# Cellular Parametric Test

## 6103

### GSM/GPRS Digital Radio Test Set

AEROFLEX
A passion for performance.

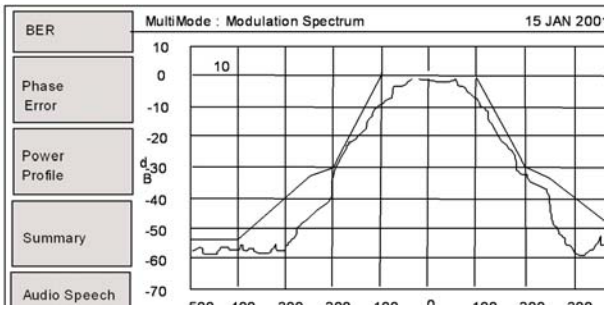

- Easy to use, fully integrated Test Set optimized for maintenance and servicing of GSM 850, 900, 1800 and 1900
- GPRS single slot receiver BLER
- Dual-Band Handover
- Modulation Analyzer for alignment and diagnostics
- Complete set of facilities for battery life evaluation
- Fax and Bi-directional Data tests, complete with diagnostics
- Cell Broadcast and point to point Short Message Service testing
- "No button start" for ultimate simplicity of operation

*Since its introduction, the Racal Instruments Wireless Solutions 6103, has set new industry standards in cellular radio testing. It is a high performance, portable, fully integrated instrument designed for the production and maintenance of GSM and GPRS mobile terminals. Aimed at GSM 850, 900, 1800 and 1900, the 6103 has been selected by most of the world's mobile manufacturers for field service operations.*

*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 readings that are out of limits being highlighted. In all, the 6103 offers five testing modes to suit any user and application.*

- Single Tests
- Automatic Sequences
- Multimode
- Unsynchronized Mode
- Remote Operation

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.



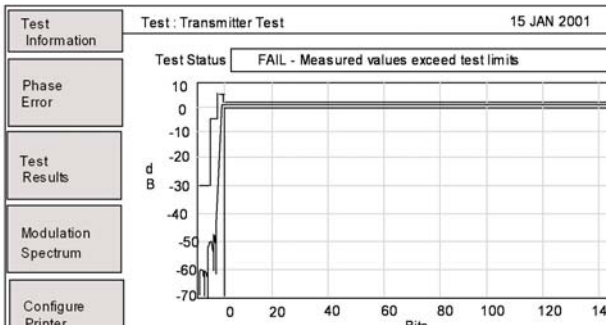

*Real-time displays for displays for simple with superimposed limit mask*

Digital radio markets are undergoing significant changes as the standards mature and new facilities are added to meet higher customer expectations. For this reason the 6103 already includes facilities not currently implemented on many networks.

Other developments allow manufacturers and network operators to realistically evaluate and compare the battery life of any GSM mobile, including 850, 900, 1800, 1900 and dual mode variants.

The story does not end there however, 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 the new facilities are available.




*Graphic displays for fast recognition of failure modes*

## GPRS

The following tests are provided for GPRS mobiles:

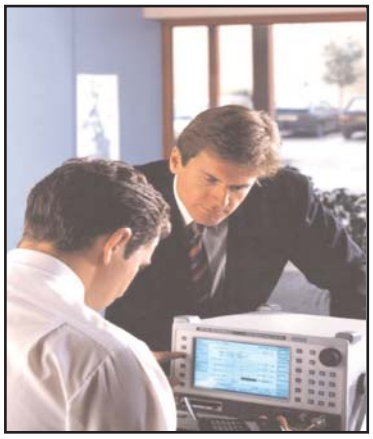
- Full GPRS attach and detach.
- Support for the four GPRS packet data coding schemes.
- GPRS BLER (Block Error Ratio) verifies the ability of the mobile to correctly determine the integrity of received data packets.

## SINGLE TESTS

For trouble shooting and development work, individual tests can be selected where any signaling necessary to perform the test is automatically generated. Prior to starting the test, the user can modify any associated parameters. On completion, the user is presented with the numeric results and a pass/fail indicator. If appropriate, any graphic information can also be viewed.

## AUTOMATIC AND GO/NO GO TESTING

The 6103 is ideal for both step by step fault or for fully automatic, GO/NO-GO testing. The automatic capability offers a choice of running one of the instrument's built-in programs or a sequence created by the user. In this way it is possible to select virtually any combination of tests with complete freedom of channel numbers, parameters and test limits. Using this facility it is possible to carry out any series of tests without even touching the instrument. This is particularly attractive for high throughput, screening applications.



Test sequences are easily produced from the front panel through a special learning mode or via a PC running a text editor. The instrument employs a form of instrument BASIC making programming very straightforward. New commands allow data entry, string handling, results processing, external device control and virtually any format of printout to be created. User variables and looping functions mean that a large number of test scenarios can be covered with very few lines of code.

## MULTIMODE

As well as test sequences and single tests, the 6103 supports a special 'Multimode'. This provides continuously updated numeric and graphic displays of all the major transmitter and receiver measurements. The graphs and graduated bar-charts aid fault diagnosis and adjustment by giving the user recognizable 'pictures' of the performance of the mobile under test, as it happens.

As a further aid to the operator, the normal GSM test limits are marked on the bargraphs. If a reading exceeds these limits, the bar itself turns solid black making a potential fault easily recognized.

While in Multimode, most parameters are easily changed such as channel, slot number, mobile power and RF level. The rotary control can now be used to continuously update the RF level for manual sensitivity testing. Any protocol necessary to perform the changes isautomatically generated making the 6103 very intuitive to operate.

## UNSYNCHRONIZED MODE

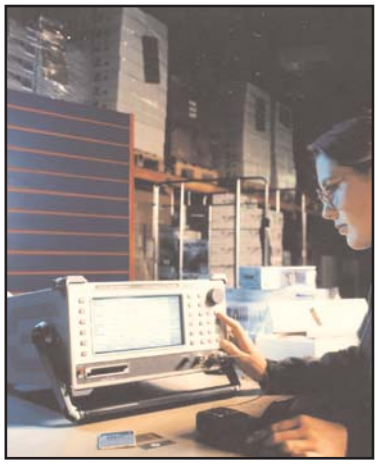
Another mode similar to the Multimode is the unsynchronized mode. This provides the user with all the diagnostic facilities for testing RF modules and partially functioning phones. It also ensures that the instrument can be used with the manufacturer's specific test modes where the transmitter or receiver can be enabled without a SIM or any network signaling.

For transmitter testing, the instrument will automatically find any signal in the GSM 850, 900, 1800 or 1900 bands and then continuously display all key measurements, including power profile and modulation spectrum graphs. A special IQ mode filter can be used for optimizing a mobiles modulator settings.

For receiver testing, the 6103 can generate a range of test signals including a valid control channel, a bursting traffic channel or an unmodulated carrier.

The unsynchronized mode is particularly suitable for making adjust-

ments to a mobile's free running frequency standard or to its transmitter power steps.



## REMOTE OPERATION

For production test systems where speed and control are paramount, the 6103 offers full IEEE488.2 remote control of all tests and readings, including graph data. Remote control of the multimode means that transmitter and receiver measurements can be performed concurrently and parameters and settings are quickly changed with simple commands. For mobile adjustment or for mobile 'local' control, the unsynchronized mode can be used. This has the benefit that no time is wasted waiting for the protocol to synchronize and set up a call.

## MEMORY CARDS

The memory cards provide the user with the ability to store and recall a number of instrument set-ups and test sequences, for carrying out various tests on differing mobile types. New test sequences can be generated from the front panel using a special learning facility and then stored on the memory card. In this way tests can be selected, limits and parameters changed, and printing controlled, guaranteeing total control and repeatability of testing.

Other forms of files can also be stored on the memory cards. These include speech phrases and test results. The PCMCIA version 2 industry standard card and DOS formatting allows direct transfer of files to a suitable PC. Two sockets are provided so that files are easily duplicated and test sequence files can be conveniently separated from results and parameter files.

## 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. 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
· Encryption (A5/1 & A5/2)
· Timing Advance
· Cell Broadcast Messages
· Point to Point SMS, MO & MT
· Calling Party Identity
· Fax Call, MO & MT
· Bi-directional Data Cell, MO & MT

## ADDITIONAL FACILITIES

**Synchronization Output** A programmable synchronization output allows external equipment such as a spectrum analyzer or a logic analyzer to be triggered at any point in the GSM frame. Using this port, spurious signals can be reviewed either out-of-band or during the unused slots.

**Auxiliary RF Port** An auxiliary RF port is also provided eliminating the need for external couplers and loads when used with other test equipment. It also allows short range monitoring of signals off-air.

**Dual-Band Handover** With dual-band mobiles and more recently Tri band mobiles commercially available and with networks operating on several bands, it is essential that phones can Camp-on to the correct BCCH and be handed over from one band to another. The 6103 can simulate a BCCH on either band while handing over TCH in either direction.

## SUPPORT

Not only is the 6103 good value for money, but it has also been designed to be simple and economic to repair. 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 policy of continuous improvement which means that specifications may change. For details of the latest enhancements and options, contact your local Aeroflex office.

## OPTIONS

The 6103 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 6103. A full list is provided on the back page along with ordering information.

## FREQUENCY STANDARDS

Under normal circumstances the 04T Option frequency standard is more than adequate, however in a laboratory or production situation higher performance may be required. The optional internal standards can achieve stabilities of up to 0.03 ppcm per year.

| | Option 04T | Option 04E | Option 04F |
|---|---|---|---|
| Frequency: | 13 MHz | 10 MHz | 10 MHz |
| Stability* | ±1 x 10 $^{-6}$ /year | ±1 x 10 $^{-7}$ /year | ±3 x 10 $^{-8}$ /year |
| 0 to 50°C: | <±3 x 10 $^{-7}$ | <±6 x 10 $^{-9}$ | <±4x10 $^{-9}$ |
| Warm up time: | 5 minutes | 30 minute | 30 minutes |

* aging after 30 days continuous operation

### TEST SIM, OPTION 70

The 6103 can be used with virtually any test SIM, however option 70 has been programmed to match the instrument's default settings, making testing very simple. The SIM is supplied as a full size SIM with 'break outs' to convert it into a miniature SIM. A full size adapter is also provided.

| | |
|---|---|
| PIN: | 0000 0000 |
| PUK1/2: | 1111 1111 2222 2222 |
| Ki: | 5E4AB358 91375D2A EE812E67 C309A629 |
| IMSI: | 001 01 012 345 6789 |
| Admin Field: | Set to 80 (Type Approval) |

# 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 & Data Tests

*Voice Loopback*
*Send speech*
*Receive speech*
*SMS point to point MO & MT (transfer in call or idle mode)*
*Fax MO & MT Bi-directional Data MO & MT*

## SIGNALING & PROTOCOL FEATURES

Control Channel

*Combined format, FCCH+SCH+CCCH+SDCCH (4)+SACCH/4 with CBCH when cell broadcast active*

Traffic Channel

*Full and half rate speech, TCH/FS+SACCH/TF and TCH/HS+SACCH/TH*
*Data at 9.6, 4.8 & 2.4 kbs TCH/F9.6, TCH/F4.8 &*
*TCH/F2.4±SACCH/TF Frequency Hopping Encryption (with option10)*
*Doppler shift Supplementary Services:Calling Line Identity*

## SIGNAL SOURCE

Modulation

*GMSK & CW*

FREQUENCY

Frequency Bands:

*869 to 894 (GSM 850) 925 to 960 MHz (E-GSM) 1.805 to 1.880 GHz (GSM1800) 1.930 to 1.990 GHz (GSM1900)*

Resolution

*1 Hz*

MAIN RF INPUT/OUTPUT LEVEL

Range

*-40 dBm to -120 dBm*

Accuracy Absolute (Typical)

*GSM 850, 900 ± 1.5 dB [1.2] (±0.6 dB)[4.5] DCS 1800 ± 2.0 dB [1.2] (±0.7 dB) [4.5] GSM 1900 ± 2.0 dB [1.2] (±0.8 dB) [4.5]*

Resolution

*0.1 dB*

Auxiliary RF Input/:Output Level Range

*-2.5 dBm to -105 dBm*

## MEASURING RECEVIER

Frequency Bands

*824 to 849 MHz 880 to 915 MHz 1.710 to 1.785 GHz 1.850 to*

*1.910 GHz*

MAIN RF INPUT/OUTPUT

Impedance

*50 Ω, 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, ±30° peak*

Accuracy RMS

*<±0.3° at 5°*

Accuracy

*<±7.2°*

FREQUENCY ERROR

Range

*±2.5 kHz*

Accuracy

*±6.5 Hz + freq Std [3]*

POWER LEVEL

Range

*+46 dBm to -1 dBm PEP*

Absolute Accuracy

*<±1.0 dB (GSM 850, 900)[2]*
*<±1.3 dB, (GSM 1800 and 1900)[2]*

Relative Accuracy

*<±0.4 dB*

PULSE PROFILE

Dynamic Range

*>48 dB*

TIME OF ARRIVAL

Accuracy

*0.05 bits*

MODULATION SPECRUM

Dynamic Range

*>52 dB[3]*

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 maximum capacity 2Gbgtes (FAT16)*

Synchronization Output

*For synchronizing external equipment such as a spectrum analyzer*

GPIB

*ANSI/IEEE 488.2 - 1987*

Compatibility Subset

*SH1, AH1, T5, L4, SR1, RL1, PP0, 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 to 130 V and 180 to 264 V AC* |
| *Frequency range:* | *45 to 66 Hz* |
| *Power consumption:* | *170 VA maximum* |

FREQUENCY STANDARD

Internal:(all sources of error)

*±1 x 10 [-6]*
*±1.2 x 10 [-7] (option 04E)*
*±3.5 x 10 [-8] (option 04F)*

External frequencies

*10 MHz ± 2.5 ppm*
*(13 MHz, option 04E/0EF)*
*-2 dBm to + 19 dBm into 50 Ω*

Output

*10 MHz or 13 MHz (option 04E/04F)*

*+9 dBm nominal into 50 Ω*

DIMENSIONS AND ENVIRONMENTAL

Height

*210 mm*

Width

*350 mm*

Depth

*420 mm*

Weight

*12 kg 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)*

Safety

*Complies with BS EN61010-1*

*Notes:*

*For signals > -110 dBm*

*Valid for 15°C to 35°C*

*10 bursts averaged, non hopping, options 04E or 04F*

*For signals >89.9 dBm into 50O*

*Valid from 15°C to 31°C*

*Supplemental characteristics provide additional information useful in applying the instrument, giving typical, but not warranted performance*

# VERSIONS AND ACCESSORIES

## ORDERING INFORMATION

| | |
|---|---|
| 6103 | Digital Radio Test Set |
| 6103 | Digital Radio Test Set GSM 900 |
| 6103 E | Digital Radio Test Set with Encryption comprising 6103 and option 10 |

### Radio Systems

| | |
|---|---|
| Option 01 | GSM 900 operation |
| Option 02 | GSM 1800 operation |
| Option 03 | GSM 1900 operation |
| Option 06 | GSM 900, 1800 and 1900 |
| Option 08 | GSM 850 operation |

Note: Option 08 cannot be ordered in combination with options 01, 02 or 06

### 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 |

### Software Options

| | |
|---|---|
| Option 300 | 6103 AIME Software - Air Interface Monitor/Emulator Software |
| 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 | Vodaphone 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 E-GSM/DCS1800/GSM1900 (supplied and miniature SIM and full size adapter) |
| Option 77 | 2M byte SRAM memory card |
| Option 78 | 10M byte flash 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 | One year Software Support |
| Option S2 | Two year Software Support |
| Option S3 | Three year Software Support |
| Option C1 | One annual calibration |
| Option C2 | Two annual calibrations |
| Option E2 | One year extended warranty |
| Option E3 | Two year extended warranty |
| Option W2 | One year extended warranty with calibration |

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AEROFLEX
A passion for performance.



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

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