CCpilot VC
Technical manual

Contents

1. Introduction

CCpilot VC is a freely programmable display computer with 5" full-colour TFT and optional touch screen.

The powerful ARM based CPU and Linux operating system constitutes an open platform that facilitates the implementation of premium user-machine interaction, reliable controls and integrated fleet management.

This technical manual provides important information regarding the device's hardware and its basic usage. For software and operating system specifics, please see additional documentation.

1.1. Product models

This documentation is applicable for all *CCpilot VC* standard models. These models are:

- *CCpilot VC* with pushbuttons.

- *CCpilot VC* with pushbuttons and optically bonded display.

- *CCpilot VC* with pushbuttons and resistive touch-screen.

- CCpilot *VC* with resistive touch-screen and no pushbuttons

All these models offer the same level of performance and connector interfaces.

The above product models are compatible with the CrossLink AI module to support wireless interfaces GSM/GPRS, WLAN and Bluetooth for communication and GPS for positioning.

1.1.1. Customized models

 1.1.2. The platform enables additional customization of hardware and software. Described herein are the features included using product models described above. Any additional feature will be described in model specific documentation.

1.2. Conventions and definitions

The following definitions are used to separate model specific details within this document. The observe symbol is also used to highlight such difference.

The 'observe' symbol is used to highligt information regarding differences between product models and options.

The 'exclamation' symbol is used to highlight information that is especially important for the end-user.

Different text formats used in this document are described in the table below:

Format	Use
Italics	*Names, designations and references.*
Bolded	**Important information**.

1.3. Identification

Each device has a label with article number, revision and serial numbers which identify your unique device. Take note of these numbers. During service and other contact with the supplier it is important to be able to provide this information.

1.4. Environment and Environmental Tolerance

The device has been designed to cope with tough environmental demands. Much effort has been put into selecting and designing system components to provide you with a user-friendly working instrument that is reliable. Rigorous testing has been conducted in order to ensure compliance to a broad range of applicable regulatory requirements and to meet the user expectations of a ruggedized device for vehicle and machinery control.

A full list of standards to which the device has been tested for compliance can be found in *chapter 7.2 -Environmental specifications*.

2. Device overview

This chapter contains illustrations of the *CCpilot VC* models showing the location of external connectors, indicators etc.

Additional mechanical information can be found in *chapter 7.3 - Weight and dimensions*

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Connectors are described in more detail in *chapter 6 - Connectors*.

2.1. CCpilot VC overview

On the front side of the device there is a 5" display with an optional resistive touch-screen, optional 2x4 soft keys with configurable function and dimmable LED illumination. There is also a light sensor in the front.

Information about *CCpilot VC standard* models can be found in c*hapter 1.1 - Product models*.

CCpilot VC **front side view**

Light sensor

Soft keys with user
configurable functionality

Display with resistive
touch-screen or glass
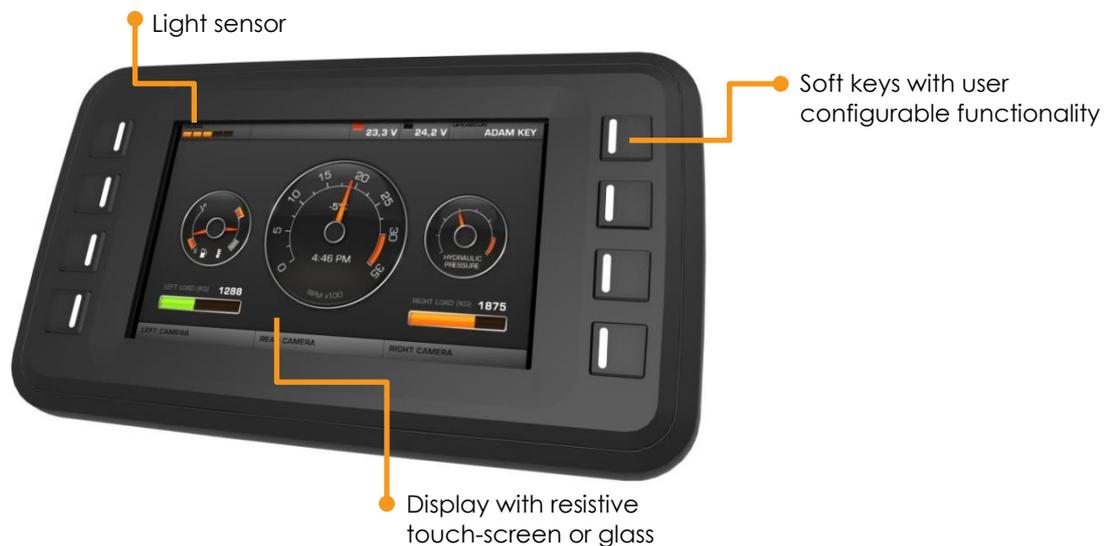
CCpilot VC **model without soft keys**

On the rear side of the device are the interface connectors (Deutsch DTM-12) and a USB connector located under a cover. There are also mounting holes for fasteners in accordance with AMPS hole pattern (RAM 2.43" x 1.31" Diamond Base) or bracket for panel mounting.

CCpilot VC rear side view

External connectors
Deutsch DTM

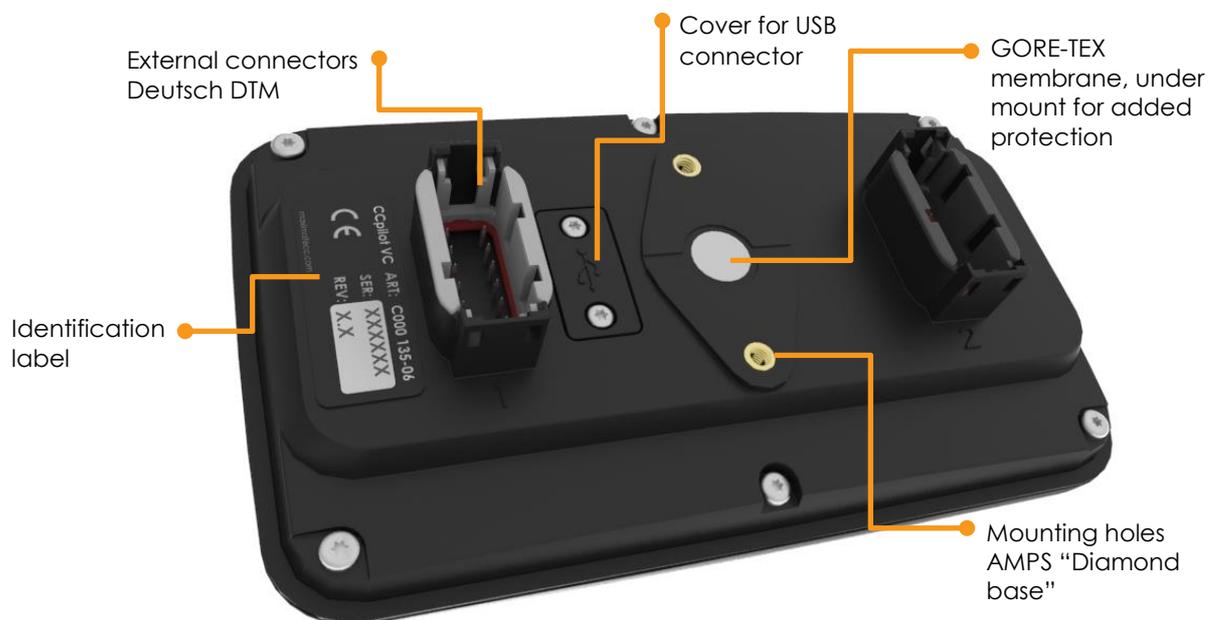Cover for USB
connector

GORE-TEX
membrane, under
mount for added
protection

Identification
label

Mounting holes
AMPS "Diamond
base"

3. Installation and handling

This chapter contains recommendations for installation, handling and maintenance of the device.

3.1. Mounting

CCpilot VC has the capability to support two different mounting methods, a RAM mount or a panel mount. These two mounting methods are described separately below.

For both fastening methods, use the appropriate M5 x 0.8 button head screw of type MRT (Torx), length should be 12mm. The recommended torque for the screws is 1.5-2.0 Nm. Using a split ring or toothed lock washer is recommended. Ensure the M5 mounting screws are clean and dry. It is also very important to use a fastening plate with holes that are not larger in diameter than 6 mm to avoid pulling out the threaded inserts from the unit.

3.1.1. RAM mount

CCpilot VC is preferably mounted using a RAM-B-238U Mount which allows adjustment of the display's position and angle. Screw length should be 12mm.

3.1.2. Panel mount

An alternate mounting method to the RAM mount would be in a panel mount using the C000135-81 bracket, see picture below. This mounting bracket is designed for min 1,5mm and max 3mm panel thickness. Screw length should be 10mm.

Ensure that *CCpilot VC* is mounted to a smooth, flat surface. Fastening the unit to an uneven surface may stress the enclosure, damage the outer flange or possibly even flex the circuit board inside, leading to a premature failure.

Panel thickness may vary from 1,5 to 3,5mm using the standard panel mount bracket.

Panel cut-out information available in dxf-format upon request for precision cutting of panels.
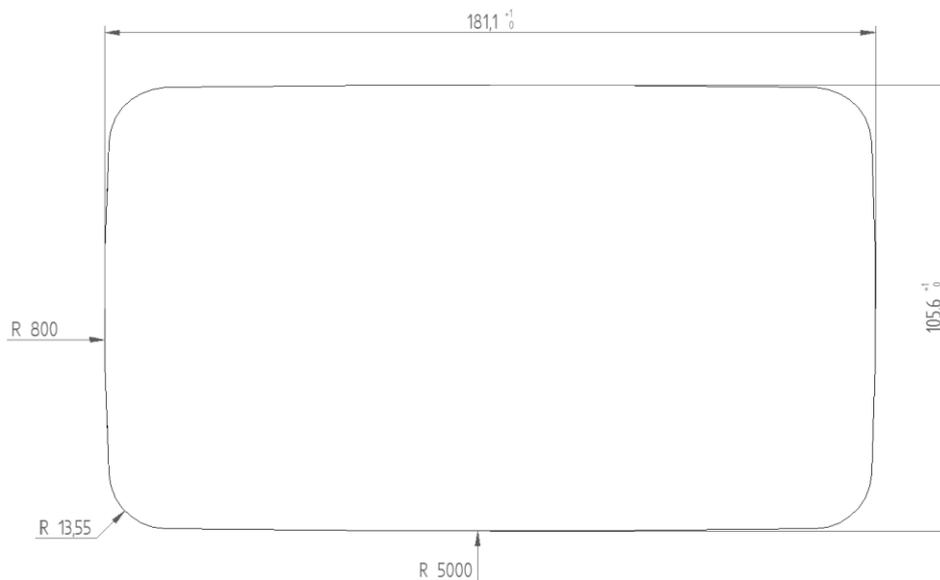
3.2. Power supply installation

This chapter describes installation of *CCpilot VC* in vehicles or other machines. The principle is the same also for other types of installations.

For connector pinout, see *chapter 6 - Connectors*.

Before installing the device into a vehicle or other machinery, carefully read through the instructions below:

- Wire gauge for the supply input shall be dimensioned with respect to cable length, supply voltage, maximum allowed voltage drop and maximum current consumption of the device.

  o As a guideline, the recommended minimum power supply cable area is:

  0.75 mm² (AWG 18)

- When connecting the device to a vehicles or machines battery (or other power source with high current capabilities), always apply fusing to prevent cable fire in case of short circuit.

  o The fuse shall be located as close to the battery/power source as possible.

- o Fuse rating shall be dimensioned with respect to wire gauge maximum current rating and inrush current of the load. Refer to *chapter 7.1 - Technical data* for fuse rating details.

    - o As a guideline, a fuse with 5-8 A current rating should be used.

- The device's external on/off control signal (multipin connector 1, pin J1-3) should be connected to the positive supply line via the vehicles turnkey switch or a separate on/off switch (see "S2" in schematic below).

    - o Remember to apply fusing also to the on/off control signal.

    - o Several *CCpilot VC* devices may be controlled by the same external on/off switch by joining their external on/off control signals. The current drawn from this signal (when turned ON) is up to 1.5 mA for each device attached. The fuse rating and wire gauge shall be dimensioned for the total switch current.

- If the vehicle or machine has a main power switch (see "S1" in schematic below), the device's power supply and on/off signal shall be connected after this switch. Observe that this switch shall **not** be used for switching the device on/off during normal operation. It is only intended for disconnecting the battery to prevent draining of the battery during prolonged stalling intervals of the vehicle or machine.
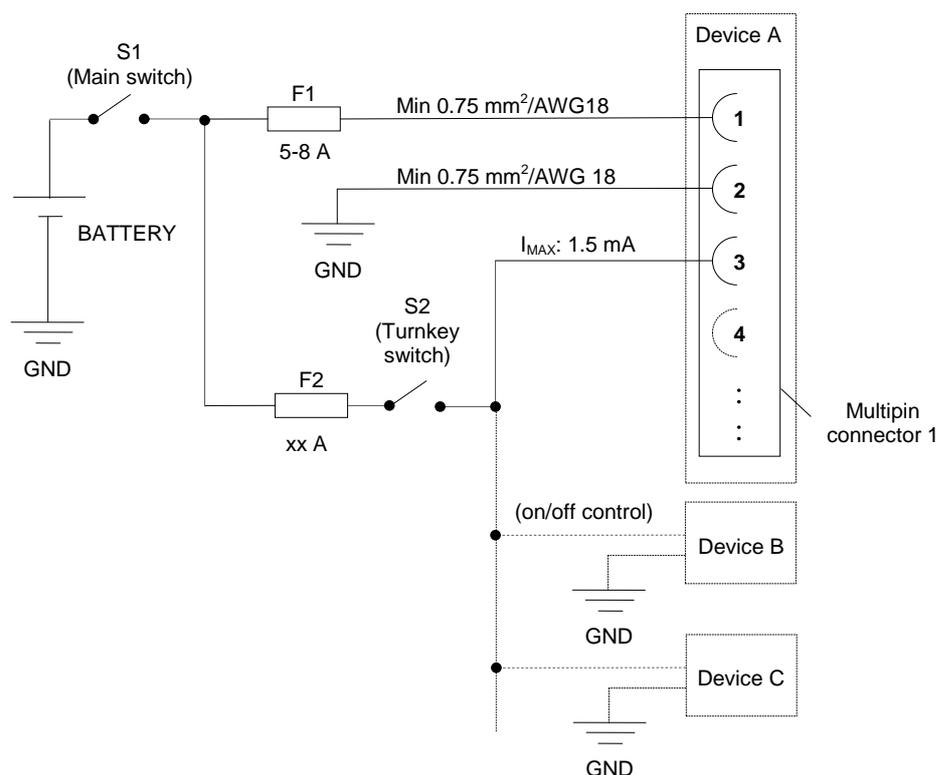
Schematic example for power supply installation of *CCpilot VC in* vehicles or other machines. The on/off control switch (S2) is shared by several devices (Device A, B, C...).

By connecting the power supply according to the illustration above, with the main switch S1 normally closed, the device will automatically start when the turnkey switch S2 is turned on and shut down when the switch is turned off. Note, the behaviour of the on/off signal is configurable through software.

3.2.1. Precautions

Ensure that the device is shut down properly before turning off the main switch S1 or in any other way making the computer powerless. Ensure that any application data is saved before turning off the device.

- Sudden power disruptions may cause the device to shut down, potentially causing lost or corrupt data. If for example the power supply voltage fluctuates significantly when starting the vehicle engine, the device should be started after the vehicle engine has been started.

- During welding all cables to the device shall be disconnected.

- Be advised that the device consumes a small amount of power from the main supply also when shutdown or suspended (up to 120 mW or 400 mW respectively). Therefore, if the device has been attached for a long period of time without the vehicle motor running, the battery may be drained, resulting in inability to start up the vehicle. A main switch for disconnecting the device's main supply is highly recommended in such situations.

3.3. Cable installation

Cables shall be installed in such a way that they don't run any risk of being damaged, pinched or worn.

- Avoid excessive bending and twisting of cables.

- Use strain-relief on cables near the device to minimize stress on cables and connectors.

- Properly snap the connectors to give good contact and avoid unnecessary strain

- Shielded cables is recommended and in some cases necessary to ensure reliable communication and appliance with industrial EMC standards.

3.4. Environmental considerations

To ensure proper and reliable operation of the device, follow the recommendations below:

- The device shall be placed in a way that prevents the unit from direct exposure to water or sunlight.

- To enable sufficient cooling, the device must be installed to allow ambient air to circulate around it. A clearance of at least 50 mm around the device is recommended.

- Avoid installing the device near hot air vents or in direct sunlight.

- To maintain the device's IP classification, both connectors need to be attached. Blind plugs for not connected signals/cables are also necessary.

- Each device has a GORE-TEX® membrane for ventilation; see location in *chapter 2 - Device overview*. For proper ventilation of the device, dirt and water must be prevented from accumulating and covering the membrane. Be cautious not to insert objects which

may puncture or detach the membrane. Doing so will violate the IP-classification and void the warranty of the device.

- Loose mounting bolts are a common cause for excessive vibration. They may come loose due to improper mounting techniques such as omitting thread locker or lock washers, over- or under-tightening. Proper tightening requires clean dry bolts and a torque wrench.

- Install the device and its cables in such a way that they are not subject to excess vibrations or other mechanical stress.

- If the unit is exposed to chemicals, water, dirt, etc it's recommended to clean it according to *chapter 3.5.1 - Cleaning* as soon as possible.

3.5. Handling and maintenance

Handle the device with care and pay attention to the following handling directives:

- Disconnect all cables to the device during welding or when performing other service to the machine imposing a risk of damaging electronic devices.

- Service and repair to the device shall only be made by authorised personnel. If the device is opened by unauthorised personnel, its warranty will be voided.

- Scratches or other damages may occur to the display surface (touch-screen or protective glass, depending on model) if it is exposed to sharp objects or heavy impacts. This must be avoided to increase the longevity of the screen.

  o Observe that *CCpilot VC* models with resistive touch-screen are more prone to scratches than non-touch models.

- The internal Flash storage has a limited number of write cycles. It is recommended that the amount of writing to flash storage is limited within software applications.

- Always consider personal safety when installing and operating the device. For example, in vehicle installations, CrossControl does not recommend that the device is being actively operated by the driver when a risk of injury to people or damage to property is present.

3.5.1. Cleaning

To ensure proper and reliable functionality over time, pay attention to the following cleaning instructions and precautions:

- Wipe the device clean from dirt using a soft, light damp cloth, preferably of *microfiber* type.

- Avoid using alkaline, alcoholic or other chemicals for cleaning; doing so may damage the device. However, small amount isopropyl alcohol may be used for removing harsh stains.

- Avoid spray or apply water or alcohol directly to the device. Instead, dampen the cloth lightly before using it for cleaning the device.

- After cleaning, make sure that the device surface is left dry.

- Never use high-pressure air, water or steam to clean the device.

3.5.2. RTC clock back-up battery

Time and date information is stored in a memory sustained by a back-up battery.

⚠ The expected life time of the battery is approximately 10 years. Contact supplier for instructions of replacing the battery.

4. Basic operations

This section covers basic operation of the device such as start-up, shut-down, suspend, resume, display operation and status notification.

⚠ Observe that the behaviour of on/off controls (external on/off control and front panel soft keys) is user configurable in terms of:

- Enabling/disabling functionality

- Which push button that shall hold the on/off functionality.

- Configurable timing parameters

All *CCpilot VC* models containing soft keys present status notifications during start up by flashing the soft keys backlight or beeping with the buzzer in different patterns.

Status notifications on *CCpilot VC* models without soft keys are limited to beeping with the buzzer and they only present critical internal errors detected by the device.

The status notification behaviour in the operational state of the device is configurable by user applications. Described herein are the factory default behaviours of the on/off controls and the status notification.

4.1. Turning ON

The *CCpilot VC* device can be started up in different ways:

1. By connecting the external on/off control signal to positive supply input (or above approximately 6 V).

   o When started this way, the on/off signal must remain asserted. De-assertion of this signal will shut down the device unless configured otherwise.

2. By a short-press on the front panel button configured for on/off control.

   a. Note that this function is not enabled as factory default.

3. It is possible to configure the device to automatically start up whenever external power is applied (i.e. without using any on/off control).

   a. Note that this function is enabled as factory default.

For suspending and resuming the device from suspend mode, see chapter 4.2.

While starting up the device, the pushbutton backlight will flash with 2 Hz. When the device enters operational state the pushbutton backlight will stop flashing and be turned on.

4.2. Turning OFF and suspending

There are several ways to turn off the *CCpilot VC* device and also alternatives to enter suspend mode instead of completely shutting down the unit.

4.2.1. Shutting Down

There are a number of ways to shut down the device, provided that it's in normal operational state when the action occurs:

1. By disconnecting the external on/off control for more than a specified time, i.e. using the turn-key functionality.

    o   The time-out is user configurable and defaults to 4 seconds.

    o   If the on/off signal is brought back high again while the device is shutting down, it won't restart automatically. A low-to-high transition must occur after the device has fully shut down to make a restart.

2. By long-pressing a front panel button configured for shutting down.

    o   The time used for detecting long-presses is user configurable and defaults to 4 seconds.

    o   A prolonged long-press (more than 8 seconds) gives a forced shutdown where the internal voltages are shut off immediately, see *chapter 4.2.3 - Forced Shutdown* for details. Note, this only applies to buttons configured as "action trigger". For details, see the software documentation.

    o   By factory default, no action is configured for the pushbuttons.

4. By the operating system shutdown alternatives.

To ensure that data does not get lost or the flash memory becomes corrupt, it is recommended that all necessary data shall be saved and all programs closed before the device is shut down.

Note that the device won't shut down from Suspend mode by these actions. See chapter 0 for details of Suspend mode and wakeup.

When performing any of the above, the *CCpilot VC* device will shut down. The pushbutton backlight will flash to indicate that releasing the button configured for shutting down will result in the unit starting to shut down.

4.2.2. Suspending/resuming

Suspending and resuming are faster alternative to shutting down and starting up the device. In suspend mode, the data remains in RAM memory and the device must be connected to external power supply to maintain its state.

Suspend mode can be entered in a number of ways:

1. By disconnecting the external on/off control, i.e. using the turn key functionality.

    o   By factory default, disconnecting the external on/off control is configured to shut-down the device.

2. By using the front panel buttons (action configurable for either short-press or long-press of the button)

> o   By factory default, no action is configured for the pushbuttons.

3.   By selecting the operating systems suspend alternative.

⚠ Observe that the device current consumption is Suspend mode is higher than in shut-down mode.

To prevent a vehicles or machines battery from draining when the device is suspended, a user configurable time-out can be set for how long the unit shall stay in Suspend mode before it automatically shuts down. The default Suspend time-out is set to 60 minutes.

Resuming from Suspend mode can be done by one of the following events:

1.   By a low-to-high transition of the external on/off control, i.e. using the turn-key functionality.

> o   Note that this is the only action that is configured for waking up the device per factory default.

2.   By pressing a front panel pushbutton configured for resuming from suspend (configured as start-up trigger).

3.   By changing the state of a Configurable Input (rising or falling) configured for resuming from suspend (configured as start-up trigger).

4.   CAN bus receive event on a bus configured for resuming from suspend (configured as start-up trigger).

Configuration of how to wake up from suspend is done through the CCsettings application or using the CCAux API. See the software guide for details.

4.2.3. Forced Shutdown

🔍 If the *CCpilot VC* is not responding, a forced shutdown can be performed by pressing and holding a pushbutton (that is configured as action trigger) until the device is switched off.

- The default button-press time for performing a forced shutdown is 8 seconds.
- By factory default, no action is configured for the pushbuttons.

⚠ A forced shutdown immediately shuts down the device, regardless of its operational state. Any information which was not saved will be lost when performing a forced shutdown. Any ongoing writing to the flash memory will be disrupted which may lead to a corrupted file system.

- Therefore it is **not** recommended to use the forced shutdown feature unless absolutely necessary.

4.3. Adjusting the screen brightness

With the *CCpilot VC* device it is possible to configure buttons as dedicated backlight brightness buttons to gradually increase or decrease the display brightness. Note that this is not configured as factory default.

The screen brightness can also be controlled from software, which also allows for automatic adjustment of the brightness using the front panel light sensor.

The backlight brightness adjustment may optionally also be automatically applied to the pushbutton backlight. The pushbutton backlight can otherwise be set separately using CCsettings application or the CCAux API.

4.4. Using the touch screen

This chapter applies to *CCpilot VC* devices containing a touch screen.

The display is equipped with a touch functionality which gives the opportunity to provide a very easy-to-use HMI (Human Machine Interface) for the user.

4.4.1. Touch screen double- and right-click operation

Double click is performed similar to using an external pointing device. Tap the screen twice in the same place.

Tap and hold the touch screen to perform a "right-click" operation.

4.4.2. Touch screen calibration

Touch screen calibration can be started by activating the Touch Calibrator application from default start up screen application. It's also possible start calibration from the command line. For detail, see the software documentation.

4.5. Status notification

All *CCpilot VC* models containing soft keys present status notifications during start up and operational state by flashing the soft keys backlight or beeping with the buzzer in different patterns.

The table below describes the *default* behaviour of the status notification for different operational states. Note that the button backlight status notification can be configured to be turned off completely.

Operational state	Soft key backlight behavior
Device off	Off
Starting up	Flashing, 2 Hz
Operating (started up)	Constant on
Shutting down	Constant on
Internal heating activated - Until lower temperature limit for start-up is reached.	Flashing, 1 Hz
Entering forced shutdown using a button configured as action trigger - During first 4 seconds - After 4 seconds - After 8 seconds	 Constant on (intensity changed) Flashing 10 Hz Off (device is switched off)

Observe that the status notification behaviour in the *operating* state is configurable by user applications running on the device.

4.6. Error codes

The internal buzzer is used for signalling error codes when the device cannot start due to a hardware failure. When this happens, the device will remain shut off, but indicates the failure reason by beeping the buzzer in a special pattern. The pattern is a certain number of beeps followed by a longer pause after which the sequence is repeated. The number of beeps is important information if the unit is sent in for service/repair. The table below lists the different error codes.

Number of beeps	Error code	Likely problem cause
1	errCodeReadErrEEPROM	Corrupted configuration settings in SS FRAM.
2	errCodeWriteErrEEPROM	Corrupted configuration settings in SS FRAM.
3	errCodeDriverInit	SS FRAM or temp/light sensor malfunction.
4	errCodeInternalVoltageOutOfLimits_NoBlinks	Internal voltages is outside allowed limits.
5	errCodeMPDoneTimeoutErr	Faulty or unprogrammed NAND Flash (OS image) or hardware error.
6	errCodeTimeOutWaitingForVoltages	Unstable internal voltages.
7	errCodeTEMPOutOfLimits	Temperature sensor malfunction or extreme operating conditions.
10	errCodeRCCInit	SS clock crystal malfunction or SS processor failure.
11	errCodeSSSState	SS processor failure or programming bug.
12	errCodeManageDiagnostics	Corrupted configuration settings in SS FRAM.
13	errCodeManageActDeAct	SS processor failure or programming bug.
14	errCodeTickTimeOutTimer	SS processor failure or programming bug.
15	errCodeOperateModeStateError	SS processor failure or programming bug.
16	errCodeHALIOReadErr	SS processor failure or programming bug.
17	errCodeHALIOWriteErr	SS processor failure or programming bug.

5. Interface overview

This section describes the various interfaces of the device. Main part of these interfaces can be accessed via software APIs. These are described in the Software user guide and programmers guide.

5.1. Storage memory

An industrial grade internal NAND flash memory is used for data storage. This makes the device resilient to shock and vibrations which would be a problem when using mechanically rotating hard disks.

The Flash module is industrial grade classified and has both static and dynamic wear levelling to prevent premature wear-out and to extend the lifetime of the memory. Still it has a limited number of write cycles. It is recommended that the amounts of writing to storage are limited within the software applications.

5.2. Front panel

5.2.1. Light sensor

There is a light sensor in the front panel used by user applications or used with the built in automated function for dimming of the display brightness.

5.2.2. Pushbuttons

Up to 8 software configurable pushbuttons are available depending on the CCpilot VC model. The buttons may be used for user application input, turning the unit on/off or controlling the backlight; refer to the software documentation for details.

5.3. Buzzer

There is a buzzer in the front panel that can be used for audible notifications. The buzzer is application controllable with configurable volume and frequency.

5.4. Analog video inputs

The *CCpilot VC* device contains one analog video input used for attaching an analog video source such as rear view- or surveillance camera.

The analog video input support PAL as well as NTSC video formats.

The cable which is used to connect the camera to the device shall be a 75 Ω coaxial cable, for example: M17/94-RG179. Shielded cables shall be used to ensure electromagnetic compliance.

Depending on the installation, it could be necessary to separate video ground from the power supply ground, by galvanic isolation on the video source side, to ensure sufficient functionality.

5.5. CAN

The *CCpilot VC* device contains two CAN ports that meet the CAN ISO 11898 2.0B specification.

Each CAN port is galvanically isolated from chassis ground and is tolerant for bus short-circuits. There is no device-internal CAN bus termination; therefore bus termination must be applied externally.

5.6. USB

The *CCpilot VC* contains two USB ports. One port is located in the multipin connector 1 and function as a host interface. This port can be used for application for data transfer or the connection of a peripheral such as a mouse or keyboard.

The second USB port which interface through a micro USB connector is located under a cover on the backside of the device. This port supports an USB OTG interface, i.e. acting as both host and device interfaces. Using the port in USB device mode, it's only for enable OS updates through a connected PC with appropriate tool installed. In USB host mode, it supports the same functionality as the USB host port in the main connector.
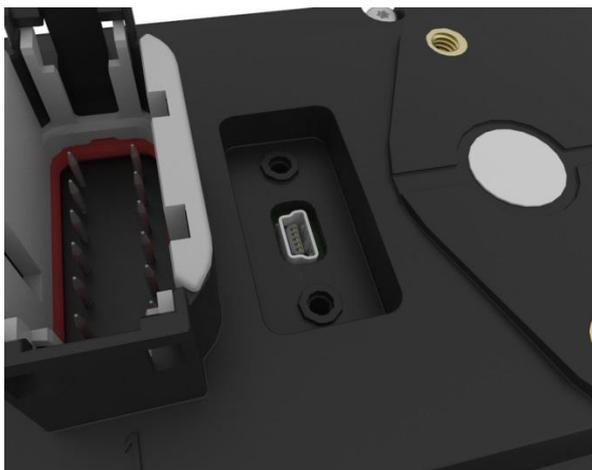
Note, the sealing property of the unit is affected when accessing the second USB port located under the hatch.

Due to limitation in the multipin connector specification, USB data signal integrity cannot be guaranteed with higher speeds than full-speed USB (12 Mbps). Though, hi-speed operation is supported by the USB host controller.

The USB ports can supply up to 500 mA each. The USB ports are internally over current and short circuit protected. Shielded cables shall be used to ensure reliable communication and electromagnetic compliance. Depending on installation the shield could be connected to USB ground or left unconnected on the Deutsch DTM-12 connector, i.e. *CCpilot VC*, side of the cable.

5.7. Ethernet

The device has an Ethernet interface supporting 10BASE-T/100-BASE-TX and Auto-MDIX with $500V_{AC}/707V_{DC}$ galvanic isolation.

Observe that:

- The Ethernet interface has *function isolation* only and must be connected to other SELV (Safety Extra Low Voltage) circuits only; i.e. local network without routing to outside plant.

- Shielded cables shall be used for this port to ensure reliable communication and electromagnetic compliance. The shield should be left unconnected on the Deutsch DTM-12 connector i.e. *CCpilot VC* side of the Ethernet cable.

- Connecting the device to a public network environment may impose a security threat.

5.8. Configurable inputs

There are two configurable inputs available on the *CCpilot VC* through the Deutsch DTM-12 connector 2.

Each input can be configured for voltage measurement, frequency measurement, resistance measurement, switched to battery (internal pull-down) or switched to ground (internal pull-up).

The operating specifications for the various operating modes are provided below:

Mode	Range	Accuracy	Resolution
Voltage	2.5 V range: 0 V-2.75 V_{DC}(typ) 2.5 V(min) 5 V range: 0 V-5.5 V_{DC}(typ) 5.0 V(min)	0.3 %	0.01V
Resistive	0-5 kΩ	±2 %	1Ω
Frequency	0.1-15000 Hz	100 ppm	0.1 Hz up to 2.5 kHz, 1 Hz at 8 kHz and 4 Hz at 15 kHz.
Switched to battery	10 kΩ pull-down	-	-
Switched to ground	10 kΩ pull-up	-	-

5.9. Configurable outputs

There are two configurable outputs available on the *CCpilot VC* through the Deutsch DTM-12 connector 1. These two self-protected high-side switched PWM outputs can be used to control external loads such as a buzzer, relay or lamps. The outputs have a maximum current rating of 1 Amps per channel.

PWM duty cycle and frequency is adjustable via API/software.

⚠ Observe that high continuous current through several I/O channels simultaneously adds internal heating of the device. At high ambient temperatures, this may cause I/Os to switch off because of thermal protection in their internal circuitry. Normal function will be restored when temperature is within acceptable level again. Note, if this occurs frequently it's recommended to improve the ventilation around the device or if possible reduce the load on the outputs.

6. Connectors

All connectors are accessible from the rear of the unit. The connectors which are twelve pin molded-in Deutsch DTM series connectors are marked with a 1(J1) and a 2(J2).

Use caution and avoid plugging/unplugging of connectors when the computer is powered up. Always replace damaged cables. If a connector pin becomes bent the interface may not function correctly and the device should be returned to the manufacturer for repair.

6.1. Connector layout

⚠ Note that descriptions herein refer to the connectors located on the device and not the cable-side connectors which are attached to the device. Though, the pinout numbering and signal descriptions are the same.

Pin	Function (DTM06-12SA)	Pin	Function (DTM06-12SB)
J1-1	Constant Power +12/24	J2-1	Configurable Input 1
J1-2	Power Ground	J2-2	Configurable Input 2
J1-3	Switched Power +12/24	J2-3	Video Input 1
J1-4	Switched Output 1	J2-4	Video Ground
J1-5	Switched Output 2	J2-5	Analog Ground
J1-6	CAN 1 Shield	J2-6	CAN 2 Shield
J1-7	CAN 1+	J2-7	CAN 2+
J1-8	CAN 1 -	J2-8	CAN 2 –
J1-9	USB Ground	J2-9	Ethernet TD+
J1-10	USB Data -	J2-10	Ethernet TD-
J1-11	USB Data +	J2-11	Ethernet RD+
J1-12	USB Vbus	J2-12	Ethernet RD-
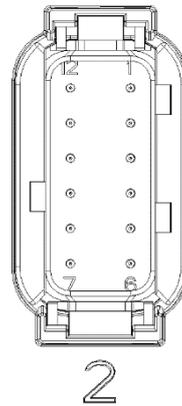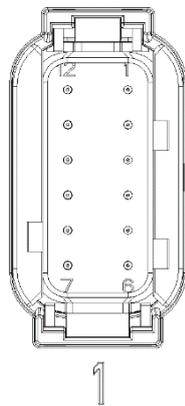
7. Specifications

7.1. Technical data

Temperature specification	
Operating	-25 to +70 °C
Storage	-40 to +85 °C

Kernel	
Processor	32-bit ARM, Freescale i.MX537, 800 MHz
Data storage	512 MB, Industrial grade NAND flash(Note)
RAM memory	256 MB, DDR3

NOTE The Flash module is industrial grade classified. It has both static and dynamic wear levelling to prevent a premature aging and to extend the lifetime of the memory. Still it has a limited number of write cycles. It is recommended that the amount of writing to flash storage is limited within the software applications.

Power Supply		
Supply Voltage		
Nominal	12 V_{DC} or 24 V_{DC}	
Extreme	10* V_{DC}…32 V_{DC}	
	* Down to 6 VDC with reduced operation (display and power outputs automatically switched off to reduce input power)	
Power Consumption		
Typical operating	5-7 W	
Max operating	< 15 W (+ external loads)	
Shutdown	< 120 mW	
Suspend	< 400 mW	
Inrush current		
@ 24 V_{DC} input	< 1.5 A (for < 10 ms)	
@ 12 V_{DC} input	< 1.5 A (for < 10 ms)	
External fuse recommendation		
Current rating (12V/24V input)	5 A (min)*	
	*This assumes that the fuse is in accordance with IEC20127 i.e. can be continuously operated at 100% of rated current.	

Interfaces	
CAN	
Type	CAN ISO 11898-2, 2.0B, (High Speed CAN)
Driver	SN65HVD234
Baud Rate	Configurable 20 – 250 kbit/s, optional up to 1 Mbit/s*
	* Internal CAN bus filters have a capacitance of 100pF (typ) as stated in the J1939 standard. This puts limitations on the CAN bus topology conciderng bus length, number of CAN nodes etc., when running at high bit-rates (i.e. above 250kbit/s).
USB	
Type	Host and device, V 2.0
Speed	Full speed, max 12 Mbit/s
Host port	5 V, max 500 mA, over-current and short-circuit protected.
Ethernet	
Type	According to 10BASE-T and 100BASE-TX standards
Isolation voltage	1500 V_{AC}, 50/60Hz
Video In	

Supported input signals	Composite video, PAL(B, D, G, H, I, M, N, Nc) and NTSC(J, M, 4.43)
Protection	Video input is ESD protected.

Configurable inputs

Input range	0-32 V
Digital input thresholds	Voltage input high: 2.4 V
	Voltage input low: 0.9 V
Analog input 0-5V	Accuracy: 3 mV ± 0.25%, resolution 0.1 mV
Analog input 0-2.5V	Accuracy: 3 mV ± 0.1%, resolution 0.1 mV
Resistance input 0-5K	Accuracy: 1 Ω ± 2% for 0-100 Ω
	Accuracy: 1 Ω ± 1% for 100-1000 Ω
	Accuracy: 3 Ω ± 1% for 1001-5000 Ω
Frequency input	Frequency range: 0.1-15000 Hz
	Time base accuracy: 100 ppm
	Period time resolution: 13.9 ns (72 MHz counter)
Internal pull-up	9100 Ω, software enabled
Internal pull-down	15140 Ω, software enabled

Configurable outputs

Nominal output current	1.3 A (Note power input current limit of 4 A)
Diagnostics	Short to GND, short to battery, over load, over temperature
On-state resistance	200 mΩ (typ), 380 mΩ (max)
Turn-on time	80 µs (typ), 180 µs (max)
Turn-off time	80 µs (typ), 200 µs (max)
Leakage current	5 µA

HMI

Pushbuttons	2x4 soft keys, configurable function. Dimmable LED illumination and tactile feedback.

Software

Operating system	Linux
Additional software	CCsettings, CCvideo.
	API's are available to access system specific settings from software applications. Refer to the *CCpilot VC Software guide* for details.

Display

5"

	TFT, 16:9
Type	WVGA, 800x480
Resolution	24 bit
Colour depth	LED, 650 cd/m^2 (min) 700 cd/m^2 (typ)*
Backlight	4-wire resistive, 3H surface hardness.
Touch-screen type	

*The optional touchscreen will lower the brightness with up to 20%

7.2. Environmental specifications

Environmental Test	Standard	Notes
Dry Heat	IEC 60068-2-2:2007	Operating: +70°C, 24h Storage: +85°C, 24h
Damp Heat	IEC 60068-2-30:2005	Operation: +25°C / +55°C >93% RH 2*24h
Cold	IEC 60068-2-1:2007	Operating: -25°C, 24h Storage: -40°C, 24h
Change of temperature	IEC 60068-2-14:2009	-20°C to +70°C, 5C/min 3hr hold time, 20 cycles
Vibration	IEC 60068-2-64:2008	0,02 g2/Hz 5-500 Hz 3x3h
Shock	IEC 60068-2-27:2009	30 g / 11ms 3x ±10 bumps
EMC Electrical Transient	ISO 7637-2:2011	Pulse 1: -50V 2: +25V 3a: -35V 3b: +35V 4: -5V 5: +70V
EMC Immunity, ESD	ISO 10605:2008	±8 kV air, ±6 kV contact
EMC RF Immunity, Radiated [1]	ISO 11452-2:2004	RF electromagnetic field 200-1000MHz, 30V/m
EMC RF Immunity, Induced [1]	ISO 11452-4:2005/Cor.1:2009	Bulk Current Injection 20-200MHz, 60 mA
EMC Radiated Emission [1]	ISO 14982:2009	MHz / Narrow b. [dBµV/m] / Broad b. [dBµV/m] 30-75 / 54-44 / 64-54 75-400 / 44-55 / 54-65 400-1000 / 55 / 65
Enclosure Ingress Protection	IEC 60529:2014	IP66

[1] Requires shielded cables for Ethernet, USB and Video interfaces.

Environmental tests are performed at 24 V_{DC} supply voltage unless otherwise required. The environmental tolerance may be affected by external factors like mounting, omitting the use of shielded cables etc.

⚠ Any changes or modifications to the device not expressly approved by CrossControl could void the environmental classification, warranty as well as user's authority to operate the equipment.

7.3. Weight and dimensions

	Description	Comments
Dimensions	187 x 112 x 48 mm	(W x H x D)
Weight	0,45 Kg	
Mounting holes	RAM-B-238U	
Spacing	48.5 mm	-
Thread dimension	M5	
Thread depth	7.7 mm	

187

112

48

CCpilot VC
maxxmotec.com
CE
ART: C000 135-06
SER: XXXXXX
REV: X.X

1

2
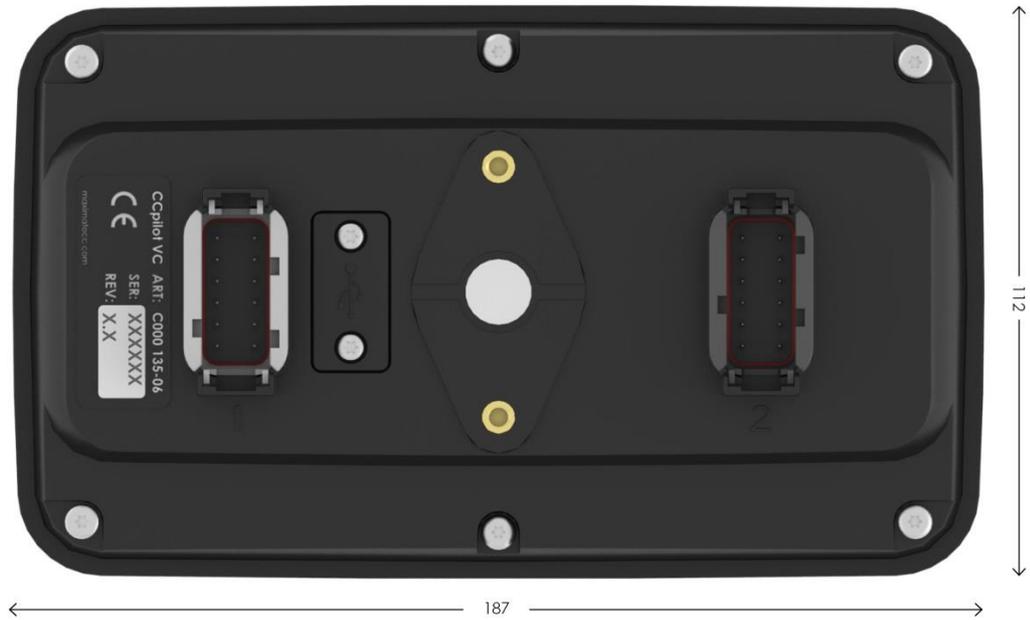
Technical Support

Contact your reseller or supplier for help with possible problems with your device. In order to get the best help, you should have your device in front of you and be prepared with the following information before you contact support.

- Part number and serial number of the unit, which you find on the brand label.

- Date of purchase, which is found on the invoice.

- The conditions and circumstances under which the problem arises.

- Error codes signaled by the internal buzzer

- Possible error messages which are shown.

- Operating system type and its version number.

- The device log files (if possible).

- Prepare a system report on the device, from within *CCsettings* (if possible).

- Information regarding possible external equipment which is connected to the device.

- Additional sources of information are available on the CrossControl support site http://support.CrossControl.com

Trade Mark

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