

0. Introduction

The RR MAX Series are GSM and LTE micro GPS trackers designed for a wide variety of vehicle tracking applications. They have multiple I/O interfaces that can be used for monitoring or controlling external devices. The built-in GPS receiver has superior sensitivity and fast time to first fix. Their multiband LTE Cat-M1 and Cat-NB1 allow the RR MAX Series location to be monitored in real time or periodically tracked by a backend server and mobile devices. 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, as well as external power supply monitoring and position report

0.1. Reference

Table 1: RR MAX Protocol Reference

SN	Document name	Remark
[1]	RR MAX @Track Air Interface Protocol	The air protocol interface between RR MAX and backend server.

0.2. Terms and Abbreviations

Table 2: Terms and Abbreviations

Abbreviation	Description
RXD	Receive Data
TXD	Transmit Data
VIN	External DC Power Input
IGN	Ignition
OUT1/IN1	Output 1 / Input 1
OUT2	Output 2
GND	Ground

1. Product Overview

1.1. Appearance

Figure 1: RR MAX Appearance



1.2. Interface Definition

The RR MAX has a 7 PIN interface connector. It contains the connections for power, and I/O. The sequence and description of the 7PIN connector are shown in the following figure:

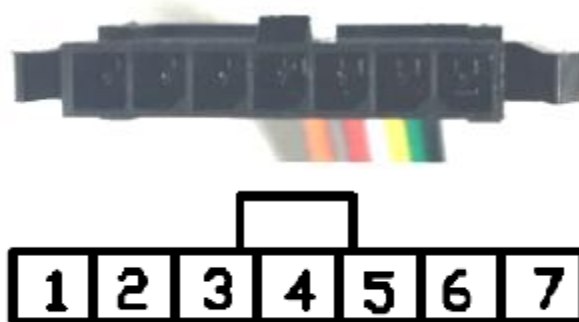


Figure 2: 7PIN Connector on the RR MAX

Table 3: Description of 7 PIN Connections

Index	Description	Comment
1	RXD	UART RXD; TTL
2	TXD	UART TXD; TTL
3	VIN	External DC power input, 8-32V
4	IGN	Ignition input, positive trigger
5	OUT1/IN1	Digital output/ input; Open drain, 150mA max
6	OUT2	Open drain, 150mA max
7	GND	GND

1.3. LED Description

RR MAX has two status LEDs which are CELL LED (Green color) and GPS LED (Red color).

CELL	Device is searching CELL network.	Fast flashing
	SIM card needs pin code to be unlocked.	ON
	Device has registered to CELL network.	Slow flashing
GPS	GPS is sleep.	OFF
	GPS is fixed.	ON
	Device is searching GPS.	Fast flashing

Table 4: LED Description

Note:

1. Fast flashing is about 500ms ON / 1sec OFF.
2. Slow flashing is about 500ms ON / 15sec OFF.

1.4. Power Connection

VIN(PIN3)/GND (PIN7) 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/24V vehicle without the need for external transformers.

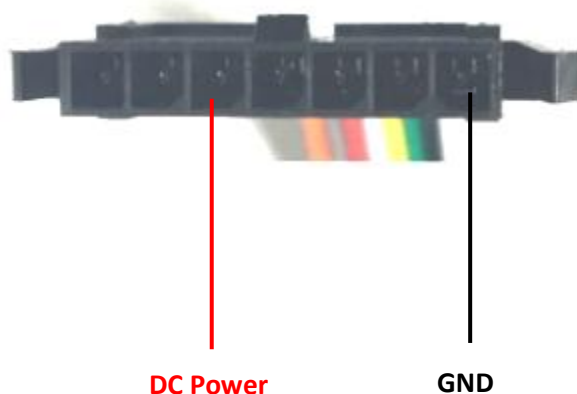


Figure 3: Typical Power Connection

1.5. Ignition Detection

IGN (Pin4) is used for ignition detection. It is strongly recommended to connect this pin to ignition key “RUN” position as shown below.

An alternative to connecting 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 start transmitting information to backend server when ignition is on, and enter power saving mode when ignition is off.

Table 5: Electrical Characteristics of Ignition Detection

Logical State	Electrical State
Active	5.0V to 32V
Inactive	0V to 3V or Open

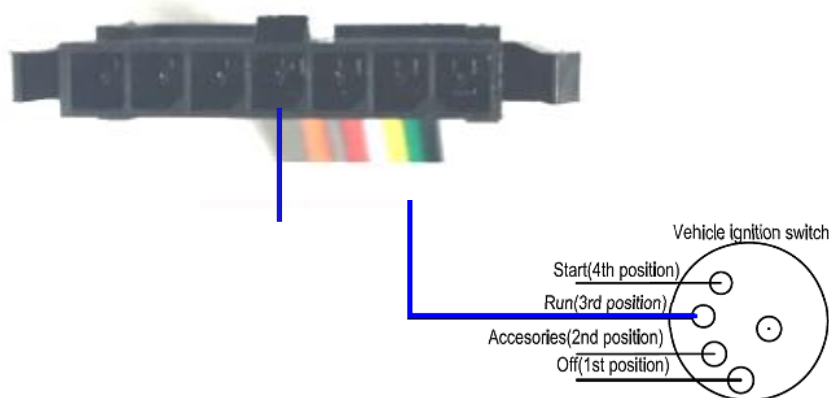


Figure 4: Typical Ignition Detection

1.6. Digital Output/ Input Connection

OUT1/IN1 (PIN5) is a digital Output/Input connection on RR MAX. It is open drain type and the maximum drain current is 150mA. The OUT1/IN1 (PIN5) can be used as a digital Output and a (negative trigger) digital Input.

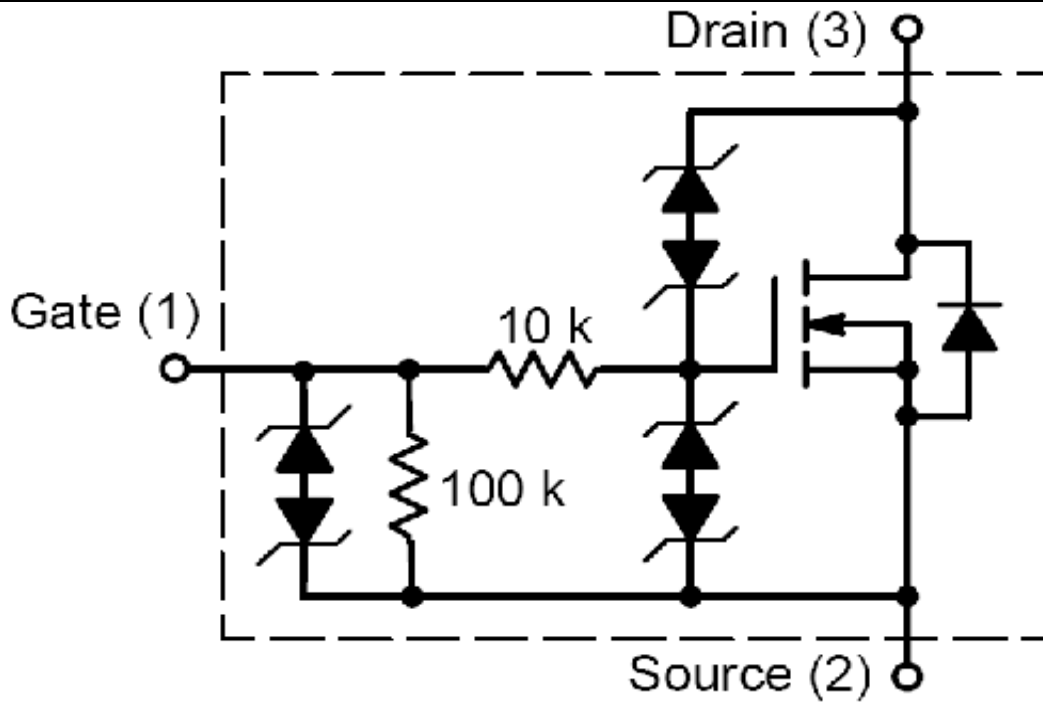


Figure 5: Digital Output Internal Drive Circuit

Table 6: Electrical Characteristics of Digital Output

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

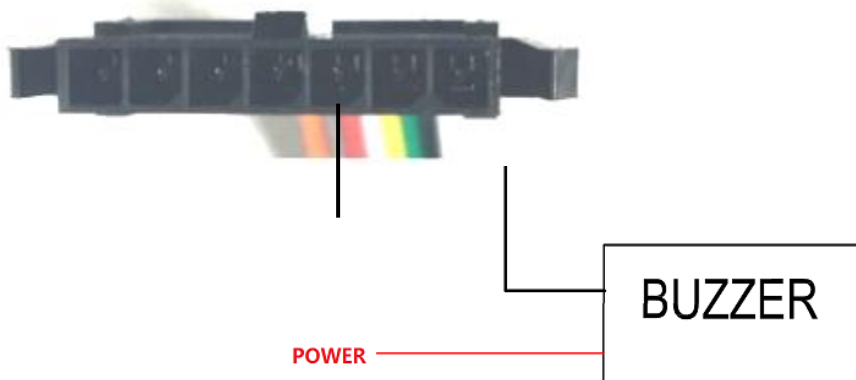


Figure 6: Typical Connection with Buzzer as Digital Output

Table 7: Electrical Characteristics of Digital Input

Logical State	Electrical Characteristics
Active	0V to 0.8V

Inactive	Open
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The following shows the recommended connection of a digital input.

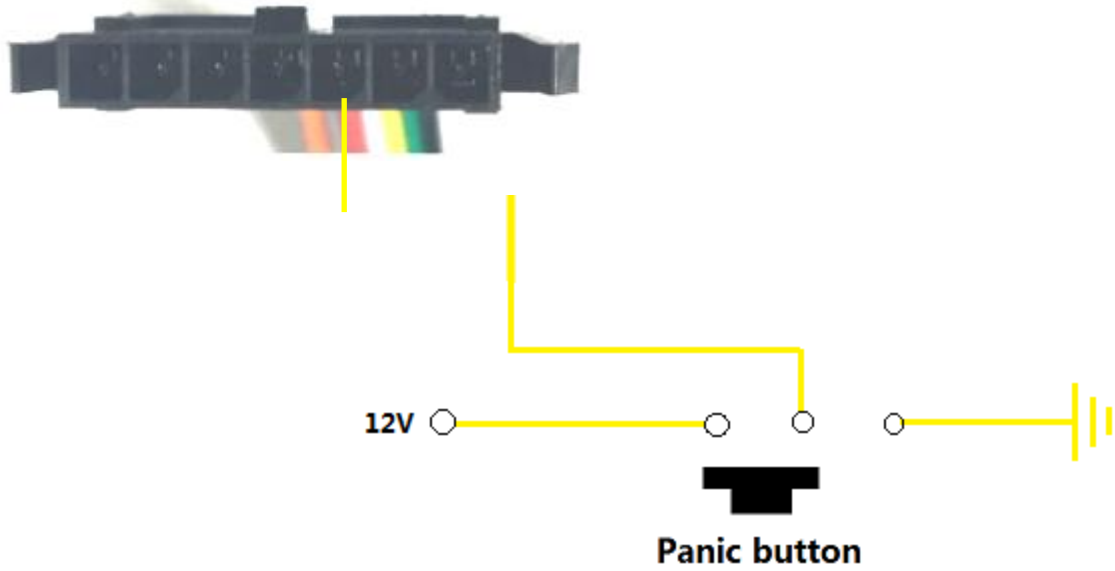


Figure 7: Typical Digital Input Connection

1.7. Digital Output

There is a digital output (PIN6) on RR MAX. It is open drain type and the maximum drain current is 150mA.

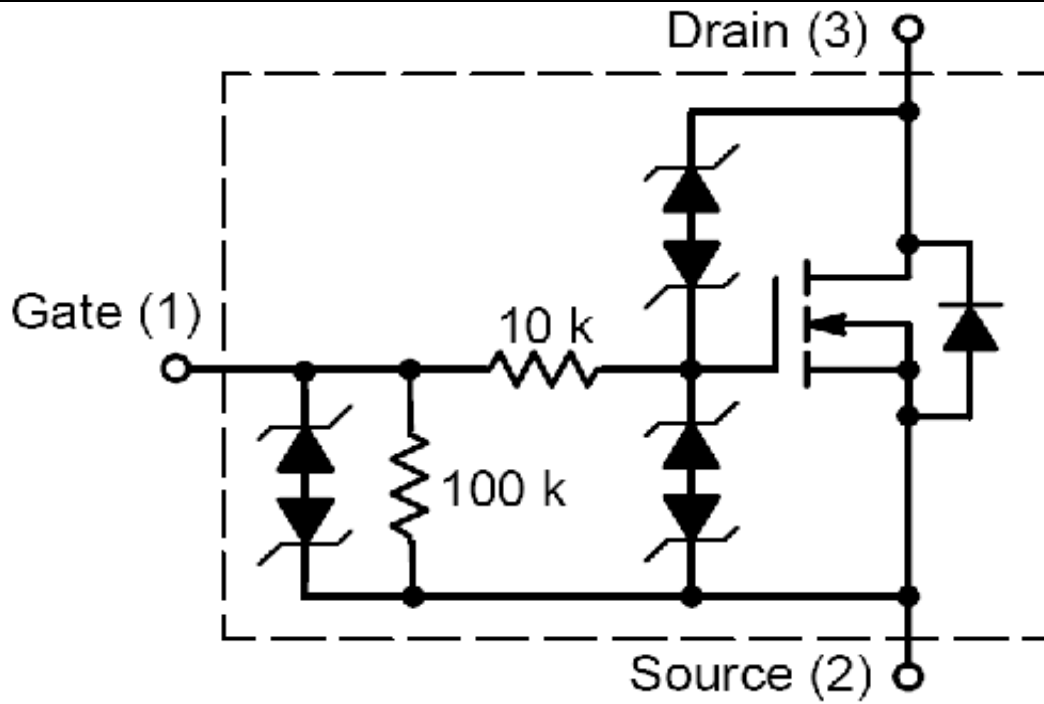


Figure 8: Digital Output Internal Drive Circuit

Table 8: Electrical Characteristics as Digital Outputs

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



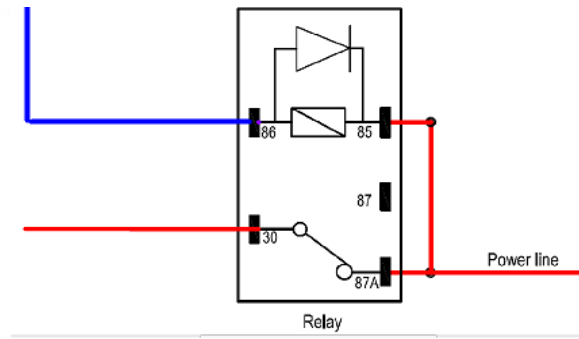




Figure 9: Typical Connection with Relay

2. Getting Started

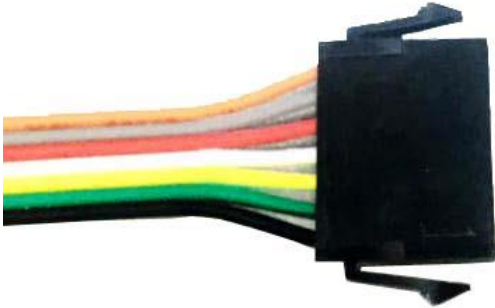
2.1. Parts List

Table 9: Parts List

Name	Picture
RR MAX Locator	 <p>90mm*55mm*13mm</p>
Extension Harness	

2.2. RR MAX Device Cable Interface

Table 10: RR MAX User Cable Colour Definition

Definition	Color	PIN No	Cable
RXD	Orange	1	
TXD	Gray	2	
VIN	Red	3	
IGN	White	4	
OUT1/IN1	Yellow	5	
OUT2	Green	6	
GND	Black	7	

2.3. Open the SIM Card cover

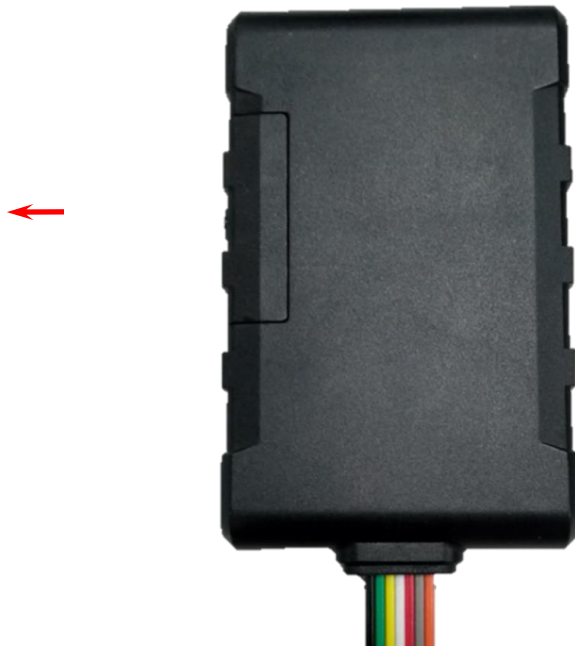


Figure 1. Open the SIM card cover

Follow the direction on the case and push to open the SIM card cover.

2.4. Close the SIM Card Cover



Figure 2. Close the SIM card Cover

Align and push to close the SIM card cover.

2.5. Install a SIM Card

Ensure the device is not powered (unplug the 7Pin cable to the OFF position) when inserting the SIM card into the holder, which shown below. Take care to align the cut mark, and then close the case.

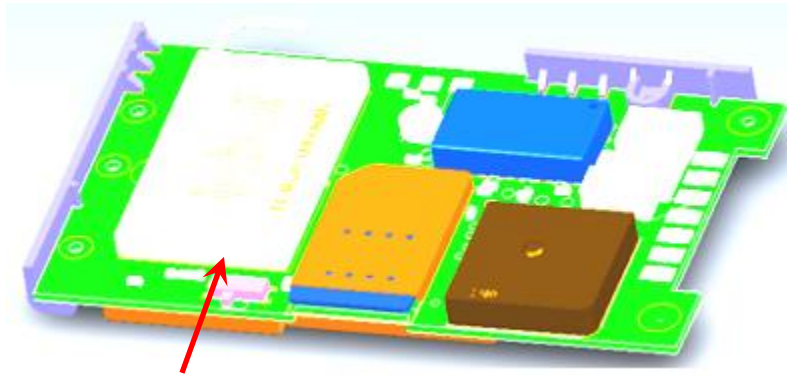


Figure 3. SIM Card Installation

2.6. Switch on the Backup Battery

To use the RR MAX backup battery, the switch must be in the ON position. The switch on the PCB board and the ON/OFF position are shown below.

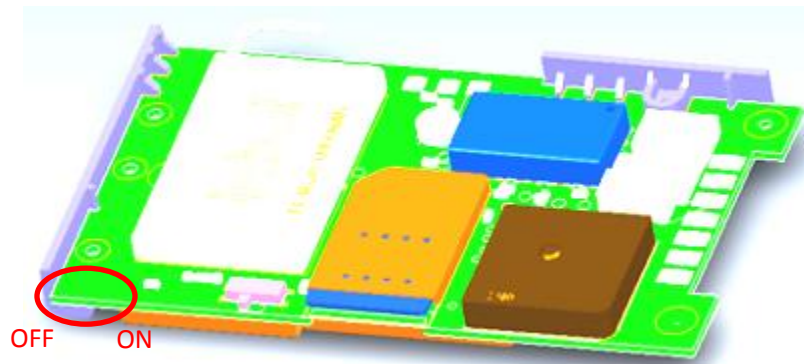


Figure 4. Switch ON/OFF Position

Note:

1. The switch must be in the "OFF" position when the RR MAX is being shipped on an aircraft.
 2. When the switch is in the "OFF" position, the battery cannot be charged or discharged and cannot be turned on.
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3. Troubleshooting and Safety Info

3.1. Troubleshooting

Trouble	Possible Reason	Solution
After RR MAX is turned on, the CELL LED always flashes quickly.	RR MAX isn't registered to the ISP.	Please register the RR MAX again and make sure the device gets the correct MDN.
	The signal is too weak; RR MAX can't be registered to the network.	Please move RR MAX into places with good LTE coverage.
Messages can't be reported to the backend server by LTE.	The IP address or port of the backend server is wrong.	Make sure the IP address for the backend server is an identified address on the Internet.
RR MAX cannot power off no matter the device was in charge or not.	Unable to power off RR MAX if charger is connected.	Disconnect charger, and try again.
RR MAX can't get successful GPS fixing.	The GPS signal is weak.	Please move RR MAX to a place with open sky.
		It is better to let the top surface face to sky. (The device has an LED indicator on the top surface.)

3.2. Safety Info

- Please do not disassemble the device by yourself.
- Please do not put the device in over heated too humid place, and avoid exposure to direct sunlight. Too high temperature will damage the device or even cause battery explosion.
- Please do not use RR MAX on the airplane or near medical equipment.