TACOM

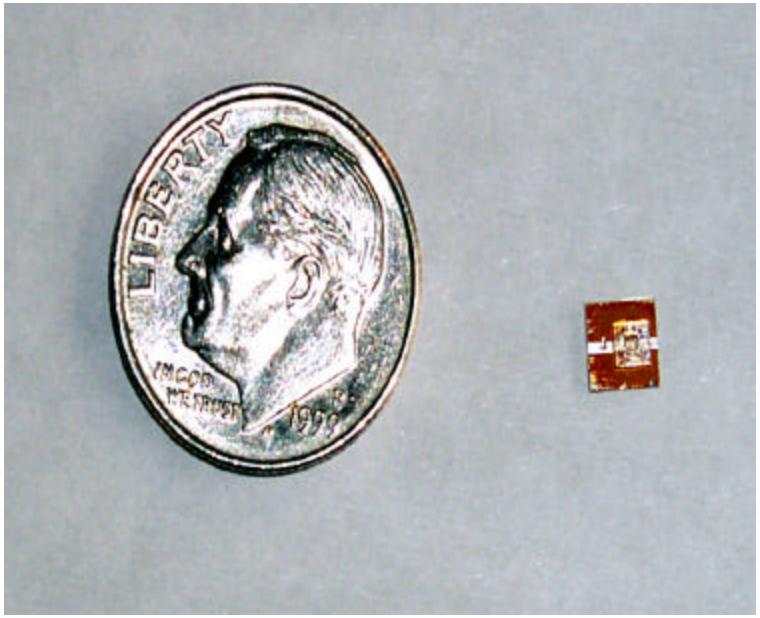
Lethality, Survivability, Mobility and Sustainment for America's Army

Leadership
Teaming
Communication
Employee Support
Strategic Thinking
Organizational Climate

Design and Development of Micro Energetic Initiators (MEI)

NDIA Fuze Conference

04/09/2003



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THE TEAM

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Organizational Climate

E TACOM-ARDEC

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- Gartung Cheng
- Neha Mehta
- Gerard Gillen
- Mark Mezger
- Mark Gelak
- Charles Robinson
- Mantech & JSSAP Funding

E Geo–Centers, Inc.

- Daniel Stec III

E Tanner Research Assoc.

- Amish Desai

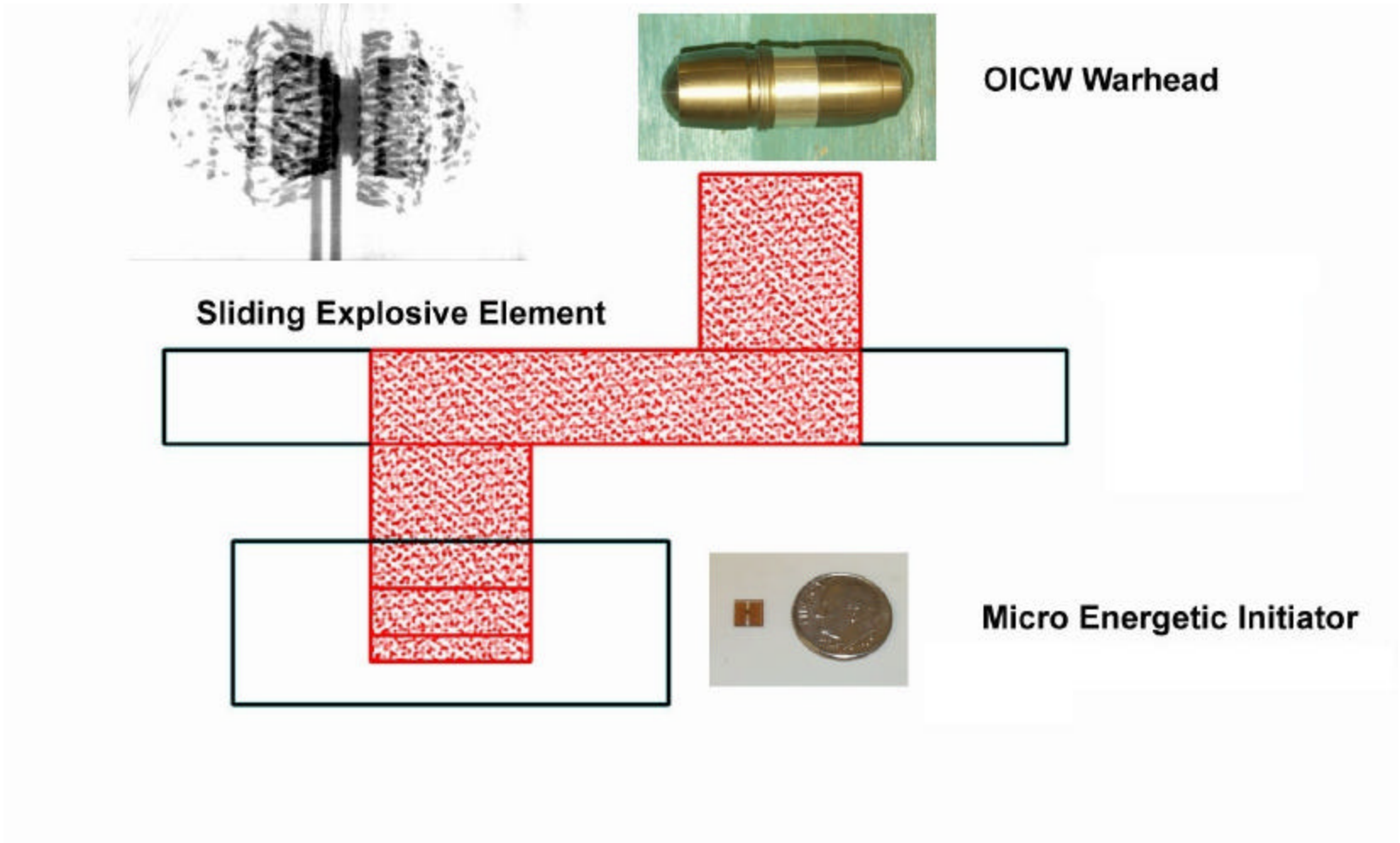
INTRODUCTION

- A joint ARMY/Industry program to develop a process for manufacturing MEI for MEMS S&A devices
- Current issues with traditional S&A that can be resolved with MEMS S&As
  - **Cost**
  - Weight
  - Size

OBJECTIVE

- Program Overall Objective: Develop low cost Safe and Arm System for the XM-29 Integrated Airburst Weapon System
- Our Objective:
  - Develop low energy compact bridge design
  - Use bridge design in developing an MEI

Schematic


OICW Warhead
Sliding Explosive Element
Micro Energetic Initiator

MEI ISSUES

- Cost
  - Loadability
  - Producibility

➢ While maintaining Reliability

MEI Development

- 4 generations of ARDEC/Tanner Bridges
  - Flat geometry
  - Thin film heating element
  - Semiconductor Industry Procedures
- COTS Vishay Bridges
- Loaded with Lead Styphnate
- Obtained Firing voltage with XM29 firing circuit

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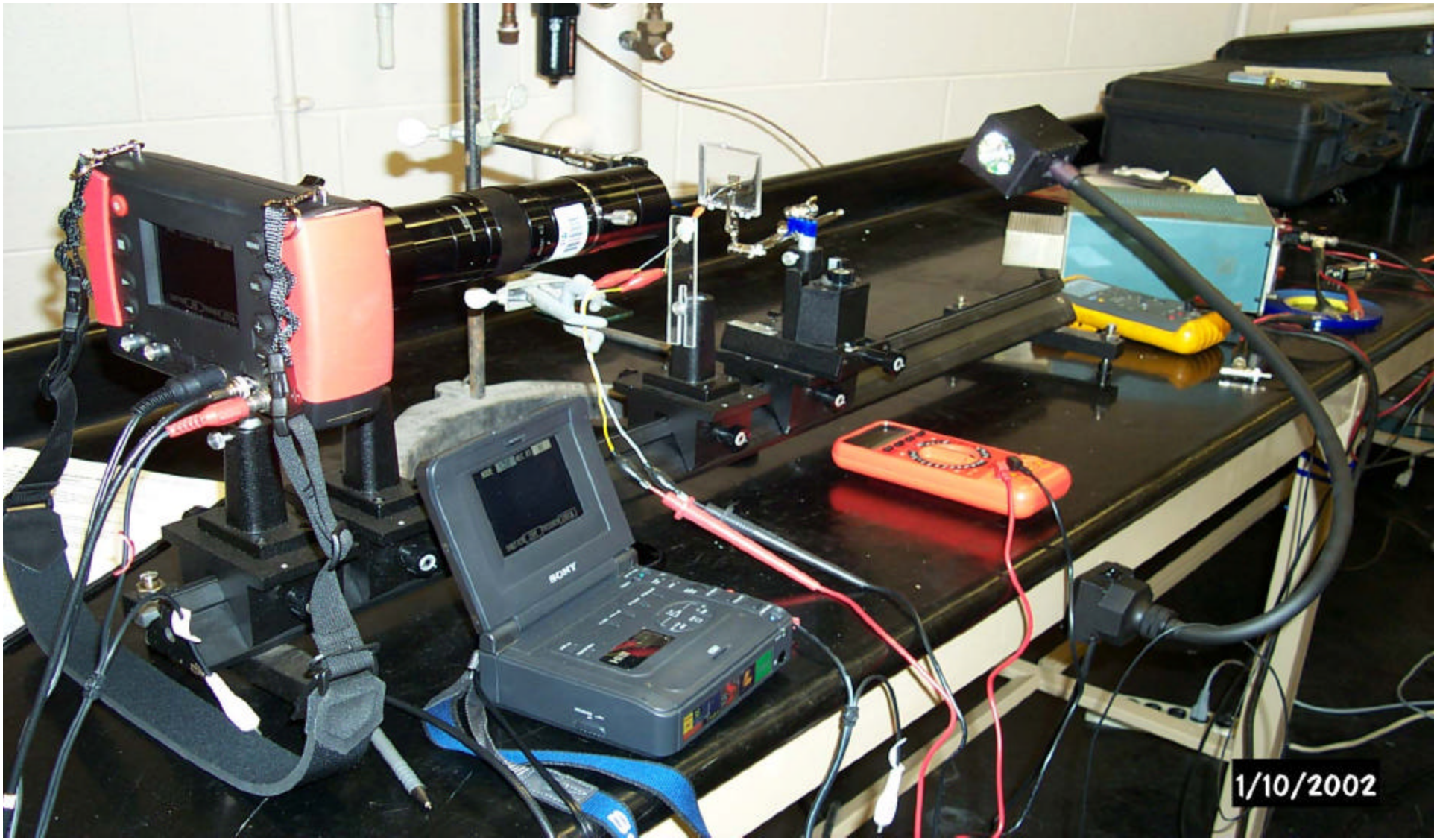
Videography Test Setup



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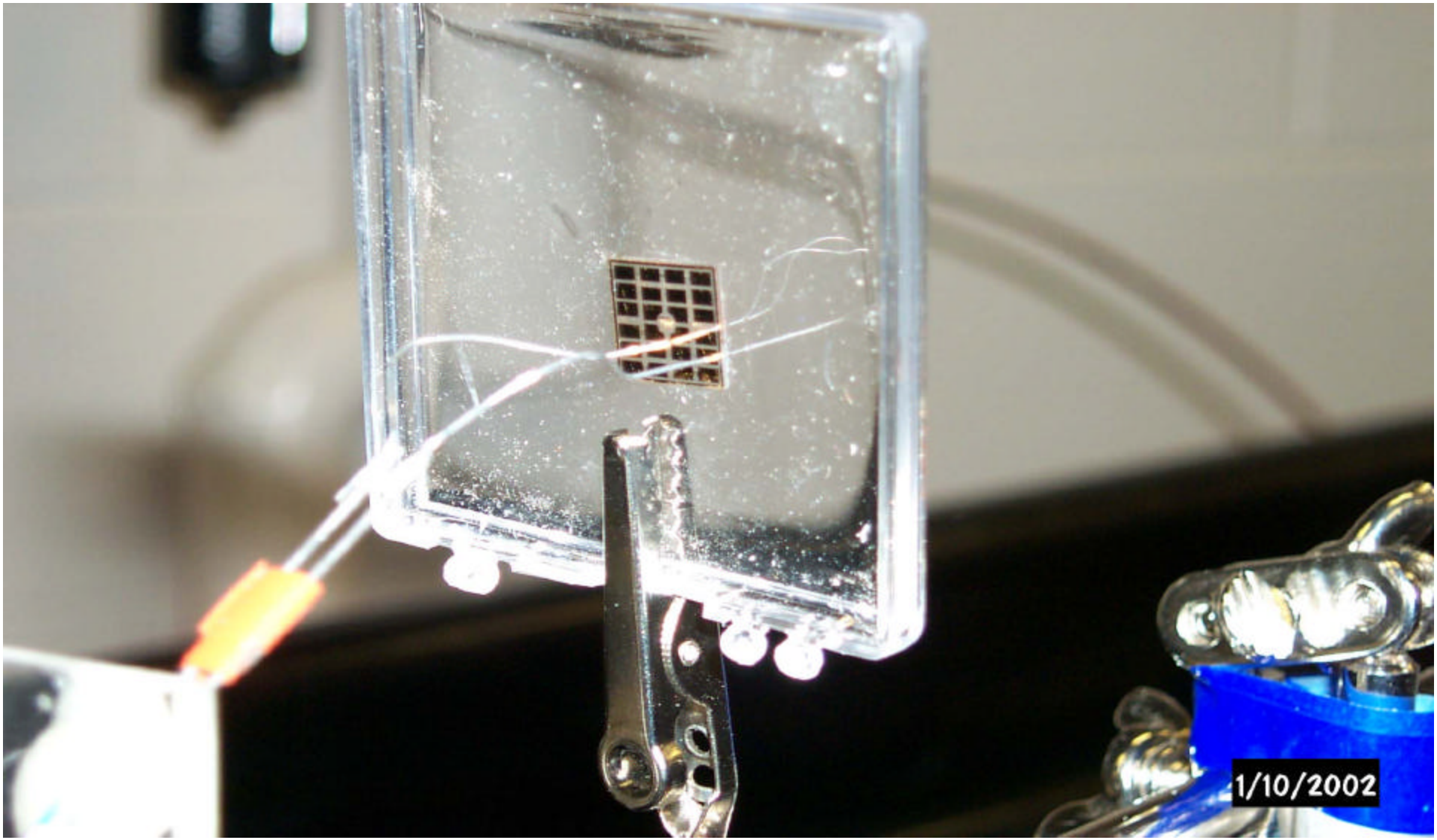
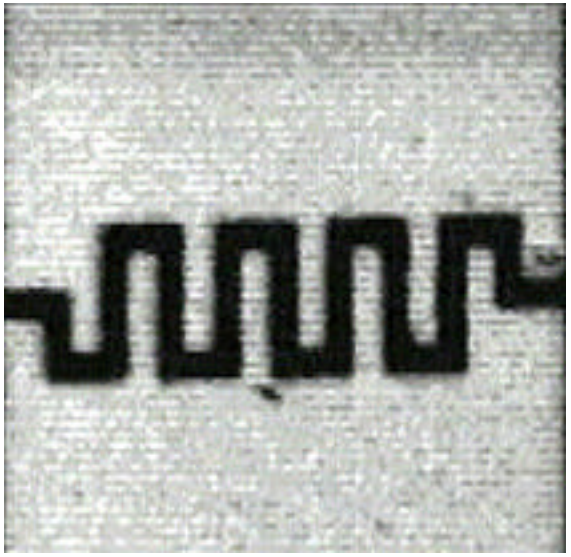
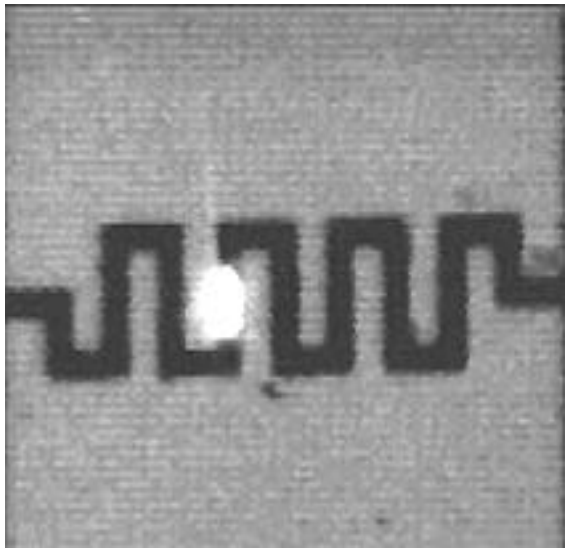
Header with leads

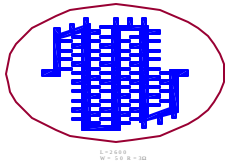
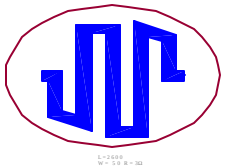
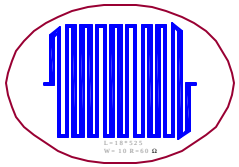
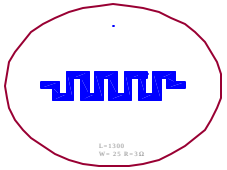


Functioning of 1st generation ARDEC/Tanner Fixture





ARDEC/Tanner 1st generation Bridges

Unit	Measured Resistance (Ω)	Firing Voltage (V)
	4.7	10
	2.8	10
	54.6	9V Battery
	2.8	6

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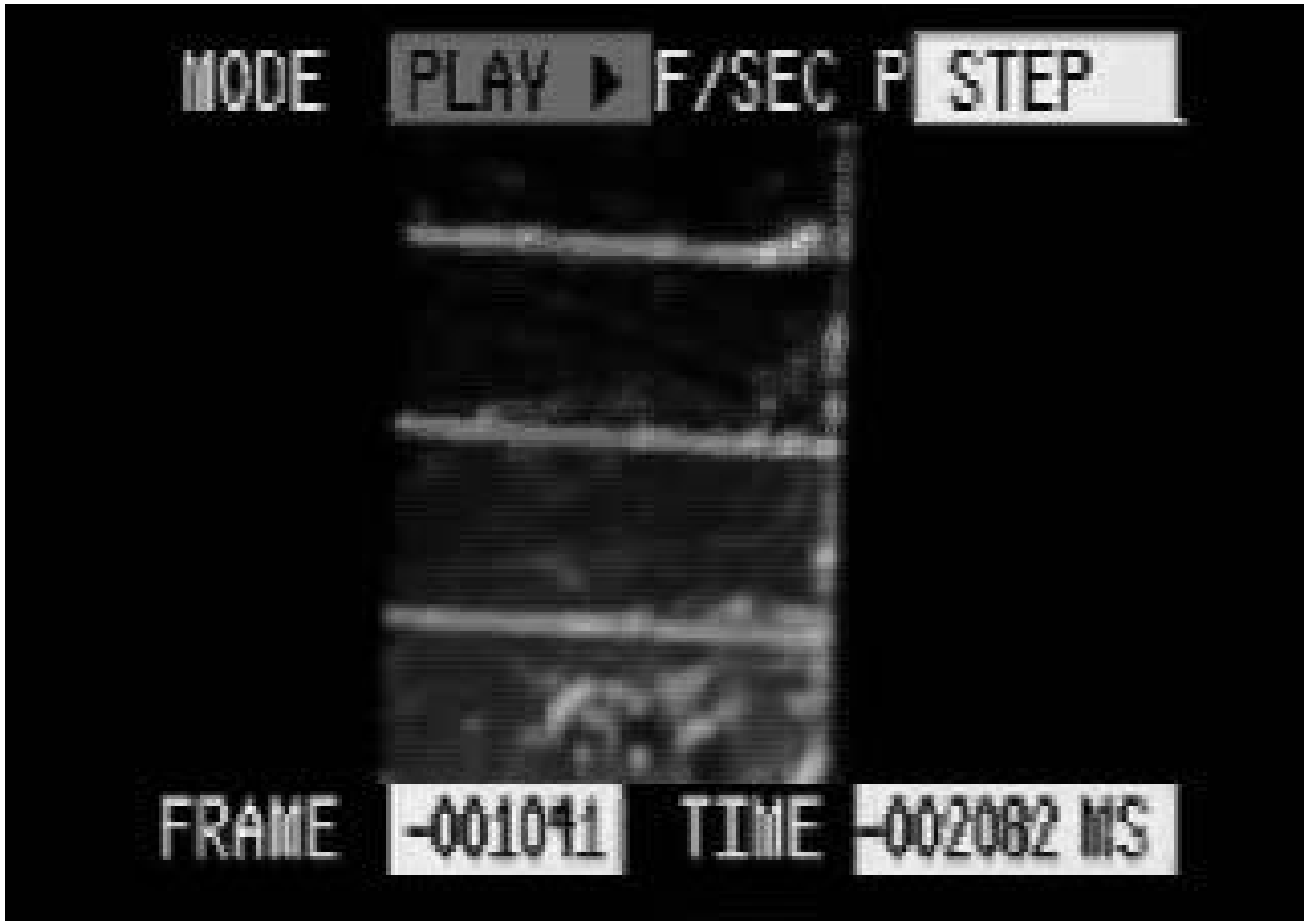
ARDEC/Tanner 2nd Generation



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2nd Generation Headers Fired with Lead Styphnate

Unit	Measured Resistance (Ω)	Firing Voltage (V)
	1.6	3
	3.6	4
	2.4	2.5
	3.6	4

3rd generation of ARDEC/Tanner Bridges loaded with Lead Styphnate

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Unit	Measured Resistance (Ω)	Voltage (V)
	1.3	3.0
	1.8	2.5
	1.5	2.75
	1.9	3.0

4th generation of ARDEC/Tanner Bridges

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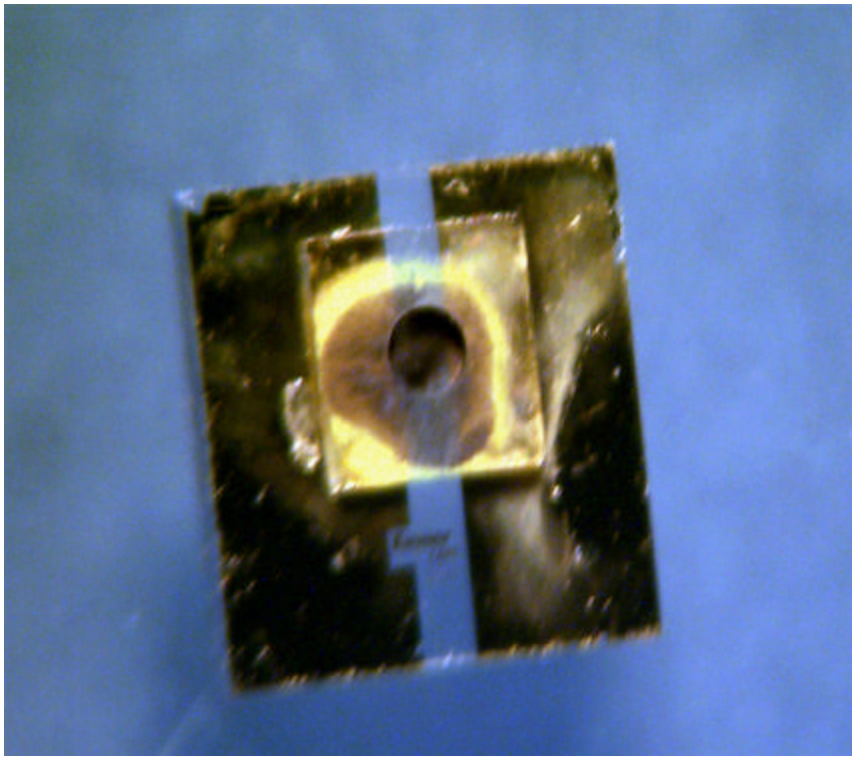
- Photoresist Insulated Bridges



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4th Generation Headers with polyimide substrate

Unit	Measured Resistance (Ω)	Bruceton test Results
	1.1	û = 1.43 s = 0.068
	2.3	û = 1.54 s = 0.056
	1.8	û = 1.23 s = 0.051
	1.5	û = 1.45 s = 0.213

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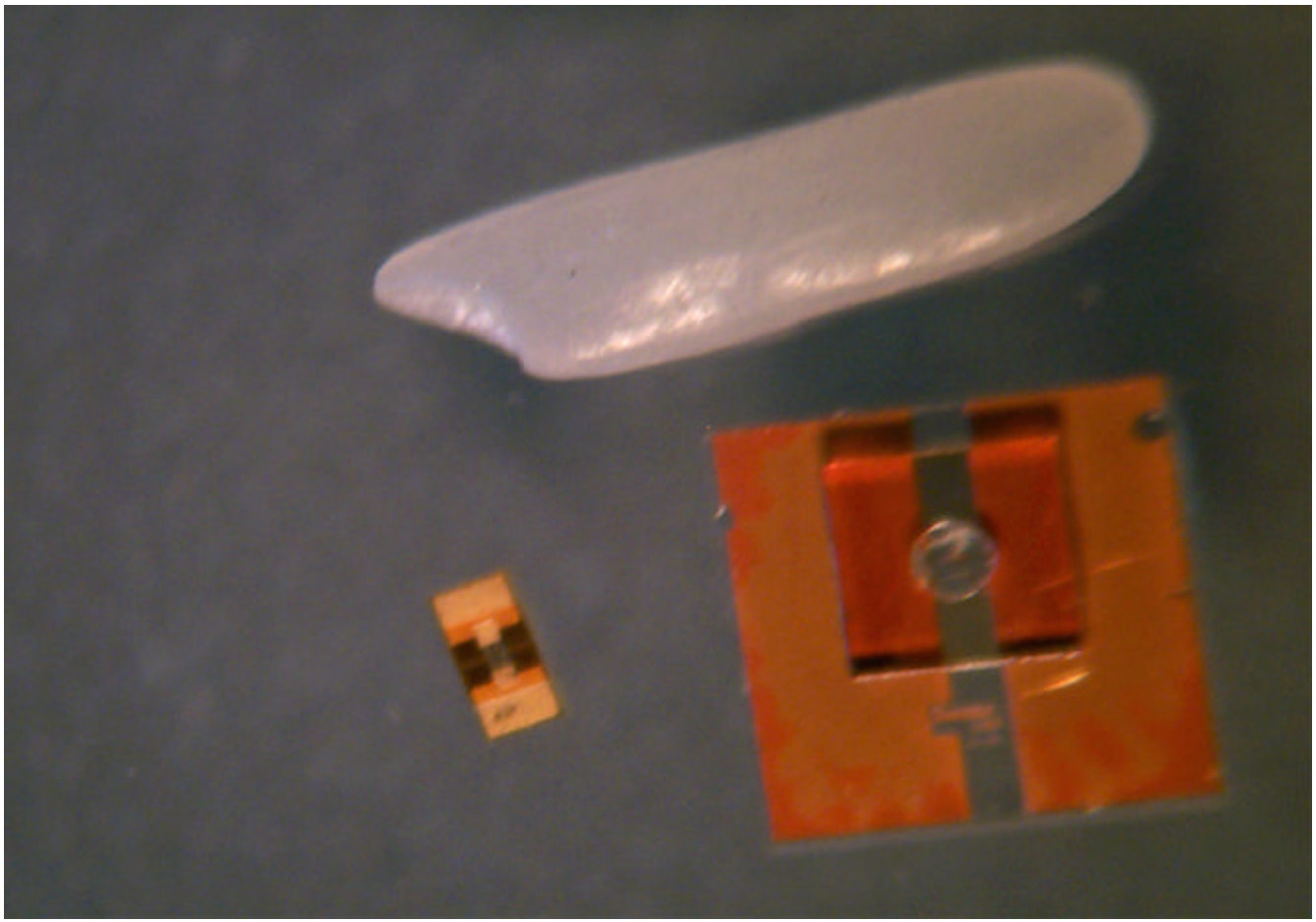
Vishay & ARDEC/Tanner Headers



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Vishay Bridges

Unit	Measured Resistance (O)	Firing Voltage (V)	Bruceton test Result
1-H 2R	3.7	1.5	
1-H 5R	5.2	1.5	
2-L 2R	2.6	1.5	$\hat{u} = 1.407$ $s = 0.0831$
3-H 5R	5.7	3.0	
4-H 2R	2.5	2.5	
7-L 2R	2.5	4.0	

Conclusion

- Met voltage requirements with high reliability
- Developed MEI
- System has applicability to munitions system