

# **HIGHPOWER**

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MODEL 8000 DOOR CONTROLLER WITH POWER OVER ETHERNET (POE)  
HARDWARE MANUAL  
VERSION 1.0.1  
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## CONTROLLER DESCRIPTION

The 8000 Series is a door controller designed for one or two door operation. It provides the installer with the latest advancements in Ethernet communications and Power-Over-Ethernet technology. The 8000 controller has been specifically designed for use with the Highpower Management System (HMS), which is a SQL based database and control program for the Windows .NET platform. The 8000 can also run in stand-alone configurations without software. When using the HMS software the 8000 is networked to provide a rich control environment that allows customers to manage alphanumeric card IDs, schedules, and holidays and to generate reports based on system activity.

The 8000 controller is used in conjunction with external card reader(s) to create a secure two-piece access control solution. The card reader inputs of the 8000 controller support a wide variety of reader types including:

- Barcode readers (Wiegand Data on Port 1 or Port 2 or Un-encoded Barcode Data on Port 1)
- Proximity Readers (Wiegand Data on Port 1 and Port 2)
- Magnetic Stripe Readers (ABA Data on Port 1 and Port 2)
- Wiegand Card Readers (Wiegand Data on Port 1 and Port 2)

Communications from the controller to the HMS software is accomplished through either RS-232 port (serial) or more commonly through the built-on Ethernet port, which supports the 802.3af POE standards.

The Power-Over-Ethernet features of the controller are unique in that the controller allows the installer to power the controller itself, two card readers and two electric strikes simultaneously when the total current draw of the connected devices is fewer than 900mA @ 12VDC (around 11 Watts).

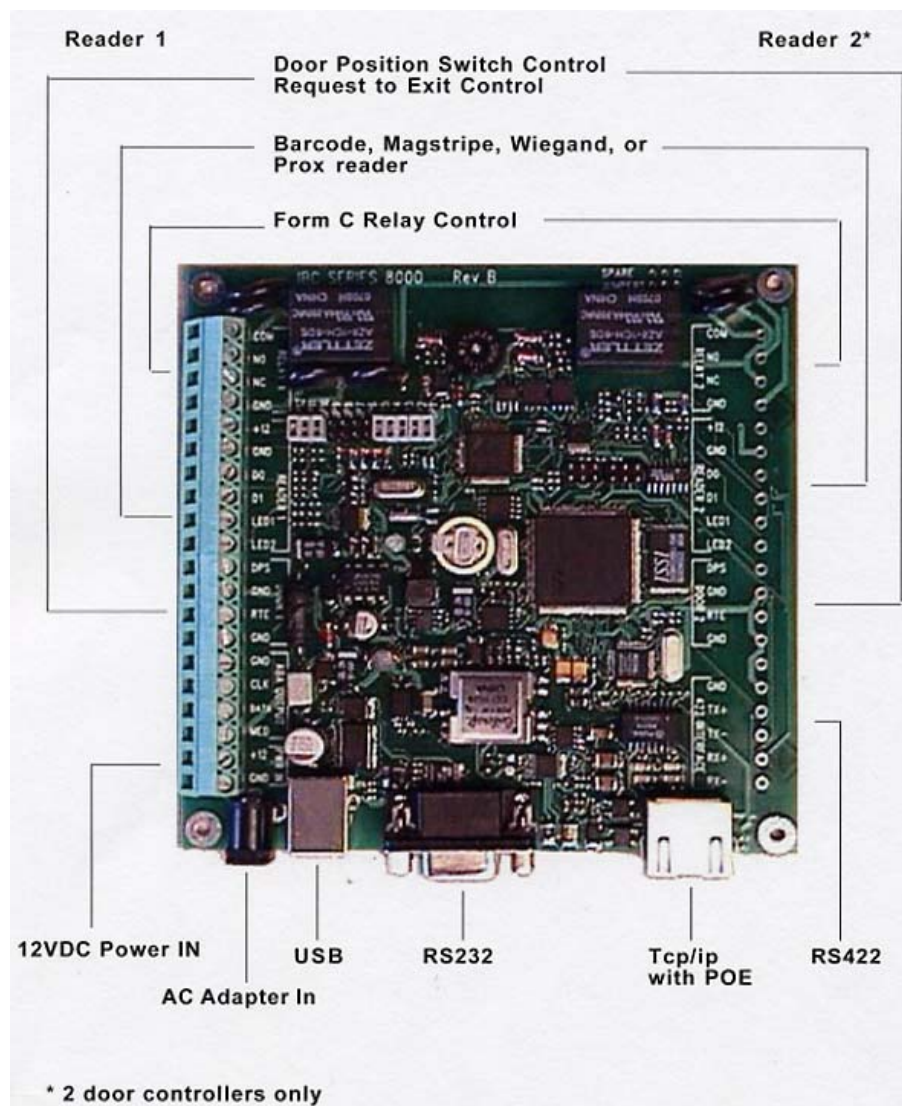
This document will describe the features of this controller for simplified installation and setup.

## KEY FEATURES

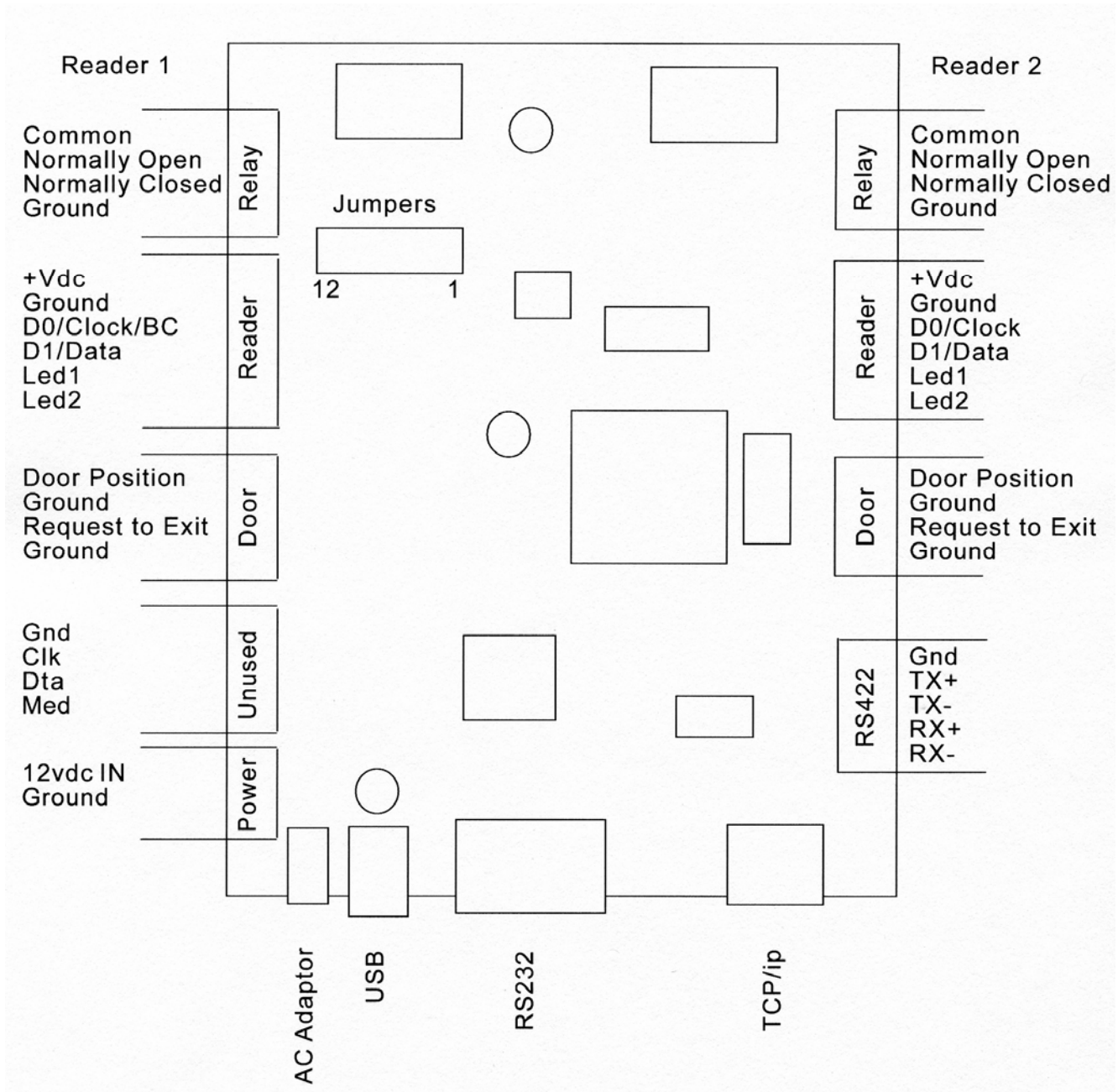
- RS-232 and Ethernet Networking with 802.3af Power-Over-Ethernet built on board.
- Two-Door Operation with Request to Exit and Door Position Switch monitoring.
- One-Door model available.
- Flash-Based Non-volatile memory 512K for each reader.
- 25 Schedules with 8 periods (when used with HMS software).
- Automatic door unlocking and relocking cycles.
- Adjustable memory structure – Memory structure is adjusted based on length of longest user ID in order to maximize memory space for IDs (automatically configured when using HMS software).
- Reader inputs can be configured to accept different signal types including Wiegand and ABA. Reader Input 1 can also accept barcode symbologies (including Code 3 of 9, I 2 of 5, Interleaved I 2 of 5, Codabar, UPC A, EAN13 and Code 128 barcode types).
- Reader inputs can mask data to include or exclude digits from user ID on a hardware level.

## 8000 CONTROLLER BOARD

### **BOARD PHOTO AND LAYOUT**

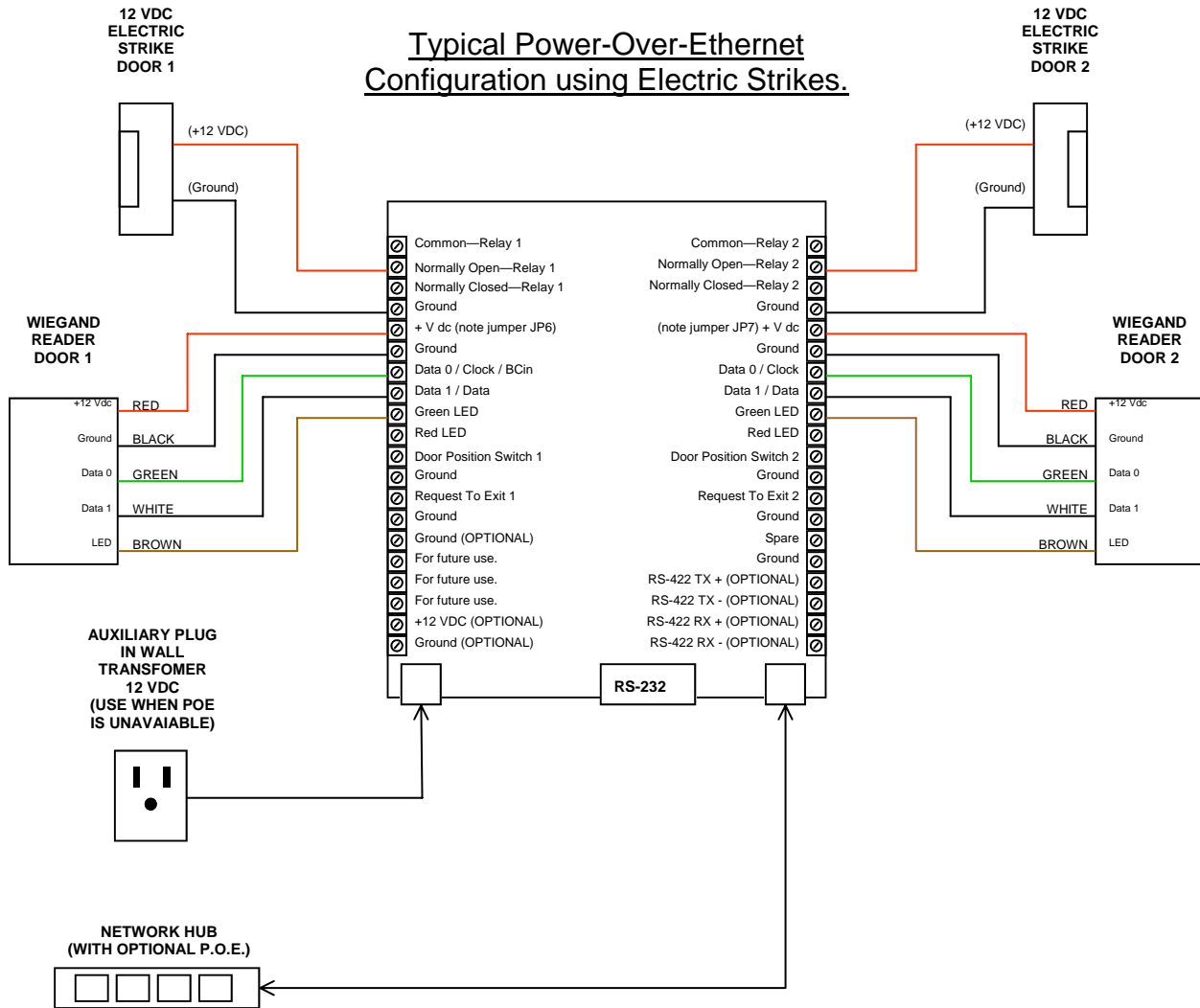


# BOARD CONNECTIONS BLOCK DIAGRAM



# TYPICAL POE CONNECTION DIAGRAM

## Typical Power-Over-Ethernet Configuration using Electric Strikes.



## **NOTICE OF INSTALLER QUALIFICATION**

The items listed in this manual may require the services of an individual who is trained in the application and installation of life safety equipment. All wiring must be in compliance with current NEC guidelines.

### POWER REQUIREMENTS

#### **FLEXIBLE POWER SUPPLY OPTIONS**

The controller is powered using either 12VDC connected to one of the terminals on the board (12vdc IN or ac adapter IN) or through using Power-Over-Ethernet via the Ethernet connector.

There is internal voltage regulation on the controller board, so a 13.8 Volt supply, or an unregulated / or regulated plug in wall adapter that can provide the required power is acceptable to use.

8000 Controllers equipped with the POE feature can get power directly through the CAT 5 networking cable through a POE network switch, so a local power supply is typically not required. There are applications where an external power supply may be required over the POE. Please read the section below concerning Power Over Ethernet for more information concerning this.

The controller power requirement (for the board only) is:

Without Onboard Ethernet: 150 mA @12 VDC

With Onboard Ethernet: 350 mA @12 VDC

When using a power supply you must make sure that the power supply will support not only the power requirements of the controller board, but also any readers and locks that you are powering off of the controller.

Additionally, there are jumpers on the controller board for powering the door strike(s) directly from the board. When you are powering the strikes from the board, DO NOT connect a power supply to the common relay contact. The controller sources the power for the strike directly from the power supply which is supplying power to the controller.

If you decide to power the strikes directly through the board, you must make sure that the total power usage for both strikes combined is not more than 700ma. This is the limitation for strike power through the board, whether powering the board from an external plug in adaptor or through POE.

Note that the door strikes can always be powered separately by changing jumpers and using the relay as a dry contact. In this case, the relay contacts should be limited to a 5 Amp load. To use the relay as a dry contact remove jumpers 11 and 12 which connect relay 1 and relay 2 contacts to the power supply on the board. **DAMAGE TO THE BOARD WILL OCCUR** if you leave these jumpers in and provide power directly to the relay common line.

#### **DETAILS ABOUT POWER OVER ETHERNET FEATURE**

The 8000 is fully IEEE 802.3af compliant. Power can be supplied over the Ethernet data lines, or on one of the unused pairs. Normally, the power is supplied by an Ethernet switch but it can also be supplied by a power inserter. A list of tested and recommended power inserters can be found in the appendices.

The power supplied over the Ethernet cable can also supply the electric strike or maglock connected to the door. An additional supply typically is not needed for the door lock. Power for the lock mechanism is taken directly from the controller board, eliminating the need for a separate power supply for the lock mechanism.

Note that because of POE specification limitations, the maximum combined power that can be supplied to all connected readers and strikes, is 700mA @12vdc. Do not exceed this power limitation or damage could occur to the controller board.

When using POE, the typical installation will require installing either a POE switch or a power inserter near the Ethernet switch. Category 5 cable can be used to connect to the controller board for lengths of up to 100 meters.

Battery backup can be implemented by using a UPS at the switch or power insertion point instead of traditionally having a battery backup at each controller box. There is no need when using POE to provide battery backup at the controller location. It is highly recommended that you install a UPS on your switch equipment to insure constant uninterrupted controller operation.

Note that an 8000 controller with POE does not have to be powered over the Ethernet. You can still power it with a standard supply. If you intend to use POE but cannot initially install the POE switch or power inserter, the 8000 can still be installed using a power supply temporarily. The 8000 should not be connected to a POE source and a local power supply at the same time. Doing this could damage the controller.

You can power external devices like electric strikes and maglocks directly from the POE interface by setting appropriate jumpers. The power insertion jumper(s) must be on for the POE power to pass through the relay to the lock mechanism. See the jumper configuration section below for setting the appropriate jumper settings.

### STAND ALONE OPERATION

The stand-alone mode operates without the need of a real-time computer connection. This is the mode that the controller is typically configured to and this mode is used in conjunction with the HMS software. When a card is read, the controller performs a search for the card number in memory. If the card number is found and the card's schedule is valid, access is granted. Cards are normally entered into the controller by transferring the card data from a PC. You can, however, enroll the cards locally at a connected reader using control cards. If cards are enrolled locally, there is no need for a computer connection at all other than for the initial programming.

There is an audit trail feature in the controller while operating in the stand-alone mode. Whenever a valid card is read, the card number, along with the date and time, is stored in the controller's memory. This audit trail data can be transferred to a computer at any time and is automatically retrieved when using the HMS software. Optionally, cards which are read but not granted access can also be stored in the audit trail to log invalid entry attempts. Audit trail data is stored in non-volatile flash memory and is not lost if power is lost. A separate audit trail is stored for each of the two doors (readers).

When a valid card is found, the appropriate output relay is triggered for the pre-programmed time, allowing the door to be opened. When the door is closed, the controller can automatically re-lock the door rather than wait until the full time period has elapsed (anti-tailgating feature) when the controller is used in conjunction with a Door Position Switch (DPS). Anti-tailgating is a programmable option.

The controller supports scheduling in the stand alone mode. Schedules tell the controller which time of day a card has access for. A card number can be associated to one or a series of schedule times, allowing multiple access times during an individual day. When using the HMS software, 25 schedules are provided, each schedule having 8 periods.

## **ADDITIONAL I/O FEATURES**

A "Request to exit" switch can be connected to an input on the controller for remote door unlocking. When the switch is engaged, the controller will trigger the relay for the pre-programmed time, allowing the door to open. The Request to exit can operate in both modes, stand-alone and online.

## **DESCRIPTION**

Stand-alone mode is the most commonly used mode in the controller. This mode is used by the HMS control software. In the stand-alone mode, the controller operates independently from a computer, but allows a computer to make changes to the controller memory.

All card numbers which have access through the door must be loaded into the controller's memory. This can be done either by loading in the data from a PC, or by enrolling each card at the reader locally. The preferred method will depend on the number of cards that you need to enroll and whether you want to use the scheduling features provided in the controller. Cards which are enrolled locally at a reader cannot use the scheduling features, so if you need to use schedules then card data must be downloaded into the controller via software.

The number of cards that can be stored in the controller depends on the size of the cards. Memory in the controller is pre-allocated and therefore you can adjust the number of allowable cards in the system based on your card data size. A list of the total number of cards which can be stores is provided in the Appendices.

## **SCHEDULES**

In the stand-alone mode, schedules are supported in the controller. Schedules allow you to specify the times of day that an employee has access for. There are 199 unique schedules that can be programmed into the controller, each schedule representing the allowable times for employee access for 7 days (Monday thru Sunday). When using the HMS software, these 200 schedules are grouped into schedules and periods, allowing for 25 schedules each with 8 periods (shifts).

Holiday schedules can also be entered in. The holiday schedule in the system is loaded in as day "8".

Cards which are enrolled at a reader are enrolled with no schedule, meaning they will have access at all times. This means that if you enroll cards at the reader you cannot specify a specific schedule. Currently, you should not use the enrolling feature at the reader if you are also using the HMS software.

Each schedule specifies the start time and end time that access is allowed.

As an example, 0700 thru 1529 represents 7:30 in the morning till 3:29 in the afternoon. At 3:30 in the afternoon and after, the employee will not have access.

It is possible to associate schedules in the controller. When you associate schedules, you are linking multiple schedules together.

For example, let us say that you want to allow access between 7 in the morning and noon, and then again between 1 pm and 4 pm. You would enter in two different schedules in the system, one for the 7 to noon, and another from 1 to 4, and then link them together. The result is a schedule which allows access from 7 to noon, and then from to 4. From noon until 1259, access is not allowed. When using the HMS software, the software will link sets of 8 schedules together automatically to form 25 schedules each with 8 intervals (shifts).

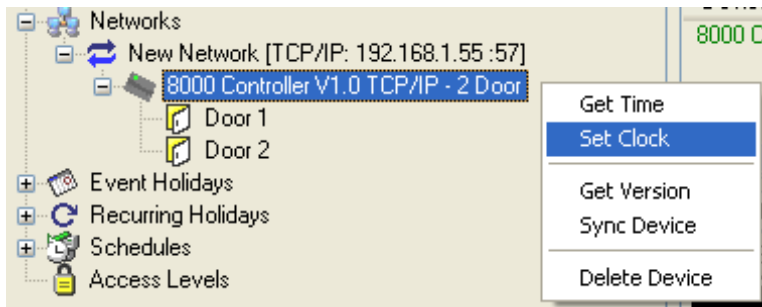


There is an audit trail in the controller which will record each transaction that occurs in the reader. The audit trail can be turned on or off. Whenever a card is read, the date and time, along with the card data is stored in the audit trail. This data can be retrieved from the controller at any time. This audit trail data is stored in a circular buffer to prevent the latest audit information from getting lost if the audit memory space is full. Note that there are separate audit trail logs for each reader connected to the controller. The HMS software will retrieve this audit trail information for each reader and use the information to generate reports with the HMS reporting facility.

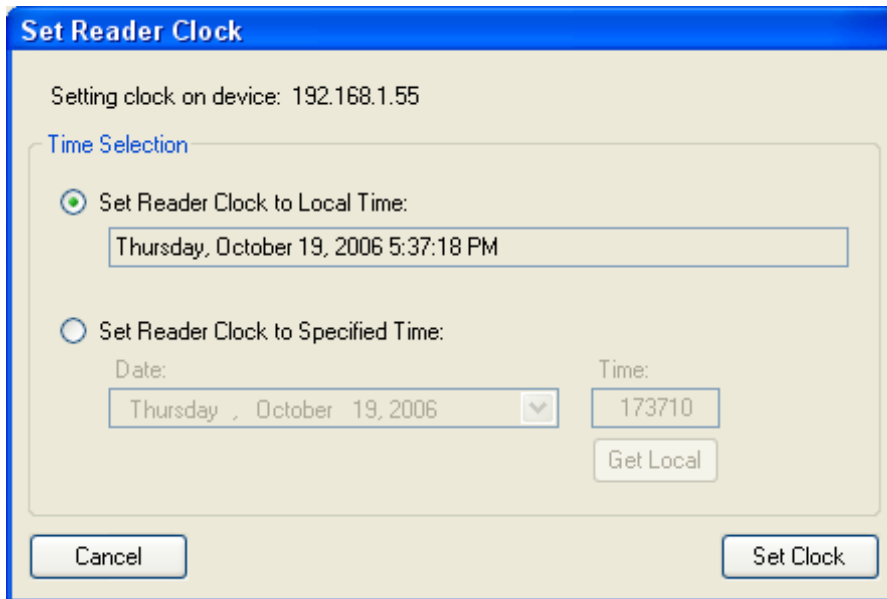
## REAL TIME CLOCK

The time is set in the 8000 using the HMS software or via typed command. Time is accurate to about 1 minute per year. It is suggested that you update the time on a periodic basis. The real time clock is updated every second. Schedule times, holiday periods, and other real time events are also checked every second. Audit trail data is accurate to the second.

To set the current time in the system using the HMS software, right click on the controller that you wish to set the time on. Left click on "Set Clock".



HMS allows you to set the clock to different times which is important if the Controllers are in different time zones:



## ADVANCED STAND-ALONE FEATURES

### SOFTWARE INTERFACE

Adding cards and changing settings in the controller is mainly done using the HMS software. You do have the option however, to add cards to the controller by using control cards. In doing this, you do not

need software for programming, but you will not be able to easily use the advanced scheduling and other advanced features of the controller.

## SCHEDULING PROGRAMMING

The controller contains memory for the loading of up to 199 schedules. These are identified as schedule numbers 001 through 199. Each loaded schedule consists of 8 entries total. Seven schedules for the 7 days of the week and 1 entry which is used for holidays. Each entry contains a start time and an ending time that access is allowed for. If an entry for a particular day is not entered, then access is not allowed for that day. The HMS software automatically groups these 200 schedules into 25 schedules each with 8 intervals (shifts).

	Start	End	Days of Week Schedule is Activated							
Interval 1:	0900	1200	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 2:	1300	1800	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 3:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 4:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 5:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 6:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 7:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 8:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays

Entered schedule times are inclusive, not exclusive. If you want to allow access from 7 in the morning until noon (don't allow access after noon), then the entered times are 0700 thru 1159. This means that at 1159 you can still unlock the door, but at 1200 noon you cannot. To refer to midnight, you use 0000. Schedules cannot cross midnight. To cross midnight you enter in a time period for the first day, and then a time period for the second day. In order to allow two time periods in the same day, you must associate two schedules together. This is handled automatically when using the HMS software.

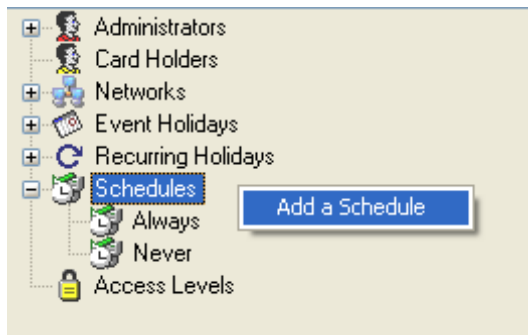
Schedule 0 is a reserved schedule. This schedule is an open schedule, meaning access is allowed at all times. Any card number entered into the system with schedule 0 is automatically allowed access at all times, all days, including holidays. Cards which are enrolled locally at the readers are also entered in with schedule 0. This means they have access at all times.

## AUTOMATIC UNLOCKING USING SCHEDULES

The 8000 contains a feature to allow either door to be unlocked during specific times of the day. You may want, for example, to keep the door open during shift changes, or during lunch periods. The HMS software can use your scheduling information to lock and unlock the doors automatically.

Schedule number 200 is a special function schedule in that the controller will automatically unlock the door when the schedule time starts for that particular day. HMS will associate multiple schedules together (starting with schedule 200) in order to unlock the door for multiple periods of the day. During the unlock period, card scans are still allowed, but they have no effect on relay operation since the relay is already actuated. If the audit trail is being used, the card scans will be stored as usual. The unlock schedules will optionally work on holidays using the "day 8" schedule times. At the beginning of the holiday period, the relay is automatically locked as usual, and then unlocked when the schedule 200, day 8 unlock start time is reached.

Adding a schedule with the HMS software is accomplished by right clicking on Schedule in the configure tree and selecting "Add a Schedule".

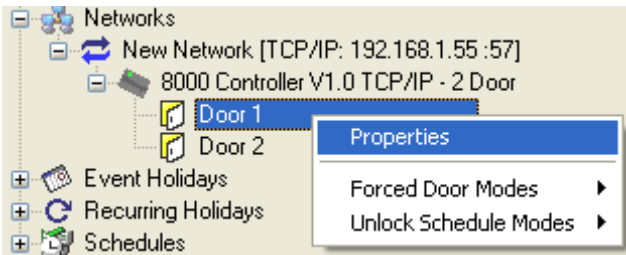


Once you have clicked Add a Schedule, then the schedule screen pops up, which allows you to set up your schedule times:

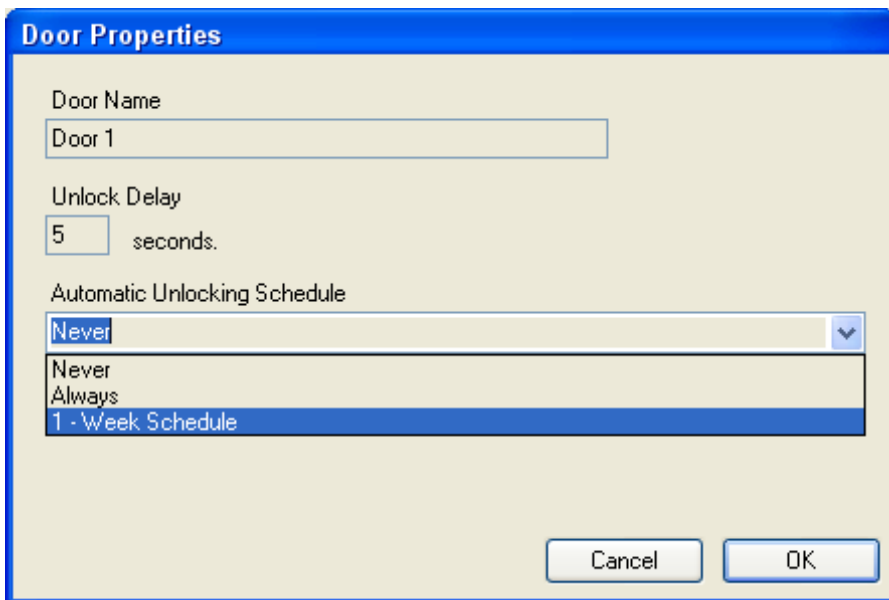
The 'Add Schedule' dialog box is shown. It has a title bar 'Add Schedule' in blue. Below the title bar, there is a text field for 'Name of Schedule:' with the value 'Week Schedule'. Below this, there is a table with columns for 'Start', 'End', and 'Days of Week Schedule is Activated'. The table has 8 rows, labeled 'Interval 1' through 'Interval 8'. Each row has two time input fields for 'Start' and 'End', and a row of buttons for the days of the week (Sun, Mon, Tue, Wed, Thu, Fri, Sat) and a 'Holidays' button. The 'Start' and 'End' times are currently set to '0900' and '1200' for Interval 1, and '1300' and '1800' for Interval 2. All other intervals have '0000' for both start and end times. At the bottom right of the dialog box, there are 'Cancel' and 'OK' buttons.

	Start	End	Days of Week Schedule is Activated							
Interval 1:	0900	1200	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 2:	1300	1800	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 3:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 4:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 5:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 6:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 7:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays
Interval 8:	0000	0000	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Holidays

Once you have configured your schedule, you must tell HMS to use the schedule as an unlocking schedule. To do this, right click on the door that you wish to work on an unlock schedule and select "Properties":



Once you click on properties, the door properties window will be shown. Pick the schedule that you have created to use as an unlock schedule:



Once you select "OK" the doors will work on the selected unlock schedule once the system has been Synced.

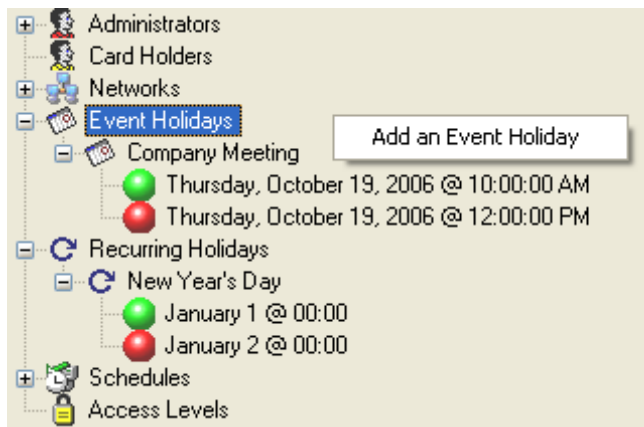
Note that Unlock periods are not implemented if the system is in a Forced Lockdown or Forced Open mode (described in later section).

## HOLIDAYS

The controller supports both *recurring holidays* and *non-recurring holiday* periods. Recurring holidays are holiday periods that recur for the same date every year (like New Years Day or Christmas). Non-recurring holidays do not recur from year to year, or the dates change, and therefore need to be programmed in every year (Special events, Labor Day, etc).

During a holiday period, the controller automatically turns off the relay, and switches to the day 8 schedule. Day 8 is therefore considered the "holiday schedule". During the holiday schedule, even if an employee normally has access for that specific day, he will not have access unless access is permitted under the day 8 schedule or if he has been entered in with schedule 0, which allows access at all times.

Non-recurring and Recurring holiday periods are specifically handled in the configure tree of the HMS software. Right-click on either “Event Holidays” or “Recurring Holidays” in order to Add a holiday to the system:

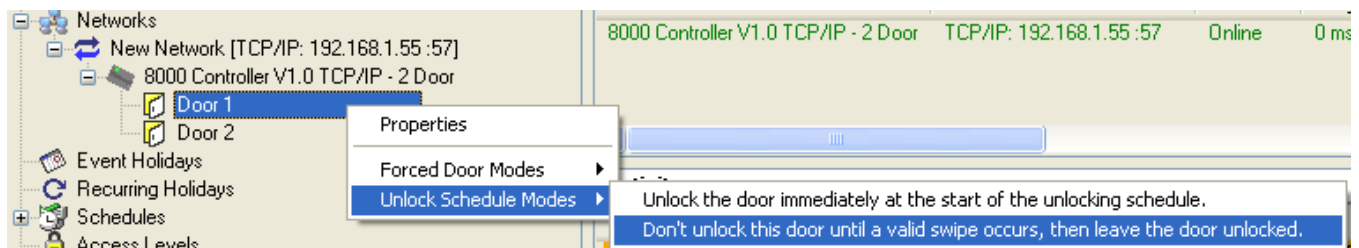


## FIRST-PERSON-IN FEATURE

First-Person-In is a feature which allows a door unlock period to be delayed until at least one valid card is read. This function is normally enabled to make sure that if the door is to be unlocked, that there is at least someone around when it does unlock.

If the First Person In option is turned on, then when an unlock period is scheduled to start, the door will remain locked. When the first valid read occurs, the door is then unlocked and remains open until the end of the unlock period. A valid read is any card which normally would have been accepted if the system was not in the unlock period.

The first-person-in features is specifically handled in the configure tree of the HMS software. In HMS, right click on the appropriate door in the configure tree, select “Unlock Schedule Modes” and then click on “Don’t unlock this door until a valid swipe occurs, then leave the door unlocked.”



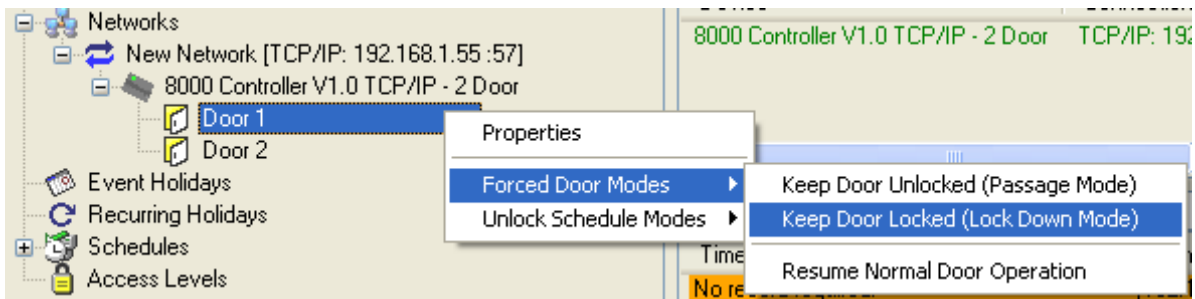
To disable the First-Person-In feature, select “Unlock the door immediately at the start of the unlocking schedule.”

## FORCED LOCKDOWNS

Either door connected to the 8000 can be locked down at any time using the HMS software, and also with the reading of a special lockdown card. During the lockdown period, only cards entered in with a schedule 0 will have access.

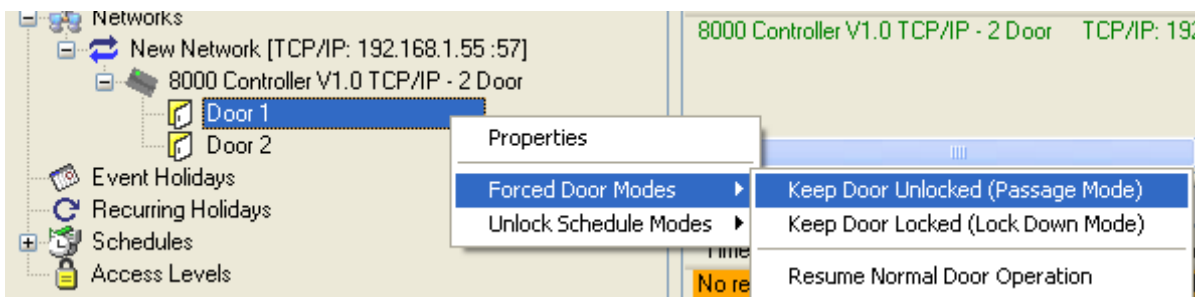
The forced lockdown can be turned off using the HMS software or also by scanning in the "End forced mode" control card.

In the HMS software, right click on the appropriate door in the configure tree, select “Forced Door Modes” and click “Keep Door Locked (Lock Down Mode)”.



## FORCED DOOR UNLOCK (PASSAGE MODE)

Passage mode (Forced "opens" of the door) can be achieved using the HMS software or by presenting the "force open" control card to a reader. In the HMS software, you right click on the appropriate door in the configure tree, select "Forced Door Modes" and click "Keep Door Unlocked".

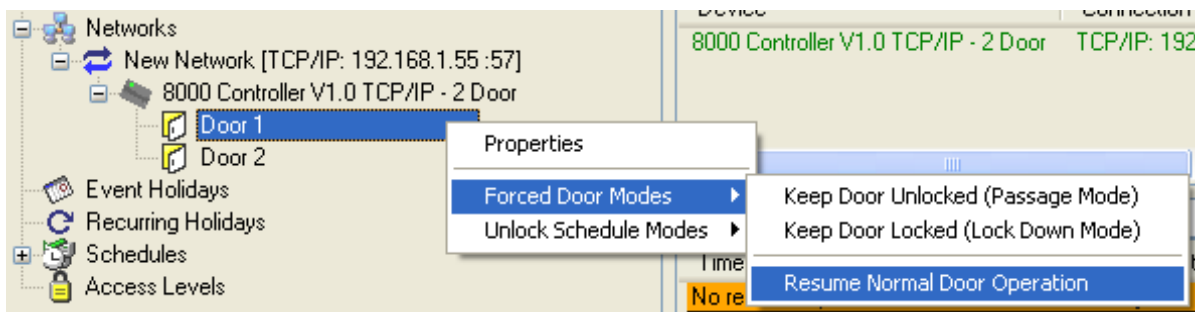


The door will remain open until the door is put back into either normal operation or into a forced lockdown. An "End forced mode" card can also be scanned to enter forced lock open mode.

## NORMAL DOOR OPERATION

Normal door operation returns a particular door to normal operation from Forced Lockdown or Passage Mode. The door will resume operating with schedules and operating with valid cards.

In the HMS software, you right click on the appropriate door in the configure tree, select "Forced Door Modes" and click "Resume Normal Door Operation".



## HARDWARE FEATURES

### **ON BOARD JUMPER FUNCTIONS**

<b>JUMPER</b>	<b>FUNCTION</b>
JP1	When removed and powered up, controller enters "Learn" mode.
JP2	RS-232 or USB active port selection (on models with USB).
JP3	TCP/IP or RS-422 active data port selection (on models with TCP/IP).
JP4	Selects which port data is sent out to in online mode. On selects (TCP/IP/RS-422). Off selects (RS-232).
JP5	Used to place the RS-232 port into a known state. Forces the controller to start up with the RS-232 port set at 9600 baud, 8 data bits, no parity. Remove this jumper and power up to make the RS-232 port online port with the above settings. Used when the ports have been changed to some unknown state.
JP6	Both of these jumpers should be on in order to provide 5V power to the readers. JP10 should be OFF when these jumpers are connected.
JP7	
JP8	Reserved for future use. THEY MUST BE LEFT OPEN.
JP9	Reserved for future use. THEY MUST BE LEFT OPEN.
JP10	Used to connect 12V power to the reader outputs. JP6 and JP7 must be removed when JP10 is connected.
JP11	Jumper supplies power from the POE supply directly to the common terminal of Relay 1. When open, Relay 1 works as a dry contact set.
JP12	Jumper supplies power from the POE supply directly to the common terminal of Relay 2. When open, Relay 2 works as a dry contact set.

### **REMOTE RELEASE**

The Remote Release Terminals provide a connection for external switches that are used to trigger Door 1 or Door 2. These switches are normally open switches, that when closed, cause the respective door to unlock. The doors will remain unlocked for their programmed unlock cycle times.

### **READER PORTS**

The controller has two Ports for reader connection.

<b>NAME</b>	<b>FUNCTION</b>
<b>READER PORT 1</b>	
(+Vdc)	(+5V) or (+12V) Reader Supply Voltage (Selected by Jumpers 6 and 10)
Ground	DC Supply Ground
D0/Clock/BC	Port 1 Wiegand Data 0 / ABA Clock Input / Barcode Input
D1/Data	Port 1 Wiegand Data 1 / ABA Data Input
LED 1	Port 1 Green LED Control Line Output
LED 2	(Optional based on reader) Port 1 Red LED Control Line Output
<b>READER PORT 2</b>	
(+Vdc)	(+5V) or (+12V) Reader Supply Voltage (Selected by Jumpers 7 and 10)
GND	DC Supply Ground
D0 / Clock	Port 2 Wiegand Data 0 / ABA Clock Input
D1 / Data	Port 2 Wiegand Data 1 / ABA Data Input
LED 1	Port 2 Green LED Control Line Output
LED 2	(Optional based on reader) Port 2 Green LED Control Line Output

## ADVANCED READER PORT FEATURES

Both reader inputs of the 8000 support Wiegand and ABA. Reader input 1 additionally supports barcode symbologies. Readers can use either 12VDC or 5VDC power and can be powered off the controller in both powered mode and using POE. Power is supplied directly from the controller for the readers.

The 8000 supports the connection of an undecoded barcode reader directly on the reader #1 connection ONLY. If you have a 2-door controller, and need barcode reading for both doors, a decoded barcode reader with magstripe emulation or wiegand interface, can be used for the 2nd reader or for both readers. Contact Highpower for assistance when picking readers with a barcode input.

Wiegand and Proximity readers should have a standard Wiegand data output (Data 0 and Data 1 signals). Most, but not all, proximity readers have this type of output. Compatible models include readers from many popular brands including and reader from Farpointe Data, HID Corporation, Indala and AWID. Barcode readers include readers from International Bar Code (IBC). The inputs of the 8000 have been tested with the Farpointe Data reader line specifically. Highpower can provide you with a Farpointe reader for your application.

Magnetic stripe readers should have an undecoded magstripe output, known as "clock and data" signals. If you need a dual-technology single reader, then any of the Magbar or Smart Prox readers from International Barcode, with ABA, Wiegand, or wand emulation outputs can also be connected to the controller. Multiple readers may be connected to the same reader input, as long as the readers have open collector outputs. If this multiple readers on one port is used, only one reader can transmit to the controller at a time.

Most 8000's are in the two-door configuration. The 2-door controller supports the connecting of 2 separate readers. Each reader is treated individually and operates independently of the other. In the stand-alone mode, each reader uses its own memory space for accessing valid ids, and for the audit trail. In the online mode, both readers share the same output. Reader styles can be mixed. You do not have to use the same technology reader on each input. For example, you can have a barcode reader as reader #1, and a magstripe reader as reader #2, or you could combine magstripe/proximity readers, etc.

### **PROXIMITY (WIEGAND) FORMATS (BOTH READER PORTS)**

The controller supports all proximity and wiegand data formats up to 64 bits. Each individual field (site code, id number, and optional issue code) is extracted and converted to a decimalized number, resulting in a numeric string. This is the string that is used for comparisons in the controller while in the stand-alone mode. In the online mode, this string is simply transmitted. The controller converts this information into a string so that masking of the data can be achieved easily should you need to mask out numbers from the card ID.

A special mode of the controller called open enrollment allows you to accept wiegand data without a decimalized conversion. In this mode, all wiegand formats up to 64 bits are accepted and stored directly with no conversion.

Three different formats are programmable, allowing the controller to accept three different card formats for each reader. Each format is fully configurable by bit, and the extracted data can be modified by the controller prior to comparison or transmission. Numbers can be added to the data, or deleted from the data. See the Advanced Concepts section for more information on this topic.



## **DETAILS ABOUT USING WIEGAND DATA**

The controller will accept any size wiegand input up to 64 bits. Please note that most proximity readers output data in the Wiegand data format.

Because Wiegand data is binary, the data is normally meaningless unless it is decoded into a useful number in some way. The industry standard for wiegand data is a 26-bit stream, consisting of a site (facility) code of 8 bits and also a badge (id) number of 16 bits. This is also the default setting for the controller. The largest site code that can be transmitted with 26 Bit Wiegand is value 255. The largest ID code that can be transmitted in 26 Bit Wiegand is 65535. The controller therefore decodes 26 bit wiegand numbers into an 8 digit string, consisting of 3 digits for the site code, and 5 digits for the id number, by default.

In order to decode a different format, you must program the controller so that it understands the bit structure that you will be reading. It is necessary to do this so that the controller will end up with the correct unique id number. You must program in the starting bit position and number of bits for the site code (if it is being used), as well as the id number. Issue codes are also supported as a separate field and they can be decoded or ignored.

It is important to note that the controller always processes wiegand bit fields in the order of site, badge (id), and then issue code (in the rare case where an issue code is being used). The controller will accept any size wiegand input up to 64 bits.

When decoding numbers are read from the card, the controller will concatenate each of the three fields in the order of site, badge, and then issue to create the actual card data number that is stored in the controller.

For example, if you have a proximity card with a facility code of 33 and an ID of 12, and have programmed the controller to decode the site code to a 3 digit number, the id field to a 6 digit number, and to ignore the issue code, the resulting number after decoding will be 033000012.

You can program the controller to accept up to 3 different wiegand data formats, and decode them based on the parameters you have set. It is therefore possible to mix different wiegand or proximity cards together in the controller. The controller will automatically discriminate them based on their bit lengths.

It is also possible to mask the wiegand input (omit or add numbers in certain positions from the read results). Characters can be added to or deleted from the decoded number using one of the input masks (described later).

Backward bit structures may also be handled by the controller. Some proximity cards contain site codes and id fields that are encoded backwards with the least significant bit first, rather than last. It is possible for the controller to read these bit streams and decode the proper number.

## **READER PORT 1 SPECIAL FEATURES**

### **BARCODE SYMBOLOGY SUPPORT**

The 8000 controller supports Wiegand and ABA (also called clock-and-data) on both reader ports.

Additionally, Reader port 1 has some additional unique features in that it can also read unencoded barcode signals. The controller supports barcode symbologies through reader port 1 only. The following barcode symbologies are supported:

- Code39
- Interleaved 2 of 5

- Industrial 2 of 5
- Standard 2 of 5
- Codabar
- UPC A
- EAN 13
- Code 128

The maximum number of barcode characters that can be decoded by the controller is 22. This includes start and stop characters and check digits. The controller can be programmed to auto-discriminate Kronos barcodes, which are normally 17 or 18 digits long. In this mode, the id is extracted from the entire Kronos string, and the remaining information is ignored. The controller can also be programmed to extract the PDI from a military/CAC barcode. This extraction yields a 9 digit number (typically the SSN). There are a number of programming options that affect the way barcodes are read and processed. These options can be found under the Advanced Concepts section. Barcode data can also be masked (omission of digits in barcode) and reformatted (numbers added to the string) on the hardware level. Note that the controller supports the direct connection of an undecoded barcode reader ONLY ON READER PORT 1.

## **MAGSTRIPE INPUT**

Both the Track 1 and Track 2 character sets are supported by the controller. Separator character translation is also supported, as well as B and C start sentinels for the Track 2 character set. Note that magnetic stripes on tracks normally use the Track 2 character set and is fully supported. Magnetic stripe data can also be reformatted using the masking commands (see Advanced Concepts).

## **DETAILS ABOUT BARCODE INPUT**

The controller can decode numerous barcode symbologies. For all supported symbologies, it is possible to prefix and suffix barcode data with up to 5 characters. This prefix and suffix is in addition to the ability to add and delete characters via the masking commands.

Start and stop characters may also be included, along with check digits and scan direction indicators. These items are normally only used when in the online mode; however they can be used in the stand-alone mode as well.

The controller also has advanced barcode decoding options, which are useful when there is writing before or after the barcode, or there are extraneous bars in the barcode.

## **PDI MODE**

When using the 8000 on Port 1 with an unencoded reader, the 8000 can automatically extract the PDI from military and Common Access Card (CAC) barcodes. The PDI is extracted to a 9-digit number. This number, on most cards, is the user's SSN.

## **BARCODE NORMALIZATION**

In rare cases, if you are reading barcodes, you may have information on the card immediately to the left or right of the barcode, which can interfere in the controller's ability to automatically decode the barcode. The 8000 has an option for you to "normalize" the barcode, by selecting which part of the data is to be decoded as a barcode.

## **MASKING INPUT DATA**

The 8000 supports a number of masking parameters, including character insertion, deletion, and selection. Character insertion allows you to add any sequence of characters to the input data at any

location. Character selection allows you to select only those characters that you want. Unselected characters are deleted. There are separate masking tables for each type of input.

For example, if you are using 2 different sets of proximity cards, 26 bit and 34 bit, with different site codes on the 34 bit cards than the 26 bit cards, and want to keep the site codes the same, you can program the controller to ignore the site codes on the 34 bit card, and then use the masking commands to add in the appropriate site code so that the site codes are the same as the 26 bit cards.

#### CUSTOM WIRING DIAGRAMS AND UNIQUE APPLICATIONS

Highpower can provide design services for you application including wiring diagrams, installation procedures, and system integration. We offer turnkey solutions for your security requirements. Please feel free to contact Highpower directly for integration services.

## TROUBLESHOOTING ISSUES

This section describes troubleshooting information that is discovered through technical support calls with our customers. Highpower attempts to update this section on a regular basis with solutions to commonly asked technical support questions. Contact Highpower at 203-634-3900 with technical questions.

<b><u>Problem Description</u></b>	<b><u>Resolution</u></b>
Nothing currently reported.	

## WARRANTY INFORMATION

Thank you for choosing a Highpower product! The Highpower Security Products, LLC Door Controller Model 8000 is manufactured to the highest quality standards to provide years of dependable service. The Model 8000 is warranted for one year from the date of shipment against defects in parts, workmanship and materials, when installed in accordance with instructions. Defects that occur within this warranty period, under normal use of the product, shall be repaired or replaced with a new unit, solely at our option. Warranty is void when product has been modified, damaged, abused, misused, subjected to abnormal use or neglect, or subjected to harsh operating environments out of the normal operating specifications.

No agent, employee or representative of Highpower Security Products, LLC has authority to bind Highpower Security Products, LLC to any oral affirmation, representation or warranty, other than set forth above. Highpower Security Products, LLC expressly disclaims all other warranties, expressed or implied, including but not limited to any implied warranties of merchantability or fitness for a particular purpose. "Fair-Safe" and "Fail-Secure" are definitions only. Use of these terms is not a performance warranty, but merely a descriptive term used to characterize a design feature.

## **APPENDIX A – MEMORY RECORD SIZE CALCULATIONS**

This appendix lists the number of available slots in the unsorted memory, sorted memory, and audit trail log for some of the most widely used record sizes. Please note that the HMS software currently only uses the Unsorted Memory Area for code storage, although future plans include Sorted Memory Area support.

<b><u>Record Size</u></b>	<b><u>Unsorted Memory Area</u></b>	<b><u>Sorted Memory Area</u></b>	<b><u>Audit Log Records</u></b>
4	10240	32085	16320
5	8777	27501	16320
6	7680	24064	16320
7	6826	21390	16320
8	6144	19251	16320
9	5585	17501	15360
10	5120	16042	14528
11	4726	14808	13760
12	4388	13750	13056
13	4096	12834	12480
14	3840	12032	11904
15	3614	11324	11392
20	2792	8750	9344
25	2275	7130	7936
40	1462	4583	5440

## APPENDIX B – COMPATIBLE POE SWITCHES

The following POE power inserters have been testing and approved for use with the 8000 controller:

SonicWall	Part No. 01-SSC-5531	Inserts power on unused lines.
Netgear	Part No. FS108P, FS116P	Switches that Inserts power on data lines.

## APPENDIX C – WIEGAND BIT SIZE TABLE

This table shows the number of bits required to encode a specific number into wiegand. This table can also be used to see how many characters are required to decimalize wiegand input fields.

<u>Bits</u>	<u>Decimal Number</u>	<u>Bits</u>	<u>Decimal Number</u>
1	1	33	8,589,934,591
2	3	34	17,179,869,183
3	7	35	34,359,738,367
4	15	36	68,719,476,735
5	31	37	137,438,953,471
6	63	38	274,877,906,943
7	127	39	549,755,813,887
8	255	40	1,099,511,627,775
9	511	41	2,199,023,255,551
10	1,023	42	4,398,046,511,103
11	2,047	43	8,796,093,022,207
12	4,095	44	17,592,186,044,415
13	8,191	45	35,184,372,088,831
14	16,383	46	70,368,744,177,663
15	32,767	47	140,737,488,355,327
16	65,535	48	281,474,976,710,655
17	131,071	49	562,949,953,421,311
18	262,143	50	1,125,899,906,842,623
19	524,287	51	2,251,799,813,685,247
20	1,048,575	52	4,503,599,627,370,495
21	2,097,151	53	9,007,199,254,740,991
22	4,194,303	54	18,014,398,509,481,983
23	8,388,607	55	36,028,797,018,963,967
24	16,777,215	56	72,057,594,037,927,935
25	33,554,431	57	144,115,188,075,855,871
26	67,108,863	58	288,230,376,151,711,743
27	134,217,727	59	576,460,752,303,423,487
28	268,435,455	60	1,152,921,504,606,846,975
29	536,870,911	61	2,305,843,009,213,693,951
30	1,073,741,823	62	4,611,686,018,427,387,903
31	2,147,484,647	63	9,223,372,036,854,775,807
32	4,294,967,295	64	18,446,744,073,709,551,615

## **APPENDIX D – TESTED COMPATIBLE READERS**

Highpower strives to make the Model 8000 as compatible as possible with Wiegand devices from many manufacturers. In accordance with this goal, we have created our Wiegand interface to automatically detect the transmission speed of any Wiegand device connected.

As a result, we are compiling a list of Wiegand devices that have been tested with the Model 8000. These devices include the following:

### **PROXIMITY READERS**

**All Wiegand “Pyramid” Reader Heads from Farpointe Data. (Models 300H, 500H).**

Note: These are good readers for most applications.

**All Wiegand “Revision E” model readers from AWID (Applied Wireless ID, Inc.)**

Note: This brand is common in the security industry.

**All Wiegand Readers from HID/Indala Corporation.**

Note: This is the most common brand in the security industry.

### **BAR CODE READERS**

**All Wiegand models from IBC (International Bar Code, Inc.)**

Note: Use the “Smart” models of IBC products when using extended bar codes.

**Non-decoded model barcode readers from various brands.**

### **MAG-STRIPE READERS**

**All Wiegand models from IBC (International Bar Code, Inc.)**

Note: Use the “Smart” models of IBC products when using custom track configurations.

Note to Installers: If you have successfully used another brand of reader with our controller or are having problems with a particular model of reader, we want to hear from you. Your comments are appreciated. Please call us direct at 203-634-3900.

## **APPENDIX E: ELECTRICAL SPECIFICATIONS**

### **Relay(s)**

Form C

Maximum Current - 6 amps

Maximum Current using POE - 700ma total

### **Supported Readers**

Wiegand, up to 64 bits Proximity (wiegand output), up to 64 bits Magstripe (clock & data), tracks 1, 2, or 3 Barcode (undecoded output - reader 1 only)

### **Reader Timing**

Wiegand/Prox up to 3 ms between pulses Wiegand/Prox 15us pulse width minimum Magstripe 50us clock strobe minimum Barcode 3" - 50" per second

### **Symbologies**

Code39, 2 of 5, 12 of 5, Ind2 of 5, Code'128, Codabar, UPCA, EAN13

### **Memory**

512K memory available for stand-alone operations.

### **Communications**

RS232

RS422

USB

TCP/IP (optional), 100FD operation

### **POE**

802.3af compliant. Power can be supplied over the data lines or unused pair.

12VDC power can be supplied directly to the strike from the POE\*

### **DPS/RTE**

TTL level Door Position switch input, and TTL level Request to Exit switch input.

### **Power Requirements**

w/o TCP/IP                    100 mA @ 12 VDC

with TCP/IP                    350 mA @ 12 VDC



## APPENDIX F: CONNECTOR DESCRIPTIONS

### Form C Relays

Common	Power for strike which is to be switched by the relay. Connect the + voltage from your power supply for the strike to this connection. The relay will then connect this contact to either the normally open or normally closed contact depending on the controller configuration.  Note... if you are powering the strike from the POE connection then this connector is unused.
Normally Open	This contact is normally open (unconnected) and closed when the controller triggers the relay, making a connection between this contact and the common contact (or POE if POE is used).
Normally Closed	This contact is normally closed (connected). Power is provided out this connection except when the relay is triggered by the controller. This connection is normally used to power a maglock which is powered to keep the door closed.
Ground	Connect to the Ground on your strike <u>only</u> if you are using POE to power the strike. Notes about relay operation:

Notes about relay operation:

The maximum allowable current using the relay common input contact is 6 amps. The maximum allowable current for both strikes using POE is 700ma combined.

The strikes can be operated by using the power provided over the POE circuit directly. Install Jumpers 11 and 12 to provide 12VDC power to the normally open/normally closed pair of contacts directly from the POE. In this mode, a separate power supply for the strike is not required.

### Reader Input

+VDC	Power output to the connected reader. The power can be 5VDC, or 12VDC. To provide 5VDC to the reader, jumpers 6 and 7 must be IN. To provide 12VDC to the reader, jumpers 6 and 7 must be out, and jumper 10 must be IN.
Ground	Connect to the reader ground.
DO/Clock	For any reader with a wiegand output, connect to the reader's DO line. For magnetic stripe readers with clock & data output, connect to the reader's clock line.
D1/Data/BC	For readers with a wiegand output, connect the reader's D1 line. For magnetic stripe readers with clock & data output, connect to the Data line. For undecoded barcode readers, connect to the reader's barcode data output line.
LED 1	For readers with 2 LEDS, connect this line to the reader's first led line, which is normally a red led.

	For readers with only one bi-color led, connect this line to the reader's bi-color led line.
LED 2	Connect this to the reader's 2nd led. If the reader has only 1 led, do not connect this line.

### **DPS / RTE**

Ground	2 ground connections are provided for connecting to the DPS (door position switch) and the RTE (request to exit).
Door Position Switch Input (DPS)	This is the door position switch sensor input. Connect this line to one side of the door position switch, and connect the ground (above) to the other side of the switch. When the door is closed, a direct connection between the door position line and the ground should be made.
Request to Exit	This is a request to exit input. Connect this line to a pushbutton switch which connects the rte line to ground when the switch is hit. A ground contact is provided next to this contact for connecting to the other side of the switch.

### **RS-232 Port**

The RS232 is a DB9 connector using Pin 2 as transmit, and Pin 3 as receive. A null modem is not required when connecting to a PC.

### **Power Connections**

AC adapter	Connect an AC adapter capable of providing 500ma minimum to the AC adapter jack.
12VDC supply	Connect your 12VDC power supply to the 12vdc IN and Ground contacts labeled "power" on the block diagram.
POE	When using POE, power does not need to be supplied to the controller, as the power is supplied through the Ethernet line.

NOTE that you can power the strikes directly through the controller using either POE or from a 12VDC supply connected to either the 12VDC connection, or the ac adapter connection. In this case, you put in Jumper 11 to provide direct power to relay 1, and jumper 12 to provide direct power to relay 2. The total power consumption routed through the board must not exceed 700ma total. This includes the strike power as well as any connected readers.

If your total power consumption (readers and strikes) will be more than 700ma, you cannot power the strikes directly through the controller. You must use the common relay line as the power source to be switched through the relay. Jumpers 11 and 12 must be removed from the board.