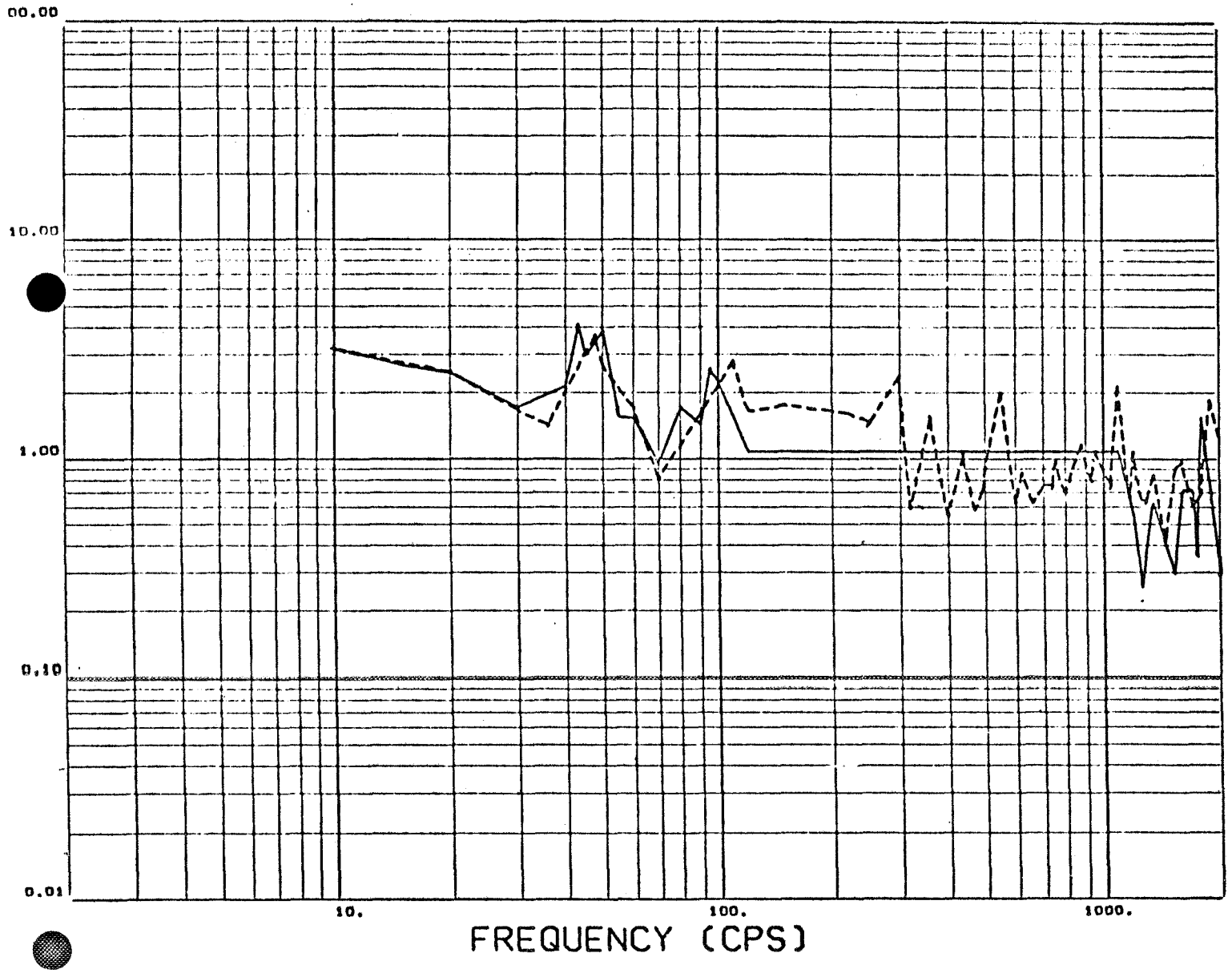
SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (7/ 1) ACCEL. 7
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE.. ____



SERIAL NO 305405 PAGE 47

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. 1856

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

STV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN [illegible]

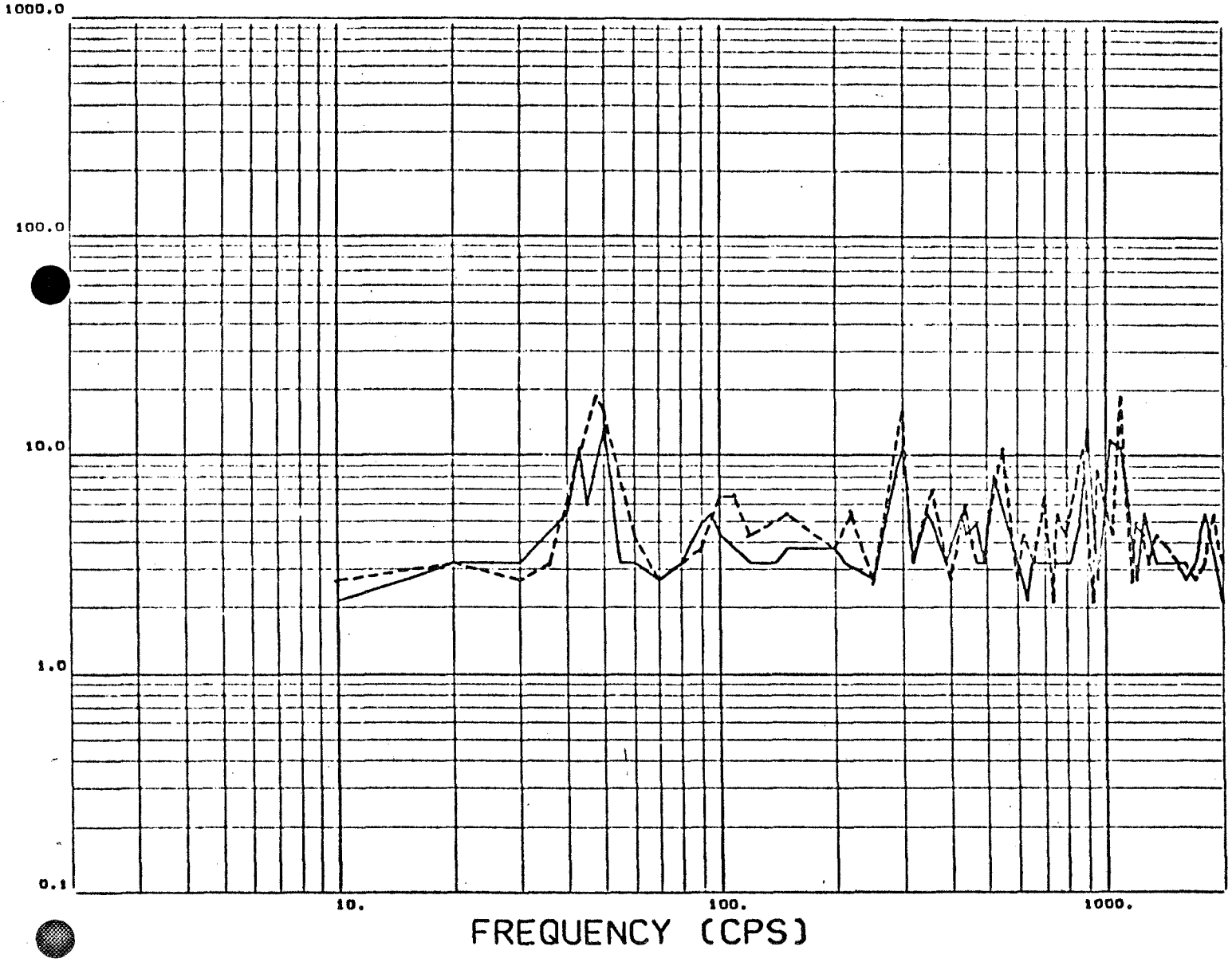
CONFIGURATION --- [illegible]

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (8)... ACCEL. 8
PICK UP RESPONSE..... ———
INPUT ACCEL.PER PAGE.. ____



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

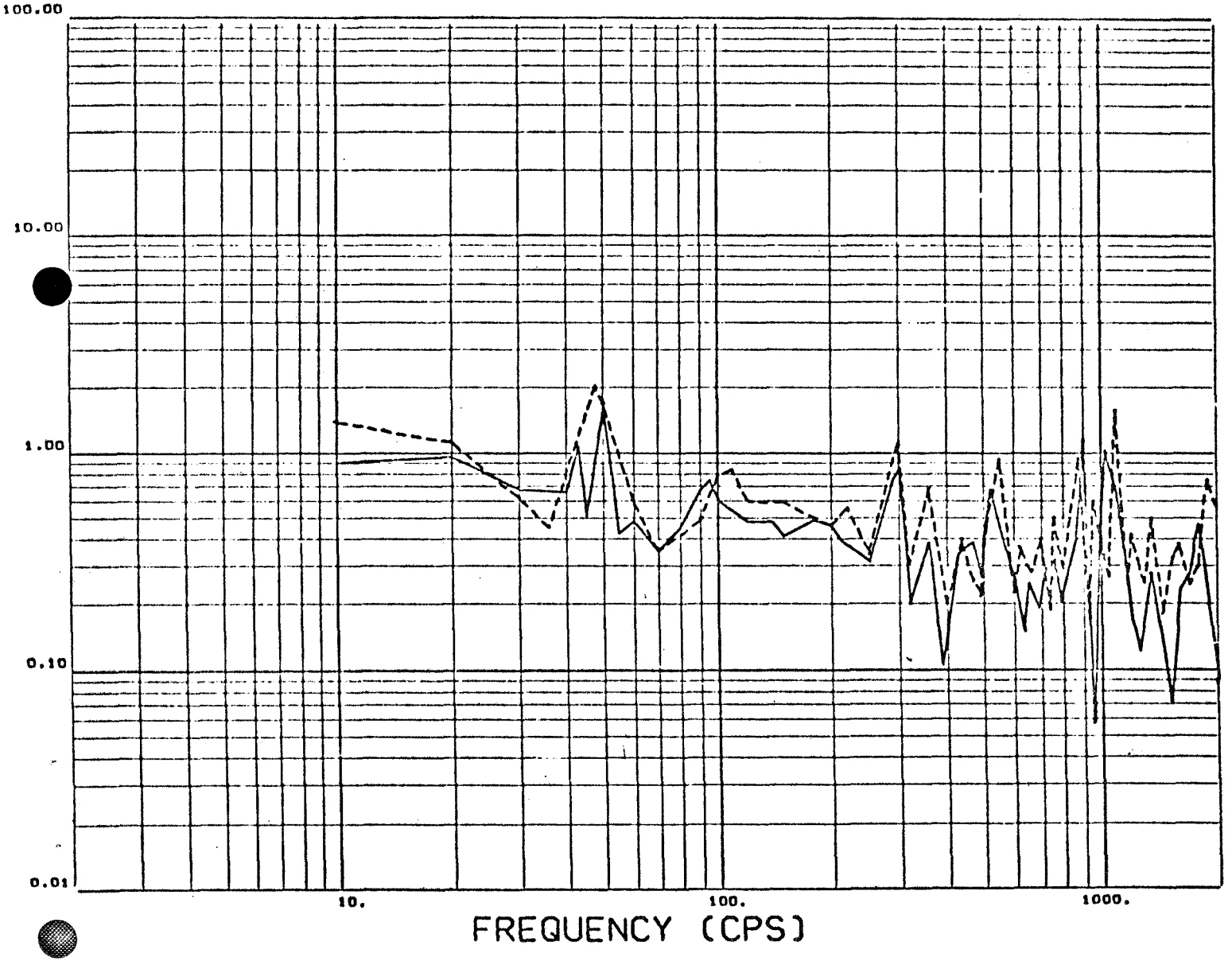
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE.....	8/6/65
AXIS OF EXCITATION....	RADIAL
PICK UP NUMBER (8/ 1)	ACCEL. 8
PICK UP RESPONSE.....	[illegible]
INPUT ACCEL.PER PAGE..	[illegible]



SERIAL NO 305409 PAGE 93

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B 58
REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

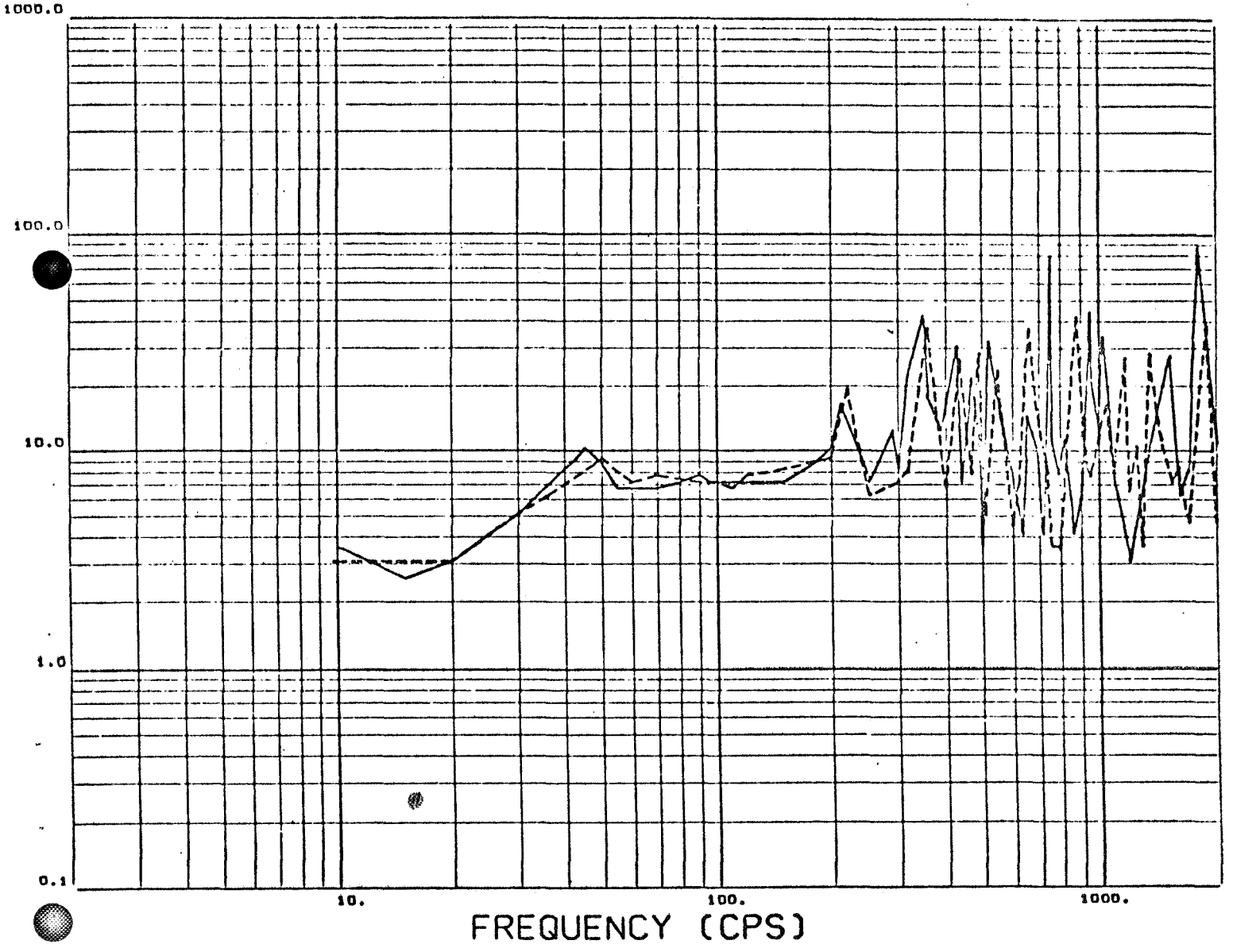
SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOW

CONFIGURATION --
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ____
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (9)... ACCEL. 9
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 305405 PAGE 54

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B59
REPORT NO. K 5130

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

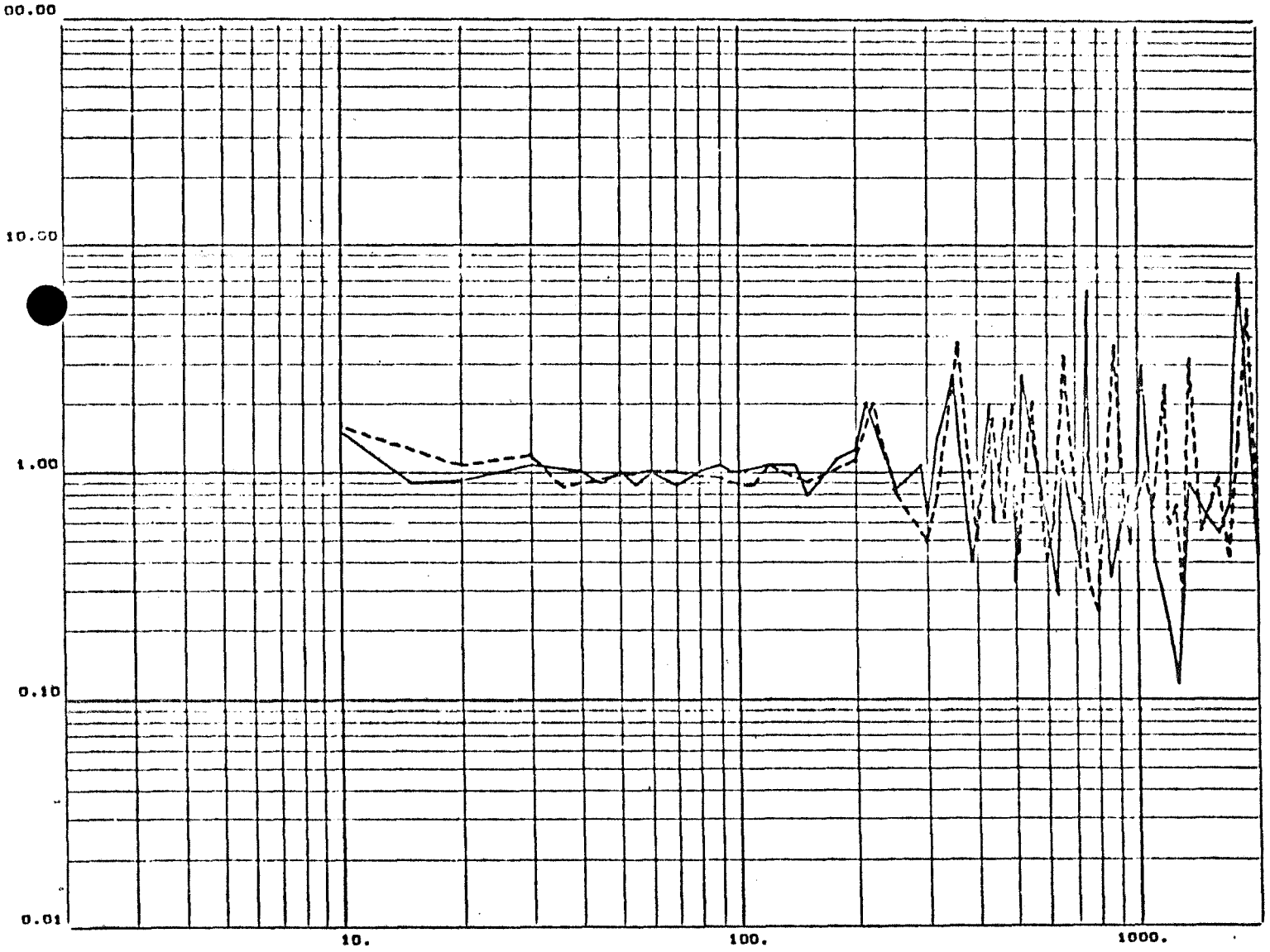
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (9/ 1) ACCEL. 9
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

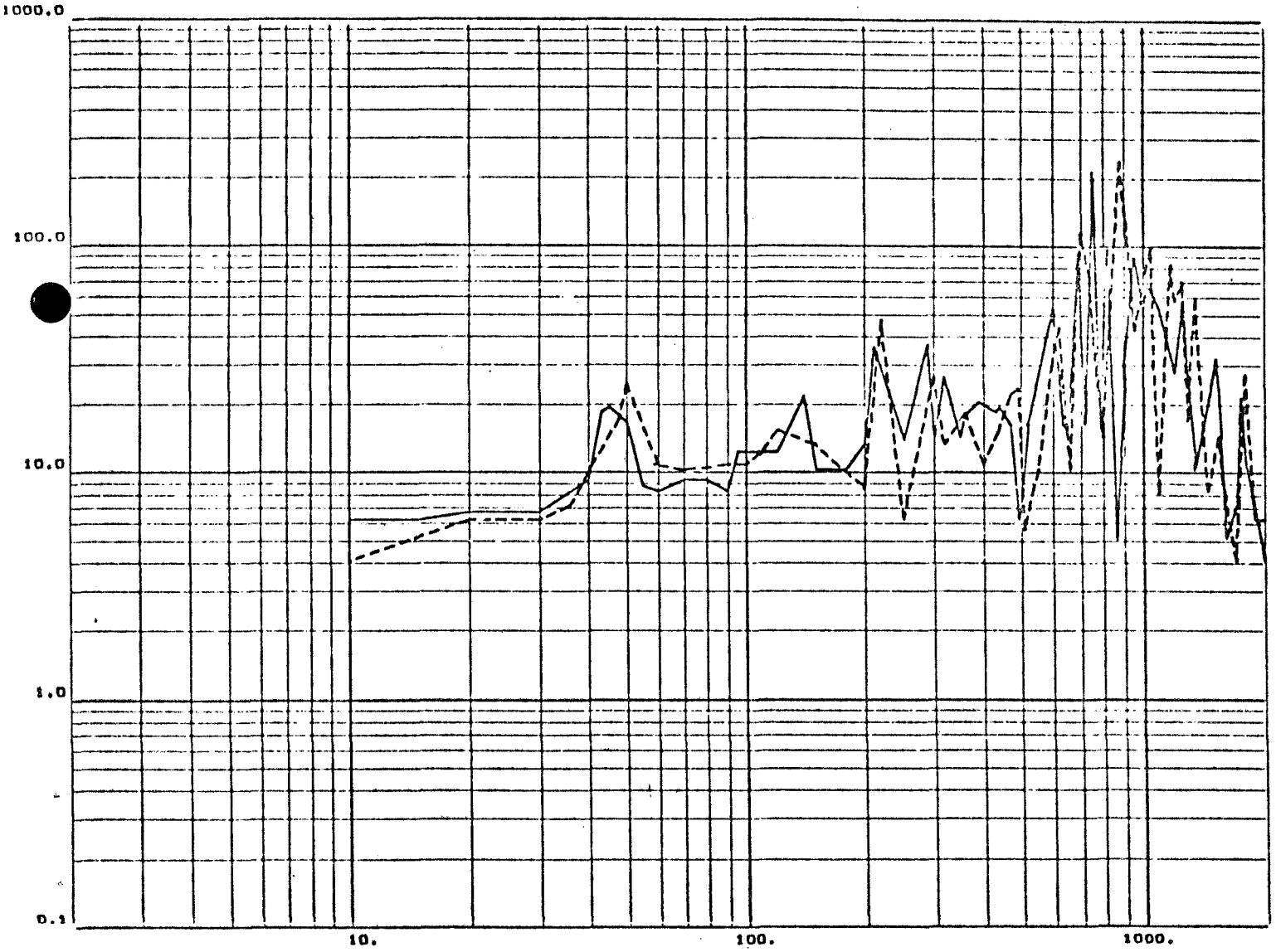
SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILDOWN FLOWRATE

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (10)... ACCEL. 10
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



DOUGLAS AIRCRAFT COMPANY , INC.

SINUSOIDAL FREQUENCY SWEEP

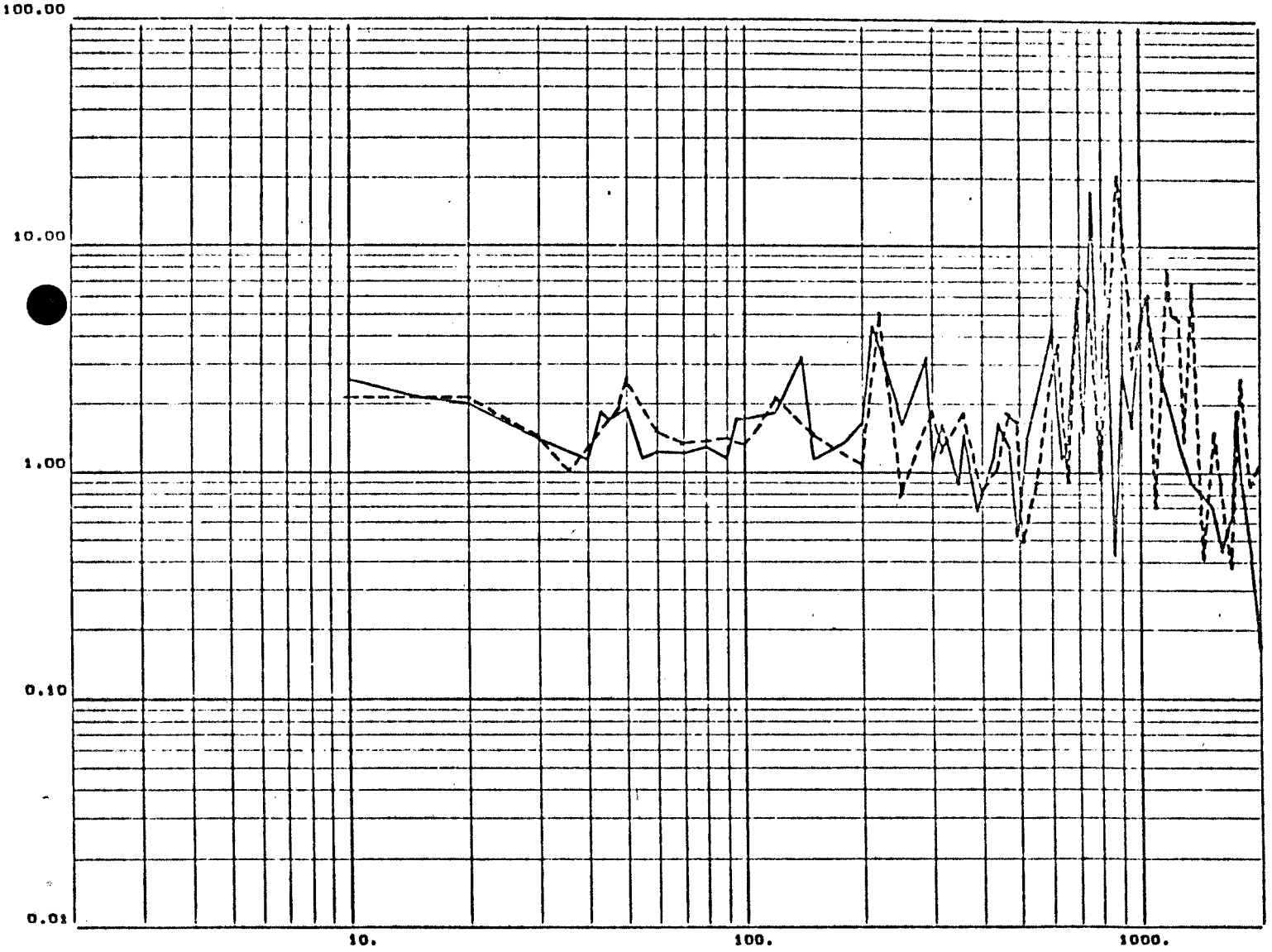
STV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/63
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (10/ 1) ACCEL. 10
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 305405 PAGE 65

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B62

REPORT NO.

SINUSOIDAL FREQUENCY SWEEP

STV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

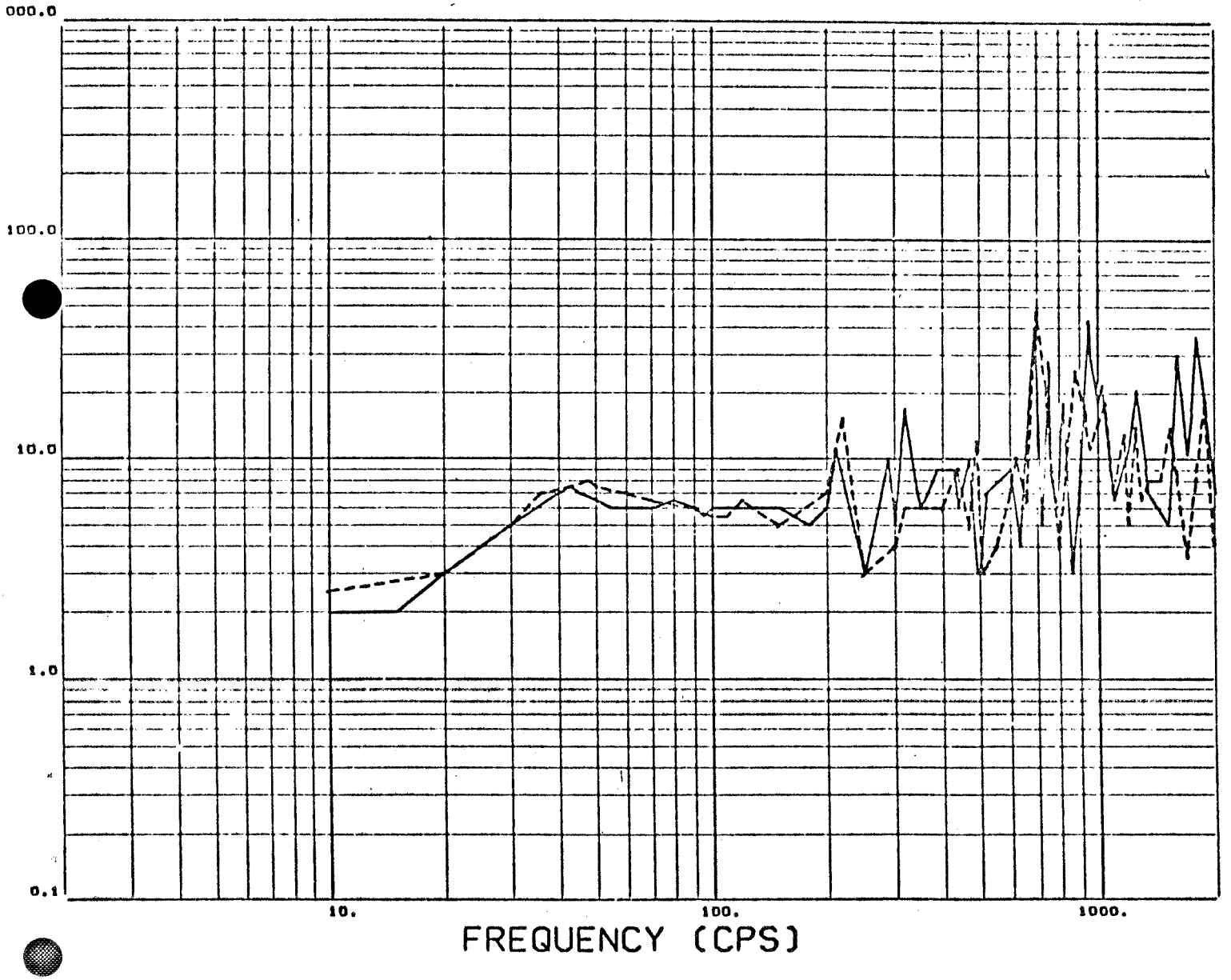
CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...
UPSWEEP ____
DOWNSWEEP - - - - -

TEST CONDITIONS....

TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (11)... ACCEL. 11
PICK UP RESPONSE.....
INPUT ACCEL.PER PAGE..



SERIAL NO 305403 PAGE 66

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. 863

REPORT NO. E-180-1

SINUSOIDAL FREQUENCY SWEEP

SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

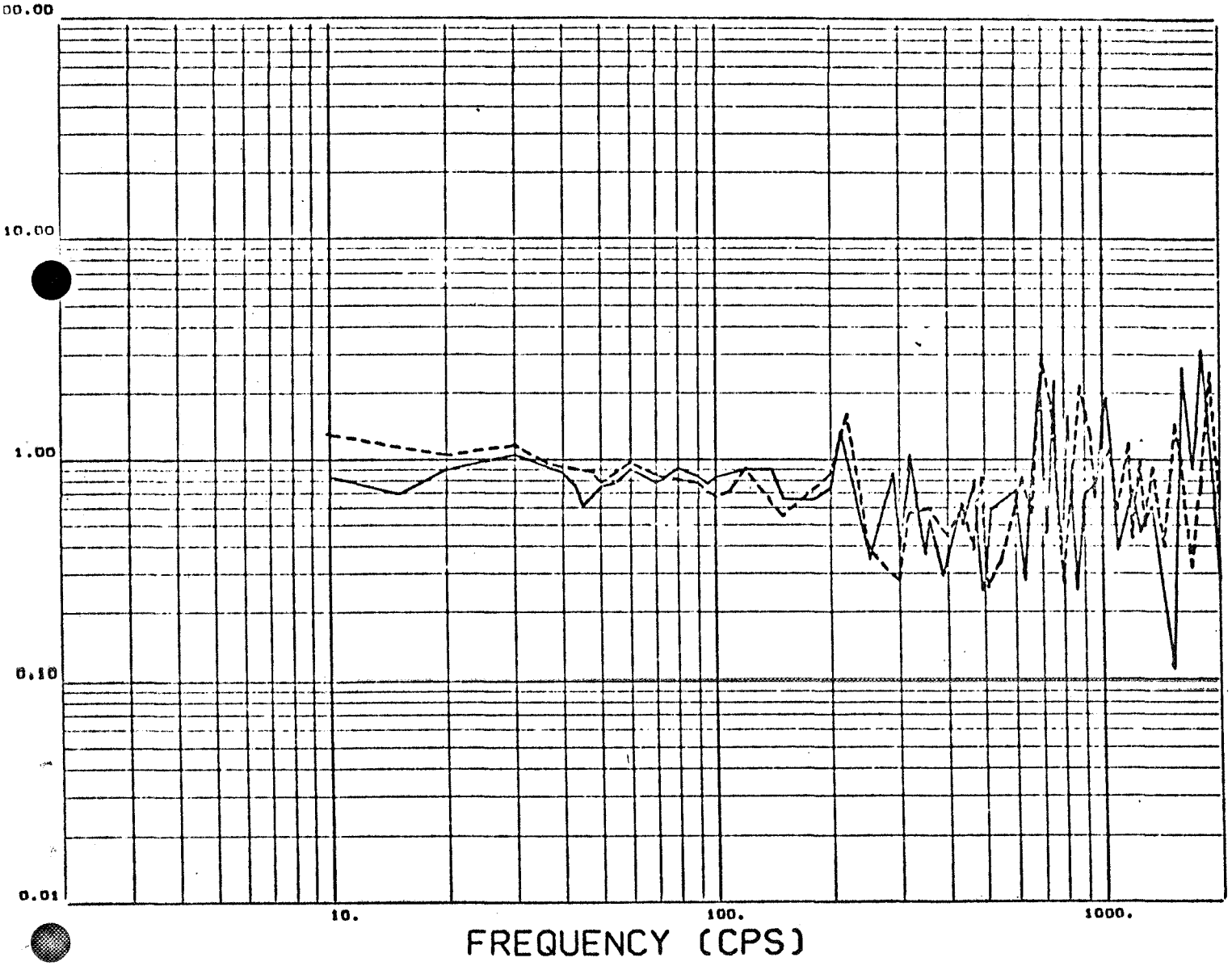
CONFIGURATION ---

NOTE... SEE PAGE ____ FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....

TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (11/ 1) ACCEL. 11
PICK UP RESPONSE..... ____
INPUT ACCEL.PER PAGE.. ____



SERIAL NO 305405 PAGE 71

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. P64

REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP

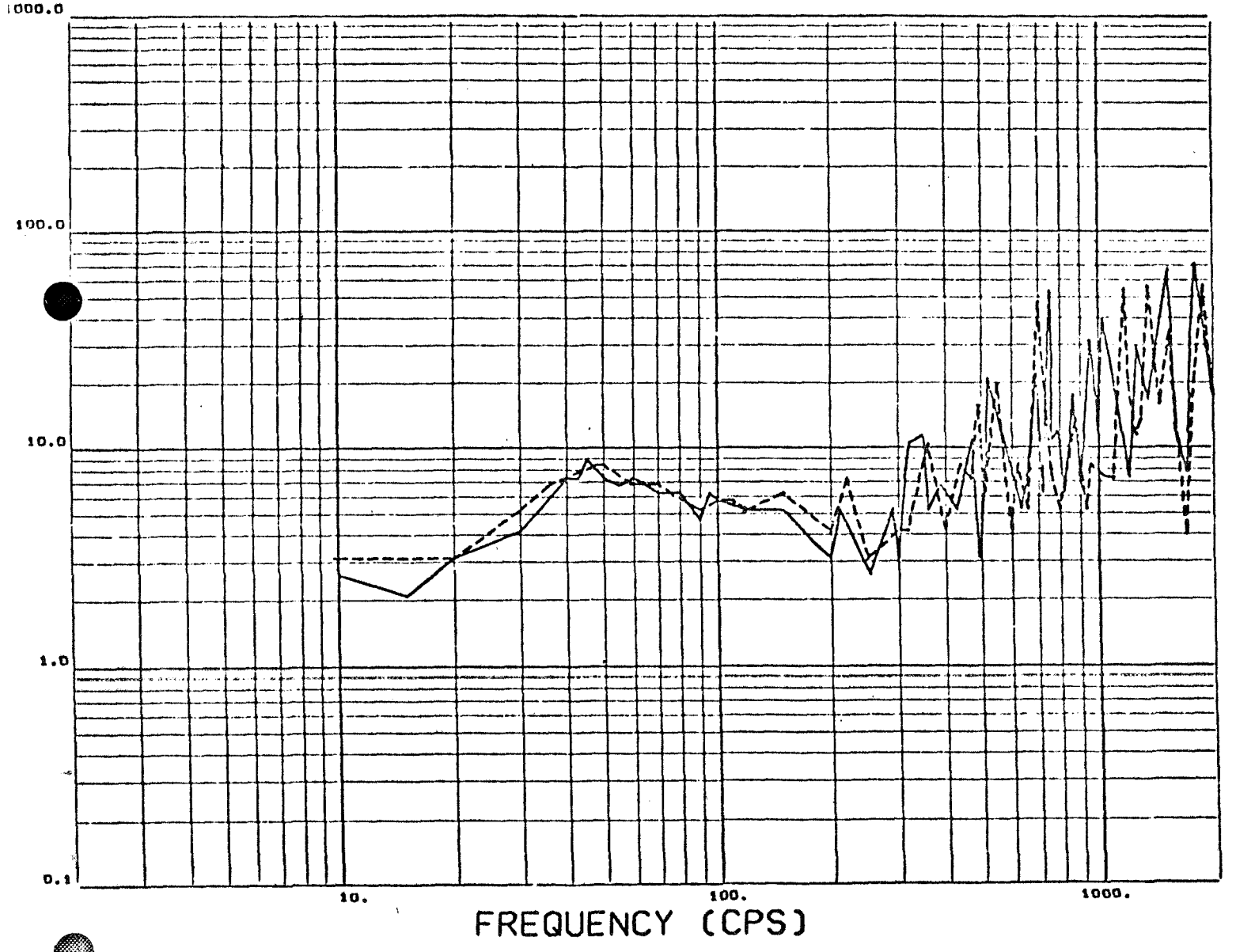
SIV-B LH2 RECIRCULATION DUCT ASSEMBLY

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---
NOTE... SEE PAGE ____
FOR PICK UP LOCATION

LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 8/6/65
AXIS OF EXCITATION.... RADIAL
PICK UP NUMBER (12)... ACCEL. 12
PICK UP RESPONSE..... [illegible]
INPUT ACCEL.PER PAGE.. ____



SERIAL NO 305405 PAGE 72

DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. B65

REPORT NO. R5180-3

SINUSOIDAL FREQUENCY SWEEP

SIVB LH2 RECIRCULATION DUCT ASSEMBLY

DSV 4B

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION ---

NOTE... SEE PAGE A23 FOR PICK UP LOCATION

LEGEND...

UPSWEEP ———

DOWNSWEEP ------

TEST CONDITIONS....

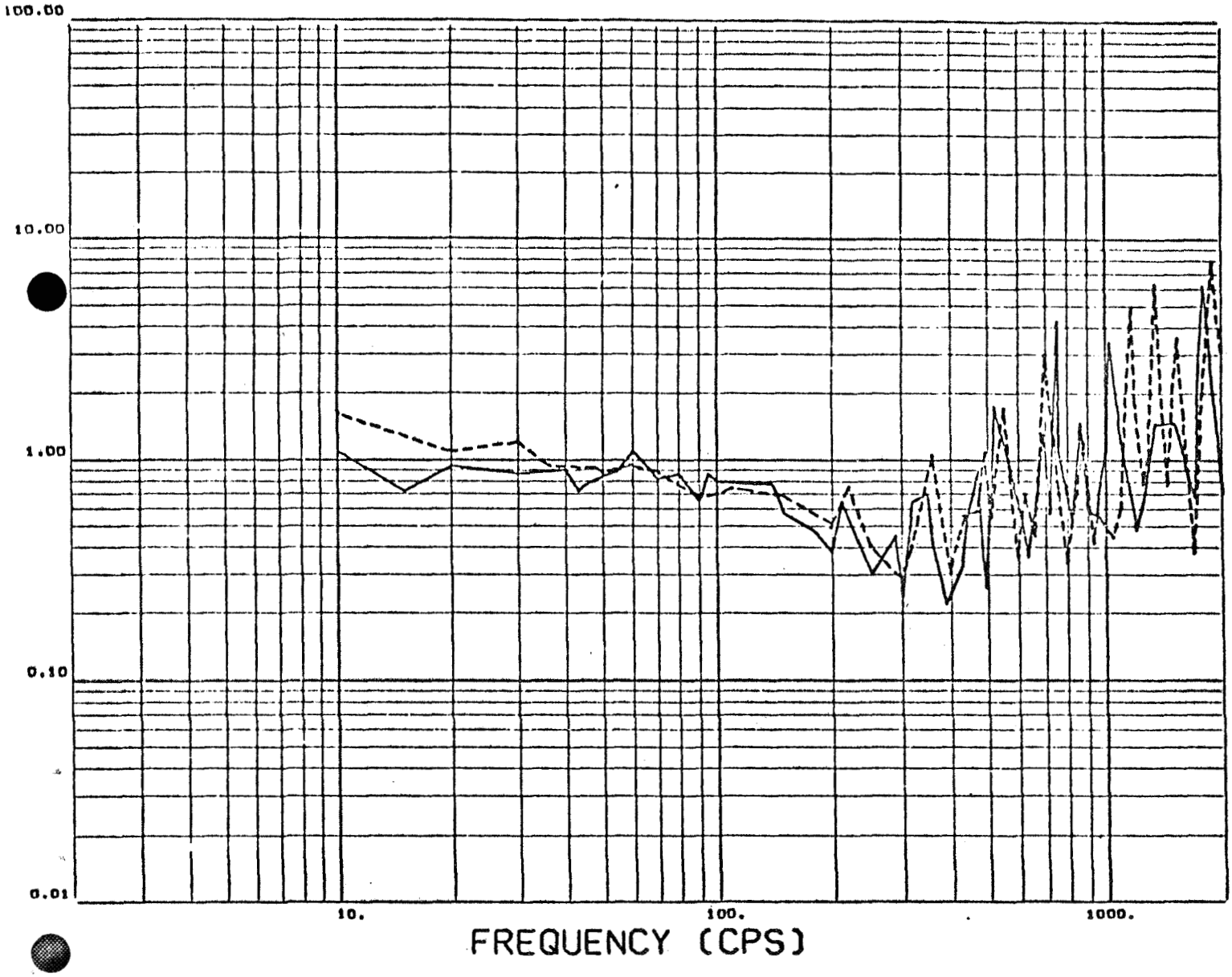
TEST DATE..... 8/6/65

AXIS OF EXCITATION.... RADIAL

PICK UP NUMBER (12/ 1) ACCEL. 12

PICK UP RESPONSE.....

INPUT ACCEL.PER PAGE..



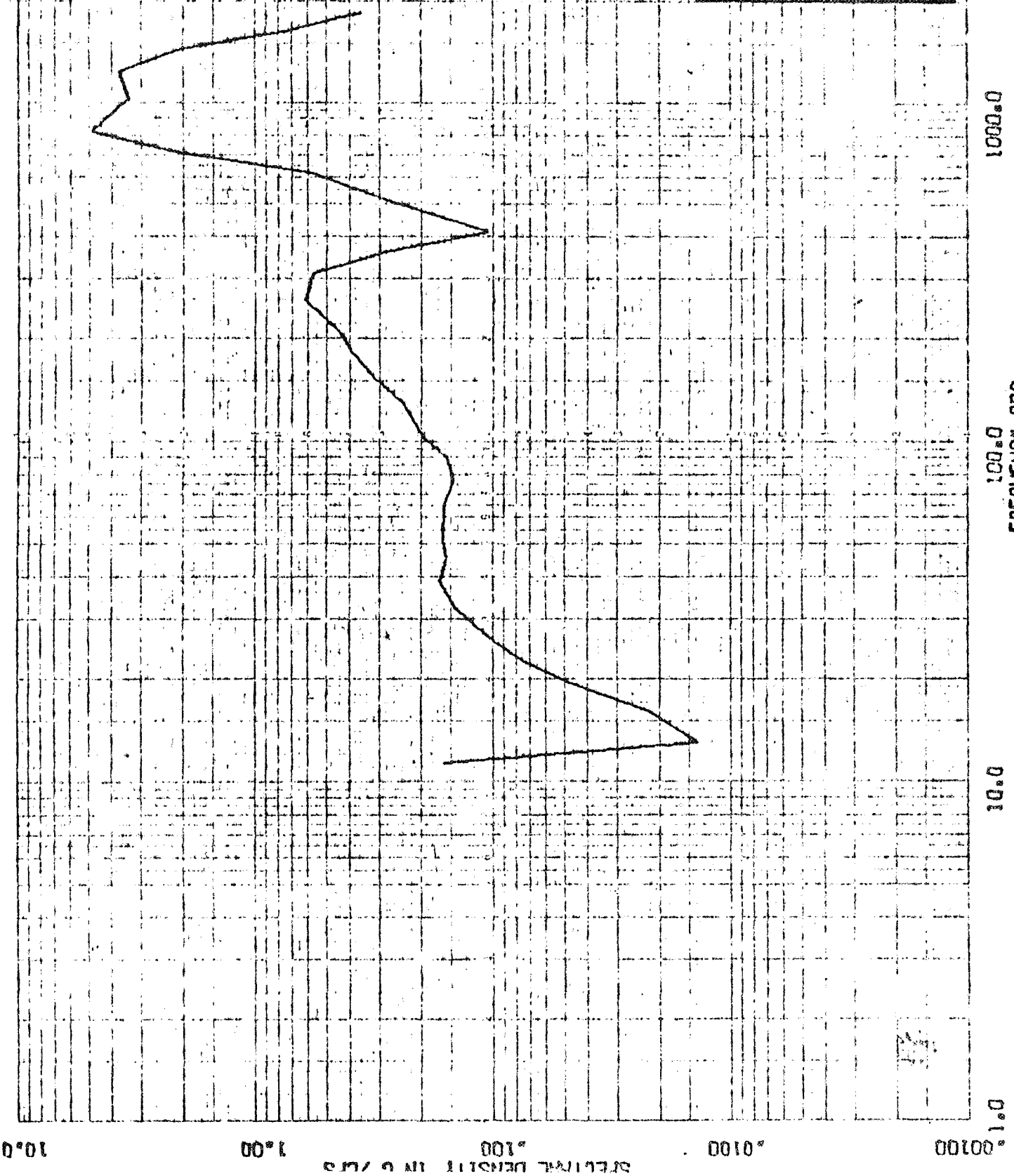
DSV-4B RANDOM VIBRATION TEST

LH_2 CHILLDOWN PROGRAMMER

CONFIGURATION
P/N 1A99966-501

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION THRUST
PICK-UP NUMBER 1
PICK-UP RESPONSE THRUST
INPUT ACCELERATION PER PAGE 61
RMS VALUE 60.6



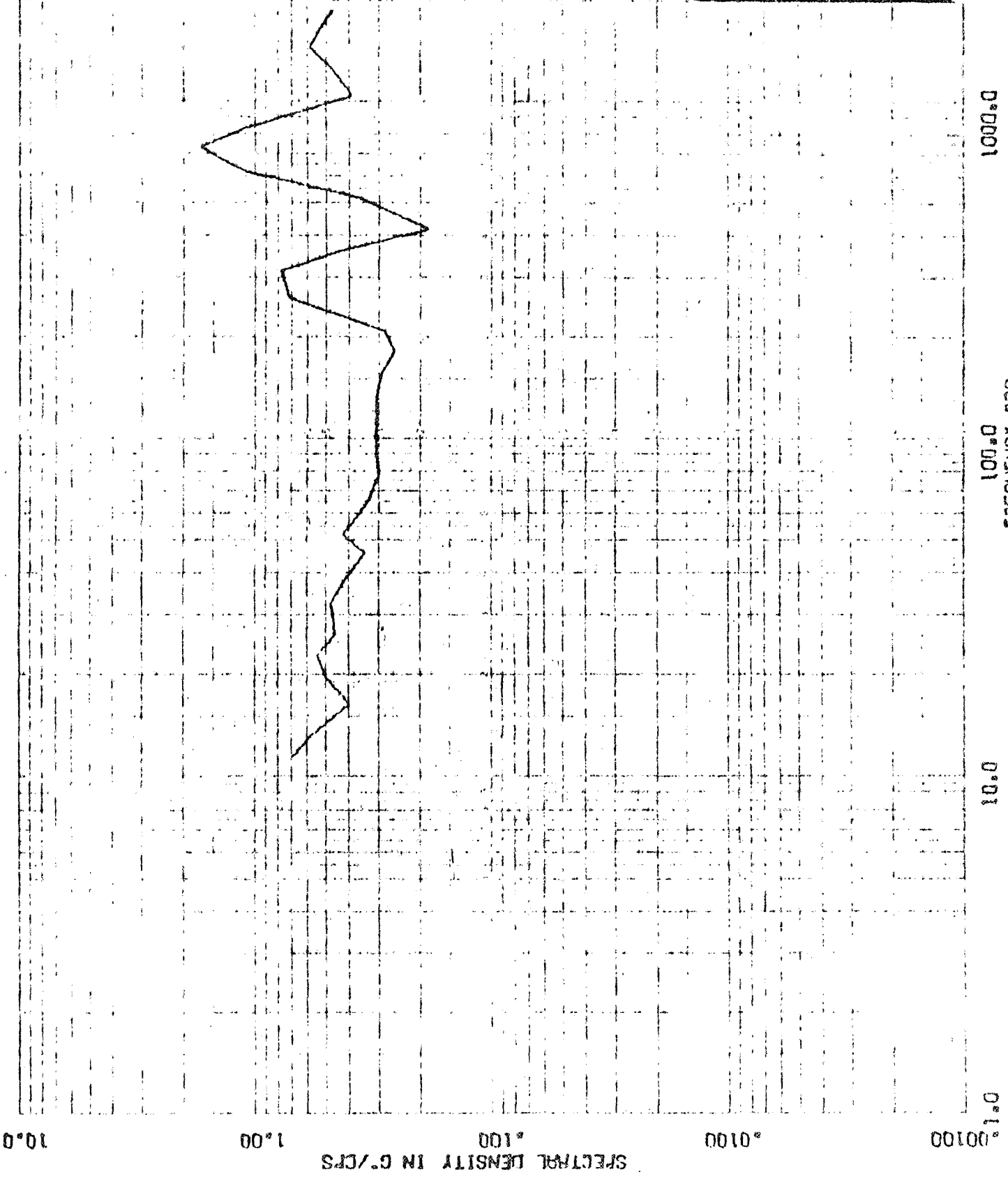
DSV-48 RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-501

NOTE
SEE PAGE [illegible] FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION THRUST
PICK-UP NUMBER 2
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PAGE 67
RMS VALUE 39.7



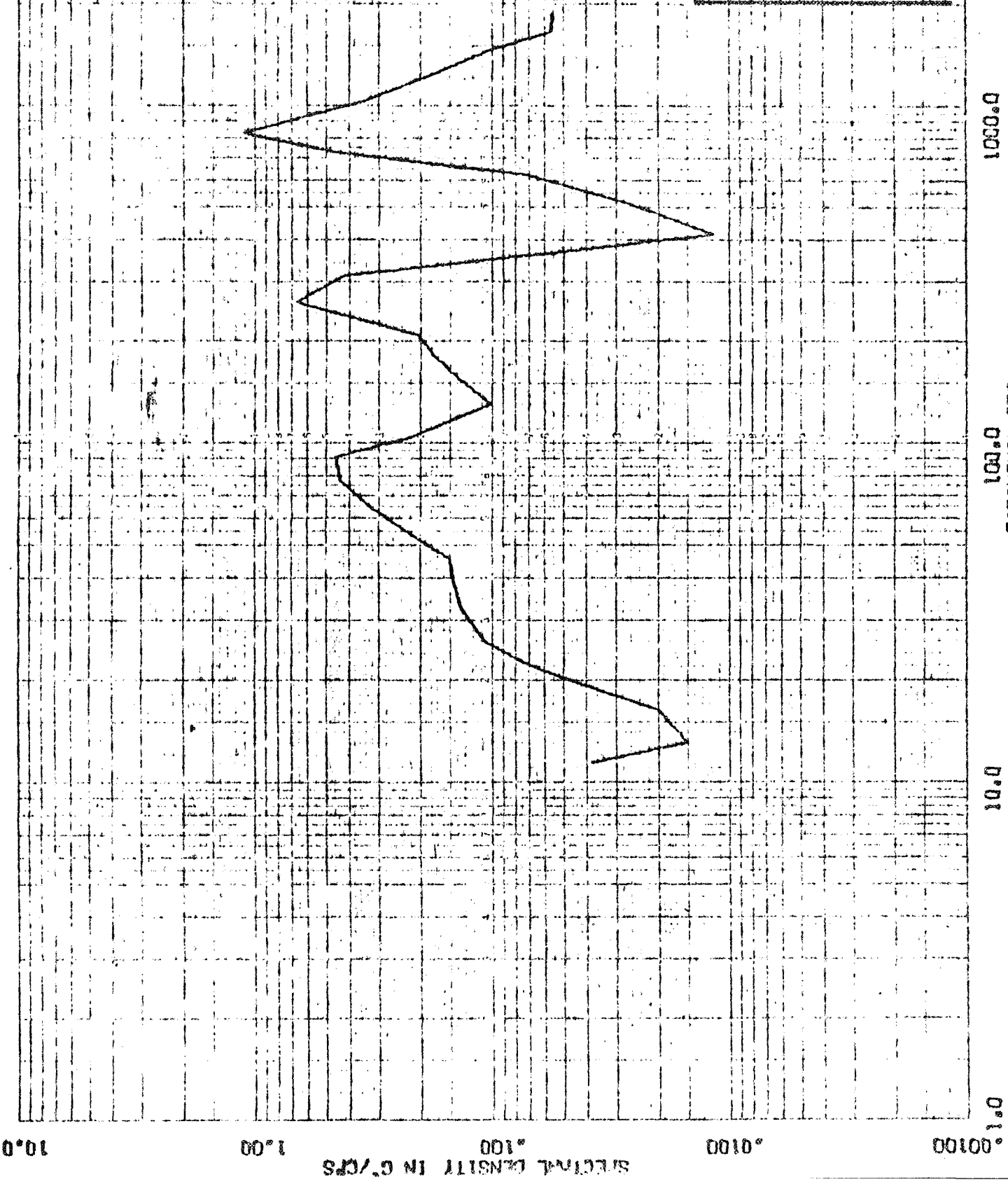
DSV-48 RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49986-501

NOTE
SEE PAGE [illegible] FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/66
AXIS OF EXCITATION [illegible]
PICK-UP NUMBER [illegible]
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PAGE 67
RMS VALUE 23.3

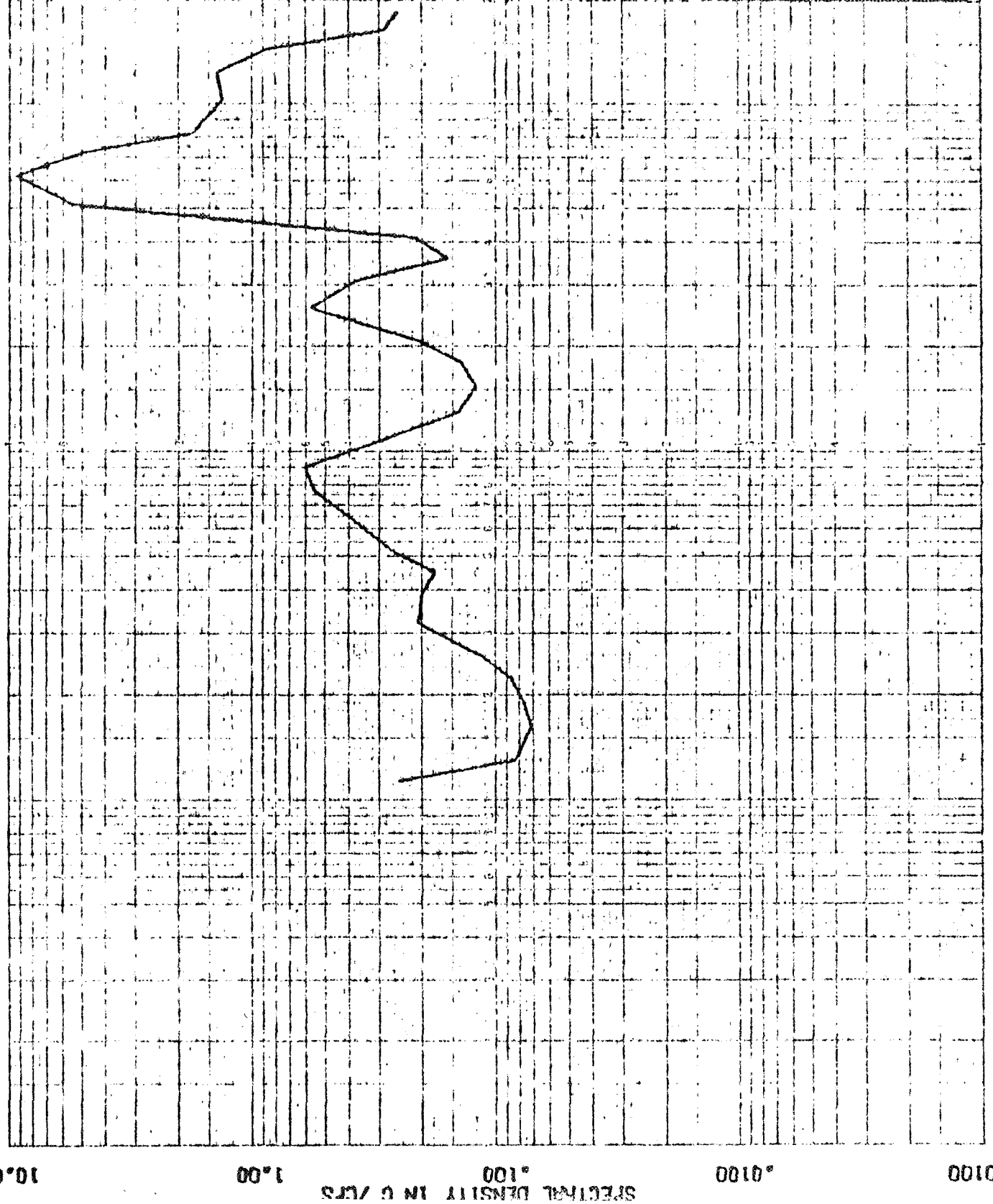


DSV-48 RANDOM VIBRATION TEST
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-501

NOTE
SEE PAGE A 73 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION [illegible]
PICK-UP NUMBER 5
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PAGE 612
RMS VALUE 60.5



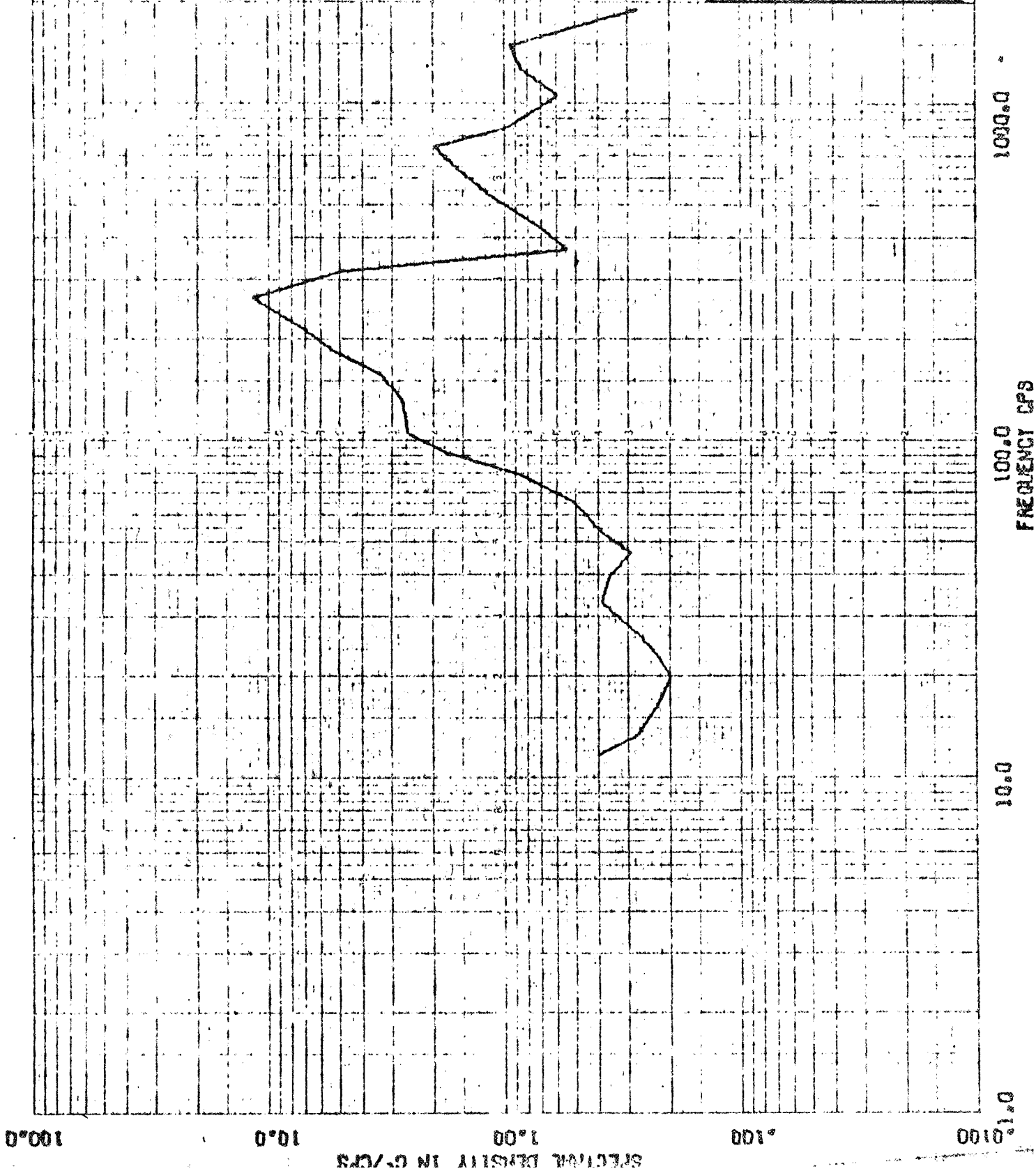
DSV-4B RANDOM VIBRATION TEST

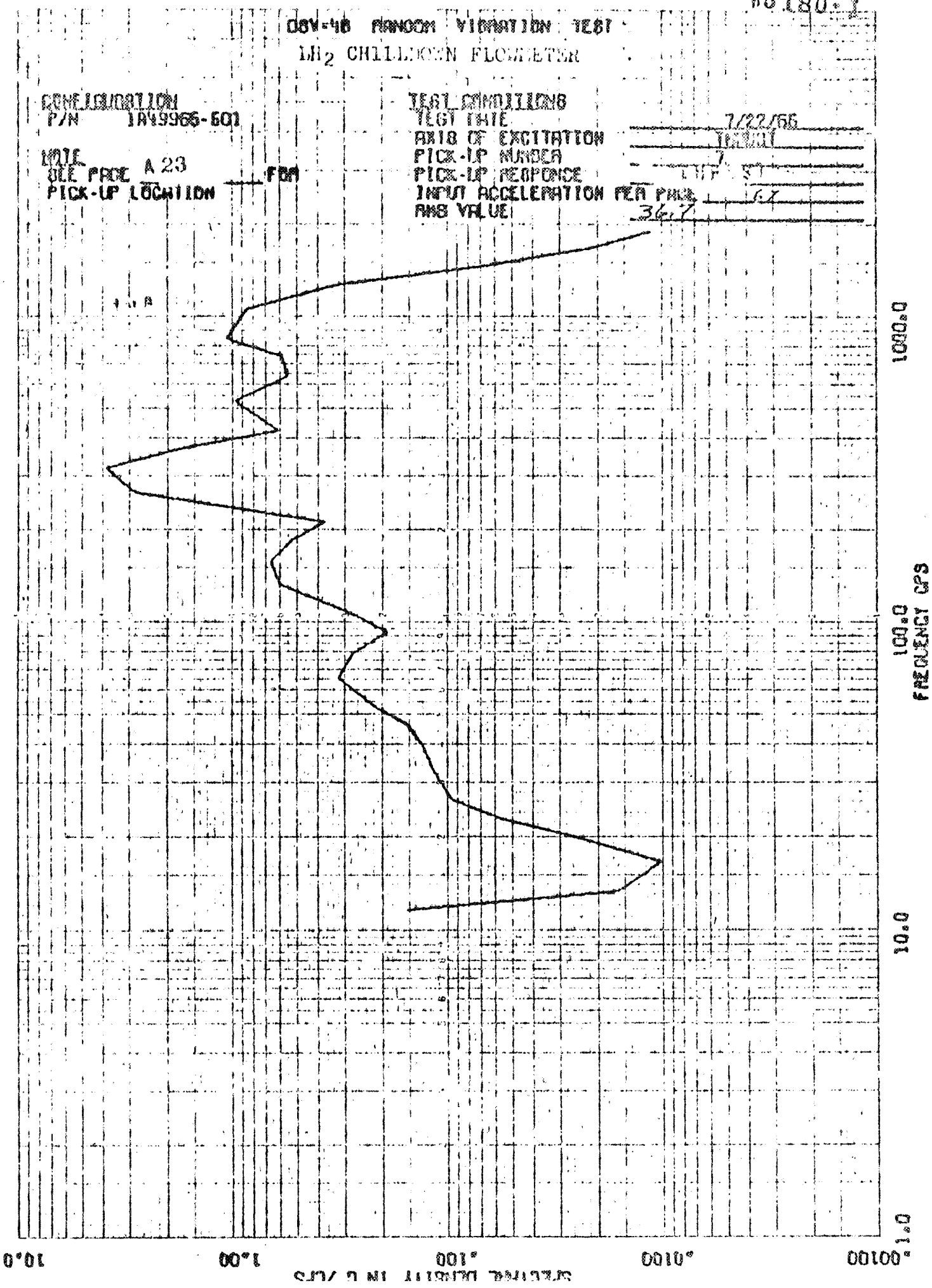
LH_2 CHILLDOWN FLOWMETER

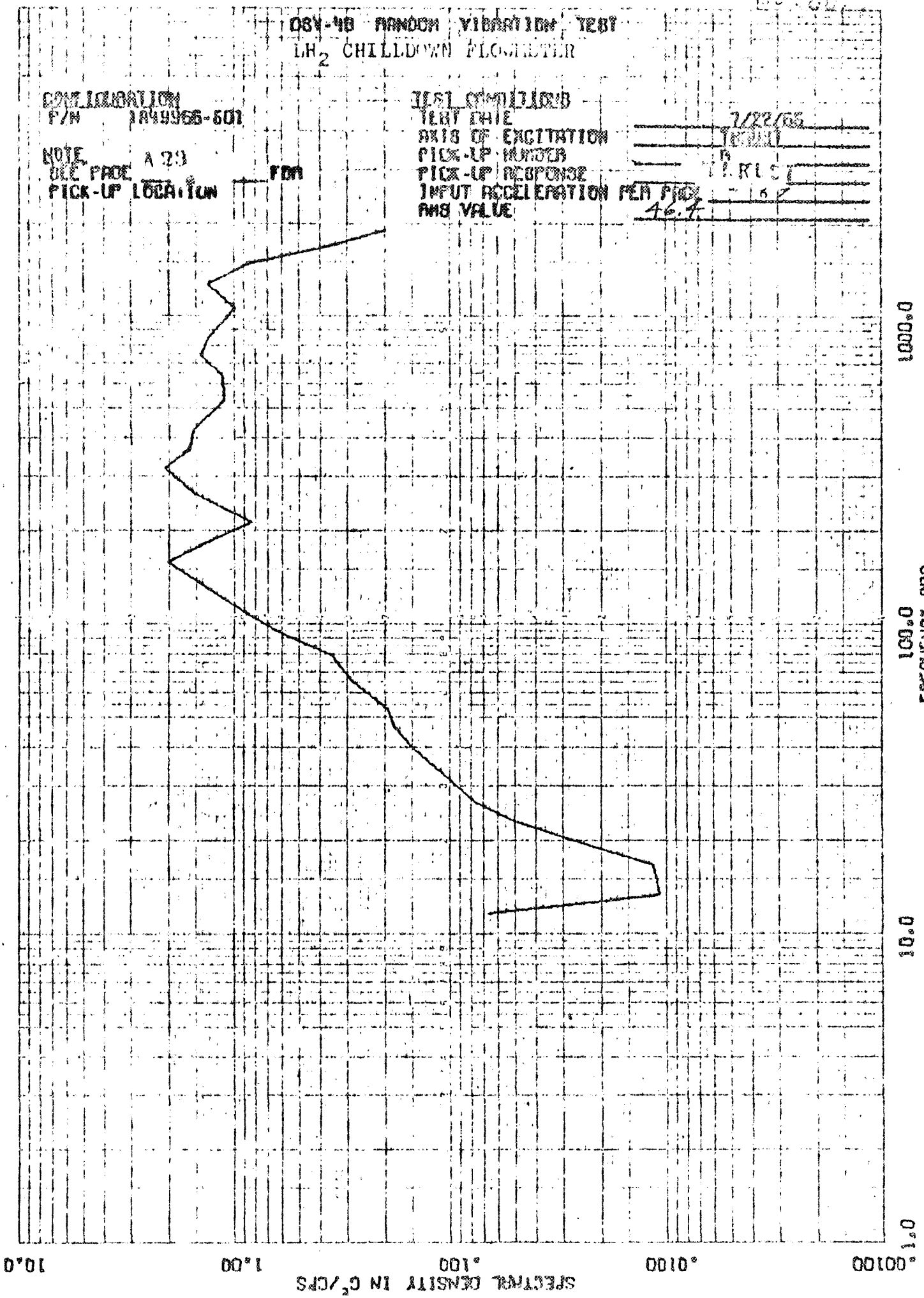
CONFIGURATION
P/N 1049966-601

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION DOWN
PICK-UP NUMBER 6
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PROL [illegible]
RMS VALUE 3.7




DSV-4B RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49966-601
NOTE
SEE PAGE A 23
PICK-UP LOCATION FOR
TEST CONDITIONS
TEST DATE 7/22/66
AXIS OF EXCITATION INPUT
PICK-UP NUMBER 7
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 67
RMS VALUE 36.7
1000.0
100.0
10.0
1.0
FREQUENCY CPS
10.0
1.00
.100
.0100
.00100
SPECTRAL DENSITY IN G/CPS


DSV-4B RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49966-601
NOTE
DEC PAGE A 23
PICK-UP LOCATION FDM
TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION TORQUE
PICK-UP NUMBER
PICK-UP RESPONSE
INPUT ACCELERATION PER PICK
RMS VALUE 46.7
1000.0
100.0
10.0
1.0
FREQUENCY CPS
.0010
.0100
.100
1.00
10.0
SPECTRAL DENSITY IN G²/CPS

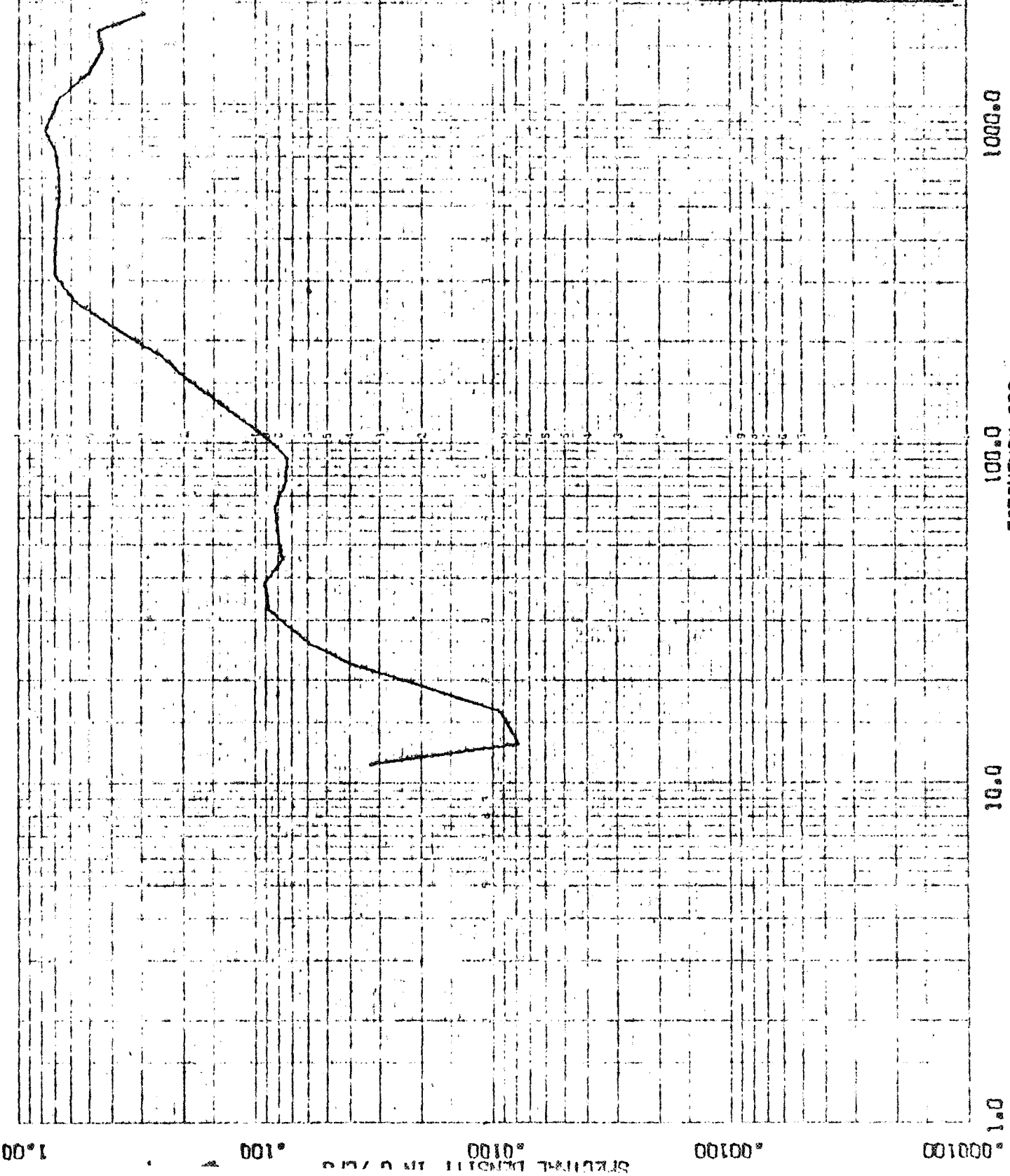
DSV-48 RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49965-601

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/66
AXIS OF EXCITATION THRUST
PICK-UP NUMBER 10
PICK-UP RESPONSE THRUST
INPUT ACCELERATION PER PAGE 67
RMS VALUE 33.8



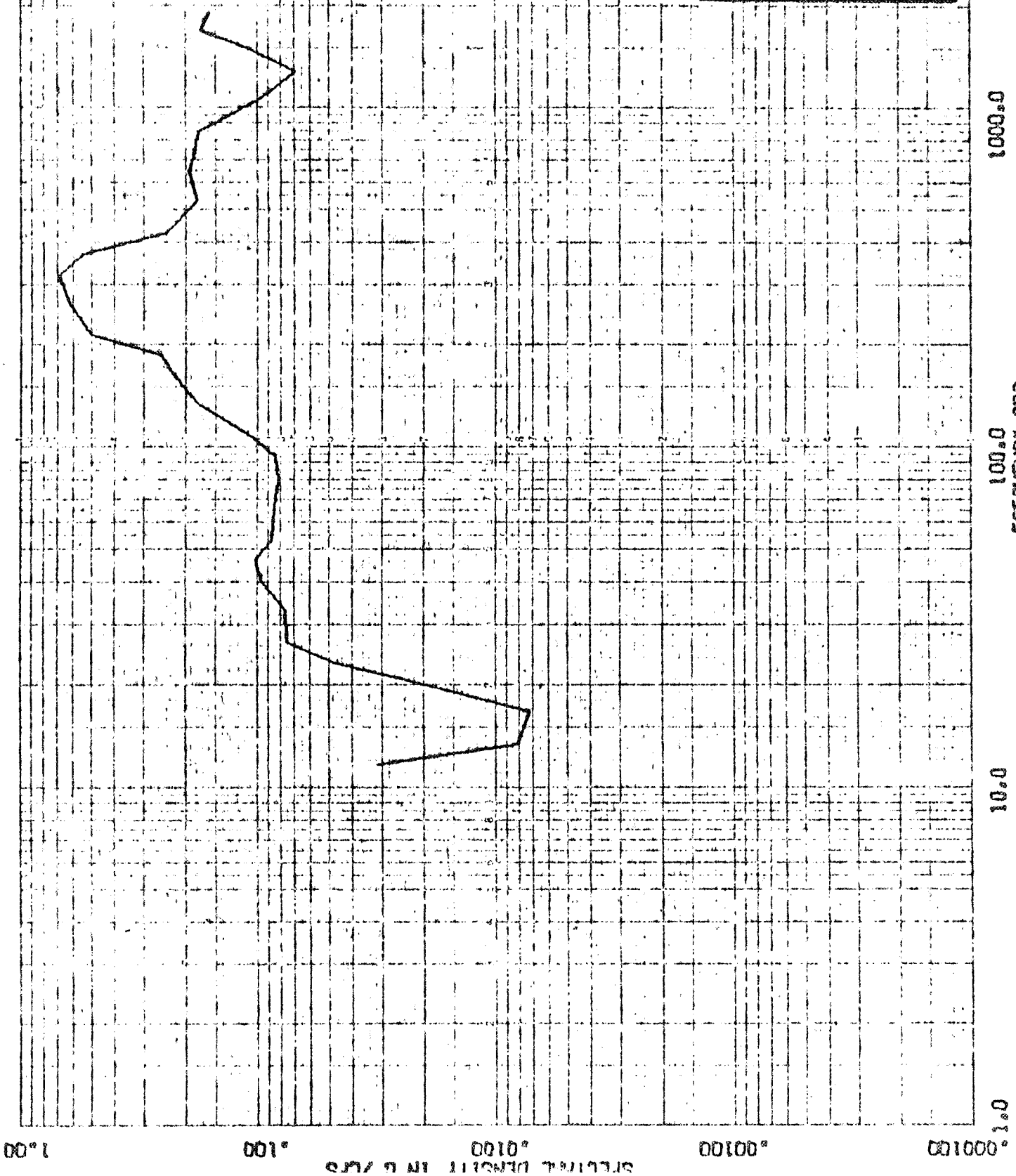
DSV-48 RANDOM VIBRATION TEST

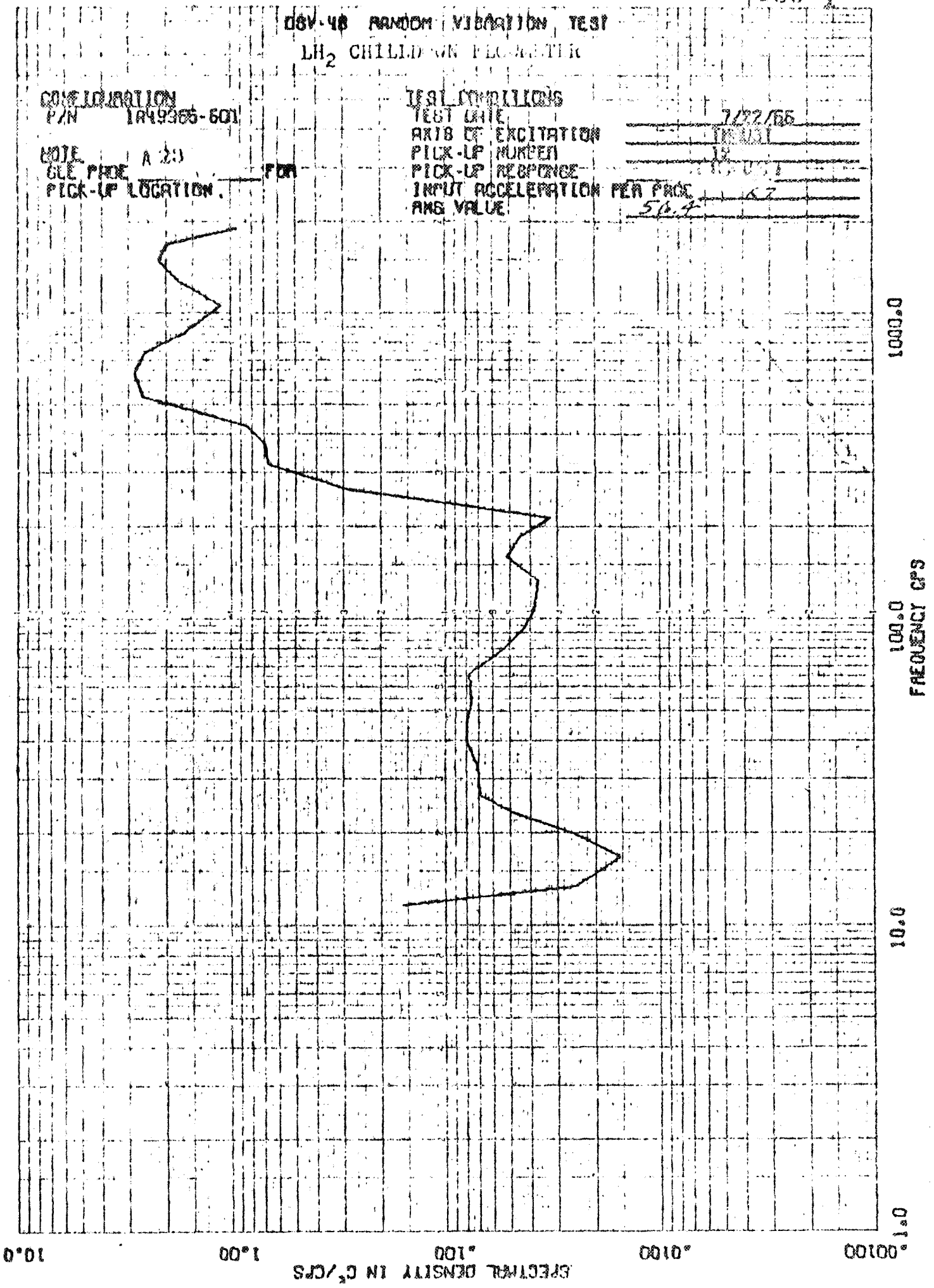
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1R49966-601

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/66
AXIS OF EXCITATION THRUST
PICK-UP NUMBER 11
PICK-UP RESPONSE TWRLST
INPUT ACCELERATION PER PAGE
RMS VALUE 2.2




DSV-48 RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49365-601
NOTE A 23
SEE PAGE FOR
PICK-UP LOCATION.
TEST CONDITIONS
TEST DATE 7/22/66
AXIS OF EXCITATION THRUST
PICK-UP NUMBER 12
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 67
RMS VALUE 56.4
1000.0
100.0
10.0
1.0
FREQUENCY CPS
10.0
1.00
.100
.0100
.00100
SPECTRAL DENSITY IN G²/CPS

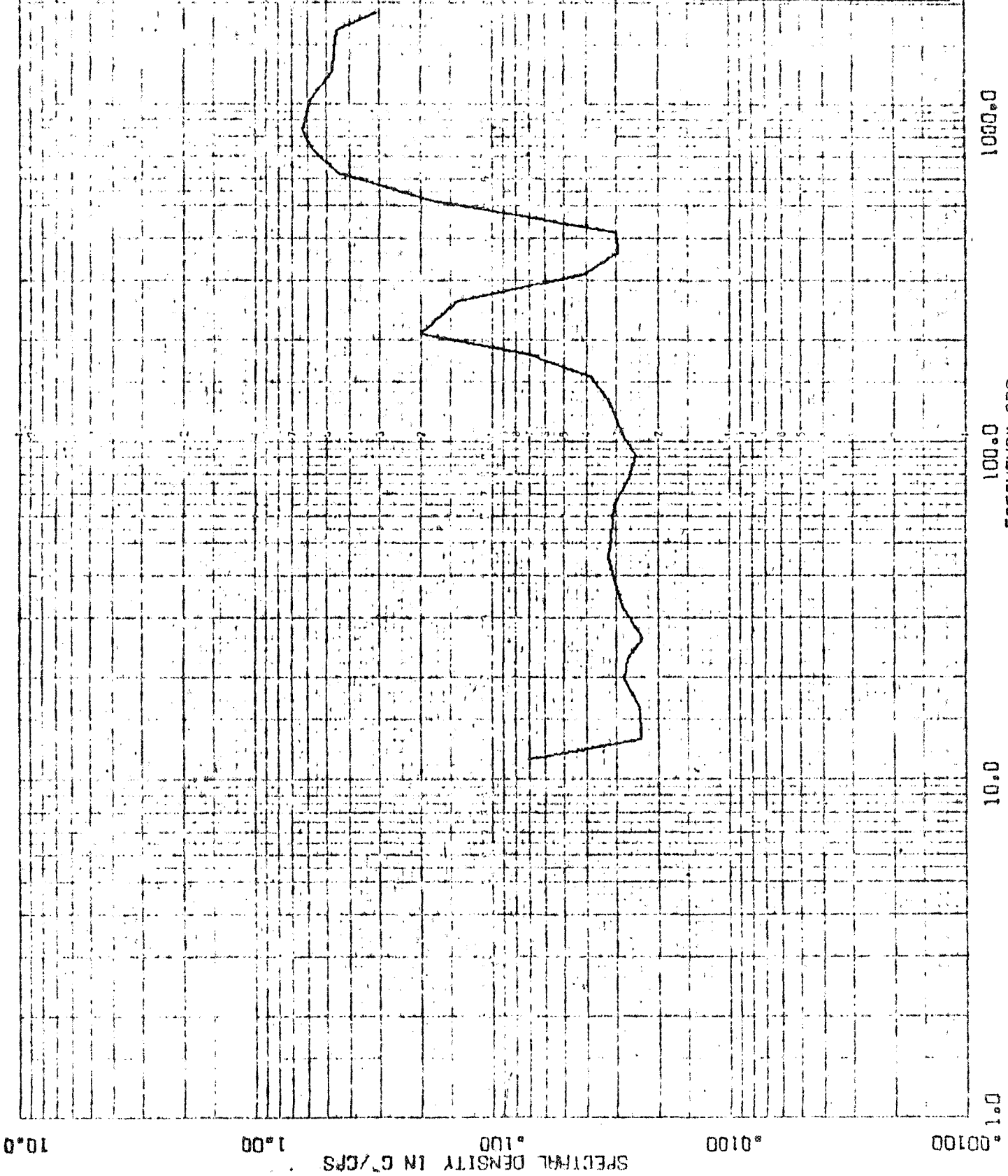
DSV-48 RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-501

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION TANG Re-Run
PICK-UP NUMBER 1
PICK-UP RESPONSE TANGENTIAL
INPUT ACCELERATION PER PAGE 76
RMS VALUE 29.1

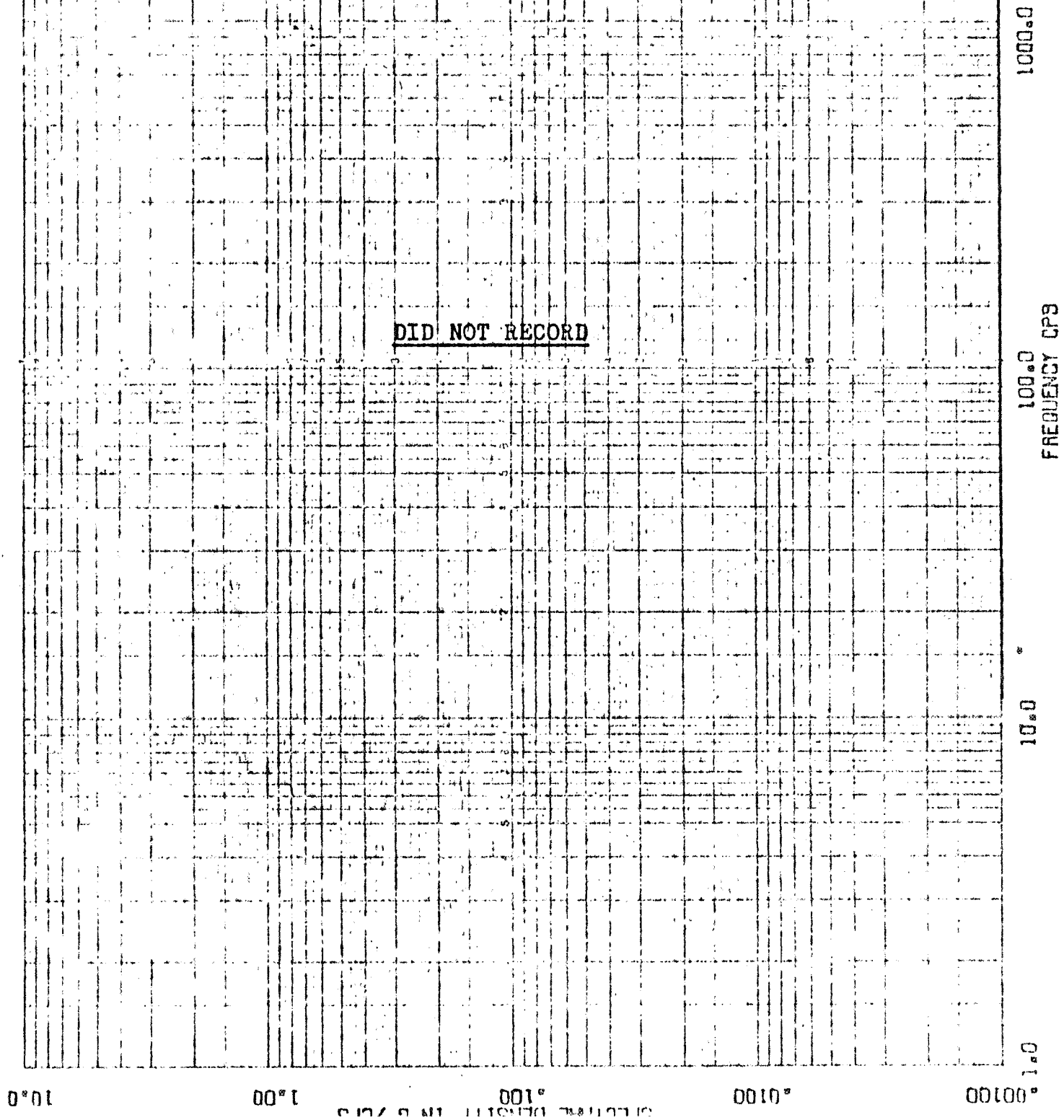


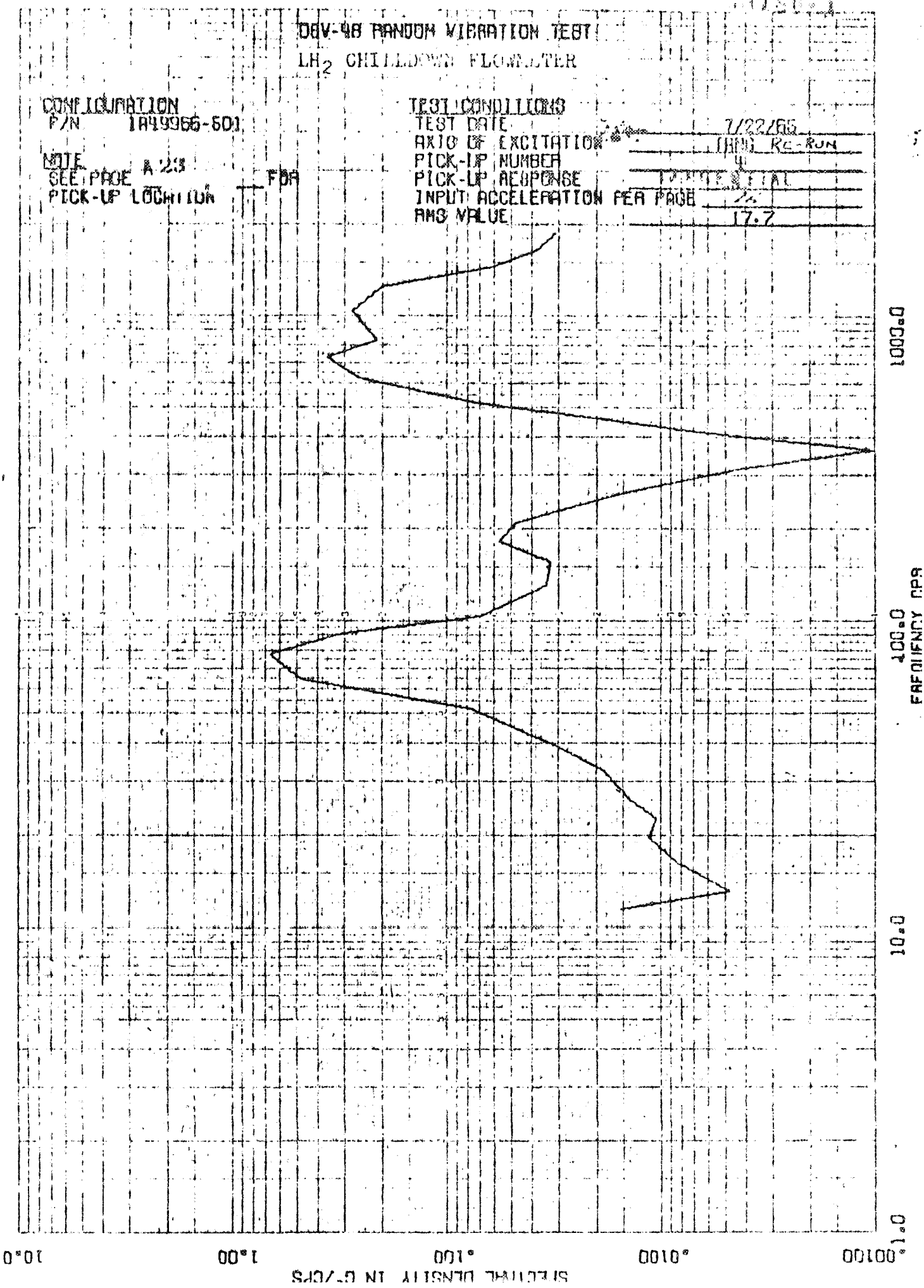
DSV-4B RANDOM VIBRATION TEST
LH_2 CHILLDOWN MONITOR

CONFIGURATION
P/N 1A49966-601

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION TANG Re-Run
PICK-UP NUMBER 2
PICK-UP RESPONSE TANGENTIAL
INPUT ACCELERATION PER PAGE 76
RMS VALUE 0.4



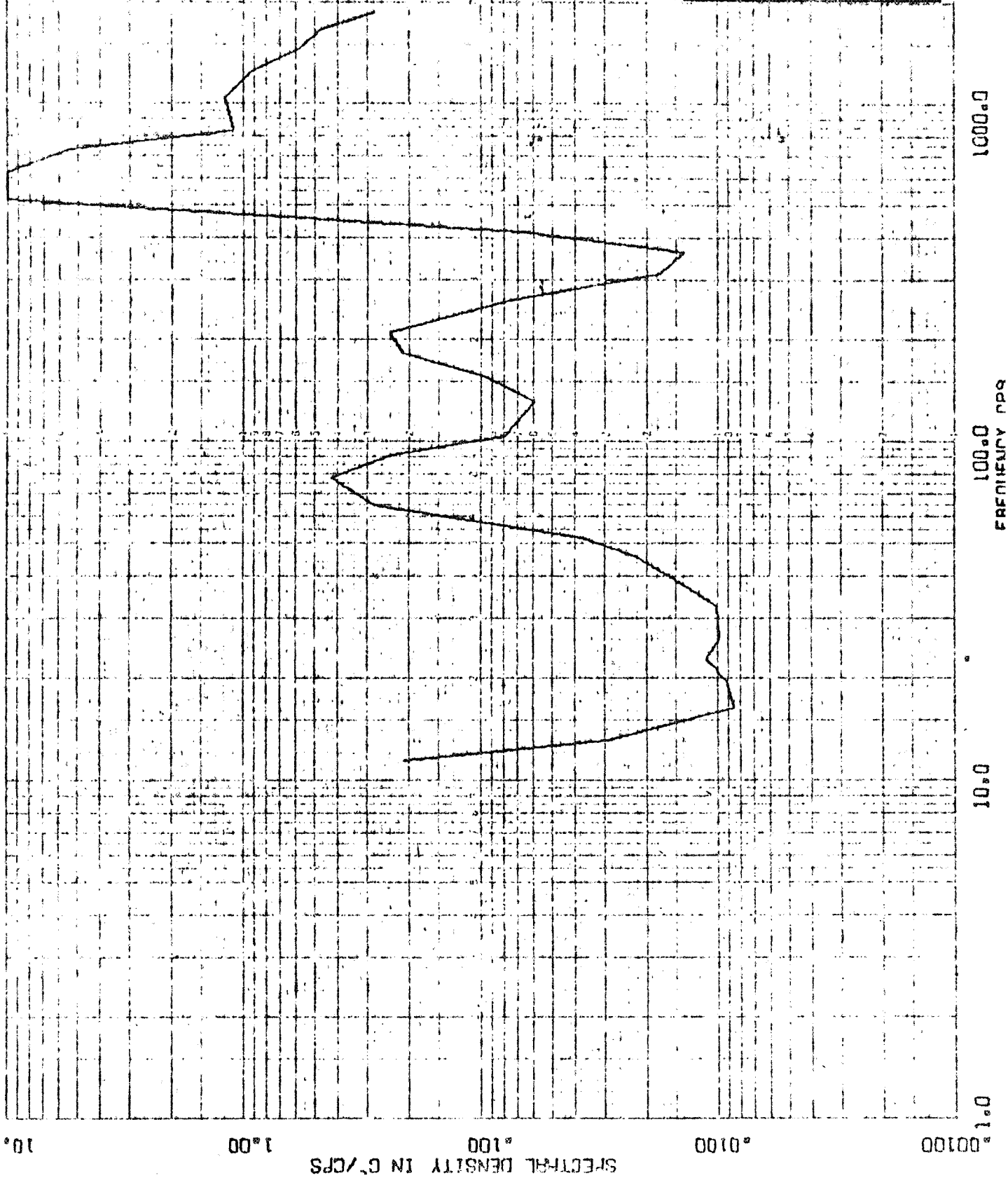

DSV-4B RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49966-501
NOTE
SEE PAGE A 23
PICK-UP LOCATION FOR
TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION TANG RE-RUN
PICK-UP NUMBER 4
PICK-UP RESPONSE TANGENTIAL
INPUT ACCELERATION PER PAGE 2
RMS VALUE 17.7
1000.0
100.0
10.0
1.0
FREQUENCY CPS
10.0
1.00
.100
.010
.00100
SPECTRAL DENSITY IN G²/CPS

D8V-4B RANDOM VIBRATION TEST
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-601

NOTE
SEE PAGE A 29 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION TAND RE-RUN
PICK-UP NUMBER 6
PICK-UP RESPONSE TRANSMITTER
INPUT ACCELERATION PER PAGE 24
RMS VALUE 78.3



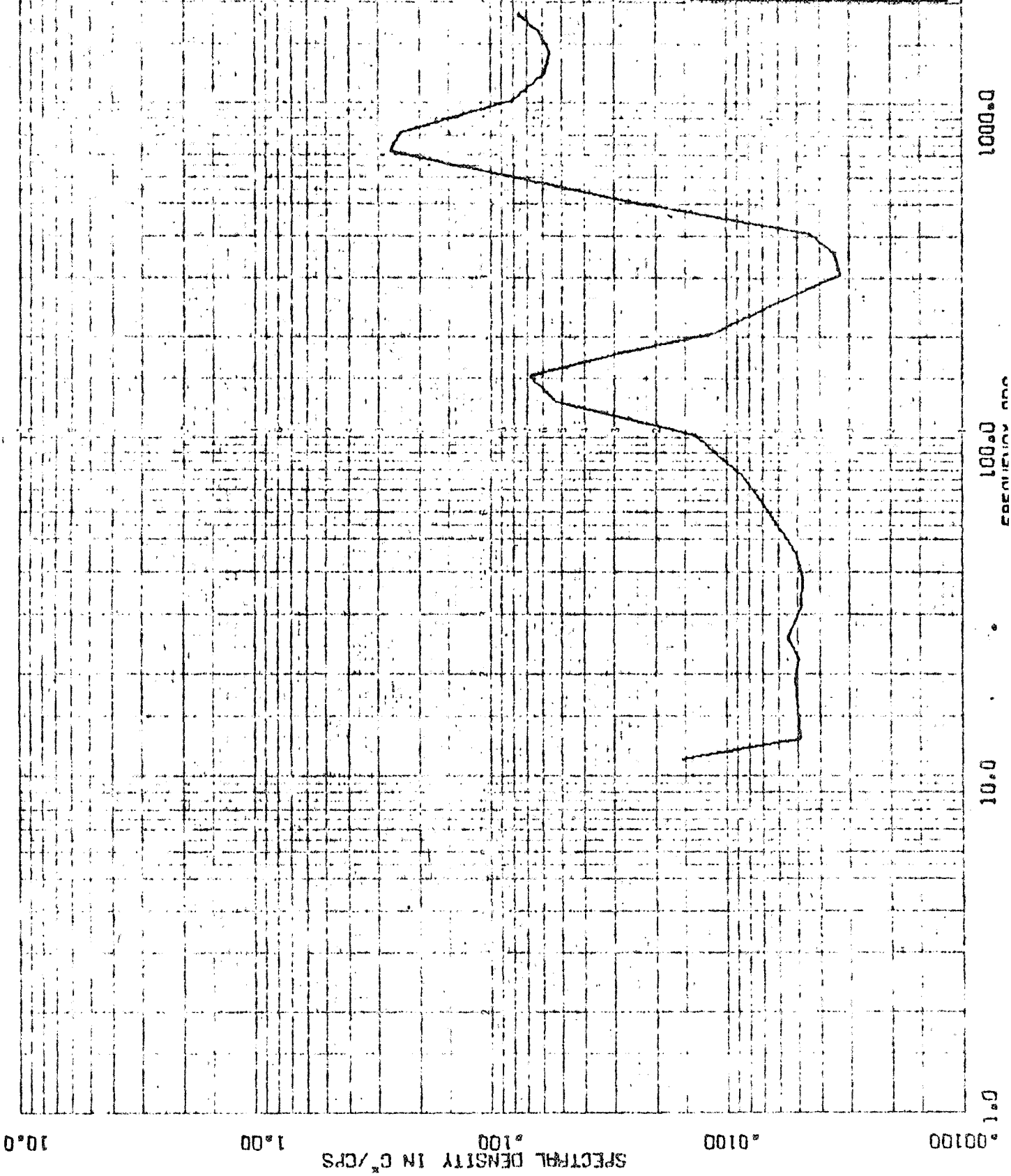
DSV-4B RANDOM VIBRATION TEST

LH2 CHILDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-501

NOTE
SEE PAGE A 2.1 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION THRU RE-RUN
PICK-UP NUMBER 6
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 2.0
RMS VALUE 15.1



DOUGLAS AIRCRAFT COMPANY, INC.

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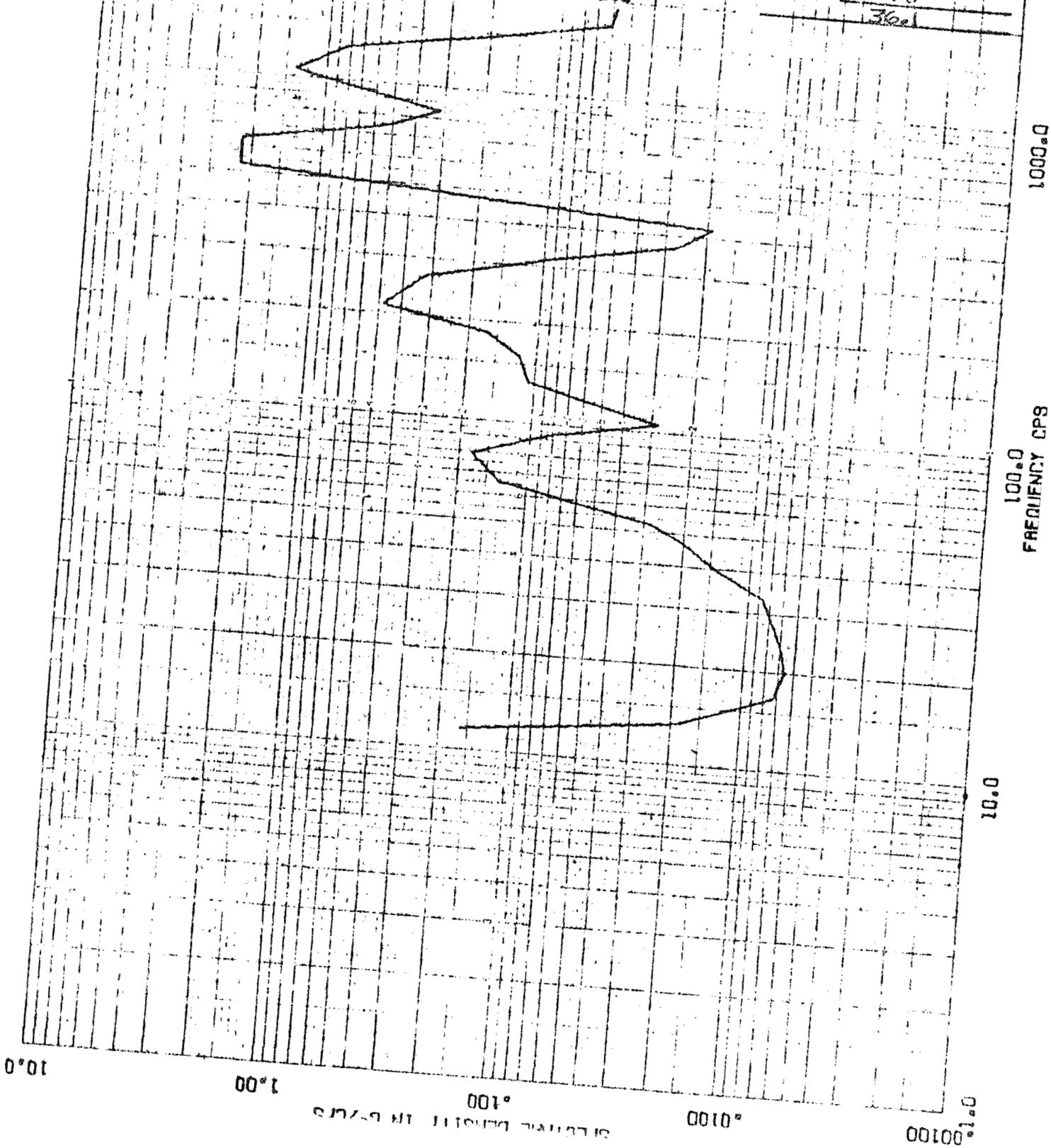
DSV-4B RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49965-501

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION LONG RE-RUN
PICK-UP NUMBER 1
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PAGE 76
RMS VALUE 36.1



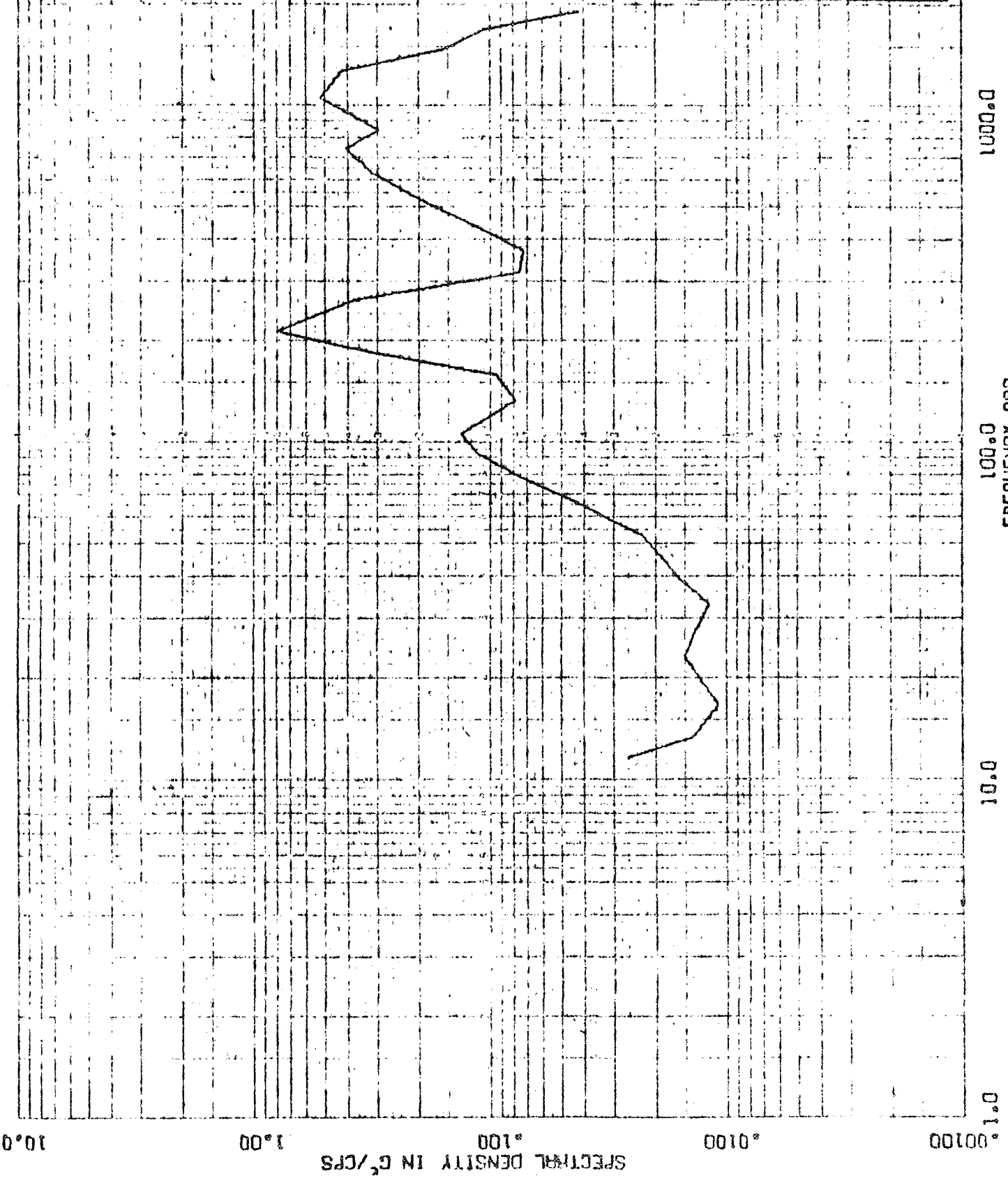
DSV-48 RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-601

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 2/22/66
AXIS OF EXCITATION THRU RE-RUN
PICK-UP NUMBER 8
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 26
RMS VALUE 23.4

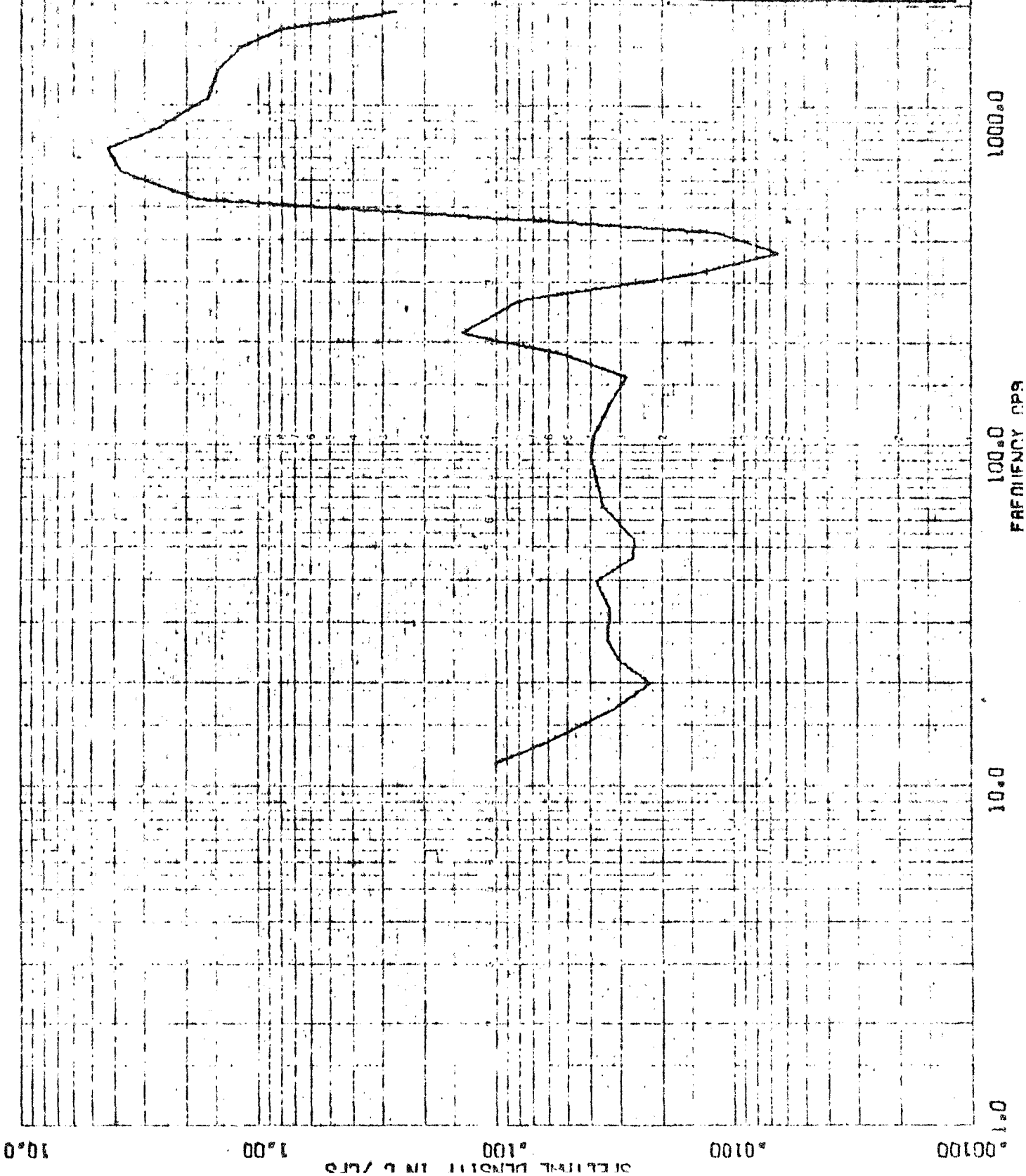


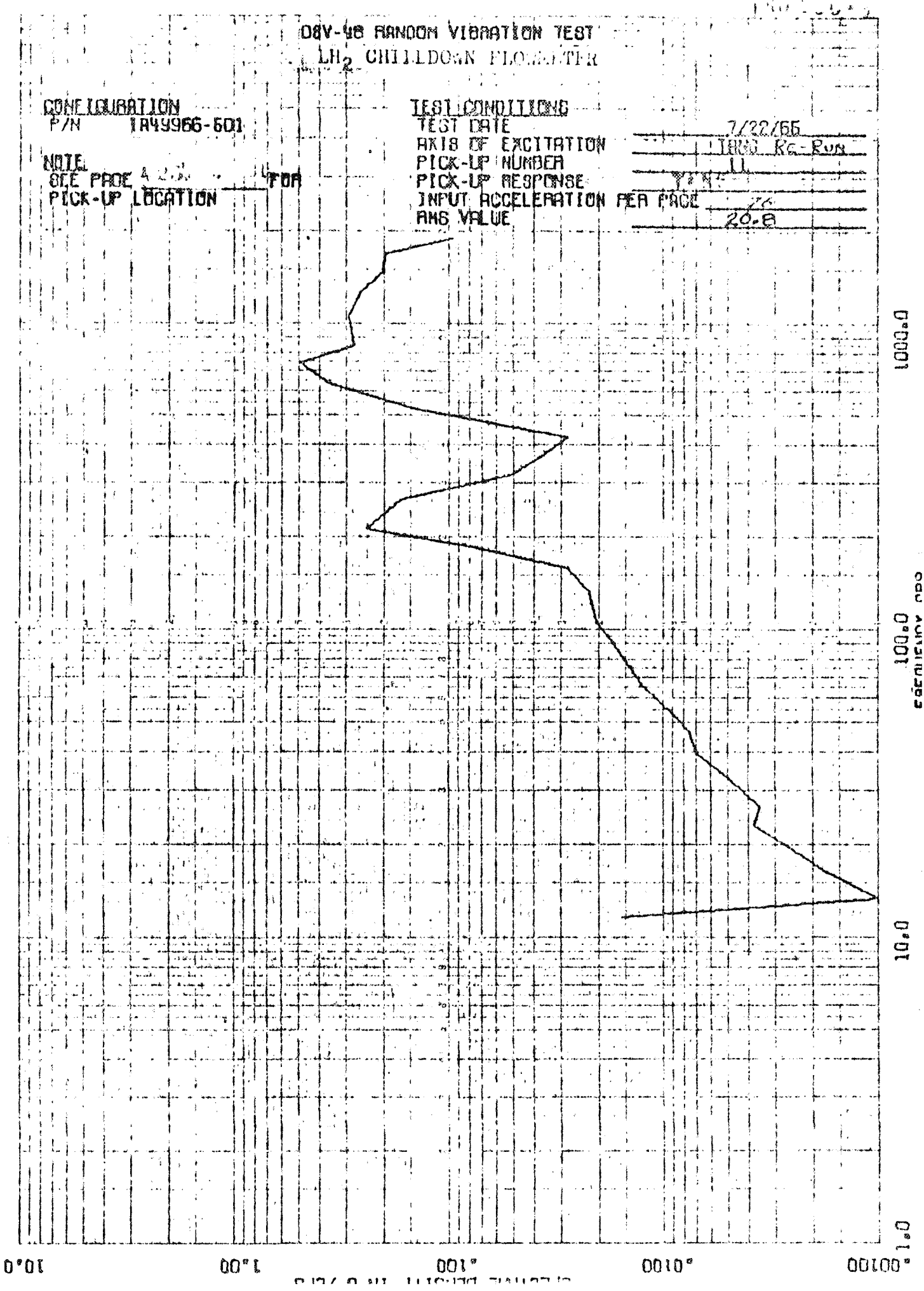
DSV-4B RANDOM VIBRATION TEST
LH_2 CHILDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-601

NOTE
SEE PAGE A 2.31 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION LONG RE-RUN
PICK-UP NUMBER 10
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PAGE 2.6
RMS VALUE 53.5



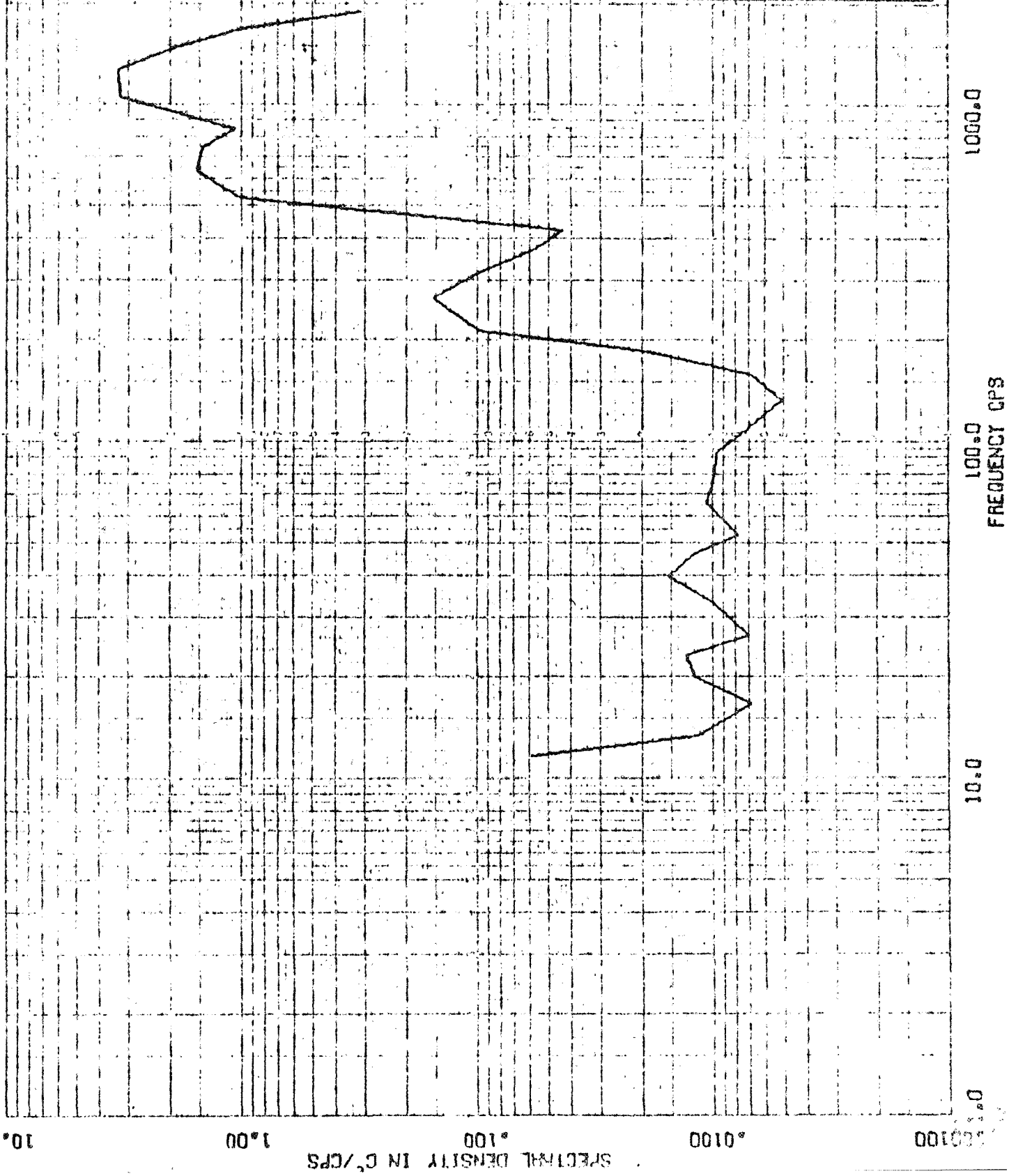

DSV-4B RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49966-501
NOTE
SEE PAGE A 2.2 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 7/22/65
AXIS OF EXCITATION TANG Re-Run
PICK-UP NUMBER 11
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 76
RMS VALUE 20.8
1000.0
100.0
10.0
1.0
10.0
1.00
.100
.0100
.00100

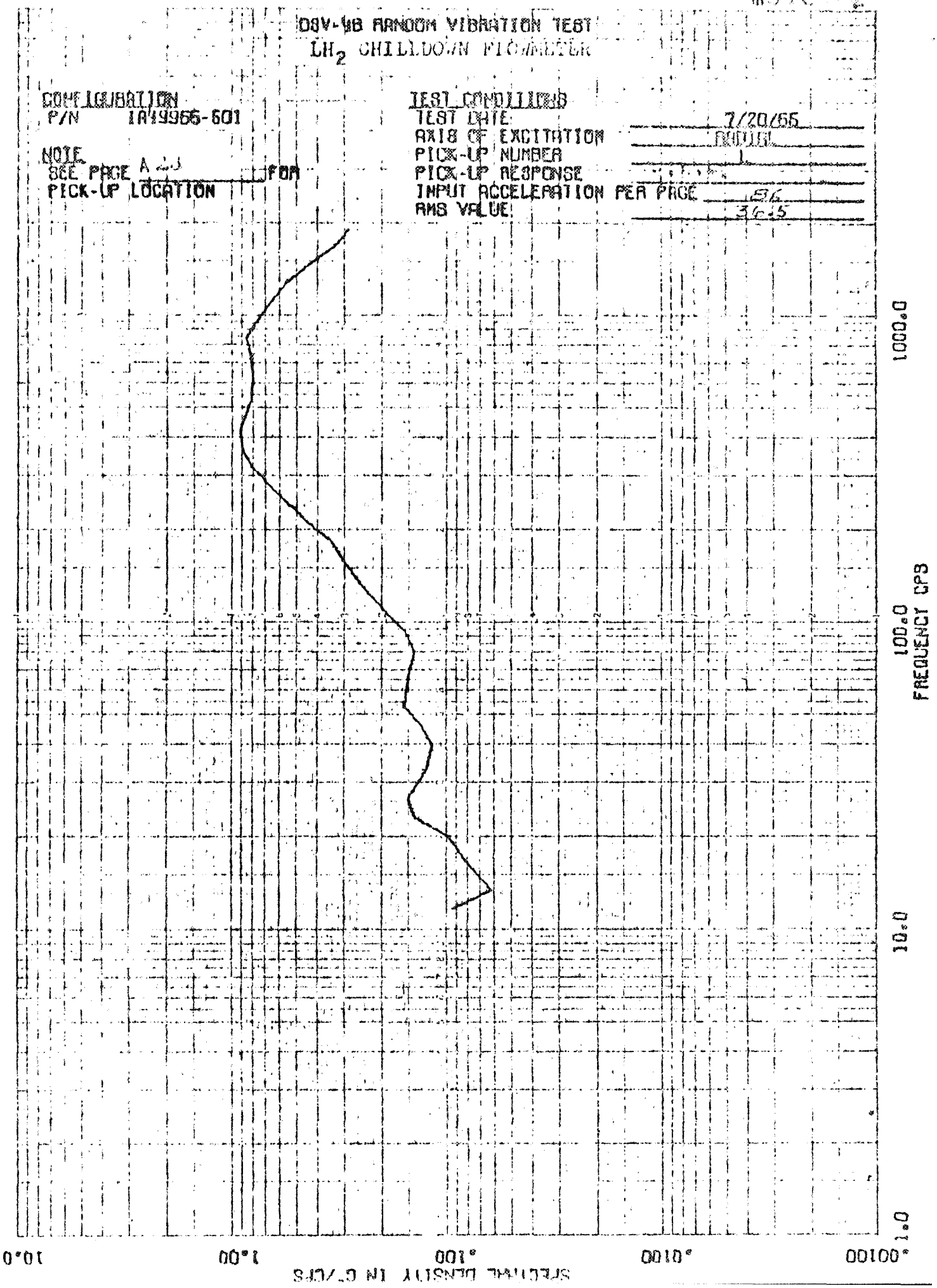
DSV-4B RANDOM VIBRATION TEST
LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-601

NOTE
SEE PAGE 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/22/66
AXIS OF EXCITATION TANG RE-RUN
PICK-UP NUMBER 12
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 20
RMS VALUE 54.8



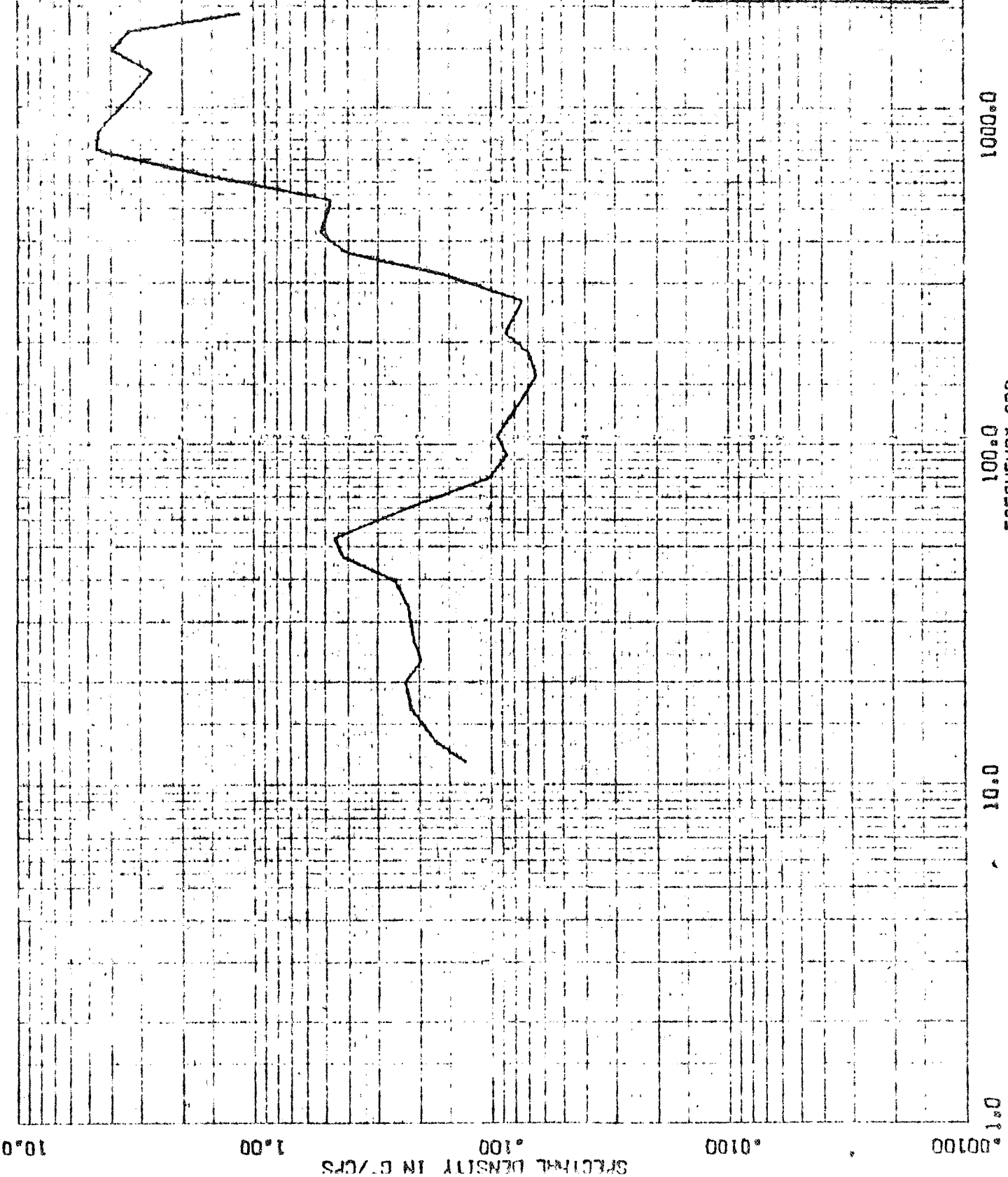

DSV-4B RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49966-601
NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 7/20/65
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER 1
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 86
RMS VALUE 36.5
1000.0
100.0
10.0
1.0
FREQUENCY CPS
10.0
1.00
.100
.0100
.00100
SPECTRAL DENSITY IN G²/CPS

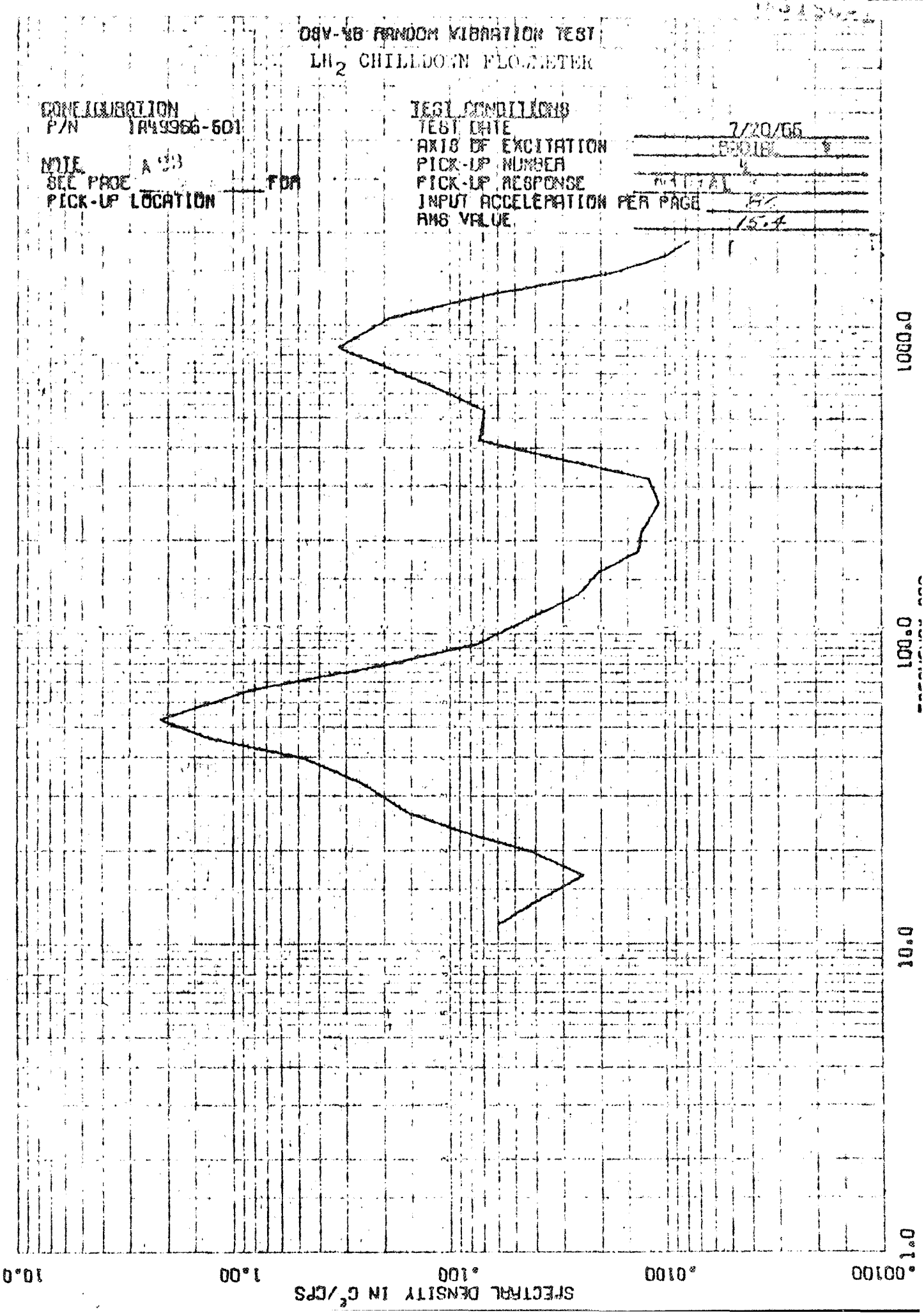
DSV-48 RANDOM VIBRATION TEST
LH_2 CHILLDOWN FLOWMETER

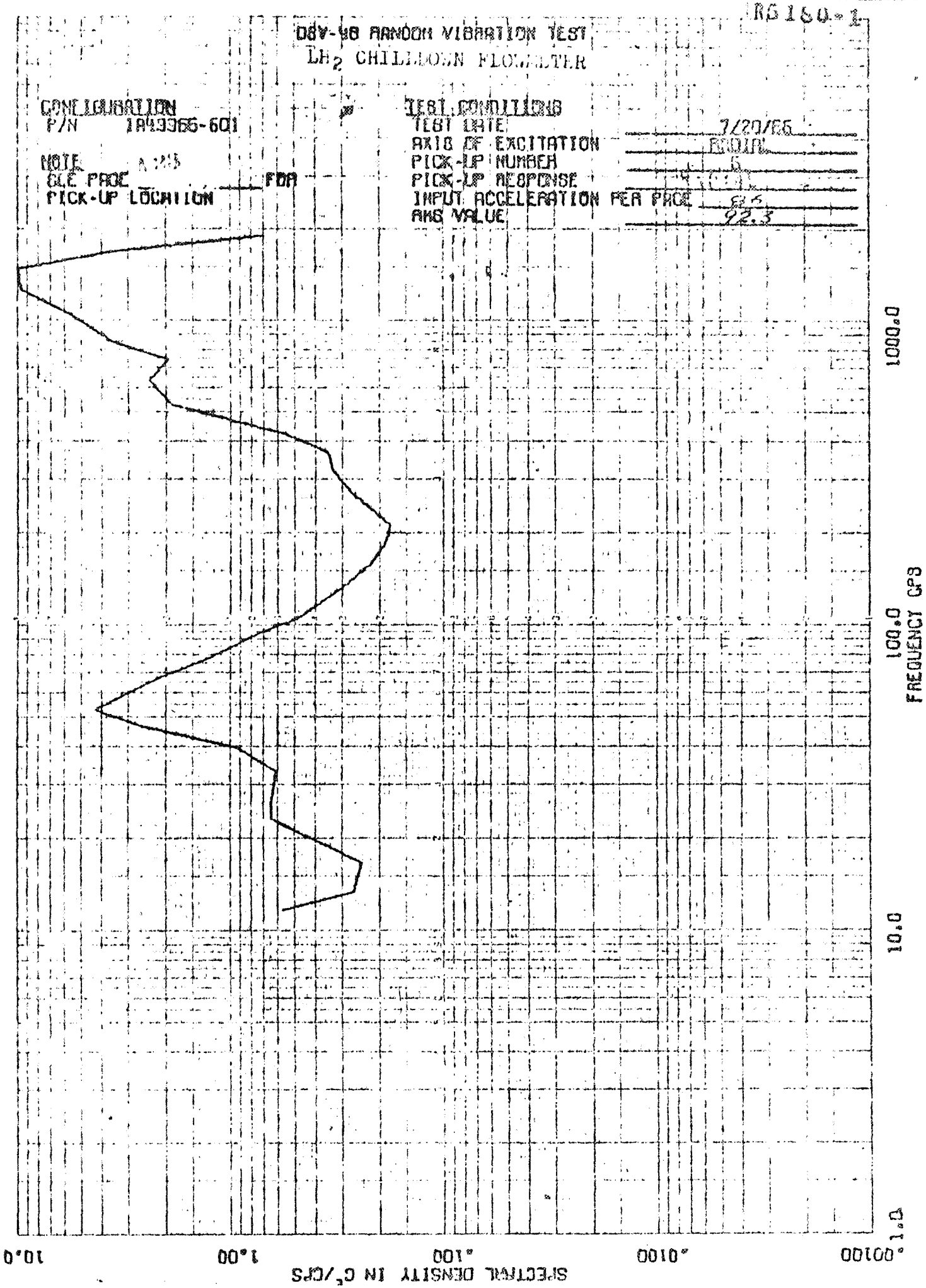
CONFIGURATION
P/N 1A49966-601

NOTE
SEE PAGE A-[illegible] FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/20/66
AXIS OF EXCITATION BROTHL
PICK-UP NUMBER 2
PICK-UP RESPONSE MAUTAL
INPUT ACCELERATION PER PAGE 86
RMS VALUE 70.8




OSV-4B RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49966-501
NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 7/20/66
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER
PICK-UP RESPONSE RADIAL
INPUT ACCELERATION PER PAGE
RMS VALUE 15.4
1000.0
100.0
10.0
1.0
10.0
1.00
.100
.0100
.00100
SPECTRAL DENSITY IN G²/CPS


DSV-4B RANDOM VIBRATION TEST
LH2 CHILLDOWN FLOWMETER
CONFIGURATION
P/N 1A49366-601
NOTE
SEE PAGE FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 7/20/66
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER 5
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 86
RMS VALUE 92.3
1000.0
100.0
10.0
1.0
FREQUENCY CPS
10.0
1.00
.100
.0100
.00100
SPECTRAL DENSITY IN G²/CPS

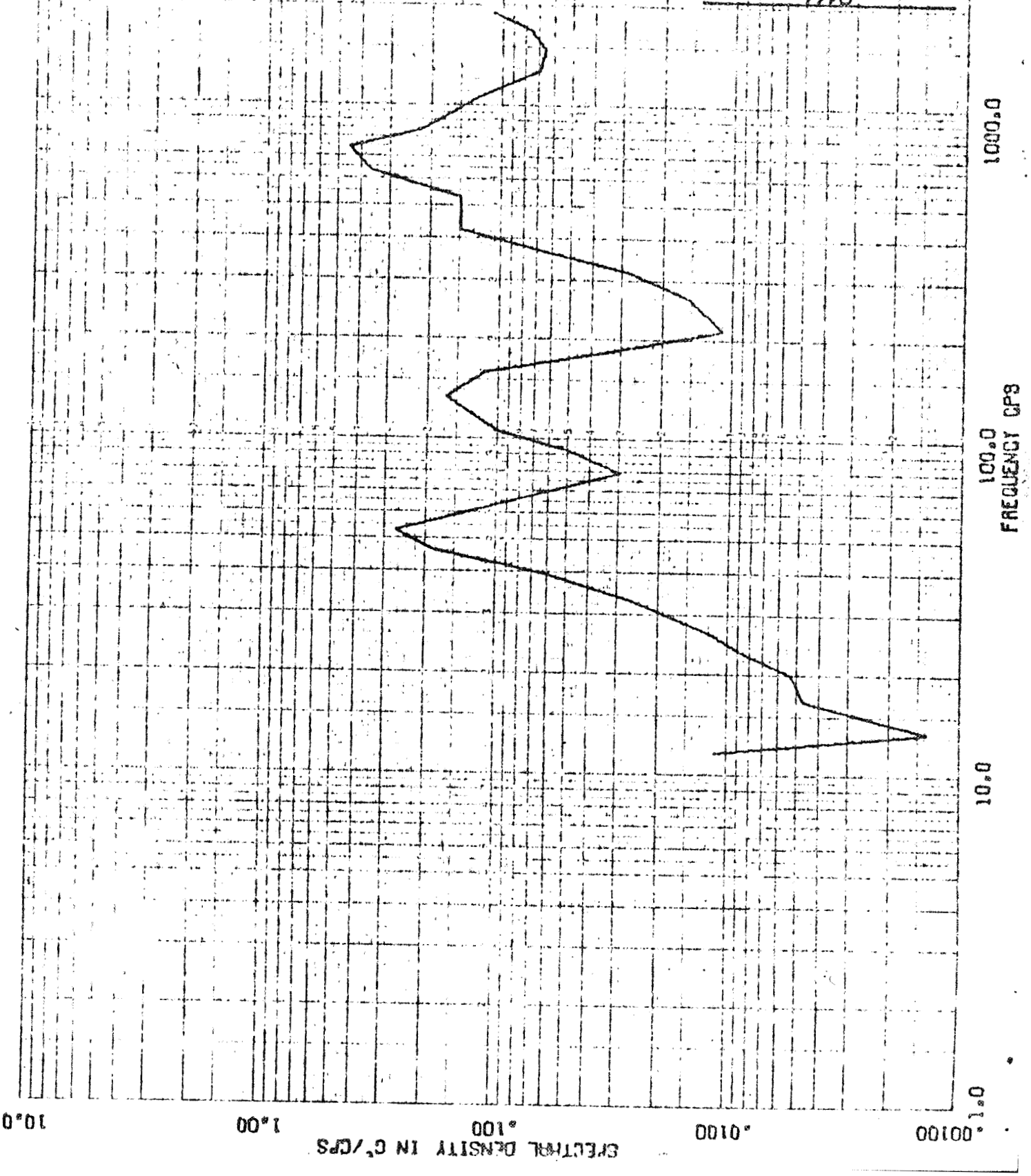
DAV-48 RANDOM VIBRATION TEST

LH_2 CHILDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-601

NOTE A 23
SEE PAGE
PICK-UP LOCATION FDA

TEST CONDITIONS
TEST DATE 7/20/65
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER 6
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 82
RMS VALUE 17.8



REPORT NO 85180-1

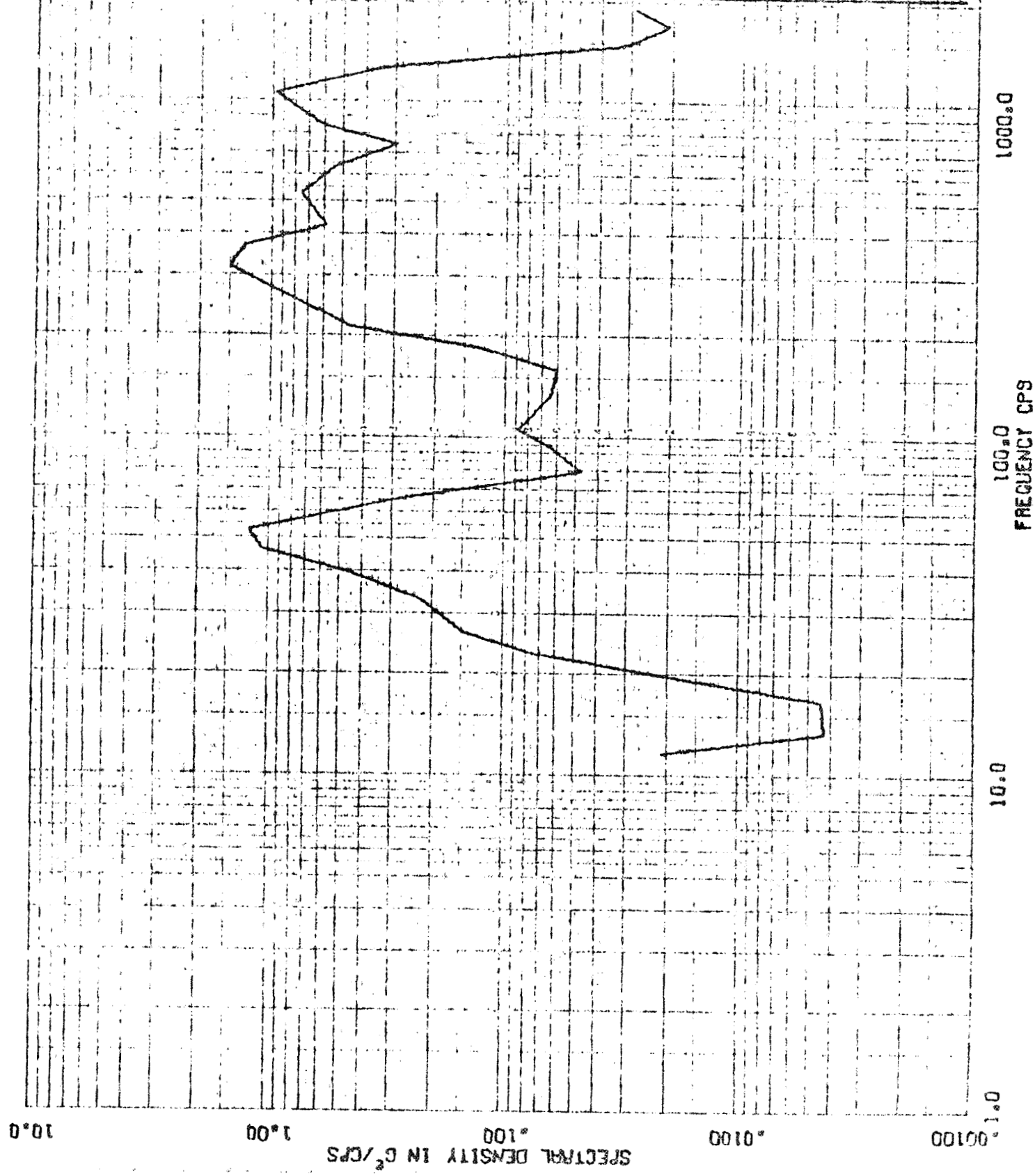
DSV-48 RANDOM VIBRATION TEST

LH_2 CHILDOWN FLOWMETER

CONFIGURATION
P/N 1A49965-601

NOTE
SEE PAGE A-25 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/20/66
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER 1
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 13A
RMS VALUE 30.6



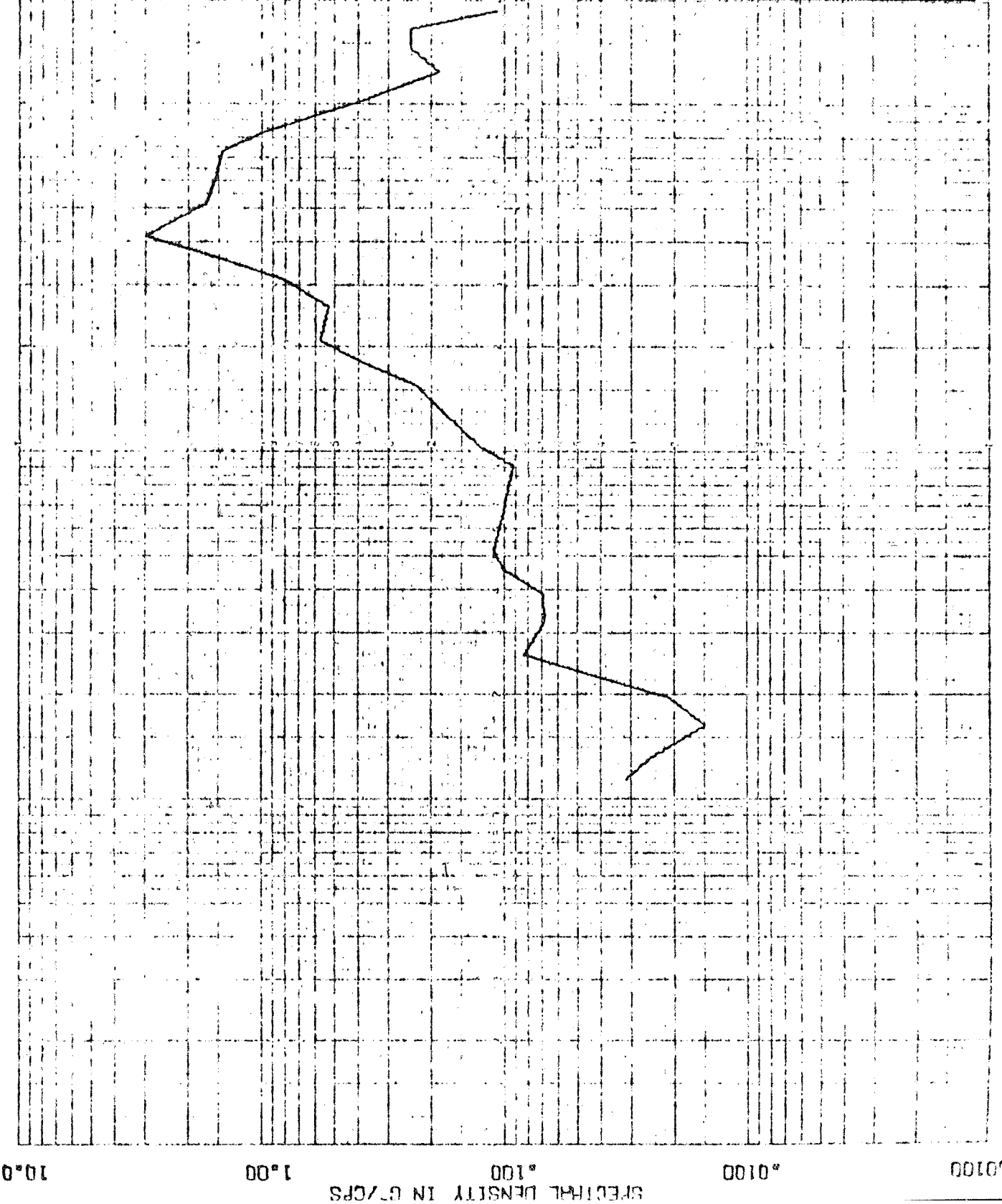
DSV-4B RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-501

NOTE
SEE PAGE 23 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/20/66
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER 3
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PAGE 86
RMS VALUE 22.2



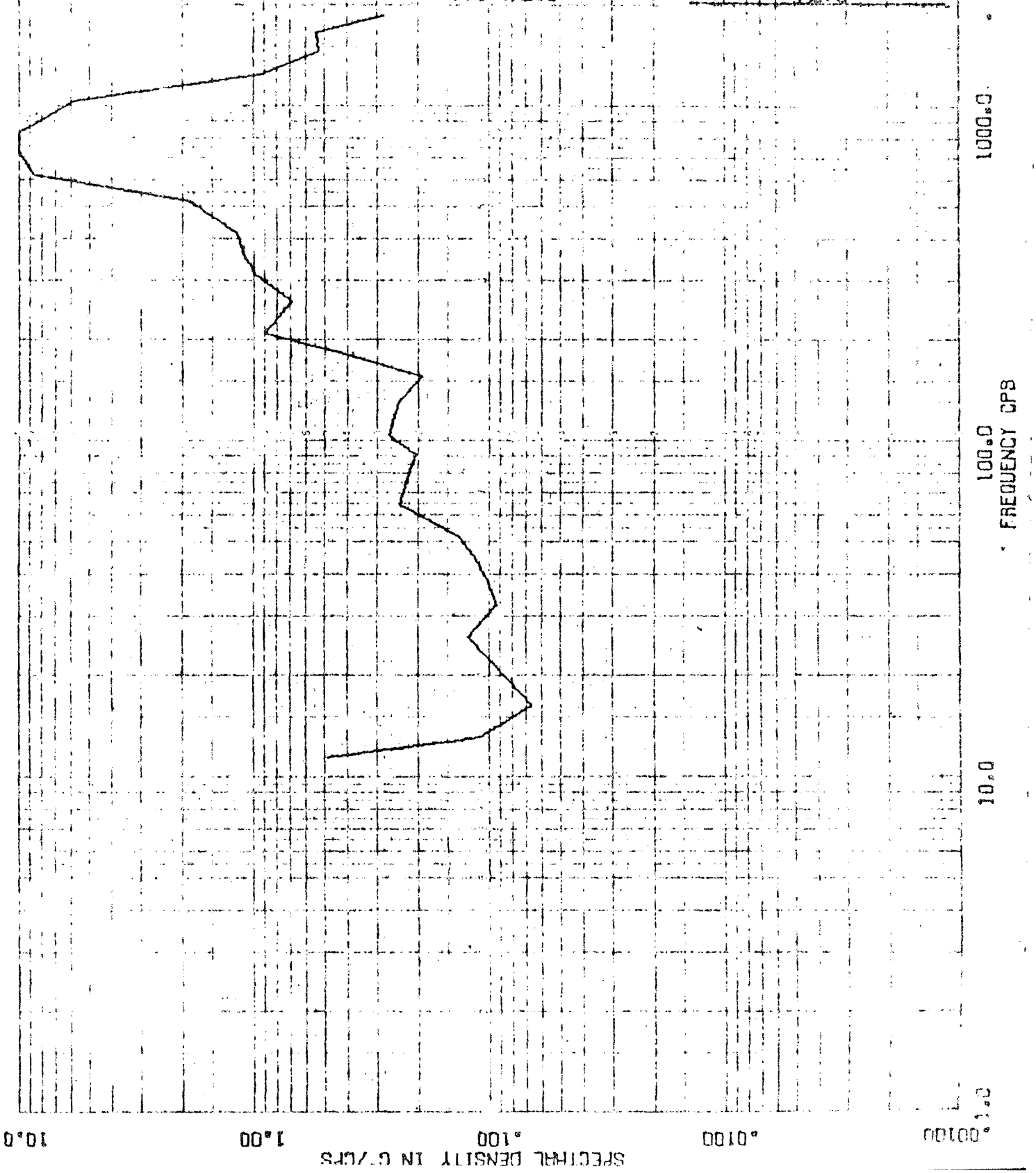
DSV-4B RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-501

NOTE
SEE PAGE A 23 FOR
PICK-UP LOCATION

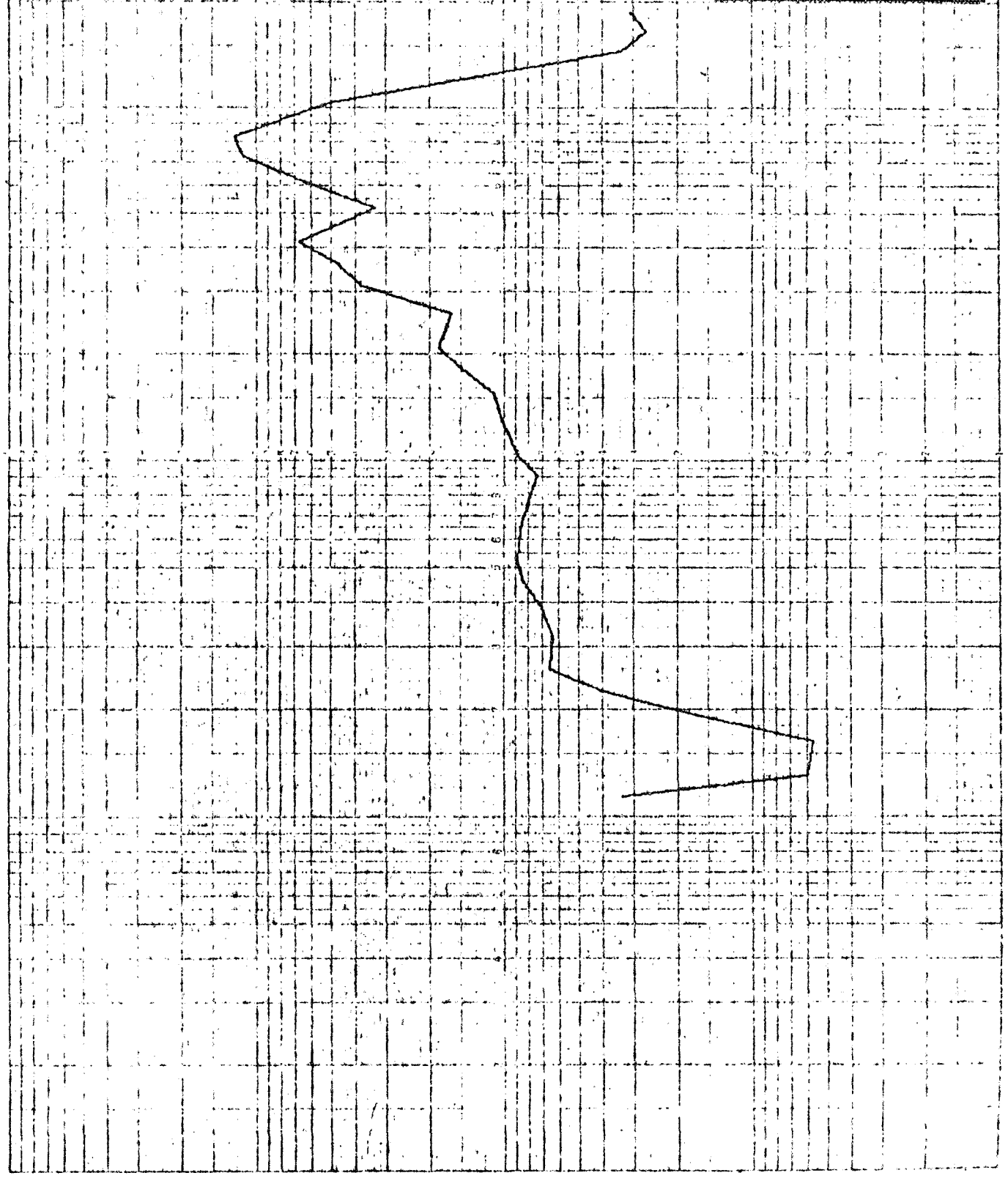
TEST CONDITIONS
TEST DATE 7/20/65
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER 10
PICK-UP RESPONSE [illegible]
INPUT ACCELERATION PER PAGE 85
RMS VALUE 92.6



DSV-4B RANDOM VIBRATION TEST

LH_2 CHILLDOWN FLOWMETER

CONFIGURATION
P/N 1A49966-601

NOTE
SEE PAGE A 28 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 7/20/65
AXIS OF EXCITATION RADIAL
PICK-UP NUMBER 11
PICK-UP RESPONSE
INPUT ACCELERATION PER PAGE 86
RMS VALUE 22.4