UserManual

PN-G

Panther 2G
Wireless Communication
Device

January
2019

R1.0

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Author	Revision	Changes	Date
	1.0	Initial version	2019Jan 10

Contents

1 Introduction

ThePN-GisaSelf-containedvehicletrackingdevicethatcombinesGPSlocationwith2Gcellular connectivity. It is primarily a location reporting device that responds to requests (user, server) and events (timers, geo-fences). Data reports consist of a single record that contains all location data and system status.

The device comes pre-configured from the factory. It is ready to use. ThePN-Gappearstoauseroraserverapplicationasanendpointdevice.Itcan bequeried,updatedandconfiguredeitherthroughaserialconnection, anovertheairIP connection, orthroughSMSmessaging.ThePN-Gpresentsitselfoverthese connectionsasanenhancedcellularmodemwithattachedfunctionalelements.Theseelemen ts include:

- GPSlocationengine
- Accelerometer
- Bluetooth
- Input/outputs dedicated for ignition, relay, buzzer, and general purpose
- SerialUARTport
- Timers
- Watchdoglockupprotection
- Power management
- Event reporting
- Voltage monitoring

AccesstotheseelementsandgeneralpurposeinterfaceisdonethroughanextendedAT command set. Configuration parameters are stored to flash memory and are automatically used on the next power up event. For more details, please reference the AT Command document.

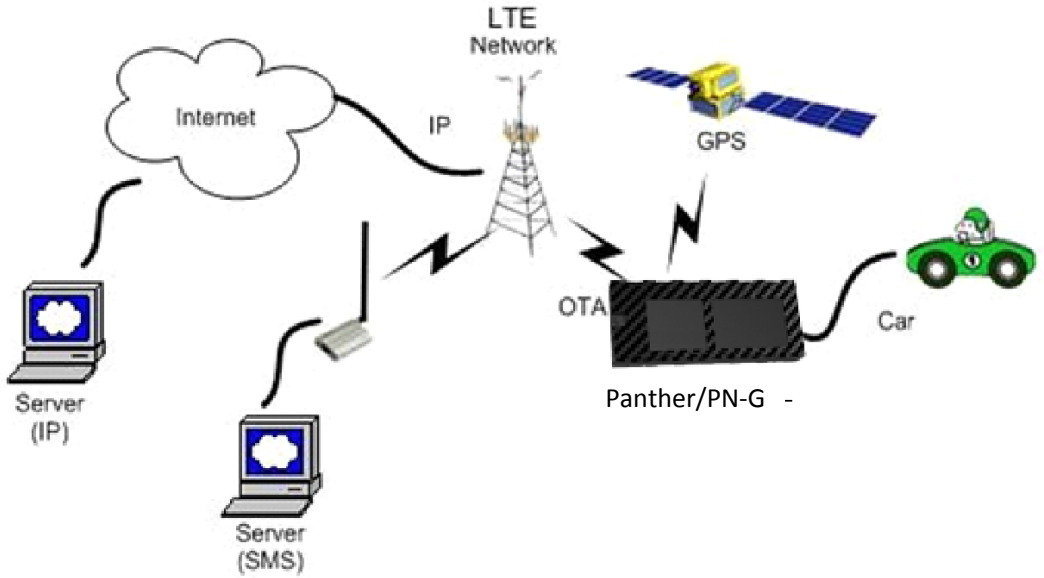


Figure 1ThisproductisbasedontheMediatek 2503x. Antennas for cellular and GPS are internal to the device.

2 HardwareDesign

2.1 Basic Hardware

Items	Requirement
Cellular Modem	Based Mediatek 2503x chipset, GPRS Class 10
Cellular Network Interface	Support for 850, 900, 1800, 1900
Frequency	GSM850: 824.20MHz-848.80MHz E-GSM900: 880MHz~915MHz DCS1800: 1710MHz~1785MHz PCS1900: 1850.20MHz-1909.80MHz
GPS Antenna	Dedicate high performance ceramic antenna
UIM requirement	Support： 3FF SIM Interrupt Mode No Support：Hot Plug/Unplug
BatteryMonitor	Internal analog input
Buildinbatterymanager	Yes
Bluetooth	Yes
Interface	Debug UART
	12V DC Input（1A current）, Ground
	Relay Drive (Open Drain , 500mA current)
	Dedicated Output for buzzer control
	Ignition Input
	GPIO
DedicateTimers	Yes
Watchdog	External HW via MCU
MotionDetect	Supported（GPS/G-Sensor）
LED	2 LED Supported 1- RED; 1- Green
Battery	Optional built in battery（80mAH Lion）
WorkingTime	4 hours
Powerswitch	No
PowerCablecolor	10 colors
PowerCableconnectortype	10-pin connector
PowerConsumption	< 5Watts

ThePN-GprovidessupportforspecializedhardwarefeaturesthroughextendedATcommands.Thefeaturessupportedincludethefollowing:

GPS

GPS location functionality is provided by the device GPS receiver. NMEA GPS records can be extracted in real time from the unit via the UART connection using special debug commands that are outside the scope of this document.

GPIO

One dedicated input, two dedicated outputs, and one general purpose IO are presentedtotheexternalenvironmentonthemainconnector. They are capable of providing system interrupts to generate are port or drive logic levels to external devices. These lines are 2.8V logical velandare16V tolerant. These pins default to input and are pulled down representing 0 when disconnected. They should be asserted to a known value if used.

LED's

TwoLEDstatusindicatorsareprovidedto verifycorrectinstallationandoperation.Thestatus LEDsarecolorcodedanddirectlyconveythestatusofthecellularandGPSsubsystems as describedinthetablebelow.Theirvalidoperationalsoindicatesoperationalstatusandpower.

LED	Function	Status
Red	GPS	**On:**GPSsatellitesacquiredandLocked **FlashSlow**:GPSsatellitesearchisinprogress **30 Sec Blink**: Device in low power mode **Off:**NopowerorGPSsubsystemfault
Green	Cellular Connection	**On:**Indicates2Gconnectionismade **FlashSlow**:2Gsubsysteminitialization in progress **FlashFast**:2G initialization but no data connection available **Off:**Nopower, Low power modeor2Gsubsystemfault

ThePN-Gprovidesusercontrolallowingthe LEDstobeextinguishedonceinstallation isverified.Thisfeaturereducespowerandfurtherconcealsthe PN-GTrackerfrom untrainedpartieswishingtodefeatitsoperation.

UART

There is one UART provided. A debugUARTportis providedforATcommands,datainteraction andoptionallyforapplication specificcontrol.

RelayDriver

A500mAsinkcapableoutputpinisprovided.Thispinismeant todrive arelaycoilindented tointerruptthestartersolenoidrelayfortheignitioncircuittoacar.

Power and Battery

Thebatterymonitor isinternalanaloginputscaledsuchthattheDCvalueofthepowerinput pintothePN-Gsystemis measured.Thisvalueisscaledtospanthemostsignificant8 bitsoftheA/Dandconsequentlycoversascalefrom0 to28Volts.

Timers

Timersresidentonthebasebandchipgenerateperiodicinterrupts forpowerdownwakeup, watchdogsupport,periodic reportgeneration andothertimerrelatedfunctions.

Watchdog

The <MCU>providesinternalsoftwareWatchdog. Also the PN-GincludesanMCUthatactsasafailsafeexternalwatchdog.TheMCUpowercycles thesystem,if noactivityisdetectedfor1 hour.

Accelerometer

The accelerometer can be used for motion detection and driver behavior monitoring.

2.2 Basic RF Performance

GNSS	
Operation Frequency:	L1: 1559MHz~1610MHz
Antenna Type:	Integral antenna
Bluetooth	
Operation Frequency:	2402MHz~2480MHz
Channel Numbers:	79
Channel Separation:	1MHz
Modulation Type:	GFSK, π/4-DQPSK, 8-DPSK
Antenna Type:	Integral antenna
GSM	
Support Networks:	GPRS
TX Frequency:	GSM850: 824.20MHz-848.80MHz E-GSM900: 880MHz~915MHz DCS1800: 1710MHz~1785MHz PCS1900: 1850.20MHz-1909.80MHz
Modulation Type:	GPRS: GMSK
Antenna Type:	Integral antenna

3 SoftwareFeatures

3.1 Basic Software

Items	Requirement
Network Interface	2G
IP Stack	IPV4/IPV6
Upgrade Method	Remoteupdate/PCtool
Remote Update	Supported – including OMA DM
Power Modes	Supported
AT Commands	Supported
Report	Supported: 1000 records
Drivers	GPIO, LED, GPS, UART, Accelerometer
GPIOs	InterruptforIgnitionStatus, Buzzer, Relay
LEDs	GPSStatus,NetworkStatus
Watch Dog	Supported
Reset	Softreset,hardreset, GPS reset, RF reset
Start up Banner	Supported

3.2 Remote Update

ThePN-GsupportsOTAfieldupgradesoftheresidentapplication.An overtheairTFTP(TrivialFileTransferProtocol)connectionismadeoveran IPconnection. Areplacementfileisthentransferred fromaservertothePN-Gandthatfilereplaces thepreviousapplicationimage.

3.3 PowerModes

ThePN-G devicesupportsseveralpowermodesthataresetbyAT commands. InfullpowermodetheGPSisactiveandthecellularsubsystem willmaintaina persistentcellularconnectionwheneverserviceisavailable.IPconnection ismaintained accordingto theconfigurationofthedevice.

Thedevicecanbeputinlowpowermodewheneveritrunsonabackupbatteryoriftheexternal batteryis loworifitis notmoving.InlowpowermodetheGPSisnot runningand theLED's areoff.Thedevicewouldreturntofull powerwheneveraneventoccursthattriggersareport. Thoseeventsinclude:

- Periodic report
- GPIO change
- IP change
- Battery threshold
- Heartbeat
- Watchdog
- Power-up
- Ignition

- Trip start and stop

Anyhardwareorsoftwareresetwillreturnthedevicetofullpowermode.

3.4 AT Commands

Extended AT commands are specific to the PN-G device. They are closely based on commands that are as similar as possible industry common devices and are essentially subsets of standard PN-G commands. Native AT commands supported by the Mediatek 2503 chipset are also available via the serial and USB interfaces.

3.5 Ack'ed Mode

UDPisnota100%reliableconnectionandoccasionalreports orcommand/responsesmaybe lost.Sinceallcommandshaveresponses,theservercanrepeatanycommandto whichthereis noresponse.Inordertoassurereliablereceptionofreports,PN-Gdevicescanbeconfigured eitherinNormalorAck'edmodetosendthereports.IntheNormalmodethereportsaresimply sent"asis" withnoacknowledgmentfromtheserver.IntheAck'edmodeeveryreportsentis expectedtobeacknowledged bytheserverbysendingbackanACKmessageback.If acknowledgementisnotreceivedwithinthespecifiedtimeout,thereportisre-sent.Ifthereport isnotacknowledgedafterthespecifiednumberofattempts,itisqueued.Ifacknowledgement isreceivedafterthereportisqueued(i.e.pasttimeoutofthelastattempt),itisignored.

Report is not considered "complete" until its acknowledgement is received. Thus, if report X is sent and report X+1 is triggered while waiting for acknowledgement of X, report X+1 will be queued until such acknowledgement is received and only then sent. The PN-G will attempt to re-send queued report(s) every time a new report is triggered. If there is more than one report queued, the reports will attempt to be sent in the order of triggering and only once the report is acknowledged, the next report is attempted. This assures that reports are sent and received in order

Ack'edmodeassuresthatallreports arereceived,butaddsoverheadintimeanddata.Report thatisnotacknowledgedissentagainandeventuallywillbequeuedandsentagain.Thenumber andfrequencyofre-triesisconfigurableviatheReportAcknowledgement command.

3.6 Event Report Format

Reportsareencoded as binaryhex.It is also echoed to the debug UART in ASCII format.

3.7Reset

Thereareanumberofresetsavailableonthedevice.Softresetonlyrestartsthesoftware runningonthedevice.Hardresetiscausedbyresettingthewholebasband moduleviaareset pin.ThereisalsoanoptiontoresettheGPSand the cellular sub-systemsindividually.

3.7.1 Context Preservation

WhenaseIf-initiated resetisperformeddue toNetworkWatchdog orbytheResetcommand (modes0,1),the contextofthesystemisbeingpreservedandisrestoredafterthereset.Thecontextincludesall theperiodictimers,thereportqueue,theodometer,etc.Thisallowstoresettheunitasa troubleshootingor preventive measurewithoutlosingreports thatarealreadyinthequeueorarependingonrunningtimers.Notethattheresetprocessmay cause1-2minofinaccuracyinthetimersandshouldnotbeconsideredasveryprecise.

3.8Startup Banner

AfteraresetastartupbannerisprintedthroughtheUARTonly.

4 TestMethod

4.1 Hardware

Test Item	Description
Baseband FunctionTest	• Power InputTest • Power Consumption and CurrentTest • Heat DissipationTest • UARTStabilityTest • GPIOLevelTest • LED StabilityTest • DropDownTest • ESDTest • High/LowTemperatureTest • HumidityTest
RFTest	• RF PerformanceTest • GPS PerformanceTest • Antenna PerformanceTest

4.2 Software Test

TestEnvironmentConstruct

☐ MessageTestenvironment

1.USBdongleandPCasmessageserver

2.SendmessagetoPN-G

☐ UDPTestenvironment

1.ConnectdongletoPCandcreatedialupasipserver

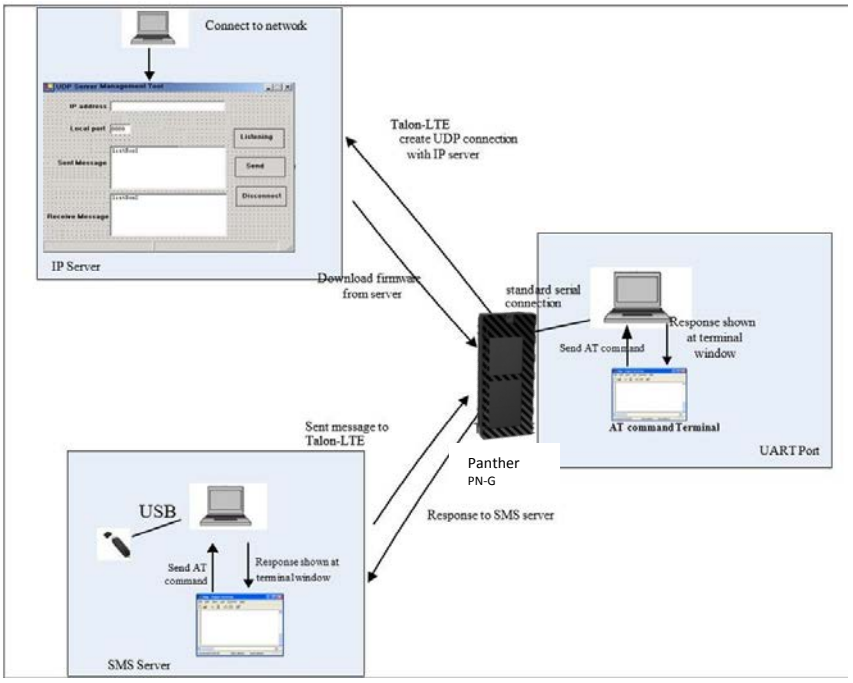
2.PN-GcreateIPconnectiontoserver

☐ UARTTestenvironment

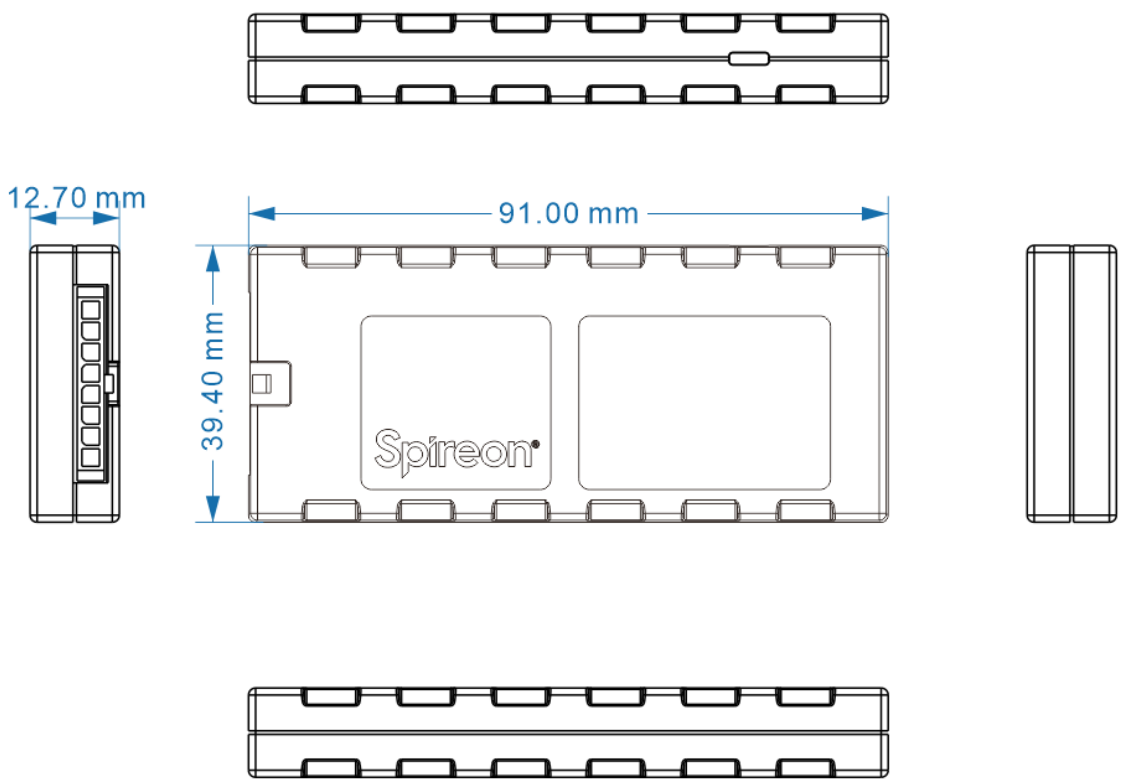
1.ConnectPN-GtoPCwithcomserialcable

2.OpenTerminaltoolandsendatcommand

3.Responsecanbeshownatterminalwindow



MechanicalStructure (mm)



FCC Statement

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

IC STATEMENT

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The distance between user and device should be no less than 20cm.
la distance entre l'utilisation et l'appareil ne doit pas être inférieure à 20 cm

RF Specification

BT	
Operation Frequency:	2402~2480MHz
Maximum Power	6.57dBm(E.I.R.P.)
GSM	
Operation Frequency:	E-GSM 900: 880~915MHz DCS 1800: 1710~1785MHz
Maximum Power (E-GSM 900):	29.9dBm
Maximum Power (DCS 1800):	25.8dBm
GNSS	
Operation Frequency:	L1: 1559MHz~1610MHz

We Pointer Telocation INC. declares that this device (MiniTrack 2G, model CM900100-000) is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU

CE

This product can be used across EU member states.

The operating temperature of the device between -30℃ to 45℃.

The device complies with RF specifications when the device used at 20cm form your body

CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

Manufacturer: Pointer Telocation INC.

Address of Manufacturer: 7715 NW 48th Street, Suite 395 Doral, FL 33166 USA

EU Declaration of Conformity

for

Radio Equipment Directive (RED) 2014/53/EU

We, Pointer Telocation INC._hereby, declare that the essential requirements set out in the **Radio Equipment Directive (RED) 2014/53/EU** have been fully fulfilled on our product with indication below:

Address: 7715 NW 48th Street, Suite 395 Doral, FL 33166 USA

Product Name: MiniTrack 2G

Model: CM900100-000

Brand Name: N/A

Hardware Version: P2

Software Version: MM12_V1.0.9

Information for auxiliary equipment

Battery	
Model:	PL 401522
Power Rating:	DC 3.7V 80mAh
Manufacturer:	BPI
Address of Manufacturer:	Building 9, Hualian industrial park, Dalang country, Longhua new district, Shenzhen city

The following standards have been applied for the investigation of compliance:

Draft ETSI EN 301 489-1 V2.2.1 (2019-03)
Draft ETSI EN 301 489-17 V3.2.0 (2017-03)
ETSI EN 301 489-19 V2.1.1 (2019-04)
Draft ETSI EN 301 489-52 V1.1.0 (2016-11)
ETSI EN 300 328 V2.1.1 (2016-11)
ETSI EN 303 413 V1.1.1 (2017-06)
ETSI EN 301 511 V12.5.1 (2017-03)
EN 62311:2008
EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013
EN 50498:2010

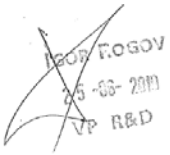
And apply notified body assessment:

CE

MiCOM Labs Inc
75 Boulder Court,
Pleasanton, California94566
USA

Furthermore, the ISO requirement for the in-process quality control procedure as well as the manufacturing process has been reached. The technical document as well as the test reports will be kept for a period at least 10 years after the last product has been manufactured at the disposal of the relevant national authorities of any Member State for inspection.
Detail contact information for this declaration has been listed below as the window of any issues relevant for this declaration.

Name: Igor Rogov
Title: VP R&D
Tel. No.: +972-73-2622320
E-mail: Igorr@pointer.com
Signature:



Date:2019-04-25