

CM1X SERIES



Installation Manual

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PREFACE

Thank you for purchasing this Tierra product. The materials available in this Manual (the “Manual”) have been prepared by Tierra S.p.A. (“Tierra”) for customers of Tierra products, and are designed to assist customers with the use of the receiver and its use is subject to these terms and conditions (the “Terms and Conditions”).



NOTICE - Please read these Terms and Conditions carefully.

■ TERMS AND CONDITIONS

USE This product is designed to be used by a professional. The user should have a good knowledge of the safe use of the product and implement the types of safety procedures recommended by the local government protection agency for both private use and commercial job sites.

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CONFIDENTIALITY This Manual, its contents and the Software (collectively, the “Confidential Information”) are the confidential and proprietary information of Tierra. You agree to treat Tierra’s Confidential Information with a degree of care no less stringent than the degree of care you would use in safeguarding your own most valuable trade secrets. Nothing in this paragraph shall restrict you from disclosing Confidential Information to your employees as may be necessary or appropriate to operate or care for the receiver. Such employees must also keep the Confidentiality Information confidential. In the event you become legally compelled to disclose any of the Confidential Information, you shall give Tierra immediate notice so that it may seek a protective order or other appropriate remedy.

WEBSITE; OTHER STATEMENTS No statement contained at the Tierra website (or any other website) or in any other advertisements or Tierra literature or made by an employee or independent contractor of Tierra modifies these Terms and Conditions (including the Software license, warranty and limitation of liability).

SAFETY Improper use of the receiver can lead to injury to persons or property and/or malfunction of the product. The receiver should only be repaired by authorized Tierra warranty service centers. Users should review and heed the safety warnings in an Appendix.

MISCELLANEOUS The above Terms and Conditions may be amended, modified, superseded, or canceled, at any time by Tierra.

■ MANUAL CONVENTIONS

This manual uses the following conventions:



NOTE - Further information to note about the configuration, maintenance, or setup of a system.



TIPS - Supplementary information that can help you configure, maintain, or set up a system.



NOTICE - Supplementary information that can have an effect on system operation, system performance, measurements, or personal safety.



WARNING - Notification that an action will result in system damage, loss of data, loss of warranty, or personal injury.



DANGER - Under no circumstances should this action be performed.



INTRODUCTION

CM1X Series is Tierra’s third generation of devices and the result of our **long-standing expertise** in providing **advanced telematics** and bringing meaningful **improvements in our HW** to keep on meeting our customers’ necessities.

Two versions of **CM1X** have been designed to suit the market requirements.

CM100, with internal antennas solution

CM110, with external antennas connectors

■ REFERENCE PART NUMBER

Part Numbers	Model	Modem Version	Segment
91732848	CM110	EC21A	AG
91732849	CM110	EC21V	AG
91732851	CM110	EC21AU	AG
91732853	CM110	EC21E	AG
91732835	CM100	EC21A	AG
91732836	CM100	EC21V	AG
91732839	CM100	EC21AU	AG
91732840	CM100	EC21E	AG
91732855	CM110	EC21A	CE
91732856	CM110	EC21V	CE
91732857	CM110	EC21AU	CE
91732859	CM110	EC21E	CE
91732842	CM100	EC21A	CE
91732843	CM100	EC21V	CE
91732845	CM100	EC21AU	CE



■ CM1XLED DISPLAY PANEL



Power LED (Red):

- **OFF** - No power supply.
- **Double blink** - powered and working.
- **Rapid blinking** - key off.



CAN-BUS LED (green):

- **Off:** CAN-BUS signal not available.
- **Solid On:** can messages received from at least one line.



MODEM LED (green):

- **Off:** Modem initialization phase. No network coverage or device in standby/wake mode.
- **Slow Blink:** GSM networks detected.
- **Fast Blink:** Device connected to the network, and ready to communicate with the server.
- **On solid:** GSM communication ongoing.



GPS LED (green):

- **Off:** GPS initialization phase or device in standby/wake mode.
- **Blinking:** Searching for GPS signal.
- **On solid:** GPS fix completed.

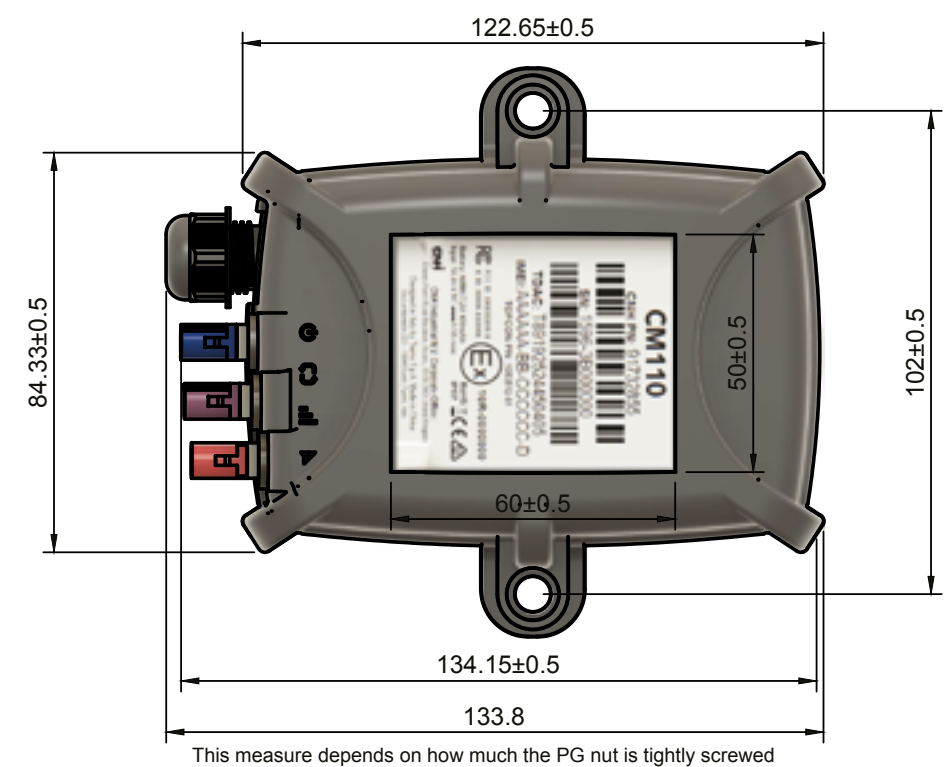
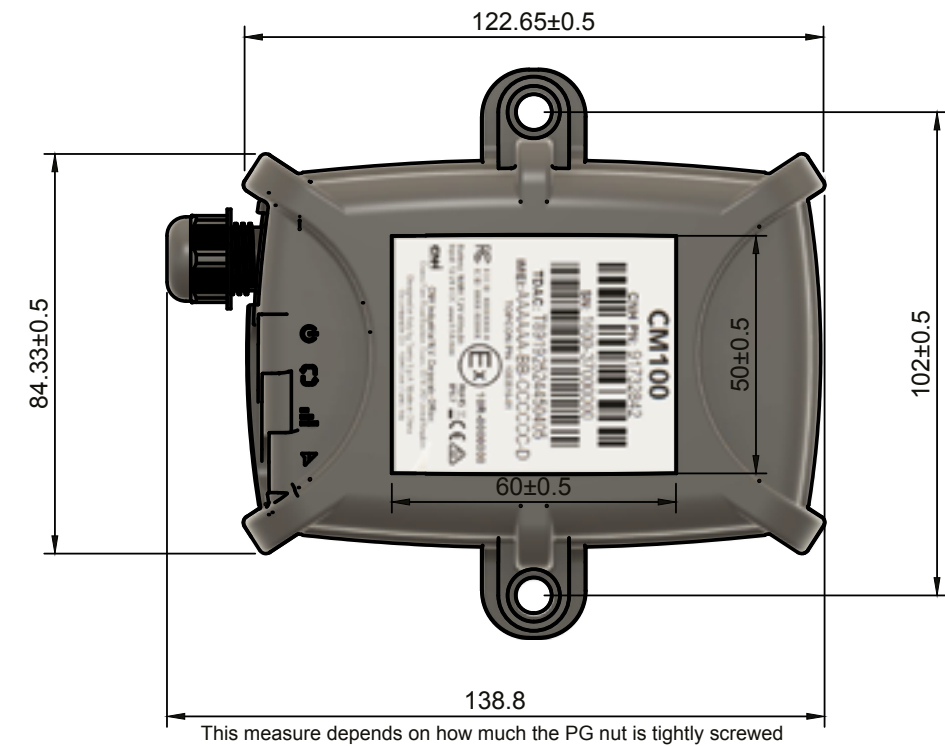
Specific scenarios

BOOT: All leds are lights up for the boot time

FACTORY LOOP: Power LED (red) fixed on and three green LEDs are OFF. At Key off, the device goes to hibernate, and every LEDs will be OFF.



■ CM1X MAIN ENVELOPE DIMENSIONS



SPECIFICATIONS

CM100

Wakeup sources	Ignition - RTC - CAN - IMU
SIM	eUICC Cubict
WiFi/BLE	WiFi 2.4 GHz, 11b/g/n20: 2412 ÷ 2472 MHz - BT/BLE 4.1: 2402 ÷ 2480 MHz
Memory	
RAM	30 MB - extended memory +8MB
Flash NAND	90 MB - extended memory +128 MB
LED	x4
Ports & Connectors	
Serial Port ^[1]	RS232
CAN Bus	2x with configurable 120 Ohm termination
Connector	Built-in harness
Cellular technologies multi-mode modem	Regional variants: - North America: LTE B2, B4, B12; WCDMA B2/B4/B5 – Verizon: LTE B4, B13 - Latin America/Australia: LTE B1, B2, B3, B4, B5, B7, B8, B28, B40; WCDMA B1/B2/B5/B8; GSM/EDGE B2/B3/B5/B8 and 2G support - Europe/East Asia: LTE B1, B3, B7, B8, B20; WCDMA B1/B5/B8; GSM/EDGE B3/B8 and 2G support - Global 3G support
RF Output power	
Bluetooth	6.8 dBm; BLE: 0.4 dBm 11b/17.8 dBm, 11g: 15.9 dBm, 11n20: 14.7 dBm, 11n40: 12.9 dBm 11ac (20MHz): 11.95dBm, 11ac (40 MHz): 9.96 dBm, 11 ac (80MHz): 9.96 dBm
E-GSM 900	33 dBm; DCS1800: 30 dBm; UMTS Band I: 23 dBm; UMTS Band VIII: 23 dBm; LTE Band 1/3/7/8/20: 23dBm
Antennas (Internal)	GNSS - WiFi - LTE
GNSS Receiver	
Frequency	GPS QZSS (Optional) GLONASS BeiDou Galileo
Motion Sensor	6-Axis Accelerometer and gyroscope
Input/Output	
Input Device	Digital/Analog/Frequency (software configurable): 4x
Output Devices	2x HS and 2x LS - 0.5 A max - short circuit protected - latched
Power Supply	
Input	12-24 V DC, 0.5 A max
Battery	NiMH 7.2 Vdc, 400 mAh Ground and battery (KL30) - Voltage: 9 to 36V Switched power (KL15) or Alternator W - Voltage: 9 to 36V
Batteries	NiMH Battery Charging time: 10 hours Capacity: 3 Wh
Remote Capabilities	
Configuration	Yes
Firmware Update ^[2]	Yes (OTA)
Environmental ^[3]	
Water/Dust Resistance	IP67 IP69K
Operating Temperature Range ^[4]	-40°C to +85°C
Humidity	5 to 95% RH
Physical	
Dimensions	L: 105 mm x W: 76 mm x H: 35 mm
Weight (with internal batteries)	275g

[1] Debug Software or firmware customization.

[2] With the exception of downloading time, updates are performed during normal usage.

[3] Totally protected against dust and the effect of immersion up to 39.3701" deep (1m).

[4] With the exception of battery recharging process.



CM110

Wakeup sources	Ignition - RTC - CAN - IMU
SIM	eUICC Cubic
WiFi/BLE	WiFi 2.4 GHz, 11b/g/n20: 2412 ÷ 2472 MHz - BT/BLE 4.1: 2402 ÷ 2480 MHz
Memory	
RAM	30 MB - extended memory +8MB
Flash NAND	90 MB - extended memory +128 MB
LED	x4
Ports & Connectors	
Serial Port ^[1]	RS232
CAN Bus	2x with configurable 120 Ohm termination
Connector	Built-in harness
Cellular technologies multi-mode modem	Regional variants: - North America: LTE B2, B4, B12; WCDMA B2/B4/B5 – Verizon: LTE B4, B13 - Latin America/Australia: LTE B1, B2, B3, B4, B5, B7, B8, B28, B40; WCDMA B1/B2/B5/B8; GSM/EDGE B2/B3/B5/B8 and 2G support - Europe/East Asia: LTE B1, B3, B7, B8, B20; WCDMA B1/B5/B8; GSM/EDGE B3/B8 and 2G support - Global 3G support
RF Output power	
Bluetooth	6.8 dBm; BLE: 0.4 dBm 11b/17.8 dBm, 11g: 15.9 dBm, 11n20: 14.7 dBm, 11n40: 12.9 dBm 11ac (20MHz): 11.95dBm, 11ac (40 MHz): 9.96 dBm, 11 ac (80MHz): 9.96 dBm
E-GSM 900	33 dBm; DCS1800: 30 dBm; UMTS Band I: 23 dBm; UMTS Band VIII: 23 dBm; LTE Band 1/3/7/8/20: 23dBm
Antennas	
External	GNSS - LTE Main - LTE Diversity (Fakra connectors)
Internal	WiFi - BLE
GNSS Receiver	
Frequency	GPS QZSS (Optional) GLONASS BeiDou Galileo
Motion Sensor	6-Axis Accelerometer and gyroscope
Input/Output	
Input Device	Digital/Analog/Frequency (software configurable): 4x
Output Devices	2x HS and 2x LS - 0.5 A max - short circuit protected - latched
Power Supply	
Input	12-24 V DC, 0.5 A max
Battery	NiMH 7.2 Vdc, 400 mAh Ground and battery (KL30) - Voltage: 9 to 36V Switched power (KL15) or Alternator W - Voltage: 9 to 36V
Batteries	NiMH Battery Charging time: 10 hours Capacity: 3 Wh
Remote Capabilities	
Configuration	Yes
Firmware Update ^[2]	Yes (OTA)
Environmental ^[3]	
Water/Dust Resistance	IP67 IP69K
Operating Temperature Range ^[4]	-40°C to +85°C
Humidity	5 to 95% RH
Physical	
Dimensions	L: 105 mm x W: 76 mm x H: 35 mm
Weight (with internal batteries)	290g

[1] Debug Software or firmware customization.

[2] With the exception of downloading time, updates are performed during normal usage.

[3] Totally protected against dust and the effect of immersion up to 39.3701" deep (1m).

[4] With the exception of battery recharging process.

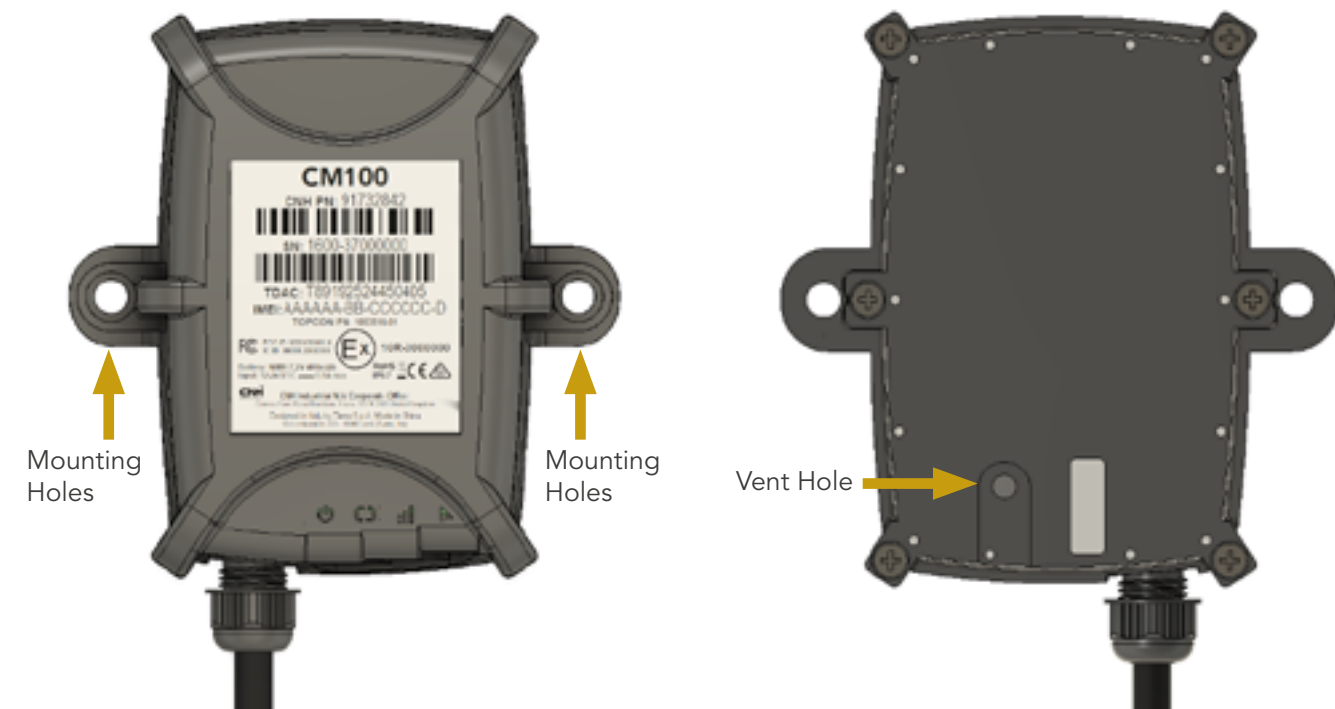


INSTALLATION

The following section describes the installation steps for CM1X devices. Vehicle cables and screws are not included

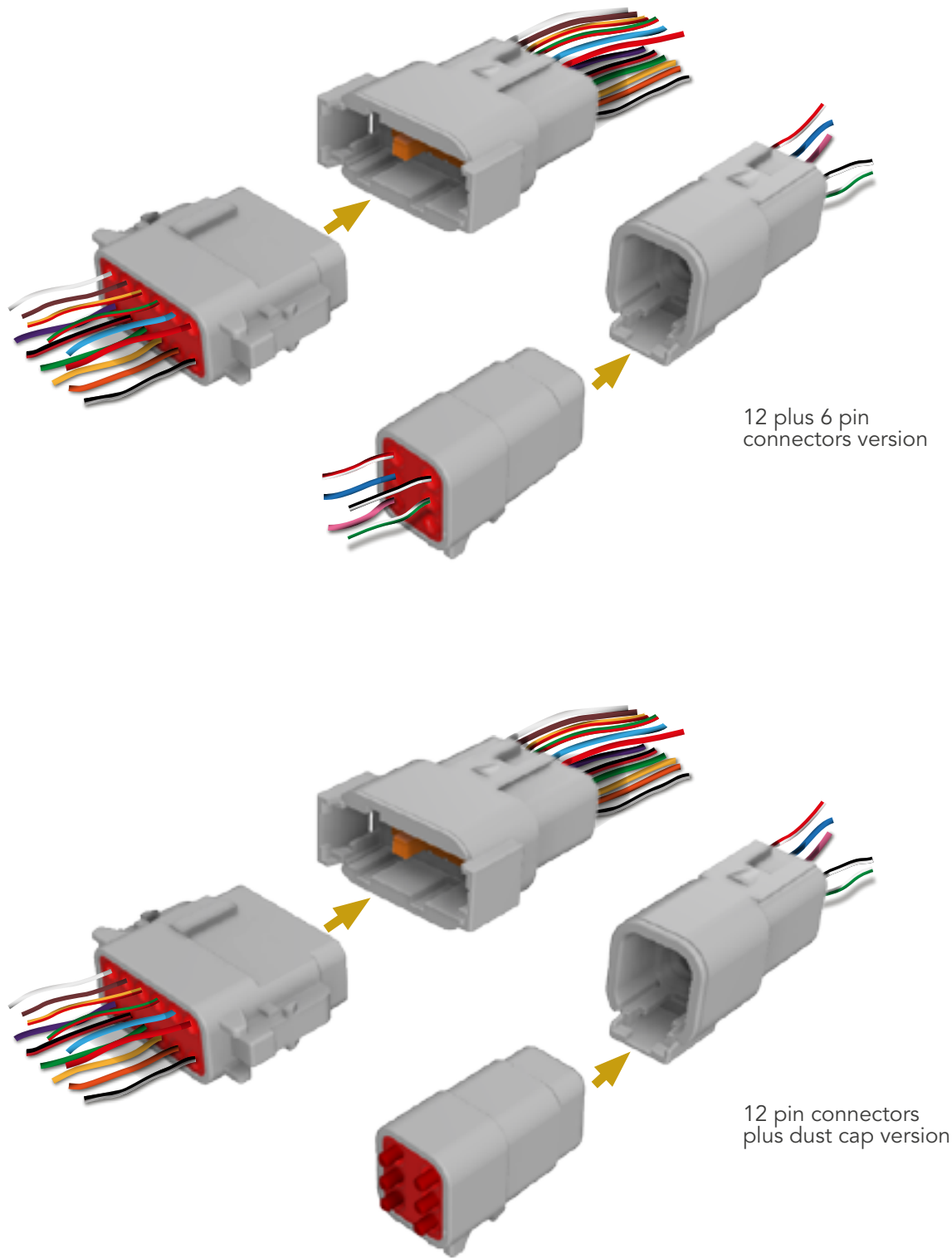
CM1X DEVICES INSTALLATION

- 1. Disconnect the vehicle battery main switch, and maintain it disconnected for the duration of the device installation process.
- 2. Install the device using bolts on dedicated mounting holes.
- 3. Guarantee a full contact of bottom cover toward the vehicle with a flat surface. CM110 can be placed with no orientation recommendation. CM100 must be orientated with the top towards the sky to improve the GNSS internal antenna performance.
- 4. Guarantee to mount the device in a protected place (e.g. inside the vehicle cabin).



WARNING - NEVER cover the vent hole in the bottom of the CM1X device with tape or Velcro. Covering the vent hole may cause device failure, as the vent hole releases humidity caused by temperature changes.

- 5. Connect the vehicle cables to the device through the connectors. Ensure that the battery line is protected by a 5A automotive fuse.



6. Connect the antenna cables (CM110 only).



Maximum gain:	1 dBi
Minimum distance from user:	20 cm from antenna apparatus
Characteristic impedance:	50 Ohm

7. Connect the vehicle battery.



NOTICE - If the device is not properly installed, any motion detected by the internal accelerometer will have a negative impact. False readings will occur unless the device is firmly in place.



WARNING - DO NOT ALLOW the CM1X or the components of the telematic system to BLOCK or LIMIT your view outside the cab.
Use goggles when drilling, cutting, or grinding on the machine.



WARNING - To avoid the effects of human exposure to electromagnetic fields, the device must be installed at a minimum distance of **20 cm** from the vehicle operator/driver.

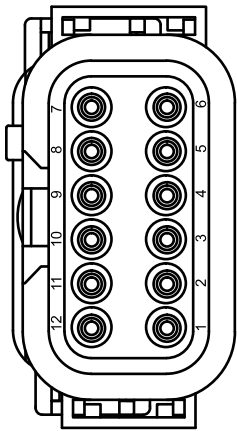
■ INSTALLATION SPECIFICATIONS

Type	Fixed
Means	Bolt M6
Max Torque	5Nm

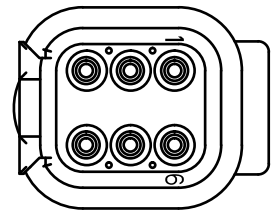


CONNECTOR PINOUT

Pin #	Signal	Color	Device Pin #
1	GND/Chassis	Black/Grey	2 - 4
2	+15	Orange	3
3	CAN1_H (In5)	Yellow	10
4	CAN1_L (In4)	Green	9
5	Out0_LS	Red/Black	13
6	RS232_Out	Violet	17
7	RS232_In	White	18
8	In0	Brown	5
9	CAN2_H (In7)	Yellow/Red	12
10	CAN2_L (In6)	Green/Red	11
11	In1	Light Blue	6
12	+30	Red	1



Pin #	Signal	Color	Device Pin #
1	In2	Pink	7
2	In3	Blue	8
3	Out1_HS	White/Red	14
4	Out2_LS	White/Black	15
5	Out3_HS	White/Green	16
6	-	Dummy Pin	-



NOTICE - The wiring schematics are noted as recommendations by Tierra, please consult your equipment manufacturers operation manuals for specific information pertaining to wiring or use of the equipment's battery as a power source.



WARNING - Before welding steel parts on the frame, disconnect the CM1X device as hardware issues may occur.



WARNING - The switched power wire (orange) should be connected to a source that is only energized during the engine run cycle.
DO NOT CONNECT RED AND ORANGE WIRES TOGETHER.
If red and orange wires are connected to the same signal source, the Key OFF event is not detected or reported and the device firmware **will not function properly**. This connection can be sourced at the output run terminal of your vehicle's alternator or other sources that are only "hot" when the engine is running (mechanical hour meter, etc.). Use a multimeter to verify that 9 to 36 volts are present only when the engine is ON. For both switched power (orange) and constant power (red), the voltage range is the same.



WARNING - Do not apply external force on the harness and allow the cables to be tension-free.



CAUTION - Wiring a piece of heavy equipment up without using the above-mentioned method causes problems with inaccurate hours being reported into Tierra web. These hours will not match the hour meter on the machine, thereby causing erroneous readings due to the presence of a switched power signal when the engine is not running. This could occur if wired to the ignition when the key switch is left ON. Due to the inability to detect Key OFF, connecting red and orange to the same signal source is never acceptable. IN ALL CASES, switched power wired to an engine run signal is the first and best practice.



NOTICE - Some vehicles, such as tractors or agricultural machines, have 3-pin connectors with ground, battery power, and switched power located inside the cabin. You can use this connector to power an CM1X device. Both constant power and switched power need to be fuse-protected (5A fuse works fine). Install a 5A fuse onto the battery power cable and another fuse onto the switched power cable if the circuit is not protected.



NOTICE - Use Ty-wraps to keep hoses and wires secured to avoid possible wear or pinch points.



NOTICE - Both switched power AND constant power MUST BE used to properly power up the box.



BATTERY PACK WARNINGS



DANGER - Opening the device by Unauthorized Personal VOIDS the Warranty!
Never attempt to open the casing of the detachable batteries! NiMH batteries can be dangerous if mishandled!



DANGER - Do not incinerate or heat battery pack above 248°F (120°C). Excessive heat can cause serious damage and possible explosion.



WARNING - Battery replacement is not allowed.



WARNING - This product contains a NiMH battery that contains Perchlorate Material. Special handling may apply.



NOTICE - Upon first connection, you must power the CM1X device for ten (10) hours of normal run time to fully charge the internal battery.

TROUBLESHOOTING

Connectivity is the most common customer technical issue. Troubleshooting involves a series of tests to isolate the issue to the main points of failure (outlined below) from which the root cause can be identified, followed by the resolution. Our trained Tierra Support Technicians can check any provision or coverage area issues and work to troubleshoot your device remotely.



WARNING - Do not attempt to repair equipment yourself. Doing so will void your warranty and may damage the hardware.

CM1X DEVICE ISSUES

- 1. Check that the device has power.
- 2. Check that the connections for ground, power, and especially switched power are correct.



CAUTION - Powering off/on the device without using the orange switched power connection can cause unwanted behavior.

- 3. If power management profiles do not function, make sure that the internal battery has a full charge (this can take up to 10 hours initially to put a full charge into the back up battery contained inside Tierra devices).
- 4. Try to power cycle the device.





TECHNICAL SUPPORT

If the troubleshooting hints and tips in this Installation Manual fail to remedy the problem, please contact Tierra Support: support-tierra@tierratelematics.com

When emailing, please provide the following information for better, faster service:

- 1. The device version.
- 2. The system/hardware specifications for the computer running the Tierra Web Application such as operating system and version, memory and storage capacity, processor speed, and so forth.
- 3. The symptoms and/or error codes/messages that precede and follow the problem.
- 4. The activities being tried when the problem occurs. If possible, include the exact steps being taken up to when the error message or other problem occurs.
- 5. How regularly the problem occurs. Generally, a customer support representative will reply within 24 hours, depending on the severity of the problem.



LINK TO USER GUIDE

Once the device is installed and running, you can access the User Guide at the following link:
<http://www.tierratelematics.com/download/CM1XInstallationManual.pdf>



CERTIFICATIONS

ANATEL



Este equipamento não tem direito à proteção contra Interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

FCC



1. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. This device model CM100/CM110 contains FCC ID: 2A6VC-AM35 and:
FCC ID: XMR201606EC21A (Modem version EC21A)
3. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
4. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
 - Reorient or relocate the receiving antenna.
 - Increase the separation between the equipment and receiver.
 - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
 - Consult the dealer or an experienced radio/TV technician for help.

UCCA



This device complies with Radio Equipment Regulations 2017 (S.I. 2017/1206) of the UK Parliament relating to the making available on the market of radio equipment.

ISED

1. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. This device model CM100/CM110 contains IC:28545-AM35 and:
IC: 10224A-201611EC21A (Modem version EC21A)
3. Responsible party's contact located in the Canada:
Name: Stephen Rosenegger
Address: Topcon Positioning Systems Inc, 855-2 Street SW, Suite 3500 Calgary AB T2P 4J8 Canada
Telephone number: +1 403-450-4262
4. This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.
L'émetteur/recepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) L'appareil ne doit pas produire de brouillage; (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
5. ICES-003 Class B Notice -Avis NMB-003 Class B :
This Class B digital device complies with Canadian ICES-003
Cet appareil numérique classe B est conforme à la norme Canadien NMB-003.
CAN ICES-3(B) /NMB-3(B)

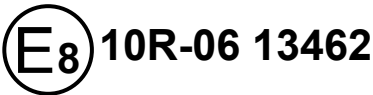
RED



This device complies with **Directive 2014/53/EU** issued by the Commission of the European Community.

ECE-R10

Approval number: E8*10R06/01*13462*00
Approval mark:



Part Number TRR-MAN-2F01
Rev A

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TIERRA

TIERRA S.p.A.
Corso Ferrucci, 112 - 10138 Torino - Italy
www.tierratelematics.com