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REPORT NO. 98-02

120MM PROPELLANT DRUMS FIRST ARTICLE TESTING (FAT)

Prepared for:
U.S. Army Armament Research, Development and Engineering Center
ATTN: AMSTA-AR-ESK
Rock Island, IL 61299-7300

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SAVANNA, ILLINOIS 61074-9639

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct First Article Testing (FAT) on 120mm propellant drums supplied by Greif Brothers Corporation, Baltimore, MD. As tested, all production prototypes of the 120mm propellant drums met minimum requirements of FAT. This report contains details of the tests conducted.

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VALIDATION ENGINEERING DIVISION
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120MM PROPELLANT DRUMS FIRST ARTICLE TESTING (FAT)

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct First Article Testing (FAT) on 120mm propellant drums supplied by Greif Brothers Corporation, Baltimore, MD.

B. AUTHORITY. This program was conducted IAW mission responsibilities delegated by the U.S. Army Materiel Command (AMC), Logistics Support Activity Packaging, Storage, and Containerization Center (LOGSAPSCC).

C. OBJECTIVE. The objective of these tests was to determine if 120mm propellant drums could meet the requirements of FAT.

D. CONCLUSION. Six drums were tested. Based on the test data recorded, it was found that all the production prototypes of the 120mm propellant drums passed FAT requirements.

PART 2

JANUARY 1998

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PART 3

TEST PROCEDURES

The following tests were conducted:

A. LEAK INTEGRITY TEST: A pressure transducer was used with data recording equipment to record pressure loss over a period of time. Utilizing this test method, the samples were pressurized with air to 3 psig with readings taken for a period of 15 seconds. Pass/fail criteria for these tests was no pressure loss for 15 seconds.

B. STACKING TEST: The test sample must be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages which might be stacked on it during transportation. The minimum height of the stack, including the test sample, must be 3.0 meters (10 feet). The duration of the test must be 24 hours, except that plastic drums, jerricans, and composite packaging 6HH, intended for liquids, were subjected to the stacking test for a period of 28 days at a temperature of not less than 40 degrees Celsius (104 degrees Fahrenheit). Alternative test methods which yield equivalent results may be used if approved by the Associate Administrator for Hazardous Materials Safety.

C. VIBRATION TEST: Three sample packagings, selected at random, must be filled and closed as for shipment. The three samples must be placed on a vibrating platform that has a vertical or rotary double-amplitude (peak-to-peak displacement) of one inch. The packages should be constrained horizontally to prevent them from falling off the platform, but must be left free to move vertically, bounce, and rotate. The test must be performed for one hour at a frequency that causes the package to be raised from the vibrating platform to such a degree that a piece of material approximately 1.6mm (0.063-inch) thickness (such as steel strapping or paperboard) can be passed between the bottom of any package and the platform.

D. DROP TEST: Each package will be dropped onto a non-yielding surface from a specified height. The drop height is measured as the vertical distance from the target to the lowest point of the package. The drop height for Packaging Group I is 1.8 meters (5.9 feet), for Packaging Group II, it is 1.2 meters (3.9 feet), and Packaging Group III is 0.8 meter (2.6 feet).

E. Pass/Fail Criteria: A package passes the above tests if there is no rupture or leakage from any of the samples.

PART 4

TEST ITEM

120mm Steel Containers:

a. Overall Height	25-3/8 inches
b. Body Height	25-1/16 inches
c. Outside Diameter	16-5/8 inches
d. Inside Diameter	16 inches
e. Outside Diameter of Cover	16-15/16 inches
f. Inside Diameter of the Bottom	15-3/16 inches
g. Outside Diameter of the Bottom	15-7/16 inches
h. Total tested	6

PART 5

TEST EQUIPMENT

A. Compression Tester.

1. Manufacturer:	Ormond Manufacturing
2. Platform:	60- by 60-inches
3. Compression Limit:	50,000 pounds
4. Tension Limit:	50,000 pounds

B. Transportation Simulator.

1. Manufacturer:	Gaynes Laboratory
2. Capacity:	6,000-pound pallet
3. Displacement:	1/2-inch amplitude
4. Speed:	50 to 400 rpm
5. Platform:	5- by 8-foot

C. Scale.

1. Manufacturer:	Fairbanks Scales
2. Model:	H90-5200
3. Platform:	6- by 8-foot
4. Capacity:	10,000 pounds

PART 6

TEST RESULTS

a. Six sample drums, marked nos. 1 - 6 selected for leak integrity testing, were subjected to a leakproofness test at 3 psi for a period of 15 seconds. The drums successfully passed the test.

Each of the sample drums, marked nos. 1 - 3, was filled with sand to a total weight of 260 pounds and secured with a closure band and latch to ensure the container remained closed. The drums successfully passed 15 seconds of the leakproofness test at 3 psi. Following this test, the containers were subjected to 2,000 pounds of compression testing for a period of 24 hours. At the end of the 24-hour period, no physical damage to the drums was noticed. One hour after removal of the compression load, the three drums were subjected to 15 seconds leakproofness testing at 3 psi. The drums successfully passed leakproofness testing.

Each of the three drum samples, marked nos. 4 - 6, was filled with sand to a total weight of 260 pounds. The drums securely sealed, as for shipment, were subjected to 1-hour vibration testing. At the end of this test, the three drums were placed on their sides to check for any visible signs of sand leakage. There was no leakage; therefore, the drums passed vibration testing. The three drums were then subjected to 15 seconds of leakproofness testing at 3 psi, which they passed.

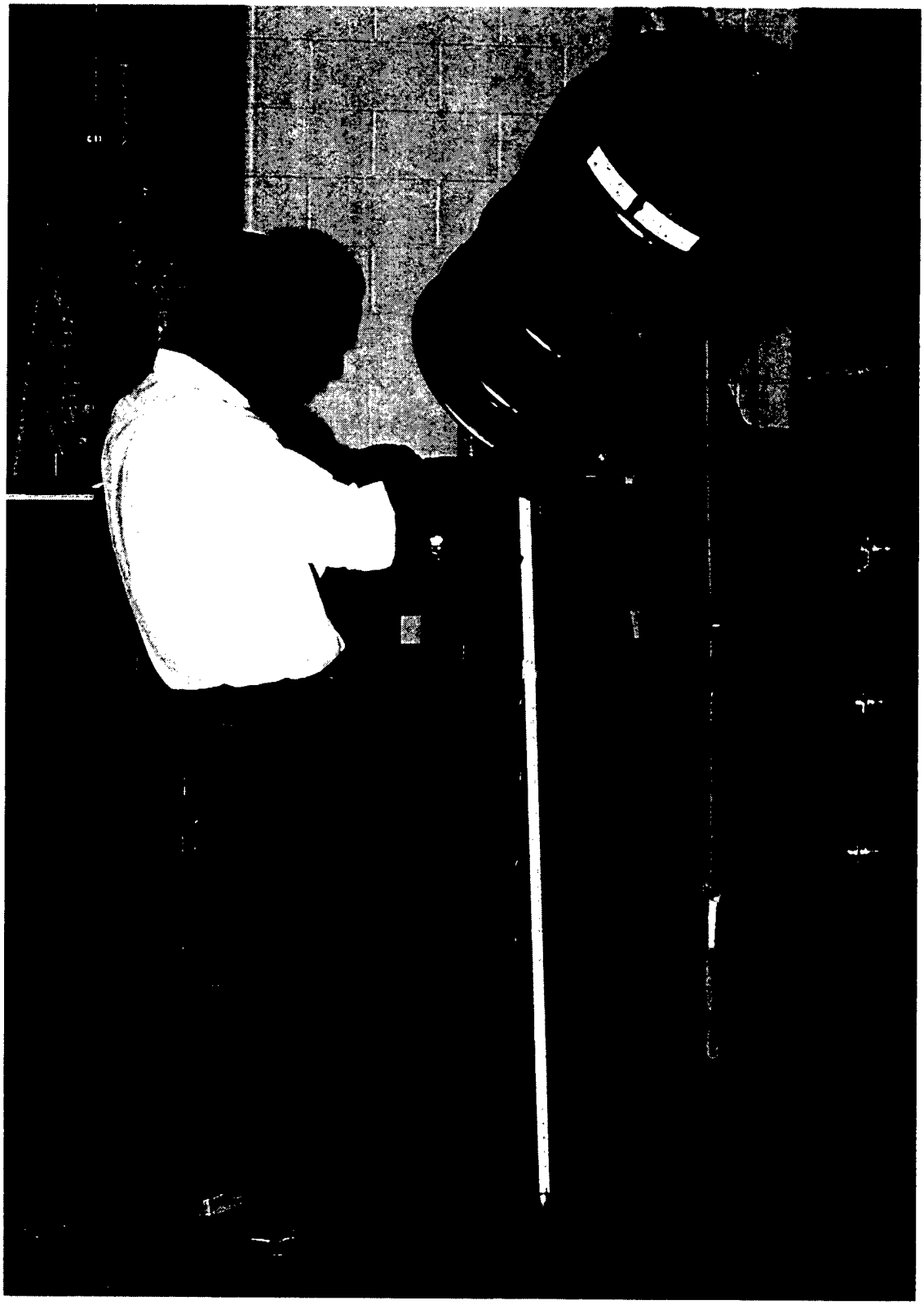
b. Two orientations of drop tests were conducted:

(1) The first drop orientation. Each of the three drums struck the floor diagonally on the circumferential seam from a height of 3.9 feet (47 inches) with only minor damage to the sides of the drums. None of the drums showed any signs of leakage of contents; therefore, they passed the drop test.

(2) The second drop orientation. Each of the three drums struck the floor flat on the container lid (upside down orientation) from a height of 3.9 feet (47 inches). There were no signs of any damage to the sides of the drums. The drums did not show any signs of leakage of contents; therefore, they passed the drop test.

PART 7

PHOTOGRAPHS



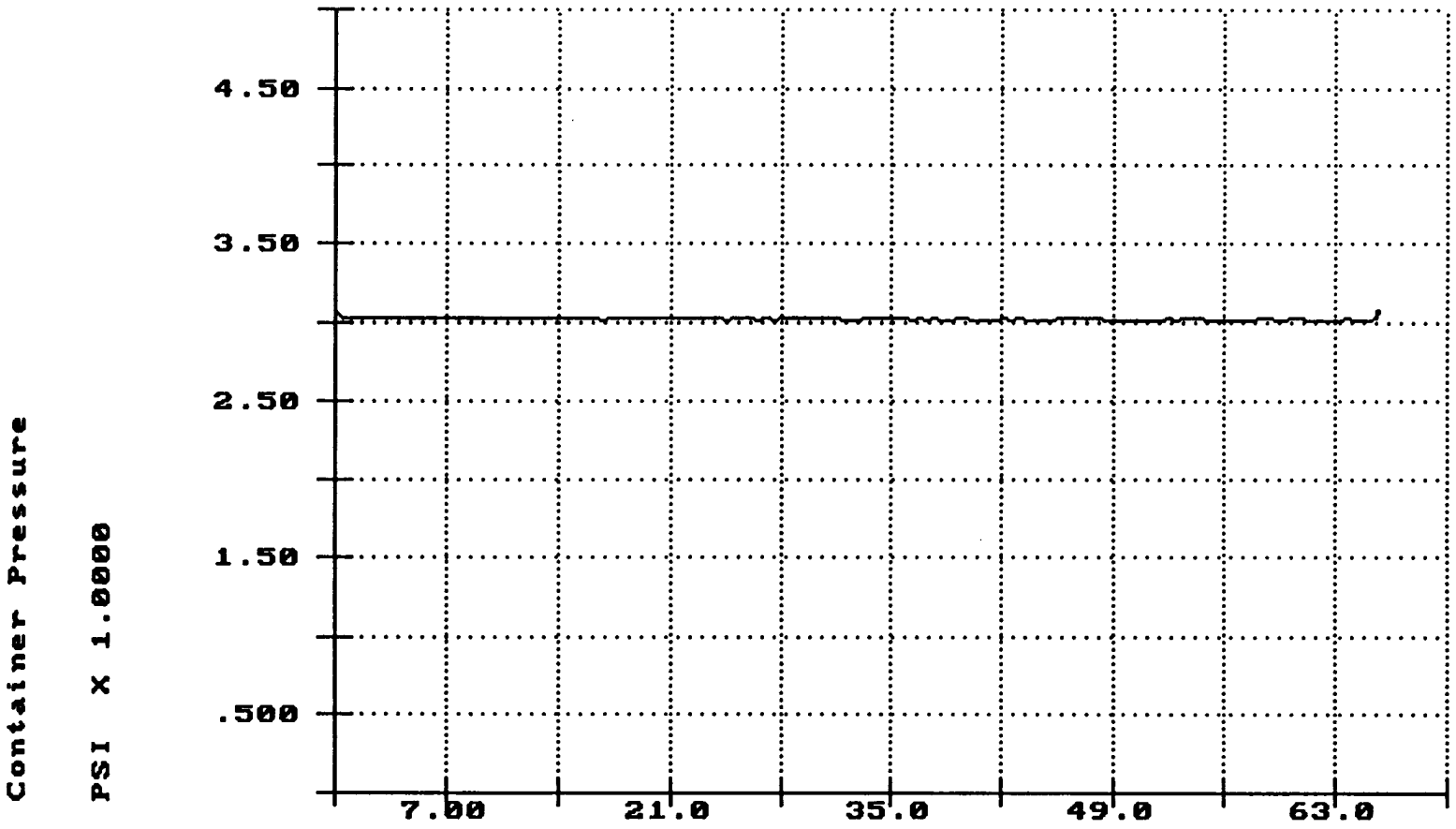
	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
PHOTO NO. A0317-SCN-98-DE120DR5. This photograph shows the drop height of container no. 2 during testing.		

	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
PHOTO NO. A0317-SCN-98-DE120DR6. This photograph shows a closeup view of container no. 2 after leak integrity testing.		

PART 8

GRAPHS

Container 1A, Initial Check Jan 15 13:47:06 1998



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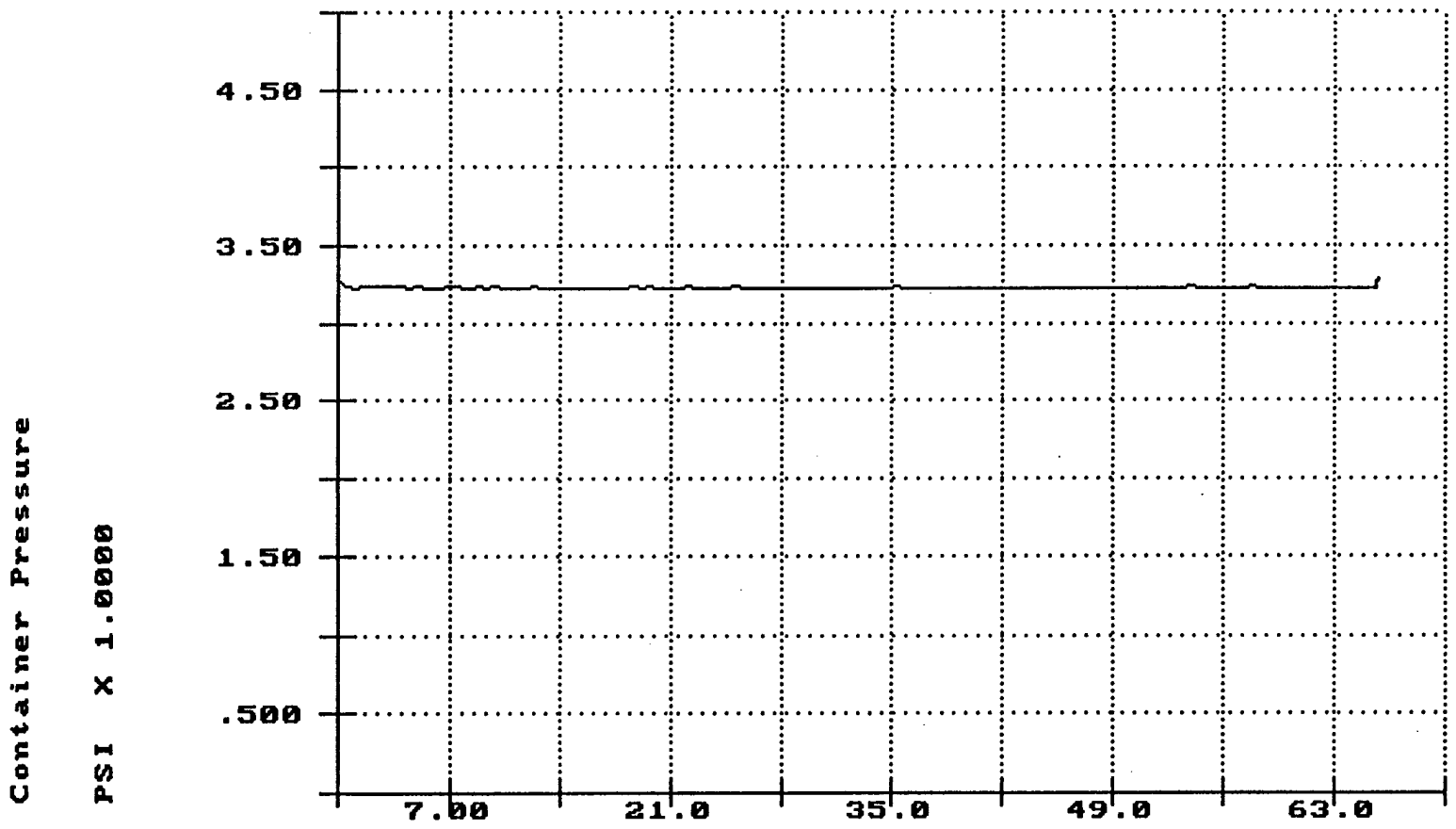

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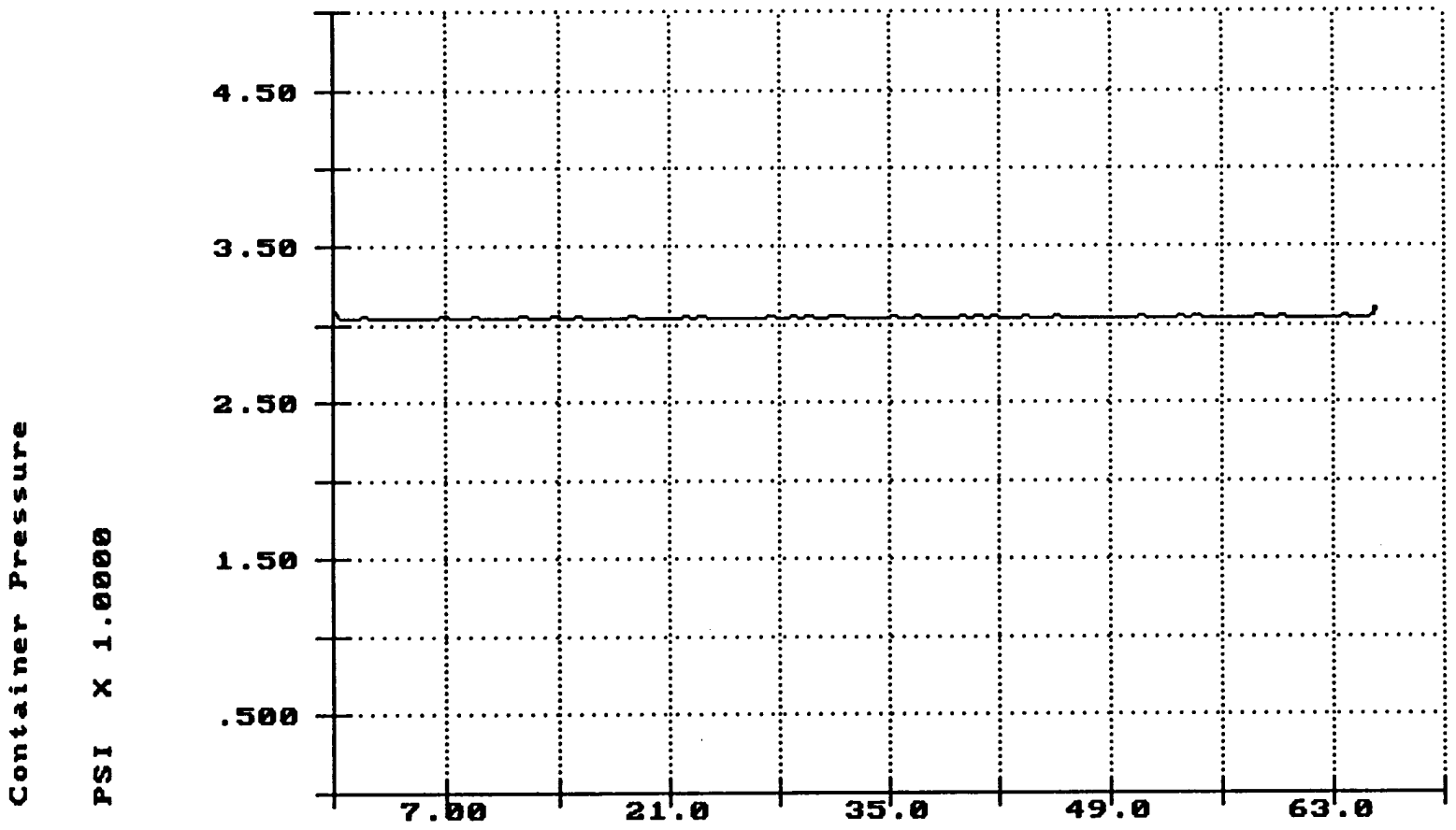

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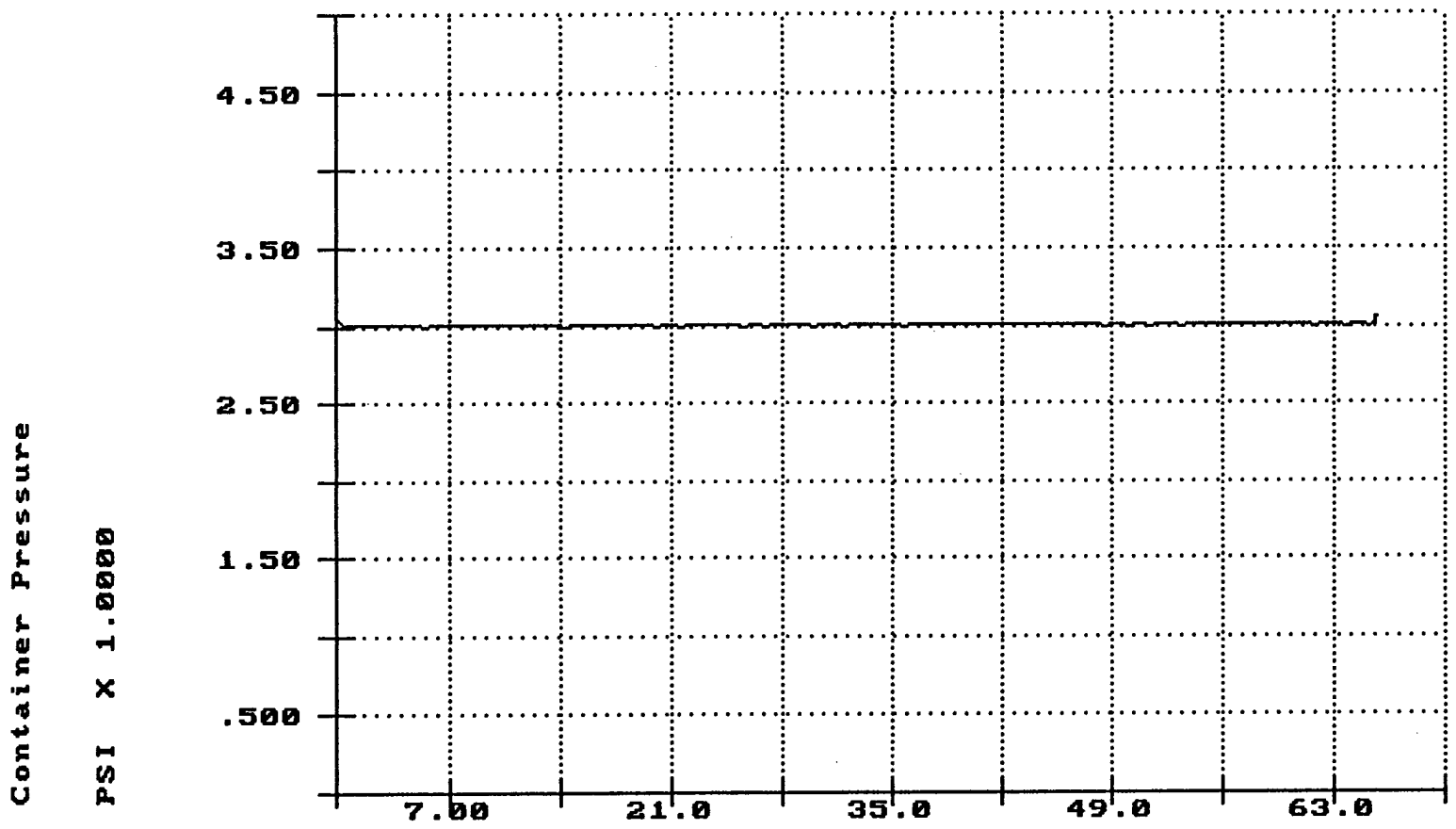

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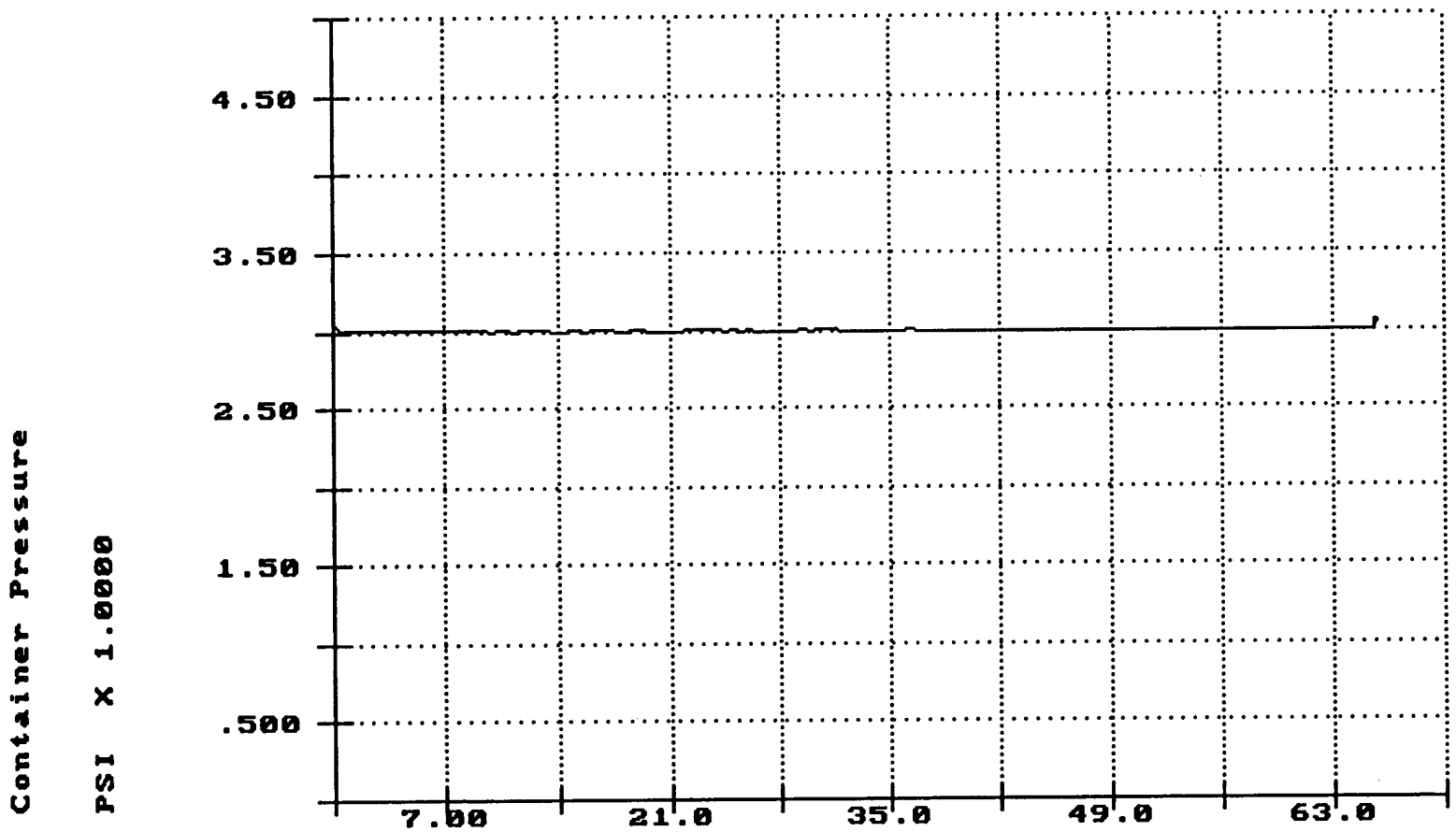

container 6A, initial check

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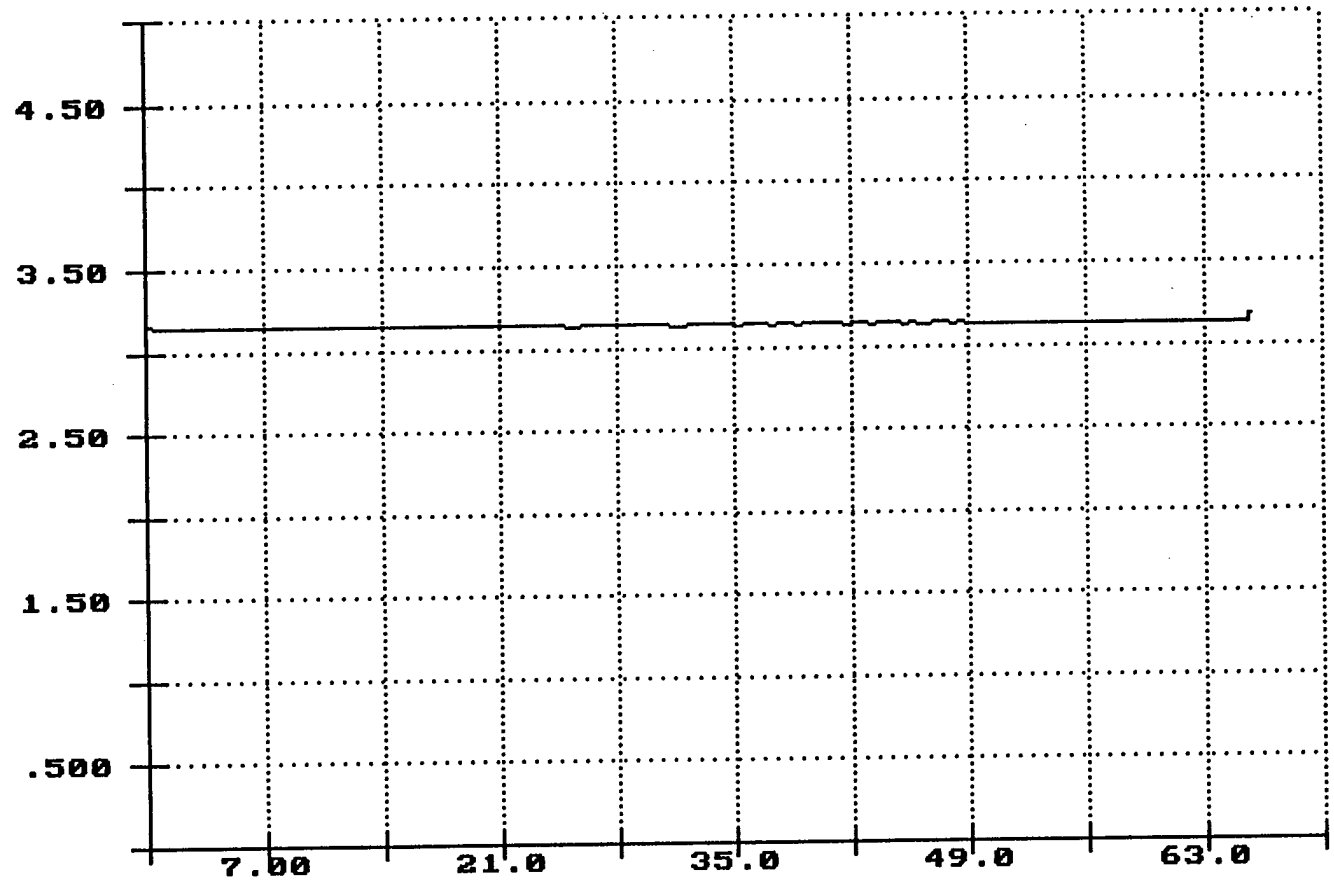

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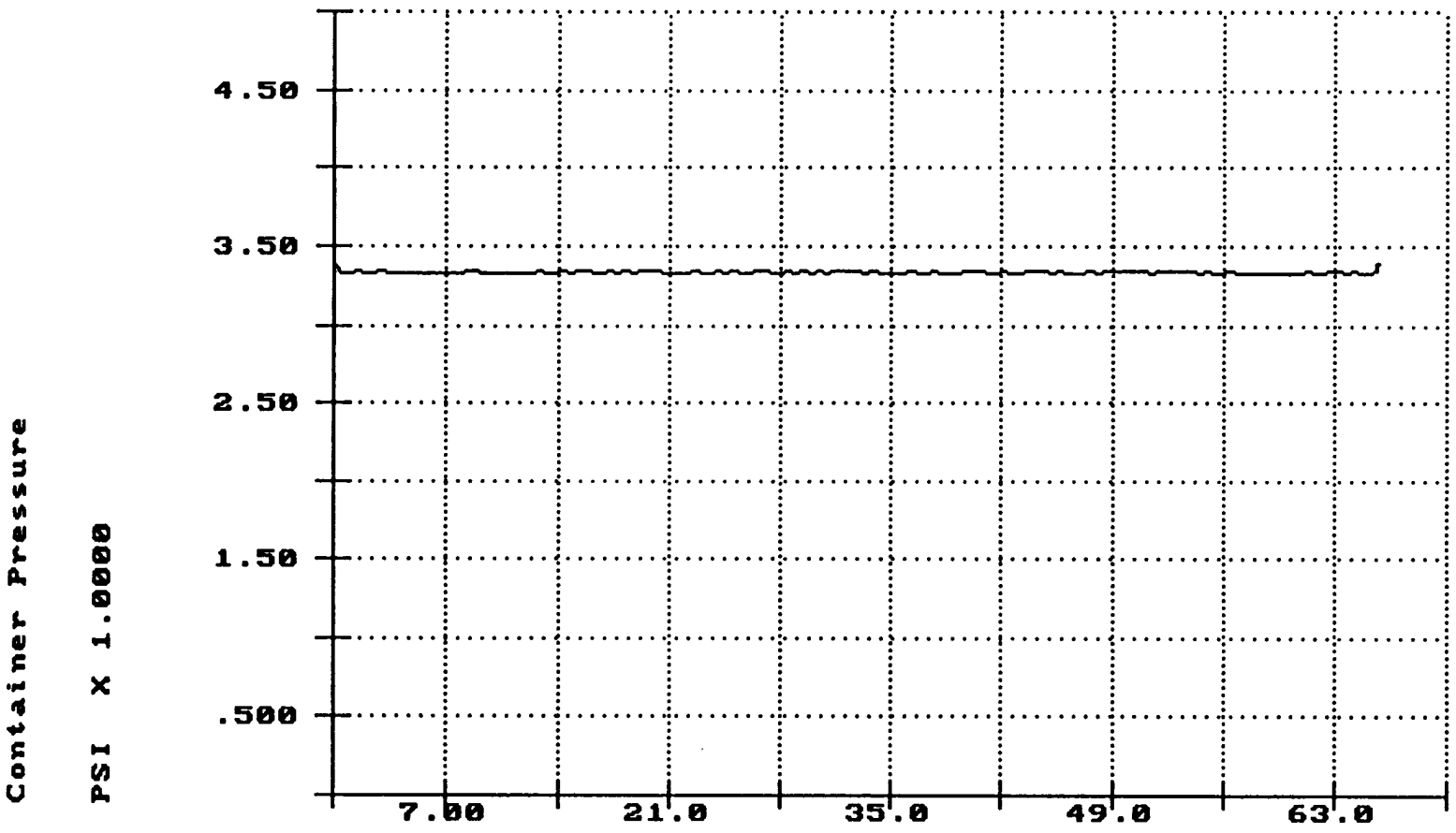

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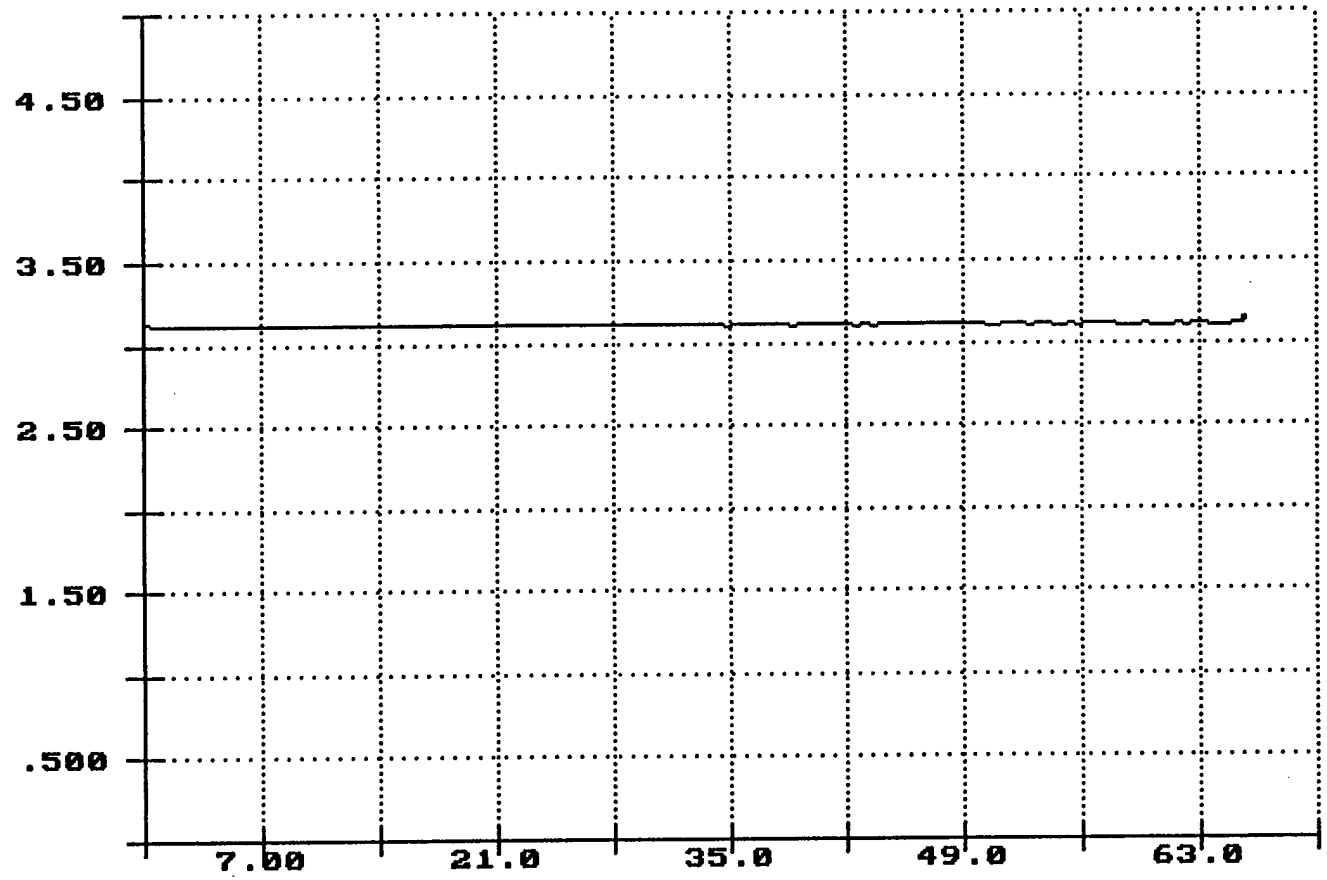

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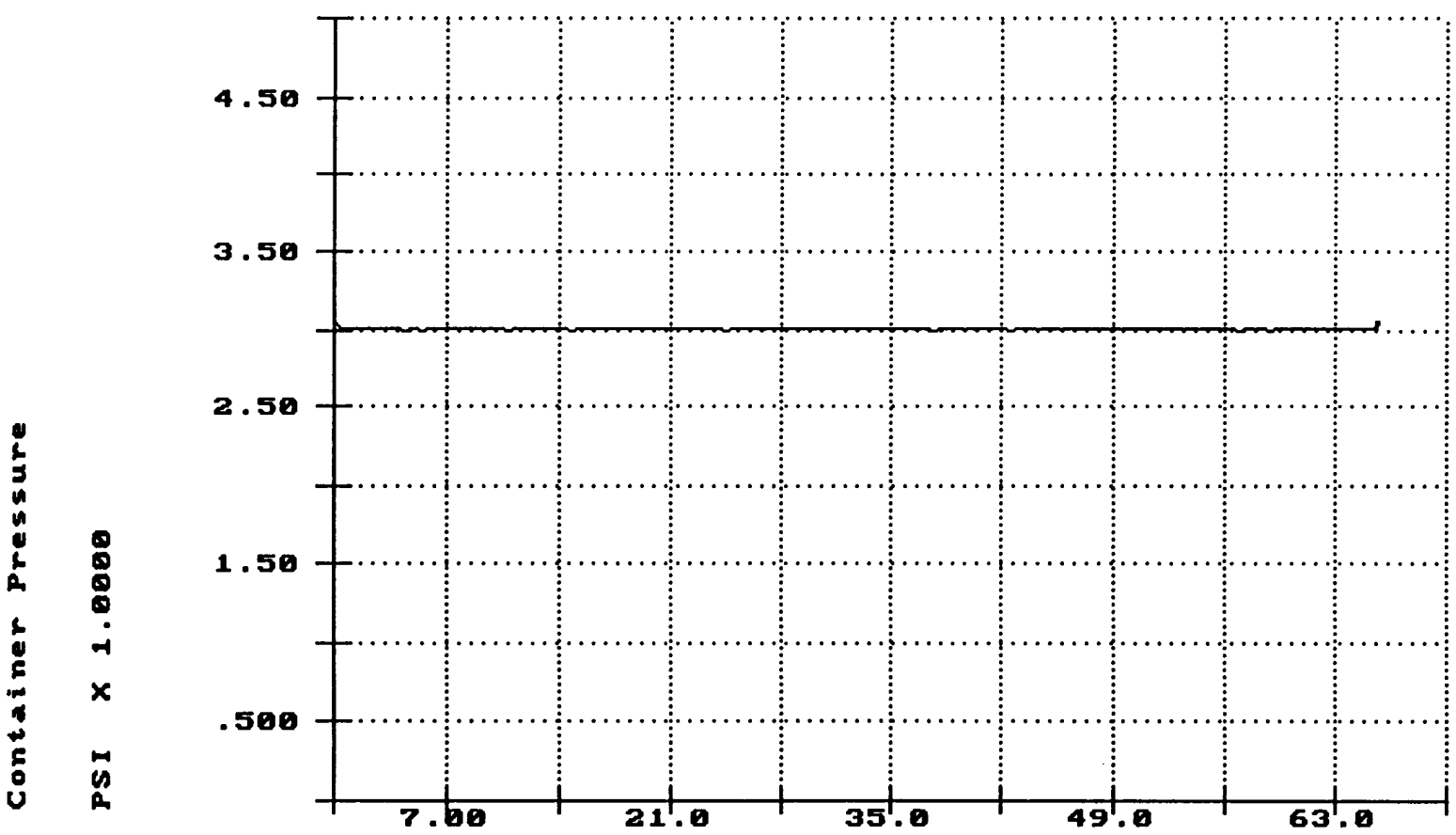

container 1A, after stacking

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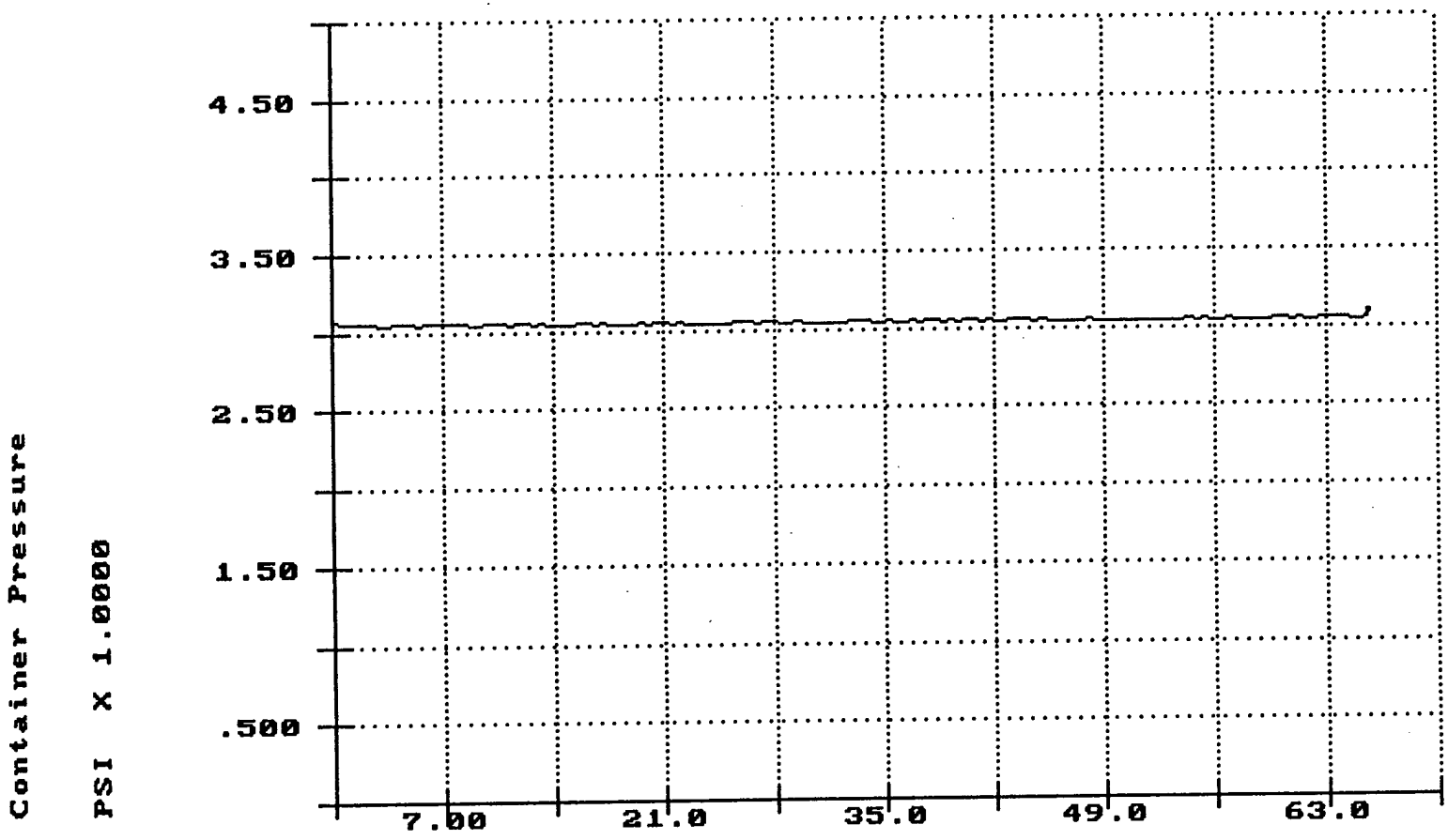

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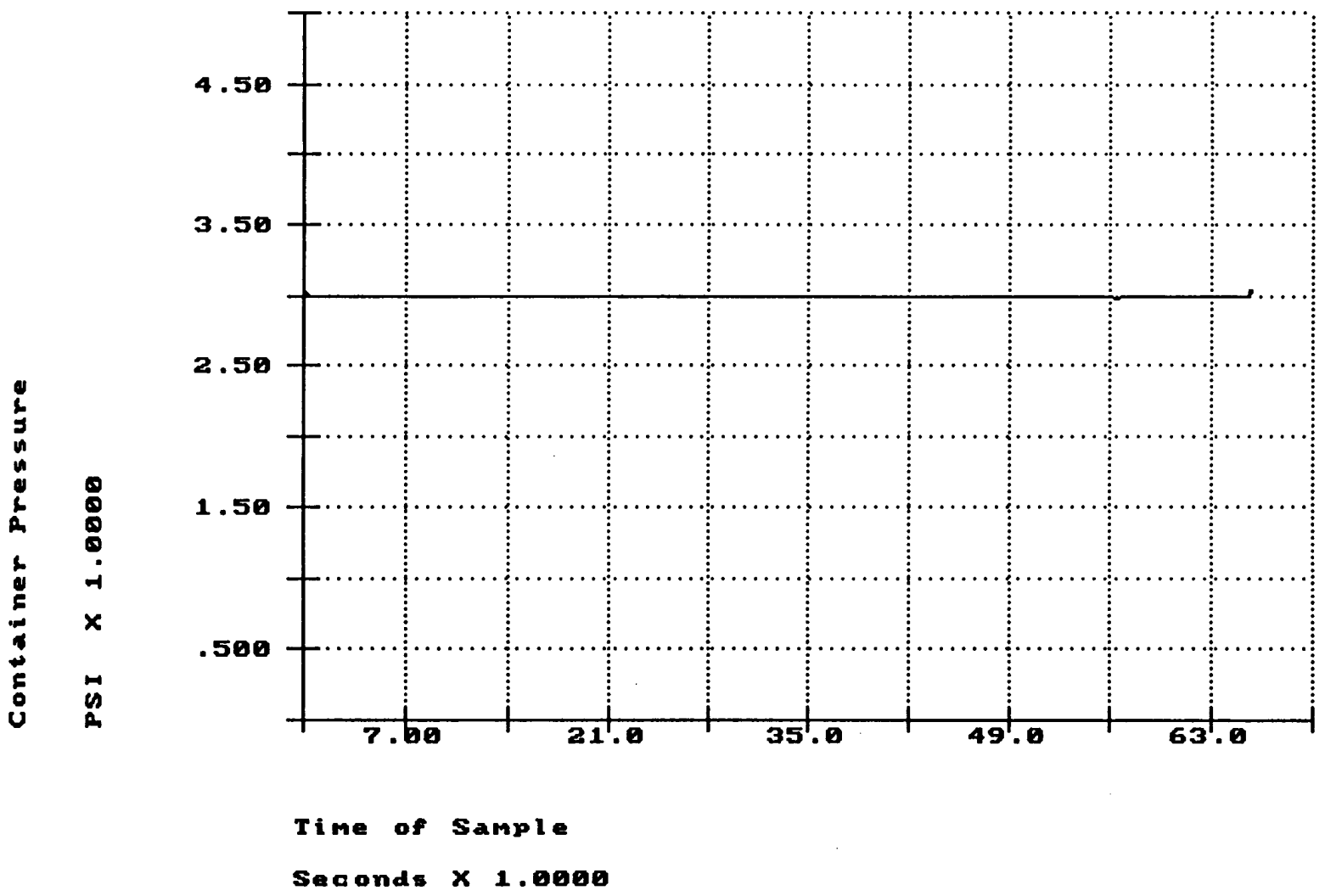

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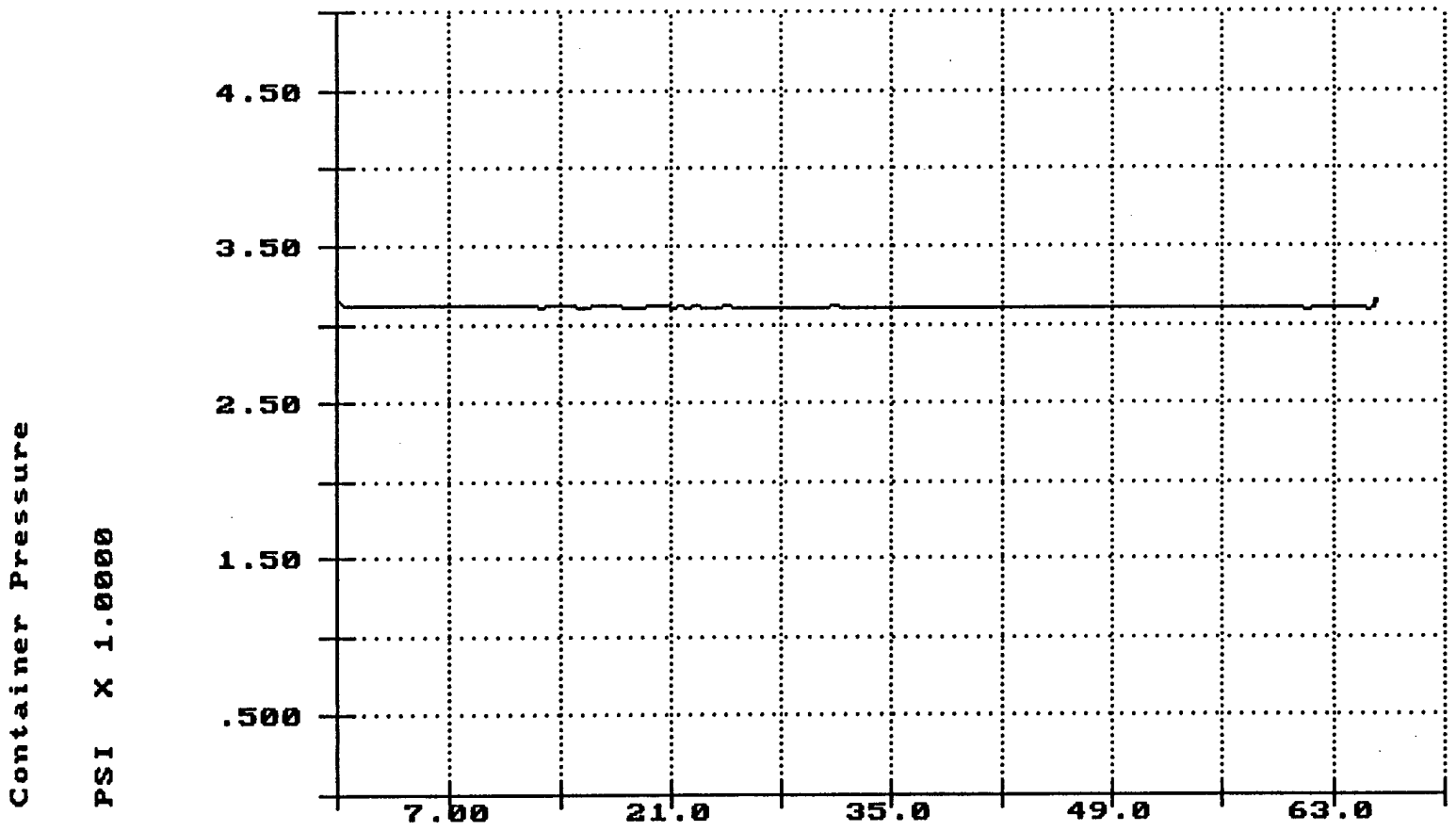

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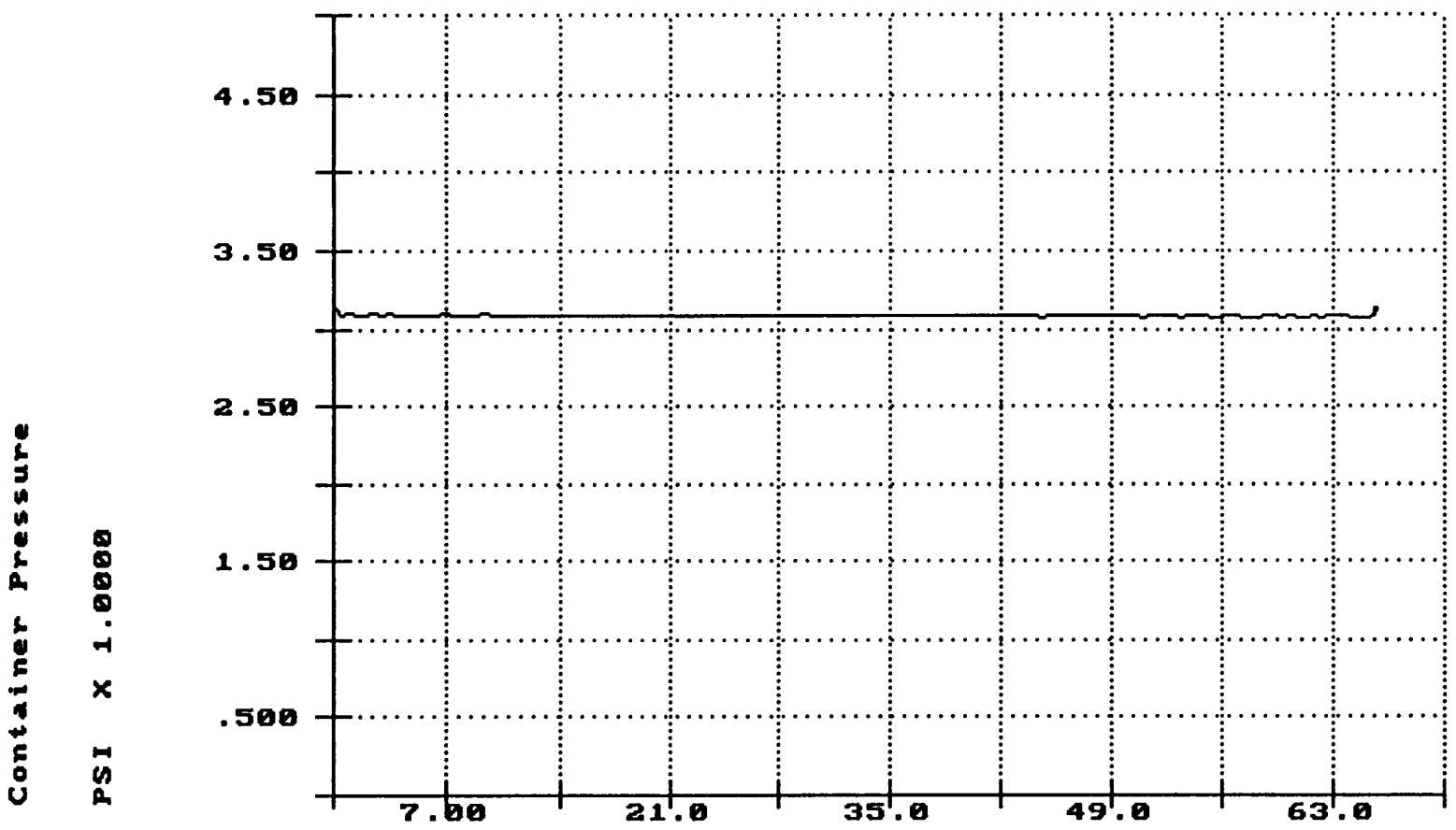

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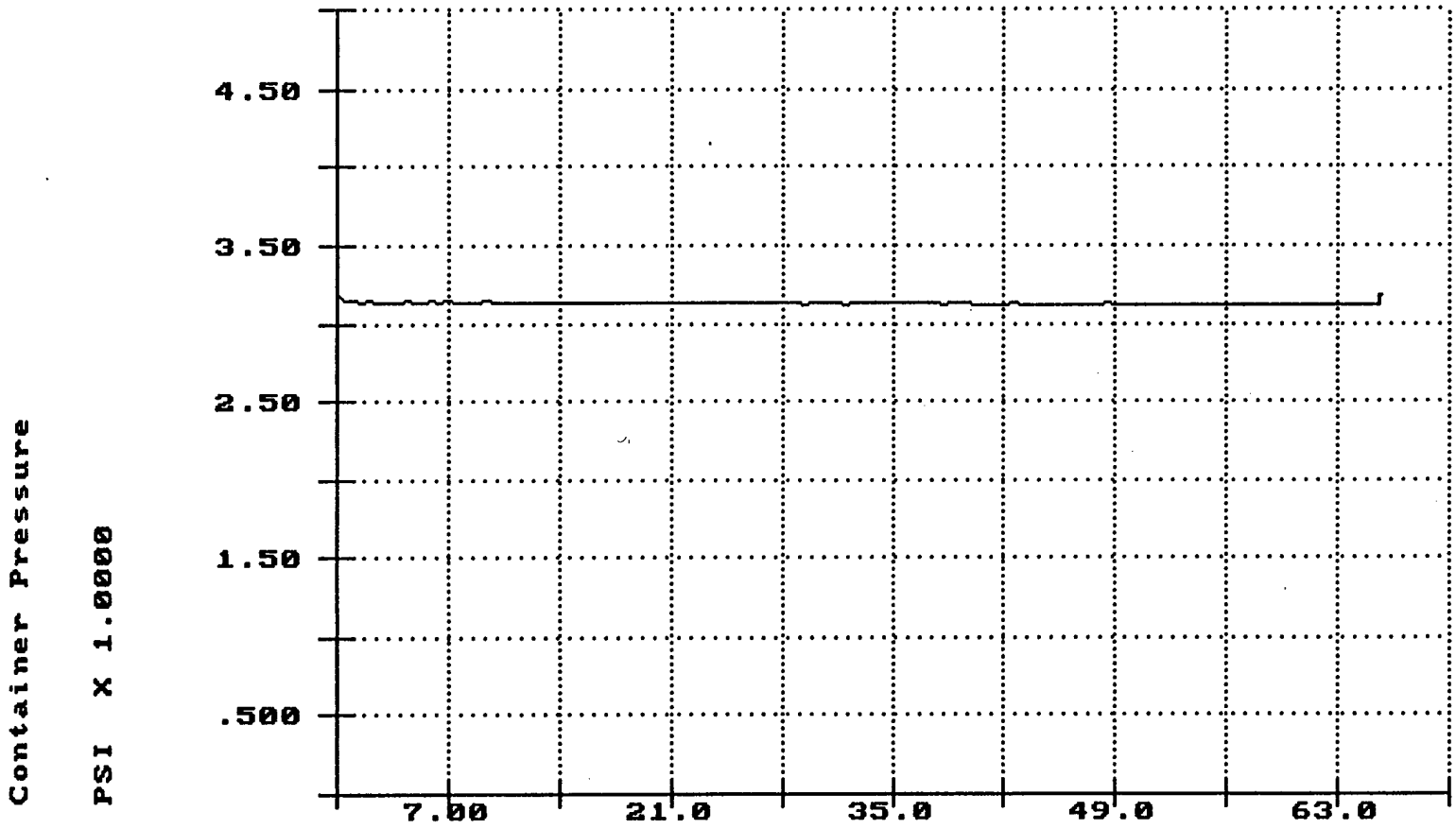

container 3a, after vibration

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