

Technical Manual

M2M Control C600 Professional

Version 1.05



Introduction

This manual contains technical documentation allowing easy installation and use of the C600 Professional unit. For information on the programming and software configuration of the C600 Professional please refer to the *M2M Control IDE* (Integrated Development Environment) documentation.

The C600 Professional is the first member belonging to the new M2M Control C-Series generation of powerful M2M units. The unit has an impressive list of features including full support for GPRS, SMS, Voice/DTMF and Data calls. The unit is especially suited for mobile tracking applications with its onboard GPS-receiver and advanced power management features. The unit is fully supported by the M2M Control IDE development tool and is fully backward compatible with previous generation of C600 units.

The C600 Professional includes many sophisticated features, including a CAN-bus interface for connection to vehicle bus networks, a SD-CARD reader with a FAT compatible file-system for easy sharing of files with a PC. There is optional support for Bluetooth, Ethernet, WiFi, Camera module and a Mobile Data Terminal.

The advanced power-management features on the C600 Professional combined with the on-board high-capacity Li-Ion battery allows the unit to stay in power-saving modes 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 a vibration sensor! These features open up for the use of the C600 Professional in exciting new application areas where extremely low power consumption and flexible wake-up conditions are a crucial parameter for successful product integration.

Attention: the use of GSM and GPRS 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

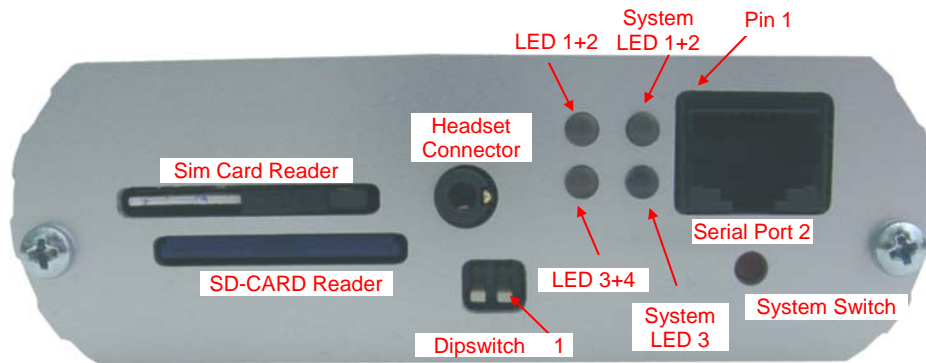


External connections

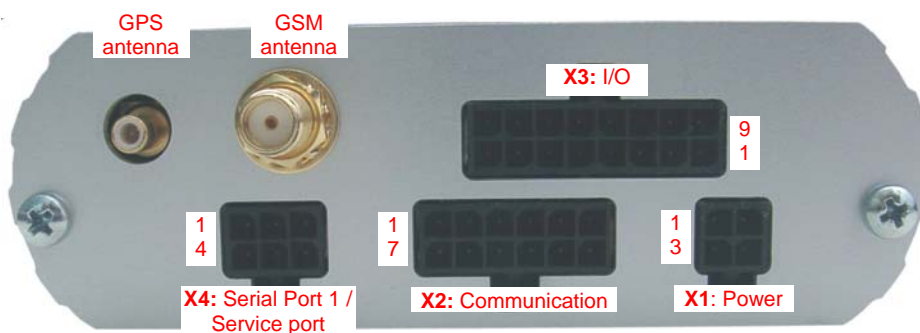
Overview

Connections to external equipment are done via the connectors located back and forth on the product. All connections are available externally for easy access; this also includes SIM-Card and SD-Card. There are no user-serviceable parts inside and the warranty is void if the unit is disassembled.

The front plate is equipped with connectors commonly accessed by the user (SIM-Card, SD-CARD, DIP-Switch, Headset, LED's and RS232). The back plate holds all connectors necessary for installation (4-pin for Power and ignition, 6-pin for RS232/Programming, 12-pin for different serial interfaces and a 16-pin for digital I/O + analog inputs). Connection to Quad-band GSM antenna is via a SMA Female and connection to a 3V active GPS antenna is done via the SMB Male connector. Both antenna connectors are located on the back plate. A graphical overview of the front- and back plate is shown below:



Front-side view



Back-side view

Connector X1: 4 pin (Power) connector overview.

Pin	Name	Description
1	SUPP	Power supply, positive (+) connection
2	DI5/IGN	Digital input 5 / Ignition input (Shared with 16 pin connector)
3	SUPP	Power supply, positive (+) connection
4	PGND	Power Ground

Connector X2: 12 pin (Communication) connector overview.

Pin	Name	Description
1	1Wire	1-Wire bus for ID-Button / Temperature sensor
2	SGND	Signal Ground
3	CAN-H	CAN-bus H-signal
4	Voice	External voice
5	RS485A	RS485 A* signal
6	RS485B	RS485 B* signal
7	1W-LED	1-Wire ID-Button LED
8	SGND	Signal Ground
9	CAN-L	CAN-bus L-signal
10	SGND	Signal Ground
11	SGND	Signal Ground
12	DC-Out	+3.3V/150mA DC-Out for external equipment. (Shared with 6 pin connector)

*Signals are inversed compared to EIA standard.

Connector X3: 16 pin (I/O) connector overview.

Pin	Name	Description
1	DOUT 1	Digital output 1
2	DOUT 3	Digital output 3
3	DIN 1	Digital input 1
4	SGND	Signal Ground
5	DIN 3	Digital input 3
6	DIN 5/IGN	Digital input 5 / Ignition input (Shared with 4 pin connector)
7	AIN 1	Analog input 1
8	AIN 2	Analog input 2
9	DOUT 2	Digital output 2
10	DOUT 4	Digital output 4
11	DIN 2	Digital input 2
12	SGND	Signal Ground
13	DIN 4	Digital input 4
14	SGND	Signal Ground
15	AGND	Analog Ground
16	AGND	Analog Ground

Connector X4: 6 pin (Serial port 1 / programming) connector overview.

Pin	Name	Description
1	TD	RS232 transmit data from Serial port 1
2	RS-Detect	Programming cable detect, normally unconnected (if programming cable, connect to GND)
3	DC-Out	+3.3V/150mA DC-Out for external equipment. (Shared with 12 pin connector)
4	RD	RS232 receive data to Serial port 1
5	SGND	Signal Ground
6	SGND	Signal Ground

RJ45 (Serial port 2) connector overview.

Pin	Name	Description
1	DSR	Data Set Ready
2	DCD	Data Carrier Detect
3	DTR	Data Terminal Ready
4	SGND	Signal Ground
5	RD	Receive data to Serial port 2
6	TD	Transmit data from Serial port 2
7	CTS	Clear To Send
8	RTS	Request To Send

Accessories available from M2M Control for cable assembly.

Order-code	Name
RT-O-TYCO-H4 TYCO p/n: 794617-4	TYCO, Connector house 4 pins. Bag with 10 pcs
RT-O-TYCO-H6 TYCO p/n: 794617-6	TYCO, Connector house 6 pins. Bag with 10 pcs
RT-O-TYCO-H12 TYCO p/n: 1-794617-2	TYCO, Connector house 12 pins. Bag with 10 pcs
RT-O-TYCO-H16 TYCO p/n: 1-794617-6	TYCO, Connector house 16 pins. Bag with 10 pcs
RT-O-TYCO-CR TYCO p/n: 794606-1	TYCO, Crimp Contacts for connector house. Wire size 0.2 to 0.5 mm ² . Bag with 100 pcs.
RT-O-TYCO-TOOL TYCO p/n: 91501-1	TYCO, Crimp hand tool for easy assembly of TYCO crimp contacts. Wire size 0.2 to 0.5 mm ²
Alternative tools:	Tyco 91501-1 (0.20 to 0.50mm ²) RS 495-9675, Farnell 1111475 Tyco 91502-1 (0.05 to 0.15mm ²) RS 495-9675, Farnell 1111476 Molex 69008-0982 (0.20 to 0.50mm ²) RS 233-3059, Farnell 673122 Molex 69008-0983 (0.05 to 0.05mm ²) RS 233-3065, Farnell 673134 Tyco 843996-6 extraction tool. RS 495-9704, Farnell 1111477
2.5mm MicroJack	Plug for headset connector. Farnell 5096339 (black plastic house) or Farnell 8045453 (metal house).

Power supply

The C600 Professional unit is to be supplied with 8..36 VDC from an external DC power source connected to the 4 pin power connector. Positive power is applied to the SUPP pin and ground is connected to the PGND pin.

The connector has two “SUPP” supply pins as these also supplies power for the Digital Outputs. If the total current consumption on the digital outputs exceeds 1.5A then power must be applied to both pins. Otherwise one pin would be sufficient.

There are three different labels for the ground connections: Power Ground (PGND), Signal Ground (SGND) and Analog Ground (AGND). The signal and analog 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 digital I/O's and serial interfaces. And the analog ground is used as a low noise analog ground reference for the analog inputs.

The C600 is protected against wrong polarity. However if the C600 unit is installed with ground connected to the C600 unit chassis (for example mounted with screws on the vehicle chassis) a wrong polarity will destroy the internal GND connection. It is therefore recommended to install a fuse on the positive supply for protection.

The C600 also contains an internal high capacity backup battery, which will supply the C600 if the external power supply should fail or be disconnected. By default the C600 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 C600 unit will wake-up if it was in power down mode. The ignition input (digital input 5) is available on the power connector to minimize the need for connectors in minimal connector installations, but it is also available on the 16 pin connector (digital I/O and analog Inputs) - only one should be used at a time.

X1: 4 pin (Power) connector overview.

Pin	Name	Description
1	SUPP	Power supply, positive (+) connection
2	DI5/IGN	Digital input 5 / Ignition input (Shared with 16 pin connector)
3	SUPP	Power supply, positive (+) connection
4	PGND	Power Ground

Digital outputs

The digital outputs control four “high-side” switches. They function like a contact, where one side is connected to the positive supply of the C600 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 4 pin power connector, which also supplies the rest of the C600 unit. As described previously there are two dedicated power pins on this connector. If the total current consumption on the digital outputs exceeds 1.5A then power must be applied to both pins. Otherwise one pin would be sufficient.

As the power is supplied together with the C600 main power, a powerfail would also impact the digital outputs.

The C600 unit offers a very advanced power management, which makes it possible to have one or more outputs enabled while the C600 is in low power mode. Please consult the M2M Control IDE online help for more information.

X3: 16 pin (I/O) connector overview.

Pin	Name	Description
1	DOUT 1	Digital output 1
9	DOUT 2	Digital output 2
2	DOUT 3	Digital output 3
10	DOUT 4	Digital output 4

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 5/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 C600 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 debounced 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 DIN 5/IGN input is available on both the 4 pin power connector and the 16 pin connector together with the other digital inputs – only one should be used at a time.

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.

X3: 16 pin (I/O) connector overview.

Pin	Name	Description
3	DIN 1	Digital input 1
11	DIN 2	Digital input 2
5	DIN 3	Digital input 3
13	DIN 4	Digital input 4
6	DIN 5/IGN	Digital input 5 / Ignition input. (Shared with 4 pin connector)
4	SGND	Signal Ground
10	SGND	Signal Ground
14	SGND	Signal Ground

Analog Inputs

The analog inputs are voltage inputs 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 512 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.

X3: 16 pin (I/O) connector overview.

Pin	Name	Description
7	AIN 1	Analog input 1
8	AIN 2	Analog input 2
15	AGND	Analog Ground
16	AGND	Analog Ground

Serial port 1 / programming port / RS485 port.

This port can be used as general-purpose RS232 serial port or as a programming port. In order to use the port for programming, the RS-DET pin must be connected to GND. When using the port as general-purpose RS232, the RSDet pin must be left unconnected. Further details on the programming cable are available in the M2M Control IDE online help.

This serial port is shared with the RS485 communication port available on the 12 pin connector. If the RS485 port is used it is not possible to use the RS232 port, and vice versa. If however, a programming cable is inserted the RS485 communication is disabled automatically.

The RS485 is a multi-drop network with a maximum of 32 units connected simultaneously to the bus. The RS485 bus contains the A (positive) and B (negative) signals, as well as a signal ground, which always must be connected to the common signal ground for all units connected to the RS485 bus! The maximum cable length for the RS485 bus is approx 400 meters, however this limit can be influenced by the quality of the cable, signaling rate, noise etc. At longer cable lengths, noisy environments or high communication speed it might be necessary to terminate the transmission line with a 120 ohm resistor between RS485A and RS485B at each end of the wires to avoid signal reflections etc.

Be aware that it is much confusion about the pin labeling of RS485. The above-mentioned conditions for positive and negative signals are actually the inverse of the standard released by EIA.

X4: 6 pin (Serial port 1 / programming) connector overview.

Pin	Name	Description
1	TD	RS232 transmit data from Serial port 1
4	RD	RS232 receive data to Serial port 1
2	RS-Detect	Programming cable detect, normally unconnected (if programming cable, connect to GND)
5	SGND	Signal Ground

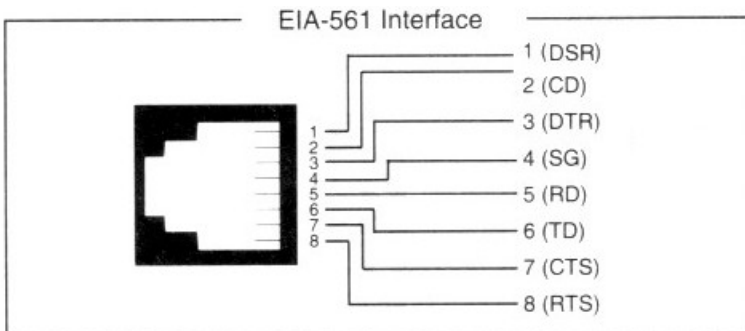
X2: 12 pin (Communication) connector overview.

Pin	Name	Description
5	RS485A	RS485 A* signal
6	RS485B	RS485 B* signal
11	SGND	Signal Ground

*Signals are inversed compared to EIA standard.

Serial port 2

The serial port 2 is a general-purpose RS232 port with all control signals according to EIA-561 that defines RS-232 on a modular connector.



The signals are available on the RJ45 connector located on the front plate of the C600.

RJ45 (Serial port 2) connector overview.

Pin	Name	Description
1	DSR	Data Set Ready
2	DCD	Data Carrier Detect
3	DTR	Data Terminal Ready
4	SGND	Signal Ground
5	RD	Receive data to Serial port 2
6	TD	Transmit data from Serial port 2
7	CTS	Clear To Send
8	RTS	Request To Send

CAN

The C600 Professional provides the physical layer for the CAN (Controller Area Network) serial communication interface in accordance with the ISO 11898 standard. The CAN bus is designed for high-speed (up to 1Mbit) robust communication in especially harsh environments like those found in the automotive industry.

The CAN interface can either be connected to an existing CAN network with a common protocol like the J1939 standard to retrieve information for surveillance or information purposes. Or the interface can be used as a robust serial data link with a non-standard protocol. Please consult the M2M Control IDE online help for more information.

The physical layer consists of a two wire (CAN-H and CAN-L) differential bus and a signal ground for reference.

If the C600 is connected to a “non-existing” network, a 120 ohm resistor must be connected between CAN-H and CAN-L at each end of the transmission-line to terminate it and avoid signal reflections.

Be aware that connecting the C600 to a CAN network can be dangerous. If the C600 is not configured with the correct network parameters, it will lead to network corruption and may interfere with other connected equipment on the bus. Especially in vehicles great precautions must be observed to prevent interruption of the communication. By default only Reading from the CAN bus is enabled and the Write capability is disabled by a hardware jumper inside the unit. Removing this jumper is done on the sole responsibility of the user and M2M Control can not be held responsible for any problems or damage due to this decision. For information how to enable CAN Write capability please refer to Appendix A.

A wide range of software functions is available for easy access to the network. Please consult the M2M Control IDE online help for further information.

X2: 12 pin (Communication) connector overview.

Pin	Name	Description
3	CAN-H	CAN-bus H-signal
9	CAN-L	CAN-bus L-signal
8	SGND	Signal Ground

1-Wire

The 1-Wire bus is available on the 12 pin connector. All 1-Wire communication goes through this 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. For 1-Wire ID-Button readers, which include a built-in LED, a dedicated output is available for this purpose. Please consult the M2M Control IDE online help for further information.

X2: 12 pin (Communication) connector overview.

Pin	Name	Description
1	1Wire	1-Wire bus for ID-Button / Temperature sensor
7	1W-LED	1-Wire ID-Button LED
2	SGND	Signal Ground

DC-Out

A 3.3V DC output is available on the 12 pin connector. It is possible to control the output in order to save power. The output is short circuit- (to ground), ESD- and transient protected. The output is also available on the 6 pin serial port 1 connector. Make sure not exceed the current specification of the output and be aware of inrush currents of the external equipment may exceed the specifications. It is recommended to install a fuse to protect the output.

This output must be enabled from the application. Please consult the M2M Control IDE online manual for more information.

X2: 12 pin (Communication) connector overview.

Pin	Name	Description
12	DC-Out	+3.3V/150mA DC-Out for external equipment. (Shared with 6 pin connector)
11	SGND	Signal Ground

Headset connector

The C600 unit has a 4-pole 2.5mm jack connector for connecting a Nokia compatible headset to the built-in GSM modem. The speaker output is amplified through the internal amplifier and is a differential (balanced) signal. An audio line transformer must be used to convert the signal to a single ended signal, when connected to external equipment that does not have a differential (balanced) input. Otherwise the GSM noise will not be suppressed/cancelled, and will pass through all the way to the loudspeaker. An external amplifier should be used when connecting a loudspeaker.

The microphone signal is biased internal for active microphones.



4 pin headset connector overview.

Pin	Name	Description
1	Mic +	Microphone positive Input
2	SPK +	Speaker positive output
3	Mic -	Microphone negative input
4	SPK -	Speaker negative output

Please consult the M2M Control IDE online manual for more information about enabling this feature.

Installing the SIM-card

The C600 Professional unit contains a standard SIM card reader. It is located on the front plate (please see the graphical view) and is easily accessed. The SIM card reader has a push/push eject system and a mechanical lock for secure installation of the SIM card. Orientate the card as showed below, and insert it into the card reader. Push the card into the reader until a click sound occurs – the card will now stay in its position. It might be necessary to use a small tool or pencil as the card, for protection purposes, is placed underneath the front-plate surface. Furthermore a mechanical lock can be slide in front of the card to prevent it from being removed accidentally.

To remove the card slide the lock to its unlocked position, and push the card into the reader until a small click sound occurs. The reader will now eject the card. It might be necessary to use a small tool or pencil to push the card into the reader.

It is possible to detect the state of both the SIM Insert and SIM lock status from the VPL program. Please consult the M2M Control IDE online manual for more information.



SIM card Orientation.

If the SIM-card is removed during GSM operation the unit will shortly after be rejected from the GSM network. When a SIM-card is inserted again the unit will automatically reset approx. 10 seconds after insertion and then commence normal operation.

Installing the SD-CARD

The C600 Professional unit has a standard SD-CARD reader with FAT file-system support for standard PC-compatibility. Up to 2 GByte capacity is supported. The SD-CARD features a Push/Push eject system for reliable insertion and operation.

To insert a card into the reader orientate it as showed below, and push the card into the reader until a click sound occurs. Remove the card by pushing it into the reader until it clicks and the reader will eject the card. Both the card detect and the write protect information is available to the user through VPL. Please consult the M2M Control IDE online help for more information. Avoid removing the SD-CARD during access to the card.



SD-Card orientation

Connecting GSM and GPS antennas

GSM Antenna

The C600 Professional unit contains an SMA Female connector for connection of a suitable GSM quad band antenna (850/900/1800/1900 MHz). 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. Please consult the installation guide that follows the GSM antenna.

GPS Antenna

The C600 Professional unit contains an SMB Male connector for connection of a suitable GPS antenna. The GPS antenna must be a 3V active GPS antenna mounted 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 GPS antenna.

Indicators (LED's)

Three bi-colored (red and green) and a single yellow LED indicators are present on the unit (see the graphical view). Two bi-colored indicators are available to the user and the remaining two LED's are signaling the status and possible errors of the C600 unit.

The user control LED one through four for application specific signaling purposes. LED 1 and 3 are green, and LED 2 and 4 is 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 C600 to signal the status of the unit. The different patterns are listed in the table below. If the color of the system LED 1+2 is yellow, the unit is actively communicating with for example the M2M Control IDE program (or another program, supporting the C600 protocol, RACP).

System LED 1+2 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.
Slow blinking green (or yellow)	The unit is executing the VPL program
Very Slow blinking green (or yellow) 1.5 second on and 0.5 second off.	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 C600 Unit loses power, or the communication is lost completely. In this case, simply upload the firmware to the unit again.

The single yellow LED is signaling either the GSM module activity or if all other LED's are off it will signal that the C600 is in the "wait for event" low power state. Please see the table below:

System LED 3 (GSM activity and “Wait For Event”) pattern overview.

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	Depending on type of call: <i>Voice call:</i> Connected to remote party. <i>Data call:</i> Connected to remote party or exchange of parameters while setting up or disconnecting a call.
8 s OFF / 10 ms ON	The C600 unit is in “Wait For Event” low power state.

Switches

DIP-Switch

The C600 Professional unit contains a dipswitch with two switches. The dipswitch is located on the front plate for easy user access (see the graphical view). To use the dipswitch in the M2M Control IDE declare a Boolean input variable, and define it as a dipswitch in the M2M Control IDE Job variable configuration dialog.

Reset-Switch

The C600 Professional unit contains a combined reset/diagnostic switch. This switch is located on the front-plate of the C600 unit (see the graphical view).

By activating the switch shortly the C600 unit will do a complete reset, as if the power was removed and reappplied.

If the switch is activated and kept activated during reset of the unit, 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 C600 Professional contains an internal Li-Ion battery for operation even during an external power fail. Making it possible to report power losses 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 occurs, due to that the power supplies both the digital outputs and C600 unit itself.

The battery charging is completely automated and handled internally by the C600 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 C600 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.

Vibration Sensor

The C600 Professional unit contains a vibration sensor. It makes it possible through the power management to detect vibrations when for example the vehicle is moved. The sensitivity 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.

Specifications for the C600 Professional

Power supply	Min	Typ	Max		
Operating Voltage	8	-	36	VDC	Protected against wrong polarity.
On-board Li-Ion Battery Pack		1.8	2	Ah	Optional Low-temperature pack available.
Unit Active		45		mA	GSM idle @ -63 dBm GSM idle @ -63 dBm Restart on: DI 5 and RTC Resume on: DI, Vibration, RTC Resume on: CAN Resume on: RS232 Resume on: GSM <i>All measurements @ 12 VDC Supply.</i>
Unit Active with GSM On		55		mA	
Unit Active with GPS On		60		mA	
Unit Active with GSM/GPS On		70		mA	
Unit Active while Charging		650		mA	
Unit in Powerdown		0.3		mA	
Unit in "Wait for Event"		0.4		mA	
Unit in "Wait for Event"		10		mA	
Unit in "Wait for Event"		14		mA	
Unit in "Wait for Event", GSM On		tbd		mA	
Digital inputs		Min	Typ	Max	All inputs are protected against transients and lowpass filtered.
	Logic "High"	8	12	40	
	Logic "Low"	-5	-	3	VDC
Digital outputs (Solid state)		Min		Max	
		-	-	36	Volt
		-		1.5	Amp
Analog inputs		Min		Max	
		0	-	+10	VDC
Storage temperature	-40	-	+90	°C	External interfaces: • TYCO 'Mate'n'Lock' connector for: • RS232 port 1 (service port) • Power, Digital I/O, Analog Input • CAN, RS485 • RJ45 for RS232 port 2 (EIA-561 compliant) • Three bi-color LED and one yellow status LED • Two DIP-Switches • SMA-Female connector for GSM antenna • SMB-Male for active 3 Volt GPS antenna • Standard 3 Volt SIM-Card reader (external access) • Nokia compatible Micro-Jack headset connector All interfaces are externally accessible
Operating temperature <i>(According to GSM 11.10 specification)</i>	-25	-	+55	°C	
Restricted operation <i>(deviations from the GSM specification may occur)</i>	-30	-	+70	°C	
Charging Temperature <i>(Low temperature charging available)</i>	0	-	+45	°C	
Humidity <i>(noncondensing)</i>	5	-	90	%	
Weight	0.300			Kg	
External dimensions	W 91 x H 31 x D 131 mm				without SMA and SMB connectors
Ingress Protection (IP)	IP44 (SIM / SD-CARD in use)				Aluminum enclosure
Approvals	EN-61000-6-3:2001 Emission EN-61000-6-2:2001 Immunity				

Technical data subject to change

Specifications for the 16-channel GPS receiver

u-blox LEA-4A

General:	16 Channels simultaneous operation DGPS capable L1 frequency (1575.42MHz) C/A code (Standard Positioning Service) Continuous tracking receiver
Update Rate:	NMEA @ 1 Hz
Accuracy:	Position 2.5m CEP DGPS/SBAS 2.5m CEP ¹
Acquisition:	Autonomous Operation in Standard Sensitivity Mode Reacquisition <1 sec. Hot Start < 3.5 sec. Warm start 33 sec. Cold start 34 sec.
Interface protocol:	NMEA 0183 v3.0 with GGA, VTG, GLL, GSA, GSV and RMC

Defintions:

Cold Start:

The GPS has no valid navigation data.

Warm Start:

The GPS has been powered down for more than one hour, but has stored information about its current position and time

Hot Start:

The GPS has been powered down for less than 2 hours and the stored position and time are valid

Reacquisition:

Time to get a fix if the signal has been blocked for a short period of time.

¹ Depends on accuracy of correction data provided by the DGPS or SBAS service
This feature is currently not supported in the firmware.

Appendix A – Enabling the CAN bus Write capability

Connecting the C600 to a CAN network can be dangerous. If the C600 is not configured with the correct network parameters, it can lead to network corruption and may interfere with other connected equipment on the bus. Especially in vehicles great precautions must be observed to prevent interruption of the communication.

By default reading from the CAN bus is enabled and Writing to the CAN bus is disabled by a hardware jumper inside the unit.

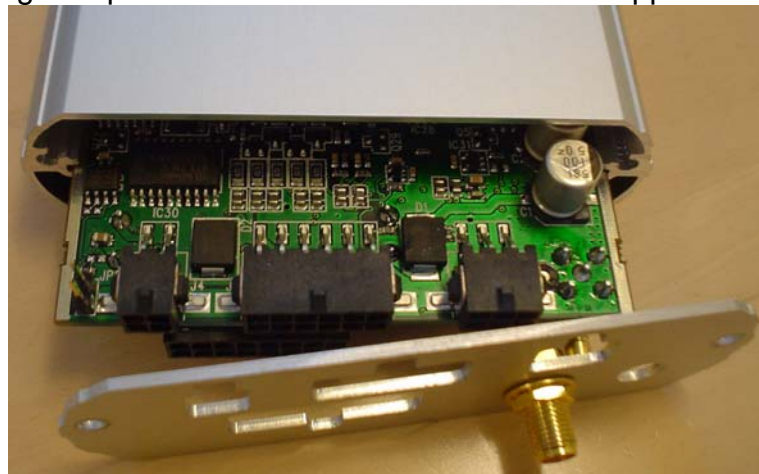
Installing this jumper, and thereby enabling the CAN-bus Write capability of the unit, is done on the sole responsibility of the user. M2M Control can not be held responsible for any problems, or damage due to the decision to enable the CAN-bus Write capability.

The following steps must be taken to enable the CAN bus Write capability of the unit:

1. Remove the back endplate – the one where the four Tyco connectors are located. Use a screwdriver (PH1) to remove the two screws.



2. Gently pull out the electronic board approximately.
Hint: Use a finger to push on the RJ45 connector on the opposite endplate.



3. Mount the jumper, as shown on the picture below:



4. Gently push the electronic board back into the encapsulation again. In any case DO NOT USE FORCE. If difficulty is experienced it is because the light-pipes on the opposite endplate has moved a bit when the electronic board was removed and it might be necessary to loosen the front endplate a bit to make them fit in the holes again.
5. Mount the endplate and secure it with the screws. Be careful not to tighten the screws too much and thereby damaging the threads.

