



S E N S I A
Rockwell Automation + SLB

QRATE HCC2

Hyperconverged Edge Controller

Hardware Manual

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February 2024

IMPORTANT SAFETY INFORMATION

SYMBOLS AND TERMS

Read user instructions carefully and visually inspect the equipment to become familiar with the device before installing, operating, or maintaining it. The following messages may be used in this document to help ensure personal safety and efficient handling of equipment.



DANGER

A hazardous situation which, if not avoided, will result in serious injury or death.

DANGER

Une situation dangereuse qui, si elle n'est pas évitée, entraînera des blessures graves ou la mort.



WARNING

A hazardous situation which, if not avoided, can result in serious injury or death, major loss of property, or catastrophic business risk.

AVERTISSEMENT

Une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures graves ou la mort, des pertes matérielles importantes ou des risques commerciaux catastrophiques.



WARNING – ELECTRICAL SHOCK

An electrical hazard which will result in personal injury if instructions are not followed.

AVERTISSEMENT - CHOC ÉLECTRIQUE

Un danger électrique qui entraînera des blessures corporelles si les instructions ne sont pas suivies.



CAUTION

A hazardous situation which, if not avoided, can result in minor or moderate injury, loss of property, or business risk.

MISE EN GARDE

Une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures légères ou modérées, la perte de biens ou un risque commercial.

Important Non-urgent information that may impact the successful use of this product.

Note Non-urgent information that may be of interest to a user.

GENERAL SAFETY PRECAUTIONS



WARNING – ELECTRICAL SHOCK

To avoid the risk of electric shock and fire, the following safety instructions must be observed and the guidelines followed.

The specifications must not be exceeded, and the device must only be applied as described in the following.

Prior to the installation and commissioning of the unit, the installation guide must be examined carefully.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

AVERTISSEMENT - CHOC ÉLECTRIQUE

Pour éviter tout risque d'électrocution et d'incendie, respectez les consignes et consignes de sécurité suivantes.

Des spécifications ne doivent pas être dépassées et l'appareil ne doit être utilisé que comme décrit ci-après.

Avant l'installation et la mise en service de l'unité, le guide d'installation doit être examiné attentivement.

Si l'équipement est utilisé d'une manière non spécifiée par le fabricant, la protection fournie par l'équipement peut être altérée.



WARNING - INSTALLATION

Installation may only be carried out by electrically skilled and instructed personnel in accordance with national legislation, including the relevant standards.

All technical data on the instrument is to be observed.

Changes to the design and modifications to the equipment are not permitted.

The equipment shall only be operated as intended and only in undamaged and perfect condition.

Sufficient segregation must exist between different cables and wires carrying different types of signal or power and all other circuits.

All wires must be terminated, complete with crimping lugs. Unused cores should be terminated to the earth bus bar.

AVERTISSEMENT – INSTALLATION

L'installation ne peut être effectuée que par du personnel qualifié et instruit conformément à la législation nationale, y compris les normes applicables.

Toutes les données techniques de l'instrument doivent être respectées.

Des modifications de conception et les modifications de l'équipement ne sont pas autorisées.

L'équipement ne doit être utilisé que conformément à sa destination et uniquement dans un état intact et parfait.

Une séparation suffisante doit exister entre les différents câbles et fils transportant différents types de signaux ou d'alimentation et tous les autres circuits.

Tous les fils doivent être terminés, complets avec des cosses de sertissage. Les conducteurs inutilisés doivent être raccordés à la barre omnibus de terre.

CONTACT SENSIA

For technical support, please refer to <https://www.sensiaglobal.com/Technical-Support>.

For all other inquiries, please refer to <https://www.sensiaglobal.com/Customer-Care> or dial 1-866-773-6742.

REVISION HISTORY

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PUBLISHER NOTES

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WARRANTY

Product warranty is specified in Sensia Terms and Conditions at the time of purchase.

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Section 1: Overview

This chapter provides an overview of the QRATE* HCC2* Hyperconverged Edge Controller hardware features.

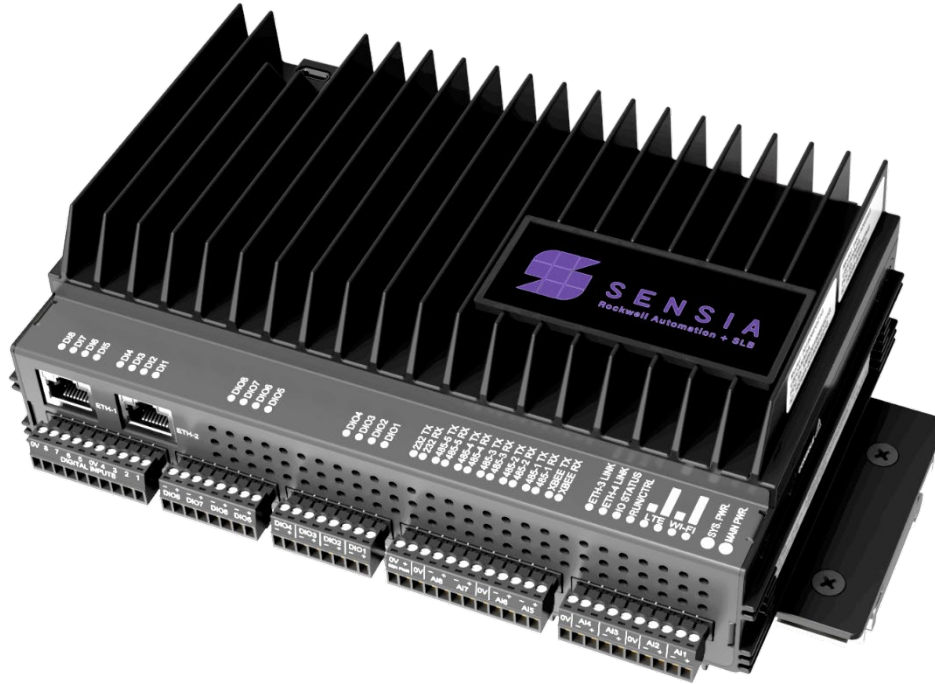


Figure 1.1—HCC2 Hyperconverged Edge Controller

1.1 INTRODUCTION

The HCC2 is a precision-data acquisition and edge controller unit designed for high-speed operation in harsh environments. This unit is suited for applications with wide temperature range and low-power consumption requirements.

The HCC2 can operate as an RTU/PLC, edge device controller and gateway, or as part of a larger integrated network of automation technologies. The data it acquires can be used locally for control or remotely for alarm and event reporting and remote data analytics. Communication options include serial, Ethernet, and wireless.

The HCC2 is available for purchase in four configurations (Table 1.1).

Table 1.1—HCC2 Configurations

Model Number	Description
50365260-2001	QRATE, HCC2, Hyperconverged Edge Controller Base Model
50369741-2001	QRATE, HCC2, Hyperconverged Edge Controller with Wi-Fi and LTE
50365260-2002	QRATE, HCC2, Hyperconverged Edge Controller Base Model, RTU plus App Enablement
50369741-2002	QRATE, HCC2, Hyperconverged Edge Controller with Wi-Fi and LTE, RTU plus App Enablement

* Mark of Sensia

1.2 STANDARD FEATURES

The following features are available with all four HCC2 configurations:

- Eight analog inputs
 - Each supports differential or single ended, 1 to 5 Vdc, 0 to 10 Vdc and 4 to 20 mA signals
 - Inputs 1 to 4 support HART FSK
 - Inputs 7 and 8 support low-voltage inputs
- Two analog outputs
 - Each supports 0 to 5 Vdc, 0 to 10 Vdc and 0 to 20 mA signals
- Eight opto-isolated digital inputs
 - IEC 61131-2 Type 1 compliant
 - Pulse counting option on all inputs, 10 to 30 Vdc, 20 mA max.
- Eight opto-isolated digital inputs/outputs
 - Pulse counting option on all inputs, 10 to 30 Vdc, 10 mA max.
 - Up to 30 Vdc, 100 mA switching on outputs
 - Pulse width modulated (PWM) option on all outputs
- User-defined programming using IEC 61131-3 PLC languages
- Modbus server/client
- DLR, Ethernet/IP & CIP Ethernet protocols
- RS-232/RS-485 communication ports
- Built-in GNSS. Supports GPS & GLONASS constellation
- Integration with Rockwell Automation's Logix controllers

1.3 OPTIONAL FEATURES

1.3.1 Radio Modules

Two optional radio module types can be used with the HCC2:

- Cellular module: LTE, wireless broadband module (Quectel EG21G)
- Wi-Fi module (Intel 9260NGW); IEEE 802.11

One of each type may be fitted to the HCC2.

The Wi-Fi module also supports Bluetooth communications but this feature is not yet implemented for use with HCC2 software.

1.3.2 Application Enablement

For models that include RTU plus App Enablement, the standard firmware will allow you to add custom software applications in addition to the core applications provided on all models. See the QRATE HCC2 Software Manual for details.

1.4 PRODUCT VIEWS

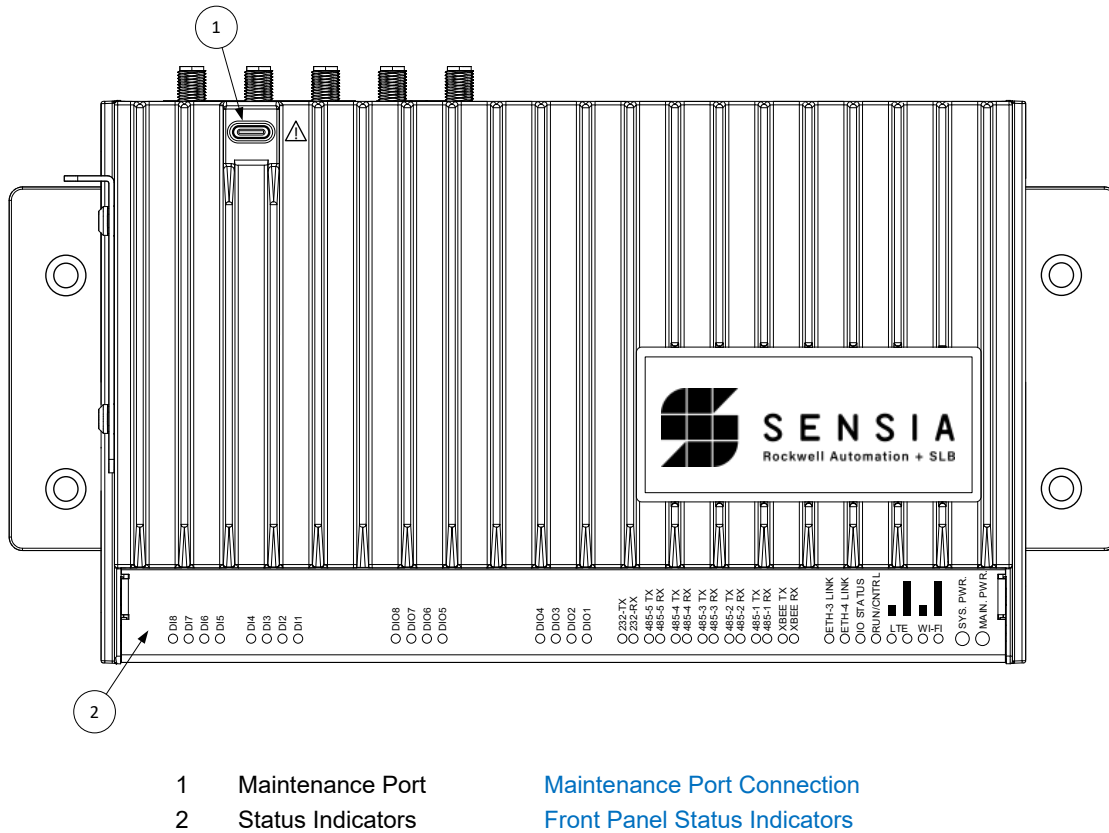


Figure 1.2—Front View

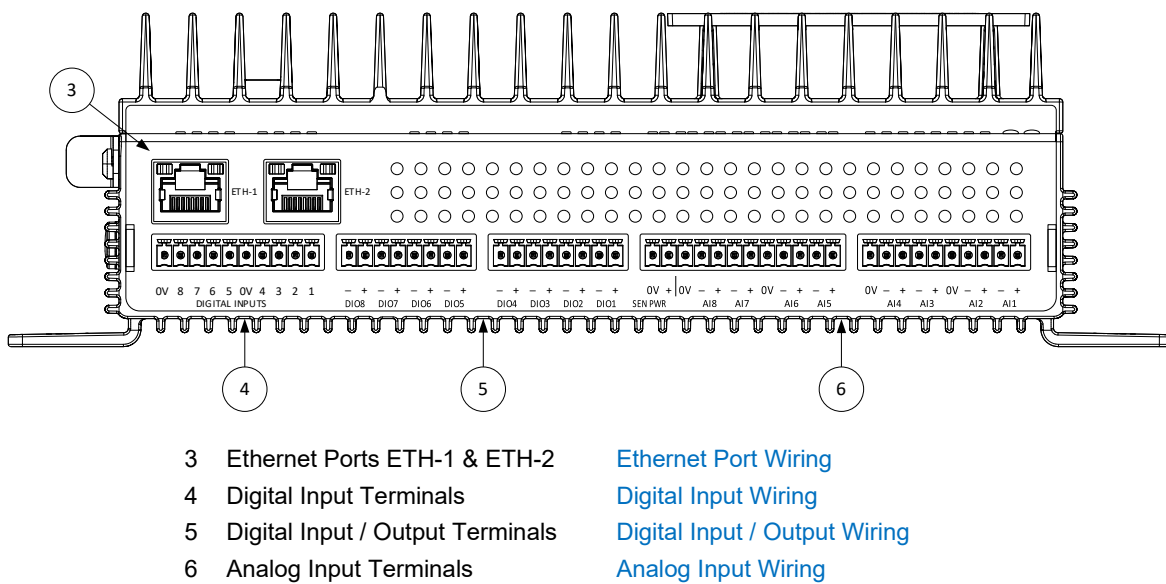
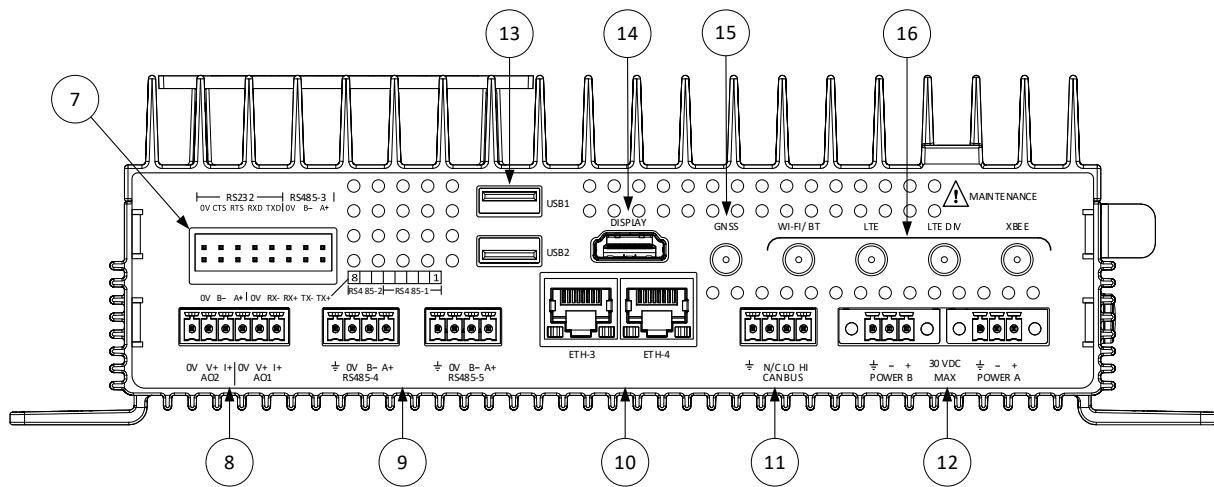
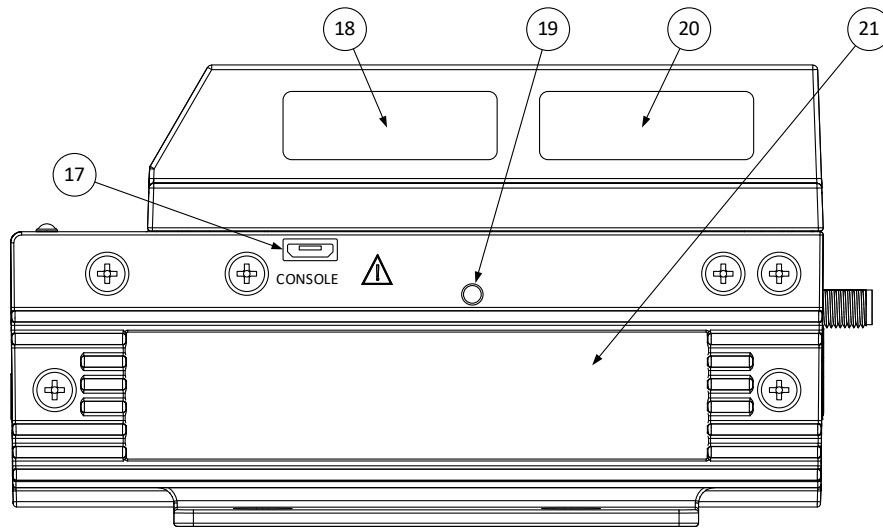


Figure 1.3—Bottom View



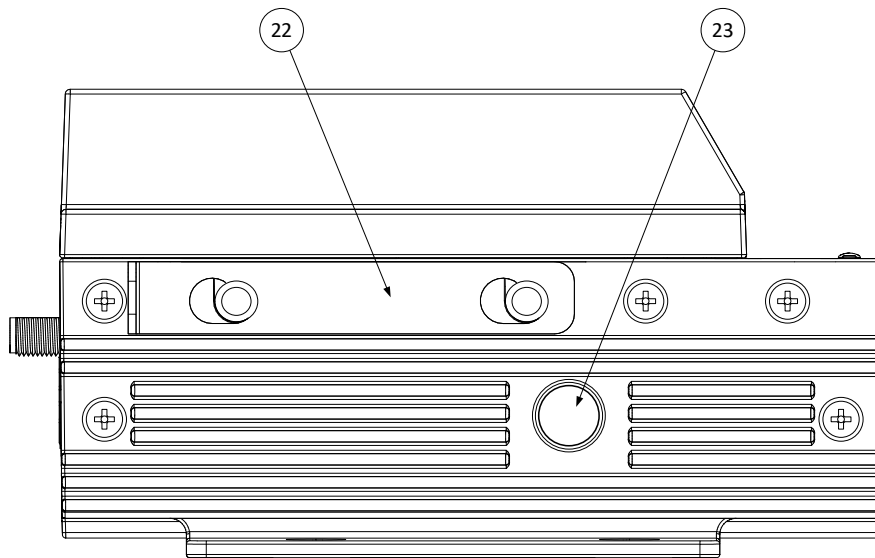
- | | | |
|----|---------------------------------------|---|
| 7 | RS232 & RS485-1 to RS485-3 Terminals | Serial Communication Port Wiring |
| 8 | Analog Output Terminals | Analog Output Wiring |
| 9 | RS485-4 & RS485-5 Terminals | Serial Communication Port Wiring |
| 10 | Ethernet Ports ETH-3 & ETH-4 | Ethernet Port Wiring |
| 11 | CAN Bus Terminals (FUTURE) | Serial Communication Port Wiring |
| 12 | Power Terminals | Power Input Wiring |
| 13 | USB 2.0 Ports USB1 & USB2 | USB Port Connection |
| 14 | HDMI Port | HDMI Port Connection |
| 15 | GNSS Antenna Connection | GNSS Antenna Connection |
| 16 | Optional Wireless Antenna Connections | Radio Antenna Connection (Optional) |

Figure 1.4—Top View



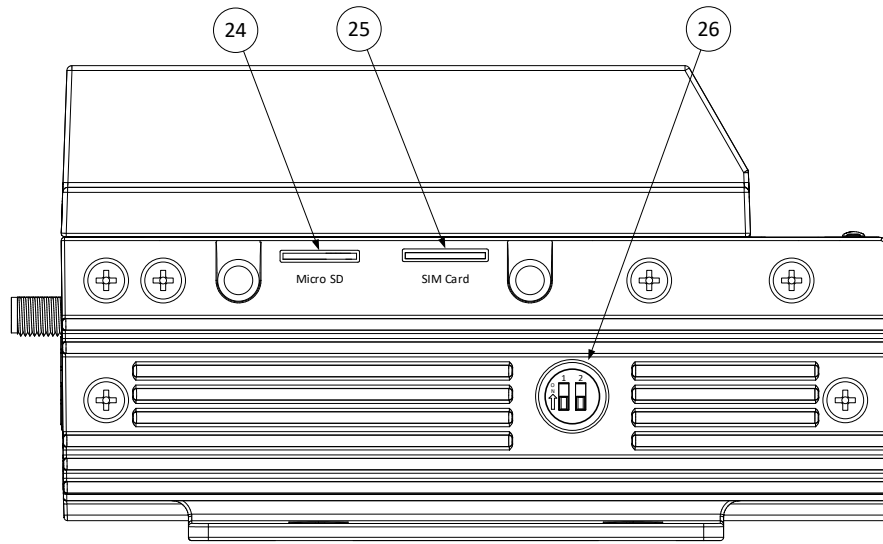
- | | | |
|----|-----------------|-------------------------------|
| 17 | Console Port | Console Port Connection |
| 18 | LTE FCC Label | Radio FCC/IC Label (Optional) |
| 19 | Reset Button | Reset Button |
| 20 | Wi-Fi FCC Label | Radio FCC/IC Label (Optional) |
| 21 | Product Label | Product Markings |

Figure 1.5—Right View



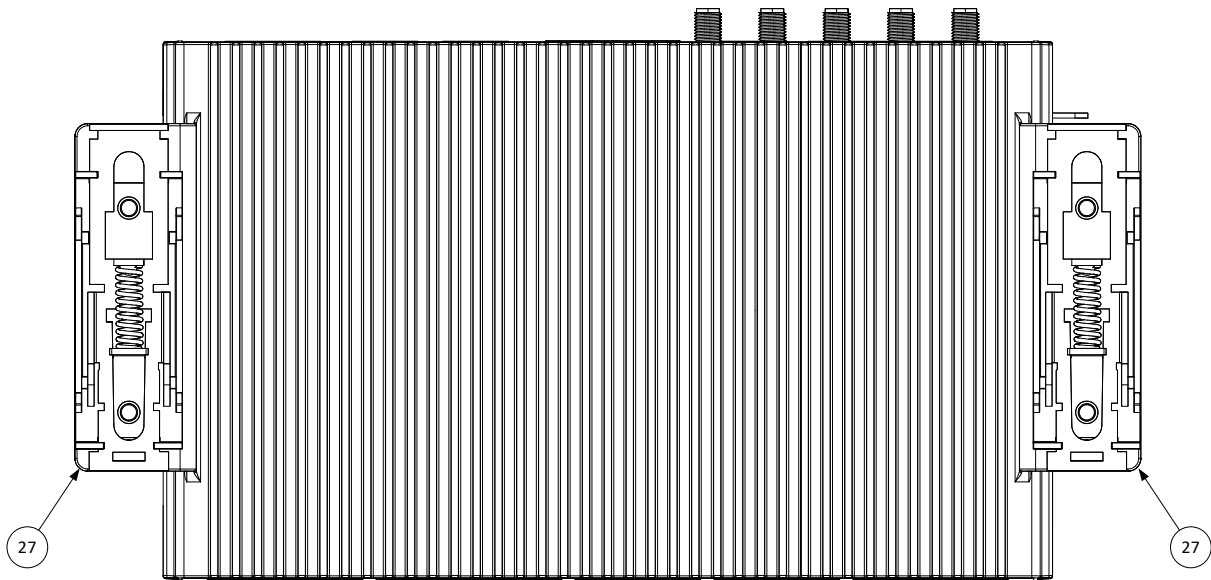
- | | | |
|----|-------------------------------------|----------------------------------|
| 22 | MicroSD & Micro-SIM Card Slot Cover | Optional MicroSD Card & SIM Card |
| 23 | Configuration Switch Cover | Hardware Configuration Switches |

Figure 1.6—Left View



- 24 MicroSD Card Slot [Optional MicroSD Card](#)
- 25 Micro-SIM Slot [SIM Card](#)
- 26 Hardware Configuration Switches [Hardware Configuration Switches](#)

Figure 1.7—Left View (Covers Removed)



- 27 Optional DIN Rail Clips [DIN Rail Installation](#)

Figure 1.8—Back View (Including Optional DIN Rail Clips)

1.5 PROCESS CIRCUITRY

HCC2 comprises two processing circuit boards, named to reflect their functionality.

The “CPU” board connects to Avalon for upstream data transfer and also runs applications locally for process information and control. It houses an Intel ATOM X86 processor to run the Operating System, user applications, and built-in servers. The board’s architecture is similar to a traditional PC with CPU, memory, Ethernet, storage, and USB connectivity. It also has Wi-Fi, GPS, and Cellular LTE capability for wireless communication.

The “IO” board runs a robust real-time operating system independent of the one on the CPU board to provide reliable control of the peripherals via the ISaGRAF program that will reside entirely on the IO board. It houses robust electronics for connecting to real-world peripherals such as motors, pumps, and relays. Central to the IO board logic is a high-performance 32-bit ARM Cortex-M7 processor. The microcontroller features a number of on-board peripherals including multiple serial peripherals and an Ethernet controller.

The two boards communicate with each other via a dedicated Ethernet link and use CIP protocol to pass information back and forth.

Section 2: HCC2 Dimensions

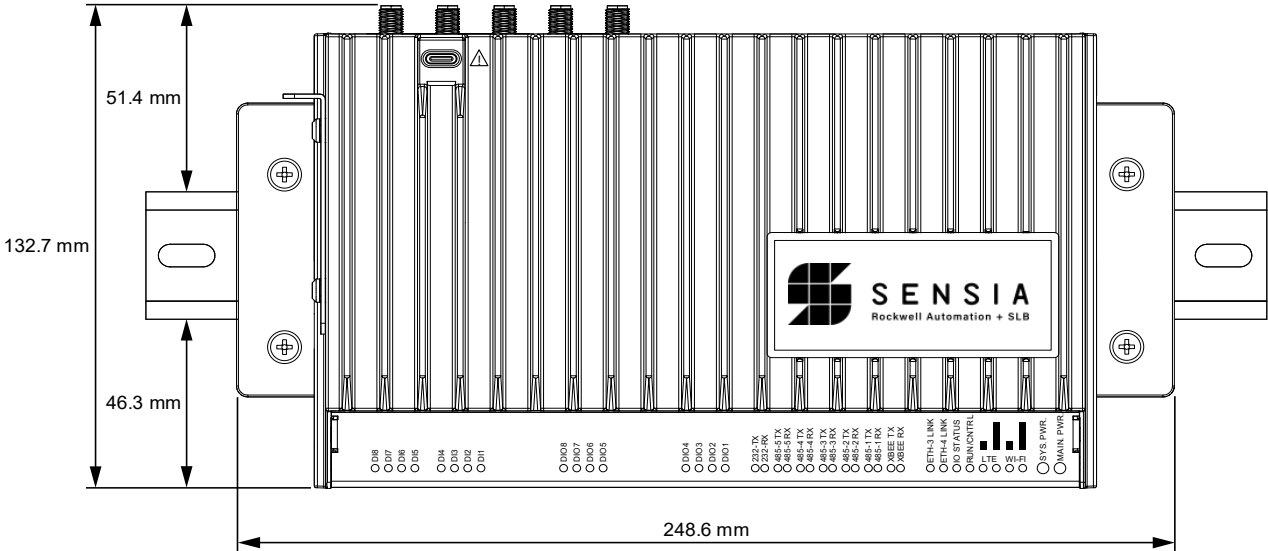


Figure 2.1—Front Dimensions (Including Optional DIN Rail Mounting)

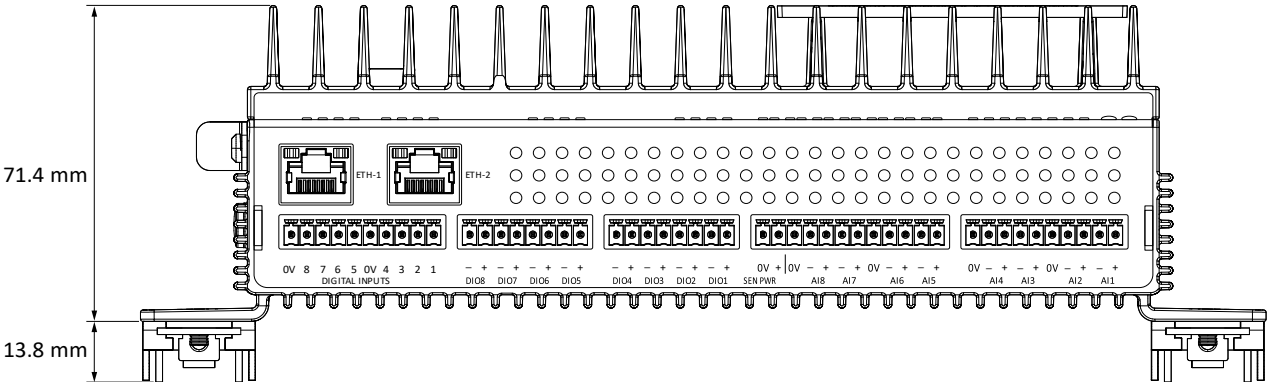



Figure 2.2—Bottom Dimensions (Including Optional DIN Rail Clips)

Section 3: Installing Your HCC2

This chapter provides instructions for installing your HCC2.

3.1 HAZARDOUS AREA CERTIFICATIONS

- Class I, Division 2, Groups A, B, C, D, T4
- Suitable for Class I, Zone 2, Groups IIC, T4
- ATEX/IECEX Increased Safety (Ex ec)
 - ATEX  II 3 G Ex ec IIC T4 Gc
 - IECEX, Ex ec IIC T4 Gc

3.2 COMPLIANCE TO EUROPEAN UNION DIRECTIVES

This product has the CE marking and is approved for installation within the European Union (EU) and European Economic Area (EEA).

3.2.1 ATEX Directive

This product is tested to meet Council Directive 2014/34/EU Explosive Atmosphere (ATEX).

3.2.2 EMC Directive

This product is tested to meet Council Directive 2014/30/EU Electromagnetic Compatibility (EMC).

3.2.3 Radio Equipment Directive

This product is tested to meet the Radio Equipment Directive (RED) 2014/53/EU which includes Article 3.1(a) Safety Standards, Article 3.1(b) EMC Standards, and Article 3.2 Radio Standards.

3.2.4 RoHS3

This product meets the Council Directive 2011/65/EU Restriction of Hazardous Substances (RoHS), also the Directive amended by (EU) 2015/863 published in 2015 (also known as RoHS 3).

3.3 CELLULAR APPROVAL

3.3.1 PTCRB

The HCC2 is certified by the PCS Type Certification Review Board (PTCRB) for use with AT&T Mobility LLC under test standard ETSI TS 102.230 and ETSI TS 36.124.

3.4 PRODUCT MARKING

Figure 3.1, page 16, shows an example product label with HCC2 product markings. See [Section 6: Specifications, page 45](#), for actual approvals and certifications.



Figure 3.1—Example Product Label

3.5 INSTALLATION CONSIDERATIONS

The HCC2 standard installation method is flat mounting onto a panel. A DIN rail mounting kit is supplied with every unit for mounting the HCC2 onto TS35 “Top Hat” Section (EN60175 - 35 x 7.5) DIN rail.

Before installing the HCC2, consider the physical and electrical installation requirements of the system, positioning of the unit for optimum operation, and requirements for communication and power wiring.

Install your HCC2 away from power lines, load lines, and other sources of electrical noise such as hard-contact switches, relays, and AC motor drives.

3.5.1 Ordinary Location

The device is UL-approved for ordinary locations. The installer must ensure that the device is installed in a non-hazardous area, and the wiring is compliant with the relevant wiring standard. The device is designed for use with an 11-30 VDC Class 2 or LPS power supply.



CAUTION

The following information is a guide for proper installation. Sensia is not responsible for the compliance or the noncompliance to any code, national, local, or otherwise for the proper installation of the HCC2 or associated equipment.

Personal injury and/or equipment damage may occur if codes are ignored during installation.



CAUTION

DO NOT touch exposed connector pins or attempt to dismantle a module. The module contains static-sensitive components. Static handling precautions must be observed.

3.5.2 Grounding

Verify that the HCC2 is properly grounded.

Two screw terminal connectors are provided on the unit power connectors, which must be connected externally to a chassis grounding point (see [Section 4: Wiring Your HCC2, page 21](#)).

When the DIN rail mounting option is used, it is advisable to also ground the DIN rail.

You must also provide an acceptable grounding path for each device in your application.

For more information on grounding guidelines, refer to the publication [1770-4.1](#).

3.5.3 Excessive Heat

To ensure that convective cooling keeps the HCC2 within the specified temperature operating range, make sure the HCC2 mounting position aligns the heat sink fins vertically. Refer to [Figure 3.2, page 18](#), for the mounting orientation.

For most applications, normal convective cooling keeps the HCC2 within the specified operating range.

Proper spacing of components within an enclosure is sufficient for heat dissipation.

In some applications, other equipment close to the HCC2 may produce substantial heat. In these cases, a forced air-cooling system should be installed to increase air flow and reduce hot spots near the HCC2.


3.5.4 Radio Frequency Interference

The operation of this equipment is subject to the following two conditions:

- Under normal operation, this equipment or device should not cause harmful interference.
- This equipment or device must accept any interference, including interference that may cause undesired operation.

3.6 SPECIAL CONDITIONS FOR SAFE USE

This equipment is approved for use in the following locations:

- Class I, Division 2, Groups A, B, C, D
- ATEX  II 3 G Ex ec IIC T4 Gc
- IECEx, Ex ec IIC T4 Gc

The equipment is also suitable for Class I, Zone 2, Groups IIC, T4 locations.



CAUTION

The equipment shall be installed in an enclosure that provides a degree of protection not less than IP54 in accordance with IEC/EN 60079-0 and accessible only with the use of a tool



CAUTION

Provision shall be made, either in the equipment or external to the equipment, to provide the transient protection device to be set at a level not exceeding 140% of the peak rated voltage values at the power supply terminals of the equipment.



CAUTION

The equipment shall only be used in an area of at least Pollution Degree 2, as defined in IEC/EN 60664-1.

Note Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity, which is caused by condensation, is expected.

United States only: All wiring must comply with the requirements stated in the National Electrical Code 501-10 (b).

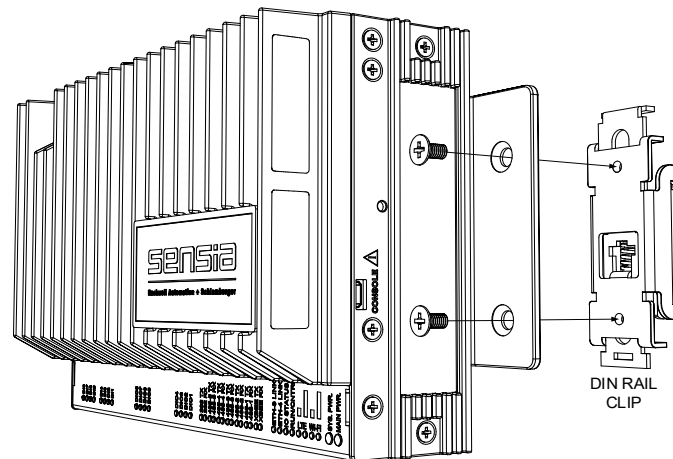


Figure 3.3—Attachment of DIN Rail Clip to HCC2

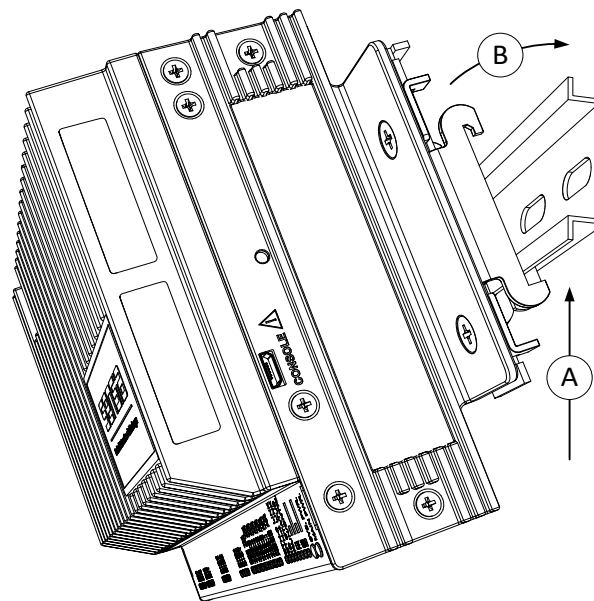


Figure 3.4—Attachment of Clip to DIN Rail

3.8 REQUIREMENTS FOR WIRELESS COMMUNICATION

The QRATE HCC2 wireless modules connect to their respective antennas. A direct antenna and remote antenna are optionally available. Refer to section [4.15 Radio and Antenna Connection \(Optional\)](#), page 37. See [Appendix A](#) for a sample Radio Equipment Directive (RED) Declaration of Conformity (DoC).

QRATE HCC2 utilizes the internal software called "SensiaOS Network Manager" to control all the radio operation.

3.8.1 FCC Radio Frequency Compliance

QRATE HCC2s that include the optional Wi-Fi and LTE radio modules comply with Federal Communications Commission (FCC) radio frequency (RF) exposure compliance requirements when the following requirements are met.

Important: To comply with FCC and IC RF exposure compliance requirements, the antenna must be installed to provide a separation distance of at least 20 cm from all persons. Changes or modifications to the installation that violate this requirement and are not authorized by the radio manufacturer could void your authority to operate the equipment.

The wireless radio 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, you are 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 to an outlet on a circuit different from that used with the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

3.8.2 IC Radio Frequency Compliance

QRATE HCC2s that include the optional Wi-Fi and LTE radio modules comply with Industry Canada (IC) license-exempt RSS standards. Operation is subject to the following conditions:

- The device may not cause interference.
- The device must accept any interference, including interference that may cause undesired operation of the device.

3.8.3 Radio Frequency Compliance

QRATE HCC2s that include the optional Wi-Fi and LTE radio modules comply with a broad range of country-specific radio frequency standards. The device wireless radio is approved for use in all the regions listed under this manual or a radio compliance label applied to the enclosure.

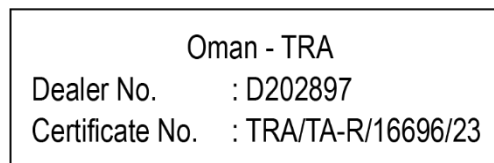


Figure 3.5—Oman Compliance Label

Section 4: Wiring Your HCC2

This chapter provides instructions and recommendations for wiring your HCC2.

4.1 WIRING REQUIREMENTS

Most start-up difficulties are the result of incorrect wiring. Read the following instructions carefully before connecting wires and reference the diagrams as needed to ensure connections are made properly.



CAUTION

Calculate the maximum possible current in each power and common wire. Observe all electrical codes and dictate the maximum current allowable for each wire size. Currents above the maximum ratings cause wiring to overheat, which causes damage.

Use conductors rated > 94°C.

For installations within the United States, the DC supply must be a Class 2 energy-limited circuit per the National Electric Code (NEC).

For installations within Canada, the DC supply must be either Class 2 power supply or a Limited Power Supply (LPS) with voltage and power outputs that do not exceed Class 2 power supply limits as per the Canadian Electrical Code (CEC).

In locations governed by the International Electrotechnical Commission (IEC) or EN standards, a safety extra-low voltage (SELV) power source must be used.



WARNING: EXPLOSION HAZARD

Do not connect or disconnect equipment while the circuit is live or unless the area is known to be free of ignitable concentrations or equivalent.

AVERTISSEMENT

Ne pas connecter ou déconnecter l'équipement lorsque le circuit est sous tension ou à moins que la zone soit connue pour être exempte de concentrations inflammables ou équivalentes.

Consider the following points while wiring

- Copper conductors must be used for wiring.
- Allow at least 50 mm (2 in.) between I/O wire ducts or terminal strips and the HCC2.
- Separate input wiring from output wiring.
- Label wiring to all devices in the system. Use tape, shrink-tubing, or other label materials.



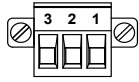
CAUTION

Do not run signal, communications, or power wiring in the same conduit. Use separate paths for wiring carrying interfering signal characteristics to preserve measurement accuracy.

4.2 POWER INPUT WIRING

The HCC2 has two power inputs for redundancy. The module will operate with one or both power inputs connected. The input voltage range is 11 to 30 Vdc.

Table 4.1—Power Input Terminals (Power A & Power B)



Terminal	Label	Function
1	+	+V Input
2	-	0 V Input
3	⏏	Earth Connection



CAUTION

Failure to connect a suitable Earth ground may result in degraded communication performance and invalidate EMC and electrical safety compliance.



CAUTION

In accordance with IEC 61984, the power input terminal connectors have no switching power (COC). They must not be plugged in or disconnected when carrying voltage or under load.

Table 4.2—Terminal Specifications

Description	Value
Recommended conductor cross section for HCC2 Power Input Wiring	0.5 mm ² (20 AWG)
Stripping length	7 mm
Terminal screw torque	0.5 Nm to 0.6 Nm
Mounting flange screw torque	0.3 Nm
Conductor cross section solid (Maximum)	2.5 mm ²
Conductor cross section flexible (Maximum)	2.5 mm ²
Conductor cross section AWG (Maximum)	12
Conductor cross section flexible, with ferrule without plastic sleeve (Maximum)	2.5 mm ²
Conductor cross section, flexible, with ferrule, with plastic sleeve (Maximum)	2.5 mm ²
2 conductors with same cross section, solid (Maximum)	1 mm ²
2 conductors with same cross section, flexible (Maximum)	1.5 mm ²
2 conductors with same cross section, flexible, with ferrule without plastic sleeve (Maximum)	1 mm ²
2 conductors with same cross section, flexible, with TWIN ferrule with plastic sleeve (Maximum)	1.5 mm ²

4.3 I/O WIRING

The HCC2 has eight analog input (AI) channels, eight digital input (DI) channels, eight configurable digital input or output (DIO) channels, and two analog output (AO) channels.

4.3.1 I/O Terminal Specifications

Table 4.3- I/O Terminal Specifications

Description	Maximum
Stripping length	7 mm
Terminal screw torque	0.5 Nm to 0.6 Nm
Conductor cross section solid (Maximum)	1.5 mm ²
Conductor cross section flexible (Maximum)	1.5 mm ²
Conductor cross section AWG (Maximum)	16
Conductor cross section flexible, with ferrule without plastic sleeve (Maximum)	1.5 mm ²
Conductor cross section, flexible, with ferrule, with plastic sleeve (Maximum)	0.5 mm ²
2 conductors with same cross section, solid (Maximum)	0.5 mm ²
2 conductors with same cross section, flexible (Maximum)	0.75 mm ²
2 conductors with same cross section, flexible, with ferrule without plastic sleeve (Maximum)	0.34 mm ²
2 conductors with same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm ²

4.4 ANALOG INPUT WIRING

The analog inputs are electrically isolated from the rest of the HCC2. Each channel is protected from overvoltage (13.50 Vdc) and overcurrent (90 mA trip current). Each channel can operate in a differential configuration, or single ended configuration by connecting AI '-' terminal to AI '0V' (all AI 0 V terminals are internally connected). Single-ended configuration is recommended when using a current input (0 to 20mA or 4 to 20mA) operation and is mandatory for HART operations.

It is recommended that twisted pair wiring be used to help prevent noise pickup.

Channels 1 to 4 share a common (multiplexed) HART FSK modem.

Channels 7 and 8 have an additional configurable option to receive a low-level voltage signal.

The HCC2 provides a low-power regulated supply for external low-level voltage transducers (SENSR PWR). The supply can provide 5 mA at 11.1 Vdc and is protected by a resettable fuse.

The analog input configuration options shown in Table 4.4 are configurable via the Unity Edge software interface. See the QRATE HCC2 Software Manual for details.

Table 4.4—Analog Input Configuration Options

Channel	Voltage Input				Current Input		HART
	0 to +10 V	0 to +5 V	-10 to +10 V	0 to 100 mV	0 to 20 mA	4 to 20mA	
1	Yes	Yes	Yes	No	Yes	Yes	Yes
2	Yes	Yes	Yes	No	Yes	Yes	Yes
3	Yes	Yes	Yes	No	Yes	Yes	Yes
4	Yes	Yes	Yes	No	Yes	Yes	Yes
5	Yes	Yes	Yes	No	Yes	Yes	No
6	Yes	Yes	Yes	No	Yes	Yes	No
7	Yes	Yes	Yes	Yes	Yes	Yes	No
8	Yes	Yes	Yes	Yes	Yes	Yes	No

**CAUTION**

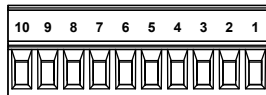
The maximum differential voltage applied to any channel must not exceed ± 12 V.

The maximum absolute voltage (i.e., with respect to AI 0 V) applied to any channel's positive or negative terminal must not exceed ± 12 V.

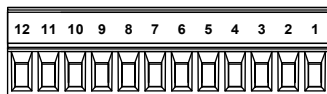
Applying voltages in excess of this may result in permanent damage to the analog input sub-system.

Note

Analog input terminal connections are distributed over two terminal blocks. Verify the location of these terminals in [Figure 1.3, page 9](#), before commencing wiring.

Table 4.5—Analog Input Terminals, AI1 to AI4

Terminal	Label	Function
1	AI1 +	Analog Input 1 +
2	AI1 -	Analog Input 1 -
3	AI2 +	Analog Input 2 +
4	AI2 -	Analog Input 2 -
5	0V	Analog Common for single ended operation
6	AI3 +	Analog Input 3 +
7	AI3 -	Analog Input 3 -
8	AI4 +	Analog Input 4 +
9	AI4 -	Analog Input 4 -
10	0V	Analog Common for single ended operation

Table 4.6—Analog Input Terminals, AI5 to AI8 and SENSR PWR

Terminal	Label	Function
1	AI5 +	Analog Input 5 +
2	AI5 -	Analog Input 5 -
3	AI6 +	Analog Input 6 +
4	AI6 -	Analog Input 6 -
5	0V	Analog Common for single ended operation
6	AI7 +	Analog Input 7 +
7	AI7 -	Analog Input 7 -
8	AI8 +	Analog Input 8 +
9	AI8 -	Analog Input 8 -
10	0V	Analog Common for single ended operation
11	SENSR PWR	Sensor Power Supply Voltage Output
12	0V	Analog Common 0V

4.4.1 Analog Input Wiring Examples

The wiring examples shown in this section show field current loops, typically 0 to 20 mA.

For current inputs like these, the AI '-' terminal is connected to the AI '0V' terminal (refer to [Figure 4.1, page 25](#)) and the Analog Input must be configured as a current input in the Unity Edge software interface. The current input configuration will enable the channel's internal 250 Ω current-sensing resistor.

For voltage inputs, the analog input must be configured as a voltage input in the Unity Edge software interface. The voltage input configuration will disable the channel's internal 250 Ω current-sensing resistor.

If a voltage measurement is to be made under the differential input mode, the common-mode input range must be within $\pm 4V$.

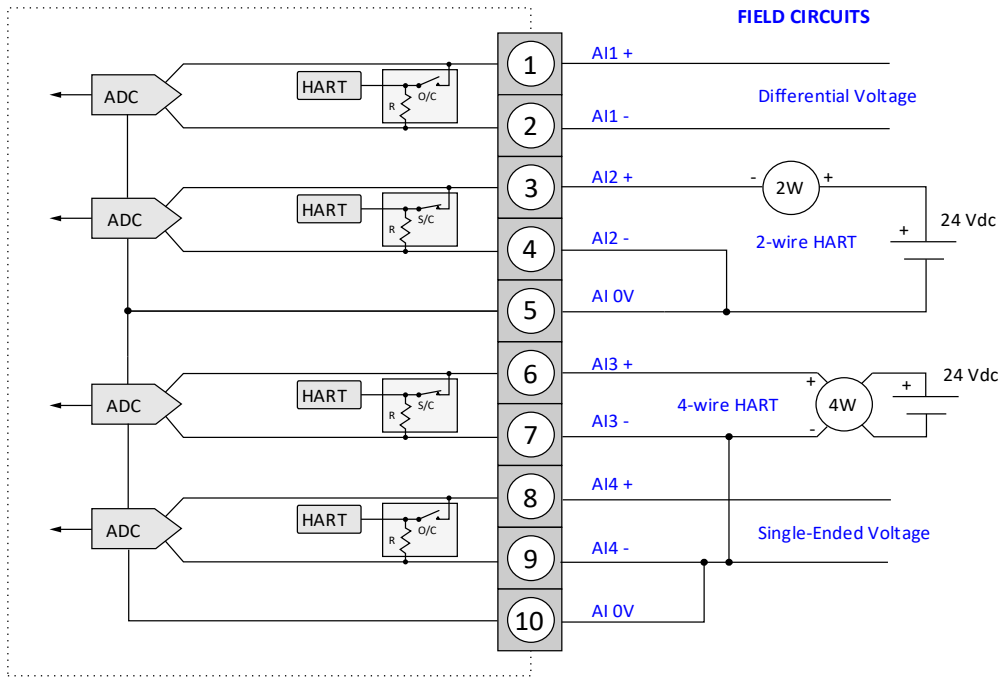


Figure 4.1—Example: Differential Voltage, HART, and Single-Ended Voltage Connections

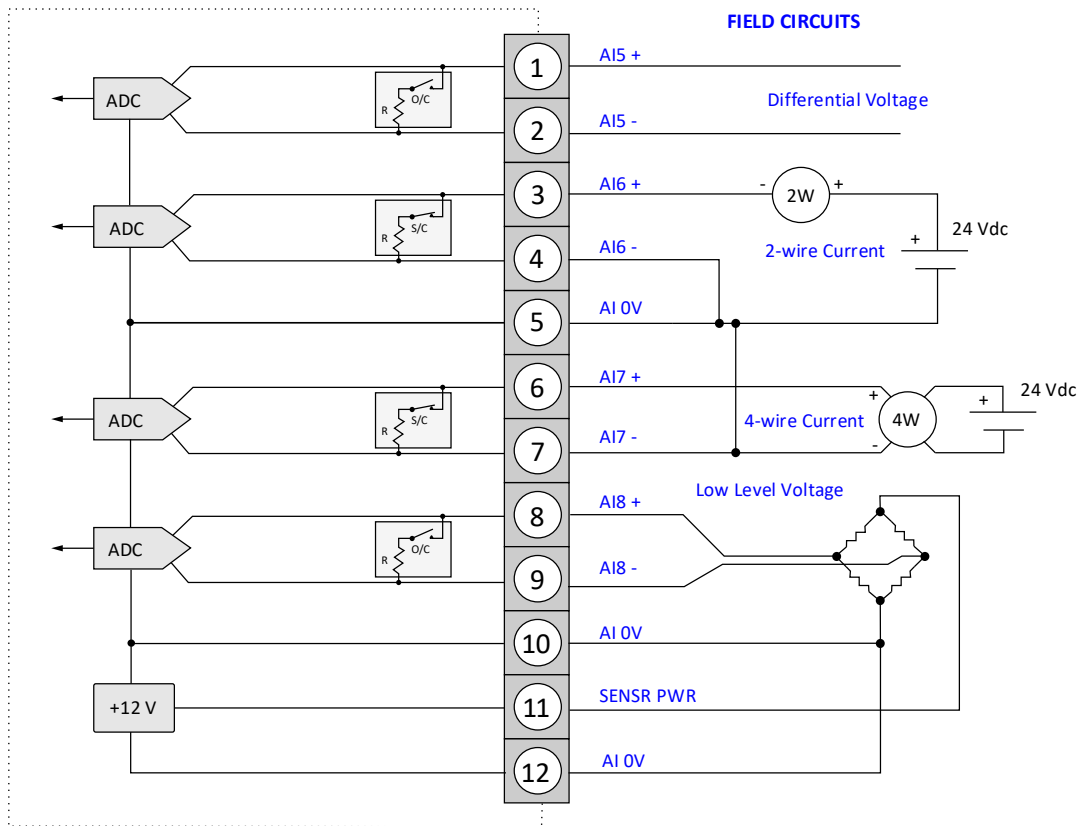


Figure 4.2—Example: Differential Voltage, 2- & 4-Wire Current, and Low-Level Voltage Connections

4.5 ANALOG OUTPUT WIRING

The HCC2 has two 12-bit resolution channels. The analog outputs are electrically isolated from the rest of the HCC2, with a local ground reference, 0 V (all AO 0 V terminals are internally connected). The output end is equipped with overvoltage protection up to 31.90 Vdc max current mode and 15.90 Vdc max. voltage mode. The HCC2 can be used with voltage or current (0 to 10 Vdc, 0 to 5 Vdc or 4 to 20 mA modes). These outputs can handle loads up to 500 Ω in current mode and 2 kΩ in voltage mode.

Table 4.7—Analog Output Terminals

Terminal	Label	Function
1	AO1 I+	Analog Output 1 Current Output
2	AO1 V+	Analog Output 1 Voltage Output
3	0V	Analog Output 0V
4	AO2 I+	Analog Output 2 Current Output
5	AO2 V+	Analog Output 2 Voltage Output
6	0V	Analog Output 0V

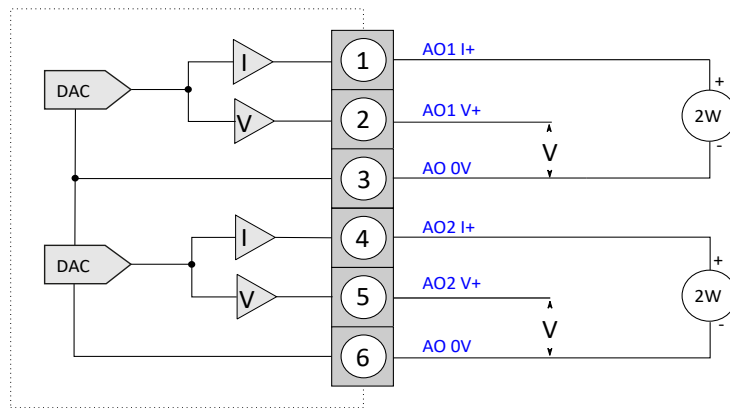
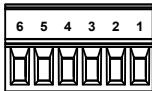


Figure 4.3—Example: Analog Output Connections

4.6 DIGITAL INPUT WIRING

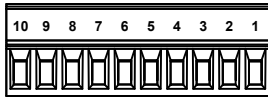
The HCC2 has eight digital input channels that are isolated from the rest of the HCC2. The channels have transient overvoltage protection up to 44.20 Vdc and overcurrent protection of 60 mA trip current. All eight digital inputs share a common return (0V).



CAUTION

Applying voltages in excess of 44.20 Vdc to any digital input may result in permanent damage to digital input sub-system.

Table 4.8—Digital Input Terminals (DI1 to DI8)



Terminal	Label	Function
1	1	Digital Input 1
2	2	Digital Input 2
3	3	Digital Input 3
4	4	Digital Input 4
5	0V	Digital Input Common 0 V Return
6	5	Digital Input 5
7	6	Digital Input 6
8	7	Digital Input 7
9	8	Digital Input 8
10	0V	Digital Input Common 0 V Return

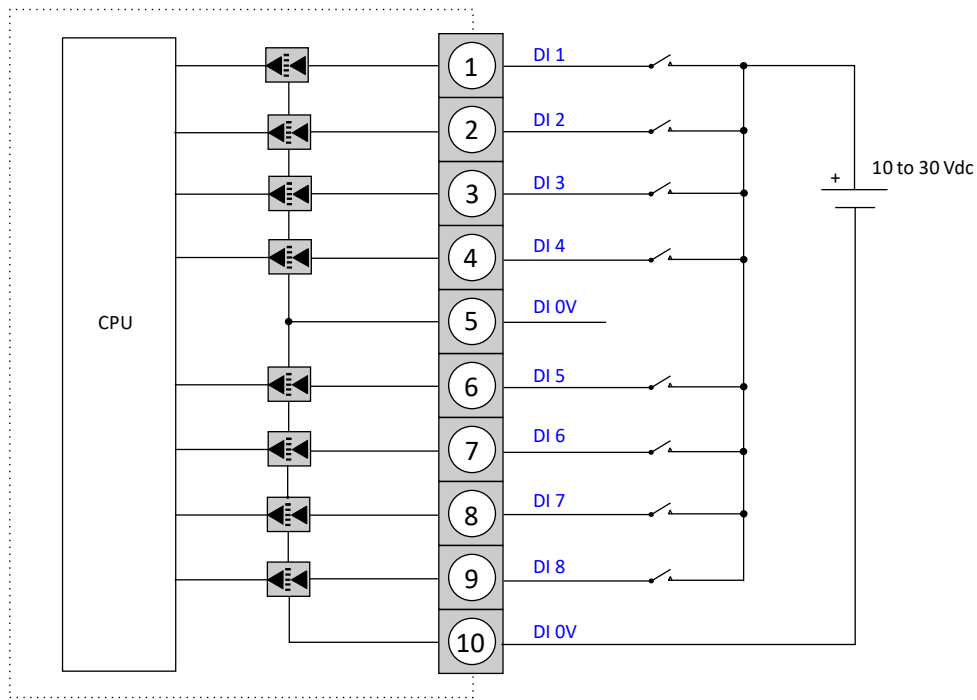


Figure 4.4—Example: Digital Input Connections

4.7 DIGITAL INPUT / OUTPUT WIRING

The HCC2 has eight DIO (digital input/output) ports which can be individually software configured as digital inputs or digital outputs. To ensure flexibility, there are no common terminals, and each DIO port comprises two dedicated terminals on one of the two 8-way connectors. The digital input/output ports are electrically isolated from the rest of the HCC2 and are rated for continuous input voltages of 10 to 30 Vdc. Each port is protected from overvoltage transients up to 44.20 Vdc max. and overcurrent of 1.10 A trip current. The digital outputs can be used for general purpose signalling, driving resistive loads, or for driving an external relay for pilot duty.



CAUTION

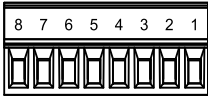
Applying voltages in excess of 44.20 Vdc to any DIO channel may result in permanent damage to the digital input/output sub-system.



CAUTION

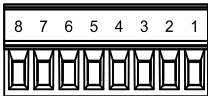
Attempting to switch currents in excess of 1.10 A when a port is configured as an output may permanently damage the digital input/output sub-system. See Specification Table, Section 6.3, for Digital Output rating.

Table 4.9—Digital Input/Output Terminals, DIO1 to DIO4



Terminal	Label	Function
1	DIO1 +	Digital Input/Output 1 +
2	DIO1 -	Digital Input/Output 1 -
3	DIO2 +	Digital Input/Output 2 +
4	DIO2 -	Digital Input/Output 2 -
5	DIO3 +	Digital Input/Output 3 +
6	DIO3 -	Digital Input/Output 3 -
7	DIO4 +	Digital Input/Output 4 +
8	DIO4-	Digital Input/Output 4 -

Table 4.10—Digital Input/Output Terminal Functions, DIO5 to DIO8



Terminal	Label	Function
1	DIO5 +	Digital Input/Output 5 +
2	DIO5 -	Digital Input/Output 5 -
3	DIO6 +	Digital Input/Output 6 +
4	DIO6 -	Digital Input/Output 6 -
5	DIO7 +	Digital Input/Output 7 +
6	DIO7 -	Digital Input/Output 7 -
7	DIO8 +	Digital Input/Output 8 +
8	DIO8 -	Digital Input/Output 8 -

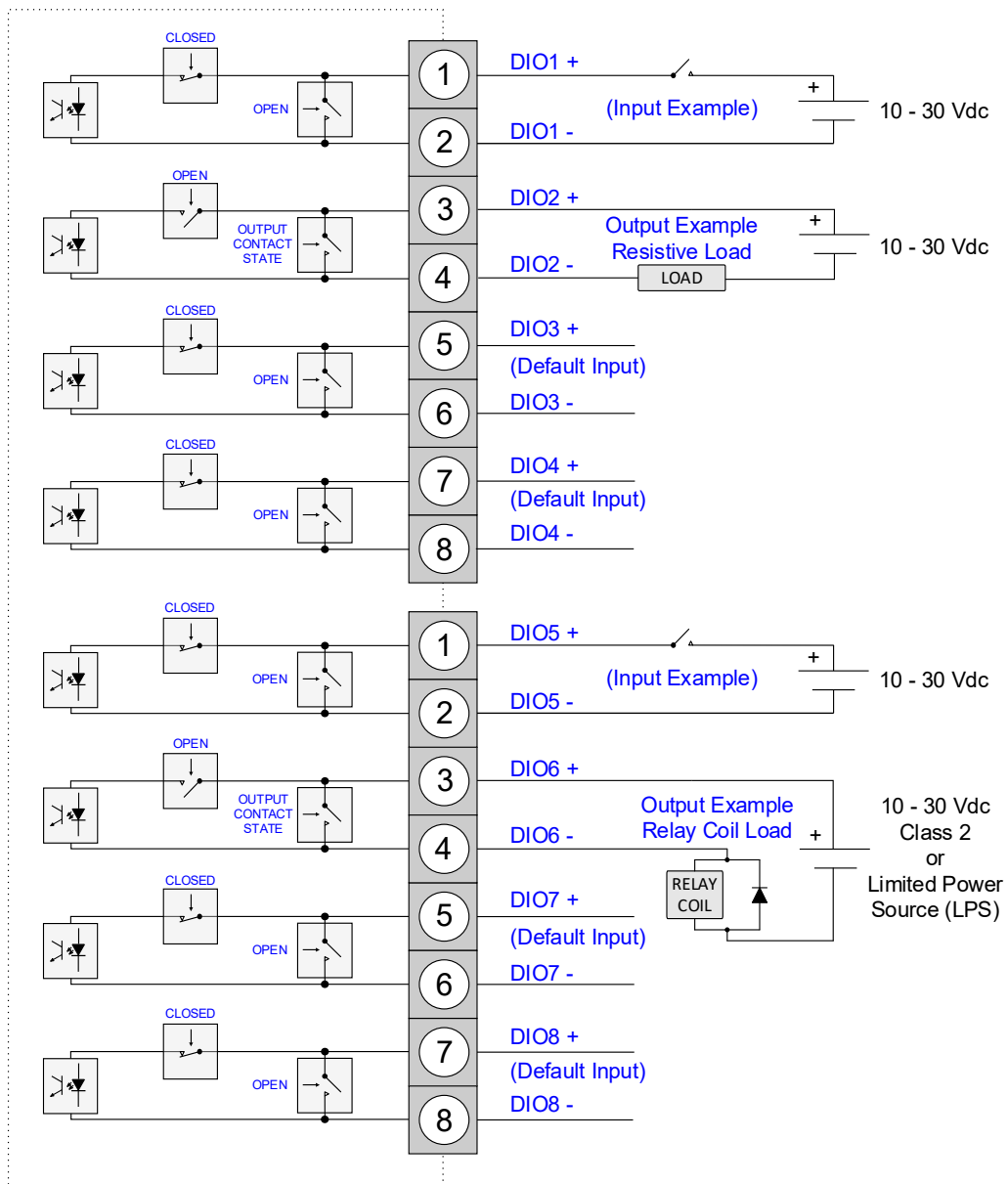


Figure 4.5—Digital Input/Output Connections



CAUTION

When using the HCC2 to drive an inductive load such as a relay coil, an external flywheel diode must be connected across the load. A general-purpose diode such as a 1N4001 is suitable. The diode prevents a large return EMF from developing when the load current is interrupted, which could damage the HCC2. See the example in Figure 4.5.



CAUTION

When an output is used to drive an external relay for pilot duty, power for the external relay coil must be provided by a class 2 power source or a Limited Power Source (LPS). See the example in Figure 4.5.

4.8 SERIAL COMMUNICATION PORT WIRING

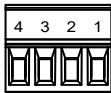
The HCC2 has five isolated RS485 serial ports. RS485-1 is a full-duplex 4-wire port. The rest of the ports are half-duplex, 2-wire ports. A software-enabled 120 Ω resistor can terminate ports RS485-4 and RS485-5. External termination must be used (if required) on ports RS485-1 to RS485-3.

The HCC2 has one RS232 serial port. RS232 is an isolated 5-wire (Rx, Tx, CTS, RTS, and 0V) port.

The HCC2 has one CAN Bus port. A software-enabled 120 Ω resistor can terminate the CAN Bus.

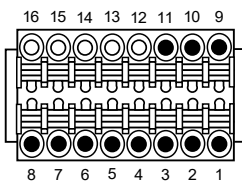
Note In accordance with IEC 61984, the communication terminal connectors have no switching power (COC). They must not be plugged in or disconnected when carrying voltage or under load.

Table 4.11—Serial Communication Terminals – RS485-4 & RS485-5



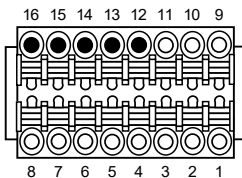
Terminal	Label	Function
1	+	RS485 A
2	-	RS485 B
3	0V	Isolated 0 V Return
4	EARTH	Cable Shield

Table 4.12—Serial Communication Terminals – RS485-1 to RS485-3



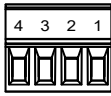
Terminal	Label	Function
1	RS485-1 TX+	RS485-1 RS485 A (Tx+)
2	RS485-1 TX-	RS485-1 RS485 B (Tx-)
3	RS485-1 RX+	RS485-1 RS485 Y (Rx+)
4	RS485-1 RX-	RS485-1 RS485 Z (Rx-)
5	RS485-1 0V	RS485-1 0 V Return
6	RS485-2 +	RS485-2 RS485 A
7	RS485-2 -	RS485-2 RS485 B
8	RS485-2 0V	RS485-2 0 V Return
9	RS485-3 +	RS485-3 RS485 A
10	RS485-3 -	RS485-3 RS485 B
11	RS485-3 0V	RS485-3 0 V Return

Table 4.13—Serial Communication Terminals – RS232



Terminal	Label	Function
12	RS232 TXD	RS232 Tx (Output)
13	RS232 RXD	RS232 Rx (Input)
14	RS232 RTS	RS232 RTS (Output)
15	RS232 CTS	RS232 CTS (Input)
16	RS232 0V	0 V Return

Table 4.14—CAN Bus Terminals (FUTURE)



Terminal	Label	Function
1	HI	CAN H
2	LO	CAN L
3	N/C	Not Used
4	G	Cable Shield



CAUTION

Shielded cabling must be used for all communication port wiring to the HCC2 to reduce electrical noise and reduce impact of the signals. The shield of each cable must be connected to a single-chassis ground point.

The following figures provide examples of some of the most common communication wiring arrangements.

4.8.1 RS232 Connections

The HCC2’s RS232 port operates as a DTE where the RTS signal is an output from the unit and CTS is an input. If hardware flow control is needed by the external equipment, connect the RS232 port of the HCC2 to an external device as shown in Figure 4.6. If flow control is not needed, omit the connections to RTS and CTS pins.

Figure 4.6 shows an example of the HCC2 (DTE) connected to an external device that is also a DTE.

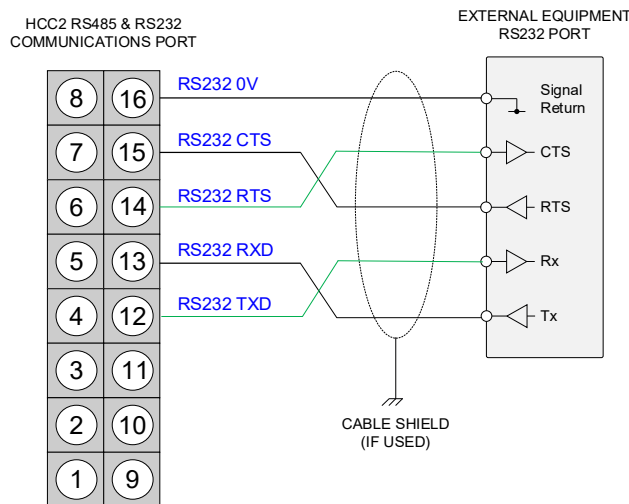


Figure 4.6—Example: RS232 Connections

4.8.2 RS485 Point-to-Point Connections

In the example shown in Figure 4.7, external 120 Ω line termination resistors must be fitted on RS485 ports 1 to 3. Internal termination must be enabled on ports RS485-4 and RS485-5 using the Unity Edge software interface.

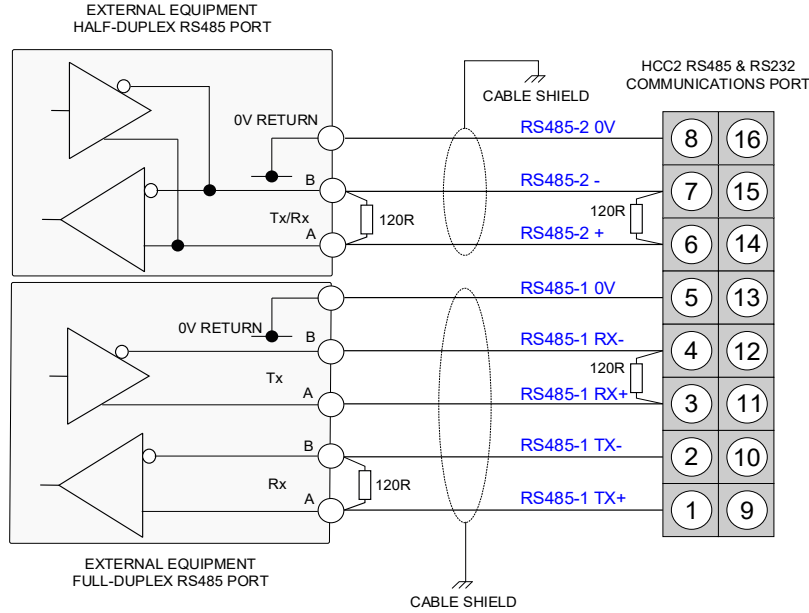


Figure 4.7—Example: RS485 Point-to-Point Connections

4.8.3 RS485 Mid-Line Connections

In the example shown in Figure 4.8, the HCC2 internal 120 Ω line termination resistor must be disabled for the port (RS485-4 & RS485-5), or not fitted externally (RS485-1 to RS485-3).

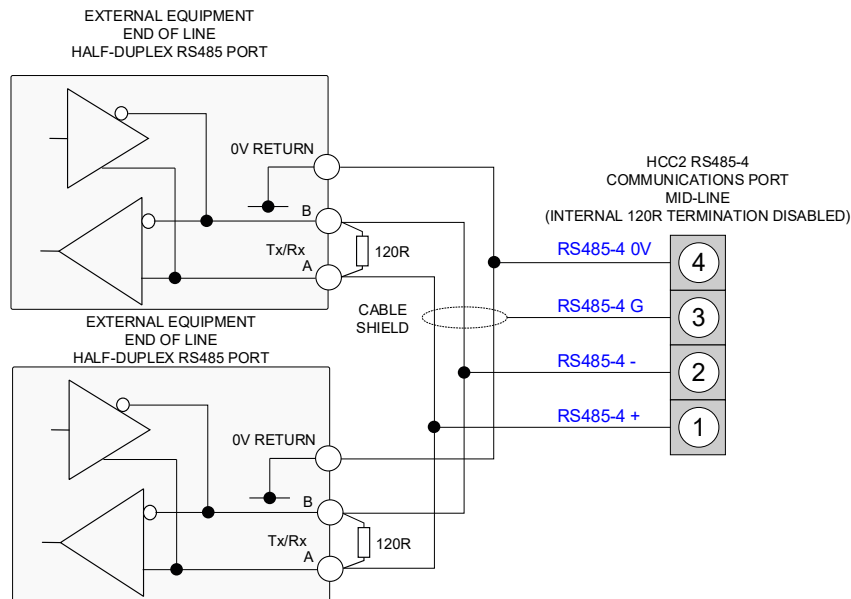


Figure 4.8—Example: RS485 Mid-Line Connections

4.8.4 RS485 End of Line Connections

In the example shown in Figure 4.9, the HCC2 internal 120 Ω line termination resistor must be enabled for ports RS485-4 & RS485-5 or an external resistor fitted for RS485 ports 1 through 3.

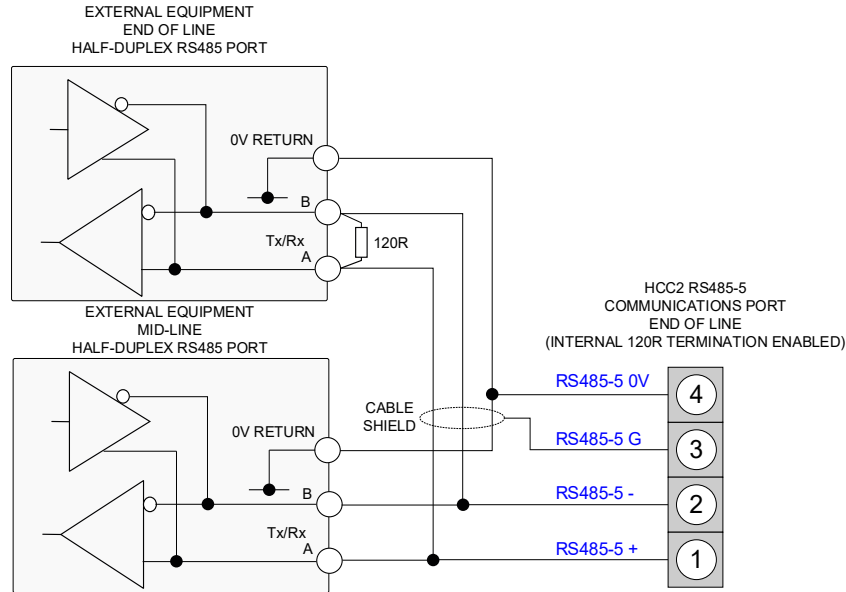


Figure 4.9—Example: RS485 End of Line Connections

4.8.5 CAN Bus Connections (FUTURE)

CAN Bus is not currently implemented in the HCC2 firmware.

An example of mid-line connection of CAN Bus equipment to the HCC2 is shown in Figure 4.10. The HCC2 internal line terminating resistor must not be enabled for the CAN Bus in this configuration. If the HCC2 is used as an end of line port or in point-to-point connections, the internal termination resistor must be enabled using the Unity Edge software interface.

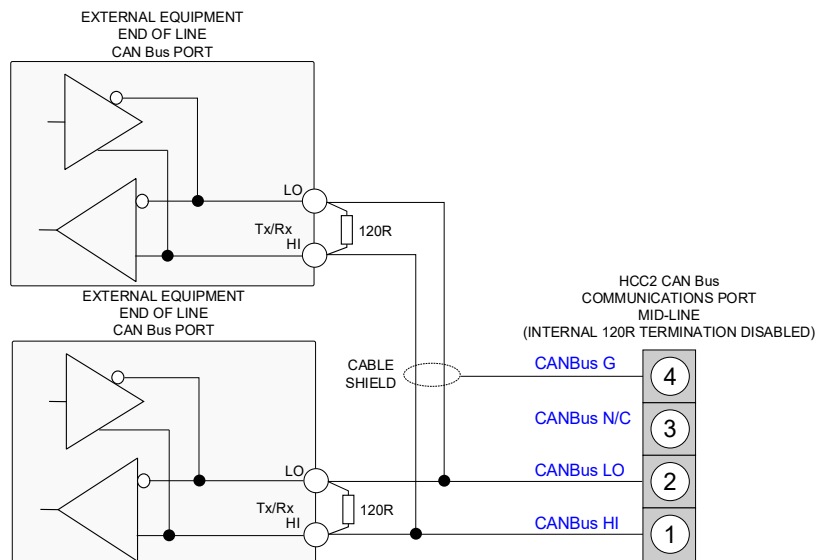


Figure 4.10—Example: CAN Bus Mid-Line Connections

4.9 ETHERNET PORT WIRING

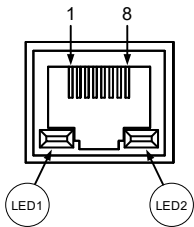
The HCC2 has four Ethernet ports. The ports are 10BASE-Te, 100BASE-TX compatible. Ports ETH-1 and ETH-2 also support 1000BASE-T. The ports work with both device-to-personal computers and device-to-device connections. The ports auto-negotiate the duplex and speed. The ports support auto MDI/MDI-X.

Ethernet ports ETH-3 and ETH-4 are switched ports (same physical IP address) and can support ODVA Device Level Ring (DLR) for use on fault tolerant networks. The DLR ports are configurable as Ring Supervisors or Ring Nodes.

Category 5e cable (Cat5e) is the minimum category suitable for connecting to the Ethernet interface.

For additional information regarding supported functionality, modes, and default IP addresses, see Section 2.2 of the HCC2 Software User Manual.

Table 4.15—Ethernet Port Recommended Usage

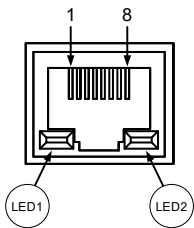


Port	Function
ETH-1	Internet / remote connectivity and configuration
ETH-2	Client SCADA / LAN / Field LAN
ETH-3 & ETH-4	Embedded switch for device and instrument field networks

The RJ45 connector and signal connections are shown below in Table 4.16.

See [Table 5.2, page 44](#), for LED function descriptions.

Table 4.16—RJ45 Signal Connections

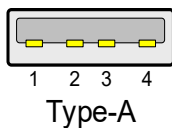


Terminal	Function
1	Tx Data +
2	Tx Data -
3	Rx Data +
4	Not Used
5	Not Used
6	Rx Data -
7	Not Used
8	Not Used

4.10 USB PORT CONNECTION

The HCC2 has two USB 2.0 communication ports (USB1 and USB2). They can be used for external HMI devices (touch panel, keyboard, mouse, etc.) and supports USB Memory Drives for file transfer.

Table 4.17—USB 2.0 Signal Connections



Terminal	Label	Function
1	VBUS	+5 V
2	D-	Data -
3	D+	Data +
4	GND	Ground return

4.11 MAINTENANCE PORT CONNECTION

The HCC2 has a single USB-C communications port for maintenance purposes.



CAUTION

USB-C Port is for maintenance use only and is not intended for normal use.

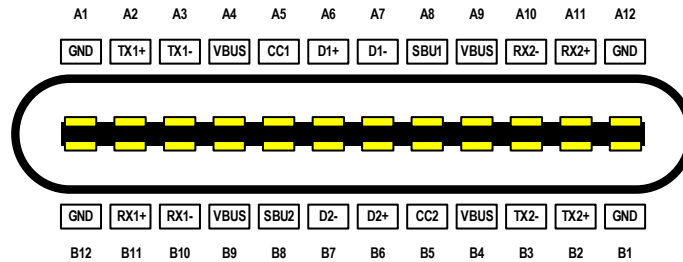


Table 4.18—USB-C Signal Connections

Terminal	Label	Function
A1	GND	Ground return
A2	SSTXp1	SuperSpeed differential pair #1, TX, positive
A3	SSTXn1	SuperSpeed differential pair #1, TX, negative
A4	VBUS	Bus power
A5	CC1	Configuration channel
A6	Dp1	USB 2.0 differential pair, position 1, positive
A7	Dn1	USB 2.0 differential pair, position 1, negative
A8	SBU1	Sideband use (SBU)
A9	VBUS	Bus power
A10	SSRXn2	SuperSpeed differential pair #4, RX, negative
A11	SSRXp2	SuperSpeed differential pair #4, RX, positive
A12	GND	Ground return
B1	GND	Ground return
B2	SSTXp2	SuperSpeed differential pair #3, TX, positive
B3	SSTXn2	SuperSpeed differential pair #3, TX, negative
B4	VBUS	Bus power
B5	CC2	Configuration channel
B6	Dp2	USB 2.0 differential pair, position 2, positive
B7	Dn2	USB 2.0 differential pair, position 2, negative
B8	SBU2	Sideband use (SBU)
B9	VBUS	Bus power
B10	SSRXn1	SuperSpeed differential pair #2, RX, negative
B11	SSRXp1	SuperSpeed differential pair #2, RX, positive
B12	GND	Ground return

4.12 CONSOLE PORT CONNECTION

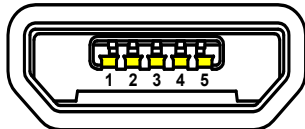
The HCC2 has a single micro USB-B port for console functions.



CAUTION

Micro USB-B Port is for maintenance use only and is not intended for normal use.

Table 4.19—Micro USB Signal Connections

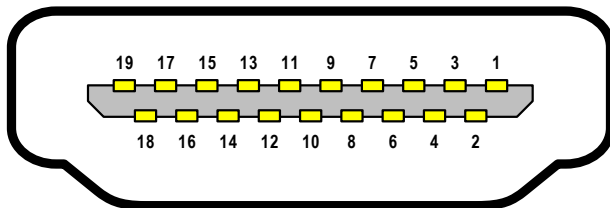


Terminal	Label	Function
1	VBUS	+5 V
2	D-	Data -
3	D+	Data +
4	ID	Not Connected
5	GND	Ground Return

4.13 HDMI PORT CONNECTION

The HCC2 has one HDMI port that supports HDMI 1.1. In order to maintain EMC approval, Sensia recommends the use of certified Ultra High Speed HDMI cables.

Table 4.20—HDMI-A Signal Connections

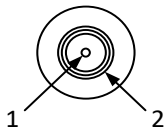


Terminal	Label	Function
1	TMDS Data2+	Data 2 +
2	TMDS Data2 Shield	Data 2 Shield
3	TMDS Data2-	Data 2 -
4	TMDS Data1+	Data 1 +
5	TMDS Data1 Shield	Data 1 Shield
6	TMDS Data1-	Data 1 -
7	TMDS Data0+	Data 0 +
8	TMDS Data0 Shield	Data 0 Shield
9	TMDS Data0-	Data 0 -
10	TMDS Clock+	Clock +
11	TMDS Clock Shield	Clock Shield
12	TMDS Clock-	Clock -
13	CEC	Not Connected
14	Reserved	Not Connected
15	SCL	I2C Serial Clock
16	SDA	I2C Serial Data
17	Ground	0 V Return
18	+5 V	+5 V
19	Hot Plug Detect	Hot Plug Detect

4.14 GNSS AND ANTENNA CONNECTION

QRATE HCC2 supports an internal GNSS Module installed on CPU board. HCC2 has one GNSS antenna connection. The HCC2 GNSS receiver is designed to operate with an external active or passive antenna. The device supports GPS at 1575.42 +/- 1.02 MHz and GLONASS at 1602 +/- 5 MHz. The GNSS module is a standard feature, the only part that will be needed is the external antenna.

Table 4.21—GNSS Antenna Signal Connections (SMA Female Connector)



Terminal	Function
1	RF Input + Antenna Power Output
2	0V

The user can use an active antenna for the GNSS receiver that meets the requirements shown in [Table 4.22, page 37](#). For a passive antenna, a minimum gain of 4 dB is required. HCC2 time can be synchronized with GNSS for improved system time accuracy.

The performance of Taoglas AA.166.A.301111 antennas (Sensia P/N 50385327) has been tested and verified with HCC2. Other antennas that meet the specifications below are also suitable.

The HCC2 requires an external antenna for GPS modules. Antenna requirements vary by country and module. Contact Sensia for assistance.

Table 4.22—Active Antenna Signal Parameters

Antenna Supply Voltage	3.3 V
Antenna Supply Current	50 mA max
Output Impedance	50 Ω
GNSS Constellations Supported	GPS & GLONASS
Average Peak Gain (antenna + LNA)	29.75 dBi
Maximum Noise Figure	2.66 dBi (GPS) & 2.97 dBi (GLONASS)
Connection	SMA male connector from antenna



CAUTION

For the best signal reception, position the GNSS antenna with clear access to the sky. Obstruction by buildings or trees can significantly reduce signal quality.

4.15 RADIO AND ANTENNA CONNECTION (OPTIONAL)

Two optional radio module types can be used with the HCC2. One of each type may be fitted to the HCC2. The following connections are available in the location:

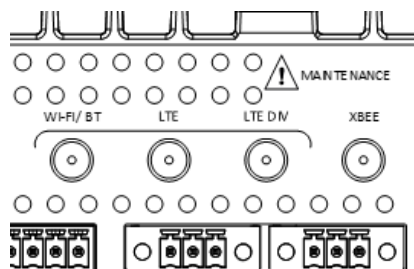


Figure 4.11—Wireless Radio Module Antenna Connections

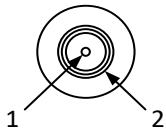
Table 4.23—Wireless Signal Parameters

Wi-Fi	Wi-Fi, IEEE 802.11 radio connection
LTE	Wireless broadband radio connection (Primary Connection)
LTE DIV	Wireless broadband radio optional connection (Diversity)
XBEE	Future

QRATE HCC2 supports an optionally installed Wi-Fi Module on CPU Board. The module supports Wi-Fi IEEE 802.11 type. If you have purchased a wireless HCC2 device (50369741), the Wi-Fi module is already installed. No additional hardware or software is required. An external antenna is required.

The device also supports an optionally installed Quectel LTE Module on CPU Board. It supports LTE-FDD, LTE-TDD, WCDMA and GSM. If you have purchased a wireless HCC2 device (50369741), the LTE module is already installed. No additional hardware or software is required. An external antenna is required as well as activation of the SIM Card.

Each radio type interfaces to the antenna via an SMA female connector. There is only one antenna for the Wi-Fi module. However, LTE supports both the LTE antenna and LTE DIV antenna. The LTE antenna connection is for normal use and should always be connected. The diversity antenna (LTE DIV) is an optional connection that can maximize the chance of a packet getting through at a given time and in a given position between a receiver and transmitter in a non-static environment for improved radio communication. The diversity antenna enhances signal quality; however, it also impacts throughput, range, and power consumption.

Table 4.24—Radio Antenna Signal Connections (SMA Female Connector)

Terminal	Function
1	RF Signal
2	0V

The selected antenna must match the fitted radio type and comply with local radio regulations.

See a listing of the radio module options in Table 4.25.

Table 4.25—Radio Type Data

Module	Radio Type	Radio Frequency / Band	Maximum Output Power	Antenna Gain Max.
Cellular	Cellular	LTE-FDD: B1/B2/B3/B4/B5/B7/B8/ B12/B13/B18/B19/B20/B25/B26/ B28 LTE-TDD: B38/B39/B40/B41 WCDMA: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8	23 dBm to 30 dBm (band dependent)	4.5 dBi (band dependent)
Wi-Fi	Wi-Fi	2.4 GHz / 5 GHz	12 dBm to 18 dBm (band dependent)	2.2 / 3.5 dBi

The performance of the Taoglas OMB.6912.03F21 antenna (Sensia P/N 50385329) has been tested and verified with HCC2 for cellular LTE operation. The LTE antenna is omnidirectional, has 50 Ω impedance and an N Type Female connector, and requires an extension coaxial cable. The LTE antenna is designed for mounting in a Y orientation on a vertical pipe.

The performance of the Pulse Larsen W5097 antenna (Sensia P/N 50385328) has been tested and verified for Wi-Fi operation. The Wi-Fi antenna is omnidirectional, has 50 Ω impedance, and an SMA Male connector. Other antennas that meet the specifications in Table 4.25 are also suitable.

The HCC2 requires an external antenna for the radio modules. Antenna requirements vary by country and radio module. Contact Sensia for assistance.



CAUTION

Local radio regulations will determine the radio frequency and transmitted power (EIRP)¹ permissible in the installed location.

To minimize interference, radio antennas should be installed away from each other and the GNSS antenna. (Note: Combination antennas are available that maintain antenna isolation internally.) The antenna must be installed to provide a separation distance of at least 20 cm from all persons.

Buildings, trees and other obstructions can adversely affect radio communications distance. For maximum transmission distance, the radio antenna should be mounted within a clear line of sight to the receiving equipment.

Note ¹: Effective Isotropic Radiated Power:

$EIRP \text{ (dB)} = \text{Radio Module Output Power (dBm)} - \text{Feeder Loss (dB)} + \text{Antenna Gain (dBi)}$.

4.16 OPTIONAL MICROSD CARD

Note The microSD card can be purchased separately from Sensia or other suitable supplier. Refer to [Table 6.4, page 49](#), for specifications and section [8.1 Spare Parts, page 55](#).

An optional microSD card can be inserted in the HCC2 device to provide additional storage space. To access the microSD card slot, remove the metal slot cover (item 22 in [Figure 1.6, page 11](#)) from the left side of the HCC2.

Referring to Figure 4.12, push the right-angled tab on the cover towards the bottom of the HCC2, then pull the cover away from the unit.



CAUTION

Always replace the metal slot cover after inserting or replacing the microSD card to ensure that it is not accidentally ejected or removed.

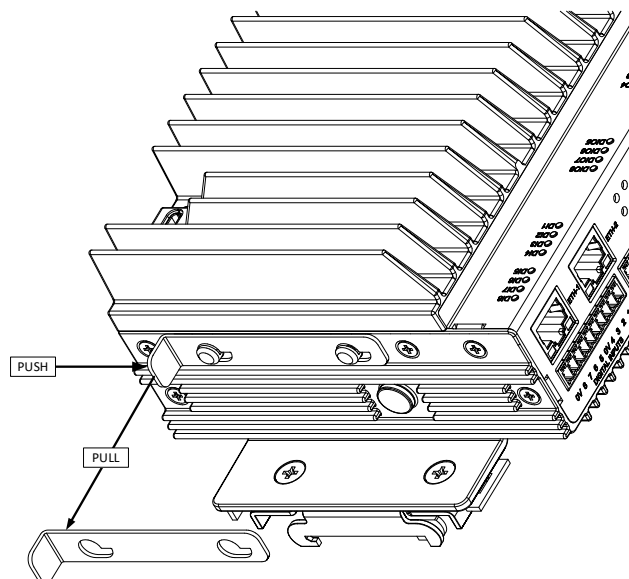


Figure 4.12—MicroSD Card and Micro-SIM Card Cover Removal

4.17 SIM CARD

The optional cellular radio module requires a user-supplied micro-SIM Card. Refer to Table 6.4 for specifications.

To access the micro-SIM card slot, remove the metal slot cover (item 22 in [Figure 1.6, page 11](#)) from the left side of the HCC2.

Referring to [Figure 4.12](#), push the right-angled tab on the cover towards the top of the HCC2, then pull the cover away from the unit.

**CAUTION**

Always replace the metal slot cover after inserting or replacing the micro-SIM card to ensure that it is not accidentally removed.

Section 5: Operate Your HCC2

This chapter provides instructions for operating your HCC2.

5.1 STARTUP

Upon applying rated power, the device will illuminate the 2 LEDs and begin initializing the bootup sequence to check the memory and load the Operating System. It may take 3 to 4 minutes to complete the sequence. If the processor's own battery backup setting is cleared, or the BIOS has been upgraded, then the device will perform a thorough memory test that will prolong the bootup sequence.

5.2 OPERATING MODES

The functionality of the HCC2 is defined by a customizable set of applications that can be deployed on the device. The wired and wireless communications, display, inputs, and outputs operate seamlessly based on the functionality programmed by the installed applications and or customized ISaGRAF programs. For additional details regarding the operation of the device, refer to the application-specific documentation.

The operating mode is also defined by the configuration dip switches. See section [5.4 Hardware Configuration Switches, page 42](#), for more information.

5.2.1 Normal Operating Mode

This switch setting provides full functionality for the device.

5.2.2 Safe Mode

This setting is used to force the HCC2 IO Board into "Safe Mode". When in "Safe Mode" the HCC2 will not load the IO Board application firmware and will wait for new firmware to be downloaded. This should only be used on the rare occasion when a firmware update was interrupted at a critical stage. This mode is likely to be used only by Sensia Authorized personnel.

5.2.3 Force DHCP Mode

This will force the HCC2 IO Board Ethernet ports (ETH-3 & ETH-4) into DHCP mode which will allow a user to reconnect with the device without knowing the IP address of the ports.

5.2.4 Protected Mode (Future)

This setting prevents downloading of a new configuration to the IO Board.

5.3 RESET BUTTON

During maintenance, a press of the Reset button on the side of the HCC2 (item 18 in [Figure 1.5, page 11](#)) will restart the CPU system. The reset button is for maintenance only and is not required for normal operation of the HCC2. The Reset momentarily toggles the power to restart the system. The Reset button does not reset the IO system.



CAUTION

Save the device settings before pressing the Reset button. The Reset button is recessed in the enclosure to avoid accidental restarts. Use a thin non-conductive pin to press the button when a system restart is necessary.

5.4 HARDWARE CONFIGURATION SWITCHES

The hardware configuration switches are located under a plastic cover that must be removed for access (Figure 5.1).



CAUTION

Always replace the plastic cover after altering the switch configuration to help prevent accidental changes.

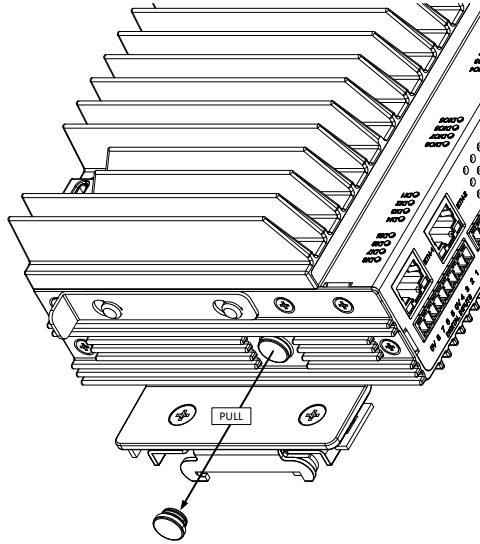
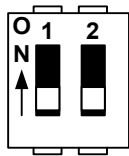


Figure 5.1—Switch Cover Removal

Table 5.1—Hardware Configuration Switch Functions



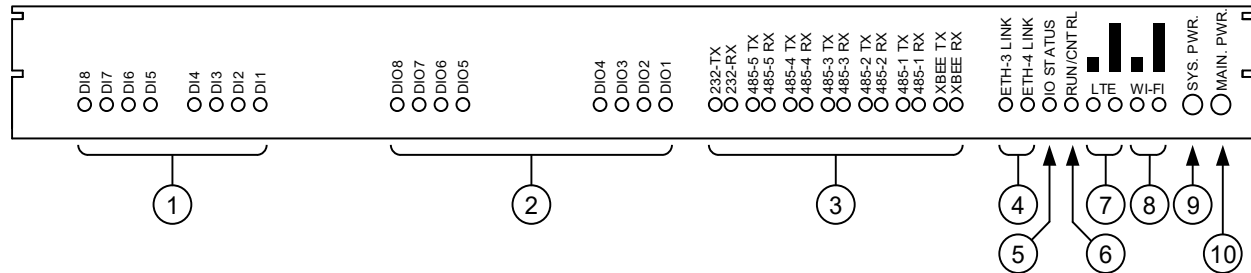
Switch		State	Description
1	2		
Off	Off	Normal	Normal Operating Mode
On	Off	Safe Mode	Used to force the HCC2 IO Board into “Safe Mode”. When in “Safe Mode” the HCC2 will not load the IO Board application firmware and will wait for new firmware to be downloaded. This should only be used in the rare occasion when a firmware update was interrupted at a critical stage.
Off	On	Force DHCP	This will force the HCC2 IO Board Ethernet ports (ETH-3 & ETH-4) into DHCP mode which is useful when the user has forgotten the IP address of the ports.
On	On	Protected Mode	Security feature to prevent unwanted changes to an active deployment on the HCC2

Note The unit is supplied with all configuration switches in the OFF position. When configuration switch settings are changed, the HCC2 must be restarted for the new settings to take effect. See section [5.3 Reset Button, page 41](#), for more information.

5.5 STATUS INDICATORS

5.5.1 Front Panel Status Indicators

Forty status indicators are displayed on the front of the enclosure as shown in [Figure 5.2, page 43](#).



1	DI 1 thru 8	Off Green	Input Off (de-energised) Input On (energised)				
2	DIO 1 thru 8	Off Green	Input or Output Off (de-energised) Input or Output On (energised)				
3	Comms TX	Off Red Flashing	No Transmit activity Transmitting Data				
	Comms RX	Off Red Flashing	No Receive activity Receiving Data				
4	Ethernet Link	Off Green Steady Green Flashing	No Ethernet Link Ethernet Link Established Ethernet Link Established and Port Activity				
		IO STATUS	Off Red Steady Green Flashing Green Steady	IO Processor not running IO Processor Fault or in Bootloader Mode IO Processor OK - No IO Board Configuration Loaded IO Processor OK – IO Board Configuration Loaded			
6	RUN/CNTRL.	Off	Application is not running				
		Green/ Yellow Flash (1 sec)	Application starting				
		Green	All applications are running, and overall 'App Status' is Up				
		Red Yellow Flash (0.3 sec)	One application exited, and overall 'App Status' is Down 'App Status' is Frozen				
7	LTE	Left LED Off Orange Flash Orange Steady Off	Right LED Off Off Off Green Steady	Disabled/Not Installed Interface Enabled, No Connection Interface Enabled, Low Signal Interface Enabled, Strong Connection			
		8	Wi-Fi	Off Orange Flash Orange Steady Off	Off Off Off Green Steady	Disabled/Not Installed Interface Enabled, No Connection Interface Enabled, Low Signal Interface Enabled, Strong Connection	
				9	SYS. PWR.	Off Green Steady	CPU in shutdown state System Power OK and Main CPU and OS is running
						10	MAIN PWR.

Figure 5.2—Front Panel Status Indication

5.5.2 Ethernet Status Indicators

The ETH-1 and ETH-2 connectors have two integrated status indicators.

Refer to Table 5.2 for the indicator location.

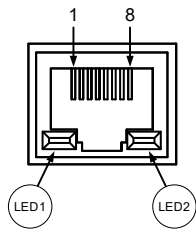


Table 5.2—Ethernet Status Indicator Descriptions

Item Ref.	Indicator	State	Description
LED1	Link	Off	HCC2 Power is off Ethernet port is not connected Ethernet link is not established
		Green Steady	Ethernet link is established but no activity
		Green Flashing	Ethernet link activity
LED2	Speed	Off	HCC2 Power is off 10BASE-T link speed
		Amber Steady	100BASE-TX link speed

The ETH-3 and ETH-4 connectors have no status indicators.

5.6 REAL-TIME CLOCK

The HCC2 micro-processor includes a real-time clock (RTC).

An on-board battery maintains the RTC when the HCC2 is not powered. The battery is not user-replaceable. HCC2 time can be synchronized via GPS or NTP for improved system time accuracy. See [Table 6.5, page 49](#), for details.

The real-time clock automatically manages leap years.

Section 6: Specifications

6.1 ENVIRONMENTAL SPECIFICATIONS

Table 6.1—Environmental Specifications

Altitude	<ul style="list-style-type: none"> • 0 to 2000 m (0 to 6600 ft) • As per IEC 61010-1
Humidity	<ul style="list-style-type: none"> • Up to 95% noncondensing • As per IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)
Pollution	<ul style="list-style-type: none"> • Pollution degree: 2 • As per IEC 60664-1
Operating Temperature	<ul style="list-style-type: none"> • -40 to +75 °C (-40 °F to +167 °F) • As per IEC 60068-2-2 (Test Bd, Operating Dry Heat)
Storage Temperature	<ul style="list-style-type: none"> • -40 to +85 °C (-40 °F to +185 °F)
Thermal Management	<ul style="list-style-type: none"> • Cooled by natural convection and thermal conduction through the enclosure. The HCC2 requires 2 inches of separation from other devices.
EMC (2014/30/EU)	<ul style="list-style-type: none"> • EN 61326-1 • EN 301 489-1 • EN 301 489-17 • EN 301 489-19 • EN 301 489-52 • FCC 47 CFR PART 15 SUBPART B • ICES-Gen Issue 1 • ICES-001 Issue 5 • ICES-003 Issue 7
Wireless (FCC/ EU)	<ul style="list-style-type: none"> • RF Exposure <ul style="list-style-type: none"> - FCC PART 1 SUBPART I - FCC PART 2 SUBPART J - RSS 102 Issue 5 - EN 62311 • BLE/BT/2.4GHz WLAN <ul style="list-style-type: none"> - ETSI EN 300 328 • 5.2 - 5.6GHz WLAN <ul style="list-style-type: none"> - ETSI EN 301 893 • 5.8GHz WLAN <ul style="list-style-type: none"> ○ EN SI EN 300 440 • BLE/BT/2.4/5GHz WLAN <ul style="list-style-type: none"> - FCC PART 15 SUBPART C - FCC PART 15 SUBPART E - ISED RSS-Gen Issue 5 - ISED RSS-247 Issue 2

Wireless (FCC/ EU continued)	<ul style="list-style-type: none"> • WWAN (FCC) <ul style="list-style-type: none"> - FCC PART 22 - FCC PART 24 - FCC PART 27 - ISED RSS-130 Issue 2 - ISED RSS-132 Issue 3 - ISED RSS-133 Issue 6+A1 - ISED RSS-139 Issue 4 - ISED RSS-199 Issue 3 - ISED RSS-247 Issue 2 • WWAN (ETSI) <ul style="list-style-type: none"> - ETSI TS 151 010-1 - ETSI EN 301 511 - ETSI EN 301 908-1 - ETSI EN 301 908-2 - ETSI EN 301 908-13 • GNSS <ul style="list-style-type: none"> - ETSI EN 300 328 - ETSI EN 303 413 • PCS Type Certification Review Board (PTCRB) <ul style="list-style-type: none"> - ETSI TS 102.230 - ETSI TS 36.124 • AT&T approval
US/ CANADA	<ul style="list-style-type: none"> • UL 121201 • UL 61010-1 • CAN/CSA C22.2 No. 61010-1 • Class I, Division 2, Groups A, B, C, D, T4 • Suitable for Class I, Zone 2, Groups II C, T4 • Ordinary Location (US and Canada)
ATEX (2014/34/EU) / IECEx	<ul style="list-style-type: none"> • EN 60079-0 • EN 60079-7 • ATEX Marking: Ex II 3 G Ex ec IIC T4 Gc -40 °F < Ta < 167 °F (-40 °C < Ta < 75 °C) • IECEx, Ex ec IIC T4 Gc • Certificate Number: UL 22 ATEX 2730X • Certificate Number: IECEx UL 22.0023X
Electrical Safety	<ul style="list-style-type: none"> • EN 61010-1 • CB Scheme Report
RoHS3 (2011/65/EU, amended EU, 2015/863)	<ul style="list-style-type: none"> • ROHS-EU
Radio Equipment Directive (RED) (2014/53/EU)	<ul style="list-style-type: none"> • Article 3.1(a) Safety Standards • Article 3.1(b) EMC Standards • Article 3.2 Radio Standards

Radio Certifications by Country*	Base Model 50365260		Wi-Fi and LTE Model 50369741	
Argentina	X			
Australia	X			
Canada	X		X	
Columbia	X		X	
Ecuador	X		X	

Radio Certifications by Country*	Base Model 50365260		Wi-Fi and LTE Model 50369741	
Egypt	X			
EU	X		X	
Kuwait	X			
Libya	X		X	
Mexico	X	Certificate Number: ULM-NOM-13900 NOM-001		
Oman	X		X	
Romania (included in EU)	X			
Saudi Arabia	X			
UAE	X			
UKCA (Safety and HazLoc)	X	Certificate Number: UL23UKEX2880X	X	
USA	X		X	
Venezuela	X			

* Ecuador, Egypt, Oman, and Venezuela are covered by IECEX.

6.2 MECHANICAL SPECIFICATIONS

Table 6.2—Mechanical Specifications

Mount Style (See Section 3.7, HCC2 Installation)	<ul style="list-style-type: none"> Panel mount Optional DIN rail clips for TS35 'Top Hat' Section (EN 60175 - 35 x 7.5)
General Dimensions (W x D x H) (See Section 2: HCC2 Dimensions)	<ul style="list-style-type: none"> Panel mount: 248.6 mm x 132.7 mm x 71.4 mm (9.8 in. x 5.2 in. x 2.8 in.) Optional DIN rail mount: 248.6 mm x 132.7 mm x 85.2 mm (9.8 in. x 5.2 in. x 3.4 in.)
Weight	<ul style="list-style-type: none"> Base unit: 1.59 kg (3.5 lb) Unit including packaging: 2.04 kg (4.5 lb)
Enclosure Type Rating	<ul style="list-style-type: none"> Metal enclosure meets IP20

6.3 SYSTEM I/O SPECIFICATIONS

Table 6.3—Input/Output Specifications

Power Supply Input	<ul style="list-style-type: none"> Input Range: 11 to 30 Vdc, 21W, Class 2 or LPS Dual redundant power feeds (each monitored with values available to the application logic) Transient overvoltage protection: 51.70 Vdc max. Overcurrent protection: 400 A max. surge current
--------------------	--

Power Supply Output	<ul style="list-style-type: none"> • 11.1 Vdc @ 5 mA • Transient overvoltage protection: 15.90 Vdc max. • Overcurrent protection: 150 mA trip current
Analog Inputs	<ul style="list-style-type: none"> • Eight analog input channels (either differential inputs or single-ended inputs) • HART Path through (Ch 1 to Ch4) • Measurement resolution: 18-bit • Calibrated measurement accuracy: 0.1% FS @ 25 °C, 0.25% over full operating temperature range
	<p>Voltage</p> <ul style="list-style-type: none"> • Single-ended voltage input mode: 0 to 10 Vdc, 0 to 5 Vdc • Differential voltage input mode: -10 to 10 Vdc • Low-level voltage input mode (Ch 7 & 8): 0 to 100 mVdc • Low-level voltage mode input calibrated accuracy: 0.1% FS @ 25 °C, 0.25% FS over full operating temperature range • Input Impedance in voltage mode: 1.9 MΩ • Input Impedance in low-level voltage mode: 94 kΩ • Transient overvoltage protection: 13.50 Vdc max.
	<p>Current</p> <ul style="list-style-type: none"> • Current input mode: 0 to 20 mA, 4 to 20 mA • Input Impedance in current mode: 280 Ω • Overcurrent protection: 90 mA trip current
Digital Inputs	<ul style="list-style-type: none"> • Eight opto-isolated digital input channels • 10-30 Vdc input, 20 mA max. • Pulse counter on all digital input channels • Maximum input frequency 10 kHz • IEC 61131-2 Type 1 Input • Transient overvoltage protection: 44.20 Vdc max. • Overcurrent protection: 60 mA trip current
Digital Input / Outputs	<ul style="list-style-type: none"> • Eight opto-isolated configurable digital input or output channels • Transient overvoltage protection: 44.20 Vdc max. • Overcurrent protection: 1.10 A trip current
	<p>Digital Inputs</p> <ul style="list-style-type: none"> • 10-30 Vdc input, 10 mA max. • Input minimum on threshold: 10 V • Input maximum off threshold: 7.5 V • Pulse counter on all digital input channels • Maximum input frequency: 10 kHz
	<p>Digital Outputs</p> <ul style="list-style-type: none"> • 10-30 Vdc, 100 mA Class 2 or LPS • Solid-state relay type output • PWM output on all digital output channels (500 Hz max. frequency) • Function: resistive, general purpose, pilot duty • On Resistance: 2.4Ω max.

Analog Outputs	<ul style="list-style-type: none"> Two analog output channels Output setting resolution: 12-bit Calibrated output accuracy: 0.25% FS @ 25 °C, 0.3% FS over full operating temperature
	Voltage <ul style="list-style-type: none"> Voltage output mode: 0 to 10 Vdc, 0 to 5 Vdc Minimum load impedance in voltage mode: 2 kΩ (Note: Output is short-circuit protected, 90 mA trip current) Transient overvoltage protection: 31.90 Vdc max. current mode, 15.90 Vdc max. voltage mode
	Current <ul style="list-style-type: none"> Current output mode: 4 to 20 mA Current mode output type: current sourcing Maximum load impedance in current mode: 500 Ω (Note: Output is short-circuit protected, 250 mA trip current)

6.4 PROCESSOR AND MEMORY SPECIFICATIONS

Table 6.4—Processor and Memory Specifications

CPU Board Processor Core	<ul style="list-style-type: none"> 1.5 GHz, Intel Atom® x6000E Series, Quad Core
CPU Board Processor Architecture	<ul style="list-style-type: none"> Intel architecture, 64-bit, multi-chip processor
I/O Processor Core	<ul style="list-style-type: none"> ARM Cortex-M7
I/O Processor Architecture	<ul style="list-style-type: none"> 32-bit RISC ARM Harvard
Flash Memory (Non-Volatile)	<ul style="list-style-type: none"> 32GB eMMC (on CPU board) 2MB (I/O processor internal) 128MB (on I/O board) – NAND flash 32KB (on I/O board) – FRAM
DRAM/ PSRAM Memory (Volatile)	<ul style="list-style-type: none"> 8GB DDR4 (on CPU board) 384KB (I/O processor internal) 8MB (on I/O board) – PSRAM
MicroSD Card	<ul style="list-style-type: none"> Capacity: 2G to 64GB Operating temperature range: -40 °C to 85 °C SLC or pSLC NAND memory Minimum write speed: 10 MB/s, Class 10, UHS-1
Micro-SIM Card	<ul style="list-style-type: none"> Micro-SIM form factor Supplied by Sensia

6.5 REAL TIME CLOCK SPECIFICATIONS

Table 6.5—Real Time Clock Specifications

Clock Capabilities	<ul style="list-style-type: none"> Day, month, year, hour, minute, second
Clock Accuracy	<ul style="list-style-type: none"> ±20 ppm @ 25 °C (10.5 minutes/year) GNSS time synchronization NTP synchronization
Backup Time (at 25 °C)	<ul style="list-style-type: none"> 2 years without primary power via lithium coin cell (not user-replaceable)

6.6 COMMUNICATION PORT SPECIFICATIONS

Table 6.6—Communication Ports

Ethernet (ETH-1 to ETH-4)	<ul style="list-style-type: none"> • RJ-45 Connector • Auto-negotiation to automatically select the highest available link-up speed. • Speed: <ul style="list-style-type: none"> – ETH-1 & ETH-2 10/100/1000 Mbps. – ETH-3 & ETH-4 10/100 Mbps. • Auto half/full duplex modes • Auto MDI/MDI-X to detect straight-through and crossover cable connection • LED speed and activity indication on ETH-1 & ETH-2 • ETH-3 & ETH-4 DLR capable • Protocols Supported (Port Specific): Ethernet/IP, CIP, Modbus TCP (Client/Server), Modbus Over TCP (Client/Server), Unity Edge Access, NTP Client
USB 1 & 2	<ul style="list-style-type: none"> • USB A female connector • Supports USB 2.0 full speed (12 MBit/s)
USB-C: Maintenance Port (Not intended for normal use)	<ul style="list-style-type: none"> • USB-C female connector • Access port for Unity Edge interface or applications management utility (EPM) connection
Micro USB-B: Console Port (Not intended for normal use)	<ul style="list-style-type: none"> • Micro USB-B female connector • BIOS console port
RS232	<ul style="list-style-type: none"> • Wire terminal connections • 5 wire full duplex (Tx, Rx, RTS, CTS & 0V) • Baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 • Parity modes: none, even and odd • Stop bits: 1 or 2 • Flow control: hardware, none • Default data format: 8 data bits and 1 stop bit hardware flow control • Supports Modbus RTU in Client and Server modes • Transmit and receive link activity status indicators
RS485-1	<ul style="list-style-type: none"> • Wire terminal connections • 5 wire full duplex • Baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 • Parity modes: none, even and odd • Stop bits: 1 or 2 • Flow control: none • Default data format: 8 data bits and 1 stop bit without flow control • Supports Modbus RTU in Client and Server modes • Transmit and receive link activity status indicators

RS485-2 & RS485-3	<ul style="list-style-type: none"> • Wire terminal connections • 3 wire half-duplex • Baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 • Parity modes: none, even and odd • Stop bits: 1 or 2 • Flow control: none • Default data format: 8 data bits and 1 stop bit without flow control • Supports Modbus RTU in Client and Server modes • Transmit and receive link activity status indicators
RS485-4 & RS485-5	<ul style="list-style-type: none"> • Wire terminal connections • 3 wire half-duplex • Baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 • Parity modes: none, even and odd • Stop bits: 1, 1.5, or 2 • Flow control: none • Default data format: 8 data bits and 1 stop bit without flow control • Software configurable 120 Ω end-of-line termination resistor • Supports Modbus RTU in Client mode • Transmit and receive link activity status indicators
CAN Bus (FUTURE)	<ul style="list-style-type: none"> • Wire terminal connections • 3 wire half-duplex • Classic (max): 1 Mbps • Flexible Data Rate (FD) (max): 5 Mbps • Software configurable 120 Ω end-of-line termination resistor • Transmit and receive link activity status indicators

6.7 DISPLAY SPECIFICATIONS

Table 6.7—Display Specifications

Display	<ul style="list-style-type: none"> • HDMI 1.1 output
Resolution	<ul style="list-style-type: none"> • 1920 x 1080P (max)

6.8 WIRELESS SPECIFICATIONS

Table 6.8—Wireless Specifications

GNSS	<ul style="list-style-type: none"> • Integrated GNSS Module on CPU Board • GPS & GLONASS constellation support • Utilize 1.575, 1.602 GHz • 50 Ω impedance
Wi-Fi	<ul style="list-style-type: none"> • Optional Module on CPU Board (Intel 9260NGW) • Wi-Fi - 2.4/ 5.0 GHz • 50 Ω impedance • Refer to Table 4.24 for Frequency and Max. Power

LTE	<ul style="list-style-type: none">• Optional Module on CPU Board (Quectel EG21G)• GSM Bands - 850, 900• WCDMA Bands - 2, 4, 5• LTE - 2, 4, 5, 7, 12, 13, 25, 26, 38, 41• 50 Ω impedance• Refer to Table 4.24 for Frequency and Max. Power
-----	--

Section 7: Maintenance and Troubleshooting

7.1 DEVICE MAINTENANCE

7.1.1 Device Cleaning

Use only a damp cloth to clean the instrument to avoid static electricity.

7.1.2 Device Repair



CAUTION

There are no user-serviceable parts within this product. Any attempt to repair the device may invalidate the warranty.

7.2 DEVICE TROUBLESHOOTING

7.2.1 Power Supply is not Functioning

Confirm the MAIN PWR LED is illuminated as described in section [5.4 Hardware Configuration Switches, page 42](#). If it is not illuminated, the incoming power is not present. Check the integrity of the power supply connected to the unit. Ensure it has a live voltage within the supplies rating and that there are no blown fuses in the circuit up to the HCC2.

Customer supplied DC power may not be live or may be installed incorrectly. The HCC2 has redundant 11-30V DC power supply inlets at Power A and Power B.

Referring to section [4.2, Power Input Wiring, page 22](#), ensure that the wiring is correctly installed into the terminal blocks and that the terminal blocks are securely fastened to the HCC2.

7.2.2 CPU has Shut Down

Confirm that the SYS PWR LED is on. If it is not illuminated, the CPU has shut down through an unknown condition or has been shut down by the OS. Remove the power for at least 10 seconds and reapply power to the device.

7.2.3 Communications with the HCC2 is not Working as Intended

If serial communications or ethernet communications are not functioning, confirm all wiring to the HCC2. Also, confirm the communication port configuration via the Unity Edge software interface. Connection terminology for ethernet, RS-232 and RS-485 varies between manufacturers and is responsible for most problems.

If wireless communication is not established, confirm the wiring to the antenna. Also, confirm the wireless communication parameters are set correctly via the Unity Edge software interface. Additionally ensure the antenna is correctly installed and its signal path is not blocked or is within range of the receiving device.

7.2.4 Other Hardware Troubleshooting

Please observe all safety warnings and precautions at the front of this manual.

See section [5.4 Hardware Configuration Switches, page 42](#), for Front Panel Status Indicators.

7.3 SERVICE

When requesting assistance from Sensia, please provide the instrument model and serial number for your unit.

7.3.1 Repacking for Shipment

When shipping the device to Sensia for service or repair, we recommend the box-in-box technique:

1. Place the instrument in its original packaging. Make sure that the original packaging is in good condition. Repair damage to foam, if possible, using pressure-sensitive tape. It is important that the shipment cannot move within the original manufacturer's shipping container.
6. Select a new shipping container that is at least six inches (15.24 cm) longer, wider, and higher than the original shipping box.
7. Fill the bottom of the new shipping container with at least two to three inches (5.08 to 7.62 cm) of packing material (foam-in-place, polyethylene corner or edge pads, inflatable packaging, loose fill peanuts, or other suitable materials).
8. Place the original manufacturer's box on top of the cushioning material and in the center of the shipping container, allowing for at least two to three inches (5.08 to 7.62 cm) of cushioning around the remaining five sides of the package.
9. Fill the remaining empty space in the package with packing material.
10. Seal the shipping container with 2-in. wide pressure-sensitive or nylon-reinforced tape, applying three strips of tape to both the top and bottom of the box, so the middle and two edge seams are sealed.

If the original packaging is not available, pack the module in electrostatic discharge (ESD) shielding packaging, and then place into static-free (low charging) packaging materials to avoid additional damage to your device.

Section 8: QRATE HCC2 Parts

8.1 SPARE PARTS

Table 8.1—QRATE HCC2 Parts

Qty.	Part Number	Description
1	50381967	Card, Memory, Industrial Micro SD, 8 GB, PSLC NAND Flash, Class 10, UHS-1, -40°C to 85°C
1	50381968	Card, Memory, Industrial Micro SD, 16 GB, PSLC NAND Flash, Class 10, UHS-1, -40°C to 85°C
1	50381969	Card, Memory, Industrial Micro SD, 32 GB, PSLC NAND Flash, Class 10, UHS-1, -40°C to 85°C
1	50381970	Card, Memory, Industrial Micro SD, 64 GB, PSLC NAND Flash, Class 10, UHS-1, -40°C to 85°C
1	50365570	Kit, Din Rail, Mounting Clip
1	50376904	Kit, Plugs, Terminal Block, IO Board, QRATE HCC2
1	50372169	Plug, Terminal Block, CPU Board, QRATE HCC2
1	Edge-Ena-Lic	License HCC2 Edge Compute Enablement Upgrade (Perpetual per device)
1	50385327	GPS Antenna, Magnetic Mount, 3M Cable, SMA Male Connector (Certified with HCC2)
1	50385328	Wi-Fi Antenna, Direct Mount, SMA Male Connector, Omnidirectional (Certified with HCC2)
1	50385329	LTE Antenna, Remote Bracket Mount, N Type Female Connector, Omnidirectional, Antenna Cable Required (Certified with HCC2)
1	50386128	LTE and GNSS Combo Antenna

8.2 ANTENNA REQUIREMENTS

To comply with FCC regulations limiting both maximum RF output power and human exposure RF radiation, maximum antenna gain (including cable loss) must not exceed the following specifications.

Table 8.2—Maximum Antenna Gain for LTE

Operating Band	FCC Max Antenna Gain (dBi)	IC Max Antenna Gain (dBi)
GSM850	8.60	7.44
GSM1900	10.19	10.19
WCDMA Band II	8.00	8.00
WCDMA Band IV	5.00	5.00
WCDMA Band V	9.42	8.26
LTE Band 2	8.00	8.00
LTE Band 4	5.00	5.00
LTE Band 5	9.41	8.25
LTE Band 7	8.00	8.00

LTE Band 12	8.70	7.76
LTE Band 13	9.16	8.09
LTE Band 25	8.00	8.00
LTE Band 26 (814-824)	9.36	NA
LTE Band 26 (824-849)	9.41	8.25
LTE Band 38	8.00	8.00
LTE Band 41	8.00	8.00

Table 8.3—Maximum Antenna Gain for Wi-Fi

Antenna Type	Antenna Peak Gain			
	2.4 GHz (dBi)	5.2 GHz (dBi)	5.5 GHz (dBi)	5.8 GHz (dBi)
PIFA	3.24	3.73	4.77	4.97
Dipole	2.89	3.19	4.41	4.22

Appendix A: Radio Equipment Directive (RED) Declaration of Conformity (DoC)

Below is a sample Declaration of Conformity for general reference. Contact the factory for the latest DoCs on base or wireless models for CE, EU, RED, UKCA, and ROHS.

	<h2>DECLARATION OF CONFORMITY</h2>	<h2>EU</h2>
<h3>QRATE HCC2 Hyperconverged Edge Controller</h3> <p>Sensia LLC 7000 Nix Drive Duncan, OK 73533 Tel: 1-580-470-9600 Email: clinton.miller@sensiaglobal.com</p> <p>Declare that the DoC is issued under our sole responsibility and belongs to the following products:</p> <p>Apparatus model/ Product: QRATE HCC2 HYPERCONVERGED EDGE CONTROLLER, MODEL 50369741 Type or Batch or Serial Number: Wireless Model</p> <p>Object of the declaration:</p> <div style="text-align: center;">  </div> <p>Description of accessories and components, including software, which allow the radio equipment to operate as intended: Antenna that meets the specification.</p> <p>The object of the declaration described above is in conformity with the relevant Union harmonization legislation:</p> <ul style="list-style-type: none"> • Radio Equipment Directive (RED), 2014/53/EU • Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) Directive, 2011/65/EU <p>The following harmonized standards and technical specifications have been applied:</p> <p><i>Radio Equipment Directive Article 3.1(a) Safety Standards:</i></p> <ul style="list-style-type: none"> • IEC 61010-1:2010/A1:2019 (Edition 3.1) - • EN 62368-1:2014 + AC:2015 - Audio/video, information and communication technology equipment - Part 1: Safety requirements (IEC 62368-1:2014, modified) • EN 62311:2008 - Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz) • EN50364:2010 - Limitation of human exposure to electromagnetic fields from devices operating in the frequency range 0 Hz to 300 GHz, used in Electronic Article Surveillance (EAS), Radio Frequency Identification (RFID) and similar applications • EN62479:2010 - Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz) 		

Radio Equipment Directive Article 3.1(b) EMC Standards:

- EN 61326-1:2013 - Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
- EN 301 489-1 V2.2.3:2019-11 ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility
- EN 301 489-17 V3.2.5:2022-08 - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband and Wideband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility
- EN 301 489-19 V2.2.1:2022-09 - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band providing positioning, navigation, and timing data; Harmonised Standard for ElectroMagnetic Compatibility
- EN 301 489-52 V1.2.1:2021-11 - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication User Equipment (UE) radio and ancillary equipment; Harmonised Standard for ElectroMagnetic Compatibility

Radio Equipment Directive Article 3.2 Radio Standards:

- EN 300 328 V2.2.2- Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
- EN 301 893 V2.1.1 - 5 GHz RLAN; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
- EN 300 440 V2.1.1 - Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
- EN 301 511 V12.5.1 - Global System for Mobile communications (GSM); Mobile Stations (MS) equipment; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
- EN 301 908-1 V15.1.1 - IMT cellular networks; Harmonised Standard for access to Radio spectrum; Part 1: Introduction and common requirements Release 15
- EN 301 908-2 V13.1.1 - IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 2: CDMA Direct Spread (UTRA FDD) User Equipment (UE)
- EN 301 908-13 V13.2.1 - IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)
- EN 303 413 V1.2.1 - Satellite Earth Stations and Systems (SES); Global Navigation Satellite System (GNSS) receivers; Radio equipment operating in the 1 164 MHz to 1 300 MHz and 1 559 MHz to 1 610 MHz frequency bands; Harmonised Standard for access to radio Spectrum

ROHS Directive:

- EN 63000:2018 – Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Signed on behalf of the manufacturer:

Name: Clint Miller

Position: Quality Manager

Place: Duncan, OK USA

Date: January 10, 2023

Signature: _____



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1-866 7 SENSIA (+1-866-773-6742)

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