



AT400 Vehicle Tracking Device

User Guide

Hardware Version 1.2

Version: 1.1

Date: November 2020

Abbreviations

ADC	Analogue to Digital Converter
ASCII	American Standard Code for Information Interchange (computer character set)
BLE	Bluetooth Low Energy
BT	Bluetooth (Classic)
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
GNSS	Global Navigation Satellite System
GSM	Global System for Mobile communication
IP	Internet Protocol (part of TCP/IP)
LED	Light Emitting Diode
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
UMTS	Universal Mobile Telecommunication Service
WGS84	World Geodetic System 1984 (global co-ordinate system used by GPS)

Product Overview

The AT400 is a highly featured vehicle tracking device, housed in a sturdy plastic enclosure with internal GNSS/GSM/UMTS antennas, and sealed to IP65 specifications. The AT400 incorporates the very latest technology, including the latest L-series low-power Cortex M4 ARM processor, Quectel M66FA 5-band global GSM/GPRS communication module and ublox SAM-M8Q GNSS, supporting GPS, GALILEO, GLONASS & BeiDou navigation systems. The AT400 operates from an external voltage source in the range 5 to 55V, and has an internal 510mAh back-up battery, allowing operation for approx. 3 hours in continuous mode. Interconnections are made with a single 12-way connector, which provides IP67 sealing when mated.

Features

The main features of the AT400 are highlighted below:

- Compact size
- IP65 sealing
- Cortex M4 ARM Processor
- ublox EVA-M8M GNSS, 72 channel, -164dBm sensitivity supporting GPS, GALILEO, GLONASS and BeiDou navigation systems
- Quectel M66FA GSM/GPRS 5-band global communications module
- Internal GSM antenna
- Internal GNSS antenna, 15mm ceramic patch
- Low power consumption (near zero current drain when vehicle ignition is off)
- 3 axis accelerometer (2/8g)
- CANBus interface with FMS and OBD support
- 2 digital inputs
- 2 digital outputs
- iButton / 1-wire
- 1 RS232 Port
- BLE option
- 3FF microSIM or MFF2 UICC chip SIM (factory option)
- Internal back-up battery, lithium-polymer, 510mAh
- Configuration by RS232, SMS or TCP/UDP
- Fast and reliable over the air firmware update (FOTA)
- Driver ID using external RFID/NFC card reader option
- Modular communication protocol X
- Pass through data mode
- SDK available for rapid development of client customised applications

Technical Specifications¹

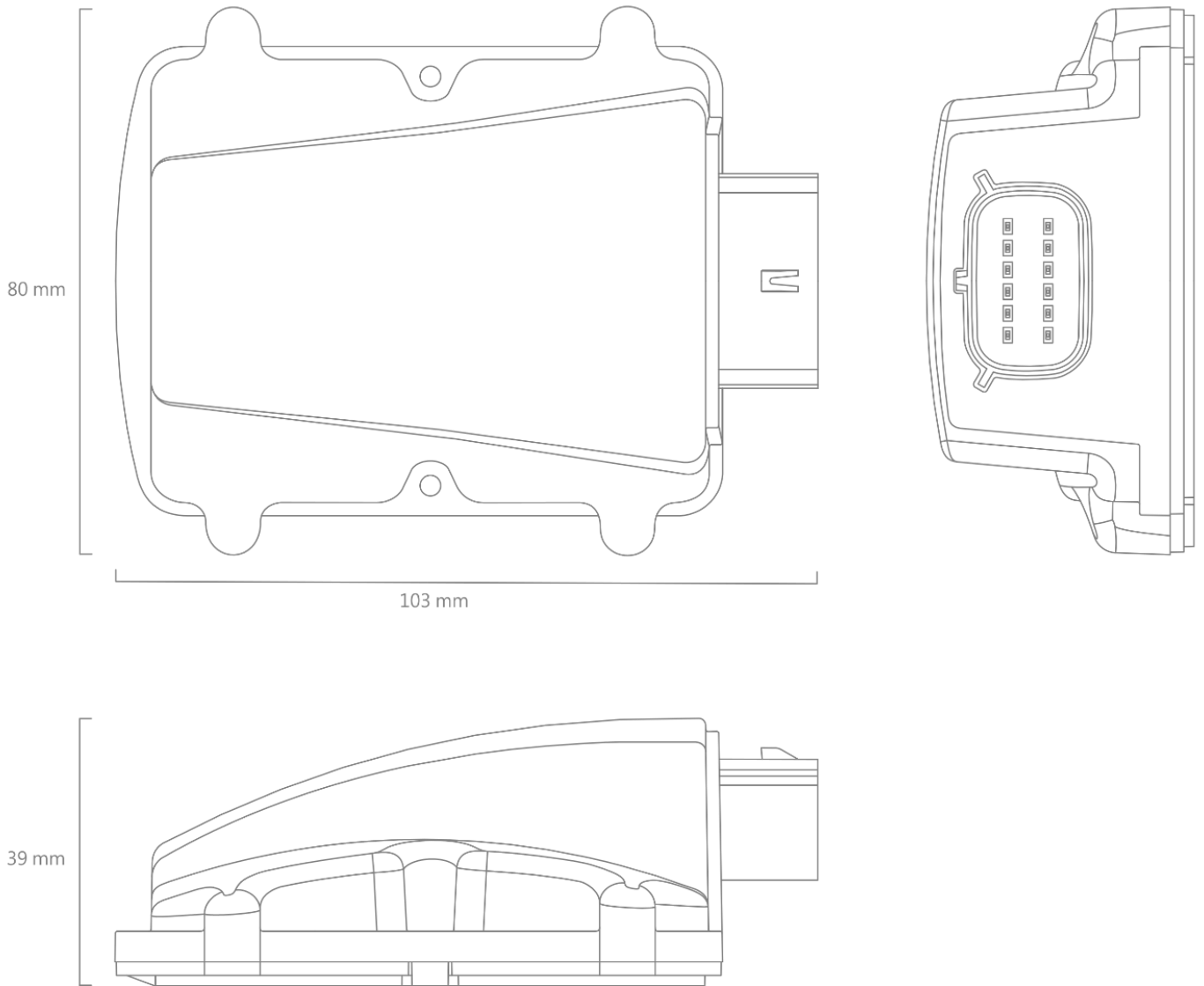
E-GSM/GPRS Modem:	2 Watts (E-GSM900 and GSM850 Class 4) 1 Watt (GSM1800 and GSM1900 Class 1) GPRS multi-slot class 10
GSM up-link (TX):	
Frequencies	824 – 849 MHz, 880 – 915 MHz, 1710 - 1785 MHz, 1850 – 1910 MHz
GSM down-link (RX):	
Frequencies	869 – 894 MHz, 925 - 960 MHz, 1805 - 1880 MHz, 1930 - 1990 MHz
GNSS Receiver:	ublox EVA-M8M GPS, GLONASS, GALILEO & BeiDou
L1 receiver:	72 channels
Position accuracy:	< 2.5m CEP
Receiver sensitivity:	-160dBm (tracking)
TTFB: Cold start	26 sec
Hot start	1 sec
Bluetooth:	BLE 4.2 (option)
Input voltage:	5 – 60 volts DC
Input Protection:	Reverse polarity, overvoltage and shorted-input tolerant
Internal Battery:	3.7V, 510mAh, lithium-polymer
Battery Life:	8 hours continuous operation 4 days operation in hourly update mode
Data transfer modes:	TCP and UDP
Communication Protocol:	Modular Protocol 'X'
Inputs/outputs:	2 digital inputs 2 digital outputs (60V, 0.5A absolute maximum) 1 RS232 serial port CANBus 1-wire / iButton
Driver ID:	iButton, RFID/NFC card
Current consumption:	45mA @ 13.8 VDC (typical) < 5mA (sleep mode - without battery) < 1mA (sleep mode - battery fitted)
Dimensions:	103 x 80 x 39 mm
Weight:	160g (with battery)
Ingress Protection:	IP65 according to DIN VDE 0470 Part 1 / EN 60 529 / IEC 529
Temperature:	
Operating	-20 to +60°C
Storage	-40 to +85°C
Connector:	Molex MX120G, Molex PN 367831201
Mating Cable Assembly:	Molex MX120G, Molex PN 367921201
SIM:	micro SIM (3FF), push-push style
Product Approvals:	CE, FCCID, EC REG 10

¹Specifications may change without notice.

Hardware Description

Overall Dimensions

103 x 80 x 39 mm



[ACTUAL SIZE]

SIM installation

The AT400 requires a micro SIM, format 3FF. Insert the SIM with the corner cut-out towards the bottom, when the device is oriented as per the picture below. Note that the device will power-up when the SIM is inserted.

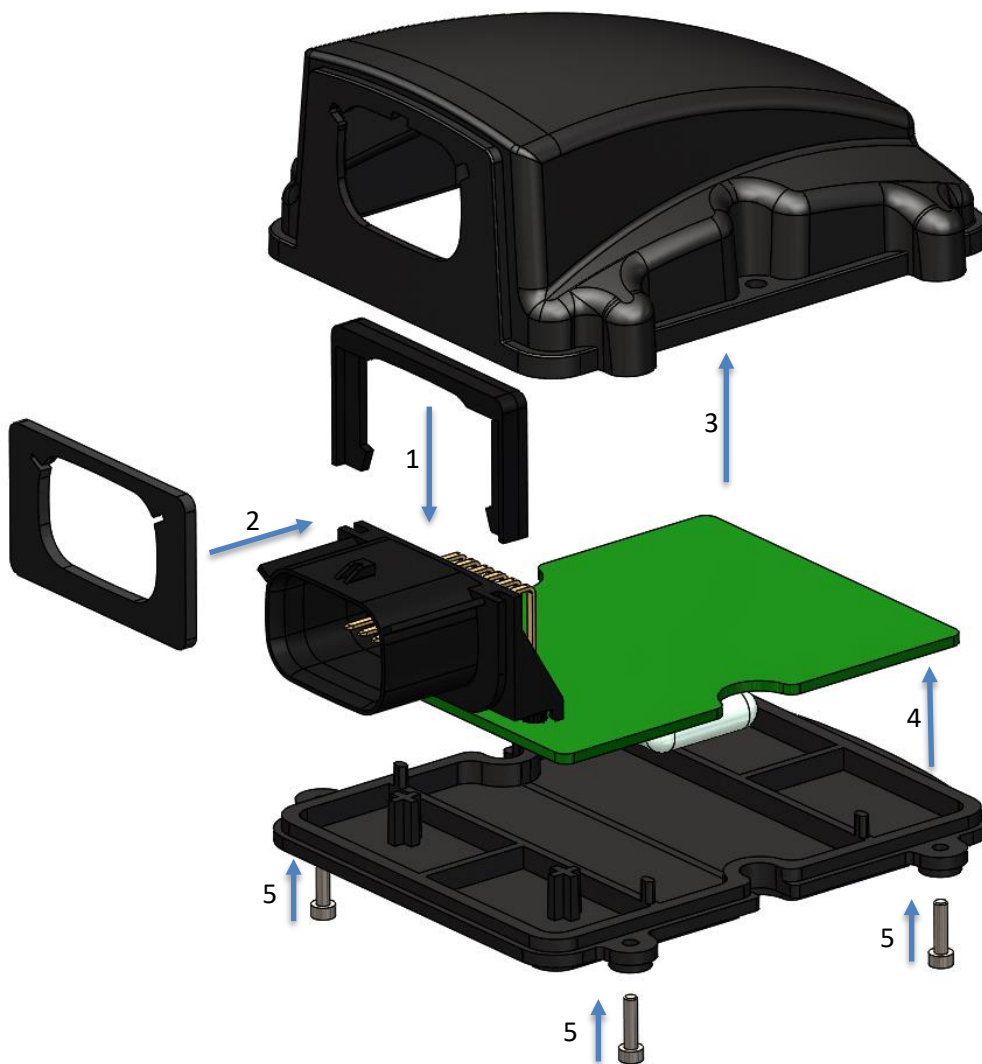


INSERT SIM

Enclosure Sealing

Assembly of the AT400 is a little more tricky and time-consuming, when compared to our other devices, and hence we recommend that the AT400 is shipped with a SIM card fitted. The enclosure assembly process is shown below:

1. Slide the surround onto the connector until it clicks into place
2. Peel the paper off the self-adhesive gasket and apply it to the connector front face
3. Feed the connector into the aperture in the enclosure top part and seat the PCB inside
4. Offer up the bottom cover to the top part (note orientation)
5. Fit QTY 4 M2 x 8mm screws and tighten with a TORX T6 driver



Power Requirements

The AT400 operates from a DC Voltage between 5 and 60 Volts. We recommend that a permanent power source is used to supply the AT400. If current drain is of concern, please refer to the Generic Command Reference Guide for options to minimise vehicle battery drain when stationary for long periods.

Back-up Battery

The AT400 operates from the external voltage source, with an internal back-up battery to allow continuous operation for short periods without external power. The device will maintain the battery charge level and seamlessly switch to battery power if the external voltage source fails or fall outside of the permitted range. Please note the handling precautions for lithium polymer batteries as outlined in the AT400 Installation Guide.

Fuse Recommendations

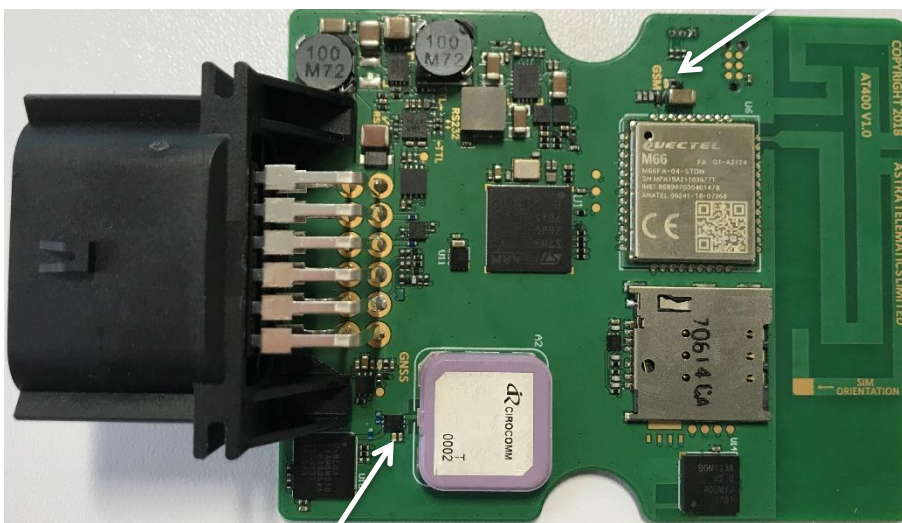
Typical current drain is 25mA @ 13.8VDC, although maximum peak current can be around 0.3A for short periods. We recommend the use of 1A fuses in the power feeds and ignition sense wires.

Internal Status LEDs

The AT400 has 2 internal status LEDs, which indicate GPS/GNSS status and GSM/UMTS network status, as per the description below:

GNSS Status:	Constant ON	Searching for initial fix
	Double Flash @ 1Hz	GPS 3D navigation
	Slow Flash @ 0.2Hz	Lost GPS navigation
GSM Status:	Flash @ rate 1 per sec	GSM ON
	Flash @ rate 1 per 2 sec	GSM registered on network
	Constant OFF	GSM Modem OFF

GSM NETWORK STATUS LED



GPS /GNSS STATUS LED

Interconnections

All connections to the AT400 are provided by a single 12-way cable assembly.

AT400 Pin Applications and Colour Code

Pin	Function	Wire colour
1	VIN 5 - 60 VDC	RED
2	DIGITAL OUTPUT 1	YELLOW
3	DIGITAL OUTPUT 2	PINK
4	DIGITAL INPUT 1	WHITE
5	DIGITAL INPUT 2	BROWN
6	VDD-DIG	ORANGE
7	GND	BLACK
8	CANL	CYAN
9	CANH	PURPLE
10	RS232-TXD	GREEN
11	RS232-RXD	BLUE
12	1-WIRE	GREY

Digital Inputs

Digital inputs 1 and 2 are normally low inputs and can be connected directly to 12/24V vehicle circuits.

Digital Outputs

The AT400 is capable of switching 2 different loads using digital outputs 1 and 2, implemented with MOSFET low-side switches. These must be used to switch the GND side of the load.

Digital outputs are capable of handling loads of up to 60V, 0.5A maximum. The digital output switches are protected by internal fuses, rated at 0.63A. The 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 AT400 device.

Integrated Accelerometer

The AT400A 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 AT400 to wake from sleep on movement, with configurable thresholds. Please refer to the MEMS parameter and Power Management section for more details.

1-wire / iButton / Temperature Probe 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.

CANBus

The AT400 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.

3.3V Auxilliary Output

This is reserved for use with external accessories. These outputs are 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.

Questions?

If you have any problems, questions or if you suspect a product failure / malfunction, please contact Astra Telematics technical support:

support@astratelematics.com

+44 161 826 8800

Electrical Parameters

Operating Conditions

Parameter	Min	Max	Units
Power Supply Input Voltage	+5	+60	V
Digital Input High Voltage Threshold	+5.0	-	V
Digital Input Low Voltage Threshold	-	+2.0	V
Digital Maximum Voltage	-	+30.0	V
Digital Maximum Current	-	250	uA

Absolute Maximum Ratings

Parameter	Min	Max	Units
Power Supply Input Voltage	-32	+63	V
Voltage on Digital Inputs	-32	+32	V
Voltage on RS232 RX	-25	+25	V
Voltage on RS232 TX	-13	+13	V
Voltage on CAN RX/TX	-12	+12	V
Voltage on iButton/Dallas Interface	-5	+5	V
Current sunk by MOSFET low side switches		500	mA
Current capacity of 3.3V and 5.0V outputs		100	mA
Voltage rating of relay and 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	45mA	24mA	< 400mW
Battery charging	500mA	275mA	< 7W
Sleep (no battery)	4mA	3mA	7mW
Sleep (with battery)	< 1mA	< 1mA	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	IP65
Vibration, broadband random	Complies with IEC60068-2-64
Shock	Complies with IEC60068-2-64
Humidity	Complies with IEC60068-2-64

AT400-STD (Standard) Kit Contents

CB403 Plug-and-Play Cable

The 12-way AT403 cable is terminated to our optional accessories. Note that each accessory is fitted with a unique connector, which matches only one of the available CB403 connectors, hence preventing incorrect termination. The following optional accessories are available from Astra Telematics and supported by direct connection to the CB403 cable:

- IB001 iButton driver ID probe
- CB242 OBD cable
- CB002 FMS cable
- CC001 contactless CANBus adapter
- BZ001 buzzer
- CR001 RFID/NFC card reader
- CR002 MIFARE card reader
- TP001 1-wire temperature sensor
- CB004 RS232 DB9 debug adapter



For installation information, please refer to our AT400 Installation Guide

AT400-FMS (FMS) Kit Contents

Our AT400 FMS kit is supplied with a CB001 power / ignition cable, a CB403 plug-and-play cable and a CC001 contactless CAN adapter ('CAN-click').

CC001 CAN-click contactless CANBus adapter

Allows read-only connection to CANBus networks without direct connection to existing vehicle cables. For use in FMS applications. Terminated for use with our CB403 plug and play cable.



CB403 Plug-and-Play Cable

The 12-way AT403 cable is terminated to our optional accessories.



AT400-OBD Kit Contents

Our AT400 OBD kit is supplied with a CB242 OBD cable and a CB403 plug-and-play cable for easy connection of accessories.

CB242 OBD Cable

Allows easy hook-up of power and CANBus connections directly from the vehicle OBD2 socket. Terminated with a 2 x 2- way connectors (one for device power and one for CANBus signals) to suit the CB403 cable:



CB403 Plug-and-Play Cable



For installation information, please refer to our AT400 Installation Guide