

Spectrum Analyzers

Measurement For Digital Mobile Communications

R3465/3463

- For PHS, PDC and NADC Standards (GSM/DCS1800/DCS1900/DECT/CDMA Measurement Optional)
- Dual Mode Analysis
 - Spectrum Analyzer Mode
 - Digital Transmission Tester Mode
- Built-In Digital Modulation Analysis Function
- Menu Operation
 - Automatically Set Standard Parameters, STD Mode and Measurement Function Keys
- Compact, Lightweight (17 kg), 6.5 Inch TFT Color LCD
- 2 Slots Memory Card Drive



(Photo is R3465)

R3465/3463

Modulation Spectrum Analyzers

Recently, digital mobile communication systems have been the focus of much attention. The R3465 and 3463 are modulation spectrum analyzers for testing such communication systems. In addition to the functions offered by conventional spectrum analyzers, the R3465 and 3463 functions for analyzing the characteristics of digital modulated signals such as modulation accuracy and transmission speed. The units have an easy-to-use "One Key" solutions design that anyone can use. There are separate keys for STD mode, which automatically sets PHS, PDC and NADC standard parameters and OBW, ACP and harmonic distortion measurement.

DDS (Direct Digital Synthesizer) technology enables the R3465 and 3463's outstanding basic specifications to be realized in a compact 17kg unit. These specifications include a frequency range of 9kHz to 8GHz (R3465) or 9kHz to 3GHz (R3463), highly stable narrow band sweep and high-speed measurement made possible by a high-speed settling synthesizer.

The R3465 and 3463 provide total support for digital mobile communication equipment in applications ranging from radio systems development to production line adjustment and testing.

■ Automatic Setting of Standard Parameters

The cumbersome parameter settings required for measuring digital radio system standards such as PHS, PDC and NADC (GSM, DCS1800, DCS1900, DECT and CDMA optional), are set automatically for each measurement item.

See the options table for each standard measurement.

■ Dual Mode Analysis

In addition to the CW mode for conventional spectrum analysis, the R3465 and 3463 have a TRANSIENT mode for analysis of modulation accuracy and transmission speed in digital transmission. The units also employ the FAST measuring algorithm to greatly reduce measurement time.

■ Menu Operation

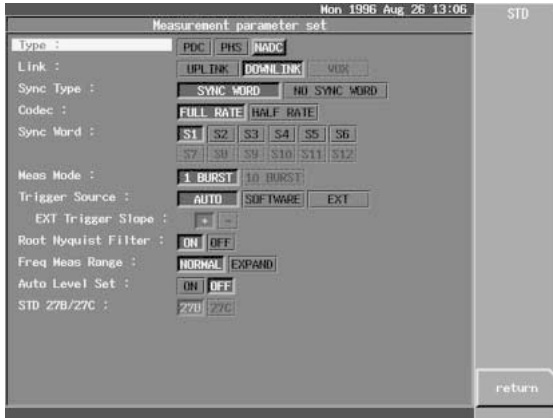
The R3465/3463 have a 'one key solutions' design for simple operation. Basic measurement and analysis functions can be easily started by selecting the desired measurement item.

■ High Performance Spectrum Analyzer Functions

The R3465 and 3463 are high performance spectrum analyzers with ample basic functions for highly detailed waveform analysis. The high-speed settling synthesizer greatly improves blanking time during narrow-band sweep (span ≤ 5 MHz) providing high speed measurement. The units have a frequency span accuracy of 1% or better, residual FM 3 Hzp-p or less/0.1 sec, and drift of 20 Hz or less. The R3465 also enables high frequency measurements with a dynamic range of -90 dBc using a built-in 1.7 GHz (min.) preselector.

1. [STD] Selection of Digital Radio Systems

The R3465/3463 can easily switch between radio systems such as PHS, PDC and NADC (GSM, DCS1800, DCS1900, DECT and CMDA optional).

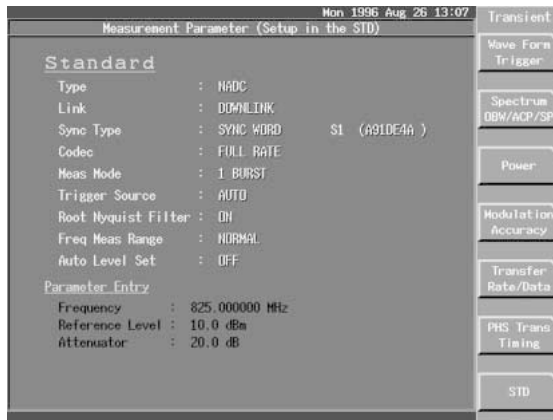


▲ NADC setting screen

2. [TRANSIENT] Selection of Measurement Items:

Menu Operation

The operation of R3465/3463 is simple. Measurement can be simply started by selecting the desired measurement items.



▲ TRANSIENT menu screen

■ NADC Standard Measurements

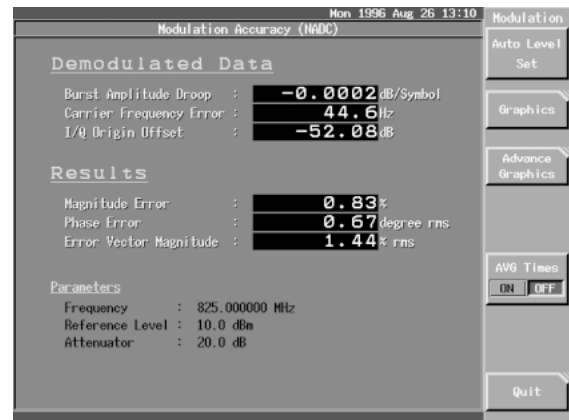
Measured item	NADC (IS-55)
Frequency stability	Yes
Transient transmission characteristics	Yes
RF power output	Yes
Power transition time	Yes
Carrier on state	Yes
Modulation accuracy	Yes
Adjacent channel leakage power	Yes*1
Out of band power due to switching	Yes
Spurious emissions, conducted (at antenna terminal)	Yes
Spurious emissions, radiated	Available*2

Notes:

- *1. The gated sweep function and the trigger detector necessary for measurement are built in the R3465/3463.
- *2. A wide band antenna and a standard signal generator (SG) are required.

■ Modulation Accuracy/Frequency Error (Phase Tracking Method) Measurement

- High speed modulation accuracy function is provided as standard.
- It enables highly stable measurements
- Function for analyzing waveforms such as constellations (Options 75/76)



■ R3465/3464 Options Table

Option	Model	R3465/R3463	R3465+51	R3465+52	R3465+56	R3465+57	R3465+58	R3465+61/R3463+61	R3465+56+61	R3465+57+61
PDC/PHS/NADC Tx Analysis		Yes	Yes	Yes	No	No	No	Yes	No	No
PDC/PHS/NADC Constellation (option 75)		Available option	Available option	Available option	No	No	No	Available option	No	No
PDC/PHS/NADC Graphics (option 76)		Available option	Available option	Available option	No	No	No	Available option	No	No
Rx Control (R3560/3561) (option 08)		Available option	Available option	Available option	No	No	No	Available option	Available option	Available option
GSM/DCS1800/DCS1900 Tx Analysis (options 51, 56, 58)		No	Yes	No	Yes	No	Yes	No	Yes	No
GSM/DCS1800/DCS1900 Graphics (option 77)		No	Available option	No	Available option	No	Available option	No	Available option	No
DECT Tx Analysis (options 52, 57, 58)		No	No	Yes	No	Yes	Yes	No	No	Yes
CDMA Tx Analysis (option 61)		No	No	No	No	No	No	Yes	Yes	Yes
CDMA Test Source Control (for R3561L. Option 09)		No	No	No	No	No	No	Available option	Available option	Available option
FM Deviation (option 73)		← Can be set for all combinations →								
Program Loader (option 15)		← Can be set for all combinations →								
± 5 × 10 ⁻⁹ /Day Crystal (option 21)		← Can be set for all combinations (R3465 only) →								

Yes : Tx analysis function
Available option : Settable option

OPT3465+51 GSM Addition
OPT3465+52 DECT Addition
OPT3465+56 GSM Only
OPT3465+57 DECT Only
OPT3465+58 GSM/DECT Only
OPT3465+61 CDMA Addition
OPT3463+61 CDMA Addition

Spectrum Analyzers

Measurement For Digital Mobile Communications

R3465/3463

Specifications

Measuring Functions:

CW mode: Spectrum measurement, OBW, ACP, HARM measurement
 Transient mode: Time domain measurement,
 Digital modulation analysis

Frequency

Frequency range:

9 kHz to 8 GHz (R3465)
 9 kHz to 3 GHz (R3463)
 Built-in YIG synchronous preselector at 1.7 to 8 GHz (R3465)

Frequency reading accuracy:

(Start, stop, center frequency, marker frequency) \pm (frequency read \times frequency reference accuracy + span \times span accuracy + 0.15 \times RBW + 10 Hz)

Marker frequency counter:

Resolution: 1 Hz to 1 kHz
 Accuracy (S/N \geq 25 dB); \pm (marker frequency \times frequency reference accuracy + 5 Hz + 1 LSD)*

Delta counter; \pm (Δ frequency \times frequency reference accuracy + 10 Hz + 2 LSD)*

* LSD: Least significant digit

Frequency reference accuracy:

$\pm 2 \times 10^{-8}$ /day, $\pm 1 \times 10^{-7}$ /year
 $\pm 5 \times 10^{-9}$ /day (OPT. 21)

Frequency stability:

Residual FM (zero span); < 3 Hz \times Np-p/0.1 s
 Drift (after 1 hour warm-up); span \leq 5 MHz,
 < 20 Hz \times (sweep time (minutes))

Spectral purity:

< -100 dBc/Hz (10 kHz offset)
 < -110 dBc/Hz (100 kHz offset)

Frequency span:

Linear span Range: 2 kHz to 8 GHz, zero span
 Accuracy; $\pm 4\%$ (span $>$ 5 MHz)
 $\pm 1\%$ (span \leq 5 MHz)

Resolution bandwidth (3 dB):

Range: 300 Hz to 3 MHz, 5 MHz (1, 3, 10 sequence)
 Accuracy; $\pm 20\%$ (RBW 1 kHz to 1 MHz)
 $\pm 30\%$ (RBW 300 Hz, 3 MHz, 5 MHz)
 Selectivity; $< 15:1$ (300 Hz to 5 MHz)

Video bandwidth

Range: 1 Hz to 3 MHz, 5 MHz (1, 3, 10 sequence)

Frequency sweep:

Sweep time: 50 ms to 1000 s (CW mode, spectrum measurement)
 Accuracy: $\pm 5\%$
 Sweep trigger: Free run, line, single, video, external
 Trace speed: 10 times/sec

Gated sweep:

Gate position/resolution 1 μ s to 65 ms/1 μ s
 Gate width/resolution 2 μ s to 65 ms/1 μ s
 Trigger: Internal IF detection, external

Amplitude

Measurement range: +30 dBm to avg. display noise level

Maximum safe input:

Avg. continuous power (input ATT \geq 10 dB): +30 dBm (1 W)
 DC input: 0 V

Display range:

Log; 10, 5, 2, 1, 0.5/div
 Linear; 10% of reference range/div

Reference level range:

Log; -105 dBm to +60 dBm (0.1 dB steps)
 Linear; 1.25 μ V to 223 V (approx. 1% of full-scale steps)

Input attenuator range:

0 to 70 dB (10 dB steps)

Dynamic Range

Average display noise level:

(Resolution bandwidth 1 kHz, 0 dB input atten, video bandwidth 1 Hz)

Frequency range	Frequency band	Displayed average noise level
10 kHz	0	-70 dBm
100 kHz	0	-80 dBm
1 MHz to 3.0 GHz	0	- (115 - 1.55 \times f (GHz)) dBm
1.7 to 7.0 GHz	1	-115 dBm
6.9 to 8.0 GHz	2	-115 dBm

1 dB gain compression:

> 10 MHz
 -5 dBm (input mixer level)

Spurious response:

Second harmonic distortion;

	Frequency range	Second harmonic distortion	Mixer level
R3465/3463	10 MHz to 3.0 GHz	< -70 dBc	-30 dBm
R3465 only	> 1.7 GHz	< -90 dBc	-10 dBm

Third order distortion (12.5 kHz separation, 300 Hz resolution bandwidth, video bandwidth 3 Hz max.);

	Frequency range	Third order distortion	Mixer level
R3465/3463	10 MHz to 3.0 GHz	< -75 dBc	-30 dBm
R3465 only	> 1.7 GHz	< -75 dBc	-30 dBm

Image/multiple out of band response;

10 MHz to 8 GHz (R3465) < -70 dBc

10 MHz to 3 GHz (R3463) < -70 dBc

Residual response; (no input signal, input ATT 0 dB, 50 Ω termination)

1 MHz to 3.0 GHz < -100 dBm

300 kHz to 8 GHz (R3465) < -90 dBm

300 kHz to 3 GHz (R3463) < -90 dBm

Amplitude Accuracy

Frequency response (10 dB input ATT):

In-band flatness;

	Frequency range	Frequency response	Frequency band
R3465/3463	9 kHz to 3.0 GHz	± 1.5 dB	0
	50 MHz to 3.0 GHz	± 1.0 dB	0
R3465 only	1.7 to 7.0 GHz	± 1.5 dB	1
	6.9 to 8.0 GHz	± 1.5 dB	2

Band switching error (calibration signal reference);

± 3 dB (9 kHz to 8.0 GHz R3465)

Calibration signal accuracy (30 MHz): -10 dBm ± 0.3 dB

IF gain error (after automatic calibration, at 1 kHz to 5 MHz RBW):

	15 to 35°C	0 to 50°C
0 to -50 dBm	± 0.5 dB	± 0.6 dB

Scale display accuracy (after automatic calibration):

	15 to 35°C	0 to 50°C
Log	$\pm 0.2/1$ dB	$\pm 0.3/1$ dB
	$\pm 1/10$ dB	$\pm 1.2/10$ dB
	$\pm 1.5/80$ dB	$\pm 1.5/80$ dB
Linear	$\pm 15\%$ of reference level (within 8 div)	$\pm 20\%$ of reference level (within 8 div)

Input attenuator switching error (with 10 dB reference, at 20 to 70 dB):

Frequency range:

9 kHz to 8.0 GHz (R3465), ± 1.1 dB/10 dB steps, maximum 2.0 dB

9 kHz to 3.0 GHz (R3463), ± 1.1 dB/10 dB steps, maximum 2.0 dB

RBW switching error (RBW: 300 kHz reference, after automatic calibration, 3 \times RBW \geq span):

RBW	15 to 35°C	0 to 50°C
300 Hz to 3 MHz	$\leq \pm 0.3$ dB	$\leq \pm 0.5$ dB

Pulse quantization error

(PRF > 500/sweep time in pulse measurement mode):

Log: 1.2 dBp-p (RBW ≤ 1 MHz)

3 dBp-p (RBW = 3 MHz)

Linear: 4% of reference level (RBW ≤ 1 MHz)

12% of reference level (RBW = 3 MHz)

Time Domain Measurement

Amplitude resolution: 12 bits

Sweep time: 50 μs to 2 s

Trigger: Free run, single, video, IF detection, external

Hold time: 200 ns to 650 ms

Analog Demodulation

Spectrum demodulation:

Modulation type: AM and FM

Audio output: Internal speaker, earphone jack, adjustable volume

Marker pause time: 100 ms to 1000 s

Digital Modulation Analysis

Applicable modulation system: π/4QPSK (PHS, PDC, NADC)

Input range: 10 MHz to 7.5 GHz (R3465), at -30 to +30 dBm
10 MHz to 3.0 GHz (R3463),

Average power: (after calibration, automatic setting)

Measurement accuracy: (Transient mode)

± 0.8 dB (in PHS, PDC, NADC bands, 15 to 35°C)

± 1.0 dB (in PHS, PDC, NADC bands, 0 to 50°C)

OBW: Standards measurement possible

ACP: (Transient (frequency)/CW mode)

PHS	PDC	NADC
0 to -57 dB (600 kHz offset)	0 to -60 dB (50 kHz offset)	0 to -55 dB (30 kHz offset)
0 to -62 dB (900 kHz offset)	0 to -64 dB (100 kHz offset)	0 to -60 dB (60 kHz offset)
		0 to -60 dB (90 kHz offset)

(NADC RBW = 1 kHz)

Spurious: -20 to -65 dBc (-70 dBm or more, Transient mode)

Modulation analysis:

	PHS	PDC/NADC
Frequency error		
Rang normal	± 13 kHz	± 1.4 kHz
expand	± 100 kHz (± 500 kHz)	± 5 kHz (± 50 kHz)
Accuracy	Reference accuracy × carrier frequency ± 5 Hz	Reference accuracy × carrier frequency ± 5 Hz
Modulation accuracy Range	0 to 30%	0 to 30%
Accuracy	± 1% ± measured value × ± 2%	± 0.5% ± (measured value) × ± 2%
Transmission measurement		
Accuracy	± 1 ppm	± 1 ppm

(): Frequency error measurement only in wide mode

GPIO: IEEE-488 bus connector, rear panel

RS232: D-SUB 9 pin, rear panel

P-I/O: D-SUB 25 pin, rear panel

EXT key: DIN, front panel

General Specifications

Temperature: Operating temperature 0 to 50°C, 85% RH max.

Power supply: AC 100/220V, switched automatically

Voltage: 100 to 120 V, 220 to 240 V

Power consumption: 300 VA (max.)

Frequency: 50/60 Hz

Weight: 17 kg max. (R3465), 16.5 kg (R3463), (excluding options, front cover and accessories)

External dimensions: Approx. 350 (W) × 177 (H) × 420 (D) mm
(excluding handle, feet and front cover)

Memory card drive: 2 slots, front panel

Connector : JEIDA Ver. 4.2/PCMCIA 2.1

Accessories

Power cable: A01412

Input cable: MC-61

Converter adapter: JUG-201 A/U

Power fuse: 21806.3 (6.3 A)

Options

Option 08 Rx Control Option (for R3560/3561)

Option 09 CDMA Test Source Control Option (for R3561L)

Option 15 Program Loader Option

Option 21 ±5 × 10⁻⁹/Day X'tal Option *2

Option 51 GSM Option *2, *3

Option 52 DECT Option *2

Option 56 GSM Only Option *1, *2, *3

Option 57 DECT Only Option *1, *2

Option 58 GSM/DECT Only Option *1, *2, *3

Option 61 CDMA Option

Option 73 FM Deviation Option

Option 75 Constellation Option (for PDC/PHS/NADC)

Option 76 Graphics Option (for PDC/PHS/NADC)

Option 77 GSM Graphics Option *2

Option 85 JIS Rack Mount Set

Option 86 EIA Rack Mount Set

*1: When this option is mounted, functions for measuring PHS, PDC and NADC standards are not available.

*2: Option can only be set on R3465.

*3: GSM option includes GSM, DCS1800, and DCS1900 (PCS1900 in the U.S.).

Application Software

PR34650440-IC PHS Auto Test (Tx, manual mode)

PR34650441-IC PHS Remote Test (Tx, remote mode)

PR34650442-IC PHS Auto/Remote Test (Tx, manual/remote)

PR34650120-IC PDC-MS TRx Auto Test (manual mode)*1

PR34650121-IC PDC-MS TRx Remote Test (remote mode)*1

PR34650122-IC PDC-MS TRx Auto/Remote Test (manual/remote mode)*1

PR34650160-IC PDC-MS Technical Conformance Measurement Software *2

PR34650460-IC PHS Technical Conformance Measurement Software
(for PS, low power CS)*2

PR34650470-IC PHS Technical Conformance Measurement Software
(for high power CS)*2

PR34650770-IC CDMA-BS Technical Conformance Measurement Software*3

*1: Requires the R3560 Test Receiver. Earlier versions of the R3465/3463 firmware may not support this software. Inquire for details.

*2: This software is for both manual and remote mode. The software requires additional measurement instruments and system calibration. Inquire for details.

*3: This software is for manual mode. This software requires additional measurement instruments and system calibration. Inquire for details.

All application software requires the R3465/3463 program loader (option 15) be installed.