SWIFT® Evo Wheel Force Transducer
Agenda

- PCB and MTS History
  - SWIFT® History
- SWIFT® Evo Overview
  - Transducer design
  - Components
  - Specifications
  - Features
- SWIFT® Evo Advantages
- Questions?
PCB and MTS History

- MTS founded 1967; PCB founded in 1966
- MTS exited the WFT market in 2013 to focus their resources and attention on their system technologies, rather than component level technologies
- MTS Systems Corporation acquired PCB Group, Inc. in July 2016. PCB’s strong brand, a broad sensor portfolio as well as renowned global customer service in the sensor market provided an opportunity to bring back the SWIFT® product line. With PCB now part of MTS, a sensor company was now the caretaker of the SWIFT® technology. This enabled product development to pick-up where MTS left off, and utilizing the resources from both companies, a realistic goal to bring an new SWIFT® product to the market could be realized. This upgraded product carries the same one-piece legacy design that has been proven in numerous demanding applications over the last 20 years. PCB and MTS both had different Wheel Force Transducers in the market at different times during their history.
SWIFT® Evo Overview

- The name SWIFT is derived from Spinning Wheel Integrated Force Transducer
- 3 forces and 3 moments measured at the spindle (Fx, Fy, Fz, Mx, My, Mz)
- Light-weight transducer for easier, faster, less expensive data acquisition and road simulation testing
- Sizes available to accommodate ATV & motorcycles, passenger cars, light trucks, SUVs, medium trucks and heavy trucks
SWIFT® Evo Overview

- Road Load Data Acquisition (RLDA)
  - Measurement of design loads
  - Typical & Critical driving condition situations
- Laboratory road simulation testing on MTS 329 Spindle Coupled Road Simulator or other road simulators
- Tire tread wear and characterization
- Suspension dynamics testing
- Development of active chassis control systems
- Developing computer models
SWIFT Overview

- **Development and Launch History**
  - SWIFT® 30 for Large Car 1998 (Original TI Electronics)
  - SWIFT® 40 for Light Truck 1999
  - SWIFT® 20 for Small Car 2002 (Low Profile TI)
  - SWIFT® 50 for Heavy Truck 2004
  - SWIFT® 50 for Heavy Truck v2 2006
  - SWIFT® 10 for Motorcycle/ATV 2008 (Mini TI)
  - SWIFT® 45 for Medium Trucks 2010

- **Development of Electronics**
  - Original Transducer Interface 1998 – 2002; Retired 2010
  - Low Profile TI 2002 – 2011; Retired 2012
  - Mini TI 2008 – 2012; Basis for Evo

- **Over $6.8M Spent from 1997 to 2010**

- **More than 800 SWIFT units have been sold around the world since product launch**
SWIFT® Evo Overview

- Converts rotating force and moment data to vehicle coordinate system
- Compensates for cross-talk
- Amplifies signal for high signal-to-noise ratio
SWIFT® Evo Overview

- Transducers are precisely calibrated, so data is portable
- Transducers used to take road data may be different than ones installed on MTS 329 Road Simulator fixture
- Move just the transducer from track to lab or share with a test rig in another country
SWIFT® Evo Sensor Design

- The one-piece design of the SWIFT® Evo transducer is machined from a solid, specially forged billet of aerospace grade high-strength aluminum or titanium with eight fully active bridges. All SWIFT® Evo transducers use this efficient and robust design and construction approach for the highest resonant frequency and durability.
SWIFT® Evo Sensor Design

- Strain Gage Bridge Technology
- Proven technology for stability over time and temperature, high frequency response, durability
- Eight full strain gage bridges
  - 32 strain gages
  - 16 gage backings
  - Zero balance and Temperature Compensation for each Bridge
SWIFT® Evo Components
The SWIFT® Evo system is made up of:

- Evo TI Interface Box (Electronics)
- Anti-Rotate Assembly and Mounting Arm
- Six axis SWIFT® Evo transducer
- Slip ring bracket and Encoder assembly
- Modified wheel rim
- Hub Adapter
- Power Supply
- Cables & Bolts
- Non-spinning Connector Housing
SWIFT® Evo Components

- SWIFT® Evo
- Slip Ring and Encoder
- Spider (Slip ring bracket)
- Modified Wheel Rim
- Transducer Interface Cable
- SWIFT Evo Transducer Interface
- Hub Adapter
SWIFT® Evo Transducer Design – Material Selection

- Aluminum 7050-T7452
  - Hand Forged for optimum grain orientation
  - Excellent combination of Strength and Toughness
  - Among the best AL alloys in fatigue performance

- Titanium TI-6AL-4V
  - Excellent combination of ultimate strength, weight, and great fatigue performance
  - Difficult to manufacture, MTS is a dominant company in manufacture of Titanium Sensors.
SWIFT® Evo Transducer Design

- Octatube Design is a greater machining challenge than competitor WFT beam styles
  - 45° faces require the use of a 4+ axis machining center.
  - Octatube wall thickness uniformity at each face is critical for mitigating crosstalk, span shift, thermal effects
  - Titanium is difficult to machine
- No other WFT uses fewer strain gages than SWIFT® Evo
  - 16 double-grid gages per SWIFT® Evo
- The flexure-isolated Octatube design is more complex, but reaps dividends in reduced gaging cost
- Despite the challenges of machining the SWIFT® Evo we have made continual improvements
  - Fixtures
  - Deep History of SWIFT® machining experience
SWIFT® Evo Transducer Design

- Each Octatube is a biaxial shear sensor
- Flexure isolation mitigates compressive loads on Octatubes, therefore Octatubes carry loads mostly in shear
  - Reduces Crosstalk
  - Improves Accuracy
  - Reduces Thermal Drift
The WFT mounts between the hub of the vehicle and the tire-rim assembly.

The design of the hub adapter and custom rim helps minimize the offset of the WFT so that the original tire/rim/wheel profile is closely maintained.

The Hub/Rim configuration objective is to preserve the original production mounting bolt pattern and wheel offset while providing a secure and safe mounting for the wheel force transducer sensor.

Preserving the original production profile and mounting will eliminate any possible interference between the sensor/rim/hub assembly and the test vehicle internal components.

Interference between the sensor/hub/rim assembly and the vehicle internal components will most definitely result in output error and possible damage to the vehicle or sensor assembly itself.

The vehicle assembly component configuration should be one of the focal points of the application.

The SWIFT® Evo transducer design simply and inexpensively adapts to a wide variety of wheel rim and hub configurations while maintaining an overall mass comparable to the standard wheel. With five sizes available, you can employ the SWIFT® Evo transducer on a wide range of vehicles.
### SWIFT® Evo Rim and Hub Adaptors

- PCB Manufactures custom rim and hub adaptors to customer specifications

#### SWIFT® Evo

**Customer Data Sheet**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Predecessor</th>
<th>Type 1</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIM TYPE</td>
<td>Single</td>
<td>Dual</td>
<td>Super Single</td>
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<tr>
<td>MANUF. RIM PART NO.</td>
<td>For reference for missing info</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIM SIZE: &quot;D&quot; x &quot;W&quot;</td>
<td>Drives Rim design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFFSET: &quot;O&quot;</td>
<td>Crucial for proper configuration and performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLEARANCE: &quot;Kc&quot;</td>
<td>Crucial for break clearance interference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOUNT LOCATION: (FRONT, REAR)</td>
<td>Front will have less clearance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PILOT DIA.: &quot;P&quot;</td>
<td>Important to pilot on hub not studs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHAMFER: &quot;C&quot;</td>
<td>Important for proper hub mounting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLANGE DIA.: &quot;F&quot;</td>
<td>Important for proper hub clearance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOLT CIRCLE DIA: &quot;BC&quot;</td>
<td>Crucial for proper hub fit and operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOLE DEPTH/GRIP LENGTH: &quot;O&quot;</td>
<td>Important for original hub mount and lug torque</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STUD HOLE DIA.: &quot;DB&quot;</td>
<td>Crucial for hub fit and performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUMBER OF HOLES: &quot;N&quot;</td>
<td>Hub will not fit if incorrect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LENGTH OF NUT: &quot;L1&quot;</td>
<td>Verification for hub design and width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LENGTH OF STUD: &quot;L2&quot;</td>
<td>Verification for hub design and width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANGLE OF HEAD: &quot;A&quot; (CONICAL)</td>
<td>Important for hub lug/stud mount</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RADIUS OF HEAD: &quot;R1&quot; (SPHERICAL)</td>
<td>Important for hub lug/stud mount</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STUD THREAD SIZE: &quot;T&quot;</td>
<td>Crucial for hub mounting and fit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BEARING CAP: &quot;B, CAP&quot;</td>
<td>Important for sensor clearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROSS VEHICLE WEIGHT</td>
<td>Important for WFT capacity verification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEAK LOADS ANTICIPATED (IF AVAILABLE)</td>
<td>Fx:</td>
<td>Mx:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fz:</td>
<td>Mz:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fy:</td>
<td>My:</td>
<td></td>
</tr>
</tbody>
</table>
SWIFT® Evo Family

- SWIFT® Evo 45
  Medium Truck
- SWIFT® Evo 40
  Light Truck & SUV
- SWIFT® Evo 30
  Large Car
- SWIFT® Evo 20
  Small Car
- SWIFT® Evo 10
  Motorcycle & ATV
SWIFT® Evo Family

- From ATV's & Motorcycles to Test Rigs to Racing applications
Adapting to the MTS Model 329 Simulator

- Hub Adapter mates the inner side of the load cell to the vehicle hub.
- Designed for use in Road Simulators – can be used on MTS 329 and other simulators. Long history of success.
- Wheel Offset Adapter mates the outer side of the load cell to the MTS 329 spindle housing.
Max. Bolt Circle Dia.: 145 mm
Wheel size accommodation: 7+ inch
Transducer weight: 2.0 kg (4.5 lb)
Slip ring assembly weight: 0.5 kg (1.1 lb)

Full Scale Calibrated Ranges:
- Longitudinal force: 25 kN
- Lateral force: 18 kN
- Vertical force: 25 kN
- Overturning moment: 4 kN-m
- Driving/braking moment: 4 kN-m
- Steering moment: 4 kN-m
<table>
<thead>
<tr>
<th>Specification</th>
<th>Aluminum</th>
<th>Titanium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Bolt Circle Dia.</td>
<td>150 mm</td>
<td>150 mm</td>
</tr>
<tr>
<td>Wheel size accommodation</td>
<td>12+ inch</td>
<td>12+ inch</td>
</tr>
<tr>
<td>Transducer weight</td>
<td>3.6 kg (7.3 lb)</td>
<td>4.9 kg (10.7 lb)</td>
</tr>
<tr>
<td>Slip ring assembly weight</td>
<td>0.6 kg (1.3 lb)</td>
<td>0.6 kg (1.3 lb)</td>
</tr>
</tbody>
</table>

Full Scale Calibrated Ranges:

<table>
<thead>
<tr>
<th>Force Type</th>
<th>Range (Aluminum)</th>
<th>Range (Titanium)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal force</td>
<td>21 kN</td>
<td>30 kN</td>
</tr>
<tr>
<td>Lateral force</td>
<td>16 kN</td>
<td>25 kN</td>
</tr>
<tr>
<td>Vertical force</td>
<td>21 kN</td>
<td>30 kN</td>
</tr>
<tr>
<td>Overturning moment</td>
<td>4 kN-m</td>
<td>6 kN-m</td>
</tr>
<tr>
<td>Driving/braking moment</td>
<td>5 kN-m</td>
<td>8.5 kN-m</td>
</tr>
<tr>
<td>Steering moment</td>
<td>4 kN-m</td>
<td>6 kN-m</td>
</tr>
</tbody>
</table>
**SWIFT® Evo 30 - Large Car**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Aluminum</th>
<th>Titanium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Bolt Circle Dia.</td>
<td>130 mm</td>
<td>130 mm</td>
</tr>
<tr>
<td>Wheel size accommodation</td>
<td>13+ inch</td>
<td>13+ inch</td>
</tr>
<tr>
<td>Transducer weight</td>
<td>4.6 kg (10.2 lb)</td>
<td>6.8 kg (15 lb)</td>
</tr>
<tr>
<td>Slip ring assembly weight ±</td>
<td>0.7 kg (1.5 lb)</td>
<td>0.7 kg (1.5 lb)</td>
</tr>
</tbody>
</table>

**Full Scale Calibrated Ranges:**

- **Longitudinal force**
  - Aluminum: 28 kN
  - Titanium: 50 kN
- **Lateral force**
  - Aluminum: 23 kN
  - Titanium: 40 kN
- **Vertical force**
  - Aluminum: 28 kN
  - Titanium: 50 kN
- **Overturning moment**
  - Aluminum: 5 kN-m
  - Titanium: 9 kN-m
- **Driving/braking moment**
  - Aluminum: 7.5 kN-m
  - Titanium: 13 kN-m
- **Steering moment**
  - Aluminum: 5 kN-m
  - Titanium: 9 kN-m
### SWIFT Evo 40 - Light Truck & SUV

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Aluminum</th>
<th>Titanium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Bolt Circle Dia.</td>
<td>170.5 mm</td>
<td>170.5 mm</td>
</tr>
<tr>
<td>Wheel size accommodation</td>
<td>15+ inch</td>
<td>15+ inch</td>
</tr>
<tr>
<td>Transducer weight</td>
<td>8.6 kg (18.9 lb)</td>
<td>13 kg (28.7 lb)</td>
</tr>
<tr>
<td>Slip ring assembly weight</td>
<td>2.3 kg (5 lb)</td>
<td>3.7 kg (8.2 lb)</td>
</tr>
</tbody>
</table>

**Full Scale Calibrated Ranges:**

- **Longitudinal force**: 40 kN, 60 kN
- **Lateral force**: 30 kN, 40 kN
- **Vertical force**: 40 kN, 60 kN
- **Overturning moment**: 9 kN-m, 15 kN-m
- **Driving/braking moment**: 13 kN-m, 18 kN-m
- **Steering moment**: 9 kN-m, 15 kN-m
SWIFT® Evo 45 - Medium Truck

Max. Bolt Circle Dia.  
Wheel size accommodation  
Transducer weight  
Slip ring assembly weight

Full Scale Calibrated Ranges:  
Longitudinal force  
Lateral force  
Vertical force  
Overturning moment  
Driving/braking moment  
Steering moment

Titanium  
275 mm  
17.5+ inch  
10.7 kg (23.6lb)  
.9 kg (2 lb)

120 kN  
48 kN  
120 kN  
28 kN-m  
30 kN-m  
28 kN-m
SWIFT® Evo Selection Chart

- Aluminum is lighter weight but lower force ratings. Typically used for RLDA
- Titanium is heavier but higher load cycles and force ratings. Typically used on 329 test rigs
- General selection method is to choose based on vehicle half axle weight

<table>
<thead>
<tr>
<th>Model</th>
<th>Material</th>
<th>Assembly Weight kg (lb)</th>
<th>Half Axle Durability Rating kg (lb)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWIFT Evo® 10</td>
<td>Ti</td>
<td>6.5 kg (14.3 lbs)</td>
<td>725 kg (1,600 lbs)</td>
</tr>
<tr>
<td>SWIFT Evo® 20</td>
<td>Al</td>
<td>9.4 kg (20.7 lbs)</td>
<td>420 kg (965 lbs)</td>
</tr>
<tr>
<td>SWIFT Evo® 20</td>
<td>Ti</td>
<td>11 kg (24.2 lbs)</td>
<td>717 kg (1,580 lbs)</td>
</tr>
<tr>
<td>SWIFT Evo® 30</td>
<td>Al</td>
<td>13.1 kg (28.9 lbs)</td>
<td>662 kg (1,460 lbs)</td>
</tr>
<tr>
<td>SWIFT Evo® 30</td>
<td>Ti</td>
<td>22.7 kg (50 lbs)</td>
<td>1,089 kg (2,400 lbs)</td>
</tr>
<tr>
<td>SWIFT Evo® 40</td>
<td>Al</td>
<td>31.8 kg (70 lbs)</td>
<td>1,225 kg (2,700 lbs)</td>
</tr>
<tr>
<td>SWIFT Evo® 40</td>
<td>Ti</td>
<td>36.3 kg (80 lbs)</td>
<td>2,313 kg (5,100 lbs)</td>
</tr>
<tr>
<td>SWIFT Evo® 45</td>
<td>Ti</td>
<td>62 kg (137 lbs)</td>
<td>3,629 kg (8,000 lbs)</td>
</tr>
</tbody>
</table>

* See specifications for complete information in English and Metric units.
SWIFT Evo - New Features

- What is improved?
  - New Evo TI and GUI
    - Makes the system easier to setup, orientate, and operate
  - Improved Thermal performance
    - SWIFT® Evo is less susceptible to drifting when it is exposed to rapid thermal changes - i.e., braking events
  - TEDS addition
    - Quicker and easier to setup and run tests – automatic read
    - Less possibility of measurement error due to incorrect calibration value being entered during test setup
Key Features

- Very easy to install – save time – take data in hours after set-up
- Compatible with MTS 329 Spindle-Coupled Road Simulators in addition to spinning RLDA applications
- Wide range of sizes
- One-piece design
- Durability – 8 fully active bridges with a total of 32 strain gages.
- Durability – designed and tested to SAE specifications J267 (truck & bus) or J328 (passenger car & Light truck) - the same specification used for rim designs
- Durability – year of experience & proven performance in the industry
Key Features

- **Low weight & durable**
  - WFT designed to fit your application and variety of vehicles with minimal change to the unmodified structures: adaptable, low mass
  - High Strength to weight ratio
  - Designed for use in Road Simulators – can be used on MTS 329 and other simulators. Long history of success
  - High Overturning Moment Capacity
  - Robust and simple On-board electronics - Impact tested to > 100 G, and the shock resistance of each axis is 60g
  - The environmental protection rating is IP67
  - Over 800 units sold
  - Long service life of units in the field
- **Low weight overall when taking into perspective its load and fatigue life.**
Key Features

- **Very Accurate**
  - High natural frequency - Widest operating Frequency
  - Improved Low cross-talk, linearity and hysteresis performance
  - Design minimized temperature induced errors
  - Calibrated as an assembly with compensation versus individually calibrated components then assembled
  - Stiff outer ring to limit end effects due to mounting configuration.

- Calibration integrity – repeatable and consistent test data year to year

- Available in two materials, depending on the model – Low weight, high sensitivity aerospace grade aluminum and extra strength Titanium for long term durability

- Contact PCB for custom units not listed
Key Features

- Service – MTS & PCB expertise – 24/7
- Two year warranty
- Trade-in program
- Repairs
- Calibration – Accredited Calibration ISO/IEC 17025 by A2LA accreditation body A2LA
- Rental program from TMS
- Consulting/Training
SWIFT® Evo Advantages - Durability

- Each unit hermetically sealed to withstand 10 psi. Tested through 100 m underwater event with no problems. Tough, single piece construction that is IP67 rated
  - No “layers” to delaminate
  - No fasteners to loosen
  - No joined surfaces to fret or corrode
- On-board electronics are:
  - minimal and simple
  - robust (surface mount technology)
- Shock rating of 60 G
SWIFT® Evo Advantages - Durability

- Highest fatigue load rating on the market
- 2 year slip ring warranty
- 800 units shipped - excellent return on investment due to expected length of service life
- Designed and tested to SAE specifications J267 (truck & bus) or J328 (passenger car & Light truck) - the same specification used for rim designs
- Over 800 units shipped since 1999. Many of these are still in use at customer sites, and calibrations prove that their accuracy and reliability do not shift over time.
SWIFT® Evo Advantages - Accuracy

- 400 Hz lowest resonant frequency for best phase and amplitude integrity. Essentially flat response to 70 Hz.
- High natural frequency limits overshoot during transient events (less than 1/3 the overshoot of competitor in 10 ms pothole impact).
- All analog signal processing - no phase or time lag as can occur with digital processing. No speed dependent lags. Phase neutral on all 4 corners.

<table>
<thead>
<tr>
<th>MEASURED VALUE</th>
<th>UNITS</th>
<th>SWIFT Evo 30A</th>
<th>SWIFT Evo 30T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonlinearity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>%FS</td>
<td>0.2 (0.15)</td>
<td>0.2 (0.15)</td>
</tr>
<tr>
<td>Moment</td>
<td>%FS</td>
<td>0.3 (0.2)</td>
<td>0.3 (0.2)</td>
</tr>
<tr>
<td>Hysteresis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>%FS</td>
<td>0.2 (0.1)</td>
<td>0.2 (0.1)</td>
</tr>
<tr>
<td>Moment</td>
<td>%FS</td>
<td>0.3 (0.2)</td>
<td>0.3 (0.2)</td>
</tr>
<tr>
<td>Crosstalk</td>
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</tr>
<tr>
<td>Fy-&gt;Fx,Fz</td>
<td>%FS</td>
<td>0.25 (0.2)</td>
<td>0.25 (0.2)</td>
</tr>
<tr>
<td>Fx&lt;-&gt;Fz</td>
<td>%FS</td>
<td>0.3 (0.2)</td>
<td>0.3 (0.2)</td>
</tr>
<tr>
<td>Fx,Fz-&gt;Fy</td>
<td>%FS</td>
<td>0.4 (0.2)</td>
<td>0.4 (0.2)</td>
</tr>
</tbody>
</table>
SWIFT® Evo Advantages - Ease of Use

- **New Graphical User Interface (GUI) - Application Features**
  - The GUI Software allows the user to configure the SWIFT® Evo TI for the user's specific application.
  - Provides an “at a glance” view of the present settings. No need to upload calibration files and check settings.
  - Use of TEDS in the SWIFT® Evo transducers eliminates the need to download calibration files to the TI box.
  - The GUI application updates only “Settings”, not calibration data.

- **The GUI application contains controls to set-up:**
  - SWIFT® Evo TI output polarities
  - Displays a pictorial representation of the Coordinate system of the SWIFT® Evo.
  - Angle Mode (Spinning or Fixed)
  - Enter fixed offset angle (Fixed mode only)
  - Enter Y-Offset (transducer centerline to tire patch centerline)
  - Select the desired Zeroing algorithm

- **The GUI application also includes:**
  - Real-time display of forces and moments
  - Shunt calibration test
  - Calibration file upload
  - Vehicle Installation Guide for SWIFT® Evo sensors

8/3/2018
SWIFT® Evo Advantages - Ease of Use

- GUI screen
SWIFT® Evo Advantages - Calibration

- Calibration – **Accredited Calibration ISO/IEC 17025** by accreditation body A2LA
- Only manufacturer to offer accredited calibration
- The recommended calibration interval is every 12 months - Calibration Intervals exceeding 24 months are not recommended
  - Calibration Intervals are determined by the users, typically driven by management or quality system.
  - Calibration Intervals are risk dependent

8/3/2018
SWIFT® Evo Advantages - Rental

- Rental Program - run by The Modal Shop
  - Can be used for short test program to cover one-off test
  - Capital / budget limited but with required testing
  - Acting as a consultant for another internal or external customer
  - Can be used to cover scheduled tests when purchased units are returned for service
  - Easy to use, and all part numbers and kit components remain the same between MTS, PCB, and The Modal Shop (TMS)
SWIFT® Evo Advantages - Rental

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  - Can be used for short test program to cover one-off test
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  - Acting as a consultant for another internal or external customer
  - Can be used to cover scheduled tests when purchased units are returned for service
  - Easy to use, and all part numbers and kit components remain the same between MTS, PCB, and The Modal Shop (TMS)
Training & Consulting Services

- **Road Load Data Acquisition:**
  - Assist with instrumentation planning and transducer selection (SWIFT and other transducers)
  - Instrumentation installation and setup.
  - Data collection

- **Data Analysis:**
  - Data quality assessments
  - Fatigue analysis
  - Damage-based data editing

- **Drive File Development:**
  - Use of RPC to develop drive files and prepare to conduct durability tests
  - Correlation assessments
Summary

Through the combined efforts of MTS and PCB® the SWIFT® Evo series has evolved from the original with improved thermal performance, adding electronic data information, and creating a new Graphical User Interface. With a stronger global team of experts we can simplify your testing with service, rental, calibration, and rapid response, making it the best choice for both road and test rig applications.

Highlights for Product:
Our products are:
- Easy to install and set up
- New GUI interface
- TEDS (Transducer Electronic Data Sheet)
- Reliable & durable; 10+ year expected life
- Improved performance
- Calibration integrity
- Compatible with MTS test rigs
- Improved thermal stability
- Wide range of sizes

Your Experience:
With a stronger team we can help your sensors last longer with expert service, calibration, and rapid response.
- Global Service
- Repairs
- Calibration
- Fast Response time
- Trade-in/exchange
- Rental Program
- Loaner
- Warranty
Questions?