# HORNER
## AUTOMATION GROUP

# HE-RCC6512 DATASHEET

## 12 Digital Inputs, 10 Digital Outputs
## 2 Analog Inputs, 4 Analog Outputs

## 1   TECHNICAL SPECIFICATIONS

### 1.1 General

| | |
|---|---|
| Required Pwr. (steady state) | 120mA at 24VDC |
| Required Pwr. (inrush) | 25A for 1ms at 24VDC switched |
| Primary Pwr. Range | 10-28VDC |
| Real-Time Clock | Battery Backed; lithium coin cell CR2450 |
| Clock Accuracy | +/- 60 seconds/month at 25°C |
| Relative Humidity | 5-95% Non-condensing |
| Operating Temp. | -10°C to +60°C |
| Storage Temp. | -10°C to +60°C |
| Battery | 3V Coin Battery |
| Weight | 12.5 oz (354.37g) |
| Mounting | 35mm DIN Rail or Panel Surface |
| Housing Type | ABS Blend |
| Certifications (CE) | USA:  https://hornerautomation.com/certifications/ Europe:  http://www.horner-apg.com/en/support/certification.aspx |

### 1.2 Control & Logic

| | |
|---|---|
| Control Language Support | Advanced Ladder Logic |
| Logic Size & Scan Rate | 16kb, 0.7ms/kB |
| PID Support | Up to 6 |
| %I (Digital Inputs) | 512 |
| %Q (Digital Outputs) | 512 |
| %AI (Analog Inputs) | 256 |
| %AQ (Analog Outputs) | 256 |
| %M (Gen. Purpose 1-bit Registers) | 1024 Non-Retentive |
| %T (Gen. Purpose 1-bit Registers) | 1024 Non-Retentive |
| %R (Gen. Purpose 16-bit Registers) | 2048 (256 Retentive) |

### 1.3 Digital DC Inputs

| | | |
|---|---|---|
| Inputs per Module | 12* | |
| Commons per Module | 1 | |
| Addressing | %I1 – %I12 | |
| Input Voltage Range | -5VDC to 24VDC | |
| Absolute Max. Voltage | 35VDC Max. | |
| Input Impedance | 10kΩ | |
| Input Current | **Pos. Logic** | **Neg. Logic** |
| Min. "On" Current | 0.8mA | -1.6mA |
| Max. "Off" Current | 0.3mA | -2.1mA |
| Min. "On" Input (Inputs 1 - 8) | 16VDC (24V) 8VDC (12V) 3VDC (5V) 0.1VDC (Zero Crossing) | |
| Max. "On" Input (Inputs 1 - 8) | 8VDC (24V) 4VDC (12V) 0.8VDC (5V) -0.1VDC (Zero Crossing) | |
| Min. "On" Input (Inputs 9 - 12) | 16VDC (24V) | |
| Max. "On" Input (Inputs 9 - 12) | 8VDC (24V) | |
| Input Filter | 500kHz, 50kHz, 5kHz | |
| OFF to ON Response | 2μs min** | |
| ON to OFF Response | 2μs min** | |
| HSC Max Frequency | 500kHz | |
| Galvanic Isolation | None | |
| Logic Polarity | Selectable in Cscape | |
| I/O Indication | None | |
| High Speed Counter (HSC) | 8 | |
| Connector Type | 5.08mm Pluggable Cage Clamp | |

*Inputs 9-12 are for aux functions, not for counting.
** All values updated 1x per scan

### 1.4 Connectivity

| | |
|---|---|
| Serial | 1 X 232, 1 X RS485 (Full/Half Duplex - Software Selectable) |
| CAN | 1 x 125kbps – 1 Mbps |
| Ethernet | 1 x 10Mbps/100Mbps |
| microSD | 1 x SD, SDHC, SDXC in FAT32 format |
| USB | USB Mini-B Slave (Configuration and Application Programming only) |
| Communication Support | TCP/IP and Modbus TCP/IP |

### 1.5 Digital DC Outputs

| | |
|---|---|
| Outputs per Module | 10 |
| Commons per Module | 1 |
| Addressing | %Q1 – %Q10 |
| Output Type | Sourcing |
| Absolute Max. Voltage | 30VDC Max. |
| Output Protection | Short Circuit & Overvoltage |
| Max. Output Current/Point | 0.5A |
| Max. Total Current | 4A Total Current |
| Max. Output Supply | 30VDC |
| Min. Output Supply | 5VDC |
| Max. Voltage Drop at Rated Current | 0.25VDC |
| Min. Load | None |
| I/O Indication | None |
| Galvanic Isolation | None |
| OFF to ON Response | 500ns min* |
| ON to OFF Response | 500ns min* |
| PWM Outputs | 8 |
| Min. PWM Pulse width | 1μs |
| Max PWM Frequency | 500kHz |
| Output Characteristics | Current Sourcing (Pos. Logic) |
| Connector Type | 5.08mm Pluggable Cage Clamp |

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## technical specifications continued...

| 1.6 Analog Inputs | |
|---|---|
| Number of Channels | 2 |
| Input Ranges | 0 - 10VDC, 0 - 20mA DC |
| Addressing | %AI1 – %AI2 |
| %AI Full Scale Value | 32,000 |
| Absolute Minimum Input Voltage | -0.5VDC |
| Absolute Maximum Input Voltage | 12VDC |
| Galvanic Isolation | None |
| Input Impedance (clamped @ -0.5 to 10.23 VDC) | mA: 15Ω +/- 1.5V  V: 100kΩ |
| Nominal Resolution | 12 bits |
| Conversion Rate | One update per ladder scan |
| Max Error at 25˚C (excludes 0˚C) | 0-20mA: 2% of full scale  0-10V: 2% of full scale |
| Filters | 160Hz hash (noise), 1-128 scan digital running average |

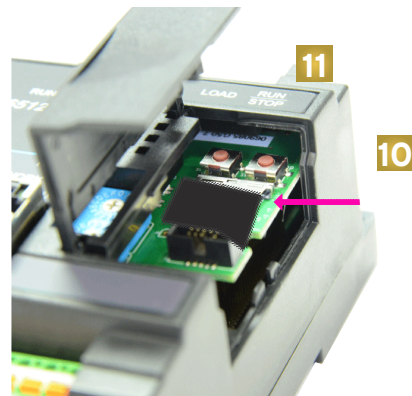| 1.7 Analog Outputs | |
|---|---|
| Number of Channels | 4 |
| Output Ranges | – 10VDC to 10VDC |
| Addressing | %AQ1 – %AQ4 |
| %AQ Full Scale Value | -32,000 to +32,000 |
| Galvanic Isolation | None |
| Nominal Resolution | 12 bits |
| Minimum Current Load | 500Ω |
| Conversion Rate | One update per ladder scan |
| Response Time | One update per ladder scan |
| Max Error at 25˚C (excludes 0˚C) | 0.25% of full scale  -10 to 10VDC |

## 2  CONTROLLER OVERVIEW

### 2.1 - Port Connectors
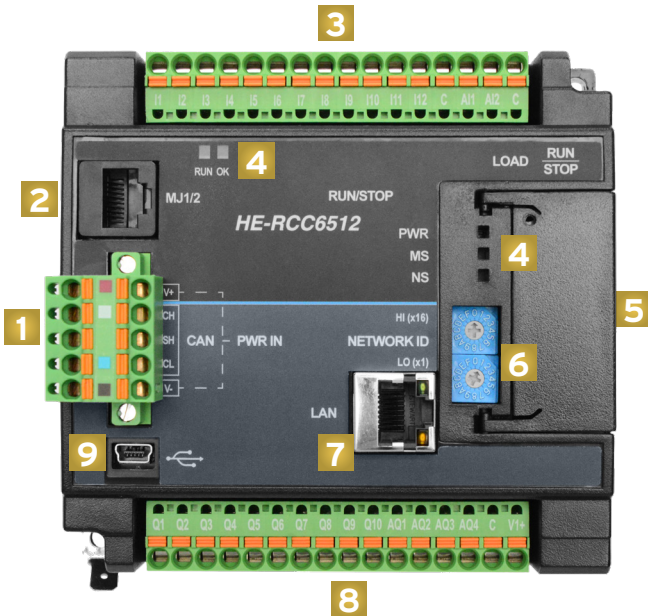


1. Power/CAN Connector
2. Serial Port
3. Input Connector - J2
4. Status LEDs
5. Door
6. Network ID Switches
7. Ethernet Port
8. Output Connector -J1
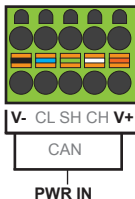9. Mini USB Port
10. microSD Slot
11. LOAD / RUN|STOP buttons

NOTE: See Precaution #12 about USB and grounding.

59 South State Ave., Indianapolis, IN 46201 | (p) 317.916.4274  (tf) 877.665.5666  (f) 317.639.4279 | www.hornerautomation.com

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## 2.2 - Power Wiring

To power up the RCC6512, supply 10-28VDC to the V+ and V- connections on the Power/CAN Analog Connector.

V-  CL SH CH  V+

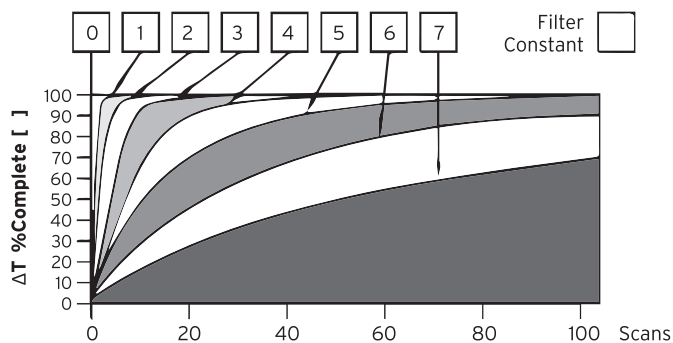CAN

**PWR IN**

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# 3  WIRING: INPUTS AND OUTPUTS

## 3.1 - Digital Input Wiring

**J2 Wiring -  Digital Input**

DI

I1 I2 I3 I4 I5 I6 I7 I8 I9 I10 I11 I12  C  AI2 AI1  C

-5 to +24VDC

**Positive Logic In**     **Negative Logic In**

Digital inputs may be wired in either a Positive Logic or Negative Logic fashion as shown. The setting in the Cscape Hardware Configuration for the Digital Inputs must match the wiring used in order for the correct input states to be registered. The state of the inputs are reflected in registers %I1 through %I12. The Common connections are found on the top connector. Inputs 1-8 have programmable input voltage ranges and input frequency filters.

## 3.2 - Digital Output Wiring

**J1 Wiring -  Digital Output**

DO

Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 AQ1 AQ2 AQ3 AQ4 C V1+

LOAD  Q1
LOAD  Q2
LOAD  Q3
LOAD  Q4...
C
10-28VDC
V1+

Digital outputs are Positive Logic. If an output is turned on, the voltage supplied at the QV+ terminal is applied to that output. When used as normal inputs, the state of the output may be controlled using the registers %Q1 - %Q10.

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## 3.3 - Analog Input Wiring

**J2 Wiring -  Analog Input**

AI

I1 I2 I3 I4 I5 I6 I7 I8 I9 I10 I11 I12  C  AI2 AI1  C

**0 - 10V Analog In**     **4 - 20mA Analog In Loop Power Required**     **4 - 20mA Analog In No Loop Power Required**

AI / C

0 - 10 V

Each Analog Input may be specified separately in the Cscape configuration as having a range of 0-10VDC, 0-20mA DC, or 4-20mA DC . For whichever range is configured, the Analog Input registers %AI1 - %AI2 will contain values between 0 - 32000 to match measurements in that range. Using this raw value, the Scaling function in Cscape, and the connected sensor's given range, it is easy to get a measurement for display, alarming, datalogging, or any other purpose required. Alternately, the raw value may be used directly for PID loops.

Filter Constant

0 1 2 3 4 5 6 7

ΔT %Complete [ ]

100 90 80 70 60 50 40 30 20 10 0

0    20    40    60    80    100  Scans

Digital filtering module response to a temperature change in the analog in.  The illustration above demonstrtes the effect of digital filtering on (set with Filter Constant).

| Data Values | |
|---|---|
| INPUT MODE: | DATA FORMAT, 12-bit INT: |
| 0-20mA, 4-20mA | 0-32000 |
| RTD | 20 Counts/ °C |

**Removing and Inserting Connectors:**
Use a small screwdriver to gently pry up the connector.
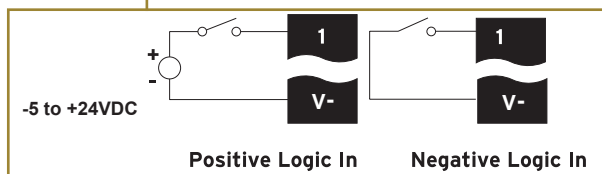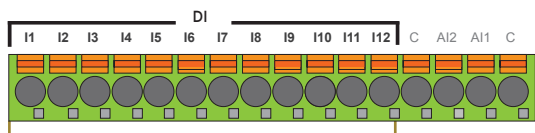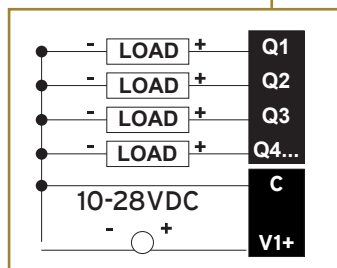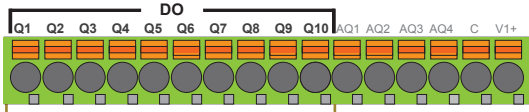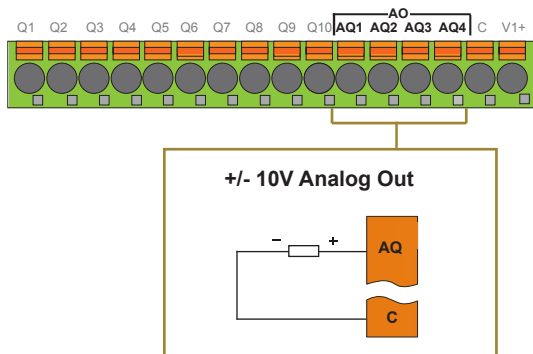Gently press on connector to snap into place.

**Wiring Details:**
Solid/Stranded wire: 12-24 awg (2.5-0.2mm).
Strip length: 0.28'' (7mm)
Torque rating: 4.5 - 7 in-lbs (0.50 - 0.78 Nm).

### 3.4 - Analog Output Wiring

**J1 Wiring - Analog Output**



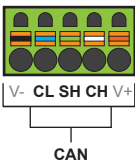**+/- 10V Analog Out**

Each Analog Output may be specified for a range of -10VDC to +10VDC. The Analog Output registers %AQ1 - %AQ4 may be used to control the output by placing a value between – 32000 to +32000 into the register. This may be directly from a PID loop output, for example.

## 4  COMMUNICATIONS

### 4.1 - CAN Communications



V-  **CL SH CH**  V+

**CAN**

The CAN port is provided via three connections on the CAN/Power: CAN_LOW (CL), CAN_HIGH (CH), and V- (C). It may be used to communicate with other OCS products using Horner's CsCAN protocol. Additionally, remote expansion I/O such as SmartRail, SmartBlock, and SmartStix may be implemented using the CsCAN protocol. If CsCAN expansion I/O is to be used, a 24VDC power source will be required on the CsCAN bus in order to power the expansion I/O modules.

| CAN1 Port Pins | | |
|---|---|---|
| **PIN** | **SIGNAL** | **DESCRIPTION** |
| 1 | V- | CAN and Device Ground - Black |
| 2 | CN L | CAN Data Low - Blue |
| 3 | SHLD | Shield Ground - None |
| 4 | CN H | CAN Data High - White |
| 5 | V+ | Positive DC Voltage Input (10-28VDC) - Red |

### CAN Wiring Details

- Locking Spring-Clalmp
- Two-terminators per Conductor
- Torque Rating: 4.5 in-lbs (0.50 N-m)
- SHLD and V+ pins are not internally connected

### 4.2 - Setting ID Switches

CsCAN Network IDs are set using the hexadecimal number system from 01 to FD. The decimal equivalent is 1-253. Refer to the Conversion Table, in the RCC6512 User Manual (MAN1133), which shows the decimal equivalent of hexadecimal numbers. Set a unique Network ID by inserting a small Phillips screwdriver into the two identical switches.

> **NOTE:** The CsCAN Baud Rate for Smart-Block I/O is fixed at 125kBd.

**Network ID Switches**
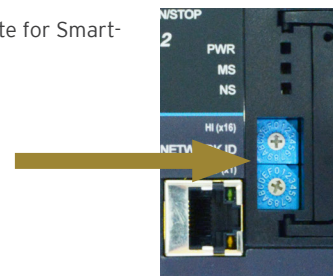


### 4.3 - Serial Communications

Two serial ports are provided via the single 8-position modular jack labeled "MJ1/2". MJ1 defaults to one of several methods available to program the controller. It may instead be specified for RS-232 communications, such as for Modbus Master/Slave, or to communicate to devices such as bar code scanners.

MJ2 may only be used as a half-duplex (2-wire) RS-232. The most common use is for Modbus communications, either as a Modbus Master or Modbus Slave, though other options are also available.
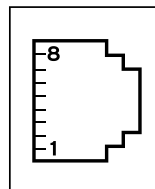


**MJ1/2 SERIAL PORTS: 8-position Module Jack**
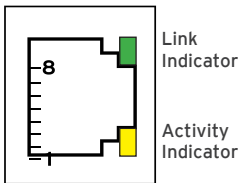
Two Serial Ports on One Module Jack

**MJ1:** RS-232

**MJ2:** RS-232 half-duplex

| MJ1 PINS | | | MJ2 PINS | |
|---|---|---|---|---|
| PIN | SIGNAL | DIRECTION | SIGNAL | DIRECTION |
| 8 | TXD | OUT | – | – |
| 7 | RXD | IN | – | – |
| 6 | 0V | GROUND | 0V | GROUND |
| 5 | +5V @ 60mA | OUT | +5V @ 60mA | OUT |
| 4 | RTS | OUT | | |
| 3 | CTS- | IN | | |
| 2 | – | – | RX-/TX- | IN/OUT |
| 1 | – | – | RX+/TX+ | IN/OUT |

> **NOTE:** Refer to connector pinout on product.

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## 4.4 - Ethernet Communications

A 10/100 Ethernet port with automatic MDI-X (crossover detection) is provided via the single 8-position modular jack labeled "LAN". Several features are available for use over Ethernet, such as CsCAN, Modbus, TCP, Ethernet IP, and EGD.

Link Indicator

Activity Indicator

Ethernet configuration is done via the Cscape Hardware Configuration.

For more information on Ethernet, available features and protocols, refer to the Ethernet supplement document (SUP0740).

## 4.5 - microSD Slot

A microSD card may be used for ladder controller read and write functions.

## 4.6 - Status LEDs

Five LEDs provide general status of the RCC:



### LED – Diagnostic Functionality

When the OK and RUN are flashing alternately, a download is in progress. When the flashing stops, the download is complete and the unit reboots (allow 30 seconds). When flashing together, the download has failed, and the number of flashes indicates the error. There will be a two second gap and the pattern will be repeated.
The number of flashes and the associated error are as follows:
**2 Flashes** - The MAC ID is empty.
**3 Flashes** - The internal MAC file is corrupt.
**4 Flashes** - The MAC ID TXT file is invalid.
**5 Flashes** - The MAC ID file is not found or the microSD card is empty or missing system files.

| LED - Normal Functionality | | | | |
|---|---|---|---|---|
| LED TYPE | WHEN OFF | WHEN ON | WHEN FLASHING (1Hz) | WHEN TOGGLING |
| PWR | No power applied | 10-28VDC applied | N/A | N/A |
| OK | Self-test fail | Self-test pass | I/O forcing enabled | Application Loading from MicroSD |
| RUN | Stop mode | Run mode | Do I/O Mode | |

| LED | State | Description |
|---|---|---|
| MS (Module Status) | Green | Module Ok |
| | Red | Real-Time Clock or I/O Configuration Error |
| | Red Flashing | Illegal Ladder Instruction or Ladder CRC Error |
| NS (CAN Network Status) | Green | Network OK |
| | Red | Illegal ID, Duplicate ID or No Response from Network Error |

## 4.7 - Buttons

Two recessed buttons provide control of several RCC modes. The door may be opened to access the buttons.
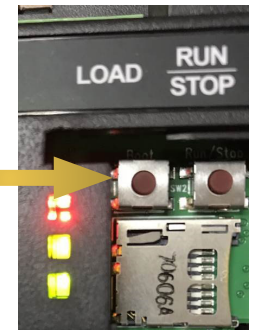


### LOAD SWITCH
• Pressing the LOAD switch during power-up boots from the microSD card. This starts a Firmware Load if the microSD is bootable and valid firmware files are found on it.
• After boot-up, pressing the LOAD switch for three (3) seconds will load an Application file stored on the microSD. The application file name must be DEFAULT.PGM. When loading an application file from microSD, there should not be firmware files present on the microSD card.

### RUN/STOP SWITCH
• After boot-up, pressing the RUN/STOP switch for 3 seconds toggles the RCC between RUN and STOP modes.

### SWITCH - ERASE PROGRAM FUNCTION
• After boot-up, pressing both Load and RUN/Stop switches for 3 seconds performs an "Erase All" function, which deletes all application programs.

**NOTE:** Firmware loaded through Cscape.

| 4.8 LED Load Program / Firmware Functionality | | | |
|---|---|---|---|
| LED OK & Run | Flashing Alternately | Flashing Together | Flashing Stops |
| Load Program | Download in Progress | Download failes, number of flashes indicates error. | Download complete; unit reboots (allow 30 seconds). |

## 5  BUILT-IN I/O

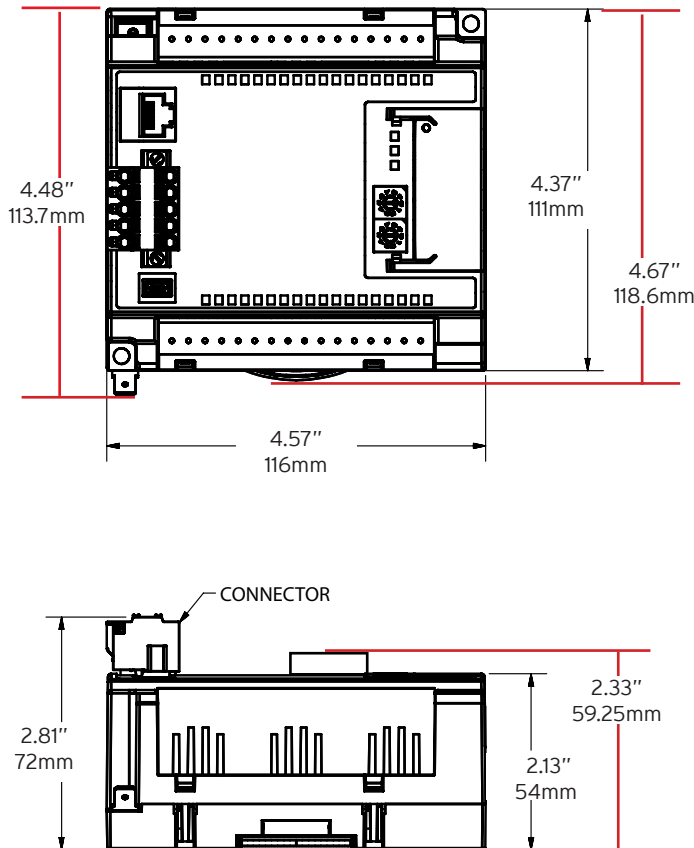| 5.1 Digital and Analog I/O Functions | |
|---|---|
| Registers | Description |
| %I1 to %I12 | Digital Inputs |
| %Q1 to %Q10 | Digital Outputs |
| %AI1 to %AI2 | Analog Inputs |
| %AQ1 to %AQ4 | Analog Outputs |

\* HSC Registers can be found in the User Manual, MAN1133.

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# 6  INSTALLATION DIMENSIONS

## 6.1 - Dimensions



4.48"
113.7mm

4.37"
111mm

4.67"
118.6mm

4.57"
116mm



CONNECTOR

2.81"
72mm

2.33"
59.25mm

2.13"
54mm

These RCC6512 module is suitable for use in the Class I, Division 2, Groups A, B, C and D Hazardous Locations only.

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZRDOUS.
ATTENTION - RISQUE D'EXPLOSION - NE DÉBRANCHEZ PAS L'ÉQUIPEMENT SAUF SI L'ALIMENTATION A ÉTÉ COUPÉE OU SI LA ZONE N'EST PAS DANGEREUSE.

Device shall be installed into an enclosure that is only accessible with the use of a tool.

### INSTALLATION PROCEDURE
1. The RCC modules conveniently mount on a DIN rail.
2. Be sure the DIN rail is in a horizontal position before installing the unit.
3. The orientation shown to the right is necessary to prevent the unit from slipping off the DIN rail.
4. Align the unit on the DIN rail then push the DIN rail clip until it clicks into place. Check to ensure that the unit is secure on the DIN rail.
5. Do NOT mount the unit on its side as this may cause the unit from slipping off the DIN rail.

**NOTE:** The spade connector for grounding and the DIN rail clip add to the overall measurements. The CAN/PWR and LAN connectors also add to the measurements.

**NOTE:** Screw holes and a spade connector are available for a mounting option.

# 7  SAFETY

## 7.1 - WARNINGS
1. To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.
2. To reduce the risk of fire, electrical shock, or physical injury, it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.
3. Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.
4. In the event of repeated failure, do NOT replace the fuse again as repeated failure indicates a defective condition that will NOT clear by replacing the fuse.
5. Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

## 7.2 - FCC COMPLIANCE
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation

## 7.3 - PRECAUTIONS
All applicable codes and standards need to be followed in the installation of this product. Adhere to the following safety precautions whenever any type of connection is made to the module:
1. Connect the safety (earth) ground on the power connector first before making any other connections.
2. When connecting to the electric circuits or pulse-initiating equipment, open their related breakers.
3. Do NOT make connection to live power lines.
4. Make connections to the module first; then connect to the circuit to be monitored.
5. Route power wires in a safe manner in accordance with good practice and local codes.
6. Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
7. Ensure hands, shoes, and floor are dry before making any connection to a power line.
8. Make sure the unit is turned OFF before making connection to terminals.
9. Make sure all circuits are de-energized before making connections.
10. Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
11. Use copper conductors in Field Wiring only, 60/75°C.
12. Use caution when connecting controllers to PCs via serial or USB. PCs, especially laptops, may use "floating power supplies: that are ungrounded. This could cause a damaging voltage potential between the laptop and controller. Ensure the controller and laptop are grounded for maximum protection. Consider using a USB isolator due to voltage potential differences as a preventative measure.

### User Manual [MAN1133]
The User Manual includes extensive information on:
- Built-in I/O and I/O Status and Calibration
- Common %S & %SR Registers
- HSC/PWM/Totalizer/Quadrature & Accumulator Registers
- Resource Limits

# 8  TECHNICAL SUPPORT

## 8.1 - Contact Information

For assistance and manual updates, contact Technical Support at the following locations:

**North America**
+1 (317) 916-4274
www.hornerautomation.com
techsppt@heapg.com

**Europe**
+353 (21) 4321-266
www.horner-apg.com
technical.support@horner-apg.com

# 9  PART NUMBER

## 9.1 - Global Part Number

The global part number is **HE-RCC6512**.

MADE IN USA   CE