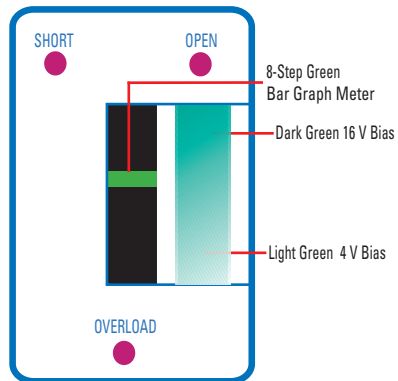


## ICP<sup>®</sup> Sensor Incoming Inspection Guide

### LEDs and Bar Graph Meters

Many of PCB's Modular Style ICP<sup>®</sup> Sensor Signal Conditioners, such as Models 442A01, 442A02, and 442A06, utilize LEDs and bar graph meters rather than the analog meters discussed on the previous page. These units have individual LEDs to indicate either an "OPEN" or a "SHORT" input circuit condition, as well as an eight-step bar graph meter, to indicate sensor bias voltage between 4 and 16 volts.



LED and BAR GRAPH METER RESPONSE	
< 2 VDC	"SHORT" LED <i>blinks</i> + bar graph meter <i>off</i>
2-4 VDC bias	"SHORT" LED <i>on</i> + bar graph meter <i>off</i>
4-16 V bias	LEDs <i>off</i> + bar graph meter <i>indicates</i> bias voltage
> 16 VDC	"OPEN" LED <i>on</i> + bar graph meter <i>off</i>

### LEDS

Other modular units such as Models 442A03, 442A04, and 442A13 utilize a single "SMART" FAULT LED to indicate normal bias voltage, input open, input short, and signal overload. An overload condition is monitored at a different point in the circuit than the bias voltage. If an open condition occurs (> 18 VDC bias) the LED illuminates without signal input. If the LED is normally off and turns on during a measurement, then an overload condition (signal > 10V) exists. If the sensor bias is normal, the LED is off.

"SMART" FAULT LED RESPONSE	
Normal (2-16 VDC bias)	LED <i>off</i>
Open (> 18 VDC)	LED <i>on</i>
Overload (> ±10 VDC)	LED <i>on</i>
Short (< 2 VDC)	LED <i>blinks</i>

SINGLE INPUT FAULT LED RESPONSE	
Open or Short	LED <i>on</i>
Bias > 1 VDC or < 23 VDC	LED <i>off</i>

The Series 481 Multi-Channel Signal conditioners have a single INPUT FAULT LED per channel that indicates if proper bias is present. If the sensor bias is normal, the LED is off.



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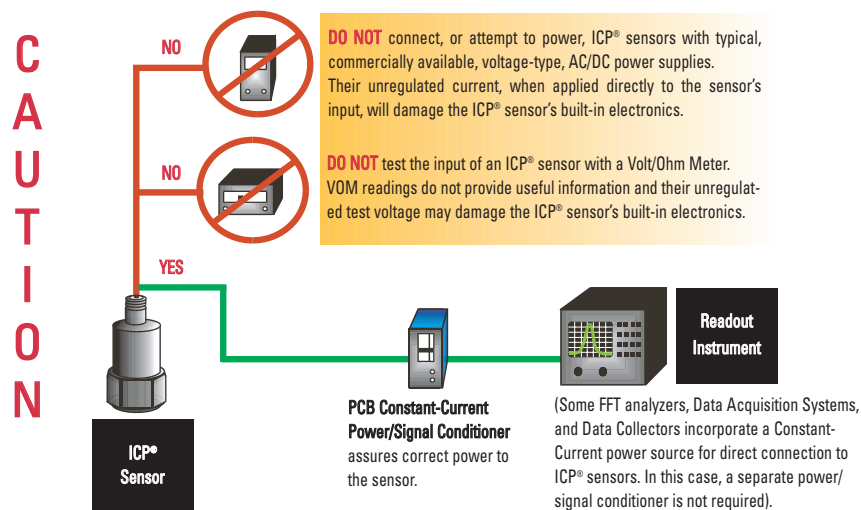
These guidelines are intended to provide helpful information for your incoming inspection process. All PCB integral electronic sensors included in this shipment have been fully tested and calibrated prior to shipment from the factory. To avoid damage to sensitive integrated circuits, please take a moment to familiarize yourself with the following before attempting any electrical hookup.

There are several important PRECAUTIONS to pay attention to when testing PCB integral electronic ICP<sup>®</sup> sensors. Primarily realize that the use of INCORRECT POWER MAY DAMAGE integral electronic ICP<sup>®</sup> sensors.

Unlike charge output piezoelectric sensors, which operate into a charge amplifier, integral electronic ICP<sup>®</sup> sensors require a special, constant-current power source. ICP<sup>®</sup> sensors should be powered only by a PCB constant-current power/signal conditioner or approved equivalent. Certain FFT analyzers, data collectors, and readout instruments may incorporate an approved, built-in, constant-current power source, which permits direct connection to ICP<sup>®</sup> sensors. If in doubt about the constant-current power specifications of your equipment, contact the instrument manufacturer for details. These guidelines are not intended to apply to other brands of Integral Electronic Piezoelectric (IEPE) Sensors, which may have different power requirements.

### PCB constant-current power/signal conditioners

- Provide the correct, 2 to 4 mA, constant-current excitation power for ICP<sup>®</sup> sensors;
- Decouple the sensor's 3 to 18 V bias voltage from the output signal (9 to 12 V bias voltage is common for most ICP<sup>®</sup> sensors); and
- Have a color coded meter, LED status indicator(s), or bar graph meter to check sensor bias, cable continuity, and connector continuity.



## PCB Constant Current (CC) Power/Signal Conditioners

For incoming inspection of ICP® sensors, and for calibration purposes, any PCB power/signal conditioner that provides a regulated, 2 to 4 mA constant-current excitation, with circuit check-out meter, is sufficient. The following salient features highlight several of PCB's more popular power/signal conditioners.

- PCB Series 480 are battery powered, AC-coupled, power/signal conditioners. Their constant-current excitation is regulated via a current limiting diode of fixed value, typically 2 mA.
- PCB Series 482 are line powered, AC-coupled, power/signal conditioners. Their constant-current excitation is regulated via a current limiting circuit that can be adjusted from 2 to 20 mA, however, they are factory set to 4 mA prior to shipment.
- PCB Series 484 are line powered, AC- or DC-coupled, power/signal conditioners. Their constant-current excitation is regulated via a current limiting circuit that can be adjusted from 2 to 20 mA, however, they are factory set to 4 mA prior to shipment. In the DC coupled mode, they are utilized for conducting quasi-static measurements, extremely low frequency measurements or for calibrating ICP® pressure or force sensors against static reference inputs.



**CAUTION:** The higher, constant-current excitation capability of the line-powered units should only be used when driving long cables (hundreds of feet in length) in field or factory installations. **DO NOT** set the constant-current above 4 mA for incoming inspection purposes, as this may cause excessive heat generation within the sensor when used with short input cables of <100 feet. For more information on testing and driving long cables, see the technical section and long cable driving "Nomograph" found in most ICP® sensor catalogs.

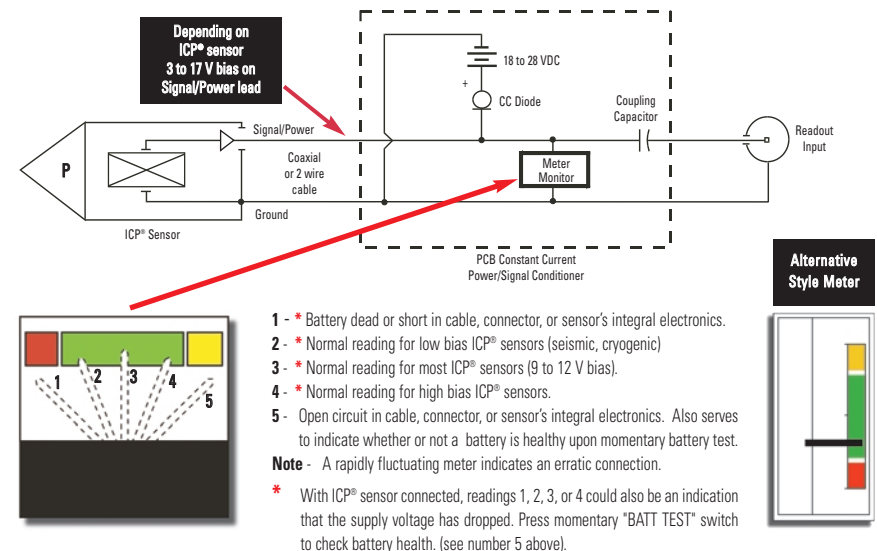
## Suggested Basic ICP® Sensor Incoming Physical Inspection Process

- Check that the correct model numbers and quantity of units delivered agree with the packing list.
- Check that the calibration certificates and manuals, if required, are included with the shipment.
- Conduct an operational check only with PCB constant current power/signal conditioner or approved equal.
- ICP® sensors are provided with mounting hardware such as studs, screws, wax, seal rings, etc. The detailed specification sheet included in each installation and operating manual identifies the standard mounting hardware furnished with each sensor. Should there be any discrepancy, call or e-mail a factory customer service representative. Also contact them any time you need additional small quantities of hardware items that can be quickly shipped to you as no-charge samples to help you with your measurement process.
- For questions or service, please call and ask for an application engineer and have model numbers readily available.

## Operational Check of ICP® Sensors

An operational check of ICP® sensors can be performed quickly and easily by utilizing the red, yellow, and green color-coded meter featured on many PCB power/signal conditioners. When an ICP® sensor, cable, and CC power/signal conditioner are connected and turned on, the meter serves to monitor and display the sensor DC bias voltage that is present on the signal lead of the sensor cable. The illustration below depicts an ICP® sensor system circuit, with the meter pointer indicating five different operating conditions. In addition, the meter may serve to display battery condition. This feature, if equipped, is activated by pressing the momentary rocker switch, located below the meter, to the "BATT TEST" position.

**The example below portrays the meter readings on a Series 480 battery-operated, power/signal conditioner.** (See back page for information on other PCB power/signal conditioners).



**GREEN** indicates normal operation. The cable and connections all have continuity and the sensor's integral electronics are turned on. The meter, which indicates sensor bias voltage, normally reads in the mid-range (9 to 12 V) for most ICP® sensors. A meter indication in the lower green is normal for low-bias sensors (3 to 6 V), such as seismic accelerometers and cryogenic pressure sensors. The meter registers in the upper green region for certain high-bias (15 to 17 V) sensors.

**RED** indicates either that there is a short in the cable, connectors, or built-in amplifier, or that the batteries are low: press "BATT TEST" switch to check battery condition.

**YELLOW** indicates an open circuit in the cable, connector, or sensor electronics. (If the ICP® sensor is not connected to the power unit, it simply indicates the supply voltage).

An erratic indication may be indicative of an intermittent cable connection or connector problem.