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OPERATING GUIDE

MODEL 5802A INSTRUMENTED LIVM™ IMPULSE HAMMER

THREE POUND SLEDGE

This operating guide contains:

- 1) Specifications, Model 5802A
- 2) Outline/Installation Drawing 127-5802A
- 3) Paper: "Low Impedance Voltage Mode (LIVM) Theory and Operation".

NOTE: LIVM is Dytran's trademark for its line of Low Impedance Voltage Mode sensors with built-in amplifiers operating from constant current sources over two wires. LIVM instruments are compatible with most other manufacturers' comparable systems.

SPECIFICATIONS MODEL 5802A 3-POUND IMPULSE HAMMER

SPECIFICATION	VALUE	UNITS
RANGE, NOMINAL FOR +5 VOLTS OUT	5000	LBS
SENSITIVITY, NOM.	1.0	mV/LB
MAXIMUM INPUT	10,000	LBS
STIFFNESS, FORCE SENSOR	42	LB/ μ IN
RESONANT FREQUENCY, SENSOR WITH NO IMPACT CAP	75	KHz
LINEARITY	+/- 2	% FS
F.S. OUTPUT	+5	VOLTS
OUTPUT IMPEDANCE, NOM	100	OHMS
VOLTAGE BIAS, INTEGRAL AMPLIFIER	+11	VDC
INPUT CURRENT RANGE [1]	2 to 20	mA
COMPLIANCE (SUPPLY) VOLTAGE RANGE [1]	+18 to +30	VOLTS DC
MATERIAL		
FORCE SENSOR	17-4 PH	ST. STEEL
HAMMER HEAD	STEEL	CAST
HANDLE	WOOD	
IMPACT TIPS, ALL	POLYURETHANE	
WEIGHT, HEAD WITH FORCE SENSOR	3	POUNDS
CONNECTOR, AT END OF HANDLE	BNC	JACK

ACCESSORIES SUPPLIED: (1) 6251T IMPACT TIP, TOUGH, RED
(1) 6251S IMPACT TIP, SOFT, BROWN

ACCESSORIES AVAILABLE: 6251H IMPACT TIP, HARD, BLACK
6251M IMPACT TIP, MEDIUM, GREEN

[1] Supply power from constant current source power sources only. Do not use with power supply without current limiting, 20 mA maximum. To do so will destroy built-in amplifier.

OPERATING INSTRUCTIONS

MODEL 5802A 3-POUND INSTRUMENTED SLEDGE IMPULSE HAMMER

INTRODUCTION

Model 5802A impulse hammer is designed to excite into motion, large, heavy structures and machines. These include, truck and locomotive chassis and other large structures.

Model 5802A an integral piezoelectric force sensor of the Low Impedance Voltage Mode (LIVM) type. This sensor utilizes self-generating quartz crystals to generate an output signal (in mV/Lb) which is exactly analogous to the impact force of the hammer.

This signal thus quantifies the input or forcing function, identifying its amplitude and frequency content. Spectrum analyzers are used to extract this information from the hammer signal and compare it to other signals generated by accelerometers located at various points of interest on the test object. These analyzers can instantly display various transfer functions such as mechanical impedance, inertance, compliance and others.

Model 5802A was designed for a nominal full scale impact level of 5000 Lbs. With a sensitivity of approximately 1 mV/Lb, full scale impact produces a +5 Volt peak signal. The exact sensitivity of each hammer is provided by means of a calibration certificate supplied with each instrument.

OPERATION

The force sensor built into Model 5802A contains an integral IC amplifier which converts the very high impedance voltage signal from the quartz crystals to a low impedance level output signal which can be read out by analyzers and other readout instruments.

The LIVM power unit supplied with the hammer should be used to power the 5802A. Certain analyzers have constant current type power sources which may be used to power the 5802A. Check the manufacturers specification on these analyzers to ascertain whether they may be used to

power the hammer. If there is any doubt, contact

Dytran for assistance in this determination. If the hammer is connected to a source of DC voltage without current limiting in the range or 2 to 20 mA, the LIVM amplifier in the hammer sensor will be immediately destroyed.

Connect the hammer to the power unit by connecting a cable from the BNC connector at the end of the hammer handle to the "Sensor" jack on the power unit. If the power unit has a BNC Sensor connector, a Model 6020AXX cable may be used for this connection. If the power unit has a 10-32 connector, a BNC to 10-32 cable such as the Model 6011AXX may be used.

Another way to make this connection is to convert the 10-32 jack to BNC by use of a Model 6113 10-32 to BNC adaptor. The Model 6020AXX cable can now be used.

After connecting the hammer to the Dytran power unit and switching power "on", observe the front panel voltmeter of the power unit. This meter monitors the force sensor IC amplifier bias voltage and as such, may be used a handy trouble shooting tool.

For example, a mid-scale reading on this meter indicates that the cable is intact, not open or shorted and that the IC amplifier is functioning.

A zero reading (Short) indicates that either a cable, connector or the IC is shorted. If this indication is observed, remove the cable and inspect for metallic shards which may be shorting across contacts.

A full-scale (Open) reading means that the amplifier is not receiving power or that it is faulty. If this occurs, check the cables for continuity and replace if necessary.

IMPACT TIPS

It is important that an impact tip be fastened to the face of the force sensor before use. To strike an object without the tip will most likely damage the force sensor beyond repair and voids the warranty.

Thread an impact tip (two are supplied) into the threaded hole in the front face of the force sensor, tightening by hand. The softer impact tip, e.g., the Model 6251S, (brown) will provide mostly low frequency excitation while the harder tips will give greater high frequency content to the input forcing function.

Experimentation is the preferred way to determine the best frequency content of the input impulse for each particular application. Four tips of varying compliance are available from Dytran to help you shape the input function for optimum performance.

FORMING THE INPUT IMPULSE

Some practice will be required before you will realize optimum performance from the 5802A impulse hammer. The following hints may help.

When striking the test object, use direct blows rather than glancing blows and try to strike the test object squarely with the center of the impact tip. The hammer head must be perpendicular to the surface of the test object being excited. Do not strike with the edge of the impact tip. (See Figure 1 below)

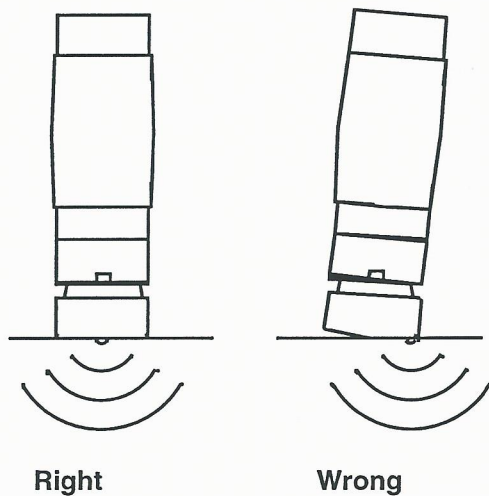


Figure 1 Right/Wrong way to strike the test object.

Use only enough force in the blow to adequately excite the test structure as evidenced by the signals from the accelerometers located at other locations on the structure. Overranging the hammer could damage it.

WARNING

Do not use the hammer without an impact tip as the force sensor will most likely be severely overranged by such an unprotected impact. The internal IC amplifier may be blown out or the hammer may sustain physical damage which could at the very least, render the calibration invalid.

OPTIONAL IMPACT TIPS

Two impact tips are provided with the Model 5802A hammer as standard accessories. These are the Model 6251T (tough) and the Model 6251S (soft). These particular models were selected as standard accessories because experience has shown that these two tips are the most called for.

Should you want to obtain higher frequency excitation in the input impulse, you may want to order the Model 6251H (hard) tip. Should the soft tip prove to be too low in response and the tough too high, you may want to try the Model 6251M (medium) tip. All tips are kept in stock at the factory and can be supplied very quickly. Contact the Dytran factory for price on these spare tips.

CAUTIONS

1) Under no circumstances must you supply power to the BNC connector from a power supply without current limiting, 20 mA maximum. This will destroy the IC amplifier in the force sensor.

2) Do not attempt to measure the resistance at the BNC connector. Many Ohm meters will provide a test voltage with high enough current to destroy the built-in IC.

3) Do not strike any object without an impact tip threaded to the front face of the hammer force sensor. This can damage the instrument.

Do not attempt to remove the force sensor. It is not designed to be field replaceable and to attempt to remove it will most certainly damage it.