



# Simulated Fault Insertion Testing

(Low latency and very high speed)

Conekt provides engineering services and leading-edge solutions to clients across a range of industries including defence; aerospace; automotive; oil and gas; intelligent transport systems; and medical. With over 50 years of experience, we provide innovative solutions based on depth and diversity of cross-disciplinary capabilities and expertise.

Combining the skills of specialist design engineers with our in-house engineering test facility, Conekt is uniquely positioned to offer a complete engineering service from concept development through prototype and product validation testing to low volume manufacture and systems integration.

Conekt is able to apply knowledge and best practice gained from its broad industrial sector expertise. We identify and deliver maximum benefit to our clients, adding value throughout the product life cycle, combining innovation, performance and cost.



## Our solutions include:

- Autonomous vehicle sensing and guidance systems
- Driver Assistance Systems
- Vehicle control systems: automotive braking and steering systems
- Automotive COTS situational awareness sensing: radar, T CAM+ and T CAM stereo vision
- Integration and testing off/on vehicle
- Processor in loop simulated Fault Insertion Testing – low latency, high speed control

## Underpinned by competences in:

- Design, simulation and analysis
- Advanced sensing, control and datafusion
- Pattern classification systems, algorithm optimisation and efficient software embedding
- Wireless monitoring, networking and vehicle comms e.g. CAN, FlexRay, Bluetooth, V2X (802.11)
- Electric actuation
- Systems and safety engineering
- UKAS accredited testing facility – HIRF, HALT, Lightning, EMC, Climatics, Vibration, Real-time X-ray, SEM

# Simulated Fault Insertion Testing

Hardware in-the-loop test environments are often associated with the integration of sub-systems within a complete vehicle system. Consequently, system response time simulations are typically limited to millisecond cycle times. Working closely with clients, Conekt specialists have developed a high-speed modular design of simulated Fault Insertion Testing (FIT) system capable of working within the micro-second time domain. Specific client requirements are accommodated, with the system becoming operational in a short timescale. Production intent software can be executed in a run-time environment which simulates the entire real-time application environment and system components. The simulation environment is flexible enough to accommodate quick changes in design and operating protocol.

To achieve this unique capability, Conekt has combined National Instruments LabVIEW tools and an FPGA-based programmable processing platform. This platform enables simulation elements to be run at high speed with very low latency, while LabVIEW tools provide a flexible rapid development and test environment.

By simulating the entire system outside of the embedded processor(s), the FIT simulation environment is capable of assessing the operation of target system components in real time:

- Motor drive control/electric actuation
- Sensing
- Microcontroller operation
- High speed actuation and control
- Electrical PCB interfaces
- Communications buses

An integrated test programme can be implemented to investigate a range of fault conditions such as 'stuck at' faults, delayed signals and electrical faults (for example component tolerances).

## The Conekt approach

An iterative approach to Fault Insertion Testing and validation historically took a client three months to complete. The Conekt solution has reduced this time drastically to less than three days, allowing every release of software to be tested before delivery to the customer. The success of the high speed FIT simulation environment has stimulated client interest in validating other products such as Electronic Stability Control Systems, air bags, ABS, tyre pressure monitoring and related ECU controller systems.

## Benefits

The new high speed FIT simulation environment offers numerous benefits, among which the two significant factors are the drastic reduction in time and costs of testing.

### Typical benefits are:

- Drastically reduced FIT duration from six to 12 weeks down to days or hours of test time
- Significant cost savings by replacing intensive, error-prone, physical FIT testing with simulation environment
- Every software release can be fully tested before shipment
- Specialised high-speed FPGA simulation environment is accessible with widely-used N.I. LabVIEW toolset
- Simulated environment enables deeper and broader test coverage with lower outlay in time and materials
- Complete simulated environment allows testing earlier in the design phase through the use of processor evaluation boards even before pre-production hardware is available
- Generic capability can be tailored to a range of applications in different market segments, e.g. defence, aerospace, automotive, industrial
- Ideally suited for testing and validating safety-critical control systems

**conekt**  
powered by TRW

TRW Conekt  
Technical Centre  
Stratford Road  
Solihull B90 4GW  
United Kingdom

Tel: +44 (0) 121 627 4242  
Fax: +44 (0) 121 627 4243  
conekt-enquiries@trw.com  
www.conekt.net