### Seat Belt Systems

#### **Objectives**

- Identify federal standards related to seat belts.
- Name types of seat belts and seat belt parts.
- · Describe types of latchplates.
- Describe types of retractors.
- · Locate latchplates and retractors.
- · Identify approved additional locking steps.
- Explain best practices about seat belt systems to caregivers.

#### FEDERAL STANDARDS FOR SEAT BELTS

NHTSA sets Federal Motor Vehicle Safety Standards (FMVSS) for seat belts and other safety features.

FMVSS 208 regulates seat belts and frontal air bags.

- Beginning with 1996 vehicle models, all passenger seat belt systems must lock to secure car seats. Driver seat belt systems do not lock because car seats are **NOT** installed in this position.
- Since 2008, lap-and-shoulder belts are required in all seating positions, except some front center seating positions.

#### Types of Seat Belts

There are two types of seat belt systems found in vehicles – lap belts and lap-and-shoulder belts.

#### A lap belt:

- Offers 2-point protection because it connects with the body in two places – at each hip.
- Does not provide upper body protection.

#### A lap-and-shoulder belt:

- Offers 3-point protection because it connects with the body in three places – at each hip and at the shoulder.
- Provides upper body protection.

A lap belt is better than no seat belt at all, but a lap-and-shoulder belt provides better protection.

### RESOURCE ON FEDERAL STANDARDS

Quick Reference Guide to Federal Motor Vehicle Safety Standards and Regulations is located on the NCPSB website.



Lap belt

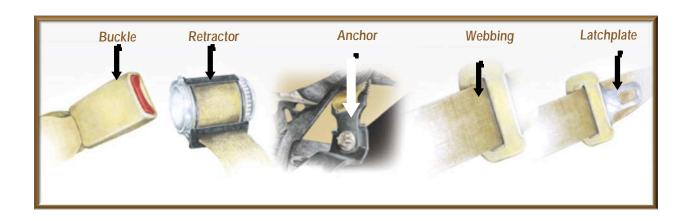


Lap-and-shoulder belt

#### **Seat Belt Parts**

Seat belts have five main parts.

- ☑ Buckles accept the latchplate and hold the seat belt in place.
- Retractors gather and store extra webbing in the vehicle. Most lap-and-shoulder seat belts have one retractor that holds the webbing for both the lap and shoulder webbing. Some lap-and-shoulder belts have two retractors one for the lap belt and one for the shoulder belt. Retractors are usually covered in a vehicle and not easy to see.
- ✓ **Anchors** attach the seat belts to a strong location in the vehicle.
- **Webbing** is the fabric part of the seat belt that crosses the person or holds the car seat or booster seat.
- ✓ Latchplates connect the seat belt webbing to a buckle in the vehicle.



All vehicles have been required to have a locking seat belt feature, either at the retractor or the latchplate since 1996.

This is called the lockability standard.

#### Types of Latchplates

There are different types of latchplates that you will encounter while checking car seats.

- Locking
- Switchable
- Sliding
- Sewn-on
- Dynamic locking



Locking latchplate

#### **Locking Latchplate**

- A locking latchplate on the seat belt can be found in older vehicles and in the center seat of some newer vehicles.
- Some have a locking bar found on the bottom or back. The bar moves back and forth, as well as up and down. It can be made of metal or plastic.
- Not all locking latchplates look the same. Some have a bar while others have a sliding metal or plastic piece.
- ☑ If the seat belt webbing and latchplate lie flat, the latchplate will lock.
- ☑ If the latchplate is tilted, the latchplate will remain unlocked.
- ☑ The steps to test if the latchplate locks are:
  - 1. Buckle the seat belt.
  - 2. Give a firm tug on the lap portion of the seat belt while pulling up on it. If the webbing does not slide through the latchplate, it is locked.





Locking latchplate with sliding metal piece – front and back



Locking latchplate with plastic piece

# Switchable Latchplate Some vehicles have a

some vehicles have a switchable latchplate that uses a button to move from the unlocked position for adults to the locked position for car seats (children).





Locking parts from a switchable latchplate – front and back

# Sliding and Sewn-on Latchplates While all seat belts will lock in a crash, not all seat belts have a latchplate that will lock to secure a car seat.

 Sliding and sewn-on latchplates have no locking feature or moving parts.



Sliding latchplate found only on lap-and-shoulder systems

#### Sliding and Sewn-on Latchplates (continued)

- Sliding latchplates are found on lap-and-shoulder belts.
   Sewn-on latchplates can be on lap belts and lap-andshoulder seat belts.
- To test if these latchplates have a locking feature, buckle the seat belt and pull up on the lap portion of the seat belt. The webbing will slip through a sliding latchplate and will NOT lock.
- Sewn-on latchplates can be found on both lap-belt-only and lap-and-shoulder seat belts.



Sewn-on latchplate found on lap-only and lap-and-shoulder seat belts

 With a sewn-on latchplate, test the seat belt – NOT the latchplate. Buckle the seat belt and test to see if it locks by firmly pulling up on the lap portion of the seat belt. The seat belt webbing will not lengthen if some type of locking mechanism has been engaged.

#### **Dynamic Locking Latchplate**

New technology can be introduced at any time. These new products may look similar to current hardware available in vehicles, but may function differently. To ensure you are using a new product correctly, you **MUST** refer to the vehicle owner's manual.

**Dynamic locking latchplates** are currently located in the front seat of some vehicles and lock the lap-and-shoulder belt when loaded by an occupant during a crash. This latchplate is **NOT** intended to lock the seat belt for a car seat.

- Some dynamic locking latchplates may seem to lock the seat belt when you buckle it across an empty seat and pull upward on the lap portion. The caregiver could believe that it is safe since it seems to lock.
- The caregiver should move the car seat to a different position or take additional steps as recommended in the vehicle owner's manual to lock the seat belt that has a dynamic locking latchplate.
- Even if you see moving parts on a latchplate, do NOT assume it is a locking latchplate. Test for lockability and check the vehicle owner's manual.

# TIP FOR DISCUSSING UNUSUAL LOCKING PROCEDURES

Always check the vehicle owner's manual to learn about unusual seat belt locking features when you cannot find a way to lock the seat belt.



Dynamic locking latchplate

## Progress Check: Latchplates

- 1. What are the two types of latchplates that can be locked?
- 2. What is the step to put a locking latchplate into the locking mode?
- 3. What is the step to put a switchable latchplate into the locking mode?
- 4. What is one way to determine if a latchplate can be locked for car seats?
- 5. What types of latchplates cannot be locked?

#### **Differences Between Types of Latchplates**

Types of Latchplates	Description
Locking	<ul> <li>Found in older vehicles and in some newer vehicles.</li> <li>Moving parts lock the lap belt webbing.</li> <li>Locking bar found on the bottom or back moves back and forth in a horizontal slot</li> <li>If seat belt webbing and latchplate lie flat, latchplate locks. If tilted, latchplate remains unlocked. To test for a locking feature buckle seat belt and pull up on lap portion of seat belt. The lap belt webbing will not lengthen as you pull up on it if the latchplate is locked.</li> </ul>
Switchable	Button moves from unlocked position for adults to locked position for car seats (children). Use the same test to confirm the latchplate is locked.
Sliding and Sewn-On	<ul> <li>Typically found on lap-and-shoulder belts.</li> <li>May have no locking feature or moving parts. To test for a locking feature, buckle seat belt and pull up on lap portion of seat belt. The lap belt webbing will lengthen as you pull up on it there is no locking feature.</li> <li>Sewn-on latchplates are found in center rear and front seating position of some cars, school buses, and many older vans.</li> <li>With a sewn-on latchplate, test seat belt, not the latchplate. Buckle the seat belt and test to see if it is locked by firmly pulling the lap portion of seat belt up. Seat belt webbing will not lengthen if some type of locking mechanism has been engaged.</li> </ul>
Dynamic Locking	<ul> <li>Located in front seat of some vehicles and will lock the lap-and-shoulder belt in a crash. Not intended to provide locking of seat belt for a car seat.</li> <li>May look like a locking latchplate. Test for lockability and check the vehicle owner's manual.</li> <li>To use with a car seat, caregiver MUST take additional steps described in the vehicle owner's manual.</li> </ul>

#### Types of Retractors

In some vehicles the retractor – not the latchplate – provides the locking part needed to keep a car seat in place at all times. The purpose of the retractor is to store the excess webbing. These retractors are usually present when a non-locking latchplate (sliding, sewn-on, or dynamic locking) is present.

When talking to caregivers, try not to use technical terms and abbreviations to explain how a part works. First, explain and demonstrate how a part works. Then, make sure caregivers practice what to do and are able to explain how it works.

#### **Emergency Locking Retractor**

You are most familiar with an emergency locking retractor (ELR) since you probably use it every day as a driver. As the name implies, an emergency locking retractor locks only in a sudden stop, acceleration, turn, or crash.

This retractor type, along with one of the non-locking latchplates – sliding, sewn-on, or dynamic locking – cannot secure a car seat without an extra, approved step.



**Emergency locking retractor (ELR)** 

Seat belts with emergency locking retractors can be found in lap-only, shoulder-only, or lap-and-shoulder belts. You cannot identify an emergency locking retractor just by looking at the seat belt. You **MUST** test the seat belt to determine if there is a locking feature.

- FMVSS required a lockability feature on vehicles made after 1996.
- If the vehicle is older than 1996, you might have a locking latchplate, but it is more likely that the seat belt retractor is an emergency locking retractor with a sliding latchplate and without locking ability. In that case, you will have to use an approved step to put the seat belt into a locked mode (locking clip or car seat lock-off).

#### **Automatic Locking Retractors**

**Automatic locking retractors (ALR)** are generally easy to use with car seats, but are almost never found in newer vehicles.

 Some seat belts with automatic locking retractors may appear to have no locking ability if tested when the seat belt is pulled out a very short distance (less than 12 to 18 inches) from the retractor. That 12 to 18-inch space is known as the dead-zone and may fool you into thinking the seat belt has no locking ability.

# STEPS TO TEST FOR AN EMERGENCY LOCKING RETRACTOR

- 1. Pull all the webbing slowly and gently out of the retractor.
- 2. Allow some of the webbing to go back into the retractor.
- 3. Try to pull the webbing out again very slowly. If the webbing goes freely in and out of the retractor after you have pulled out all of the webbing, you have an emergency locking retractor.

NOTE: When you do this test, do not pull quickly or jerk the webbing because this might trigger the emergency locking features of the retractor.

#### **Automatic Locking Retractors (continued)**

 The true test of seat belt system locking is to pull firmly up on the lap part of the buckled seat belt. The belt should not lengthen. You can also put the belt around yourself and if it locks in place and continues to get smaller and cannot lengthen, you have identified an automatic locking retractor.



Automatic locking retractor (ALR)

# STEPS TO TEST FOR AN AUTOMATIC LOCKING RETRACTOR

- 1. Pull 24 to 36 inches of webbing slowly and gently out of the retractor.
- 2. Allow some of the webbing (3 to 6 inches) to spool back in the retractor.
- 3. Gently pull the webbing. If no webbing comes out, then the retractor is an automatic locking retractor.

#### Switchable Retractors

**Switchable retractors** start out in an unlocked "comfortable" mode for adult occupants and switch to a locked mode for use with a car seat. A switchable retractor with a sliding latchplate is the most common system you will encounter in the field.

- Just like the switchable latchplate, you manually have to change this retractor from an emergency mode to the always or automatic locking mode.
- Once switched to the automatic locking retractor mode, this belt will only shorten and cannot be lengthened. To return to the emergency locking mode, this belt must be unbuckled and all of the webbing fed back into the retractor.

Switchable retractors can be found in vehicles with:

- Lap-belt-only
- Lap-and-shoulder belt



Switchable retractor

#### Switchable Retractors (continued)

Seat belts with switchable retractors switch to a tight, locked seat belt to install a car seat. A switchable retractor switches to an automatic locking retractor by pulling the belt all the way out slowly.

- You may find instructions on the seat belt webbing for how to use the seat belt with a car seat but many switchable retractors do not come with a label. Test the retractor to be certain.
- A seat belt with a switchable retractor fits the adult comfortably and will lock only in an emergency such as a crash, acceleration, sudden stop, or turn. It should only be switched to the locking position to install a car seat or, in some cases, a booster seat.

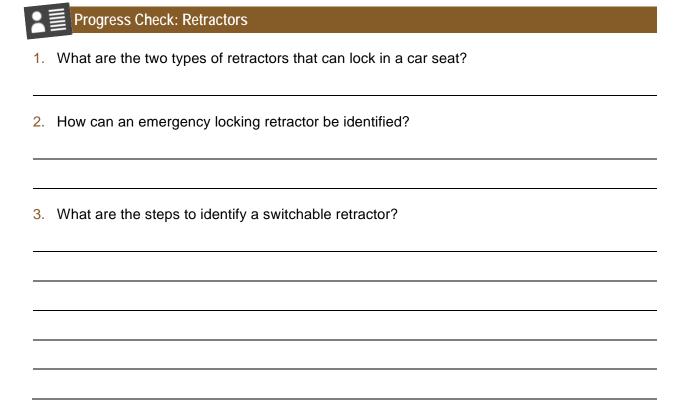
Remember, correct installation of a car seat requires the seat belt to be locked at all times.

#### No Retractor

Some lap belts have no retractor and the webbing lies freely on the seat.

# STEPS TO TEST FOR A SWITCHABLE RETRACTOR

- 1. Slowly pull out all of the webbing from the retractor. Be careful not to pull too quickly on the webbing because this might trigger the emergency locking mechanism.
- 2. When you have pulled all the webbing out of the retractor, let a few inches go back in. You probably will hear a clicking sound as the webbing goes back into the retractor.
- 3. Pull on webbing. If the webbing will not pull out again, the belt is locked you have confirmed the seat belt has a switchable retractor.





#### **Practice Activity: Locate Latchplates and Retractors**

The goal of this practice activity is to correctly identify seat belt latchplates and retractors.

- 1. For each vehicle, write the vehicle number and mark the seating location in the column on the left side of each table.
- 2. Locate the seat belt latchplate and retractor for each vehicle and seating locations and enter it the column on the right side of each table.

First Assigned Vehicle	
Vehicle #	Latchplate:  Locking Switchable Sliding Sewn-on
Seating Position  D Driver	Retractor:  ALR Switchable ELR None

Second Assigned Vehicle		
Vehicle #	Latchplate:  Locking Switchable Sliding Sewn-on	
Seating Position  Doriver	Retractor:  ALR Switchable ELR None	

Third Assigned Vehicle	
Vehicle #	Latchplate:  Locking Switchable Sliding Sewn-on
Seating Position  D Driver	Retractor:  ALR Switchable ELR None

Fourth Assigned Vehicle		
Vehicle #	Latchplate:  Locking Switchable Sliding Sewn-on	
Seating Position  D Driver	Retractor:  ALR Switchable ELR None	

#### APPROVED ADDITIONAL LOCKING STEPS

In vehicles made before 1996, seat belts were not federally required to provide a locking feature. Some vehicles did have the locking feature, but it was voluntary on the part of the manufacturer.

Vehicle manufacturers approved two additional steps to secure a car seat in vehicles where neither the retractor nor the latchplate can be locked at all times.

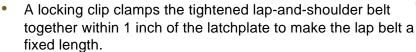
- With a lap-and-shoulder belt, a locking clip/lock-off is one of the approved additional steps.
- With a lap belt with a sewn-on latchplate, belt-shortening clips are the approved additional step.
- You should NEVER use a belt-shortening clip with a lap belt that has a locking latchplate.

#### Locking Clip/Lock-Off

Three conditions must be present to use a locking clip.

- Retractor = emergency locking
- Latchplate = sliding
- Lap-and-shoulder belt is one piece of webbing

**Locking clips (lock-offs)** come on the car seats from the factory.



- A lock-off can be on either side of the car seat and must be used according to the car seat manufacturer. This also locks to make the lap belt a fixed length. It is the fixed length lap belt that locks a car seat in place.
- They can be permanently attached to the car seat (lock-off) or can be separately stored on the car seat for removal and use by the consumer. Either a lock-off or locking clip is safe to use. They perform the same function. Do NOT use a locking clip if a lock-off is present on the seat.
- A locking clip locks the lap-and-shoulder belts together so the car seat does not move more than 1 inch side-to-side or front-to-back at the belt path.
- Locking clips MUST be placed according to the manufacturer instructions. Unless instructed otherwise, place the locking clip no more than 1 inch from the latchplate.
- Incorrect placement of the locking clip can lead to too much slack in the seat belt in a crash and can result in serious injury to child.
- The locking clip (lock-off) is a temporary fix until the retractor engages in a crash. The locking clip can come off in a crash.



Locking clip stored on car seat for removal and use



Lock-off

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#### VIDEO • Install a Locking Clip

Record steps you observe to install a locking clip.		

### RESOURCES FOR LOCKING CLIPS

- The Install a Locking Clip video is located on the NCPSB website. View it periodically to keep your skills fresh.
- A job aid with photographs and installation steps is also located on the NCPSB website and in the Appendix of your TG. Be sure to have it available when educating caregivers.

#### **Belt-Shortening Clip**

Three conditions must be present to use a belt-shortening clip:

- Retractor = emergency locking
- Latchplate = sewn-on
- No locking feature (there may or may not be a separate shoulder belt)

**Belt-shortening clips** are another approved additional step to use if you are educating caregivers who have an older vehicle that has no locking features in the seat belt system. The belt-shortening clip takes the place of the retractor as all the webbing is pulled out of the retractor and shortened with the belt-shortening clip.

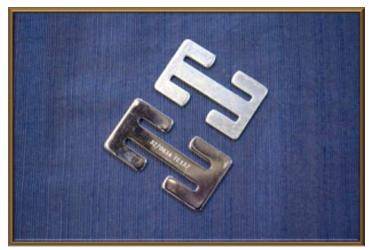


Belt-shortening clip

- Frequently, this type of seat belt is found in the front seat of an older car with a motorized shoulder belt and a separate lap belt.
- You can often move a car seat to a back seat location, but in some vans and school buses there will be no other seating position.
- There are times when only a belt-shortening clip will provide the locking feature on a lap belt because neither the retractor nor the latchplate locks.
- While the stronger belt-shortening clip could be used in place of a locking clip (that comes
  free with a car seat), the locking clip NEVER takes the place of the belt-shortening clip to
  shorten a seat belt.
- Use belt-shortening clips as a last resort. Carefully assess all other alternatives before using this clip.
- Belt-shortening clips are considered vehicle parts (have a part number) and can be purchased at the parts department of an auto dealership.

#### **Belt-Shortening Clip (continued)**

Belt-shortening clips are made of heavier metal. A belt-shortening clip can be used as a locking clip, but a locking clip can NEVER be used to perform belt-shortening.



Belt-shortening clip vs. locking clip

MODEO II	
VIDEO • Install a Belt-Shortening Clip	RESOURCES FOR BELT- SHORTENING
Record steps you observe to install a belt-shorteni	<ul> <li>The Install a Belt-Shortening Clip video is located on the NCPSB website. View it periodically to keep your skills fresh.</li> <li>A job aid with photographs and installation steps is also located on the NCPSB website and in the Appendix of your TG. Be sure to have it available when educating caregivers.</li> </ul>
	<u>caregivers.</u>

Whether new or experienced, knowing when you must use a belt-shortening clip can be a challenge. Do not hesitate to call on others with more experience to help.

When to Use a Locking Clip/Lock-off Vs. a Belt-Shortening Clip

Locking Clip/Lock-Off	Belt-Shortening Clip
Found on every car seat with a harness	Purchased from auto dealer
Used with lap-shoulder belt with emergency locking retractor and sliding latchplate	Used on lap portion of seat belt with emergency locking retractor and sewn-on latchplate
Used only on seat belt with retractor as backup	Used in place of retractor: no retractor backup available
<b>NEVER</b> used to replace belt-shortening clip or to shorten a seat belt	Can be used in place of locking clip

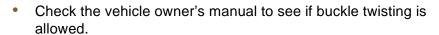
### Flip Latchplate and/or Twist Buckle Stalk

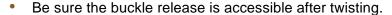
Sometimes, even seat belts that are designed to lock cannot because of the car seat belt path.

Unbuckling and flipping the latchplate over is a step that has been crash-tested and is approved for use in most vehicles if the locking latchplate is tilted and stays in an unlocked position.

- Check the vehicle owner's manual to see if the manufacturer does not allow twisting a seat belt to shorten the webbing.
- Not all latchplates allow for flipping.

Twisting the buckle stalk is helpful when the buckle does not lie flat, is in the car seat belt path, or does not allow the belt to be locked with an additional part. This will make the buckle webbing shorter and buckle lower.





### Additional Reasons to Flip a Latchplate or Twist a Buckle Stalk

Sometimes when a seat belt passes through the car seat belt path as directed by the manufacturer, the latchplate will be positioned so that the locking mechanism is tilted and does not hold the car seat tightly.

The seat belt is probably out of position and cannot lock. Remember that the webbing and latchplate must be flat to stay locked.

#### Follow these approved steps:

- 1. Flip the latchplate over one time to engage the latchplate's locking feature. This changes the locking angle. Always test the seat belt to be certain it remains locked tightly.
- 2. Twist the buckle stalk if it is made of webbing.
  - Best practice is to twist as little as is necessary to obtain a tight seat belt fit.
  - ALWAYS use a minimum number of twists, with a maximum of three. The Society of Automotive Engineers (SAE) Child Restraint Subcommittee, based on IMMI (seat belt webbing company) data, agreed upon this number.

It is approved to use a locking clip on a lap-and-shoulder seat belt with a locking latchplate as a last resort. If flipping the latchplate and twisting the buckle webbing do not keep the seat belt from pulling out, you can use a locking clip.



Flipped latchplate



Twisted buckle stalk

#### Additional Reasons to Flip a Latchplate or Twist a Buckle Stalk (continued)

It is important to remember to check the manufacturer's instructions for both steps, as some buckles cannot be twisted and some latchplates cannot be flipped. Most manuals, however, will not mention or prohibit flipping latchplates or twisting buckle stalks.

### RESOURCE ON TWISTING SEAT BELTS

IMMI Memorandum on Twisting Seat Belts can be found on the NCPSB Board website.



#### **Explain Best Practices About Seat Belt Systems to Caregivers**

There are key questions to ask caregivers related to seat belt systems. Explain and demonstrate best practices to caregivers.

#### **KEY QUESTIONS**

- ☑ How many child passengers are you transporting?
- ✓ What are their ages and weights?
- ☑ What types of seat belt systems are in the vehicle?
- Are the seat belt systems buckle, retractor, anchors, webbing, and latchplate in good working order?
- ☑ Do the seat belts in the vehicle have a locking feature (vehicles since 1996)?
- ✓ Does the seat belt lock at the latchplate or the retractor?
- ☑ What are the latchplate and retractor types?

#### **BEST PRACTICES**

Test whether a latchplate provides a locking feature.

- 1. Buckle the seat belt.
- 2. Give a firm tug on the lap portion of the seat belt while pulling up on it.

Test whether the retractor provides a locking feature.

- 1. Pull all the webbing slowly and gently out of the retractor.
- 2. Allow some of the webbing to go back into the retractor.
- 3. Try to pull the webbing out again very slowly.
- 4. If the webbing goes freely in and out of the retractor, you have an emergency locking retractor. If the webbing stays locked and makes a clicking noise when you let it go back in, then you have an automatic locking retractor. If it moves freely but then locks when you pull all of the webbing out, you have a switchable retractor.

Determine when to use a locking clip. You must have the following:

- 1. Emergency locking retractor
- 2. Sliding latchplate
- 3. Lap-and-shoulder belt is all one piece of webbing

Determine when to use a belt-shortening clip. You must have the following:

- 1. Emergency locking retractor
- 2. Sewn-on latchplate
- 3. A separate lap belt with no locking feature. There may or may not be a separate shoulder belt.

Fill in the correct answers from the right-hand column for each of the questions.

1.	Name the latchplates that do not lock before a crash.	Emergency locking retractor
	, and	Automatic locking retractor
2.	Which retractor has no locking feature under normal driving	Switchable retractor
	conditions?	Dynamic locking latchplate
		Locking latchplate
3.	What tool would you use with an emergency locking retractor lap belt and sewn-on latchplate to secure a car seat?	Sliding latchplate
		Sewn-on latchplate
		Switchable latchplate
4.	What retractor is always locked when it is buckled under normal driving conditions?	Locking clip
		Lock-off
E	What retractor sharper from one mode to enother?	Belt-shortening clip
5.	What retractor changes from one mode to another?	Flipping the latchplate

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#### VIDEO • Install a Car Seat with a Locking Latchplate

Record steps you observe to install a car seat with a locking latchplate.	

# RESOURCES FOR VEHICLES WITH LOCKING LATCHPLATES

- The Install a Car Seat with a Locking Latchplate video is located on the NCPSB website. View it periodically to keep your skills fresh.
- A job aid with photographs and installation steps is also located on the NCPSB website and in the Appendix of your TG. Be sure to have it available when educating caregivers.



Record steps you observe to install a car seat with an automatic locking retractor.

#### RESOURCES ON VEHICLES WITH AN AUTOMATIC LOCKING RETRACTOR

- This Install a Car Seat with an Automatic Locking Retractor video is located on the NCPSB website. View it periodically to keep your skills fresh.
- A job aid with photographs and installation steps is also located on the NCPSB website and in the Appendix of your TG. Be sure to have it available when educating caregivers.