

VIAVI

TM500 O-RU Tester

The VIAVI TM500 O-RU Tester Solution covers a wide range of test capabilities, allowing customers to ensure conformance, interoperability and performance of their O-RU across the product development lifecycle from functional test through to conformance and certification.

VIAVI is boosting the capabilities of the TM500 O-RU Tester to offer two versatile configurations. Both setups offer real-time generation of the Open RAN C/U-plane messaging for the IQ data stream; flexibility to test a wide range of frequencies and bandwidths; and customizability to allow users to easily configure and modify test parameters.

Each setup mode is designed to deliver specific benefits and functionalities:

TM500 O-RU Tester with VSA/VSG Test Setup (Diagram 1)

- **High Precision:** Utilizes a standalone Vector Signal Analyzer (VSA) and Vector Signal Generator (VSG) for high-accuracy signal analysis and generation, ideal for detailed performance assessment.
- **Use Case:** Primarily used for conformance and certification testing. Ensures that the O-RU meets rigorous conformance and certification requirements, facilitating seamless integration into broader network deployments.
- **Comprehensive Test Coverage:** The setup supports conformance test suites aligned with WG4 CONF FR1/FR2 and 3GPP TS 38.141-1/2 Chapter 6 and 7.

TM500 O-RU Tester with PVT360A Test Setup (Diagram 2)

- **Compact Solution:** Incorporates the PVT360A, a compact, single-box VSA/VSG instrument that enhances test efficiency and reduces operational complexity.
- **Use Case:** Designed for early-stage development where numerous engineers need to work in parallel, performing functional and system-level testing. Accelerates the R&D process by enabling comprehensive testing across multiple parameters, ensuring robust development from the ground up.
- **Comprehensive Test Coverage:** The setup supports full 5G NR FR1 spectrum, providing up to 8 GHz frequency and 500 MHz bandwidth and conformance test suites aligned with O-RAN WG4 CONF FR1.

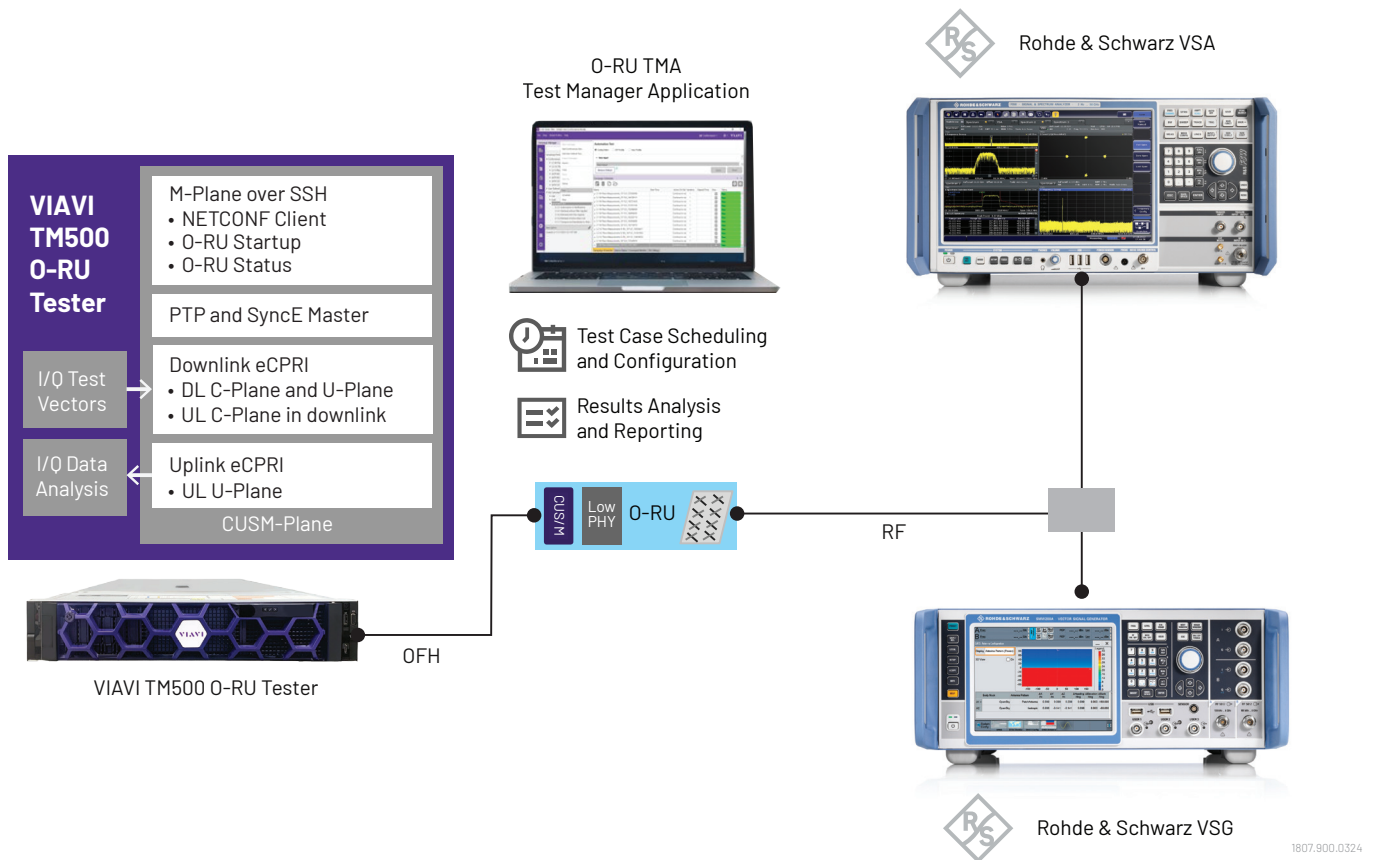


Diagram 1: TM500 O-RU Tester with VSA/VSG Test Setup

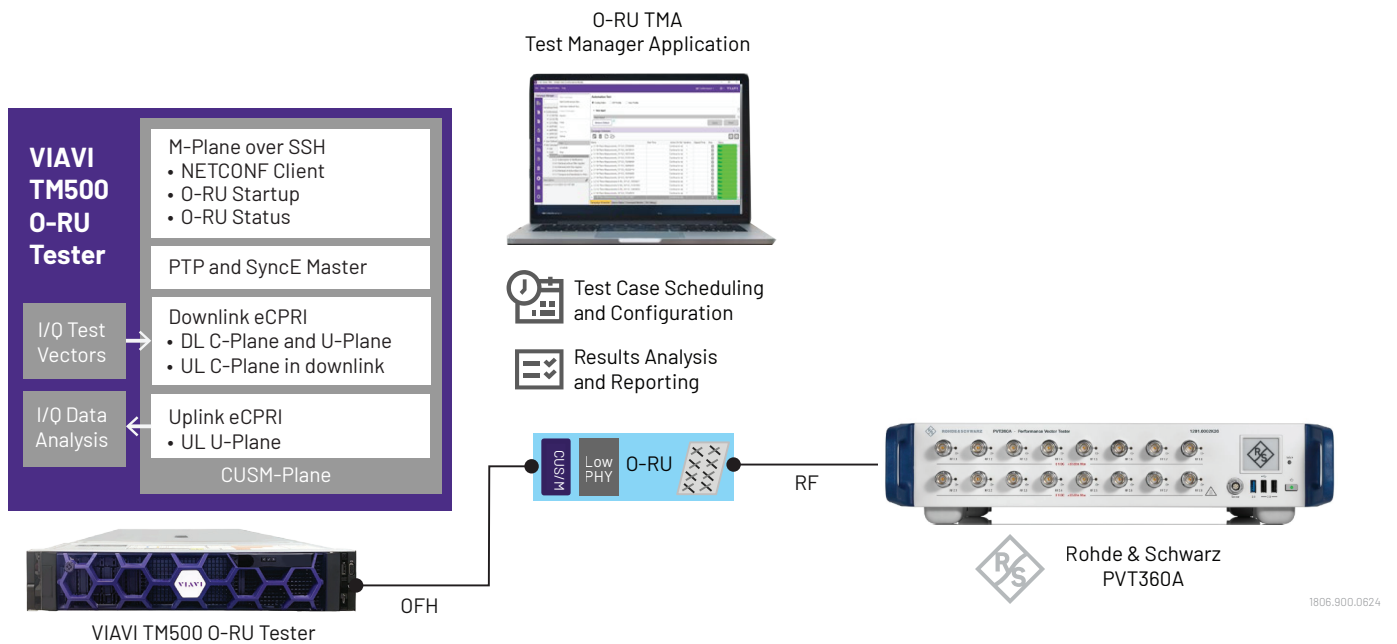


Diagram 2: TM500 O-RU Tester with PVT360A Test Setup

TM500 O-RU Tester Functional Overview

The TM500 O-RU Tester effectively simulates the O-DU functionality, encompassing management-plane (M-plane) and control/user-plane (C/U-plane) interactions necessary for configuring and managing the interface with the O-RU under test. This includes the crucial task of exchanging I/Q data over the user-plane (U-plane).

Support for O-RAN S-Plane Options

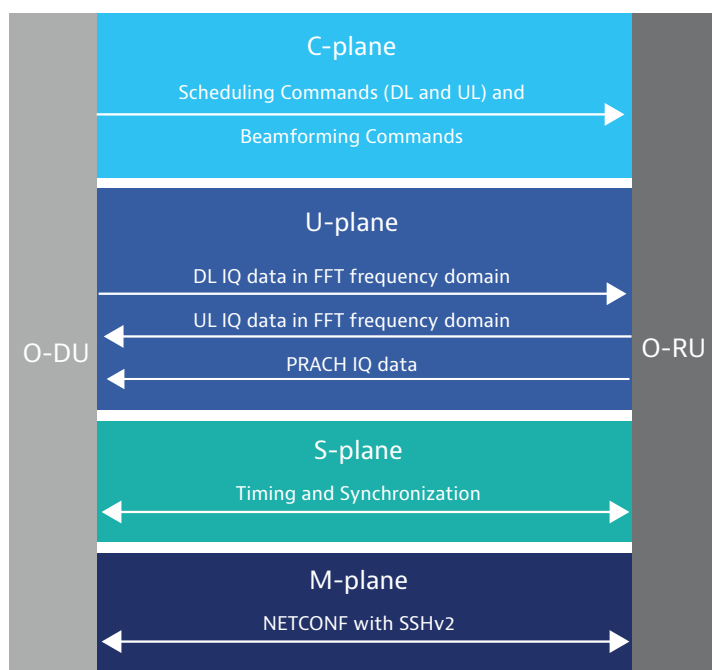
PTP and SyncE Capabilities

- Grandmaster Functionality: Equipped with Precision Time Protocol (PTP) and Synchronous Ethernet (SyncE) Grandmaster capabilities, facilitating precise timing and synchronization across network elements.
- PTP Client Mode: Allows the tester to synchronize with an external PTP Grandmaster, enhancing flexibility in network time management.

GPS Synchronization

- Supports synchronization to a GPS signal, operating independently of the O-RU's local link synchronization capability (LLS-C4). This feature ensures robust and accurate timing across distributed network architectures, critical for maintaining consistent service quality and network reliability.

These enhancements make the TM500 O-RU Tester a versatile tool in setting up and validating O-RU configurations, particularly in testing environments where synchronization accuracy and reliability are paramount.



1271.900.0922

TM500 O-RU Tester Capabilities

NETCONF Client and M-Plane Support

- Fully supports stateful management-plane (M-plane) operations. The O-DU emulator cycles through standard M-plane procedures, establishing a robust link with the O-RU for efficient data handling.
- NETCONF Client supports Start-Up and get/edit of M-plane attributes in the O-RU under test.

C/U-Plane Signal Processing

- The C/U-plane engine of the O-DU emulator generates real-time eCPRI packets from downlink signals produced by the Vector Signal Generator (VSG) or PVT360A. These eCPRI packets are transmitted to the O-RU via the Open Fronthaul interface, ensuring seamless data flow.
- O-RAN C/U-plane functionality for exchanging I/Q data over Lower Layer Split 7–2x interface, with real-time CU-Plane eCPRI packet generation.

Downlink and Uplink Signal Analysis

- Downlink signals received at the O-RU's Tx port are analysed using VSE software and VSA or PVT360A, providing detailed insights into signal quality and integrity.
- Uplink signals are captured at the O-RU's Rx port, converted to UL U-plane eCPRI packets, and sent back to the O-DU emulator. These packets respond to uplink-focused C-plane packets received by the O-RU. Uplink frequency domain signals are analysed using the VSE software to assess signal performance and compliance.

Advanced Synchronization and Protocol Analysis

- PTP/SyncE Grandmaster and PTP Client for synchronization with external PTP Master, supporting a wide range of synchronization topologies.
- OFH interface connectivity monitoring and jumbo frame support.
- Embedded protocol analyser for OFH traffic analysis, ensuring thorough examination of control/user-plane messaging with eCPRI over Ethernet.
- Extensive support of sections and section extension types.
- Multiple options for stimulus waveform generation to suit various testing needs.

Integrated Test Management

- The O-RU TMA offers a single point of control, enabling users to configure, manage, analyse, and generate comprehensive test case reports from one interface.
- Test scripts automation and report generation for both VSA/VSG and PVT360A setups.
- RESTful APIs facilitate integration with third-party automation controllers.

Equipment and Compatibility:

- TM500 O-RU Tester is designed to integrate seamlessly with Rohde & Schwarz's SMW200A Vector Signal Generator, FSV3007 Vector Signal Analyzer and PVT360A.
- Compatibility with other Rohde & Schwarz models is also supported, providing flexible options for various testing scenarios. For more information on equipment and setup, please contact VIAVI and Rohde & Schwarz sales representatives.

Key Benefits of TM500 O-RU Tester

- **Proven Market Leadership:** Trusted by major network equipment manufacturers for 4G, 5G, and O-RAN testing.
- **Comprehensive Testing:** Supports conformance, functional, and performance testing, ensuring thorough evaluation.
- **Simplified Usability:** Unified control via O-RU TMA, with automated test scripts and report generation.
- **Scalability and Flexibility:** Scalable for R&D to production environments, with seamless transitions between setups.
- **Global Support:** Single point of contact for support, integrating VIAVI and Rohde & Schwarz expertise.
- **Efficiency and Precision:** Advanced signal processing and synchronization for accurate testing.
- **Comprehensive Analysis:** Embedded protocol analyser for detailed signal performance insights.

TM500 O-RU Tester Specification

Feature	Functionality with VSA/VSG Test Setup	Functionality with PVT360A Test Setup
O-RAN Specification Compliance	O-RAN.WG4.CUS	
	O-RAN.WG4.MP	
	O-RAN.WG4.CONF	
3GPP Specification Compliance	3GPP TS 38.141-1/2 Chapter 6 and 7	
RU category	Category A, Category B	
Sub Carrier Spacing (SCS)	15 kHz, 30 kHz, 120 kHz, 240 kHz	15 kHz, 30 kHz
Channel Bandwidth	All bandwidth parts up to 100 MHz	
Antenna streams	2T2R, 4T4R	
Synchronization plane	G.8275.1 based Sync for O-RU	
	GNSS based sync for O-RU and O-DU	
	SyncE based sync for O-RU	
C/U Plane Transport	Ethernet transport encapsulation eCPRI transport header 10GbE/25GbE interconnect	
	Configurable eAxC ID	
	VLAN ID based separation of C/U-Plane and M-Plane traffic	
	Jumbo frame support	
	MTU size control	
	Application Layer fragmentation support	
U-Plane data compression method options	No IQ compression	
	Block floating point compression	
	Configuration IQ compression scaling	
	Modulation Compression	

TM500 O-RU Tester Specification continued

Feature	Functionality with VSA/VSG Test Setup	Functionality with PVT360A Test Setup
C-Plane message types	Section Type 0	
	Section Type 1	
	Section Type 3	
	Section Extension Type 1: Beamforming Weights Extension Type	
	Section Extension Type 4: Modulation compression params	
	Section Extension Type 5: Modulation compression additional scaling params	
	Section Extension Type 6: Non-contiguous PRB allocation	
	Section Extension Type 11: Flexible Beamforming Weights Extension Type	
M-Plane	Hierarchical Model Hybrid Model	
	O-RU controller discovery	
	NETCONF Call Home	
	NETCONF Security	
	NETCONF Authentication	
	Monitoring NETCONF connectivity	
Waveforms	Predefined 3GPP Test Models	
	Downlink stimulus waveform generation	
	Uplink stimulus waveform generation	
	Custom configuration stimulus waveform generation	
	On-board real time CU-Plane eCPRI packets generation	

Applicable Part Numbers

The part numbers are sub-categorized into VIAVI DU emulation and R&S components. A complete test setup shall include all the components from each category. The recommended R&S VSG/VSA or PVT360A configurations are listed here whereas the full specifications and an overview of available options can be obtained from the R&S website.

VIAVI DU Emulator Hardware	
TK1089	TM500 O-RU Tester DU Emulation Hardware
TK1115	O-RU Tester PTP/SyncE enabled Switch
TK1112	O-RU Tester Interconnection Unit and Accessories (1U 19" rack mountable unit with programmable settings)
TK1116	O-RU Tester Interconnect Unit and cables
TB5800-25G-O-DU or MTS5800-25G-O-DU	Mobility TB5800-100G Package for O-RU Test Support or Mobility MTS5800-100G Package for O-RU Test Support
VIAVI DU Emulator Software	
TK2055	(O-RAN) Open Fronthaul DU Emulation M-Plane
TK2135	(O-RAN) Open Fronthaul DU Emulation C/U-Plane

R&S Hardware for VSA/VSG Test Setup	
Hardware	Software
R&S Vector Signal Generator (SMW200A with SMW-B1006)	R&S VSG 5G NR Release 15 - DL/UL (SMW-K144)
R&S VSG Hardware Option – 2 RF paths (SMW-B2006)	R&S VSG O-RAN Measurement Application (VSE-K175)
R&S VSG bandwidth configuration according to requirements	R&S Vector Signal Explorer Software with License dongle, PC SW (VSE, FSPC)
R&S VSG baseband configuration according to requirements	R&S VSE 5G NR DL/UL Measurements (VSE-K144)
R&S Signal Analyzer (FSV3007)	R&S VSE O-RAN Measurement Application
R&S VSA bandwidth configuration according to requirements	

R&S Hardware for PVT360A Test Setup	
Hardware	Software
RS PVT360A - Basic Assembly; PVT-B40H	RS PVT360A - 5G NR WinIQSIM2 waveforms for ARB, Rel. 15/16;PVT-KW320
RS PVT360A - Single Instrument Interface; PVT-PB36H	RS PVT360A - U-Plane generation;PVT-KW327
RS PVT360A - RF unit, 1st TRX, frequency 6 GHz, bandwidth 250 MHz; PVT-B106H	RS PVT360A - Waveform creator;PVT-KW201
	RS PVT360A - VSE base software;VSE-PVT
	RS PVT360A - 5G NR R15 UL and DL;VSE-KP144
	RS PVT360A - O-RAN RU UL and DL;VSE-KP175

To find out more information about Rohde & Schwarz Instruments and Applications, please visit [ROHDE & SCHWARZ](https://www.rohde-schwarz.com)

Support

VIAVI is committed to providing a seamless support experience and will serve as the primary contact for all TM500 O-RU Tester systems, including any integrated Rohde & Schwarz equipment. Whether purchased directly from VIAVI or Rohde & Schwarz, customers can rely on VIAVI for comprehensive first-line support across the entire system and benefit from a single, unified point of contact for all support needs.



Contact Us **+1 844 GO VIAVI**
(+1 844 468 4284)

To reach the VIAVI office nearest you,
visit viavisolutions.com/contact

© 2024 VIAVI Solutions Inc.
Product specifications and descriptions in this document are subject to change without notice.
Patented as described at
viavisolutions.com/patents
tm500-oru-tester-ds-wir-nse-ae
30191220 908 0524

viavisolutions.com