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Willtek 4304/5

Mobile Service Tester

- High accuracy in a powerful test instrument that is easy to use
- Handoff capability from AMPS/ NAMPS/TDMA and vice versa
- Other models available for CDMA2000 (1xRTT) and CDMAOne (IS-95)
- Data management results can be printed, stored or managed on a PC
- Free software updates available on the Internet
- Simulates real network conditions for complete testing

The 4304/4305Willtek Mobile Service Tester is specially designed to meet the needs of service depots and repair sites that have to repair and align TDMA mobile phones. Customers can choose the appropriate model from the Willtek 4300 Series according to their format requirements, AMPS/NAMPS/CDMA2000/TDMA. The Willtek 4300 Series includes:

- 4301 Mobile Service Tester
  AMPS plus NAMPS
- 4302 Mobile Service Tester
  AMPS plus CDMA2000
- 4303 Mobile Service Tester
  AMPS, CDMA2000 plus
  PCS (1900 MHz)
- 4304 Mobile Service Tester
  AMPS plus TDMA and
  IS-136 basic software
- 4305 Mobile Service Tester
  AMPS plus TDMA, PCS (1900 MHz)
  and IS-136 basic software

Easy to operate

Each tester in the Willtek 4300 Series shares the same three main characteristics: accuracy, ease of handling and affordability. The 4304 Mobile Service Tester allows testing of AMPS, NAMPS and TDMA mobile phones, while the 4305 Mobile Service Tester is able to test the 1900 MHz (PCS) band too. Handoffs between formats (AMPS, NAMPS and TDMA) are standard.

Three powerful test modes

Both the 4304 and 4305 offer QuickTest, AutoTest and Manual modes to enable easy repair and alignment of mobile phones.

The QuickTest mode provides a reliable Go/NoGo decision at the press of a button, while the equally easy-to-use AutoTest mode provides more intensive testing. In the Manual mode users can set all important conditions and parameters that occur in a real network, and measure and align mobile phones accordingly. All results are displayed on the screen when Manual mode is used.

To achieve even greater accuracy, an external reference oscillator can be connected. Measurement results can be printed via the parallel printer port and the powerful set of SCPI commands allows the Mobile Service Tester to be remotely controlled via GPIB or via RS-232-C interface.

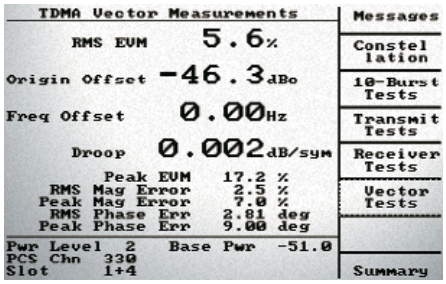
As a member of the next generation of cellular test systems, the Mobile Service Tester is functional and fully compatible with the Willtek 3600 models. With firmware updates available on the Internet that can be easily downloaded and installed into the test system, the Willtek Mobile Service Tester is a valuable asset now and for the future.

AMPS/NAMPS measurements

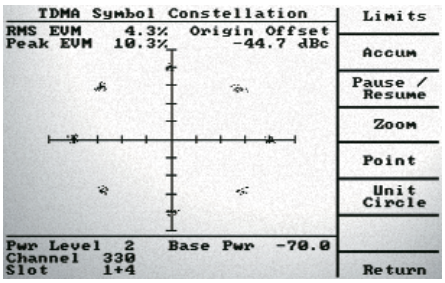
Analog BER
SINAD
Mobile TX power (MAC)
Frequency error
SAT, ST deviation
SAT, ST frequency measurement
ST duration
DSAT, DST (NAMPS)
Audio deviation
Wideband deviation
Residual deviation
Receiver distortion
Receiver sensitivity

TDMA measurements

Digital BER
BER reporting (MAHO BER)
RSSI binary/nominal (dB)
MAHO RSSI binary/nominal (dB)
2nd carrier RSSI
Audio test
Normal audio loopback
Receiver audio
Silent audio
Droop
RMSEVM (error vector magnitude)
Peak EVM (error vector magnitude)
RMS magnitude error



Results screen show all TX vector measurements.



The spread of modulation vectors are clearly illustrated with the TDMA constellation screen.

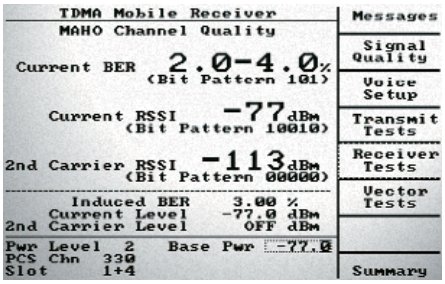
Peak magnitude error
RMS phase error
PEAK phase error
Origin offset
EVM normalized over 10 bursts
Mobile TX power (MAC)
Frequency error
Time alignment
Acquisition time
Receiver sensitivity
Forward RO (requires VSELP)
Reverse RO (requires VSELP)
Average MS power
Maximum MS power (Peak)
Fading simulation
Burst power/timing display
Constellation display
I/Q tuning spectrum display

Signaling

Mobile registration
MS call (mobile-originated)
BS call (page mobile)
MS release
BS release
Handoff
Alert with info
Flash with info
Authentication
SSD update
MS hookflash with info
Short message system
Message waiting
Message channel

Additional features

Mobile DTMF key check
QuickTest
AutoTest
Manual operation mode



RX bit error rate screen illustrates an induced BER of 3%.

Specifications

Basic RF data

Input/output impedance	50 Ω
VSWR	< 1.30 (900 MHz) < 1.80 (1900 MHz)
RF input/output	TNC-type, female
Internal reference frequency	10 MHz
Temperature stability	0.2 x 10^{-6} (0°C to 50°C)
Aging	10^{-6} per year
External reference input	BNC-type, female
External reference frequency	10 MHz
Cal Out	TNC-type, female

System functions

TDMA

RF Generator (TDMA)

Frequency

Range	869.040 MHz to 893.970 MHz (4304/05) 1930 MHz to 1990 MHz (4305)
Resolution	0.01 MHz (NAMPS) 0.03 MHz (AMPS/TDMA)
Accuracy	same as reference frequency

Output level

Range	–23 dBm to –125 dBm
Resolution	0.1 dB
Accuracy	±0.75 dB + 0.003 dB/dB (from –30 dBm to –120 dBm at 25°C) ±2.0 dB + 0.003 dB/dB (from –30 dBm to –120 dBm at 10°C to 40°C)

Modulation

Type	π/4 DQPSK α = 0.35
RMS vector error	6%

RF Analyzer (TDMA)

Frequency

Range	824 MHz to 849 MHz (4304/05) (within ±500 Hz from channel center) 1850 MHz to 1910 MHz (4305) (within ±500 Hz from channel center)
Resolution	1 Hz (within ±500 Hz from channel center)
Accuracy	2 Hz (plus accuracy of the reference frequency)

Level

Range	–60 dBm to +40 dBm
Resolution	0.1 dB
Accuracy	±0.65 dB + 0.003 dB/dB (from +40 dBm to –20 dBm at 25°C) 1.2 dB (at 10°C to 40°C)

Demodulation measurement

Measurement samples	157 symbols (max.)
Burst timing range	+5, –20 symbols relative to standard offset burst timing
Accuracy	±5 µs (1/8 symbol)
EVM accuracy	0.4% ±2% of reading
Residual EVM	< 2.8% (typical)
Residual phase error	< 1.6° (typical)
Residual magnitude error	< 1.0° (typical)
I/Q origin offset accuracy	0.5 dB for –40 dBc (typical)

Tuning spectrum

Level range	+40 dB to –100 dB
Amplitude accuracy	1 dB (up to –40 dBc, from (relative) +20 dBm to –40 dBm)
Amplitude accuracy	3 dB (from +30 dBm (absolute) to –40 dBm)
Frequency resolution	190 Hz
Frequency accuracy	95 Hz (plus reference frequency error plus RF-tuning error)

AMPS/NAMPS

RF Generator (AMPS/NAMPS)

Frequency

Range	869.040 MHz to 893.970 MHz (4304/05) 1930 MHz to 1990 MHz (4305)
Resolution	0.01 MHz (NAMPS) 0.03 MHz (AMPS)
Accuracy	same as reference frequency

Output level

Range	–23 dBm to –125 dBm
Resolution	0.1 dB
Accuracy	±0.75 dB + 0.003 dB/dB (from –30 dBm to –120 dBm at 25°C) ±2.0 dB + 0.003 dB/dB (from –30 dBm to –120 dBm at 10°C to 40°C)

Modulation

Type	Frequency modulation
Frequency range	50 Hz to 12 kHz
Deviation range	0 Hz to 12 kHz
Deviation accuracy	±5% (from 300 Hz to 12 kHz + FM residuals)

RF Analyzer (AMPS/NAMPS)

Frequency

Range	824 MHz to 849 MHz
Resolution	0.01 MHz (NAMPS) 0.03 MHz (AMPS/TDMA)
Accuracy	±10 Hz (plus accuracy of the reference frequency)

Level

Range	–20 dBm to +40 dBm
Resolution	0.1 dB
Accuracy	±0.65 dB + 0.003 dB/dB (from +40 dBm to –20 dBm at 25°C) 1.2 dB (at 10°C to 40°C)

Frequency counter (RF) – (AMPS)

Range	±30 kHz from channel frequency
Resolution	0.01 kHz
Accuracy	±10 Hz (plus accuracy of the reference frequency)
Sensitivity	–20 dBm typical

Demodulation measurement

Type	Frequency modulation
Frequency range	50 Hz to 12 kHz
Deviation range	0 Hz to 21.585 kHz
Deviation accuracy	±5% (from 300 Hz to 12 kHz rates + FM residual)
Residual FM and noise	< 50 Hz rms (0.3 to 3 kHz)

DEMOD output

Level	1 V_{rms} = 8 kHz deviation
Frequency	10 Hz to 50 kHz
Impedance (load)	> 600 Ω

SINAD

Range	45 dB (at 1 kHz, at 1 V_{rms} In to Audio In)
Accuracy	1 dB (for inputs 0.1 to 1.0 V_{rms})
Distortion	0.6% (at 1 kHz, at 1 V_{rms} In to Audio In)

Basic AF data

Audio In	BNC-type, female
Audio Out	BNC-type, female
DEMOD Out	BNC-type, female

AF Generator (AMPS/NAMPS)

Frequency

Range	1 Hz to 100 kHz
Resolution	1 Hz
Accuracy	same as reference frequency

Output level

Range	0 to 8.00 V_{rms}
Resolution	0.008 V_{rms}
Distortion (sine wave)	< 0.50% (for 20 Hz to 50 kHz, V_{out} < 7.50 V_{rms})

AF Analyzer (AMPS/NAMPS)

External audio input

Level range	0 to 5.115 V_{rms}
Frequency range	50 Hz to 50 kHz
Impedance	200 kΩ

Frequency counter (SAT, ST)

Range	±20 kHz
Resolution	0.001 kHz
Accuracy	±0.001 kHz + accuracy of the reference frequency

DC measurements

Input level	0 to 15 VDC

Output level measurements

Voltage level	0 to 15 V DC
Resolution	0.1 V
Accuracy	±0.1 V + 1 Digit
Current	0 to 5 A
Resolution	0.1 A
Accuracy	±0.1 A + 1 Digit

General data

External interfaces computer/control

Serial interface	RS-232-C
Printer interface	Centronics (parallel), Epson/IBM compatible
GPIB	IEEE STD 488 port
Disk drive	1.44 MB, 3.5-in, PC compatible

Power requirements

Mains voltage range	85 to 264 VAC (max 5 A)
Mains voltage frequency	47 to 440 Hz

Environmental specifications

Storage temperature	–20°C to +70°C
Operating temperature	+10°C to +40°C
Storage humidity	10% to 90% (noncondensing)
Operating humidity	10% to 75% (noncondensing)

Physical specifications

Size (h x w x d)	8 x 17.5 x 20.5 in (203 x 445 x 521 mm)
Weight	43 lb (19.5 kg)

Ordering information

Willtek 4301 Mobile Service Tester AMPS (includes NAMPS)	M 104 301
Willtek 4302 Mobile Service Tester AMPS/CDMA2000	M 104 302
Willtek 4303 Mobile Service Tester AMPS/CDMA2000/PCS	M 104 303
Willtek 4304 Mobile Service Tester AMPS/TDMA including IS-136 basic software	M 104 304
Willtek 4305 Mobile Service Tester AMPS/TDMA/PCS including IS-136 basics software	M 104 305

Options

IS-136 custom software (for 4304, 4305)	IIS136COPT
OSC1 Oven-controlled oscillator (0.05 ppm)	M 248 962
Screen capture software	M 892 193

Upgrades

4301 to 4302 AMPS only to AMPS/CDMA	I-CDMA-OPT
4302 to 4303 AMPS/CDMA to AMPS/CDMA/PCS	I-FEX-OPT
4301 to 4304 AMPS only to AMPS/TDMA	I-TDMA-OPT
4304 to 4305 AMPS/TDMA to AMPS/TDMA/PCS	I-FEX-OPT

Note: Specifications, terms and conditions are subject to change without prior notice.

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