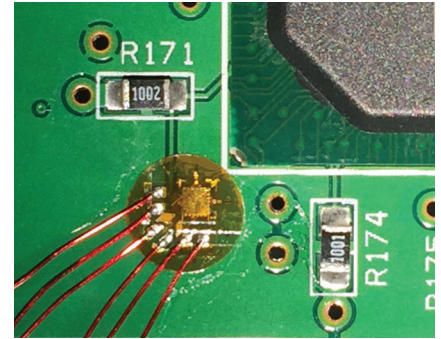


Strain Measurements on PCAs

Advances in printed circuit assembly design and manufacturing, plus the requirement for lead-free solder, have resulted in a need to test PCAs to determine if the design can withstand the rigor of manufacturing, packaging, transporting, and day-to-day use of electronic devices. The electronics industry has produced standards, such as IPC/JEDEC 9704 and IPC/JEDEC 9702, which describe the methods in which strain gages are used for printed circuit assembly testing.



Step 1 Define the Test Conditions

Conditions to Consider	Your Test Conditions
Static measurement One sample per second or less, steady loading	
Dynamic measurement Cyclical or impact loading, high frequency Event duration Anticipated frequency	
Installation longevity Short Term: Hours, days, weeks Long Term: Months, years	
Environment Maximum temperature Minimum temperature Exposure (laboratory, solvents, corrosive)	



Step 2 Ensure Appropriate Surface Preparation Materials Are On Hand

Use the recommended surface preparation materials for aluminum:

- | | |
|--------------------------------------|-------------------------------|
| GC-6 alcohol | M-Prep Neutralizer 5A |
| GSP-1 gauze sponge | M-Prep Conditioner A |
| 400-grit SCP-3 silicon carbide paper | PCT-3M gage installation tape |
| CSP-1 cotton-tipped applicator | PDT-3 drafting tape |

Reference **Instruction Bulletin B-129**: SEARCH our website using the document number **11129**.

Strain Gage Installation Checklist

Printed Circuit Assemblies



Step 3 Select the Strain Sensor

Consult the Micro-Measurements team and/or review our [Tech Note TN-505](#), “Strain Gage Selection – Criteria, Procedures, Recommendations” for detailed information about the strain gage selection process.

Step 3A: Select the Gage Series for the Temperature Range

Consider the temperature range that will be encountered during the strain measurements and select a **Gage Series** that meets your requirements.

Gage Series	Temperature Range	Features
C2A	-60°F to +180°F (-50°C to +80°C)	Encapsulated constantan gages with preattached ready-to-use cables
C5K	-100°F to +400°F (-75°C to +205°C)	Pre-cabled, wide temperature range
C2K	-60°F to +150°F (-50°C to +66°C)	Pre-cabled, higher resistance
L2A	-100°F to +250°F (-75°C to +120°C)	Encapsulated constantan gages with preattached ribbon leads
WK	-452°F to +550°F (-269°C to +290°C)	Fully encapsulated K-alloy gages with high-endurance leadwires

Step 3B: Choose the STC for Your Material

When temperature changes will occur during the course of strain measurements, **self-temperature-compensation (STC) 06** is typically selected for PCAs.

Step 3C: Consider the Geometry

The following Micro-Measurements strain gages are frequently used in PCA testing. Some, such as the G1350 and S5198 patterns, are specifically designed for PCA testing. Check [Super Stock](#) for gages that are available to ship promptly.

Type	Gage Designation	Geometry/Construction
Stacked Rosette	C2A-06-G1350-120/SP70 C2K-06-G1350-350/SP70 C2A-06-031WW-350 L2A-06-031WW-350 C2A-06-062WW-350 L2A-06-062WW-350	Pre-cabled (C2A, C2K) Pre-leaded (L2A)
	WK-06-030WR-350 WK-06-060WR-350	High endurance lead ribbons
Planar Rosette	C5K-06-S5198-350/33F C5K-06-S5198-350/39F	Miniature gage, pre-cabled
Linear Gage	C2A-06-015LW-120	Small pattern, pre-cabled
	C5K-06-S5145-350-33F	Miniature, 350 Ω, pre-cabled



Step 4 Select the Adhesive

Adhesive	Conditions to Consider
<u>M-Bond 200 Kit</u>	The most frequently used adhesive for short-term room temperature testing, with fast installation

Application Kit	About the Contents
<u>BAK-200 Kit</u>	Contains M-Bond 200 adhesive and basic materials for surface preparation (does not include GC-6 alcohol); excellent for use with pre-cabled gages

Follow the instructions included with the adhesive for application and cure requirements. Micro-Measurements offers other adhesives can be used as well. Contact us for specific advice.



Step 5 Select Cable and Solder Terminals

Micro-Measurements offers a variety of **cable types** for gage installation on plastics and composites. For ease of installation, consider pre-cabled gages; no additional cable is required unless length needs to be extended.

Cable	Conditions to Consider
Vinyl Insulated	Room temperature testing
Teflon Insulated	Wide temperature range testing, high moisture or water immersion, and chemical resistance

Solder Terminals	Conditions to Consider
<u>Bondable Terminals</u>	Bonded to the test structure, these can be used as transition or anchor point for cable.



Step 6 Select a Solder

Micro-Measurements has a wide selection of **solder** for strain gage applications. Solder melt point should be at least 50°F (28°C) above the maximum operating temperature. Solder is not needed when using pre-cabled gages.



Step 7 Select a Protective Coating

Consider the environmental conditions that the coating will need to resist and any application issues, such as:

Environmental Conditions	Application Issues
<ul style="list-style-type: none"> • Temperature range • Humidity • Chemical exposure • Localized reinforcement concerns 	<ul style="list-style-type: none"> • Vertical surface • Horizontal surface • Component sensitivity

M-Coat A and **M-Coat C** are the most popular coatings for PCA testing. Both will seal down the wires and provide a rugged installation while isolating the strain gage humidity changes in a laboratory environment (M-Coat A) or field testing (M-Coat C).

For testing in other environments and temperatures, refer to the **Protective Coating Selection Guide** to select the proper coating.

Strain Gage Installation Checklist

Printed Circuit Assemblies



Step 6 Select the Measurement Instrumentation

Micro-Measurements offers a wide variety of **instrumentation** specifically designed and optimized for strain measurement. Simple Strain Indicators are available for high-accuracy static measurements. Signal Conditioning Amplifiers accept direct strain gage input and provide a conditioned signal output in the ± 10 V range. Data Systems accept direct strain gage input and provide reduced data, already in engineering units of strain and/or stress.



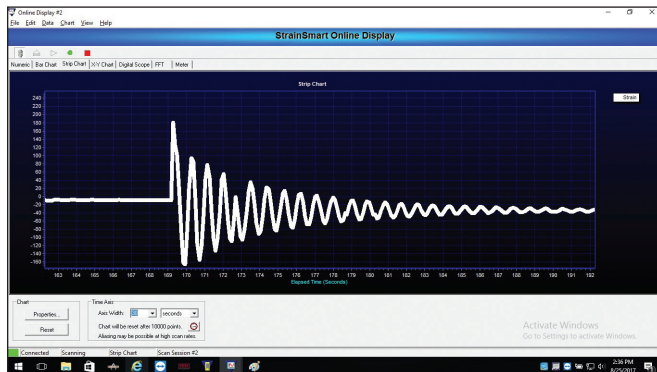
P3
Strain Indicator



StudentDAQ



D4 Data Acquisition
Conditioner



StrainSmart® Data Acquisition Software



System 8000 Data Acquisition



System 9000 Data Acquisition



Pacific Instruments
Series 6000 Data Acquisition System