159

DOUGLAS

MISSILE & SPACE SYSTEMS DIVISION
DOUGLAS AIRCRAFT CO., INC.

ENGINEERING LABORATORIES & SERVICES
TECHNICAL MEMORANDUM

TO: H. T. Sorensen, A-290

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

SUBJECT: VENT PORT CHECK VALVE VIBRATION TESTS

COPIES TO: D. D. Hofferth, H. B. Mitchell, W. Keller, G. Cameron, B. R. Wyatt, Jr., C. Hansen, D. Dearing, A3-860; T. J. Sereno, A-270; I. M. Williamson, A-270; C.W. Wilson, A3-860(14)

CATALOG NO. PDL 83687

REPORT NO. TM-DSV48-ENV-

DATE 8/3/67

REQUESTED BY D. D. Hofferth

E.W.O. 29273 TCD 1T10590

TEST PLAN & ITEM NO. J-20 41412

SALES ORDER 5769-6404

CLASSIFICATION OR RESTRICTION: Unclassified

PREPARED BY: Nicholas Der
N. Der

APPROVED BY: T. J. Sereno

Prime Lab. Test Conductor

APPROVAL SIGNATURES CERTIFY THAT ALL REQUIREMENTS OF REPORT HAVE BEEN MET INCLUDING THE REPORTING OF NEW TECHNOLOGY/REPORTABLE ITEMS PER SPB'S 92 AND 93 DISCLOSURES ARE MADE ON FORMS 25-207 AND 25-207-1

NEW TECHNOLOGY: IS CONTAINED IN THIS REPORT, ☒ IS NOT CONTAINED IN THIS REPORT

ABSTRACT

SEP 1970
RECEIVED
NASA STI FACILITY
INPUT BRANCH

INTRODUCTION

Vibration tests were performed for qualification testing of two Vent Port Check Valves. The tests were conducted at the vibration facility of the Douglas Dynamics Laboratory, Santa Monica, California, on June 16 and 17, 1967.

PURPOSE

The purpose of the tests was to determine if the vibration environment would cause degradation in the sealing capability of the valves.

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

FACILITY FORM 602

N70-75910
(ACCESSION NUMBER)

(THRU)

41
(PAGES)

None
(CODE)

CR-113304
(NASA CR OR TMX OR AD NUMBER)

(CATEGORY)

EQUIPMENT

Test Specimen

The test specimen consisted of the following:

> Two Vent Port Check Valves, P/N 1B67481-1 A, specimen numbers 10 and 11, Test Plan Item J-20, manufactured by the Circle Seal Company, Anaheim, California.

These components and their associated plumbing and hardware were installed in the vent ports of an Actuation Control Module, Test Plan Item J-3, which is used in the pneumatic power system of the DSV-4B stage. The vibration fixture was a rigid magnesium block, measuring 9 x 9 x 5 inches, secured to the shaker head through an adapter plate. The block, property of the Wyle Laboratories, El Segundo, California, bore the identification W-91640 and weighed 26 pounds.

Test Equipment

ITEM	MANUFACTURER	MODEL	TAG/SERIAL NO.
Oscillograph	CEC	5-124	651909
Galvanometers	CEC	7-326 (4)	*
Accelerometers	Endevco	2226 (3)	*
		2235C	HB 63
Amplifiers	Unholtz-Dickie	8PC	EI-27377
		8PMCVA	EI-11826
Amplifiers	Endevco	2711	HA 28
		2713A (2)	*
Tape Recorders	Ampex	CP-100	611828
		PR-10	0942069
Vibration System	Ling	335	36
PSD Equalizer	Ling	ASDE-80	61
Oscillator	Technical Prod.	TP626	611595-2
Analyzer	Technical Prod.	TP627	611595-3
Power Integrator	Technical Prod.	TP633	611595-1
X-Y Recorder	Moseley	2	963

* Channel assignments and instrumentation information are presented on pages A1 through A3.

Accuracy and repeatability were verified by standard calibration procedures during the periodic calibration and certification of the test equipment.

PROCEDURE

The test assembly was attached to the top of the magnesium block for excitation in the A axis, and to the side of the block for excitation in the B and C axes. Four accelerometers were mounted. The control accelerometer (number 1) was oriented in the direction of the vibration and was used simultaneously for shaker control and data recording. The directions of the axes and locations of the accelerometers are shown on pages B1 through B5.

Tests, consisting of sinusoidal sweeps followed by random excitation exposures, were conducted in each of the three mutually perpendicular axes. The test sequence was completed in each axis before changing to the next axis.

Sinusoidal vibration was applied from 5 to 2000 to 5 cps with the frequency changing at the rate of one octave per minute. Input levels were as follows:

FREQUENCY (cps)	LEVEL
5 - 160	0.06 inch D.A. Disp.
160 - 380	80.0g (0 - peak)
380 - 400	0.012 inch D.A. Disp.
400 - 1200	100.0g (0 - peak)
1200 - 2000	70.0g (0 - peak)

Accelerometer response signals during the sinusoidal testing were recorded on oscillograph charts.

Random vibration tests were performed in each axis in the following steps:

1. The spectral density equalizer was set to 1/4 power and the desired spectrum was checked visually by examination of the equalizer meters.

2. When the setting followed the spectrum closely, a brief full-power run was made, during which time the signal response of the control accelerometer was recorded on a magnetic tape loop and subsequently analyzed and plotted by a continuous sweep analysis system. The following filter bandwidths were used:

FREQUENCY RANGE (cps)	BANDWIDTH (cps)
20 - 50	5
50 - 100	20
100 - 2000	50

3. When the plot showed a satisfactory spectrum, the regular full-power run was completed. Accelerometer response signals were recorded on 1-inch magnetic tape.

PROCEDURE (continued)

The duration of the random vibration tests was 12 minutes in each axis. Input levels were as follows:

FREQUENCY (cps)	LEVEL
20 - 55	0.2 g^2/cps
55 - 150	+9.0 db/octave
150 - 200	3.5 g^2/cps
200 - 350	-3.0 db/octave
350 - 1000	2.0 g^2/cps
1000 - 2000	-6.0 db/octave

The random vibration magnetic tape data were reduced by the Cascade method with the use of the following filter bandwidths:

FREQUENCY RANGE (cps)	BANDWIDTH (cps)
8 - 16	1.1
16 - 32	3
32 - 65	6.5
65 - 130	13
130 - 260	26
260 - 520	52
520 - 1000	104
1000 - 2000	208

Functional requirements were monitored by Prime Laboratory (ADDO) personnel during the vibration testing.

RESULTS AND DISCUSSION

Sinusoidal data are presented as plots of Acceleration versus Frequency on the following pages:

AXIS	PAGE NUMBER
A	A4 through A7
B	A8 through A11
C	A12 through A15

RESULTS AND DISCUSSION (continued)

Equalization plots of the random vibration inputs, as approved by the Task Force representative, are presented on pages A16 through A18.

Random vibration data are presented as plots of Power Spectral Density versus Frequency on the following pages:

AXIS	PAGE NUMBER
A	A19 through A22
B	A23 through A26
C	A27 through A30

Post-test examination revealed no apparent damage to the test specimens resulting from the vibration exposures.

ATTACHMENTS

Pages A1 through A30

Pages B1 through A5

FORM NO. 29-508 (2-65)

DOUGLAS

INSTRUMENTATION CHANNEL ASSIG

TEST TITLE VENT PORT CHECK VALVE

S.O. 5769-6404 EWO 29273 TCD 1T 10590

P.N. SPECIMEN 18 67481-1 SPEC. # 10 , # 11

ENGINEER David/Dar EXT 3522

TECHNS. Jarnigan/Nakashima

STANDARD ACCEL. TYPE _____ S.N. _____ CAL. DUE _____

TAPE REC. W

RECORD SPE

OSCILLOGRAPH

PAPER SPEED

TIMING LINES

LOC. NO.	TAPE REC. CHAN	OSC CHAN	XDCR CABLE NO.	MEASUREMENT LOCATION	RESP. AXIS	XDCR MODEL
1	1	1		Control - Input to J-3	A	2235C
2	2	2		On J-3 Module - Input to J-20	A	2226
3	3	3		On J-3 Module - Input to J-20	B	2226
4	4	4		On J-3 Module - Input to J-20	C	2226
5						
6						
7						
8						
9						
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
0						

NOTES & SKETCHES

Foldout ①

NT DYNAMIC TEST

REPORT NO. R 6033-1
PAGE A1

MP-100 S/N 611828 FACILITY 335#1 UNIT 143
15 IN/SEC 27 Kc TAPE REEL NO
TYPE 5-124 S/N 651909
1.25 IN/SEC
SEC PAPER

SHEET OF
DATE June 17, 1967
LINE ITEM J-20
RUN NO. Sine & Random
AXIS A

SERIAL NO.	XDCR AMP MODEL	SERIAL NO.	OSC GALVO MODEL	SERIAL NO.	TAPE REC AMP MODEL	CALIB. Random	CALIB Sine UP	CALIB Sine DOWN	Sens. pc/g pk	
HB 63	8 TMLVA	EI-11216	7-326	18760		60 grms	100 gpk	100 gpk	25.1	1
NC 63	2713A	KB 25	7-326	13362		300 gpk	100 gpk	300/100 gpk	2.94	2
NC 59	2711	HA 28	7.326	18965	*	100 gpk	100 gpk	30 gpk	2.89	3
PB 83	2713A	KB 30	7-326	13379	**	100 gpk	100 gpk	30 gpk	2.50	4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20

* 5 MIN. AFTER THE BEGINNING WAS CHANGED TO 300 gpk

** 5 MIN. AFTER THE BEGINNING WAS CHANGED TO 300 gpk

Foldout 2

FORM NO. 28-588 (2-65)

DOUGLAS

INSTRUMENTATION CHANNEL ASSIG

TEST TITLE VENT PORT CHECK VALVE

S.O. 5769-6404 SWO 29273 TCD 1T 10590

P/N SPECIMEN 1B 67481-1 SPEC. # 10 , # 11

ENGINEER David/Der EXT 3522

TECHNS. Jorgensen/Nakashima

STANDARD ACCEL. TYPE _____ S/N _____ CAL DUE _____

TAPE REC. NO

RECORD SPE

OSCILLOGRAPH

PAPER SPEED

TIMING LINES

LOC. NO.	TAPE REC. CHAN	OSC CHAN	XDCR CABLE NO.	MEASUREMENT LOCATION	RESP. AXIS	XDCR MODEL
1	1	1		Control - Input to J-3	B	2235C
2	2	2		On J-3 Module - Input to J-20	A	2226
3	3	3		On J-3 Module - Input to J-20	B	2226
4	4	4		On J-3 Module - Input to J-20	C	2226
5						
6						
7						
8						
9						
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
0						

NOTES & SKETCHES

Foldout #1

ENT DYNAMIC TEST

CP-100 S N 611828 FACILITY 335#1 UNIT 143

15 IN SEC 27 Kc TAPE REEL NO.

TYPE 5-124 S N 651909

0.25 IN SEC

SEC PAPER

REPORT NO R 6033 -1

PAGE A2

SHEET OF

DATE June 16, 1967

LINE ITEM J-20

RUN NO. Sine & Random

AXIS B

SERIAL NO.	XDCR AMP MODEL	SERIAL NO.	OSC GALVO MODEL	SERIAL NO.	TAPE REC AMP MODEL	CALIB. Random	CALIB Sine UP	CALIB Sine DOWN	Sens. pc/g_{pk}	LOC NO.
HB 63	8 PC *	EI-27377	7-326	18760		60 g_{rms}	100 g_{pk}	100 g_{pk}	25.1	
MC 63	2713A	KB 25	7-326	13362		1000 g_{pk}	100 g_{pk}	300/30 g_{pk}	2.94	
MC 59	2711	HA 28	7-326	18965		1000 g_{pk}	300 g_{pk}	300/30 g_{pk}	2.89	
PB 83	2713A	KB 30	7-326	13379		300 g_{pk}	100 g_{pk}	100/30 g_{pk}	2.50	
						↑	↑			
						6-17-67	6-16-67			

* AMPLIFIER CHANGED TO 8PMCVA # EI-11826 FOR RANDOM RUN

Foldout #2

FORM NO. 28-598 (2-55)

DOUGLAS

INSTRUMENTATION CHANNEL ASSIG

TEST TITLE VENT PORT CHECK VALVE

S.O. 5769-6404 EWO 29273 TCD 1T 10590

P.N. SPECIMEN 18 67481-1 SPEC. # 10, # 11

ENGINEER David/Dey EXT. 3522

TECHNS. Jernigan/Nakashima

STANDARD ACCEL. TYPE _____ S.N. _____ CAL. DUE _____

TAPE REC. M

RECORD SP

OSCILLOGRAP

PAPER SPEED

TIMING LINES

LOC. NO.	TAPE REC. CHAN	OSC CHAN	XDCR CABLE NO.	MEASUREMENT LOCATION	RESP. AXIS	XDCR MODEL
1	1	1		Control - Input to J-3	C	2235C
2	2	2		On J-3 Module - Input to J-20	A	2226
3	3	3		On J-3 Module - Input to J-20	B	2226
4	4	4		On J-3 Module - Input to J-20	C	2226
5						
6						
7						
8						
9						
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
0						

NOTES & SKETCHES

Foldout #1

T DYNAMIC TEST

REPORT NO	R 6033 - 1
PAGE	A 3
SHEET	OF
DATE	June 17, 1967
LINE ITEM	J-20
RUN NO.	Sine & Random
AXIS	C

CB-100 S/N 611828 FACILITY 33581 UNIT 143

15 IN/SEC 27 Kc TAPE REEL NO

YPE 5-124 S/N 651909

25 IN/SEC

SEC PAPER

SERIAL NO.	XDCR AMP MODEL	SERIAL NO.	OSC GALVO MODEL	SERIAL NO.	TAPE REC AMP MODEL	CALIB. Random	CALIB Sine UP	CALIB Sine DOWN	Sens. pe/g pk	
HB 63	8 PMCVA	KI-11826	7-326	18760		60 g rms	100 g pk	100 g pk	25.1	1
MD 63	2713A	KB 25	7-326	13362		1000 g pk	100 g pk	300/30 g pk	2.94	2
MC 59	2711	HA 28	7.326	18965		100 g pk	30 g pk	100/30 g pk	2.89	3
PB 83	2713A	KB 30	7-326	13379		1000 g pk	300 g pk	300/100 g pk	2.50	4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20
										21
										22
										23
										24
										25

foldout #2

DOUGLAS AIRCRAFT COMPANY , INC.

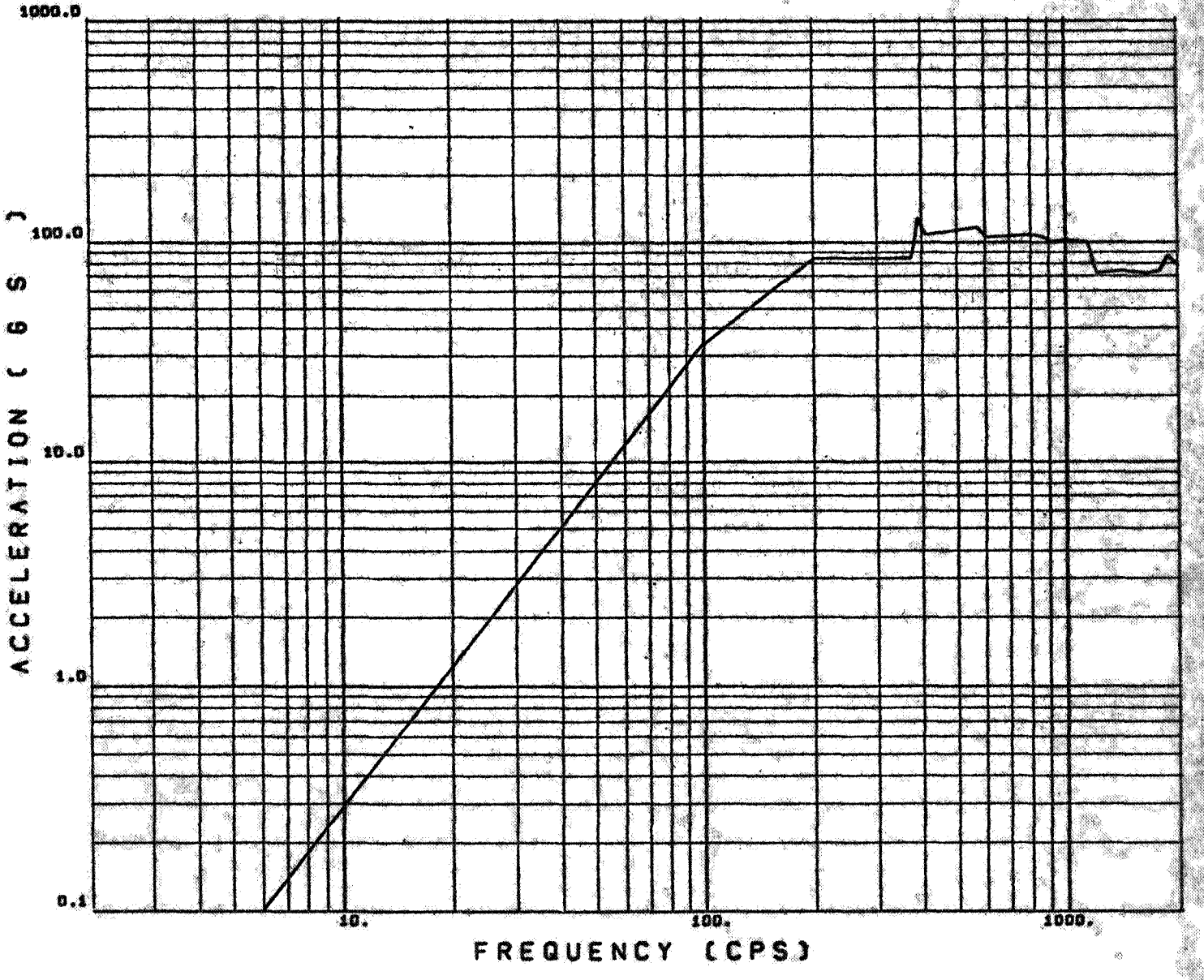
PAGE NO.
REPORT NO. 6033-1

SINUSOIDAL FREQUENCY SWEEP

SIV-B VENT PORT CHECK VALVE (J-20)

CONFIGURATION ---
NOTE... SEE PAGE B1
FOR PICK UP LOCATION
COMMENT--- REFERENCE CHANNEL
LEGEND...
UPSWEEP ———
DOWNSWEEP - - - - -

TEST CONDITIONS....
TEST DATE..... 6/17/67
AXIS OF EXCITATION.... A
PICK UP NUMBER (1)... 1 HB63
PICK UP RESPONSE..... A
INPUT ACCEL.PER PAGE.. ———



DOUGLAS AIRCRAFT COMPANY , INC.

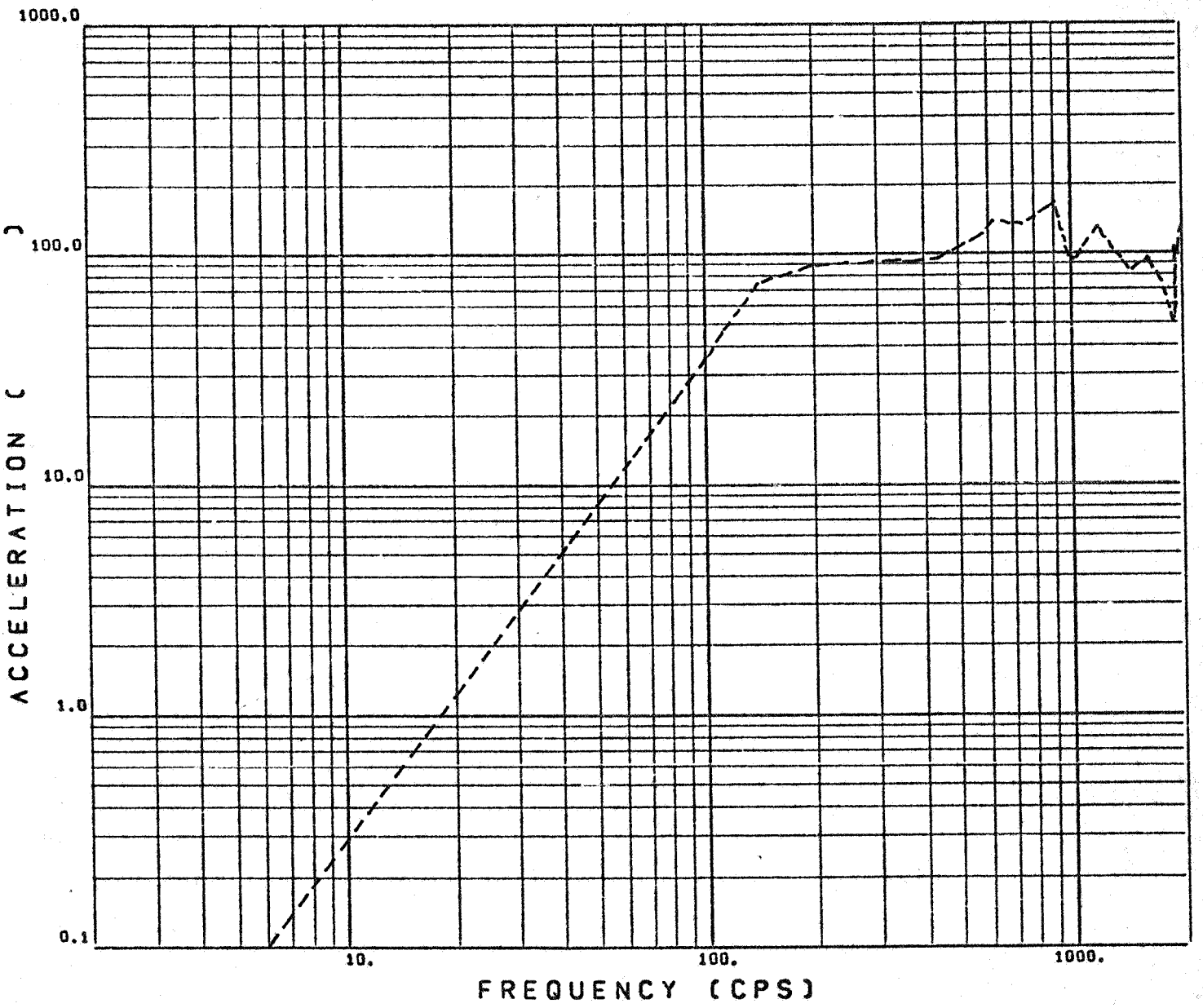
PAGE NO. A5
REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP
SIV-B VENT PORT CHECK VALVE
(J-20)

CONFIGURATION ---
NOTE... SEE PAGE B1
FOR PICK UP LOCATION

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

TEST CONDITIONS....
TEST DATE..... 6/17/67
AXIS OF EXCITATION.... A
PICK UP NUMBER (8)... 2 NC63
PICK UP RESPONSE..... A
INPUT ACCEL.PER PAGE.. A4



DOUGLAS AIRCRAFT COMPANY , INC.

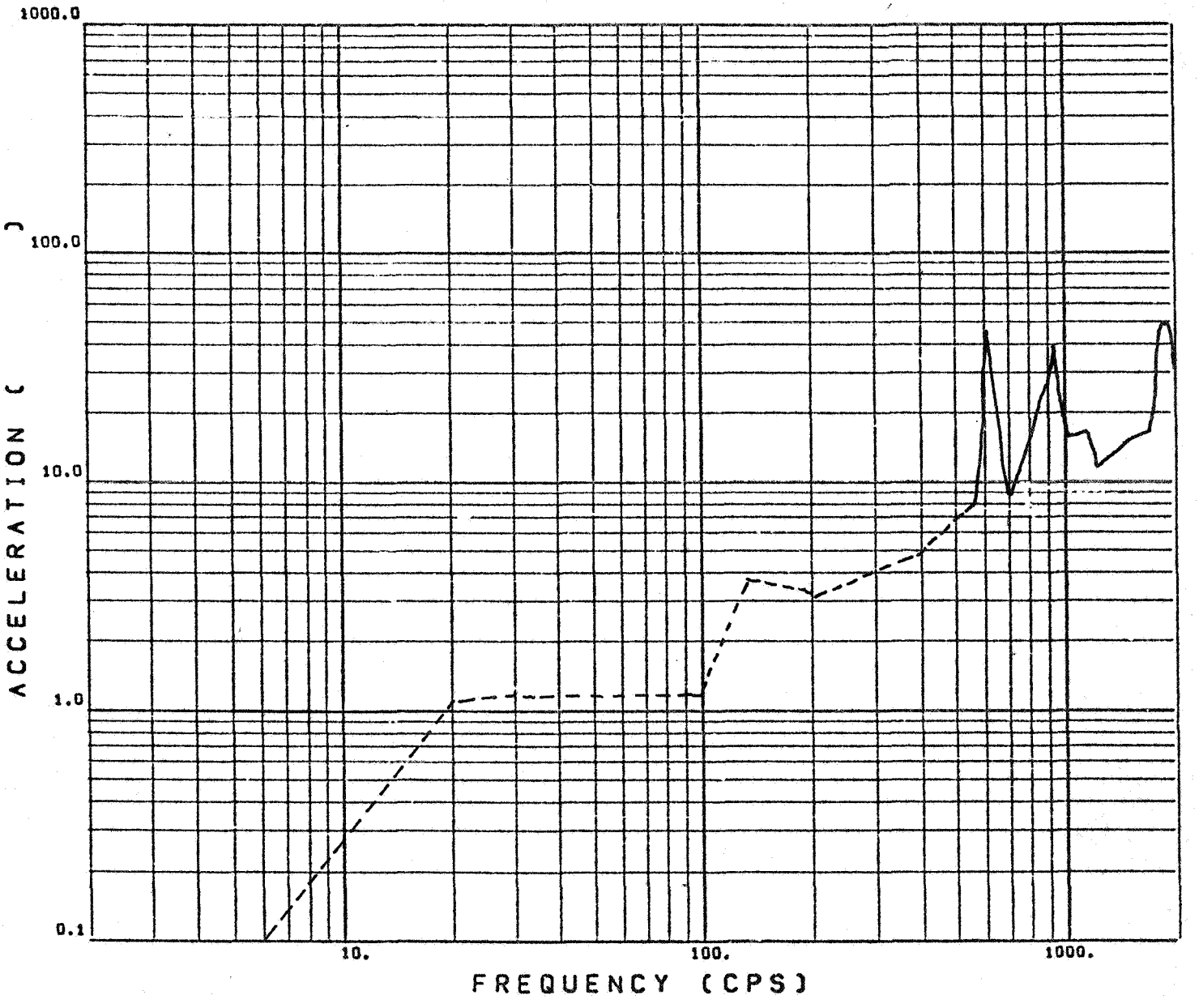
PAGE NO. A6
REPORT NO. 6003-1

SINUSOIDAL FREQUENCY SWEEP
SIV-B VENT PORT CHECK VALVE
(J-20)

CONFIGURATION ---
NOTE... SEE PAGE B1
FOR PICK UP LOCATION

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

TEST CONDITIONS....
TEST DATE..... 6/17/67
AXIS OF EXCITATION.... A
PICK UP NUMBER (6)... 3 HC59
PICK UP RESPONSE..... B
INPUT ACCEL.PER PAGE.. A4



DOUGLAS AIRCRAFT COMPANY , INC.

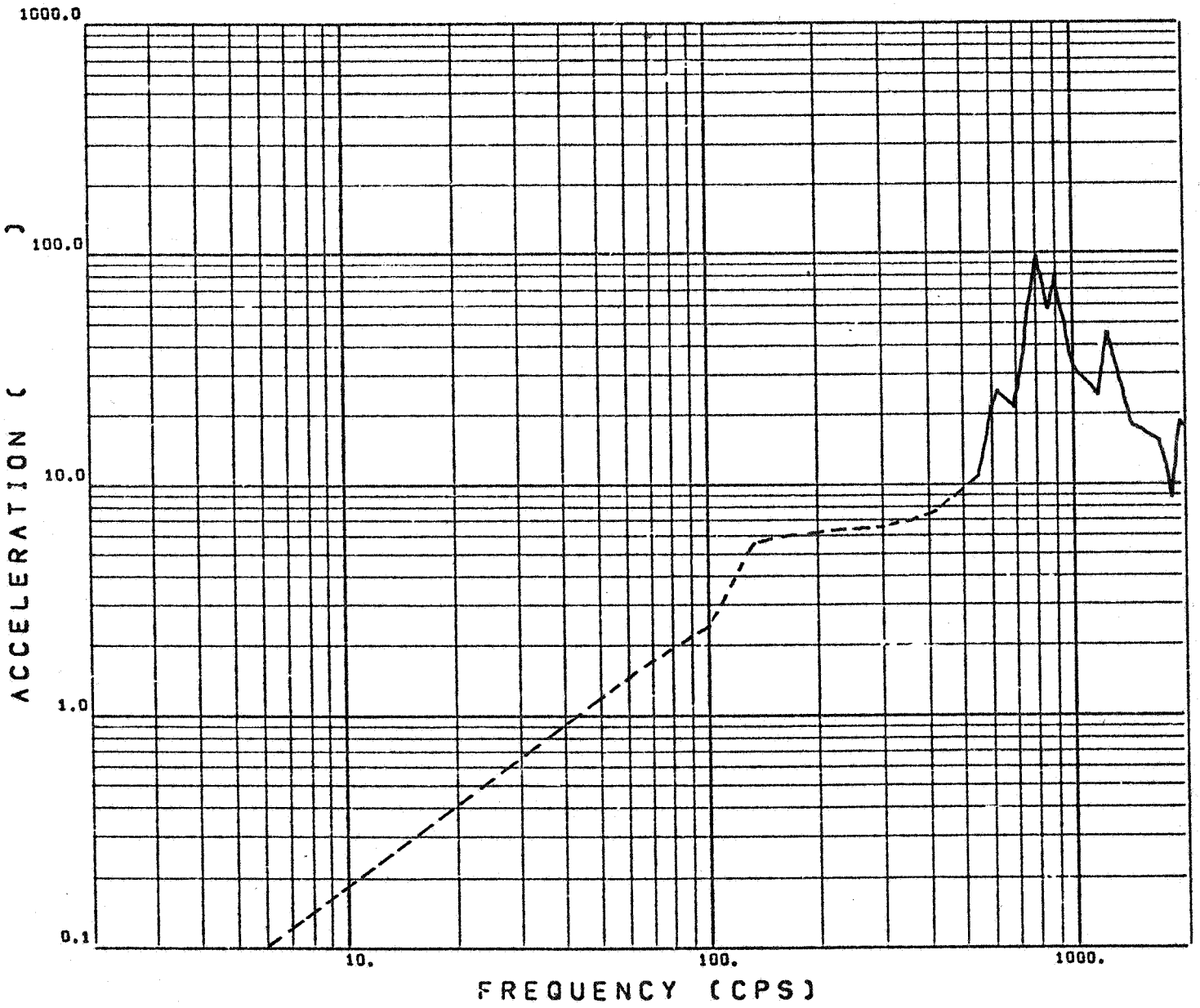
PAGE NO. A7
REPORT NO. [illegible]

SINUSOIDAL FREQUENCY SWEEP
SIV-B VENT PORT CHECK VALVE
(J-20)

CONFIGURATION ---
NOTE... SEE PAGE B1
FOR PICK UP LOCATION

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

TEST CONDITIONS....
TEST DATE..... 6/13/67
AXIS OF EXCITATION.... A
PICK UP NUMBER (11)... 4 PB83
PICK UP RESPONSE..... C
INPUT ACCEL.PER PAGE.. A4



DOUGLAS AIRCRAFT COMPANY , INC.

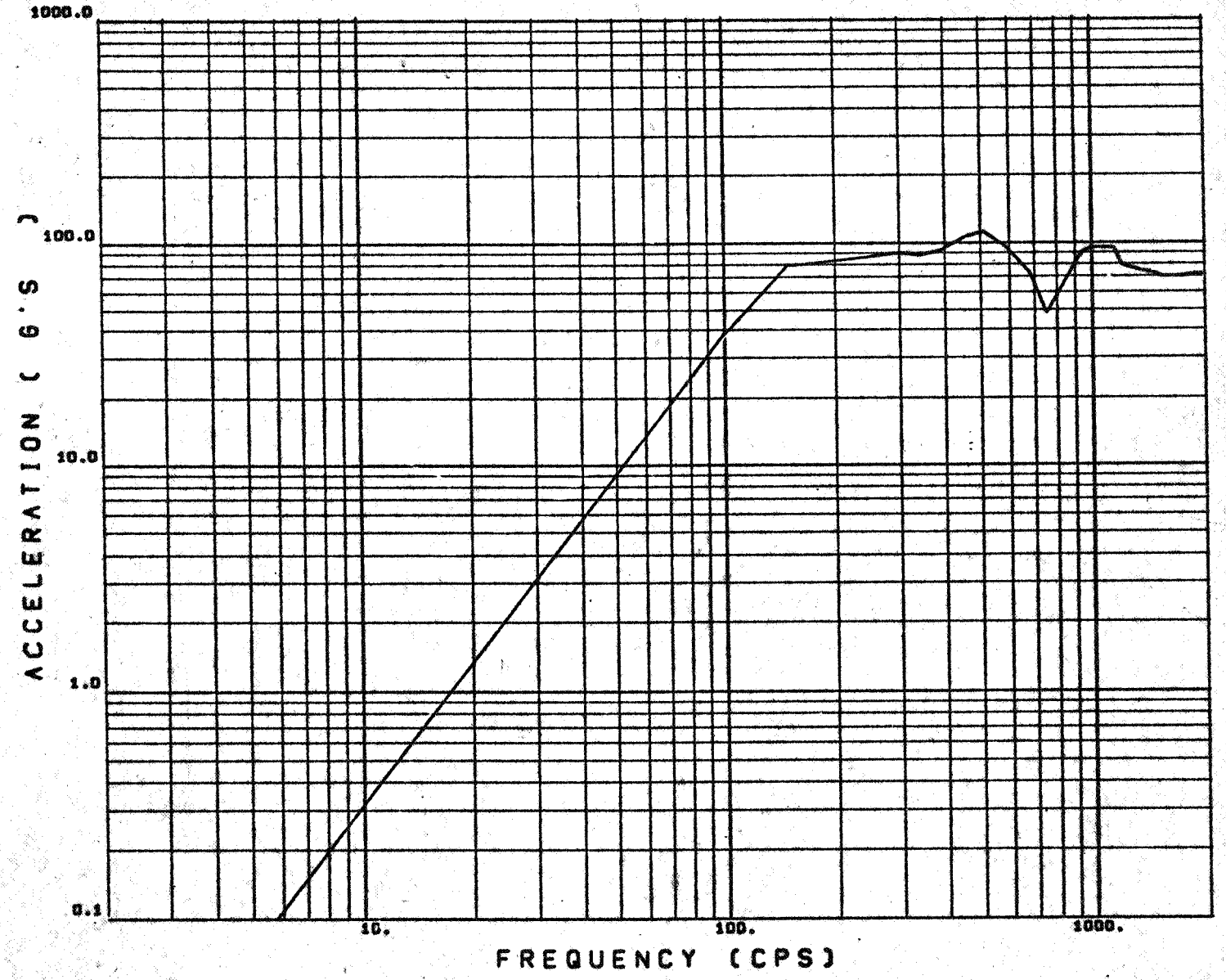
PAGE NO. A8
REPORT NO. R 6033-1

SINUSOIDAL FREQUENCY SWEEP

SIV-B VENT PORT CHECK VALVE (J-20)

CONFIGURATION ---
NOTE... SEE PAGE B3
FOR PICK UP LOCATION
COMMENT--- REFERENCE CHANNEL
LEGEND...
UPSWEEP ———
DOWNSWEEP - - - - -

TEST CONDITIONS....
TEST DATE..... 6/16/67
AXIS OF EXCITATION.... B
PICK UP NUMBER (1)... 1 HB63
PICK UP RESPONSE..... B
INPUT ACCEL.PER PAGE.. ———



DOUGLAS AIRCRAFT COMPANY , INC.

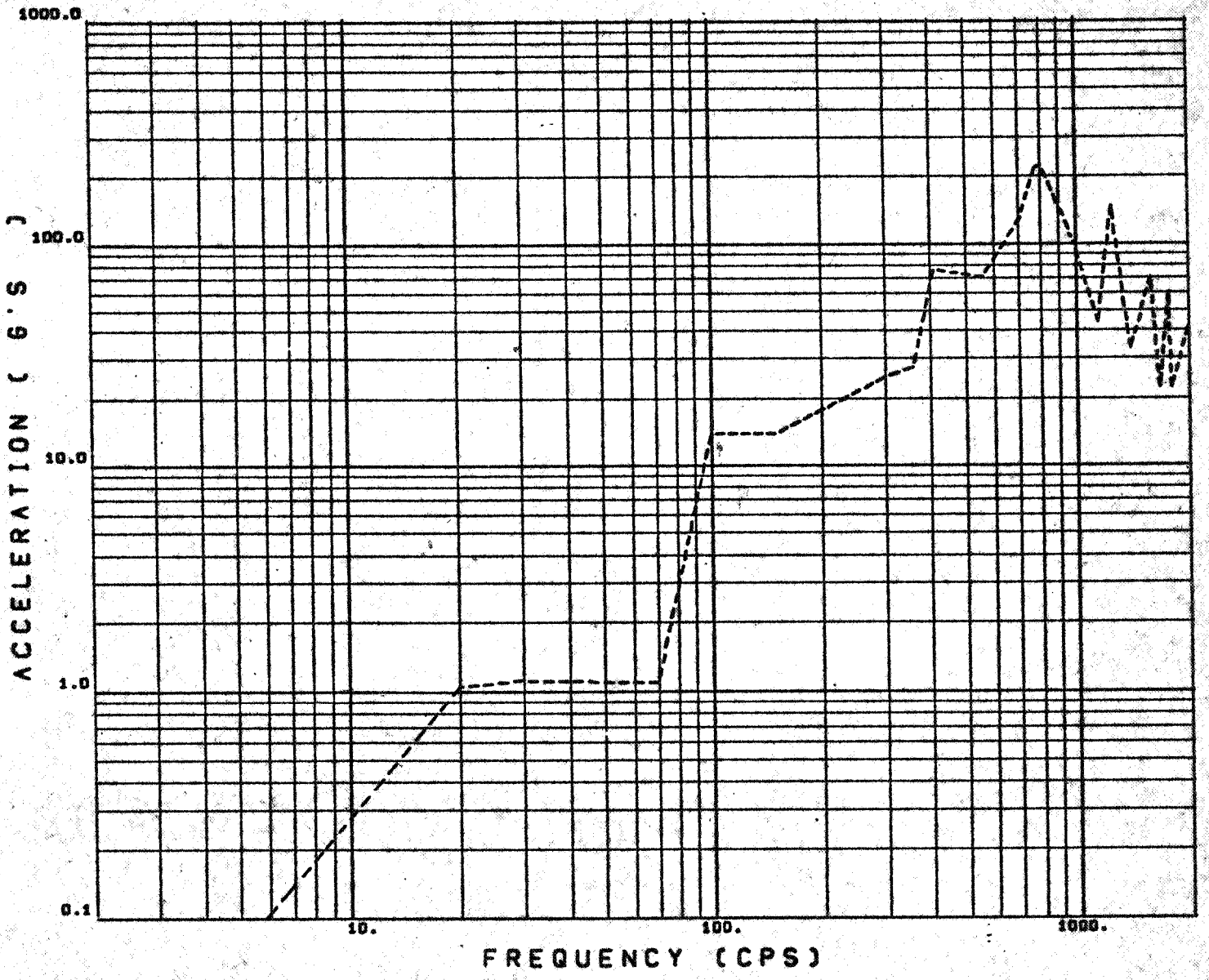
PAGE NO. A9
REPORT NO. R 6013.3-1

SINUSOIDAL FREQUENCY SWEEP

SIV-B VENT PORT CHECK VALVE (J-20)

CONFIGURATION ---
NOTE... SEE PAGE B3
FOR PICK UP LOCATION
COMMENT---
LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 6/16/67
AXIS OF EXCITATION.... B
PICK UP NUMBER (2)... 2 NC63
PICK UP RESPONSE..... A
INPUT ACCEL.PER PAGE.. A8



DOUGLAS AIRCRAFT COMPANY , INC.

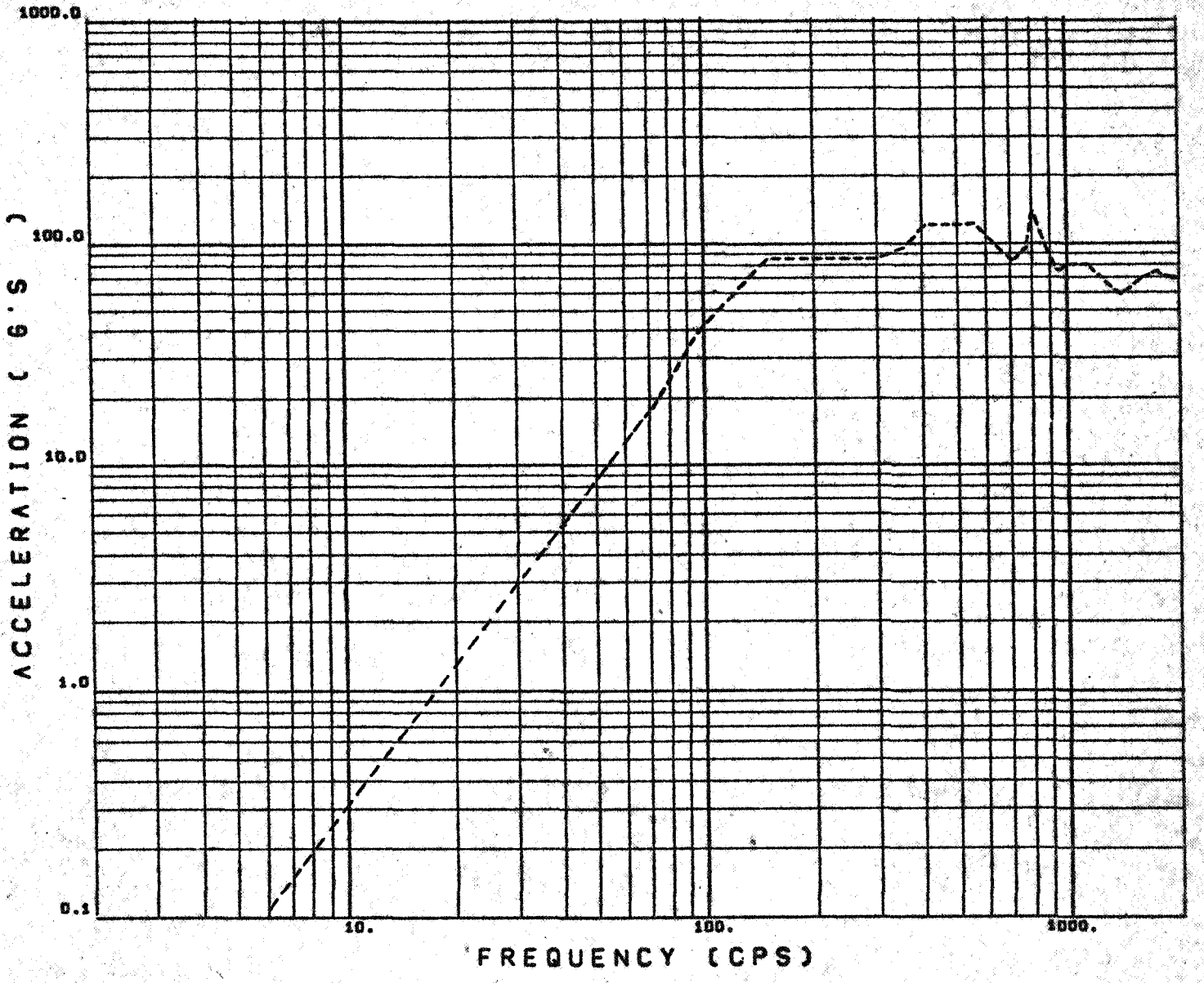
PAGE NO. A10
REPORT NO. 6033-1

SINUSOIDAL FREQUENCY SWEEP

SIV-B VENT PORT CHECK VALVE (J-20)

CONFIGURATION ---
NOTE... SEE PAGE B3
FOR PICK UP LOCATION
COMMENT---
LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 6/16/67
AXIS OF EXCITATION.... B
PICK UP NUMBER (3)... 3 NC59
PICK UP RESPONSE..... B
INPUT ACCEL.PER PAGE.. A8



DOUGLAS AIRCRAFT COMPANY , INC.

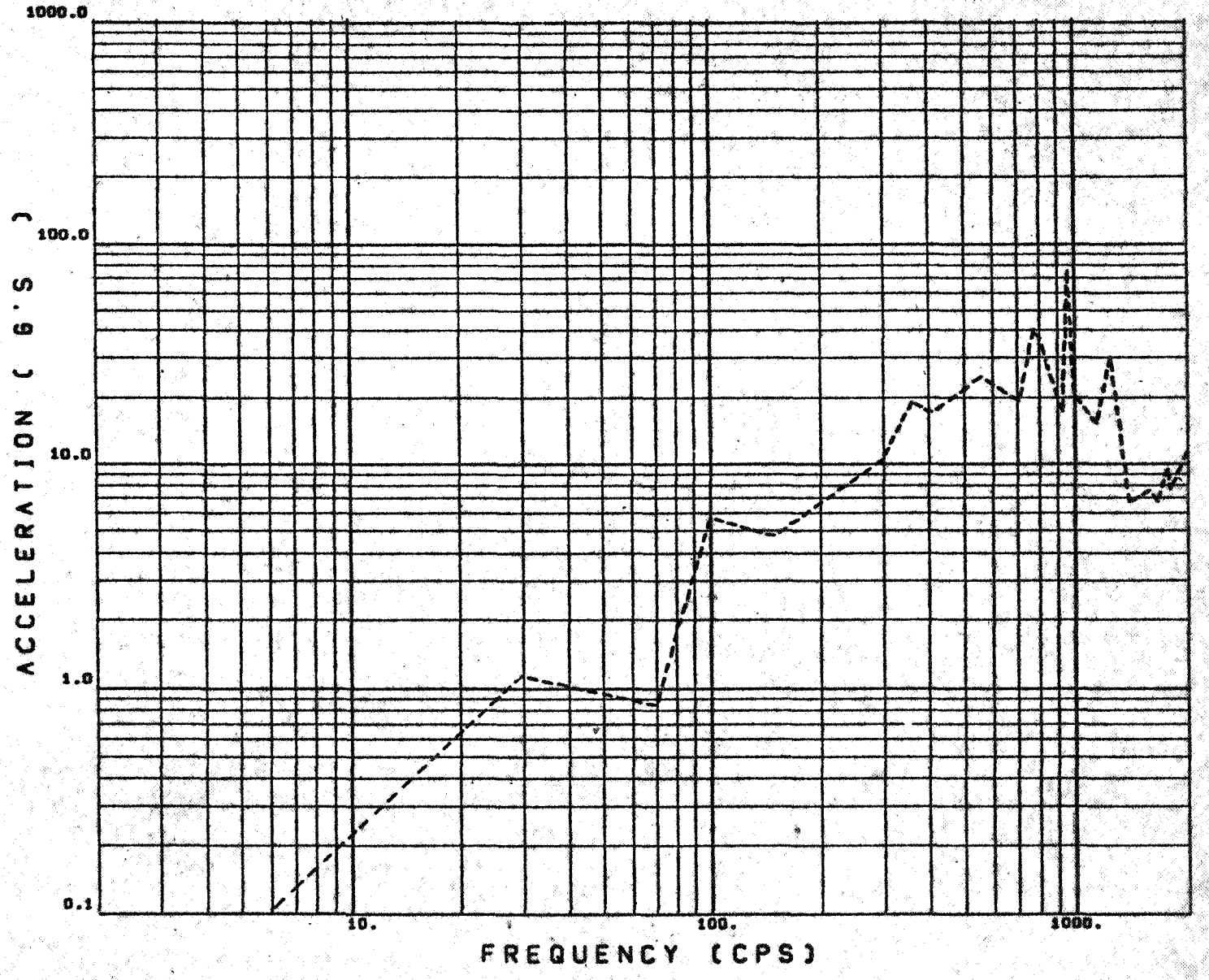
PAGE NO. A 11
REPORT NO. R 6103 3-1

SINUSOIDAL FREQUENCY SWEEP

SIV-B VENT PORT CHECK VALVE (J-20)

CONFIGURATION ---
NOTE... SEE PAGE B3
FOR PICK UP LOCATION
COMMENT---
LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 6/16/67
AXIS OF EXCITATION.... B
PICK UP NUMBER (4)... 4 PB83
PICK UP RESPONSE..... C
INPUT ACCEL.PER PAGE.. A8



DOUGLAS AIRCRAFT COMPANY , INC.

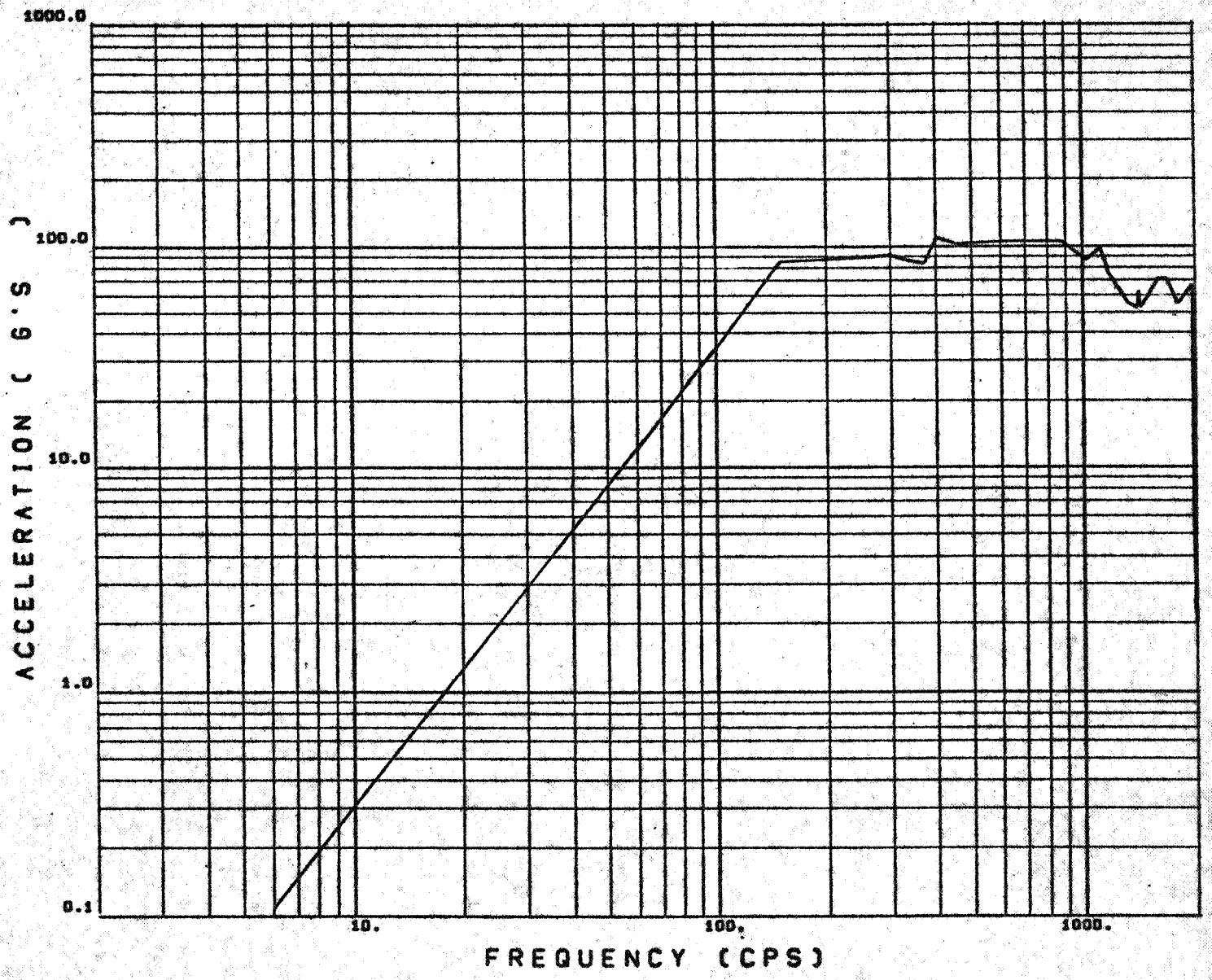
PAGE NO. A12
REPORT NO. B 0033-1

SINUSOIDAL FREQUENCY SWEEP

SIV-B VENT PORT CHECK VALVE (J-20)

CONFIGURATION ---
NOTE... SEE PAGE B5
FOR PICK UP LOCATION
COMMENT--- REFERENCE CHANNEL
LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 6/17/67
AXIS OF EXCITATION.... C
PICK UP NUMBER (1)... 1 HB63
PICK UP RESPONSE..... C
INPUT ACCEL.PER PAGE.. ———



DOUGLAS AIRCRAFT COMPANY , INC.

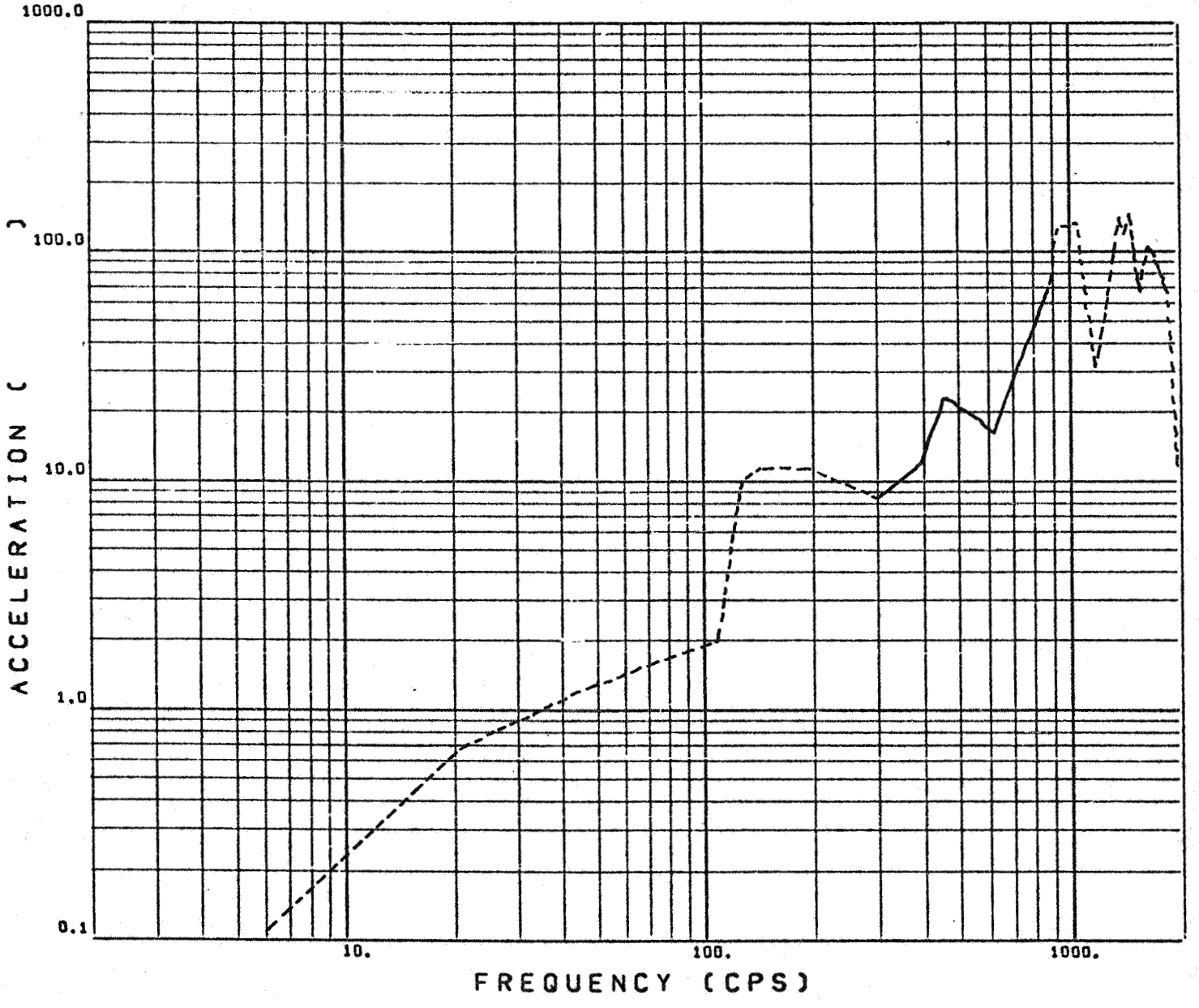
PAGE NO. A 13
REPORT NO. A603.3-1

SINUSOIDAL FREQUENCY SWEEP
SIV-B VENT PORT CHECK VALVE
(J-20)

CONFIGURATION --- B5
NOTE... SEE PAGE
FOR PICK UP LOCATION

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

TEST CONDITIONS....
TEST DATE..... 6/17/67
AXIS OF EXCITATION.... C
PICK UP NUMBER (10)... 2 NC63
PICK UP RESPONSE..... A
INPUT ACCEL.PER PAGE.. A 12



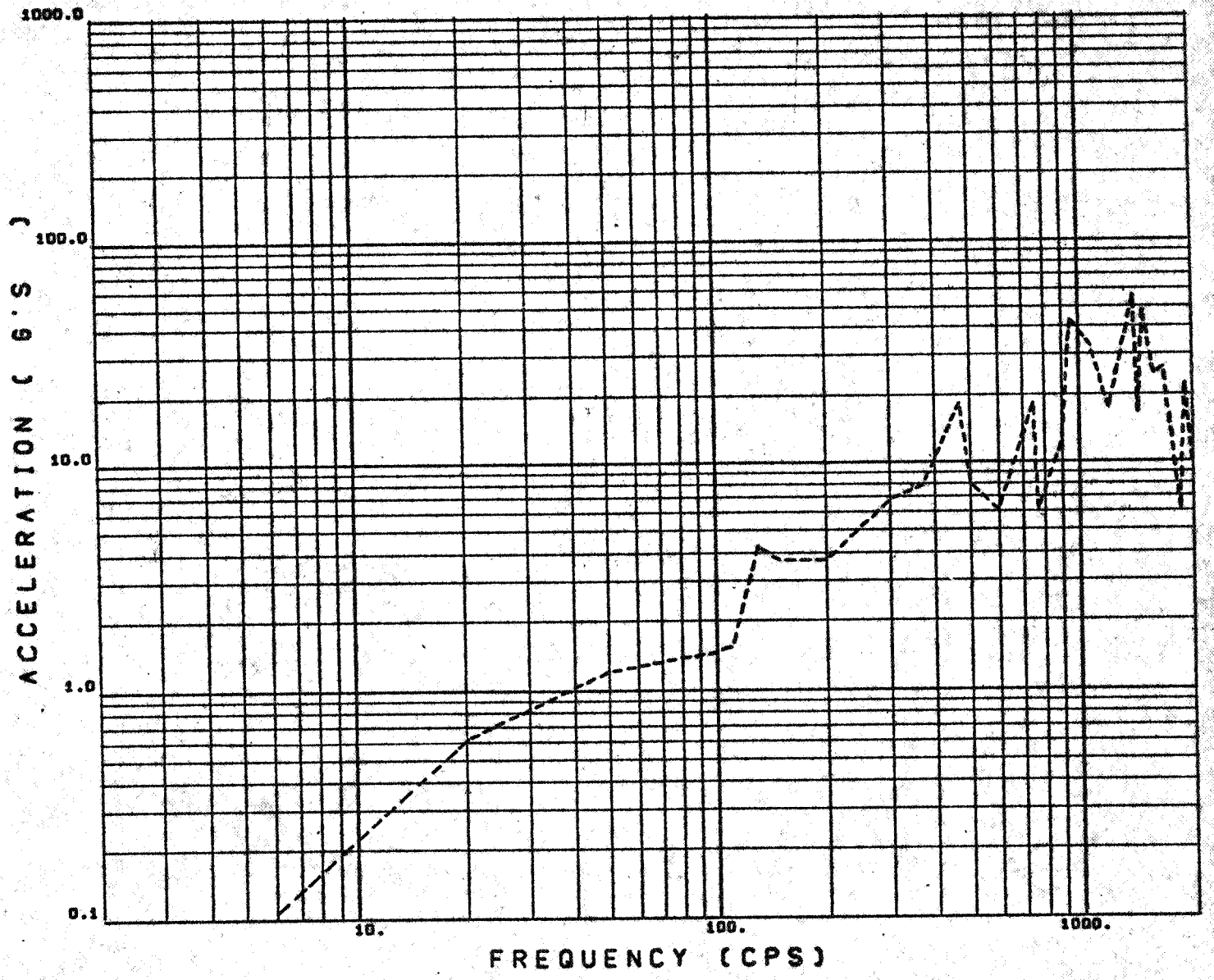
DOUGLAS AIRCRAFT COMPANY , INC.

PAGE NO. A 14
REPORT NO. R6033-1

SINUSOIDAL FREQUENCY SWEEP
SIV-B VENT PORT CHECK VALVE
(J-20)

CONFIGURATION --- B5
NOTE... SEE PAGE
FOR PICK UP LOCATION
COMMENT---
LEGEND...
UPSWEEP ———
DOWNSWEEP ------

TEST CONDITIONS....
TEST DATE..... 6/17/67
AXIS OF EXCITATION.... C
PICK UP NUMBER (3)... 3 NC59
PICK UP RESPONSE..... B
INPUT ACCEL.PER PAGE.. A 12



DOUGLAS AIRCRAFT COMPANY , INC.

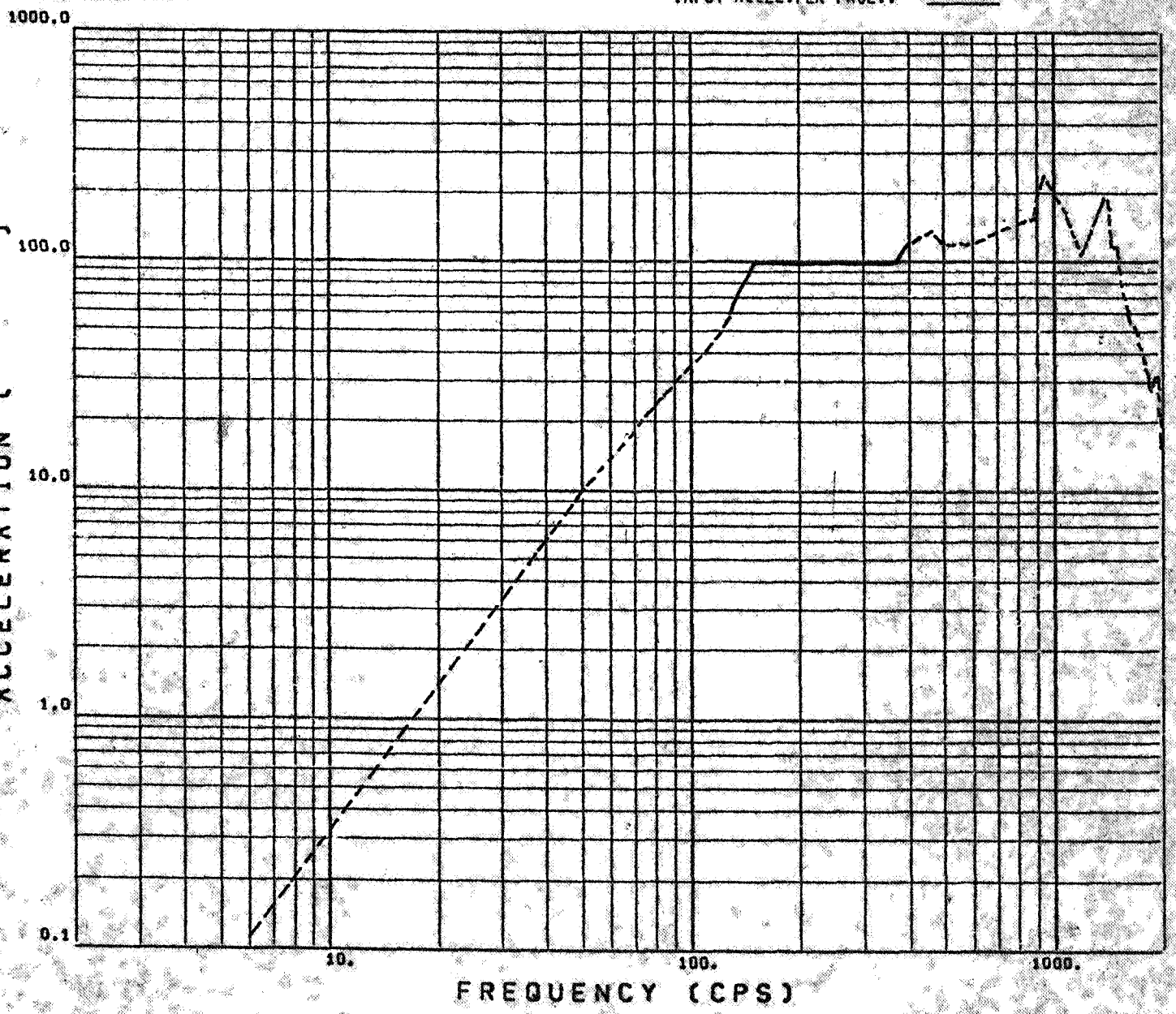
PAGE NO. A15
REPORT NO. K6023-1

SINUSOIDAL FREQUENCY SWEEP
SIV-B VENT PORT CHECK VALVE
(J-20)

CONFIGURATION --- B5
NOTE... SEE PAGE ___
FOR PICK UP LOCATION

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

TEST CONDITIONS....
TEST DATE..... 6/17/67
AXIS OF EXCITATION.... C
PICK UP NUMBER (9)... 4 . 7003
PICK UP RESPONSE..... C
INPUT ACCEL.PER PAGE.. A12



DSV-4B RANDOM VIBRATION TEST

VENT PORT CHECK VALVE J - 20

CONFIGURATION

P/N 1B 67481-1

S/N 9 to 11

NOTE

SEE PAGE B1 FOR PICK-UP LOCATION

TEST CONDITIONS

TEST DATE 6/17/1967

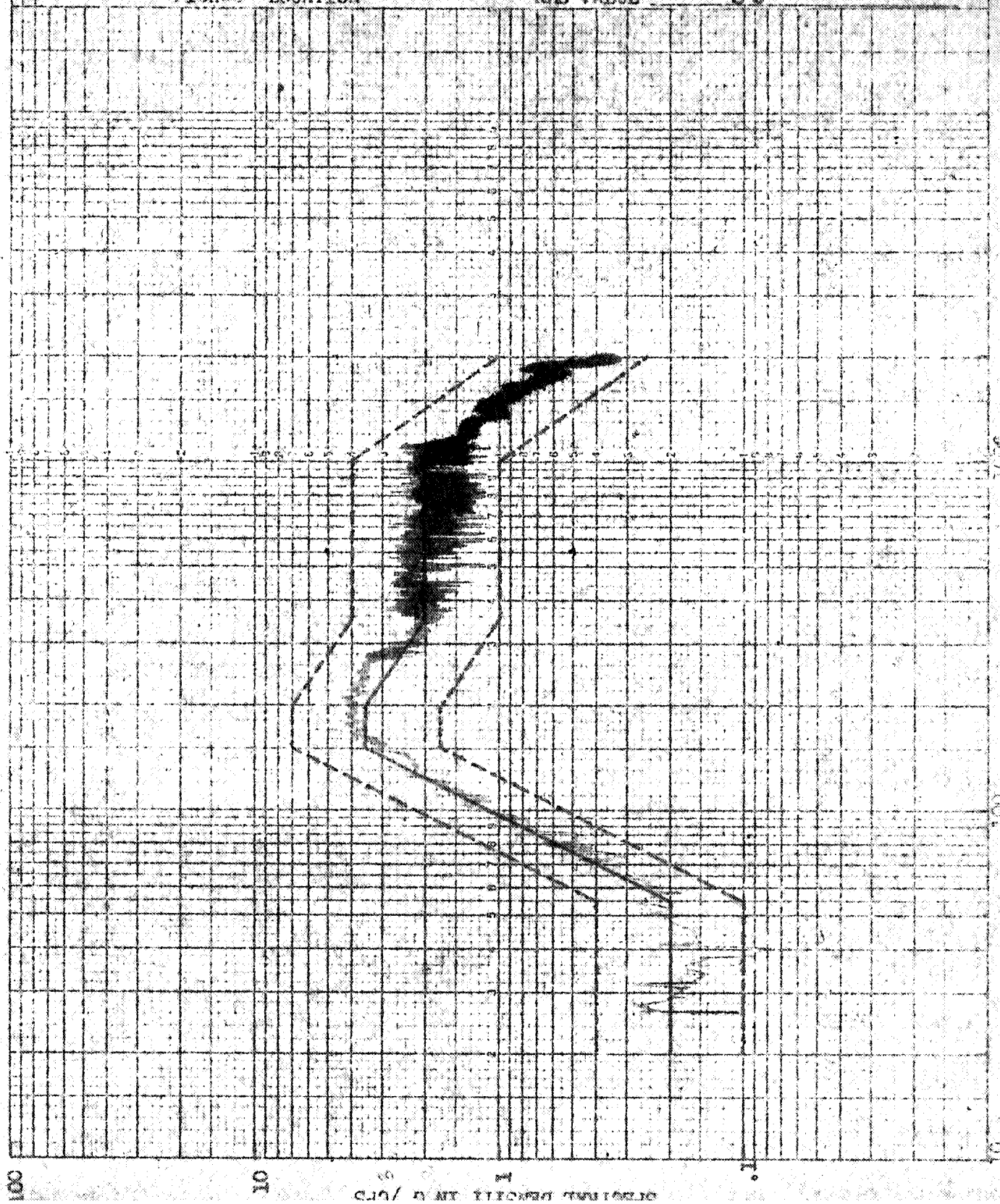
AXIS OF EXCITATION Q

PICK-UP NUMBER 1

PICK-UP RESPONSE A

INPUT ACCELERATION PER PAGE

RMS VALUE .55



DSV-4B RANDOM VIBRATION TEST

VENT PORT CHECK VALVE J - 20

CONFIGURATION

P/N 1B 67481-1

S/N ~~9~~ 10 & 11

NOTE

SEE PAGE B3 FOR PICK-UP LOCATION

TEST CONDITIONS

TEST DATE 6/17/1967

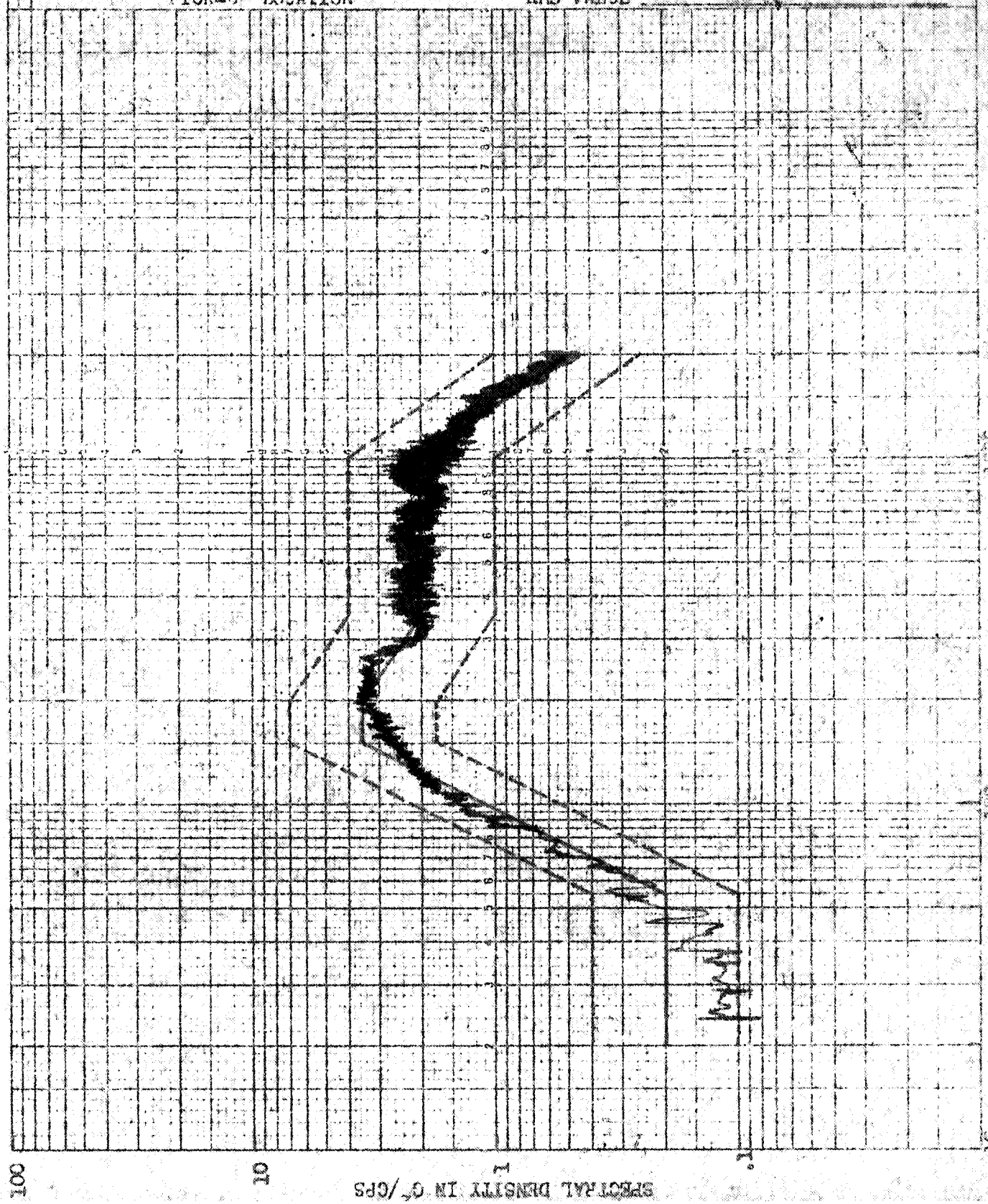
AXIS OF EXCITATION B

PICK-UP NUMBER 1

PICK-UP RESPONSE B

INPUT ACCELERATION PER PAGE

RMS VALUE 55



DOUGLAS AIRCRAFT COMPANY, INC.

DSV-4B RANDOM VIBRATION TEST

VENT PORT CHECK VALVE J - 20

CONFIGURATION

P/N 1B 67481-1

S/N ~~9~~ 10 & 11

NOTE

SEE PAGE B5 FOR PICK-UP LOCATION

TEST CONDITIONS

TEST DATE 6/17/1967

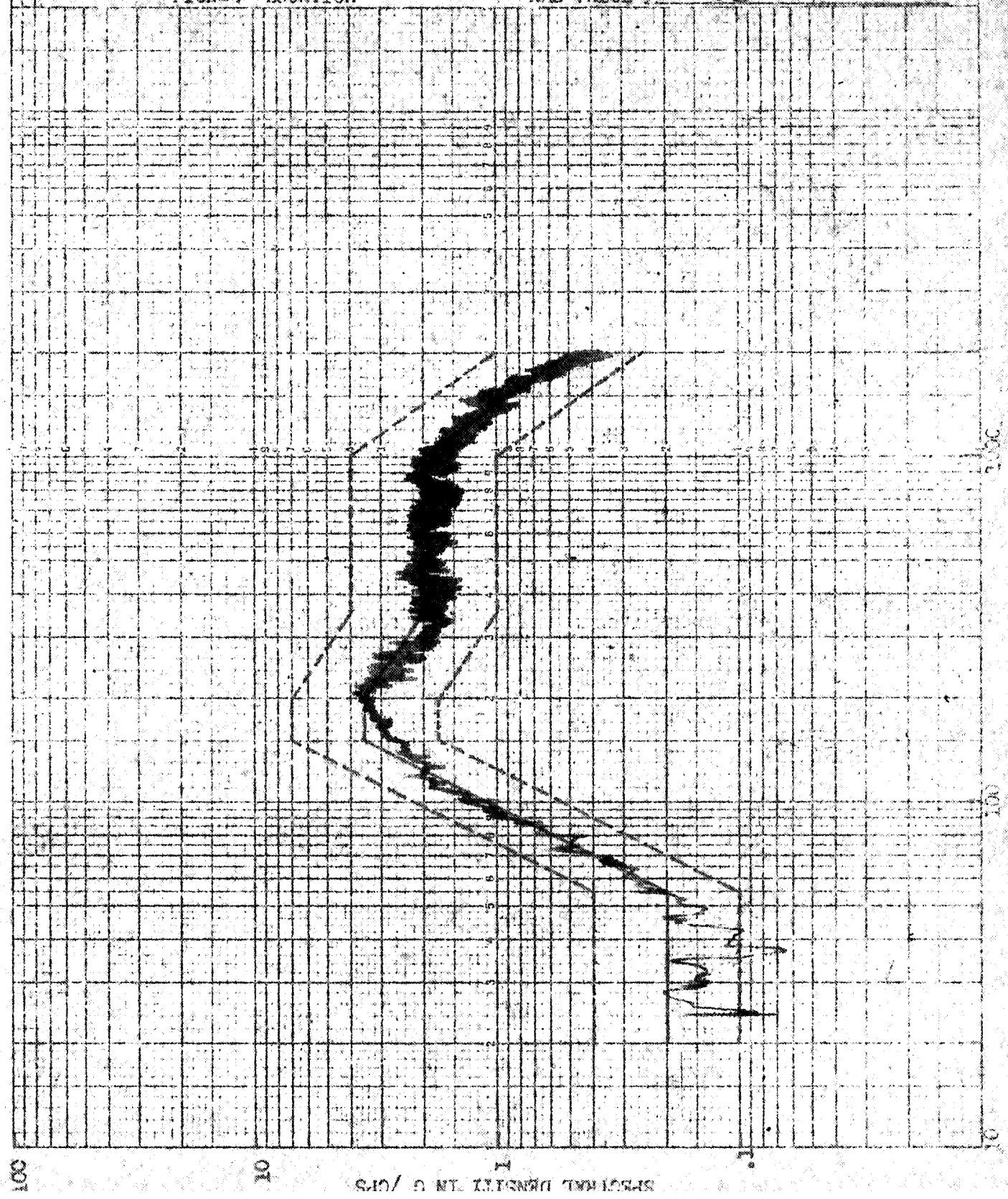
AXIS OF EXCITATION C

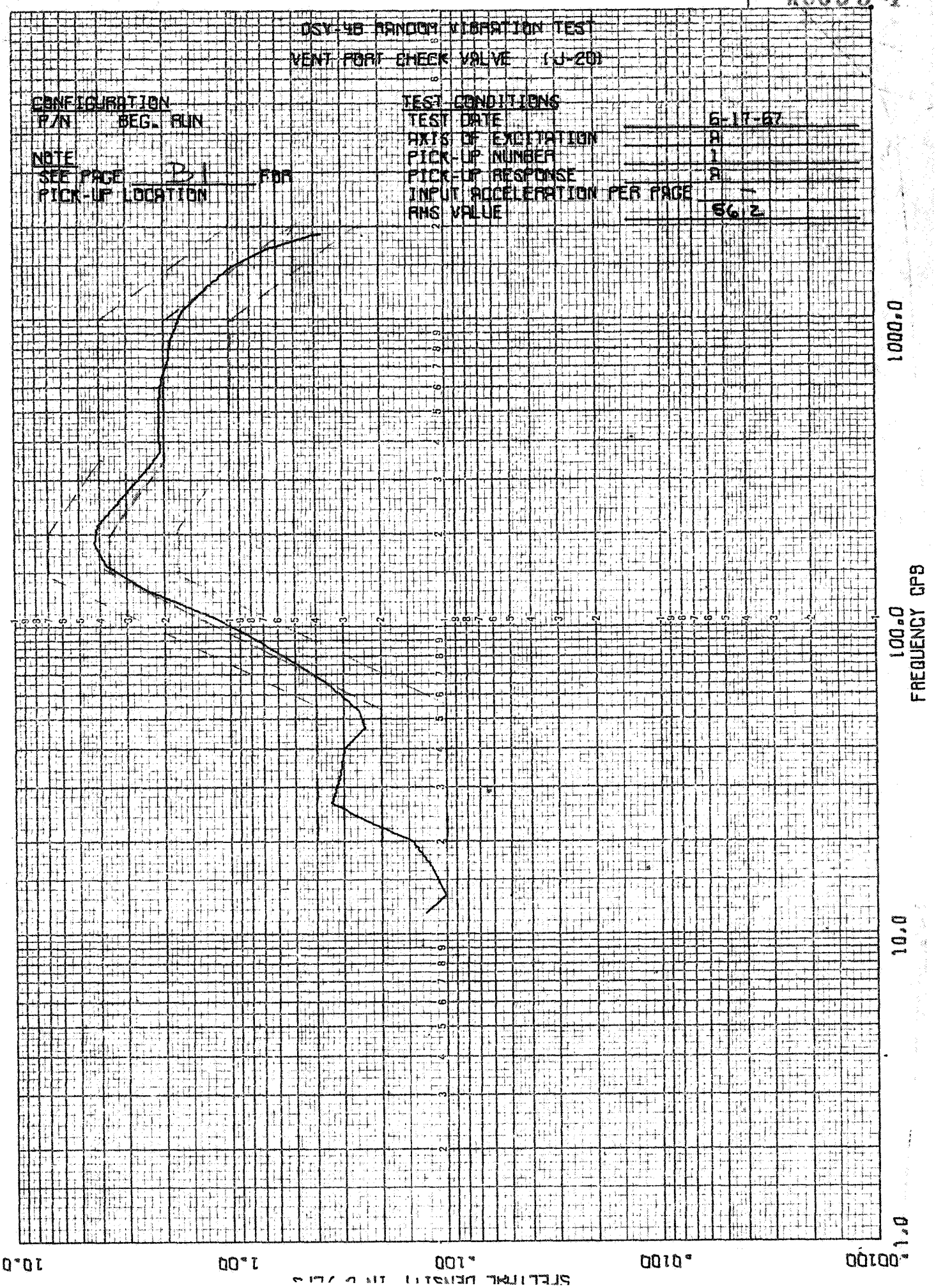
PICK-UP NUMBER 1

PICK-UP RESPONSE C

INPUT ACCELERATION PER PAGE

RMS VALUE 53




OSV-4B RANDOM VIBRATION TEST
VENT PORT CHECK VALVE (J-20)
CONFIGURATION
P/N BEG. RUN
NOTE
SEE PAGE B1 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 6-17-67
AXIS OF EXCITATION A
PICK-UP NUMBER 1
PICK-UP RESPONSE A
INPUT ACCELERATION PER PAGE —
RMS VALUE 86.2
1000.0
100.0
10.0
1.0
FREQUENCY CPS
.0010
.0100
.100
1.00
10.0

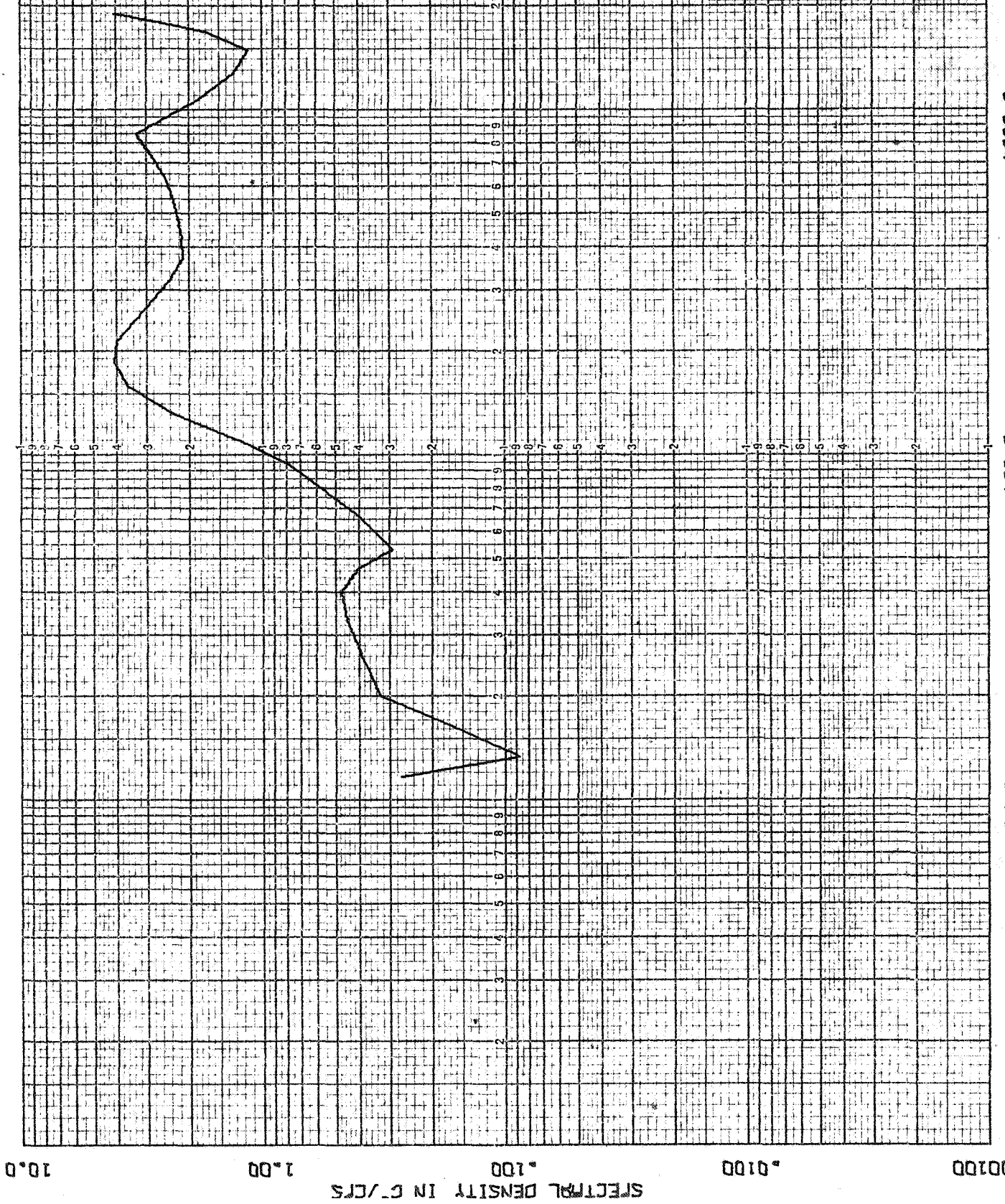
DSV-4B RANDOM VIBRATION TEST

VENT PORT CHECK VALVE 1J-200

CONFIGURATION
P/N BEG. RUN

NOTE
SEE PAGE B1 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 6-17-67
AXIS OF EXCITATION A
PICK-UP NUMBER 2
PICK-UP RESPONSE A
INPUT ACCELERATION PER PAGE A19
RMS VALUE 74.3



DSV-4B RANDOM VIBRATION TEST

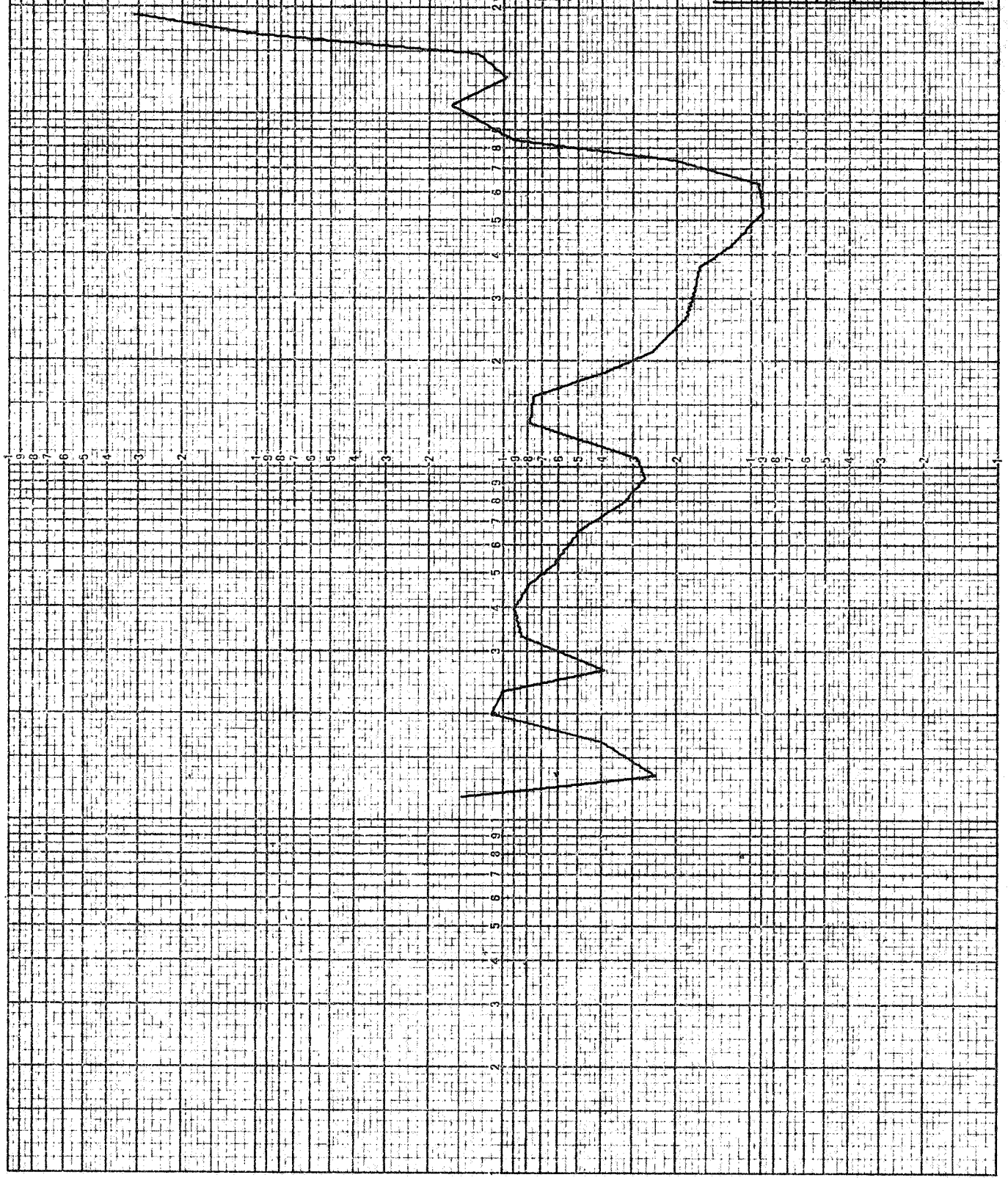
VENT PORT CHECK VALVE (J-20)

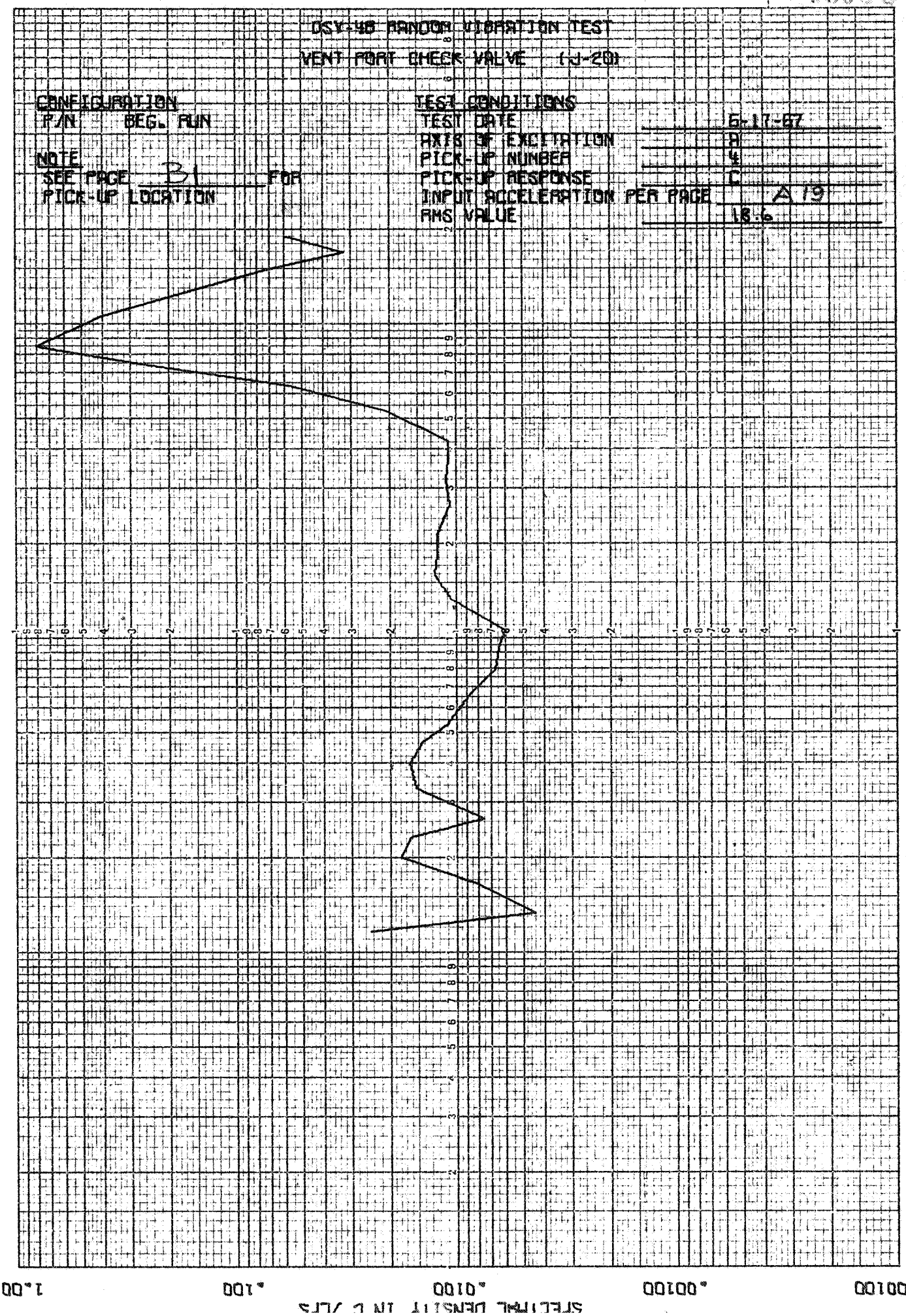
CONFIGURATION
P/N BEG. RUN

NOTE
SEE PAGE B1 FOR
PICK-UP LOCATION

TEST CONDITIONS

TEST DATE	6-17-67
AXIS OF EXCITATION	A
PICK-UP NUMBER	3
PICK-UP RESPONSE	B
INPUT ACCELERATION PER PAGE	A19
RMS VALUE	12.1




OSV-4B RANDOM VIBRATION TEST
VENT PORT CHECK VALVE (J-20)
CONFIGURATION
P/N BEG. RUN
NOTE
SEE PAGE B1 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 6-17-67
AXIS OF EXCITATION B
PICK-UP NUMBER 4
PICK-UP RESPONSE C
INPUT ACCELERATION PER PAGE A19
RMS VALUE 18.6
1000.0
100.0
10.0
1.0
FREQUENCY CPS
.00100
.0100
.100
1.00
SPECTRAL DENSITY IN G²/CPS

DSV-40 RANDOM VIBRATION TEST

VENT PORT CHECK VALVE J-20

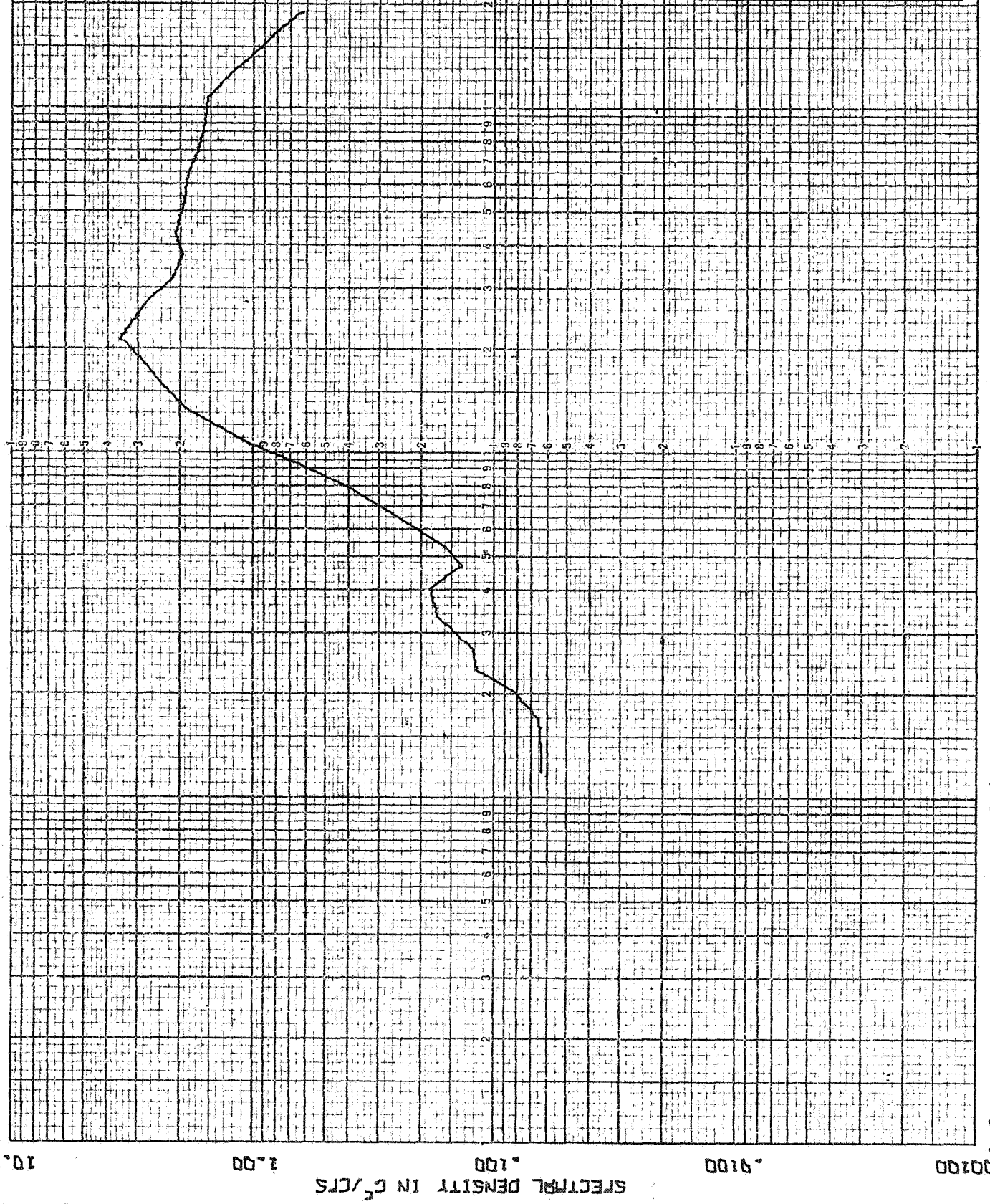
REV. 1-21-7

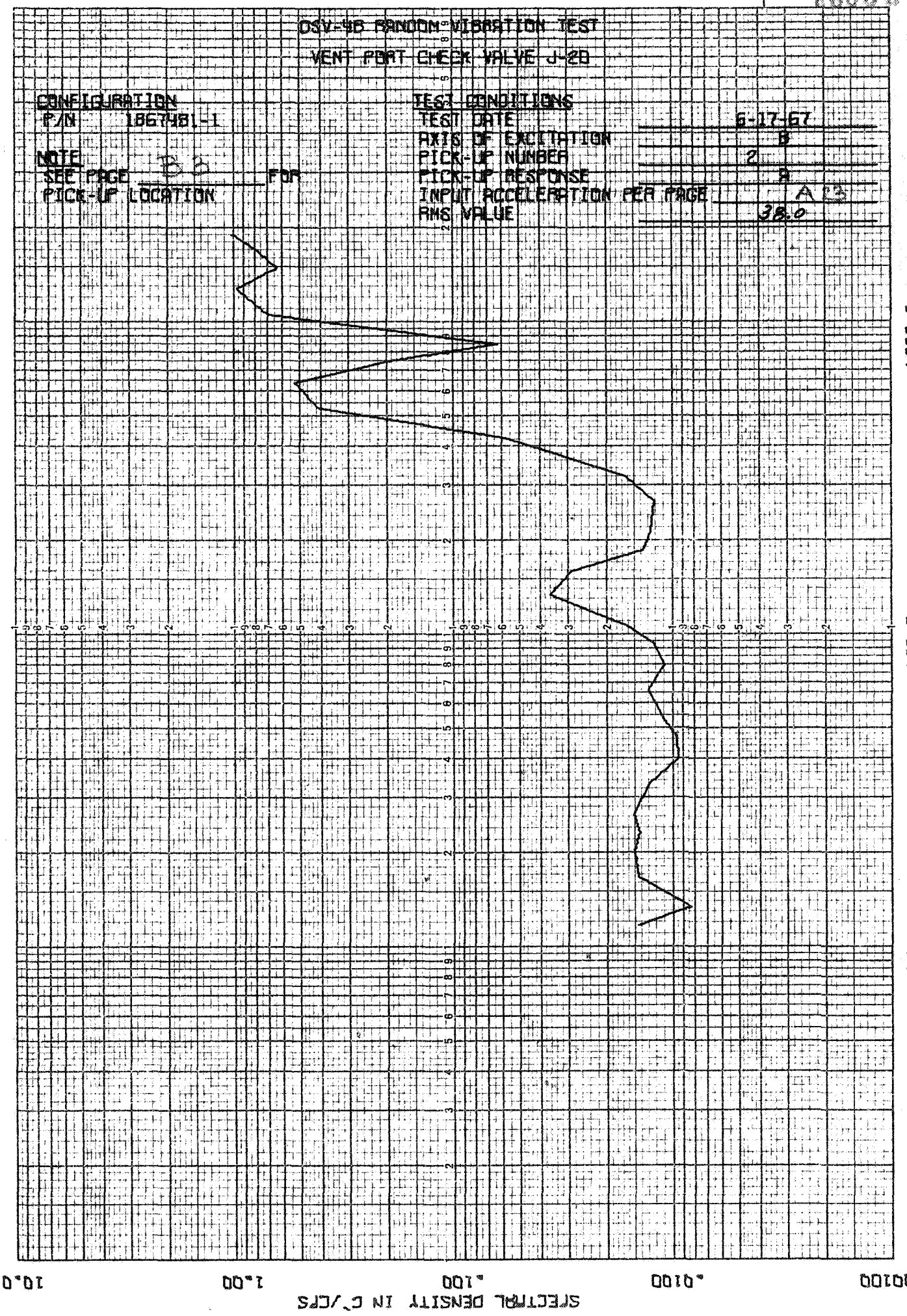
CONFIGURATION
P/N 1867481-1
MIDDLE OF RON

NOTE
SEE PAGE B3 FOR
PICK-UP LOCATION

TEST CONDITIONS

TEST DATE	6-17-67
AXIS OF EXCITATION	B
PICK-UP NUMBER	1
PICK-UP RESPONSE	G
INPUT ACCELERATION PER PAGE	—
RMS VALUE	56.9




DSV-4B RANDOM VIBRATION TEST
VENT PORT CHECK VALVE J-2B
CONFIGURATION
P/N 1867481-1
NOTE
SEE PAGE B2 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 6-17-67
AXIS OF EXCITATION B
PICK-UP NUMBER 2
PICK-UP RESPONSE A
INPUT ACCELERATION PER PAGE A23
RMS VALUE 38.0
1000.0
100.0
10.0
1.0
FREQUENCY CPS
.00100
.0100
.100
1.00
10.0
SPECTRAL DENSITY IN G²/CPS

OSV-4B RANDOM VIBRATION TEST

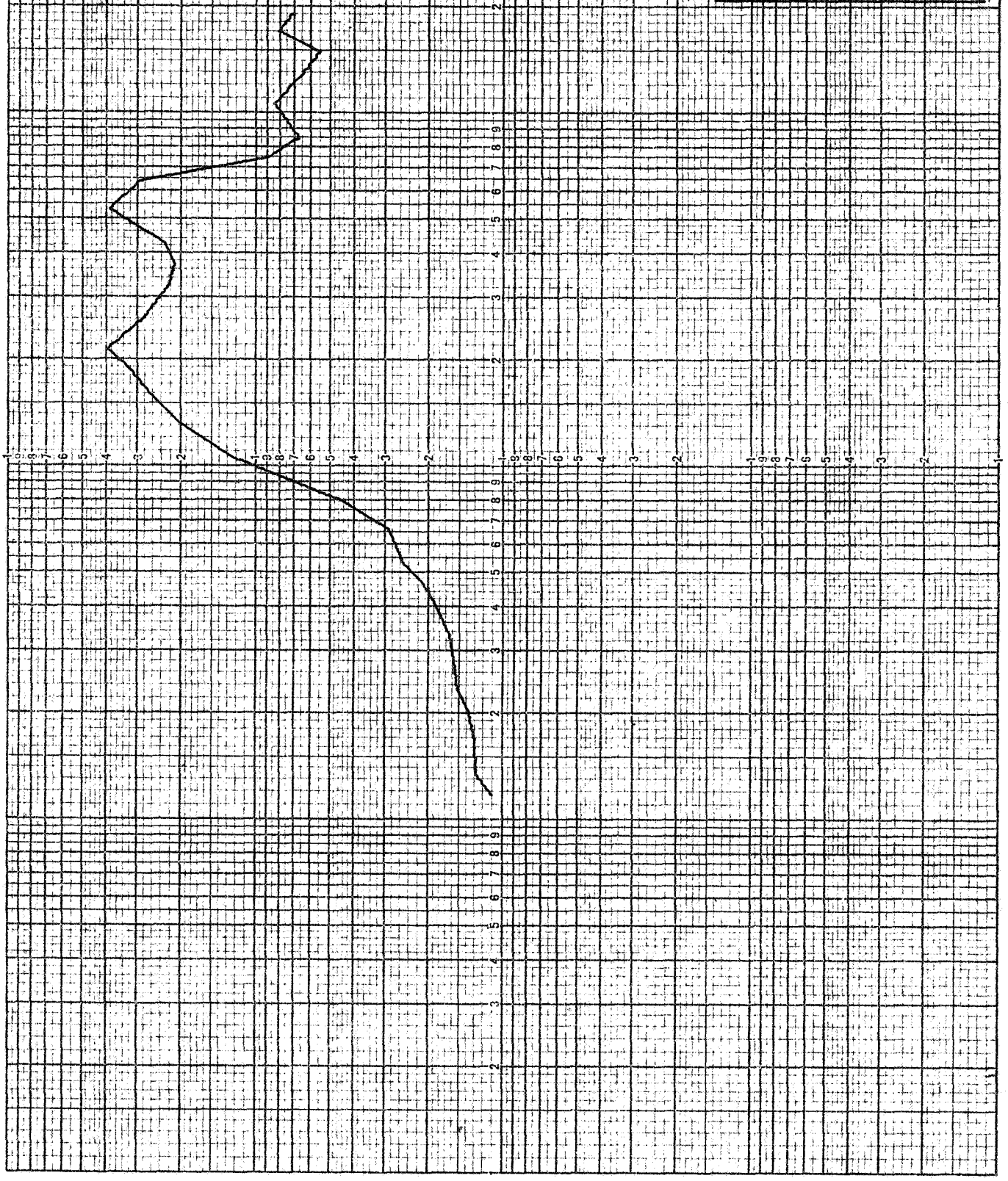
VENT PORT CHECK VALVE J-20

CONFIGURATION
P/N 1867481-1

NOTE
SEE PAGE D-2 FOR
PICK-UP LOCATION

TEST CONDITIONS

TEST DATE	6-17-67
AXIS OF EXCITATION	B
PICK-UP NUMBER	3
PICK-UP RESPONSE	B
INPUT ACCELERATION PER PAGE	A 23
RMS VALUE	53.5



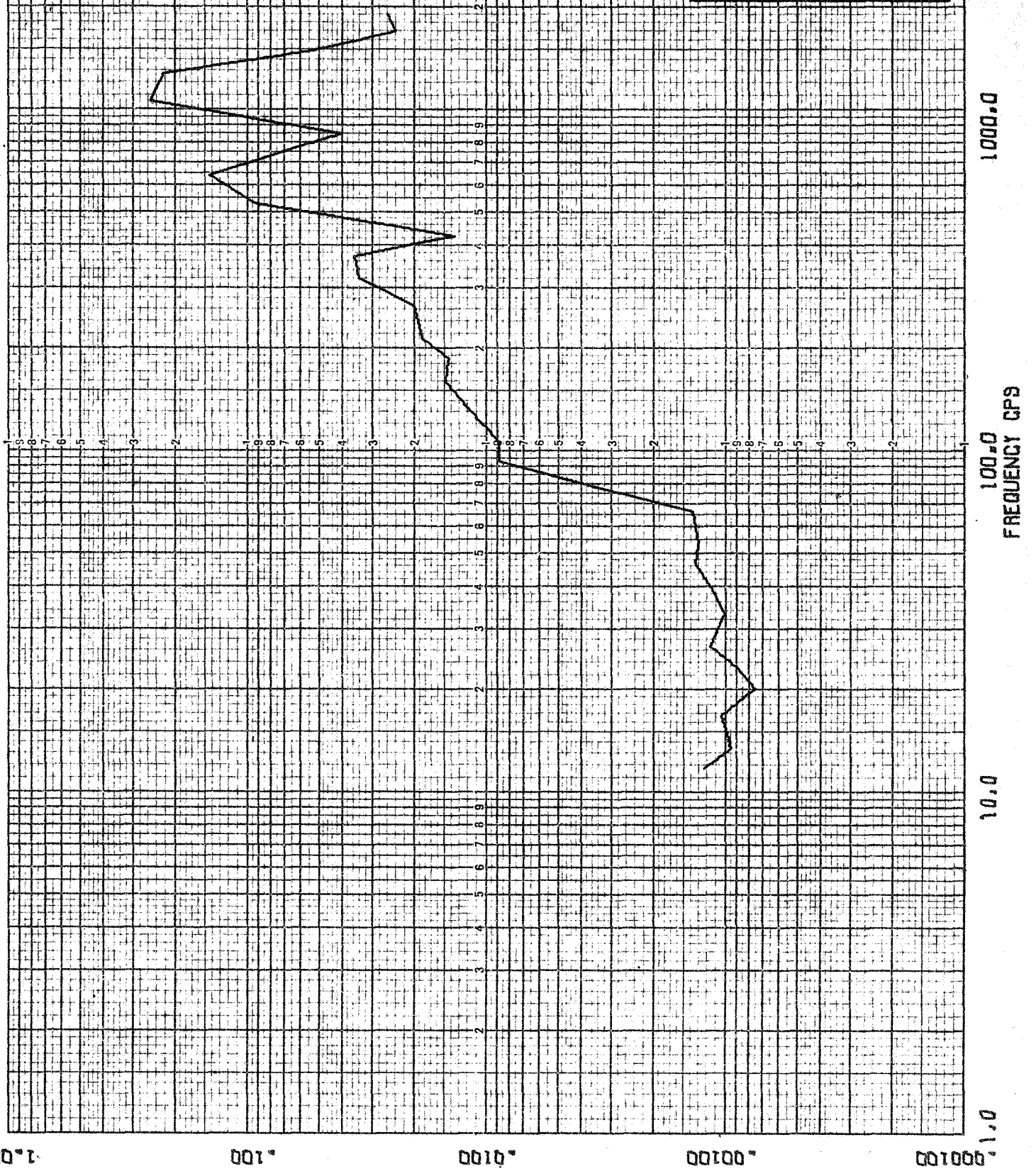
DSV-4B RANDOM VIBRATION TEST

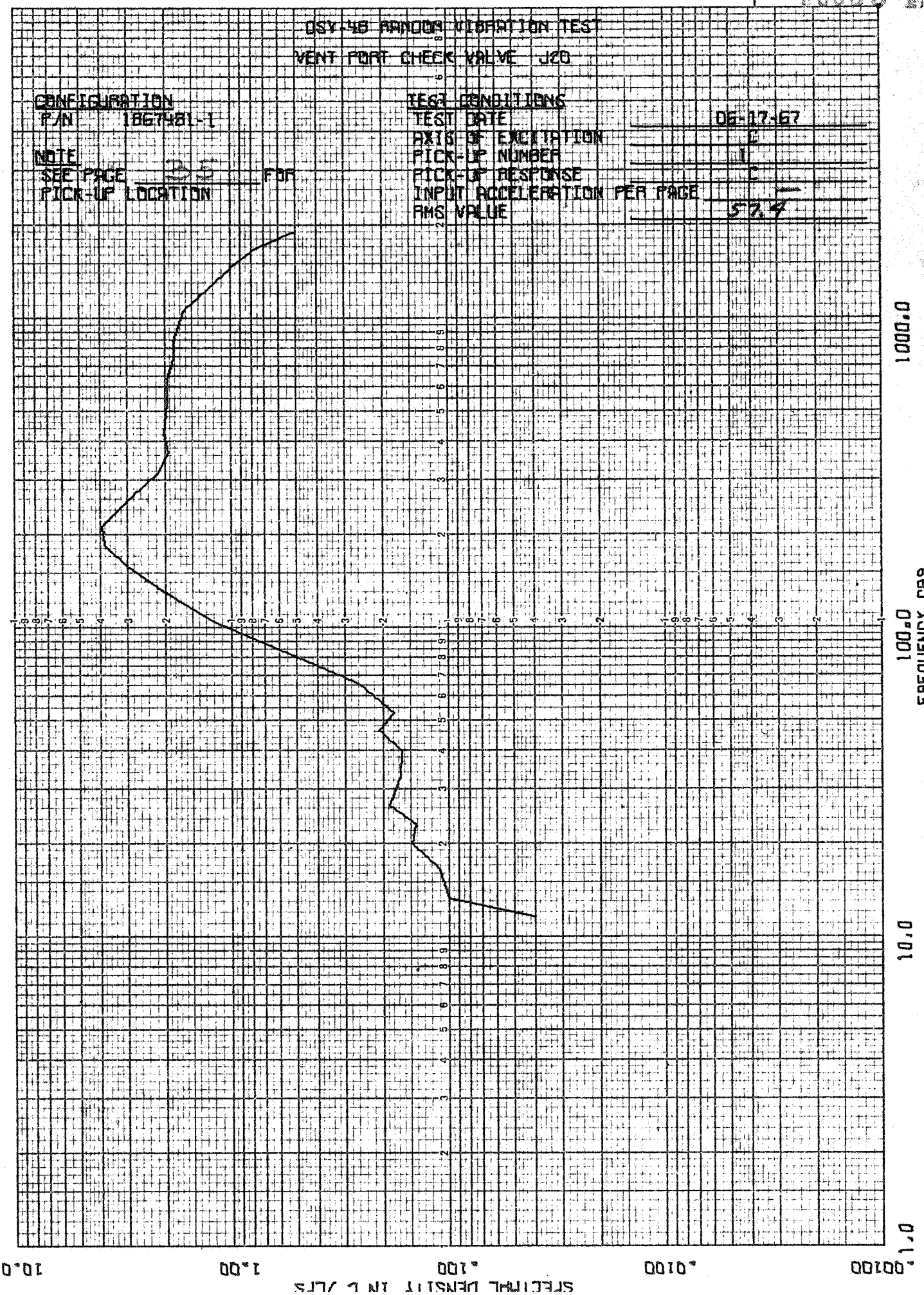
VENT PORT CHECK VALVE J-20

CONFIGURATION
P/N 1867481-1

NOTE
SEE PAGE B3 FOR
PICK-UP LOCATION

TEST CONDITIONS
TEST DATE 5-17-67
AXIS OF EXCITATION B
PICK-UP NUMBER 4
PICK-UP RESPONSE C
INPUT ACCELERATION PER PAGE A 23
RMS VALUE 14.1




OSV-4B RANDOM VIBRATION TEST
VENT PORT CHECK VALVE J20
CONFIGURATION
P/N 1867481-1
NOTE
SEE PAGE D5 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 06-17-67
AXIS OF EXCITATION L
PICK-UP NUMBER 1
PICK-UP RESPONSE C
INPUT ACCELERATION PER PAGE —
RMS VALUE 57.4
1000.0
100.0
10.0
1.0
FREQUENCY CPS
.0010
.0100
.100
1.00
10.0
SPECTRAL DENSITY IN G²/CPS

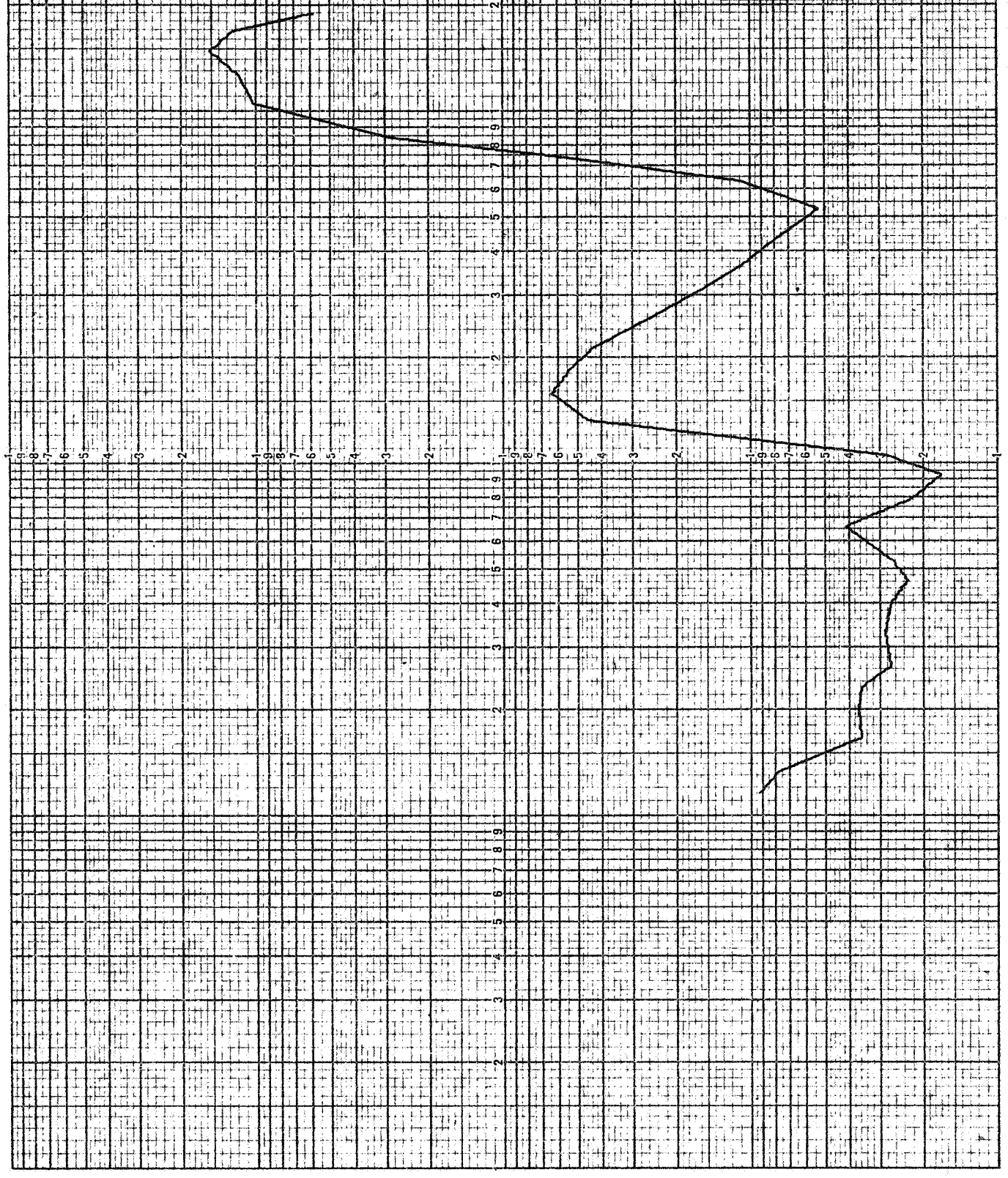
OSV-48 RANDOM VIBRATION TEST

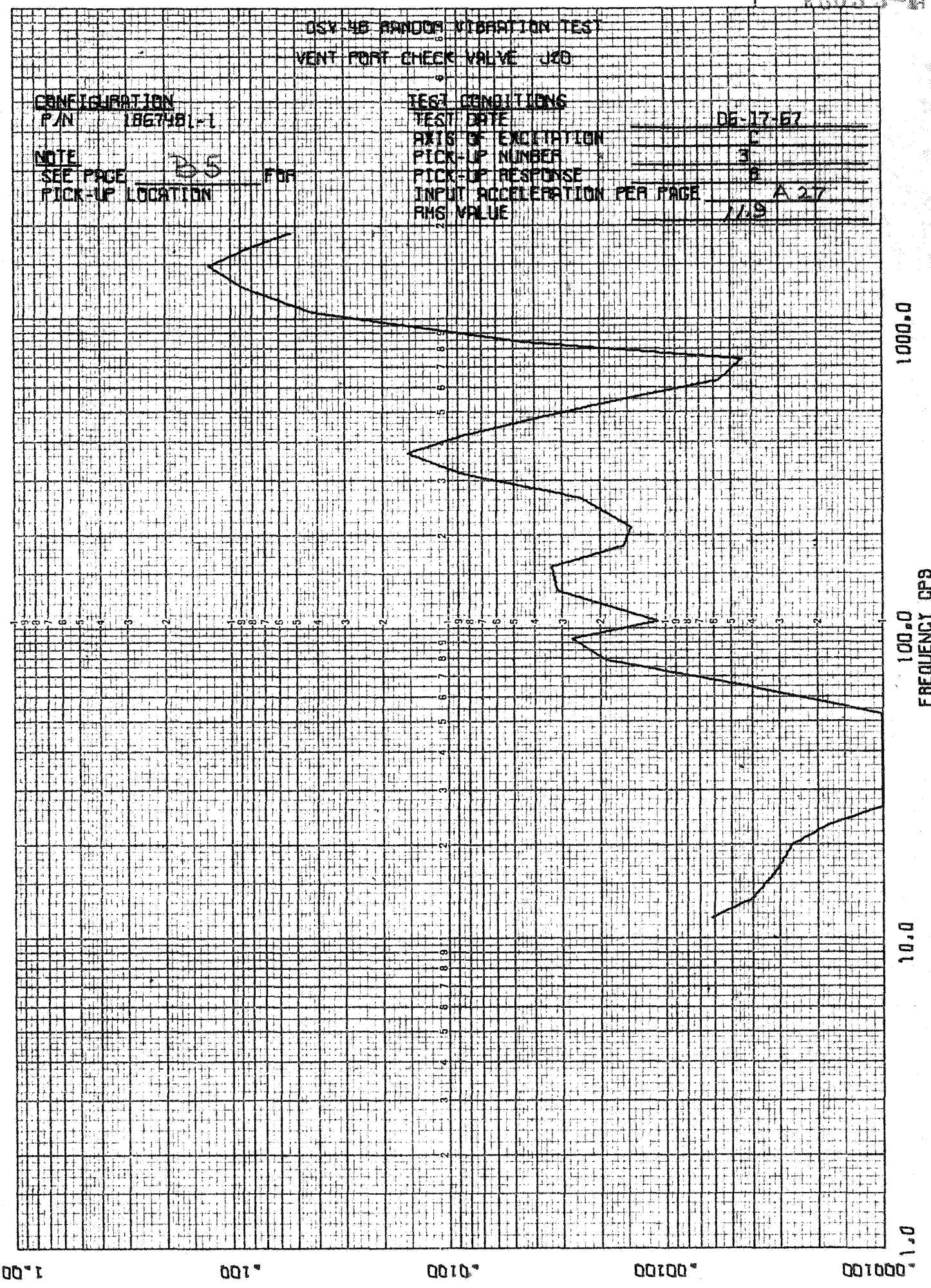
VENT PORT CHECK VALVE J20

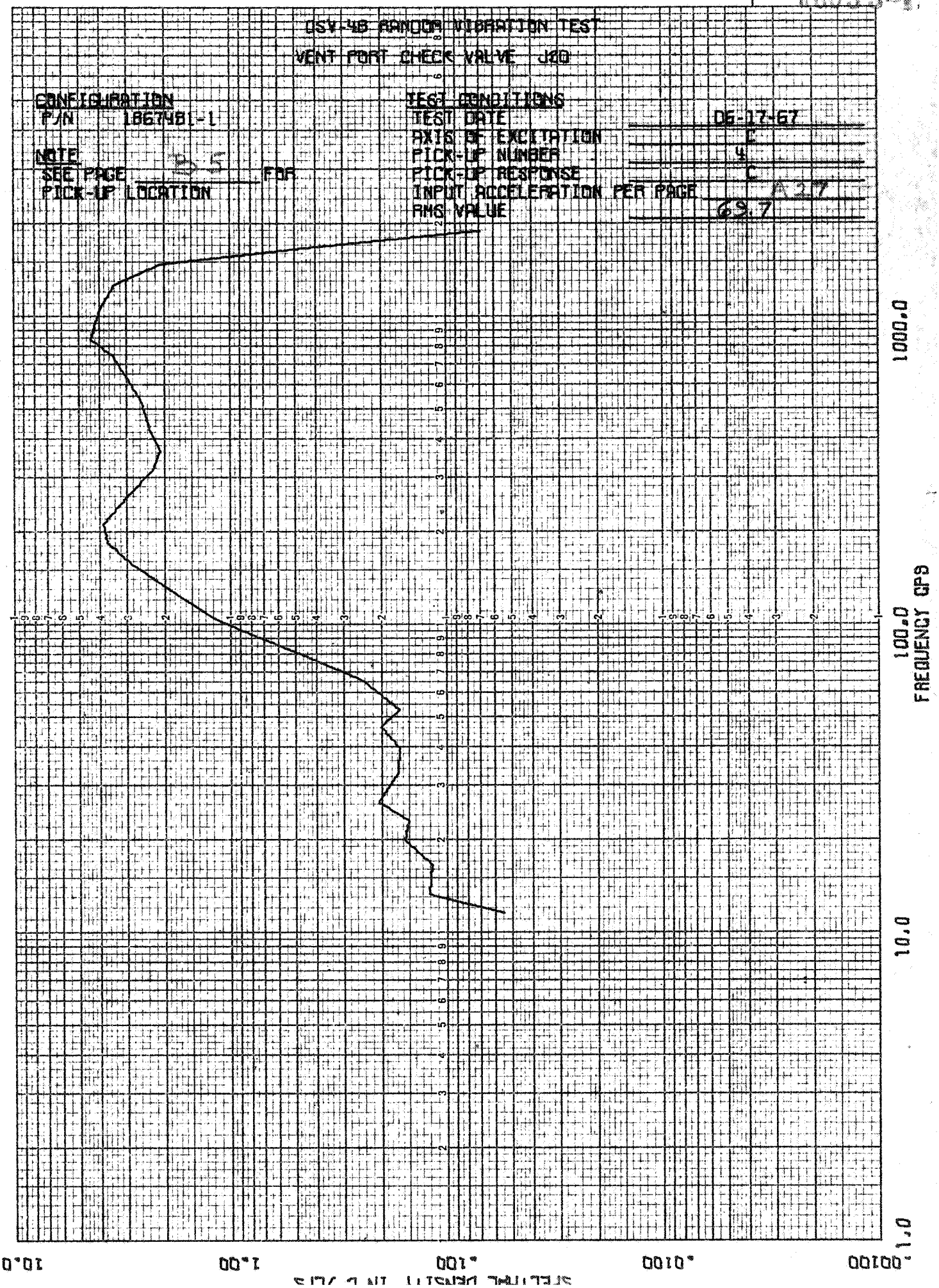
CONFIGURATION
P/N 1867481-1

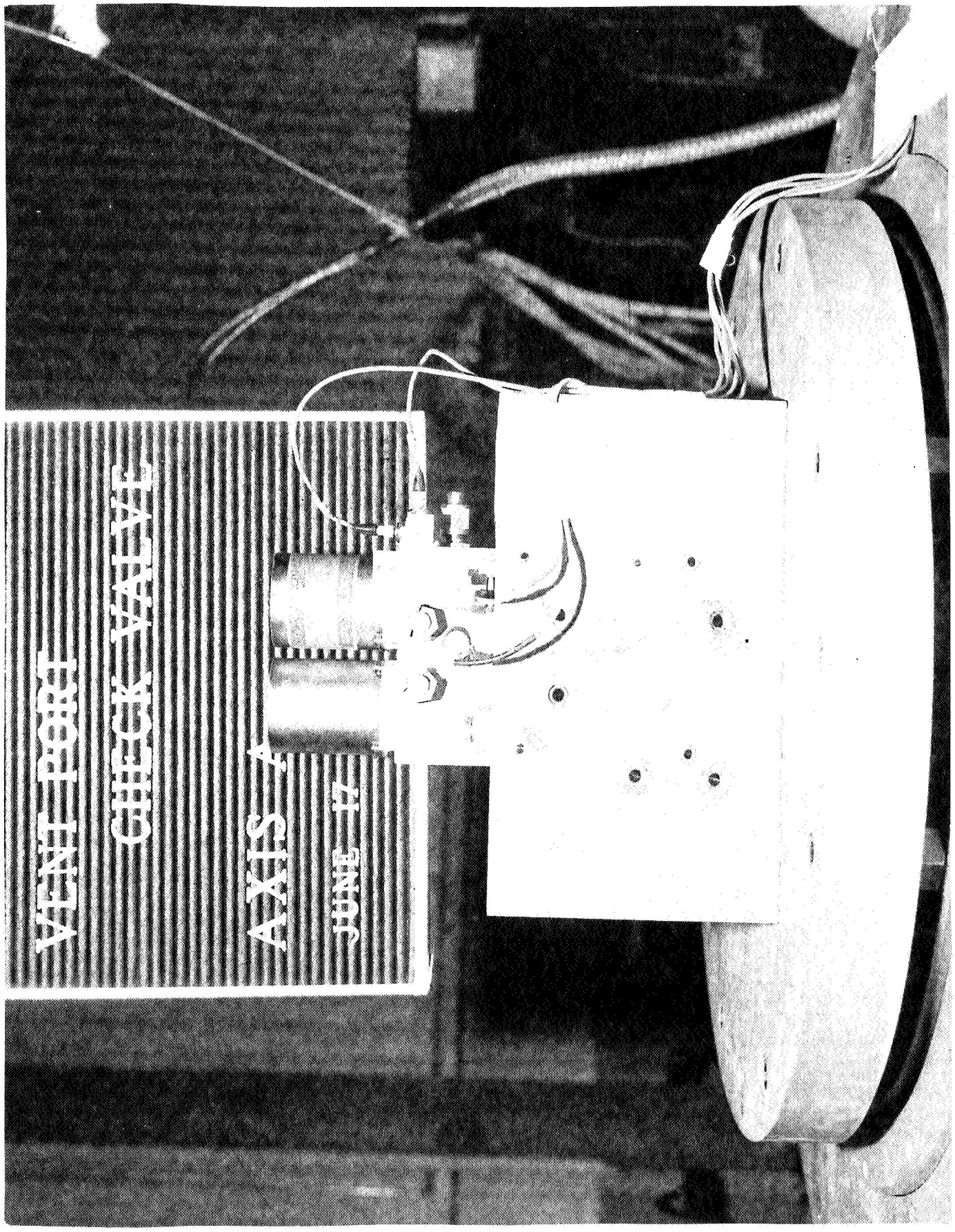
NOTE
SEE PAGE P-5 FOR
PICK-UP LOCATION

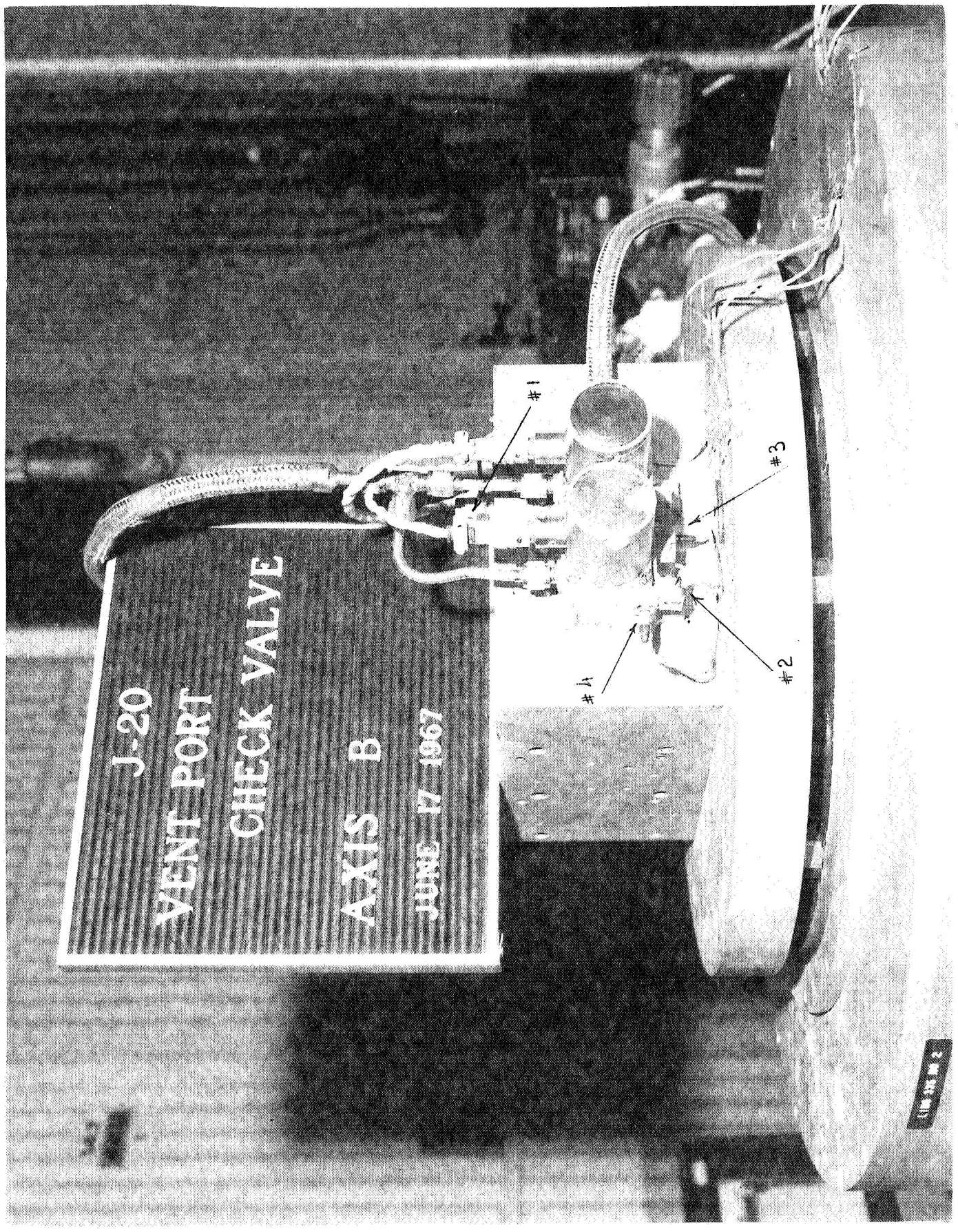
TEST CONDITIONS
TEST DATE 06-17-67
AXIS OF EXCITATION C
PICK-UP NUMBER 2
PICK-UP RESPONSE A
INPUT ACCELERATION PER PAGE A 27
RMS VALUE 37.2

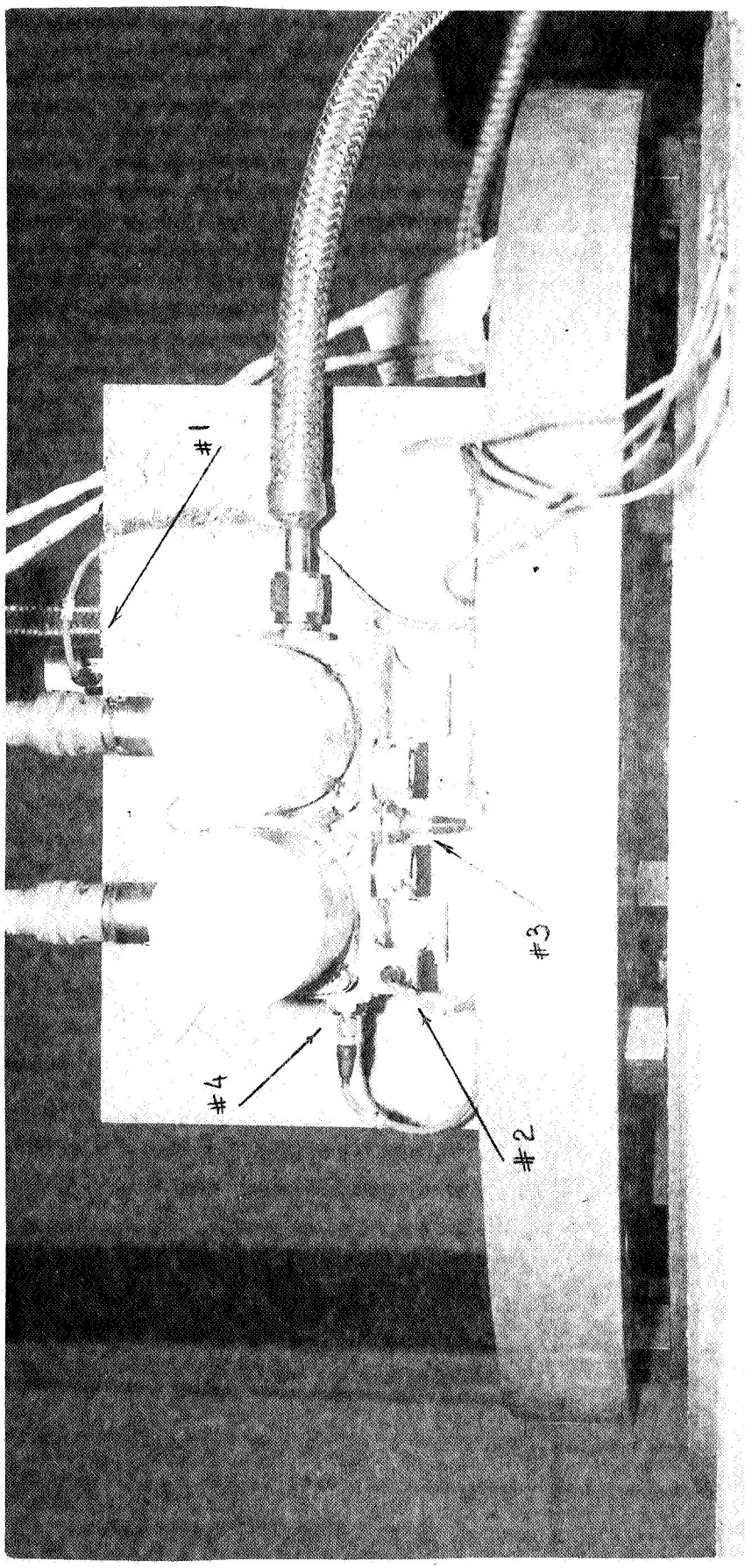


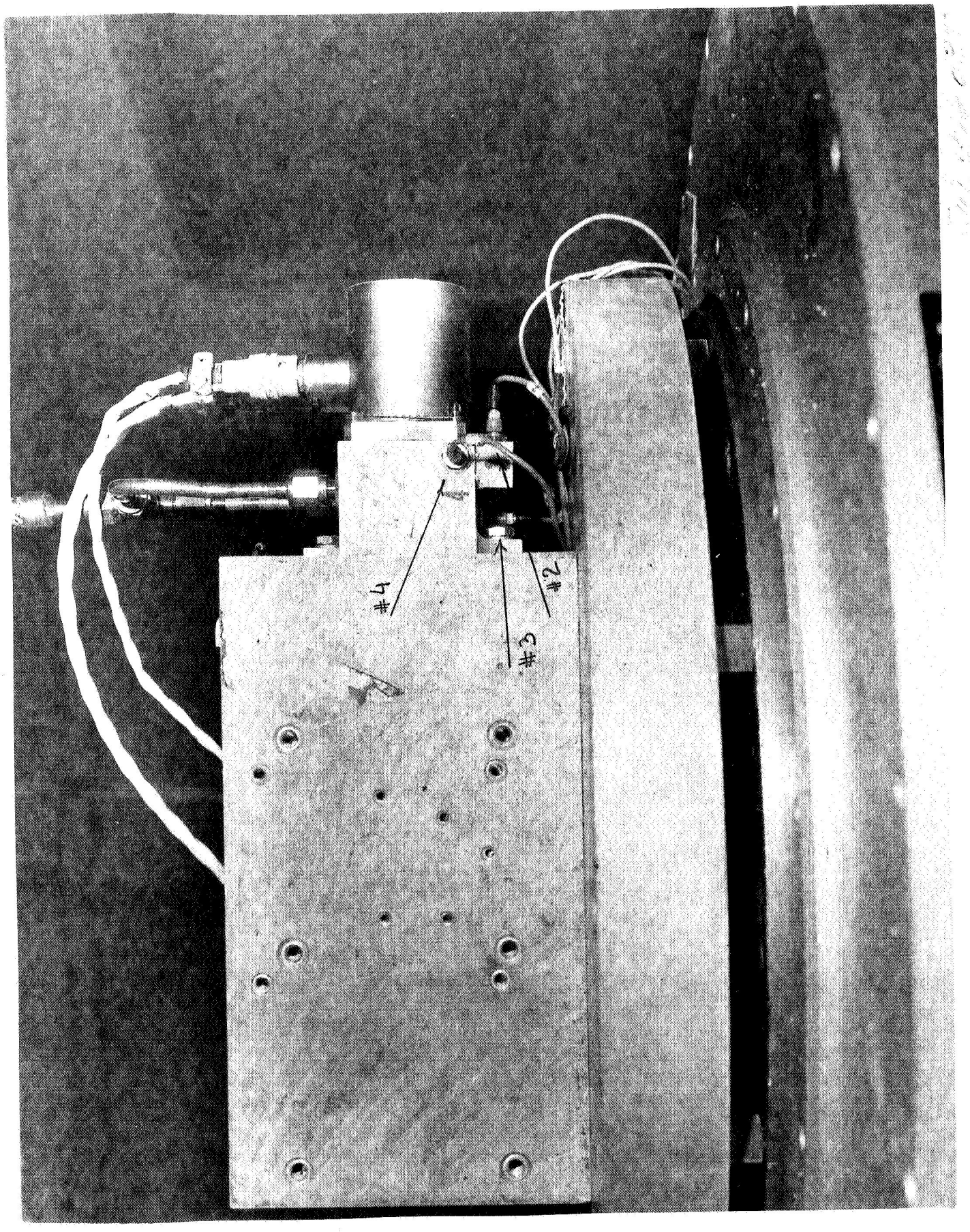

OSV-4B RANDOM VIBRATION TEST
VENT PORT CHECK VALVE J20
CONFIGURATION
P/N 1867481-1
NOTE
SEE PAGE B5 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE D6-17-67
AXIS OF EXCITATION C
PICK-UP NUMBER 3
PICK-UP RESPONSE B
INPUT ACCELERATION PER PAGE A27
RMS VALUE 11.9
1000.0
100.0
10.0
1.0
FREQUENCY CPS
1.00
.100
.0100
.00100
.000100

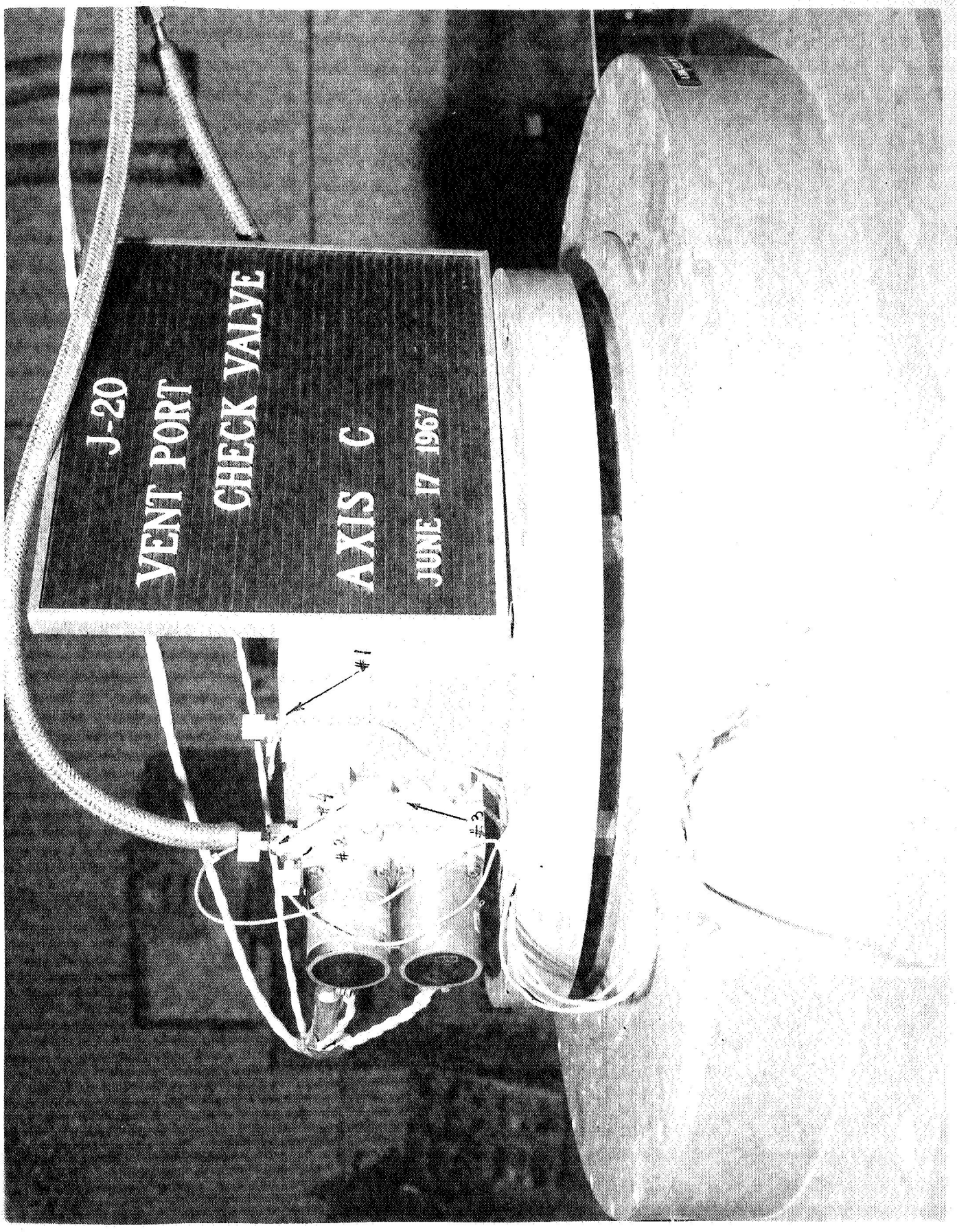

OSV-4B RANDOM VIBRATION TEST
VENT PORT CHECK VALVE J20
CONFIGURATION
P/N 1867481-1
NOTE
SEE PAGE B5 FOR
PICK-UP LOCATION
TEST CONDITIONS
TEST DATE 06-17-67
AXIS OF EXCITATION C
PICK-UP NUMBER 4
PICK-UP RESPONSE C
INPUT ACCELERATION PER PAGE A27
RMS VALUE 69.7
1000.0
100.0
10.0
1.0
FREQUENCY CPS
10.0
1.00
.100
.0100
.00100
SPECTRAL DENSITY IN G²/CPS


VENT PORT
CHECK VALVE
AXIS A
JUNE 17


J-20
VENT PORT
CHECK VALVE
AXIS B
JUNE 17 1967
#1
#2
#3
#4


#1
#2
#3
#4


#4
#3
#2



Accelerometer Locations, C Axis