

AT110V5 Advanced Vehicle Tracking Device

User Guide

Version: 5.0

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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 (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 AT110 is a highly featured vehicle tracking device, housed in a sturdy aluminium enclosure with external GNSS/GSM/UMTS antennas. The AT110 incorporates the very latest technology, including the latest Cortex M3 ARM processor, ublox SARA-U2 penta-band 3G (GSM/UMTS) communication module and ublox EVA-M8M GNSS, supporting GPS, GALILEO, GLONASS & BeiDou navigation systems. The AT110 operates from an external voltage source in the range 5 to 50V and has an internal 950mAh back-up battery which allows operation for approx. 10 hours in continuous mode, or 10 days in low-power mode. Basic 3 wire (power and ignition) connections are made using a simple 3 way connector and cable assembly. More advanced features are available by using the 36 way data connector.

Features

The main features of the AT110 are highlighted below:

- Compact matchbox sized dimensions
- Cortex M3 ARM Processor
- ublox EVA-M8M GNSS, 72 channel, -164dBm sensitivity
- supporting GPS, GALILEO, GLONASS and BeiDou navigation systems
- ublox SARA-U2 penta-band 3G UMTS/HSPA global communications module
- Low power consumption (near zero current drain when vehicle ignition is off)
- 3 axis accelerometer (2/8g)
- CANBus interface with FMS and OBD support
- 6 digital inputs
- 5 digital outputs
- 1-wire Dallas interface
- 2 ADC inputs
- 2 RS232 Ports
- Internal back-up battery, lithium, 950mAh
- Configuration by RS232, SMS or TCP/UDP
- Fast and reliable over the air firmware update
- Modular communication protocol X
- Pass through data mode
- SDK available for rapid development of client customised applications
- Approved to: TBC

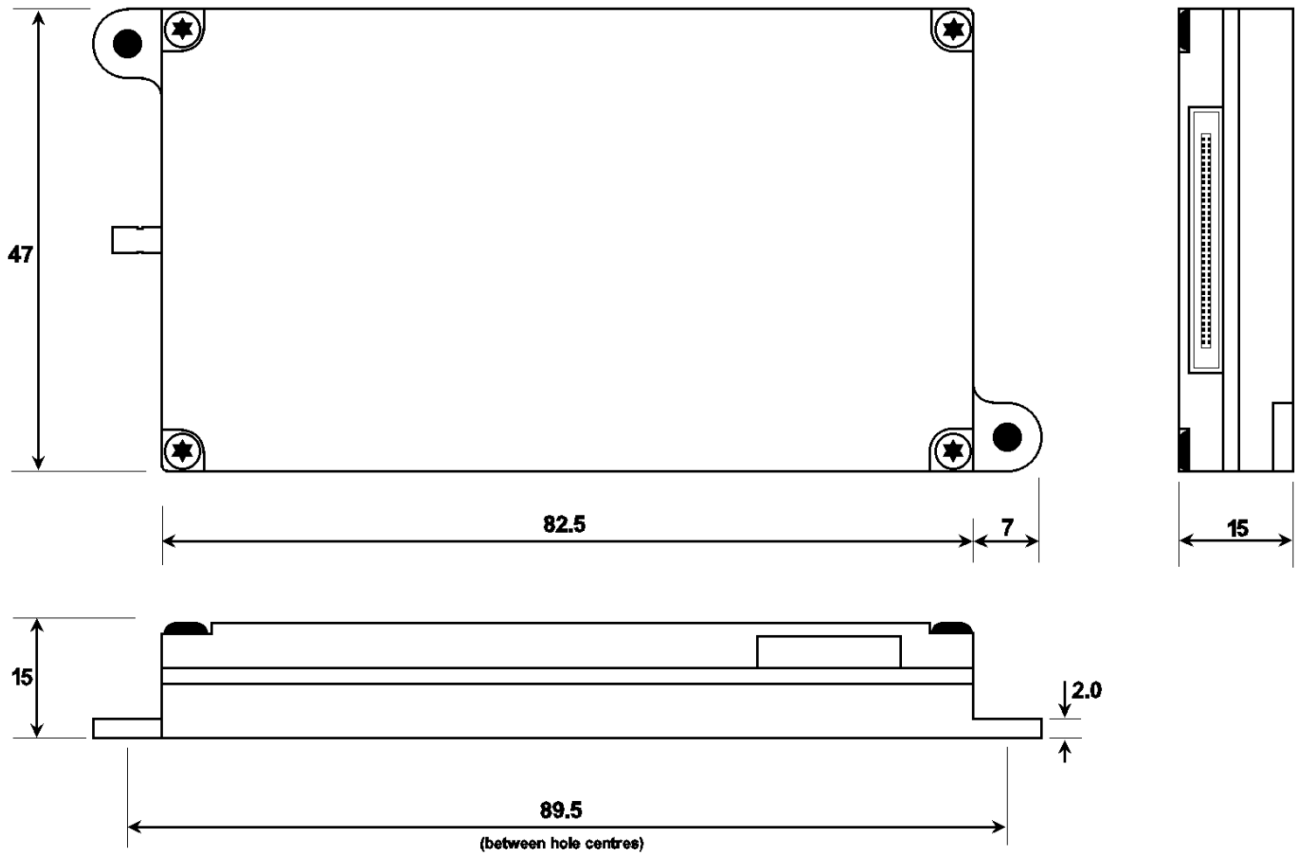
Technical Specifications¹

UMTS/HSPA Communications:	800/850/900/1900/2100 MHz
GSM/GPRS Communications:	850/900/1800/1900 MHz
GSM Antenna:	external
GPS Antenna:	external
GPS Receiver:	EVA-M8M
L1 receiver:	72 channels
Position accuracy:	2.5m CEP
Receiver sensitivity:	-164dBm (tracking)
TTFF: Cold start	26 sec
Hot start	1 sec
Input voltage:	6 – 50 volts DC
Internal Battery:	3.7V, 950mAh
Battery Life:	10 hours continuous operation 10 days operation in low-power mode (hourly update)
Data transfer modes:	GPRS / UMTS 3G (TCP or UDP)
Inputs/outputs:	4 digital pull-up inputs 2 digital pull-down inputs 5 digital outputs (MOSFET low-side switches) 2 ADC inputs (0-5V and 0-15V range) CANBus / FMS 2.0 / OBD2 2 RS232 serial ports
Current consumption, max:	300mA @ 13.8 VDC (battery charging at max. rate)
Current consumption, average:	25mA @ 13.8 VDC (typical)
Current consumption, sleep:	< 100uA
Dimensions:	85 x 47 x 15 mm (3.3" x 2.0" x 0.6")
Weight:	180g
Temperature:	
Operating	-20 to +85°C
Storage	-30 to +85°C
Connectors:	
GPS	SSMB
GSM	MCX
Data	Hirose ST40X-36S, 36 way
Power	JST PHR-3 (3 way plug)
SIM:	micro SIM (3FF), push-push style
Product Approvals:	TBC

¹Specifications may change without notice.

Hardware Description

Dimensions



SIM installation

Note: fitting the SIM will trigger the AT110 to power up.

The AT110 must be fitted with a SIM card (micro SIM, format 3FF) to allow access to a GSM/GPRS/UMTS network services. The SIM card is installed in a small slot in the side of the AT110. Correct orientation of the SIM card is essential for correct operation. Push the SIM card into the slot until the edge is flush with the AT110 case. To remove the SIM card, simply push it again, and it will spring out. SIM PIN must be disabled.



Power requirements

The AT110 operates from a DC Voltage between 5 and 50 Volts. We recommend that a permanent power source is used to supply the AT110. If current drain is of concern, please refer to the power management section for options to minimise vehicle battery drain when stationary for long periods.

Fuse Recommendations

Typical current drain is 25mA @ 13.8VDC and 14mA @ 27.6VDC, although maximum peak current can be around 500mA for very short periods. The AT110 is supplied with a 1.0m power cable, which is fitted with 1A fuses in the power feeds and ignition sense wires.

Back-up Battery

The AT110 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. Note that the operating temperature range of the AT110 is reduced when the battery option is fitted (see Specifications section). Please also note the handling precautions for lithium polymer batteries as outlined in the AT110 Installation Guide.

Powering up your AT110

Fitting the SIM acts as the on/off switch. Your AT110 will power up as soon as the SIM is inserted.

LED Indicators

The AT110 has 2 external status LEDs, which indicate GPS/GNSS status and GSM/UMTS network status, as per the description below:

GPS/GNSS STATUS (GREEN):

ON CONTINUOUSLY
FAST DOUBLE FLASH
OFF

device is powered-up and is searching for first location fix
good fix received, typically 1Hz flash (once per second)
device currently has no location fix

GSM/UMTS STATUS (BLUE):

OFF
100mS ON / 2S OFF
DOUBLE 50mS ON / 2 SEC OFF
DOUBLE 100mS ON / 2 SEC OFF
50mS ON / 50mS OFF
ON CONSTANTLY
800mS ON / 200mS OFF

no network service
Registered on home network 2G service
Registered on home network 3G service
Registered on roaming network 2G service
Registered on roaming network 3G service
device is currently transmitting data on home network
device is currently transmitting data on roaming network

Interconnections

For basic installations, the 3 wires provided on the standard power cable are all that is necessary, these provide power and ignition input (digital 1) using a 3 way cable which mates with the 3 way power header on the AT110 device.

AT110 Power Connections and Colour Code

Pin Number	Application	Wire Colour
1	Supply Voltage, 5 - 50 VDC	RED
2	GND	BLACK
3	IGNITION Input (digital input 1)	WHITE

Other connections to the AT110 are provided by a single 36 way cable assembly (see below).

AT110 Data Connector Applications and Colour Code

Pin Number	Application	Wire Colour
1	GND	black
2	RS232-TX1	green
3	RS232-TX2	green/white
4	GND	black/white
5	RS232-RX1	blue
6	RS232-RX2	blue/white
7	JTAG (for SDK users only)	brown/white
8	JTAG (for SDK users only)	orange/white
9	JTAG (for SDK users only)	purple/white
10	JTAG (for SDK users only)	orange/black
11	JTAG (for SDK users only)	yellow/black
12	JTAG (for SDK users only)	green/black
13	3.3V output (regulated), 250mA fused	red/white
14	Digital output 1	gray/black
15	GND	pink/black
16	Digital output 2	pink/red
17	Digital output 5	pink/yellow
18	auxilliary output 5-50 VDC*, 250mA fused	red*
19	4.5V output (unregulated), 250mA fused	red/black
20	RESERVED	pink/white
21	RESERVED	pink/blue
22	Digital output 3	light blue/black
23	Digital output 4	light blue/yellow
24	CANH	light blue/green
25	CANL	light blue/blue
26	GND	gray/red
27	ADC1 (0-5V)	pink
28	ADC2 (0-15V)	light green
29	GND	light blue/red
30	1-wire / iButton / temperature probe	light blue
31	Digital input 1 - Ignition	white
32	Digital input 2 - Panic	gray
33	Digital input 3	purple
34	Digital input 4	yellow
35	Digital input 5 (pull-down)	orange
36	Digital input 6 (pull-down) - Private mode	brown

*this is an output to power external accessories, not to be used to supply power to the device

Digital Inputs

Digital inputs 1 to 4 are normally low and can be connected directly to 12/24V vehicle circuits.

Digital inputs 5 and 6 are normally high, for use in pull-down applications. Simply switch to GND to activate these inputs.

Note: damage may be caused to the AT110 device if a voltage source is applied to digital inputs 5 and 6.

Digital Outputs

The AT110 is capable of switching 5 different loads using digital outputs 1–5, implemented with MOSFET low-side switches. These must be used to switch the GND side of the load.

Digital outputs 1-5 are capable of handling loads of up to 30V, 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 AT110 device.

Analogue to Digital Converter (ADC) Inputs

ADC1 can be used to measure analogue voltages up to 5.0V maximum

ADC2 can be used to measure analogue voltages up to 15.0V maximum

External scaling can be used to measure higher voltages if necessary.

Integrated Accelerometer(s)

The AT110 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 AT110 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 AT110 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.

5-50V, 4.5V and 3.3V Outputs

These are reserved for use with external devices, all are fused at 250mA (non-resetting). The 3.3V regulated output can be used as a reference voltage for external temperature sensors and used with the ADC1 input.

Device Configuration / Settings

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

Questions?

If you have any problems, questions, please contact Astra Telematics technical support:

support@gps-telematics.co.uk

+44 161 826 8800

Electrical Parameters

Operating Conditions

Parameter	Min	Max	Units
Power Supply Input Voltage	+7	+36	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	-	0.5	A

Absolute Maximum Ratings

Parameter	Min	Max	Units
Power Supply Input Voltage	-32	+40	V
Voltage on Digital 1-4 and ADC Inputs	-32	+32	V
Voltage on Digital 5-6 (pull-down)		+3.3	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 handling of solid state relay switches		500	mA
Voltage rating of relay and MOSFET switches		+30.0	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

AT110-STD (Standard) Kit Contents

Our AT110 standard kit is supplied with a CB110 power / ignition cable and an AE001 combined GSM-GPS antenna.

CB110 Power / Ignition Cable

This 3-way fused cable is used to connect a permanent voltage source (i.e. power), ground and an ignition-switched voltage source (i.e. ignition sense) to the AT110 device. The CB001 is fitted with our standard 4-way power / ignition connector, which mates with a matching connector on the CB243 cable.



AE001 Combined GSM / GNSS Antenna

The standard AT110 kit includes an AE001 combo antenna, for mounting beneath the vehicle dashboard, adhesive side down:



Alternatively, we can offer the AE003 glass-mount combo antenna, which is designed for mounting inside the vehicle windscreen, adhesive side up:



CB113 Plug-and-Play Cable

The 30-way AT110 cable is terminated to suit the CB001 power / ignition cable (above), and also allows easy connection of our optional accessories. Note that each accessory is fitted with a unique connector, which matches only one of the available CB113 connectors, hence preventing incorrect termination. The following optional accessories are available from Astra Telematics and supported by direct connection to the CB113 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
- DB001 driver behaviour indicator



For installation information, please refer to our AT110 Installation Guide