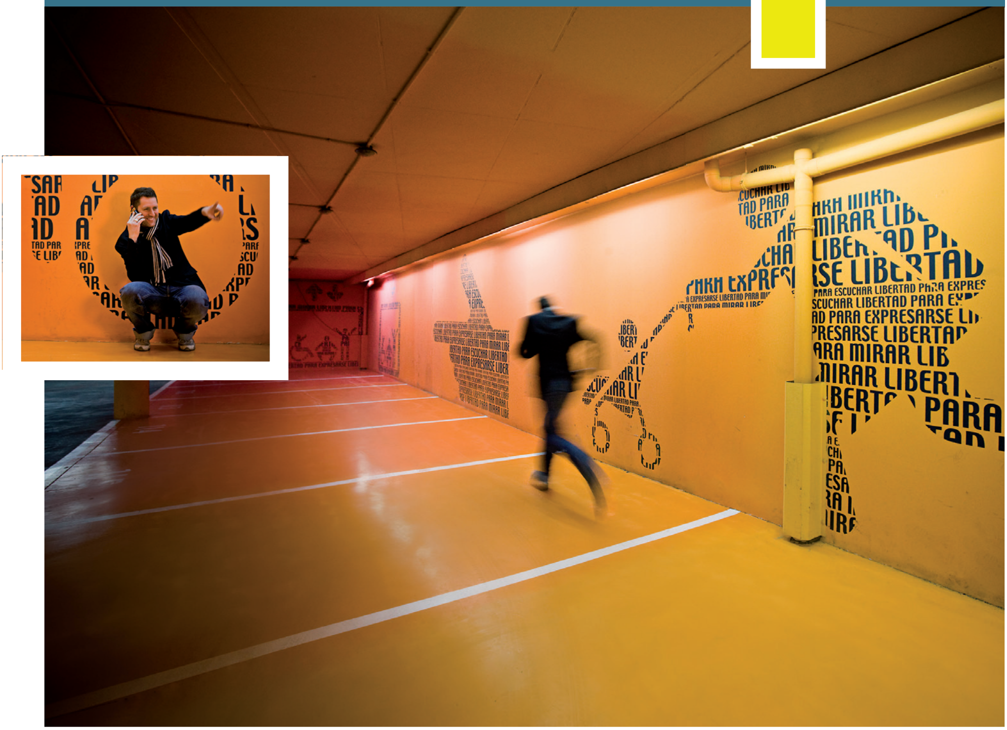
TEMS™ POCKET 15.1

User's Manual



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1. Introduction

Welcome to TEMS Pocket.

TEMS Pocket is a handheld tool for **verification**, **maintenance**, and **trouble-shooting** of mobile networks as well as for basic cell planning tasks. Built into a commercial mobile phone or tablet, TEMS Pocket collects measurements and events and presents them on the device display. The measurements can be stored for later analysis in other products such as TEMS Discovery Device and TEMS Investigation.

The combination of **small size** and **powerful testing** features makes TEMS Pocket a convenient tool for day-to-day monitoring of mobile networks, particularly in an indoor or pedestrian scenario. In addition, since the mobile device can function as the user's regular phone, TEMS Pocket provides a powerful way to find errors **without explicitly searching** for them.

TEMS Pocket is designed as an **integral part** of the device's user interface. This promotes continuous use by engineers and technicians, which translates into more time for them to detect, document, and solve problems.

1.1. TEMS Pocket Devices

This document describes TEMS Pocket 15.1 as implemented on the following devices:

Phones

- Sony Xperia Z3 D6603 (LTE/WCDMA/GSM)
- Sony Xperia Z2 D6503 (LTE/WCDMA/GSM)
- Sony Xperia V LT25i (LTE/WCDMA/GSM)
- Sony Xperia T LT30a (LTE/WCDMA/GSM)
- LG G2 VS980 (LTE; CDMA/EV-DO)
- Samsung Galaxy S5 SM-G900A (LTE/WCDMA/GSM)
- Samsung Galaxy S5 SM-G900F (LTE/WCDMA/GSM)

- Samsung Galaxy S5 SM-G900I (LTE/WCDMA/GSM)
- Samsung Galaxy S5 SM-G900P (LTE; CDMA/EV-DO)
- Samsung Galaxy S5 SM-G900V (LTE; CDMA/EV-DO)
- Samsung Galaxy S5 SM-G9006V (LTE/WCDMA/GSM)
- Samsung Galaxy S4 GT-I9506 (LTE/WCDMA/GSM)
- Samsung Galaxy S4 Mini SGH-I257 (LTE/WCDMA/GSM)
- Samsung Galaxy Note 4 SM-N910F (LTE/WCDMA/GSM)
- Samsung Galaxy Note 4 SM-N910G (LTE/WCDMA/GSM)
- Samsung Galaxy Note 4 SM-N910T (LTE/WCDMA/GSM)
- Samsung Galaxy Note 3 SM-N900T (LTE/WCDMA/GSM)
- Samsung Galaxy Avant SM-G386T (LTE/WCDMA/GSM)
- Sharp SG304SH (LTE/WCDMA/GSM)

Tablets

- HTC Nexus 9 (LTE/WCDMA/GSM)
- Samsung Galaxy Note 10.1 LTE GT-N8020 (LTE/WCDMA/GSM)

1.2. TEMS Pocket Editions

Please note that the TEMS Pocket product also exists in various regional editions, all of which are covered by the product documentation (including this manual) but are not differentiated there. This means that descriptions of functionality and external device compatibility are not necessarily applicable in every single respect to the TEMS Pocket edition you have purchased. Any restrictions that apply to your edition are indicated in the Release Note included in the delivery.

1.3. Do Not Update Firmware

Note: On TEMS Pocket devices other than Sony devices, you *must not* accept any firmware updates from the device vendor or operator. **Performing such a firmware update may render the device unusable as a TEMS Pocket device. Rooting must be avoided for the same reason.**

When Ascom issues a new release of TEMS Pocket device firmware, the device must be sent back to Ascom for updating. Note that this does not apply to updating of the TEMS Pocket application, which can be done using the TEMS Pocket installer (compare section 1.4).

1.4. What to Do If TEMS Pocket Is Uninstalled

If you switch Google accounts on your TEMS Pocket device, perform a hardware reset on the device, or do something else that causes the TEMS Pocket application to be removed, download the TEMS Pocket PC installer from the GLS web interface (see section 3.8) and run it to reinstall the application.

2. Recently Introduced Features in TEMS Pocket

2.1. What’s New in TEMS Pocket 15.1

2.1.1. Devices

2.1.1.1. New Device: Samsung Galaxy S5 SM-G900F

This is an LTE Category 4 device intended for the European market. It is prepared for **VoLTE**, and with Ascom software installed it supports **POLQA** for both mobile-to-mobile and mobile-to-fixed.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), 850 (B5), 2600 (B7), 900 (B8), 800 (B20)
  - WCDMA 850 (Band V), 900 (VIII), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
- Google Android 4.4.4
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS and GLONASS support
- Chipset/CPU: Qualcomm MSM8974AC, quad-core, 2.5 GHz

2.1.1.2. New Device: HTC Nexus 9 OP82200 Tablet

This is an **LTE Category 4 tablet** with an 8.9 inch display.

Please note that this tablet does not have CS voice support.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), AWS 1700/2100 (B4), 850 (B5), 2600 (B7), 900 (B8), 800 (B20)
  - WCDMA 850 (Band V), 900 (VIII), 1700 (IV), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - LTE EARFCN/PCI lock
  - WCDMA UARFCN lock
  - WCDMA disable handover
- Google Android 5.0
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS and GLONASS support
- Chipset/CPU: Nvidia Tegra K1-64, dual-core, 2.3 GHz

2.1.2. Service Testing

2.1.2.1. POLQA on More Devices

POLQA has been implemented on the following additional TEMS Pocket devices:

- Sony Xperia Z3 D6603
- Samsung Galaxy S5 SM-G900P

- Samsung Galaxy Note 4 SM-N910F

2.1.2.2. Multiple Parallel FTP Downloads

You can now perform multiple concurrent FTP downloads of the same file, each download being conducted by a separate TEMS Pocket managed FTP client. The utility of this feature is twofold: it can be used to **maximize throughput** in networks with certain properties, and it permits testing of data download **in multiple streams** from the same FTP server.

2.1.2.3. WebKit-based HTTP Client

As an alternative to the built-in HTTP client in TEMS Pocket, a separate on-device **HTTP client based on WebKit** is now available to use for HTTP download. The browsed content appears in a floating window on top of the TEMS Pocket application.

2.1.2.4. SFTP for Logfile Upload

The SSH File Transfer Protocol (**SFTP**) has been introduced as a new protocol for logfile upload, offered as an alternative to FTP and HTTP.

2.1.2.5. TEMS Pocket Remote Enhancements

- TEMS Pocket in Remote mode can connect to **FleetManager 2.3**.
- **Logfile upload** can be triggered when the vehicle is **stationary** or moving very slowly.
- The device **GPS can be kept turned on** at all times, enabling positioning of events that are sent to FleetManager even if no measurement is being conducted. (This is needed for the "logfile upload when stationary" function.)

2.1.3. New Collected and Presented Data

2.1.3.1. Carrier Aggregation

- **LTE physical layer throughput** is presented for primary and secondary serving cells separately.
- The **LTE Cell Configuration** view has been split into separate instances for primary and secondary serving cells.

2.1.3.2. New LTE Value Elements

- **EMM state and EMM substate** have been added in the LTE Cell Configuration data view.

2.1.3.3. CDMA Speech Codec Information

- The **Capacity Operating Point (COP)** of the currently used speech codec is presented.

2.1.3.4. Extended and Improved Scan Data Presentation

- Data views presenting **GSM color code scans** with the PCTel IBflex have been added. This scan data was previously only recorded on file.
- The presentation of scan data in general has been made both **more smooth and more informative**. Any detected cell now lingers for at least one second in the display so that it can be readily observed, even if the scanner loses track of the cell sooner than this. More generally, the scan data presentation is smoothed to show maximum values over the past second, thus reducing split-second fluctuations that might make a jittery impression on a human observer.

2.1.3.5. Data Collection for Ranplan iBuildNet

TEMS Pocket 15.1 can be employed as a data-collecting tool by the in-building network planning tool **Ranplan iBuildNet**. This application can initiate a pinpointing session in TEMS Pocket, and in the process a selection of RF data (a subset of what is recorded in regular TEMS Pocket logfiles) is logged and reported back to Ranplan iBuildNet.

2.1.4. Other Usability Improvements

2.1.4.1. Customizable Value Element Presentation

The **color palette** that encodes measurement values in the TEMS Pocket user interface is now freely customizable. Besides substituting other colors for the default green, yellow and red, you can also adjust the **value thresholds** for switching between colors in the presentation.

2.1.4.2. Header Lights Displaying Measurement Values

The “pointed bulb” style lights in the data view headers can now be **toggled to show the values** of the quantities they represent. Tap the lights, and the text labels with quantity names (such as “RSRP”) are replaced by the latest readings for these quantities (such as “–113 dBm”). Tapping once more restores the name labels.

2.1.4.3. Reworked Event Presentation

Events generated by TEMS Pocket are now presented in a **data view** similar to those for Layer 3 and SIP messages, equipped with the same useful **freezing function** enabling easy inspection of specific events in the flow. The new presentation replaces the event log.

The displaying of events in **map views** and **line charts** has also been enhanced, with event details shown in a pop-up when the event is tapped. On the indoor map, a scrollable event list can also be called up.

For both events and messages a **filtering** function has been added, allowing you to show only items of a particular type, or to hide items of a particular type.

2.1.4.4. Refined Presentation of iBwave Transmitter Files

Indoor cells from iBwave transmitter files are now drawn on indoor maps in a more sophisticated manner. Multiple colors, picked according to a **contrast-maximizing** scheme, and **differentiated sector radii** are used to enable clear visualization of numerous cells at the same site.

When you select a cell site, a separate **legend** appears, linking plot colors to cell names if available in the transmitter file, or else identifying cells by means of key parameters (for example, EARFCN and PCI).

2.1.4.5. Custom Data View Headers

You now have the option to set up custom data view headers, **one for each technology**. Such headers are assembled in the same way as custom views, that is, as a **mosaic of text, graphs, and value bars** laid out on a grid. Any value elements available in TEMS Pocket can figure in a custom header.

Preconfigured examples of custom headers are supplied in the application. The standard headers remain side by side with the custom ones.

2.1.4.6. Custom Data Views in Controller

The controller device in a TEMS Pocket multi-device setup can now display **custom data views**, that is, views whose contents you assemble yourself piece by piece.

2.1.4.7. New Design of Menu System and Quick Access Buttons

All TEMS Pocket drop-down menus have been consolidated into one, accessed from a new button on the action bar. Each of the other buttons now has a single function (start/stop script, start/stop logfile recording, etc.). The new arrangement makes it easier to find commands and settings in TEMS Pocket.

2.2. What Was New in TEMS Pocket 15.0

2.2.1. New Device: Sony Xperia Z3 D6603

This is Sony's **successor to Xperia Z2**, an LTE Category 4 device operating on a wide range of LTE and UMTS bands.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), AWS 1700/2100 (B4), 850 (B5), 2600 (B7), 900 (B8), 750 (B13), 700 (B17), 800 (B20)
  - WCDMA 850 (Band V), 900 (VIII), AWS 1700/2100 (IV), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - LTE EARFCN/PCI lock
  - WCDMA UARFCN/SC lock
  - GSM cell lock/multi-lock, cell prevention
- Google Android 5.0
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS and GLONASS support

- Chipset/CPU: Qualcomm MSM8974AC, quad-core, 2.5 GHz

2.2.2. New Device: Samsung Galaxy Note 4 SM-N910G

This is a Galaxy Note 4 phone operating on LTE (FDD/TDD) and UMTS. It is a Category 6 device supporting **carrier aggregation**. TEMS Pocket on this device is **POLQA**- and **VoLTE**-capable.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), AWS 1700/2100 (B4), 850 (B5), 2600 (B7), 900 (B8), 700 APT (B28), 2600 TDD (B38), 2300 TDD (B40)
  - WCDMA 850 (Band V), 900 (VIII), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 6 (300/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - LTE EARFCN/PCI lock
  - WCDMA UARFCN lock
  - WCDMA disable handover
- Google Android 4.4.4
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm APQ8084, quad-core, 2.7 GHz

2.2.3. New Device: Samsung Galaxy Note 4 SM-N910T

This is T-Mobile’s Galaxy Note 4 phone, operating on LTE and UMTS. It is an LTE Category 6 device, thus supporting **carrier aggregation**. TEMS Pocket on this device is **VoLTE**-capable and offers **POLQA** scoring for both mobile-to-mobile and mobile-to-fixed calls.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), AWS 1700/2100 (B4), 850 (B5), 2600 (B7), 900 (B8), 700 (B12), 700 (B17)
  - WCDMA 850 (Band V), 1700 (IV), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 6 (300/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
- Google Android 4.4.4
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS and GLONASS support
- Chipset/CPU: Qualcomm APQ8084, quad-core, 2.7 GHz

2.2.4. New Device: Samsung Galaxy S5 SM-G900A

This AT&T-branded device operates on LTE and UMTS. It has **carrier aggregation** capability and supports both **POLQA** and **VoLTE**.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), AWS 1700/2100 (B4), 850 (B5), 2600 (B7), 700 (B17)
  - WCDMA 850 (Band V), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12

- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - LTE EARFCN/PCI lock
  - WCDMA UARFCN lock
  - WCDMA disable handover
- Google Android 4.4.4
- WLAN 802.11 a/b/g/n/ac (2.4 and 5 GHz)
- Chipset/CPU: Qualcomm SM8974AC, quad-core, 2.5 GHz
- Integrated GPS with A-GPS support

2.2.5. Android 5.0 (Lollipop) Support

TEMS Pocket 15.0 can run on devices with Android 5.0 (Lollipop) installed.

2.2.6. Voice Call Sequence: Alternating MO and MT Calls

Testing voice by trading calls back and forth between a mobile device and a fixed-side CallGenerator is a long-standing feature of other TEMS products like TEMS Automatic and TEMS Investigation. With the release of TEMS Pocket 15.0, such call sequences can be set up in TEMS Pocket as well, so that the application can be used as an **“answering machine” in voice testing**. A work order action named Call Sequence alternates mobile-originated and mobile-terminated voice calls and measures **voice quality** in terms of POLQA.

This action also adds the ability to conduct **mobile-to-fixed VoLTE** calls with TEMS Pocket.

In TEMS Pocket 15.0, the Call Sequence action is supported on the Samsung Galaxy S4 GT-I9506 device. *(Still true in TEMS Pocket 15.1.)*

To simplify the setup of mobile-terminated calls, TEMS Pocket was also equipped with the ability to automatically **detect the device phone number** whenever possible. The number can be entered manually as a fallback.

2.2.7. Speech Path Delay

TEMS Pocket 15.0 introduced calculation of speech path delay on the receiving side in mobile-to-mobile voice calls. This is the **time it takes for the speech to travel** to the calling party and back.

Speech path delay is a quantity which in the past could usually only be determined by slow and tedious manual procedures. By contrast, in TEMS Pocket, it is obtained **automatically and “for free”** as a by-product of the audio quality measurement.

What TEMS Pocket devices support speech path delay appears from the table in chapter 15.

2.2.8. Compact Overviews of Agents in Multidevice Setup

To ease the task of supervising the agents in a TEMS Pocket multidevice setup, new screens giving quick **overviews of all connected agents** were added to the controller. The Agent Cell Status view shows what technology, band, channel, and cell each agent is currently using, while the Agent Cell Data view exhibits some key RF measurements, physical channel throughput, and device transmit power.

2.2.9. Logfile Recovery

A logfile recovery mechanism was implemented in TEMS Pocket 15.0. If the recording of a logfile is interrupted for whatever reason, for instance because the device crashes or Android terminates the TEMS Pocket application, then TEMS Pocket will by default try to **salvage and reconstitute the file** the next time it starts up. A successfully recovered logfile is saved just like a regular one but with a prefix “recovered” added to the file name.

2.2.10. More Flexible Licensing

The TEMS Pocket 15.0 **product packages** (Professional, Standard, Remote) as well as the TEMS Pocket Lite 15.0 edition became **licensed as add-ons** in GLS rather than being permanently tied to the TEMS Pocket device. This opens up the possibility of **moving licenses between devices**, enabling more flexible usage and higher utilization of the purchased TEMS Pocket licenses.

The appropriate product package add-on is already mapped to each device on delivery, so there is no extra admin burdening the user in this regard. Add-ons for functionality options such as POLQA are handled in the same way as before.

2.2.11. New LTE Value Elements

2.2.11.1. New LTE Value Elements

- **RSRP and RSRQ per Rx antenna** are available as LTE value elements for presentation in custom data views. (They are not included in any built-in data views.)
- A bunch of further new LTE value elements also became presentable in TEMS Pocket 15.0. They do not appear in any predefined data views in this version but can be **shown in custom views**:
  - LTE PDCP DL/UL Throughput
  - LTE PDSCH Phy Throughput: primary/secondary carrier; also broken down by transport block (CW0/CW1) for each carrier – 6 elements in total
  - LTE PDSCH Resource Block Allocation Count
  - LTE SRS Tx Power

2.2.12. Presentation of Zones from iBwave Map Sets

iBwave indoor map sets (*.ibwc) may define a collection of **polygon-shaped zones** for each map it contains. TEMS Pocket 15.0 can (and will by default) display these zones if present, colored and labeled according to their definitions.

2.2.13. Withdrawn Devices

The following TEMS Pocket devices were withdrawn in version 15.0:

- Samsung Galaxy S4 GT-I9505
- Samsung Galaxy Note 3 SM-N900V

2.3. What Was New in TEMS Pocket 14.5

2.3.1. New Device: Samsung Galaxy Avant SM-G386T

This is an LTE/UMTS device used by T-Mobile. TEMS Pocket on this device supports **VoLTE** and audio quality measurement with **POLQA**.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), AWS 1700/2100 (B4), 850 (B5), 700 (B12)
  - WCDMA 850 (Band V), 1700 (IV), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - LTE EARFCN/PCI lock
  - WCDMA UARFCN lock
- Google Android 4.4.2
- WLAN 802.11b/g/n
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8226, quad-core, 1.2 GHz

2.3.2. Keeping Local Copies of Logfiles

Until the 14.5 version, TEMS Pocket logfiles were automatically deleted from the device after they have been uploaded to a server. This remains the default behavior, but TEMS Pocket 14.5 introduced the option to **keep the logfiles on the device storage medium** after the upload. The files are then moved to a special “uploaded” folder.

2.3.3. Presentation of Cells from iBwave Transmitter Files

Each map in an iBwave indoor map set (with extension *.ibwc) may be accompanied by a **“transmitter” file**, which holds data on cell sites present in the space covered by the map. TEMS Pocket 14.5 **presents cell data from such files** if present, drawing the cells on the floor plans and displaying their names in cell list data views and in the data view header.

2.4. What Was New in TEMS Pocket 14.4

2.4.1. New Device: Samsung Galaxy S5 SM-G900V

This Galaxy S5 model is an LTE/CDMA Verizon device. TEMS Pocket on this device supports **VoLTE** and **POLQA**.

- Frequency bands:
  - LTE AWS 1700/2100 (Band 4), 700 (B13)
  - CDMA 800 (BC0), 1900 (BC14)
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - EV-DO Rel. 0, Rev. A
  - CDMA 2000, cdmaOne, 1xRTT
- Real-time control capabilities:
  - RAT lock (LTE, CDMA, EV-DO)
  - Band lock (LTE)
- Google Android 4.4.2
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974AC, quad-core, 2.5 GHz

2.4.2. New Device: Samsung Galaxy S5 SM-G9006V

This is an LTE (**FDD/TDD**) and UMTS Galaxy S5 used by China Unicom.

- Frequency bands:
  - LTE 2100 (Band 1), 1800 (B3), 2600 (B7), 2300 TDD (B40), 2500 TDD (B41)
  - WCDMA 850 (Band V), 900 (VIII), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
- Google Android 4.4.2
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974AC, quad-core, 2.5 GHz
- Dust and water protected (IP67 rated)

2.4.3. New Device: Samsung Galaxy Note 4 SM-N910F

This is a Galaxy Note 4 operating on LTE (FDD) and UMTS. It is a Category 6 device supporting **carrier aggregation**.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), AWS 1700/2100 (B4), 850 (B5), 2600 (B7), 900 (B8), 700 (B17), 800 (B20)
  - WCDMA 850 (Band V), 900 (VIII), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 6 (300/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12

- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - LTE EARFCN/PCI lock
  - WCDMA UARFCN lock
  - WCDMA disable handover
- Google Android 4.4.4
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm APQ8084, quad-core, 2.7 GHz

2.4.4. New Device: Sharp SG304SH

This is an LTE (FDD/TDD) and UMTS phone used by the Japanese operator Softbank. TEMS Pocket on this device supports **VoLTE** and **POLQA**.

- Frequency bands:
  - LTE 2100 (Band 1), 1800 (B3), 900 (B8), TDD 2500 (B41)
  - WCDMA 900 (VIII), 2100 (I)
  - GSM 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - WCDMA disable handover
- Google Android 4.4.2
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974AB, quad-core, 2.3 GHz

- Dust and water protected (IP65/IP67 rated)

2.4.5. Cell Usage Statistics Data View

TEMS Pocket 14.4 kept building the collection of statistics data views, adding one that shows the **history of cell usage** for each supported cellular technology. The current serving cell (or strongest active set member) is always on top, and below it up to 15 other cells are ranked according to the total time they have been used. This gives a valuable overview of the cells the device has been interacting with during your tests.

2.4.6. HTTP Get with SSL

TEMS Pocket 14.4 supports **SSL encryption** not only for HTTP Post but also for **HTTP Get** sessions.

2.4.7. Enhancements to Multi-device Setup

A number of additions and improvements were made to the TEMS Pocket controller–agent setup:

- **Service-specific progress views** for agents are available in the controller.
- **Scanning status views** (for a scanner connected to an agent) are available in the controller.
- The **current agent** is now selected from (and indicated in) the controller’s navigation menu, where all connected agents appear.
- **Controller offered preinstalled** on a Samsung Wi-Fi tablet.

2.5. What Was New in TEMS Pocket 14.3

2.5.1. New Device: Samsung Galaxy S5 SM-G900P

This is Sprint’s Galaxy S5 model with **TD-LTE** as well as CDMA/EV-DO support.

- Frequency bands:[1]
  - LTE 1900 (Band 25), 850 (B26), 2500 TDD (B41)
  - CDMA 800 (BC0), 1900 (BC14)

- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - EV-DO Rel. 0, Rev. A
  - CDMA 2000, cdmaOne, 1xRTT
- Real-time control capabilities:
  - RAT lock (LTE, CDMA, EV-DO)
  - Band lock (LTE)
- Google Android 4.4.2
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974AC, quad-core, 2.5 GHz
- Dust and water protected (IP67 rated)

2.5.2. CDMA/EV-DO RAT Lock

The Radio Access Technology lock control function was **extended** to CDMA and EV-DO for the newly introduced Samsung Galaxy S5 SM-G900P as well as for the previously supported CDMA-capable LG G2 VS980 device.

2.5.3. ECSFB (Enhanced CS Fallback) Support

ECSFB (“E” for “enhanced”) is the term used for **CS fallback** performed **from LTE to CDMA**. This function is supported by the Samsung Galaxy S5 SM-G900P device.

2.5.4. PCTel IBflex Scanning Enhancements

- **GSM scanning** support added: RSSI and Color Code scan methods. The latter incorporates C/I measurement and System Information decoding.
- **Presentation** of IBflex scan data in data views.

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1. WCDMA and GSM also supported by the phone when in Global mode, but not supported in TEMS Pocket.

2.5.5. Statistics Data View

A new data view was created showing statistics on

- the **outcome of executed service sessions**: attempts, successes, failures, and (where applicable) a performance indicator such as mean throughput taken over all sessions;
- **RAT usage**, further broken down by mode (idle/connected). Any time spent in no service is also indicated.

The statistics persist after restart of TEMS Pocket; on the other hand, they can be reset by the user at any time.

2.5.6. Synchronization of TEMS Pocket Devices to FTP Server

This feature allows an FTP server to be used as a **central repository** for TEMS Pocket settings (including custom data views) as well as for auxiliary data: scripts, map sets, and cell files.

TEMS Pocket devices can connect to this FTP server and download all contents currently available. This provides an easy way to ensure that all TEMS Pocket users always have **up-to-date configuration data** installed on their devices.

2.5.7. GPS Synchronization of Controller and Agents

In a TEMS Pocket multi-device setup, the **controller can share its GPS signal** (taken from the device’s built-in GPS or from an external Bluetooth GPS) **with all agents**, overriding agents’ GPS data.

The point of doing that is to ensure that all devices are assigned the exact **same positions in logfiles**, and also to circumvent any possible issues with GPS reception inside the backpack holding the agents.

2.5.8. User-definable Device Equipment IDs

This was another usability improvement for the multi-device configuration. Each TEMS Pocket device, as well as a connected external scanner, can be **assigned a unique equipment ID** of the form “EQ*n*” in logfiles. Such tagging serves to tell devices apart when post-processing TEMS Pocket logfiles in TEMS Investigation or TEMS Discovery Device.

2.5.9. LTE Rank Indication Feedback

The “LTE Data” view in TEMS Pocket already showed actual LTE rank indication for transmissions on the PDSCH, reflecting the number of transmission layers used. New in version 14.3 was the presentation of the **UE’s feedback** on the rank indication, advising the network on what value it finds most suitable. This feedback is sent on the PUSCH or PUCCH.

2.5.10. LTE Cell TX Antenna Balancing

A new LTE data view “eNB TX Antenna Difference” was provided, indicating the **difference in transmit power between the TX antennas** of an eNodeB. These measurements can be used to determine in real time if a newly deployed site has a problem with one of the TX antennas, for example:

- Feeders mistakenly swapped with another sector.
- Problem with one of the x-polarization branches.
- Feeder connector inadequately fastened (wrong torque applied?).

Compared to traditional methods of diagnosis, this feature can reduce troubleshooting turnaround time by several days.

In the case of carrier aggregation, the TX antenna difference is plotted for each carrier separately.

2.5.11. AICH Status Added to WCDMA RACH View

The AICH status parameter, indicating if and how transmitted **RACH preambles are acknowledged**, was added to the WCDMA RACH Analysis data view.

2.5.12. Individual Value Elements Selectable in Map Views

As an alternative to the RAT-independent value element families, a mechanism was added for selecting an **individual** value element for display in the **indoor and outdoor map** views.

2.5.13. Data Collection for iBwave Mobile Planner

From version 16.3 onward, TEMS Pocket can be harnessed as a data-collecting tool by **iBwave Mobile Planner**, an in-building network planning application. Mobile Planner can initiate a pinpointing session in TEMS Pocket, and in the process selected RF data (a subset of regular TEMS Pocket logfiles) is logged and reported back to Mobile Planner.

2.6. What Was New in TEMS Pocket 14.2

2.6.1. New Device: Sony Xperia Z2 D6503

The Xperia Z2 from Sony is the new **premier TEMS Pocket device**, the successor to both LT25i and LT30a. It is an LTE Category 4 phone spanning a generous set of E-UTRA bands.

- Frequency bands:
  - LTE 2100 (Band 1), 1900 (B2), 1800 (B3), AWS 1700/2100 (B4), 850 (B5), 2600 (B7), 900 (B8), 700c (B13), 700bc (B17), 800DD (B20)
  - WCDMA 850 (Band V), 900 (VIII), 1700 (IV), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
  - LTE EARFCN/PCI lock
  - WCDMA UARFCN/SC lock
  - GSM cell lock/multi-lock, cell prevention
  - Vocoder lock
  - Cell barred lock
  - WCDMA fast dormancy control

- Google Android 4.4
- WLAN 802.11a/b/g/n/ac
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974AB, quad-core, 2.3 GHz
- Dust and water protected (IP55 and IP58 rated)

2.6.2. New Device: Samsung Galaxy S5 SM-G900I

This is an international Samsung Galaxy S5 model, primarily intended for the Asian market.

Among its supported bands, the **APT band** (B28) is of particular interest as it has the potential to become an internationally accepted roaming band.

- Supported bands:
  - LTE 2100 (Band 1), 900 (B2), 1800 (B3), 850 (B5), 2600 (B7), 900 (B8), 700 (B28), TDD 2300 (B40)
  - WCDMA 850 (Band V), 900 (VIII), 1900 (II), 2100 (I)
  - GSM 850, 900, 1800, 1900
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
- Google Android 4.4
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974AC, quad-core, 2.4 GHz
- Dust and water protected (IP67 rated)

2.6.3. New Device: Samsung Galaxy Note 3 SM-N900T

This is T-Mobile's Galaxy Note 3 phone. It is **VoLTE**-capable and calculates **POLQA**.

- Supported bands:
  - LTE 700 (Band 17), AWS 1700/2100 (B4)
  - WCDMA 850 (Band V), AWS 1700/2100 (IV), 1900 (II), 2100 (I)
  - GSM 850/900/1800/1900 MHz
- Throughput capabilities:
  - LTE Category 4 (150/50 Mbit/s)
  - HSDPA Category 24 (42 Mbit/s), HSUPA Category 6 (5.8 Mbit/s)
  - GPRS/EDGE Class 12
- Real-time control capabilities:
  - RAT lock (LTE, WCDMA, GSM)
  - Band lock (LTE, WCDMA, GSM)
- Google Android 4.4
- WLAN 802.11a/b/g/n/ac (2.4 and 5 GHz)
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974AB, quad-core, 2.3 GHz

2.6.4. New Device: LG G2 VS980

This phone is an LTE/CDMA device employed by Verizon and supporting **VoLTE** and **POLQA**.

- Supported bands:[1]
  - LTE 700 (Band 13), AWS 1700/2100 (B4)
  - CDMA 800 (BC0), 1900 (BC14)
- Throughput capabilities:
  - LTE Category 3 (100/50 Mbit/s)

1. WCDMA and GSM also supported by the phone when in Global mode, but not supported in TEMS Pocket.

  - EV-DO Rel. 0, Rev. A
  - CDMA 2000, cdmaOne, 1xRTT
- Google Android 4.4.2
- WLAN 802.11a/b/g/n
- Integrated GPS with A-GPS support
- Chipset/CPU: Qualcomm MSM8974, quad-core, 2.3 GHz

2.6.5. PCTel SeeGull IBflex for In-building Scanning

TEMS Pocket 14.2 was the first TEMS Pocket release with **PCTel SeeGull scanner** connectivity. The model supported is the **IBflex** scanner, which is specifically designed to ease and speed up indoor walkaround testing, being small and lightweight and equipped with a "hot swap" battery system. It is therefore an ideal scanning device to deploy in tandem with TEMS Pocket.

The IBflex scans all major cellular technologies; in TEMS Pocket 14.2 the following scanning methods are supported:

- LTE signal scan
- WCDMA CPICH scan
- CDMA PN scan, EV-DO PN scan
- RSSI scan on all the above technologies

The 14.2 release supported collection of IBflex scan data and recording it in logfiles. *Scan data presentation in the TEMS Pocket user interface was added in version 14.3; see section 2.5.4.*

2.6.6. New Mechanism for Controlling Data Session Length

Data service testing may be done in "burst" mode, where data transfer rates are simply measured for periods of predetermined length, without the requirement of completing any particular task. When calculating KPIs in such a scenario, we obviously do not want to trigger a failure just because the allotted transfer time expired. A new action setting "**End session after…**" was therefore added in TEMS Pocket 14.2 alongside the existing "Maximum duration":

- The "End session after" setting relates strictly to the data transfer. When this time expires, the action ends with **success**.

- The “Maximum duration” setting relates to the action as a whole (including preguard and session setup). If this duration expires, the action ends and counts as a **failure**. Note that this behavior is not configurable, unlike the situation in preceding releases.

Both of these timers are optional. “End session after” is available in FTP, HTTP, and streaming actions.

2.6.7. Other New Features

- Support was introduced for TEMS Pocket Lite on **Wi-Fi only devices**. This can be useful for running a controller on a separate low-cost tablet or when testing on Wi-Fi is the objective.
- The controller/agent configuration was expanded to accommodate up to **seven agents**.

2.6.8. Withdrawal of Sony Xperia LT25i, LT30a

Being replaced by the new Z2 D6503 phone, the older Xperia models LT25i and LT30a were withdrawn as supplied TEMS Pocket devices. However, the **LT25i with external antenna** was still available for purchase in TEMS Pocket 14.2 *(and remains so in TEMS Pocket 15.1)*. Previously sold LT30a units can be upgraded to TEMS Pocket 15.1, and the LT30a is therefore kept in the present manual.

2.7. What Was New in TEMS Pocket 14.1

- WCDMA CPICH scanning with DRT4311B scanner
- New action for logfile recording start/stop at any point in a script
- Custom logfile naming with file name prefixes

2.8. What Was New in TEMS Pocket 14.0

- New device: Samsung Galaxy S4 GT-I9506
- Presentation of SIP messages
- New license handling with Global License Server
- LTE “EARFCN/PCI Lock” control function
- WCDMA “UARFCN Lock” and “Disable Handover” control functions

- Refined call event handling; CS fallback events
- Improved data view navigation

3. Product Packages and Licensing

3.1. TEMS Pocket 15.1 Product Packages

TEMS Pocket 15.1 is available in a variety of packages:

- The **Professional** package encompasses the full set of product features, and it is the package covered in this User's Manual.
- The **Standard** package does not include logfile recording or indoor pinpointing, nor can it be combined with the scanning options. In other respects, the Standard package is identical with Professional.
- The **Remote** package converts TEMS Pocket into an autonomous probe, which is controlled by FleetManager. See chapter 24.

3.2. TEMS Pocket Lite

TEMS Pocket also exists in a variety called **TEMS Pocket Lite**. TEMS Pocket Lite differs from the regular TEMS Pocket in that it collects less detailed measurements: specifically, basic RF and data measurements available from the smartphone operating system (Android). On the other hand, TEMS Pocket Lite can be installed on any Ascom-approved and tested Android device.

TEMS Pocket Lite is covered in a separate User's Manual; please refer to this document for further information on TEMS Pocket Lite.

3.3. TEMS Pocket Devices

TEMS Pocket is usually purchased along with the device on which it is going to run, and the device is then delivered with the TEMS Pocket application already installed. However, there are two cases where customers need to install TEMS Pocket software by themselves:

- When upgrading to a new TEMS Pocket version on the same device.

- When the customer supplies devices of their own, purchasing only TEMS Pocket software from Ascom.

In these situations, the customer must also install the product package license. A new device must also be registered in Ascom's licensing system, GLS. Details follow in subsequent sections of this chapter. (We are assuming here that you are going to perform these tasks yourself. Alternatively, they might be done for you by the GLS admin in your organization.)

3.4. Multi-device TEMS Pocket

Several TEMS Pocket devices can interact in a **multi-device configuration** where a **controller** device remote-controls the actions of a set of **agents**.

How to set up and operate a multi-device configuration is covered in chapter 25.

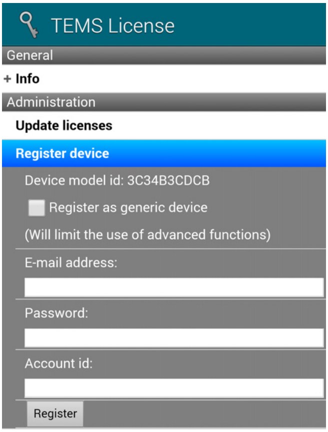
3.5. Registering Your TEMS Pocket Device

If you are using an Ascom-supplied device, you can skip this section.

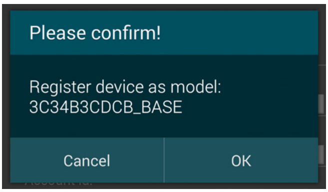
However, if you are using a device supplied by your organization, you first need to register the device with Ascom's licensing system, GLS.

Ascom will have sent a welcome email to the person in your organization named as email contact, containing a link to the GLS web interface. You need to obtain this email.

- Click the link provided in the welcome email. It will take you to a login page.
- Click the **Password Finder** link at the bottom of the page.
- Enter your email address and press **Submit**. You will now receive another email with a password for GLS.
- Now start the **TEMS License** app on the device.
- Under **Administration**, tap **Register device**.



- If you are going to run TEMS Pocket Lite on this device, check the option **Register as generic device**. Otherwise, leave this box unchecked.
- Enter your email address and the password you were just sent. **Note** that the email address must be in lowercase.
- If your organization has multiple customer accounts with Ascom, you also need to specify the correct **Account id**. If there is only one account, you can leave this field blank.
- Tap the **Register** button.
- Tap **OK** to confirm.



The device is now registered in GLS and is assigned a “Base” license (which does not in itself confer any rights to use TEMS Pocket functionality).

3.6. Licenses in TEMS Pocket

3.6.1. Product Package License

A TEMS Pocket device always needs to have a license for the product package installed; specifically, one of the following:

- Professional
- Standard
- Remote
- Lite (not capable of acting as controller)
- Lite capable of acting as controller

On TEMS Pocket devices supplied by Ascom, this license is preinstalled. However, if your organization supplied the device, you need to activate this license yourself. How to go about this is the topic of section 3.6.3.

3.6.2. Licenses for Specific Functions

A number of functions in TEMS Pocket require special license options on the device:

- **Audio quality measurement (AQM)** with **POLQA**. The following applies:
  - In the *one-way mobile-to-mobile* AQM setup (section 14.2.1.1), the calling TEMS Pocket device must have a POLQA license, but no license is required for the receiving device. However, if you want the devices to be able to switch roles, so that either device can originate the calls, then both devices must have a POLQA license.
  - In the *two-way mobile-to-mobile* AQM setup (section 14.2.1.2), both devices must have a POLQA license.
  - In the *mobile-to-fixed* AQM setup (section 14.2.1.3), the TEMS Pocket device must have a POLQA license, and the CallGenerator must have a POLQA and CS voice license.
- **Multi-device** configuration with controller and agents. More specifically, it is the controller device that requires the license option.
- **Scanning** of mobile networks using an external scanner. Separate options are provided for:
  - DRT scanner

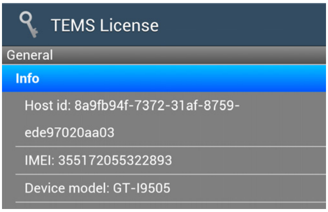
– PCTel scanner.

- Testing and logfile upload using a **secure connection** through **SSL**. The SSL license option is under embargo restrictions and can only be sold to certain countries.

Such license options are purchased separately, and you always need to activate them yourself on the TEMS Pocket device. See section 3.6.3.

3.6.3. Procedure for Activating Licenses

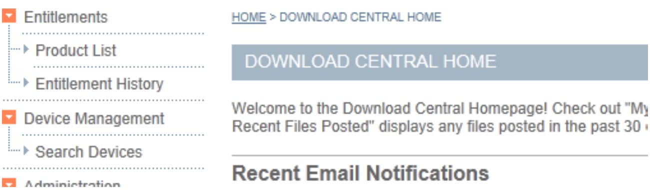
- Start the **TEMS License** app on the device.
- Under **Info**, look up the **Host id** in this app:



You now need to log in to Ascom's GLS web interface. It is preferable to do this on a PC.

- Click the link provided in the welcome email mentioned in section 3.5. It will take you to a login page.
- Enter your email address and GLS password (obtained as described in section 3.5). **Note** that the email address must be in lowercase.

You are taken to a page titled **Download Central Home**.



- On this web page, in the navigation column under **Device Management**, click **Search Devices**.
- In the list of devices, find the device ID that represents your TEMS Pocket device by entering the Host id from the TEMS License app in the **Device**

ID search field. It is usually sufficient to enter the last few digits of the string, preceded by a wild card, like this: “*1234”. Click the device ID link once you have located it.

At the bottom of the **View Device** screen, all license options (“add-ons”) that are pre-installed by Ascom on your device are listed.

- To activate any license options that are *not* pre-installed on your device, you need to *map* the corresponding add-ons to it. Click the **Map Add-Ons** link beneath the list of installed options.

TEMS Pocket Local option
TEMS Pocket logfile write option

Map Add-Ons   Remove Add-Ons   Download Capability Response   View History

The **Map Add-Ons** screen appears, displaying an overview of the pool of TEMS Pocket add-ons at your organization’s disposal. However, only add-ons that are applicable to the selected device are listed. For reasons of space, only selected columns of the table are shown below.

Add-On Name	Acti	Available Units in Line Item	Total Units in Line Item	Maximum Add-On Units Allowed on Device	Units to Configure
TEMS Pocket Controller Option	A6C 505	9	10	1	
TEMS Pocket DRT Option	A1B 7BA	9	10	1	
TEMS Pocket SSL Option	23F 829	7	10	1	
TEMS Pocket POLQA Option for Sony Lt25i	D93 4B0	8	10	1	
TEMS Investigation SW Option Sony Xperia V LT25i	290 36F	8	10	1	

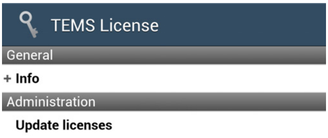
Map Add-Ons

The **Available Units in Line Item** column shows the number of licenses currently available, out of the total purchased, which is given in the **Total Units in Line Item** column.

The **Maximum Add-On Units Allowed on Device** column tells how many license options of a given type can be activated simultaneously on the same device. This number is one for all TEMS Pocket add-ons.

What you need to do here is to map the add-ons you have purchased.

- For each add-on, enter a “1” in the **Units to Configure** column. Then click the **Map Add-Ons** button. The status of each add-on changes to “License not generated”.
- When you are done mapping add-ons, return to the TEMS License app and tap the **Update licenses** item there.



The status of the add-ons in the GLS web interface will now change to “License generated”, and the TEMS License app will display all the licenses that are now installed on the device.

You are now ready to start using TEMS Pocket with all features you have a license for.

3.6.3.1. Alternative Activation Procedure

There is an alternative way to activate license options.

In the GLS web interface, on the **Map Add-Ons** screen, the **Activation Code** column holds an alphanumeric string for each add-on:

Add-On Name	Activation Code	Order	Expiration
TEMS Pocket Controller Option	A6C1-63D1-51D5-5051	(95670661)	Permanent
TEMS Pocket DRT Option	A1BB-C9C2-84E6-7BA7	(95670661)	Permanent

You can activate a license option by noting down this code, entering it in the TEMS License app under **Enter activation code**, and then tapping **Update licenses**. This may be useful if on some occasion you need to activate a license option when unable to access the GLS web interface.

3.7. Deactivating/Returning Licenses

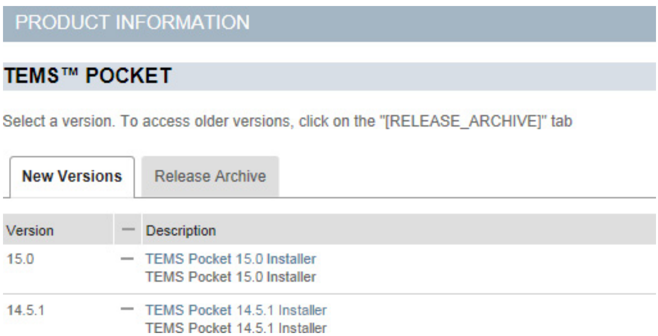
To uninstall a TEMS Pocket license from your device and return it to the pool of available licenses, proceed as in section 3.6.3, but on the **View Device** screen, click the **Remove Add-Ons** link instead. The table from the **Map**

Add-Ons screen reappears here, and you can remove licenses selectively as desired.

3.8. Downloading TEMS Pocket Software

Ascom-supplied TEMS Pocket devices are delivered with TEMS Pocket software already installed. However, if this software is uninstalled for some reason, or you are using devices of your own, then you need to download the software from the GLS web interface. This is done as follows.

- Log in to the GLS web interface as described in section 3.6.3.
- In the navigation column under **Entitlements**, click **Product List**.
- In the list of products, click **TEMS Pocket**.
- On the **Product Information** screen, click the TEMS Pocket installer you want to download.



- On the **Product Download** screen, click the download link for the TEMS Pocket installer. A ZIP archive is now downloaded.
- Install the TEMS Pocket software on your mobile device.

3.9. License File on Sony Phones

This section is unrelated to the license options and GLS user interface discussed in sections 3.6–3.7 and applies to the Sony Xperia phones only.

On Sony Xperia phones, a TEMS Pocket license file resides on the internal memory card. The file is named TEMS_v1.lic and stored in the root.

For other devices, the internal memory card is unrelated to license handling.

4. Overview of TEMS Pocket

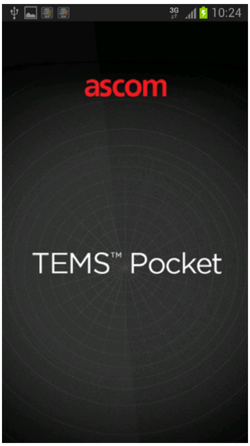
4.1. Prerequisites for Running TEMS Pocket

4.1.1. SIM/CSIM Card

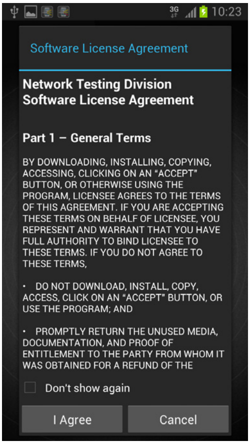
For all TEMS Pocket functions except Wi-Fi scanning and data transfer, the TEMS Pocket device must have a SIM or CSIM card installed. The application will start up even if no SIM/CSIM card is present, and some data (for example, on detected network cells) may appear in the user interface, but of course no mobile network related services can be used in this situation.

4.2. Launching the TEMS Pocket Application

- Launch TEMS Pocket by tapping the TEMS Pocket icon in the device’s application launcher.

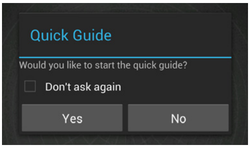


This screen appears while TEMS Pocket is starting up.



The text of the Ascom Network Testing software license agreement then appears.

- Tap the **I Agree** button to continue.



You are asked whether you want to view the TEMS Pocket Quick Guide. This is a brief tutorial on the most important functions of TEMS Pocket.

The Quick Guide can always be accessed from the **Help** menu; see section 4.5.

4.2.1. Autostart of TEMS Pocket

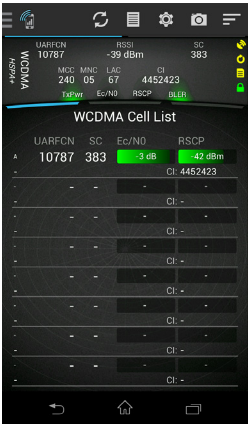
TEMS Pocket can be configured to launch automatically after the device has started up. How to do this is described in section 21.1.1.

4.2.2. Notes on TEMS Pocket Start-up Behavior

When starting up, TEMS Pocket will adjust various settings on the device as needed to enable adequate execution of its supported tasks. This includes resetting the RAT lock and all other control functions in order to put the device in a known state.

4.3. TEMS Pocket User Interface

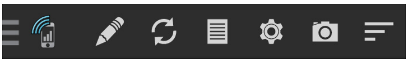
4.3.1. Initial View



Once TEMS Pocket has initialized, it will display the cell list data view for the radio access technology the device is connected to.

Everything about the data views is covered in chapter 5.

4.3.2. Action Bar



At the top of the screen, immediately below the Android status bar, is an **action bar** with a number of buttons. The set of buttons that appears is in part context-dependent.

Each of these buttons has a single function or pair of functions:

 **Navigation** button: Open a menu of data view categories.

 **Filemark** button: *(Visible during recording)* Add a filemark to the logfile.

 **Script** button: Start a script, or stop the script that is running.

 **Logfile Recording** button: Start and stop logfile recording manually.

 **Settings** button: Inspect and edit TEMS Pocket settings.

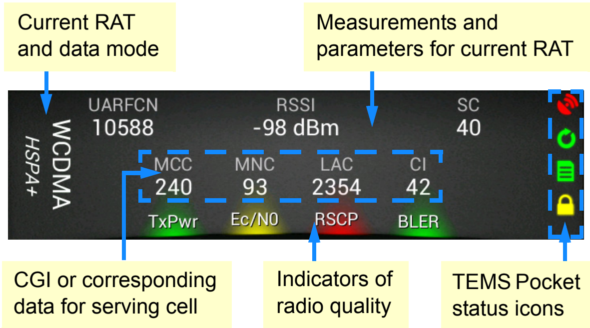
 **Screenshot** button: Take screenshots of data views.

 **Menu** button: Opens a drop-down menu that gives access to a variety of commands and settings, as well as to this user manual.

The use of the buttons is covered in all of the appropriate contexts throughout this manual.

4.3.3. Data View Header

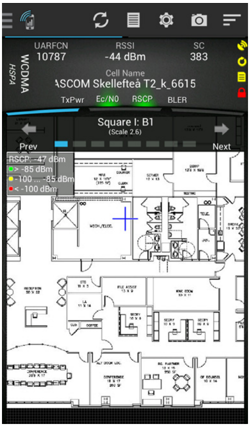
In the topmost part of the data view is always shown a set of general data related to the cellular technology currently in use, as well as a column of icons reflecting the current status of TEMS Pocket.



Regarding the status icons, see also section 5.5.2.

The indicators and symbols at the very top of the screen are the same as in the commercial device, except that the TEMS Pocket status icons will also sometimes appear there (as described in section 5.5.2).

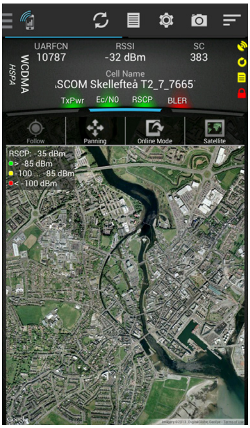
4.3.4. Indoor Map: Positioning by Pinpointing



Indoor Map view

In an indoor environment or other location without GPS coverage, you can use the Indoor Map view (see chapter 7) to pinpoint your test route. You load a floor plan or other image of your testing area into the Indoor Map view, then indicate your route by marking waypoints on that map. The map image can also be assigned a geographical position.

4.3.5. Outdoor Map View



Outdoor Map view

When testing in locations with GPS coverage, the Outdoor Map view (see chapter 8) can be used to display measurements, events and cell sites. This view allows you to easily locate network trouble spots and visualize network performance geographically.

4.3.6. Scripts

TEMS Pocket offers the use of *scripts* for automated testing of various services. See chapter 9.

4.3.7. Events

When you run a script in TEMS Pocket, *events* are generated pertaining to radio (Layer 3 signaling), device operation, script progress, and more. See section 5.14.1 and chapter 6.

4.3.8. Logfiles

You can record data collected by TEMS Pocket in *logfiles* and replay these files in TEMS Pocket itself or load them in TEMS Investigation or TEMS Discovery Device. See chapter 10.

4.3.9. Cell Files

You can import a *cell file* into TEMS Pocket in order to display cells by name (rather than by CGI) in data views as well as in the Outdoor Map view. See chapter 12.

4.3.10. Control Functions

TEMS Pocket has a number of *control functions* modifying the device’s behavior in the cellular network. These include locking the device to a RAT, band, cell, or channel. What control functions are supported depends on the device. See chapter 13 for full details.

4.3.11. GPS Positioning

TEMS Pocket supports positioning of data in logfiles using either the device’s built-in GPS or an external GPS. See chapter 20.

4.3.12. Tablet User Interface

TEMS Pocket as implemented on tablets has the same functionality (in general terms) as the mobile phone based TEMS Pocket applications. However, to make good use of the larger screen, the tablet user interface is organized differently in some respects. Please turn to chapter 23 for details.

4.4. TEMS Pocket File Storage Locations

Please note that the file system referred to in this section cannot be browsed through the TEMS Pocket user interface (nor from the device's standard user interface; a third-party Android app is required). Naturally you can always view the directory structure by connecting the device to a PC.

4.4.1. Logfiles

TEMS Pocket logfiles can be stored either on the internal memory card of the device (called "/phone" below; the designation varies between vendors) or on an external memory card, if the device has one inserted. The choice is made in the **Settings** menu; see section 21.2.1.

Internal storage locations are as follows.

- TEMS Pocket Professional, regular Local work mode: /phone/pocket/logfiles/ (*.pcap files with IP capture data are also stored here)
- Remote: /phone/pocket/logfiles/remote
- Agent: /phone/pocket/logfiles/

The path to an external memory card is likewise vendor-dependent; here are some examples:

- Samsung Galaxy S4 GT-I9506: /mnt/extSdCard
- Sony Xperia T LT30a: /ext_card

The same directory structure (/pocket with subdirectories) is created on an external memory card. However, on Android 4.4 devices the path is different; see below.

Remarks on Devices Running Android 4.4 or Later

On devices running Android 4.4 or later, if logfiles are stored in external storage, they are put in a directory Android/data/com.ascom.pocket/pocket. The subdirectories are the same.

> **Note:** If TEMS Pocket is uninstalled, the above folder will be automatically removed. When storing logfiles in external storage on a device running Android 4.4 or some later version, be sure to copy all logfiles before running the TEMS Pocket installer.

4.4.2. Other Files

Other TEMS Pocket related files are always stored on the internal memory card, in the following locations:

- **Cell files:** /phone/pocket/private/cellfiles/
- **Custom views:** /phone/pocket/views/ (files named view_<n>.custom, where <n> = 01, 02, ...)
- **Email attachments:** /phone/pocket/private/attachments/
- **Exported settings:** /phone/pocket/exportsettings/ (*.pes; *.pocket)
- **Indoor map sets:** /phone/pocket/private/mapsets/ (*.ibwc)
  - In Agent work mode, map sets are stored in /phone/pocket/private/mapsets/agents
- **Logfile prefix type definitions file:** /phone/pocket/private/ (*.cfg)
- **Routes:** /phone/pocket/private/waypoints/
- **Screenshots:** /phone/pocket/screenshots/ (when saved separately and not in a logfile)
- **Scripts:** /phone/pocket/private/scripts/
- **Speech files:** /phone/odm/polqa/saved/ (speech recordings scoring beneath a MOS threshold)
- **SSL certificates:** /phone/pocket/private/certificates/

4.4.3. Device-specific Remarks

- On Sony Xperia LT25i and LT30a, the built-in media scanning in Android is not triggered automatically when the phone is connected to a PC via USB. This means that a reboot of the device might be necessary before files created by TEMS Pocket (logfiles, map sets, etc.) become visible in the PC’s file explorer. As a workaround, to avoid restarting the phone, you can use third-party apps on Google Play to update the available media.

4.5. Accessing User Documentation and Other Product Information

To open the present document in HTML format in the device’s web browser:

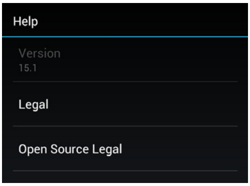
Tap the Menu button, and under **Other** select **User Manual**.

To open the Quick Guide to TEMS Pocket:

Tap the Menu button, and under **Other** select **Quick Guide**.

TEMS Pocket also has a Help menu containing some further information about the product:

Tap the Menu button, and under **Other** select **Help**.



Version: TEMS Pocket version, e.g. “15.1”.

Legal: Provides a link to the text of the TEMS Pocket software license agreement.

Open Source Legal: Provides a link to license agreements for open-source software components used in TEMS Pocket.

4.6. Language Support

The TEMS Pocket 15.1 devices support languages as follows:

- Regular device user interface: Same as in the commercial device release.
- TEMS Pocket user interface
  - Text display: English
  - User input: English

> **Note:** There is no support for inputting non-ASCII characters. When entering text strings, only use characters from the ASCII set.

4.7. General Advice on Using TEMS Pocket

See also Ascom’s statement on mobile test probes in appendix A.

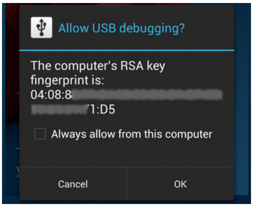
4.7.1. Configuring Device Settings

The names of options and their positions in the menu system may vary between Android versions; representative examples are given below.

- For the device’s internal GPS to be available to TEMS Pocket, it must be enabled in the device: **Settings** → **More** → **Location services** → **Use**

GPS satellites. This setting does not have any bearing on an external GPS.

- If the device is to connect to an external scanner via Bluetooth, the Bluetooth function must be activated in the device: **Settings** → **Connections** → **Bluetooth**.
- Make sure that data traffic is enabled: Under **Settings** → **Connections** → **More networks** → **Mobile networks**, the **Mobile data** checkbox must be checked.
- You may need to enable data roaming. This is done under **Settings** → **Connections** → **More networks** → **Mobile networks**, by checking the **Data roaming** checkbox.
- When you connect a TEMS Pocket device running Android 4.2.2 or later to the PC, a dialog titled “Allow USB debugging?” will pop up on the device screen. Check the box **Always allow from this computer**, and tap OK.



4.7.2. Keeping TEMS Pocket in the Foreground

TEMS Pocket may be terminated by Android’s built-in Out of Memory Manager if moved to the background. This is more frequent on devices with a small amount of RAM, but may occur on any device. To avoid this it is recommended always to keep TEMS Pocket in the foreground when measuring.

4.7.3. Battery Charging Considerations

Running several tasks in parallel on a TEMS Pocket device places a heavy load on the device battery. It may in fact happen that the battery charger cannot keep up with the power consumption, so that the battery eventually will be drained even if the charger is connected all the time. This situation may arise for example if the device is more or less constantly running one service or another while at the same time having its display fully lit.

When engaging the device in highly power-consuming tasks, you should always use the regular charger supplied with the device. Charging the device via the USB cable will often be vastly insufficient when running TEMS Pocket.

4.7.4. TEMS Pocket vs. TEMS Investigation

When a device possesses licenses for both TEMS Pocket and TEMS Investigation, the two applications cannot coexist on the device. This means that:

- If the TEMS Pocket device is connected to a PC and you start TEMS Investigation on that PC, the TEMS Pocket application will shut down.
- If you connect your TEMS Pocket device to a PC where TEMS Investigation is running, you cannot start the TEMS Pocket application.

4.8. Exiting TEMS Pocket

You exit the TEMS Pocket application by tapping the Menu button, scrolling down to the **Other** section, and choosing **Exit**.

5. Data Views

5.1. General Data View Properties

The presentation in data views combines **textual** and **graphical** elements. The **colors** used in the latter and what value ranges they represent are customizable: see section 5.16.

Many data views in TEMS Pocket are **RAT-specific**; there exist, for example, separate cell list data views for each supported RAT. Which views can appear is of course dependent on the range of technologies supported by the device; which view is shown at a given instant is governed by the RAT the device is currently using. The switching between views is automatic.

Whenever a parameter is currently **not valid**, this is indicated in the data view by a dash “–”.

In all graphs containing a **legend**, you can tap anywhere in the graph to hide the legend. Tap once more to make the legend visible again. When you swipe to a graph view, the legend is always visible, even if you have previously hidden it.

5.2. The Screenshot Capture Function

You can take screenshots of the data views using the built-in screen capture function. Whenever you use this function, snapshots are taken of *all* data views as well as the currently shown data view header.

Tap the Screenshot button on the action bar *twice* in rapid succession. After the first tap, the button turns blue; after the second tap, the device vibrates briefly, and the screenshots are taken.

Screenshots are transparent, that is, they do not include the on-screen “spider web” background. This is in order to minimize the size of the image files.

Screenshot image files are named according to the pattern yyyy-mm-dd_hh.mm.ss_<data view category><sequence no.>_screenshot.png, for example 2014-08-16_17.55.32_Data1_screenshot.png.

If you take screenshots while a logfile is being recorded, you can opt to save the screenshots in the logfile (*.trp) along with its other contents. You are asked on each occasion whether to do that or save the images in the screenshot folder (see section 4.4.2).

5.3. Other Data View Actions

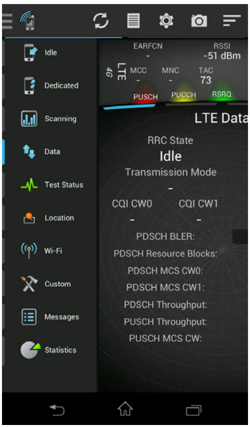
In some data views you can perform an action relating to a piece of data shown in the view. For example, in data views listing cells, you can lock on one of the cells.

Specifics on data view actions are found in the relevant sections of chapter 5.

5.4. Survey of Data Views

The data views are divided into the categories found in the **navigation menu**. To expose this menu:

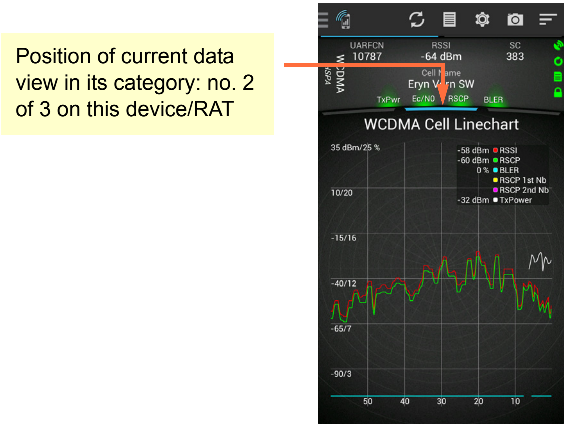
Tap the Navigation button on the action bar. (Alternatively, you can tap the Back button instead.)



The indicator along the left-hand edge of the navigation menu shows what category the currently visible view belongs to.

- Select an item from the navigation menu to go to that data view category. The data view displayed will be the one last shown in that category. If the category has not been visited before, the first view in it will be shown.
- To hide the navigation menu without making a selection, tap the Navigation or Back button once more, or tap in the data view. (Other gestures in data views are disabled while the navigation menu is being shown.)

On entering a data view, you can browse the data views within the same category by swiping left and right. The array of indicators along the top edge of the data view show the position of the current view in the category, counting only views that belong to the cellular technology the device is currently using. There is no wraparound when browsing through data views in a category.



The list that follows covers all TEMS Pocket 15.1 data views that exist; please note that TEMS Pocket devices usually do not display all of these, since they do not support all of the technologies involved. Refer to section 5.4.1 for details.

Furthermore, at any given time, only data views pertaining to the current RAT make an appearance in the user interface. A data view associated with a TEMS Pocket feature that is optional and/or supported only on a subset of devices (e.g. AQM) appears only if the feature is available.

Data View Name	Displayed Contents	Ref.
Idle category		
GSM Cell List	ARFCN, BSIC, RxLev, C1, and C2 for GSM serving cell and neighbors.	5.6.1
GSM Cell Line Chart	RxLev and RxQual for serving cell; RxLev for two strongest neighbors; device TxPower.	5.6.2
WCDMA Cell List	UARFCN, scrambling code, E_c/N_0, and RSCP for WCDMA serving cell/active set and neighbors.	5.6.3

Data View Name	Displayed Contents	Ref.
WCDMA Cell Line Chart	UTRA Carrier RSSI; RSCP for serving cell; BLER; RSCP for two strongest neighbors; device TxPower.	5.6.4
LTE Cell List	EARFCN, PCI, RSRP, and RSRQ for LTE serving cell and neighbors.	5.6.5
LTE Cell Line Chart	E-UTRA Carrier RSSI; RSRP and CINR for serving cell; RSRP for two strongest neighbors; device PUSCH TxPower.	5.6.6
LTE Cell Configuration	E-UTRA band, MME, and Physical Cell parameters for LTE serving cell; TDD parameters.	5.6.7
CDMA Cell List	RF channel number, PN offset, E_c/I_0, and E_c for CDMA (1x) active, candidate, and neighbor sets.	5.6.8
EV-DO Cell List	RF channel number, PN offset, E_c/I_0, and E_c for EV-DO active, candidate, and neighbor sets.	5.6.9
Dedicated category		
GSM Dedicated Mode	GSM dedicated mode radio parameters.	5.7.1
GSM RACH Analysis	Parameters and data related to RACH signaling in GSM.	5.7.2
WCDMA Dedicated Mode	WCDMA dedicated (connected) mode radio parameters.	5.7.3
WCDMA RACH Analysis	Parameters and data related to RACH signaling in WCDMA.	5.7.4
LTE Dedicated Mode	LTE dedicated mode radio parameters.	5.7.5
LTE RACH Analysis	Parameters and data related to RACH signaling in LTE.	5.7.6

Data View Name	Displayed Contents	Ref.
eNB TX Antenna Difference	LTE eNB Tx1–Tx2 transmit power difference: per carrier in case of carrier aggregation.	5.7.7
CDMA Perform	CDMA (1x) active mode radio parameters.	5.7.8
EV-DO Perform	EV-DO active mode radio parameters.	5.7.9
Scanning category *(shown only if a scanning license is present)*		
Scanning Status	Status of external scanner; progress of scripted scanning.	5.8.2
LTE scan views	LTE scan data: one view for each detected EARFCN, showing RSRP, RSSI, RSRQ, and CINR.	5.8.3
WCDMA scan views	WCDMA scan data: one view for each detected UARFCN, showing E_c/N_0, RSCP, SIR, and delay spread.	5.8.4
GSM scan views	GSM scan data: one view for each band where at least one ARFCN is detected, showing BSIC, RxLev, and C/I for each ARFCN.	5.8.5
CDMA scan views	CDMA scan data: one view for each detected RF channel, showing E_c, E_c/I_0, aggregate E_c/I_0, and delay spread for found cells.	5.8.6
EV-DO scan views	EV-DO scan data: one view for each detected RF channel, showing E_c, E_c/I_0, aggregate E_c/I_0, and delay spread for found cells.	5.8.7
Data category		
GPRS/EDGE Data	Parameters and data related to GPRS/ EDGE.	5.9.1

Data View Name	Displayed Contents	Ref.
GPRS/EDGE RLC Throughput	RLC/MAC throughput charts for GPRS/EDGE.	5.9.2
HSPA Data	Parameters and data related to HSPA.	5.9.3
HSPA RLC Throughput	RLC throughput charts for HSPA.	5.9.4
HSDPA Modulation/ Packet Data Performance	HSDPA modulation scheme usage; MAC-HS uplink/downlink throughput; downlink TB size; downlink BLER.	5.9.5
LTE Data	Parameters and data related to LTE data transfer.	5.9.6
LTE PHY Throughput	Physical layer throughput charts for LTE.	5.9.7
PDP Context Information	Information on current PDP contexts.	5.9.8
RLP Throughput	RLP throughput charts for EV-DO.	5.9.9
Test Status category		
Script Progress	General progress of a script that is being executed.	5.10.1
AQM Progress	Progress of scripted AQM testing.	5.10.2
Call Sequence Progress	Progress of scripted voice call sequence.	5.10.3
Email Progress	Progress of scripted email testing.	5.10.4
FTP Progress	Progress of scripted FTP testing (download or upload).	5.10.5
HTTP DL Progress	Progress of scripted HTTP Get.	5.10.6
HTTP UL Progress	Progress of scripted HTTP Post.	5.10.7

Data View Name	Displayed Contents	Ref.
Logfile Upload Progress	Progress of scripted logfile upload.	5.10.8
Ping Progress	Progress of scripted Ping testing.	5.10.9
SMS Progress	Progress of scripted SMS testing.	5.10.10
Voice Progress	Progress of scripted voice testing.	5.10.11
YouTube Progress	Progress of scripted YouTube testing.	5.10.12
Location category		
Indoor Map	See chapter 7.	
Outdoor Map	See chapter 8.	
GPS	GPS positioning data.	5.11.3
Wi-Fi category		
Wi-Fi	Wi-Fi states; signal strength and bandwidth of Wi-Fi networks detected.	5.12.1
Wi-Fi Cell List	Strongest Wi-Fi access points detected.	5.12.2
Custom category		
(Five empty placeholders)	User-customized views.	5.13
Messages category		
Events	Listing of events generated in TEMS Pocket.	5.14.1
Layer 3 Messages	Listing of transmitted and received Layer 3 messages.	5.14.2
SIP Messages	Listing of transmitted and received SIP messages.	5.14.3

Data View Name	Displayed Contents	Ref.
Statistics category		
Service Sessions	Statistics on the outcome of service sessions.	5.15.1
RAT Usage	Statistics on device RAT usage.	5.15.2
Cell Usage	Statistics on device cell usage for each RAT.	5.15.3

5.4.1. Data View Support in Devices

- LTE data views are shown on all devices.
- GSM and WCDMA views appear on devices supporting UMTS.
- CDMA and EV-DO views appear on devices supporting CDMA.
- Scanning views are supported by all devices and are visible when a scanning license is present.
- Test Status views are shown on all devices insofar as they support the services.
- Other views are shown on all devices.

5.5. Data View Header

The topmost part of the view always shows a selection of data related to the cellular technology and data bearer currently in use. When the device switches to a different technology, the header is replaced automatically.

In addition to the predefined data view headers, described in sections 5.5.1–5.5.7, you can optionally assemble custom headers, one for each technology. The latter are the topic of section 5.5.8.

5.5.1. Indication of RAT and Data Mode

The leftmost part of the header displays two strings. On the right, in upright (non-italic) type, is a RAT indicator showing what radio access technology the device is currently using. On the left, written smaller and in italics, is shown the current data mode, meaning the type of bearer being used for data transfer. The latter can be either a mobile network bearer or Wi-Fi.

Here is the full list of RAT and data mode designations that can appear:

5.5.1.1. RATs

- GSM, WCDMA, LTE, CDMA+EV-DO

5.5.1.2. Data Modes

Note that this data mode indication is much more fine-grained than the one given on the Android status bar.

- GSM data modes:
  - *2G* (shown when neither of the modes below is active)
  - *GPRS*
  - *EDGE*
- WCDMA data modes:
  - *3G* (shown when none of the modes below is active)
  - *HSPA*
  - *HSPA DC* (dual carrier)
  - *HSPA+*
  - *HSPA+ MIMO*
  - *HSPA+ DC*
  - *HSPA+ DC MIMO*
- LTE data modes:
  - *4G*
  - *4G CA* (carrier aggregation)
- CDMA/EV-DO data modes:
  - *1X* (1xRTT)
  - *3G* (all 1xEV-DO varieties)
- Wi-Fi data modes:
  - *Wi-Fi* (shown whenever Wi-Fi is active as data bearer)

5.5.2. Status Icons

A column of icons appears on the far right in the data view header. These icons give a quick overview of:

- script execution
- GPS status
- logfile recording
- control functions applied.

Generally speaking, the icons give an indication of *what last happened*. They do not provide comprehensive information but should be seen as a complement to the data views.

Script Icon

Symbol	Meaning
green	A script is running, and the last action completed normally.
red	A script is running, but the last action failed.
yellow	No script is running.

GPS Icon

Symbol	Meaning
green	The GPS selected for use with TEMS Pocket (internal or external) is delivering valid coordinates.
red	The GPS selected for use with TEMS Pocket is currently not delivering valid coordinates.
yellow	No GPS selected for use with TEMS Pocket.

Logfile Recording Icon

Symbol	Meaning
green	Logfile recording is in progress and proceeding normally.
red	Logfile recording is in progress, but the free space on the internal memory card is running low (< 20 MB left).
yellow	No logfile being recorded.

Control Icon

This icon appears only on devices where TEMS Pocket offers control functions.

Symbol	Meaning
green	The control function last invoked was successfully applied, and at least one control function is currently in effect.
red	The control function last invoked was not successfully applied. (Other control functions that were previously applied with success may still be in effect.)
yellow	No control functions currently in effect.

When no TEMS Pocket data view is being displayed, those icons that are red or green will instead appear on the status bar at the top of the screen. When you swipe down from the status bar, a drop-down notification (reading simply “TEMS Pocket”) appears for each icon.

5.5.3. Colored Indicators for Value Elements: General Properties

Each of the “colored light” indicators at the bottom of the header represents the quantity it is labeled with. The default color coding is tabulated in the sections that follow.

You can tap the row of indicators to toggle the labels for all of them so that they display the current values of the quantities instead. This mode of presentation persists if the device switches to a different RAT. Tapping the indicators once more causes the quantity names to reappear.

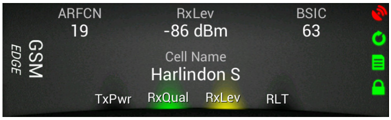
At start-up, the indicators always show the quantity names.

Labels showing quantity names

Labels showing current values

5.5.4. Built-in Data View Header for GSM

No cell file loaded



Cell file loaded

All data shown in the header pertains to the current serving cell.

- **ARFCN:** Absolute Radio Frequency Channel Number
- **RxLev:** Received Signal Level (dBm)
- **BSIC:** Base Station Identity Code

CGI data (shown if no cell file is loaded)

- **MCC:** Serving cell Mobile Country Code
- **MNC:** Serving cell Mobile Network Code
- **LAC:** Serving cell Location Area Code
- **CI:** Serving cell Cell Identity, 16 bits, decimal (= C-Id: ▸ 3GPP 25.401, section 6.1.5)

If a cell file is loaded, the CGI parameters are replaced by the cell name. You can then tap and hold this section of the screen (or, better, to the left or right of it to avoid obstructing the view) in order to display CGI instead. The presentation reverts to cell name once you release your finger.

You can change the display format for some of these parameters by long-pressing them; see section 21.3.

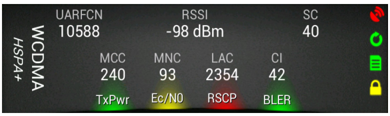
Indicators (see also color key below)

- **TxPwr:** UE Transmit Power
- **RxQual:** Received Signal Quality
- **RxLev:** Received Signal Level
- **RLT:** Radio Link Timeout, Current/Max ratio

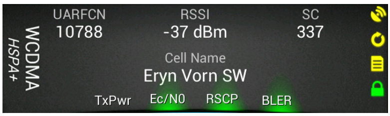
Indicator Color Key

Measurement	Red	Yellow	Green
TxPower (dBm)	20 ... 31	9 ... 20	0 ... 9
RxQual	5 ... 7	1 ... 4	0
RxLev (dBm)	–120 ... –95	–95 ... –75	–75 ... –10
RLT current/max (%)	0 ... 90	90 ... 100	100

5.5.5. Built-in Data View Header for WCDMA



No cell file loaded



Cell file loaded

All data shown in the header pertains to the current serving cell (idle mode) or the strongest cell from the primary carrier in the active set (connected mode). No cell from the secondary carrier in an HSPA dual carrier configuration ever appears in the header.

- **UARFCN:** UARFCN, UMTS Absolute Radio Frequency Channel Number
- **RSSI:** Received Signal Strength, equal to UTRA Carrier RSSI
- **SC:** Scrambling Code of serving cell (idle mode) or strongest active set member (connected mode). Regarding dual carrier, see above.

CGI data (shown if no cell file is loaded)

- **MCC:** Serving cell Mobile Country Code
- **MNC:** Serving cell Mobile Network Code
- **LAC:** Serving cell Location Area Code
- **CI:** Serving cell Cell Identity, 28 bits, decimal (= UC-Id: ▶ 3GPP 25.401, section 6.1.5)

If a cell file is loaded, the CGI parameters are replaced by the cell name. You can then tap and hold this section of the screen in order to display CGI instead. The presentation reverts to cell name once you release your finger.

You can change the display format for some of these parameters by long-pressing them; see section 21.3.

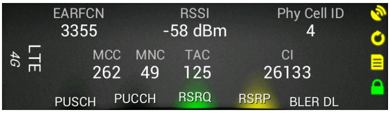
Indicators (see also color key below)

- **TxPwr:** UE Transmit Power
- **Ec/N0:** Carrier-to-noise ratio, E_c/N_0
- **RSCP:** Received Signal Code Power
- **BLER:** Block Error Rate in percent, average taken over all downlink transport channels (DCH only)

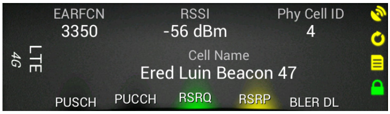
Indicator Color Key

Measurement	Red	Yellow	Green
TxPower (dBm)	10 ... 50	0 ... 10	–31 ... 0
E_c/N_0 (dB)	–34 ... –15	–15 ... –10	–10 ... 0
RSCP (dBm)	–140 ... –100	–100 ... –85	–85 ... –15
BLER (%)	50 ... 100	20 ... 50	0 ... 20

5.5.6. Built-in Data View Header for LTE



No cell file loaded



Cell file loaded

All data shown in the header pertains to the current serving cell.

- **EARFCN:** E-UTRA ARFCN (Absolute Radio Frequency Channel Number)
- **RSSI:** E-UTRA Carrier RSSI (Received Signal Strength Indicator)
- **Phy Cell ID:** Physical layer Cell Identity

CGI data (shown if no cell file is loaded)

- **MCC:** Serving cell Mobile Country Code
- **MNC:** Serving cell Mobile Network Code
- **TAC:** Serving cell Tracking Area Code
- **CI:** Serving cell E-UTRAN Cell Identifier, 28 bits, decimal: ▶ 3GPP 36.300, section 8.2

If a cell file is loaded, the CGI parameters are replaced by the cell name. You can then tap and hold this section of the screen in order to display CGI instead. The presentation reverts to cell name once you release your finger.

You can change the display format for some of these parameters by long-pressing them; see section 21.3.

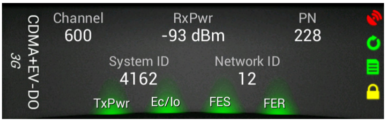
Indicators (see also color key below)

- **PUSCH:** PUSCH Tx Power
- **PUCCH:** PUCCH Tx Power
- **RSRQ:** Reference Signal Received Quality
- **RSRP:** Reference Signal Received Power
- **BLER DL:** Block Error Rate on PDSCH (Physical Downlink Shared Channel)

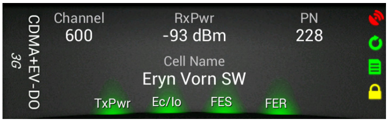
Indicator Color Key

Measurement	Red	Yellow	Green
PUSCH Tx Power (dBm)	15 ... 30	–10 ... 15	–30 ... –10
PUCCH Tx Power (dBm)	15 ... 30	–10 ... 15	–30 ... –10
RSRQ (dB)	–30 ... –24	–24 ... –9	–9 ... 0
RSRP (dBm)	–140 ... –100	–100 ... –70	–70 ... –40
BLER DL (%)	50 ... 100	20 ... 50	0 ... 20

5.5.7. Built-in Data View Header for CDMA/EV-DO



No cell file loaded



Cell file loaded

All data shown in the header pertains to the current active set.

- **Channel:** RF channel number
- **RxPwr:** Receive Power (dBm)
- **PN:** PN Offset of serving cell (idle mode) or strongest active set member (active mode)

SID and NID (shown if no cell file is loaded)

- **System ID:** System Identification (SID)
- **Network ID:** Network Identification (NID)

If a cell file is loaded, the SID and NID parameters are replaced by the cell name. You can then tap and hold this section of the screen in order to display SID/NID instead. The presentation reverts to cell name once you release your finger.

Indicators (see also color key below)

- **TxPwr:** Transmit Power
- **Ec/Io:** Signal-to-noise ratio for strongest active set member

- **FES:** Finger Energy Sum
- **FER:** Frame Erasure Rate (shown for CDMA); alternates with **PER:** Packet Error Rate (shown for EV-DO)

Indicator Color Key

Measurement	Red	Yellow	Green
TxPwr (dBm)	10 ... 36	0 ... 10	–63 ... 0
E_c/I_0 (dB)	–32 ... –24	–24 ... –9	–9 ... 0
FES (dB)	–64 ... –25	–25 ... –15	–15 ... 10
FER (%)	6 ... 100	2 ... 6	0 ... 2
PER (%)	6 ... 100	2 ... 6	0 ... 2

5.5.8. Custom Data View Headers

For each cellular technology, in addition to the built-in data view header, a customizable header is provided where you can display whatever data you like. Examples are preconfigured in the application.[1]

More precisely, the customizable space is that taken up by the technology-specific items in the built-in headers. The RAT and data mode indicators (section 5.5.1) and the status icons (section 5.5.2) remain unchanged in custom headers.

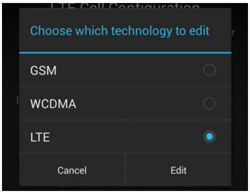
You edit custom headers in exactly the same way as custom *data views* (covered in section 5.13), except that the amount of screen real estate is smaller. Do as follows:

- Swipe left in the data view header.

The preconfigured header appears for the technology currently in use. This is shown by the thin blue line above the header switching from the left-hand to the right-hand position.

1. No example is preconfigured for CDMA/EV-DO.


To edit the header, tap the Menu button, and under **Create/Modify** select **Custom Top View**.



- Choose which technology for which you want to edit the custom header, and tap **Edit**.

(This choice is independent of which header is currently being displayed – that is, which technology the device is currently using.)

A grid of cells is now overlaid on the header as an editing aid.

- From this point onward, proceed according to the instructions in section 5.13.1 on editing custom data views. The value elements and types of graphical building blocks available in headers are exactly the same.

When you are done setting up the custom header:

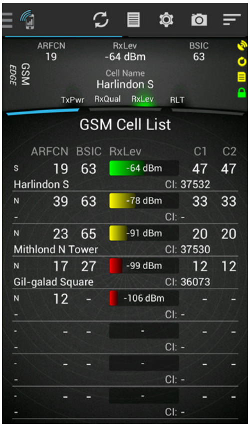

Tap the Menu button once more, and under **Create/Modify**, uncheck **Custom Top View**.

You can now scroll between the default and custom headers by swiping.

- Repeat the above steps for any other technologies for which you want to create a custom header.

5.6. "Idle" Data View Category

5.6.1. GSM Cell List Data View



For the header, see section 5.5.4.

The view displays the serving cell (always on top) and up to seven neighbors (in order of descending signal strength).

- **S:** Serving cell
- **N:** Neighbor cell.

ARFCN: ARFCN, Absolute Radio Frequency Channel Number.

BSIC: BSIC, Base Station Identity Code.

RxLev: Received Signal Level.

C1: Pathloss Criterion C1. ▶ 3GPP 45.008, section 6.4

C2: Cell Reselection Criterion C2. ▶ 3GPP 45.008, section 6.4

If a cell file is loaded, a string with the following information appears on a separate line below each line of cell data:

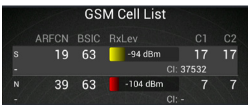
Cell name according to cell file.

CI: Cell identity according to cell file.

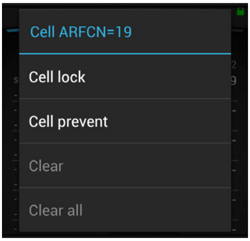
Data View Actions

You can do one of the following (not both at the same time):

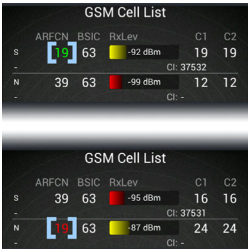
- *Lock* on one or several cells listed in this view. The device is then restricted to camping on these cells alone.
- *Prevent* one or several cells listed in this view. The device is then prevented from camping on these cells.



Tap and hold a cell to bring up a context menu with data view actions.



- Tap **Cell lock** to apply a lock to this cell.
- Tap **Cell prevent** to prevent use of this cell.

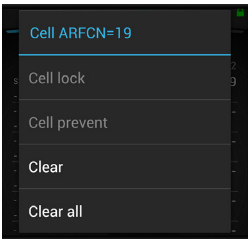


The ARFCN is highlighted in the list:

- in *green* if locked on (top);
- in *red* if prevented (bottom).

You can add more cells to the set locked on or prevented. Just tap and hold any cell in the list as shown above.

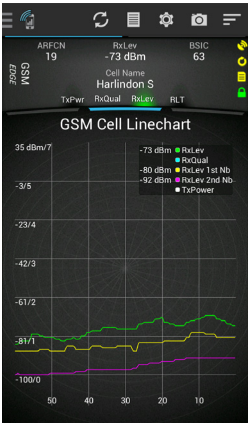
Any actions applied in this way are also immediately reflected in the control function settings, described in chapter 13.



- To undo a lock or prevent action, long-tap the relevant cell and choose **Clear**.
- To undo all lock or prevent actions at once, long-tap any cell in the list and choose **Clear all**.

If a cell that you locked on has disappeared from the GSM Cell List view, and you want to release that lock, you can always do this from the Control Functions menu as described in section 13.11.2.

5.6.2. GSM Cell Line Chart Data View



For the header, see section 5.5.4.

The chart shows the latest 60 seconds. Each label “<n>” on the x-axis means “*n* seconds ago”.

The y-axis has both dBm and RxQual unit scale marks.

RxLev: Received Signal Level of serving cell in dBm.

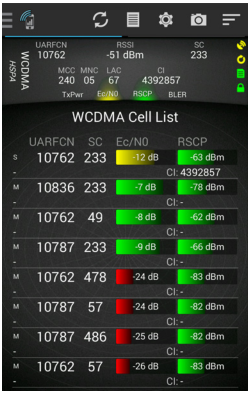
RxQual: Receive Bit Error Rate, RxQual, of serving cell; scale defined in ▶ 3GPP 45.008, section 8.2.

RxLev 1st Nb: RxLev of strongest neighbor (dBm).

RxLev 2nd Nb: RxLev of second strongest neighbor (dBm).

TxPower: UE Transmit Power (dBm).

5.6.3. WCDMA Cell List Data View



For the header, see section 5.5.5.

Up to eight cells are displayed, each belonging to one of the following categories:

- **S:** Serving cell (idle mode)
- **A:** Active set member (connected mode). In case of dual carrier HSPA, cells from both primary and secondary carriers appear here with equal priority.
- **M:** Monitored neighbor
- **D:** Detected neighbor.

The categories are prioritized as listed above, cells from lower-ranking categories being displayed as far as space allows. Within each category, cells are sorted by descending E_c/N_0.

UARFCN: UARFCN, UMTS Absolute Radio Frequency Channel Number.

SC: Scrambling Code.

Ec/No: E_c/N_0 (dB), signal-to-noise ratio measured according to ▶ 3GPP 25.215, section 5.1.5.

RSCP: Received Signal Code Power (dBm).

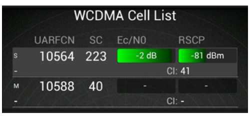
If a cell file is loaded, a string with the following information appears on a separate line below each line of cell data:

Cell name according to cell file.

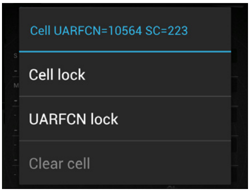
CI: Cell identity according to cell file.

Data View Actions

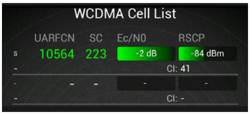
- You can *lock* on a cell or UARFCN that is listed in this view. The phone is then restricted to camping on that cell/UARFCN.



Tap and hold a cell to bring up a context menu with data view actions.



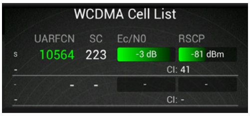
- Tap **Cell lock** to apply a lock to this cell (i.e. this UARFCN + SC combination).
- Tap **UARFCN lock** to apply a lock to this UARFCN, without specifying a SC. That is, the whole UARFCN is allowed.



Cell lock (UARFCN + SC)

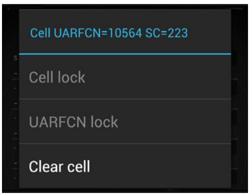
The entity locked on is highlighted in green in the list:

- For a cell lock, both UARFCN and SC are highlighted.
- For a UARFCN lock, only the UARFCN is highlighted.



UARFCN lock

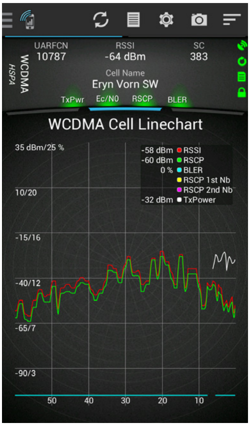
Any action applied in this way is also immediately reflected in the control function settings, described in chapter 13.



- To undo a lock action, long-tap the relevant cell and choose **Clear cell**.

If a cell that you locked on has disappeared from the WCDMA Cell List view, and you want to release that lock, you can always do this from the Control Functions menu as described in section 13.2.

5.6.4. WCDMA Cell Line Chart Data View



For the header, see section 5.5.5.

The chart shows the latest 60 seconds. Each label “<n>” on the x-axis means “*n* seconds ago”.

The y-axis has both dBm and percent scale marks.

RSSI: Received Signal Strength, equal to UTRA Carrier RSSI.

RSCP: Received Signal Code Power (dBm) of serving cell.

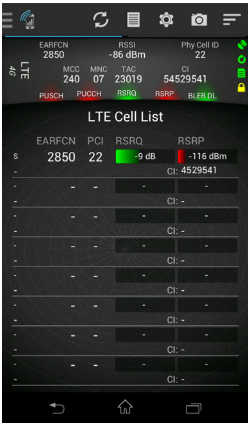
BLER: Block Error Rate in percent, average taken over all downlink transport channels (DCH only).

RSCP 1st Nb: RSCP of strongest neighbor (dBm).

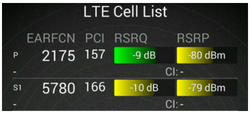
RSCP 2nd Nb: RSCP of second strongest neighbor (dBm).

TxPower: UE Transmit Power (dBm).

5.6.5. LTE Cell List Data View



For the header, see section 5.5.6.



CA case

Up to eight cells are displayed, each belonging to one of the following categories:

- **S:** Serving cell (non-CA)
- **P:** Primary serving cell (CA)
- **S1:** Secondary serving cell (CA)
- **M:** Measured neighbor (always used).

Serving cells are prioritized above neighbors, the latter being displayed as far as space allows. Within each category, cells are sorted by descending RSRP.

EARFCN: E-UTRA ARFCN (Absolute Radio Frequency Channel Number).

PCI: Physical layer Cell Identity. PCI = 3 × PCIG + PI; value range = {0 ... 503}.
▶ 3GPP 36.211, section 6.11

RSRQ: Reference Signal Received Quality (dB).

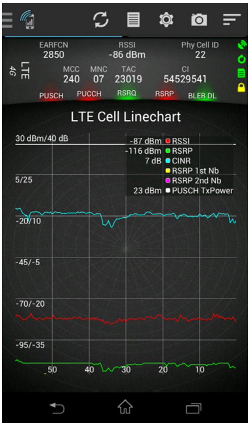
RSRP: Reference Signal Received Power (dBm).

If a cell file is loaded, a string with the following information appears on a separate line below each line of cell data:

Cell name according to cell file.

CI: Cell identity according to cell file.

5.6.6. LTE Cell Line Chart Data View



For the header, see section 5.5.6.

The chart shows the latest 60 seconds. Each label “<n>” on the x-axis means “*n* seconds ago”.

In case of carrier aggregation, RSSI, RSRP, and CINR are shown for both primary serving cell (no suffix in legend) and secondary serving cell (suffix “**S1**” in legend).

The y-axis has both dBm and dB scale marks.

RSSI: E-UTRA Carrier RSSI (Received Signal Strength Indicator) in dBm.

RSRP: RSRP of serving cell (dBm).

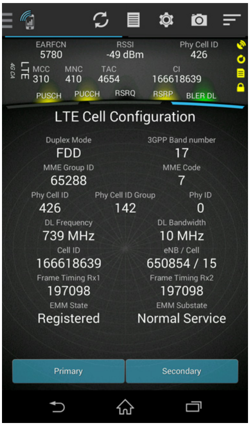
CINR: CINR of serving cell (dB).

RSRP 1st Nb: RSRP of strongest neighbor (dBm).

RSRP 2nd Nb: RSRP of second strongest neighbor (dBm).

PUSCH TxPower: Transmit power on PUSCH.

5.6.7. LTE Cell Configuration Data View



Non-TDD version of view. For the header, see section 5.5.6.

This view deals with the LTE serving cell.

The buttons **Primary** and **Secondary** at the bottom lets you toggle between the primary and secondary cells in case of carrier aggregation.

Duplex Mode: FDD or TDD.

3GPP Band Number: Number of E-UTRA band as laid down in ► 3GPP 36.101, table 5.5-1 “E-UTRA Operating Bands”.

MME Group ID: Mobility Management Entity Group ID. Part of the Globally Unique Temporary UE Identity (GUTI), it uniquely identifies the MME which allocated the GUTI. ► 3GPP 23.003, section 2.8.1

MME Code: Mobility Management Entity Code. Part of the GUTI, it temporarily and uniquely identifies the UE within the MME that allocated the GUTI. ► 3GPP 23.003, section 2.8.1

Phy Cell ID: Physical layer Cell Identity, PCI = 3 × PCIG + PI. Value range: {0 ... 503}. ► 3GPP 36.211, section 6.11

Phy Cell ID Group: Physical layer Cell Identity Group, PCIG. Value range: {0 ... 167}.

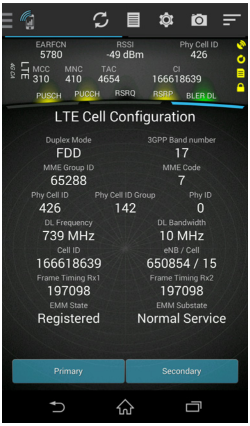
Phy ID: Physical layer Identity, PI. Value range = {0, 1, 2}.

DL Frequency: Downlink frequency used in serving cell.

DL Bandwidth: Downlink bandwidth of serving cell in MHz, one of: {1.4, 3, 5, 10, 15, 20}.

Cell ID: ECI, E-UTRAN Cell Identifier. Used to identify a cell uniquely within a PLMN. Length: 28 bits. ► 3GPP 36.300, section 8.2

(continued on next page)



(continued)

eNB / Cell: ECI divided into an eNodeB part (eNB-ID, 20 bits) and a cell part (8 bits).

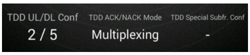
Bottom part

Frame Timing Rx1: Cell frame timing of serving cell relative to the network's absolute time reference, as received on antenna Rx1. Given in LTE T_s units; range {0 ... 307199}.

Frame Timing Rx2: Same as preceding, but as received on antenna Rx2.

EMM State: EPS Mobility Management state. ▶ 3GPP 24.301, section 5.1.3.2

EMM Substate: EPS Mobility Management substate. ▶ 3GPP 24.301, section 5.1.3.2



If the device supports TD-LTE, the following TDD-specific parameters are added at the bottom when TDD is being used:

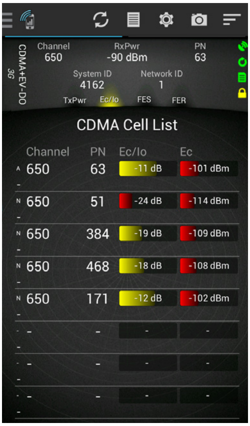
TDD UL/DL Conf: TDD uplink–downlink configuration. ▶ 3GPP 36.211, table 4.2-2

TDD ACK/NACK Mode: ACK/NACK feedback mode for TDD. ▶ 3GPP 36.212, section 5.2.2.6

- 0: Multiplexing
- 1: Bundling

TDD Special Subfr. Conf: TDD special subframe configuration. ▶ 3GPP 36.211, table 4.2-1

5.6.8. CDMA Cell List Data View



For the header, see section 5.5.7.

Up to eight cells are displayed, each belonging to one of the following categories:

- **A:** Active set
- **C:** Candidate set
- **N:** Neighbor set.

The categories are prioritized as listed above, cells from lower-ranking categories being displayed as far as space allows. Within each category, cells are sorted by descending E_c/I_0.

Channel: RF channel number.

PN: PN offset.

Ec/Io: E_c/I_0 (dB), signal-to-noise ratio.

Ec: Received signal code power (dBm).

If a cell file is loaded, a string with the following information appears on a separate line below each line of cell data:

Name of cell according to cell file.

5.6.9. EV-DO Cell List Data View

This view has exactly the same contents as the CDMA Cell List view (see section 5.6.8) but for EV-DO cells.

5.7. “Dedicated” Data View Category

5.7.1. GSM Dedicated Mode Data View

For the header, see section 5.5.4.

Channel Mode: GSM channel mode, one of:

- FR = Voice, Full Rate
- EFR = Voice, Enhanced Full Rate
- HR = Voice, Half Rate
- AFR = Voice, AMR Full Rate
- AHR = Voice, AMR Half Rate
- CSD = Circuit-switched data
- SIG = Signaling only

TCH ARFCN: Traffic Channel (TCH ARFCN) or Stand-alone Dedicated Control Channel (SDCCH ARFCN) or Packet Dedicated Traffic Channel (PDTCH ARFCN). Hopping channels are shown one at a time.

RLT Ratio: Radio Link Timeout, ratio of current value to maximum (= start) value, expressed in percent. ▶ 3GPP 45.008, section 5.2

RxQual: Receive Bit Error Rate, RxQual; scale defined in ▶ 3GPP 45.008, section 8.2.

Timeslots: List of timeslots in use, e.g. “157” meaning timeslots 1, 5, and 7.

Timing Adv: Timing Advance.

TxPower: UE Transmit Power (dBm).

Channel Type: Channel type, one of {BCCH, PBCCH, PDTCH, SDCCH, TCH/F, TCH/H}.

Subchannel: Subchannel Number {0 ... 7}.

Ciphering: Ciphering Mode, one of {A5/1, A5/2, A5/3, GEA/1, GEA/2}. ▶ 3GPP 43.020

Hopping: Use of frequency hopping: On/Off.

HSN: Hopping Sequence Number {0 ... 63}.

MAIO: MAIO, Mobile Allocation Index Offset {0 ... 63}. ▶ 3GPP 45.002

Speech codec: Voice codec and codec rate.

5.7.2. GSM RACH Analysis Data View

For the header, see section 5.5.4.

The view displays parameters and data related to RACH signaling and paging in GSM.

Establish Cause: Establishment cause in Channel Request message. ► 3GPP 44.018, section 9.1.8

Random Reference: Random Reference in Channel Request message. ► 3GPP 44.018, section 9.1.8

Max TxPower: The maximum TX power level an MS may use when accessing on a Control Channel, CCH. ► 3GPP 44.018, table 10.5.2.4.1, MS-TXPWR-MAX-CCH

Max Retransm: Maximum number of retransmissions. ► 3GPP 44.018, table 10.5.2.29.1

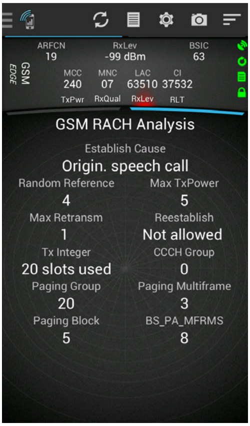
Reestablish: Call reestablishment allowed/not allowed in the cell. ► 3GPP 44.018, table 10.5.2.29.1

Tx Integer: Number of slots used to spread the transmission. ► 3GPP 44.018, table 10.5.2.29.1

CCCH Group / PCCCH Group: The former of these appears for CS and the latter for PS data.

- *CS data:* Mobiles in a specific CCCH group will listen for paging messages and make random accesses only on the specific CCCH to which the CCCH group belongs. ► 3GPP 45.002, section 6.5.2, CCCH_GROUP
- *PS data:* Same mechanism, but with “CCCH” replaced by “PCCCH”. ► 3GPP 45.002, section 6.5.6, PCCCH_GROUP

(continued on next page)



(continued)

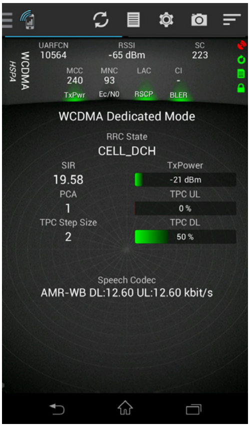
Paging Group: The mobile's paging group. ▶ 3GPP 45.002, sections 6.5.2, 6.5.6, PAGING_GROUP

Paging Multiframe: Paging multiframe: ▶ 3GPP 45.002, section 6.5.3

Paging Blk Idx: Paging block index: ▶ 3GPP 45.002, section 6.5.3

BS_PA_MFRMS: Number of 51-multiframes between transmission of paging messages to mobiles of the same paging group {2 ... 9}. ▶ 3GPP 45.002, section 3.3.2.3, BS_PA_MFRMS

5.7.3. WCDMA Dedicated Mode Data View



For the header, see section 5.5.5.

RRC State: RRC State, one of {CELL_DCH, CELL_FACH, CELL_PCH, URA_PCH, Idle}.

SIR: Signal-to-Interference Ratio (dB).

TxPower: UE Transmit Power (dBm).

PCA: Power Control Algorithm: ▶ 3GPP 25.331

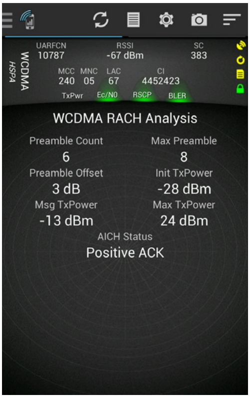
TPC UL: Transmit Power Control on uplink over the last 0.5 seconds: percentage of power control commands that were "increase" commands.

TPC Step Size: Transmit Power Control Step Size (dB). ▶ 3GPP 25.331

TPC DL: Transmit Power Control on downlink over the last 0.5 seconds: percentage of power control commands that were "increase" commands.

Speech codec: Voice codec and codec rate.

5.7.4. WCDMA RACH Analysis Data View



For the header, see section 5.5.5.

The view displays parameters and data related to RACH signaling in WCDMA.

The WCDMA random access procedure is comprehensively described in ▶ 3GPP 25.214, section 6.1.

Preamble Count: Number of preambles used in this preamble ramping cycle.

Max Preamble: Preamble Retrans Max, maximum number of preambles in one preamble ramping cycle.

Preamble Offset: Power Ramp Step, power increase between consecutive preambles (dB).

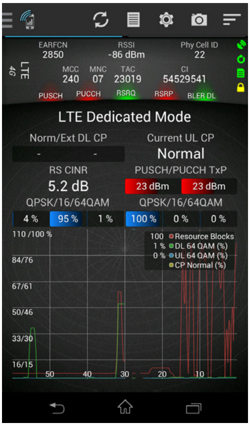
Init Tx Power: Preamble_Initial_Power, transmit power of first RACH preamble (dBm).

Msg Tx Power: Transmit power of RACH preamble to which a response was obtained (dBm).

Max Tx Power: Maximum allowed transmit power of RACH preamble (as well as overall; dBm).

AICH Status: Acknowledgement of RACH preamble sent on Acquisition Indicator Channel (AICH). One of: {No ACK, Positive ACK, Negative ACK}.

5.7.5. LTE Dedicated Mode Data View



For the header, see section 5.5.6.

Left-hand column: Downlink

Norm/Ext DL CP: Percentage distribution of downlink cyclic prefix usage: Normal (left) vs. Extended (right). Updated once every second.

RS CINR: Reference Signal CINR in dB.

QPSK/16/64QAM: Percentage distribution of downlink modulation scheme usage: QPSK (left), 16-QAM (center), 64-QAM (right). Updated once every second.

Right-hand column: Uplink

Current UL CP: Type of cyclic prefix currently used on uplink: Normal or Extended.

PUSCH/PUCCH TxP: Transmit powers on PUSCH and PUCCH respectively: maximum value during the past second.

QPSK/16/64QAM: Percentage distribution of uplink modulation scheme usage: QPSK (left), 16-QAM (center), 64-QAM (right). Updated once every second.

Graph

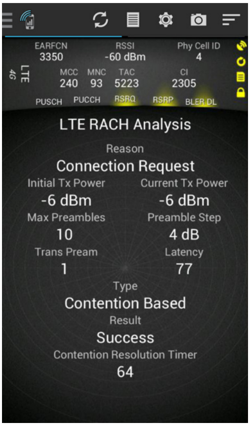
The line chart shows the latest 60 seconds. Each label “<n>” on the x-axis means “*n* seconds ago”. The y-axis has two sets of scale marks: “number of” (left) and “percent” (right).

Resource Blocks: PDSCH resource block allocation, also presented numerically in the “LTE Data” view (see section 5.9.6).

DL 64 QAM, UL 64 QAM: 64-QAM usage rate (in %) on downlink and uplink, respectively.

CP Normal: “Normal” cyclic prefix usage rate (in %) on downlink.

5.7.6. LTE RACH Analysis Data View



For the header, see section 5.5.6.

The view displays parameters and data related to RACH signaling in LTE. The LTE random access procedure is comprehensively described in ► 3GPP 36.321, section 5.1.

Reason: Reason for RACH signaling. This is indicated for each RACH attempt. One of: {Connection Request, Radio Link Failure, UL Data Arrival, DL Data Arrival, Handover}.

Initial Tx Power: Transmit power of first RACH preamble (dBm).

Current Tx Power: Transmit power of current RACH preamble (dBm).

Max Preambles: Maximum number of preambles in one preamble ramping cycle. Taken from LTE Layer 3 message System Information Block 2.

Preamble Step: Power ramping step size, power increase between consecutive preambles (dB). Taken from LTE Layer 3 message System Information Block 2.

Trans Preambles: Number of transmitted preambles in current RACH procedure.

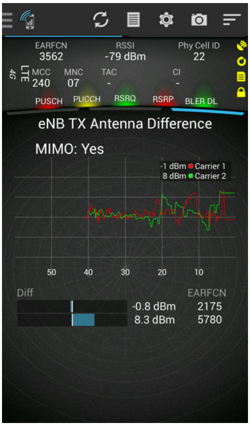
Latency: Time between Random Access Request and last successful Random Access Response.

Type: RACH procedure type: "Contention Free" or "Contention Based".

Result: RACH procedure result. One of: {Success, Failure at MSG2, Failure at MSG4 due to CT timer expired, Failure at MSG4 due to CT resolution not passed, Aborted}

Contention Resolution Timer: MAC contention resolution timer expressed as a number of subframes. Taken from LTE Layer 3 message System Information Block 2.

5.7.7. eNB TX Antenna Difference Data View



For the header, see section 5.5.6.

The view shows the difference in cell-specific reference signal (RS) power between the eNodeB's Tx1 and Tx2 antennas (average taken over Rx1 and Rx2 receiver antennas). A positive value means that Tx1 is stronger; a negative value means that Tx2 is stronger. Each presented value is further averaged over 20 samples in the time domain.

Given for each carrier separately in case of carrier aggregation.

For this data view to be populated, the "DL TX measurements" log must be turned on in the Settings menu; see section 21.1.7.

Graph

Above the graph, a text string indicates whether MIMO is being used (Yes/No).

One curve is plotted for each carrier, 1 and 2.

The line chart shows the Tx1–Tx2 RS power difference over the last 60 seconds.

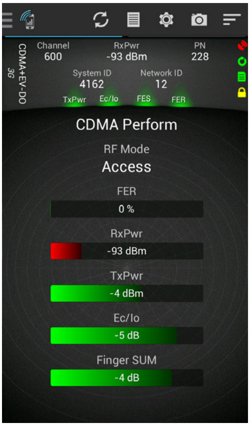
Bottom part

Row 1: Carrier 1;
Row 2: Carrier 2

Diff: Tx1–Tx2 RS power difference, displayed as a bar and as a numeric value. Equal to rightmost value in line chart.

EARFCN: EARFCN of carrier.

5.7.8. CDMA Perform Data View



For the header, see section 5.5.7.

RF Mode: “<technology> <device state>”, where

- <technology> = “CDMA”
- <device state> = one of “Init”, “Idle”, “Access”, “Traffic”.

FER: Frame Erasure Rate (%).

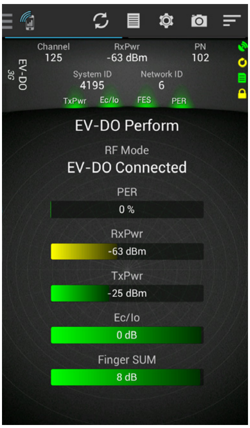
RxPwr: Receive Power (dBm).

TxPwr: Transmit Power (dBm).

Ec/Io: E_c/I_0, signal-to-noise ratio for strongest active set member (= topmost PN in CDMA Cell List data view, section 5.6.8; unit dB).

Finger SUM: Finger Sum, total signal-to-noise ratio (E_c/I_0) for all Rake fingers (dB).

5.7.9. EV-DO Perform Data View



For the header, see section 5.5.7.

RF Mode: “<technology> <AT state>”, where

- <technology> = “EV-DO”
- <AT state> = one of “Inactive”, “Acquisition”, “Sync”, “Idle”, “Access”, “Connected”.

PER: Packet Error Rate (%).

RxPwr: Receive Power (dBm).

TxPwr: Transmit Power (dBm).

Ec/Io: E_c/I_0, signal-to-noise ratio for strongest active set member (= topmost PN in CDMA Cell List data view, section 5.6.8; unit dB).

Finger SUM: Finger Sum, total signal-to-noise ratio (E_c/I_0) for all Rake fingers (dB).

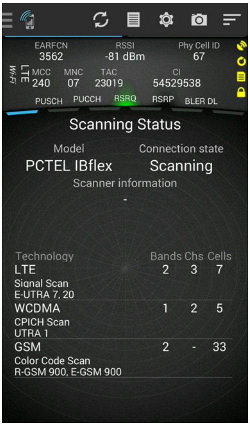
5.8. “Scanning” Data View Category

5.8.1. General Remarks on Presentation of Scan Data

These remarks apply equally to PCTel and DRT scanners.

- All quantities in scan views are updated once every second and show the latest value measured.
- A cell which has been detected at some point is always displayed at least once, even if it has disappeared again by the time the view is refreshed. On being displayed, if the cell does not appear in the next measurement report, it is removed from the view at the next refresh.
- The update frequency for a particular cell or channel will vary widely depending on the number of technologies and the total number of channels scanned. For example, if you scan entire bands with System Information decoding turned on, successive measurements on the same channel will be far apart in time.

5.8.2. Scanning Status Data View



For the header, see sections 5.5.4–5.5.7.

This is a combined status and progress view for scanning with an external scanner.

Top part

Model: Scanner model.

Connection state: One of: "Off", "Connecting", "Connected", "Scanning", "Disconnecting", "Disconnected".

Scanner information: This field shows messages from the scanner.

Bottom part

For each technology on which at least one scan is in progress, the following is indicated:

Technology: Cellular technology, type(s) of scan being performed, and scanned bands.

Bands: Number of scanned bands where at least one channel is currently detected.

Chs: Total number of channels currently detected. Not used for GSM, where only **Cells** are needed.

Cells: Total number of cells currently detected.

Tapping a row in this table takes you to the relevant series of scan type specific data views. These views are covered in sections 5.8.3–5.8.4.

All numbers in the table are cleared when the scan stops.

For the script setup, see section 9.5.

5.8.3. LTE Signal Scan Data Views

For the header, see sections 5.5.4–5.5.7.

One view appears for each detected EARFCN, up to a maximum of 12. If more than 12 EARFCNs are detected, only 12 will appear in the presentation.

Top part (immediately beneath header)

Shows the EARFCN, the E-UTRA band to which it belongs, and the Carrier RSSI. Below this data is a string of position indicators, where the highlighted indicator shows the position of the current view in the sequence of LTE scan data views. To the right of these indicators is displayed the number of EARFCNs currently detected (same as **Channels** in the Scanning Status data view, section 5.8.2).

Use the **Prev** and **Next** arrows to browse the LTE scan data views.

Main body of view

Cells are sorted by decreasing RSRP. The cell list is scrollable and can hold up to 30 cells.

PCI: Physical layer Cell Identity. PCI = 3 × PCIG + PI; value range = {0 ... 503}. ▶ 3GPP 36.211, section 6.11

RSRP: Reference Signal Received Power (dBm).

RSSI: E-UTRA Carrier RSSI (Received Signal Strength Indicator) in dBm.

RSRQ: Reference Signal Received Quality (dB).

CINR: Reference Signal Carrier to Interference-plus-Noise Ratio (dB).

Bandwidth: Detected bandwidth of this EARFCN.

Tx Ports: Number of Tx signals detected.

5.8.4. WCDMA CPICH Scan Data Views

For the header, see sections 5.5.4–5.5.7.

One view appears for each detected UARFCN, up to a maximum of 12. If more than 12 UARFCNs are detected, only 12 will appear in the presentation.

Top part (immediately beneath header)

Shows the UARFCN, the UTRA band to which it belongs, and the UTRA Carrier RSSI. Below this data is a string of position indicators, where the highlighted indicator shows the position of the current view in the sequence of WCDMA scan data views. To the right of these indicators is displayed the number of UARFCNs currently detected (same as **Channels** in the Scanning Status data view, section 5.8.2).

Use the **Prev** and **Next** arrows to browse the WCDMA scan data views.

Main body of view

Cells are sorted by decreasing RSCP. The cell list is scrollable and can hold up to 30 cells.

SC: Scrambling Code.

RSCP: Received Signal Code Power (dBm).

Ec/N0: E_c/N_0 (dB), signal-to-noise ratio according to ▶ 3GPP 25.215, section 5.1.5.

SIR: Signal-to-Interference Ratio (dB).

Spread: Delay spread, time in μs between the first and last E_c/N_0 peaks that are above the PN threshold. This is a measure of the signal spreading due to multipath propagation.

CFO: Center Frequency Offset (Hz).

Rake fingers: Number of decoded Rake fingers.

5.8.5. GSM Color Code Scan Data Views

For the header, see sections 5.5.4–5.5.7.

One view appears for each scanned GSM band where at least one ARFCN has been detected. Up to 5 views can be shown, i.e. one for each GSM band in existence (E-900 and R-900 being distinguished on the 900 MHz band).

Top part (immediately beneath header)

Shows the GSM band designation. Below it is found a string of position indicators, where the highlighted indicator shows the position of the current view in the sequence of GSM scan data views. To the right of these indicators is displayed the number of bands where at least one ARFCN is currently detected (same as **Bands** in the Scanning Status data view, section 5.8.2).

Use the **Prev** and **Next** arrows to browse the GSM scan data views.

Main body of view

Cells are sorted by decreasing RxLev. The cell list is scrollable and can hold up to 50 cells.

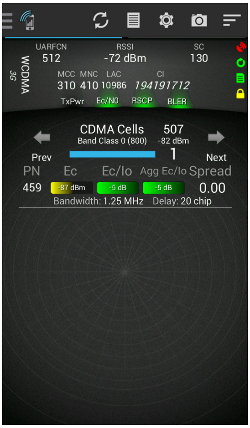
ARFCN: Absolute Radio Frequency Channel Number.

BSIC: Base Station Identity Code.

RxLev: Received Signal Level (dBm).

C/I: Carrier-to-interference ratio (dB).

5.8.6. CDMA PN Scan Data Views



For the header, see sections 5.5.4–5.5.7.

One view appears for each detected RF channel, up to a maximum of 12. If more than 12 RF channels are detected, only 12 will appear in the presentation.

Top part (immediately beneath header)

Shows the RF channel, the CDMA band to which it belongs, and the RF channel I_0. Below this data is a string of position indicators, where the highlighted indicator shows the position of the current view in the sequence of CDMA scan data views. To the right of these indicators is displayed the number of RF channels currently detected (same as **Channels** in the Scanning Status data view, section 5.8.2).

Use the **Prev** and **Next** arrows to browse the CDMA scan data views.

Main body of view

Cells are sorted by decreasing E_c. The cell list is scrollable and can hold up to 30 cells.

PN: PN offset.

Ec: Received Signal Code Power (dBm).

Ec/Io: Peak E_c/I_0 (dB), signal-to-noise ratio.

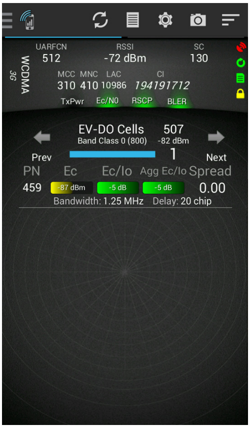
Agg Ec/Io: Aggregate E_c/I_0 (dB).

Spread: Delay spread, time in chips between the first and last E_c/I_0 peaks that are above the PN threshold. This is a measure of the signal spreading due to multipath propagation.

Bandwidth: Detected bandwidth of this RF channel.

Delay: Pilot delay in chips.

5.8.7. EV-DO PN Scan Data Views



For the header, see sections 5.5.4–5.5.7.

One view appears for each detected RF channel, up to a maximum of 12. If more than 12 RF channels are detected, only 12 will appear in the presentation.

Top part (immediately beneath header)

Shows the RF channel, the CDMA band to which it belongs, and the RF channel I_0. Below this data is a string of position indicators, where the highlighted indicator shows the position of the current view in the sequence of EV-DO scan data views. To the right of these indicators is displayed the number of RF channels currently detected (same as **Channels** in the Scanning Status data view, section 5.8.2).

Use the **Prev** and **Next** arrows to browse the EV-DO scan data views.

Main body of view

Cells are sorted by decreasing E_c. The cell list is scrollable and can hold up to 30 cells.

PN: PN offset.

Ec: Received Signal Code Power (dBm).

Ec/Io: Peak E_c/I_0 (dB), signal-to-noise ratio.

Agg Ec/Io: Aggregate E_c/I_0 (dB).

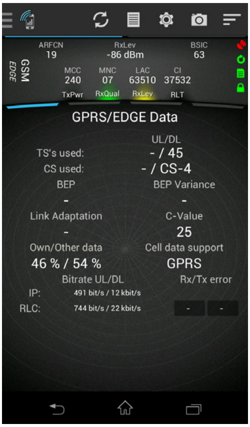
Spread: Delay spread, time in chips between the first and last E_c/I_0 peaks that are above the PN threshold. This is a measure of the signal spreading due to multipath propagation.

Bandwidth: Detected bandwidth of this RF channel.

Delay: Pilot delay in chips.

5.9. “Data” Data View Category

5.9.1. “GPRS/EDGE Data” Data View



For the header, see section 5.5.4.

All data shown here pertains to the device’s latest reporting period, unless otherwise noted.

TS’s used: Timeslots used on uplink/downlink.

CS used: *(updated for each multiframe)*

- *GPRS:* Channel coding scheme on downlink/uplink {CS1 ... CS4}.
- *EDGE:* Modulation coding scheme on downlink/uplink {MCS1 ... MCS9}.

BEP: EDGE mean bit error probability.

BEP Variance: EDGE bit error probability variance.

Link Adaptation: Automatic Repeat Request Mode {ARQ1, ARQ2}. ► 3GPP 44.060, section 9.2.3.1

C-Value: EDGE C Value {0 ... 63}.

Own/Other data: Own data/Other data ratio during last multiframe.

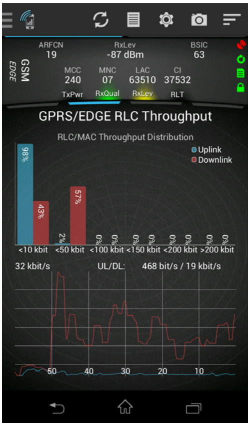
Cell data support: Technology supported in cell: GPRS or EGPRS.

Bitrate UL/DL: IP and RLC/MAC level throughputs on uplink and downlink. All of these figures are updated once every second.

Rx/Tx error: RLC/MAC level only. Updated once every second.

- **Rx error:** Percentage of data blocks erroneously decoded on downlink.
- **Tx error:** Percentage of data blocks retransmitted on uplink.

5.9.2. GPRS/EDGE RLC Throughput Data View



For the header, see section 5.5.4.

This view presents RLC/MAC throughput for GPRS/EDGE data transfer.

Bar chart "RLC/MAC Throughput Distribution"

This histogram shows the distribution of RLC/MAC-level data throughput on uplink (blue) and downlink (red).

Line chart

This line chart tracks RLC/MAC-level data throughput over the past 60 seconds: uplink (blue), downlink (red).

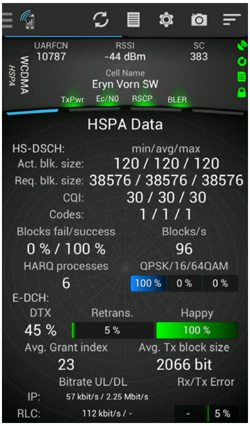
The value on the far left indicates the maximum value on the y-axis. The values on the right are those of the latest data points plotted.

Clearing the Graphs

You can clear the histogram and the line chart independently by long-pressing the desired graph and selecting **Clear History**.

The graphs are cleared automatically when you start a script, as well as when you load or unload a logfile.

5.9.3. “HSPA Data” Data View



For the header, see section 5.5.5.

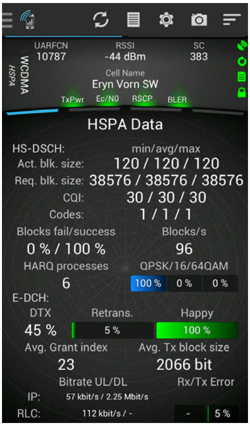
All data shown here pertains to the device’s latest reporting period, unless otherwise noted.

HS-DSCH:

- **Act. blk. size:** Actual HS-DSCH transport block size in bits: minimum/average/ maximum.
- **Req. blk. size:** Requested transport block size in bits (corresponding to minimum CQI): minimum/average/maximum.
- **CQI:** Minimum/average/maximum value of CQI (Channel Quality Indicator). CQI values are defined in ▶ 3GPP 25.214, section 6A.2.
- **Codes:** Number of channelization codes used on the HS-DSCH: minimum/average/ maximum. Obtained with HSPA+ enabled devices.
- **Blocks fail:** Block error rate on HS-DSCH for first retransmission. Updated once every second.
- **Blocks success:** Percentage of blocks on HS-DSCH that were transmitted success-fully on first attempt (zero retransmissions). Updated once every second.
- **Blocks/s:** Total number of blocks to be received on the HS-DSCH during the latest one-second period.

HARQ processes: Number of active HARQ (Hybrid Automatic Repeat Request) processes on the HS-DSCH.

(continued on next page)



(continued)

QPSK/16/64QAM: Percentage distribution of downlink modulation scheme usage: QPSK (left), 16-QAM (center), 64-QAM (right). Updated once every second.

E-DCH:

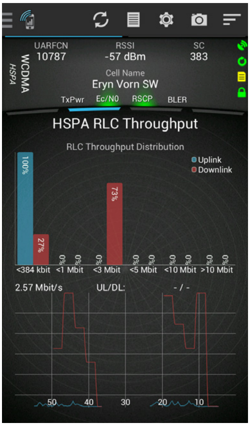
- **DTX:** DTX rate (%) on uplink.
- **Retrans.:** Number of retransmissions on E-DPCCH/E-DPDCH divided by the number of TTIs.
- **Happy:** Happy rate (%), i.e. the percentage of TTIs where the UE was happy, as defined in ▶ 3GPP 25.321, section 11.8.1.5.
- **Avg. Grant index:** Average value of Serving Grant Index.
- **Avg. Tx block size:** Average transport block size in bits on E-DCH.

Bitrate UL/DL: IP- and RLC-level throughputs on uplink and downlink. All of these figures are updated once every second.

Rx/Tx Error: (RLC level only; updated once every second)

- **Rx Error:** Percentage of data blocks erroneously decoded on downlink.
- **Tx Error:** Percentage of data blocks retransmitted on uplink.

5.9.4. HSPA RLC Throughput Data View



For the header, see section 5.5.5.

This view presents RLC throughput for HSPA data transfer.

Bar chart "RLC Throughput Distribution"

This histogram shows the distribution of RLC-level data throughput on uplink (blue) and downlink (red).

Line chart

This line chart tracks RLC-level data throughput over the past 60 seconds: uplink (blue), downlink (red).

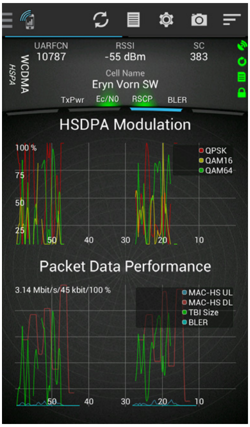
The value on the far left indicates the maximum value on the y-axis. The values on the right are those of the latest data points plotted.

Clearing the Graphs

You can clear the histogram and the line chart independently by long-pressing the desired graph and selecting **Clear History**.

The graphs are cleared automatically when you start a script, as well as when you load or unload a logfile.

5.9.5. HSDPA Modulation/Packet Data Performance Data View



For the header, see section 5.5.5.

These line charts track various HSDPA and other packet data related quantities over the past 60 seconds.

HSDPA Modulation part (top)

QPSK: The percentage of time QPSK was used as modulation method.

QAM16: The percentage of time 16-QAM was used as modulation method.

QAM64: The percentage of time 64-QAM was used as modulation method.

Packet Data Performance part (bottom)

MAC-HS UL: MAC-hs throughput on uplink.

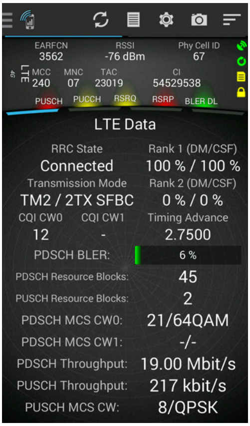
MAC-HS DL: MAC-hs throughput on downlink.

TB Size: Average transport block size on HS-DSCH.

BLER: Block Error Rate in percent, average taken over all downlink transport channels (DCH only).

The value on the far left indicates the maximum value on the y-axis. The values on the right are those of the latest data points plotted.

5.9.6. "LTE Data" Data View



For the header, see section 5.5.6.

Quantities shown here are updated when the value changes, unless otherwise noted. All quantities except Timing Advance are invalid in RRC state "Idle".

RRC State: "Idle" or "Connected".

Transmission Mode: Downlink transmission mode. See section 5.9.6.1.

Rank 1 (DM/CSF): Percentage of time the following quantities have had the value 1:

- *Left:* Actual Rank Indication (RI) on PDSCH. DM = Demapper.
- *Right:* Rank Indication feedback from UE sent on PUSCH or PUCCH. CSF = Channel State Feedback. ▶ 3GPP 36.212

Rank 2 (DM/CSF): Percentage of time the quantities mentioned under **Rank 1** have had the value 2.

CQI CW 0: Best value of Channel Quality Indicator for code word 0 during the past second. Updated once every second. The range is {0 ... 30}, with higher values providing larger transport block size and higher-order modulation. ▶ 3GPP 25.214, section 6A.2

CQI CW 1: Best value of Channel Quality Indicator for code word 1 during the past second. Updated once every second.

Timing Advance: Timing Advance; ▶ 3GPP 36.321, section 5.2. Multiply this value by 16 to determine the Timing Advance Index, which has the range {0 ... 63}: ▶ 3GPP 36.213, section 4.2.3. Each Timing Advance Index increment represents 0.52 μs.

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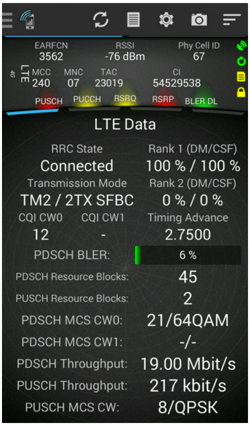


(continued)

PDSCH BLER: Block error rate on Physical Downlink Shared Channel.

PDSCH Resource Blocks: Number of resource blocks on PDSCH.

PDSCH MCS CW 0: Modulation Coding Scheme for code word 0 on PDSCH. Given as a table index value {0 ... 31} according to ▶ 3GPP 36.213, section 7.1.7.1 and also in plain text.

PDSCH MCS CW 1: Modulation Coding Scheme for code word 1 on PDSCH.

PDSCH Throughput: Throughput on Physical Downlink Shared Channel. Updated once every second.

PUSCH Throughput: Throughput on Physical Uplink Shared Channel. Updated once every second.

PUSCH MCS CW: Modulation Coding Scheme on PUSCH. Given as a table index value {0 ... 31} according to ▶ 3GPP 36.213, section 7.1.7.1 and also in plain text.

5.9.6.1. Transmission Modes

Compare ▶ 3GPP 36.213, Table 7.2.3-0.

For 2 × 2 MIMO, this is one of:

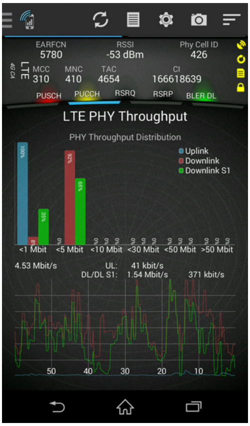
Mode	Displayed String	Explanation
TM1	SISO	Single-input single-output
TM2	2TX SFBC	Two Tx antennas, space-frequency block coding
TM3	2TX OL SM	Two Tx antennas, open-loop spatial multiplexing
TM4	2TX CL SM Rank(2)	Two Tx antennas, closed-loop spatial multiplexing, Rank = 2

Mode	Displayed String	Explanation
TM5	2TX MU MIMO	Two Tx antennas, multi-user multiple-input multiple-output
TM6	2TX CL SM Rank(1)	Two Tx antennas, closed-loop spatial multi-plexing, Rank = 1
TM7	BF Port5 SISO	Beamforming, antenna port 5, single-input single-output
TM7	BF Port7 SISO	Beamforming, antenna port 7, single-input single-output
TM8	DL BF Port7-8	Dual-layer beamforming, antenna ports 7–8

For 4 × 4 MIMO, this is one of:

Mode	Displayed String	Explanation
TM1	SIMO	Single-input multiple-output
TM2	4TX SFBC-FSTD	Four Tx antennas, space-frequency block coding combined with frequency switched transmit diversity
TM3	4TX OL SM	Four Tx antennas, open-loop spatial multiplexing
TM4	4TX CL SM Rank(2)	Four Tx antennas, closed-loop spatial multi-plexing, Rank = 2
TM5	4TX MU MIMO	Four Tx antennas, multi-user multiple-input multiple-output
TM6	4TX CL SM Rank(1)	Four Tx antennas, closed-loop spatial multi-plexing, Rank = 1
TM7	BF Port5 SIMO	Beamforming, antenna port 5, single-input multiple-output
TM7	BF Port7 SIMO	Beamforming, antenna port 7, single-input multiple-output
TM8	DL BF Port7-8	Dual-layer beamforming, antenna ports 7–8

5.9.7. LTE PHY Throughput Data View



For the header, see section 5.5.6.

This view presents physical layer throughput for LTE data transfer.

Bar chart "PHY Throughput Distribution"

This histogram shows the distribution of:

- PUSCH throughput (*blue*)
- PDSCH throughput for serving cell (*red*). In case of CA, this is the primary serving cell.
- PDSCH throughput for secondary serving cell (*green*). Valid for CA only.

Line chart

This line chart tracks the same quantities as in the bar chart (see above) over the past 60 seconds.

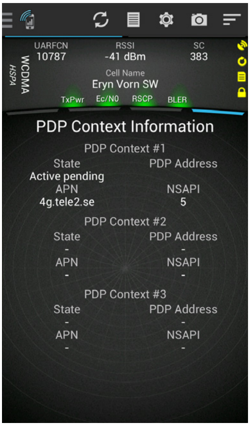
The value on the far left indicates the maximum value on the y-axis. The values on the right are those of the latest data points plotted.

Clearing the Graphs

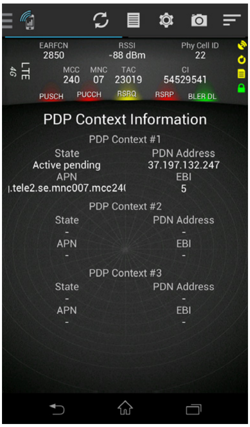
You can clear the histogram and the line chart independently by long-pressing the desired graph and selecting **Clear History**.

The graphs are cleared automatically when you start a script, as well as when you load or unload a logfile.

5.9.8. PDP Context Information Data View



GSM/WCDMA



LTE

For the header, see sections 5.5.4–5.5.6.

The view displays information on up to three PDP contexts.

State: PDP context state. One of: “Active”, “Active pending”, “Inactive”, “Inactive pending”, “Modification pending”.

PDP Address/PDN Address:

- *GSM, WCDMA:* IPv4 PDP address. ▶ 3GPP 24.008, section 10.5.6.4
- *LTE:* IPv4/IPv6 PDN address. ▶ 3GPP 23.402, section 4.7

APN: Access Point Name (shown as scrolling text).

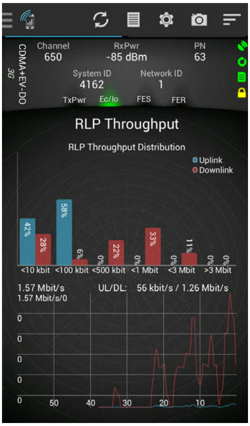
NSAPI/EBI:

- *GSM, WCDMA:* NSAPI, Network Service Access Point Identifier. ▶ 3GPP 24.008, section 10.5.6.2
- *LTE:* EBI, EPS Bearer ID. The range is {0 ... 15}, where 0 means the ID is unassigned. ▶ 3GPP 24.007, section 11.2.3.1.5

For CDMA no information is displayed in this view, since the PDP context concept does not exist in that technology.

> **Note:** PDP context data is not reported on a regular basis, but only in connection with PS attach. Since the device performs this attach at power-on whenever possible, it will already have taken place when TEMS Pocket is launched, and the above data view will then not display any information. However, one way to elicit PDP context data in this view is to switch the device to flight mode and then back.

5.9.9. RLP Throughput Data View



For the header, see section 5.5.7.

This view presents RLP throughput for EV-DO data transfer. Please note that data transfer over CDMA (1x) does *not* appear in this view.

Top chart: "RLP Throughput Distribution"

This histogram shows the distribution of RLP-level data throughput on uplink (blue) and downlink (red).

Bottom chart

This line chart tracks RLP-level data throughput over the past 60 seconds: uplink (blue), downlink (red).

The value on the far left indicates the maximum value on the y-axis. The values on the right are those of the latest data points plotted.

Clearing the Graphs

You can clear the histogram and the line chart independently by long-pressing the desired graph and selecting **Clear History**.

The graphs are cleared automatically when you start a script, as well as when you load or unload a logfile.

5.10. “Test Status” Data View Category

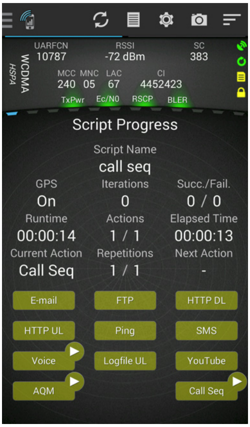
This data view shows the progress of the script that is currently running, if any. When you stop the script, this view is cleared, and all counters are reset.

- The **Script Progress** data view gives general information on script progress, independent of what types of action are being run.
- The other data views in this category contain action-specific progress and service performance data. For certain action types, a graph is plotted which scrolls from right to left in real time.

Line charts always show the latest 60 seconds of execution time for the action type in question.

How to compose scripts is explained in chapter 9.

5.10.1. Script Progress Data View



For the header, see sections 5.5.4–5.5.7.

Script Name: The name of the script that is currently running.

GPS: Use of GPS.

Iterations: Total number of completed script iterations.

Succ./Fail.: Total number of successfully completed script actions (all iterations) / Total number of failed script actions (all iterations).

Runtime: Total elapsed script execution time (all iterations).

Actions: Index of current action in list of actions / Total number of actions in script.

Elapsed Time: Elapsed execution time for current action (reset at start of new action).

Current Action: Type of current action (FTP, HTTP, etc.) or intermediate period between actions (Preguard, Postguard). “Midguard” refers to the **Repeat guard** period between repetitions of an action (used in certain action types).

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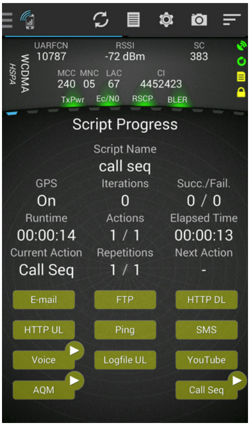

(continued)

Repetitions: Index of current repetition of action / Total number of repetitions to perform (**Repeat action** parameter in script setup).

Next Action: Next action in script (no wraparound: "-" is shown while last action is executed).

Script action type buttons

Tap one of these buttons to jump to an action-specific progress view (they are described in sections 5.10.2–5.10.12). When an action of a particular type is executing, the corresponding button is tagged with a "play" symbol, as are buttons for any other views that are populated. For example, when running a Call Sequence action, the Voice and AQM progress views are populated as well.

Furthermore, the buttons are color-coded in a similar way as the status icons (described in section 5.5.2):

- *Yellow/Olive green:* No action of this type has been run yet.
- *Green:* The last action of this type completed with success.
- *Red:* The last action of this type failed.

Regarding script setup, see chapter 9.

5.10.2. AQM Progress Data View

Direction: Call direction: mobile-originated ("MO") or mobile-terminated ("MT").

Type: Measurement setup: Mobile-to-mobile ("M2M") or mobile-to-fixed ("M2F").

Algorithm: Bandwidth of the transmitted speech that is considered by the POLQA algorithm: narrowband ("NB") or super-wideband ("SWB"). See section 14.2.1. Regarding POLQA in general, see section 14.1.

Speech Codec: Voice codec and codec bit rates (downlink/uplink) currently used in the AQM voice call. Bit rates are obtained for CS only.

Min / Avg / Max: Minimum, average, and maximum AQM score for the current repetition of the AQM action.

Current: Current AQM score. The update interval may vary slightly since the AQM computation time is noticeably dependent on processor load, but is generally around 6 s.

Count: Number of AQM scores computed during the current repetition of the AQM action.

State: Current state of device. One of:

- *Recording:* A speech sentence received from the other call party is being recorded so that a MOS score can be calculated.
- *Injecting:* A speech sentence is being played back to the other call party so that it can record the audio.

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- *Idle:* In this state, the device does nothing in particular. It is an intermediate state entered when switching between, for example, Recording and Injecting.
- *Resync:* The device has lost the synchronization with the other call party and is working to re-establish it. No audio is recorded or injected in this state.

Meas. Duration: Elapsed measurement time / Configured measurement duration in action settings (both given in seconds). Only the actual measurement is timed; call setup and the like are not included. – This option is available on devices supporting audio sync; see the listing in chapter 15.

SPD: Speech path delay in ms, the length of time it takes for the speech to travel from the receiving party to the calling party and back to the receiving party again.Obtained during mobile-terminated (MT) calls only. Supported on a subset of devices as indicated in chapter 15.

Graph

For an AQM action, the histogram shows the AQM score distribution for the current repetition of the AQM action.

For a Call Sequence action, the distribution pertains to execution of the action as a whole.

For the script setup, see section 9.3.9. Regarding audio quality measurement with TEMS Pocket in general, see chapter 14.

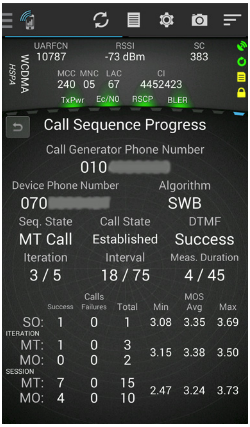
5.10.2.1. Older Devices

On older devices that support downlink-only AQM, a field **Mode** is shown instead of Direction, Type, and Algorithm. However, it contains the same information in a single string with spaces, e.g. “MO M2M SWB”.

If the Bidirectional option in the AQM action is not checked, “(record only)” is added at the end of the **Mode** string.

5.10.3. Call Sequence Progress Data View

During execution of a Call Sequence action, the Voice and AQM progress views are also populated.



Top part

Call Generator Phone Number: Phone number to the CallGenerator acting as other party in the calls. Regarding input format for international calls, see section 21.1.5.1.

Device Phone Number: Phone number of the TEMS Pocket device itself.

Algorithm: Bandwidth of the transmitted speech that is considered by the POLQA algorithm: narrowband (“NB”) or super-wideband (“SWB”). See section 14.2.1. Regarding POLQA in general, see section 14.1.

Seq. State: State of call sequence execution. One of: “SO Call”, “MT Call”, “MO Call”, “Waiting”, “Cancel Call”, “Aborting”.

Call State: One of: “Attempt”, “Setup”, “Established”, “Ended”, “Blocked”, “Dropped”.

DTMF: State of DTMF signaling. One of: “Sending”, “Success”, “Failure”.

Iteration: Index of current iteration of Call Sequence action / Total number of iterations of Call Sequence action.

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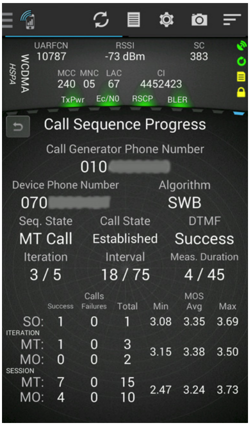

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Interval: Time elapsed of current interval / Interval length. For the precise meaning of "interval", consult section 9.3.10.

Meas. Duration: Time elapsed of current measurement period / Maximum measurement duration. Note that the maximum shown here may be lower than what is set in the script (namely, if the configured duration is too long to fit within the Interval timeslot).

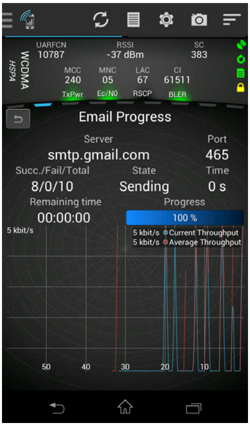
Bottom part

Table showing call success and MOS statistics:

- for SO calls
- for the current iteration of the Call Sequence action
- for the entire Call Sequence action (i.e. spanning all iterations if applicable).

For the script setup, see section 9.3.10.

5.10.4. Email Progress Data View



Server: IP address or host name of SMTP server.

Port: The port on which the SMTP server listens for requests.

Succ./Fail/Total: Number of emails successfully delivered/Number of emails whose delivery failed/Total number of emails to send.

State: State of SMTP client. The values that will normally be visible in the user interface are:

- Inactive
- Preparing
- Connecting
- Logging In
- Sending
- Quitting
- Finished
- Aborting

Time: Time elapsed for the email that is currently being sent. Given in seconds.

Remaining Time: Estimated remaining time of the email session.

Progress: Percentage of the email data transfer that has been completed.

Graph

Line chart of current and average application-level email throughput. This throughput is shown only during the email transfer as such and not during host lookup, login/logout, or other steps of setting up and taking down the email session.

For the script setup, see section 9.3.1.

5.10.5. FTP Progress Data View

FTP Server URL: Name and full path of file being uploaded/downloaded over FTP. The server can be specified by an IPv4 address (12-digit number) or a plain-text name.

Direction: FTP session type (UL or DL).

Port: The FTP server port used.

Finished / Started / Total Instances: Number of finished / Number of started / Total number of parallel FTP downloads. Numbers larger than one occur here if the script parameter **Parallel instances** > 1.

Remaining Time: Estimated remaining time of the FTP session(s). In case of multiple parallel downloads, the aggregate time for all of these is shown.

Progress: Percentage of the FTP data transfer that has been completed. In case of multiple parallel downloads, an aggregate percentage for all downloads is shown.

Graph

Line chart of uplink/downlink application-level FTP throughput. For multiple parallel downloads, the total throughput is charted.

For the script setup, see section 9.3.2.

5.10.6. HTTP DL Progress Data View

HTTP URL: The URL of the web page being downloaded.

Transfer Time: Duration of the current HTTP session in seconds.

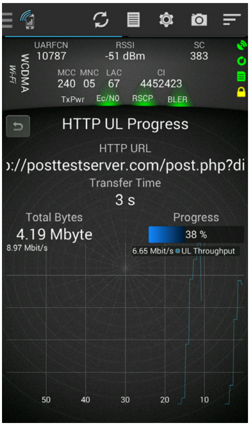
Graph

Line chart of downlink application-level HTTP throughput.

For the script setup, see section 9.3.3.

If the on-device HTTP client is used, a floating window appears on top of the progress view, showing downloaded content. You can drag this window around, minimize it, or close it.

5.10.7. HTTP UL Progress Data View



HTTP URL: HTTP Post destination.

Transfer Time: Duration of the current HTTP session in seconds.

Total bytes: Total amount of data transferred during the session.

Progress: Percentage of the file upload that has completed.

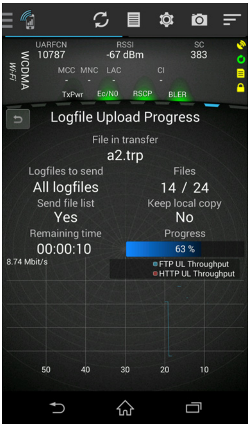
Graph

Line chart of uplink application-level HTTP throughput.

For the script setup, see section 9.3.3.

5.10.8. Logfile Upload Progress Data View

Logfile upload can be performed via FTP or HTTP(S).



File in transfer: Name of logfile currently being uploaded.

Logfiles to send: Value of **Logfiles to send** parameter in Logfile Upload action: see section 9.6.2.

Files: Number of logfiles uploaded / Total number of logfiles to be uploaded.

Send file list: Indicates whether or not text files are sent listing logfiles to be uploaded, as detailed under **Send file list** in section 9.6.2.

Keep local copy: Indicates whether or not uploaded logfiles are kept on the storage medium. See the **Keep local copy** parameter in section 9.6.2.

Remaining time: Estimated remaining time of the Logfile Upload action.

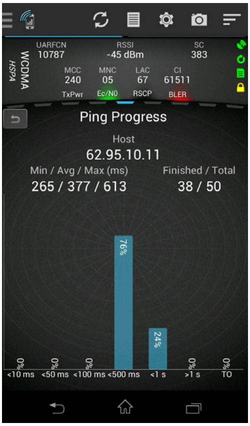
Progress: Upload progress, stated as the percentage of logfiles in the current batch that has been uploaded.

Graph

Line chart showing application-level FTP or HTTP(S) throughput for the logfile upload.

For the script setup in general, see section 9.6.2.

5.10.9. Ping Progress Data View



Host: The URL of the host being pinged.

Min / Avg / Max (ms): Minimum/average/ maximum ping round-trip time for the current repetition of the Ping action. Timeouts and errors are left out of account in these statistics.

Finished / Total: Number of finished pings/ Total number of pings to be sent in the action.

Graph

Histogram of ping round-trip times for the current repetition of the Ping action. The “TO” bin on the far right represents timeouts (no response within the specified maximum time to wait).

For the script setup, see section 9.3.5.

5.10.10. SMS Progress Data View

Phone number: Number of SMS recipient.

Type: Always “Send” in this TEMS Pocket version.

Success / Failure / Total: Number of successfully sent SMS messages / Number of failed SMS messages / Total number of SMS messages to be sent in the current repetition of the SMS action.

Access delay: Time from SMS send start until RP-ACK is received from the network: minimum/average/maximum.

End-to-end: Time from SMS send start until a delivery report (RP-DATA with SMS Status Report) is received from the network: minimum/average/maximum.

Timeouts and failures are left out of account in the Access delay and End-to-end statistics. Values are given in seconds, rounded off to one decimal place.

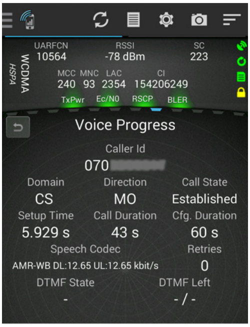
Graph

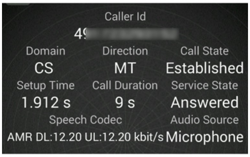
Histogram of access delay and end-to-end times for the current repetition of the SMS action. The “TO” bin on the far right represents timeouts and failures.

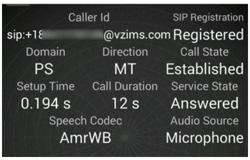
For the script setup, see section 9.3.6.

5.10.11. Voice Progress Data View

This view shows the progress of both Voice MO and Voice MT actions. It is also populated during execution of AQM and Call Sequence actions.







Three use cases shown: 1) CS and MO; 2) CS and MT; 3) PS and MT.

Caller Id: Phone number or identity of the other party in the call.

SIP Registration: *(PS only)* One of “Registered”, “Unregistered”.

Domain: CS or PS.

Direction: MO (mobile-originated) or MT (mobile-terminated).

Call State: One of: “Attempt”, “Setup”, “Established”, “Ended”, “Blocked”, “Dropped”.

Setup Time: Call setup time in seconds. This time is computed at the application layer, so it can differ slightly from the call setup time indicated during replay in TEMS Investigation.

Call Duration: Duration of the call so far in seconds.

Cfg. Duration: *(MO call)* Total call duration configured in script setup: see section 9.3.7. Not valid for AQM and Call Sequence actions.

Service State: *(MT call)* One of: “Waiting”, “Incoming call”, “Answering”, “Answered”, “Playing sound”, “Disconnected”.

Speech Codec: Voice codec and codec bit rate currently used in the call. Bit rate is obtained for CS only. For CDMA, the codec’s capacity operating point (COP) is also indicated, as a number defined in ▸ 3GPP2 C.S0014-E.

Retries: *(MO call)* Total number of retries made during the current call.

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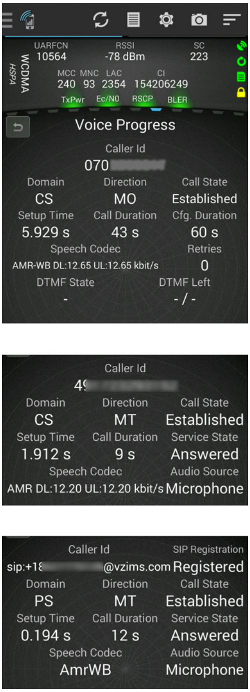


Three use cases shown: 1) CS and MO; 2) CS and MT; 3) PS and MT.

(continued)

Audio Source: *(MT call)* Regular microphone audio or AQM sentence playback; see section 9.3.8 regarding the script setup.

DTMF State: State of DTMF signaling. One of: "Sending", "Success", "Failure", "Monitoring".

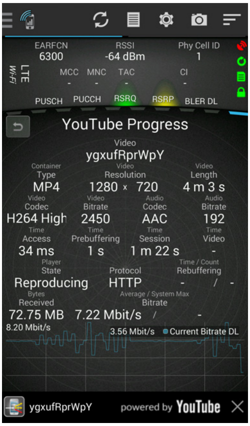
DTMF Left: Number of DTMF tones left to send / Total number of DTMF tones to be sent.

For the script setup in general, turn to sections 9.3.7 and 9.3.8.

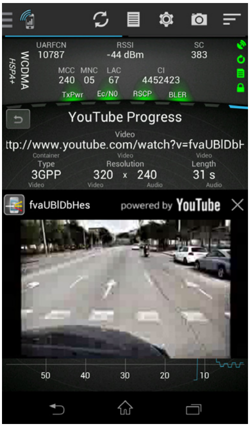
5.10.12. YouTube Progress Data View

The video is displayed in a floating window that can be moved freely up and down the screen. (On a tablet, the video window can be dragged around both horizontally and vertically.)

If you move the video window all the way to the bottom, the video footage itself is hidden, and only the YouTube title bar with the clip id remains visible. This is handy when you want an unobstructed view of the TEMS Pocket user interface, so that you can inspect data on test progress or other data, or navigate menus during testing.



Video window hidden at bottom of screen



Video window visible

Video: YouTube video id.

Container Type: Video container format. One of FLV, MP4, 3GPP, or WebM.

Video Resolution: Horizontal and vertical resolution (e.g. 240 × 160).

Video Length: Length of the video in hours, minutes and seconds.

Video Codec: Type of compression used on the video.

Video Bitrate: Video bitrate in compressed format.

Audio Codec: Type of compression used on the audio.

Audio Bitrate: Audio bitrate in compressed format.

Time Access: Time from sending of GET request until an answer is received.

Time Prebuffering: Time spent prebuffering the video.

Time Session: Time from sending of GET request to end of replay. Given in hours, minutes and seconds.

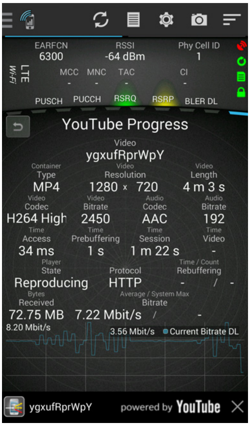
Time Video: Time from display of first video frame to end of replay.

Player State: One of: “Prebuffering”, “Reproducing”, or “Rebuffering”.

Protocol: HTTP or HTTPS. **Note:** For an HTTPS stream, most data in the view cannot be presented, as explained in section 9.3.4.

Time/Count Rebuffering: Total time in seconds spent on rebuffering / Total number of GET requests for the same video. These statistics are shown at session end.

(continued on next page)



(continued)

Bytes Received: Total number of bytes received at TCP level. (The sum is taken over all video streaming data streams and can vary between different replays of the same video.)

Average/System Max Bitrate: Average and maximum downlink TCP throughput. The maximum is only shown at session end.

Graph

Line chart of downlink TCP throughput.

For the script setup, see section 9.3.4.

5.10.13. Other Actions

The **Control Function**, **IP Capture**, **Logfile Recording**, **Wait**, and **Wi-Fi** actions do not have a progress data view.

The progress of scanning conducted with an external scanner, controlled by **Scan** actions, is not displayed in the Test Status views but rather in the Scanning Status data view (see section 5.8.2).

5.11. "Location" Data View Category

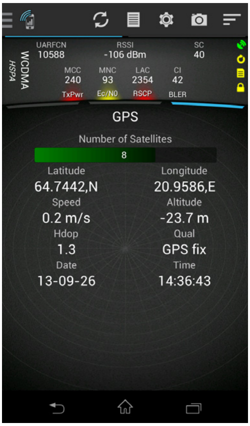
5.11.1. Indoor Map View

This view is not a regular data view, but it is included in the Location category. See chapter 7.

5.11.2. Outdoor Map View

This view is not a regular data view, but it is included in the Location category. See chapter 8.

5.11.3. GPS Data View



For the header, see sections 5.5.4–5.5.7.

This view always presents data either from the device's internal GPS or from an external GPS that is currently connected. How to select a GPS for use with TEMS Pocket is explained in section 20.3.

Number of Satellites: The number of satellites the GPS currently sees.

Latitude, Longitude: Latitude and longitude given in decimal degrees.

Speed: Speed in meters per second.

Altitude: Height above sea level in meters.

Hdop: Horizontal dilution of precision, HDOP.

Qual: Reads "GPS fix" if GPS fix obtained, otherwise left blank ("-").

Date: Date ("yy-mm-dd").

Time: Time of day ("hh:mm:ss", UTC).

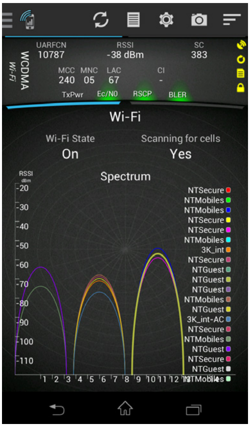
In a script, the use or non-use of GPS data is set in the general script properties; see section 9.2.1.

Manually, you can turn the GPS on and off by tapping the Menu button and under **Actions** selecting **Turn On GPS** or **Turn Off GPS**.

Regarding GPS use with TEMS Pocket generally, see chapter 20.

5.12. “Wi-Fi” Data View Category

5.12.1. Wi-Fi Data View



The header shown is that belonging to the cellular technology last used; see sections 5.5.4–5.5.7. However, the data mode is given as “Wi-Fi”.

Wi-Fi State: Indicates whether the Wi-Fi function in the device is active or not: “On” or “Off”.

Scanning for cells: Indicates whether Wi-Fi scanning is currently active: “Yes” or “No”.

Spectrum section

Here is shown the result of Wi-Fi scanning. Each detected Wi-Fi network is visualized as a lobe, associated in the legend with the network name (SS ID). The network the device is currently connected to is drawn with a thicker line (in the screenshot, the greenish yellow lobe on the right).

The height of a lobe indicates the RSSI (dBm) of that Wi-Fi network.

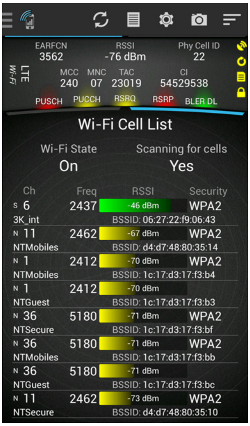
The width of a lobe represents the network’s allotted transmission bandwidth (fixed at 20 MHz in ▶ IEEE 802.11a/b/g; variable in ▶ IEEE 802.11n/ac). The numbers {1 ... 14} labeling the x-axis are the channel numbers defined in that standard.

Along the x-dimension is thus also visualized the overlap between Wi-Fi networks.

Please note that Wi-Fi access points with hidden SS ID cannot be detected by TEMS Pocket.

When Wi-Fi scanning is turned off, the graph is immediately cleared.

5.12.2. Wi-Fi Cell List Data View



The header shown is that belonging to the cellular technology last used; see sections 5.5.4–5.5.7. However, the data mode is given as “Wi-Fi”.

Wi-Fi State: Indicates whether the Wi-Fi function in the device is active or not: “On” or “Off”.

Scanning for cells: Indicates whether Wi-Fi scanning is currently active: “Yes” or “No”.

The rest of the view shows a list of Wi-Fi access points detected by Wi-Fi scanning. Up to eight access points are displayed, each belonging to one of the following categories:

- **S:** Serving
- **N:** Neighbor.

The categories are prioritized as listed above, neighbors being displayed as far as space allows. Within each category, cells are sorted by descending RSSI.

Ch: Channel number according to ▶ IEEE 802.11b/g/n.

Freq: Channel center frequency in MHz.

RSSI: Received Signal Strength (dBm).

Security: Wi-Fi security protocol: one of {WPA2, WPA, WEP} or none.

A string with the following information about each Wi-Fi access point appears on a separate line:

SS ID: Name of Wi-Fi network.

BSS ID: MAC address of Wi-Fi access point, given in hexadecimal format: “12:34:56:78:9a:bc”.

The cell file format (see appendix F) currently does not extend to Wi-Fi access points.

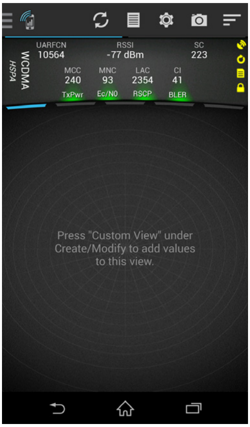
5.13. “Custom” Data View Category

This data view category holds empty data views whose contents you pick and choose yourself in any way you like. With the exception of bar charts, custom views are built from the same types of graphical elements that make up predefined views: line charts, value bars, values in text format, and static (descriptive) text labels.

A number of value elements which do not appear in any predefined data views can be presented in custom data views. These elements are listed in appendix D.

Up to five custom views can be populated.

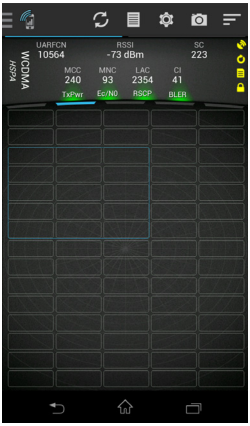
5.13.1. Editing Custom Data Views



At the outset, while still empty, a custom data view looks like this.

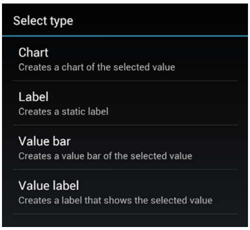
To start adding contents to the view, tap the Menu button, and under **Create/ Modify** select **CustomView**.

A grid of cells becomes visible. This grid is just an editing aid and is hidden again when you leave edit mode.



- Drag to select a rectangular area of any size in the grid. The selection is marked by a blue contour as shown in the screenshot. (If the view already contains other building blocks, the new one cannot overlap with any of those.)

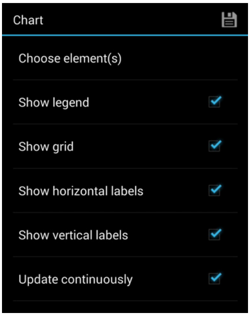
When you release your finger, a configuration dialog appears; see below.



A building block in a custom view can be of the following types:

- **Chart:** Line chart showing one or several value elements. See section 5.13.1.1.
- **Label:** Static text string, used for descriptive purposes. See section 5.13.1.2.
- **Value bar:** Horizontal bar whose length and color represent a value element. The value and unit are also printed as text on top of the bar. See section 5.13.1.3.
- **Value label:** Text-only presentation of value element. See section 5.13.1.4.

5.13.1.1. Chart Settings



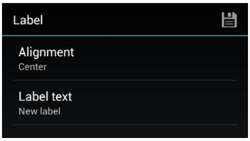
- **Choose element(s):** When you tap this field, a value element picker appears. Check all of the elements you want to display (up to five), then tap **OK**.
- **Show legend:** Check to display a legend in the chart, showing the current value of each value element and what colors are used to plot them.
- **Show grid:** Check to have a grid of horizontal and vertical lines drawn in the chart background.
- **Show horizontal labels:** Check to display value labels on the x-axis.
- **Show vertical labels:** Check to display value labels on the y-axis.
- **Update continuously:** If this is checked, the chart will update (the horizontal axis will scroll) at fixed time intervals, creating a smoother presentation. If the option is not checked, the chart will update whenever plotted quantities are updated by device reports, but not otherwise.

Labels can be displayed only if the grid is also drawn. In charts of small dimensions, it may be best to leave out the labels in order to avoid clutter.

Charts do not have an integrated title field; to name a chart, simply add a text label above or beside it.

To commit the chart to the custom view, tap the Save button in the top right corner.

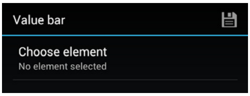
5.13.1.2. Label Settings



- **Alignment:** Horizontal alignment of the text label: left, right, or center.
- **Label text:** Enter the label text here.

Tap Save to commit.

5.13.1.3. Value Bar Settings



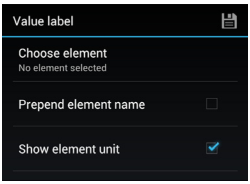
- **Choose element:** Tap to access a value element picker and select your value element. The coloring will by default follow the regular predefined color ranges: see appendix B.

The current value and the unit of the value element are printed on top of the bar. The appearance of this text string is not user-configurable.

The bar is always drawn from left to right in the allotted space. For this reason, value bars should always be oriented horizontally.

Tap Save to commit.

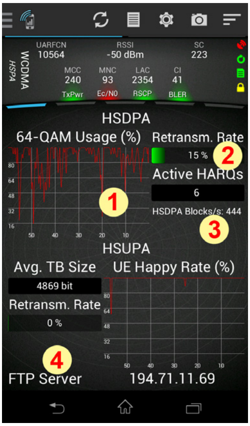
5.13.1.4. Value Label Settings



- **Choose element:** Tap to access a value element picker and select your value element.
- **Prepend element name:** Check to have the value label headed by the value element name plus a colon and space.
- **Show element unit:** Check to append the value element unit at the end of the label. Appears only for value elements that have a unit.

Tap Save to commit.

5.13.2. Example



For the header, see sections 5.5.4–5.5.7.

In this custom view, a selection of HSDPA and HSUPA value elements have been assembled, with the FTP server IP used for testing added at the bottom.

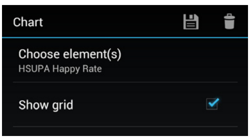
All types of custom view building blocks are represented here (most of them more than once):

1. Chart (with legend, grid, and labeled axes)
2. Value bar
3. Value label (with prepended value element name)
4. Label

5.13.3. Modifying an Existing Custom View

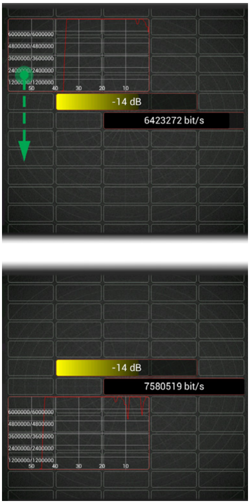
Tap the Menu button, and under **Create/Modify** toggle **CustomView** on if it is not turned on already.

- To edit the contents of a building block, simply tap it and the applicable dialog in section 5.13.1 will appear.



To delete a building block, tap it in the view, then tap the Delete button in the top right corner of the settings dialog.

- To replace a building block by a different one, delete the existing block and add a new one in the same space.



- You can move a building block to a different position by dragging it. The only restriction is that a building block cannot overlap with another. It is however perfectly possible to drag a building block across and past another, then drop it on the other side. See the screenshot sequence.
- You need to exit edit mode to be able to swipe left/right to a different custom view.

5.13.4. Saving and Transfer of Custom Views

Each custom view configuration is automatically saved on file, as detailed in section 4.4.2. You can transfer custom views to other TEMS Pocket devices by copying and pasting these files. Before TEMS Pocket can use a custom view file that has been shared in this way, the application must be restarted.

Custom views are also among the items you can download by synchronizing your TEMS Pocket device to an FTP server; see chapter 22.

5.14. “Messages” Data View Category

5.14.1. Events Data View

For the header, see sections 5.5.4–5.5.7.

This data view lists *events* generated by TEMS Pocket in order to inform you of various noteworthy occurrences. Full coverage of what event types exist and how they are presented is found in chapter 6.

By default this view is automatically refreshed, with each new event appearing at the top of the list. However, to be able to study the event flow at your leisure, you can freeze the data view by *dragging* the event list gently *downward*. While the view is frozen, further dragging actions cause the event list to scroll. The scrolling bar on the far right shows your current position in the list.

While the view is frozen, the notification bar (blue) at the top of the list indicates the number of new events that have occurred after you froze the view. In a logfile, these events are recorded normally, independently of the data view state.

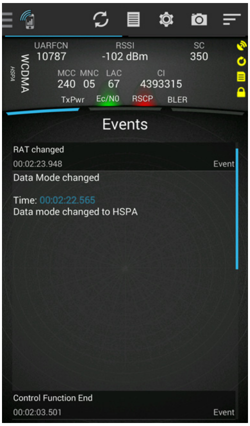
To return the data view to live mode, tap the **Scroll to top** link on the notification bar, or scroll manually all the way to the top of the event list. The view is then updated with all events that were queued while the view was frozen.

The event timestamps have 1 ms resolution.

You can view the full details of an event by tapping it. See section 5.14.1.1.

5.14.1.1. Viewing Event Details

When you tap an event, it is expanded to show any additional information that it carries, as detailed in section 6.3.



In all mobile phone implementations of TEMS Pocket, the additional event information is displayed inline as an expansion of the event list item. On tablets, however, the plain-text decoding is displayed separately to the right of the event list (see chapter 23).

- *Double-tap* the additional information field to hide it again. Alternatively, you can tap the Back button.

5.14.1.2. Showing and Hiding Events of Specific Types

You can toggle the visibility of any type of event as follows, as explained in section 6.2:

Tap the Menu button, and under **Create/Modify** select **Appearance**.

- Tap the **Events** category.

For an event that appears in the Events data view, there are some shortcuts:

- Long-press the event of interest. In the context menu that appears:
  - Choose **Hide this message type** to suppress all events of this type in the data view.
  - Choose **Show only this message type** if you want to show only events of this type and hide all others.

If you want to show hidden events again, go to **Appearance** → **Events** and check the **Show in list** option for each (or revert to the default settings, according to which all events will display in the data view). Again, see section 6.2.

5.14.1.3. Clearing the Events Data View

- To clear all contents in the Events data view, long-press any event in the list and choose **Clear list** from the context menu that appears.

The Events data view can hold up to 2,000 events. After this number is exceeded, the oldest event drops out whenever a new event is generated.

While the view is frozen, up to 1,999 events can be buffered for later presentation. Any events in excess of that number will not appear when the view is released (but in a logfile, all events are always recorded).

5.14.2. Layer 3 Messages Data View

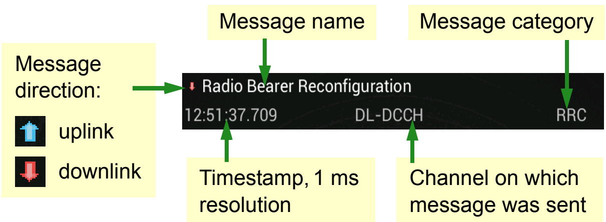
For the header, see sections 5.5.4–5.5.7.

This data view lists Layer 3 messages transmitted and received by the device. All technologies are covered; that is, whatever subset of GSM, WCDMA, LTE, CDMA, and EV-DO the device supports.

The view has the same freezing mechanism and other interactivity features as the Events view, as described in section 5.14.1.

You can view the full plain-text decoding of a message by tapping it; see section 5.14.2.2.

For each message, the following information is provided in the data view:



5.14.2.1. Layer 3 Message Categories

Each Layer 3 message belongs to one of the following categories:

GSM/WCDMA

- **CBS**, Cell Broadcast Service
- **CC**, Call Control

- **GMM**, GPRS Mobility Management
- **LLC**, Logical Link Control
- **MM**, Mobility Management
- **RLC/MAC**, Radio Link Control/Medium Access Control
- **RR**, Radio Resource (Management)
- **RRC**, Radio Resource Control
- **SM**, Session Management
- **SMS**, Short Message Service
- **SS**, Supplementary Services

LTE

- **EMM**, EPS (Evolved Packet System) Mobility Management
- **ERRC**, EPS Radio Resource Control
- **ESM**, EPS Session Management

CDMA

> **Note:** These designations are channel types, but are displayed on the far right as message categories. The channel field in the middle is empty for CDMA.

- **ACH**, Access Channel
- **FTCH**, Forward Traffic Channel
- **PCH**, Paging Channel
- **RTCH**, Reverse Traffic Channel
- **SCH**, Supplemental Channel

EV-DO

- **ACH MAC**, Access Channel MAC
- **Addr. Mgmt**, Address Management
- **Air Link Mgmt**, Air Link Management
- **Authentication**

- **CCH MAC**, Control Channel MAC
- **Conn. State**, Connected State
- **Encryption**
- **FTCH MAC**, Forward Traffic Channel MAC
- **Idle State**
- **Init. State**, Initialization State
- **Key Exchange**
- **MM Cap. Disc.**, Multimode Capability Discovery
- **Overhead Msgs**, Overhead Messages
- **Packet Cons.**, Packet Consolidation
- **Physical Layer**
- **Route Update**
- **Security**
- **Session Cfg**, Session Configuration
- **Stream**
- **Stream0**, **Stream1**, **Stream2**, **Stream3**
- **Virtual Stream**

5.14.2.2. Plain-text Decoding of Layer 3 Messages

When you tap a Layer 3 message, its contents are displayed in plain-text decoded format. The mechanics of the presentation are the same as for event details in the Events view; see section 5.14.1.1.

5.14.2.3. Showing and Hiding Layer 3 Messages of Specific Types

This works the same way as in the Events data view; see section 5.14.1.2.

5.14.2.4. Clearing the Layer 3 Messages Data View

This, too, is handled just as in the Events data view; see section 5.14.1.3. Everything said there about how the event queue is managed also applies equally to Layer 3 messages.

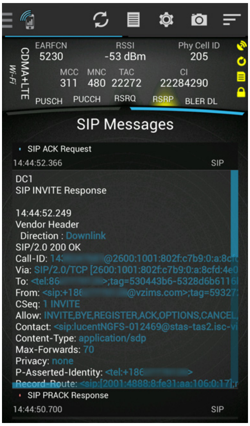
5.14.3. SIP Messages Data View

For the header, see sections 5.5.4–5.5.7.

This data view lists SIP messages transmitted and received by the device.

The view has the same freezing mechanism and other interactivity features as the Events view, as described in section 5.14.1.

5.14.3.1. Plain-text Decoding of SIP Messages



When you tap a SIP message, its contents are displayed in plain-text decoded format. The mechanics of the presentation are the same as for event details in the Events view; see section 5.14.1.1.

5.14.3.2. Showing and Hiding SIP Messages of Specific Types

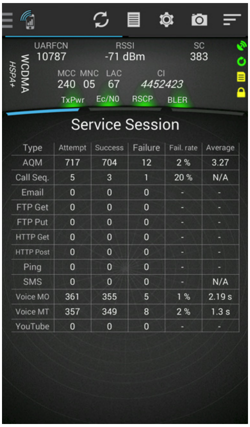
This works the same way as in the Events data view; see section 5.14.1.2.

5.14.3.3. Clearing the SIP Messages Data View

This, too, is handled just as in the Events data view; see section 5.14.1.3. Everything said there about how the event queue is managed also applies equally to SIP messages.

5.15. “Statistics” Data View Category

5.15.1. Service Sessions Data View



For the header, see sections 5.5.4–5.5.7.

Here are shown statistics on scripted service sessions for services supported in TEMS Pocket.

Type: Type of service.

Attempt: Number of attempted sessions.

Success: Number of successfully completed sessions.

Failure: Number of failed sessions.

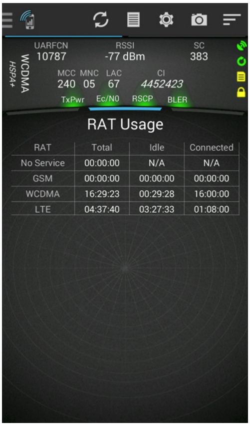
Fail. rate: Percentage of sessions that failed, equal to (**Failure** / **Attempt** × 100) rounded off to the nearest integer.

Average:

- AQM: Average MOS score.
- Call sequence: Not applicable.
- Email, FTP, HTTP, YouTube: Average application-level throughput.
- Ping: Average round-trip delay.
- SMS: Not applicable.
- Voice: Call setup time.

After one session, the value might not be identical to that reported in the service session “end” event; this is due to differences in the methods of computation (handling of fractions of seconds). Usually, the values are very close.

5.15.2. RAT Usage Data View



RAT usage shown as percentage of total in this screenshot. For the header, see sections 5.5.4–5.5.7.

This view shows statistics on the device’s RAT usage. For each RAT is shown the following:

Total: Total time spent using this RAT.

Idle: Time spent in idle mode.

Connected: Time spent in connected/dedicated mode.

See also below. An additional row is provided for the “No service” state (total time only).

Only RATs supported by the device when running TEMS Pocket appear in the table. Exception: In Controller mode, where this view is shown for the current agent, all technologies appear (GSM, WCDMA, LTE, CDMA, EV-DO).

Tap the table to switch between absolute values (time in the format “hh:mm:ss”) and percentages.

To reset all metrics in this view:

Tap the Menu button, and under **Settings** select **Reset Statistics**.

The view is not reset when TEMS Pocket is restarted.

5.15.2.1. Details on Idle and Connected Mode Statistics

The concept of “connected mode” also covers GSM dedicated mode and is necessarily not quite homogeneous across all of the supported technologies. The table that follows indicates how idle and connected mode are defined for the purposes of this data view, based on the values of suitable value elements:

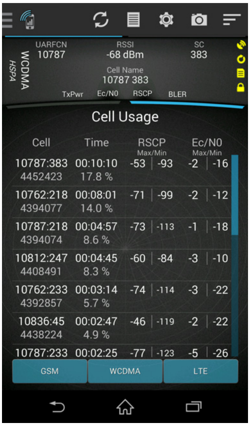
RAT	State Value Element	Idle	Connected
GSM	GSM Channel Type	BCCH	PDTCH, SDCCH, TCH/F, TCH/H

RAT	State Value Element	Idle	Connected
WCDMA	WCDMA RRC State	RRC Idle, CELL_PCH, URA_PCH	CELL_FACH[1], CELL_DCH
LTE	LTE RRC State	RRC Idle	RRC Connected
CDMA	CDMA RF Mode	Init, Inactive, Idle	Access, Acquisition, Connected, Sync, Traffic
EV-DO	EV-DO RF Mode		

1. In state CELL_FACH, a data service session is assumed to be running, which is a slight simplification.

If TEMS Pocket is unable to determine the mode with certainty for some time segment, that time is not assigned to either mode, so that the sum of Idle and Connected will then not add up to the total.

5.15.3. Cell Usage Data View



For the header, see sections 5.5.4–5.5.7.

This view shows statistics on cell usage. The current serving cell or strongest cell in the active set always appears on top, while other cells are ranked according to the total time they have been used. The list is scrollable and can hold up to 16 cells.

Separate statistics are maintained for each RAT supported by the device when running TEMS Pocket. In Controller mode, where this view is shown for the current agent, all of GSM, WCDMA, LTE, CDMA, and EV-DO appear. To switch the view to a different RAT, tap the corresponding button at the bottom of the view.

For each cell, the following data is given:

Cell column: Channel and code (e.g. UARFCN:SC for WCDMA); cell identity (not shown for CDMA/EV-DO).

Time column: Time spent on this cell ("hh:mm:ss"); also expressed in percent of the total.

Third column: Highest and lowest signal strength measured, e.g. RSCP (dBm) for WCDMA.

Fourth column: Highest and lowest signal quality measured, e.g. E_c/N_0 (dB) for WCDMA.

For cells that are not uniquely identified (for example, if the SC is obtained but not the UARFCN), only the Time column is populated, and the remaining columns are invalid.

To reset all metrics in this view:

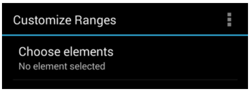
Tap the Menu button, and under **Settings** select **Reset Statistics**.

The view is not reset when TEMS Pocket is restarted.

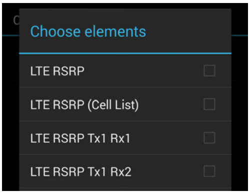
5.16. Customizing Ranges and Colors in Value Element Presentation

It is possible to modify the default graphical presentation of value elements, defined in section 5.5 (for data view headers) and in appendix B. You can both replace colors and change the value ranges to which the colors are applied.

Tap the Menu button, and under **Create/Modify** select **Appearance**. On the screen that follows, select **Ranges**.



- Tap **Choose elements**.

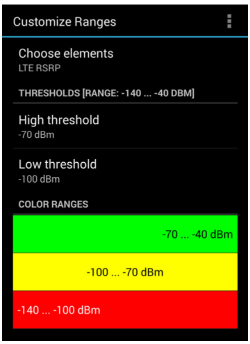


Value thresholds for color switching can only be edited for one element at a time. New colors, on the other hand, can be applied to multiple value elements in one go.

Please note that certain elements occur in several variants which are presented in different places in the user interface. For example, there is one LTE RSRP (with no suffix) occurring in the data view header and another occurring in the LTE Cell List view.

- Check the value element(s) you want to edit, then tap **OK**.

5.16.1. Customizing a Single Value Element



If you have selected a single value element, a section **Thresholds** appears with attributes **High threshold** and **Low threshold**. They determine the points of transition between the "high", "intermediate", and "low" colors, as illustrated in the **Color ranges** section. The latter shows the current color attributes of the value element and the value ranges currently assigned to each color.

- Tap a threshold to edit it. The value ranges printed on top of the colors will adjust accordingly.
- To edit a color attribute, tap the appropriate color bar.

In the color picker, you define a color in terms of its hue, saturation, and brightness.

- To adjust the hue, move the slider on the vertical bar on the right.
- To adjust the saturation, move the small circle horizontally within the gradient box.
- To adjust the brightness, move the circle vertically.

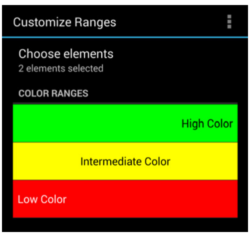
The tile to the left of the arrow shows the color set for this color attribute before you started editing it. The tile to the right of the arrow shows the currently selected color.

Among the tiles at the bottom, the first row holds recently selected colors, while the second row holds some frequently used standard colors.

Tap any of these tiles to (re)use the corresponding color.

- When you have settled on a color to use, tap the **Done** button. In the **Color ranges** section, the edited color attribute is repainted to reflect the change.
- Repeat for any other colors you wish to change.

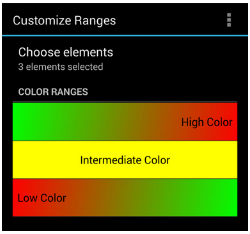
5.16.2. Customizing Multiple Value Elements



If you have selected multiple value elements to customize, you can only edit their color attributes, assigning the same range of colors to all of these elements. In this case, the attributes are labeled simply **High Color**, **Intermediate Color**, and **Low Color**.

- Tap a color attribute to edit it, just as described in section 5.16.1.

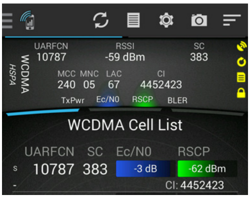
Editing Value Elements with Dissimilar Colors



If the existing color ranges are differently defined among the selected value elements, the **Color ranges** section will show gradients composed of all colors that occur. In the screenshot, some elements use green (= “good”) for high values and red (= “bad”) for low ones, whereas other elements reverse this pattern. A notification “Multiple colors used!” also appears in this case.

In the color picker, the “current color” tile (left) likewise shows a gradient composed of all colors currently used by some value element for this attribute.

5.16.3. Presentation of Customized Ranges and Colors



The new value range and color settings are immediately applied in data views and data view headers. No restart of TEMS Pocket is needed.

In this example, High Color has been changed to blue for WCDMA E_c/N_0.

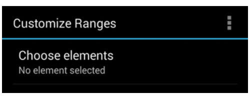
5.16.4. Resetting the Value Element Presentation

Here is how to restore the default ranges and color attributes for value elements.

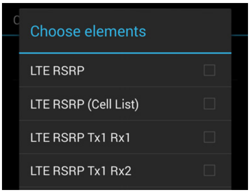
Tap the Menu button, and under **Create/Modify** select **Appearance**. On the screen that follows, select **Ranges**.

To reset the presentation of all value elements, tap the Overflow button and select **Reset all**.

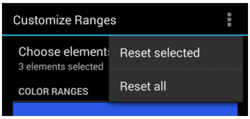
- To reset the presentation of a specified subset of value elements, do as follows:



- Tap **Choose elements**.



- Check the value elements you want to reset. Then tap **OK**.



Tap the Overflow button and select **Reset selected**. When prompted to confirm, tap **Yes**.

5.16.5. Exporting and Importing Value Element Presentation Settings

This export is done in conjunction with other presentation settings and is covered in section 6.5.

6. Events and Messages

TEMS Pocket displays *events* to indicate a variety of occurrences that are worthy of note. A large number of events are predefined; you can also define custom events of your own.

Events in TEMS Pocket 15.1 subdivide into the following categories:

- Radio events
- Session events (also includes logfile recording events)
- System events (related to device operation)
- Custom events

Presentation options for events are shared by *Layer 3* and *SIP messages* displayed in the application, so that sections 6.1 and 6.2 are equally applicable to these messages.

6.1. Presentation in Data Views

The main vehicle of presentation for events is the Events data view, which is described in section 5.14.1.

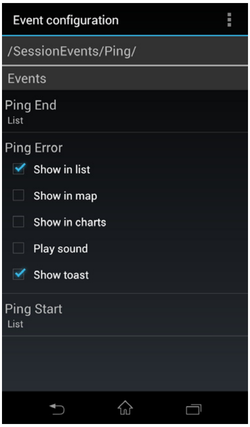
Similar data views are provided for Layer 3 messages (section 5.14.2) and SIP messages (section 5.14.3).

6.2. Presentation Options for Events and Messages

Besides being listed in data views, events and messages can be presented in a number of other ways. This is configured from the Event Configuration menu.

Tap the Menu button, and under **Create/Modify** select **Appearance**. On the screen that follows, select **Events**.

- Navigate the hierarchy of events and messages to locate the individual item or group of items you want to change settings for. The following options exist:



Show in list: List occurrences of this event or message in the relevant data view.

Show in map: Plot this event or message along routes in map views. For such plotting to be enabled, the “Events” layer must be selected for displaying in the map view: see sections 7.7 and 8.6.

Show in charts: Indicate this event or message in data view line charts.

Play sound: Play an audio alert when this event or message occurs.

Show toast: Briefly display a notification (“toast” in Android parlance) at the bottom of the screen when this event or message occurs.

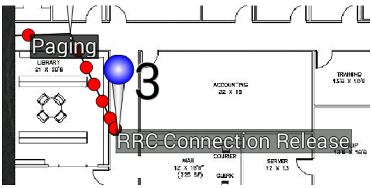
Each of these presentation options (other than the data views) is exemplified in the subsections that follow.

To revert to the default settings for all events and messages, do the following at the top level in the Event Configuration menu:


Tap the Overflow button and select **Reset**.

6.2.1. Presentation in Map Views

The event or message name is displayed as a framed text label centered on the point along the route where the event was generated or the message sent/received.



If the positions of several events or messages are close enough that their labels would overlap, only the most recent item is displayed.

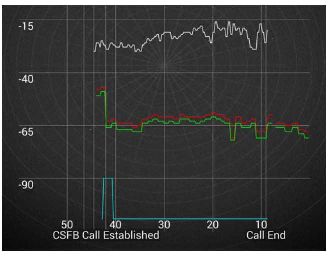
6.2.1.1. Indoor Map Specific Features

(What is said of events here applies analogously to messages.)

- If you *tap* an event briefly, a box with event details appears (the same details as when you expand the event in the Events view: see section 5.14.1). See the bottom right part of the screenshot.
- If you *long-press* an event, a list of events appears, identical in format with the Events view list and sensitive to tapping and scrolling. See the top right part of the screenshot. If you select an event in the list, it will always be plotted on the map, taking precedence over any other events that occurred at or near the same spot.

6.2.2. Presentation in Data View Line Charts

A horizontal line in the chart, accompanied by a descriptive text label below the x-axis, indicates the precise time when an event or message occurred.



Again, if several events or messages occur so close in time that their labels would collide, the label is displayed only for the most recent item, and the others are represented only by a horizontal line.

6.2.3. Presentation by Audio Alerts

Events and messages can also be announced by means of spoken audio alerts. Speech synthesis is used to produce this audio.

6.2.4. Presentation in Notification Boxes

Finally, events and messages can be presented as notifications (“toasts”) appearing briefly at the bottom of the screen.

6.3. List of Predefined Events

This section lists all events that are predefined in TEMS Pocket, along with any extra information that they carry. More detailed descriptions are provided for call events and other events that require it.

Events which are by default shown in line charts are tagged with an “**L**” in the tables that follow.

Events which are by default shown in map views are tagged with an “**M**”.

6.3.1. Radio Events

For SIP events generated in the course of VoLTE calls, see section 6.3.2.

6.3.1.1. Call Events: GSM/WCDMA

These call events are generated on GSM and WCDMA networks.

All GSM/WCDMA call events have Call Control id as extra information. This is usually zero, but may take a value between 1 and 6 in case of multiple concurrent voice calls. Call Control id is omitted from the table below.

Event Name	Description/Extra Information
Blocked Call **L M**	Call abnormally ended prior to Call Established event (for example because all traffic channels were busy). **Extra information:** CC cause

Event Name	Description/Extra Information
Call Attempt **L M**	*GSM:* A traffic channel was requested (through the Layer 3 message Channel Request). Note that the request could also be for a signaling channel, in which case no call is actually attempted; the two types of request cannot be distinguished. *WCDMA:* An RRC Connection Request was sent following initiation of an MO or MT call. **Extra information:** Call direction (MO/MT)
Call End **L M**	Normally triggered by the CC message Release. **Extra information:** Call end cause (MS initiated/ NW initiated/Unknown), Call duration
Call Established **L M**	Triggered by the Layer 3 message Connect (MO call) or Connect Acknowledge (MT call). **Extra information:** Call direction (MO/MT)
Call Setup **L M**	Triggered by one of the Layer 3 messages Alerting or Connect. **Extra information:** Call direction (MO/MT), Call setup time (measured from Call Attempt, i.e. the *first* call attempt)
Dropped Call **L M**	Call ended abnormally after Call Established event. **Extra information:** CC cause

CS Fallback from LTE to GSM/WCDMA

Event Name	Description/Extra Information
CSFB Call Attempt **L M**	Triggered by the Layer 3 message NAS Extended Service Request. Generated while the device is still connected to the LTE network. **Extra information:** Call direction (MO/MT)

Event Name	Description/Extra Information
CSFB Call Established **L M**	Triggered by the Layer 3 message Connect (MO call) or Connect Acknowledge (MT call). **Extra information:** Call direction (MO/MT)
CSFB Call Setup **L M**	Triggered by the Layer 3 message Alerting. **Extra information:** Call direction (MO/MT); Call setup time (measured from CSFB Call Attempt, i.e. the *first* call attempt)

A CSFB blocked call gives rise to a regular Blocked Call event.

CS Fallback from LTE to CDMA: ECSFB

The same CSFB events are generated for ECSFB as well.

6.3.1.2. Call Events: CDMA

These call events are generated on CDMA networks.

The designation "MR" below refers to device mode reports.

Event Name	Description/Extra Information
Blocked Call **L M**	Triggered by one of the following: • Unexpected change to idle or init state before Call Established • CM Call Event (MR) message with "Block or Drop" event received • Generalized Searcher General Status (MR) message received with Searcher State = "Acquisition" or "Sync" and no data session in progress • CM State Response (MR) message with CM System Mode "No Service" event received. **Extra information:** Blocked type ("No Service" or "Unknown Block Type")

Event Name	Description/Extra Information
Call Attempt **L M**	*MO call:* Origination (ACH) message sent with a voice Service Option. *MT call:* Page Response (ACH) message received with a voice Service Option. **Extra information:** Call direction (MO/MT)
Call Attempt Retry **L M**	A call attempt (see Call Attempt) was repeated.
Call End **L M**	Triggered by Order (RTCH) or Order (FTCH) message with order code “Release”, or CM Call Event (MR) message with “Call End” event received. **Extra information:** Call duration
Call Established **L M**	*MO call:* Triggered by Service Connect Completion (RTCH) message, and thus generated immediately after Call Setup. *MT call:* Order (RTCH) message with order code “Connect”. **Extra information:** Call direction (MO/MT)
Call Setup **L M**	Triggered by Service Connect Completion (RTCH) message. **Extra information:** Call direction (MO/MT), Call setup time

Event Name	Description/Extra Information
Dropped Call **L M**	Triggered by one of the following: • Unexpected change to idle or init state after Call Established • CM Call Event (MR) message with "Block or Drop" event received • Generalized Searcher General Status (MR) message received with Searcher State = "Acquisition" or "Sync" and no data session in progress • CM State Response (MR) message with CM System Mode "No Service" event received. **Extra information:** Call duration

CS Fallback from LTE to CDMA

Event Name	Description/Extra Information
CSFB Call Attempt **L M**	Triggered by the Layer 3 message NAS Extended Service Request. Generated while the device is still connected to the LTE network. **Extra information:** Call direction (MO/MT)
CSFB Call Established **L M**	Same triggers as for CSFB Call Setup, and generated immediately after that event. **Extra information:** Call direction (MO/MT)

Event Name	Description/Extra Information
CSFB Call Setup **L M**	Triggered by one of the following: • Fast Forward Power Control (MR) • Fast Forward Power Control Statistics (MR) • Reverse Power Control Statistics (MR) message with Service Option (1), (3), (17), (38) or (68), each of which specifies a type of voice service. • Status Snapshot Response (MR) with CDMA Mode = “Init”, “Idle”, or “Access” after a previous Service Option triggered event was dismissed (aborted). **Extra information:** Call direction (MO/MT); Call setup time (measured from CSFB Call Attempt, i.e. the *first* call attempt)

6.3.1.3. Intersystem Events

Event Name	Description/Extra Information
Handover From EUTRA **L M**	Successful handover from EUTRAN to UTRAN. **Extra information:** • Handover type: PS or SRVCC • Source RAT, target RAT • Handover interruption time, measured from Mobility From EUTRA Command (with Handover To UTRAN indication) to Handover To UTRAN Complete.

6.3.1.4. Other Radio/Data Mode Events

Event Name	Description/Extra Information
Cell Changed **L**	The device changed to a different cell within the same RAT and on the same channel/carrier. **Extra information:** • *GSM:* ARFCN, Old BSIC, New BSIC • *WCDMA:* UARFCN, Old SC, New SC • *LTE:* EARFCN, Old PCI, New PCI • *CDMA/EV-DO:* RF Channel, Old PN, New PN
Channel Changed **L**	The device changed to a different channel/carrier within the same RAT. **Extra information:** • *GSM:* Old ARFCN, New ARFCN • *WCDMA:* Old UARFCN, New UARFCN • *LTE:* Old EARFCN, New EARFCN • *CDMA/EV-DO:* Old RF channel, New RF channel
Data Mode Changed	The device changed to a different data mode. **Extra information:** • Old data mode, New data mode (each being one of those listed in section 5.5.1)
RAT Changed **L M**	The device changed to a different RAT. **Extra information:** Old RAT, New RAT (each being one of "GSM", "WCDMA", "LTE", "CDMA", "EV-DO")

6.3.2. SIP Events

Event Name	Description/Extra Information
SIP Blocked Call	Call abnormally ended prior to SIP Call Established event. **Extra information:** Cause
SIP Call Attempt	Triggered by SIP Invite Request. **Extra information:** Call direction (MO/MT); Caller id of remote party
SIP Call Attempt Retry	Triggered by SIP Invite Request with same call id as in a preceding SIP Call Attempt. **Extra information:** Call direction (MO/MT); Caller id of remote party
SIP Call Established	Triggered by SIP Invite Response with status code 200 = OK. **Extra information:** Call direction (MO/MT)
SIP Call Setup	Triggered by SIP Invite Response with status code 180 = Ringing. **Extra information:** Call direction (MO/MT), Call setup time (measured from SIP Call Attempt, i.e. the *first* call attempt); Caller id of remote party
SIP Dropped Call	Call ended abnormally after SIP Call Established event. **Extra information:** Cause
SIP End Call	Triggered by SIP Bye. **Extra information:** Call end cause (MS initiated/ NW initiated), Call duration
SIP Registered	Triggered by SIP Register Response with status code 200 = OK (if not already registered)
SIP Registration Failure	SIP registration failed. **Extra information:** Cause

Event Name	Description/Extra Information
SIP Unregistered	Device unregistered from SIP server.

6.3.3. Session Events

Among these events, all “End” events imply successful completion of the session.

6.3.3.1. AQM Events

Event Name	Description/Extra Information
AQM Start	Dialed number, AQM mode, Duration
AQM End	AQM mode, AQM samples, AQM score: min./avg./max.
AQM Error	Cause
Call Sequence Start	Dialed number, AQM algorithm, Call duration, Number of MT calls, Number of MO calls, Interval, Number of iterations
Call Sequence End	Number of iterations, SO call outcome, MO call statistics (successes/failures/total), MT call statistics (successes/failures/total), MOS statistics (min./avg./max.)
Call Sequence Error	Number of iterations, SO call outcome, MO call statistics (successes/failures/total), MT call statistics (successes/failures/total), MOS statistics (min./avg./max.)

6.3.3.2. Control Function Events

Event Name	Description/Extra Information
Control Function Start	(No extra information)

Event Name	Description/Extra Information
Control Function End	Control function successfully applied
Control Function Error	Control function unsuccessfully applied

6.3.3.3. Controller/Agent Events

Event Name	Description/Extra Information
Agent Connected	Agent name, Agent id
Agent Disconnected	Agent name, Agent id
Agent Script Start	Agent name, Agent id, Script name
Agent Script End	Agent name, Agent id

6.3.3.4. Email Events

Event Name	Description/Extra Information
Email Start	Recipient, SMTP server address and port, Security, Number of emails
Email End	Avg. throughput, Avg. transfer time
Email Error	Successes, Success ratio, Failures, Failure ratio, Cutoff ratio, Avg. throughput, Avg. transfer time
Email Send Success	Avg. throughput, Message size, Transfer time
Email Send Failure	Cause, Avg. throughput, Transfer time

6.3.3.5. FTP Events

These are triggered both by FTP service testing and by logfile upload over FTP.

Event Name	Description/Extra Information
FTP Connected To Server	FTP server IP address, Connection time, Sequence number of FTP download instance
FTP Start	Direction (UL/DL), FTP server host name, File name, FTP port, User name on FTP server, Time after which to end session, Number of parallel instances
FTP Transfer Complete	Sequence number of FTP download instance completed
FTP End	Direction (UL/DL), Avg. throughput, Duration of session
FTP End Session After Time	Session time
FTP Error	Direction (UL/DL), Cause

6.3.3.6. HTTP Events

These events are triggered by HTTP Get service testing.

Event Name	Description/Extra Information
HTTP Start	URL, Time after which to end session
HTTP End	Avg. throughput, Duration of session
HTTP End Session After Time	Session time
HTTP Error	Cause

6.3.3.7. HTTP Upload Events

These events are triggered both by HTTP Post service testing and by logfile upload over HTTP.

Event Name	Description/Extra Information
HTTP Upload Start	Method (always Post), URL, Authentication (Yes/No), User name, Time after which to end session (HTTP Post only)
HTTP Upload End	Avg. throughput, Transfer time, Total bytes
HTTP Upload End Session After Time	Session time
HTTP Upload Error	Cause, Throughput and transfer time for the upload

6.3.3.8. Idle Events

Event Name	Description/Extra Information
Idle Start	Duration of Idle action
Idle End	(No extra information)
Idle Error	Time left of Idle action

6.3.3.9. IP Capture Events

Event Name	Description/Extra Information
IP Capture Start	(No extra information)
IP Capture End	Number of packets captured
IP Capture Error	Error message

6.3.3.10. Logfile Events

Event Name	Description/Extra Information
Logfile Start	(No extra information) Generated for all types of logfile recording.
Logfile Stop	(No extra information) Generated for all types of logfile recording.
Logfile Error	Error message
Filemark	The user inserted a filemark into the logfile being recorded. The filemark text is supplied as extra information with the event. See section 10.5.

6.3.3.11. Logfile Upload Events

These events are triggered for upload over FTP only.

Event Name	Description/Extra Information
Logfile Upload Start	Number of logfiles to be uploaded
Logfile Upload End	(No extra information)
Logfile Upload Error	Number of logfiles uploaded when error occurred

6.3.3.12. OnDevice Events

These events are provided to ease handling of technical support issues concerning Ascom on-device software. They are not of immediate interest to TEMS Pocket users.

6.3.3.13. Parallel Execution Events

Event Name	Description/Extra Information
Parallel Execution Start	(Extra information dependent on constituent actions)
Parallel Execution End	(Extra information dependent on constituent actions)
Parallel Execution Error	(Extra information dependent on constituent actions)

6.3.3.14. Ping Events

Event Name	Description/Extra Information
Ping Start	Host, Number of pings
Ping End	Round-trip time statistics (min./avg./max.)
Ping Error	Latest error cause *or* indication of timeout(s), Ping statistics (success/timeout/error), Round-trip time statistics (min./avg./max.)

6.3.3.15. Scanner Events

Event Name	Description/Extra Information
External Scanner Connected	An external scanner has been connected and detected by TEMS Pocket. – Scanner model, various device information
External Scanner Disconnected	An external scanner has been disconnected from TEMS Pocket. – Scanner model
Scan Start	Connection type, Technologies
Scan End	(No extra information)
Scan Error	Cause

Event Name	Description/Extra Information
CDMA Scan Start	Scan type, Bands/channels
EVDO Scan Start	Scan type, Bands/channels
GSM Scan Start	Scan type, Bands/channels
LTE Scan Start	Scan type, Bands/channels
WCDMA Scan Start	Scan type, Bands/channels

6.3.3.16. Script Events

Event Name	Description/Extra Information
Script Start	Script name
Script Iteration	Sequence number of the iteration started
Script End	Script execution time, Number of iterations, Number of successful actions, Number of failed actions
Maximum Duration Triggered	Service name, Maximum duration set

6.3.3.17. SMS Events

Event Name	Description/Extra Information
SMS Start	Sequence number of SMS, Phone number, Number of SMS messages to send, Text size, Delivery report flag, Delivery timeout, Send timeout
SMS End	Access delay (min./avg./max.), End-to-end time (min./avg./max.)
SMS Error	Failure ratio, Access delay (min./avg./max.), End-to-end time (min./avg./max.)

Event Name	Description/Extra Information
SMS Send Start	Sequence number of SMS
SMS Send Success	Access delay, End-to-end time
SMS Send Failure	Cause

6.3.3.18. Synchronize Events

Event Name	Description/Extra Information
Synchronize Start	FTP server URL, Items selected (Yes/No for each), Overwrite files (Yes/No)
Synchronize End	Number of files synchronized for each item
Synchronize Error	Cause, Number of files synchronized for each item (if any)

6.3.3.19. Voice Events

Event Name	Description/Extra Information
Voice MO Start	Dialed number
Voice MO End	(No extra information)
Voice MO Error	Cause
Voice MT Start	Audio source, Use of audio path filtering
Voice MT End	Call duration
Voice MT Error	Cause, Call duration
Voice MT Call Received	Caller id

6.3.3.20. Wi-Fi Events

Event Name	Description/Extra Information
Wi-Fi Enable	(No extra information)
Wi-Fi Disable	(No extra information)
Wi-Fi Start	(No extra information)
Wi-Fi End	(No extra information)
Wi-Fi Error	Cause

6.3.3.21. YouTube Events

Event Name	Description/Extra Information
YouTube Start	Video id, Streaming duration Generated at start of action.
YouTube End	(No extra information)
YouTube Error	Cause
YouTube Session Timeout	Session time
YouTube Video Start	(No extra information) If the script action points to a non-existent YouTube video, the cause is stated as “Internal error”.
YouTube Video End	(No extra information)
YouTube Video Error	(No extra information; for error cause, see YouTube Error event)

6.3.3.22. Success Criteria for “Parallel” Action

The outcome of the Parallel action depends on how the **Abort condition** parameter is set (see section 9.4) and on the outcomes of the individual services run:

Abort Condition	Service Result	Parallel Result
Stop at all done	No failures	Success
	At least one failure	Failure
Stop at first done	First service succeeded	Success
	First service failed	Failure
Stop at first success	No service failed before first service finished with success	Success
	At least one service failed before first service finished with success	Failure
	No service succeeded	Failure
Stop at first error	No failures	Success
	At least one failure	Failure

6.3.4. System Events

These events relate to the operation of the TEMS Pocket device.

Event Name	Description/Extra Information
Battery Low	The battery level has dropped below 10%.
Ext Memory Card Error	An error occurred in communicating with the external memory card. – Error message
GPS Connected	An external GPS has been Bluetooth paired and connected in Android.
GPS Disconnected	An external GPS has been disconnected in Android.
GPS Position Found	The GPS currently in use has started reporting valid positions. – New valid position

Event Name	Description/Extra Information
GPS Position Lost	The GPS currently in use has stopped reporting valid positions. – Last valid position
Low Disk Space	There is less than 20 MB disk space remaining.

6.4. Custom Events

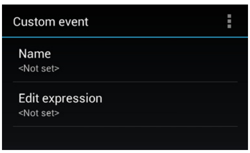
Besides the predefined events, you can create your own custom-made events which are based on TEMS Pocket value elements satisfying given conditions. Such conditions can be combined into complex boolean expressions.

6.4.1. Creating Custom Events

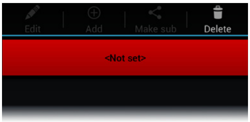
To create a custom event:

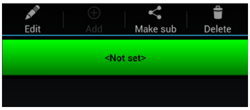
Tap the Menu button, and under **Create/Modify** select **Custom Events**.

Tap the Overflow button and select **Add custom event**.



- Under **Name**, enter a name for the custom event.
- Then tap **Edit expression** to define the event’s trigger condition.





You now enter a graphical interface where you build the boolean expression for the event.

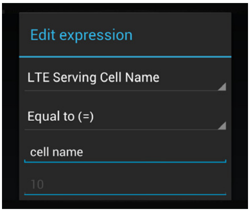
At the outset, a solitary red bar is displayed. The bar represents a condition of the form “<value element> <relational operator> <value>”, for example “LTE RSSI < –90 [dBm]”. The red color means that the condition has not been defined yet. Proceed as follows:

- Tap the bar. Its color changes to green, meaning that it is currently selected for editing. At the top of the screen, a toolbar of buttons appears.

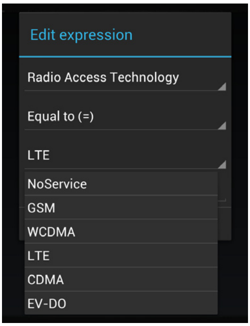
To define this condition, tap the **Edit** button. A pop-up dialog appears which is gone through in section 6.4.1.1 below.

6.4.1.1. Defining a Value Element Condition

Numerical value element



Text-format value element



Enumerable value element

This dialog contains four fields.

Field 1: Select the **value element** to which the condition should apply.

Field 2: Select a **relational operator**, one of: <, <=, >, >=, =, or !=. For text-format and enumerable value elements, only = and != are available.

Field 3: Enter the **value** to which the value element should be compared.

Field 4: Enter a **hysteresis** value. This parameter applies to conditions involving one of the operators <, <=, >, or >=. When taken into account, the hysteresis has the following effect:

- After an expression $x > y$ or $x >= y$ has evaluated to true, it will be considered false until after the following has been true at some point: $x < y - Hyst$.
- After an expression $x < y$ or $x <= y$ has evaluated to true, it will be considered false until after the following has been true at some point: $x > y + Hyst$.

See also below as well as section 6.4.2.

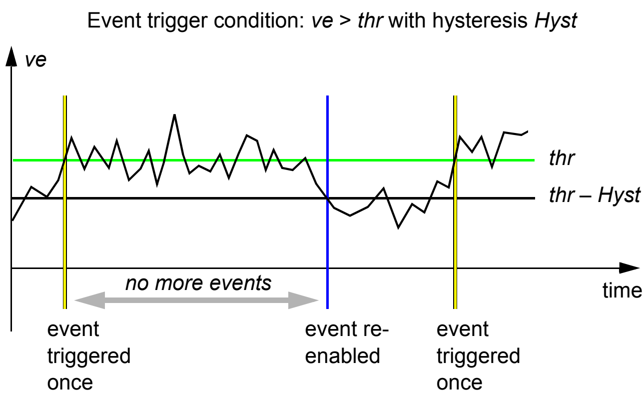
The hysteresis mechanism can be described more informally as follows, considering the simple case where the custom event trigger consists of a single "$x > y$" condition:

- When the value element goes above the threshold, the event is triggered once at that time.

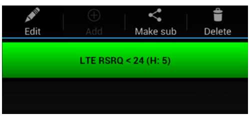
- If the value element stays above the threshold, *or* is fluctuating around it at no great distance, no more events are generated.
- Event generation is re-enabled only when the value element drops sufficiently far below the threshold, as specified by the hysteresis parameter.

The function of the hysteresis is to introduce a degree of inertia into the event generation, avoiding a profusion of events (“ping-pong” effect) in case of rapidly fluctuating measurement values.

See the diagram below for an illustration.



In more complex event trigger expressions, like the ones created in section 6.4.1.2, the application of the hysteresis is somewhat less straightforward. Section 6.4.2 discusses this issue further.

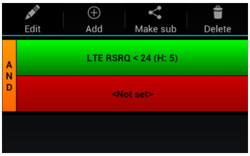


- When you are done defining the value element condition, tap **OK** to commit your settings. The bar in the graphical interface is then labeled with the condition just specified.

6.4.1.2. Creating Complex Boolean Expressions

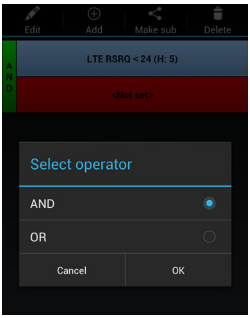
A single value element condition like the one set up in section 6.4.1.1 is a perfectly valid custom event in its own right. However, it is also possible to build more complex event triggers in the form of boolean expressions involving multiple conditions. The supported boolean operators are AND and OR.

To expand a condition C_1 into a boolean expression of the form (C_1 <boolean operator> C_2), where C_2 is another condition, select the condition C_1 and tap the **Make sub** button.



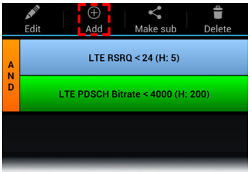
The boolean operator is by default set to AND, and the new condition (red) is appended below the existing one.

If you nest boolean expressions, the operator at the next level will default to OR, the third to AND, etc., automatically building the alternating pattern of a boolean expression that contains no redundancy. (However, if you edit an operator later on, other operators in the event expression will not adjust automatically in any way.)

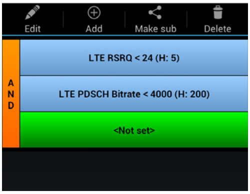


To change an operator, tap it, then tap **Edit** and make a new selection.

Proceed to define the new condition just as in section 6.4.1.1.

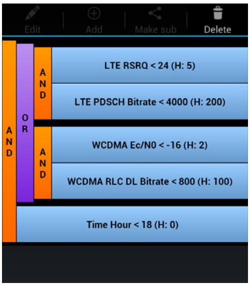


To add one more condition to an AND or OR subexpression, tap any constituent part of that expression (the operator or one of the conditions), and then tap the **Add** button. The new condition is always put at the bottom.



By repeatedly applying the **Add** and **Make sub** operations you can assemble any AND/OR expressions you like, up to a maximum depth of five nested boolean operators. Wherever the maximum depth has been reached, the **Make sub** button is grayed out.

Below is an example of a composite event expression:

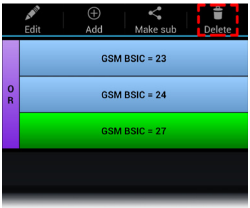


Stated informally, we want to trigger this event if the device is on either LTE or WCDMA, and the signal quality and the throughput are both “too low”; but only if this occurs before 6 p.m.

It is worth noting that if you like, you can construct the entire logical structure first, and then proceed to fill in the conditions:

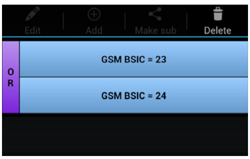
In this screenshot we have begun defining the event trigger by setting up the same boolean expression as in the previous example. What remains is to enter a value element condition in each of the red fields.

6.4.1.3. Deleting Parts of an Event Expression



To delete an element from an event expression, tap that element, and then tap the **Delete** button. You are prompted to confirm the delete.

Deleting a condition removes that condition from the expression. See the screenshot for an example.



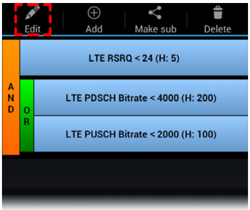
Deleting an operator also **deletes the entire subexpression** belonging to that operator. You are warned about this.

Performing a delete may cause TEMS Pocket to simplify the expression that remains (always leaving its logical structure intact). See section 6.4.1.4.

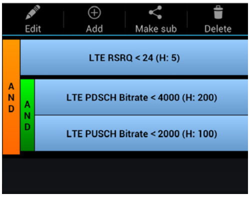
6.4.1.4. Automatic Simplification of Event Expressions

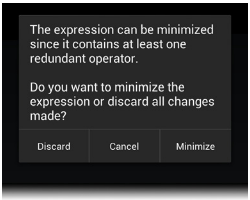
If editing the event expression results in one or more boolean operators becoming redundant, the expression will be automatically simplified to eliminate the redundancy. Examples follow.

Simplification After Editing an Operator



In this expression, the OR is changed to an AND. As a result, this boolean operator building block becomes superfluous in the graphical representation, since C_1 AND (C_2 AND C_3) = C_1 AND C_2 AND C_3.

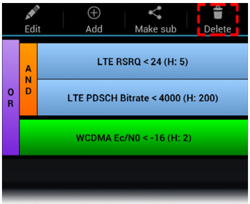


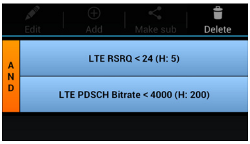


When you tap the Back button to leave the expression editor, a message informs you that the expression contains redundancy. You can then choose either to minimize the expression or to discard your changes.

If you choose **Minimize**, the simplified expression that results is flattened, with the two AND levels collapsed into one.

Simplification After Deleting a Condition or Operator





Suppose that you delete the WCDMA condition selected (green) in the top screenshot. The OR subexpression is then left with a single operand and has become redundant. It is therefore removed along with the WCDMA condition (bottom screenshot). This is done automatically by TEMS Pocket, without any prompt appearing.

In this last example, if you delete the AND operator instead, the whole AND subexpression will go away. Moreover, once again the OR will lose one of its operands, so the OR will be removed as well. Only a lone WCDMA condition will remain in this case.

6.4.1.5. Deleting the Entire Event Expression

To delete everything from the graphical event expression editor, deselect any part of the event expression that is currently selected by tapping it, then tap **Delete**.

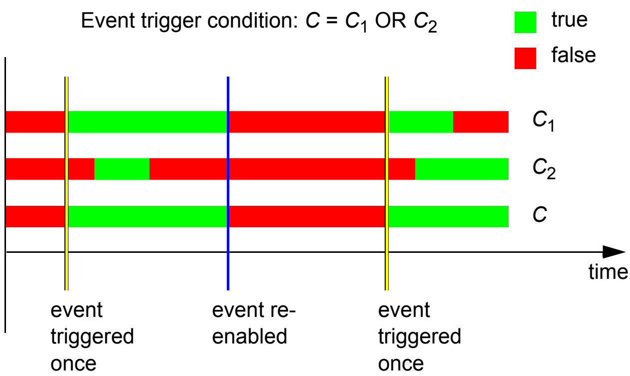
6.4.2. Properties and Custom Events and Their Evaluation

6.4.2.1. Unconstrained Trigger Semantics

No validation or "sanity check" of custom event expressions is performed by TEMS Pocket. It is possible to create expressions that will never evaluate to true. You need to take care to compose expressions that make sense and trigger the event as you intended.

6.4.2.2. Triggering Rules for Boolean Expressions

After a composite event expression has evaluated to true and triggered its event, the event will not be triggered again until the expression has turned false and then true once more. Note carefully that this applies to the expression as a whole; for example, if a composite expression has an OR at the top level and has just evaluated to true, its event triggering will not be re-enabled until after both members of the OR expression have been false at the same time at some point.



6.4.2.3. Effect of Hystereses on Trigger Evaluation

In a boolean expression containing several value element conditions, each hysteresis is strictly local in scope and applies only to the condition for which it is defined. However, whether or not the hystereses will be taken into account at all depends on the evaluation result for the expression as a whole. The following rules are applied:

- As long as the total expression is false, all hystereses are disregarded and do not affect the evaluation of their respective conditions.
- When the total expression becomes true, all conditions that are logically true at this point have their hystereses enabled, so that they do count in evaluating the conditions. Each hysteresis remains enabled until the hysteresis criterion is satisfied at some point ($x < y - Hyst$ or the equivalent thereof). After this has occurred, that particular hysteresis is disabled (independently of all other hystereses).
- The above process begins anew after the total expression has toggled to false and then back to true again.

As will be obvious from the above, the evaluation of a complex expression with many hystereses may be hard to follow and may yield unexpected results. It may therefore be wise to limit the number of hystereses used.

6.4.3. Presentation of Custom Events

The same range of presentation options exists for custom events as for predefined events. See section 6.2.

In the Events data view, the extra information for a custom event consists of the value element or elements that caused the event expression to become true, and their values at that time. Below is an example.

6.4.4. Removing Custom Events

To remove a custom event:

- Select the event in the Custom Events list.

Tap the Overflow button and select **Remove**.

To remove all custom events:

Tap the Menu button, and under **Create/Modify** select **Appearance**. On the screen that follows, select **Events**.

Tap the Overflow button and select **Remove all**.

6.5. Exporting and Importing Presentation Settings

You can export the current presentation settings (covered in section 6.2) for events and messages. The export also includes the definitions of any custom events currently defined (see section 6.4) as well as ranges and colors for value element presentation (see section 5.16).

The export always encompasses all of the above items, and everything that is available in each category; it cannot be done selectively.

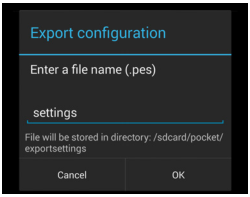
When TEMS Pocket is upgraded, a settings export is done automatically before the old version is uninstalled. After installation of the new version, the settings are imported back into the application.

6.5.1. Exporting Presentation Settings

To perform the export:

Tap the Menu button, and under **Create/Modify** select **Appearance**.

Tap the Overflow button and select **Export**.



Type a name for the export file. It will have extension .pes and is stored in the directory indicated in section 4.4.2. The file name must be distinct from those of existing *.pes files.

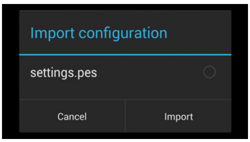
6.5.2. Importing Presentation Settings

Note: When you import settings, all of the old settings are overwritten. You are warned about this by an on-screen message. Note especially that any existing custom events are *deleted* and replaced by those present in the .pes file (if any).

To perform the import:

Tap the Menu button, and under **Create/Modify** select **Appearance**.

Tap the Overflow button and select **Import**.



The presentation settings files stored on the device are listed. Select which one of them to import.

7. The Indoor Map View

The **Indoor Map** function enables import of maps and positioning of measurements in indoor locations and other places where GPS coverage is lacking. The positioning is done by pinpointing the test route in the Indoor Map view on a georeferenced floor plan or other map image. Please note that the map image **must** be geographically positioned (i.e. must have an accompanying TAB file) if it is to be used in TEMS Discovery Device or TEMS Investigation later on.

TEMS Pocket map sets are created in ***.ibwc** format, which is the container format used in the iBwave Design indoor radio planning software tool. Existing such map sets may include files with **cell data** as well as definitions of polygon-shaped **zones**, both of which can be displayed in TEMS Pocket. Items in the *.ibwc format that are not mentioned in this chapter are currently not presentable in the TEMS Pocket application.

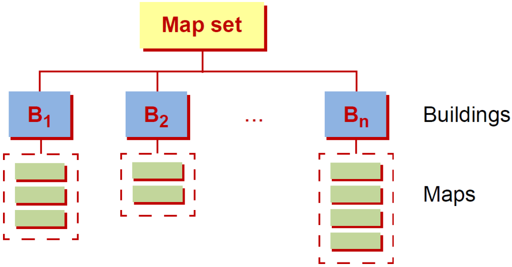
7.1. Creating and Configuring Map Sets

This section describes how to create *.ibwc map sets within TEMS Pocket.

Alternatively, existing map sets can be used. As regards file transfer, note especially the possibility of downloading map sets from an FTP server: see chapter 22.

7.1.1. Map Set Structure

A map set covers a number of buildings, each of which contains a collection of maps. Below is a hierarchical diagram showing the map set structure.



7.1.2. Obtaining Map Images

First you need to obtain images of the environment that is going to be covered during measurement. For example, use the device's camera to photograph the emergency or evacuation plan for the relevant floor(s) of the building. The best image quality is obtained if the camera is set in black-and-white mode. Also avoid using the flash. If you are using an image from a different source, it must be in JPEG, PNG, or BMP format.

7.1.3. Creating a New Map Set

 Tap the Menu button, and under **Create/Modify** select **Indoor Maps**.

 Tap the Overflow button and select **New Map Set**.

- Tap **Name** and enter a name for the new map set.

Now for each building to be covered by the map set, do the following:

- Tap **Buildings**.

 Tap the Overflow button and select **Add Building**.

- Tap **Name** and enter a name for the building.
- Then tap **Maps**.

 Tap the Overflow button and select **Add Indoor Map**.

- You are now invited to pick an image to use as a map. Select your floor plans or other background images that you want to use. The selected image files are added to the map set. A map set can contain up to 99 images.

Map sets are saved in the iBwave container format (extension .ibwc). These files are self-contained and can easily be transferred to other devices. Map sets are saved to the directory specified in section 4.4.2.

It is also possible to store a logfile (*.trp) containing a map set in the map set directory, and then load it into the Indoor Map view just like a map set (*.ibwc), as described in section 7.2.

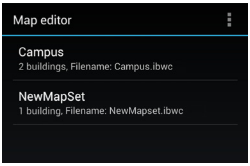
7.1.4. Specifying Map Set Properties

You can set some position properties and other metadata for the map set.

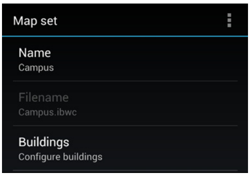
If you are not already in the Map Editor:

Tap the Menu button, and under **Create/Modify** select **Indoor Maps**.

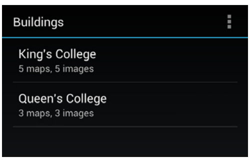
A list of the map sets you have already created appears.



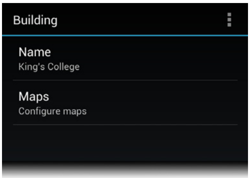
- Tap the map set you want to define properties for.



- Here you can edit the map set name by tapping it.
- The map set file name also appears, identical with the **Name** string plus the extension .ibwc.
- Tap **Buildings** to access a list of the buildings defined in the map set.

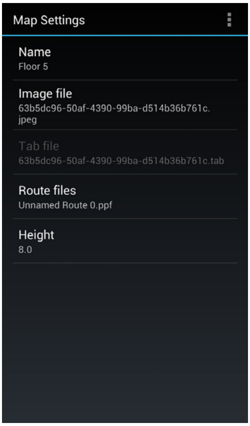


- Tap an individual building to access its constituent parts (maps).



- You can edit the building name by tapping it.
- Tap **Maps** to access a list of the maps defined for this building.
- Then tap an individual map to access its properties.

The map properties are as follows:



- **Name:** Name assigned to the map.
- **Image file:** Name of the map image file.
- **Tab file:** TAB file associated with the map image. A TAB file residing in the same directory as the map image and identically named will appear automatically in this field. Section 4.4 gives the path to the map set directory. Regarding geodetic datum and reference points in TAB files, see section 7.1.4.1. An example TAB file is given in appendix H.

A TAB file *must be present* if the map image is going to be loaded in TEMS Discovery Device or TEMS Investigation later on. Unpositioned images in BMP, GIF, JPEG, PNG, or TIF format can be georeferenced using the **ImagePositioning** utility.

- **Route files:** Planned routes associated with this map image, if any. See section 7.5.6. Tap this field to select from a list of available route files. Note that several route files can be associated with the same map.
- **Height:** Height above sea level of the floor depicted in the map image.

7.1.4.1. Requirements on TAB Files

The geodetic datum in TAB files must be WGS84, represented by the value 104. Other datums are not supported.

Reference points in TAB files must be at least three in number and must not lie in a straight line. For best accuracy, the points should be distributed in such a way that they span as large an area as possible. Choosing points that are near-collinear or very close together may introduce a large source of error in the positioning. To achieve accurate positioning of measurements, it is of course also essential that the mapping between pixel coordinates and latitude/longitude values in the TAB file be carefully done.

7.1.5. Managing Maps in a Map Set

If you tap and hold a map in a map set, a menu with the choices **Move up**, **Move down**, and **Delete** appears.

- Use the move commands to move the map one step up or down in the map set.
- Use the **Delete** command to delete this map from the map set.

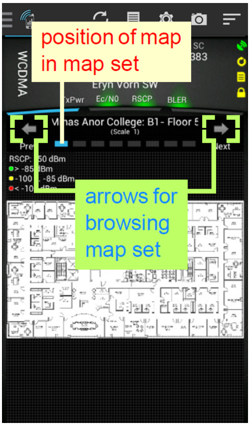
7.2. Loading a Map Set into the Indoor Map View

At the outset the Indoor Map view is empty. A grid is drawn in the view when no map set is loaded.

Here is how to load a map set into the Indoor Map view:

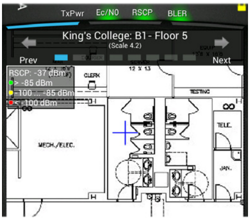
 Tap the Menu button, and under **Actions** select **Load Map Set**.

- Select the desired map set and tap **Load**. The map set now loads in the Indoor Map view.



If the map set contains several images, the first is shown. If there are several buildings in the map set, the whole map set structure is flattened into a single sequence of maps when viewed here.

You flip through the maps by tapping the arrows that appear in the top left and right corners of the Indoor Map view. The map sequence wraps around after you browse to the first or last map. The position indicator beneath the map name indicates the position of the currently displayed map in the (flattened) map set sequence.

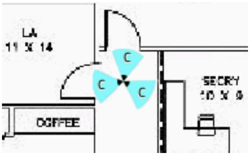


When the Indoor Map view is zoomed in (**Scale** > 1.0), any dragging action results in panning the currently visible map. When the view is zoomed out (**Scale** = 1.0), swiping right will take you to the next view in the Location group, i.e. the Outdoor Map view (section 5.11.2), and swiping up or down will take you to a different data view group.

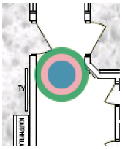
7.3. Presentation of iBwave Transmitter Files

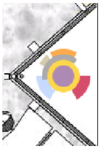
The iBwave indoor map set container format (*.ibwc) includes a “transmitter” file in XML format, holding data on indoor cells. One transmitter file can be provided with each map in the indoor map set. If transmitter files are present in a map set, the cells they describe are automatically plotted in the Indoor Map view.

Two presentation modes exist:



If **Dynamic cell colors** is turned off in the map settings (see section 21.1.6), then the presentation is the same as for TEMS-specific cell files in the Outdoor Map view (described in section 8.4), except that no lines are drawn to the current serving cell or active set. That is, cells are drawn in a uniform cyan color.





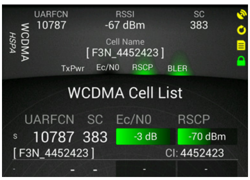
If **Dynamic cell colors** is turned on, each cell is drawn in a unique color, using a color scheme designed to minimize clashes with the default value element colors (green, yellow, red). For cells located at the same site, the circle sector radii are differentiated to enable clear visualization of a large number of overlapping sectors.

- Tap a cell site to have all cells located there listed in a special legend in the top right corner of the map view: see section 7.6.2.
- Tap anywhere else in the view to hide the legend.

Cells can be displayed selectively with respect to radio access technology, as explained in section 7.7.

Note that TEMS-specific cell files are not used in the Indoor Map view. See chapter 12 for full coverage of this type of cell file.

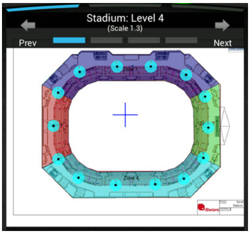
Cells listed in the transmitter file for the map (floor) currently displayed in the Indoor Map view are also presented in other places in TEMS Pocket:



- Cell names appear in the data view header and in cell list data views, just like cell names from TEMS-specific cell files. These names are enclosed within square brackets [ ], which are meant to symbolize the walls of a building.
- The cells are included in the results of cell searches performed as an aid to target selection for the RAT, band, and cell lock functions; see various subsections of chapter 13.

7.4. Presentation of iBwave Zones

iBwave indoor map sets (*.ibwc) may include, for each map it contains, a pair of files with extensions .mid and .mif defining a collection of *zones* on that map. Each zone consists of a closed polygon covering some part of the map.



These zones are by default displayed in TEMS Pocket if present, colored and labeled according to their definitions. Zones are drawn on top of the map image itself but beneath everything else (waypoints, value element markers, events, transmitters).

If you do not want the zones shown, deselect the **Zones** map layer as described in section 7.7.

7.5. Pinpointing Your Test Route

7.5.1. Fundamentals of Pinpointing

You can perform pinpointing in either of two ways:

- **Manually**, marking waypoints freely on the map. See section 7.5.5.
- According to a predetermined **planned route**. See section 7.5.6.

Your route will be recorded in a logfile. Logfile recording starts automatically when you start pinpointing and is ended when you stop pinpointing.

7.5.2. Coexistence with Other TEMS Pocket Functions

- While a script is running, pinpointing is disabled. You must stop the script first. (On the other hand, you *can* start a script while the pinpointing function is active; however, the logfile recording normally triggered by the script is then suppressed. Only the pinpointing function will produce a logfile in this case.)
- While you are recording a logfile manually, pinpointing is disabled.
- While pinpointing is active, you cannot swap maps; that is, you cannot move from one image in the map set to another.

7.5.3. Plotting Route Markers with Value Elements

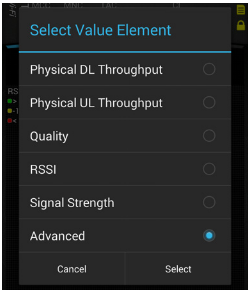
You can optionally have markers plotted along your route which are color-coded according to a selected piece of RF data or a throughput rate (“value element”). The route markers constitute a separate map layer which can be shown or hidden; see section 7.7.

The color coding of the markers is the same as that used for the value element in data views. The range of colors employed is shown in the map legend (see section 7.6.1); a complete listing of default value element color ranges is given in appendix B. It is possible to change the default colors and their associated value ranges; how to do this is covered in section 5.16.

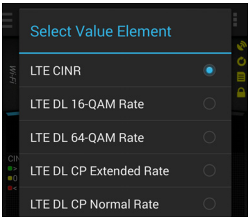
What you select for map plotting is either a single value element or a *family* of value elements. The latter contains one element for each radio access technology, all denoting the same fundamental quantity such as “signal strength”. As the TEMS Pocket device switches between technologies, the map presentation automatically follows suit, always showing the value element that belongs to the currently used technology.

The feature is customized as follows:

Tap the Menu button, and under **Actions** choose **Select Value Element**.



Value element families



Advanced: Individual value elements

- A list appears with a number of value element families plus an item **Advanced** for selecting a single value element. Pick what you want to show; selecting **Advanced** calls up a new list holding all plottable value elements, from which you pick one.
- Tap **Select**.

By default, the Signal Strength value element family is plotted. Full explanations of what these designations mean for each technology are given in appendix C.

From now on, all pinpointed routes will be traced by dot-shaped markers whose color encodes the appropriate value element as measured at each point. Refer to the map legend for an explanation of the color coding (again, see section 7.6.1).

If you want to plot a different value element or value element family, simply make a new selection as described above. Note, however, that if you do this in the middle of pinpointing a route, the value element markers already plotted will be erased.

The waypoints that you mark on the map are always indicated by pin symbols colored blue, and the straight-line segments connecting them are drawn in black. Neither of these colors is affected by the **Select Value Element** command.

Route markers are plotted also during logfile replay (covered in section 10.6).

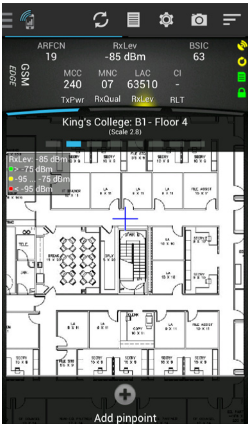
7.5.4. Presentation of Events and Messages

See section 6.2.1.1.

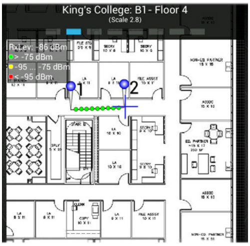
7.5.5. Manual Pinpointing

 Tap the Menu button, and under **Start** select **Start Pinpoint**.

If you have enabled logfile prefixes, a prefix selection dialog appears at this point; see section 21.2.3.

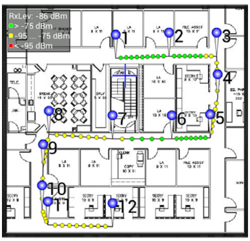


- Pan the map to position the crosshairs correctly. It may also be helpful to use the zoom function; pinch and spread to zoom the map image in and out. Alternatively, you can double-tap to zoom out to normal. The current magnification is indicated numerically in the top right corner.
- Tap **Add pinpoint** to place a waypoint at the spot marked by the crosshairs. The waypoint is marked by a pin symbol and labeled with a sequence number.

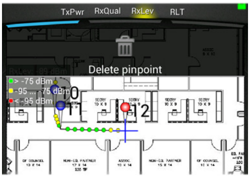


- Pan the map to position it for the next waypoint, then tap **Add pinpoint** again. A new pin is drawn and joined to the previous one by a connecting line.

Route markers are drawn along each route segment as soon as it has been completed, that is, when you mark a new waypoint ending the segment. For the setup, see section 7.5.3. A maximum of 10 route markers are drawn between two waypoints.



- Continue pinpointing at regular intervals along the route, and whenever you change direction. If you stop along the way, pinpoint when you stop and again when you resume your walk.



- If you want to undo a pinpointing action, tap the relevant pin. The pin turns red, and the map is re-centered around it. Confirm by tapping **Delete pinpoint** at the top of the view. Connecting lines are redrawn, and the numbering is adjusted automatically.
- To cancel the delete action, just tap the pin once more. Its color then reverts to blue.

When you have completed your route:

Tap the Menu button, and under **Start** select **Stop Pinpoint**.

After you stop pinpointing, a TEMS Pocket logfile with extension .trp is created and stored in the location stated in section 4.4.2.

Logfiles can be replayed in TEMS Pocket itself, as detailed in section 10.6. You can also transfer the logfiles to a PC and open them in TEMS Investigation or TEMS Discovery Device.

7.5.6. Pinpointing According to Planned Route

7.5.6.1. Creating Planned Routes

Here is how to design planned routes in TEMS Pocket.

- Load the map set you are going to use, if it is not loaded already. Compare section 7.2.

Tap the Menu button, and under **Create/Modify** select **Indoor Maps**.

- Navigate to the map on which you want to trace the route.
- Tap the map's **Route files** property. (Compare section 7.1.4.)

Now tap the Overflow button and select **Create route file**.

- Enter a name for the route file.
- A dialog appears with the message "Save all mapset changes and start route editor?". Tap **Yes**.

The user interface now switches to the Indoor Map view, and you proceed to create your planned route by placing waypoints exactly as when doing manual pinpointing (see section 7.5.5). The only difference consists in how the task is concluded:

When you have completed your route, tap the Menu button, and under **Actions** select **Save Route Changes**.

The new route is now stored with the map as a file with extension .ppf. (Selecting **Discard Route Changes** instead will discard all the route waypoints that you have just defined. The route itself remains, but it will contain no waypoints.)

- The new route appears in the list of route files associated with the map.

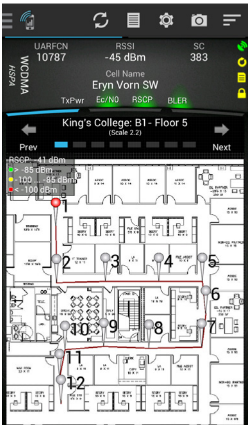
7.5.6.2. Loading a Planned Route and Using It for Pinpointing

- Load the map set containing the planning route.

Tap the Menu button, and under **Actions** select **Load Route**.

- Select the desired route file from the list that appears, and tap **Load**.

Pinpointing Procedure



Regardless of which method you used to load your planned route, the route is drawn in dark red on the map. Waypoints are marked by pin symbols.

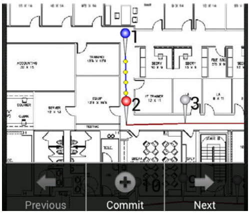
To pinpoint according to this route, do as follows:

- Go to the physical location marked by the first waypoint (highlighted in red).

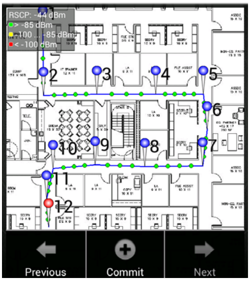
Tap the Menu button, and under **Start** select **Start Pinpoint**.

If you have enabled logfile prefixes, a prefix selection dialog appears at this point; see section 21.2.3.

- A panel with three buttons appears, and the map is centered around the first waypoint. Tap the **Commit** button to indicate that you are currently in that location.
- Tap **Next** to proceed to the next waypoint. The highlighting in red then switches to that waypoint, and the map is re-centered around it.



- Walk in a straight line and at a steady pace towards the spot marked by the highlighted waypoint. When you have reached it, tap **Commit**. The route segment just completed is retraced in black.



- Continue in this fashion until you have finished the route.

(It is possible to move backwards along the route by tapping the **Previous** button.)

When you have completed the route:

Tap the Menu button, and under **Start** select **Stop Pinpoint**.

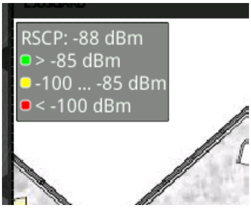
You can unload the route file as follows:

Tap the Menu button, and under **Actions** select **Unload Route**.

The route is removed from the Indoor Map view.

7.6. Indoor Map Legends

7.6.1. Value Element Legend

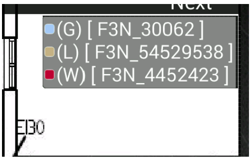


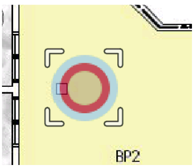
In the top *left* corner of the Indoor Map view, a legend appears showing:

- The value element being plotted and its current value.
- An explanation of the color coding used for this value element. The default colors are tabulated for all selectable value elements in appendix B.

This legend can be hidden; see section 7.7.

7.6.2. Transmitter File Legend





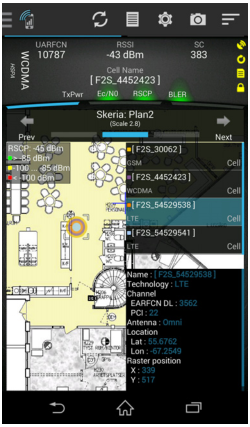
If the map set contains a transmitter file, and you have enabled multicolor presentation of this cell data (see sections 7.3 and 21.1.6), then when you tap a cell site, an additional legend identifying the selected cells appears in the top *right* corner of the Indoor Map view.

For each cell the following is indicated:

- Color used to draw the cell.
- Technology to which the cell belongs. One of: (G) = GSM; (W) = WCDMA; (L) = LTE; (C) = CDMA/EV-DO.
- String identifying the cell, enclosed within square brackets. The cell name is given if provided in the transmitter file; otherwise, CGI data is indicated in the following format:
  - GSM: <BCCH ARFCN>:<BSIC>
  - WCDMA: <DL UARFCN>:<SC>
  - LTE: <DL EARFCN>:<PCI>
  - CDMA/EV-DO: <RF channel>:<PN offset>
  - Wi-Fi: <SSID>:<BSSID>

When no cell site is selected, this legend is hidden.

7.6.2.1. Expanding the Transmitter File Legend

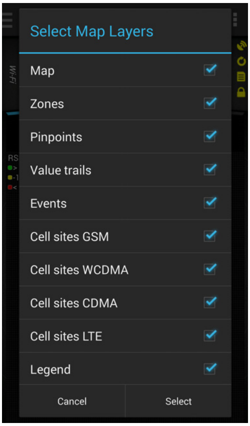


- With a cell site selected, so that the transmitter file legend is visible, you can long-press anywhere else in the Indoor Map view to toggle the legend to an expanded format (top right in screenshot).
- In this cell list, you can tap a cell to expose further data on this cell, as recorded in the transmitter file (bottom right in screenshot).
- Long-press the map again to revert the legend to the compact format. The cell details pane will remain if open.
- Single-tap in the map to hide all cell data.

7.7. Showing and Hiding Indoor Map Layers

You can turn the visibility on and off for various map layers individually.

Tap the Menu button, and under **Actions** choose **Select Map Layers**.



- **Map:** Google Maps imagery.
- **Zones:** Zones defined in the indoor map set. See section 7.4.
- **Pinpoints:** Routes made up of pin symbols and connecting lines.
- **Value trails:** Route markers encoding a value element.
- **Events:** Event presentation. If this is unchecked, no events will appear in the Indoor Map view regardless of the **Show in map** setting for individual events (see section 6.2).
- **Cell sites GSM**, etc.: Cell site data for various radio access technologies, as found in transmitter files included in the indoor map set. See section 7.3.
- **Legend:** Map legend explaining value element color ranges: see section 7.6.1. This option does not affect the visibility of the transmitter file legend.

Check a layer to show it; uncheck to hide it.

7.8. Unloading a Map Set

To unload the currently loaded map set:

 Tap the Menu button, and under **Actions** select **Unload Map Set**.

8. The Outdoor Map View

The Outdoor Map view is intended for outdoor drive testing with access to GPS coverage. The view uses Google Maps imagery in the form of roadmaps and/or satellite images.

Routes can be plotted in live mode as well as in replay mode.

When a cell file is loaded, cell sites can be displayed from that file, and cells currently being used can be pointed out.

In live mode, for obvious reasons, all plotting that relates to the device's current position is possible only when GPS data is available.

8.1. Supported Google Maps Content

The map content supported is limited to the basics, and most options found in Google Maps are disabled. For example, Street View is not supported. You can however switch between map types, as described in section 8.7.4.

8.2. Plotting Your Route on the Outdoor Map

The device's current position is always marked by a white dot.

Along your test route, you can leave a trail of markers whose color encodes a piece of RF data or a throughput rate. Whether or not to show the route marker map layer is set as described in section 8.6.

As in the Indoor Map view, you select a either a single value element or a family of similar value elements that spans all supported technologies. In the latter case, TEMS Pocket automatically picks the value element that matches the technology currently in use. To make this selection:

Tap the Menu button, and under **Actions** choose **Select Value Element**.

The same value elements are selectable as in the Indoor Map view. See appendix C, and compare what is said in section 7.5.3. By default, the Signal Strength value element family is plotted.

Up to 10,000 route markers can be plotted in the Outdoor Map view.

To clear all route markers from the Outdoor Map view:

Tap the Menu button, and under **Actions** select **Clear History**.

8.3. Displaying Events on the Outdoor Map

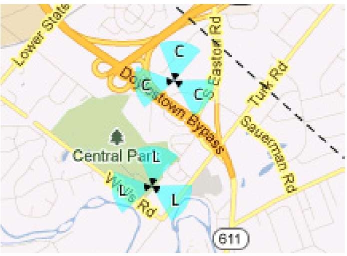
Events are displayed in the Outdoor Map view as text labels pointing to a route marker. See section 6.2.1.

8.4. Displaying Cell Sites on the Outdoor Map

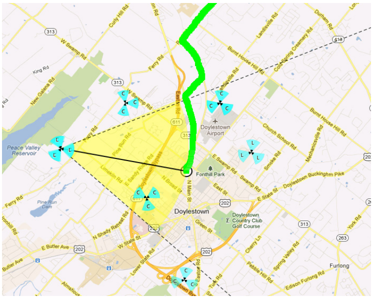
Cell sites can be displayed in the Outdoor Map view according to a cell file that you have loaded into TEMS Pocket. See chapter 12.

Each cell of a site is visualized as a cyan-colored sector extending from the site’s position and covering an angle that corresponds to the cell beam width as indicated in the cell file. The innermost part of a site is drawn in black to indicate the site position more distinctly.

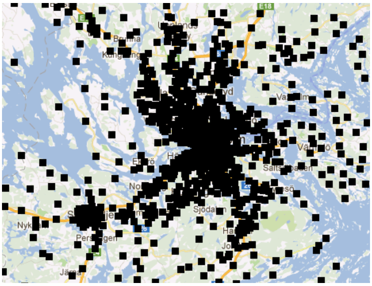
Cells are marked with a letter representing the radio access technology:
G = GSM, **W** = WCDMA, **L** = LTE, **C** = CDMA.



When the TEMS Pocket device has an active network connection, a line is drawn from the device’s current position to the serving cell or to each cell in the active set. An extension of the cell sector, reaching out to the device’s position, is drawn as an overlay in a semi-transparent yellow color. The radii of the sector are further extended by means of dashed lines all the way out to the edge of the map view. The purpose of these lines is to indicate the angle within which it is reasonable for a device to be served by this cell.



A maximum of 1,000 cells (not sites, please note) will be plotted in the Outdoor Map view. If you zoom out so far as to view an area comprising more than 1,000 cells, all sites are replaced by small black squares in the presentation. If the number of in-view cells exceeds 10,000, all presentation of cells is disabled. These limits are imposed for readability and performance reasons.



Cells drawn as black squares

No cells plotted when map is zoomed out far enough

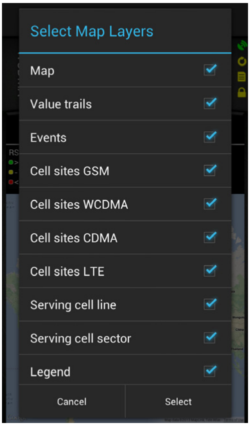
8.5. Outdoor Map Legend

A value element legend appears in the Outdoor Map view. It looks the same and provides the same information as in the Indoor Map view; see section 7.6.1. The legend can be hidden, as described in section 8.6.

8.6. Showing and Hiding Outdoor Map Layers

You can turn the visibility on and off for various map layers individually.

Tap the Menu button, and under **Actions** choose **Select Map Layers**.



- **Map:** Google Maps imagery.
- **Value trails:** Route markers encoding a value element.
- **Events:** Event presentation. If this is unchecked, no events will appear in the Outdoor Map view regardless of the **Show in map** setting for individual events (see section 6.2).
- **Cell sites GSM:** GSM cell site data from cell file.
- **Cell sites WCDMA:** WCDMA cell site data from cell file.
- **Cell sites CDMA:** CDMA/EV-DO cell site data from cell file.
- **Cell sites LTE:** LTE cell site data from cell file.
- **Serving cell line:** Line(s) from device position to serving cell/active set.
- **Serving cell sector:** Extension of serving cell sector (yellow, with dashed radial lines).
- **Legend:** Map legend explaining value element color ranges.

Check a layer to show it; uncheck to hide it.

8.7. Map Controls

This section deals with the buttons located at the top of the Outdoor Map view.

8.7.1. Follow

When the Follow function is **on**, the map will autopan as you move around, so that it is always centered around your current position. You can zoom the map by pinching and spreading. This is the default setting.

As soon as you activate the Follow function, **Panning** is automatically turned off if currently active. (Automatic panning and manual panning obviously cannot coexist.)

When the Follow function is **off**, there is no automatic panning of the map, even if the device moves out of the area displayed. You need to pan manually using the **Panning** function.

8.7.2. Panning

When this function is **on**, swiping actions in the map view will pan the map. Pinching and spreading will zoom the map.

When you turn the Panning function on, **Follow** is automatically turned off if currently active. Compare section 8.7.1.

When this function is **off**, swiping in the map view does not affect the map, but horizontal swiping takes you to a different data view, as described in section 5.4. Furthermore, the map cannot be zoomed by pinching and spreading in this state. This is the default setting.

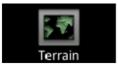
8.7.3. Online Mode/Offline Mode

Online Mode: Download map imagery from Google whenever an Internet connection is available.

Offline Mode: Use cached Google Maps imagery. This mode is useful if problems can be expected with the internet connection in the field, or if you want to prevent map downloads detracting from service testing performance. You can then download Google Maps content for your testing area by other means (for example, in advance while still in the office), and then put the Outdoor Map view in offline mode so that it relies on that cached content rather than a live connection to Google Maps. Map tiles other than those downloaded will then be black and empty apart from the message “Sorry, we have no imagery here.”.

8.7.4. Map Type

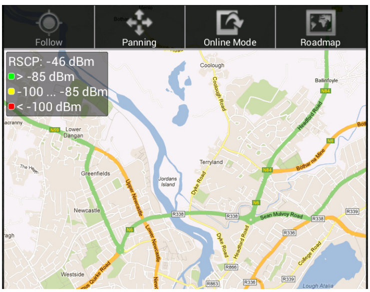
Roadmap: Displays the default road map view.



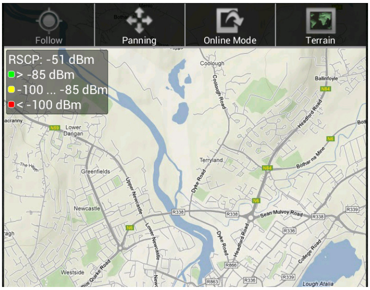
Terrain: Displays a physical map based on terrain data.

Satellite: Displays Google Earth satellite images.

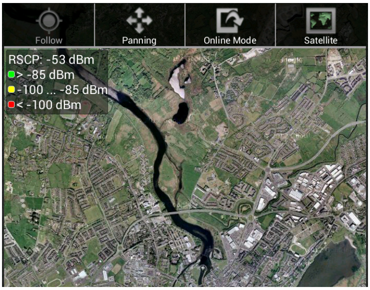
Hybrid: Displays a composite of the roadmap and satellite views.



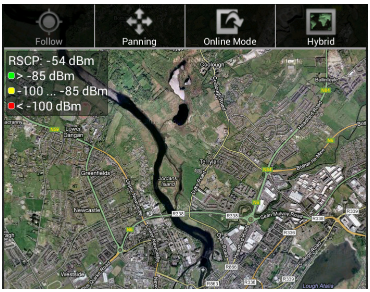
Roadmap



Terrain



Satellite



Hybrid

9. Scripts

9.1. Introduction to Scripts

Scripts are used to **automate testing of services**. The following services and tasks are supported by the script function:

Actions Running a Single Service

- Email
- FTP (upload or download)
- HTTP (Get or Post)
- YouTube
- Ping
- SMS[1]
- Voice MO (mobile-originated calls)
- Voice MT (mobile-terminated calls)
- AQM (audio quality measurement during voice calls)
- Call Sequence (alternating mobile-originated/mobile-terminated calls)

Actions Running Multiple Concurrent Services

- Parallel

Actions for Mobile Network Scanning

- Scan

Actions Related to Logfiles

- Logfile Recording

1. Not supported for CDMA.

- Logfile Upload

Other Actions

- Control Function
- IP Capture
- Wait
- Wi-Fi (Wi-Fi network scanning)

You can have the execution of script actions **recorded** automatically in logfiles: see section 9.6.1. It is also possible to have those logfiles **uploaded** automatically to an FTP, SFTP, or HTTP server: see section 9.6.2.

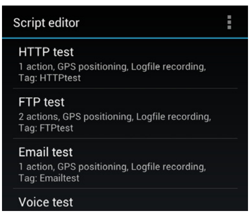
You **start and stop** a script manually from the action bar: see section 9.9. Scripts can also be configured to start and stop **automatically** when specified events occur. When a script is executed, its actions are performed one after another in the order they come in the script definition. Once started, the script repeats as many times as specified in the script settings, or until it is stopped (manually or by an event), or else indefinitely until the device's internal memory card fills up.

> **Note:** Running a script for extended periods of time places a high load on the device battery. See section 4.7.3 for advice on how to ensure that the battery is not drained.

Script **setups** are stored on file, as detailed in section 4.4.2. Such files can be transferred to other TEMS Pocket units. Scripts can be **downloaded** from an FTP server using the synchronization function described in chapter 22.

9.2. Basics of Composing Scripts

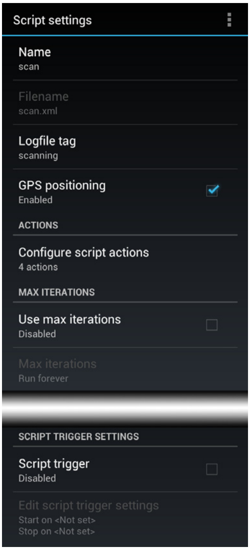
To access the script editing function, tap the Menu button, and under **Create/Modify** select **Scripts**.



Any scripts already defined are listed here.

To define a new script, tap the Overflow button and select **New Script**.

9.2.1. General Script Settings



Here you define general script settings.

Name: Enter a name for the script here.

Filename: Here is displayed the name of the script file, identical with the string entered under **Name** plus the extension .xml.

Logfile tag: Here you can define a tag that will be added at the beginning of the logfile name. By default, logfile names consist only of the script name and the date and time of recording, as described in section 10.2.

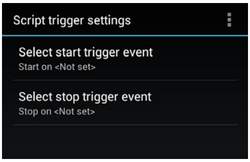
GPS positioning: Governs whether or not to make use of the currently selected GPS (see section 20.3) during script execution.

Configure script actions: Tap this item to edit the list of actions the script should perform. See sections 9.3–9.8.

Use max iterations: If this is disabled, the script will run indefinitely. If you want to limit the number of times the script should run, enable this option, then tap **Max iterations** and enter the desired number.

Script trigger: Set this to Enabled if you want to start and stop the script when some specified events occur. Tap **Edit script trigger settings** to pick these events. See section 9.2.2 for further information. Also **note** that the “master” option under General settings must be turned on to enable script triggering, as explained in section 21.1.3.

9.2.2. Script Trigger Settings



Select start trigger event: Tap this field to pick the event that should cause the script to start.

Select stop trigger event: Tap this field to pick the event that should stop the script.

In each case you are taken to the Event Configuration menu (covered in section 6.2) to make the selection. Only one start and one stop event can be selected.

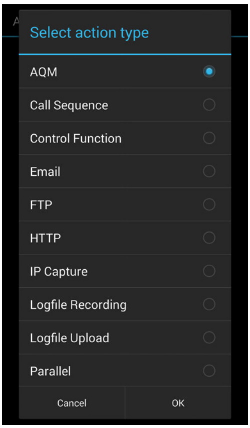
When a script is triggered, it will override any other script that may be running. That script will be stopped, and the triggered script will start executing instead.

9.2.3. Adding an Action to a Script

To add an action to the script:

- In the general script settings, tap **Configure script actions**.

To add an action to the script, tap the Overflow button and select **New Action**.

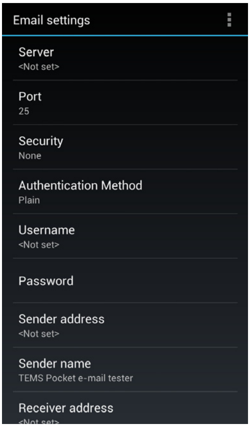


- Select an action type, then tap **OK**.

The action types are gone through one by one in the subsections that follow.

9.3. Single-service Measurement Actions

9.3.1. “Email” Action Settings



Server: IP address or host name of the SMTP server.

Port: The port on which the SMTP server listens for requests.

Security:

- *None:* No security is applied.
- *SSL:* The SSL (Secure Sockets Layer) cryptographic protocol is used throughout the email session. **Note** that this requires the TEMS Pocket SSL license option: see section 3.6.2.

Authentication Method:

- *Plain:* The normal method today, specified in ▶ IETF RFC 4616.
- *Login:* SMTP AUTH login, a Microsoft proprietary method.

Username: User name of email account.

Password: Password for email account.

Sender address: Email address of sender.

Sender name: Name of email sender.

Receiver address: Email address of recipient.

Message type: Plain text or HTML. Images in HTML will be inlined.

Message subject: Content of email Subject field.

Message text type:

- *Custom text:* String entered by user.

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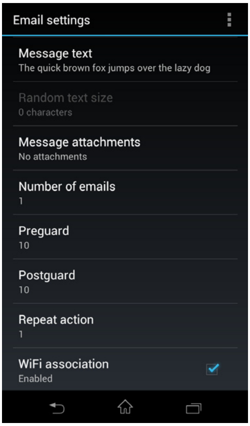

(continued)

- *Random text:* String of random alphanumeric ASCII characters generated by TEMS Pocket.

Message text: This field is enabled if **Message text type** is set to "Custom text". Enter the email message body text here.

Random text length: This field is enabled if **Message text type** is set to "Random text" and specifies the length of the generated text.

Message attachments: You can add one or several attachments to the email message. Each attachment can be either a file stored on the device (see section 4.4.2) or a randomly generated file. In the latter case, you are prompted for the desired file size. **Note** that binary files are base 64 encoded, which means that the volume of data actually transmitted will be larger than the total file size of the attachments.

Number of emails: The number of emails to send (all identical and defined by the above extra information). The maximum is 99.

Preguard, Postguard: Guard periods automatically inserted before and after the measurement task, respectively. The purpose of the guard periods is to ensure that the signaling setting up and taking down the service session is recorded to the logfile and made available for post-processing. For this reason, they should not be set too short; the default for both is 10 s (see appendix E.6).

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

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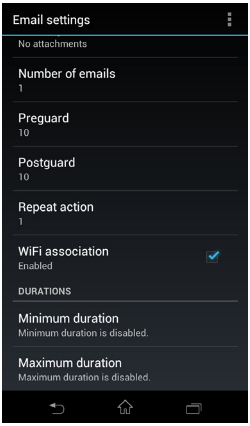


(continued)

Wi-Fi association: By setting this to Disabled, you prevent the device from connecting to a Wi-Fi access point (even if a Wi-Fi network is available) and force it to run the session over a cellular network instead. Note that the default Android behavior is always to use Wi-Fi if it is the best available bearer. The option provided here eliminates the need to deactivate Wi-Fi manually in the device's regular settings to achieve the same effect.

Minimum duration: If you enter a value here (in seconds), the action will run for at least the time specified (not counting guard periods). If the task is completed quicker than this, TEMS Pocket will idle until the minimum duration has been completed, and only then will the action end. By default this setting is disabled.

Maximum duration: If you enter a value here (in seconds), it puts a cap on the action duration (guard periods not included). If the task is not completed within the maximum time allowed, the action is terminated anyway. A Maximum Duration Triggered event is then generated, and the action is considered as failed so that an error event is generated as well.

The duration parameters are useful if you want to keep the duration of actions (more or less) uniform, for example in a benchmarking scenario where all devices should execute actions at a similar pace and thus collect a similar total amount of data.

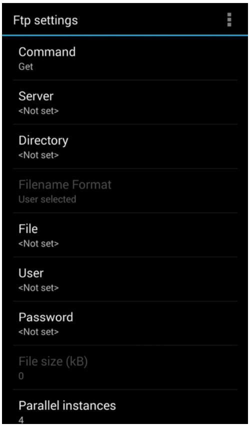
By default this setting is disabled.

Link to Email Progress data view

9.3.1.1. Advice on Email Size

Please bear in mind that most SMTP servers have an email message size limit, typically on the order of 10 MB. Note also that for TEMS Pocket to be able to send an email, there must be sufficient free space on the internal memory card for the temporary file that is created in the process.

9.3.2. “FTP” Action Settings



Command: Get or Put.

Server: FTP server to download from or upload to. The server is given as [ftp://]<host>[:<port>], where <host> is an IPv4 address or a plain-text string. A port number can optionally be specified; otherwise, the default port 21 is used.

Directory: FTP server directory to read from or write to.

File name format: *(Applicable to uploads only)*

- *User selected:* The uploaded file always receives the same name, stated under **File**.
- *Timestamp and Serial Number:* A unique name is generated for each uploaded file according to the pattern <datetime>_<device serial number>.dat, where <datetime> = yyyymmddThhmmssZ and the serial number is the IMEI or MEID.

File: For download, enter the file to fetch. For upload, if **File name format** = User selected, enter the static file name to use; if **File name format** = Timestamp and Serial Number, the file name is generated as described above and cannot be edited here.

User, Password: User name and password on the FTP server.

File size (kB): *(Applicable to uploads only)* Size of the file to upload. This is a generated file containing random data.

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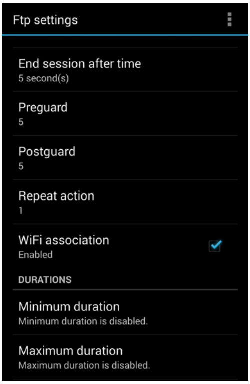


(continued)

Parallel instances: *(Applicable to downloads only)* If you set this parameter larger than 1, TEMS Pocket will create the corresponding number of FTP clients, all of which will log in to the FTP server in parallel and download the specified file. With *n* parallel instances, a total data volume of *n* times the file size will be downloaded. The maximum number of parallel instances is 9. See also section 9.3.2.1.

The purpose of this feature is to maximize throughput in networks with certain properties, as well as to test download of data in multiple streams from one FTP server.

End session after time: If you specify a value here, the FTP session is ended automatically after that time. The duration is counted from the moment the first FTP packet is received from or sent to the server. If the session time expires, an event with the suffix "End Session After Time" is generated; however, the action is not regarded as failed, and no error event is generated.

Note that this parameter is tied to the data transfer as such, not to the action as a whole. The duration of the latter can be limited with the Maximum duration parameter.

Preguard, Postguard: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Wi-Fi association, Durations: See section 9.3.1.

Link to FTP Progress data view

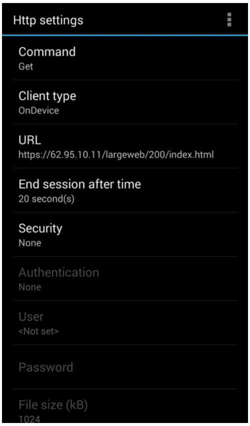
9.3.2.1. Prerequisites for Multiple Parallel FTP Downloads

FTP file downloads with *n* FTP clients in parallel requires that the user account on the FTP server support at least *n* concurrent logins and data transfers.

9.3.2.2. Collecting Input to KPIs

When collecting input data to KPIs, multiple parallel downloads must not be used. This is because a number of metrics are in this case aggregated over all parallel instances (see section 5.10.5, “FTP Progress Data View”), which means that certain KPIs will be lacking or erroneous. If your TEMS Pocket data is going to be post-processed into KPIs, always keep **Parallel instances** at 1.

9.3.3. “HTTP” Action Settings



Command: Get or Post.

Client type: See also section 9.3.3.1.

- *Internal:* HTTP client built into the TEMS Pocket application.
- *OnDevice:* Separate on-device HTTP browser.

URL: URL to download from or upload to.

End session after time: If you specify a value here, the HTTP session is ended automatically after that time. The duration is counted from the moment the first HTTP packet is received from or sent to the server. If the session time expires, an event with the suffix “End Session After Time” is generated; however, the action is not regarded as failed, and no error event is generated.

Note that this parameter is tied to the data transfer as such, not to the action as a whole. The duration of the latter can be limited with the Maximum duration parameter.

Security: None or SSL. Only applicable if a valid security (SSL) license is available: see section 3.6.2. If SSL is selected, the HTTPS protocol is used. Root certificates for the websites you want to test then need to be stored under phone/pocket/private/certificates (file extensions .der, .pem).

The parameters **Authentication** ... **Additional parameters** are valid for HTTP Post only.

Authentication: None or Basic. The latter is according to ▶ IETF RFC 2617. Note that if Basic is used without SSL (see **Security**), the **Password** will be sent as plain text.

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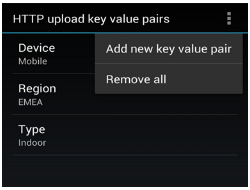
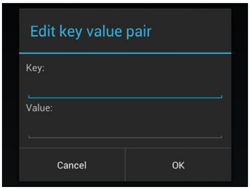


Additional parameters: Key-value pairs displayed



Editing a key-value pair

(continued)

User: User name on the HTTP server, if required. Only applicable if **Authentication** is set to Basic.

Password: User password on the HTTP server, if required. Only applicable if **Authentication** is set to Basic.

File size (kB): Size of the file to upload. This is a generated file containing random data, named randomfile.dat.

Additional parameters: Here it is possible to add or edit key-value pairs to be sent with the HTTP Post request. Tapping this field takes you to the list of existing key-value pairs.

- Tapping the button **Add new key value pair** displays the dialog where you enter a name for the key (mandatory) and a name for the value (optional).
- Tapping **Remove all** removes all key-value pairs from the list.
- Tapping an existing key-value pair displays the same dialog as when adding a new one. You can edit the key and/or the value.
- Long-pressing a key-value pair displays a context menu from which you can move the pair to a different position in the list, or remove the pair.

Preguard, Postguard: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Wi-Fi association, Durations: See section 9.3.1.

Links to progress data views: HTTP DL; HTTP UL

9.3.3.1. Properties of HTTP Clients

This section contrasts the available HTTP clients, detailing some key properties of each.

TEMS Pocket Built-in HTTP Client

- Downloads images, but not things such as objects within iframes.
- Follows redirects.
- Allows SSL (with SSL license option: see section 3.6.2).
- Does not expand javascripts. They are downloaded as text.
- Tests access and download of the web page and is not affected by differences in page download due to dynamic content (since javascripts are not parsed).

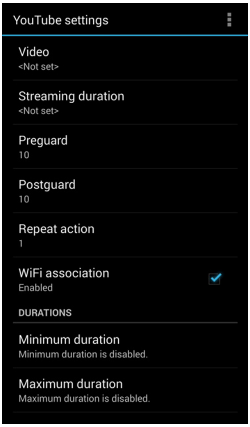
On-device HTTP Browser

- Separate from TEMS Pocket application.
- Uses WebKit layout engine software for rendering web pages: ▶ www.webkit.org.
- Follows redirects.
- Allows SSL (with SSL license option).
- Web page download will vary with the volume of dynamic content, if present.
- Supported by the devices listed in section 16.1.

9.3.4. “YouTube” Action Settings

This action downloads and replays YouTube™ video clips. It requires a YouTube Android app (version 5.3.24) to be installed on the device.

Note that the YouTube app *must not* be upgraded to a newer version that never runs sessions in HTTP (that is, unencrypted) mode. See section 9.3.4.2 for further details.



Video: YouTube video id. This identifier can be obtained as follows:

- Internet browse to YouTube.
- Find and start watching the video of interest.
- Inspect the address bar. The characters after “v=” (up to the first “#” if the address contains such optional extensions) is the YouTube video id. It is written in boldface in the examples that follow.

Example 1: http://www.youtube.com/watch?v=**sPkmeJunie4**

Example 2: http://www.youtube.com/watch?v=**sPkmeJunie4**#feature=c4-overview#list=UUak5EU8HFAuRA7zqJIk8Zuw

Note that it is not possible to control from TEMS Pocket whether the stream will be delivered over HTTP or HTTPS; it may happen that HTTPS is used although the URL you inspected read “http://”. If the stream is encrypted using HTTPS, most of the data in the YouTube progress view (see section 5.10.12) cannot be obtained. Also compare section 9.3.4.2.

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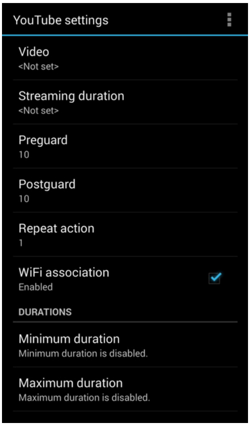


(continued)

Streaming Duration: If you enter a value here, the streaming session is ended automatically after that time. The duration is counted from the moment the first HTTP packet is received from to the server. If the session time expires, an event with the suffix "End Session After Time" is generated; however, the action is not regarded as failed, and no error event is generated.

Note that this parameter is tied to the data transfer as such, not to the action as a whole. The duration of the latter can be limited with the Maximum duration parameter.

Preguard, Postguard: See section 9.3.1. However, for YouTube actions it is *imperative* to use a postguard of at least 10 s.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Wi-Fi association, Durations: See section 9.3.1.

Link to YouTube Progress data view

9.3.4.1. YouTube App Settings

In the YouTube app you can turn on the option **High quality on mobile** to get video streams with higher resolution when testing with TEMS Pocket. Be aware that doing so may increase the prebuffering time.

9.3.4.2. Note on YouTube App Versions

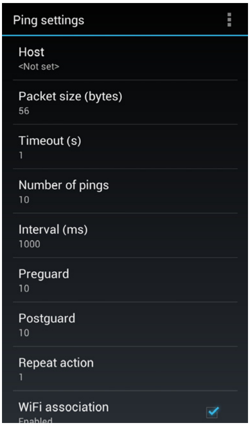
TEMS Pocket uses an older version (5.3.24) of the YouTube Android app which can stream over HTTP (as opposed to HTTPS), thus allowing more measurements to be obtained.

When you are logged on to Google Play, the device may automatically upgrade the YouTube app to a newer version that never runs streaming sessions in HTTP mode but always uses HTTPS. Since very few measurements can be extracted from an encrypted stream, such an upgrade must be avoided. To this end, disable automatic software updates in Google Play. Also enter the Application manager and manually uninstall any YouTube app update already received.

9.3.4.3. Device-specific Limitations

- On some devices, the window showing the YouTube video suffers from transparency issues when moved to the upper half of the screen. The movie will however always be shown correctly.
- The Samsung Galaxy S4 Mini SGH-I257 requires pre- and postguards of at least 10 seconds in a YouTube action, otherwise the action will fail.

9.3.5. “Ping” Action Settings



Host: The IP address or host name of the server to be pinged.

Packet size (bytes): Size in bytes of the ping packet. The maximum size is 65,500 bytes. To this an 8-byte ICMP header and a 20-byte IP header are added prior to transmission.

Timeout (s): Maximum time to wait for each ping response.

Number of pings: The number of pings to send. The maximum is 999.

Interval (ms): Time between consecutive pings.

Preguard, Postguard: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

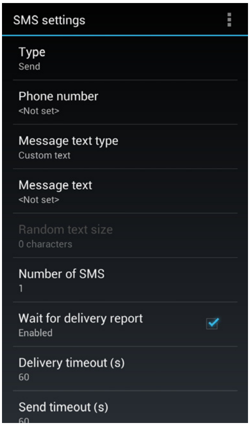
Wi-Fi association, Durations: See section 9.3.1.

Link to Ping Progress data view

9.3.5.1. Device-specific Limitations

- The **Timeout** setting in the Ping action is ignored on some devices, which means that the resulting round-trip time may be much longer than the maximum specified timeout.

9.3.6. “SMS” Action Settings



Type: Always “Send” in this version of TEMS Pocket.

Phone number: Number of SMS recipient.

Message text type:

- *Custom text:* String entered by user.
- *Random text:* String of random alphanumeric ASCII characters generated by TEMS Pocket.

Message text: This field is enabled if **Message text type** is set to “Custom text”. Enter the SMS message body text here.

Random text size: This field is enabled if **Message text type** is set to “Random text” and specifies the length of the generated text.

Number of SMS: The number of SMS messages to send (all identical and defined by the above parameters). The maximum is 99. If more than one SMS are sent, a sequence number is appended to each SMS (#01, #02, etc.).

Wait for delivery report: Governs whether or not TEMS Pocket will wait for SMS delivery reports. This is a prerequisite for computing the end-to-end statistics shown in the SMS Progress data view (see section 5.10.10).

Delivery timeout: The time in seconds to wait for a delivery report. The timer starts ticking when the send ACK is received. If **Wait for delivery report** is set to Disabled, this field is grayed out.

Send timeout: The time in seconds to wait for a send ACK (“RP-ACK”).

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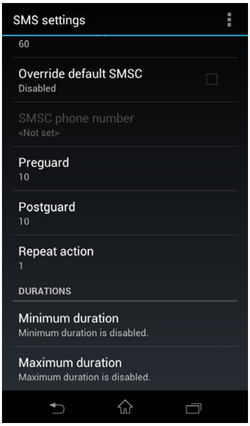

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Override default SMSC: Governs whether to override the default SMS center (entered as a setting in Android) and send messages to a different SMS center.

SMSC phone number: This field becomes editable when **Override default SMSC** is set to Enabled. Enter the phone number to your custom SMSC here. If the field is left empty, the default SMSC number will be used anyway.

Preguard, Postguard: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Durations: See section 9.3.1.

Link to SMS Progress data view

9.3.6.1. Technical Notes on SMS Composition, Encoding, and Transfer

Long SMS messages (more than 160 characters) are supported, up to a maximum of 9,999 characters. The same limit applies for both custom and random text. Please note that Android may issue warnings about messages shorter than this; specifics are vendor and device dependent.

TEMS Pocket prepends a five-digit internal reference number abcde to each SMS and sometimes also tacks on a sequence number nn at the end of the message (see Number of SMS above). The full syntax is: abcde:<message text>#nn. In consequence, up to 9 characters of each SMS are taken up by this tagging.

Whenever possible, the 7-bit default encoding is used. If characters outside of that range occur, TEMS Pocket switches to a different encoding (8-bit or UCS2). The choice of encoding cannot be controlled by the TEMS Pocket user, except indirectly by including characters that will require 8-bit or UCS2.

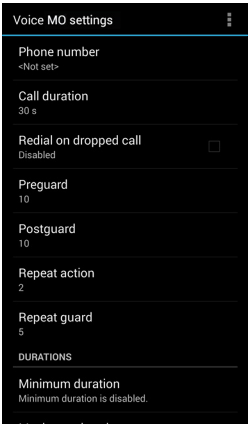
Once sent, SMS messages cannot be recalled by TEMS Pocket. This means that if you stop an SMS action, an interrupted SMS transfer may give rise to signaling during subsequent actions and may delay their execution.

If you do not specify an SMSC in the action, a default SMSC must be set in the device. How to do this varies from one device to another.

The SMS technical specifications are found in ▸ 3GPP 23.040. Please note that SMS is not supported for CDMA.

9.3.7. “Voice MO” Action Settings

This action is used to dial mobile-originated voice calls.



Phone number: The phone number to be dialed. Any characters available in the device interface can be used.

Call duration: Duration of the voice call in seconds.

Redial on dropped call: If set to Enabled, the device will automatically redial the call if it is dropped. A maximum of three redials are made on each occasion; that is, if the call is successfully redialed and then dropped again, up to three new retries are made.

Preguard, Postguard: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Repeat guard: If Repeat action is set larger than 1, a guard period is automatically inserted between repetitions. Here you set the length of that guard period in seconds.

Durations: See section 9.3.1.

Link to Voice Progress data view

9.3.7.1. Requirements for TEMS Pocket VoLTE Testing

- Device modem IP capture needs to be used in conjunction with VoLTE testing if you want to record RTP packets.
- For the Samsung Note 3 SM-N900T, device modem IP capture with **Max packet size** = 1500 bytes is required for SIP signaling. SIP signaling

cannot be obtained on this device without the complete IP packages. Note, on the other hand, that this setting is ill suited to high data transfer rates, so you should not run such tests concurrently with VoLTE testing.

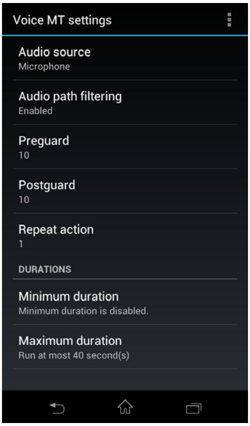
See section 9.7.2 for the relevant setting.

9.3.8. “Voice MT” Action Settings

This action is primarily intended to receive mobile-terminated voice calls, during which audio quality scores are computed (by the calling device). The calling device is controlled by an AQM action, which is covered in section 9.3.9.

Note that this is just one of several possible AQM setups, one intended for the “one-way” scenario just described. The full range of possible AQM configurations is detailed in sections 14.2.1–14.2.1.3.

Audio quality measurement is supported with the subset of TEMS Pocket devices listed in chapter 15. The Voice MT action as such, however, is supported by all TEMS Pocket devices, and it can be used simply as an “answering service” (with **Audio source** set to “Microphone”).



Audio source:

- *Microphone:* During the call, the audio is taken from the device microphone as normal.
- *AQM sentences:* During the call, the TEMS Pocket device plays back speech sentences designed specifically for audio quality measurement. This option is available only if the TEMS Pocket device is equipped with a POLQA license. If you attempt to run a script with this option set on a device that does not support it, the script will fail.

Audio path filtering: Use of device-specific audio-enhancing functions such as noise suppression, audio stretch, comfort noise, and gain control. Currently, this option is *always enabled* (not configurable).

Preguard, Postguard: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Durations: See section 9.3.1.

Link to Voice Progress data view

9.3.9. “AQM” Action Settings

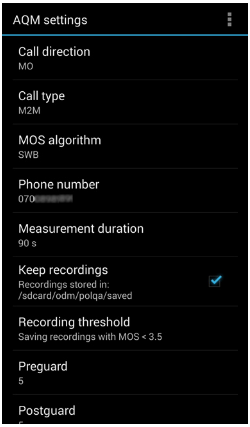
This action handles voice calls during which audio quality measurement (AQM) is performed. It is supported with the subset of TEMS Pocket devices listed in chapter 15. Audio quality measurement can be set up in a number of different ways; the full range of possible configurations is detailed in sections 14.2.1–14.2.1.4. In one configuration, the receiving device is controlled by a Voice MT action, which is covered in section 9.3.8. There is also the possibility of computing AQM scores during a Call Sequence action: see section 9.3.10.

For the answering party in a “two-way” mobile-to-mobile AQM configuration (see section 14.2.1.2), a number of settings are not valid and are ignored. These are marked with an asterisk (*) below.

As a general rule, the answering party should have *no other actions* than the AQM action running.

The device microphone will be muted while the AQM action executes. Avoid the following during AQM testing:

- Using a headset (whether cable-connected or Bluetooth) with the device.
- Activating loudspeaker mode or making any other sound-related adjustments on the device.

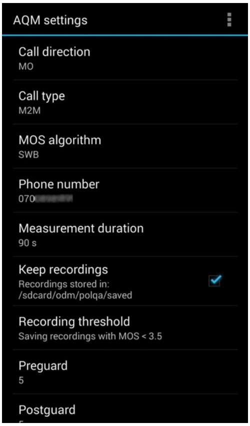


Call direction: Mobile-originated (“MO”) or mobile-terminated (“MT”).

Call type: Mobile-to-mobile (“M2M”) or mobile-to-fixed (“M2F”). The latter option is used when calling a CallGenerator.

MOS algorithm: Bandwidth of the transmitted speech that is considered by the POLQA algorithm: narrowband (“NB”) or super-wideband (“SWB”). See section 14.2.1. Regarding POLQA in general, see section 14.1.

(continued on next page)



(continued)

Bidirectional: This option appears only for older devices that support downlink-only AQM.

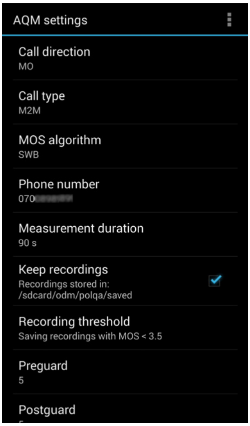
- If checked, measurements are made in both directions, so that this device will alternate between measuring audio quality and injecting sound to the other party.
- If not checked, this device will only measure audio quality, never inject sound to the other party.

Phone number*: AQM voice calls are placed either to another TEMS Pocket device or to a CallGenerator. Here you enter the phone number of the receiving party. Any characters available in the interface of the TEMS Pocket device can be used.

Measurement duration*: Duration of the AQM voice call in seconds. The maximum is 600 s.

Keep recordings: If checked, speech recordings (sentences) that receive a bad enough POLQA MOS score will be saved in the location specified in section 4.4.2. The limit is set under **Recording threshold**, which can range from 0 to 5. The value 0.0 means that nothing is saved; the value 5.0 means that all recordings are saved. – This option is available on devices supporting audio sync; see the listing in chapter 15.

(continued on next page)



(continued)

Audio path filtering: *(Appears only on devices supporting these functions)* Use of device-specific audio-enhancing functions such as noise suppression, audio stretch, comfort noise, and gain control. By turning this off, you enable TEMS Pocket to measure network audio quality in a more unbiased way, without device-specific audio processing impacting results.

Preguard*, Postguard*: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Repeat guard: If Repeat action is set larger than 1, a guard period is automatically inserted between repetitions. Here you set the length of that guard period.

Durations: See section 9.3.1.

Link to AQM Progress data view

9.3.9.1. Device-specific VoLTE Requirements

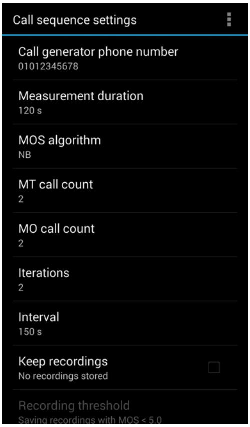
On the LG G2 VS980 and Samsung Note 3 SM-N900T, device modem IP capture must be turned on if you want reports on packet jitter and the like. See section 9.7.2.

9.3.10. “Call Sequence” Action Settings

This action conducts a sequence of voice calls, starting with mobile-terminated calls and continuing with mobile-originated ones. The entire call sequence can be iterated multiple times within a single execution of the action.

Further details on the call sequence structure are given in section 9.3.10.1.

Note: AQM scores computed by the CallGenerator are not automatically transferred to TEMS Pocket. Rather, files containing such scores need to be retrieved from the CallGenerator and merged with TEMS Pocket data in TEMS Investigation or TEMS Discovery Device.



CallGenerator phone number: Phone number to the CallGenerator acting as other party in the calls.

Measurement duration: Desired duration of audio quality measurement during each call. Not necessarily equal to actual call duration; compare Interval.

MOS algorithm: Bandwidth of the transmitted speech that is considered by the POLQA algorithm: narrowband (“NB”) or super-wideband (“SWB”). See section 14.2.1. Regarding POLQA in general, see section 14.1.

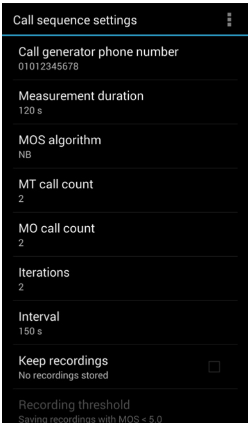
MT call count: Number of mobile-terminated calls to receive from the CallGenerator in each iteration of the call sequence.

MO call count: Number of mobile-originated calls to dial to the CallGenerator in each iteration of the call sequence.

Iterations: Number of times to run through the MT + MO call sequence.

Interval: Length of timeslot allotted to one MT/MO call and the subsequent waiting period. See the diagram in section 9.3.10.1. Interval must be at least 30 seconds longer than **Measurement duration**.

(continued on next page)



(continued)

Keep recordings: If checked, speech recordings (sentences) that receive a bad enough POLQA MOS score will be saved in the location specified in section 4.4.2. The limit is set under **Recording threshold**, which can range from 0 to 5. The value 0.0 means that nothing is saved; the value 5.0 means that all recordings are saved. – This option is available on devices supporting audio sync; see the listing in chapter 15.

Preguard*, Postguard*: See section 9.3.1.

Repeat action: Total number of times to execute the action before the script proceeds to the next action. The maximum is 99.

Repeat guard: If Repeat action is set larger than 1, a guard period is automatically inserted between repetitions. Here you set the length of that guard period.

Durations: See section 9.3.1.

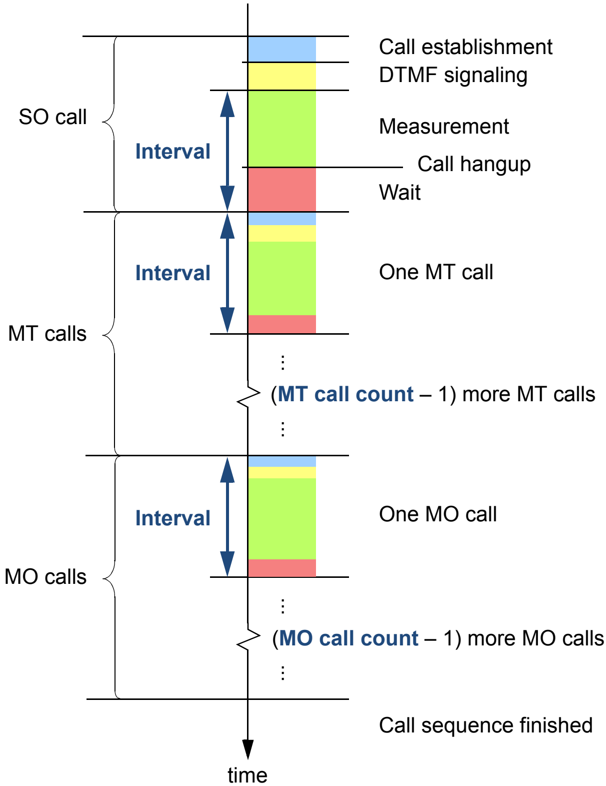
Link to Call Sequence Progress data view

9.3.10.1. Structure of Call Sequence

The Call Sequence action has the following structure at the top level:

- SO (Sequence Order) call
- Repeat as many times as specified under **Iterations**:
  - First, all MT calls.
  - Then, all MO calls.

The diagram below shows the first iteration of a Call Sequence action. As just explained, in subsequent iterations (if any), the SO call is not repeated.



Sequence Order Call

The action always starts with an SO (Sequence Order) call to the CallGenerator. The function of the SO call is to order MT calls from the CallGenerator and to inform it about the requested call sequence setup as dictated by the action settings. These parameters are sent by DTMF signaling and also include the device phone number, which must be defined in the **Settings** menu under **Phone settings**. You can have TEMS Pocket automatically detect the device's phone number if possible; otherwise, you must enter the number manually. See section 21.1.5. If the CallGenerator is located in a different country, you must format the device phone number as described in section 21.1.5.1.

Voice quality is measured also during the SO call.

Structure of Calls

All calls, regardless of type (SO/MT/MO), involve the following steps:

1. Call establishment
2. DTMF signaling
3. Audio quality measurement

The first **Interval** starts when the last DTMF tone is sent in the SO call. From that point on, intervals of identical length are rigidly repeated back-to-back. If call establishment and DTMF signaling take too long for a particular call, the measurement time specified under **Measurement duration** is automatically shortened so that the call will end before the current interval expires.

The waiting time after each call is equal to whatever is left of **Interval** after call establishment, DTMF signaling, and measurement. The waiting time is thus variable.

Aborting of Call Sequence Action

If you stop a Call Sequence action before the sequence of calls has been completed, TEMS Pocket will place a Cancel call to the CallGenerator, instructing it to stop calling.

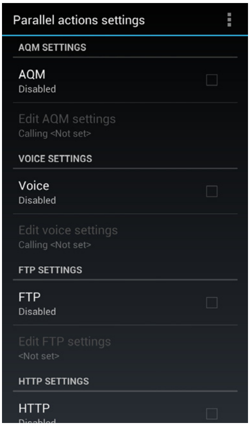
If TEMS Pocket misses three MT calls in a row, the CallGenerator will abort the Call Sequence action. No Cancel call is needed in this case.

9.3.10.2. Devices Supporting the Call Sequence Action

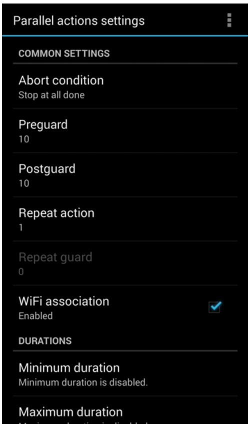
See chapter 15.

9.4. The “Parallel” Action

The Parallel action is used to run multiple services concurrently. You can run one session of each of the following types: Voice MO, AQM, FTP, HTTP, Ping, Email, SMS, and YouTube.



Service settings (first screen height)



Common settings

In the dialog, each of these service types has a separate settings section. A checkbox governs whether or not to include this service in the action. Below the checkbox is an item **Edit** <service type> **settings**, which opens a settings dialog similar to that found in the corresponding single-service action, except that certain general parameters are not present. These are instead found under **Common settings** and are defined only once for the Parallel action as a whole: **Preguard**, **Postguard**, **Repeat action**, **Repeat guard**, **Wi-Fi association**, and the **Durations** settings.

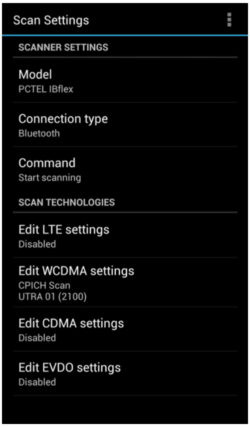
Under Common settings is also found an **Abort condition** parameter, which determines when the Parallel action should stop executing. The following options are provided:

- **Stop at all done:** Stop only after all services have finished (either succeeded or failed).
- **Stop at first done:** Stop as soon as one service has finished (succeeded or failed).
- **Stop at first success:** Stop when one service has finished with success.
- **Stop at first error:** Stop when one service has finished with error.

For details on the outcome of a Parallel action as a function of the outcomes of the service sessions and the chosen Abort condition setting, see section 6.3.3.22.

9.5. The “Scan” Action

This action starts or stops scanning in a mobile network, using an external scanner connected to the TEMS Pocket device. For an overview of scanning with TEMS Pocket, see chapters 17 (DRT) and 18 (PCTel).



Model: Scanner model: DRT4311B or PCTel IBflex.

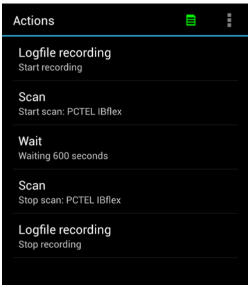
Connection type:

- *DRT:* Only USB supported at present.
- *PCTel:* Bluetooth or USB. To be able to connect via Bluetooth, the TEMS Pocket device must have this function turned on.

Command: “Start scanning” or “Stop scanning”.

Edit LTE settings, etc.: Tap these items to configure scan settings for each technology. See sections 9.5.3 (DRT) and 9.5.4 (PCTel).

To give duration to the scan, you must interpose some other action between the “start scan” and “stop scan” actions. The simplest method is to use a Wait action. Compare sections 17.3, 18.3.



Here a Wait is used to leave the scanning on for 60 seconds, after which it is stopped.

If a “start scan” action is not followed by a “stop scan” action in the script, the scanning will continue until the script terminates.

9.5.1. Support for Concurrent Scans

Scanning can be done on multiple mobile technologies concurrently if everything is set up in the *same* Scan action.

On the other hand, it is *not* possible to start several scans in parallel using multiple Scan actions, each with a different set of channels chosen. If multiple “start scan” actions occur in sequence with no “stop scan” in between, only the first of these is executed, and the rest are ignored.

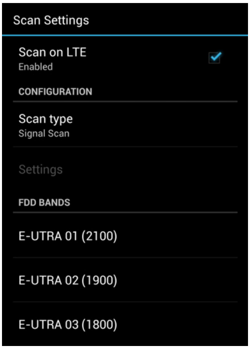
Scanner-specific limitations may exist as well.

9.5.2. Priority of Manual Scanning

If scanning has been started manually before the script starts, all script-controlled scanning is inhibited, and the manual scan will continue independently of the script.

9.5.3. DRT Scan Settings

9.5.3.1. LTE Signal Scan Settings

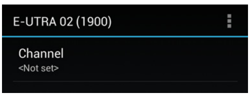


Scan on LTE: Check this to enable LTE signal scanning. Doing so makes the band and channel settings editable. If you disable this option and later re-enable it, the channels previously selected (if any) will reappear.

Scan type: Only signal scan is currently supported.

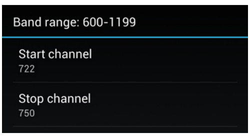
FDD bands, TDD bands: Here all supported E-UTRA bands are listed, both FDD and TDD, identified by their numbers and frequencies.

When you tap a band, a new dialog appears:

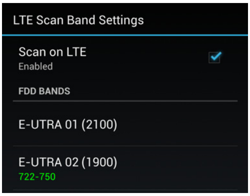


You select the frequencies to scan by setting up one or several continuous EARFCN ranges.

- Tap an EARFCN range to configure it.



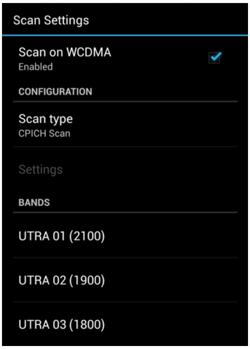
- For each EARFCN range, specify the **Start channel** and **Stop channel** parameters.



- Then tap the Back button to confirm. The selected EARFCNs are now enumerated in *green* in the list of bands.

You can proceed to select further channel ranges on the same band and/or on other bands.

9.5.3.2. WCDMA CPICH Scan Settings

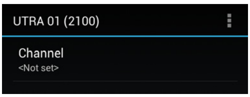


Scan on WCDMA: Check this to enable WCDMA CPICH scanning. Doing so makes the band and channel settings editable. If you disable this option and later re-enable it, the channels previously selected (if any) will reappear.

Scan type: Only CPICH scan is currently supported.

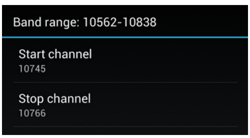
Bands: Here all supported UTRA bands are listed, identified by their numbers and frequencies.

When you tap a band, a new dialog appears:

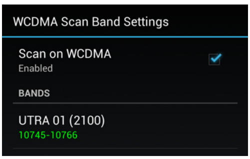


You select the frequencies to scan by setting up one or several continuous UARFCN ranges.

- Tap a UARFCN range to configure it.



- For each UARFCN range, specify the **Start channel** and **Stop channel** parameters.



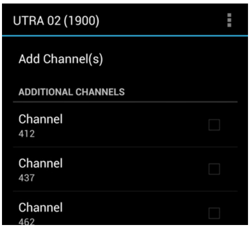
- Then tap the Back button to confirm. The selected UARFCNs are now enumerated in *green* in the list of bands.

You can proceed to select further channel ranges on the same band and/or on other bands.

9.5.4. PCTel Scan Settings

The user interface for selecting bands and channels is basically the same as for DRT; see section 9.5.3. However, the following differences must be noted:

- For LTE RSSI scan, the selection of channel ranges is subject to bandwidth-dependent restrictions. Not all channels are available for selection, regardless of bandwidth. Details appear in on-screen messages.
- For LTE signal scan, channel ranges cannot be selected at all, but only single channels. A maximum of 24 channels can be scanned on a given band (16 if System Information decoding is turned on).
- On WCDMA, “additional channels” are available on certain bands, as defined in 3GPP. These are listed individually at the bottom of the channel selection dialog for the band in question, and they are selected by checking a checkbox:



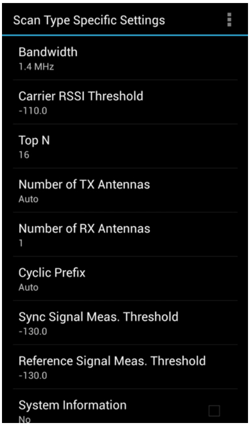
- The naming of bands is according to 3GPP by default. However, you can switch to PCTel’s own band designations as follows:

In the Scan Settings dialog, tap the Overflow button and select **Use PCTel band names**.

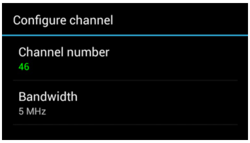
Tap the Overflow button once more to revert to 3GPP naming (**Use 3GPP band names**).

- For PCTel, certain scan parameters are also configurable under **Settings**. They are covered in the subsections that follow.

9.5.4.1. LTE Signal Scan Settings



LTE signal scan settings



Channel-specific bandwidth

Bandwidth: The bandwidth to scan. One of: {1.4, 3, 5, 10, 15, 20} MHz. **Note:** For LTE signal scan, this is the *default* bandwidth. For each channel selected it is possible to define a different bandwidth, which will then override the default. See the second screenshot.

Carrier RSSI Threshold: The measurements on reference signals and synchronization signals will be performed only if measured Carrier RSSI is above this threshold.

Top N: Here you specify how many cells the scanner should report; the value *N* causes the scanner to return the *N* strongest cells.

Number of TX Antennas: The number of Tx antenna ports to measure on (multiple ports for MIMO). The scanner is capable of detecting this automatically (“Auto” option).

Number of RX Antennas: The number of Rx antennas on the scanner (multiple antennas for MIMO).

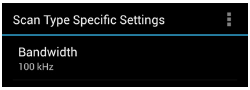
Cyclic Prefix: The type of cyclic prefix used in OFDM, e.g. “Normal 15 kHz”. The scanner is capable of detecting this automatically (“Auto” option).

Sync Signal Meas. Threshold: Only synchronization signal measurements above this threshold (in dBm) will be reported.

Reference Signal Meas. Threshold: Only reference signal measurements above this threshold (in dBm) will be reported.

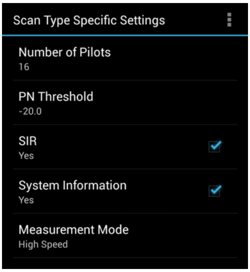
System Information: Decoding of System Information.

9.5.4.2. LTE RSSI Scan Settings



Bandwidth: The bandwidth to scan. One of: {1.4, 3, 5, 10, 15, 20, 100} MHz. Note that the choice made here affects what channel ranges can be selected.

9.5.4.3. WCDMA CPICH Scan Settings



Number of Pilots: To scan the *N* strongest scrambling codes, enter the value *N* here ($N \leq 32$).

PN Threshold: This is a signal code power threshold (in dB) used for the aggregate E_c/I_0 and delay spread measurements.

If the PN threshold is set too low, the aggregate E_c/I_0 and delay spread values will be affected by random noise more than may be desired. By raising the threshold you reduce the influence of random noise correlations, and you will thus be able to discern multipath and fading effects more accurately. A threshold value of –20 dB is recommended.

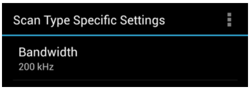
SIR: Set to Yes for the scanner to report signal-to-interference ratio (SIR).

System Information: Setting this to Yes causes the scanner to decode System Information blocks (continuously). With this option selected, a maximum of 16 scrambling codes can be scanned.

Measurement Mode: There are two choices, High Speed and High Dynamic. These are two algorithms with different priorities:

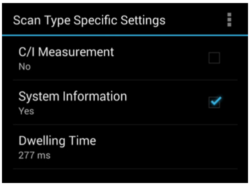
- **High Dynamic** puts the emphasis on accuracy. Each sample reported by the scanner is typically based on a measurement 20 ms in length.
- **High Speed** is faster and accordingly less accurate. Each reported sample is typically based on a 10 ms measurement.

9.5.4.4. WCDMA RSSI Scan Settings



Bandwidth: The bandwidth to scan. One of: {200 kHz, 3.84 MHz}.

9.5.4.5. GSM Color Code Scan Settings

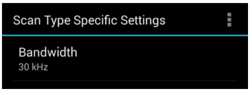


C/I Measurement: Use of C/I measurement.

System Information: Decoding of System Information.

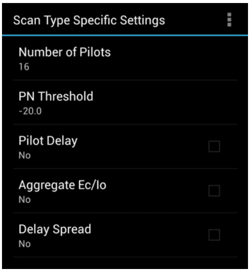
Dwelling Time: The length of time the scanner dwells on each BCCH trying to decode System Information blocks, before moving on to the next BCCH.

9.5.4.6. GSM RSSI Scan Settings



Bandwidth: The bandwidth to scan. One of: {30 kHz, 200 kHz}.

9.5.4.7. CDMA PN Scan Settings



Number of Pilots: To scan the *N* strongest pilots, enter the value *N* here ($N \leq 32$).

PN Threshold: This is a signal code power threshold (in dB) used for the delay spread measurements.

If the PN threshold is set too low, the delay spread values will be affected by random noise more than may be desired. By raising the threshold you reduce the influence of random noise correlations, and you will thus be able to discern multipath and fading effects more accurately. The setting –20 dB is recommended.

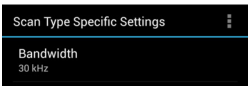
The following measurements can be turned on or off:

Pilot Delay: The number of chips between the expected arrival time and the actual arrival time of the signal.

Aggregate Ec/Io: The sum of all peak pilot E_c/I_0 values that are above the PN threshold.

Delay Spread: The number of chips between the first and last pilot E_c/I_0 peaks above the PN threshold.

9.5.4.8. CDMA RSSI Scan Settings



Bandwidth: The bandwidth to scan. One of:

- 30 kHz: “Condensed” or CW band.
- 1.25 MHz: CDMA band.

9.5.4.9. EV-DO PN Scan Settings

Same settings as for CDMA PN scan; see section 9.5.4.7.

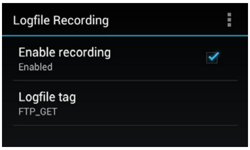
9.5.4.10. EV-DO RSSI Scan Settings

Same settings as for CDMA RSSI scan; see section 9.5.4.8.

9.6. Logfile-related Actions

9.6.1. “Logfile Recording” Action Settings

This action is used to turn logfile recording on or off at any point in a script. Any number of such actions can be inserted. In this way you can freely choose how to distribute measurement actions across logfiles.



Enable recording: Tap to toggle between “Enabled” (start recording) and “Disabled” (stop recording).

Logfile tag: You can add an action-specific logfile tag here, independently of the one defined in the general script settings (see section 9.2.1). In logfile names, the action-specific tag comes after the general one if both are present.

This action *must* be used to have any of the script execution recorded, unless you have started manual recording before starting the script.

If several “start recording” actions occur without an intervening “stop”, all except the first are redundant, and when saving the script you are asked whether to remove the redundant actions. If you keep them, they are ignored at execution time anyway. The same applies to multiple “stop recording” actions without an intervening “start”.

If a “start recording” action is present but no “stop” follows, everything after the “start” action (and, in subsequent script iterations, also whatever precedes it) is recorded in a single logfile. The recording stops only when the script terminates.

9.6.1.1. Recording Coverage Icon

At the top of the script action list, an icon indicates to what extent measurement actions are covered by logfile recording:

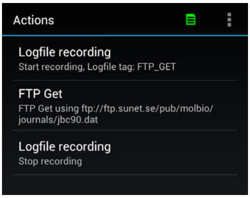
 All measurement actions will be recorded.

 One or several measurement actions will not be recorded (at least not during the first script iteration).

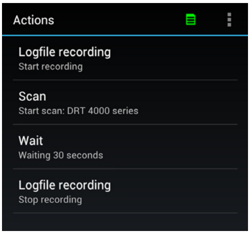
 The script will produce no logfiles, because no “start recording” action is present.

When leaving the script action list, you will be prompted if the recording coverage icon is red or yellow.

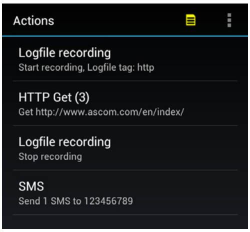
Examples:



Each execution of the FTP action will be recorded in a separate logfile.



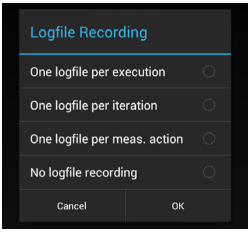
In this script, 30 seconds' worth of scanning is recorded in a new logfile in each iteration. (The scanning is turned on once and then left running; it is turned off only when the script terminates.)



The HTTP action will be recorded (in a separate logfile on each occasion), but the SMS action will not be.

9.6.1.2. Quick Setup of Logfile Recording

You can **tap** the logfile coverage icon in order to quickly set up logfile recording for the entire script, in any of a number of ways. The following dialog appears:



One logfile per execution: The entire script execution (all script iterations) will be recorded in a single logfile. – "Start recording" is inserted first in the script; no "stop recording" is used.

One logfile per iteration: Each iteration of the script is recorded in a new logfile. – "Start recording" is inserted first in the script; "stop recording" is inserted last.

One logfile per meas. action: Each measurement action is recorded in a logfile of its own. – Each measurement action is encapsulated by a preceding "start recording" and a following "stop recording". (After a lone Scan action, no "stop recording" is added.)

No logfile recording: No measurement actions are recorded. – The script will contain no Logfile Recording actions. (This option is helpful if you want to start over defining the recording setup and insert Logfile Recording actions manually.)

Regardless of the option chosen, any previously added recording actions are first removed.

9.6.1.3. Priority of Manual Recording

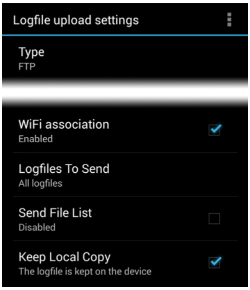
If a logfile is being recorded manually when the script starts, all script-controlled logfile recording is inhibited.

9.6.2. “Logfile Upload” Action Settings

Logfiles can be uploaded via FTP, SFTP, or HTTP(S). This is governed by the **Type** setting.

Whenever this action executes, TEMS Pocket tries to upload logfiles as specified by the **Logfiles to send** parameter, and then deletes all files successfully uploaded. However, no more than 500 logfiles will be uploaded at a time. If there are files left after this action terminates, they will be taken care of the next time a Logfile Upload action is executed.

9.6.2.1. General Settings



Type: One of: FTP, SFTP, or HTTP. Logfile upload over SFTP requires the SSL license option: see section 3.6.2.

Wi-Fi association: See section 9.3.1. Note that you can use this flag to divert logfile uploads to a different bearer from that used for testing.

Logfiles to send: This setting is related to the concept of TEMS Pocket sessions; see chapter 11. The following options exist:

- *All non-session logfiles:* Only logfiles not recorded during a TEMS Pocket session (i.e. stored directly under phone/pocket/logfiles) will be uploaded. Compare section 4.4.1.
- *Session logfiles:* Only logfiles recorded during a TEMS Pocket session (i.e. stored in a subdirectory (phone/pocket/logfiles/sessions/<session name>) will be uploaded.
- *All logfiles:* Both session and non-session logfiles will be uploaded.
- *Latest session:* Only logfiles from the latest TEMS Pocket session (if one exists) will be uploaded.

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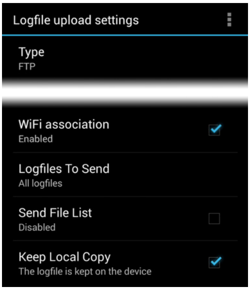


(continued)

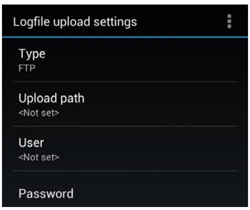
Send file list: If enabled, then before the actual logfiles, one text file is sent for each session, listing the logfiles to be uploaded. These files are named “<session name>.nnn”, where nnn is the number of logfiles (e.g. “003”, “123”). **Note:** If an error occurs or the upload is aborted, these files are not updated later on to reflect what files were actually uploaded.

Keep local copy: By default, logfiles are deleted after they have been uploaded. However, if you check this option, uploaded logfiles will be moved to a directory phone/pocket/logfiles/uploaded and kept there.

Here, too, logfiles belonging to TEMS Pocket sessions as well as TEMS Pocket Remote logfiles are stored in separate subdirectories: uploaded/sessions/<session name> and uploaded/remote respectively. Again, compare section 4.4.1.

No local copies are ever made of file lists generated by the **Send file list** option.

9.6.2.2. Logfile Upload via FTP or SFTP



Upload path: Path to a server directory where the logfiles should be uploaded.

For FTP, an example of an upload path is: ftp://ftp.myserver.com/tems/pocketlogfiles.

For SFTP, the path must have the following format: sftp://<IP address>[:<port>]/<directory path>, for example, sftp://1.2.3.4:22/home/myuser/myfiles. If the port number is left out, port 22 is assumed by default.

User, Password: User name and password on the FTP/SFTP server, insofar as required. For SFTP, see also below.

SFTP Login Methods

Supported SFTP login methods are publickey, password, and keyboard-interactive.

To use the publickey login method, you must have your private key stored on the TEMS Pocket device in a file named id_rsa under /phone/pocket/private/certificates/. Supported formats are *.pem and *.pkcs8. Only one such certificate file can be stored on the device at a time. (The public key resides on the SFTP server.)

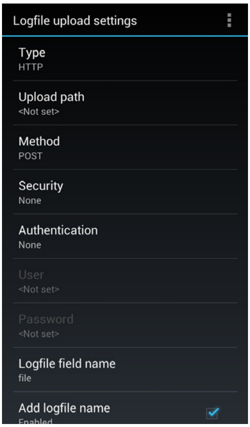
In the Logfile upload settings:

- Under **User**, enter your user name on the SFTP server.
- Leave **Password** blank.

To use the password or keyboard-interactive login method (each will be tried in turn), do as follows:

- Under **User** and **Password**, enter your credentials on the SFTP server.

9.6.2.3. Logfile Upload via HTTP(S)



Logfile upload settings: Top part

Upload path: Path to an upload script in an HTTP server directory. This script (*.php) takes care of the uploaded logfiles, e.g. test.myserver.com/post.php. The path can be entered without the protocol prefix “http://” or “https://” since the **Security** parameter controls which protocol is used.

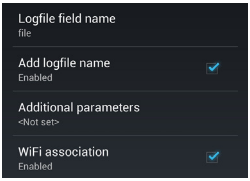
Method: Only POST available. ▶ IETF RFC 2616

Security: None or SSL. Only applicable if a valid security (SSL) license is available: see section 3.6.2. If SSL is selected, the HTTPS protocol is used (see **Upload path**).

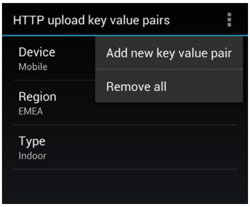
Authentication: None or Basic. The latter is according to ▶ IETF RFC 2617. Note that if Basic is used without SSL (see **Security**), the **Password** will be sent as plain text.

User: User name on the HTTP server, if required. Only applicable if **Authentication** is set to Basic.

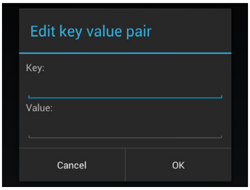
(continued on next page)



Logfile upload settings: Bottom part



Additional parameters: Key-value pairs displayed



Editing a key-value pair

(continued)

Password: User password on the HTTP server, if required. Only applicable if **Authentication** is set to Basic.

Logfile field name: The name of the field in the Content-Disposition header for the file to be uploaded (containing the actual logfile). The script mentioned under **Upload path** expects a file with this name, containing a logfile. ► IETF RFC 2388

Add logfile name: Enabled or Disabled. If Enabled is selected, the name of the actual logfile is also added in the Content-Disposition header for the file to be uploaded. ► IETF RFC 2388

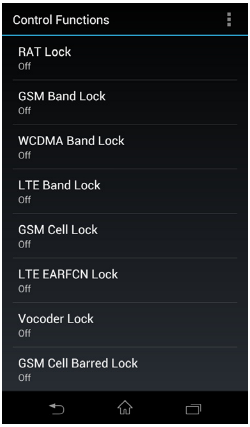
Additional parameters: Here it is possible to add or edit key-value pairs to be sent with the HTTP Post request, providing additional assistance to the script in sorting the uploaded logfiles. Tapping this field takes you to the list of existing key-value pairs.

- Tapping the button **Add new key value pair** displays the dialog where you enter a name for the key (mandatory) and a name for the value (optional).
- Tapping **Remove all** removes all key-value pairs from the list.
- Tapping an existing key-value pair displays the same dialog as when adding a new one. You can edit the key and/or the value.
- Long-pressing a key-value pair displays a context menu from which you can move the pair to a different position in the list, or remove the pair.

Link to Logfile Upload Progress data view

9.7. Other Script Actions

9.7.1. "Control Function" Action Settings



The settings for this action are exactly the same as when applying control functions manually, as described in chapter 13 (which see).

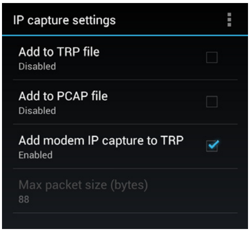
Note that a Control Function action always sets *all* control functions anew. (There is no "as-is" option that leaves a particular previous setting unchanged.)

During script execution, the settings specified by a Control Function action remain in force until the next time a Control Function action is executed, or else until the script terminates.

9.7.2. "IP Capture" Action Settings

The IP Capture action enables or disables packet capture. Note that this action does *not* by itself start logfile recording; rather, that must be initiated in one of the ways mentioned in section 10.1. Note also that a PCAP file is created only in connection with TRP logfile recording; it is not possible to record PCAP files independently.

Note: For packet data to be captured on file (whether TRP logfiles or PCAP files), the IP Capture action must *precede* the Logfile Recording action in the script.



- **Add to TRP file:** If checked, packet capture data from the Android IP stack is saved to a regular TEMS Pocket logfile (*.trp) alongside other data logged to that file.
- **Add to PCAP file:** If checked, packet capture data from the Android IP stack is saved to a PCAP file, which can be read for example by Wireshark. The PCAP file is named identically to the TRP logfile (as described in section 10.2), except that the extension is replaced by .pcap. PCAP files are stored in the same directory as TRP logfiles: see section 4.4.2.
- **Add modem IP capture to TRP file:** *(Valid only for VoLTE-capable devices)* If checked, packet capture data from the *device modem* is saved to a TEMS Pocket logfile (*.trp) along with other content. This data cannot be saved to a PCAP file. See also section 9.7.2.1.
- **Max packet size (bytes):** The maximum number of bytes of each packet that will be captured. Any further bytes in the packet will be truncated. **Note:** This setting does not apply to device modem IP data, for which the number of bytes logged is fixed.

9.7.2.1. Notes on Device Modem IP Capture

This option is valid only for devices with VoLTE capability.

Device modem IP data is obtained only when the modem is in use, that is, when running data services over a mobile network (as opposed to Wi-Fi).

The IP data obtained from the device modem is mostly equivalent to that captured from the Android IP stack. VoLTE, however, is an exception, since the IMS client (unlike clients for other data services) is built into the modem. For this reason, VoLTE can be run over the device modem only, and IP data for this service does not propagate to the Android IP stack. Therefore you *must* capture device modem IP data to provide RTP packet input to the computation of VoLTE KPIs during post-processing, whether using TEMS Discovery Device or some other tool.

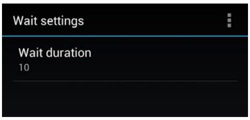
On the other hand, device modem IP capture is **not suitable for high throughput tests** since it affects the performance of the device.

9.7.2.2. IP Capture Requirements for KPI Data Collection

If you use the IP capture action to collect input to KPIs (computed in post-processing), you must set the **Max packet size** parameter high enough to catch the relevant data. The precise number of bytes required varies depending on the data service and protocol used; as a rule of thumb, 150 bytes will usually be sufficient.

Be aware in this connection that the IP capture generates a processing load directly proportional to the number of bytes captured as well as to the network throughput rate. In consequence, the performance of TEMS Pocket may be substantially affected, and at very high loads the application will become extremely unresponsive. Turning off the option **Add modem IP capture to TRP file** will greatly alleviate such performance issues.

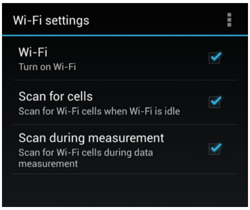
9.7.3. “Wait” Action Settings



You can use the Wait action to insert a guard time between other actions, or to give duration to a task such as mobile network scanning (start scan → Wait → stop scan). The Wait action itself does nothing in particular.

Wait duration: The length of time (in seconds) the device should wait.

9.7.4. "Wi-Fi" Action Settings



Wi-Fi: If checked, the script will turn on the device's Wi-Fi function. Note that this does *not* by itself cause any Wi-Fi scanning to be performed.

Scan for cells: Check this to allow the script to perform Wi-Fi scanning while Wi-Fi is idle, that is, when no data transfer is in progress over this bearer. Restricting scanning in this way ensures that Wi-Fi throughput performance will not be affected.

Scan during measurement: This option becomes available if **Scan for cells** is turned on and lets you allow or inhibit script-initiated Wi-Fi scanning while data is being transferred over Wi-Fi. You may not want to do any scanning in that situation, since it consumes a non-trivial amount of resources and will to some extent reduce the achievable throughput. **Note:** Even if this option is turned off, Android will still perform Wi-Fi scanning whenever it sees fit, so that the device always uses the best available access point. Only Wi-Fi scanning initiated by the TEMS Pocket script is suppressed.

The **Wi-Fi** and **Scan for cells** options correspond to the manual command **Turn On Wi-Fi** with its associated option **Scan for Wi-Fi Cells**. See chapter 19.

To give duration to Wi-Fi scanning, you must interpose some other action between the "enable" and "disable" actions. See section 19.1 for further instructions.

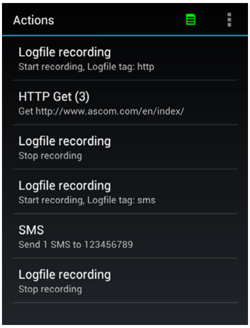
The output from Wi-Fi scanning is presented in the data views described in sections 5.12.1 and 5.12.2.

For clarity, it may be remarked that this action is unrelated to the **Wi-Fi association** setting in data service actions (about which see section 9.3.1).

9.8. Editing a Script

9.8.1. The Assembled Script

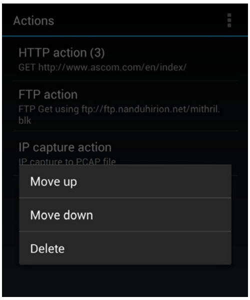
Once you are done setting up an action, simply tap the Back button to return to the list of actions in the script.



In this list the new action appears below those previously defined. Here is an example where multiple actions have been set up, each measurement action being recorded in a separate logfile. The addition “(3)” after “HTTP Get” means that this action will be executed three times back-to-back (**Repeat action** parameter, see section 9.3.3).

You can add one more action to the script by again tapping the Overflow button, selecting **New Action**, and proceeding as described above.

9.8.2. Rearranging and Deleting Actions in a Script



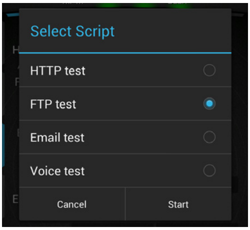
- To move an action one step upward or downward in the script, long-press the action in the list of actions and select **Move up** or **Move down** from the menu that pops up.
- To delete an action from a script, long-press the action and select **Delete**.

You can also delete an action while editing it, by tapping the Overflow button and selecting **Delete**.

9.8.3. Controlling Logfile Recording

To modify the logfile recording setup in the script, insert, move or delete Logfile Recording actions as appropriate (see section 9.6.1), or tap the Recording Coverage icon to apply one of the quick setups described in section 9.6.1.2.

9.9. Starting and Stopping a Script



To start a script:

Tap the Script button.

(Alternatively, tap the Menu button, and under **Start** select **Start Script**.)

- Select the desired script from the list that appears and tap **Start**.

Once started, the script will keep running until one of the following things happens:

- The number of turns specified in the general script settings have been completed (see section 9.2.1).
- The script is stopped manually as described below.
- The script is stopped by the occurrence of an event that has been selected as "stop" trigger (again, see section 9.2.1).
- The internal memory card is full, the device battery is drained, or some other device-related issue prevents the script from continuing.

The **Test Status** data views detail the outcome of the script execution: see section 5.10. Statistics on scripted sessions are presented in the **Statistics** data views: see section 5.15.

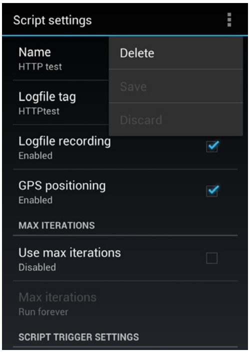
To stop a script that is running, do as follows:

Tap the Script button once more.

(Alternatively, tap the Menu button, and under **Start** select **Stop Script**.)

Be aware that if you stop a script, it may happen that no "End" or "Error" event is generated for the service session that is interrupted.

9.10. Deleting Scripts



To delete a script:

Tap the Menu button, and under **Create/Modify** select **Scripts**.

- Tap the script you want to delete.

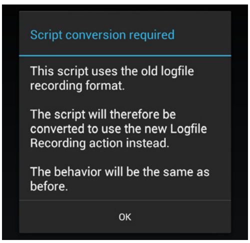
Tap the Overflow button and select **Delete**.

Note: When you delete a script, the script file is permanently removed from the device's file system.

9.11. Conversion of Logfile Handling in Older Scripts

Script-controlled logfile recording was handled differently in TEMS Pocket versions prior to 14.1, and the Logfile Recording action type did not exist. Logfile recording was either enabled or disabled for the script execution as a whole, and each action was recorded in a separate logfile (or in some cases several files).

If you open a script composed in the old format in the Script Editor, a dialog titled “**Script conversion required**” will appear.



If logfile recording is enabled in the script, it will be converted by the insertion of a “start recording” action before each measurement action and a “stop recording” action after each such action. In this way the behavior of the script is preserved.

If you run an old-format script without having opened it in the Script Editor, the script will likewise execute in the same way as before.

10. Logfiles

10.1. Logfiles in TEMS Pocket: Overview

TEMS Pocket can record its measurements in logfiles, containing the same richness of detail as logfiles recorded with TEMS Automatic/TEMS Symphony test probes or with devices connected to TEMS Investigation. The same TRP format is used as in these other TEMS products.

Logfiles are **stored** on the device's internal memory card, or alternatively on an external memory card (see section 4.4.1), as regular files in the device file system.

You can **record** logfiles **manually** in the following ways:

- By giving the **Start Logfile Recording** command. See section 10.3.
- In connection with pinpointing in the Indoor Map view. See section 7.5.

You can also have logfiles recorded **automatically** during execution of scripts. See section 9.6.1.

Regarding logfile **naming**, see section 10.2.

You can insert **filemarks** into a logfile that is being recorded: See section 10.5.

TEMS Pocket has a logfile **replay** function, described in section 10.6. You can also study TEMS Pocket logfiles by transferring them to a PC and opening them in other TEMS products, listed in section 10.7.

TEMS Pocket is capable of **uploading** logfiles over the cellular network to an FTP or HTTP server, using the built-in FTP or HTTP client. This is implemented as a special script action: see section 9.6.2. It is of course also possible to transfer logfiles via USB or Bluetooth, or to send them as attachments to email.[1]

1. The latter methods require installation of a third-party Android app, since TEMS Pocket logfiles are not visible in the device's standard user interface; see section 4.4.

If a logfile recording is interrupted because of a device malfunction or because the TEMS Pocket application terminates unexpectedly, TEMS Pocket will by default attempt to **recover** the logfile. This is the topic of section 10.8.

10.2. Logfile Naming Format

TEMS Pocket logfile names always end with a timestamp of the format yyyymmddThhmmssZ, indicating at what time the recording started.

In scripted recording, logfile names can optionally be extended with a script tag (see section 9.2.1) and/or a Logfile Recording action tag (see section 9.6.1). The full logfile name syntax then becomes:

<script tag>_<Logfile Recording action tag>_<timestamp>.trp

When doing indoor pinpointing, you can add special **prefixes** to logfile names. See sections 21.2.2–21.2.3.

10.3. Recording Logfiles Manually

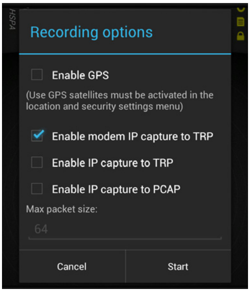
You can initiate recording of a logfile manually, without running a script. (Logfile recording in connection with pinpointing is covered in section 7.5.)

To start manual logfile recording:

 Tap the Logfile Recording button.

(Alternatively, tap the Menu button, and under **Start** select **Start Logfile**

Recording.)



A dialog with recording options appears.

Enable GPS: Check in order to record GPS positions in the TRP logfile. Note that for this to be possible, the device must have its built-in GPS enabled in the regular device settings (as remarked in section 4.7.1) or an external GPS connected.

Enable modem IP capture to TRP: Check in order to capture IP data from the device modem in the TRP logfile. *This option is visible only on VoLTE-capable TEMS Pocket devices.*

Enable IP capture to TRP: Check in order to capture packet data from the Android IP stack in the TRP logfile.

Enable IP capture to PCAP: Check in order to capture packet data from the Android IP stack in a PCAP file (which will receive the same file name as the TRP logfile but with extension .pcap).

Max packet size: The maximum number of bytes of each packet that will be captured. **Note:** This setting does not apply to device modem IP data, for which the number of bytes logged is fixed.

The IP capture settings are the same as in the IP Capture script action and are described in more detail in section 9.7.2.

- Tap **Apply**. The logfile recording now starts.

The logfile is stored in the usual location as described in section 4.4.1.

To stop the recording:

 Tap the Logfile Recording button once more.

(Alternatively, tap the Menu button, and under **Start** select **Stop Logfile Recording**.)

10.3.1. Limitations of Manual Logfile Recording

You can only record one logfile manually at a time.

You cannot start manual logfile recording in the following situations:

- While a script is running. This applies generally, hence also during execution of **Wait** and **Logfile Upload** actions.
- While pinpointing is active.
- While logfile replay is in progress.

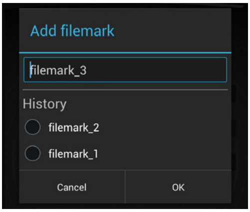
10.4. Free Memory Requirements

- Any operation that triggers logfile recording (starting a script, starting pinpointing, or recording a logfile manually) requires that the chosen storage media have at least 20 MB free memory. If the available memory is less than that, the operation cannot be performed.
- A logfile recording in progress will stop if the free memory on the chosen storage media drops below 10 MB.

10.5. Filemarks

You can insert a **filemark** in a logfile that is being recorded in order to tag a segment of particular interest in the file, or just to note down some pertinent fact related to the recording. Multiple filemarks can be inserted in the same logfile.

Whenever logfile recording is active, the Filemark button is visible on the action bar. Tap this button to add a filemark at the current position in the logfile.



This dialog appears.

- In the text box, enter the filemark text. Optionally, you can reuse the text of any of the latest five filemarks added, by selecting the desired filemark from the **History** list.
- Tap **OK** to insert the filemark.

Next time you enter the dialog, the text box will hold the text of the previous filemark with an underscore and sequence number appended. If the previous filemark already had a sequence number, the number is incremented.

Inserting a filemark also generates a Filemark event (see section 6.3.3).

When a TEMS Pocket logfile is replayed in TEMS Investigation, filemarks are displayed in the same way as TEMS Investigation filemarks.

10.6. Replaying Logfiles

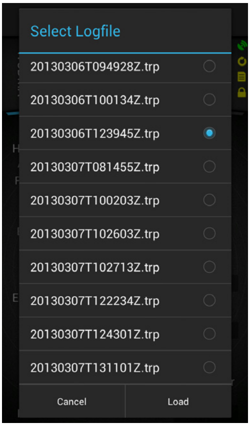
This function is used to replay TEMS Pocket logfiles in TEMS Pocket itself.[1] Note that you can also load logfiles into TEMS Investigation and TEMS Discovery Device and make use of the powerful presentation facilities in these tools.

During replay, the TEMS Pocket views are updated by the logfile content exactly as in live mode, that is, exactly as if the data were being received from the network.

To load a logfile:

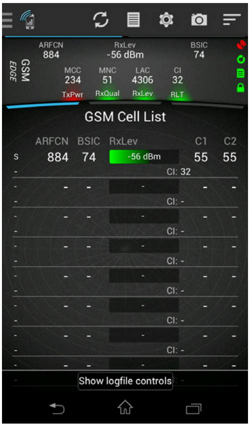
Tap the Menu button, and under **Actions** select **Load Logfile**.

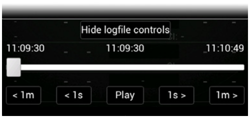
1. Please note that it is not possible to replay TRP logfiles from other TEMS products in TEMS Pocket. (For one thing, TEMS Investigation TRP logfiles may contain data from multiple devices, something which cannot be presented in TEMS Pocket.)



- A list appears of the TEMS Pocket logfiles found on the device's internal memory card. Select the desired logfile from the list and tap **Load**.

Once you have selected a logfile, the TEMS Pocket user interface (all data views) is cleared, and the logfile replay is put on standby. Furthermore, a panel with logfile replay controls becomes available at the bottom of the screen; see the next screenshot.



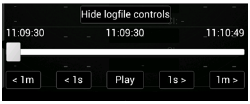


- Tap **Show logfile controls**.

The timestamps on the left and right indicate the times of day when the logfile recording started and ended, respectively. The timestamp in the middle shows the point to which the replay has advanced, as also indicated graphically by the slider.

- To start the replay, tap the **Play** button. Its label changes to **Pause**. Tap the button once more to pause the replay.
- While the replay is paused, you can jump forwards or backwards in the logfile, one second or one minute at a time, using the buttons [**< 1m**], [**< 1s**], [**1s >**], [**1m >**] ("s" = second, "m" = minute). You can also jump to an arbitrary point in the logfile by dragging the slider.

In the Indoor Map view, if you skip past one or several route waypoints, value element markers will not be filled in for the whole of the skipped segment, but only from the last waypoint before the point you skipped to.



You may want to conceal the logfile controls to be able to inspect data views more easily. To this end, tap **Hide logfile controls**. To show the controls again, just tap the button once more (**Show logfile controls**).

To close and unload the logfile that is currently loaded:

Tap the Menu button, and under **Actions** select **Unload Logfile**.

With this command you exit replay mode and return the application to “live” mode. The TEMS Pocket views are cleared, after which they will once again fill up with live data.

10.6.1. Coexistence with Other Device and TEMS Pocket Functions

You can use any of the device’s regular functions while replaying a logfile, for example take an incoming call or write an SMS. Such actions do not interfere with the replay in any way.

On the other hand, while at least one of the TEMS Pocket functions logfile recording, script execution, and pinpointing is active, logfile replay is disabled.

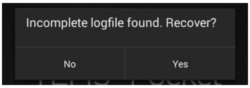
10.7. Logfile Compatibility with Other TEMS Products

- TEMS Pocket 15.1 logfiles can be post-processed in TEMS Discovery Device 10.0.8 or later.
- TEMS Pocket 15.1 logfiles can be loaded in TEMS Investigation 17.0 or later.

Please note that zones in iBwave map sets currently cannot be displayed in other TEMS products.

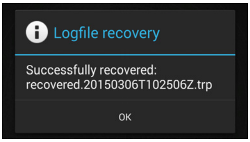
10.8. Logfile Recovery

If a device malfunction occurs or the TEMS Pocket application terminates unexpectedly during logfile recording, TEMS Pocket will by default try to *recover* the logfile next time the application is started.



You are then prompted to decide whether or not to recover this particular file.

If you tap **Yes**, TEMS Pocket goes ahead with the recovery. Another prompt will appear telling whether the operation succeeded.



If the logfile was successfully recovered, it is named according to the regular format described in section 10.2 (with the original timestamp and any added tags), only with "recovered." prefixed to the file name.

The file is written to the same location where it would have been stored if the recording had ended normally. For example, if a TEMS Pocket session was active at the time of recording, the logfile will be placed in the directory for that session.

You can turn off the logfile recovery function by tapping the Settings button and selecting **Logfile**; see section 21.2.6.

It should be kept in mind that the logfile recovery is done on a "best effort" basis. There is no guarantee that a logfile can be recovered, and even if TEMS Pocket succeeds in creating a recovered file, one cannot be certain that it can be replayed in TEMS Pocket or loaded in other TEMS products. However, in a very high percentage of cases, logfiles are indeed recoverable in a state where their data can be read.

What will always be missing in a recovered logfile is some data at the end of the file. How much depends on the circumstances of the recording, but as a rule of thumb, 30–60 seconds' worth of data will be lost. For this reason, if the recording had been ongoing for less than one minute when interrupted, the recovered logfile will most probably be empty, and thus not replayable.

11. TEMS Pocket Sessions

When working with TEMS Pocket, you can optionally delimit bouts of testing in time by means of **TEMS Pocket sessions**. In the current product version, such sessions are used to enable automated storage of logfiles in session-specific folders and subsequent selective uploading of logfiles.

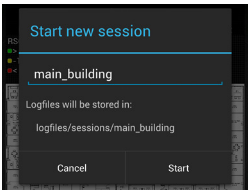
The concept of a TEMS Pocket session is completely independent of service testing sessions, which are frequently referred to elsewhere in this manual.

Only one TEMS Pocket session can be active at a time.

11.1. Starting and Stopping TEMS Pocket Sessions Manually

You can start a TEMS Pocket session independently of other activities as follows.

Tap the Menu button, and under **Other** select **Pocket Session**.

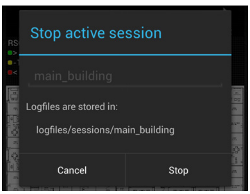


- Enter a name for the session in the text field, then tap the **Start** button.

Logfiles recorded during this session will be stored in a directory named after the string you enter here: /phone/pocket/logfiles/sessions/<session name>/ .

To end an ongoing session:

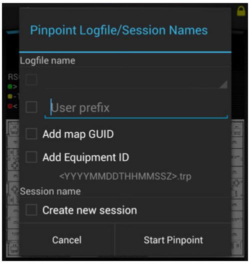
Tap the Menu button, and under **Other** select **Pocket Session**.



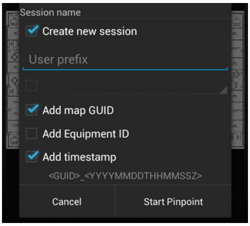
- The name of the current session is shown. To end it, tap the **Stop** button.

11.2. Starting and Stopping TEMS Pocket Sessions in Connection with Pinpointing

When you start pinpointing in the Indoor Map view, you have the option to start a separate TEMS Pocket session for the duration of the pinpointing. On giving the **Start Pinpoint** command, you are presented with this dialog (provided that you have not turned it off – see section 21.2.3):



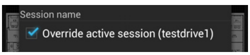
To start a TEMS Pocket session, check the **Create new session** box. A number of further options will then appear, governing the name of the session and hence the name of the directory where logfiles will be stored during the session.



The naming options are a bit more elaborate than for manual session start. You can add all of the following elements to the session name:

- Free-text string
- Predefined string
- Map GUID
- Device equipment ID
- Timestamp (indicating date and time when the TEMS Pocket session is started)

If a TEMS Pocket session is active when you issue the Start Pinpoint command, you can if you wish override that session and switch to a new one for the duration of the pinpointing. The other options are the same as above:



When you select **Stop Pinpoint**, TEMS Pocket always ends the pinpointing-specific session and returns to the previously active session (if any).

11.3. Application of TEMS Pocket Sessions

11.3.1. Logfile Upload

When setting up a logfile upload action in a script, you can specify what files to upload based on the TEMS Pocket session concept. See section 9.6.2.

11.3.2. Multi-device Configurations

The TEMS Pocket session concept is applicable also in a multi-device configuration. If you have started a session on the controller, the controller will push it out to all agents, so that each agent will normally store logfiles in a directory with the same name. However, if the session name contains the device equipment ID, each agent will use its own ID (EQ1, EQ2, etc.), so that the directory names will be different.

12. Cell Files

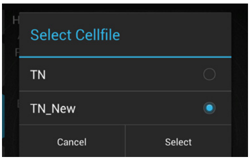
This chapter deals with TEMS product specific cell files. Regarding the presentation of transmitter files from *.ibwc containers, see section 7.3.

You can import a **cell file** into TEMS Pocket in order to display cells by name (rather than by CGI) in data views. Cell file data is also searched as an aid to target selection for cell and channel lock, and cell counts are shown in connection with RAT and band lock. For details, see the various sections of chapter 13.

Cell files are in XML format, and relevant aspects of their syntax are described in appendix F.[1]

To import a cell file, do as follows:

Tap the Menu button, and under **Actions** select **Load Cellfile**.



- A list appears of the TEMS Pocket cell files found on the device's internal memory card. Pick the desired cell file from the list, and tap the **Select** button.

For the storage location on the internal memory card, see section 4.4.2.

You can download cell files from an FTP server using the synchronization function described in chapter 22.

Once you have imported a cell file, network cells will be presented by name in TEMS Pocket data views and in the Outdoor Map view (as detailed in chapters 5 and 8) whenever they can be matched with an entry in the cell file. Note that plotting of cells on the outdoor map requires that the cell file include their geographical positions.

When you restart TEMS Pocket, the cell file that was last loaded in the application (if any) is automatically reloaded.

1. The file format is the same as in TEMS Investigation and contains a wide range of data, most of which is currently not used in TEMS Pocket.

13. Control Functions

Control functions are used to modify the device's behavior in a cellular network.

Control functions can be applied either manually or automatically during execution of a script. For the latter, see section 9.7.1. This chapter deals with manual control functions.

13.1. Control Function Support in Devices

TEMS Pocket devices are equipped with control functions as set out in the tables below. Functions implemented in the TEMS Capability Control app (see appendix I) are marked "**TCC**".

Please note that "cell lock" and "cell prevention" are applicable in both idle and dedicated/connected mode, that is, to both *cell selection* and *handover*.

Table 1

Control Function/Device	Xperia Z3 D6603	Xperia Z2 D6503	Xperia V LT25i	Xperia T LT30a	Galaxy S5 SM-G900A	Galaxy S5 SM-G900F	Galaxy S5 SM-G900I	Galaxy S5 SM-G900P	Galaxy S5 SM-G900V	Galaxy S5 SM-G9006V	Section Ref.
LTE RAT lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	13.3
WCDMA/GSM RAT lock	✓	✓	✓	✓	✓	✓	✓			✓	13.3
CDMA/EV-DO RAT lock								✓	✓		13.3
LTE band lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	13.4
WCDMA/GSM band lock	✓	✓	✓	✓	✓	✓	✓			✓	13.4
LTE cell lock	✓	✓									13.5

Control Function/Device	Xperia Z3 D6603	Xperia Z2 D6503	Xperia V LT25i	Xperia T LT30a	Galaxy S5 SM-G900A	Galaxy S5 SM-G900F	Galaxy S5 SM-G900I	Galaxy S5 SM-G900P	Galaxy S5 SM-G900V	Galaxy S5 SM-G9006V	Section Ref.
LTE EARFCN lock			✓	✓							13.6
LTE: disable inter-freq HO **TCC**			✓	✓							13.6.1
LTE EARFCN/PCI lock **TCC**					✓		✓			✓	13.7
WCDMA UARFCN lock **TCC**					✓		✓			✓	13.8
WCDMA: disable HO **TCC**					✓		✓			✓	13.9
WCDMA cell lock	✓	✓	✓	✓							13.10
GSM cell (multi-)lock/prevent	✓	✓	✓	✓							13.11
Vocoder lock		✓	✓	✓							13.13
Cell barred lock		✓	✓	✓							13.14
Access class lock			✓	✓							13.15
WCDMA fast dormancy control		✓	✓	✓							13.16

Table 2

Control Function/Device	Galaxy S4 GT-I9506	Galaxy S4 Mini SGH-I257	Galaxy Note 4 SM-N910F	Galaxy Note 4 SM-N910G	Galaxy Note 4 SM-N910T	Galaxy Note 3 SM-N900T	Galaxy Avant SM-G386T	Galaxy Note GT-N8020	HTC Nexus 9	LG G2 VS980	Sharp SG304SH	Section Ref.
LTE RAT lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	13.3
WCDMA/GSM RAT lock	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	13.3
CDMA/EV-DO RAT lock										✓		13.3
LTE band lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	13.4

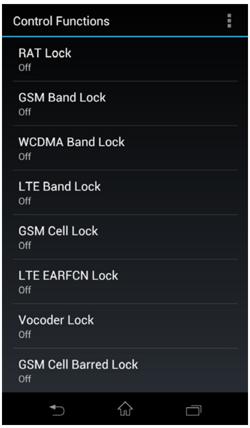
Control Function/Device	Galaxy S4 GT-I9506	Galaxy S4 Mini SGH-I257	Galaxy Note 4 SM-N910F	Galaxy Note 4 SM-N910G	Galaxy Note 4 SM-N910T	Galaxy Note 3 SM-N900T	Galaxy Avant SM-G386T	Galaxy Note GT-N8020	HTC Nexus 9	LG G2 VS980	Sharp SG304SH	Section Ref.
WCDMA/GSM band lock	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	13.4
LTE EARFCN/PCI lock **TCC**	✓	✓	✓	✓		✓	✓		✓			13.7
WCDMA UARFCN lock **TCC**	✓	✓	✓	✓		✓	✓		✓			13.8
WCDMA: disable HO **TCC**	✓		✓	✓		✓			✓		✓	13.9

13.2. Accessing Control Functions

To access the control functions:

Tap the Menu button, and under **Actions** select **Control Functions**.

A dialog appears listing the various control functions and their current states.



Dialog shown for Sony Xperia devices

To apply a control function:

- Tap the desired function in this dialog.
- Make your selection according to the descriptions in sections 13.3–13.4 (which see).

Then tap the Overflow button and select **Apply**.

To reset an individual control function:

- Tap that function in the dialog shown here.

Then tap the Overflow button and select **Reset**.

To reset all control functions:

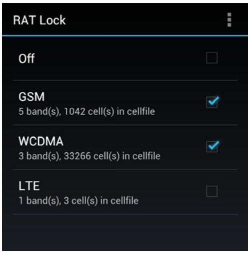
While in the dialog shown here, tap the Overflow button and select **Reset all control functions**.

Regarding interplay between control functions, see section 13.17.

13.3. RAT Lock

This function locks the device to a subset of its supported radio access technologies when in idle mode. The function does not have any effect on RAT selection in dedicated mode.

When a RAT lock is applied, and this results in the device being forced away from the network it is currently attached to, the device will detach from that network and subsequently try to attach to some other network that is allowed by the RAT lock. If this fails, the device will go into no service mode.



Off: This means that TEMS Pocket does not influence the device's network selection. Bear in mind, though, that the device can also be RAT locked from the device's regular user interface; see note below.

GSM, etc.: What RATs appear here depends on what the device supports. Another possible subset is {LTE, CDMA, EV-DO}.

If you check a (permitted) subset of RATs, the device is forced to camp on a network belonging to one of the selected technologies, whenever such a network is available. Checking all technologies, of course, is equivalent to **Off** and is automatically converted to that setting.

Please note that certain RAT subsets are disallowed; you will be notified in the user interface if you attempt to select such a subset. A similar effect can be obtained by combining suitable band locks instead (see section 13.4). For example, to lock the device to WCDMA and LTE, allow the available bands for these technologies but deselect the available GSM bands.

If a cell file is loaded, then for each RAT the number of bands and cells in the cell file *that the device supports* is indicated below the RAT name. That is, the counts include only bands and cells that are in fact available to the device.

13.3.1. Note on Native RAT Lock Functions

In the regular user interface of Sony and Samsung devices, under **Settings** → **Connections** → **More networks** → **Mobile networks** → **Network mode**, it is possible to make a choice between “**LTE/GSM/WCDMA**”, “**GSM only**”, “**WCDMA only**”, and “**LTE only**” (or similar). It is recommended *not* to use this function in conjunction with TEMS Pocket.

13.3.2. Multiple RAT Lock: Limitations

On the following devices, locking on multiple RATs is not supported:

- Samsung Galaxy S5 SM-G900I
- Samsung Galaxy S4 GT-I9506

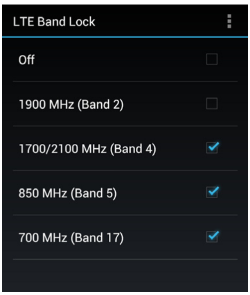
13.4. Band Lock: LTE/WCDMA/GSM

You can lock the device to a subset of its supported frequency bands on LTE, WCDMA, or GSM. Note that this operation will result in no service if you prevent the use of all bands that are available at the current location. Conversely, checking all bands is equivalent to **Off** (that is, no lock applied) and is automatically converted to that setting.

If a cell file is loaded, then for each band, the number of cells on that band listed in the cell file is indicated beneath the band name.

The device cannot be band-locked while a voice call is in progress.

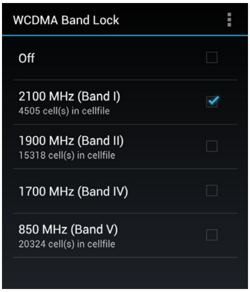
13.4.1. LTE Band Lock



Off: Function not applied.

1900 MHz (Band 2), etc.: The device will be locked to the indicated subset of LTE bands.

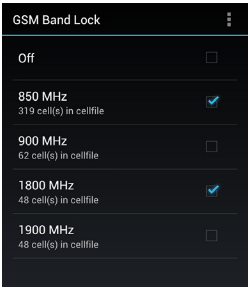
13.4.2. WCDMA Band Lock



Off: Function not applied.

2100 MHz (Band I), etc.: The device will be locked to the indicated subset of WCDMA bands.

13.4.3. GSM Band Lock



Off: Function not applied.

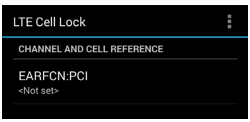
850 MHz, etc.: The device will be locked to the indicated subset of GSM bands.

13.5. LTE Cell Lock

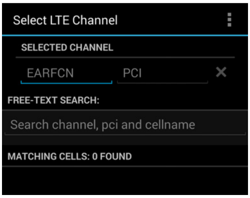
This function locks the device to one Physical Layer Cell Identity (PCI) on one EARFCN. The PCI lock is optional; if it is not applied, the function reduces to an EARFCN lock.

One aspect of the behavior of this function must be noted: together with the cell lock, an **LTE RAT lock** is also implicitly applied. While the cell lock is in effect, any user-initiated RAT lock command will be ignored. However, such a command will take effect after the LTE cell lock has been released.

To apply the function:



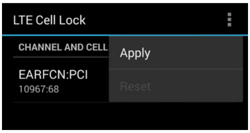
- Tap the **EARFCN:PCI** item.



Here you can either simply enter an EARFCN (and, optionally, a PCI) under **Selected Channel**, or you can search the cell file (if one is loaded) for matching parameters and cell names under **Free-text Search**. The search hits are listed under **Matching Cells**, and you can pick the EARFCN and PCI of one of these. Only cells on bands that the device actually supports will turn up as matches in the search.

For full details on the cell search function, see section 13.12.

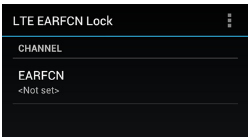
After entering an EARFCN, and a PCI if desired, tap the Back button.



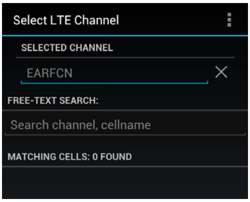
Back in the LTE Cell Lock dialog, tap the Overflow button and select **Apply**.

13.6. LTE EARFCN Lock

This function locks the device to one EARFCN.



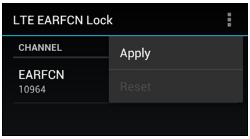
- Tap the **EARFCN** item.



Here you can either simply enter an EARFCN under **Selected Channel**, or you can search the cell file (if one is loaded) for matching EARFCNs and cell names under **Free-text Search**. The search hits are listed under **Matching Cells**, and you can pick the EARFCN of one of these. Only cells on bands that the device actually supports will turn up as matches in the search.

For full details on the cell search function, see section 13.12.

After entering an EARFCN, tap the Back button.



Back in the LTE EARFCN Lock dialog, tap the Overflow button and select **Apply**.

13.6.1. Disabling LTE Inter-frequency Handover

The EARFCN lock function needs to be combined with the function for disabling LTE inter-frequency (that is, inter-EARFCN) handover. The latter is available in the separate Ascom TEMS Capability Control app (see appendix I.2) and should be applied before the EARFCN lock. When both functions are applied, the device will be forced to remain on the same EARFCN as long as it is in connected mode. However, if the device goes into idle mode, the EARFCN lock no longer prevents it from switching to a different EARFCN.

If you attempt to lock on an EARFCN that the device does not support, the control function will fail. Note that this behavior is different from the corresponding WCDMA and GSM locking functions, where the device goes into no service mode in this situation.

13.7. LTE EARFCN/PCI Lock

This function locks the device to one Physical Layer Cell Identity on one EARFCN. It is implemented in the TEMS Capability Control app and is described in appendix I.1. A device reboot may be required, in which case it is performed automatically on the lock being applied.

For the PCI lock to take effect, it needs to be combined with a RAT lock to LTE from within TEMS Pocket. The latter operation is covered in section 13.3.

13.8. WCDMA UARFCN Lock

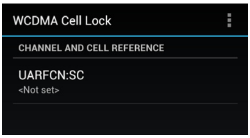
This function locks the device to one WCDMA UARFCN. It is implemented in the TEMS Capability Control app and is described in appendix I.3.

13.9. WCDMA Disable Handover

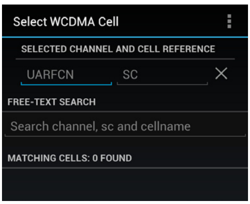
This function disables all kinds of handover in WCDMA. It is implemented in the TEMS Capability Control app and is described in appendix I.4.

13.10. WCDMA Cell Lock

This function singles out one cell (UARFCN + scrambling code combination) or simply one UARFCN that the device should use.



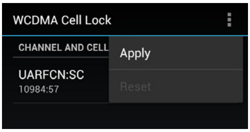
- Tap the **UARFCN:SC** item.



Here you can either simply enter a UARFCN (and, optionally, a scrambling code) under **Selected Channel and Cell Reference**, or you can search the cell file (if one is loaded) for matching parameters and cell names under **Free-text Search**. The search hits are listed under **Matching Cells**, and you can pick the UARFCN and SC of one of these. Only cells on bands that the device actually supports will turn up as matches in the search.

For full details on the cell search function, see section 13.12.

After entering a UARFCN, and a scrambling code if desired, tap the Back button.



Back in the WCDMA Cell Lock dialog, tap the Overflow button and select **Apply**.

The same function can alternatively be applied from the WCDMA Cell List data view to a cell or UARFCN that appears there. Any action that you perform from the Control Functions menu is also immediately reflected by means of highlighting (in green) in the WCDMA Cell List data view. See section 5.6.3 for full details.

The WCDMA Cell Lock function can be described in general terms thus:

- In **idle mode**, the function forces the device to camp on the selected cell or some cell on the selected UARFCN.
- In **connected mode**, the function has the following effect:
  - The device encourages the network to include the selected cell (or any cell on the selected UARFCN, if no scrambling code has been specified) in the active set when the device comes close enough to measure on the cell.
  - Once a desired cell has entered the active set, the device keeps it there until the connection drops. That is, no further soft or softer handovers are performed adding cells to the active set.
  - Nothing in particular is done to have unwanted cells removed from the active set; this only happens naturally as the device reaches the boundary of a cell.

A good way to use this function is as follows: Apply the function while the device is in idle mode to lock it to the cell or UARFCN you want to test. Then run your service testing. Only the desired cell, or cells on the desired UARFCN, will then be admitted to the active set.

13.10.1. Technical Notes on Idle Mode

After the function has been applied, the device will still search on all UARFCNs, but will accept only the selected UARFCN or UARFCN + SC combination. It may therefore take some time from the moment the control function is applied until the device finds an acceptable cell.

13.10.2. Technical Notes on Dedicated Mode

The “encouraging” referred to in section 13.10 is accomplished by TEMS Pocket by filtering the Measurement Reports sent to the network. Only the Measurement Reports signaling intra- and inter-frequency events are filtered. Further, the reports are only filtered if the target cell has been measured and found acceptable, which the network controls through the Measurement Control messages it sends to the device.

13.11. GSM Cell Lock

You can do one of the following:

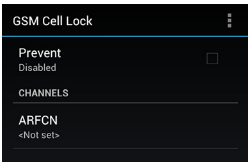
- *Lock* on one or several cells. The device is then restricted to using these cells alone.
- *Prevent* one or several cells. The device is then prevented from using these cells.

It is not possible to apply both types of function at the same time.

The GSM Cell Lock function has an effect in idle as well as dedicated mode. In other words, it can be used to control both cell selection and handover behavior.

If the signals from all allowed cells are too weak, the device will go into no service mode.

13.11.1. Applying GSM Cell Lock Functions

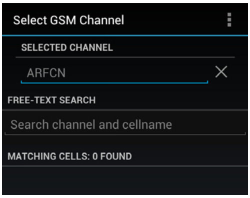


The **Prevent** flag governs what type of action is performed:

- For *locking*, uncheck the Prevent box.
- For *preventing*, check the Prevent box.

The procedures for locking and preventing are exactly analogous; in either case you simply define the set of ARFCNs the operation should apply to.

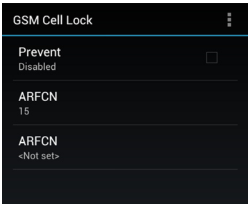
- Tap the **ARFCN** item.



Here you can either simply enter an ARFCN under **Selected Channel**, or you can search the cell file (if one is loaded) for matching ARFCNs and cell names under **Free-text Search**. The search hits are listed under **Matching Cells**, and you can pick the ARFCN of one of these. Only cells on bands that the device actually supports will turn up as matches in the search.

For full details on the cell search function, see section 13.12.

After entering an ARFCN, tap the Back button.

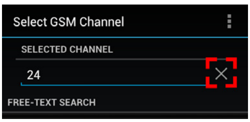


The selected ARFCN now appears in the GSM Cell Lock dialog. A further **ARFCN** item is also provided, enabling you to add one more ARFCN to the set if desired.

When you are done adding ARFCNs, tap the Overflow button and select **Apply**.

The same functions can alternatively be applied from the GSM Cell List data view to cells that appear there. Any actions that you perform from the Control Functions menu are also immediately reflected by means of highlighting (green/red) in the GSM Cell List data view. See section 5.6.1 for full details.

13.11.2. Releasing GSM Cell Lock Functions



To release a control function for one cell:

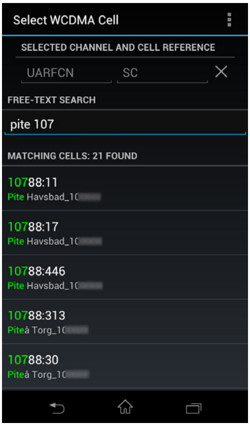
- Tap the **ARFCN** item you want to remove.
- Under Selected Channel, tap the “cross” button to erase the ARFCN number from the input field. Then tap the Back button.

In the GSM Cell Lock dialog, tap the Overflow button and select **Apply**.

- To release all applied lock or prevent functions, use the Reset command as explained in section 13.2.

13.12. Notes on the Cell Search Function

This section applies to both LTE, WCDMA, and GSM cell lock. If no cell file is loaded, the search described below will simply never return any hits.



In this WCDMA example, the cells matched are those whose name contains the substring "pite" *and* whose name, UARFCN, or SC contains the substring "107".

What you type into the **Free-text Search** field is matched with the following tags in the cell file (whose format is described in appendix F):

- <CELLNAME> (all technologies)
- <EARFCN_DL> (LTE)
- <UARFCN_DL>, <SC> (WCDMA)
- <ARFCN> (GSM).

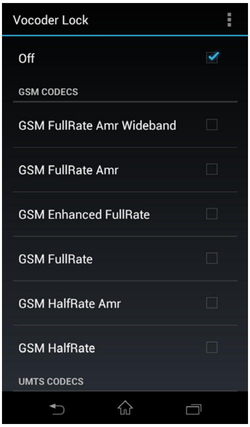
You can enter multiple search terms, separated by spaces. The **Selected Channel [...]** fields themselves function as search fields (where a single term can be entered).

An implicit AND relationship holds among all search terms. At least two characters must be typed in each field; a single character in a field will be disregarded in the search. On the other hand, a single-character term *is* valid in the **Free-text Search** field if entered alongside another term.

The search is run automatically as soon as you have typed enough characters. Under **Matching Cells**, all cells that meet the current search criteria are presented with their channel number, (*WCDMA only*) SC, and name, along with an indication of the total number of matches. The matching segments are highlighted in green; note that matching of substrings also applies to digits in cell parameters.

For WCDMA, tap a cell to select its UARFCN and SC. The **Selected Channel...** fields are then populated with those values, and the **Matching Cells** list is filtered so that only cells having the same UARFCN and SC are left. The procedure is the same for other technologies, except that the SC has no counterpart.

13.13. Vocoder Lock



Off: Function not applied.

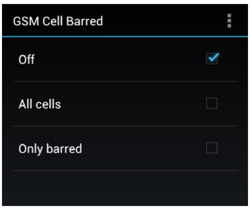
GSM codecs, UMTS codecs: Check the codecs that the device should report as supported to the network:

- GSM Full Rate AMR Wideband
- GSM Full Rate AMR
- GSM Enhanced Full Rate
- GSM Full Rate
- GSM Half Rate AMR
- GSM Half Rate
- UMTS AMR
- UMTS AMR2
- UMTS AMR Wideband

13.14. Cell Barred Lock

This function lets you alter the device's behavior with respect to barred, reserved, and other cells.

13.14.1. GSM Cell Barred

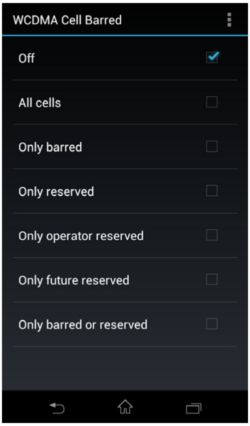


Off: The device will not camp on barred cells.

All cells: The device will camp on any cell, ignoring cell barring.

Only barred: The device will camp only on barred cells.

13.14.2. WCDMA Cell Barred



Off: The device will not access barred or reserved cells.

All cells: The device will access any cell, also barred and reserved ones.

Only barred: The device will only access barred cells.

Only reserved: The device will only access reserved cells.

Only operator reserved: The device will only access cells that are reserved for operator use.

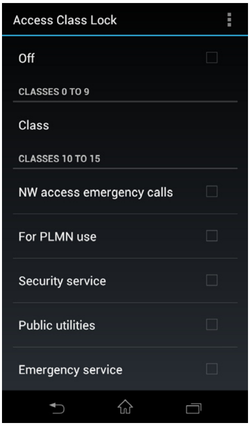
Only future reserved: The device will only access cells that are reserved for future use.

Only barred or reserved: The device will only access cells that are barred or reserved.

Note: In WCDMA, it typically takes a while until this control function comes into effect. This is because cell barred/reserved settings are contained in System Information messages, which are sent only infrequently in WCDMA. TEMS Pocket cannot apply the control function until it has read System Information and found out about the cell's current status.

13.15. Access Class Lock

This function allows you to manipulate access class settings (▶ 3GPP 22.011, chapter 4).



Off: Function not applied.

Classes 0 to 9: Every device is by default allocated randomly to one of these access classes. You can change the default allocation here by tapping **Class** and selecting a class from the list that appears.

Classes 10 to 15: Membership of these classes entitles a device to make access attempts in various special situations. Check the classes that you want the device to be a member of: **NW access emergency calls**, etc.

13.16. WCDMA Fast Dormancy Control

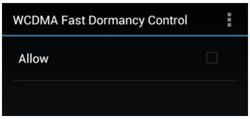
This function can be used to inhibit fast dormancy in WCDMA networks.

Fast dormancy is a 3GPP mechanism designed to save smartphone battery as well as network resources by minimizing the time the device spends in power-consuming states. Smartphones normally tend to keep a PDP context active at all times, even when no data is transmitted, which causes waste of battery in the device and also consumes resources on the network side for keep-alive signaling.

On the other hand, for the device to be able to quickly resume data transfer when needed, and to prevent excessive state transition signaling, the device should not go all the way back into IDLE state too easily.

As defined in ▶ 3GPP Release 8, TS 25.331, section 8.1.14, the UE is required to wait for the network-configured timer T323 to expire before it can release the network connection. When the timer expires, the UE sends a Signaling Connection Release Indication (SCRI) message with a parameter “UE requested PS data session end”. The network can now decide to do nothing, to put the UE in IDLE state, or to put the connection into Cell_PCH or URA_PCH state.

The TEMS Pocket control function works as follows:



When **Allow** is checked, the control function is turned off, and TEMS Pocket does not interfere with the fast dormancy procedure described above if it is activated in the network.

When **Allow** is unchecked, the control function is turned on, and fast dormancy is inhibited. TEMS Pocket achieves this by suppressing the SCRI message with the parameter “UE requested PS data session end”.

Note: Be aware that the device will never enter a dormant state if it is charging. Therefore, allowing fast dormancy is pointless in that situation.

13.17. Interplay between Control Functions

This section describes the interdependencies among the various locking functions. For convenience, the cell lock, cell prevent, channel/carrier lock, and band lock functions (sections 13.4–13.12) are referred to collectively below as “intra-technology” functions.

- While the device is locked to a RAT, no control function associated with a different RAT can be applied (all such items are grayed out in the **Control Function Settings** dialog). The RAT lock must be released first.
- You can apply multiple intra-technology functions at the same time; for example, both a WCDMA band lock and a WCDMA cell lock.
- Applying an intra-technology function does *not* automatically lock the device to the corresponding RAT. If the device is currently on a different RAT, then the intra-technology function will of course not have any immediate effect. It will take effect if and when the device switches to the RAT associated with the intra-technology function.

13.18. Coexistence with Other TEMS Pocket Functions

Control functions cannot be applied during logfile replay.

Control functions cannot be applied manually while a script is running; but you can insert special actions in the script which apply control functions as part of the script execution. See section 9.7.1.

14. Audio Quality Measurement

Audio quality can be measured in TEMS Pocket using the POLQA algorithm.

14.1. The POLQA Algorithm

The POLQA (Perceptual Objective Listening Quality Analysis) algorithm, defined in the ITU-T P.863 standard, measures end-to-end speech quality by comparing one party's undistorted input signal (serving as reference) with the degraded version of the same signal received by the other party. The severity of the degradation as perceived by human listeners is assessed using highly refined models of the human ear and the brain's processing of auditory input.

POLQA is the successor of PESQ (ITU-T P.862) and has been specially developed for HD voice, 3G and 4G/LTE, and VoIP. The POLQA algorithm has been designed to eliminate known weaknesses of PESQ, particularly in these areas:

- Handling of new and complex types of distortions that arise from today's convergence and coexistence of voice, data, and multimedia application services. One example is the effects of packet loss and of packet loss concealment.
- Performance for higher-bandwidth audio signals (wideband, super-wideband).
- Performance for CDMA speech codecs and hence for CDMA networks in general.

More information about POLQA is available at ▸ www.itu.int/rec/T-REC-P.863/en.

14.2. AQM in TEMS Pocket

AQM support in TEMS Pocket is tabulated in chapter 15.

Please note that AQM requires a special license option. For the details on license requirements, turn to section 3.6.2.

14.2.1. AQM Setups

AQM scores for voice calls can be calculated in TEMS Pocket in the following setups:

- During mobile-to-mobile calls between two TEMS Pocket devices. Two distinct scenarios are possible:
  - AQM scores calculated at one end (by the calling party), or:
  - AQM scores calculated at both ends (by both parties).
- During calls between a TEMS Pocket device and a CallGenerator. The TEMS Pocket device calculates AQM scores. Here, again, two scenarios exist:
  - AQM scores calculated by the TEMS Pocket device only, or:
  - AQM scores calculated by both the TEMS Pocket device and the CallGenerator.

These setups are dealt with in turn in subsections 14.2.1.1–14.2.1.4.

The calling TEMS Pocket device is controlled by either an AQM or a Call Sequence script action. The answering device in mobile-to-mobile AQM is controlled by either an AQM or a Voice MT action. This is detailed in the following.

Voice codec bandwidth is specified to the POLQA algorithm as narrowband ("NB") or super-wideband ("SWB"). This choice is indicated by the **MOS algorithm** setting. During AQM testing, the speech sentences transmitted are always SWB encoded; it is however possible to set the bandwidth differently for the two devices involved in the AQM call. Choosing "NB" for bandwidth will cause the POLQA algorithm to consider only the narrowband portion of the signal spectrum in assessing voice quality.

In the mobile-to-mobile setup, any combination of bearer is supported: VoLTE to VoLTE, VoLTE to CS, CS to VoLTE, and CS to CS. In the mobile-to-fixed setup, only CS is supported.

14.2.1.1. Mobile-to-mobile AQM: One-way

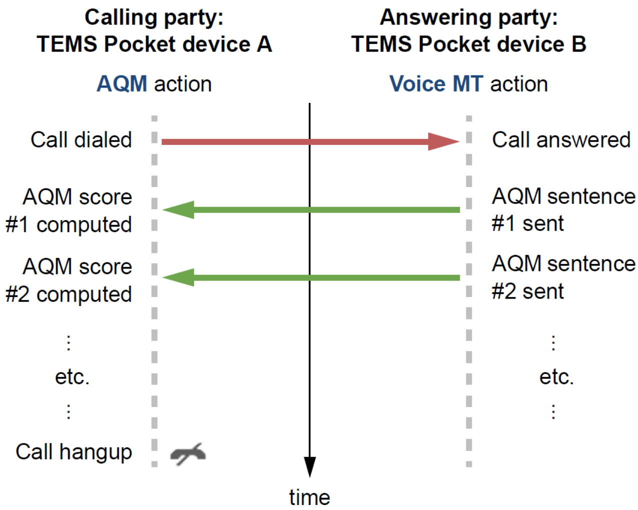
In this setup, the two TEMS Pocket devices have distinct roles. One device plays back a succession of speech sentences to the other, which records the sentences and computes AQM scores. The device tasked with the AQM computation is the party that dials the call.

- For the calling party, set up an AQM action with **Call direction** set to "MO" and **Call type** set to "M2M".

- The answering party does not compute any AQM scores and is controlled by a Voice MT script action: see section 9.3.9.

As explained in section 14.2.1, **MOS algorithm** can be either "NB" or "SWB".

The procedure is illustrated in the following diagram:



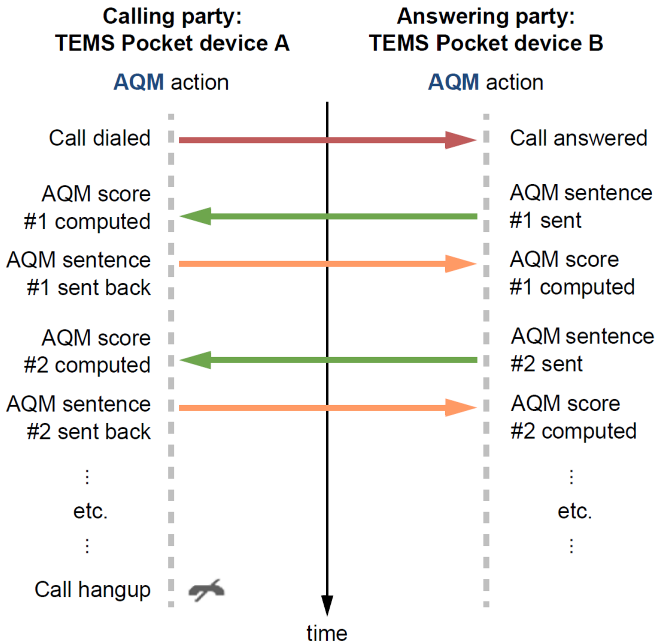
14.2.1.2. Mobile-to-mobile AQM: Two-way

In this setup, both TEMS Pocket devices are controlled by an AQM script action. The devices take turns sending and receiving speech sentences, and AQM scores are computed by both devices.

- For the calling party, set **Call direction** to "MO", and set **Call type** to "M2M".
- For the answering party, set **Call direction** to "MT", and set **Call type** to "M2M".

As explained in section 14.2.1, **MOS algorithm** can be either "NB" or "SWB", and the codec can be set differently for the two devices.

Refer to the diagram for an overview of the measurement procedure.



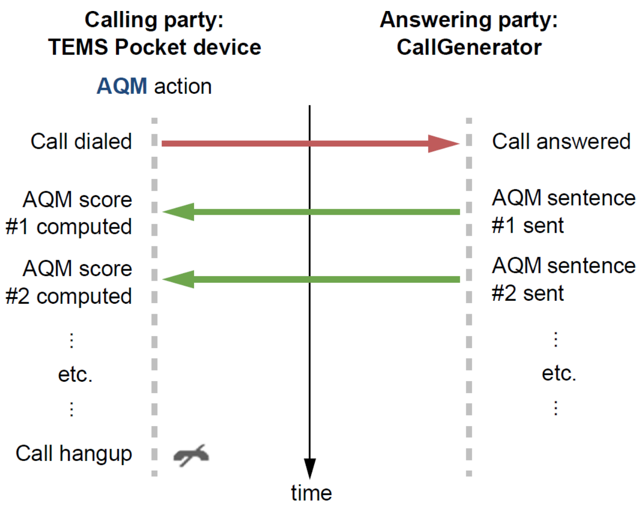
14.2.1.3. Mobile-to-fixed AQM: One-way

In this setup, a TEMS Pocket device dials a CallGenerator, which plays back speech sentences so that TEMS Pocket can calculate AQM scores.

Note: This setup is supported for CS only, not for VoLTE.

- In the AQM action, Set **Call direction** to "MO", and set **Call type** to "M2F". As explained in section 14.2.1, **MOS algorithm** can be either "NB" or "SWB".

The communication flow in this configuration is similar to one-way mobile-to-mobile AQM (section 14.2.1.1), as depicted in the following diagram.



14.2.1.4. Mobile-to-fixed AQM: Two-way (Call Sequence)

In this setup, a TEMS Pocket device dials a CallGenerator to initiate a Call Sequence action. The sequence may consist of both MT and MO calls, and AQM scores are computed by both parties. Everything about the Call Sequence setup is explained in section 9.3.10; see especially the diagram in section 9.3.10.1.

14.2.2. Time Adjustment of AQM Data in Replay Mode

In live mode, the presentation of AQM data is inevitably somewhat delayed because of the non-trivial time taken to compute the scores.

However, when replaying logfiles, AQM data is time-adjusted (moved backwards in time) so that it aligns with other presented data. This makes it easier to study how various factors – for example, block error rate and handovers – affect the AQM scores.

15. Voice Capabilities of TEMS Pocket Devices

The table below sums up some key voice-related capabilities of supported TEMS Pocket devices. Those devices that do not appear in the table do not have any of these capabilities.

Device	AQM				VoLTE
	M2M	M2F	SPD	Audio Sync	
Sony Xperia Z3 D6603	✓	✓	✓		
Sony Xperia V LT25i	✓				
LG G2 VS980	✓				✓
Samsung Galaxy Avant SM-G386T	✓	✓	✓		✓
Samsung Galaxy Note 4 SM-N910F	✓	✓	✓	✓	
Samsung Galaxy Note 4 SM-N910G	✓	✓	✓	✓	✓
Samsung Galaxy Note 4 SM-N910T	✓	✓	✓	✓	✓
Samsung Galaxy Note 3 SM-N900T	✓				✓
Samsung Galaxy S5 SM-G900A	✓		✓	✓	✓
Samsung Galaxy S5 SM-G900F	✓	✓	✓	✓	
Samsung Galaxy S5 SM-G900I	✓				
Samsung Galaxy S5 SM-G900P	✓	✓	✓	✓	✓
Samsung Galaxy S5 SM-G900V	✓				✓
Samsung Galaxy S4 GT-I9506	✓	✓	✓	✓	
Samsung Galaxy S4 Mini SGH-I257	✓				✓
Sharp SG304SH	✓	✓	✓	✓	✓

The Call Sequence work order action is supported by the following devices:

- Samsung Galaxy S4 GT-I9506

16. Data Service Support in TEMS Pocket Devices

This chapter gives full detail on support for data services that are not handled by all TEMS Pocket devices.

16.1. HTTP with On-device Client

The following devices support HTTP browsing with the on-device (WebKit-based) HTTP client. See section 9.3.3 and especially subsection 9.3.3.1.

- Sony Xperia Z3 D6603
- Sony Xperia Z2 D6503
- Samsung Galaxy Avant SM-G386T
- Samsung Galaxy Note 4 SM-N910F
- Samsung Galaxy Note 4 SM-N910G
- Samsung Galaxy Note 4 SM-N910T
- Samsung Galaxy S5 SM-G900F
- Samsung Galaxy S5 SM-G900I
- Samsung Galaxy S5 SM-G900P
- Samsung Galaxy S5 SM-G900V

17. Mobile Network Scanning with DRT4311B Scanner

TEMS Pocket has the ability to conduct scanning of mobile networks with an external DRT4311B scanner connected to the TEMS Pocket device, and to present the results of such scans. The scanning can be either manual or scripted.

Mobile network scanning with a DRT scanner is completely independent of other TEMS Pocket activities and never conflicts with any of these. The data view header is unaffected by scanning activities.

17.1. Scope of DRT4311B Scanning

TEMS Pocket 15.1 supports:

- LTE signal scan
- WCDMA CPICH scan

The DRT4311B scanner supports the following bands:

- E-UTRA Bands 1–12, 14, 17–21, 23–26
- UTRA Bands 1–14, 19–21, 25, 26

17.2. Prerequisites

- The TEMS Pocket device needs to have an app from DRT installed which is named “DRT Mps Scanner Service”. This app is installed automatically by the TEMS Pocket installer.
- A special TEMS Pocket license option is required for DRT mobile network scanning; see section 3.6.2.
- Adapter: Mini-A plug to USB-A receptacle
- Cable: USB-A plug to smartphone plug

17.3. Setting Up a Scan

DRT mobile network scanning can be controlled by a script, or it can be started and stopped manually.

A scripted scan is set up by defining “Scan” type actions, one for starting and one for stopping the scan. For the details, see section 9.5. Please note that some other action must intervene between the start and stop actions, since otherwise the scan will have no substantial duration. The simplest solution is to insert a Wait action of the desired length.

A manual scan is set up in the following way:

Tap the Settings button.

- On the Settings menu, select **Scanning**.
- The parameters in the dialog that appears are exactly the same as for a scripted scan, except that the **Command** parameter is absent. Configure them according to section 9.5.3.

17.4. Connecting the Scanner

When you connect the DRT scanner for the first time, a message will appear saying: “**Open Drt Mps Service Application when this accessory is connected?**” Check the box “**Use by default for this USB accessory**” and tap **OK**. The message will now no longer appear on future occasions when you connect the scanner. The DRT app launches.

Whenever the scanner is connected and TEMS Pocket is running, you can do (manual) scanning while using other TEMS Pocket functions at the same time.

17.5. Running a Scan

Before you start scanning, make sure the Drt Mps Service icon is visible on the Android status bar.

To run a scripted scan, simply execute the prepared script as usual: see section 9.9.

To run a scan manually, do as follows:

Tap the Menu button, and under **Start** select **Start Scan**.

- The scan currently configured as described in section 17.3 will now start and will execute indefinitely until it is halted.

To stop the scan, tap the Menu button, and under **Start** select **Stop Scan**.

17.6. Presentation of Scans

The output from mobile network scanning is presented in the data views described in section 5.8.

17.7. Recording Scan Data in Logfiles

When logfile recording is active, it will capture mobile network scan data (just like any other network testing data) whenever such scanning is in progress.

18. Mobile Network Scanning with PCTel IBflex Scanner

TEMS Pocket has the ability to conduct scanning of mobile networks with an external PCTel IBflex scanner connected to the TEMS Pocket device. The scanning can be either manual or scripted.

Mobile network scanning with a PCTel scanner is completely independent of other TEMS Pocket activities and never conflicts with any of these. The data view header is unaffected by scanning activities.

18.1. Scope of PCTel IBflex Scanning

TEMS Pocket 15.1 supports:

- LTE signal scan
- WCDMA CPICH scan
- GSM color code scan
- CDMA PN scan
- EV-DO PN scan
- RSSI scan on all of the above technologies.

The PCTel IBflex scanner supports the following bands:

- E-UTRA Bands 1–14, 17–31, 33–44
- UTRA Bands 1–6, 8–9, 11, 19, 21, 25
- GSM 850, 900, 1800, 1900
- CDMA/EV-DO Band Classes 0, 1, 5, 10, 14, 15, 20

18.2. Prerequisites

- SeeGull Connect must be installed on the TEMS Pocket device. The app is installed automatically by the TEMS Pocket installer.

- A special TEMS Pocket license option is required for PCTel mobile network scanning; see section 3.6.2.

18.3. Setting Up a Scan

PCTel mobile network scanning can be controlled by a script, or it can be started and stopped manually.

A scripted scan is set up by defining “Scan” type actions, one for starting and one for stopping the scan. For the details, see section 9.5. Please note that some other action must intervene between the start and stop actions, since otherwise the scan will have no substantial duration. The simplest solution is to insert a Wait action of the desired length.

A manual scan is set up in the following way:

Tap the Settings button.

- On the Settings menu, select **Scanning**.
- The parameters in the dialog that appears are exactly the same as for a scripted scan, except that the **Command** parameter is absent. Configure them according to section 9.5.4.

18.4. Connecting the Scanner

- Before connecting the scanner, make sure its power switch is in the “**1**” (top) position and not in the “**1 (P_{SAVE})**” (bottom) position. The **SYS** LED should be steady green.

Whenever the scanner is connected and TEMS Pocket is running, you can do (manual) scanning while using other TEMS Pocket functions at the same time.

18.5. Running a Scan

To run a scripted scan, simply execute the prepared script as usual: see section 9.9.

To run a scan manually, do as follows:

Tap the Menu button, and under **Start** select **Start Scan**.

- The scan currently configured as described in section 18.3 will now start and will execute indefinitely until it is halted.

To stop the scan, tap the Menu button, and under **Start** select **Stop Scan**.

18.6. Presentation of Scans

The output from mobile network scanning is presented in the data views described in section 5.8. Please note that for PCTel RSSI scans, no such presentation is yet available. This will follow in coming TEMS Pocket releases.

18.7. Recording Scan Data in Logfiles

When logfile recording is active, it will capture mobile network scan data (just like any other network testing data) whenever such scanning is in progress.

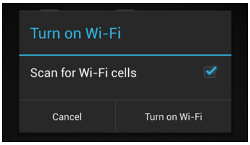
19. Wi-Fi Scanning

Wi-Fi availability and Wi-Fi scanning can be controlled from within TEMS Pocket. The effect of activating Wi-Fi scanning is exactly the same as when turning on Wi-Fi in the device’s regular user interface.

19.1. Starting and Stopping a Wi-Fi Scan

Wi-Fi scanning can be started manually as follows:

Tap the Menu button, and under **Actions** select **Turn On Wi-Fi**.



In the dialog that appears, check the option **Scan for Wi-Fi cells**, and tap the **Turn on Wi-Fi** button. (If you do not check the option, Wi-Fi is enabled on the device, but no scanning is initiated.)

To stop the scanning and turn Wi-Fi off:

Tap the Menu button, and under **Actions** select **Turn Off Wi-Fi**.

The Wi-Fi function can also be controlled by a script by means of the “Wi-Fi” action: see section 9.7.4. Please note that some other action must then intervene between the “enable scan” and “disable scan” Wi-Fi actions, since otherwise the scan will have no substantial duration. The simplest solution is to insert a Wait action of the desired length.

19.2. Presentation of Wi-Fi Scans

The output from Wi-Fi scanning is presented in the data views described in sections 5.12.1 and 5.12.2.

19.3. Recording Wi-Fi Scan Data in Logfiles

When logfile recording is active, it will capture Wi-Fi scan data whenever such scanning is in progress.

19.4. Wi-Fi Scanning vs. Wi-Fi Data Transfer

As explained in section 9.7.4, if you wish to test data transfer over Wi-Fi, it may be appropriate to turn off Wi-Fi scanning in TEMS Pocket during this time to prevent it from impinging on data transfer performance. If repeated continually, as is done by TEMS Pocket, the scanning will have a substantial negative impact on the data throughput. Most of the time, therefore, it may be suitable to have the **Scan for cells** option turned on (scanning allowed in Wi-Fi idle mode) but the **Scan during measurement** option turned off.

Also remember that in script actions, the **Wi-Fi association** parameter must be set to “Enabled” for Wi-Fi to be allowed as data bearer. See section 9.3.1.

20. GPS Usage with TEMS Pocket

This chapter deals with using the device’s built-in GPS or an external GPS with TEMS Pocket.

20.1. TEMS Pocket Functionality Requiring GPS Data

GPS data is required in TEMS Pocket in order to:

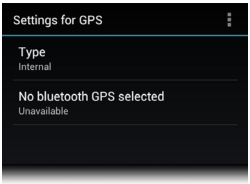
- Plot routes in the Outdoor Map view. See chapter 8.
- Make use of cell file look-up to present cells by name in data views and in the Outdoor Map view.
- Populate the GPS data view. See section 5.11.3.

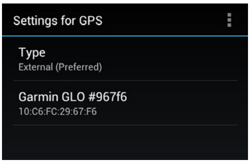
20.2. Supported External GPS Units

- GlobalSat BT-359

20.3. Selecting a GPS to Use with TEMS Pocket

Tap the Settings button and select **General** → **GPS**.





Type:

- **Internal:** Select this to always use the device's built-in GPS. Please note that the built-in GPS must be enabled in Android to be available to TEMS Pocket. See section 4.7.1.
- **External (Preferred):** Select this to make TEMS Pocket use an external GPS that has been Bluetooth paired with and connected to the TEMS Pocket device. The pairing and connect operations take place in Android and are not handled from within TEMS Pocket. Specifics differ between Android versions and are not described further here; but the operations are always performed from somewhere under the **Settings** menu.

Should the external GPS be accidentally disconnected or run out of battery, TEMS Pocket will automatically switch to the internal GPS as a fallback. This is why the string reads "(Preferred)". If and when the external GPS becomes available again (for example, when it has been recharged), TEMS Pocket will automatically revert to using the external GPS.

20.3.1. Built-in vs. External GPS: Pros and Cons

An external GPS has the advantage of reducing the power consumption in the mobile device. It is also easier to install in a position with good satellite coverage. For example, you might place the GPS on the car dashboard, where it has better satellite line of sight, and use the mobile device inside the car where GPS coverage might be inferior or even unavailable.

On the other hand, it should be noted that the internal GPS units in today's smartphones have improved significantly in accuracy and acquisition rate compared to older devices, so that they deserve consideration as a convenient alternative to an external GPS. Using an external GPS also obviously means one more device to keep track of and to keep charged.

20.4. Controlling the GPS

Scripts in TEMS Pocket have a setting that governs GPS use, as explained in section 9.2.1.

When you record a logfile manually, you are prompted to decide whether to include GPS data in the logfile. See section 10.3.

TEMS Pocket also has commands for manually turning the GPS on and off. These commands are useful if you are doing tests without running a script.

- To turn on the GPS:

Tap the Menu button, and under **Actions** select **Turn On GPS**.

- To turn off the GPS:

Tap the Menu button, and under **Actions** select **Turn Off GPS**.

All of the operations mentioned in this section apply to any GPS, whether internal or external.

20.5. GPS Events

A number of events relating to GPS operation are generated by TEMS Pocket. Regarding these, turn to section 6.3.4.

21. Settings Menu

From the Settings menu, a number of aspects of TEMS Pocket behavior are configured.

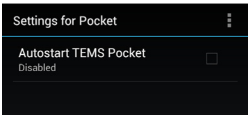
 To access this menu, tap the Settings button.

A number of subcategories are found, as detailed in this chapter.

All of these settings are preserved when upgrading TEMS Pocket, for instance using the TEMS Pocket installer.

21.1. General Settings

21.1.1. TEMS Pocket Application Settings



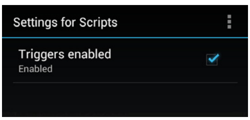
Autostart TEMS Pocket: If set to Enabled, TEMS Pocket will launch automatically after the device has started up. The application will also restart itself if closed unexpectedly.

Note: The device must not be SIM locked.

21.1.2. GPS Settings

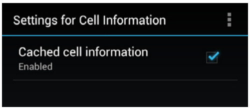
Here you indicate what type of GPS device TEMS Pocket should use: an internal or an external one. See section 20.3.

21.1.3. Script Settings



Triggers enabled: This must be checked to allow events to trigger starting and stopping of scripts. Compare section 9.2.1.

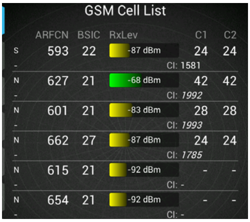
21.1.4. Cell Information Settings



Cached cell information: If set to Enabled, TEMS Pocket will reuse information on previously detected cells in the presentation. A more detailed explanation follows below.

Cell identities are reported infrequently from the network, and only for the current serving cell, not for neighbors. As a result, no recently reported cell identity is typically available for most cells in the cell list views. Even for the serving cell, it may take a while until the cell identity is obtained.[1]

The cell caching function remedies this situation by storing all cells that are detected by TEMS Pocket in a look-up table. As a result, whenever such a cell reappears in the list later on, its identity can be presented immediately, without the need to wait until it is reported from the network. Such a deduced cell identity is shown in *italics* in the data views.



Here is an example from GSM. The first three neighbors have previously been the serving cell at some point, so that their CIs have been reported. TEMS Pocket stored these CIs and now redisplays them (in italics) when the cells appear as neighbors instead.

The caching operates in LTE, WCDMA, and GSM networks. It is especially useful after the device has switched to a different RAT and then back again. On returning to the “old” RAT, cell identities will be populated immediately for all cells previously encountered in that network.

Please note that while in practice a deduced cell identity will be correct nearly all of the time, there is nevertheless a possibility that it is wrong, namely if a cell is encountered whose other identifying parameters (e.g. UARFCN + SC) have the same values as some previously detected cell.

The cell caching function as such is always active; what the setting governs is whether or not the cached cell identities will be used in the presentation. The

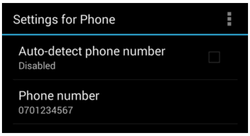
---

1. That is, unless a cell file and GPS positioning data are available, in which case TEMS Pocket can look up cell identities in the cell file instead. The cell caching function is aimed at improving the presentation in the absence of a cell file.

cached information is cleared only when you exit TEMS Pocket, or if you actively choose to erase it. The latter is done as follows:

Tap the Menu button, and under **Settings** select **Clear Cached Cell IDs**.

21.1.5. Phone Settings



Auto-detect phone number: If this option is enabled, TEMS Pocket will try to detect the device phone number automatically for use in (mobile-to-fixed) AQM actions and Call Sequence actions. If the detect succeeds, the number is displayed under **Phone number** below.

Phone number: Shows the detected device phone number if auto-detect is enabled and has succeeded. Otherwise, you need to enter the phone number manually here (for example, if the number is not stored on the SIM). If the phone number is not known to TEMS Pocket, AQM M2F and Call Sequence actions will fail.

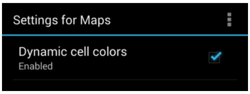
Regarding international calls, see section 21.1.5.1 below.

21.1.5.1. Interacting with a CallGenerator in a Different Country

When interacting with a CallGenerator that resides in a different country, the international call prefix must be stated explicitly in the device phone number; the plus sign “+” cannot be used as a general symbol for the international call prefix. Examples:

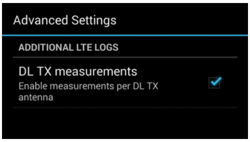
- To use a CallGenerator in Sweden from the UK, configure the device phone number as 00 44 <national phone number without leading zero>. Here, 00 is the international call prefix used in Sweden, and 44 is the country calling code for the UK.
- To use a CallGenerator in Japan from the UK, configure the device phone number as 010 44 <national phone number without leading zero>. Here, 010 is the international call prefix used in Japan.

21.1.6. Maps Settings



Dynamic cell colors: In presenting cells from an indoor map set transmitter file, TEMS Pocket will automatically assign a color to each cell according to a predetermined scheme. See section 7.3. This setting has no bearing on the Outdoor Map view.

21.1.7. Advanced Settings

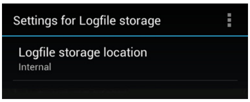


Additional LTE Logs:

- **DL TX measurements:** This log must be turned on to populate the eNB TX Antenna Difference data view (see section 5.7.7). **Note:** This log generates a high processing load and should be turned off if the above data view is not of interest.

21.2. Logfile Settings

21.2.1. Logfile Storage Settings

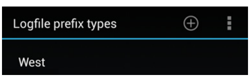


Logfile storage location:

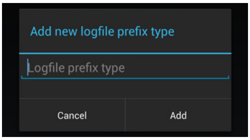
- **Internal** means the device’s internal memory card.
- **External** means an external memory card installed in the device.

21.2.2. Edit Logfile Prefix Types

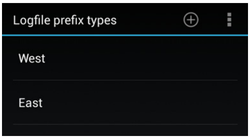
It is possible to define prefix strings that can optionally be prepended to logfile names. At present this function applies only to logfiles recorded in connection with pinpointing.



To define a new logfile prefix, tap the Actions button.



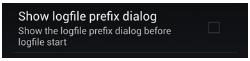
- Type the desired string, and tap **Add**.



The prefix is added to the list of logfile prefix types.

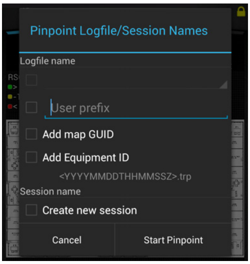
- To delete a prefix from the list, long-press it and tap **Delete**.

21.2.3. Show Logfile Prefix Dialog



To get the opportunity to define a logfile prefix for use at recording time, check this box.

When this option is turned on, the following dialog will appear after you give the **Start Pinpoint** command (compare sections 7.5.5 and 7.5.6.2):



- In the first box, select one of the logfile prefixes you have defined.
- In the second box, you can enter another free-text prefix, intended to represent yourself as a TEMS Pocket user.
- You can also choose to add the map set GUID (predefined in the map set) as a prefix.
- Finally, you can add the device equipment ID (see section 21.2.4) as a prefix.

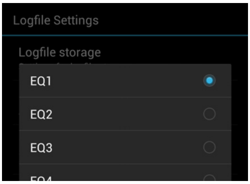
The complete logfile name syntax resulting from the current dialog settings is displayed beneath the set of options.

The dialog furthermore contains a section related to TEMS Pocket sessions; this is covered in section 11.2.

When done, tap the **Start Pinpoint** button to proceed.

21.2.4. Device Equipment ID

This feature is intended primarily for multi-device TEMS Pocket configurations (see chapter 25). Each TEMS Pocket device can be assigned an equipment ID in the format “EQ*n*” in logfiles. Such tagging serves to tell devices apart when post-processing TEMS Pocket logfiles in TEMS Investigation or TEMS Discovery Device.

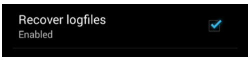


- Select a designation from the range “EQ1” ... “EQ8”.

21.2.5. Scanner Equipment ID

This is analogous to Device Equipment ID (see section 21.2.4) but is applied to an external scanner connected to the TEMS Pocket device, rather than to the device itself.

21.2.6. Recover Logfiles

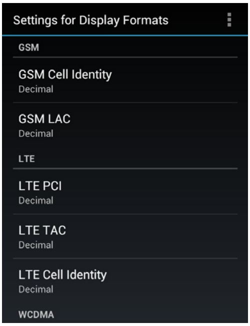


This setting governs whether or not the logfile recovery function is enabled. Regarding this function, see section 10.8.

21.3. Display Format Settings

A number of value elements in TEMS Pocket can be displayed in either decimal or hexadecimal format. In some cases, parameter-specific formats are also selectable (for example, Group ID/Phy ID for LTE PCI).

Display format settings take effect immediately, both in live mode and during logfile replay. They also persist after TEMS Pocket is restarted.



You can access the display settings either from this menu or by long-pressing the value element of interest in the data view or header.

To save your changes, tap the Overflow button and select **Save**, or simply exit the dialog using the Back button. In either case, the value element formats are now updated throughout the application.

21.4. Scanning Settings

See sections 17.3 (DRT) and 18.3 (PCTel).

21.5. Exporting and Importing Settings

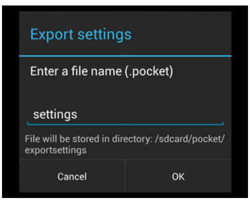
You can export the settings currently in force in the whole of the **Settings** menu.

When TEMS Pocket is upgraded, a settings export is done automatically before the old version is uninstalled. After installation of the new version, the settings are imported back into the application.

21.5.1. Exporting Settings

To perform the export:

While in the Settings menu, tap the Overflow button and select **Export**.



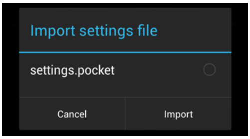
Type a name for the export file (or keep the default name “settings”). It will have extension .pocket and be stored in the directory indicated in section 4.4.2. The file name must be distinct from those of existing *.pocket files.

21.5.2. Importing Settings

Note: When you import settings, all of the old settings are overwritten. You are warned about this by an on-screen message.

To perform the import:

While in the Settings menu, tap the Overflow button and select **Import**.



The TEMS Pocket settings files stored on the device are listed. Select which one of them to import.

These settings are also among the items you can download by synchronizing your TEMS Pocket device to an FTP server; see chapter 22.

22. Synchronizing the Device Configuration to an FTP Server

This feature allows an FTP server to be used as a central repository for TEMS Pocket settings and auxiliary data (scripts, map sets, cell files). TEMS Pocket devices can connect to the server and download all material currently available in these categories, or a subset of them.

The synchronization function provides an easy way to ensure that all TEMS Pocket users in an organization have up-to-date configurations on their devices.

22.1. Setting Up the FTP Server

The directory structure on the FTP server must be set up as follows:

- For each user, project, or other entity that you want to distinguish, create a directory /<user_name>/pocket/ in the server root with subdirectories

  cellfiles/ (*.xml)
  mapsets/ (*.ibwc)
  scripts/ (*.xml)
  views/ (*.custom – see section 5.13.4)
  exportsettings/ (*.pocket – see section 21.5.1)

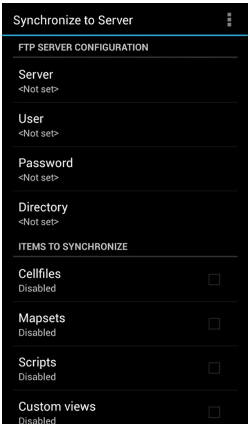
and store your data in this structure. The extensions for the relevant file types are indicated above.

It is convenient to use a tool such as FileZilla to create the FTP server directory structure and upload your data to the server.

22.2. Setting Up the Synchronization

To use this function:

Tap the Menu button, and under **Settings** select **Synchronize to Server**.



Server: FTP server specified by an IPv4 address (12-digit number) or a plain-text name.

User, Password: User name and password on the FTP server, if required.

Directory: Directory on the FTP server from which to download, e.g. /<user1>/pocket/. See section 22.1 regarding server directory structure.

Items to synchronize: Here you select what categories of data to download from the server.

- Cell files
- Map sets
- Scripts
- Custom views (**Note:** Downloading new custom views requires restart of TEMS Pocket)
- Exported settings (those in the **Settings** menu)

Overwrite existing items: This setting governs how to resolve conflicts between identically named files on the FTP server and the TEMS Pocket device.

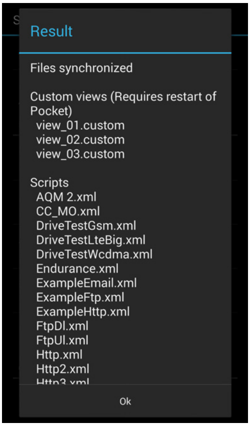
- If enabled, the server file will replace the existing file on the device.
- If disabled, the existing device file will be kept.

22.3. Running the Synchronization

While in the synchronization setup dialog:

Tap the **Synchronize** button.

A progress bar appears, showing the progress of the synchronization. When the procedure has completed, a result screen is displayed listing all files that were synchronized:



22.4. Inspecting the Result of the Latest Synchronization

While in the synchronization setup dialog, you can view a list of the files that were downloaded to the device the last time a synchronization was performed:

Tap the Overflow button and select **Last Result**.

The list looks like the one presented on completion of the synchronization. This information persists even if TEMS Pocket is restarted.

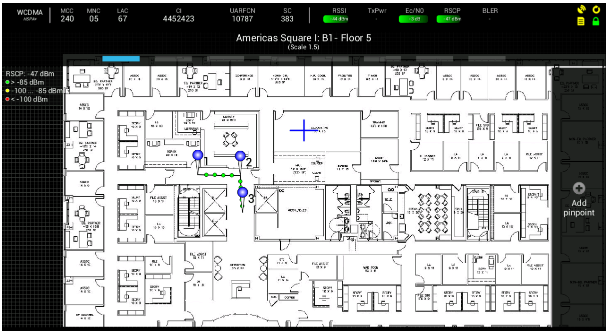
23. TEMS Pocket on Tablets

The TEMS Pocket user interface on tablets is generally similar to the mobile phone user interface. The differences that do exist are described here.

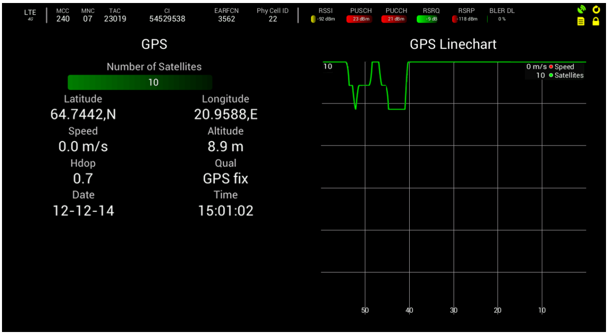
Below is a screenshot of the tablet user interface:

The following is worth noting:

- In the header, the simple LED-style measurement value indicators shown on the phone screen are replaced by horizontal bars with the current numerical value displayed on top of them. Compare section 4.3.3.
- Data views are shown two at a time, side by side, in the main screen area. These are adjacent views in the currently selected data view category. Scrolling between data views is done in the usual manner.
- The pinpointing and logfile replay controls appear on the right-hand side of the screen for easy access when holding the tablet:



- The GPS data view is augmented with a graph (“GPS Line Chart”) showing the vehicle speed and the number of satellites seen:



- Plain-text decoded Layer 3 and SIP messages are not displayed inline in the message list but rather separately on the right:

24. TEMS Pocket Remote

A TEMS Pocket device running in Remote mode can be used as an unattended probe tasked with (for example) monitoring or benchmarking. The device is then controlled remotely from Ascom's FleetManager and does not expose most of the regular TEMS Pocket real-time diagnostics interface. TEMS Pocket Remote does however have a user interface of its own, showing the application's current status and letting the user configure its behavior towards FleetManager.

This chapter deals with the TEMS Pocket Remote interface and explains how the device (called *client* in this context) operates in Remote mode.

24.1. TEMS Pocket Remote vs. Professional

If your TEMS Pocket device was purchased with a Remote-only license, it will show only the user interface components described in this chapter.

If, on the other hand, your TEMS Pocket was purchased with both Professional and Remote license options, you can switch between Local (i.e. normal) mode and Remote mode as described in chapter 26. Note that TEMS Pocket Remote must be offline to permit this transition: see section 24.2.2.

24.2. Data Views in TEMS Pocket Remote

24.2.1. Data View Categories

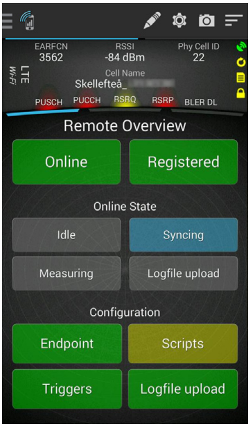
TEMS Pocket Remote displays the following data view categories.

- **Remote:** These are data views unique to TEMS Pocket Remote. They are described in sections 24.2.2–24.2.4.
- **Test Status:** Same as in TEMS Pocket Professional. See section 5.10.
- **Location:** The GPS and Outdoor Map views are available. See section 5.11 and chapter 8.

- **Wi-Fi:** Same as in Professional. See section 5.12.
- **Statistics:** Same as in Professional. See section 5.15.

24.2.2. “Remote Overview” Data View

This data view shows the current status of the TEMS Pocket Remote application in terms of its activities and its communication with FleetManager.



Online/Shutting down:

- *Green:* The client is active and will communicate with the configured FleetManager Endpoint and collect measurements (if configured to do so).
- *Yellow:* The client is unregistering from FleetManager and is about to cease functioning as a TEMS Pocket Remote probe. The label reads **Shutting down** while the client is in this state.
- *Red:* The client is inactive (offline) and will do nothing. Settings, however, can be configured before the client goes online.

Tap the Menu button, and under **Start** select **Go Online**/**Go Offline** to toggle this setting.

Registered:

- *Green:* The client has completed registration with FleetManager.
- *Red:* The client has not yet registered with FleetManager, or it is not online. When the client goes online, it will proceed to register immediately.

A client must be online to be able to conduct testing as a TEMS Pocket Remote probe. If the **Initial registration required** flag is set (see section 24.3.2), the client must also have registered successfully.

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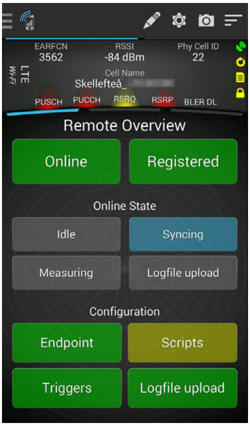

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Online State: When TEMS Pocket Remote is online, its current state is highlighted in blue. The possible states are:

- **Idle:** No client activity except waiting for sync timeout and/or firing of measurement triggers.
- **Syncing:** The client is synchronizing with FleetManager. This entails: synchronization of client settings; download of new work orders (containing scripts) that have become available since the previous sync; upload of positioning data, events, and client information.
- **Measuring:** The client is executing a script, some details of which can then be inspected in the Local Content/Active Measurement view (see section 24.2.4).
- **Logfile upload:** The client is uploading logfiles.

When you start TEMS Pocket in Remote mode, the application will return to the state it was in before you exited. This also applies if autostart is enabled under General settings (see section 21.1.1).

Configuration: These indicators refer to some vital aspects of the configuration of the client as a TEMS Pocket Remote probe.

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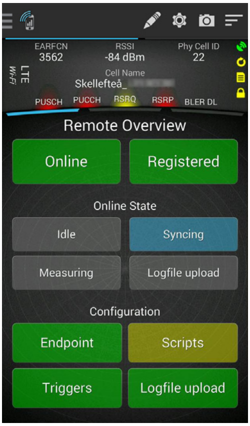

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Endpoint: FleetManager endpoint in FleetManager settings: see section 24.3.1.

- *Green:* A syntactically valid IP address has been entered as endpoint. Note, however, that no further verification of the IP address is associated with this status value (for example, whether it in fact leads to a valid FleetManager).
- *Red:* No syntactically valid IP address entered as endpoint. While this is lacking, the client cannot go online.

Scripts: This means scripts downloaded by the client from FleetManager. When in Remote mode, you cannot compose scripts locally on the client.

- *Green:* At least one script is present, and all of them are executable. For a script to be executable, it must be syntactically correct; furthermore, it must be active in FleetManager, and the work order it is part of must be active as well. Compare section 24.2.4.
- *Yellow:* Scripts are present, and at least one of them is executable, but there is also at least one script that is not.
- *Red:* There are no scripts on the client, or scripts are present but none of them can be executed.

To find out details about why scripts are not executable, you can inspect the “Remote” events appearing in the Events data view (see section 5.14.1) when the device is in Remote mode.

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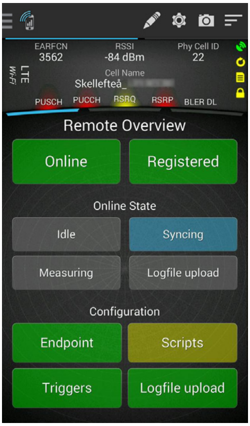

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Triggers:

- *Green:* All scripts present have valid triggers.
- *Yellow:* At least one script has valid triggers, but there is also at least one script that is either missing all triggers or has no stop trigger defined (so that the script will run endlessly).
- *Red:* No script has valid triggers.
- *Gray:* No active scripts present.

Logfile upload:

- *Green:* Logfile upload has been configured on this device.
- *Red:* Logfile upload has not been configured on this device.

24.2.3. FleetManager/Logfiles View

This data view shows FleetManager settings and some information on logfiles recently recorded.

FleetManager section

Configured Endpoint: FleetManager URL accessed by the client.

User Name: User identity for logging in to FleetManager.

Client Name: Name of the client in FleetManager.

Secure Connection: Use of secure (SSL) connection: Yes/No. Equivalent to FleetManager URL starting with “https”.

Proxy Used: Use of proxy server: Yes/No.

Last Successful Sync: Date and time when the client last performed a wholly successful synchronization to FleetManager (all steps succeeding).

Running Web Service Action: Task currently being performed as part of the interaction between the client and FleetManager.

Logfiles section

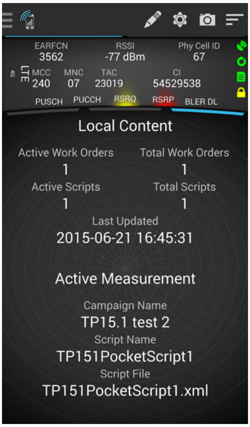
Logfile Upload Endpoint: Destination of uploaded logfiles.

Remote Logfiles: Number of TEMS Pocket Remote logfiles currently stored on the client in the location given in section 4.4.1 (files not yet uploaded). Any files recorded in Professional mode are not included in the count. If the number of Remote logfiles exceeds 500, the string “500+” is displayed.

Last Recorded: Date and time when the latest logfile was recorded.

24.2.4. Local Content/Active Measurement View

This data view shows information on what content the client has downloaded from FleetManager, and on the measurement it is currently undertaking.



Local Content section

Active Work Orders: A work order is an entity that encompasses one or several scripts. Work orders are what is downloaded by the client. Here is shown the number of work orders that are associated with the client and have been configured as active in FleetManager.

Total Work Orders: Total number of work orders associated with and downloaded by the client.

Active Scripts: Number of downloaded scripts that are currently active, that is, allowed to be run. Inactive scripts are ones that belong to an inactive work order, or that have their "Run" checkbox unchecked in FleetManager.

Total Scripts: Total number of scripts downloaded by the client.

Last Updated: Date and time when the work orders and scripts were last updated (during synchronization with FleetManager).

Active Measurement section

Campaign Name: Name of the measurement campaign that the client is currently running.

Script Name: Name of the currently executing script.

Script File: File name of the currently executing script.

More information about the executing script can be found in the Test Status category of data views (see section 5.10).

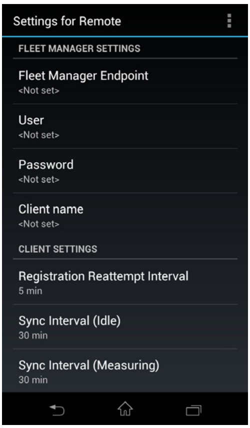
24.3. Configuration of TEMS Pocket Remote

To edit configuration parameters for TEMS Pocket Remote, tap the Settings button and select **Remote**.

Any changes made to most of these settings take effect immediately, even if a script is executing – including client settings that govern synchronization behavior (see section 24.3.2). The only exceptions are changes to FleetManager and proxy settings, which will come into effect at the next synchronization (they will not be picked up during a synchronization that is already in progress).

The settings can alternatively be edited from FleetManager, in which case they will be retrieved by the client at the next synchronization. If a setting has been edited both on the client and in FleetManager since last sync, the client setting will normally prevail. There is one exception, namely if the client is "clean" with default settings throughout (for example, if the TEMS Pocket application has just been removed and reinstalled) but has previously registered with FleetManager with modified (non-default) settings. In this case, FleetManager settings will take precedence.

24.3.1. FleetManager Settings



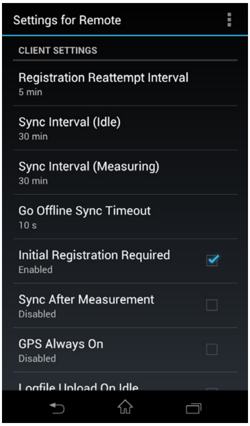
FleetManager Endpoint: URL of FleetManager endpoint to which the client logs in.

User, Password: Credential used by the client when logging in to FleetManager.

Client Name: Name by which the client is known to FleetManager, and which is displayed in the FleetManager user interface.

24.3.2. Client Settings

Note that synchronization with FleetManager can also be done manually at any time. See section 24.4.



Registration Reattempt Interval: This setting governs how frequently the client will retry registration with FleetManager in case the registration fails.

Sync Interval (Idle): The interval at which the client synchronizes with FleetManager when in idle mode. The timer is reset when the client returns to Idle state (from Measuring).

Sync Interval (Measuring): The interval at which the client should ideally synchronize with FleetManager when measuring, that is, while executing a script. However, after the sync interval times out, the client first finishes the current script iteration before syncing, then pauses the script to do the synchronization. After the sync is complete, the script resumes, embarking on the next iteration.

If the sync interval times out a second time during the *same* iteration, the entire script is stopped. A sync is performed, but afterwards the client goes into Idle state without resuming the script. In practice, therefore, this parameter provides an additional mechanism (besides the stop trigger in the script) for limiting the script execution time. It can also be used to abort a script that might unintentionally have been configured as to never finish. In this way you become able to reconfigure the invalid script from FleetManager and push the corrected script to the client within twice the time interval configured here.

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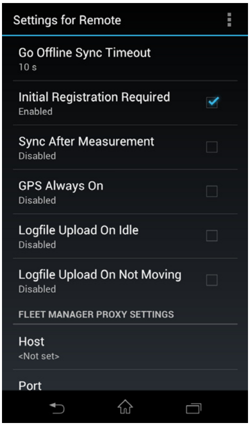

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Go Offline Sync Timeout: The length of time to wait for an acknowledgment from FleetManager after the Go Offline command has been given (see section 24.2.2). If no acknowledgment arrives within this time, the client goes offline anyway.

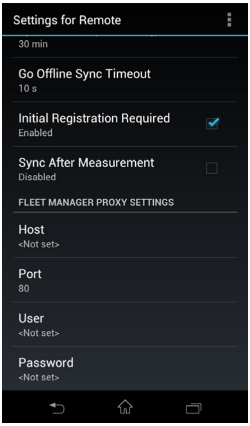
Initial Registration Required: If set to Enabled, successful registration with FleetManager is required before the client is allowed to run scripts it has already downloaded (that is, on some previous occasion when the client was registered).

Sync After Measurement: If set to Enabled, the client will perform an extra synchronization each time it has finished a script normally (the script's stop trigger evaluated to true, or the maximum number of script iterations was completed).

GPS Always On: By default, in Remote mode, the device GPS is switched on only during measurement. However, if you enable this option, the GPS will always be on. This enables positioning of events that are sent to FleetManager even if no measurement is being conducted. If you want to use the function "upload logfiles when not moving" (see section 24.6.3.2), you must have the GPS turned on at all times.

Logfile Upload On Idle, Logfile Upload On Not Moving: See section 24.6.3.

24.3.3. FleetManager Proxy Settings



If FleetManager is to be accessed through a proxy server, enter the proxy settings here.

24.3.4. Logfile Upload Settings

These settings duplicate those in the Logfile Upload script action (covered in section 9.6.2) and are used for manual logfile upload in TEMS Pocket Remote: see section 24.6.2.

24.4. Manual Synchronization with FleetManager

A TEMS Pocket Remote device can be manually synchronized with FleetManager:

Tap the Menu button, and under **Start** select **Synchronize**.

Compare the settings for recurrent automatic synchronization described in section 24.3.2.

> **Note:** If you perform a manual synchronization during measurement, the script will start over from the first iteration.

24.5. Script Handling in Remote Mode

If trigger conditions are satisfied for several scripts simultaneously, one script is picked for execution, while the others are placed in a queue. The first script is run to completion, and then the other scripts are executed in turn. However, if the script's stop trigger becomes true while the script is waiting in the queue, that script is not executed at all.

The general advice that can be given here is to take care to compose triggers that make good sense and do not conflict unnecessarily.

24.6. Logfile Upload in Remote Mode

24.6.1. Scripted Logfile Upload

Scripted uploading of logfiles is performed by means of the Logfile Upload script action (see section 9.6.2), just as in Professional. Therefore, if no script having a Logfile Upload action is active on the client, no logfiles will be uploaded automatically, unless uploads are triggered by one of the conditions in section 24.6.3.

If you want to schedule uploads at a specific **time of day**, you can set up the script to be started at a given time. To this end, have the script triggered by a custom event that involves "Time" value elements, expressing the desired condition (for example, Time Hour = 17 in order to upload logfiles at 5 p.m.). See section 9.2.2 regarding script trigger settings and section 6.4 regarding creation of custom events.

24.6.2. Manual Logfile Upload

Unlike Professional, TEMS Pocket Remote has a function for "on-demand" logfile upload which can be initiated manually at any time. Such uploads are governed by the Remote-specific upload settings (see section 24.3.4).

To edit the manual upload configuration, tap the Settings button and select **Remote**, then scroll down to the **Logfile Upload Settings** section.

To initiate an upload, tap the Menu button, and under **Start** select **Upload Logfiles**.

24.6.3. Logfile Upload Triggered in Special Situations

A number of special options exist for logfile upload in TEMS Pocket, as mentioned in section 24.3.2. See the subsections that follow.

24.6.3.1. Logfile Upload On Idle

Checking this option will cause a logfile upload to begin as soon as the device is neither running a measurement nor synchronizing to FleetManager. However, if a start trigger for measurement becomes true, or the sync interval times out, then the upload is stopped immediately and the device starts measuring or synchronizing instead. The upload will resume once the device goes idle again.

24.6.3.2. Logfile Upload On Not Moving

Checking this option will trigger a logfile upload as soon as the vehicle stops or slows down to a very low speed (< 10 km/h on average during the last 30 s). If a measurement is in progress, the upload will wait until the current iteration of the script has finished.

If the vehicle starts moving again (faster than specified above), or if GPS coverage is lost, the upload will terminate immediately.

If the vehicle is still stationary when the upload completes, TEMS Pocket Remote will begin a new measurement at that point.

24.7. Logfile Recovery in Remote Mode

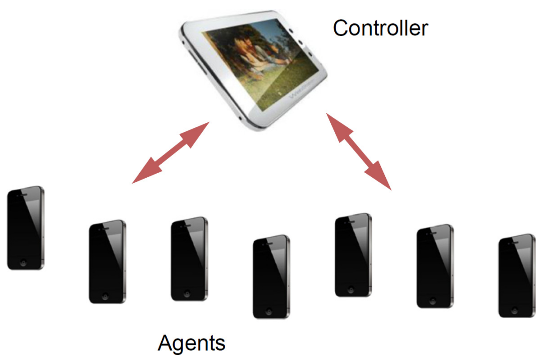
In TEMS Pocket Remote, recovery of incomplete logfiles is always attempted (no question appears in the user interface), provided that the recovery function is enabled in the Settings menu (see section 21.2.6).

25. Multi-device TEMS Pocket

This chapter describes the features and functionality of the TEMS Pocket multi-device configuration.

25.1. System Overview

In the multi-device configuration, one TEMS Pocket device called the **controller** is used to remote-control up to seven other devices, called **agents**. The communication takes place via Bluetooth. From the controller you can assign scripts and map sets to agents, order agents to start and stop measuring, and monitor agents' status. The controller device should preferably be a tablet, but it can also be an ordinary phone. (To keep the layout compact, screenshots from phones are mostly used in this chapter.)



The controller's user interface is mostly limited to the functions just mentioned, plus the indoor and outdoor map views. Agents, too, have a very trimmed-down user interface compared to that of TEMS Pocket in regular Local mode. Both are described in what follows.

25.2. Work Modes and Licensing

TEMS Pocket units in a multi-device configuration operate in special work modes: **Controller** and **Agent**, respectively. These are separate from both Local mode and Remote mode (as laid out in chapter 26), and the Controller mode requires a special license option (see section 3.6.2).

On each device in a multi-device configuration, you need to set the work mode the first time you start TEMS Pocket. One device is then designated as controller, and all other devices as agents. How to do this is gone through in section 25.3.

25.2.1. Availability in Product Packages

The multi-device configuration is available in TEMS Pocket product packages as follows:

Work Mode/ Package	Profes-sional	Standard	Lite	Remote
Controller	Optional	Optional	Optional	
Agent	Included	Optional		Included

Note especially that the controller can be a TEMS Pocket Lite device. Using a Lite license for the controller allows it to run on any tablet, and not only on TEMS Pocket Professional tablets.

Compare section 4.1 regarding product packages generally.

25.2.2. Controller and Agent States

The controller can be either *active* or *inactive*, and the following actions can be performed in each state:

- **Inactive:** Add/remove agents; configure scripts.
- **Active:** Connect/disconnect agents; configure scripts, run scripts; start/ stop pinpointing.

An agent can likewise be *active* or *inactive*, and the following actions can be performed in each state:

- **Inactive:** Make agent discoverable.

- **Active:** Make agent discoverable; once discoverable, agent will accept connection request from controller.

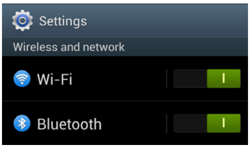
How to switch between the states is covered in section 25.3.

25.3. Initial Configuration

25.3.1. Initial Configuration of Agents

For each agent, work through the following steps:

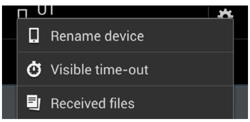
- Tap **Settings** on the phone.



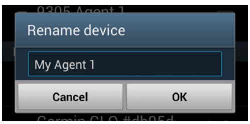
- Set **Bluetooth** on.

It is a good idea to give each agent a user-friendly Bluetooth device name, so that you can easily tell the agents apart in the controller. On Sony phones, this is done as follows:

- Tap the **Bluetooth** item.
- Tap the Menu button on the device (i.e. not in TEMS Pocket) or the Overflow button visible in this context to open the Bluetooth settings menu at the bottom of the screen.



- From that menu, select **Rename device**/ **Rename phone**.



- Give the device a name of your choice, then tap **OK**.

On LG and Samsung devices, the procedure is different:

- In the regular menu system, go to:
  – *(LG)* **Settings** → **About phone** → **Phone name**

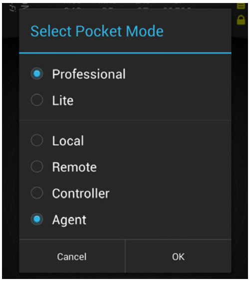
– *(Samsung)* **Settings** → **More** (or **General**) → **About device** → **Device name**

and enter a new name there.

After renaming the device, continue as follows:

- Start TEMS Pocket.

Tap the Menu button, and under **Other** select **Pocket Mode**.



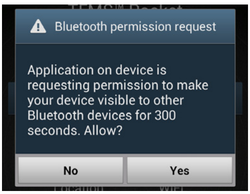
- In the bottom section, select **Agent**, and tap **OK**.

You are now ready to activate the device:

Tap the Menu button, and under **Start** select **Activate**.

You also need to make the agent *discoverable* so that the controller can find it.

Tap the Menu button, and under **Start** select **Make discoverable**.



- In the permission request dialog that appears, tap **Yes**.

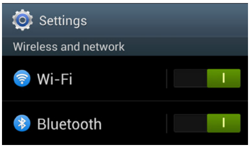
25.3.2. Initial Configuration of Controller

Tap the Menu button, and under **Start** select **Pocket Mode**.

- In the bottom section, select **Controller**, and tap **OK**.

Turn on Bluetooth:

- Tap **Settings** on the device.



- Set **Bluetooth** on.

- You may want to give the controller a user-defined Bluetooth name just like the agents. This is done in the same way as described in section 25.3.1.

Tap the Menu button, and under **Start** select **Start Discovery** to find the agents.

- Wait a few seconds until the agents show up in the **Found Devices** list. Please note that all Bluetooth devices that are within range will appear in this list, not just your TEMS Pocket agents.

- Tap the **Add** button for each agent.
- If an agent does not appear in this list, issue the **Make discoverable** command once more on the agent (see section 25.3.1) and repeat the discovery procedure on the controller as just described.

When you have added all agents, tap the Menu button, and under **Start** select **Stop Discovery**.

The **Controlled Agents** view is populated with the agents you have added.

If you have added an agent that you are not going to use any more, you can remove it as follows:

- Select the agent in the Controlled Agents view so that the list item is expanded and the control buttons are exposed. Then tap the **Remove** button.

- Finally, activate the controller:

Tap the Menu button, and under **Start** select **Activate**.

25.4. Connecting to the Agents in the Controller

To connect **one agent** to the controller:

- Select the agent in the Controlled Agents view to expand the agent list item.

- Tap the **Connect** button.
- Wait until the connection is established.

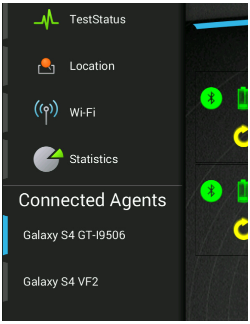
To connect **all agents** to the controller in a single action:

Tap the Menu button, and under **Actions** select **Connect All**.

When an agent is connected, its connection icon turns green, and the status icons are colored according to the agent’s current status. For details, see section 25.11.

The number of connected agents, and the total number of agents controlled, are indicated in the header of the Controlled Agents view. The header furthermore displays the controller’s current status: Active (as always when agents are connected), Discovering, or Inactive.

You can tap the **Poke** button of a connected agent to verify which physical device it represents. The agent device will then vibrate and display a toast “Notification from controller”. This function can be useful when you are handling multiple devices and need to remind yourself of which is which.



All connected agents also appear at the bottom of the navigation menu under the heading **Connected Agents**. If no agent is connected, the text "No agents..." is displayed in the navigation menu. Compare section 25.11.10.

25.5. Disconnecting from Agents in the Controller

To disconnect **one agent** from the controller:

- Select the agent in the Controlled Agents view to expand the agent list item.
- Tap the **Disconnect** button.
- Wait until the device is disconnected.

To disconnect **all agents** from the controller:

Tap the Menu button, and under **Actions** select **Disconnect All**.

25.6. Synchronizing GPS Between Controller and Agents *(Optional)*

From the controller you can assign the controller's GPS position to all agents, overriding the agents' own reported GPS positions:

Tap the Settings button and select **General** → **GPS**.

- Check the option **Synchronize GPS to all agents**.

The purpose of such an action is twofold:

- to ensure that the controller and all agents share the exact same position in recordings;
- to eliminate any possible problems with inferior GPS reception inside the backpack where the agents are typically installed.

The controller may take its position either from its built-in GPS or from an external Bluetooth GPS (see section 20.3). In the former case, when GPS synchronization is active, the controller GPS is turned on automatically when you start a measurement on one of the agents.

25.7. Assigning Unique Device IDs to Agents *(Optional)*

Each agent (and a connected external scanner if present) can be assigned a unique “EQ*n*” identity to help distinguish devices during post-processing in other TEMS products. See sections 21.2.4, 21.2.5.

25.8. Composing Scripts

Composing scripts in the controller is done exactly as in Local mode and is not detailed here. See chapter 9.

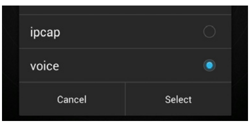
What needs to be kept in mind, however, is that the controller lets you compose any type of script action, while running that action on an agent requires that the agent a) support the action type and b) have the appropriate license for it. You need to keep track of this yourself. If an agent is unable to execute an action, the action will simply fail.

25.9. Assigning Scripts to Agents

From the controller you can either assign a common script to be run on all agents, or you can assign script to agents individually.

25.9.1. Assigning a Common Script to All Agents

Tap the Menu button, and under **Actions** choose **Select Common Script**.

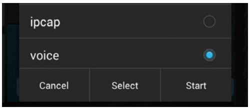


- Pick the desired script and tap **Select**.

25.9.2. Assigning a Script to a Single Agent

To assign a script to a single agent:

- In the Controlled Agents view, tap the agent's **Script** button.



- Select the script that you want to run on this agent.
- If you just want to make the selection for now and leave the measurement for later, tap **Select**.
- If you want to the agent to start measuring according to this script right away, tap **Start**. See also section 25.10.

25.10. Starting and Stopping Scripts on Agents

You can start measurement on all agents at the same time by tapping the Menu button, and then under **Start** selecting **Start Measuring**. Each agent will then begin to execute its assigned script (whether the scripts are different or a common script is used by all agents).

Stopping measurement on all agents is done analogously by tapping the Menu button and under **Start** selecting **Stop Measuring**.

How to start a script on a single agent is described in section 25.9.2. To stop the script, perform the same actions once more and tap the **Stop** button that will appear in this situation.

25.11. Monitoring Agents from the Controller

All data views covered here except the progress and map views are found in the **Controller** category.

25.11.1. "Controlled Agents" View

This view is covered in general terms in section 25.4. See also section 25.11.1.1.

25.11.1.1. Agent Status Icons

The Controlled Agents view displays a number of **status icons** for each agent:

Connection Status Icon

Color	Meaning
Green	The agent is connected.
Yellow	The agent was disconnected by the user (in either agent or controller user interface).
Red	Unexpected disconnect (not user-initiated).

Battery Status Icon

Color	Meaning
Green	The battery level is above 30%.
Yellow	The battery level is between 10% and 30%.
Red	The battery level is below 10%.

Storage Status Icon

Color	Meaning
Green	More than 50 MB free memory.
Yellow	Between 20 MB and 50 MB free memory.
Red	Less than 20 MB free memory.

Measuring Status Icon

This icon also appears in the Agent Test Status view (see section 25.11.4).

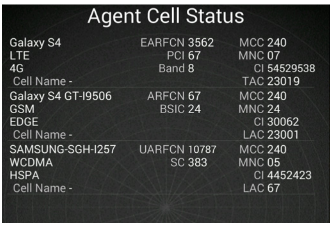
Color	Meaning
Green	A script is running, and the last action completed normally.
Yellow	No script is running.
Red	A script is running, but the last action failed.

Control Status Icon

Color	Meaning
Green	The control function last invoked was successfully applied, and at least one control function is currently in effect.
Yellow	No control functions currently in effect.
Red	The control function last invoked was not successfully applied. (Other control functions that were previously applied with success may still be in effect.)

25.11.2. “Agent Cell Status” Data View

This view gives a compact summary of the status of all connected agents: specifically, data on the current technology, band, channel, and cell in use.

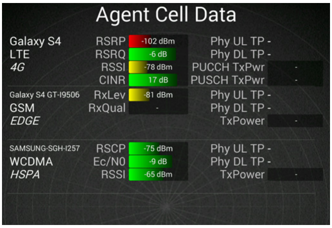


For CDMA/EV-DO, the following is indicated: Channel, PN, SID, and NID.

You can change the display format for some of these parameters by long-pressing them; see section 21.3.

25.11.3. “Agent Cell Data” Data View

This is another overview of all connected agents, showing some key RF measurements, physical channel throughput, and device transmit power.

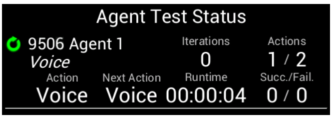


For CDMA/EV-DO, the following is indicated: E_c, E_c/I_0, RxPower, Phy UL/DL Throughput, and TxPower.

25.11.4. “Agent Test Status” Data View

Here is shown what kind of testing the agents are currently performing.

For each agent, a subset is shown of the information given in the Agent Script Progress view (see section 25.11.7).

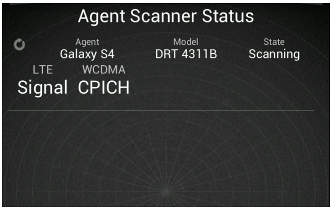


A single agent connected in this example

- *Top left:* Measuring status icon (see section 25.11.1.1); agent name; name of script being executed (in italics).
- **Iterations:** Total number of completed script iterations.
- **Actions:** Index of current action in list of actions / Total number of actions in script.
- **Action:** Type of script action currently executed.
- **Next action:** Type of next action in script.
- **Runtime:** Total elapsed script execution time (all iterations).
- **Succ./Fail.:** Total number of successfully completed script actions (all iterations) / Total number of failed script actions (all iterations).

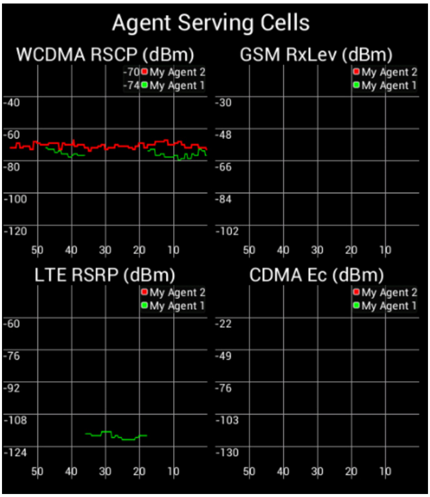
25.11.5. “Agent Scanner Status” Data View

This view shows what kind of scanning the agents are currently doing (by means of connected external scanners). On a tablet, a scanning cell list view for one scanned technology (see section 5.8) is displayed on the right-hand side. If you are scanning multiple technologies, tap the desired technology in the status view to show the cell list view for that technology.

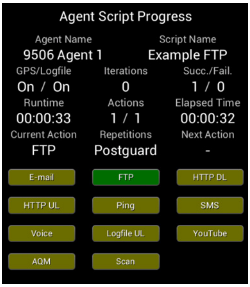


25.11.6. “Agent Serving Cells” Data View

This view holds signal strength charts for all cellular technologies supported by the agents. Data is displayed from all agents side by side.



25.11.7. "Agent Script Progress" Data View



Under **Test Status** is found the Agent Script Progress view, which shows more detailed data on the progress of an agent's script execution. It is similar to the regular Script Progress data view described in section 5.10.1, except that the agent name has been added. The agent presented is the one selected as current (see section 25.11.10).

As in Local mode, you can tap a button representing a service type to access the corresponding service-specific progress view.

25.11.8. Indoor Map and Outdoor Map Views

The controller map views show the same contents as the corresponding views on the agent selected as current (see section 25.11.10); that is, the route of that agent is tracked in the usual manner, as described in chapters 7 and 8.

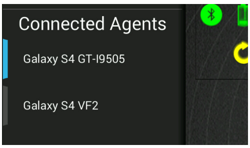
If you switch to a different current agent, the map views are blanked, except that waypoints created in the Indoor Map view will remain.

25.11.9. Custom Views

Custom data views can be built in the controller in the same way as in Local mode; refer to section 5.13 for full details. Such views will display data for the agent selected as current (see section 25.11.10).

25.11.10. Selecting a Current Agent

Most data views in the controller (Agent Script Progress view, service-specific progress views, map views, and custom views) can only show data for one agent at a time.



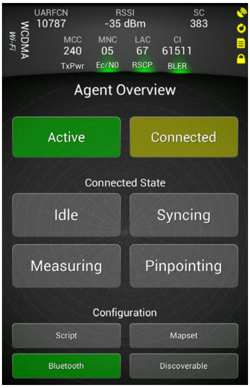
You select this agent by tapping it in the navigation menu under **Connected Agents**. That agent is then displayed as **Selected Agent** in the header of the Controlled Agents view. It is also marked by a blue vertical line in the navigation menu.

At the outset, the agent at the top of the Connected Agents list is selected as current.

25.12. Status Views Displayed on Agents

Besides a subset of the regular Local mode data views, agents exhibit the following views which show various aspects of their current status and configuration.

25.12.1. Agent Overview



Active:

- *Green:* Agent activated.
- *Red:* Agent deactivated (all connection attempts from controllers are ignored). See section 25.3.1.

Connected:

- *Green:* Agent connected.
- *Yellow:* Agent waiting for connection.
- *Red:* Agent disconnected by user, or connection lost for some other reason. See section 25.4.

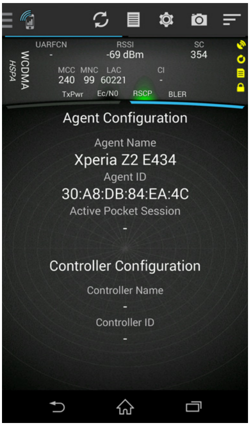
Connected State: The current state is highlighted in blue.

- **Idle:** The agent is connected but is currently not doing anything.
- **Syncing:** The agent is communicating with the controller.
- **Measuring:** The agent is executing a script.
- **Pinpointing:** The agent is pinpointing (and possibly measuring as well).

Configuration:

- **Script:** *Green* = The received script is valid. *Red* = The received script is invalid.
- **Mapset:** *Green* = The received map set loaded successfully. *Red* = The received map set could not be loaded.
- **Bluetooth:** *Green* = Bluetooth communication is available.
- **Discoverable:** *Green* = The device is currently discoverable as a Bluetooth device.

25.12.2. "Agent Configuration" View



Agent Configuration section

Agent Name: Bluetooth name given to the agent device during initial configuration (or at any point later on); see section 25.3.1.

Agent ID: Unique identifier (Bluetooth MAC address) of agent device.

Active Pocket Session: TEMS Pocket session currently active, if any (started on the controller). See chapter 11.

Controller Configuration section

Here the controller device currently controlling the agent is identified.

Controller Name: Bluetooth name of controller device.

Controller ID: Unique identifier (Bluetooth MAC address) of controller device.

25.13. Pinpointing

When pinpointing in multi-device mode, you mark the waypoints in the controller's Indoor Map view. These positions are then pushed out to all agents, so that the logfile recorded by each agent will include both the map set used and the waypoints created.

25.13.1. Preparations

What you need to do in terms of preparations is a) to load a map set and b) to select a script to run.

- First make sure that all agents are connected. See section 25.4.
- On the controller device, tap the **Location** icon. The Indoor Map view appears.

Loading a map set is done just as described in section 7.2:

Tap the Menu button, and under **Actions** select **Load Map Set**.

- Select the map set that you want to use.
- Tap **Load**. The map is loaded into the Indoor Map view.

Then assign scripts to the agents: either a common script to all of them, or a unique script to each agent. Turn to section 25.9 for details.

25.13.2. Walking a Route and Measuring

To begin your route, tap the Menu button, and under **Start** select **Start Pinpointing**.

The first time you use a map set, it must first be downloaded to all agents, which may take some time. Please wait until all agents have received the map set.

If the map set is large, it may be a good idea to store the map set in advance locally on the agents, eliminating the need to transfer it over Bluetooth.

- Next, start the **script** you want to run. (You must defer this until after starting pinpointing, for the reasons explained in section 7.5.2.)

Tap the Menu button, and under **Start** select **Start Measuring**.

- Now walk your route and mark waypoints in the Indoor Map view as you go, just as in Local mode. You can delete waypoints if needed. Please refer to section 7.5.

The waypoints are distributed to all agents, so that they all receive identical positioning data. You cannot do any pinpointing directly on the agents; however, the waypoints received from the controller are shown in each agent's Location view.

When you have completed your route, tap the Menu button, and under **Start** select **Stop Pinpointing**. This will also unload the map set from the agents.

To stop your script, tap the Menu button, and under **Start** select **Stop Measuring**.

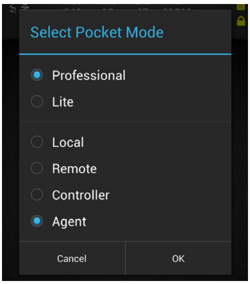
25.14. Storing of Logfiles

Logfiles recorded by the agents are stored locally on each agent device, as detailed in section 4.4.1. There is no automatic transfer of logfiles from the agents to the controller (this would be very slow and time-consuming over Bluetooth). However, you can use the Logfile Upload script action (see section 9.6.2) to transfer logfiles wherever you wish, just as in Local mode.

26. Switching Between TEMS Pocket Work Modes

If your TEMS Pocket device is equipped with license options that give access to multiple product packages and/or work modes, you can switch between these as described here. All such switching is done without restarting the TEMS Pocket application.

Tap the Menu button, and under **Other** select **Pocket Mode**.



Top section

- TEMS Pocket **Professional** encompasses the full set of product features. See section 3.1.
- TEMS Pocket **Lite** has a reduced set of features. See section 3.2.

Bottom section

- **Local:** Regular TEMS Pocket with full real-time diagnostics user interface, as described in this manual outside of chapters 24 and 25.
- **Remote:** TEMS Pocket Remote, an autonomous data-collecting probe: see chapter 24.
- **Agent:** Device functioning as an agent in a multi-device TEMS Pocket configuration, receiving instructions from the controller: see chapter 25.
- **Controller:** Device controlling the actions of agents in a multi-device TEMS Pocket configuration: see chapter 25.

To be able to switch modes, the TEMS Pocket device must be basically “idle”. That is:

- In Local mode, no script, logfile recording/replay, or pinpointing can be active.
- In Remote mode, the client must be offline.
- In Agent or Controller mode, the device must be deactivated.

The Pocket Mode menu option is visible only if the device is equipped with license options allowing it to actually switch between settings: for example, between {Professional, Local} and {Professional, Remote}. Otherwise, the Pocket Mode option is hidden. If it is present, the dialog may still contain fewer choices that the full set shown above, again as dictated by the license options on the device.

27. External Antenna Kit

An **external antenna kit** is offered with TEMS Pocket on the Sony Xperia V LT25i phone. The device is then permanently fitted with SMA female connectors on the back.

With an external antenna you can easily verify previously deployed antenna solutions, or find faulty cables, using only a mobile device. The antenna kit also includes a mini-antenna for normal handheld use; the phone’s internal antenna, on the other hand, is permanently disabled in this configuration.

The external antenna solution is available with TEMS Pocket Professional and TEMS Pocket Standard.

28. Configuration of DRT Transmitter

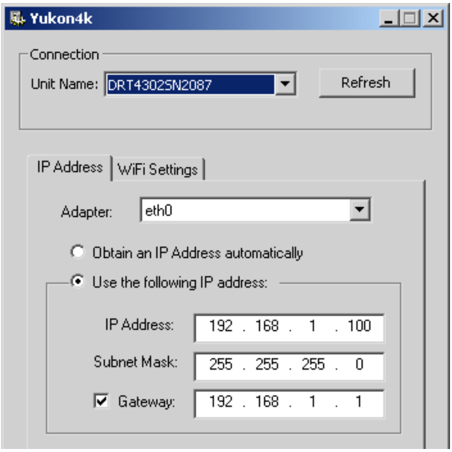
TEMS Pocket can be used in conjunction with a DRT4302A+ test transmitter. Such a transmitter can be included in the TEMS Pocket product package.

The DRT transmitter is controlled from a PC, to which it can be connected directly by means of a cable, over a local area network, or via Wi-Fi. The instructions that follow tell how to configure the transmitter and the PC in each case.

28.1. Setting Up the Transmitter

Before you begin, you need to install the **Nome** application, which functions as the transmitter’s user interface, on the PC. Along with it, another application **Yukon4k** is installed which is used for configuring the transmitter’s network connection.

1. After installing the above software, start Yukon4k. This application will find the DRT transmitter automatically and present its name as shown in the screenshot below.

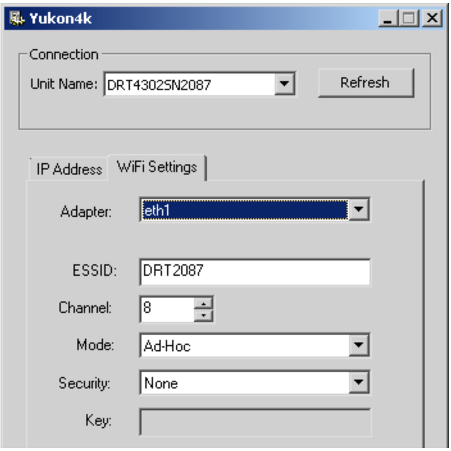


2. On the **IP Address** tab you can set IP addresses for Ethernet and Wi-Fi. The adapter for Ethernet is “eth0” and by default uses the IP address 192.168.1.100. The Wi-Fi adapter is called “eth1” and uses the default IP address 192.168.2.100.

3. If you are going to connect to the transmitter via Ethernet, then for **Adapter** = “eth0” you need to select **Obtain an IP Address automatically** and click the **Set Unit IP Configuration** button. Compare section 28.3.

4. To be able to access the transmitter over Wi-Fi, enter appropriate settings on the **WiFi Settings** tab:
   - **ESSID:** Wi-Fi network name.
   - **Channel:** Select an unused channel in the range 1 ... 10.
   - **Mode:** Always **Ad-Hoc**. The transmitter’s Wi-Fi (802.11b/g) interface operates in an “ad-hoc” (peer-to-peer) configuration; the interface currently does not support the Wi-Fi “infrastructure” mode of operation. Control is determined when the unit is powered on. **Note** that any device that is going to receive signals from the DRT transmitter must support the “ad-hoc” mode of operation.
   - **Security:** “None” or WEP.
   - **Key:** If WEP is used, enter the WEP key here.

When you are done entering the parameters, click the **Set Wireless Configuration** button.



5. If you want to change between Ethernet and Wi-Fi connection mode, you must reboot the transmitter. See section 28.1.1 below.

28.1.1. Changing between Ethernet and Wi-Fi Network Configuration Modes

On power-up or boot, the transmitter checks to see if there is an Ethernet cable connected to the DATA connector. If an Ethernet cable is present, the unit is configured to use that cable for control; if not, it selects Wi-Fi for communications.

To switch between these modes, it is necessary to turn off power to the transmitter and plug in or plug out the Ethernet cable as appropriate. Then power on the unit again, and the networking mode will be selected as just described.

28.2. Configuring the PC for Direct Connection

The DRT transmitter is shipped configured for a direct connection, with the static IP address 192.168.1.100 assigned to its Ethernet (“eth0”) adapter. The PC’s Ethernet adapter must likewise have its TCP/IP address configured as static and in the range 192.168.1.nnn, where nnn is any number between 1 and 255 except 100.

Follow these steps:

1. Access the Windows user interface showing your network connections:
   - (Windows 7) **Start** → **Control Panel** → **Network and Sharing Center** → **Change Adapter Settings**
   - (Windows Vista) **Start** → **Settings** → **Network Connections**
   - (Windows XP) **Start** → **Connect To** → **Show All Connections**.
2. Double-click **Local Area Connection**.
   - Click the **Properties** button.
3. In the box below "**This connection uses the following items:**", select:
   - (Windows 7/Vista) "Internet Protocol Version 4 (TCP/IPv4)"
   - (Windows XP) "Internet Protocol (TCP/IP)".
   - Then click the **Properties** button.
4. Select "**Use the following IP address**". Under **IP address**, enter 192.168.1.100. Under **Subnet mask**, enter 255.255.255.0. Then click **OK**.
5. Connect the transmitter to the PC's Ethernet port with a crossover 100Base-T cable.

28.3. Configuring the PC for LAN Connection

As explained in section 28.1, step 3, the Ethernet adapter of the DRT transmitter needs to be set to "obtain an IP address automatically". You need to change this setting on the PC as well.

Follow these steps:

1. Access the Windows user interface showing your network connections:
   - (Windows 7) **Start** → **Control Panel** → **Network and Sharing Center** → **Change Adapter Settings**
   - (Windows Vista) **Start** → **Settings** → **Network Connections**
   - (Windows XP) **Start** → **Connect To** → **Show All Connections**.
2. Double-click **Local Area Connection** and click the **Properties** button.
3. In the box below "**This connection uses the following items:**", select:
   - (Windows 7/Vista) "Internet Protocol Version 4 (TCP/IPv4)"
   - (Windows XP) "Internet Protocol (TCP/IP)".

4. Select "**Obtain an IP address automatically**".
5. Select "**Obtain DNS server address automatically**". Then click **OK**.
6. Connect the PC and the transmitter to available Ethernet ports on the same subnet of the LAN with normal (non-crossover) 100Base-T cables. If the remote location is not on the same subnet, then a VPN connection may be used to create an extended virtual subnet that can host the transmitter as if it were on a local subnet.

28.4. Verifying the Configuration

Here is how to confirm and troubleshoot the connection to the transmitter.

Before you begin, make sure your firewall is disabled.

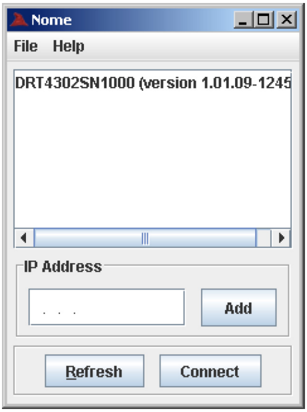
1. Connect the Ethernet cable or cables as described in sections 28.2 and 28.3.
2. Open a Windows command prompt (select **Start** → **Run**, enter cmd, and press Enter).
3. Ping the unit by typing the command ping drt4302snaaaa, where aaaa is the serial number of the device, and observe if responses are received.
4. If no response occurs, you may use Wireshark to capture the Ethernet traffic and determine the unit's current IP address. Enter the filter term nbns.flags == 0x2910 to isolate the Netbios Naming Service registration messages sent out by the transmitter. The IP address will be included in the message from the transmitter.

28.5. Configuring Transmitter Cell Information

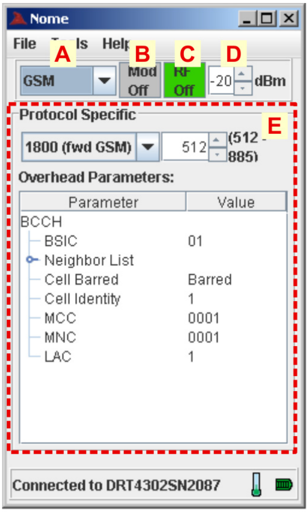
There are two ways to connect to the DRT transmitter and set up its cell information: through Nome or through a web interface.

28.5.1. Configuring the Transmitter Using Nome

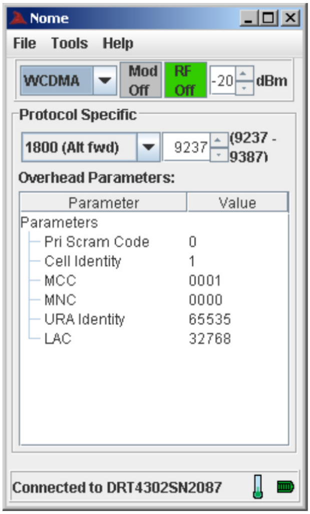
1. Start Nome and wait for the application to find the DRT transmitter. When found, it appears in the list box.



2. Select the DRT transmitter in the list, and click **Connect**. A new screen appears where you configure transmitter settings.



Technology = GSM



Technology = WCDMA

3. In the top section highlighted in the screenshot above, you can configure the following (letters refer to labels added in red):

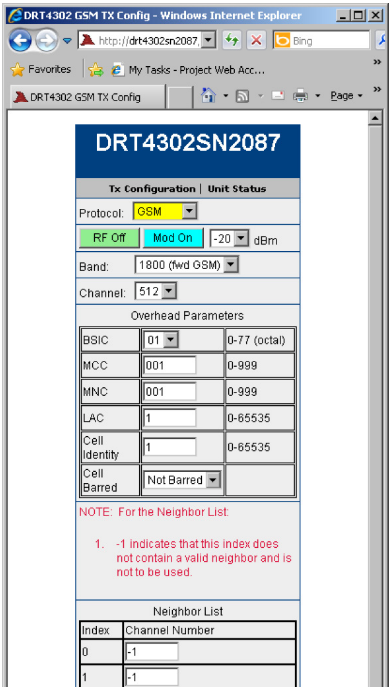
- **A:** Cellular technology, GSM or WCDMA.
- **B:** Modulation On or Off. **Mod On** means that the transmitter mimics a GSM or WCDMA downlink channel. **Mod Off** means that a CW signal is transmitted.
- **C:** **RF Off** = transmission turned off; **RF On** = transmission turned on.
- **D:** Output power, configurable in the range –20 ... +21 dBm.

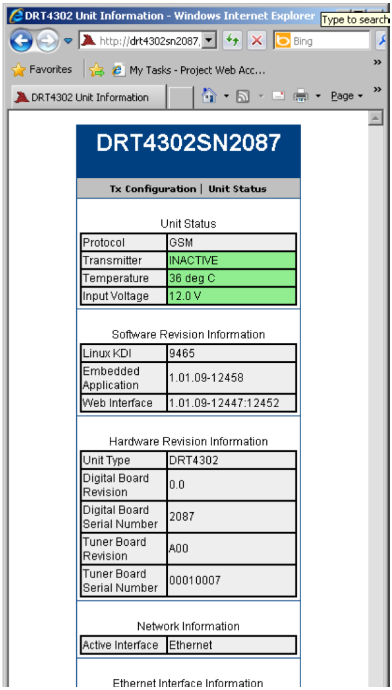
4. **Protocol Specific** section (**E**): Here you set what band and (U)ARFCN to use, along with other cell parameters.

28.5.2. Configuring the Transmitter Using Web Interface

The web browser used to access the DRT transmitter interface must support Ajax, for example: Internet Explorer 8 or later, Firefox 3.0.17, Firefox 3.6.3.

1. Connect to the transmitter with a web browser by entering the URL http://drt4302snaaaa, where aaaa is the serial number of the device. Alternatively, you can also enter the IP address for the transmitter: by default, http://192.168.1.100 for Ethernet or http://192.168.2.100 for Wi-Fi.
2. The web browser interface looks somewhat different from the Nome application. Click the **Tx Configuration** link to set transmission parameters (left-hand screenshot below); compare section 28.5.1, step 3. Clicking the **Unit Status** link displays device status information, as shown in the screenshot on the right.


DRT4302 GSM TX Config - Windows Internet Explorer
DRT4302SN2087
Tx Configuration | Unit Status
Protocol: GSM
RF Off
Mod On
-20 dBm
Band: 1800 (fwd GSM)
Channel: 512
Overhead Parameters
BSIC 01 0-77 (octal)
MCC 001 0-999
MNC 001 0-999
LAC 1 0-65535
Cell Identity 1 0-65535
Cell Barred Not Barred
NOTE: For the Neighbor List:
1. -1 indicates that this index does not contain a valid neighbor and is not to be used.
Neighbor List
Index Channel Number
0 -1
1 -1


DRT4302 Unit Information - Windows Internet Explorer
DRT4302SN2087
Tx Configuration | Unit Status
Unit Status
Protocol GSM
Transmitter INACTIVE
Temperature 36 deg C
Input Voltage 12.0 V
Software Revision Information
Linux KDI 9465
Embedded Application 1.01.09-12458
Web Interface 1.01.09-12447:12452
Hardware Revision Information
Unit Type DRT4302
Digital Board Revision 0.0
Digital Board Serial Number 2087
Tuner Board Revision A00
Tuner Board Serial Number 00010007
Network Information
Active Interface Ethernet
Ethernet Interface Information

29. Support Contact Information

29.1. Technical Support

As a TEMS customer, you can log in to the TEMS Portal at ▶ www.ascom.com/nt/en/index-nt/tems-support.htm in order to access the complete range of TEMS Pocket product information.

If you have a question about TEMS Pocket which is not answered in any written source, please contact TEMS technical support. Contact information is given on the page just linked.

29.2. Follow Us

Our monthly newsletter TEMS News contains articles on new TEMS product releases and their features, general information about the TEMS portfolio, and much more. To sign up for this free service, go to ▶ www.ascom.com/nt/en/index-nt/nt-news.htm and click the "TEMS News" link. In this section of our website you can also read our press releases and find out about upcoming events where Ascom Network Testing will participate.

You can also follow Ascom Network Testing on Facebook, LinkedIn and YouTube, as well as subscribe to our RSS feed. Links are provided in the "Follow Us" section at ▶ www.ascom.com/networktesting.

Appendix A. Ascom Statement on Mobile Test Probes

Certain Ascom Network Testing products use FCC approved mobile phones as test probes. When integrated with certain Ascom products, the Ascom mobile test probes have been retested to ensure that the test probe continues to comply with applicable FCC requirements.

Ascom mobile test probes are intended for use in cellular network testing only.

Ascom mobile test probes should be professionally installed, and only Ascom-specified external antennas should be used as part of the test configuration.

No Wi-Fi, Bluetooth or NFC (Near-Field Communication) features of the mobile test probe should be used when using Ascom mobile test probe products.[1]

This equipment radiates radio frequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to radio communications.

Users assume full responsibility for performance and possible interference if these instructions are not followed.

1. Except, of course, when activating one of these features through the Ascom product itself.

Appendix B. Graphic Representation of Data

This appendix describes the default color coding used to visualize value elements in data views. It is possible to replace these colors with others; see section 5.16.

B.1. GSM Data

Quantity	Red	Yellow	Green
C/I (dB)	–5 ... 9	9 ... 16	16 ... 30
RLC/MAC Rx/Tx error rate (%)	50 ... 100	20 ... 50	0 ... 20
RLC/MAC DL/UL bit rate (kbit/s)	0 ... 75	75 ... 150	150 ... 243
RLT current/max (%)	0 ... 90	90 ... 100	100
RxLev (dBm)	–120 ... –95	–95 ... –75	–75 ... –10
RxQual	5 ... 7	1 ... 4	0
TxPower (dBm)	20 ... 31	9 ... 20	0 ... 9

B.2. WCDMA Data

Quantity	Red	Yellow	Green
BLER (%)	50 ... 100	20 ... 50	0 ... 20
E_c/N_0 (dB)	–34 ... –15	–15 ... –10	–10 ... 0
RLC DL bit rate (kbit/s)	0 ... 1000	1000 ... 8000	8000 ... 43008

Quantity	Red	Yellow	Green
RLC DL error rate (%)	50 ... 100	20 ... 50	0 ... 20
RLC UL bit rate (kbit/s)	0 ... 500	500 ... 3000	3000 ... 5898
RLC UL error rate (%)	50 ... 100	20 ... 50	0 ... 20
RSCP (dBm)	–140 ... –100	–100 ... –85	–85 ... –15
RSSI (dBm)	–130 ... –85	–85 ... –75	–75 ... –20
SIR (dB)	–30 ... –15	–15 ... –10	–10 ... 30
TPC DL increase command (%)	0 ... 39, 61 ... 100	not used	39 ... 61
TPC UL increase command (%)	0 ... 39, 61 ... 100	not used	39 ... 61
TxPower (dBm)	10 ... 50	0 ... 10	–31 ... 0

B.2.1. HSPA Data Specific

Quantity	Red	Yellow	Green
E-DCH happy rate (%)	0 ... 20	20 ... 50	50 ... 100
E-DCH retransm. rate (%)	50 ... 100	20 ... 50	0 ... 20

B.3. LTE Data

Quantity	Red	Yellow	Green
BLER DL (%)	50 ... 100	20 ... 50	0 ... 20
CINR (dB)	–40 ... 0	0 ... 8	8 ... 30
PDSCH throughput (kbit/s)	0 ... 3750	3750 ... 30000	30000... 960000
PUCCH Tx Power (dBm)	15 ... 30	–10 ... 15	–30 ... –10
PUSCH throughput (kbit/s)	0 ... 1875	1875 ... 15000	15000 ... 36696
PUSCH Tx Power (dBm)	15 ... 30	–10 ... 15	–30 ... –10

Quantity	Red	Yellow	Green
RSRP (dBm)	–140 ... –100	–100 ... –70	–70 ... –40
RSRQ (dB)	–30 ... –24	–24 ... –9	–9 ... 0
RSSI (dBm)	–110 ... –100	–100 ... –70	–70 ... –10

B.4. CDMA/EV-DO Data

Quantity	Red	Yellow	Green
Aggregate E_c/I_0 (dB)	–32 ... –24	–24 ... –9	–9 ... 0
E_c (dBm)	–157 ... –100	–100 ... –60	–60 ... 10
E_c/I_0 (dB)	–32 ... –24	–24 ... –9	–9 ... 0
FER (%)	6 ... 100	2 ... 6	0 ... 2
FES, Finger energy sum (dB)	–64 ... –25	–25 ... –15	–15 ... 10
PER (%)	6 ... 100	2 ... 6	0 ... 2
RLP DL bit rate (kbit/s)	0 ... 100	100 ... 1000	1000 ... 3174
RLP UL bit rate (kbit/s)	0 ... 100	100 ... 500	500 ... 1843
Rx Power (dBm)	–120 ... –90	–90 ... –30	–30 ... 10
Tx Power (dBm)	10 ... 36	0 ... 10	–63 ... 0

B.5. POLQA

Quantity	Green	Yellow	Red
POLQA score (MOS-LQO)	3 ... 5	2 ... 3	0 ... 2

B.6. Wi-Fi

Quantity	Green	Yellow	Red
RSSI (dBm)	–55 ... –35	–75 ... –55	–95 ... –75

B.7. GPS Data

Quantity	Green	Yellow	Red
Number of GPS satellites used in fix	4 ... 12	3	0 ... 2

Appendix C. Value Element Families Presentable in Map Views

This appendix lists the families of value elements that can be selected for route plotting in the Indoor Map view (see section 7.5.3) and Outdoor Map view (see section 8.2).

C.1. RSSI

- GSM: RxLev
- WCDMA: RSSI
- LTE: RSSI
- CDMA/EV-DO: RxPwr

C.2. Signal Strength

- GSM: RxLev
- WCDMA: RSCP
- LTE: RSRP
- CDMA/EV-DO: E_c

C.3. Quality

- GSM: RxQual
- WCDMA: E_c/N_0
- LTE: RSRQ
- CDMA/EV-DO: E_c/I_0

C.4. Physical DL Throughput

- GSM: RLC DL bit rate
- WCDMA: RLC DL bit rate
- LTE: PDSCH Throughput
- CDMA/EV-DO: RLP DL bit rate

C.5. Physical UL Throughput

- GSM: RLC UL bit rate
- WCDMA: RLC UL bit rate
- LTE: PUSCH Throughput
- CDMA/EV-DO: RLP UL bit rate

Appendix D. Value Elements Specific to Custom Data Views

The following value elements do not appear in any predefined data views but are available for presentation in custom data views (regarding which see section 5.13).

Value Element Name	Range/Unit	Description
LTE PDCP DL Throughput	0 ... 350 Mbit/s	Total downlink throughput in the PDCP protocol layer (sum over all radio bearers).
LTE PDCP UL Throughput	0 ... 350 Mbit/s	Total uplink throughput in the PDCP protocol layer (sum over all radio bearers).
LTE PDSCH Phy Throughput Primary Carrier	0 ... 350 Mbit/s	Total throughput on the PDSCH, measured as the throughput rate from the physical layer to the MAC layer. In case of carrier aggregation (CA), this element refers to the primary carrier.
LTE PDSCH Phy Throughput Secondary Carrier	0 ... 350 Mbit/s	Total throughput on the PDSCH for secondary carrier.
LTE PDSCH Phy Throughput CW0 Primary Carrier	0 ... 350 Mbit/s	Throughput on the PDSCH for Transport Block 0. In case of CA, this element is for the primary carrier.
LTE PDSCH Phy Throughput CW0 Secondary Carrier	0 ... 350 Mbit/s	Throughput on the PDSCH for Transport Block 0, secondary carrier.

Value Element Name	Range/Unit	Description
LTE PDSCH Phy Throughput CW1 Primary Carrier	0 ... 350 Mbit/s	Throughput on the PDSCH for Transport Block 1. In case of CA, this element is for the primary carrier.
LTE PDSCH Phy Throughput CW1 Secondary Carrier	0 ... 350 Mbit/s	Throughput on the PDSCH for Transport Block 1, secondary carrier.
LTE PDSCH Res. Block Allocation Count	0 ... $8 \cdot 10^6$	Number of PDSCH resource blocks allocated over the past second. In case of CA, this element refers to the primary carrier. (No element is currently available for the secondary carrier.)
LTE PUSCH Res. Block Allocation Count	0 ... $8 \cdot 10^6$	Number of PUSCH resource blocks allocated over the past second.
LTE RSRP and RSRQ IEs: General remark	In case of CA, these elements refer to the primary carrier. (No elements are currently available for the secondary carrier.)	
LTE RSRP Tx1 Rx1	–140 ... –40 dBm	RSRP contribution from eNodeB antenna Tx1 as received on antenna Rx1.
LTE RSRP Tx1 Rx2	–140 ... –40 dBm	RSRP contribution from eNodeB antenna Tx1 as received on antenna Rx2.
LTE RSRQ Tx1 Rx1	–30 ... 0 dB	RSRQ contribution from eNodeB antenna Tx1 as received on antenna Rx1.
LTE RSRQ Tx1 Rx2	–30 ... 0 dB	RSRQ contribution from eNodeB antenna Tx1 as received on antenna Rx2.
LTE SRS Tx Power	–50 ... 23 dBm	Transmit power of sounding reference signal. ▶ 3GPP 36.211, section 5.5.3

Appendix E. Default Settings in TEMS Pocket

This appendix lists default values for a selected editable settings in TEMS Pocket. Defaults that are not very interesting in themselves (for example, the default body text in emails) are omitted.

E.1. General Settings

- **Autostart TEMS Pocket:** Disabled
- **GPS** → **Type:** Internal
- **Scripts** → **Triggers enabled:** Enabled
- **Phone** → **Auto-detect phone number:** Enabled

E.2. Logfile Settings

- **Recover logfiles:** Enabled

E.3. Event and Message Settings

- All events listed in the Events data view
- All messages listed in the Layer 3 Messages and SIP Messages data views
- Notification box shown for all error events
- Other presentation options turned off

E.4. Indoor Map Settings

- All layers visible

E.5. Outdoor Map Settings

- All layers visible
- Map type: Roadmap

E.6. Script Editor Settings

E.6.1. General Settings

- **Logfile recording:** Enabled
- **GPS positioning:** Enabled

These defaults are the same for all actions in which they occur:

- **Preguard:** 10 s
- **Postguard:** 10 s
- **Repeat guard:** 5 s
- **Wi-Fi association:** Enabled

E.6.2. AQM Action Settings

- **Call duration:** 600 s

E.6.3. Email Action Settings

- **Port:** 25
- **Security:** None
- **Authentication method:** Plain
- **Message type:** Custom text
- **Number of emails:** 1

E.6.4. FTP Action Settings

- **Command:** Get
- **File size:** 1024 kB

E.6.5. IP Capture Action Settings

No options selected.

E.6.6. Logfile Upload Action Settings

- **Logfiles to send:** All non-session logfiles
- **Send file list:** Disabled
- **Keep local copy:** No, logfile removed after upload

E.6.7. Ping Action Settings

- **Packet size:** 56 bytes
- **Timeout:** 1 s
- **Number of pings:** 10
- **Interval:** 1000 ms

E.6.8. Scan Action Settings (PCTel)

E.6.8.1. LTE Signal Scan

- **Bandwidth:** 1.4 MHz
- **Carrier RSSI Threshold:** –110 dBm
- **Top N:** 16
- **Sync Signal Meas. Threshold:** –130 dBm
- **Reference Signal Meas. Threshold:** –130 dBm
- **System Information:** No

E.6.8.2. WCDMA CPICH Scan

- **Number of Pilots:** 16
- **PN Threshold:** –20.0 dB
- **SIR:** Yes
- **System Information:** Yes
- **Measurement Mode:** High Speed

E.6.8.3. GSM Color Code Scan

- **C/I Measurement:** No
- **System Information:** No
- **Dwelling Time:** 277 ms

E.6.8.4. CDMA PN Scan, EV-DO PN Scan

- **Number of Pilots:** 16
- **PN Threshold:** –20.0 dB
- **Pilot Delay:** No
- **Aggregate Ec/Io:** No
- **Delay Spread:** No

E.6.9. SMS Action Settings

- **Message type:** Custom text
- **Number of SMS:** 1
- **Wait for delivery report:** Enabled
- **Delivery timeout:** 60 s
- **Send timeout:** 60 s
- **Override default SMSC:** Disabled

E.6.10. Voice MO Action Settings

- **Call duration:** 30 s
- **Redial on dropped call:** Disabled

E.6.11. Wait Action Settings

- **Wait duration:** 10 s

E.7. Control Function Settings

All control functions turned off.

E.8. TEMS Pocket Remote Settings

- **Registration Reattempt Interval:** 5 min
- **Sync Interval (Idle):** 30 min
- **Sync Interval (Measuring):** 30 min
- **Go Offline Sync Timeout:** 10 s
- **Initial Registration Required:** Enabled
- **Sync After Measurement:** Disabled

Appendix F. TEMS Product Cell File Format

This appendix deals with the TEMS-specific cell file format.

An XML cell file imported into TEMS Pocket must include the tags shown in the example below. Position data is syntactically optional, but is of course required for plotting of cells in the Outdoor Map view.

The tag names are all self-explanatory; in this example, one cell each is defined for GSM, WCDMA, LTE, and CDMA[1]. This data is a subset of the XML cell file format used in TEMS Investigation; see TEMS Investigation Technical Reference, chapter “Format of XML Cell File”.

Please note that TEMS Pocket can only display characters from the Extended ASCII set. Characters outside that set will appear as question marks “?” in the TEMS Pocket user interface.

Cell File Content

```
<TEMS_CELL_EXPORT>

  <GSM>
    <CELL_LIST>
      <GSM_CELL>
        <CELLNAME>My GSM Cell #1</CELLNAME>
        <CGI>
          <MCC>240</MCC>
          <MNC_LENGTH>2</MNC_LENGTH>
          <MNC>1</MNC>
          <LAC>5028</LAC>
          <CI>4362</CI>
        </CGI>
        <BSIC>
          <NCC>2</NCC>
```

1. No EV-DO specific data is given in the cell file; the <CDMA> data serves for EV-DO as well.

```
          <BCC>2</BCC>
        </BSIC>
        <CHANNEL_INFO>
          <BCCH>
            <ARFCN>19</ARFCN>
          </BCCH>
        </CHANNEL_INFO>
<!--  OPTIONAL CONTENT -->
        <POSITION>
          <GEODETIC_DATUM>WGS84</GEODETIC_DATUM>
          <LATITUDE>47.949722</LATITUDE>
          <LONGITUDE>-17.355278</LONGITUDE>
        </POSITION>
<!-- END OPTIONAL CONTENT -->
      </GSM_CELL>
    </CELL_LIST>
  </GSM>

  <WCDMA>
    <CELL_LIST>
      <WCDMA_CELL>
        <CELLNAME>My WCDMA Cell #1</CELLNAME>
        <UARFCN_DL>10787</UARFCN_DL>
        <SC>124</SC>
        <CGI>
          <MCC>240</MCC>
          <MNC_LENGTH>2</MNC_LENGTH>
          <MNC>5</MNC>
          <LAC>27</LAC>
          <CI>60001</CI>
        </CGI>
<!--  OPTIONAL CONTENT -->
        <POSITION>
          <GEODETIC_DATUM>WGS84</GEODETIC_DATUM>
          <LATITUDE>55.949722</LATITUDE>
          <LONGITUDE>-9.355278</LONGITUDE>
        </POSITION>
<!-- END OPTIONAL CONTENT -->
      </WCDMA_CELL>
    </CELL_LIST>
  </WCDMA>

  <LTE>
    <CELL_LIST>
      <LTE_CELL>
        <CELLNAME>My LTE Cell #1</CELLNAME>
        <EARFCN_DL>5206</EARFCN_DL>
```

```
        <POSITION>
          <GEODETIC_DATUM>WGS84</GEODETIC_DATUM>
          <LATITUDE>51.137990700</LATITUDE>
          <LONGITUDE>-9.943741439</LONGITUDE>
        </POSITION>
        <PCI>1</PCI>
        <PCIG>10</PCIG>
<!--  OPTIONAL CONTENT -->
        <LTE_CGI>
          <MCC>193</MCC>
          <MNC>11</MNC>
          <TAC>18</TAC>
          <CI>123456789</CI>
        </LTE_CGI>
<!-- END OPTIONAL CONTENT -->
      </LTE_CELL>
    </CELL_LIST>
  </LTE>

  <CDMA>
    <CELL_LIST>
      <CDMA_CELL>
        <CELLNAME>My CDMA Cell #1</CELLNAME>
        <PN_OFFSET>60</PN_OFFSET>
        <CDMA_CHANNEL_INFO>
          <BAND>CDMA 800</BAND>
          <CHANNEL>384</CHANNEL>
        </CDMA_CHANNEL_INFO>
<!--  OPTIONAL CONTENT -->
        <POSITION>
          <GEODETIC_DATUM>WGS84</GEODETIC_DATUM>
          <LATITUDE>46.949722</LATITUDE>
          <LONGITUDE>-17.355278</LONGITUDE>
        </POSITION>
<!-- END OPTIONAL CONTENT -->
      </CDMA_CELL>
    </CELL_LIST>
  </CDMA>

</TEMS_CELL_EXPORT>
```

Appendix G. Cell Identification

This appendix describes the algorithms used by TEMS Pocket to identify network cells with entries in a TEMS product cell file. For the cell file format, see appendix F.

The following procedure is used to find a matching cell:

- Try to match cell parameters in the cell file, also considering the geographical position of the sample. Specifically:
  - For a GSM cell, ARFCN and BSIC.
  - For a WCDMA cell, UARFCN and SC.
  - For an LTE cell, EARFCN and PCI + PCIG.
  - For a CDMA cell, RF channel and PN offset.
- A position is considered valid if the distance to the cell is less than 100 km.
- If multiple matches are found within a 100 km radius, the closest cell is picked.
- If the position is invalid, no result is returned unless a unique match is found in the cell file.

Appendix H. Example of TAB File

Below is an example of a valid TAB file. Such a file must accompany each map in an indoor map set, as explained in section 7.1.4.

```
!table
!version 300
!charset WindowsLatin1

Definition Table
  File "floorplan.jpeg"
  Type "RASTER"
  (599768.98,5033832.86) (0,0) Label "Top Left",
  (599778.96,5033789.66) (0,779) Label "Bottom Left",
  (599843.16,5033849.99) (1323,0) Label "Top Right",
  (599853.14,5033806.79) (1323,779) Label "Bottom Right"
  CoordSys Earth Projection 8, 104, "m", -75, 0, 0.9996, 500000, 0
  Units "m"
```

Appendix I. The TEMS Capability Control App

An Android app named “TEMS Capability Control” is supplied with TEMS Pocket. Its functions are covered in this appendix.

The functions of this app are available on TEMS Pocket devices as laid out in the tables in section 13.1. Some devices require a reboot after applying a function, while others do not. The relevant button in the user interface is labeled “**Apply**” or “**Apply and reboot**” accordingly.

Function	Section Ref.
LTE EARFCN/PCI lock	I.1
Disabling LTE inter-freq HO	I.2
WCDMA UARFCN lock	I.3
Disabling WCDMA handover	I.4

I.1. LTE EARFCN/PCI Lock

The effect of this function is to lock the device to one PCI on a given EARFCN. The lock persists in idle as well as connected mode.

- To apply the lock, check **LTE EARFCN/PCI lock**, enter values for EARFCN and PCI, and tap the **Apply** or **Apply & reboot** button.

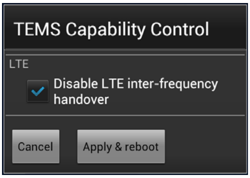
Note: If you are making use of the device's internal GPS, the device must always be rebooted; otherwise the internal GPS will stop delivering data. See section I.5.

For the PCI lock to come into effect, you also need to **RAT lock** the device to LTE within TEMS Pocket, as described in section 13.3.

- To release the PCI lock, uncheck the **LTE EARFCN/PCI lock** box, and tap **Apply** [**& reboot**] once again.

There is no collision between this function and the LTE EARFCN lock control function within TEMS Pocket (see section 13.6), because no device has both.

I.2. Disabling LTE Inter-frequency Handover



The effect of this function is to disable or re-enable LTE inter-frequency handover: that is, handover from one EARFCN to another.

This function is intended to be used in conjunction with the LTE EARFCN Lock control function, as explained in section 13.6. With LTE inter-frequency handover disabled, the TEMS Pocket device is forced in connected mode to stay on the EARFCN it has been locked on while in idle mode.

The TEMS Pocket device needs to be rebooted for a change in handover behavior to take effect. This is done automatically when you tap the **Apply & reboot** button. Note that once LTE inter-frequency handover has been disabled, no further reboot is required on any occasion when you apply an LTE EARFCN lock.

I.3. WCDMA UARFCN Lock

The effect of this function is to lock the device to a specified UARFCN.

- To apply the lock, check **WCDMA UARFCN lock**, enter a number, and tap **Apply** [**& reboot**].

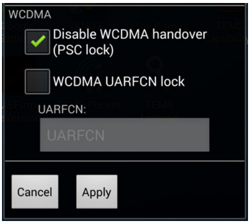
No RAT lock to WCDMA within TEMS Pocket is required in conjunction with the UARFCN lock. However, on the Samsung Galaxy S4 models, you must force the device to WCDMA in this manner to ensure that the UARFCN lock is applied right away.

If the phone is not RAT locked but connects to a WCDMA network anyway later on, a previously applied UARFCN lock will come into effect at that time.

- To release the lock, uncheck **WCDMA UARFCN lock** and tap **Apply** [**& reboot**] again.

This function is independent of “Disable WCDMA handover” (section I.4).

I.4. Disabling WCDMA Handover



This function suppresses the measurement reports normally sent from the device to the WCDMA network, thus preventing any handovers ordered on the basis of such reports (intra-frequency as well as inter-frequency). This is equivalent to locksing the device on its current UARFCN and SC while in dedicated mode. The function does not have any effect on cell reselection in idle mode.

- To apply the function, check **Disable WCDMA handover (PSC lock)** and tap the **Apply** [**& reboot**] button.

- To restore normal WCDMA handover behavior, uncheck the “**Disable** ...” box and tap **Apply** [**& reboot**] once more.

This function is independent of “WCDMA UARFCN lock” (section I.3).

I.5. Known Limitations

Limitation	Affected Devices
The device GPS stops working after applying a TEMS Capability Control function, and the device must be rebooted to restore the GPS. An on-screen notification appears about this when Apply is tapped.	Samsung Galaxy S4 GT-I9506
Applying a WCDMA UARFCN lock also causes a RAT lock to WCDMA to be implicitly applied, and subsequently neither the TEMS Pocket RAT lock function nor the device’s generic Network mode setting works properly until the UARFCN lock is released.	Samsung Galaxy S5 SM-G900A, SM-G900I, SM-G9006V Samsung Galaxy Note 4 SM-N910F, SM-N910G Samsung Galaxy Note 3 SM-N900T Samsung Galaxy Avant SM-G386T

Limitation	Affected Devices
After applying a TEMS Capability Control function, calls dialed in the next 30 seconds or so will be silent. It is necessary to wait at least 30 s before making a call.	Samsung Galaxy Note 4 SM-N910F

Appendix J. Using TEMS Pocket as Data Collector for iBwave Mobile Planner or Ranplan iBuildNet

TEMS Pocket can be used as an indoor data-collecting application by the products **iBwave Mobile Planner** and **Ranplan iBuildNet**. The instruction that follows is valid for both of these products, and each is referred to as “the planning tool” below.

- From the planning tool it is possible to initiate a pinpointing session in TEMS Pocket (which will be started up if it is not already running).
- If the project in the planning tool contains multiple maps, you are prompted in the TEMS Pocket user interface to choose which map to work with.
- Proceed to pinpoint your route in TEMS Pocket in the usual manner.
- When you stop pinpointing, a TEMS Pocket logfile is created normally. However, a subset of that data is also relayed to the planning tool, where it can be imported into the current project.

Note: The duration of the logging done for the planning tool is limited to one hour. If the pinpointing session in TEMS Pocket lasts longer than that, only data from the last hour will be captured in the log.

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