Power Management

for TISLOG Handhelds

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This white paper demonstrates how to manage the power consumption of your mobile data terminals optimally while they are running with the TISLOG Telematics software.

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1.

What is "Power Management"?

Mobile computers usually obtain the required power from rechargeable batteries. For these batteries the longest possible operating time is required: The goal is to ensure at least an 8-hour shift or the length of a tour without external power supply. If the devices are not currently in use, they have to be switched to a power saving mode and possibly be recharged.

All arrangements for the optimal control of these processes are summarized under the term "Power Management". This white paper presents closer information on Power Management - for the extension of the runtime of your handhelds.

2.

What influences power consumption and thus the runtime?

In order to come to a good estimate of the power consumption of the PDA and possibly be able to regulate it as well, it is necessary to know the main electricity consumers of PDA's. For mobile computers working with TISLOG, the following functions are important to know (in order of consumption):

1. Display + display / keyboard backlight
2. WLAN radio module
3. WWAN (GPRS / UMTS) radio module
4. GPS receiver
5. Bluetooth radio module
6. Scanner / imager or camera (including LED flash)
7. Other electronics (processor, memory)

Of course, this order may change by the type of application. For example, in scan-intensive applications such as the loading scan the consumption ratio caused by the scanner is higher than during a tour, on which the scanner is only in use occasionally. Moreover, the runtime also depends directly on the available battery capacity and the charging status of the battery (also see chapter 6).

3.

How to achieve the longest runtime possible?

A low power consumption - and thus a long runtime - can be achieved by only enabling essential consumers. The configuration of TISLOG offers several settings for this purpose, for example

- Switching off the display and keyboard backlight while the device is not in use
- Turning off unnecessary radio modules (e.g. WLAN module on tour, or WWAN + GPS receiver during indoor scanning)
- Activation of scanner or camera electronics only when necessary
- complete shutdown of the unit (suspend mode, see chap. 4) during long breaks or rest periods

Some of these settings are highly dependent on the **application profile**. For example, the sleep mode time for display and keypad backlight should be set longer for warehouse applications than on a delivery round. This matters, because on the go the operator only scans occasionally, while he must constantly read the display and be able to see the buttons in a dark hall.

On the other hand, during a tour navigation is used, therefore the display + backlight may not be shut down at all during navigation. Since during this process the GPS receiver and WWAN modem are also active, the operating time can reduce to 50-70% of the normal values.

4.

Optimally adjusting the suspend mode

Everyone knows that from his own mobile phone: Although it is "turned off", it is still able to receive calls, SMS or even e-mails. This can only work because the mobile phone actually is never really "switched off", but only set to a "sleep state" (suspend mode) by the switch off key. The same happens in the TISLOG PDA's. Here, however, are various settings available to configure the suspend mode.

For example, you can:

1. Disable the suspend mode completely during an active delivery and pick-up tour.

2. Switch display + backlight off during a break, but otherwise the device remains ready for operation. It can still receive or send data, and the device can thus also be located.

3. Shut off all consumers (radio modems, display etc.) after finishing a tour, and by this put the device into a "deep sleep" with low power consumption. In this mode, it remains ready for operation for several days without charging. After switching the device on again the deactivated components will have to be activated again, which for some parts can take a few minutes (e.g. the GPS receiver).

4. Set a "deep sleep with periodic waking up" at longer rest periods. The device is then, for example, just activated every 30 minutes without turning the display on again. It then sends a short "I'm alive" message, and then turns off again. This way, the monitoring of the devices is possible even during longer rest periods (weekends).

5.

Suspend mode better adjusted with TISLOG software

In some devices, the function of the "switch off button" is processed directly by the operating system. This does not always ensure proper functioning according to the set configuration. For example, the GPS receiver can not be switched on again. Therefore, in these devices the switch off via the on/off button is **disabled by the TISLOG software** and replaced by a menu function or a function key. The TISLOG software performs a controlled switch off and restart of all necessary components of the handheld according to the set configuration.

Switch on/ off of the device is controlled by the TISLOG mobile PSV3 software

Battery technology, operating conditions and longevity

Modern PDA's are equipped with replaceable lithium ion batteries. Find extensive information about this type of battery e.g. under http://de.wikipedia.org/wiki/Lithium-Ionen-Akkumulator. (in german language only)

Some essential features and typical characteristics are:

- The capacity of the battery pack is 8.8 to 18.5 Wh (- equivalent to 2400 mAh - 5000mAH typically at 3.7V cell voltage)
- Protection against overcharging or deep discharge through the integrated electronics
- Life in the typical application field is 1.5-3 years (about 500 charge-cycles)
- The charging temperature ranges between 0 °C and 40 °C (partially 45 °C), operation outside this temperature range is indeed possible, but then the battery will not be charged.
- Only minor effects of aging, even older batteries do still have 80-90% of the initial capacity (if no defects are present!) after 2-3 years
- Batteries may only be charged while inserted in the device or with suitable chargers offered by the manufacturer. Incorrect chargers can cause massive functional impairment or even lead to destruction of the battery.

7.

Backup battery + Data security

All modern handheld devices with TIS-LOG save your data in a "flash" memory. Everyone knows this memory technology from USB sticks and camera memory cards. It allows data storage almost unlimited in time (about 10 years) even without power supply. A backup battery is therefore not necessary to backup. However, a backup battery allows to change the main battery without the necessity of a subsequent reboot of the device software (warm or cold).

8.

Warm start / Cold start

After a battery change or after a software problem occurred, it may happen that the system software and application software TISLOG is restarted. This process is called warm or cold start. A loss of stored data is unlikely. However, it may be necessary to repeat an unfinished process (e.g. a delivery).

Conclusion

For smooth operation of your mobile computers a long battery life is an important prerequisite. The configuration for TISLOG offers a variety of settings to save power. Power management means to temporarily disable unnecessary function modules and intelligently configure the suspend mode. This will extend the runtime of your PDA's significantly.

The company

The TIS GmbH, based in Bocholt, is a market-leader in sophisticated Telematics projects. TIS stands for "Technische Informationssysteme" (= Technical Information Systems).

Since 1985, the company develops intelligent products for mobile order management. Based on industrial PDA's under the brand TISLOG Logistics & Mobility TIS has realized flexible Telematics solutions for the transport and logistics sector, for retail chains and Intralogistics.

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