General Description:
The Smart Bump Integrator (BI) is a response-type road roughness measuring system designed to evaluate road surface condition by measuring the relative vertical displacement of a vehicle's suspension with respect to the vehicle body.
The system records raw bump data and converts it into calibrated roughness indices such as IRI (International Roughness Index) using user-defined calibration equations.
When properly calibrated, the system delivers accuracy comparable to or exceeding conventional bump integrators.

Technical Specifications :

Bump Integrator Encoder

- **Type:** Mechanical response-type roughness sensor
- **Sensing Principle:** Relative displacement measurement between vehicle body and suspension
- **Encoder Type:**
  High-resolution optical encoder
  High reliability and long service life
- **Function:**
  Converts suspension movement ("bumps") into electrical signals
  Transmits signals to the control panel for processing
- **Installation Location:**
  Mounted on vehicle floor above rear suspension
- **Mounting Configurations Supported:**
  Solid rear axle (Half-car measurement)
  Independent rear suspension – dual unit (Quarter-car average, recommended)
  Independent rear suspension – single unit (Quarter-car, not recommended)

Control Panel (Controller Unit) :

- **Function:**
  Receives raw signals from encoder
  Processes bump data in real time
  Communicates processed data to display device
- **Communication:**

Note: Specifications are subject to change, Photos shown above are Indicative, Actual Product can Vary.

Wireless data transmission to Android tablet

- **Interfaces:**
  Power input
  Data input from encoder
- **System Role:**
  Core processing unit of the BI system

Display & Data Processing Unit :
Type: Android Tablet (supplied with system)
Functions:
Real-time display of road roughness data
a. User control and command interface
b. Data storage, processing, and reporting
c. Displayed Live
Parameters:

- Distance
- Vehicle speed
- Bump count
- WRC (Wheel Revolution Count)
- IRI
- Road condition classification

Data Storage:

- Internal database within the tablet

Output Format:

- Exportable reports in Excel (.xls / .xlsx) format

Software & GUI Features :

- **Home Screen Functions:**
  New Project creation
  Access to saved projects
  System information
  Help menu
  Hotspot ON/OFF
  System settings
- **Data Visualization:**
  Distance vs Bump Graph
  Speed vs Bump Graph
  Result / Condition Graph
  Bar Graphs and Pie Charts
- **Mapping Function:**
  GPS-based road condition mapping
  Road displayed on map with color-coded condition classification
  Latitude & Longitude logging
- **Calibration & Settings**
  Calibration Equation
  [Y = aX + b]
  Where:
  X = Raw bump data
  Y = Calibrated roughness value (e.g., IRI)
- **User-configurable Parameters:**
  IP address of control panel
  Calibration constants a and b
- **Operational Features**

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Minimal operator intervention during surveys
Real-time data acquisition and display
Automatic data saving upon completion of WRC
Manual save option if WRC is incomplete
Pass / Release function for skipping road sections
Reset function for clearing current readings

- **Installation Requirements** •
  Installation above rear suspension
  Supplied mounting accessories
  Suitable for rugged and extreme road conditions
  Quick installation and easy field serviceability
- **System Advantages**:
  Proven response-type roughness measurement technology
  Low cost compared to vehicle-mounted profilers
  Wireless operation
  Live IRI and road condition monitoring
  Strong analytical and reporting tools
  One-click report generation

Applications:

- Road roughness surveys
- Pavement condition evaluation
- Highway and rural road assessment
- Maintenance planning and quality control

System Configuration:

The Smart Bump Integrator system consists of three primary units: 1. 2. 3. Bump Integrator Encoder Control Panel (Controller Unit) Display & Data Processing Unit (Android Tablet with BI Software)

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