Wireless Networks Division


Acterna’s Wireless Networks Division offers a wide range of solutions for the testing of handsets, devices, RF and wireless networks. These solutions support carriers of wireless networks in meeting their testing requirements. The maintenance of networks is made easier by optimizing operations, monitoring performance and confirming billing accuracy. The mobile phone industry uses Acterna’s solutions to accelerate production, detect faults and check compliance. In a nutshell, users of the Wireless Networks Division’s solutions gain real advantages over their competitors.

Acterna is a world leader in mobile handset test equipment used by service providers to determine specific problems with mobile phones and validate the need for repair. Acterna’s Air Interface Instruments and network systems are recognized leaders in their field and are deployed around the world. Acterna’s R&D labs are actively developing testing solutions for all of emerging wireless services and networks.

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Introduction

Dear User of the Acterna TestPad
Base Station & Air Interface Test Module (BAT),

We hope that you will enjoy using the BAT as much as we enjoyed designing it for you.

Your feedback on this test instrument is always welcome. It enables us to improve the BAT through updates and upgrades. So your feedback can be the first step towards an improved version of the BAT! Send us your comments; you can reach us by email, fax or via our local sales offices.

Additional information, hints and updates on the latest software can be accessed online: www.acterna.com.

Your BAT Team

Support Europe/Asia
Tel: +49 89 99641-386
Fax: +49 89 99641-440
email: EuroWireSupport@acterna.com

Support Americas
Tel: +1 800 245 6356
+1 317 788 9351
Fax: +1 317 614 8347
email: USWirelessSupport@acterna.com
The Base Station & Air Interface Test Module (BAT)

The BAT Module is a handheld RF spectrum meter based on the Acterna TestPad 2000™ platform. Base stations can be tested while in operation, without any shut down. You can test a base station either at its RF output connector or over the air interface. Simple use and a small size make testing easier than ever.

About this manual

The Getting Started Guide supplements the complete operating manual. It should be read before installing the BAT Module and taking it into operation. Further instructions are contained in the operating manual which is included with the BAT Module in the form of detailed online help.

This booklet will provide you with initial information and guide you up to the point where you will be able to retrieve more detailed information from the online help.

The main sections of this manual advise you
• how to unpack and install the BAT Module
• about the main applications
• about the highest menu level of the user interface
• how to retrieve more help from the built-in online help

Safety instructions

Maintenance and repair is only allowed for specially trained service technicians. Opening a unit without permission causes loss of warranty.

Unpacking the BAT

Keep the cardboard box for shipping the BAT back to Acterna for recalibration and inspection (recommended once a year).

Standard equipment delivery

- **a** 1 Base Station & Air Interface Test Module (BAT)
- **b** 2 RF cables, N-type on N-type connectors, 2 m (ca. 6 ft.) long, one with a blue cap and one with a yellow cap
- **c** 2 RF adapter cables, N-type to SMA connectors, one marked blue, one marked yellow
- **d** 1 high-band antenna (not included in the cellular version)
- **e** 1 low-band antenna, indicated by a cap with two colored rings (not included in the PCS version)
- **f** 4 removable cable binders
- **g** This Getting Started Guide
Acterna TestPad 2000™ (V3) delivery

Note: If the BAT Module has been ordered with the Acterna TestPad 2000™, the latter is delivered in the same main box. The TestPad comes with a Getting Started Guide of its own; please refer to this when unpacking and installing the TestPad.

The complete tester consists of the BAT Module and the Acterna TestPad 2000™. The latter consists of the following:

a  User Interface Module
b  Power supply
c  Power cord

d  30 dB bidirectional dual-band coupler (max. 500 W)
Connecting Acterna TestPad 2000™ with the BAT Module

- The Acterna TestPad 2000™ may contain another application module. If so, remove that other module.
- Slide the BAT Module into the Acterna TestPad 2000™.
- Tighten the screw with a coin.
- Power on the TestPad.
- The application software will be downloaded from the BAT Module (this will take a few minutes).
- Your BAT starts operation and is ready for use.

Please read the following pages carefully and do not forget to charge the battery before going out in the field!
Elements of Acterna TestPad 2000™ and BAT

Apart from the large touchscreen right in the middle, the Acterna TestPad 2000™ with the BAT Module consists of the following user elements:

a  Power LEDs  
b  Connectors  
c  Table for absolute power and reflection  
d  Switches and connectors  
e  Battery slot  
f  Handle with stylus pocket  
g  PCMCIA card slot and printer port

The components above are explained and illustrated in more detail on the following pages.
Power LEDs

POWER LED lights up when the Acterna TestPad 2000™ is switched on.

CHARGE Illumination indicates that the battery is being charged.

LOW BATTERY LED lights up when battery charge is low.

Handle with pocket for stylus

Handle for carrying the TestPad.

The stylus can be used to operate the user interface more easily. You can put the yellow stylus inside the pocket so you will not lose it.
Table for absolute power and reflection

For your convenience, a conversion table for power and reflection measurements is printed on the right-hand side of the front panel of the module.

If you want to convert between different dimensions, please use the equations below:

\[
\text{Power [dBm]} = 30 + 10 \log_{10} \text{Power [W]}
\]

\[
\text{Reflection [dB]} = 20 \log_{10} \left( \frac{VSWR + 1}{VSWR - 1} \right)
\]
Connectors

Antenna Connector for the BAT stick antenna
Trigger Connector for triggering time measurements
Reflection Connector for the reflected coupler power
Main Connector for the attenuated radio output or the coupled forward power

Note: The short antenna is for PCS (high-band) measurements and the long antenna with two colored rings is for cellular (low-band) measurements.

Warning: The power input to the Antenna connector must not exceed 1 mW (0 dBm); the power input to the Reflection and Main connectors must not exceed 1 W (30 dBm).
A PCMCIA memory card can extend the storage capacity of your BAT. It will also speed up the BAT application after module swap (the memory card needs to be ATA-compatible). An external PCMCIA storage device is highly recommended if you want to store many screenshots.

**Printer port**

The printer port is also used to up- and download the base station configuration data, as well as for result files. The PC Upload/Download Software Option to the BAT is required for this task.
Switches and connectors

DC IN  Use this connector to supply your Acterna TestPad 2000 with voltage from an external DC supply and to charge your battery.

0/1  This switch is used to turn the power on and off.

Handset  The BAT module does not make use of the Handset connector.

Battery slot

Note: With some versions of the TestPad 2000, the battery slot can be opened with a coin.
Three Main Applications for Using the BAT

Application 1: Measurements at the base station’s attenuated output

Attach one end of the blue cable to the Main connector of the BAT and the other end to the attenuated RF output of the base station radio section (max. 1 W).
With this application you can measure:

- Output power
- Output spectrum
- Output ripple
- Carrier frequency
- Carrier frequency error

**Warning:** Always use the attenuated output. Never connect the high-power output of the radio directly to the BAT. A direct connection can be hazardous and may destroy your test equipment.

Taking measurements at the base station’s attenuated output
Application 2: Measurements using a coupling device

When using a bidirectional coupler you can take the same measurements as on the attenuated output. You can also test the match between antenna and radio by measuring the reflection value. A high reflection value indicates a mismatch. A mismatch may reduce the coverage of the base station and is often caused by defective antennas.

Many base stations already include a fixed bidirectional coupler; for testing base stations without this feature, bidirectional couplers are available from Acterna (Dual-Band Coupler, order code AC-016953). This device is of high accuracy and superior to many couplers built into base stations.

• Connect one end of the blue cable to the Main connector of the BAT and the other end to the forward port of the bidirectional coupler (normally the coupler port which is closer to the radio).
• Connect one end of the yellow cable to the Reflection connector of the BAT and the other end to the reflected port of the bidirectional coupler (normally the coupler port closer to the antenna).

**Warning:** Always use the coupled port of a coupling device. Never connect the BAT directly to the high-power output of the radio or to the feedthrough connector of the coupler. Direct connection can be hazardous and will destroy your test instrument.
With this application you can measure:

- Output level
- Output spectrum
- Output power ripple
- Carrier frequency error
- Reflected power (antenna match)
- Frequency-dependent reflected power

Taking measurements using a bidirectional coupler
Application 3: Measurements over the air interface

With measurements over the air interface you can analyze the RF environment of the base station. You can cover all the frequencies in which the base station transmits or receives by using the two antennas included in the standard delivery. Attach the respective antenna to the Antenna connector and start testing. The BAT separately checks the base station’s RF environment for transmission (forward link) and reception (reverse link).
Note: Use the long antenna (with two rings on top) for the cellular (low) band. Use the short antenna for the PCS (high) band.

With this application you can test:

The RF environment of the base station
- Emitted field strength
- Emitted spectrum
- Neighboring base stations
- Interference on the forward link (downlink)

The RF environment of the base station’s receiver
- Noise floor
- Mobile station emissions
- Interference on the reverse link (uplink)
Working With the User Interface

The user interface of the TestPad 2000™ with the BAT Module is designed to be intuitive and easy to use. Although it is recommended that you use the stylus supplied with the TestPad to activate functions on the screen, you can also lightly touch the screen with any blunt object or with your finger.

When you power the module, the main screen appears as shown above.

The following pages only describe the most important sections of the screen. For more in-depth information, please refer to the online help.
**Most important display sections**

<table>
<thead>
<tr>
<th>Application Buttons</th>
<th>Configuration Window</th>
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<tr>
<td>Setup Window</td>
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**Application Window**

<table>
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<tr>
<th>Action Buttons</th>
<th>System Buttons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Window</td>
<td></td>
</tr>
</tbody>
</table>

The display is divided into several sections. The most important ones, to begin with, are the System and Application button sections which are described on the following pages.

**Application buttons**

**Configure**

Using the “Configure” application, you can enter your location, verify or reconfigure the settings of a base station, add or delete a base station configuration, and save the configuration to a disk.
Check

With “Check” you can test the base station. If it fails the test, arrows will point to the specific measurements that indicate the failure. You can then enter comments on the result or save the result as a screenshot.

Power

Press this button to check the output power alignment, including ripple detection. Power is measured in actual values (dBm).

Reflection

This application is used for measuring the signal reflection.

Frequency

If you want to measure the frequency spectrum, press this button; the application also provides to check against a template.

Waterfall

The Waterfall application gives you a general overview over the RF environment. Interference in the selected frequency band is detected and displayed.
System buttons

Restart

“Restart” resets the settings of the selected application (button) to the values which were active when the application was invoked. The Restart button also restarts the measurements.

System

The “System” button can be used for the basic system setup, allowing you to enter parameters such as user name, date and time, storage location (for screenshots and reports), sound volume and brightness. You can also view the equipment revisions.

Print

Using “Print” you can save screenshots or reports. If a printer is connected to the TestPad 2000, you can also print the reports. Select the System button to set up the printing location, e.g. when using a PCMCIA-based memory extension.

Help

For calling up the online help.
Online help screen

ACTERNA Base Station & Air Interface Test Module

Welcome
An example
The display
Configuration
  Base station dialog
  Area dialog
  Base station details dialog
Applications
  Check application
  Power measurement
  Power over time measurement
  Frequency spectrum measurement
  Reflection measurement
  Waterfall application

Next >

The online help will guide you in operating the BAT. It can be called up by pressing the question mark on the screen. The help screens contain all information that you need to proceed with testing.
Up- and Downloading Configuration Data and Reports

Acterna provides an optional up- and download software (order code 2700-PC) for use with the BAT Module. The software is based on an MS-Excel sheet containing macros.

Using the different tables of the MS-Excel sheet, you can enter all relevant parameters of the different base stations so that you have them available at a glance. If run on a laptop PC, you can simply click on a base station entry and have access to all information on site. The software also enables you to load these base station configuration data from the PC to the BAT Module and to transfer test results back to the PC.

Service and Calibration

The BAT can only be repaired by Acterna’s trained service engineers. Each repair requires a new calibration of the BAT to ensure measurement accuracy. The BAT should be recalibrated at least once a year. The cables and adapters should also be sent in for inspection; they will be checked and exchanged for new ones if damaged.

Replacement parts (cables, adapter cables and cable binders) can be ordered directly from Acterna:

<table>
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<tr>
<th>Description</th>
<th>Order Code</th>
</tr>
</thead>
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<tr>
<td>N to N cable, 2 m (6 ft), blue cap</td>
<td>CB-382811</td>
</tr>
<tr>
<td>N to N cable, 2 m (6 ft), yellow cap</td>
<td>CB-382810</td>
</tr>
<tr>
<td>N to SMA adapter cable, blue</td>
<td>CB-382819</td>
</tr>
<tr>
<td>N to SMA adapter cable, yellow</td>
<td>CB-382818</td>
</tr>
<tr>
<td>Removable cable binder (incl. 4 pcs)</td>
<td>AC-770163</td>
</tr>
<tr>
<td>Antenna with TNC connector, cellular</td>
<td>1019-00-1052</td>
</tr>
<tr>
<td>Antenna with TNC connector, PCS</td>
<td>1019-00-1039</td>
</tr>
<tr>
<td>Replacement battery</td>
<td>BA-014081</td>
</tr>
</tbody>
</table>
Federal Communications Commission (FCC) Notice

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The authority to operate this equipment is conditioned by the requirements that no modifications be made to the equipment unless the changes or modifications are expressly approved by Acterna.

Industry Canada Notice

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.
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<th>Comment</th>
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<tr>
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<td>First edition</td>
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<td>Corrections</td>
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Designations such as utility names, company names and trade names are not specially indicated in this manual, as they are all widely known. Such names may, however, be the property of companies or other such bodies.

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Acterna
Wireless Technical Assistance Center
6620 Network Way
Indianapolis, IN 46278
USA
Tel:   +1 800 245 6356
       +1 317 788 9351
Fax:   +1 317 614 8347
e-mail: USwirelesssupport@acterna.com

Acterna München GmbH
Wireless Support
Gutenbergstr. 2 – 4
85737 Ismaning
Germany
Tel:   +49 89 996 41-386
Fax:   +49 89 996 41-440
e-mail: eurowiresupport@acterna.com

Internet: www.acterna.com
Acterna Sales Offices

Worldwide Headquarters
20400 Observation Drive
Germantown
Maryland 20876-4023
USA

Regional Sales Headquarters
North America
20400 Observation Drive
Germantown
Maryland 20876-4023
USA
Toll Free: +1 866 228 3762
Tel: +1 301 353 1550
Fax: +1 301 444 8468

Latin America
Av. Eng. Luis Carlos Berrini
936/8º e 9º andares
04571-000 São Paulo, SP
Brasil
Tel: +55 11 5503 3800
Fax: +55 11 5505 1598

Asia/Pacific
42 Clarendon Street
PO Box 141
South Melbourne, Victoria 3205
Australia
Tel: +61 3 9690 6700
Fax: +61 3 9690 6750

Western Europe
Arbachtalstrasse 6
72800 Eningen u. A.
Germany
Tel: +49 7121 86 22 22
Fax: +49 7121 86 12 22

Eastern Europe,
Middle East & Africa
Elisabethstrasse 36
2500 Baden
Austria
Tel: +43 2252 85 521 0
Fax: +43 2252 80 727

1st Neopalimovskiy Per. 15/7 (4th floor)
119121 Moscow
Russia
Tel: +7 095 248 2508
Fax: +7 095 248 4189

Acterna is present in more
than 80 countries. To find
your local sales office, go to
www.acterna.com