User Manual

AR-4LH

Vehicle Tracking Device

Author	Revision	Changes	Date
Tony_Wang	V01	Initial version	2017-08-27

Contents

1 Introduction

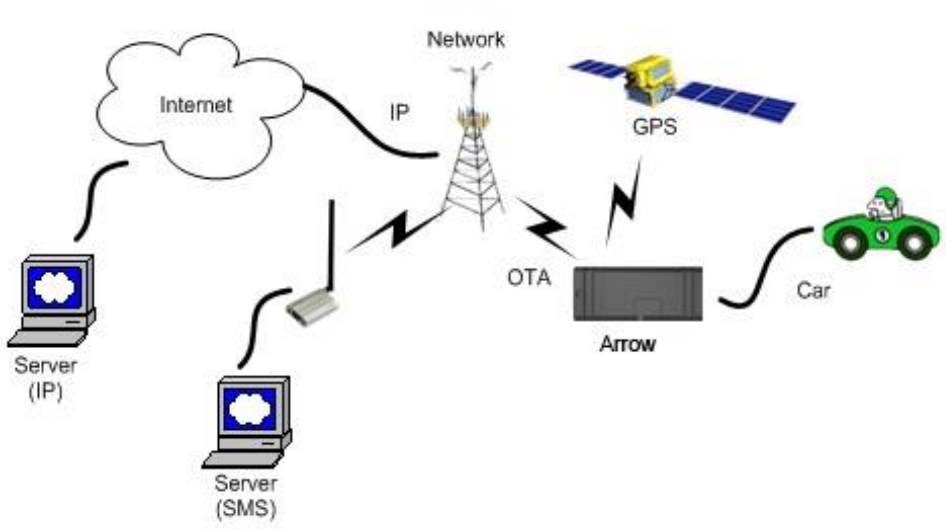
The Arrow-L is a self-Contained vehicle tracking device that combines GPS location with WCDMA/LTE connectivity.

The Arrow-L appears to a user or a server application as a single endpoint device. It can be queried, updated and configured either through a serial connection, or an over the air LTE or WCDMA IP connection, or through SMS messaging. The Arrow-L presents itself over these connections as an enhanced cellular modem with attached functional elements. These elements include:

- GPS location engine
- General Purpose Bidirectional I/O (GPIO) pins
- Relay drive pin output
- Serial UART port
- Input voltage monitor (optional)
- Watchdog lockup protection

Access to these elements and general purpose interfaces is done through an extended AT command set as defined herein.

Application scene:



This product will be designed based on the MDM9207-1 baseband chipset, which includes LTE Cat.1, WCDMA, and GPS functionality. The device will use one multi-band antenna and one dedicated GPS antenna.

2 Hardware Design

2.1 Basic Hardware

Items	Requirement
Baseband Chipset	MDM9207-1
RF Transceiver	WTR2965
Memory	MCP_NAND 2Gb / mobile DDR2 1Gb
Air Interface	Support for WCDMA and LTE Cat.1
Frequency	4G band support : Band2/4/12 3G band support : Band2/5
Antenna	Internal Antenna
GPS Antenna	Dedicated high performance ceramic antenna
Interface	UART TX
	UART RX
	12V DC Input（1A current）
	Relay Drive
	GPIO1
	GPIO2
Battery Monitor	internal analog input scaled (Optional)
Watchdog	Supported
Motion Detect	Sensor
LED	2 LED Supported 2 LEDs(one is RED，one is Green)
Battery	Built in battery（80MAH Lion）
Working Time	4 hours
Power Cable connector type	8 pin
Power Consumption	< 5Watts

The Arrow-L provides support for specialized hardware features through extended AT commands. The features supported include the following.

GPS

The major functionality of the GPS system is to compute the correlation results between the incoming signal and the selected PRN code based on certain Carrier Doppler Frequency, Code Doppler Frequency, code phase, carrier phase, and the particular satellite the system is tracking or acquiring.

GPIO

The GPIO pins are presented to the external environment on the main connector. They are general purpose bidirectional lines capable of providing system interrupts to generate a report or drive logic levels to external devices. These lines are 2.8V logic level and are 16V tolerant.

LED's
Two LED status indicators are provided to verify correct installation and operation.

UART
A UART port is provided for AT command and data interaction and optionally for application specific control.

Relay Driver
A 500mA sink capable output pin is provided. This pin is meant to drive a relay coil intended to interrupt the starter solenoid relay for the ignition circuit to a car.

Battery Monitor
The battery monitor is internal analog input scaled such that the DC value of the power input pin to the Arrow-L system is measured.

Watchdog
MDM9207-1 chipset provide internal software and hardware Watchdog.

Motion Detect
This function will work with firmware power down options to keep the Arrow-L in a very low power down state until motion is detected. Upon wakening, a report can then be generated.

2.2 Basic RF Performance

Items	Requirements	Remark
TRP free space	CTIA	TRP free space
TIS free space	CTIA	TIS free space

Board RF Specification	
3G WCDMA	
Band	Band2 / Band5
Rx Spec	Follow TS 34.121 Ch.6
Tx Spec	Follow TS 34.121 Ch.5
4G LTE Cat.1	
Band	Band2 / Band4 / Band12
Rx Spec	Follow TS 36.521 Ch.7
Tx Spec	Follow TS 36.521 Ch.6
GPS	
Frequency Support	L1-band (1.57542GHz) Channels: 210 PRN， 66 Search， 22 Simultaneous tracking
Sensitivity	Sensitivity (UHIS): Tracking: -156dBm

	Reacquisition: -153dBm Acquisition: -144dBm
Tracking Time Requirement	Acquisition time: Hot: <2s Warm: <15s Cold: <60s Reacquisition: 2s - 10s Depends on signal level

2.3 Certification and Safety

Items	Requirement
Drop Design	0.8meter 6 direction standard drop test
Temperature Range	-20 to 40℃ Operation -40 to +85℃ Storage
Humidity:	20% to 90% Operation 10% to 95% Storage
Altitude:	-500 to +18,000m
FCC Certification	FCC 47 CFR Part 15 and Part 18
Safety	UL Listing
ESD Requirement	8KV non-Conductive

3 Test Method

3.1 Hardware

Test Item	Description
Baseband Function Test	• Power Input Test • Power Consumption and Current Test • Heat Dissipation Test • UART Stability Test • GPIO Level Test • LED Stability Test • Drop Down Test • ESD Test • High/Low Temperature Test
RF Test	• RF Performance Test • GPS Performance Test • Antenna Performance Test

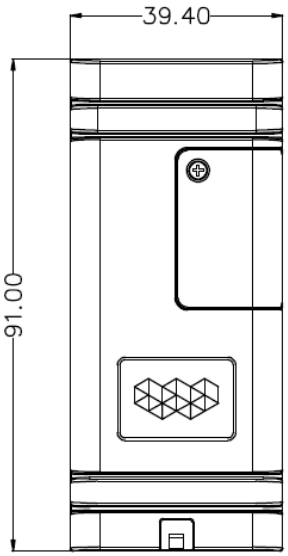
3.2 Software Test

Test Environment Construct

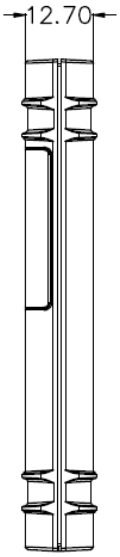
- Message Test environment
  1. USB dongle and PC as message server
  2. Send message to Arrow-L
- UART Test environment
  1. Connect Arrow-L to pc with com serial cable
  2. Open Terminal tool and send at command
  3. Response can be shown at terminal window

Mechanical Structure(mm)

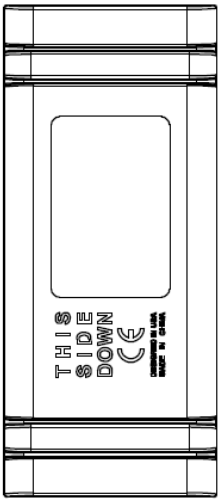
TOP View



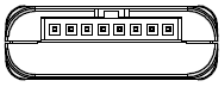
RIGHT View



BOTTOM View



FRONT View



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.

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.

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

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 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.