Axiom xa
Security Management System

Integrated Access Control and Security Management System

new generation
building security

RBH
ACCESS

HARDWARE MANUAL

Version 6.1.1

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The RBH Axiomxa™ System combines access control, building management, and security monitoring in a highly integrated and expandable package. Axiomxa™ Security Management Software runs on a standard IBM compatible PC and is designed for use in installations ranging from simple two door systems to complex systems covering multiple sites and containing thousands of access points and tens of thousands of cardholders.

The system can monitor over 1,000 networked controller units (**NC-100)** with each controller capable of monitoring eight card readers and 320 input/output points.   Remote site monitoring capability is 4,096 readers and 65,535 input/output points.   Local site capacity exceeds 8,000 readers and 250,000 input/output points.   A minimum configuration consists of a PC, a single controller unit (**NC-100**) and a single reader controller (**RC-2**) that allows connection of two card readers, eight inputs and eight outputs.

The PC is used for data entry, setting up the database, and monitoring activity on the system. Once the database is downloaded to the controllers, the PC is not required for system operation. Should the PC be powered down, the NC-100 controller will perform all access and other control functions, including logging up to 100,000 events. When the connection is restored, the log is reported to the PC.

Axiomxa™ Security Management software runs on all standard PC networks. On a networked PC system, all control functionality and system monitoring is available at all PCs. Networked systems are usually necessary on larger installations where a single operator can not handle the volume of incoming messages.

The Axiomxa™ system hardware consists of a number of different networks. The controller network (**C-NET)** links up to fifteen controller units to a single port on the PC. This network can be directly connected to a serial port on the PC in which case a separate serial port is required for each network. Controller number one in the network is designated the master and is connected to the PC and all other controllers are referred to as slaves.

All controllers in the network are connected together in a fault tolerant, high speed Arcnet LAN. Arcnet is a highly reliable networking architecture and is widely used in industrial control applications. This LAN module transfers data at speeds of 156k bits/second to 2.5M bits/second and when wired in a ring is immune to a single point of attack.   The network will continue to operate normally with a single short or a cut on any inter- controller connection.

The controllers use a powerful Motorola 32-bit micro controller and come standard with 256k bytes of RAM. A plug in memory expansion board allows the memory to be expanded to 16 Megabytes. All RAM is battery backed by a replaceable lithium battery. A built in watchdog circuit monitors the operation of the controller and performs a system reset if an out of control situation is detected.

Each controller has a second local network (**D-NET)** for connection to card reader controllers (**RC-2**) and input/output boards (**IOC-16**). This RS485 network operates at 38400 bits/second and is also wired in a fault tolerant ring providing protection from a single point of failure. Devices can be placed on the local network up to 3000 feet (1000 meters) apart and the network supports up to twenty devices (up to four RC-2s and up to sixteen IOC-16s). The controller polls each device on the network and processes any data reported such as access verification requests and input status changes.

A **RC-2** (*Reader Controller*) supports two access points. Each RC-2 can monitor two reader or reader/keypad units; eight input points and control eight output points. Inputs and outputs are programmable for dedicated access point functions such as door contact, request to exit button and door lock or can be used as general purpose I/O.

All operating information including times, facility codes, card formats and other parameters are stored locally in non-volatile memory in the RC-2. If communication is lost with the controller, the RC-2 can be programmed to operate in facility code mode where access is granted upon presentation of a valid facility code only. The system reverts to normal operation when communication resumes with the controller.

IOC-16 (*Input/Output Controller*) devices have sixteen ports, each configurable as an input or output. Outputs are programmable as normally energized or normally de-energized and a fire panel input facilitates fail-safe operation. Seven input configurations are provided ranging from simple normally closed contacts to two EOL loops for high security applications.

The system architecture utilized by Axiomxa™ is extremely powerful, flexible, and expandable. As new devices are developed for the system, compatibility will be maintained with existing network devices, ensuring continued possibilities for system upgrading and expansion.

Axiomxa™ System Diagram
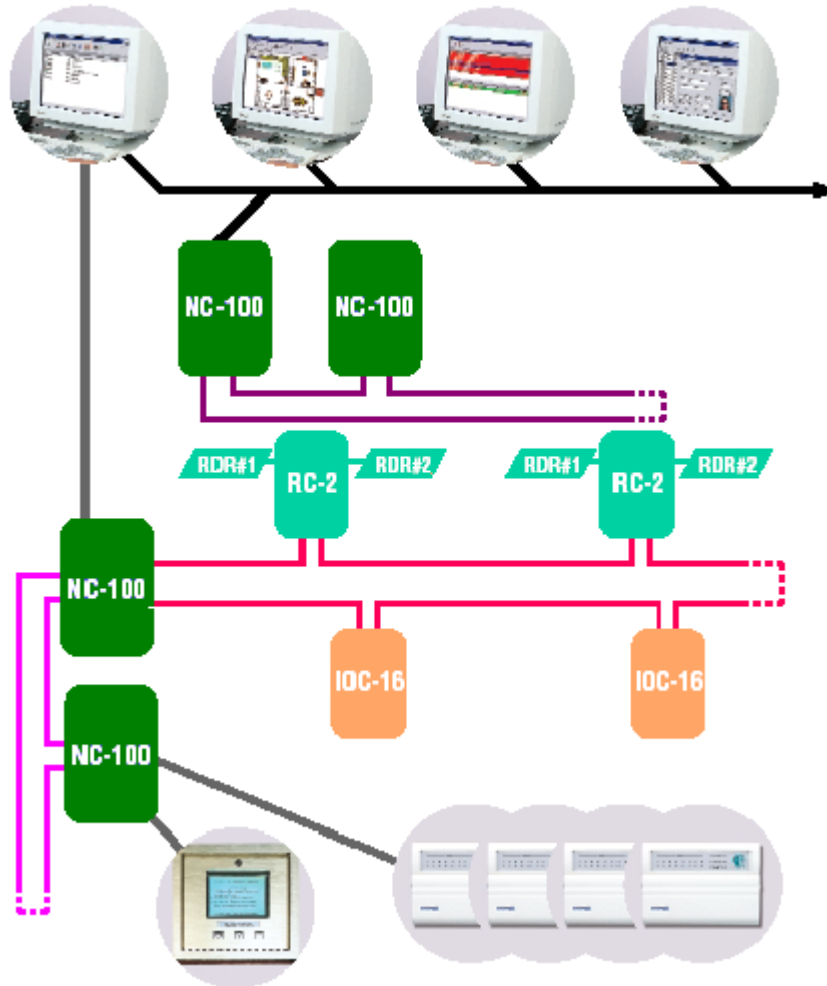
Chapter 2
Network Controller (NC-100)

The Axiomxa™ access control system consists of one or more network controllers (**NC-100**). All information required by the controller is downloaded from the PC and stored locally in battery backed flash memory. This information includes configuration data, cardholder records, access levels, schedules, and all other records necessary for the operation of the system. The controller operates independent of the PC and all decision-making is performed locally, even in the event of total power loss.

The NC-100 contains a powerful 32-bit micro-controller and has a base RAM configuration of 256k, expandable to 16M. Advanced features including 32-bit processing, built in high speed LAN interface, Flash RAM, and fault tolerant design make the NC-100 one of the most powerful and versatile controllers currently available.

NC-100 (Network Controller) Silkscreen Legend
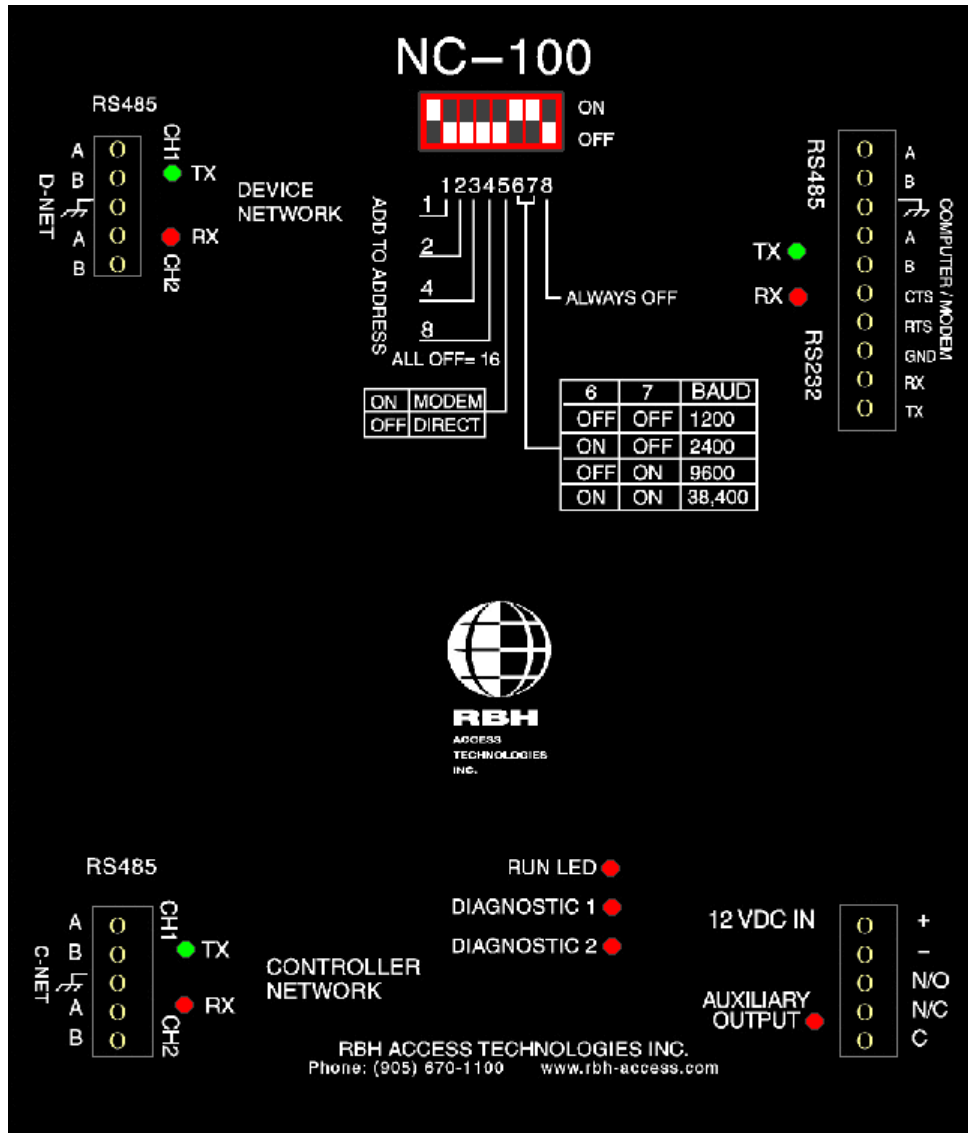
Connection Details

Power

The controller does not require a built in battery-backed power supply. Rather the NC-100 obtains its power from either the reader controller (*RC-2*) or the Input/Output controller (*IOC-16*).

The NC-100 requires 9-14vdc and draws about 220mA in the standard 256k RAM configuration.

Host Interface

The Host interface connects the NC-100 to a PC through either an RS232, TCP/IP Ethernet or an RS485 (*4 wire*) interface.

C-NET CH1 and CH2

The C-NET (*Controller Network*) connects NC-100 controllers together on a high-speed bi-directional fault tolerant network. CH2 on the master controller connects to CH1 on the next NC-100 on the network and so on. CH2 on the last controller in the network is wired back to CH1 on the first controller to form a ring (*see C-NET diagram on page 14*).

D-NET CH1 and CH2

D-NET (*Device Network*) connects local device controllers (*RC-2, IOC-16*) to the NC-100 controller on a high-speed bi-directional fault tolerant network. Connect CH2 on the NC-100 to CH1 on the first device controller, and connect CH2 on this device controller to CH1 on the next device controller on the D-NET and so on. Connect CH2 on the last device controller back to CH1 of the NC-100 to complete the ring (*see the D-NET diagram on page17*).

Auxiliary Output

This is a dry contact relay output rated for 2A@30vdc that does not have a valid use at this time.

Earth

The controller contains several layers of protection against induced high voltage transients from static discharge, lightning, and power line spikes. In order for this protection to be fully effective, a good connection to earth ground is essential. Wire this connection to a metal cold water pipe or similar structure. Do not connect directly to the AC earth. Use 16 AWG or heavier cable and keep the length as short as possible (*less than 50 feet [15meters]*).

Although the NC-100 has three possible ground connection points, the ground connections are normally made at the PC. This leaves the ground connections at the C-NET and D-NET ports available for cable shield connections.

DIP Switch Settings

The NC-100 DIP switch controls a number of operating parameters including the device address and serial port baud rate. The system must be powered down if the controller address is changed using DIP switches 1 through 4. All other DIP switch changes are processed immediately and do not require a power down.

Note: To Reset Panel – All DIP switches must be off.

DIP Switch	
DIP Switch	**Function**
1 - 4	Controller Address
5	Direct Host Connection
6,7	Controller Baud Rate
8	4 Wire RS485 (Always Off)

Controller Addressing

Use DIP switches 1, 2, 3, and 4 to select the controller address. The address is binary coded and the switch settings for all fifteen possible addresses are given below.

Controller Addressing				
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Address**
On	Off	Off	Off	1 (Master)
Off	On	Off	Off	2 (Slave)
On	On	Off	Off	3 (Slave)
Off	Off	On	Off	4 (Slave)
On	Off	On	Off	5 (Slave)
Off	On	On	Off	6 (Slave)
On	On	On	Off	7 (Slave)
Off	Off	Off	On	8 (Slave)
On	Off	Off	On	9 (Slave)
Off	On	Off	On	10 (Slave)
On	On	Off	On	11 (Slave)
Off	Off	On	On	12 (Slave)
On	Off	On	On	13 (Slave)
Off	On	On	On	14 (Slave)
On	On	On	On	15 (Slave)

Master Controller

Each C-NET must have a single NC-100 designated as the master controller. The master controller connects to the PC. Setting the DIP switch address to 1 will automatically designate a NC-100 as the master controller.

Slave Controller

NC-100 Controllers occupying addresses 2 through 15 in the C-NET are referred to as slave controllers.

Direct Connect

Leave DIP switch 5 off, modem selection is no longer supported.

Direct Connect / Modem Selection	
DIP Switch 5	**Interface Type**
OFF	Direct Connect To PC
ON	Modem

Computer Port Baud Rate Selection (Master Only)

The controller's serial port baud rate is set with controller DIP switches 6 and 7. This setting determines the speed used to communicate with the PC serial port. If the controller is connected directly to the PC, the controller baud rate must be the same as the baud rate set for the port on the PC. The default PC baud rate is 9600.

Controller Baud Rate Selection		
DIP Switch 6	**DIP Switch 7**	**Baud Rate**
OFF	OFF	1200
ON	OFF	2400
OFF	ON	9600
ON	ON	38400

RS485 4 Wire Interface Selection (Master Only)

RS485 4 Wire Interface Selection	
DIP Switch 8	**Interface Type**
OFF	4 Wire

Panel Reset

Setting all DIP switches to the off position and powering up the NC-100 will reset the memory completely.

PC Connection

The master controller is connected to a serial port on the PC. The PC serial port is assigned to the C-NET under the Communication Port Setup screen in the Axiomxa™ software.

Normally the baud rate is set to 9600 for direct connection to the PC using the standard RS232 interface. The baud rate may be lowered if the distance between the PC and controller is greater than 150 feet (*45 meters*) or 38400 baud may be used if the distance is less than 30 feet (*9 meters*).

To maintain speed at distances greater than 150 feet (*45 meters*), the RS485 interface should be used. RS485 is built into the NC-100 controller but is not part of the standard PC. The PC must be fitted with either an RS485 serial card or an external RS232 to RS485 serial port converter.

RS232 Connection

Controller to PC Connection (RS232)		
Controller	**DB 9 Connector**	**DB 25 Connector**
Ground	Gnd. Pin 5	Gnd. Pin 7
TX	RX Pin 2	RX Pin 3
RX	TX Pin 3	TX Pin 2

PC to NC-100 - RS232 Interface Wiring
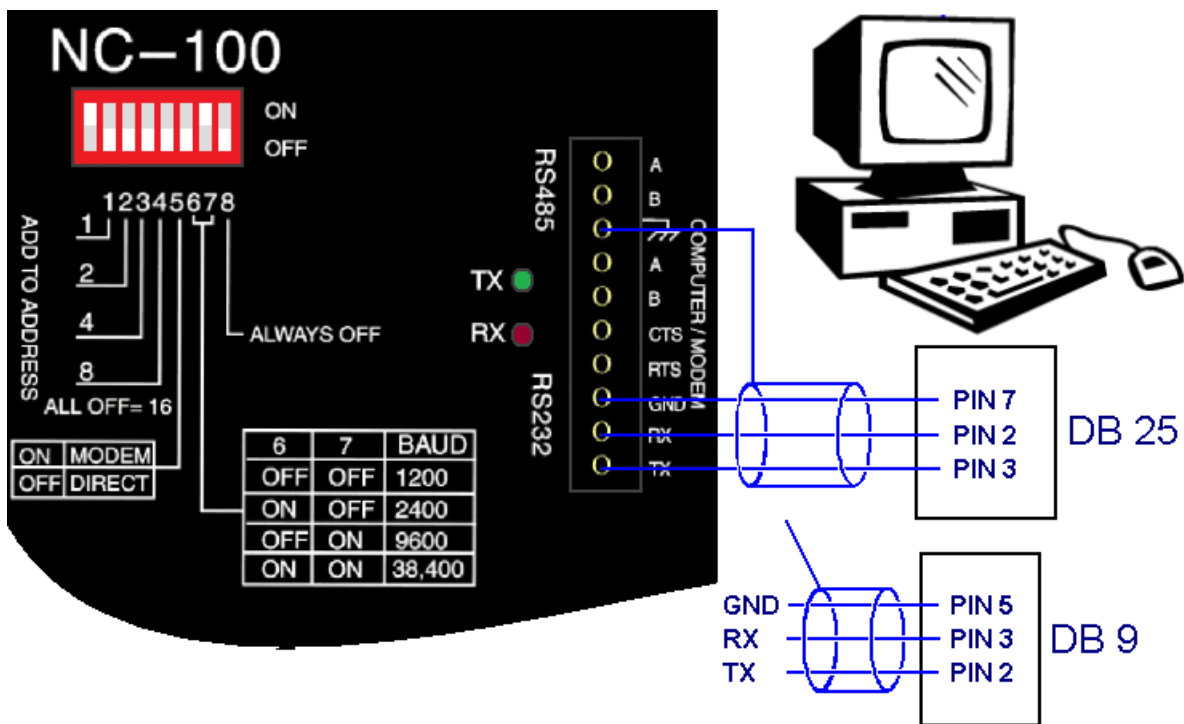
Cable Specification

    3 or 4 conductor shielded, 18 to 22 AWG

Maximum Cable Length

    9600 baud   150 feet (45meters)

    38400 baud   30 feet (9 meters)

RS485 Connection

The NC-100 controller supports 4 wire RS485 interfaces. DIP switch 8 should always be set to the OFF position, and will then always be ready for 4-wire RS485 operation.

The RS485 interface allows the distance between the controller and the PC to be extended up to 4000 feet (*1200 meters*) at 38.4k baud. RS485 requires two twisted pair cables and must be terminated at both ends with a 130-ohm resistor. This termination is already built into the NC-100. Ensure that the PC end provides proper termination. If not provided on board, add a 130-ohm resistor across both A/B connections at the PC end.

PC to NC-100 Connection – 4 Wire RS485 Interface Wiring
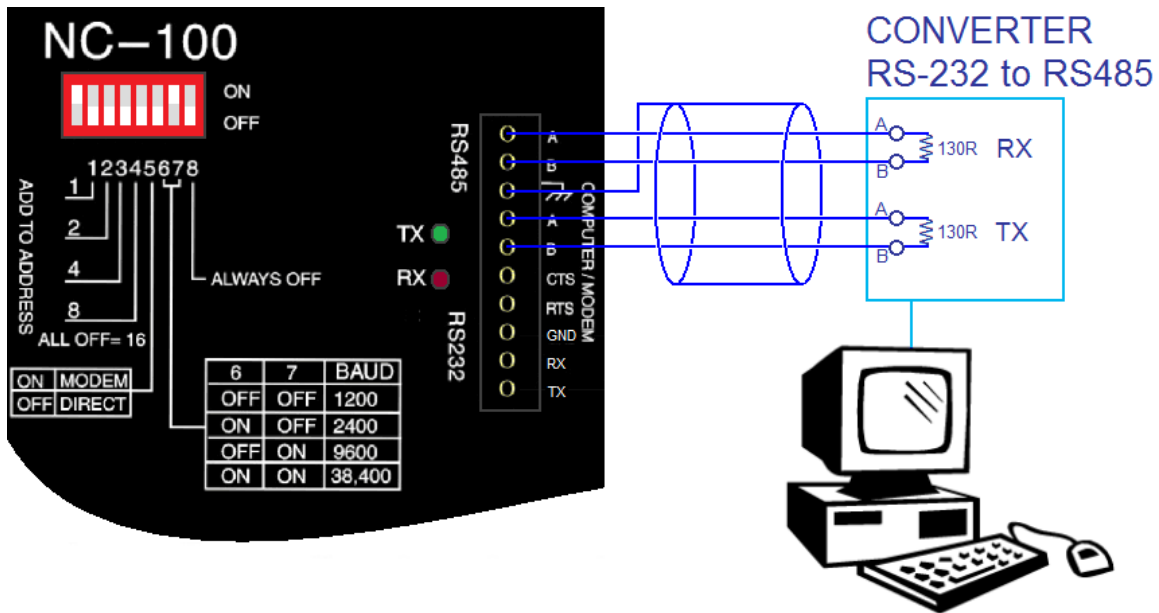
Cable Specification

2 twisted pair, individually shielded, 18 to 22 AWG

Maximum Cable Length

4000 feet (*1200 meters*)

NC-100 Networks

The NC-100 controller has two separate network interfaces. The **C-NET** (*Controller Network*) connects the master NC-100 to other slave NC-100 controllers using a secure bi-directional Arcnet LAN. The **D-NET** (*Device Network*) connects up to four RC-2 and sixteen IOC-16 controllers to each NC-100 in the C-NET using secure bi-directional RS485 communications. All field devices, such as readers, locks and contacts, are in turn wired into the RC-2 and IOC-16 device controllers.

C-NET (Controller Network)

Up to fifteen NC-100 controllers can be linked together and feed into a single communication port on the PC. Controller number 1 is designated the master controller and may be connected to the PC using serial or TCP/IP communications. The remaining controllers are referred to as slaves and can only communicate to the PC through the master NC-100. Serial ports on the slave NC-100 controllers are not used.

C-NET (Controller Network)
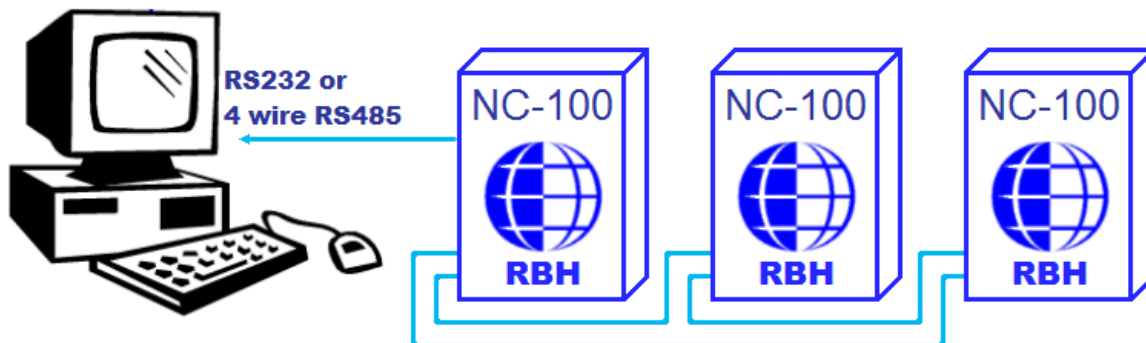
The controllers are wired together in a high-speed fault tolerant ring network. Fault tolerance means the system is immune to a single point of failure and will continue to operate with a short or cut on any single cable section. The fault condition is reported to the PC.

Each NC-100 controller has two network connections for C-NET communication, labeled Channel 1 and Channel 2, and the controllers are connected together in a daisy chain fashion. Channel 2 on the first controller to Channel 1 on its downstream neighbor. Channel 2 on the last controller is wired back to Channel 1 on the master controller to complete the network ring as per the following diagram.

C-NET (Controller Network) Connection Diagram
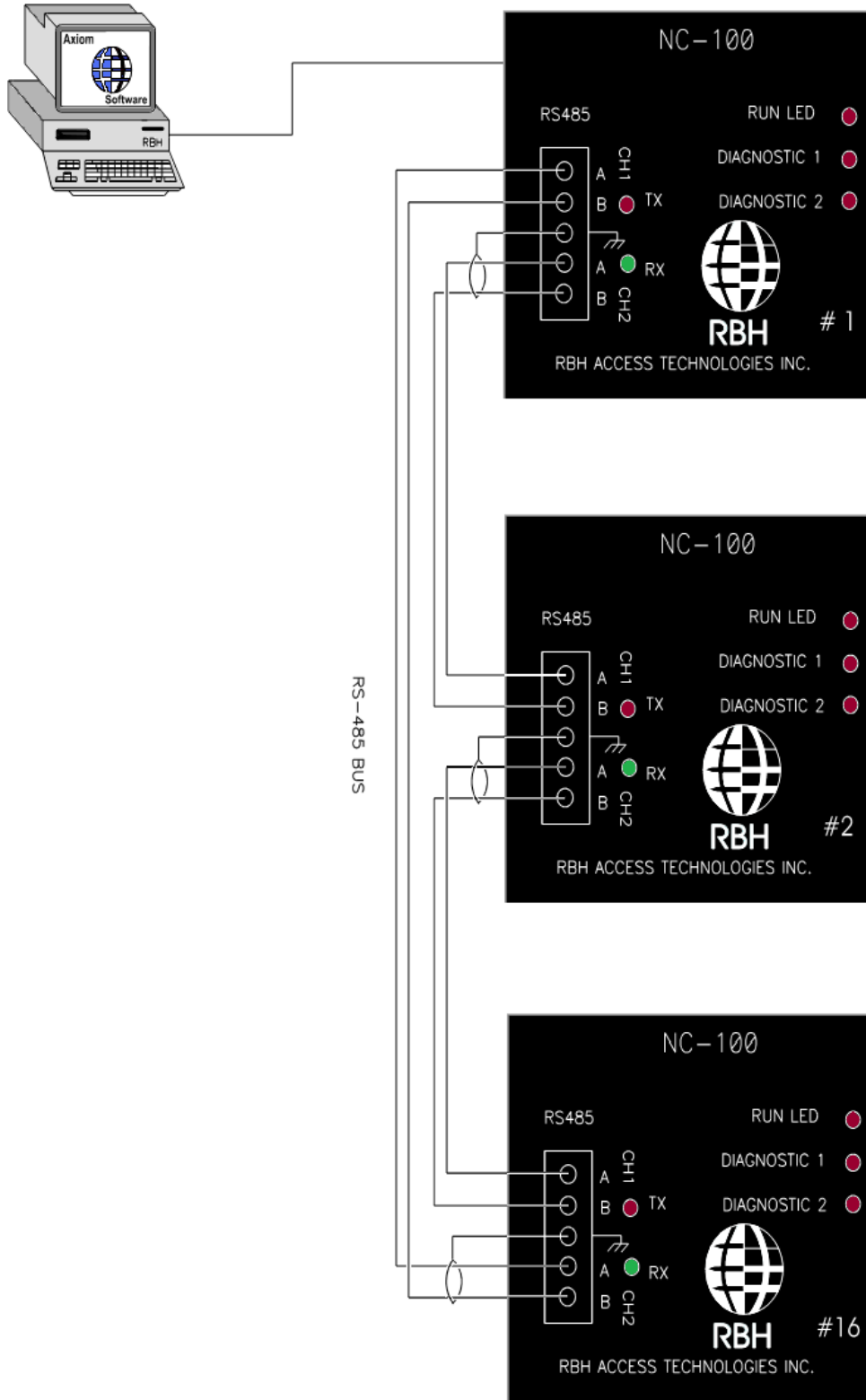
C-NET Cable

Use 20 to 22 AWG shielded stranded twisted pair cable for all C-NET connections.

C-NET Maximum Cable Length

The maximum distance for any link in the C-NET ring is 2500 feet (*760 meters*) and the total ring length cannot exceed 10000 feet (*3000 meters*).

Status LED's

Computer/ Modem Port

The computer port has two LEDs to show the flow of data between the NC-100 controller and PC. The red RX LED flashes when the controller receives data. The green TX LED flashes when the controller transmits data. If the controller is connected directly to the PC, the status LED flashes continuously.

C-NET LEDs

The inter-controller network (*C-NET*) has two status LEDs. The red RX LED flashes when data is received from another controller. The green TX LED flashes when the controller transmits data. On a properly functioning system the C-NET LEDs flash continuously and may appear to be on all the time.

D-NET LEDs

The device-controller network (*D-NET*) has two status LEDs. The red RX LED flashes when data is received from a network device (*RC-2, IOC-16*). The green TX LED flashes when data is transmitted by the NC-100 to any device controller on the D-NET. On a properly functioning system the D-NET LEDs flash continuously and may appear to be on all the time.

Run LED

The run LED flashes every half-second and indicates the system is running normally.

Diagnostic LEDs 1 and 2

These LEDs are used for factory diagnostics only.

1 – Flashes when receiving a message from other controller.

2 – Flashes in normal mode (*sending messages to other controllers*).

D-NET Device Network

Up to four RC-2 reader controllers, and up to sixteen IOC-16 input/output controllers, may be connected to each NC-100 in the C-NET using high speed RS485 communications over a fault tolerant bi-directional loop. This ring is called the D-NET. Fault tolerance means the system is immune to a single point of failure and will continue to operate with a short or cut on any single cable section. The fault condition is reported immediately to the PC.

D-NET (Device Network)
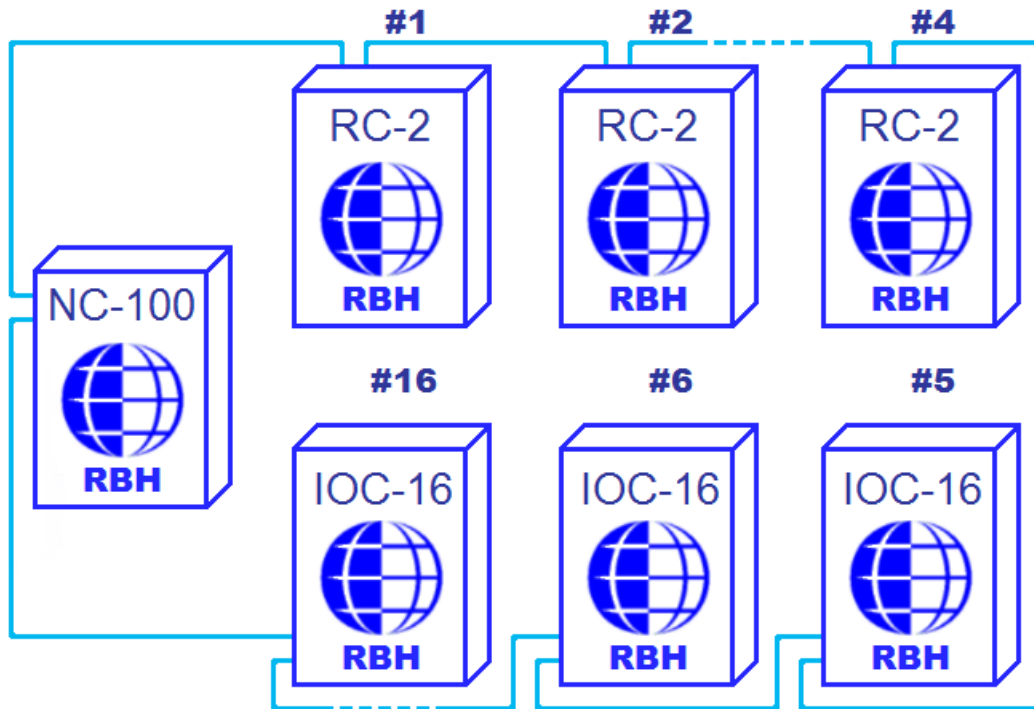
The D-NET connects IOC-16 and RC-2 device controllers in a daisy chain fashion to the NC-100 controller. Each NC-100 controller has two D-NET ports designated Channel 1 and Channel 2 and the D-NET is wired in a ring by connecting Channel 2 on the NC-100 controller to Channel 1 on the first RC-2 or IOC-16. Connect Channel 2 on the first device controller to Channel 1 on the next device controller and so on. Channel 2 on the last device is wired back to Channel 1 on the NC-100 controller to complete the ring.

Device controllers do not have to be in address sequence in the ring. However, using sequential device controller addressing is recommended as this makes your cabling diagrams easier to follow and simplifies troubleshooting as the devices are in the correct numerical sequence. Connect RC-2 Controllers (*up to four*) first in the D-NET, followed by up to sixteen IOC-16 Controllers as per the diagram on page 18.

Device Controller Address Assignment	
Address	**Device Controller**
1 – 4	RC-2
5 – 20	IOC-16

D-NET (Device Network) Connection Diagram
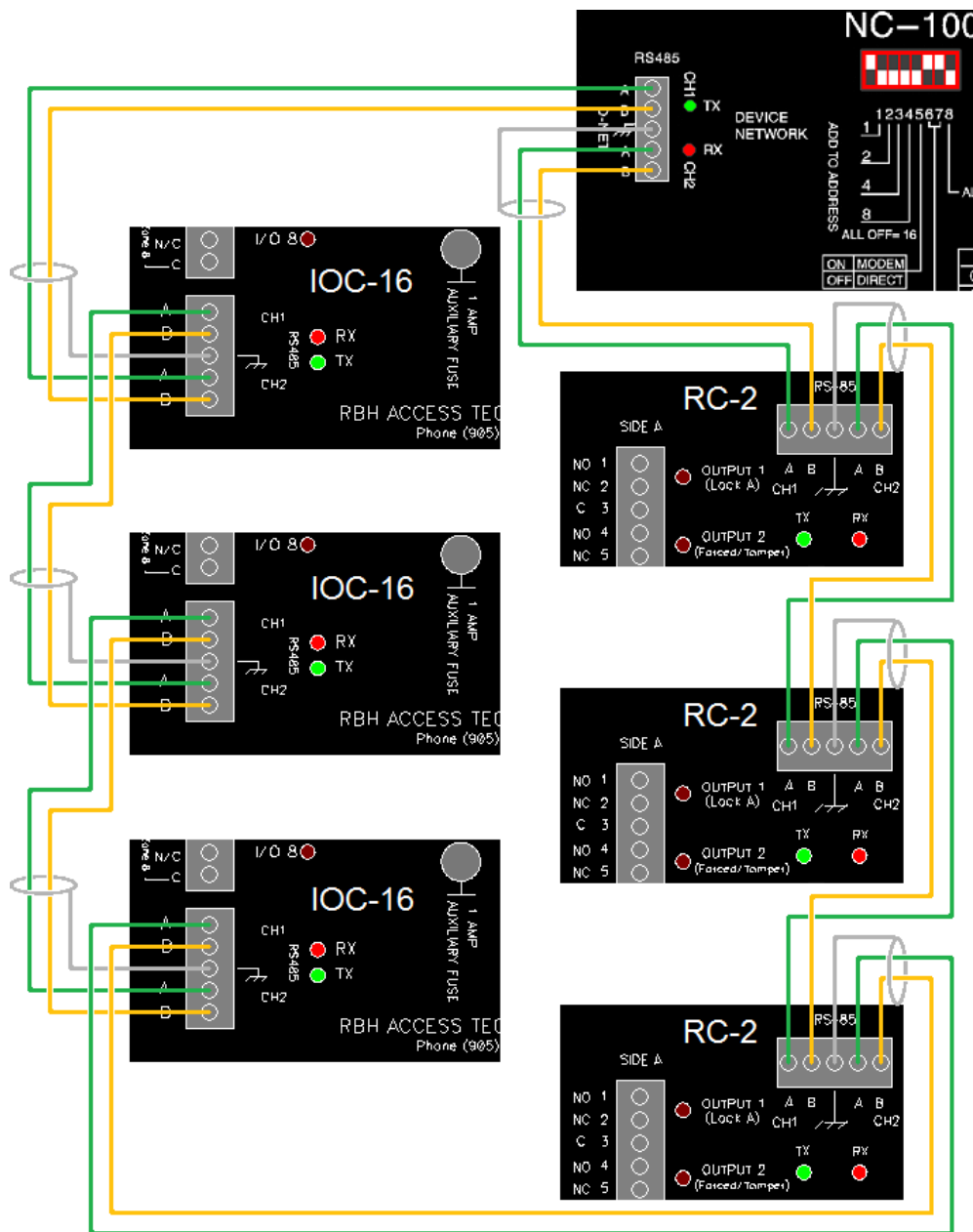
D-NET Maximum Cable Length

The maximum distance for any link in the ring is 3000 feet (*900 meters*) and the total ring length cannot exceed 15,000 feet (*4600 meters*).

D-NET Cable

Use 20 to 22 AWG shielded twisted pair cable for all D-NET connections. Shielded cable is recommended to minimize problems that can arise in electrically noisy environments. In addition, shielded cable may be necessary to prevent the network from interfering with signals on other cables in the same trunk.

D-NET Termination

There are some controllers/devices that do not have termination built into the unit. These devices are: UNC500, PC100, and SafeSuite™. In most cases, termination is not needed because the devices are connected to other devices on the network that will have termination built in. Units which terminate automatically are the NC100, RC2, and IOC16. The NRC and NURC (*trimmed down replacements for the RC-2*) can be terminated using jumpers JP2, JP3, and JP4 or JP1, JP2, and JP3 (*respectfully*). All three jumpers must be ON.

SafeSuite™ units are normally installed with Riser boards which have termination on each leg of the 485 connections so nothing else needs to be done to terminate these units. PC100s will normally be added to networks which have terminated devices such as RC2s or IOC16s. If possible, always put a device that can be terminated at the start and end of the line. For example; if you have a system where the PC100 is mixed with NRCs or NURCs, make sure that PC100 is not the last device. This will allow you to set the jumpers on the NRC or NURC for termination on the first and last device. Because the UNC does not have termination jumpers, the first device connected to the UNC500 will have termination as will the last device on that DNET.

Clearing NC-100 Memory

The NC-100 battery backed RAM can be completely cleared by the following process.

1. Power down the controller.

2. Set all eight DIP switches to OFF.

3. Power up the controller.

4. Wait until the two diagnostic LEDs flash rapidly.

5. Power down the controller and set the DIP switches to configure the controller.

6. Reapply power to the controller.

Clearing the RAM in this manner is only necessary in the rare occasion where RAM is completely corrupted and the system is unable to communicate with the PC.

C h a p t e r   3
R e a d e r   C o n t r o l l e r   (R C - 2)

Each RC-2 monitors two readers or reader/keypad units as well as eight inputs and controls eight outputs. RBH recommends that RC-2's be used for dedicated access point operation. However in certain instances inputs and outputs may be individually configured for general I/O purposes.

The RC-2 has two sides, labeled A and B, and each side implements an independent access point. Typically an access point includes a reader, door contact, request to exit button and programmable outputs for lock, forced entry, door held open and alarm shunt.

Each RC-2 includes two built in power supplies. The 1Amp reader power supply provides both 5 and 12 volt DC power for reader devices. An additional 1Amp@12volts is available on the auxiliary power output to power other devices such as motion detectors and warning devices. The system requires a 40 or 80 VA transformer and a rechargeable backup battery.

A separate 12/24-volt power supply is provided for powering door locks.

The RC-2 performs extensive system status monitoring and provides a high degree of local feedback on system status for the technician. AC power, battery voltage, reader, and auxiliary fuses are all monitored. Status LEDs indicate the status of all inputs and outputs, AC fault, low voltage, fuse blown, communication activity, and run information.

RC-2 (Reader Controller) Silkscreen Legend
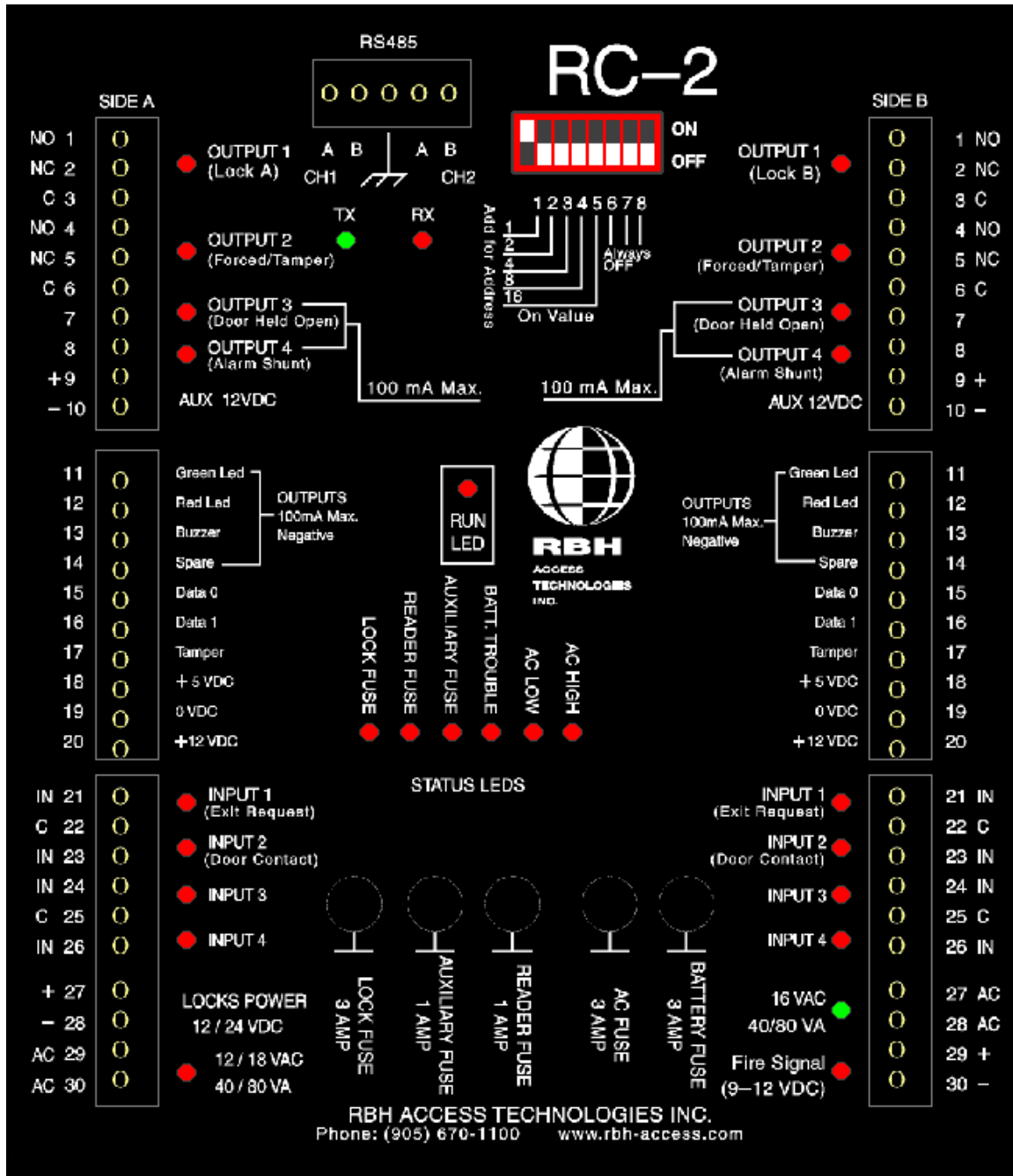
Connection Details

The RC-2 has two sides labeled A and B. References to A and B below refer to side A and B of the RC-2.

Output 1 A/B (Terminals 1, 2, 3)

SPDT dry contact relay, 2A@30V

Output 2 A/B (Terminals 4, 5, 6)

SPDT dry contact relay, 2A@30V

Output 3 A/B (Terminal 7)

Open collector to ground, sinks 100ma@12vdc. Use for switching light loads such as relays or piezo buzzers.

Output 4 A/B (Terminal 8)

Open collector to ground, sinks 100mA@12V

Auxiliary Power Output (Terminals 9, 10)

This fused output provides 12vdc@1A to power external devices.

Reader A/B (Terminals 11 To 20)

These terminals provide the Wiegand reader interface.

Inputs 1, 2, 3, And 4 A/B (Terminals 21 To 26)

These terminals provide four supervised input circuits for each of sides A and B.

Lock Power DC Output (Terminals 27, 28 Side A)

DC power for door locks. The output voltage is 12 or 24volts depending on the transformer used. **The lock power supply is not battery backed.** An external power supply must be used if battery backup is required for lock devices.

Lock AC Power Input (Terminals 29, 30 Side A)

The RC-2 has a separate power supply for the lock. This supply requires a separate AC transformer suitable for the lock being used. The lock power supply accepts 12 to 18vac and can deliver up to 3Amps. Use a 40VA transformer if the lock draws 2Amps or less. Use an 80 VA transformer if the current draw is between 2Amps and 3Amps.

Main AC Power (Terminals 27, 28 Side B)

The RC-2 is powered from a 16.5vac transformer. A 40VA transformer is adequate if the combined auxiliary and reader current draw is 1Amp or less. An 80VA transformer is required for heavier loads. A 12volt rechargeable battery provides backup power. A current-limited, float-charging circuit provides battery charging.

Powering From DC

To power the RC-2 from an external DC supply, connect a 12 to 14volt external supply to the AC inputs. Do not connect to the battery input as the battery input is disconnected until power, which normally comes from the AC, is applied to the controller. The system will report an AC low condition if the input voltage drops below 14volts.

Backup Battery (Red and Black Leads)

Use a 12v lead acid or gel cell rechargeable battery with a rating of 6AH or higher.

Fire Release Input (Terminals 29, 30 Side B)

The fire input requires 12vdc from the fire panel. As long as the 12volts is present, the onboard outputs are enabled and are under the control of the RC-2. In the event of a fire, the fire panel removes the 12volt signal and all relay outputs are de-energized. This is typically used to unlock doors in the event of a fire. Lock outputs should be programmed as normally energized (*unlocked when de-energized*) for fail-safe operation. **Electronic outputs are unaffected by the fire release input.** If fire signal monitoring is not required, this input must be connected to the RC-2 auxiliary power output to provide the required 12volts.

******************************* *Warning* *************************************

The fire release function of the RC-2 is not UL or ULC approved. The fire release function works best when all reader input and output configurations are set to default (check Chapter 9 in the Axiomxa™ User Manual for default settings). Fire release functions should be thoroughly tested following any change to RC-2 inputs and outputs.

▪▪▪

Tamper

Connect the tamper leads to a normally closed cabinet tamper switch. If a cabinet tamper switch is not used, the tamper leads should be shorted.

DIP Switch Settings

The RC-2 DIP switch sets a number of operating parameters. The RC-2 controller reads the DIP switch continuously and the configuration can be changed without the need to power down the controller.

DIP Switch	
DIP Switch	**Function**
1 - 5	RC-2 Address
6, 7, 8	Not used (Always set to OFF)

RC-2 Addressing

Up to four RC-2 devices can be attached to a controller allowing a total of eight readers to be connected. The four RC-2s must be assigned addresses in the range 1 to 4. Addresses must be unique and the network will not operate properly if duplicate addresses are programmed.

RC-2 Addressing					
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Address**
On	Off	Off	Off	Off	1
Off	On	Off	Off	Off	2
On	On	Off	Off	Off	3
Off	Off	On	Off	Off	4

Status LED's

Run

The run LED indicates that the RC-2 is operating. Normally the LED flashes once every second. Very rapid flashing indicates the RC-2 is not communicating with the controller.

AC High

The AC high LED comes on when the AC voltage is above 20volts RMS.

AC Low

The AC low LED comes on when the AC voltage drops below 14volts RMS.

Battery Trouble

The battery trouble LED indicates that the battery voltage is below 11volts.

Reader Fuse

The reader fuse LED indicates the 1Amp reader fuse is blown. This fuse is blown if the reader 5 or 12volt output is overloaded.

Auxiliary Fuse

The auxiliary fuse LED indicates the 1Amp auxiliary fuse is blown.

Lock Fuse

LED on indicates the lock fuse is blown.

D-NET LED's

The local-controller network has two status LEDs. The red RX LED flashes when data is received from the controller. The green TX LED flashes when data is transmitted by the RC-2. Normally the status LEDs flash continuously.

Battery Test

A dynamic battery test is performed under scheduled control. During the test a 1Amp load is switched across the battery and the voltage is monitored. At the end of the test a pass or fail message is reported to the PC. The frequency and duration of the test are programmable from the Axiomxa™ software. Typically the battery is tested once every day and the test duration is thirty seconds.

Battery Protection

The backup battery is protected from deep discharge and possible irreversible damage during a prolonged ac power failure. The battery voltage is continuously monitored and will disconnect if the voltage drops below 10 volts.

Inputs

The RC-2 has eight fully supervised inputs, four on side A and four on side B. Each input is individually programmable from the PC. The RC-2 employs digital filtering to eliminate the effect of interference on the input loops and verifies all loop changes before reporting to the controller. Loop resistance is continuously monitored using a built in eight bit analog to digital converter and can be viewed from the PC, providing the service technician with a valuable diagnostic tool and allowing marginal circuit loops to be detected and repaired before a full blown fault develops.

Each input has four states: Restore, Alarm, Trouble, and Illegal. Trouble is reported if a short or break is detected on a supervised circuit and illegal is reported if the measured loop resistance lies between valid states. For example, if the circuit type is programmed as '2 resistor normally closed', 1k represents a restored state and 2k represents an alarm state. If the loop resistance changes by more than 15% but not enough to enter the next state, an illegal state is reported.

RTE Request to Exit (Input 1A, 1B)

The RTE input is connected to a push button mounted on the door or to a motion detector mounted near the door. A normally open or normally closed button can be used and the circuit type can be programmed from the PC. Activating the RTE input will unlock the door. The RTE can be disabled by time zone. This input can be used as a general purpose input if RTE operation is not required. If not used, leave the default RTE settings in the Axiom$xa^{™}$ software configuration.

Door Contact (Input 2A, 2B)

The door contact input monitors the state of the door. Forced entry, door held open alarm, and door held open warning require monitoring of the door state. This input can be used as a general-purpose input if the door contact is not required. If not used, leave the default RTE settings in the Axiom$xa^{™}$ software configuration.

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Door Contact Connection Diagram
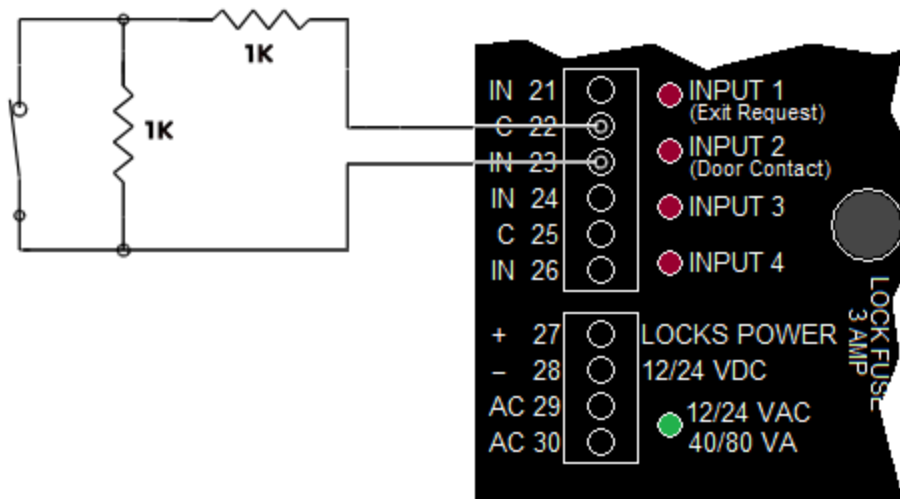
Input Circuit Types

The RC-2 supports seven different input circuit types ranging from no resistor for low security applications to two resistor normally closed circuits where the highest security is required.

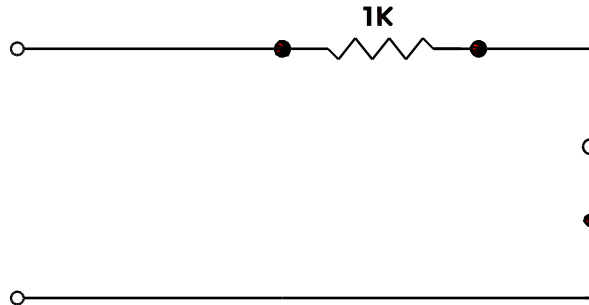| Normally Closed, No Resistor	
Loop Resistance	**State**
Short	Restore
Open Circuit	Alarm

Normally Open, No Resistor	
Loop Resistance	**State**
Short	Alarm
Open Circuit	Restore
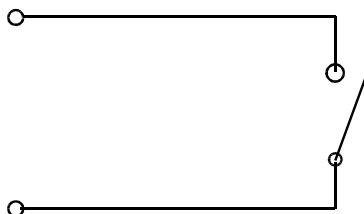
Normally Closed, One Resistor	
Loop Resistance	**State**
Short	Trouble
1k	Restore
Open Circuit	Alarm

Normally Closed, Two Resistor	
Loop Resistance	**State**
Short	Trouble
1k	Restore
2k	Alarm
Open Circuit	Trouble
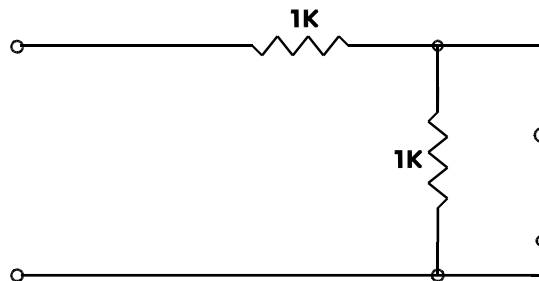
This circuit provides a high degree of supervision and detects both short and open circuit fault conditions. Use this circuit in high security applications.

Normally Open, One Resistor	
Loop Resistance	**State**
Short	Alarm
1k	Restore
Open Circuit	Trouble
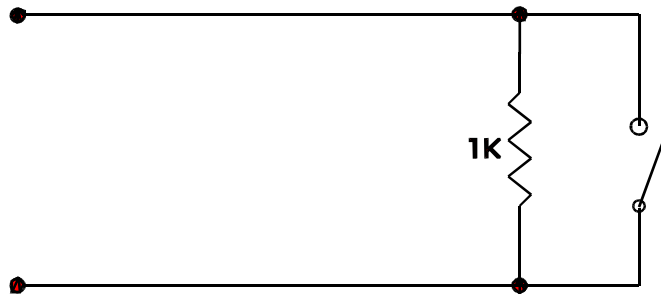
Normally Open, Two Resistor	
Loop Resistance	**State**
Short	Trouble
1k	Alarm
2k	Restore
Open Circuit	Trouble
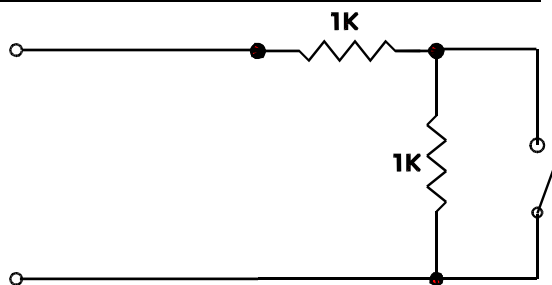
Normally Open And Normally Closed, One Resistor	
Loop Resistance	**State**
Short	Alarm
1k	Restore
Open Circuit	Alarm
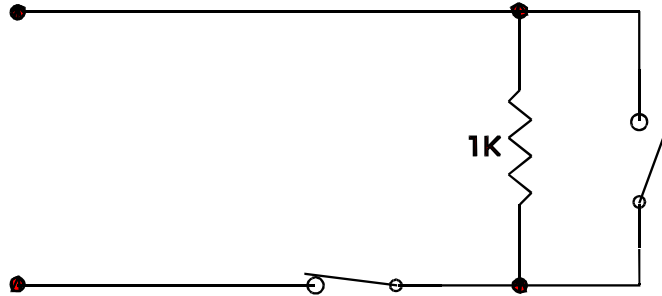
This circuit type is used where normally open and normally closed contacts are used in the same loop.

Outputs

The RC-2 has eight outputs, four on side A and four on side B. Outputs 1A/B and 2A/B are dry contact relays capable of switching 2Amps@30vdc. Outputs 3A/B and 4A/B use electronic drivers and can switch 100ma. Outputs are programmable from the PC as normally energized or normally de-energized. Normally energized outputs are used for fail-safe operation where it is essential that the output return to a safe state when the system fails due to power loss, communications failure, or fire.

Electronic outputs are 'switched negative' which means that they switch the power negative to the terminal. When the output is off, the output terminal is electronically disconnected. Outputs can be programmed to operate in a default mode described below or they can be used as general-purpose outputs. However, the output definition in the Axiomxa™ configuration software should never be left blank. If the output is unused, use the default output definitions provided in the Axiomxa™ configuration software.

Electronic Output Connection Diagram
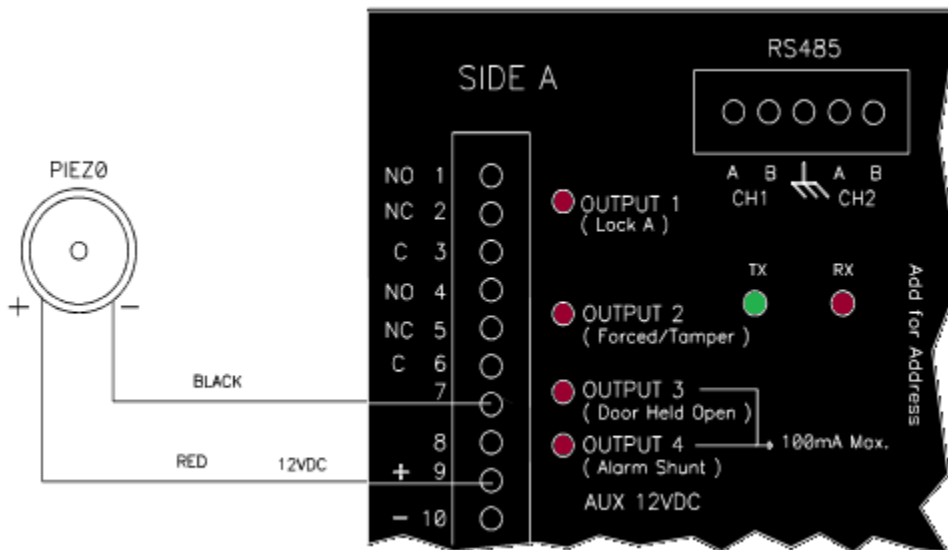
Switching Inductive Devices (Locks, Bells)

Exercise caution when switching an inductive load. Inductive devices include external relay, solenoids, bells, and door locks. All of these devices generate extremely high voltage spikes (*several thousand volts*) when power is applied or removed and possible disruption of the operation could occur if this interference gets on to the electronic circuit board.

This interference can be suppressed by placing a diode (*1N4001 or similar*) across the lock or other inductive device being switched. Connect the diode cathode (*end with band*) to the positive terminal and the other end to the negative terminal. The diode must be placed at the device being switched and not at the controller.

Default Output Operation

Lock Output (Relay Outputs 1A, 1B)

Output 1 controls a magnetic lock or door strike.

Magnetic Lock Connection Diagram
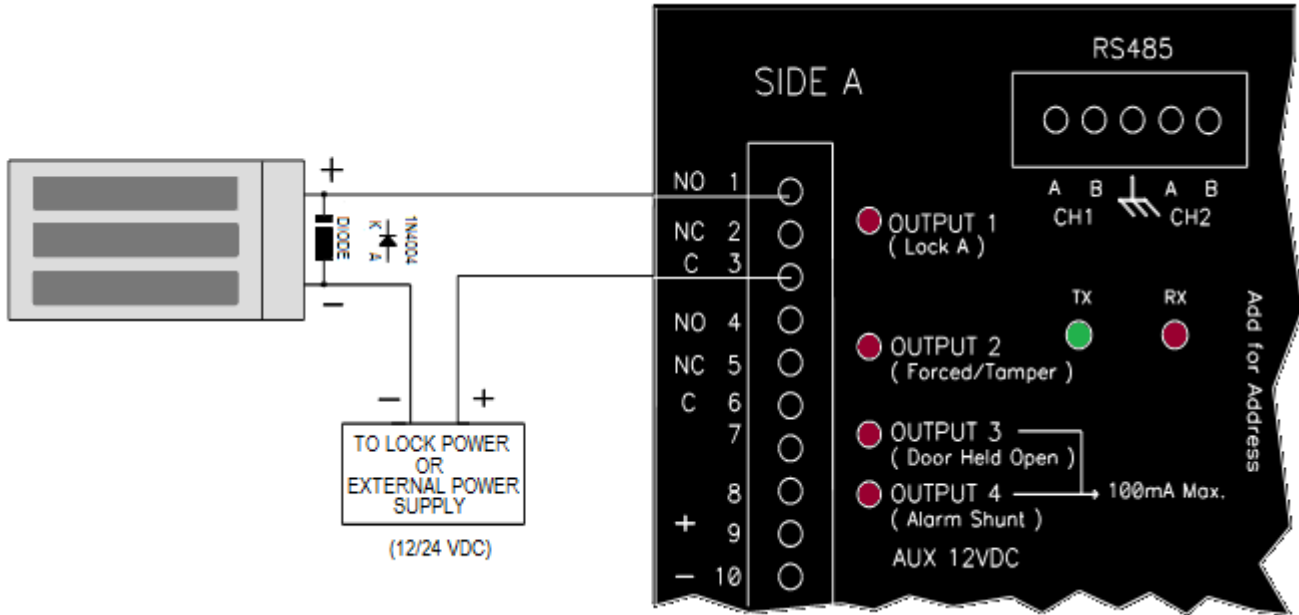
For magnetic locks, the relay should be configured from the PC as normally energized for fail-safe operation. If power fails (*AC and battery*) or the fire input is released, the power to the magnetic lock is removed and the door is opened.

Door Strike Connection Diagram
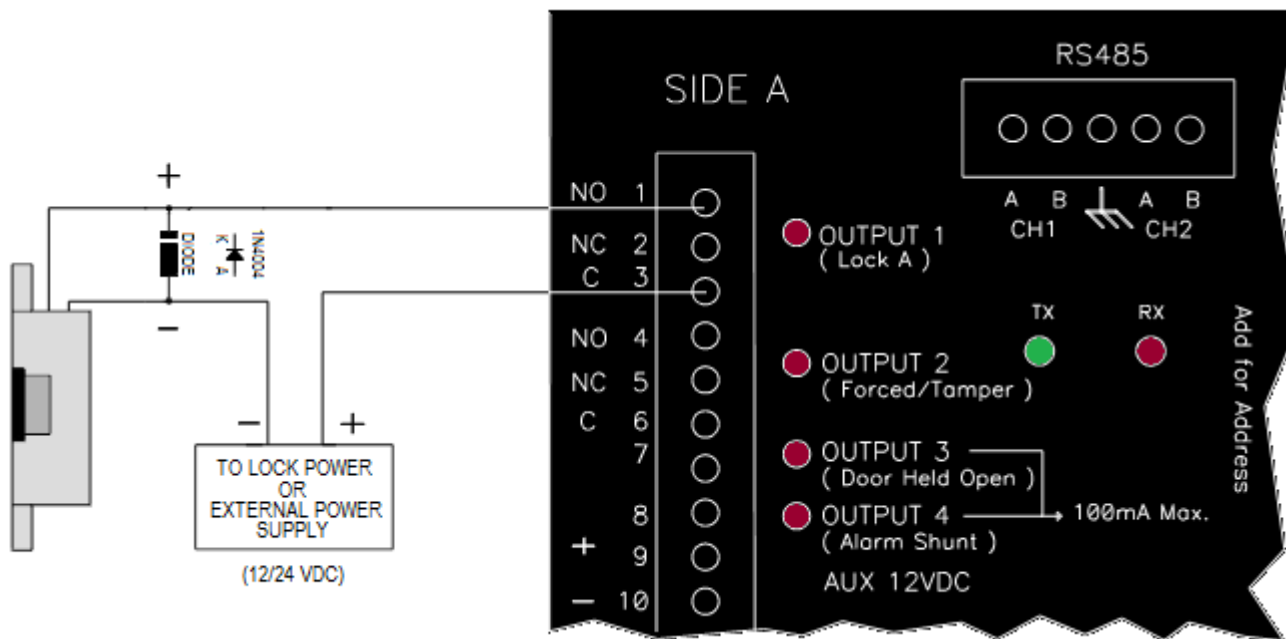
Forced / Tamper (Relay Outputs 2A, 2B)

Output 2 turns on if the door is forced open or if a reader tamper is detected. This output remains on for as long as the alarm condition exists.

Door Held Open (Electronic Outputs 3A, 3B)

Output 3 turns on if the door is held open longer than the PC programmed limit. This output remains on until the door closes. During the warning period, this output will pulse every second.

Door Held Open Alarm Output Connection Diagram

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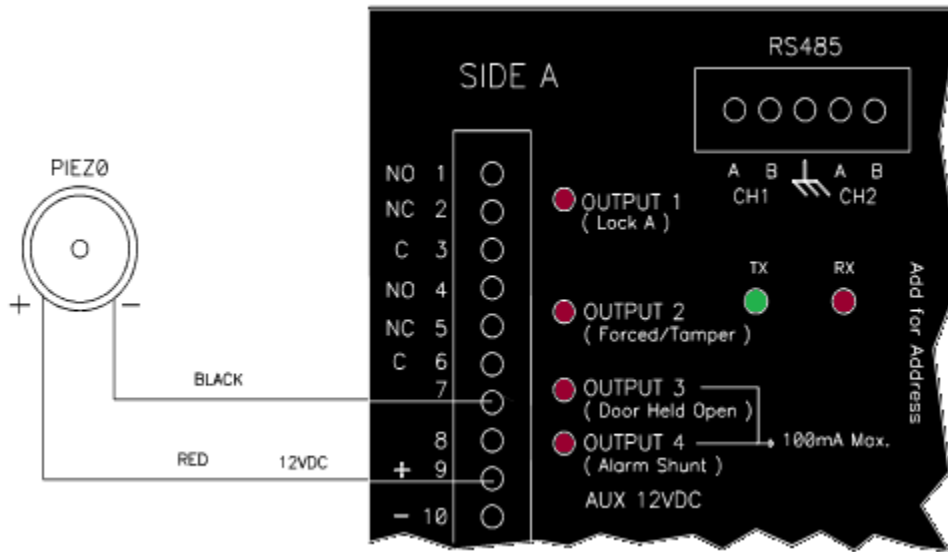
Alarm Shunt (Electronic Outputs 4A, 4B)

The alarm shunt output turns on when the door is unlocked. This output turns off when the door is re-locked if the door is closed at that time; otherwise the output turns off when the door closes. Normally the shunt output is used to shunt the door contact if a secondary alarm panel monitors the contact.

Alarm Shunt Output Connection Diagram
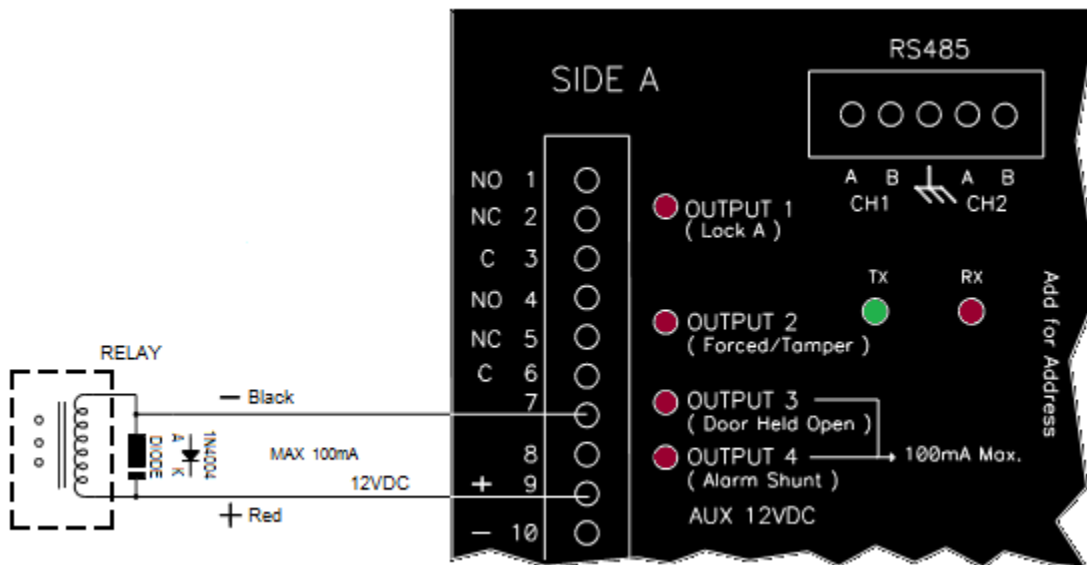
Access Point Operating Modes

Two Person (Escort)

The Red LED flashes slowly.

In Escort mode, two valid cards are required for access. The reader Buzzer beeps rapidly after the first card is presented. A second valid card must be presented within ten seconds for access to be granted.

High Security

The Red LED flashes quickly.

In high security mode, only cardholders with high security clearance are allowed access.

Unlocked

The green LED turns on to indicate the door is unlocked.

Tamper

The Buzzer sounds continuously.

Lockout Alarm

The Buzzer beeps rapidly.

A lockout alarm occurs when a user-defined number of 'Access Denied' messages occur. These messages can include 'Invalid Card Number', 'No Access at this Time', 'No Access at this Reader', or 'Invalid PIN Code'.

Door Held Open Warning

The Buzzer beeps slowly.

Door Held Open Alarm

The Buzzer beeps rapidly.

Keypad / Reader Combination

The Buzzer emits a short beep every second after a card is presented, until a PIN is entered.

Access Granted

The Buzzer emits one long beep and the green LED turns on for the duration of the unlock time.

Access Denied

The Buzzer emits two short beeps and the red LED flashes twice.

Reader Connection Diagrams

The RC-2 supports any reader device using the Wiegand format.

RC-2 to 5-Volt Reader Connection Diagram[1]
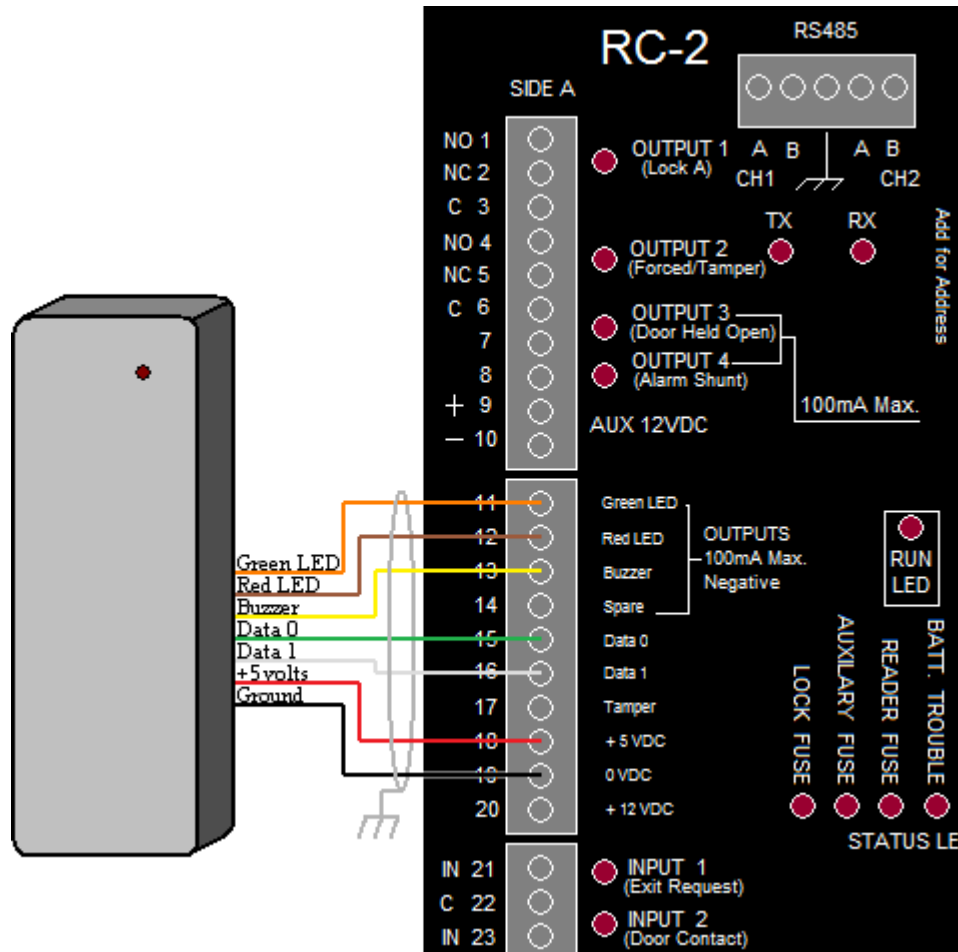
Cable Specification

5-conductor, stranded, shielded cable (*not twisted*), 20 to 22 AWG

Maximum Cable Length

22 AWG Cable: 250 feet (*75 meters*)

20 AWG Cable: 500 feet (*150 meters*)

---

[1] Reader wire colours may vary for different reader manufactures. Please verify your wiring.

RC-2 to 12-Volt Reader Connection Diagram[2]

Cable Specification

> 7-conductor, stranded, shielded cable (*not twisted*), 20 to 22 AWG

Maximum Cable Length

> 22 AWG Cable: 250 feet (*75 meters*)

> 20 AWG Cable: 500 feet (*150 meters*)

---

[2] Reader wire colours may vary for different reader manufactures. Please verify your wiring.

RC-2 to 24-Volt Reader Connection Diagram[3]

Cable Specification

6-conductor, stranded, shielded cable (*not twisted*), 20 to 22 AWG
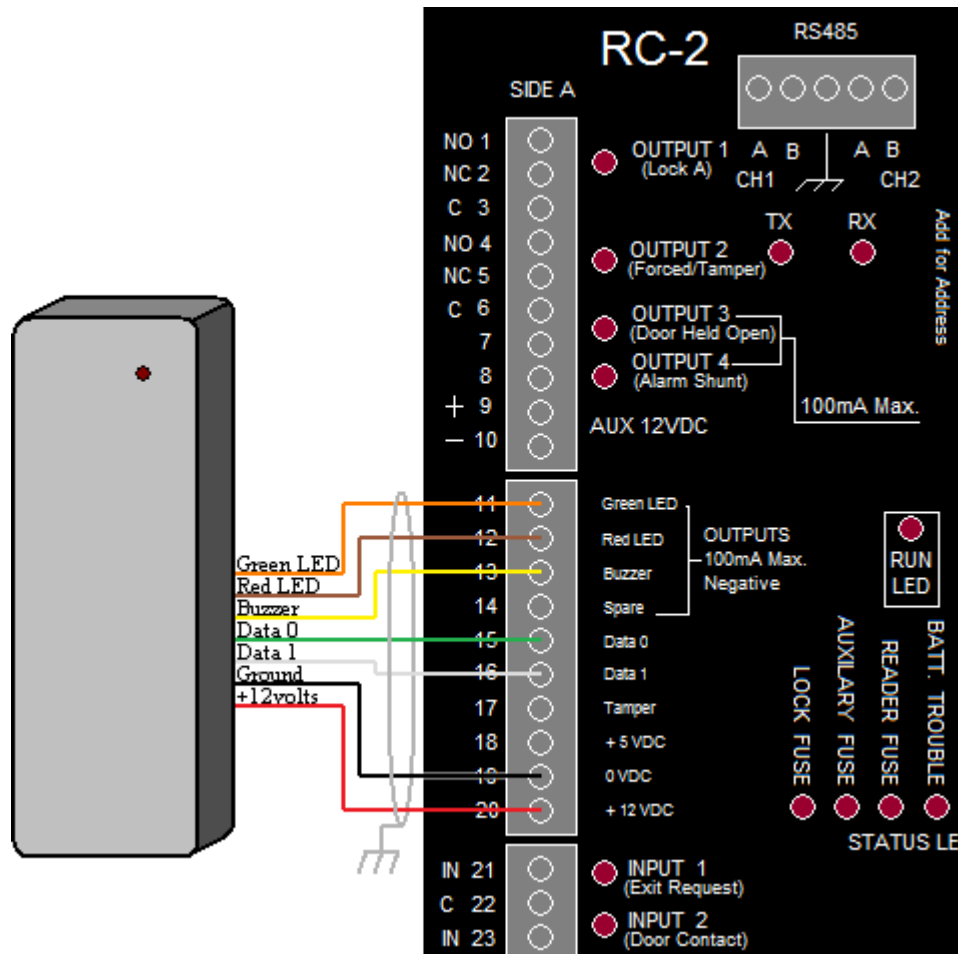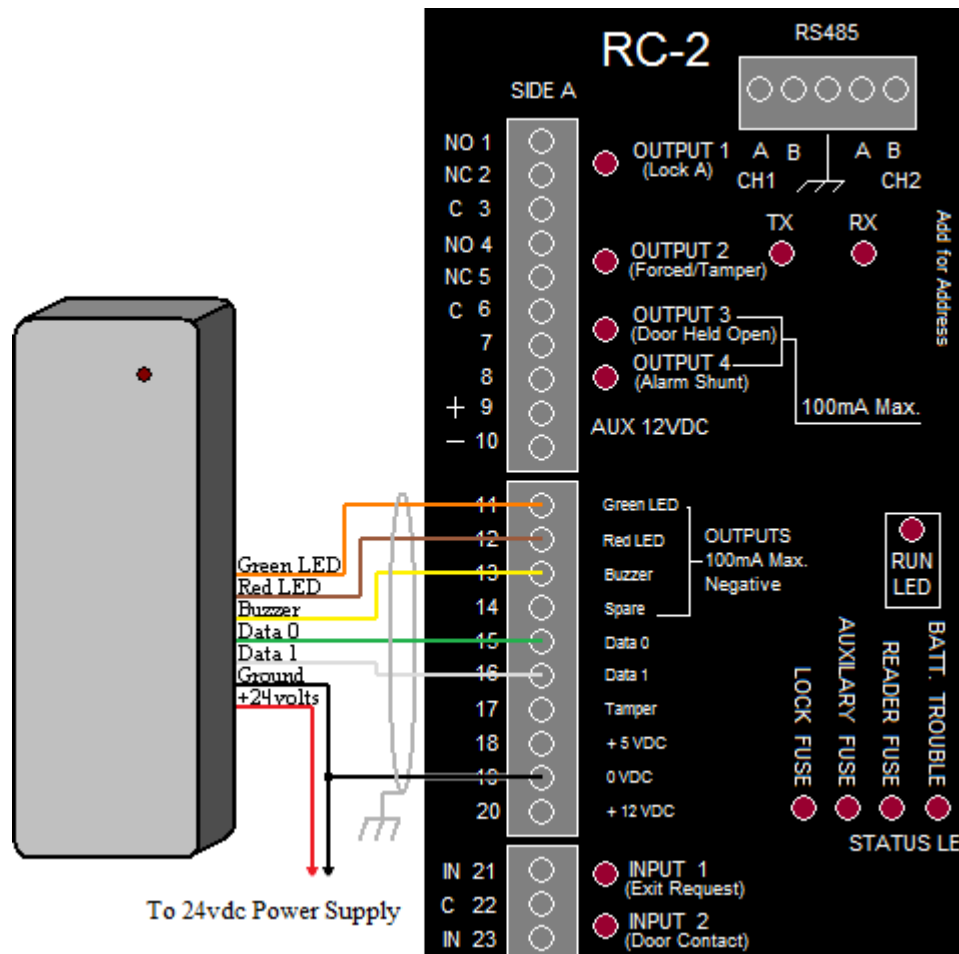
Maximum Cable Length

22 AWG Cable: 250 feet (*75 meters*)

20 AWG Cable: 500 feet (*150 meters*)

---

[3] Reader wire colours may vary for different reader manufactures. Please verify your wiring.

12-Volt Keypad Connection Diagram[4]

(with or without proximity)

Cable Specification

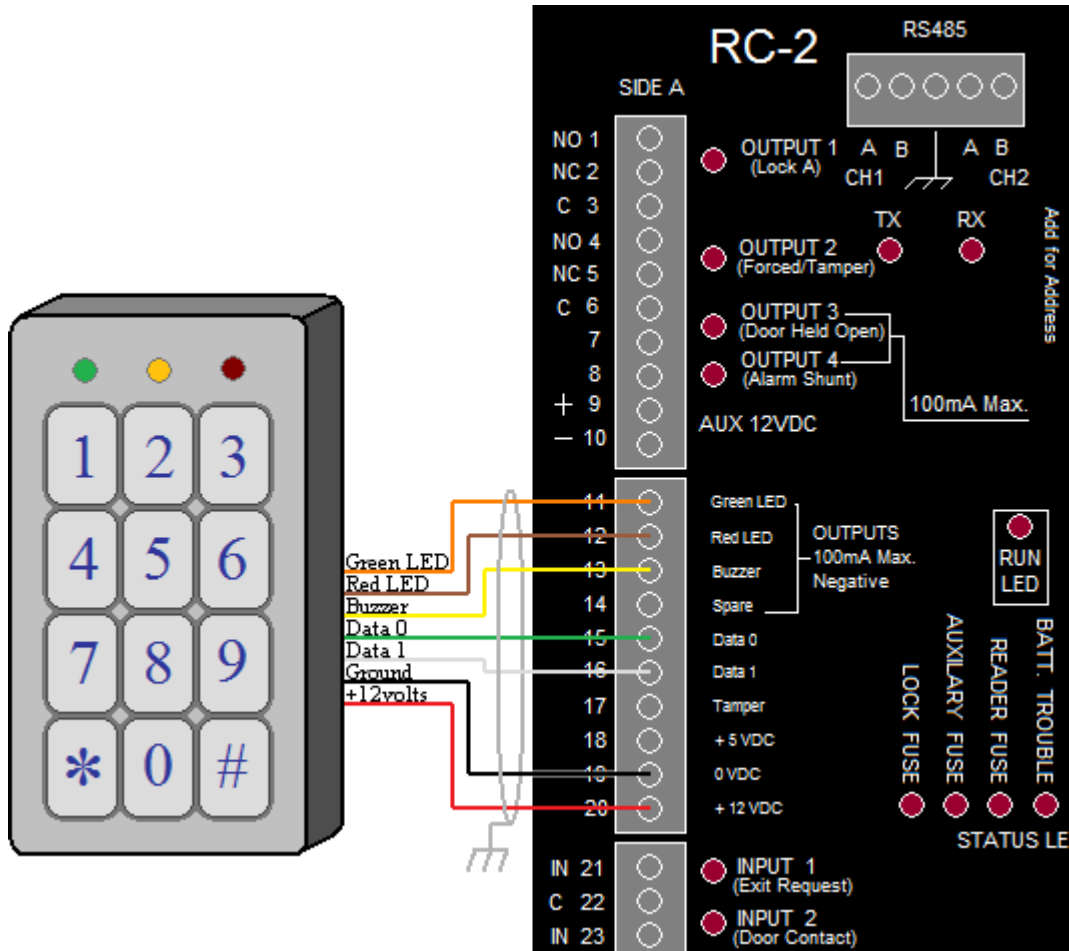 7-conductor, stranded, shielded cable (*not twisted*), 20 to 22 AWG

Maximum Cable Length

  22 AWG Cable: 250 feet (*75 meters*)

  20 AWG Cable: 500 feet (*150 meters*)

---

[4] Keypad wire colours may vary for different keypad manufactures. Please verify your wiring.

Chapter 4
Input/Output Controller (IOC-16)

The I/O Module (*IOC-16*) has sixteen I/O ports, each of which is configurable as a zone input or a relay output. A single LED indicates the status of each I/O point. If the I/O point is configured as an input, the LED is off if the input is restored and on otherwise. If the I/O point is configured as and output, the LED is off if the output is de-energized and on if the output is energized.

IOC-16 (I/O Controller) Silkscreen Legend
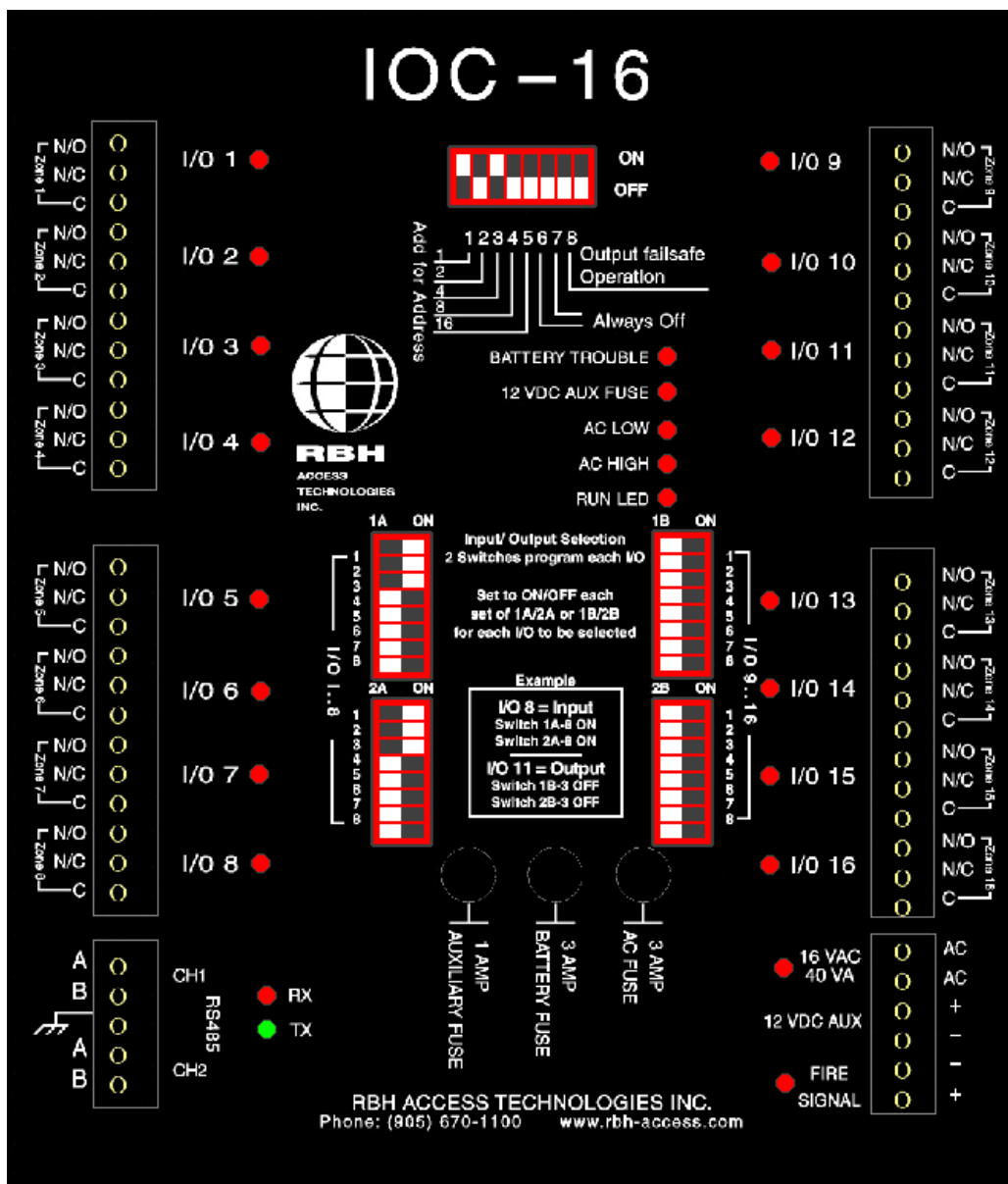
Connection Details

Auxiliary Power Output

This fused output provides 12v@1A to power external devices.

Backup Battery (Red and Black Lead)

Use a 12v lead acid or gel cell rechargeable battery with a rating of 6AH or higher.

AC Power

The IOC-16 is powered from a 16.5vac 40VA transformer. The IOC-16 draws about 0.5Amps when all 16 relays are energized. An additional on board power supply provides 1Amp at 13.8volts and can be used to power external devices or the NC-100 controller. An external 12volt rechargeable battery provides backup power.

Powering From DC

To power the IOC-16 from an external DC supply, connect a 12 to 14volt external supply to the AC inputs. Do not connect to the battery input as the battery input is disconnected until power, which normally comes from the AC, is applied to the controller.

Fire Release Input (Terminals)

The fire input requires 12vdc from the fire panel. When the 12volts are present, the onboard outputs are enabled and are under the control of the IOC-16. In the event of a fire, the fire panel removes the 12volt signal and all relay outputs are de-energized. This is typically used to unlock doors in the event of a fire. Lock outputs should be programmed as normally energized (*unlocked when de-energized*) for fail-safe operation.

If fire signal monitoring is not required, this input must be connected to the IOC-16 auxiliary power output.

****************************** *Warning* *************************************

The fire release function of the IOC-16 is not UL or ULC approved. Fire release functions should be thoroughly tested following any change to IOC-16 outputs.

****

Tamper

Connect the tamper leads to a normally closed cabinet tamper switch. If a cabinet tamper switch is not used, the tamper leads should be shorted.

DIP Switch 1 Settings

The IOC-16 DIP switch sets a number of operating parameters. The IOC-16 controller monitors the DIP switch settings continuously and the configuration can be changed without the need to power down the controller.

DIP Switch	
DIP Switch	**Function**
1 - 5	IOC-16 Address
6,7	Not used (*Always OFF*)
8	Output Fail Safe Operation (*ON*)

IOC-16 Addressing

Up to 16 IOC-16 devices can be attached to each NC-100 controller allowing a total of two hundred and fifty-six input/output points to be connected. The IOC-16's can be assigned any address in the range 5 to 20 (*addresses 1 to 4 are reserved for the RC-2s*). Addresses must be unique and the network will not operate properly if duplicate addresses are programmed.

IOC-16 Addressing					
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Address**
On	Off	On	Off	Off	5
Off	On	On	Off	Off	6
On	On	On	Off	Off	7
Off	Off	Off	On	Off	8
On	Off	Off	On	Off	9
Off	On	Off	On	Off	10
On	On	Off	On	Off	11
Off	Off	On	On	Off	12
On	Off	On	On	Off	13
Off	On	On	On	Off	14
On	On	On	On	Off	15
Off	Off	Off	Off	On	16
On	Off	Off	Off	On	17
Off	On	Off	Off	On	18
On	On	Off	Off	On	19
Off	Off	On	Off	On	20

Status LED's

Run

The run LED indicates that the IOC-16 is operating. Normally the LED flashes once every second. Very rapid flashing indicates the IOC-16 is not communicating with the NC-100 controller.

AC High

The AC high LED comes on when the AC voltage is above 20volts RMS.

AC Low

The AC low LED comes on when the AC voltage drops below 14volts RMS.

Battery Trouble

The battery trouble LED indicates that the battery voltage is below 11volts.

Auxiliary Fuse

The auxiliary fuse LED indicates the 1Amp auxiliary fuse is blown.

Network LEDs

The local-controller network has two status LEDs. The red RX LED flashes when data is received from the controller. The green TX LED flashes when data is transmitted by the IOC-16. Normally the status LEDs flash continuously.

Battery Test

A dynamic battery test is performed under scheduled control. During the test a 1Amp load is switched across the battery and the voltage is monitored. At the end of the test a pass or fail message is reported to the PC. The frequency and duration of the test are programmable from the PC. Typically the battery is tested once every day and the test duration is thirty seconds.

Battery Protection

The backup battery is protected from deep discharge and possible irreversible damage during a prolonged ac power failure. The battery voltage is continuously monitored and disconnected if the voltage drops below 10volts.

Input / Output Selection

Programming a port on the IOC-16 as an input or output requires set up changes in both software and hardware. Software setup is done in the Device Configuration screen at the PC. Hardware configuration requires setting of on board DIP switches. Each input/ output port has two DIP switches that determine if the port is an input or output. An input port is selected by setting both switches on and an output is selected by setting both switches off. Ports 1 to 8 are programmed with DIP switches 1A and 2A, and ports 9 to 16 are programmed with DIP switches 1B and 2B.

Ports 1 – 8 Input/ Output Selection			
I/O	Switches 1A, 2A	Input	Output
1	1	On	Off
2	2	On	Off
3	3	On	Off
4	4	On	Off
5	5	On	Off
6	6	On	Off
7	7	On	Off
8	8	On	Off

Ports 9 – 16 Input/ Output Selection			
I/O	Switches 1B, 2B	Input	Output
9	1	On	Off
10	2	On	Off
11	3	On	Off
12	4	On	Off
13	5	On	Off
14	6	On	Off
15	7	On	Off
16	8	On	Off

Inputs

The IOC-16 has sixteen fully supervised inputs. Each input is individually configurable from the PC for various circuit types.

For full details of circuit types, refer to Input Circuit Types on page 25.

IOC-16 Input Connection Diagram
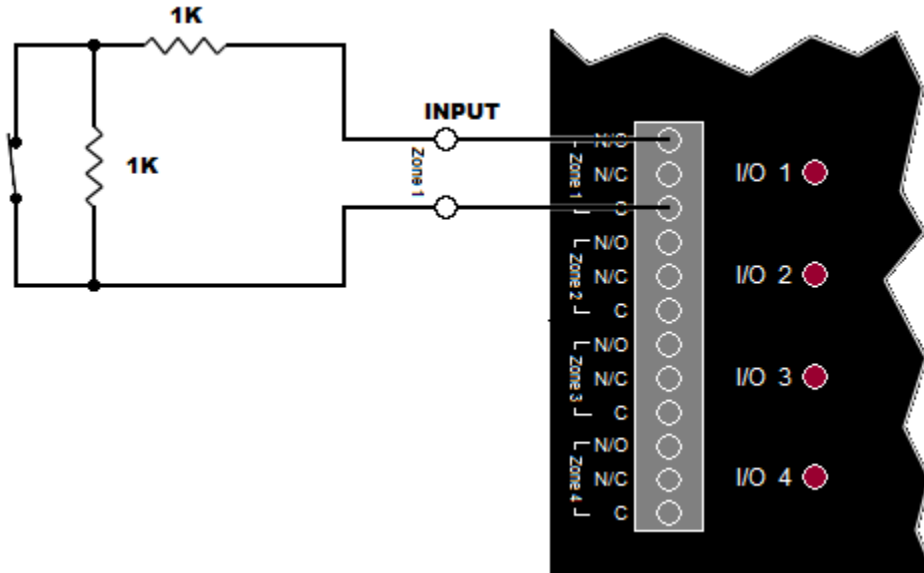
Outputs

The IOC-16 has sixteen dry contact relays capable of switching 2Amps@30vdc. Outputs are programmable from the PC as normally energized or normally de-energized. Normally energized outputs are used for fail-safe operation where it is essential that the output return to a safe state when the system fails due to power loss, communications failure, or fire.

IOC-16 Output Connection Diagram
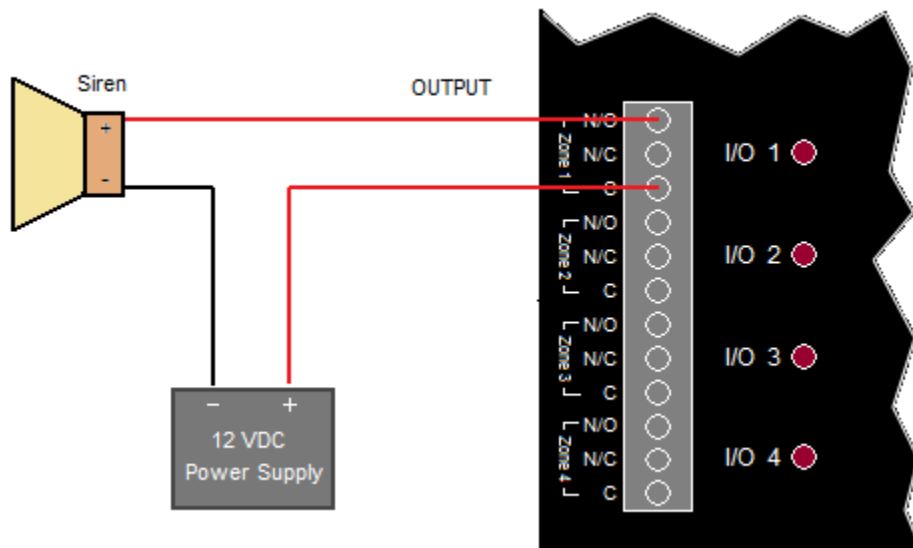
Switching Inductive Devices (Locks, Bells)

Exercise caution when switching an inductive load. Inductive devices include external relay, solenoids, bells, and door locks. All of these devices generate extremely high voltage spikes (*several thousand volts*) when power is applied or removed and possible disruption of the operation could occur if this interference gets on to the electronic circuit board.

This interference can be suppressed by placing a diode (*1N400x or similar*) across the lock or other inductive device being switched. Connect the diode cathode (*end with band*) to the positive terminal and the other end to the negative terminal. The diode must be placed at the device being switched and not at the controller.

### Fail Safe Output Operation

The IOC-16 can operate in fail-safe mode by setting DIP switch 8 to ON. In fail-safe mode, all outputs are de-energized if the IOC-16 loses communication with the NC-100 controller. If the IOC-16 is used for elevator control, program all outputs as normally energized. All floors will then be enabled if the board loses power or communication or if the fire alarm input is released.

Elevator Control

Axiomxa™ provides extensive elevator access control capability. A standard reader or keypad is mounted in the elevator cabin(*s*). Upon presentation of a valid code by a user, the system enables all floors that the user is authorized to access. The user access level determines the floors and time periods during which access is allowed. Turning on a relay output on the IOC-16 controller enables floor access. The relay outputs are wired to the elevator control interface board provided by the Elevator Company. A single IOC-16 controls up to sixteen floors and up to sixteen IOC-16s can be connected to a single NC-100 controller.

A single input on the RC-2 can be configured as a floor reset input for each elevator cabin. This input is connected to an output from the elevator that trips when a floor is selected. All floors currently enabled will be disabled when this input trips. This feature increases the security of the elevator control, as the possibility of a second unauthorized person pressing a button from the previous person's selection is eliminated. As soon as the first person selects a floor, all other floors selections are canceled.

Elevator Control Overview
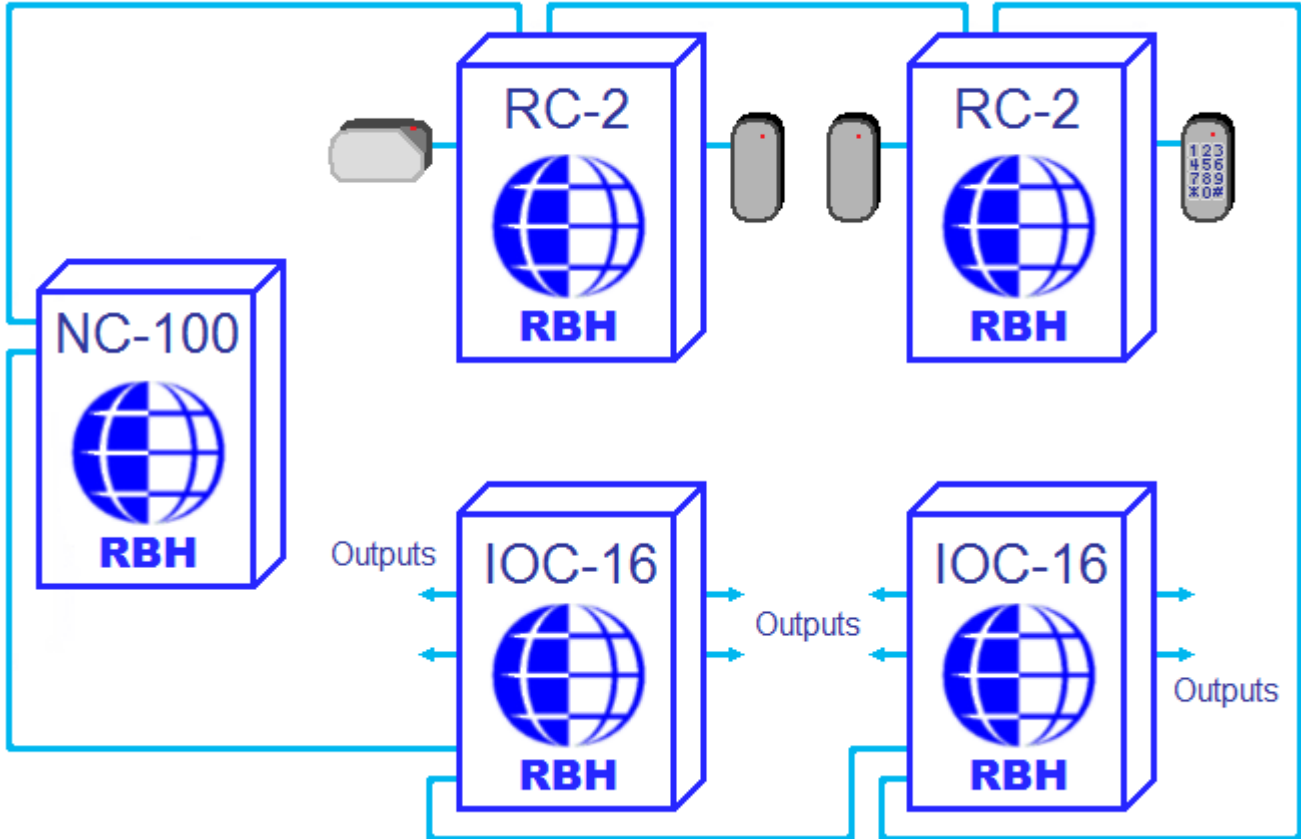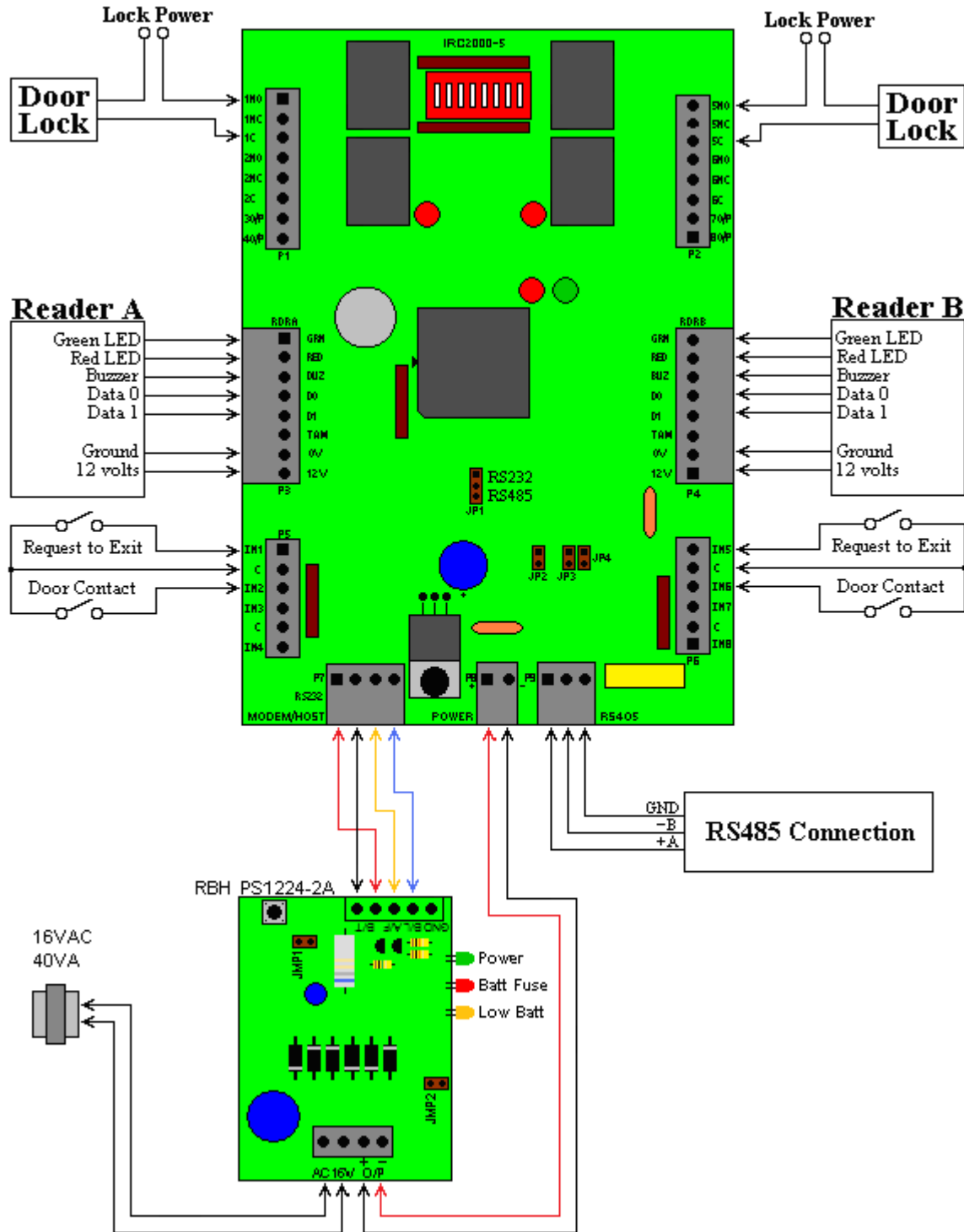
Elevator Control Connection Diagram
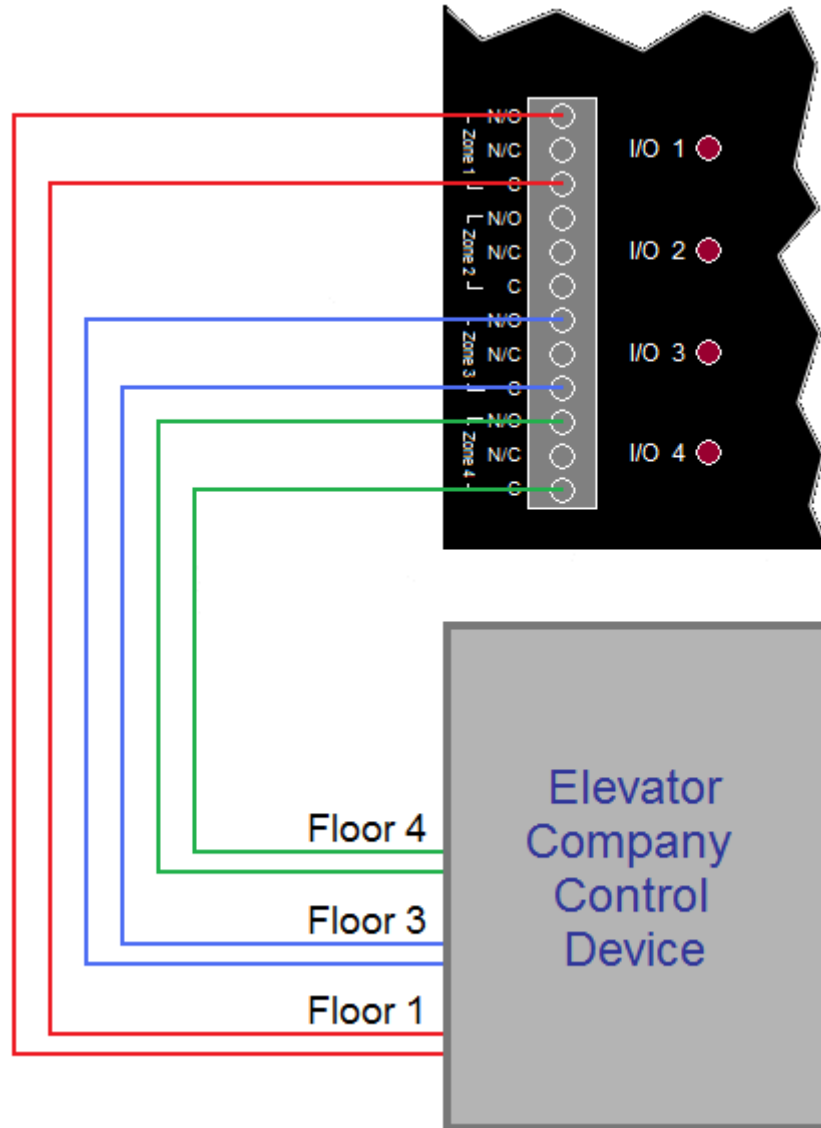
Note: Configure all outputs on the IOC-16 as normally energized.

# Chapter 5
NRC2000 & NURC2000

IRC2000 Wiring Diagram

Wiring

To connect NRC2000s and NURC2000s to an NC100 simply connect them all in parallel (on the RS485 connection connect all A's together & all B's together) and jumper channel 1 & channel 2 together on the NC100 (A to A, & B to B).

It is not recommended to mix RC2s and IOC16s with NRC2000s and NURC2000s because of the loop wiring of the RC2s and IOC16s.
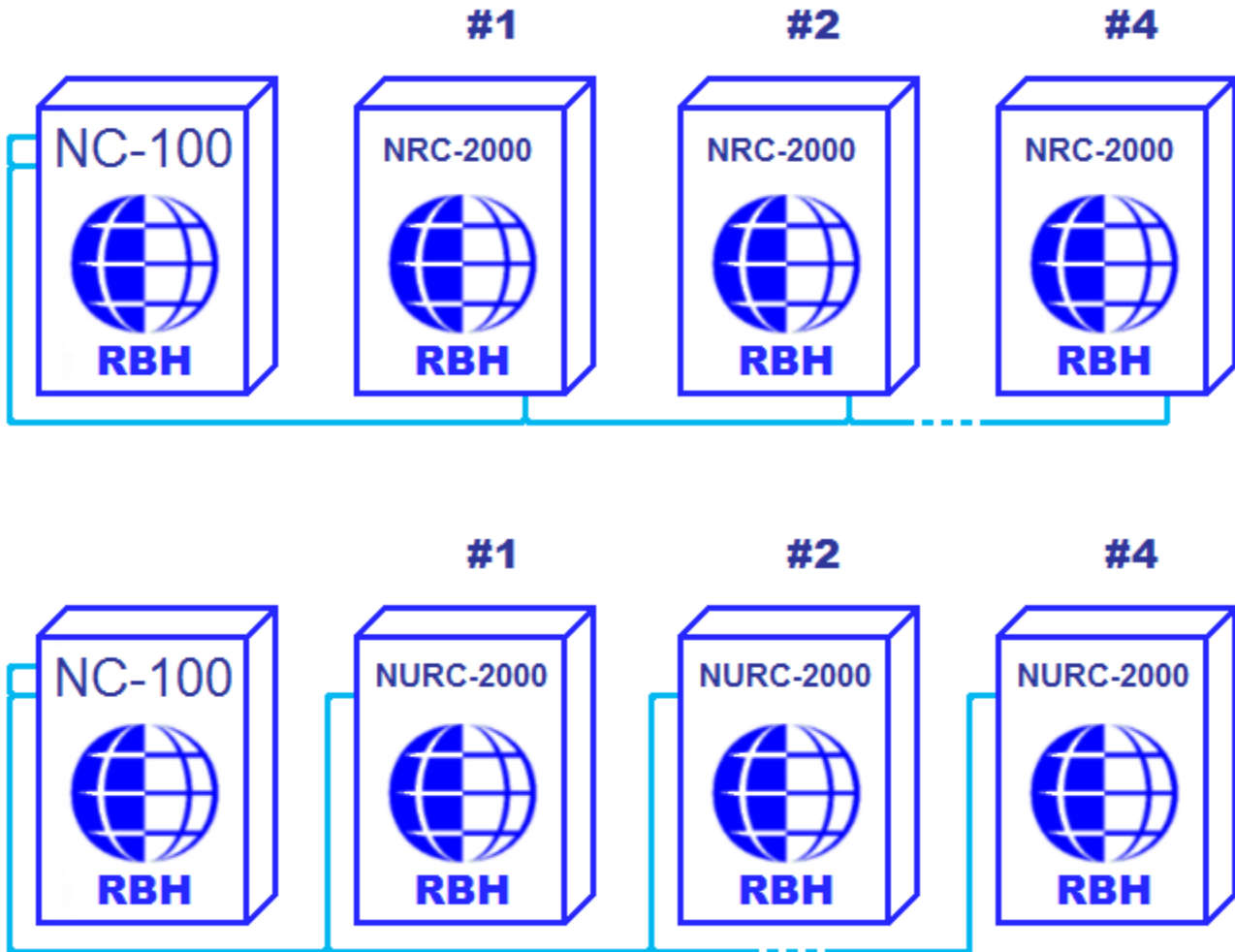
The NRC2000 uses an IRC2000 board to provide most of the functionality of the RC2 board to the Axiom system. The NRC2000 firmware version 3 is based on RC firmware version 34, and includes all updates and bug fixes associated with that version.

Modification

Due to the lack of internal power supply and fewer I/O lines the NRC2000 does not provide the following functionality:

1) Reader Tamper – the reader tamper inputs can be used to monitor AC failure and low battery. Reader "A" tamper is used for AC voltage detection and should be shorted to ground to avoid "AC FAIL" message, if the power supply modifications are not done. Reader "B" tamper is used for battery voltage detection and should be left open to avoid the "BATTERY FAIL" message, if the power supply modifications are not done.

2) Cabinet Tamper – always reports normal.

3) Fuse monitoring – due to lack of power supply – always normal

4) Dual RS485 redundant communications – has only a single channel so must be wired differently!

🖉 **Technical bulletin TB53 will show how to modify the IRC2000 board and how to connect to the power supply to monitor for 'Battery Low' and 'AC Failure'.**

C h a p t e r   6
P C - 1 0 0
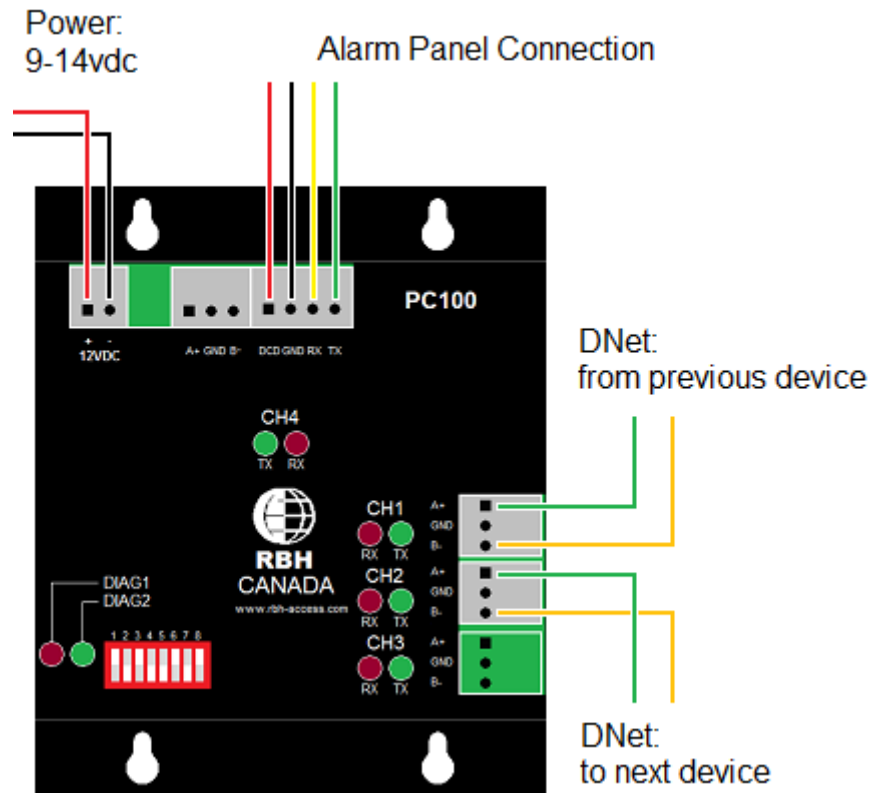
The PC-100 connects to the NC-100 through the DNet, as does all devices. Into channel 1 and out from channel 2.

Power:

9-14vdc @ 150ma

LEDs

DIAG1 – Interface status
DIAG2 – Axiom status:
Communication Channel LEDs – Each communication channel has a green transmit LED and a red receive LED.

Normally flashing at a rate of once a second, DIAG2 will flash twice as fast if the unit is offline with the Axiom Device network.

Specifications

N C - 1 0 0   S p e c i f i c a t i o n

Controller Power Requirements:	9 – 12vdc (*Available from RC-2 or IOC-16*)	
Current Consumption:	220mA (*256k RAM version*)	
Processor:	32 bit Motorola micro controller	
Flash ROM:	Download firmware upgrades from the PC to NC-100	
Memory:	256k, expandable to 16M bytes of RAM	
System Capacities:	NC-100's per C-NET Network	Maximum of 15
	RC-2 Controllers per NC-100	4 (*8 card readers*)
	IOC-16 Controllers per NC-100	16 (*320 Inputs or Outputs*)
	Cardholder No.'s per NC-100	10,000 standard, expand to 500,000
	Event Log per NC-100	5,000 standard, expand to 100,000
Clock/RAM backup battery:	3v Lithium battery	
C-NET (NC-100 to NC-100):	Network Type	ARCNET LAN
	Communications Speed	156k up to 2.5Mb per second
	Circuit Type	Ring (*short or open circuit protection*)
D-NET (NC-100 to RC-2 and IOC-16):	Network Type	RS485 High Speed Network
	Ports	Two fully supervised RS485 ports
	Communications speed	38400 bits/second
	Circuit Type	Ring (*short or open circuit protection*)
Local PC & Remote Communications:	Type	RS232, TCP/IP Ethernet, RS485 4 wire
	Serial Port Speed	Programmable, 1200 to 38,400 baud
Real Time Clock:	Built-in as standard	
Watch Dog Circuit:	Built-in as standard	
Housing dimensions:	**H** 9.75in x **W** 6.875in x **D** 3.25in (*25 x 18 x 10 cm*)	
Operating temperature:	0 to 70°C (*35 - 150°F*)	
Operating Humidity:	20 to 80% RH (*non-condensing*)	

R C - 2   S p e c i f i c a t i o n

Controller Power Requirements:	One 16.5vac 40VA transformer	Controller & Auxiliary
	One 12/18vac 80VA transformer	Door Lock Power
Battery Backup:	12v 7AH lead acid rechargeable battery recommended	
Battery Charging Output:	Charging voltage 13.8v regulated	
	Built-in deep discharge protection	
	Dynamic load test	
Current Consumption:	400-mA max per controller	
Power Outputs:	Reader power:	12v@1A (*fused*)
		5v@1A (*fused*)
	Auxiliary power:	12v@1A (*fused*)
Fuses:	Battery (*Supervised*)	3Amp
	Reader power	1Amp
	Auxiliary power	1Amp
	AC power	3Amp
	Lock power	3Amp
Reader Connection:	Supports up to two readers (*multiple format*)	
	On-board reader tamper monitoring	
	Supports red and green reader LED outputs	
	Supports reader audible	
Outputs:	Four form C relay, SPDT 2A@30vdc, dry contacts	
	Four electronic drivers, (*max 100ma*)	
Inputs:	Eight fully supervised circuits, 1, 2 or no EOL resistor (*1k*)	
	One dedicated tamper switch input	
	One dedicated fire alarm input	
	Analog loop resistance measurement and reporting	
D-NET (NC-100 to RC-2 and IOC-16):	Ports	Two fully supervised RS485 ports
	Communications speed	38400 bits/second
	Circuit Type	Ring (*short or open circuit protection*)
On-Board Diagnostics:	Status	Eight output state LEDs
		Eight input state LEDs
		One fire signal status LED
	Communications	Two RX, TX communication LEDs
		One Run LED
	Power	Four ON/OFF status LEDs
	Fuses	Four fuse blown LEDs
Housing dimensions:	**H** 9.75in x **W** 6.875in x **D** 3.25in (*25 x 18 x 10 cm*)	
Operating temperature:	0 to 70°C (*35 - 150°F*)	
Operating Humidity:	20 to 80% RH (*non-condensing*)	

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I O C - 1 6   S p e c i f i c a t i o n

Controller Power Requirements:	One 16.5vac 40VA transformer	
Battery Backup:	12v 7AH lead acid or gel cell	
Battery Charging Output:	Charging voltage 13.8v regulated Built-in deep discharge protection Dynamic load test	
Current Consumption:	500ma max per controller (*with all relays energized*)	
Power Outputs:	Auxiliary power:	12v@1A (*fused*)
Fuses:	Battery (*Supervised*) Auxiliary power AC power	3Amp 1Amp 3Amp
Input / Outputs	Sixteen I/O ports fully selectable as inputs or outputs	
Output Types:	Up to sixteen form C relays, SPDT 2A@30vdc, dry contacts	
Input Types:	Up to sixteen fully supervised circuits, 1, 2 or no EOL resistor (*1k*) One dedicated tamper switch input One dedicated fire alarm input Analog loop resistance measurement and reporting	
D-NET (Device Network):	Ports Communications speed Circuit Type	Two fully supervised RS485 ports 38400 bits/second Ring (*short or open circuit protection*)
On-Board Diagnostics:	Status Communications Power Fuses	Eight input/output state LEDs One fire signal status LED Two RX, TX communication LEDs One Run LED Three ON/OFF status LEDs Two fuse blown LEDs
Housing dimensions:	**H** 9.75in x **W** 6.875in x **D** 3.25in (*25 x 18 x 10 cm*)	
Operating temperature:	0 to 70°C (*35 - 150°F*)	
Operating Humidity:	20 to 80% RH (*non-condensing*)	

N R C - 2 0 0 0   S p e c i f i c a t i o n

Controller Power Requirements:	9 – 14V DC	
Current Consumption:	250ma	
Flash ROM:	Download firmware upgrades from the PC to IRC-2000	
System Capacities:	IRC-2000's per System	Maximum of 32
	Readers per IRC-2000	2
	Cardholder (normal)	Maximum 5,000
	(extended)	Maximum 8,000
	Event Log per IRC-2000	Maximum 1,400
Network Connection:	Type	RS-232 or RS-485
	Serial Port Speed	9600, 28800, 38400, or 56000
Real Time Clock:	Dallas DS1994 with battery back up	
Housing dimensions:	**H** 12in. x **W** 14in. x **D** 3½in.	
Operating temperature:	0 to 70°C (35 - 150°F)	
Operating Humidity:	20 to 80% RH (*non-condensing*)	

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N U R C - 2 0 0 0   S p e c i f i c a t i o n

Controller Power Requirements:	9 – 14V DC

Current Consumption:	200ma

Flash ROM:	Download firmware upgrades from the PC to URC-2000.

System Capacities:	URC-2000's per System	Maximum of 32
	Readers per URC-2000	2
	Cardholder	Maximum 3,000
	Event Log per URC-2000	Maximum 1,400

Network Connection:	Type	RS-485
	Serial Port Speed	9600, 28800, 38400, or 56000

Real Time Clock:	Dallas DS1994 with battery back up

Board dimensions:	**H** 3in. x **W** 6½in.

Operating temperature:	0 to 70°C (35 - 150°F)

Operating Humidity:	20 to 80% RH (*non-condensing*)

P C - 1 0 0   S p e c i f i c a t i o n

Controller Power Requirements:	9 – 14V DC	
Current Consumption:	150ma	
Flash ROM:	Download firmware upgrades from the PC to PC-100.	
System Capacities:	PC-100's per System	Maximum of 1
Network Connection:	Type Serial Port Speed	RS-232 and RS-485 9600, 28800, 38400, or 56000
Real Time Clock:	Dallas DS1994 with battery back up	
Board dimensions:	**H** 4¼in. x **W** 4¾in.	
Operating temperature:	0 to 70°C (35 - 150°F)	
Operating Humidity:	20 to 80% RH (*non-condensing*)	
PC Connection:	Can be connected via RS232 or RS485	

C a b l e   S p e c i f i c a t i o n

PC To Controller

      RS232:   3 or 4 conductor shielded, 18 to 22 AWG
Maximum Cable Length

| 9600 baud | 150 feet (*45 meters*) |
| 38400 baud | 30 feet (*9 meters*) |

      4 Wire RS485:   2 twisted pair, individually shielded, 18 to 22 AWG
Maximum Cable Length
4000 feet (*1200 meters*)

C-NET: (NC-100 to NC-100)

1 twisted pair, shielded, stranded 20 to 22 AWG
Maximum Ring Section Cable Length
2500 feet (*750 meters*)
Maximum Total Ring Cable Length
10000 feet (*3000 meters*)

D-NET: (NC-100 to RC-2, IOC-16)

1 twisted pair, shielded, 20 to 22 AWG
Maximum Ring Section Cable Length
3000 feet (*900 meters*)
Maximum Ring Length
15000 feet (*4600 meters*)

RC-2 to Reader:

20 to 22 AWG, 6 or 8-conductor, stranded, shielded (*not twisted*)
Maximum Cable Length
22 AWG Cable 250 feet (*75 meters*)
20 AWG Cable 500 feet (*150 meters*)

Input / Output Port Circuit Loop:

2-conductor, 20 to 22 AWG
Maximum Cable Length
1000 feet (*300 meters*)

I n d e x