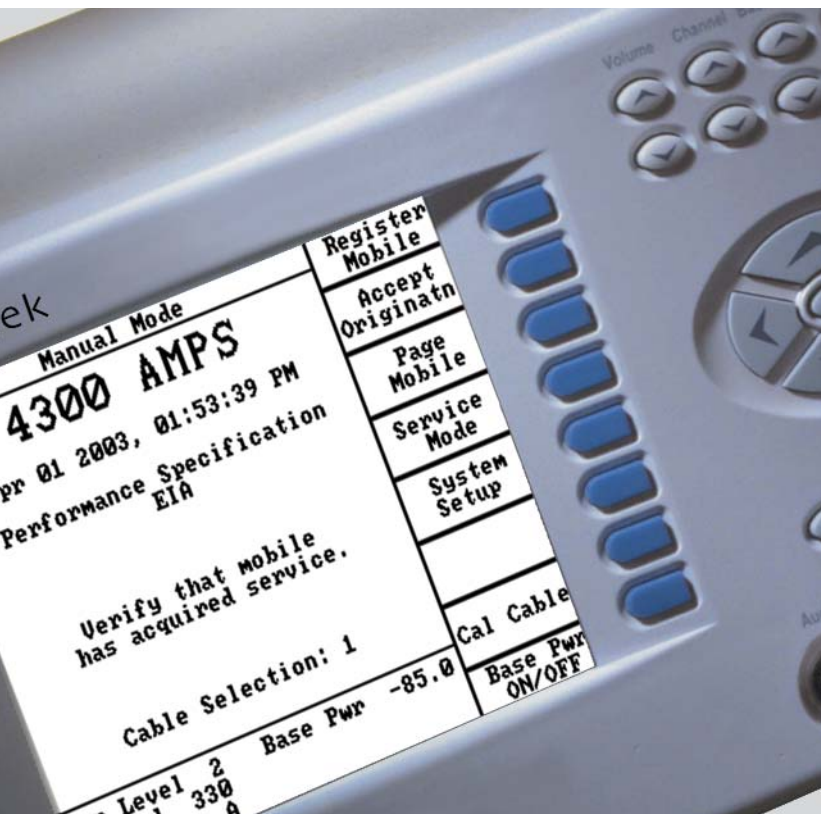# will'tek

Willtek
4302/3
Mobile Service Tester

AMPS/NAMPS, CDMA IS-95 and CDMA2000 included

A powerful test solution for AMPS, NAMPS, CDMAOne (IS-95), CDMA2000 (1xRTT)

Excellent performance at a competitive price

Extensive graphical analysis

Choice of Manual, QuickTest or AutoTest Modes

An easy-to-use testing instrument that requires minimal training

Simulates real network conditions for complete testing

TDSO-SO32 for testing data devices

The Willtek 4300 CDMA Series provides manufacturing, service depots and repair sites with a powerful, cost-effective solution for the testing and alignment of mobile phones. Developed by Willtek, the leading vendor of mobile handset test equipment, this series of compact test instruments also enables service providers to determine specific problems with mobile phones and validate the need for repair quickly, efficiently and cost-effectively.

The latest development of the 4300 CDMA Series includes test capability for the new 2.5G-CDMA2000 (1xRTT) wireless technology, as well as legacy IS-95 standards. Using the Willtek 4300 CDMA Series, service and repair organizations can screen mobile phones on arrival, test repairs and realignments, and perform final customer return testing faster and to the highest quality standards.

The Willtek 4300 CDMA Series is available at an extremely competitive price, ensuring customers can benefit from leading-edge test performance for a relatively small investment. The test system is also easy to use, so it simplifies integration into the test environment and minimizes training costs. In addition, the product features a compact, lightweight design that makes it suitable for all kinds of testing operations.

The unit is available in two models, 800 MHz US Cellular band (Willtek 4302) or 1900 MHz (Willtek 4303) which supports both US and Korean PCS bands. Both units also provide full test capabilities for the Analog AMPS and NAMPS cellular formats. Handoff between all formats is standard, including 800 MHz to 1900 MHz hyperband handoff.

The code domain graph shows the rho measurements (in dB) for each I and Q Walsh Code channel plotted as a bar graph. The current Walsh code selection is displayed in inverse video on the graph. Below the Walsh Code display are the numeric measurements values for the selected code. This screen also displays the composite rho and total power for the mobile signal, as well as time and frequency errors in the pilot signal.

AMPS/NAMPS measurements

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

CDMA2000 measurements

Transmitter measurements
Average power
Maximum power
Minimum power
Gated output power
Open loop power accuracy
Time response of open loop power control
Access probe power
Standby power
Closed loop power
Waveform quality (rho)
Composite (multicode) waveform quality (rho)
Channel frequency error
Timing error
Code domain power (graphical and data)
Code domain time and phase offsets (data only)
Carrier feedthrough
RMS error vector magnitude
Peak error vector magnitude
RMS magnitude error
Peak magnitude
RMS phase error
Peak phase error
I/Q imbalance

Receiver measurements
Frame error rate (FER)
Receiver sensitivity
Receiver dynamic range
Demodulation with AWGN
Mobile reported FER
Mobile reported pilot strength

Handoff capability
AMPS to NAMPS and vice versa
CDMA to AMPS/NAMPS
Hyperband from CDMA 800 MHz to CDMA 1900 MHz and vice versa
Softer handoff

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
Message waiting

Three powerful test modes
The Willtek 4300 CDMA test instruments can be operated in the Manual, QuickTest or AutoTest modes to enable rapid and easy repair or alignment of CDMA devices.

The QuickTest mode provides a reliable Go/NoGo decision at the press of a single button, while the equally easy-to-use AutoTest mode provides more intensive testing. In the Manual Operations mode, users can set all of the important conditions and parameters which occur in a real network and measure and align mobile phones accordingly.
Simplified integration into automatic and production test systems can be achieved over IEEE 488 or serial remote control busses. Test control programs can also be written by a customer using a SCPI command set, or from the Willtek CATS LabWindows™-based test environment.

Together, these features combine to make the Willtek 4300 CDMA Series the most cost-effective test solution available for mobile phone repair and realignment operations.

CDMA test summary (voice)

CDMA test summary (loopback)

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	0.2×10^{-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

CDMA

RF generator

Frequency

Cellular	869 to 894 MHz (4302, 4303)
US PCS	1930 to 1990 MHz (4303)
Korean PCS	1805 to 1870 MHz (4303)
Resolution	10 kHz
Accuracy	same as reference frequency

Amplitude

Level	−23 dBm to −125 dBm
Resolution	0.1 dB
Accuracy	±0.75 dB ±0.003 dB/dB
	below −30 dBm at 25°C, from −30 to −120 dBm
	±2.0 dB + 0.003 dB/dB below −30 dBm
	from 10°C to 40°C, from −30 to −120 dBm

AWGN

Range	+5 to −10 dB
	relative to CDMA Channel power
Resolution	0.1 dB
Accuracy	±1 dB

CDMA modulation

Type	QPSK
Residual rho	> 0.97
Carrier feedthrough	< −30 dBc

CDMA channels
Sector A

F-Pilot	Walsh code 0
F-Sync	Walsh code 32
F-Paging	Walsh code 1
F-QPCH	Walsh code 80
F-FCH	selectable Walsh codes (2-64)
F-OCNS	fixed to upper three Walsh codes

Sector B (utilized in softer handoff)

F-Pilot	Walsh code 0
F-FCH	selectable Walsh codes (2-63)
F-OCNS	fixed to Walsh Code 64

RF analyzer

Frequency

Cellular	824 to 849 MHz (4302, 4303)
US PCS	1850 to 1910 MHz (4303)
Korean PCS	1715 to 1780 MHz (4303)
Resolution	10 kHz
Accuracy	±10 Hz relative to frequency reference

Power range

Max input	+40 dBm
Measurement range	−60 dBm to +40 dBm
Accuracy	±0.65 dB + 0.003 dB/dB at 25°C
	±1.2 dB from 10°C to 40°C

Waveform quality rho

Range	0.90 to 1.0
Accuracy	±0.003
Timing measurement accuracy	±60 ns

External CDMA signals interface

Inputs	10 MHz reference, even second clock
Outputs	even second clock chip x 16, chip x 8,
	chip x 4, chip, PN clock, 20 ms, 80 ms, 1.25 ms

Call processing

Protocols supported

	IS95A
	JSTD-008
	TSB74
	IS2000-P_REV6

Functions

	registration
	base station origination
	base station release
	mobile origination
	mobile release
	authentication, message waiting, caller ID

Handoffs

	intraband hard handoff
	interband hard handoff
	handoff to AMPS/NAMPS
	sector (softer) handoff

Speech encoding

	loopback,
	canned speech, silent, normal
	audio tones, audio chirp

Common control channel parameters

	NID
	SID
	MCC
	MNC
	F-QPCH state
	F_PCH relative level
	reverse link traffic pilot gain

Access channel parameters

	nominal power
	initial power
	power step
	probe steps
	response sequences
	request sequences
	preamble length
	timeout

Registration support

	timer-based
	power up
	power down
	zone
	distance
	ordered
	implicit (origination)
	parameter change

Service options

	support for RC 1-5
	SO1 – 9.6 kbps voice echo
	SO2 – 9.6 kbps data loopback
	SO3 – 9.6 kbps EVRC voice
	SO9 – 14.4 kbps data loopback
	SO17 – 14.4 kbps voice echo
	SO55 – RC 3, 4 and 5 data loopback
	SO32 – test data service option (RC 3 and RC 4)
	SO32768 – 14.4 kbps voice echo

Reverse link power control

	active
	alternating
	all up
	all down

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 VDC
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

OSC1	M 248 962
Oven-controlled oscillator (0.05 ppm)	
Screen capture software	M 892 193

Upgrades

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

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