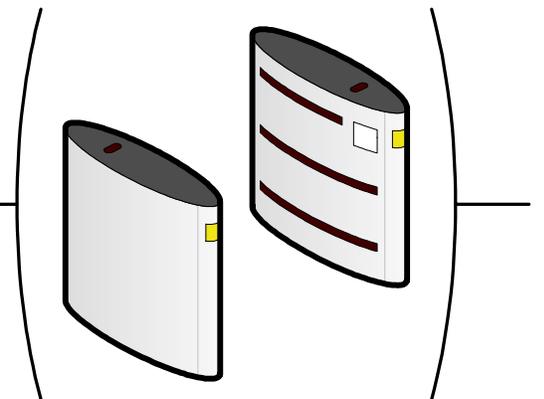


---

## Installation Manual

Oval optical turnstiles with vertical reveal housings  
PM-DINS-2031-A





## Table of Contents

<b>Background</b> .....	1	Case 1: Free exit, controlled entry.....	18
External features .....	1	Case 2: Fully programmable.....	19
Key terms .....	1	Alarm outputs .....	20
Exterior dimensions .....	2	Best practices .....	20
Exterior and interior assembly.....	2	<b>Configuring Turnstiles</b> .....	<b>21</b>
<b>Securing A Site: Checklist</b> .....	<b>3</b>	Setting parameters .....	21
<b>Planning and Preparing the Site</b> .....	<b>4</b>	DIP switch settings.....	22
Planning .....	4	<b>Using Turnstiles</b> .....	<b>27</b>
Conduit installation .....	6	<b>Maintaining Turnstiles</b> .....	<b>28</b>
<b>Unpacking Turnstiles</b> .....	<b>7</b>	<b>Troubleshooting</b> .....	<b>29</b>
<b>Installing Turnstiles</b> .....	<b>8</b>	<b>Warranty &amp; Returns</b> .....	<b>31</b>
Overview .....	8	Warranty .....	31
Installation preparation.....	8	Returns .....	31
Cabling and structural installation .....	9	<b>Appendix A: Terminal Board Reference</b> .....	<b>33</b>
Unit testing .....	15	<b>Glossary</b> .....	<b>34</b>
Final assembly.....	16	<b>Index</b> .....	<b>37</b>
<b>Integrating With Access Control Systems</b> .....	<b>17</b>	<b>Feedback</b> .....	<b>39</b>
Concepts .....	17		



This document is **strictly confidential**, and contains proprietary information protected by copyright. No part of this document may be reproduced in any form or by any means without prior written consent from PathMinder Inc.

Information in this document is subject to change without notice.

Copyright 2001-2004 PathMinder Inc.

---

**Path**Minder Optical Turnstiles



51 Spectrum Way  
Ottawa ON K2R 1E6  
Canada



Phone 613.726.3555  
Fax 613.721.7770



[support@pathminder.com](mailto:support@pathminder.com)  
[www.pathminder.com](http://www.pathminder.com)

---

## Document management

Revision	Date	Change(s)	Name
-	2002/06/21	Modified PM-DINS-2021: added updates for new frame/housing with vertical reveals; updated dip switches; added several troubleshooting items	DC
A	2004/11/11	Updated DIP switch information; added new power supply information; removed generic L1320 panel diagram	DC



## Background

### Background >

#### External features

The oval optical turnstile is shown in Figure 1, with key components labeled.

The card reader can be mounted under the top surface of the turnstile (directly under an etching of a hand-with-badge symbol) or behind a translucent plate on the side of the turnstile (as shown).

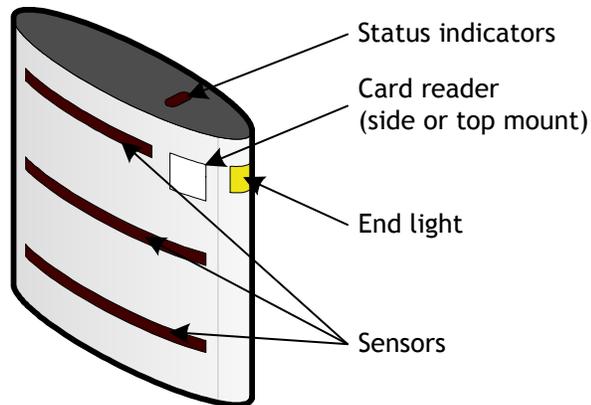


Figure 1: Exterior components of a turnstile

### Background >

#### Key terms

Turnstiles detect people with optical beams that are transmitted across the person's path. Two turnstiles make a **lane**.

Turnstiles are configured as transmit and receive pairs. A turnstile on one side of the lane sends the optical beams, and is thus called the **transmit side** of the lane. The turnstile on the other side of the lane detects the beams, and is called the **receive side**.

The first lane in an installation is made up of two **end turnstiles**: one that transmits and one that receives. Placing **interlane turnstiles** between the end turnstiles makes subsequent lanes. Each interlane turnstile receives on one side and transmits on the other.

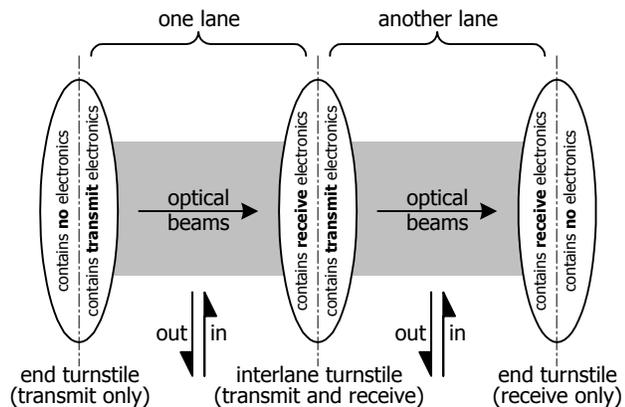


Figure 2: Transmit and receive sides of a lane

Background >

Exterior dimensions

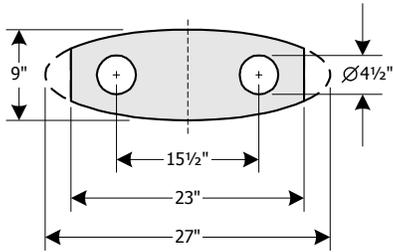


Figure 3: Turnstile base dimensions

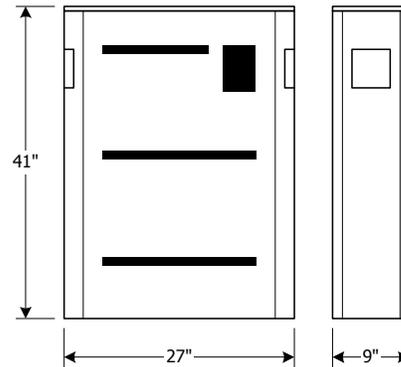


Figure 4: Turnstile dimensions

Background >

Exterior and interior assembly

The outer shell of the turnstile is composed of two panels and two end caps that mount on a frame; all the electronic components are mounted on the frame as well (Figure 5).

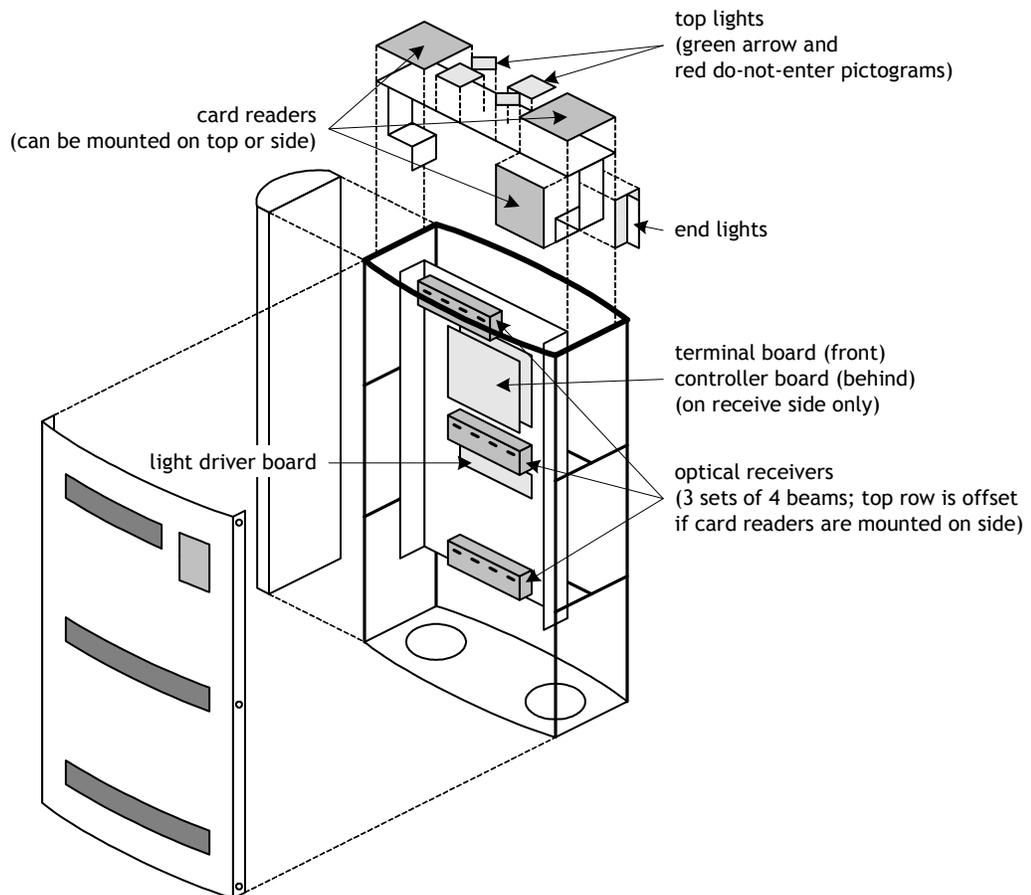


Figure 5: Turnstile assembly

---

## Securing A Site: Checklist

The major steps to securing a site with optical turnstiles are:

- 
- 1 **Plan** the installation, consulting local authorities having jurisdiction (page 4)

---

  - 2 Order, receive, and **unpack** the turnstiles (page 7)

---

  - 3 **Install** and test the turnstiles, observing all local building codes (page 8)

---

  - 4 **Integrate** the turnstiles with the building access control system (page 17)

---

  - 5 **Customize** the turnstile settings (page 21)

---

  - 6 **Train** building personnel (page 27)

---

## Planning and Preparing the Site

Planning and preparing >

### Planning

#### Calculate how many turnstile lanes are required

Observe the passageway during peak traffic (as people arrive in the morning, or as people leave for lunch, for instance), and determine the peak traffic flow.

PathMinder turnstiles typically have a peak capacity of 35 people per minute per lane.

Given the peak traffic flow in people per minute, divide by 35 and round up to the next whole number to determine the approximate number of lanes that are required. For example, if the planner observes a peak traffic flow of 80 people per minute, three lanes will be necessary.

The planner should also consider the site's capacity and try to accommodate future changes in traffic flow. For example, if a building is only half full, and has a peak rate of 25 people per minute, it would be advisable to install two lanes to accommodate the 50 people per minute that could be expected if the building were full.

It is often useful to arrange lanes so that, at peak periods, some lanes are entry-only and some are exit-only; this smoothes traffic flow, because, for instance, everyone approaching a turnstile (from either direction) will move to the lanes on their right. This eases congestion and increases throughput.

In a typical scenario, after the person presents his/her card to the turnstile, the time delays are:

100 ms	for the proximity card reader to read the card
200 ms	for the access control system to send an "access granted" signal (this varies between 100 and 1000 ms)
1000 ms	for the person to walk through the turnstile (one or two steps)
+ 100 ms	for the turnstile to reset itself (this is usually less than 50 ms)
1400 ms	total time for a person to pass through the turnstile

To account for any other delays, it is conservatively estimated that it takes a little less than 1<sup>3</sup>/<sub>4</sub> seconds for a person to pass; thus, the turnstile can handle 35 people per minute.

## Decide where to place the turnstiles



When planning turnstile placement and spacing, consult local building and fire authorities having jurisdiction to assure that the exit can handle the necessary flow of people (particularly in an emergency).

At least one lane per entrance must be wide enough to accommodate a wheelchair. Other lanes may be narrower, but it is common practice to have all lanes equally wide.

PathMinder oval optical turnstiles meet ADA (USA) and CSA (Canada) regulations at a 32" lane width. Thus, at least one lane must be at least 32" wide.

PathMinder recommends that all lanes be spaced 32" apart, to allow wheelchair users a choice of lanes like everyone else.

PathMinder's detection beams will work when the turnstiles are spaced 24" to 60" apart.

A row of turnstile lanes is typically placed between a security desk and a wall. Remember to leave at least 4" to 6" between the side of the turnstile and the wall/desk so that the panels can be removed for service.

In some installations, railings or waist-height walls are installed between the last turnstile and the wall (as in Figure 6), where it is undesirable to add another lane.

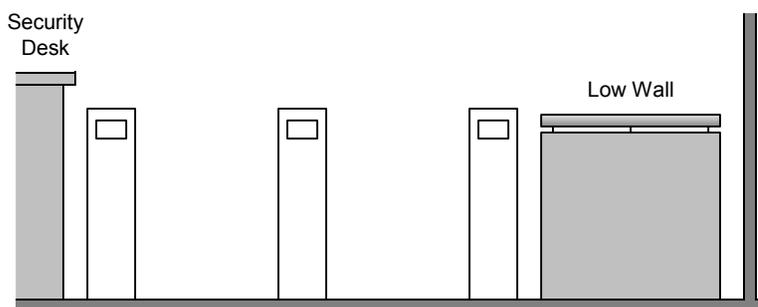


Figure 6: Typical installation between security desk and wall, with low barrier wall to fill in extra space

Having determined how many lanes are necessary, the planner should carefully measure the passage width and decide where each turnstile will be placed.

After the turnstile placement has been decided, conduits must be installed.

## Planning and preparing >

### Conduit installation



All installations shall be in accordance with applicable building codes and/or local authorities having jurisdiction.

Obtain the necessary approvals and permits before beginning the installation.

#### Install conduits

At least two conduits must be installed under the row of turnstiles, as in Figure 7. One conduit is for the 16VAC cables and the earth ground. The other conduit is for the interlane cables (communications and DC power between adjacent units) and for the communication between each turnstile and the access control system.

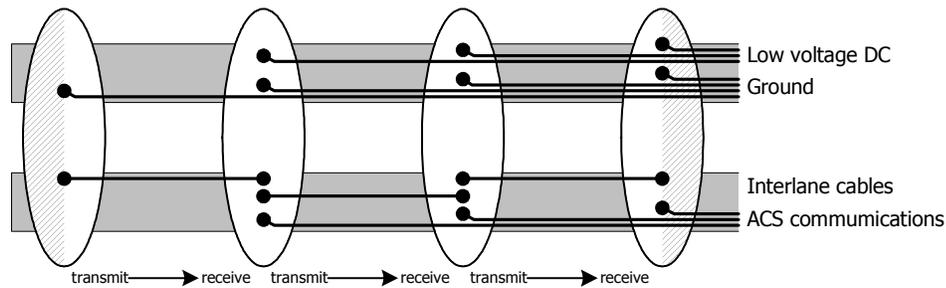


Figure 7: Conduits under a row of turnstiles



Do not run the interlane cables/ACS communication cables in the same conduit as the power cables.

The conduit openings in the turnstile base are described Figure 8. As long as the power and data cables use different conduits, any number/size of conduits can be used, so long as the conduits enter the turnstile in the holes provided.

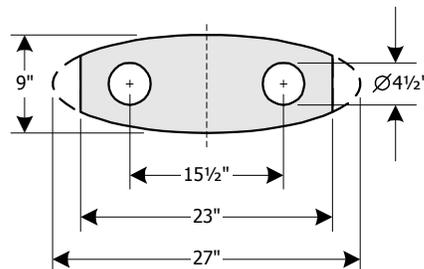


Figure 8: Turnstile base conduit template

#### Material Considerations

If metal conduits are installed, it will be necessary to install a plastic ring over the end of the conduit so that no sharp edges exist; this will prevent cables from being inadvertently stripped as they are pulled.

#### Alternatives

In some installations, conduits are not used. This is common if there is an unused basement or crawlspace directly below the area. A hole is drilled through the floor below the turnstiles, through the ceiling below. Cables are then run across the ceiling underneath. In such an installation, it is imperative that, once the cables are installed, the holes be filled with a fire stopping material; this also prevents dirt, dust, and fumes from entering and damaging the turnstile.

## Unpacking Turnstiles

The turnstiles arrive on-site fully assembled.

If the turnstile crates look damaged, notify the shipping company immediately.

Take care when unpacking the turnstiles, and inspect them immediately for damage. Damage that occurs during installation is not covered under warranty. Thus, if the turnstiles are damaged during shipping, it is imperative that such damage be noticed and reported immediately, before installation begins.

Interlane turnstiles and end turnstiles are packed and shipped differently.

Each interlane turnstile crate should contain:

- one turnstile (housing, frame assembly, and core electronics for transmit and receive sides)
- one transformer/power supply
- one set of interlane cables, pre-terminated on the transmit side

Each receive-only end turnstile crate should contain:

- one turnstile (housing, frame assembly, and core electronics for receive side)
- one transformer/power supply

Each transmit-only end turnstile crate should contain:

- one turnstile (housing, frame assembly, and core electronics for transmit side)
- one set of interlane cables, pre-terminated on the transmit side

A copy of this manual accompanies every shipment.

One side of the crate is removable (Figure 9); the other sides are typically glued together.

Locate the removable side—it is typically made of a larger piece of wood than the back side. Remove it to slide out the turnstile.

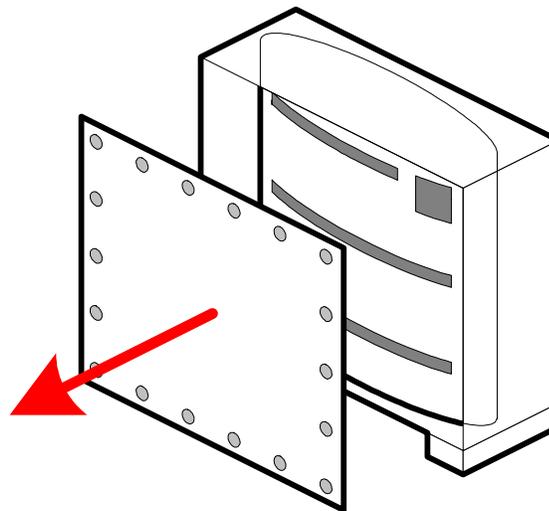


Figure 9: One side is removable; the others are not.

# Installing Turnstiles

Installing >

## Overview

To install the turnstiles:

1. Install the power supply
2. Run power, ground, and interlane cables
3. Disassemble the turnstile
4. Bolt down the turnstile base
5. Install card readers
6. Connect the ground cable
7. Connect the power cables, card readers, and communication cables
8. Install the battery (if desired)
9. Install and connect the alarm buzzers (if desired; one buzzer is pre-installed)
10. Connect the ACS cabling
11. Test the turnstile
12. Reassemble the turnstile



Electronics are sensitive to electrostatic discharge. Ground yourself (by touching the frame of the turnstile) and wear a grounding wrist strap when handling or configuring the turnstile electronics. Equipment damage from ESD is not covered under warranty.

Installing >

## Installation preparation

### Tools Required

To install the turnstiles, you will need:

- Wire cutters/strippers
- Bolts and nuts
- Bolt anchors (depending on flooring material)
- Drill with drill bit appropriate for flooring material
- Phillips screwdriver
- Ratchet (to tighten bolts)
- Very small flat-head screwdriver (for tightening wire terminals)

Bolts are needed to secure the turnstile to the floor. Typically, turnstiles are installed on concrete floors that have been covered with tile, terrazzo, or marble. Bolts are embedded in the concrete, and then nuts are used to secure the turnstile to the bolts. The bolts and bolt anchors must be sufficiently long to secure the turnstile in the concrete, as shown in Figure 10 (bolt lengths are exaggerated for the purposes of illustration). Be sure to use the correct bolt anchors for the floor material.

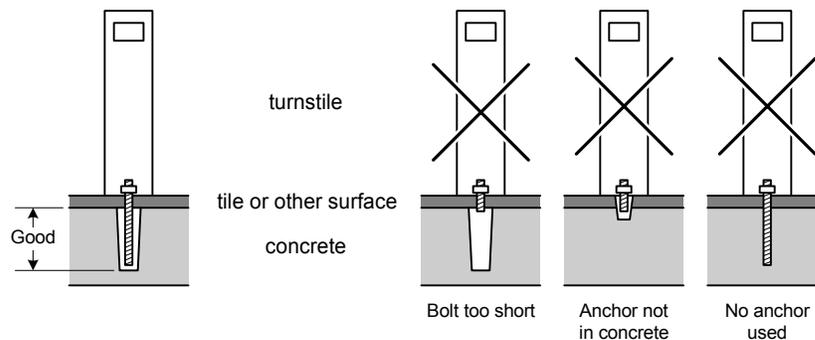


Figure 10: Bolt considerations

Installing >

## Cabling and structural installation



All installations shall be in accordance with applicable building codes and/or local authorities having jurisdiction.

Before installing the turnstile, install the power supplies and run all the cables. Do not plug in the power supplies until the turnstiles have been installed and the ground and power cables have been connected.

### Power supply overview

There may be one or two sources of power for any given turnstile, depending on its configuration:

Turnstile configuration (definitions in Figure 2, page 1)	Receives power from 13.8VDC power supply	Receives DC power from interlane cable
Transmit only	No	Yes
Interlane	Yes	Yes
Receive only	Yes	No

### Install power supplies and run power and ground cables

One 13.VDC power supply is supplied for each turnstile *except* the transmit-only end turnstile. Equivalently, there is one power supply per lane. Do not power multiple turnstiles from a single power supply.

Install each power supply in a well-ventilated area close to a source of site power. The power supply may overheat if it is placed in an unventilated enclosure. Install the power supply less than 100' from the turnstile.

For each lane, run a pair of cables from the output of the low-voltage DC power supply to the receive side of the turnstile. Note that one of the end turnstiles (that which only has a transmit side) will not receive power this way. Select a gauge of wire that is appropriate to the length of the wire, according to local building codes. Generally, use 16-gauge cable for a distance up to 40 feet; use 14-gauge up to 70 feet, and use 12-gauge cable up to 100 feet.

Alternatively, the power supply may be placed in the base of the turnstile; in this case, run 120V AC to each turnstile through the conduit. Observe local wiring requirements.

Each turnstile must be properly grounded. Run a 14-gauge cable from each turnstile (including both end turnstiles) to an earth ground at the power source.

Use the correct conduit. One conduit is for low-voltage power cables and ground, and the other is for access control and for communication between turnstiles (see Figure 11). If doubt exists, contact the installation planner.

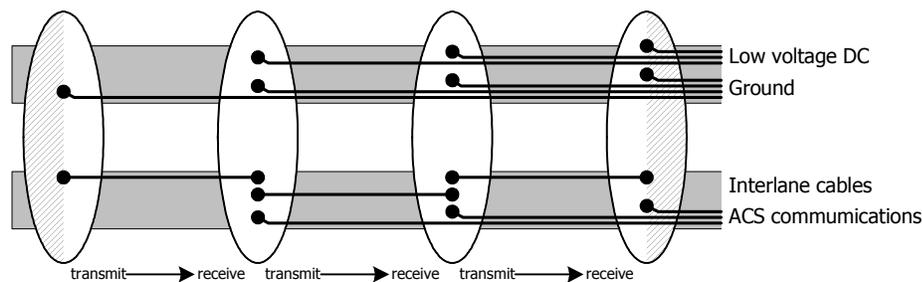


Figure 11: Power, access control system cables, and interlane cables

**Disassemble turnstile**

Six hex screws are used to secure each side panel to the turnstile frame. Remove the screws using an Allen key remove the panels. Do not use a power screwdriver/drill to remove the screws—the holes strip easily.

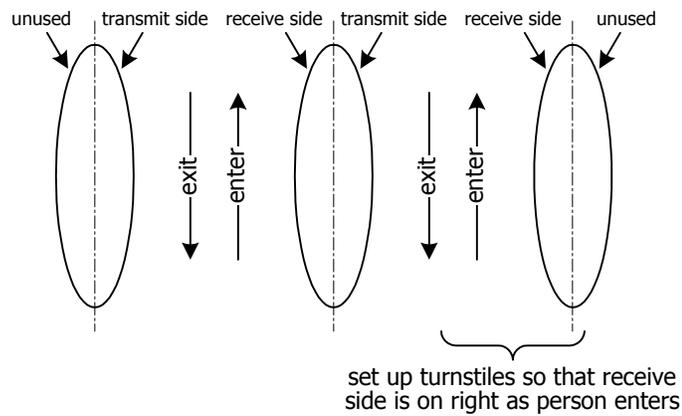
**Install and level base**

Bolt the bottom section of the outer casing to the floor. Make sure that the large holes in the bottom of the base straddle the conduit openings. Gather the cables in the conduits and pull them carefully up through the base of the turnstile.

Attach the frame to the bottom section of the casing.

Check that the frame is level (upright) and is parallel to the other turnstiles. This is important for proper operation.

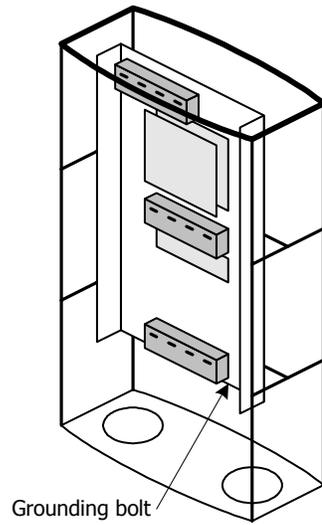
Install the turnstiles such that, as the person enters the secure area, the receive side of the lane (see Figure 5, page 2) is on the right-hand side, as in Figure 12.



**Figure 12: Turnstile orientation**

**Connect ground**

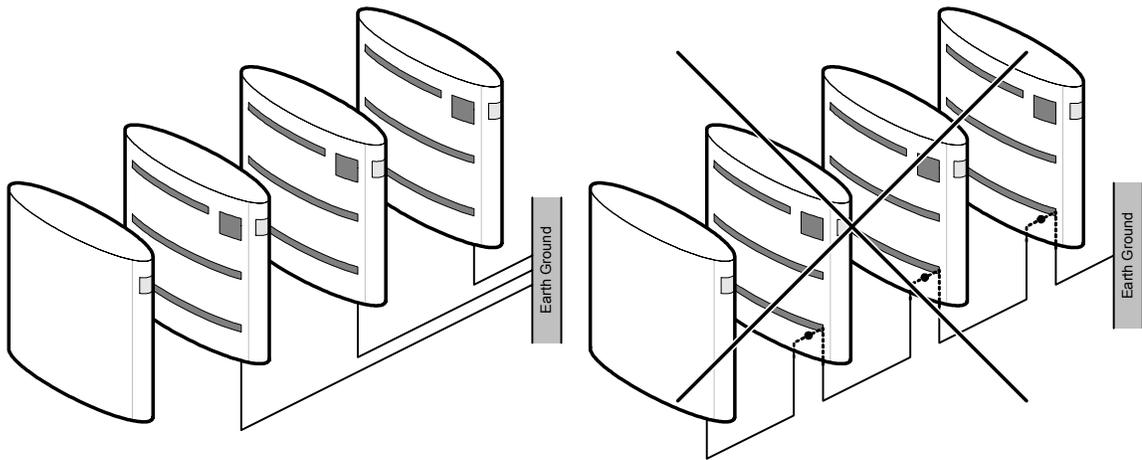
Connect the ground cable to a bolt on the turnstile frame (Figure 13).



**Figure 13: Location of ground connection**



Do not connect the grounds in series (see Figure 14).



**Figure 14: Proper ground configuration**

### **Install Card Readers**

Proximity card readers are not normally included in the turnstile.

The turnstiles accept almost any card reader. Cables for Wiegand card readers are installed in the turnstiles at the factory. If Wiegand card readers are not used, the card readers must be wired directly to the ACS, bypassing the turnstile electronics.

Install card readers on the top or side of the frame (Figure 5, page 2). Make sure the detector is facing upwards/outwards. The top mount will accept very large card readers, but the largest card reader that can be mounted on the side mount is 4.75" × 3.00" × 0.875"

The colour codes for the card reader cables are:

Blue: beeper  
Orange or brown: green LED  
White: data 1  
Green: data 0  
Black: ground  
Red: +12V

The card reader installed on the transmit side of the lane will use a fairly long data cable (an 8'-10' cable is pre-installed with the other interlane cables), since it will connect to the receive side of the lane.

### **Run interlane cables**

PathMinder provides interlane cables with the units. These connect the transmit and receive sides of a lane, carrying data and DC power. When shipped from the factory, the interlane cables are terminated on the transmit side of the lane, and need to be connected to the receive side of the lane.

The interlane cables are:

1. DC power (a pair of 22-gauge wires)
2. transmit beam control (8 24-gauge wires in a ribbon cable with RJ-45 ends)
3. transmit top- and end-light control (8 24-gauge wires in a ribbon cable with RJ-45 ends)
4. card reader (8 24-gauge wires in one cable)

Run the interlane cables between every pair of turnstiles. There should be one set of cables under each lane (see Figure 11).

### Connect power, card readers, and communications

Once the cables have been pulled through the conduits and the turnstiles have been installed and grounded, connect the power and communications cables (Figure 15) according to the table below.

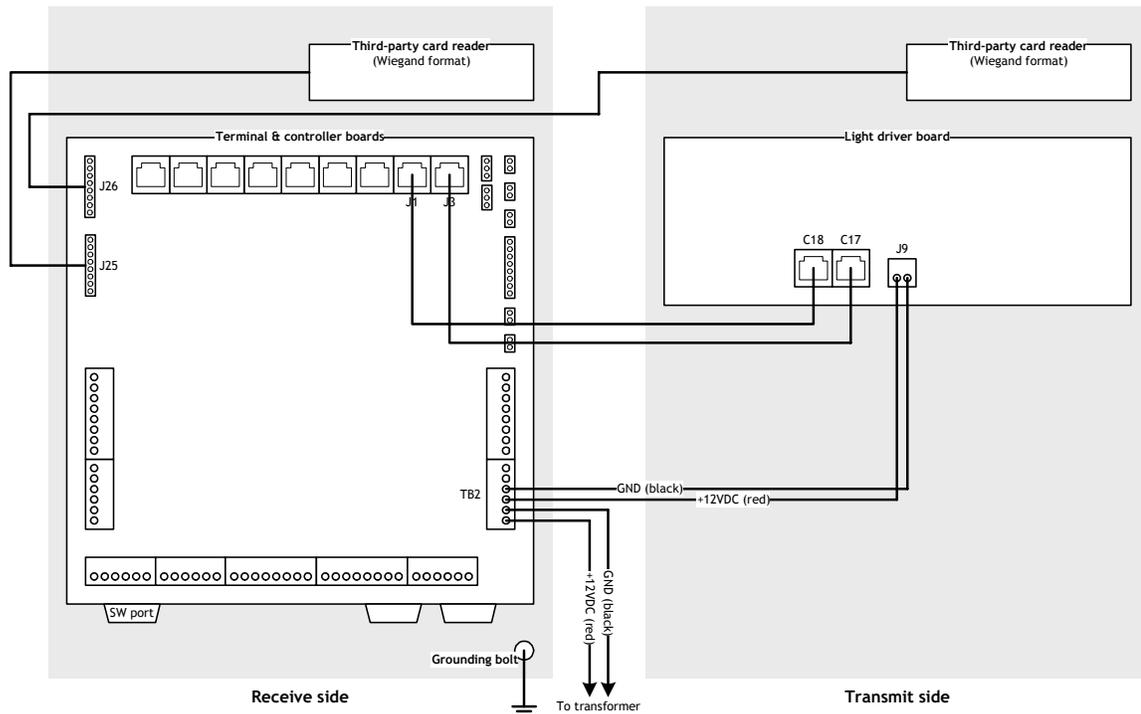


Figure 15: Power and communications connections

Cable	Connection	Notes
1 DC interlane power cable	Connect from J9 on light driver board to TB2* on terminal board	Observe polarity
2 RJ45 terminated cable (yellow sticker near cable ends)	Connect from C18 on light driver board to J1 on terminal board	-
3 RJ45 terminated cable (orange sticker near cable ends)	Connect from C17 on light driver board to J3 on terminal board	-
4 Transmit-side card reader cable	Connect from card reader output to J26 on terminal board	-
5 Receive-side card reader cable	Connect from card reader output to J25 on terminal board	-
6 Output from 13.8 VDC power supply	Connect from power supply output to leftmost two posts of TB2 on terminal board	Observe polarity

\* The TB2 connector is not plugged in when the turnstile is shipped; plug it in after making connection #1.

### Connect alarm buzzers

The turnstile provides three outputs for buzzers: one for alarms, one for access granted, and one for access denied. The alarm buzzer is included, and is already connected. Typically, small 12V buzzers are used for the access granted/access denied outputs, if desired. These outputs are not to be confused with the alarm outputs for the ACS (page 20).

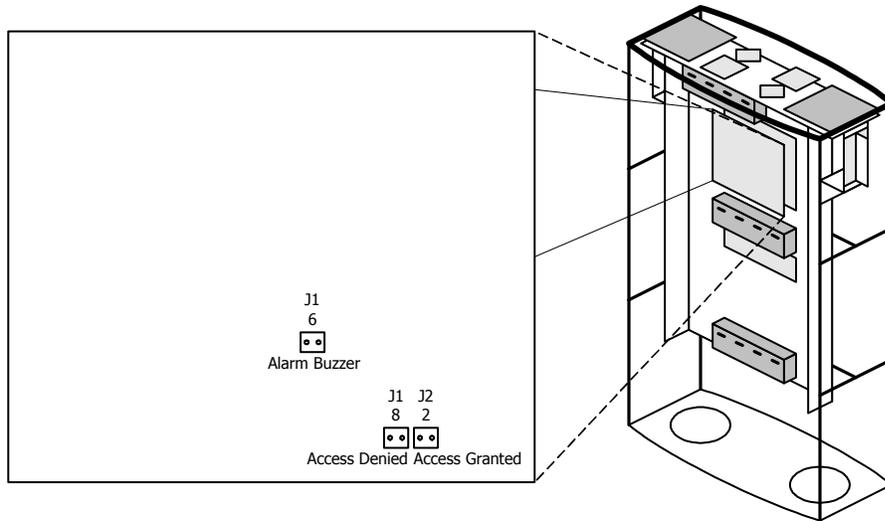


Figure 16: Location of buzzer outputs

### Apply power

Plug in the power supply.

### Connect ACS cabling

Connect the turnstiles to the access control system. Please refer to Integrating With Access Control System on page 17.

Also be sure that the door controllers are set to “re-lock on door open”. The turnstiles may exhibit odd behaviour if the door controllers are set to “re-lock on door close”.

## Installing &gt;

## Unit testing

Before putting the covers back on the turnstiles, it is advisable to run a few quick tests to make sure everything is in order.

There are five main areas to check: system heartbeat, light drivers, alarms, card readers, and state control.

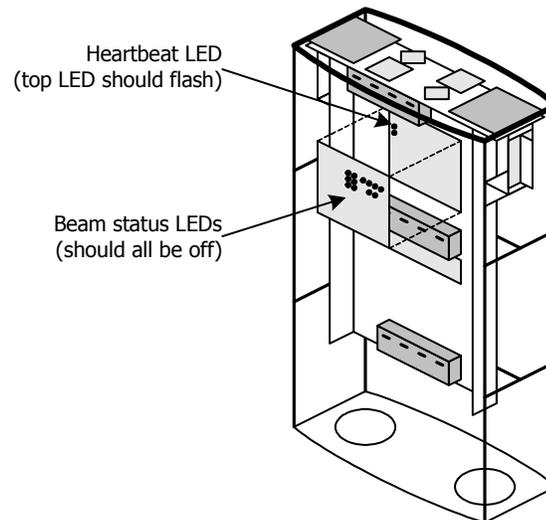


Figure 17: Location of heartbeat and beam status LEDs

#### Heartbeat

Check that the heartbeat LED on the controller board is slowly flashing (Figure 17). It starts flashing approximately fifteen seconds after power is applied to the board.

#### Beam Status

Check the diagnostic LEDs on the terminal board. Make sure none are illuminated (Figure 17).

#### Alarms

Walk through the turnstile without presenting a card. This should produce an alarm; the end lights should turn red and flash, and the red indicator on the top of the unit should flash. Make sure that end lights and top lights flash in both directions (on both the entrance and exit ends).

#### Card Readers

If cards are available, check that the system grants access to a valid card. When a valid card is presented, the top light should turn green, the end lights closest the person should turn green, and the opposite end lights should turn red.

Also verify that the system denies access to an invalid card. When a card is denied, the system should stay in the present card mode.

#### State Control

Depending on how the turnstiles are integrated into the ACS, it may be possible to open and close each lane of turnstiles from the ACS. See the next section, Integrating With Access Control Systems, for further details.

Use the ACS to put each direction (in and out) of the lane in free passage mode. All indicators (top lights, end lights) should turn green.

Use the ACS to put each direction of the lane in lane closed mode. All indicators should turn red, and an alarm should be generated when someone passes through the lane.

Installing >

**Final assembly**

Inspect the cabling inside the turnstile, and make sure that all cables are tied down. Typically, tie wraps are used to secure cables down both vertical edges of the internal frame.

Replace the outside panels, and fasten them to the frame with the screws provided. Do not use power tools (screwdriver/drill) to drive the screws—the holes strip easily. Turnstile covers are machined to tight tolerances, so make sure that the pieces are properly aligned before putting in the screws.

Confirm again that the units are working properly. This completes the installation process.

## Integrating With Access Control Systems

### Integrating >

### Concepts

PathMinder turnstiles are designed to interface to almost any access control system.

In a typical access control system, a door has a card reader, a magnetic lock that is released when access is granted, and a door contact that monitors whether the door is open or closed (as in Figure 18).

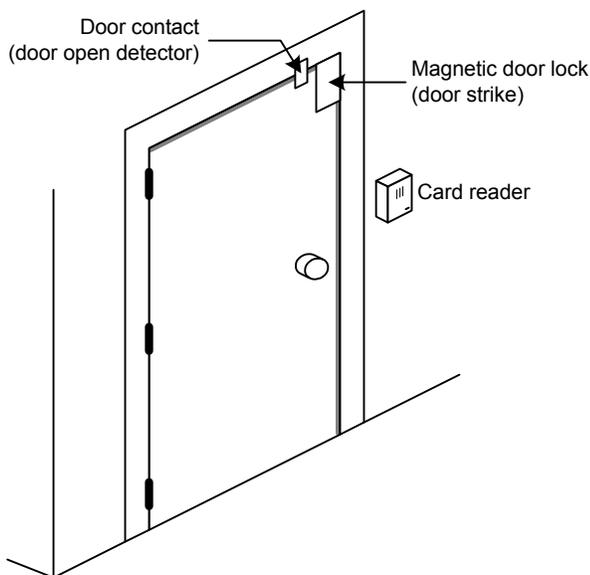


Figure 18: Door features in a typical access control system

Typically, each turnstile lane acts as two doors (one door in, one door out). When a person passes through a turnstile, the signals that are sent to the access control system are similar to those that would be sent in the previous scenario.

A typical entry scenario is:

Door	Turnstile
A person approaches the door	A person approaches the turnstile
The person places his/her card near the reader	The person places his/her card near the reader
The card reader reads the card, and the access control system releases the magnetic lock	The card reader reads the card, and the access control system sends an access granted signal to the turnstile; the turnstile indicator turns green, indicating that the person can pass
The access control system waits for the door contact to be broken, indicating the door is open	When the person passes fully through the turnstile, the turnstile sends the access control system a short door contact pulse, indicating that the person has, in effect, opened the door, passed through the door, and closed the door
The access control system waits for the door contact to be re-established, indicating that the door is closed	
The access control activates the magnetic lock	The access control sends a signal to activate the lock; the turnstile illuminates the yellow indicator to show the next person that he/she should present a security card

Integrating >

Case 1: Free exit, controlled entry

In a simple configuration, the turnstiles are configured as a door where the person must use his/her access card to enter, but is allowed to exit without the card. This is equivalent to the case where a door has a card reader to grant access from the outside but can be opened by a handle on the inside. The wiring for this configuration is shown below in Figure 19.

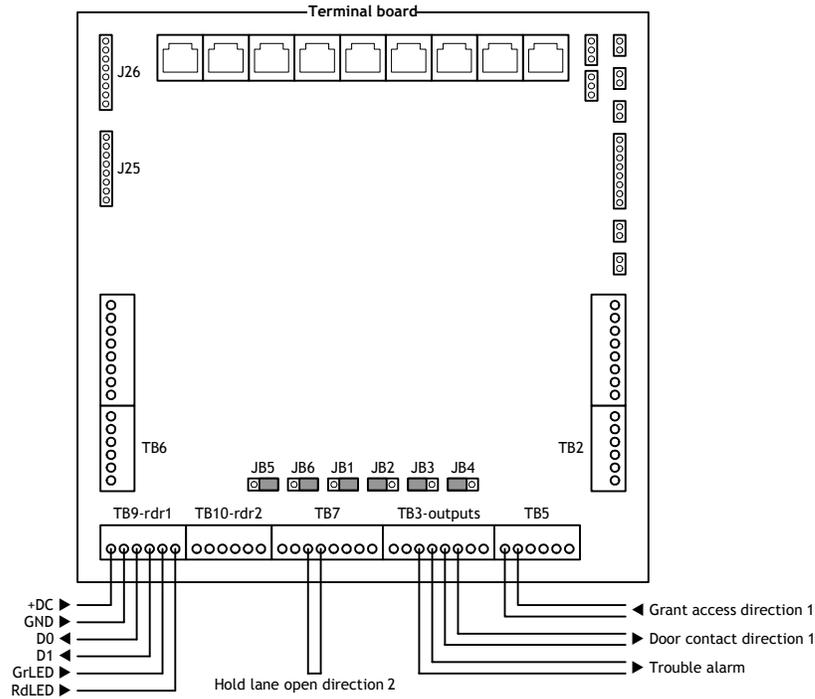


Figure 19: Wiring for free exit/controlled entry scenario

All ACS panel outputs shall be configured as dry contacts.

The *Lane Open 2* connection on TB7 is shorted; the exit direction of the turnstile is set to let people pass without presenting a card.

Integrating >

Case 2: Fully programmable

With a reasonably complete, full-featured access control system, more of the turnstile's features can be used, as in the diagram below.

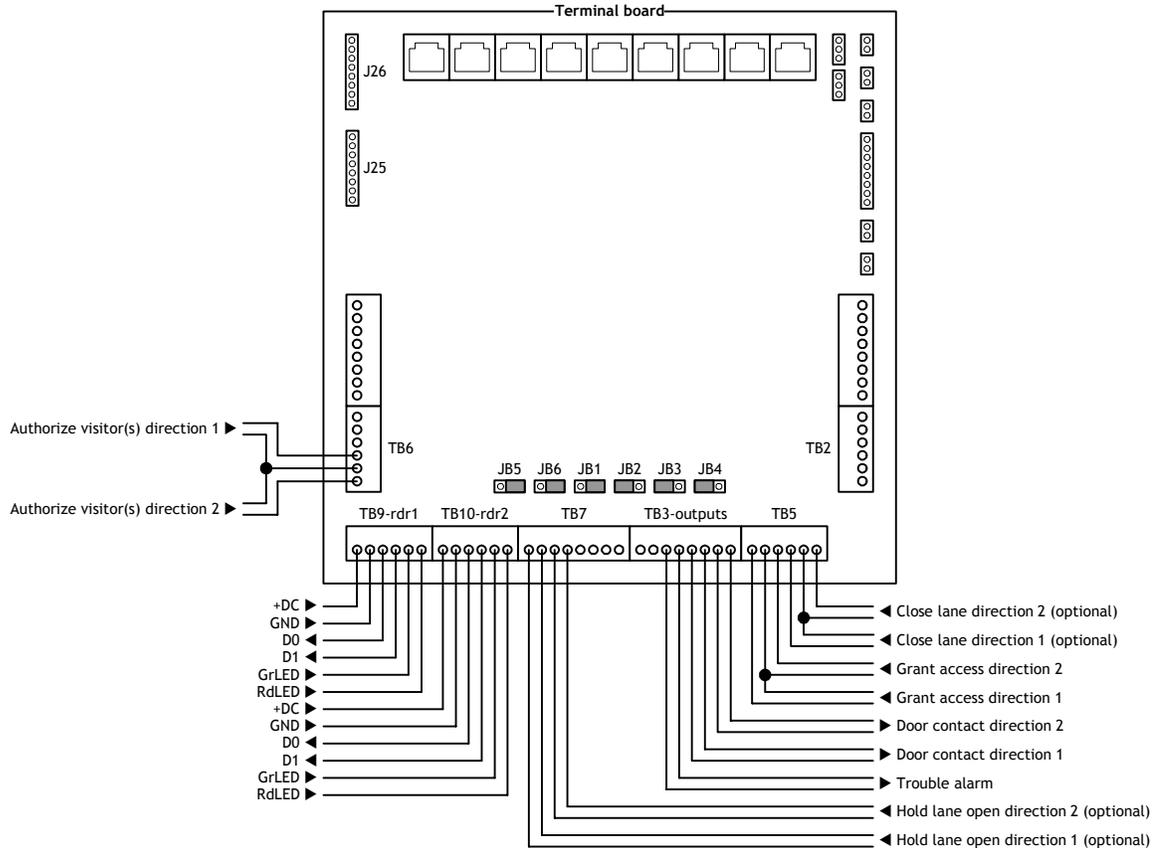


Figure 20: Wiring for fully programmable ACS

All ACS panel outputs shall be configured as dry contacts.

The *Open Lane Output* and *Close Lane Output* connections on the ACS are specially programmed. To keep the lane open/closed, keep the corresponding terminal shorted. For instance, to close a lane in both directions, short *Close Lane Outputs*. To re-open the lane for card access, remove the short.

## Integrating >

### Alarm outputs

The turnstile provides the ACS four alarm outputs:

- general alarm
- trouble alarm
- unauthorized entry (in)
- unauthorized entry (out)

The turnstile can be configured to generate a general alarm when any of the other alarms are generated; this is useful for an ACS panel that only has one alarm input. To have all alarms trigger a general alarm, change settings B1 or B2 (page 23).

The **trouble alarm** is triggered when:

- something inside the turnstile fails
- the turnstile loses power

The **unauthorized entry alarm** sounds when:

- a person passes through the turnstile without presenting a card
- a person passes through the turnstile after presenting an invalid card
- a person passes through a closed lane
- a person passes through a lane in one direction immediately after someone has presented a valid card in the opposite direction.

In a typical installation, only the trouble alarm output is connected to the ACS. This provides the best communication between the turnstile and the ACS:

- power failures and turnstile failures are communicated to the ACS through the trouble alarm
- unauthorized entries are communicated to the ACS implicitly: the ACS knows an unauthorized entry has occurred when the turnstile sends a door contact signal, but no access granted has been sent (as if the person had forced open a magnetically-locked door similar to the one in Figure 18)

An alternative is to connect the general alarm output to the ACS, which relays all the above information to the ACS, but the ACS has no way of distinguishing an unauthorized entry from a more serious problem.

These alarm outputs are not to be confused with the outputs for alarm buzzers (page 14).

## Integrating >

### Best practices

It is recommended that, when installing several lanes, different lanes be connected to different ACS panels. This provides a measure of redundancy; if one ACS panel goes down, some lanes will still be available.

In some sites, a latching pushbutton is used to open all the lanes at the same time. This is a simple way to open the site for open houses, for instance. Some sites use it to open the turnstiles after a fire alarm has been cleared, and a large number of employees need to re-enter the building simultaneously. Diodes are used to connect the switch to each turnstile in parallel.

For best throughput, it is preferable to set the ACS to re-lock the door when it opens. Many access control systems default to re-locking the door when it closes.

Remember to minimize the length of the simulated door contact that the turnstile generates. In most cases, 500 ms is adequate. Anything longer than about a half second can result in the turnstile being slow to reset after a person has walked through.

## Configuring Turnstiles

The turnstiles are ready to run out of the crate. The default values are carefully selected such that there is rarely a need to change them when integrating with an access control system. Nonetheless, there are several configurable parameters, as presented in the following section.

### Configuring >

#### Setting parameters

Each PathMinder turnstile has several switches on the terminal board that determine how it operates. These can be used to change alarms and timeouts.

The switches are located in the middle of the terminal board, as in Figure 21 below. There are eight sets of switches, numbered S1 through S8. Each set of switches has eight switches. The default settings for the switches are shown.

Each time the switch settings are changed, it is necessary to reset the system. This can be done in one of two ways. Either:

- remove the TB2 connector from the terminal board for two seconds, then reconnect it, or
- momentarily short the Reset jumper (also labeled J10) on the terminal board; be careful to avoid touching adjacent components

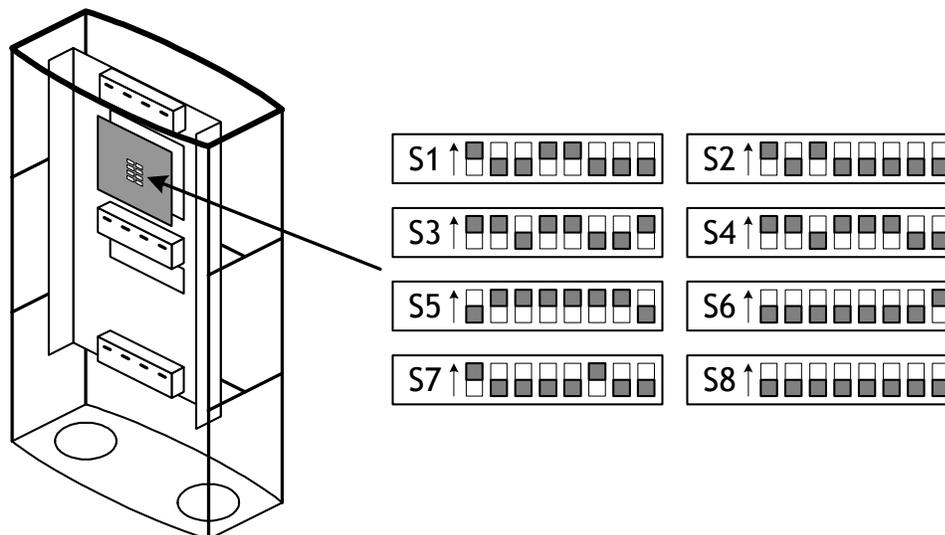


Figure 21: Default switch settings on terminal board

Alternatively, the *PathMinder TrueCount System Administrator* software can make the changes. After the software is used, the DIP switches are disabled. To re-enable the DIP switches after the software has been used, consult the troubleshooting section on page 30.

## Configuring &gt;

## DIP switch settings

The default setting for each parameter is listed in **bold**.

**Factory default settings**

Switches that are not listed below are set at the factory; these settings are critical for turnstile operation and must not be changed. The defaults for all switches are shown in Figure 21 on page 21.

**Audio**

Parameter	Value	Switch Settings		
		S1 #1		
A1	Make the audible alarm turn off after a certain number of seconds (determined by setting A2)		<b>On</b>	
	Make the audible alarm stay on until a security person clears it		Off	
		S1 #4	S1 #5	S1 #6
A2	Change how long audible alarms last	2 seconds	Off	Off
		3 s	On	Off
		4 s	Off	Off
		<b>5 s</b>	<b>On</b>	<b>Off</b>
		7 s	Off	On
		8 s	On	On
		9 s	Off	On
		10 s	On	On
		S1 #2		
A3	When the alarm sounds, make a constant tone		<b>Off</b>	
	When the alarm sounds, beep (cycle on and off)		On	
		S1 #3		
A4	Change the duration of the alarm beep	½ second on, ½ second off	On	
		<b>¼ second on, ¼ second off</b>	<b>Off</b>	
		S2 #6		
A5	Change how long the unit beeps when granting access	<b>¼ second</b> ½ s	<b>Off</b> Off	
		S4 #6	S4 #7	S4 #8
A6	Change how long the unit beeps when denying access	¼ second	Off	Off
		<b>¾ s</b>	<b>On</b>	<b>Off</b>
		1¼ s	Off	Off
		1¾ s	On	Off
		2¼ s	Off	On
		2¾ s	On	On
		3¼ s	Off	On
		3¾ s	On	On

## Alarms

Parameter	Value	Switch Settings		
		S3 #4		
B1 When the trouble alarm is activated, also activate the general alarm*	<b>Yes</b>	<b>On</b>		
	No	Off		
		S3 #5		
B2 When the unauthorized entry alarm is activated, also activate the general alarm*	<b>Yes</b>	<b>On</b>		
	No	Off		
		S3 #1	S3 #2	S3 #3
B3 Change how long the general alarm lasts	2 seconds	Off	Off	Off
	3 s	On	Off	Off
	4 s	Off	On	Off
	<b>5 s</b>	<b>On</b>	<b>On</b>	<b>Off</b>
	7 s	Off	Off	On
	8 s	On	Off	On
	9 s	Off	On	On
	10 s	On	On	On
		S6 #8		
B4 Generate an alarm if someone partially enters the detection matrix and then backs out		On		
Generate an alarm only if someone walks fully into the detection matrix		<b>Off</b>		
		S8 #5		
B5 Normal jump sensitivity		<b>Off</b>		
Extra sensitivity to jump attempts		On		

\*Note PathMinder units offer three types of alarm outputs (general, trouble, unauthorized entry), but many access control systems only offer one type of alarm input. See discussion of alarm connections on page 20.

**Access Denied**

Parameter	Value	Switch Settings		
		S3 #8		
C1 Wait for an access denied signal from the ACS Assume that access has been denied if, after a card has been read, an access granted signal isn't received in a given time period (set by C2)		Off		
		<b>On</b>		
		S4 #1	S4 #2	S4 #3
C2 Set the length of time the turnstile will wait for an access granted signal before assuming that access has been denied	½ second	Off	Off	Off
	¾ s	On	Off	Off
	<b>1 s</b>	<b>Off</b>	<b>On</b>	<b>Off</b>
	1 ¼ s	On	On	Off
	1½ s	Off	Off	On
	1¾ s	On	Off	On
	2 s	Off	On	On
	2¼ s	On	On	On

**Door Contacts & Unauthorized Entry Outputs**

Parameter	Value	Switch Settings		
		S7 #1	S7 #2	S7 #3
D1 Change the length of the door contact and unauthorized entry pulses sent	½ second	Off	Off	Off
	<b>1 s</b>	<b>On</b>	<b>Off</b>	<b>Off</b>
	5½ s	Off	On	Off
	6 s	On	On	Off
	10½ s	Off	Off	On
	11 s	On	Off	On
	15½ s	Off	On	On
	16 s	On	On	On
		S7 #5		
D2 Treat the unauthorized entry output as a door contact	Yes	On		
	<b>No</b>	<b>Off</b>		
		S7 #6		
D3 Generate door contacts when the guard has temporarily switched the turnstile to let people through	Yes	Off		
	<b>No</b>	<b>On</b>		

**Note:** In access control timer mode, parameter D1 sets the *maximum* length of the pulse sent; the pulse is terminated either when the turnstile sees the ACS door strike re-lock or when the allotted time has elapsed, whichever occurs first.

Also see parameter F2, which determines whether to generate door contacts in free passage mode.

**State timing**

	Parameter	Value	Switch Settings
			S3 #7
E1	Activate alarm if beams are blocked for 10 seconds		Off
	Activate alarm if beams are blocked for 30 seconds		<b>On</b>
			S2 #1
E2	Use the turnstile's internal timer to determine state changes ("turnstile timing mode")		Off
	Rely on the access control system to determine state changes ("access control system timing mode")		<b>On</b>
			S6 #6
E3	Automatically grant access for any card presented		Off
			<b>On</b>

**Free passage**

The turnstile changes from card access mode to free passage mode when a prolonged access granted signal is received.

	Parameter	Value	Switch Settings		
			S5 #3	S5 #4	S5 #5
F1	Change the length of time that the access granted signal is held after a door closure to indicate that the turnstile should switch into free passage mode (ACS timing mode; see parameter E2).	32 seconds	Off	Off	Off
		¼ s	On	Off	Off
		1¼ s	On	On	Off
		2¼ s	On	Off	On
		<b>3¼ s</b>	<b>On</b>	<b>On</b>	<b>On</b>
				S5 #6	
F2	Generate a door contact every time someone walks through the turnstile (to count people)	Yes		Off	
		<b>No</b>		<b>On</b>	
			S5 #1	S5 #2	
F3	Change the length of time that the access granted signal is held to indicate that the turnstile should switch into free passage mode (Turnstile timing mode; see parameter E2).	<b>2 seconds</b>	<b>Off</b>	<b>Off</b>	
		7 s	On	Off	
		12 s	Off	On	
		17 s	On	On	

**Lights**

	Parameter	Value	Switch Settings	
			S6 #3	
G1	Change the rate at which the lights flash	<b>¼ second</b> ½ s	<b>Off</b> On	
			S6 #4	
G2	In card access mode, show a yellow end light and the yellow top light indicator when idle In card access mode, show a green end light and both the yellow and red top light indicators when idle		<b>Off</b> On	
			S4 #4	S4 #5
G3	Change the duration of the red lights when access is denied after a card is read	2 seconds  3 s 4 s <b>5 s</b>	Off On Off <b>On</b>	Off Off On <b>On</b>
			S6 #2	
G4	Red lights are illuminated in service mode No lights are illuminated in service mode		<b>Off</b> On	

**Other devices**

	Parameter	Value	Switch Settings	
			S8 #8	
H1	No hardware desktop controller present Hardware desktop controller present		<b>Off</b> On	

**Access granted inputs**

	Parameter	Value	Switch Settings		
			S2 #5		
I1	Use a separate access granted signal for each direction (outputs from ACS go to AG-1 and AG-2 independently) Use one ACS output to trigger an access granted signal; the turnstile will infer in which direction to grant access based on the last card read (output from ACS is wired to AG-1 and AG-2 in parallel, and card readers must be wired through the turnstile's terminal board; AG signal must be received before parameter C2 expires)		<b>Off</b> On		
			S2 #2	S2 #3	S2 #4
I2	In "turnstile timer mode", determines how long to wait for a person to walk through once an access granted signal is received.	<b>5 seconds</b>  7 s 10 s 12 s 15 s 17 s 20 s 22 s	<b>Off</b> On Off On Off On Off On <b>On</b>	<b>Off</b> Off On On Off Off On On <b>On</b>	<b>Off</b> Off Off On On On On On <b>On</b>

## Using Turnstiles

Each side of a turnstile lane has three main modes of operation:

1. free passage: everyone is allowed to pass through the turnstile without presenting a security card
2. card access: each person must pass their security card over the card reader and be authenticated by the access control system before they are allowed to move through the turnstile; an alarm sounds if no card is presented
3. lane closed: no passage is allowed; an alarm sounds if a person walks through the turnstile

The status indicators and the end light on the turnstile indicate the mode. See Figure 22.

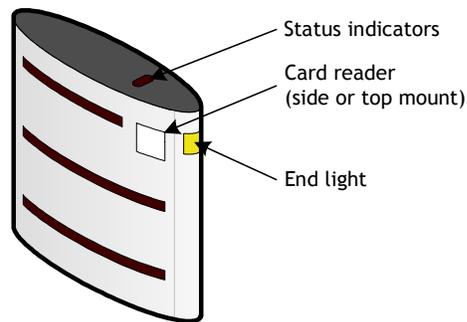


Figure 22: Status indicators

The indicator lights on the end of the turnstile indicate whether

- the person may pass (green)
- the person must present their card (yellow)
- the person is not allowed to use the lane (red)
- the person has been denied access (yellow and red alternate)
- the person has triggered an alarm (flashing red)

The green arrow indicator and the red do-not-enter indicator on the top of the turnstile illuminate when the green and red lights are shown, respectively.

Some users encounter difficulty when trying to use their security card. Cards should be presented directly over the card reader (as indicated in Figure 22) on the right-hand side of the lane (as indicated in Figure 23). Cards only need to be presented when the yellow end light is illuminated.

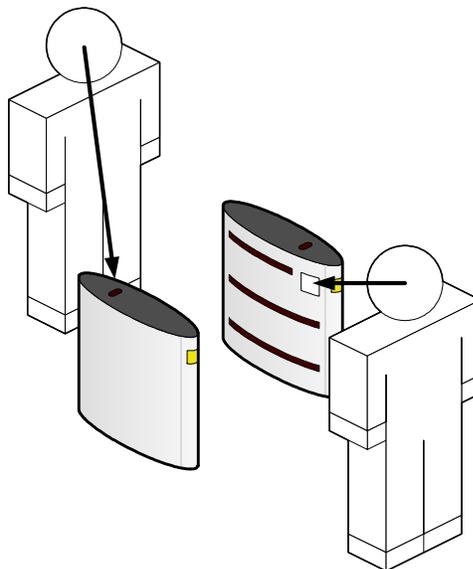


Figure 23: Present cards on etched hand-with-card symbol (top-mounted readers, as illustrated) or in front of card reader panel (side-mounted readers)

## Maintaining Turnstiles

PathMinder optical turnstiles are dependable and require little maintenance, even in high-traffic environments.

Turnstiles should be cleaned periodically. In particular, it is important that the sensor windows remain clean. They should be cleaned on a weekly basis with a soft cloth and a mild residue-free window cleaning fluid.

It is recommended that turnstiles be opened annually for testing and cleaning. Disconnect the power source (but not the ground) from the turnstile before removing the cover.

- Use a can of compressed air to dislodge dust from the electronics.  
Compressed air used for cleaning computer keyboards is appropriate.
- Use a vacuum to remove accumulated dust out of the bottom of the turnstile.
- Use a soft cloth and a mild window cleaning fluid to clean the inside of the sensor windows.

Before putting the cover back on the turnstile, visually inspect the interior for signs of damage, excess dirt accumulation, and corrosion.

## Troubleshooting

### Top light or end light doesn't appear

Verify that the unit is on and power connections are in place. The light driver board in the turnstile has LEDs that register what state it intends to show on the end and top lights (Figure 24).

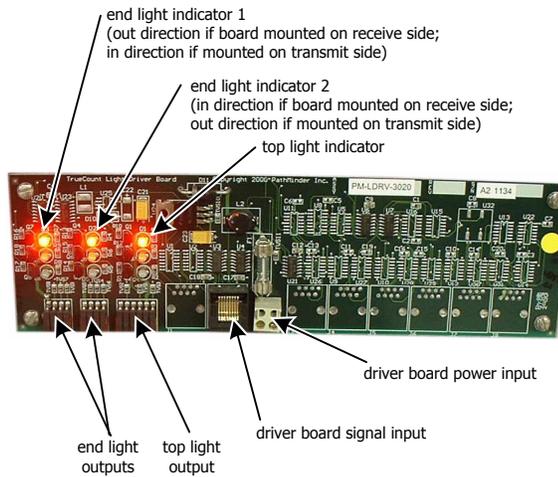


Figure 24: Light driver board input, indicators, and outputs

If the state LEDs are functioning correctly, check the signal connection between the light driver board and the end/top lights. Otherwise, unplug and reconnect the cable between the light driver board and the terminal board. If lights on the transmit side are malfunctioning, this will be an interlane cable, which is more susceptible to damage than an internal cable, and should thus be tested. Also check the fuse on the light driver board, which is located above the power input.

### Part of the turnstile has lost power

It is likely that either a fuse has blown or a wire has become disconnected. Each fuse on both the terminal board and the power supply is adjacent to an LED; if this LED is not lit, the fuse has blown, and should be replaced. If the fuses appear to be fine, verify that the power connections are in place (Figure 15, page 13). Unplug and reconnect the power connections to make sure they are properly seated.

If the card readers aren't getting power, check to see whether they are getting power from the ACS or the turnstile (see page 12), and try using the other power source.

### When the building power fails, no alarm is generated

Turnstiles only generate power failure alarms when they lose power entirely; units with battery backups only generate alarms when both the outside AC power and the battery have failed. The solution is to install a relay in the AC power supply that will notify the ACS when turnstile power is lost.

### When I present a valid card in one direction in an interlane turnstile, the adjacent lane opens in the other direction; when I take the top off the turnstile, the problem goes away

Some card readers need space between their top surface and the turnstile cover (about  $\frac{1}{4}$ " ). Lower the card readers (usually by using smaller standoffs). If possible, try using a different card reader; card readers that advertise the same range but use a smaller antenna often solve this problem. Also check that the frame is grounded properly.

### Alarm outputs are always active

First, verify that the ACS is not generating an alarm. Once satisfied that the ACS is working properly, there are jumpers on the terminal board (JB1-JB6) that determine whether the alarm outputs are normally open or normally closed; change the appropriate jumper to the opposite position.

### One colour of lights always stays on, even if another colour is illuminated

There is a bad transistor on the light driver board. Replace the light driver board. This may be covered by warranty; contact PathMinder.

If all colour LEDs are always on, the LED board is probably not connected properly; unplug and re-plug the cables between the LED board and the light driver board, and between the light driver board and the terminal board.

**The card readers don't reset right away, so subsequent cards can't be read immediately**

Some access control systems shunt the card reader when the door contact is open. If the turnstile is set to generate a very long (> 1 second) door contact, this problem can appear. Change the door contact (either via DIP switches or software) to be about ½ second. Test the system carefully to make sure that the ACS registers every door contact. If the ACS does not receive a door contact, the lane remains open for several seconds after a person has walked through. If this happens, increase the door contact length to about ¾ seconds and try again.

Also verify that the ACS is set to “re-lock on door open”.

**Sometimes the lane stays green after someone has presented a card and walked through**

The door contact generated is too short. The ACS isn't recognizing that a person has walked through. Either decrease the amount of time of a valid door opening in the ACS, or increase the length of the door contact generated by the turnstile (by DIP switches or software). Also verify that the ACS is set to “re-lock on door open”.

**The DIP switches don't seem to work—the turnstile's behaviour doesn't change when I change the switches**

The settings have probably been changed through software on another occasion; you will need to reset the turnstile to its factory defaults. To re-enable the DIP switches after the software has been used:

1. turn off the turnstile
2. write down the settings for switch #8
3. set switch 8 #1-8 to on-on-on-on-off-off-off-on
4. turn on the turnstile
5. wait for it to boot up (about 90-120 seconds)
6. turn it off
7. change switch 8 back to its previous settings
8. turn the turnstile back on.

The turnstile is now ready to use the DIP switches.

**The card reader range is terrible**

Some card readers offer a sensitivity/power adjustment (usually a DIP switch under the cover of the card reader). Set it to the highest setting. The most effective solution, however, is to use a better card reader; look for a brand-name reader with 6" range.

**Beams aren't working properly**

Beam problems are indicated on LEDs on the terminal board (Figure 25). LEDs D2, D3, and D4 indicate whether there is a malfunction in the top, middle, or bottom row of optical beams, respectively. LEDs D8 through D11 indicate which LED/receiver in the row is malfunctioning. For example, if the second beam in the middle row were not functioning properly, LEDs D3 (middle row) and D9 (second beam) would illuminate.

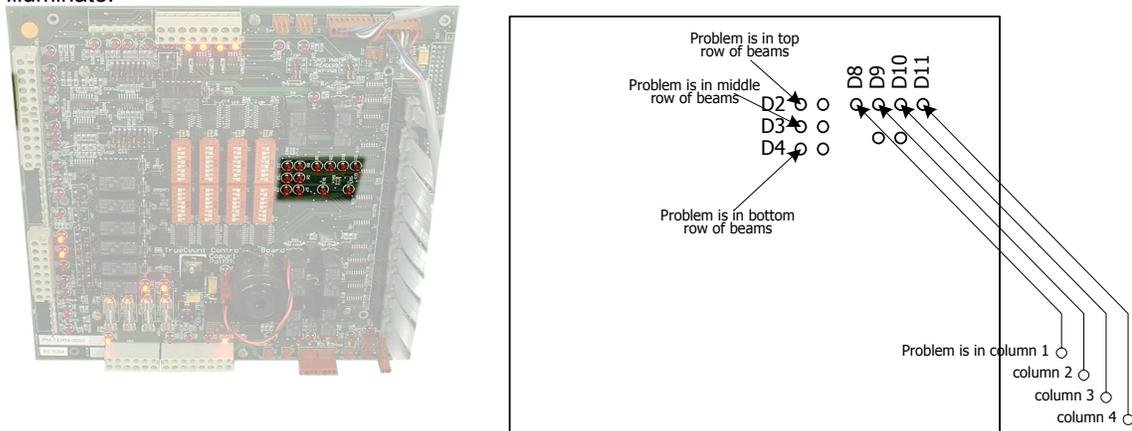


Figure 25: Beam diagnostic LEDs

If an entire row of beams isn't working, unplug and re-plug the RJ-45 cable that connects the row of LEDs or receivers to the terminal board. If individual beams are malfunctioning, there are three common causes of beam blockages: dirty windows, loose cables, and bent LEDs. To solve, clean the windows, tie down any loose cables (the sides of the internal frame have places to affix tie wraps for this purpose), and locate and repair any LEDs or receivers that have bent leads.

## Warranty & Returns

### Warranty & returns >

#### Warranty

PathMinder turnstiles are warranted against failure and incorrect operation for a period of one year from date of factory shipment, provided they are operated in a clean indoor environment and have been installed and maintained according to the guidelines in this manual.

It is expected that the users of the turnstiles be properly trained by building security staff; false alarms generated by unknowledgeable users do not constitute incorrect operation of the turnstile.

Damage caused by electrostatic discharge (ESD) and/or improper grounding is not covered under warranty.

Damage caused during installation is not covered under warranty.

For most orders, PathMinder “Standard Terms and Conditions” apply. GSA orders are excepted.

### Warranty & returns >

#### Returns

Defective or failed units can be returned to PathMinder.

It is necessary to contact PathMinder technical support before returning the units; often, it is possible to troubleshoot turnstile problems by phone; other times, it is only necessary to replace one board in the unit, a task that can be accomplished without removing the units. Units will be repaired, upgraded, or replaced at the discretion of the PathMinder support team.

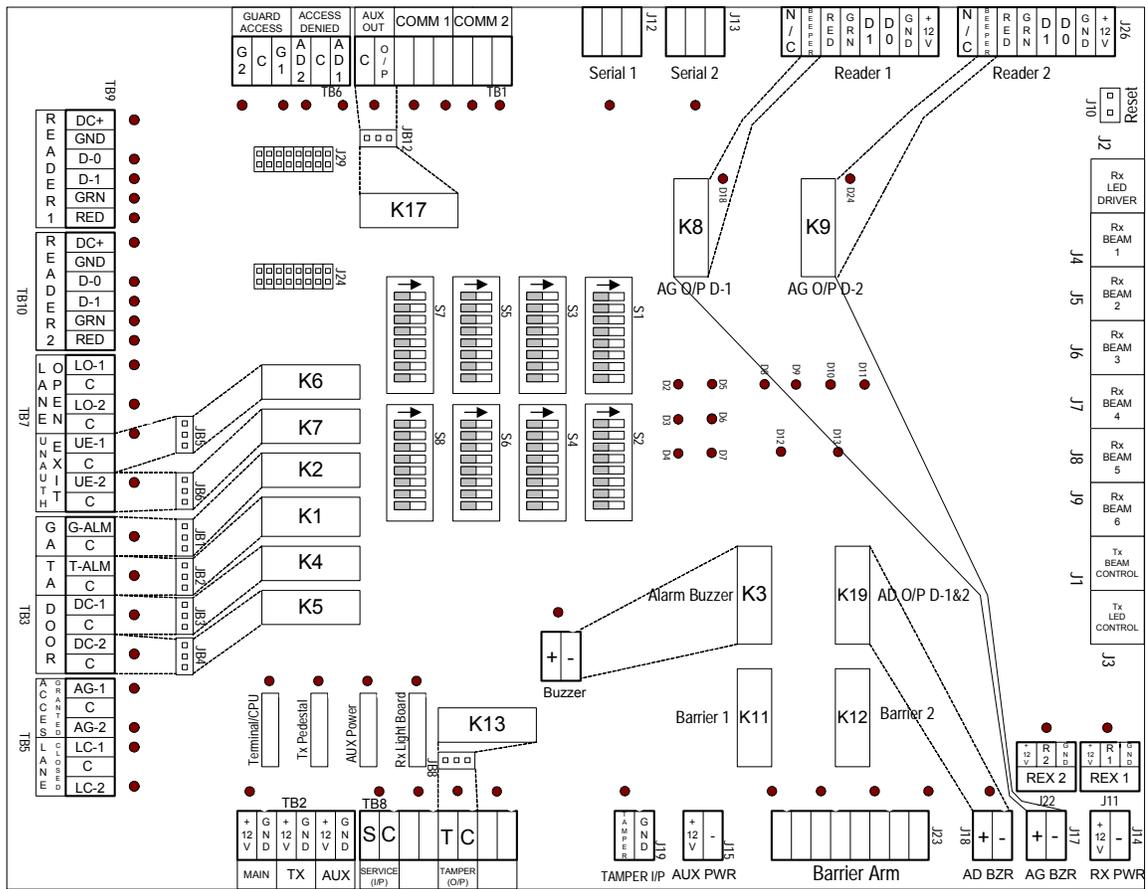
If the PathMinder support personnel determine that a unit should be returned, they will provide the necessary shipping instructions and return authorization code.

PathMinder support is available at [support@pathminder.com](mailto:support@pathminder.com) or at (613) 726-3555, 8:30-17:00 EST, or by appointment.



# Appendix A: Terminal Board Reference

The schematic of the terminal board (in the receive side of each turnstile lane) is shown below.



The terminal board power input should be metered at 13.8 Vdc.

The terminal board's maximum current draw is approximately 2.5 A.

## Glossary

<b>Access control system</b>	an integrated set of electronics that helps secure a facility/building; at a minimum, it will have a way of identifying people entering/exiting the building (usually a security badge), and a way to validate these people so as to allow or deny them passage (usually a simple database of people and permissions)
<b>ACS</b>	see <i>access control system</i>
<b>Access denied</b>	<ol style="list-style-type: none"> <li>1. an optional signal sent from the access control system to the turnstile indicating that a security card that has just been presented is invalid</li> <li>2. a state the turnstile enters briefly, either when an access denied signal is received from the ACS, or after a certain period of time has elapsed since an access card was read; in this state, the top and end lights flash, and an alarm is triggered if a person walks through the lane</li> </ol>
<b>Access granted</b>	<ol style="list-style-type: none"> <li>1. a signal sent from the access control system to the turnstile indicating that a security card that has just been presented is valid, and that the person should be allowed to pass</li> <li>2. a state the turnstile enters briefly, either when an access granted signal is received from the ACS; in this state, the top and end lights turn green in one direction, and a single person is permitted to walk through the lane</li> </ol>
<b>Card access</b>	a turnstile state; if a lane is in card access mode, a person must present a valid security card before passing through the lane; the other turnstile states are <i>free passage</i> and <i>lane closed</i>
<b>Card reader</b>	a device that validates electronic badges that employees use to identify themselves to the security system
<b>Controlled entry</b>	indicates that the inbound direction of a lane is in <i>card access</i> mode
<b>Controller board</b>	the circuit board inside the turnstile (on the receive side of a lane) that manages the detection of people passing through the lane
<b>DIP switches</b>	small banks of switches on a circuit board used to configure parameters
<b>Direction</b>	a path through a lane; each lane has an in direction and an out direction
<b>Door strike</b>	an electrically-activated magnetic door lock that is controlled by an access control system
<b>End light</b>	a visual indicator of the turnstile's state, visible from many metres away as a person approaches a turnstile; see Figure 1 on page 1
<b>End turnstile</b>	a turnstile at the edge of an entrance; one side of such a turnstile is usually against a wall or desk; it has optical receivers or transmitters, but not both, and has only one card reader; two end turnstiles make up the first lane of an installation, and subsequent lanes are made by inserting interlane turnstiles between the end turnstiles
<b>Free exit</b>	indicates that the outbound direction of a lane is in <i>free passage</i> mode
<b>Free passage</b>	a turnstile state; if a lane is in free passage mode, people can pass through it without setting off alarms, and without presenting a security card first; the other turnstile states are <i>card access</i> and <i>lane closed</i>
<b>General alarm</b>	a signal sent from the turnstile to the access control system indicating that something is wrong
<b>Heartbeat</b>	a light on the controller board that flashes on and off to indicate that the turnstile is operating properly; it is only active when the turnstile is on and functioning normally
<b>Housing</b>	the outside sheath of a turnstile
<b>Interlane</b>	a turnstile that isn't an end turnstile; it is involved in monitoring the two adjacent lanes

---

<b>Interlane cables</b>	a set of four cables that transmit data and DC power between adjacent turnstiles, connecting both sides of a lane
<b>Lane</b>	a monitored passageway into or out of a secure area; a lane has a turnstile on either side
<b>Lane closed</b>	a turnstile state; people are not allowed to pass through the lane, regardless of whether they present a valid security card; the other turnstile states are <i>card access</i> and <i>free passage</i>
<b>Lane open</b>	see <i>free passage</i>
<b>Light driver board</b>	the circuit board inside the turnstile that controls the end lights and top lights; the light driver board on the transmit side of a lane also sequences the transmission of the detection beams (in addition to controlling the end and top lights)
<b>Pedestal</b>	see <i>turnstile</i>
<b>Receive side</b>	the electronics on one side of a lane (usually on a person's right as they enter the secure area); it contains a relatively large number of electronic components, including receivers for the detection beams
<b>Secure mode</b>	see <i>card access mode</i>
<b>Security card</b>	a plastic card that identifies a person, and is used to grant the person access to a site; this could be a magnetic card or a Wiegand (proximity) card
<b>Tailgate</b>	the action of two people walking through a lane in single file at close proximity (perhaps only a few inches away)
<b>Terminal board</b>	the circuit board inside the turnstile that provides a connection among all the other circuit boards and the access control system; also provides switches to control turnstile parameters
<b>Top light</b>	a set of indicators in a window on the top surface of the turnstile; these are the status indicators in Figure 1 on page 1
<b>Transmit side</b>	the electronics on one side of a lane (usually on a person's left as they enter the secure area); although it contains very few electronic components, it has a full set of detection beam transmitters
<b>Trouble alarm</b>	a signal sent from the turnstile to the access control system indicating either a power failure or a component failure
<b>Turnstile</b>	an optical security device that grants or denies access to an entrance/exit, and counts the number of people passing through it; one physical unit (a housing, frame, and electronics)
<b>Unauthorized entry alarm</b>	an optional signal sent from the turnstile to the access control system when a person walks through a lane that is in card access mode without first presenting a valid security card



# Index

access control system timing mode			
enabling.....	25		
access denied			
defined .....	34		
settings.....	24		
access granted			
defined .....	34		
accessibility.....	5		
ACS integration			
alarms .....	20		
free exit, controlled entry.....	18		
fully programmable. 19, 20, 22, 31			
alarm buzzers .....	14		
alarms			
connection to ACS.....	20		
not generated during power failure			
.....	29		
settings.....	23		
anchors.....	8		
audio settings.....	22		
beam status lights .....	15		
beams			
problems with .....	30		
beep.....	22		
bolts .....	8		
cabling .....	9		
gauge recommendations.....	9		
running .....	9		
card readers			
external location .....	1		
installing .....	12		
internal position .....	2		
range .....	30		
terminating .....	13		
cleaning .....	28		
conduit			
material.....	6		
planning.....	6		
contact.....	4		
current, maximum .....	33		
dimensions.....	6		
dip switches			
not working.....	30		
dip switches .....	21		
door contact			
settings .....	24		
earth ground.....	11		
end light .....	1		
floor			
materials and drilling.....	8		
free passage			
settings.....	25		
ground.....	11		
series vs. parallel.....	11		
heartbeat.....	15		
housing .....	2		
installation .....	8		
interlane cables			
description of .....	12		
terminating.....	13		
lane open			
settings .....	25		
lights			
missing .....	29		
settings.....	26		
maintenance .....	28		
outer shell .....	2		
power			
partial loss .....	29		
power supply.....	9		
reboot.....	21		
receive .....	2		
reset.....	21		
schematics			
terminal board.....	33		
speakers.....	14		
status indicators .....	1		
surface installation.....	8		
terrazzo, installing on .....	8		
traffic planning.....	4		
training users.....	27		
transformer.....	9		
transmit .....	2		
trouble alarm .....	20		
turnstile timing mode			
enabling .....	25		
turnstiles			
base knockout template.....	6		
calculating number necessary ....	4		
comparison with card access door			
.....	17		
definition of .....	35		
exploded view .....	2		
grounding.....	11		
installing.....	8		
orientation.....	10		
resetting .....	21		
spacing of .....	5		
testing.....	15		
unpacking .....	7		
unauthorized entry			
settings .....	24		
unauthorized entry alarm.....	20		
user interface .....	27		
wheelchair .....	See accessibility		
wiegand card reader.....	12		



# Feedback

PathMinder updates its manuals periodically. Please take the time to provide feedback on this document. We look forward to hearing from you!

**Kindly return to:**  
PathMinder Inc.  
Attention: Technical Communications  
51 Spectrum Way  
Ottawa ON K2R 1E6  
Canada

**PathMinder TrueCount Optical Turnstile System  
Installation Manual: 2000 Series  
PM-DINS-2031-A, 2004/11/11**

1. List any errors or inaccuracies you have found in the manual.

---

---

---

---

2. Describe any information you feel is missing from the manual.

---

---

---

---

3. List any area(s) where the manual is unclear, ambiguous, or difficult to understand.

---

---

---

---

4. Provide any other comments.

---

---

---

---

