ELECTRIC & HYBRID VEHICLE TESTING & DEVELOPMENT
Noise sources are distinct between electric vehicles and conventional vehicles due to their different types of power. Electric vehicles have systems that contribute differently to the interior and exterior noise levels and quality. PCB offers a wide array of microphones specifically designed to meet many different exacting applications.

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
- Cost effective
- TEDS
- Intrinsically safe (for battery testing) and high temperature versions available

1/2" LOW NOISE ICP® MICROPHONE SYSTEM
MODEL 378A04

- Prepolared (industry’s first)
- Frequency Range: 10 Hz - 16 kHz
- Less than 6.5 dBA noise floor
- High sensitivity, 450 mV/Pa
- TEDS

1/2" PREPOLARIZED RANDOM INCIDENCE MICROPHONE
MODEL 378C20

- Sensitivity: 50 mV/Pa
- Frequency Range: 3.75 Hz – 16 kHz
- Dynamic range: 16 dB(A) – 137 dB
- Excellent for vehicle interior sound measurements
<table>
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<th>APPLICATIONS INLCUDE:</th>
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<tr>
<td>Cabin noise testing</td>
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<td>Wind noise testing</td>
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<td>Powertrain development</td>
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<td>Noise source location</td>
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<td>Sound system performance</td>
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<td>Vehicle and powertrain noise, vibration and harshness (NVH)</td>
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<td>Automotive component and system performance</td>
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<tr>
<th>1/2&quot; WATER AND DUST RESISTANT ICP® MICROPHONE SYSTEM</th>
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<td>MODEL 130A24</td>
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<tr>
<td>ICP® water resistant array</td>
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<tr>
<td>IP55 rated</td>
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<tr>
<td>Frequency Range: 20 Hz to 16 kHz</td>
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<tr>
<td>IP55 Rated for harsh environments</td>
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<tr>
<td>Cost effective</td>
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<td>Harsh testing environment applications</td>
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<tr>
<th>1/4&quot; FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM</th>
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<tr>
<td>SERIES 130F</td>
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<tr>
<td>Low noise floor: 24 dBA</td>
</tr>
<tr>
<td>Frequency Range: 10 Hz to 20 kHz (+/- 4 dB)</td>
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<td>Integral preamplifier &amp; SMB jack connector</td>
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<td>TEDS</td>
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<td>High channel count applications</td>
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<th>SURFACE MICROPHONE</th>
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<tr>
<td>MODEL 130B40</td>
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<tr>
<td>Low profile 1/8&quot; (3 mm) microphone system</td>
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<tr>
<td>Dynamic Range: 150 dB before clipping</td>
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<tr>
<td>Water and dust resistant grid cap</td>
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<td>Integral 5 ft cable</td>
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<td>Adhesive mounting for flush mounted applications</td>
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Hybrid and electric vehicles present NVH testing challenges due to vehicle complexity and potential for problems with electrical isolation. NVH issues related to the addition of new electrical devices, gear whine, and vehicle resonances increase the number of NVH areas to be tested. Our broad line of accelerometers is engineered to meet these challenges, by incorporating ground and case isolation. Electrically isolated accelerometers help avoid measurement errors and poor test data that can result when ground loops and stray electrical signals are present during testing.

**VIBRATION**

**HIGH SENSITIVITY ICP® TRIAXIAL ACCELEROMETER**

- Model 356A15
- Sensitivity: 100 mV/g
- Measurement Range: ±50 g pk
- Frequency Range: 5 to 5000 Hz
- Electrical Connector: 1/4-28 4-Pin

**TRIAXIAL, GENERAL PURPOSE ICP® ACCELEROMETER**

- Model 356A25
- Sensitivity: 25 mV/g
- Measurement Range: ±200 g pk
- Frequency Range: 1 to 5000 Hz
- Electrical Connector: 1/4-28 4-Pin

**TRIAXIAL, GENERAL PURPOSE ICP® ACCELEROMETER**

- Model 356A02
- Sensitivity: 10 mV/g
- Measurement Range: ±500 g pk
- Frequency Range: 1 to 5000 Hz
- Electrical Connector 1/4-28 4-pin
**GROUND ISOLATED TEDS TRIAXIAL ACCELEROMETER**  
MODELS J356A43, J356A44, J356A45

- Ground isolated
- Frequency Range: (±5%) 0.7 to 7 kHz
- 1/4 - 28 4-pin connector
- TEDS IEEE 1451.4 enabled
- Available in sensitivities 10 mV/g, 50 mV/g, and 100 mV/g

**MINIATURE TRIAXIAL ICP® ACCELEROMETER**  
SERIES 356A03

- Sensitivity: 10 mV/g
- Measurement Range: ±500 g pk
- Frequency Range: 2 to 8000 Hz (y or z axis) 2 to 5000 Hz (x axis)
- Small 0.25 (6.4 mm) adhesive mount cube
- Ground isolation model available

**MINIATURE CERAMIC SHEAR ICP® ACCELEROMETER**  
MODEL 352A24

- Sensitivity: 100 mV/g
- Measurement Range: ±50 g pk
- Frequency Range: 1.0 to 8000 Hz
- Miniature, lightweight (0.8 gm)

**INTRINSICALLY SAFE ACCELEROMETER**  
MODEL EX639A91

- Sensitivity: 100 mV/g
- Measurement Range: ±50 g pk
- Frequency Range: 0.5 to 13000 Hz
- Electrical Connector: 4-Pin, M12
- Intrinsically safe for EV battery testing

**GROUND ISOLATED TRIAXIAL HIGH SENSITIVITY ICP® ACCELEROMETER**  
MODEL 354C03

- Ground isolated
- Frequency Range: (±5 %) 0.5 to 2 kHz
- Sensitivity: 100 mV/g
- Thru-hole mounting

**HIGH SENSITIVITY ICP® ACCELEROMETER**  
MODEL 352C33

- Frequency Range: (±5%) 0.5 to 10 kHz
- Sensitivity: 100 mV/g
- 10-32 side connector
- Ground isolation model available
MEMS DC ACCELEROMETERS
MODEL 3711F
Sensitivities: (± 3%) 6.75 mV/g to 675 mV/g
Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
Frequency Range: (±5%)
0 to 250 Hz to 0 to 1500 Hz

TRIAXIAL MEMS DC ACCELEROMETERS
MODEL 3713F
Sensitivities: (± 3%) 6.75 mV/g to 675 mV/g
Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
Frequency Range: (±5%)
0 to 250 Hz to 0 to 1500 Hz

DIFFERENTIAL MEMS DC ACCELEROMETERS
MODEL 3741F
Sensitivities: (± 3%) 13.5 mV/g to 1350 mV/g
Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
Frequency Range: (±5%)
0 to 250 Hz to 0 to 1500 Hz

DIFFERENTIAL, TRIAXIAL MEMS DC ACCELEROMETERS
SERIES 3743F
Sensitivities: (± 3%) 13.5 mV/g to 1350 mV/g
Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
Frequency Range: (±10%)
0 to 2500 Hz to 0 to 1500 Hz

VIBRATION

PCB® series 3711F, 3713F, 3741F, and 3743F DC response sensors are used to measure low frequency motion down to zero hertz. Each series includes a full scale measurement range from ± 2g to ± 200g and features low spectral noise with high resolution. DC response sensors feature gas-damped silicon MEMS sensing elements for uniform, repeatable performance and high frequency overload protection.
Vibration Accessories

PCB® offers a wide selection of signal conditioners, accessories, and cables that complement our sensors for testing electric vehicles, hybrid electric vehicles, and fuel cell vehicles. See our website for the complete offering of these products.

**4-CONDUCTOR, SHIELDED, FEP CABLE**
MODEL 010GXX
- Used with triaxial ICP® accelerometers
- 4 conductor, shielded, FEP jacket
- 1/4-28, 4-socket plug to 3 BNC plugs

**4-CONDUCTOR, SHIELDED, FEP CABLE**
MODEL 034WXX
- Used with triaxial ICP® accelerometers
- 4 conductor, shielded, FEP jacket
- IP68 Rated 1/4-28, 4-socket plug to 3 BNC plugs

**4-CONDUCTOR, SHIELDED, POLYURETHANE CABLE**
MODEL 078WXX
- Used with triaxial ICP® accelerometers
- 4 conductor, shielded, flexible polyurethane jacket
- IP68 Rated 1/4-28, 4-socket plug to 3 BNC plugs

**NF CABLE**
4-CONDUCTOR TERMINATION
- Connector Style: Triple Splice
- Connector Style: BNC
- Connection Type: Plug (male pin)
- Temperature Range: -40 to +176 °F (-40 to +80 °C)
- Grounded shield

**ICP® SIGNAL CONDITIONER**
MODEL 483C15
- 8 individual channels
- ICP® and voltage sensor input
- Selectable gain of x1, x10, x100

**LOW-NOISE COAXIAL CABLE**
SERIES 003CXX
- Used with single axis ICP® accelerometers
- Low-noise coaxial cable
- 10-32 coaxial plug to BNC plug
High-precision, DC responding Endevco piezoresistive accelerometers are widely specified for vehicle safety testing due to their high-output, low mass designs and compact size for mounting within difficult-to-reach areas. Their survivability, miniature size and DC response measurement capabilities offer solutions for a diverse set of automobile testing requirements.

**AUTO SAFETY SENSORS**

**UNDAMPED PIEZORESISTIVE ACCELEROMETER**
MODEL 7264C
- DC response and wide bandwidth
- Undamped - meets NHTSA SA572-S4
- Mechanical stops
- Passenger safety testing

**PIEZORESISTIVE TRIAXIAL ACCELEROMETER**
MODEL 7268C
- 500 and 2000 g ranges
- DC response
- 12 wire integral cable
- Original equipment for WorldSID ATD

**ANGULAR RATE SENSOR**
MODEL 7310A
- Ranges of 100, 500, 1500, 6K, 8K, 12K and 18K deg/sec
- Up to 2000 Hz bandwidth
- Weighs less than 3 grams
- Operates with 5 to 16 V input
PIEZORESISTIVE ACCELEROMETER
MODEL 701AH - 701FH
- High sensitivity, 0.3 mV/g
- Multi-mode gas damping
- Flat frequency response
- Rugged housing and cable with 28 AWG conductors

PIEZORESISTIVE ACCELEROMETER
MODEL 726CH
- High sensitivity 600mV FSO
- Multi-mode damping
- DC response and wide bandwidth
- In-dummy application

PIEZORESISTIVE ACCELEROMETER
MODEL 757AH - 757FH
- High sensitivity, 0.3 mV/g
- Multi-mode gas damping
- Crash and shock testing
- Survives up to 10,000 g shock

APPLICATIONS INCLUDE:
Anthropomorphic test devices (ATD) - DC accelerometers and angular rate sensors meeting J211/J2570/ISO6487, NHTSA SA572 designed for use inside various dummies
On-vehicle crash test - Rugged accelerometers with a wide variety of form factors for use in on-vehicle crash environments
SLED testing - DC accelerometers designed specifically for sled track test environment
Pedestrian safety testing - Highly damped accelerometers meeting EuroNCAP directives, suitable for installing inside headform
ABS/Airbag Testing - Miniature pressure transducers with broad frequency response, perfect for airbag design and tests
Side impact testing - Small pressure sensors that fit inside doors and other tight locations
TRIAXIAL PIEZORESISTIVE ACCELEROMETER
MODEL 713 - 713F
- High sensitivity, 0.3 mV/g
- Multi-mode damping
- Compact package, eliminates mounting block

PIEZORESISTIVE PRESSURE TRANSDUCER
MODEL 8510B
- 200, 500, 2000 psig ranges
- Airbag testing
- Rugged, miniature

PIEZORESISTIVE PRESSURE TRANSDUCER
MODEL 8530B
- 15, 50 and 100 psia ranges
- Side impact testing
- Absolute reference

DAMPED PIEZORESISTIVE ACCELEROMETER
MODEL 7264H
- DC response and wide bandwidth
- Multi-mode damping
- High sensitivity
- Passenger safety testing

PIEZORESISTIVE PRESSURE TRANSDUCER
MODEL 8530C
- 200, 500, 1000, 2000 psia ranges
- Detachable cable
- ABS studies

PIEZORESISTIVE PRESSURE TRANSDUCER
MODEL 8530BM37
- 200, 500, 1000, 2000 psia ranges
- Detachable cable
- ABS studies

PIEZORESISTIVE PRESSURE TRANSDUCER
MODEL 858H
- High sensitivity, 0.3 mV/g
- Multi-mode gas damping
- Mountable on x, y, or z axis
ENDEVCO AUTO SAFETY SELECTION CHART

START

NUMBER OF AXIS?
TRIAXIAL
SINGLE

VEHICLE

MOUNTING LOCATION

ATD

NUMBER OF AXIS?
TRIAXIAL
SINGLE

DAMPING?
DAMPED
UNDAMPED

713 713F COMPACT
757AH 757FH MINIATURE
701AH 701FH ROUGGED
726CH FLAT TO 5kHz
758H VERSATILE MOUNTING
7266C WORLD SID
7264C COMPLIES WITH NHTSA 508-94/234
7264B CENTER CG
726CH FLAT TO 5kHz
7264H HEADFORM STUDIES

Damped triax
Damped single axis
Undamped triax
Undamped single axis