



# GV350M Series User Manual

EGPRS/LTE Cat-M1/LTE Cat-NB1/GNSS Tracker

QSZTRACGV350MUM0106

Version: 1.06

*International Telematics Solutions Innovator*

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## 0. Revision History

Version	Date	Author	Description of Change
1.00	2018-02-03	Jake Su	Initial
1.01	2018-04-25	Jake Su	Revision
1.02	2018-05-25	Jake Su	Revision
1.03	2018-05-28	Jake Su	Revision
1.04	2018-08-10	Jake Su	Fixed picture
1.05	2018-11-06	Jake Su	Modify interface definition
1.06	2019-02-12	Jake Su	Modify Chapter 6.16

## 1. Introduction

The GV350M Series is compact GPS trackers designed for a wide variety of vehicle tracking applications. It has multiple I/O interfaces that can be used for monitoring or controlling external devices. The GV350M Series supports various bands of LTE Cat-M1 (eMTC) and LTE Cat-NB1 (NB-IoT) used by North American and European cellular operators. The built-in GPS receiver has superior sensitivity and fast initial positioning. Its built-in 3-axis accelerometer allows motion detection and sophisticated power management algorithms extend battery life. System integration is straightforward as complete documentation is provided for the full featured @Track protocol. The @Track protocol supports a wide variety of reports including emergency alarm, Geo-fence boundary crossings, external power supply monitoring and position reports.

### 1.1. Reference

Table 1. GV350M Series Protocol Reference

SN	Document Name	Remark
[1]	GV350M Series @Track Air Interface Protocol	The air interface protocol between GV350M and backend server.

### 1.2. Terms and Abbreviations

Table 2. GV350M Series Terms and Abbreviations

Abbreviation	Description
AIN	Analog Input
DIN	Digital Input
DOUT	Digital Output
GND	Ground
1W-DATA	1-Wire Data
RXD	Receive Data
TXD	Transmit Data
CANH	High-level CAN Bus Line
CANL	Low-level CAN Bus Line

## 2. Product Overview

### 2.1. Product Appearance







Figure 1. Appearance of GV350M

## 3. Parts List

Before starting, check whether all the following items have been included with your GV350M. If anything is missing, please contact your supplier.

Table 3. GV350M Series Parts List

Name	Picture
GV350M Locator	 80*49*26 mm
User Cable	
GPS Antenna (Optional)	
DATA_CABLE_M (Optional)	

## 4. Interface Definition

The GV350M has a 16-pin interface connector which contains the connections for power, I/O, RS232, 1-Wire, CAN, etc. The sequence and definition of the 16-pin connector are shown in the following figure:

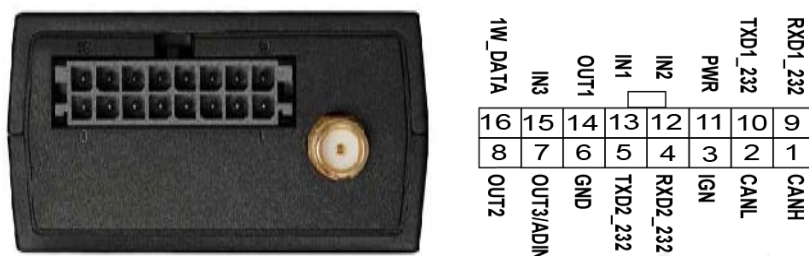


Figure 2. The 16-pin Connector on the GV350M

Table 4. Description of 16-pin Connections

Pin No.	Pin Name	Function Description
1	CANH	CAN Bus H
2	CANL	CAN Bus L
3	IGN	Ignition detection input, positive trigger
4	RXD2_232	The 2nd external RXD_232
5	TXD2_232	The 2nd external TXD_232
6	GND	Ground
7	ADIN/OUT3	One special I/O can be configured as a 0-32V analog input or an open drain output with 150 mA max drive current
8	OUT2	Open drain output2, 150mA max drive current
9	RXD1_232	The 1st external RXD_232
10	TXD1_232	The 1st external TXD_232
11	PWR	DC power 8-32V
12	IN2	Negative trigger input2
13	IN1	Negative trigger input1
14	OUT1	Open drain output1, 150mA max drive current
15	IN3	Negative trigger input3
16	1W_DATA	1-Wire data

## 5. GV350M Device Cable Color

Table 5. GV350M Device Cable Color Definition

Definition	Color	No.	Cable	No.	Color	Definition
1 W_DATA	Green	16		8	Gray	OUT2
IN3	Pink	15		7	Brown	ADIN/OUT3
OUT1	Yellow	14		6	Black	GND
IN1	Orange	13		5	Orange/Black	TXD2_232
IN2	Blue	12		4	Orange/White	RXD2_232
PWR	Red	11		3	White	IGN
TXD1_232	Gray/White	10		2	Brown/Black	CANL
RXD1_232	Gray/Black	9		1	Brown/White	CANH



## 6. Getting Started

### 6.1. Open the Case



Figure 3. Open the Case

Insert the opener into the gap of the case as shown above, and push the opener up until the case is unsnapped.

### 6.2. Close the Case



Figure 4. Close the Case

Place the cover on the bottom at the position as shown in the figure above. Slide the cover against the direction of the arrow until it snaps.

### 6.3. Install a SIM Card

Install the SIM card into the holder when power is off as shown below (unplug the 16-pin cable and switch the internal battery to OFF position). Take care to align the cut mark. Close the card holder and then close the case.



Figure 5. SIM Card Installation

## 6.4. Install the Internal Backup Battery

GV350M has an internal backup Li-ion battery.



Figure 6. Backup Battery Installation

## 6.5. Switch on the Backup Battery

To use the GV350M backup battery, the switch must be at the ON position. The switch and the ON/OFF position are shown as below.



Figure 7. Switch and ON/OFF Position

### Note:

1. The switch must be at the "OFF" position when the GV350M is shipped on an aircraft.
2. When the switch is at the "OFF" position, the battery can be charged, but cannot be discharged.

## 6.6. Install the External GPS Antenna (Optional)

There is an SMA GPS antenna connector on GV350M. The GV350M will automatically detect and use the external antenna when it is connected.



Figure 8. GPS Antenna of GV350M

## 6.7. Power Connection

PWR (pin 11)/GND (pin 6) are the power input pins. The input voltage range for this device is from 8V to 32V. The device is designed to be installed in vehicles that operate on 12V or 24V systems without the need for external transformers.

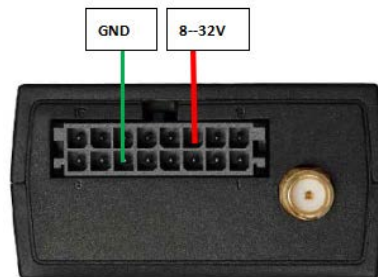


Figure 9. Typical Power Connection

## 6.8. Ignition Detection

IGN (pin 3) is used for ignition detection. It is recommended to connect this pin to the “RUN” position of the vehicle ignition switch as shown below.

An alternative to connect to the ignition switch is to find a non-permanent power source that is only available when the vehicle is running, for example, the power source for the FM radio.

IGN signal can be configured to transmit information to the backend server when ignition is on and enter the power saving mode when ignition is off.

Table 6. Electrical Characteristics of Ignition Detection

Logical State	Electrical Characteristics
Active	5.0V to 32V
Inactive	0V to 3V or open loop

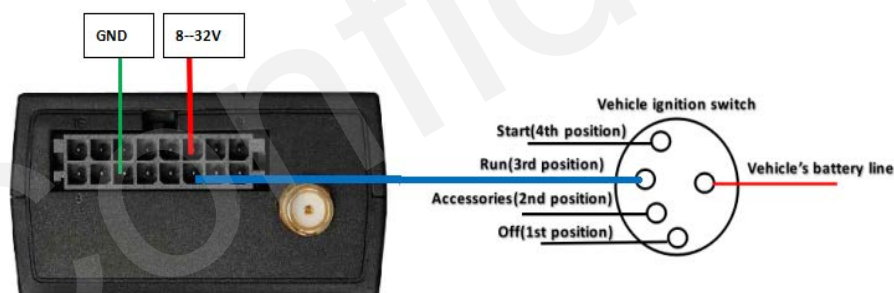


Figure 10. Typical Ignition Detection Connection

## 6.9. Digital Inputs

There are three general purpose digital inputs on GV350M. They all are negative triggers.

Table 7. Electrical Characteristics of the Digital Inputs

Logical State	Electrical Characteristics
Active	0V to 0.8V
Inactive	Open loop

The following picture shows the recommended connection of a digital input.

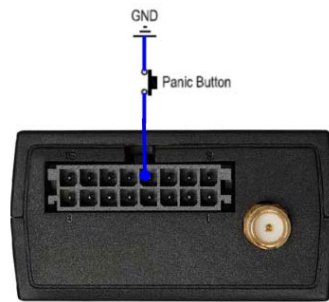


Figure 11. Digital Input Connection

### 6.10. Analog Inputs

There is one analog input on GV350M, and the analog input voltage range is from 0V to 32V. The following picture shows the recommended connection.

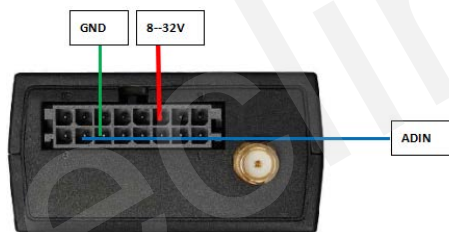


Figure 12. Analog Input Connection

**Note:**

Pin 7 is a multifunctional pin. It can be configured as a digital output or an analog input.

### 6.11. Digital Output

There are three digital outputs on GV350M. All are of open drain type and the maximum drain current is 150 mA. Each output has a built-in over current PTC resettable fuse.

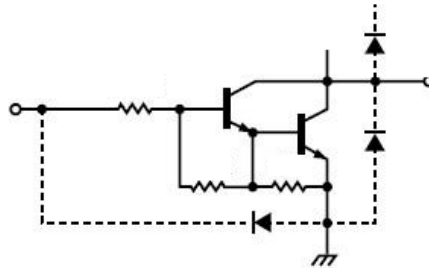


Figure 13. Digital Output Internal Drive Circuit

Table 8. Electrical Characteristics of Digital Outputs

Logical State	Electrical Characteristics
Enable	<1.5V @150 mA
Disable	Open drain

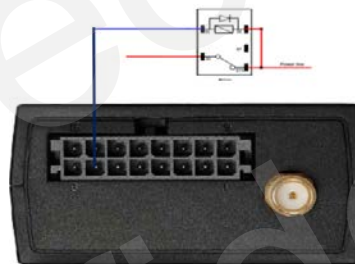


Figure 14. Typical Connection with a Relay

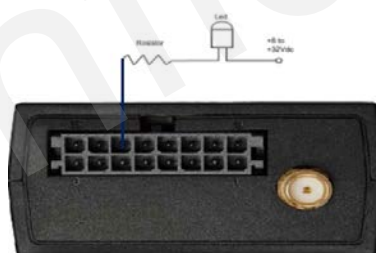


Figure 15. Typical Connection with a LED

**Note:**

1. OUT1 will latch the output state during reset.
2. Pay attention to the polarity of the relay if it is pre-installed with an internal flyback diode during connection. Install an additional diode externally if there is no pre-installed internal diode. A common diode such as a 1N4004 one will work in most circumstances.

## 6.12. Device Status LED

Table 9. Definition of Device Status and LED

LED	Device Status	LED Status
CEL (Note 1)	Device is searching CEL network.	Fast flashing
	Device has registered to CEL network.	Slow flashing
	SIM card needs PIN to unlock.	ON
GPS (Note 2)	GPS chip is powered off.	OFF
	GPS sends no data or data format error occurs.	Slow flashing
	GPS chip is searching GPS signal.	Fast flashing
	GPS chip has received GPS signal.	ON
PWR (Note 2)	No external power and internal battery voltage is not lower than 3.65V.	OFF
	No external power and internal battery voltage is below 3.65V.	Slow flashing
	External power in and internal battery is charging.	Fast flashing
	The external power is connected and the battery is not in the charging state.	ON

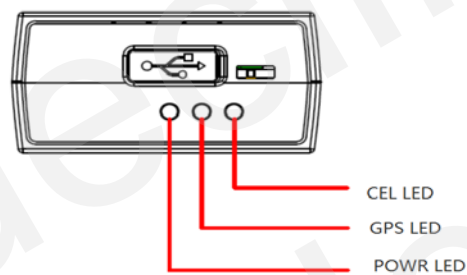


Figure 16. GV350M LEDs

### Note:

1. CEL LED cannot be configured
2. GPS LED and PWR LED can be configured to turn off by using the Manage Tool
3. Fast flashing: About 100ms ON/200ms OFF
4. Slow flashing: About 200ms ON/1000ms OFF

## 6.13. Serial Port/UART Interface

There are four lines dedicated to the Serial Port/UART interface (TXD1 TXD2 RXD1 RXD2). TXD/RXD is standard RS232 signal.

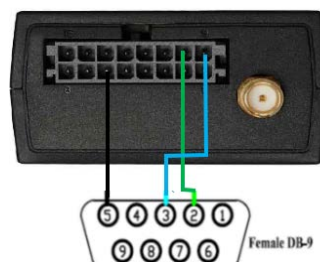


Figure 17. Connection with RS232 Port

### 6.14. 1-Wire Devices Connection

Standardly, GV350M Series 1-Wire device uses two-wire connection (short circuit VDD with GND for DS18B20).



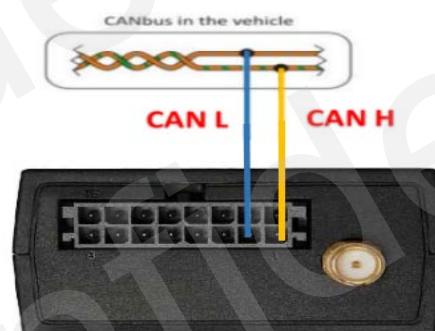
**Two-wire Connection**

Figure 18. 1-Wire Devices Connection

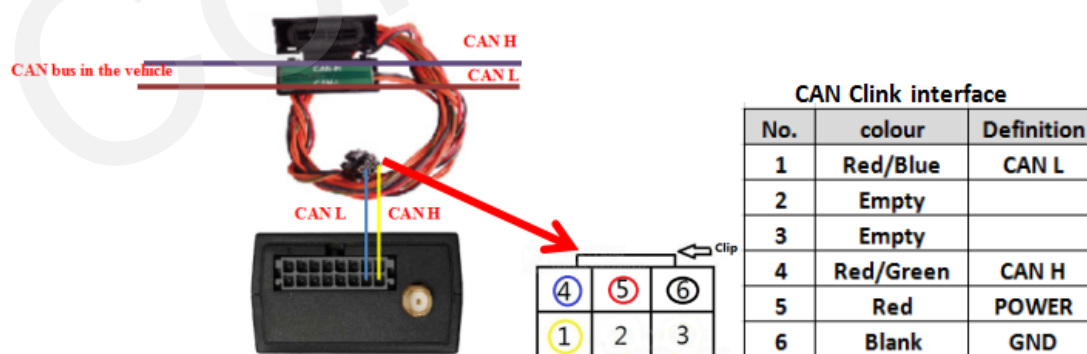
### 6.15. CAN Bus Devices Connection

GV350M Series can support CAN interfaces, which directly decode information from the ECU of multiple types of vehicles without depending on external devices. The firmware is developed based on J1939 protocol. It mainly consists of the Ignition Detection Process, CA (Claim Address) Request Process and VIN Request Process.

CAN equipment is connected via stripping connection or induction connection (CANL and CANH of CAN equipment are clipped by CAN Clink developed by Queclink to read relevant parameters).



A. Stripping Connection



B. Induction Connection

Figure 19. GV350M CAN Bus Connection

**Note:**

1. Ignition Detection Process: After CAN function is enabled, device first detects ignition status. Ignition can be divided into two forms, one is wire ignition, the other is non-wire ignition which is determined by if the RPM is greater than 0, if it is greater than 0, non-wire ignition is considered to have occurred. If neither form of ignition is detected it would be considered that ignition is off.
2. CA Request Process: After ignition is detected, if no valid CAN Bus address is detected, device will send CA request to CAN Bus. It would auto exit CA request process if CA request is successful or no valid request is retrieved within 60s.
3. VIN Request Flow Chart: After ignition is detected and CA request is successful, device will further initiate VIN request. The request interval is once per 12s. It would auto end VIN request process if VIN request is successful or no valid VIN retrieved within 120s.
4. Currently, CAN parameters in the following table are supported.

No.	Parameter Name	Acquisition Mode	Description	Related to GTCAN
1	Doors	Broadcast	Door status: opened/closed	<Doors>
2	Total distance	Broadcast	Accumulated total distance of vehicle	<Total Distance>
3	Total fuel used	Broadcast	Accumulated fuel used volume	<Total Fuel Used>
4	Total driving hours	Broadcast	Accumulated total driving hours	<Total Driving Time>
5	Fuel level in liter	Broadcast	Remaining fuel level	<Fuel Level>
6	Fuel level in percent	Broadcast	Remaining fuel level percentage	<Fuel Level>
7	Current fuel consumption	Broadcast	Current fuel consumption rate(L/100Km or L/H)	<Fuel Consumption>
8	Vehicle speed	Broadcast	Driving speed	<Vehicle Speed>
9	Engine speed	Broadcast	Engine rotate speed	<Engine RPM>
10	Accelerator pedal pressure	Broadcast	Percentage of accelerator pedal position	<Accelerator Pedal Pressure>
11	Engine coolant temperature	Broadcast	The temperature of engine coolant	<Engine Coolant Temperature>
12	Total engine idle time	Broadcast	Accumulated engine idle time (idle state)	<Total Engine Idle Time>
13	Total idle fuel used	Broadcast	Accumulated engine idle fuel consumption (idle state)	<Total Idle Fuel Used>
14	Axle weight	Broadcast	Vehicle axle weight	<Axle Weight>
15	Lights	Broadcast	Lights status	<Lights>
16	VIN	Request	Vehicle identification number	<VIN>



## 7. Troubleshooting and Safety Info

### 7.1. Troubleshooting

Table 10. GV350M Series Troubleshooting List

Problem	Possible Reason	Solution
After GV350M Series is turned on, the CEL LED always flashes quickly.	The signal is too weak. GV350M Series isn't registered to the network.	Move GV350M Series to a place with good network coverage.
Messages can't be reported to the backend server by GPRS.	APN is wrong. Some APNs cannot visit the internet directly.	Ask the network operator for the right APN.
	The IP address or port of the backend server is wrong.	Make sure the IP address for the backend server is an identified address in the internet.
There is no response from UART when GV350M Series is configured by using UART.	GV350M Series is in power saving mode.	Retry GV350M Series Manage Tool to wake up the device.
GV350M Series can't get successful GPS fix.	The GPS signal is weak.	Move GV350M Series to a place with open sky.
		It is better to let the top surface face the sky.

### 7.2. Safety Info

- ◆ Do not disassemble the device by yourself.
- ◆ Do not put the device in the overheated or too humid place, and avoid exposure to direct sunlight. Too high temperature will damage the device or even cause battery explosion.
- ◆ Do not use GV350M on the airplane or near medical equipment.

## 8. Appendix: Supported Accessories

- ◆ DATA\_CABLE\_M
- ◆ Active\_Buzzer\_1M
- ◆ 1-Wire temperature sensor
- ◆ Relay with socket
- ◆ RS232 camera
- ◆ Antenna\_GPS\_SMA\_3M
- ◆ UFS
- ◆ Garmin
- ◆ RFID reader (DR100 and DR102)