NEOMETRIX

TACAN Test Bench

Product Catalog

www.neometrixgroup.com

About us:

Neometrix Defence Celebrating 20 Years of Excellence! For the past two decades, Neometrix Defence has maintained its position as a premier provider of advanced test benches and rigs.

Our accreditation by the Directorate General of Aeronautical Quality Assurance, India (DGAQA) and Defence Research & Development Organization, India (DRDO) underscores our commitment to upholding the highest international defence industry standards.

Counting the Indian Air Force/Army/Navy, Ministry of Defence, Hindustan Aeronautical Limited, and DRDO among our esteemed clientele, we are recognized for delivering state-of-the-art solutions and unwavering performance reliability.

Strengths & Capabilities:

Neometrix Defence is a powerhouse of engineering brilliance, proudly serving every Indian Air Force station and partnering with the Indian Army, Navy, Railways, BARC, NPCIL, and ISRO. With a team of over 100 elite engineers and visionary founders from IIT Kanpur and IIT Delhi, we harness cutting-edge technology to set the gold standard in mechanical engineering.

We Don’t Just Meet Industry Demands – We Define Them!

- We have established our presence in all Air Force stations across India. With the Indian Air Force as our leading customer, we are dedicated to upholding the highest standards of excellence in the aerospace industry.
- Our extensive clientele extends beyond the defence industry, including projects with the Indian Army, Navy, Railways, BARC, NPCIL, ISRO, and more. In essence, we excel in all aspects of mechanical engineering!
- Our team comprises over 100 graduate engineers, supported by a cutting-edge manufacturing site equipped with state-of the-art machinery, enabling us to meet the highest Engineering standards.
- The founders of our company are distinguished graduates from IIT Kanpur and IIT Delhi, bringing extensive expertise and a wealth of engineering knowledge to Neometrix Defence.

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Introduction:

The TB TACAN Unit Test Bench is a turnkey Factory Acceptance Testing (FAT) platform engineered by Neometrix Defence for Moog Fernau's TACAN 2010 "I-Level" navigation equipment. Hosted in our advanced Chennai facility—accredited by DGAQA and DRDO—it replaces time-consuming bench-level checks with fully automated, software-driven procedures. Every test sequence is initiated from a central HMI and executed by distributed module controllers, delivering consistent, repeatable results regardless of operator skill.

By automating validation of all 25 functional modules—ranging from microcontroller-based transponders and amplifiers to passive RF splitters and combiners—the bench ensures each component meets the tightest MIL-STD and IEC tolerances. Test scripts dynamically adjust stimulus levels (RF power, keying pulses, load conditions) and capture critical metrics (power flatness, VSWR, detector voltage) with microsecond resolution. All raw data, plots and pass/fail decisions are collated into a tamper-proof digital dossier.

Key business benefits include:

- Accelerated Commissioning: Pre-delivery FAT at Neometrix cuts on-site integration time by up to 40%, enabling faster deployment of TACAN units in operational theatres.
- Reduced Field Rework: Early detection of performance drifts or mis-configurations slashes corrective maintenance costs—and eliminates mission-critical downtime.
- Full Traceability: Every measurement, calibration event, and firmware revision is automatically logged, audited, and archived to support customer QA and Defense accreditation.
- With safety interlocks, ESD-safe workstations, and remote diagnostic capabilities, the TB TACAN bench not only guarantees product integrity but also safeguards personnel and sensitive electronics throughout the test cycle.

Purpose & Applications:

The TB TACAN Unit Test Bench serves multiple critical roles across the product lifecycle, from initial factory verification through long-term in-service support. By centralizing and automating complex functional tests, it ensures both technical excellence and operational efficiency for Defense and aerospace stakeholders.

Factory Acceptance Testing (FAT)

- Before any unit leaves the factory, every module undergoes a programmatic FAT sequence that mirrors customer-approved specifications. Automated scripts apply calibrated RF stimuli and load conditions, capture performance data, and generate a complete test report—eliminating manual measurement errors and guaranteeing that each transponder, amplifier, and interface board meets the contractual acceptance criteria.

Pre-Delivery Verification

- In a final “ship-ready” check, the bench runs a condensed suite of smoke-tests and configuration audits to detect firmware mismatches, connector mis-wiring, or drift in RF characteristics. This early catch of minor defects prevents costly installation delays, reduces on-site troubleshooting, and preserves project timelines for aircraft integration teams.

Operator Training & Certification

- New maintenance personnel can use the test bench as a hands-on classroom. With its intuitive touchscreen interface and guided test workflows, trainees learn module diagnostics, safe hot-swap procedures, and ESD best practices in a repeatable environment—accelerating skill acquisition and ensuring operators are qualified before handling live TACAN equipment in the field.

Defense Navigation Quality Assurance

- The bench’s high-resolution measurements of bearing accuracy, signal stability, and pulse-code modulation (PCM) data integrity directly translate to safer in-flight navigation. Periodic QA cycles using this bench provide Defense customers with documented proof that each TACAN unit continues to meet strict MIL-STD tolerances, maintaining mission-critical trust in airborne guidance systems.

OEM Build Verification

- For large-volume production runs, batch certification on the TB TACAN bench reduces returns and warranty claims. By validating a statistically significant sample of modules from each production lot, manufacturers can catch systemic assembly or component issues early, optimize yield, and provide customers with confidence in product reliability.

Regression Testing

- Whenever firmware is updated or hardware components are revised, regression tests ensure that new code or parts haven't introduced unintended side-effects. The bench re-executes the full test suite against updated modules, comparing results to historical baselines to confirm that key parameters—like RF power, VSWR, and timing accuracy—remain within tolerance

Key Features:

- **Distributed µC Nodes** in each module for localized data acquisition (voltage, current, RF power)
- **High-Speed CAN-Bus** communication at 1 Mbps for deterministic, low-latency control
- **Quick-Connect RF/Power Looms (J1–J7)** enabling tool-free fixture swaps and hot-swap capability
- **Automated, Sequenced Test Scripts** with built-in pass/fail logic and conditional branching
- **Real-Time Digital Reporting** via customizable dashboards and automated PDF/CSV export
- **DGAQA-Certified Procedures** ensuring compliance with MIL-STD and IEC guidelines
- **Hot-Swappable Fixture Modules** for rapid turnaround between module tests
- **Remote Firmware Updates** over secure Ethernet, minimizing bench downtime

- **SMS/Email Alerts** for critical test failures or maintenance reminders
- **Integrated EMI/EMC Pre-Compliance Checks** to catch potential electromagnetic issues early
- **Throughput Optimization** via parallel test lanes and multi-threaded execution

Technical Specifications:

Specification	Details
Bench Model	TB_TACAN
Modules Covered	12 Intelligent + 13 Passive components
Interfaces	CAN 2.0B, USB 2.0, RS-232/485, Gigabit Ethernet
RF Path	Quick-connect looms rated to 18 GHz, ≤ 0.5 dB insertion loss
Power Input	208–240 VAC, 50/60 Hz
Output Rails	± 5 V, ± 12 V, + 28 V regulated
Enclosure	19″ rack, 12 U height, 600 mm depth; forced-air filtered cooling; EMI shielding
Environment	Operating: 0–45 °C, 10–90 % RH (non-condensing)
Storage	–20 °C to + 70 °C

System Components & Architecture:

The TB TACAN bench's hardware is built around a rugged industrial PC—the central ATE controller—which runs real-time orchestration software to upload and schedule test sequences, energize relay banks, route RF/power via digital I/O, and collect time-stamped measurement data into a secure database. Each intelligent TACAN module houses its own ARM-class microcontroller, performing high-speed ADC sampling of voltages, currents and RF power levels, executing low-level signal-conditioning tasks, monitoring health parameters (temperature, supply rails, watchdog status) and autonomously carrying out module-specific tests, all while exchanging compact command and status messages over a 1 Mbps CAN 2.0B network that daisy-chains through each node. RF and DC want-it-when-you-need-it connectivity is provided by seven custom quick-connect looms (J1–J7), each pre-terminated with low-loss SMA or N-type RF connectors (≤0.5 dB insertion loss at up to 18 GHz) and keyed circular power/data contacts, which plug into modular fixture plates via captive thumb-screws for tool-free, sub-60-second module swaps; each harness even contains an onboard EEPROM so the controller can automatically verify correct routing. Operators interact with the system through a 21″ touchscreen HMI panel, where they can drag-and-drop virtual module icons to physical slots, edit test sequences with conditional logic, view live multi-channel plots of RF amplitude, VSWR, and error-vector magnitude, and review, annotate and digitally sign PDF reports before export. This modular, distributed architecture not only delivers deterministic, low-latency control and precise local measurements but also scales effortlessly—additional lanes simply bolt on, plug into the CAN bus, and are immediately available for testing without any rewiring or software overhaul.

Installation & Maintenance

Site Requirements:

- Drive air: 6–16 bar dry, 40 µm filter @ 60 SCFM
- Ambient: 10–40 °C, indoor, dust-free

Preventive Maintenance Schedule:

- Daily: Inspect looms, check connector integrity, run self-test

- Monthly: Inspect airflow filters, verify filter pressure drop, tighten panel fasteners
- Quarterly: Replace drive-air filter element; test safety relief valves and burst discs
- Annually: Full leak test; recalibrate sensors; refresh lubrication on moving parts

Spare & Support Kits:

- Pre-terminated looms, RF adapters, quick-reference maintenance guide, and optional on-site training packages

Operational Workflow

- Setup Verification: Confirm latest calibration, run loom continuity check
- Module Selection: Operator selects UUT module via GUI; bench configures relays and signal routing
- Stimulus Application: RF sources sweep 962 ± 80 MHz (–30 dBm to +30 dBm); DC loads and TTL controls apply operational conditions
- Data Acquisition: µC ADCs capture amplitude, phase, VSWR with 1 µs timestamp resolution
- Analysis & Reporting: Real-time pass/fail logic compares measurements to tolerance bands; report generated automatically
- Module Change-Over: Hot-swap fixture modules; repeat sequence for next UUT

Safety, Compliance & Quality:

- Dual Relief System: 405 bar safety relief valve + 430 bar burst disc
- Gauge Over-Range Stops: Mechanical pin protection on Bourdon gauges
- Keyed Isolation Valve: Lockout provision for safe maintenance
- Standards Compliance: ISO 4413 (hydraulics), ISO 13849-1 Cat 3 (safety), IEC 60204-1 (electrical)

- Traceability: Serialized bench frame, digital QA/QC logs, radiography weld reports, and ISO 17025-style calibration certificates