ACCELEROMETERS & MICROPHONES FOR RAIL APPLICATIONS
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.
**MONITORING**

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.

**RIDE CONTROL (MONITORING RIDE AND COMFORT QUALITY)**

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.
**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.

<table>
<thead>
<tr>
<th>1/4&quot; FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM</th>
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<th>1/4&quot; FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM</th>
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<tbody>
<tr>
<td>MODEL 130F20</td>
<td>MODEL 130F21</td>
<td>MODEL 130F22</td>
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<tr>
<td>- Low Noise Floor: 24 dBA</td>
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<tr>
<td>- Frequency Range: 10 Hz - 20 kHz (±4 dB)</td>
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<tr>
<td>- Electrical Connector: BNC Jack (Typical)</td>
<td>- Electrical Connector: 10-31 coaxial jack</td>
<td>- Electrical Connector: SMB coaxial socket</td>
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<tr>
<th>1/2&quot; WATER AND DUST RESISTANT ICP® MICROPHONE SYSTEM</th>
<th>1/2&quot; LOW NOISE ICP® PREPOLARIZED MICROPHONE SYSTEM</th>
<th>1/2&quot; FREE-FIELD ICP® MICROPHONE SYSTEM</th>
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<tbody>
<tr>
<td>MODEL 130A24</td>
<td>MODEL 378A04</td>
<td>MODEL 378B02</td>
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<tr>
<td>- Sensitivity: 10 mV/Pa</td>
<td>- Less than 6.5 dBA noise floor</td>
<td>- Sensitivity: 50 mV/Pa</td>
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<tr>
<td>- Frequency Range: 20 Hz - 16 kHz (±3 dB)</td>
<td>- Frequency Range: 5 Hz to 20 kHz</td>
<td>- Frequency Range: 3.75 Hz – 20 kHz</td>
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<tr>
<td>- IP55 Rated for harsh environments</td>
<td>- High sensitivity, 450 mV/Pa</td>
<td>- Dynamic Range: 137 dB re 20 µPa (± 2 dB) (Typical)</td>
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<th>SURFACE MICROPHONE</th>
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<tr>
<td>MODEL 130B40</td>
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<tr>
<td>- Sensitivity: (±3 dB) 8.5 mV/Pa</td>
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<tr>
<td>- Dynamic Range: 150 dB before clipping</td>
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<td>- Electrical Connector: 10-32 Coaxial plug</td>
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NOISE MONITORING

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.

SOUNDAVISOR™ PORTABLE NOISE MONITORING
MODEL NMS044

- Remote 24/7 monitoring
- Easy deployment in the field
- Solar power options
- Real-time exceedance and event alerts