ACCELEROMETERS & MICROPHONES FOR RAIL APPLICATIONS
PCB® has been involved in rail sensor design since 1998, at the request of a European customer who required an accelerometer to accurately detect the condition of bearings and low frequency lateral motion on high speed trains. A PCB series 625 accelerometer was chosen to collect a comprehensive amount of data over several months of bogie monitoring. After analyzing this data, a customized sensor solution was developed to include filtering, high shock survivability, and specialized mounting.

PCB’s ability to customize our sensors to meet the exact needs of our rail customers, has enabled PCB to exceed our customers expectations. With tens of thousands of sensors used in rail applications world-wide, PCB can achieve the high standards required for rail monitoring, along with sensor solutions for complex applications.

- PCB Piezotronics’ Quality System meets the requirements of AS9100 and ISO-9001.
- PCB® maintains an A2LA ISO/IEC 17025 certified calibration laboratory.
Bogie system monitoring is used to monitor the vibration of trains, and depending on the location, can be used for preventative maintenance, early detection of failure, bogie hunting, and ride quality. Bogie system monitoring is an essential component to train maintenance, which ensures that parameters such as the wear within the bearings, shafts, brakes, and wheels are identified and properly monitored. This allows repair work to be scheduled efficiently, drive down maintenance costs, and prevent potential instabilities that may cause an accident.

- Condition monitoring offers opportunities to increase reliability and safety, and to achieve lower maintenance costs. Using condition detection systems and applying detailed algorithms for data processing can detect early damage and allow time for repairs before a mechanical failure occurs. Expenses will be saved in the long term with maintenance being scheduled during non-peak times to increase vehicle reliability.

- Derailment prevention of high speed passenger trains is a extremely important safety system that uses very complex algorithms to detect irregular oscillations, when transmitted to the operator or automatically shutdown the system. The requirement for safety monitoring creates the need to make a real-time decision based on provided data.

Passenger ride quality is an important factor in rider comfort. Track irregularities are transmitted to the passenger and their frequency and amplitude (especially laterally) must be measured to determine the effect on comfort quality. PCB has sensors and microphones that can be used to measure these characteristics.
Rail systems use specially developed accelerometers for monitoring that meet strict environmental and safety standards. PCB designs rail accelerometers using the optimum technology type to meet the needs of the application. Industrial type sensors are used in these rail applications as the construction of these sensors are ideal for the rail environment which covers a wide range of ambient conditions. In addition to the below stock accelerometers, PCB is able to provide custom accelerometers with TEDS, surge protection, frequency filtering, electrical isolation, as well as specialized cables that meet specific environmental and rail standards.

**LOW PROFILE, INDUSTRIAL, ICP® ACCELEROMETER**
**MODEL 602D11**
- Sensitivity: (±10%) 100 mV/g (10.2 mV/(m/s²))
- Measurement Range: ±50 g (±490 m/s²)
- Frequency Range: (±3dB) 0.5 to 8000 Hz

**GENERAL PURPOSE, INDUSTRIAL, ICP® ACCELEROMETER**
**MODEL 603C01**
- Sensitivity: (±10%) 100 mV/g (10.2 mV/(m/s²))
- Measurement Range: ±50 g (±490 m/s²)
- Frequency Range: (±3dB) 0.5 to 10000 Hz

**LOW PROFILE INDUSTRIAL ICP® ACCELEROMETER**
**MODEL 607A61**
- Sensitivity: (±15%) 100 mV/g (10.2 mV/(m/s²))
- Measurement Range: ±50 g (±490 m/s²)
- Frequency Range: (±3dB) 0.5 to 10000 Hz

**MODAL ARRAY, ICP® ACCELEROMETER**
**MODEL 333B40**
- Sensitivity: (±10%) 500 mV/g (51.0 mV/(m/s²))
- Measurement Range: ±10 g pk (±98 m/s² pk)
- Frequency Range: (±5%) 0.5 to 3000 Hz

**RING-STYLE, INDUSTRIAL, ICP® ACCELEROMETER**
**MODEL 606B01**
- Sensitivity: (±20%) 100 mV/g (10.2 mV/(m/s²))
- Measurement Range: ±50 g (±490 m/s²)
- Frequency Range: (±3dB) 0.5 to 10000 Hz

**TRIAXIAL ICP® SEAT PAD ACCELEROMETER**
**MODEL 356B41**
- Sensitivity: (±10%) 100 mV/g (10.2 mV/(m/s²))
- Measurement Range: ±10 g pk (±98 m/s² pk)
- Frequency Range: (±5%) 0.5 to 1000 Hz
MEMS DC ACCELEROMETERS
SERIES 3711F
- Sensitivities available from (± 3%) 6.75 mV/g (68.8 mV/s²) to 6.75 mV/g (0.69 mV/(m/s²))
- Measurement Range available from: ±2 g pk(±19.6 m/s² pk) to ±200 g pk(±1962 m/s² pk)
- Frequency Range available from: (±5%) 0 to 250 Hz to 0 to 1500 Hz

TRIAXIAL MEMS DC ACCELEROMETERS
SERIES 3713F
- Sensitivities available from (± 3%) 6.75 mV/g (68.8 mV/s²) to 6.75 mV/g (0.69 mV/(m/s²))
- Measurement Range available from: ±2 g pk(±19.6 m/s² pk) to ±200 g pk(±1962 m/s² pk)
- Frequency Range available from: (±5%) 0 to 250 Hz to 0 to 1500 Hz

DIFFERENTIAL MEMS DC ACCELEROMETERS
SERIES 3741F
- Sensitivities available from (± 3%) 13.5 mV/g (1.38 mV/(m/s²)) to 1350 mV/g (137.6 mV/(m/s²))
- Measurement Range available from: ±2 g pk(±19.6 m/s² pk) to ±200 g pk(±1962 m/s² pk)
- Frequency Range available from: (±5%) 0 to 250 Hz to 0 to 1000 Hz

TRIAXIAL, GENERAL PURPOSE, ICP® ACCELEROMETER
MODEL 356A02
- Sensitivity: (±10%) 10 mV/g (1.02 mV/(m/s²))
- Measurement Range: ±500 g pk (±4900 m/s² pk) (±490 m/s²)
- Frequency Range: (±5%) 1 to 5000 Hz

TRIAXIAL, ICP® ACCELEROMETER
MODEL HT356A66
- Sensitivity: (±10%) 10 mV/g (1.02 mV/(m/s²))
- Measurement Range: ±500 g pk (±4900 m/s² pk)
- Frequency Range: (±5%) 2 to 4000 Hz

LOW COST EMBEDDABLE ACCELEROMETER
MODEL RHHT66102APZ1
- Sensitivity: (±20%) 10 mV/g (1.02 mV/(m/s²))
- Measurement Range: 500 g (5000 m/s²)
- Frequency Range: (±3dB) 0.5 to 5k Hz
RIDE QUALITY

PCB microphones can be used to measure acoustic fields within and around train cars. Customer satisfaction and overall ride quality are directly tied to the types of noises an individual may experience during their trip. PCB microphones meet all applicable IEC standards for test and measurement microphones, and have excellent frequency and amplitude response to ensure accurate measurements in a wide variety of rail applications.

1/4" FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM
MODEL 130F20
- Low Noise Floor: 24 dBA
- Frequency Range: 10 Hz - 20 kHz (±4 dB)
- Electrical Connector: BNC Jack (Typical)

1/4" FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM
MODEL 130F21
- Low Noise Floor: 24 dBA
- Frequency Range: 10 Hz - 20 kHz (±4 dB)
- Electrical Connector: 10-31 coaxial jack

1/4" FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM
MODEL 130F22
- Low Noise Floor: 24 dBA
- Frequency Range: 10 Hz - 20 kHz (±4 dB)
- Electrical Connector: SMB coaxial socket

1/2" WATER AND DUST RESISTANT ICP® MICROPHONE SYSTEM
MODEL 130A24
- Sensitivity: 10 mV/Pa
- Frequency Range: 20 Hz - 16 kHz (±3 dB)
- IP55 Rated for harsh environments

1/2" LOW NOISE ICP® PREPOLARIZED MICROPHONE SYSTEM
MODEL 378A04
- Less than 6.5 dBA noise floor
- Frequency Range: 5 Hz to 20 kHz
- High sensitivity, 450 mV/Pa
- Electrical connector: BNC Jack

1/2" FREE-FIELD ICP® MICROPHONE SYSTEM
MODEL 378B02
- Sensitivity: 50 mV/Pa
- Frequency Range: 3.75 Hz – 20 kHz
- Dynamic Range: 137 dB re 20 µPa (± 2 dB) (Typical)

SURFACE MICROPHONE
MODEL 130B40
- Sensitivity: (±3 dB) 8.5 mV/Pa
- Dynamic Range: 150 dB before clipping
- Electrical Connector: 10-32 Coaxial plug
Controlling and monitoring railway and train noise in residential and urban areas is critical. Outdoor noise monitoring systems allow you to gather the data needed to ensure you are being a good neighbor.

**NOISE MONITORING**

**SOUNDAVISOR™ PORTABLE NOISE MONITORING**
MODEL NMS044

- Remote 24/7 monitoring
- Easy deployment in the field
- Solar power options
- Real-time exceedance and event alerts
MTS Sensors, a division of MTS Systems Corporation (NASDAQ: MTSC), vastly expanded its range of products and solutions after MTS acquired PCB Piezotronics, Inc. in July, 2016. PCB Piezotronics, Inc. is a wholly owned subsidiary of MTS Systems Corp.; IMI Sensors and Larson Davis are divisions of PCB Piezotronics, Inc.; Accumetrics, Inc. and The Modal Shop, Inc. are subsidiaries of PCB Piezotronics, Inc.