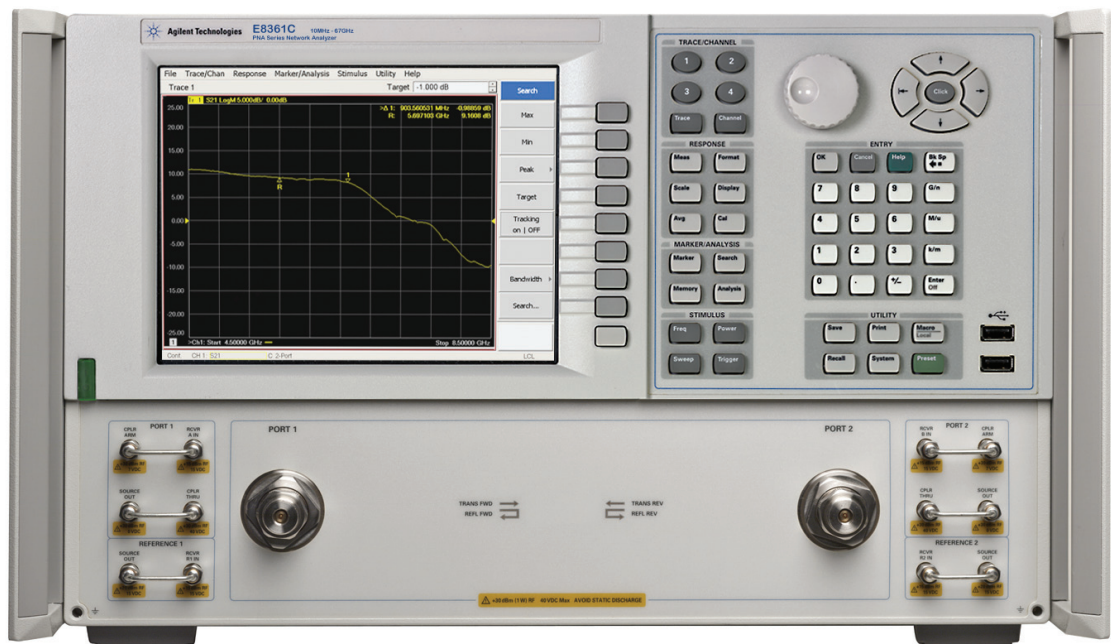# Agilent
PNA Series
Microwave Network Analyzers

Configuration Guide

PNA E8362C	10 MHz to 20 GHz
PNA E8363C	10 MHz to 40 GHz
PNA E8364C	10 MHz to 50 GHz
PNA E8361C	10 MHz to 67 GHz

This guide describes standard configurations, for the PNA (E836xC) Series microwave network analyzers. This guide should be used with the *Agilent PNA family data sheets* for a complete description of these analyzers.

For applications, measurement accessories, and general accessories please see *Agilent PNA Family Network Analyzers Configuration Guide*, part number 5990-7745EN.

Agilent Technologies

Agilent offers the following options for all PNA family network analyzers

Certification options
☐ **Commercial calibration certification with test data (Option UK6)**
Complete set of measurements which tests unit to manufacturer's published specifications. Includes calibration label, calibration certificate, and data report. Conforms to ISO 9001.

☐ **ISO 17025 compliant calibration (Option 1A7)**
Complete set of measurements which tests unit to manufacturer's published specifications. Includes calibration label, ISO 17025 calibration certificate, and data report, measurement uncertainties and guardbands on all customer specifications. Conforms to ISO 17025 and ISO 9001.

☐ **ANSI Z540 compliant calibration (Option A6J)**
Complete set of measurements which tests unit to manufacturer's published specifications. Includes pre- and post-adjustment data with measurement uncertainty information compliant to the ANSI/NCSL Z540 standard.

Warranty and service
1-, 3-, and 5-year warranty and service plans are available at the time of instrument purchase. Standard warranty is 1 year.

Documentation
The PNA Series instruments are equipped with an Online Help system available within the instrument in the following languages: English, Japanese, Chinese, German, Spanish, and French. Service guides and the Online Help system are available on the web: **www.na.tm.agilent.com/pna**

Calibration Software Licenses
☐ **Perpetual license for built-in performance test software for Agilent inclusive cal (Option 897)**
Adds built-in performance testing and calibration software for self-maintainers. Requires additional equipment. See the analyzer's Service Guide for more information on equipment required.

☐ **Perpetual license for built-in performance test software for Standards compliant cal (Option 898)**
Adds built-in performance testing and calibration software for self-maintainers. Requires additional equipment. See the analyzer's Service Guide for more information on equipment required.

PNA Series Network Analyzer

E8362C	10 MHz to 20 GHz	E8363C	10 MHz to 40 GHz	E8364C	10 MHz to 50 GHz	E8361C	10 MHz to 67 GHz

Option configurations

To add options to a product, order the corresponding item number.

	Description	For E8362C	For E8363C	For E8364C	For E8361C	Additional information
Test set						
Option 014	Configurable test set	E8362C-014	E8363C-014	E8364C-014	E8361C-014	
Power configuration						
Option UNL	Extended power range and bias-tees	E8362C-UNL	E8363C-UNL	E8364C-UNL	E8361C-UNL	Only E8361C requires 014
Option 016	Add receiver attenuators	E8362C-016	E8363C-016	E8364C-016	E8361C-016	Requires UNL (only E8361C also requires 014)
Option H85[1]	High-power configuration	E8362CH85	E8363CH85	E8364CH85		Includes 014, 016, UNL[2], 080, 081
Measurement applications						
Option 010	Time-domain capability	E8362C-010	E8363C-010	E8364C-010	E8361C-010	
Option 080	Frequency offset	E8362C-080	E8363C-080	E8364C-080	E8361C-080	Requires 014 (E8361C only, 081 required if UNL is also purchased)
Option 081	Reference receiver switch	E8362C-081	E8363C-081	E8364C-081	E8361C-081	Requires 014, 080 (only E8361C also requires UNL)
Option 082	Scalar-calibrated converter measurements	E8362C-082	E8363C-082	E8364C-082	E8361C-082	Requires 014, 080
Option 083	Vector- and scalar-calibrated converter measurements	E8362C-083	E8363C-083	E8364C-083	E8361C-083	Requires 014, 080, 081(only E8361C also requires UNL)
Option 084[3]	Embedded LO measurements	E8362C-084	E8363C-084	E8364C-084	E8361C-084	Requires 082 or 083
Option 550[4]	4-port measurement application	E8362C-550	E8363C-550	E8364C-550	E8361C-550	Requires 014
Option 551[4]	N-port capabilities	E8362C-551	E8363C-551	E8364C-551	E8361C-551	Requires 014
Pulse, antenna, mm-wave						
Option H08	Pulsed-RF measurement capability	E8362C-H08	E8363C-H08	E8364C-H08	E8361C-H08	Requires 014, 080 (Option H11 recommended)
Option H11	IF access (for antenna, pulsed-RF and mm-wave measurements)	E8362C-H11	E8363C-H11	E8364C-H11	E8361C-H11	Requires 014, UNL, 080, and 081
Accessories						
Option 1CM	Rack mount kit for use without handles	E8362C-1CM	E8363C-1CM	E8364C-1CM	E8361C-1CM	
Option 1CP	Rack mount kit for use with handles	E8362C-1CP	E8363C-1CP	E8364C-1CP	E8361C-1CP	
Calibration documentation						
Option 1A7	ISO 17025 compliant calibration	E8362C-1A7	E8363C-1A7	E8364C-1A7	E8361C-1A7	
Option UK6	Commercial calibration certificate with test data	E8362C-UK6	E8363C-UK6	E8364C-UK6	E8361C-UK6	
Option A6J	ANSI Z540 compliant calibration	E8362C-A6J	E8363C-A6J	E8364C-A6J	E8361C-A6J	
Calibration software for self-maintainers						
Option 897[5]	Perpetual license of built-in performance test software for Agilent exclusive calibration	E8362C-897	E8363C-897	E8364C-897	E8361C-897	
Option 898[5]	Perpetual license of built-in performance test software for standards compliant calibration	E8362C-898	E8363C-898	E8364C-898	E8361C-898	

1. Option H85 is ordered as a separate model, as indicated.
2. UNL up to 67 GHz does not include bias-tees. Only includes source attenuators.
3. Requires firmware A.07.05 and above, plus 1.1 GHz CPU board.
4. Option 550 is a subset of 551; therefore they cannot be ordered together. When ordering a test set, select an option to specify the appropriate interconnect jumper cable set between the analyzer and the test set.
5. Additional hardware required. Please refer to the analyzer's Service Guide for required service test equipment.

PNA Series Network Analyzer

The microwave PNA Series instruments are integrated vector network analyzers equipped with a built-in S-parameter test set, synthesized source, a hard disk drive, USB interfaces, and an 8.4″ LCD color touch screen display. The E8362C has 3.5 mm male 50-ohm test ports. The E8363C/64C have 2.4 mm male 50-ohm test ports. The E8361C has 1.85 mm male 50-ohm test ports. Included with each instrument is a mouse, keyboard (U.S.) and a 1-year return-to-Agilent service warranty.

Test set and power configuration options

☐ **Configurable test set (Option 014)**
Provides six front panel access loops. Three access loops are for port one and three for port two. The loops provide access to the signal path between (a) the source output and the reference receiver, (b) the source output and directional coupler thru arm and (c) the coupled arm of the directional coupler and the port receiver. This option provides the capability to improve instrument sensitivity for measuring low-level signals, to reverse the directional coupler to achieve even more dynamic range or to add components and other peripheral instruments for a variety of measurement applications. (see *PNA Series Microwave Data Sheet* literature number 5989-7605EN for a basic block diagram)

☐ **Extended power range and bias-tees (Option UNL)**
Adds two 60 dB step attenuators and two bias-tees to the E8362/3/4C. Adds two 50 dB step attenuators and two bias-tees to the E8361C. A step attenuator and bias-tee set is inserted between the source and test port one and another set between the source and test port two. (see *PNA Series Microwave Data Sheet* literature number 5989-7605EN for a basic block diagram)

☐ **Add receiver attenuators (Option 016)**
An attenuator is added between each test port and its corresponding receiver. Two 35 dB step attenuators are added to the E8362/3/4C. Two 50 dB step attenuators are added to the E8361C (see *PNA Series Microwave Data Sheet* literature number 5989-7605EN for a basic block diagram).

☐ **High-power test set (Model E836xCH85)**
This configuration combines options that are often necessary for high power measurements (UNL[1], 014, 016, 080, 081). The only difference between ordering Option H85 versus a combination of the options listed above is the source attenuator option UNL. Standard UNL includes two source attenuators and two bias-tees. Option H85 includes the two source attenuators, but not the bias-tees, as the bias-tees are the power-limiting factor in the network analyzer test set. The maximum power at the test port is +43 dBm (< 20 GHz), and +40 dBm (> 20 GHz).

Option 080, frequency-offset mode, is included in Option H85 because it manages the phase-locking internally (instead of depending on the R1 receiver). So if you need to use external components in the path of the R1 receiver, it makes the measurements simpler and more robust.

Measurement applications

☐ **Time-domain capability (Option 010)**
For viewing reflection and transmission responses in time or distance domain.

☐ **Frequency offset (Option 080)**
This option enables the PNA Series microwave network analyzers to set the source frequency independently from where the receivers are tuned. This ability is important for two general classes of devices: mixers (and converters) and amplifiers. Option 080 provides a very basic user interface.

☐ **Reference receiver switch (Option 081)**
Option 081 adds a solid-state internal RF transfer switch in the R1 reference-receiver path (see *PNA Series Microwave Data Sheet* literature number 5989-7605EN for a block diagram). The switch allows the instrument to easily switch between standard S-parameter (non-frequency-offset) measurements and frequency offset measurements such as relative phase or absolute group delay that require an external reference mixer. The user can set the switch manually or remotely, but it is best used with the frequency-converter application (Option 083), where it is controlled automatically during the vector-mixer calibration procedure and subsequent measurements.

☐ **Scalar-calibrated converter measurements (Option 082)**
With a simple setup and calibration, this application provides the highest accuracy for conversion-loss (or gain) measurements by combining one-port and power-meter calibrations to remove mismatch errors. Option 080 required.

☐ **Vector- and scalar-calibrated converter measurements (Option 083)**
This converter measurement adds an intuitive and easy-to-use user interface, advanced calibration choices that provide exceptional amplitude and phase accuracy, and control of external signal sources for use as local oscillators. Mixer calibration techniques include scalar-mixer calibration and vector-mixer calibration (requires Option 081). Finally, the frequency-converter application supports all of Agilent's major signal source families.

☐ **Embedded LO Measurements (Option 084)**
This option tunes the PNA receivers to the output frequency of the converter under test, without the need for access to internal LOs or a common reference signal. For converters with embedded LOs, this option enables measurements of match-corrected conversion loss/gain (requires Option 082 or 083), and absolute group delay (requires Option 083).

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1. UNL does not include bias-tees. Only includes source attenuators

PNA Series Network Analyzer

☐ **4-port measurement application (Option 550)**
Adds multiport analyzer mode to any PNA network analyzer with Option 014 configurable test set, which enables full 4-port error correction and measurement capabilities using an external test set. Only standard measurement class is available in the multiport analyzer mode.

☐ **N-port capabilities (Option 551)**
Adds multiport analyzer mode to any PNA network analyzer with Option 014 configurable test set, which enables full N-port error correction and measurement capabilities using an external test set. Only standard measurement class is available in the multiport analyzer mode.

Pulse, antenna, mm-wave

☐ **Pulsed-RF measurement capability (Option H08)**
Provides software to set up and control pulsed-RF measurements with point-in-pulse capability. The software sets the coefficient of the PNA's digital-IF filter to null out unwanted spectral components, enables the IF gates provided with IF access (Option H11), and controls selected Agilent pulse generators. It can be run on the PNA or an external computer. A ".dll" file containing the IF-filter algorithms is included for automated pulsed-RF testing. The pulsed application is configured to work with the Agilent 81110A series pulse generator.

For more detailed information regarding pulsed measurement capabilities with the microwave PNA refer to the Agilent Web site **www.agilent.com/find/pna** and download the *PNA Series MW Network Analyzers Configuration Guide for Pulsed Measurements*, literature number 5989-7913EN.

☐ **IF access (Option H11)**
Provides hardware to enable antenna, point-in pulse, and broadband millimeter-wave measurements to 110 GHz. For each of the MW PNA's measurement receivers, IF gates (enabled with pulsed measurement capability, Option H08) and external IF inputs are added. In addition, access to the PNA's internal RF and LO source is provided for remote mixing applications. For basic antenna measurements, only Option H11 is necessary. Pulsed antenna applications also require the pulsed measurement capability (Option H08). Broadband measurements to 110 GHz, also requires an N5260A millimeter-wave test set controller.

Note: Use external IF access for up to 20 dB more sensitivity when making antenna measurements with a remote mixing configuration. Add Option H08 (Pulsed-RF Measurement Capability) to enable advanced pulsed measurements. Or upgrade to a broadband (10 MHz to 110 GHz) VNA system simply by purchasing an N5260A controller test set with test heads (Option 110, 120, or 130).

Accessories

☐ **Rack mount kit without handles (Option 1CM)**
Adds a rack mount (5063-9217) and rail kit (E3663AC) for use without handles.

☐ **Rack mount kit with handles (Option 1CP)**
Adds a rack mount (5063-9237)[1] and rail kit (E3663AC) for use with standard supplied handles.

Configuration Details
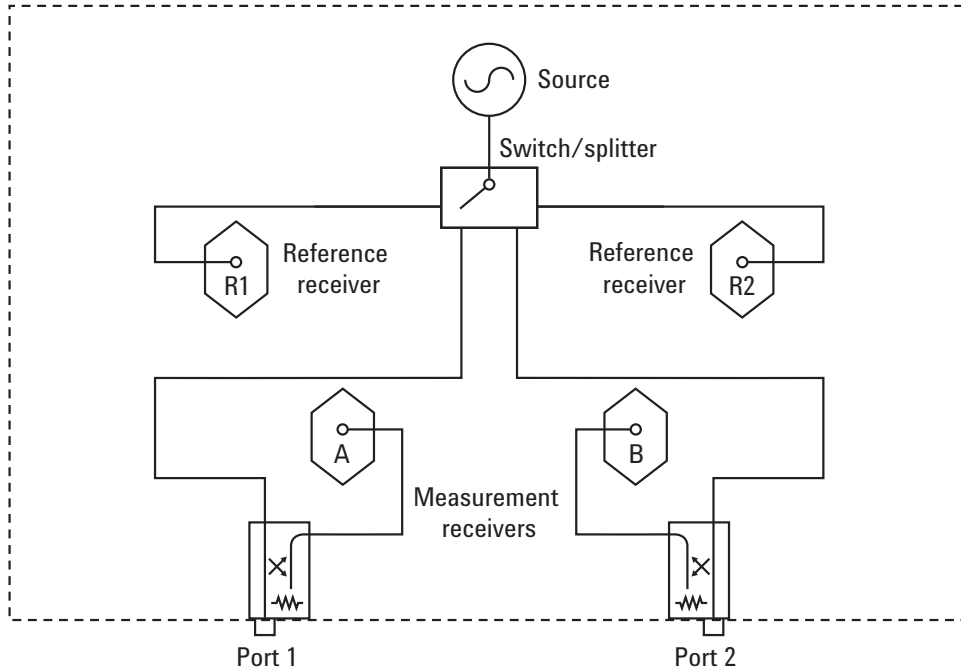
Selecting the correct mixer-test configuration:
Most mixer or converter test applications require Options 014, 080, and 082 for conversion loss/gain, or Options 014, 080, 081 and 083 for conversion loss/gain and phase/delay measurements. If you want to create and automate your own custom frequency-offset measurements (for example, intermodulation distortion), you may only need Options 014 and 080. For converters that require input power below -27 dBm, or for devices that have a large amount of LO feedthrough (like an unfiltered mixer), Option UNL, which adds source attenuators, is highly recommended. Besides allowing lower input power levels, these attenuators improve the isolation between the PNA's internal source and LO leakage signals, helping to prevent source-unleveled errors. For devices that put out signals near or above the receiver's compression levels (which varies between –3 and +5 dBm, depending on the model and frequency), Option 016 is recommended, which adds receiver attenuators. Finally, Option 010, which adds time-domain analysis, is very useful for gating out unwanted, time-delayed responses which often occur when measuring mixers.

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1. The 5063-9237 kit assumes you have the standard handles shipped with the instrument. If you do not have handles, order a 5063-9224 kit.
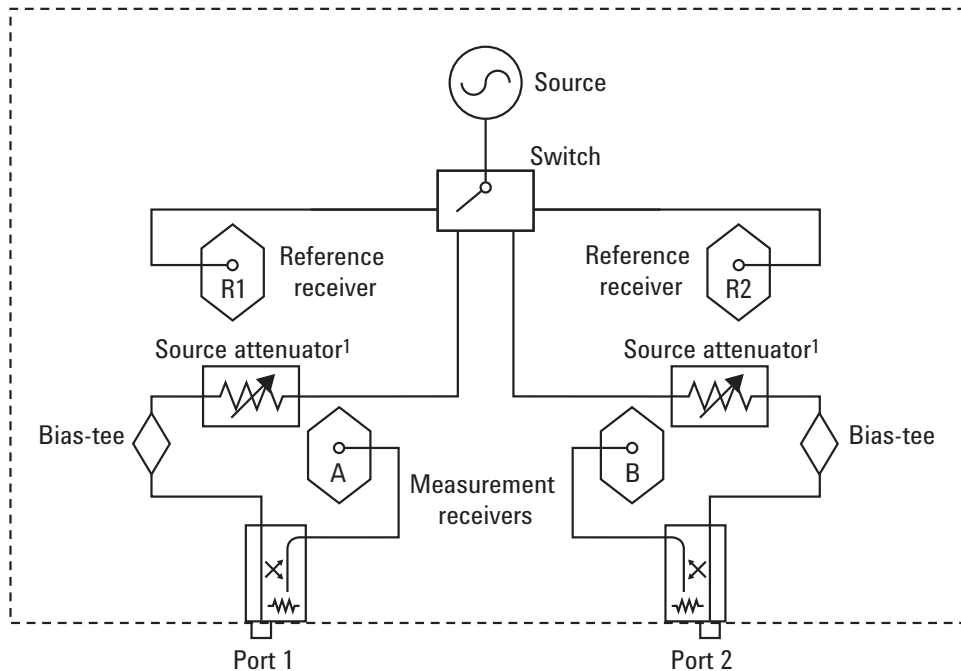
PNA Series Network Analyzer

Simplified test set block diagrams

Standard power range

Source

Switch/splitter

R1 — Reference receiver

Reference receiver — R2

A

B

Measurement receivers

Port 1

Port 2

Extended power range and bias-tees (Option UNL)

Source

Switch

R1 — Reference receiver

Reference receiver — R2

Source attenuator[1]

Source attenuator[1]

Bias-tee

Bias-tee

A

B

Measurement receivers

Port 1

Port 2

1. Source attenuator for E8362/3/4C is 60 dB in 10 dB steps.
   Source attenuator for E8361C is 50 dB in 10 dB steps.

PNA Series Network Analyzer

Simplified test set block diagrams – continued

Configurable test set (Option 014)
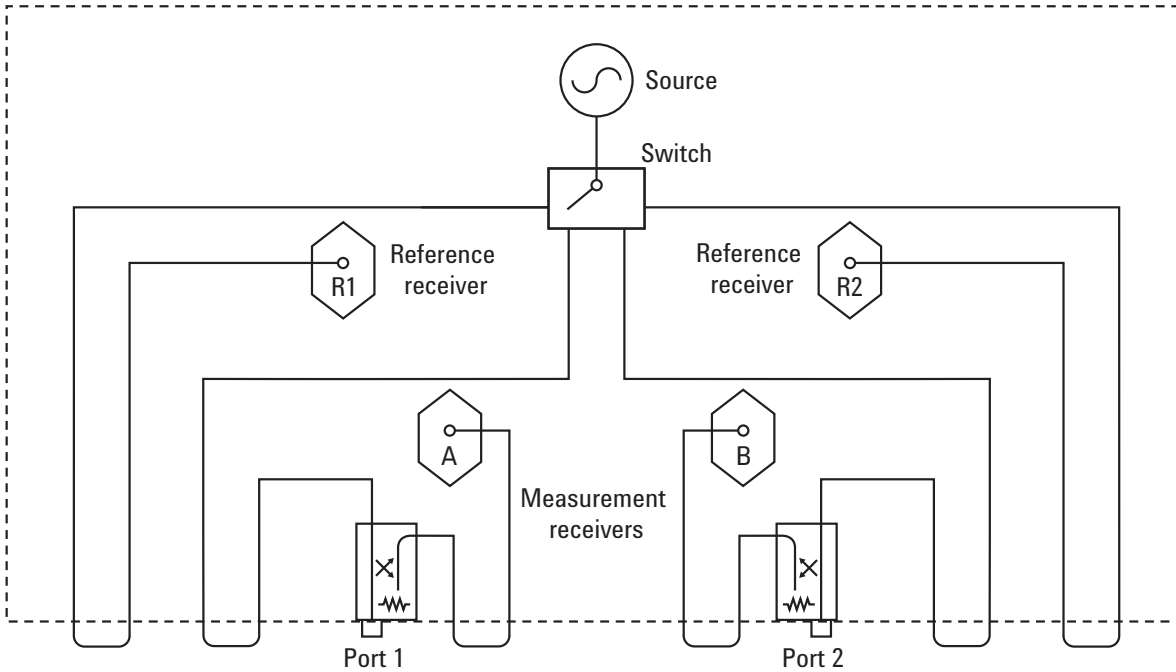
Configurable test set with extended power range and bias-tees (Option UNL and 014)
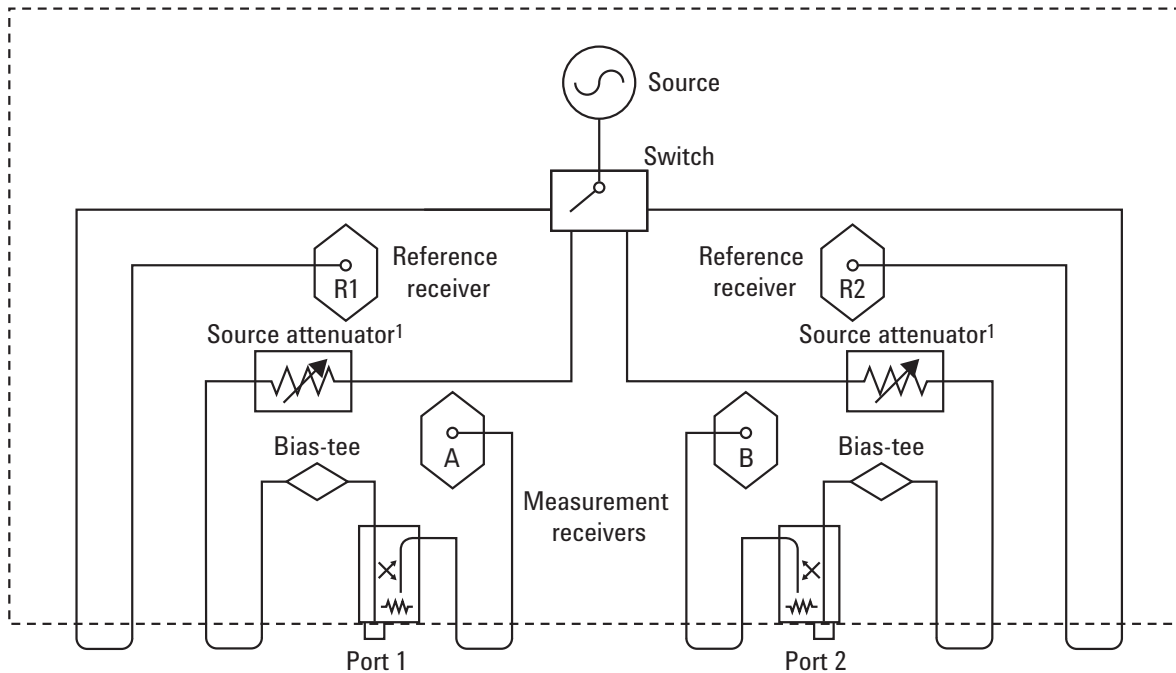
1. Source attenuator for E8362/3/4C is 60 dB in 10 dB steps.
    Source attenuator for E8361C is 50 dB in 10 dB steps.

PNA Series Network Analyzer

Simplified test set block diagrams – continued

Fully optioned, active device or mixer/converter test configuration (Options 014, UNL, 016, 080, 081)
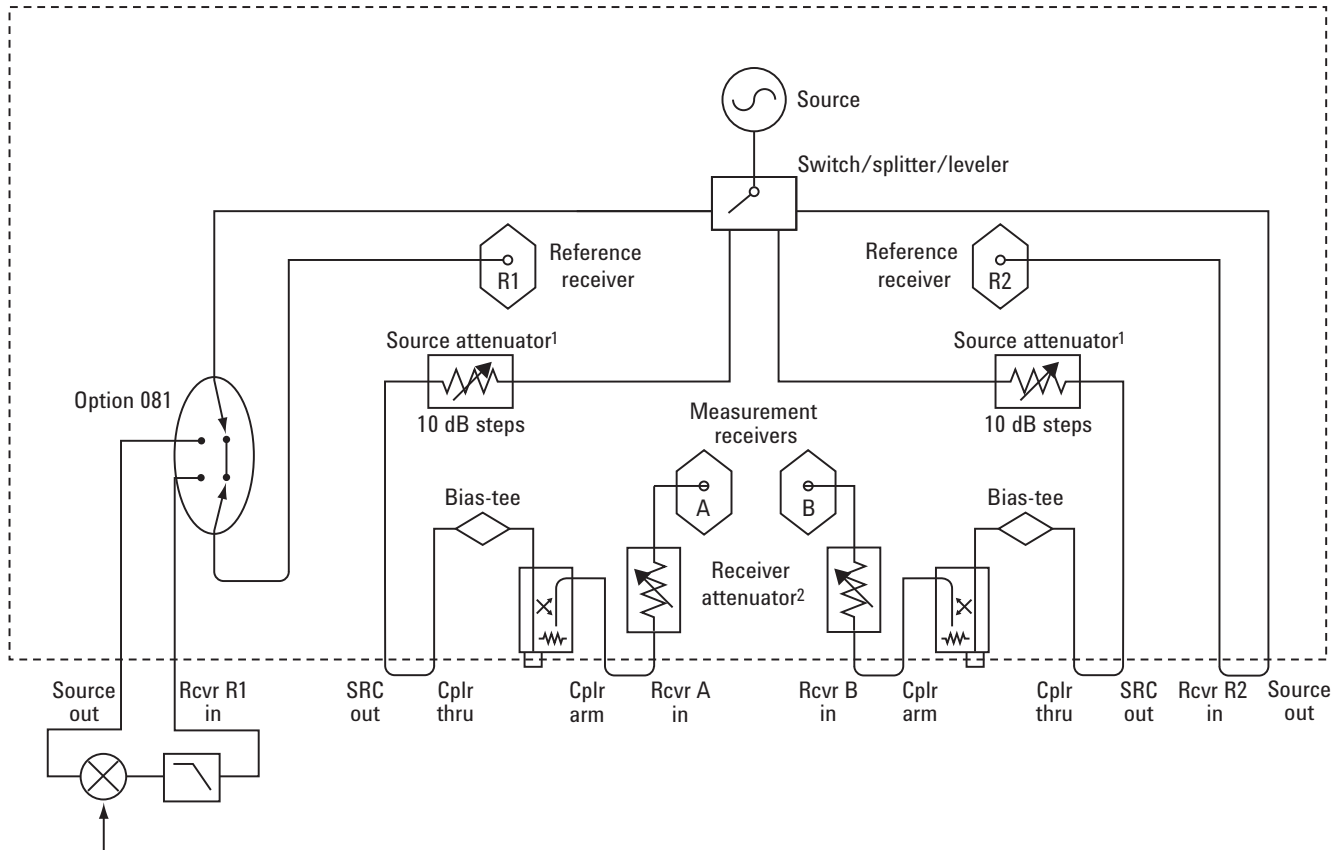
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1. Source attenuator for E8362/3/4C is 60 dB in 10 dB steps. Source attenuator for E8361C is 50 dB in 10 dB steps.
2. Receiver attenuator for E8362/3/4C is 35 dB in 5 dB steps. Receiver attenuator for E8361C is 50 dB in 10 dB steps.

PNA Series Network Analyzer

Simplified test set block diagrams – continued

High-power configuration (Model E836xCH85)
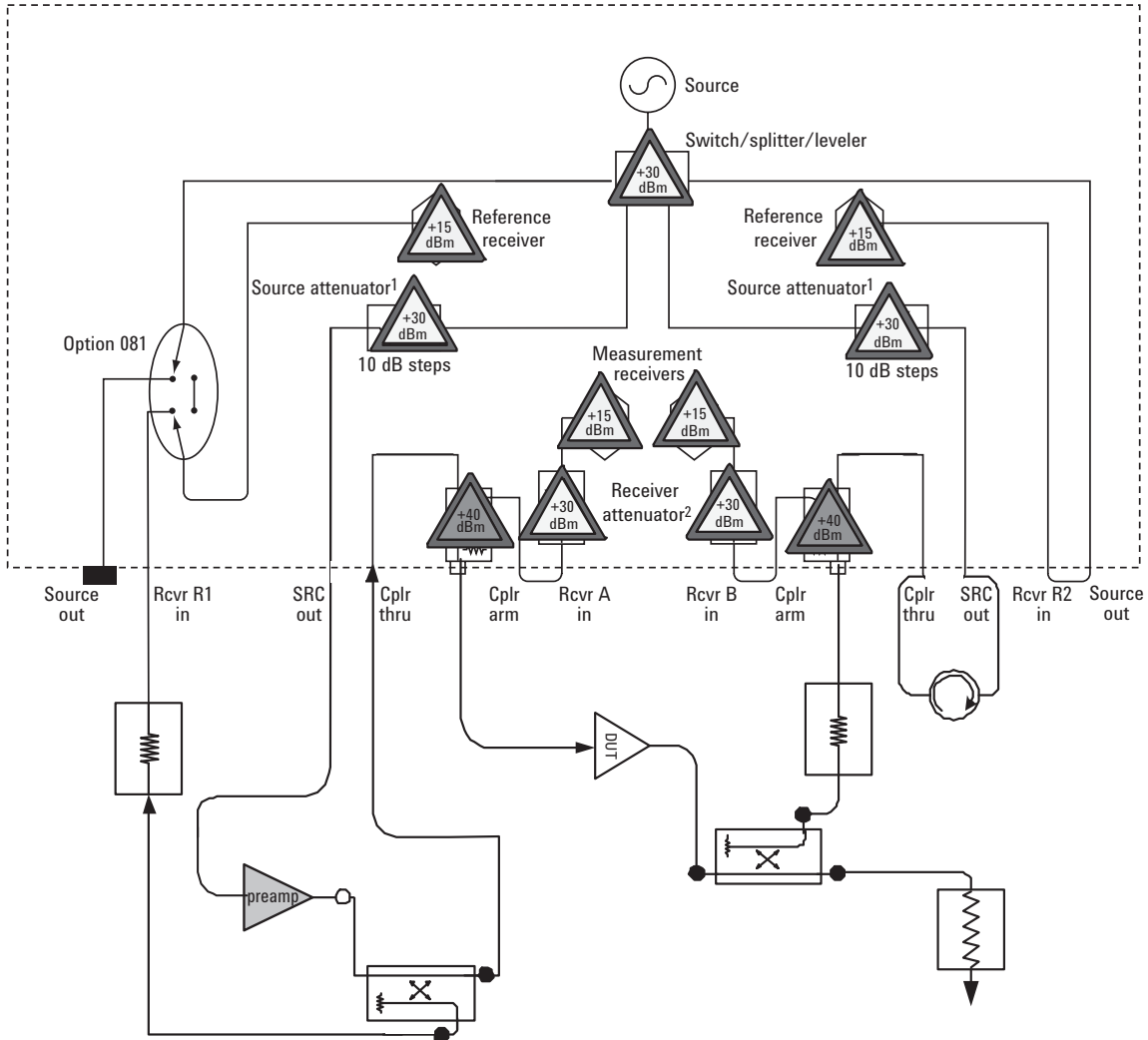
Power levels shown on the diagram are damage levels. At a minimum, keep power levels 6 dB below damage level. For optimal performance, keep the power level incident upon the receivers -20 dBm or less. This will keep the receivers out of compression.

1. Source attenuator for E8362/3/4C is 60 dB in 10 dB steps.
2. Receiver attenuator for E8362/3/4C is 35 dB in 5 dB steps.

PNA Series Network Analyzer

Simplified test set block diagrams – continued

**Fully optioned, pulse-RF, antenna, or mm-wave configuration
(Options 014, UNL, 016, 080, 081, H11)**

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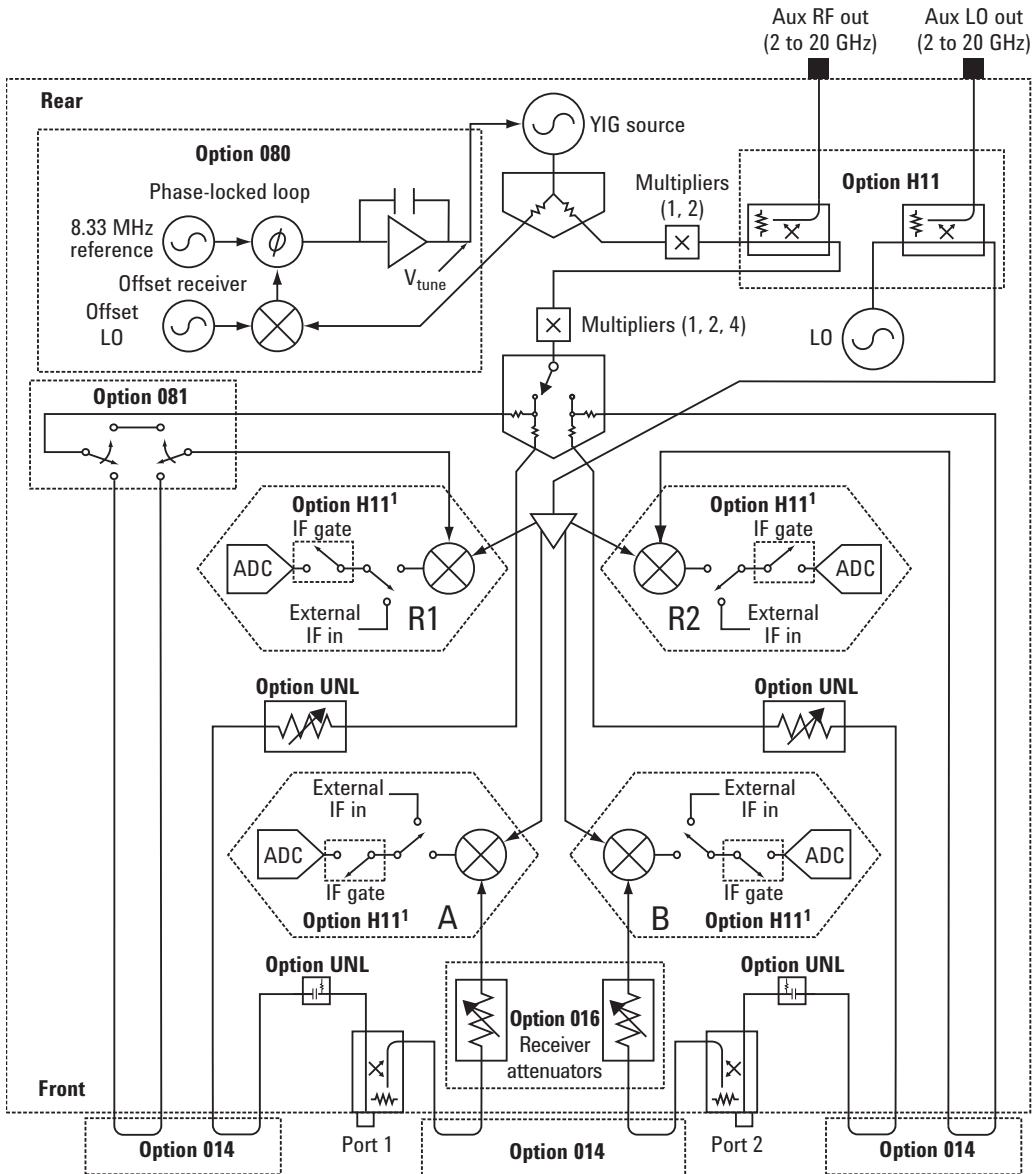
1. Option H11: IF-gate controls and external-IF inputs are accessed on rear panel.
   IF gates are enabled with Option H08. External-IF input frequency is 8.33 MHz.

PNA Series Network Analyzer

Upgrade kits
Upgrade kits for the PNA Series E8361C, E8362C, E8363C, E8364C

Upgrade kits are available to add options after initial purchase. To order an upgrade kit for the PNA series, order the analyzer's model number followed by a "U", then indicate the option to be added (for example, E8362CU-010). The current configuration and serial number of the instrument to be retrofitted are required as part of the order.

☐ **Time-domain** (Option 010)
   User installable.
☐ **Configurable test set** (Option 014)
   Provides six front-panel RF access loops.
   Includes installation at an Agilent service center.
☐ **Receiver attenuators** (Option 016)
   Includes installation at an Agilent service center.
☐ **Frequency range upgrade to an E8363C (40 GHz) PNA**
   (Option 040/041)
   Available only for the E8362C. Includes
   installation at an Agilent service center.
☐ **Frequency range upgrade to an E8364C (50 GHz) PNA**
   (Option 050/051)
   Available only for the E8362C and E8363C.
   Includes installation at an Agilent service center.
☐ **Frequency range upgrade to an E8361C (67 GHz) PNA**
   (Option 067/068)
   Available only for the E8363C and E8364C.
   Includes installation at an Agilent service center.
☐ **Frequency-offset** (Option 080)
   Includes installation at an Agilent service center.
☐ **External reference switch** (Option 081)
   Includes installation at an Agilent service center.
☐ **Scalar-calibrated converter measurements** (Option 082)
   User installable. Option 080 required.
☐ **Frequency converter measurement application** (Option 083)
   User installable. Option 080 and 081 required.
☐ **Embedded LO Measurements** (Option 084)
   Advanced software tuning that provides absolute group delay of converters with embedded LOs without the need for access to a common reference signal. The measurement result is the same as locking the DUT LO to the reference mixer LO. (Options 080 and 083 required) Requires firmware A.07.05 and above plus 1.1 GHz CPU board.
☐ **A/B to C model upgrades**
   Order E8361AU-221, E8362BU-221, E8363BU-221, or E8364BU-221

Note:

1.1 GHz CPU is required to upgrade. Please refer to Customer Support Service Guides for the correct part number http://na.tm.agilent.com/pna/documents.html

☐ **4-Port measurement application** (Option 550)
   (Available for E8361C, E8362C/3C/4C)
   Enables full 4-port error correction and differential measurements. Option 014 and external test set required. User installable.
☐ **N-port capabilities** (Option 551)
   (Available for E8361C, E8362C/3C/4C)
   Adds full N-port error correction and measurement capabilities. Option 014 and external test set required. User installable.
☐ **Extended power range** (Option UNL)
   Adds a step attenuator and a bias-tee between source and each test port. Includes installation at an Agilent service center.
☐ **Pulsed-RF measurement capability** (Option H08)
   Provides software to set up and control pulsed-RF measurements using narrowband detection, with point-in-pulse and pulse-profile capability. User installable.
☐ **IF access** (Option H11)
   Provides hardware for antenna, point-in-pulse, and millimeter-wave measurements. Adds rear-panel RF and LO outputs, external IF inputs, and IF gates (gates enabled with Option H08). Includes installation at an Agilent service center.
☐ **High-power test set** (Option H85)
   Removes bias tees for higher test port power-handling capability. Options UNL, 014, 016, 080, and 081 are required. Includes installation at an Agilent Service Center.

Calibration Software Licenses

☐ **Perpetual license for built-in performance test software for Agilent inclusive cal (Option 897)**
   Adds built-in performance testing and calibration software for self-maintainers. Requires additional equipment. See the analyzer's Service Guide for more information on equipment required.

☐ **Perpetual license for built-in performance test software for standards compliant cal (Option 898)**
   Adds built-in performance testing and calibration software for self-maintainers. Requires additional equipment. See the analyzer's Service Guide for more information on equipment required.

Note: For applications, measurement accessories, and general accessories please see *Agilent PNA Family Network Analyzers Configuration Guide*, part number 5990-7745EN.

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