### *** APPLICATION NOTE ***

## STRAIN GAUGE - LOAD CELL
### Measurements
### With the CAT System.

This application note describes the use of the GHI CAT for wideband strain gauge and load cell transient measurements.

**APPLICATION:** Applied and transmitted shock loads from a 200 lb pendulum impact are to be measured. The object tested is a nuclear fuel rod grid fixture used to hold fuel rods in a power reactor. The pendulum acceleration during impact is also recorded in order to obtain dynamic displacement for correlate with impact energy. The output of an angle transducer attached to the pendulum fulcrum is also recorded.

**REQUIRED DATA:** Plots of outputs of loadcells, accelerometers and angular transducer vs time, force transmissibility and coherence vs frequency and fixture displacement vs time. See other side of this page for reproductions of reports.

**CAT SETUP:** Refer to Figure 1. The structure to be tested is attached to load cell #1 which is backed up by an inertial mass. Load cell #2 and the accelerometer are attached to the pendulum. An angle sensor is attached to the pendulum arm at the top fulcrum. The CAT is set for 4 channels and the outputs of the various transducer signal conditioners are connected to the CAT. Transfer functions of the 4 transducers are entered on the CAT Setup Table. After selection of recording time and trigger parameters, the CAT is ready.

**SPECIAL SETUP CONSIDERATIONS:** The signal conditioners should put out full scale outputs in the range of 0.4 v to 20 v peak, and for these tests, an upper bandwidth of 10 KHz. Using the 2nd recording speed of the CAT (260 mSec.) the effective bandwidth of the digitized data will be 12.5 KHz. The Nyquist folding frequency (.5 x sample rate) will be 62.5 KHz, well above the amplifier and analysis frequencies. Hence, no anti alias filters will be needed.
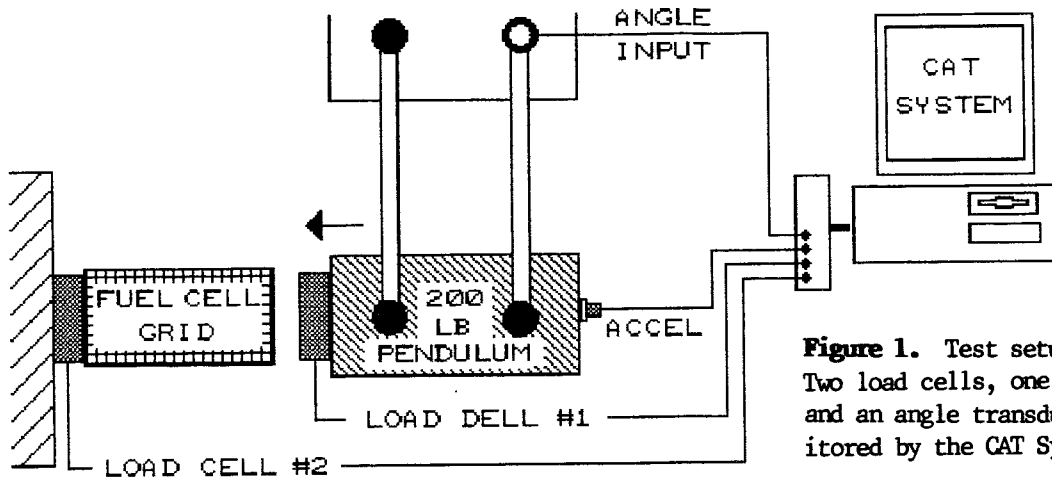
**up date**

**Figure 1.** Test setup schematic. Two load cells, one accelerometer and an angle transducer are monitored by the CAT System.



Sensitivity:
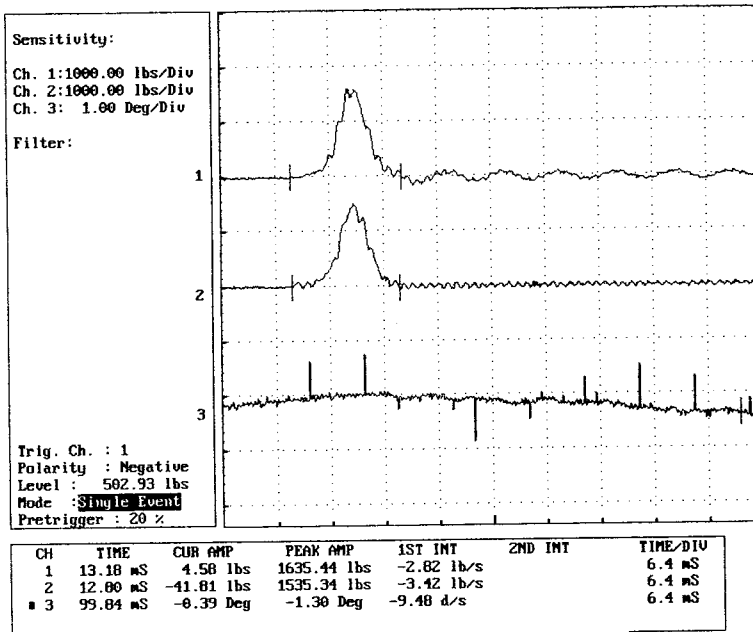
Ch. 1:1000.00 lbs/Div
Ch. 2:1000.00 lbs/Div
Ch. 3:  1.00 Deg/Div

Filter:

Trig. Ch. : 1
Polarity  : Negative
Level :    502.93 lbs
Mode  :Single Event
Pretrigger : 20 %

| CH | TIME | CUR AMP | PEAK AMP | 1ST INT | 2ND INT | TIME/DIV |
|---|---|---|---|---|---|---|
| 1 | 13.18 mS | 4.58 lbs | 1635.44 lbs | -2.82 lb/s | | 6.4 mS |
| 2 | 12.00 mS | -41.81 lbs | 1535.34 lbs | -3.42 lb/s | | 6.4 mS |
| ▪ 3 | 99.84 mS | -0.39 Deg | -1.30 Deg | -9.48 d/s | | 6.4 mS |

**Figure 2.** Load cells and angle vs time.



Drop Height=   0.1 In

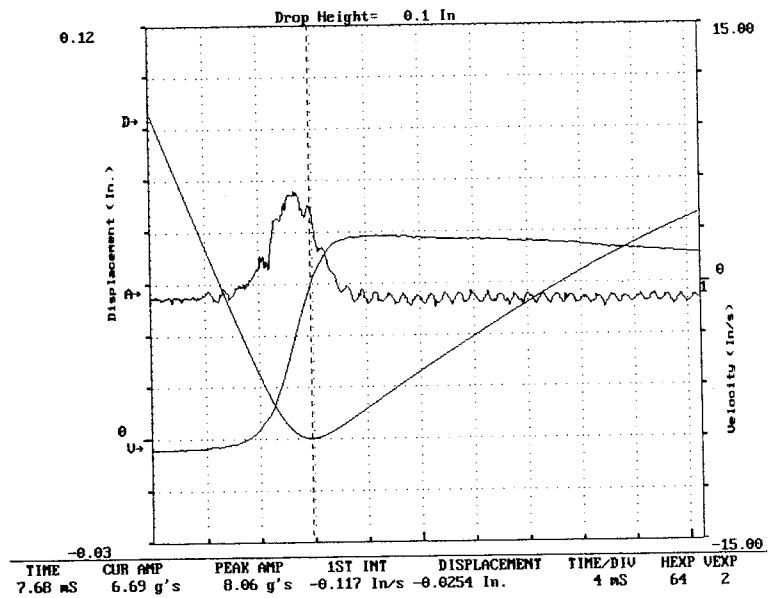| TIME | CUR AMP | PEAK AMP | 1ST INT | DISPLACEMENT | TIME/DIV | HEXP | VEXP |
|---|---|---|---|---|---|---|---|
| 7.68 mS | 6.69 g's | 8.06 g's | -0.117 In/s | -0.0254 In. | 4 mS | 64 | 2 |

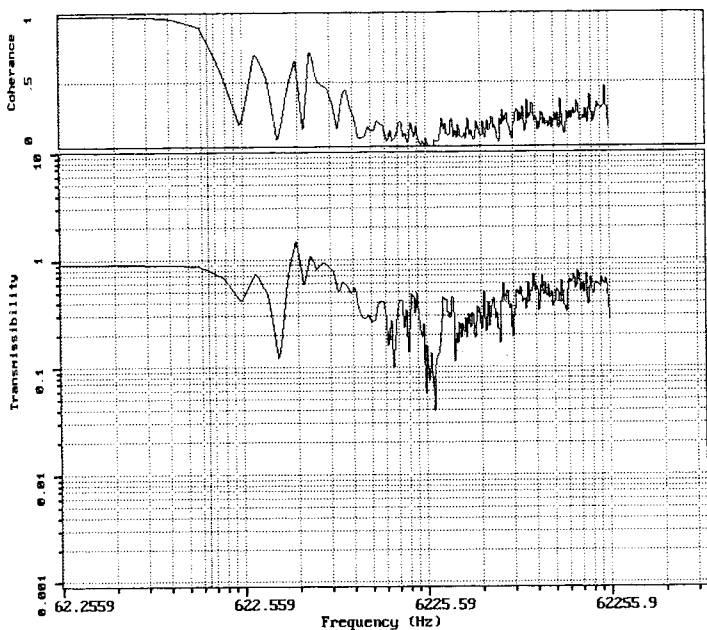**Figure 3.** Acceleration, velocity and displacement vs time.



**Figure 4.** Shock transmissibility and coherence between load cell #1 and load cell #2.