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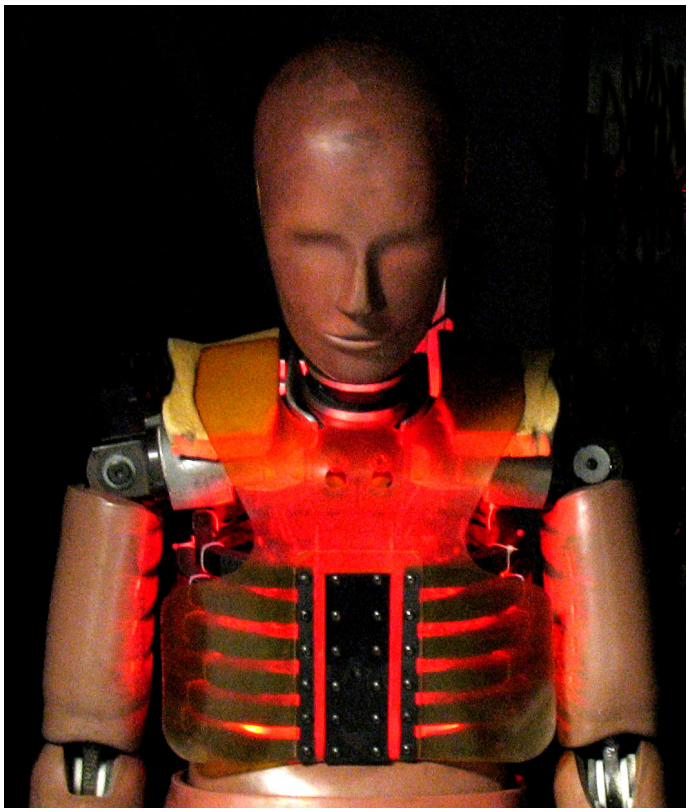
# Hybrid III ATD – 50th Male RibEye™

## A Better Way to Measure Thorax Displacement

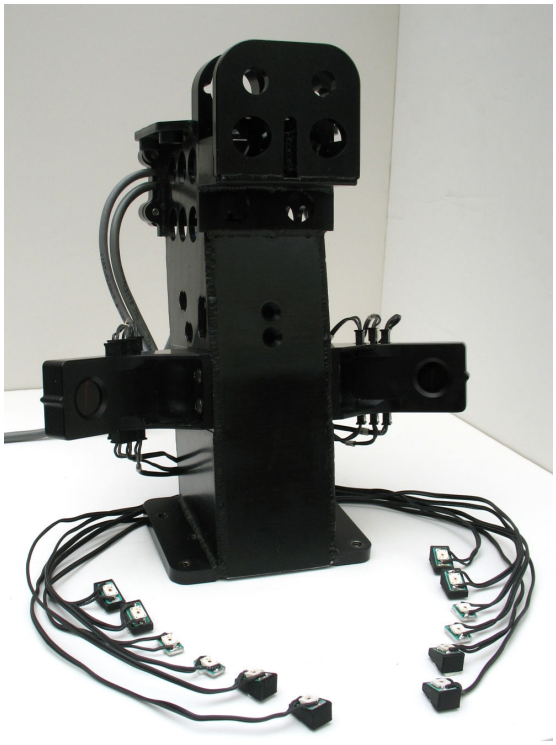


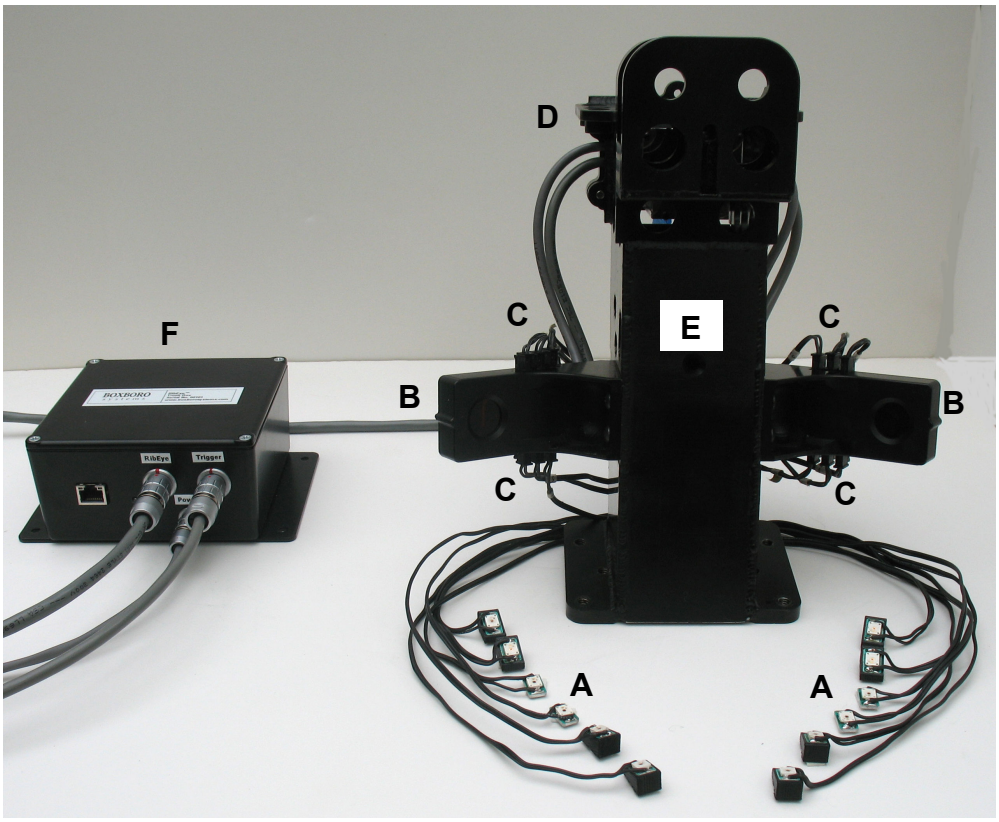
### RibEye Advantages

- Multiple point measurement:
  12 points @ 10 kHz sample rate,
  captures linear and oblique loads
- Multiple-axis: measures X and Y positions for each LED
- Non-contact: no mechanical linkages between spine and ribs
- Shows seat-belt loading effects on all ribs
- Simple installation of LEDs
- Interfaces with existing data acquisition systems: open protocol for RibEye operation by DAS software
- Meets ISO 6487-2000 and SAE J211 specifications

### Measurement Capabilities

- Accuracy
  +/– 0.2 mm typical
  +/– 1 mm max. error
- Range
  X axis: up to 85 mm chest compression
  Y axis: +/– 90 mm from center of spine
  Z axis from top rib to bottom rib
- Acquisition time @ 10 kHz sample rate
  30,000 ms (30 seconds) in RAM
  2 seconds in flash memory
  (500 ms pre-trigger/1500 ms post-trigger)
- Temperature range
  Operating, –18°-38°C (0°-100°F)
  Max. accuracy, 18°-29°C (65°-85°F)






## RibEye Components

**A** 12 LEDs mounted on ribs at measurement points

**B** Two optical sensor heads to derive LED positions

**C** LED connector blocks built into sensor heads

**D** RibEye controller mounted in back of spine

**E** New spine modified for mounting the RibEye

**F** Trunk box (power, trigger, and communications connectors), located externally

## Other information

- PC-based control software exports data in Diadem, ISO, or CSV formats (PC not included)
- Power requirement:
  12-36 Volts DC
  8.3 W (data acquisition)
  5.3 W (idle)
  12.3 W (max.)
- U.S. Patent Number 7508530
- For more data, please see our website literature, including papers from the 2011 ESV Conference about third-party testing using the RibEye

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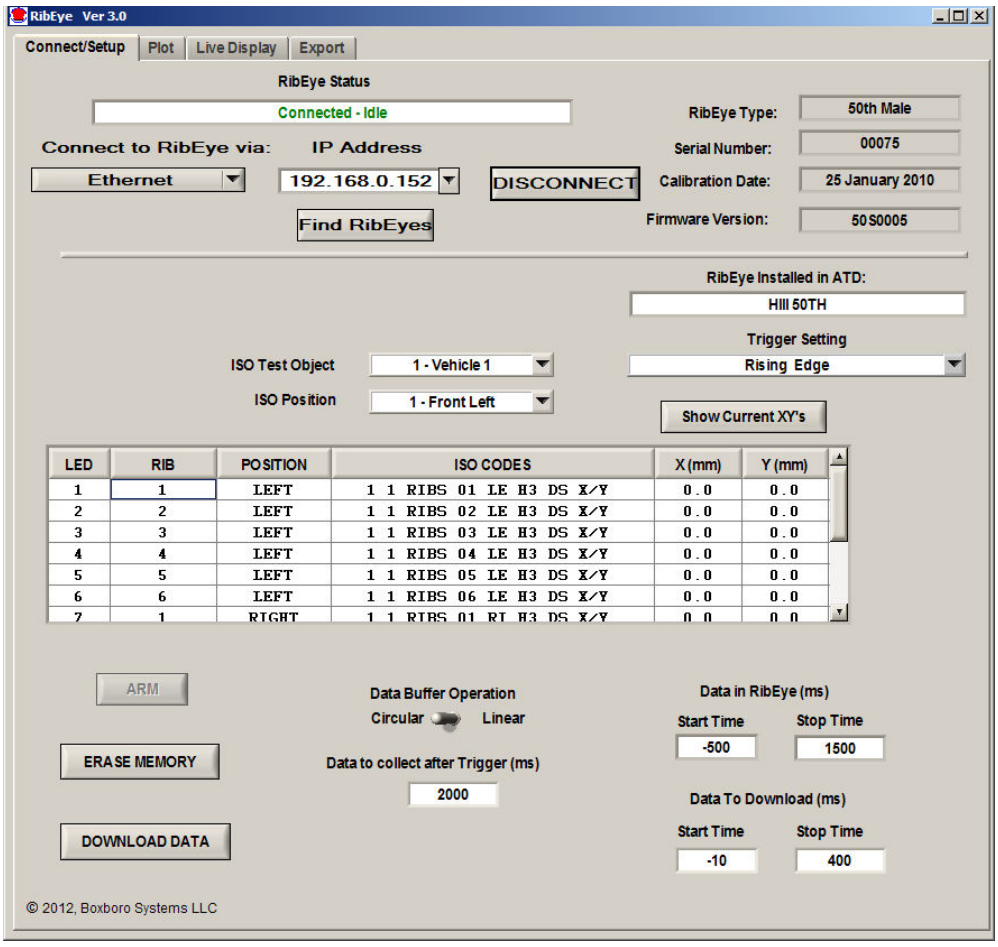

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# Hybrid III ATD – 5th Female RibEye™

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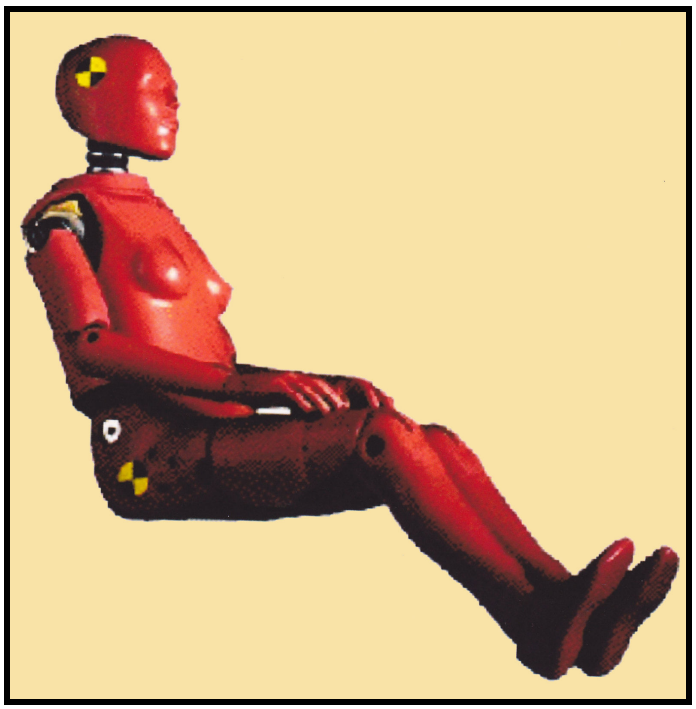

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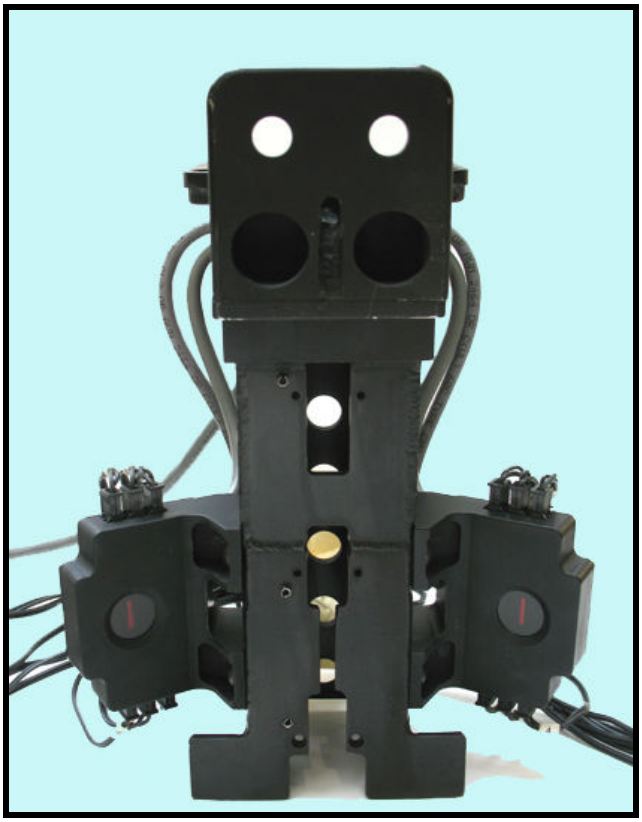
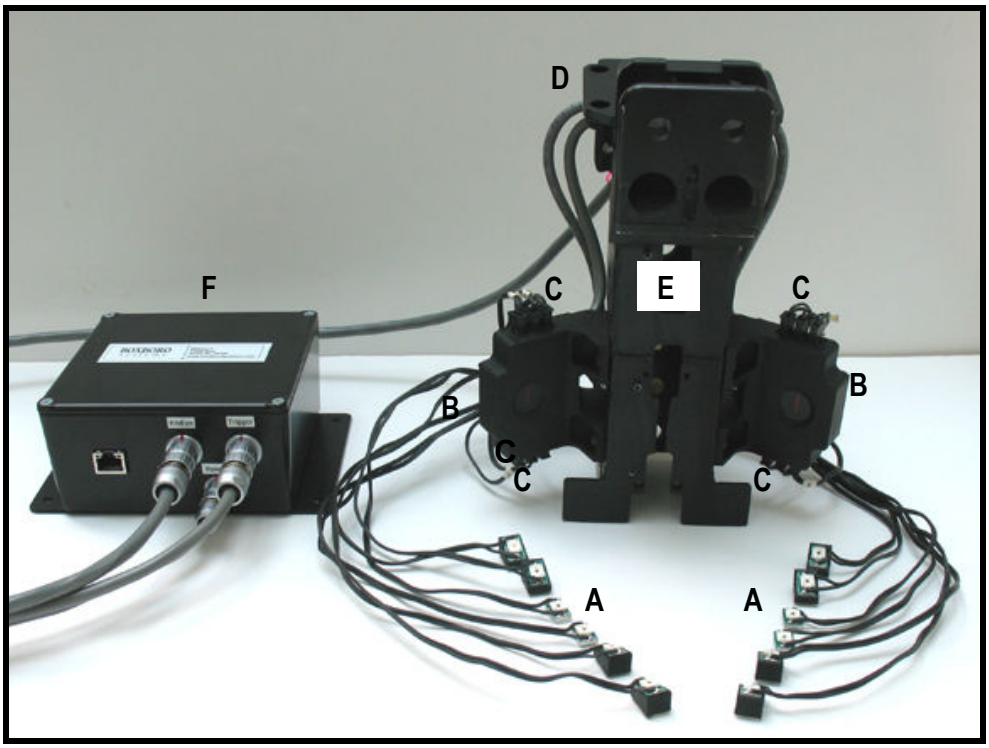
### Measurement Capabilities

- Accuracy
  +/– 0.2 mm typical
  +/– 1 mm max. error
- Range
  X axis: up to 60 mm chest compression
  Y axis: +/– 75 mm from center of spine
  Z axis from top rib to bottom rib
- Acquisition time @ 10 kHz sample rate
  30,000 ms (30 seconds) in RAM
  2 seconds in flash memory
  (500 ms pre-trigger/1500 ms post-trigger)
- Temperature range
  Operating, –18°-38°C (0°-100°F)
  Max. accuracy, 18°-29°C (65°-85°F)



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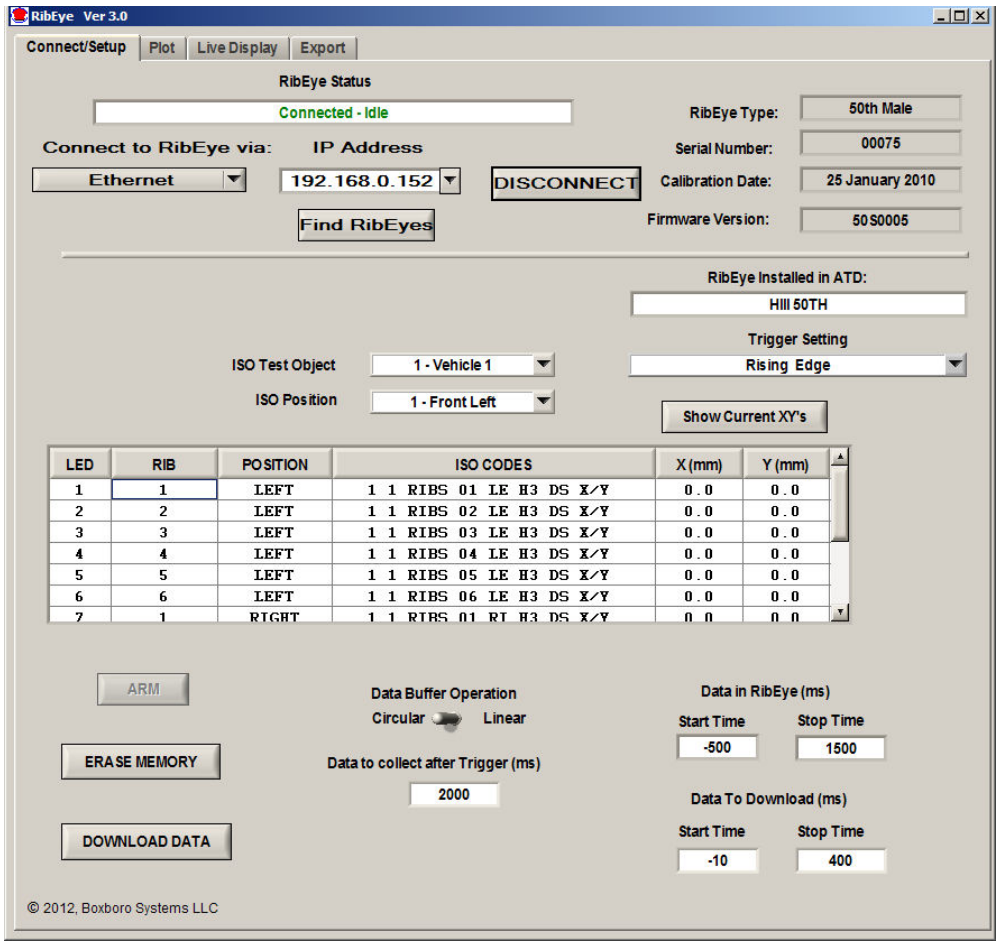

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# WorldSID ATD – 50th Male RibEye™

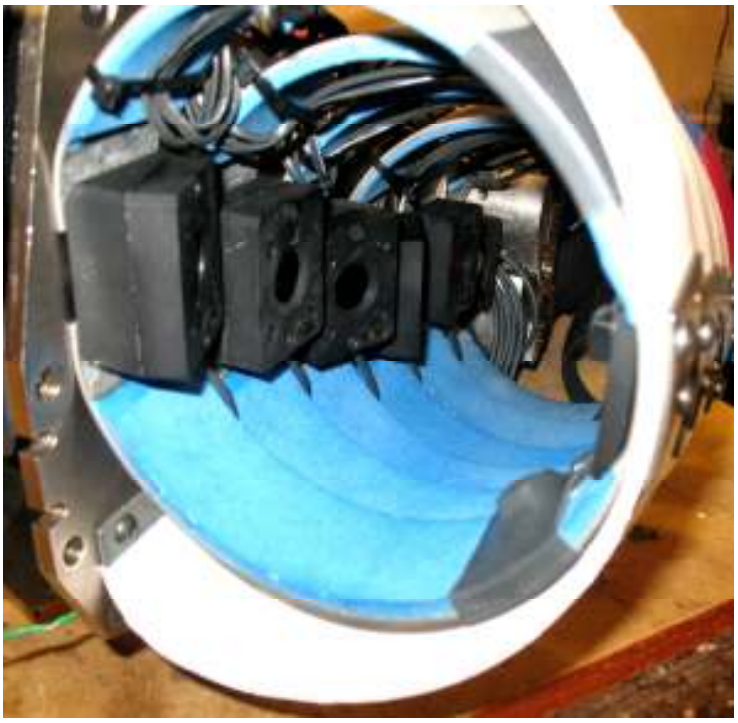
## A Better Way to Measure Thorax Displacement

### RibEye Advantages

- Multiple point measurement:
  18 points @ 10 kHz sample rate,
  captures linear and oblique loads
- Six-LED version also available
- Multiple-axis: measures X, Y and Z positions for each LED
- Non-contact: no mechanical linkages between spine and ribs
- Mounts to existing holes in spine and ribs – no modifications to dummy
- Interfaces with existing data acquisition systems: open protocol for RibEye operation by DAS software
- Meets ISO 6487-2000 and SAE J211 specifications

### Measurement Capabilities

- Accuracy
  For Y and Z data:
  ± 0.2 mm typical
  ± 1 mm max. error
  For X data, max. error < 1.5 mm
- Range
  X axis: ± 130 mm fore/aft
  Y axis: 85 mm chest compression
  Z axis: 80 mm up, 50 mm down
- Acquisition time @ 10 kHz sample rate
  25,000 ms (25 seconds) in RAM
  1.7 seconds in flash memory
- Temperature range
  Operating, –18°-38°C (0°-100°F)
  Max. accuracy, 18°-24°C (65°-75°F)



RibEye Sensors

RibEye LEDs

## More information

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# WorldSID ATD – 5th Female RibEye™

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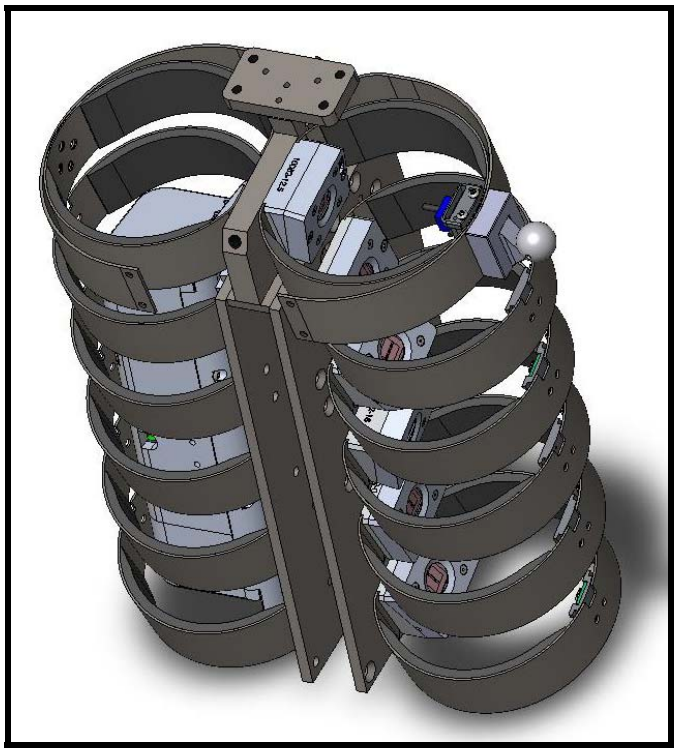
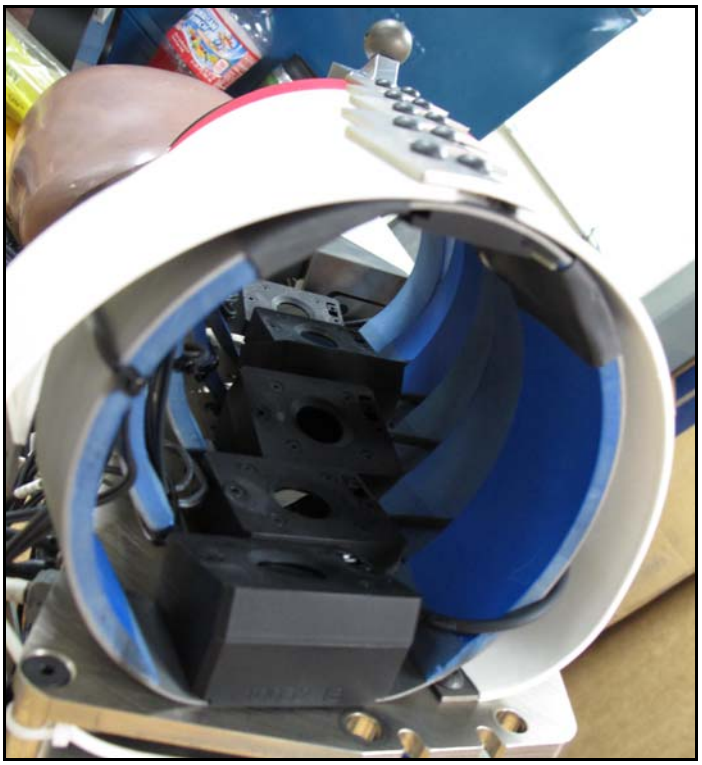
- Mounts to existing holes in spine and ribs – no modifications to dummy
- Interfaces with existing data acquisition systems: open protocol for RibEye operation by DAS software
- Meets ISO 6487-2000 and SAE J211 specifications

### Measurement Capabilities

- Accuracy
  For Y and Z data:
  ± 0.2 mm typical
  ± 1 mm max. error
  For X data, max. error < 1.5 mm
- Maximum range
  X axis: ± 120 mm fore/aft
  Y axis: 67 mm chest compression
  Z axis: 80 mm up, 65 mm down
- Acquisition time @ 10 kHz sample rate
  25,000 ms (25 seconds) in RAM
  1.7 seconds in flash memory
- Temperature range
  Operating, –18°-38°C (0°-100°F)
  Max. accuracy, 18°-24°C (65°-75°F)



**WorldSID 5th Female RibEye Thorax**



**RibEye Sensors**

**RibEye LEDs**

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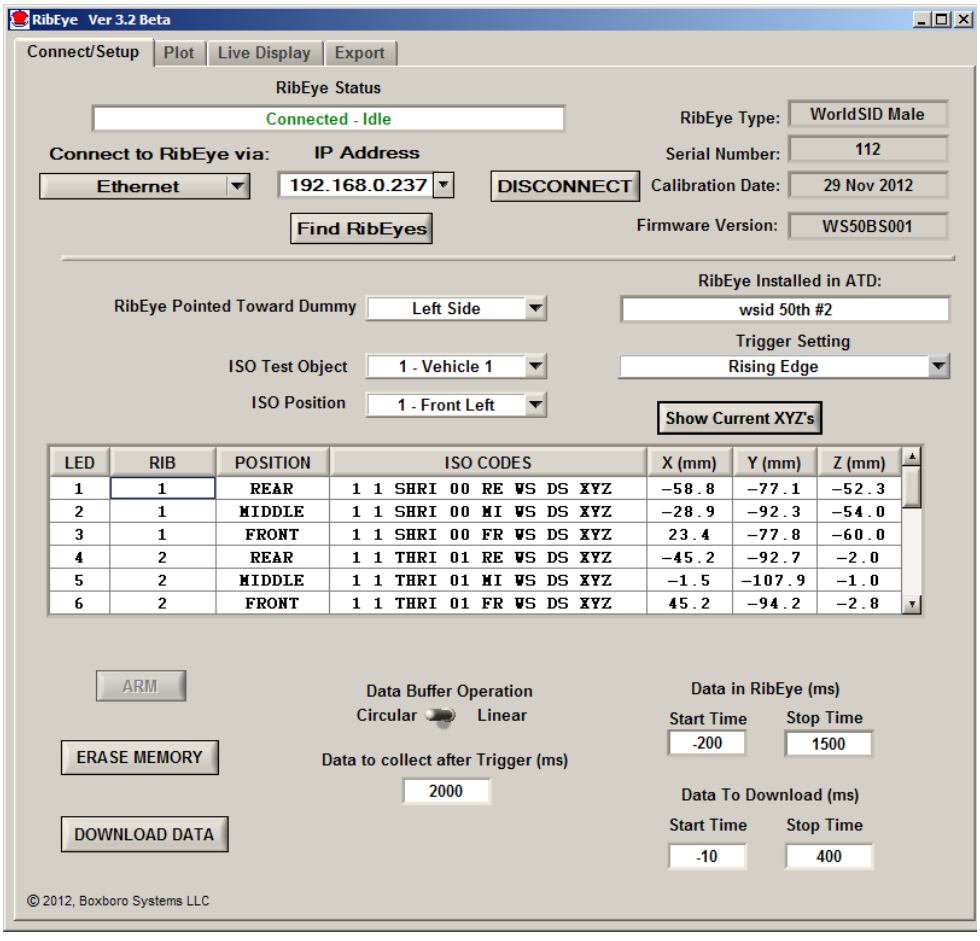

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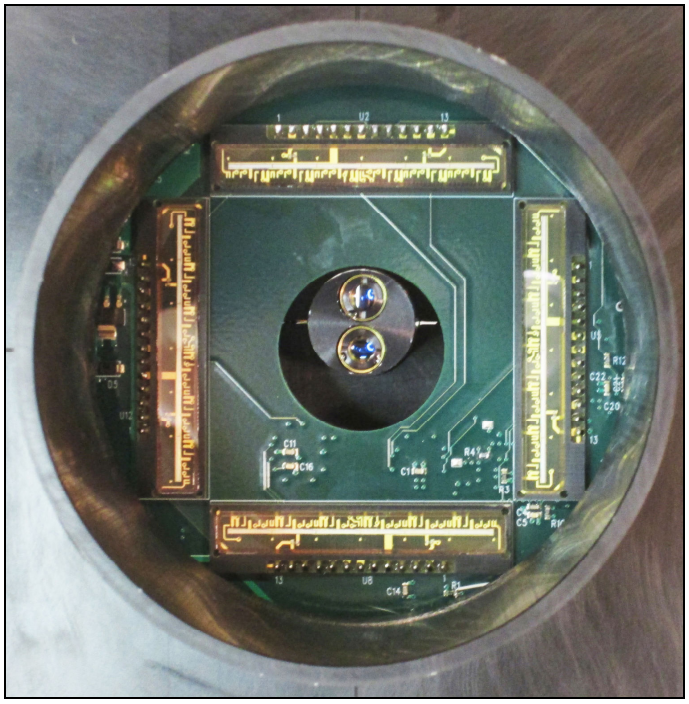
# Deflection and Twist Measurement System (DTMS™)

## A Better Way to Measure Dynamic Motion in Large Structures



*Sensor Array and Cross-Hair Laser*

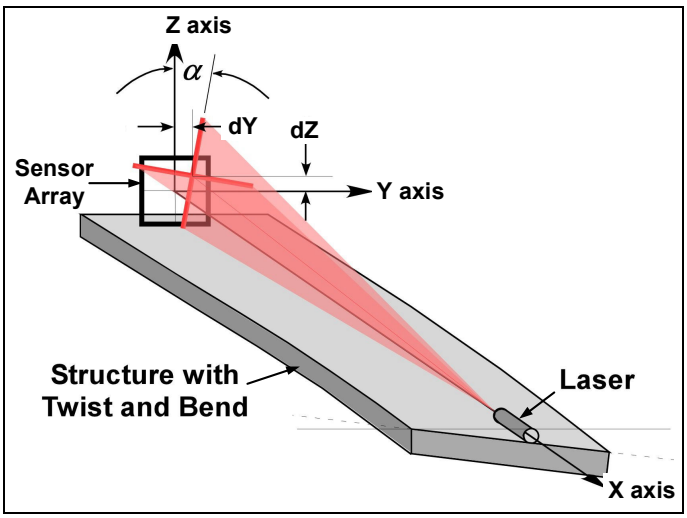
## DTMS Advantages

- Measures five degrees of freedom at multiple points selected by the user
- Records and displays dynamic mode shapes while the structure is moving
- Reports data relative to one end of the structure, not a fixed ground reference
- Results are not affected by the structure's motion or acceleration
- Accommodates unusual structural shapes and can be mounted inside hollow spaces
- Software included to provide configuration, data logging, and three ways to plot
- Simple communication via Modbus RTU protocol over RS485 network

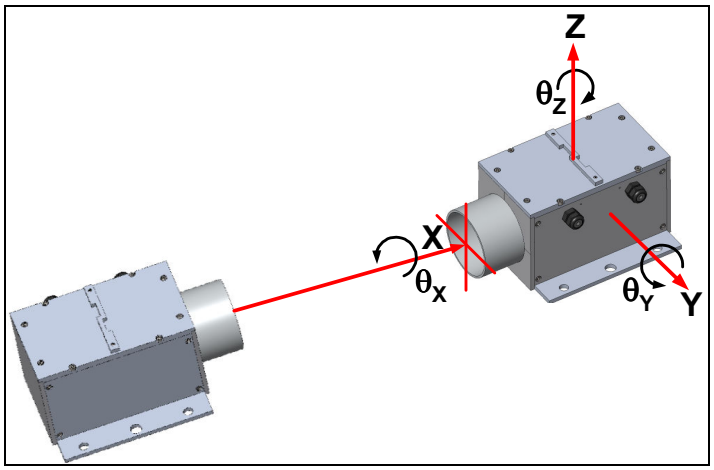
## Description and Capabilities

- Scalable laser tool available in half or full segments or string of multiple segments
- Applications include bridges, buildings, boat hulls, trains, crane booms, vehicle frames, and airplane wings
- Accuracy certified by independent U.S. lab with NIST/NPL traceability
- Deflection and twist reported in real time
  - Deflection accuracy: 0.2 mm
  - Twist accuracy: 0.1 degree
  - Frequency response: up to 100 Hz
- Y, Z measurement range per segment
  - 0 to 47 mm (+/– 23.5 mm)
- Maximum twist
  - X axis: 35 degrees per segment
  - Y, Z depend on number of segments

*Schematic of Half Segment*

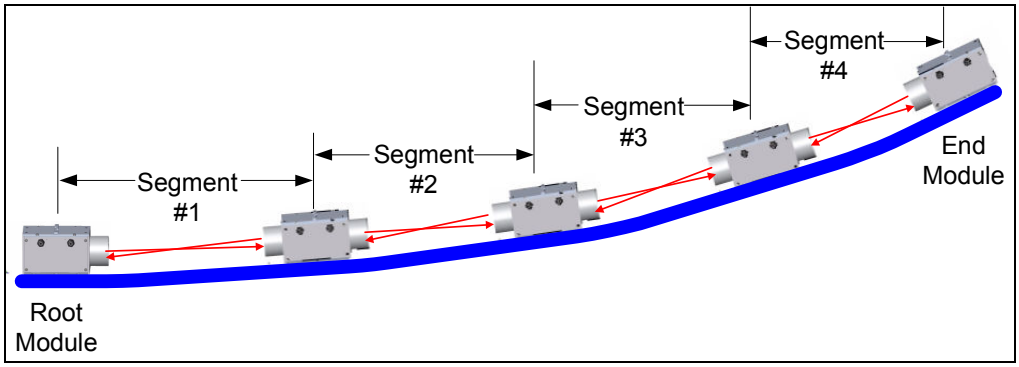


***Schematic of Full Segment with Coordinate System***

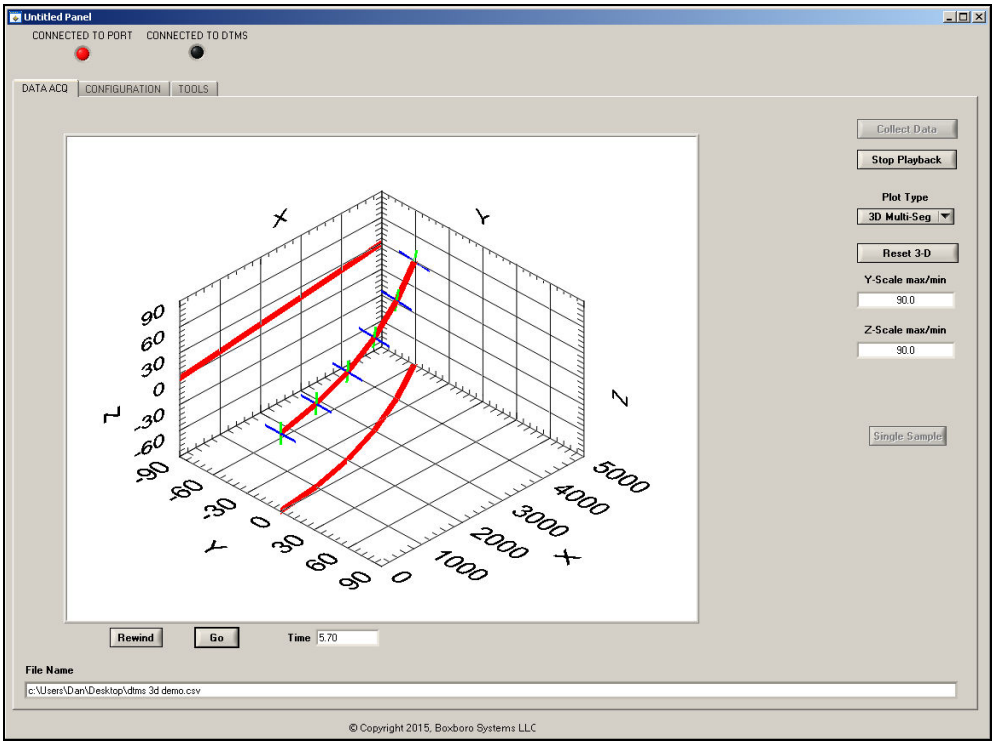



***DTMS Module Enclosure in Multi-Segment System***


***Multi-Segment Schematic***




***DTMS Data 3-D Plot***




For more information, go to www.boxborosystems.com
or contact Dan Handman, 978-257-2219, dan@boxborosystems.com