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DEC 5 1958

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date: 7/28/98
Authority: ADC ADD
Name: W Payne
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Name: R B Craven
Determination (Circle Number(s))
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O K Goldpenner

MK 7 Mod 3 Fuse, 3-2
Project No. ET-7090
Case No. 608.01
Completed 10-6-58
Ref. Sym: 1611(388)

INVENTORIED
DATE 10-30-61
JTR

INVENTORIED
JUL 3 1962
3441-1

INVENTORIED
AUG 6 1964
3427-1

MK 7 Mod 3 Fuse Vibration Tests

INVENTORIED
MAR 2 1959
BY ORG. 4/22

Summary of Results

Difficulties encountered during temperature and vibration with components of the MK 7 were as follows:

1. During the CAT at -65°F, trouble apparently occurred in the MC-73 Timer.

2. During CAT at 165°F difficulty was encountered in setting the MC-219 potentiometers. It was not possible to set R4 at 55 seconds. It jammed at 51.75.

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3. After Axis II vibration, the MC-134 would not charge during channel 1 contact fuzing test. Examination of the MC-73 revealed that the Timing Gear Assembly had traveled down the screw far enough to allow the TO switch to activate. It would not move farther without manually forcing it. Once it was forced, the timer ran down and the X-unit charged. Repeated attempts to cause the failure to repeat were not successful.

4. During Axis III vibration, at approximately 100 cps, one of the "Special Plate Nuts", which holds the MC-73 mount, broke away from the frame.

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5. The MC-219, which was vibrated separately, failed during Axis III vibration. During paragraph 70.5 of the CAT, the MC-219 would not quit stepping. Post mortem revealed failure in the S-3 Motor Driven Relay. The brushes were not mating with the commutator.

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6. During vibration, a notch was cut from the top of the MC-3 on the one pad side of the cartridge. This notch was apparently caused by interference with a rivet head on the MC-35.

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CLASSIFICATION CHANGED TO: U
AUTHORITY: R. B. Craven
PERSON CHANGING MARKING & DATE: Emelda Selph 7/28/98
RECORD ID: 98SN3182
PERSON VERIFYING MARKING & DATE: W C Payne 7/30/98
DATED: 7/28/98

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Object of Test

The object of this test was to compare the MK 7 Mod 3 Fuse to the MK 7 Mod 2 Fuse, during vibration exposure. This especially involved padding used on the ends of the MC-3, and the new vibration mounts used on the MC-73. It was requested in a Work Order dated 7-14-58. Mr. R. W. Donohoe, 5522, was the consultant.

Procedure and Results

One MK 7 Mod 3 Fuse, number 76586, consisting of the following components was tested:

MC-73 Interval Timer	EY-14472-K6
MC-219 Remote Switching Control	AA-3944-G5
	AA-2503-B4-L7
MC-131 Interconnecting Box	AA-5061-F7
MC-251 Motor Generator	AF-21949-A5
MC-251 Motor Generator	AF-21629-A5
MC-3 Radar Set	
MC-3 Radar Set	
MC-291 Battery Box	AK-0031-C3
MC-291 Battery Box	AK-0070-C3
MC-84B Dynamotor	
MC-84B Dynamotor	

On 7-30-58, initial CAT was performed using T-196, Serial Number BR-B007-F4, T-160 Serial Number EV-0382-B5 and MC-134, Serial Number AS-1121-G4. No calibration date was available for these units. During this initial CAT the unit functioned in accordance with IMI-300339, Issue B.

On 8-7-58 another CAT was performed with the unit (including an MC-219) stabilized at -65°F. Prior to and during the CAT, the heater in the MC-73 was operating. During the test per paragraph 70-10, which was part of the Timer Setting R-4 test, the X-unit had not charged after 6 minutes. After six minutes, almost zero time was required to reset the timer so it appeared that the timer had not run down at all. The sequence was repeated and the unit functioned properly.

Following tests at -65°F, the unit was removed from the chamber and allowed to return to ambient temperature. It was then placed in a chamber and stabilized at 165°F. CAT tests were run with the unit at this temperature. During these tests, the potentiometers on the MC-219 (R2, R4 and R5) were difficult to turn. R4 was supposed to be set at

55 seconds but it jammed at 51.75 seconds and could not be moved any farther. The test was satisfactory except for the time involving the R-4 setting.

On 9-6-58, the unit was vibrated along Axis I which was along the longitudinal axis of the fuse. This vibration consisted of a resonance search from 10 to 300 cps with an input of 3 g and vibration at resonance for one hour with an input of 3 g. Accelerometers were located as shown in Figures 2 and 3. Resonances occurred at 70 cps, 170 cps and 300 cps so the one hour of resonance vibration was divided equally among these three frequencies. During CAT following this axis of vibration, the channel 2 timer motor sounded like it was laboring, even with the timer in the reset position. The unit functioned properly during this CAT. Figure 4 shows plots of accelerations on the different components during this vibration.

Following vibration along Axis I, the same procedure was repeated along Axis II which was the transverse axis of the fuse parallel with the transverse axes of the MC-3's. Resonant frequencies along this axis were 70 cps, 260 cps and 300 cps. The hour of resonance vibration was divided equally among these three frequencies. Following this vibration, a CAT was performed. The time for paragraph 40-6 was 42.32 seconds compared to a specified time of 5.00 ± 0.40 seconds. During test per paragraph 100-5, the X-unit would not charge. It was suspected that trouble existed in the timer so it was removed and examined. No electrical troubles were evident, but it appeared that the "Timing Gear Assembly" was bound mechanically. It had travelled down the screw far enough for the TO switch to activate but would not move farther down the screw. It was manually forced, allowing the timer to run down and charge the X-unit. Repeated attempts to cause it to repeat the difficulty were unsuccessful and the test finished with no more trouble. Figure 5 shows plots of the accelerations.

Following vibration along Axis II, the procedure was repeated again along Axis III. This was the transverse axis of the fuse perpendicular to the transverse axis of the MC-3's. During the resonance search along this axis, one of the "Special Plate Nuts", which holds the MC-73 mounts, broke loose from the fuse structure. See Figure 3. The MC-73 was removed and vibration continued along this Axis. CAT performed after completion of this vibration, using the MC-73 that had been removed, was satisfactory. Figure 6 shows plots of the accelerations.

The MC-219 was not vibrated during the rest of the vibration so a separate vibration test was run on a new unit numbered AA-2503-B4-L7. A complete CAT was run following each axis of vibration. Following Axis III vibration which was parallel to the base and the narrow

dimension of the switch, trouble developed. During the part of the test per paragraph 70.5, the switch would not quit stepping. The test was stopped and the MC-219 was post-mortemed by Organization 5522. This post-mortem revealed trouble in the S-3 motor driven switch. The armature had been displaced enough to prevent the brushes from mating with the commutator bars.

One other vibration test was run on the fuse, the object of which was to evaluate the MC-3 pads during conditions of low temperature. The entire fuse with the vibration jig and ballast unit mounted together was stabilized at -65°F. A moisture proof cover was placed around the fuse and packed with dry ice while the unit was being mounted on the vibration table. Vibration was started with the dry ice still in the container. The dry ice was then removed and vibration continued. Thermocouples mounted on the pads, initially read -43°F on the top pad of the radar that had two pads, -107°F on the bottom pad of this radar and -33°F on the pad on top of the radar that used only one pad. By the time the vibration cycle reached 500 cps, the first thermocouple read -35°F, the second read -120°F and the third -10°F. Apparently the thermocouple which read -120°F had a piece of dry ice laying against it. Resonance occurred at 16 cps on the radar with two pads. The temperature on this pad was 7°F at the time resonance was determined.

Hardness tests were made on the pads before and after vibration. Before vibration the average reading of the Shore Hardness Durometer, Type A-2, was approximately 25. Following vibration, the average was 11 in the damaged area of the small pad and 17 in the damaged area of the large pad. In the undamaged area of the large pad, it averaged 20-25 and in the undamaged area of the small pad it averaged 20-25. The damaged areas were located where the most intimate contact was made between the radar and the pads.

Compression tests were run on samples of these pads, 1.75 inches in diameter. These tests were run with an Instron Testing Machine, plotting displacement versus applied force for five conditions of the pad. One was run with the pad at 165°F, one at ambient after 165°F, one at -65°F, one at ambient after -65°F and one at ambient before any other condition. Figure 7 shows these curves.

During the entire test, contacts of the various components were monitored for chatter and no chatter was evident.

This completed tests to be performed on this fuse.

Bill Johnson

Test Engineer: BILL JOHNSON - 1611-1

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Distribution

ET-7090
Ref. Sym: 1611(388)
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Approved by: R. S. HOOPER - 1611-1

BJ:1611-1:cc

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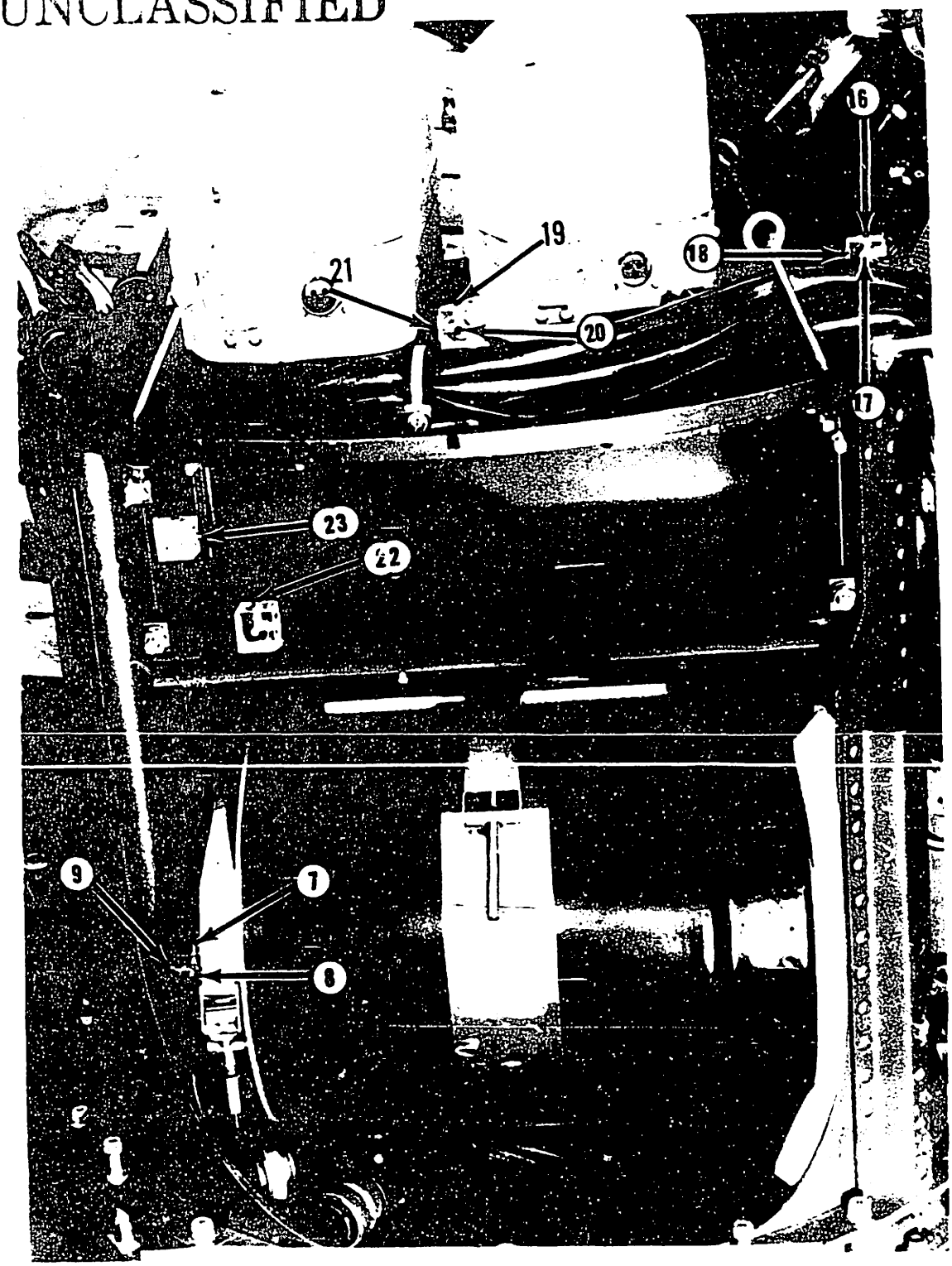

FIGURE 1 - ACCELEROMETER LOCATIONS, MK 7 MOD 3 FUSE

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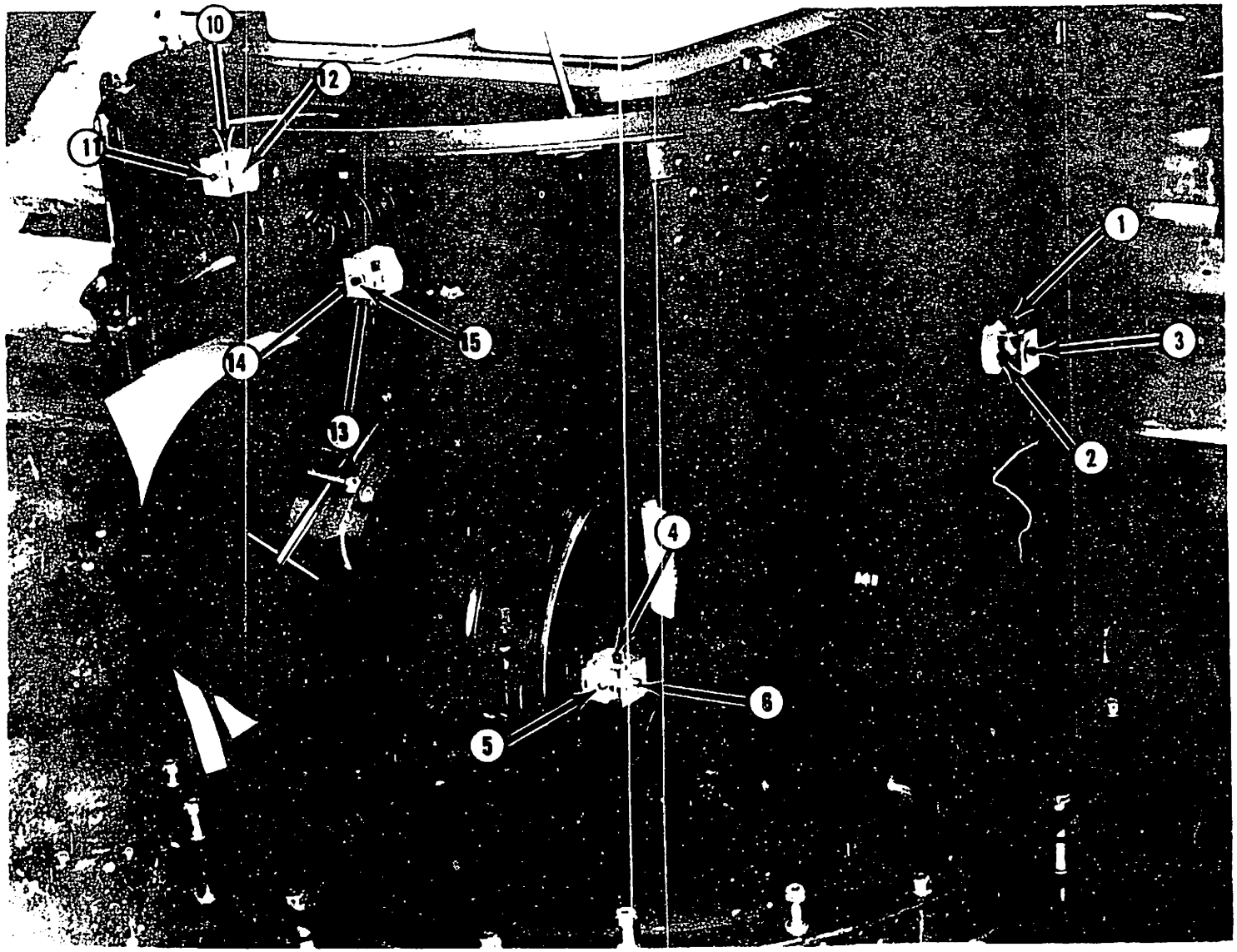

FIGURE 2 - ACCELEROMETER LOCATIONS, [illegible]

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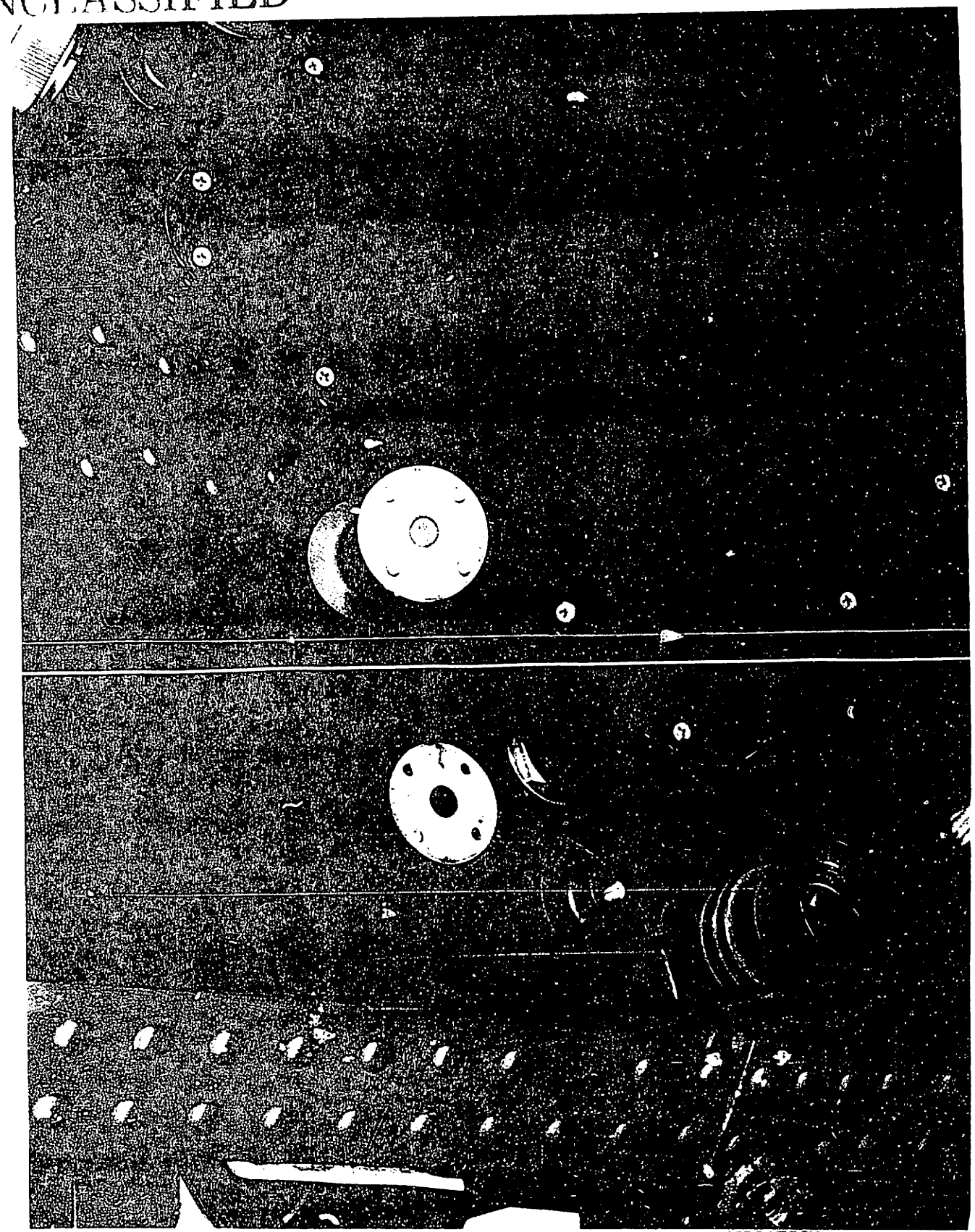

FIGURE 3 - BROKEN SPECIAL PLATE NUT RIVETS DURING AXIS III VIBRATION

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N.B. - Symbols indicate sensitive direction of accelerometer.

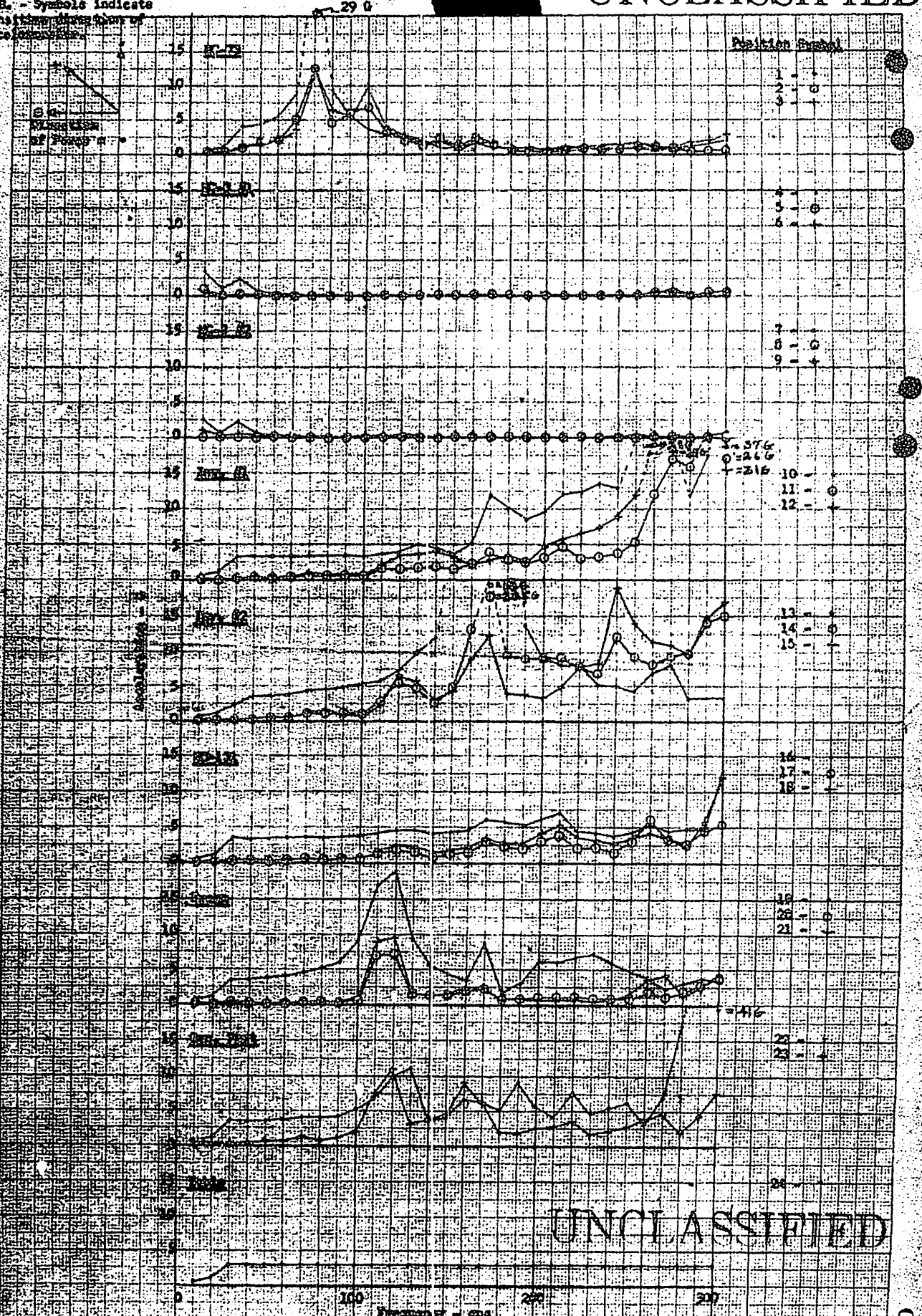

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FIGURE 4 - TRANSMISSIBILITY CURVES FOR RK 7 [illegible] FUSE FROM 10 - [illegible] CPS ALONG AXIS I

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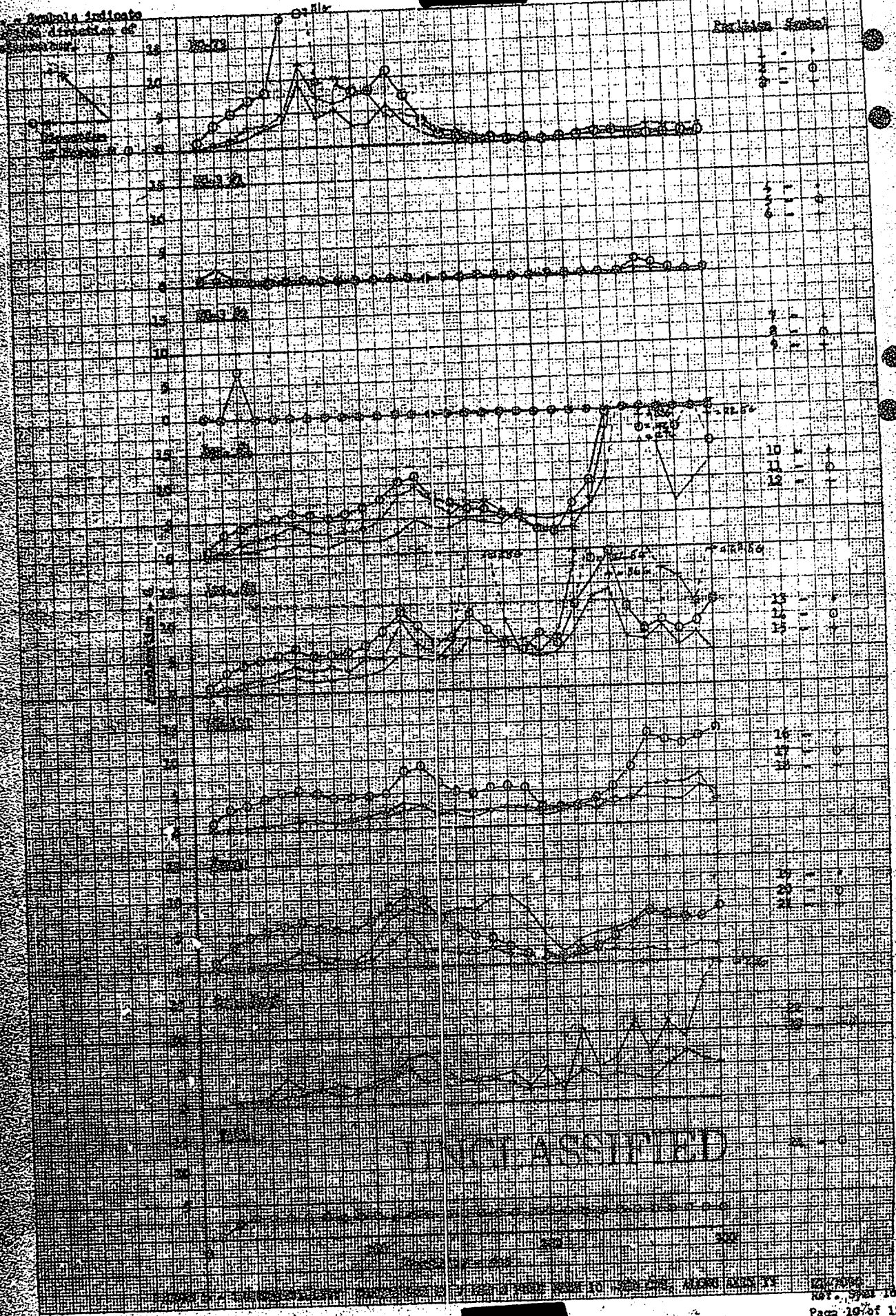

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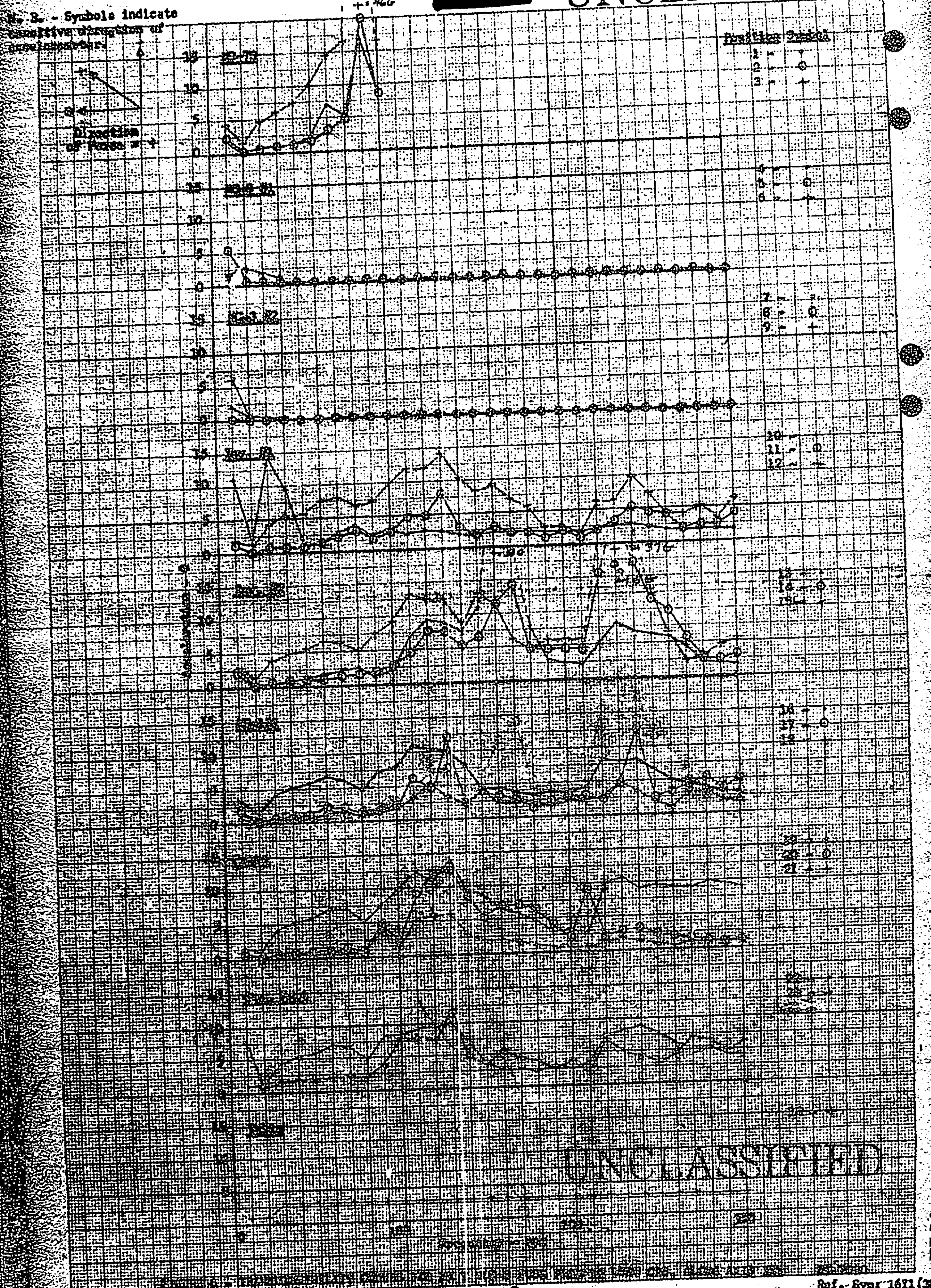

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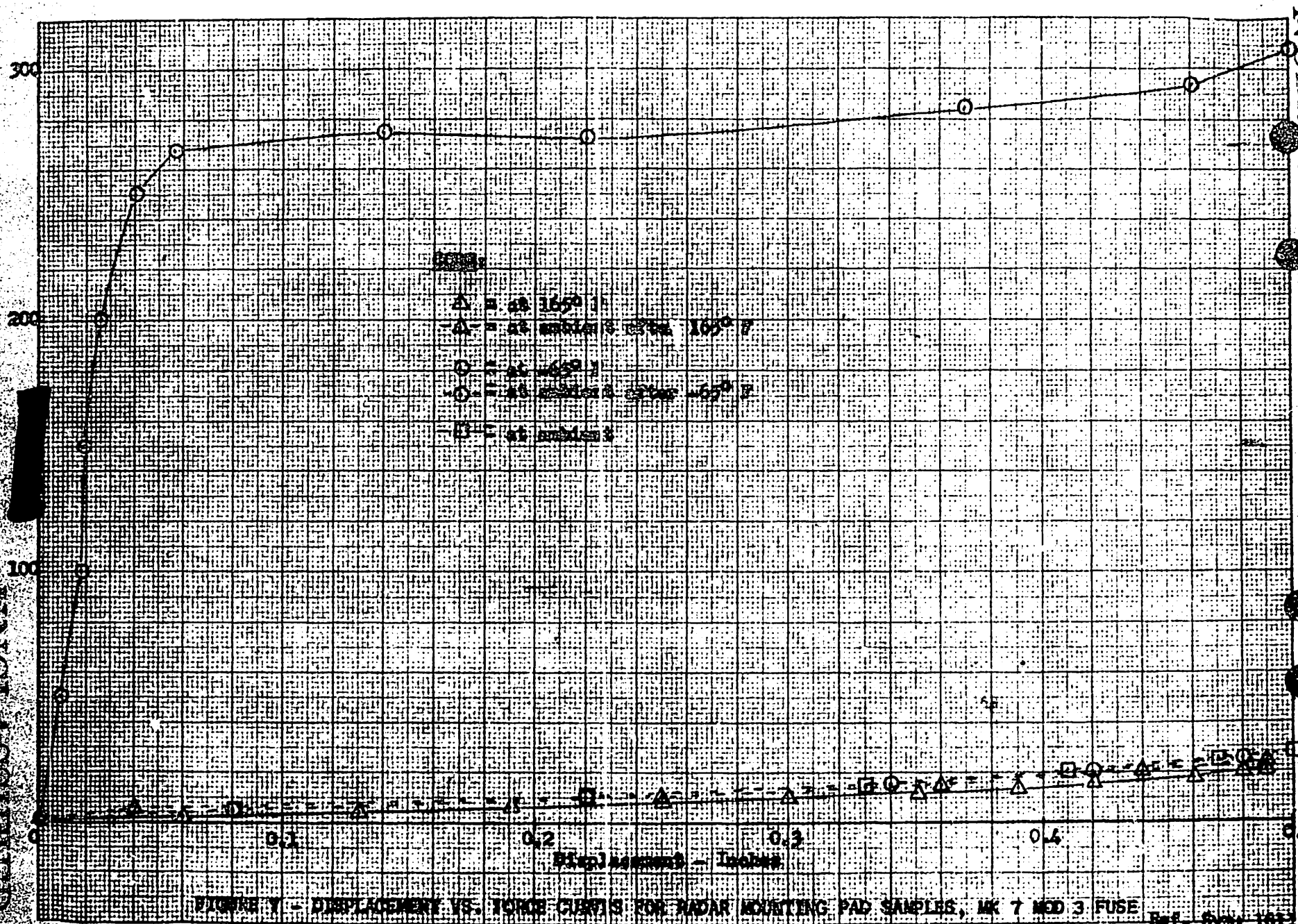

FIGURE 7 - DISPLACEMENT VS. FORCE CURVES FOR RADAR MOUNTING PAD SAMPLES, MK 7 MOD 3 FUSE

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