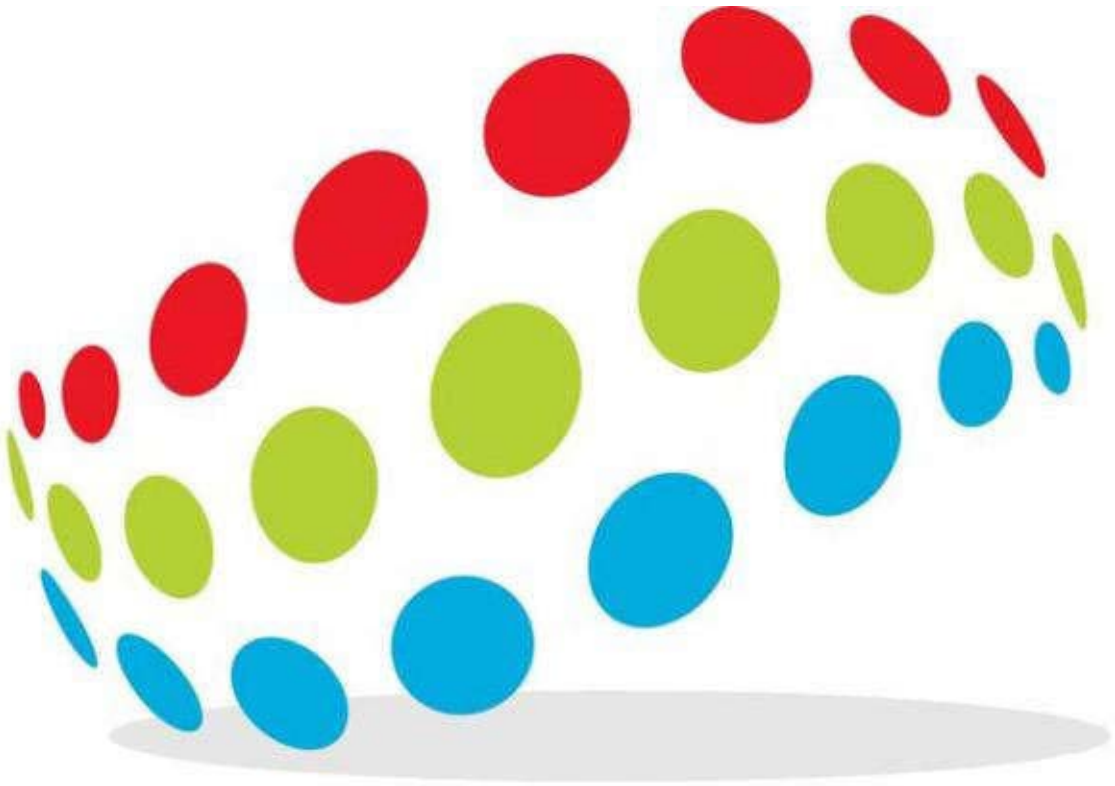
FJ1100L User Manual



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Author	Revision	Changes	Date
jinyi	1.1	Initial version	2018-01-03

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1 Introduction

The FJ1100L is a vehicle tracking device that uses a GPS satellite receiver to determine location information and a CAT-1 transceiver to communicate information to and from a land based server. In addition, the FJ1100L has several Inputs that may be configured to detect states of sensors and Outputs that can control accessories.

The FJ1100L is powered by standard vehicle power (12V or 24V). It accepts several harnesses: a 2 wire power harness, and 4 wire IO harness.

Communications between the FJ1100L and the server are carried out using the UDP protocol with sequence acknowledgment messages to confirm receipt of messages by the server.

Configuration of the device can be conducted using serial communications over the USB port or by sending SMS messages to the device.

ID and Tooling Design

The housing will be provided by customer. The product appearance is shown as follows:

Item	Definition
Dimension	103mm *53mm *18.65mm
Weight	/

2.Hardware

Physical and Electrical Specifications

*Dimensions: 103mm *53mm *18.65mm*

Weight: 74.5 g (with optional battery)

Input Voltage: 4-36VDC

Power consumption:

- Active mode: 200mA @12VDC
- Sleep mode: <2mA @12VDC

Operating temperature: -30℃ to 75℃

Storage temperature: -40℃to 85℃

Input/Output

Digital Inputs: 1

Relay driver Outputs: 1

Function LEDs: 2

GPS Status GREEN

Cellular Status ORANGE

Cellular Communication

Operation Mode:

FDD_LTE(Cat1)

Operation Band： Lte_B4,

Lte_B13

Modulation: Uplink:QPSK

Downlink: QPSK/16QAM

2.5 GPS Specification

-167dBm Tracking Sensitivity

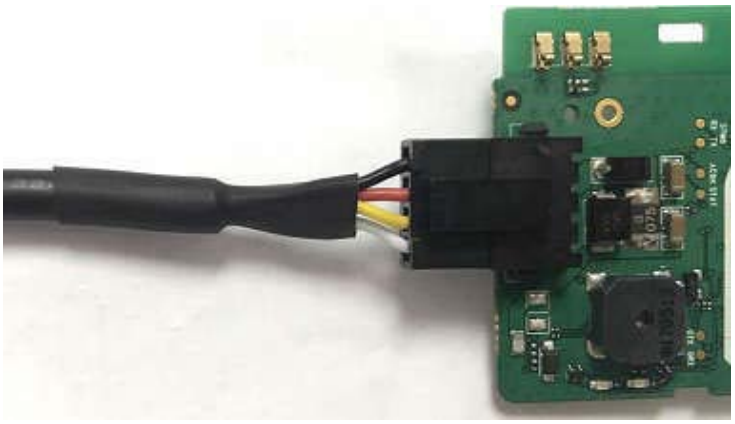
Location Technology(72 channel GPS)

Location Accuracy (2 meter CEP50)

Harnesses

There are1 harnesses that may be used with the FJ1100L:

1. 4 wire power and I/O harness



The picture above shows the 4 wire power and I/O harness. The wiring details are:

Power and I/O Harness 4 wires

1. Black **V-** is connected to Negative or Ground
2. Red **V+** is connected to Positive , +12VDC or +24VDC
3. Yellow**Input0** is an input biased high, negative trigger.
4. White **Output 0** is an output, open collector, may be used for Starter Disable.

Hardware features

The FJ1100L provides support for specialized hardware features through extended AT commands. The features supported include the following.

GPS

The major functionality of the GPS module 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 module is tracking or acquiring.

GPIO

Two GPIO pins, GP1 and GP2, 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 pins default to input. GP1 is pulled down representing 0 when disconnected; GP2 is pulled up representing logical 1 when disconnected. They should be asserted to a known value if used. GP1 is intended to use for Ignition Sensing.

LED's

Two LED status indicators are provided to verify correct installation and operation. The status LEDs are color coded and directly convey the status of the CAT-1 and GPS subsystems as described in the table below. Their valid operation also indicates operational status and power.

LED	Function	Status
GREEN	GPS	**On: GPS satellites acquired and Locked** **Flash Slow**: GPS satellite search is in progress **Off: No power or GPS subsystem fault**
ORANGE	CAT_1	**On: Indicates** CAT_1 **connection is made** **Flash Slow**: CAT_1 subsystem initialized but no connection **Flash Fast**: CAT_1 initialization in process **Off: No power or** CAT_1 **subsystem fault**

The device provides user control allowing the LEDs to be extinguished once installation is verified. This feature reduces power and further conceals the device Tracker from untrained parties wishing to defeat its operation.

Battery Monitor

The battery monitor is internal analog input scaled such that the DC value of the power input pin to the device system is measured. This value is scaled to span the most significant 8 bits of the A/D and consequently covers a scale from 0 to 25.5 Volts.

Timers

Timers resident on the CAT-1 baseband chip generate periodic interrupts for power down wakeup, watchdog support, report generation and other timer related functions. Report timers are supported by related AT command and cause generation of periodic reports.

Motion Detect

A factory populates option for motion detector is provided. If populated at the time the FJ1100L is manufactured, this option will work with firmware power down options to keep the FJ1100L in a very low power down state until motion is detected. Upon wakening, a report can then be generated.

Basic RF Performance

LTE BAND4			LTE BAND13		
BW	**Mode**	**Maximum Target**	**BW**	**Mode**	**Maximum**
5MHZ	QPSK	22.5dBm±1.5	5MHZ	QPSK	22.5dBm±1.5
	16QAM	22.5dBm±1.5		16QAM	22.5dBm±1.5
10MHZ	QPSK	22.5dBm±1.5	10MHZ	QPSK	22.5dBm±1.5
	16QAM_UP_27RB	22.5dBm±1.5		16QAM_UP_27RB	22.5dBm±1.5
15MHZ	QPSK	22.5dBm±1.5			
	16QAM_UP_27RB	22.5dBm±1.5			
20MHZ	QPSK	22.5dBm±1.5			
	16QAM_UP_27RB	22.5dBm±1.5			

B4/B13 TX Performance	
Minimum Output Power	<-39dBm
Transmit OFF power	<-48.5 dBm
Frequency Error	|Δf| ≤ (0.1 PPM + 15 Hz)
Error Vector Magnitude (EVM)	PUSCH 17.5@QPSK BPSK ;12.5%@16QAM
	PUCCH 17.5%
	PRACH 17.5%@FFS

Carrier leakage	<-24.2dBc@3.2 dBm ±3.2dB	
	<-19.2dBc@-26.8 dBm ±3.2dB	
	<-9.2dBc@-36.8 dBm ±3.2dB	
Adjacent Channel Leakage power Ratio	<-32.2dBc@ACPR1_UTRA	
	<-35.2dBc@ACPR2_UTRA	
	<-29.2dBc@ACPR_EUTRA	
Transmitter Spurious emissions	<-36 dBm@BW=1 KHz	9 kHz ≤ f < 150 kHz
	<-36 dBm@BW=10KHz	150 kHz ≤ f < 30 MHz
	<-36 dBm@BW=100KHz	30 MHz ≤ f < 1000 MHz
	<-30dBm@BW=1MHz	1 GHz ≤ f < 12.75 GHz

Frequency Range：

B4: TX (1710--1755) MHZ RX (2110--2155) MHZ

B13: TX (698--716) MHZ RX (746--756) MHZ

Safety

Items	Requirement
Drop Design	1.2meter 6 direction standard drop test
Temperature Range	-40 to 85°C Operation -50 to +100° C Storage
Humidity:	20% to 90% Operation 10% to 95% Storage
Altitude:	-500 to +18,000m
Safety	UL Listing
Others Operator Requirement	Industry Canada/ AT&T (optional)
ESD Requirement	15KV non-conductive

3. Software Features

Basic Software

Items	Requirement
Air Interface	CAT1 B4/B13; GPS
1x Data	Supported
IP Stack	Ipv4/IPV6
Upgrade Method	Remote update / PC tool
RUIM	Optional
Compatible with None-RUIM	Supported
Remote Update	Supported
Power Modes	Supported
AT Command	Supported
Report	Supported；3000records
Driver	GPIO，LED，GPS，UART
GPIOs	Interrupt for Door Open Detect, Ignition Status
LEDs	GPS Status,CAT-1 Status
Watch Dog	Supported (CBP8.2 integrated)
Reset	Soft reset
Startup Banner	Supported

Power Modes

The FJ1100L device supports several power modes that are set by the power mode command. In full power mode the cellular subsystem will maintain a persistent cellular connection whenever service is available as well as an IP connection where available.
Any hardware or software reset will interrupt any power mode and return the device to full power mode. In summary, the conditions permanently restoring full power mode include:

- Power cycle
- Reset command
- SMS or UART power mode command
- Motion detect (if detector installed and enabled)

When in a power down mode, the following resources will cause interrupts that will wake the FJ1100L and cause it to attempt complete the function associated with the interrupt. Simultaneous interrupts will cause sequential completion of each associated function. These interrupts include:

- Report timer
- GPIO change
- Battery threshold
- Heartbeat

- Power-up

The related interrupt function will be attempted for a total duration set the associated parameter in the power mode command.

Reset

There is an internal soft reset.

Test Method

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** • **Humidity Test**
RF Test	• **RF Performance Test** • **GPS Performance Test** • **Antenna Performance Test**

Software Test

Test Environment Construct

- message Test environment

  1. usb dongle and PC as message server
  2. send message to FJ1100L

- UDP Test environment

  1. connect dongle to PC and create dialup as ip server

- UART Test environment

  1. connect FJ1100L to pc with com serial cable
  2. open Terminal tool and send at command
  3. reponse can be shown at terminal window

4 Event codes

The table below relates the Event codes in the message to the reason the message was generated:

Message #	Message Type	Description
0	Interval	Auto Report (auto report when moving)
1	Vibration	Vibration alarm(report when GPS is OFF and vibration detected)
2	Power Disconnect	Power cut alarm (report when external power is cut off)
3	Power Connect	Power connected alarm (external power has been connected)
4	Ignition ON	Hardwired or Virtual Ignition ON detected
5	Ignition OFF	Hardwired or Virtual Ignition OFF detected
6	Input 2 High	Input2 high alarm
7	Input 2 Low	Input2 low alarm
8	Stop	Device has stopped moving
9	Heartbeat	Heartbeat periodic report
13	Input 1 High	Input1 high alarm
14	Input 1 Low	Input 1 Low alarm
19	Crash Alarm	Crash Detected
24	Heading Change	Heading change detected
25	Tow Alert	Device is moving but being pulled
35	Starter Disabled	An output has been set by SMS command
36	Starter Enabled	An output has been cleared by SMS command
41	Harsh Accel	Harsh acceleration has been detected
42	Harsh Brake	Harsh Braking has been detected
43	Swerve Left	A left swerve has been detected
44	Swerve Right	A right swerve has been detected

Generation of these messages will occur based on the configuration settings on the device. The device is preconfigured by the software loaded on the device in the factory. The defaults in the software may vary depending on the configuration ordered with devices

FCC Regulations

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.

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.

Caution ：

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

The devise cannot be used within 20cm of any persons and must not be colocated within 20cm of other transmitter antennas