

## NetTek Analyzer

### ► YBT250 Base Station Transmitter and Interference Analyzer

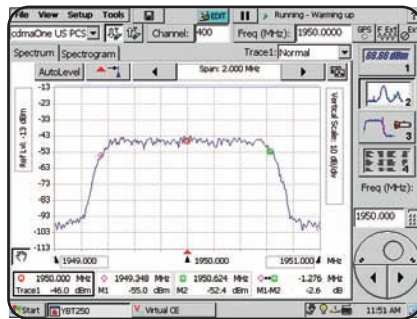


### Portable, Ready for the Field

#### Digital and Analog Transmitter Verification with Outstanding Interference Resolution Capabilities

The Tektronix NetTek analyzer is a revolutionary portable field tool. The YBT250 test module tailors this system for fast trouble resolution and easy transmitter verification of cellular, DCS/PCS and 3G base stations and Node Bs.

The NetTek analyzer with the YBT250 test module is not an expensive, do-everything solution; instead, the YBT250 test module is optimized to perform the day-to-day RF and demodulation measurement tasks that occupy the majority of a technician's time. Further, the YBT250 test module offers this capability at a surprisingly low price, in a rugged, easy-to-use package, suitable for all field environments.



Now, only one tool is needed for RF transmitter maintenance, with specific measurements for GSM/GPRS, EDGE, W-CDMA/UMTS/HSDPA, cdmaOne, cdma2000 1xRTT, cdma2000 1xEV-DO, iDEN, TDMA and analog. Power measurements can be made for user-defined channels.

### ► Features & Benefits

Handheld, Multi-standard Base Station Transmitter Field Tester

Measure Power and Verify the Most Important RF Transmitter Functions of GSM/GPRS, EDGE, W-CDMA/UMTS, HSDPA, cdmaOne, cdma2000 1xRTT, cdma2000 1xEV-DO, TDMA and Analog Base Stations

Measure power for iDEN and user-defined channels

Interference Analyst with High Sensitivity, Including AM and FM Demodulation, Helps Identify Interference Problems

Modular Instrument for Handheld NetTek Platform which Allows for Easy Future Expansion for New Functions

Measure cdmaOne, cdma2000, 1xEV-DO, GSM/GPRS/EDGE and W-CDMA/UMTS/HSDPA RF Performance Over-the-Air

Scan for Coverage of cdmaOne, cdma2000, 1x EV-DO, GSM/GPRS/EDGE and W-CDMA/HSDPA Signals

Supports Rev 19 of Motorola LMF software

### ► Applications

Base Station Transmitter Troubleshooting in the Field

Resolve Interference Problems

Maintenance and Installation Checks

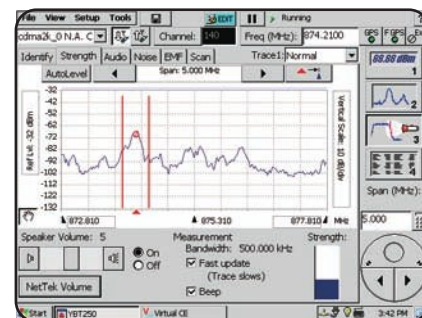
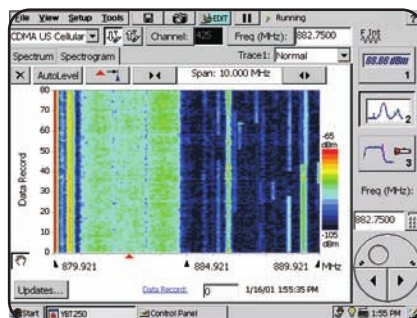
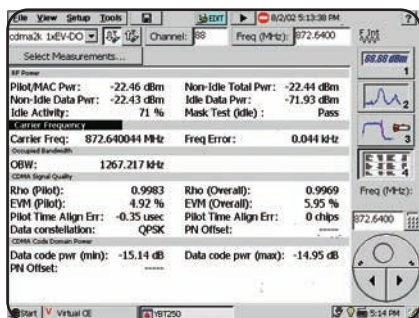
RF QoS Monitoring

W-CDMA and RF Field Strength Measurements

Calibration of Motorola Base Stations

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### Easy to Use

The NetTek analyzer is based around the familiar Windows CE operating system. As a result, users will spend less time learning the instrument and more time troubleshooting the network. The YBT250 test module puts measurement functions just a point of the finger away. Furthermore, built-in help guides speed the measurement process.

Common measurements have been optimized for quick, repeatable results. For example, novice users can display spectrum analyzer results with straightforward Windows-like zoom and resize controls.

The Sequencer allows users to do a customized selection of the RF Power Carrier Frequency, Occupied Bandwidth, Code Domain Signal Quality and Code Domain Power measurements.

### Interference Analyst Option

The YBT250 test module helps locate and identify stray signals that cause dropped calls and poor quality service. To better see what signals may be polluting a Base Station receiver, the optional interference package allows measurements to -134 dBm. This sensitivity also makes the unit ideal for site surveys.

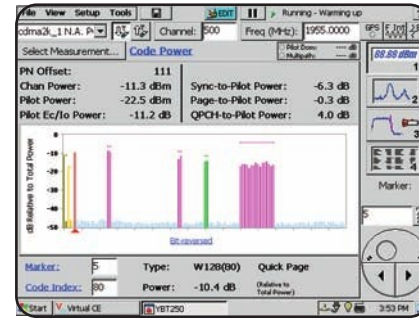
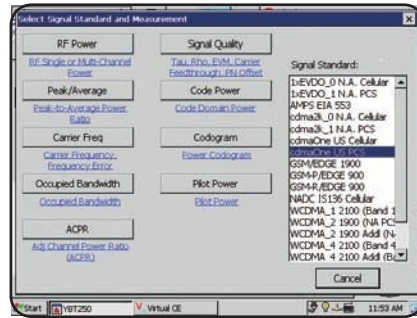
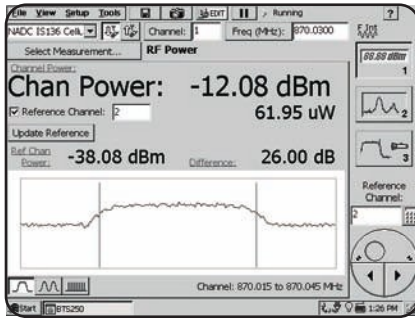
The YBT250 test module also includes a spectrogram display, allowing the user to capture spectrum activity while displaying frequency, power level and time information. This translates to easier identification of hard-to-find, periodic interference problems.

The Interference option includes a built-in modulation ID function. Simply touch a signal, and the instrument will offer information on the likely modulation type, differentiating between CDMA, W-CDMA, GSM, IS-136 and analog transmissions. A strength meter can then help find the location of the interferer.

In addition to interference identification and location capability, the interference option also includes the capability to measure RF Field Strength, allowing the measurement of RF emissions at any given location. Also available is the capability to measure multiple W-CDMA C-PICH (Ec) field strengths, identified by scrambling codes. This is essential when checking emission limits of W-CDMA Node Bs.

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### Power Measurement

This portable instrument does not sacrifice accuracy. The YBT250 test module allows you to measure channel power for common CDMA, GSM, TDMA and analog systems. Measurement accuracy is ±0.75 dB.

Furthermore, peak-to-average power characteristics can be reported for digital carriers.

Burst power can also be measured automatically with the YBT250 test module for GSM and TD-SCDMA systems.

For cdma2000 1x EV-DO systems, the YBT250 provides an idle and non-idle time domain mask as well as Pilot/MAC power and Idle Activity.

### Maintenance Tx Checks

The YBT250 test module's combination of measurements means the unit is up to the task of performance monitoring and troubleshooting.

Measurement results can be saved into Windows-compatible formats and results can be overlaid on the instrument to yield insight into system degradation. Furthermore, the spectrogram formats allow the user to easily monitor transmitter performance over time, with user-defined sample intervals.

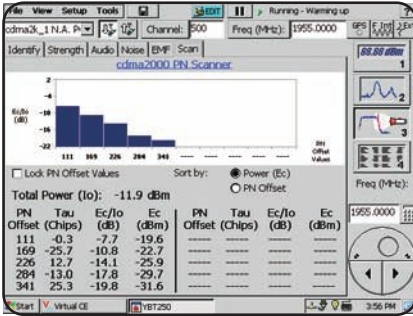
Channel power and frequency error measurements can be performed on multiple radios with just a few taps.

### Optional cdmaOne and cdma2000 1xRTT Demodulation

This option adds extensive cdmaOne and cdma2000 1x (RC1-RC5) demodulation capabilities to the YBT250. It provides the user with code domain power, code domain signal type identification, pilot power, PN offset identification, signal quality measurements such as Rho, EVM and Carrier Feedthrough, and other cdmaOne and cdma2000 specific measurements.

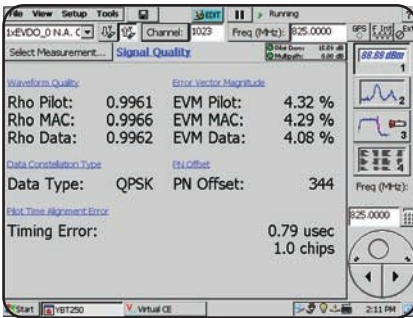
# NetTekAnalyzer

## ► YBT250 Base Station Transmitter and Interference Analyzer



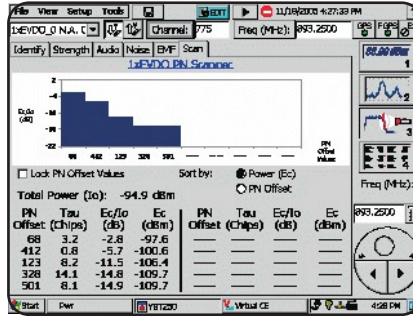
### Optional cdmaOne/cdma2000 Over-the-Air Measurements and Scanner

This cdmaOne/cdma2000 over-the-air software option adds the capability to make cdmaOne/cdma2000 measurements without taking the base station out of service or using a physical test connection. This option also automatically identifies the PN offsets for the ten strongest pilots and graphically displays their power level and timing error. This option monitors pilot dominance and multipath power so users can evaluate their RF measurement environment.



### Optional cdma2000 1x EV-DO Demodulation

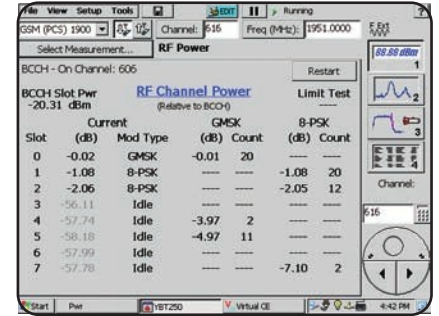
With this cdma2000 1x EV-DO option (which includes Rev A capability), the instrument can perform MAC code domain power, pilot, Rho, EVM, data modulation type identification and other cdma2000 1x EV-DO measurements.



### Optional 1xEV-DO Over-the-Air Measurements and Scanner

The 1xEV-DO scanner adds two capabilities. First, it allows BTS maintenance personnel to find the “Sweet Spot” for over-the-air 1xEV-DO signal quality tests. This can now be done without taking the base station out of service, or even hooking up to the BTS. Second, it gives optimization and planning personnel the ability to troubleshoot coverage, interference and co-channel interference issues with an easy-to-use handheld tool.

This option automatically identifies the PN offsets for the ten strongest pilots and graphically displays their power level, timing error and Ec/Io. This option also measures pilot dominance and multipath power so users can evaluate their RF measurement environment.

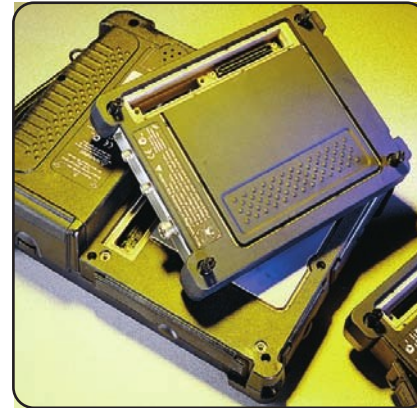
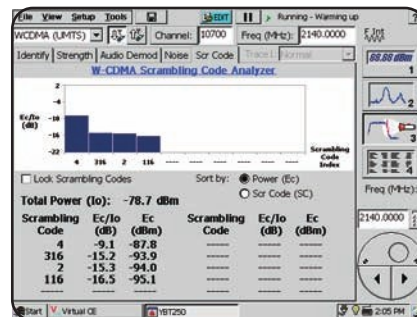
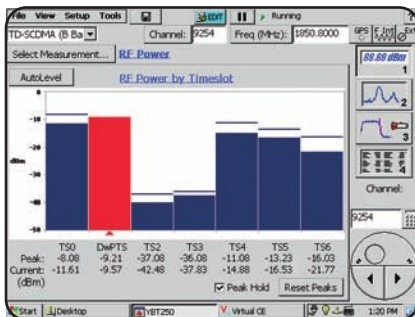
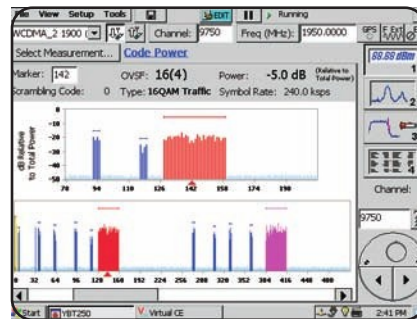
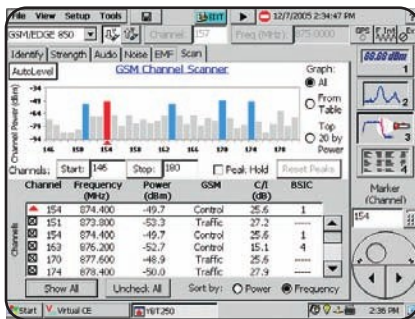


### Optional GSM/GPRS and EDGE RF and Demodulation Testing

This GSM/GPRS and EDGE measurement suite adds the capability to test EGPRS signals to the YBT250. It provides the user with the most important base station RF measurements. These measurements include RF power measurements for each time slot, Power vs. Time, EVM, Phase Error, Origin Offset, Carrier-to-Interference ratio and other EDGE measurements.

## NetTekAnalyzer

### ► YBT250 Base Station Transmitter and Interference Analyzer



► NetTek platform combined with test modules.

### The Modules and the Platform

The Tektronix NetTek analyzer platform is required for using NetTek modules and cards. The NetTek platform includes the display, power supply, CPU and battery compartments. Modules can then be attached to the back. Up to four modules can be attached at once. A variety of modules and options allows you to tailor the instrument to service the standards and interfaces in use in your network.

The modular design also means that the instrument can easily be upgraded. New measurements or standards can be added with software upgrades or with additional modules.

### Optional GSM/GPRS/EDGE Scanner Optional W-CDMA/UMTS/HSDPA Demodulation

The GSM/GPRS/EDGE Scanner adds two capabilities. First, it allows BTS maintenance personnel to find the "sweet spot" for over-the-air GSM, GPRS or EDGE signal quality tests. This can now be done without taking the base station out of service, or even hooking up to the BTS. Second, it gives optimization and planning personnel the ability to troubleshoot coverage, interference and co-channel interference issues with an easy-to-use handheld tool. This option automatically identifies the channel, frequency, power, channel type, C/I and if a control channel, the BSIC, for channels in the selected range.

### Optional TD-SCDMA RF Measurements

This TD-SCDMA option provides DwPTS power (pilot power), along with instantaneous and peak power readings for each downlink time slot. This critical setting affects the size of the TD-SDCMA cell. In addition, the option provides occupied bandwidth measurements.

This W-CDMA/UMTS/HSDPA option adds 3GPP Release 5 demodulation capabilities to the YBT250. It provides the user with code domain power, pilot and sync power, scrambling code, EVM overall, EVM for 16 QAM modulations, Peak Code Domain Error and other W-CDMA specific measurements. In addition, the option includes provision for measurement of Revision 5 signals using Transmit Diversity.

### Optional W-CDMA/UMTS/HSDPA Scrambling Code Analyzer

This W-CDMA/UMTS/HSDPA option adds the capability to evaluate the co-channel interference from neighboring Node B base stations. This enables users to determine the effect of making changes to or adding a Node B base station to their network and to evaluate any changes which might contribute to pilot pollution.

W-CDMA Field Strength measurements are also available, enabling essential measurement of C-PICH (Ec) emissions.

# NetTekAnalyzer

## ► YBT250 Base Station Transmitter and Interference Analyzer

### ► Characteristics

#### YBT250 Test Module

Operation Modes –  
Transmitter Testing.  
Interference Analysis.  
Spectrum Monitoring.

#### Measurement Packages

Interference Option IN1  
AM/FM Demodulation.  
Interference Identification.  
Spectrogram with Variable Duration.  
Signal Strength.  
Noise Floor Measurement.  
RF Field Strength.  
W-CDMA Field Strength<sup>1</sup>.  
RF Measurement Options GR1, CR1, CRE, WR1,  
IR1, AR1, EM1  
RF Carrier Frequency –  
 $\pm 10$  Hz + Time base Error, 99% Confidence Interval.  
Occupied Bandwidth (OBW) –  
Bandwidth within which 99% of the power transmitted on a single channel lies.  
FM Deviation (Applicable to AR1) –  
 $\pm 10\%$  typical.  
For deviations 2 to 10 kHz; usable range to 15 kHz.  
Audio frequency = maximum 3 kHz.  
RF Channel Power<sup>2</sup> (CW or Peak Envelope Power) –  
 $\pm 0.75$  dB for  $-20$  dBm to  $+30$  dBm  
[ $\pm 0.5$  dB typical].  
 $\pm 1.25$  dB for  $-80$  dBm to  $-20$  dBm  
[ $\pm 1.0$  dB typical].  
Burst Power Measurement (Applicable to GR1,  
CRE, EM1 and TR1) –  
 $\pm 1.0$  dB for  $-20$  dBm to  $+30$  dBm  
[ $\pm 0.75$  dB typical].  
 $\pm 1.5$  dB for  $-80$  dBm to  $-20$  dBm  
[ $\pm 1.25$  dB typical].  
cdmaOne, cdma2000 1x RTT, and cdma2000 1x  
EV-DO Demodulation Options CD1, CD2, CD3, CDE  
Waveform Quality –  $\pm 0.005$  for  $0.9 < \rho < 1.0$ .  
Code Domain Power –  
 $\pm 1$  dB when  $> -20$  dB relative to Tx power.  
Code Domain Power display update: 1 s (typical).  
Timing Error –  $\pm 250$  ns, typical.  
Carrier Feedthrough –  
 $\pm 2$  dB,  $-50$  dBc residual floor (applicable to CD1  
and CD2).  
Other Measurements –  
Codogram, Pilot Power, Error Vector Magnitude,  
PN Offset.

<sup>1</sup> If ordered with Opt. WS1.

<sup>2</sup> Also applies to RF field strength.

cdma2000 PN offset Scanner Opt. CS1  
Input Signal Range –  $-120$  dBm to  $+30$  dBm.  
Resolution –  
I<sub>o</sub>, E<sub>c</sub>/I<sub>o</sub>, E<sub>c</sub>:  $-0.1$  dB.  
PN Offset: 1 PN index.  
Tau: 0.1 chip.  
Accuracy –  
E<sub>c</sub>:  $\pm 2$  dB for E<sub>c</sub>  $\geq -95$  dBm and E<sub>c</sub>/I<sub>o</sub>  $\geq -8$  dB,  
 $\pm 3$  dB for E<sub>c</sub>  $\geq -110$  dBm and E<sub>c</sub>/I<sub>o</sub>  $\geq -12$  dB.  
Tau:  $\pm 0.5$  chip, of highest power multipath component of each detected PNOS, relative to input timing reference (ESC or YBGPS1).  
1xEV-DO PN Offset Scanner Opt. ES1  
Input Signal Range –  $-120$  dBm to  $+30$  dBm.  
Resolution –  
I<sub>o</sub>, E<sub>c</sub>/I<sub>o</sub>, E<sub>c</sub>:  $0.1$  dB.  
PN Offset: 1 PN Index.  
Tau: 0.1 chip of highest power multipath component of each detected PN Offset, relative to input timing reference (ESC or YBGPS1).  
GSM/GPRS and EDGE RF and Demodulation Measurements Opt. EM1  
Error Vector Magnitude (8-PSK only) –  
 $\pm 1.5\%$ ;  $4\% \leq \text{EVM} \leq 10\%$ .  
Phase Error (GMSK Only) –  
 $\pm 1.0^\circ$ ;  $2^\circ \leq \text{Phase Error} \leq 12^\circ$ .  
RF Power vs. Time –  
Resolution: 1  $\mu$ s, 1 symbol.  
Time Uncertainty:  $\pm 0.2$  symbol,  $\pm 0.8 \mu$ s.  
Other Measurements –  
Slot Aware Burst Power, RF Carrier Frequency,  
Occupied Bandwidth, Origin Offset, Carrier to Interference Ratio.  
GSM/GPRS/EDGE Channel Scanner Opt. GS1  
Input Signal Range –  $-120$  dBm to  $+30$  dBm.  
C/I Ratio Range –  $0$  dB to  $50$  dB.  
Resolution –  
Frequency:  $0.001$  MHz.  
Peak Power:  $0.1$  dBm.  
C/I:  $0.1$  dB.  
W-CDMA/UMTS/HSDPA Demodulation Opt. WD2  
Error Vector Magnitude – Resolution  $0.01\%$ .  
Code Domain Power –  
 $\pm 1$  dB when  $> -20$  dB relative to Tx power.  
Code Domain Power display update: 1 s (typical).  
Scrambling Code – Determination 2 s.  
Scrambling Code Analyzer for W-CDMA/UMTS/HSDPA Opt. WS1  
Input Signal Range –  $-117$  dBm to  $+30$  dBm.  
Resolution –  $0.1$  dB.  
Accuracy<sup>3</sup> (E<sub>c</sub>) –  
 $\pm 2$  dB for E<sub>c</sub>  $\geq -102$  dBm and E<sub>c</sub>/I<sub>o</sub>  $\geq -12$  dB (typical).  
 $\pm 3$  dB for E<sub>c</sub>  $\geq -112$  dBm and E<sub>c</sub>/I<sub>o</sub>  $\geq -14$  dB (typical).

<sup>3</sup> Also applies to W-CDMA field strength.

### General Specifications

#### Frequency Characteristics

Input Range –  $30$  MHz to  $2500$  MHz.  
Internal Frequency Accuracy (Time base Error) –  
 $\pm 0.5$  ppm ( $\pm 0.015$  ppm typical, after GPS lock.  
Requires YBGPS1.)  
Internal Frequency Aging (Time base Error) –  
 $\pm 1$  ppm/yr.  
Available Spans (in Spectrum Monitoring) –  
 $10$  kHz to  $2470$  MHz.  
Resolution Bandwidths (automatically set in  
Spectrum Monitoring Mode) –  $100$  Hz to  $6$  MHz.  
Phase Noise –  $\leq -70$  dBc/Hz at  $20$  kHz offset.

#### Amplitude Characteristics (CW or peak envelope, measured in 100 kHz span)

Amplitude Range –  
 $-114$  dBm to  $+30$  dBm.  
 $-134$  dBm to  $+30$  dBm ( $100$  MHz to  $2$  GHz) with Interference option IN1.  
 $-132$  dBm to  $+30$  dBm ( $2$  GHz to  $2.2$  GHz) with Interference option IN1.  
RF Input Overload Protection –  $+30$  dBm to  $50$  W.  
Signal Related Spurious Response –  
IM3 better than  $-70$  dBc, typical.  
 $2^{\text{nd}}$  harmonic better than  $-60$  dBc, typical.  
Amplitude Display –  
 $10$  Divisions;  $1$  to  $10$  dB per division.  
Spectrum Display Modes –  
Max., min., norm., avg., dual trace.

#### Inputs

RF –  $50 \Omega$ , type N.  
Frequency Reference –  
 $50 \Omega$ , type BNC (f).  
freq<sub>in</sub> = 2, 4.8, 10, 13, 15, or 19.6608 MHz and others. Automatically detected.  
Timing Input –  $10$  k  $\Omega$ , type BNC (f).  
YBT250 Test Module Weight –  $1.4$  kg/ $3.1$  lbs.  
NetTek Mainframe Weight –  $4.1$  kg/ $9.04$  lbs.  
Operating Temperature –  
Specified temperature range:  $0^\circ\text{C}$  to  $50^\circ\text{C}$ .  
Functional temperature range:  $-10^\circ\text{C}$  to  $+50^\circ\text{C}$ .  
Storage Temperature –  $-40^\circ\text{C}$  to  $+60^\circ\text{C}$ .  
Calibration – Two year cycle.  
Warranty – One year.

#### Physical Characteristics

Dimensions	mm	in.
Height	187	7.375
Width	241	9.5
Depth	32	1.25
Weight	kg	lbs.
Net	1.4	3.1

### ► Ordering Information **Service**

#### **YBT250**

Module without platform. Module must be ordered with one standard RF Measurement package. NetTek analyzer platform is required for using NetTek modules and cards.

#### **Options**

Opt. CR<sup>1</sup><sup>1</sup> – RF measurements for cdmaOne and cdma2000.

Opt. CRE<sup>1</sup><sup>1</sup> – RF measurements for cdma2000 1x EV-DO.

Opt. IR<sup>1</sup><sup>1</sup> – RF measurements for IS-136.

Opt. AR<sup>1</sup><sup>1</sup> – RF measurements for Analog.

Opt. TR<sup>1</sup><sup>1</sup> – RF Measurements for TD-SDCMA.

Opt. IN<sup>1</sup><sup>3</sup> – Interference Analyst.

Opt. CD3 – Demodulation for cdmaOne and cdma2000.

Opt. CS<sup>1</sup><sup>5</sup> – Over-the-air analysis for cdmaOne and cdma2000.

Opt. CDE – Demodulation for cdma2000 1x EV-DO including Rev A.

Opt. ES<sup>1</sup><sup>4</sup> – 1xEV-DO PN scanner.

Opt. GR<sup>1</sup><sup>1</sup> – RF measurements for GSM.

Opt. EM<sup>1</sup><sup>1,2</sup> – RF and Demodulation measurements for GSM/GPRS and EDGE.

Opt. GS1 – GSM/GPRS/EDGE scanner.

Opt. WR<sup>1</sup><sup>1</sup> – RF measurements for W-CDMA/UMTS.

Opt. WD2 – Demodulation for W-CDMA/UMTS/HSDPA.

Opt. WS<sup>1</sup><sup>3</sup> – Scrambling Code Analyzer for W-CDMA/UMTS.

Opt. L0 – English manual for YBT250.

Opt. L10 – Russian manual for YBT250.

<sup>1</sup> RF measurement packages. Multiple RF measurement packages can be added as options; one RF package is required.

<sup>2</sup> RF and Demodulation measurement package.

<sup>3</sup> Provides W-CDMA Field Strength if Opt. WS1 is ordered along with Opt. IN1.

<sup>4</sup> YGPS1 is required.

<sup>5</sup> YBT250 CD3 and YBGPS1 are required.

Opt. C3 – Calibration Service 3 years.

Opt. C5 – Calibration Service 5 years.

Opt. D1 – Calibration Data Report.

Opt. D3 – Calibration Data Report 3 years (with Opt. C3).

Opt. D5 – Calibration Data Report 5 years (with Opt. C5).

Opt. R3 – Repair Service 3 years.

Opt. R5 – Repair Service 5 years.

#### **Suggested YBT250 Test Module Accessories**

Sniffer Antenna, Broadband – Order 119-6609-00.

Beam Antenna, 824 to 896 MHz – Order 119-6594-00.

Beam Antenna, 896 to 960 MHz – Order 119-6595-00.

Beam Antenna, 1710 to 1880 MHz – Order 119-6596-00.

Beam Antenna, 1850 to 1990 MHz – Order 119-6597-00.

Magnetic Mount Antenna, 824 to 2170 MHz – (Requires 103-0449-00 adapter). Order 119-6970-00.

Antenna Adapter Type-N (m) to FME (m) – (For 119-6970-00 antenna). Order 103-0449-00.

Pre-filter, General Purpose, 824 to 2500 MHz, Type-N (f) Connector – Order 119-7246-00.

Pre-filter, 850 MHz Uplink Band, 824 to 849 MHz, Type-N (f) Connector – Order 119-7245-00.

Pre-filter, 850 MHz Downlink Band, 869 to 894 MHz, Type-N (f) Connector – Order 119-7023-00.

Pre-filter, 900 MHz Downlink Band, 921 to 960 MHz, Type-N (f) Connector – Order 119-7022-00.

Pre-filter, 1800 MHz Downlink Band, 1805 to 1880 MHz, Type-N (f) Connector – Order 119-7021-00.

Pre-filter, 1900 MHz Downlink Band, 1925 to 1995 MHz, Type-N (f) Connector – Order 119-6972-00.

Pre-filter, 2100 MHz Downlink Band, 2105 to 2175 MHz, Type-N (f) Connector – Order 119-6971-00.

Cable, 50  $\Omega$ , BNC (m) 3 foot (91 cm) – Order 012-0482-00.

Cable, 50  $\Omega$ , Straight Type-N (m) and Angled Type-N (m) Connector, 1.6 foot (50 cm) – Order 174-4977-00.

Cable, 50  $\Omega$ , Type-N (m) to Type-N (m) Connector, 3 foot (91 cm) – Order 174-5002-00.

Cable, 50  $\Omega$ , Low-precision Type-N (m) to Type-N (m) Connector, 6-foot Cable (1.83 m) – Order 012-0114-00.

Cable, 50  $\Omega$ , Type-N (m) to Type-N (m) Connector, Low VSWR, High Shielding, 6-foot (182 cm) – Order 012-1683-01.

Cable, 50  $\Omega$ , Precision, Amplitude and Phase Stable, Type-N (m) to Type-N (m) Connector, 10-foot (3.0 m) – Order 012-1619-00.

DC Block, Type-N (f) to Type-N (m) Connector – Order 119-6598-00.

Calibrated Coupler, Type-N Connectors, 500 to 1000 MHz – Order 119-6600-00.

Directional Coupler, Type-N Connectors, 920 to 2200 MHz – Order 119-6601-00.

Power Splitter/Combiner, Type-N (f) Connectors, 1 W, 200 MHz to 2.5 GHz – Order 119-7024-00.

Attenuator, Type-N (f) to Type-N (m) Connector, 50 W, 20 dB – Order 119-6599-00.

Adapter, Universal Kit, 30 pcs – Order 119-6602-00.

Adapter, Type-N (m) to BNC (f) – Order 103-0045-00.

Adapter, Type-N (m) to Type-N (m) – Order 103-0430-00.

Adapter, Right Angle, Type-N (m) to Type-N (f) – Order 103-0448-00.

Adapter, Barrel, Type-N (f) – Order 103-0429-00.

Adapter, 7/16 (f) to Type-N (f) – Order 103-0431-00.

Adapter, 7/16 (m) to Type-N (f) – Order 103-0432-00.

Adapter, SMB (f) to BNC (m) – Order 174-3578-00.

Metal Cap, BNC – Order 200-0678-00.

Metal Cap, Type-N – Order 200-4696-00.



## NetTekAnalyzer

### ► YBT250 Base Station Transmitter and Interference Analyzer

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