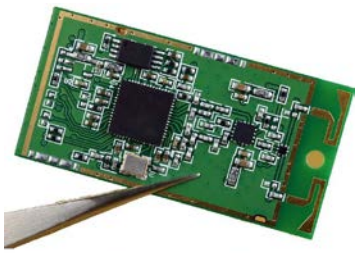
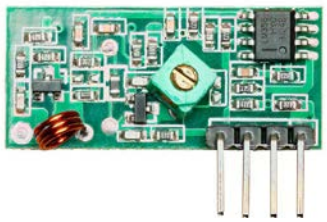
Industrial field: Semiconductors Operational category: Manufacturing and production lines

RF Module Testing System





Key feature

This paper introduces a system that enables high-speed testing of RF modules, for which demand is growing due to adoption of fifth-generation (5G) mobile communications systems, while accommodating fast setup changes on the production line and software creation.

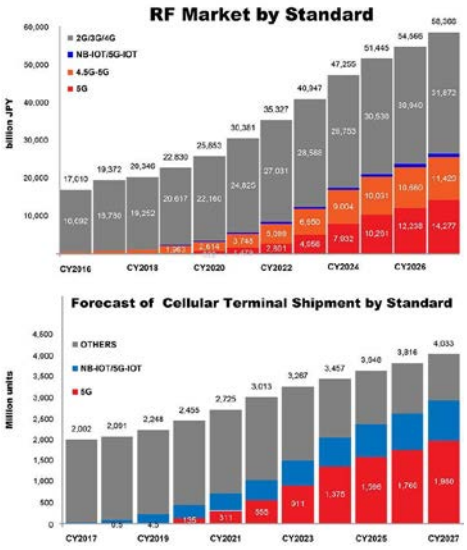
Growing Demand in Smartphones and Vehicle Applications

Demand for RF modules that are used in mobile devices such as smartphones is growing due to adoption of fifth-generation (5G) mobile communications systems. Production volumes of these components are expected to continue to grow in the future for other uses including vehicle applications such as self-driving vehicles, drones, and industrial applications such as robots.

RF device manufacturers' development programs are working to shift from standalone devices to modules in order to deliver higher performance and lower costs. Most of these modules consist of electronic circuit boards.

RF modules are often used in important devices where malfunctions are unacceptable, and where high quality and high reliability are a must. Consequently, it will be key to deliver quality improvements at manufacturing facilities as well as reduced testing takt times as production volumes grow.

This paper introduces a system that can accelerate testing between production processes of RF modules while facilitating fast setup changes on the production line and test software creation to accommodate changes in the models being produced..



Issues in RF Module Intermediate Testing

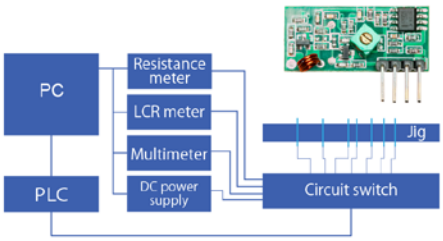
Tests between production processes are also known as intermediate tests. The intermediate tests of RF modules consists of the tests described in the table to the right.

In the past, testing systems consisted of a "bed-of-nails" fixture with a probe for each test point, a relay circuit for switching circuits, measurement instruments (such as a resistance meter, multimeter, and LCR meter), a DC power supply, a computer or PLC to control these components, and a program to execute test sequences. This approach suffers from the following issues:

- Inability to shorten test cycle time due to the difficulty of switching circuits and synchronizing measurement instrument control
- Significant amount of time required to create test sequences for different models DUTs because programs lack versatility
- Significant amount of time required to identify issues underlying equipment failures (poor maintainability)

Intermediate testing tasks

S/O testing	Checking for broken wires and short-circuits in PC boards, connectors, and other components
Component testing	Checking values of passive elements such as resistors, capacitors, and coils and active elements such as diodes
Function testing	Checking output voltage, current consumption, and digital communications after energizing the device under test



Test system architecture

Realizing High-speed Testing and High Maintainability

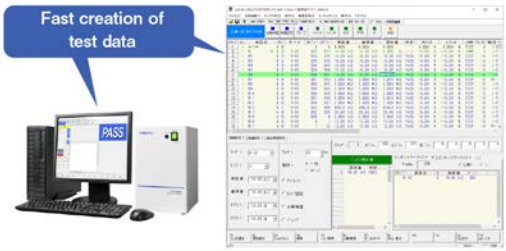
The In-Circuit Tester FA1220 is a combination of a circuit-switching device (scanner), electric measurement instruments, and a DC power supply inside a compact enclosure. It operates according to test sequences created using a desktop software in order to successfully address challenges posed by intermediate testing of RF modules.

- High-speed testing is made possible by the optimized synchronization of the system's built-in scanner, measurement circuit boards, and power supply.
- Create test data in a short period of time using the system's software.
- Self-test functionality can automatically identify issues in the event of equipment failure.
- Self-test functionality can prevent erroneous judgments and shipment of defective products.

Growth in RF module production volume will likely lead to an increase in the number of manufacturing facilities aiming to achieve both higher quality and shorter test takt times.
The In-Circuit Tester FA1220 holds the potential to address the needs of such facilities.

Overwhelmingly fast testing

S/O testing	From approx. 0.8 ms per pin
Component testing	From approx. 0.9 ms per step
Macro testing	From approx. 2.0 ms per step
IC testing	From approx. 1.0 ms per pin
Charging	From approx. 3.0 ms per group
Pin contact testing	From approx. 1.0 ms per pin



Functionality and Concept that Make it Possible to Embed the FA1220 into Other Equipment

Despite its compact size, the In-Circuit Tester FA1220 has the ability to be customized with additional scanners for measurement of up to 1,024 pins.
An I/O board allows the system to be controlled from an external source. For example, an external device can start the testing or receive the judgment results.
In this way, the FA1220's functionality and specifications well-suited to integration into the user's own systems.