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MAY 1 8 1961

MC-1264, 3-2
T-17636
13.858.00
4-12-61

9/27/98
RB Craner
10/6/98
W Layne

DECLASSIFY

TCG-NNT-1; TCG-SAFF-1

TO: DISTRIBUTION

Re: Vibration Test of MC-1264 Mounting Bracket (Dwg. 158699), Manufactured by Bendix

Object of Test

This test was conducted to prove the new design of the MC-1264 mounting bracket. The effect of vibration (per specification and overtest) was studied.

Authorization for Test

This test was requested by Division 7117 in a Work Order Authorization dated 3-7-61. Mr. P. L. Brown was the consultant. The material for test was received 3-9-61.

Summary

One MC-1264 bracket assembly was received for testing in accordance with the consultant's instructions. The assembly was mounted in the prescribed manner, and subjected to a resonant survey along each of the three mutually perpendicular axes. Upon completion of the resonance search, and while being vibrated at resonance along the Z axis, the battery mounting straps were found to be cracked and broken.

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A second modified bracket assembly was received for testing. A number of exploratory survey operations were conducted to determine which type of padding material reduced amplification at the MC-1264 battery. Vinyl was found to be the best material. The assembly was subsequently vibrated at resonance with no resultant damage.

At the consultant's request, the bracket assembly was subjected to an overtest to destruction. A resonant survey and vibration at resonance were conducted from 500 cps to 2000 cps with an input acceleration of 10.0g. Approximately 5 hours of overtest vibration were completed before cracked and broken mounting straps were noted.

Functional Measurements and Methods

The equipment and instrumentation used in this test are listed in Table I.

All tests were conducted in accordance with the consultant's instructions.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP

CLASSIFICATION CHANGED TO: U	AUTHORITY: W. C. Layne
Emilda Selph 10/08/98	99SN0053
PERSON CHANGING MARKING DATE	
W. C. Layne 10/12/98	10/06/98
PERSON VERIFYING MARKING DATE	

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DW
MC-1264
3-2

[redacted]

Test Specifications are noted as follows:

Vibration test from 10 to 500 cps.

Frequency Range (cps)	Constant Acceleration or Double Amplitude
10-73-10	0.036 inch
73-500-73	10.0g

1. Resonant search, record every 10 cps from 10 to 73 cps and every 20 cps from 73 to 500 cps.

   Resonance shall be determined by the most destructive frequency or amplification. (Pickup on each battery)

2. After the resonant search, vibrate the assembly along each of it's mutually perpendicular axes for 60 minutes in 15 minute cycles. (Subtract resonant search time from cycling time.)

3. Vibrate for 60 minutes at resonance, if no resonant frequency is noted, vibrate at 500 cps with 10.0g input.

Procedure and Results

One MC-1264 bracket assembly with two MC-1264 batteries was received for testing on 3-9-61.

This test assembly was mounted in a manner simulating an actual service installation, and subjected to the prescribed vibration test. (The test installation, pickup locations, and major axes are shown in Figure 1.) The battery strap bolts were torqued to 30 in. lbs. to conduct this test. A resonance (or critical frequency) search was first conducted in each of the three mutually perpendicular axes. Both filtered and unfiltered readings were taken for direct comparison, with no significant difference noted. Survey results are shown below:

Axis	Amplification	Frequency
X	Less than 2:1	To 500 cps
Y	8:1	460 cps
Z	7:1	340 cps

The test assembly was subsequently mounted along the Z axis and subjected to vibration at resonance. A significant change in the vibration output was noted at approximately 13 minutes of resonance vibration. The test was stopped and a visual inspection revealed strap breakage and cracking. (Bracket damage is shown in Figure 2.) The vibration test was interrupted at this point and the bracket assembly was returned to the consultant.

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A second MC-1264 bracket assembly was received for testing on 3-22-61. The strap mounting pin stock was increased in diameter to 1/4 inch, and the strap bolt torque was increased to 50 in. lbs. on this test assembly. This assembly was mounted in the prescribed manner (shown in Figure 1), and subjected to the test procedure described in Functional Measurements and Methods. No physical damage was noted during the vibration environment. Frequency response curves for the Y and Z axes are shown in Figure 4. (All amplifications below 2:1 were not plotted, hence no curve was plotted for the X axis.)

Since amplifications were high in the Y and Z axes, the bracket assembly was modified and the vibration test repeated. The standard rubber pads were replaced by pads made of a harder rubber material. Survey results indicated reduced amplifications in the X and Y axes, but amplification remained high in the Z axis (as shown in Figure 5).

The rubber pads were again removed from the bracket assembly. An aluminum pad was mounted in the battery No. 1 insert and a vinyl pad was placed in the No. 2 insert. This assembly was then subjected to a resonant search in the Z axis. Survey results indicated very high amplification on the aluminum pad. (A comparison of survey readings are plotted on Figure 6.) The aluminum pad was replaced by a second vinyl pad and a survey was conducted between 400 and 500 cps. Amplifications were reduced to the allowable limits (as specified by the consultant) on both of the batteries. Vibration at resonance was then conducted in each of the three mutually perpendicular axes, with the vinyl pads installed. Upon completion of this test, a visual inspection revealed no damage to the bracket assembly or batteries.

At the request of the consultant, the bracket assembly was subjected to an overtest. A resonant survey and one hour of vibration at resonance were first conducted in the Z axis. A 10.0g input acceleration was maintained between 500 cps and 2000 cps. Since no resultant damage was noted during this part of the test, the overtest was conducted in the Y axis. Again, no damage was noted. The overtest was continued in the X axis. Upon completion of the resonance survey, while attempting to pinpoint a resonant frequency, a battery mounting strap broke. (Bracket damage, as a result of overtest, is shown in Figure 3.) This bracket withstood approximately 5 hours of overtest vibration. The curves, plotted from the overtest survey data, are shown on Figure 7.

Upon completion of testing, the MC-1264 battery bracket assembly was returned to Division 7117.

for Bill Johnson
ROBERT B. FRANTZ - 7321-3

A. K. Alberts
A. K. ALBERTS - 7321-5

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RBF:7321-3:mep

Enc: Fig. 1-7
Table I

[redacted]

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Distribution:
E. I. Bruce, 7117
Attn: P. L. Brown
J. M. Wiesen, 1442
D. S. Bliss, 2344
E. H. Copeland, 7321
J. R. Harrison, 7523
R. K. Smeltzer, 3421-3

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FIG. 2 BRACKET DAMAGE DURING THE VIBRATION ENVIRONMENT

D#1-3273

[redacted]

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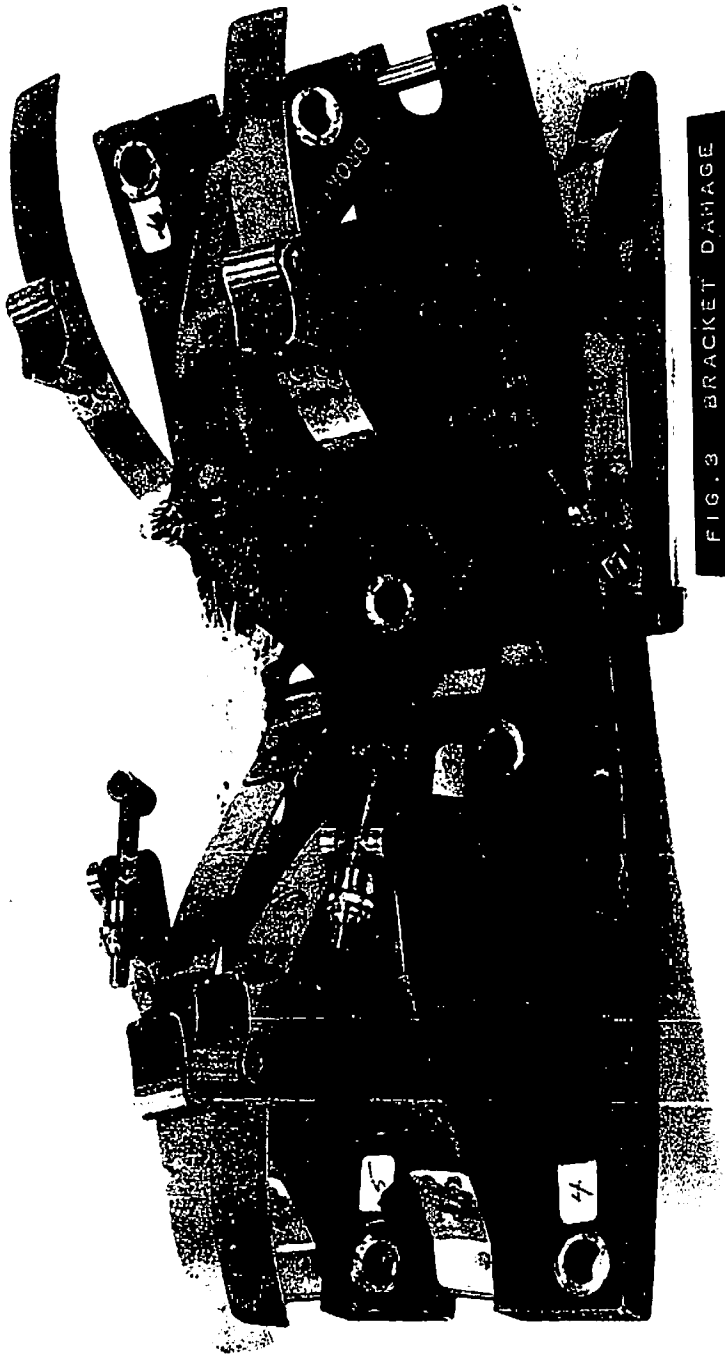

FIG. 3 BRACKET DAMAGE DURING THE OVERTEST VIBRATION ENVIRONMENT

T. 17636

D#1-5092

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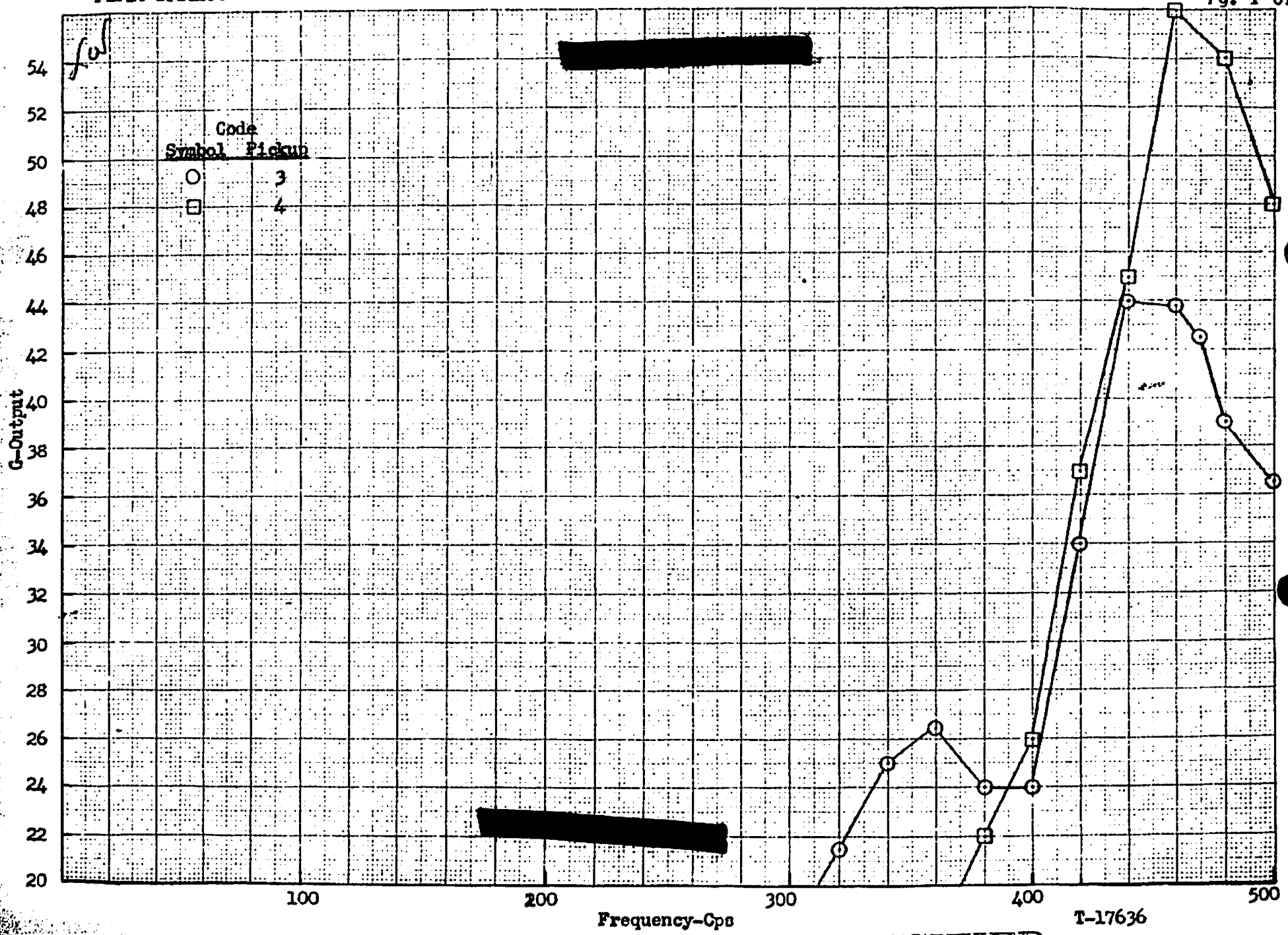
10 X 10 TO THE CM. 359-14
KEUFFEL & ESSER CO.

MC-1264 Resonant Survey
First Bracket

Unfiltered Y Axis

10g input

Fig. 4



T-17636

K+E 10 X 10 TO THE CM. 359-14 KEUFFEL & ESSER CO. MADE IN U.S.A.

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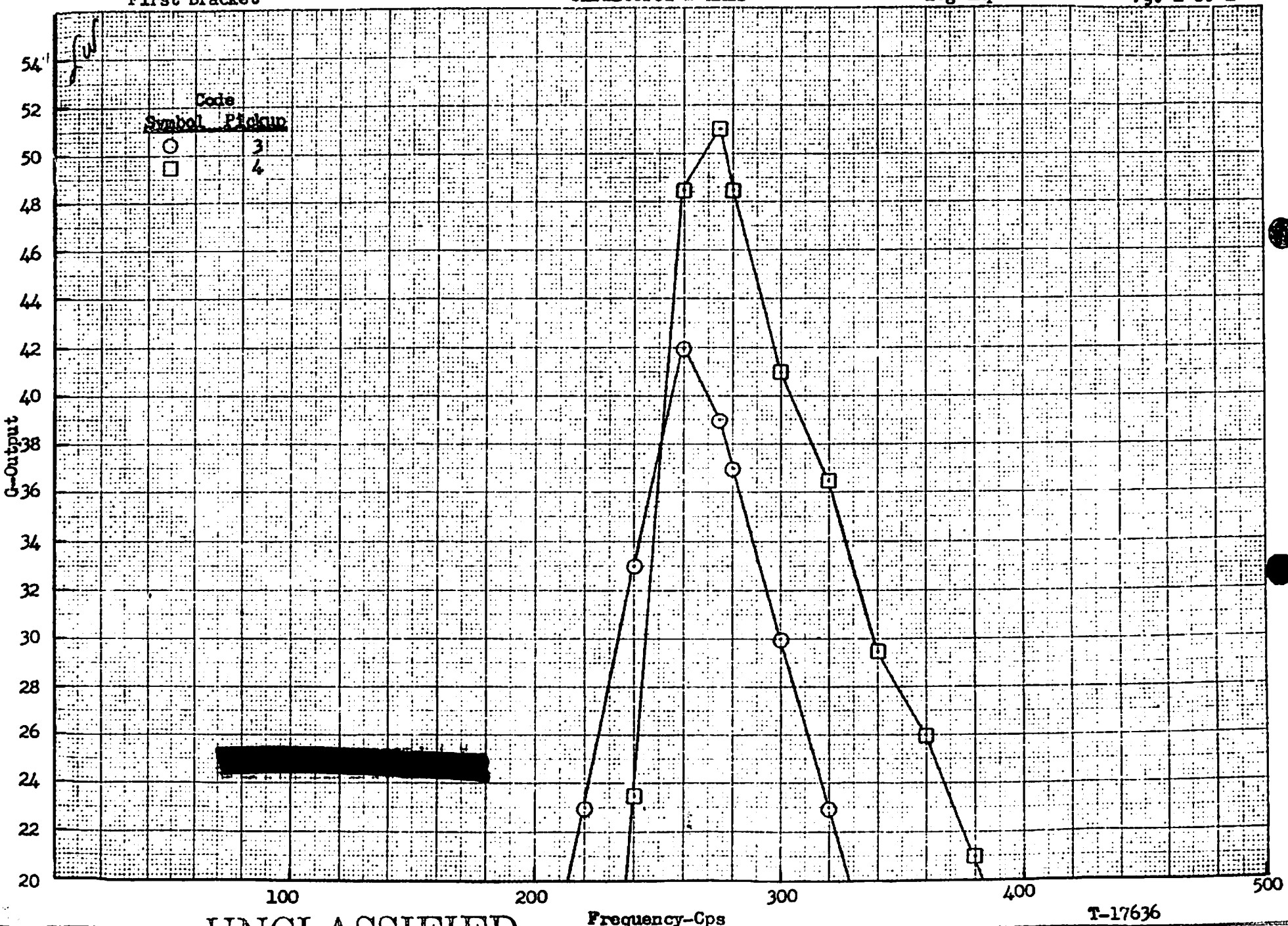
MC-1264 Resonant Survey
First Bracket

Unfiltered Z Axis

10g input

Fig. 4
Pg. 2 of 2



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K+E 10 X 10 TO THE CM. 359-14 KEUFFEL & ESSER CO. MADE IN U.S.A.

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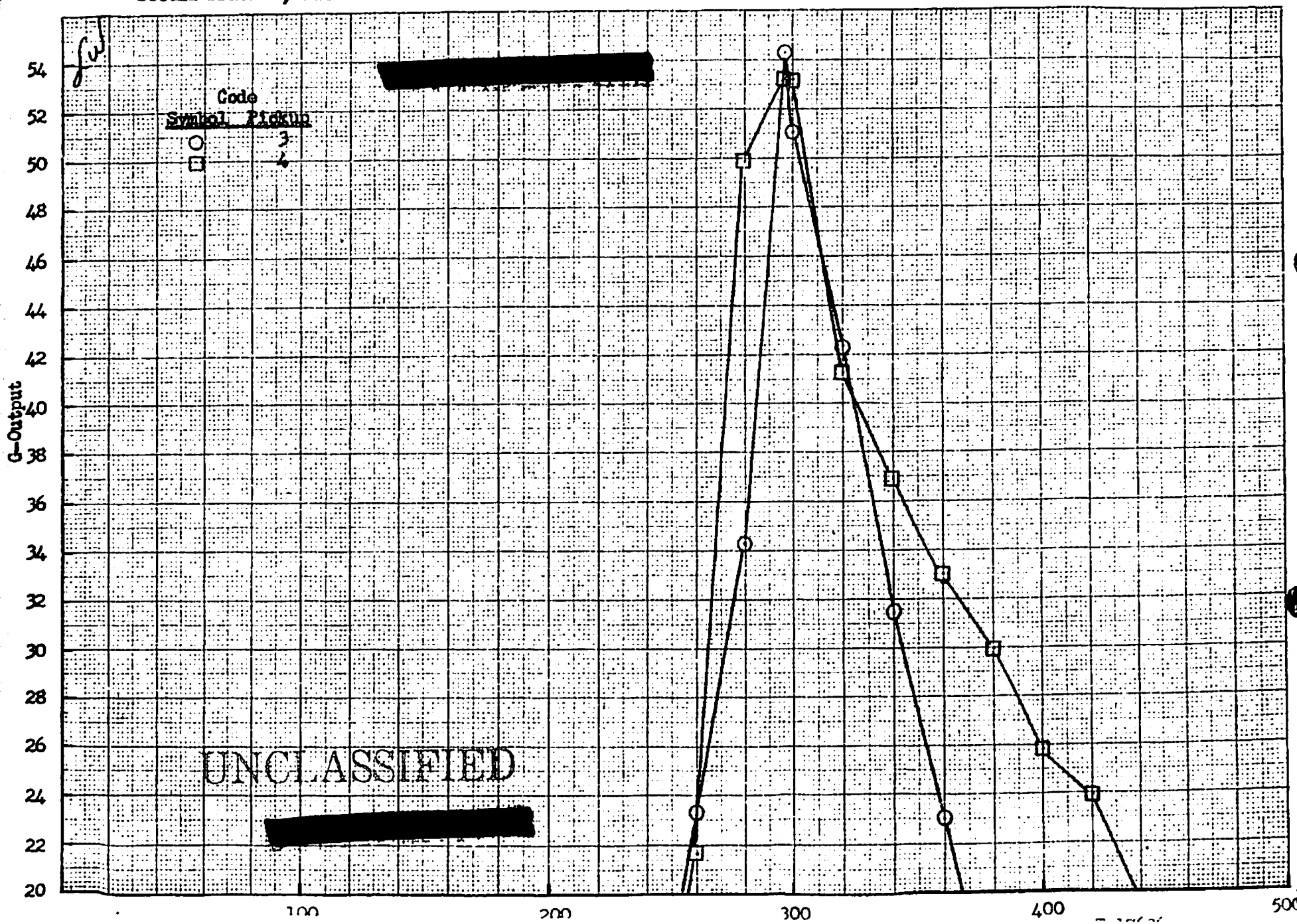
MC-1264 Resonant Survey
Second Bracket, Two Rubber Pads

Filtered Z Axis

10g input

Fig. 5



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K&E 10 X 10 TO THE CM. 359-14 KEUFFEL & ESSER CO.

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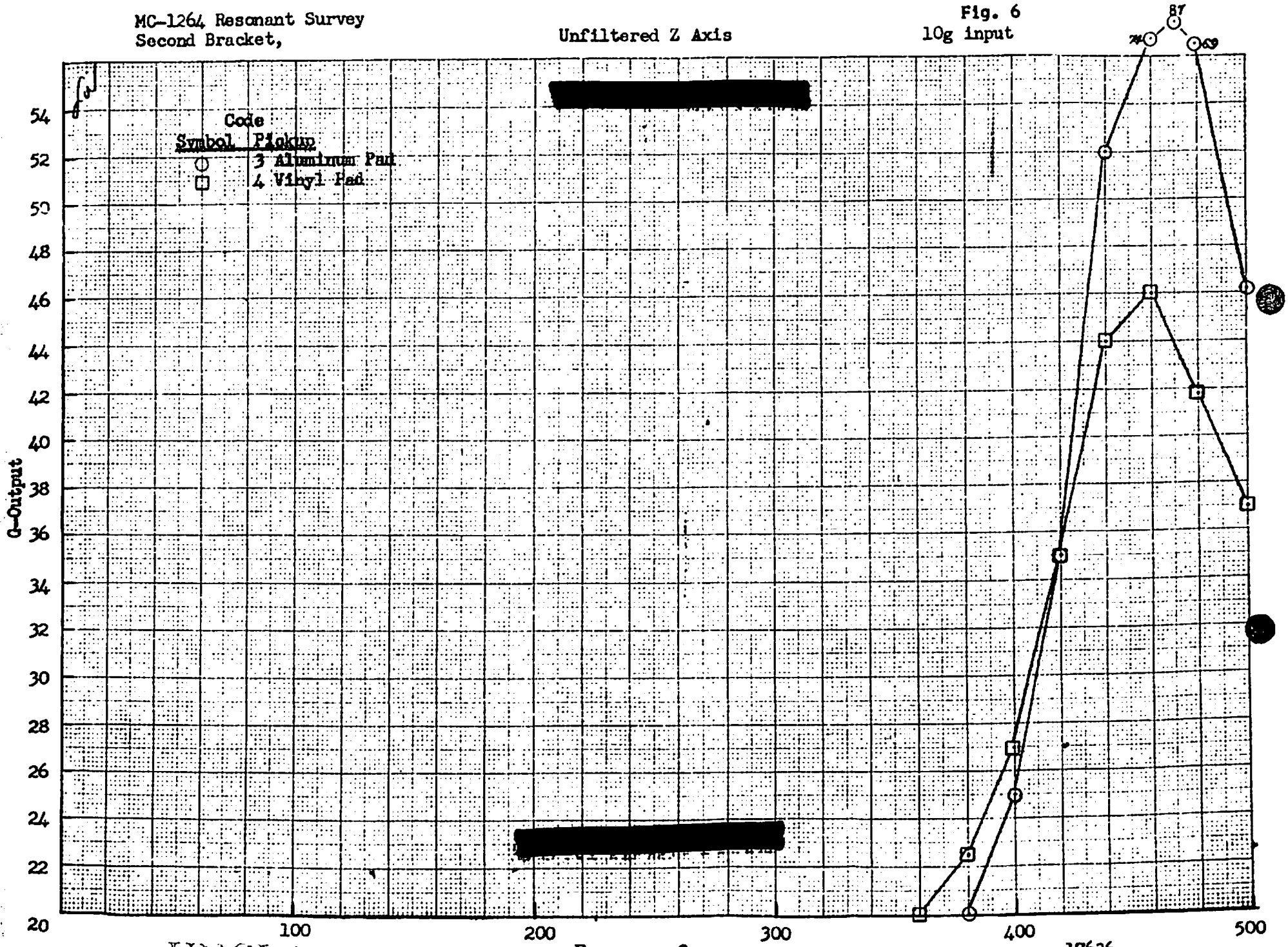
MC-1264 Resonant Survey
Second Bracket,

Unfiltered Z Axis

Fig. 6
10g input



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K+E 10 X 10 TO THE CM. 359-14
KEUFFEL & ESSER CO.

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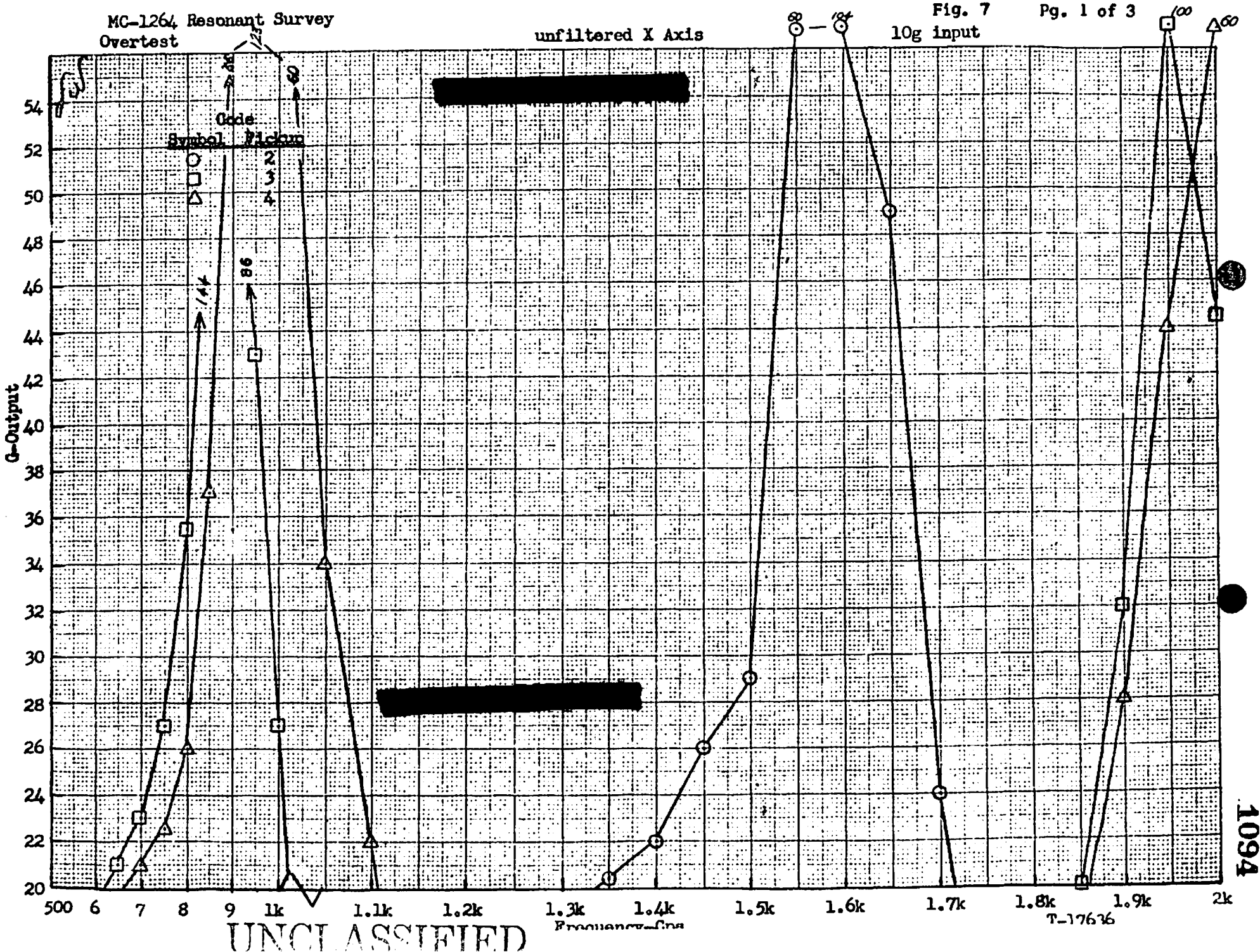

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K+E 10 X 10 TO THE CM. 359-14 KEUFFEL & ESSER CO.

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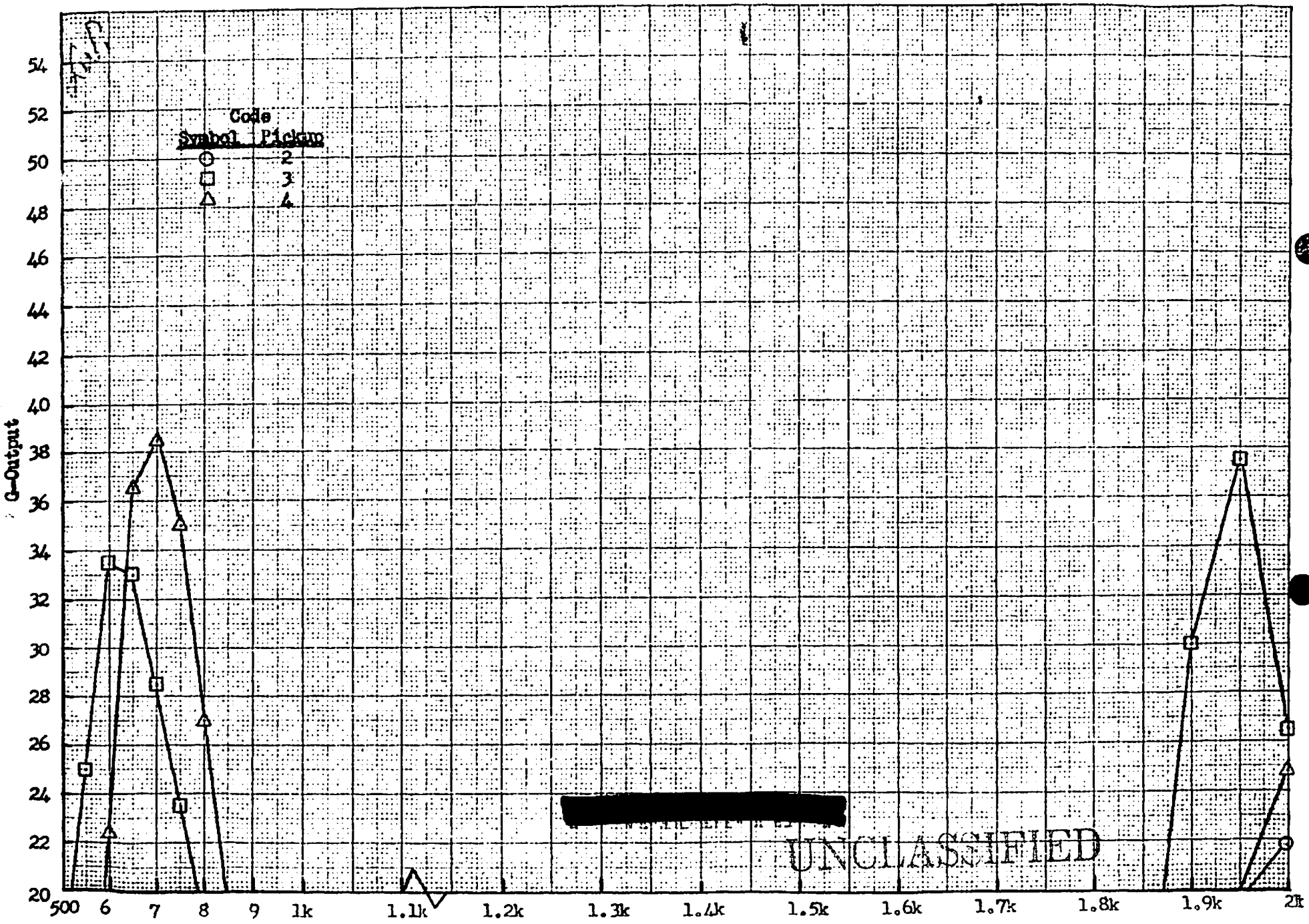
MC-1264 Resonant Survey
Overtest

Unfiltered Y Axis

10g input

Fig. 7
Pg. 2 of 3



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K+E 10 X 10 TO THE CM. 359-14
KEUFFEL & ESSER CO.

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MC-1264 Resonant Survey
Overtest

Unfiltered Z Axis

10g input

Fig. 7
Pg. 3 of 3

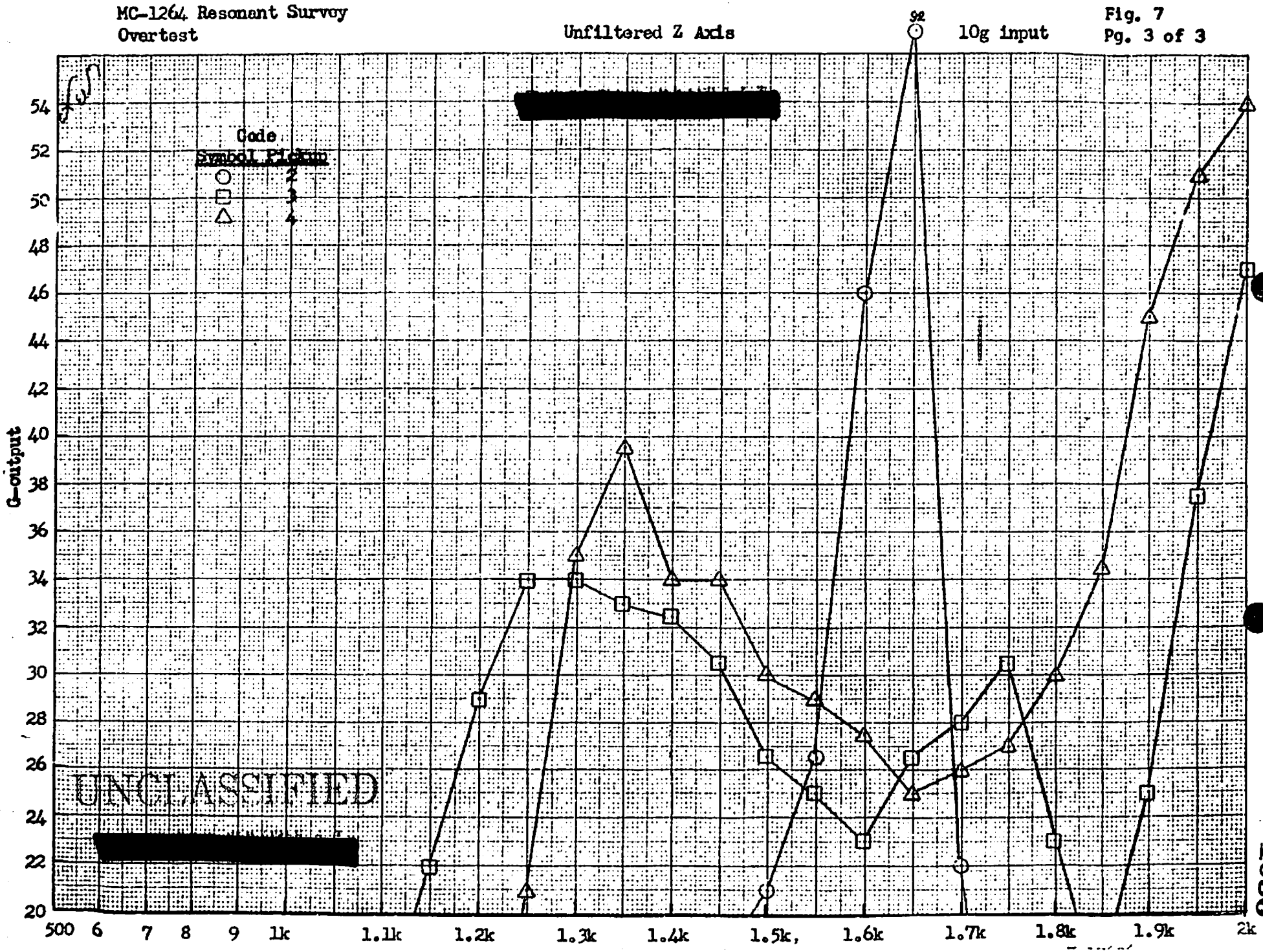

TABLE I
ENVIRONMENTAL
EQUIPMENT LIST

[redacted]

ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS	
1 *	VIBRATION TABLE	LING	No. 3	3-13-61	WEEK	SYSTEM	5-2000 CPS	*NOTE: SYSTEM TESTING BRACKET.	THIS USED IN FIRST
2 *	INPUT VOLTMETER	BALLANTINE MOD. 320	S # 106265	3-13-61	WEEK		—		
3. *	INPUT ACCELEROMETER	ENDEVCO MOD. 2213	S # 4653	PRIOR TO TEST	TEST	ACCURACY:	—		
4. *	OUTPUT ACCELEROMETERS	ENDEVCO MOD. 2213	S # 106267	PRIOR TO TEST	TEST		—		
5. *			S # 8403	PRIOR TO TEST	TEST	± 10 %	—		
6. *			S # 5609	PRIOR TO TEST	TEST		—		

[redacted]

TABLE I
ENVIRONMENTAL
EQUIPMENT LIST

[redacted]

ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS	
7 *	LOW PASS FILTER	SKL	S # 8096	PRIOR TO TEST	TEST	SYSTEM ACCURACY: ± 10 %	800 CPS CUTOFF		
8 **	VIBRATION TABLE	MB	No. 6	4-10-61	WEEK		5-2000 CPS	** NOTE: THIS SYSTEM USED IN TESTING SUBSEQUENT BRACKETS.	
9 **	INPUT VOLTMETER	BALLANTINE MOD. 320	S # 93105	4-10-61	WEEK		—		
10 **	OUTPUT VOLTMETER	BALLANTINE MOD. 320	S # 106266	4-10-61	WEEK		—		
11 **	INPUT ACCELEROMETER	ENDEVCO MOD. 2213	S # 4509	PRIOR TO TEST	TEST		—		
12 **	HIGH-LOW PASS FILTER	SANDIA	SER. # 64235	PRIOR TO TEST	TEST		LO: 800 CPS HIGH: 3 KC		

[redacted]

TABLE I
ENVIRONMENTAL
EQUIPMENT LIST

[redacted]

ITEM NO.	NAME	MFG. & MODEL	S-NO./ SER. NO.	DATE OF LAST CAL.	CAL. PER.	ACCURACY	RANGE	REMARKS
** 13.	ACCELEROMETERS OUT PUT	ENDEVCO MOD. 2213	S # 4658	PRIOR TO TEST	TEST	SYSTEM ACCURACY ± 10%	—	
** 14.			S # 7452	PRIOR TO TEST	TEST		—	
** 15.			S # 6465	PRIOR TO TEST	TEST		—	
** 16.	WAVE ANALYZER	PANORAMIC	No. 113427	PRIOR TO TEST	TEST		—	
				[redacted]				