astra telematics

AT240 Advanced Vehicle Tracking Device

User Guide

Hardware Version 8.x

Version: 5.3

Date: July 2018

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 AT240 is a highly featured vehicle tracking device, housed in a sturdy plastic enclosure with internal GNSS/GSM/UMTS antennas, and sealed to IP67 specifications. The AT240 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 AT240 operates from an external voltage source in the range 5 to 50V, and has an internal 450mAh back-up battery, allowing operation for approx. 3 hours in continuous mode. Interconnections are made with a single 30-way connector, which provides IP68 sealing when mated.

Features

The main features of the AT240 are highlighted below:

- Compact size (approximately cigarette box dimensions)
- IP67 sealing
- 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
- Internal GSM/UMTS antenna
- Internal GNSS antenna, 25mm 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
- 6 digital inputs
- 5 digital outputs
- iButton / 1-wire
- 2 ADC inputs
- 2 RS232 Ports
- Internal back-up battery, lithium-polymer, 510mAh
- Configuration by RS232, SMS or TCP/UDP
- Fast and reliable over the air firmware update
- 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
- Approved to: CE, 2004/104/EC

Technical Specifications[1]

UMTS/HSPA Comms:	800/850/900/1900/2100 MHz
GSM/GPRS Comms:	850/900/1800/1900 MHz

GPS Receiver:

L1 receiver:	72 channels
Position accuracy:	< 2.5m CEP autonomous
Receiver sensitivity:	-164dBm (tracking)
TTFF: Cold start	< 26 sec
Warm start	< 3 sec
Hot start	< 1 sec

Input voltage:	5 – 50 volts DC
Input Protection:	Reverse polarity, overvoltage and shorted-input tolerant
Internal Battery:	3.7V, 510mAh, lithium-polymer
Battery Life:	3 hours continuous operation 3 days operation in hourly update mode
Data transfer modes:	TCP and UDP
Communication Protocol:	Modular Protocol 'X'

Inputs/outputs:	6 digital inputs	(4 normally low, 2 pull-down)
	5 digital outputs	(low side MOSFET switches)
	2 RS232 serial ports	
	2 ADC inputs	(5.0V and 15.0V range)
	CANBus	
	1-wire / iButton	
	1-wire temperature sensor (dual sensor)	

Driver ID:	iButton, RFID/NFC card
Current consumption:	25mA @ 13.8 VDC (typical) < 4mA (sleep mode - without battery) < 50uA (sleep mode - battery fitted)
Dimensions:	104 x 85 x 23 mm
Weight:	160g (with battery)
Ingress Protection:	IP67 according to DIN VDE 0470 Part 1 / EN 60 529 / IEC 529

Temperature:

Operating	-20 to +60°C
Storage	-40 to +85°C
Connector:	Samtec RPB5-15
Mating Cable Assembly:	Samtec RC5-15-01
SIM:	micro SIM (3FF), push-push style
Product Approvals:	CE, FCCID

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[1]Specifications may change without notice.
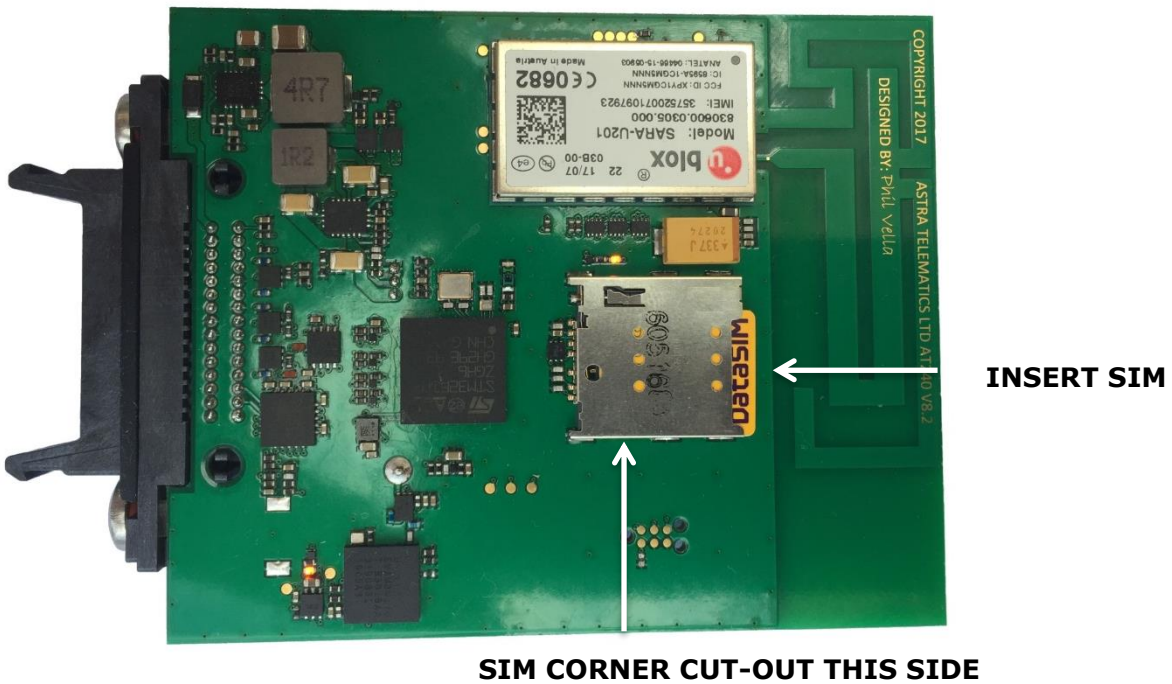
Hardware Description
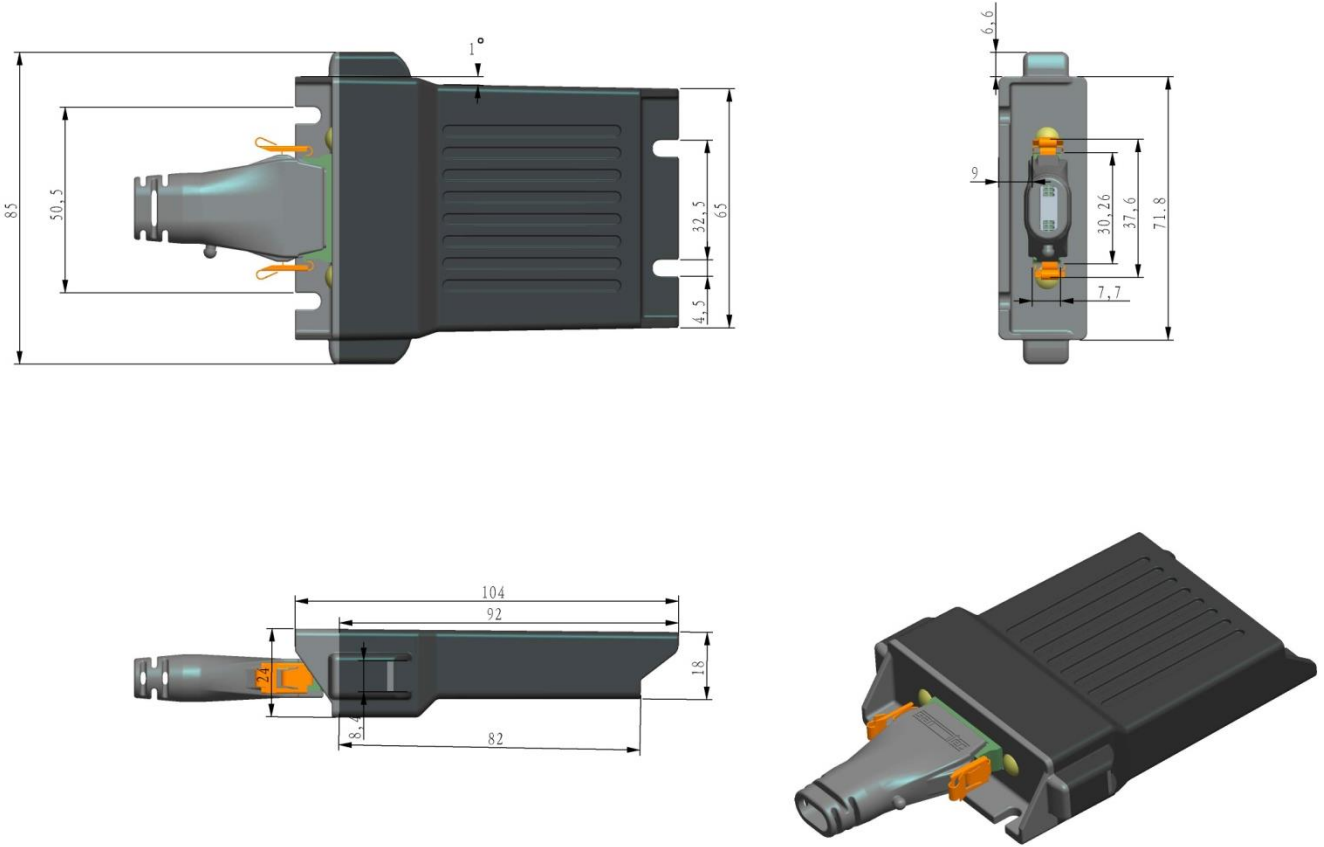
Overall Dimensions
104 x 85 x 24 mm

SIM installation
The AT240 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

SIM CORNER CUT-OUT THIS SIDE

Enclosure Sealing

When fitting the enclosure cover, please ensure that both clips are snapped into place to guarantee IP67 sealing.

Power requirements

The AT240 operates from a DC Voltage between 5 and 50 Volts. We recommend that a permanent power source is used to supply the AT240. 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 AT240 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 AT240 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 AT240 Installation Guide.

Fuse Recommendations

Typical current drain is 25mA @ 13.8VDC and 14mA @ 27.6VDC, although maximum peak current can be around 0.5A for short periods. We recommend the use of 1A fuses in the power feeds and ignition sense wires.

Internal Status LEDs

The AT240 has 2 internal status LEDs, which indicate GPS/GNSS status and GSM/UMTS network status, as per the description below:

GPS/GNSS LED

|	
ON CONTINUOUSLY	device is powered-up and is searching for first location fix
FAST DOUBLE FLASH	good fix received, typically 1Hz flash (once per second)
OFF	device has current no location fix

GSM/UMTS LED

OFF	no network service
100mS ON / 2S OFF	Registered on home network 2G service
DOUBLE 50mS ON / 2 SEC OFF	Registered on home network 3G service
DOUBLE 100mS ON / 2 SEC OFF	Registered on roaming network 2G service
50mS ON / 50mS OFF	Registered on roaming network 3G service
ON CONSTANTLY	device is currently transmitting data on home network
800mS ON / 200mS OFF	device is currently transmitting data on roaming network

GSM / UMTS NETWORK STATUS
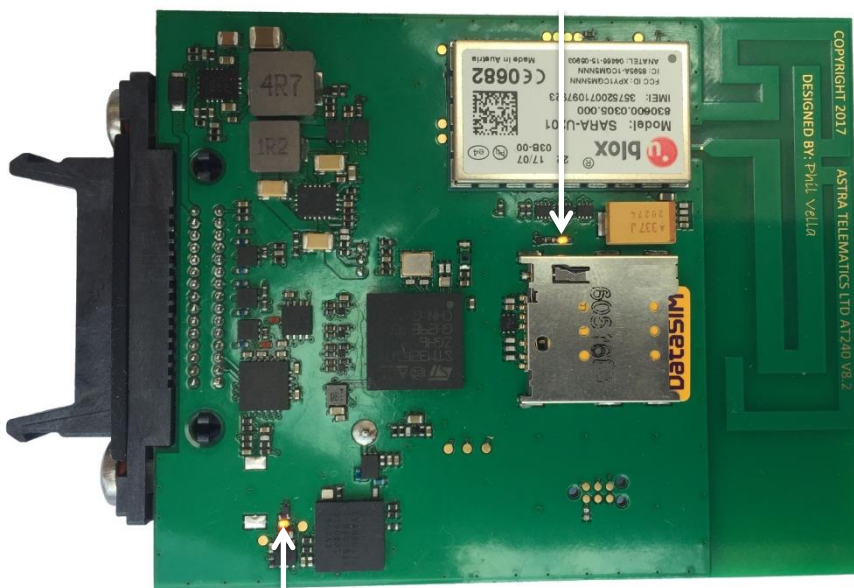
GPS /GNSS STATUS

AT240-STD (Standard) Kit Contents

Our AT240 standard kit is supplied with a CB001 power / ignition cable and a CB243 plug-and-play cable for easy connection of accessories.

CB001 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 AT240 device. The CB001 is fitted with our standard 4-way power / ignition connector, which mates with a matching connector on the CB243 cable.

CB243 Plug-and-Play Cable
The 30-way AT240 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 CB243 connectors, hence preventing incorrect termination. The following optional accessories are available from Astra Telematics and supported by direct connection to the CB243 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 AT240 Installation Guide

AT240-FMS (FMS) Kit Contents

Our AT240 FMS kit is supplied with a CB001 power / ignition cable, a CB243 plug-and-play cable and a CC001 contactless CAN adapter ('CAN-click').

CB001 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 AT240 device. The CB001 is fitted with our standard 4-way power / ignition connector, which mates with a matching connector on the CB243 cable.

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 CB243 plug and play cable.

CB243 Plug-and-Play Cable
The 30-way AT240 cable is terminated to suit the CB001 power / ignition cable (above), and also allows easy connection to FMS using either the CC001 contactless adapter or the CB002 FMS cable.

AT240-OBD Kit Contents

Our AT240 OBD kit is supplied with a CB242 OBD cable and a CB243 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 CB243 cable:

CB243 Plug-and-Play Cable
The 30-way AT240 cable is terminated to suit the CB242 OBD 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 CB243 connectors, hence preventing incorrect termination. The following optional accessories are available from Astra Telematics and supported by direct connection to the CB243 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 AT240 Installation Guide

Interconnections
All connections to the AT240 are provided by a single 30 way cable assembly.

AT240 Pin Applications and Colour Code

Pin Number	Application	Wire Colour
1	supply voltage 5-50 VDC	black
2	Digital input 5 (pull-down)	brown
3	GND	red
4	Digital input 3	orange
5	Digital output 4	yellow
6	Digital input 1 – Ignition	green
7	Digital input 2 – Panic	blue
8	ADC1 (0-5V)	purple
9	Digital input 4	grey
10	GND	white
11	Digital input 6 (pull-down) – Private mode	pink
12	Digital output 2	light green
13	ADC2 (0-15V)	black / white stripe
14	GND	brown / white stripe
15	GND	red / white stripe
16	Digital output 1	orange / white stripe
17	GND	green /white stripe
18	Digital output 5	blue / white stripe
19	iButton / temperature probe (1-wire)	purple / white stripe
20	4.5V output (unregulated), 150mA fused	red / black stripe
21	SWDIO (SDK users only)	orange / black stripe
22	SWCLK (SDK users only)	yellow / black stripe
23	Digital output 3	green / black stripe
24	3.3V output (regulated), 150mA fused	grey / black stripe
25	RS232-TX1	pink / black stripe
26	RS232-TX2	pink / red stripe
27	RS232-RX1	pink / blue stripe
28	RS232-RX2	pink / green stripe
29	CANH	light blue
30	CANL	light blue / black stripe

Digital Inputs
Digital inputs 1 to 4 are normally low inputs 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 AT240 device if a voltage source is applied to digital inputs 5 and 6!

Digital Outputs
The AT240 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 AT240 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
The AT240A has a built in 3 axis MEMS accelerometer that operates in the range ±2g and is used to measure driver behaviour (acceleration and braking) during normal driving conditions.

The accelerometer also allows the AT240 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 AT240 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.

4.5V and 3.3V Outputs
These are 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. 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@gps-telematics.co.uk
+44 161 826 8800

Electrical Parameters

Operating Conditions

Parameter	Min	Max	Units
Power Supply Input Voltage	+5	+50	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	+50	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 capacity of 3.3V and 5.0V outputs		100	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	IP67 (dustproof and waterproof to 1m[*])
Vibration, broadband random	Complies with IEC60068-2-64
Shock	Complies with IEC60068-2-64
Humidity	Complies with IEC60068-2-64

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[*]Conditions as per DIN VDE 0470 PART 1 / EN 60 529 / IEC 529