Train borne track vibration defect detection

Adjustable to shock level required

Automatic recording of pre-triggered levels

GPS positioning recording to sub 2 metre accuracy (depends on Satellite Fix)

Data acquisition SW linking to graphical output

Ethernet, Wi-Fi, GPRS to cloud links

Statistical mgt. of data to MySQL Database

Backend SW design service to customer specification

Certified to EN50155

Efficient identification of track faults

The Train Ride Monitoring Unit, or ‘BumpBox’ as it has become known, is designed to provide an elegant cost effective solution to the continuing issue of track fault identification.
System Architecture

By using the latest embedded computing technology, the Bump Box is able to identify and record common track faults by measuring the shock and vibration characteristics generated in the carriage of the train going over the fault.

The system can be programmed to trigger on particular pre-defined shock levels and is able to log information (including pre and post events) as well. Many thousands of events can be recorded and stored in the Bump Box covering multiple test runs for future analysis.

The information is stored graphically and can be scaled according to the tester’s particular needs.

BumpBox

The BumpBox is a ruggedized Linux OS based computer designed for rugged environments.

The unit comprises of Acceleration and Gyroscope sensing transducers utilising 8 transducer input channels. The BumpBox is fitted with GPS, GPRS and WIFI.

An onboard ruggedized recording disk captures all recorded track data in either stand alone mode or automated distribution of data across the internet direct to customer email, mobile or stored onto the cloud for secure direct customer access in real time.

An external monitor, keyboard and mouse can be connected to the unit if WIFI or 3G isn’t available.

Local Connection Options

Once stored within the system, the Bump box offers several ways of extracting stored events for analysis. The tester can simply connect via USB/VGA, Wi-Fi or for complete remote diagnostics via a 3G GPRS modem if fitted to the system.

Stored results provide a graphical image of the track faults vibration and shock characteristics. It also provides event time and its GPS derived co-ordinates to allow scheduling of maintenance before a fault developed into a critical condition.
Software Modules

The BumpBox is provided with a user friendly software interface with connectivity to the unit across WIFI using a laptop computer, allowing for the viewing of stored event data or real time continuous on board monitoring.

A web based software application for data presentation, using charts, graphs and Geo data, can be fully customized to meet individual customer requirements. Remote diagnostics provide capability to change exceedence levels and ensure the unit is functioning correctly.

Multiple data sets/event data from the same or different vehicles crossing the same track can be compared to provide defect validation and/or defect growth monitoring (trending techniques). Information is also provided on infrastructure condition ensuring the highest quality and condition of the track is maintained, thus allowing advanced predictive maintenance planning.

The SW within the unit can be modified as required to comply with the following standards or parts of these standards.

- ISO 2631 Mechanical Vibration & Shock - Human exposure to the whole body vibrations.
- BS EN 2009;12299 - Ride comfort for passengers
- UIC513 - Passenger comfort in relation to vibrations in Rail Vehicles.

Onboard Measurements

The BumpBox onboard measurements include lateral, vertical and longitudinal accelerations, along with gyroscope heading rate, direction of travel, speed, distance, time and date, all identified with a unique unit/train identification number and exceedence levels.

Solid state relay outputs allow interconnection (with isolation) into the onboard vehicle logging systems if necessary.

Currently the onboard transducers are used with dedicated signature algorithms identifying track areas where rough ride exists and cause significant vertical exceedence levels. The unit can also be used to identify vehicle vibrations due to deteriorating suspension.

Web-Based Data Management and Reporting Software

- Web Based event Mapping Dashboard against GPS co-ordinates.
- Geographical Location of all BumpBoxes are updated every 6 seconds.
- Bar graph arrays detailing event occurrences changing colour as defects grow in size.

Tel: +44 (0)7880 503526
Geo-Spatial coordinates identifying track defects, severity and Excel/PDF output reporting.

Email configurations for operator notifications detailing, defect event, time, location, severity and degradation.

System Specification

**PSU INPUT VOLTAGE:** 77VDC to 134VDC. Meets EN50155 for radiated and conducted emissions and susceptibility. (The unit can be battery operated on request).

**POWER CONSUMPTION:** 10 to 25 watts depending on load

**PROCESSOR:** Intel Atom E680T 1.60 GHz

**OPERATING SYSTEM:** Linux

**DRAM:** 1GB soldered DRAM

**STORAGE:** 32GB MSATA solid state drive for Data storage

**Wi-Fi:** IEEE 802.11

**MODEM:** Provision for HSPA (GSM 3G etc.) Modem with Sim slot

**POSITIONING SYSTEM:** Provision for built in GPS & dead reckoning system with tilt compensation, 3 axis gyro with heading rate.

**VIBRATION MONITORING FACILITY:** Tri-axis accelerometer with associated filtering and amplification. Nominally set +/-1G for operation of relay to provide external indication of 1G event during operational use.

**EXTERNAL CONNECTORS:** Rail approved rugged connectors, power and relay IO, provision for GPS Antenna, provision for modem antenna. Two USB and one VGA

**Other:** Event triggered internal relay for connection to existing train logging system.