RIFA-S Compact-Sized Vehicle Tracker

RIFA-S Series User Manual

Version 1.1
May 11, 2020

ANTZER TECH CO., LTD.

Website：www.antzer-tech.com
Facebook：www.facebook.com/ANTZERTECH/
Tel：+886-2-7729-9223
Email：sales@antzer-tech.com
Office：7F-7, No.237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City 221 Taiwan

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Change History

Version	Date	Author	Description
1.0	2020/3/16	Haney Huang	First version release
1.1	2020/5/11	Haney Huang	Modified the typo of the temp. range in Ch2.

1. Introduction

ANTZER TECH's RIFA-S is a hardwired, compact-sized vehicle tracker with GNSS positioning module. The data of the device is transmitted through LPWAN Network under TCP/IP or MQTT protocol. Users could monitor their vehicles easily on the web-interface platform anytime and anywhere. With RIFA-S compact-sized GNSS vehicle tracker, users will receive real-time alerts in case of towing, attempted theft or suspicious movement of the vehicles.

2. Specification

General	Vehicle Interface	Hardwired Cable with 6-pin MicroFit Connector for Power, Ignition Signal (Optional SKU with CAN Bus)
Vehicle Network	CAN Bus Protocols (Optional SKU)	ISO15765-4 On-Board Diagnostic and J1939
Cellular Network	Frequency Bands	GSM/GPRS: 900, 1800 Mhz (Only for LARA-R211 SKU)
		HSPA/UMTS: 2100 Mhz (Only for LARA-R280 SKU)
		LTE Cat-1: Band 4, 13 or Band 3, 7, 20 or Band 3, 8, 28
		LTE Cat-M1/NB-IoT: Band 2, 3, 4, 5, 8, 12, 13, 20, 28
	Data Protocols	TCP, UDP or MQTT
Wireless Network	Bluetooth (Optional SKU)	2.4GHz Low Energy Bluetooth Class 2
GNSS	Chipset	u-blox M8 Engine, 72 Channels support GPS, Galileo, GLONASS, BeiDou
	Dead Reckoning (Optional SKU)	Optionally Support UDR or CAN-to-ADR
Sensor		3-Axis Accelerometer
LED Indicator		x2 LEDs (Green: GPS, Blue: Cellular Network, Red: System Status)
SIM Card	Form Factor	Nano SIM (4FF) or Embedded-SIM
SD Card	(Optional SKU)	Micro SD for Data Logging
Configuration Port		Micro-USB Port for Configuration Firmware Update Over-The-Air through Cellular
Power	Power Input Range	8~32V DC Power Input
	Power Mode	Operating Mode and Sleeping Mode
	Min. Power Consumption	<3mA @ 12V (Sleeping mode)
Environment	Operating Temperature	-20 to 70 °C (With Battery); -30 to 75 °C (Without Battery)
	Storage Temperature	-40 to 85 °C
	Certificate and Vibration	NCC, RoHS and MIL-STD-810G 514.6C-1 Category 4 - Common Carrier
	Humidity	10% to 90% R.H. (Non-Condensing)
Dimensions		50 x 50 x 25 mm (Without Hardwired Cable)
Battery	Lithium Ion Polymer Battery	Optionally support Built-in 3.7V 185mAh Battery

3. Dimensions

4. LED Indicators

- Power LED (Color: Red)

Behavior	Meaning
Permanently Switched ON	Device is powered on
OFF	Device is not working or in the Sleep Mode

- WWAN LED (Color: Blue)

| Behavior	Meaning
Blinking	WWAN register successfully to the base station
Blinking when the Red LED is OFF	Note able to register to the base station or the SIM card doesn't work properly

- GNSS LED (Color: Green)

Behavior	Meaning
Blinking	Normal Mode, GNSS module is working
OFF	Device is in the Sleep Mode or GNSS function failed

5. Connections

5.1. MicroFit Connector

[Hard-wired Cable, 120mm]
1. Power
2. Ignition (Optional)
3. CAN Bus (Optional)

1	GND	2	8~32V Input
3	Ignition	4	GND
5	CAN_High	6	CAN_Low

6 pin MicroFit Connector

5.2. Micro-USB Connector

There is a micro-USB port on the RIFA-S for configuration. Connect RIFA-S to the USB port on your PC or notebook and run the RIFA-S configuration tool or AT commands to configure the device.

* Warning: RIFA-S can be powered by USB (0.8A@5V). With the power from USB port, RIFA-S is only available for configuration, not for any other usages.

5.3. Nano SIM (Optional SKU: Chip SIM)

There's a nano SIM card slot inside the RIFA-S. To insert the SIM card, please follow the steps below to open the case.

*Note: There's an option SKU using chip SIM, the chip SIM will automatically start working once the device is powered up.

Open from the Left and Right sides of the case:

Left

Right

Step 1 Pull-out the upper cover from the notch and use the other hand to squeeze the bottom cover at the same time

Pull-out the upper cover from the notch

Squeeze the bottom cover
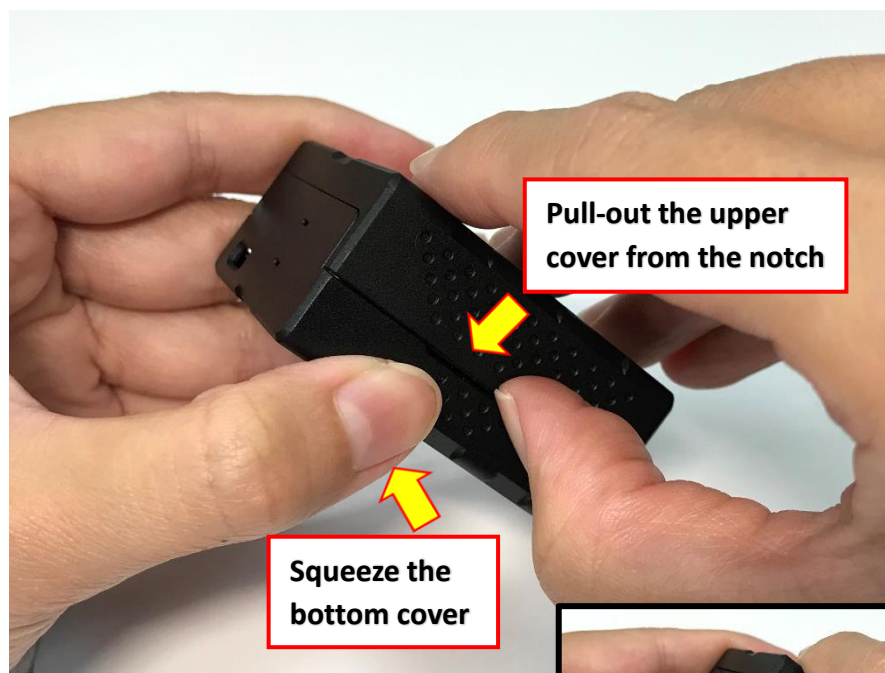
Open One Side of the Case First →

Step 2   Turn to the other side of the device



Step 3   Open the other side of the case follow the same instructions in Step1 and the case could be opened successfully.

Pull-out the upper cover from the notch

Squeeze the bottom cover
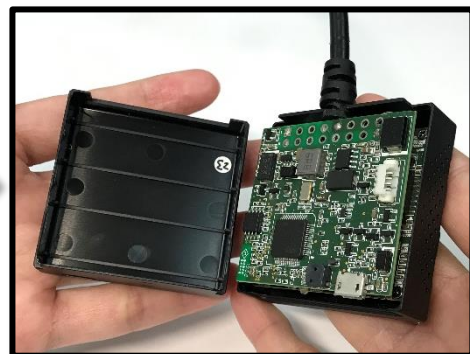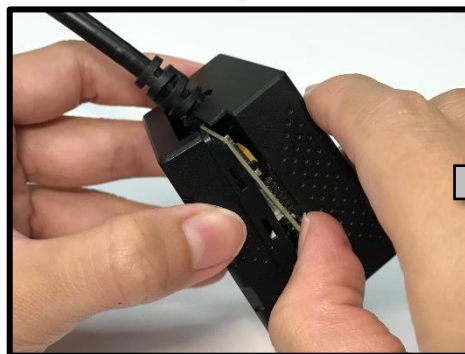
Step 4   Insert the SIM card to the device

Nano SIM Card Slot

SIM
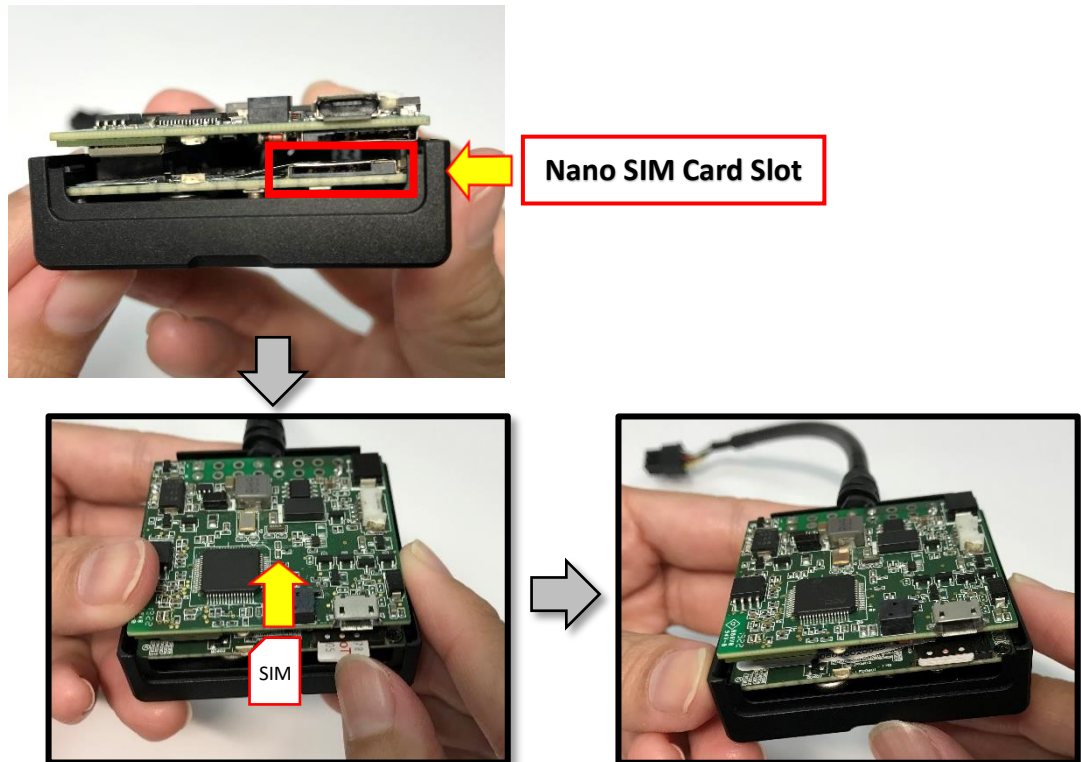
Step 5   Attach the covers by pushing against the snap gently on the left and right sides.

Push against the snap gently
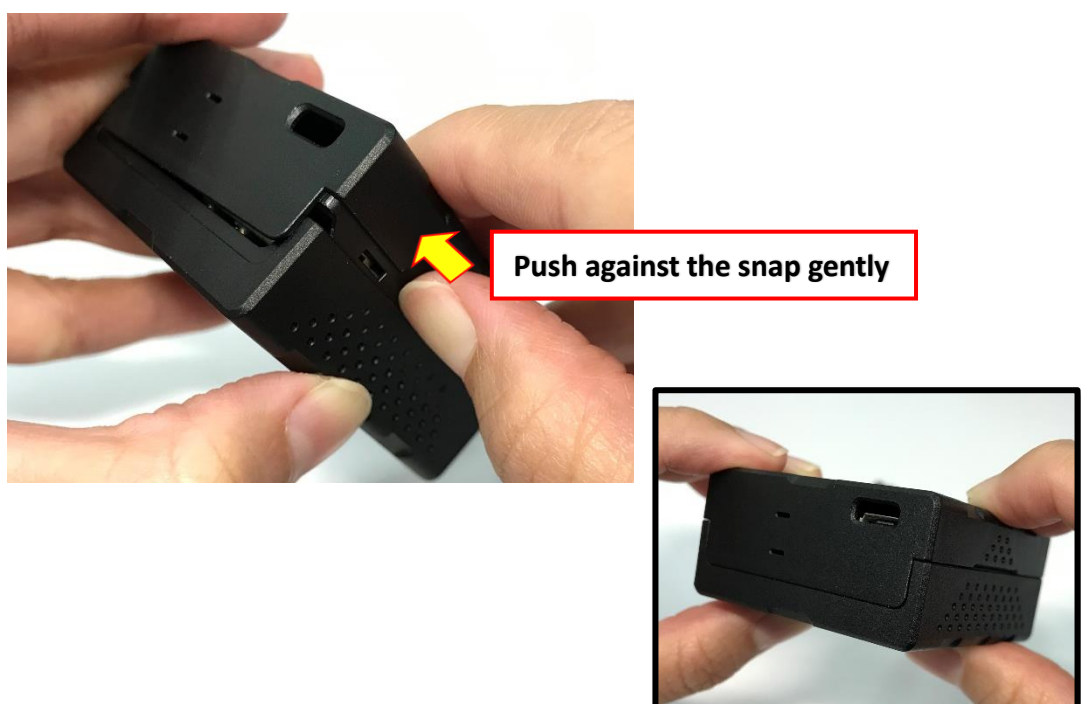
6. Technical Information about internal battery

Battery Type: Lithium-ion Polymer 3.8V 180mAh

  When RIFA-S lose the power source from the MicroFit or USB connector, the backup battery will start working for the device to send out alerts. The operating time with internal backup battery depends on temperature, data sending frequency and the number of charge/discharge cycles.

  Please note that the backup battery should be turned off after testing to avoid over-discharge the battery when the device is in the stock. Please use AT command or configuration tool to turn off the backup battery. The backup battery will turn on once the device is powered on.

Appendix A - RIFA-S Series Transmission Protocol

Tracking Data by ASCII Format

*Single Packet:

For the single packet (we use ASCII data format), each field is delimited by a single comma " , " for example :

Header						Data1	Trailer		
Prefix	,	Len	,	Seq_Id	,	Tracking Data	*	Checksum	<CR><LF>

```
             |----------Calculated Length ------|
|------Included for Checksum calculation--------|
```

*Multiple-Packets:

When it comes to the multiple-packets, each tracking data is delimited by <CR><LF> character (0x0D 0x0A). for example, if there are three packets , the data format is as blow:

Header					Data1	Trailer	Data2	Trailer	Data3	Trailer		
Prefix	,	Len	,	Seq_Id	Tracking Data (Packet 1)	<CR><LF>	Tracking Data (Packet 2)	<CR> <LF>	Tracking Data (Packet 3)	*	Checksum	<CR><LF>

```
       |--------------- Calculated Length ------------------------ |
|----------Included for Checksum calculation--------------------------------|
```

Device Message Formats:

Syntax:

<Prefix>,<Len>,<Seq_ID>,<Tacking Data>*<Checksum><CRLF>

@@,<Len>,<Seq_ID>,<UD> ,<EC>,<EP>,<LT>,<LN>,<AL>,<SP>,<HD>,<GD>,<GT>,<PF>,<DS>,<AI1>,<IN>,<OT>…..*XX<CR><LF>

Field	Descriptions	Unit
Prefix	Default "@@"	
Len	Package Length	
Seq_ID	Sequence number, cyclic accumulation from 1 to 65535	
UD	Unit ID, Default IMEI	
EC	Event Code	See Table A
EP	Event Params	See Table A
LT	Latitude (NMEA format), e.g. DDMM.mmmm	0.00001 unit
LN	Longitude (NMEA format), e.g. DDMM.mmmm	0.00001 unit
AL	Altitude in meters above sea level, e.g. AA.a	0.1 unit
SP	Speed over the ground in knots, e.g. SSS.sss	0.001 unit
HD	Heading over ground in degrees, e.g. HHH.hh	0.01 unit
GD	UTC Date, e.g. YYMMDD	
GT	UTC TIME, e.g. hhmmss	
PF	1 if a GPS valid fix. 0 if not a valid fix.	
DS	Odometer	0.1 Km
AI1	Analog Input Value *Always show "0" since it's not supported in RIFA-S*	
IN	All Input Status	
OT	All Output Status *Always show "0" since it's not supported in RIFA-S*	
…..	<Custom Info> For appending additional data field to the tail of the standard Tacking Data. *Please refer to Appendix C for detailed information*	
*XX	Checksum	

Table A. Event Code and Event Parameters

Event Code	Event Params	Descriptions
2	NULL	GPRS Time based tracking event
21	Input Index (0)	Input on Alert
22	Input Index (0)	Input off Alert
25	NULL	Motion on alert
26	NULL	Motion off alert
27	NULL	Impact on alert
28	NULL	Impact off alert
29	NULL	Idle on alert
30	NULL	Idle off alert
31	NULL	Towing detected alert (define as Appendix B)
32	NULL	Towing stopped alert (define as Appendix B)
33	NULL	Moving detected
34	NULL	Moving stopped
35	NULL	Harsh acceleration on event
36	NULL	Harsh acceleration off event
37	NULL	Harsh brake on event
38	NULL	Harsh brake off event
39	NULL	Harsh cornering on event
40	NULL	Harsh cornering off event
41	NULL	Direction change alert
43	NULL	Main power on event
44	NULL	Main power off event
45	NULL	Main power low voltage on event
46	NULL	Main power low voltage off event
47	NULL	Backup battery low voltage on event
48	NULL	Backup battery low voltage off event
49	NULL	Over speed on event
50	NULL	Over speed off event
51	Geofence Index (Max: 255)	Geofence in event
52	Geofence Index (Max: 255)	Geofence out event
57	NULL	Main power lost on event
58	NULL	Main power lost off event

Appendix B - AT command list of RIFA-S

Syntax:

<u>Write cmd:</u>

AT+<Command >,<Parameter1>,<Parameter2>,<Parameter3>….<CR><LF>

<u>Response:</u>

OK+<Command ><CR><LF> or FAIL+<Command ><CR><LF>

<u>Read cmd:</u>

AT+<Command >?<CR><LF>

<u>Response:</u>

OK+<Command >,<Parameter1>,<Parameter2>,<Parameter3>….<CR><LF>

<u>**//WWAN: set parameters of your WWAN module (SIM card information)**</u>

AT+WWAN,<WWAN_Enable>,<APN>,< Host_IP >,< Socket_Type >,< Host_Port >,< UDP_LocalPort >,< UserName >,< Password >,< PDP_Authentication >

<WWAN_Enable>: 0:Disable WWAN, 1:Enable WWAN

<APN>: Max Len 32

< Host_IP >: Max Len 32

< Socket_Type >: 0: TCP, 1:UDP

< Host_Port >: 0-65535

< UDP_LocalPort >: 0-65535

< UserName >: Max Len 32

< Password >: Max Len 32

< PDP_Authentication >: 0:None, 1:PAP, 2:CHAP, 3:AUTO

//INPUT:set the debounce time of ACC input and digital input.

Write cmd:

AT+INPUT,<Index>,<ENABLE>,<On Debounce Time>,<Off Debounce Time>

Read cmd:

AT+INPUT,<Index>,?

<Index>: 0 is ACC PIN

<ENABLE>: 0: Disable, 1: Enable

<On Debounce Time>: Minimum unit is 0.1sec, 0-65535, default 10 (1sec)

<Off Debounce Time>: Minimum unit is 0.1sec, 0-65535, default 10 (1sec)

//IDLE: set the parameters of idle event code

AT+IDLE,<Condition>,<Idle Speed>,<Duration>

<Condition>:

  0: disable, 1: only used speed, 2: ACC ON, 3:ENGINE ON, 4: ACC ON & ENGINE ON

<Idle Speed>: default 10km/h, 0-255

<Duration>: minimum unit is 1 sec, default 30 (30 sec), 0-65535

//TOWING:set the parameters of towing event code

AT+TOW, <Condition>,<TOW Speed>,<Duration>

<Condition>:

  0: disable, 1: ACC OFF, 2:ENGINE OFF, 3: ACC OFF & ENGINE OFF

< TOW Speed>: default 10km/h, 0-255

<Duration>: base on 1 sec, default 5 (5 sec), 0-65535

//MOVING: set the parameters of moving event code

AT+MOVE,<Enable>,<Speed>,<Distance>,< Duration >

<Enable>: 0 disable, 1 enable

<Speed>: 10 (Km/h)

<Distance>: 3 (minimum unit is 10m)

< Duration >: 2 sec(minimum unit is 1sec)

//Limit Speed: set the parameters of speed limitation event code

AT+LSPD, <Enable>,<OnThreshold>,< OnDuration >,< OffThreshold >,< OffDuration >

<Enable>: 0 disable, 1 enable

<OnThreshold>: 70 (km/h)

< OnDuration >: 30 (seconds, minimum unit is 1sec)

< OffThreshold >: 60 (km/h)

< OffDuration >: 30 (seconds, minimum unit is 1sec)

//Car(Engine) Power ON and OFF Event: set the parameters of car power on and off event code

AT+ENGE, <Enable>, <OnThreshold>,< OnDuration >,< OffThreshold >,< OffDuration >

<Enable>: 0 disable, 1 enable

<OnThreshold>:132 (volt, minimum unit is 0.1 volt), ex: parameter 132 = 13.2 volt

<OnDuration>: 30 (seconds, minimum unit is 1sec)

<OffThreshold>:124 (volt, minimum unit is 0.1 volt), ex: parameter 124 = 12.4 volt

<OffDuration>:180 (seconds, minimum unit is 1sec)

//Car(Engine) Power Low Event: set the parameters of car power low event code

AT+MPWLW, <Enable>,< Power Low Voltage>,<Duration>

<Enable>: 0 disable, 1 enable

< Power Low Voltage>: 110 volt (Minimum unit is 0.1 volt) 110 = 11.0 volt

<Duration>: 2 sec (minimum unit is 1sec)

//Backup Battery Low Event (hard-coded) :the parameters of RIFA-S battery power low event code

Default low volt is 3.5 volt, duration is 20 sec,

This function Enable/Disable is following AT+MPWLW

//Heading Change Event: set the parameters of car heading change event code

AT+HDCG, <Enable>,< Degrees>,<Sampling Time>

<Enable>: 0 disable, 1 enable

< Degrees>: Default 45 deg. (Range is from 0 to 359)

<Sampling Time>: Default is 2 sec (minimum unit is 1sec)

//Impact Event: set the parameters of impact event code

AT+IMPT, <Enable>,<Impact Threshold>,<Debounce Delay>

<Enable>: 0 disable, 1 enable

<Impact Threshold>: Default 2000mg (Range is from 1000 to 2000mg)

<Debounce Delay>: Debounce time delay in second for the first impact detection

to the next detection. Default 2 sec

//Motion Event: set the parameters of motion event code

AT+ MTON, <Enable>,<Motion Threshold>,<Debounce delay>

<Enable>: 0 disable, 1 enable

<Motion Threshold>: Default is 100 mg, Range is from 30 to 2000mg.

<Debounce delay>: Default is 5 sec (minimum unit is 1 sec)

Example:

Write:AT+MTON,1,100,5

Means: enable motion event of threshold 100mg and debounce delay 5 secs

//Power Saving Mode: set the parameters of how to enter power saving code

AT+PWSV,< Power OFF Detect >,<Duration>

< Power OFF Detect >: 0: Disable, Bit 0: Motion OFF, Bit 1: Engine OFF, Bit 2: ACC OFF

<Duration>: Default 3min(minimum unit is 1 min), wait after <Power OFF Detect> conditions

are all detected, then enter into power saving.

//System Reset (only Write Cmd): reset and save parameters by this command

AT+RST,<Action>

<Mode>:

1: System Reboot

2: Save all parameters

3: Reset all parameters to factory default

4: Clear external flash memory

// Query firmware Version: check the firmware version by this command

AT+VER?

//Tracking Report Data: set up the frequency of tracking data

AT+TRCK,<Mode>,< Tracking interval >

<Mode>: 0: Disable Tracking Report Data, 1: Time Mode

< Tracking interval >: Default "30" seconds (minimum unit is 1sec)

//Set SIMCard PIN Code: key in the pin code of SIM card if needed

AT+PIN,<PIN Code>

<PIN Code>: Max Len 10 characters

//Set the vehicles virtual odometer: define the initial value of virtual odometer

AT+ODOM,<odom_value>

<odom_value>: set the virtual odometer initial value (Default value is 0 Kilometers)

The unit of virtual odometer value is in 0.1 kilometer (ex: value 12350 is equal to set 1235 km)

//Set the vehicles identification number : customer can set up the ID of the RIFA from 00000~99999, it can help you to track the device by ID and show IDs in your backend server.

AT+VIN,< ID_Number >

< ID_Number >: vehicles identification number,

               Max Len 17 characters (Default setting is IMEI)

// Car Power Lost Event: send out alert when the car power is lower than 4 Volts (hard-coded) and the status last longer than the duration time set in this command

AT+PLOS, <ENABLE>, <Duration (Sec)>

<Enable>: 0 disable, 1 enable

<Duration>: 10 sec (minimum unit is 1sec)

//Set Harsh Acceleration event: set command to activate harsh acceleration detecting

AT+HRAC,<Enable>,< Accelerate _Threshold>,< Duration >

<Enable>: 0:Disable, 1:Enable

< Accelerate_Threshold > Default 100mg, Range is from 30 to 2000mg.

< Duration > Duration in 0.1 seconds, Max Range is 255, Default: 3 (300ms)

//Set Harsh Brake event : set command to activate harsh brake detecting

AT+HRBK,<Enable>,< Brake _Threshold>,< Duration >

<Enable>: 0:Disable, 1:Enable

< Brake _Threshold > Default 300mg, Range is from 30 to 2000mg.

< Duration > Duration in 0.1 seconds, Max Range is 255, Default: 3 (300ms)

//Set Harsh Cornering event : set command to activate harsh corneting detecting

AT+HRCR,<Enable>,< Cornering _Threshold>,< Duration >

<Enable>: 0:Disable, 1:Enable

< Cornering _Threshold > Default 300mg, Range is from 30 to 2000mg.

< Duration > Duration in 0.1 seconds, Max Range is 255, Default: 3 (300ms)

Note: For best performance of harsh driving detection, please confirm that the hard-wired side of the RIFA-S is installed toward the heading of vehicle headstock and keep it flat.

//Geofencing Set-up : RIFA-S support geofence function which can help user to define the allowed or prohibited region. When vehicle is crossing to the geofence function, RIFA-S will send the event code 51 and 52 to backend server.

Appendix C - Custom Information from RIFA-S

- **FORMAT: set the data format which transmit from RIFA-S**

  AT+FORMAT,<Data Format>,<Format Header Prefix>,<Format Custom Info>

<Data Format>:	0: ASCII, 1:Binary (reserved)
<Format Header Prefix>:	@@ (default)
<Format Custom Info>:	Null (default)

- **Set the vehicle communication protocol type**

  AT+OBD2,< Vehicle Protocol Type>

  < Vehicle Protocol Type>:

0 :	Auto Search Protocol (Only OBD-II)
1 :	ISO 15765 CAN 11 bit 500K
2 :	ISO 15765 CAN 29 bit 500K
3 :	ISO 15765 CAN 11 bit 250K
4 :	ISO 15765 CAN 29 bit 250K
10 :	SAE1939 29 bit 250K
11 :	SAE1939 29 bit 500K
99 :	Disable

- **Custom Information Table: General Vehicle Information**

Field	Descriptions	Data Size	Unit (value range)
+MB	Main Power Voltage (Car Battery)	uint16_t	0.1 volt
+BV	Backup battery voltage	uint16_t	0.1 volt

- **OBDII Parameters**

Field	Descriptions	Data Size	Unit (value range)
+BV	Backup battery voltage	uint16_t	0.1 volt
+BO1	Malfunction Indicator Lamp Status	uint8_t	0: OFF, 1: ON
+BO2	Engine Load	uint8_t	% (0 ~ 100)
+BO3	Intake Manifold Absolute Pressure	uint8_t	kPa (0 ~ 255)
+BO4	Vehicle Speed	uint8_t	km/h (0 ~ 255)
+BO5	Throttle Position	uint8_t	% (0 ~ 100)
+BO6	Fuel Tank Level Input	uint8_t	% (0 ~ 100)
+BO7	Absolute Barometric Pressure	uint8_t	kPa (0 ~ 255)
+BO8	Relative Throttle Position	uint8_t	% (0 ~ 100)
+BO9	Relative Accelerator Pedal Position	uint8_t	% (0 ~ 100)
+BH1	Fuel Pressure	uint16_t	kPa (0 ~ 765)
+BH2	Engine RPM	uint16_t	rpm (0 ~ 16383)
+BH3	Mass Air Flow Rate	uint16_t	0.01 grams/sec (0 ~ 65535)
+BH4	Run Time Since Engine Start	uint16_t	Seconds (0 ~ 65535)
+BH5	Control Module Voltage	uint16_t	0.001 volt (0 ~ 65535)
+BH6	Absolute Load Value	uint16_t	% (0 ~ 25700)
+BH7	Engine Fuel Rate	uint16_t	L/h (0 ~ 3212)
+BI1	Engine Coolant Temperature	int16_t	℃ (-40 ~ 215)
+BI2	Intake Air Temperature	int16_t	℃ (-40 ~ 215)
+BI3	Ambient Air Temperature	int16_t	℃ (-40 ~ 215)
+BI4	Engine Oil Temperature	int16_t	℃ (-40 ~ 210)
+BS1	Vehicle Identification Number	17 char.	TBD

- **J1939 Parameters**

Field	Descriptions	Data Size	Unit (value range)
+TO1	Wheel-Based Vehicle Speed	uint8_t	0 to 250 km/h
+TO2	Fuel Level	uint8_t	0 to 100 %
+TO3	Barometric Pressure	uint8_t	0 to 125 kPa
+TO4	Engine Throttle Position	uint8_t	0 to 100 %
+TO5	Engine Percent Load	uint8_t	0 to 250 %
+TO6	Accelerator Pedal Position 1	uint8_t	0 to 100 %
+TO7	Anti-Lock Braking (ABS) Active	uint8_t	0 to 3 Bit 1~2 : Position of doors Bit 3~8 : Reserved(000000) 00 ABS passive but installed 01 ABS active 10 Reserved 11 Not available
+TO8	Position of doors	uint8_t	0 to 15 Bit 1~4 : Position of doors Bit 5~8 : Reserved(0000) 0000 At least 1 door is open 0001 Closing last door 0010 All doors closed 0011-1101 Not defined 1110 Error 1111 Not available
+TO9	Low / High Beam Head Light Command	uint8_t	0 to 15 Bit 1~2 : Low Beam Status Bit 3~4 : High Beam Status Bit 5~8 : Reserved(0000) 00 De-activate 01 Activate 10 Reserved 11 Don't Care

+TO10	Right / Left Turn Signal Lights Command	uint8_t	0 to 15 Bit 1~2 : Right Signal Status Bit 3~4 : Left Signal Status Bit 5~8 : Reserved (0000) 00 De-activate 01 Activate 10 Reserved 11 Don't Care
+TH1	Engine Speed	uint16_t	0 to 8,031 rpm
+TH2	Engine Fuel Rate	uint16_t	0 to 3,2127 L/h (0.1 unit)
+TH3	Battery Potential / Power Input 1	uint16_t	0 to 3,2127 V (0.1 unit)
+TH4	Engine Inlet Air Mass Flow Rate	uint16_t	0 to 3,2127 kg/h (0.1 unit)
+TI1	Engine Coolant Temperature	int16_t	-40 to 210 deg C
+TI2	Engine Oil Temperature	int16_t	-273 to 1735 deg C
+TI3	Ambient Air Temperature	int16_t	-273 to 1735 deg C
+TI4	Engine Intake Manifold 1 Air Temperature	int16_t	-273 to 1735 deg C
+TI5	Steering Wheel Angle	int16_t	-31374 to 31374 rad (0.001 unit)
+TL1	High Resolution Total Vehicle Distance	uint32_t	0 to 21,055,406 km
+TS1	Vehicle Identification Number	17 char	TBD

- **Example:**

    Attach custom data (e.g. OBDII data) to standard protocol, please set AT command "AT+FORMAT". The data format and sequence are defined by your AT command. 。

Command Set:
    AT+FORMAT,0,@@,**+BV+BO4+BH2+BO1+BI4+BH5+BI1**

- **The data structure sent to server is as below sequence:**

Syntax:
@@,<Len>,<Seq_ID>,<UD> ,<EC>,<EP>,<LT>,<LN>,<AL>,<SP>,<HD>,<GD>,<GT>,<PF>, <DS>,<AI1>,<IN>,<OT>,**<BV>,<BO4>,<BH2>,<BO1>,<BI4>,<BH5>,<BI1>***XX<CR><LF>

Example:
@@,114,73,352953080326071,2,0,250200935,1213344184,363,45,26726,190116,1 02603,1,3,0,1,1,**37,125,1800,1,85,12000,70***04

37	=>	Backup battery voltage is 37 * 0.1 = 3.7 volts
125	=>	Vehicle Speed is 125 km/h
1800	=>	Engine RPM is 1800 rpm
1	=>	MIL ON
85	=>	Engine Oil Temperature is 85 ℃
12000	=>	Control Module Voltage is 12000 * 0.001 = 12.000 volts
70	=>	Engine Coolant Temperature is 70 ℃

Appendix D - BLE Transmit Protocol Format (Optional)

RIFA BLE Transmission Protocol Format
GPS 、 OBD2 、 GSensor Data

Framing: Total = 20 bytes

DLE	STX	CMD	DLC	Data		DLE	ETX
1 byte	1 byte	1 byte	1 byte	14 bytes		1 byte	1 byte
0x10	0x02					0x10	0x03
0	1	2	3	4 ~ 17		18	19

Response = 0x91: Receive GPS Latitude + Hemisphere Data (ASCII)

DLE	STX	CMD	DLC	Latitude	Hemi	0x00	DLE	ETX
0x10	0x02	0x91	11	10 bytes	N or S	3 bytes	0x10	0x03

Response = 0x92: Receive GPS Longitude + Hemisphere Data (ASCII)

DLE	STX	CMD	DLC	Longitude	Hemi	0x00	DLE	ETX
0x10	0x02	0x92	12	11 bytes	E or W	2 bytes	0x10	0x03

Response = 0x93: Receive GPS Altitude Data (ASCII)

DLE	STX	CMD	DLC	Altitude	0x00	DLE	ETX
0x10	0x02	0x93	7	7 bytes	7 bytes	0x10	0x03

Response = 0x94: Receive GPS Speed + Degree Data (ASCII)

DLE	STX	CMD	DLC	Speed	Degree	0x00	DLE	ETX
0x10	0x02	0x94	11	6 bytes	5 bytes	3 bytes	0x10	0x03

Response = 0x96: Receive GPS Date + Time (ASCII)

DLE	STX	CMD	DLC	Date	Time (UTC)	DLE	ETX
0x10	0x02	0x96	6	6 bytes (DDMMYY)	8 bytes (hhmmss.d)	0x10	0x03

Response = 0xB1: Receive G-Sensor Data (Binary)
(**available data length = 12bit, lowest 4bit is unavailable data, negative value represent by 2's complement number**)

DLE	STX	CMD	DLC	XX YY ZZ	0x00	DLE	ETX
0x10	0x02	0xB1	6	6 bytes	8 bytes	0x10	0x03
				XX_L/H(4,5), YY_L/H(6,7), ZZ_L/H(8,9)			

Response = 0xA1: Receive MIL+ELD+ECT+FLP+IMAP+RPM+SPEED+IAT+MAF Data (Binary)																
DLE	STX	CMD	DLC	MIL (unsign)	ELD (unsign)	ECT (sign)	FLP (unsign)	IMAP (unsign)	RPM (unsign)	SPEED (unsign)	IAT (sign)	MAF (unsign)	DLE	ETX		
0x10	0x02	0xA1	14	1 byte	1 byte	2 byte	2 byte	1 byte	2 byte	1 byte	2 byte	2 byte	0x10	0x03		
						ECT_L ECT_H	FLP_L FLP_H		RPM_L RPM_H		IAT_L IAT_H	MAF_L MAF_H				

Response = 0xA2: Receive THROTTLE+ENG RUNTIME+FTLI+ABP+Volt+AVL+RTP+AAT+RAPP Data (Binary)														
DLE	STX	CMD	DLC	THROTTLE	ENG RUNTIME	FTLI (unsign)	ABP (unsign)	Volt (unsign)	AVL (unsign)	RTP (unsign)	AAT (sign)	RAPP (unsign)	DLE	ETX
0x10	0x02	0xA2	13	1 byte	2 byte	1 byte	1 byte	2 byte	2 byte	1 Byte	2 Byte	1 Byte	0x10	0x03
					ERT_L ERT_H			Volt_L Volt_H			AAT_L AAT_H			

Response = 0xA3: Receive EOT+EFR Data (Binary)							
DLE	STX	CMD	DLC	EOT (sign)	EFR (unsign)	DLE	ETX
0x10	0x02	0xA3	4	2 byte	2 byte	0x10	0x03
				EOT_L EOT_H	EFR_L EFR_H		

Appendix E - Server Information Settings

//==//
//   Command   //
//==//
//Set the backend server information include Acknowledgement and Heartbeat.

Syntax:
AT+SERVER,<SERVER_ACK>,<ACK_TIMEOUT>,<ACK_Retry_Counter>,<Heartbeat_ interval>

<SERVER_ACK>:

If the ACK is required, device will wait for the ACK and then send next report. If no ACK is received within <ACK_TIMEOUT> value for <ACK_Retry_Counter> times, the device will reset wwan module and try the steps again.

0: ACK is not required.

1: ACK is required.

<ACK_TIMEOUT>:

Minimum unit is 1 sec, 0-255, default 10 sec.

<ACK_Retry_Counter>:

0-255, default 5 times.

<Heartbeat_ interval>:

Period in minutes for the device to send heartbeat package message to the backend server.

0-255, default 0 minute(Disable).

```
//==================================================================//
//                      Heartbeat Message Format                    //
//==================================================================//
```

Heartbeat is recommended to ensure TCP connection when the time interval of tracking is set too long. Whenever tha backend server receives a heartbeat package, it should reply an acknowledgement to device

Syntax:
<Header>,<Seq_Num>,<UD><CR><LF>

<Header>:   2 Bytes, it is in ASCII "@Z" (0x40 0x5A).
Header of the package from tracker to server.

<Seq_Num>:
The backend server uses the <Seq_Num> extracted from the heartbet package from the device as the <Seq_Num> in the server acknowledgement of the heartbeat.

<UD>:
Unit ID, Default IMEI.
Package size: 22~26 Bytes(ASCII Format).

Example:
@Z,65535,352753092064383<CR><LF>

```
//==================================================================//
//                 Server Acknowledgement Message Format           //
//==================================================================//
```

Server response message format in ACK protocol for acknowledging receipt of device message.

Syntax:

<Header>,<Seq_Num>,<UD><CR><LF>

<Header>: 2 Bytes, it is in ASCII "$$" (0x24 0x24).
Header of the package from server to tracker.

<Seq_Num>:
The backend server uses the <Seq_Num> extracted from the received message as the <Seq_Num> in the server acknowledgement.
<UD>:
Unit ID, Default IMEI.
Package size: 22~26 Bytes(ASCII Format).

Example:
$$,5,352753092064383<CR><LF>

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