ELECTRIC & HYBRID VEHICLE TESTING & DEVELOPMENT
ACOUSTICS

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
- Prepolarized (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
1/2" WATER AND DUST RESISTANT ICP® MICROPHONE SYSTEM
MODEL 130A24
- ICP® water resistant array
- IP55 rated
- Frequency Range: 20 Hz to 16 kHz
- IP55 Rated for harsh environments
- Cost effective
- Harsh testing environment applications

1/4" FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM
SERIES 130F
- Low noise floor: 24 dBA
- Frequency Range: 10 Hz to 20 kHz (+/- 4 dB)
- Integral preamplifier & SMB jack connector
- TEDS
- High channel count applications

SURFACE MICROPHONE
MODEL 130B40
- Low profile 1/8" (3 mm) microphone system
- Dynamic Range: 150 dB before clipping
- Water and dust resistant grid cap
- Integral 5 ft cable
- Adhesive mounting for flush mounted applications

APPLICATIONS INCLUDE:
- Cabin noise testing
- Wind noise testing
- Powertrain development
- Noise source location
- Sound system performance
- Vehicle and powertrain noise, vibration and harshness (NVH)
- Automotive component and system performance
- Harsh testing environment applications
- General noise reduction
VIBRATION

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.

HIGH SENSITIVITY ICP® TRIAXIAL ACCELEROMETER
MODELS 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
**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

**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)

**MINIATURE TRIAXIAL ICP® 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

**CASE ISOLATED HIGH SENSITIVITY TRIAXIAL ICP® ACCELEROMETER**
MODELS 354B04 & 354B05

- Sensitivity: 10 and 100 mV/g
- Frequency Range (±5 %): 0.4 to 10000 Hz
- Weight: 0.51 oz (14.5 gm)
- 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
VIBRATION

**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

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.

**LOW-NOISE COAXIAL CABLE**
Series 003CXX
- Used with single axis ICP® accelerometers
- 10-32 coaxial plug to BNC plug
- Low-noise coaxial cable

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

**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

**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

**LOW-NOISE COAXIAL CABLE**
Series 003CXX
- Used with single axis ICP® accelerometers
- 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**
MODELS 7310A & 7330
- Ranges of 100, 500, 1500, 6K, 8K, 12K and 18K deg/sec
- Up to 2000 Hz bandwidth
- Weighs less than 3 grams (7310A)
- Weighs less than 10 grams (7330)
- Operates with 5 to 16 V input
PIEZORESISTIVE ACCELEROMETER
MODEL 726CH
- High sensitivity 600mV FSO
- Multi-mode damping
- DC response and wide bandwidth
- In-dummy application

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 757AH - 757FH
- High sensitivity, 0.3 mV/g
- Multi-mode gas damping
- Crash and shock testing
- Miniature for tight spaces
- 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

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
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 8530C
- 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 8530BM37
- 200, 500, 1000, 2000 psia ranges
- Detachable cable
- ABS studies

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

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

PIEZORESISTIVE PRESSURE TRANSDUCER
MODEL 8530BM37
- 200, 500, 1000, 2000 psia ranges
- Detachable cable
- ABS studies
ENDEVCO AUTO SAFETY SELECTION CHART

START

VEHICLE

NUMBER OF AXIS?

TRIAXIAL

SINGLE

MOUNTING LOCATION

DAMAGED

DAMPED

UNDAMPED

ATD

NUMBER OF AXIS?

TRIAXIAL

SINGLE

DAMPING?

DAMPED

UNDAMPED

UNDAMPED

DAMPED

713AL
713FL
COMPACT

757AH
757FH
MINIATURE

701AH
701FH
ROUGGED

726CH
VERSATILE
MOUNTING

758H
WORLD SID

7268C
VERSATILE
MOUNTING

7264C
CENTER C

726CH
HEADFORM
STUDIES

Damped triax
Damped single axis
Undamped triax
Undamped single axis