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
- 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

R3465/3463 Modulation Spectrum Analyzers

Recently, digital mobile communication systems have been the focus of much attention. The R3465/3463 are new modulation spectrum analyzers for testing these new communication systems. In addition to the functions offered by conventional spectrum analyzers, the R3465/3463 have functions for analyzing 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 independent 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 R3465/3463’s excellent basic specifications to fit into a compact size 17 kg. These specifications include a frequency range of 9 kHz to 8 GHz (R3465) or 9 kHz to 3 GHz (R3463), highly stable narrow band sweep and high-speed measuring made possible by the newly-developed high speed settling synthesizer.

The R3465/3463 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

As well as CW mode, for conventional spectrum analysis, the R3465/3463 have a TRANSIENT mode for digital transmission analysis of modulation accuracy and transmission speed. The unit also employ the FAST function, a newly-developed measuring algorithm which greatly reduces the 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 R3465/3463 are high performance spectrum analyzers with ample basic functions for waveform analysis in minute detail. The newly-developed high speed settling synthesizer has greatly improved blanking time during narrow-band sweep (span ≤ 5 MHz), providing high speed measurement. The units have a frequency span accuracy of 1% or less, residual FM 3 Hz p-p or less /0.1 sec, and drift 20 Hz or less (span ≤ 5 MHz). The R3465 also enables high frequency measurements with a dynamic range of 90 dBc using a 1.7 GHz (min.) built-in preselector.

R3465/3463
1. **STD** Selection of Digital Radio Systems
   The R3465/3463 can easily switch between radio systems such as PHS, PDC and NADC (CSM, DCS1800, DCS1900, DECT and CMDA optional).

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.

3. **START** Executing Measurement

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### NADC Standard Measurements

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>NADC (IS-55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency stability</td>
<td>Yes</td>
</tr>
<tr>
<td>Transient transmission characteristics</td>
<td>Yes</td>
</tr>
<tr>
<td>RF power output</td>
<td>Yes</td>
</tr>
<tr>
<td>Power transition time</td>
<td>Yes</td>
</tr>
<tr>
<td>Carrier on state</td>
<td>Yes</td>
</tr>
<tr>
<td>Modulation accuracy</td>
<td>Yes</td>
</tr>
<tr>
<td>Adjacent channel leakage power</td>
<td>Yes*1</td>
</tr>
<tr>
<td>Out of band power due to switching</td>
<td>Yes</td>
</tr>
<tr>
<td>Spurious emissions, conducted (at antenna terminal)</td>
<td>Yes</td>
</tr>
<tr>
<td>Spurious emissions, radiated</td>
<td>Available option*2</td>
</tr>
</tbody>
</table>

Notes:
*1. The gated sweep function and the trigger detector necessary for measurement are built in the R3465/3463.
*2. A wideband 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.

### Constellation and Other Waveform Analysis Functions (Options 75, 76)

Powerful support of PHS, PDC and NADC digital modulation analysis such as constellation display, EYE pattern display and demodulated data display...etc.

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**Contents**
## Spectrum Analyzers

### Measurement For Digital Mobile Communications

### R3465/3463

#### R3465/3464 Options Table

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<th>Data Rate</th>
<th>Measurement For Digital Mobile Communications</th>
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<tr>
<td>PDC/PHS/NA Digital Mobile Communications (option 07)</td>
<td>R3465/3464</td>
<td>Available option</td>
<td>Available option</td>
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<tr>
<td>PDC/PHS/NA Digital Mobile Communications Graphics (option 76)</td>
<td>R3465/3464</td>
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<td>Available option</td>
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<tr>
<td>Rx Control (for R3560 only)</td>
<td>R3465+51</td>
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<td>Available option</td>
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<td>GSM/DCS1800/DCS1900 Tx Analysis (options 51, 56, 58)</td>
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<td>Available option</td>
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### GSM/DCS1800/DCS1900 Tx Analysis (Options 51, 56, 58, R3465 Only)

The GSM Option (options 51, 56, 58) provides a burst envelope function for measurement of the ON/OFF characteristics of TDMA format digital modulated signals and a burst spectrum function, enabling spectrum analysis in the burst ON interval. GMSK signal frequency error, phase error and power measurement can be done at the touch of a button.

#### Applicable Communication Systems

GSM, DCS1800 (PCN), DCS1900 (PCS) (MS/BTS)

#### Measurement Items

- Burst envelope measurement (1 burst/1 frame/Zoom mode)
- Power measurement
- Power vs time measurement
- Frequency error/Phase error measurement
- Burst spectrum measurement
- Modulation spectrum measurement
- Switching spectrum measurement
- Spurious emission intensity (in-band)

#### GSM Graphics Option (option 77)

### Analysis Functions

- Bit frequency display
- Phase error display
- Phase error of FFT display
- Trellis display
- Demodulated data display

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1. 5 x 10^-9/Day Crystal (option 21)
DECT Tx Analysis (Options 52, 57, 58, R3465 Only)

The DECT Option (options 52, 57, 58) enables burst envelope measurement and burst spectrum measurement, conforming to various physical packets at the touch of a button. The GFSK modulation analysis function also enables measurements of Tx power, power vs time and FM deviation.

### Applicable Communication Systems
- **DECT**: RFP (Radio fixed part)/PP (Portable part)

### Measurement Items
- Burst envelope measurement
- Power measurement
- Power vs time measurement
- FM deviation measurement
- Emission due to modulation measurement
- Emission due to transient measurement
- Timing jitter measurement
- Spurious emission measurement
- Graphics display

CDMA Tx Analysis (Option 61)

The CDMA option (option 61) enables measurements of the CDMA transmitter characteristics including waveform quality analysis (such as RHO) and code domain power measurements as specified by IS-95/J-STD-008. US/KOREA-cellular, US/KOREA-PCS, Japan-cellular and China-cellular base and mobile stations can be covered by a single unit.

### Measurement Items
- Burst envelope measurement
- Gated output power measurement
- Channel power measurement
- ON/OFF ratio measurement
- OBW measurement
- Waveform quality measurement (Rho, $\tau$, others)
- Code domain power measurement
- Spurious emission measurement
- Graphics display
Spectrum Analyzers

**Measurement For Digital Mobile Communications**

**R3465/3463**

### Specifications

**Dynamic Range**

- **Average display noise level:**
  - Frequency range: 0 to 10 kHz  0 dB input atten, video bandwidth 1 Hz
  - Frequency range: 100 kHz to 1 MHz  10 dB input atten
  - Frequency range: 1 MHz to 3.0 MHz  20 dB input atten
  - Frequency range: 1.7 Hz to 7.0 GHz  30 dB input atten
  - Frequency range: 8.85 to 8.95 GHz  40 dB input atten

- **1 dB gain compression:** >10 Hz

### Spurious Response

- **Second harmonic distortion:**
  - Second harmonic distortion 25 dB
  - Second harmonic distortion >25 dB

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

### Amplitude Accuracy

- **Frequency response (10 dB input ATT):**
  - Frequency response 0 to 50°C
  - Frequency response 0 to 30°C

- **Band switching error (calibration signal reference):**
  - ± 3 dB (9 kHz to 8.0 GHz)

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

- **IF gain uncertainty (after automatic calibration, at 1 kHz to 5 MHz RBW):**
  - ± 0.6 dB

### Scale display accuracy (after automatic calibration):

#### Measurement Functions:
- CW mode: Spectrum measurement, OBW, ACP, HARM measurement
- Digital modulation analysis

#### Frequency

- **Frequency range:** 9 kHz to 8 GHz (R3465)
  - 9 kHz to 3 GHz (R3463)
  - Built-in YIG synchronous prescaler at 1.7 to 8 GHz (R3465)

- **Frequency reading accuracy:** ± 2 × 10⁻³/°day, ± 1 × 10⁻³/year

- **Frequency stability:** ± 1.2 × 10⁻³/°day, ± 5 × 10⁻³/year (OPT. 21)

- **Spectral purity:** η < 3 Hz × (sweep time (minutes))

- **Input attenuator switching error (with 10 dB reference, at 20 to 70 dB):** ± 1.5 dB

#### Resolution Bandwidth

- **Linear:** 10% of reference range/div
- **Log:** ± 0.15/80 dB

#### Frequency Span

- **Linear:** 1.25 MHz
- **Log:** ± 0.31 dB

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

- Frequency range: 9 kHz to 8 GHz, ± 1.1 dB/10 dB steps, maximum 2.0 dB
- RBW switching error (RBW: 300 kHz reference, after automatic calibration, 3 x RBW 2 span):
  - RBW: 10 to 30 kHz  0 to 50°C
  - RBW: 30 kHz to 300 kHz  0 to 50°C
  - RBW: 300 kHz to 3 MHz  0 to 50°C

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**Contents**
Pulse quantization error
(PRFS > 500/sweep time in pulse measurement mode):
Log: 1.2 dBp-p (RBW ≤ 1 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: 4/16QAM, 16QAM, 32QAM
Input range: 10 MHz to ≥5 GHz, at ≤-60 dBm
Average power: (after calibration, automatic setting)
Measurement accuracy: (Transmode 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: (Frequency error measurement only in wide mode)

Modulation analysis:
Frequency accuracy
PHS: ±5 kHz (±50 kHz)
PDC: ±2% ± (measured value)
NADC: ±0.5 ± (measured value)

[Ref: IEEE-488 bus connector, rear panel]
[Ref: D-SUB 9 pin, rear panel]
[Ref: DIN, front panel]
[Ref: JEIDA Ver. 4.2/PCMCIA 2.1]

General Specifications
Temperature: Operating temperature 0 to 50°C, 85% RH max.
Power supply: AC 100 to 220 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. 177 (H) × 350 (W) × 420 (D) mm (excluding handle, feet and front cover)
Memory card drive: 2 slots, front panel

Connection: (option 15) be installed.
Option 86 EIA Rack Mount Set
Option 85 JIS Rack Mount Set
Option 77 GSM Graphics Option *2
Option 76 Graphics Option (for PDC/PHS/NADC)
Option 75 Constellation Option (for PDC/PHS/NADC)
Option 73 FM Deviation Measurement Option
Option 61 CDMA Option
Option 52 DECT Only Option
Option 51 GSM Option

Application Software
[Ref: Requires the R1350 Test Receiver. Earlier versions of the R3465/3463 firmware may not support this software. Inquire for details.]
[Ref: Requires R3465/3463 firmware may not support this software. Inquire for details.]
[Ref: Requires GDP Option. Measurement range is to 3GHz.]
[Ref: This software is for both manual and remote mode. The software requires additional measurement instruments and system calibration. Inquire for details.]
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[Ref: Requires R3560 Test Receiver. Earlier versions of the R3465/3463 firmware may not support this software. Inquire for details.]

Spectrum Analyzers
Digital Modulation Analysis Function Provided Standard

R3465/3463