HORNER
AUTOMATION GROUP

RCC972 DATASHEET

8 Digital Inputs / 4 Digital Outputs
8 Analog Inputs / 4 Analog Outputs

1   TECHNICAL SPECIFICATIONS

1.1 General

Required Pwr. (steady state)	130mA at 24VDC
Required Pwr. (inrush)	30A for 1 ms @24VDC switched
Primary Power Range	10-32VDC
Relative Humidity	5-95% non-condensing
Operating Temp.	-10˚C to +60˚C
Storage Temp.	-10˚C to +70˚C
Battery	No Battery
Weight	10 oz / 283.5 g
Mounting	35 mm DIN Rail or Panel Surface
Switches	1-Run / Idle, 2-Load
LEDs	1-Power, 2-OK, 3-Run
Terminal Type	Spring Clamp 0.2'' / 5.08mm Removable
Housing Type	Plastic (UL 50 rated, flame retardant, UV resistant)
Altitude	Up to 2000m
Certifications (CE)	USA: https://hornerautomation.com/certifications Europe: https://www.hornerautomation.eu/support/certifications-2

1.2 Registers

Network Digital In/Out	64 per ID
Network Analog In/Out	32 per ID
Digital Inputs (%I)	2048
Digital Outputs (%Q)	2048
Analog Inputs (%AI)	512
Analog Outputs (%AQ)	512
Gen. Purpose 16-bit Registers (%R)	4096 Retentive
Gen. Purpose 1-bit Registers (%T)	2048 Non-Retentive
Gen. Purpose 1-bit Registers (%M)	2048 Retentive

1.3 Connectivity

Serial	1 x RS232 port, RJ45
CAN	1 x 125kbps – 1Mbps
CAN Protocol	CsCAN
Ethernet	1 x 10Mbps/100Mbps
Ethernet Connector	RJ45, Auto MDIX
microSD	1 x SD, SDHC, SDXC in FAT32 format

1.4 Digital DC Inputs

Inputs per Module	8	
Addressing	%I1 – %I8	
Input Voltage Range	0-30VDC	
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	8VDC	
Max. "Off" Input	3VDC	
OFF to ON Response	Scan Rate Dependent	
ON to OFF Response	Scan Rate Dependent	

1.5 Digital DC Outputs

Outputs per Module	4
Output Type	Sourcing / 10kΩ Pull-Down
Absolute Max. Voltage	28VDC Max.
Output Protection	Short Circuit
Max. Output Current per Point	0.5A
Max. Total Current	2A Total Current
Max. Output Supply	30VDC
Min. Output Supply	10VDC
Max. Voltage Drop at Rated Current	0.25VDC
Max. Inrush Current	650mA per channel
Min. Load	None
I/O Indication	LED
Galvanic Isolation	None
OFF to ON Response	Scan Rate Dependent
ON to OFF Response	Scan Rate Dependent
Output Characteristics	Current Sourcing (Pos. Logic)

User Manual [MAN1078]
The User Manual includes extensive information on Built-in I/O, Configuration, Common %S & %SR Registers.

MADE IN USA   CE

3/12/2020 | MAN1200-03-EN

technical specifications continued...

1.6 Analog Inputs

Number of Channels	8
Input Range	0-20mA
Maximum Input Resistance	72Ω (clamped @ -0.5VDC to 6VDC)
Safe Input Voltage Range*	+/- 30VDC
Negative Logic	12 Bits
%AI Full Scale	0-32,000 counts
Max. Over-Current	35mA
Accuracy (% of full scale)	1.00%
Max. Error @ 25˚C (excluding zero)	1.5% of full scale
Conversion Rate	All channels converted once per ladder scan
Filtering	160Hz hash (noise) filter 1-128 scan digital running average filter

1.7 Analog Outputs

Number of Channels	4
Output Range	0-20mA
Minimum Current Load	500Ω
Galvanic Isolation	None
Nominal Resolution	12 Bits
%AQ Full Scale	0-32,000 counts
Response Time	One update per ladder scan
Accuracy (% of full scale)	0.5%
Max. Error @ 25˚C (excluding zero)	0.25% of full scale
Conversion Rate	All channels converted once per ladder scan

2 CONTROLLER OVERVIEW

2.1 - Port Connectors
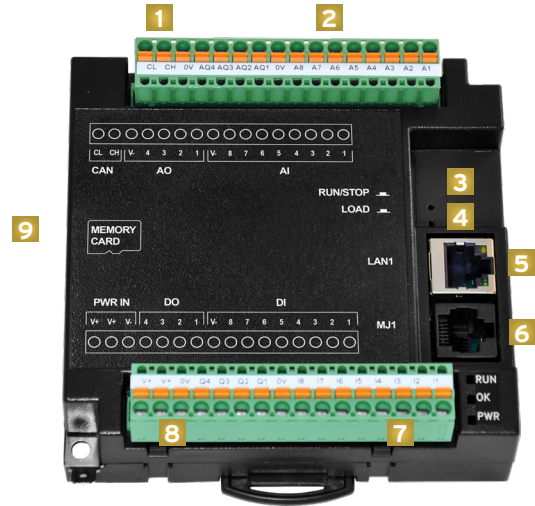
1.	CAN Port Connector	6.	RS232 Port
2.	Analog I/O Connector	7.	Digital I/O Connector
3.	Run/Idle Switch	8.	Power Connector
4.	Load Switch	9.	microSD Memory Card
5.	Ethernet Port		

2.2 - Power Wiring

To power up the RCC972, supply 10-32VDC to the V+ and C connections on the Power & Input connector.

Wiring Specifications

- **For I/O Wiring (discrete)**, use the following wire type or equivalent: Belden 9918, 18AWG (0.8mm²) or larger.
- **For Shielded Analog I/O wiring**, use the following wire type or equivalent: Belden 8441, 18AWG (0.8mm²) or larger.
- **For CAN wiring**, use the following wire type or equivalent: Belden 3084, 24 AWG (0.2mm²) or larger.
- **Torque Rating:** 4.5-7 in-lbs (0.50 - 7.8N-m)
- **Power Up**: Connect to Earth Ground. Apply 10-30VDC

3/12/2020 | MAN1200-03-EN

3 WIRING: INPUTS & OUTPUTS

3.1 - Digital & Analog Information

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

Analog Input - Raw input values for channels 1-4 are found in the registers as Integer-type data with a range from 0 – 32000.
Analog inputs may be filtered digitally with the Filter Constant found in the Cscape Hardware Configuration for Analog Inputs. Valid filter values are 0 – 7 and act according to the following chart.
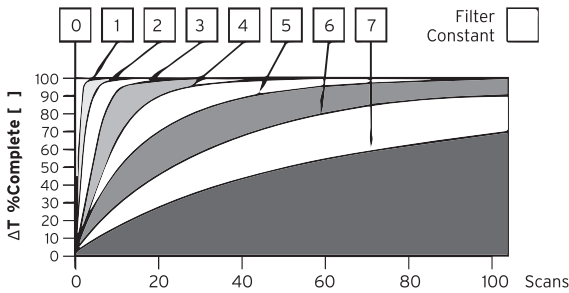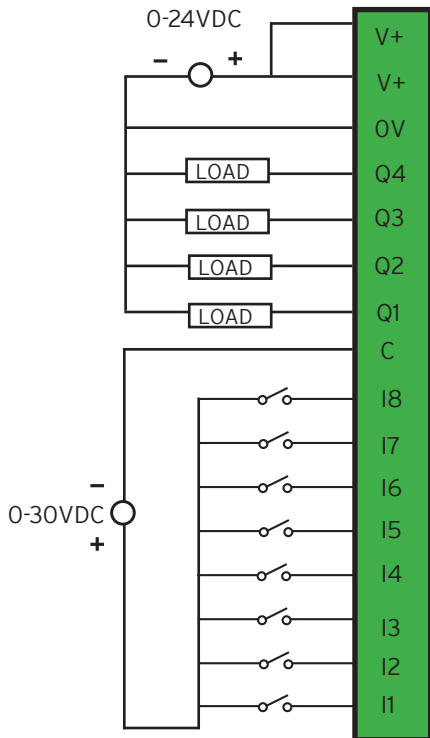

Data Values	
INPUT MODE:	DATA FORMAT, 12-bit INT:
0-20mA, 4-20mA	0-32000
RTD	20 Counts/ °C

3.2 - Digital Input/Output Wiring

Digital I/O	
V+	DC Power In
V+	DC Power In
V-	0V
Q4	Digital Out4
Q3	Digital Out3
Q2	Digital Out2
Q1	Digital Out1
C	0V
I8	Digital In8
I7	Digital In7
I6	Digital In6
I5	Digital In5
I4	Digital In4
I3	Digital In3
I2	Digital In2
I1	Digital In1

NOTE: The wiring examples show POSITIVE LOGIC input wiring. Do not apply power to the Analog Inputs without a load.

3.3 - Analog Input/Output Wiring

Analog I/O	
1	Analog In1
2	Analog In2
3	Analog In3
4	Analog In4
5	Analog In5
6	Analog In6
7	Analog In7
8	Analog In8
C	0V
1	Analog Out1
2	Analog Out2
3	Analog Out3
4	Analog Out4
0V	0V
CH	CAN High
CL	CAN Low
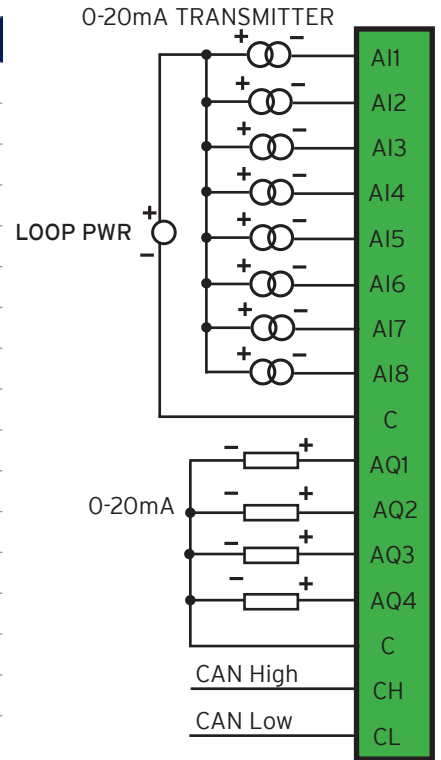
4 BUILT-IN I/O

4.1 - Digital & Analog I/O Registers

Register Map	
Registers	**Description**
%I1 to %I8	Digital Inputs
%I9 to %I15	Reserved
%I16	%Q Fault Status
%Q1 to %Q4	Digital Outputs
%AI1 to %AI8	Analog Inputs
%AQ1 to %AQ4	Analog Outputs

3/12/2020 | MAN1200-03-EN
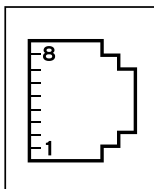
5 COMMUNICATIONS

5.1 - CAN Communications

The CAN port is provided via two connections: CAN_LOW (CL) and CAN_HIGH (CH). It may be used to communicated with the 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.
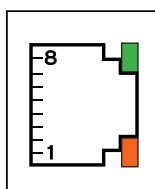
5.2 - Serial Communications

MJ1 SERIAL PORT

MJ1: RS-232
Use for Cscape programming and application-defined communications.

MJ1 PINS		
PIN	SIGNAL	DIRECTION
8	TXD	OUT
7	RXD	IN
6	0V	GROUND
5	+5V @ 60mA Max	OUT
4	RTS	OUT
3	CTS	IN
2	N/C	–
1	N/C	–

5.3 - Ethernet Communications

Link Indicator

Activity Indicator

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 WebMI, Modbus TCP/IP, Ethernet/IP, SMTP (E-mail), expansion I/O to SmartRail, and more. 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).

5.4 - microSD Slot

A microSD card may be used for data and alarm logging, historic trending, program loading, firmware updates, and many other features. Supported types of microSD cards are SD, SDHC, and SDXC as long as the format of the card file system is FAT32.

communications continued...

5.5 - Status LEDs

Three LEDs provide the general status of the RCC.

LED - Normal Functionality			
LED TYPE	WHEN OFF	WHEN ON	WHEN FLASHING (1Hz)
PWR	No Power Applied	10-30VDC Applied	N/A
OK	Self-Test Fail	Self-Test Pass	I/O Forcing Enabled
RUN	Stop Mode	Run Mode	Do I/O Mode

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.
- **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.

5.6 - Buttons

Two recessed buttons provide control of several RCC modes. A paperclip may be used as the buttons are far enough recessed that a pen or pencil is not able to activate them.

SWITCH - NORMAL FUNCTIONALITY

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

Load and Run / Stop
- After boot-up, pressing both Load and RUN/Stop switches for 3 seconds performs an "Erase All" function, which deletes all application programs.
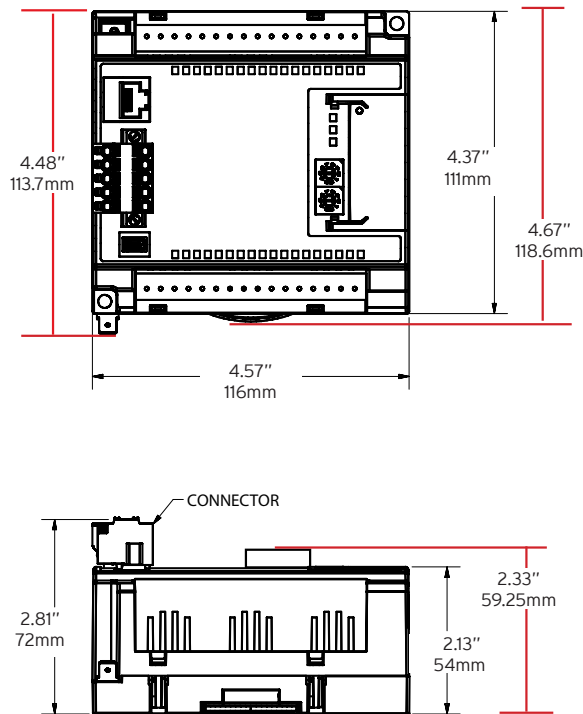
6 PART NUMBER

Global Part Number - HE-RCC972

3/12/2020 | MAN1200-03-EN

7   DIMENSIONS & INSTALLATION

7.1 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

7.2 Installation Instructions

These RCC modules are 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.

Devices shall be installed into an enclosure suitable for the environment that is only accessible with the use of a tool.
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.

8   TECHNICAL SUPPORT

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

North America
+1 (317) 916-4274
(877) 665-5666
www.hornerautomation.com
techsppt@heapg.com

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

9   SAFETY

9.1 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.

9.2 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

9.3 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.

MADE IN USA   CE

3/12/2020 | MAN1200-03-EN