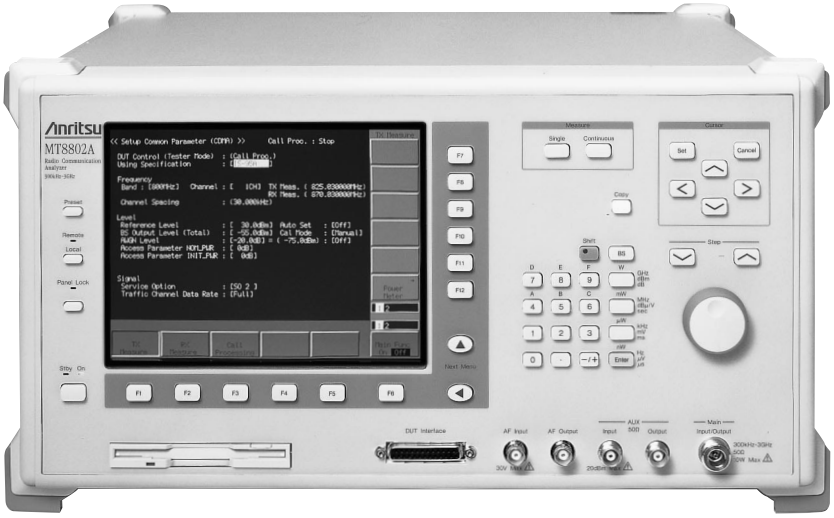
# RADIO COMMUNICATION ANALYZER

# MT8802A

**300 kHz to 3 GHz**






NEW

CE GPIB



## Feature

- One-box tester for CDMA measurement

## Performance and functions

- **Call processing function**

When operating as an artificial base station, the MT8802A performs various operations such as evaluation of registration, origination, termination, conversation, loopback, handoff, disconnection from network, and disconnection from mobile station. These functions allow the terminal to be set to measure the transmission/reception performance, including waveform quality and frame error rate. During conversation, voice from the terminal can be looped back at the MT8802A, allowing the terminal operation to be checked easily.

- **Cellular and PCS bands**

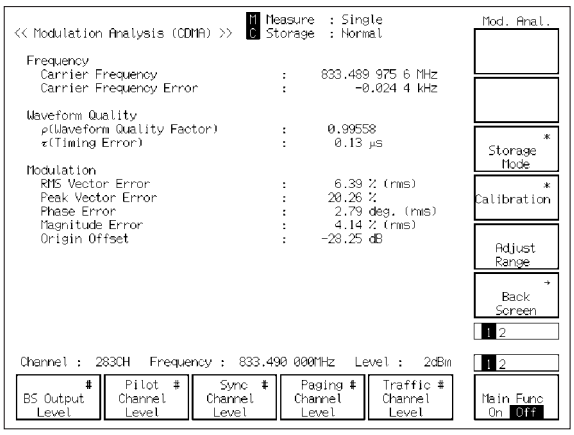
The MT8802A can measure the following systems by changing the band mode; USA 800-MHz cellular band (TIA/EIA/IS-95A standard CDMA), USA 1.9 GHz PCS band (ANSI J-STD-008 standard).

- **Access probe output power measurement**

The power level of multiple access probes can be measured in accordance with the standards. Standby output power can also be measured between access probes.

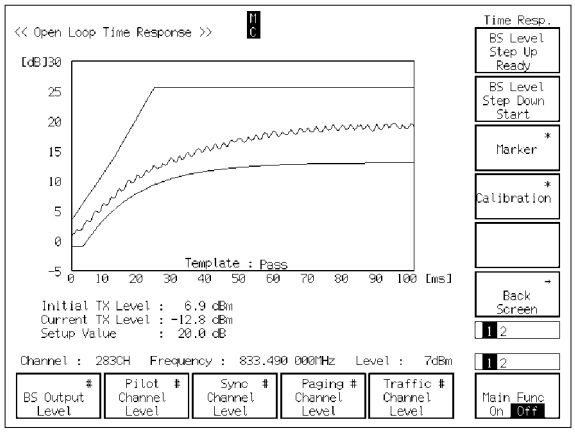
- **Waveform quality measurement**

The waveform quality (ρ), frequency error, timing error (τ), vector error, phase error, amplitude error, and origin offset can be measured.




- **Openloop power control time response measurement**

The base station transmission power can be changed in steps to measure the terminal output power time response; pass/fail evaluation is performed according to the standards.

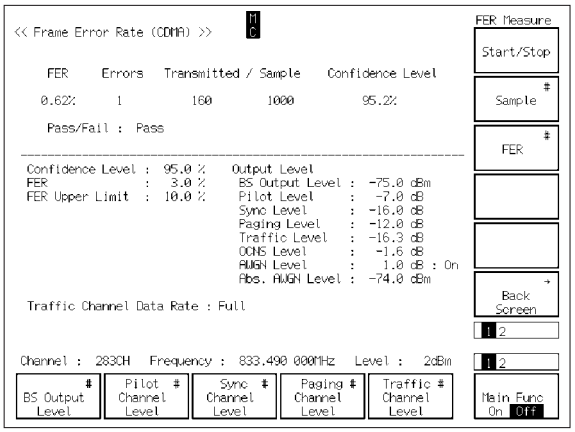



- **Wide-band power meter**

A high-accuracy thermocouple power sensor is built in. Accurate power measurement is ensured even for low-level signals by calibrating a narrow-band IF level meter using this wide-band power meter.

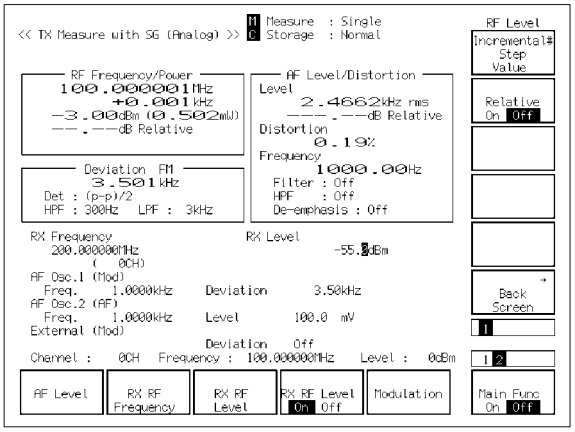
- **Frame error rate measurement**

The frame error rate can be measured and pass/fail evaluation performed based on the confidence level. The built-in high-accuracy signal generator and AWGN generator permit traffic channel demodulation testing in a noisy environment.



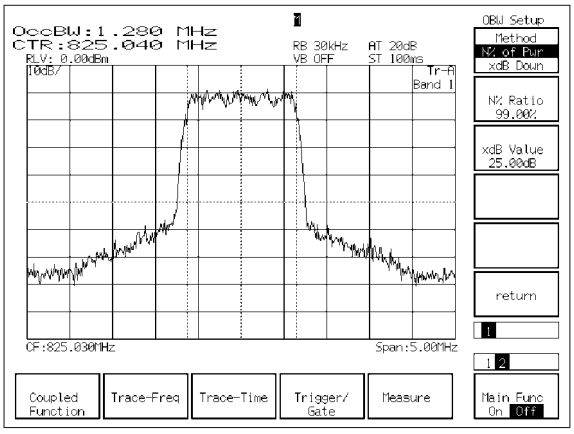

**• Analog measurement functions**

The MT8802A has general analog measurement functions, too. FM TX/RX testing is easy and efficient using the built-in signal generator, AF oscillator, RF analyzer (narrow-band power meter, frequency counter, FM measurement), and audio analyzer functions.




**• Spectrum analyzer function (Option 07)**

The spectrum analyzer with synthesized local oscillator covers a frequency range of 10 MHz to 3 GHz with a resolution of 1 Hz.




## Specifications

**• MT8802A mainframe**

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|---|---|
| General | Frequency range: 300 kHz to 3 GHz<br>Maximum input level<br>Main: +40 dBm (10 W); AUX: +20 dBm (100 mW)<br>Main input/output connector<br>Connector: N type; Impedance: 50 Ω; VSWR: ≤1.2 (≤2.2 GHz); ≤1.3 (>2.2 GHz)<br>Auxiliary input/output connector: TNC type<br>Reference oscillator<br>Frequency: 10 MHz<br>Starting characteristics: ≤5 x $10^{-8}$/day (After 10 minutes of warm-up, referred to frequency after 24-hour warm-up)<br>Aging rate: ≤2 x $10^{-8}$/day, ≤1 x $10^{-7}$/year ✱Referred to frequency after 24-hour warm-up<br>Temperature characteristics: ≤5 x $10^{-8}$ (0˚ to 50˚C, referred to frequency at 25˚C)<br>External reference input: 10 or 13 MHz (±1 ppm), 2 to 5 Vp-p |
| Signal generator | Frequency<br>Frequency range: 10 MHz to 3 GHz, Resolution: 1 Hz, Accuracy: Reference oscillator accuracy ±100 mHz<br>Output level<br>Level range (no modulation or analog modulation): –13 to –133 dBm (Main), +7 to –133 dBm (AUX)<br>Level accuracy: ±1 dB (10 MHz to 2.2 GHz, ≥–123 dBm, 18˚ to 28˚C), ±3 dB (10 MHz to 2.2 GHz, ≥–133 dBm), ±2 dB (>2.2 GHz, ≥–123 dBm, 18˚ to 28˚C), ±4 dB (>2.2 GHz, level: ≥–133 dBm)<br>Signal purity<br>Spurious: ≤–50 dBc (no modulation, offset frequency: 100 kHz to 50 MHz, except carrier frequency of 1300 to 1400 MHz, 2000 to 2100 MHz), ≤–40 dBc (all band)<br>Harmonics: ≤–25 dBc (no modulation)<br>FM modulation<br>Frequency deviation: 0 to 40 kHz (resolution: 10 Hz)<br>Accuracy: Set value ±5% ±1 digit (internal modulation frequency: 1 kHz, excluding residual FM)<br>Internal/external modulation frequency: 20 Hz to 20 kHz<br>Frequency characteristics: ±0.5 dB (referenced to 1 kHz between 0.3 to 3 kHz with 4 kHz deviation)<br>±1 dB (referenced to 1 kHz between 20 Hz to 20 kHz with 4 kHz deviation)<br>Modulation distortion: ≤–50 dB (internal modulation frequency: 1 kHz, frequency deviation: 5 kHz, demodulation bandwidth: 0.3 to 3 kHz)<br>External modulation<br>Input level: 1 Vpeak (terminated); Input impedance: 600 Ω |

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|---|---|
| AF oscillator | Frequency<br>Range: 20 Hz to 20 kHz; Setting resolution: 0.1 Hz; Accuracy: Synchronized with reference oscillator<br>Output level<br>Range: 0.1 mVrms to 3 Vrms (EMF) ⁎MAIN output: 600 Ω<br>0.1 mVrms to 0.3 Vrms (EMF) ⁎MAIN output: 50 Ω<br>Setting resolution: 1 µV (<4 mV), 10 µV (<40 mV), 100 µV (<0.4 V), 1 mV (≤3 V)<br>Accuracy (bandwidth: <30 kHz)<br>Unbalanced output: ±0.5 dB (1 kHz, ≥1 mV), ±1 dB (20 Hz to 20 kHz, ≥1 mV)<br>Floating output: ±2 dB (1 kHz, ≥1 mV)<br>Output impedance<br>MAIN: 600 Ω/50 Ω selectable, unbalanced, BNC<br>Microphone: 600 Ω, floating, DUT I/F<br>Distortion: ≤–50 dBc (1 kHz, 1 V), ≤–45 dBc (20 Hz to 20 kHz, 1 V) ⁎Bandwidth: <30 kHz<br>Noise generator: White noise passed through a weighting filter (conforming to ITU-T Rec. G.227) |
| RF analyzer | Power meter (narrow band)<br>Frequency range: 10 MHz to 3 GHz<br>Level range: 0 to +40 dBm (Main), –40 to +20 dBm (AUX)<br>Accuracy: ±10% (Main, after calibration with internal wide band power meter)<br>±1 dB (AUX, 18˚ to 28˚C, reference level: ≥–12 dBm, after calibration)<br>Linearity: ±0.3 dB (0 to –30 dB)<br>Frequency counter<br>Frequency: 10 MHz to 3 GHz<br>Input level: –20 to +40 dBm (Main), –40 to +20 dBm (AUX)<br>Resolution: 1 Hz<br>Accuracy: ± (reference oscillator accuracy + 10 Hz)<br>Measurement method: IF frequency counting (bandwidth: ±30 kHz)<br>FM measurement<br>Frequency: 10 MHz to 3 GHz<br>Input level: –20 to +40 dBm (Main), –40 to +20 dBm (AUX)<br>Filters<br>HPF: 50 Hz, 300 Hz (3 dB cut-off frequency); LPF: 3 kHz, 15 kHz (3 dB cut-off frequency)<br>Frequency deviation: 0 to 20 kHz<br>Demodulation frequency: 30 Hz to 20 kHz<br>Accuracy: 1% + residual FM (demodulation frequency: 1 kHz)<br>Frequency characteristics: ±0.5 dB (referenced to demodulation frequency 1 kHz)<br>Residual FM: 8 Hzrms (demodulation frequency: 0.3 to 3 kHz)<br>Distortion: 0.3% (demodulation frequency: 1 kHz, demodulation bandwidth: 0.3 to 3 kHz, frequency deviation: 5 kHz)<br>øM measurement<br>Frequency range: 10 MHz to 3 GHz<br>Input level range: –20 to +40 dBm (Main), –40 to +20 dBm (AUX)<br>Filters<br>HPF: 50 Hz, 300 Hz (3 dB cut-off frequency)<br>LPF: 3 kHz, 15 kHz (3 dB cut-off frequency)<br>Phase deviation: 0 to 10 rad<br>Demodulation frequency: 300 Hz to 3 kHz<br>Accuracy: 1% + residual øM (demodulation frequency: 1 kHz)<br>Frequency characteristics: ±0.5 dB (referenced to demodulation frequency 1 kHz)<br>Residual øM: 0.01 rad-rms (demodulation frequency: 0.3 to 3 kHz)<br>Distortion: 0.5% (demodulation frequency: 1 kHz, demodulation bandwidth: 0.3 to 3 kHz, frequency deviation: 5 rad)<br>FM demodulation output<br>Frequency deviation: 0 to 40 kHz (4/40 kHz range)<br>Demodulation frequency: 50 Hz to 10 kHz<br>Output level: 4 Vpeak (EMF, at full-scale)<br>Output impedance: 600 Ω<br>Frequency characteristics: ±1 dB (referenced to demodulation frequency 1 kHz)<br>Distortion: 1% (demodulation frequency: 1 kHz, demodulation bandwidth: 0.3 to 3 kHz, frequency deviation: 4 kHz, 4 kHz range)<br>Filters<br>HPF: 300 Hz (3 dB cut-off frequency), LPF: 3 kHz (3 dB cut-off frequency)<br>De-emphasis: 750 µs |
| Audio analyzer | Input impedance: 600 Ω/100 kΩ selectable, unbalanced, BNC<br>Bandpass filter<br>HPF: 400 Hz (for tone rejection), De-emphasis: 750 µs<br>Weighting filter: ITU-T P.53/C-MESSAGE selectable<br>AF level measurement<br>Frequency: 30 Hz to 20 kHz; Level: 1 mVrms to 30 Vrms; Accuracy: ±0.5 dB<br>Distortion measurement<br>Frequency: 100 Hz to 5 kHz; Level: 30 mVrms to 30 Vrms; Accuracy: ±1 dB (frequency: 1 kHz, distortion: 1%)<br>AF frequency measurement<br>Frequency: 30 Hz to 20 kHz; Level: 30 mVrms to 30 Vrms; Accuracy: ±0.1 Hz |
| Others | Display<br>Color TFT-LCD, Size : 7.8 inches; Number of dots : 640 x 480 dots<br>Hard copy: Enable data hard copy of the display through a parallel interface (applicable for ESC/P)<br>GPIB: This equipment is specified as a device, can be controlled from external controller.<br>Not available controller function (excluding power switch and FD ejection)<br>Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2<br>Parallel interface<br>Conforms to the Centronics, outputs printing data to printer<br>Data line exclusive for output: 8<br>Control line: 4 (BUSY, $\overline{\text{DTSB}}$, $\overline{\text{ERROR}}$, PE)<br>Connector: D-sub 25 pins, female<br>RS-232C: All functions controlled by external controller (excluding power switch and FD ejection)<br>Baud rate: 1200, 2400, 4800, 9600 bps<br>Dimensions and mass: 426 (W) x 221.5 (H) x 451 (D) mm, ≤27 kg<br>Power: 100 to 120/200 to 240 Vac (automatic voltage switch system), 47.5 to 63 Hz, ≤300 VA<br>Operating temperature: 0˚ to +50˚C |

### • MX880201A CDMA Measurement Software

| | |
|---|---|
| Signal generator | Frequency range: 869.04 to 893.97 MHz (30 kHz step, IS-95A), 1930.00 to 1989.95 MHz (50 kHz step, J-STD-008)<br>Level setting range: –18 to –133 dBm (Main, AWGN off), +2 to –133 dBm (AUX, AWGN off)<br>–24 to –133 dBm (Main, AWGN on), –4 to –133 dBm (AUX, AWGN on)<br>Relative level accuracy:<br>±0.2/20 dB (18˚ to 28˚C) ⁎Relative level accuracy at level change in time response of open-loop power control<br>Waveform quality: ρ >0.99 (pilot channel: 0 dB)<br>Channel level<br>Pilot channel: 0 dB, –5 to –10 dB (0.1 dB step)<br>Paging channel: –7 to –20 dB (0.1 dB step)<br>Sync channel: –7 to –20 dB (0.1 dB step)<br>Traffic channel: –7 to –20 dB (0.1 dB step, full rate), –10 to –23 dB (0.1 dB step, half rate),<br>–13 to –26 dB (0.1 dB step, quarter rate), –16 to –29 dB (0.1 dB step, eighth rate)<br>OCNS channel: Automatic setting<br>Channel level accuracy: ±0.2 dB (relative level accuracy between any 2 channels)<br>AWGN level setting range:<br>+6 to –20 dB/1.23 MHz or off (0.1 dB step, relative level for 1.23 MHz band power of BS transmission signal)<br>AWGN level accuracy: ±0.2 dB (relative level for forward traffic channel)<br>Auxiliary output signal<br>CDMA reference output: 19.6608 MHz (BNC connector, TTL level)<br>CDMA timing output: 1.25 ms, 20 ms, 26.67 ms, 80 ms, 2 s (D-sub 25-pin, TTL level) |
| Reception measurement | FER measurement: FER measurement value, error frame number, test frame number, confidence limit pass/fail |
| Transmission measurement | Frequency range: 824.04 to 848.97 MHz (30 kHz step, IS-95A), 1850.00 to 1909.95 MHz (50 kHz step, J-STD-008)<br>Modulation analysis<br>Input code channel: 1 channel only<br>Level range: +40 to –20 dBm (average power within a burst, main connector only)<br>Frequency measurement: Measurement error reference ±10 Hz (after execution adjust range)<br>Waveform quality: Measurement range: 0.9 to 1.0, measurement error: ±0.003 (after execution adjust range)<br>Residual vector error: <5% (after execution adjust range)<br>Power measurement (IF level meter)<br>Measurement range: +40 to –50 dBm<br>Measurement accuracy: ±0.4 dB (+40 to 0 dBm, after execution power meter calibration)<br>±0.4 dB (+40 to –10 dBm, after execution power meter calibration, 18˚ to 28˚C)<br>±0.7 dB (+40 to –10 dBm, after execution internal oscillator calibration,18˚ to 28˚C)<br>Linearity: ±0.1 dB (0 to –10 dB), ±0.2 dB (–10 to –20 dB), ±0.5 dB (–20 to –40 dB) ⁎Referred to reference level: ≥–10 dBm<br>Input connector: Main connector only<br>Measurement item: Power meter measurement, gated output power measurement, access probe output power measurement,<br>standby output power measurement, time response of open-loop power control measurement<br>Power meter<br>Measurement range: +40 to –10 dBm<br>Measurement accuracy: ±10% (0˚ to 50˚C, 0 to +40 dBm), ±10% (18˚ to 28˚C, –10 to +40 dBm, at average value)<br>⁎After calibration at zero, output level of signal generator: ≤–53 dBm<br>Input connector: Main connector only |
| Call processing | Functions: Registration, origination, termination, conversation, loopback (service option 2), hard handoff, disconnection from network, disconnection from mobile station<br>Protocol: IS-95A, J-STD-008<br>Input frequency range: 824.04 to 848.97 MHz (30 kHz step, IS-95A), 1850.00 to 1909.95 MHz (50 kHz step, J-STD-008) |

### • Spectrum analyzer (Option 07)

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|---|---|
| Frequency | Frequency<br>Frequency range: 0 Hz to 3 GHz (Band 0), 10 MHz to 3 GHz (Band 1)<br>HPF: On/off switchable (band 1, 1.6 to 3 GHz)<br>Frequency setting range: 0 Hz to 3 GHz (Band 0), 10 MHz to 3 GHz (Band 1) ⁎Resolution: 1 Hz<br>Accuracy<br>Frequency display accuracy: ± (display frequency x reference frequency accuracy + span x span accuracy)<br>Marker frequency accuracy<br>Normal marker: Same as display accuracy; Delta marker: Same as span accuracy<br>Frequency span<br>Span setting range: 0 Hz or 10 kHz to 3 GHz (band 0), 0 Hz or 10 kHz to 2.99 GHz (band 1)<br>Span accuracy: ±2.5%<br>Resolution bandwidth<br>Setting range: 300 Hz to 1 MHz (3 dB BW), 1-3 sequence<br>Accuracy: ±2% (300 Hz to 300 kHz), ±10% (1 MHz)<br>Selectivity (60 dB : 3 dB): ≤5 : 1<br>Video bandwidth: 3 Hz to 100 kHz (1-3 sequence), off ⁎Setting range is limited by resolution bandwidth.<br>Sideband noise: ≤–95 dBc/Hz (1 GHz, 10 kHz offset), ≤–115 dBc/Hz (1 GHz, 100 kHz offset) |

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| Amplitude (band 1) | Maximum input level<br>Continuous average power: +40 dBm (Main), +20 dBm (AUX)<br>DC voltage: 0 V<br>Average noise level (resolution bandwidth: 1 kHz, video bandwidth: 10 Hz):<br>≤–90 dBm (10 MHz to 2.2 GHz), ≤–85 dBm (>2.2 GHz) ⁎Main, input attenuator: 20 dB<br>≤–110 dBm (10 MHz to 2.2 GHz), ≤–105 dBm (>2.2 GHz) ⁎AUX, input attenuator: 0 dB<br>Residual response: ≤–70 dBm (Main, input attenuator: 20 dB), ≤–90 dBm (AUX, input attenuator: 0 dB)<br>Level accuracy: ±1.5 dB (Main, reference level: +10.1 to +40 dBm, 0 to –50 dB of reference level)<br>±1.5 dB (AUX, reference level: –9.9 to +20 dBm, 0 to –50 dB of reference level)<br>Reference level<br>Setting range: –60 to +50 dBm (Main), –80 to +30 dBm (AUX)<br>Setting resolution: 0.1 dB<br>Accuracy: ±0.5 dB (Main, +10.1 to +40 dBm), ±1.0 dB (Main, –60 to +10 dBm),<br>±0.5 dB (AUX, –9.9 to +20 dBm), ±1.0 dB (AUX, –80 to –10 dBm)<br>⁎After calibration, frequency: 100 MHz, span: 2 MHz; Input attenuator, resolution bandwidth, video bandwidth, and sweep time: AUTO<br>Resolution bandwidth switching error: ±0.1 dB (resolution bandwidth reference: 3 kHz)<br>Frequency characteristics: ±0.5 dB [100 MHz reference, input attenuation: 30 dB (10 dB for AUX), 18˚ to 28˚C]<br>Log linearity: ±0.5 dB (0 to –50 dB, resolution bandwidth: ≤1 MHz), ±1.0 dB (0 to –70 dB, resolution bandwidth: ≤30 kHz),<br>±1.0 dB (0 to –80 dB, resolution bandwidth: ≤1 kHz)<br>⁎Frequency: 10 MHz to 2.2 GHz, Reference level: ≥0 dBm (Main), ≥–20 dBm (AUX)<br>Spurious response: ≤–55 dBc (10 to 100 MHz), ≤–60 dBc (100 to 1500 MHz) ⁎2nd harmonic distortion at mixer input: –30 dBm |
| Sweep | Sweep time:<br>100 ms to 1000 s (frequency domain sweep), 100 ms to 1000 s (time domain sweep, resolution bandwidth: ≤1 kHz),<br>10 ms to 1000 s (time domain sweep, 3 to 10 kHz), 1 ms to 1000 s (time domain sweep, resolution bandwidth: ≥30 kHz)<br>Trigger switch: FREERUN, TRIGGERED<br>Trigger source<br>WIDE IF VIDEO [bandwidth (3 dB): ≥20 MHz, trigger slope: RISE/FALL]<br>EXT (trigger level: TTL; trigger slope: RISE/FALL)<br>Trigger delay<br>Range: 0 µs to 100 ms; Resolution: 2 µs<br>Gate sweep<br>Displays spectrum of input signal at specified gate on frequency domain display<br>Gate delay: 2 µs to 100 ms; Resolution: 2 µs<br>Gate width: 2 µs to 100 ms; Resolution: 2 µs |
| Functions | Marker functions<br>Signal search: PEAK → CF, PEAK → REF<br>Zone marker: NORMAL, DELTA<br>Marker function: MARKER → CF, MARKER → REF, ZONE → SPAN<br>Peak search: PEAK, NEXT PEAK, NEXT RIGHT PEAK, NEXT LEFT PEAK<br>Measure function<br>Noise power: dBm/Hz, dBm/ch<br>C/N: dBc/Hz, dBc/ch<br>Occupied bandwidth: N% of power method, X-dB down method<br>Adjacent channel power: Reference total power method, reference level method, channel designate display (2 channels x 2), graphic display<br>Average power within a burst: Average power of time domain waveform within specified time |
| Others | Number of data points: 501 points<br>Detector mode<br>POS PEAK: Displays max. point between sample points<br>NEG PEAK: Displays min. point between sample points<br>SAMPLE: Displays momentary value at sample points<br>Display memory<br>Trace A: Displays frequency spectrum<br>Trace B: Displays frequency spectrum<br>Trace time: Displays time domain waveform at center frequency<br>Storage function:<br>NORMAL (refreshed), VIEW (frozen), MAX HOLD (displays maximum envelope), MIN HOLD (displays minimum envelope), AVERAGE, CUMULATIVE, OVER WRITE |

## Ordering information

Please specify the model/order number, name, and quantity when ordering.

| Model/Order No. | Name | |
|---|---|---|
| | **Main frame** | |
| MT8802A | Radio Communication Analyzer | |
| | **Standard accessories** | |
| J0576B | Coaxial cord (N-P • 5D-2W • N-P), 1 m: | 1 pc |
| J0768 | Coaxial adapter (N-J • TNC-P): | 2 pcs |
| | Power cord, 2.6 m: | 1 pc |
| F0014 | Fuse, 6.3 A: | 2 pc |
| | MT8802A operation manual: | 1 copy |
| | **Options** | |
| MT8802A-07 | Spectrum analyzer | |
| MX880201A | CDMA Measurement Software (required for MT8802A operation) | |
| | **Peripherals** | |
| MS8606A | Digital Mobile Radio Transmitter Tester | |
| MS2602A | Spectrum Analyzer | |
| MG3671B | Digital Modulation Signal Generator | |

| Model/Order No. | Name |
|---|---|
| | **Optional accessories** |
| J0127C | Coaxial cord (BNC-P • RG-58A/U • BNC-P), 0.5 m |
| J0769 | Coaxial adapter (BNC-J • TNC-P) |
| J0040 | Coaxial adapter (N-P • BNC-J) |
| MN1607A | 50 Ω Coaxial Switch |
| MA1612A | Four-Point Junction Pad |
| J0395 | Fixed attenuator for high power (30 dB, 30 W, DC to 9 GHz) |
| J0007 | GPIB cable, 1 m |
| J0008 | GPIB cable, 2 m |
| B0329D | Front cover (1MW 5U) |
| B0331D | Front handle kit (2 pcs/set) |
| B0332 | Joint plate (4 pcs/set) |
| B0333D | Rack mount kit |
| B0334D | Carrying case (hard type, with protective cover and casters) |
| J0742A | RS-232C cable (for NEC PC-9801 type, D-sub 25-pin) |
| J0743A | RS-232C cable (for PC-AT type, D-sub 9-pin) |