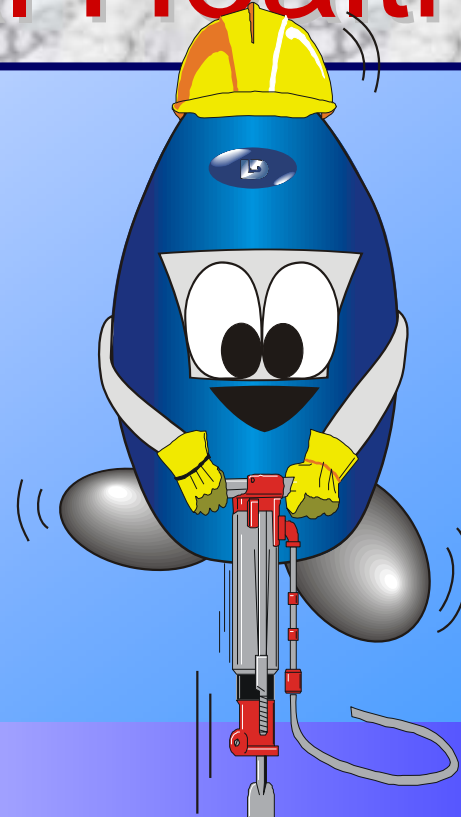


# Vibration Exposure and Occupational Health

Instrument Standards  
and Measurements



*Focus on Vibration Exposure*

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# Occupational Hygiene Vibration Exposure Instrument – the IHVM 100

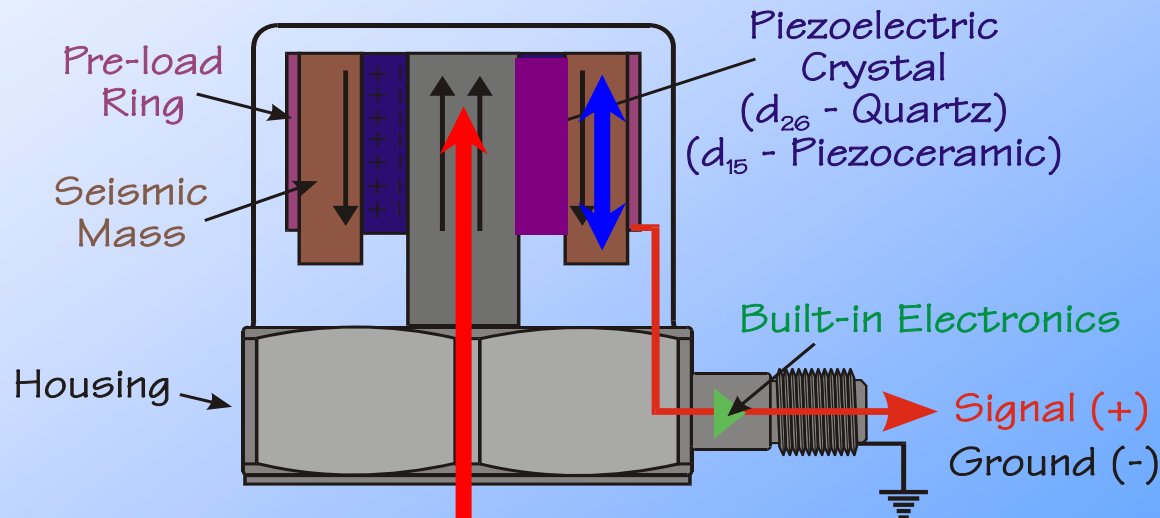
- Digital signal processor (DSP) based instrument
- Hand-Arm and Whole-Body modes in one instrument
- Simultaneous three channel measurements: X,Y,Z and calculation of Sum ( $\Sigma$ )
- Supports ICP<sup>®</sup> mode ACCELEROMETERS or direct input, allows use of any existing sensor (4 pin LEMO input connector adapter cables)
- Lightweight, rugged, hand-held instrument with easy to read LCD display
- Conforms to ISO 8041



# How the Vibration is Sensed

## ➤ Accelerometer

- Simple single degree-of-freedom device which converts the acceleration aspect of motion into a proportional electrical signal
  - Linear Acceleration
  - Angular Acceleration (Not Discussed Here)

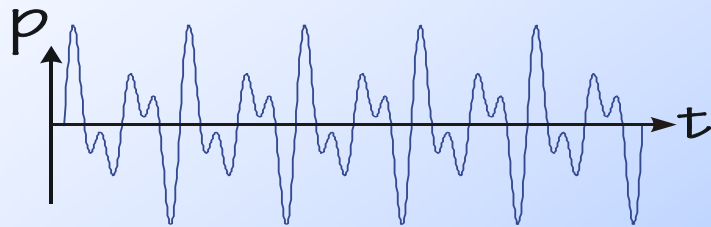


- **Amplitude Signal Output is: mV per g ( $m/s^2$ )**

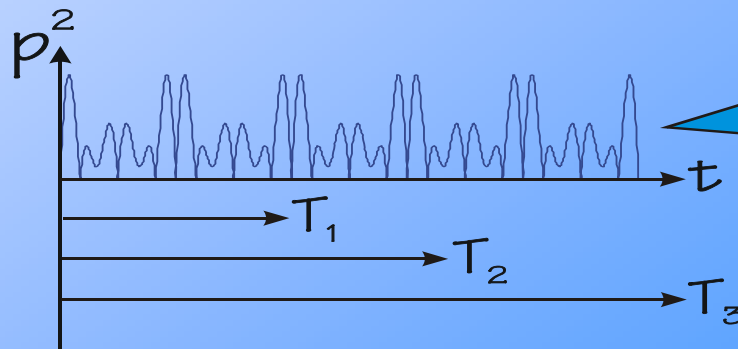


# RMS Integration of Vibration Signal

- If mean value = 0, then what?
- Root Mean Squared (RMS) value



$$\text{RMS} = \sqrt{\frac{1}{T} \int_0^T p^2 dt}$$



# Measurement Standards

---

**ISO 8041** governs the design of vibration-measuring instrumentation to produce comparable results for all types of vibration affecting humans.

Instrumentation specified in this standard covers the need to perform at least one of the measurement methods according to **ISO 2631** and **ISO 5349**



# Measurement Standards

- **ISO 8041: Human response to vibration -- Measuring instrumentation**
- **ISO 2631-1: Mechanical vibration and shock -- Evaluation of human exposure to whole-body vibration -- Part 1: General requirements**
  - **ISO 2631-2: Evaluation of human exposure to whole-body vibration -- Part 2: Continuous and shock-induced vibrations in buildings (1 to 80 Hz)**
- **ISO 5349: Mechanical vibration -- Guidelines for the measurement and the assessment of human exposure to hand-transmitted vibration**
  - **ISO 10819: Mechanical vibration and shock -- Hand-arm vibration -- Method for the measurement and evaluation of the vibration transmissibility of gloves at the palm of the hand**



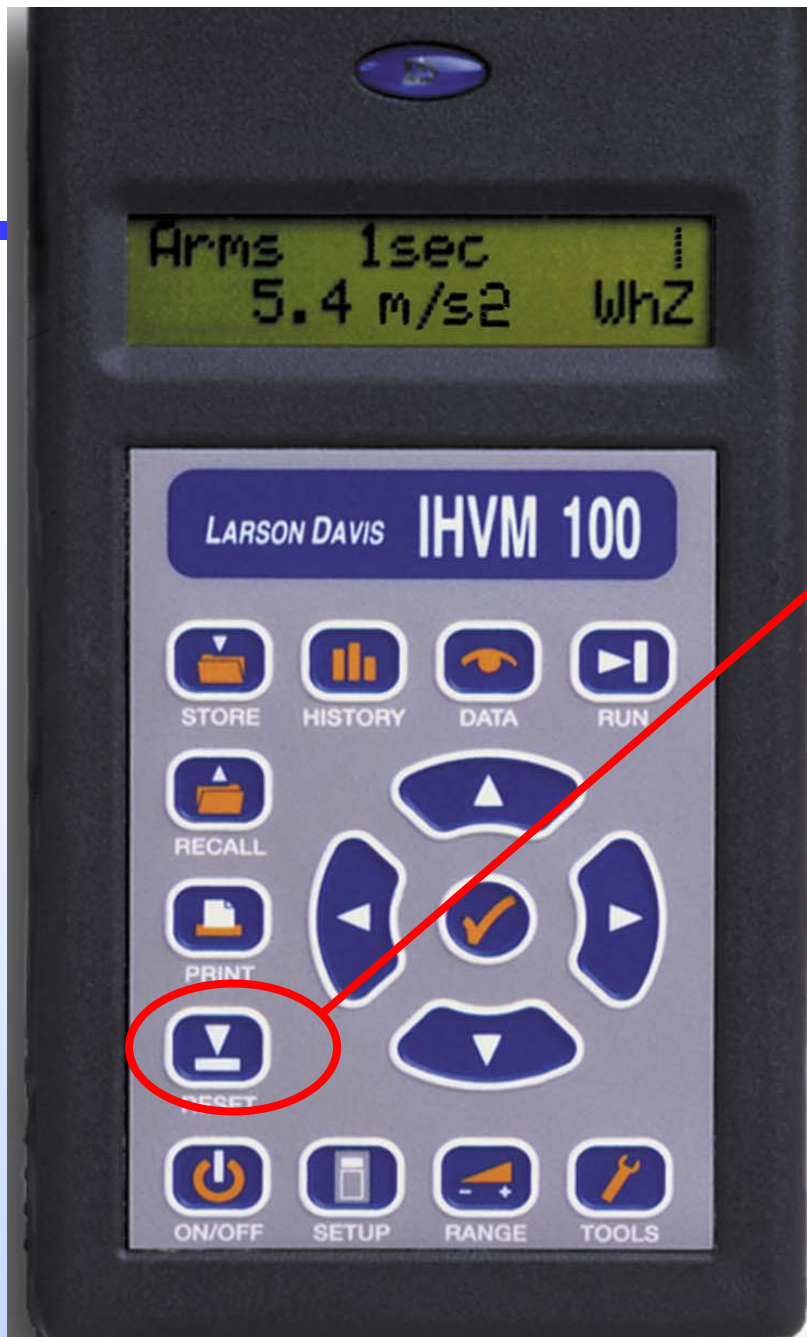
# On/Off Key



➤ Power On/Off



# Reset Key



**RESET Key – Clears  
Data from the  
Screen (does NOT  
erase STORED  
FILES!)**



# Print Key



**PRINT Key – Prints results to Printer**



# Recall Key



**RECALL Key – Gives  
You Stored Files  
(data)**

**(01,02,etc.)**

***OR...***

***Gives You Stored  
Setups***

***(S01, S02, etc)***



# Store Key



**STORE Key – Allows you to Store Test Data**

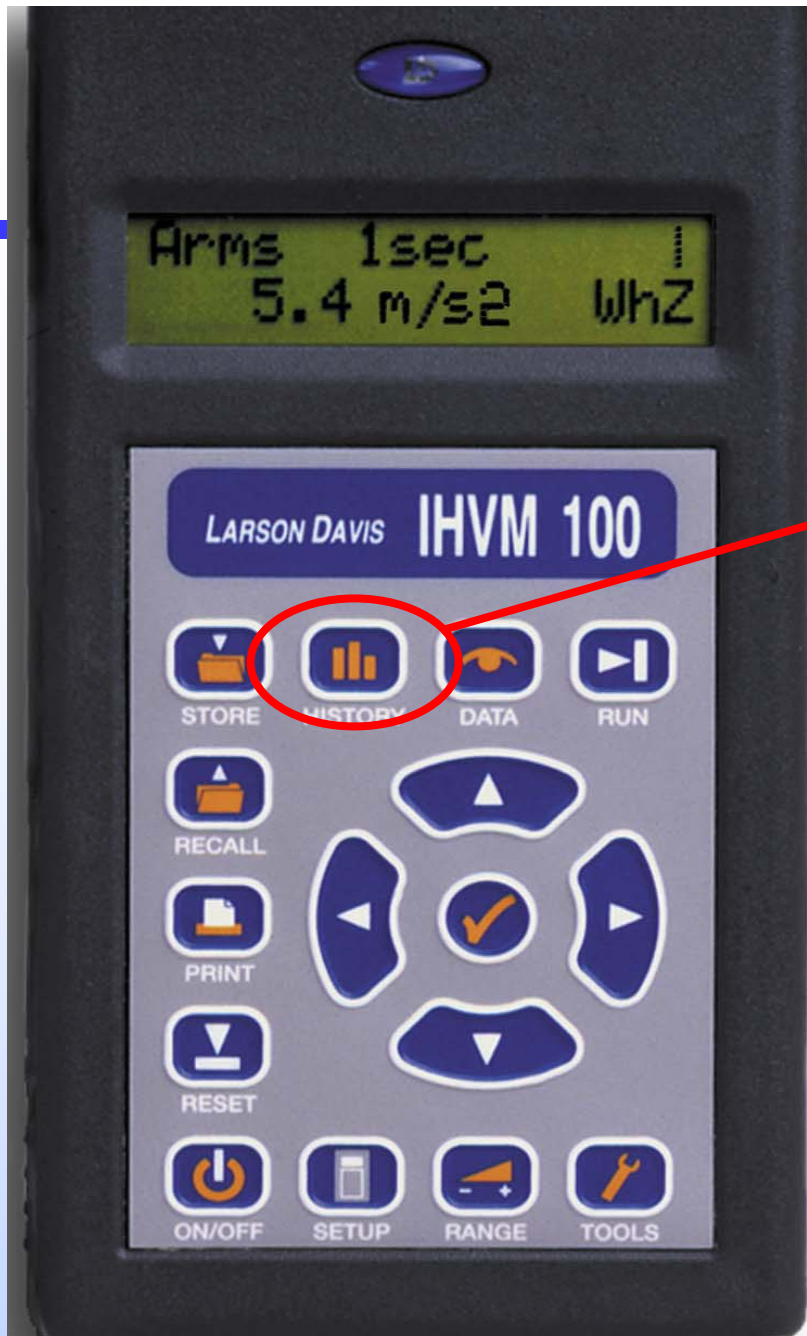
**(01, 02, etc)**

**OR**

**Allows you to store SETUP**



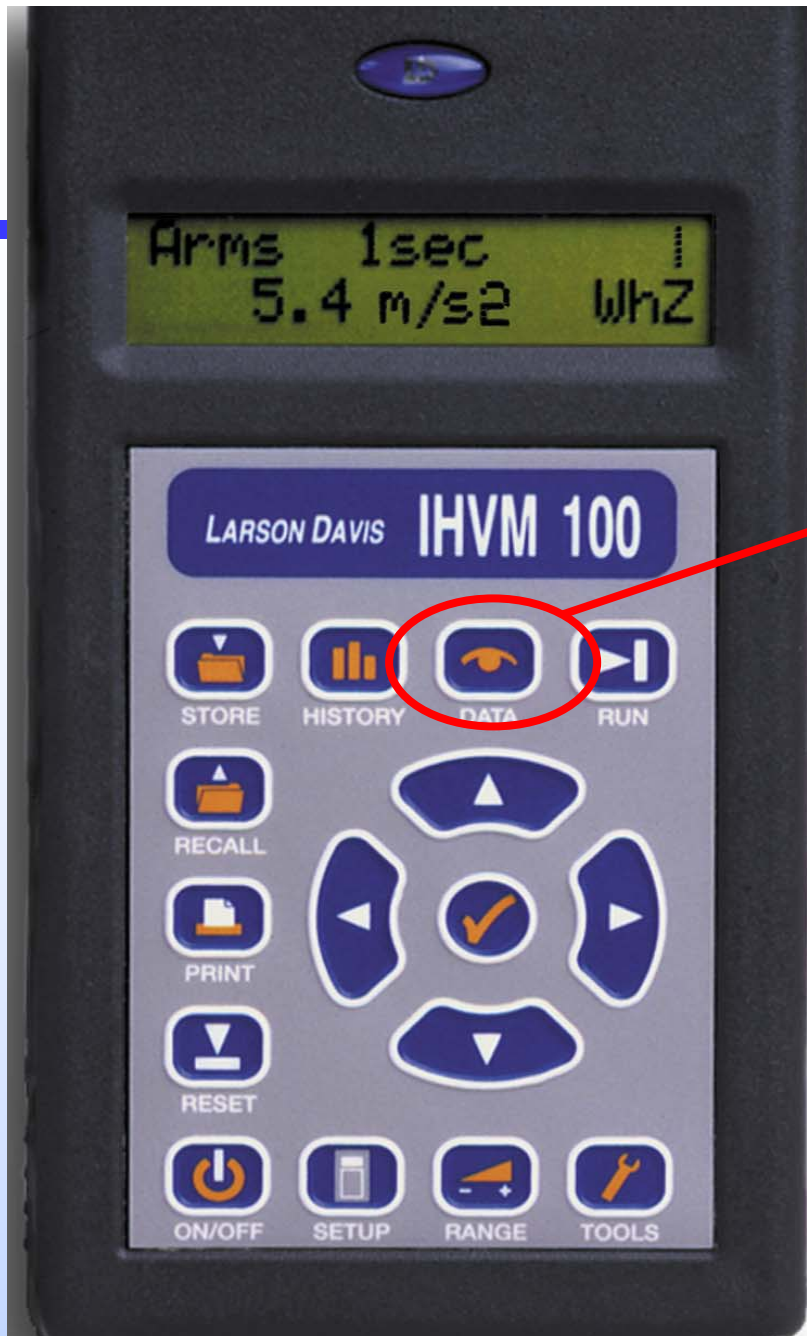
# History Key



➤ View History Data



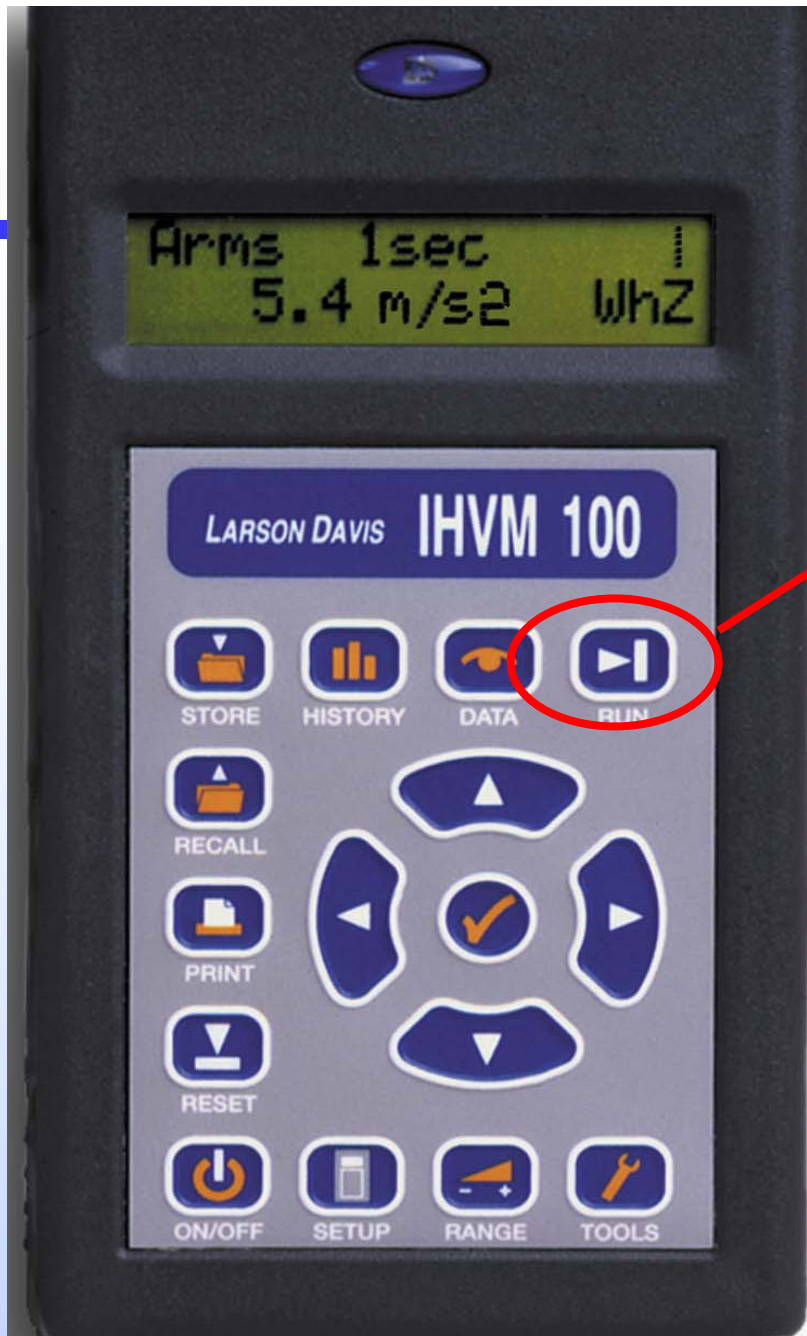
# Data Key



➤ View Data



# Run Key



- Start and stop a test
- “Run – Pause” Key



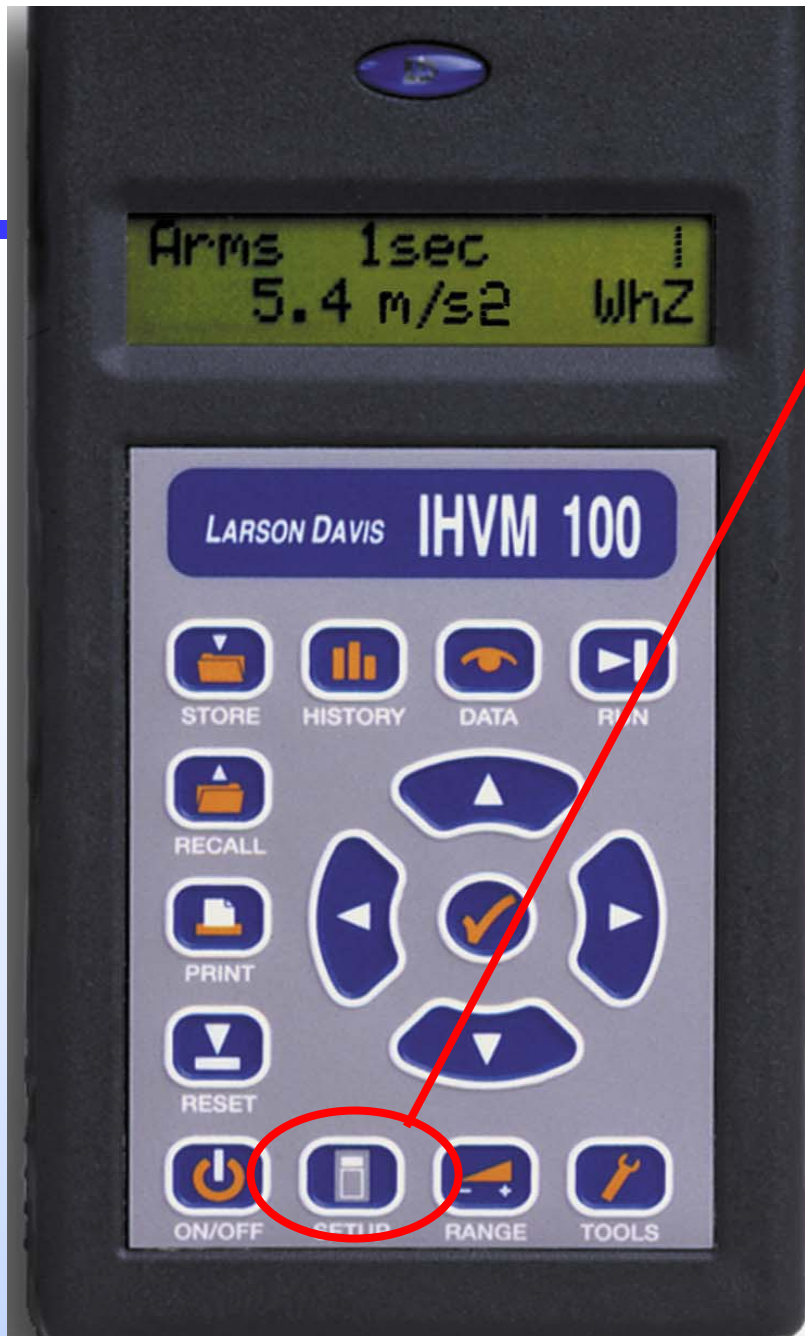
# On/Off Key



➤ Power On/Off



# Setup Key



## Here you will find:

- Operating Mode (HA/WB/SEV)
- Averaging
- Store Time
- Auto Store
- 2<sup>nd</sup> History (Peak)



# Range Key

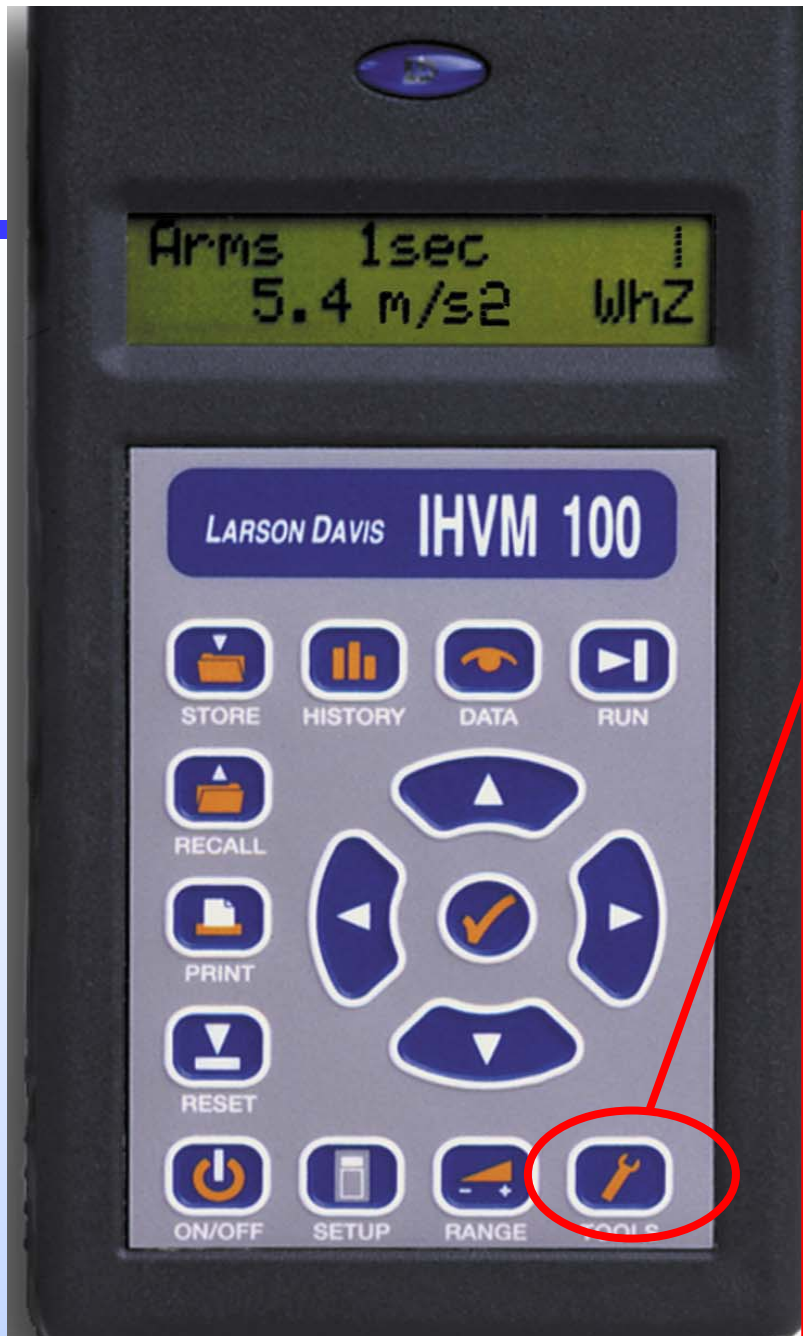


## Here you will find:

- Auto Range
- Gain (X,Y,Z)
- Cal Level
- Calibrate (X,Y,Z)
- Sensitivity (X,Y,Z)
- dB re (reference value)
- Exposure Reference



# Tools Key



## Here you will find:

- Date
- Accelerometer
- Display Units
- Sum Factor (X,Y,Z)
- AC / DC Output (X,Y,Z)
- Baud Rate
- Print History
- Erase All Files
- Erase Steups
- Header (1,2,3,4)
- Language

# Set-up can also be done with Software

The image shows a screenshot of the Blaze software interface. The main window has a menu bar (File, Edit, View, Options, Records, Graph, Window, Help) and a toolbar. On the left, there is a Session Log window showing a session for '00105' connected on '23 Nov 2'. The main area displays the 'HVM 100 Instrument Manager' dialog box, which is currently on the 'General Settings' tab. The 'Instrument Status' section shows a list of instrument setups: '<Instrument>', 'S0 1 Sec. Log', 'S1 60 Sec. Log', 'S2 Hand/Arm', 'S3 WB Buildings', 'S4 Setup Empty', 'S5 Setup Empty', and 'S6 Setup Empty'. Below this list are buttons for 'Make Current', 'Write setups to HVM', 'Save As ...', and 'Reload from HVM'. The 'Setup' section includes tabs for 'Range', 'Tools 1', 'Tools 2', and 'Sensor'. The 'Operating Mode' is set to 'Hand/Arm'. The 'Weighting' section shows 'X Wh', 'Y Wh', and 'Z Wh'. A 'Loading stored Setups ...' dialog box is overlaid on the main window, showing a progress bar at 80% and a 'Cancel' button. The 'HVM 100 Instrument Manager' dialog box also has a 'Close' button at the bottom right.

## HVM 100 Instrument Manager

Instrument Status | General Settings | Manual Control | Download | Calibrate

## Instrument Setups

- \* <Instrument>
- S0 1 Sec. Log
- S1 60 Sec. Log
- S2 Hand/Arm
- S3 WB Buildings
- S4 Setup Empty
- S5 Setup Empty
- S6 Setup Empty

Make Current

Write setups to HVM

Save As ...

Reload from HVM

Setup | Range | Tools 1 | Tools 2 | Sensor

Select sensor and enter sensitivity data, or  
Retrieve user-defined data from sensor list.

Enter Sens.

X 9.86

Y 10.09

Z 9.93

Sensor List

Accelerometer:

ICP

## Sensor List

Select a sensor to load the sensitivities.

Serial #	Axes	Manufacturer	Model	Type	Cal. Date	X Sens.	Y Sens.	Z Sens.
7645	3	PCB	356B40	ICP	11/23/05	98.56 mV/g	101.5 mV/g	99.79 mV/g
98347	3	LD	SEN021F	ICP	11/23/05	9.860 mV/g	10.09 mV/g	9.930 mV/g

OK

Add

Edit

Delete

Export

Print List

Cancel