Beating Aggressive Cost Targets with DFMA

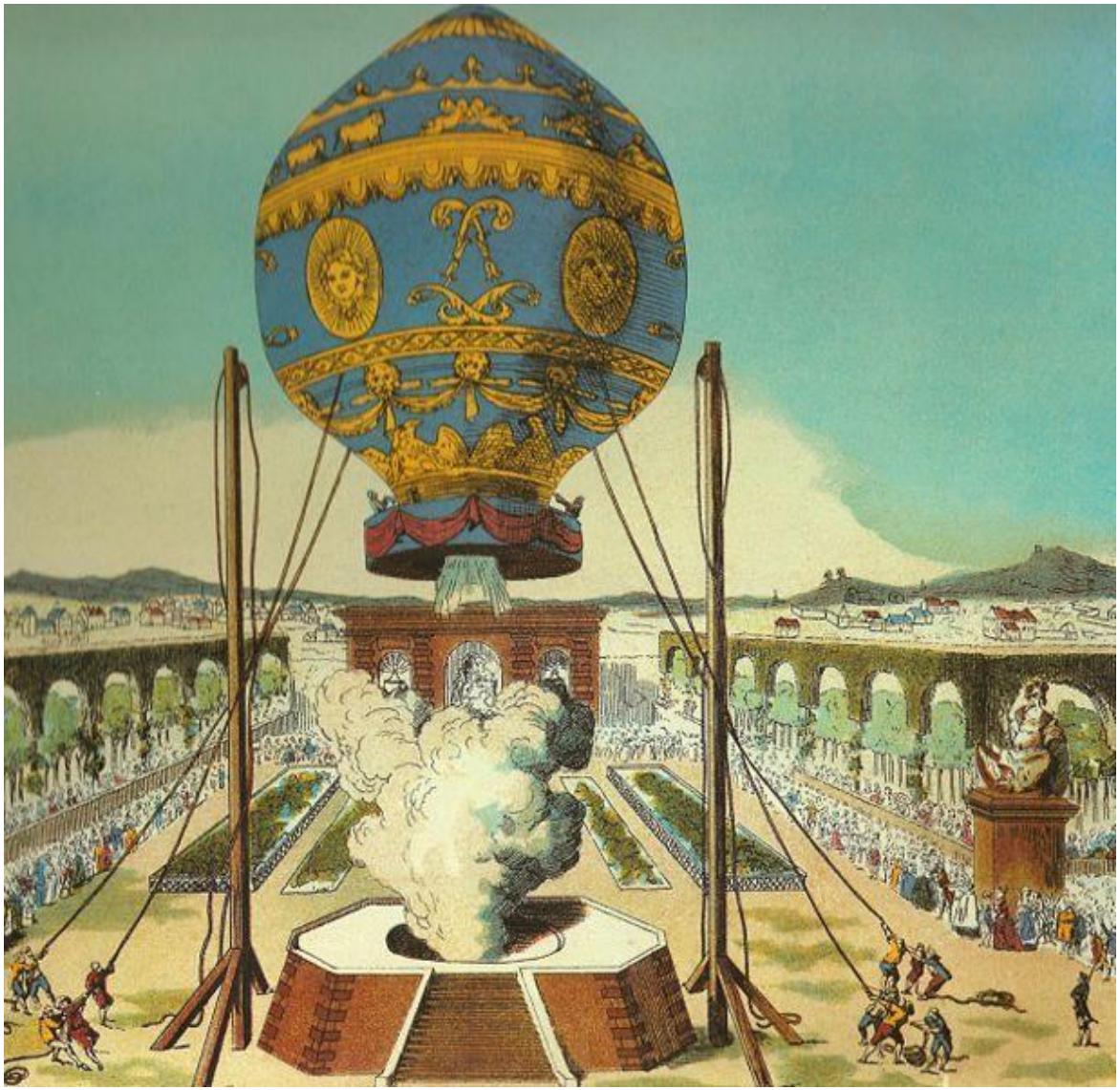
Kevin Marett
Bill Devenish

12.June.2012

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Montgolfier Brothers

Jacques-Etienne 1745-1799
Joseph-Michel 1740-1810



- Paper manufacturers in France.
- During their first balloon test flight (Dec. 14, 1782), the lifting force was so great that they lost control of their craft.
  - The device floated nearly two kilometers.
  - It was destroyed, after landing, by the "indiscretion" of passersby.
- The first living beings flown in an attached basket of a balloon were: a sheep, a duck and a rooster (Sep. 19, 1783).
- King Louis XVI decreed that condemned criminals would be the first test pilots.
- The first untethered, manned, balloon flight occurred in Paris, on Nov. 21, 1783.

Agenda

- Background
- Product Definition
- Concept Methodology using DFMA
- Implemented Design Strategies
- DFMA Analysis Results

Background

Sound Level Meter

Microphone

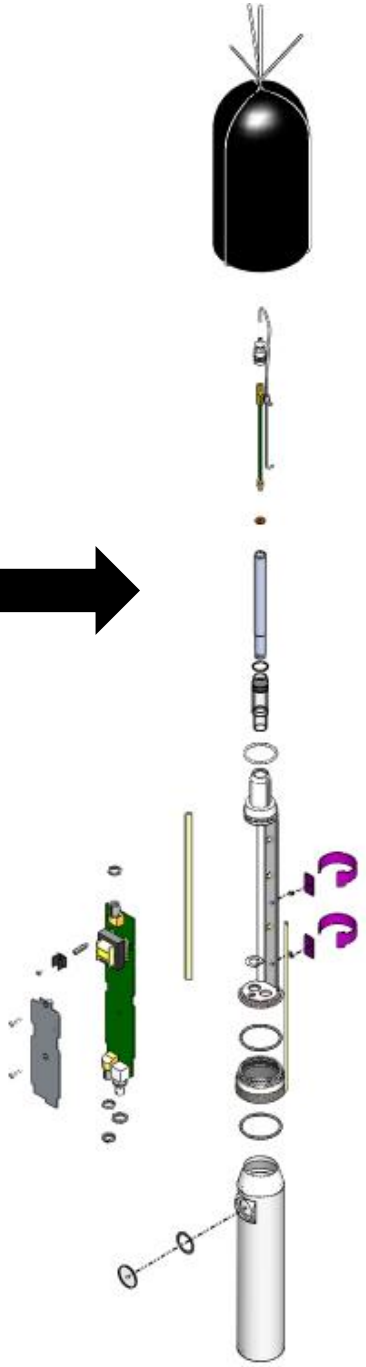
Preamplifier

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Existing Outdoor Preamp

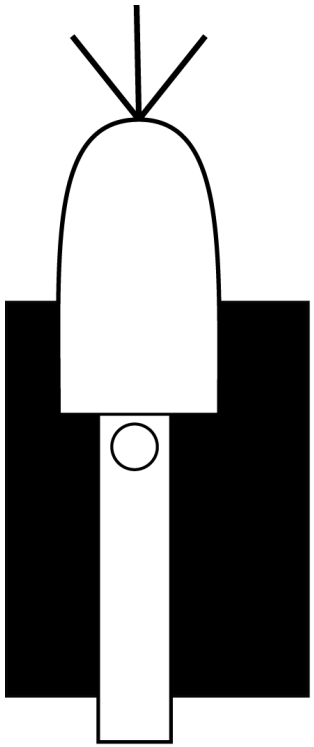
Preamplifier

Internal Environmental
Control &
Electronic Processing



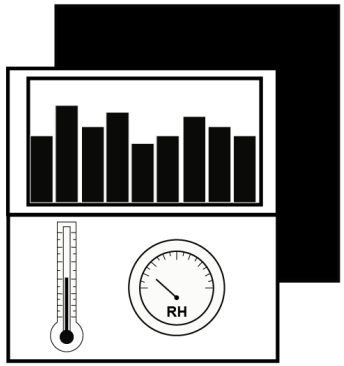
LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Challenge



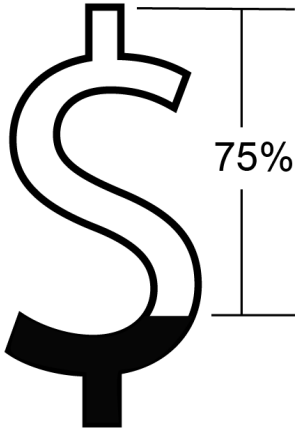
Existing Preamp

+



New Features

-



75% Cost

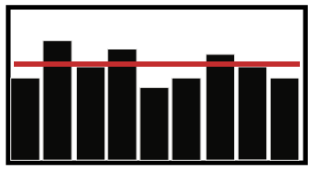
=

?

New Preamp

Process

Stage #1:
DFMA Baseline



Feature Set

Stage #2:
Develop Concepts

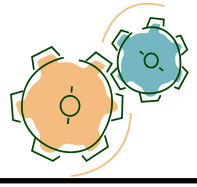
Generational
Concepts

Infeasible
Concepts

Stage #3:
DFMA Analysis

Comparison

Stage #4:
Concept Feasibility

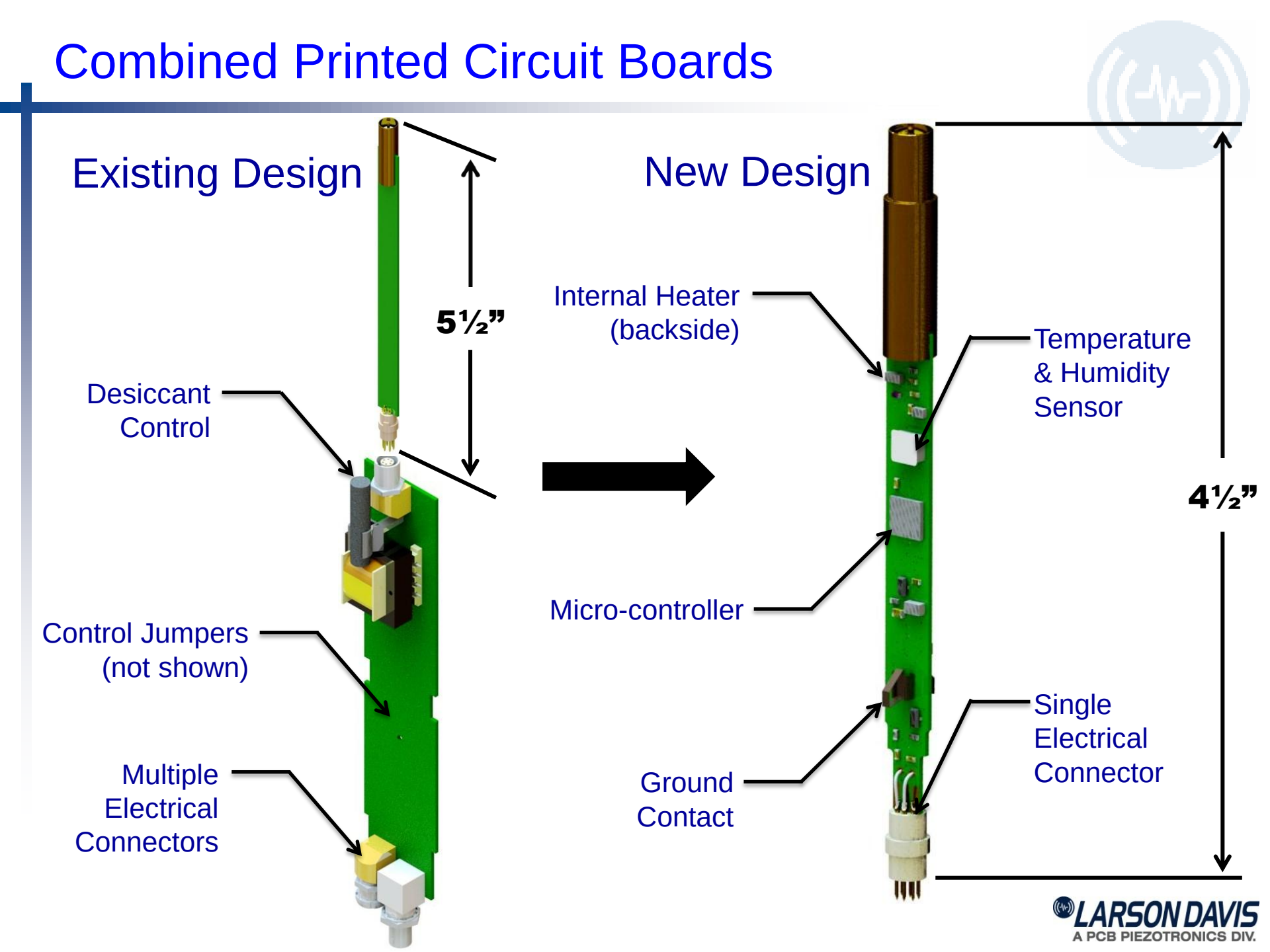


Optimal, Feasible
Concept

Development

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Combined Printed Circuit Boards



LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Fastener Reduction

16 Fasteners in Existing Preamp:

(1) Desiccant Holder

(2) Velcro Strap

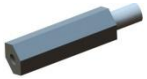
(3) ½ - 28 Panel Nut

(1) 1¾” Retaining Ring

(2) 4 – 40 x ½” Phillips Screw

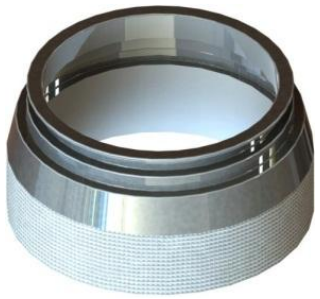
(1) 2 – 56 x ¼” Pan Head Screw

(1) 4 – 40 x 2 – 56 Standoff



(1) #4 Washer

(1) 1½” NPT base adapter



(2) Velcro Tape

(1) ¼” – 20 Thumbscrew

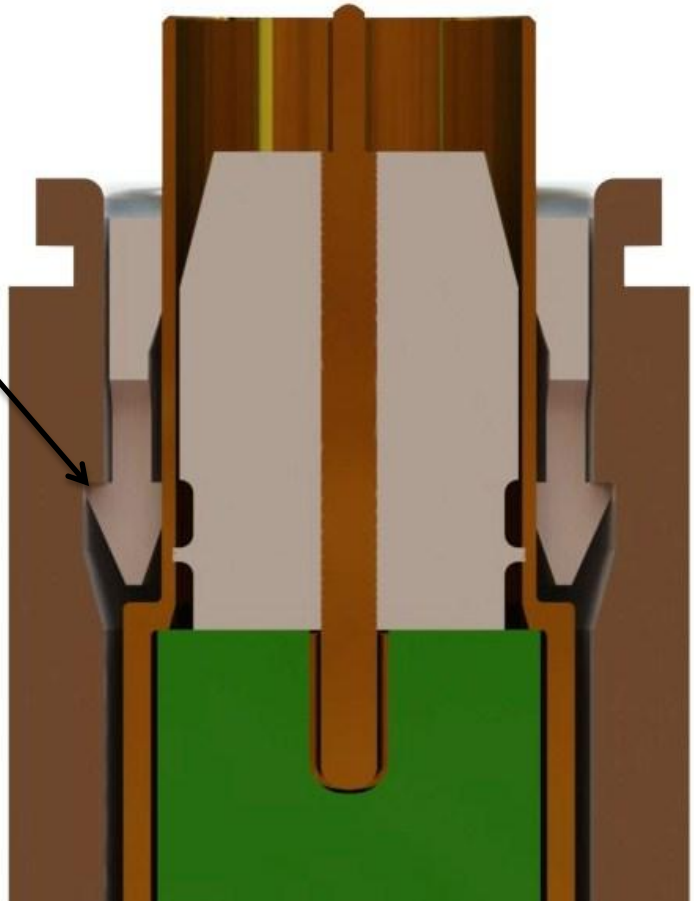
2 Fasteners in New Preamp:

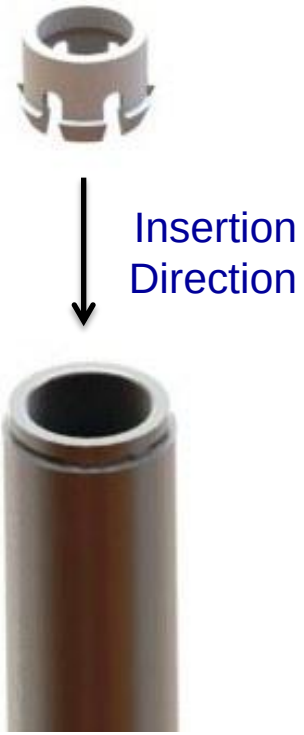
(1) 1½” NPT base adapter

(1) ¼” – 20 Thumbscrew

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

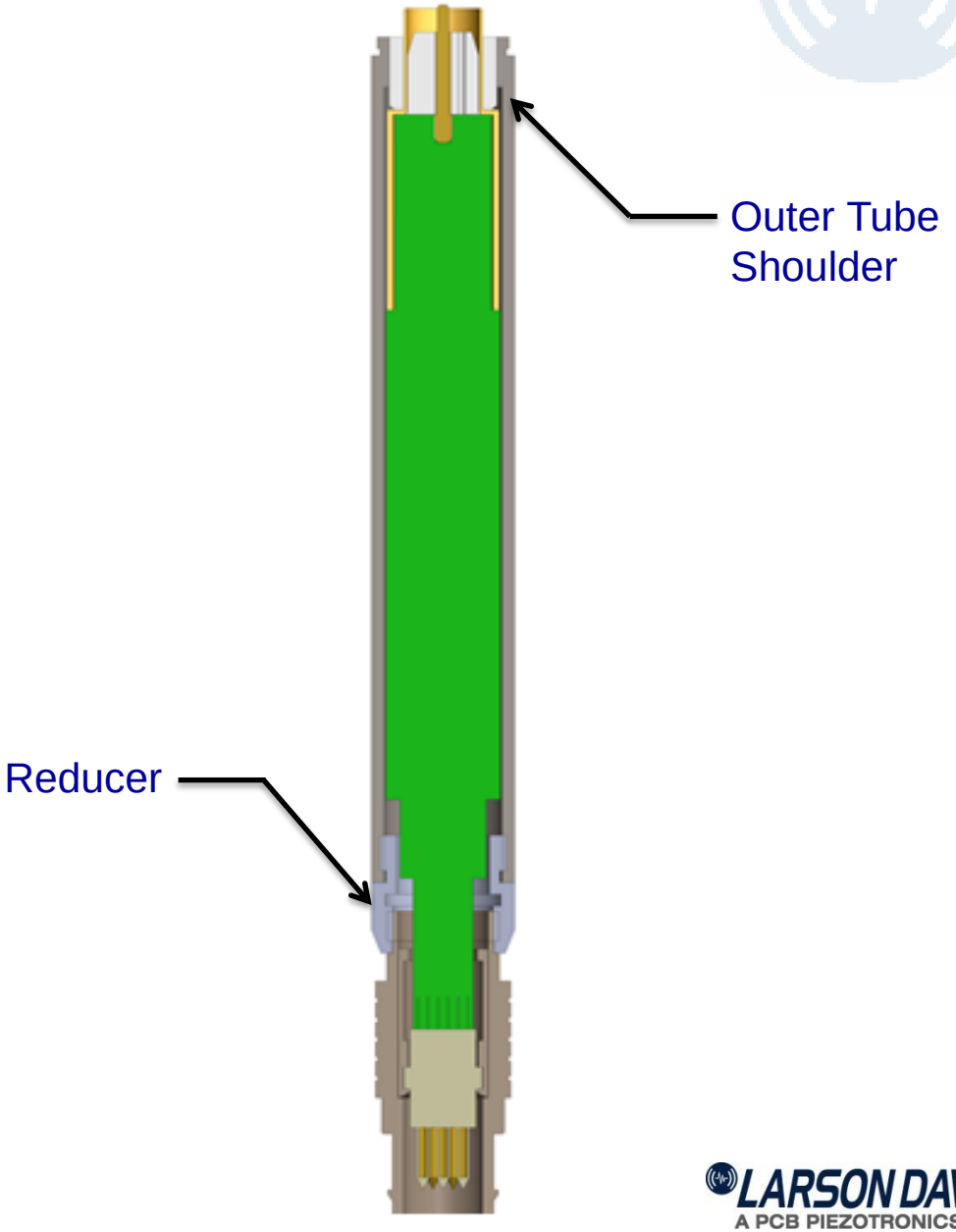
Snap Fit





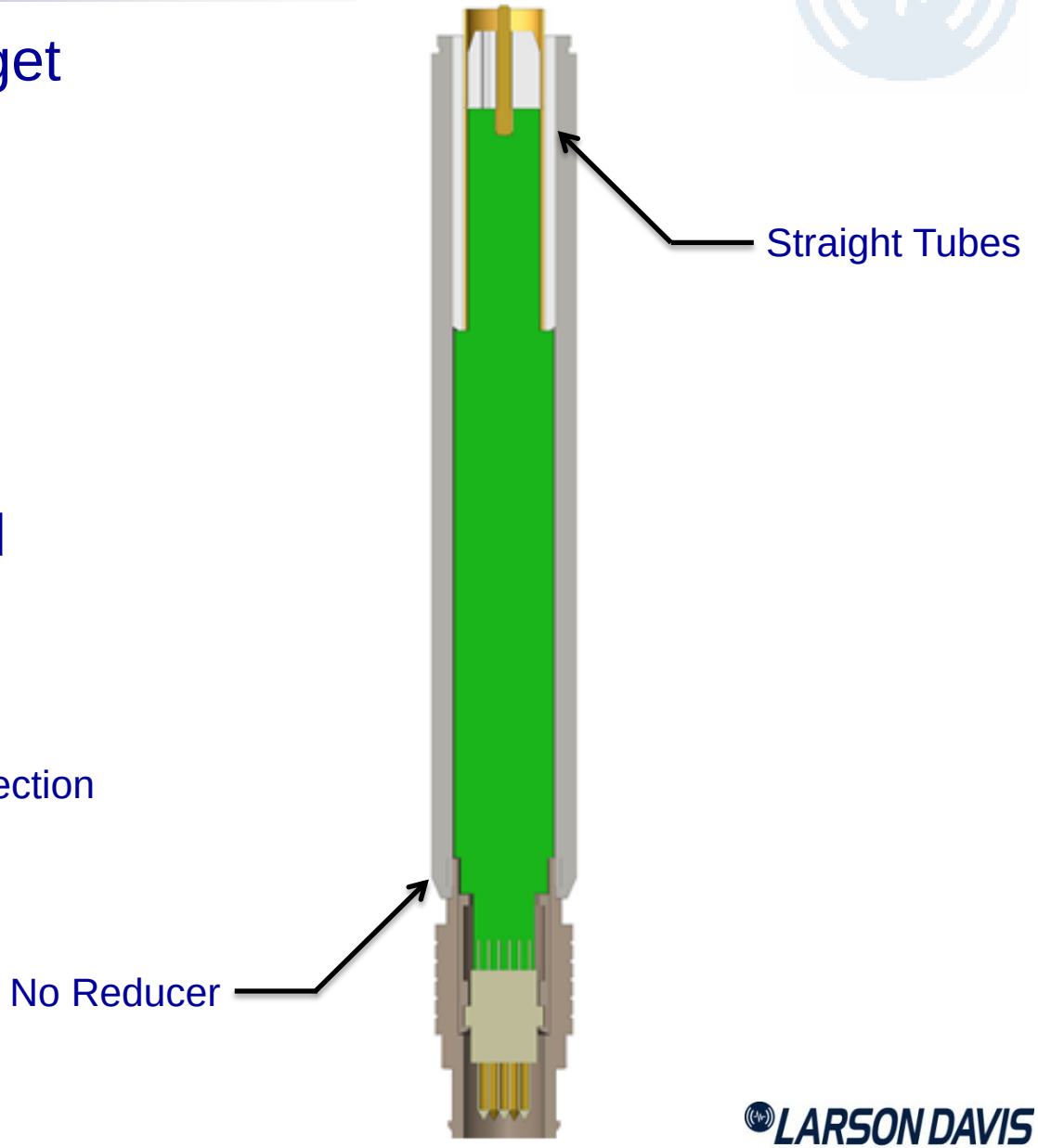
Subassembly Concept A

- 13.6% Below Cost Target
- 11 Total Parts
- Based on Existing Design



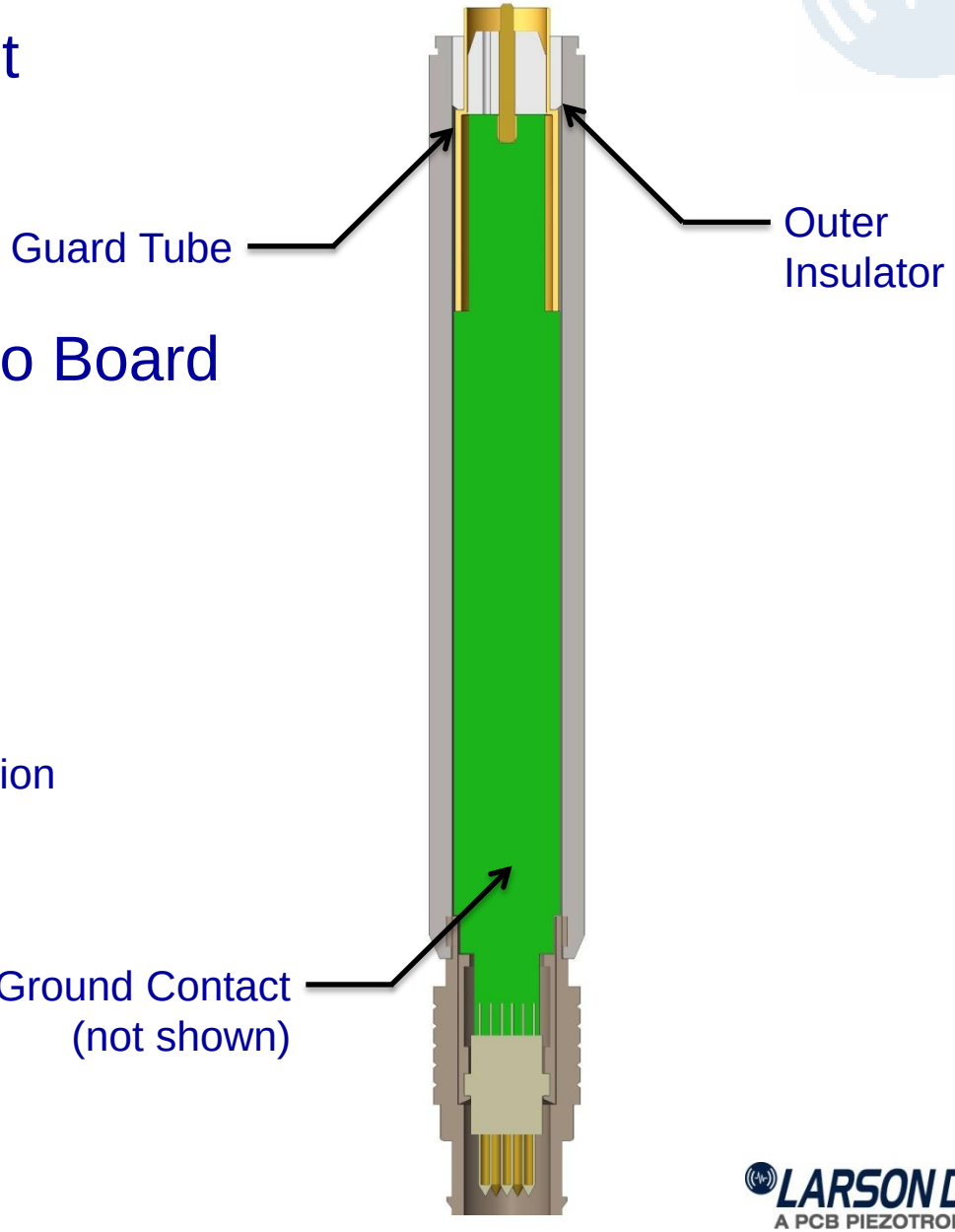
Subassembly Concept B

- 29.2% Below Cost Target
- 10 Total Parts
- Removed Reducer
  - 90% Thread Engagement
- Straightened Front-end
  - Removed Shoulders
- Interference Fit
  - Unconstrained in Upward Direction



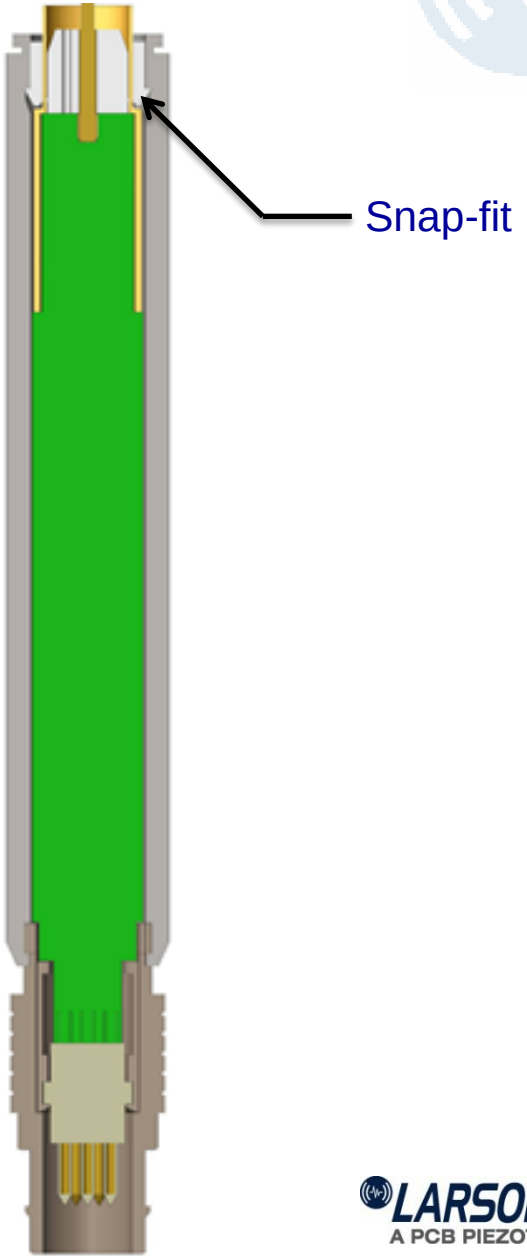
Subassembly Concept C

- 28.8% Below Cost Target
- 9 Total Parts
- Moved Ground Contact to Board
- Expanded pcb Area
  - Re-shouldered Guard Tube
- Kept Interference Fit
  - Unconstrained in Upward Direction
  - Reduced Contact Length

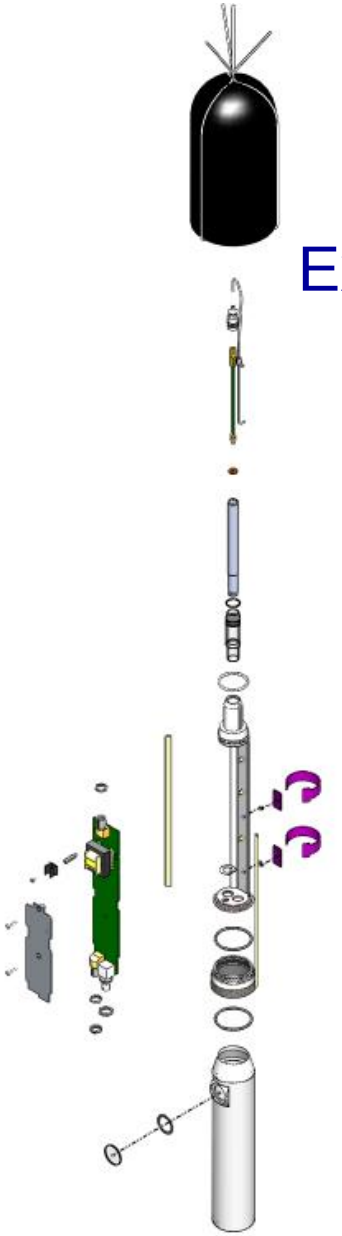


Subassembly Concept D

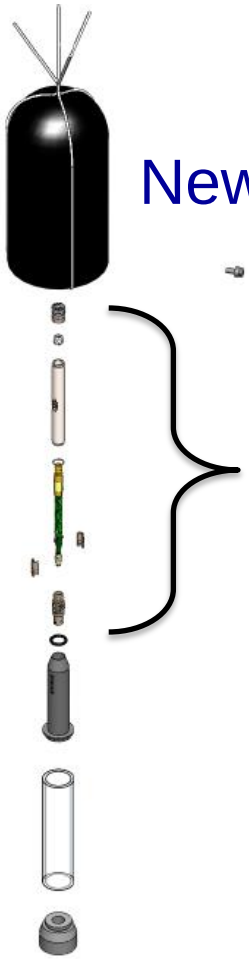
- 20.8% Below Cost Target
- 9 Total Parts
- Added Snap-fit
  - Constrained in Upward Direction



Simplified Assembly



Existing Design



New Design

Subassembly Focus

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Results

	Existing Preamp	New Preamp
Normalized Cost	100%	20%
Total Part Count	50	18
Assy Time (min.)	75.7	7.2
PCB Assemblies	2	1
Fasteners	16	2
DFA Index	0.5	4.9

Take-off with DFMA