



Group 4 Securicor

Securing Your World

G4S PID3

User Operation Manual

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1. INTRODUCTION

This document describes operation of the G4S PID3 device from an end-users perspective. The PID3 device is one piece of the Longitude offender GPS tracking system and is designed to communicate with a G4S Longitude GPS device (hereon referred to as the “GPS” device). Detailed description of the operation of the GPS device is covered in a separate manual.

The GPS device uses GPS satellites as well as CDMA cell tower based location information to determine the geographical location of an offender (or participant) at any time. The GPS device periodically reports its location information as well as status information to a monitoring centre using the CDMA wireless network. The PID3 is a body-worn device that is securely strapped around the offender’s ankle or arm and is in constant communication with a paired GPS device by means of a short-range ZigBee radio link. This short range radio link between the GPS device and the PID3 is used to ensure that the GPS device is being carried by the offender (or in close proximity to the offender) and that the location of the offender can be monitored. Figure 1 shows the GPS and PID3 devices.



Figure 1: Longitude GPS device (left) and PID3 device (right)

The PID3 device may only be paired with one GPS device at any time. The PID3 device paired to a particular GPS device is determined by a configuration command sent to the GPS device from the Monitoring Centre. The GPS and PID3 form a network and communicate with each other using secure

encrypted messages with a unique key for each such GPS/PID3 network. This allows multiple GPS/PID3 paired devices to co-exist.

2. GENERAL OPERATIONAL DESCRIPTION

2.1 NETWORK SETUP MODE

The PID3 device will be in an “OFF” state when in storage wherein it will not be transmitting (or receiving) any radio messages. When it is to be installed on an offender, it will need to be turned on using the “ON” key on an Officer Key Fob (OKF) device. Figure 2 shows an OKF device on top of a PID3 device. If any OKF key other than the “ON” key is used to wake up the PID3 device, the PID3 will shut down and return to its “OFF” state after waiting 5 seconds (provided the “ON” key is not also pressed during this time).



Figure 2: OKF and PID3

For reliable operation, ensure that the OKF is placed in contact with the PID3 in the exact orientation as shown in Figure 2 when the PID3 ON/OFF buttons are pressed, and that the OKF is not moved away from the PID3 for at least 2 seconds after each button press.

On initial startup, the PID3 device starts up in “NW_SETUP” mode wherein it will be transmitting “NW_SETUP” messages. The NW_SETUP message will be transmitted by the PID3 device every 5 seconds. These messages are essentially messages that indicate that the PID3 device is on and is waiting for a “NW_ATTACH_ALLOW” message from the GPS device that it is to be paired with. When the PID3 receives this message, its ZigBee network setup is complete.

NOTE: The user must ensure that the GPS device is correctly set up with the PID3 serial number that it needs to be paired with before the PID3 can successfully attach to the GPS devices network. To configure the GPS device with the PID3 Serial Number that it needs to be paired with, a configuration command must be sent from the monitoring centre to the GPS device.

Instead of a “NW_ATTACH_ALLOW” message, if the PID3 device gets a “NW_ATTACH_DENY” message from the GPS device, it will then just shut down - this situation should not occur unless the GPS device is sent incorrect configuration settings from the monitoring center. While in NW_SETUP mode, the PID3 LED blinks red every 2 seconds. If the “NW_ATTACH_ALLOW” message is not received within 5 minutes of the PID3 entering NW_SETUP mode, the PID3 will return to its OFF state to conserve battery life.

2.2 STRAP SETUP MODE

After successfully receiving an “NW_ATTACH_ALLOW” message from the GPS device, the PID3 enters “STRAP_SETUP” mode and starts transmitting STRAP_SETUP messages to the GPS device. These messages indicate that the PID3 device is waiting for the optical fiber strap on the PID3 device to be closed. The STRAP_SETUP message will be transmitted by the PID3 device every 5 seconds. When the PID3 detects that the strap has remained closed continuously for at least 30 seconds, it exits strap setup mode and enters regular “MONITORING” mode. In STRAP_SETUP mode, the PID3 LED blinks every 5 seconds; a red blink indicates that the PID3 detects that the optical strap is not closed, whereas a green blink indicates that the strap is detected as closed. After 30 seconds of the strap being detected as continuously closed, the PID3 blinks the LED green three times very quickly, and vibrates once, to indicate that it is now entering MONITORING mode. In case the strap is not detected as closed for a continuous 30 second period during a 30 minute interval after entering STRAP_SETUP mode, the PID3 will turn back to its OFF state.

2.3 MONITORING MODE

In MONITORING mode, the PID3 transmits “STATUS” messages. These messages are to be used by the GPS device to determine the presence or absence of the PID3 device in its range as well as report other status information about the PID3 device such as its tamper and battery status. STATUS messages are transmitted approximately every 20 seconds with a randomization factor of +/- 3 seconds. The PID3 expects an acknowledgement (ACK) from the GPS device to its STATUS message. **NOTE:** It may take up to 2 minutes for the PID3 to receive the ACK from the GPS device as the PID3 only polls the GPS device for messages once every 2 minutes to conserve battery life.

In MONITORING mode, if the PID3 does not receive an ACK from the GPS device for 2 minutes, it will vibrate the vibrator on the PID3 three times in quick succession to alert the offender that he is not within range of the GPS device. The PID3 will vibrate again after two minutes, and then once again after another two minutes if it still fails to receive an ACK from the GPS device. There will be no more vibrate alerts after this to conserve the vibrator battery on the PID3. If the PID3 eventually gets an ACK from the GPS device, it will then again be able to provide vibrate alerts to the offender with the same sequence as described before.

2.4 LOSS OF CONTACT BETWEEN PID3 AND GPS DEVICE

If the GPS device does not receive any STATUS message from the PID3 device for a specified “PID_LEAVE_TIME” interval (typically 5 minutes), it logs an event indicating that it has lost contact with the PID3 and reports this event to the monitoring centre. When the GPS device eventually does receive a STATUS message after logging the loss of contact event, it logs and reports another event indicating that PID3 contact has been re-established. The GPS device and its configuration parameters determine when the loss of contact event, as well as the contact re-established event, is logged and reported to the monitoring center.

2.5 PID3 EXTENDED INFORMATION REQUEST

Once the PID3 device is in MONITORING mode, the GPS device may also send an information request command to the PID3 device. In response to this command, the PID3 will transmit an “INFO” message. The info message reports additional operating information about itself such as its battery voltage, a number corresponding to the amount of battery capacity used up by the PID3, its software version, etc. The GPS device may choose to send this command periodically (e.g. once a day) or upon a request from the monitoring centre. Again, it may take up to 2 minutes for the PID3 to receive this command from the GPS device and respond to it. The INFO message from the PID3 device contains the following information:

- ❖ **Wakeup_SN:** This is the number of the Officer Key Fob that was used to wake up the PID3.
- ❖ **ShutDownReason:** This reports the reason for the last shut down of the PID3 device. Possible reasons are enumerated below:

ID	ShutDown Reason	Description
0	NOT_SPECIFIED	Shutdown was caused by unknown reason
1	NW_ATTACH_DENY	PID3 shutdown due to NW_ATTACH_DENY message received from GPS device
2	NW_SETUP_TIMEOUT	Shutdown due to timeout waiting for NW_ATTACH_ALLOW message from GPS device while in NW_SETUP mode
3	STRAP_SETUP_TIMEOUT	Shutdown due to timeout waiting for strap to be closed in STRAP_SETUP mode
4	STRAP_OPEN_TIMEOUT	Shutdown due to strap being open for longer than timeout period in MONITORING mode
5	HOST_CMD	Shutdown due to shutdown command received from GPS device
6	SW_FORCED	Shutdown was due to a software forced condition
7	FOB_OFF_KEY	Shutdown was due to the OKF OFF key
8	MAIN_BATT_EOL	Shutdown was due to PID3 detecting main battery voltage reaching end-of-life threshold limit
255	FLASH_ERASED	Shutdown was due to a required flash segment being detected as erased

- ❖ **Shutdown_SN:** This is the serial number of the Officer Key Fob or the serial number of the GPS device that was used to shutdown the PID3.
- ❖ **MainBattVolts:** This is a value representing the PID3 main battery measured voltage.
- ❖ **VibeBattVolts:** This is a value representing the PID3 vibrator battery measured voltage.
- ❖ **MainBattCount:** This is a number representing the amount of main battery capacity already consumed by the PID3 device since the date of manufacture. This number can provide an idea of how much additional life can be expected out of the main battery.
- ❖ **VibeBattCount:** This is number representing the amount of vibrator battery capacity already consumed by the PID3 device since the date of manufacture. This number can provide an idea of how much additional life can be expected out of the vibrator battery.
- ❖ **SwError:** This is a value, which if it is not 0, reports the type of software error encountered by the PID3
- ❖ **SwVer:** This value represents the firmware version of the PID3 device.

2.6 PID3 COMMANDS FROM GPS DEVICE

The PID3 device can also receive commands from the GPS device. The Table below enumerates the various commands that the Pid3 can receive from the GPS device.

	Command	Description
1	Shutdown PID3	Causes the PID3 to shut down (provided that the optic strap is open)
2	Send Info Message	Instructs the PID3 to send extended INFO message to the GPS device
3	NW_ATTACH_ALLOW	Allows the PID3 to join the GPS device network
4	NW_ATTACH_DENY	Denies the PID3 permission to join the GPS network

2.7 TURNING PID3 OFF

The PID3 device can be shut down by using the “OFF” button of the Officer Key Fob (OKF) or due to a shutdown command received from the GPS device. It should be noted that shutdown will only occur if the PID3 optic fiber strap is in an open condition, otherwise the shutdown command will be ignored. Before shutting down, the PID3 sends a SHUTDOWN message to the GPS device and leaves the paired GPS devices network before actually powering off.

NOTE: If the fiber optic strap is severed or kept open continuously for 48 hours, while the PID3 is in MONITORING mode, it will shut down and return to its OFF state to conserve battery.

3. PID3 STATE INDICATOR SUMMARY

Following is a summary of the various indicators (red/green led blinks and vibrator vibrates) when the PID3 is in its various operating modes or when it is progressing from one operating mode to another:

State	# Green LED Blinks	# Red LED Blinks	# of Vibrates	Comments
PID3_INIT	1			When PID3 is woken up from “OFF” state by any FOB key.
FOB_ON_KEY	2		2	When PID3 detects that it was woken up from “OFF” state by the FOB “ON” key.
NW_SETUP		1		Repeats every 2 seconds
NW_ATTACH_ALLOW	3		3	When going from NW_SETUP to STRAP_SETUP mode
NW_ATTACH_DENY		3	3	When “ATTACH” denied by parent, PID3 will shutdown and return to OFF state.
STRAP_SETUP	1	1		Repeats every 5 seconds, either red or green – depending on strap closed state
SETUP_COMPLETE	3		3	
HOST_ACK_TIMEOUT			3	When GPS contact lost for at least two minutes. This will repeat every two minutes if the condition persists - up to a total of 3 times. After that no more vibrate alerts will be provided till contact with GPS is re-established and the sequence starts anew.
PID3_SHUTDOWN		3		

4. Regulatory Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

Any changes or modifications are not expressly approved by the party responsible for compliance which could void the user's authority to operate this equipment.

5. Radio Frequency (RF) Safety Exposure

The PID3 has been approved for portable application in the United States. Specific Absorption Rate (SAR) is not required due to average conducted output power is less than 60/f (GHz) mW in according to FCC regulations and guidelines.