

AT202 LPWA – GPRS – GNSS Vehicle Tracking Device

User Guide



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Device Hardware Version:	1.x
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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
GNSS	Global Navigation Satellite 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
LPWAN	Low-Power Wide Area Network
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
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 AT202 is low-cost vehicle tracking device, housed in a compact ABS enclosure, with internal GNSS and GSM \ LTE antennas. The AT202 incorporates the very latest technology, including a Cortex M4 ARM low-power series processor, Quectel BG600L-M3 GPRS \ LTE communications and Quectel LC86L GNSS, supporting GPS, GLONASS, GALILEO and BeiBou. The AT202 operates from an external DC voltage source and has a 900mAh internal back-up battery, allowing operation for approx. 15 hours in continuous mode, or 50 days in low-power mode (daily update). Interconnections are made with a single 16-way connector.

Features

The main features of the AT202 are highlighted below:

- Compact size
- Cortex M4 ARM Processor
- Quectel LC86L GNSS
- Quectel BG600L-M3 GPRS + LTE Cat M1 + NB-IoT communications
- Internal GSM and LTE antennas - PIFA PCB trace, high-sensitivity
- Internal GNSS antenna, 15mm 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

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

GNSS Location

GNSS Antenna:	Internal 15 x 15 x 4mm ceramic patch
GNSS Receiver:	Quectel LC86L
L1/B1 Receiver:	GPS L1 C/A: 1574.397-1576.443 MHz GLONASS L1: 1597.781-1605.656 MHz BeiDou B1 C/A: 1559.052-1563.144 MHz
Position Accuracy:	< 2.5m CEP @ -130dBm
Receiver Sensitivity:	-166dBm (GPS + GLONASS, tracking & navigation)
TTFB: Cold start	< 15 sec (average) @ -130 dBm
Hot start	< 2 s (average) @ -130 dBm

Power

External Voltage Source:	5 – 60 VDC 65.0V Absolute maximum
Internal Battery:	3.7V, 900mAh
Battery Life:	15 hours continuous operation 18 days operation in low-power mode @ 1 hour reporting 50 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

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

Interconnections

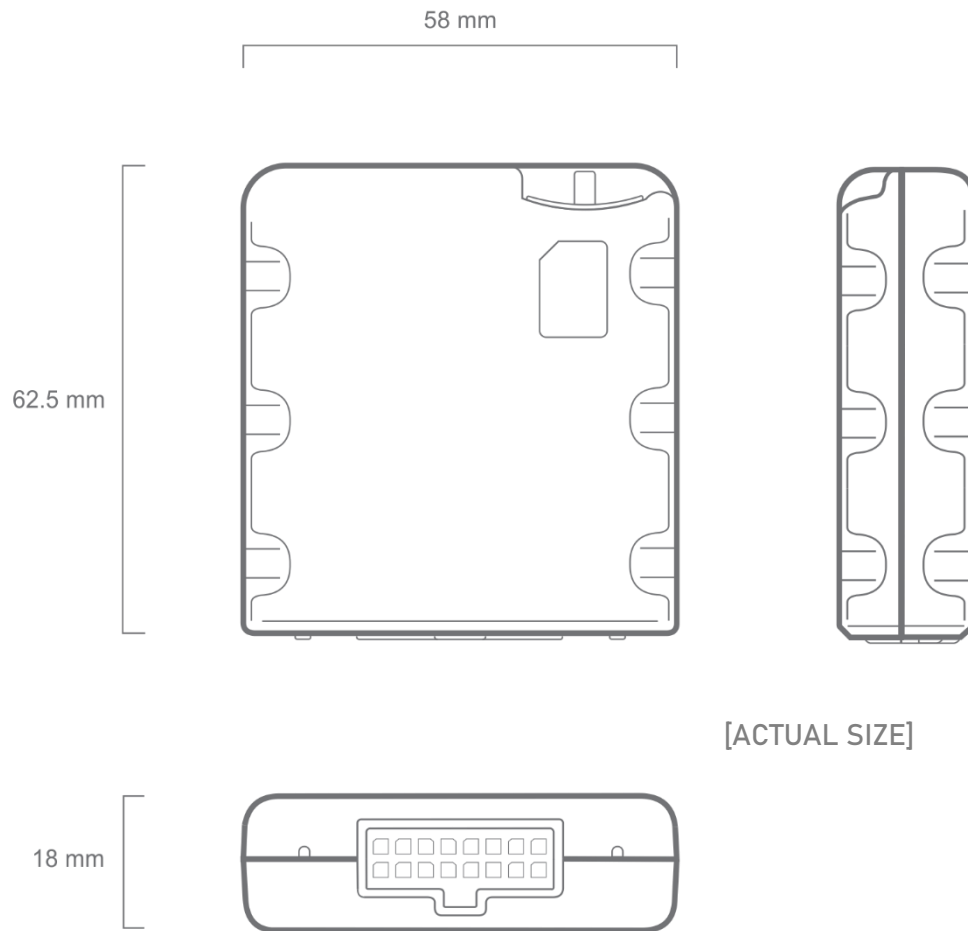
2 digital pull-up inputs
2 digital outputs, 60V, 0.5A maximum, open drain (optional 3.3V drive)
1-wire (dallas)
ADC input, 0- 80V range
CANBus / FMS 2.0 / OBD2
1 RS232 serial port (TTL levels optional)

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 AT202 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 AT202 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 AT202 connections please see page 7.

Power requirements

The AT202 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 AT202. 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 AT202 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	Searching for initial fix
	Double Flash @ 1Hz	GPS 3D navigation
	Slow Flash @ 0.2Hz	Lost GPS navigation
	Rapid Flashing (>2Hz)	TEST MODE (contact astra support)
COMM Status (blue):	200 ms ON / 1800 ms OFF	ON / SEARCHING
	1800 ms ON / 200 ms OFF	registered on network
	Constant OFF	Modem OFF

Mounting

We recommend mounting the AT202 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 GNSS performance, please mount the AT202 with the 'SKY SIDE' facing the sky.

Interconnections

All connections to the AT202 are provided by a single 16-way connector.

AT202 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 AT202 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 digital output switches are protected by internal fuses, rated at 0.63A. These fuses are not user-replaceable, and are not covered by warranty, hence any replacements are chargeable. An external fuse, rated at 0.5A will avoid internal damage to the AT202 device.

Analogue to Digital Converter (ADC) Input

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

CANBus

The AT202 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 AT202 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 AT202 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 AT202 shares a common set of configuration commands with our other devices. Please refer to our Generic Device Configuration Reference for details.

Integrated Accelerometer

The AT241 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 AT241 to wake from sleep on movement, with configurable thresholds. Please refer to the \$MEMS parameter for more details.

1-wire / iButton (Dallas Key) Interface

This can be used with iButton devices for the purpose of driver ID, or with DS18B20 temperature probes. Please refer to the appropriate application notes for more details of how to use these features.

3.3V Auxilliary Power Output

This is reserved for use with external devices. The 3.3V regulated output can be used as a reference voltage for external temperature sensors and used with the ADC1 input. This output is fused at 150mA, maximum recommended current drain is 100mA.

Device Configuration / Settings

For device configuration options and related commands, please refer to the Astra Telematics Command Reference document, which describes our generic commands, which can be used with all our devices.

Electrical Parameters

Operating Conditions

Parameter	Min	Max	Units
Power Supply Input Voltage	+6	+60	V
Digital Input High Voltage Threshold	+7.0	-	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