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AVL-300

Automatic Vehicle Tracking Device

USER MANUAL

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Revision History

Revision	Date	Author	Description of change
1.00	2011-8-10	Owen Feng	Initial
1.01	2011-8-19	Owen Feng / Lei/Vivi	First review
1.02	2011-09-09	Owen Feng	Add picture of new case(V3)
1.03	2011-09-27	Owen Feng	1- add “Switch ON the Backup Battery” 2- add new feature output with PTC over current protection
1.04	2011-10-10	Owen Feng	1-page 7 add notes of FCC
1.05	2011-12-16	Owen Feng	Add battery off position note

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1. Introduction

The AVL300 is a powerful GPS locator designed for vehicle or asset tracking. It has superior receiver sensitivity, fast TTFF (Time to First Fix) and supports Quad-Band GSM frequencies 850/900/1800/1900, its location can be monitored in real time or be periodically tracked by a backend server or other specified terminals. The AVL300 has multiple input/output interfaces that can be used for monitoring or controlling external devices. Based on the integrated @Track protocol, the AVL300 can communicate with a backend server through the GPRS/GSM network to transfer reports of Emergency, geo-fence boundary crossings, low backup battery or scheduled GPS position as well as many other useful functions. Users can also use AVL300 to monitor the status of a vehicle and control the vehicle by its external relay output. System Integrators can easily setup their tracking systems based on the full-featured @Track protocol.

This device complies with part 15B, part 22 and part 24 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference (2) this device must accept any interference, including interference that may cause undesired operation.

1.1. Reference

Table 1: AVL300 Protocol Reference

SN	Document name	Remark
[1]	AVL300 @Track Air Interface Protocol	The air protocol interface between AVL300 and backend server.

1.2. Terms and Abbreviations

Table 2: Terms and Abbreviations

Abbreviation	Description
AGND	Analog Ground
AIN	Analog Input
DIN	Digital Input
DOUT	Digital Output
GND	Ground
MIC	Microphone
RXD	Receive Data
TXD	Transmit Data
SPKN	Speaker Negative

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SPKP	Speaker Positive

2. Product Overview

2.1. **Parts List**

Before starting, check that the Device and Wiring harness have been included with your AVL300. The GPS antennae is optional and not included. If anything is missing, please contact your supplier.

Figure 1. Appearance of AVL300

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2.2. **Parts List**

Table 3: Part List

Name	Picture
AVL300 Locator	80*49*26 mm
User Cable	
Extend Cable (Optional)	
GPS Antenna (Optional)	
DATA_CABLE_M (Optional)	

2.3. **Interface Definition**

The AVL300 has a 16 PIN interface connector. It contains the connections for power, I/O, RS232, microphone, speaker, etc. The sequence and definition of the 16PIN connector are shown in following figure:

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Figure 2. The 16 PIN connector on the AVL300

Table 4: Description of 16 PIN Connections

Index	Description	Comment	Color
1	MICP	Single end, 2-2.2k microphone, internal bias	Grey
2	AGND	Analog ground	Grey W/Blk Stripe
3	IGN	Ignition input, positive trigger	White
4	RXD	UART RXD, RS232	Green
5	TXD	UART TXD, RS232	Black W/Wht. Stripe
6	GND	Power and digital ground	Black
7	OUT3	Open drain, 150mA max	Brown
8	OUT2	Open drain, 150mA max	Yellow
9	EARP	Differential output, 32ohm 1/4w speaker	Purple
10	EARN		Purple W/Wht Stripe
11	PWR	External DC power input, 8-32V	Red
12	IN2	Digital input, negative trigger	Orange W/Blk Stripe
13	IN1	Digital input, negative trigger	Orange
14	OUT1	Open drain, 150mA max ,with latch circuit	Blue
15	AD1/IN3	Multifunction input, analog or digital input	Green
16	AD2	Analog input 0-2.8v	Brown W/Wht Stripe

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3. Getting Started

3.1. **Opening the Case**

Figure 3. Opening the Case

Insert the triangular-pry-opener into the gap of the case as shown below, push the opener up until the case unsnapped.

3.2. **Closing the Case**

Figure 4. Closing the Case

Place the cover on the bottom in the position as shown in the following figure. Slide the cover against the direction of the arrow until it snapped.

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3.3. **Installing a SIM Card**

Open the case and ensure the unit is not powered (unplug the 16Pin cable and switch the internal battery to off position). Slide the holder right to open the SIM card. Insert the SIM card into the holder as shown below with the gold-colored contact area facing down taking care to align the cut mark. Close the SIM card holder. Close the case.

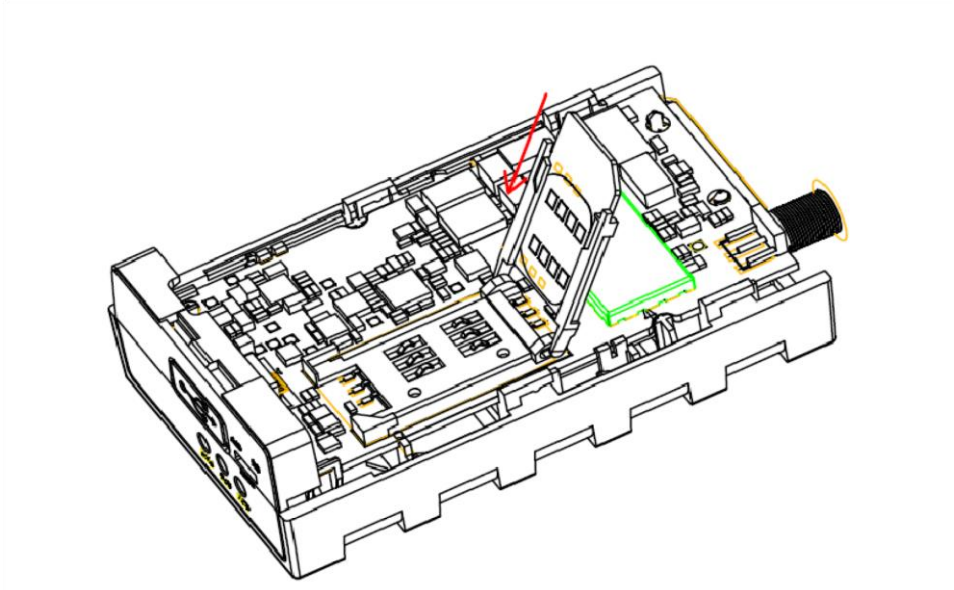

Figure 5. SIM Card Installation

3.4. **Installing the Internal Backup Battery**

Figure 6. Backup Battery Installation

There is an internal backup Li-ion battery,

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3.5. **Switch ON the Backup Battery**

To use the AVL300 backup battery, the switch must be at the ON position. Switch on the case and ON/OFF position are shown below.

Figure 7. Switch and ON/OFF position Note:

1-The switch must be on the “OFF” position when shipped on an aircraft.

2-When the switch is on the “OFF” position, the battery cannot be charged or discharged.

3.6. **Installing the External GPS Antenna (Optional)**

There is a SMA GPS antenna connector on AVL300. The AVL300 will automatically detect and use an external antenna when connected.

Figure 8. GPS Antenna of AVL300

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3.6.1. GPS Antenna Specification

Table 5: GPS Antenna Specification

GPS antenna:	Frequency: 1575.42MHz
Bandwidth:	>5MHz
Beam width:	>120 deg
Supply voltage:	2.7V-3.3V
Polarization:	RHCP
Gain:	Passive: 0dBi min Active: 15dB
Impedance:	50Ω
VSWR:	<2
Noise figure:	<3

3.7. Power Connection

PWR (PIN12) / GND (PIN6) 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.

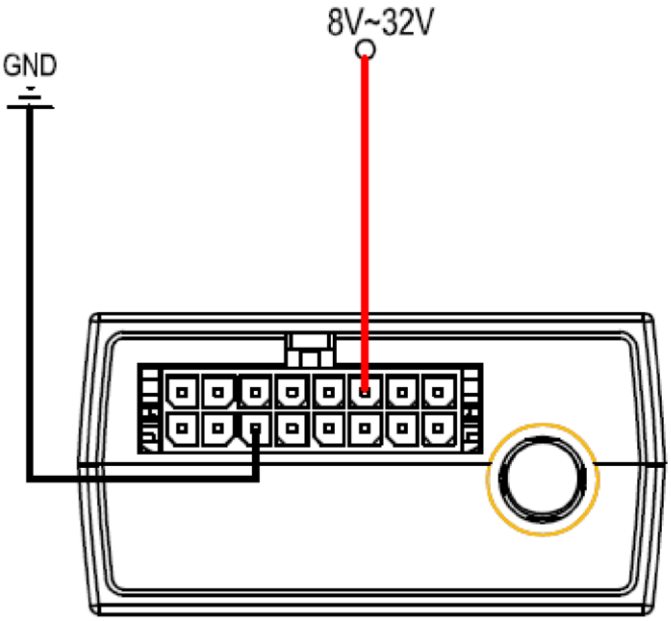

Figure 9. Typical Power Connection

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3.8. **Ignition Detection**

Table 6: Electrical Characteristics of Ignition Detection

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

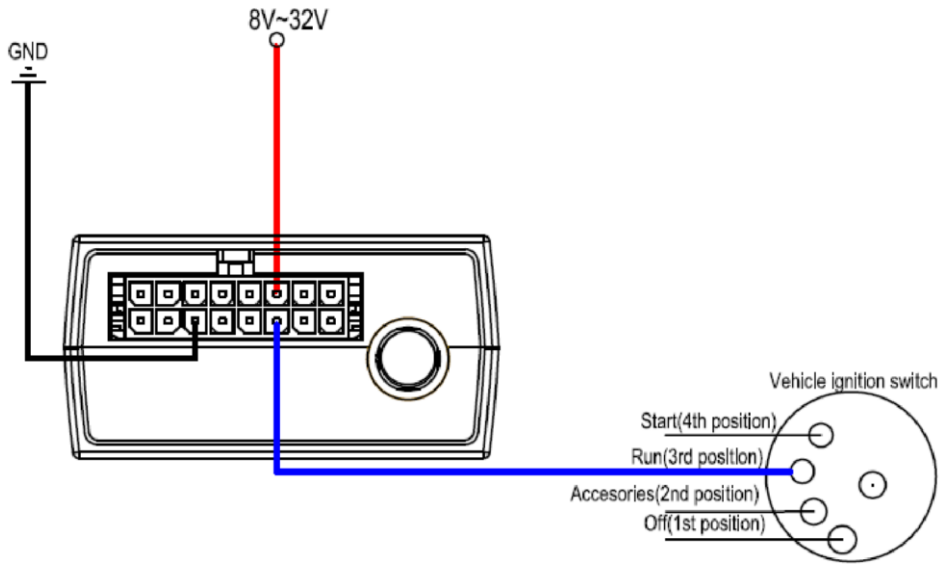

Figure 10. Typical Ignition Detection

IGN (Pin3) is used for ignition detection. It is strongly recommended to connect this pin to ignition key "RUN" position as shown. If you do not connect the ignition detection, not all functions of the device will be available.

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.

3.9. **Digital Inputs**

There are three general purpose digital inputs on AVL300. They are all negative trigger.

Table 7: Electrical Characteristics of the digital inputs

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

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

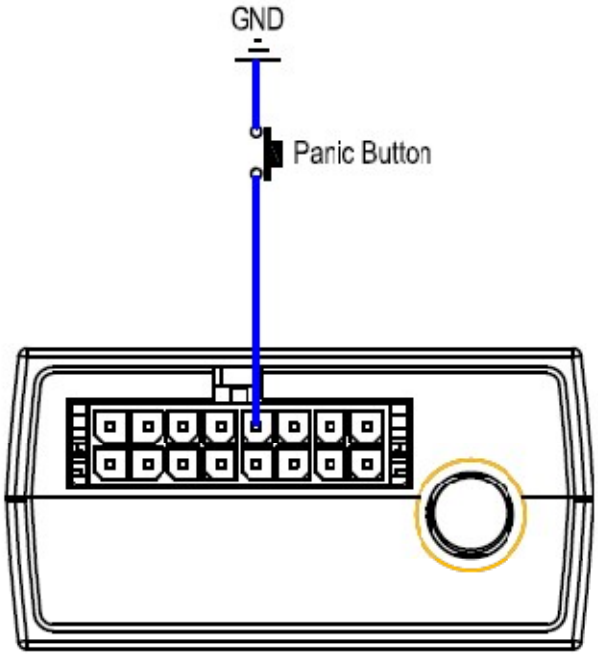

Figure 11. Typical Digital Input Connection

3.10. Analog Inputs

There are two analog inputs on AVL300, the analog input voltage range is from 0 to 2.8V.
The following diagram shows the recommended connection.

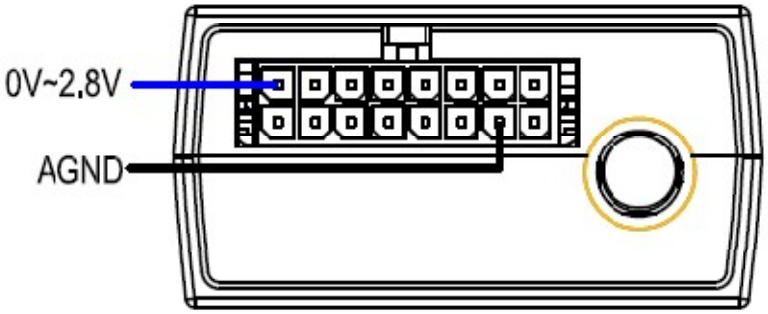

Figure 12. Typical Analog Input Connection

Note: PIN 15 is a multifunction pin: it can be configured as a digital input or an analog input.

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3.11. **Digital Outputs**

There are three digital outputs on AVL300. All are of open drain type and the maximum drain current is 150 mA. Each output has the built-in over current and recovery PTC fuse

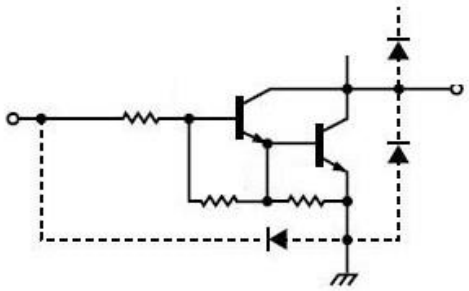

Figure 13. Digital Output Internal Drive Circuit

Table 8: Electrical Characteristics of Digital Outputs

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

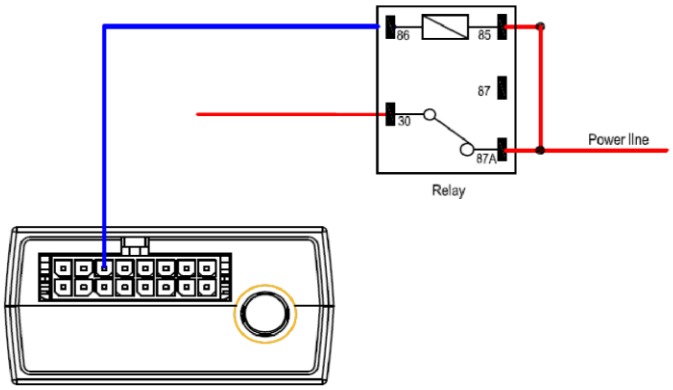

Figure 14. Typical Connection with Relay

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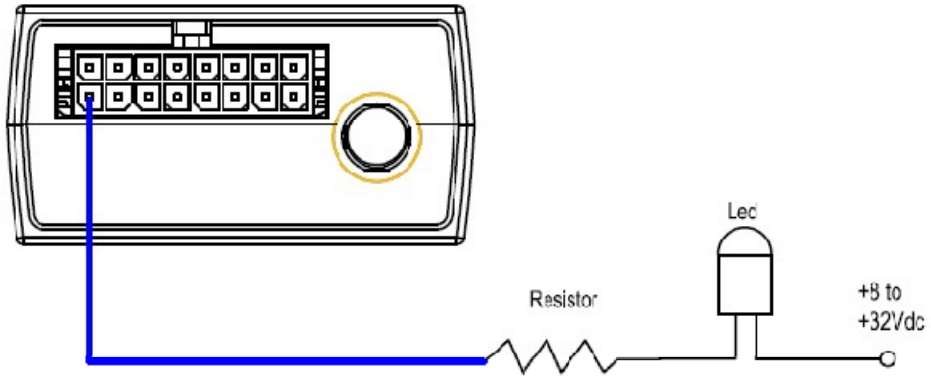

Figure 15. Typical Connection with LED

Note:

1. OUT1 will latch the output state during reset.
2. All outputs are internally pulled up to PWR pin by a diode. So no external flyback diode is needed when the output is connected to an inductive load.

3.12. **Device Status LED**

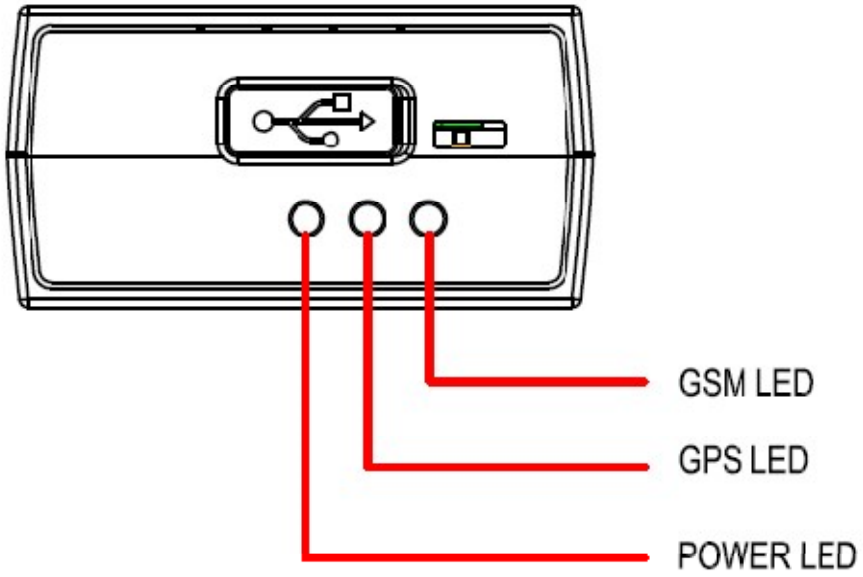

Figure 16. AVL300 LED on the Case

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Table 9: Definition of Device status and LED

LED	Device status	LED status
GSM (note1)	Device is searching GSM network	Fast flashing (Note3)
	Device has registered to GSM network.	Slow flashing (Note4)
GPS (note 2)	SIM card needs pin code to unlock.	ON
	GPS chip is powered off	OFF
	GPS sends no data or data format error.	Slow flashing
	GPS chip is searching GPS info.	Fast flashing
	GPS chip has gotten GPS info.	ON
PWR (note 2)	No external power and internal battery voltage is lower than 3.35V.	OFF
	No external power and internal battery voltage is below 3.5V.	Slow flashing
	External power in and internal battery is charging	Fast flashing
	External power in and internal battery is fully charged	ON

Note:

1 - GSM LED cannot be configured.

2 - GPS LED and PWR LED can be configured to turn off after a period of time using the configuration tool

3 - Fast flashing is about 60ms ON/ 780ms OFF

4 - Slow flashing is about 60ms ON/ 1940ms OFF

3.13. **Audio Interface**

The AVL300 offers a pair of differential outputs for an audio speaker and a signal-end microphone input. The audio output can be directly connected to 32ohm 0.25 w speaker.

To achieve higher power output, please use an external audio amplifier (not supplied)

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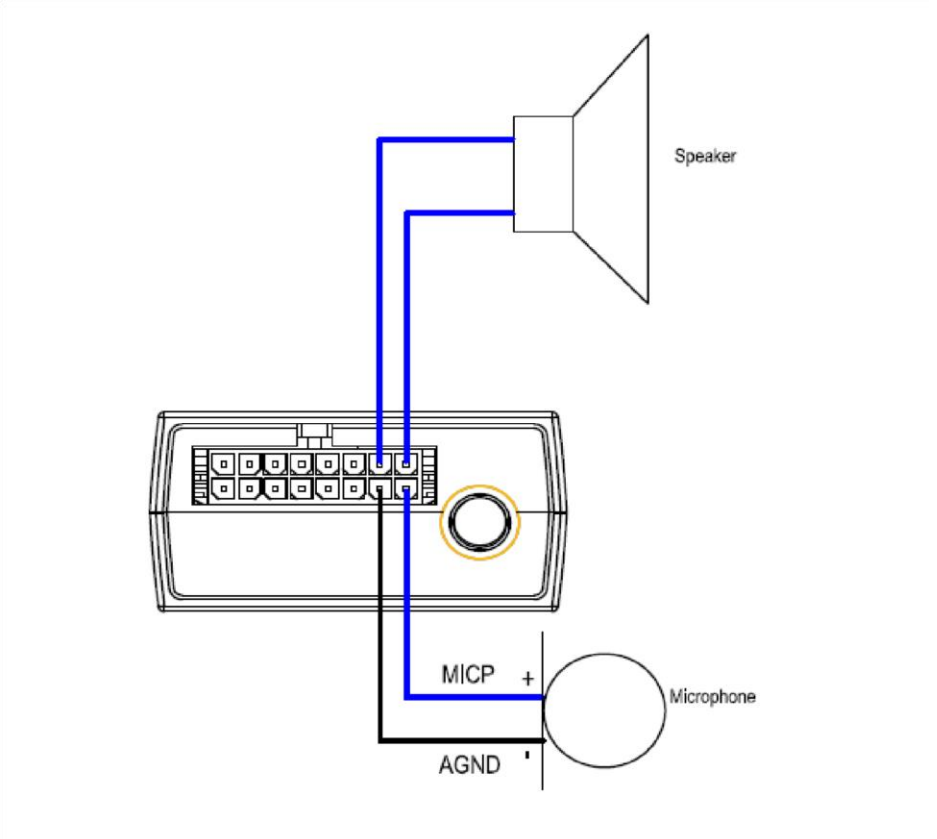

Figure 17. Typical Audio Connection

3.13.1. Microphone Input Characteristics

Table 10: The Characteristics of Microphone

Parameter	Min	Typ	Max	Unit
Working Voltage	1.0	1.5	2.0	V
Working Current	200		500	uA
External Microphone Load Resistance		2.2		k Ohm

Notes:

1. Using electret microphone, sensitivity of -42 ± 3 dB/Pa @ 2V, impedance 2.2kΩ.
2. 2 - For RF noise suppression, two capacitors that 10pF and 33pF are recommended to be included within the microphone.

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3.14. **Serial Port / UART Interface**

There are two lines dedicated to the Serial Port / UART interface (TXD and RXD).TXD / RXD are standard RS232 signal.

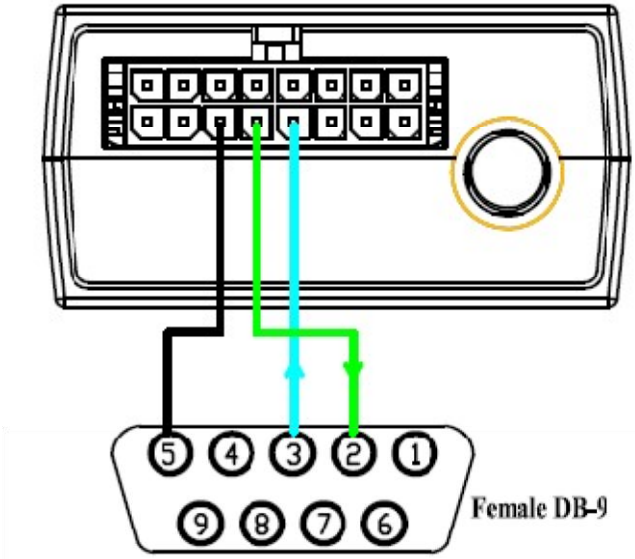

Figure 18. Typical Connection with RS232 Port

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