



User Manual for RCC Series Controllers

March 23, 2018

MAN1078-02-EN_RCC_Series_UserManual

PREFACE

This manual explains how to use the RCC Controller.

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To obtain warranty service, return the product to your distributor with a description of the problem, proof of purchase, postpaid, insured and in a suitable package.

ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing the RCC controller module to appropriately design the end system, to appropriately integrate the RCC controller module and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

NOTE: The programming examples shown in this manual are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator.

VISUAL MAP OF KEY CHAPTERS

FIRST STEP of ANY TASK: DATASHEET			
<p>Each RCC unit is sent with a datasheet in the box. The datasheet is the first document to refer to for model-specific information related to RCC models such as pin-outs, jumper settings, and other key installation information. To obtain updates to datasheets, manuals and user documentation, visit a Horner website: (North America: https://hornerautomation.com and Europe: http://www.horner-apg.com.)</p>			
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CHAPTER 1: SAFETY / COMPLIANCE

1.1 Safety Warnings and Guidelines

When found on the product, the following symbols specify:



Warning - Consult user documentation.



Warning - Electrical Shock Hazard.

WARNING - EXPLOSION HAZARD - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

WARNING - To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

WARNING - 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.

WARNING - Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

WARNING - In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

WARNING - EXPLOSION HAZARD - Substitution of components may impair suitability for Class I, Division 2.

WARNING - The USB parts are for operational maintenance only. Do not leave permanently connected unless area is known to be non-hazardous.

WARNING - EXPLOSION HAZARD - BATTERIES MUST NOT BE CHANGED.

WARNING - BATTERY MAY EXPLODE IF MISTREATED. DO NOT RECHARGE, DISSASSEMBLE, OR DISPOSE IN FIRE.

WARNING: 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.

- a. All applicable codes and standards need to be followed in the installation of this product.
- b. For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG or larger.

Adhere to the following safety precautions whenever any type of connection is made to the module.

- a. Connect the green safety (earth) ground first before making any other connections.
- b. When connecting to electric circuits or pulse-initiating equipment, open their related breakers. Do not make connections to live power lines.
- c. Make connections to the module first; then connect to the circuit to be monitored.
- d. Route power wires in a safe manner in accordance with good practice and local codes.
- e. Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
- f. Ensure hands, shoes, and floors are dry before making any connection to a power line.
- g. Make sure the unit is turned OFF before making connection to terminals. Make sure all circuits are de-energized before making connections.
- h. Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

1.2 Grounding

Grounding is covered in various chapters within this manual.

1.3 Compliance

To check for compliance and updates, visit the Horner website.

(North America: <https://hornerautomation.com> or Europe: <http://www.horner-apg.com>).

CHAPTER 2: INTRODUCTION

2.1 General Overview of a 972, 1410, or 8842 RCC Unit

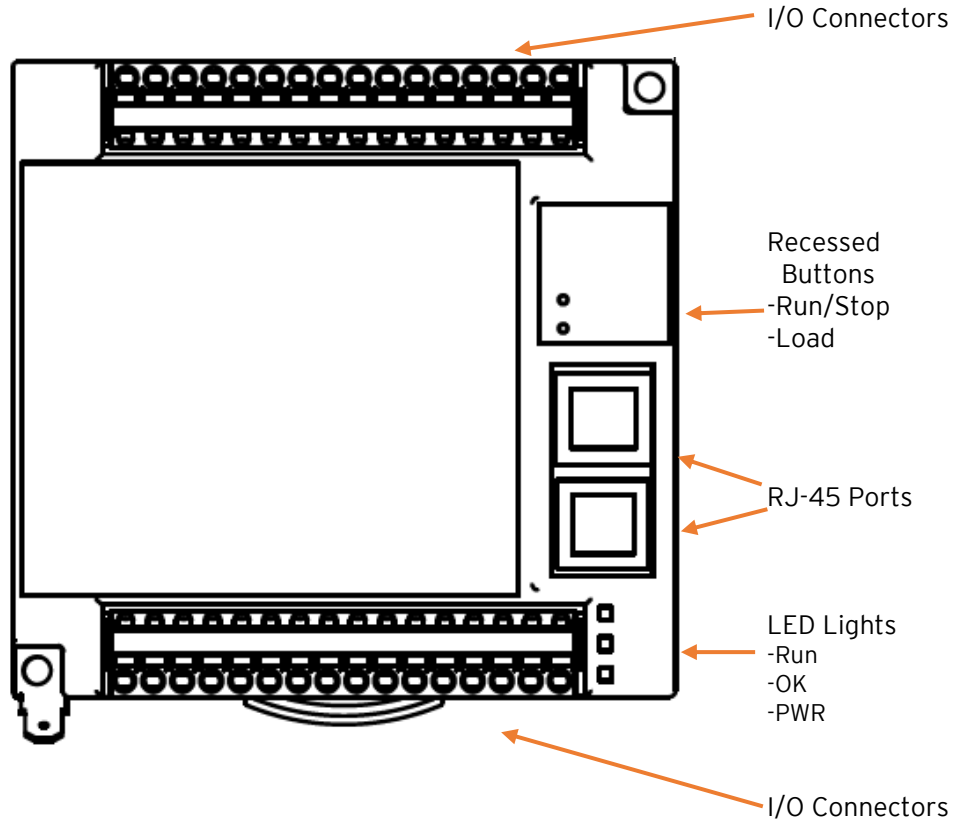
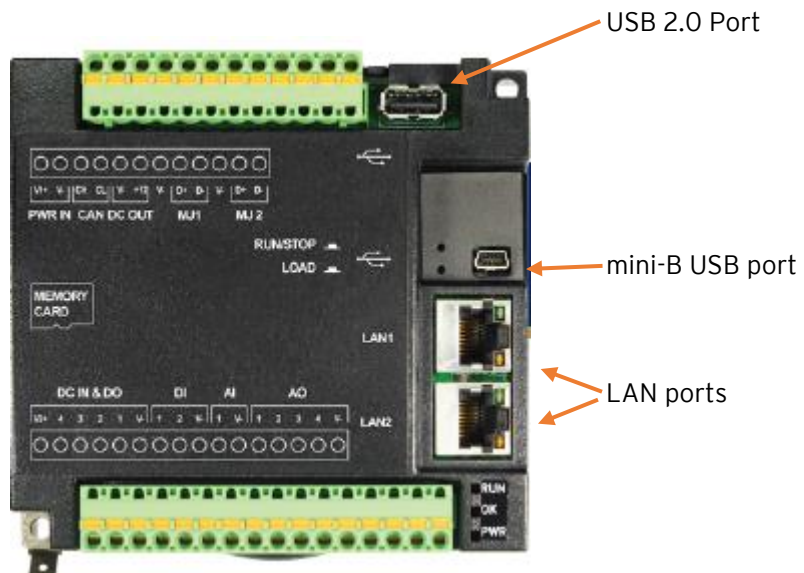


Figure 2.1 - Overview of the RCC

2.2 General Overview of an RCC2414 Unit



2.2.1 Where to Find Information about the RCC

- a) **Datasheet** - The **datasheet is the first document to refer to for key information** related to specific RCC models. The datasheets are available on the Horner website and contain pin-outs and other model specific information.

Table 2.1 - Datasheets for RCC Models	
RCC Model	Datasheet
RCC972	MAN0970
RCC1410	MAN1034
RCC2414	MAN1033
RCC8842	MAN1073

- b) **User Manual** -This manual provides general information that is common to RCC models and can be downloaded from our website to obtain user documentation and updates. (North America: <https://hornerautomation.com> or Europe: <http://www.horner-apg.com>)

2.2.2 Four main types of information are covered in this manual

- a) Safety and installation guidelines / instructions (Mechanical and Electrical)
- b) Descriptions of hardware features (Serial ports, Removable Media, Communication Options, etc.)
- c) Configuration and use of the RCC
- d) Maintenance and support

2.2.3 Manual Index

Major topics of interest may be found in the [Index](#) towards the end of this manual.

2.3 Connectivity to the RCC

The RCC has excellent capabilities for connecting to a variety of devices. The diagram below shows some examples of devices that can be used with the RCC.

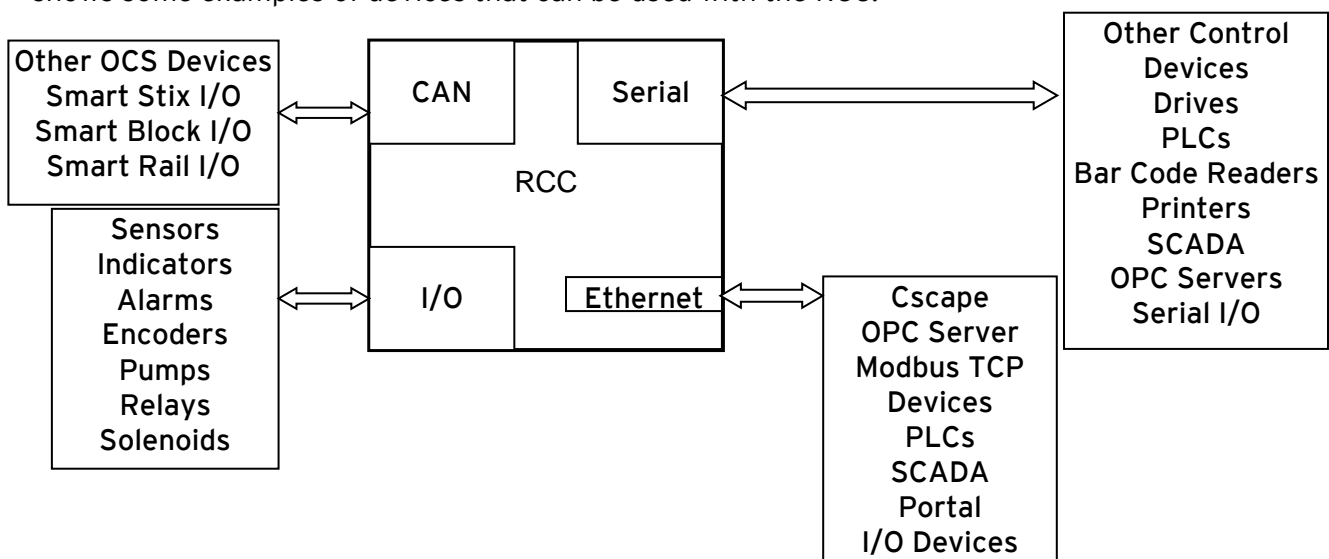


Figure 2.2–Visual Overview of Connectivity of the RCC OCS

2.4 Features of RCC

The RCC are industrial control devices with built in I/O. They combine control, I/O, and networking into a single, integrated package. Unique features of the RCC include:

- Advanced control capabilities including floating point, multiple auto-tuning PID loops, and string handling capabilities
- Removable media for storage of programs, data logging, and on-site updating
- CsCAN networking for communication with remote I/O, other controllers, or PCs
- Configurable serial protocols for communication to drives, PLCs, or other serial peripherals
- Advanced high speed I/O capabilities
- Cscape programming software that allows all aspects of the RCC to be programmed and configured from one integrated application
- On board Ethernet port (10/100Mbps) for Cscape programming and application defined communication, with Auto MDI/MDI-X
- WebMI and Push capabilities for access from the Internet
- Small, compact, din-rail mountable logic controller with flexible built in I/O

2.5 Accessories

Please visit the Horner Control Accessories website for communication, programming, and I/O accessories.

North America: <http://hornerautomation.com/product-category/home/control-accessories/>

Europe: <http://horner-apg.com/en/products.aspx>

2.6 Useful Documents and References

The following information serves as a *general* listing of Horner controller products and other references of interest with their corresponding manual numbers. Visit the Horner websites to obtain user documentation and updates.

Table 2.2- Useful Documents and References	
Controller	Manual Number
EXL6 OCS e.g., HE-EXL1Ex, HEXT351C1xx	MAN1032
EXL10 OCS e.g., HE-EXV1Ex, HEXT505C1xx	MAN1029
RCC1410 e.g., HE-RCC1410	MAN1020
RCC2414 e.g., HE-RCC2414	
RCC8842 e.g., HE-RCC8842	
RCC972 e.g., HE-RCC972	
XL4 OCS e.g., HE-XC1Ex, HEXT251C1xx	MAN0964
XL7 OCS e.g., HE-XW1Ex, HEXT391C1xx	MAN0974
XLE OCS e.g., HE-XE1xx, HE-XE1Ex, HEXE220Cxx	MAN0878
XLT OCS e.g., HE-XT10X, HE-XT1Ex, HEXT240C1xx	
X2 OCS e.g. HE-X2A, HEX2R	MAN1130
X5 OCS HE-X5	MAN1039
ZX OCS e.g., HE-ZX452, HE-ZX752, HE-ZX1152	MAN1018
Other Useful References	
CAN Networks	MAN0799
Cscape Programming and Reference	MAN0313
DeviceNet™ Implementation	SUP0326

CHAPTER 3: MECHANICAL INSTALLATION

NOTE: The datasheet is the first document to refer to for information related to RCC models such as pin-outs, I/O and general specification, and other key installation information. Visit the Horner websites to obtain datasheets, user documentation, and updates.

3.1 Overview

The mechanical installation greatly affects the operation, safety, and appearance of the system. Information is provided to mechanically install the unit such as cutout sizes, mounting procedures and other recommendations for the proper mechanical installation of the unit.

3.2 RCC Dimensions

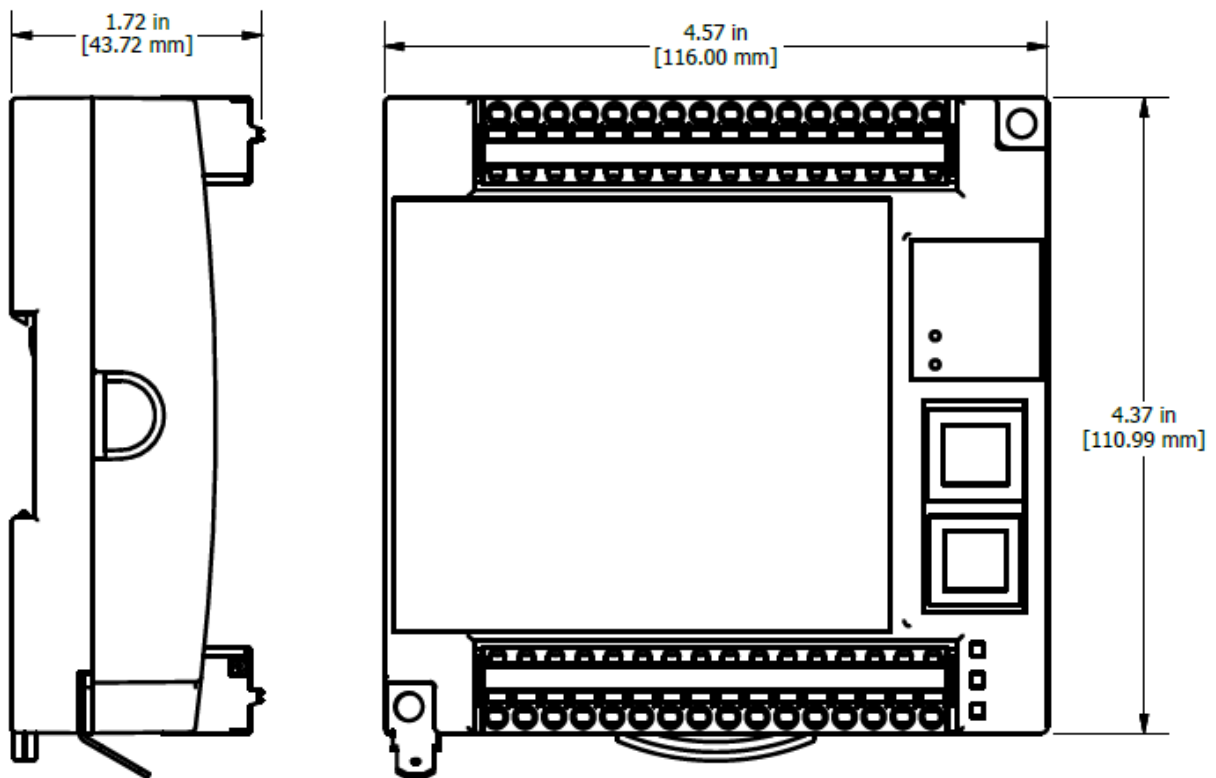


Figure 3.1 - RCC Dimensions

3.2.1 Temperature / Ventilation

Ensure that the DIN Rail layout design allows for adequate ventilation and maintains the specified ambient temperature range. Consider the impact on the design if operating at the extreme ends of the ambient temperature range. For example, if it is determined that a cooling device is required, allow adequate space and clearances for the device in the panel box or on the panel door if DIN rail is mounted inside.

3.2.2 Orientation

RCC should be mounted with locking DIN Tab facing down.

3.2.3 Noise

Consider the impact on the panel layout design and clearance requirements if noise suppression devices are needed. Be sure to maintain an adequate distance between the RCC and noisy devices such as relays, motor starters, etc.

For details on output protection, especially when using contactors and solenoids see MAN0962.

3.2.4 Shock and Vibration

The RCC has been designed to operate in typical industrial environments that may inflict some shock and vibration on the unit. For applications that may inflict excessive shock and vibration please use proper dampening techniques or relocate the RCC to a location that minimizes shock and/or vibration.

CHAPTER 4: ELECTRICAL INSTALLATION

NOTE: The datasheet is the first document to refer to for model-specific information related to RCC models such as pin-outs and other key installation information. Visit the Horner websites to obtain datasheets, user documentation, and updates.

4.1 Grounding Definition

Ground: The term **ground** is defined as a conductive connection between a circuit or piece of equipment and the earth. Grounds are fundamentally used to protect an application from harmful interference causing either physical damage such as by lightning or voltage transients or from circuit disruption often caused by radio frequency interference (RFI). Grounding is also for the safety of the user.

4.2 Ground Specifications

Ideally, a ground resistance measurement from equipment to earth ground is 0Ω . In reality, it typically is higher. The U.S. National Electrical Code (NEC) states the resistance to ground shall not exceed 25Ω . Horner APG recommends less than 15Ω resistance from our equipment to ground. Resistance greater than 25Ω can cause undesirable or harmful interference to the device.

4.3 How to Test for Good Ground

In order to test ground resistance, a Ground Resistance Tester must be used. A typical Ground Resistance Meter Kit contains a meter, two or three wire leads, and two ground rods. Instructions are supplied for either a two-point or three-point ground test.

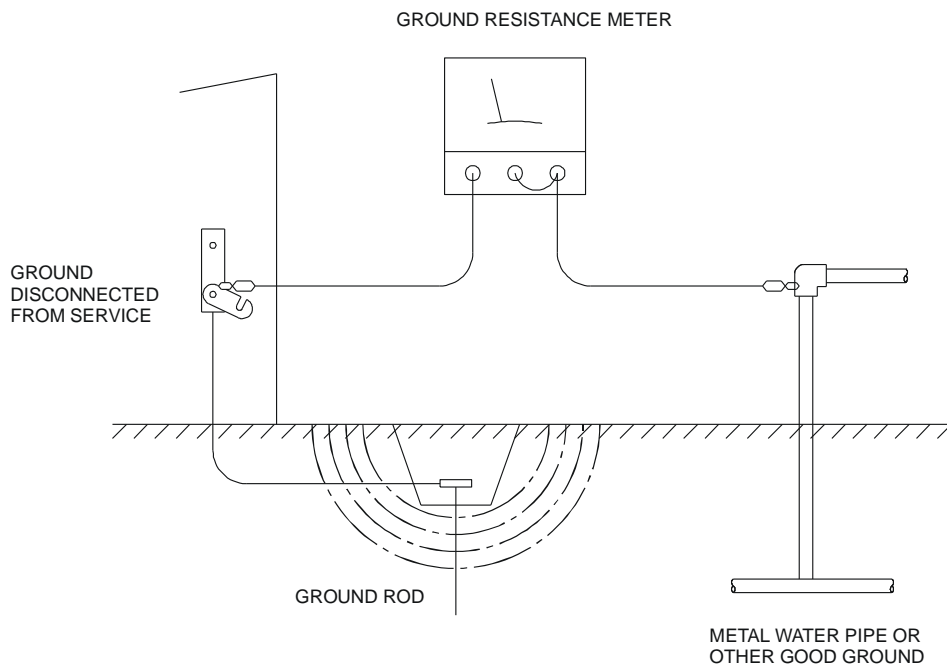


Figure 4.1 - Two-Point Ground Connection Test

To power the RCC unit, V+ and V- wires are directly wired to one of the terminal strips, similar to what is shown below on the RCC972. Earth Ground is the auxiliary spade at the bottom.

NOTE: Each RCC model has its own power connection on terminals different than those shown on the RCC972 here. For correct power connections, please refer to the datasheet specific to the RCC model being used.

Table 4.1 - Primary Power Port Pins		
PIN	Signal	Description
V+	DC IN	Input power supply positive voltage
C	0V	Input power supply ground

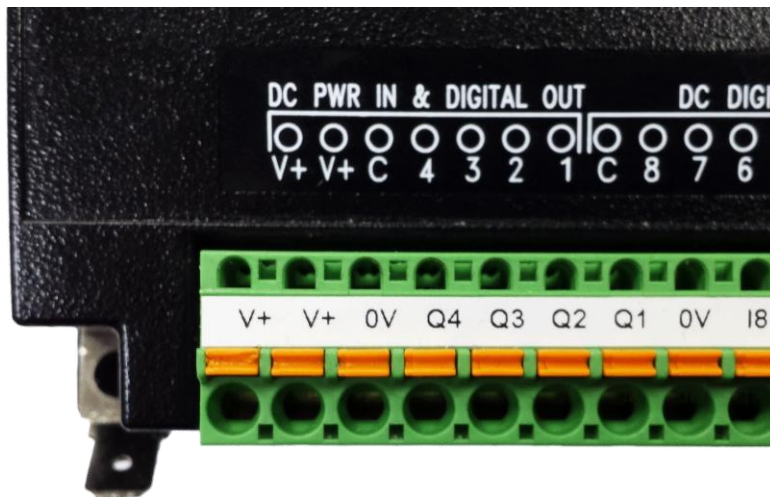


Figure 4.1 - RCC972 Power Connector (Primary Power Port)

CHAPTER 5: SERIAL COMMUNICATIONS

5.1 Overview

All RCC models provide at least one serial port. On all models except for the RCC2414, the 8-pin modular connector labeled **MJ1** is for serial communications and contains a RS232 port (MJ1). On RCC1410 and RCC8842 models, the same connector also contains a 2-wire RS485 port (MJ2). By default, MJ1 can be connected to the COM port of a PC running Cscope, for controller programming. In addition, both MJ1 and MJ2 can be used for application-specific communication, using a variety of standard data exchange protocols.

On the RCC2414 model, there are two 2-wire RS485 ports located on the top terminal strip. They are labeled "Port1" and "Port 2" on the unit itself, and they are referred to as MJ1 and MJ2 in the programming software.

Refer to the datasheet specific to the RCC model being used for serial port pinouts.

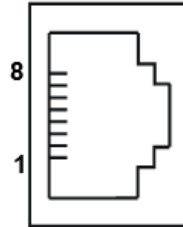
5.2 MJ1 Serial Port Pinout

NOTE: Please refer to individual datasheets for more details.

Table 5.1 - Datasheets for RCC Models	
RCC Model	Datasheet
RCC972	MAN0970
RCC1410	MAN1034
RCC2414	MAN1033
RCC8842	MAN1073

5.2.1. RCC972 MJ1 Pins

Table 5.2 - RCC 972 MJ1 Pins		
Pin	RCC972 MJ1 Pins	
8	TXD	OUT
7	RXD	IN
6	0 V	Ground
5	+5V (60mA Max)	OUT
4	RTS	OUT
3	CTS	IN
2	N/C	
1	N/C	

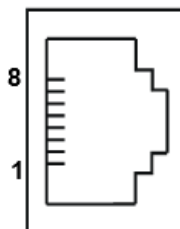


MJ1: RS-232–Use for Cscope programming and application-defined communications.

5.2.2. RCC1410 MJ1 and MJ2 Pins

Table 5.3- RCC1410: MJ1 and MJ2 Pins				
	MJ1 Pins		MJ2 Pins	
PIN	Signal	Direction	Signal	Direction
8	TXD	OUT	--	--
7	RXD	IN	--	--
6	0V	Ground	0V	Ground
5	+5V (60mA Max)	OUT	+5V (60mA Max)	OUT
4	RTS	OUT	--	--
3	CTS	IN	--	--
2	--	--	RX- / TX-	IN / OUT
1	--	--	RX+ / TX+	IN / OUT

MJ1: RS-232 w/full handshaking.
MJ2: RS-485 half duplex.



5.2.3 RCC2414 Serial Port Pins

The RCC2414 has two serial ports that are provided via cage clamp terminals. Both are 2-wire RS-485 only.

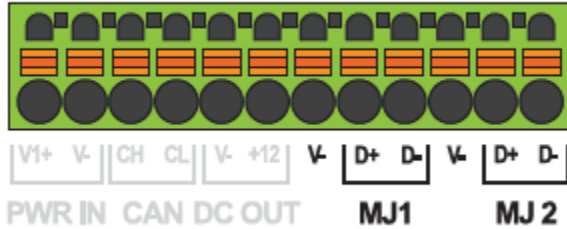
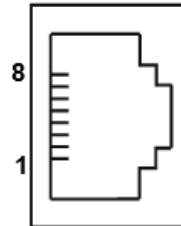


Figure 5.1 - RCC2414 Serial Port Pins

5.2.4 RCC8842 MJ1 and MJ2 Pins

MJ1: RS-232 w/full handshaking / MJ2: RS-485 half-duplex.



NOTE: Both serial ports are in one modular jack. To break pins out to terminals, use HE200MJ2TRM accessory.

Table 5.4 - RCC8842: MJ1 and MJ2 Pins				
	MJ1 Pins		MJ2 Pins	
PIN	Signal	Direction	Signal	Direction
8	TXD	OUT	--	--
7	RXD	IN	--	--
6	OV	Ground	OV	Ground
5	+5V (60mA Max)	OUT	+5V (60mA Max)	OUT
4	RTS	OUT	--	--
3	CTS	IN	--	--
2	--	--	RX- / TX-	IN / OUT
1	--	--	RX+ / TX+	IN / OUT

5.3 Cscape Programming via Serial Port

The MJ1 serial port supports CsCAN Programming Protocol (except RCC2414). If a PC COM port is connected to the MJ1 serial port, Cscape can access the RCC for programming and monitoring. Programming can also be done via the CAN connection or Ethernet. For serial port programming on MJ1, **HE-XCK Programming Kit** can be use (except RCC2414).

5.4 Ladder-Controlled Serial Communication

Using Serial Communication function blocks, both MJ1 and MJ2 ports support Generic ASCII for connection to such devices as barcode scanners or any other device that simply sends a string of text. Modbus Master and Modbus Slave Protocols are also supported on both ports in both ASCII and RTU formats. In addition, external modems can be connected and accessed using the Modem function block.

CHAPTER 6: CAN COMMUNICATIONS

NOTE: For additional CAN information, refer to the CAN Networks manual (MAN0799) on the Horner websites.

6.1 Overview

All RCC models provide CAN networking options, which are implemented with CL and CH connections at the terminal. They are similar to the RCC972 shown below. The CAN connection is terminated (120Ω resistor) at each end of the network wiring for proper functionality.

NOTE: The order of the CL and CH connections differ depending on the RCC model being used. Please refer to the datasheet for the specific RCC being used.

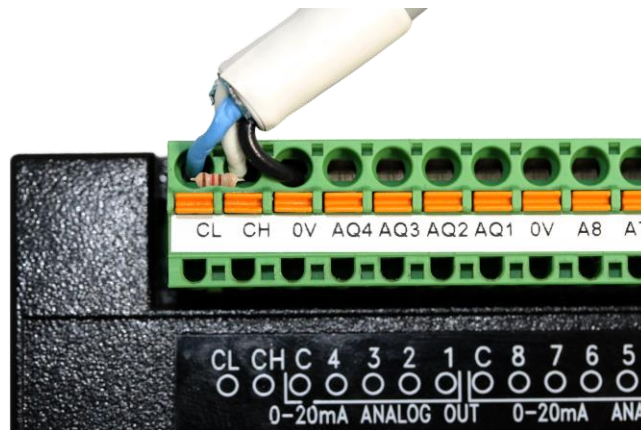


Figure 6.1 - CAN Connection

The CAN port can be used for RCC programming by connecting it to the CAN port of another OCS or RCC that is connected with Cscape. The CAN port also allows the RCC to exchange global data with other OCS/RCS controllers. CAN supports accessing of remote network I/O devices: SmartStix, SmartBlock, and SmartRail Modules.

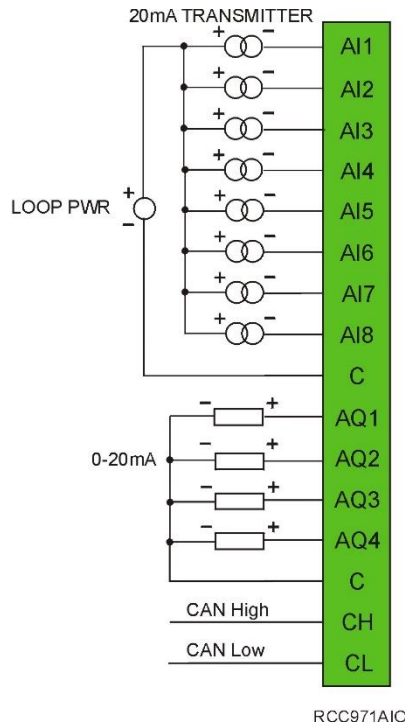
6.2 Port Description

The RCC CAN ports implement the ISO 11898-2 physical layer and the CAN 2.0A data link layer standards. Also, since the CAN ports are powered by an internal isolated power supply, external CAN power is not required for the RCC CAN port itself. However, external CAN port power is required for remote I/O devices, such as SmartStix, SmartBlock, and SmartRail.

6.3 CAN Port Wiring

The CN L and CN H communication wires must be terminated with a 120 Ω resistor.

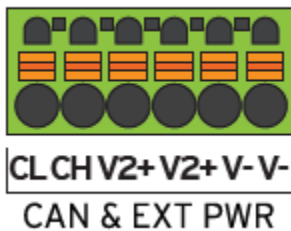
6.3.1 RCC972 CAN Port Wiring



For CAN wiring, use the following wire type or equivalent: Belden 3084, 24 AWG (0.2mm²) or larger.

Figure 6.2 - RCC972 CAN Port Wiring

6.3.2 RCC1410 CAN Port Wiring



CAN communications are provided via three connectors on the CAN connector: CAN_LOW (CL), CAN_HIGH (CH), and V- (C).

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.

Figure 6.3 - RCC1410 CAN Port Wiring

6.3.3 RCC2414 CAN Port Wiring

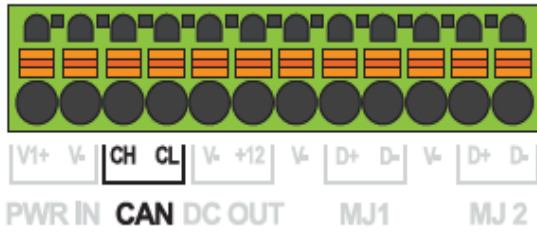


Figure 6.4 - RCC2414 CAN Port Wiring

The CAN port is provided via three connections on the CAN, Power, and Analog connector:

CAN_LOW (CL), CAN_HIGH (CH), and V- (C).

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.

6.3.4 RCC8842 CAN Port Wiring

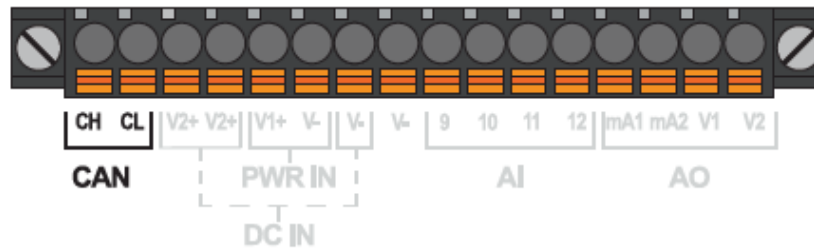


Figure 6.5 - RCC8842 CAN Port Wiring

The CAN port is provided via three connections on the CAN, Power, and Analog connector: CAN_LOW (CL), CAN_HIGH (CH), and V- (C).

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.

6.4 Cscape Programming via CAN

The CAN port supports CsCAN Programming Protocol. If a PC has a CAN interface installed (via PCI card or USB), and the PC CAN port is connected to the RCC CAN port, Cscape can access the RCC for programming and monitoring.

In addition, the RCC supports single-point-programming of all RCC and other OCS/RCS devices that are connected to the CAN port network. If the PC COM port is connected to the RCC MJ1 serial port, the RCC can act as a pass-through gateway allowing Cscape to access all RCC and OCS/RCS devices that are attached to the CAN port network.

6.5 Ladder-Controlled CAN Communication

Using Put and Get Network Words function blocks, the CAN port can exchange digital and analog global data with other RCC or OCS/RCS devices (nodes) attached to the CAN port network.

In addition, Put and Get Network Heartbeat function blocks allow nodes on the CAN port network to regularly announce their presence and to detect the presence (or absence) of other nodes on the network.

6.6 Using CAN for I/O Expansion (Network I/O)

Connecting Network I/O devices (SmartStix, SmartBlock or SmartRail) to the RCC CAN port allows the RCC I/O to be economically expanded and distributed. A variety of modules are available for this purpose.

CHAPTER 7: ETHERNET COMMUNICATION

7.1 MAC Address

MAC Address: The RCC MAC Address is found in System Registers %SR35-36.

All Horner controllers hold 00-E0 in the first two segments. Therefore, the first two segments of the MAC Address are not represented in System Registers.

%SR36 holds the middle two segments of the address.

%SR35 holds the last two segments of the address.

Example: MAC Address 00-e0-c4-01-45-4e is held in %SR35/36 as follows:

%SR35-16#454e and %SR36-16#c401 as viewed in Cscape Datawatch, format Hexadecimal.

7.2 Ethernet Module Protocols and Features

The following table describes the Ethernet Module Protocols and features supported by RCC.

Table 7.1 - Ethernet Protocols / Features	
Protocol / Feature	Protocol / Feature Description
ICMP Ping	Internet Control Message Protocol
EGD (Peer)	GE Fanuc Ethernet Global Data
SRTP Server	GE Fanuc Service Request Transfer Protocol
CsCAN TCP Server	Horner APG CsCAN over Ethernet
Modbus TCP Client	Modbus over Ethernet
Modbus TCP Server	Modbus over Ethernet
Ethernet / IP Client	ODVA CIP over Ethernet
Ethernet / IP Server	ODVA CIP over Ethernet
FTP Server	File Transfer Protocol
HTTP Server	Hypertext Transfer Protocol (Web Server)
ASCII over TCP/IP Server	ASCII Data over Ethernet
SMTP Client	E-mail Send capabilities

7.3 Ethernet System Requirements

Full Ethernet functionality requires:

- PC running Cscape Programming Software Version 9.3 SP6 or later (for configuration)
- RCC controller with onboard Ethernet port.

7.4 Ethernet Module Specifications

Table 7.2 - Ethernet Module Specifications	
Speeds	10 BaseT Ethernet (10-Mbps) 100 BaseTx Fast Ethernet (100-Mbps)
Modes	Half or Full Duplex
Auto-Negotiation	Both 10/100-Mbps and Half/Full Duplex
Connector Type	Shielded RJ-45
Cable Type <i>(Recommended)</i>	CAT5 (or better) UTP
Port	Auto MDI/MDI-X (Auto Crossover)

7.5 Ethernet Module Configuration

NOTE: The following configuration is required for all applications regardless of the protocols used. Additional configuration procedures must be performed for each protocol used.

To configure the Ethernet Module, use Cscape Programming Software to perform the following steps:

1. On the main Cscape screen, select the **Controller** menu and its **Hardware Configure** sub-menu to open the Hardware Configuration dialog (Figure 7.1).
2. If configuring a different product model than the one shown in the Hardware Configuration dialog, click on the topmost **Config** button, select the desired PRODUCT Model, and then click **OK**.

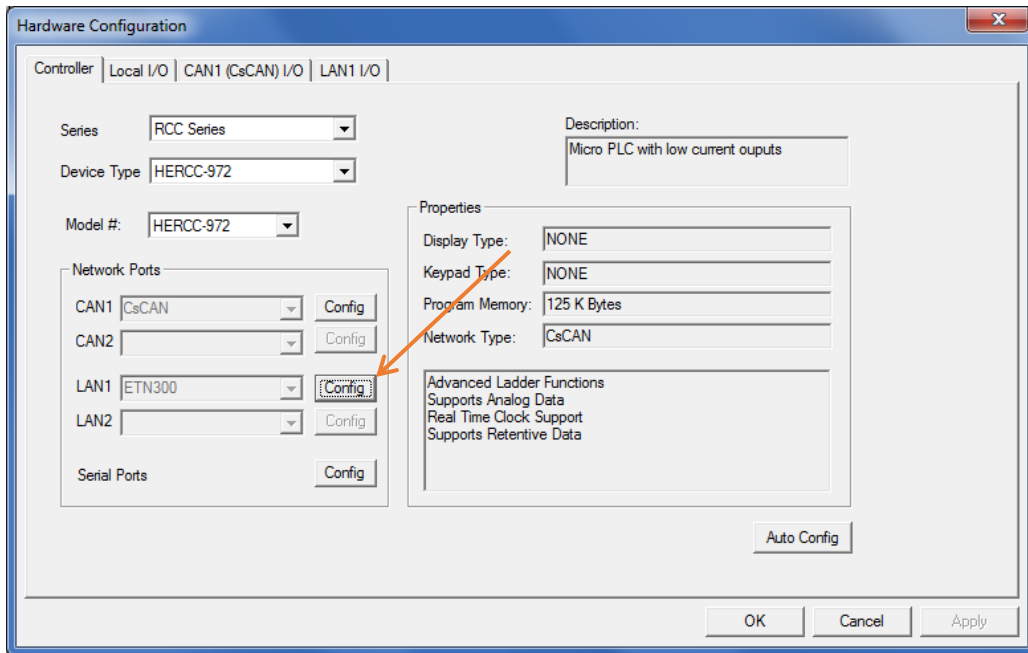


Figure 7.1 - Hardware Configuration Dialog

3. Click the **Config** button to the right of LAN1 revealing the Ethernet Module Configuration dialog as shown in figure 7.2.

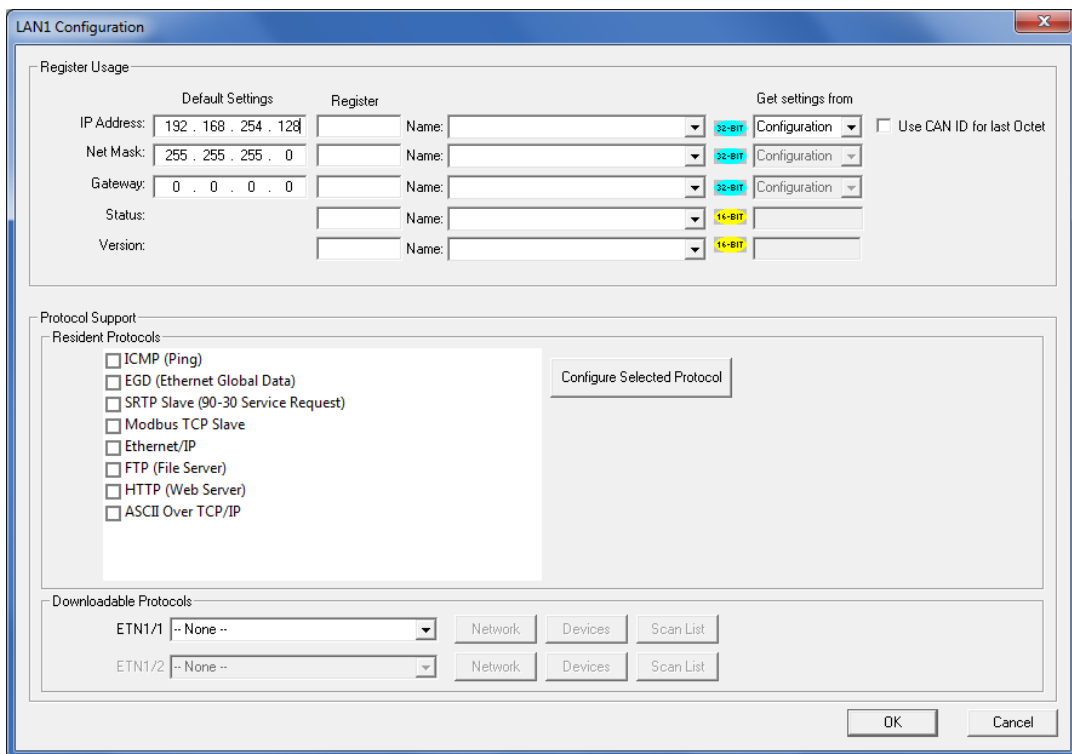


Figure 7.2 - Ethernet Module Configuration

4. Configure the Ethernet Module parameters as follows:

IP Address: Enter the static IP Address for the Ethernet Module being configured.

NOTE: *IP Addresses are entered as four numbers, each ranging from 0 to 255. These four numbers are called octets and they are always separated by decimal points.*

Net Mask: Enter the Net Mask (sometimes called Subnet Mask) being used by all nodes on the local network. Typical local networks use Class C IP Addresses, in which case the low octet (rightmost number) is used to uniquely identify each node on the local network. In this case, the default Net Mask value of 255.255.255.0 should be used.

Gateway: Enter the IP Address of a Gateway Server on the local network that allows for communication outside of the local network. To prevent the Ethernet Module from communicating outside the local network, set the Default Gateway IP Address to 0.0.0.0 (the default setting).

Status Register: Enter a register reference (such as %R100) to indicate which 16-bit register will have the Ethernet Status word written to it. Table 7.3 shows how this register value is formatted and explains the meaning of each bit in the Status Word.

Table 7.3 - Ethernet Status Word Register Format															
High Byte								Low Byte							
Bit 16	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
0	0	Dup	Spd	0	Rx	Tx	Link	TCP Connections							
Status Bit(s)		Status Indication						Status Values							
0		Reserved						Always 0							
Dup		Link Duplex (Auto-Negotiated)						0 = Half Duplex 1 = Full Duplex							
Spd		Link Speed (Auto-Negotiated)						0 = 10MHz 1 = 100MHz							
Rx		Receive State						0 = Inactive 1 = Active							
Tx		Transmit State						0 = Inactive 1 = Active							
Link		Link State						0 = Down 1 = Up							
TCP Connections		Total Number of Active TCP Connections (CsCAN, SRTP, Modbus, EIP, FTP, HTTP)						0 40							

Version Register: Enter a register reference (such as %R101) to indicate which 16-bit register will have the Ethernet Firmware Version written to it. The value stored in the Version Register is (Ethernet Firmware Version * 100). For example, for Ethernet Firmware Version 4.30, the Version Register will contain 430. This version will only change with a complete controller Firmware Update.

Ethernet Module Register Usage - Standard Configuration

To perform a standard configuration, fill in the **IP Address**, **Net Mask**, and **Gateway** with addresses that are valid for the network to which the controller is connected. If desired, registers may be specified in which these settings will be reflected. Leave the **Get settings from** selection set to **Configuration**.

Optionally, check the **Use CAN ID for last Octet** box in order to leave the last octet of the IP Address editable by way of changing the controllers CAN ID. This does not affect the Net Mask or Gateway settings.

NOTE: The low octet of the IP Address can be replaced with the unit's CAN Network ID, by checking the **Use CAN ID for last Octet** checkbox.

7.5 Ethernet Configuration - IP Parameters

For primary operation, the IP address, Net Mask, and Gateway should be set in the LAN config of the **Cscape Hardware Configuration**. There are options to get IP parameters from the LAN Config or to get parameters from registers. The following points on IP parameter configuration should be considered.

- **IP Parameters in Non-Volatile RAM:** The IP parameters of the Cscape LAN Config are written to non-volatile RAM on power down.
- **"Cscape LAN Config" / "Get Settings from" Configuration:** When 'Get settings from' is set to Configuration, the IP parameters specified under 'Default Settings' is used after downloading to the controller. After power cycle, the unit reverts to the last downloaded Cscape LAN Config that was loaded into non-volatile RAM at power down.
- **"Cscape LAN Config" / "Get Settings from" Register:** When 'Get settings from' is set to Register, the IP parameters are retrieved from the OCS registers assigned in LAN Config. Configured registers must be populated with the desired IP parameters. When the OCS is placed back into run mode, it reverts to the registers for IP parameters.

7.6 Ethernet Module Protocol Configuration

The **Protocol Support** area contains a list of the resident protocols supported by the platform being configured. To activate a protocol, check its checkbox.

For protocols that require additional configuration, click on a listed protocol to select it and then click the **Configure Selected Protocol** button. This will open a new dialog with configuration options for the selected protocol.

For detailed information on individual protocol configuration, refer to the latest version of the Ethernet Supplement. Search for "ETN300" on <https://hornerautomation.com> and select the **SUP0740** document.

CHAPTER 8: DOWNLOADABLE COMMUNICATION PROTOCOLS

8.1 Overview

Through loadable protocol device drivers, certain models of the OCS family can provide the ability to exchange data with remote devices such as variable-frequency drives, PLCs, and remote I/O devices. This feature greatly expands the OCS 's control capability with negligible effect on the OCS 's ladder scan time.

Remote devices that communicate serially must do so under certain rules of data transfer known as a protocol. Many device manufactures have created their own protocol for communications with their device. For an OCS to communicate with a specific device, it must be loaded with the corresponding serial communications protocol device driver that supports that protocol.

A limited number of protocol device drivers are packaged with the Cscape distribution; however, as more are developed, they will be made available as add-on packages. A device driver is typically distributed as a Windows module, which contains the Configuration Menus, Help Files and the Target Executable Driver Code. When updating device drivers, an install routine loads the device driver to the Cscape directory structure and makes that driver available to Cscape applications.

Once installed, the protocol device driver can be included as part of a Cscape application by selecting it from a list of installed protocol device drivers and attaching it to the desired serial port (Program > Protocol Config menu). Only one protocol device driver can be associated with a serial port, though some OCS models support multiple protocols on a single Ethernet port.

Once the protocol is selected for a specific port, that port must be configured to match the bit transfer size and rate of the target device(s). This is configured under the **Network Config** menu, which contains port specific information such as the basic serial port parameters (i.e. baud rate, stop bits parity, retries, etc.). In addition to the serial port parameters, this menu also contains the transaction scan update control configuration and any network level protocol specific configuration.

Once the network is configured, each device on the serial communications network must be configured. For some communications (i.e. RS232), the network can be limited to one device. The devices are configured under the **Device Config** menu, which contains an arbitrary device name, the device ID and optionally an OCS status register that contains any device fault information.

Once each device(s) is configured, a **Scan List** of entries must be created which defines the transfer of data between a local (OCS) register(s) and a remote device register(s). These entries are created under the **Data Mapping** menu, which contains an OCS register, a target device ID, a target device register address, the number of registers to transfer, and update type.

Each entry can be configured for one of two types of initiating a transaction: **Polled and Triggered**. Polled type entries initiate a transaction with the remote device on every transaction scan. Triggered type entries only initiate a transaction when a corresponding local (OCS) binary trigger register is *set*. Once a triggered type transaction completes, the protocol device driver *resets* the local (OCS) binary register to indicate completion.

These basic types are also subdivided into Read or Write operations. For polled operations, a Read operation only reads from a remote device. Likewise a Read/Write operation continuously reads from the remote device unless the target OCS register value changes from one ladder scan to another. In this case, the new OCS value is written to the target device. For triggered operations, only a Read or Write action is available.

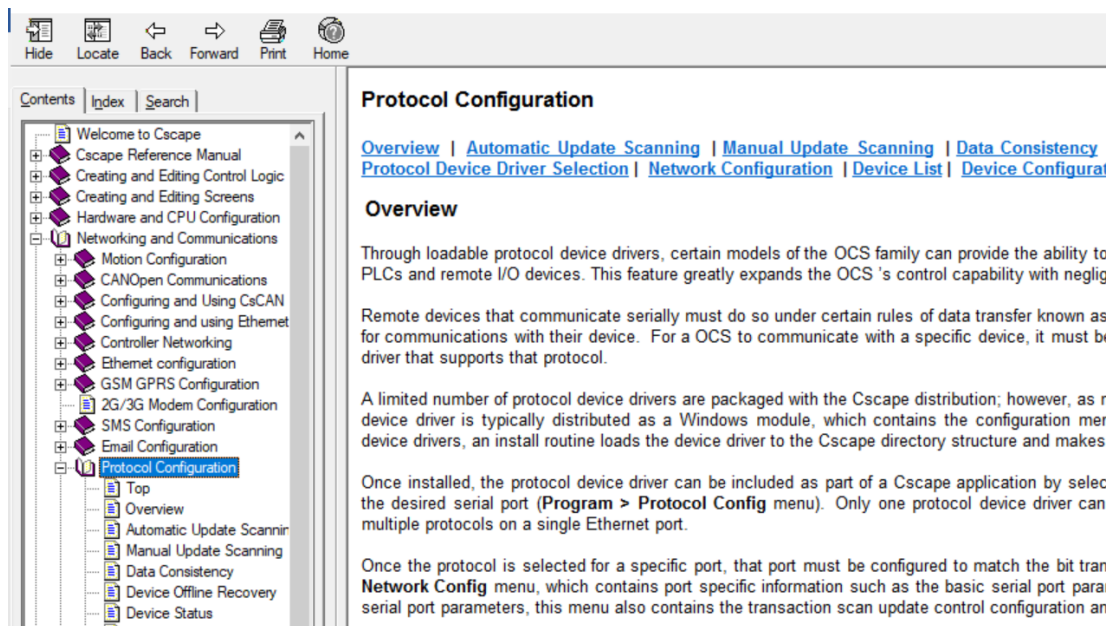
When downloaded to the OCS , the Scan List is scanned sequentially to generate data transactions with the remote device. This transaction scanning can be on a continual basis (**automatic**) or controlled from ladder logic (**manual**) once a complex connection is programmatically created (i.e., dialup modem). The specific transaction-scanning mode is selected from the **Network Config** menu.

The following Horner Automation websites offer OCS Protocol Software Downloads.

North America: <http://hornerautomation.com/support-files/>

Europe: <http://horner-apg.com/en/products/software/ocs-protocols.aspx>

Please refer to the Cscape Help file for more information on Downloadable Protocols Configuration. After opening the Cscape Help file, select **Contents → Networking and Communications → Protocol Configuration**.



8.2 Protocol Config

After opening Cscape, choose **Program → Protocol Config**, and select the port drop-down box to select a protocol device driver. All protocol device drivers currently loaded in Cscape are displayed in the dropdown selection. Some OCS models can be limited in the number of ports or number of protocol device drivers that can be selected. Once a protocol is selected, the Network, Devices, and Data (Scan List) must be configured through corresponding dialogs accessible through the respective buttons (Network, Device, and Scan List.)

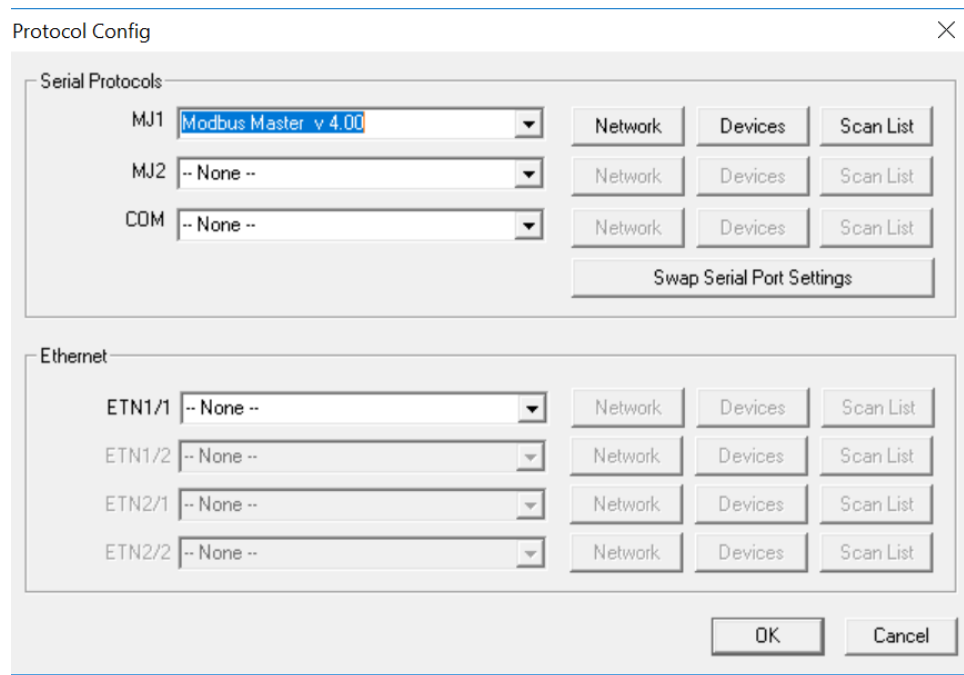
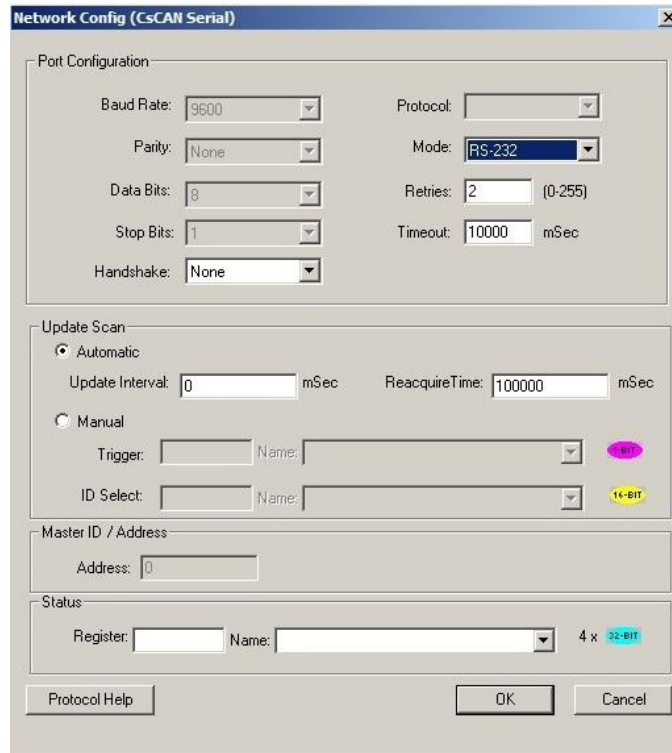


Figure 8.1 - Protocol Config Dialog

Three fields must be configured after a protocol is selected:

1. Network
2. Devices
3. Scan List

8.3 Network Configuration



Network Config (CsCAN Serial)

Port Configuration:

Baud Rate: 9600 Protocol: []

Parity: None Mode: RS-232

Data Bits: 8 Retries: 2 (0-255)

Stop Bits: 1 Timeout: 10000 mSec

Handshake: None

Update Scan:

Automatic
 Update Interval: 0 mSec ReacquireTime: 100000 mSec

Manual
 Trigger: [] Name: [] 1-BIT

ID Select: [] Name: [] 16-BIT

Master ID / Address:

Address: 0

Status:

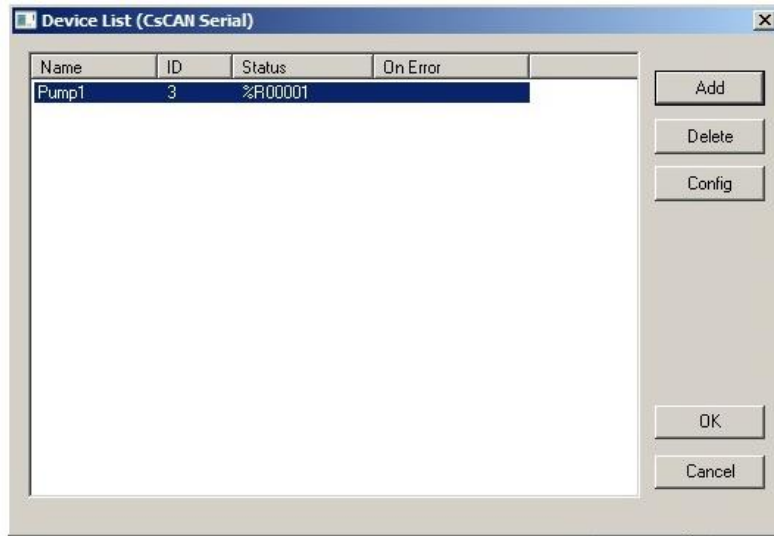
Register: [] Name: [] 4 x 32-BIT

Protocol Help OK Cancel

Network Configuration provides the required parameters to configure the network. Each protocol is different and may not require all the Network Config field. Please refer to the table below for the options in the Network Config field.

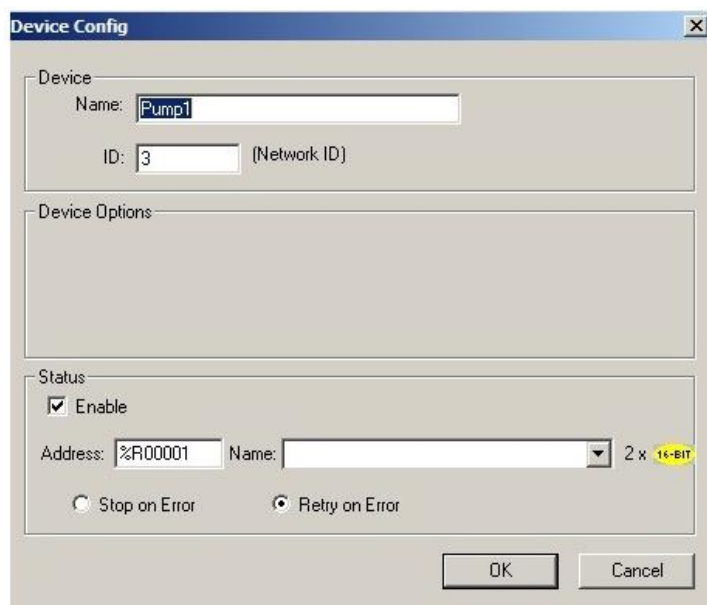
8.4 Device List and Device Configuration

Device List



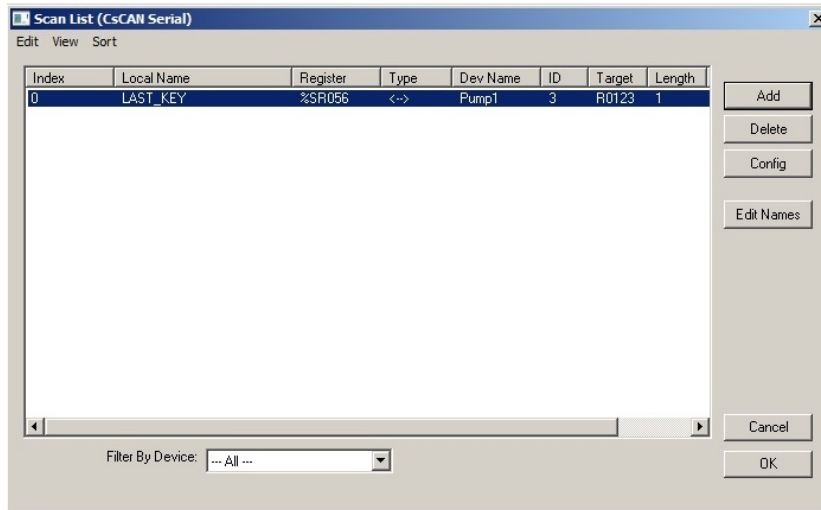
The Device List is reached from the Device button on the Protocol Config screen and provides a list of the configured devices on the Network. Devices must be created and exist in this list before corresponding Scan List entries can be created for this device. Typically, the number of entries is limited to **64 devices**.

Device Configuration



This configuration is reached from the Device List when adding or modifying an existing device.

8.5 Scan List



This can be accessed from the Scan List button on the Protocol Config screen or the Mapping button on the Device List screen and provides a Scan List of the Data Mapping entries. To transfer data between the OCS and remote target, a Scan List must be created that defines each transaction. Each mapping entry (transaction) contains the source and destination registers, the number of consecutive registers transferred, the direction of the transfer and what triggers the transfer. Typically the number of entries is **limited to 512**.

NOTE: The order of the Scan List is the order in which the transactions occur. Sort functions are provided to change the order of the list. Each entry also has an identifying index. If the device status register is enabled and a transaction failure occurs, the status register indicates the index number of the transaction that has failed.

CHAPTER 9: REMOVABLE MEDIA

9.1 Overview

All RCC models provide a Removable Media slot, labeled **Memory Card**, which supports standard MicroSD flash memory cards. MicroSD cards can be used to save and load applications, to capture graphics screens and to log data for later retrieval.



Figure 9.1 - Removable MicroSD Memory Card Slot

9.2 MicroSD Cards

Cards labeled either microSD or TransFlash that are in FAT32 format are compatible with the RCC Memory slot. Sizes up to 128GB have been tested at the time of this writing.

The Memory slot is equipped with a “push-in, push-out” connector and a MicroSD card can be safely inserted into the Memory slot whether the RCC power is On or Off.

To install a MicroSD card: Align its 8-pin gold edge connector down, card label facing the front of the RCC unit as shown in Figure 8.1; then carefully push it all the way into the Memory slot. Ensure that it clicks into place.

To remove the MicroSD card: Push in on the top of the card gently to release the spring. The card pops out for removal.

9.3 MicroSD File System

The MicroSD Memory slot uses the PC-compatible FAT32 File System. This means that a PC, with a MicroSD-compatible card reader, can read files that have been written by the RCC and can write files that can be read by the RCC.

However, the RCC does not support long filenames, but instead implements the 8.3 filename format. This means that all file and directory names must consist of up to eight (8) characters, followed by an optional dot, and an optional extension with up to three (3) characters.

Directories and sub-directories can be nested up to 16 levels deep as long as each pathname string does not exceed 147 characters.

9.4 Using Removable Media to Log Data

Using Read and Write Removable Media function blocks, an application ladder program can read and write RCC register data in the form of comma-delimited files, with a .CSV extension. These files are compatible with standard database and spreadsheet PC programs. In addition, an application ladder program can use Rename and Delete Removable Media function blocks to rename and delete files.

9.5 Using Removable Media to Load and Save Applications

A special file type, with a .PGM extension, is used to store RCC application programs on MicroSD.

Pressing and holding the **LOAD** button for three seconds upon power up will load the program that is stored on the MicroSD (more details in Chapter 13).

Cscape can also save an application directly to a MicroSD card, which is plugged into the PC's MicroSD compatible card reader by selecting the Export to Removable Media item on the Cscape File menu.

9.6 Removable Media (RM) Function Blocks in Cscape

NOTE: For detailed information regarding RM function blocks and parameters, refer to the help file in Cscape Software.

The following RM functional blocks are available in Cscape Software. These function blocks will reference

- MicroSD when filename is prefixed with 'A:' or nothing.

Table 9.1 - RM Functional Blocks	
Read RM csv	Allows reading of a comma-separated value file from the MicroSD interface into the controller register space.
Write RM csv	Allows writing of a comma-separated value file to the MicroSD interface from the controller register space.
Rename RM csv	Allows renaming a file on the RM card. The data in the file is not changed.
Delete RM csv	Allows deleting a file on the RM card.
Copy RM csv	Allows copying a file on the RM card. The data in the file is not changed.

9.7 Filenames used with the Removable Media (RM) Function Blocks

The RM function blocks support the flash with a DOS/Windows standard FAT-16 file system. All names must be limited to the "8.3" format where the filename contains eight characters a period then a three-character extension. The entire filename including any path must be less than or equal to 147 characters.

When creating filenames and directories it is sometimes desirable to include parts of the current date or time. There are six special symbols that can be entered into a filename that are replaced by the RCC with current time and date information.

Table 9.2 - Filename Special Symbols		
Symbol	Description	Example
\$Y	Substitutes the current 2-digit year	2014 = 14
\$M	Substitutes the current month with a 2-digit code	March = 03
\$D	Substitutes the current day	22 nd = 22
\$h	Substitutes the current hour in 24-hour format	4 pm = 16
\$m	Substitutes the current minute	45 = 45
\$s	Substitutes the current second	34 = 34

NOTE: All the symbols start with the dollar sign (\$) character. Date symbols are in upper case, time symbols are in lower case.

The following are examples of the substituted time/date filenames:

Current date and time	= March 1, 2013 3:45:34 PM
Filename: Data\$M\$D.csv	= Data0301.csv
Filename: Year\$Y\Month\$M\aa\$D_\$h.csv	= Year04\Month03\aa01_15.csv
Filename: Month_\$M\Day_\$D\h_\$m_\$s.csv	= Month_03\Day_01\15_45_34.csv

NOTE: Time/Date requires setting on the RCC972 and is only maintained while the RCC is powered. Time and Date will need to be reconfigured on power cycle.

9.8 System Registers used with RM

Table 9.3 - RM System Registers	
%SR174 Removable Media Protect	Write a 1 to prohibit read/write access to the removable media card. Write a zero (0) to allow access.
%SR175 Status	This shows the current status of the RM interface.
%SR176 Free Space	This 32-bit register shows the free space on the RM card in bytes.
%SR178 Card Capacity	This 32-bit register shows the total card capacity in kilobytes.

Possible status values are shown in the table:

Table 9.4 - RM Status Values	
0	RM interface OK
1	Card present but unknown format
2	No card in slot
3	Card present, but not supported
4	Card swapped before operation was complete
5	Unknown error

For additional status information, consult the Cscape Help File.

CHAPTER 10: GENERAL I/O

NOTE: Each RCC unit is sent with a datasheet in the box. The datasheet is the first document to refer to for model-specific information related to RCC models such as pin-outs and other key installation information. Visit the Horner websites to obtain datasheets, user documentation, and updates.

10.1 Overview

The RCC is a compact unit that contains high density, very versatile I/O. Using the I/O properly requires wiring to the proper terminals unit and configuring Cscape properly. This section will offer some tips and suggestions to configure the I/O properly. For the register mapping of the I/O, refer to the [Index](#) at the end of this manual for the pages referencing register mapping.

10.2 Solid-State Digital Outputs

Solid-state digital outputs are generally used to activate lamps, low voltage solenoids, relays, and other low voltage and low current devices.

NOTE: The digital outputs used on RCC controllers are “sourcing” outputs. This means the output applies a positive voltage to the output pin when turned ON. When turned off, the output applies approximately zero volts with respect to the I/O ground.

The digital outputs used in the RCC have electronic short circuit protection and current limiting. While these electronic protections work in most applications, some application may require external fusing on these outputs.

The digital outputs in the RCC are typically controlled via %Q bits in the register mapping.

When the controller is stopped the operation of each output is configurable. The outputs can hold the state they were in before the controller stopped or they can go to a predetermined state. The default behavior for an output when entering stop mode is for the digital outputs to turn off. For more information on Stop State see the [Index](#) to find pages referencing Cscape settings.

10.3 Digital Inputs

NOTE: The digital inputs on the RCC are designed for low-voltage DC inputs. The inputs are designed to support both positive and negative input modes. The mode is set by a configuration parameter in Cscope. All the inputs on the unit must be configured to the same mode.

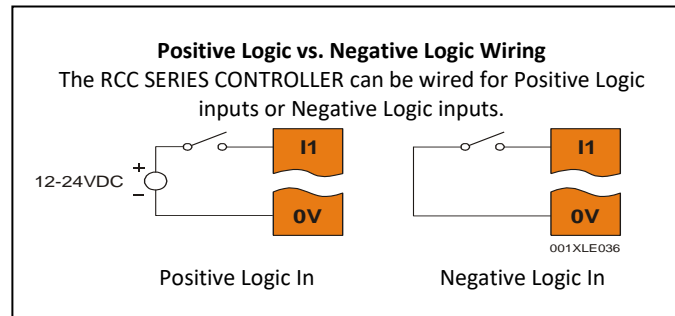


Figure 10.1 - Positive and Negative Inputs

In positive logic mode a positive voltage applied to the input will turn the input. The internal design of this mode is basically a resistor from the input to I/O ground. This mode is sometimes called sourcing.

In negative logic mode, connecting the input to the I/O ground or 0V will turn the input on. The internal design of this mode is basically a resistor from the input to the positive I/O voltage (usually 12 or 24V). This mode is sometimes called sinking.

10.4 Analog Inputs

NOTE: See the data sheet for the RCC model being used and see the appropriate page in this manual (see [Index](#)) for details on how to use Cscape to configure the digital filtering.

The analog inputs on certain RCC models allow voltage or current measurement from a variety of devices.

Analog inputs may read 0-20 mA current only or may also read 0-10VDC. **Refer to the datasheet specific to the RCC model being used.**

The analog inputs have a digital filter that can be used to filter electrical noise that may be unavoidable in some installations. The downside to digital filtering is the inputs will respond more slowly to sudden changes in the actual input.

For more information on analog input configuration and use, see the chapter on Cscape Configuration.

10.4.1 Common Cause of Analog Input Tranzorb Failure.

If a 4-20mA circuit is initially wired with loop power but without a load, the analog input could see 24VDC. This is higher than the rating of the tranzorb.

This can be solved by not connecting loop power prior to load connection or by installing a low-cost PTC in series between the load and the analog input.

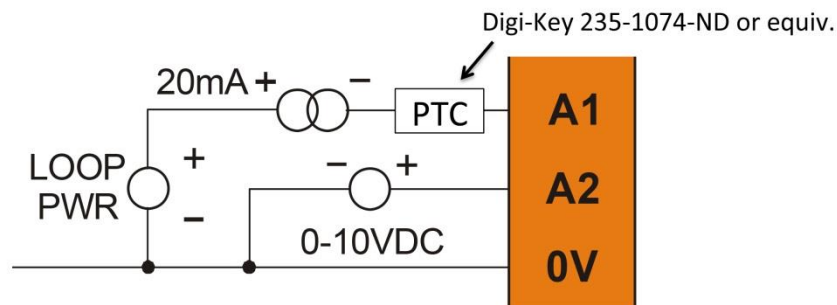


Figure 10.2 - Analog Input Tranzorb - Troubleshooting

10.5 Analog Outputs

The analog outputs on RCC devices may provide only 0-20mA output or may also provide a 0-10VDC output. **Refer to the datasheet specific to the RCC model being used.**

When the controller is stopped, the operation of each output is configurable. The outputs can hold the state they were in before the controller stopped, or they can go to a predetermined value. By default analog outputs are set to a value of zero. For more information on Stop State, refer to the appropriate pages (see [Index](#)) for the configuration chapter for Cscape settings.

CHAPTER 11: CSCAPE CONFIGURATION

11.1 Overview

RCC hardware is programmed with a Windows based PC application called Cscape. This application can be used to program, configure, monitor and debug all aspects of the RCC unit. Please see the online help provided with Cscape for additional details.

11.2 Cscape Status Bar

When the RCC is connected to a PC using Cscape software, a Status Bar appears at the bottom of the screen. The Cscape Status Bar can be used to determine if communications have been established between the RCC and the Cscape program. Components of the Cscape Status Bar are explained below.

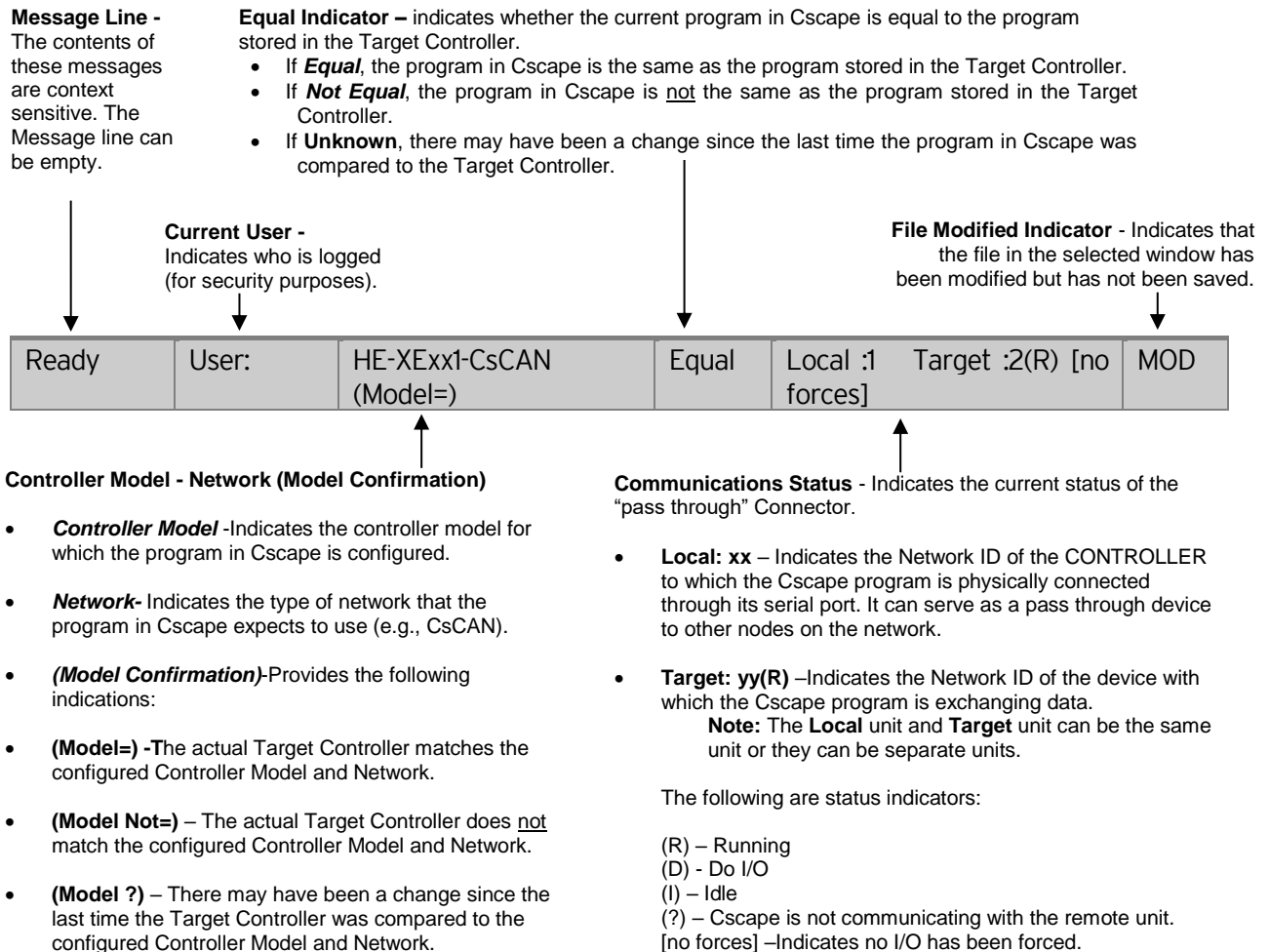


Figure 11.1 - Cscape Status Bar

11.3 Establishing Communications

The RCC can communicate with Cscape using serial port communications via MJ1 Port, Ethernet, and CAN (CsCAN). On the RCC2414 model, programming via USB is also available.

For RCC, use Cscape Version 9.30 SP6 or later.

Connect a PC (Personal Computer running a Windows Microsoft operating system) serial port to the MJ1 port on the RCC. CBL600 adapter and cable can be used to connect the MJ1 port to the PC's USB port.

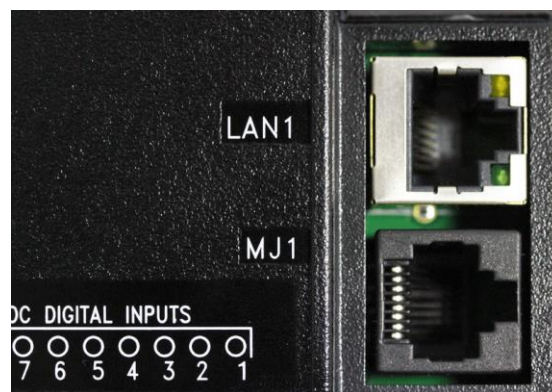


Figure 11.2 - MJ1 Connector to be used via Serial or with Serial to USB adapter to PC

If the recommended CBL600 serial to USB adapter is used, the following dialogs will appear to configure the USB port driver when a powered up unit is connected to the PC





Figure 11.3 - Hardware Wizard Screenshots

Now that the RCC is plugged in, go to the Cscape menu **Controller → Connection Wizard**, choose your connection method. If you're connecting for the first time, we suggest connecting via USB.

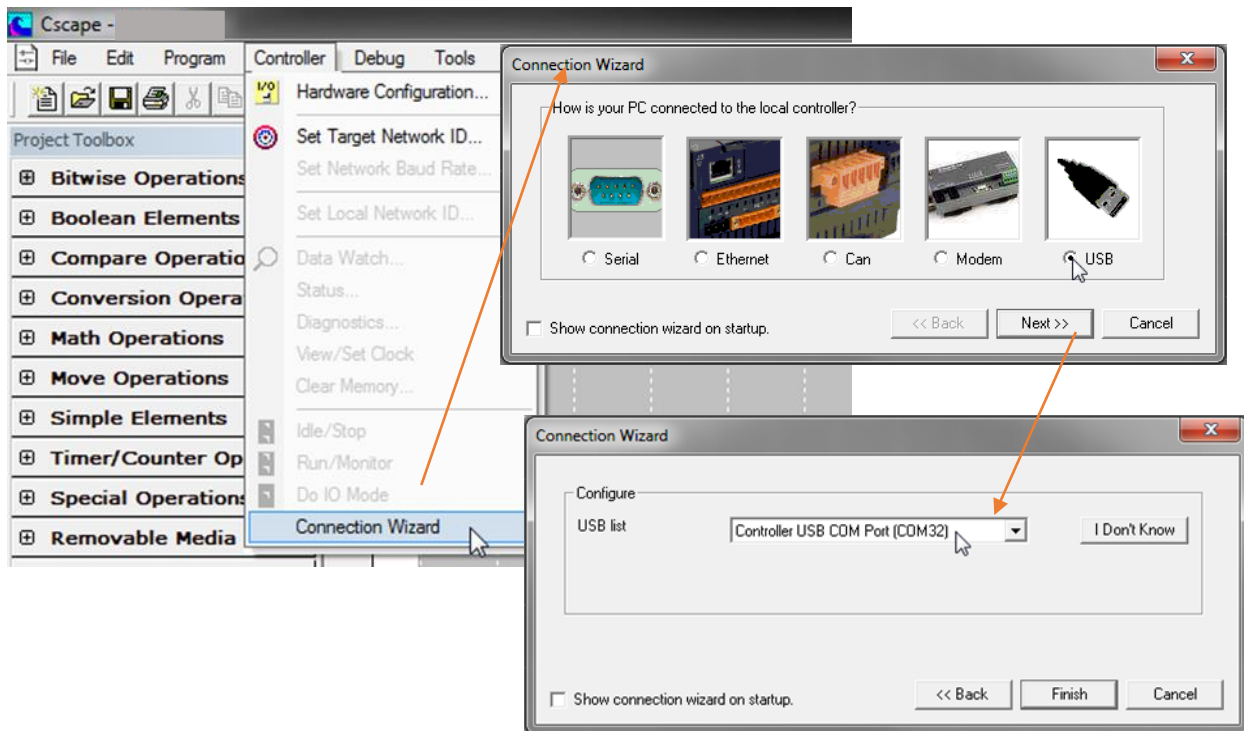


Figure 11.4 - Cscape Connection Wizard Screenshots

If **Controller USB COM Port** is not present in the dropdown list, the Windows operating system has not yet recognized the RCC unit as an installed device. Be sure the installation process is complete and that the correct drivers are installed.

An alternate way to select the COM setting is to go to **Cscape** → **Tools** → **Application Settings** → **Communication** and choose the USB port.

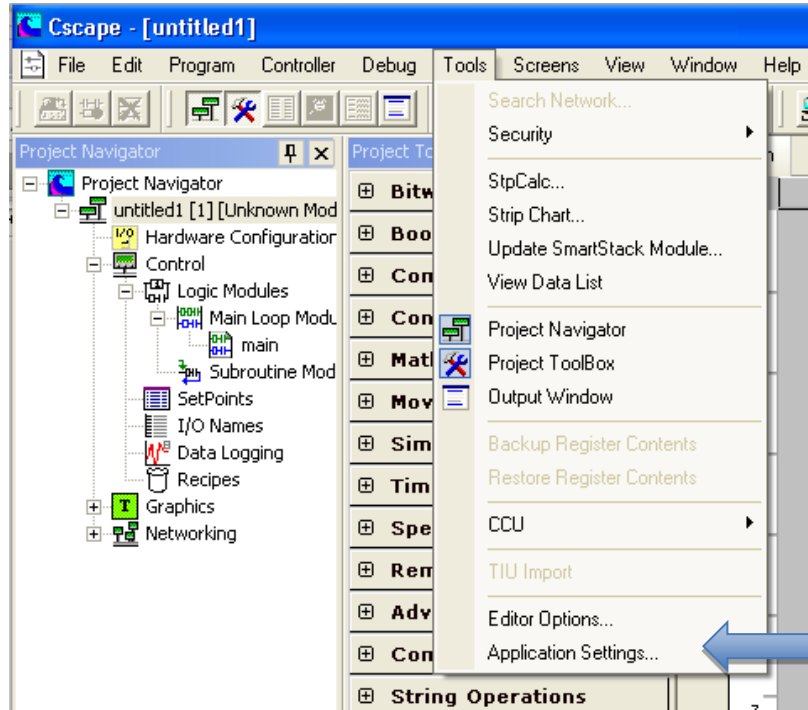


Figure 11.5 - Cscape: Alternative Connection Method Screenshot

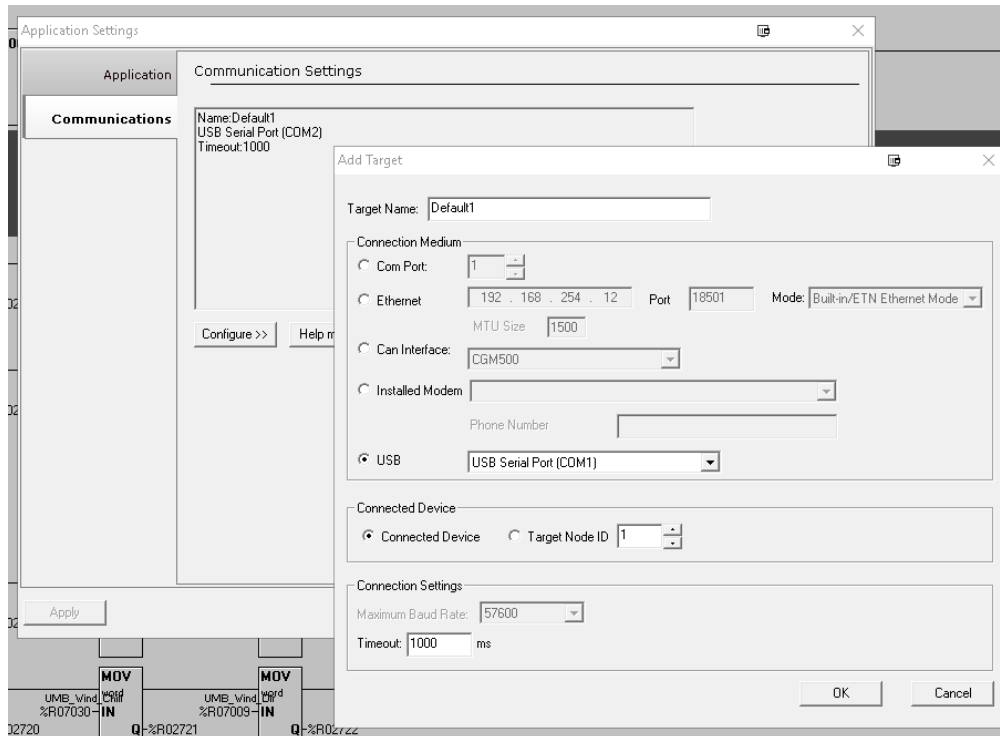


Figure 11.6 - Add Target Screenshot in Cscape

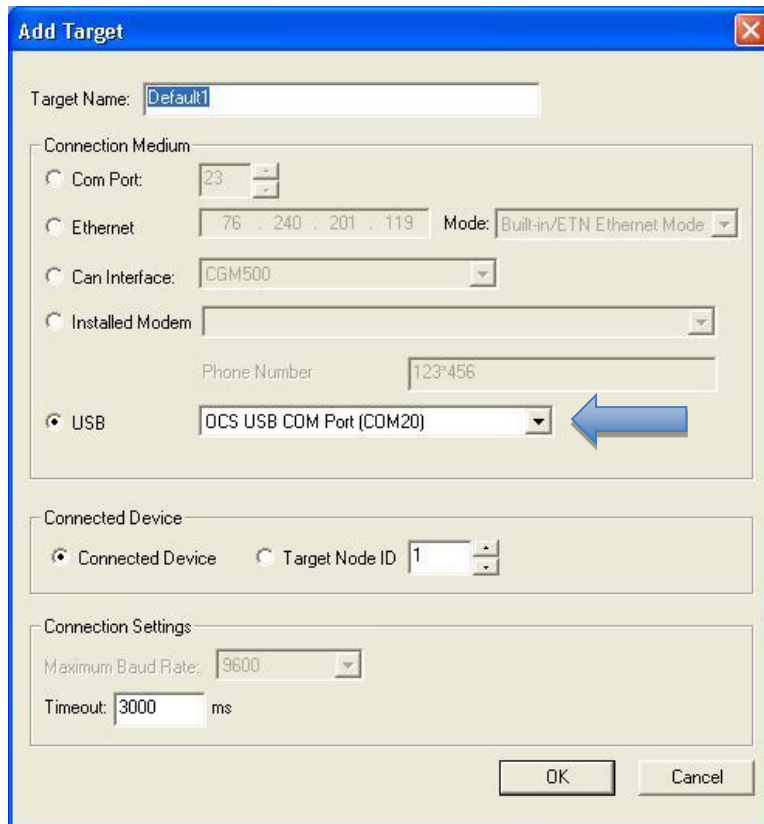


Figure 11.7 - Cscape: Add Target

NOTE: The following fields need to be filled for communication configuration if Cscape Connection Wizard was not used. Table 11.1 explains the information needed in each field.

1. Target Name
2. Connection Medium
3. Connected Device
4. Connection Settings

Table 11.1 – Communication Configuration Dialog

Target Name	Name for connection. This is not a mandatory column to be filled, by default Cscape will populate 'Default1' in edit box.
Connection Medium	
Com Port	Select this option to communicate over serial communication with the device. The port number can be configured here.
Ethernet	<p>Select this option to communicate over Ethernet. Provide the IP address of the device and select the mode: HE GSM GPRS mode, Built in/ ETN Ethernet mode, or HE XEC Ethernet mode.</p> <p>Select HE GSM GPRS mode if communication with RCC series controller on GPRS is required and the device has GSM modem installed in RCC series controller.</p> <p>Select Built in/ ETN Ethernet mode if the device has on-board Ethernet port.</p> <p>Select HE XEC Ethernet mode if the device has Ethernet comm. option board installed in RCC series controller.</p> <p>NOTE: For GPRS connectivity, GPRS configuration from Programs → Messaging → GPRS needs to be done.</p> <p>NOTE: The controller should support the type of connectivity selected and configured for Ethernet communication.</p>
CAN Interface	Select this option to communicate over CAN. This option requires additional hardware to be installed with the PC to be able to do so. Select the type of hardware installed from the dropdown.
Installed Modem	<p>Select this option to communicate to the device through the internal modem of the computer. Cscape will automatically detect the internal modem attached with PC and list in the attached drop down. User can select modem and telephone number for target controller.</p> <p>NOTE: Cscape will do necessary initialization for the selected internal modem.</p>
USB	Select this option to communicate over USB. Now Horner devices and Horner USB to serial converters are recognized and can be specifically selected.
Connected Device	
NOTE: This configuration is required if the controller to which Cscape is communicating is connected to a CsCAN network.	
Connected Device	By default this option is selected and networking feature of Cscape is disabled.
Target Node ID	On selecting this option, Networking feature of Cscape is enabled. CsCAN ID for the target controller to be provide here.
Connection Settings (General Communication Settings)	
Maximum Baud Rate	Select the baud rate for serial communication.
Timeout	<p>Select the communication timeout.</p> <p>NOTE: Select a larger timeout for GPRS and installed modem communication configuration</p>

If communications are successful, the message line should show “USB (COM8)” for this example, and an (R) should follow the Target number. For more information on the status bar, see the status section [above](#) in this chapter, section [Cscape Status Bar](#).



When connected directly to the controller to which Cscape communications are required, the **Local ID** and the **Target ID** should match.

Local ID and Target ID Match

If communication is established, the target indicator will show the mode of the controller **Target: yy(R)** as shown in the status section above in this chapter, section [Cscape Status Bar](#).

If the controller is not communicating, ensure the target ID is set correctly. The **Target ID** allows directing communications to a particular unit when multiple units are connected via a CsCAN network. Units without CsCAN network ports respond to any network ID and do not require the ID to be configured.

To change the RCC target ID in Cscape, go to **Controller → Set Local Network ID**.

11.3.1 Communicating via MJ1 Serial Port

Start by configuring Cscape to use the correct communications port. This can be done using the **Tools → Options → Communication Port** dialog in Cscape.

Connect the PC’s serial port to the port labeled MJ1 on the RCC.

If communications are successful, the target indicator should show the mode of the controller **Target: yy(R)** as shown in the status section above.


If the controller is not communicating, it may be required to set the target ID of the controller in Cscape.

The Target ID allows directing communications to a particular unit when multiple units are connected via a CsCAN network. Units without CsCAN network ports respond to any network ID and do not require the ID to be configured.

To change the Target ID of Cscape use the **Controller → Set Target Network ID** dialog.

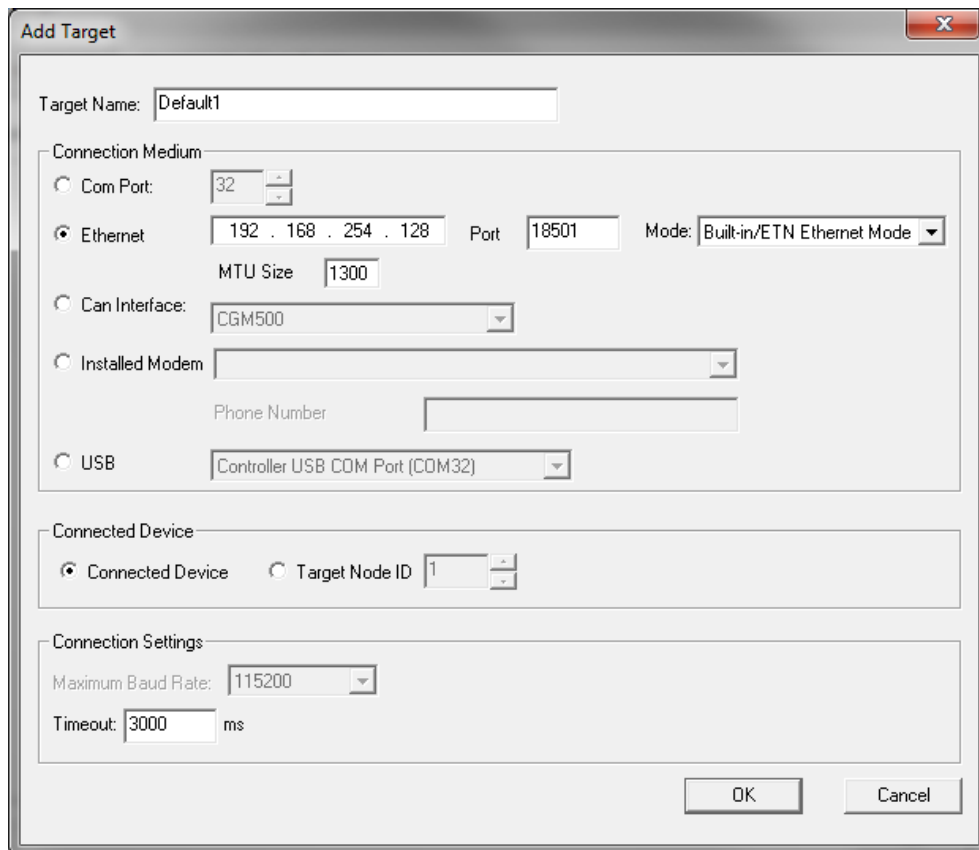
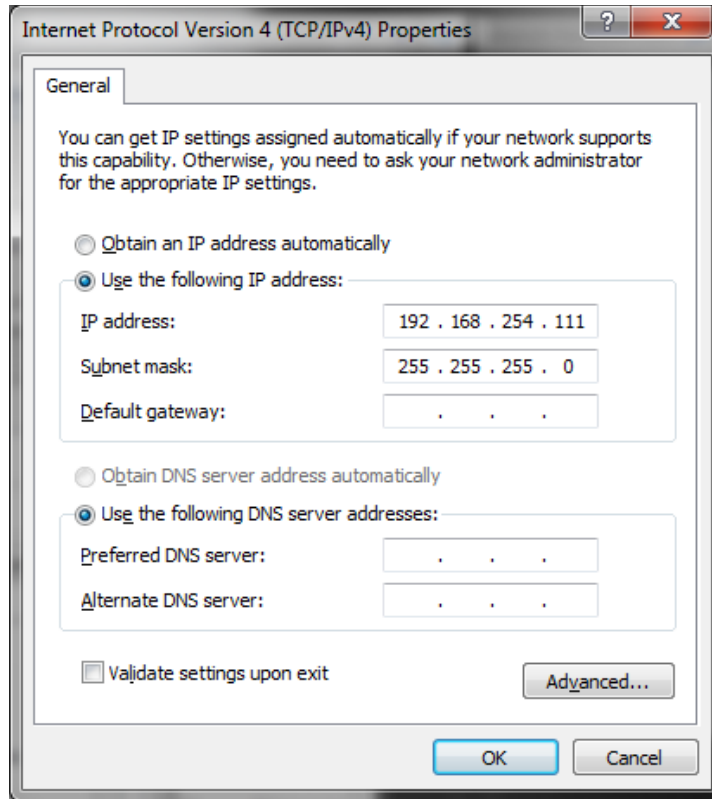
11.3.2 Communicating via On Board Ethernet Port

From the factory, the RCC OCS is set to the IP Address 192.168.254.128. To obtain Ethernet communications between Cscape and the RCC OCS using a single Ethernet cable between a PC and the RCC, or through an unmanaged Ethernet Switch, the PC will also need to be manually configured as follows (may require Administrator access on PC):

1. Access the Network Connections in the Control Panel (Shortcut: Press the Windows key  and type 'Network Connections'... select the resulting filtered link).
 2. Double-click the connection being used to directly connect to the RCC to bring up the Connection Status.
 3. Click **Properties**.
 4. Double-click **Internet Protocol Version 4 (TCP/IPv4)** in the list of available protocols.
 5. The PC may normally be set to "Obtain an IP address automatically". Click next to **Use the following IP address**:
 6. Use the IP address 192.168.254.111 or something other than that of the RCC.
 7. The Subnet Mask (255.255.255.0) should fill in automatically once the IP address has been entered.
 8. The Default Gateway is not required for a direct connection.
 9. Click OK all the way back to the Network Connections dialog.
 10. Confirm the RCC is set to the default 192.168.254.128 address or something on the same network.
 11. In Cscape, click **Tools → Application Settings → Communications → Configure** .
 12. Select Ethernet, and then enter the IP address of the RCC.
- NOTE:** The MTU setting defaults to the maximum 1500. It needs to match the PC's MTU setting for the best results. A PC may be set to an MTU of 1300 or something other than the default maximum setting by a network administrator.
13. The **Port** for CsCAN over Ethernet is **18501**.
 14. The **Mode** for any controller with built-in Ethernet is **Built-in/ETN Ethernet Mode**.
 15. Change the **Timeout** value to **3000** for direct connections. Timeout values of 5000-30000+ may be common for access over the internet or via VPN or other more complex networks.
 16. Click **OK** all the way back to the main Cscape window. It may take a moment to initialize the communications.
 17. Check the status bar for successful communications.

ETN : 172.27.1.183	User: NONE	HERCC Model Equal	Equal	Local:253 Target:253(R) [no forces]	MOD
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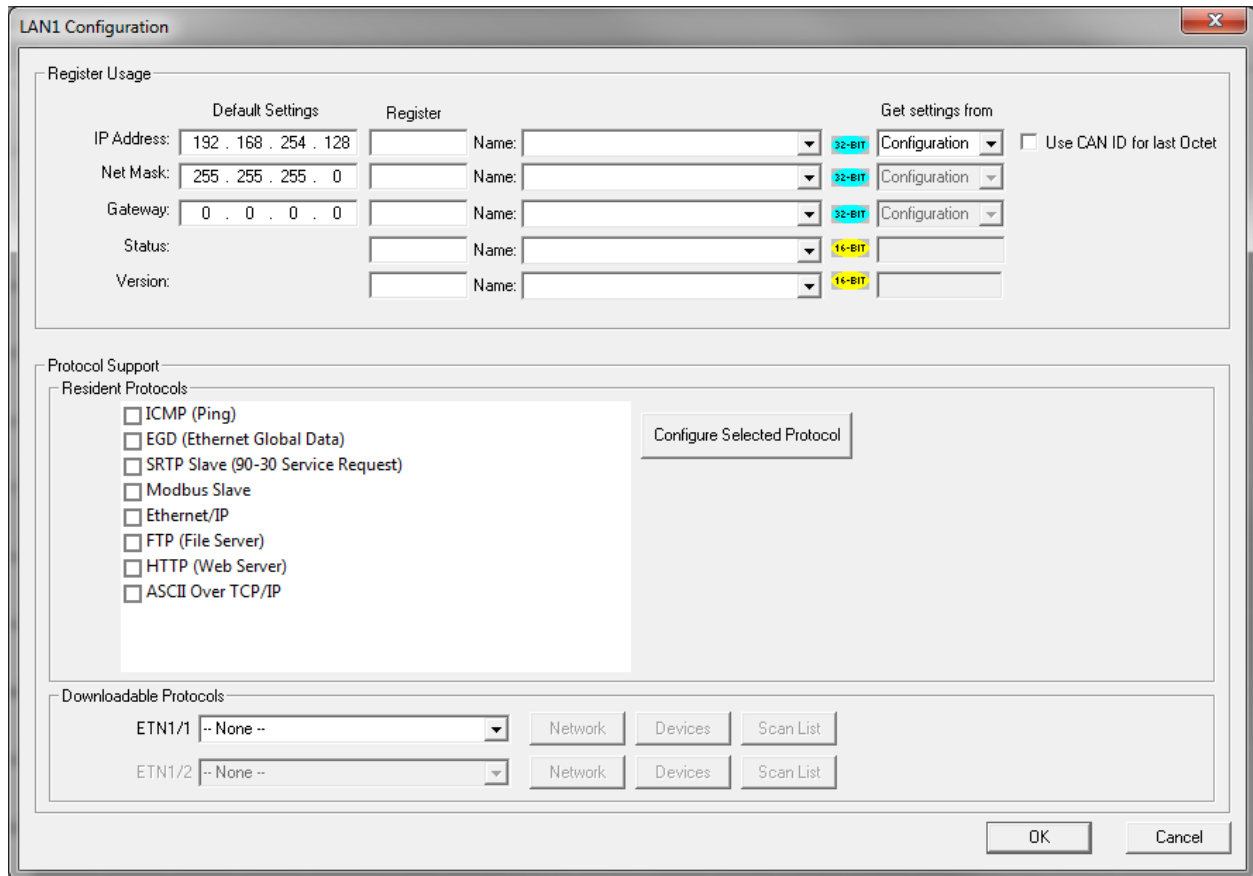
See the next page for examples of the PC Ethernet setup and the Cscape Ethernet setup mentioned in the above steps.



To configure the Ethernet settings of the RCC using Cscape, go to **Controller → Hardware Configuration**. If not already done, select the correct connected controller, or use the **Auto Config** button to automatically recognize a controller that is already successfully connected to Cscape.

Below the main controller configuration, under **Network Ports**, find **LAN1** and click on the **Config** button to the right of the greyed-out ETN300.

In the LAN1 Configuration, fill in the network setup for the RCC. It may be required to consult IT personnel to determine proper settings if connection to a corporate network is needed.



Default Settings		Register		Get settings from	
IP Address:	192 . 168 . 254 . 128		Name:	32-BIT	Configuration
Net Mask:	255 . 255 . 255 . 0		Name:	32-BIT	Configuration
Gateway:	0 . 0 . 0 . 0		Name:	32-BIT	Configuration
Status:			Name:	16-BIT	
Version:			Name:	16-BIT	

Protocol Support

Resident Protocols

- ICMP (Ping)
- EGD (Ethernet Global Data)
- SRTP Slave (90-30 Service Request)
- Modbus Slave
- Ethernet/IP
- FTP (File Server)
- HTTP (Web Server)
- ASCII Over TCP/IP

Downloadable Protocols

ETN1/1	-- None --	Network	Devices	Scan List
ETN1/2	-- None --	Network	Devices	Scan List

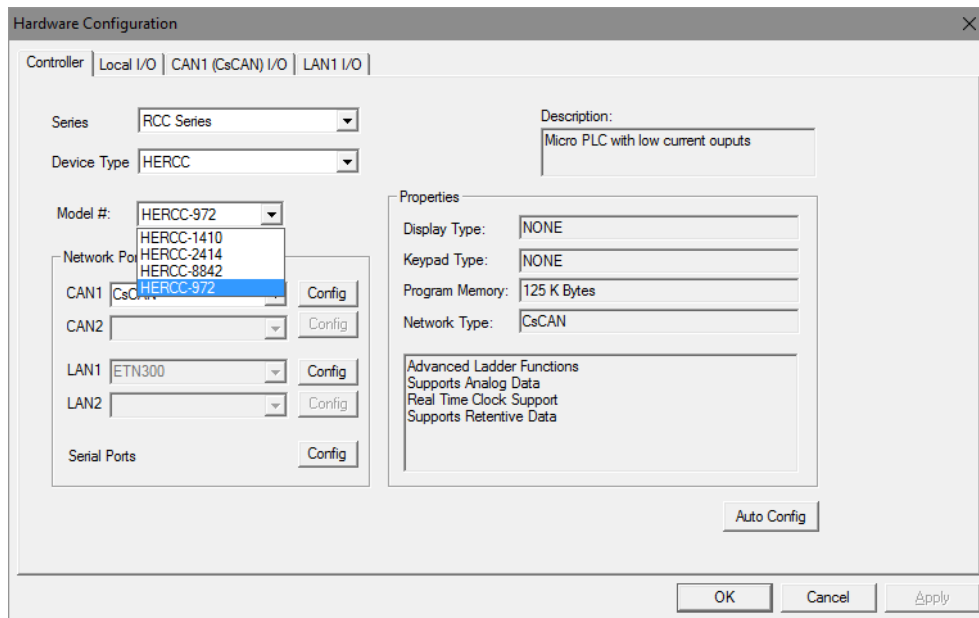
If **Get settings from** is set to **Configuration** for any parameter, the addresses in the **Default Settings** column will take place when this program is loaded and every time this controller enters RUN mode. Registers may optionally be defined that will reflect the settings. These settings may temporarily be changed via the SYSTEM menu, but will revert to the Cscape-configured settings at any transition into RUN mode, i.e. a program download or at power-up.

If **Get settings from** is set to **Register** for any parameter, the addresses in the **Default Settings** column are ignored entirely. The addresses instead must come from the configured registers. It is not possible to change these settings via the SYSTEM menu in this case.

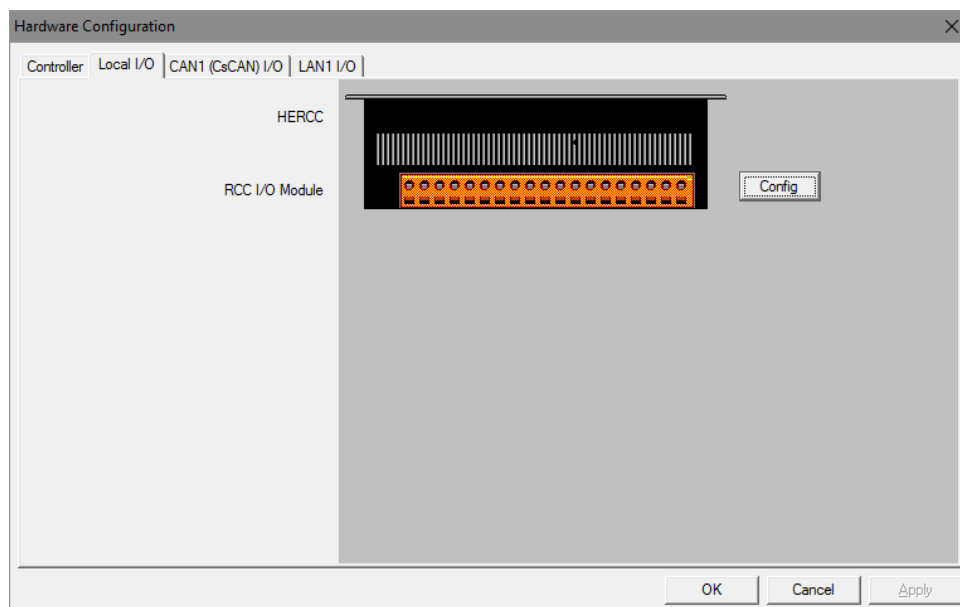
11.4 Hardware Configuration

An overview of configuration:

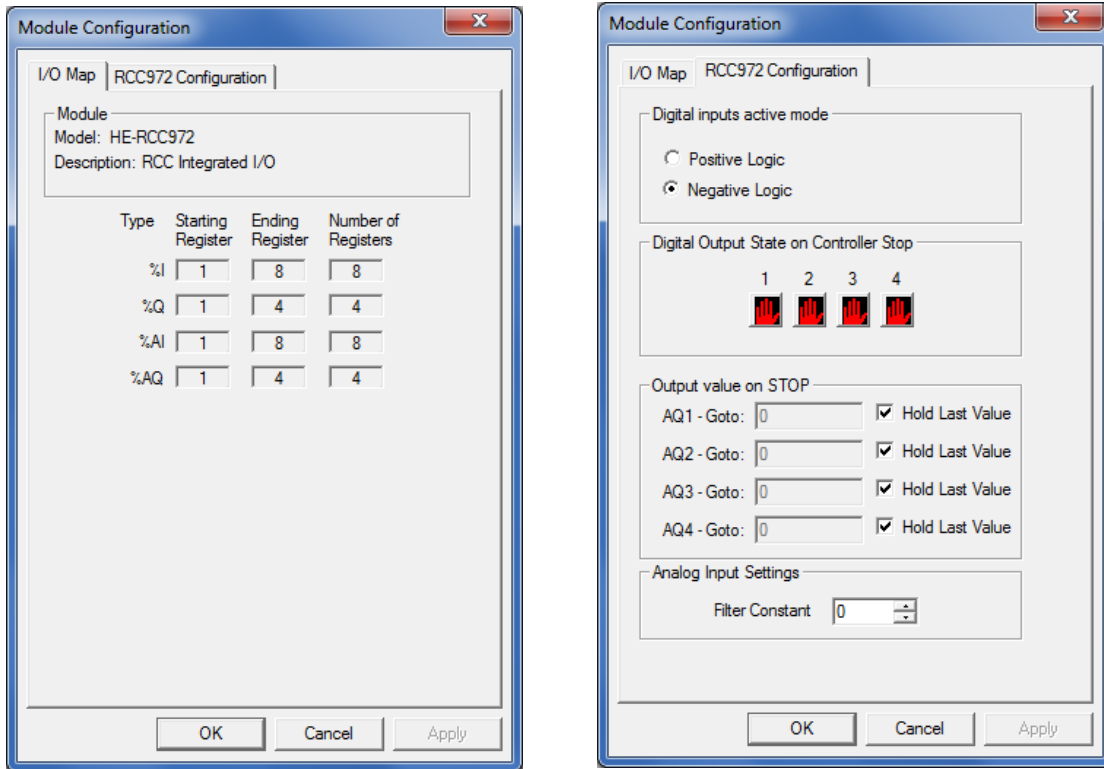
1. Start the configuration by selecting the **Controller** → **Hardware Configuration** menu item.
2. If the RCC is already connected and communicating with Cscope, press the **Auto Config System** button to automatically detect the connected RCC model.
3. If the RCC is not connected:
 - a. Select **RCC Series** from the Series dropdown.
 - b. Confirm **HERCC** in the Device Type dropdown.
 - c. Select the model to be used from the Model # dropdown.



4. Click the **Local I/O** tab to access the configuration for the I/O.

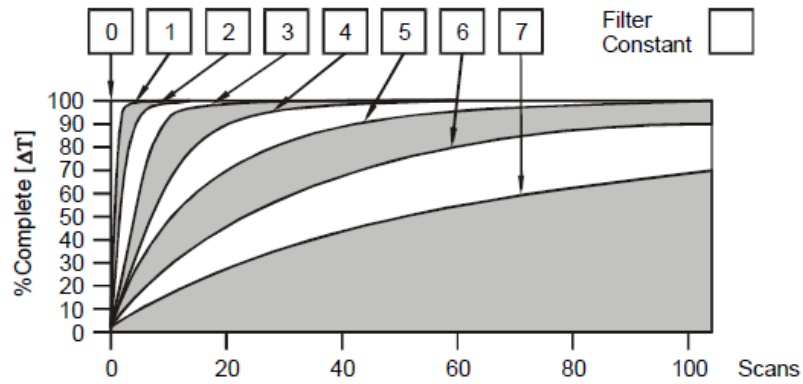


5. From here, the I/O map and addresses may be viewed. These addresses may not be changed and no other program configurations, such as remote I/O, should overlap these addresses.
6. Next, click the **RCCxxx Configuration** to configure I/O. Depending on the RCC model being used, some or all of the following options may be available



7. Configure the **Digital Inputs** to operate as required.
 - a. If **Positive Logic**, the inputs will register as 'ON' if voltage is applied to the input pin.
 - b. If **Negative Logic**, the inputs will register as 'ON' if the input pin is grounded.
8. Configure the **Digital Outputs** to be in the desired state when the RCC is put into STOP mode, such as when a program is being loaded.
 - a. By default, outputs will turn 'OFF'.
 - b. Outputs may be set to turn 'ON'.
 - c. Outputs may be set to 'Hold Last State'.
9. Configure the **Analog Inputs**.
 - a. The **Filter Constant** may be set from 0 to 7 to digitally filter the signal as shown in the following chart.
 - b. On some models, the input type may be specified as 4-20mA, 0-20mA, or 0-10V.
10. Configure the **Analog Outputs**.
 - a. The **Output Value on STOP** may be set to either 'Hold Last Value' or to a specific raw value from 0-32000 when the RCC is put into STOP mode, such as when a program is being loaded.
 - b. On some models, the Output Mode may be specified as 4-20mA, 0-20mA, or 0-10V.

For Analog Inputs, the **Filter Constant** sets the level of digital filtering according to the following chart. Digital filtering minimizes noise and jitter, improves effective resolution, and provides adequate speed for most temperature monitor control applications.



CHAPTER 12: REGISTERS

12.1 Register Definitions

When programming the RCC, data is stored in memory that is segmented into different types. This memory in the controller is referred to as registers. Different groups of registers are defined as either bits or words (16 bits). Multiple registers can usually be used to handle larger storage requirements. For example, 16 single-bit registers can be used to store a word or two 16-bit registers can be used to store a 32-bit value.

Below is a table of the type of registers found in the RCC unit.

Table 12.1—Types of Registers	
Register	Description
%AI Analog Input	16-bit input registers used to gather analog input data such as voltages, temperatures, and speed settings coming from an attached device.
%AQ Analog Output	16-bit output registers used to send analog information such as voltages, levels, or speed settings to an attached device.
%AIG Global Analog Input	Specially defined 16-bit input registers that come from the network.
%AQG Global Analog Output	Specially defined 16-bit output registers that go to the network.
%D Display Bit	These are digital flags used to control the displaying of screens on a unit which has the ability to display a screen. If the bit is SET, the screen is displayed.
%I Digital Input	Single-bit input registers. Typically, an external switch is connected to the registers.
%IG Global Digital Input	Specially defined single-bit inputs that come from the network.
%K Key Bit	Single-bit flags used to give the programmer direct access to any front panel keys appearing on a unit.
%M Retentive Bit	Retentive single-bit registers.
%Q Digital Output	Single-bit output registers. Typically, these bits are connected to an actuator, indicator light or other physical outputs.
%QG Global Digital Output	Specially defined single-bit outputs that go to the network.
%R General Purpose Register	Retentive 16-bit registers.
%S System Bit	Single-bit coils predefined for system use.
%SR System Register	16-bit registers predefined for system use.
%T Temporary Bit	Non-retentive single-bit registers.

12.2 Useful %S and %SR registers

Table 12.2- Common %S Register Definitions	
Register	Description
%S1	Indicate First Scan
%S2	Network is OK
%S3	10mS timebase
%S4	100mS timebase
%S5	1 second timebase
%S6	I/O is OK
%S7	Always ON
%S8	Always OFF
%S9	Pause 'n Load soon
%S10	Pause 'n Load done
%S11	I/O being forced
%S12	Forcing is enabled
%S13	Network I/O is OK
%S16	Ethernet COM module is OK

Table 12.3 - %SR Registers				
Register	Name	Description	Min Val	Max Val
%SR1	USER_SCR	Current User Screen Number	1	1023
%SR2	ALRM_SCR	Current Alarm Screen Number (0=none)	0	1023
%SR3	SYS_SCR	Current System Screen Number (0=none)	0	14
%SR4	SELF_TEST	Bit-Mapped Self-Test Result	0	65535
%SR5	CS_MODE	Control Station Mode (0=Idle, 1=Do I/O, 2=Run)	0	2
%SR6	SCAN_RATE	Average Scan Rate (/ 10)	-	1000
%SR7	MIN_RATE	Minimum Scan Rate (/ 10)	-	1000
%SR8	MAX_RATE	Maximum Scan Rate (/ 10)	-	1000
%SR9-10	EDIT_BUF	Data Field Edit Buffer	0	2 ³² -1
%SR11-12	LADDER_SIZE	Ladder Code Size	2	256K
%SR 13-16	Reserved	-	-	-
%SR17-18	IO_SIZE	I/O Configuration Table Size	16	127K
%SR19-20	NET_SIZE	Network Configuration Table Size	34	1K
%SR21-22	SD_SIZE	Security Data Table Size	-	-
%SR23	LADDER_CRC	Ladder Code CRC	0	65535
%SR 24-25	Reserved	-	-	-
%SR26	IO_CRC	I/O Configuration Table CRC	0	65535
%SR27	NET_CRC	Network Configuration Table CRC	0	65535
%SR28	SD_CRC	Security Data Table CRC	0	65535
%SR29	NET_ID	This Station's Primary Network ID (CsCAN)	1	253
%SR30	NET_BAUD	Network Baud Rate (CsCAN) (0=125KB; 1=250KB; 2=500KB; 3=1MB)	0	3
%SR31	NET_MODE	Network Mode (0=network <u>not</u> required; 1=network required; 2=network optimized; 3=network required and optimized)	0	3
%SR32	LCD_CONT	LCD Display Contrast setting	0	255
%SR33	FKEY_MODE	Function Key Mode (0=Momentary; 1=Toggle)	0	1
%SR34	SERIAL_PROT	RS232 Serial Protocol Mode (0=Firmware Update (RISM); 1=CsCAN; 2=Generic (Ladder- Controlled); 3=Modbus RTU; 4=Modbus ASCII)	0	4

Table 12.3 - %SR Registers				
Register	Name	Description	Min Val	Max Val
%SR35-36	SERIAL_NUM	This Station's 32-bit Serial Number	0	2 ³² -1
%SR37	MODEL_NUM	This Station's Binary Model Number	0	65535
%SR38	ENG_REV	Firmware Rev Number (/ 100)	0000	9999
%SR39	CPLD_REV	BIOS Rev Number (/ 100)	000	255
%SR40	FPGA_REV	FPGA Image Rev Number (/ 10)	000	255
%SR41	LCD_COLS	Vertical Pixel Count		
%SR42	LCD_ROWS	Horizontal Pixel Count		
%SR43	KEY_TYPE	Keypad Type		
%SR44	RTC_SEC	Real-Time-Clock Second	0	59
%SR45	RTC_MIN	Real-Time-Clock Minute	0	59
%SR46	RTC_HOUR	Real-Time-Clock Hour	0	23
%SR47	RTC_DATE	Real-Time-Clock Date	1	31
%SR48	RTC_MON	Real-Time-Clock Month	1	12
%SR49	RTC_YEAR	Real-Time-Clock Year	1996	2095
%SR50	RTC_DAY	Real-Time-Clock Day (1=Sunday)	1	7
%SR51	NET_CNT	Network Error Count	0	65535
%SR52	WDOG_CNT	Watchdog-Tripped Error Count	0	65535
%SR53-54	BAD_LADDER	Bad Ladder Code Error Index	0	65534
%SR55	F_SELF_TEST	Filtered Bit-Mapped Self-Test Result	0	65535
%SR56	LAST_KEY	Key Code of Last Key Press or Release	0	255
%SR57	BAK_LITE	LCD Backlight Dimmer Register 0 = 0% On; 25=25% On; 100-255 = 100% On	0	255
%SR58	USER_LEDS	User LED Control / Status	0	65535
%SR59-60	Reserved	-	-	-
%SR61	NUM_IDS	This Station's Number of Network IDs	1	253
%SR62	NUM_IDS	This Station's Number of Network IDs	1	253
%SR63	SS_BASE	SmartStack I/O Base Selector	0	7
%SR64	SS_STATUS	SmartStack I/O Base Status	0	2
%SR65-76	SS_INFO_1	SmartStack I/O Module #1 Information Structure	-	-
%SR77-88	SS_INFO_2	SmartStack I/O Module #2 Information Structure	-	-
%SR89-100	SS_INFO_3	SmartStack I/O Module #3 Information Structure	-	-
%SR101-112	SS_INFO_4	SmartStack I/O Module #4 Information Structure	-	-
%SR113-114	GOBJ_SIZE	Graphics Object Table Size	8	256K
%SR115-116	GSTR_SIZE	Graphics String Table Size	8	128K
%SR117-118	GBMP_SIZE	Graphics Bitmap Table Size	4	256K
%SR119-120	GTXT_SIZE	Graphics Text Table Size	8	128K
%SR121-122	GFNT_SIZE	Graphics Font Table Size	8	256K
%SR123-124	PROT_SIZE	Protocol Table Size	16	64K
%SR125	GOBJ_CRC	Graphics Object Table CRC	0	65535
%SR126	GSTR_CRC	Graphics String Table CRC	0	65535
%SR127	GBMP_CRC	Graphics Bitmap Table CRC	0	65535
%SR128	GTXT_CRC	Graphics Text Table CRC	0	65535
%SR129	GFNT_CRC	Graphics Font Table CRC	0	65535
%SR130	PROT_CRC	Protocol Table CRC	0	65535
%SR131-163	Reserved	-	-	-
%SR164.3		Read bit indicating Auto Restore of Register Data has been performed (Fail Safe)		
%SR164.4		Read bit indicating Backup of Register Data has been performed (Fail Safe)		
%SR164.5		Enable AUTORUN (Fail Safe)		
%SR164.6		Enable AUTOLOAD (Fail Safe)		
%SR164.7		Backup trigger bit		

Table 12.3 - %SR Registers				
Register	Name	Description	Min Val	Max Val
%SR164.8		Clear Backup trigger bit		
%SR164.9		MAKE_CLONE trigger bit		
%SR164.10		LOAD_CLONE trigger bit		
%SR164.11		Status indicating Make Clone Fail (This bit goes high when Make / Create clone fails)		
%SR164.12		Status indicating Load Clone Fail (This bit goes high when Load clone fails)		
%SR165-173	Reserved			
%SR174	Removable Media Protect	Write a one (1) to prohibit read/write access to the removable media card. Write a zero (0) to allow access.		
%SR175	Removable Media	Current Removable Media interface status	0	6
%SR176-177	Removable Media	Indicates free space on the Removable Media card in bytes.	0	2 ³¹
%SR178-179	Removable Media	Indicates the total card capacity in bytes.	0	2 ³¹
%SR180	Reserved	-	-	-
%SR181	ALM_UNACK	Unacknowledged Alarm (high bit indicates what group #)		
%SR182	ALM_ACT	Active Alarm (high bit indicates what group #)		
%SR183	SYS_BEEP	System Beep Enable (0=disabled; 1=enabled)		
%SR184	USER_BEEP	Software configurable (0=OFF; 1=ON)		
%SR185	SCR_SAVER	Screen Saver Enabled (0=disabled; 1=enabled)		
%SR186	SCR_SA_TM	Screen Saver Time in minutes (delay)		
%SR187	NET_USE	Average Net Usage of all units on the CAN network		
%SR188	NET_MIN	Minimum Net Usage of all units on the CAN Network		
%SR189	NET_MAX	Maximum Net Usage of all units on the CAN network		
%SR190	NT_TX_AVG	Average Net Usage of this unit		
%SR191	NT_TX_MIN	Minimum Net Usage of this unit		
%SR192	NT_TX_MAX	Maximum Net Usage of this unit		

For additional information on system bits and registers, refer to the Cscape Help file.

12.3 Resource Limits

Table 12.4 - Resource Limits	
Resource	Value
%S	13
%SR	192, 200-205
%T	2048
%M	2048
%R	4096
%K	5
%D	1023
%I	2048
%Q	2048
%AI	512
%AQ	512
%IG	64 (per ID)
%QG	64 (per ID)
%AIG	32 (per ID)
%AQG	32 (per ID)
Ethernet	CsCAN, Ping, EGD, SRTP, Modbus TCP Master (Downloadable protocol) & Slave, Ethernet IP, FTP, or HTTP @ 10MBd or 100MBd
CsCAN	125kBd, 250kBd, 500kBd, or 1MBd
Serial Ports	2 RS-232 / RS-485 Ports. Software Selectable.
IDs Per CsCAN Network	64 w/o repeat (253 w/ 3 repeaters)
Ladder Code	128kB

12.4 Register Map for RCC Series

Table 12.5–RCC Series Register Map			
RCC Model	REGISTER	DESCRIPTION	TYPE
RCC972	%I1 to %I8	Digital Inputs	
	%I9 to %I15	Reserved	
	%I16	%Q Fault Status	
	%Q1 to %Q4	Digital Outputs	
	%AI1 to %AI8	Analog Inputs	0-20mA
	%AQ1 to %AQ4	Analog Outputs	0-20mA
RCC1410	%I1 to %I14	Digital Inputs	
	%I15	Reserved	
	%I16	%Q Fault Status	
	%Q1 to %Q10	Digital Outputs	
RCC2414	%I1 to %I2	Digital Inputs	
	%I3 to %I15	Reserved	
	%Q1 to %Q4	Digital Outputs	
	%AI1	Analog Inputs	0-10VDC
	%AQ1 to %AQ4	Analog Outputs	0-10VDC
RCC8842	%I1 to %I8	Digital Inputs	
	%I9 to %I15	Reserved	
	%I16	%Q Fault Status	
	%Q1 to %Q8	Digital Outputs	
	%AI1 to %AI4	Analog Inputs	0-10VDC 0-20mA 4-20mA
	%AQ1 to %AQ2	Analog Outputs	0-10VDC 0-20mA 4-20mA

CHAPTER 13: MAINTENANCE

13.1 Firmware Updates

The RCC products contain field updatable firmware to allow new features to be added to the product at a later time. Firmware updates should only be performed when a new feature or correction is required. Updating the firmware erases the program memory and a program will need to be loaded into the RCC after the firmware update is finished for it to function again.

WARNING: Firmware updates should only be performed when the equipment being controlled by the RCC is in a safe, non-operational state. Communication or hardware failures during the firmware update process can cause the controller to behave erratically resulting in injury or equipment damage. Make sure the functions of the equipment work properly after a firmware update before returning the device to an operational mode.

Load switch

1. Pressing the **LOAD** switch during power-up boots from the Micro SD card. This starts a Firmware Load if the Micro SD is bootable and valid firmware files are found on it.
2. After boot-up, pressing the **LOAD** switch for three (3) seconds either starts a Firmware Load or an Application Load depending upon what files are found on the Micro SD. If firmware files are found, a Firmware Load is performed. If firmware files are not found and the DEFAULT.PGM file is found, an Application Load is performed.

During the firmware update, the RUN and OK light will flash an alternating pattern. Once the firmware update is finished, load a program into the RCC and place in RUN mode.

13.2 Backup Battery

All the RCC OCS models, EXCEPT for the RCC972, use a lithium-ion battery. This battery powers the real time clock, registers, and data memory when power is removed. Under normal conditions, the battery should last seven years. Higher operating temperatures or variations in batteries may reduce this time.

NOTE: The battery is adhered to the unit and not replaceable.

NOTE: The RCC972 does not have a backup battery.

If the battery fails, please contact Horner Technical Support for further instructions. Do not attempt to disassemble the unit as the lithium battery may explode or catch fire if mishandled.

If the battery voltage is below 2.0V or if the battery is 7 to 10 years old, it is recommended that it be replaced as preventative maintenance.

WARNING: Lithium batteries may explode or catch fire if mistreated. Do NOT recharge, disassemble, heat above 100°C (212°F), incinerate, or puncture.

CHAPTER 14: MODBUS COMMUNICATIONS

14.1 Modbus Overview

For complete Modbus instructions, please refer to the Help file in Cscape.

Modbus (serial) and Modbus TCP/Modbus UDP (Ethernet) are popular, de-facto standard protocols that allow industrial devices from multiple manufacturers to easily share data in real-time. For Modbus serial communications, the RCC can act as either a Master or a Slave. For Modbus Ethernet communications, the RCC can act as either a Client (Master) or Server (Slave), or both at the same time.

Modbus protocol (serial or Ethernet) allows for one master and multiple slaves. The master always initiates the conversation by sending a request to a particular slave. Only the addressed slave will send a response when the request is completed. Should the slave be unable to complete the request, it returns the appropriate error response. Should the slave be unable to respond, the master's timeout timer expires to provide an indication of **No Response**.

14.2 Modbus Slave Overview

For complete Modbus Slave instructions, please refer to the Help file in Cscape.

The Modbus function block, when used with the appropriate Modem and /or Open function blocks, allows the primary serial port on the controller to act as a Modbus/RTU slave. The Modbus function supports both ASCII and RTU modes of operation across a range of baud rates and protocol frames. Also supported is port activity status, an inactivity timer, support for call-on exception, and support for store and forward (repeater) operation for radio modems.

For Modbus Server (slave) over Ethernet, the Modbus/TCP protocol simply needs to be selected in the LAN1 section of the Hardware Configuration dialog box in Cscape - see [Section 11.3.2](#). The RCC will automatically reply to Read and Write requests from a Modbus TCP Client (master).

Section 14.5 describes the supported Modbus Commands as well as the Modbus Map for RCC References (%R, %M, etc.). This map applies for both Modbus serial and Modbus over Ethernet.

14.3 Modbus Master Overview

For complete Modbus Master instructions, please refer to the Help file in Cscape.

When acting as a Modbus master, there are two primary mechanisms used by the RCC to allow the user to specify the data to be read/written from/to the slaves.

Modbus Master Function Block—For serial only. This is an advanced feature that should only be used in rare occasions.

Protocol Config—The Protocol Config is configured in the Hardware Configuration dialog box in Cscape (serial and Ethernet) - See [Section 11.3.2](#). This is the preferred method in most applications.

After the protocol has been selected from the dropdown menu, the **Network**, **Devices**, and **Scan List** become available. The Protocol Config is configured on three different levels:

- **Network**—Parameters, such as the polling rate of the data scan, are specified along with timeout values, retry, and re-acquisition settings. Serial configuration, baud rate, parity, etc. are also set here.
- **Devices**—For every slave to be polled, configuration details are added in the Devices dialog box. This includes Slave ID (serial) and IP Address (Ethernet). Under Device Type, the Modbus addressing style matching that specified in the slave's user documentation may be selected. For instance, some slaves specify Modbus addresses (i.e. 40,001), and others specify offsets (i.e. 0000).
 - **Hex or Decimal**—Some specify addresses in hex and others in decimal. By allowing the user to select the Modbus addressing style for each slave on the network, a minimum of address conversion is required. Also, if the slave is another Horner product (i.e. another RCC or an OCS), the "Native Addressing" option can be selected (i.e. %R1, %M17, etc.), and this skips the conversion to Modbus style altogether.
- **Scan List**—This is where the specific Modbus addresses to be read/written from/to each slave are specified. Up to 32 words of data can be read at the same time.
- **Ethernet Configuration**—Modbus TCP or Modbus UDP is selected here.

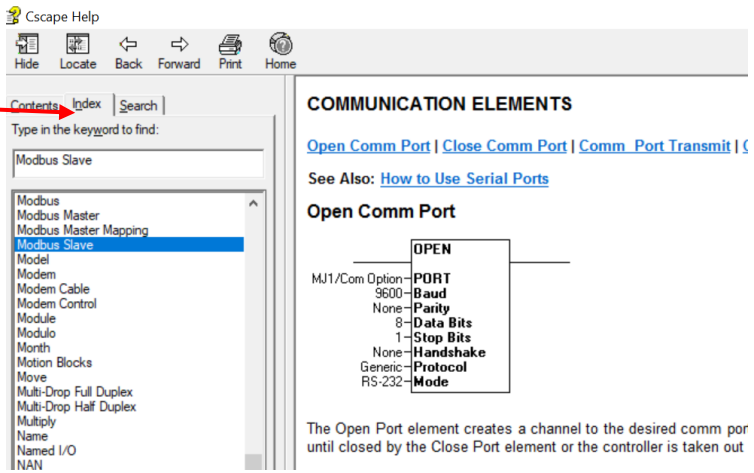
NOTE: Once configuration has been completed on the Network and Devices level, Modbus data can be directly read/written from graphics objects in the Cscape screen editor. This is available even if the Modbus register is not listed on the scan list.

The above information is just an introduction to the topic. For more detailed information, please consult the Cscape Help file.

14.4 Opening Cscape Help File

After opening the Cscape Help file, select the Index table and search for “Modbus Slave” or “Modbus Master”, as shown below.

Select “Index” tab.



The screenshot shows the Cscape Help application window. The 'Index' tab is selected in the top navigation bar. A search box contains the text 'Modbus Slave'. A list of search results is displayed, with 'Modbus Slave' highlighted. The right pane shows the 'COMMUNICATION ELEMENTS' section, including links for 'Open Comm Port', 'Close Comm Port', and 'Comm Port Transmit'. Below these links is a diagram of an 'OPEN' port element with its configuration parameters: MJ1/Com Option, PORT, 9600, Baud, None, Parity, 8, Data Bits, 1, Stop Bits, None, Handshake, Generic, Protocol, and RS-232, Mode. A note at the bottom states: 'The Open Port element creates a channel to the desired comm port until closed by the Close Port element or the controller is taken out'.

14.5 Modbus Addressing Table for RCC Units

To access RCC registers, a Modbus Master must be configured with the appropriate register type and offset. This is usually accomplished with one of two methods:

1. The first method uses **Traditional Modbus References**, in which the high digit represents the register type and the lower digits represent the register offset (starting with Register 1 for each type). Since only four register types can be represented in this manner, RCC Modbus Function Blocks pack several RCC register types into each Modbus register type. Starting addresses of each RCC register type are shown in the **Traditional Modbus Reference** column of the Table 14.1.

2. The second method requires the Modbus Master to be configured with a specific **Modbus Command** and **Modbus Offset**. The supported Modbus commands and the associated offsets are also illustrated in Table 14.1.

Table 14.1 - Modbus Master Mapping				
RCC Reference	Maximum Range	Traditional Modbus Reference	Modbus Commands	Modbus Offset
%I1	2048	10001	Read Input Status (2)	0
%IG1	64	13001		3000
%S1	13	14001		4000
%K1	0	15001		5000
<hr/>				
%Q1	2048	1	Read Coil Status (1) Force Coil (5) Force Multiple Coils (15)	0
%M1	2048	3001		3000
%T1	2048	6001		6000
%QG1	64	9001		9000
<hr/>				
%AI1	512	30001	Read Input Register (4)	0
%AIG1	32	33001		3000
%SR1	200	34001		4000
<hr/>				
%AQ1	512	40001	Read Holding Register (3) Load Register (6) Load Multiple Registers (16)	0
%R1	2488	40513		0
%R1	2048	43001		3000
%AQG1	32	46001		6000
%R1	4096	410001		10000

CHAPTER 15: TROUBLESHOOTING / TECHNICAL SUPPORT

Chapter 15 provides commonly requested troubleshooting information and checklists for the following topics.

- Connecting to the RCC controller
- Local controller and local I/O
- CsCAN Network
- Removable media

In the event that this information is not enough, please contact Technical Support at the locations indicated at the end of this chapter.

15.1 LED - Normal Functionality

Table __ - LED: Normal Functionality				
LED Type	When OFF	When ON	When Flashing (1Hz)	When Toggling
PWR	No Power Applied	10-30VDC 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		
	White	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		

15.2 LED Load Program/Firmware Functionality

Table 15.2 - LED Load Program/ Firmware Functionality			
LED OK & RUN	Flashing Alternately	Flashing Together	Flashing Stops
Load program or firmware	Download in Progress	Download fails, number of flashes indicates the error.	Download Complete, unit reboots (allow 30 seconds).

15.3 Switch - Normal Functionality

Load switch

- Used for firmware updated, as noted in previous section

Run/Stop switch

- After boot-up, pressing the **RUN/STOP** switch for three (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 three (3) seconds performs an "Erase All" function, which deletes all application programs.

15.4 LED - Diagnostic Functionality

The LEDs are also used to indicate some fault conditions in the unit. The two LEDs, OK and RUN, will flash a number of times depending upon the fault. There will be a two-second gap and the pattern will be repeated. The number of flashes and the associated error are as follows:

No. of flashes	Table 15.3 - Diagnostic LED Flashing/ Fault Meaning
2	The MAC ID is empty.
3	The internal MAC file is corrupt.
4	The MAC ID TXT file is invalid.
5	The MAC ID file is not found or the USD card is empty or missing system files.

15.5 Connecting to the RCC

Cscape connects to the local controller automatically when the serial connection is made. The status bar below shows an example of a successful connection. This status bar is located in the bottom right hand corner of the Cscape window.

Local:253 Target:253(R) [no forces]

In general the **Target** number should match the **Local** number. The exception to this is when the controller is being used as a "pass through" unit where other controllers on a CsCAN network could be accessed through the local controller.

Determine connection status by examining feedback next to **Local & Target** in the status bar of Cscape.

Table 15.4 - Cscape Target & Local Numbers	
Local: ###	If a number shows next to Local , then communication is established to the local controller.
Local: No Port	Cscape is unable to access the COM port of the PC. This could mean that Cscape is configured for a COM port that is not present or that another program has control of the COM port. Only one Cscape window can access a port at a time. Subsequent instances of Cscape opened will indicate No Port.
Local: No Com	Cscape has accessed a PC COM port, but is not communicating with the controller. This typically occurs when the controller is not physically connected.
Local: ???	Unknown communication error. Close Cscape, power cycle the controller and reopen Cscape with a blank project. Check Local.
Target: #(I,R,D)	If I (idle), R (run), or D (do I/O) shows next to Target number , then communication is established to the target controller.
Target: #(?)	Communication is not established to the target controller. Check node ID of controller and set Target to match. Make sure local connection is established.

15.5.1 Connecting Troubleshooting Checklist (serial port - MJ1 Programming)

1. Controller must be powered up.
2. Ensure that the correct COM port is selected in Cscape. **Tools → Applications Settings → Communications.**
3. Ensure that a cable with proper pinout is being used between PC and controller port MJ1.
4. Check that a Loaded Protocol or ladder is not actively using MJ1.
5. Successful communications with USB-to-serial adapters vary. If in doubt, Horner APG offers a USB to serial adapter. Part numbers HE-XCK and HE-CPK.

15.5.2 Connecting Troubleshooting Checklist (ETN port programming)

1. Controller must be powered up.
2. Ensure that the correct IP address is given in the Ethernet field and correct Mode is selected, in Cscape: **Tools → Applications Settings → Communications Port.**
3. Ensure that an Ethernet connection has been established by pinging the controller from the Windows DOS prompt.

WARNING: Setting outputs ON in Do I/O mode can result in injury or cause machinery to engage in an unsafe manner depending on the application and the environment.

15.7 CsCAN Network

For complete information on setting up a CsCAN network, refer to CAN Networks manual (MAN0799) by visiting the Horner websites for the address to obtain documentation and updates.

Network status, node ID, errors, and baud rate in the controller system menu are all in reference to the CsCAN network. These indications can provide performance feedback on the CsCAN network and can also be used to aid in troubleshooting.

15.7.1 CsCAN Network Troubleshooting Checklist

1. Use the proper Belden wire type or equivalent for the network as specified in MAN0799.
2. The RCC does not provide 24VDC to the network. An external voltage source must be used for other devices such as SmartStix I/O.
3. Check voltage at both ends of the network to ensure that voltage meets specifications of attached devices.
4. Proper termination is required. Use 121 Ω (or 120 Ω) resistors at each end of the network. The resistors should be placed across the CAN_HI and CAN_LO terminals.
5. Measure the resistance between CAN_HI and CAN_LO. If the network is properly wired and terminated there should be around 60 Ω .
6. Check for duplicate node ID's.
7. Keep proper wires together. One twisted pair is for V+ and V- and the other twisted pair is used for CAN_HI and CAN_LO.
8. Make sure the baud rate is the same for all controllers on the network.
9. Assure shields are connected at one end of each segment -- they are not continuous through the network.
10. Do not exceed the maximum length determined by the baud rate and cable type.
11. Total drop length for each drop should not exceed 6m (20'). A drop may include more than one node. The drop length adds to the overall network length.
12. Network should be wired in "straight line" fashion, not in a "star" pattern.
13. In applications requiring multiple power supplies, make sure the V- of all supplies is connected together and to earth ground at one place only.
14. In some electrically noisy environments it may be necessary to add repeaters to the network. Repeaters can be used to add additional nodes and/or distance to the network and protect the signal against noisy environments. The Horner APG repeater is part # HE200CGM100.

15.8 Removable Media - Basic Troubleshooting

Table 15.5 - Removable Media Troubleshooting	
Description	Action
RCC does not read media card.	Attempt to reformat MicroSD card on PC
RCC will not download project file.	Make sure the project file is saved as a .pgm file and not a .csp file. In addition, to file must be .pgm, the file's I/O configuration must match the RCC configuration for it to download.

15.9 Technical Support Contacts

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

North America:

Tel: 1-877-665-5666

Fax: (317) 639-4279

Website: <https://hornerautomation.com>

Email: techspt@heapg.com

Europe:

Tel: (+) 353-21-4321-266

Fax: (+353)-21-4321826

Website: www.horner-apg.com

Email: tech.support@horner-apg.com

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