

Cellular Parametric Test

Racal Instruments Wireless Solutions

6104 - Digital Radio Test Set

AEROFLEX
A passion for performance.



- Easy to use, fully integrated test set optimized for maintenance and servicing of GSM850, GSM900, GSM1800 and GSM1900 mobiles
- GPRS single slot receiver BLER
- Fast and accurate measurements taken at the touch of a button
- Modulation analyzer for alignment and diagnostics
- Supports Full Rate, Half Rate and Enhanced Full Rate speech and 3 digit MNC for North America
- Runs customer designed test sequences
- Supports dual-band handover
- "No button start" for ultimate simplicity of operation

The 6104 Digital Radio Test Set, has been purposely designed for mobile test. It is a high performance, portable, fully integrated instrument designed for the service and repair of modern digital mobile telephones. Aimed at GSM850, GSM900, GSM1800 and GSM1900 the 6104 gives fast, accurate results. The user controls have been carefully designed to allow operators of any skill level to successfully test and fault find mobile phones. A 'no button start' feature allows them to be tested rapidly without even touching the instrument. Another mode provides all key measurements to be viewed simultaneously with any reading out of limits being highlighted, making adjustment simplicity itself. The 6104 offers six testing modes to suit any user and application.

SINGLE TESTS

- Single Tests Include - Call Set-up, Call Terminate, Handover, Transmitter, Receiver, Sensitivity, Voice Loopback, Speech, Power Level Steps and Timing Advance Tests.
- Easily modified parameters.
- Test results are viewed using clear numerical and graphical displays.
- Pass or fail indicator given.

GPRS

The following tests are provided for GPRS mobiles:

- Full GPRS attach and detach.
- Support for the four GPRS packet data coding schemes.
- GPRS BLER (Block Error Ratio) verifies the ability of the mobile to correctly determine the integrity of received data packets.

AUTOMATIC SEQUENCES

- Fully automatic Go/No-Go fault finding. Using the 6104 built in tests increases the speed of testing and increases throughput.
- Step by step fault finding to determine the exact nature of the fault.
- User defined sequences can be easily produced either from the front panel through a special learning mode or via a PC running a text editor. For the user's convenience the sequences can then be stored on a PCMCIA memory card and then run from one of the test set's 2 memory card slots.

MULTIMODE

- Provides continuously updated numeric and graphic displays of all key transmitter and receiver measurements. The results are compared to the normal GSM test limits and if a reading exceeds these limits it becomes highlighted.

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- Parameters can be changed interactively and any protocol necessary to perform the changes is automatically generated making the 6104 very intuitive to operate.

UNSYNCHRONIZED MODE

- Unsynchronized mode turns the 6104 into a signal generator and tuned receiver which provides the user with all the diagnostic facilities for testing RF modules and partially functioning phones, without using the Layer 2/ Layer 3 protocols.
- IQ modulation can be used for optimizing a mobile's modulator settings.
- Unsynchronized mode can be used to calibrate and realign the mobile; it should be noted that the 6104 unsynchronized mode is supported by all the leading manufacturers' service software.

REMOTE OPERATION

- 6104 offers full IEEE488 (GPIB) remote control of all tests and readings, including graph data.
- Remote control of 'Multimode' means that transmitter and receiver measurements can be performed concurrently and parameters and settings are quickly changed with simple commands. This vastly increases the speed of gathering the relevant test information.

The use of a large LCD display, coupled with intuitive streamlined soft keys, ensures that the user can select the required operation, change parameter values and read test results quickly and clearly without the need for an external PC or monitor. The use of soft keys and a spinwheel also allows the user to move quickly and logically through the menu structure and select the desired operation without any ambiguity.

THE FUTURE

Aeroflex has a policy of ongoing product enhancement. As a result, the instrument firmware is periodically updated to reflect changes in standards and new market requirements. A software support scheme enables customers' units to be automatically updated as soon as new facilities become available.

COMPREHENSIVE SIGNALING PROTOCOL

All signaling between the Test Set and the mobile-under-test is completely automatic so that the user does not need to have detailed knowledge of signaling standards. The 6104 even knows when to use phase 2 protocol. Individual signaling procedures can be invoked including:

- Location updating
- Call set-up, MO & MT
- Call termination, MO & MT
- Call lost
- Handover (inc. Dual-Band)
- Emergency calls
- Frequency hopping
- Timing advance
- Calling party identity

SUPPLEMENTARY FEATURES

- Dual Band Handover - With the introduction of dual-band mobiles and with networks operating on both bands, it is essential that the phones can Camp-on to the correct BCCH and be handed over from one band to another. The 6104 can simulate a BCCH on either band whilst handing over TCH in either direction.
- Auxiliary RF Port
- Synchronization Output - For synchronizing external equipment.
- Test SIM - Every 6104 is supplied with one Test SIM, additional Test SIMs may be purchased, see Option 70.
- Extended SMS 14.4k data.

SUPPORT

Not only is the 6104 good value for money, but it has also been designed to be simple and economic to maintain. The pre-calibrated modules and self diagnostic capabilities mean that repair times and costs are minimized. This is further backed up by a world-wide network of service centers offering a full range of repair, calibration and support facilities, Aeroflex has a growing library of pre-written test sequences and software modules available free to 6104 customers. Library sequences are a good way to see what is possible and a good point to start programming from.

Further information about the range of hardware and software support options can be found at www.aeroflex.com

OPTIONS

The 6104 in its basic form is a complete integrated test set capable of performing the full range of measurements on a GSM mobile. To complement this Aeroflex can supply a range of options and accessories which significantly enhance the applications of the 6104.

SPECIFICATION

TEST CAPABILITY

Functional Tests

Call Set up - MO & MT
Call Termination - MO, MT & Call lost
Synchronized Handover

Transmitter Tests

Tx Test - Power, Phase & Frequency Error, Power Profile
Modulation Spectrum, Burst
Timing Power Levels/Steps
Timing Advance

Receiver Tests

Rx Test - CII & CIb BER, FER,
RXQUAL, RXLEV, GPRS BLER
Sensitivity (Absolute)

Speech Tests

Voice Loopback
Send speech
Receive speech

SMS/data & Fax

SMS/E-SMS
Data 2.4T - 14.4T & 2.4NT - 14.4NT
Fax

SIGNAL SOURCE

Modulation

GMSK & CW
Frequency

Frequency Bands

869-894 MHz (GSM 850) Channels
925-960 MHz(E-GSM) Channels
from 0 to 124,975 to 1023.
1.805 - 1.880 GHz (GSM1800)
Channels from 512 to 885.
1.930 - 1.990 GHz (GSM1900)
Channels from 512 to 810.

Resolution

1 Hz
Main RF Input/Output Level

Range

-40 dBm to -120 dBm
 ± 1.5 dB (E-GSM)^{1,2}
 ± 2.0 dB (DCS1800)^{1,2}
 ± 2.0 dB (GSM1900)^{1,2}

Resolution

0.1 dB

Auxiliary RF Input/Output Level Range

-25 dBm to -105 dBm

MEASURING RECEIVER

Frequency Bands:

824 - 849 MHz (GSM 850) Channels

880 - 915 MHz (E-GSM)
1.710 - 1.785 GHz (DCS1800)
1.850 - 1.910 GHz (GSM1900)

Main RF Input/Output Impedance

50 ohms, nominal

VSWR

1.3:1

Connector

N Type female
Input Level Range +46 dBm to -1 dBm PEP
Max. Power 80 W PEP; 10 W continuous

Auxiliary RF Input/Output Connector type

TNC female

Input Level Range

± 31 dBm to -16 dBm PEP

Max. power

2.5 W PEP; 0.3 W continuous

MEASUREMENTS

Phase Error Range

10° RMS, $\pm 30^\circ$ peak

Accuracy RMS

$< \pm 0.3^\circ$ at 5°

Accuracy Peak

$< \pm 7^\circ$

Frequency Error Range

± 2.5 kHz

Accuracy

± 6.5 Hz + freq. Std.

Power Level Range

+46 dBm to -1 dBm PEP

Absolute Accuracy $< \pm 1.0$ dB, (EGSM)²
 $< \pm 1.3$ dB, (DCS1800,
GSM1900)²

Relative Accuracy

$< \pm 0.4$ dB

Pulse Profile Dynamic Range:

> 48 dB

Time Arrival Accuracy:

0.05 bits

Modulation Spectrum Dynamic Range

> 52 dB

Frequency Span

1 MHz (5 channels)

INTERFACES

Memory Card

2 sockets, PCMCIA V2.0

Card size

Type 1,2 or 3

Card types supported

SRAM, ATA flash EEPROM and hard disk

Synchronization Output

For synchronizing external equipment such as a spectrum analyser

GPIB

ANSI/IEEE 488.2 - 1987

Compatibility Subset

SH1, AH1, T5, L4, SR1, RL1, PPO, DC1, DTO, CO, E1

RS232 Interfaces

2 configurable ports for printing and control 9 way male D-Type

Parallel Printer

25 way female D-Type

GENERAL

Voltage ranges

85 - 130 V and 180 - 262 V AC

Frequency range

45 - 66 Hz

Power consumption

170VA maximum

Frequency Standard Internal

$\pm 1 \times 10^{-6}$ (all sources of error)

$\pm 1.2 \times 10^{-7}$ (Option 04E)

$\pm 3.5 \times 10^{-8}$ (Option 04F)

External frequencies

10 MHz \pm 2.5 ppm

(13 MHz, Option 04E/04F)

-2 dBm to +19 dBm into 50 ohm

Output

10 MHz or 13 MHz

(Option 04E/04F) +9dBm nominal into 50 ohm

DIMENSIONS AND ENVIRONMENTAL

Height

210 mm

Width

350 mm

Depth

420 mm

Weight

12kg approx.

Operating Temperature

0 to 50° C

Calibration Period

1 year

EMC

Complies with

EN61326-1:1997+A1:1998

Class B (emissions)

EN61326-1:1997+A1:1998

Table 1 (immunity)

BS EN50082-1 (immunity)

Safety:

Complies with BS EN61010-1

Notes:

1. For signals $>$ -110 dBm

2. Valid for 15°C to 35°C

VERSIONS AND ACCESSORIES

6104 DIGITAL RADIO TEST SET

Radio Systems

Option 01	GSM 900 operation
Option 02	GSM 1800 operation
Option 03	GSM 1900 operation
Option 06	GSM 1900, 1800 and 900
Option 08	GSM 850 operation
Option 09	Quad Band operation

Frequency Standards

Option 04T	Normal Frequency Standard
Option 04E	High Stability Frequency Standard
Option 04F	Very High Stability Frequency Standard

Encryption

Option 10R	Encryption, factory fit
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Software Options

Option 313	GPRS single slot receiver testing software
Option 314	Voice Quality Analysis (VQA)
Option 320	Enhances Short Message Service and Cell

Broadcast Software

Option 330	14.4 kbs Data Functionality
Option 340	Vodafone Fixed Sequence
Option 341	Nokia Fixed Sequence
Option 342	Ericsson Fixed Sequence

ACCESSORIES

Option 61	Soft padded carrying case with shoulder strap and accessory pocket.
Option 62	Rigid transit case for heavy duty use (exceeds ATA 300 Category 1)
Option 64	Front Panel Protection Cover
Option 70	Test SIM GSM/DCS1800/GSM1900 (supplied and miniature SIM and full size adapter)
Option 77	2M byte SRAM memory card
Option 79	2G byte Hard disk drive
Option 90	Test Set / PC RS232 download cable, (9 way D-type)
Option 91	Test Set / Printer RS232 cable (25 way D-type)
Option 92	Test Set / Printer parallel cable

SUPPORT OPTIONS

Option S1	1 year Software support
Option S2	2 years Software support
Option S3	3 years Software support

Option C0	Calibration certificate
Option C1	1 annual Calibration
Option C2	2 annual Calibrations
Option C3	3 annual Calibrations
Option W1	1 year Extended warranty
Option W2	2 years Extended warranty
Option W3	3 years Extended warranty
Option Si0	Enhanced Silver service contract during initial warranty period
Option Si1	1 year Silver service contract
Option Si2	2 years Silver service contract
Option Si3	3 years Silver service contract
Option G0	Enhanced Gold service contract during initial warranty period
Option G1	1 year Gold service contract
Option G2	2 years Gold service contract
Option G3	3 years Gold service contract

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CHINA Beijing

Tel: [+86] (10) 6467 2761 2716
Fax: [+86] (10) 6467 2821

CHINA Shanghai

Tel: [+86] (21) 6282 8001
Fax: [+86] (21) 62828 8002

FINLAND

Tel: [+358] (9) 2709 5541
Fax: [+358] (9) 804 2441

FRANCE

Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY

Tel: [+49] 8131 2926-0
Fax: [+49] 8131 2926-130

HONG KONG

Tel: [+852] 2832 7988
Fax: [+852] 2834 5364

INDIA

Tel: [+91] 80 5115 4501
Fax: [+91] 80 5115 4502

KOREA

Tel: [+82] (2) 3424 2719
Fax: [+82] (2) 3424 8620

SCANDINAVIA

Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SPAIN

Tel: [+34] (91) 640 11 34
Fax: [+34] (91) 640 06 40

UK Burnham

Tel: [+44] (0) 1628 604455
Fax: [+44] (0) 1628 662017

UK Stevenage

Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601
Freephone: 0800 282388

USA

Tel: [+1] (316) 522 4981
Fax: [+1] (316) 522 1360
Toll Free: 800 835 2352

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www.aeroflex.com
info-test@aeroflex.com



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.