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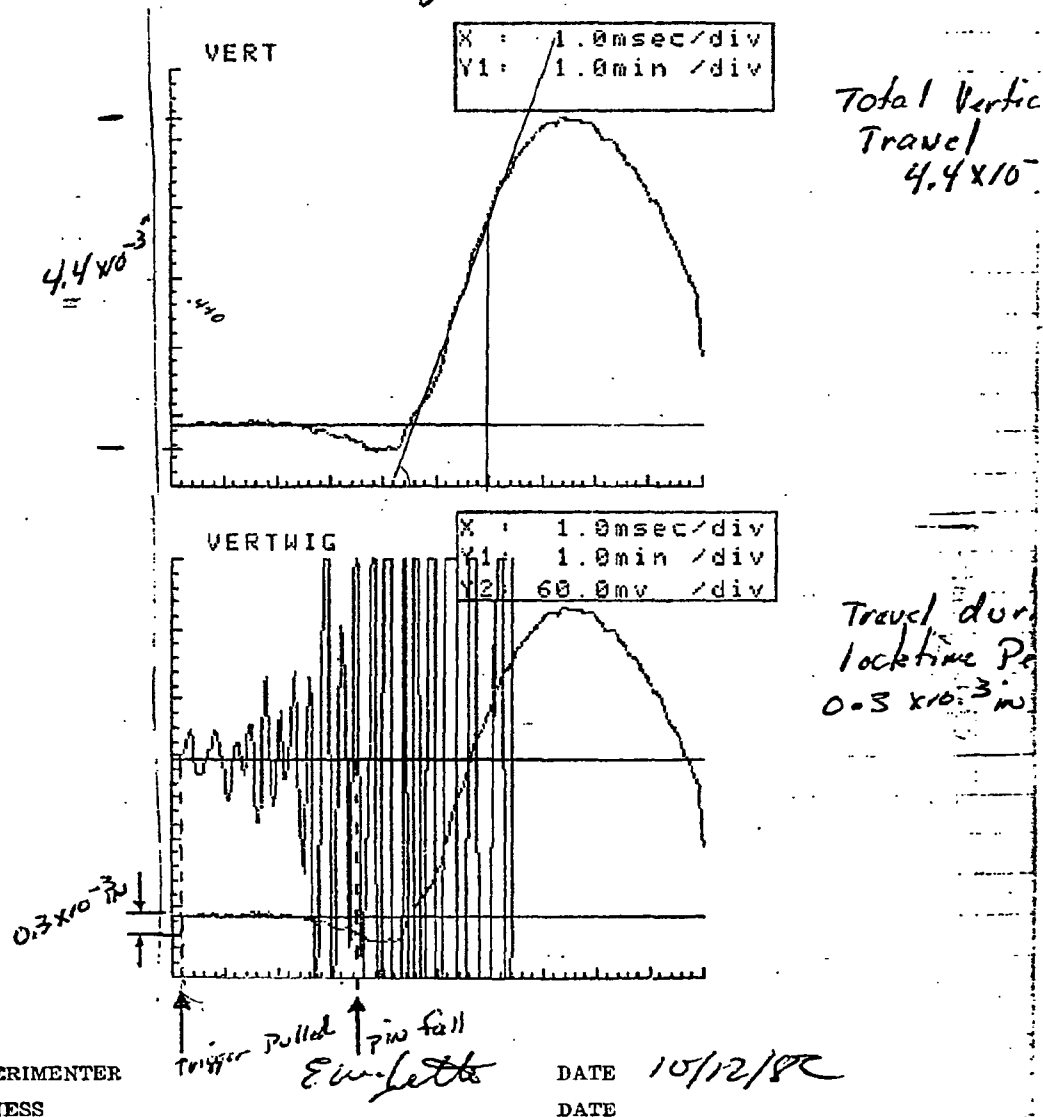
10/12/82

SUBJECT OF EXPT.

Measurement of wiggle.

Step 1.

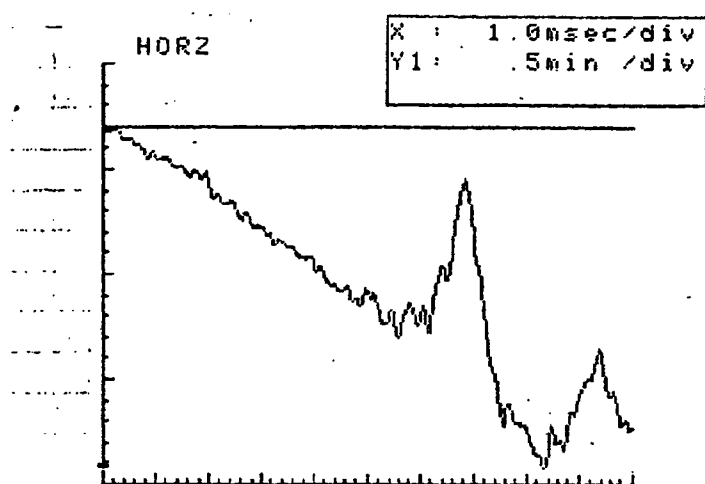
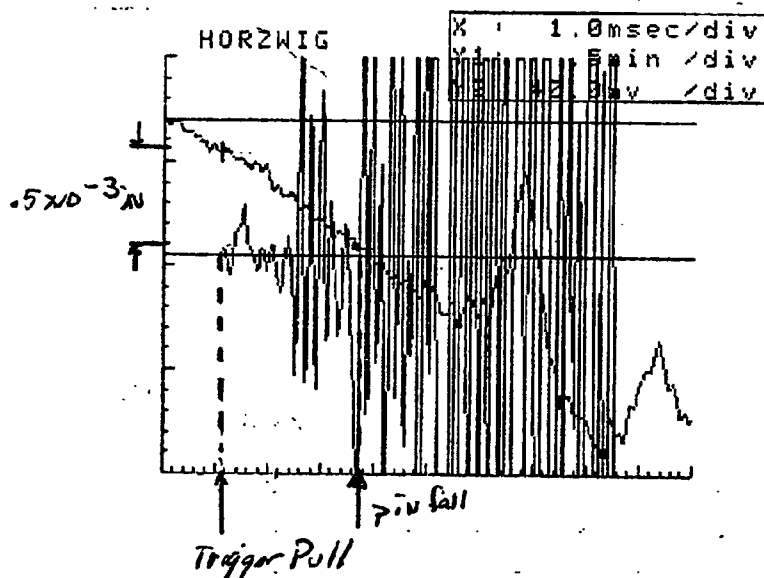
2 Tektronix Displacement/Velocity transducers were mounted on the gun's muzzle (M/200 7mm 08). An audio microphone was taped to the receiver. Vertical was locked at first. Traces below show vertical motion with the mic trace overlaid on one. ~~The~~ The lock time period can be seen from the mic trace. Dry fired - SR Franz - shooter



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Same as pg 6. Horizontal Motion

Total travel  
 $1.5 \times 10^{-3}$  inTravel During  
locktime period  
 $0.5 \times 10^{-3}$  in

Applying the conversion factor of 500 to  
translate muzzle motion to motion at 600 yds  
we get:

Vertical during locktime : 0.15 in  
Horizontal " " : 0.25 in

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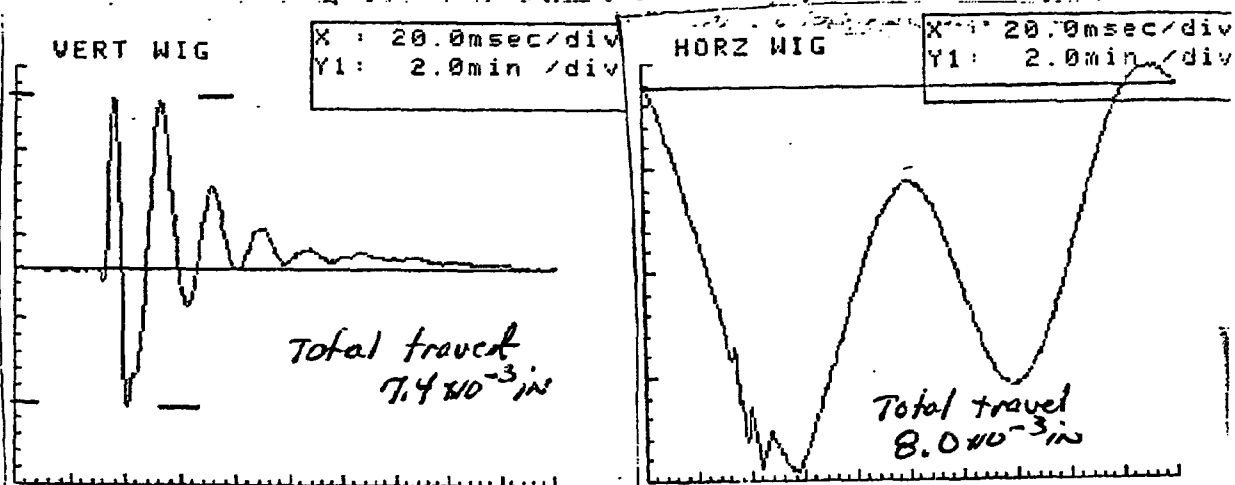
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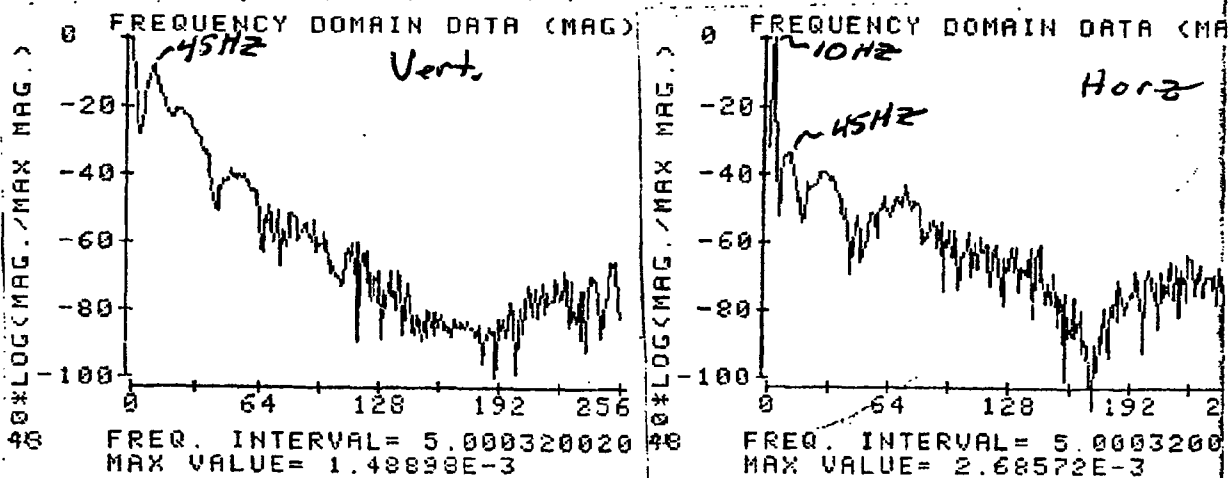
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Frequency Study - Muzzle Wiggles

In this test the time base of the sample was increase to 20 msec/div. The Traces were stored and an FFT performed to study the frequency makeup of the signal.



The total travel occurred ~~in~~ after 20 msec. - well after muzzle exit.  
Below is the frequency data.



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the primary frequencies are labeled on the graph.

Next Step. The gun was mounted in a vise and clay fired. The same transducers and instrument settings were used.

VERTVISE

X : 20.0msec/div  
Y1: 2.0min/div

HORZVISE

X : 20.0msec/div  
Y1: .5min/div

Total travel  
 $6.4 \times 10^{-3}$  in

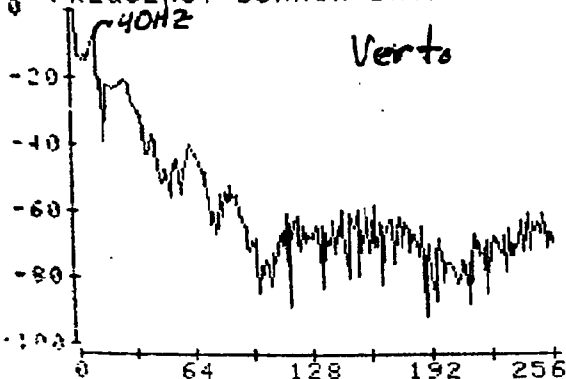
Total travel  
 $1.2 \times 10^{-3}$  in

It can be seen that the vertical travel is due mostly to the vibration of the barrel from F.P. impact. Horizontal travel is much greater handled.

FREQUENCY DOMAIN DATA (MAG)

40Hz

Verto

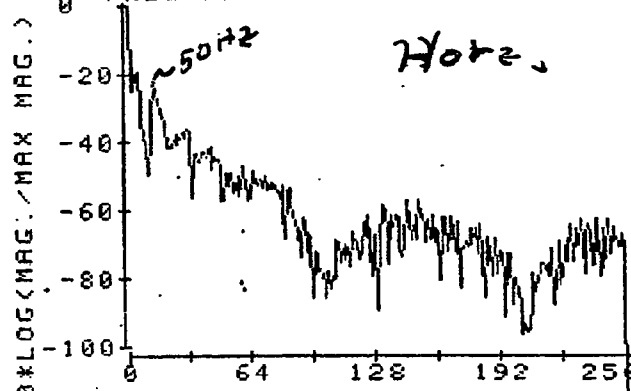


FREQ. INTERVAL= 5.000320020  
MAX VALUE= 1.25791E-3

FREQUENCY DOMAIN DATA (MAG)

50Hz

Horz.



FREQ. INTERVAL= 5.000320020  
MAX VALUE= 1.18901E-3

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Explanation of freq. plots pg 8-9

This data seems to indicate that very little motion is present in the vertical direction. The amplitude of vertical motion is the similar hand held vs. vise. The primary frequency is at  $\approx 45 \text{ Hz}$ , in both cases. This corresponds fairly well with the primary vibration mode of the barrel.

The horizontal direction is a different story. The hand held case has a large travel compared with the vise held case. The frequency data shows a spike at  $10 \text{ Hz}$ . No corresponding peak is visible in the vise held case.

### Summary:

There is no measurable shooter wiggle in the vertical direction with our equipment.

The ~~motion~~ shooter wiggle in the horizontal direction has a magnitude of about .008 in. and a frequency of  $10 \text{ Hz}$ . Data from pg 7 shows that for the lock time period only a small portion of the total travel is significant due to the low frequency.

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