Embedded JTAG Solutions
Testing and programming every assembly

Automotive Test Solutions
Test solutions for the automotive industry.
Test systems for automotive control units, bus communication and acoustic analysis as well as end-of-line applications

Optics as an inspiration and benchmark.
Optical inspection (AOI), Solder Paste Inspection (SPI), Automated X-ray Inspection (AXI) and custom solutions (IVS)

Inspection Solutions
Inspection of printed circuit boards using Automated Optical Inspection (AOI), Solder Paste Inspection (SPI), Automated X-ray Inspection (AXI) and custom solutions (IVS)

GÖPEL electronic GmbH.
Constantly growing, yet close to its customers.
Testing technologies that are a pleasure to use
GÖPEL electronic develops and manufactures electrical and optical measuring and testing technology, as well as test and inspection systems for electronic components, printed circuit boards, and also industrial electronics and automotive electronic systems. The company’s business divisions are Automotive Test Solutions, Embedded JTAG Solutions, Industrial Function Test and Inspection Solutions (AOI, AXI, SPI, IVS). Besides the company’s headquarters in the German city of Jena, GÖPEL electronic also operates multiple sales and service offices in the US, the UK, India and China. We also have numerous specialists involved in the global distribution and service network. For more information, visit www.goepel.com

Would you like to standardise your testing and programming in development and production?

Would you like to be able to put prototypes into operation quickly – and without firmware, too?

Is your test coverage decreasing with your existing testing options?

Do you have a problem finding space for test points?

Do you need detailed error diagnostics?

Are your data volumes growing, and your programming times along with them?

Then Embedded JTAG Solutions are just what you’re looking for!
Embedded Board Test
Embedded Functional Test
Embedded Programming

Made in Germany
Embedded JTAG Solutions

Since the introduction of the 1149.1 standard in 1990, GOEPEL electronic has been working on hardware and software solutions that utilize the JTAG interface for testing board connections and functionality. Over the years, additional extensions to the standard and test technologies have been added, which are now grouped together under the term Embedded JTAG Solutions.

But what are these Embedded JTAG Solutions? Embedded JTAG Solutions consist of a total of three application areas.

1. **Embedded Board Test**
   - Embedded JTAG Solutions also provide Embedded Board Test, for verification of functional board connections. With this capability, boundary scan, microcontroller and FPGA resources are used to find shorts, non-soldered pins and pull resistors.

2. **Embedded Functional Test**
   - Today’s test strategies now require more than just testing board connections. In addition to the traditional task of assuring perfect connectivity, Embedded JTAG Solutions provide Embedded Functional Test to also assure correct board and component functionality.

3. **Embedded Programming**
   - The growing demand for and challenges involved with in-system programming of a variety of data often represents a major hurdle today, especially with increasing file sizes and growing demands on programming speed. Embedded JTAG Solutions address such challenges by enabling the use of on-board resources to program at high speed.

Embedded JTAG Solutions reveal the test coverage that can be achieved right from the first circuit diagram. As a result, optimizations can be introduced as early as the design process, and a large number of test points can be omitted.

Embedded JTAG Solutions are also ideal for repair work. No matter whether faults appear during production or only after reaching the end customer – detailed error messages make repair work much easier.

It is often necessary to analyze malfunctions in detail either in the panel or separately. With Embedded JTAG Solutions, testing can be carried out as soon as a power supply and JTAG bus are available. A bed of nails is not required.

Diagnostics on first prototypes can often prove difficult as there are no reliable testing options available for the hardware and software. Embedded JTAG Solutions make it possible to find or rule out any soldering and assembly defects, and all without any firmware or software on the board.

From individual assemblies to panel testing, Embedded JTAG Solutions enable a high level of test coverage in an extremely short test time, as well as allowing programming of assemblies in series production. This is possible both in panels and on all individual circuits in parallel.
Development and prototyping

**Embedded JTAG Solutions · Application**

**Implementation**
- A test coverage analysis in the circuit diagram provides information in advance of where test points can be saved and others more optimally tested.

**Goal**
- Fast, precise prototype testing from the very first assembly.

**Result**
- Better tests with higher quality.

**Solution**
- The Embedded JTAG Solutions offer universal test and programming tools for the developer with many options.

**Basis**
- The cornerstone for a good testability of assemblies is laid in development. In order to face production errors as early as possible, options for later testing must be considered in the circuit.

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**Application · Embedded JTAG Solutions**

**Implementation**
- Implementation
  - Test coverage analysis in the wiring diagram and layout.
  - Fast hardware verification.

**Project report**
- The project documentation for Embedded JTAG Solutions is fully automated. Test programs that are created can be easily reused in subsequent production and repair processes.

**Board Grabber**
- Hardware debugger without firmware at the pin or cable level.

**ScanVision Schematic**
- ScanVision Schematic.

**ScanVision Layout**
- ScanVision Layout.

**SCANFLEX II CUBE**
- Compact LAN/USB system.
Independence
The core problem persists: missing or limited test access to the unit under test. The Embedded JTAG Solutions therefore provide the optimum tools for precise fault diagnosis.

Precision
Combined with existing test systems (ATE), you can also achieve an even greater testing depth.

Requirement
Test focus on production faults. The increase of fault coverage and testing throughput are the top priority.

Speed
The Embedded JTAG Solutions are a universal tool for quick testing and rapid FPGA and Flash programming, as well as for individual assemblies as well as for complete use.

Challenge
Test programmes can be used as early as in development. As no firmware is required for testing assemblies, the tests are possible and adaptable independent of development.

Precision
Combined with existing test systems (ATE), you can also achieve an even greater testing depth.

Combining technologies to increase test coverage:
- Boundary scanning and function testing: high test coverage, even in dynamic applications.
- Boundary scanning and AOI placement testing and opto-electronic checks.
- Boundary scanning and flying probe testing: complete flexibility without adapters for high mix.
- Boundary scanning and in-circuit testing: high throughput with the best diagnostic quality for high volumes.
- Boundary scanning and gang testing: simultaneous programming and testing of multiple units.

- High test coverage without test points.
- Reduced time-consuming function tests.
- Connection to MES systems.
- Interface validation/ testing.
- Control by 3rd-party systems (LabVIEW, TestStand ...).
- Testing of high-speed signals (USB 2.0, PCIe, SATA).
The Embedded JTAG Solutions also allow the repair of field returns. This plays a particularly important role in the automotive sector, for example, in the avoidance of product recalls. Such a test can also take place on site. The user therefore has the option to immediately repair the assembly or to replace it later.

Faults
Production faults are particularly annoying in high-quality assemblies. Yet faulty assemblies do not necessarily have to be destroyed.

Analysis and fault prevention
A precise fault analysis of the assemblies can produce valuable faults and helps to prevent future defects.

Solution
The Embedded JTAG Solutions allows the repair of field returns. This plays a particularly important role in the automotive sector, for example, in the avoidance of product recalls. Such a test can also take place on site. The user therefore has the option to immediately repair the assembly or to replace it later.

- fast repair thanks to detailed fault analysis
- Hardware debugging options without the need for firmware
- Firmware update options for the software in the panel
- Cyclic panel testing also possible
- easy test access via JTAG interface, even with built-in and encapsulated PCBs

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Support

In terms of support you have around the clock access to the GENESIS user platform. Updates and upgrades for software applications as well as the latest product information such as training videos are available there. Furthermore, you receive worldwide comprehensive support for your special requirements thanks to a global partner network.

Guidance

GOEPEL electronic accompanies and supports its customers right from the start. The Design-for-Testability Guide, for example, offers recommendations with which you can optimise test processes as early on as possible. With the test coverage analysis for circuit diagram and layout you can optimise test points and test coverage.

Training

Both as a user of and someone interested in our technologies, you can be brought right up to date at regularly occurring seminars, training sessions and webinars. At user conventions, such as the Boundary Scan Days, you can also expand your personal network and exchange experiences with colleagues. Interesting EMS service providers also have the option of becoming a partner in the “EMS programme” cooperation network. And, of course, the experts at GOEPEL electronic will help you to find the test strategy tailored to you.

Customer requirements

Be it system installation, on-site commissioning or in-line and standalone turnkey solutions: you can rely on the expertise of GOEPEL electronic employees at all times. Particularly with customer-specific adjustments, project creation or adapter planning and design, we are always on your side.
Software

Embedded JTAG Solutions

Solution

The key to a successful use of the Embedded JTAG Solutions, more than ever before, lies in the quality of the software used. Various editions ensure that, depending on the requirements in development and production, the best possible service is available. As a pioneer of automatic test programme creation, GOEPEL electronic offers the complete range, from the smallest studio system to the high-end version. The modular expansion capability, as well as licensing that can be adapted to every need, ensure a high degree of flexibility.

Features that make all the difference

- **Simple, fast and targeted project development** using intelligent tools and automated system processes.
- **Support for testing and programming strategies** that goes beyond boundary scanning, for internal and external instrumentation.
- **Interactive visualisation** at the layout, schematic, and logic level for graphical analysis and debugging.
- **Integrated protection**, block scan vectors that damage hardware, guaranteeing safe test programs.
- **Scalable high-performance platform** with over 50 integrated tools, a central project database, and consistent user interface.
- **Enhanced test coverage** and precise error diagnostics thanks to full inclusion of non-scan circuitry components.

High-performance Tools

- **Scalable high-performance platform with over 50 integrated tools, a central project database and consistent user interface.**

Security

- **Integrated protective functions block scan vectors** that damage hardware, guaranteeing safe test programs.

Test coverage

- **Enhanced test coverage** and precise error diagnostics thanks to full inclusion of non-scan circuitry components.

Infrastructure test

- **Connection test**: I/O connection test
- **Analogue I/O-Test**: Infrastructure test
- **Memory test**: Structure tests, function/emulation tests, programming
- **Logic cluster test**: Flash programming
- **Microcontroller programming**: Microcontroller programming
- **PLD/FPGA programming**: Microcontroller programming
- **Integrated self-testing**: Function test via universal operating system
- **High-speed test via universal FPGA design**: High-speed test via universal FPGA design

Structure tests, function/emulation tests, programming

- **Enhanced test coverage** and precise error diagnostics thanks to full inclusion of non-scan circuitry components.
**Hardware**

**Embedded JTAG Solutions**

**Solution**
As with software, hardware is also a part of the GOEPEL electronic tradition of fulfilling the highest quality and service demands throughout the entire product. In perfect teamwork with the software, the Embedded JTAG Solutions make applications possible that go far beyond the standard boundary scan. There is a particular focus on flexibility in the development of our hardware lines. This means all systems can be scaled and expanded.

- **Scalable high-performance platform for scanning operations of 100 MHz, in parallel on up to eight independent TAP interfaces**

- **Flexibility**
  - Separately controlled I/O modules with VarioCore® technology for reconfigurable analog, digital and mixed-signal functions

- **Data transmission quality**
  - The best transmission quality for TAP signals, even over large distances of up to ten metres, with full runtime compensation

- **Modularity**
  - Controllers, I/O modules, TAP transceivers and TAP interface cards that can be freely combined, enabling scalable system configurations

- **ATC ready**
  - Specialist front-end hardware guarantees seamless integration in in-circuit testers, flying probe testers, function testers and other ATEs

- **Universality**
  - Support for testing and programming strategies that go beyond boundary scanning, for internal and external instrumentation

**I/O-module with 96 mixed-signal channels**

**VPC-based TAP16**

**Chip/IOB fixture module for testing high-speed modules**

**SCANFLEX controller for industrial use**

**SCANFLEX II module for error-free (differential) data transmission**

**USB/LAN controller for up to eight units under test**

**USB/LAN controller for PXI Express**

**SCANFLEX controller for PXI Express**

**Transceiver interface card for integration in adapter solutions**