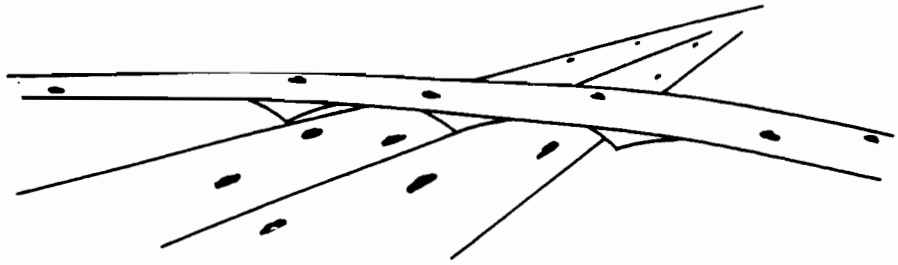

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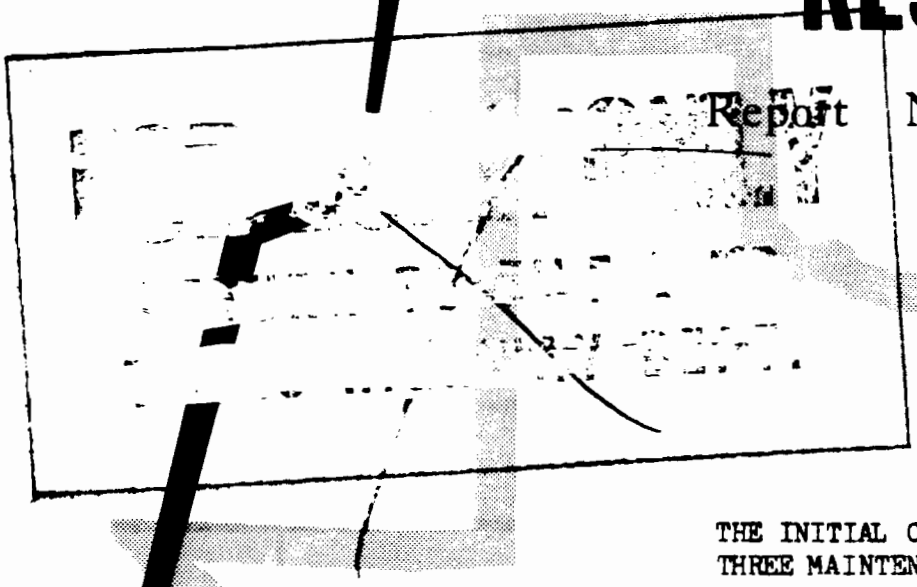
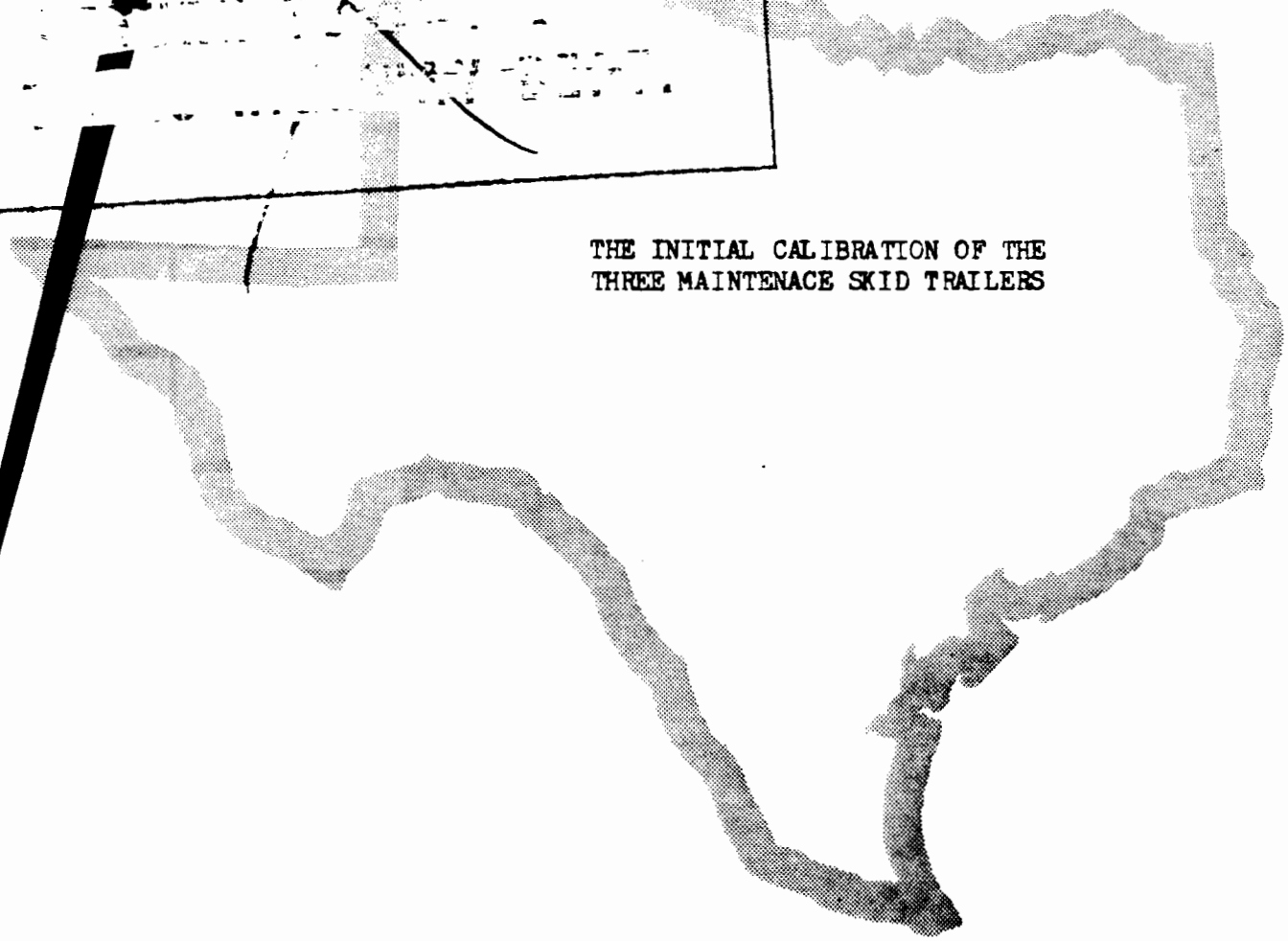


THE INITIAL CALIBRATION OF THE THREE MAINTENACE SKID TRAILERS



TEXAS HIGHWAY DEPARTMENT

THE INITIAL CALIBRATION OF THE THREE MAINTENANCE SKID TRAILERS

Introduction

The Equipment and Procurement Division Shops completed the fabrication of three skid test trailers in August, 1967. These three trailers were patterned after the original research skid test trailer with the exception of modifications in the watering system and the force measuring system. The development of the original trailer is given in Research Report No. 45-1.

Object

The object of this report is to reveal the required development of the force measuring system and to indicate the initial calibration of the trailers.

Description of Equipment

The changes made in the maintenance trailers during the fabriction can be understood more fully by comparing the research trailer and the maintenance trailers in the following table:

TABLE I
DIFFERENCES IN THE RESEARCH AND MAINTENANCE TRAILERS

Research Trailer	Maintenance Trailers
1. Watering System	1. Watering System
Uses a centrifugal water pump powered by an electric motor. The electrical energy was furnished by a gasoline engine driven generator.	Uses a impeller type water pump powered by a gasoline engine.
2. Force Measuring System	2. Force Measuring System
Uses transducers which are straingages on an aluminum drag link. The strain has been correlated to the friction force measured.	Uses transducers which are Linear Variable Differential Transformers (LVDT) measuring the deflection of the aluminum drag link at the point of loading. The deflection at the point of loading has been correlated to the friction force measured.

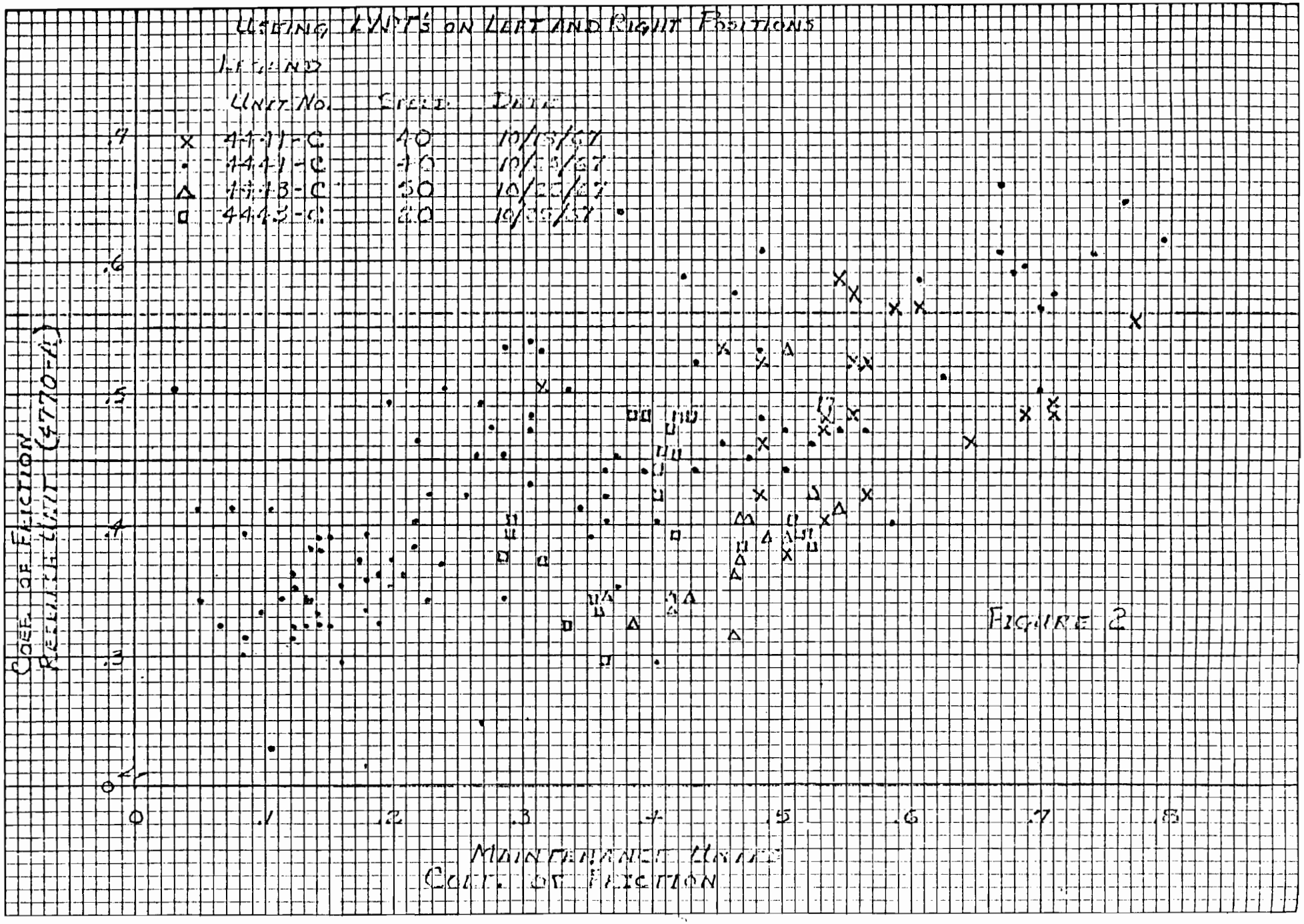


FIGURE 2

electrical plugs between the truck and the trailer were inducing erratic results. Accordingly a commercial clip type plug originally used was changed to a more suitable military type plug. Apparently, this alleviated some of the variation between trailers and also a portion of the temperature drift in the recorder.

Experiment No. 3

Also, in January, occasion presented itself in which only one LVDT was used. It was found that the recorder drift was low and almost nil when one LVDT was used. When both LVDT's were again connected in the original manner, large recorder drift again appeared.

Further testing was initiated in which it was found that a high degree of correlation could be obtained between the old and new trailer, if only one LVDT was used on the left side. However, these tests revealed that the maintenance trailer was producing much higher values than the values obtained with the research trailer on the surfaces with better skid resistance. If for instance, both the old and new trailers were calibrated with a proving ring in a static condition such that the force read on the proving ring was the same as the force read on the recorder, the information in Table II was found in field test conditions.

TABLE II
INITIAL TESTS REVEALING VARIATION BETWEEN RESEARCH UNIT AND MAINTENANCE UNIT USING ONE LVDT IN LEFT POSITION

Section No.	Research Trailer (Feb. 1, 1968)	Maintenance Trailer # 41 (Feb. 12, 1968)
1	248	244
2	493	713
3	528	770
4	550	930
5	625	973
6	440	577
7	418	475

TABLE IV
FORCE MEASUREMENTS OBTAINED ON LEFT AND RIGHT POSITIONS
MAINTENANCE TRAILER 41
(Braking Left Wheel)

Section No.	LVDT Fransducer in Position on Left Side Only (Feb. 15, 1968)	LVDT Transducer in Position on Right Side Only (Feb. 15, 1968)
1	273	- 18
2	744	- 272
3	968	- 304
4	988	- 350
5	1150	- 403
6	656	- 187
7	594	- 165

Experiment No. 5

During the next testing, the research trailer was replaced with one of the maintenance trailers. In order to accomplish this test, the LVDT's were disconnected from the maintenance trailer and the strain gage system from the research trailer was installed on the maintenance trailer. This rearrangement produced a unit similar to the research equipment with the only difference being a new trailer. Results of tests on the same sections are revealed in the following table. It was concluded from this experiment that the two trailers were performing in the same manner. Since all four trailers were fabricated from the same design, it was assumed that all trailers were performing in the same manner.

A review at this point indicated that:

1. The units were producing results which could be correlated but the maintenance trailers were revealing much higher values as compared to the research trailer.
2. There were no differences in values due to the physical features of the trailers.
3. There were no differences in values due to the use of different recorders

It was concluded that the variation being revealed existed in the forced measuring system on the trailer. Since the strain gauges measure only the strain in the drag link, it was thought that the LVDT's could be measuring deflection at the point load in not only the drag link but also the channel beam to which the drag link was connected.

Experiment No. 7

Further testing was then pursued in which the LVDT was mounted on the channel member to which the drag link is connected, thereby measuring only the deflection between the drag link and the channel member (See Figure 1). This testing indicated readings which were reasonable when comparing both the research and maintenance trailers and a high degree of correlation was found. Next the LVDT was mounted in its original position and deflection was measured on the channel beam only. (That is the beam to which the aluminum drag links are attached).

TABLE VII

Force Measurements, Indicating Undesirable Deflection in the Channel Member to Which the Drag Link is Attached.

Section Number	Force Readings from Deflection in Channel Member
1	29
2	172
3	132
4	241
5	241
6	99
7	87

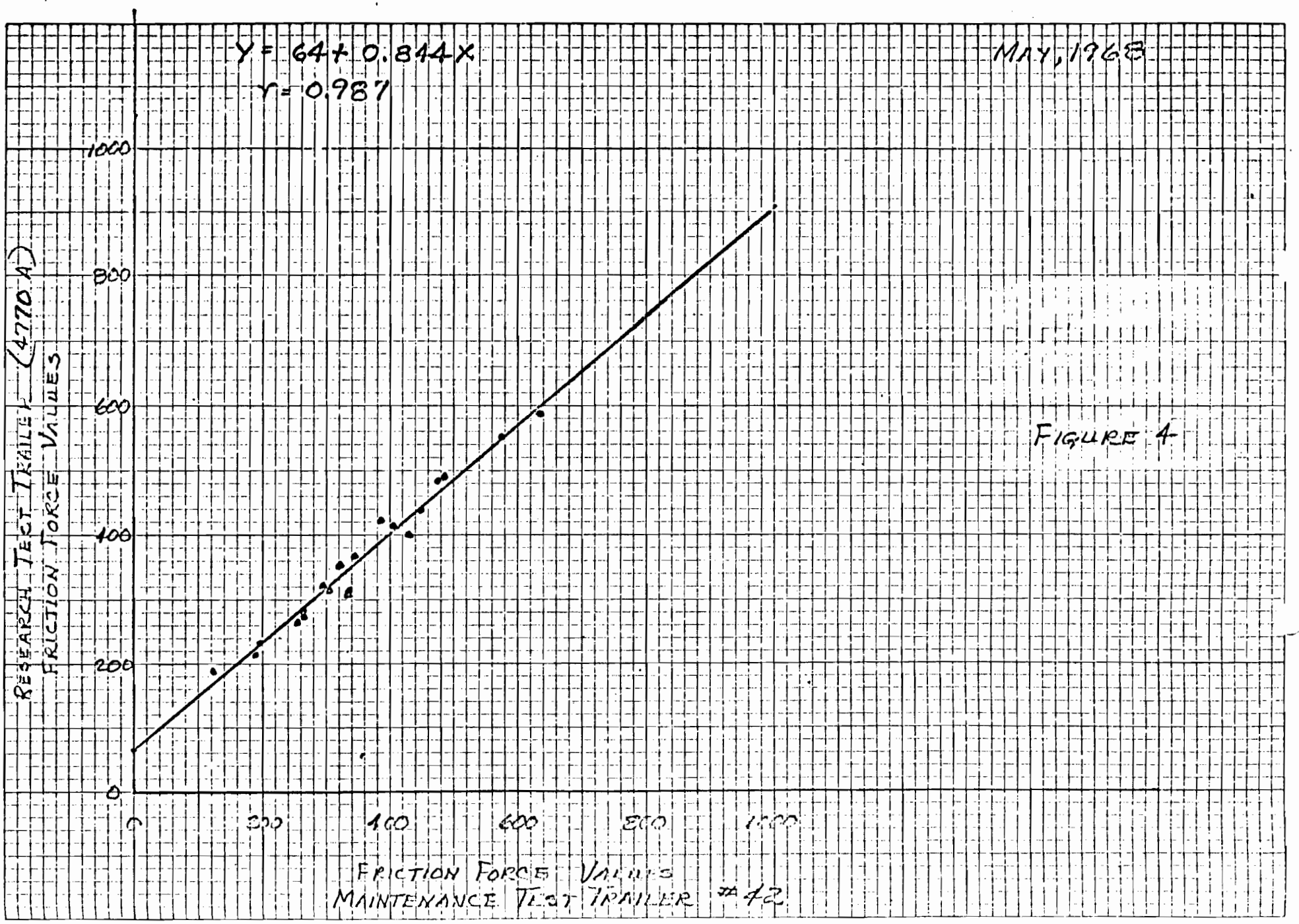


FIGURE 4-