

DOOR CLOSERS

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Closing the Door

This lesson closes this course. As you complete this last lesson, try to relate what you've learned in other lessons. As a professional locksmith, what else do you need to know about doors? Stop and think a minute. You'll find that you need to know just about everything about doors, except how to build one. Although you may never hang a door, you need to know how they are hung to help you figure out why a lock doesn't work. You need to know all about locks and lock hardware and the regulations that govern their use on doors. And you need to know about door closers.

A door closer is just what it sounds like—it closes the door. As you'll learn in this lesson, modern door closers do more. Some hold the door open. Some even respond to fire alarms!

The need to have doors remain closed has existed since doors were first invented. Before door closers were developed, we used devices made of springs and weights to help close doors and keep them closed. These devices were noisy and inconsistent in terms of closing speed.

However, once inventors started to improve door closers, they got a lot more effective and efficient very quickly. Between 1873 and 1916, door closers went from being ugly, noisy, unreliable, and as likely to slam as not close at all to elegant and efficient devices similar to what we use today.

The US Patent Office issued the first US patent for a door closing device to Francis Richards on November 25, 1873. It consisted of a tube that contained a spring and a screw that operated as a closing speed valve. On June 15, 1880, the Patent Office issued Lewis C. Norton a patent on a pneumatic door closer. This device built on Richards' door closer by adding air pressure in the cylinder. The air pressure prevented the door from slamming closed.

Then on January 3, 1882, the Patent Office issued Norton a second patent. The new closer had improved closing performance, speed control, and was more effective in closing the door. On June 17, 1882, Norton founded the Norton Door Check and Spring Company. On August 1, 1882, Edward Gillon and W.C. Clark of Boston were issued a variation patent to the Norton closer. These two inventors used an external torsion spring on the arm rather than inside the cylinder.

Eugene Blount received the first US liquid door closer patent on July 9, 1889. The first US liquid door patent was issued to William Gilfillan on March 2, 1897. And on February 1, 1916, John Gerard of New Britain, Connecticut, invented the first concealed-in-the-door liquid closer.

Today, every fire door must be self-latching. This requires a door closer. Apartment vestibule and hotel doors also need to lock behind people as they leave. So these doors also require door closers. Door closers play an important role in saving energy. They keep cooled or heated air from escaping. And more doors than ever require closers due to the Americans with Disabilities Act (ADA).

As a professional locksmith, you need the technical knowledge to specify the right door closer for the door you are servicing. This lesson will get you started in acquiring that knowledge.

Objectives

When you have completed this lesson, you should be able to

- ☞ List and describe the three components that make up most door closers.
- ☞ Define the two checking mechanism adjustments that let you control the speed of closure on most modern door closers.
- ☞ List and describe four types of surface door closers.
- ☞ Recognize three types of concealed door closers.
- ☞ List and describe three types of floor closers.
- ☞ List and describe two types of automatic operator door closers.
- ☞ Explain fire door and ADA requirements that apply to door closers.



Main Ideas

1. Operation Overview
2. The Four Types of Door Closers
3. Legal Requirements

Operation Overview

Door closers control the speed and the amount of pressure needed to both open and close a door. Most door closers consist of three components:

- a power source,
- a checking mechanism, and
- a connecting arm or transmitter.

The Power Source

The power source provides the force that closes the door. It can be hydraulic pressure, pneumatic (air) pressure, or electrical. Air is not as precise and reliable as hydraulic fluid. Hydraulic fluid is normally sealed in the cylinder and has non-freezing characteristics.



Sweep Speed Adjustment—
Controls the movement of a door from the open position until just before it latches



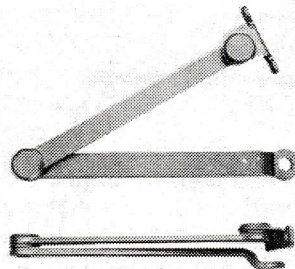
Latch Speed Adjustment—
Controls the speed of the last 10 percent of a door's closing movement

The Checking Mechanism

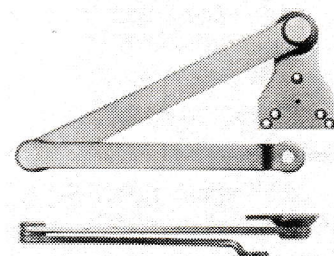
The checking mechanism controls the rate at which the door closes. For most modern door closers, it consists of a **sweep speed adjustment** and a **latch speed adjustment**. You can adjust the closer to shut quickly and then slow down just before latching to avoid slamming. Or you can adjust it to close slowly and then speed up just before it latches to make sure it latches.

The Connecting Arm or Transmitter

The connecting arm or transmitter conducts the closing force. The connecting arm transmits the force to the door frame. A transmitter conducts the force electrically to the closing mechanism.



Standard Arm



Parallel Arm

(courtesy of Yale Security Inc.)

The standard arm has more power efficiency than the parallel arm, but it doesn't look as good.

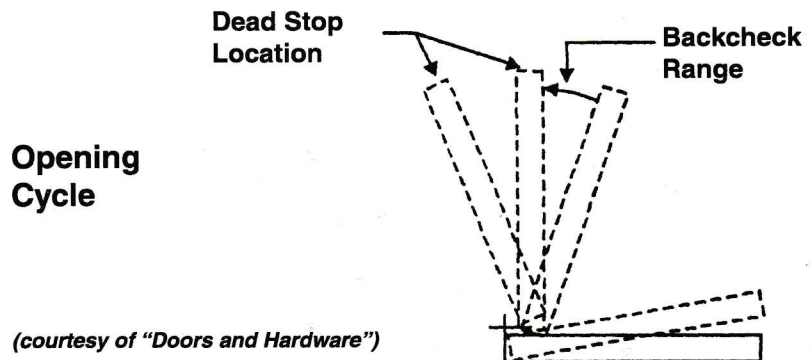
Other Features

Door closers can have several built-in and optional features. These include backcheck, dead stop, closing speed, latch speed, hold open, and delayed action.

When you open a door operated by a closer, you will feel some resistance. When you push the door into the 70 percent open zone, you enter the backcheck range. This feature, **backcheck control**, keeps a door from being opened too quickly. It lets the door open at the normal speed to almost 75 degrees. Then it slows the door down for the rest of the opening movement so the door does not swing out of control.



Backcheck Control—
Hydraulic circuit designed to cushion a door's opening swing at about 75 degrees



Dead Stop—A door closer feature that stops the door before it is fully open

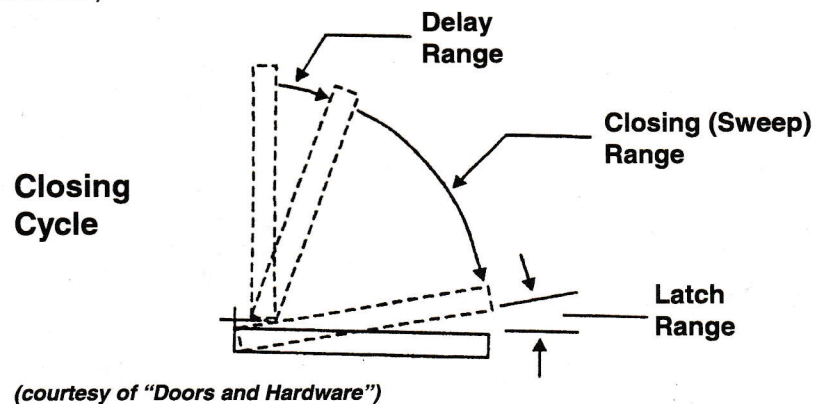
To protect the door, pedestrians, and walls, a **dead stop** feature is built into most heavy duty floor closers. This feature stops the door before it is fully open.

You learned earlier in this lesson that you control closing speed by adjusting sweep speed and latch speed.

Delayed action closing is a feature of some door closers. Delayed action closers delay the closing from maximum opening to about 75 percent closed. Then the door closes normally.



Delayed Action—Delays closing from maximum opening to approximately 75 percent closed

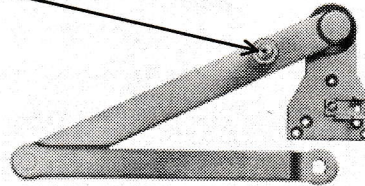




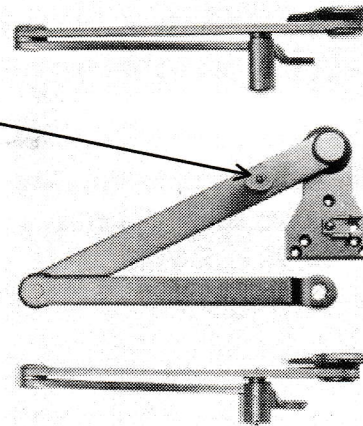
Hold Open—Holds the door open when it is opened to a 90 degree position, then closes it normally once it is pulled a little toward closing

Some door closers have an optional **hold-open** feature. When the closer uses an arm, the feature may be located on the arm. When the door is opened to a 90 degree position, the arm holds it open until you pull the door a little. Then it closes normally. In some cases, the hold-open feature may be on the floor or the wall.

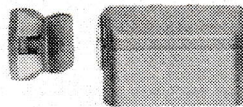
**Key Adjusted
Hold-Open
Arm**



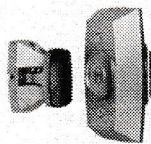
**Thumbturn
Adjusted
Hold-Open
Arm**



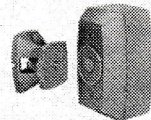
Electro-Magnetic Door Holders



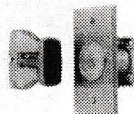
Floor Mount Series



Narrow Projection Series



Surface Mount Series



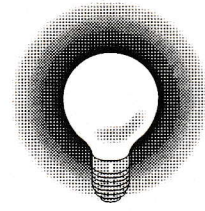
Flush with Wall Series

(courtesy of Yale Security Inc.)

When you properly install and adjust a door closer, it will control the door throughout its opening and closing swing.

Organize the Main Ideas

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1. Operation Overview
 - a. The Power Source
 - b. The Checking Mechanism
 - c. The Connecting Arm or Transmitter
 - d. Other Features

Check Your Knowledge 1



This quiz will help you check what you've learned in this section of the lesson. Read through the questions and jot down your answers. Then check those against the suggested answers at the end of this lesson. If your answers differ greatly from the suggested answers, you may wish to reread the text before you go on.

1. The three components that make up most door closers are the _____, the _____, and the _____. (Fill in the blanks.)
2. The power source on a door closer can be _____ pressure, _____ pressure, or _____. (Fill in the blanks.)
3. The _____ adjustment controls the movement of a door from the open position until just before it latches. (Fill in the blanks.)
4. The _____ adjustment controls the speed of the last 10 percent of a door's closing movement. (Fill in the blanks.)
5. The parallel arm has more power efficiency than the standard arm, but it doesn't look as good. (True or False?)
6. The _____ control is a hydraulic circuit designed to cushion a door's opening swing at about 75 degrees. (Fill in the blank.)
7. To protect the door, pedestrians, and walls, the _____ feature stops the door before it is fully open. (Fill in the blanks.)
8. The _____ feature delays closing from maximum opening to approximately 75 percent closed. (Fill in the blanks.)
9. The _____ feature holds the door open when it is opened to a certain point, then closes it normally once it is pulled a little toward closing. (Fill in the blanks.)

The Four Types of Door Closers

The four types of door closers are

- surface,
- concealed,
- floor, and
- automatic operator.

Surface Closers



Surface Closers—Closers which are mounted on the surface of the door and frame

Surface closers are made by many manufacturers worldwide. They are the most popular type of closer used today. Some have metal or plastic covers to improve their appearance. The less costly models are painted.

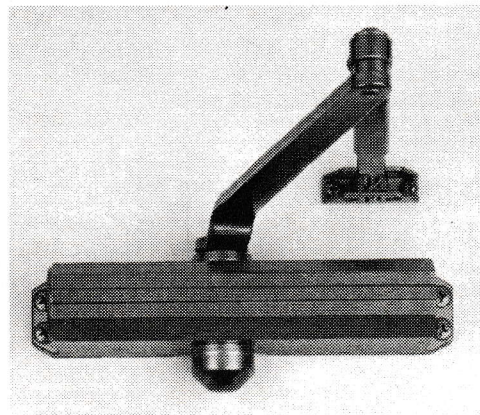
Delayed action, backcheck, and closing speed adjustment are available on surface closers.

The four types of surface closers you will learn about in this section are listed below.

1. Regular Arm (Standard)
2. Parallel Arm
3. Top Jamb
4. Track Closer with Smoke Detector or Door Holder/Release

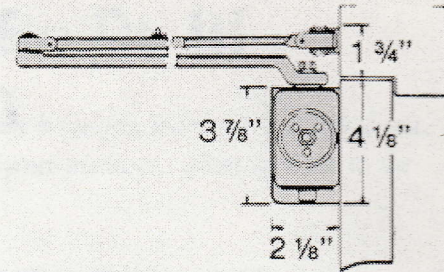
Regular Arm (Standard) Surface Closer

You mount this type with the closer on the pull side of the door and the arm on the top rail. It is never used on exterior out-swing doors. The door opening for the standard surface closer cannot be more than about 130 degrees.



(courtesy of Yale Security Inc.)

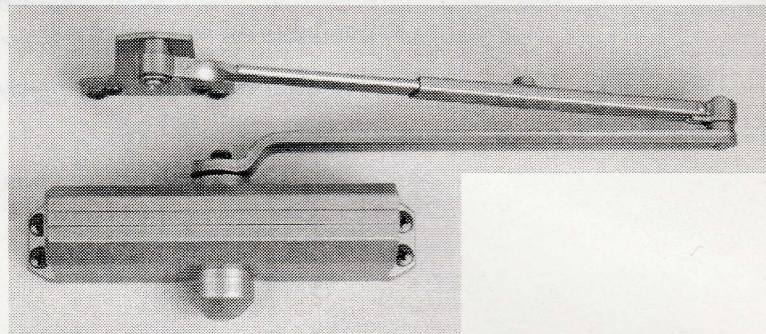
Regular Arm Installation



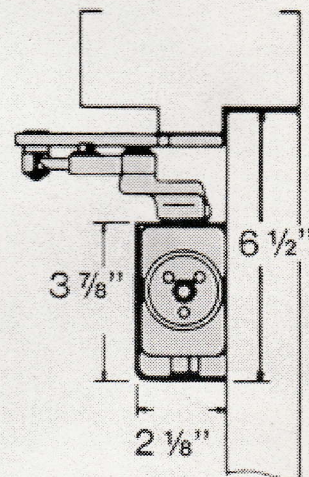
(courtesy of Yale Security Inc.)

Parallel Arm Surface Closer

You mount this closer to the door with a parallel arm that is attached to the door stop. The maximum door opening for this closer is about 180 degrees.



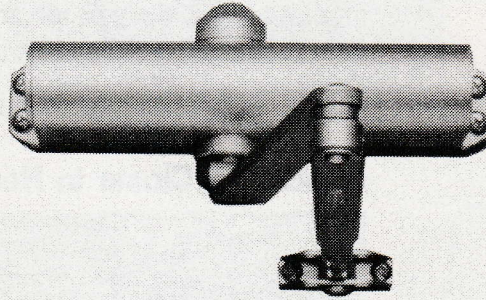
Parallel Arm Installation



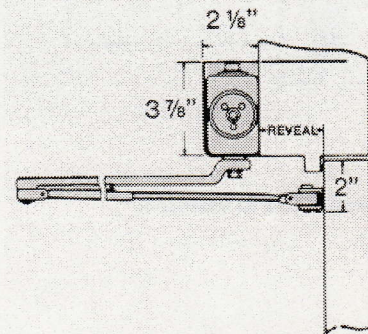
(courtesy of Yale Security Inc.)

Top Jamb Surface Closer

You mount this closer on the top jamb with the arm on the push side of the door. The door opening for the top jamb surface closer cannot be more than about 180 degrees.



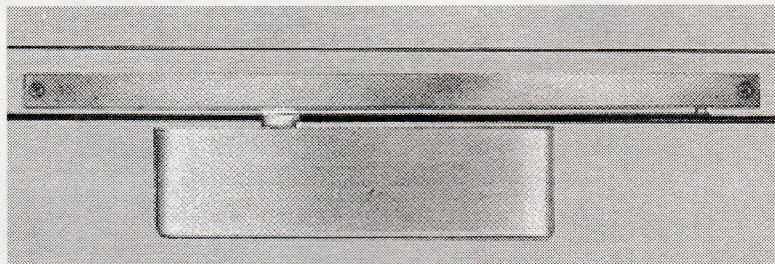
Top Jamb Installation



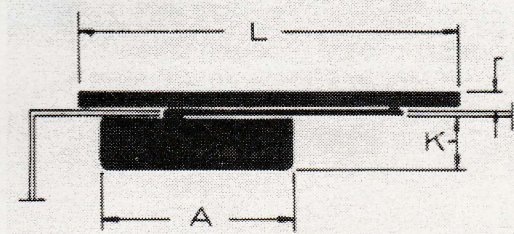
(courtesy of Yale Security Inc.)

Track Surface Closer

You mount this closer to the door and the track to the frame. The closer is available with or without a smoke detector. If smoke is detected, the closer closes the door.



Track Closer Installation



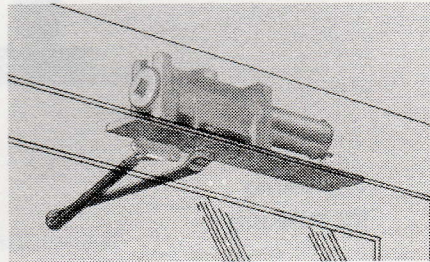
(courtesy of LCN Closers)

Concealed Closers

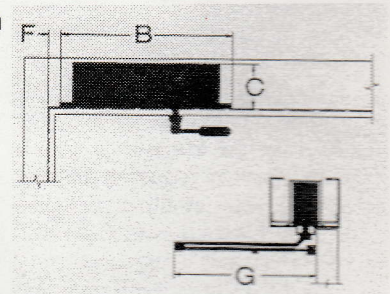
Concealed closers are out of sight. They can not be harmed by cleaning chemicals, dirt, or airborne contaminants. However, they are easily reached for service adjustments. Concealed closers do an excellent job and are still within the price range of the more costly surface closers.

The three types of concealed closers are pictured below.

Concealed Closer in Header with Exposed Arm

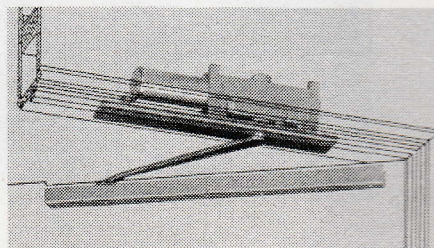


Installation

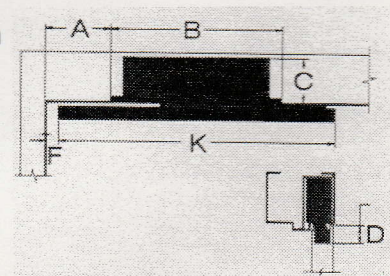


(courtesy of LCN Closers)

Concealed Closer in Header with Concealed Track Arm

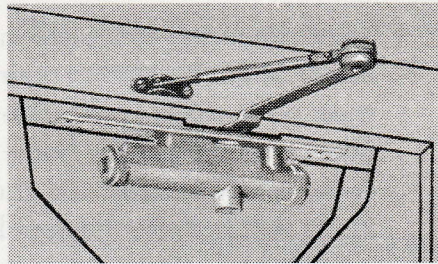


Installation

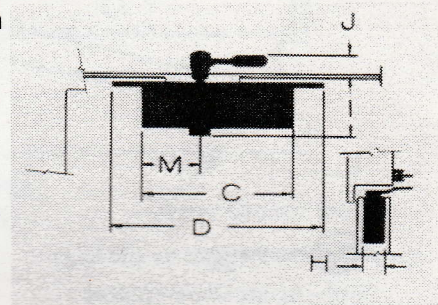


(courtesy of LCN Closers)

Concealed Closer in Door with Exposed Arm

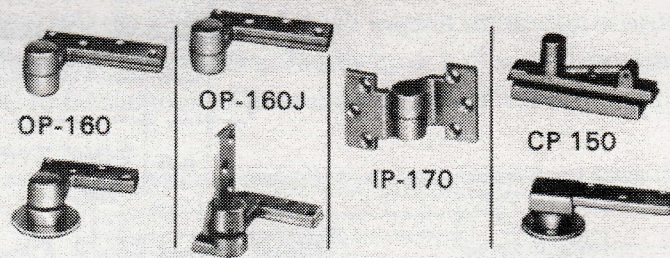


Installation



(courtesy of LCN Closers)

Some concealed door closers can be hung on pivots.



Offset
Pivots

with jamb
mounted
bottom

Offset Pivot
for tall or
heavy doors

Center
Pivots

(courtesy of LCN Closers)

Floor Closers

Floor closers are concealed in the floor. You usually use them on thick, large, or heavy doors. However, you can also use them on specialty application doors and doors which have floors as shallow as 2". Some examples of specialty application doors are arched doors on churches and doors that are built into a wall to make the door look like part of the wall.

These closers are barely visible and thus do not detract from the appearance of the door. The three types of floor closers are listed below.

1. Center Hung
2. Offset Hung
3. Independently Hung



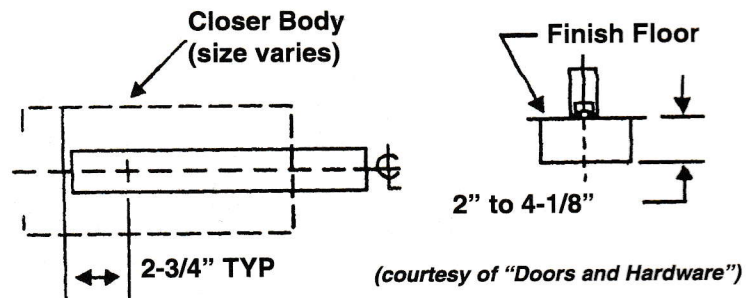
Single-Acting Door—A door that swings only one way, in or out



Double-Acting Door—A door that swings both ways, in and out

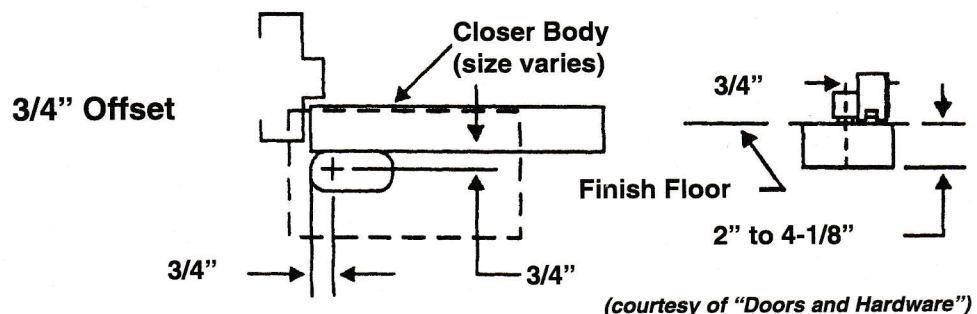
Center Hung Floor Closer

These floor closers have a pivot point at the center of a door's thickness. A center hung door can be a **single-acting door** or a **double-acting door**. When a door is center hung, it is practically impossible to see how the door is operated.



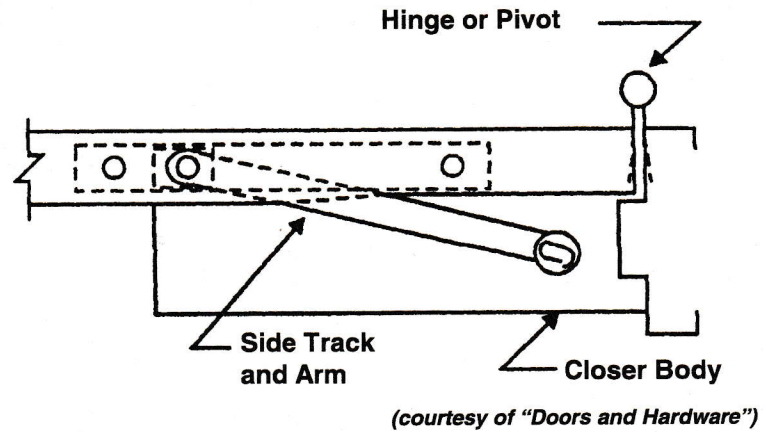
Offset Hung Floor Closer

These floor closers have the pivot point off the face of a door, normally at 1/2". Doors that require a **wide throw** to avoid special wood trim would use a 12" offset. The offset must match at both the top and the bottom for the door to close properly.



Independently Hung Floor Closer

These floor closers are hung on hinges or pivots. You use them only on single-acting doors, most often on pocket doors.

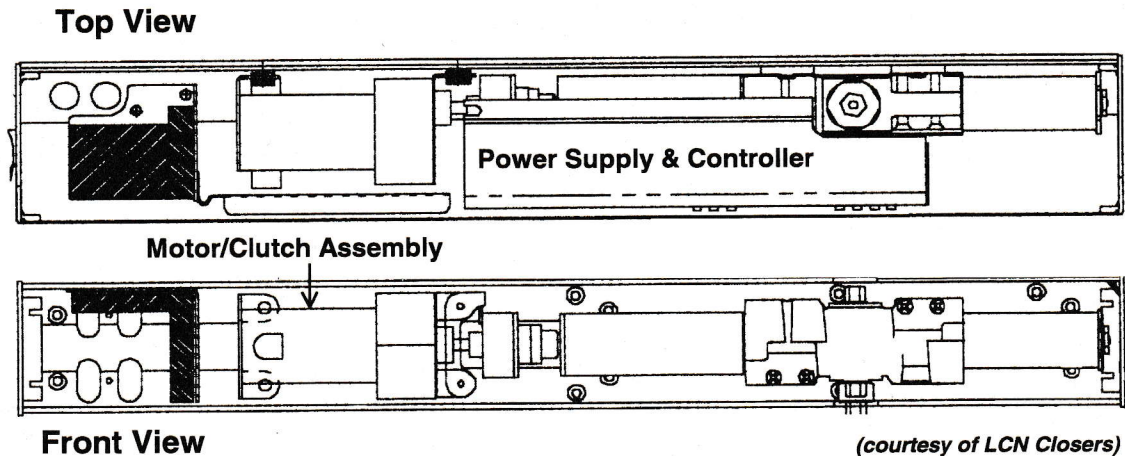


Automatic Operator Door Closers

The two types of automatic operator closers are electrical and pneumatic.

Electrical Automatic Operator Door Closer

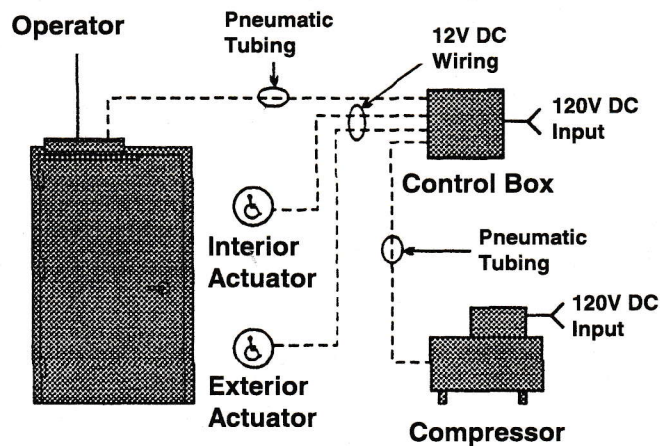
Electrical power goes to the header in this type of automatic operator door closer. A push button or motion sensor opens the door. The units normally have a closing delay time of from 10 to 60 seconds. These closers are surface mounted.



Pneumatic Automatic Operator Door Closer

You also surface mount this type of automatic operator closer. A basic system contains

- an operator to control the door,
- a control box that contains the valves and electrical timing circuits,
- actuators that act as switches to start the system, and
- a compressor air source.



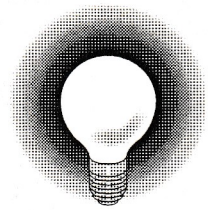
(courtesy of LCN Closers)

Pneumatic control is quiet, efficient, and extremely reliable. The flexible tubing is the only connection between the control box and the door frame.

You can easily adjust the opening force and timing cycle to meet the needs of specific installations. Control boxes are normally mounted within 50 feet of the controlled door.

Organize the Main Ideas

This outline will help you organize the information in this section of the lesson. Read through the outline and jot down what you remember about each of the topics listed. If you can't remember details related to one or more of the topics, you may wish to reread the text before you go on.



1. The Four Types of Door Closers

a. Surface Closers

1) Regular Arm (Standard) Surface Closer

2) Parallel Arm Surface Closer

3) Top Jamb Surface Closer

4) Track Surface Closer

b. Concealed Closers

1) Concealed Closer in Header with Exposed Arm

2) Concealed Closer in Header with Concealed Track Arm

3) Concealed Closer in Door with Exposed Arm

c. Floor Closers

- 1) Center Hung Floor Closer
- 2) Offset Hung Floor Closer
- 3) Independently Hung Floor Closer

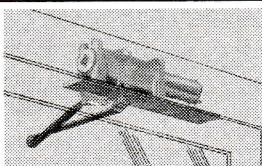
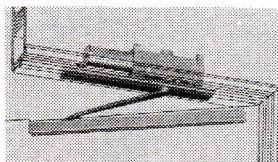
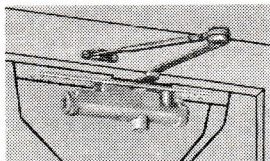
d. Automatic Operator Door Closers

- 1) Electrical Automatic Operator Door Closer
- 2) Pneumatic Automatic Operator Door Closer

Check Your Knowledge 2



This quiz will help you check what you've learned in this section of the lesson. Fill in the missing information in the table below. Then check your table against the one in this section. If your table differs greatly from the one in this section, you may wish to reread the text before you go on.

Door Closer	Description or View
1. 5000	You mount this type with the closer on the pull side of the door and the arm on the top rail. It is never used on exterior out-swing doors. The door opening for this closer cannot be more than about 130 degrees.
2.	You mount this closer to the door with an arm that is attached to the door stop. The maximum door opening for this closer is about 180 degrees.
3.	You mount this closer with the arm on the push side of the door. The door opening cannot be more than about 180 degrees.
4.	Usually you mount this closer to the frame and the track to the door. The closer is available with or without a built-in smoke detector. If smoke is detected, the closer closes the door.
5.	
6.	
7. <i>Push-Pull Closer</i> <i>1000</i>	
8.	These closers have a pivot point at the center of a door's thickness.
9.	These closers have the pivot point off the face of a door, normally at 180°.
10.	These closers are hung on hinges or pivots. You use them only on single-acting doors, most often on pocket doors.
11. <i>Fire-Retardant Closer</i>	A push button or motion sensor opens the door. The units normally have a closing delay time of from 10 to 60 seconds.
12.	Tubing, a control box, and actuators work together to open and close the door.

(illustrations courtesy of LCN Closers)

Legal Requirements

As you know, fire doors require closers. And you know that if you repair and install hardware on doors, you must know about

- your local building codes and fire codes that apply to door hardware.
- the National Fire Protections Association (NFPA) Codes.
- the Americans with Disabilities Act (ADA).

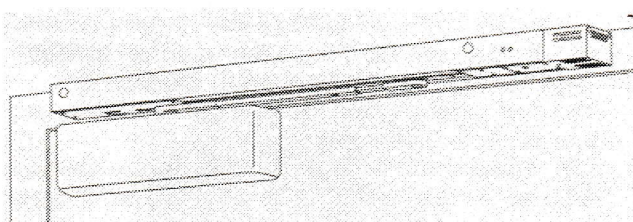
You learned how these codes and regulations apply to door hardware in Lessons 8 and 12.

Because door closers are mounted on doors, the same rules apply to them. And there are some rules that apply particularly to door closers.

Fire Doors

A closing device must be installed on every fire door. All closing devices must be approved by UL (Underwriter's Laboratories) or some other testing agency. The only exception to this rule is for pairs of doors on mechanical rooms through which equipment must be moved.

For fire-rated doors, this closer holds the door at 90 degrees during normal operation, but closes the door when smoke is detected or the battery fails. Track includes smoke detector and holding mechanism powered by 9V alkaline battery.



(courtesy of LCN Closers)

When dealing with a fire door with a minimum opening resistance of 5 lbs interior or 82 lbs exterior, the fire door requirements override ADA requirements. However, you may install a power assist operator to meet both fire door and ADA requirements.

Heat Resistant Attachments

Make sure you use heat resistant attachments. Door closers for fire-rated doors must use steel screws or steel through bolts. Most manufacturers supply aluminum or zinc hex bolts. These will melt under normal fire conditions and the closer may fall off the door.

Adequate Reinforcement

Make sure you provide enough reinforcement to support the closer. Even through bolts will pull through wood veneers.

Hold-Open Function

When the hold-open function is required on a fire door, use a closer with an additional magnetic holder. This holder is electrically connected to the fire alarm system. In case of a fire, the door will close and stay closed.

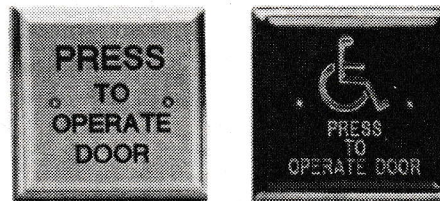
ADA Requirements

Adjust the sweep so that from an open position of 70 degrees, the door takes at least 3 seconds to move to a point 3" from the latch, measured to the leading edge of the door.

The maximum force needed to pull or push an exterior door open must not be more than 8 lbs.

The maximum force needed to pull or push an interior door open must not be more than 5 lbs.

Switches, Sensors, and Transmitters for ADA Applications



Press-Type Wall Switches

Frame Switch



Retro-Reflective Beam-Type Sensor



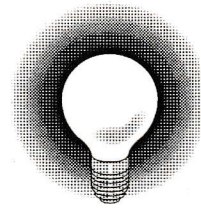
Single Channel Hand-Held Transmitter



(courtesy of Yale Security Inc.)

Organize the Main Ideas

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1. Legal Requirements

a. Fire Doors

1) Heat Resistant Attachments

2) Adequate Reinforcement

3) Hold-Open Function

b. ADA Requirements

Check Your Knowledge 3



This quiz will help you check what you've learned in this section of the lesson. Read through the questions and jot down your answers. Then check those against the suggested answers at the end of this lesson. If your answers differ greatly from the suggested answers, you may wish to reread the text before you go on.

1. The only exception to the rule that a closer must be installed on every fire door is for pairs of doors on _____ through which _____ must be moved. (Fill in the blanks.)
2. When dealing with a fire door with a minimum opening resistance of 5 lbs interior or 82 lbs exterior, the _____ requirements override _____ requirements. (Fill in the blanks.)
3. Door closers must use aluminum or zinc hex bolts. (True or False?)
4. According to ADA requirements, the maximum force needed to pull or push an exterior door open must not be more than _____ lbs. (Fill in the blank.)
5. According to ADA requirements, the maximum force needed to pull or push an interior door open must not be more than _____ lbs. (Fill in the blank.)

For Closers ...

Here are some openings to Locksmith resources on the Worldwide Web.

Schlage--<http://www.schlagelock.com/schlage>

Ilco--<http://www.ilcoUnican.com/>

Corbin Russwin--<http://pages.prodigy.com/locks/corbin.htm>

Master Lock---<http://www.masterlock.com>

And theses are just a few. Visit

<http://www.jfbdtp.com/locksmithlinks.html>

for links to many more locksmithing websites.



You've reached the end of the lesson, but what have you learned? Let's find out. First complete the exercise below using only your memory. Next go back to the text to complete and/or check your answers.

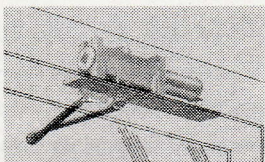
1. List and describe the three components that make up most door closers.

Sweep Speed Adjustment

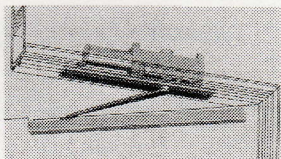
Latch Speed Adjustment

3. List and describe four types of surface door closers.

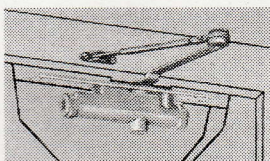
4. Recognize three types of concealed door closers. (Label the illustrations below on the blanks provided.)



Concealed door closer mounted in door



Concealed door in header with concealed
trim on top



Concealed door in door with trim

5. List and describe three types of floor closers.

6. List and describe two types of automatic operator door closers.

7. Explain fire door and ADA requirements that apply to door closers.

Fire Door Requirements

ADA Requirements

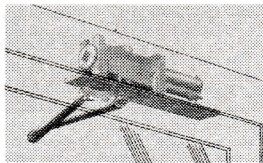


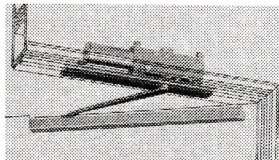
Stop for Review

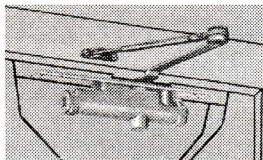
To answer the following questions, circle the letter next to the correct response. Only one correct response is provided for each question.

1. The _____ provides the force that closes the door.
 - a. sweep speed adjustment
 - b. connecting arm or transmitter
 - c. power source
 - d. checking mechanism
2. The _____ controls the rate at which the door closes.
 - a. dead stop feature
 - b. connecting arm or transmitter
 - c. power source
 - d. checking mechanism
3. The _____ conducts the closing force.
 - a. dead stop feature
 - b. connecting arm or transmitter
 - c. power source
 - d. checking mechanism
4. The sweep speed adjustment _____.
 - a. controls the speed of the last 10 percent of a door's closing movement
 - b. cushions a door's opening swing at about 75 degrees
 - c. stops the door before it is fully open
 - d. controls the movement of a door from the open position until just before it latches
5. The latch speed adjustment _____.
 - a. controls the speed of the last 10 percent of a door's closing movement
 - b. cushions a door's opening swing at about 75 degrees
 - c. stops the door before it is fully open
 - d. controls the movement of a door from the open position until just before it latches
6. The regular arm or standard surface door closer _____.
 - a. is mounted on the push side of the door
 - b. is mounted on the pull side of the door
 - c. is mounted to the door with an arm that is attached to the door stop
 - d. has a built-in smoke detector and alarm
7. The parallel arm surface door closer _____.
 - a. is mounted on the push side of the door
 - b. is mounted on the pull side of the door
 - c. is mounted to the door with an arm that is attached to the door stop
 - d. has a built-in smoke detector and alarm

8. The top jamb surface door closer _____.
 - a. is mounted on the push side of the door in an opening that cannot be more than about 180 degrees
 - b. is mounted on the pull side of the door in an opening that cannot be more than about 130 degrees
 - c. is mounted to the door with an arm that is attached to the door stop in an opening that cannot be more than about 180 degrees
 - d. has a built-in smoke detector and alarm
9. The track surface door closer _____.
 - a. is mounted on the push side of the door in an opening that cannot be more than about 180 degrees
 - b. is mounted on the pull side of the door in an opening that cannot be more than about 130 degrees
 - c. is mounted to the door with an arm that is attached to the door stop in an opening that cannot be more than about 180 degrees
 - d. is mounted to the frame and the door and has a built-in smoke detector and alarm
10. *Label the illustrations below on the blanks provided.*







11. Center hung floor closers _____.
 - a. have the pivot point off the face of a door, normally at 1/2"
 - b. have the pivot point at the center of a door's thickness
 - c. are mounted to the center of the frame
 - d. are mounted at about 3/4" from the center of the frame
12. Offset hung floor closers _____.
 - a. have the pivot point off the face of a door, normally at 1/2"
 - b. have the pivot point at the center of a door's thickness
 - c. are hung on hinges or pivots and used only on single-acting doors
 - d. are mounted at about 3/4" from the center of the frame

13. Independently hung floor closers _____.
 - a. have the pivot point off the face of a door, normally at 12 o'clock
 - b. have the pivot point at the center of a door's thickness
 - c. are mounted to the center of the frame
 - d. are hung on hinges or pivots and used only on single-acting doors
14. _____ does NOT describe an electrical automatic operator door closer.
 - a. A push button or motion sensor that opens the door and a closing delay time of about 10 to 60 seconds
 - b. A power source mounted to the frame and a track that includes a built-in smoke detector
 - c. Tubing, a control box, and actuators that work together to open and close the door
 - d. A power source mounted to the pull side of the door and a transmitter on the top rail
15. _____ does NOT describe a pneumatic automatic operator door closer.
 - a. A push button or motion sensor that opens the door and a closing delay time of about 10 to 60 seconds
 - b. A power source mounted to the frame and a track that includes a built-in smoke detector
 - c. Tubing, a control box, and actuators that work together to open and close the door
 - d. A power source mounted to the pull side of the door and a transmitter on the top rail
16. A closing device must be installed on every _____.
 - a. single-acting door
 - b. pocket door
 - c. fire-rated door
 - d. pair of doors on mechanical rooms through which equipment must be moved
17. You must use _____ on door closers for fire-rated doors.
 - a. aluminum hex bolts
 - b. steel screws or steel through bolts
 - c. zinc hex bolts
 - d. track bolts
18. According to ADA requirements, the maximum force needed to pull or push an exterior door open must not be more than _____ lbs.
 - a. 5
 - b. 10
 - c. 18
 - d. 8
19. According to ADA requirements, the maximum force needed to pull or push an interior door open must not be more than _____ lbs.
 - a. 5
 - b. 10
 - c. 18
 - d. 8