

Operating and low power mode handling with the *iTrax02*

General Overview

This document explains recommended methods for operating the iTRAX02 GPS receiver from the host application to minimize power consumption and to attain maximum operating time in battery operated devices.

Since there is no support for battery backup in the iTRAX02 the philosophy of how to use iTRAX02 is somewhat different than other GPS receivers. Conventional GPS receivers use battery backup for storing information when power supplies are cut down. Battery backup systems however cost money and increases board space needed. There is also a long-term reliability issue to consider with battery back-up systems. The iTRAX02 stores all information in the non-volatile Flash memory instead and thus no battery backup is needed. Space and costs are reduced.

When the power is switched off without proper procedures the iTRAX02 performs always a true cold start when powering up again (no ephemeris, time, nor position is stored and are thus not known at power-up). This leads to unnecessary long TTFF times as the ephemeris etc. have to be downloaded from the sky again. If the iTRAX02 is powered down according to the procedures outlined in this document the TTFF is very fast and the usability is better. The customer can choose and configure the operating modes to best suit the application.

It is recommended that the power supplies (VRF and VBB) are always connected to the receiver (See Figure 1). The low power modes are achieved by giving appropriate commands using either the iTALK binary messages (Port 0) or NMEA messages (Port 1).

In this document NMEA commands are used to describe the recommended procedures. The NMEA commands are described in more detail in the NMEA Protocol description found e.g. on the web-site .

Normal operating mode

When the iTRAX02 receiver is powered up the first time it performs a cold start, i.e. starts looking for satellites without any a-priori information available. Due to a dedicated HW search engine the TTFF is usually 45-50 seconds even at a true cold start. The power consumption is nominally 115mW running all 12 channels and calculating a fix every second. The average power consumption can be dramatically reduced when entering the low power modes described above.

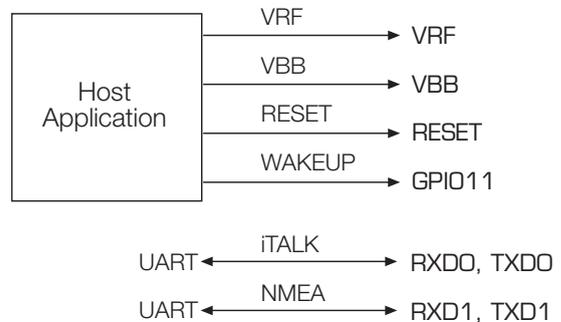


Figure 1. Recommended minimum interfaces

Stopping the iTrax02 and putting it into Idle mode or Sleep mode

Figure 2 shows a procedure for stopping iTRAX02 and putting it into low power modes. The STOP command forces the storing of all navigation data (ephemeris, almanacs and all information from the latest fix) to non-volatile memory (flash device).

It is recommended to use the stop command if A) navigation is stopped for a longer period of time and/or if power supply will be removed or B) if navigation is stopped only for a short period of time (idle - or sleep mode), but the user wants to make sure that the last navigational data is stored in case of a power cut.

After a successful stop command the user can leave the module as it is in Idle mode, put it to Sleep mode by giving a recommended PWRDOWN command or remove the power supply.

Notice that using PWRDOWN mode instead of removing the power supply enables shortest possible TTFF time.

The time required for acquiring a fix after the navigation has been stopped for a while (less than 2 hours) is approximately 8 – 10 seconds, assuming the supply power hasn't been removed meanwhile. This is the so called "hot start".

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NOTE! After receiving the acknowledgement to a successful STOP command it is recommended to wait for at least 1 second before switching off the power to allow iTRAX02 to safely store all navigation data to non-volatile memory.

Note also that when STOP command is given and if the VRF and VBB power supplies are removed, the power consumption is 0mW. If the power supplies are left on after STOP command i.e. idle mode, the iTRAX02 consumes 20mW. In sleep mode the power consumption is 80uW.

Idle mode (stop command) means that only the base band is active while sleep mode (pwrdown command) means that only the oscillator is active.

When the user starts to navigate after the power supply has been removed and connected on again, an aiding message from the host processor results in faster acquisition time as the processor otherwise makes a cold start even if navigational data is previously stored by a stop command. Note that iTRAX02 starts automatically to navigate when power is

connected and that this feature can be disabled and stored with the AUTOSTART and STORE commands.

Stopping navigation for a short period of time (e.g. 30 - 300 seconds)

If the navigation is stopped only for a short period of time (i.e. we know that we will re-start navigation soon) we can omit the STOP and the START commands from the procedure. Thus the flash device is not worn out unnecessarily because only the STOP command forces the storing of the navigation data. Note however that if power supply is removed during this time navigational data is lost.

When giving the PWRDOWN command during navigation, the iTRAX02 will stop navigating and go into sleep mode. Navigation will re-start automatically after either external wake-up or after sleep time has elapsed. This is very useful for example when a fix is needed e.g. once a minute and when power supply is maintained. In this type of "interval mode" iTRAX02 is most of the time in sleep mode and only wakes up to make one or more fixes. If a fix is needed more often than every 30 seconds it is better to maintain the iTRAX02 in continuous navigational mode to minimize power consumption as the receiver consumes some more power when it starts searching for satellites after idle or sleep mode (i.e stop or pwrdown).

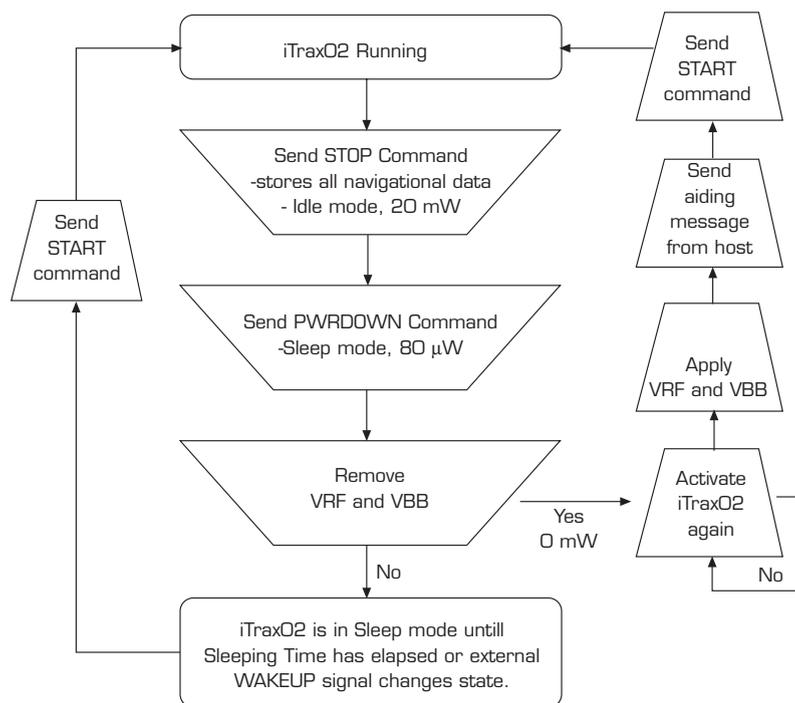


Figure 2. Entering low power modes