

A photograph of four large, cylindrical cooling towers of a nuclear power plant. The towers are made of a light-colored, textured material, possibly concrete or metal. They are arranged in a row, with the one on the right being the closest and largest, and the others receding into the background. Thick white steam or smoke is rising from the top of each tower, partially obscuring the sky. The sky is a clear, pale blue.

NUCLEAR POWER INSTRUMENTATION



NUCLEAR POWER INSTRUMENTATION

Survive integrated gamma flux to 10^8 rads

Survives integrated neutron flux to 10^{10} N/cm²

PCB®'s charge accelerometers utilize piezo ceramic sensing elements to directly output an electrostatic charge signal that is proportional to applied acceleration. Charge accelerometers do not contain built-in signal conditioning electronics. As a result, external signal conditioning is required to interface their generated measurement signals to readout or recording instruments. The sensor's charge output signals can be conditioned with an in-line, fixed charge amplifier.

Since there are no electronics built into charge accelerometers, they can operate and survive exposure to very high temperatures (up to +1200 °F/+649 °C for some models). In addition, charge accelerometers are used for thermal cycling requirements or to take advantage of existing charge amplifier signal conditioning equipment. It is important to note that measurement resolution and low frequency response for charge acceleration sensing systems are dependent upon the noise floor and discharge time constant characteristics of the signal conditioning and readout devices used.

RADIATION HARDENED VERY HIGH TEMPERATURE SINGLE-ENDED CHARGE ACCELEROMETERS



CE

900°F
(482 °C)

VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL 357A63

Sensitivity: 0.53 pC/g
Measurement Range: ± 5000 g pk
Frequency Range: 10 kHz pk
Electrical Connector: 10-32 coaxial jack



CE

900°F
(482 °C)

VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL 357B61

Sensitivity: 10 pC/g
Measurement Range: ± 1000 g pk
Frequency Range: 5 kHz pk
Electrical Connector: 10-32 coaxial jack



CE

900°F
(482 °C)

VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL 357B69

Sensitivity: 3.5 pC/g
Measurement Range: ± 500 g pk
Frequency Range: 6 kHz pk
Electrical Connector: 10-32 coaxial jack



CE

900°F
(482 °C)

VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL EX356A73

Sensitivity: 10 pC/g
Measurement Range: ± 1000 g pk
Frequency Range: 5 kHz pk
Electrical Connector: 10-32 coaxial jack

HARDLINE CABLE, RADIATION HARDENED



CE

10-32 COAXIAL PLUG

MODEL FZ



CE

COAXIAL HARDLINE CABLE

MODEL 023



CE

10-32 COAXIAL PLUG

MODEL FZ

HARDLINE CABLE, RADIATION HARDENED

CE



IN-LINE CHARGE AMPLIFIER

MODEL 422E65/A

Sensitivity: ($\pm 2\%$) 1 mV/pC
Voltage Output: ± 5 V pk
Temperature Range (Operating):
-65 to +250 °F

IN-LINE CHARGE AMPLIFIER

MODEL 422E66/A

Sensitivity: ($\pm 2\%$) 10 mV/pC
Voltage Output: ± 5 V pk
Temperature Range (Operating):
-65 to +250 °F

FOR SENSOR CHAIN SCHEMATIC, SEE FIGURE 1 ON PAGE 7

RADIATION HARDENED VERY HIGH & EXTREME TEMPERATURE DIFFERENTIAL CHARGE ACCELEROMETERS

CE



VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL 357A100

Sensitivity: 5 pC/g
Measurement Range: ± 200 g pk
Frequency Range: 5 kHz pk
Electrical Connector: 7/16-27 2-pin

CE



VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODELS 357C7X

Sensitivity: 10 pC/g (71),
50 pC/g (72), 100 pC/g (73)
Measurement Range: ± 1000 g pk
(71) ± 500 g pk (72) ± 300 g pk (73)
Frequency Range: 4 kHz pk (71)
2.5 kHz (72) 2kHz pk (73)
Electrical Connector: 7/16-27 2-pin

CE



EXTREME TEMPERATURE CHARGE ACCELEROMETER

MODELS EX357A94 & EX357A95

Sensitivity: 3.3 pC/g
Measurement Range: ± 1000 g pk
Frequency Range: 3.0 kHz pk
Electrical Connector: 7/16-27 2-pin

HARDLINE CABLE, RADIATION HARDENED

CE



2-SOCKET PLUG, 7/16-27 THD

MODEL GN

CE



2-CONDUCTOR HARDLINE CABLE

MODEL 013XXX

CE



2-PIN JACK, 7/16-27 THD

MODEL GP

PTFE JACKETED CABLE



CE

PTFE JACKETED CABLE WITH 2-SOCKET PLUG, TO 2-SOCKET PLUG, MS3106 (25 FT CABLE)

045M19B CABLING

DIFFERENTIAL CHARGE AMPLIFIERS

CE



DIFFERENTIAL CHARGE AMPLIFIER

MODEL 422M182

Sensitivity: 4 mV/pC
Voltage Output: ± 5 V pk
Temperature Range (Operating):
-60 to +185 °F

CE



DIFFERENTIAL CHARGE AMPLIFIER

MODEL 422M196

Sensitivity: 10 mV/pC
Voltage Output: ± 5 V pk
Temperature Range (Operating):
-60 to +185 °F

FOR SENSOR CHAIN SCHEMATIC, SEE FIGURE 2 ON PAGE 7

RADIATION HARDENED EXTREME TEMPERATURE DIFFERENTIAL CHARGE ACCELEROMETERS

CE



VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL 357A100

Sensitivity: 5 pC/g
Measurement Range: ± 200 g pk
Frequency Range: 5 kHz pk
Electrical Connector: 7/16-27 2-pin

CE



VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODELS 357C7X

Sensitivity: 10 pC/g
Measurement Range: ± 1000 g pk
Frequency Range: 4 kHz pk
Electrical Connector: 7/16-27 2-pin

CE Ex



EXTREME TEMPERATURE CHARGE ACCELEROMETER

MODELS EX357A9X

Sensitivity: 3.3 pC/g
Measurement Range: ± 1000 g pk
Frequency Range: 3.0 kHz pk
Electrical Connector: 7/16-27 2-pin

HARDLINE CABLE, RADIATION HARDENED

CE



2-SOCKET PLUG, 7/16-27 THD

MODEL GN

CE



2-CONDUCTOR HARDLINE CABLE

MODEL 013XXX

CE



2-PIN JACK, 7/16-27 THD

MODEL GP

PTFE JACKETED CABLE



CE

PTFE JACKETED CABLE WITH 2-SOCKET PLUG, 7/16-27 THD TO PIGTAILS (25 FT CABLE)

045M21B CABLING

DIFFERENTIAL CHARGE AMPLIFIERS

CE



DIFFERENTIAL CHARGE AMPLIFIER

MODEL 421B3X

Sensitivity: Configurable
Voltage Output: ± 5 V pk
Temperature Range (Operating): -22 to +185 °F

CE



DIFFERENTIAL CHARGE AMPLIFIER

MODEL EX682A40

Sensitivity: 10 mV/pC
Voltage Output: ± 2.5 V pk
Temperature Range (Operating): -60 to +185 °F



FOR SENSOR CHAIN SCHEMATIC, SEE FIGURE 3 ON PAGE 7

RADIATION HARDENED EXTREME TEMPERATURE SINGLED-ENDED CHARGE ACCELEROMETERS



AXIS OF MEASUREMENT

MODELS EX357E90 & EX357E92



AXIS OF MEASUREMENT

MODELS EX357E91 & EX357E93

EXTREME TEMPERATURE CHARGE ACCELEROMETER

EX357E9X SERIES

Sensitivity: 5 pC/g (EX357E90 & EX357E91)
2.3 pC/g (EX357E92 & EX357E93)

Measurement Range: ± 1000 g pk

Frequency Range: 3.0 kHz pk

Output into sensor base (EX357E90 & EX357E92)

Output Output perpendicular to sensor base (EX357E91 & EX357E93)



VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL 357A64

Sensitivity: 5 pC/g

Measurement Range: ± 200 g pk

Frequency Range: 5 kHz pk

Electrical Connector:
10-32 Coaxial jack



VERY HIGH TEMPERATURE CHARGE ACCELEROMETER

MODEL 357M168

Sensitivity: 10 pC/g (71), 50 pC/g (72), 100 pC/g (73)

Measurement Range: ± 1000 g pk (71) ± 500 g pk (72) ± 300 g pk (73)

Frequency Range: 4 kHz pk (71) 2.5 kHz (72) 2kHz pk (73)

Electrical Connector:
10-32 Coaxial jack

PTFE JACKETED CABLE



PTFE CABLE WITH 10-32 PLUG TO 10-32 PLUG

MODEL 003EBXXXEB

XXX = Denote cable length, 010 = 10 feet
(Metric lengths available)

HARDLINE CABLE, RADIATION HARDENED



IN-LINE CHARGE AMPLIFIER

MODEL 422E35

Sensitivity: 1 mV/pC

Voltage Output: ± 2.5 V pk

Temperature Range (Operating):
-65 to +250 °F

IN-LINE CHARGE AMPLIFIER

MODEL 422E36

Sensitivity: 10 mV/pC

Voltage Output: ± 2.5 V pk

Temperature Range (Operating):
-65 to +250 °F

FOR SENSOR CHAIN SCHEMATIC, SEE FIGURE 4 ON PAGE 7

FIGURE 1:
IN-LINE CHARGE AMPLIFIERS, RADIATION HARDENED

- A** Model 357B63 or 357B61 or 357B69 – Charge accelerometer
 - B** Model 023FZXXXFZ – Cable with 10-32 plug to 10-32 plug
 - C** Model 422E65/A or 422E66/A – In-line charge amplifier
 - D** Model 023FZXXXGA – Cable with 10-32 plug to 10-32 jack
 - E** Model 003C03 – Cable with 10-32 plug to BNC plug
 - F** ICP® sensor signal conditioner
 - G** Model 012A03 – Cable with BNC plug to BNC plug
 - H** Readout, recording, or data acquisition device
- XXX = Denote cable length, 010 = 10 feet (Metric lengths available)

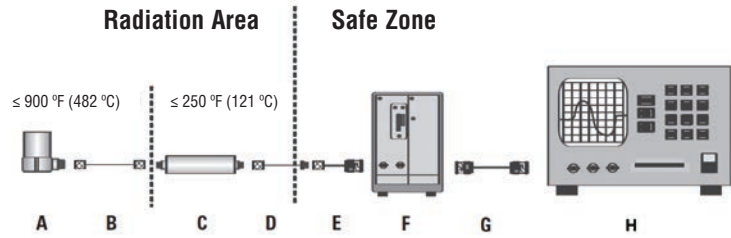


FIGURE 2:
IN-LINE CHARGE AMPLIFIERS, RADIATION HARDENED

- A** Model 357A100 or 357C71 or 357C72 or 357C73 or EX357A9X – Charge accelerometer
 - B** Model 013GNXXXGP – Cable with 2 socket plug to 2 pin jack
 - C** Model 045M19B – Cable with PY connector to BP connector
 - D** Model 422M183 or Model 422M196 – Charge amplifier
 - E** Model 003D03 – Cable with BNC plug to BNC plug
 - F** ICP® sensor signal conditioner
 - G** Model 012A03 – Cable with BNC plug to BNC plug
 - H** Readout, recording, or data acquisition device
- XXX = Denote cable length, 010 = 10 feet (Metric lengths available)

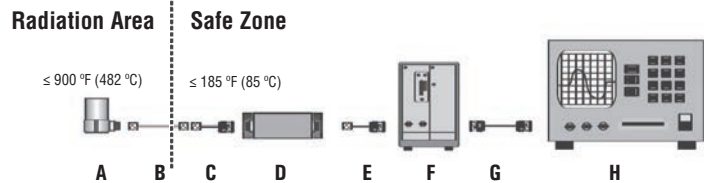


FIGURE 3:
IN-LINE CHARGE AMPLIFIERS, RADIATION HARDENED

- A** Model 357A100 or 357C71 or 357C72 or 357C73 or EX357A9X – Charge accelerometer
 - B** Model 013GNXXXGP – Cable with 2 socket plug to 2 pin jack
 - C** Model 045M21B – Cable with PY connector to pigtailed
 - D** Model 421B3X or Model EX682A40 – Charge amplifier
 - E** Model 003ACXXXAD – Cable with pigtailed to BNC plug
 - F** ICP® sensor signal conditioner
 - G** Model 012A03 – Cable with BNC plug to BNC plug
 - H** Readout, recording, or data acquisition device
- XXX = Denote cable length, 010 = 10 feet (Metric lengths available)

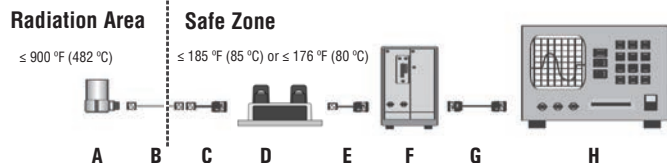
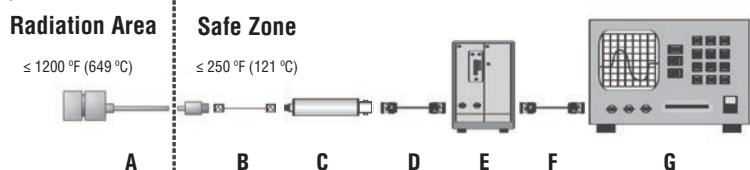


FIGURE 4:
IN-LINE CHARGE AMPLIFIERS, RADIATION HARDENED

- A** Model EX357E90 or EX357E91 or EX357E92 or EX357E93 – Charge accelerometer
 - B** Model 003EBXXXEB – Cable with 10-32 plug to 10-32 plug
 - C** Model 422E35 or 422E36 – In-line charge amplifier
 - D** 003DXX – Cable with BNC plug to BNC plug
 - E** Model 003C03 – Cable with 10-32 plug to BNC plug
 - F** ICP® sensor signal conditioner
 - G** Model 012A03 – Cable with BNC plug to BNC plug
 - H** Readout, recording, or data acquisition device
- XXX = Denote cable length, 010 = 10 feet (Metric lengths available)





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