Racal 6103

Digital Radio Test Set

PRODUCT INFORMATION

• Battery Life Testing Application Notes – rev. 1.1

For use in conjunction with software release version 3.03.

• Introduction:

These notes are provided to enable the user to become familiar with the Battery Life Test Sequences. These Test Sequences follow a procedure proposed by The European Manufacturers Association - Task Group for Mobile Stations (ECTEL-TWG). The Battery Life Test procedure is designed to provide manufacturers with a consistent and accurate method to measure both the Standby and Talk times of a mobile handset. The Battery Life Test Sequences are available from Racal Instruments as part of the RIBASIC Example Sequence Library, Part number 64-0047.

Note: The Battery Life Test procedure is under continuous improvement to enhance product performance. The method detailed in this application note follows the current recommendations. Please check with Racal Instruments to ascertain if any enhancements have been made to the recommended test method.

• Equipment required:

- Racal Instruments 6103 with firmware version 3.03 or higher (check this by selecting "Self tests/System" from the main menu)
- Example Sequence Library P/N (64-0047)
- RF test lead
- Racal Instruments Test SIM
- GSM, DCS or PCS Compatible phone and battery
- Epson-compatible printer.

• Equipment set up

1. Connect the printer to the 6103 via the parallel printer port. Ensure that the “Parallel” port is selected under the “Results” menu. Fully charge the mobile battery. Install test SIM.
2. Connect the mobile under test to the 6103 using a suitable RF lead. (an electrical connection is preferable to an inductive).
3. If required enter the offset for the RF cable.

• RIBASIC Sequence Library

The example sequence library disk contains a set of 15 RIBASIC example program files designed for use with the Racal Instruments 6103 Digital Radio Test Set. RIBASIC is a simple programming language, based on BASIC, a tool which can be used to control the range of test functions available on the 6103 and manipulate the results.

Only the Battery Life Test Sequences ‘STANDBY and TALK.SEQ’ are considered in this document. To obtain more details regarding the Test Sequences and RIBASIC please refer to the “WHERE TO GET MORE INFORMATION” section at the end of this document.

• How to load the test sequence files

- Copy sequence files to a PCMCIA memory card
- Insert the card into a slot in the 6103 Test Set
- Select "Test Sequences" from the main menu
- Select "Run File"
- Select required file i.e. ‘STANDBY.SEQ’

Note: *These files can be used to test GSM900, DCS1800 and PCS1900 phones. Different parameter lists for all 3 systems are built into the sequences. The appropriate parameters are loaded automatically by selecting the appropriate radio system.*

Battery life testing sequences

- **Measurement of Standby Time**

- **Description:**

  Measures a mobile's battery life in idle mode by repeatedly running the Synchronization/ Registration test until the mobile fails to perform location updating. The periodic update interval is selectable as a number of minutes from 1 to 1530. The selected value is rounded up to the nearest 6 minutes, the default is 30.

***Note**: The Standby Time test is performed with the paging multi-frames parameter set to 5.*

Standby battery life test procedure:

- Run the test sequence:
  - select "Test Sequences" in main menu
  - select "Run File"
  - select the file “STANDBY.SEQ” from the PCMCIA card and press ‘Accept’
- Choose either to keep the default parameter settings (shown in Table 1.0) or to enter your own values. The default values are as per the ECTEL- TWG recommendations, which are selected to give accurate, repeatable and representative results. If you choose to set your own parameters, the test set will ask for the following:
  - Current band, select 0, 2 or 3 (GSM, DCS OR PCS)
  - Value of paging multi-frames (2-9)
  - Discontinuous Transmission DTX 0,1, 2
  - Periodic Update Interval Time (0-1530 minutes, each value is rounded up to the nearest 6 minutes, i.e. 1=6 etc)
  - Value of page mode (0-3)

The Periodic Update Interval Time (PUIT) specifies how often the mobile will perform location updating. The recommended standard setting is 30 minutes, but any value down to a minimum of 6 can be used. The test will run until the 6103 set does not receive a location update from the mobile when expected (i.e. the battery has run down), A results sheet showing start time, stop time and total standby time (shown in Figure 1.0) will then be printed.

- **Standby battery life test sequence details**

♦ Automatic results printing is turned off, and printing is directed to the printer, via the parallel port.

♦ The recommended ECTEL values (shown in Table 1.0) can be selected, or user can enter own values.

♦ The DSINF parameter is used to set the cell allocation table and the neighbor cell table (see "GSM Parameter Configuration commands", Section 6, Volume 2 of the 6103 operator's manual).

♦ The test time out is set so it is slightly longer than the Periodic Update Interval

♦ The Start time is recorded and then the Synchronization/Registration test is run repeatedly until the mobile fails to respond.

♦ The stop time and stop date is then recorded.

♦ Finally the total Standby time is calculated, and the result printed.

<u>Table 1.0 Standby Mode Parameter Settings</u>

Parameters	Settings: GSM / DCS
SIM	Phase 2 with clock stop
Rx Level	-82 dBm
Cell re-selection	No
T3212 (PUIT)	30 mins (5 deci hours)
BA list	16 frequencies as follows **GSM**:1,9,17,26,34,42,50,58,67,75,83,91,99,108,116,124 **DCS**:512,530,560,580,610,640, 670, 700, 720, 740, 760, 790, 810, 840, 860, 885
SMS CB	OFF
BS_PA_Mfrms (DRX)	5 multi frames (2 – 9)
DTX – Discontinuous Transmission.	OFF (2)
Control Chan. Freq.	ARFCN 62 / 70
Page_Mode	0 (0 – 3)
Handover	No

<u>Figure 1.0 Sample Standby test results sheet.</u>

```
+--------------------------------------------+
| 6103 Test Set (GSM) – Mobile Battery Life    |
| in idle mode (standby time)                  |
+--------------------------------------------+
| Mobile Details                               |
| IMSI: ************       IMEI: ***********   |
| Revision: Phase 2        Power class: 4      |
| Encryption: A5/1 A5/2                        |
+--------------------------------------------+
| Test Results                                 |
|  |
| Parameters used:                             |
| Periodic update interval: 30 mins            |
| Page Mode: 0                                 |
| Paging Multiframes: 5                        |
| Discontinuous Transmission: 2                |
|  |
| Test started at 09:30:36 on 20 APR 1998      |
| Communication lost 19:11:38 on 20 APR 1998   |
| Total standby time 9 Hours, 41 minutes       |
+--------------------------------------------+
```

Measurement of Talk Time

- **Description:**

Measures a mobile's battery life in dedicated mode (i.e. talk time) by continuously running the voice loopback test until the mobile fails to respond. The power level and channel are selectable at the start of the sequence and these parameters are then used when the voice loopback test is run.

***Note**: The Talk time test is performed with discontinuous transmission (DTX) switched off. DTX may be enabled by the addition of the "CONIFG DTX" to the Battery Life test Sequences or by directly editing the value of the DTX parameter in a parameter file. For more details regarding DTX, please refer to the "WHERE TO GET MORE INFORMATION" section at the end of this document.*

- **Talk time battery life test procedure:**
- Run the Talk test sequence as per Standby test, but choose TALK.SEQ instead
- Choose whether to keep the default parameter settings (shown in Table 2.0) or enter your own values. The default values are as per the ECTEL-TWG recommendations, and have been selected to give accurate, repeatable and representative results. If you choose to set your own parameters, the test set will ask for the following:
  - Current band select 0, 2, or 3 (GSM, DCS or PCS)
  - Value of paging multi-frames (2-9)
  - Discontinuous Transmission DTX 0, 1, 2
  - Periodic Update Interval Time (0-1530)
  - Value of page mode (0-3)
  - Select whether to hop on a pre-defined series of channels (-shown in table 1.0-) or run the test on one particular channel. If you choose to run the test on one channel, enter the channel number in the text box.

The mobile is put into voice loopback mode until the call is lost, indicating the battery is discharged. A results sheet (shown in Figure 2.0) is then printed showing the start time, stop time and total Talk Time.

- **Talk time Battery Life Test Sequence**

♦ The recommended ECTEL values (shown in Table 2.0) can be selected, or user may enter their own values.

♦ It is recommended to run the test with channel hopping on, as defined in Table 2.0. If it is set to off the user must choose a channel to run the test on. The start time of the battery test is then recorded.

♦ The DSINF parameter is the same as that used in the standby time test

♦ The Start time is recorded, the Voice Loopback test is then run repeatedly until the mobile fails to respond.

♦ The stop time and stop date is then recorded.

♦ Finally the total Talk time is calculated, and the results printed.

***Note**: Both the standby and talk time test sequences are limited to testing an assumed maximum battery life of one year.*

Table 2.0 Dedicated Mode Parameter Settings

Parameter	Settings
Rx Level	-82 dBm
Hopping	ON, 5 frequencies GSM: 1, 30 ,62, 93,124 DCS: 512, 600, 690, 780, 885
Handover	No
MS-Tx-Lev (Power)	5 (29 dBm) GSM 1 (28 dBm) DCS
BA List	16 frequencies as follows GSM:19,17,26,34,42,50,58,6,7.75,83, 91,99,108,116,124 DCS:512,530,560,580,610,640,670,700,720,740,760,790,8 1 0,840,860,885
Uplink DTX	2 (OFF)
Call	Continuous

Figure 2.0 Sample Talk time test results sheet.

```
+-------------------------------------------+
| 6103 Test Set (GSM) – Mobile Battery Life     |
| in dedicated mode (Talk Time)                 |
+-------------------------------------------+
| Mobile Details                                |
| IMSI: ************    IMEI: ***********       |
| Revision: ** Power class: 4 Encryption: On    |
+-------------------------------------------+
| Test Results                                  |
|  |
| Parameters used                               |
| TCH ARFCN: (hopping)                          |
| Mobile power level: 7                         |
| Periodic U/date interval: 30 mins             |
| Page Mode: 0                                  |
| Paging Multiframes: 5                         |
| Discontinuous Transmission: 2                 |
|                                               |
| Test started at 09:34:54 on 21 APR 1998       |
| Communication lost at 11:48:52, 21 APR 1998   |
| Total talk time: 2 Hours 14 minutes           |
+-------------------------------------------+
```

WHERE TO GET MORE INFORMATION

- **How to obtain the sequence library and the Battery life test procedure**

  To obtain a copy of the RIBASIC sequence library and the Battery Life test procedure please contact your local Racal Representative or the Customer Help Desk on +44 (0)1753 741010.

- **About these sequences**

  See explanatory comments built into the sequences: view them using any standard text editor program such as Microsoft Notepad

- **About running sequences**

  See the 6103 Operator's Manual Volume 2, "Test Sequences" (Section 4) and "Test Sequences Menu" (Section 5)

- **About programming in RIBASIC**

  See the 6103 Operator's Manual Volume 2, "Programming Test Sequences" (Section 5 Annex A)

- **About parameters to use when running tests with RIBASIC**

  For running tests with the RIBASIC "TEST" command, see the 6103 Operator's Manual Volume 2, "Single Test Commands" (Section 6)

  For defining parameters with the RIBASIC "CONFIG" command, see the 6103 Operator's Manual Volume 2, "GSM Parameter Configuration Commands" (Section 6)

- **About the Debug facility.**

  The debug facility is an engineering feature of the 6103 designed for use by Racal engineers. This port can provide access to additional information and parameters not normally accessible via the instruments front panel. Further information may be obtained by contacting Racal Instruments.

- **Parameter Settings for Battery life testing**

  The sequence file can be edited and saved to memory card to control the discontinuous transmission parameter DTX. This is different to the previous Battery Life Test sequnces for version 2.02B, where it was necessary to use the Debug facility to enable DTX.

The setting for the DTX parameter are 0, 1 and 2. The values have the following meaning:

0 : MS may use DTX if possible
1 : MS is commanded to use DTX (DTX On)
2 : MS is commanded **Not** to use DTX (DTX Off)

- **Troubleshooting**

  NOTE: *when using these files, you may occasionally get the error message "RIBASIC Error: Range of values for ...." - this is not an error in the sequence files, but is caused by the following:*

1. If you have enabled offsets under the "Offsets" menu, then some of the parameters used in the tests may be out of range. Either alter the offset or modify the values used in the sequence.

In case of problems please contact your local Racal Representative or the Customer Help Desk on +44 (0)1753 741010.

RACAL INSTRUMENTS

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