

# astra telematics

## AT201 LPWA – GPRS – GNSS Vehicle Tracking Device

### User Guide



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Device Hardware Version:	1.1
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# Abbreviations

ADC	Analogue to Digital Converter
ASCII	American Standard Code for Information Interchange (computer character set)
BLE	Bluetooth Low Energy
BT	Bluetooth
CAN	Controller Area Network
DC	Direct Current
FET	Field Effect Transistor
GIS	Geographic Information System
GPRS	General Packet Radio Service (part of GSM)
GPS	Global Positioning System
GSM	Global System for Mobile communication
IP	Internet Protocol (part of TCP/IP)
LED	Light Emitting Diode
LTE	Long-Term Evolution (wireless mobile communication standard)
MEMS	Micro Electro-Mechanical System
NMEA	National Marine Electronics Association (defined a GPS output format)
OTA	Over the Air (remote configuration of devices)
PC	Personal Computer
PCB	Printed Circuit Board
PDU	Protocol Description Unit (describes a binary SMS format)
RFID	Radio Frequency Identification
SIM	Subscriber Identity Module
SMS	Short Message Service
SMSC	Short Message Service Centre
SV	Satellite Vehicle
TCP	Transmission Control Protocol (part of TCP/IP)
UDP	User Datagram Protocol
WGS84	World Geodetic System 1984 (global co-ordinate system used by GPS)

# Product Overview

The AT201 is low-cost vehicle tracking device, housed in a compact ABS enclosure, with internal GNSS and GSM \ LTE antennas. The AT201 incorporates the very latest technology, including a Cortex M4 ARM low-power series processor, Quectel BG600L-M3 GPRS \ LTE communications and SAM-M8Q GNSS from ublox, supporting GPS, GLONASS, GALILEO and BeiBou. The AT201 operates from an external DC voltage source and has a 900mAh internal back-up battery, allowing operation for approx. xx hours in continuous mode, or xx days in low-power mode (daily reporting). Interconnections are made with a single 16-way connector.

## Features

The main features of the AT201 are highlighted below:

- Compact size
- Cortex M4 ARM Processor
- ublox SAM-M8Q GNSS
- Quectel BG600L-M3 GPRS + LTE Cat M1 + NB-IoT communications
- Internal GSM and Bluetooth antennas - PIFA PCB trace, high-sensitivity
- Internal GNSS antenna, 10mm ceramic patch
- Low power consumption (near zero current drain when vehicle ignition is off)
- 3 axis accelerometer (2/8g)
- CANBus
- ADC input, 80V range
- 2 digital inputs
- 2 digital outputs
- RS232 Port (TTL level option)
- Internal back-up battery, lithium-polymer, 900mAh
- Configuration by RS232, SMS or TCP/UDP
- Fast and reliable over the air firmware update
- Modular communications protocol X
- TCP or UDP mode
- Non-volatile storage for 2000 reports
- SDK available for rapid development of client customised applications
- Approved to: CE, 2004/104/EC

## Technical Specifications

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### GSM-EGPRS / LTE Cat M1 / Cat NB2 Communication

Communications Module:	Quectel BG600L-M3
GSM EGPRS Frequency Bands:	850/900/1800/1900 MHz
LTE Cat M1 Frequency Bands:	B1/B2/B3/B4/B5/B8/B12/B13/B14/B18/B19/B20/B25/B26/B27/B28/B66/B85
Cat NB2 Frequency Bands:	LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B28/B66/B71/B85
GSM Antenna:	Internal PIFA PCB trace
Data Transfer Modes:	TCP or UDP

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### GNSS Location

GPS Receiver:	ublox SAM-M8Q
GPS Antenna:	Internal 15 x 15 x 4mm ceramic patch
L1 Receiver:	72 channels
Position Accuracy:	2.5m CEP
Receiver Sensitivity:	-165dBm (GPS + GLONASS, tracking & navigation)
TTF: Cold start	26 sec
Hot start	1 sec
Anti-jamming:	Active CW detection and removal; extra onboard SAW band pass filter
Spoofing detection:	Built-in

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### Power

External Voltage Source:	5 – 65 VDC
Internal Battery:	3.7V, 900mAh
Battery Life:	?? hours continuous operation ?? days operation in low-power mode @ 1 hour reporting ?? days operation in low-power mode @ 1 day reporting
Current Consumption, max:	300mA @ 13.8 VDC (battery charging at max. rate)
Current consumption, average:	25mA @ 13.8 VDC (typical)
Current consumption, sleep:	< 100uA

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### Features

Configuration:	Astra Generic Configuration commands over SMS / TCP / RS232
Firmware update:	Supports Firmware Update Over-The-Air (FOTA)
Memory:	Total 1024k on-board non-volatile flash memory
Report storage:	6000 reports
Communication Protocol:	Astra Telematics Modular Protocol X via TCP / UDP sockets

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### Interconnections

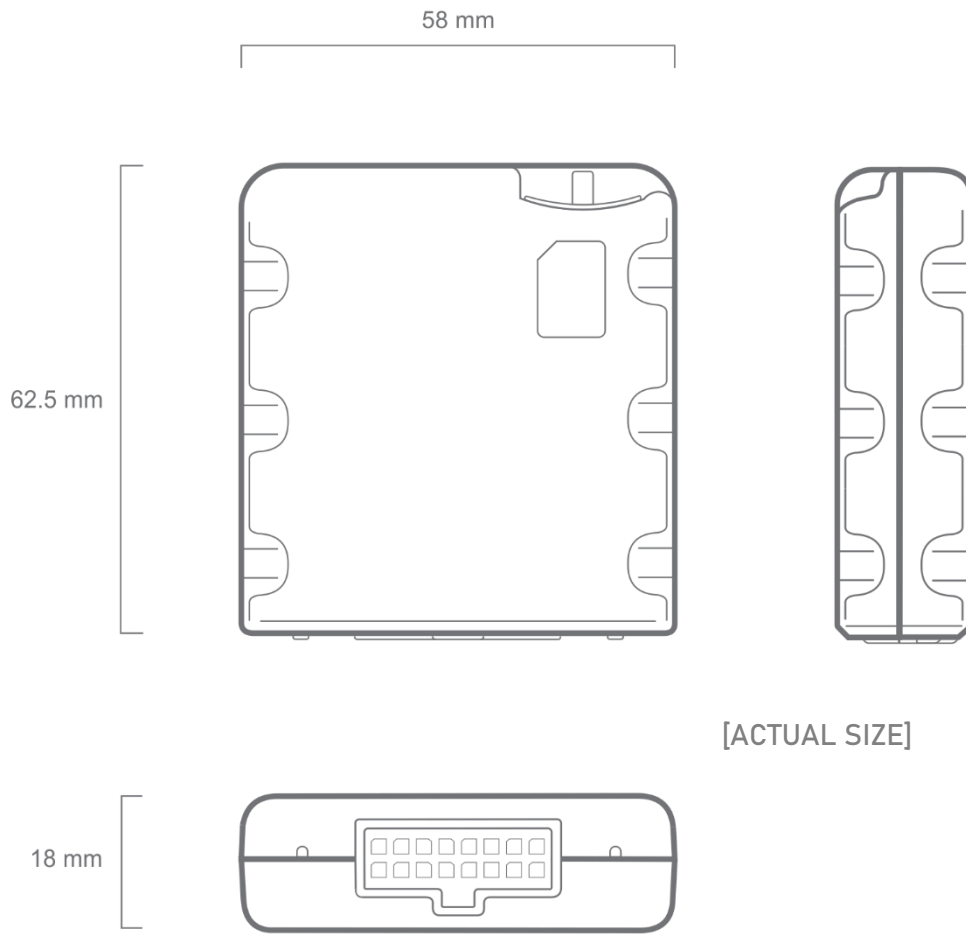
2 digital pull-up inputs  
2 digital outputs, 60V, 0.5A maximum, open drain (optional 3.3V drive)  
1-wire (dallas)  
ADC input, 0- 80V range  
CANBus / FMS 2.0 / OBD2  
1 RS232 serial port (TTL levels optional)

SIM: Mini SIM 2FF Format

POWER & DATA: Molex MicroFit 3.0, dual row, 16-way male

Weight  
Dimensions

55g  
62 x 58 x 18 mm



# Hardware Description

## Back-up battery

Each AT201 is supplied with a 900mAh internal lithium-polymer back-up battery.

## Basic electrical connections

A permanent connection to +12V/+24V vehicle power should be provided to the AT201 using the RED and BLACK wires, via a 1A fuse. If using a wired ignition-sense, connect this to digital input 1, again we recommend the use of a 1A fuse:

RED	+12 / +24V	1A FUSED
BLACK	GROUND	1A FUSED
WHITE	IGNITION	1A FUSED

All unused wires should be insulated to avoid undesired behaviour.

For a full table of AT201 connections please see page 7.

## Power requirements

The AT201 operates from a DC Voltage between 6 and 60 Volts (65V absolute maximum). We recommend that a permanent 'live' power source is used to supply the AT201. If current drain is of concern, please refer to the power down options which can be specified with the IGNM command.

## SIM installation

The SIM should be inserted in the slot at the rear of the device (with ABS enclosure fitted). The image on the device gives guidance for correct orientation. Note that the AT201 powers up when the SIM is inserted. For shipping with SIM fitted, we suggest extracting the SIM a few millimetres to power off the device.



## Status LEDs

GPS Status (green):	Constant ON Double Flash @ 1Hz Slow Flash @ 0.2Hz	Searching for initial fix GPS 3D navigation Lost GPS navigation
COMM Status (blue):	200 ms ON / 1800 ms OFF 1800 ms ON / 200 ms OFF Constant OFF	ON / SEARCHING registered on network Modem OFF

## Mounting

We recommend mounting the AT201 by either of the following methods:

- Double sided foam adhesive tape, using de-greaser / solvent on the vehicle surface
- Secure to vehicle using a cable tie, 5.0mm width to suit the cable tie guides on the device

## Orientation

For optimum GPS performance, please mount the AT201 with the 'SKY SIDE' facing the sky.

## Interconnections

All connections to the AT201 are provided by a single 16-way connector.

### AT201 Pin Applications and Colour Code

Pin	Function	Wire colour
1	JTMS	
2	ADC INPUT 1	VIOLET
3	RS232-TXD	GREEN
4	VIN 5 - 60 VDC	RED
5	DIGITAL INPUT 1	WHITE
6	DIGITAL OUTPUT 1	YELLOW
7	JTCK	
8	CANH	RED / WHITE
9	CANL	GREEN / YELLOW
10	DIGITAL OUTPUT 2	PINK
11	RS232-RXD	BLUE
12	GND	BLACK
13	DIGITAL INPUT 2	BROWN
14	IBUTTON	GREY
15	VDD-DIG	ORANGE
16	GND	

### Digital Inputs

Digital inputs 1 and 2 are suitable for use in 'power-take-off' applications and can be connected directly to 12/24V vehicle circuits.

### Digital Output

The AT201 is capable of switching 2 external loads of up to 60V, 0.5A using MOSFET Low Side Switches (open drain), which must be used to switch the GND side of the load. The use of a 1A in-line fuse with these switches is essential to prevent any damage through fault scenarios.

### Analogue to Digital Converter (ADC) Input

ADC1 can be used to measure analogue voltages up to 80.0V maximum

## **CANBus**

The AT201 has integrated CANBus. Please refer to CANBus and FMS Application Notes for details of supported protocols and features.

**IMPORTANT NOTE:** The CANBus pins are ESD protected to 15kV, but can only withstand a continuous voltage of 12V maximum. These pins must not be used for any other application to avoid damage to the device.

## **Integrated Accelerometer**

The AT201 has a built in 3 axis MEMS accelerometer that operates in the range  $\pm 2g$  and is used to measure driver behaviour (acceleration and braking) during normal driving conditions.

The accelerometer also allows the AT201 to wake from sleep on movement, with configurable thresholds. Please refer to the \$MEMS parameter for more details.

## **iButton (Dallas Key) Interface**

This can be used to read iButton devices for the purpose of Driver Identification. See the Driver ID Application Note for more details of how to use this feature.

## **Configuration**

The AT201 shares a common set of configuration commands with our other devices. Please refer to our Generic Device Configuration Reference for details.



# Electrical Parameters

## Operating Conditions

Parameter	Min	Max	Units
Power Supply Input Voltage	+6	+60	V
Digital Input High Voltage Threshold	+5.0	-	V
Digital Input Low Voltage Threshold	-	+2.0	V
Digital Output Maximum Voltage	-	+60.0	V
Digital Output Maximum Current	-	0.5	A

## Absolute Maximum Ratings

Parameter	Min	Max	Units
Power Supply Input Voltage	-32	+65	V
Voltage on Digital 1-2	-32	+32	V
Voltage on RS232 RX	-25	+25	V
Voltage on RS232 TX	-13	+13	V
Voltage on iButton/Dallas Interface	-5	+5	V
Current sunk by MOSFET low side switches		500	mA
Voltage rating of MOSFET switches	-	+60.0	V
Storage Temperature	-40	+85	°C
Operating Temperature (without battery)	-20	+60	°C
Operating Temperature (with battery)	0	45	°C

## Typical Power Consumption

Operating Mode	Current @ 13.8V	Current @ 27.6V	Power Consumption
Fully Operational	25mA	14mA	< 400mW
Battery charging	500mA	275mA	< 7W
Sleep (no battery)	0.5mA	0.3mA	7mW
Sleep (with battery)	< 10uA	< 10uA	0.1mW

## Environmental Specifications

Parameter	Specification
Storage temperature	-40 to +85 °C
Operating temperature (no battery)	-20 to +60 °C
Operating temperature (with battery)	0 to +45 °C (note: no charging below 0°C)
Ingress Protection	N/A
Vibration, broadband random	Complies with IEC60068-2-64
Shock	Complies with IEC60068-2-64
Humidity	N/A