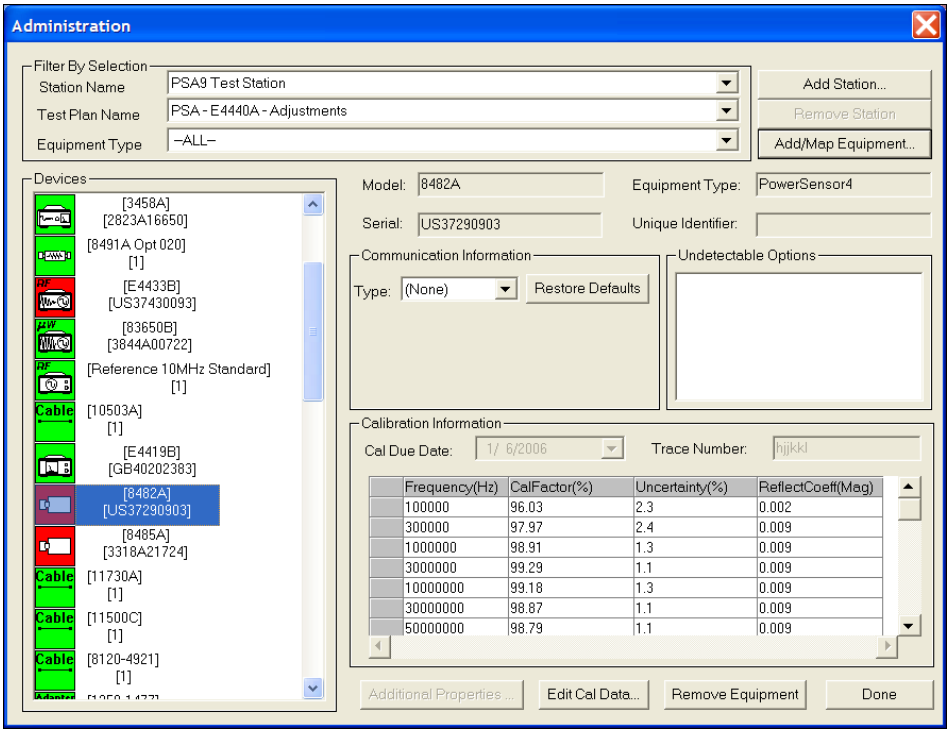
Keysight N7800A
Calibration and Adjustment Software for Self-Maintainers

Data Sheet



KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Get Licensed Access to Run the Same Software Used in Keysight Service Centers

Keysight Technologies, Inc. strives to provide the best service available for a broad range of instruments, but you may be a customer who balances cost, quality, and cycle time requirements by performing your own calibrations whenever possible. If you have the necessary equipment, facility, manpower, and skill, you could benefit from having robust automated routines to facilitate the calibration task.

If you perform calibration for instruments owned by your company and do not offer calibration as a commercial service, you may be eligible for licensed access to Keysight calibration software.

N7800A calibration and adjustment software offers you the following:

- Licensed access: to the same OEM calibration software used in Keysight Service Centers
- Compliance to: ISO/IEC 17025:2005, ANSI Z540-1:R2002, ANSI Z540.3-2006
- OEM performance tests: for all data sheet specifications and installed options
- Automated adjustments: whenever measured performance is outside acceptance limits
- Measurement uncertainty analyses: in accordance with the ISO Guide for Expression of Uncertainty of Measurements
- Reduced cost and risk: of managing new capital instrument purchases because Keysight supports a broad set of standards

Overview

Performance tests

During the new product introduction phase, Keysight research and development and manufacturing engineers characterize the actual performance of pilot production runs. Support engineers and metrologists work to ensure the performance tests have sufficiently low measurement uncertainty and adequate margin to warrant instrument performance to factory specifications. This combined attention to an ISO GUM based measurement equation[1], and detailed knowledge of the instrument block diagram, results in a sequence of original equipment manufacturer (OEM) performance tests for use in service centers. Every warranted (also known as "hard") specification has a corresponding performance test over the range of specified conditions (frequency range, level, etc.). In short, performance tests measure the actual performance of every hard specification, for every option.

Note: For those customers who rely on a subset of the overall specifications, the N7800A allows users to select only those performance tests that apply to their enterprise.

1. JCGM 100:2008, Guide to the expression of uncertainty in measurement

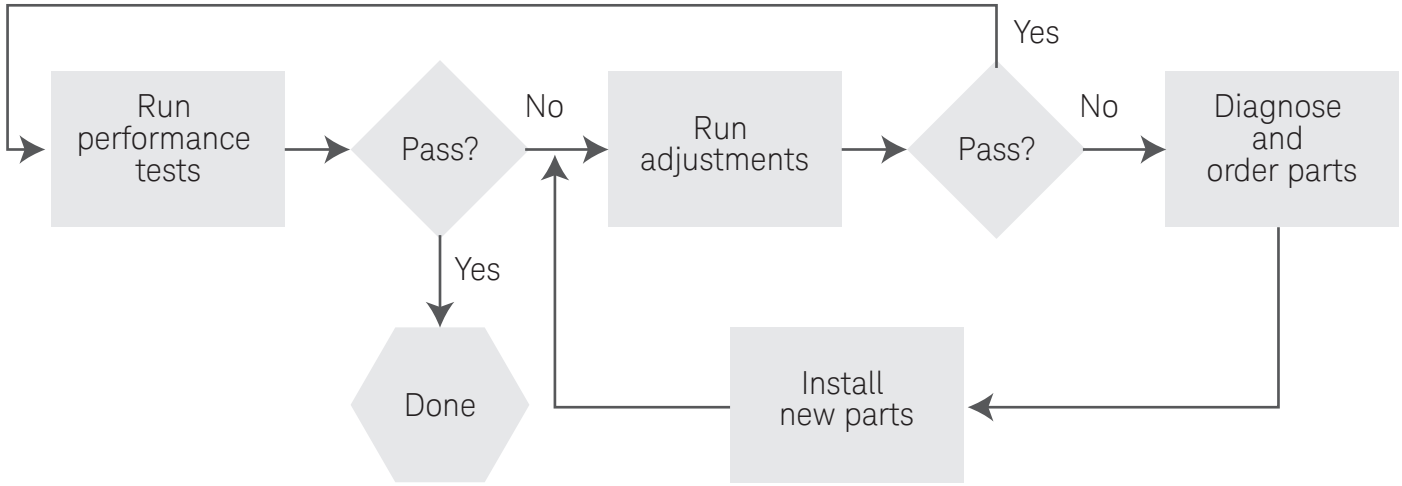


Figure 1. Keysight N7800A software gives you an advantage at every step of the calibration, adjustment and repair process.

Automated adjustments, if needed

The days of screwdriver "tweaks" are long gone. Many of the performance advantages offered by Keysight instruments rely on the ability to fine-tune the hardware under microprocessor control. Amplifier gains, filter corners, DC offsets, and other functions can be adjusted according to measurement environment and component aging. These adjustments require complex iterative external measurements and calculations to characterize the instrument while changing internal DAC settings. Intimate knowledge of the architecture and detailed circuitry are required, so such adjustment capability is available only in the Keysight N7800A platform software.

Keysight Service Center records indicate that roughly 10% of customers' instruments fail at least one specification during initial performance testing, but can be brought into compliance simply through automatic adjustments, eliminating the need for a "hardware repair". Only Keysight N7800A calibration software includes adjustments to reduce costly repair charges and untimely delays.

Post-repair adjustments

When an instrument is broken and PC boards or other major components are replaced, post-repair adjustments are required before performance tests can be re-run to ensure it performs within specifications. For example, Figure 2 and 3 show the post-repair adjustments and performance tests you would need to run on an E4438C signal generator after replacing one or more boards. Keysight N7800A software streamlines this process by automating these post-repair procedures.

Post-repair adjustments - example

Adjustments	Replaced assembly									
	A1 to A6 (Keyboard to power supply)	A7 Baseband generator	A9 Digital demodulator	A10 I/Q multiplexer	A11 Internal bit error rate analyzer	A12 CPU	A13 Output	A14 Extended frequency output	A15 Sampler	A16 Frac-N
Self test	x	x	x	x	x	x	x	x	x	x
Analog bus ADC calibration						x	x	x	x	x
Modulation source relative gain calibration										x
FM/PM out-of-band calibration										x
FM/PM YO frequency compensation calibration									x	x
DCFM calibration						x				x
AM audio path offset calibration							x	x		
Burst modulator calibration							x	x		
Pre-level calibration							x	x		x
VBLO mixer bias calibration							x	x		
Digital gain adjust calibration							x	x		
Bypass gain adjust calibration							x	x		
ALC calibration							x	x		
Power level accuracy, high power calibration							x	x		x
ALC modulation driver bias calibration							x	x		
Power level accuracy, low power calibration							x	x		
Power search calibration							x	x		
AM gain calibration							x	x		
I/Q gain/offset/quadrature calibration		x		x			x	x		
I/Q impairment calibration		x		x			x	x		
I/Q timeskew calibration-baseband		x								
I/Q timeskew calibration-RF		x					x			

Figure 2. E4438C post-repair adjustments (partial list).

Post-repair performance tests - example

Performance tests	Replaced assembly									
	A1 to A5 and A12	A6 Power supply	A7 Baseband generator	A9 Digital demodulator	A10 I/Q Multiplexer	A11 Internal bit error rate analyzer	A13 Output	A14 Extended frequency output	A15 Sampler	A16 Frac-N
Self test	x	x	x	x	x	x	x	x	x	x
Internal FM accuracy and distortion										x
Internal AM accuracy and distortion							x	x		
Phase modulation accuracy and distortion										x
FM frequency response										x
AM frequency response							x	x		
Phase modulation frequency response										x
DCFM frequency offset relative to CW										x
Residual FM		x								
Harmonic, subharmonic and nonharmonic spurious signals		x	x				x		x	x
Power level accuracy		x					x	x		x
Digital modulation level accuracy					x		x	x		
Internal digital modulation quality			x		x		x			
Custom I/Q ED modulation quality			x		x		x	x		
Pulse modulation on/off ratio							x	x		
Burst modulation on/off ratio							x	x		
CDMA adjacent channel power			x		x		x			
WCDMA adjacent channel power			x		x		x			
Phase noise and residual FM		x					x	x	x	x
Dual arbitrary waveform generator check			x		x					
GSM loopback BER check			x	x		x				

Figure 3. E4438C post-repair performance tests (partial list).

Instruments Covered

The N7800A platform covers over 200 instruments.

Instrument families	Instrument product numbers covered
Signal analyzers	
CSA	N1996A
EMI receivers	N9038A, N9039A
ESA	E4401B, E4402B, E4403B, E4404B, E4405B, E4407B, E4408B, E4411B, E7401A, E7402A, E7403A, E7404A,E7405A
Noise figure	N8972A, N8973A, N8974A, N8975A
PSA	E4440A, E4443A, E4445A, E4446A, E4447A, E4448A, N5531S
VSA	E4406A, 89610A, 89611A, 89640A, 89641A
X-Series	N9000A, N9010A, N9020A, N9030A, N9040B
Signal sources	
ESG	E4428C, E4438C, E4400B, E4420B, E4421B, E4422B, E4423B, E4424B, E4425B, E4426B, E4430B, E4431B, E4432B, E4433B, E4434B, E4435B, E4436B, E4437B
X-Series	N5161A, N5162A, N5171B, N5172B, N5173B, N5181A/B, N5182A/B, N5183A/B/M, N5193A
PSG	E8241A, E8244A, E8247C, E8251A, E8254A, E8257C/D/N, E8267C/D, E8663D
Other	E8663B
Network analyzers	
ENA	E5071C, E5072A, E5080A
PNA	E8356A, E8357A, E8358A, E8361A/C, E8362A/B/C, E8363A/B/C, E8364A/B/C, E8801A, E8802A, E8803A, N3381A, N3382A, N3383A, N5230A/C, E9427A, N5221A/AS, N5222A/AS, N5224A/AS, N5225A/AS, N5227A/AS, N5231A/AS, N5232A/AS, N5234A/AS, N5235A/AS, N5239A/AS, N5241A/AS, N5242A/AS, N5244A/AS, N5245A/AS, N5247A/AS, N5249A/AS
Oscilloscopes	
Infiniuum	DSO90254A, DOS90404A, DSO90604A, DSO90804A, DSO91204A, DSO91304A, DSA90254A, DSA90404A, DSA90604A, DSA90804A, DSA91204A, DSA91304A
PXI modules/Instruments	
	M9202A, M9300A, M9370A, M9371A, M9372A, M9373A, M9374A, M9375A, M9380A, M9381A, M9391A, M9393A
Power meters and power sensors	
P-series	N1911A, N1912A, N8262A, N1913A, N1914A
Power sensors	8481A, 8482A, 8485A, 8485D, 8487A, E9304A, U2000A/B/H, U2001A/B/H, U2002A/H, U2004A, N5532A/B, N8481A/B/H, N8482A/B/H, N8485A, N8486AR/AQ, N8487A, N8488A
Wireless test	
	N4010A, E6601A, N8300A
Synthetic instruments	
	N8211A, N8212A, N8201A
Other	
	N9912A, N9913A, N9914A, N9915A, N9916A, N9917A, N9918A, N9923A , N9925A, N9926A, N9927A, N9928A, N9935A, N9936A, N9937A, N9938A, E6651A, U2722A, U2723A, U2761A, N5106A

Figure 4. Keysight calibration and adjustment software covers a range of RF and µW instruments.

Licenses Offered

License option	Description
N7800A-U1S	Test Management Environment (TME) cal +MU+GB, fixed PC, one year initial non-commercial license.
N7800A-U1R	TME cal+MU+GB, fixed PC, one year renewal non-commercial license. (requires previous N7800A-U1S installation)

N7800A-U1S non-commercial fixed PC license

If you perform calibration for instruments owned by your company and do not offer calibration as a commercial service, you may be eligible for a fixed PC license. The N7800A-U1S provides unlimited licensed use for any covered instruments (you must have the required lab standards, of course) for a period of 1-year, on one fixed PC. The N7800A-U1R is the corresponding annual renewal license for one fixed PC. The measurement report includes ISO GUM measurement uncertainty, and is compliant with ISO/IEC 17025, ANSI Z540-1, or ANSI Z540.3.

Compliance with ISO 17025, ANSI Z540-1, or ANSI Z540.3

The N7800A calibration software calculates point-by-point measurement uncertainty according to the ISO/IEC Guide to Expression of Measurement Uncertainty[1]. The documented uncertainty analysis often encompasses 20 to 30 pages of complex equations for each performance test, so having these embedded in the software saves your metrology staff substantial effort. You can select the report format you need to comply with the requirements you must meet. For details see: **www.keysight.com/find/Z540.3**.

1. JCGM 100:2008, Guide to the expression of uncertainty in measurement

Support for a broad set of lab standards

Keysight strives to reduce your cost of operating a state-of-the-art calibration center by supporting the broadest practical range of lab standards. Should you find that you do not already have one of the many alternative lab standards listed in our documentation, and need to purchase new equipment, our metrologists maintain a convenient list of Recommended (and Alternative) Lab Standards and Special Cal Options, which lists the standards (instruments) and options that provide the broadest coverage across all N7800A applications. You may, of course, choose to purchase only those options required for the products you intend to test, by examining the detailed Help Text for those specific N7800A applications.

Free download of latest software versions

The latest revisions of all N7800A software supporting new instruments, new options, enhancements to existing procedures, and maintenance fixes are posted on-line for FREE download at **www.cal.software.keysight.com**. You do need a valid license to run the software (see right column).

Getting Started

Step	Description
Step 1	Download and install the N7800A Test Management Environment at: **www.cal.software.keysight.com**
Step 2	Download and install the instrument family cal procedures at: **www.cal.software.keysight.com**
Step 3	Make sure you have the lab standards needed to run the downloaded instrument family cal procedures. View **Recommended (and Alternative) Lab Standards and Special Cal Options** with online help to see if your existing equipment can run the calibration procedure or if you need to purchase any new lab standards.
Step 4	Enter the details regarding model, serial number, and calibration date of your lab standards into the N7800A software, that it can verify everything is ready and available for use.
Step 5	Purchase the N7800A software license.
Step 6	Receive an email with a unique Certificate of Entitlement number and activate/redeem the license online at: **www.keysight.com/find/SoftwareManager**.
Step 7	Import the calibration software license into your test system controller by following the instructions provided in the acknowledgement email.
Step 8	Begin calibration.

Useful Web Links

- See more information at: **www.keysight.com/find/calibrationsoftware**.
- View **Recommended (and Alternative) Lab Standards and Special Cal Options**, if purchasing new lab standards.
- To download calibration software, visit **www.cal.software.keysight.com**.
- To redeem license certificates, visit **www.keysight.com/find/SoftwareManager**.

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