

Production test systems based on R&S TSVP

Electrical, mechanical and optical performance testing of telephones

The R&S TSVP [*] test platform, the basis of many Rohde & Schwarz production test systems, allows optical testing of displays by cameras thanks to a newly implemented image processing function. The latest application demonstrating the versatility of this production test platform is the fully automatic performance test of business telephones in the Leipzig Siemens production line. The test system allows the stimulation of the devices under test (DUTs), electrical and acoustic tests, as well as optical inspection of display elements.



Photo 43 736/2

FIG 1 Production Test Platform R&S TSVP with cameras for optical test of displays (rack configuration)

Comprehensive performance – example telephones

The test system (FIGs 1 and 3) described here and based on the R&S TSVP is optimized for the automatic final test of business telephones in production lines. After assembly, the telephones are transported to the fully automatic inline test system in carriers and checked for all essential functions. The following tests were implemented:

- ◆ Actuating and testing the keypad by pneumatic plungers (artificial fingers)
- ◆ Inspection of LEDs with optical sensors
- ◆ Testing the LCD by cameras with different test patterns
- ◆ Testing the handsfree facility by an acoustic coupler in the test adapter
- ◆ Testing the electrical interfaces for telephone handsets and add-ons
- ◆ Testing the telecom interfaces (analog, ISDN and the like)

Test Platform R&S TSVP: Optimal for complex production tasks

The R&S TSVP is based on the industrial bus standards cPCI and PXI (PCI eXtension for Instrumentation), so it can be expanded by a whole variety of switching and measuring functions and is thus ideal for complex tasks of this kind.

The larger number of slots (up to 31) compared to competitor solutions allows the configuration of complex systems for the verification, performance and final testing of modules or units of equipment.

To implement these widely differing tests, it was necessary to develop new modules, integrate OEM boards and customer components. In addition to the CPU board, the system contains numerous modules for electrical and

optical tests and for simulating interfaces (FIG 5). The test system also controls the contacting station via a PLC (programmable logic control) interface and the pneumatic and electrical relays in the test adapter by digital I/O signals (FIG 2).

Space-saving mechanical integration into production line

The R&S TSVP concept allows integration of the entire T&M equipment into just one frame. Externally, only power supplies and line filters are required. A system rack (FIG 1) is not absolutely necessary. The test system can be integrated straight into a production line (FIG 3).

Economizing on the floor space and wiring compartment for the system rack means that it is possible to design a more compact production line and thus increase productivity.

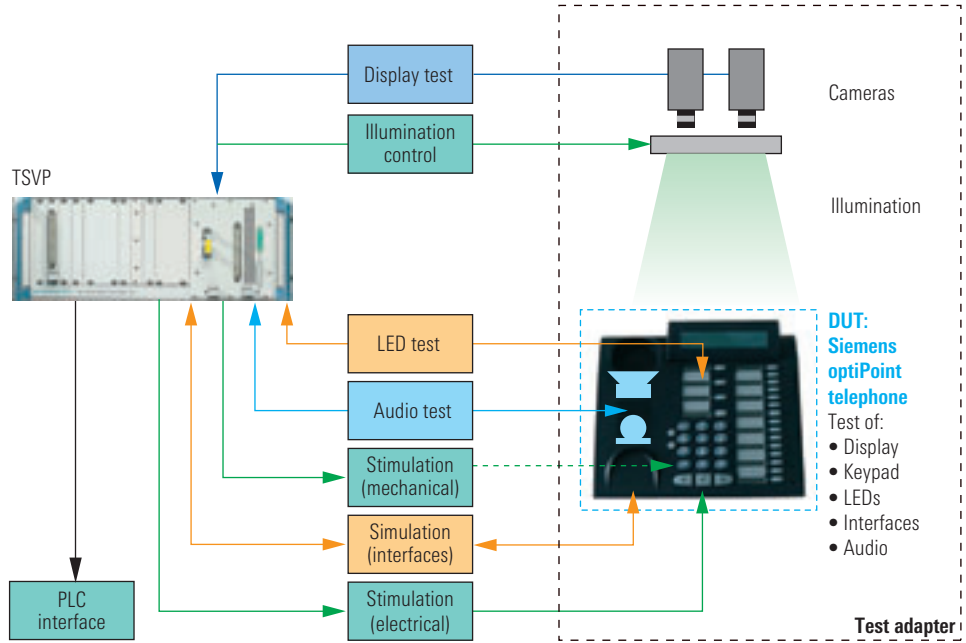


FIG 2 Block diagram of complete system

Convenient system software

The generic test operator interface (GTOP) from Rohde & Schwarz allows

selection and manual or automatic initiation of various test sequences. The user is also informed about the running and the results of the individual tests and testing overall. The results are logged for repairs and can be archived.

GTOP accesses the comprehensive Rohde & Schwarz generic test sequence library (GTSL) in the TSVP through TestStand software from National Instruments. The modular structure permits straightforward integration of custom and external modules such as a frame grabber for the display test.



Photo 43813/1

FIG 3 Thanks to its compactness, the test system can be integrated into the production line of Siemens in Leipzig.

► Fully automatic display test with cameras

The integration of optical inspection of displays into the test system completes the electrical performance and final tests ready implemented. These optical tests can be used for all applications with electrical modules plus display functions, e.g. in mobile phone or automobile production.

The reliability of displays and the tougher outgoing inspection carried out by producers mean that testing can increasingly be limited to programming displays and checking their functionality in terminals, i.e. with little quality assurance follow-up. So a display test will focus on the following:

- ◆ Measuring the contrast and the brightness of active areas in a non-driven state for optimally setting the display operating points
- ◆ Evaluation of symbols (correct character set)
- ◆ Display illumination (LEDs)

Definition of these test routines is implemented in application-oriented software for the inspection of monochrome displays. It is characterized by ease of operation and configuration of the display test functions. Of course, the modular concept of the GTSL driver library from Rohde & Schwarz allows integration of software modules for analysis of graphical colour displays (FIG 4).

A special advantage is the subsequent analysis of collected result parameters under TestStand, where further quality criteria can be added.

Considerable effort went into surmounting technical barriers during the implementation of the optical performance tests, yielding interesting solutions:

- ◆ Selection of suitable cameras that can be accommodated in the test adapter
- ◆ Choice of effective lighting to avoid reflections on the protective foil and polarization effects
- ◆ Use of suitable routines for analysis of contrast in the absence of a chessboard pattern (FIG 6)

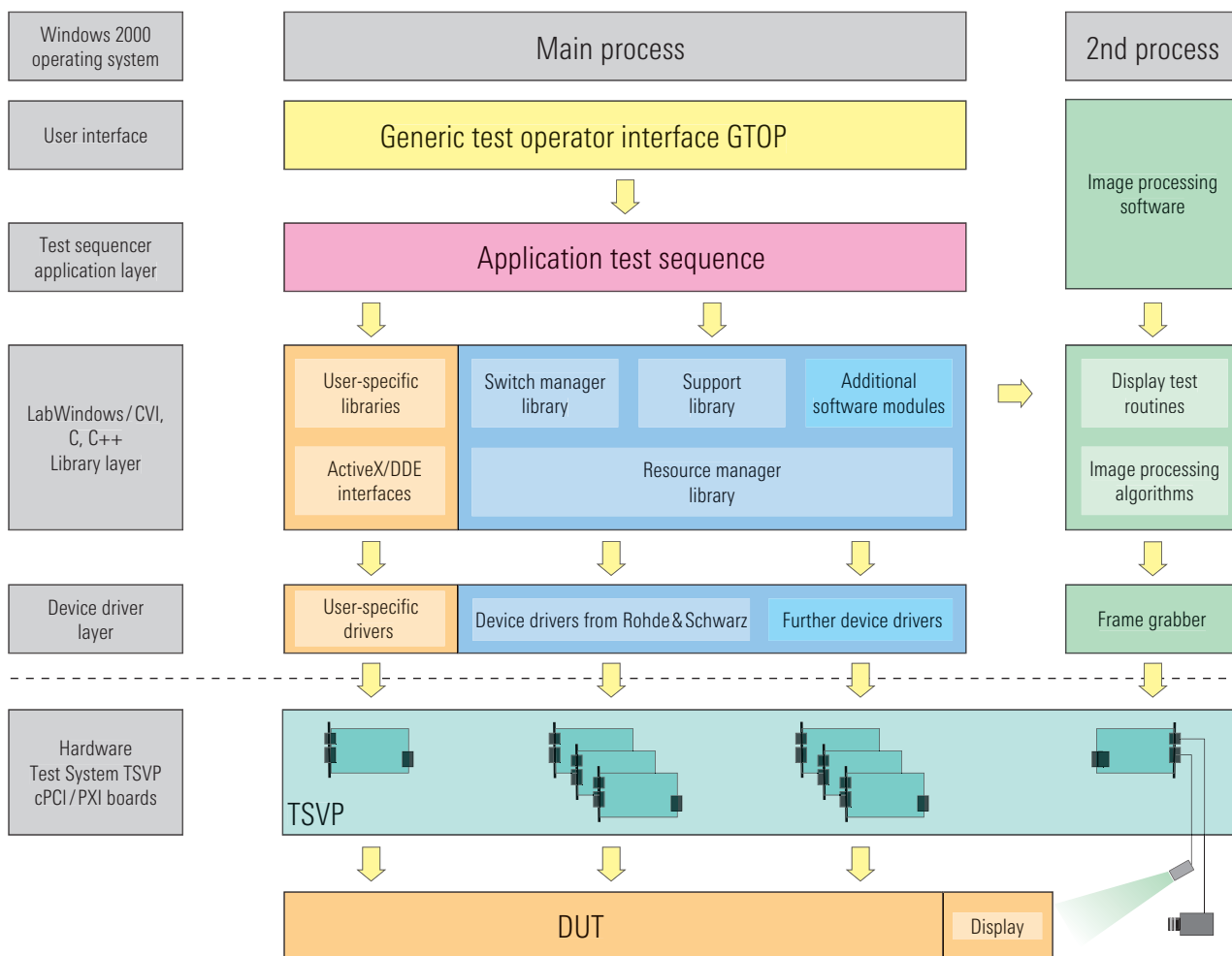


FIG 4 The modular software structure of the Test Platform R & S TSVP allows retrofitting of numerous applications.

User benefit – system solutions from a single source

Rohde & Schwarz is a provider of complete system solutions for production tests. In addition to basic expandability, the open and modular structure of the R&S TSVP system allows the user to add and integrate his own components. This speeds up user familiarization and promotes his own sense of responsibility for the further development and support of the system.

Thanks to the integration of electrical and optical tests and the driving of mechanical components in only one

Type	Board	Function
TS-PDMM	Digital multimeter *	Selftest, LED test
TS-PMA	Matrix board *	Signal switching
TS-PRL1	TTL I/O board *	Digital I/O functions
TS-ADIO	Optocoupler board *	Programmable logic control (PLC)
TS-PDM1	Open-collector board *	Relay control keypad plungers
TS-PIM	PCM adaptation board *	PCM interface control
TS-SER	Serial interface board *	Carrier control
TS-ABI	a/b test board	Simulation of a/b interface AF generator, AF analyzer
External	LAN board *	DUT control
External	Frame grabber *	Picture recording, lighting control
Supplied by customer	Module	Telephone control

FIG 5 Boards used in R&S TSVP (* in cPCI version)

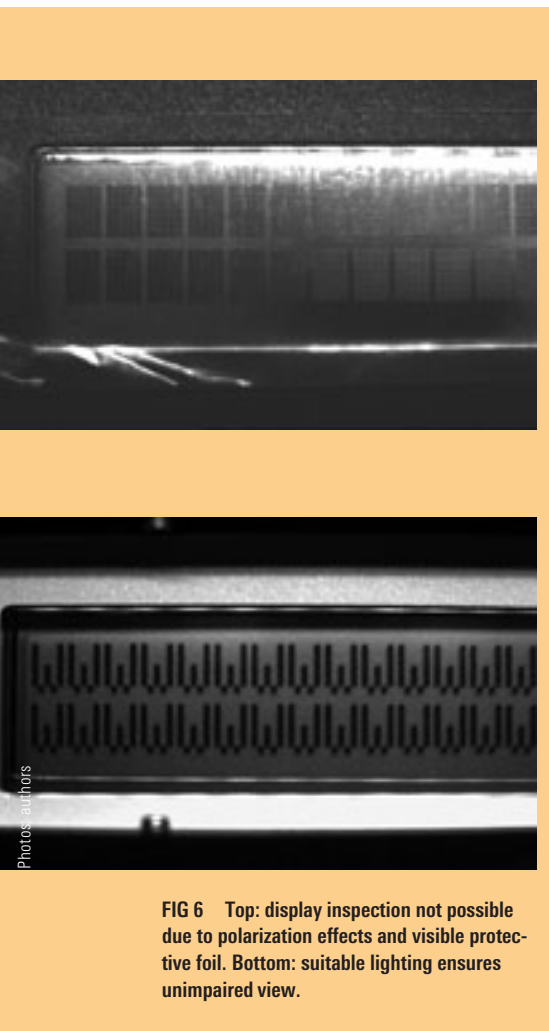


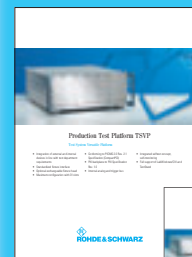
FIG 6 Top: display inspection not possible due to polarization effects and visible protective foil. Bottom: suitable lighting ensures unimpaired view.

frame, the Test System Versatile Platform R&S TSVP, the user gets a compact solution from a single source with immense benefits:

- ◆ The concentration of components reduces the layout and allows them to be optimally attuned to one other
- ◆ Responsibility for the correct interaction of components lies with Rohde & Schwarz
- ◆ Space requirements are reduced by integration of the test system into the production line

Erwin Böhler; Gert Heuer

More information and data sheet at
www.rohde-schwarz.com
(search term: TSVP)



Data sheet
R&S TSVP



Data sheet Universal
Relay Card R&S TS-PRL1
for R&S TSVP

REFERENCES

- [*] Cellular Phone Production Test Platform TS7100 – Compact, flexible and ready to go for mass production. News from Rohde & Schwarz (2000) No. 169, pp 4–7