FR201 Product Manual

Revision History

Revision History	Date
First release of FR201 manual	2022-03-11
Update Boot Jumper Pinout	2022-06-28
2.3 Motherboard Connect Update	2023-01-12
Modified the "Front I/O" with "1x USB 3.2 10Gb/s" Instead of "2x USB 3.2 10Gb/s'	2023-7-21
Updated to include new isolated PoE module	2024-08-05

Table of Contents

1 - System Overview

1.1 System Introduction

The Factor 201 (FR201) harnesses the power of the Raspberry Pi Compute Module 4, which provides the core functionality of the Raspberry Pi 4. Combined with our own industry-focused carrier board, and a custom-designed industrial chassis, the Factor 201 has been engineered for today's industrial and embedded applications.
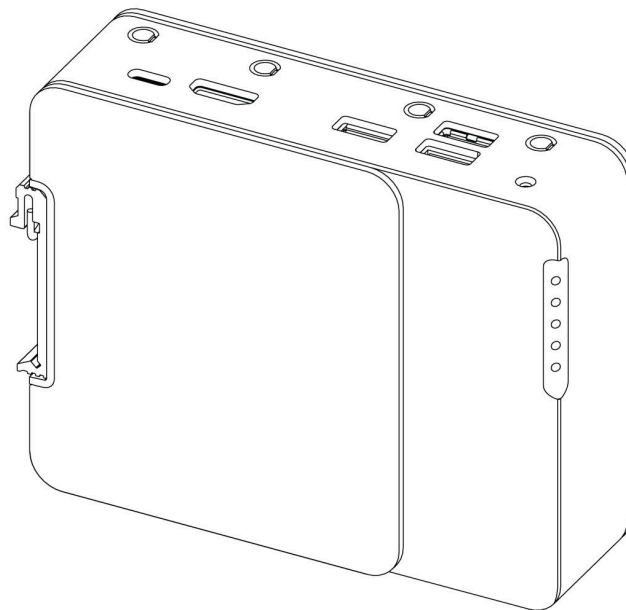
For use as a compact IoT gateway, edge device, or customizable industrial controller, the Factor 201 is the industrial Raspberry Pi solution you've been waiting for.

1.2- In-box Accessories

- 1x Power Terminal Block

- 1x Com Terminal Block

If you purchased additional items such as mounting brackets, power supplies or terminal block connectors, they will be located in the system box or within the outer shipping carton.

All drivers and product guides can be found on the corresponding product page. For more information on accessories and additional features, visit the Factor 200 Series page.
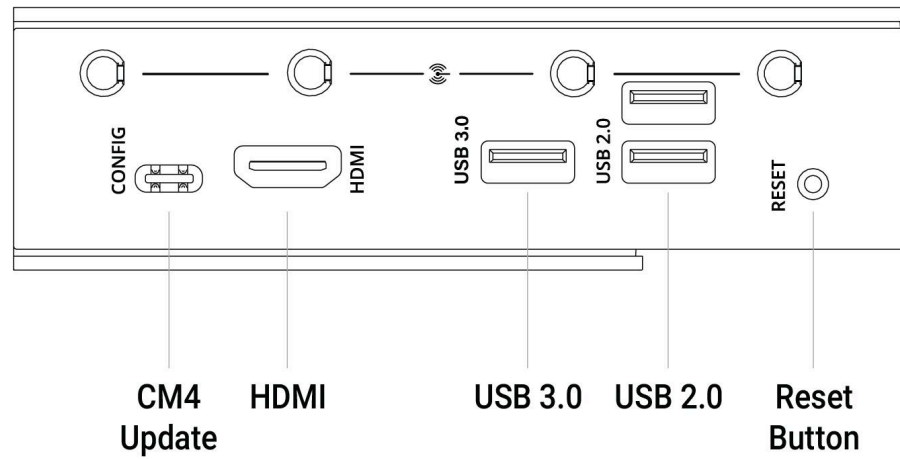
Factor Series Page: https://www.onlogic.com/computers/industrial/fanless/factor-200/

Factor 201 Product Page: https://www.onlogic.com/fr201/

1.3 - Product Specifications

Model	Factor 201
System Dimensions	5.07" x 1.5" x 4" 129x 38 x 102 mm
Board Dimensions	4.47" x 3.85"
CPU (on solder side of board)	Raspberry Pi CM4 Headers
Memory	CM4-dependent, up to 32GB
LAN Controller	1x Realtek RTL8153B (GbE) 1x from CM4 (GbE)
Expansion	1x M.2 2280 B-Key (USB 3.2 5Gb/s) 1x M.2 2280 B-Key (SATA III)
Back I/O	2x 1GbE LAN 1x 5-pin Serial (RS232/422/485) 3-pin Terminal Block with 12~24 V input
Front I/O	1x USB 3.0 5Gb/s 2x USB 2.0 1x HDMI 1x USB-C for CM4 Programming 1x Reset button
Onboard Headers & Connectors	1x Battery on a cable 1x Raspberry Pi Expansion Header (Female; internal) 1x SPI TPM Header 1x CM4 Boot Mode Select 1x PoE PD Header 1x USB2 Modem Header
Voltage Input	12~24V or PoE PD
Power Input	3-pin Terminal Block or PoE PD via optional add-on
Operating Systems	Raspbian, Ubuntu 22.04
Special Features	RTC TPM header - support TPM01 Support for 4G LTE and GPS expansion cards
Thermal Standards (Subject to change through RFI and RFQ steps)	Board Operating Temperature: -20-60C Storage Temperature: -40-85C Operating Humidity: 10% - 95% (non-condensing)
Extra Chassis Features	4 Antenna holes M3x0.5 threaded mounting holes

Regulatory	SAFETY IEC/UL/EN 62368-1 EMC CISPR 32/35 Class A FCC Part 15 Class A IEC/EN 60601-1-2:2014 EMC Ready Radio Equipment Directive (2014/53/EU) [Only applicable for configurations with wireless transmitters RoHS 3 Directive (2015/863/EU)[WEEE Directive (2012/19/EU)

1.4 - Exterior Features and Dimensions

1.4.1 - Top I/O

CONFIG
HDMI
USB 3.0
USB 2.0
RESET

CM4 Update | HDMI | USB 3.0 | USB 2.0 | Reset Button

1.4.2 - Bottom I/O

PoE PD Capable

Power Input | Serial | LAN | LAN PoE PD Capable
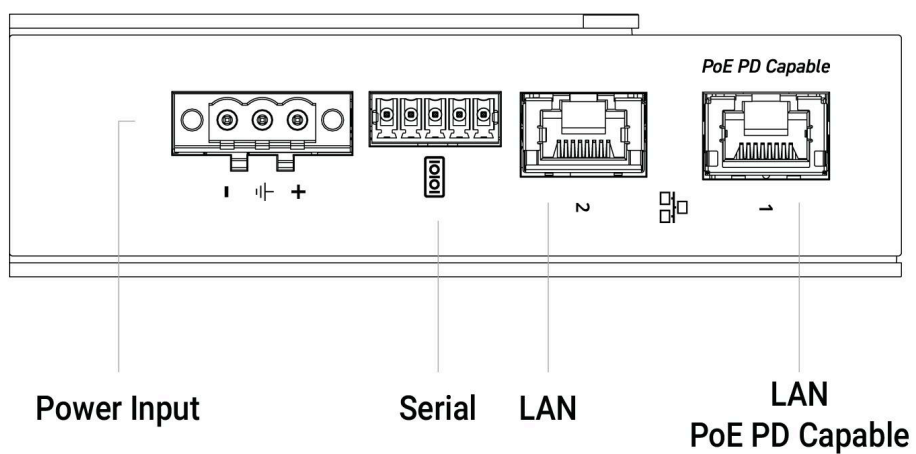
1.4.3 - Factor 201 Dimensions (FR201)

102.5 mm

38 mm

129 mm
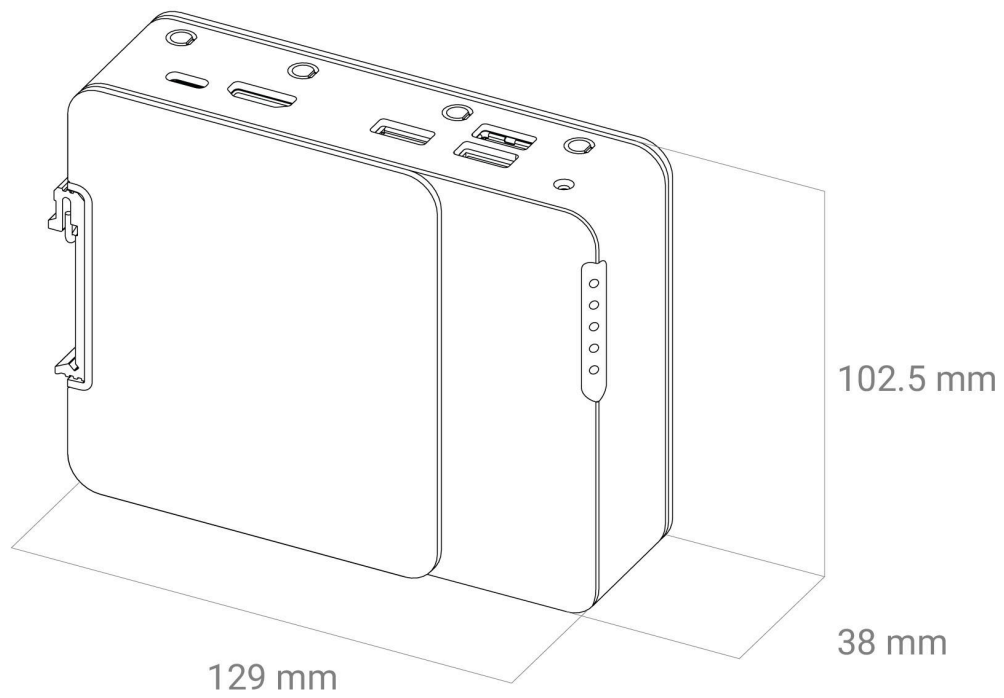
1.5 - System Block Diagram
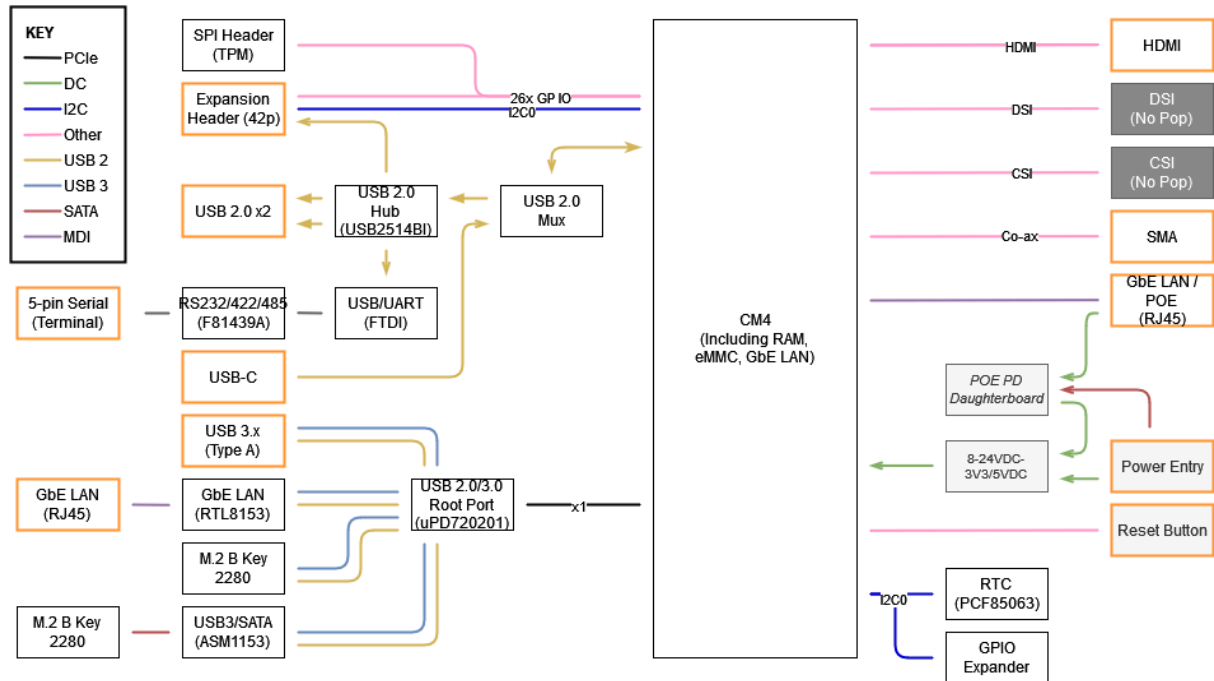
2 - I/O Definitions

2.1 - Top I/O Definition
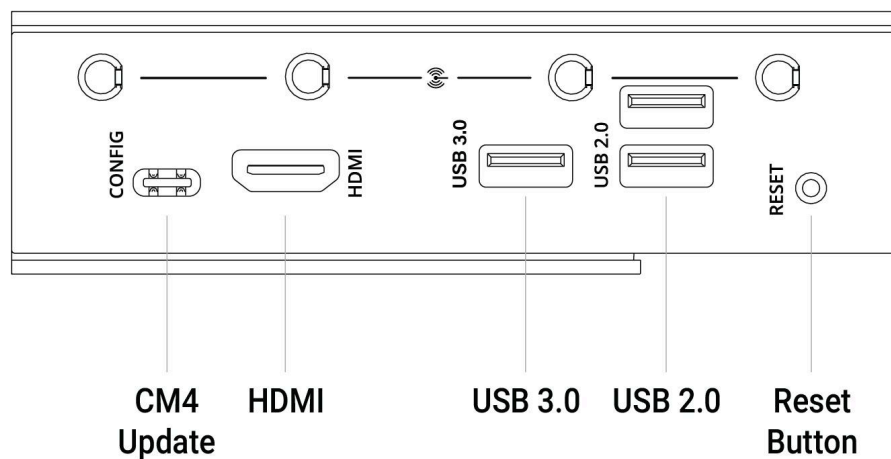
USB-C Config Port (CM4 Update)

A USB-C port is provided to connect to the CM4 in USB 2.0 device mode, to update the bootloader firmware or modify the eMMC filesystem in USB MSD mode.

A USB 2.0 host used to connect the FR201 must provide a 5V output in order to enable the USB-C connection to the CM4. System power for the FR201 must also be provided separately via the main power input or optional PoE.

USB 3.x, alternate function modes, and power output are not supported on this connector.

HDMI

FR201 uses the CM4's integrated HDMI to drive the external HDMI Port. Resolutions up to 4096x2304 @ 60Hz are supported. CEC (Consumer Electronics Control) functionality is also supported, depending on software configuration.

USB 3.2 Gen1 5Gb/s

One USB 3.2 Gen1 (5Gb/s) port is provided for peripherals or boot media.

By default, this port is disabled during system boot to ensure that the CM4 boots from internal media. This behavior can be changed in software, or via the jumper header located in the center of the motherboard. See the headers section of this manual for more information.

USB 2.0

Two USB 2.0 ports are provided for peripheral usage. Together, they may deliver a maximum of 2A at 5V, depending on peripheral and device configuration.

Reset Button

The front reset button can be used to trigger a reset of the CM4. The reset button is a momentary contact button that is tool-accessible through the chassis.
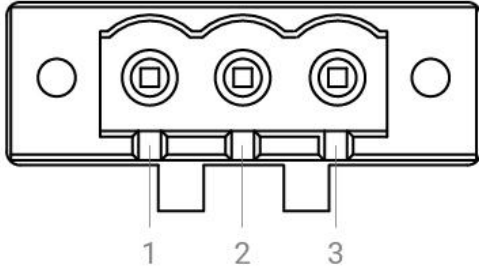
2.2 Bottom I/O Definition
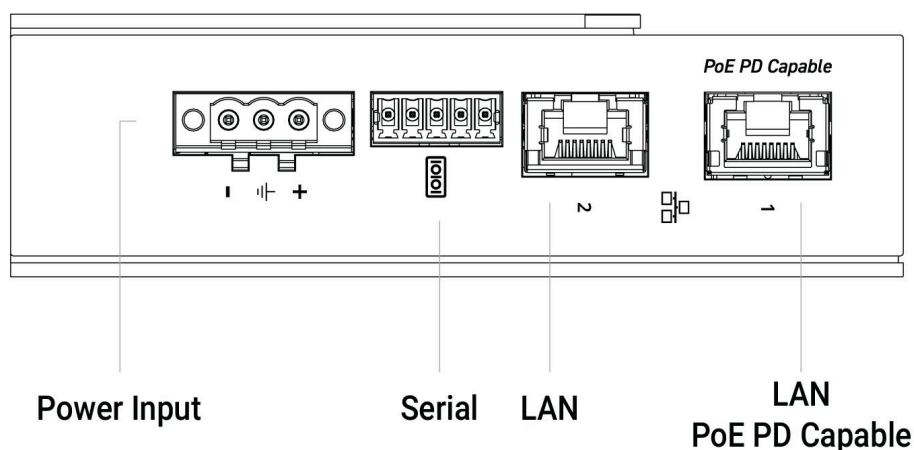
3-Pin Terminal Block Power Connector

Mainboard power is applied to the FR201 platform by way of a 3-pin terminal block connector (Mating part: Dinkle 2ESSM-03P or equivalent). The system is operational from 8V~24V. The maximum rated current of the connector is 15A per pin. Use a wire gauge that is rated for the operational current. See below for on-board connector pinout.
Note: DC power input should not be connected when the system is supplied with POE power via the add-on module.
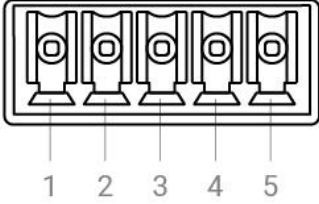
Pin	Definition
1	GND
2	Chassis/Earth GND
3	12~24V VDC Input

3-Pin terminal power pinout

5-Pin COM Terminal Block

The serial port supports RS-232, RS-422, and RS-485 configurations by way of a 5-pin terminal block connector (Mating part: Dinkle 0221-2005 or equivalent). The mode can be selected from within the operating system using available configuration tools. See FR201 software documentation for details.

Pin	RS-232	RS-422	RS-485
1	GND	GND	GND
2	NC	TX-	TX-/RX-
3	NC	RX-	NC
4	RX	TX+	TX+/RX+
5	TX	RX+	NC
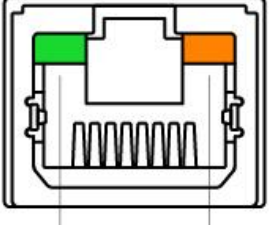
COM terminal pinout

LAN1 - CM4 Driven

The CM4 LAN Port on FR201 supports up to 1Gbps link speeds over standard shielded CAT5e or CAT6 cables. The connector is the industry standard RJ45 connector. The LAN link state is shown by the two LEDs enclosed in the port. Activity is also indicated by the LAN1 LED on the side of the system. The default configuration is included below, but the behavior can be customized using the CM4 boot configuration file.

PoE PD (power input) support is available optionally by adding the ADP125 FR200 isolated POE PD module to the system.
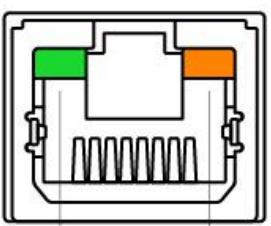
Note: DC power input should not be connected when the system is supplied with POE power via the non-isolated ADP122 add-on module.

Speed/Act State	Speed State	Function
Off	Off	LAN link is not established
Green (Flash for Activity)	Off	10 Mb/s data rate
Green (Flash for Activity)	Orange	100 Mb/s data rate
Off	Orange (Slow Blink)	1000 Mb/s data rate

LAN activity light description

LAN2 - Realtek RTL8153B

The second LAN Port on FR201 supports up to 1Gbps link speeds over standard shielded CAT5e or CAT6 cables. The connector is the industry standard RJ45 connector. The LAN link state is shown by the two LEDs enclosed in the port. The description is included below. Activity is also indicated by the LAN2 LED on the side of the system.

Speed/Act State	Speed/Act State	Function
Off	Off	LAN link is not established
Green (Flash off for Activity)	Green (Flash on for activity) / Orange	10 Mb/s data rate
Green (Flash on for Activity)	Green (Flash on for Activity) / Orange	100 Mb/s data rate
Green (Flash off for Activity)	Green (Flash on for Activity) / Orange	1000 Mb/s data rate

LAN activity light description

2.3 - Motherboard Connectors
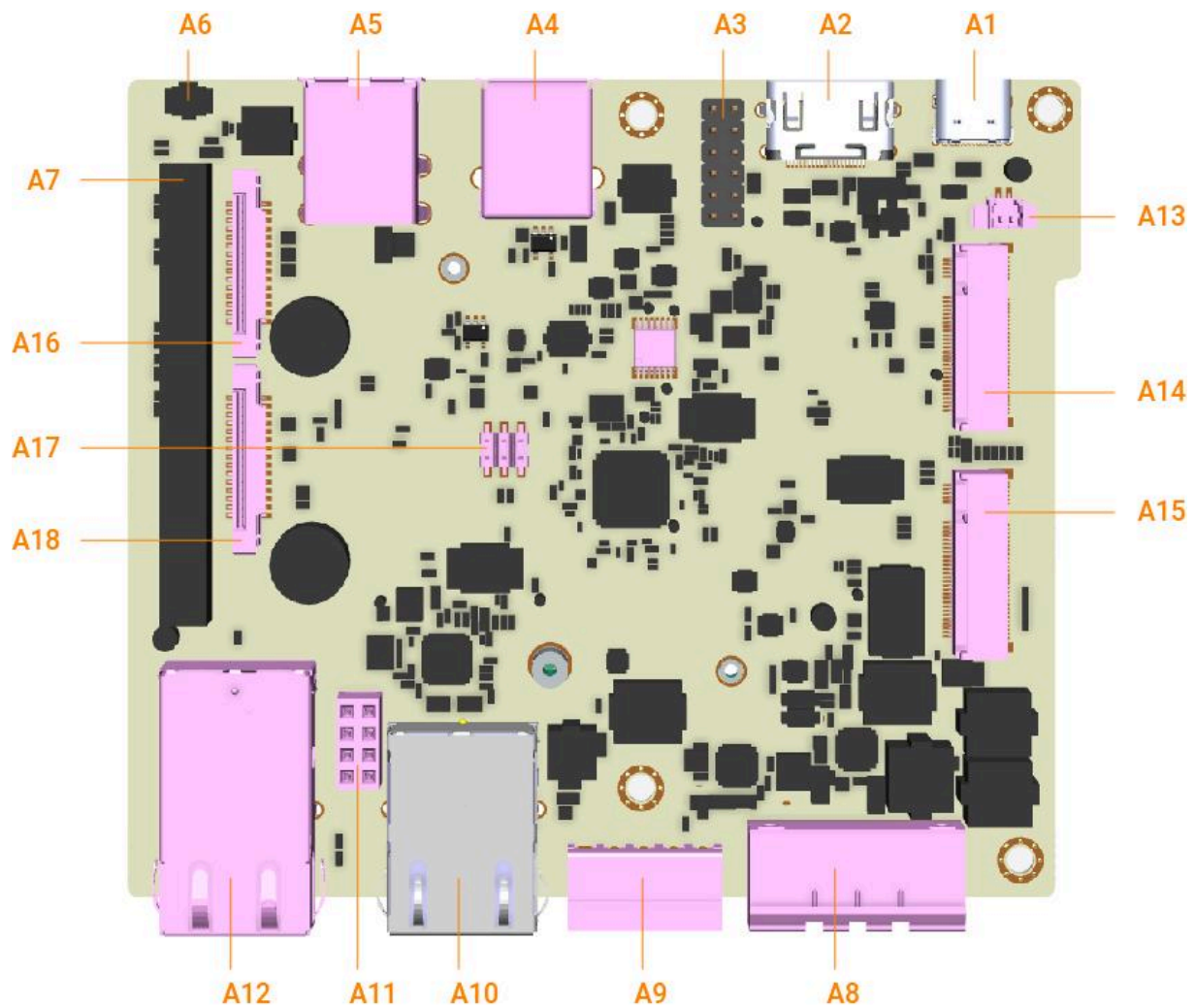
Item	Function Description
A1	USB-C (USB 2.0 for CM4 Firmware Update)
A2	HDMI
A3	TPM
A4	USB 3.2
A5	USB 2.0 (x2)
A6	Pinhole Reset Button
A7	Raspberry Pi Header
A8	Power Input

A9	Serial Terminal Block
A10	RJ45 Gb Ethernet (RTL8153)
A11	PoE Add-on Connector
A12	RJ45 Gb Ethernet (CM4)
A13	RTC Battery Connector
A14	M.2 B-Key (SATA)
A15	M.2 B-Key (USB3)
A16	DSI Connector (Not Populated)
A17	CM4 Boot Function Jumper Header
A18	CSI Connector (Not Populated)

M.2 B-Key

An M.2 B-Key port is present on the FR201 motherboard to allow support for B-Key form-factor expansion cards. Supported cards include 3042, 2242, and 2260 form-factors with an adapter and 2280 form-factor without. The B-Key connector on the FR201 platform supports PCIe Gen 3 x2, USB 3.2 5Gb/s, USB 2.0, SATA Gen I (1.5Gbps), SATA Gen II (3.0Gbps), and SATA Gen III (6.0Gbps) devices.
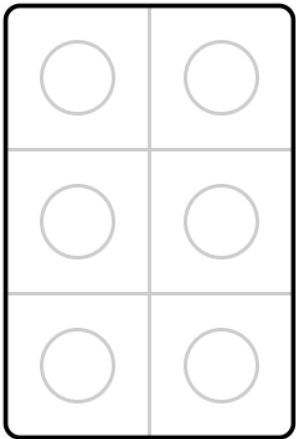
 A full pinout table for this expansion slot is provided in **Appendix D**.

Boot Function Jumper Header

A 2mm pin header and jumpers are used to configure some CM4 boot settings.

To enable write-protect for the bootloader, short pins 3 and 4 and apply power to the system.

To disable OS boot and place the CM4 in bootloader update mode, short pins 5 and 6 and apply power. The system will wait for a connection from an outside system via the USB-C configuration port in order to perform firmware updates.

Jumper Position	Function
5-6	Force Enable USB3 Boot
3-4	CM4 Bootloader Write-Protect
1-2	CM4 Boot Disable (Bootloader Mode)

ATX/CMOS header pinout
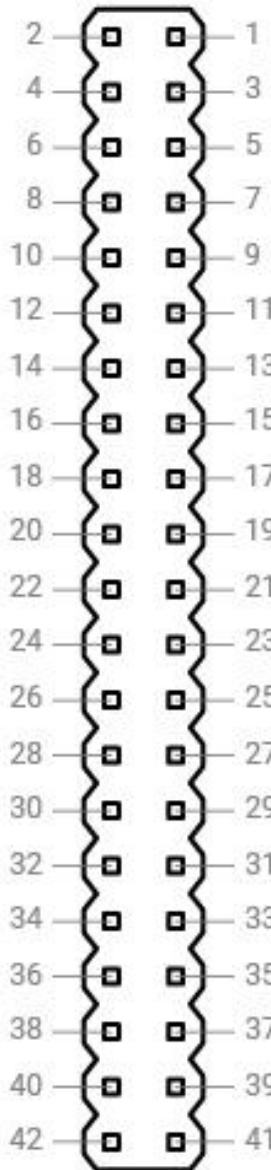
RTC Battery Header

The RTC battery on the FR201 platform is used to retain platform settings and maintain the real-time clock for the system. If the RTC battery is low, CMOS settings will not be retained and you may receive an alert in the operating system. The cabled RTC battery should be replaced with a Maxell CR2032-WK11 (or UL listed equivalent). An equivalent battery shall use a Hirose DF13-2S-1.25c connector to mate with the on-board connector.

Raspberry Pi Header

The Raspberry Pi header is designed to mimic the header on the standard Raspberry Pi 4, with additional features. For a detailed list of standard features that this header supports, see the Raspberry Pi documentation. The connector on the Factor 201 is female, but is pinned such that a developer can install a male-to-male interposer and use it as a standard hat header, if the developer notes the following changes:

1. A USB2.0 connection is added at pins 41 & 42.
2. The header's I2C connection (typically noted as ID_SC and ID_SD) is changed to the system I2C bus, rather than the Raspberry Pi ID bus.
3. The header's GPIO16, 18, 20, & 21 connections are shared with the TPM (configured as SPI6 when installed). If TPM support is desired, developers must avoid implementing these pins on the expansion header as well.

Pin	Function	Pin	Function
2	3.3V	1	5V
4	GPIO02	3	5V
6	GPIO03	5	GND
8	GPIO04	7	GPIO14
10	GND	9	GPIO15
12	GPIO17	11	GPIO18
14	GPIO27	13	GND
16	GPIO22	15	GPIO23
18	3.3V	17	GPIO24
20	GPIO10	19	GND
22	GPIO09	21	GPIO25
24	GPIO11	23	GPIO08
26	GND	25	GPIO07
28	I2C0_SDA	27	I2C0_SCL
30	GPIO05	29	GND
32	GPIO06	31	GPIO12
34	GPIO13	33	GND
36	GPIO19	35	GPIO16
38	GPIO26	37	GPIO20
40	GND	39	GPIO21
42	USB2_DN	41	USB2_DP

Raspberry Pi header pinout

DSI Header (Not Populated)

The DSI (MIPI display) header is pinned identically to the Raspberry Pi 4 DSI header, but is not implemented or installed by default, and is not supported at this time.

CSI Header (Not Populated)

The CSI (MIPI camera) header is pinned identically to the Raspberry Pi 4 DSI header, but is not implemented or installed by default, and is not supported at this time.

POE Add-on Connector

The POE PD Add-on connector is designed to support the OnLogic ADP125 POE PD add-on module. Other uses are not supported.
See specifications for the ADP125 here

CM4 Headers

The dual-header CM4 connectors support installation of Raspberry Pi CM4 modules. Two mounting standoffs are included to secure the module.

3 - Mounting Instructions

For a full set of mounting options and instructions, see the FR201 Spec Sheet & Dimensional Drawings.

4 - Power Management

4.1 - Protection Circuitry

Parameter	Value
Nominal operating voltage (Rated DC value of input)	12~24V
Undervoltage protection trip DC level (system turns off)	6.5V
Maximum safe DC voltage (system not damaged)	27V

These DC levels specified are the absolute max values for the pins for function and safety of the system. The protection circuitry allows for brief transient voltages above these levels without the system turning off or being damaged. A transient voltage suppressor on the power input allows momentary excursions above stated limits. For input power consumption and current see **Appendix A.**

4.2 - Input Voltage Qualification

The base FR201 system is capable of operation with an input voltage ranging from 12V - 24V DC, however different configurations will impact total system draw and may limit input voltage flexibility in the final application.

5 - Regulatory Compliance

5.1 - CE

The computer system was evaluated for medical, IT equipment, and maritime EMC standards as a class A device. The computer complies with the relevant equipment directives for the CE mark. Modification of the system may void the certifications. Testing includes: EN 55032, EN 55035, IEC 60601-1, EN 62368-1, EN 60950-1, and IEC 60945. The computer is approved for co-existance of the two provided radio transmitters when used with the specified antennas.

5.2 - FCC Statement

This device complies with part 15 of the FCC rules as a Class A device. 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.

5.3 - ISED

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-003(A) / NMB-003(A)

5.4 - UKCA

The computer system was evaluated for IT equipment EMC standards as a class A device. The computer complies with the relevant IT equipment directives for the UKCA mark.

5.5 - VCCI

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。　　　　　　　　　　　VCCI-A

6. Appendices

6.1 - Appendix A: Power Consumption

The power consumption of the Factor 201 was measured for various system configurations, workloads, and power states at both 12V and 24V system input voltages. Tests were performed using Burnintest v9.0 build 1012 to stress system components with and without graphics enabled. These tests were performed with Intel Turbo Boost disabled. Enabling Turbo will draw additional power. The build configurations and power consumption are listed in the tables below. (**note:** system configurations using discrete GPUs are limited to 19V-24V input. Only 24V is tested for Configuration 3).

*The configurations below are using representative samples of internal devices, the specific components mentioned below may vary from the devices provided by OnLogic.

System Component	Config 1 Low	Config 2 Mid	Config 3 High
CPU	CM4 BCM2711	CM4 BCM2711	CM4 BCM2711
Memory	2GB	4GB	8GB
SATA Storage	none	Innodisk DEM28-A28M41BW1DC-27	Innodisk DEM28-A28M41BW1DC-27
M.2 B-Key Modem	none	none	MDG200
OS	Raspberry Pi OS	Raspberry Pi OS	Raspberry Pi OS

The power consumption for each system configuration is record below

Config 1 Low		
Power Consumption	12V (W)	24V (W)
OS Idle	3.9	4.2
CPU / 1-Core Stress	4.9	5.4
CPU / 4-Core Stress	6.7	7.3

Config 2 Mid		
Power Consumption	12V (W)	24V (W)
OS Idle	4.6	4.8
CPU / 1-Core Stress	6.7	6.9
CPU / 4-Core Stress	7.6	7.9

Config 3 High		
Power Consumption	12V (W)	24V (W)
OS Idle	5.3	5.4
CPU / 1-Core Stress	7.4	7.5
CPU / 4-Core Stress	8.2	8.3

# 6.3 - Appendix B: Software Documentation

For a detailed overview of the configuration and individual settings, please refer to the OnLogic support site. Instructions for updating the BIOS can also be found on the support site. Please refer to the link below for detailed instructions.

https://www.onlogic.com/support/documentation/factor/

6.4 - Appendix C: System Thermal Results

The thermal performance of the FR201 was validated by loading the system to simulate expected workloads while the test system was exposed to high ambient temperatures in a thermal chamber environment. Two different workloads were considered, a 4 core load for heavy processing and a single core workload to evaluate single thread performance. In each workload, the system was run at 100% load for 45 seconds and then the load was removed for a 15 second rest. In order to profile performance at a variety of thermal conditions, the thermal chamber temperature was raised from 40°C to 60°C with a 4 hour dwell at each 5° increment. CPU clock speeds were measured for the duration of the tests. The results were analyzed by comparing the average clock speed over the duration of the test to the expected base clock speed. In the 4 core test, CPU throttling was observed beginning at 50°C, with performance gradually decreasing to just above the maximum throttle state (600 MHz) at 60°C. In the single thread test, throttling does not begin until 55°C, with average frequency remaining above 900 MHz at 60°C.

***FR201 - 4 Core 75% Load** Thermal Testing Graph - The image below shows the thermal test results from an FR201 in a thermal chamber with 75% full 4 core workload (45s at 100% followed by 15s rest) over a temperature range from 40-60°C with a 4 hour dwell every 5°C.*
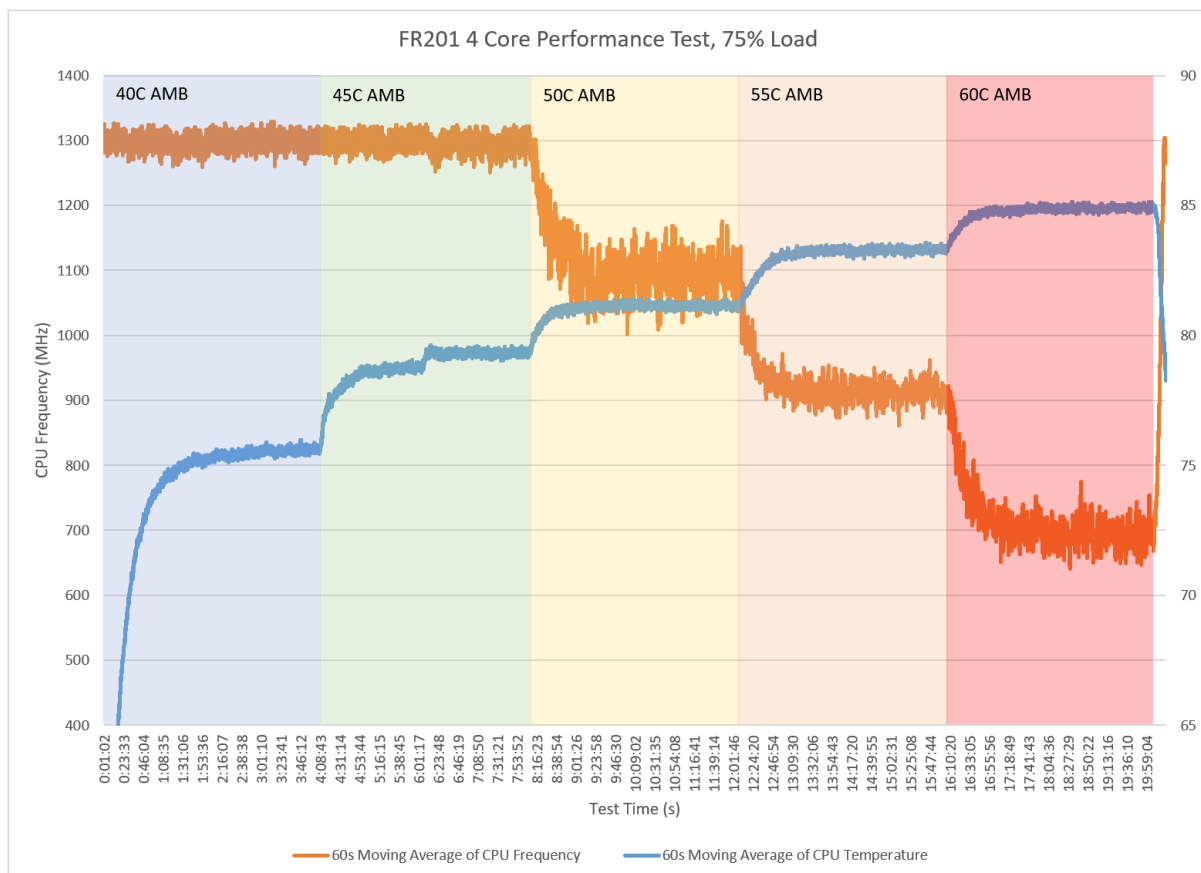
FR201 - 4 Core 75% Load Thermal Testing Results Table - the table below shows the key component temperature values from the above test

Item Tested	Pass	Test Result	Delta [%]
SSD	< 75°C	72.3°C	3.6%
Top Ambient	< 85°C	72.7°C	14.4%
CM4 Ambient	< 85°C	82.2°C	3.3%
CM4 VR Case	< 100°C	89.1°C	10.9%
Carrier Board VR Case	< 100°C	78.8°C	21.2%

FR201 - Single Thread 75% Load Thermal Testing Graph - The image below shows the thermal test results from an FR201 in a thermal chamber with 75% single thread workload (one core at 75% for 45s followed by 15s rest) over a temperature range from 40-60°C with a 4 hour dwell every 5°C.
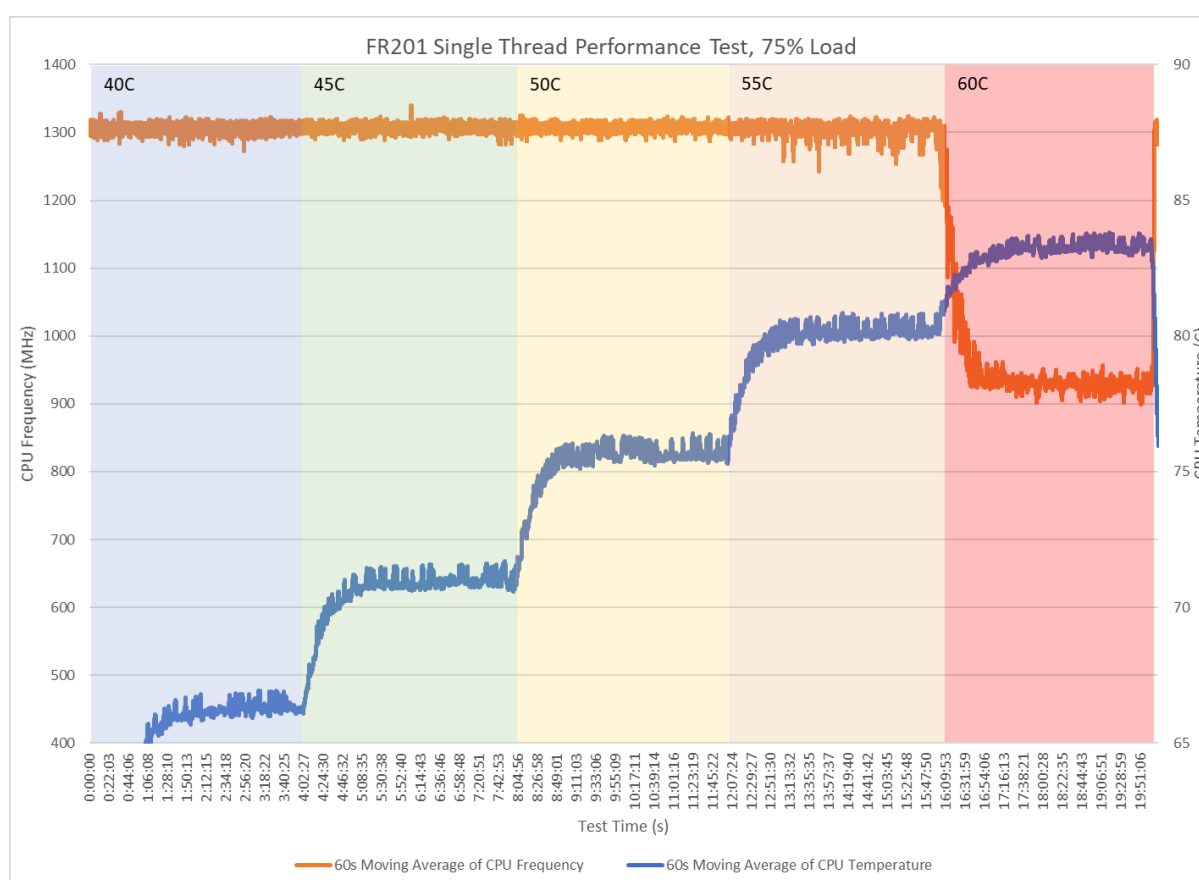
FR201 - Single Thread 75% Load Thermal Testing Results Table - the table below shows the key component temperature values from the above test

Item Tested	Pass	Test Result	Delta [%]
SSD	< 75°C	72.5°C	3.3%
Top Ambient	< 85°C	74.7°C	12.1%
CM4 Ambient	< 85°C	78.9°C	7.2%
CM4 VR Case	< 100°C	81.1°C	18.9%
Carrier Board VR Case	< 100°C	76.6°C	23.4%

6.5 - Appendix D: Expansion Port Pinout

6.5.1 - M.2 B-Key (MODEM)

Pin	Function	Function	Pin
1	NC	3.3V	2
3	GND	3.3V	4
5	GND	FULL_CARD_POWER_OFF#	6
7	USB 2.0 D+	W_DISABLE1#	8
9	USB 2.0 D-	WAN_ACT_N	10
11	GND	KEY	
	KEY	KEY	
	KEY	KEY	
	KEY	KEY	
	KEY	NC	20
21	NC	NC	22
23	NC	NC	24
25	NC	NC	26
27	GND	NC	28
29	USB3.1-Rx-	NC	30
31	USB3.1-Rx+	NC	32
33	GND	NC	34
35	USB3.1-Tx-	NC	36
37	USB3.1-Tx+	NC	38
39	GND	NC	40
41	NC	NC	42
43	NC	NC	44
45	GND	NC	46
47	NC	NC	48
49	NC	PERST#	50
51	GND	NC	52
53	NC	NC	54
55	NC	NC	56
57	GND	NC	58
59	NC	NC	60
61	NC	NC	62

63	NC	NC	64
65	NC	NC	66
67	RESET_N	NC	68
69	NC	3.3V	70
71	GND	3.3V	72
73	GND	3.3V	74
75	NC		

6.5.2 - M.2 B-Key (SATA)

Pin	Function	Function	Pin
1	CONFIG_3	3.3V	2
3	GND	3.3V	4
5	GND	FULL_CARD_POWER_OFF#	6
7	NC	W_DISABLE1#	8
9	NC	SSD_LED_ACT_N	10
11	GND	KEY	
	KEY	KEY	
	KEY	KEY	
	KEY	KEY	
	KEY	NC	20
21	CONFIG_0	NC	22
23	NC	NC	24
25	NC	NC	26
27	GND	NC	28
29	NC	NC	30
31	NC	NC	32
33	GND	NC	34
35	NC	NC	36
37	NC	NC	38
39	GND	NC	40
41	SATA-B+	NC	42
43	SATA-B-	NC	44
45	GND	NC	46
47	SATA-A-	NC	48
49	SATA-A+	PERST#	50
51	GND	NC	52

53	NC	NC	54
55	NC	NC	56
57	GND	NC	58
59	NC	NC	60
61	NC	NC	62
63	NC	NC	64
65	NC	NC	66
67	RESET_N	SUSCLK	68
69	CONFIG_1	3.3V	70
71	GND	3.3V	72
73	GND	3.3V	74
75	CONFIG_2		

6.6 Appendix E: Safety Information

Do not open or modify the device. The device uses components that comply with FCC and CE regulations. Modification of the device may void these certifications.

6.6.1 Safe Use and Installation Instructions

1. Install the device securely. Be careful handling the device to prevent injury and do not drop.
2. Wall or ceiling mounting the device requires use of a mounting plate or bracket. The plate or bracket must be of metal construction and have a minimum thickness of 1mm.
3. Use M4x0.5mm Flat Head screws to attach mounting plate or mounting brackets to threaded holes on bottom or rear of chassis. Screws should be a minimum length of 4mm. Add 1mm of screw length for every mm of additional thickness of plate or bracket beyond 1.5mm.
4. Ambient operating temperature must be between 0 °C to 60 °C with a non-condensing relative humidity of 10-90%.
5. The device can be stored at temperatures between -10 °C to 85 °C.
6. Keep the device away from liquids and flammable materials.
7. Do not clean the device with liquids. The chassis can be cleaned with a cloth.
8. Allow at least 2 inches of space around all sides of the device for proper cooling. It is recommended to mount the device such that the metal side plates are vertical to allow air to rise unobstructed. Alternative orientations may result in reduced operational temperature range.
9. This device is intended for indoor operation only.
10. Use UL Listed external power supply with rated output 8-24Vdc
11. Install the device only with shielded network cables.
12. Only use SAE approved cables for automotive installation.
13. The installer should be experienced in aftermarket installation and familiar with general practices for installing electronics devices in vehicles.
14. The device should not be installed in the driver's area of a vehicle.
15. The device should be mounted in accordance with accepted aftermarket practices and

materials for vehicle installation.
16. Only use UL Listed connectors for power and serial.
17. Service and repair of the device must be done by qualified service personnel. This includes, but is not limited to, replacement of the CMOS battery. Replacement CMOS battery must be of the same type as the original.
18. Proper disposal of CMOS battery must comply with local governance.

⚠️ **WARNING:** There is danger of explosion if the CMOS battery is replaced incorrectly. Disposal of battery into fire or a hot oven, or mechanically crushing or cutting of a battery can result in an explosion.

6.6.2 Instructions d'utilisation et d'installation en toute sécurité

1. Installez l'appareil en toute sécurité. Manipulez l'appareil avec précaution pour éviter de vous blesser et ne le laissez pas tomber.
2. Le montage mural ou au plafond de l'appareil nécessite l'utilisation d'une plaque ou d'un support de montage. La plaque ou le support doit être en métal et avoir une épaisseur minimale de 1 mm.
3. Utilisez des vis à tête plate M4x0,5 mm pour fixer la plaque de montage ou les supports de montage aux trous filetés au bas ou à l'arrière du châssis. Les vis doivent avoir une longueur minimale de 4 mm. Ajoutez 1 mm de longueur de vis pour chaque mm d'épaisseur supplémentaire de plaque ou de support au-delà de 1,5 mm.
4. La température ambiante de fonctionnement doit être comprise entre 0 °C et 60 °C avec une humidité relative sans condensation de 10 à 90 %.
5. L'appareil peut être stocké à des températures comprises entre -10 °C et 85 °C.
6. Gardez l'appareil à l'écart des liquides et des matériaux inflammables.
7. Ne nettoyez pas l'appareil avec des liquides. Le châssis peut être nettoyé avec un chiffon.
8. Laissez au moins 2 pouces d'espace autour de tous les côtés de l'appareil pour un refroidissement correct. Il est recommandé de monter l'appareil de manière à ce que les plaques latérales métalliques soient verticales pour permettre à l'air de monter sans obstruction. Des orientations alternatives peuvent entraîner une plage de températures de fonctionnement réduite.
9. Cet appareil est destiné à une utilisation en intérieur uniquement.
10. Utilisez une alimentation externe homologuée UL avec sortie nominale 8-24 Vdc
11. Installez l'appareil uniquement avec des câbles réseau blindés.
12. Utilisez uniquement des câbles approuvés par SAE pour une installation automobile.
13. L'installateur doit avoir de l'expérience dans l'installation du marché secondaire et être familiarisé avec les pratiques générales d'installation d'appareils électroniques dans les véhicules.
14. L'appareil ne doit pas être installé dans le poste de conduite d'un véhicule.
15. L'appareil doit être monté conformément aux pratiques acceptées du marché secondaire et aux matériaux d'installation du véhicule.
16. Utilisez uniquement des connecteurs homologués UL pour l'alimentation et la série.
17. L'entretien et la réparation de l'appareil doivent être effectués par un personnel qualifié. Cela inclut, mais sans s'y limiter, le remplacement de la batterie CMOS. La batterie CMOS de remplacement doit être du même type que celle d'origine.
18. L'élimination appropriée de la batterie CMOS doit être conforme à la gouvernance locale.

⚠️ **AVERTISSEMENT:** Il existe un risque d'explosion si la pile CMOS n'est pas remplacée correctement. L'élimination de la batterie dans le feu ou dans un four chaud, ou l'écrasement ou le découpage mécanique d'une batterie peut entraîner une explosion.