

Calibration Kit NRVC

Power calibration up to 18 GHz

With the introduction of ISO9000 standard specifications and the growing number of related accreditations, manufacturers of measuring equipment are required to cope with an increasing volume of calibration. On-site calibration by the manufacturer or the user is often the fastest and most cost-effective solution, especially when using Calibration Kit NRVC from Rohde & Schwarz.

Calibration Kit NRVC (FIG 1) is used for fast, program-controlled calibration of Rohde & Schwarz NRVC-Z and URV5-Z sensors [1; 2]. All Rohde & Schwarz branch offices as well as users of these sensors all over the world are thus able to perform calibration with accuracy to data sheet specifications and comparable to that of factory calibration.

Functions

Calibration Kit NRVC comprises three sets: NRVC for absolute calibration, option NRVC-B1 for verification, and option NRVC-B2 for linearity checking. The core of the absolute calibration set is a broadband power standard consisting of a power splitter and thermocouple power sensor. The power standard, operated on Dual-Channel Power Meter NRVD [3], enables exact determination of the measurement accuracy of power and voltage sensors throughout their frequency range and at the relevant reference level. The power range of -10 to $+20$ dBm ($100 \mu\text{W}$ to 100mW) can be extended to -30 dBm ($1 \mu\text{W}$) by means of a high-precision 20 dB attenuator for the calibration of diode power sensors. Depending on the frequency range, test signals are supplied by an RF or microwave source, eg Signal Generator SMP (FIG 2).

Display linearity across a wide power range can be checked by means of option NRVC-B2 of the calibration kit. Linearity checks, not commonly

performed in the classic calibration of power sensors, prove very useful for modern sensors with their numerically linearized characteristics. A highly linear insertion unit is used as a linearity reference, and test signals are supplied by Power Signal Generator SMGL at a frequency of 50 MHz.

NRVC features high measurement speed for all types of calibration, so only about 15 min are needed to measure a DUT in several positions of its RF connector and for the complete logging of results. Any SWR values measured at a separate test setup can be transferred to the calibration program in the form of an ASCII file. The program checks values for compliance with specifications and includes them in the calibration report.



FIG 1
 Calibration Kit
 NRVC with power
 standard as main
 component
 Photo 43 074/1

Measurement accuracy and traceability

All important components of the calibration kit, ie power standard, 20 dB attenuator and linearity standard, carry the label of the German Calibration Service (DKD), which certifies traceability to national standards. The

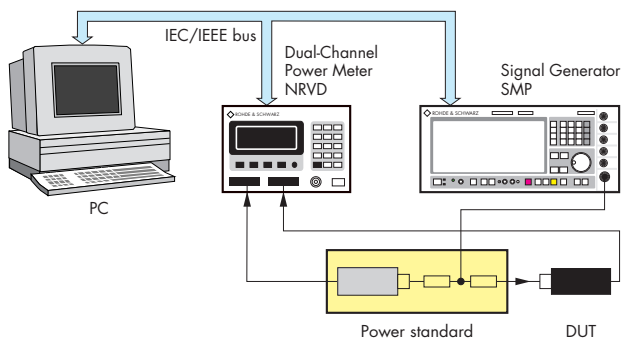


FIG 2
Test setup for calibration of Thermo-couple Power Sensor NRV-Z51

power standard is measured at more than 50 frequencies for enhanced accuracy; from 100 MHz a transfer standard is used that can be traced directly to the corresponding primary standard of the German Standards Laboratory (PTB) in Braunschweig. This together with mismatch correction reduces measurement uncertainty to nearly that of the transfer standard.

The user can check the accuracy of his calibration kit any time before recalibration in two ways. The power standard and reference attenuator can be tested by applying DC voltage, which already affords a high degree of reliability. Or NRVC can be checked across the whole frequency range by means of Verification Set NRVC-B1. This set contains a thermocouple power sensor and a diode sensor calibrated at Rohde & Schwarz on the associated Calibration Kit NRVC, the results of calibration being stored in the correction data memories of the sensors. The user can thus easily determine any

differences between NRVC and the verification set. Calibration Kit NRVC and its options are recalibrated at Rohde & Schwarz at yearly intervals.

Operation

Operation of the test setup is largely menu-controlled by the "Recal" calibration program, running under Microsoft Windows 3.1 or Windows 95. An IEC/IEEE-bus interface is all that is needed for communication with Power Meter NRVD and the signal generators. The program supports various types of signal generator and up to two NRVDs, one of which may take up the power and linearity standards and the other the DUT. This configuration is useful when switchover is made between absolute calibration and linearity measurements.

Although the program is largely self-explanatory, a context-sensitive help file is provided to explain all steps of sensor calibration, making it extremely

easy to familiarize with NRVC. The program further supports configuration and modification of test setups.

Sensor calibration with a few mouse clicks

Calibration basically comprises **four steps**:

- reading of current correction data from sensor memory as a basis for recalculating the data set,
- checking of sensor against a power or linearity standard with the components of the calibration kit (up to 18 GHz) or of another calibration system (eg for sensors above 18 GHz); in the latter case a test file (ASCII) that can be read by the program must be generated,
- recalculation of correction data from measured data,
- programming of sensor EPROM with the new data.

Each of the above steps requires just a few mouse clicks. The program allows execution of a step only if the previous step has been properly performed. The sensor calibration data, eg the levels and frequencies at which absolute accuracy is measured (FIG 3), as well as instrument settings are stored in two separate configuration files for the sensor and the associated instrument.

For **documentation** an "Incoming Inspection Test Report" or a "Calibration Report" can be generated at a key-stroke and output on a printer. The reports conform to ISO9000 requirements.

The calibration kit comes with all components required for connection to a signal source and Dual-Channel Power Meter NRVD. This includes a low-loss microwave connecting cable, a precision termination for insertion units, a harmonic filter and a power splitter for linearity measurements, various adapters, accessories for DC voltage measurements and the complete software. The calibration kit is supplied in three sturdy boxes at an

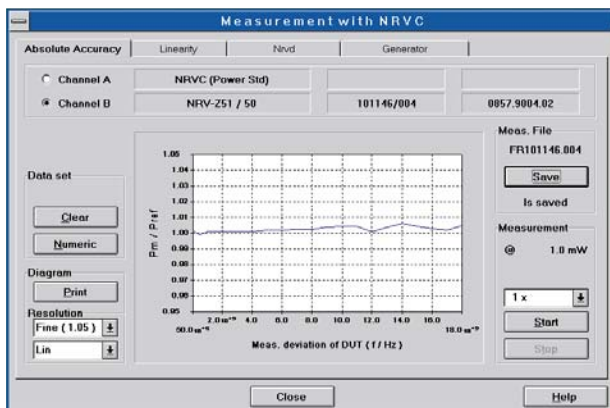


FIG 3
Interactive mask for automatic absolute accuracy measurement

attractive price, making it a worthwhile investment for many calibration centers and industrial users.