



# **TWIST** OWNER'S MANUAL

**DEALER/SUPPLIER:**

THIS MANUAL MUST BE GIVEN TO THE USER OF THIS WHEELCHAIR.

**USER:**

BEFORE USING THIS WHEELCHAIR, YOU MUST READ THIS MANUAL IN IT'S ENTIRETY AND SAVE IT FOR FUTURE REFERENCE.

**ATTENDANTS/ASSISTANTS:**

BEFORE ASSISTING THE USER OF THIS WHEELCHAIR, YOU MUST READ THIS MANUAL IN IT'S ENTIRETY AND SAVE IT FOR FUTURE REFERENCE.

SERIAL NUMBER \_\_\_\_\_

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## GENERAL WARNINGS

### A. SAFETY INSPECTIONS AND MAINTENANCE

#### ⚠ WARNING

It is important to keep your wheelchair in proper working condition. Chapter 2 of this Manual outlines the safety inspections that you should make before each use of your chair, as well as weekly and quarterly inspections.

1. ALWAYS inspect and maintain your TiLite wheelchair strictly in accordance with the instructions and charts in Chapter 2.
2. If you detect a problem in the course of your inspections or maintenance, ALWAYS have the chair serviced or repaired to correct the problem **BEFORE** using the chair.
3. ALWAYS have your chair completely inspected and serviced by an authorized TiLite supplier at least once a year.
4. ALWAYS perform your safety inspections and any maintenance or adjustments while the chair is unoccupied (unless this Manual expressly states otherwise).

*If you fail to inspect or maintain your wheelchair as directed in this Manual, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### B. ACCLIMATING TO YOUR NEW CHAIR

#### ⚠ WARNING

Each wheelchair is a unique piece of medical equipment, with unique handling, maneuvering and ride characteristics. Whether you are a new wheelchair user or have years of experience, you **MUST** take the time to acclimate to this particular chair before you begin riding. Start slowly and take the time to learn the handling, maneuvering and ride characteristics of this chair. For example, your previous chair may have been a heavier and less responsive chair, and therefore, you may be used to using more force than is necessary to maneuver your TiLite chair.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### C. WEIGHT LIMITATION

#### ⚠ WARNING

The TiLite Twist has a weight limit of 165 pounds (74.8 kilograms). This weight limitation applies to the combined weight of the user and any items carried by the user. **DO NOT** exceed this weight limit.

*If you exceed the limit, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### D. PREVENTING ACCIDENTS AND INJURIES

#### ⚠ WARNING

1. You **MUST** be properly and fully trained in the safe use of this wheelchair by your health care advisor **BEFORE** you use this chair.
2. Together with your health care advisor, you **MUST** analyze your level of function and ability and develop your own methods for safe use that best suit you based on your level of function and ability.
3. You **MUST** learn the limits of your ability and operate this wheelchair within such limits. This means you must **PRACTICE** the maneuvers you will need to perform, such as bending, reaching and transfers, until you know the limits of your ability. **ALWAYS** practice with the assistance of someone who can help you until you know what can cause, and how to avoid, a fall or tip-over. **NEVER** try a new maneuver on your own until you are sure you can do it safely.
4. **ALWAYS** learn as much as you can about the places where you will be using your chair before you get there. **ALWAYS** be alert for hazards and learn how to avoid them.
5. Anti-tips **MUST** be used with your wheelchair at all times. Because anti-tips are an option on this wheelchair, TiLite strongly recommends you order the anti-tips as they are an important safeguard for the wheelchair user.
6. Together with your health care advisor, you **MUST** analyze your medical condition to determine whether you are capable of using this chair safely and/or what options or accessories you will require in order to use this chair safely (e.g., pressure-relief cushions, seat belts).

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

# CHAPTER 1: WARNINGS

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## E. CHANGING/ADJUSTING YOUR WHEELCHAIR

### ⚠ WARNING

1. Use extreme caution when changing or adjusting the configuration of your TiLite wheelchair. When you change or adjust the configuration, you may increase the risk of a tip-over. Therefore, you should consult your authorized TiLite dealer BEFORE you change or adjust the configuration. Further, TiLite recommends that you use anti-tips at all times, and this is particularly true after you have changed or adjusted the configuration of your chair.
2. Unauthorized modifications to your chair, or the use of parts not supplied or approved by TiLite, may change the chair structure, may cause a safety hazard, including an increased risk of a tip-over, and will void the warranty.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## F. ENVIRONMENTAL FACTORS

### ⚠ WARNING

1. Riding your TiLite wheelchair on wet, icy or other slick surfaces increases the risk of losing control of the wheelchair or tipping over. Use extra care if you must ride your chair on any such surface. If you have any doubt about your ability to negotiate a particular surface, ALWAYS ask for assistance.
2. Titanium does not rust or corrode. Aluminum does not rust, but it will corrode. However, contact with water or excess moisture may still damage parts or components of your TiLite wheelchair that are made from other materials and could cause such parts or components to fail. Therefore, DO NOT:
  - a. use your chair in a shower, pool or other body of water,
  - b. leave your chair in a damp location, or
  - c. fail to dry your chair as soon as you can if it gets wet or if you use water to clean it.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## G. STREET USE

### ⚠ WARNING

1. As a wheelchair rider, you MUST obey all traffic rules pertaining to pedestrians (use of crosswalks, etc.). Most states do not permit wheelchairs to be ridden on public roads, streets or highways (*i.e.*, as one would drive a car), so you should not do so without first consulting the traffic laws in your own state. Even if legal, riding your wheelchair on public roads, streets or highways is extremely dangerous and is not recommended.
2. At all times when riding your wheelchair in public areas (sidewalks, crosswalks, parking lots, etc.), be very alert to the danger of motor vehicles.
3. At night, or when lighting is poor, use reflective tape on your chair and clothing.
4. Due to your low position, it may be hard for drivers to see you. This is particularly true in situations where drivers may be driving in reverse, such as parking lots. If at all possible, make eye contact with drivers before you go forward. When in doubt, yield until you are sure it is safe, even if you have the right-of-way.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## H. TERRAIN

### ⚠ WARNING

Your TiLite wheelchair is designed for riding over firm, relatively smooth surfaces such as concrete and asphalt outdoors and indoor flooring (wood, tile, etc.) and carpeting. Your TiLite wheelchair is NOT designed for riding over sand, loose soil or rough terrain. Do NOT operate your chair in such terrain. You may damage the wheels or axles or loosen fasteners of your chair.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*



## I. MOTOR VEHICLE SAFETY

### ⚠WARNING

TiLite wheelchairs are NOT designed to be used for seating in a motor vehicle, and TiLite wheelchairs do NOT meet Federal standards for motor vehicle seating.

1. NEVER sit in your chair while in any type of moving vehicle (bus, automobile, van, truck, boat, train, etc.). In an accident or sudden stop, you may be thrown from the chair. In an accident or sudden stop, a wheelchair seat belt will NOT prevent injuries and may, in fact, cause injuries.
2. ALWAYS transfer to an approved vehicle seat before the vehicle begins moving.
3. ALWAYS secure yourself in the approved vehicle seat using the proper seating restraints (in a motor vehicle, lap/shoulder belts; in a plane, lap belts, etc.).
4. NEVER transport your chair in the front seat of a vehicle. Movements of the vehicle may cause the chair to shift and interfere with the driver's ability to control the vehicle.
5. When transporting your chair in a moving vehicle, ALWAYS secure your chair so that it cannot roll or shift. In most cases, stowing it in the trunk is the safest alternative.
6. NEVER use any chair that has been involved in a motor vehicle accident. A wheelchair that has been involved in a motor vehicle accident may be damaged in ways that are not readily apparent and which could cause the chair to fail in use.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## J. WEIGHT TRAINING

### ⚠WARNING

NEVER use your TiLite wheelchair for weight training. When your chair was set up with the assistance of your health care advisor, your center of gravity was determined based on your weight, the configuration of your chair and your abilities. If you engage in weight training activities in your chair, you are altering the total weight supported by your chair and the distribution of that weight. The center of gravity of your chair may not be appropriate with the additional weight or with the different distribution of weight, which may cause the chair to tip over. The additional weight could exceed the weight limit for the chair and damage the chair. If you intend to engage in weight training, TiLite recommends that you utilize weight training equipment with built-in seating and that you transfer to that seating rather than using your chair.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## K. OBTAINING ASSISTANCE

### ⚠WARNING

#### **For The Wheelchair User:**

ALWAYS make sure that each person who assists you reads and understands this entire Manual, especially the Warnings in Chapter 1.

#### **For Attendants/Assistants:**

1. ALWAYS work with the user's health care advisor to learn safe methods to assist the wheelchair user and to determine which methods are best suited to your abilities and those of the user.
2. ALWAYS communicate to the user what you plan to do before you do it and explain what you expect the user to do while you are taking such action. This will put the user at ease and reduce the risk of an accident due to a miscommunication.
3. ALWAYS use good posture and proper body mechanics in order to avoid injury to your back.
4. When you lift or support the user or tilt the chair, ALWAYS bend your knees slightly and keep your back as upright and straight as you can.
5. Wheelchair push handles are designed to provide a secure location for an attendant to grip the rear of the wheelchair to prevent a fall or tip-over. ALWAYS make sure the wheelchair has push handles and ALWAYS use them. REGULARLY check to make sure the push handle grips are securely seated on the back canes so they will not rotate or slip off.

# CHAPTER 1: WARNINGS

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6. If you are going to tilt the chair backward, ALWAYS remind the user to lean back.
7. If you are going to descend a curb or single step, ALWAYS lower the chair slowly in one easy movement. NEVER let the chair drop the last few inches to the ground. This may damage the chair or injure the user.
8. ALWAYS become familiar with the user's wheelchair and all of its parts and components. In particular, be very aware of any removable parts. Removable parts must NEVER be used for a hand-hold or lifting supports because they may inadvertently release, resulting in possible injury to the user and/or assistant.
9. Anti-tips may present a tripping hazard to the attendant. To avoid tripping over the anti-tips, unlock and rotate anti-tip tubes up, out of the way. However, if you must leave the user unattended, even for a moment, ALWAYS rotate the anti-tips back into the down position and lock the rear wheels using the wheel locks. This will reduce the risk of a tip-over or loss of control of the chair.
10. When you are learning a new assistance technique, ALWAYS have an experienced attendant help you before attempting it on your own.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## L. STANDING ON YOUR CHAIR

### **⚠WARNING**

Your TiLite wheelchair has been designed for use as a wheelchair, not as a step ladder. NEVER stand on your TiLite wheelchair.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## WARNINGS FOR SAFE USE OF YOUR WHEELCHAIR

### A. LEARNING TO DO A “WHEELIE”

#### **⚠WARNING**

DO NOT attempt to perform a “wheelie” in your wheelchair because of the dangerous nature of this kind of maneuver.

TiLite recognizes that some wheelchair users will ignore this warning. If you should choose to ignore this warning, you should follow these steps to help learn to do a “wheelie” as safely as possible (but doing a “wheelie” is never completely safe and TiLite assumes no responsibility for any injury you may sustain as a result of doing a “wheelie”):

1. Read and follow the Warning for “WHEELIES” on page 1-9.
2. NEVER attempt to learn how to do a “wheelie” without the assistance of someone strong enough to catch you should you start to tip over (a “spotter”). Your spotter should read and be completely familiar with this entire Manual, especially this Warning and the Warning for “WHEELIES” on page 1-9.
3. Instruct your spotter to stand at the rear of your chair. Your spotter must be agile enough to move with you and your chair to prevent a tip-over.
4. Instruct your spotter to keep his or her hands BENEATH the push handles or backrest rigidizer bar so that he or she is ready to catch you if you exceed the balance point of the rear wheels and start to tip over backward.
5. When your spotter is in position and is ready, place your hands on the forward portion of the handrims. Using the handrims, make a quick BACKWARD movement of the rear wheels, quickly followed by a hard FORWARD thrust. This will tilt the chair up on the balance point of the rear wheels. DO NOT remove your hands from the handrims after either the backward movement or forward thrust so that you can continue to manipulate the rear wheels to maintain your balance on the two rear wheels.
6. Use SMALL movements of the handrims to maintain your balance on the two rear wheels.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### B. CLIMBING A CURB OR SINGLE STEP

#### **⚠WARNING**

1. NEVER attempt to negotiate a curb or single step without assistance.

2. Instruct your assistant to stand at the rear of your wheelchair, with the front of the wheelchair facing the obstacle. NEVER attempt to negotiate any such obstacle backward.
3. Instruct your assistant to tilt the chair up on the rear wheels so that the casters clear the curb or step.
4. Instruct your assistant to slowly move the chair forward and to gently lower the casters to the upper level as soon as you are sure that they are beyond the edge of the curb or step.
5. Instruct your assistant to continue to roll the chair forward until the rear wheels contact the face of the curb or step.
6. Instruct your assistant to lift and roll the rear wheels up to the upper level.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## C. CLIMBING A FLIGHT OF STAIRS

### **⚠WARNING**

DO NOT climb a flight of stairs with the user in the wheelchair.

However, TiLite recognizes that wheelchair users may, on occasion, have no other choice. Only if you have no alternative, you should follow these steps to climb up a flight of stairs.

1. NEVER attempt to negotiate more than one step unless you have two (2) able-bodied adult assistants.
2. ALWAYS position the chair and rider facing away from the stairs, with one assistant at the rear (facing away from the stairs) and one at the front of the chair (facing the rider).
3. The assistant at the rear of the chair is in control of this procedure. He or she must tilt the chair back to its balance point on the rear wheels. NEVER attempt to lift a wheelchair by lifting on any removable (detachable) parts, including upholstery and removable push handles or push handle grips.
4. The second assistant at the front must firmly grasp a non-detachable part of the front frame (but NOT swing away hangers) with both hands and lift the chair up and over one stair at a time.
5. Each assistant then carefully moves up to the next stair.
6. Repeat steps 1 through 5 for each stair, until you reach the landing.
7. When you reach the landing, the assistants should roll the chair backward on the two rear wheels until the casters have cleared the last step, at which point the assistants can gently lower the casters to the landing.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## D. DESCENDING A CURB OR SINGLE STEP

### **⚠WARNING**

1. NEVER attempt to negotiate a curb or single step without assistance.
2. When you are still several feet from the edge of the curb or step, instruct your assistant to stand at the rear of your wheelchair and turn it around so you are facing AWAY from the obstacle.
3. NEVER attempt to negotiate any such obstacle facing forward.
4. Instruct your assistant to carefully step backwards, pulling the chair backwards, until he or she is off the curb or stair and standing on the lower level. The assistant should watch his or her step over his or her shoulder when backing up in this manner.
5. Instruct your assistant to carefully pull the chair backward until the rear wheels reach the edge of the curb or step, and to then allow the rear wheels to slowly roll down to the lower level.
6. Instruct your assistant that, when the rear wheels are safely on the lower level, he or she may then tilt the chair backward to the balance point of the rear wheels, thereby raising the casters off the upper level.
7. Instruct your assistant to slowly roll the chair backward on the rear wheels, taking small steps until the casters have cleared the step or curb and, when clear, to gently lower the casters to the ground at the lower level.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

# CHAPTER 1: WARNINGS

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## E. DESCENDING A FLIGHT OF STAIRS

### ⚠️WARNING

DO NOT descend a flight of stairs with the user in the wheelchair.

However, TiLite recognizes that wheelchair users may, on occasion, have no other choice. Only if you have no alternative, you should follow these steps to descend a flight of stairs.

1. NEVER attempt to negotiate more than one step unless you have two (2) able-bodied adult assistants.
2. ALWAYS position the chair and rider facing down the stairs, with one assistant at the rear (facing down the stairs) and one at the front of the chair (facing the rider).
3. The assistant at the rear of the chair is in control of this procedure. He or she must tilt the chair back to its balance point on the rear wheels and roll it to the edge of the first step. NEVER attempt to lift a wheelchair by lifting on any removable (detachable) parts, including upholstery and removable push handles or push handle grips.
4. The second assistant at the front must stand at the third step from the top and firmly grasp a non-detachable part of the front frame (but NOT swing away hangers) with both hands. The second assistant must lower the chair one stair at a time by letting the rear wheels roll over the stair edge. Each assistant then carefully moves down to the next stair.
5. Repeat steps 1 through 4 for each stair, until you reach the ground level.
6. When you reach the ground level, the first assistant should carefully lower the casters to the ground.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## WARNINGS REGARDING FALLING AND TIPPING OVER

### A. CENTER OF GRAVITY—STABILITY AND BALANCE



### ⚠️WARNING

Most falls or tip-overs occur when you go beyond the center of gravity of you and your wheelchair. TiLite wheelchairs are designed to remain stable and upright in normal daily use and activities so long as you do not exceed the center of gravity.

Every movement you make in your chair, and the rapidity with which you move, will have an affect on your center of gravity. The more you shift your body weight and the greater the speed at which you shift it, the greater the impact on your center of gravity in your chair.

There is a point where your wheelchair will tip forward or backward or to the side—which is a function of your center of gravity in the chair—its center of balance and stability. The type of chair, the setup of your chair, the options on your chair and the changes you make to the setup or options will all affect the center of gravity and therefore the stability of the chair. As the stability decreases, the risk of a fall or tip-over increases.

Set forth below is a list of various types of adjustments that you may be able to make to your wheelchair, depending on the wheelchair model you own, and a brief description of how those adjustments will affect your center of gravity:

1. The position of the rear wheels is the most significant factor affecting your center of gravity. The more you move the rear wheels forward, the more likely your chair will tip over backward.

2. The distance between the rear wheels. The less distance between the rear wheels, the greater the likelihood your chair will tip over to the side.
3. The amount of rear wheel camber. The less camber, the greater the likelihood your chair will tip over to the side.
4. The height of your seat. As you raise the height of your seat, you raise your center of gravity and increase the likelihood of all types of tip-overs.
5. The angle of your seat. As you increase the angle of your seat (relative to the floor), your position in the chair is shifted toward the rear of the chair, increasing the likelihood your chair will tip over backward.
6. The angle of your backrest. As you increase the angle of your backrest (relative to the seat), your position in the chair is shifted toward the rear of the chair, increasing the likelihood your chair will tip over backward.
7. The height of your seat back. As you lower the height of your seat back, you make it easier to lean back in your chair, which in turn shifts your center of gravity rearward and increases the likelihood your chair will tip over backward.
8. The position of your casters. As you move your casters rearward on the frame (toward the rear wheels), you increase the likelihood your chair will tip over forward.

Other factors will affect your center of gravity:

1. A change in your body position, posture or weight distribution. For example, if you lean forward you shift the center of gravity forward and increase the likelihood of tipping over forward.
2. Riding your chair on a ramp or slope. On an up-slope, your weight shifts to the rear and a backward tip-over becomes more likely. On a down-slope, your weight shifts to the front of the chair and a forward tip-over becomes more likely.
3. The use of a backpack or other options, and the amount of weight added by those options. For example, carrying a lot of weight in a backpack will shift the center of gravity rearward and increase the likelihood of tipping over backward. However, using a TiLite seat pouch beneath the seat sling to carry heavier items will lower your center of gravity and reduce, but not eliminate, your risk of a tip over.

In order to reduce the risk of a tip-over, you should:

1. CONSULT your doctor, nurse or therapist to find out what axle and caster position and other chair configuration options are best for you.
2. CONSULT your authorized TiLite dealer BEFORE you modify or adjust your wheelchair. Often, an adjustment you wish to make can be offset by another that you have not considered. For example, you may want to adjust the back angle rearward, which will increase the likelihood of a rear tip-over. You might not think you could counteract this tendency by moving the rear wheels backward. Your authorized TiLite dealer will be able to give you expert, personalized advice in such matters. See “Changing/Adjusting Your Wheelchair” on page 1-2.
3. ALWAYS have someone assist you until you learn your chair’s balance points and are completely comfortable in your ability to operate your chair under all conditions so as to avoid tip-overs.
4. ALWAYS use anti-tips. See “Changing/Adjusting Your Wheel Chair” on page 1-2.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### **B. TRANSFERRING IN AND OUT OF YOUR WHEELCHAIR**

#### **⚠WARNING**

Transferring in or out of your wheelchair is one of the most dangerous things you can attempt relating to your wheelchair. It requires good balance, agility and upper body conditioning. At some point in every transfer, there is no wheelchair seat beneath you and the seat, bed, etc. to or from which you are transferring is not beneath you either.

Important rules that will help to reduce the risk of a fall during a transfer are discussed below:

1. ALWAYS work with your health care advisor to learn safe transfer methods.
2. ALWAYS ask your health care advisor to teach you proper body positioning during a transfer and how to support yourself during a transfer.
3. ALWAYS have someone assist you when you transfer until you have learned how to transfer safely and have developed the upper body strength and coordination to transfer safely.

# CHAPTER 1: WARNINGS

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4. ALWAYS move your chair as close as you can to the seat (bed, etc.) to which you are transferring. If possible, use a transfer board.
5. ALWAYS lock the rear wheels using wheel locks before you transfer. This keeps the rear wheels from rolling.

**NOTE:** Wheel locks will NOT keep your chair from sliding away from you or tipping.

6. If your wheels have pneumatic (inflatable) tires, ALWAYS make sure to keep the tires properly inflated at all times. The wheel locks may slip if the tire pressure is low, which may cause the chair to roll unexpectedly during a transfer.
7. ALWAYS rotate the casters as far forward as possible and turn them to the seat (bed, etc.) to which you are transferring.
8. ALWAYS remove the wheelchair armrests, or swing them out of the way, so they do not impede your movement during the transfer.
9. If possible, ALWAYS remove the footrests, or swing them out of the way, to ensure your feet do not get caught between the footrests. TiLite strongly recommends that you place your feet on the floor when you are transferring to or from your chair.
10. NEVER put your weight on the footrests when you are transferring to or from your chair because this may cause the chair to tip over and/or roll away.
11. When transferring into your chair, ALWAYS transfer as far back onto your seat as possible in order to reduce the risk that the chair will tip over or move away from you causing you to fall.
12. If possible, ALWAYS try to avoid falling into your chair uncontrollably when transferring into your chair. This places undue stress on your chair's components, and if your chair does start to move or tip you will not be ready to regain control.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## C. DRESSING/UNDRESSING IN YOUR CHAIR

### ⚠WARNING

When you engage in activities while seated in your chair such as dressing or undressing or changing your clothes, your weight will shift. Since your attention will be directed to the activity in question, your risk of falling or tipping over is increased. To reduce this risk, get dressed or undressed or change your clothes while seated in a regular chair or on a bed. If you must get dressed or undressed or change your clothes while seated in your wheelchair:

1. ALWAYS rotate the casters so they are trailing forward. This makes the chair more stable. NOTE: To get your casters to trail forward, first move your chair forward and, second, back up. By moving backward, your casters will rotate and trail forward.
2. ALWAYS lock your anti-tips in the down position so the risk of a backward tip-over is minimized. If your chair does not have anti-tips, back it up against a wall and lock both rear wheels using your wheel locks.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## D. BENDING/LEANING/REACHING

### ⚠WARNING

When you bend, reach or lean from your chair you will affect the center of balance of your chair. Therefore, bending, reaching or leaning may cause you to fall or tip over. In order to avoid falling or tipping over, you must determine your particular safety limitations given the configuration of your chair and your body weight and type. To do this, practice bending, reaching and leaning activities (and various combinations of such activities) under the supervision of your health care advisor. Do this BEFORE attempting active use of your chair. The following will help you avoid falling or tipping over when bending, reaching or leaning from your chair:

1. NEVER bend, reach or lean in a way that requires you to move forward in your seat.
2. ALWAYS keep your buttocks in contact with the backrest and the seat cushion when bending, reaching or leaning.
3. NEVER shift your weight in the same direction you are bending, reaching or leaning.
4. NEVER reach or lean to the rear unless your chair has anti-tips locked in place.

5. NEVER reach with both hands. By keeping one hand free, you may be able to catch yourself to prevent a fall if the chair starts to tip.
6. NEVER reach or lean over the top of the seat back. If you do so you may damage the seat back tubes, which could cause you to fall.
7. ALWAYS move your chair as close as possible to the object you are trying to reach.
8. NEVER shift your weight to the footrests.
9. NEVER try to pick up an object from the floor by reaching down between your knees. You are less likely to tip over if you reach to the side of your chair when picking up an object on the floor.
10. DO NOT lock the rear wheels when bending, reaching or leaning backward. Locking the rear wheels creates a tip point and makes falling or tipping over more likely.
11. When bending or leaning, ALWAYS grasp one rear wheel with one hand. This will help to prevent a fall if the chair starts to tip over.
12. ALWAYS rotate the casters until they are trailing forward. This will make the chair more stable.

**NOTE:** To get your casters to trail forward, first move your chair forward past the object you want to reach and, second, back up alongside the object. By moving backward, your casters will rotate and trail forward.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## E. MOVING BACKWARD

### ⚠WARNING

When you propel backward, you will tend to shift your weight backward, making a tip-over more likely. In addition, you may be unable to see an obstruction that could block one of your wheels and cause a tip-over. Therefore, use extreme caution when propelling backward. If you must propel backward:

1. ALWAYS propel slowly with smooth, short strokes.
2. MAKE frequent stops to check for obstructions in your path.
3. If your chair has anti-tips, ALWAYS make sure to lock them in place.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## F. WHEELIES

### ⚠WARNING

Balancing in your chair on just the rear wheels with the casters in the air is known as doing a “wheelie.” DOING A WHEELIE IS DANGEROUS. A fall or tip-over is very likely. However, if you can do a “wheelie” safely, you may be able to overcome curbs and obstacles that would otherwise impede you.

NEVER attempt to learn to do a “wheelie” without first consulting your health care advisor to make sure you are a good candidate to learn to do a “wheelie.” NEVER attempt to learn to do a “wheelie” without an assistant that can catch you if you should happen to start to fall. NEVER attempt to learn to do a “wheelie” unless you are a skilled rider of this chair. See “Learning to do a ‘Wheelie’” on page 1-4.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## G. OBSTACLES

### ⚠WARNING

When riding outdoors, uneven pavement, sidewalk irregularities, potholes and other obstacles and road hazards can be dangerous. When riding indoors, doorway thresholds, plush carpeting and other obstacles can be dangerous. In order to avoid these risks:

1. ALWAYS be alert for such dangers.
2. ALWAYS scan the area ahead of you as you ride.

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3. REMOVE or cover threshold strips between rooms.
4. INSTALL ramps at entry or exit doors from your residence. Make sure the transition from such ramps to the pavement or other surface is smooth and does not have an abrupt drop-off.
5. ALWAYS make sure the floors where you live and work are level.
6. KEEP all floors where you live and work free of obstacles and hazards.
7. When riding UP and over an obstacle, lean your upper body slightly FORWARD.
8. When riding DOWN from a higher to a lower level, press your upper body BACKWARD lightly.
9. ALWAYS keep both hands on the handrims as you go over an obstacle.
10. NEVER push or pull on any object, such as a door knob or door jamb or furniture, in order to propel your chair.
11. If your chair has anti-tips, lock them in place before you go UP over an obstacle.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## H. CURBS/STEPS

### **⚠WARNING**

Curbs and steps are extremely dangerous obstacles.

1. NEVER attempt to go up or down a single curb or step without an assistant UNLESS:
  - a. you are a very skilled rider of your chair; and
  - b. you have previously learned to safely do a “wheelie” in your chair; and
  - c. you are sure you have the strength and balance to control your chair during any such maneuver.
2. ALWAYS unlock and rotate anti-tips up and out of the way so they do not prevent you from executing this maneuver.
3. Even if you are a highly skilled rider, NEVER attempt to climb or descend a curb or step more than 4” high.
4. ALWAYS go straight up or down a curb or step. NEVER climb or descend at an angle.
5. ALWAYS be aware that the impact of dropping down from a curb or step can damage your chair or cause components to become loose. If you perform such maneuvers, inspect your chair more frequently.

If you are not highly skilled at tilting the chair, or the step or the curb is more than 4” high, ALWAYS have an assistant help you negotiate curbs and steps. Your assistant must first read the Warnings contained in this Manual in their entirety, especially the sections titled “Climbing a Curb or Single Step”, “Climbing a Flight of Stairs”, “Descending a Curb or Single Step” and “Descending a Flight of Stairs” on pages 1-4 to 1-6.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## I. HILLS/SLOPES/RAMPS

### **⚠WARNING**

The center of balance of your chair is affected by the slope of the surface over which you are riding. Because your center of balance will be affected, your chair will be less stable when it is at an angle. This is especially true when riding on a slope sideways. Furthermore, do not assume anti-tips will prevent a fall or tip-over under these conditions. The following rules may help to avoid a fall or tip-over:

1. ALWAYS go up or down a slope, hill or ramp as straight as possible. If you try to cut the corner, you will be traversing the slope, hill or ramp sideways to the slope and your risk of tipping over sideways will increase.
2. NEVER use your chair on a slope greater than 10%—a slope with an elevation greater than one foot in height for every ten feet in length.
3. NEVER stop on a steep slope. If you stop on a steep slope, you may not be able to maintain control of the chair.
4. NEVER use rear wheel locks as a brake to slow or stop your chair. Wheel locks are NOT brakes. Doing so will most likely cause the chair to veer out of control.
5. NEVER try to turn around or change direction when going up or down a slope.
6. ALWAYS stay in the CENTER of a ramp.
7. NEVER start up or down a ramp unless you are certain the ramp is wide enough for its entire length so your wheels will not fall off the edge.



8. In order to control your speed, ALWAYS keep pressure with your hands on the handrims when going down a hill, slope or ramp. DO NOT go too fast. Excessive speed may cause you to lose control of your chair, or it may cause your casters to flutter which can cause a fall or tip-over.
9. ALWAYS lean or press your body in the UPHILL direction. This will help shift your weight to counteract the change in the center of balance caused by the hill, slope or ramp.
10. ALWAYS ask for assistance if you have any concerns at all about your ability to maintain safe control of your chair on a hill, slope or ramp.
11. ALWAYS be alert for wet or slippery conditions or surfaces, any changes in the grade of the slope (such as a lip, bump or depression), and any drop-off or lip at the bottom of a slope. For example, even a 3/4 inch lip at the bottom of a ramp can cause the casters to stop and cause the chair to tip forward.
12. Ramps at your home and work must meet all legal requirements for your area, including building codes. If you are having a ramp installed at your home or work, ALWAYS make sure it complies with local legal requirements.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## J. STAIRS

### **⚠WARNING**

NEVER use your wheelchair on stairs without the assistance of at least two (2) able-bodied assistants or attendants and ONLY AFTER such assistants or attendants have read and understand the Warnings “Climbing a Flight of Stairs” and “Descending a Flight of Stairs” on page 1-6.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## K. ESCALATORS

### **⚠WARNING**

NEVER use your wheelchair on an escalator, not even with an assistant or attendant.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## L. ASSISTANTS AND ATTENDANTS

### **⚠WARNING**

Before you permit any person to assist you in any aspect of riding your wheelchair, you MUST require that the assistant or attendant fully read, understand and follow the Warnings contained in this Manual.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## WARNINGS REGARDING COMPONENTS AND OPTIONS

### A. ANTI-TIPS

#### **⚠WARNING**

Anti-tips are an optional accessory that can help to prevent your chair from tipping over backward. However, even the use of anti-tips will not guarantee that your chair will not tip over backward. Also, they will not prevent your chair from tipping over sideways or forward. TiLite strongly recommends you use anti-tips with your wheelchair. This is most especially true:

- a. if you are a new wheelchair rider; or
- b. even if you are an experienced rider but you are switching to a new wheelchair, regardless of whether the prior chair was as lightweight as your TiLite; or
- c. even if you are an experienced rider in your TiLite chair but you have made any modifications or adjustments to the configuration of your chair, such as changing the position of the front or rear wheels, changing the seat height, changing the camber or changing

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the seat or back angle. Any modification or change to your chair can make it easier to tip over and you should use anti-tips until you have adapted to the modified configuration; or  
d. even if you are an experienced rider in your TiLite chair but your physical condition has changed.

In order to properly use your anti-tips, please follow the following rules:

1. Your anti-tips should be between 1-1/2 inches to 2 inches off the ground when they are locked in place in the “down” position.
2. If your anti-tips are set too LOW, they may “catch” on obstacles that you can expect to encounter in normal wheelchair use. If this happens, you may tip over and fall.
3. If your anti-tips are set too HIGH, their ability to prevent a backward tip-over will be limited and they may not prevent a tip-over at all.
4. ALWAYS keep your anti-tips locked in place in the “down” position unless:
  - a. You have an attendant (but your attendant must rotate the anti-tips into the “down” position whenever he or she leaves you unattended in your chair, even for a moment), or
  - b. You have to climb or descend a curb or step or overcome an obstacle. Even if this is the case, only unlock the anti-tips if you can safely climb or descend the curb or step or overcome the obstacle and make sure the anti-tips are locked in the “up” position.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## B. SEAT SLINGS/CUSHIONS

### ⚠ WARNING

TiLite seat slings (which are standard equipment) and cushions (which are optional equipment) are not designed for the relief of pressure. If you have pressure sores, or are at risk to get them, you may need a special pressure-relieving cushion or other seating system. If you have pressure sores, consult with your doctor immediately. If you are at risk to develop pressure sores or do not know if you are at risk, consult with your doctor as to the most appropriate seating system for you. TiLite has NO information about your medical condition and assumes no responsibility should you choose the wrong seating system for your medical needs. You MUST regularly check your seat sling while you are seated in your wheelchair to ensure that the tension is properly adjusted so that your weight does not cause the seat sling to touch the crosstubes beneath the seat sling.

TiLite also offers a limited number of seat cushions manufactured by other manufacturers. However, the selection of any of these products is a decision to be made by you and your doctor or therapist. TiLite has NO information about your medical condition and assumes no responsibility should you choose the wrong seating system for your medical needs.

*If you ignore these Warnings, you may develop pressure sores, which can be a life-threatening complication from wheelchair use.*

## C. UPHOLSTERY FABRIC

### ⚠ WARNING

1. If the fabric of your seat sling or seat back becomes worn or torn, ALWAYS replace it immediately. If you fail to do so, the seat sling or seat back upholstery may sag or fail.
2. The upholstery on your chair is flame retardant. Laundering or allowing the upholstery to become wet repeatedly will reduce the flame retardant qualities of the fabric.
3. DO NOT “drop down” into your chair. By placing undue force on the upholstery, you will weaken the fabric and it may become worn sooner than it otherwise would. If you do “drop down” into your chair on a regular basis, inspect and replace the upholstery more often.
4. The upholstery on your chair will weaken with age and use. Regularly inspect your upholstery for fraying, thin spots, or stretching of the fabric at the rivet holes.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## D. SEATING SYSTEMS

### ⚠ WARNING

TiLite does not sell any seating systems specifically designed for use with TiLite wheelchairs, nor does TiLite recommend any particular seating system. If your doctor or therapist recommends that you use a seating system with your TiLite chair, always consult with an authorized TiLite dealer to determine if the recommended seating system is compatible with your TiLite chair. In addition, the following Warnings must be followed:

1. If you add a seating system to your TiLite chair, you will affect its center of balance. This may cause the chair to tip over. Therefore, NEVER install a new seating system on your own. Instead, have it installed by an authorized TiLite dealer who can assist you in making other necessary adjustments to ensure your center of balance is maintained as closely as possible to what you are used to.
2. As with other changes to the configuration of your chair that affect its center of balance, if you add a seating system to your TiLite chair, ALWAYS use anti-tips until you have fully learned to control your chair in its new configuration.
3. Keep in mind that adding a seating system also may inhibit the proper operation of a folding back on your chair.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## E. POSITIONING OR SEAT BELTS

### ⚠ WARNING

TiLite hook & loop, non-padded seat belts and Bodypoint® non-padded hip belts, both of which are optional equipment, are intended ONLY for use as a positioning aid for simple positioning needs, such as posterior pelvic tilt. These belts will not be sufficient for persons with more involved positioning needs. Only your health care advisor can determine the proper positioning products for your situation. If used improperly, positioning or seat belts can cause severe injury or even death. If your health care advisor has instructed you to use positioning or seat belts, make sure they instruct you on the proper usage of such belts, and such professional should supervise your use of such belts to ensure you can use them safely.

1. Belts must fit snugly in order to work properly. However, they must not be so snug they interfere with your breathing. Your health care advisor should be able to slide his or her open hand flat between the belt and your body.
2. Make sure you do not slide down in your chair while wearing a belt. If this should happen, you may suffer chest compression or be suffocated due to pressure from the belt.
3. Do not use a positioning or seat belt unless you are capable of removing the belts easily in an emergency. If you cannot do this, consult with your health care advisor for other options to help with your posture.
4. There are devices that help to keep you from sliding down in the seat of your wheelchair, such as a pelvic wedge. Consult with your health care advisor to find out if you need to use such a device in conjunction with positioning or seat belts to mitigate the risks described above.
5. NEVER use positioning or seat belts as a motor vehicle restraint. These types of belts are NOT intended to protect the wheelchair rider from the forces involved in a vehicle accident, and they may, in fact, cause you to be injured. TiLite recommends wheelchair users ALWAYS transfer to appropriate motor vehicle seating when traveling in a motor vehicle.

**Note to Attendants/Assistants:** NEVER use positioning or seat belts as a patient restraint (a restraint requires a doctor's order) or on a wheelchair user who is comatose or agitated.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## F. ARMRESTS

### ⚠ WARNING

Armrests are optional equipment on TiLite wheelchairs. TiLite armrests are detachable and are not designed to support the weight of your wheelchair. Therefore, NEVER lift your chair by its armrests. If you do, they may detach, causing you to drop the chair, or you may break the armrests or cause them to become loose and break at a later time unexpectedly. ALWAYS lift your chair by grasping the non-detachable parts of the main frame (not including the swing away hangers or backrests).

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*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## G. FOOTRESTS

### **⚠ WARNING**

Certain footrests are standard equipment with TiLite wheelchairs. Other, more specialized footrests are optional equipment. The following rules apply to footrests:

1. ALWAYS allow for AT LEAST 2 inches of clearance between the ground and the lowest point on the underside of your footrests. If you set your footrests too LOW, they may “catch” on obstacles you can expect to find in normal use of your chair. If your footrests “catch,” the chair may stop and tip forward.
2. NEVER lift your wheelchair by grasping the footrests. Footrests are detachable and are not designed to support the weight of your chair. If you do, the footrests may detach, causing you to drop the chair, or you may break the footrests or cause them to become loose and break at a later time unexpectedly.
3. READ and understand the Warnings under “Transferring In and Out of Your Wheelchair” on pages 1-7 to 1-8 of this Manual. There is important information in that section regarding your footrests and transfers.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## H. REAR WHEELS

### **⚠ WARNING**

Rear wheels are standard components on your wheelchair. The positioning of the rear wheels is a critical factor in locating the center of balance of your chair. Any change to your rear wheel position will change your center of balance. Therefore, use extreme caution when making any adjustment to the position of your rear wheels.

1. As you move the rear wheels and axles forward on your chair, you shift the center of balance FORWARD. This means it is easier for your chair to tip over backward.
2. As you move the rear wheels and axles backward on your chair, you shift the center of balance BACKWARD. This means your chair is less likely to tip-over backward. However, even if your rear wheels and axles are set as far back as possible, the chair can still tip-over backward.
3. ALWAYS consult with your health care provider to determine the best rear wheel/axle setup for you based on your weight and body type and your abilities to control the chair.
4. Once you and your health care provider have determined the best rear wheel/axle setup for you, NEVER change the setup UNLESS you are sure you are not at risk to tip over.
5. If you do change the rear wheel/axle position, you MUST adjust the positioning of the rear wheel locks to ensure they work properly to lock the rear wheels. When relocating the rear wheel locks, make sure the locking arm indents the tire by at least 3/16” when the wheel lock is in the “locked” position.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## I. AXLES

### **⚠ WARNING**

Stainless quick-release axles are a standard TiLite wheelchair component. Other axle types are optional equipment. All TiLite axles are designed to make your rear wheels easy to remove quickly. However, if not used properly, they can be dangerous.

NEVER use your chair UNLESS you are sure that both rear axles are locked into place in the axle receiver. If an axle is not fully locked into place, the rear wheel may come off during use of the chair and cause you to fall. You can tell when the axle is locked into place because the quick-release button in the center of the axle will pop out fully. It is also a good idea to pull on the wheel to double-check that the axle is securely locked as a final precaution.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## J. PNEUMATIC TIRES

### ⚠WARNING

Pneumatic rear tires are standard components on TiLite wheelchairs. Pneumatic front tires are optional equipment on some TiLite wheelchairs.

With pneumatic tires, it is important to maintain the proper inflation. Maintaining the proper inflation will extend the life of your tires and will reduce the rolling resistance of your chair, making it easier to use.

1. Check your tires WEEKLY for proper inflation. The correct inflation level is imprinted on the tire sidewall.
2. DO NOT use your chair if any of the pneumatic tires are under-inflated or over-inflated.
3. If any tire is under-inflated, the chair may tend to veer to one side, which could cause you to lose control of the chair.
4. If a rear tire is under-inflated, the wheel lock for that wheel may not work properly and may slip, thereby allowing the wheel to turn unexpectedly.
5. An over-inflated tire may burst, thereby causing a loss of control of the chair.
6. ALWAYS have pneumatic tire inner tubes replaced by an authorized TiLite dealer.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## K. REAR WHEEL LOCKS

### ⚠WARNING

Standard rear wheel locks are available on all TiLite wheelchairs as a no-charge option. Scissor Locks and Uni-Locks are optional equipment. TiLite wheel locks are NOT designed to slow or stop a moving wheelchair - they are NOT brakes. Wheel locks are ONLY designed to keep the rear wheels from rolling when your chair is at a complete stop.

1. NEVER attempt to “brake” by using rear wheel locks to try to slow or stop your chair when it is moving. If you do so, you will lose control of the chair and may fall.
2. ALWAYS make sure the locking arm of your wheel lock embeds into the tire at least 3/16” when in the locked position. If the wheel lock does not properly embed in the tire, the wheel lock may not work and the chair may roll unexpectedly.
3. ALWAYS maintain proper tire pressure. If a rear tire is under-inflated, the wheel lock for that wheel may not work properly and may slip, thereby allowing the wheel to turn unexpectedly.
4. When you transfer to or from your chair, ALWAYS set both rear wheel locks to prevent the rear wheels from rolling.

*I*

*f you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## L. PUSH HANDLES

### ⚠WARNING

Push handles are optional equipment on TiLite wheelchairs. Push handles provide secure points for an attendant or assistant to hold the rear of the chair to prevent a fall or tip-over. If you have an attendant or assistant, you should have push handles installed on your chair by TiLite. TiLite offers push handles that are integral to the back canes and bolt-on push handles. TiLite recommends that you do NOT use non-TiLite bolt-on push handles because they will damage the backrest of your TiLite chair. Your attendant or assistant should regularly check the push handle grips to make sure they fit securely and will not rotate or slip off. Push handles should NEVER be used to lift the chair or pull the chair, especially when it is occupied, as they may detach. ALWAYS lift or pull the chair by grasping a non-detachable part of the main frame (not the backrest, armrest or footrest).

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

# CHAPTER 1: WARNINGS

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## M. FASTENERS

### **△WARNING**

TiLite uses only high-strength, high-quality fasteners (nuts, bolts, screws and clamps) on its wheelchairs. If you replace any of these fasteners with improper or inferior fasteners, you may damage your chair or may cause it to fail unexpectedly.

1. ALWAYS use fasteners obtained from an authorized TiLite dealer.
2. REGULARLY inspect all fasteners to make sure they have not become loose. If any become loose, tighten them immediately.
3. NEVER over-tighten or under-tighten the fasteners on your chair. Over-tightened or under-tightened fasteners may damage your chair or fail unexpectedly.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## N. UNAUTHORIZED PARTS AND ACCESSORIES

NEVER use parts, accessories or adapters other than those authorized by TiLite. If you have any doubt about the compatibility of a particular part, accessory or adapter, consult with an authorized TiLite dealer or contact TiLite Customer Service.

*If you ignore these Warnings, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

# CHAPTER 2: SAFETY INSPECTION, MAINTENANCE & TROUBLESHOOTING

## Introduction

Your TiLite wheelchair is designed, engineered and built to provide you with years of exceptional performance. However, proper maintenance and regular safety inspections are essential in order to make sure your wheelchair is operating properly, safely and at maximum efficiency. In addition, proper maintenance and regular safety inspections will extend the life of your TiLite wheelchair.

## Safety Inspections and Maintenance

### ⚠ WARNING

*If you fail to inspect and maintain your wheelchair as directed in this Manual, you will be at risk for health complications or you may fall, tip over or lose control of your wheelchair and seriously injure yourself or others or damage the wheelchair.*

### ⚠ WARNING

After making ANY adjustments or repairs to your wheelchair and after any servicing of your wheelchair, ALWAYS make sure all attachment hardware is tightened securely BEFORE using the chair. *If you ignore this Warning, you may fall, tip over or lose control of your wheelchair and seriously injure yourself or others or damage the wheelchair.*

1. You MUST inspect and maintain your TiLite wheelchair strictly in accordance with the following chart.
2. If your inspection uncovers any problem, make sure to service or repair the problem BEFORE using the wheelchair.
3. If your inspection reveals any loose, worn, bent or damaged parts, you MUST tighten, repair or replace them before using your TiLite wheelchair.
4. Clean your wheelchair ONLY in accordance with the instructions under “Cleaning” on page 2-3.
5. Annually, or more often if necessary, you MUST have your wheelchair serviced and thoroughly inspected by a qualified TiLite dealer.
6. In addition to the maintenance and safety inspections indicated in the chart below, ALWAYS make sure that all nuts and bolts are tight before riding in your wheelchair.

Inspection Item	Initially	Weekly	3 Months
<b>General</b> <ul style="list-style-type: none"> <li>• Make sure chair rolls straight (does not drag or pull to one side)</li> <li>• Inspect for loose/missing/broken/worn/damaged hardware</li> </ul>	√ √	√ √	
<b>Rear Wheels</b> <ul style="list-style-type: none"> <li>• Inspect for cracked, bent or broken spokes</li> <li>• Make sure all spokes are uniformly tight</li> <li>• Inspect hubs and rims for cracks and wear</li> <li>• Inspect for “trueness” (excessive side movement when wheel lifted and spun indicates lack of “trueness”)</li> </ul>	√ √ √ √	√  √	√  √
<b>Quick-Release/Quad-Release Axles</b> <ul style="list-style-type: none"> <li>• Make sure axles are free of dirt and lint</li> <li>• Wipe axle with cloth using either a “dry” silicone spray or a “dry” Teflon® -based lubricant</li> <li>• Make sure that axles lock properly in axle sleeve</li> </ul>	√  √	  √ <sup>1</sup>	√ √

<sup>1</sup>You MUST make sure that axle locks properly in the axle sleeve every time you remove and reinstall a rear wheel, and you should verify this at least weekly.

## CHAPTER 2: SAFETY INSPECTION, MAINTENANCE & TROUBLESHOOTING

Inspection Item	Initially	Weekly	3 Months
<b>Rear Tires</b> <ul style="list-style-type: none"> <li>• Check for proper inflation as per sidewall of pneumatic tire</li> <li>• Inspect for cracks, wear and flat spots</li> </ul>	√ √	√ √	
<b>Camber Tube/Axle Sleeves</b> <ul style="list-style-type: none"> <li>• Make sure camber plug clamps are securely tightened</li> <li>• Make sure camber plugs are secure in camber plug clamps and axle sleeves are secure in camber plugs</li> </ul>	√ √	√ √	
<b>Handrims</b> <ul style="list-style-type: none"> <li>• Inspect for signs of rough edges or peeling</li> <li>• Make sure handrims are securely attached to rim</li> </ul>	√ √		√ √
<b>Wheel Locks</b> <ul style="list-style-type: none"> <li>• Make sure wheel locks embed proper distance into tire and prevents chair from moving when engaged</li> <li>• Make sure wheel locks do not interfere with tire when disengaged</li> <li>• Make sure pivot points are free of wear and looseness</li> </ul>	√ √ √	√ √ √	
<b>Seat Sling and Back Upholstery</b> <ul style="list-style-type: none"> <li>• Inspect for rips or sagging</li> <li>• Inspect fastening flaps to ensure they are securely attached</li> <li>• Inspect while seated to ensure sling supports your weight and does not touch crosstubes</li> </ul>	√ √ √	√ √	√
<b>Casters/Forks</b> <ul style="list-style-type: none"> <li>• Inspect wheels and tires for cracks and wear</li> <li>• Inspect wheel/fork assembly for proper tension by spinning caster (caster should come to a gradual stop); if caster wobbles, tighten axle; if caster binds to a stop, loosen axle</li> <li>• Inspect wheel/fork assembly/stem bolt to ensure that stem bolt is secure (wheel/fork assembly should not have excessive play relative to the stem bolt but should rotate freely); if necessary, tighten stem bolt</li> <li>• Ensure that wheel bearings are clean and free from moisture</li> <li>• If pneumatic, check for proper inflation as per the sidewall</li> </ul>	√ √ √ √ √	√ √ √ √	√ √
<b>Armrests</b> <ul style="list-style-type: none"> <li>• Inspect to ensure that all hardware is securely attached</li> </ul>	√	√	
<b>Footrests/Hangers</b> <ul style="list-style-type: none"> <li>• Inspect to ensure that all hardware is securely attached</li> </ul>	√	√	
<b>Anti-Tips</b> <ul style="list-style-type: none"> <li>• Inspect anti-tip wheel for cracks and wear</li> <li>• Inspect to ensure that anti-tip receiver is securely attached</li> </ul>	√ √	√	√
<b>Frame</b> <ul style="list-style-type: none"> <li>• Inspect for cracks</li> </ul>	√		√



# CHAPTER 2: SAFETY INSPECTION, MAINTENANCE & TROUBLESHOOTING

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## Cleaning

Clean your chair regularly. Cleaning often will reveal loose or worn parts and enhance the smooth operation of your chair.

### Cleaning the Frame

Use a soft clean cloth with soap and water to clean the frame. Immediately dry all components and parts that become wet. Note: Do NOT use Scotch Brite™ pads, steel wool, abrasive cleaners or petroleum-derived products to clean a painted aluminum or titanium frame.

### Cleaning the Upholstery

1. Regularly hand-wash the seat sling and back upholstery using water and a mild detergent. Always allow the upholstery to air dry before riding in the chair.
2. NEVER machine wash the upholstery, and NEVER machine dry the upholstery.
3. When washing the upholstery, carefully check for sagging, rips or tears. If you find any rips or tears, you MUST order new upholstery.
4. After washing the seat sling, always check the tension while seated in the chair to ensure the sling does not touch the crosstube beneath the seat sling.

### Axles and Moving Parts

Clean axles and other moving parts weekly with a slightly damp cloth. The cloth should not be wet. Try to wipe away any lint, dust or dirt on these parts that could interfere with their smooth operation. DO NOT use WD-40®, 3-in-1 oil®, or other penetrating lubricants on quick-release or quad-release axles. Instead, as indicated in the chart under “Safety Inspections and Maintenance,” ALWAYS use either a “dry” Teflon®-based lubricant or a “dry” silicone spray as a lubricant.

## Storage

1. Always store your chair in a clean, dry location. Excessive dirt can cause moving parts to become damaged or fail. Moisture can rust or corrode the non-titanium components of your chair.
2. Always fully inspect your chair after it has been stored for any period before riding in it. See the chart under “Safety Inspections and Maintenance” on pages 2-1 to 2-2.
3. If you store your chair for more than three (3) months, have your chair inspected by an authorized TiLite supplier.

## Troubleshooting

Your TiLite wheelchair is a precision-engineered product. To ensure your chair continues to operate at peak performance, you will need to make minor adjustments from time to time — especially if you alter the original factory settings. The chart below provides advice on solving some of the more common “adjustment” issues you may experience. If the solutions below do not solve your problem or if you experience a problem not addressed below, please contact an authorized TiLite supplier or TiLite Customer Service. Please note, if more than one solution in the chart below applies to your particular adjustment issue, always try one solution at a time until the problem is solved.

## CHAPTER 2: SAFETY INSPECTION, MAINTENANCE & TROUBLESHOOTING

Chair Veers Right or Left	Caster Flutter	Looseness in Chair	Squeaks and Rattles	Sluggish Turning or Performance	Floating Caster	Solution
√	√			√	√	If you have pneumatic front and/or rear tires, make sure that the tires are properly and equally inflated
	√	√	√	√		Make sure that all nuts and bolts are securely tightened
		√	√			Make sure that all spokes and nipples are uniformly tight on all spoked wheels
√	√			√	√	Make sure that caster barrels and mounts are properly adjusted
	√	√	√	√		Make sure that rear wheels are equally spaced away from the seat frame
√				√		Adjust the toe-in/toe-out of the rear wheels

## ⚠ WARNING

Check all clamps, screws, nuts and bolts that secure the footrest to the wheelchair frame to make sure they are securely tightened before using the wheelchair. *If you ignore this Warning, the footrests could move unexpectedly while you are using the chair, causing you to fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## ⚠ WARNING

A calf strap is offered as an option with each wheelchair to prevent your feet from slipping backwards off of the footrest. TiLite recommends that you purchase our calf strap with your wheelchair. Always make sure the calf strap is secure when using the wheelchair. *If you ignore this Warning, you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## ⚠ WARNING

Whenever you adjust the angle or height of your footrest, or you replace your footrest, always allow at least 2" of ground clearance to permit you to maneuver over objects. *If you ignore this Warning, you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## Angle Adjustable Footrest (Standard or CAT)

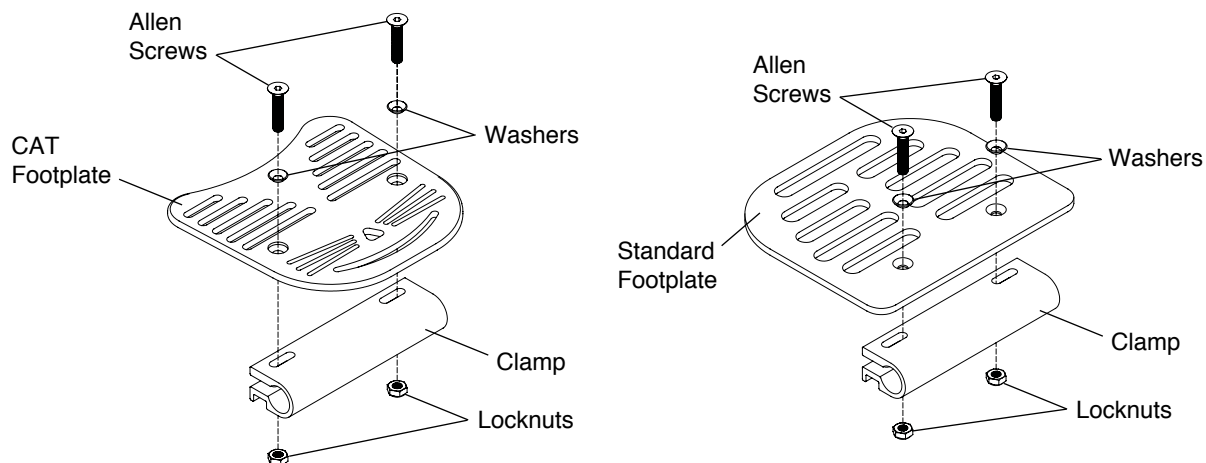
### Adjusting the Angle

Tools needed:

- 5/32" Allen Wrench

1. Loosen, but do not remove, the two Allen screws that secure the footplate to the clamp. See Figure 3-1.
2. Adjust the footrest to the desired angle.
3. Tighten the Allen screws, making sure the screws and the locknuts are secure and will not permit the footplate to move up or down under weight.

**Figure 3-1**  
Adjusting the Angle



### Adjusting the Height/Replacing

Tools needed:

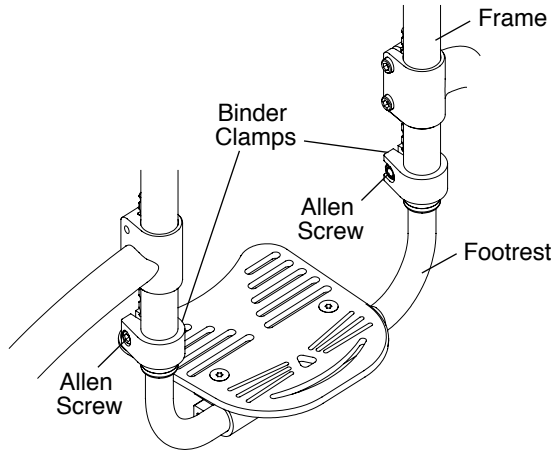
- 3/16" Allen Wrench
- Ruler

1. Loosen the Allen screws in the two binder clamps that secure the footrest to the frame. See Figure 3-2. If replacing the footrest, loosen the Allen screws sufficiently to permit you to completely remove the old footrest and make sure to leave the plastic footrest insert sleeve inside the frame tube. If adjusting the height, loosen the Allen screws sufficiently to permit the footrest to move up and down freely within the binder clamps.
2. If replacing the footrest, remove the old footrest and install the new footrest into the frame.
3. Place the end of a ruler on the floor and hold it vertically against the left corner of the footrest. Adjust the left side of the footrest (or the new footrest) to the desired height (not less than 2" of ground clearance) and loosely tighten the Allen screw in the left binder clamp so the left side of the footrest cannot change. See Figure 3-3.

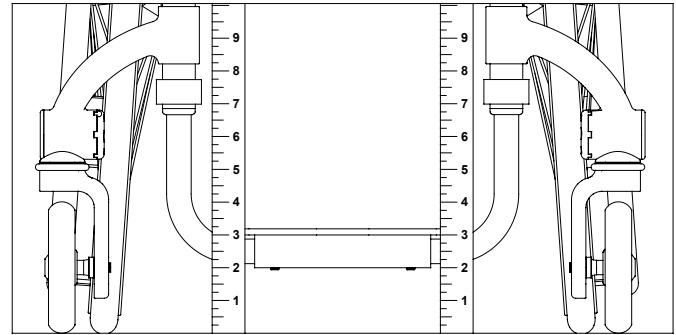
# CHAPTER 3: FOOTRESTS

4. Repeat the procedure from Step 3 above on the right side of the footrest (or the new footrest).
5. When both sides are set at an equal distance from the floor, make sure all four (4) wheels are in contact with the floor and then fully tighten the two Allen screws in the binder clamps that secure the footrest to the wheelchair frame.

**Figure 3-2**  
Adjusting the Height/ Replacing



**Figure 3-3**  
Footrest Height Adjustment



## Angle Adjustable High Mount Footrest (Standard or CAT)

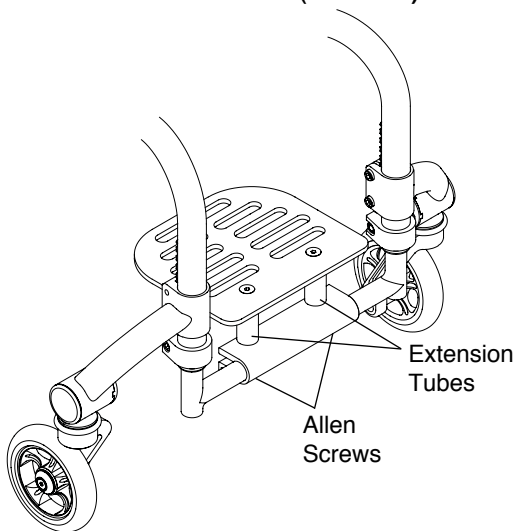
### Adjusting the Angle

Tools needed:

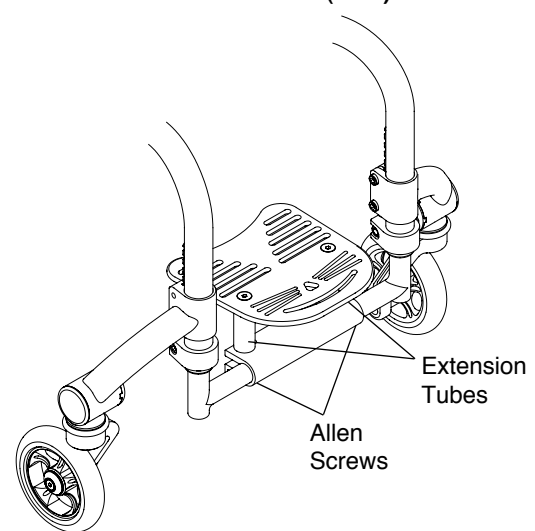
- 3/16" Allen Wrench

1. Loosen, but do not remove the Allen Screws. See Figures 3-4 and 3-5.
2. Adjust the footrest to the desired angle.
3. Tighten the Allen Screws making sure the screws are secure and will not permit the footplate to move up or down under your weight.

**Figure 3-4**  
Angle Adjustable High Mount Footrest  
with Extension Tubes (Standard)



**Figure 3-5**  
Angle Adjustable High Mount Footrest  
with Extension Tubes (CAT)



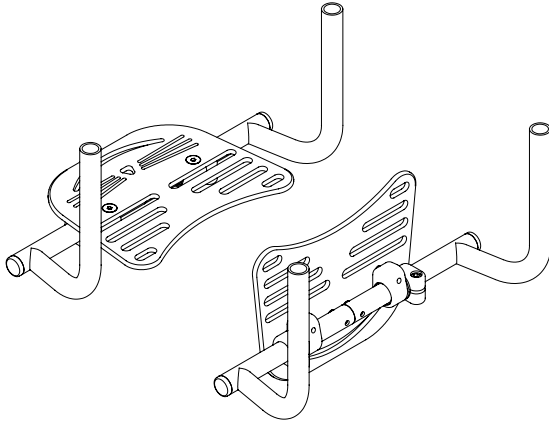
### Adjusting the Height/Replacing

The Angle Adjustable High Mount Footrest can be replaced, or the height adjusted, by using the tools and following the procedures under “Angle Adjustable Footrest (Standard or CAT) – Adjusting the Height/Replacing” on pages 3-1 and 3-2.

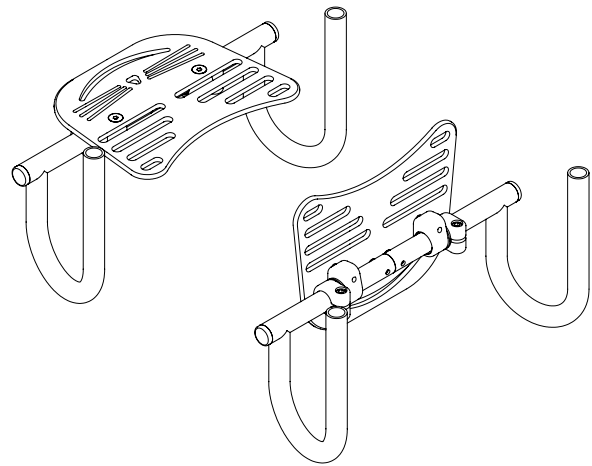
### CAT Flip-Back Angle Adjustable Footrest / CAT Flip-Back Angle Adjustable High Mount Footrest

The Flip-Back Footrest can be flipped upward and backward to position the footplate out of the way for purposes of transferring into and out of the wheelchair. See Figures 3-6 and 3-7.

**Figure 3-6**  
Flip-Back Footrest



**Figure 3-7**  
Flip-Back High Mount Footrest



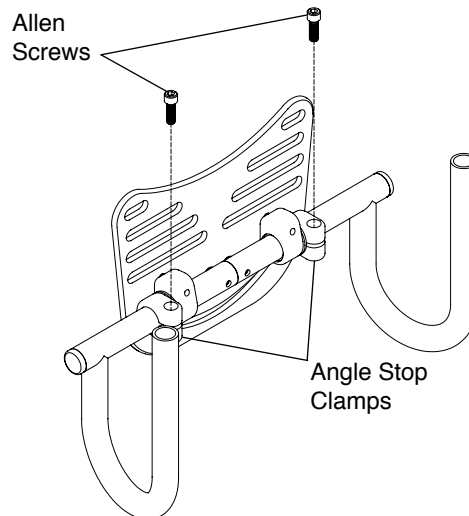
#### Adjusting the Angle

Tools Needed:

- 3/16" Allen Wrench

1. Flip back the footplate.
2. Loosen, but do not remove, the two Allen screws as shown in Figure 3-8.
3. Adjust the footrest to the desired angle.
4. Securely tighten the two Allen screws loosened in Step 2.

**Figure 3-8**  
Adjusting the Angle

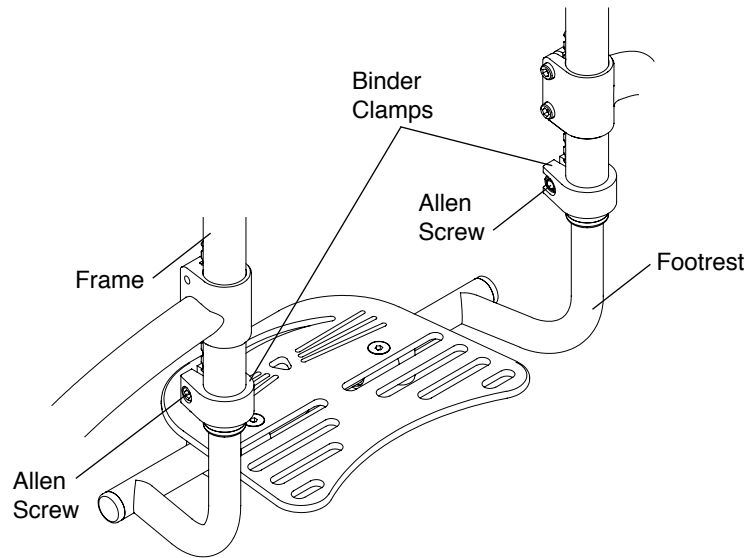


#### Adjusting the Height/Replacing

The footrest can be replaced, or the height adjusted, by using the tools and following the procedures under "Angle Adjustable Footrest (Standard or CAT) – Adjusting the Height/Replacing" on pages 3-1 to 3-2. See Figure 3-9.

# CHAPTER 3: FOOTRESTS

**Figure 3-9**  
**Adjusting the Height/ Replacing**



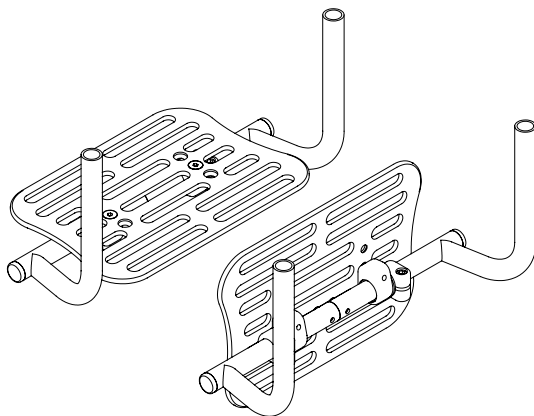
## **Flip-Back Depth & Angle Adjustable Footrest / Flip-Back Depth & Angle Adjustable High Mount Footrest**

The Flip-Back Depth & Angle Adjustable Footrest and Flip-Back Depth & Angle Adjustable High Mount Footrests can be flipped upward and backward to position the footplate out of the way for purposes of transferring into and out of the wheelchair. See Figures 3-10 and 3-11.

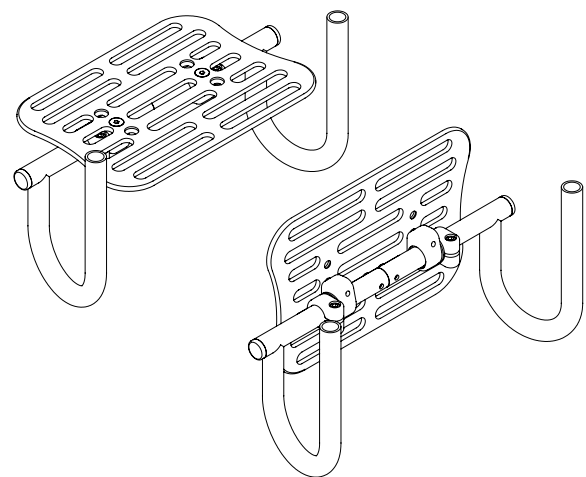
You can adjust the angle of the footrest by using the tools and following the procedures for adjusting the angle of the footrest as set forth under “CAT Flip-Back Angle Adjustable Footrest / CAT Flip-Back Angle Adjustable High Mount Footrest – Adjusting the Angle” on page 3-3.

You can adjust the height of, or replace, the footrest by using the tools and following the procedures for adjusting the height of, or replacing a footrest as set forth under “Angle Adjustable Footrest (Standard or CAT) – Adjusting the Height/Replacing” on pages 3-1 to 3-2.

**Figure 3-10**  
**Flip-Back Depth Adjustable Footrest**



**Figure 3-11**  
**Flip-Back Depth Adjustable High Mount Footrest**



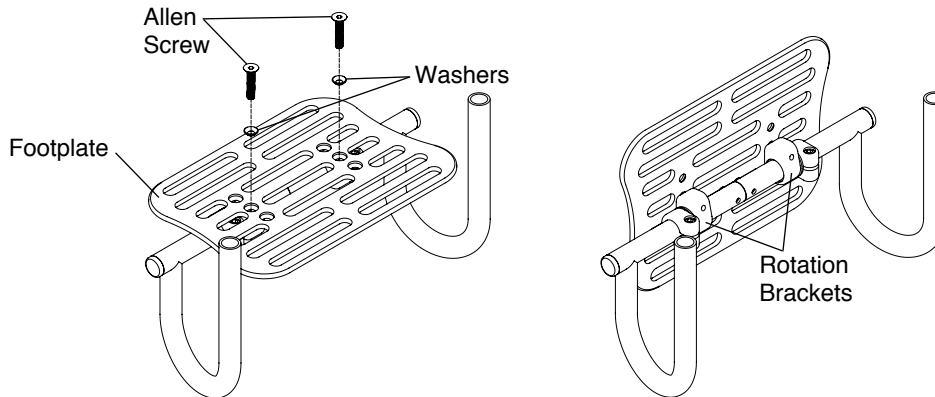
## Adjusting the Depth

Tools needed:

- 5/32" Allen Wrench

1. Remove the Allen screws and washers that attach the footplate to the rotation brackets. See Figure 3-12.
2. Move the footplate to the desired depth.
3. Reinstall and securely tighten the Allen screws and washers.

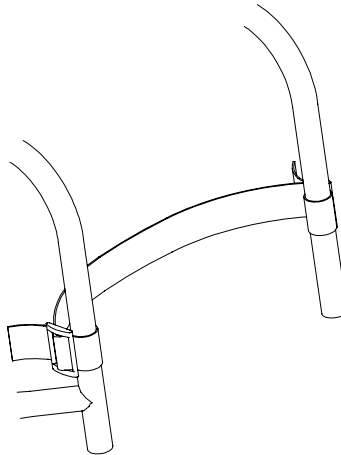
**Figure 3-12**  
**Adjusting the Depth**



## Buckle Adjustable Calf Strap

Buckle Adjustable Calf Strap is shown in Figure 3-13. Install the calf strap as shown in Figure 3-13.

**Figure 3-13**  
**Buckle Adjustable Calf Strap**



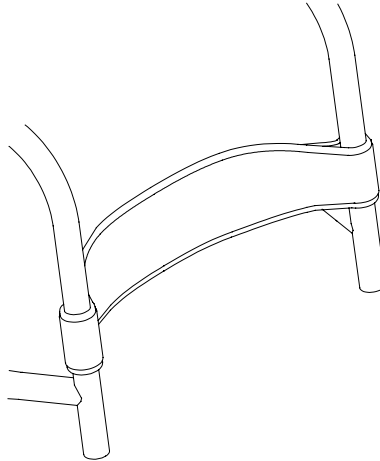
## CHAPTER 3: FOOTRESTS

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### Velcro Adjustable Calf Strap/Padded Adjustable Calf Strap

The Velcro Adjustable Calf Strap and Padded Adjustable Calf Strap are shown in Figure 3-14. Install the calf straps as shown in Figure 3-14.

**Figure 3-14**  
**Padded Adjustable Calf Strap**





# CHAPTER 4: BACKRESTS AND PUSH HANDLES

## FOLDING ALUMINUM ADJUSTABLE HEIGHT BACKREST

**Note:** The Folding Aluminum Adjustable Height Backrest is standard and is also depth and angle adjustable. Integrated Push Handles are available as a no-charge option. The Lock-Down Backrest is an option.

### ⚠ WARNING

Before using your wheelchair, make sure the backrest is securely in place in the upright position and all mounting hardware is securely tightened. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### Folding the Backrest

1. Grasp the TiShaft Release Bar and pull up. See Figures 4-1.
2. Push the backrest forward toward the front of the chair.

**Note:** If you have a Lock-Down Backrest, make sure the backrest is locked securely in the folded position.

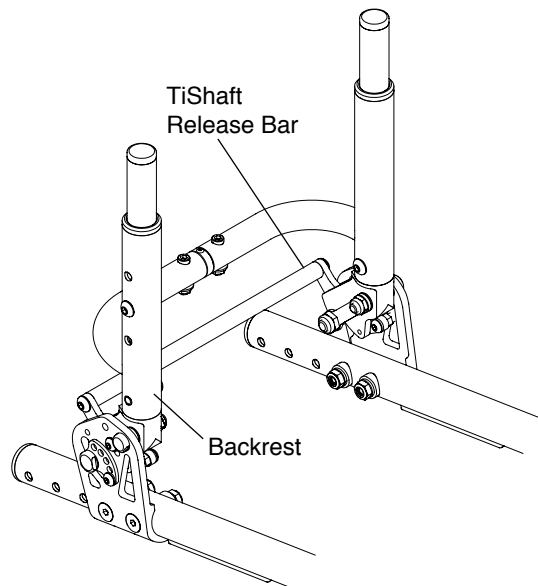
### Unfolding the Backrest

1. Lift up on the backrest and pull towards the rear of the chair.
2. Make sure the backrest locks securely into place.

### Unfolding the Lock-Down Backrest

1. Push up the TiShaft Release Bar and pull the backrest towards the rear of the chair.
2. Make sure the backrest locks securely into place.

**Figure 4-1**  
**Folding Adjustable Height Backrest with TiShaft Release Bar**



### Adjusting the Back Mount

Tools Needed:

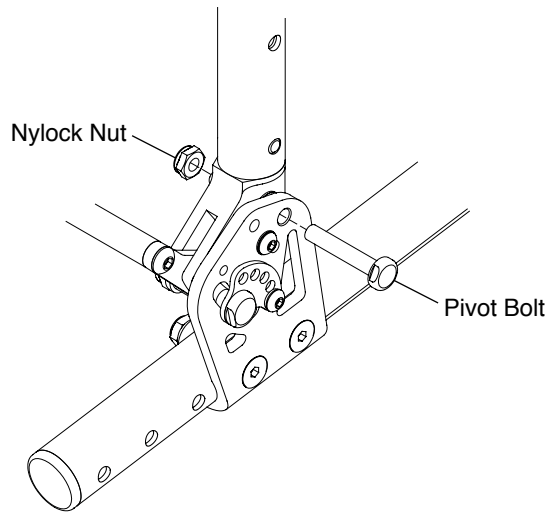
- Two 7/16" Open End Wrenches

If your backrest is difficult to fold and unfold or is too loose, follow these procedures:

1. Using an Open End wrench, hold the pivot bolt in place and slightly loosen or tighten the nylock nut with the second Open End wrench. See Figure 4-2.
2. Repeat the procedure on each side of the chair until the desired tightness is achieved.

# CHAPTER 4: BACKRESTS AND PUSH HANDLES

**Figure 4-2**  
**Adjusting the Back Mount**



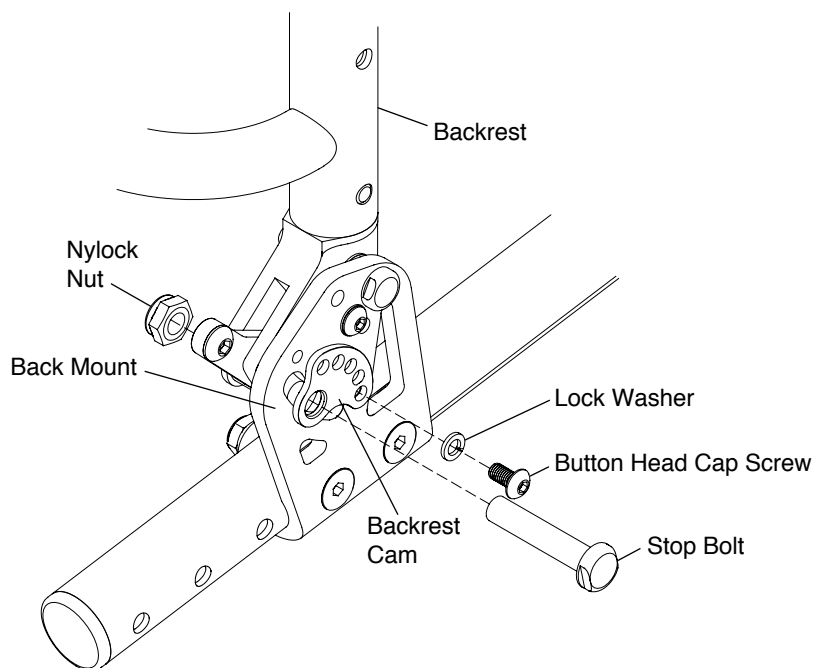
## Changing the Back Angle

Tools Needed:

- 7/16" Open End Wrench
- 1/2" Open End Wrench
- 1/8" Allen Wrench

1. On each side of the chair, using the Allen wrench, remove the Button Head Cap screw and lock washer. See Figure 4-3.
2. On each side of the chair, using the Open End wrenches, loosen but do not remove the stop bolt and nylock nut.
3. Adjust the backrest to the desired angle. On one side of the chair, while holding the backrest in place, align one of the five holes in the backrest cam with one of the three holes in the back mount. Place the Button Head Cap screw through the lock washer, the backrest cam and into the back mount. Securely tighten.
4. Securely tighten the stop bolt and nylock nut.
5. Repeat Steps 3 and 4 on the other side of the chair.

**Figure 4-3**  
**Changing the Back Angle**



# CHAPTER 4: BACKRESTS AND PUSH HANDLES

## Adjusting the Backrest Height

Tools Needed:

- 5/32" Allen Wrench

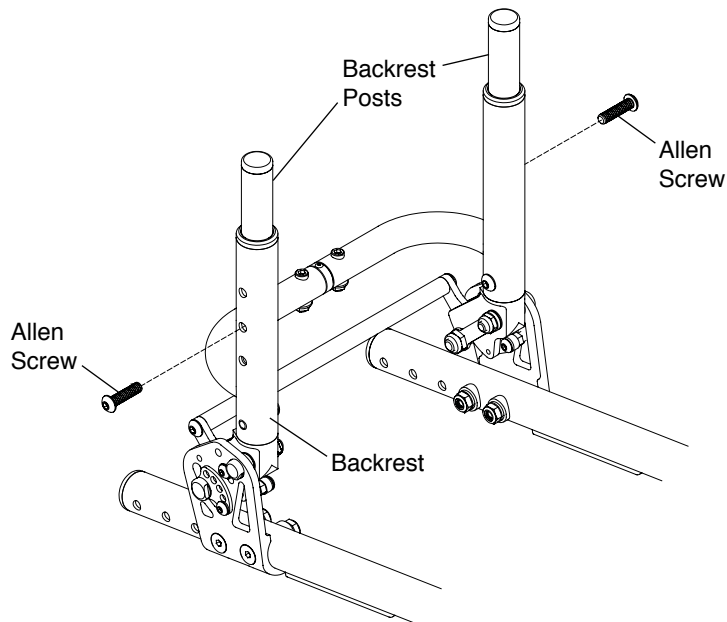
**Note:** In order to adjust the backrest height, it is helpful to remove the backrest upholstery. Therefore, make a note of the tautness of the backrest upholstery before removing it so you can reinstall it to approximately the same degree of tautness.

1. Remove the backrest pad. See “Velcro®-Style Adjustable Back Upholstery” or “Tension Adjustable by Straps Back Upholstery” on pages 7-1 to 7-3.
2. On both sides of the chair, remove the Allen screw that secures the backrest post inside the backrest. See Figure 4-4.
3. Reposition both backrest posts to the desired height inside the backrest, and reinsert and securely tighten the two Allen screws.
4. Make sure both backrest posts are at the same height in the backrest.
5. Reinstall the backrest upholstery. See “Velcro®-Style Adjustable Back Upholstery” or “Tension Adjustable by Straps Back Upholstery” on pages 7-1 to 7-3.

### ⚠ WARNING

The threads on the Allen screws that secure the backrest posts to the backrest have been treated with a Vibra-TITE® VC-3, a locking and sealing coating, to reduce the possibility that they will become loose. You should be able to adjust the backrest height approximately four times without reapplying thread lock to these screws. TiLite requires that you reapply Vibra-TITE® VC-3 after every fourth adjustment. *If you ignore this Warning, your backrest posts could become loose or disconnected from the wheelchair, and you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

**Figure 4-4**  
**Adjusting the Backrest Height**



## Replacing the Backrest

Tools Needed:

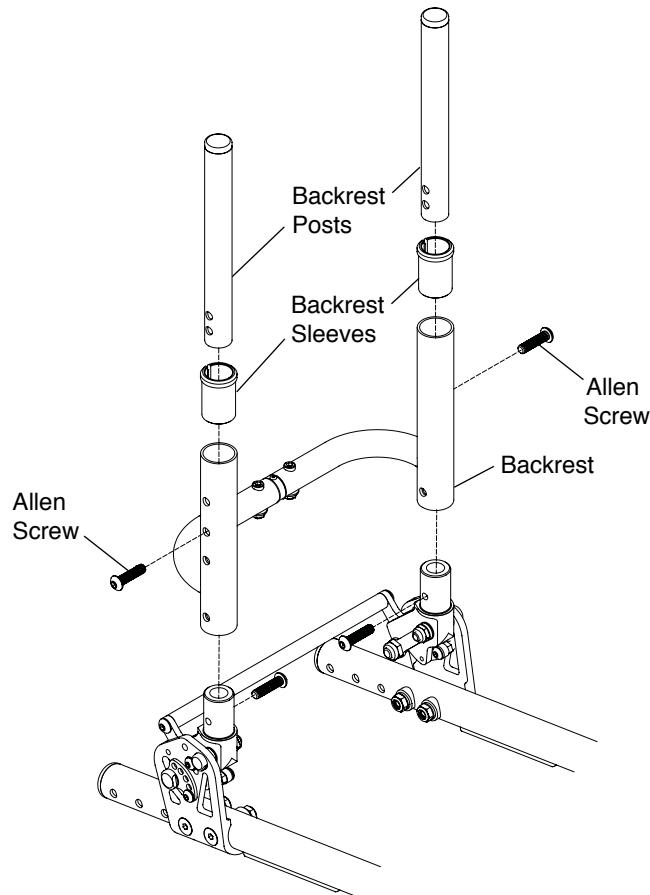
- 5/32" Allen Wrench

1. Remove the backrest upholstery. See “Velcro®-Style Adjustable Back Upholstery” or “Tension Adjustable by Straps Back Upholstery” on pages 7-1 to 7-3.
2. Remove the backrest posts. See “Folding Aluminum Adjustable Height Backrest – Adjusting the Backrest Height” on page 4-3.
3. Remove the backrest sleeves. See Figure 4-5.

## CHAPTER 4: BACKRESTS AND PUSH HANDLES

4. Remove the two Allen screws (one on each side of the chair) and remove the backrest. See Figure 4-6.
5. Install the new backrest and securely tighten the two Allen screws.
6. Install the backrest sleeves in the new backrest.
7. Reinstall the backrest posts.
8. Reinstall the backrest upholstery.

Figure 4-5  
Replacing the Backrest



### Adjusting the Depth

Tools Needed:

- 7/16" Open End Wrench
- 5/32" Allen Wrench

1. Remove the four Allen screws (two on each side) that secure the back mount to the seat tube. Note the order of the saddles, washers and nylock nuts. See Figure 4-6.
2. Reposition the back mounts to the desired depth.
3. Reinstall the four Allen screws through the back mount, seat tube, saddles and washers and securely tighten the nylock nuts.

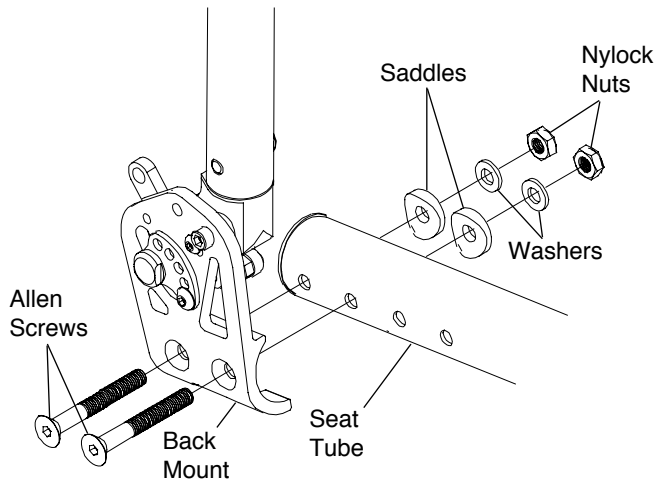
**Note:** If your chair has Swing Away Armrests (see Figure 4-7), you may need to use the longer screws provided with your chair in order to secure both the back mount and the armrest receiver.

### ⚠ WARNING

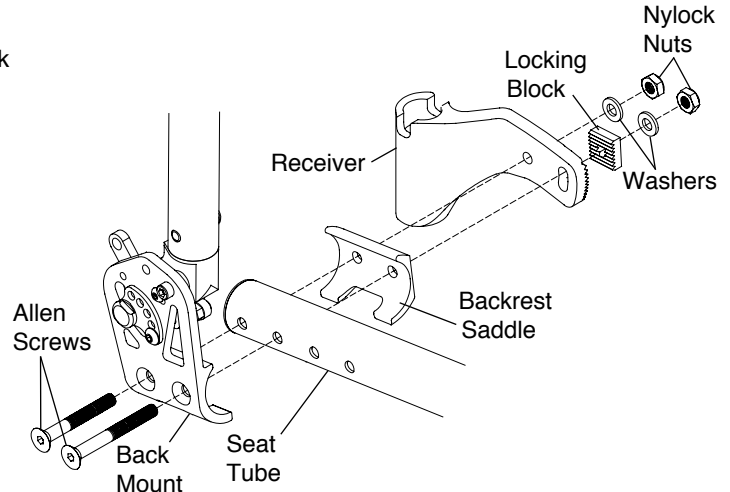
Any changes to the depth of the backrest will affect the stability (*i.e.* center of gravity) of the chair. Use extreme caution when using a new backrest depth as it may make the chair more prone to tip over. After adjusting the depth of the backrest, you must consider whether additional changes need to be made to compensate for the modified stability of the chair (*e.g.*, changing the rear axle position, backrest angle, rear seat height). *If you ignore this Warning, your chair may not perform properly, which in turn, may cause you to fall, tip over or lose control of the chair and seriously injure yourself or others or damage the chair.*

# CHAPTER 4: BACKRESTS AND PUSH HANDLES

**Figure 4-6**  
Adjusting the Depth



**Figure 4-7**  
Adjusting the Depth with Swing Away Armrests



## Bolt-On Push Handles

### Mounting

Tools Needed:

- 5/32" Allen Wrench
- 3/16" Allen Wrench

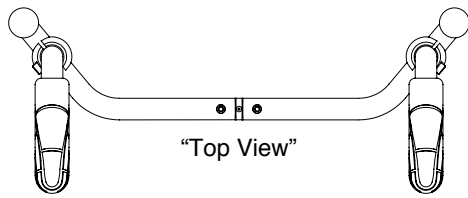
1. See Figure 4-8 for the correct location to mount the Bolt-On Push Handles to the rigidizer bar.
2. Assemble the two halves of the clamp around the rigidizer bar. See Figure 4-9.
3. Insert the 1" Allen screw through the washer into the bottom hole on the clamp and loosely tighten.
4. Insert the push handle into the clamp and align the holes in the push handle with the two upper holes in the clamp.
5. Insert the two 1-1/8" Allen screws through the washers, the two halves of the clamp and the push handle and securely tighten.
6. Make sure the push handle is correctly positioned for proper pushing and securely tighten the 1" Allen screw.

### ⚠ WARNING

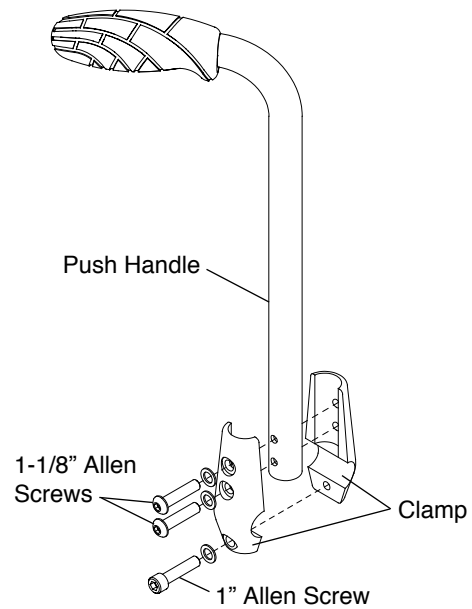
Your assistant or attendant should NEVER attempt to lift a wheelchair up a curb, step or flight of stairs by lifting on any removable (detachable) parts, such as Bolt-On Push Handles. Similarly, your assistant or attendant should NEVER attempt to lower a wheelchair down a curb, step or flight of stairs by holding onto any removable (detachable) parts, such as the Bolt-On Push Handles. *If you ignore this Warning, the removable parts, such as the Bolt-On Push Handles, could detach from the wheelchair causing you to fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

# CHAPTER 4: BACKRESTS AND PUSH HANDLES

**Figure 4-8**  
Location for Bolt-On Push Handles



**Figure 4-9**  
Bolt-On Push Handles



## Removing

Tools Needed:

- 5/32" Allen Wrench
- 3/16" Allen Wrench

1. Remove the three Allen screws and remove the clamp and handle. See Figure 4-9.

## Bolt-On Height-Adjustable Push Handles

### Mounting

Tools Needed:

- 3/16" Allen Wrench

1. See Figure 4-10 for the correct location to mount the Height-Adjustable Push Handles.
2. Assemble the two halves of the clamp around the rigidizer bar. See Figure 4-11.
3. Insert the four Allen screws into the two halves of the clamp and securely tighten.
4. Insert the push handle through the clamp until the handle is at the desired height and securely tighten the adjustable handle.

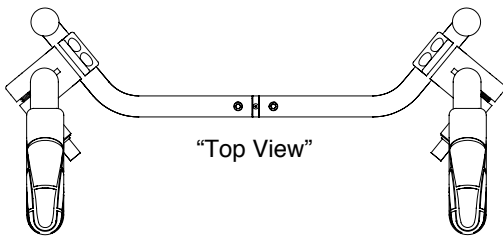
**Note:** The adjustable handle operates as a ratchet, thereby enabling the user to easily disengage and engage the clamp for purposes of repositioning or removing the push handles.

### ⚠ WARNING

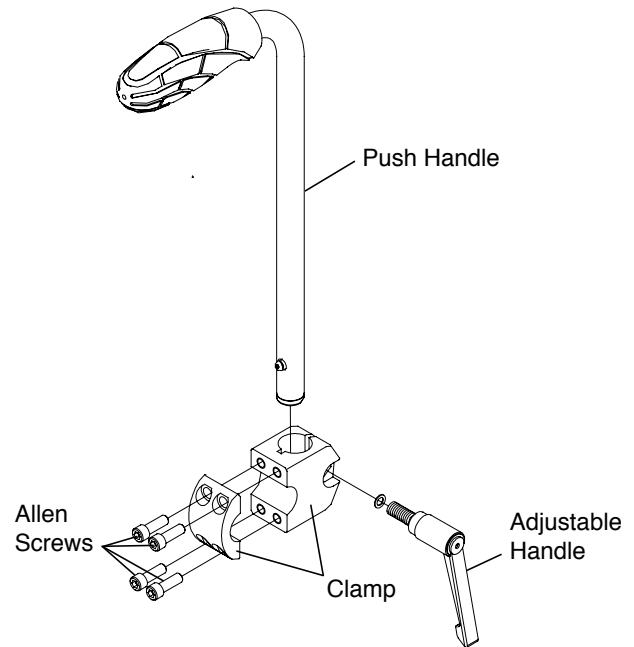
Your assistant or attendant should NEVER attempt to lift a wheelchair up a curb, step or flight of stairs by lifting on any removable (detachable) parts, such as Adjustable Height Push Handles. Similarly, your assistant or attendant should NEVER attempt to lower a wheelchair down a curb, step or flight of stairs by holding onto any removable (detachable) parts, such as the Adjustable Height Push Handles. *If you ignore this Warning, the removable parts, such as the Adjustable Height Push Handles, could detach from the wheelchair causing you to fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

# CHAPTER 4: BACKRESTS AND PUSH HANDLES

**Figure 4-10**  
**Bolt-On Adjustable Height Push Handles**



**Figure 4-11**  
**Bolt-On Adjustable Height Push Handles**



## Removing

Tools Needed:

- 3/16" Allen Wrench

1. Remove the four Allen screws. See Figure 4-11.
2. Remove the clamp and handle.

## Bolt-On Center Mount Height-Adjustable Push Handle

### Adjusting

1. Grasp the adjustable handle and lift counterclockwise while holding the push handle. See Figure 4-12.
2. Raise or lower the push handle to the desired height.
3. Turn the adjustable handle clockwise and tighten, securing the push handle in place.

### Removing

1. Grasp the adjustable handle and lift counterclockwise while holding the push handle. See Figure 4-12.
2. Press the release button at the bottom of the push handle and lift the handle to remove it from the push mount.

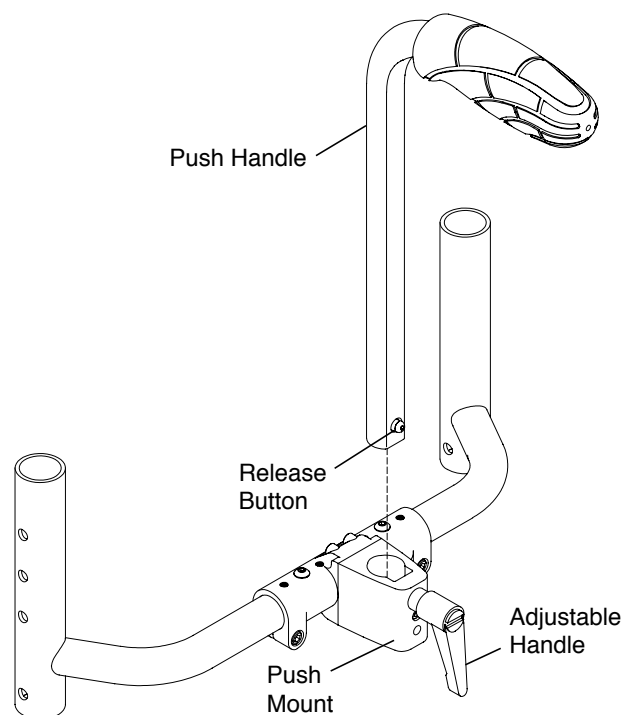
### ⚠ WARNING

Your assistant or attendant should NEVER attempt to lift a wheelchair up a curb, step or flight of stairs by lifting on any removable (detachable) parts, such as Center Mount Adjustable Height Push Handles. Similarly, your assistant or attendant should NEVER attempt to lower a wheelchair down a curb, step or flight of stairs by holding onto any removable (detachable) parts, such as the Center Mount Adjustable Height Push Handles. *If you ignore this Warning, the removable parts, such as the Center Mount Adjustable Height Push Handles, could detach from the wheelchair causing you to fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## CHAPTER 4: BACKRESTS AND PUSH HANDLES

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Figure 4-12  
Bolt-On Center Mount Height-Adjustable Push Handle



### CENTER MOUNT STROLLER HANDLE

#### Adjusting

1. Grasp the quick-release cam lock and lift while holding the stroller handle. See Figure 4-13.
2. Raise or lower the stroller handle to the desired height.
3. Turn the quick-release cam lock clockwise to tighten, push the quick-release cam lock down to secure the stroller handle in place.

#### Removing

1. Grasp the quick-release cam lock and lift while holding the stroller handle. See Figure 4-13.
2. Press the release button at the bottom of the stroller handle tube and lift the handle to remove it from the stroller handle clamp.

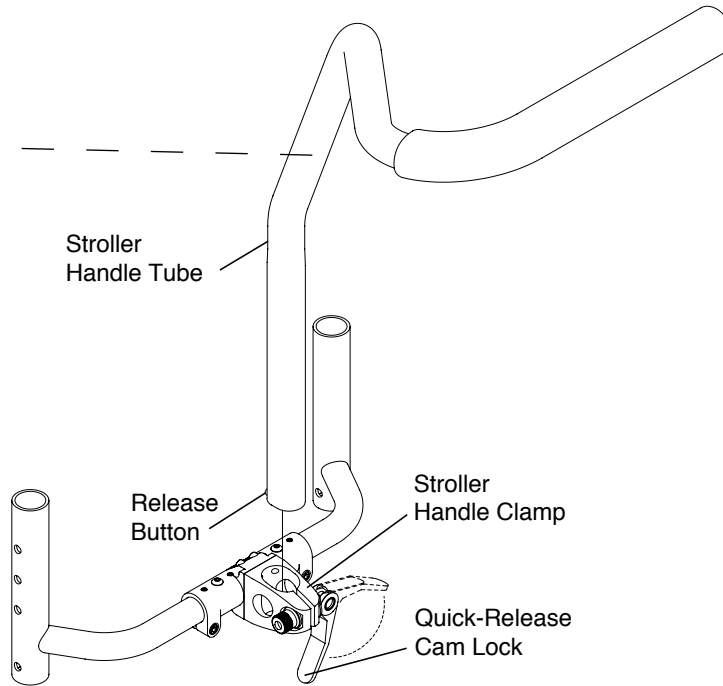


# CHAPTER 4: BACKRESTS AND PUSH HANDLES

Figure 4-13  
Center Mount Stroller Handle



Stroller Handle  
Warning



Stroller  
Handle Tube

Release  
Button

Stroller  
Handle Clamp

Quick-Release  
Cam Lock



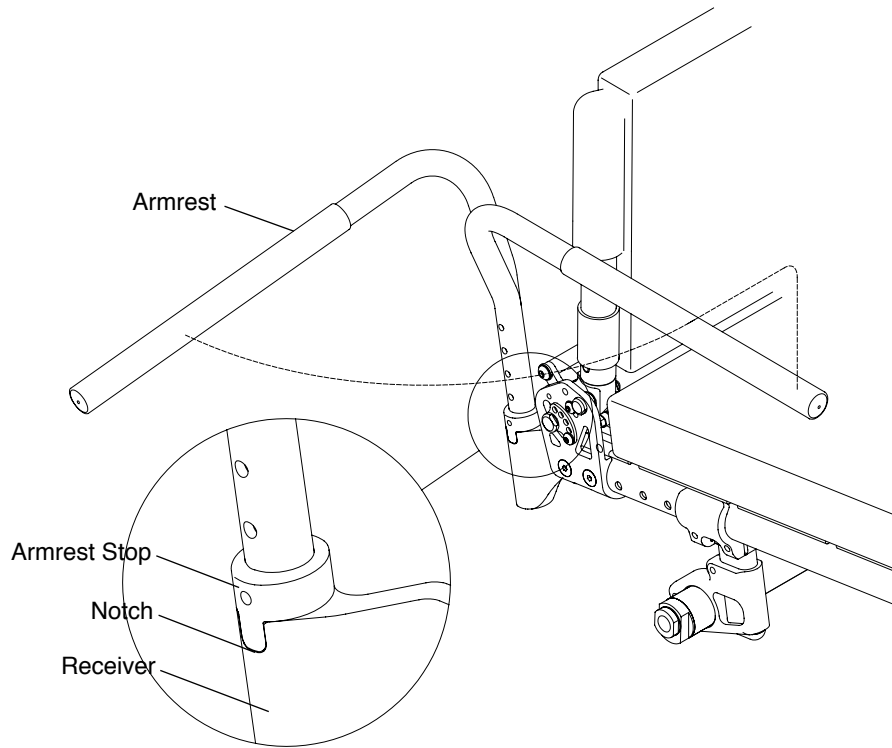
## Swing Away Tubular Armrest

To swing away the armrest, lift the armrest and rotate the armrest away from the chair. See Figure 5-1. Make sure to lift the armrest until the armrest stop is above the notch on the receiver.

To replace the armrest, rotate the armrest back towards the chair and gently push it down into place. See Figure 5-1. Make sure the armrest stop is in the notch on the receiver.

**Note:** The Swing Away Tubular Armrests pivot on nylon sleeves, located inside the receiver. If the armrest does not rotate properly, remove the armrest, clean the armrest and inside the receiver thoroughly. If this does not solve the problem, check the nylon sleeves for wear.

**Figure 5-1**  
Operating the Swing Away Armrest



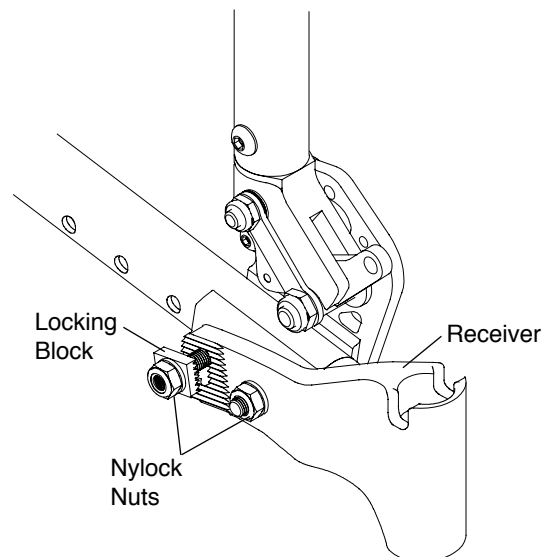
### Adjusting the Angle

Tools Needed:

- 7/16" Open End Wrench
- 5/32" Allen Wrench

1. Remove the armrest from the receiver.
2. On one side of the chair, loosen, but do not remove the nylock nuts while holding the locking block in position with your finger. See Figure 5-2.
3. To change the angle of the armrest, move the locking block one or more teeth up or down until the desired armrest angle is achieved.
4. Make sure the locking block teeth are fully engaged with the teeth on the receiver, and securely tighten the nylock nuts.
5. Repeat this procedure on the other side of the chair.

**Figure 5-2**  
Adjusting the Angle



# CHAPTER 5: ARMRESTS

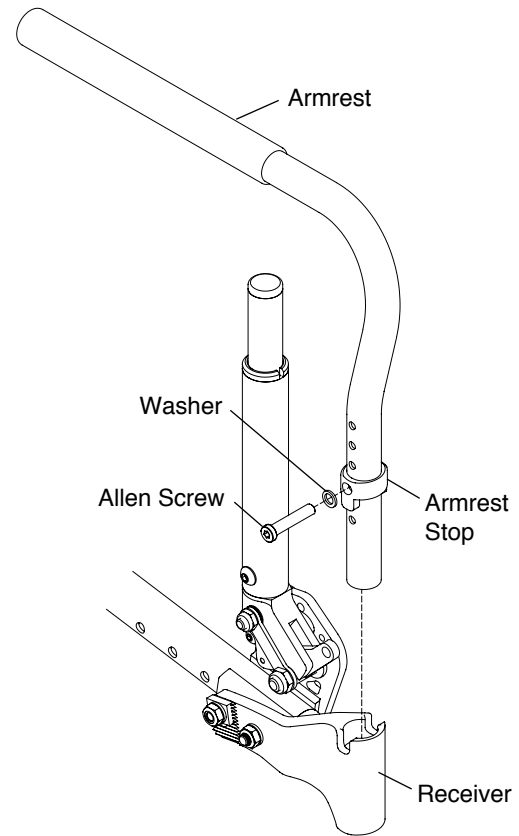
## Adjusting the Height

Tools Needed:

- 5/32" Allen Wrench

1. Remove the armrest from the receiver.
2. Remove the Allen screw and washer securing the armrest stop. See Figure 5-3.
3. Reassemble the armrest stop in the desired location on the armrest (in 3/4" increments).
4. Securely tighten the Allen screw.
5. Reinstall the armrest in the receiver.

**Figure 5-3**  
**Adjusting the Height**



## Pediatric Desk Arm with Rigid Side Guard

### ⚠ WARNING

Make sure the armrest is securely engaged in the desk arm housing (see Figure 5-4), before applying weight to the armrest. *If you ignore this Warning, you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### ⚠ WARNING

Make sure the desk arm housing securely locks in the desk arm mount before applying weight to the desk arm. *If you ignore this Warning, you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## Adjusting the Armrest Height

1. Pull up on the height adjustment lever to permit the armrest to be raised or lowered to the desired height. See Figure 5-4.
2. After repositioning the armrest to the desired height, release the height adjustment lever, pressing the handle against the desk arm housing to lock the armrest in that position. The positioning holes are in 1/2" increments.

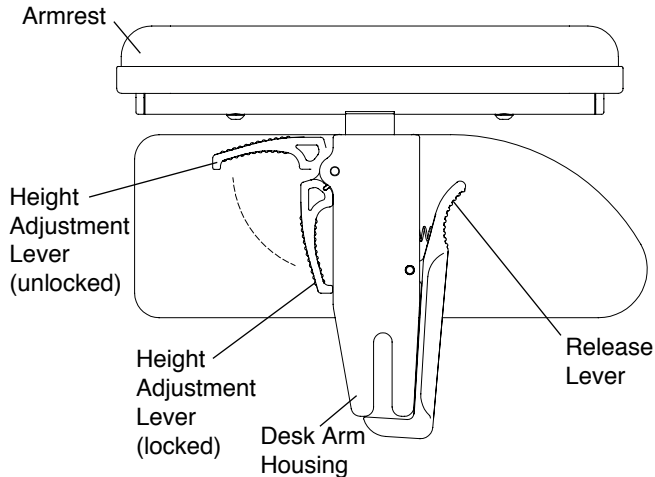
## Removing

1. To remove the desk arm assembly, press and hold the release lever. See Figure 5-4.
2. While holding the release lever, lift the desk arm assembly to remove it from the desk arm mount. See Figure 5-5.

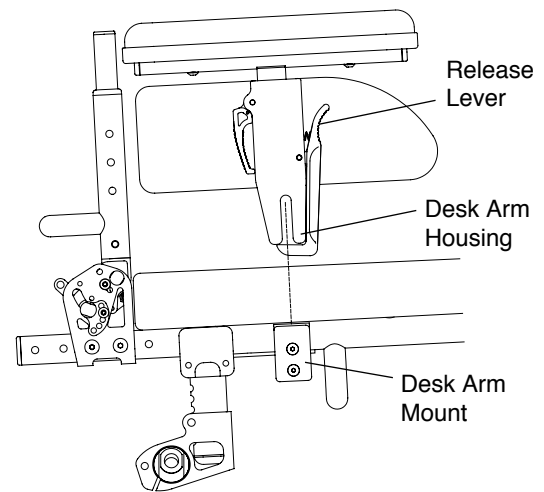
## Replacing

Slide the desk arm bracket into the desk arm mount. See Figure 5-5.

**Figure 5-4**  
**Removable Desk Arm**



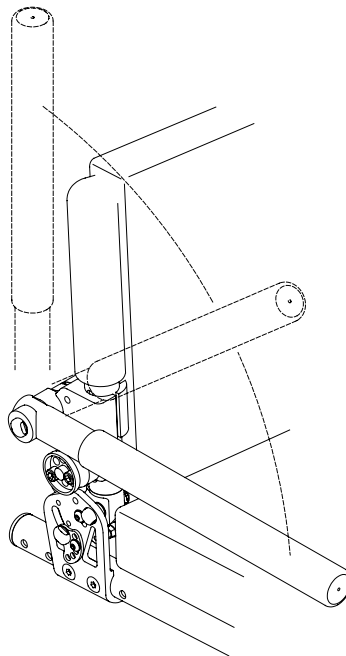
**Figure 5-5**  
**Mounting Desk Arm**



## Flip-Back Tubular Armrest

To flip back the armrest, raise the front of the armrest and rotate it straight back as far as possible. Reverse this procedure to return the armrest to its original position. See Figure 5-6.

**Figure 5-6**  
**Flip-Back Armrest**



## Adjusting the Armrest Height

Tools Needed:

- 3/16" Allen Wrench

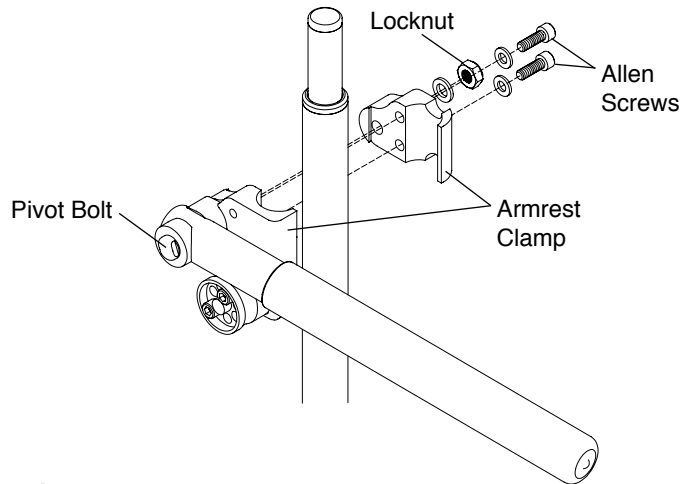
1. Loosen but do not remove the two Allen screws securing the armrest clamp to the backrest. See Figure 5-7.
2. Loosen but do not remove the locknut which secures the pivot bolt.
3. Slide the armrest to the desired height on the backrest.
4. Securely tighten the Allen screws and locknut.
5. Follow Steps 1 through 4 on the other side of the chair. Make sure the armrest is set at the same height on both sides of the chair.

# CHAPTER 5: ARMRESTS

## ⚠ WARNING

Make sure the Flip Back Tubular Armrest is securely tightened on the backrest before applying weight to the armrest. *If you ignore this Warning, you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

**Figure 5-7**  
**Adjusting the Armrest Height**



## Adjusting the Armrest Angle

Tools Needed:

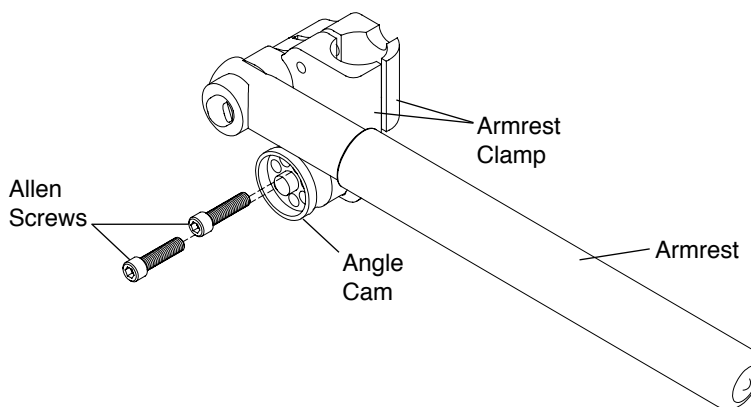
- 3/16" Allen Wrench

1. To adjust the angle at which the armrest sits when in the down position, remove the two Allen screws which secure the angle cam to the armrest clamp. See Figure 5-8.
2. Raise the armrest to the desired angle at which the armrest sits in the down position. Align two holes in the angle cam with two holes in the armrest clamp. Reinstall the two Allen screws.
3. Securely tighten the Allen screws.
4. Follow Steps 1 through 3 on the other side of the chair.

## ⚠ WARNING

Make sure that the Allen screws in the angle cam are securely tightened to the armrest clamp before applying weight to the armrest. *If you ignore this Warning, you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

**Figure 5-8**  
**Adjusting the Armrest Angle**



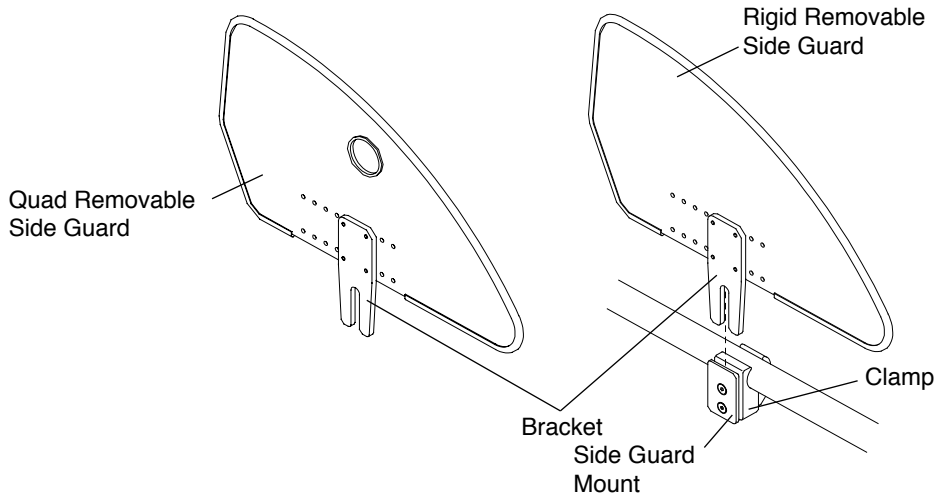
## ⚠ WARNING

The threads on the Allen screws that secure the angle cam to the armrest clamp have been treated with a Vibra-TITE® VC-3, a locking and sealing coating, to reduce the possibility that they will become loose. You should be able to adjust the angle of the armrest approximately four times without reapplying thread lock to these screws. TiLite requires that you reapply Vibra-TITE® VC-3 after every fourth adjustment. *If you ignore this Warning, your backrest posts could become loose or disconnected from the wheelchair, and you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## Rigid Removable and Quad Removable Side Guards (Aluminum and Carbon Fiber)

To remove either type of Rigid Side Guard, lift the side guard out of the side guard mount by grasping it at the top or place finger in the hole and pull it upward. See Figure 6-1. To replace, place the bracket into the slot between the side guard mount and the clamp and push down.

**Figure 6-1**  
**Rigid Side Guards**



### Adjusting

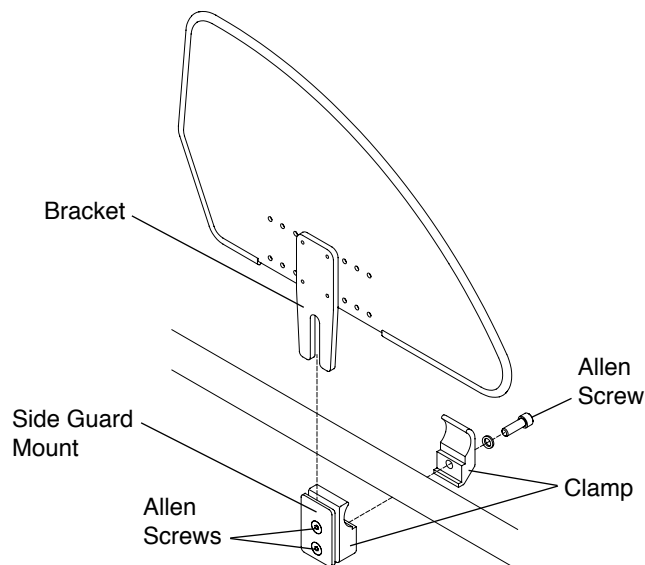
Tools Needed:

- 1/8" Allen Wrench

You can adjust the “snugness” of the fit of the side guard bracket in the side guard mount by loosening or tightening the two Allen screws in the side guard mount. See Figure 6-2.

Either type of Rigid Side Guard can be made “non-removable” by firmly tightening the two Allen screws in the side guard mount while the side guard is installed.

**Figure 6-2**  
**Replacing Rigid Side Guard**



# CHAPTER 6: SIDE GUARDS

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## Removing

Tools Needed:

- 3/16" Allen Wrench

To remove the entire side guard assembly, including the clamp:

1. Remove the side guard from the side guard mount.
2. Remove the Allen screw that secures the two halves of the clamp to the frame. See Figure 6-2.

## Reinstalling

Tools Needed:

- 3/16" Allen Wrench

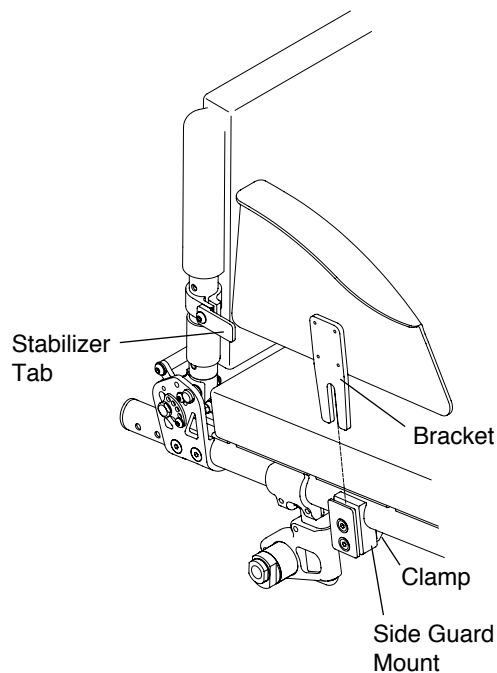
1. Align the two halves of the clamp around the seat tube of the chair frame. See Figure 6-2.
2. Insert the Allen screw into the two halves of the clamp and securely tighten.
3. Insert the side guard bracket into the side guard mount and adjust the two Allen screws as described under "Rigid Removable and Quad Removable Side Guards – Adjusting" on page 6-1.

## Fendered Carbon Fiber Side Guard

To remove the Fendered Side Guard, lift the side guard out of the side guard mount. To replace, place the bracket into the slot between the side guard mount and the clamp. Make sure the rearward end of the side guard is inside the stabilizer tab. See Figure 6-3.

To adjust the fendered side guards, see "Rigid Removable and Quad Removable Side Guards – Adjusting" on page 6-1.

**Figure 6-3**  
**Fendered Carbon Fiber Side Guard**





# CHAPTER 7: BACK UPHOLSTERY, SEAT UPHOLSTERY AND SEAT CUSHIONS

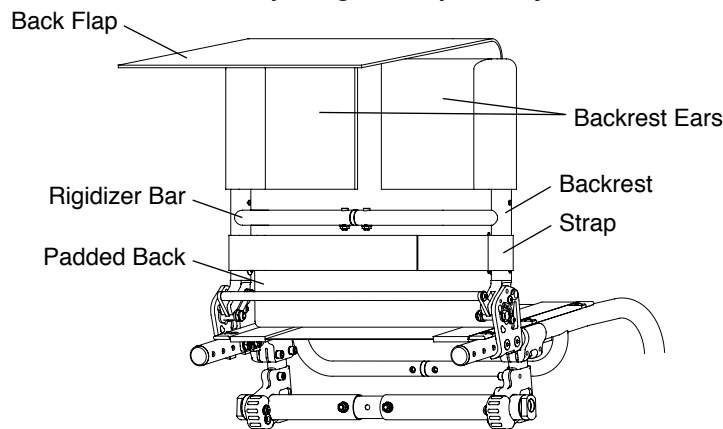
## Velcro®-Style Adjustable Back Upholstery

**Note:** When adjusting the tension of the back upholstery, DO NOT apply so much tension that the backrest tubes are pulled out of vertical. If this occurs, you may cause the chair to “track” improperly or to develop a “floater.”

### Adjusting the Tension

1. Lift the back flap to expose the backrest ears. See Figure 7-1.
2. Completely detach the two backrest ears from the padded back, but do not remove them from the backrest.
3. Adjust to the desired tautness. The closer together the two backrest ears, the more taut the padded back will be. The farther apart the two backrest ears, the looser the padded back will be. Tighter back upholstery will increase the stability and maintain normal maneuverability of the chair because the user is pushed forward slightly. Looser back upholstery will increase maneuverability, but will make the chair more prone to tip over backward because additional weight is being distributed behind the rear wheels.
4. Align the top of the padded back with the two backrest ears to ensure that the top of the back upholstery is even with the top of the backrest.
5. If desired adjust the tension of the strap.
6. Securely attach the padded back to the backrest ears using the Velcro®-style material and lower the back flap back into position in front of the rigidizer bar.

**Figure 7-1**  
**Adjusting Back Upholstery**



### Replacing

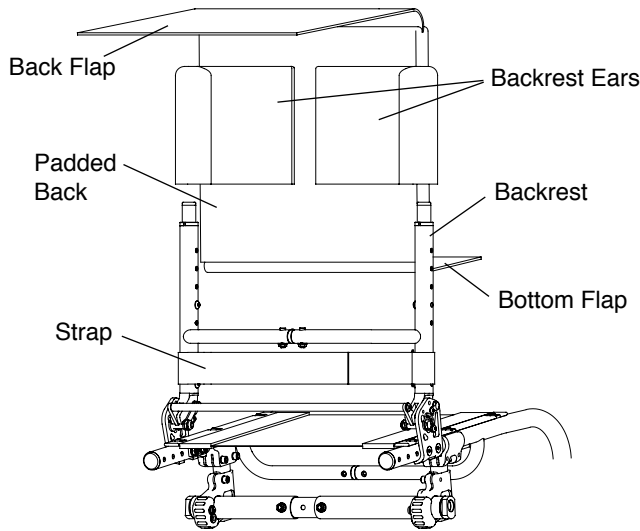
1. Lift the back flap to expose the backrest ears. See Figure 7-2.
2. Completely detach the two backrest ears and strap from the padded back and remove them from the backrest.

**Note:** If your chair has Integrated or Fold-Down Push Handles, you will need to remove the bolts that secure the backrest ears to the backrest (using a 1/8" Allen wrench) and the bolts that secure the backrest posts inside the backrest (using a 5/32" Allen wrench). See Figure 7-3 and see “Folding Aluminum Adjustable Height Backrest – Adjusting the Backrest Height” on page 4-3.

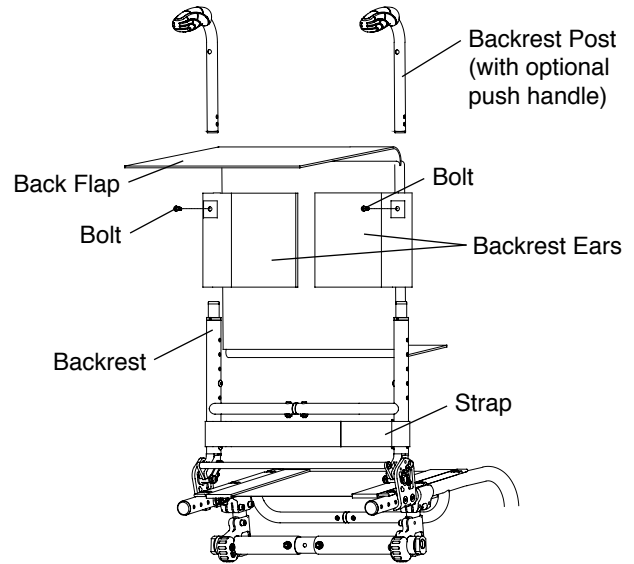
3. Remove the seat cushion.
4. Detach the bottom flap from the seat upholstery.
5. Attach the bottom flap of the new back upholstery to the seat upholstery.
6. Install the two new backrest ears on the backrest.
7. Adjust to the desired tautness. See “Velcro®-Style Adjustable Back Upholstery – Adjusting the Tension” on page 7-1.
8. Align the top of the padded back with the two backrest ears to ensure that the top of the back upholstery is even with the top of the backrest.
9. Reinstall the strap and adjust to the desired tautness.
10. Securely attach the padded back to the backrest ears and lower the back flap back into position in front of the rigidizer bar.
11. Replace the seat cushion.

# CHAPTER 7: BACK UPHOLSTERY, SEAT UPHOLSTERY AND SEAT CUSHIONS

**Figure 7-2**  
**Replacing Back Upholstery**



**Figure 7-3**  
**Adjusting Back Upholstery with Push Handles**



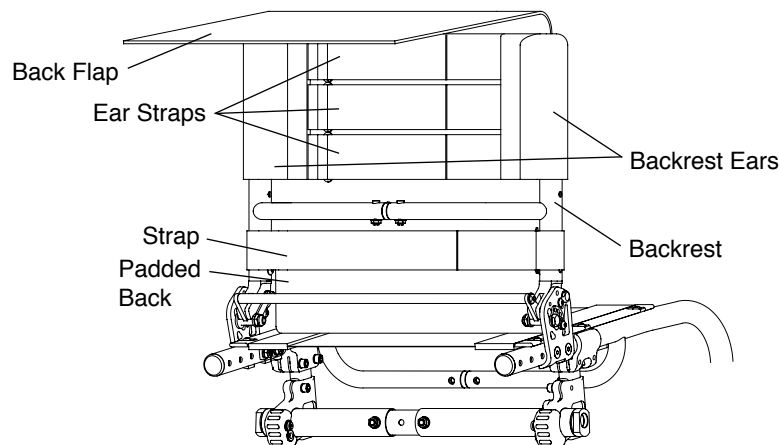
## Tension Adjustable by Straps Back Upholstery

**Note:** When adjusting the tension of the back upholstery, DO NOT apply so much tension that the backrest tubes are pulled out of vertical. If this occurs, you may cause the chair to “track” improperly or to develop a “floater.”

### Adjusting the Tension

1. Lift the back flap to expose the backrest ears. See Figure 7-4.
2. Completely detach the padded back from the backrest ears. Do not remove the backrest ears from the backrest.
3. Adjust to the desired tautness by loosening the ear straps and then pulling on the loose end to pull the backrest ears closer together. Tighter back upholstery will increase the stability and maintain normal maneuverability of the chair because the user is pushed forward slightly. Looser back upholstery will increase maneuverability, but will make the chair more prone to tip over backward because additional weight is being distributed onto the rear wheels.
4. Align the top of the padded back with the two backrest ears.
5. If desired adjust the tension on the strap(s).
6. Securely attach the padded back to the backrest ears and lower the back flap back into position in front of the rigidizer bar.

**Figure 7-4**  
**Adjusting Tension Adjustable Back Upholstery**



# CHAPTER 7: BACK UPHOLSTERY, SEAT UPHOLSTERY AND SEAT CUSHIONS

## Replacing

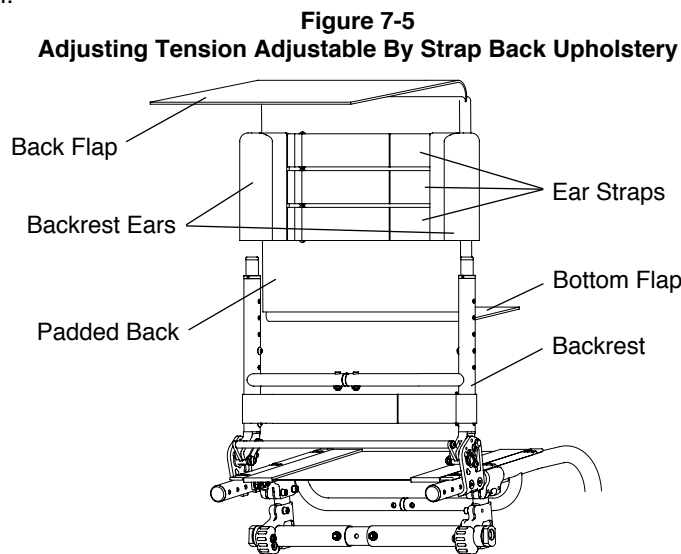
1. Lift the back flap to expose the backrest ears. See Figure 7-5.
2. Completely detach the backrest ears and the strap(s) from the padded back and remove them from the backrest.

**Note:** If your chair has Integrated or Fold-Down Push Handles, you will need to remove the bolts that secure the backrest ears to the backrest (using a 1/8" Allen wrench) and the bolts that secure the backrest posts inside the backrest (using a 5/32" Allen wrench). See Figure 7-3 and see "Folding Aluminum Adjustable Height Backrest – Adjusting the Backrest Height" on page 4-3.

3. Remove the seat cushion.
4. Detach the bottom flap from the seat upholstery at the underside of the seat upholstery.

**Note:** On chairs with depth adjustable backrests, the back upholstery attaches to the top of the seat upholstery.

5. Attach the bottom flap of the new back upholstery to the seat upholstery at the underside of the seat upholstery
6. Install the new backrest ears on the backrest.
7. Adjust to the desired tautness. See "Tension Adjustable by Straps Back Upholstery – Adjusting the Tension" on page 7-2.
8. Align the top of the padded back with the backrest ears.
9. Reinstall the strap(s) and adjust to the desired tautness.
10. Securely attach the padded back to the backrest ears and lower the back flap back into position in front of the rigidizer bar.
11. Replace the seat cushion.



## Tension Adjustable Bolt-On Seat Upholstery

### ⚠ WARNING

Do not make the tension of the seat sling upholstery so loose that it does not properly support your weight. You must never permit the sling to become so loose that your weight is borne by the crosstube below the seat sling. *If you ignore this Warning, you may develop pressure sores, which can be a life-threatening medical complication.*

### Adjusting the Tension

Tools required:

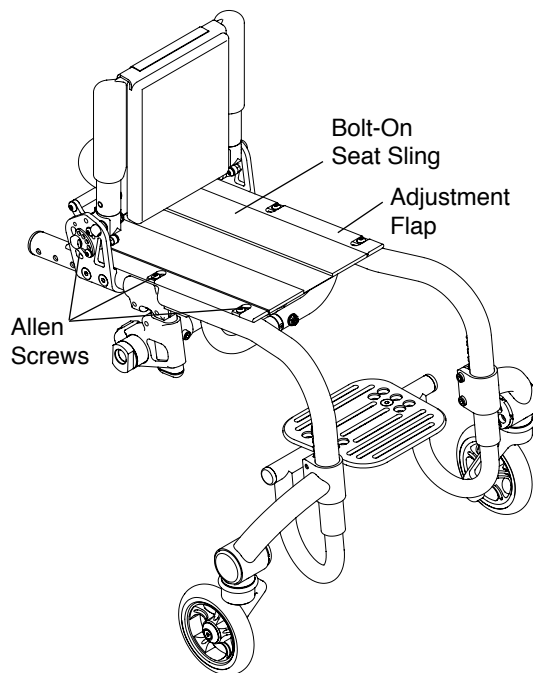
- 1/8" Allen Wrench

1. Remove the seat cushion.
2. Detach the back upholstery from the seat upholstery (see "Velcro®-Style Adjustable Back Upholstery" or "Tension Adjustable by Straps Back Upholstery" on pages 7-1 to 7-3).

## CHAPTER 7: BACK UPHOLSTERY, SEAT UPHOLSTERY AND SEAT CUSHIONS

3. Loosen, but do not remove, the Allen screws on the side of the seat upholstery where the adjustment flap is located on the underside of the seat upholstery. See Figure 7-6.
4. Detach the adjustment flap, adjust the seat upholstery to the desired tension, and re-secure the adjustment using the Velcro®-style material.
5. Retighten the Allen screws that attach the seat upholstery to the frame.
6. Reattach the back upholstery to the seat upholstery and replace the seat cushion.

**Figure 7-6**  
**Adjusting/Replacing**



### Replacing

Tools required:

- 1/8" Allen Wrench

1. Remove the seat cushion.
2. Detach the back upholstery from the seat upholstery (see "Velcro®-Style Adjustable Back Upholstery" or "Tension Adjustable by Straps Back Upholstery" on pages 7-1 to 7-3).
3. Remove all bolts that attach the seat upholstery to the chair frame. See Figure 7-6.
4. Remove the Bolt-On Seat Sling.
5. If your replacement upholstery included new aluminum seat rails, proceed to Step 6. If not, remove the aluminum seat rails from old upholstery and insert them into the new upholstery.
6. Place the new seat upholstery on the frame and align the fastening holes in the upholstery and aluminum seat rails with the holes in the seat tubes of the frame.
7. Loosely install all the bolts on the side of the seat sling where the adjustment flap is located.
8. Install all the bolts on the opposite side of the seat sling and securely tighten.
9. Detach the adjustment flap and adjust the seat upholstery to the desired tension.
10. Fully tighten the bolts that attach the seat upholstery to the frame.
11. Reattach the bottom of the back upholstery to the seat upholstery and replace the seat cushion.

### Solid Aluminum Seat Pan

#### Removing/ Replacing

Tools required:

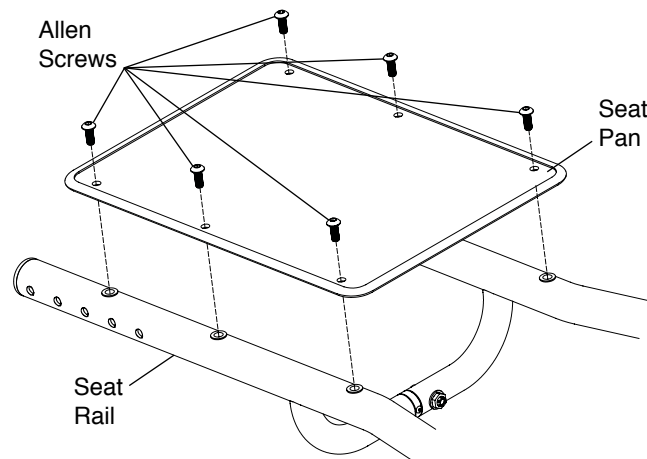
- 1/8" Allen Wrench

1. Remove the seat cushion.
2. Remove the Allen screws attaching the seat pan to the seat rail. See Figure 7-7.

# CHAPTER 7: BACK UPHOLSTERY, SEAT UPHOLSTERY AND SEAT CUSHIONS

3. Align the holes of your new replacement seat pan with the holes on the seat rails.
4. Finger tighten the 6 new Allen screws (three on each side).
5. Securely tighten the Allen screws.
6. Replace the seat cushion.

**Figure 7-7**  
**Removing/Replacing**



## Seat Cushions

### Replacing the Foam Insert in the TiLite Seat Cushion

1. Lift up and remove the existing seat cushion from the seat upholstery.
2. Unzip the seat cushion cover and remove the foam insert.
3. Insert the new foam insert into the seat cushion cover.
4. Close the seat cushion cover and replace on the chair.

For seat cushions manufactured by manufacturers other than TiLite (e.g. Corbee, StimuLite, Roho, Varilite), consult the owner's manual provided by the applicable manufacturer.

### Velcro®-Style Adjustable Seat Belt

#### ⚠ WARNING

Installation of the Velcro®-Style Seat Belt must be performed by an authorized TiLite dealer or qualified technician. *If you ignore this Warning, serious injury may result.*

#### ⚠ WARNING

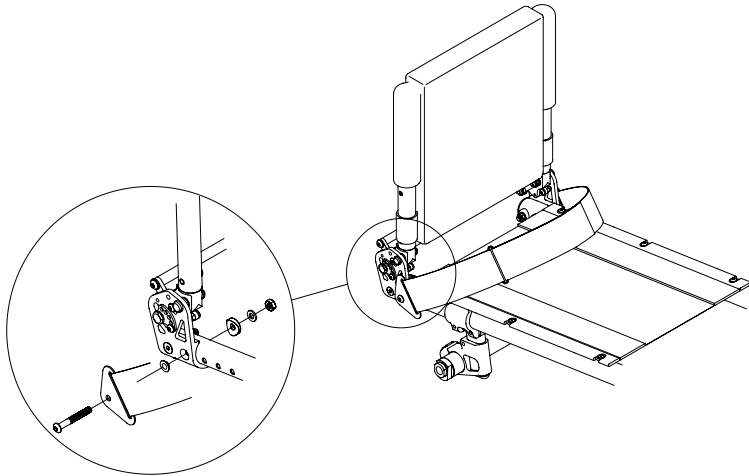
The Velcro®-Style Seat Belt must be worn tightly fitted across the lower pelvis or thighs at all times. A loose belt can allow the user to slip down and create a risk of strangulation. Have your seating specialist demonstrate its proper adjustment and use. See Figures 7-8 and 7-9. Accidental release of the Velcro®-Style Seat Belt can allow the user to slip down or fall from the wheelchair. If the user's movements or cognitive abilities could lead to accidental release, a caregiver must be present at all times during its use. Ensure that all caregivers know how to unfasten the product. Failure to do so may delay release in an emergency. As with any new seating support, the Velcro®-Style Seat Belt may change the way a person sits. Users must continue to practice regular pressure relief activities and skin integrity checks, not only where this product contacts the user, but also in primary pressure-bearing areas such as the sacrum, legs, and buttocks. If increased skin redness or irritation occurs, discontinue use and consult your physician or seating specialist. Failure to do so may result in serious injury, such as pressure ulcers. *If you ignore any of these Warnings, you may incur serious or life-threatening injuries.*

#### Installation

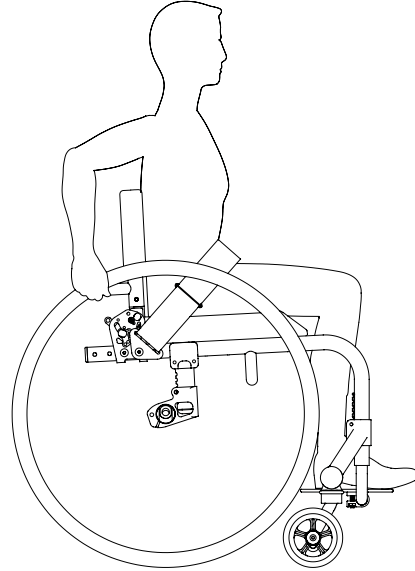
The seat belt must be installed as shown in Figure 7-9.

# CHAPTER 7: BACK UPHOLSTERY, SEAT UPHOLSTERY AND SEAT CUSHIONS

**Figure 7-8**  
Velcro®-Style Seat Belt with D-Ring



**Figure 7-9**  
Proper Belt Position for Belt with D-Ring



## Adjustment

When the belt is properly adjusted and tightened, it should fit snug so that the user's pelvis is secure. See Figure 7-9. If length adjustment is necessary to achieve a good fit or to remove the belt for cleaning, this can be done using the belt end fittings.

## Safety Check

When properly positioned in the wheelchair, the wheelchair user should lean forward and side to side to check the fit. Check for:

1. Normal operation of adjustment straps.
2. Comfort: look for areas of irritation.
3. Position: if too high or too low, adjust anchor points.
4. Interference with other devices: relocate anchor points as necessary.
5. Move chair through full range of motion, including folding, and rolling. Check for any interference.

## Maintenance

Check periodically for signs of wear in the stitching and webbing. If significant wear is found, contact your supplier for qualified repair or replacement by TiLite.

# CHAPTER 8: AXLE PLATES AND CAMBER PLUGS (CENTER OF GRAVITY; REAR SEAT HEIGHT)

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The Twist is equipped with a camber tube. By adjusting the position of the camber tube, you can adjust the center of gravity of your chair. You also can adjust the rear seat height. This chapter explains the various adjustments that are possible. The same adjustment will apply regardless of the degree of camber.

## **⚠ WARNING**

Any changes to the position of the camber tube will affect the stability of the chair. Use extreme caution when using a new camber tube position as the new position may make the chair more prone to tip over. *If you ignore this Warning, your chair may not perform properly, which in turn, may cause you to fall, tip over or lose control of the chair and seriously injure yourself or others or damage the chair.*

## **⚠ WARNING**

Whenever you adjust the position of the camber tube (either to adjust the rear seat height or the center of gravity), it may be necessary to adjust the toe-in/toe out of the rear wheels. See “Adjusting Toe-In/Toe-Out” on pages 8-3 to 8-4. In addition, whenever you adjust the position of the camber tube or when you adjust the toe-in/toe-out, it may be necessary to square the casters to the floor. See “Angle Adjustable Speedloader Caster Mount – Adjusting the Angle” on page 11-8. *If you ignore this Warning, your chair may not perform properly, which, in turn, may cause you to fall, tip over or lose control of the chair and seriously injure yourself or others or damage the chair.*

**Note:** It is recommended that you remove the rear wheels and turn the chair upside down before attempting to make any adjustments described in this chapter.

## **Camber Mounts**

### **Adjusting the Rear Seat Height**

Tools Needed:

- 3/16” Allen Wrench

1. Note the original position of the camber tube clamp relative to the notches on the vertical strut. See Figure 8-1.
2. Remove the two Allen screws (one on each side) and washers that secure the camber tube clamps to the vertical struts.
3. Reposition the camber tube clamp to the desired height. Notches are 3/8” apart.

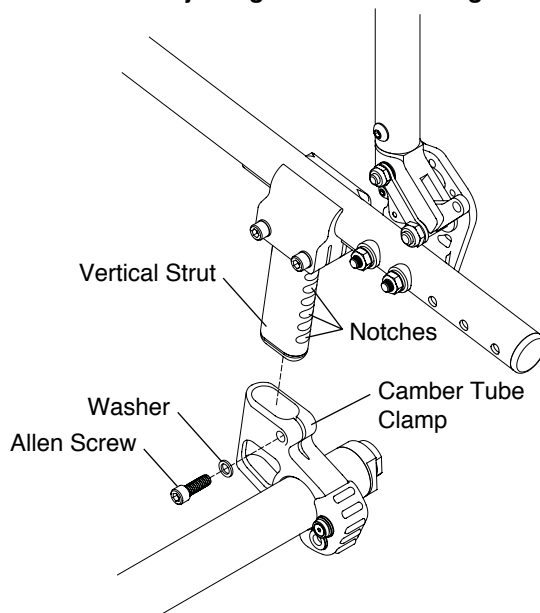
**Note:** Vertical struts come in three sizes, short, medium and long. If you are not able to achieve the desired seat height with your existing vertical strut, you may need to purchase longer or shorter struts.

4. Make sure the identical notches are used on both vertical struts.
5. Reinstall the two Allen screws (one on each side) and washers and securely tighten.
6. Check the toe-in/toe-out and adjust as needed, and square the casters as needed. See pages 8-3 and 8-4.

# CHAPTER 8: AXLE PLATES AND CAMBER PLUGS (CENTER OF GRAVITY; REAR SEAT HEIGHT)

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**Figure 8-1**  
**Adjusting the Rear Seat Height**



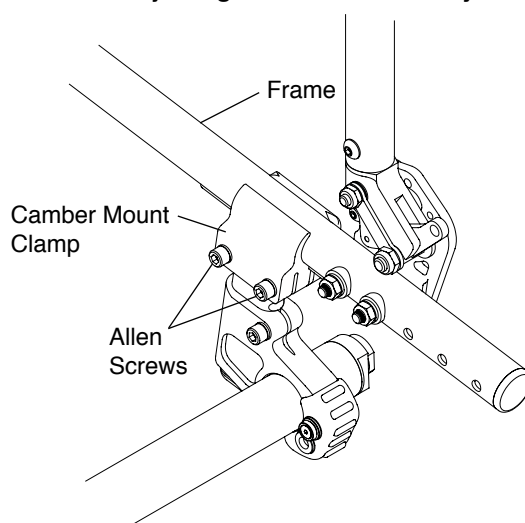
## **Adjusting the Center of Gravity**

Tools Needed:

- 3/16" Allen Wrench
- Ruler

1. Loosen, but do not remove, the four Allen screws (two on each side of the chair) that secure the camber mount clamps to the frame. See Figure 8-2.
2. Slide the camber mount clamps forward or rearward along the frame until it is positioned in the desired location. Use a ruler to ensure the camber mount assemblies on both sides of the chair are the same distance from the ends of the frame tubes.
3. Securely tighten the four Allen screws.
4. Check the rear seat height and adjust as needed.
5. Check the toe-in/toe-out and adjust as needed and square the casters as needed. See pages 8-3 and 8-4.

**Figure 8-2**  
**Adjusting the Center of Gravity**





# CHAPTER 8: AXLE PLATES AND CAMBER PLUGS (CENTER OF GRAVITY; REAR SEAT HEIGHT)

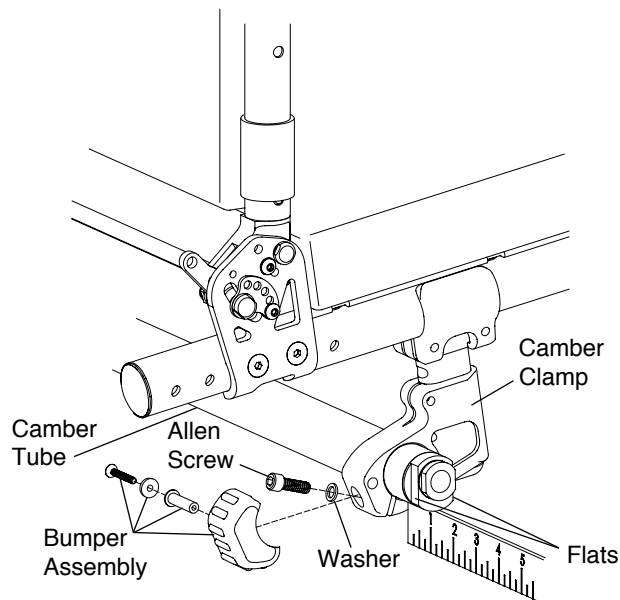
## Replacing the Camber Tube

Tools Needed:

- 3/16" Allen Wrench
- 5/64" Allen Wrench
- Ruler

1. Remove the rear wheels.
2. Using the 5/64" Allen wrench, remove the bumper assembly, making note of the order in which the parts are assembled.
3. Loosen, but do not remove, the Allen screw that secures the camber tube to each camber clamp. See Figure 8-3.
4. Remove the camber tube.
5. Install the new camber tube, making sure the distance from the outside edge of the camber clamp to the end of the camber tube is identical on each side of the chair.
6. Make sure that the camber plug flats are perpendicular to the ground and that the camber is oriented properly.
7. Securely tighten both Allen screws.
8. Reinstall the bumper assembly.
9. Reinstall the rear wheels.
10. Check the toe-in/toe-out and adjust as needed and square the casters. See pages 8-3 and 8-4.

**Figure 8-3**  
**Replacing the Camber Tube**



## Adjusting Toe-In/Toe-Out

Tools Needed:

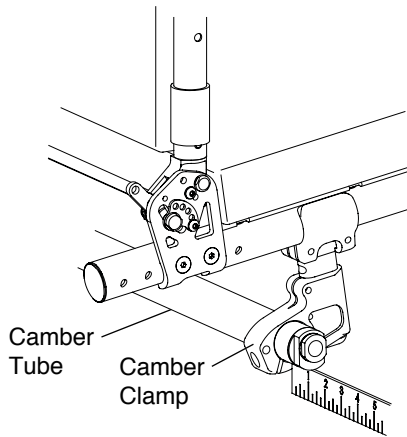
- 3/16" Allen Wrench
- 7/8" Open End Wrench
- Ruler or Tape Measure

**Note:** Adjusting toe-in/toe-out does not apply to chairs with 0° camber; however, it is still necessary to make sure that the camber plug flats are perpendicular to the ground.

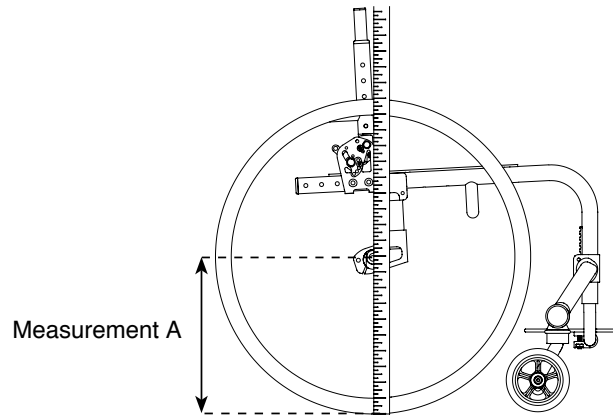
1. Make sure the distance from the end of the camber tube to the camber clamp is identical on both sides of the chair. See Figure 8-4.
2. Make sure the rear wheels are properly inflated.
3. Place the chair on all four wheels with the casters trailing toward the rear of the frame. See Figure 8-5.

# CHAPTER 8: AXLE PLATES AND CAMBER PLUGS (CENTER OF GRAVITY; REAR SEAT HEIGHT)

**Figure 8-4**  
Adjusting the Toe-In/Toe-Out

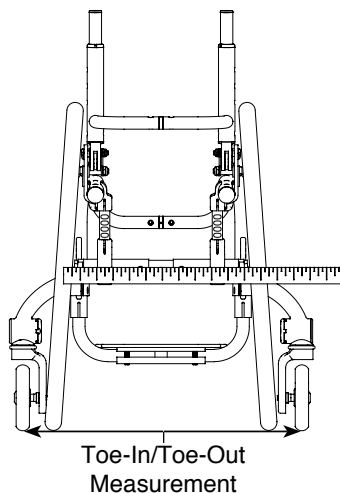


**Figure 8-5**  
Adjusting the Toe-In/Toe-Out

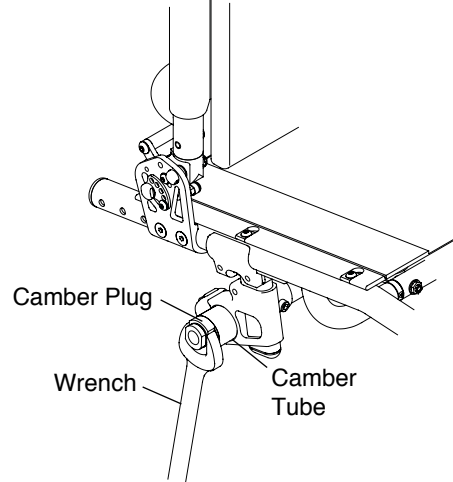


4. Measure from the floor to the center of the axle (“Measurement A”). Be sure the tape measure/ruler is perpendicular to the floor.
5. Block the wheels with a heavy object so the chair can not roll forward or backward (do not use the wheel locks as this may affect the toe-in/toe-out adjustment).
6. Measuring from the floor at the rear of each tire, mark the tire (with a felt tip pen) at the same height as Measurement A.
7. Measuring from the floor at the front of each tire, mark the tire (with a felt tip pen) at the same height as Measurement A.
8. Measure the distance between the left and right tires at the rear reference marks made in Step 6. See Figure 8-6.
9. Measure the distance between the left and right tires at the front reference marks made in Step 7.
10. If the measurements in Steps 8 and 9 are the same (within 1/8”), no toeing adjustment is needed, and you may skip to Step 13. If not, proceed to Step 11.
11. Loosen the Allen screw in each camber clamp that secures the camber tube in place.
12. If the measurement in Step 9 is less than the measurement in Step 8, rotate the camber tube using the 7/8” Open End wrench rearward to toe-out the rear wheels. If the measurement in Step 9 is greater than the measurement in Step 8, rotate the camber tube using the 7/8” Open End wrench forward to toe-in the rear wheels. Continue adjusting the camber tube until these two measurements are equal. See Figure 8-7.
13. Securely tighten the Allen screws in the camber tube mount.
14. Square the casters to the floor.

**Figure 8-6**  
Adjusting the Toe-In/Toe-Out



**Figure 8-7**  
Adjusting the Toe-In/Toe-Out



## ⚠ WARNING

Do not attempt any of the procedures in this chapter when the chair is occupied. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## Stainless and Titanium Quick Release Axles

### Adjusting

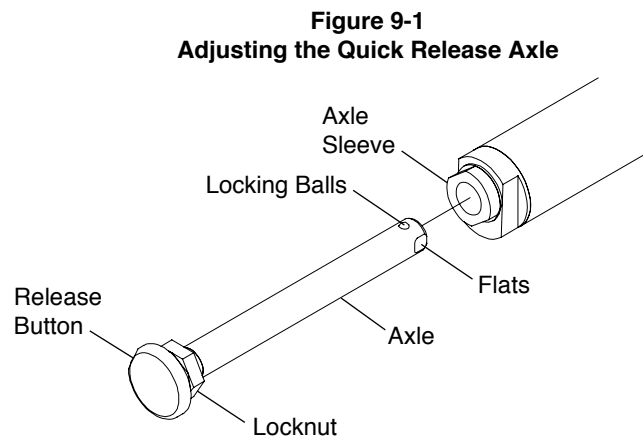
## ⚠ WARNING

Quick Release Axles are pre-adjusted to permit minimal “play” in the axle. TiLite recommends that you do not adjust the axle. Improperly adjusting the axle could cause it to malfunction—too much “play” can cause the axle to bend and become stuck in the axle sleeve; too little “play” can prevent the locking balls from engaging fully, causing the wheel to disengage from the chair without warning. TiLite recommends that an authorized TiLite dealer make any adjustments. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### Tools Needed:

- 3/4” End Wrench
- 7/16” End Wrench

1. Depress the release button and remove the rear wheel and Quick Release Axle. See Figure 9-1.
2. Remove the axle from the wheel by depressing the release button and sliding the axle through the rear wheel hub.
3. Once removed from the hub, release the release button (the locking balls should be fully extended).
4. Increase or decrease axle “play” by adjusting the locknut while securing the opposite end of the axle using the smaller wrench at the flats at the end of the axle.
5. Depress the release button on the Quick Release Axle and slide the axle through the rear wheel hub.
6. Depress the release button and reinstall the rear wheel into the axle sleeve.
7. Before riding in the chair, make sure the locking balls have fully secured the wheel in the axle sleeve by pulling on the hub without depressing the release button on the Quick Release Axle. If the locking balls do not fully engage, repeat these procedures and increase the “play” (i.e., increase the distance between the locknut and the locking balls) to permit the locking balls to fully engage properly. Also, check to make sure there is not too much “play” in the axle.



# CHAPTER 9: AXLES

## Quad Release Axles

### Adjusting the Handle

#### ⚠ WARNING

Quad Release Axles are pre-adjusted to permit minimal “play” in the axle. TiLite recommends that you do not adjust the axle. Improperly adjusting the axle could cause it to malfunction—too much “play” can cause the axle to bend and become stuck in the axle sleeve; too little “play” can prevent the locking balls from engaging fully, causing the wheel to disengage from the chair without warning. TiLite recommends that an authorized TiLite dealer make any adjustments. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

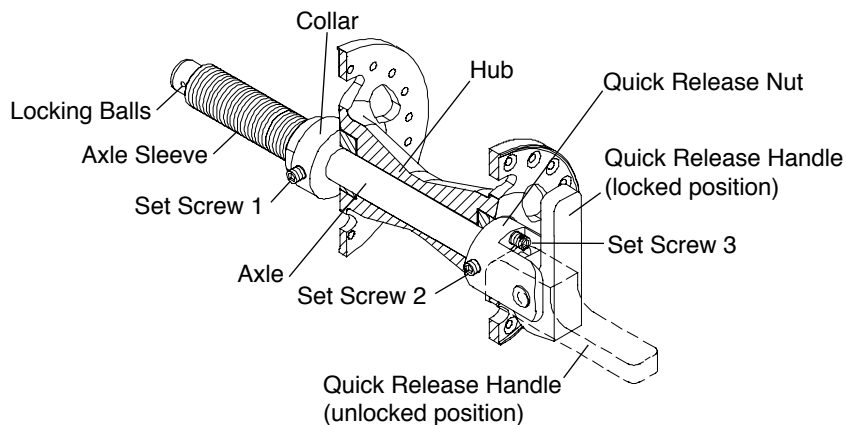
If the release handle does not flip back and forth from locked to unlocked properly, or if you cannot fully engage it in the locked position or the unlocked position, the procedure below will permit you to adjust the operation of the handle.

#### Tools Needed:

- 5/64” Allen Wrench

1. Flip the quick-release handle to the unlocked position and remove the rear wheel and Quad Release Axle. See Figure 9-2.
2. Flip the quick release handle to the locked position.
3. To adjust the “play” between the quick release handle and the release button inside the quick release nut: (a) loosen Set screw 2 on the quick release nut; (b) rotate the quick-release nut clockwise or counter-clockwise on the axle until the release button inside the quick release nut just touches the release handle while it is in the locked position; and (c) tighten Set screw 2.
4. Adjusting the “play” in the quick release handle may necessitate an adjustment to the “play” between the collar and the wheel hub. See “Quad Release Axles – Adjusting the Play” on page 9-3.
5. With the quick release handle in the unlocked position, reinstall the rear wheel on the chair.
6. Before riding in the chair, make sure the locking balls have fully secured the wheel in the axle sleeve by pulling on the hub with the release handle in the locked position. If the locking balls do not fully engage, repeat these procedures to increase the “play” (i.e., increase the distance between the quick release nut and the locking balls), to permit the locking balls to fully engage properly. Also, check to make sure there is not too much play in the axle. See “Quad Release Axles – Adjusting the Play” on page 9-3.

**Figure 9-2**  
**Quad Release Axle Adjustment**



#### ⚠ WARNING

The threads on the set screws on the Quad Release Axles assemblies are treated with Loctite® 242®, a medium strength thread lock. If you loosen any set screw, you MUST remove and reapply Loctite® 242® or an equivalent medium strength thread lock. *If you ignore this Warning, your rear wheel could become loose or fall off and you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### Adjusting the “Play”

#### **⚠ WARNING**

Quad Release Axles are pre-adjusted to permit minimal “play” in the axle. TiLite recommends that you do not adjust the axle. Improperly adjusting the axle could cause it to malfunction—too much play can cause the axle to bend and become stuck in the axle sleeve; too little play can prevent the locking balls from engaging fully, causing the wheel to disengage from the chair without warning. TiLite recommends that an authorized TiLite dealer make any adjustments. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

If there is too much “play” in the axle so the wheel is loose when locked into position in the axle sleeve or too little “play” so the locking balls do not properly engage, follow this procedure:

Tools Needed:

- 5/64” Allen Wrench

1. Flip the quick release handle to the unlocked position and remove the rear wheel and Quad Release Axle. See Figure 9-2.
2. Adjust Set screw 3 on the quick release nut so that no portion of Set screw 3 is protruding out of the opposite side of the quick release nut (the side adjacent to the wheel hub).
3. Loosen Set screw 1 on the collar.
4. Replace the wheel on the chair.
5. With the wheel still on the chair and the quick release handle in the locked position so the locking balls are fully engaged, securely tighten Set screw 1 so the collar is securely on the axle sleeve.
6. With the release handle in the unlocked position, turn Set screw 3 clockwise to remove any remaining “play” between the wheel hub and collar.
7. Flip the quick release handle to the locked position and check the “play” in the axle. Make sure the locking balls fully engage and lock the axle into the camber tube. If there is still too much “play” in the axle, repeat the procedure in Step 6. If you have taken too much “play” out of the axle, repeat the procedure in Step 6, but turn Set screw 3 counter-clockwise to add “play” to the axle.
8. Before riding in the chair, check the “play” in the wheel and check to make sure the locking balls have fully secured the axle inside the axle sleeve by pulling on the hub with the quick release handle in the locked position. If the locking balls do not properly engage or there is too much “play”, return to Step 1 and repeat this procedure.

#### **⚠ WARNING**

The threads on the set screws on the Quad Release Axle assemblies are treated with Loctite® 242®, a medium strength thread lock. If you loosen any set screw, you **MUST** remove and reapply Loctite® 242® or an equivalent medium strength thread lock. *If you ignore this Warning, your rear wheel could become loose or fall off and you could fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*



## ⚠ WARNING

TiLite recommends that you remove the wheel locks from your chair frame prior to engaging in any contact sport. *If you ignore this Warning, you may seriously injure yourself or others or damage the wheelchair.*

## ⚠ WARNING

The wheel stop must embed at least 3/16" into the tire or the chair may roll unexpectedly. Therefore, before adjusting the lock you must inflate the tires to the recommended tire pressure (see sidewall of the tire). If you adjust the locks when the tires are under-inflated, the lock will not operate properly when the tire is fully inflated. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## ⚠ WARNING

After adjusting the wheel locks, engage the wheel locks and push against the tires to verify that the wheel locks prevent the wheels from moving. If not, readjust the wheel locks until the wheel locks securely prevent the chair from rolling. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

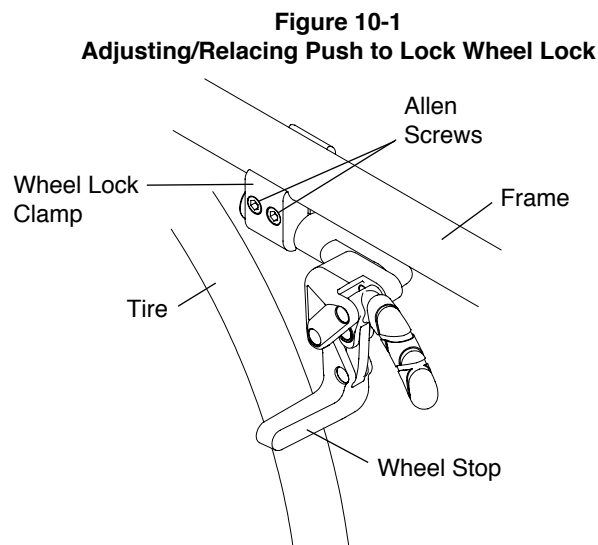
## Compact Composite Push to Lock

### Adjusting

Tools Needed:

- 3/16" Allen Wrench

1. Loosen the Allen screws in the wheel lock clamp. See Figure 10-1.
2. Adjust the position of the wheel lock clamp on the frame so the wheel stop embeds at least 3/16" into the tire when engaged in the locked position.
3. Securely tighten the two Allen screws that secure the wheel lock clamp to the frame.



### Replacing

Tools Needed:

- 3/16" Allen Wrench

1. Loosen the two Allen screws that secure the wheel lock clamp to the frame. See Figure 10-1.
2. Slide the wheel lock out of the clamp.
3. Slide the new wheel lock into the wheel lock clamp, but do not tighten the Allen screws.
4. Follow the procedures under "Compact Composite Push to Lock – Adjusting" on page 10-1 to position and secure the new wheel lock.

# CHAPTER 10: WHEEL LOCKS

## Compact Composite Pull to Lock

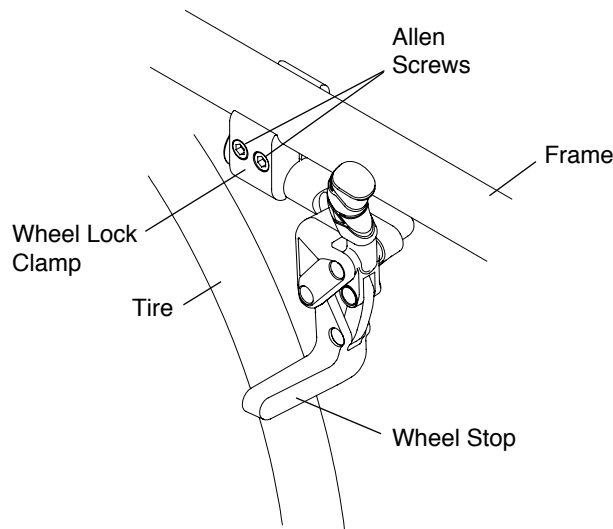
### Adjusting

Tools Needed:

- 3/16" Allen Wrench

1. Loosen the Allen screws in the wheel lock clamp. See Figure 10-2.
2. Adjust the position of the wheel lock clamp on the frame so the wheel stop embeds at least 3/16" into the tire when engaged in the locked position.
3. Securely tighten the two Allen screws that secure the wheel lock clamp to the frame.

**Figure 10-2**  
**Adjusting/Relacing Pull to Lock Wheel Lock**



### Replacing

Tools Needed:

- 3/16" Allen Wrench

1. Loosen the two Allen screws that secure the wheel lock clamp to the frame. See Figure 10-2.
2. Slide the wheel lock out of the clamp.
3. Slide the new wheel lock into the wheel lock clamp, but do not tighten the Allen screws.
4. Follow the procedures under "Compact Composite Pull to Lock – Adjusting" on page 10-2 to position and secure the new wheel lock.

## Compact Composite Scissor Lock

### Adjusting

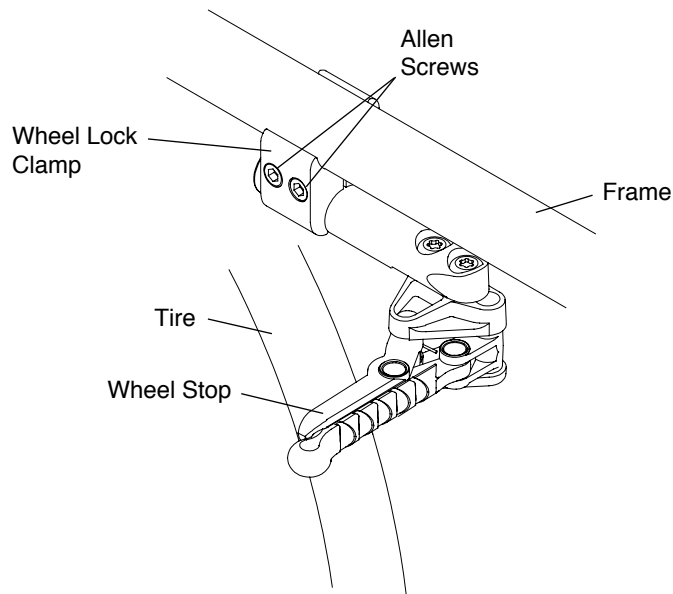
Tools Needed:

- 3/16" Allen Wrench

1. Loosen the two Allen screws in the wheel lock clamp. See Figure 10-3.
2. Adjust the position of the wheel lock clamp on the frame so the wheel stop embeds at least 3/16" into the tire when engaged in the locked position.
3. Securely tighten the two Allen screws that secure the wheel lock clamp to the frame.



**Figure 10-3**  
**Adjusting/Replacing the Composite Scissor Lock**



## Replacing

Tools Needed:

- 3/16" Allen Wrench

1. Loosen the two Allen screws that secure the wheel lock clamp to the frame. See Figure 10-3.
2. Slide the wheel lock out of the clamp.
3. Slide the new Composite Scissor Lock into the wheel lock clamp, but do not tighten the two Allen screws.
4. Follow the procedures under "Compact Composite Scissor Lock – Adjusting" on page 10-2 to position and secure the new Scissor Lock.

## Uni-Lock

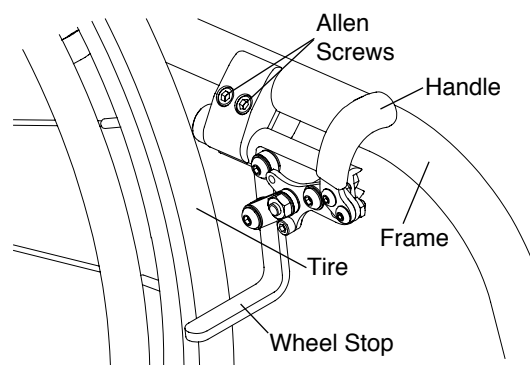
### Adjusting the Uni-Lock

Tools Needed:

- 3/16" Allen Wrench

1. Loosen the two Allen screws in the wheel lock clamp. See Figure 10-4.
2. Adjust the position of the wheel lock clamp on the frame so the wheel stop embeds at least 3/16" into the tire when engaged in the locked position.
3. Securely tighten the two Allen screws that secure the wheel lock clamp to the frame.

**Figure 10-4**  
**Adjusting/Replacing Uni-Lock Wheel Lock**



# CHAPTER 10: WHEEL LOCKS

## Replacing the Uni-Lock

Tools Needed:

- 3/16" Allen Wrench

1. Loosen the two Allen screws that secure the wheel lock clamp to the frame. See Figure 10-4.
2. Slide the wheel lock out of the clamp.
3. Slide the new Uni-Lock into the wheel lock clamp, but do not tighten the Allen Screws.
4. Follow the procedures under "Adjusting the Uni-Lock" on page 10-3 to position and secure the new wheel lock.

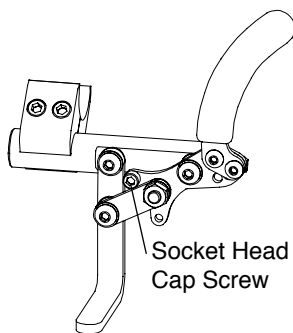
## Changing the Uni-Lock from the Push to the Pull Position

Tools Needed:

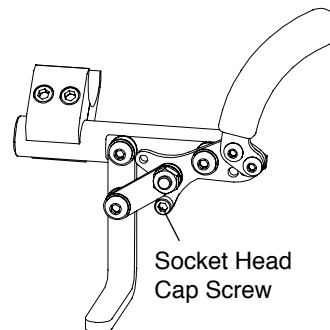
- 5/32" Allen Wrench

The Uni-Lock wheel lock can be set up so that you either pull the handle to engage the lock or push the handle to engage the lock. To determine which setup you have, locate the small socket head cap screw in the wheel lock handle base. If it is in the upper position (see Figure 10-5), the Uni-Lock is set to the "Pull to Lock" position. If it is in the lower position (see Figure 10-6), the Uni-Lock is set to the "Push to Lock" position.

**Figure 10-5**  
Pull to Lock Position



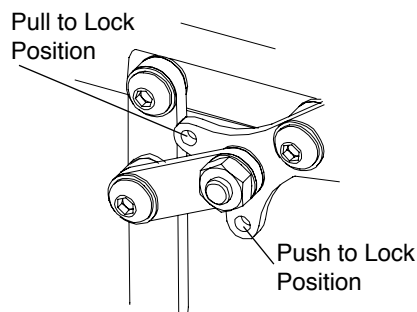
**Figure 10-6**  
Push to Lock Position



You can change the operation from pull to push or vice versa as follows:

1. Remove the socket head cap screw and reposition it to either the pull to lock or push to lock position, as desired. See Figure 10-7.
2. Securely tighten the socket head cap screw.

**Figure 10-7**  
Repositioning the Handle



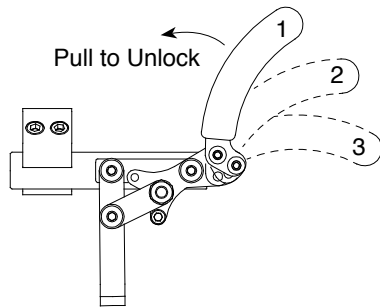
## Repositioning the Handle of the Uni-Lock Wheel Lock

Six (6) handle positions are achievable using the Uni-Lock. See Figures 10-8 through 10-11. Each handle position can be used as either a pull to lock or a push to lock (see "Changing the Uni-Lock From the Push to the Pull Position" on page 10-4), resulting in 12 possible Uni-Lock setups.

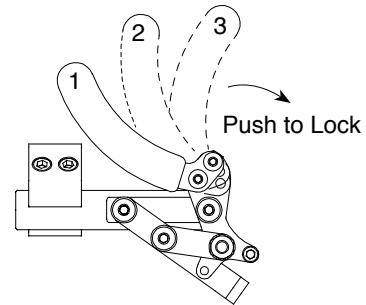
## CHAPTER 10: WHEEL LOCKS

Figures 10-8 through 10-11 show the handle in both the engaged (locked) and disengaged (unlocked) positions. Study the figures to determine which handle configuration will work best for you. Follow the directions below to reconfigure your handle to the desired configuration.

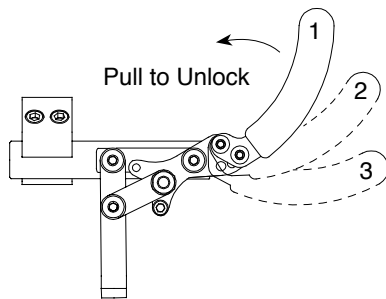
**Figure 10-8**  
Standard Handle Positions 1, 2 and 3 (Locked)



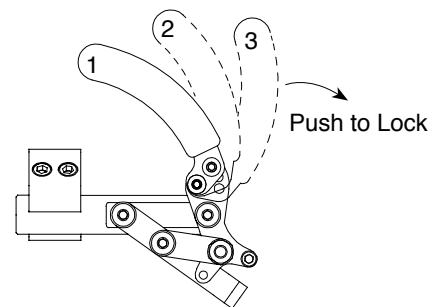
**Figure 10-9**  
Standard Handle Positions 1, 2 and 3 (Unlocked)



**Figure 10-10**  
Reverse Handle Positions 1, 2 and 3 (Locked)



**Figure 10-11**  
Reverse Handle Positions 1, 2 and 3 (Unlocked)



### Standard Handle Positions 1, 2, 3

The Uni-Lock ships with the handle in standard position 3. If you desire to switch to standard positions 1 or 2, follow the procedures below.

#### Tools Needed:

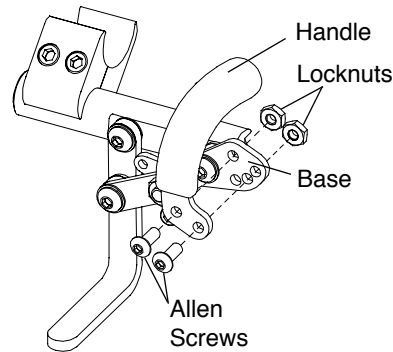
- 1/8" Allen Wrench
- 3/8" Open End Wrench

1. As shown in Figure 10-12, the wheel lock handle attaches to the wheel lock handle base with two Allen screws. There is only one hole in the wheel lock handle base through which to attach the upper Allen screw. There are three holes in the wheel lock handle base through which to attach the lower Allen screw.
2. Remove the lower Allen screw and locknut that secure the wheel lock handle to the wheel lock handle base.
3. Loosen, but do not remove, the upper Allen screw that secures the wheel lock handle to the wheel lock handle base.
4. Reposition the wheel lock handle to the desired Standard Handle Position 1, 2 or 3 (see Figures 10-8 and 10-9) and replace the Allen screw and locknut.
5. Securely tighten both Allen screws and locknuts.

# CHAPTER 10: WHEEL LOCKS

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**Figure 10-12**  
**Removing the Wheel Lock Handle**



## Reversed Handle Positions 1, 2, 3

You can achieve three additional wheel lock handle positions for your Uni-Lock by reversing the wheel lock handles from the right and left Uni-Locks. To do this, follow the procedures below.

### Tools Needed:

- 1/8" Allen Wrench
- 3/8" Open End Wrench

1. Remove the two Allen screws and locknuts that secure the wheel lock handle to the wheel lock handle base on both the right and left Uni-locks. See Figure 10-12.
2. Install the wheel lock handle from the left Uni-Lock on the right Uni-Lock in the desired position (see Figures 10-10 and 10-11).
3. Install the wheel lock handle from the right Uni-Lock on the left Uni-Lock.
4. Securely tighten all screws and locknuts.

## **Uni-Lock with Extension Handles**

All of the adjustments set forth under "Uni-Lock" on pages 10-3 to 10-6 apply to the Uni-Lock with Extension Handles.

## Standard Forks

### ⚠ WARNING

Always mount identical size casters and forks on both sides of your chair. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### Replacing Casters

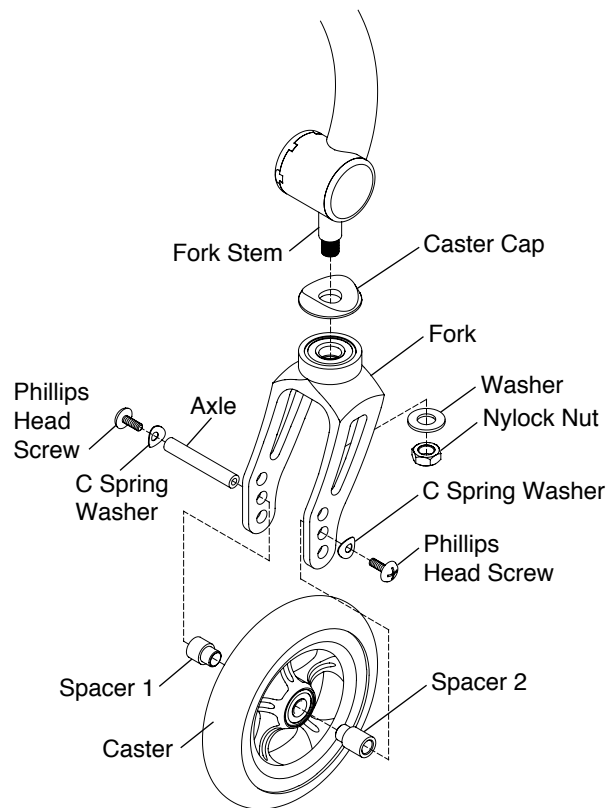
Tools Needed:

- Two #2 Phillips Head Screw Drivers

1. Remove the two Phillips Head screws, C Spring washers and axle. Use one screw driver to hold one screw in place and a second screw driver to loosen the other screw. See Figure 11-1.
2. Remove the caster and spacers.
3. Install the new caster, spacers and C Spring washers onto the fork and securely tighten the two screws so there is no space between the caster, the spacers and the fork sides. Use one screw driver to hold one screw in place and securely tighten the other screw with the second screw driver.

**Note:** If your chair has 4" or 5" TiLite Performance casters, make sure that Spacer 2 (which is wider than Spacer 1) is positioned on the recessed side of the caster, which should be oriented outwards when the casters are in the trailing position.

**Figure 11-1**  
**Bearing Fork**



### Replacing Forks

Tools Needed:

- 9/16" Socket Wrench

1. Remove the casters. See "Standard Forks – Replacing Casters" on page 11-1.
2. Loosen and remove the nylock nut and washer. See Figure 11-1.
3. Remove the old fork and caster cap and install the replacement fork and old caster cap on the fork stem.
4. Replace the nylock nut and washer and securely tighten.
5. Reinstall the casters. See "Standard Forks – Replacing Casters" on page 11-1.

# CHAPTER 11: CASTERS AND FORKS

## Slipstream Single-Sided Forks

### Replacing Casters

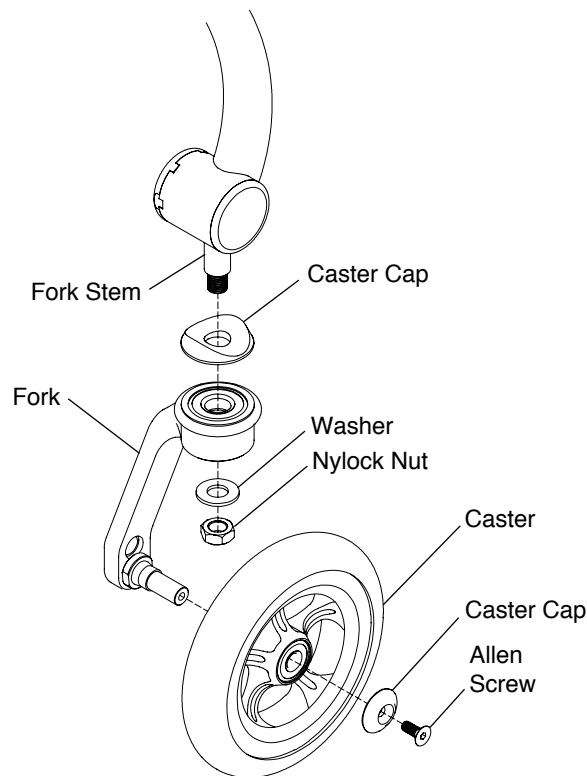
Tools Needed:

- 1/8" Allen Wrench

1. Remove the Allen screw and caster cap. See Figures 11-2.
2. Remove the caster.
3. Install the new caster onto the Slipstream Single-Sided Fork, replace the single sided caster cap and securely tighten the screw so there is no space between the caster and the Slipstream Single-Sided Fork side. If you have Performance casters be sure the "dish" of the caster faces outward as the fork is trailing rearward.

**Note:** If you are replacing your casters with a wider caster, you must replace the axle with a longer axle. Likewise, if you are replacing your wide caster with a smaller width caster, make sure you also order the shorter axle.

**Figure 11-2**  
**Slipstream Single-Sided Fork**



### Replacing Forks

Tools Needed:

- 9/16" Wrench
- 1/8" Allen Wrench

1. Remove the casters. See "Slipstream Single-Sided Forks – Replacing Casters" on page 11-2.
2. Remove the nylock nut and washer. See Figure 11-2.
3. Remove the old fork and install the replacement fork on the fork stem.
4. Replace the nylock nut and washer and securely tighten.
5. Reinstall the casters. See "Slipstream Single-Sided Forks – Replacing Casters" on page 11-2.

## Adjusting the Front Seat Height Using the Caster Height Track

Tools needed:

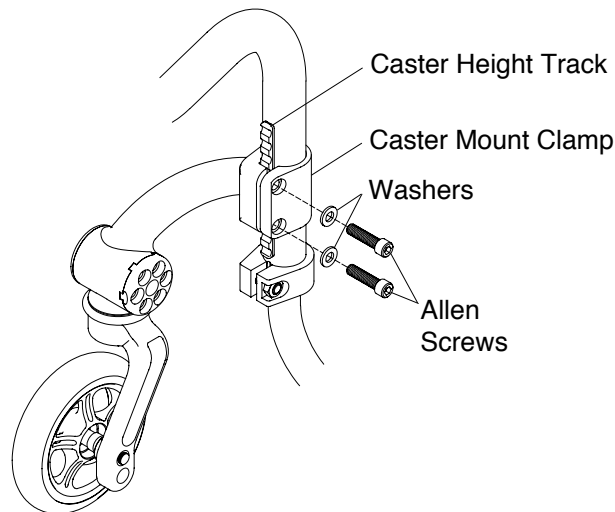
- 3/16" Allen Wrench

1. On one side of the chair, remove the two Allen screws and washers from the caster mount clamp. See Figure 11-3.
2. Slide the caster mount clamp to the desired height. The caster height tracks allow 1/2" adjustments. Reinstall the washers and Allen screws. Securely tighten.
3. Follow Steps 1 and 2 on the other side of the chair.

### ⚠ WARNING

Always use identical caster height tracks on both sides of your chair. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

**Figure 11-3**  
Caster Mount Assembly



## Adjusting the Front Seat Height – Standard Forks

You can adjust the front seat height of your chair up or down without changing the casters to a larger or smaller size. Follow the procedures under “Standard Forks – Replacing Casters” on page 11-1 to mount the casters in the alternative axle holes in the fork. The full range of adjustability will not be available with 5” or 6” casters. Additional adjustability may be achieved with different forks or casters or with fork stem extensions. Contact TiLite Customer Service for assistance.

## Adjusting the Front Seat Height – Slipstream Single-Sided Forks

Tools needed:

- 5/8” Open End Wrench
- Screwdriver

You may be able to adjust the front seat height of your chair up or down without changing the casters to a larger or smaller size. The full range of adjustability will not be available with 5” or 6” casters.

1. Remove the caster. See “Slipstream Single-Sided Forks – Replacing Casters” on page 11-2.
2. Using the shaft of the screwdriver, remove the E-Ring by pressing downward across the open portion of the E-Ring. See Figure 11-4. The E-Ring will spring off of the axle, you must wear protective eyewear.
3. Using the 5/8” Open End wrench, remove the axle from the Single-Sided Fork.
4. Place the axle in the alternate axle hole and securely tighten.
5. Using the shaft of the screwdriver, replace the E-Ring by pressing downward across the closed portion of the E-Ring, snapping the E-ring into place.

## CHAPTER 11: CASTERS AND FORKS

6. Replace the caster. See “Slipstream Single-Sided Forks – Replacing Casters” on page 11-2.
7. Follow Steps 1 through 6 on the opposite fork.

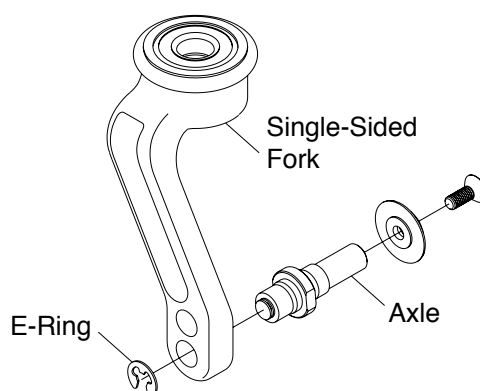
### ⚠ WARNING

Always use identical axle holes on both sides of your chair. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### ⚠ WARNING

The threads on the axles are treated with Vibra-TITE® VC-3, a locking and sealing coating, to reduce the possibility they will become loose. You should be able to remove and reinstall these axles approximately four times without reapplying the coating. If you repeatedly remove and reinstall these axles, TiLite requires that you reapply Vibra-TITE® VC-3 after every fourth adjustment. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

Figure 11-4  
Slipstream Single-Sided



### Floating Casters

Tools needed:

- 3/16" Allen Wrench
- 5/16" Allen Wrench (If needed for bumper assembly)
- Wood Block (1" Minimum)
- Drafting Triangle
- Ruler

**Note:** TiLite designs its rigid wheelchairs to be flexible for improved maneuverability and increased ride comfort. However, this flexibility requires that your chair be set up properly. The following procedure will enable you to set up your TiLite rigid wheelchair so it will perform to its potential.

1. Place the wheelchair on a smooth, level surface with the casters trailing rearward.
2. Before making any adjustments to the chair, it is important to check the following:
  - a. The tires are properly inflated to the PSI rating shown on the sidewall of the tire.
  - b. The camber tube is properly centered on the frame side to side and the camber tube is straight relative to the rear of the frame. For adjustments see “Replacing the Camber Tube” on page 8-3.
  - c. The toe-in/toe-out is correctly set up (see “Adjusting Toe-In/Toe-Out” on pages 8-3 and 8-4).

All items in this list are performed at the factory to ensure proper frame alignment before shipping. If an adjustment still needs to be made, complete it before proceeding. If no adjustment is needed, proceed to Step 3.

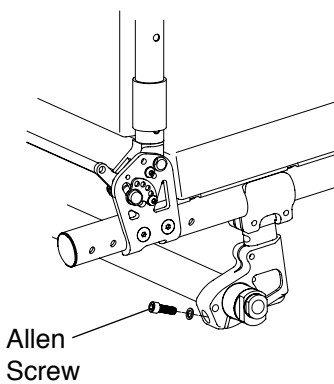
3. Loosen, but do not remove, the Allen screw in the footrest binder clamp only on the side of the floating caster as shown in Figure 11-6. See “Angle Adjustable Footrest - Adjusting the Height/Replacing” on pages 3-1 and 3-2.
4. If your chair has a bumper assembly (not shown), this assembly will need to be removed. Loosen, but do not remove, all of the Allen screws in the camber tube clamp on the side opposite the floating caster as shown in Figure 11-5. Do not loosen the two CG bracket Allen screws too much as it will allow the clamp to slide within the CG bracket.
5. Wiggle the chair and let it settle on to the flat surface to release any bind that may have existed within the chair assembly.



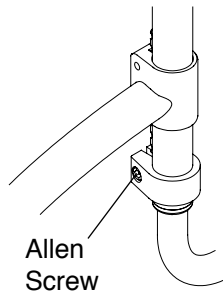
## CHAPTER 11: CASTERS AND FORKS

6. Make sure your footrest is set to your desired seat-to-footrest measurement, and, using a ruler, make sure the left and right sides of the footrest are the same distance to the level surface. It is important to have both sides of the footrest level and the footrest binder clamp screw tightened before the camber tube mount assemblies are tightened.
7. Tighten the footrest clamp screw.
8. Tighten the camber clamp screws starting with the uppermost screws and working downward.
9. If the above adjustments correct the floater and all four wheels are flat on the level surface, you are finished with your adjustment. If a caster is still floating, repeat Steps 3 through 8. If you continue to have a floater, proceed to Steps 10 through 13.
10. Loosen, but do not remove, the Allen screw in the footrest binder clamp only on the side of the floating caster as shown in Figure 11-6. See “Angle Adjustable Footrest - Adjusting the Height/Replacing” on pages 3-1 and 3-2.
11. Place a wood block under the other caster (which is not floating) as shown in Figure 11-7.
12. Apply gentle downward pressure on the caster mount of the floating caster. It is advisable that you have an assistant to place downward pressure on the opposite side of the chair at the backrest when making this adjustment.
13. Remove the wood block and check to see if the caster still floats. If the caster no longer floats, securely tighten the Allen screw in the footrest binder clamp. If the caster still floats, or if the other caster starts to float, check that the footrest is level and repeat Steps 10 through 13 until the caster no longer floats.
14. If the floater continues and cannot be corrected using these steps, please contact TiLite Customer Service.

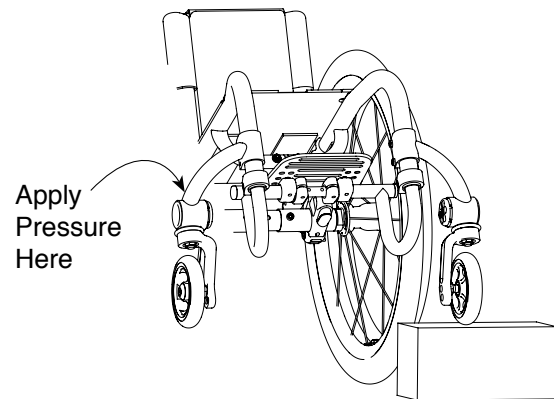
**Figure 11-5**  
Allen Screws on Camber Clamp



**Figure 11-6**  
Allen Screws on Footrest Clamp



**Figure 11-7**  
Fixing a Floating Caster



### Glide Forks

#### ⚠ WARNING

Always mount identical size casters and forks on both sides of your chair. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### Replacing Casters - Standard Forks

Tools Needed:

- Two Phillips Screwdrivers

1. Remove the two Allen screws, C Spring washers and axle that secure the caster to the fork. Use one Phillips screwdriver to hold one screw in place and a second Phillips screwdriver to loosen the other screw. See Figure 11-8.
2. Remove the caster and spacers from the fork.
3. Install the new caster, spacers and C Spring washers onto the fork and securely tighten the two screws so there is no space between the caster, the spacers and the fork sides. Use one Phillips screwdriver to hold one screw in place and securely tighten the other screw with the second Phillips screwdriver.

**Note:** If your chair has 3", 4" or 5" TiLite Litespeed casters, make sure that Spacer 2 (which is wider than Spacer 1) is positioned on the recessed side of the caster, which should be oriented outwards when the casters are in the trailing position.

# CHAPTER 11: CASTERS AND FORKS

## Replacing Casters - Slipstream Single-Sided Forks

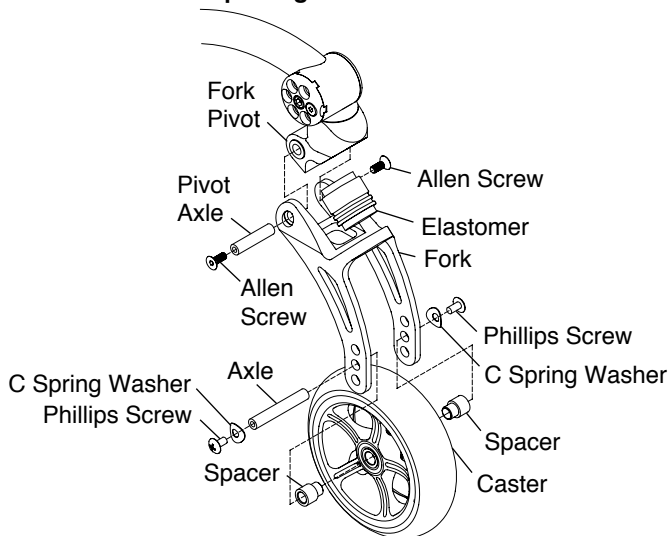
To replace the casters, use the tools and follow the instructions under “Slipstream Single-Sided Forks – Replacing Casters” on page 11-2.

### Replacing the Elastomer

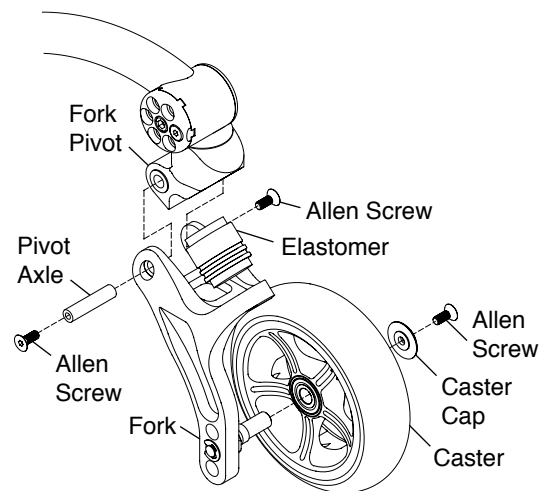
Tools Needed:

- Two 1/8” Allen Wrench
1. Remove the Allen screws from the fork pivot and push out the pivot axle. See Figures 11-8 and 11-9.
  2. Separate the two halves of the Glide fork to release the elastomer.
  3. Install the new elastomer. See Figures 11-8 and 11-9.
  4. Push firmly on the two halves of the Glide fork to facilitate reinstalling the Allen screws and pivot axle.

**Figure 11-8**  
Replacing the Elastomer



**Figure 11-9**  
Replacing the Elastomer

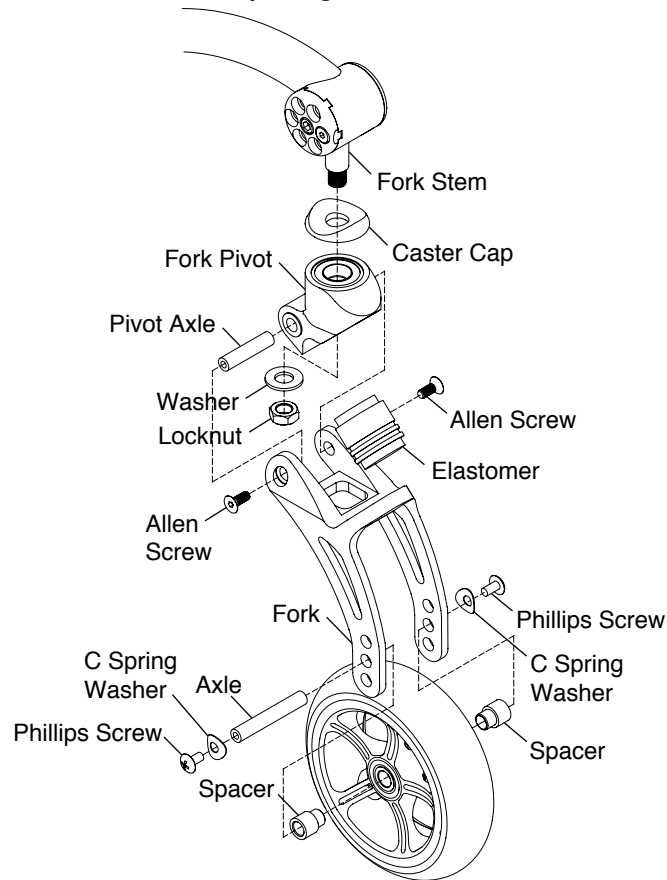


### Replacing Glide Forks - Standard and Slipstream Single-Sided

Tools Needed:

- Two 1/8” Allen Wrenches
  - 9/16” Socket Wrench
1. Remove the casters. See “Glide Forks - Replacing Casters - Standard Forks” on page 11-5 or “Glide Forks - Replacing Casters - Slipstream Single-Sided Forks” on page 11-6.
  2. Remove the Allen screws from the fork pivot and push out the pivot axle. See Figure 11-10.
  3. Separate the two halves of the Glide fork.
  4. Using the Open End wrench, loosen and remove the locknut and washer from the fork stem. Slide the fork pivot and caster cap off of the fork stem. Slide the caster cap and replacement fork pivot onto the fork stem and holding the parts in place, slide the washer onto the fork stem and tighten the locknut.
  5. Push firmly on the two halves of the Glide fork with the elastomer in place, aligning the holes of the fork pivot with the fork. Insert the pivot axle, reinstall the Allen screws and securely tighten.
  6. Reinstall the casters. See “Glide Forks - Replacing Casters - Standard Forks” on page 11-5 or “Glide Forks - Replacing Casters - Slipstream Single-Sided Forks” on page 11-6.

**Figure 11-10**  
**Replacing Glide Forks**



## ANGLE ADJUSTABLE SPEEDLOADER CASTER MOUNT

### Adjusting the Angle

Tools Needed:

- 1/8" Allen Wrench
- 3/16" Allen Wrench
- Drafting Angle

1. Place the chair on a level surface.
2. Using the 1/8" Allen Wrench, remove Allen screw 1 (outer screw) and the washer. See Figures 11-11 to 11-13.
3. Using the 3/16" Allen wrench, loosen but do not remove Allen screw 2 (center screw) enough to allow the end cap tabs to slide out of the tab slots.
4. Using a drafting triangle or similar 90° angle tool as shown in Figures 11-14 and 11-15, rotate the fork until the flat edge of the fork is perpendicular to the level surface.
5. While holding the fork in place, and with the end cap tabs engaged in the tab slots, check to see if one of the six perimeter holes in the caster end cap aligns with one of the three threaded holes in the caster mount. If so, proceed to Step 7. If not, proceed to Step 6.
6. Pull the caster end cap away from the caster housing and rotate the caster end cap one-sixth turn and re-engage the caster end cap tabs in the tab slots. Again, check to see if one of the six perimeter holes in the caster end cap aligns with one of the three threaded holes in the caster mount. If so, proceed to Step 7. If not, repeat this Step 6 using the next combination of caster end cap tabs and tab slots.
7. Thread Allen screw 1 through the two aligned parts and loosely tighten.

**Note:** There are six perimeter holes in the caster end cap and three threaded holes in the caster mount. These are designed to permit 17° of adjustment in 1° increments.

# CHAPTER 11: CASTERS AND FORKS

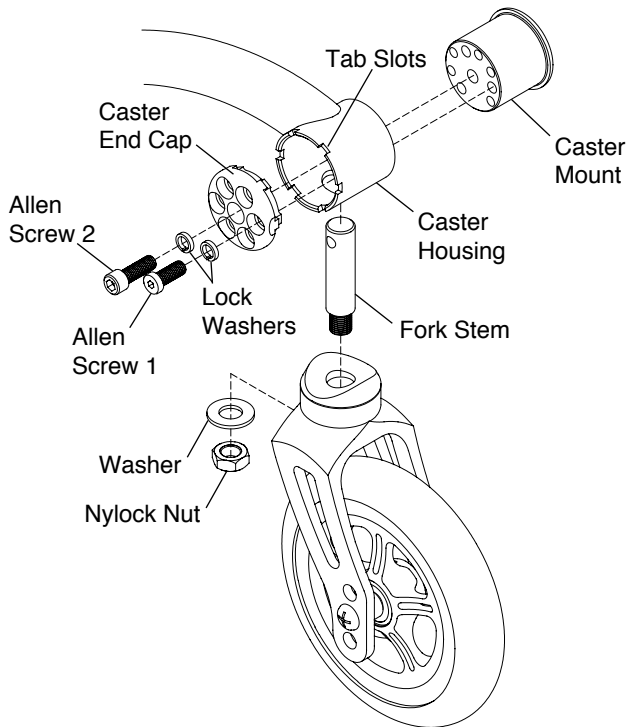
- Securely tighten the center screw.
- Securely tighten the outer screw to a torque setting of 60 inch/lbs.
- Repeat Steps 2 through 9 for the opposite caster.

**Note:** The caster end caps on each side of the chair are mirror images. One is marked with an “R” and one with an “L”. Once one side is squared, simply adjust the other side to be the mirror image, and it too will be square.

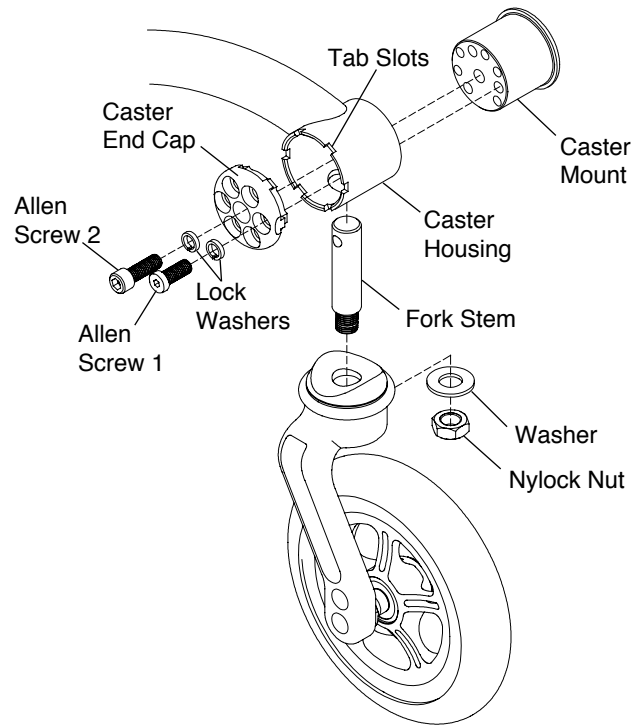
**Note:** If you are not able to square your casters and have changed the configuration of your chair, you may need to reverse the right and left caster end caps to achieve the desired angle.

- Recheck the forks to be certain they are still perpendicular to the level surface before riding.

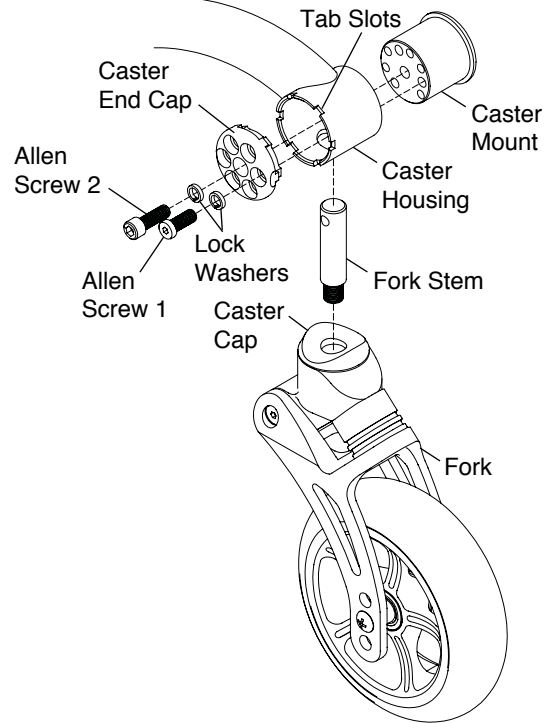
**Figure 11-11**  
**Adjusting the Angle (Bearing Fork)**



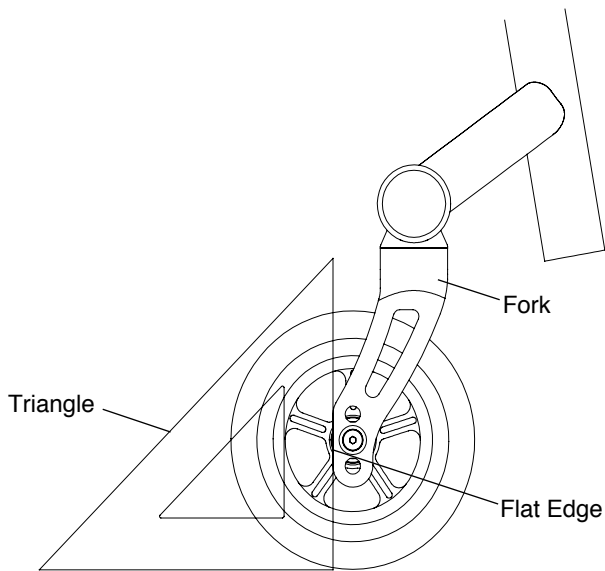
**Figure 11-12**  
**Adjusting the Angle (Single-Sided Fork)**



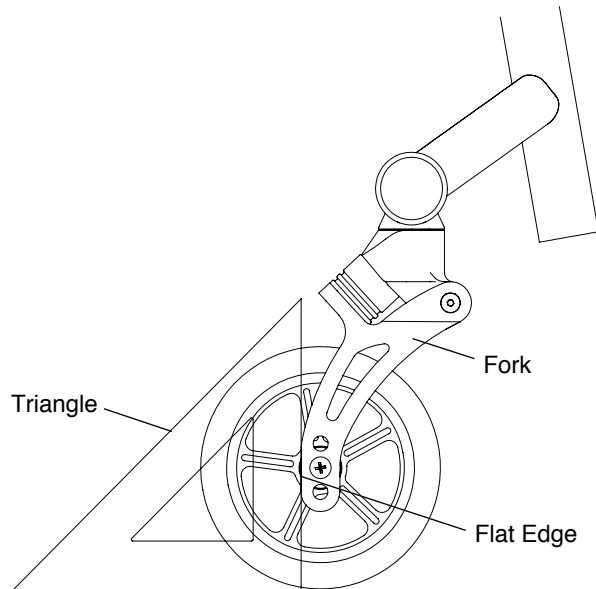
**Figure 11-13**  
**Adjusting the Angle (Glide Fork)**



**Figure 11-14**  
**Bearing Fork/ Slipstream Single-Sided Fork**



**Figure 11-15**  
**Glide Fork**





## ⚠ WARNING

DO NOT attempt any of the procedures in this chapter if the chair is occupied. *If you ignore this Warning, serious injury to the occupant will occur.*

## Quick Release Axle

### Removing

1. Hold the wheel securely at the hub. See Figure 12-1.
2. Depress the release button on the Quick Release Axle and slide the wheel and axle out of the axle sleeve.
3. Release the release button.

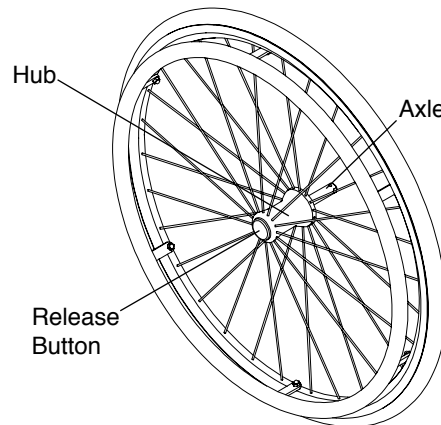
### Replacing

## ⚠ WARNING

Make sure the locking balls fully secure the Quick Release Axle inside the axle sleeve before operating the chair. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

1. Hold the wheel securely at the hub. See Figure 12-1.
2. Depress the release button on the Quick Release Axle, making sure the locking balls recess into the axle.
3. Insert the axle all the way into the axle sleeve.
4. Release the release button.
5. Pull firmly on the wheel (without depressing the release button) to make sure the wheel is locked securely in place.

**Figure 12-1**  
Removing and Replacing the Rear Wheel with the Quick Release Axle



## Quad Release Axle

### Removing

1. Unlock the lever on the Quad Release Axle. See Figure 12-2.
2. Slide the wheel and axle out of the axle sleeve.

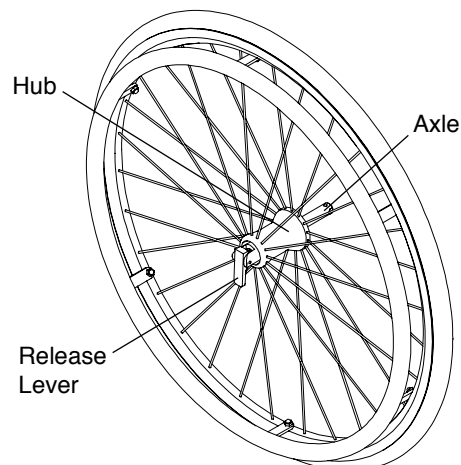
### Replacing

## ⚠ WARNING

Make sure the locking balls fully secure the Quad Release Axle inside the axle sleeve before operating the chair. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

1. Hold the wheel securely at the hub. See Figure 12-2.
2. Unlock the lever on the Quad Release Axle, making sure the locking balls recess into the axle.
3. Insert the axle all the way into axle sleeve.
4. Lock the lever on the Quad Release Axle.
5. Pull firmly on the wheel (without unlocking the lever) to make sure the wheel is locked securely in place.

**Figure 12-2**  
Removing and Replacing the Rear Wheel with the Quad Release Axle



# CHAPTER 12: REAR WHEELS

## Handrims

### ⚠ WARNING

You must have your handrims replaced by an authorized TiLite dealer or qualified technician. *If you ignore this Warning, you may seriously injure yourself or others or damage the wheelchair.*

## Pneumatic Tires and Tubes

### ⚠ WARNING

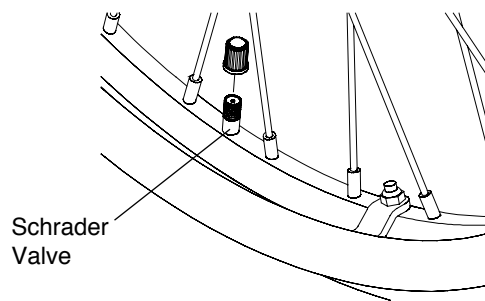
Fully deflate the tire before performing any disassembly procedures. Do not re-inflate the tire until all re-assembly is completed. *If you ignore this Warning, you may seriously injure yourself or others or damage the wheelchair.*

Tools required:

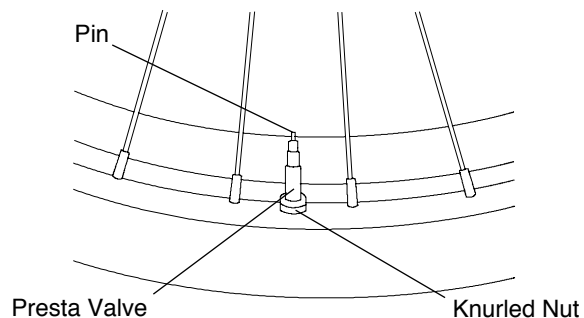
- #2 Phillips Screw Driver
- 3/8" Open End Wrench or 5/16" Open End Wrench

1. Remove the rear wheel from the chair.
2. Remove all air from the inner tube. If you have a Schrader valve (see Figure 12-3), remove the valve stem cap and release all of the air from the tube by pressing down on the pin in the center of the valve stem. If you have a Presta valve (see Figure 12-4), remove the valve stem cap, unscrew, counter clockwise, the knurled nut on the valve stem and release all of the air from the tube by pressing down on the pin in the center of the valve stem.
3. Remove the tire and inner tube.
4. Make sure the rim strip is properly in place.
5. Install the new inner tube and wheel tire onto the wheel.
6. Make sure the tire is properly seated in the wheel rim, and inflate the tire to the correct PSI rating on the sidewall of the tire.
7. Reinstall the rear wheel on the chair.

**Figure 12-3  
Schrader Valve**



**Figure 12-4  
Schrader Valve**



## Solid Tires

### ⚠ WARNING

Replacement of solid tires requires specialized equipment. Therefore, if your solid tires need replacement, you must have this done by an authorized TiLite dealer or qualified technician. *If you ignore this Warning, you may seriously injure yourself or others or damage the wheelchair.*

## Rear Wheel Spacers

### Adjusting Rear Wheel Spacing

### ⚠ WARNING

Make sure you use the same spacers on both sides of the chair. Do not use spacers exceeding a total of 3/4". If more than 3/4" of the axle sleeve is outside of the camber plug, the axle sleeve could disengage from the camber plug while you are using the chair. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*



Tools required:

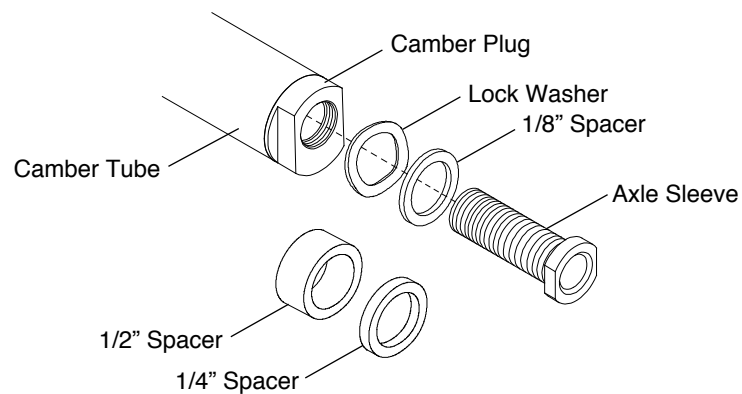
- 7/8" Open End Wrench
- 3/4" Open End Torque Wrench

1. Place the 7/8" Open End wrench onto the camber plug and use the 3/4" Open End Torque wrench to remove the axle sleeve. See Figure 12-5.

**Note:** If you have only one washer and do not have a lock washer, your rear wheel spacing package will include a lock washer. Always use a lock washer.

2. Add or delete the spacers you need to increase/ decrease your rear wheel spacing, keeping the two washers against the head of the axle sleeve.
3. After you have adjusted your rear wheel spacing, reinstall the axle sleeve in the camber plug and hand-tighten.
4. Using a Torque wrench, tighten the axle sleeve to 230 inch-pounds.

**Figure 12-5**  
**Rear Wheel Spacing**



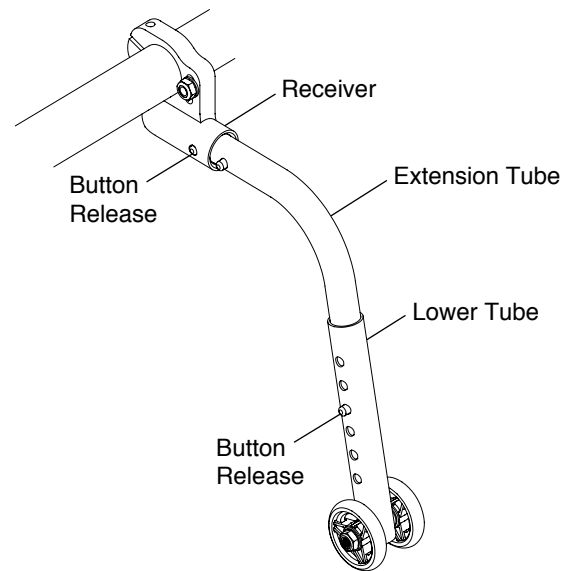


## Black Aluminum Anti-Tips

### Adjusting

1. The bottom of the anti-tip wheels should be between 1-1/2" and 2" above the floor to ensure proper functionality. To adjust the height, press the two release buttons on the telescoping lower tube, then adjust the height of the lower tube. See Figure 13-1.
2. To rotate the anti-tips upward, press the release button on the extension tube to release the extension tube and rotate upward until the release button locks in place on the opposite side of the anti-tip receiver.
3. To remove the anti-tip, press the release button on the extension tube and pull the extension tube out of the anti-tip receiver.

**Figure 13-1**  
Adjusting the Rear Anti-Tip



### Mounting

#### ⚠ WARNING

Only an authorized TiLite dealer or qualified technician should install the rear anti-tip receiver. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

#### Tools Needed:

- 5/32" Allen Wrench
- 3/16" Allen Wrench
- 7/16" Open End Wrench

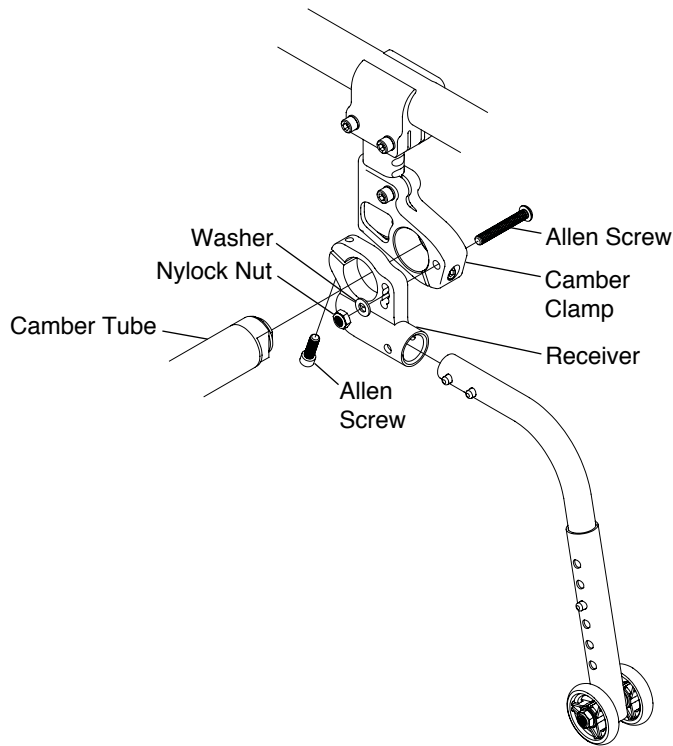
1. Remove the rear wheels and place the frame on a level surface.
2. Remove the camber tube. See "Camber Mounts – Replacing the Camber Tube" on page 8-3.
3. Thread the Allen screw through the right side camber clamp, right side anti-tip receiver, and the washer and securely tighten the nylock nut. See Figure 13-2.

**Note:** Make sure that the anti-tip receiver is oriented to be parallel to the floor.

4. Repeat Step 3 on the left side camber clamp and left side anti-tip receiver.
5. Reinstall the camber tube. See "Camber Mounts – Replacing the Camber Tube" on page 8-3.
6. Tighten the Allen screw in each anti-tip receiver so that it securely clamps into the camber tube.
7. Reinstall the rear wheel.

# CHAPTER 13: ANTI-TIPS

**Figure 13-2**  
**Mounting the Black Aluminum Anti-Tip Receiver**

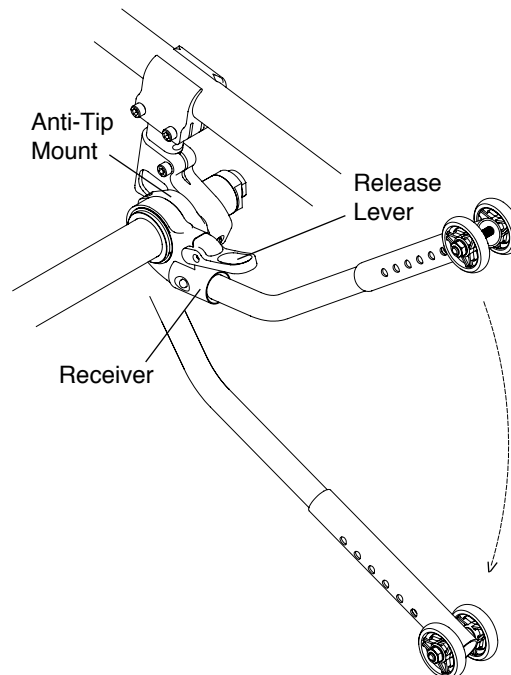


## USER FRIENDLY FLIP-UP ANTI-TIPS

### Engaging

To engage the anti-tip, grip the anti-tip firmly, pressing down on the release lever, lower the anti-tip until the anti-tip receiver re-engages in the anti-tip mount in the “down” position shown in Figure 13-3.

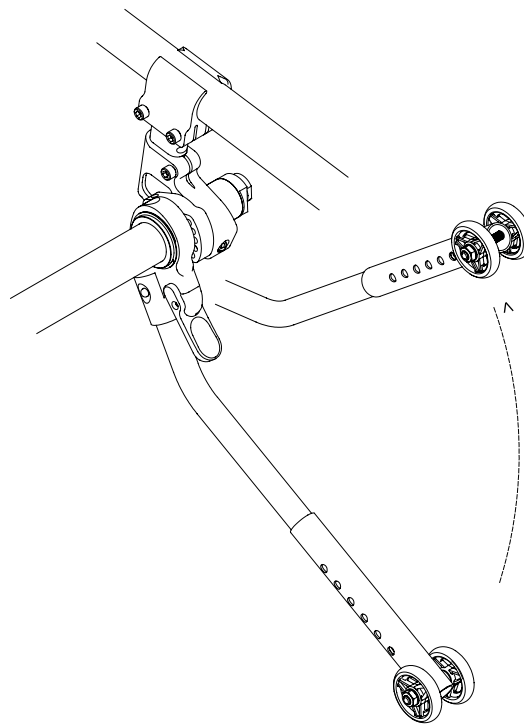
**Figure 13-3**  
**Engaging the Anti-Tip**



## Disengaging

To disengage the anti-tip, grip the anti-tip firmly, pressing down on the release lever, raise the anti-tip until the anti-tip receiver re-engages in the anti-tip mount in the “up” position shown in Figure 13-4.

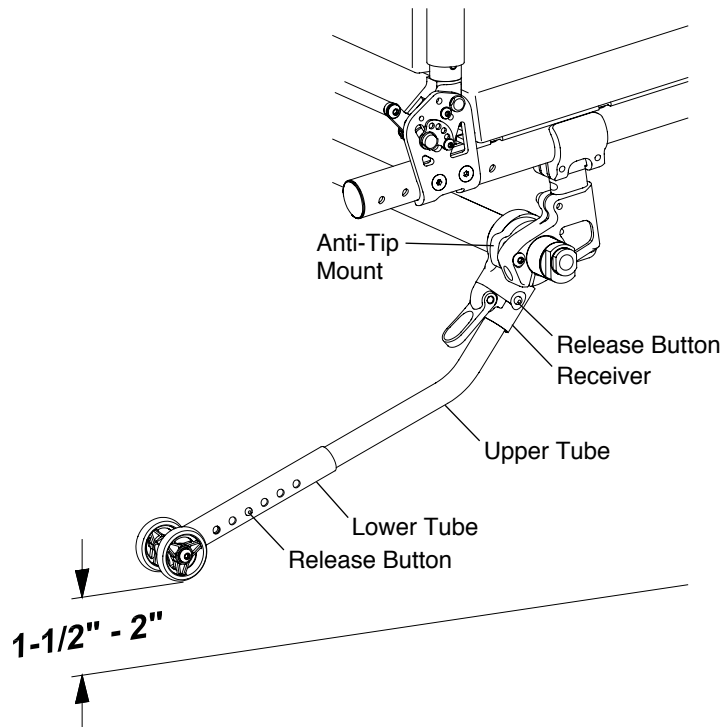
**Figure 13-4**  
**Disengaging the Anti-Tip**



## Adjusting

To adjust the height of the anti-tip, press the two release buttons on the telescoping lower tube and adjust the height of the lower tube so that the wheel is within 1-1/2" to 2" off the ground. See Figure 13-5.

**Figure 13-5**  
**Adjusting the Anti-Tip**



## CHAPTER 13: ANTI-TIPS

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### Removing

To remove the anti-tip tube, press the two release buttons on the anti-tip receiver and pull the upper tube out of the anti-tip receiver. See Figure 13-5.

### Mounting

#### ⚠ WARNING

Only an authorized TiLite dealer or qualified technician should install the anti-tip receiver. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

#### ⚠ WARNING

Do not disassemble the anti-tip mounting assembly. See Figure 13-6. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

Tools Needed:

- 5/32" Allen Wrench
- 3/16" Allen Wrench

1. Remove the rear wheels and place the frame on a level surface.
2. Remove the camber tube. See "Camber Mounts – Replacing the Camber Tube" on page 8-3.
3. Thread the Allen screw through the right side camber tube clamp and into the right side anti-tip mount using the center of the three threaded holes and loosely tighten. See Figure 13-6.
4. Repeat Step 3 with the left side camber tube clamp and the left side anti-tip mount.
5. Reinstall the camber tube. See "Camber Mounts – Replacing the Camber Tube" on page 8-3. The bumper cannot be reinstalled.
6. With the wheelchair standing upright on a level surface, engage the anti-tip as described under "User Friendly Flip-Up Anti-Tips – Engaging" on page 13-2.
7. Adjust both lower tubes so that the wheels are within 1-1/2" to 2" off the ground. See Figure 13-5. If this is not possible, proceed to Step 8. If you can achieve the proper ground clearance, proceed to Step 9.
8. If you cannot achieve the proper ground clearance in Step 7, then remove the Allen screw installed in Step 3 and reinstall it in either the upper or lower holes in the anti-tip mounts. Then repeat Steps 6 and 7.
9. Securely tighten the Allen screws that secure the camber tube clamps to the anti-tip mounts.
10. Securely tighten the Allen screw in each anti-tip mount to secure the anti-tip mount to the camber tube.

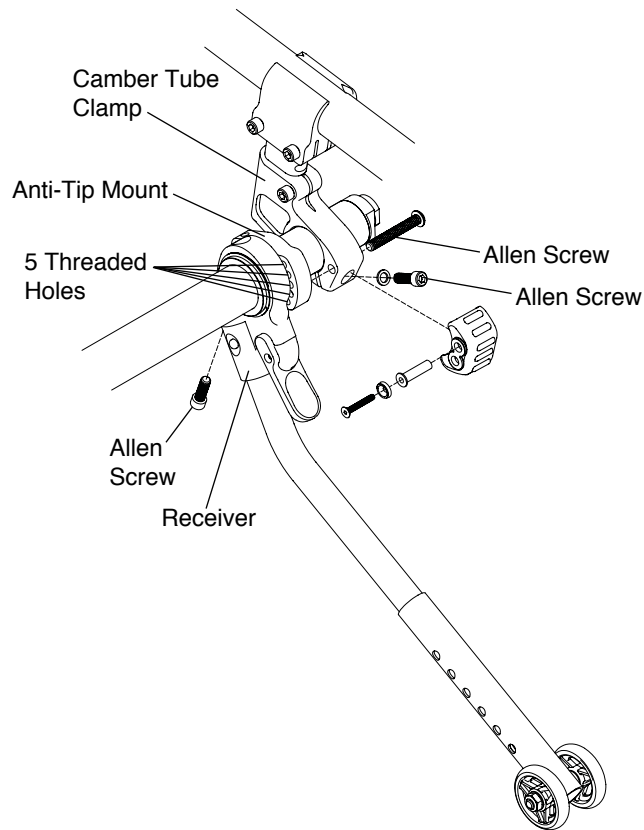
#### ⚠ WARNING

Both anti-tips MUST be mounted using the identical threaded hole in each of the anti-tip mounts. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

#### ⚠ WARNING

Before sitting in the chair, make sure that the anti-tips are operating properly. To do this, place the unoccupied chair on a level surface, engage the anti-tips, and tip the chair backward until the anti-tips are supporting the weight of the chair. Apply sufficient pressure to ensure that the anti-tips are operating properly. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

**Figure 13-6  
Mounting**



## Center Mount Single Swivel Caster Anti-Tip

### ⚠ WARNING

Only an authorized TiLite dealer or qualified technician should install the anti-tip receiver. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

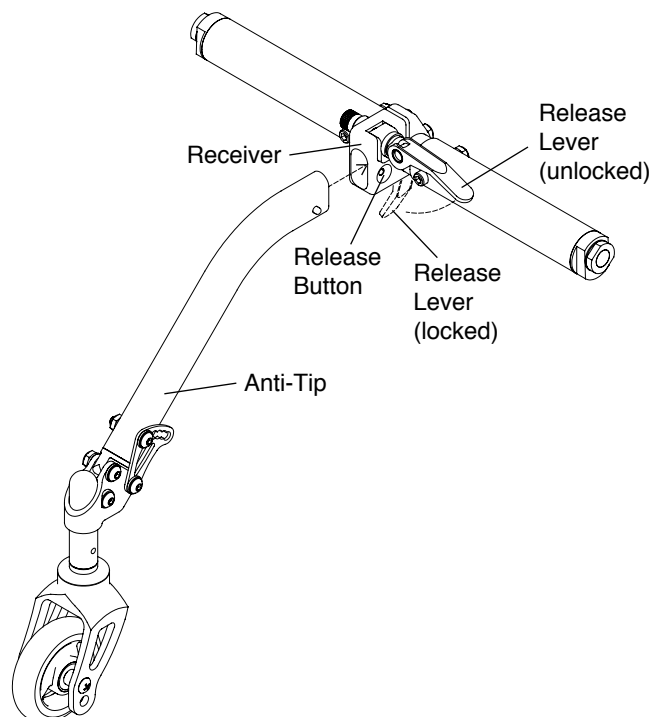
### ⚠ WARNING

Before sitting in the chair, make sure that the anti-tips are operating properly. To do this, place the unoccupied chair on a level surface, engage the anti-tips, and tip the chair backward until the anti-tips are supporting the weight of the chair. Apply sufficient pressure to ensure that the anti-tips are operating properly. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### Engaging

To engage the anti-tip, raise the release lever to the unlock position, grip the anti-tip firmly, engage the anti-tip in the receiver until the release button clicks into place and lower the release lever into the locked position as shown in Figure 13-7.

**Figure 13-7  
Engaging**

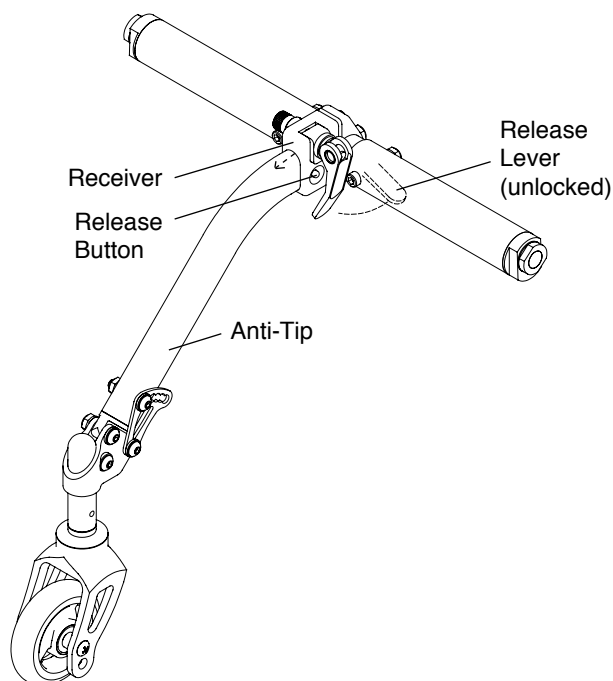


## CHAPTER 13: ANTI-TIPS

### Removing

To remove the anti-tip, raise the release lever to the unlocked position, grip the anti-tip firmly, press the release button and pull rearward on the anti-tip to disengage it from the receiver as shown in Figure 13-8.

**Figure 13-8**  
**Removing**



### Adjusting the Angle

Tools Needed:

- 5/32" Allen Wrench
- 7/16" Open End Wrench

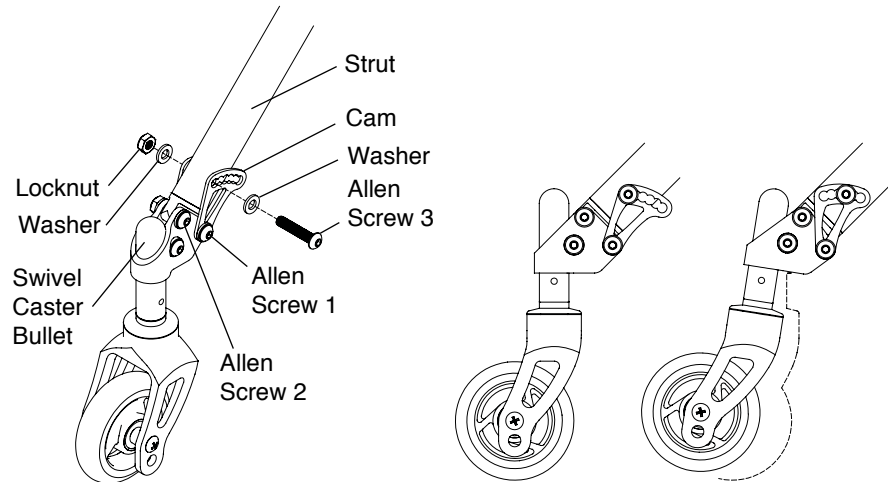
1. Loosen but do not remove Allen screws 1 and 2. See Figure 13-9.
2. Remove Allen screw 3, the washers and the locknut. Note the order in which the various parts were assembled.
3. Adjust the angle of the swivel caster bullet by pulling it out at an angle or pressing it toward the strut. When the desired angle is achieved, align the appropriate hole in the cam with the hole in the strut.
4. Insert Allen screw 3 through the washers, cam, strut and into the locknut. Securely tighten.
5. Securely tighten Allen screws 1 and 2.

### ⚠ WARNING

Before sitting in the chair, make sure that the anti-tips are operating properly. To do this, place the unoccupied chair on a level surface, engage the anti-tips, and tip the chair backward until the anti-tips are supporting the weight of the chair. Apply sufficient pressure to ensure that the anti-tips are operating properly. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*



**Figure 13-9**  
**Adjusting the Angle**



## Adjusting the Height of the Caster

Tools Needed:

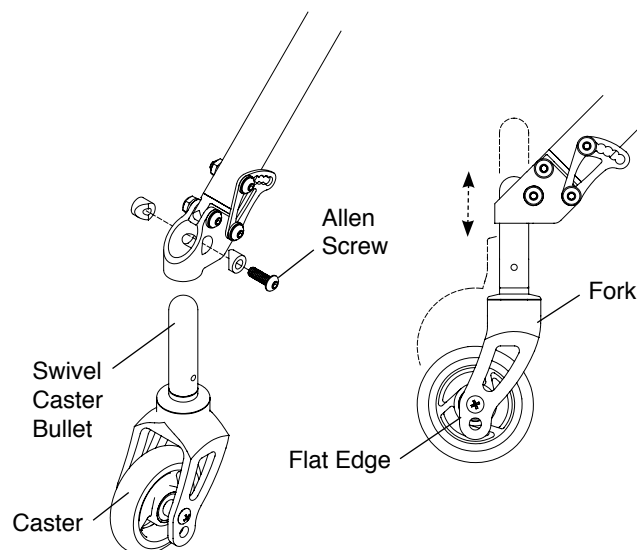
- 5/32" Allen Wrench

1. Loosen but do not remove the Allen screw. See Figure 13-10.
2. Raise or lower the swivel caster bullet to the desired height. For an inactive anti-tip, the bottom of the anti-tip caster should be between 1-1/2" and 2" above the floor to ensure proper functionality. For an active anti-tip which is in contact with the ground at all times, lower the caster to be level with the ground.
3. The active anti-tip caster will need to be squared using a drafting triangle or similar 90° angle tool as shown in Figure 11-14. Rotate the fork until the flat edge of the fork is perpendicular to the level surface. If the angle needs to be adjusted please use the tools and follow the procedures under "Center Mount Single Swivel Caster Anti-Tip – Adjusting the Angle" on page 13-6.
4. Securely tighten the Allen screw.

### ⚠ WARNING

Before sitting in the chair, make sure that the anti-tips are operating properly. To do this, place the unoccupied chair on a level surface, engage the anti-tips, and tip the chair backward until the anti-tips are supporting the weight of the chair. Apply sufficient pressure to ensure that the anti-tips are operating properly. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

**Figure 13-10**  
**Adjusting the Height of the Caster**



# CHAPTER 13: ANTI-TIPS

## Mounting

### ⚠ WARNING

Only an authorized TiLite dealer or qualified technician should install the anti-tip receiver. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

#### Tools Needed:

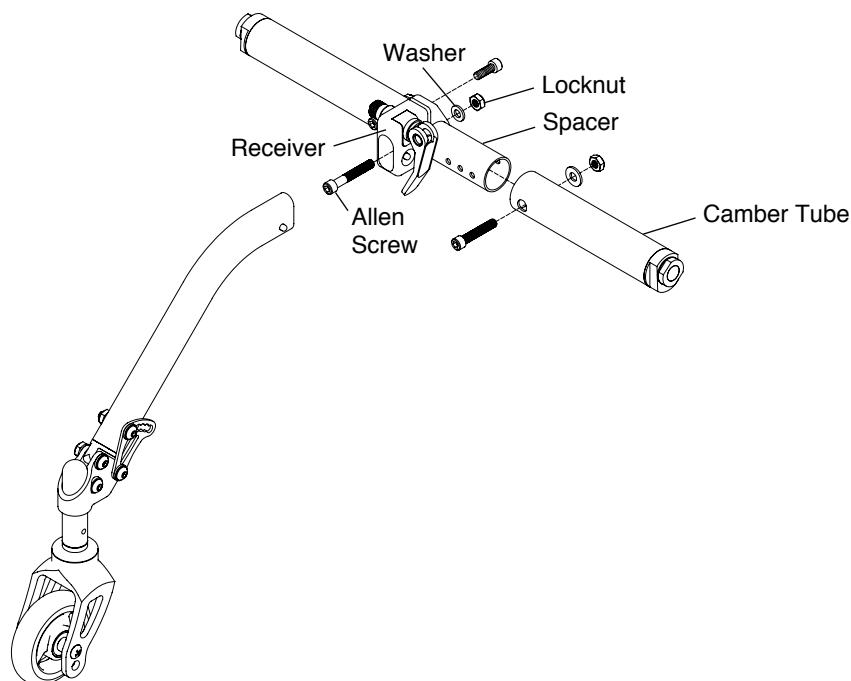
- 3/16" Allen Wrench
- 7/16" Open End Wrench

1. Remove the rear wheels and place the frame on a level surface.
2. Remove the camber tube. See "Camber Mounts – Replacing the Camber Tube" on page 8-3.
3. Remove one half of the camber tube leaving the spacer exposed on one end.
4. Slide the camber mount anti-tip receiver clamp onto the spacer. Insert the Allen screw through the inside of the receiver, the spacer and washer and into the locknut. Securely tighten. See Figure 13-11. Reassemble the camber tube.
5. Reinstall the camber tube. See "Camber Mounts – Replacing the Camber Tube" on page 8-3. Make sure the anti-tip receiver is open at the rear of the chair to accept the strut of the anti-tip.
6. With the wheelchair standing upright on a level surface, engage the anti-tip as described under "Engaging" on page 13-5.
7. Adjust the angle of the anti-tip to within 1-1/2" to 2" off the ground for the inactive anti-tip. See "Center Mount Single Swivel Anti-Tip – Adjusting the Angle" on page 13-6. Adjust the active anti-tip to the ground and square the caster if needed. See "Center Mount Single Swivel Anti-Tip – Adjusting the Angle" on page 13-6.

### ⚠ WARNING

Before sitting in the chair, make sure that the anti-tips are operating properly. To do this, place the unoccupied chair on a level surface, engage the anti-tips, and tip the chair backward until the anti-tips are supporting the weight of the chair. Apply sufficient pressure to ensure that the anti-tips are operating properly. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

**Figure 13-11**  
**Mounting**



## Replacing the Caster

To replace the caster, please use the tools and follow the procedures under “Standard Forks – Replacing Casters” on page 11-1.

## Center Mount Non-Swivel Anti-Tip

### ⚠ WARNING

Only an authorized TiLite dealer or qualified technician should install the anti-tip receiver. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

### ⚠ WARNING

Before sitting in the chair, make sure that the anti-tips are operating properly. To do this, place the unoccupied chair on a level surface, engage the anti-tips, and tip the chair backward until the anti-tips are supporting the weight of the chair. Apply sufficient pressure to ensure that the anti-tips are operating properly. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## Engaging

To engage the anti-tip, raise the release lever to the unlock position, grip the anti-tip firmly, engage the anti-tip in the receiver until the release button clicks into place and lower the release lever into the locked position as shown in Figure 13-7.

## Removing

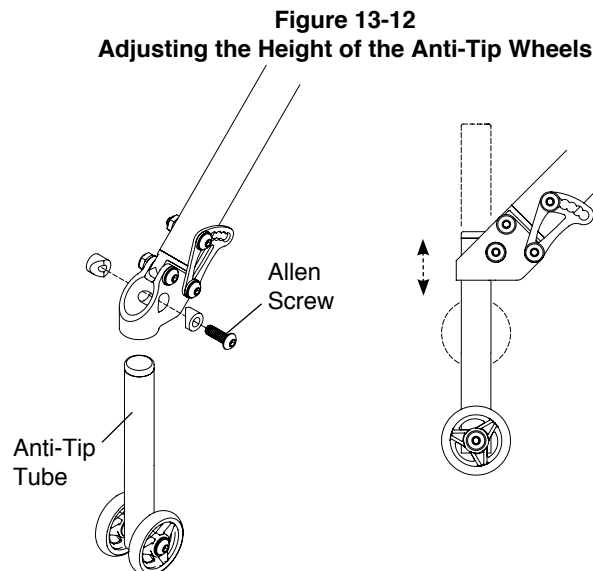
To remove the anti-tip, raise the release lever to the unlocked position, grip the anti-tip firmly, press the release button and pull rearward on the anti-tip to disengage it from the receiver as shown in Figure 13-8.

## Adjusting the Angle

To adjust the angle, please use the tools and follow the procedures under “Center Mount Single Swivel Anti-Tip – Adjusting the Angle” on page 13-6.

## Adjusting the Height of the Anti-Tip Wheels

To adjust the height of the anti-tip wheels, please use the tools and follow the procedures under “Center Mount Single Swivel Anti-Tip – Adjusting the Height of the Caster” on page 13-7. See Figure 13-12.



## Mounting

### ⚠ WARNING

Only an authorized TiLite dealer or qualified technician should install the anti-tip receiver. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

## CHAPTER 13: ANTI-TIPS

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To mount the Center Mount Single Non-Swivel Anti-Tip, please use the tools and follow the procedures under “Center Mount Single Swivel Anti-Tip – Mounting” on page 13-8.

# CHAPTER 14: ADJUSTABLE SEAT WIDTH AND DEPTH

TiLite Twist wheelchairs are designed to be expandable to accommodate the needs of a growing child. This chapter explains the procedures to follow in order to expand the seat width and/or depth on these chairs. Up to two additional aluminum backrest release bars may be ordered at no additional charge. Please contact Customer Service for assistance.

## Adjusting the Width of the Wheelchair

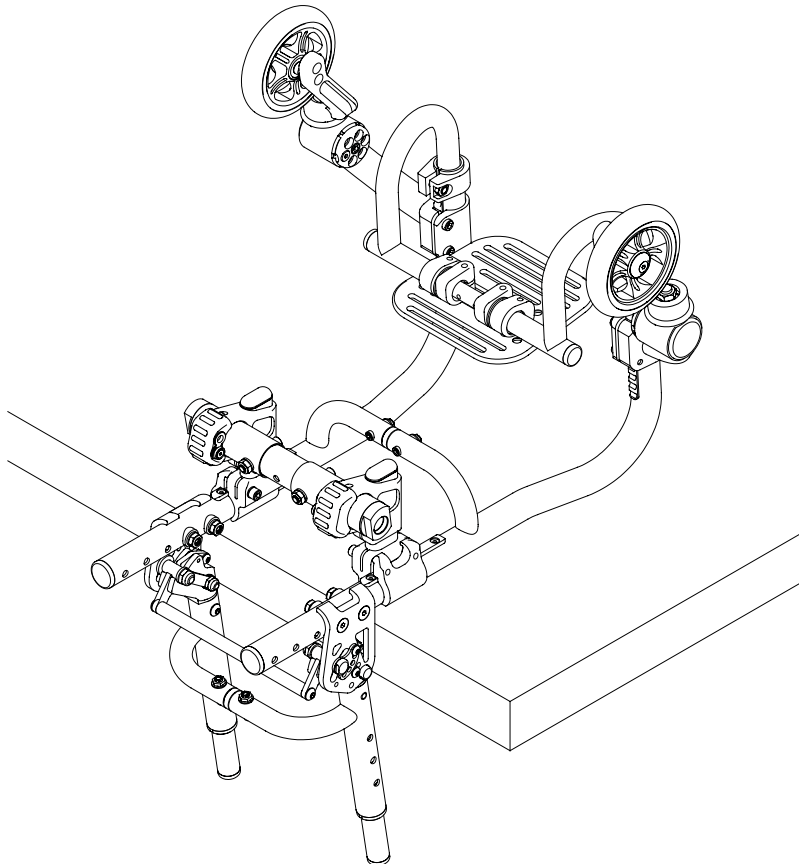
TiLite Twist wheelchairs are equipped with frame expansion spacers. These spacers enable you to adjust the width of the chair within a 3" range.

### Tools Needed:

- 3/16" Allen Wrench
- 5/32" Allen Wrench
- 7/16" Open End Wrench
- 3/8" Open End Wrench
- Ruler or measuring tape

1. Remove the rear wheels from the chair.
2. Remove the seat cushion.
3. Remove the back upholstery. See "Velcro®-Style Back Upholstery" or "Tension Adjustable by Straps Back Upholstery" on pages 7-2 and 7-3.
4. Remove the seat sling. See "Tension Adjustable Bolt-On Seat Upholstery – Replacing the Upholstery" on page 7-4 or "Solid Aluminum Seat Pan – Removing/Replacing" on pages 7-4 and 7-5.
5. Remove any side guards or armrests installed on the chair.
6. Place the frame upside down on a level surface as shown in Figure 14-1.

**Figure 14-1**  
**Twist frame on level surface**

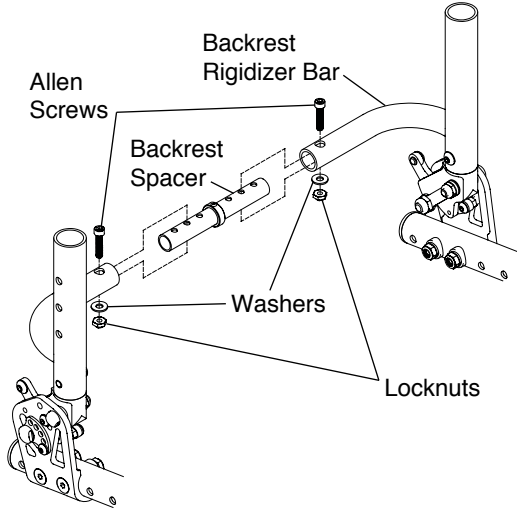


# CHAPTER 14: ADJUSTABLE SEAT WIDTH AND DEPTH

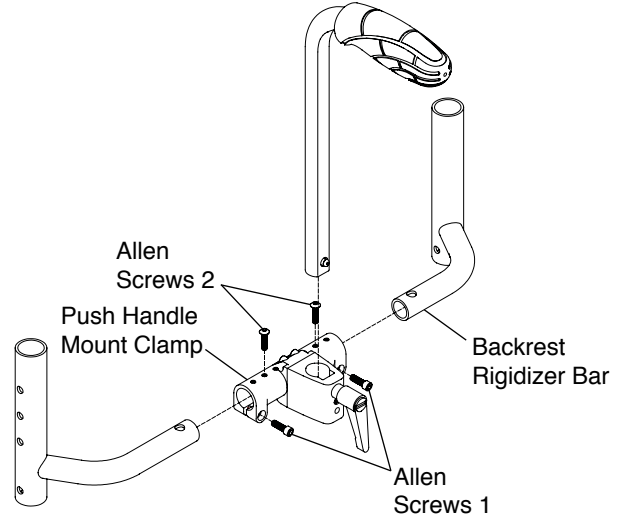
7. If your backrest includes the backrest spacer, remove both Allen screws, washers and locknuts on the backrest spacer. See Figure 14-2.

If your backrest includes the push handle mount clamp, loosen but do not remove Allen screws 1 and remove Allen screws 2. See Figures 14-3.

**Figure 14-2**  
**Backrest with Spacer**

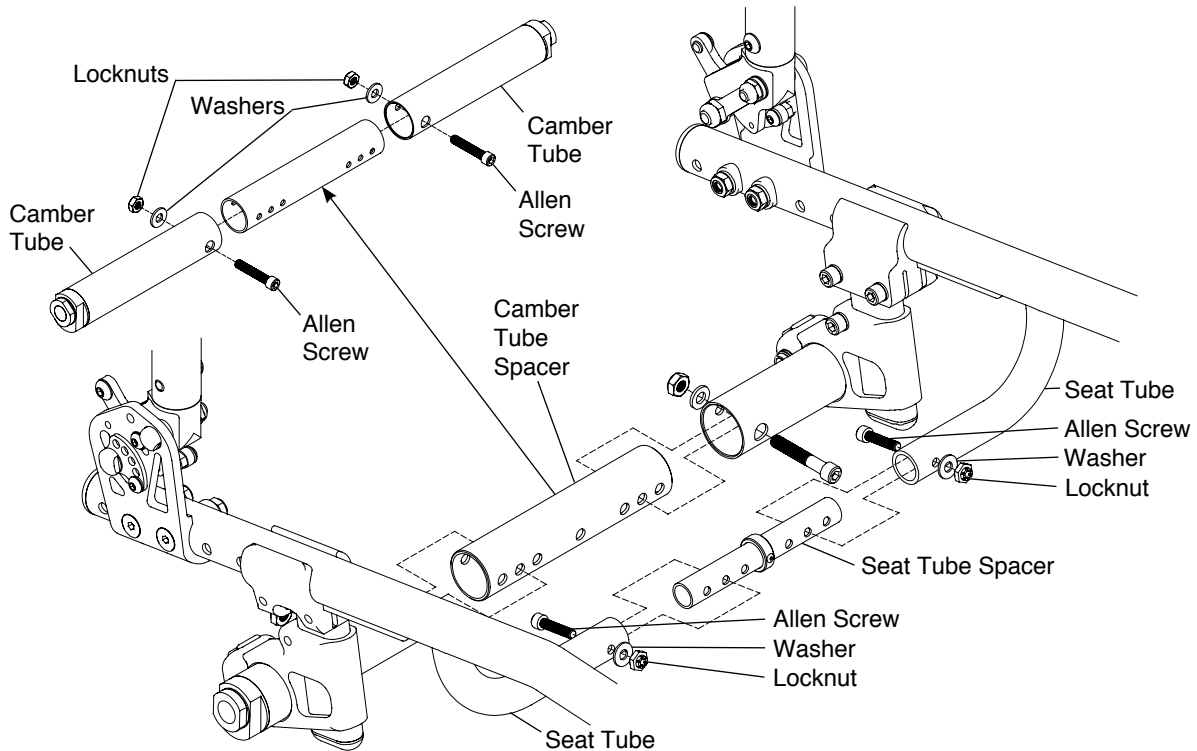


**Figure 14-3**  
**Backrest with Push Handle Clamp**



8. Remove both Allen Screws, washers and locknuts on the seat tube spacer and camber tube spacer. See Figure 14-4.

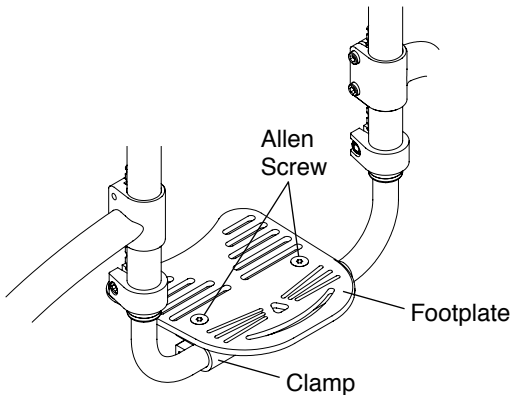
**Figure 14-4**  
**Seat Tube Spacer and Camber Tube Spacer**



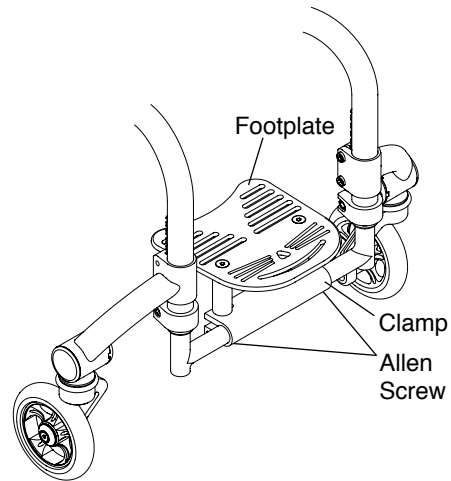
# CHAPTER 14: ADJUSTABLE SEAT WIDTH AND DEPTH

9A. If you have an angle adjustable or high mount angle adjustable footrest, loosen the two Allen screws that secure the footplate to the clamp. See Figures 14-5 and 14-6.

**Figure 14-5**  
Angle Adjustable



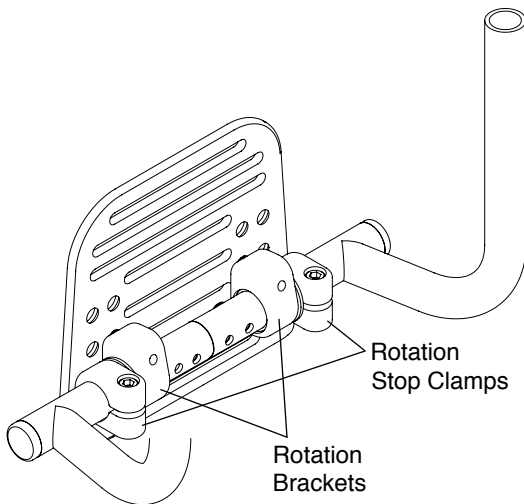
**Figure 14-6**  
High Mount Angle Adjustable



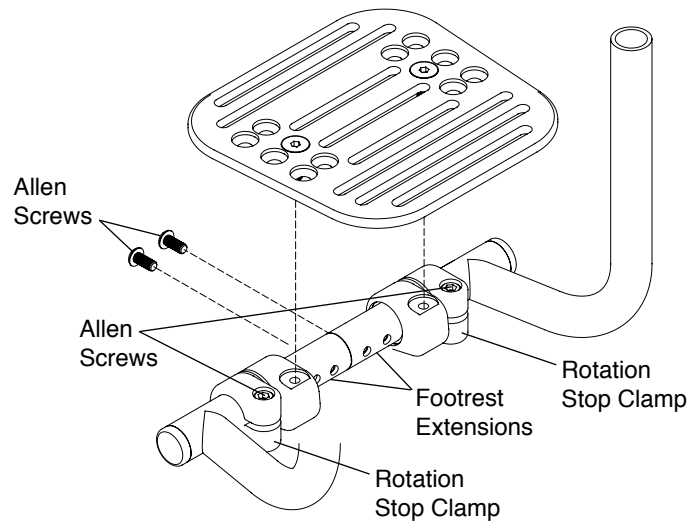
9B. If you have a flip-back footrest or a high mount flip-back footrest (with any type of footplate) as shown in Figure 14-7:

- Loosen, but do not remove, the Allen screws in the two rotation stop clamps. See Figure 14-8.
- Remove the Allen screws that secure the footrest extensions to the footrest spacer (located inside the footrest extensions). See Figure 14-8.

**Figure 14-7**  
Location of Rotation Stop Clamps on Small Footrest



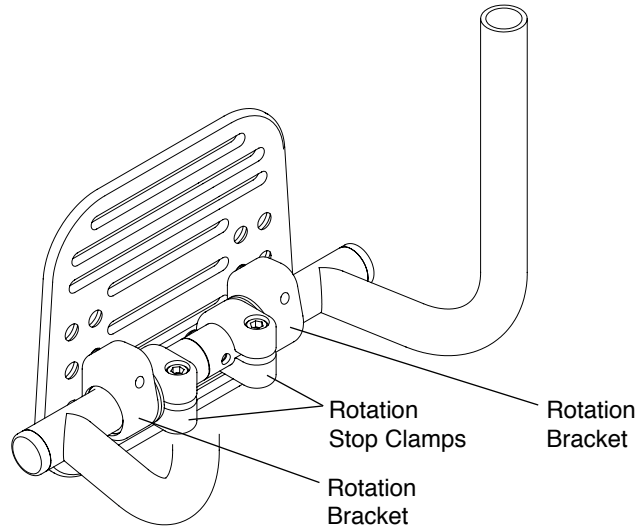
**Figure 14-8**  
Expanding the Footrest Spacer



# CHAPTER 14: ADJUSTABLE SEAT WIDTH AND DEPTH

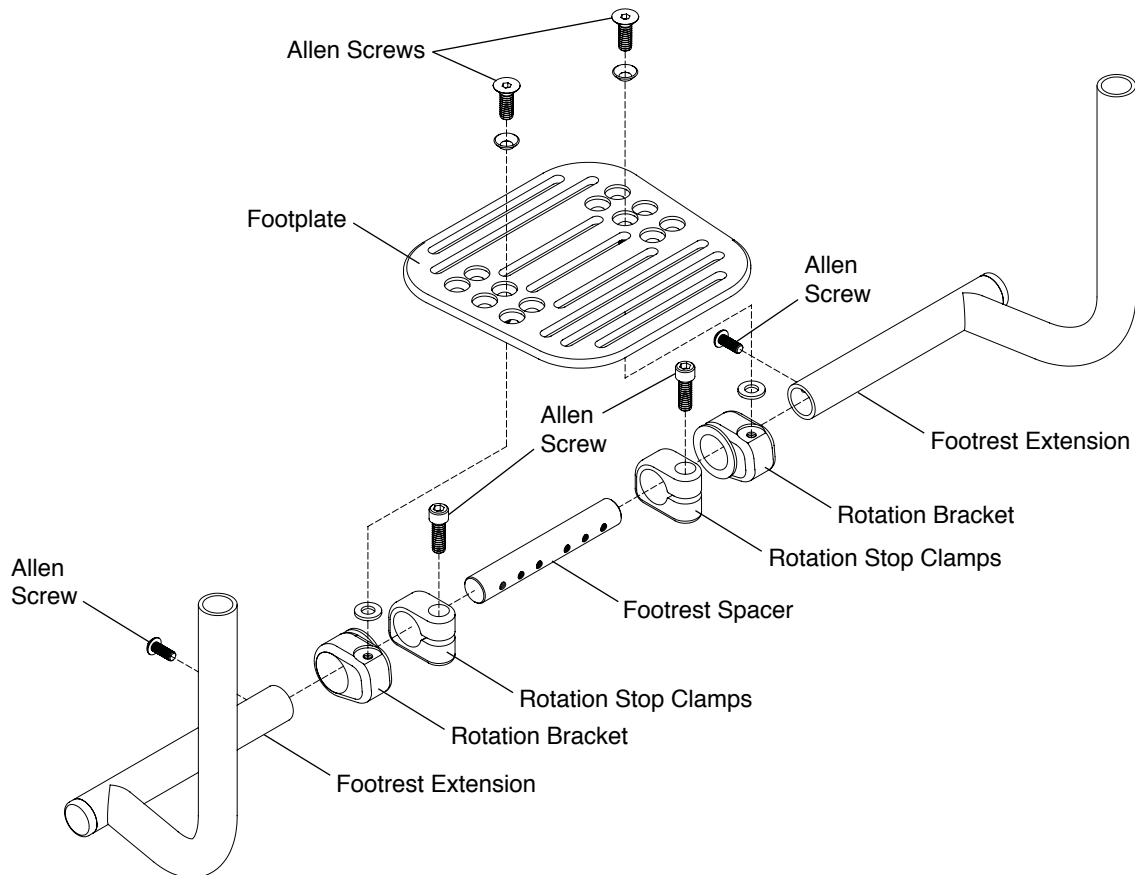
9C. If you have a flip-back footrest or a high mount flip-back footrest (with any type of footplate) as shown in Figure 14-9:

**Figure 14-9**  
**Location of Rotation Stop Clamps on Small Footrest**



- Remove the footrest extensions from the frame. See “Angle Adjustable Footrest (Standard or CAT)—Adjusting the Height/Replacing” on pages 3-1 to 3-2.
- Remove the Allen screws that secure the footplate to the rotation brackets. See Figure 14-10.

**Figure 14-10**  
**Expanding the Footrest**

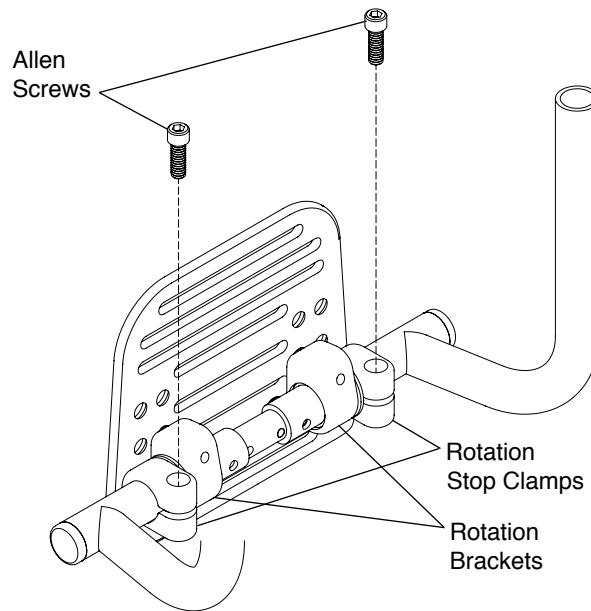




## CHAPTER 14: ADJUSTABLE SEAT WIDTH AND DEPTH

- c. Remove the Allen screws that secure the rotation stop clamps to the footrest extensions.
- d. Remove the Allen screws that secure the footrest extensions to the footrest spacer.
- e. Remove the rotation stop clamp and rotation bracket from each footrest extension and reinstall on the opposite footrest extension, so that the reassembled footrest appears as shown in Figure 14-11.

**Figure 14-11**  
**Location of Rotation Stop Clamps on Small Footrest After Expanding the Width**



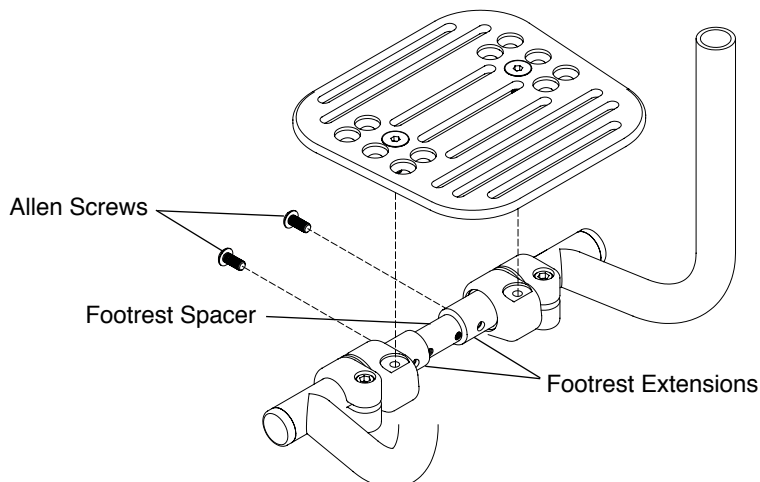
10. Starting with the seat tube spacer and the camber tube spacer, adjust the chair to the desired width. See Figure 14-4. The chair adjusts in 1" increments. Reinstall and hand tighten the Allen screws that secure the seat tube to the seat tube spacer and the camber tube to the camber tube spacer.

**Note:** Make sure that the spacers are centered inside the camber tube and the seat tube and that both are the same width.

11. Adjust the backrest to the same width as the new seat width, making sure that the backrest spacer or push handle mount clamp is centered on the backrest rigidizer bar. See Figures 14-2 and 14-3. Reinstall and hand tighten the Allen screws that secure the backrest spacer or push handle mount clamp.
12. Measure the seat width at the front of the frame and at the rear of the frame. If both seat widths are equal, securely tighten the Allen screws that secure the seat tube spacer, the camber tube spacer and the backrest spacer or push handle mount clamp.
- 13A. If you have an angle adjustable or high mount angle adjustable footrest, securely tighten the two Allen screws that secure the footplate to the clamp, thereby securing the clamp to the footrest extensions. See Figures 14-5 and 14-6.
- 13B. If you have a flip-back footrest or a high mount flip back footrest (with any type of footplate) as shown in Figure 14-7:
  - a. Reinstall the Allen screws that secure the footrest extensions to the footrest spacer, making sure that the footrest spacer is centered inside the two footrest extensions. Securely tighten. See Figure 14-12.

## CHAPTER 14: ADJUSTABLE SEAT WIDTH AND DEPTH

Figure 14-12  
Reassembling the Flip-Back Footrest after Expansion



**Note:** The threads on the Allen screws that secure the footrest spacer to the footrest extensions have been treated with a Vibra-TITE® VC-3, a locking and sealing coating, to reduce the possibility that they will become loose. If you repeatedly remove and reinstall these screws, you should be able to remove and reinstall these screws approximately four times without reapplying the coating. TiLite requires that you reapply Vibra-TITE® VC-3 after every fourth adjustment. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

- b. Adjust the two rotation stop clamps to the desired angle for the footrest (see “CAT Flip-Back Angle Adjustable Footrest / CAT Flip-Back Angle Adjustable High Mount – Adjusting the Angle” on page 3-3) and securely tighten. See Figure 14-8.
- 13C. If you have a flip-back footrest or a high mount flip-back footrest (with any type of footplate) as shown in Figure 14-9:
- a. Reinstall the Allen screws that secure the footrest extensions to the footrest spacer, making sure that the footrest spacer is centered within the two footrest extensions. Securely tighten. See Figure 14-12.

**Note:** The threads on the Allen screws that secure the footrest spacer to the footrest extensions have been treated with a Vibra-TITE® VC-3, a locking and sealing coating, to reduce the possibility that they will become loose. If you repeatedly remove and reinstall these screws, you should be able to remove and reinstall these screws approximately four times without reapplying the coating. TiLite requires that you reapply Vibra-TITE® VC-3 after every fourth adjustment. *If you ignore this Warning, you may fall, tip over or lose control of the wheelchair and seriously injure yourself or others or damage the wheelchair.*

- b. Reinstall the footplate and securely tighten the Allen screws that secure the footplate to the rotation brackets.
  - c. Flip up the footrest and reinstall the Allen screws that secure the rotation stop clamps. Loosely tighten.
  - d. Reinstall the footrest assembly onto the frame of the chair. See “Angle Adjustable Footrest (Standard or CAT)—Adjusting the Height/Replacing” on pages 3-1 to 3-2.
  - e. Adjust the two rotation stop clamps to the desired angle for the footrest (see ““CAT Flip-Back Angle Adjustable Footrest / CAT Flip-Back Angle Adjustable High Mount – Adjusting the Angle” on page 3-3”) and securely tighten. See Figure 14-8.
14. Adjust the width of the tension adjustable bolt-on seat sling to the approximate new width of your chair. See “Tension Adjustable Bolt-On Seat Upholstery—Adjusting the Tension” on pages 7-3 to 7-4. Install the seat upholstery. See “Tension Adjustable Bolt-On Seat Upholstery—Replacing” on page 7-4.

**Note:** If your chair had a solid aluminum seat pan, you will need to order a new seat pan to fit your new chair width.

15. Reinstall the back upholstery.

## CHAPTER 14: ADJUSTABLE SEAT WIDTH AND DEPTH

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16. Reinstall the side guards or armrests.
17. Reinstall the seat cushion.
18. Reinstall the rear wheels.
19. Check the toe-in/toe-out and adjust as needed and square the casters.

### **Adjusting the Seat Depth**

To adjust the seat depth, use the tools and follow the procedures under “Folding Aluminum Adjustable Height Backrest – Adjusting the Depth” on page 4-4.



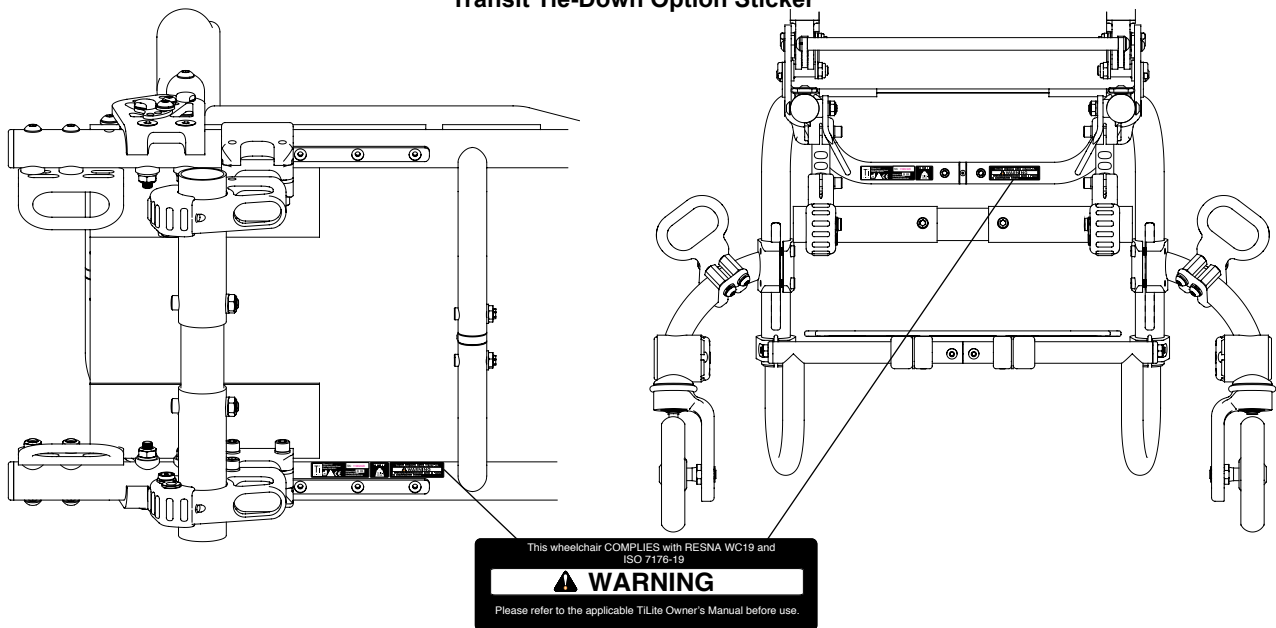
# CHAPTER 15: TRANSPORTATION OPTIONS

As of this date, the Department of Transportation has not approved any tie down systems for transportation of a user while in a wheelchair, in a moving vehicle of any type. It is TiLite's position that users of wheelchairs should transfer into appropriate seating in vehicles for transportation and should use the restraints made available by the auto industry.

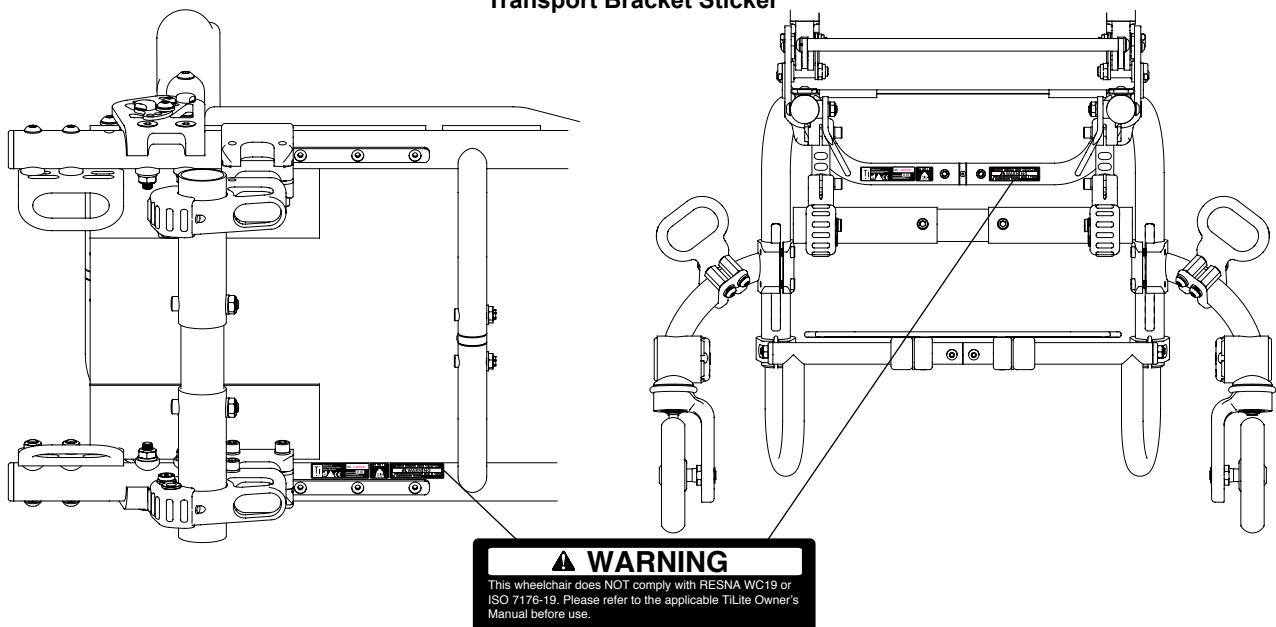
## TRANSPORTATION OPTIONS

The TiLite Twist is available with a Transit Tie-Down Option or a Wheelchair Transport Option. The Transit Tie-Down Option, which is only available as a factory-installed option, has been crash-tested in accordance with ISO 7176-19 as described in this Owner's Manual. It is approved for occupied transit use. The Wheelchair Transport Option has NOT been crash-tested in accordance with either ISO 7176-19 or ANSI/RESNA WC19. It is approved only for transportation of an UNOCCUPIED wheelchair. To determine whether your TiLite Twist is equipped with the Transit Tie-Down Option or the Wheelchair Transport Option, see Figures 15-1 and 15-2.

**Figure 15-1**  
**Transit Tie-Down Option Sticker**



**Figure 15-2**  
**Transport Bracket Sticker**



# CHAPTER 15: TRANSPORTATION OPTIONS

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## GENERAL WARNINGS

### **⚠WARNING**

If you cannot locate either sticker on your TiLite Twist (see Figures 15-1 and 15-2), you must assume that your chair is equipped with Transport Brackets and is only to be used for unoccupied transport of a wheelchair in a motor vehicle.

### **⚠WARNING**

This Chapter contains detailed information regarding the exact configuration of the Twist wheelchair that was subjected to the frontal impact and other tests required by ISO 7176-19. See “Statement of Compliance/Specifications” on pages 15-5 and 15-6. Those test results apply only to the configuration of the wheelchair as tested and described herein. Therefore, if you order your chair differently, such as with a seating system manufactured by someone other than TiLite, you are hereby advised that the wheelchair was not tested in such different configuration and should not be considered “transit approved” by TiLite. Because TiLite has not tested the chair with such different configurations, TiLite has no knowledge of how the product would perform in such configuration. Therefore, TiLite makes no claims or warranties about the wheelchair’s performance in any configuration other than the configuration described herein. TiLite has not authorized any person to make any such claims or warranties on TiLite’s behalf.

### **⚠WARNING**

The Twist wheelchair equipped with TiLite’s Transit Tie-Down Option has been dynamically tested in a forward-facing orientation for a 30 mph (48-km/h) frontal impact with varying weights, as set forth in “Statement of Compliance/ Specifications” on pages 15-5 and 15-6. The Twist wheelchair equipped with TiLite’s Transit Tie-Down Option has met the performance requirements for traveling forward-facing in frontal impact conditions, and it should be used **ONLY** for forward-facing seating in motor vehicles. Its use in other orientations (e.g., rearward-facing or sideways-facing) has not been tested, and it should **NOT** be used in such other orientations.

### **⚠WARNING**

Do not ride this wheelchair in a motor vehicle if your weight, together with the weight of all items attached to the wheelchair (such as backpacks, seat pouches, etc.) is more than 165 lbs (75 kg).

### **⚠WARNING**

Alterations or substitutions should **NOT** be made to the wheelchair securement points or to structural or frame parts or components. The TiLite wheelchairs were tested in the configurations with the components specified in “Statement of Compliance/ Specifications” on pages 15-5 and 15-6. Any significant modification or substitution to the wheelchair’s components or seating could significantly alter the chair’s performance during an impact.

### **⚠WARNING**

TiLite expressly disclaims that use of its Transit Tie-Down Option or Transport Bracket Option on a TiLite wheelchair will prevent the wheelchair user from injury or death in the event of a motor vehicle accident.

## CHAPTER 15: TRANSPORTATION OPTIONS

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### **⚠WARNING**

A sudden stop and/or collision may structurally damage your wheelchair. Such damage may not be visible. **IMMEDIATELY STOP** using any wheelchair that is involved in any such incident. Because the structural damage may not be visible, you **MUST** replace any wheelchair that is involved in any such incident.

### **USE OEM SEATING AND RESTRAINT SYSTEMS**

#### **⚠WARNING**

Whenever feasible, wheelchair users should transfer into the vehicle seat and use the Original Equipment Manufacturer (OEM) vehicle-installed restraint system and the unoccupied wheelchair should be stored in a cargo area or secured in the vehicle during travel.

### **USE APPROPRIATE TIE-DOWN SYSTEMS AND USE THEM PROPERLY**

#### **⚠WARNING**

Your TiLite wheelchair **MUST** be used with Wheelchair Tie-Down and Occupant Restraint Systems (WTORS) that meet the requirements of the SAE (Society of Automotive Engineers) J2249 Recommended Practice – Wheelchair Tie-Down and Occupant Restraint Systems for Use in Motor Vehicles (SAE J2249). Do **NOT** use WTORS that are designed to rely on the wheelchair structure to transfer occupant restraint loads to the vehicle.

#### **⚠WARNING**

Do **NOT** use your TiLite wheelchair with a WTORS unless the WTORS has been installed fully in accordance with the instructions of the manufacturer of the WTORS and SAE J2249.

#### **⚠WARNING**

**ALWAYS** attach the WTORS to your TiLite wheelchair at all four (4) of the TiLite Transit Tie-Down Option securement points in accordance with the instructions provided by the manufacturers of the WTORS and SAE J2249.

**Note:** See Figures 15-4 and 15-5 for the location of the four (4) TiLite installed WTORS securement points.

#### **⚠WARNING**

**ALWAYS** attach vehicle-anchored occupant restraints (pelvic belts and upper torso belts) in accordance with the instructions of the manufacturer of such restraints and SAE J2249.

### **USE PROPER EQUIPMENT/USE ONLY AS INSTRUCTED**

#### **⚠WARNING**

You **MUST** use your Twist wheelchair in strict accordance with all warnings and instructions contained in this Owner's Manual.

#### **⚠WARNING**

The Twist wheelchair equipped with TiLite's Transit Tie-Down Option was dynamically tested in a forward-facing orientation with the specified anthropomorphic test dummy restrained by **BOTH** a vehicle-anchored pelvic belt and a vehicle-anchored upper torso belt. **BOTH** pelvic and upper torso (shoulder) belts should be used to reduce the possibility of head and chest impacts with

## CHAPTER 15: TRANSPORTATION OPTIONS

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components of the motor vehicle. TILITE REQUIRES THAT BOTH PELVIC AND UPPER TORSO BELTS BE USED FOR MAXIMUM PROTECTION IN A FRONTAL IMPACT COLLISION.

### **⚠WARNING**

The backrest angle may be adjustable on your TiLite wheelchair. You must adjust the backrest angle so that it does not exceed the angle specified in Table 15-1 below, when the wheelchair is occupied during transit in a motor vehicle.

### **AVOID USING IMPROPER EQUIPMENT/SECURE OTHER EQUIPMENT**

### **⚠WARNING**

Postural supports, such as pelvic positioning belts, anterior trunk supports and lateral trunk supports, should NOT be relied on for occupant restraint in a moving vehicle unless they are labeled as being in accordance with ISO 7176-19.

### **⚠WARNING**

Posturing and positioning accessories, such as pelvic positioning belts, anterior trunk supports and lateral trunk supports, should NEVER be relied upon for occupant restraint in a moving vehicle unless they are labeled as being in accordance with the requirements specified in ISO 7176-19.

### **⚠WARNING**

Whenever possible, other auxiliary wheelchair equipment should be either effectively secured to the wheelchair or removed from the wheelchair and secured in the vehicle during travel so that such equipment does not break free and cause injury to the vehicle occupants in the event of a collision.

### **⚠WARNING**

In order to reduce the potential of injury to vehicle occupants, wheelchair-mounted trays and other accessories, such as IV poles, respiratory equipment, backpacks and other personal items, not specifically designed for crash safety should: (i) be removed and secured separately in the vehicle, or (ii) be secured to the wheelchair but positioned away from the occupant with energy-absorbing padding placed between the tray or other accessory and the occupant.

### **⚠WARNING**

IF YOU FAIL TO HEED THE WARNINGS IN THIS OWNER'S MANUAL, YOU MAY DAMAGE YOUR WHEELCHAIR, CAUSE SEVERE PHYSICAL INJURY TO OTHERS OR SUFFER SEVERE PHYSICAL INJURIES YOURSELF, UP TO AND INCLUDING DEATH.

## **INTRODUCTION**

This Chapter of the Twist Owner's Manual provides detailed instructions on the proper use of TiLite's Transit Tie-Down Option and Transit Bracket Option for your Twist wheelchair.

In 2001, the International Organization for Standardization (ISO) developed and adopted ISO 7176-19 entitled "Wheeled Mobility Devices for Use in Motor Vehicles" (ISO 7176-19). ISO 7176-19 sets forth design and performance requirements, and associated test methods, for wheeled mobility devices (wheelchairs) that will be used as seats in motor vehicles. ISO 7176-19 was last revised in 2008.



## CHAPTER 15: TRANSPORTATION OPTIONS

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In 2000, the American National Standards Institute, Inc. (ANSI) and the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) adopted ANSI/RESNA Wheelchair Standards Volume 1, Section 19 entitled “Wheelchairs Used as Seats in Motor Vehicles” (ANSI/RESNA WC/19). ANSI/RESNA WC/19 was developed to establish design and performance requirements for wheelchairs that will be used as seats in a motor vehicle.

Both ISO 7176-19 and ANSI/RESNA WC/19 provide a testing methodology for testing a wheelchair in a simulated frontal impact collision at 30 mph (48 kph). One difference between ISO 7176-19 and ANSI/RESNA WC/19 is that ISO 7176-19 permits the anthropomorphic test dummy to be secured using a vehicle-anchored pelvic belt and a vehicle-anchored shoulder belt while ANSI/RESNA WC/19 requires that the anthropomorphic test dummy be secured using a wheelchair-anchored pelvic belt and a vehicle-anchored shoulder belt.

ISO 7176-19 and ANSI/RESNA WC/19 are intended to promote occupant safety and reduce the risk of injury for motor-vehicle occupants who remain seated in their wheelchair during transit by improving the crashworthiness of wheelchairs that conform to its requirements. In the opinion of the authors of ANSI/RESNA WC/19, “a wheelchair that complies with all the requirements of this standard can be considered to provide a reasonable measure of safe and suitable seating during vehicle ingress/egress, during normal transportation, and in a frontal impact” (emphasis added). However, the authors of ANSI/RESNA WC/19 also noted that “wheelchairs that conform to the requirements of this standard should not be considered to offer seating and occupant restraint that is equivalent to that provided by seats provided by the vehicle manufacturer” (emphasis added). Similarly, the authors of ISO 7176-19 stated that wheelchairs “that comply with this part of ISO 7176 will have additional features that provide increased levels of occupant security and safety whilst their occupants are riding in motor vehicles.” Accordingly, ISO 7176-19 and ANSI/RESNA WC/19 include numerous warnings to the effect that “wheelchair users should transfer to the vehicle seat and use the vehicle-installed restraint system whenever it is feasible.”

Therefore, there are several important considerations that users of TiLite’s Transit Tie-Down Option must keep in mind. First, ISO 7176-19 only tests for wheelchair performance where the wheelchair, secured in the forward-facing position, is involved in a frontal impact collision at 30 mph (48 kph). It does not test for wheelchair performance in any other type of collision, including, without limitation, side impacts, rear impacts, rollovers or higher speed frontal impacts. Second, compliance with ISO 7176-19 does not guarantee that the occupant will not be injured, even in a frontal impact collision at 30 mph (48 kph) or less. In such an impact, the forces experienced are very severe and injuries can be sustained even if the wheelchair performs exactly as required by the standard.

This Owner’s Manual contains detailed information regarding the exact configuration of the TiLite wheelchairs that were subjected to the frontal impact and other tests required by ISO 7176-19. See “Statement of Compliance/Specifications” below. The results of that testing apply only to the configuration of the wheelchair as tested and described herein. **Therefore, if you order your chair differently, such as with a seating system manufactured by someone other than TiLite, you are hereby advised that the wheelchair was not tested in such different configuration and should not be considered “transit approved” by TiLite. Because TiLite has not tested the chair with such different configurations, TiLite has no knowledge of how the product would perform in such configuration. Therefore, TiLite makes no claims or warranties about the wheelchair’s performance in any configuration other than the configuration described herein. TiLite has not authorized any person to make any such claims or warranties on its behalf.**

### STATEMENT OF COMPLIANCE/SPECIFICATIONS

Twist wheelchairs equipped with TiLite’s Transit Tie-Down Option conform to the requirements of ISO 7176-19. Specifically, it has been tested in accordance with Section 5.2 (Frontal Impact), Section 5.3 (Accessibility of Securement Points Intended for Use with Four-Point Strap-Type Tie-Downs with Hook-Type End-Fittings) and Section 5.4 (Accommodation of Vehicle-Anchored Belt Restraints) of ISO 7176-19.

## CHAPTER 15: TRANSPORTATION OPTIONS

The wheelchair Tie-Down and occupant restraint system (WTORS) used in these tests was strap-type tie-down that complied with SAE J2249 and ISO 10542-1.

The TiLite Wheelchair Transport Bracket Option has NOT been crash-tested either pursuant to ISO 7176-19 “Wheeled Mobility Devices for Use in Motor Vehicles” or pursuant to ANSI/RESNA WC19. Therefore, the Wheelchair Transport Bracket Option is provided solely for the purpose of securing an UNOCCUPIED wheelchair in a motor vehicle.

**TABLE 15-1  
TiLite Wheelchair Test Configuration**

	<b>Twist</b>
Seat Width	15 in.
Seat Depth	16 in.
Seat Back Height.	19.5 in.
Rear Seat Height	17.5 in.
Seat Angle	6 degrees
Seat Back Angle	95 degrees
Wheelchair Weight	25 lbs.
Seat Sling	Tension Adjustable Bolt-On
Back Upholstery	Tension Adjustable by Straps
Backrest Type	Folding Aluminum Adjustable Height with Aluminum TiShaft Back Release Bar
Frame Angle	90 degrees
Wheels	24” wire wheels with 4 degrees of camber
Casters	5” Performance 5-Spoke Billet Aluminum with Polyurethane Tire
Footrest	Angle Adjustable
Other Options	None
Mass of ATD	130 lbs. (59 kg)
Maximum User Weight.	165 lbs. (75 kg)

The TiLite Twist wheelchair with the Transit Tie-Down Option was tested in accordance with ISO 7176-19 Section 5.2 using a surrogate wheelchair tie-down device that complied with Annex E of ISO 7176-19 and a three-point, vehicle-anchored, occupant restraint system consisting of a shoulder belt and a pelvic belt. The anthropomorphic test dummy weighed as set forth in the table above. The wheelchair that was tested passed the frontal impact test configured as described above.

The rider of a TiLite Twist wheelchair must not weigh more than the Maximum User Weight stated above. If there are items attached to the wheelchair, such as backpacks, seat pouches, etc., the weight of such attached items must be counted as part of the Maximum User Weight limit for the wheelchair. In other words, if the wheelchair rider has a 20 lb (9.1 kg) backpack attached to the wheelchair, then the wheelchair rider must not weigh more than the Maximum User Weight in Table 15-1 less 20 lbs. **The TiLite Twist wheelchair was not tested with a wheelchair-anchored pelvic belt, and TiLite does not offer this wheelchair with a wheelchair-anchored pelvic belt.**

### POSITIONING THE WHEELCHAIR IN THE VEHICLE

#### **⚠WARNING**

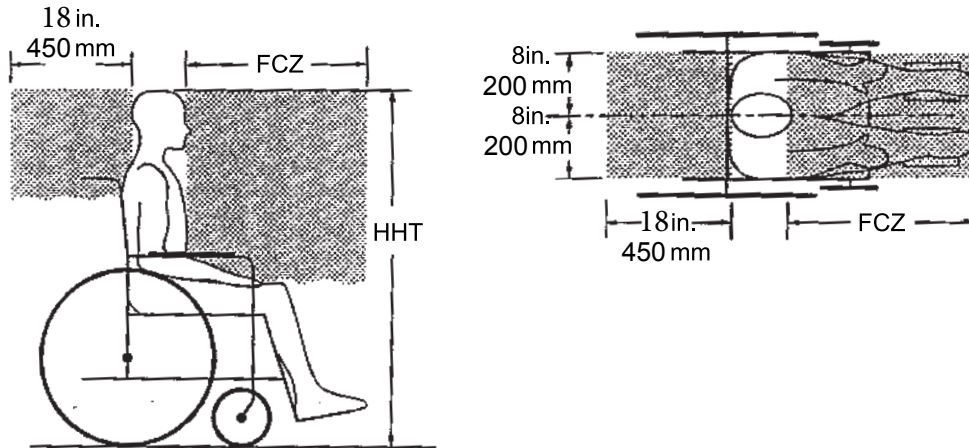
The TiLite Twist wheelchair equipped with a TiLite Transit Tie-Down Option complies with the requirements of ISO 7176-19 and, as such, has been designed and tested for use ONLY as a forward-facing seat in a motor vehicle. This TiLite wheelchair was not designed to be rearward-facing or sideways-facing when used as a seat in a motor vehicle.

## CHAPTER 15: TRANSPORTATION OPTIONS

### ⚠ WARNING

It is imperative that the wheelchair ALWAYS be positioned in a vehicle with appropriate clear zones around the wheelchair because in a frontal impact, even when properly secured, the wheelchair and its occupant will move from their secured position. Clear zones are required whether the wheelchair occupant is restrained by both pelvic and upper torso belts or only by a pelvic belt. The use of only pelvic or only upper torso belts is highly dangerous and is never recommended. The minimum necessary clear zones for the TiLite wheelchairs are shown in Figure 15-3.

Figure 15-3  
Clear Zones



- **Frontal Clear Zone** (“FCZ”) is measured from the front most point on an occupant’s head and is 26” (650 mm) with pelvic and shoulder belts and 37-1/2” (950mm) with pelvic belt only. The recommended clearance may not be achievable for wheelchair-seated drivers.
- **Rear Clear Zone** (“RCZ”) is 18” (450 mm) and is measured from the rear most point on an occupant’s head. There must be no obstructions in the RCZ.
- **Seated head height** (“HHT”) is measured from the floor of the vehicle to the top of the occupant’s head and it ranges from about 47” (1200 mm) for a small adult female to about 61” (1550 mm) for a tall adult male.

## SECURING THE WHEELCHAIR TO THE VEHICLE

### ⚠ WARNING

The Tie-Down brackets on your wheelchair were designed, located and installed by TiLite to comply with ISO 7176-19 and SAE J2249 standards so as to ensure that they operate properly and maximize the performance of the brackets in a frontal impact collision. The two front Tie-Down brackets (see Figures 15-4 and 15-5) should NEVER be removed or relocated to another position on the wheelchair frame. The two rear brackets may be removed ONLY if it is necessary to adjust the seat depth. However, any adjustment of the rear Tie-Down brackets must ALWAYS be performed by an authorized TiLite dealer, and, even if such an adjustment is made, you must ALWAYS use the bolts and nuts originally shipped with your wheelchair. If you substitute another bolt or nut, the Tie-Down brackets may not operate properly. Notwithstanding this Warning regarding removing or relocating the brackets, you should ALWAYS inspect the brackets before securing the wheelchair in a motor vehicle to ensure that they are properly secured, and, if necessary, the bolts should be tightened.

1. Whenever feasible, wheelchair users should transfer to the Original Equipment Manufacturer vehicle seat and use the vehicle-installed restraint system.

## CHAPTER 15: TRANSPORTATION OPTIONS

2. This wheelchair must be used **ONLY** with a WTORS comprised of a four-point, strap-type wheelchair Tie-Down and a three-point, vehicle-anchored, pelvic and torso belt-type, occupant restraint that has been installed in accordance with the manufacturer's instructions and SAE J2249. It is **NOT** compatible with other types of WTORS.

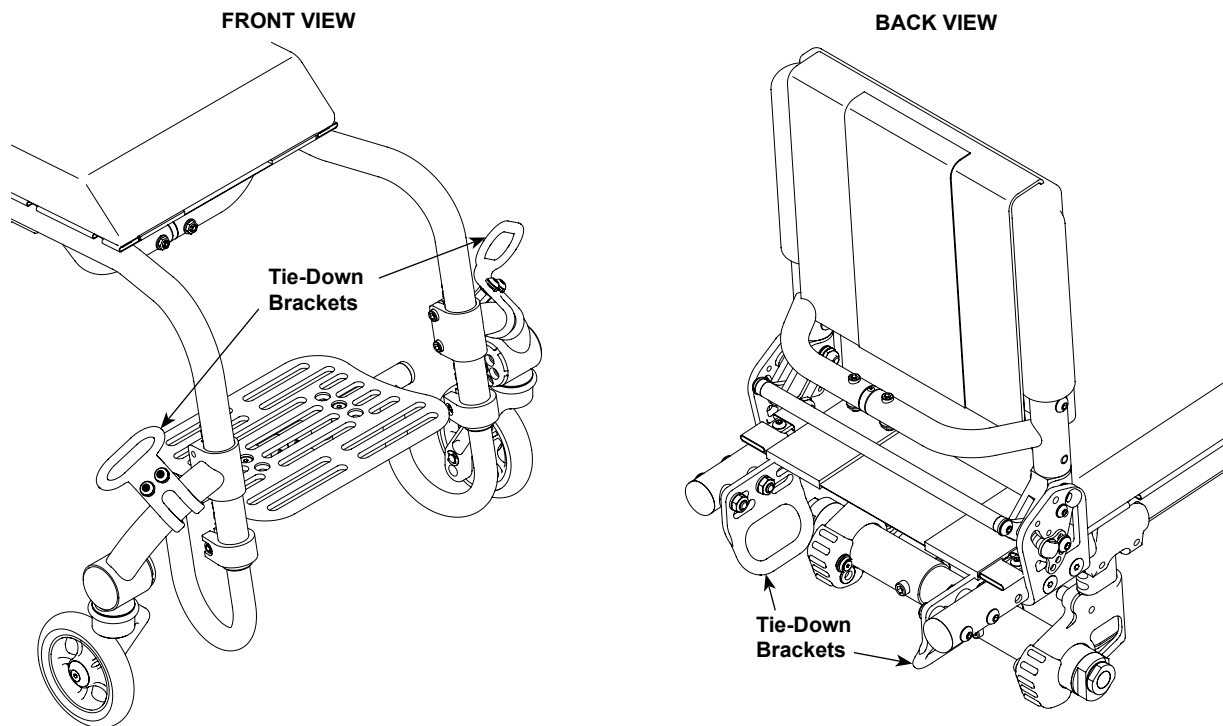
3. This wheelchair **MUST** be positioned in a forward-facing position prior to engaging the WTORS.

4. The positions of the four wheelchair securement points (Tie-Down brackets) are shown in Figure 15-4.

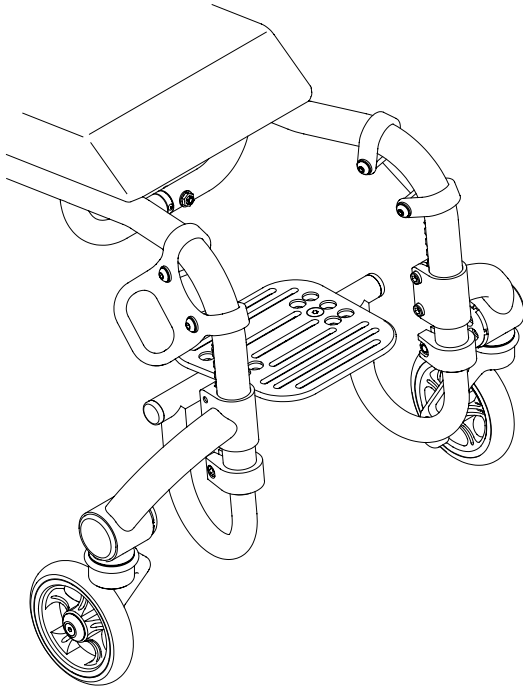
**Note:** For Twist wheelchairs manufactured prior to October 2012, the two front securement points were located as shown in Figure 15-5.

5. Each of the four Tie-Down brackets (see Figure 15-4) is identified with the symbol shown in Figure 15-6

**Figure 15-4**  
**Tie-Down Brackets**



**Figure 15-5**  
Front Tie-Down Brackets  
(Prior to October 2012)



**Figure 15-6**  
Bracket Labels



6. Carefully inspect each of the four Tie-Down brackets to ensure that they are properly secured to the wheelchair.
7. Carefully inspect each wheelchair Tie-Down strap for damage or wear.
8. The four wheelchair Tie-Down straps must be attached to the four Tie-Down brackets in accordance with the WTORS manufacturer's instructions and SAE J2249.
9. Each of the four wheelchair Tie-Down straps must be tightened to ensure that the wheelchair is securely fastened to the vehicle—there should be no “play” or looseness in any of the four wheelchair Tie-Down straps.

### **SECURING THE OCCUPANT; POSITIONING THE PELVIC AND UPPER TORSO BELTS**

#### **⚠WARNING**

A three-point, vehicle-anchored, pelvic and upper torso belt occupant restraint system must be properly installed and worn while riding in your TiLite Twist wheelchair in a motor vehicle.

#### **⚠WARNING**

A side-view pelvic-belt angle of 30° to 75° to the horizontal (see Figure 15-7) is preferred to lower pelvic belt angles.

#### **⚠WARNING**

Always ensure that the vehicle-anchored pelvic and upper torso belt buckles are positioned so that the release buttons will not be contacted by wheelchair components during a crash.

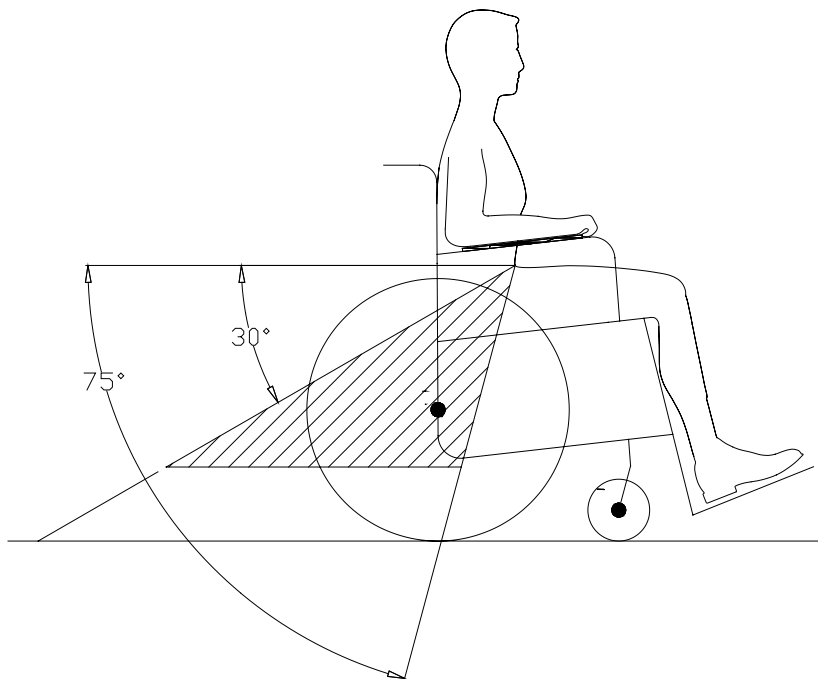
1. Carefully inspect the vehicle-anchored occupant restraint system belts, brackets and clamps to ensure that they are properly secured to the vehicle and are not damaged or worn.
2. Secure the wheelchair occupant using the vehicle-anchored pelvic belt and vehicle-anchored upper torso belt. See Figure 15-7. It is imperative that you position the belts properly. Paragraphs 3 to 7 which follow explain how to properly position your vehicle-anchored restraint belts.

## CHAPTER 15: TRANSPORTATION OPTIONS

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3. The pelvic belt should be worn low across the front of the pelvis so that the angle of the pelvic belt is within the preferred zone of 30° to 75° to the horizontal. See Figure 15-7. A steeper (greater) angle within the preferred zone is desirable.

**Figure 15-7**  
**Pelvic Belt Angle**



**Note:** Steeper side-view pelvic-belt angles are especially important if the pelvic belt is intended to be used for postural support in addition to occupant restraint in a frontal crash. Steeper angles will reduce the tendency for a vertical gap to develop between the user and the belt due to compliance of seat cushions and belt movement, thereby reducing the tendency for the user to slip under the belt and for the belt to ride up on the soft abdomen during normal use.

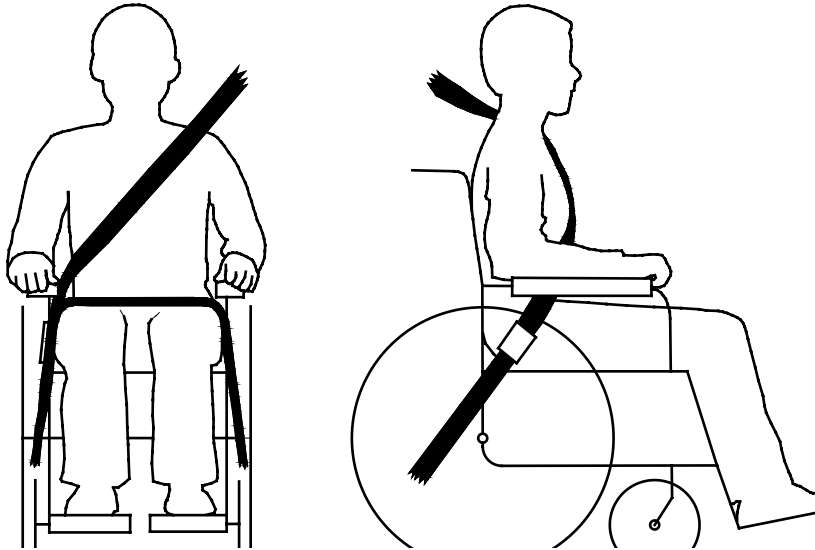
**Note:** Steeper belt angles also reduce the tendency for upper torso belts to pull the pelvic belt onto the abdomen during frontal impact loading.

4. The upper torso belt should fit over the shoulder and across the chest. See Figure 15-8.
5. Belt restraints should not be held away from the body by wheelchair components or parts, including, for example, the wheelchair armrests or wheels. See Figure 15-8 for the correct position of the belt restraints. See Figure 15-9 for the incorrect position of the belt restraints.

## CHAPTER 15: TRANSPORTATION OPTIONS

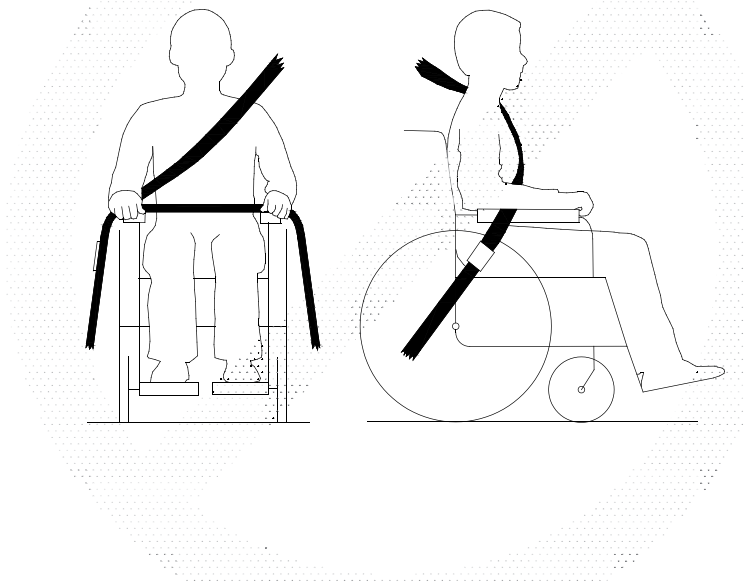
**Figure 15-8**  
**Illustration of Proper Belt-Restraint Fit**

Belt restraints should make full contact with the shoulder, chest, and pelvis and pelvic belts should be positioned low on the pelvis near the thigh-abdominal junction.



**Figure 15-9**  
**Illustration of Improper Belt-Restraint Fit**

Belt restraints must not be held away from the body by wheelchair components such as armrests or wheels



6. Always adjust the belt restraints to fit as tightly as possible, consistent with the wheelchair user's comfort.
7. Always carefully inspect the belt webbing to ensure that it is not twisted. If it is twisted, it will reduce the surface area of the belt that is in contact with the user, which could adversely affect the performance of the belt and injure the user in the event of an impact.

## CHAPTER 15: TRANSPORTATION OPTIONS

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### RATING OF ACCOMMODATION OF VEHICLE-ANCHORED BELT RESTRAINTS

In accordance with ISO 7176-19 Annex D, the TiLite wheelchairs were evaluated by an independent, university test facility with regard to the effective use of a vehicle-anchored three-point belt restraint system.

The TiLite Twist received an overall score of 14 points for a rating of C.

### SEATING OPTIONS

#### **⚠WARNING**

The TiLite Twist wheelchair was crash-tested in accordance with ISO 7176-19 only with TiLite Tension Adjustable Bolt-On seat upholstery and Tension Adjustable by Straps back upholstery. Therefore, these are the only seating options approved by TiLite for use with the TiLite Transit Tie-Down Option. If you order your TiLite wheelchair with the Transit Tie-Down Option and you use seating components other than these, the performance of the other seating system or upholstery is unknown. Therefore, TiLite makes no warranty or claim as to the performance of the TiLite wheelchair in the event of a motor vehicle accident of any type, even if the other seating system was crash tested with a different manufacturer's wheelchair or with a surrogate wheelchair in accordance with ANSI/RESNA WC/20.