DIGITAL MOBILE RADIO TRANSMITTER TESTER
MS8606A
300 kHz to 3 GHz

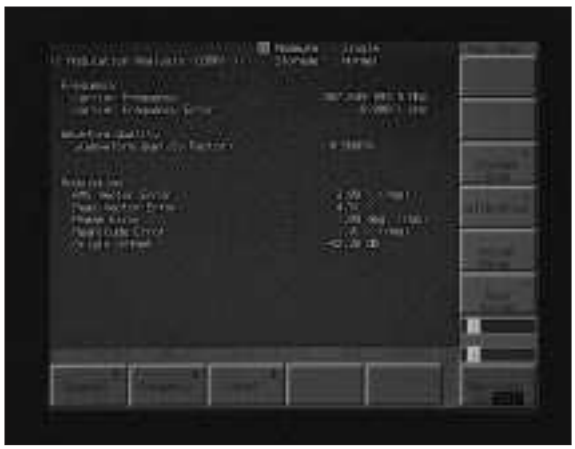
NEW

CE

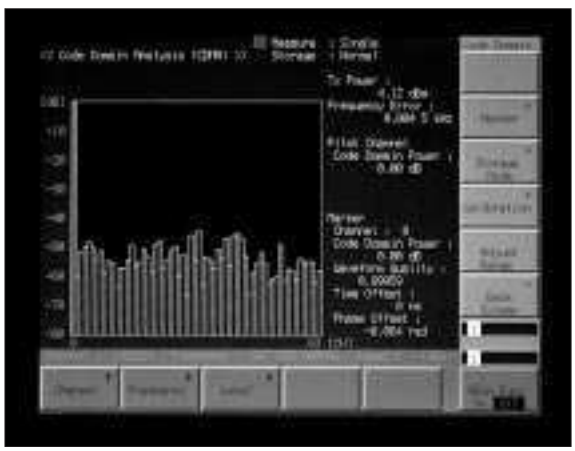
GPIB

The MS8606A can measure CDMA (IS-95, ARIB STD-T53) forward and reverse transmission characteristics. It is ideal for measuring transmitter characteristics including frequency, waveform quality (ρ), timing error (τ), code domain power, transmitter power, occupied bandwidth, neighboring spurious, etc.
The MS8606A can measure PDC transmission characteristic such as transmission frequency and power, modulation accuracy, occupied bandwidth, and adjacent channel power, in addition to the bit error rate.
The built-in spectrum analyzer covers frequencies of 10 MHz to 3 GHz making it ideal for R&D. In addition, the general-purpose evaluation functions can be used to measure the adjacent channel power, occupied bandwidth, and sideband noise of radio equipment.
The MS8606A has general-purpose analog measurement functions, including frequency counter, power meter, FM/øM measurement, AF oscillator and audio analyzer, making it perfect for FM radio transmission tests (AF oscillator and audio analyzer optional).

Features
- For CDMA, PDC measurement
- High-speed, high precision measurement
- Built-in spectrum analyzer and AF measurement function



CDMA modulation analysis



Code domain power measurement

Specifications

• **MS8606A**

Frequency range		300 kHz to 3 GHz
Max. input level		MAIN connector: +40 dBm (10 W), AUX connector: +20 dBm (100 mW)
Input impedance		50 Ω, VSWR: ≤1.2 (≤2.2 GHz, MAIN connector), ≤1.3 (>2.2 GHz, MAIN connector)
Input connector		N-type (MAIN connector), TNC-type (AUX connector)
Reference oscillator		Frequency: 10 MHz Starting characteristics: ≤5 x 10^{-8}/day (after 10 minutes of warm-up, compared to the frequency after 24-hour warm-up) Aging rate: ≤2 x 10^{-8}/day, ≤1 x 10^{-7}/year (compared to the frequency after 24-hour warm-up) Temperature characteristics: ≤5 x 10^{-8} (compared to the frequency at 25˚C) External reference input: 10 or 13 MHz (±1 ppm), 2 to 5 Vp-p
Power meter		Frequency range: 300 kHz to 3 GHz Level range: 0 to +40 dBm Measurement accuracy: ±10% (after zero calibration)
Spectrum analyzer	Frequency	Frequency setting Setting range: 0 to 3 GHz (band: 0), 10 MHz to 3 GHz (band: 1), Setting resolution: 1 Hz Frequency accuracy Display accuracy: ±(display frequency x reference frequency accuracy + span x span accuracy) Normal marker: Same as display frequency accuracy Delta marker: Same as span accuracy Frequency span Setting range: 0 Hz, 10 kHz to 3 GHz (band: 0); 0 Hz, 10 kHz to 2.99 GHz (band: 1) Span accuracy: ±2.5% RBW (resolution bandwidth) Setting range: 300 Hz to 1 MHz (3 dB BW, 1-3 sequence) Accuracy: ±2% (300 Hz to 300 kHz), ±10% (1 kHz) Selectivity (60 dB : 3 dB): ≤5:1 VBW (video bandwidth): 3 Hz to 100 kHz (1-3 sequence), through Side band noise: ≤–95 dBc/Hz (1 GHz, 10 kHz offset), ≤–115 dBc/Hz (1 GHz, 100 kHz offset)
	Amplitude (at Band: 1)	Maximum input level Continuous average power: +40 dBm (MAIN connector), +20 dBm (AUX connector) DC voltage: 0 V Average noise level (at RBW: 1 kHz, VBW: 10 Hz): ≤–90 dBm (MAIN connector, 10 MHz to 1 GHz, input attenuator: 20 dB) ≤–90 dBm + f[GHz] (MAIN connector, >1 GHz, input attenuator: 20 dB) ≤–110 dBm (AUX connector, 10 MHz to 1 GHz, input attenuator: 0 dB) ≤–110 dBm + f[GHz] (AUX connector, >1 GHz, input attenuator: 0 dB) Residual response: ≤–70 dBm (MAIN connector, input attenuator: 20 dB), ≤–90 dBm (AUX connector, input attenuator: 0 dB) Total level accuracy MAIN connector: ±1.5 dB (reference level: +10.1 to +40 dBm, at 0 to –50 dB of reference level) AUX connector: ±1.5 dB (reference level: –9.9 to +20 dBm, at 0 to –50 dB of reference level) Reference level Setting range: –50 to +50 dBm (MAIN connector), –75 to +30 dBm (AUX connector) Setting resolution: 0.1 dB Accuracy: ±0.5 dB (MAIN connector, +10.1 to +40 dBm), ±1.0 dB (MAIN connector, –50 to +10 dBm) ±0.5 dB (AUX connector, –9.9 to +20 dBm), ±1.0 dB (AUX connector, –75 to –10 dBm) RBW switching error: ±0.1 dB (referenced to RBW: 3 kHz) Frequency response: ±0.5 dB [referenced to 100 MHz, input attenuator: 30 dB (10 dB for AUX); temperature range: 18 to 28˚C] Log linearity: ±0.5 dB (0 to –50 dB, RBW: ≤1 MHz), ±1.0 dB (0 to –70 dB, RBW: ≤30 kHz), ±1.0 dB (0 to –80 dB, RBW: ≤3 kHz) ∗10 MHz to 2.2 GHz, reference level: ≥0 dBm (MAIN connector); ≥–20 dBm (AUX connector) 2nd harmonic distortion: ≤–55 dBc (10 to 100 MHz), ≤–60 dBc (100 to 1500 MHz) ∗At mixer input level: –30 dBm
	Sweep	Setting range: 100 ms to 1000 s (frequency axis sweep), 100 ms to 1000 s (time axis sweep, RBW: ≤1 kHz) 10 ms to 1000 s (time axis sweep, RBW: 3 to 10 kHz), 1 ms to 1000 s (time axis sweep , ≥30 kHz) Trigger switch: FREERUN, TRIGGERED Trigger source: WIDE IF VIDEO (3 dB bandwidth: ≥20 MHz, trigger slope: RISE/FALL) EXT (trigger level: TTL level, trigger slope: RISE/FALL) Trigger delay Setting range: 0 µs to 100 ms, Resolution: 2 µs Gate delay, gate width Setting range: 2 µs to 100 ms, Resolution: 2 µs
	Functions	Marker Signal search: PEAK→CF, PEAK→REF Zone marker: NORMAL, DELTA Marker→function: MARKER→CF, MARKER→REF, ZONE→SPAN Peak search: PEAK, NEXT PEAK, NEXT RIGHT PEAK, NEXT LEFT PEAK Measurement Noise power: dBm/Hz, dBm/ch C/N: dBc/Hz, dBc/ch Occupied bandwidth: Power N% method, X dB down method Adjacent channel power Reference measurement: Total power/reference level method, Display method: Channel designate display 2 channels x 2, graphic display Average power of burst signal: Average power within the specified time range of the time axis waveform
	Others	Number of data point: 501 Detection mode: POS PEAK, NEG PEAK, SAMPLE Display function: TRACE A, TRACE B, TRACE TIME Storage function: NORMAL, VIEW, MAX HOLD, MIN HOLD, AVERAGE, CUMULATIVE, OVER WRITE

Continued on next page

Analog measurement	RF analyzer	Power measurement (wide band) Frequency range: 300 kHz to 3 GHz Level range: 0 to +40 dBm (MAIN connector) Accuracy: ±10% (after zero point calibration) Power measurement (narrow band) Frequency range: 10 MHz to 3 GHz Input level: 0 to +40 dBm (MAIN connector), –40 to +20 dBm (AUX connector) Accuracy: ±10% (MAIN connector, after calibration with internal wide band power meter) ±1 dB (AUX connector, reference level: ≥–12 dBm, after calibration) Linearity: ±0.3 dB (0 to –30 dB) Frequency measurement Frequency range: 10 MHz to 3 GHz Input level: –15 to +40 dBm (MAIN connector), –40 to +20 dBm (AUX connector) Resolution: 1 Hz Accuracy: ±(reference oscillator accuracy + 10 Hz) ∗IF frequency counting (bandwidth: ±30 kHz) FM measurement Frequency range: 10 MHz to 3 GHz Input level: –15 to +40 dBm (MAIN connector), –40 to +20 dBm (AUX connector) Deviation: 0 to 20 kHz Demodulation frequency: 30 Hz to 20 kHz Accuracy: 1% of indicated value + residual FM (demodulation frequency: 1 kHz) Frequency response: ±0.5 dB (demodulation frequency: referenced to 1 kHz) Residual FM: 8 Hz-rms (demodulation frequency: 0.3 to 3 kHz) Distortion: 0.3% (demodulation frequency: 1 kHz, demodulation bandwidth: 0.3 to 3 kHz, deviation: 5 kHz) Filters (3 dB cut-off): HPF (50 Hz, 300 Hz), LPF (3 kHz, 15 kHz) øM measurement Frequency range: 10 MHz to 3 GHz Input level: –15 to +40 dBm (MAIN connector), –40 to +20 dBm (AUX connector) Deviation: 0 to 10 rad Demodulation frequency: 300 Hz to 3 kHz Accuracy: 1% of indicated value + residual øM (demodulation frequency: 1 kHz) Frequency response: ±0.5 dB (demodulation frequency: referenced to 1 kHz) Residual øM: 0.01 rad-rms (demodulation bandwidth: 0.3 to 3 kHz) Distortion: 0.5% (demodulation frequency: 1 kHz, demodulation bandwidth: 0.3 to 3 kHz, deviation: 5 rad) Filters (3 dB cut-off): HPF (50 Hz, 300 Hz), LPF (3 kHz, 15 kHz)
Others		Display: Color TFT-LCD, 7.8”, 640 x 480 dots Hard copy: Enables data hard copy of the display through a parallel interface (printer: ESC/P compatible printer) GPIB: This equipment is specified as a device, can be controlled from external controller (excluding power switch). Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2 Parallel interface: Conform to the Centronics. Outputs printing data to printer. D-sub 25-pin connector (female) RS-232C: All functions except power switch controlled by external controller (baud rate: 1200, 2400, 4800, 9600 bps)
Dimensions and mass		426(W) x 221.5(H) x 451(D) mm, ≤22 kg
Power		100 to 120/200 to 240 Vac (–15%/+10%, max. voltage: 250 V, automatic voltage switch system), 47.5 to 63 Hz, ≤300 VA
Operating temperature		0˚ to 50˚C

• Option 01: AF measurement

The following items have been added to the standard analog measurement items.

Audio analyzer	Input impedance: 600 Ω/100 kΩ (unbalanced, BNC connector) Filters HPF: 400 Hz (for tone rejection), De-emphasis: 750 µs, Weighting filter: ITU-T P.53, C-Message AF Level measurement Frequency range: 30 Hz to 20 kHz, Level range: 1 mVrms to 30 Vrms, Accuracy: ±0.5 dB Distortion measurement Frequency range: 100 Hz to 5 kHz, Level range: 30 mVrms to 30 Vrms, Accuracy: ±1 dB (frequency: 1 kHz, distortion factor: 1%) AF frequency measurement Frequency range: 30 Hz to 20 kHz, Level range: 30 mVrms to 30 Vrms, Accuracy: ±0.1 Hz
AF generator	Frequency Frequency range: 20 Hz to 20 kHz, Setting resolution: 0.1 Hz, Accuracy: Same as reference oscillator Output Level range: 0.1 mVrms to 3.0 Vrms (EMF, main output impedance: 600 Ω) 0.1 mVrms to 0.3 Vrms (EMF, main output impedance: 50 Ω) Setting resolution: 1 µV (output level: <4 mV), 10 µV (output level: ≤40 mV), 100 µV (output level: ≤0.4 V), 1 mV (output level: ≤3 V) Accuracy (bandwidth: <30 kHz) Unbalanced output: ±0.5 dB (frequency: 1 kHz, output level: ≥1 mV), ±1 dB (frequency: 20 Hz to 20 kHz, output level: ≥1 mV) Floating output: ±2 dB (frequency: 1 kHz, output level: ≥1 mV) Output impedance Main output: 600 Ω, 50 Ω (unbalanced, BNC-type) Microphone input: 600 Ω (floating, DUT interface) Distortion: <–50 dBc (bandwidth: <30 kHz, demodulation frequency: 1 kHz, output level: 1 V) <–45 dBc (bandwidth: <30 kHz, demodulation frequency: 20 Hz to 20 kHz, output level: 1 V) Noise generator: White noise passed through a weighting filter (conforming to ITU-T Rec. G.227)
FM demodulation output	Deviation: 0 to 40 kHz (4/40 kHz range) Demodulation frequency: 50 Hz to 10 kHz Output level: 4 Vpeak (EMF, at full-scale range) Output impedance: 600 Ω
Mass	≤1 kg

• MX860601A CDMA Measurement Software

All specifications are guaranteed after the Adjust Range key and Calibration key are pressed.

Modulation/frequency measurement	Frequency range: 10 MHz to 2.2 GHz Input level: –10 to +40 dBm (average power during burst on, MAIN connector) Carrier frequency accuracy: ±10 Hz Waveform quality (ρ) Measurement accuracy: <0.001 Modulation accuracy Residual vector error: <3.0%
Code domain analysis	Frequency range: 10 MHz to 2.2 GHz Input level: +10 to +40 dBm (MAIN connector) Carrier frequency accuracy: ±10 Hz Code domain power measurement accuracy: ±0.1 dB (at –7 dBc) Waveform quality (ρ) Measurement accuracy: <0.001
Amplitude measurement	Frequency range: 10 MHz to 2.2 GHz Input level: +10 to +40 dBm (average power during burst on, MAIN connector), 0 to +40 dBm (continuous signal, MAIN connector) –20 to +20 dBm (average power during burst on, AUX connector), –30 to +20 dBm (continuous signal, AUX connector) Transmitter power accuracy: ±10% (MAIN connector), ±1 dB (AUX connector, reference level: ≥–12 dBm, 18˚ to 28˚C) Burst analysis: Rise/fall edge characteristics and on/off ratio analysis function
Occupied bandwidth measurement	Frequency range: 20 MHz to 2.2 GHz Input level: 0 to +40 dBm (average power during burst on, MAIN connector), –20 to +20 dBm (average power during burst on, AUX connector) Measurement system: Spectrum analyzer or FFT method
Neighboring spurious measurement	Frequency range: 20 MHz to 2.2 GHz Input level: +10 to +40 dBm (average power during burst on, MAIN connector), –20 to +20 dBm (average power during burst on, AUX connector) Measurement system: Spectrum analyzer method Measurement range: ≥50 dB (900 kHz offset), ≥60 dB (1.98 MHz offset)

• MX860602A PDC Measurement Software

All specifications are guaranteed after the Adjust Range key and Calibration key are pressed.

Modulation/frequency measurement	Frequency range: 10 MHz to 2.2 GHz Input level: –10 to +40 dBm (average power during burst on, MAIN connector), –30 to +15 dBm (average power during burst on, AUX connector) Carrier frequency accuracy: ±(reference oscillator accuracy + 1 Hz) Modulation accuracy Measurement range: 0 to 12.5%, Accuracy: ±(2% of indicated value + 0.5%) Origin offset accuracy: ±0.5 dB (relative to signal of –30 dBc) Transmission rate Measurement range: 42 kbps ±100 ppm, Accuracy: ±1 ppm Waveform display: Constellation display
Amplitude measurement	Frequency range: 10 MHz to 2.2 GHz Input level: +10 to +40 dBm (average power during burst on, MAIN connector), –40 to +20 dBm (average power during burst on, AUX connector) Transmitter power accuracy: ±10% (MAIN connector), ±1 dB (AUX connector, reference level: ≥–12 dBm, 18˚ to 28˚C) Carrier-off power measurement: ≥65 dB (normal mode, compared to average power during burst on) ≥95 dB (wide dynamic range mode, compared to average power during burst on: 3 W) ⋆Measured limit determined by average noise level (≤–60 dBm, 100 MHz to 2.1 GHz) Rise/fall edge characteristics: Displays waveform while synchronizing modulated data of measured signal, displays limit line, rise/fall edge time measurement (measured at 100 kHz bandwidth)
Occupied bandwidth measurement	Frequency range: 10 MHz to 2.2 GHz Input level: +5 to +40 dBm (average power during burst on, MAIN connector), –15 to +20 dBm (average power during burst on, AUX connector) Standard mode: Displays calculation result after measured signal with sweep-type spectrum analyzer High speed mode: Displays calculation result after analyzing signal (one burst) with FFT
Adjacent channel power measurement	Frequency range: 10 MHz to 2.2 GHz Input level: +5 to +40 dBm (average power during burst on, MAIN connector), –15 to +20 dBm (average power during burst on, AUX connector) Standard mode: Displays calculation result after measured signal with sweep-type spectrum analyzer High speed mode: Displays calculation result after analyzing signal (one burst) with spectrum analyzer emulation Measurement range: ≥60 dB (50 kHz offset), ≥65 dB (100 kHz offset)
Batch measurement function	Measurement item: Transmission frequency, modulation accuracy, origin offset, transmission rate, transmitter power, leakage power during carrier-off, pass/fail decision for specifications of transmitter output time response, occupied bandwidth, adjacent channel power Measurement time: ≤1.5 s (amplitude measurement: normal mode; occupied bandwidth and adjacent channel power measurements: high-speed mode) ≤2 s (amplitude measurement: wide dynamic range mode; occupied bandwidth and adjacent channel power measurement: high-speed mode)
Error rate measurement	Measurement pattern: PN9, PN15 Number of measurement bit: 10^2, 2556, 10^3, 10^4, 10^5, ∞ Input level: TTL (NRZ), Input terminal: BNC-type (rear panel) or DUT interface (front panel)

Ordering information

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

Model/Order No.	Name	
	Mainframe	
MS8606A	Digital Mobile Radio Transmitter Tester	
	Standard accessories	
J0576B	Coaxial cord (N-P•5D-2W•N-P), 1 m:	1 pc
J0768	Coaxial adaptor (N-J•TNC-P) :	1 pc
J0017F	Power cord, 2.6 m:	1 pc
F0014	Fuse, 6.3 A:	2 pcs
	Options	
MS8606A-01	AF measurement (audio analyzer, AF oscillator)	
MX860601A	CDMA Measurement Software	
MX860602A	PDC Measurement Software	
	Peripherals	
MT8801B	Radio Communication Analyzer	
MS8604A	Digital Mobile Radio Transmitter Tester	
MD1620C	Signalling Tester	
MD6420A	Data Transmission Analyzer	
MS2602A	Spectrum Analyzer	
MG3670B/C	Digital Modulation Signal Generator	
MG3671A/B	Digital Modulation Signal Generator	
	Optional accessories	
J0127C	Coaxial cord (BNC-P•RG-58A/U•BNC-P), 0.5 m	
J0769	Coaxial adaptor (BNC-J•TNC-P)	
J0040	Coaxial adaptor (N-P•BNC-J)	
MN1607A	Coaxial Switch (DC to 3 GHz, 50 Ω, external controllable)	
MA1612A	Four-Point Junction Pad (5 to 3000 MHz)	
J0395	Fixed attenuator for high power (30 dB, 30 W, DC to 8 GHz)	
J0007	GPIB cable, 1 m	
J0008	GPIB cable, 2 m	
B0329D	Front cover (1MW5U)	
B0331D	Front handle (2 pcs/1 set)	
B0332	Joint prate (4 pcs/set)	
B0333D	Rack mount kit	
B0334D	Carrying case (hard type)	