M2M Control C520

Technical Manual

Version 1.01

Introduction

This manual contains technical documentation allowing easy installation and use of the M2M Control C520 unit. For information on the programming and software configuration of the M2M Control C520 please refer to the M2M CONTROL IDE documentation.

RTCU stands for **R**emote **T**erminal **C**ontrol **U**nit. A RTCU constitutes a unique combination of a programmable control-unit with the possibility of both digital- and analog I/O plus a GSM / UMTS communication.

The M2M Control C520 is a compact, waterproof and ruggedized telematics tracking and control platform, based on a powerful X32-architecture also found in the popular C600 Series. The C520 is especially suited for advanced telemetry / telematics applications with its on-board Multi-GNSS receiver and power-management features.

The C520 offers a true world-wide 3G Penta-band UMTS/HSPA engine and state-of-the-art GNSS positioning engine with GPS and GLONASS support. In addition the device offers an on-board advanced 3D-movement sensor, a RS232 and 1-Wire interface as well as a wireless RF transceiver (ISM 868 MHz).

The unit is fully supported by the M2M CONTROL IDE development tool (IEC 61131-3) and has been designed for the most demanding M2M and Internet of Things applications, which cannot be solved with simpler non-programmable devices.

The M2M Control C520 includes many sophisticated features, including Micro SD-CARD with up to 32 GB capacity and 512 Kbyte internal flash drive with a FAT32 compatible file-system for easy sharing of files with a PC. As a powerful feature the M2M Control C520 fully supports the Garmin Fleet Management / Navigation Interface (FMI) allowing development of advanced navigation / messaging applications.

The advanced power-management features on the M2M Control C520 combined with the on-board low-capacity Li-Ion battery allows the unit to stay in power-saving mode for a longer period of time still being connected to the GSM network and capable of waking up on for example GSM activity, change of digital inputs or the 3D-movement sensor. These features open up for the use of the M2M Control C520 in exciting new application areas where extremely low power consumption and flexible wake-up conditions are crucial parameters for successful product integration.

The C520 communication has powerful features such as: IVR (Interactive Voice Response) implementation using Voice/DTMF, SMS/PDU messages, optimized host implemented TCP/IP stack with full support the M2M Control Gateway concept.

Warning: the use of GSM and 3G services can generate cost. Take care that the tariff of the used SIM card is suitable for your application. We highly recommend not using SIM cards where GPRS services are charged by elapsed time.

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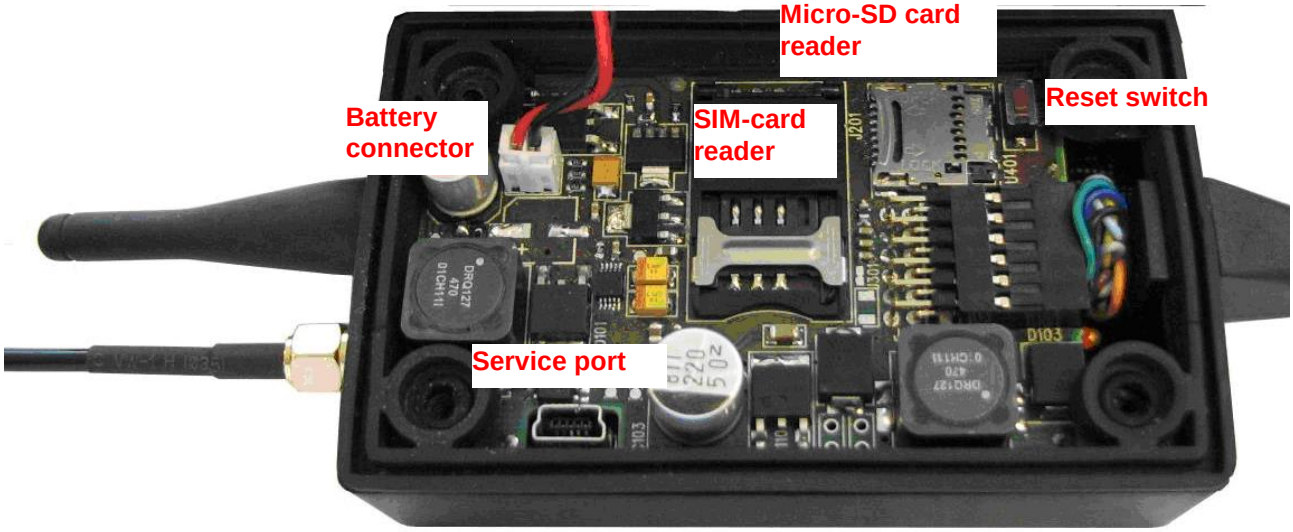
Graphical view



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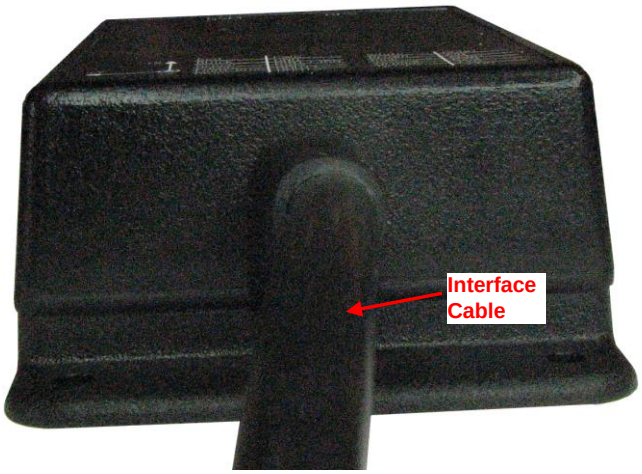
External connections

Overview

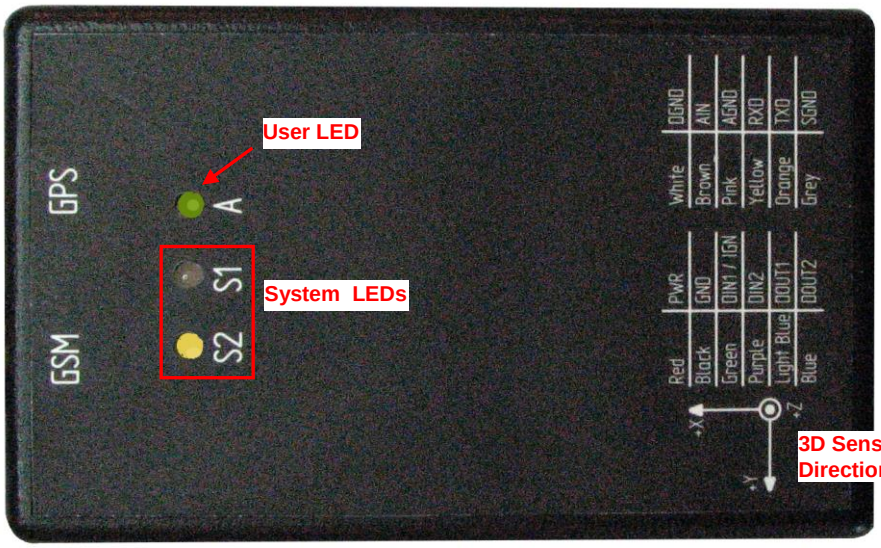
Connections to external equipment are done via the connectors/cables located back and forth on the product. All connections are available externally for easy access.
The front side is equipped with a SMA female Quad-band GSM antenna connector, and a SMA female GPS antenna connector. In the back side the interface cable to the unit is located. The interface cable is color coded and includes power supply, digital input/output interfaces, analog input interface and serial communication interface.

A graphical overview of the front, back and top side is shown below:

Front-side view



Back-side view



Top-side view

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Interface cable overview.

Color	Name	Description
Red	PWR	Power supply, positive (+) connection
Black	PGND	Power supply, negative (-) connection
Green	DIN1 / IGN	Digital input 1, ignition input
Purple	DIN2	Digital input 2
Light Blue	DOUT1	Digital output 1
Blue	DOUT2	Digital output 2
Brown	AIN	Analog input
Pink	1Wire	1-Wire bus for ID-Button / Temperature sensor etc.
White	GND	Digital ground
Yellow	RXD	Receive Data for serial port 1, RS232 compatible
Orange	TXD	Transmit Data from serial port 1, RS232 compatible
Grey	SGND	Signal ground

Power supply

The M2M Control C520 unit is to be supplied with 8..36 VDC from an external DC power source connected to the power cables in the interface cable. Positive power is applied to the red colored cable and ground is connected to the black colored cable.

There are three different labels for the ground connections: Power Ground (PGND), Signal Ground (SGND) and I/O Ground (GND). The signal and I/O grounds are filtered from the power ground. Power ground must only be used as power supply return path. The signal ground is used as ground reference for serial interfaces, and I/O ground used by both digital and analog I/Os, and 1-Wire bus.

The M2M Control C520 has a protection circuit on the supply lines which includes protection against wrong polarity, electrical disturbances, conducted transients and load-dumps that can occur in a vehicle.

The M2M Control C520 also contains an internal high capacity backup battery, which will supply the unit if the external power supply should fail or be disconnected. By default the C520 is powered down when a power fail occur. This setting however can be changed. Please consult the M2M CONTROL IDE online help for more information.

When the ignition input is activated with a logical high, the unit will wake-up if it was in power down mode.

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Digital Outputs

The digital outputs control two “high-side” switches. They function like a contact, where one side is connected to the positive supply of the C520 unit, and the other is the output. The switches are protected against short circuit, ESD and electronic kickback from inductive loads such as relays etc. The maximum switch-able inductance is 20mH and must not be exceeded.

The digital outputs are supplied through the power cable in the interface cable, which also supplies the rest of the unit. As the power is also the C520 main power, a power-fail would also affect the digital outputs.

The C520 offers a very advanced power management, which makes it possible to have one or more outputs enabled while the C520 is in low power mode. Please consult the M2M CONTROL IDE online help for more information.

Please note: Special attention to wiring must be taken; if the total current consumption of the digital outputs exceeds 1A then power supply ground (GND) must be used as return path for the output(s) in order to avoid temperature increasing in the enclosure.

Digital Inputs / Ignition Input

The digital inputs are all low-pass filtered and transient protected. To activate the inputs, connect a positive voltage between the input and the GND connector.

Please note: The DIN 1 / IGN input is a special input as it also functions as the ignition input. If the ignition input is activated with a logical high or low (Wait For Event mode only) when the C520 is in low power mode, it will wake-up the unit. A power apply will also wake-up the unit if it is in power-down mode or WaitForEvent mode with power Apply and/or ignition selected for wake-up. The ignition is de-bounced with a period between 1-2 ms when used as a digital input. So any logical level applied to this input must be greater than 2 ms to be valid.

The power management allows the possibility to configure a wake-up on one or more digital inputs with individually configured falling- or rising edge detection. Please consult the M2M CONTROL IDE online help for more information.

To support backward compatibility with the C600 series DIN 1 / IGN can also be addressed as DIN 5 from the VPL application.

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Analog Input

The analog input is voltage input with a range from 0V to 10V DC. The analog voltage is converted to a digital value with a resolution of 10bit or 1024 in decimal. The decimal value with 10V applied to the input is 1023 and 511 for 5V.

The input signal is connected between AIN and AGND. AGND must be connected to the reference of the connected equipment. Please be aware that deviations may occur, as the system is very noise sensitive. Avoid long unshielded wires and large fast-changing signals routed parallel to the analog signals.

The inputs are low-pass filtered, ESD- and transient protected.

Serial port (RS-232)

This port is a general-purpose RS232 serial port and does not support handshaking.

1-wire Bus Interface

The 1-Wire bus is available on the interface cable. All 1-Wire communication goes through single pin and all 1-Wire devices connected to this pin retrieves its power directly from the bus (called parasitic power). By this only two wires are needed – the 1-wire signal and the ground reference – allowing minimal cable installations.

Please Note: 1-Wire ID-Button reader is supported by the C520 except for the LED.

USB programming port

The USB port is for programming and communicating with the M2M CONTROL IDE. A standard mini-USB cable can be used between the unit and the PC. For location of the service port connector please refer to Appendix A

3D-movement Sensor

The M2M Control C520 unit contains a 3D-movement and vibration sensor. It makes it possible to detect movement and position change in 3 directions, X-Y-Z, and vibration through the power management when for example the vehicle is moved. The sensitivity and thresholds for different directions can be altered from within the VPL program - making it suitable for various applications. Please consult the M2M CONTROL IDE online manual for more information.

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Indicators (LED's)

Two bi-colored (red and green) and a single yellow LED indicators are present on the top side of the unit (see external connections overview). One bi-colored LED (A) is available to the user and the remaining two LED's (S1 and S2) are signaling the status and possible errors of the unit.

The user control LED one and two for application specific signaling purposes.

- LED named A on the top side of the unit, consists of LED 1 (green) and LED 2 (red)

They are easily accessed from within the VPL program, and it is possible to mix the LED's to obtain a third color, yellow. Please consult the M2M CONTROL IDE online manual for more information.

The remaining two LED's are used by the C520 to signal the status of the unit. The different patterns are listed in the table next page. If the color of the system LED 1 (S1) is yellow, the unit is actively communicating with for example the M2M CONTROL IDE program (or another program, supporting the RACP protocol).

S1: System LED1 pattern overview.

Pattern	Description
Fastest blinking, green	The unit is initializing, preparing to start the VPL program
Fast blinking, green (or yellow)	The VPL program is not executing, but stopped by the reset/diagnostic switch.
500ms On / 500ms Off green (or yellow)	The unit is executing the VPL program
1.5s On / 0.5s Off. green (or yellow)	The unit is executing the VPL program and charging the internal back-up battery.
Fast blinking, red (or yellow)	A runtime error has been detected in the program. Use the M2M CONTROL IDE to obtain the fault log.
Alternating Fast/Slow, red (or yellow)	The unit has lost its Firmware! This can only happen if, during a firmware upgrade, the unit looses power, or the communication is lost completely. In this case, simply upload the firmware to the unit again.
75ms On / 925ms Off	Execution speed is different from full-speed.

The single yellow LED (S2) is signaling either the GSM module activity or if all other LED's are off it will signal that the C520 is in the "wait for event" low power state. Please see the table below:

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S2: System LED2 pattern overview (GSM activity and "Wait For Event")

Pattern	Operating Status
Off	The GSM module is turned off
600 ms On / 600 ms Off	No SIM card inserted or no PIN code entered, or network search in progress, or ongoing user authentication, or network logon in progress.
75 ms On / 3 s Off	Logged to the network. No call in progress.
75 ms On / 75 ms Off / 75 ms On / 3 s OFF	A GPRS session is active
Flashing	Indicates GPRS data transfer.
On	Connected to remote party for datacall or exchange of parameters while setting up or disconnecting a call.
8 s OFF / 10 ms ON	The unit is in "Wait For Event" low power state.

System switch (RST)

The M2M Control C520 unit contains a combined reset/diagnostic switch. This switch is located inside of the unit (see the graphical view).

By activating the switch shortly the C520 unit will do a complete reset, as if the power was removed and reapplied. If the reset switch is held down for approx. 3 seconds[1] the VPL program/project uploaded to the unit will not be started and the unit will turn on the GSM module and establish connection to the GSM network and to GPRS / Gateway (if configured). This method will also activate the unit if it is powered down due to a power fail. The feature is very helpful when maintenance without power is needed. To "exit" (power down the unit again) from this mode simply activate the reset switch shortly. The status indicator indicates the state by fast blinking green or yellow as stated above.

Internal Li-Ion battery

The M2M Control C520 contains an internal Li-Ion battery for operation even during an external power fail. Making it possible to report power loses etc. Please note that when external power is removed the unit will by default be powered down. This setting can be changed though and is documented in the M2M CONTROL IDE online manual. The digital outputs are also disabled when a power fail occur, due to that the power supplies both the digital outputs and C520 unit itself.

[1] System LED S2 will flash three times when this state is entered.

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The battery charging is completely automated and handled internally by the C520 unit – leaving no need for user interaction. Different kinds of functions (Battery Low, Charger Enable, Charging status etc) are available for the user though. Please consult the M2M CONTROL IDE online manual for more information.

The charge current is very high, for shorter charge time, as specified in the technical specifications; Make sure both power supply and cables can handle the high current.

The battery will be charged whenever a power fail has occurred to establish the capacity making the battery ready for the next power fail. A maintenance charge will start every 100-hour after the last charge. This is to compensate for the battery self-discharge etc. As standard the battery cannot be charged above 45°C or below 0°C. The C520 unit will automatically detect the temperature and terminate the charge process if the temperature is out of this range.

Low temperature charging is available as an option. Please consult M2M Control for further information.

The temperature has very high influence on the battery capacity. At 0°C the capacity has dropped to 60% of the initial capacity and it falls dramatically at lower temperatures. The battery cycle (numbers of charges and discharges) has also influence on the capacity. After 300 cycles the capacity has dropped to approximately 80% of the initial capacity.

Warning:
Misusing the M2M Control C520 unit may cause the built-in battery security circuit to be damaged.

- Do not place the unit in high temperature locations such as direct sunlight or near engines. Using the C520 unit in this environment may result in loss of battery performance and a shortened life expectancy.
- Do not allow the battery to get wet.
- Avoid strong impacts and shocks.

For more information regarding the environmental limitations see “Specifications for M2M Control C520” below or consult the M2M Control C520 Datasheet.

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Micro SD card reader

The M2M Control C520 unit has a standard Micro SD card reader which is located inside the unit (see drawing below or graphical view). The Micro SD card reader is a lid based system with mechanical lock for reliable insertion and operation.

The M2M Control C520 supports a FAT file-system for standard PC-compatibility. Up to 32 GByte capacity is supported. Please refer to Appendix C for SD-Card installation guide.

Both the card detect and the write protect[2] information is available to the user through the application. Please consult the M2M CONTROL IDE on-line help for more information. Avoid removing the Micro SD card during access to the card.

Approved Micro SD-cards

To ensure the highest performance and compatibility it is important to use SD-CARDs that has been approved and tested by M2M Control.

The following Commercial Grade Micro SD card's from Sandisk has been approved:

Capacity	Sandisk SKU
4GB	SDSDQM-004G-B35
8GB	SDSDQM-008G-B35
16GB	SDSDQM-016G-B35
32GB	SDSDQM-032G-B35

Commercial grade SD-CARDs can be used in applications where the limited write endurance is acceptable - for example if the SD-CARD is often replaced. Commercial grade SD-CARDs should not be used in applications where a potential failure on the media is considered mission critical.

For applications that uses the SD-CARD media extensively and where a failure is critical, it is recommended to use approved Industrial Grade SD-CARDs.

M2M Control has approved and recommends industrial grade SD-CARDs from ATP that is available in capacities from 512 MB to 32 GB.

ATP Industrial Grade SD/SDHC Cards are optimized for demanding industrial applications with consistent performance in all conditions. ATP uses reliable SLC flash technology with a flash endurance more than 20 times higher than commercial grade products with MLC flash.

[2] There is lack of hardware implementation of this signal, but for compatibility reason the software function will always return "not write protected".

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The differences in write endurance between commercial grade MLC flash and ATP Industrial grade SLC flash is quite remarkable for write-intensive applications:

Product Line	Details	Total Writeable Data Prediction @ 1GB	Time Prediction @ 500 writes a day (1GB)
ATP Industrial Grade	Industrial SLC Flash + Advanced Wear Leveling	80,000 GB or 2,800,000 writes	**5,740 days** or **15.7 years**
Commercial Grade	Grade A MLC (2 bits per cell) + Advanced Wear Leveling	4,000 GB or 140,000 writes	**280 days**

UMTS / HSPA engine

The M2M Control C521 offers a world-wide Penta-band UMTS/HSPA engine with the following features:

- UMTS: 800/850/900/1900/2100 MHz.
- GSM: 850/900/1800/1900 MHz.
- SMS (Text and PDU)
- UMTS release 7, category 6.
- CSD up to 14.4 Kbps.

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868MHz ISM RF

The M2M Control C520 is provided with an ISM band RF module, which gives the unit ability of communicating with other devices wireless. The unit communicates in the 868 MHz frequency band. The RF module hardware is setup to comply with the European EN 300 220 requirements. Please consult the M2M CONTROL IDE on-line help for more information on how to configure the RF module.

In the table below the specifications of the RF module is shown:

Data	Value
Max. Output Power	+10 dBm
Frequency	869,4 MHz
Modulation	GFSK
Max. Baud Rate	38,4 kbaud

Please Note: Listen **B**efore **T**alk (LBT)[3] functionality to comply with EN 300 220 is implemented in the RF module. If the unit is installed in an environment with disturbance in the same frequency band, difficulties in RF transmission will be observed.

Antennas

GSM / UMTS

The M2M Control C520 unit contains an SMA Female connector for connection of a suitable antenna. When installing the antenna, please make sure that the antenna is not in close proximity of metallic parts or anything else that can influence the efficiency of the GSM antenna.

GNSS / GPS

The M2M Control C520 supports GPS, GLONASS and QZSS so a suitable GNSS antenna must therefore be used. The connection is with an SMB Male connector and the GNSS antenna must be a 3V active antenna with a SMB Female connector.

When installing the antenna, please make sure that the antenna has a reasonable view of the sky, so that it can receive the weak signals from the satellites. Please also consult the installation guide that follows the antenna.

[3] LBT is a term used in radio communication whereby a radio transmitter senses its radio environment before it starts a transmission

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Barcode

The barcode found on the C520 unit contains the serial number. A short format with total length of 9 digits is used. The 9 digits of the barcode are equal to the unit serial-number. The first three digits in the short format serial-number identify the unit type, and for the M2M Control C520 this unique code is **227**.

The barcode format used: 2/5 Interleaved with Check Digit

Power consumption

Detailed information on the maximum power consumption of the C520 unit in different states and at different supply voltages is listed below.

Maximum power consumption: Unit running on external supply.

	8V	12V	36V		
Unit Active	70	50	20	mA	
Unit Active with GSM On	85	55	20	mA	GSM idle @ -63dBm
Unit active with GPS On	95	65	25	mA	
Unit Active with GSM/GPS On	110	75	35	mA	GSM idle @ -63dBm
Unit Active while charging	520	500	190	mA	
Unit in power-down	0.95	0.65	0.35	mA	Restart on DI5, RTC
Unit in “wait for event”	0.95	0.65	0.35	mA	Resume on DI, Vibration, RTC
Unit in “wait for event”	11	7	3	mA	Resume on RS232
Unit in “wait for event”	25	20	7	mA	Resume on GSM activity

If the external power source is removed and the internal battery is enabled the power consumption from the battery will be as listed below.

Maximum power consumption: Unit running on internal battery.

	BAT		
Unit Active	90	mA	
Unit Active with GSM On	95	mA	GSM idle @ -63dBm
Unit active with GPS On	115	mA	
Unit Active with GSM/GPS On	125	mA	GSM idle @ -63dBm
Unit in power-down	1	mA	Restart on DI5, RTC
Unit in “wait for event”	1	mA	Resume on DI, Vibration, RTC
Unit in “wait for event”	15	mA	Resume on RS232
Unit in “wait for event”	35	mA	Resume on GSM activity

Note: Power consumption from a fully charged battery.

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Specifications for the 99-channelsMulti-GNSS receiver

	MediaTek MT3333 Single Chip Super Sensitivity	
General:	99 acquisition / 33 tracking / up to 210 PRN channels. Multi GNSS engine for GPS, GLONASS and QZSS Support DGPS, SBAS(WAAS,EGNOS,MSAS,GAGAN). A-GPS capable. Anti-jamming, Multi-tone Active Interface Canceller.	
Update Rate:	NMEA @ up-to 4 Hz	
Accuracy:	Position Velocity DGPS/SBAS	<2.5m CEP <0.1m/s <2.5m CEP[4]
Sensitivity:	Tracking/navigation Reacquisition Cold Start (Autonomous) (GPS chipset reference parameters)	-165 dBm -160 dBm -148 dBm
Time-To-First-Fix[5]:	Autonomous Operation in Standard Sensitivity Mode	
	Reacquisition[6] Hot Start[7] Aided start[8] Warm start[9] Cold start[10]	< 1 sec. < 1 sec. < 3 sec. < 30 sec. < 35 sec.
Interface protocol:	NMEA 0183 v3.01 with GGA, VTG, GLL, GSA, GSV and RMC.	

[4] Depends on accuracy of correction data provided by the SBAS service.
[5] All satellites at -130 dBm.
6 Time to get a fix when signal has been blocked for a short period of time.
7 The GPS has been powered down for less than 2 hours and the stored position and time are valid.
[8] The GPS has valid A-GPS information. A-GPS is currently unsupported in the standard firmware.
[9] The GPS has been powered down for more than one hour, but has stored information about its current position and time.
[10] The GPS has no valid navigation data.

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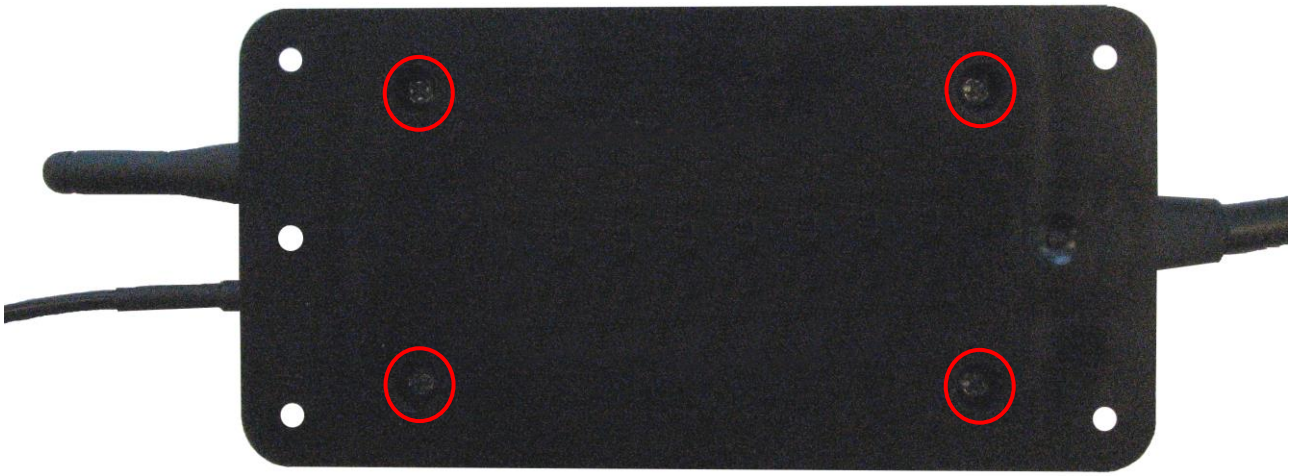
Appendix A – Assembling/Disassembling of the Unit

In order to comply with IP-66 SIM-Card reader, Micro-SD card reader and Service port connector (mini-USB) are mounted in the enclosure. User may need to open the enclosure in order to get access to these connectors. The following steps describe assembling and disassembling the enclosure:

1. Remove the back plate of the M2M Control C520. The four screws are located at the corners of the back plate as shown below:



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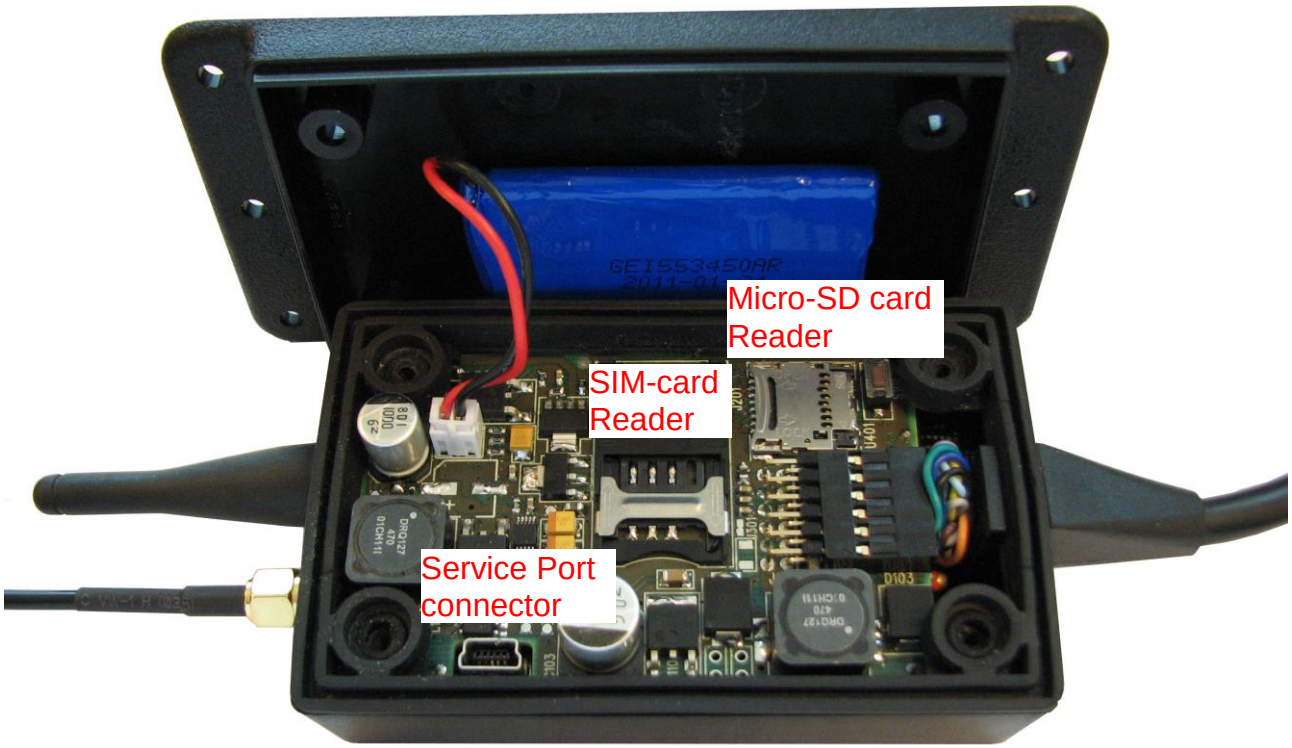
2. Gently lift the back plate. Please note, that the internal backup battery is mounted on the back plate and connected to the unit with short cables. If the necessary precaution is not taken when removing the back plate the battery, battery cable or the unit may be damaged. The open enclosure should look like this:



3. To avoid the damaging the battery cable or connector it is advised to detach the battery cable.

Assembling of the enclosure is the opposite order of disassembling.

Please note: The rubber seal must be mounted and aligned correctly before closing the enclosure. The interface cable mould has a cut-out for the sealing rubber. The rubber must be fitted properly in it in order to maintain IP-66.

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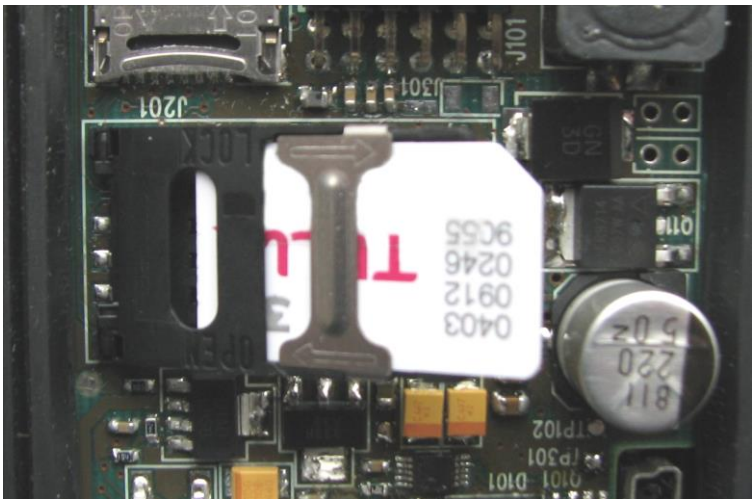
Appendix B – Installing the SIM Card

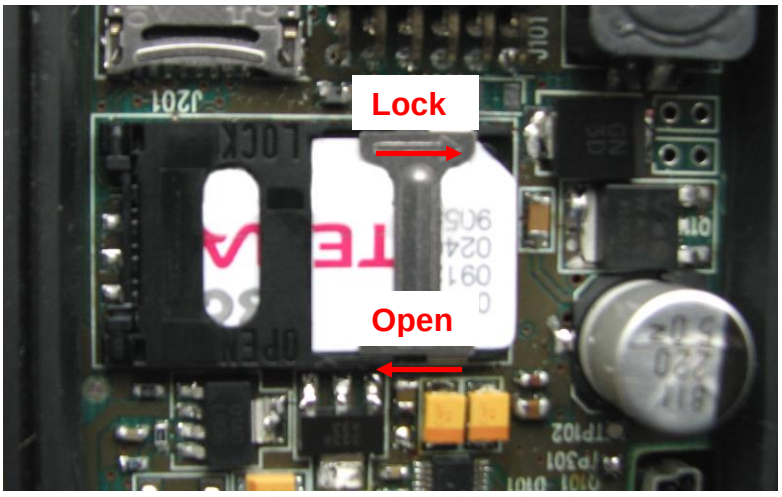
The SIM card reader is a lid based type with a mechanical lock for secure installation of the SIM card.

Open the hinged lid of the SIM card reader, orientate the card as showed below, and insert it into the lid of the card reader. Close the lid, and slide the metal locking mechanism to the locked position as shown with an arrow and text on the lid, until a click is heard.

To remove the card slide the metal locking mechanism to the unlocked position as shown with an arrow and text on the lid, and open the lid. The SIM card can now be removed.



SIM card orientation.



SIM inserted and locked

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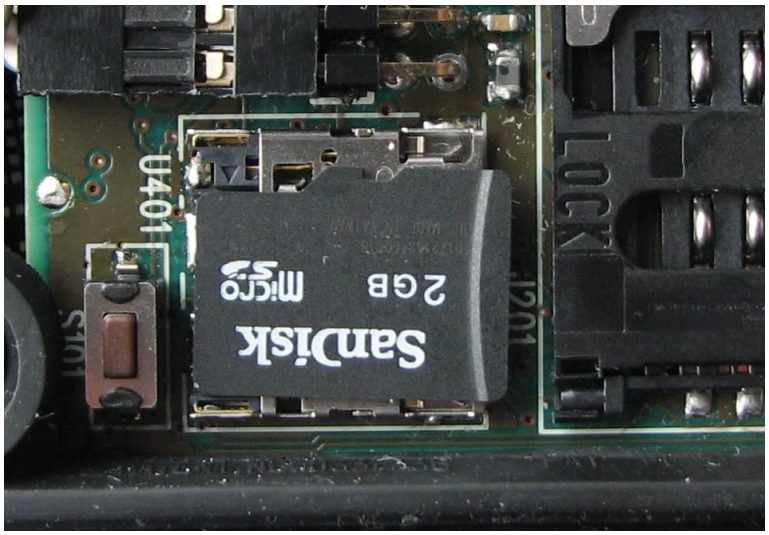
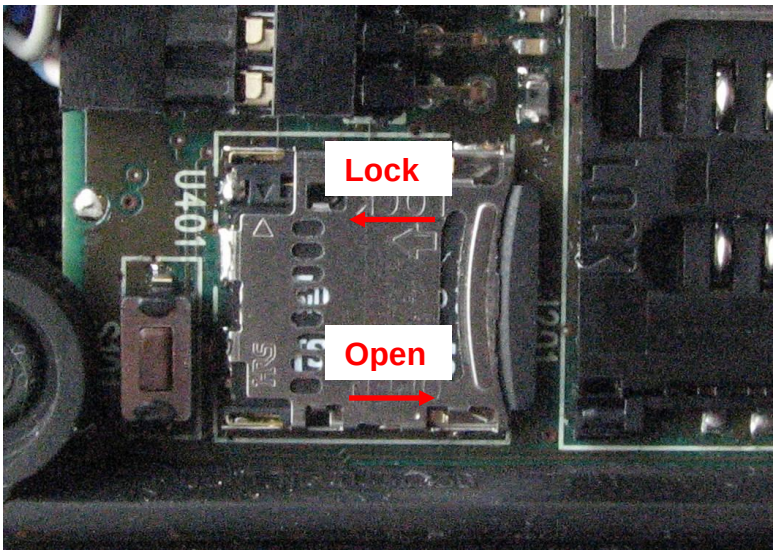
Appendix C – Installing the Micro SD card

To insert a Micro SD card into the reader open the hinged lid of the card reader, orientate it as shown below, and push the card into the lid. Close the lid, and slide the metal lid in the direction that is shown with an arrow on the lid, until a click is heard.

Remove the card by sliding the lid in the direction that is shown with an arrow on the lid, and then open the lid. Avoid removing the Micro SD card during access to the card.



Micro SD card orientation



Micro SD card inserted and locked

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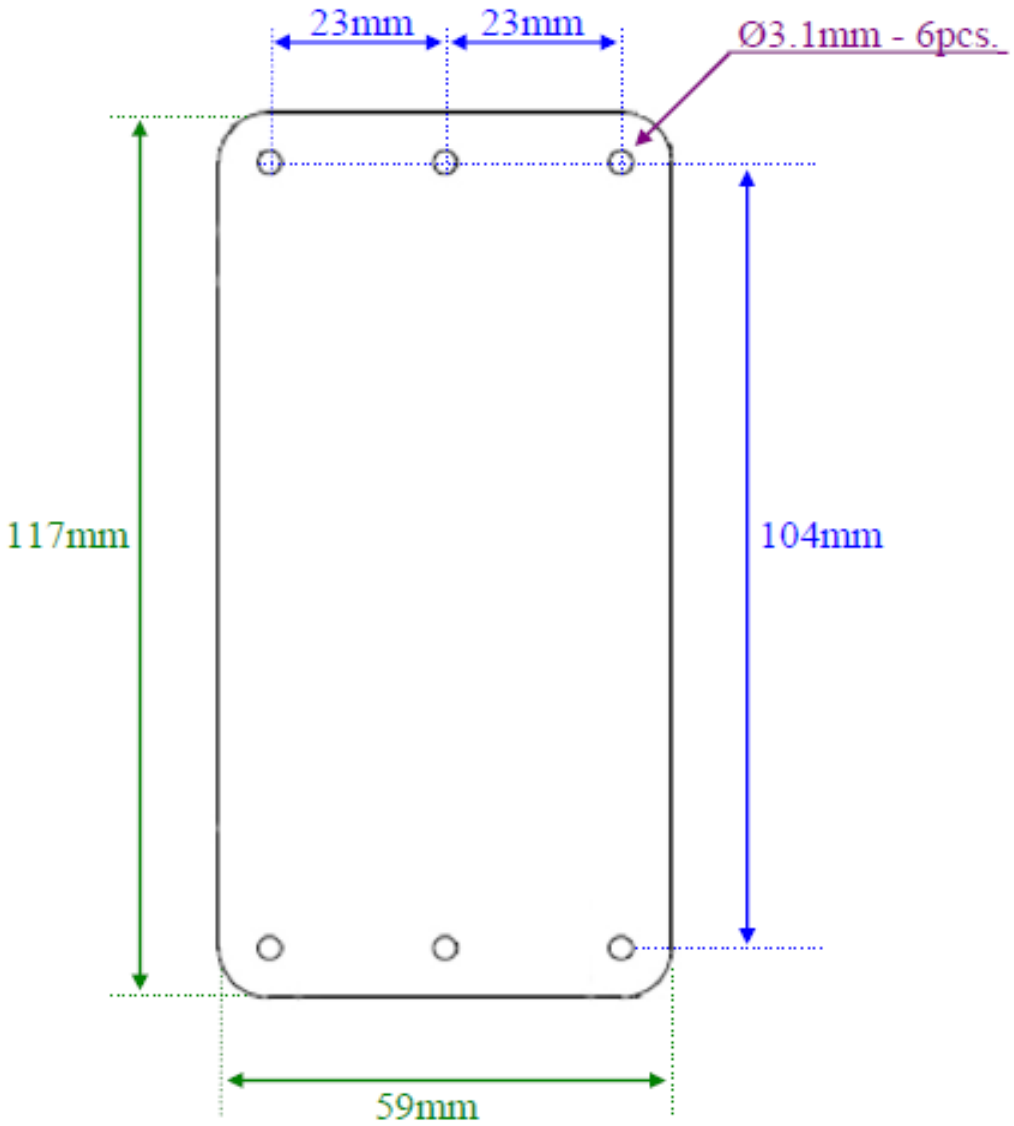
Appendix D – mounting drawing



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Appendix E – M2M Control C520 Specifications

Processor and Main-memory
- Powerful 32-bit ST ARM processor.
- 1088 KB fast execution RAM.
- 2304 KB Flash for firmware/application.

Storage
- 3.5 MB persistent data flash.
- 4 MB internal FAT32 flash drive.
- 1 MB circular automatic datalogger.
- 8 KB Virtual FRAM with fast access / unlimited write endurance.

GSM / UMTS
- Pentaband UMTS/HSPA.
  GSM: 850/900/1800/1900 MHz
  UMTS: 800/850/900/1900/2100 Mhz
- CSD with up to 14.4 Kbps.
- SMS / PDU.
- Micro-SIM 1.8/3 volt.

GNSS / GPS
- Mediatek MT3333 Multi-GNSS chip.
- GPS, GLONASS and QZSS
- 99 acquisition / 33 tracking channels.
- SBAS (WAAS,EGNOS,MSAS,GAGAN).
- Prepared for A-GPS.
- Position update with up to 4 hz.
- Sensitivity.
  Tracking: -165 dBm
  Reacquisition: -160 dBm
  Cold start: -148 dBm.
- Accuracy: < 2.5m CEP.

Accelerometer
- 3-axis digital acceleormeter.
- Resolution: 12 bit @ ±16g.
- Low-power mode.

Electrical Specification.
- Operating voltage is 8 to 36 VDC.
- Short and reverse power protected.

Digital/Analog Interface
- 2 x digital solid-state digital output.
  Max. 36 volt / 0.75 A per. channel.
  Short-circuit, ESD, Inductive kick-back protected up to 20 mH.
- 2 x digital inputs.
  Logic high: 8 to 40 VDC.
  Logic low: -5 to 3 VDC.
- Digital input #1 can be used as ignition.
- 1 x analog input.
  Range is 0..10V.
  Resolution: 10 bit
  Precision: ±1.5% FSR @ 25°C
- Protected against transients and low-pass filtered.

Communication
- **C520:** RS232 and 1-Wire bus.
- **C521:** Full CAN2.0B with hardware filtering and multi-speed support.
- On-board 868 Mhz ISM RF

Power Management
- 5 execution speeds.
- Wait for Event: Timer, Digital input, RS232, CAN, GSM, Accelerometer and power change state.
- Wait for event, from: 600 uA@12V.
- Supervision of supply voltage / type.

Battery and Charger
- On-board 900mA (nom.) Li-Ion battery.
- Intelligent charger with temperature throttle and sub-zero degrees support.
- On-board temperature sensor.

External Interface
- 2 x bi-color LED indicators.
- Yellow LED for status.
- SMA female connector for GSM antenna.
- SMA female connector for GPS antenna.

Internal Interface
- Mini-USB connector for service port.
- SIM-card slot for micro-SIM.
- Micro SD-CARD slot.
- Reset/recovery switch,

Physical Characteristics
- Encapsulation: Black UL94 plastic.
- Sealing membrane.
- 50 cm open-ended interface cable.
- GSM/GPS antennas pre-mounted.
- Approx. 250 gram without accessories.
- W 92 x H 30 x D 58 mm.

Environmental Specification
- Operating temperature: -30 to 55°C.
- Battery charge temperature:
  -10 to 45 °C
- Recommended storage temperature:
  0 to 45 °C.
- Humidity: 5..90% (non condensing).
- IP-66 ingress protected.

Approvals
- E1 approval: 2004/104/EC UN ECE R10.
- CE mark / Applied R&TTE directive.
- GSM engine: CE/GCF/FCC/PTCRB.

Warranty
- Two-years return to factory parts and labor.
- Optional warranty up to 5 years.
  (restrictions apply).

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