PNA-X Vector Network Analyzer

NA5202A 10 MHz to 26.5 GHz

NA5204A 10 MHz to 43.5 GHz

NA5205A 10 MHz to 50 GHz

PRELIMINARY

Data subject to change

Introduction

The NA5202A/4A/5A PNA-X network analyzers simplify frequency-translating component testing with the source-per-port PNA-X. This highly configurable instrument includes four ultra-low phase noise and harmonic signal sources, two low-noise receivers, and two combiners in a single test setup. Switchable front-panel loops on the source path and direct receiver access reduce the cabling required for complex high-power testing — and the associated signal power losses. Additionally, this integrated hardware eliminates the need for external signal generators and switches in the test setup. Consolidate your design verification setup while minimizing test cycle time and the potential for errors with the new source-per-port PNA-X.

KEYSIGHT

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Definition

Specification (spec) [1]

Warranted performance. Specifications include guardbands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions. All specifications and characteristics apply over a 25 °C ± 5 °C and relative humidity of 25 to 70% range (unless otherwise stated).

The following conditions must be met:

- Instrument has been turned on for 90 minutes with VNA application running.
- Instrument is within its calibration cycle.
- Instrument remains at a stable surrounding environment temperature (between 0 °C to 40 °C) for 60 minutes prior to turn-on.

Characteristics (char.)

A performance parameter that the product is expected to meet before it leaves the factory, but that is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.)

Expected performance of an average unit at a stable temperature between 25 °C ± 5 °C for 60 minutes prior to turn-on and during operation; does not include guardbands. It is not covered by the product warranty. The instrument must be within its calibration cycle.

Nominal (nom.)

A general, descriptive term or design parameter. It is not tested, and not covered by the product warranty.

Supplemental Information

A performance parameter that is tested on sampled product during design validation. It does not include guardbands and is not covered by the product warranty.

Calibration

The process of measuring known standards to characterize an instrument's systematic (repeatable) errors.

Corrected (residual)

Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well "known" they are, plus system repeatability, stability, and noise.

Uncorrected (raw)

Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

1. For all tables in this data sheet, the specified performance at the exact frequency of a break is the better value of the two specifications at that frequency.

Dynamic Range

The specifications in this section apply to measurements under the following conditions:

- 10 Hz IF bandwidth
- No averaging applied to data
- Does not include crosstalk effects

Table 1. System dynamic range at test port

NA5202A

	Low gain mode		High gain mode	
Frequency Band	**Spec (dB)**	**Typical (dB)**	**Spec (dB)**	**Typical (dB)**
10 MHz – 45 MHz	81	85	92	95
45 MHz – 141 MHz	101	105	116	120
141 MHz – 582 MHz	113	118	129	134
582 MHz - 2.234 GHz	124	130	141	146
2.234 GHz -14 GHz	125	131	142	148
14 GHz - 21.25 GHz	122	129	140	146
21.25 GHz – 24 GHz	120	128	137	144
24 GHz - 26.5 GHz	117	124	134	141

NA5204A/NA5205A

	Low gain mode		High gain mode	
Frequency Band	**Spec (dB)**	**Typical (dB)**	**Spec (dB)**	**Typical (dB)**
10MHz - 45MHz	80	84	94	97
45MHz - 141MHz	100	104	116	121
141MHz - 582MHz	116	120	131	135
582MHz - 14GHz	124	131	141	148
14GHz - 21.25GHz	121	127	138	144
21.25GHz -35GHz	127	133	141	148
35 GHz - 42.5 GHz	123	129	137	144
42.5GHz - 50GHz	116	123	131	137

1. NA5204A is up to 43.5 GHz.

Uncorrected System Performance

Table 7. Noise mode uncorrected system performance[1]

NA5202A

	Source match	Load match	Directivity	Load Match	Source Match	Directivity	Transmission Tracking	Reflection Tracking
Frequency range	**Spec**	**Spec**	**Spec**	**Typical**	**Typical**	**Typical**	**Typical**	**Typical**
10 MHz to 22 MHz	-4	-4	-17	-8	-8	-22	1.5	1.5
22 MHz to 100 MHz	-8	-8	-20	-12	-12	-25	1.5	1.5
100 MHz to 2 GHz	-12	-12	-28	-15	-15	-32	1.5	1.5
2 GHz to 5 GHz	-14	-14	-25	-18	-18	-31	1.5	1.5
5 GHz to 12.55 GHz	-9	-9	-17	-13	-13	-21	1.5	1.5
12.55 GHz to 18 GHz	-6	-6	-14	-11	-11	-18	1.5	1.5
18 GHz to 26.5 GHz	-4	-4	-12	-9	-9	-17	1.5	1.5

NA5204A/NA5205A

	Source match	Load match	Directivity	Load Match	Source Match	Directivity	Transmission Tracking	Reflection Tracking
Frequency range	**Spec**	**Spec**	**Spec**	**Typical**	**Typical**	**Typical**	**Typical**	**Typical**
10 MHz to 22 MHz	-4	-4	-15	-8	-8	-18	1.5	1.5
22 MHz to 100 MHz	-8	-8	-20	-12	-12	-27	1.5	1.5
100 MHz to 2 GHz	-9	-9	-25	-14	-14	-31	1.5	1.5
2 GHz to 5 GHz	-14	-14	-25	-18	-18	-31	1.5	1.5
5 GHz to 12.55 GHz	-9	-9	-17	-13	-13	-21	1.5	1.5
12.55 GHz to 18 GHz	-6	-6	-11	-11	-11	-15	1.5	1.5
18 GHz to 26.5 GHz	-4	-4	-11	-8	-8	-15	1.5	1.5
26.5 GHz to 33 GHz	-4	-4	-13	-8	-8	-19	1.5	1.5
33 GHz to 42.5 GHz	-4	-4	-10	-8	-8	-14	1.5	1.5
42.5 GHz to 50 GHz	-4	-4	-6	-8	-8	-10	1.5	1.5

1. Noise mode sets noise figure switches on port 1 and port 2 to noise path.
2. NA5204A is up to 43.5 GHz/

Test Port Output

Table 8. Frequency resolution, accuracy, stability

Description	Specification	Typical
Frequency range	NA5202A 10 MHz to 26.5 GHz NA5204A 10 MHz to 43.5 GHz NA5205A 10 MHz to 50 GHz	N/A
Frequency resolution	1 Hz	N/A
Frequency accuracy	± 0.15 ppm	N/A
Initial Frequency Accuracy[1]	± 0.1 ppm	± 0.02 ppm
Frequency stability	N/A	±0.02 ppm, -20° to 70°C[2] ±0.05 ppm (first year)[3]

1 Verified after Factory Frequency Reference adjustment, or after adjustment at a Keysight Service Center.
2 Assumes no variation in time.
3. Assumes no variation in temperature Stability generally improves over time.

Table 9. Maximum output port power (dBm)

NA5202A

Frequency Band	Spec (dBm)	Typical (dBm)	Combiner, Typical (dBm)
10MHz - 32MHz	6	10	6
32MHz - 141MHz	10	13	9
141MHz - 900MHz	12	14	10
900MHz - 2.234GHz	7	10	6
2.234GHz – 14 GHz	9	13	6
14 GHz - 21.25GHz	7	11	4
21.25 GHz - 25.1GHz	4	8	1
25.1GHz - 26.5GHz	2	6	-1

NA5204A/NA5205A

Frequency Band	Spec (dBm)	Typical (dBm)	Combiner, Typical (dBm)
10MHz - 32MHz	6	11	5
32MHz - 141MHz	11	15	9
141MHz - 900MHz	12	15	10
900MHz - 2.234GHz	8	11	5
2.234GHz – 14 GHz	9	12	4
14 GHz - 21.25 GHz	5	9	0
21.25 GHz – 30 GHz	11	15	3
30GHz - 35GHz	10	14	2
35GHz - 42.5GHz	8	12	-1
42.5GHz - 46GHz	4	9	-3
46GHz - 49GHz	2	7	-7

Frequency Band	Spec (dBm)	Typical (dBm)	Combiner, Typical (dBm)
49GHz - 50GHz	0	6	-7

1. NA5204A is up to 43.5 GHz.

Table 10. Power sweep range (dB)

NA5202A

Frequency Band	ALC ON Spec (dB)	ALC ON Typical (dB)	ALC OFF Typical (dB)
10MHz - 32MHz	31	40	99
32MHz - 141MHz	35	43	102
141MHz - 900MHz	37	44	103
900MHz - 2.234GHz	32	40	99
2.234GHz – 14 GHz	34	43	102
14 GHz - 21.25GHz	32	41	100
23GHz - 25.1GHz	29	38	97
25.1GHz - 26.5GHz	27	36	95

NA5204A/NA5205A

Frequency Band	ALC ON Spec (dB)	ALC ON Typical (dB)	ALC OFF Typical (dB)
10MHz - 32MHz	31	41	100
32MHz - 141MHz	36	45	104
141MHz - 900MHz	37	45	104
900MHz - 2.234GHz	33	41	100
2.234GHz – 14 GHz	34	42	101
14 GHz - 21.25 GHz	30	39	98
21.25GHz - 30GHz	36	45	104
30GHz - 35GHz	35	44	103
35GHz - 42.5GHz	33	42	101
42.5GHz - 46GHz	29	39	98
46GHz - 49GHz	27	37	96
49GHz - 50GHz	25	36	95

1. NA5204A is up to 43.5 GHz.

Table 11. Power level accuracy (dB) [1]

NA5202A

Frequency Band	Spec (dB)	Typical (dB)
10MHz - 32MHz	+/-2.5	+/-1.25
32MHz - 141MHz	+/-1.5	+/-0.6
141MHz - 900MHz	+/-1.5	+/-0.4
900MHz - 12.5GHz	+/-1	+/-0.4
12.5GHz - 26.5GHz	+/-2	+/-0.4

NA5204A/NA5205A

Frequency Band	Spec (dB)	Typical (dB)
10MHz - 32MHz	+/-2.5	+/-1.5
32MHz - 900MHz	+/-2.0	+/-0.6
900MHz - 12.5GHz	+/-1.5	+/-0.4
12.5GHz - 30GHz	+/-2.0	+/-0.6
30GHz - 42.5GHz	+/-2.0	+/-0.8
42.5GHz - 50GHz	+/-2.5	+/-1

Table 12. Power level linearity (dB) [1]

NA5202A

	ALC ON				
	-25 dBm to -15 dBm	> -15 dBm	-30 dBm to -25 dBm	-25 dBm to -15 dBm	> -15 dBm
Frequency Band	Spec (dB)	Spec (dB)	Typical (dB)	Typical (dB)	Typical (dB)
10MHz - 32MHz	+/-1.5	+/-1.0	+/- 0.7	+/-0.3	+/-0.2
32MHz - 141MHz	+/-1.0	+/-1.0	+/- 0.7	+/-0.3	+/-0.2
141MHz - 900MHz	+/-1.0	+/-1.0	+/- 0.7	+/-0.3	+/-0.2
900MHz - 12.5GHz	+/-1.0	+/-1.0	+/- 0.5	+/-0.2	+/-0.2
12.5GHz - 26.5GHz	+/-1.0	+/-1.0	+/- 0.3	+/-0.2	+/-0.2

NA5202A

	ALC OFF		
	-90 dBm to -80 dBm	-80 dBm to -45 dBm	> -45 dBm
Frequency Band	Typical (dB)	Typical (dB)	Typical (dB)
10 MHz – 141 MHz	--	+/-3.5	+/-0.8

	ALC OFF		
	-90 dBm to -80 dBm	-80 dBm to -45 dBm	> -45 dBm
141 MHz – 900 MHz	--	+/-1.3	+/-0.2
900MHz - 4.4 GHz	+/-1.5	+/-1.3	+/-0.2
4.4GHz – 23 GHz	+/-1.3	+/-0.5	+/-0.2
23GHz - 26.5 GHz	+/-1.3	+/-0.8	+/-0.3

NA5204A/NA5205A

	ALC ON				
	25 dBm to -15 dBm	> -15 dBm	-30 dBm to -25 dBm	-25 dBm to -15 dBm	> -15 dBm
Frequency Band	Spec (dB)	Spec (dB)	Typical (dB)	Typical (dB)	Typical (dB)
10MHz - 900MHz	+/-2.0	+/-1.0	+/-1.5	+/-0.6	+/-0.2
900MHz - 12.5GHz	+/-1.5	+/-1.0	+/-1	+/-0.2	+/-0.2
12.5GHz - 50GHz	+/-1.0	+/-1.0	+/-0.5	+/-0.2	+/-0.2

1. NA5204A is up to 43.5 GHz.

NA5204A/NA5205A

	ALC OFF		
	-90 dBm to -80 dBm	-80 dBm to -45 dBm	> -45dBm
Frequency Band	Typical (dB)	Typical (dB)	Typical (dB)
10MHz - 900MHz	TBD	TBD	TBD
900MHz - 12.5GHz	TBD	TBD	TBD
12.5GHz - 50GHz	TBD	TBD	TBD

1. NA5204A is up to 43.5 GHz.

Table 13. Harmonics and spurs (dBc)

NA5202A

Fundamental Frequency	2nd Harmonics @ 0 dBm output (dBc)	2nd Harmonics @ maximum power output (dBc)
10 MHz - 22 MHz	-47	-35
22 MHz - 141 MHz	-55	-46
141 MHz - 480 MHz	-64	-57
480 MHz - 5 GHz	-65	-61
5 GHz - 13.25 GHz	-69	-61

Fundamental Frequency	3rd Harmonics @ 0 dBm output (dBc)	3rd Harmonics @ maximum power output (dBc)
10 MHz - 22 MHz	-52	-36
22 MHz - 141 MHz	-71	-58
141 MHz - 480 MHz	-71	-65
480 MHz - 5 GHz	-71	-65
5 GHz - 8.85 GHz	-72	-65

Fundamental frequency	Sub Harmonics @ 0 dBm output (dBc)	Sub Harmonics @ maximum power output (dBc)
22 MHz - 45 MHz	-69	-64
45 MHz - 82 MHz	-69	-64
82 MHz - 141 MHz	-68	-64
141 MHz - 480 MHz	-73	-73
480 MHz - 26.5 GHz	-84	-80

Fundamental frequency	Non-Harmonic Spurs @ 0 dBm output (dBc)
10 MHz - 814 MHz	-81
814 MHz - 6 GHz	-77
6 GHz – 12.55 GHz	-75
12.55 GHz – 23.6 GHz	-72
23.6 GHz – 26.5 GHz	-67

NA5204A/NA5205A

Fundamental frequency	2nd Harmonics @ 0 dBm output (dBc)	2nd Harmonics @ maximum power output (dBc)
10 MHz - 22 MHz	-46	-36
22 MHz - 141 MHz	-56	-48
141 MHz - 5 GHz	-65	-60
5 GHz - 16.7 GHz	-70	-63
16.7 GHz - 18 GHz	-70	-63
18 GHz - 25 GHz	-60	-48

Fundamental frequency	3rd Harmonics @ 0 dBm output (dBc)	3rd Harmonics @ maximum power output (dBc)
10 MHz - 22 MHz	-56	-42
22 MHz - 141 MHz	-71	-60
141 MHz - 5 GHz	-73	-67
5 GHz - 16.7 GHz	-73	-67

Fundamental frequency	Sub Harmonics @ 0 dBm output (dBc)	Sub Harmonics @ maximum power output (dBc)
22 MHz - 45 MHz	-71	-68
45 MHz - 82 MHz	-71	-70
82 MHz - 141 MHz	-71	-70
141 MHz - 480 MHz	-73	-72
480 MHz - 5 GHz	-83	-83
5 GHz - 11.8 GHz	-76	-77
11.8 GHz - 18 GHz	-56	-58
18 GHz - 50 GHz	-45	-46

Fundamental frequency	Non-Harmonic Spurs @ 0 dBm output (dBc)
10 MHz - 814 MHz	-81
814 MHz - 6 GHz	-77
6 GHz – 12.55 GHz	-75
12.55 GHz – 23.6 GHz	-72
23.6 GHz – 50 GHz	-67

Table 14. Nominal power (Preset Power Level)

Description	Specification
Nominal Power (Preset Power Level)	-5 dBm

Table 15. Power resolution, maximum/minimum settable power

Description	Specification	Typical
Settable resolution	--	0.01 dB
Maximum settable power	--	+30 dBm
Minimum settable power	--	-100 dBm

Table 16. Phase noise with option UNY (dBc/Hz)

	Offset frequency					
Frequency	**100 Hz**	**1 kHz**	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
1 GHz	-111	-115	-138	-146	-154	-154
5 GHz	-100	-101	-126	-134	-149	-150
10 GHz	-93	-95	-120	-128	-142	-146
20 GHz	-87	-89	-114	-122	-137	-140
26.5 GHz	-86	-86	-111	-120	-136	-139

Table 17. Phase noise without option UNY (dBc/Hz)

			Offset frequency			
Frequency	**100 Hz**	**1 kHz**	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
1 GHz	-91	-114	-131	-141	-150	-153
5 GHz	-78	-101	-117	-128	-138	-146
10 GHz	-72	-94	-111	-121	-132	-140
20 GHz	-66	-88	-105	-115	-126	-134
26.5 GHz	-64	-86	-103	-113	-123	-131

Test Port Input

Table 18. Test port noise floor (dBm)

NA5202A

	Low gain mode		High gain mode	
Frequency band	**Spec (dBm)**	**Typical (dBm)**	**Spec (dBm)**	**Typical (dBm)**
10 MHz – 45 MHz	-70	-74	-81	-84
45 MHz – 141 MHz	-88	-91	-100	-104
141 MHz – 582 MHz	-100	-104	-115	-118
582 MHz – 26.5 GHz	-111	-116	-130	-133

NA5204A/NA5205A

	Low gain mode		High gain mode	
Frequency band	**Spec (dBm)**	**Typical (dBm)**	**Spec (dBm)**	**Typical (dBm)**
10MHz - 45MHz	-67	-71	-81	-85
45MHz - 141MHz	-82	-87	-100	-104
141MHz - 900MHz	-98	-102	-114	-118
900MHz - 26.5GHz	-111	116	-129	-133
26.5GHz -35GHz	-113	-117	-128	-132
35GHz - 50GHz	-109	-114	-125	-130

1. NA5204A is up to 43.5 GHz.

Table 19. Receiver compression at test port

NA5202A

		Specification	
Description	**Input power at test port (dBm)**	**Magnitude (dB)**	**Phase (°)**
500 MHz to 5.556 GHz	12	0.3	1.5
5.556 GHz to 8.819 GHz	13	0.3	1.5
8.819 GHz to 11.1 GHz	14	0.3	1.5
11.1 GHz to 15.8 GHz	15	0.3	1.5
15.8 GHz to 23 GHz	15	0.3	1.5
23 GHz to 26.5 GHz	14	0.3	1.5

NA5204A/5A

		Specification	
Description	**Input power at test port (dBm)**	**Magnitude (dB)**	**Phase (°)**
500 MHz to 5.556 GHz	12	0.3	1.5
5.556 GHz to 8.819 GHz	13	0.3	1.5
8.819 GHz to 11.1 GHz	14	0.3	1.5

	Specification		
Description	Input power at test port (dBm)	Magnitude (dB)	Phase (°)
11.1 GHz to 15.8 GHz	15	0.3	1.5
15.8 GHz to 23 GHz	15	0.3	1.5
23 GHz to 26.5 GHz	14	0.3	1.5
26.5 GHz to 28 GHz	13	0.3	4
28 GHz to 29 GHz	12	0.3	4
29 GHz to 33 GHz	11	0.3	4
35.258 GHz to 39.34 GHz	10	0.3	4
39.34 GHz to 44.4 GHz	10	0.3	4
44.4 GHz to 50 GHz	11	0.3	4

Table 20. Trace Noise Magnitude (dB rms) [1]

NA5202A

	Spec	Typical		
Frequency band	IFBW = 1 kHz	IFBW = 1 kHz	IFBW =100 kHz	IFBW = 600 kHz
10 MHz to 900 MHz	0.03	0.019	0.17	0.39
900 MHz to 23 GHz	0.0015	0.00055	0.0023	0.0049
23 GHz to 26.5 GHz	0.0025	0.00065	0.0023	0.0047

1. Low gain mode -5 dBm

NA5204A/NA5205A

	Spec	Typical		
Frequency band	IFBW = 1 kHz	IFBW = 1 kHz	IFBW =100 kHz	IFBW = 600 kHz
10 MHz to 67 MHz	0.15	0.04	0.4	0.96
67 MHz to 100 MHz	0.01	0.004	0.04	0.091
100 MHz to 582 MHz	0.002	0.0017	0.016	0.036
582 MHz to 1.14 GHz	0.002	0.0006	0.0025	0.0058
1.14 GHz to 21.25 GHz	0.002	0.0006	0.0022	0.0052
21.25 GHz to 35.28 GHz	0.002	0.0006	0.002	0.0047
35.28 GHz to 50 GHz	0.002	0.0007	0.0023	0.0058

1. Low gain at -5 dBm

Table 21. Trace noise phase (degree rms) [1]

NA5202A

	Spec	Typical		
Frequency band	**IFBW = 1 kHz**	**IFBW = 1 kHz**	**IFBW =100 kHz**	**IFBW = 600 kHz**
10 MHz to 205 MHz	0.26	0.13	1.21	2.91
205 MHz to 900 MHz	0.01	0.0036	0.037	0.061
900 MHz to 9 GHz	0.01	0.0036	0.011	0.027
9 GHz to 14 GHz	0.02	0.0065	0.013	0.03
14 GHz to 18 GHz	0.02	0.0065	0.015	0.03
18 GHz to 26.5 GHz	0.032	0.01	0.015	0.034

1. Low gain at -5 dBm

NA5204A/NA5205A

	Spec	Typical		
Frequency band	**IFBW = 1 kHz**	**IFBW = 1 kHz**	**IFBW =100 kHz**	**IFBW = 600 kHz**
10 MHz to 67 MHz	0.6	0.28	3	7
67 MHz to 141 MHz	0.05	0.028	0.28	1
141 MHz to 582 MHz	0.011	0.007	0.072	0.17
582 MHz to 9 GHz	0.0047	0.0025	0.018	0.04
9 GHz to 12.5 GHz	0.006	0.003	0.018	0.04
12.5 GHz to 27 GHz	0.013	0.0054	0.017	0.04
27 GHz to 50 GHz	0.03	0.013	0.027	0.05

2. Low gain at -5 dBm

Table 23. Damage input level at test ports

Description	
Damage Input Level	+27 dBm or ± 35 VDC (Warranted)

Noise Receiver Input

Table 25. Receiver Noise Figure (dB)

NA5202A

Description	Specification	Typical
10 MHz to 22 MHz	37	26
22 MHz to 100 MHz	17	13
100 MHz to 3.2 GHz	15	13
3.2 GHz to 6 GHz	17	15
6 GHz to 9 GHz	19	16
9 GHz to 26.5 GHz	17	14

1. IFBW = 4 MHz, 30 dB Gain

NA5204A/NA5205A

Description	Specification	Typical
10 MHz to 22 MHz	62	37
>22 MHz to 100 MHz	21	28
>100 MHz to 3.2 GHz	20	16
>3.2 GHz to 9 GHz	25	19
>9 GHz to 21.25 GHz	17	15
>21.25 GHz to 33 GHz	19	18
>33 GHz to 46 GHz	23	21
>46 GHz to 50 GHz	25	21

1. IFBW = 4 MHz, 30 dB Gain
2. NA5204A is up to 43.5 GHz.

Table 26. Noise figure trace noise (dB rms) at 4 MHz BW

Description	Specification	Typical
10 MHz to 26.5 GHz (NA5202A)	0.15	0.1
10 MHz to 43.5/50 GHz (NA5204A/5A)	0.15	0.1

Table 27. Noise receiver linearity (dB) at 4 MHz BW [1] – specification

NA5202A

30 dB gain, Reference to -60 dBm	15 dB Gain, Reference to -60 dBm	0 dB Gain, Reference to -20 dBm	-15 dB Gain, Reference to -20 dBm	Specification
-86 dBm to -46 dBm	-75 dBm to -31 dBm	-42 dBm to -2 dBm	-42 dBm to -34 dBm	0.08
>-46 dBm to -36 dBm	>-31 dBm to -29 dBm	>-2 dBm to 3 dBm	>-34 dBm to 3 dBm	0.1

NA5204A/NA5205A

30 dB gain, Reference to -60 dBm	15 dB Gain, Reference to -60 dBm	0 dB Gain, Reference to -20 dBm	-15 dB Gain, Reference to -20 dBm	Specification
-86 dBm to -46 dBm	-75 dBm to -31 dBm	-42 dBm to -2 dBm	-35 dBm to 3 dBm	0.08
>-46 dBm to -36 dBm	>-31 dBm to -29 dBm	>-2 dBm to 3 dBm	>3 dBm to 5 dBm	0.1

1. NA5204A is up to 43.5 GHz.

Table 28. Noise receiver input range – specification

NA5202A

Description	Max DUT NF + Gain (dB) [1]				Max Input Power (dBm) for <0.1 dB Compression[2]			
	30 dB Gain	15 dB Gain	0 dB Gain	-15 dB Gain	30 dB Gain	15 dB Gain	0 dB Gain	-15 dB Gain
50 MHz to 2.68 GHz	54	54	72	89	-35	-35	-17	0
500 MHz to 5.56 GHz	52	54	73	89	-37	-35	-16	0
5.56 GHz to 7 GHz	53	56	74	89	-36	-33	-15	0
7 GHz to 8.82 GHz	53	62	74	89	-36	-27	-15	0
8.82 GHz to 17.629 GHz	49	61	73	89	-40	-28	-16	0
17.629 GHz to 26.5 GHz	49	61	74	84	-40	-28	-15	-5

1 Limited by 0.1 dB receiver compression. Applies to devices with bandwidth bandwidths, calculate the DUT output noise power as -174 dBm + 10*log10(B) + Gain (dB) + NF (dB), where B is the bandwidth of the DUT in Hz, and use the Max Input Power specification.
2 Derived from ensuring < 0.25 dB compression with a CW signal 5 dB higher than the stated max input power value for 0.1 dB compression. Referenced to test port 2.

NA5204A/NA5205A

Description	Max DUT NF + Gain (dB) [1]				Max Input Power (dBm) for <0.1 dB Compression[2]			
	30 dB Gain	15 dB Gain	0 dB Gain	-15 dB Gain	30 dB Gain	15 dB Gain	0 dB Gain	-15 dB Gain
50 MHz to 2.68 GHz	51	54	72	89	-38	-35	-17	0
500 MHz to 5.56 GHz	52	54	73	89	-37	-35	-16	0
5.56 GHz to 7 GHz	53	56	74	89	-36	-33	-15	0
7 GHz to 8.82 GHz	53	63	74	89	-36	-26	-15	0
8.82 GHz to 15.8 GHz	49	62	73	89	-40	-27	-16	0
15.8 GHz to 17.629 GHz	49	63	73	89	-40	-26	-16	0
17.629 GHz to 21.25 GHz	49	62	73	89	-40	-27	-16	0
21.25 GHz to 27 GHz	49	62	74	89	-40	-27	-15	0
27 GHz to 35 GHz	49	61	74	89	-40	-28	-15	0
35 GHz to 39.34 GHz	44	59	68	89	-45	-30	-21	0
39.34 GHz to 44.4 GHz	44	59	69	84	-45	-30	-20	-5
44.4 GHz to 50 GHz	44	61	69	84	-45	-28	-20	-5

1 Limited by 0.1 dB receiver compression. Applies to devices with bandwidth bandwidths, calculate the DUT output noise power as -174 dBm + 10*log10(B) + Gain (dB) + NF (dB), where B is the bandwidth of the DUT in Hz, and use the Max Input Power specification.
2 Derived from ensuring < 0.25 dB compression with a CW signal 5 dB higher than the stated max input power value for 0.1 dB compression. Referenced to test port 2.

General Information

Table 44. Miscellaneous information

Description	Supplemental Information
System IF Bandwidth Range	1 Hz to 15 MHz., nominal. 20 MHz and 30 MHz nominal (Option W1F)
CPU	For the latest information on CPUs and associated hard drives, visit: PNA Hard Drives and CPUs (keysight.com)
LXI	CPU version 10.0
	LXI 1.5 Extended Functions: HiSLIP; VSI-11 Discovery and Identification
Maximum Number of Points	100003

Table 45. Front panel information, all options

Description	Typical performance
RF Connectors	
Test Ports	NA5202A 3.5 mm (male), 50 ohm (nominal), 0.002 in. Center Pin Recession (characteristic) NA5204A/5A 2.4 mm (male), 50 ohm (nominal), 0.002 in. Center Pin Recession (characteristic)
Jumpers	NA5202A 3.5 mm (female) connectors with SMA (male) jumper cables NA5204A/5A 2.4 mm (female) connectors with 2.4 mm (male) jumper cables
USB 2.0 Ports - Primary (4 ports)	
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Display	
Size	31 cm (12.1 in) diagonal color active matrix LCD; 1280 (horizontal) X 800 (vertical) resolution
Refresh Rate	Vertical 60 Hz; Horizontal 49.31 kHz
Pixels	Any of the following would cause a display to be considered faulty: A complete row or column consists of “stuck” or “dark” pixels. More than six “stuck on” pixels (but not more than three green) or more than 0.002% of the total pixels are within the LCD specifications. More than twelve “dark” pixels (but no more than seven of the same color) or more than 0.004% of the total pixels are within the LCD specifications. Two or more consecutive "stuck on" pixels or three or more consecutive "dark" pixel (but no more than one set of two consecutive dark pixels). “Stuck on” pixels or more than two “dark” pixels less than 6.5 mm apart (excluding consecutive pixels).
Display Range	
Magnitude	±2500 dB (at 500 dB/div), max
Phase	±2500° (at 500 degrees/div), max
Polar	10 pUnits, min 10,000 Units, max
Display Resolution	
Magnitude	0.001 dB/div, min
Phase	0.01°/div, min
Marker Resolution	
Magnitude	0.001 dB, min
Phase	0.01°, min
Polar	10 pUnit, min

Table 46. Rear panel information, all options

Description	Typical performance	
External Reference In		
Connector	BNC, female	
Input Frequency	10 MHz ±0.3 ppm, 100 MHz ±0.3 ppm	
Input Level	10 MHz: -15 dBm to +20 dBm 100 MHz: -10 dBm to +20 dBm	
Input Impedance	50 Ω, nom.	
10 MHz Reference Out		
Connector	BNC, female	
Output Frequency	10 MHz ±0.7 ppm, 100 MHz ±0.7 ppm	
Signal Type	Sine Wave	
Output Level	+10 dBm ±4 dB into 50 Ω	
Output Impedance	50 Ω, nominal	
Harmonics	<-40 dBc, typical	
External IF Inputs (Option D1F)		
Function	Allows use of external IF signals from remote mixers, bypassing the PNA's first converters	
Connectors	SMA (female); A, B, C, D, R1, R2, R3, R4 (4-port); A, B, R1, R2 (2-port)	
Input Impedance	50 Ω	
RF Damage Level	+23 dBm	
DC Damage Level	5.5 VDC	
0.1 dB Compression Point Normal IF path Narrowband IF path	 -9.0 dBm at 7.438 MHz -17 dBm at 10.70 MHz	
External IF Outputs (Option D1F)		
Function	Allows use of wideband IF signals from internal mixers	
Connectors	SMA (female); A, B, C, D, R1, R2, R3, R4 (4-port); A, B, R1, R2 (2-port)	
Bandwidth	Up to 5 GHz	
Pulse I/O Connector		
Connector type	15-pin mini D-sub (for pin assignment information, refer to the PNA online help)	
Pulse Inputs (IF Gates)		
Function	Internal receiver gates used for point-in-pulse and pulse-profile measurements	
Input Impedance	1 K Ohm	
Source Modulators	20 ns minimum pulse width	
Input Impedance	50 Ω	
RF Damage Level	+23 dBm	
DC Damage Level	5.5 VDC	
Drive Voltage	0 V (off), +3.3 V (on), nominal	
External Test Set Driver		
Function	Used for driving remote mixers	
Connections	3.5 mm (female)	
LO Output Frequency Range	0.01 GHz to 26.5 GHz	
Rear Panel LO Power	**NA5202A**	
Frequency Band	**Lower Limit, Typical (dBm)**	**Upper Limit, Typical (dBm)**
10MHz - 15MHz	-9	11

Description	Typical performance	
15MHz - 1.5GHz	-4	3
1.5GHz-15.8GHz	-2.5	2.5
15.8GHz-22.2GHz	-3.5	3.5
22.2GHz-26.5GHz	-3	4
Rear Panel LO Power	**NA5204A/NA5205A**	
Frequency Band	**Lower Limit, Typical (dBm)**	**Upper Limit, Typical (dBm)**
10MHz - 2.681GHz	-4	3.5
2.681GHz - 19.67GHz	-3	2
19.67GHz-31.6GHz	-5	5
31.6GHz-39.34GHz	-3	2
39.34GHz-50GHz	-4	4
Bias Tee Inputs		
Connectors	BNC(f) for ports 1, 2, 3 and 4	
Fuse	500 mA, bi-pin style	
Maximum Bias Current	±200 mA with no degradation of RF specifications	
Maximum Bias Voltage	±40 VDC	
Other Rear Panel Interface		
Trigger Inputs/Outputs	BNC(f), TTL/CMOS compatible	
Test Set IO	25-pin D-Sub connector, available for external test set control	
Power IO	9-pin D-Sub, female; analog and digital IO	
Handler IO	37-pin D-Sub connector; all input/output signals are default set to negative logic; can be reset to positive logic via GPIB command	
GPIB	Two ports - dedicated controller and dedicated talker/listener. 24-pin D-sub (Type D-24), female; compatible with IEEE-488	
28 V	28 volts switched for noise source	
CPU Version	10.0	
USB-A Ports	Four SuperSpeed USB ports (900 mA each) and one USB device port. There are also four USB-A ports (500 mA each) on the front panel. The total current limit for all rear panel USB-A ports is 3.6 amps. The total current limit for all front panel USB-A ports is 2 amps.	
USB-C (Host)	Two USB-C connectors with support for USB-3.1. Thunderbolt3, and Display Port. max Power Delivery of 15W at 5V or 36W at 15V each	
LAN	1G and 10G ports; 10GBASE-T, Ethernet, 8-pin configuration; auto selects between the data rates. Works with Cat6/Cat7 cable.	
DisplayPort	Standard DisplayPort connector for connection to external displays	
Line Power		
Frequency, Voltage	50/60/400 Hz for 100/120 VAC 50/60 Hz for 220/240 VAC	
	Power supply is auto switching	
Max	900 W	

1 High power devices require external power supply.

Table 47. Analyzer dimensions and weight

All models are shipped with bottom feet, handles and front and rear hardware.

Cabinet Dimensions

Height	**Metric (mm)**	**Imperial (inches)**
Without bottom feet:EIA RU[1] = 6	267	10.5
With bottom feet	282	11.1
Width	**Metric (mm)**	**Imperial (inches)**
Without handles or rack-mount flanges	426	16.8
With handles, without rack-mount flanges	573	22.6
With handles and rack-mount flanges	TBD	TBD
Depth	**Metric (mm)**	**Imperial (inches)**
Without front and rear panel hardware	591	23.3
With front and rear panel hardware, handles	629	24.8
Weight (nominal)	**Net**	**Shipping**
NA5202A 2-port models	99.2 lbs, 45.0 kg	TBD
NA5202A 4-port models	118.4 lbs, 53.7 kg	TBD
NA5204A/5A 2-port models	103 lbs, 46.7 kg	TBD
NA5204A/5A 4-port models	123.2 lbs, 55 kg	TBD

Table 48. Environmental and physical specifications

Description		
Description	Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of Storage, Transportation and End-use; those stresses include, but are not limited to, temperature, humidity, shock, vibration, altitude, and power line conditions. Test Methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.	
Temperature	Operating	0 to 40 °C ambient
	Non-operating	-10 to 60 °C
Humidity	Operating	Type tested at 20 to 80 %, wet bulb temperature < 29 °C (non-condensing)
	Non-operating	Type tested at 20 to 90 %, wet bulb temperature < 40 °C (non-condensing)
Altitude	Operating/non-operating	Up to 4,572 meters (15,000 feet)
Vibration	Operating	0.21 G maximum, 5 Hz to 500 Hz
	Non-operating	0.5 G maximum, 5 Hz to 500 Hz
Instrument protection	IP 30 IEC/EN 60529	
Warm-up time	90 minutes	

Regulatory and Environmental Information

For Regulatory and Environmental information, refer to the PNA Series Installation and Quick Start Guide, located online at http://literature.cdn.keysight.com/litweb/pdf/E8356-90001.pdf.

Currently, there is no NA520xA certification available for CE and South Korean Certification (KC) mark for the identifier code: Kst-WN24938.

PNA-X Test Set Configuration Details

This section describes test set options in more detail and provides block diagrams. The block diagrams include additional hardware options that are not part of the test set options, such as pulse modulators, receiver attenuators, a noise receiver on Port 1, a combiner on Port 2, and IF access. Refer to the section “Hardware options” for a complete list. Also refer to the product data sheet and technical overview for more information.

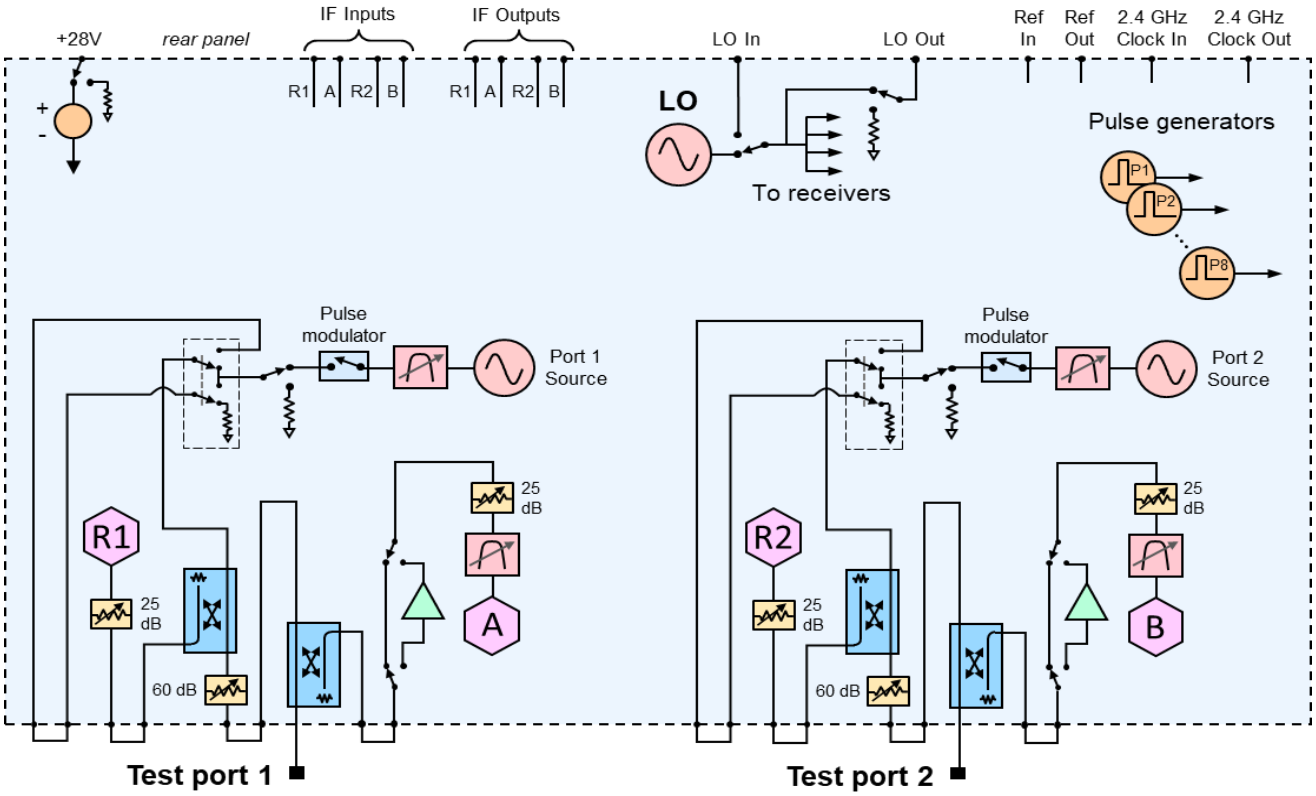
2-port test set options

Two-port test set options come with two sources. Setting the two sources to different frequencies requires Option 2SS and one of these software licenses: S93080/029/082/083/084/086/087/089/090x/093/094B.

If the bias tees are not included, the maximum power rating on the test port couplers is +43 dBm. If the bias tees are included, the maximum power rating on the test port couplers is limited to +30 dBm. In either case, additional attenuators or isolators are typically required to protect other components inside the instrument.

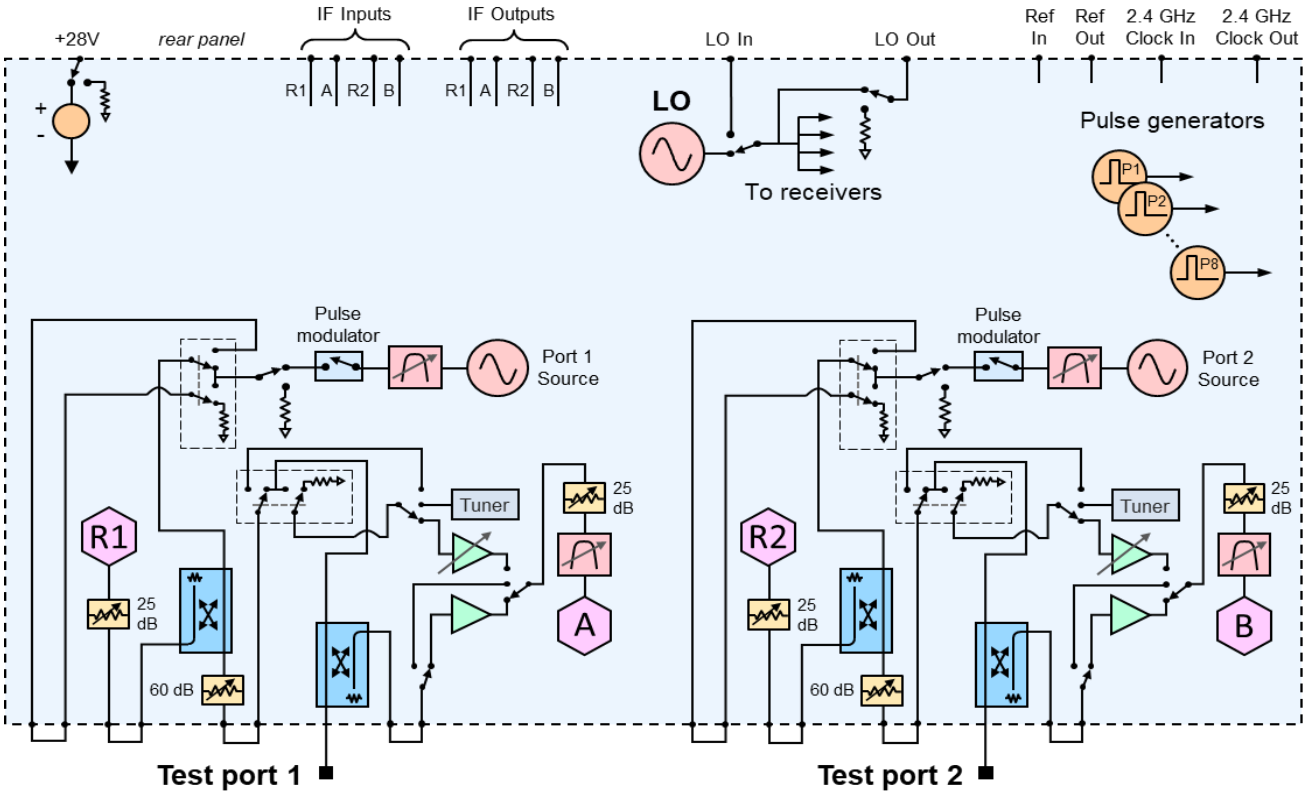
2-ports, source attenuators, with configurable test set (Option 231)

This 2-port test set option comes with four front-panel access loops, a source attenuator, and a switched-gain test receiver with pre-selection filters for each port. The loops provide access to the signal path (a) between the source output and the reference receiver, (b) between the source output and the directional coupler thru arm, (c) between the coupled arm of the directional coupler and the test port receiver, and (d) to the mechanical switch of the source output as a switchable source loop. It also comes with eight pulse generators and optional receiver attenuators and pulse modulators.



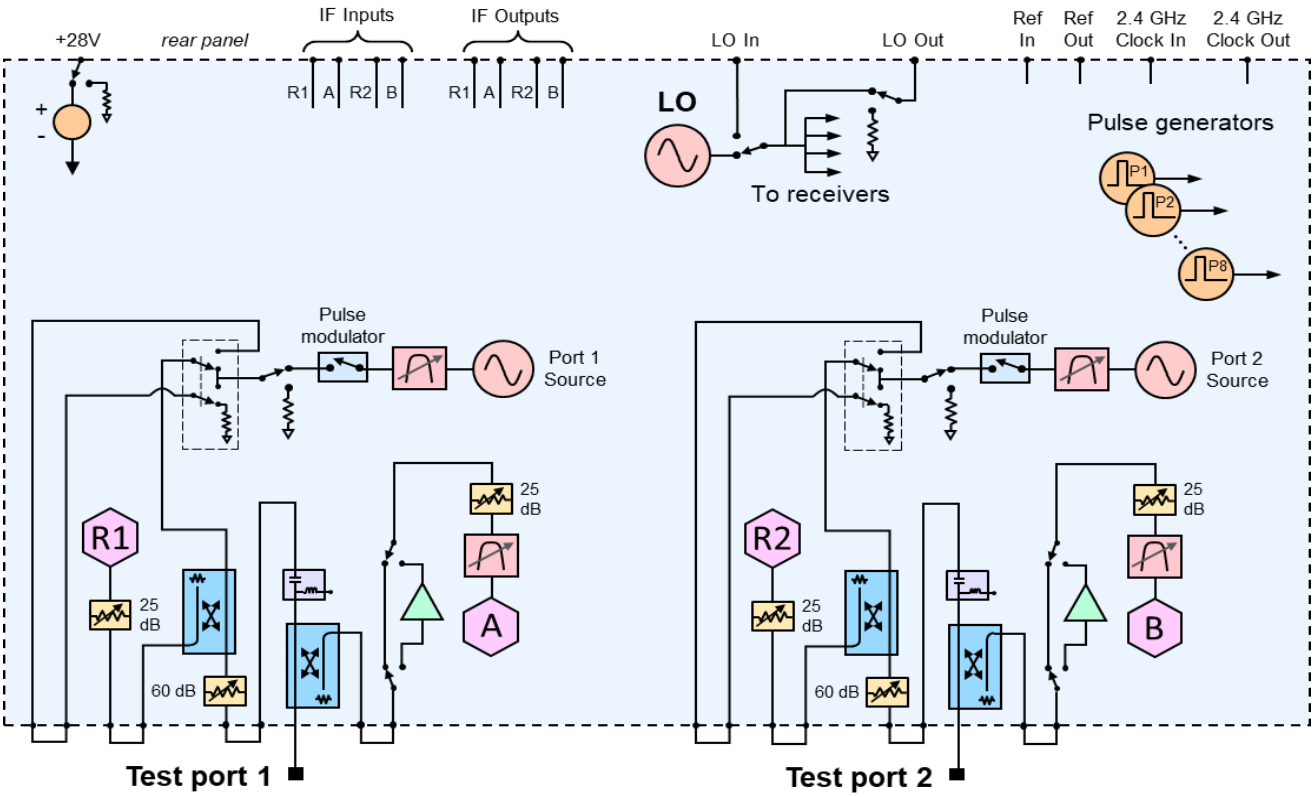
2-ports, source attenuators, low-noise receivers with configurable test set (Option 239)

This test set option includes the same hardware as Option 231: four front-panel access loops, a source attenuator, and a switched-gain test receiver with pre-selection filters for each port, and also comes with eight pulse generators and optional receiver attenuators and pulse modulators. In addition, this option provides a low-noise receiver on port 2 and a noise tuner on port 1. Option NR1 adds a low-noise receiver to port 1 and a built-in noise tuner to port 2 for reverse noise figure measurements.



2-ports, source attenuators, bias tees, with configurable test set (Option 241)

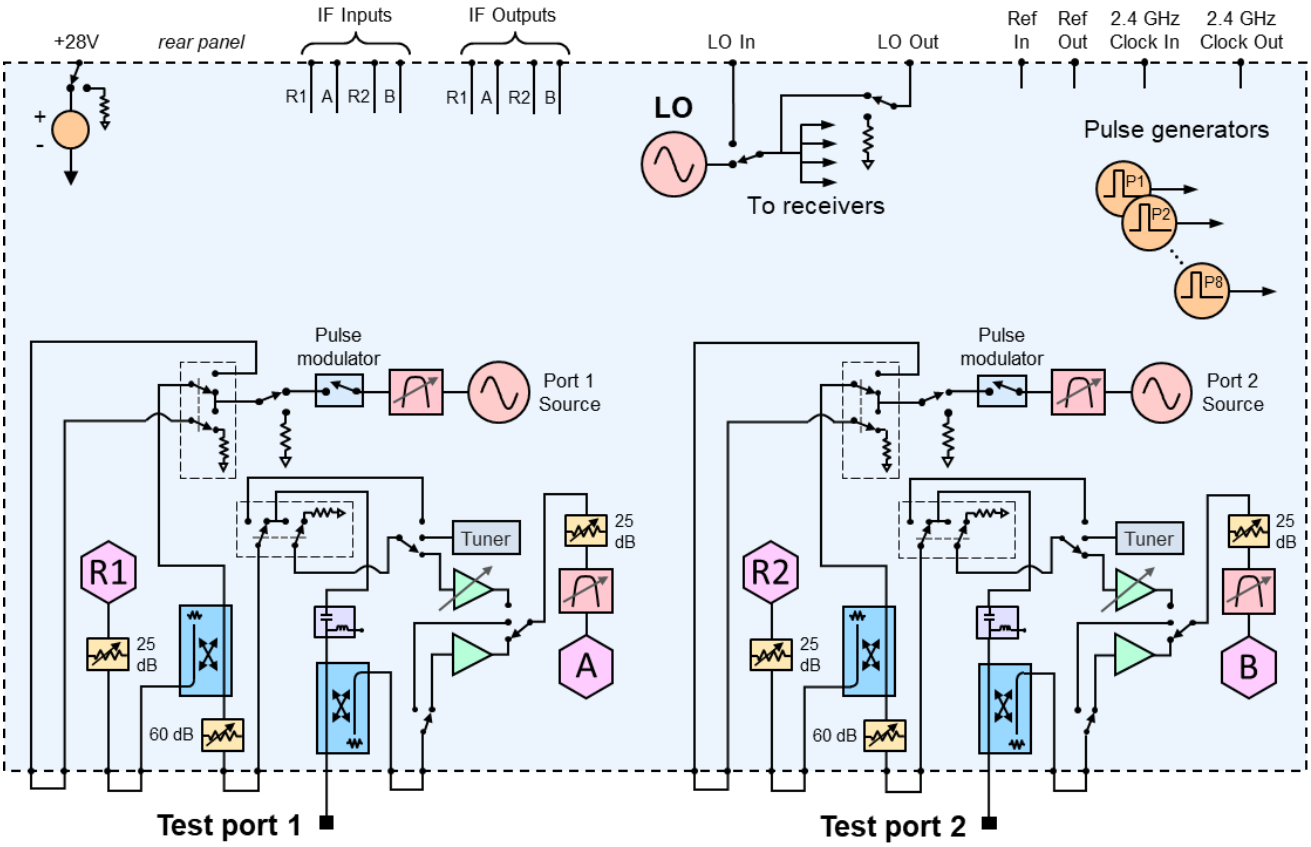
This test set option includes the same hardware as Option 231: four front-panel access loops, a source attenuator, and a switched-gain test receiver with pre-selection filters for each port, and eight pulse generators and optional receiver attenuators and pulse modulators. In addition, this option provides bias tees for each port.



2-ports, source attenuators, bias tees, low-noise receiver with configurable test set (Option 249)

This test set option includes the same hardware as Option 241: four front-panel access loops, a source attenuator, a switched-gain test receiver with pre-selection filters, and a bias tee for each port, and eight pulse generators and optional receiver attenuators and pulse modulators. In addition, this option provides

low-noise receiver on port 2 and a noise tuner on port 1. Option NR1 adds a low-noise receiver to port 1 and a built-in noise tuner to port 2 for reverse noise figure measurements.



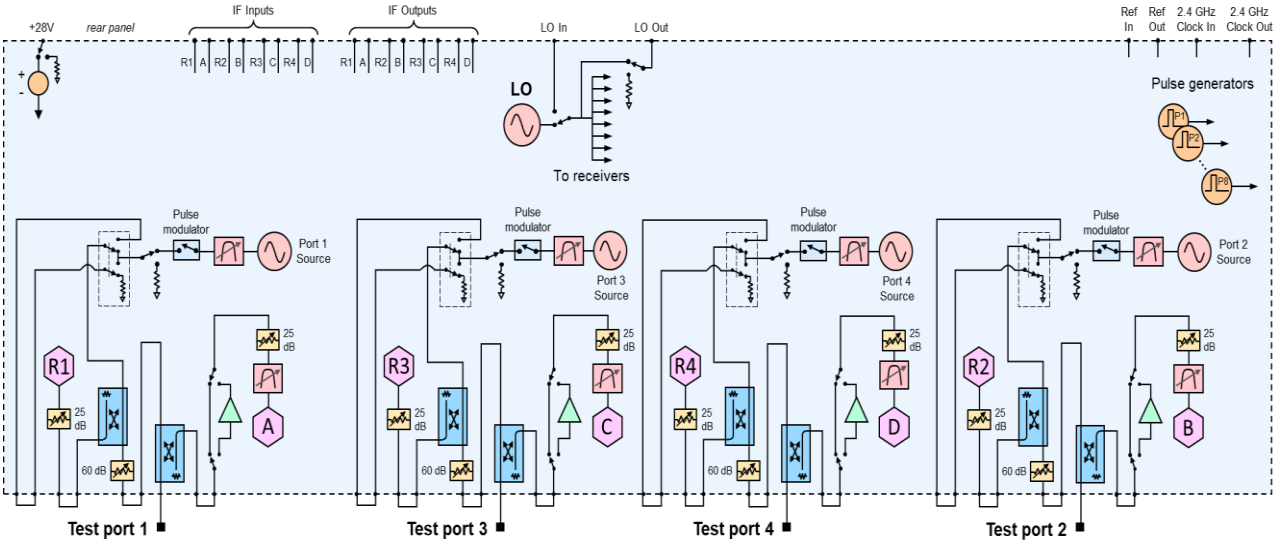
4-port test set options

Four-port test set options come with four sources that are tuned to the same frequency without one of these software licenses: S93080/029/082/083/084/086/087/089/090x/093/094B. Having at least one of these software licenses allows independent frequency control of source 1 and source 3, with the limitation that the frequency of source 2 will be the same as source 1 and the frequency of source 4 will be the same as source 3. Independent frequency control for all four sources requires Option 4SS and at least one of the software licenses mentioned above.

If bias tees are not included, the maximum power rating on the test port couplers is +43 dBm. If bias tees are included, the maximum power rating on the test port couplers is limited to +30 dBm. In either case, additional attenuators or isolators are typically required to protect other components inside the instrument.

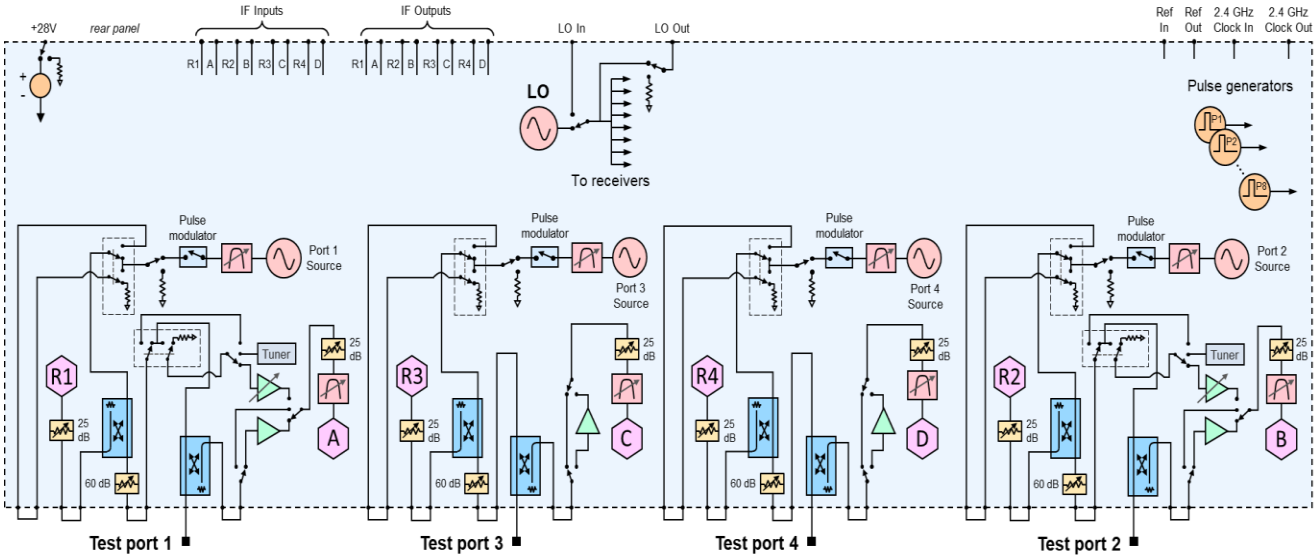
4-ports, source attenuators, with configurable test set (Option 431)

This 4-port test set option comes with four front-panel access loops, a source attenuator, and a switched-gain test receiver with pre-selection filters for each port, and eight pulse generators and optional receiver attenuators and pulse modulators. The loops provide access to the signal path (a) between the source output and the reference receiver, (b) between the source output and the directional coupler thru arm, (c) between the coupled arm of the directional coupler and the test port receiver, and (d) to the mechanical switch of the source output as a switchable source loop.



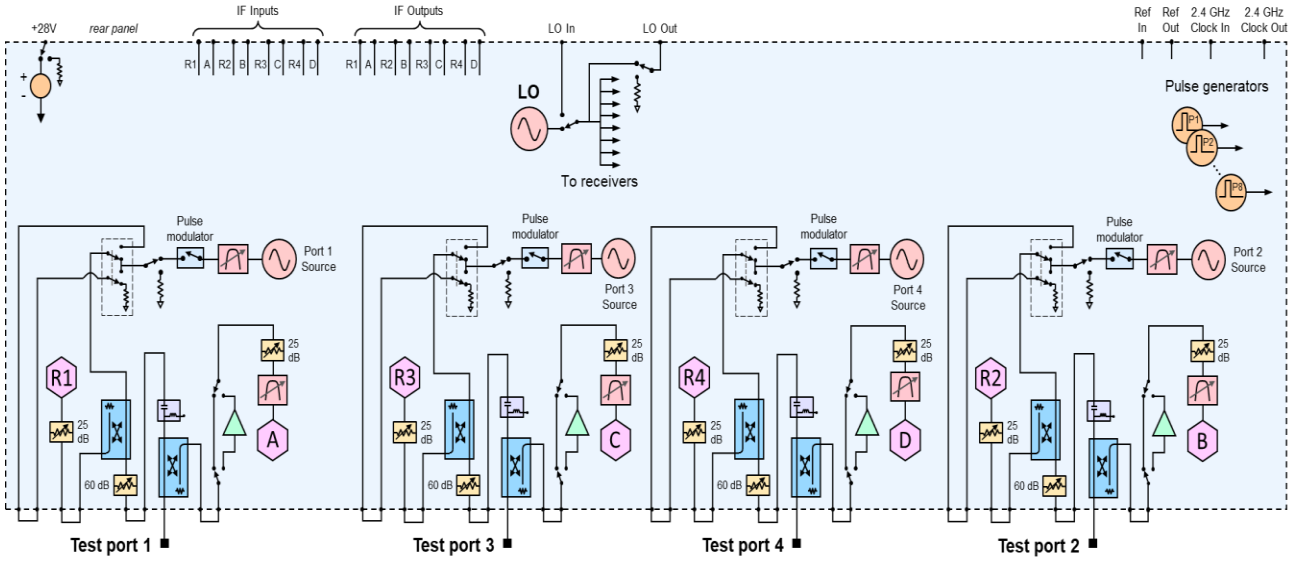
4-ports, source attenuators, low-noise receivers with configurable test set (Option 439)

This test set option includes the same hardware as Option 431: four front-panel access loops, a source attenuator, and a switched-gain test receiver with pre-selection filters for each port, and eight pulse generators and optional receiver attenuators and pulse modulators. In addition, this option provides a low-noise receiver on port 2 and a noise tuner on port 1. Option NR1 adds a low-noise receiver to port 1 and a built-in noise tuner to port 2 for reverse noise figure measurements.



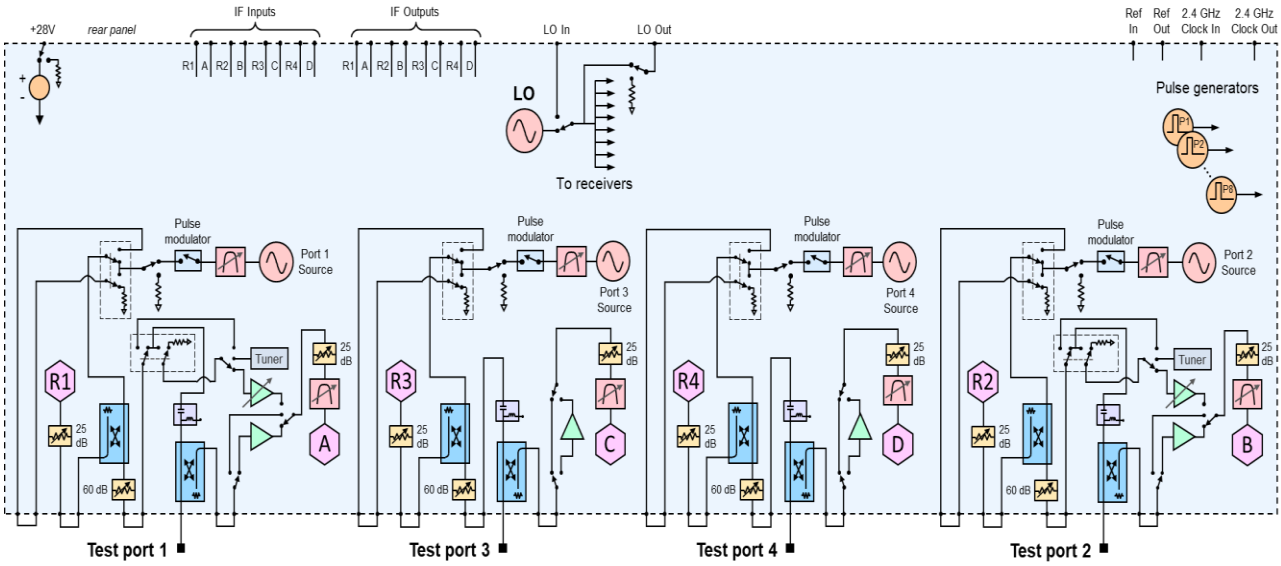
4-ports, source attenuators, bias tees, with configurable test set (Option 441)

This test set option includes the same hardware as Option 431: four front-panel access loops, a source attenuator, and a switched-gain test receiver with pre-selection filters for each port, and eight pulse generators and optional receiver attenuators and pulse modulators. In addition, this option provides bias tees for each port.



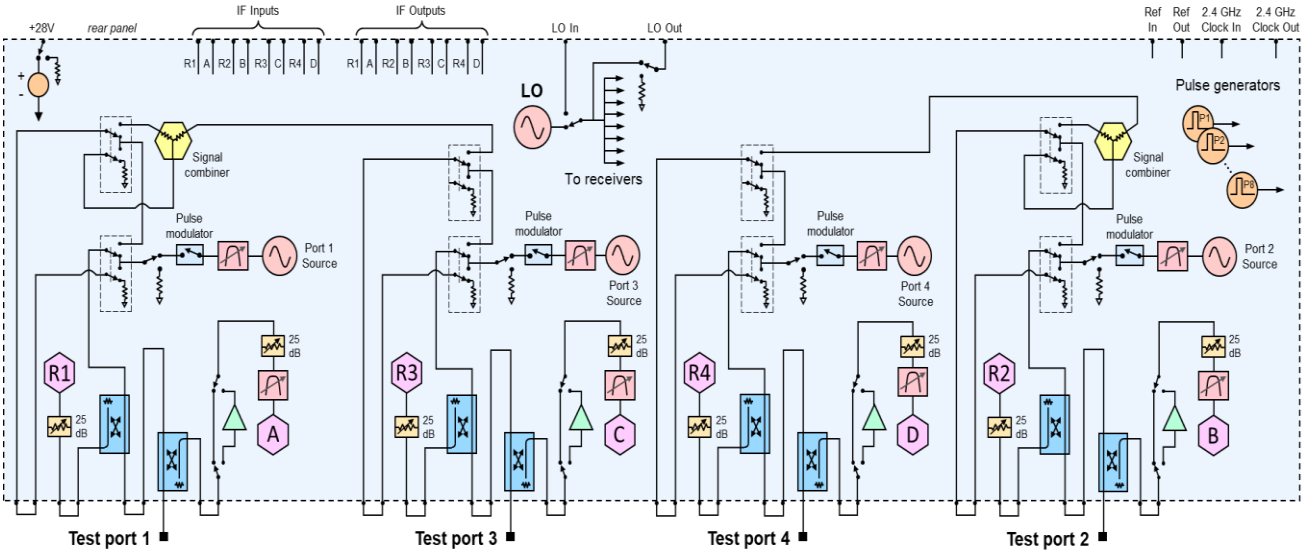
4-ports, source attenuators, bias tees, low-noise receiver with configurable test set (Option 449)

This test set option includes the same hardware as Option 441: four front-panel access loops, a source attenuator, a switched-gain test receiver with pre-selection filters, and a bias tee for each port and eight pulse generators and optional receiver attenuators and pulse modulators. In addition, this option provides a low-noise receiver on port 2 and a noise tuner on port 1. Option NR1 adds a low-noise receiver to port 1 and a built-in noise tuner to port 2 for reverse noise figure measurements.



4-ports, combiner with configurable test set (Option 451)

This 4-port test set option comes with four front-panel access loops and a switched-gain test receiver with pre-selection filters for each port and eight pulse generators and optional receiver attenuators and pulse modulators but no source attenuators, this option also includes an internal combiner on port 1 to combine the output of source 1 and source 3 for two-tone intermodulation distortion measurements. Option CB2 adds a combiner on port 2 to combine the output of source 2 and source 4 for reverse two-tone intermodulation distortion measurements.



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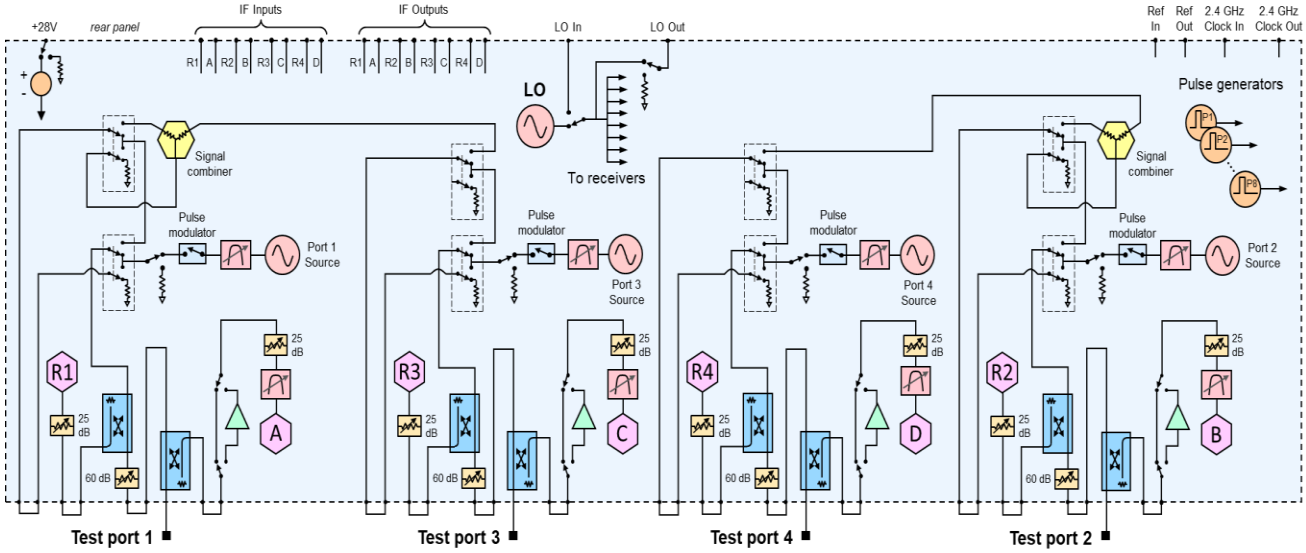
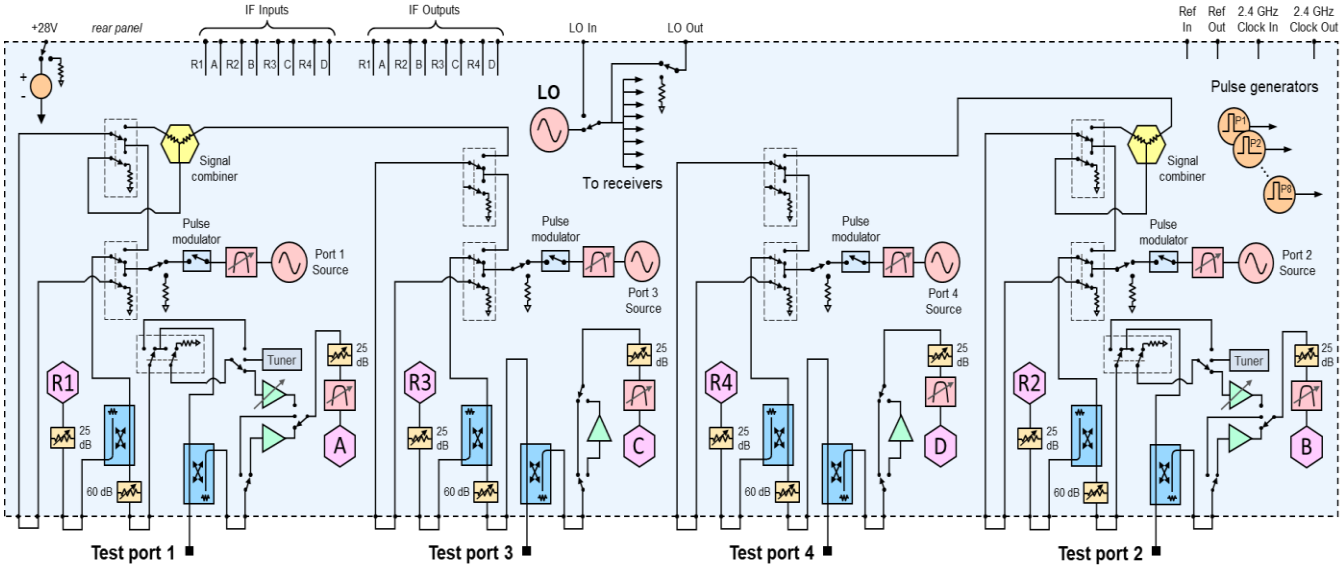
4-ports, combiner with configurable test set (Option 471)

Along with the hardware of Option 451, this test set option comes with a source attenuator for each port. Option CB2 adds a combiner on port 2 to combine the output of source 2 and source 4 for reverse two-tone intermodulation distortion measurements.



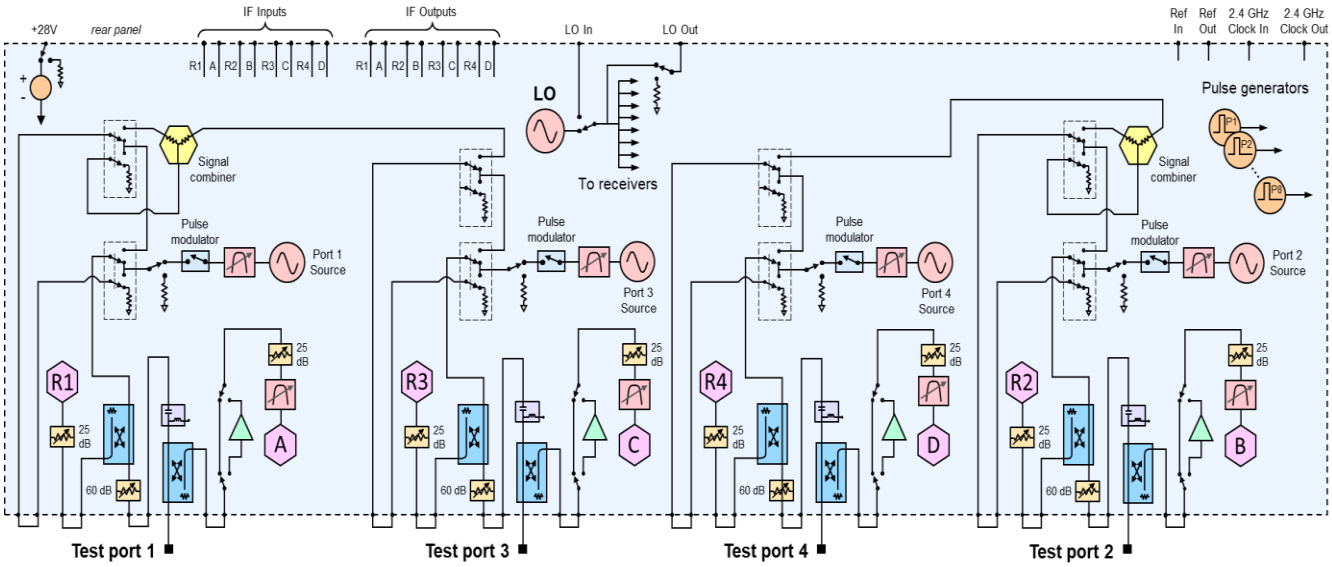
4-ports, combiner, low-noise receiver with configurable test set (Option 479)

Along with the hardware of Option 471, this test set option comes with a low-noise receiver on port 2 and a noise tuner on port 1. Option NR1 adds a low-noise receiver to port 1 and a built-in noise tuner to port 2 for reverse noise figure measurements. Option CB2 adds a combiner on port 2 to combine the output of source 2 and source 4 for reverse two-tone intermodulation distortion measurements.



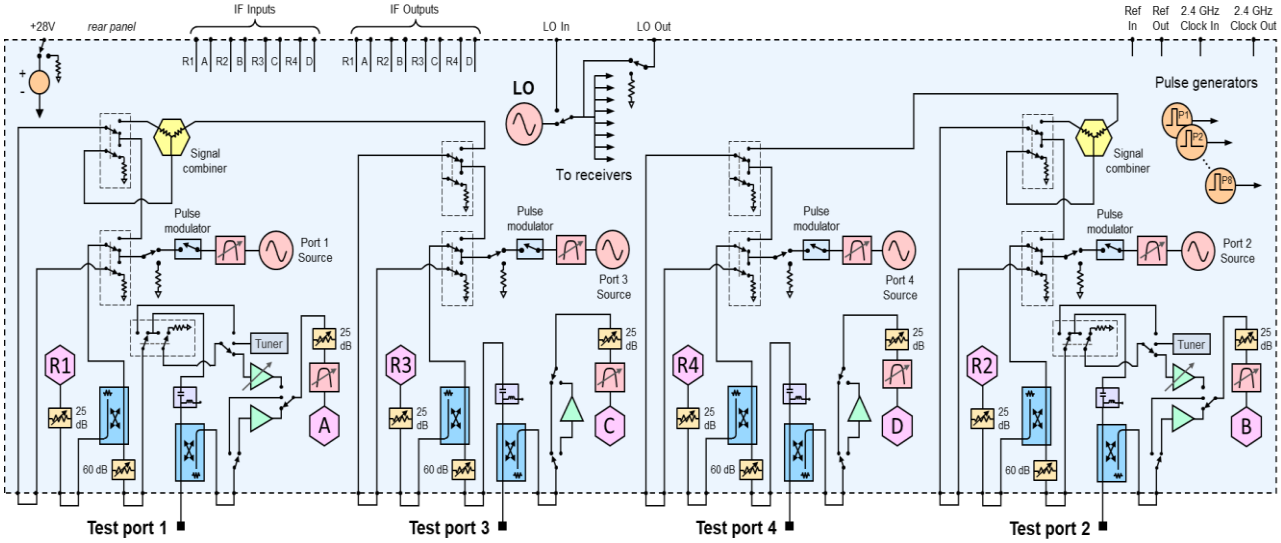
4-ports, combiner, bias tees with configurable test set (Option 481)

Along with the hardware of Option 471, this test set option comes with bias tee at each port. Option CB2 adds a combiner on port 2 to combine the output of source 2 and source 4 for reverse two-tone intermodulation distortion measurements.



4-ports, combiner, bias tees, low-noise receiver with configurable test set (Option 489)

Along with the hardware of Option 481, this test set option comes with a low-noise receiver on port 2 and a noise tuner on port 1. Option NR1 adds a low-noise receiver to port 1 and a built-in noise tuner to port 2 for reverse noise figure measurements. Option CB2 adds a combiner on port 2 to combine the output of source 2 and source 4 for reverse two-tone intermodulation distortion measurements.



Literature Information

- PNA-X Vector Network Analyzer Configuration Guide 3124-1588.EN

Web Resources

- Keysight Vector Network Analyzer Page - www.keysight.com/find/na
- Keysight Vector Network Analyzer Software Page - www.keysight.com/find/vnasoftware
- Keysight Electronic Calibration (ECal) Module Page - www.keysight.com/find/ecal

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Prevent delays caused by technical questions and reduce system downtime due to instrument maintenance and repairs with Keysight Services. Keysight Services are here to support your test needs with expert technical support, instrument repair and calibration, software support, training, alternative acquisition program options, and more.

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Keysight Services

Offering	Benefits
KeysightCare 	KeysightCare provides elevated support for Keysight instruments and software, with access to technical support experts who respond within a specified time and ensure committed repair and calibration turnaround times (TAT). KeysightCare offers multiple service agreement tiers, including KeysightCare Assured, Enhanced, and Application Software Support. See the KeysightCare data sheet for details.
KeysightCare Assured	KeysightCare Assured goes beyond basic warranty with repair services that include committed TAT and unlimited access to technical experts.
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Maximize your test system up-time by securing technical support, repair, and calibration services with committed response and turnaround times. 1-year KeysightCare Assured is included in every new instrument purchase. Obtain multi-year KeysightCare upfront to eliminate the need for lengthy and tedious paperwork and yearly requests for maintenance budget. Plus, you benefit from secured service for 2, 3, or 5 years.

Service	Function
KeysightCare Enhanced*	**Includes tech support, warranty and calibration**
R-55B-001-1	KeysightCare Enhanced – Upgrade 1 year
R-55B-001-2	KeysightCare Enhanced – Extend to 2 years
R-55B-001-3	KeysightCare Enhanced – Extend to 3 years (Recommended)
R-55B-001-5	KeysightCare Enhanced – Extend to 5 years (Recommended)
KeysightCare Assured	**Includes tech support and warranty**
R-55A-001-2	KeysightCare Assured – Extend to 2 years
R-55A-001-3	KeysightCare Assured – Extend to 3 years
R-55A-001-5	KeysightCare Assured – Extend to 5 years
Start-Up Assistance	
PS-S40-01	Included – instrument fundamentals and operations starter
PS-S40-04	Recommended – instrument fundamentals and operations starter
PS-S40-02	Optional, technology & measurement science standard learning

* Available in select countries. For details, please view the datasheet. R-55B-001-2/3/5 must be ordered with R-55B-001-1.

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