IRC-2000™ (UL)

Access Control Controller

HARDWARE MANUAL

new generation
building security

RBH
ACCESS
TECHNOLOGIES
INC.

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FCC

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

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C h a p t e r   1
I n t r o d u c i n g   I N T E G R A 3 2 ™

The **Integra32**™ system from RBH Access Technologies Inc. represents the latest in access technology specifically designed for smaller applications. Its intuitive graphical interface allows users to take advantage of the power of the **Integra32**™ with a minimal amount of training.

Integra32™ Security Management software runs on PCs with Windows 98[1], 2000[2], XP, or Server 2003. Up to sixteen **IRC-2000**s (*Intelligent Field Panels*) can be connected together, for a maximum capacity of thirty-two readers. The system also supports a maximum of two thousand cardholders.

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 **IRC-2000** controller will perform all access and other control functions, including logging up to 1,400 events. When the connection is restored, the log will then be reported to the PC.

Connect the first control to the PC by RS232, (*for single control systems*) or by RS485 (*maximum total wiring distance is four thousand feet*).

The **IRC-2000** Intelligent Field Panels utilize flash firmware for easy upgrades. The **IRC-2000** panels use fully distributed intelligence for off-line operations. In addition to supporting two card readers, each **IRC-2000** Intelligent Field Panel also has eight fully supervised alarm inputs along with eight outputs (*four dry contact outputs and four open collector outputs*). IRC-2000 is UL 294 listed as an access control unit and has not been investigated as burglar alarm control unit.

Features not investigated by UL and should not implemented in UL listed system, but provided as optional features include the capacity for forty holidays, one hundred and twenty-eight time zones, as well as handicap access by cardholder. High security and lock/unlock modes are also supported. Each panel can have up to sixty-four input/output links, and the system is capable of holding two hundred and fifty-five pre-programmed operator commands. Both local and timed Antipassback are also supported.

Integra32™ System Diagram
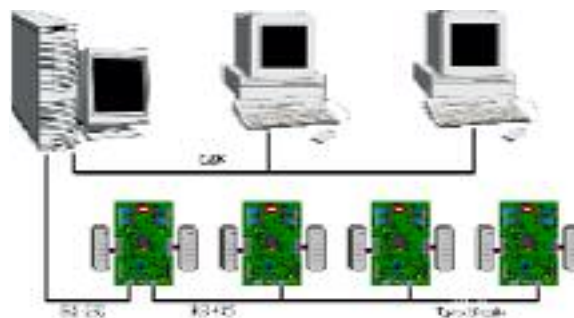
(Computers are only needed for system programming.)

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[1] Second Edition is recommended.
[2] Must have at least service pack 2 installed.

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IRC-2000 Wiring Diagram

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2
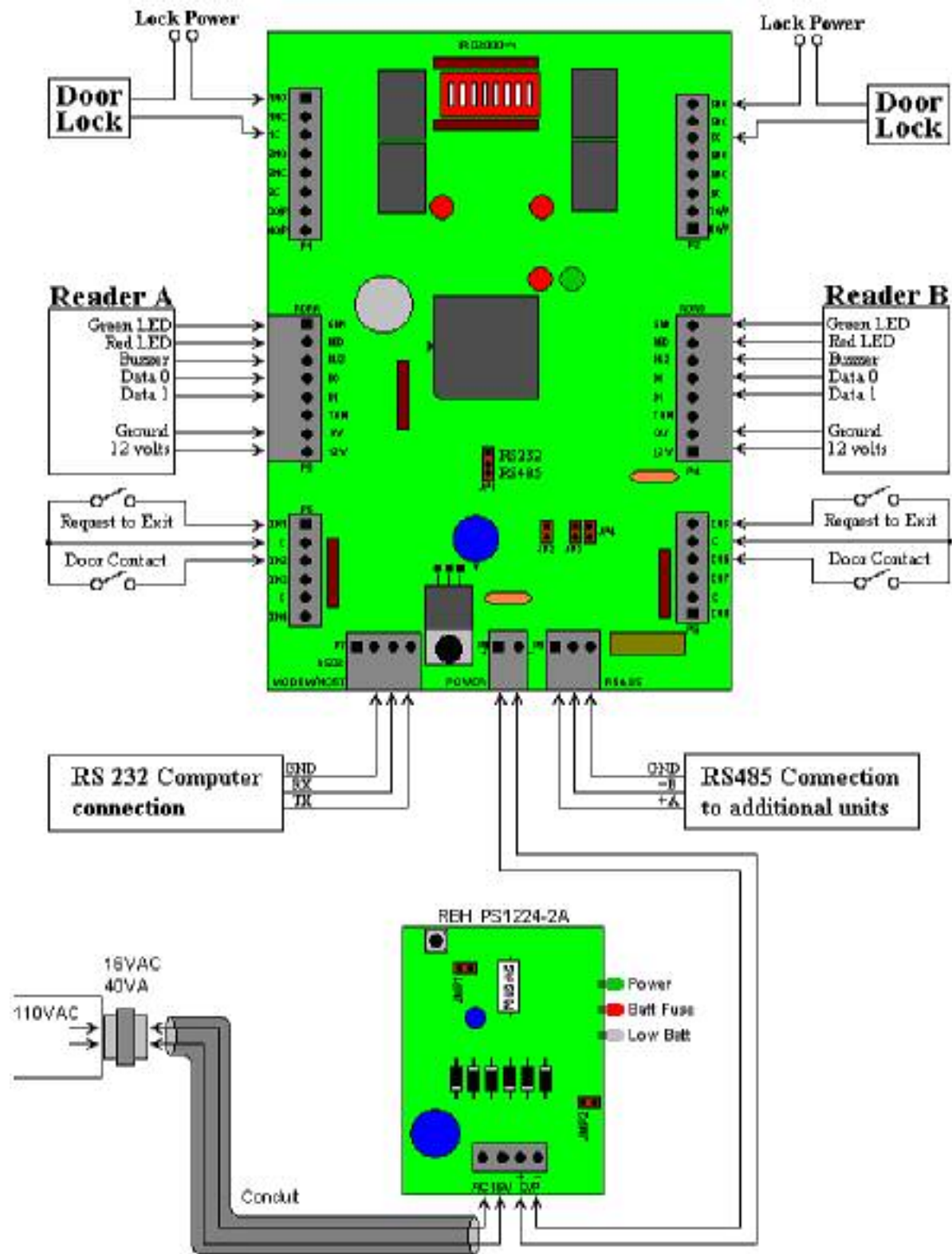
C h a p t e r   2
I n t e l l i g e n t   F i e l d   P a n e l

The Integra32™ access control system consists of one or more controllers (*IRC-2000*). All information required by the controller is downloaded from the PC and stored locally in 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 (*while operating on battery backup*).

IRC-2000 (Intelligent Field Panel)

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3
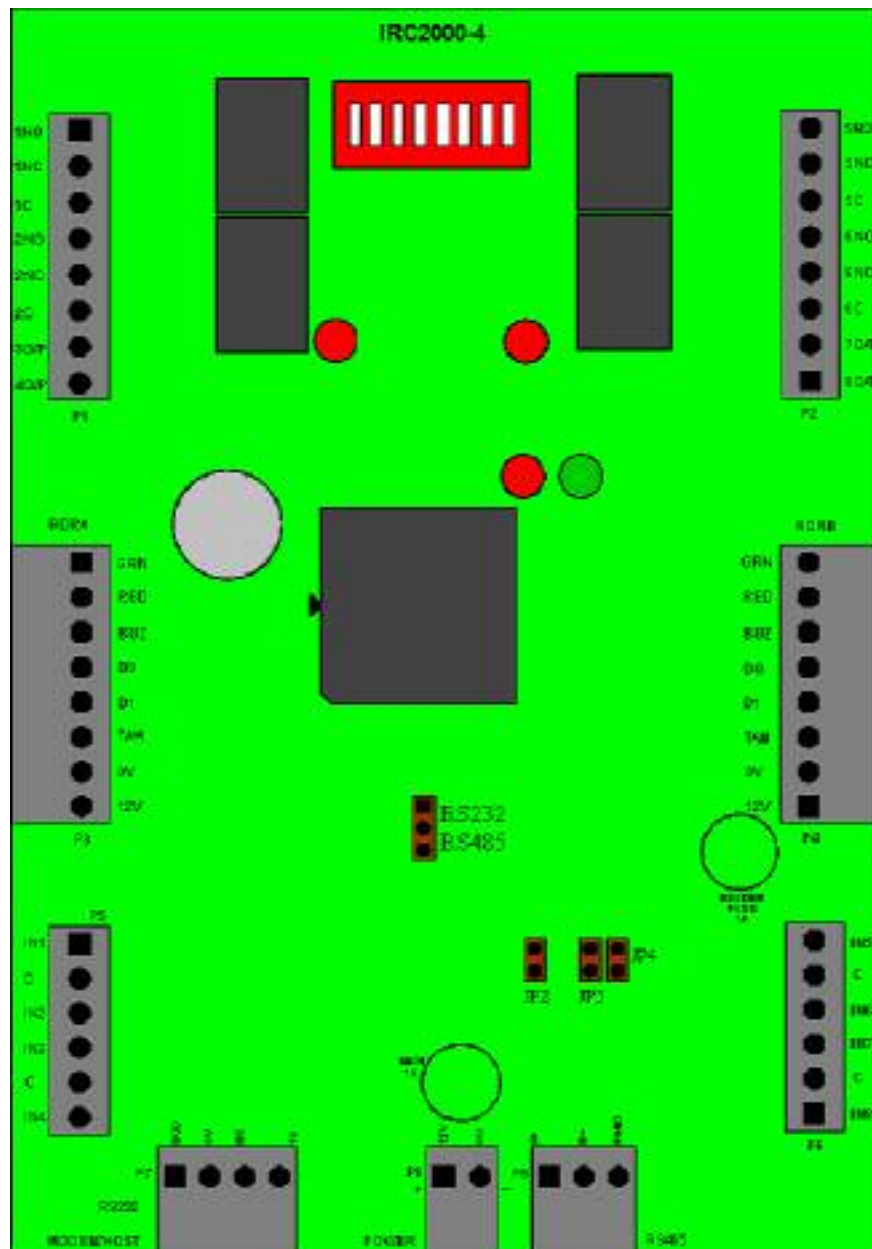
Connection Details

Power

The compatible class 2 transformer for use with IRC-2000 is made by Ultratech Power Products, part number CT5723-03, UL Listed and rated at 120V ac, 0.28 Amp at 60 Hz on the primary side and 16.5V ac maximum 37VA on the secondary side. This transformer has to be fastened to a junction box and secondary wire needs to run in conduit back to IRC-2000. Installation of this transformer has to comply with the National Electrical Code. Standby battery has to be UL recognized and rated at 12 V dc with capacity of 7 amp hours. Battery manufactured by Ultratech Power Product, part number UT1270.

PC/ Modem Interface

The PC/Modem interface connects the IRC-2000 to a PC or modem through an RS232, or an RS485 (*2-wire*) interface.

Inputs

There are two common terminals for each set of four inputs (*one between inputs one and two, another between three and four, one between five and six, and one between seven and eight*). Seven different input types are supported (*including normally open, normally closed, one resistor and two resistor configurations*).

Outputs

Four of the eight programmable outputs are dry contact relays (*UL rated 2A @ 30v dc*). These are designated as outputs one, two, five, and six. The other four outputs are solid-state switches (*open collector to ground*). These four solid-state switches are rated at range of 9.8-12V dc at a maximum of 100mA

Readers

Readers are connected to non-programmable outputs BUZ, RED, & GRN, as well as data inputs D0 and D1. Both readers have their own connection terminals, reader A on the left side of the board and reader B on the right. These card readers have to be rated at range of 10-12.4V dc and have a maximum current rating of 250mA.

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*).

For multiple panels always use only a single point ground reference for all panels. Bring the grounds of all panels back to one location.

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Grounding the IRC-2000 Panels

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IRC2000-4

Outputs:
#1, 2, 5, 6 – form C Relays
#3, 4, 7, 8 – open collector to ground

P1

1NO
1NC
1C
2NO
2NC
2C
3O/P
4O/P

P2

5NO
5NC
5C
6NO
6NC
6C
7O/P
8O/P

RDRA

P3

GRN
RED
BUZ
D0
D1
TAN
0V
12V

Reader A:

Green LED
Red LED
Buzzer O/P
Data 0
Data 1
Tamper I/P
Power O/P

Reader B:

Green LED
Red LED
Buzzer O/P
Data 0
Data 1
Tamper I/P
Power O/P

RDRB

P4

GRN
RED
BUZ
D0
D1
TAN
0V
12V

RS232
RS485

READER FUSE 1A

P5

IN1
C
IN2
IN3
C
IN4

JP2   JP3   JP4

Inputs 1-4

Inputs 5-8

P6

IN5
C
IN6
IN7
C
IN8

P7

RS232

NODE/HOST

P8 +   —
POWER

P9
RS485

RS485 Connection

PC/Modem Interface

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DIP Switch Settings

The IRC-2000's DIP switches control a number of operating parameters including the device address and serial port baud rate. The controller must be powered down to accept any changes in the DIP switch settings. Use DIP switches one through five to set the controller address. Switches six and seven set the communication baud rate, and switch eight is used to set the connection type (*modem or direct)*.

DIP Switch	
DIP Switch	**Function**
1 - 5	Controller Address
6,7	Controller Baud Rate
8	Modem/Direct PC Connection

Table 1
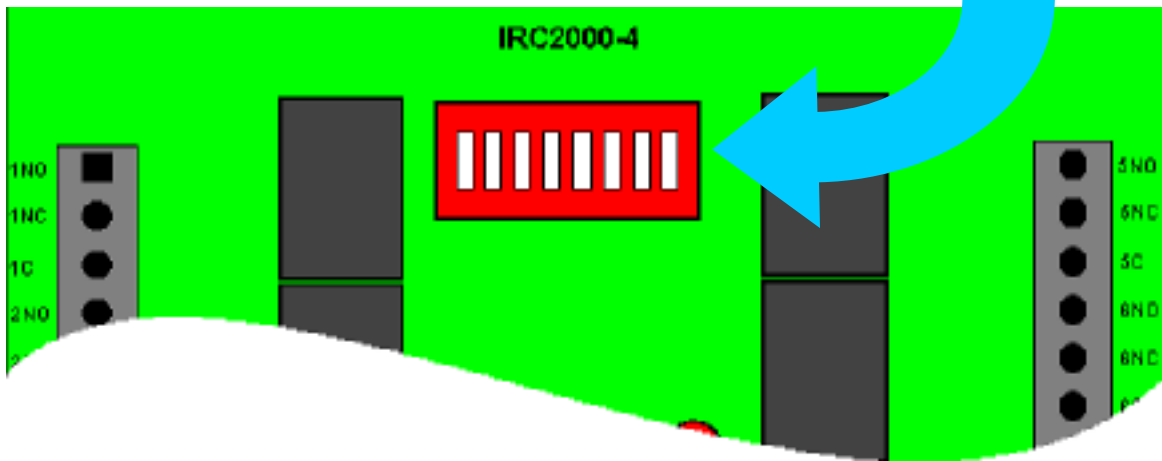
Controller Addressing

Use DIP switches 1, 2, 3, 4, and 5 to select the controller address. The address is binary coded and the switch settings for all sixteen possible addresses are given below.

Controller 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
On	Off	On	Off	Off	5
Off	On	On	Off	Off	6

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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

Table 2

Direct Connect/Modem Selection

DIP switch 8 specifies whether the IRC-2000 is connected directly to a serial port on the PC or communicates with the PC over a modem. Contact the RBH tech support office for information on the optional TCP/IP Ethernet connection. TCP/IP Ethernet connection has not been investigated by UL. For UL listing the PC connection is for programming the IRC-2000 only. The model IRC-2000 control unit is for stand-alone use only.

Direct Connect / Modem Selection	
DIP Switch 8	**Interface Type**
OFF	Direct Connect To PC
ON	Modem

Table 3

Computer/Modem Port Baud Rate Selection

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 modem or 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 38,400.

Controller Baud Rate Selection		
DIP Switch 6	**DIP Switch 7**	**Baud Rate**
OFF	OFF	9,600
ON	OFF	28,800
OFF	ON	38,400
ON	ON	56,000

Table 4

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PC Connections

RS232 Connection

The PC serial port used to connect to the IRC-2000 panels is assigned under the Communication Port Setup screen of Network properties window in the **Integra32**™ software. The baud rate is set by default to 9600 for direct connection to the PC using the standard RS232 interface. The RS232 interface can be used to connect to a single controller or to the first controller of a network. The distance between the PC and controller can not be greater than 150 feet (*50 meters*), or 30 feet (*10 meters*) if the baud rate is increased to 38,400.

For distances greater than 150 feet (5*0 meters*), an RS485 interface must be used. RS485 is built into the IRC-2000 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.

Additional controllers can be connected via the RS485 terminals.

Controller to PC Connection (RS232)		
Controller	**DB9 Connector**	**DB25 Connector**
GND	Pin 5	Pin 7
TX	Pin 2	Pin 3
RX	Pin 3	Pin 2

Table 5

PC to IRC-2000 - RS232 Interface Wiring
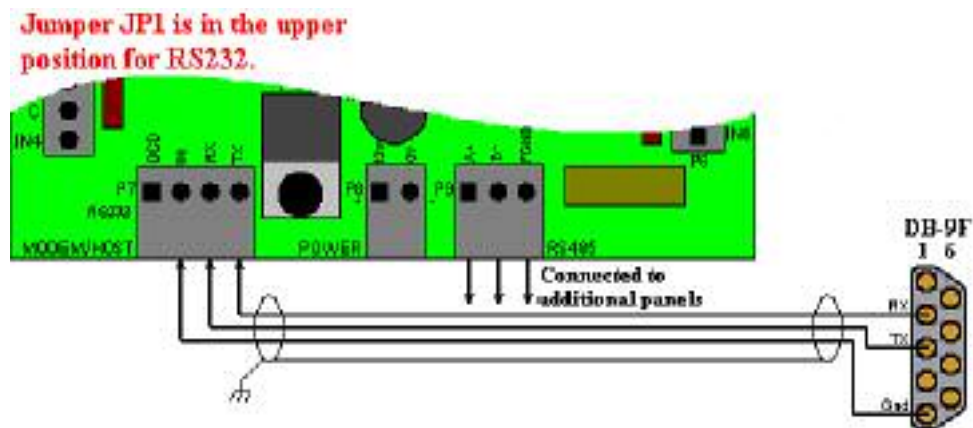
Cable Specification

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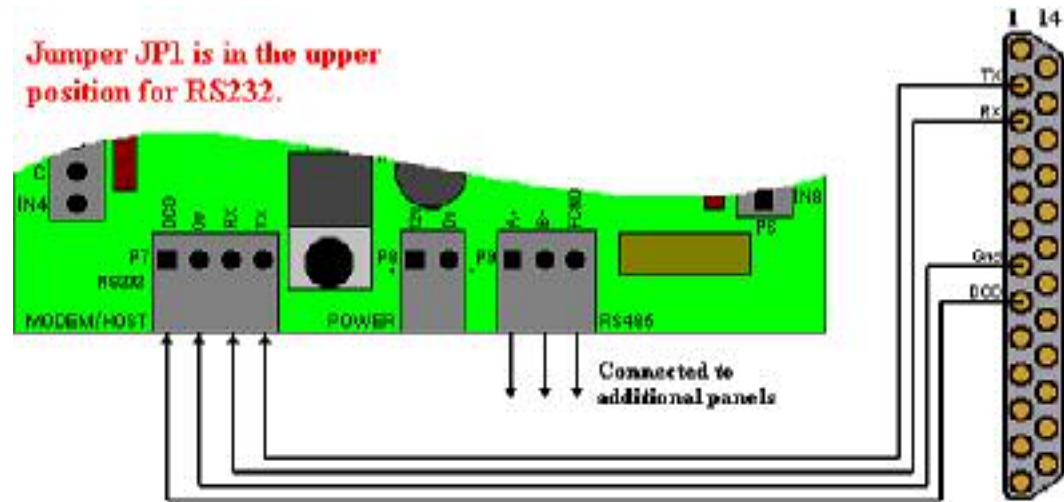
Maximum Cable Length

   9600 baud   150 feet (50 meters)

   56000 baud   50 feet (15 meters)

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Modem Connection

The IRC-2000 can be connected to the PC via a modem. The modem connection is similar to the RS-232 connect with the inclusion of the DCD terminal. For UL listing the PC connection is for programming the IRC-2000 only. The model IRC-2000 control unit is for stand-alone use only.

If multiple controllers are used then the RS-485 connecter will be needed to connect the additional controllers to the modem controller.

Cable Specification

4-conductor shielded, 18 to 22 AWG

Maximum Cable Length

9600 baud	150 feet (50 meters)
56000 baud	50 feet (15 meters)

RS485 Connection

The IRC-2000 controller supports a two-wire RS485 interface. Jumpers JP1 is to be set on the lower two pins for RS485 operation.

The RS485 interface allows the distance between the controller and the PC to be extended up to 4000 feet (*1200 meters*). RS485 requires one twisted pair shielded cable. The last controller must have the 'terminator' jumper in place; also ensure that the PC end is properly terminated. If not provided on board, add a 130-ohm resistor across both A(+) & B(-) connections at the PC end.

Cable Specification
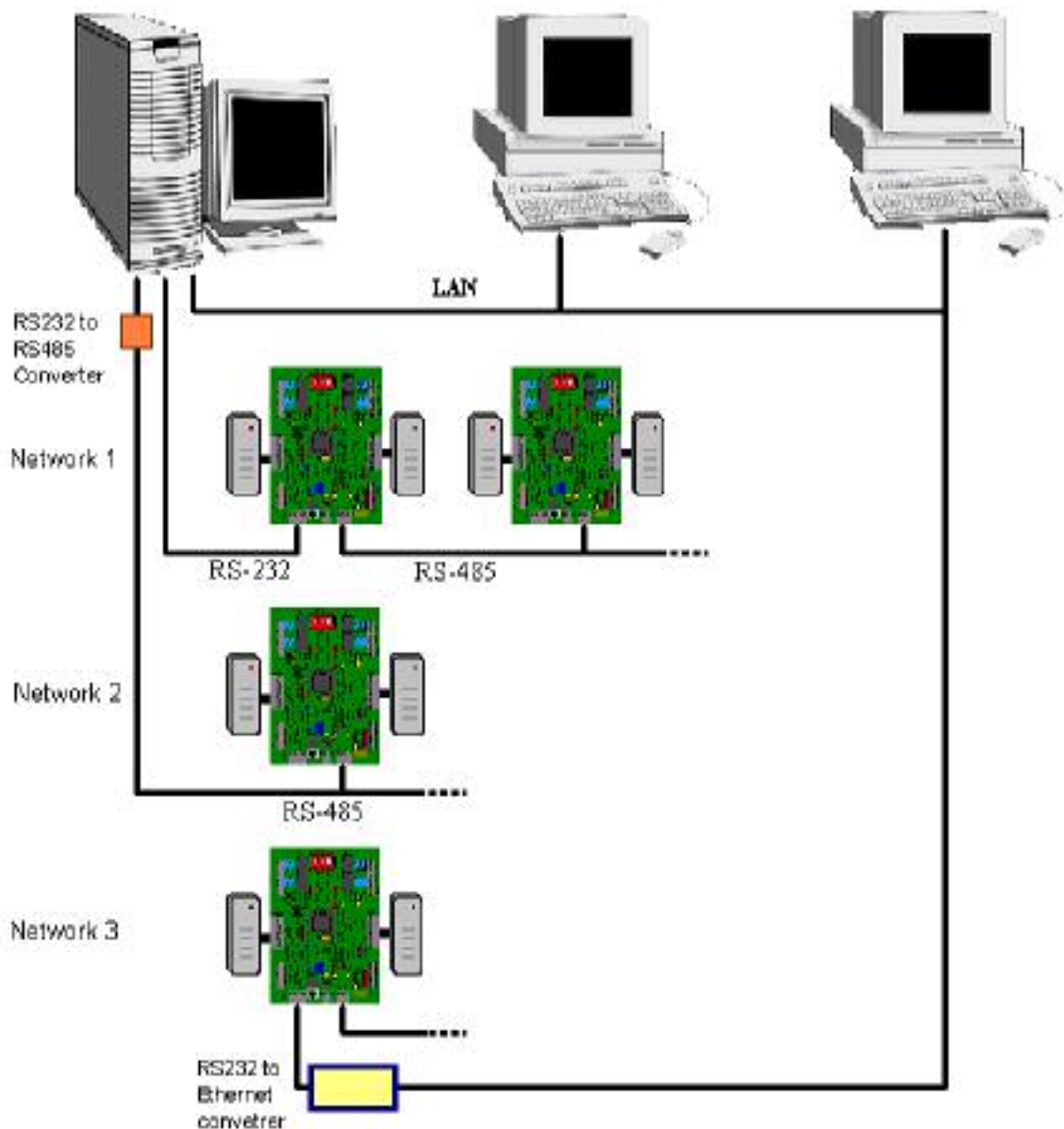
Single twisted pair, shielded, 18 AWG

Maximum Cable Length

4000 feet (1200 meters)

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Controller Networks

Up to sixteen IRC-2000 controllers can be connected to a single PC. They can be connected to the same network or distributed across up to sixteen networks. After the first controller of the network is connected to the PC, additional controllers can be connected to the network via the RS485 terminals. Connect the TX/A terminal of one controller to the TX/A terminal next one, and connect the RX/B terminal to the RX/B terminal. All of the controllers on a network are connected in parallel. Controller Network has not listed to UL 294.

Controller Network Connection Diagram

(Computers are only needed for system programming.)

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Status LED's

Computer/Modem Port

The computer/modem port has two LEDs to show the flow of data between the IRC-2000 controller and PC or modem. The red RX LED (*LED3*) flashes when the controller receives data. The green TX LED (*LED4*) flashes when the controller transmits data. If the controller is connected directly to the PC, the status LED's flash continuously.

Run LED

The run LED (*LED2*) flashes to indicate the controller is not communicating, it is on solid when running normally, and off if power is missing.

Diagnostic LED

This LED (*LED1*) will be on if either (*reader A or reader B*) buzzer output is on.

Fuses

There are two 1.25 amp fuses on the IRC-2000 board. F1 is connected to Reader Power and F2 is connected to Main Power.

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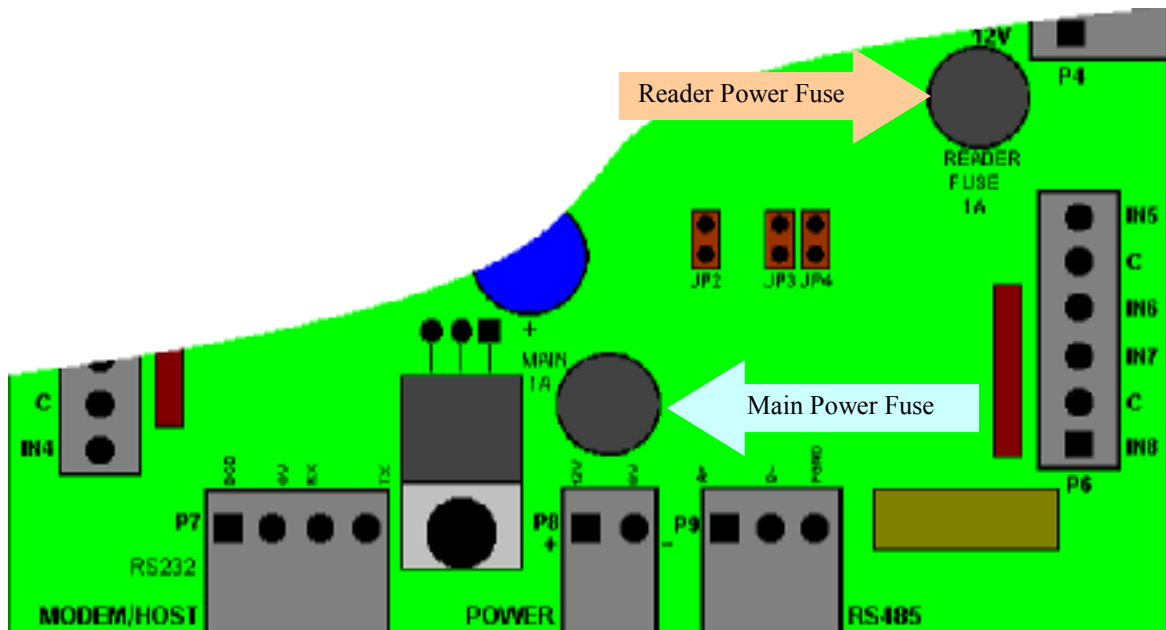
Jumpers

JP1   The upper position is for RS232, and the lower position is for RS485. (*In a multi-panel network with the first panel connected to the PC via RS-232 and all other panel connected to the first panel via RS-485, set JP1 of panel #1 to RS-232 and all other JP1s to RS-485*)

JP2   Bias Low – RS485 tuning
JP3   Termination – RS485 tuning
JP4   Bias High – RS485 tuning

> **Leave jumpers JP2, JP3, and JP4 open. Do not use these jumpers without consulting RBH.**

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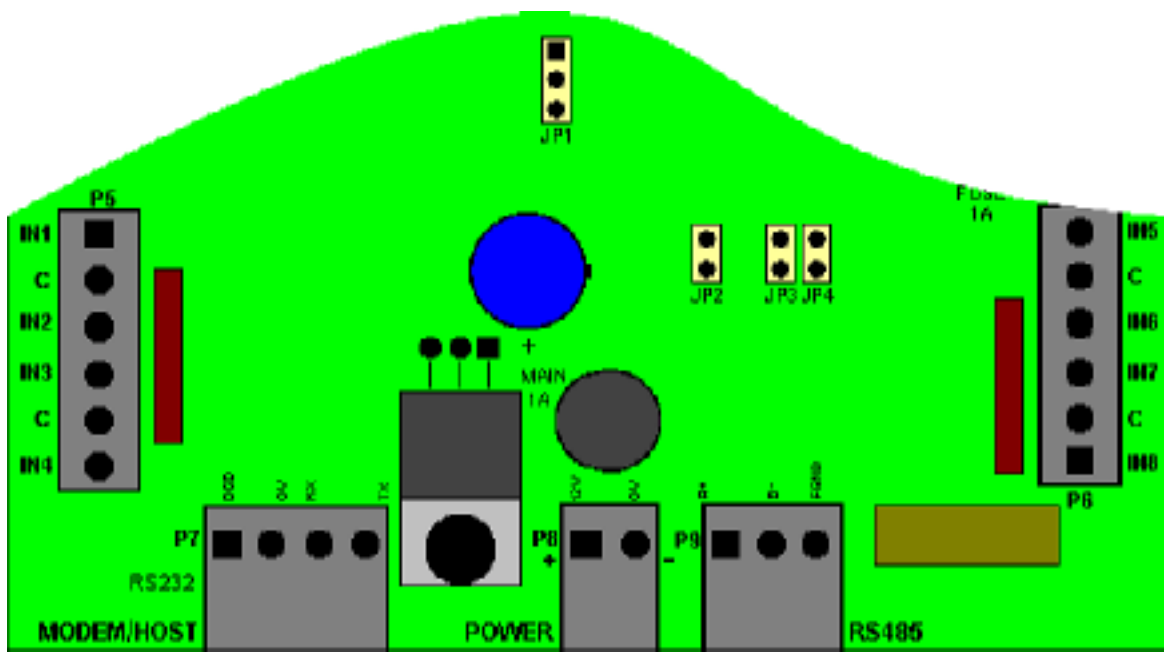
C h a p t e r   3
I n p u t   &   O u t p u t   C o n n e c t i o n s

Inputs

The IRC-2000 has eight fully supervised inputs, two sets of four each with two common terminals. All inputs are individually programmable from the PC. The IRC-2000 employs digital filtering to eliminate the effect of interference on the input loops and verifies all loop changes before reporting to the controller.

Each input can report up to four states; Open, Short, Abnormal, and Normal. For example, if the circuit type is programmed as '2 resistor normally closed', 1k represents a normal state and 2k represents an abnormal state. Less then twenty ohms is a short and very high resistance is an open.

RTE (Request to Exit)

Inputs programmed, as RTE will be connected to push buttons mounted on the door or to motion detectors mounted near the door. Activating the RTE input will unlock the door. The RTE can be disabled by time zone. Multiple inputs can be programmed as RTEs for the same door. (***For UL systems the RTE can not be programmed normally open without supervision.***)

DC (Door Contact)

Inputs programmed as door contacts monitor the state of the door. Forced entry, door held open alarm and door held open warning require monitoring of the door state.

General Purpose

General Purpose Inputs are inputs that have user purpose. The user defines what happens when they change state. They can trigger links, cause alarms, and/or report their change of state.

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Input Circuit Types

The IRC-2000 supports seven different input circuit types ranging from no resistor for low security applications to two resistors normally closed circuits where the highest security is required. Besides Normally closed and no resistor, all other types have not been investigated by UL.

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

Table 6

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

Table 7

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Normally Closed, One Resistor	
Loop Resistance	**State**
Short	Trouble
1k	Restore
Open Circuit	Alarm

Table 8
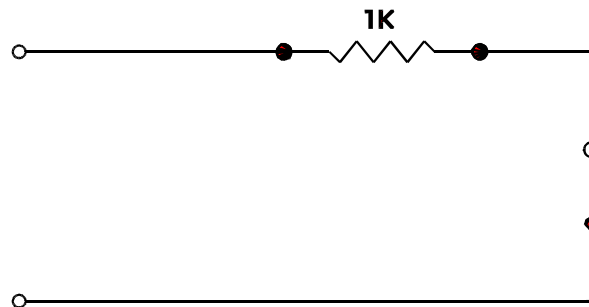
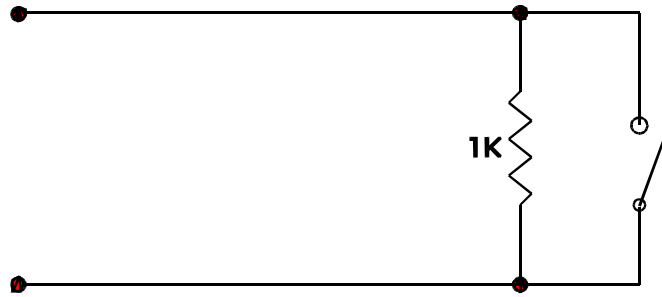| Normally Closed, Two Resistor	
Loop Resistance	**State**
Short	Trouble
1k	Restore
2k	Alarm
Open Circuit	Trouble

Table 9
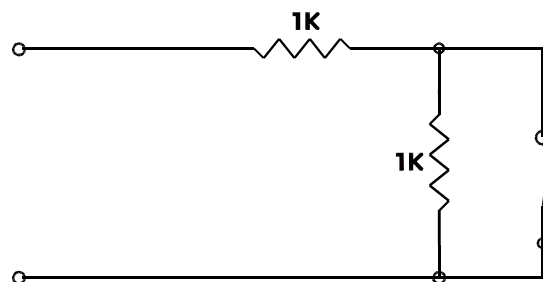
This circuit provides a high degree of supervision and detects both short and open circuit fault conditions. Use this circuit in high security applications.
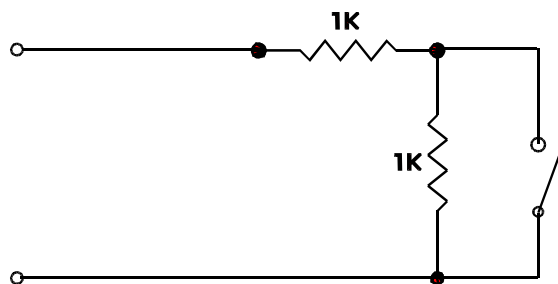
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Normally Open, One Resistor	
Loop Resistance	**State**
Short	Alarm
1k	Restore
Open Circuit	Trouble

Table 10

Normally Open, Two Resistor	
Loop Resistance	**State**
Short	Trouble
1k	Alarm
2k	Restore
Open Circuit	Trouble

Table 11

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<table>
<tr><td colspan="2">Normally Open And Normally Closed, One Resistor</td></tr>
</table>

Loop Resistance	State
Short	Alarm
1k	Restore
Open Circuit	Alarm

Table 12
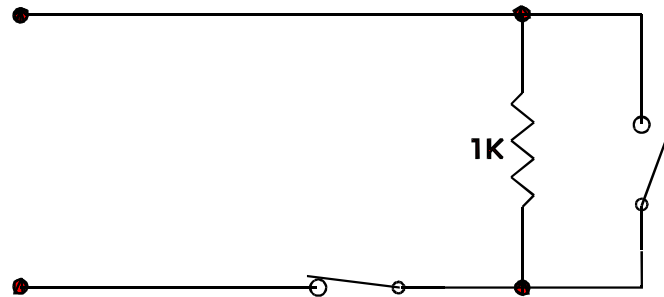
This circuit type is used where normally open and normally closed contacts are used in the same loop.

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Outputs

The IRC-2000 has eight outputs; four relay outputs and four solid-state outputs. Outputs 1, 2, 5, and 6 are dry contact relays (*UL rated 2A @ 30v dc*). Outputs 3, 4, 7, and 8 use electronic drivers and can switch up to 100ma. All outputs are programmable from the PC as 'On State' energized or 'On State' de-energized. 'On State' de-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, for ancillary notification devices, 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 for lock or handicap operation (*as described below*), or they can be used as general-purpose outputs.

Lock Output

The lock output is used to activate or deactivate the locking device on the door. It can apply power to door strikes or remove power from magnetic locks.

Handicap Output

This output is used to drive door operators. It turns on less than one second after the Lock Output is turned on, and stays on until the Lock Output is turned off. Only designated cardholders will activate this output.

Alarm Shunt Output

This output is activated at the same time as the Lock Output and is used to bypass the door contact of a burglar alarm panel. The Alarm Shunt Output will reset with the closure of the access control panel's door contact (*the Alarm Shunt Output will stay activated past the Unlock Time as long as the door is open*). A door with two contacts (*one for the burglar Alarm and one for the access control*) will require an Alarm Shunt Output to prevent the burglar alarm system for going into alarm during a valid entry.

Modem Power Output

The Modem Power Output is a normally activated output that is used to reset a modem by momentarily removing the power from the modem.

General Purpose Output

General Purpose Outputs are outputs that are user controlled. They are activated and de-activated by user defined links and schedules.

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Electronic Output Connection Diagram

The electronic outputs (*3O/P, 4O/P, 7O/P, and 8O/P*) are capable of switching up to 100mA to ground.
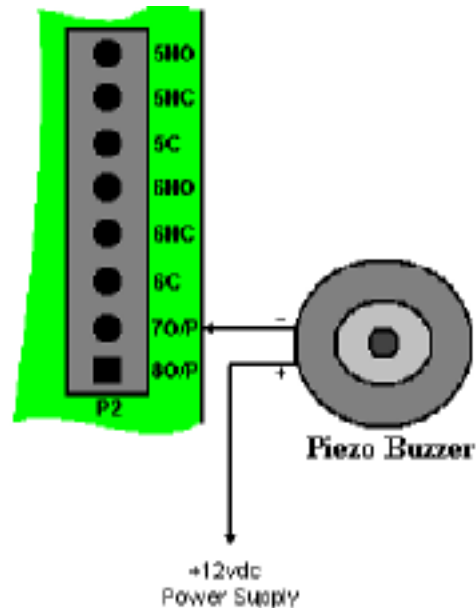
Switching Inductive Devices (Locks, Bells)

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 (*1N4004 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.

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Relay Output Operation

Lock Output

Any output can be used to control a magnetic lock or door strike. Multiple outputs can be set to the same function (*outputs one and two can both be Lock outputs for reader A*).

Magnetic Lock Connection Diagram
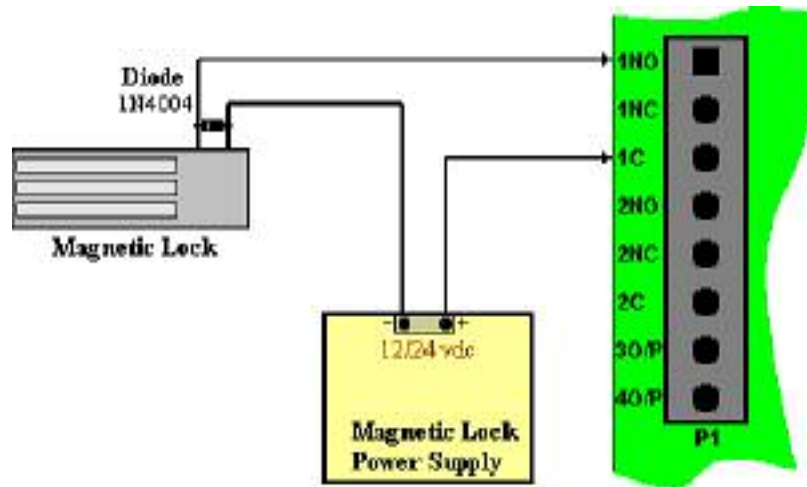
For magnetic locks, the relay should be configured from the PC as 'On State' de-energized for fail-safe operation. If power fails (*AC and battery*), the power to the magnetic lock is removed and the door is opened. The magnetic lock and its power supply shall be UL listed.

Door Strike Connection Diagram
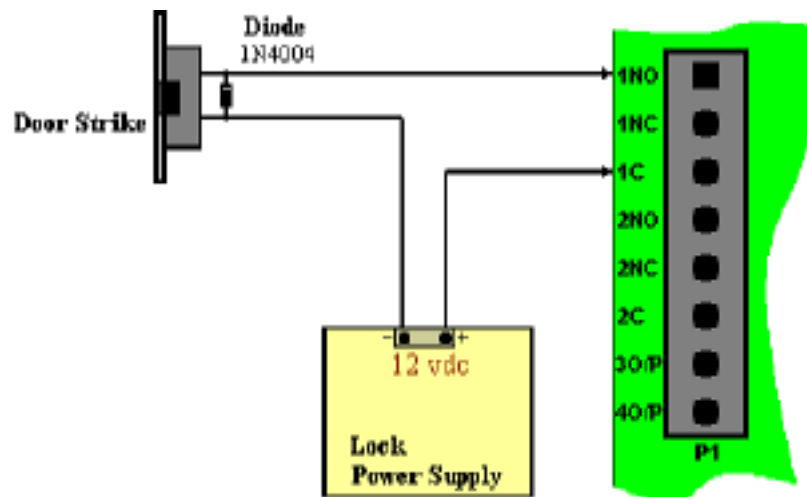
The door strike device and its power supply shall be UL listed.

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Handicap Output Connection Diagram
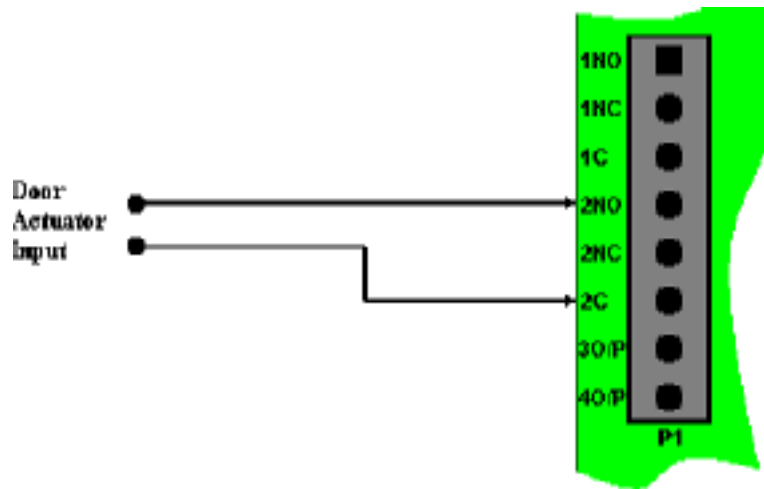
If this output is used with an inductive load, use a back EMF diode
(*as described on page 21*) **to prevent damage to other equipment.**

Access Point Operating Modes

High Security

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

Unlocked

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

Door Held Open Warning

The Buzzer beeps slowly.

Door Held Open Alarm

The Buzzer beeps continuously.

Keypad / Reader Combination

The Buzzer emits a series of short beeps 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.

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Reader Connection Diagrams

The IRC-2000 supports reader devices using the Weigand format.

IRC-2000To Reader Connection Diagram
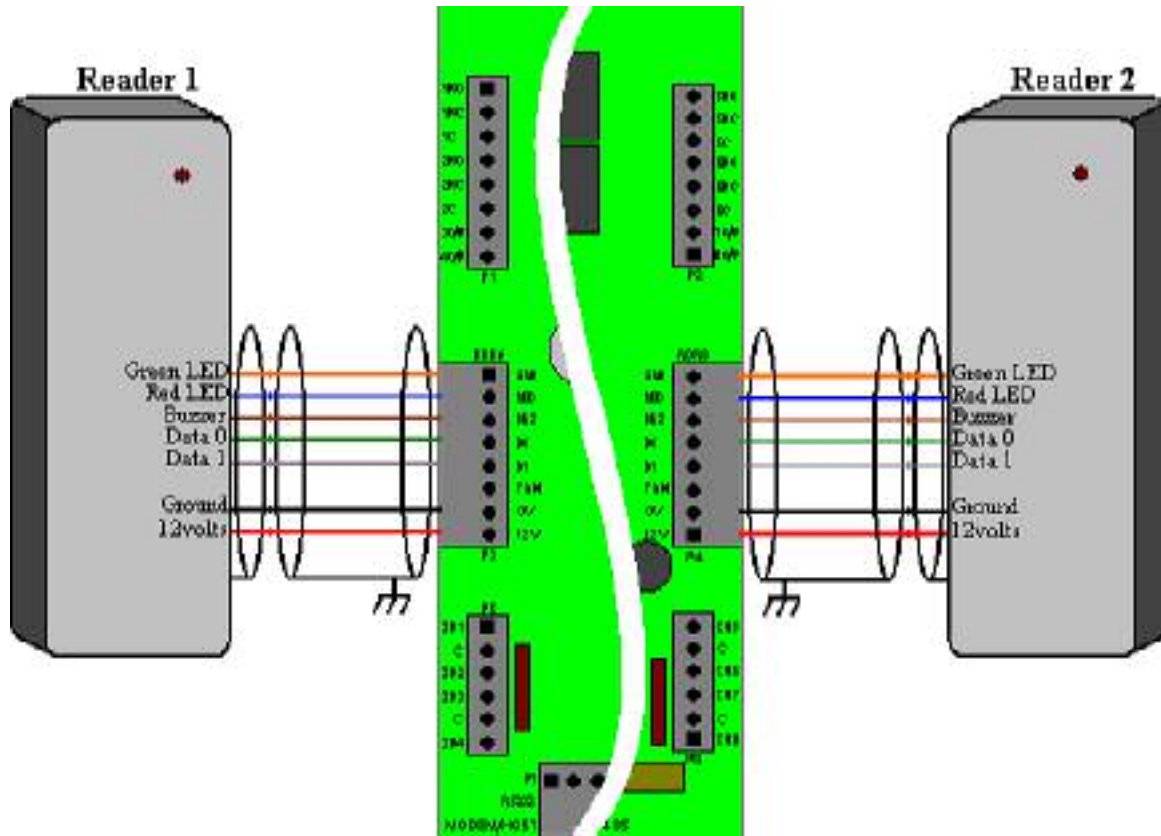
Cable Specification

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)

Compatible Card Readers

SR-2400, MM6800, SP-3820, KP-6840: These Weigand card readers connect directly to the IRC-2000 and are powered from the control unit, and are UL Listed.

6005B, 5365, 5395, 5355: These Weigand card readers connect directly to the IRC-2000 and are powered from the control unit, and are UL Listed.

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S p e c i f i c a t i o n s

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

Controller Power Requirements:	Primary : 120VAC, 0.28 Amp @60Hz. Secondary : 16.5VAC, 37VA @ 60Hz.

Current Consumption:	2 AMP

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

IRC-2000 Capacities:	Readers per IRC-2000	2
	Cardholders	Maximum 2,000
	Event Log per IRC-2000	Maximum 1,400

PC-Network Connection	Type	RS-232 or RS-485
	Serial Port Speed	9600, 28800, 38400, or 56000
	IRC-2000s per network	16

Housing dimensions:	**H** 12in. x **W** 14in. x **D** 3½in.

Operating temperature:	0 to 70°C (35 - 150°F)	UL 0-49°C (32-120°F)

Operating Humidity:	20 to 85% RH (*non-condensing*)

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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 (50 meters)
56000 baud   50 feet (15 meters)

IRC-2000 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)

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