

2959

Digital TDMA (IS-136A) Testing

To simplify testing, digital phone tests mirror analog test procedures with alterations only to account for the different digital measurements and enhanced features available with modern TDMA (IS-136A) handsets. Set up and testing of IS-136A handsets can be fully automatic for all modes available in the handset, or it can be manual and interactive for diagnostic analysis. In addition to the normal registration and call control functions the 2959 provides control over specialized TDMA (IS-136A) test features.

- All eleven RF power levels
- TDMA-specific call control such as time slot changes
- DTMF signaling from the handset
- RMS EVM (Error Vector Magnitude), phase error, droop, and I/Q origin offset (Carrier leak)
- RMS EVM over the first 10 symbols
- Voice loopback tests or actual voice checks with built-in VSELP and ACELP codecs including the energy (r0) variable of the VSELP codec
- BER verification of the phone's receiver
- MAHO RSSI (Mobile Assisted Handoff-Receive Signal Strength Indication) on the alternate channel at -75, -85 and -95 dBm
- Full-featured Constellation display of the transmitter's modulation

CDPD Modem Testing

CDPD (Cellular Digital Packet Data) is a separate packet radio service deployed on many AMPS cellular networks. The 2959's CDPD test mode simulates the functions of Mobile Data Base Stations (MDBS) and Mobile Data Intermediate Systems (MD-IS), which provides the stimulus and response necessary to test mobile-end systems (M-ES) often called CDPD wireless modems.

Though some handsets may have CDPD modems built in, they always operate separately from the phone, and are tested as autonomous devices. The external modems have an RF connector for their antennas, and a data connector for a laptop's serial connector. Modems can be integrated into laptops, cellular phones or PDAs (Personal Digital Assistants). Testing can be as simple as connecting the external modem to a laptop loaded with the appropriate software to communicate with the CDPD modem, connect the 2959's RF test port to the modem's antenna connector, and then running a simple automatic test such as a Ping. Modems integrated into other devices do not require an auxiliary laptop connection for proper testing.

Not only do CDPD modems require traditional radio testing associated with cellular phones, the 2959 must be able to simulate the CDPD base station and the supporting network. This requires test analysis of the 19,200 baud GMSK RF carrier from the modem; protocol checks of the CDPD messages and associated

compression, encryption, and authentication algorithms. As in cellular handset testing, you have control over specialized functions for CDPD tests:

- RF power and frequency
- Frequency stability and modulation indexes
- Receiver sensitivity
- Verification of CDPD protocol functions.
- GMSK (Gaussian Minimum Shift Keying) eye pattern
- Graphic burst analysis for relative on/off switching level confirmation and spectrum plot over the assigned channel.

Specification

RF Signal Generator

FREQUENCY

Range
869.01 to 893 (Mobile Station Rx frequency range)

Resolution
10 kHz

Accuracy
Same as Timebase

INTERNAL FM MODULATION

AMPS Test Tone Frequency
1 kHz

AMPS Data
Manchester encoded

NAMPS Test Tone Frequency
1 kHz

NAMPS DSAT/DST
codes 0 through 6

EXTERNAL FM MODULATION INPUT

Impedance
2 k Ω nominal

Sensitivity
100 Hz/mV peak, \pm 30% at 1 kHz

Frequency Range
300 Hz to 3 kHz

$\pi/4$ DQPSK MODULATION
RMS Error Vector magnitude (EVM)
As defined by EIA/TIA-627

CDPD GMSK MODULATION

Data Rate
19.2 kbps, \pm 1 bps

Deviation
4.8 kHz peak, \pm 240 Hz

B.T. Product
0.5

RF OUTPUT (T/R CONNECTOR)

Level Range
-40 to -127 dBm

Level Resolution
0.1 dB

Level Accuracy
 \pm 1.5 dB

Receiver

FREQUENCY

Range
824.01 to 848.97 MHz (Mobile Station Tx Frequency Range)

Resolution
10 kHz

INPUT POWER

Maximum Input
5 W maximum (continuous into T/R Connector)

SENSITIVITY

FM Audio
-90 dBm, 12 dB SINAD

Meter Functions

RF POWER

Frequency Range
824.01 to 848.97 MHz

Power Range
0.05 mW to 4 W

Accuracy (Reading <3 mW)
 \pm 20%, \pm 1 digit

Accuracy (Reading \geq 3 mW)
 \pm 15%, \pm 1 digit

T/R Port VSWR
<1.5:1

RF FREQUENCY ERROR

Range
 \pm 10 kHz

Resolution (N/AMPS, TDMA)
1 Hz

Resolution (CDPD)
10 Hz

Accuracy
Same as timebase, \pm 2 Hz

ANTENNA VSWR MEASUREMENT

Range
1.20:1 to 4.00:1

Resolution
0.01

AF COUNTER

SAT Range (AMPS)
5,950 Hz to 6,050 Hz

ST Range (AMPS)
9,950 Hz to 10,050 Hz

Resolution
1 Hz

Accuracy
 \pm 1 Hz, \pm 1 digit

FREQUENCY DEVIATION

	Minimum		Maximum
SAT Range (AMPS)	\pm 1 kHz	to	\pm 3 kHz
ST Range	\pm 7 kHz	to	\pm 9 kHz
DSAT/DST Range	\pm 0.5 kHz	to	\pm 0.9 kHz
AMPS Voice Range	\pm 1 kHz	to	\pm 14 kHz
NAMPS Voice Range	\pm 1 kHz	to	\pm 4 kHz

For CDPD GMSK

\pm 4.8 kHz (with any valid CDPD Data)

Deviation Resolution

0.01 kHz

Deviation Accuracy

\pm 5%, \pm 1 digit

SINAD

Range
3 to 40 dB

Resolution
0.1 dB

Accuracy
 \pm 1 dB at 12 dB SINAD

Test Frequency
1 kHz

CABLE LOSS MEASUREMENT

Cable Loss Range
0.0 to 20.0 dB

Cable Loss Resolution
0.1 dB

Cable Loss Accuracy
 \pm 0.5 dB (0 to 3 dB reading)

$\pi/4$ DQPSK (EVM)

EVM Range
0% to 23% RMS

EVM Resolution
0.01%

EVM Error
<1.7% RMS

Timebase

INTERNAL TIMEBASE

Frequency
10 MHz nominal

Uncertainty
±0.1 ppm

Temperature Stability
±0.1 ppm

Ageing Rate
±0.1 ppm/year

EXTERNAL TIMEBASE

Level
0.25 to 6.0 V p-p

Frequency
10 MHz

Impedance
1 k Ω nominal

Power Requirements

AC INPUT

Source Voltage
100 to 240 VAC

Source Frequency
47 Hz to 63 Hz

Power Consumption
<75 W

DC INPUT

Source Voltage
11.5 to 15 VDC

Power Consumption
<75 W

Physical Characteristics

DIMENSIONS AND WEIGHT

Outside Dimensions (H x W x D)
164.9 mm x 303.6 mm x 381.5 mm
6.43 in x 11.84 in x 14.88 in

Weight
11.8 kg (26 lb) (not including lid or lid contents)

Versions and Accessories

When ordering please quote the full ordering information

Ordering

Numbers

2959	Advanced Multi-Mode Cellular Test Set
2959-C	Advanced Multi-Mode Cellular Test Set with Certificate of Calibration

Versions

Accessories

AC6001	Printer
AC6002	Service Cart
AC6003	RF Cable Set
AC6004	Audio Adapter



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