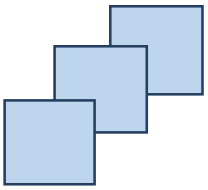
FIFOTRACK TILT DETECTION



Model: Tilt

Version: V1.1

www.fifotrack.com

Copyright and Disclaimer

- All copyrights belong to Shenzhen fifotrack Solution Co., Ltd. You are not allowed to revise, copy or spread this file in any form without consent of fifotrack.
- is trademark of fifotrack, protected by law.
- Please read this user guide carefully before installation to avoid any possible personal injury or property loss.

Document History

Version	Revision Date	Author	Detail
V1.1	Mar 30, 2022	Vito Hu	Revision Version

Contents

Document History **3**

1 Overview **5**

2 Applied Model **5**

3 Terms **5**

4 Start and Procedure **6**

4.1 Start Tilt Detection by B36 Command 6

4.2 Comparison Timer 6

4.3 pre-alarm 7

4.4 alarm-delay 7

4.5 Tilt Alarm 8

4.6 About date-time field in GPRS Package 8

5 Wearing Suggestion **9**

1 Overview

Angle of detection exceeds a specific value, it is regarded as tilt. Tilt detection can be used for the elder or someone disabled. When tilt function is active, device monitors its placement status, and triggers pre-alarm/alarm when the status matched. Pre-alarm/alarm can be used to contact with intensive care unit or rescue center, or call for guardian, or etc.. It can significantly reduce the rescue delay, or reduce the harm to who use the device.

fifotrack supports tilt detection very well, with high accuracy, less misreport. Reading the below chapters will help you to get better understanding about tilt detection, and more convenient usage.

2 Applied Model

Tilt detection function is applied for:

- **Q2**

3 Terms

tilt: Angle changes over 35^{o}, and lasts for more than 10s

comparison timer: When angle changes over 35^{o}, device starts 10s countdown comparison timer. During the period, device returns to normal if angle is normal, or motion detected. When 10s timer expired, which means tilt detected, device starts pre-alarm and alarm-delay

pre-alarm: After tilt detected, device starts vibrating motor and voice display. This stage is called pre-alarm. Pre-alarm is used to remind someone around, or the user. Pre-alarm can be cancelled by motion or key-press. The duration of pre-alarm is configurable

alarm-delay: After tilt detected, device will delay for some seconds to send out alarm information to care/rescue center, the delayed seconds is called alarm-delay. Alarm-delay can be cancelled by motion or key-press. The duration of alarm-delay is configurable

reset-on-motion: hereinafter called as “ROM”. Motion/Large shaking can be used to cancel/stop pre-alarm and alarm delay. When pre-alarm cancelled, vibrating motor and voice displaying stops; When alarm-delay cancelled, device updates new placement status, and keep silence till next tilt occur. Reset On Motion is configurable

4 Start and Procedure

4.1 Start Tilt Detection by B36 Command

Default, tilt detection is disabled. Using *B36* command to enable and set tilt function. Below table shows the detail of *B36* command, user can set *B36* to device according to actual needs.

B36 – Setting Tilt Detection	
Description	B36,<enable>,<pre-alarm-t>,<alarm-t>,<rst-on-motion> 01 Angle of detection over 35°, and last for more than 10s, it is regards as "Tilt" 02 enable: 0~Disable tilt detection (default); 1~Enable 03 pre-alarm-t: pre-alarm duration, unit second, default 30s, range [0,1000]. When tilt detected, tracker starts vibrating motor and voice displaying to remind user 04 alarm-t: Alarm trigger delay, unit second, default *alarm-t*=*pre-alarm-t*, range [0, *pre-alarm-t*]. After tilt detected, tracker do nothing but pre-alarm, and sends GPRS/SMS alarm package when *alarm-t* expired 05 rst-on-motion: Reset on Motion. Shake to cancel pre-alarm and alarm-delay; After cancelled, vibrating motor and voice displaying will be stopped, and NO GPRS/SMS alarm package sent; When *rst-on-motion*==1, NO pre-alarm vibrating remind/voice display, nor tilt alarm triggered under continuous moving or walking status
Reply	B36,<err_code> 01 err_code: procession error code. OK – Succeed. UNSUPPORT – Command not supported. FAILED – Procession failed.

After tilt is active, device gets the current angle and acceleration along x/y/z-axis as initial placement status data, and compares newly read data with the initial one every 40ms. When one or more angle in x/y/z-axis changes over 35°, device starts 10seconds countdown comparison timer.

4.2 Comparison Timer

In the 10seconds countdown comparison timer, device continues comparing newly read angle with the initial one, and decreases one by one second if the angle difference is more than 35°.

Under below two situations, timer will be reset to 10s:

1 Motion/Large shaking detected (e.g. continuous walking). This operation is enabled by setting *rst-on-motion*==1 in *B36* command, and disabled by setting *rst-on-motion*==0. If motion is continuously detected for more than 15seconds, device recognizes the current status, which includes angle and acceleration along x/y/z-axis, as the latest initial placement data, and subsequence

calculation will base on it. The method can significantly reduce the probability of tilt alarm under motion situation. For example, device' slippery in packsack when running or jumping, and etc..

2 Angle returns to normal, timer will reset to 10s, till next calculation that angle changes over 35^{o}

When the timer counts to zero, which means tilt detected, device starts pre-alarm and alarm-delay timer

NOTE

- Motion to reset timer is enabled/disabled by setting *rst-on-motion* field in *B36* command
- pre-alarm and alarm-delay timer are running in parallel, and the duration of each can be set by *B36* command.

4.3 pre-alarm

After entering pre-alarm stage, device starts a timer, whose duration is set by *pre-alarm-t* field in *B36* command, starts vibrating motor and voice displaying to remind someone around or the user. Inside the period of the timer, below two operations can be used to stop pre-alarm stage, and return to detecting stage:

1 Short press SOS key

2 Motion/Large shaking. Device recognizes the current status, which includes angle and acceleration along x/y/z-axis, as the latest initial placement data, and subsequence calculation will base on it.

After pre-alarm stopped, device returns to detecting stage, stop vibrating motor and voice displaying

NOTE

- Motion to stop pre-alarm stage is enable/disabled by setting *rst-on-motion* field in *B36* command
- SOS key to stop pre-alarm stage is mandatory

4.4 alarm-delay

When the comparison timer counts to zero, it means tilt detected. Device starts a alarm-delay timer, whose duration is set by *alarm-t* field in *B36* command.

Inside the period of the timer, below two operations can be used to stop alarm-delay timer, and return to detecting stage; NO "Tilt" alarm information will be sent out until next tilt detected. This operation method provides a method to reduce the interaction with care/rescue center by not uploading alarm information.

1 Short press SOS key

2 Motion/Large shaking. Device recognizes the current status, which includes angle and acceleration

along x/y/z-axis, as the latest initial placement data, and subsequence calculation will base on it.

If none operation occurs, and the timer counts to zero, device will send out "Tilt" alarm information via GPRS or SMS

NOTE

- Motion to stop alarm-delay timer is enable/disabled by setting *rst-on-motion* field in *B36* command
- SOS key to stop alarm-delay timer is mandatory

4.5 Tilt Alarm

After alarm-delay timer counts to zero, device triggers "Tilt" alarm, and then sends out "Tilt" alarm information via GPRS. There are two GPRS packages:

1 Send out the first GPRS package immediately after "Tilt" alarm triggered, with invalid GPS location data. The first package can be used to inform care/rescue center what is happening.

2 Device starts GPS module to get new location, and sends out the second GPRS package with true latitude/longitude. The second package is used to inform care/rescue center the accuracy position.

User can set the other methods for "Tilt" alarm, such as SMS or phone-call, please contact to us: info@fifotrack.com

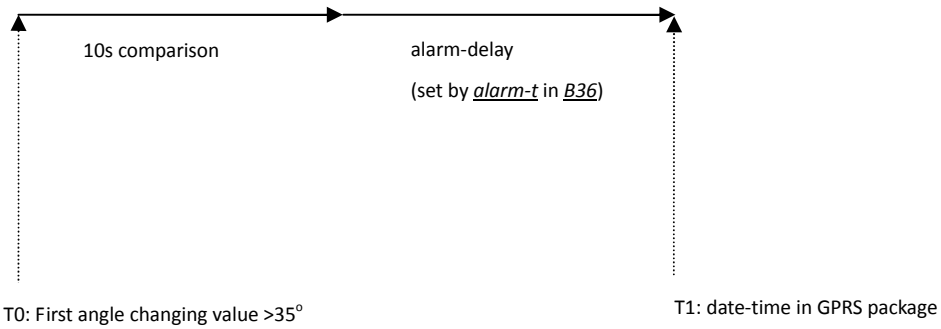
4.6 About date-time field in GPRS Package

There are two condition, based on *rst-on-motion* field in *B36* command.

B36.rst-on-motion==0: Reset On Motion Disabled

When the first angle changing value over 35°, device starts 10seconds comparison timer, next alarm-delay, and then sends out "Tilt" alarm. As a result, the delay from first tilt to "Tilt" alarm is:

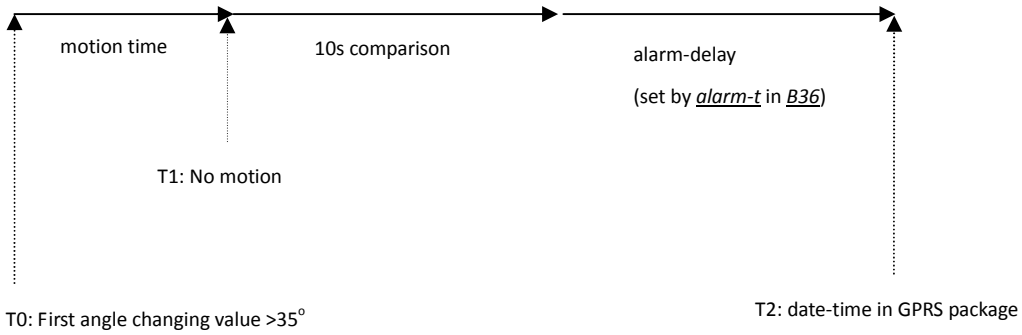
△T=(T1 – T0) = (10 + *alarm-t*)



B36.rst-on-motion==1: Reset On Motion Enabled, 10s comparison timer will be reset due to motion

When the first angle changing value over 35°, device starts 10seconds comparison timer, counts down after no motion detected; when comparison timer counts to zero, device starts alarm-delay, and at last sends out "Tilt" alarm. As a result, the delay from first tilt to "Tilt" alarm is:

△T=(T2 – T0) = (*motion time* + 10 + *alarm-t*), where 0 < *motion time* < 15s



5 Wearing Suggestion

Tilt function requires massive calculation, using angle and acceleration along x/y/z-axis, which is read from built-in 6D motion sensor. It is placement sensitive. To get better accuracy, it is suggested to wear the device on place not easy to slip, avoid using lanyard.