Service Manual

TDX® SP

Wheelchair Base

DEALER: Keep this manual. The procedures in this manual **MUST** be performed by a qualified technician.

For more information regarding Invacare products, parts, and services, please visit www.invacare.com

INVACARE®

Yes, you can.®

⚠ DANGER

Risk of Death, Serious Injury or Damage

Improper use of this product may cause injury or damage.

If you are unable to understand the warnings, cautions or instructions, contact a health care professional or dealer before attempting to use this equipment.

- DO NOT use this product or any available optional equipment without first completely reading and understanding these instructions and any additional instructional material such as user manuals, service manuals or instruction sheets supplied with this product or optional equipment.

Continued use of the wheelchair with damaged parts could lead to the wheelchair malfunctioning causing injury to the user and/or caregiver.

- Check all wheelchair components and carton for damage and test components before use. In case of damage or if the wheelchair is not working properly, contact a qualified technician or Invacare for repair.

⚠ WARNING

Risk of Injury, Damage or Death

Improper setup, service, adjustment or programming may cause injury, damage or death.

– Qualified technician MUST setup, service and program the wheelchair.

– DO NOT allow non-qualified individuals to perform any work or adjustments on the wheelchair.

– DO NOT setup or service the wheelchair while occupied except for programming or unless otherwise noted.

– Turn off power BEFORE adjusting or servicing the wheelchair. Note that some safety features will be disabled.

– Ensure all hardware is securely tightened after setup, service or adjustments.

– Warranty is void if non-qualified individuals perform any work on this product.

⚠ DANGER

Risk of Death or Serious Injury

Not wearing your seat positioning strap could result in death or serious injury.

ALWAYS wear your seat positioning strap. Your seat positioning strap helps reduce the possibility of a fall from the wheelchair. The seat positioning strap is a positioning belt only. It is not designed for use as a safety device withstanding high stress loads such as auto or aircraft safety belts. If signs of wear appear, seat positioning strap MUST be replaced IMMEDIATELY.

REFERENCE DOCUMENTS

Refer to the table below for part numbers of additional documents which are referenced in this manual.

MANUAL	PART NUMBER
MK6i™ Electronics Field Reference Guide	1141471
Adjustable ASBA user manual	1143196
Adjustable ASBA Service Manual	1143238

NOTE: Updated versions of this manual are available on www.invacare.com

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SPECIAL NOTES

Signal words are used in this manual and apply to hazards or unsafe practices which could result in personal injury or property damage. See the information below for definitions of the signal words.

SIGNAL WORD	MEANING
⚠ DANGER	Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Caution indicates a potentially hazardous situation which, if not avoided, may result in property damage, minor injury or both.
IMPORTANT	Indicates a hazardous situation that could result in damage to property if it is not avoided.
NOTE:	Gives useful tips, recommendations and information for efficient, trouble-free use.

NOTE: THE INFORMATION CONTAINED IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE.

NOTE: As a manufacturer of wheelchairs, Invacare endeavors to supply a wide variety of wheelchairs to meet many needs of the end user. However, final selection of the type of wheelchair to be used by an individual rests solely with the user and his/her healthcare professional capable of making such a selection. Invacare highly recommends working with a qualified rehab technology provider, such as an ATP (Assistive Technology Professional).

NOTICE

NOTE: As of January, 1 2017, Transport Ready Option (TRRO) has been discontinued on this product. Please contact your dealer or Invacare for legacy information or to answer questions regarding TRRO.

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 Invacare's position that users of wheelchairs should be transferred into appropriate seating in vehicles for transportation and use be made of the restraints made available by the auto industry. Invacare cannot and does not recommend any wheelchair transportation systems.

- TRBKTS includes four factory-installed wheelchair transport brackets. TRBKTS has not been crash-tested in accordance with WC 19. Use these transport brackets only to secure an unoccupied wheelchair during transport.
- TRRO includes four factory-installed transport brackets and a wheelchair anchored pelvic belt. TRRO has been crash-tested in accordance with ANSI/RESNA WC Vol 1 Section 19 Frontal Impact Test requirements for wheelchairs with a 168 lb crash dummy, which corresponds to a person with a weight of 114 to 209 lbs.

⚠ WARNING

Improper installation or service may result in injury, damage or death.

- Transport ready packages are not retrofittable to existing models and are not field serviceable.

- DO NOT over tighten hardware.

NOTE: Refer to Transport in Vehicles on page 78 for more information about transporting the wheelchair.

NOTE: Wheelchairs with TRRO or TRBKTS Only - Battery retention brackets MUST be installed at all times.

The drive behavior initially experienced by the user may be different from other wheelchairs previously used. This power wheelchair has Invacare's SureStep® technology, a feature that provides the wheelchair with optimum traction and stability when driving forward over transitions and thresholds. The following warnings apply specifically to the SureStep feature:

⚠ WARNING!

Risk of Injury, Damage or Death

Loss of traction or stability on inclines/grades or ramps may cause injury, damage or death. Lighter weight users may be at an increased risk. Surfaces that may be wet, icy, oily, slippery, painted, treated wood, rotten wood, rusted metal or other similar surfaces or materials may also increase risk.

– DO NOT use on inclines or ramps where surface is uncertain or compromised.

– DO NOT use on inclines greater than nine (9) degrees.

– DO NOT operate the seating system while the wheelchair is moving. Stop before operating seating system.

– DO NOT operate the seating system while on an incline. Operation on an incline may result in increased instability.

– To determine and establish your particular safety limits, practice use of this product on various sloping surfaces in the presence of a qualified healthcare provider before attempting active use of this wheelchair.

– DO NOT use on inclines where line of sight is impaired.

– Travel at a reduced, constant speed and DO NOT make sudden stops or direction changes. Release the joystick and allow the wheelchair to come to a full stop before changing directions. Traveling at high speeds reduces traction and increases stopping distance.

– DO NOT drive in an elevated position while on an incline.

– DO NOT leave elevating legrests in the fully extended position when proceeding down inclines/grades.

– DO NOT leave an unoccupied wheelchair unattended on inclines or ramps.

LABEL LOCATIONS

⚠ DANGER

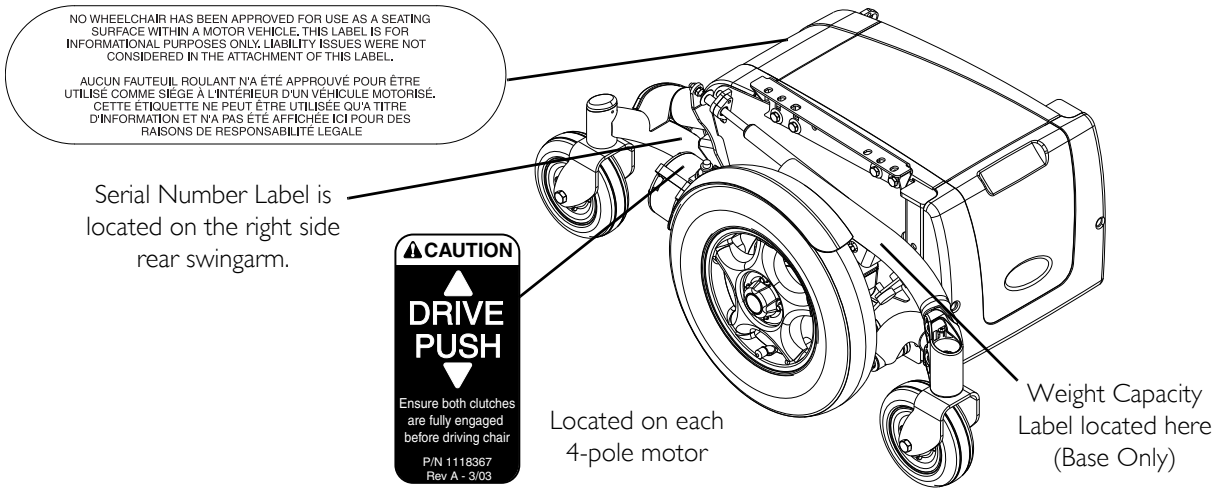
Risk of Injury, Damage or Death

Missing or damaged labels may contribute to injury damage or death.

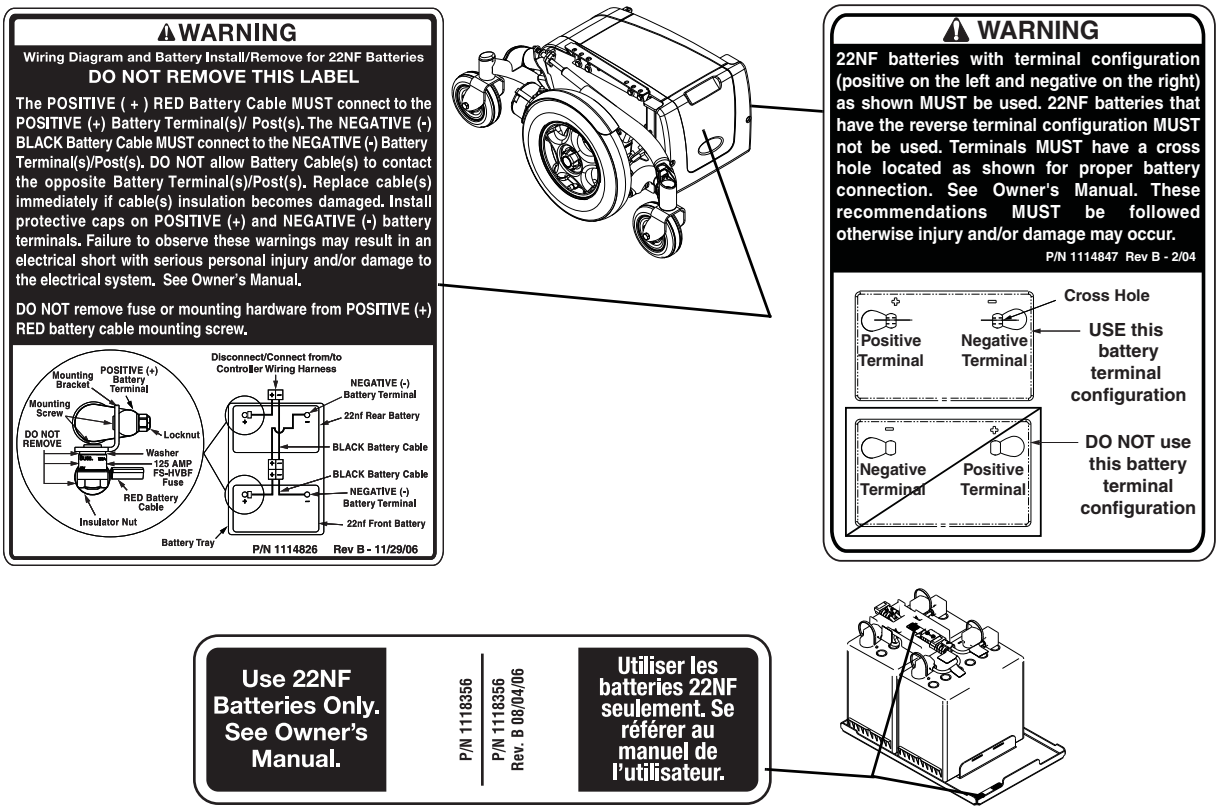
- Ensure labels are present and legible.

NOTE: Labels are subject to change without notice.

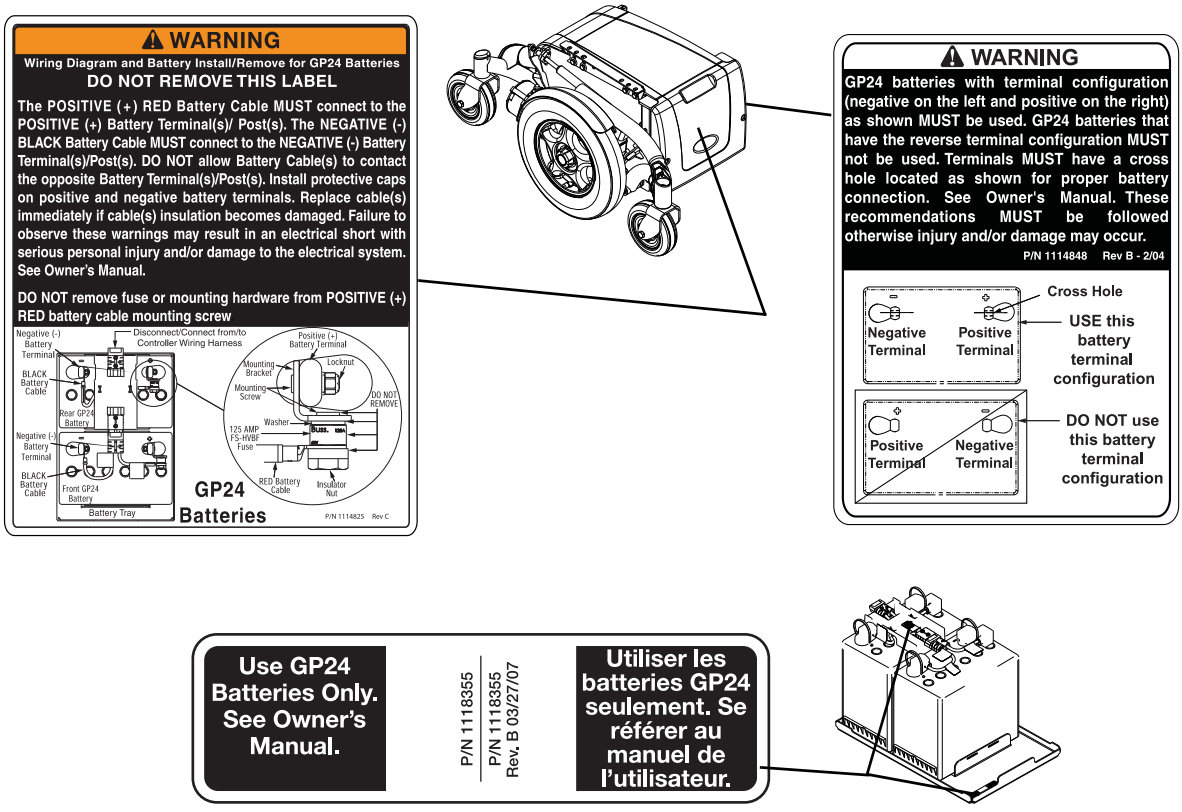
All Wheelchairs



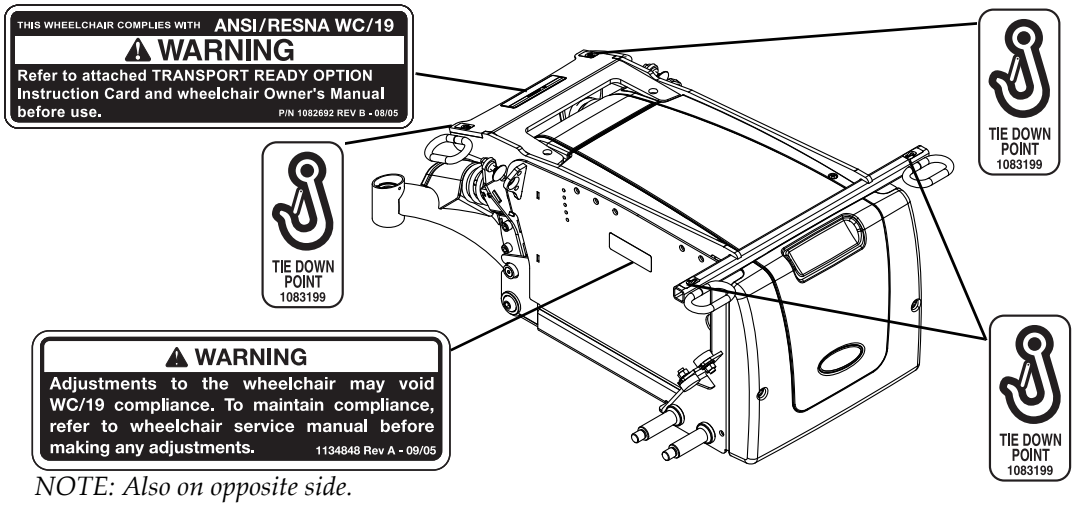
Wheelchairs with 22NF Batteries



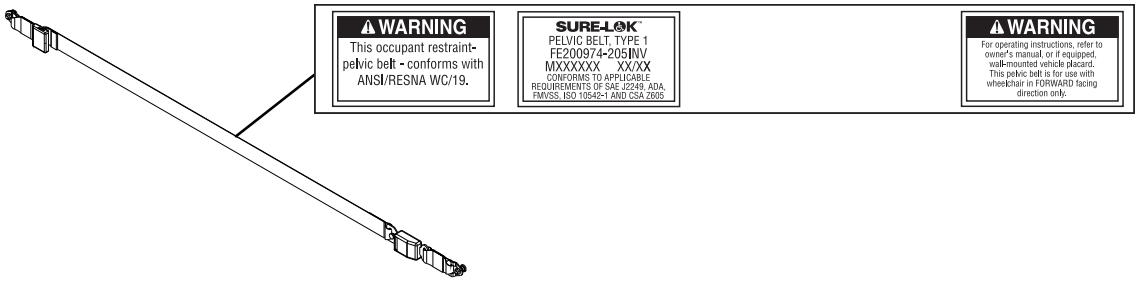
Wheelchairs with GP24 Batteries



Wheelchairs with TRRO

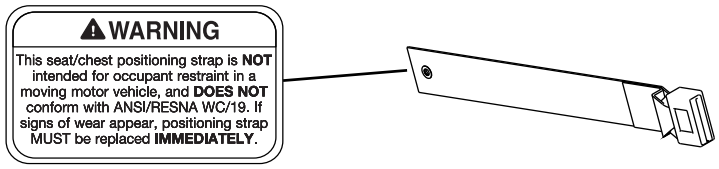


NOTE: Also on opposite side.



Wheelchairs without TRRO

NOTE: Auto style seat positioning strap shown. This label is also on the airline style seat positioning strap.



SPECIFICATIONS

TDX SP

	TDX SP	
MODELS:	TDXSPBASE, TDXSP, TDXSP-CG, TDXSP-MCG, TDXSP-CG-GT, TDXSP-GT, TDXSP-MCG-GT	
BASE LENGTH (WITHOUT FRONT RIGGINGS):	35.25 inches	
OVERALL WIDTH OF BASE (WITHOUT JOYSTICK):	24 inches (With two 22NF Batteries) 25.5 - inches (With two GP 24 Batteries or three 22NF Batteries)	
OVERALL HEIGHT WITH ASBA SEAT: WITH FORMULA CG TILT ONLY:	 35.5 to 39.5 inches 36.5 to 40.5 inches	
OVERALL LENGTH WITH CENTER MOUNT FRONT RIGGING: WITHOUT FRONT RIGGINGS:	 42.9 inches @ 0° 35.25 inches	
WEIGHT (BASE ONLY) WITHOUT 22NF BATTERIES: WITH TWO 22NF BATTERIES: WITHOUT GP24 BATTERIES: WITH TWO GP24 BATTERIES: WITH TRANSPORT READY OPTION:	 123 lbs 221 lbs 158 lbs 260 lbs Add 10 lbs	
MOTOR:	4 Pole	
DRIVE AXLE:	Non-adjustable	
***DRIVE WHEELS/TIRES:**	14 x 3-inch Foam Filled or Pneumatic (Standard)	
***CASTERS:**	6 x 2-inch, Semi-pneumatic with Precision Sealed Bearings	
CASTER FORKS:	Two side fork	
BATTERY REQUIREMENTS NUMBER OF BATTERIES NEEDED: MANUFACTURER: MODEL: VOLTAGE: CAPACITY (AMP-HOURS) FOR 5 HOUR RATING: *NOTE: Only sealed non-spillable batteries that meet DOT CFR 173.159 (d), IATA Packing Instructions 806, and IATA Provision A67 shall be installed in this wheelchair.*	GP24 2 MK batteries p/n M24SLDG batteries only 12 63	22NF 2 MK batteries p/n M22NFSLDG batteries only 12 43.2
OPERATING TEMPERATURE	122 F (50 C) Maximum to -13 F (-25 C) Minimum	
STORAGE TEMPERATURE	149 F (65 C) Maximum to -58 F (-40 C) Minimum	
FOOTRESTS:	Telescoping Front Rigging Supports, 2-inch and 4-inch long Pivot Slide Tube	
SEAT TILT ANGLE ADJUSTMENT:	Adjustable (0° to 10°)	

NOTE: All dimensions are ± .50 inches unless otherwise indicated.

**NOTE: The size of tire is marked on the side wall of each drive tire. The caster tires do not have the tire size marked as the caster tires are not serviceable. If new tire is needed, the entire caster wheel assembly MUST be replaced.*

	TDX SP
WEIGHT LIMITATION	4 POLE
WITH ASBA SEAT:	Up to 300 lbs
WITH FORMULA™ CG POWERED SEATING:	Up to 300 lbs

⚠ WARNING

Risk of Death or Serious Injury

Exceeding the weight capacity of the wheelchair/seating system could cause instability resulting in death or serious injury.

– DO NOT exceed the weight capacity.

NOTE: Weight limitation is total weight (user weight plus any additional items that the user may require [back pack, etc.]). Example: If weight limitation of the wheelchair is 300 lbs and additional items equal 25 lbs, subtract 25 lbs from 300 lbs this means the maximum weight limitation of the user is 275 lbs.

NOTE: All dimensions are ± .50 inches unless otherwise indicated.

**NOTE: The size of tire is marked on the side wall of each drive tire. The caster tires do not have the tire size marked as the caster tires are not serviceable. If new tire is needed, the entire caster wheel assembly MUST be replaced.*

SECTION 1—GENERAL GUIDELINES

NOTE: SECTION 1 - GENERAL GUIDELINES contains important information for the safe operation and use of this product.

General

⚠ DANGER

Risk of Death, Serious Injury or Damage

Improper use of this product may cause injury or damage.

If you are unable to understand the warnings, cautions or instructions, contact a health care professional or dealer before attempting to use this equipment.

- DO NOT use this product or any available optional equipment without first completely reading and understanding these instructions and any additional instructional material such as user manuals, service manuals or instruction sheets supplied with this product or optional equipment.

Continued use of the wheelchair with damaged parts could lead to the wheelchair malfunctioning causing injury to the user and/or caregiver.

- Check all wheelchair components and carton for damage and test components before use. In case of damage or if the wheelchair is not working properly, contact a qualified technician or Invacare for repair.

Accessories

⚠ WARNING

Risk of Serious Injury or Damage

Use of non-Invacare accessories may result in serious injury or damage.

Invacare products are specifically designed and manufactured for use in conjunction with Invacare accessories. Accessories designed by other manufacturers have not been tested by Invacare and are not recommended for use with Invacare products.

DO NOT use non-Invacare accessories.

To obtain Invacare accessories, contact Invacare by phone or at www.invacare.com.

Replacement Parts

⚠ DANGER

Risk of Death, Serious Injury or Damage

Use of incorrect or improper replacement (service) parts may cause death, serious injury, or damage.

Replacement parts MUST match original Invacare parts.

ALWAYS provide the wheelchair serial number to assist in ordering the correct replacement parts.

Repair or Service Information

⚠ DANGER

Risk of Death, Serious Injury, or Damage

Continued use of the wheelchair that is not set to the correct specifications may cause erratic behavior of the wheelchair resulting in death, serious injury, or damage.

Performance adjustments should only be made by professionals of the healthcare field or persons fully conversant with this process and the driver's capabilities.

After the wheelchair has been set up/adjusted, check to make sure that the wheelchair performs to the specifications entered during the set up procedure. If the wheelchair does not perform to specifications, turn the wheelchair Off immediately and reenter set up specifications. Contact Invacare, if wheelchair still does not perform to correct specifications.

⚠ WARNING

Risk of Death, Serious Injury, or Damage

Missing attaching hardware could cause instability resulting in death, serious injury or damage.

Ensure all attaching hardware is present and tightened securely.

⚠ WARNING

Risk of Serious Injury or Damage

Attaching hardware that is loosely secured could cause loss of stability resulting in serious injury or damage

After ANY adjustments, repair or service and before use, make sure that all attaching hardware is tightened securely.

⚠ DANGER

Risk of Death or Serious Injury

Electric shock can cause death or serious injury

To avoid electric shock, inspect plug and cord for cuts and/or frayed wires. Replace cut cords or frayed wires immediately.

⚠ DANGER

Risk of Death, Serious Injury, or Damage

Corroded electrical components due to water and/or liquid exposure, or incontinent users can result in death, serious injury, or damage.

– Minimize exposure of electrical components to water and/or liquids. Electrical components damaged by corrosion MUST be replaced immediately.

– Wheelchairs that are used by incontinent users and/or are frequently exposed to water/liquids may require replacement of electrical components more frequently.

⚠ WARNING

Risk of Injury, Damage or Death

Malfunctioning or damaged joystick may cause unintended/erratic movement resulting in injury, damage or death.

– Ensure the joystick is securely connected to controller.

– DO NOT use if joystick does not spring back to the neutral position or becomes sticky or sluggish.

– DO NOT use if joystick boot is torn or damaged.

– DO NOT use with a broken or missing joystick knob.

– If unintended/erratic movement occurs, stop using the wheelchair immediately and contact a qualified technician.

– Ensure control knobs are secure before using the wheelchair. Stop using the wheelchair immediately and contact a qualified technician if control knobs are not secure.

G-Trac

⚠ WARNING

Risk of Serious Injury or Damage

Improperly connecting the motor leads to the controller may cause injury or damage.

WHEELCHAIRS WITH G-TRAC: Crossing the motor leads (for example: connecting the left motor lead into the right motor connector on the controller) may result in unintended movement.

DO NOT cross the motor leads when connecting the motors to the controller - otherwise injury or damage may occur.

Stability Lock

⚠ DANGER

Risk of Death or Serious Injury

Not performing periodic maintenance on stability lock could result in death or serious injury.

ALWAYS perform the periodic maintenance to the stability lock listed in the inspection checklist of this manual.

Sip n' Puff (Pneumatic) Controls

⚠ WARNING!

Risk of Injury or Damage

Improper mounting or maintenance of the Sip n' Puff control including the mouthpiece and breath tube may cause injury or damage.

Water inside the Sip n' Puff interface module may cause damage to the unit.

Excessive saliva residue in the mouthpiece/straw can reduce performance.

Blockages, a clogged saliva trap or air leaks in the system may cause Sip N' Puff not to function properly.

– Ensure moving parts of the wheelchair, including the operation of powered seating, DO NOT pinch or damage the Sip n' Puff tubing.

– Saliva trap MUST be installed to reduce risk of water or saliva entering the Sip n' Puff interface module.

– Occasionally flush the mouthpiece to remove saliva residue.

– The mouthpiece/straw MUST be completely dry before installation.

– If Sip n' Puff does not function properly, inspect system for blockages, clogged saliva trap or air leaks.

– As necessary, replace mouthpiece, breath tube and saliva trap.

NOTE: Contact your Invacare dealer/provider for more information about maintaining and troubleshooting the Sip n' Puff system.

Operating Information

⚠ WARNING

Risk of Minor to Serious Injury

Pinch points can cause minor to serious injury.

Be mindful of potential pinch points and use caution when using this product.

⚠ WARNING

Risk of Injury, Damage or Death

Loss of traction or stability on inclines/grades or ramps may cause injury, damage or death. Lighter weight users may be at an increased risk. Surfaces that may be wet, icy, oily, slippery, painted, treated wood, rotten wood, rusted metal or other similar surfaces or materials may also increase risk.

– DO NOT use on inclines or ramps where surface is uncertain or compromised.

– DO NOT use on inclines greater than nine (9) degrees.

– DO NOT operate the seating system while the wheelchair is moving. Stop before operating seating system.

– DO NOT operate the seating system while on an incline. Operation on an incline may result in increased instability.

– To determine and establish your particular safety limits, practice use of this product on various sloping surfaces in the presence of a qualified healthcare provider before attempting active use of this wheelchair.

– DO NOT use on inclines where line of sight is impaired.

– Travel at a reduced, constant speed and DO NOT make sudden stops or direction changes. Release the joystick and allow the wheelchair to come to a full stop before changing directions. Traveling at high speeds reduces traction and increases stopping distance.

– DO NOT drive in an elevated position while on an incline.

– DO NOT leave elevating legrests in the fully extended position when proceeding down inclines/grades.

– DO NOT leave an unoccupied wheelchair unattended on inclines or ramps.

Electrical

Grounding Instructions

⚠ WARNING

Power wheelchairs are equipped with three-prong (grounding) plugs for protection against possible shock hazards. Where a two-prong wall receptacle is encountered, it is the personal responsibility and obligation of the customer to contact a qualified electrician and have the two-prong replaced with a properly grounded three-prong wall receptacle in accordance with the National Electrical code. If you must use an extension cord, use only a three-wire extension cord having the same or higher electrical rating as the device being connected. DO NOT, under any circumstances, cut or remove the round grounding prong from any plug used with or for Invacare products. In addition, Invacare has placed RED warning tags on some equipment. DO NOT remove these tags.

⚠ DANGER

Risk of Death, Injury or Damage

Shock hazards and risk of fire exist due to use of improper extension cord and/or use of three prong adapters.

– To avoid injury or product damage, when using an extension cord, use only a UL approved three wire extension cord having at least 16 AWG (American Wire Gauge) wire and the same or higher electrical rating as the device being connected.

– DO NOT use three prong to two prong adapters.

SECTION 2—ELECTROMAGNETIC COMPATIBILITY (EMC) INFORMATION

⚠ WARNING

CAUTION: IT IS VERY IMPORTANT THAT YOU READ THIS INFORMATION REGARDING THE POSSIBLE EFFECTS OF ELECTROMAGNETIC INTERFERENCE ON YOUR POWERED WHEELCHAIR.

Electromagnetic Interference (EMI) From Radio Wave Sources

Powered wheelchairs and motorized scooters (in this text, both will be referred to as powered wheelchairs) may be susceptible to electromagnetic interference (EMI), which is interfering electromagnetic energy (EM) emitted from sources such as radio stations, TV stations, amateur radio (HAM) transmitters, two way radios, and cellular phones. The interference (from radio wave sources) can cause the powered wheelchair to release its brakes, move by itself, or move in unintended directions. It can also permanently damage the powered wheelchair's control system. The intensity of the interfering EM energy can be measured in volts per metre (V/m). Each powered wheelchair can resist EMI up to a certain intensity. This is called its "immunity level." The higher the immunity level, the greater the protection. At this time, current technology is capable of achieving at least a 20 V/m immunity level, which would provide useful protection from the more common sources of radiated EMI.

There are a number of sources of relatively intense electromagnetic fields in the everyday environment. Some of these sources are obvious and easy to avoid. Others are not apparent and exposure is unavoidable. However, we believe that by following the warnings listed below, your risk to EMI will be minimized.

The sources of radiated EMI can be broadly classified into three types:

1) **Hand-held Portable transceivers (transmitters-receivers with the antenna mounted directly on the transmitting unit. Examples include: citizens band (CB) radios, "walkie talkie", security, fire and police transceivers, cellular telephones, and other personal communication devices).**

NOTE: Some cellular telephones and similar devices transmit signals while they are ON, even when not being used.

2) **Medium-range mobile transceivers, such as those used in police cars, fire trucks, ambulances and taxis. These usually have the antenna mounted on the outside of the vehicle; and**
3) **Long-range transmitters and transceivers, such as commercial broadcast transmitters (radio and TV broadcast antenna towers) and amateur (HAM) radios.**

NOTE: Other types of hand-held devices, such as cordless phones, laptop computers, AM/FM radios, TV sets, CD players, cassette players, and small appliances, such as electric shavers and hair dryers, so far as we know, are not likely to cause EMI problems to your powered wheelchair.

⚠ WARNING

Powered Wheelchair Electromagnetic Interference (EMI)

Because EM energy rapidly becomes more intense as one moves closer to the transmitting antenna (source), the EM fields from hand-held radio wave sources (transceivers) are of special concern. It is possible to unintentionally bring high levels of EM energy very close to the powered wheelchair's control system while using these devices. This can affect powered wheelchair movement and braking. Therefore, the warnings listed below are recommended to prevent possible interference with the control system of the powered wheelchair.

Electromagnetic interference (EMI) from sources such as radio and TV stations, amateur radio (HAM) transmitters, two-way radios, and cellular phones can affect powered wheelchairs and motorized scooters. Also, the electronics used in our powered wheelchair can generate a low level of electromagnetic interference, which however will remain within the tolerances permitted by law.

FOLLOWING THE WARNINGS LISTED BELOW SHOULD REDUCE THE CHANCE OF UNINTENDED BRAKE RELEASE OR POWERED WHEELCHAIR MOVEMENT WHICH COULD RESULT IN SERIOUS INJURY.

1) **Do not operate hand-held transceivers (transmitters receivers), such as citizens band (CB) radios, or turn ON personal communication devices, such as cellular phones, while the powered wheelchair is turned ON;**
2) **Be aware of nearby transmitters, such as radio or TV stations, and try to avoid coming close to them;**
3) **If unintended movement or brake release occurs, turn the powered wheelchair OFF as soon as it is safe;**
4) **Be aware that adding accessories or components, or modifying the powered wheelchair, may make it more susceptible to EMI (NOTE: There is no easy way to evaluate their effect on the overall immunity of the powered wheelchair); and**
5) **Report all incidents of unintended movement or brake release to the powered wheelchair manufacturer, and note whether there is a source of EMI nearby.**

Important Information

1) **20 volts per metre (V/m) is a generally achievable and useful immunity level against EMI (as of May 1994) (the higher the level, the greater the protection);**
2) **This device has been tested to a radiated immunity level of 20 volts per meter.**
3) **The immunity level of the product is unknown.**

Modification of any kind to the electronics of this wheelchair as manufactured by Invacare may adversely affect the EMI immunity levels.

⚠ CAUTION

Risk of Injury or Damage

EMC interference affecting other products may result in injury or damage.

To avoid impacting the operation and function of other products:

- Products not specified by Invacare that may be used on or near the wheelchair may be impacted by emissions from this product if they have a sensitivity level that is lower than the recognized standard and provided by this wheelchair. Refer to the manufacturer specifications for any electronic device BEFORE use near this product to determine its level of immunity and potential risk.

SECTION 3—SAFETY INSPECTION/TROUBLESHOOTING

Safety Inspection Checklists

NOTE: Initial adjustments should be made to suit the end user's personal body structure needs and preference. After initial setup, perform these procedures every time the wheelchair is serviced.

Inspect/Adjust Initially

⚠ DANGER

Risk of Injury, Damage or Death

Overinflation of tires may cause tires to explode.

—Inflate tire to the proper tire pressure (P.S.I./ kilopascals) listed on the side wall of the tire.

—Only use wheelchair with tires at proper tire pressure.

—The wheels and tires should be checked periodically for cracks and wear and should be replaced if necessary.

- ❑ Ensure wheelchair rolls straight (no excessive drag or pull to one side).
- ❑ Inspect all fasteners.
- ❑ Inspect TRRO/TRBKTS fasteners and hardware.
- ❑ Ensure clothing guards are secure.
- ❑ Arms are secure but easy to release and adjustment levers engage properly.
- ❑ Adjustable height arms operate and lock securely.
- ❑ Upholstery has no rips.
- ❑ Armrest pad sits flush against arm tube.
- ❑ Axle nut and wheel mounting nuts are secure on drive wheels.
- ❑ No excessive side movement or binding when drive wheels are lifted and spun when disengaged (free-wheeling).
- ❑ Ensure that casters are free of debris.
- ❑ Wheels/casters have proper tension when wheels/casters are spun (when free-wheeling). Wheels/casters should come to a gradual stop.
- ❑ Loosen/tighten caster locknut if wheel wobbles noticeably or binds to a stop.
- ❑ Ensure all caster/wheel/fork/headtube fasteners are secure and not damaged/missing.
- ❑ Wheel locks DO NOT interfere with tires when rolling.
- ❑ Wheel lock pivot point are free of wear and looseness.
- ❑ Wheel locks are easy to engage.
- ❑ Inspect tires for flat spots and wear.
- ❑ Check pneumatic tires for proper inflation.
- ❑ Check center mount front riggings for worn/frayed belts and/or loose fasteners. If found, replace these items.
- ❑ Check that all labels are present and legible. Replace if necessary.
- ❑ Inspect locking gas cylinders.
- ❑ Clean upholstery and armrests.
- ❑ Clean dirt and lint from axles.
- ❑ Clean dirt and lint from bearings.
- ❑ Inspect mechanical anti-dive for function.
- ❑ Inspect seat positioning strap for any signs of wear. Ensure buckle latches. Verify hardware that attaches strap to frame is secure and undamaged. Replace if necessary.
- ❑ Inspect foam handgrips for damage. If damaged, have them replaced by a qualified technician.
- ❑ Inspect motor brushes and gearbox coupling.
- ❑ Inspect electrical components for signs of corrosion. Replace if corroded or damaged.
- ❑ For optimum performance, replace locking-gas cylinders every two years.

Troubleshooting - Mechanical

WHEELCHAIR VEERS LEFT/RIGHT	SLUGGISH TURN/ PERFORMANCE	CASTERS FLUTTER	SQUEAKS AND RATTLES	LOOSENESS IN WHEELCHAIR	WHEELCHAIR 3 WHEELS	SOLUTIONS
X	X	X				If pneumatic, check tires for correct and equal pressure.
X	X	X	X			Check for loose stem nuts/bolts.
X		X				Check that casters contact ground at the same time.
				X	X	If pneumatic, check tires for correct and equal pressure.

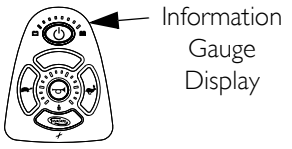
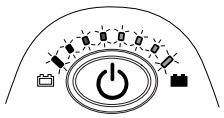
Troubleshooting - Electrical

NOTE: For additional troubleshooting information and explanation of error codes, refer to the individual Electronics Manual supplied with each wheelchair.

SPJ™ +, SPJ+ w/PSS or SPJ+ w/ACC Joysticks

The joystick information gauge and the service indicator give indications of the type of fault or error detected by the control module. When a fault is detected, the wheelchair may stop and not drive. The LEDs on the information gauge may flash in a particular pattern or the service indicator light will flash. The number or type of flashes indicates the nature of the error. If multiple errors are found, only the first error encountered by the control module will be displayed.

Information Gauge Display Diagnostics

DISPLAY	DESCRIPTION	DEFINITION	COMMENTS
			
	All LEDs are off.	Power is off.	
	All LEDs are on.	Power is on.	Fewer than three LEDs on implies reduced battery charge.
	Left RED LED is flashing.	Battery charge is low.	The batteries should be charged as soon as possible.
	Left to Right "chase" alternating with steady display.	Joystick is in programming, inhibit and/or charging mode.	The steady LEDs indicate the current state of the battery charge.
	All LEDs are flashing slowly.	Joystick has detected Out- of-Neutral-at-Power-Up mode.	Release the joystick to Neutral.

Service Indicator Light Diagnostics

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
1	E 01	User Fault	00	Stall Timeout or user error.	Release joystick to neutral and try again.
2	E02	Battery Fault	00	Recharge batteries or replace.	Check the batteries and cable. Try charging the batteries. Batteries may require replacing.

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
3	E03	Left Motor Fault	00	Left Motor Short Circuit	Check the left motor, connections and motor cable.
			01	Left Motor Open Circuit	
			02	Left Motor Connection Fault B-	
			03	Motor Terminal Connected to B+	
			04	Left Motor Voltage Fault	
			05	Left Motor Bridge Fault	
			06	Too Many Hardware Current Limit Events	
			07	Current Offset Out of Range	
			08	Hardware Current Limit Fault	
4	E04	Right Motor Fault	00	Right Motor Short Circuit	Check the right motor, connections and motor cable.
			01	Right Motor Open Circuit	
			02	Right Motor Connection Fault B-	
			03	Motor Terminal Connected to B+	
			04	Right Motor Voltage Fault	
			05	Right Motor Bridge Fault	
			06	Too Many Hardware Current Limit Events	
			07	Current Offset Out of Range	
			08	Hardware Current Limit Fault	
5	E05	Left Park Brake Fault	00	Left Park Brake Drive-Time Test Failed	Check the left park brake connections and cable.
			01	Left Park Brake Output Enabled When Wheelchair Idle	
			02	Left Park Brake Output Did not Enable When Entering Drive Mode	
			03	Left Park Brake fault during power-up testing	
			04	Left park brake feedback low during drive (park brake short)	

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
6	E06	Right Park Brake Fault	00	Right Park Brake Drive-Time Test Failed	Check the right park brake connections and cable.
			01	Right Park Brake Output Enabled When Wheelchair Idle	
			02	Right Park Brake Output Did not Enable When Entering Drive Mode	
			03	Right Park Brake fault during power-up testing	
			04	Right park brake feedback low during drive (park brake short)	
7	E07	Remote Fault	00	Local SR Fault (CPU, EEPROM, etc.)	Check the communications bus, connections and wiring. Replace the remote.
			01	Joystick fault at the remote	
			02	Speed pot fault at the remote	
8	E08	Controller Fault	00	Controller fault	Check connections and wiring. Replace power module.
			01	RAM fault	
			02	ROM fault	
			03	CPU fault	
			04	EEPROM fault	
			05	Watchdog fault	
			06	Stack fault	
			07	Software fault	
			08	Power-up testing fault	
			09	Relay fault or precharge fault	
			10	Bridge fault or disable all fault	
			11	Electronics fault: Thermistor	
			12	Calibration setting fault	
9	E09	Communications Fault	00	Remote connection lost	Check connections and wiring. Replace Bus cable.
			01	Low communication mode	
10	E10	General Fault	00	General fault	Check all connections and wiring. Contact Invacare Technical Service.
11	E11	Incompatible/incorrect Remote	00	Incompatible/incorrect Remote	Wrong type of remote connected. Ensure the branding of the joystick matches that of controller unit.

MPJ™ +, PSR+, PSF+ Joysticks or Displays

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
⚠ SPM L Park Brake Fault or ⚠ SPM R Park Brake Fault displays and wheelchair does not drive.	Motor lock levers disengaged (Error code E9 or E10).	Engage motor lock levers. Refer to user manual shipped with wheelchair.
CHARGER PLUGGED IN displays.	Battery charger connected (Error code E28).	Unplug battery charger from the wheelchair. Refer to Charging Batteries on page 72.
⚠ SPM Battery Fault displays and the wheelchair does not drive.	Batteries need to be charged (Error code E14).	Charge batteries. Refer to Charging Batteries on page 72. If batteries fail to charge properly, check battery charger or replace batteries. Refer to Replacing Batteries on page 65.
STOP JOYSTICK TIMEOUT displays and the wheelchair does not drive.	Joystick or input device is disconnected (Error code 32).	Turn off power, reconnect the joystick of input device and turn power on.
STOP JS REV TOO LARGE STOP JS FWD TOO LARGE STOP JS LFT TOO LARGE or STOP JS RGT TOO LARGE displays and the wheelchair does not drive.	The joystick or input device is sending a value outside of the reverse, forward, left or right limits (Error codes E01, E02, E03 or E04).	Replace joystick or input device.
NEUTRAL TESTING displays.	The joystick neutral test has failed (Error code E18).	Release the joystick and try to get the joystick back into the center-most position.
STOP BAD JOYSTICK CAL VALUES displays and the wheelchair does not drive.	The joystick calibration values are outside of the expected range (Error code E19).	Recalibrate the joystick (joystick throw procedure).
⚠ SPM NOT CONNECTED	The MPJ or Display module is not communicating with the control module (Error code E200).	Check the connections between the joystick or display and the controller. Turn the power off and then back on. Replace the controller if necessary.
⚠ SPM Communications Fault displays and the wheelchair drives slowly.	The controller has determined a fault during a previous turn-off process (Error code E41).	Turn the wheelchair off and back on.
ATTENDANT ACTIVE and  displays.	The Proportional or Digital Attendant control is active and can be used to drive the chair (Error code W05).	This is normal behavior.
Batteries draw excessive current when charging.	Battery failure. Electrical malfunction.	Have batteries checked for shorted cell. Replace if necessary. Refer to Replacing Batteries on page 65. Contact Invacare for service.
Battery indicator flashes the charge level is low - immediately after recharge.	Battery failure. Malfunctioning battery charger. Electrical malfunction.	Check batteries for shorted cell. Replace if necessary. Replace charger. Contact Invacare for service.
Battery indicator flashes the charge level is low - too soon after being recharged.	Batteries not charged. Weak batteries.	Have charger checked. Replace batteries if necessary. Refer to Replacing Batteries on page 65.
Motor “chatters” or runs irregular.	Electrical malfunction.	Contact Invacare for service.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Joystick erratic or does not respond as desired.	Damaged motor coupling. Electrical malfunction. Controller programmed improperly.	Inspect motor coupling. Refer to Replacing the SSD Motor or Gearbox Only on page 40. Contact Invacare for service. Check programming. See electronics manual.
Wheelchair does not respond to commands.	Joystick error.	Calibrate joystick. Check programming. Check "INPUT TYPE": Programming Menu. Check joystick throw: DIAGNOSTICS menu. Re-Calibrate Joystick. Check Drive Lock Out status. Check motor brake engagement. Try different Joystick.
Power indicator off - even after recharging.	Electrical malfunction.	Contact Invacare for service.

Troubleshooting - Motor/Gearbox/Brake

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Motor makes a clicking noise.	Bad gearbox, chipped or worn gears. bad bearings.	Replace gearbox. If bearings are bad, replace motor.
	Raised commutator plate inside of motor.	Ohm out motor and replace motor if high reading is present. Normal reading is .5-5 Ohms.
Grinding noise or motor is locking up.	Bad gearbox. Bad coupler between motor and gearbox or bad bearings. Bad Gears.	Replace gearbox. Replace coupler. If bearings are bad, replace motor.
Motors stall and starts up again.	Current Rollback.	Stop driving the wheelchair and , with the power on, let electronics cool.
Wheelchair will not drive with power on (E09 or E10).	Check motor locks.	Engage motor locks to drive wheelchair. Swap out motor leads. Using a programmer, check for error codes. *NOTE: WHEELCHAIRS WITH G-TRAC ONLY - Before swapping motor leads for troubleshooting purposes, use the programmer to turn off G-trac in all drives.*
Motor chatters or runs erratically, or only one motor turns.	Damaged connector or worn brushes. Bad motor or gear box. Commutator bars expanded. Water or oil in motor.	Ohm out motors. Check brushes and replace brushes if necessary. Replace motor if high reading is present. Normal reading is .5-5 Ohms. 4 Pole ONLY. Inspect commutator bars for expansion from getting to hot. Replace motor. Rotate gearbox by hand.
	Controller malfunction.	Check for error codes with programmer. Refer to the MK6i Electronics Programming Guide, part number 1141471.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Wheelchair veers to the left or right when driving on level surface.	Uneven tire pressure. Motors out of balance.	Inflate tires. Replace tires if worn. Use programmer to balance motors.
E09/E10 error code will not go away.	Bad motor connection. Bad brake coil.	Check all connections. Ohm out each brake coil. Normal reading is 48-80 Ohms. Swap out motor leads. Using a programmer, check for error codes. *NOTE: WHEELCHAIRS WITH G-TRAC ONLY - Before swapping motor leads for troubleshooting purposes, use the programmer to turn off G-trac in all drives.*
Gearbox is leaking Fluid.	Bad seal around drive shaft Loose hardware.	If seal is bad, replace gearbox. Remove motor brushes and inspect for grease contamination. Replace motor if contamination is found. If loose hardware is found retighten hardware.
Excessive clicking coming from motor/gearbox.	Bad bearing in motor or gearbox.	Replace motor or gearbox.
	Loose wheel hardware.	Tighten hardware, (use removable Loctite® on hardware). Follow torque settings in this manual.
Gearbox shaft movement or bent shaft.	Rough driving.	Replace gearbox.
Motor Stutters.	Poor connection or worn brushes.	Check motor connectors. Check brushes and replace if necessary.
Motor Fails to start after initial installation.	Battery voltage is too low. Bad Connection. Brake Disengaged.	Check batteries and recharge if necessary. Check connector. Engage brake.
Motor is running then fails to restart when stopped.	Heavy load on the motors forcing controller into the current rollback mode.	Leave power On and allow controller to count down, and recharge the wheelchair overnight with power On.
	Blown fuse in battery wiring harness.	Replace battery wiring harness.
	Damaged Motor.	Replace brushes if necessary, or replace motor if internal damage is determined.
		Ohm out motor to check for possible internal damage (worn out brushes may be possible).
	Controller power stage board or relays may be damaged.	Replace controller or send to Invacare for repair.
Motor runs but loses power.	Controller senses heavy load and has entered the current rollback mode.	Stop driving and let electronics cool. Check battery level when driving with a multimeter. Calibrate joystick throw.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Wheelchair loses all power while driving.	Bad Connection on wheelchair.	Turn power "Off", wait 10 seconds and turn power back "On". Check joystick connection. Check battery connection and fuses. Measure battery voltage.
Excessive forward motion when braking	Stability lock not engaging properly.	Adjust the stability lock. Refer to Adjusting the Stability Lock Setting on page 53.

Troubleshooting - Battery

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Batteries won't charge.	Blown battery fuse or damaged cables/connectors. Batteries sat discharged too long.	Check cables and connectors for damage or replace battery wiring harness. Replace batteries.
Short Charge Time	One or both batteries may be bad (if batteries charge up to soon).	Check each battery and replace if needed.
No power to wheelchair.	Bad connection or blown fuse. Check Joystick connection. Batteries are dead.	Check all connections and housings for damage. If you have blown fuse a new battery wiring harness must be purchased. Check battery voltage and replace if necessary.
	Loose battery connections	Check battery cable connections, may have vibrated loose when driving on rough terrain.
Corroded battery wiring connections.	Possible water, salt, or urine damage.	Replace battery wiring harness.
E14 Error code.	Low voltage	Recharge or replace batteries.

Troubleshooting - Battery Charger

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
No LED's on Charger	Charger not plugged into outlet.	Make sure the charger is plugged into the outlet.
	No AC power at outlet.	Check for AC power with digital volt meter.
	Damaged power cord.	Check for damage on the power cord, replace if damaged or send in for repair.
	Charger LED's burnt out.	Send charger to Invacare for repair.
	Charger may have internal fuse that is blown.	Send charger to Invacare for repair.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Batteries won't charge.	Blown battery fuse in wiring harness.	Check battery wiring harness fuse on the wheelchair.
	Charger not plugged into outlet.	Make sure charger is plugged into the outlet.
	No AC power at the outlet.	Check for AC power with a digital volt meter.
	Charger Power cord may be damaged, or the connector may be damaged.	Check for damage and replace if necessary, or send in for repair.
	Charger may have internal damage.	Charge batteries with known good charger.
	Battery voltage too low for charger to start charging cycle.	Replace batteries.
Batteries have short driving range during a single charge. Battery Gauge falls off faster than normal.	Consumer not charging batteries long enough.	Instruct consumer to charge for 8-10 hours minimum.
	Batteries may be weak.	Perform load test. Electronics Field Reference Guide, part number 1141471.
	Check programming settings.	Ensure all performance parameters have not been set to their highest settings. Refer to MK6i Electronics Field Reference Guide, part number 1141471.
	Heavy load on motors.	Chairs weight distribution may be offset (wheelchair may be front loaded).
E28 Error code.	Charger still plugged in when user tries to drive the wheelchair.	Unplug charger to drive wheelchair.

Checking Battery Charge Level

The following "Do's" and "Don'ts" are provided for your convenience and safety.

DO	DON'T
Read and understand this manual and any service information that accompanies a battery and charger before operating the wheelchair.	Don't perform any installation or maintenance without first reading this manual.
Move the wheelchair to a work area before opening battery box or installing service batteries.	Don't perform installation or maintenance of batteries in an area that could be damaged by battery spills.
Recharge as nightly to maintain a high charge level and extend battery life.	Don't make it a habit to discharge batteries to the lowest level.
Follow recommendations in this manual when selecting a battery or charger.	Don't use randomly chosen batteries or chargers.
Fully charge new batteries before using.	Don't put new batteries into service before charging.
Use a carrying strap to remove, move or install a battery.	Don't tip or tilt batteries.
Push battery clamps on the terminals. Spread clamps wider if necessary.	Don't tap on clamps and terminals with tools.
Use ONLY a GEL charger for a GEL battery or "Sealed" battery.	Don't mismatch your battery and chargers.

Field Load Test

NOTE: For this procedure, refer to FIGURE 3.1.

- Old batteries lose their ability to store and release power, due to increased internal resistance. This means that as you try to take power from the battery, some of that power is used up in the process of passing through the battery, resulting in less voltage at the posts. The more power drawn, the lower the voltage available. When this lost voltage drops the output 1.25 volts under load (2.5 for a pair), replace the batteries.
- To spot this problem, test the batteries under load.
- Use a digital voltmeter to check battery charge level at the charger connector. It is located on the joystick. If reading is 2.5 volts or more for a pair, the batteries must be charged.

NOTE: Read these instructions carefully and the manufacturer's instructions on the digital voltmeter before using the digital voltmeter.

NOTE: Invacare recommends that only a qualified technician perform this test.

1. Ensure that power is Off.
2. Make sure battery is fully charged. An extremely discharged battery will exhibit the same symptoms as a bad one.
3. Remove the footrests from the wheelchair. Refer to user manual shipped with wheelchair.
4. Connect the voltmeter leads to the charger port on the wheelchair as shown in FIGURE 3.1.

NOTE: Most digital voltmeters are not affected by polarity, however, analog meters (meters with swinging needles) can be and should be used carefully. A good meter reading should be 25.0 to 26 VDC.

NOTE: When performing STEPS 5 and 6 ensure feet are clear from casters and stationary object - otherwise injury may result.

5. Sit in wheelchair and place feet against a door jam, workbench or other stationary object.
6. Turn the power On and carefully push the joystick forward, trying to drive the wheelchair through the stationary object.

NOTE: This puts a heavy load on the batteries as they try to push through the stationary object. If the wheels spin, have two individuals (one on each arm) apply as much downward pressure as possible on the arms of the wheelchair.

7. Read the meter while the motors are straining, no longer than 3-4 seconds, to determine the voltage under load.

NOTE: If the voltage drops more than 2.5 volts from a pair of fully charged batteries while under load, they should be replaced regardless of the unloaded voltages. Refer to Replacing Batteries on page 65.

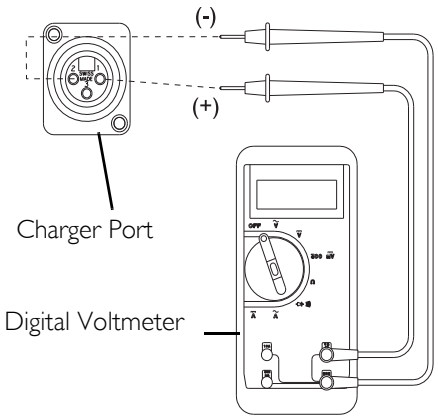


FIGURE 3.1 Field Load Test

Motor Testing

NOTE: For this procedure, refer to FIGURE 3.2.

1. On the 4-pin motor connector, locate the two contacts in the motor connector housings.
2. Set the digital multimeter to measure resistance in ohms (Ω).
3. Measure the resistance between the two motor contacts.

NOTE: A normal reading is between .5 to 5 ohms. A reading of O.L. (open line) or in excess of 15 ohms indicates a problem. High readings are generally caused by bad connections and/or damaged brushes. Contact Invacare.

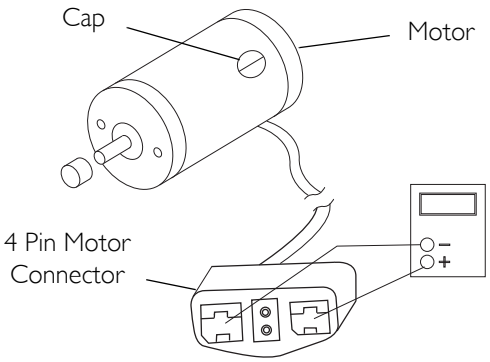


FIGURE 3.2 Motor Testing

4-Pole Motor Brush Inspection and/or Replacement

NOTE: For this procedure, refer to FIGURE 3.3 on page 33.

NOTE: There is one contact brush under each brush cap on the motor housing. There are four motor brushes on a 4 pole motor.

NOTE: It may be necessary to remove the motor to access all of the motor brushes. Refer to Removing/Installing the SSD Motor/Gearbox Assembly on page 39.

NOTE: If the brush caps are hard to remove they are either overtightened or the motor has become very hot. Allow 30 minutes for motors to cool. If brush caps still cannot be removed, contact Invacare Technical Phone Support.

1. Turn the power off.
2. Disengage the motors.
3. Locate a brush cap on the 4 pole motor (four caps in all). See Detail "A" in FIGURE 3.3.
4. Remove the brush cap with a very wide flat blade screwdriver.
5. Pull the motor brush partially out of the brush holder. See Detail "B" in FIGURE 3.3.

NOTE: If not installing a new motor brush, it is very important to note which way the existing motor brush comes out of the motor. The existing motor brush MUST be placed into the motor exactly the same way to ensure good contact with the commutator.

6. Place a temporary mark on the motor casting and on the top of the motor brush to indicate the orientation.
7. Remove the motor brush from the brush holder.
8. Inspect the motor brush thoroughly for excessive wear or chips in the brush and any discoloration in the shunt wire.
9. Perform one of the following:
   - If motor brush is in good condition, (i.e., the end of the brushes are smooth and shiny, the spring is not damaged or discolored, and shunt wire is not discolored) perform the following:
     i. Install existing motor brush into brush holder exactly the same way it was pulled out using the marks as reference points.
     ii. Install motor brush cap.

     NOTE: Tighten and loosen motor brush cap a couple times to ensure proper seating of the motor brush.
   - If motor brush is in bad condition (brush is worn or damaged) replace immediately by performing the following:
     i. Install new motor brush into brush holder.
     ii. Install motor brush cap.

     NOTE: This process, also called Brush Burn-in or Finger Printing Process, is necessary to seat the brush to the commutator plates inside the motor for optimum performance of the motor.

NOTE: DO NOT leave the wheelchair unattended while performing this procedure - otherwise damage to wheelchair and/or property may occur.

NOTE: This procedure MUST be performed with little or no load on the motor.

iii. Put the wheelchair on blocks so that the drive wheels do not contact the ground.

NOTE: For STEPS iv and vi, use a rubber band to hold the driver control in the direction needed or program the chair for latched driving. Refer to the electronics manual for latched programming instructions.

iv. Run the motors forward for one hour.

v. Turn motors off and allow 30 minutes for motors to cool off.

vi. Run the motors in reverse for one hour.

vii. When process is complete, remove wheelchair from blocks and test drive the wheelchair.

NOTE: If wheelchair still does not perform properly, call Invacare Technical Service at 1-800-832-4707.

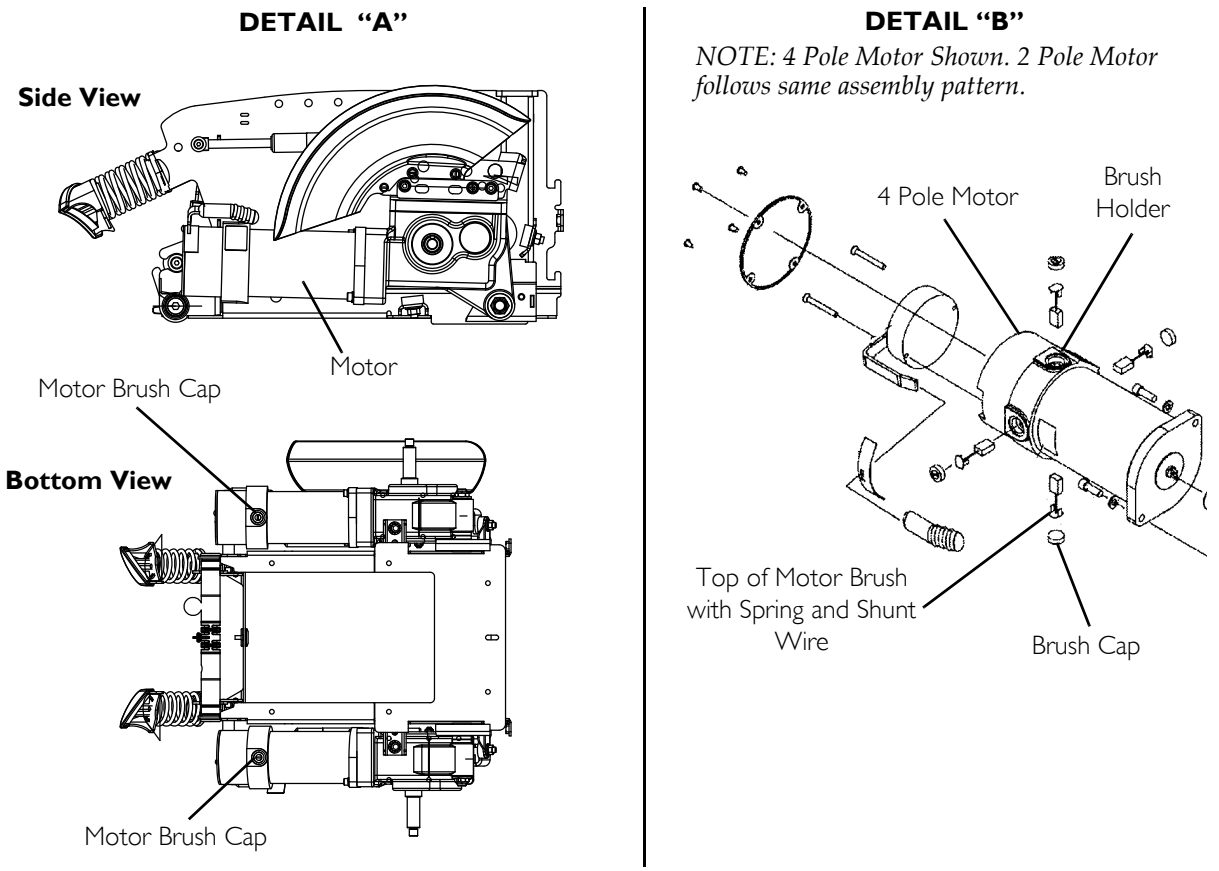


FIGURE 3.3 4-Pole Motor Brush Inspection and/or Replacement

Electro-Mechanical Parking Brake Testing

NOTE: For this procedure, refer to FIGURE 3.4.

NOTE: This procedure should only be performed on wheelchairs with conventional motor/gearbox assembly.

1. On the four-pin motor connector, locate the side by side connectors in the black housings.
2. Set the digital multimeter to read ohms.
3. Measure the resistance between the two brake contacts. A normal reading is between 40-80 ohms depending on the motor.

NOTE: A reading of 0 ohms (Ω) or a very high reading; i.e., mohms or O.L. (Open Line) indicates a shorted brake or an open connection respectively. If either condition exists, contact Invacare Technical Phone Support.

⚠ WARNING

A shorted electro-mechanical brake will damage the brake output section in the controller. DO NOT connect a shorted electro-mechanical brake to a good controller module. A shorted brake MUST be replaced.

NOTE: A bad motor can damage the controller module but a bad controller will NOT damage a motor.

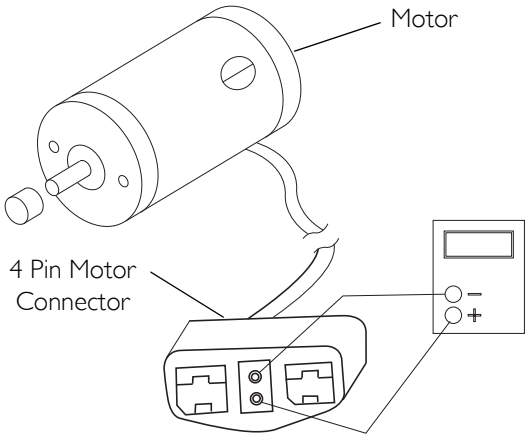


FIGURE 3.4 Electro-Mechanical Parking Brake Testing

SECTION 4—WHEELS AND WHEEL LOCKS

NOTE: The following tools and materials are required to perform this procedure:

- 13-mm socket with ratchet
- Needle-nose pliers
- Wheel puller
- Two 5-inch blocks
- Torque wrench
- Loctite 242
- Anti-sieze compound

Removing/Installing the SSD Motor Drive Wheel/Wheel Hub

NOTE: For this procedure, refer to FIGURE 4.1

NOTE: Reverse this procedure to install the drive wheels.

1. Place two 5-inch blocks under battery frame to lift frame off the ground for ease in performing this procedure.
2. Remove the five mounting screws securing the drive wheel to the wheel hub.
3. Remove the drive wheel from the wheel hub.
4. If necessary, remove the locknut, washer, wave washer and 5mm spacer securing the wheel hub on the drive shaft.
5. If necessary, repeat STEPS 2-3 to remove the remaining drive wheel.

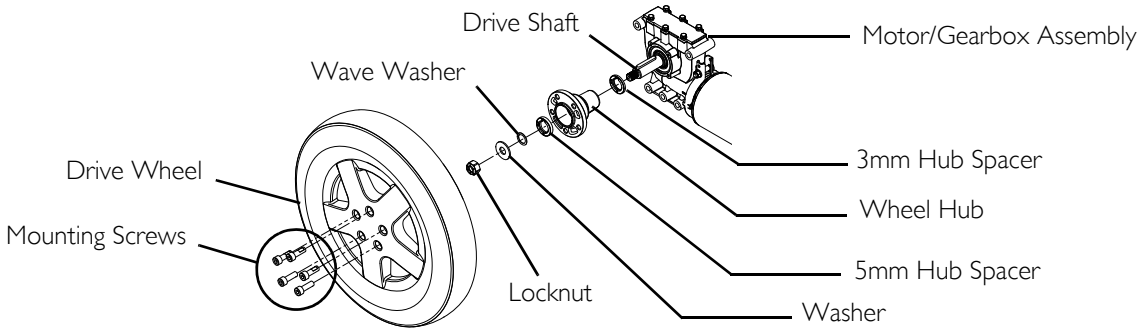


FIGURE 4.1 Removing/Installing the SSD Motor Drive Wheel/Wheel Hub

Removing/Installing the Inside Rim and Pneumatic Tire

NOTE: For this procedure, refer to FIGURE 4.2.

Removing

1. Remove the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.

⚠ DANGER

If wheelchair is equipped with pneumatic tires, deflate the tire before removing rim. Otherwise, the rim and hardware will become projectiles and cause serious personal injury and/or damage to surrounding property.

2. Remove the five 5/16-18 x 7/8-inch hex head cap screws that secure the inside rim to the outside rim.
3. Remove the inside rim and tire.

Installing

1. Place the outside rim against one side of the tire.
2. Place the inside rim against the other side of the tire.

NOTE: Align the mounting holes in the inside rim with the mounting holes in the outside rim.

3. Secure the inside rim and the outside rim to the tire with the five 5/16-18 x 7/8-inch hex head cap screw with patch. Torque to 13 ft-lbs ± 20%.
4. Install the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.

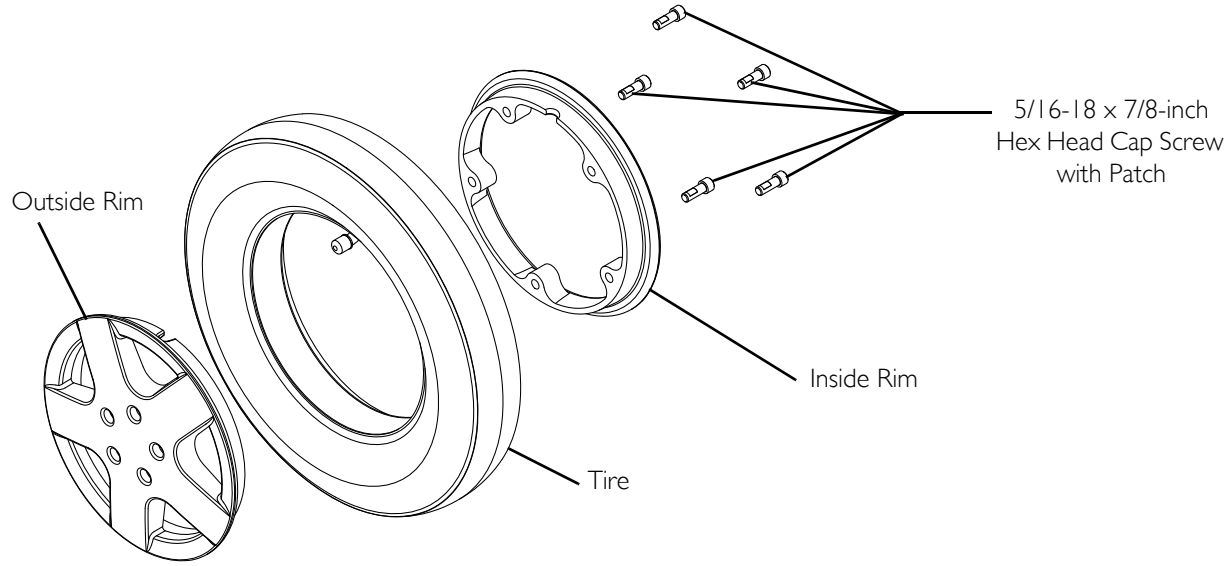


FIGURE 4.2 Removing/Installing the Inside Rim and Pneumatic Tire

Replacing the Front/Rear Casters

Two Sided Fork Casters

NOTE: For this procedure, refer to FIGURE 4.3.

NOTE: Front and rear casters are replaced in the same manner.

NOTE: When replacing the front/rear caster assemblies, it is necessary to brace the caster assemblies to prevent the wheel from spinning.

1. Remove the 7/16-20 X 3-1/4 inch hex head screw, two 15/32 X 5/8 X 3/64 inch washers and 7/16-20 locknut that secure the existing caster to the fork.
2. Remove the existing caster and discard.
3. Using the 7/16-20 X 3-1/4 inch hex head screw, two 15/32 X 5/8 X 3/64 inch washers and 7/16-20 locknut, secure the new caster to the fork. Torque to 13 ft-lbs ± 20%.

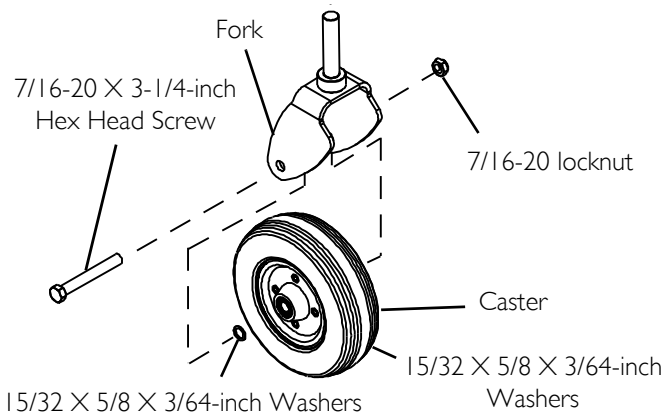


FIGURE 4.3 Replacing the Front/Rear Casters - Two Sided Fork Casters

Adjusting Caster Fork Assemblies

NOTE: For this procedure, refer to FIGURE 4.4.

NOTE: Front and rear caster assemblies are adjusted in the same manner.

NOTE: A #10-32 X 11/16-inch Phillips head screw is used to secure the front head tube cap to the front head tube. A #10-16 X 3/8-inch phillip pan head drill screw secures the rear head tube cap to the rear head tube.

1. Remove the mounting screw securing the head tube cap to the head tube.
2. To properly tighten caster fork assembly and guard against flutter, perform the following check:

NOTE: Two people are recommended to perform the following procedure - one to tip wheelchair back and one to inspect/adjust the caster assembly.

   A. Tip back the wheelchair.
   B. Pivot both caster assemblies to top of their arc simultaneously.
   C. Let casters drop to bottom of arc (casters should swing once to one-side, then immediately rest in a straight downward position).
   D. Adjust 5/8-1/8-inch locknuts according to freedom of caster swing.

3. Test the wheelchair maneuverability.
4. Adjust 5/8-1/8-inch locknuts if necessary, and repeat STEPS 2-3 until correct.
5. Position the head tube cover onto the top of the head tube.
6. Using the mounting screw, secure the head tube cap to the head tube.

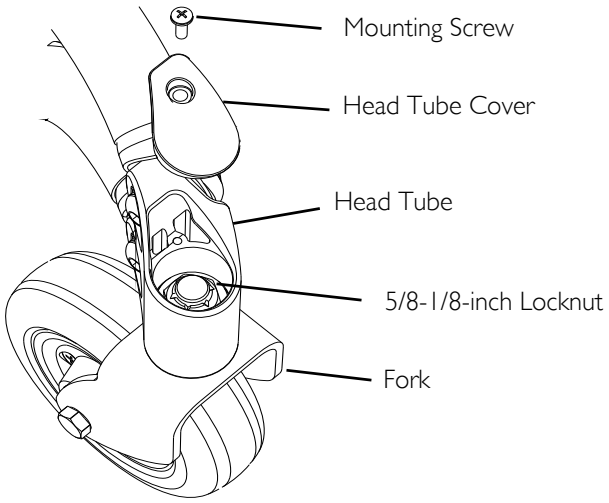


FIGURE 4.4 Adjusting Caster Fork Assemblies

Removing/Installing the Caster Fork Assemblies

NOTE: For this procedure, refer to FIGURE 4.5 on page 37.

NOTE: Front and rear caster assemblies are replaced in the same manner.

NOTE: A #10-32 X 11/16-inch Phillips head screw is used to secure the front head tube cap to the front head tube. A #10-16 X 3/8-inch phillip pan head drill screw secures the rear head tube cap to the rear head tube.

Removing

1. Remove the mounting screw securing the head tube cap to the head tube.
2. Remove the 5/8-1/8 locknut and 5/8 X 1-5/16 X 1/8 inch washer and 5/8 X 1-1/8 X 3/16 inch stem spacer from the threaded post securing the caster fork assembly to the headtube.
3. If necessary, remove the two bearings and tolerance rings from the head tube.

Installing

1. If necessary, insert the two bearings and tolerance rings into the head tube.
2. Insert the threaded post of the caster fork assembly into the head tube.
3. Using the 5/8-1/8 locknut and 5/8 X 1-5/16 X 1/8 inch washer and 5/8 X 1-1/8 X 3/16 inch stem spacer, secure the caster assembly to the headtube.
4. Adjust the caster fork assembly. Refer to Adjusting Caster Fork Assemblies on page 36.
5. Using the mounting screw secure the head tube cap to the head tube.

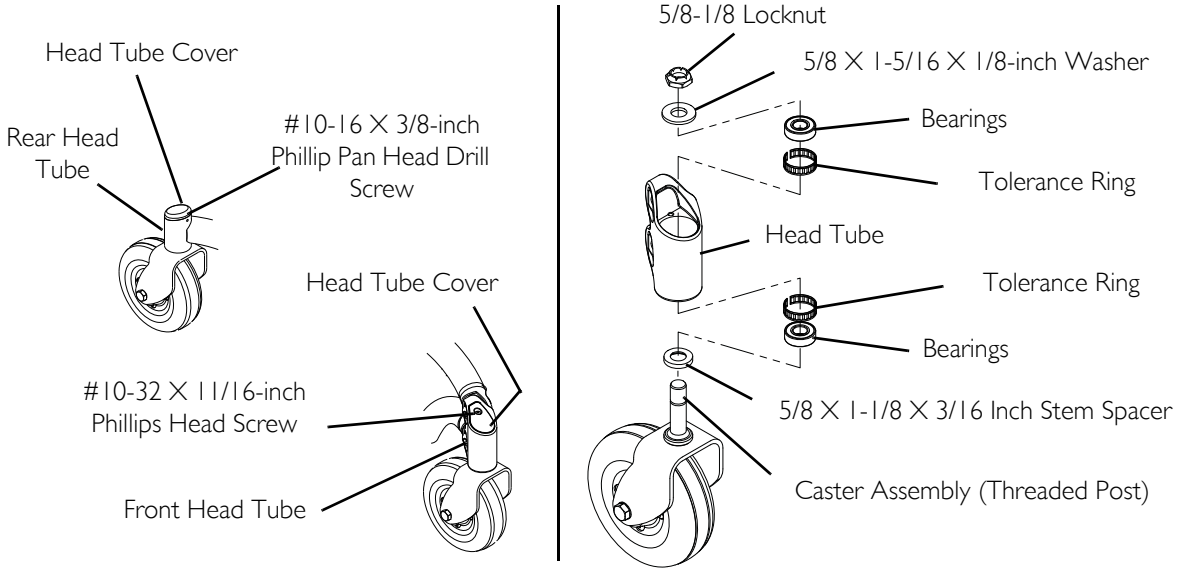


FIGURE 4.5 Removing/Installing the Caster Fork Assemblies

Installing the Wheel Locks - SSD 4-pole Motor

NOTE: For this procedure, refer to FIGURE 4.6.

NOTE: Reverse STEPS 1 - 4 to remove the wheel lock.

1. Remove the drive wheels as necessary. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
2. Align the two rear most mounting holes of the wheel lock with the two mounting holes of the wheel lock mounting bracket.
3. Using two hex head screws, washers and locknuts, secure the wheel lock to the wheel lock mounting bracket. Hand tighten the two hex head screws and locknuts.
4. Reinstall the drive wheel(s). Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
5. With the wheel lock in the unlocked position, pivot the wheel lock until the wheel lock shoe is between 5/32 and 5/16-inches away from the drive wheel. Securely tighten the two hex head screws and locknuts.
6. If necessary repeat STEPS 1 - 5 to install the remaining wheel lock.

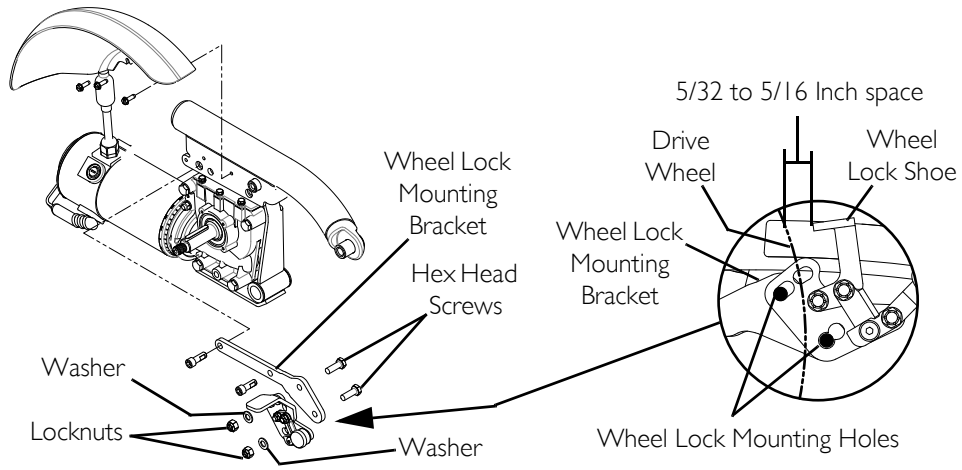


FIGURE 4.6 Installing the Wheel Locks - SSD 4-pole Motor

Installing the Wheel Lock Bracket - SSD 4-pole Motor

NOTE: For this procedure, refer to FIGURE 4.6.

NOTE: Reverse STEPS 1 - 4 to remove the wheel lock.

1. Remove the drive wheels as necessary. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
2. Using the two socket head cap screws, secure the wheel lock mounting bracket to the walking beam assembly. Torque socket head cap screws to 13 ft-lbs ± 20%.
3. Reinstall the drive wheel(s). Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
4. Repeat STEPS 4 - 8 to install the remaining wheel lock.

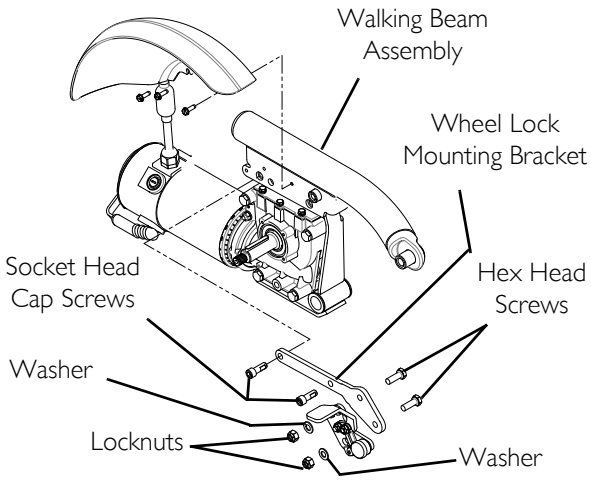


FIGURE 4.7 Installing the Wheel Locks - SSD 4-pole Motor

SECTION 5—MOTORS

Removing/Installing the SSD Motor/Gearbox Assembly

NOTE: For this procedure, refer to FIGURE 5.1 on page 39.

Removing the SSD Motor/Gearbox Assembly

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick On/Off switch is in the Off position.
3. Place two 5-inch blocks under battery frame to lift frame off the ground for ease in performing this procedure.
4. Remove the rear shroud. Refer to Removing/Installing the Wheelchair Shrouds on page 60.
5. Remove the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.

NOTE: Take note of position and orientation of tie-wraps securing wiring to the wheelchair before cutting tie-wraps that secure the motor wiring to the wheelchair base frame. Wiring must be reinstalled and secured in the same position and orientation as it was removed from.

6. Cut and remove any tie-wrap securing the motor cable to the wheelchair base frame and other cables.
7. Disconnect the motor cable from the controller.
8. Remove the four hex head screws securing the motor/gearbox assembly to the suspension arm.
9. Remove the motor/gearbox from the suspension arm.
10. If necessary. Repeat STEPS 5-9 to remove the remaining motor/gearbox.

Installing the SSD Motor/Gearbox Assembly

1. Perform one of the following -
   - If replacing the entire motor/gearbox assembly perform the following:
     i. Ensure the new motor is properly indexed to gearbox. Refer to Aligning the SSD Motor to the Gearbox on page 41.
     ii. Install the brake lever. Refer to Installing the SSD Brake Lever on page 41.
     iii. Install the brake lever push/drive label. Refer to Installing the SSD Motor Push/Drive Label on page 41.
     iv. Reverse STEPS 3-9 to reinstall motor/gearbox of Removing the SSD Motor/Gearbox Assembly on page 39.
   - If replacing the motor or gearbox perform the following:
     i. Replace the motor or gear box. Refer to Replacing the SSD Motor or Gearbox Only on page 40.
     ii. Reverse STEPS 3-9 to reinstall motor/gearbox of Removing the SSD Motor/Gearbox Assembly on page 39.

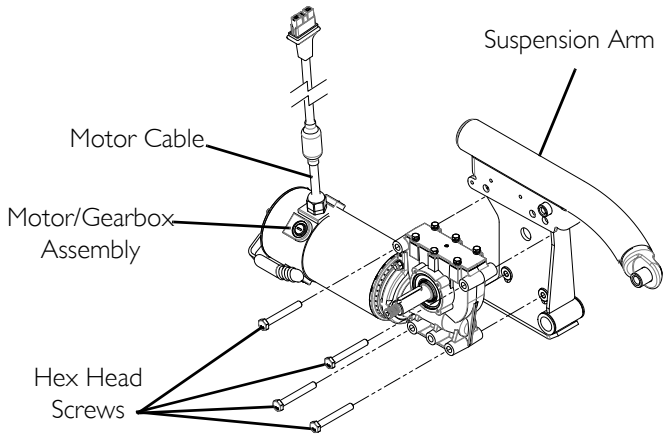


FIGURE 5.1 Removing/Installing the SSD Motor/Gearbox Assembly

Replacing the SSD Motor or Gearbox Only

NOTE: For this procedure, refer to FIGURE 5.2 ON PAGE 40.

NOTE: Take note of the position and orientation of the motor in relation to the gearbox before separating the motor from the gearbox.

1. Remove the square neck bolt, spacer, washer and locknut securing the band clamp to the motor/gearbox assembly.
2. Pulling the band clamp open, remove the existing band clamp from the motor/gearbox assembly. Discard existing band clamp.
3. Firmly gripping the motor and the gearbox, pull to separate the motor from the gearbox.
4. Remove the existing coupling from between the motor and the gearbox.
5. Discard the existing coupling and either the existing motor or gearbox depending on which is being replaced.
6. Insert the new coupling onto the motor drive shaft.
7. Align the gearbox drive shaft with the new coupling.
8. Twist the motor to the proper alignment to the gearbox. Refer to Aligning the SSD Motor to the Gearbox on page 41.
9. Push the motor into the gearbox.

NOTE: When installing the new band clamp, it may be necessary to pull the band clamp open to slide the new band clamp around the motor/gearbox.

10. Use the new band clamp, and the existing square neck bolt, spacer, washer and locknut to secure the motor to the gearbox. Torque locknut to 75 in-lbs ± 10%.
11. If replacing the motor, install the brake lever. Refer to Installing the SSD Brake Lever on page 41.

TDX SP, TDX SI and 3G Storm Series Wheelchairs

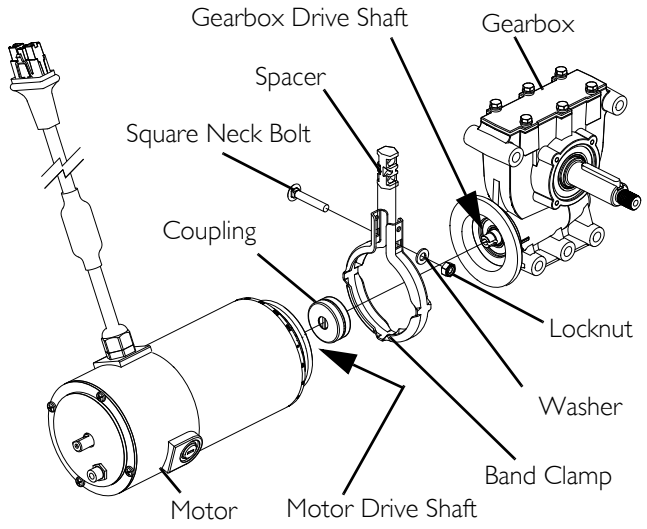
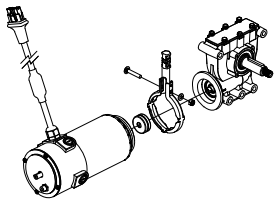
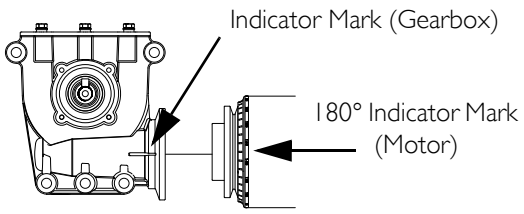
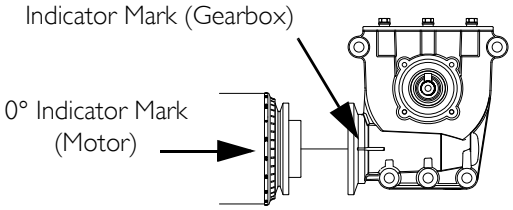


FIGURE 5.2 Replacing the SSD Motor or Gearbox Only

Aligning the SSD Motor to the Gearbox

1. If adjusting an assembled motor/gearbox, loosen the square neck bolt, spacer, washer and locknut securing the band clamp to the motor/gearbox assembly.
2. Align the motor to the gearbox according to the table below:

WHEELCHAIR	LEFT SIDE	RIGHT SIDE
TDX SP - 4 POLE 		

3. If adjusting an assembled motor/gearbox, securely tighten the square neck bolt, spacer, washer and locknut. Torque locknut to 75 in-lbs ± 10%.

Installing the SSD Brake Lever

NOTE: For this procedure, refer to FIGURE 5.3.

NOTE: Brake levers are right and left side specific. Brake levers MUST mount to the brake lever post as described in STEP 2 and shown in FIGURE 5.3 to ensure the proper brake lever has been mounted to the correct motor.

1. Locate the brake lever post on the end of the motor opposite the gearbox.
2. Align the brake lever with the brake lever post so that:
   - The brake lever handle will be positioned towards the outside of the wheelchair.
   - The set screw will tighten against the flat space of the brake lever post.
   - The cut out on the bottom edge of the brake lever will fit around the brake lever stop.
3. Securely tighten the set screw securing the brake lever to the brake lever post.
4. If necessary, perform STEPS 1-3 to install the remaining brake lever.

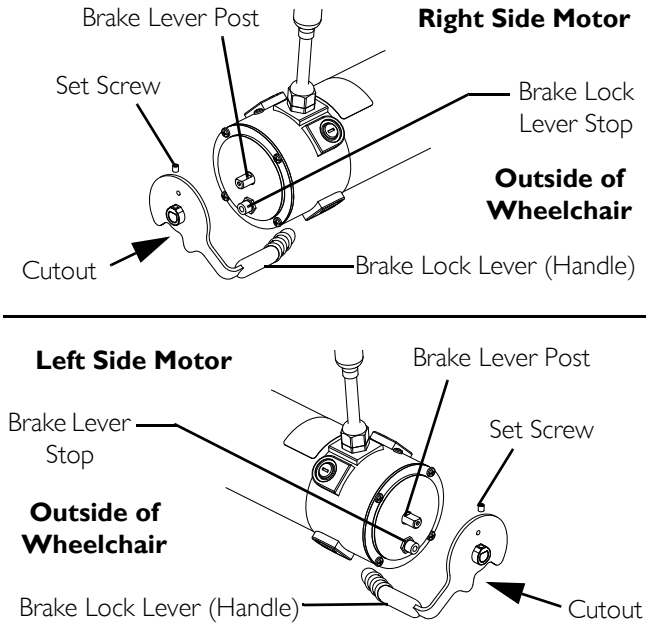


FIGURE 5.3 Installing the SSD Brake Lever

Installing the SSD Motor Push/Drive Label

NOTE: For this procedure, refer to FIGURE 5.4.

1. Peel the label from the adhesive backing.
2. Position the label on the motor near the brake lever as shown.
3. If necessary, repeat STEPS 1-2 for opposite motor to install the remaining push/drive label.

NOTE: Right side motor shown, use same location for left side motor.

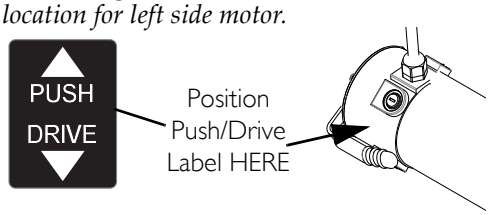


FIGURE 5.4 Installing the SSD Motor Push/Drive Label

SECTION 6—SIDE FRAME

Removing/Installing The Walking Beam Assembly

NOTE: For this procedure, refer to FIGURE 6.1 on page 43.

NOTE: Theses procedures apply to both sides of the wheelchair.

NOTE: It is recommended that an assistant be present when lifting the wheelchair frame.

Removing the Walking Beam Assembly

1. Remove batteries. Refer to Replacing Batteries on page 65.
2. Place two 5-inch blocks under battery frame to lift frame off the ground for ease in performing this procedure.
3. Remove the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
4. Remove the lower pivot link. Refer to Removing/Installing the Lower Pivot Link on page 44.
5. Remove the upper and lower front bumpers. Refer to Removing/Installing the Front Bumpers on page 47.
6. Disconnect the 4-Pole motor connector from the controller.

NOTE: Take note of position and orientation of tie-wraps and wiring prior to removing tie-wraps.

7. Cut tie-wraps that secure the motor cable to the base frame.
8. Lift the rear suspension and depress the pivot ball pin to de-activate the locking mechanism of the locking-gas cylinder.

NOTE: Continue holding the rear suspention up to de-activate the locking-gas cylinder until the walking beam has been rotated into position.

9. Rotate the walking beam assembly until the 5/16 X 2.50 socket head shoulder screw aligns with the circular opening in the battery box.
10. Remove the 1/4-20 locknut securing the 5/16 X 2.50 socket head shoulder screw and the locking-gas cylinder to the walking beam.
11. Push the 5/16 X 2.50 socket head shoulder screw towards the base frame and the locking-gas cylinder is free from the walking beam assembly.
12. Position the locking-gas cylinder against the wheelchair frame.
13. Remove 1/2-20 locknut and.505 X 1.124 X .100 inch washer or washer plate securing the walking beam assembly to the base frame.

NOTE: A coved washer is located between the walking beam assembly and the base frame.

14. Remove the walking beam assembly and coved spacer from the base frame.

Installing the Walking Beam Assembly

NOTE: If necessary to perform STEP 1, lift the rear frame to activate the locking-gas cylinder in order to overcome the spring force and compress the locking-gas cylinder.

1. Position the locking-gas cylinder against the base frame in line with the circular opening in the battery box.
2. Apply Super Lube Multi Purpose Grease w/PTFE (Teflon®) or other silicon based grease to the walking beam mounting pin.

NOTE: A coved washer is located between the walking beam assembly and the base frame.

3. Install the walking beam assembly and coved spacer onto the walking beam mounting pin.
4. Using the 1/2-20 locknut and .505 X 1.124 X .100 inch washer or washer plate, secure the walking beam assembly to the base frame. Torque to 13 ft-lbs ± 20%, then back off 1/4 turn.
5. Lift the rear suspension and depress the pivot ball pin to de-activate the locking mechanism of the locking-gas cylinder.

NOTE: Continue holding the rear suspention up to de-activate the locking-gas cylinder until the walking beam has been rotated into position.

6. Rotate the walking beam assembly until the 5/16 X 2.50 socket head shoulder screw aligns with the circular opening in the battery box and the locking-gas cylinder.
7. Push the 5/16 X 2.50 socket head shoulder screw through the battery box, the locking-gas cylinder and the walking beam assembly.
8. Using the 1/4-20 locknut, secure the 5/16 X 2.50 socket head shoulder screw and the locking-gas cylinder to the walking beam. Torque to 75 in-lbs ± 20%.
9. Install the upper and lower front bumpers. Refer to Removing/Installing the Front Bumpers on page 47.
10. Connect the 4-Pole motor connector to the controller.
11. Install the lower pivot link. Refer to Removing/Installing the Head Tube on page 44.
12. Install the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
13. Remove the two 5-inch blocks under battery frame, gently lowering the wheelchair frame to the ground.
14. Install the batteries. Refer to Replacing Batteries on page 65.
15. Using tie-wraps, secure the motor cable to the wheelchair frame.

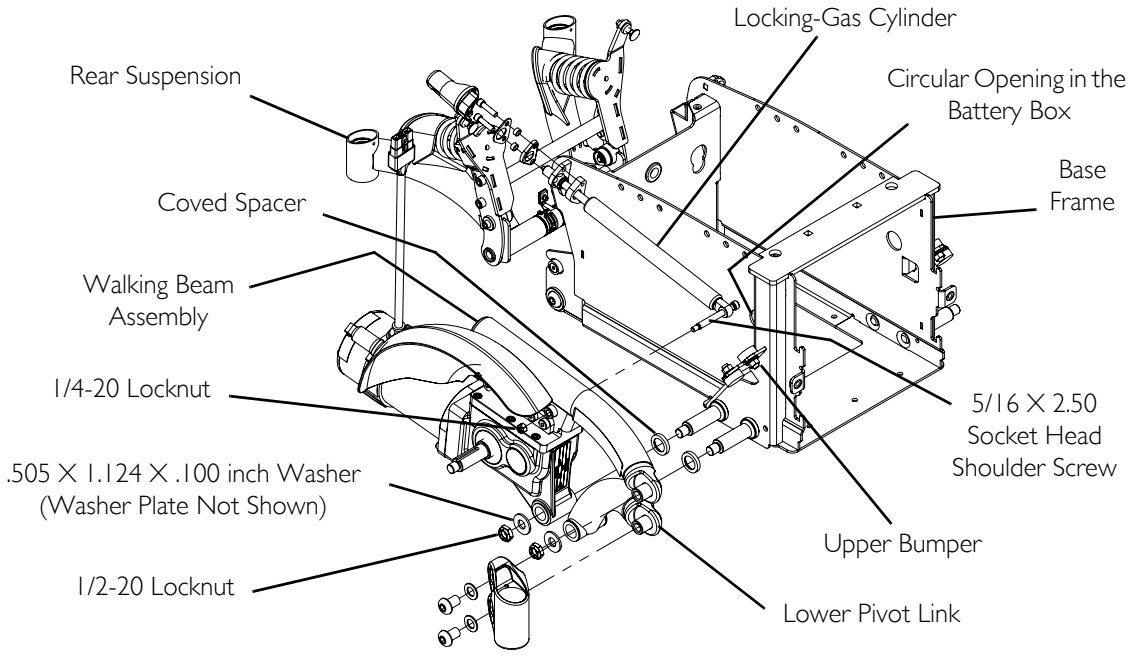


FIGURE 6.1 Removing the Walking Beam Assembly

Removing/Installing the Head Tube

NOTE: For this procedure, refer to FIGURE 6.2.

NOTE: Reverse this procedure to install the head tube.

1. Remove the two 1/2-13 X 1.0 inch button head cap screws and .510 X .890 X .062 inch nylon washers securing the head tube to the lower pivot link and the walking beam.

NOTE: When installing the head tube, torque the 1/2-13 X 1.0 inch cap screws to 13 ft-lbs ± 20% then back off 1/8 turn.

2. Remove the head tube from the lower pivot link and the walking beam.

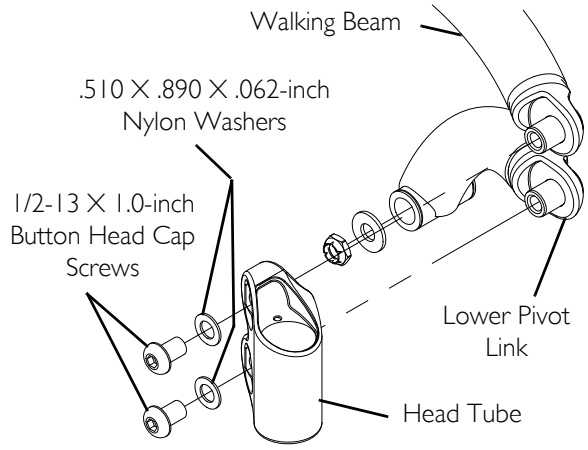


FIGURE 6.2 Removing/Installing the Head Tube

Removing/Installing the Lower Pivot Link

NOTE: For this procedure, refer to FIGURE 6.3.

NOTE: Reverse this procedure to install the lower pivot link.

NOTE: Before installing the lower pivot link apply Super Lube Multi Purpose Grease w/PTFE (Teflon) or other silicon based grease to the lower pivot link mounting pin.

1. Remove the head tube. Refer to Removing/Installing the Head Tube on page 44.

NOTE: When installing the lower pivot link, torque the 1/2-20 locknut to 13 ft-lbs ± 20%.

2. Remove the 1/2-20 locknut and .505 X 1.124 X .100 inch washer or washer plate securing the lower pivot link to the wheelchair frame.

NOTE: A coved washer is located between the lower pivot link and the base frame.

3. Remove the lower pivot link and coved spacer from the base frame.

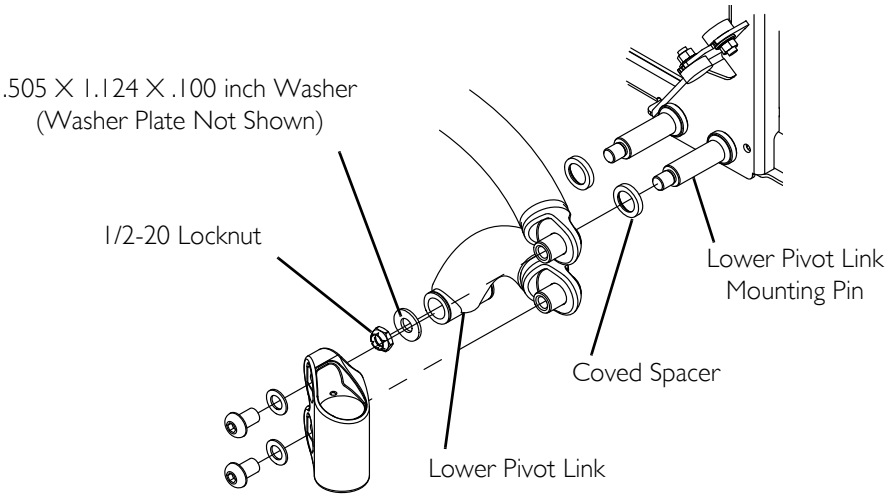


FIGURE 6.3 Removing/Installing the Lower Pivot Link

Removing/Installing The Locking-Gas Cylinder Assembly

NOTE: For this procedure, refer to FIGURE 6.4 on page 46.

NOTE: This procedure applies to both sides of the wheelchair.

Removing

1. Remove the walking beam assembly. Refer to Removing/Installing The Walking Beam Assembly on page 42.

NOTE: Depending on the date of manufacture, the stability lock boot will be secured to the wheelchair frame by a tie-wrap or 10-32 hex head screw.

2. Remove the stability lock boot.
3. Perform one of the following:

NOTE: To improve access to the 1/4-20 X .63 socket head screws, use a long, ball head allen wrench or remove the two 1/4-20 X 5/8-inch flat head screws and nylon spacers allowing the rear frame to tilt away from the base frame.

- Before 3/5/07 - Remove the two 1/4-20 X .63 socket head screws, spacers, and plate securing the boot plate to the base frame and the block guide clamp (Detail "A").
- After 3/4/07 - Remove the two 1/4-20 X .63 socket head screws securing block guide clamp to the base frame (Detail "B").

4. Lift the rear suspension and depress the pivot ball pin to de-activate the locking mechanism of the locking-gas cylinder.

NOTE: If the locking-gas cylinder is forced against the vertical member of the battery box and will not move, while lifting the rear suspension to de-activate the locking mechanism, use a rubber mallet to knock the locking-gas cylinder downward to relieve force holding the locking-gas cylinder in place.

5. Push the locking- gas cylinder towards the rear of the wheelchair and pull the locking-gas cylinder away from the base frame.
6. Remove the locking-gas cylinder from the base frame guide block.
7. Repeat STEPS 1-6 if removing the locking-gas cylinder on opposite side of the wheelchair frame.

Installing

1. Apply Super Lube Multi Purpose Grease w/PTFE (Teflon) or other silicon based grease to the pivot ball of the new locking gas cylinder where it engages the guide block and guide block clamp.
2. Position the pivot ball into the base frame guide block.
3. Perform one of the following:

NOTE: Before installing, apply a small amount of Locktite 242 to the threads of the socket head cap screws.

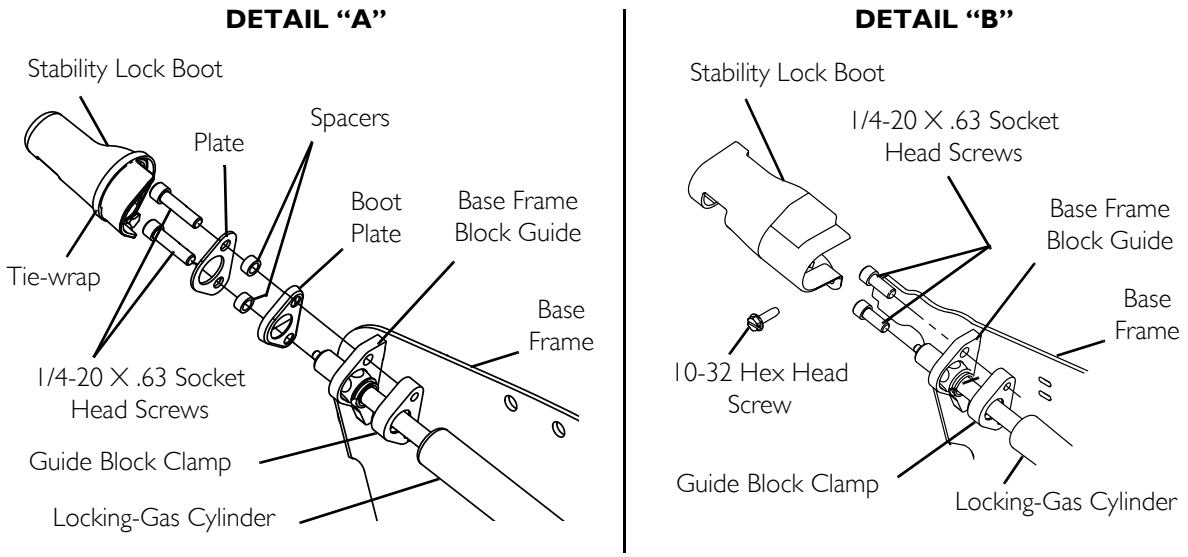
NOTE: If the two 1/4-20 X 5/8-inch flat head screws and nylon spacers securing the rear frame to the base frame were removed when the locking-gas cylinder was removed, re-install the two 1/4-20 X 5/8-inch mounting screws and nylon spacers after securely tightening the two 1/4-20 X .63 socket head screws.

- Before 3/5/07 - Using the two 1/4-20 X .63 socket head screws, spacers, and plate secure the boot plate to the base frame and the block guide clamp. Torque to 75 in-lbs ± 20% (Detail "A").
- After 3/4/07 - Using the two 1/4-20 X .63 socket head screws secure block guide clamp to the base frame. Torque to 75 in-lbs ± 20% (Detail "B").

4. Holding the locking-gas cylinder in position, lift the rear suspension and depress the pivot ball pin to de-activate the locking mechanism of the locking-gas cylinder.

NOTE: If necessary, use the vertical member of the battery box to assist with compressing the locking-gas cylinder. While lifting the rear suspension to de-activate the locking mechanism, position the loose end of the locking-gas cylinder against the vertical member of the battery box and lift up until the locking-gas cylinder fits into the locating bracket and aligns with the circular opening.

5. Pushing the locking-gas cylinder towards the rear of the wheelchair, position the locking-gas cylinder against the base frame into the locating bracket so that the end aligns with the circular opening in the battery box.
6. Install the walking beam assembly and lower pivot link. Refer to Removing/Installing The Walking Beam Assembly on page 42.
7. Verify stability lock setting. Refer to Stability Lock Inspection/Adjustment on page 52.
8. Check the stability lock function. Refer to Checking Stability Lock Function on page 53.
9. Repeat STEPS 1-8 if installing the locking-gas cylinder on opposite side of the wheelchair frame.



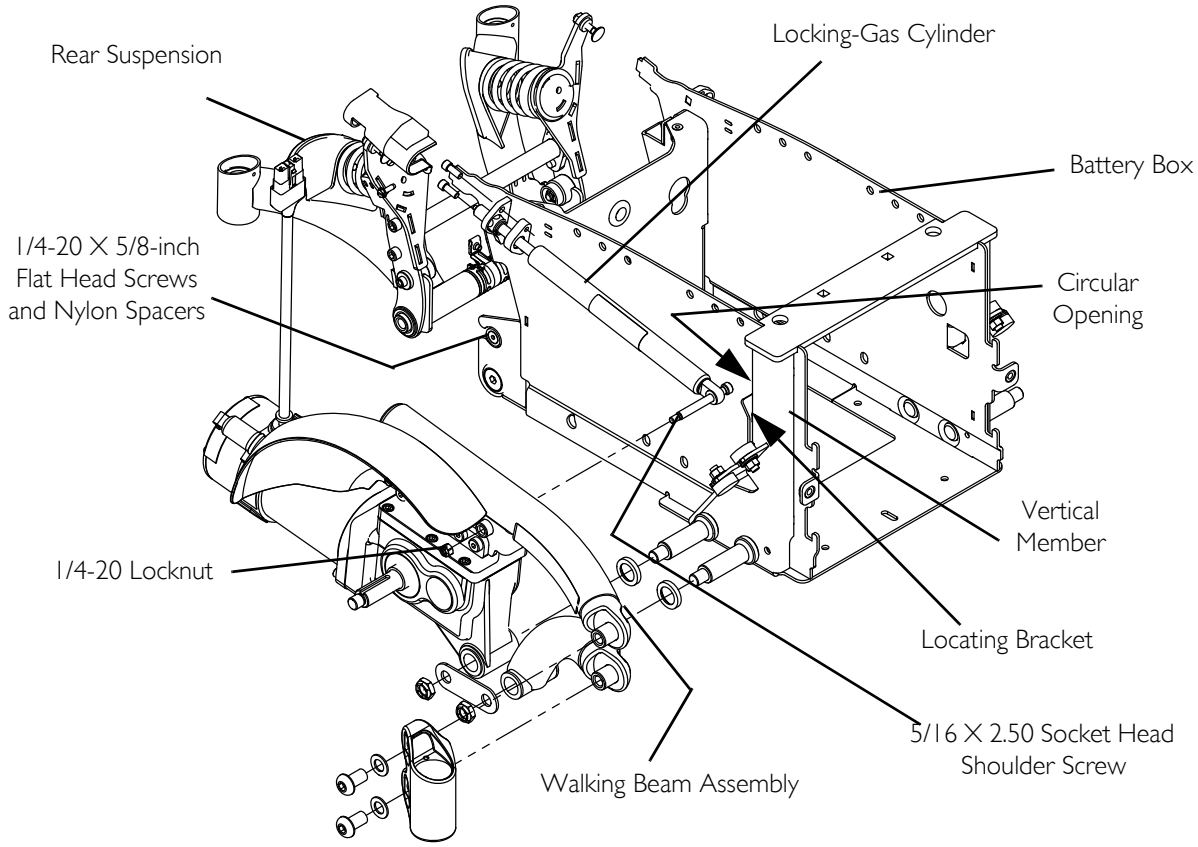


FIGURE 6.4 Removing/Installing The Locking-Gas Cylinder Assembly

Removing/Installing the Fender Assembly

NOTE: For this procedure, refer to FIGURE 6.5.

Removing

1. Remove the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
2. Remove the three 10-32 X 5/8-inch hex head screws that secure the fender to the swingarm.
3. Remove fender from the walking beam.

Installing

1. Align the fender with the walking beam.
2. Secure the fender to the fender bracket with the three 10-32 X 5/8-inch mounting screws. Securely tighten. Torque to 40 in-lbs.
3. Install the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.

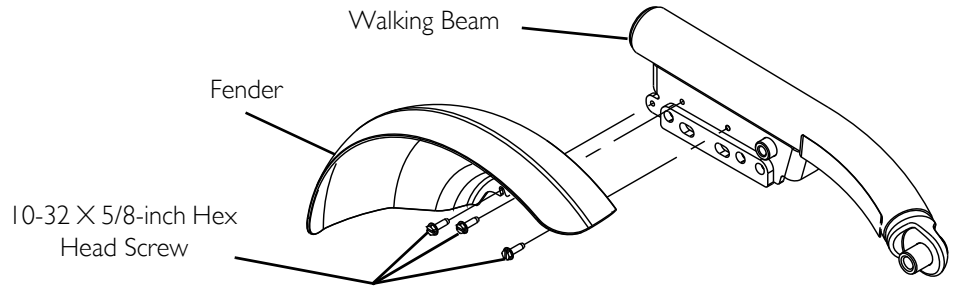


FIGURE 6.5 Removing/Installing the Fender Assembly from a 2-Pole and 4-Pole Motor

Removing/Installing the Front Bumpers

NOTE: For this procedure, refer to FIGURE 6.6.

NOTE: If replacing one or more bumpers, it is recommended to replace all four bumpers.

NOTE: This procedure applies to forward and rear facing bumpers on both sides of the wheelchair.

NOTE: Reverse this procedure to install the bumper.

Bolt-On Front Bumpers

1. Remove the drive wheel. Refer to Removing/Installing the SSD Motor Drive Wheel/Wheel Hub on page 34.
2. Remove the 5/16-18 keps nut and .328 X .75 X .060 washer securing the front bumper to the wheelchair frame.
3. Remove the bumper from wheelchair frame.
4. If necessary repeat STEPS 1-3 on remaining bumpers.

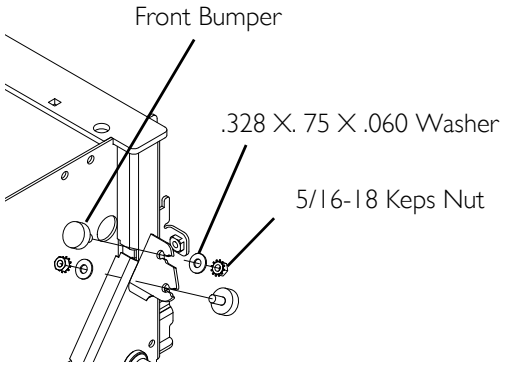


FIGURE 6.6 Removing/Installing the Front Bumpers

SECTION 7—REAR FRAME

Removing/Installing the Rear Suspension Assembly

NOTE: For this procedure, refer to FIGURE 7.1 on page 49.

Removing

NOTE: Place two 5-inch blocks under the battery frame to lift the frame off the ground to ease in performing this procedure.

1. Remove the rear shroud. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.
2. If necessary, rotate the motor up to gain access to both sets of mounting hardware.

NOTE: Before cutting the tie-wraps, note the position and orientation of the wiring harness.

3. Cut the tie-wraps securing the motor leads, joystick cable, and any other wiring to the rear suspension assembly.
4. Disconnect the right and left motor leads and the joystick cable from the controller.
5. Remove the two 1/4-20 X 5/8-inch mounting screws and nylon spacer securing the rear suspension assembly to the wheelchair frame.

NOTE: When performing STEP 6, if only one of the 1/2-13 X 1.0-inch mounting screws can be removed from the rear suspension assembly, perform STEP 7, otherwise proceed to STEP 8.

NOTE: On most TDS SP wheelchairs, a thin screwdriver can be inserted through the pivot bar and rear swing arm to hold the pivot bar in blace while removing the two 1/2-13 X 1.0-inch mounting screws.

6. Remove the two 1/2-13 X 1.0-inch mounting screws and rear pivot bushings securing the rear suspension assembly to the wheelchair frame.
7. If only one of the 1/2-13 X 1.0-inch mounting screws and rear pivot bushings can be removed, perform the following:
   A. Compress the rear springs:
      - Block Method - Lift the rear frame assembly up and add spacers under the rear casters until the rear springs remains compressed and the nylon spacer can be removed.
      - Clamp Method - Perform the following steps:
        - Remove the two nylon spacers and 1/4-20 X 5/8-inch mounting screws.
        - Let the rear frame assembly fall away from the battery box to create more room to work.
        - Remove the two rubber end caps and use a vise-clamp or c-clamp to compress springs until the nylon stop can be removed.
   B. Remove the pivot bar and remaining 1/2-13 X 1.0-inch mounting screw, rear pivot bushing from the rear suspension assembly and center bushing assembly (Detail "A").
8. Remove the rear suspension assembly from the wheelchair frame.

Installing

1. Position the rear frame assembly between the mounting brackets of the wheelchair frame.
2. Perform one of the following to secure the rear suspension assembly to the wheelchair frame:

   NOTE: On most TDX SP wheelchairs, a thin screwdriver can be inserted through the pivot bar and rear swing arm to hold the pivot bar in blace while installing the two 1/2-13 X 1.0-inch mounting screws.

   - If two mounting screws were removed - Using the two 1/2-13 X 1.0-inch mounting screws and rear pivot bushings, secure the rear suspension assembly to the wheelchair frame. Torque to 45 ft-lbs ± 20%.
   - If one mounting screw was removed (Detail "A") -
     i. Position the center bushing assembly between the two rear swing arms.
     ii. Insert the pivot tube and the remaining 1/2-13 X 1.0-inch mounting screw, rear pivot bushing into the rear suspension assembly and wheelchair frame.
     iii. Using the remaining 1/2-13 X 1.0-inch mounting screw, rear pivot bushing, secure the pivot bar and rear suspension assembly to the wheelchair frame.

3. Perform one of the following to compress the rear springs:
   - Block Method - Lift the rear frame assembly up and add spacers under the rear casters until the rear springs remains compressed and the nylon spacer can be installed.
   - Clamp Method - Use a vise-clamp or c-clamp to compress springs until the nylon spacer can be installed.
4. Using the two 1/4-20 X 5/8-inch mounting screws and nylon spacer, secure the rear frame assembly to the wheelchair frame. Torque to 75 in-lbs ± 20%.
5. Connect the right and left motor leads and the joystick cable to the controller.

NOTE: When Securing the wiring, ensure motor leeds have enough slack to allow full motion of the walking beam and that all wiring will not become pinched or damaged by moving parts.

6. Using tie-wraps, secure wiring and cables to rear frame.
7. Remove the 5-inch blocks supporting the wheelchair frame.
8. Install the two rubber end caps.
9. Adjust the stability lock setting. Refer to Adjusting the Stability Lock Setting on page 53.
10. Install the rear shroud. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.

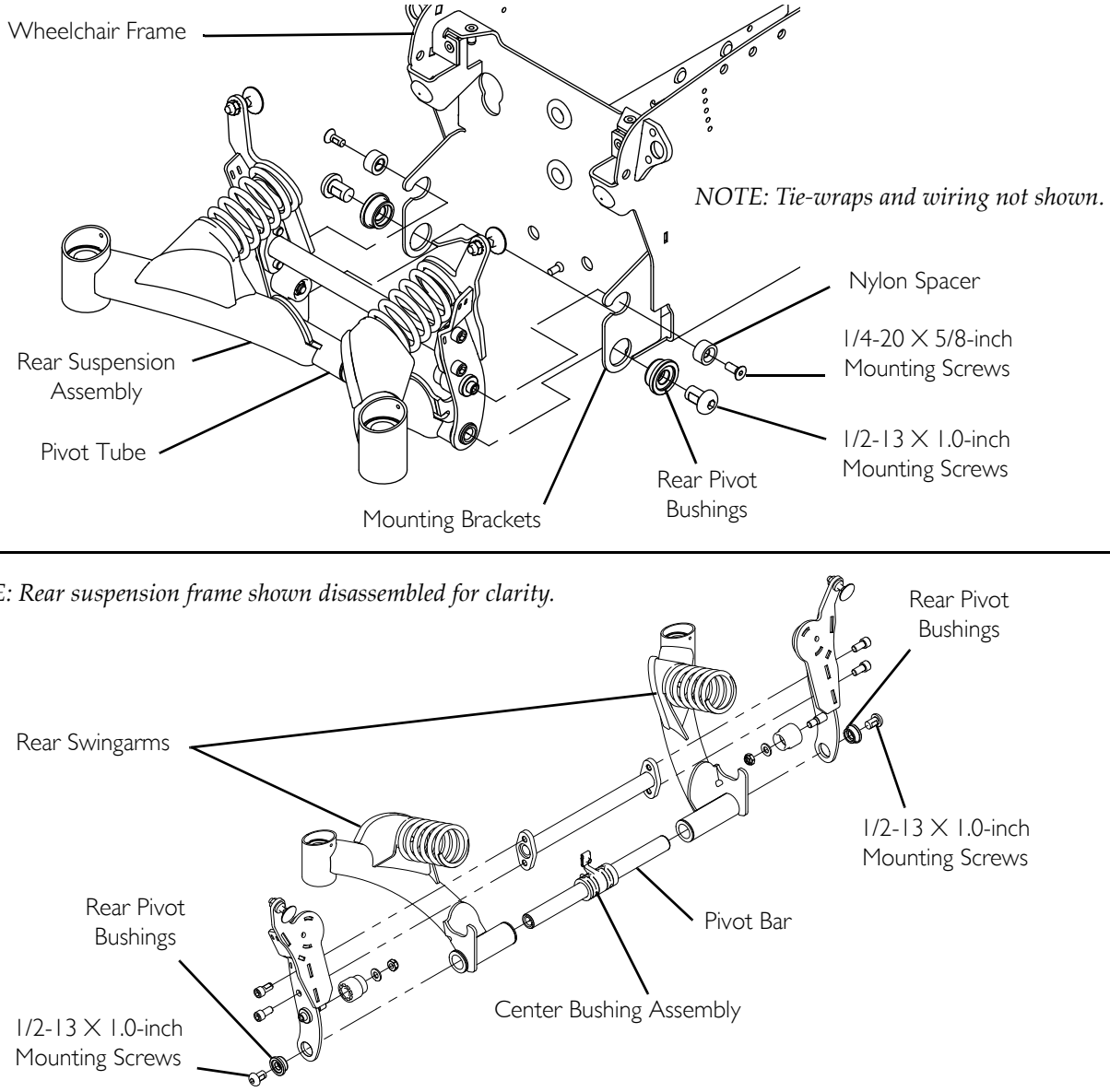


FIGURE 7.1 Removing/Installing the Rear Suspension Assembly

Removing/Installing the Rear Springs

NOTE: For this procedure, refer to FIGURE 7.2.

NOTE: Place two 5-inch blocks under the base frame to lift frame off the ground to ease in performing this procedure.

NOTE: If replacing a rear spring, it is strongly recommended to replace both rear springs to ensure proper operation of the wheelchair.

Removing

NOTE: Depending on the date of manufacture, the stability lock boot will be secured to the wheelchair frame by a tie-wrap or a 10-32 hex head screw.

1. Remove the two stability lock boots.
2. Place two 5-inch blocks under the base frame.
3. Compress the rear springs:
   - Block Method - Lift the rear frame assembly up and add spacers under the rear casters until the rear springs remains compressed and the nylon spacer can be removed.
   - Clamp Method - Perform the following steps:
     i. Remove the two nylon spacers and 1/4-20 X 5/8-inch mounting screws.
     ii. Let the rear frame assembly fall away from the battery box to create more room to work.
     iii. Remove the rubber end caps and use a vise-clamp or c-clamp to compress springs until the nylon stop can be removed.

NOTE: If necessary, use a flat screwdriver to pry the nylon stop from the spring bracket.

4. Remove the two 5/16-18 locknuts, 5/16 X 5/8 X 1/16-inch washers and nylon stops from the two spring brackets.
5. Remove the blocks from under the rear casters or remove the vise clamp or c-clamp.
6. Remove the two rear springs.

Installing

NOTE: If replacing the spring, perform this procedure with a new spring.

1. Position the two rear springs between the spring brackets and the rear frame assembly.
2. Perform one of the following to compress the rear springs:
   - Block Method - Lift the rear frame assembly up and add spacers under the rear casters until the rear springs remains compressed.
   - Clamp Method -
     i. Use a vise-clamp or c-clamp to compress springs.
     ii. Using the two 1/4-20 X 5/8-inch mounting screws and nylon spacer, secure the rear frame assembly to the wheelchair frame. Torque to 75 in-lbs ± 20%.
3. Install the two 5/16-18 locknuts, 5/16 X 5/8 X 1/16-inch washers and nylon stops onto the two spring brackets. Torque to 75 in-lbs ± 20%.
4. Remove the blocks from under the rear casters or remove the vise clamp or c-clamp.
5. Adjust the stability lock setting. Refer to Adjusting the Stability Lock Setting on page 53.

NOTE: Depending on the date of manufacture, the stability lock boot will be secured to the wheelchair frame by a tie-wrap or a 10-32 hex head screw.

6. Install the two stability lock boots onto the base frame guide block.

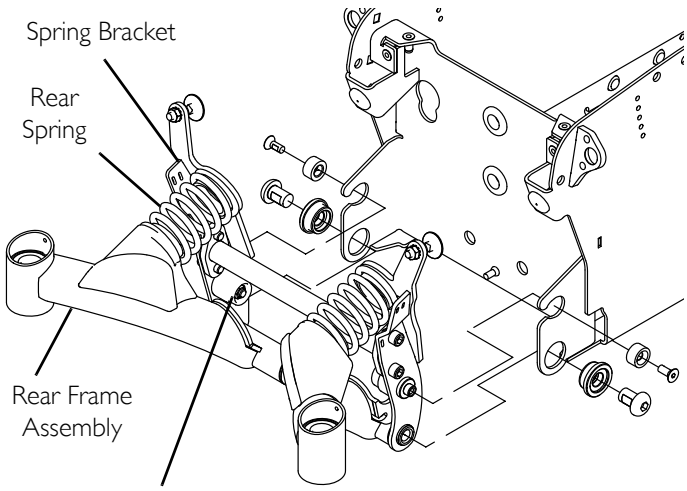


FIGURE 7.2 Removing/Installing the Rear Springs

Replacing the Elevator Bolt

NOTE: For this procedure, refer to FIGURE 7.3.

NOTE: It is recommended to replace and or adjust the setting of both elevator bolts at the same time.

NOTE: Place two 5-inch blocks under the base frame to lift the frame off the ground for ease in performing this procedure.

NOTE: Depending on the date of manufacture, the stability lock boot will be secured to the wheelchair frame by a tie-wrap or a mounting screw.

1. Remove the two stability lock boots.
2. With the base frame elevated on two 5-inch blocks, allow the rear frame to swing down.
3. Remove the two 1/4-20 X 5/8-inch mounting screws and nylon spacer securing the rear frame assembly to the wheelchair frame (Detail "A").
4. Remove the two existing 1/4-20 keps nuts securing the two existing elevator bolts to the pivot spring brackets.
5. Thread the two elevator bolts toward the base frame until the elevator bolts can be removed from the pivot spring brackets.
6. Thread the new elevator bolt(s) into the pivot spring bracket(s).
7. Install the two 1/4-20 X 5/8-inch mounting screws and nylon spacer securing the rear frame assembly to the wheelchair frame (Detail "A").
8. Remove the blocks from under the base frame.
9. Adjust the stability lock setting. Refer to Adjusting the Stability Lock Setting on page 53.

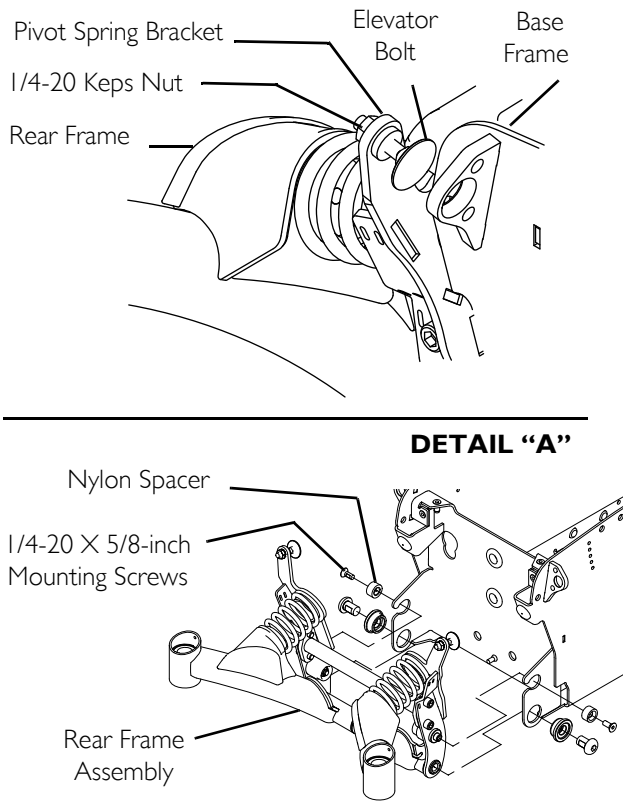


FIGURE 7.3 Replacing the Elevator Bolt

Disassembling/Assembling the Rear Suspension Frame

NOTE: For this procedure, refer to FIGURE 7.4.

NOTE: Reverse this procedure to assemble the rear suspension frame.

NOTE: If it is necessary to replace parts of the rear suspension frame, use the new parts when assembling the rear frame.

1. Remove the pivot springs from the rear suspension frame. Refer to Removing/Installing the Rear Springs on page 50.
2. Remove the rear suspension frame from the base frame. Refer to Removing/Installing the Rear Suspension Assembly on page 48.

NOTE: When assembling the rear suspension frame, torque the four 5/16-18 X 5/8 socket head cap screws to 13 ft-lbs ± 20%.

3. Remove the four 5/16-18 X 5/8 socket head cap screws and securing the pivot cross-member to the two rear swingarms.
4. Separate the two rear swingarms from the pivot bar.
5. Remove the center bushing assembly from the pivot bar.

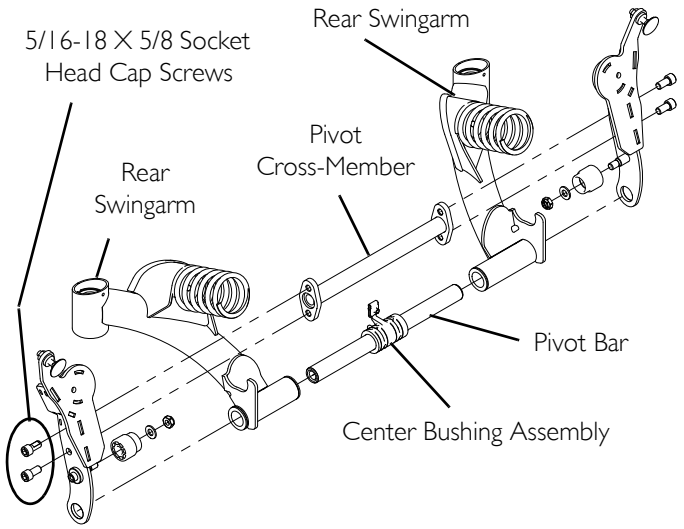


FIGURE 7.4 Disassembling/Assembling the Rear Suspension Frame

Stability Lock Inspection/Adjustment

NOTE: For this procedure, refer to FIGURE 7.5.

NOTE: Depending on the date of manufacture, the stability lock boot will be secured to the wheelchair frame by a tie-wrap or a 10-32 hex head screw.

1. Remove the two stability lock boots.
2. Ensure all six wheels of the wheelchair are in contact with the floor or work surface.

NOTE: A United States penny may be used to gauge the distance between the elevator bolt and the pivot ball.

3. Insert a 1/16-inch gauge on the pivot release pin between the elevator bolt and pivot ball of both locking-gas cylinders (one on each side of the wheelchair) to ensure there is a 1/16-inch gap between the elevator bolts and the pivot balls.
4. If necessary, adjust the elevator bolt as necessary to achieve 1/16-inch clearance. Refer to Adjusting the Stability Lock Setting on page 53.
5. Compress the rear springs several times by pulling down on back canes or kneeling in the seat and pushing on the back canes to make sure the setting will not change after adjustment.
6. Repeat STEP 3 to verify that 1/16-inch clearance setting has not changed.
7. If the 1/16-inch clearance has changed, repeat STEPS 4-6 to reset clearance to 1/16-inch.
8. Using a tie-wrap or a mounting screw, install the stability lock boot onto the base frame guide block.

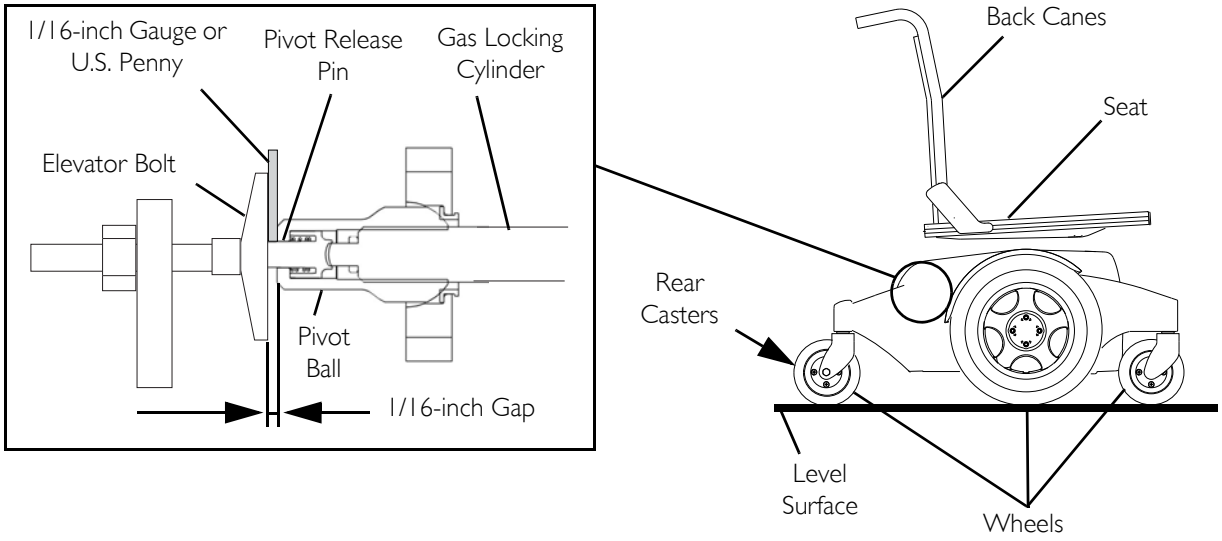


FIGURE 7.5 Stability Lock Inspection/Adjustment

Adjusting the Stability Lock Setting

NOTE: For this procedure, refer to FIGURE 7.6.

NOTE: Depending on the date of manufacture, the stability lock boot will be secured to the wheelchair frame by a tie-wrap or a 10-32 hex head screw.

1. Ensure all six wheels of the wheelchair are in contact with the floor or work surface.
2. If necessary, remove the two stability lock boots.
3. If necessary, remove the two existing 1/4-20 keps nuts that secure the two existing elevator bolts to the pivot spring brackets.

NOTE: A United States penny may be used to gauge the distance between the elevator bolt and the pivot ball.

4. Thread the elevator bolts towards the base frame until there is a 1/16-inch gap between the elevator bolts and the pivot ball of the locking-gas cylinder.
5. While maintaining the position of the elevator bolts, use two new 1/4-20 keps nuts to secure the new elevator bolts to the pivot spring brackets.
6. Using a tie-wrap or mounting screw, install the stability lock boot onto the base frame guide block.

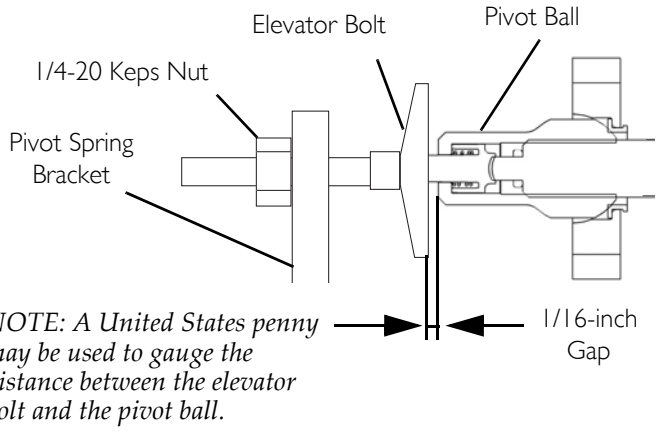


FIGURE 7.6 Adjusting the Stability Lock Setting

Checking Stability Lock Function

NOTE: For this procedure, refer to FIGURE 7.7.

1. Verify motor locks are engaged.
2. Ensure all six wheels of the wheelchair are in contact with the floor or work surface.
3. Standing behind the wheelchair, lift the back canes up and forward.
4. If both of the following conditions occur, the stability lock is functioning properly:
   A. The wheelchair rocks forward slightly and then locks.
   B. The rear casters remain in contact with the floor or rise less than 1/4-inch.
5. If the stability lock does not function, contact Invacare Technical Service at (800) 832-4707.

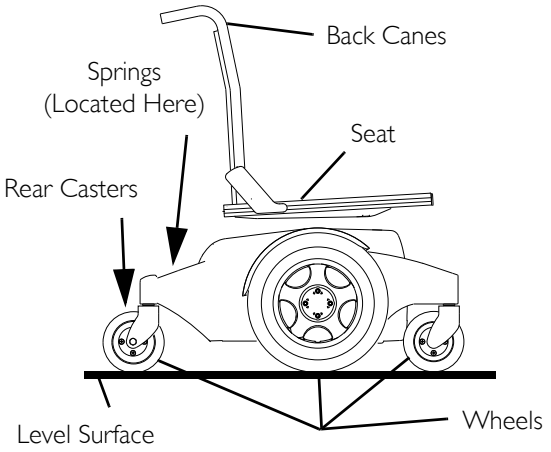


FIGURE 7.7 Checking Stability Lock Function

Check Actuator Function

NOTE: For this procedure, refer to FIGURE 7.8.

1. Position the 3-1/2 to 5-inch block under the rear portion of the battery box.
2. Perform a visual inspection to verify that the pivot release pin projecting out from the pivot ball of the stability lock actuator. The projection should be approximately 3/16 inches. Refer to Detail "A".
3. Lift the back end of the motor upward at least an inch or until full upward travel is achieved, then push down on the back end of the motor and observe for one of the following:
   - If the motor does not move downward, the actuator is locking. To release motor, lift the rear suspension assembly until the elevator bolt pushes in on the pivot release pin to lower the motor.
   - If the motor moves downward the actuator is not locking. contact Invacare Technical Service (800-832-4707).

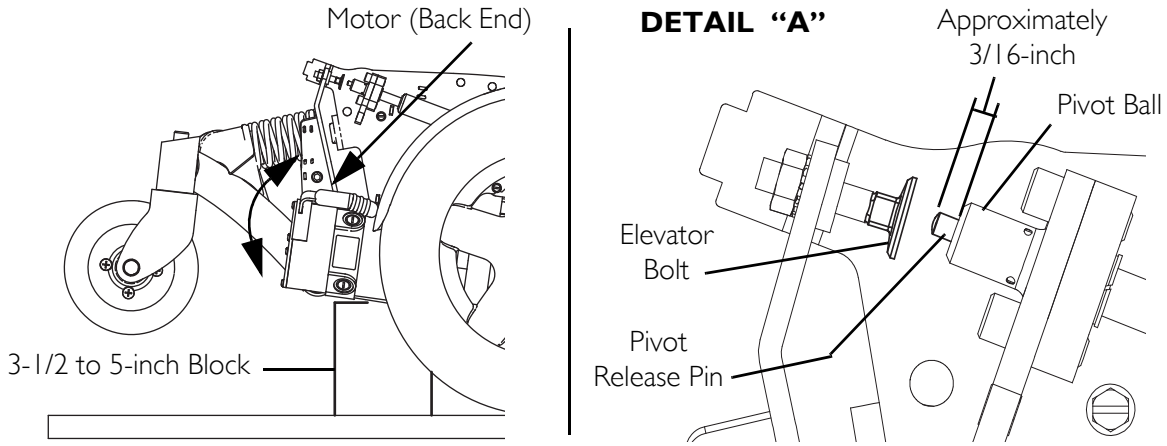


FIGURE 7.8 Checking the Actuator Function

SECTION 8—BASE FRAME

Removing/Installing Seat

NOTE: Before removing the seat assembly, note the position and orientation of the mounting position and hardware.

NOTE: If making any changes to the seat assembly that would effect the wheelchair center of gravity (adjusting seat depth or back height, adding or removing a powered seating option, etc.) then it is necessary to check the stability lock adjustment. Refer to Adjusting the Stability Lock Setting on page 53.

Adult Size Seats

NOTE: For this procedure, refer to FIGURE 8.1 on page 55.

Removing

1. Remove seating system and seat pan.
2. Remove the eight 5/16-18 X 3/4 socket head screws, 11/32 X 13/16 X 3/4 ground washers and four 5/16-18 plates that secure the seat frame to the base frame.
3. Lifting up, remove the seat assembly from the base frame.

Installing

1. Position the seat assembly onto the base frame.
2. Using the eight 5/16-18 X 3/4 socket head screws, 11/32 X 13/16 X 3/4 ground washers and four 5/16-18 plates, secure the seat frame to the base frame. Torque to 13 ft-lbs ± 20%.
3. Remove seating system and seat pan.

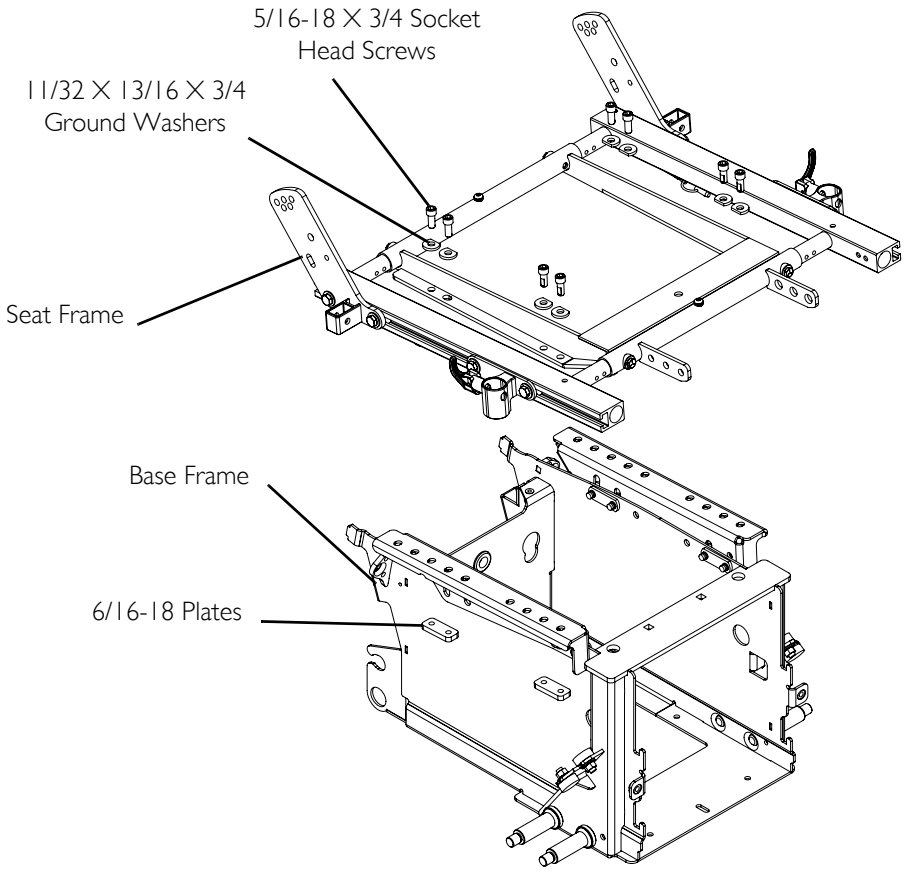


FIGURE 8.1 Removing/Installing Seat - Adult Size Seats

Adjusting Seat Angle (Non TRRO Wheelchairs Only)

⚠ WARNING

Wheelchairs with TRRO Only - Adjusting the back angle from the factory setting will void TRRO compliance. After adjusting the back angle, DO NOT transport an occupied wheelchair in a motor vehicle of any kind. The wheelchair may only be transported in a motor vehicle while unoccupied, and will be considered TRBKTS.

TDX SP with Adult Seat

NOTE: For this procedure, refer to FIGURE 8.2.

NOTE: The following tools are required to perform this procedure.

- *5/16-inch Socket with Ratchet*
- *Torque Wrench*
- *Pitch Angle Gauge*

1. Loosen but DO NOT remove the eight 5/16-18 X .75 hex head screws securing the seat-to-floor bracket to the base frame.
2. Using the pitch angle gauge, reposition the two seat-to-floor brackets to the desired angle.
3. Tighten the eight 5/16-18 X .75 hex head screws. Torque to 13 ft-lbs ± 20%.

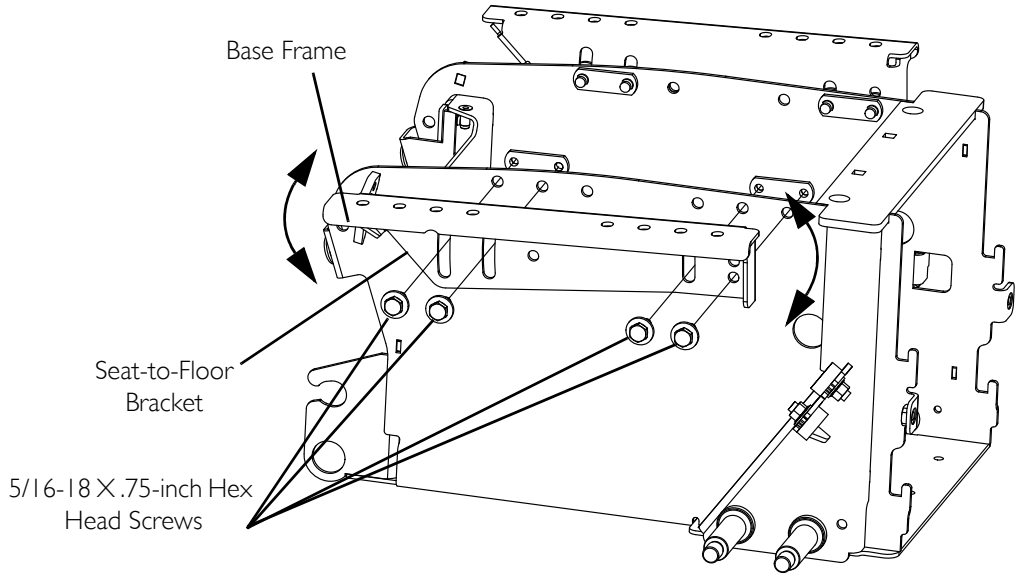


FIGURE 8.2 Adjusting Seat Angle (Non TRRO Wheelchairs Only)

Checking Formula CG Seating System Mounting Position

⚠ WARNING

Risk of injury or damage

Moving the seating system from the factory setting may reduce driver control, wheelchair stability, traction and increase caster wear.

Move the seating system ONLY when necessary to fit the wheelchair to the user.

If the seating system must be moved, ALWAYS Inspect the wheelchair to ensure the front rigging DOES NOT interfere with the front casters.

If the seating system must be moved, ALWAYS Inspect to ensure the wheelchair DOES NOT easily tip forward or backward.

NOTE: For this procedure, refer to FIGURE 8.3 on page 57.

NOTE: Applies to Formula CG Tilt, Recline or Tilt/Recline seating systems only.

1. Determine mounting position:
   - Wheelchairs with Swing Away Front Rigging (Detail "A") -
     i. Rotate front casters forward as if the wheelchair were moving in reverse.

     NOTE: If wheelchair is equipped with composite footrests, point the front casters toward the footplate.

     ii. Measure the gap between the front caster and the footplate. Perform one of the following:
     - 1 to 1½ inch Gap - Formula CG seating system is in the proper mounting position.
     - Gap is Greater than 1½ inches - Formula CG seating system is not in the proper mounting position. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.
   - Wheelchair with Manual or Power Center Mount Front Rigging (Detail "B") -
     i. Position center mount front rigging to the lowest setting to position the footplate as close as possible to the front shroud.

     ii. Measure the gap between the footplate and the front shroud.

     iii. Perform one of the following:
     - 1 to 1½ inch Gap - Formula CG seating system is in the proper mounting position.
     - Gap is Greater Than 1½ inches - Formula CG seating system is not in the proper mounting position. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.

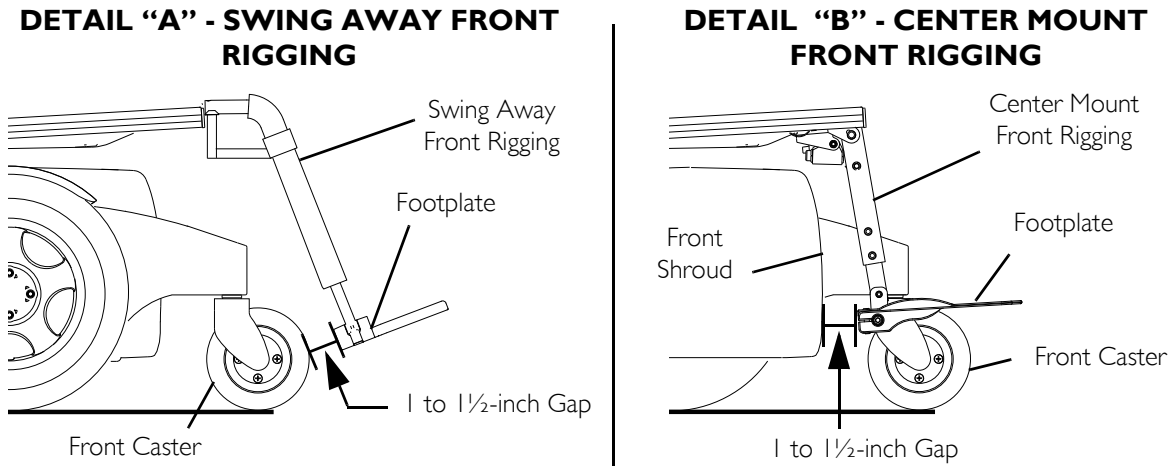


FIGURE 8.3 Checking Formula CG Seating System Mounting Position

Adjusting the Formula CG Seating System Mounting Position

NOTE: For this procedure, refer to FIGURE 8.4 on page 59 and FIGURE 8.3 on page 57.

NOTE: Applies to Formula CG Tilt, Recline or Tilt/Recline seating systems only.

1. Loosen, but DO NOT remove, the four hex screws and locknuts securing the seat frame mounting bracket to the interface mounting bracket.
2. Perform one of the following to ensure the Formula CG seating system is in the proper mounting position:

NOTE: Some front rigging and seat depth combinations may not allow for the 1-inch gap. In this situation, slide the seat frame mounting brackets as far back as possible.

- Wheelchairs with Swing Away Front Rigging - Slide the seat frame mounting brackets as far as possible towards the rear of the wheelchair (FIGURE 8.4). Leave 1 to 1½-inch of clearance between the front riggings and the front casters in all caster positions (Detail "A" of FIGURE 8.3).
- Wheelchairs with Manual or Power Center Mount Front Rigging - Slide the seat frame mounting brackets as far as possible towards the rear of the wheelchair (FIGURE 10). Leave 1 to 1½-inch of clearance between the center mount front riggings and the front shroud (Detail "B" of FIGURE 9).

3. Ensure the interface mounting brackets and the seat frame mounting brackets are flush and square.
4. Secure the seat frame mounting brackets to the interface mounting plates. Torque the four hex bolts and locknuts to 13 ft-lbs ± 20%.
5. Cycle the tilt and/or recline functions to verify wiring harnesses DO NOT obstruct the path of the system. If they do, perform one of the following:
   - Wires were damaged during inspection - Replace damaged wires.
   - Wires were not damaged during inspection - Cut tie-wraps and relocate wires to a location where they will not become damaged.

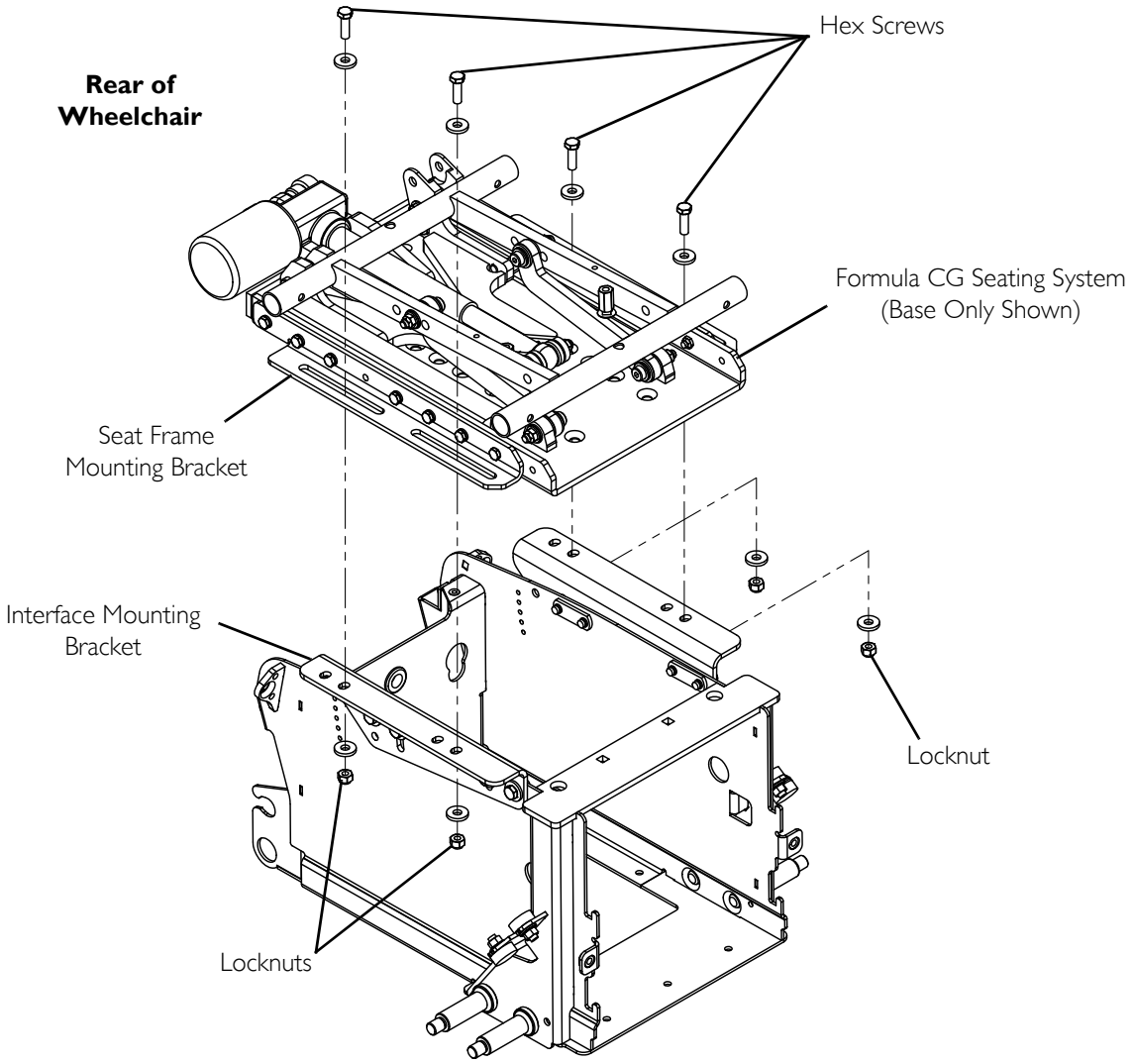


FIGURE 8.4 Adjusting the Formula CG Seating System Mounting Position

Removing/Installing the Wheelchair Shrouds

NOTE: For this procedure, refer to FIGURE 8.5 on page 61.

NOTE: The following tools are required to perform this procedure.

- *Phillips Head Screwdriver*
- *5/16-inch Allen Wrench*

Top Shroud

NOTE: Reverse this procedure to install the top shroud.

1. Remove the seat from the base frame.
2. Remove the four 10-32 X 1/2-inch pan head screws securing the top shroud to the base frame.
3. Lifting up, remove the top shroud from the base frame.

Rear shroud

NOTE: Reverse this procedure to install the rear shroud.

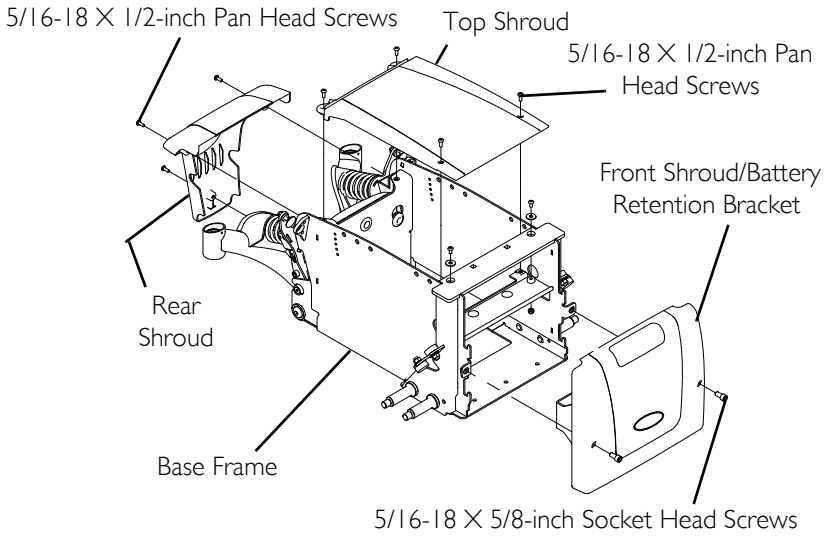
1. Remove the three 10-32 X 1/2-inch pan head screws, thumb screw or lock knob securing the rear shroud to the base frame.
2. Remove the rear shroud from the base frame.

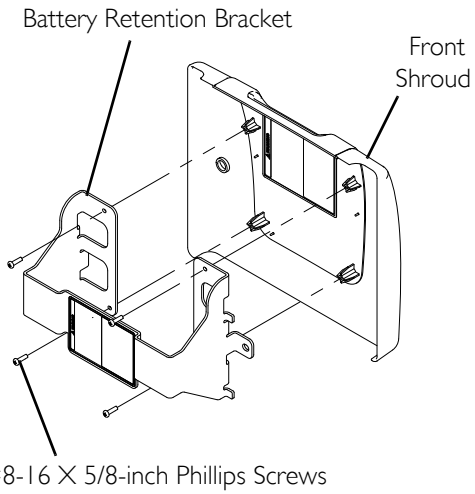
Front Shroud and Battery Retention Bracket

NOTE: Reverse this procedure to install the front shroud and battery retention bracket.

NOTE: The front shroud and battery retention bracket are removed from and installed onto the wheelchair frame as a single unit.

1. Remove the two 5/16-18 X 5/8-inch socket head screws securing the front shroud/battery retention bracket to the base frame.
2. Lift up to unhook the battery retention bracket from the base frame and remove the front shroud/battery retention bracket from the base frame.
3. If necessary to replace the front shroud or the battery retention bracket, perform the following:
   A. Remove the four #8-16 X 5/8-inch Phillips screws securing the battery retention bracket to the front shroud.
   B. Separate the front shroud from the battery retention bracket.
   C. Discard the item to be replaced and replace with new front shroud or battery retention bracket.
   D. Using four #8-16 X 5/8-inch Phillips screws, secure front shroud to the battery retention bracket.





TDX SP with Thumb Screw or Lock Knob

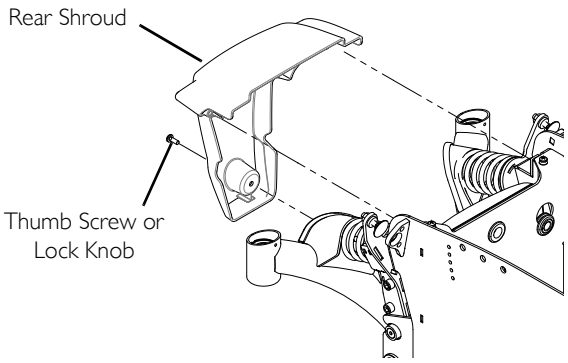


FIGURE 8.5 Adjusting the Formula CG Seating System Mounting Position

SECTION 9— BATTERIES

⚠ DANGER

Risk of Death or Serious Injury

Failure to observe these warnings can cause an electrical short resulting in death, serious injury, or damage to the electrical system.

The POSITIVE (+) RED battery cable MUST connect to the POSITIVE (+) battery terminal(s)/post(s).

The NEGATIVE (-) BLACK battery cable MUST connect to the NEGATIVE (-) battery terminal(s)/post(s).

NEVER allow any of your tools and/or battery cable(s) to contact BOTH battery post(s) at the same time. An electrical short may occur and serious injury or damage may occur.

Install protective caps on positive and negative battery terminals.

Replace cable(s) immediately if cable(s) insulation becomes damaged.

DO NOT remove fuse or mounting hardware from POSITIVE (+) red battery cable mounting screw.

⚠ WARNING!

Risk of Injury or Damage

Improper installation of the battery can result in injury or damage.

– Batteries can weigh up to 52 lbs (23.6 kg). ALWAYS use a battery lifting strap when lifting the battery. It is the most reliable method of carrying a battery and preventing serious injury.

⚠ WARNING!

Risk of Injury or Damage

Improper lifting technique may cause injury or damage.

– Use proper lifting techniques, assistance and gear such as straps when available when lifting heavy loads.

⚠ WARNING!

Risk of Injury

Exposure to battery acid may result in injury.

– The use of rubber gloves is recommended when working with batteries.

– DO NOT allow the liquid in the battery to come in contact with skin, clothes or other possessions. It is a form of acid and harmful or damaging burns may result. Should the liquid touch your skin, wash the area IMMEDIATELY and thoroughly with cool water. In serious cases or if eye contact is made, seek medical attention IMMEDIATELY.

– DO NOT install/reinstall a battery with a cracked or otherwise damaged case.

NOTE: Invacare strongly recommends battery installation and replacement be performed by a qualified technician. Read the installation instructions noted on the battery and in the manual. Ensure there is no battery acid in the bottom or around the battery box or on the sides of the battery(ies). Neutralize battery acid with baking soda if found. Clean battery tray and batteries prior to installation. Use battery lifting strap when available. Keep batteries in an upright position and avoid tipping. Use only deep cycle gel cell battery. Use box wrench when tightening clamps. Do Not wiggle the battery terminals/posts when tightening.

Using the Proper Batteries

⚠ WARNING

Risk of Injury or Damage

Improper configuration of battery terminals may cause injury or damage.

– Batteries with terminal configuration as shown MUST be used.

– Terminals MUST have a cross hole in them as shown.

– The POSITIVE (+) RED battery cable MUST connect to the POSITIVE (+) battery terminals/posts.

– The NEGATIVE (-) BLACK battery cable MUST connect to the NEGATIVE (-) battery terminals/posts.

– DO NOT allow any of your tools and/or battery cables to contact both battery terminals at the same time.

⚠ CAUTION

Risk of Damage

Use of wrong battery type or size may cause damage.

– DO NOT force a battery into place.

– Batteries with molded straps or flanges that interfere with proper battery placement should not be used.

– Use batteries listed in this manual for proper replacement.

NOTE: Failure to use the correct battery size and/or voltage may cause damage to your wheelchair and give you unsatisfactory performance. The warranty and performance specifications contained in this manual are based on the use of deep cycle gel cell batteries. Invacare strongly recommends their use as the power source for this unit.

NOTE: Carefully read battery/battery charger information prior to installing, servicing or operating your wheelchair.

1. Position battery on ground/flat surface as shown below.
2. Visually inspect the battery to ensure proper polarity:

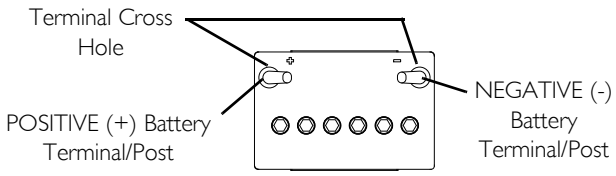
⚠ WARNING

FOR WHEELCHAIRS USE 22NF BATTERIES

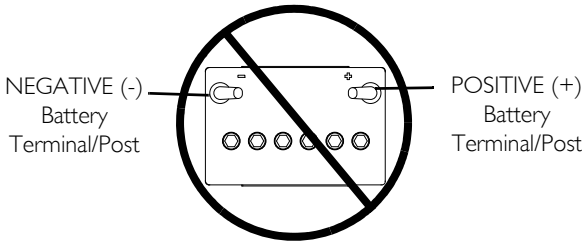
Batteries with terminal configuration (POSITIVE on the left and NEGATIVE on the right) as shown below MUST be used. Batteries that have the reverse terminal configuration MUST not be used - otherwise injury and damage may occur.

Terminals MUST have a cross hole in them as shown below..

PROPER BATTERIES TO USE



DO NOT USE THIS TYPE OF BATTERY

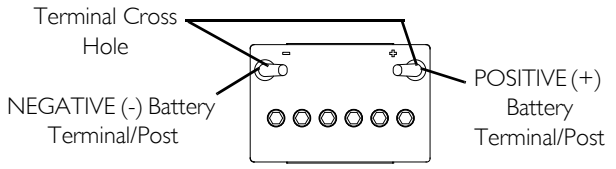


FOR WHEELCHAIRS USE GP24 BATTERIES

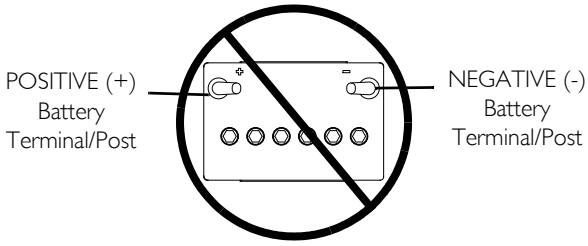
Batteries with terminal configuration (POSITIVE on the right and NEGATIVE on the left) as shown below MUST be used. Batteries that have the reverse terminal configuration MUST not be used - otherwise injury and damage may occur.

Terminals must have a cross hole in them as shown below.

PROPER BATTERIES TO USE



DO NOT USE THIS TYPE OF BATTERY



Replacing Batteries

NOTE: For this procedure, refer to FIGURE 9.1 on page 66.

NOTE: The following tools are required to perform this procedure:

- *Wire Cutter*

1. Remove the batteries from the wheelchair. Refer to Removing/Installing the Batteries From/Into the Wheelchair on page 67.
2. Cut the tie-wraps that secure the battery terminal covers to the battery terminals.
3. Slide the RED battery terminal cover back on the RED battery cable to expose the POSITIVE battery terminal.
4. Slide the BLACK battery terminal cover back on the BLACK battery cable to expose NEGATIVE battery terminal.

⚠ DANGER

Risk of Death or Serious Injury

Failure to observe these warnings can cause an electrical short resulting in death, serious injury, or damage to the electrical system.

The POSITIVE (+) RED battery cable MUST connect to the POSITIVE (+) battery terminal(s)/post(s).

The NEGATIVE (-) BLACK battery cable MUST connect to the NEGATIVE (-) battery terminal(s)/post(s).

NEVER allow any of your tools and/or battery cable(s) to contact BOTH battery post(s) at the same time. An electrical short may occur and serious injury or damage may occur.

Install protective caps on positive and negative battery terminals.

Replace cable(s) immediately if cable(s) insulation becomes damaged.

DO NOT remove fuse or mounting hardware from POSITIVE (+) red battery cable mounting screw.

5. Remove the locknut that secures the bracket of the POSITIVE battery cable to the POSITIVE (+) battery post of the battery.
6. Remove the locknut that secures the NEGATIVE battery cable to the NEGATIVE(-) battery post of the battery
7. Discard the existing battery.
8. Position battery connector bracket or wiring harness onto the new 22NF or GP24 battery as shown.
9. Secure the NEGATIVE battery cable to the NEGATIVE (-) battery post with existing mounting screw and locknut.
10. Secure the bracket of the POSITIVE battery cable to the POSITIVE (+) battery post with existing mounting screw and locknut.
11. Position each battery terminal cover over top of each battery terminal.
12. Secure battery terminal covers in place with one tie-wrap.
13. Install batteries into wheelchair. Refer to Removing/Installing the Batteries From/Into the Wheelchair on page 67.

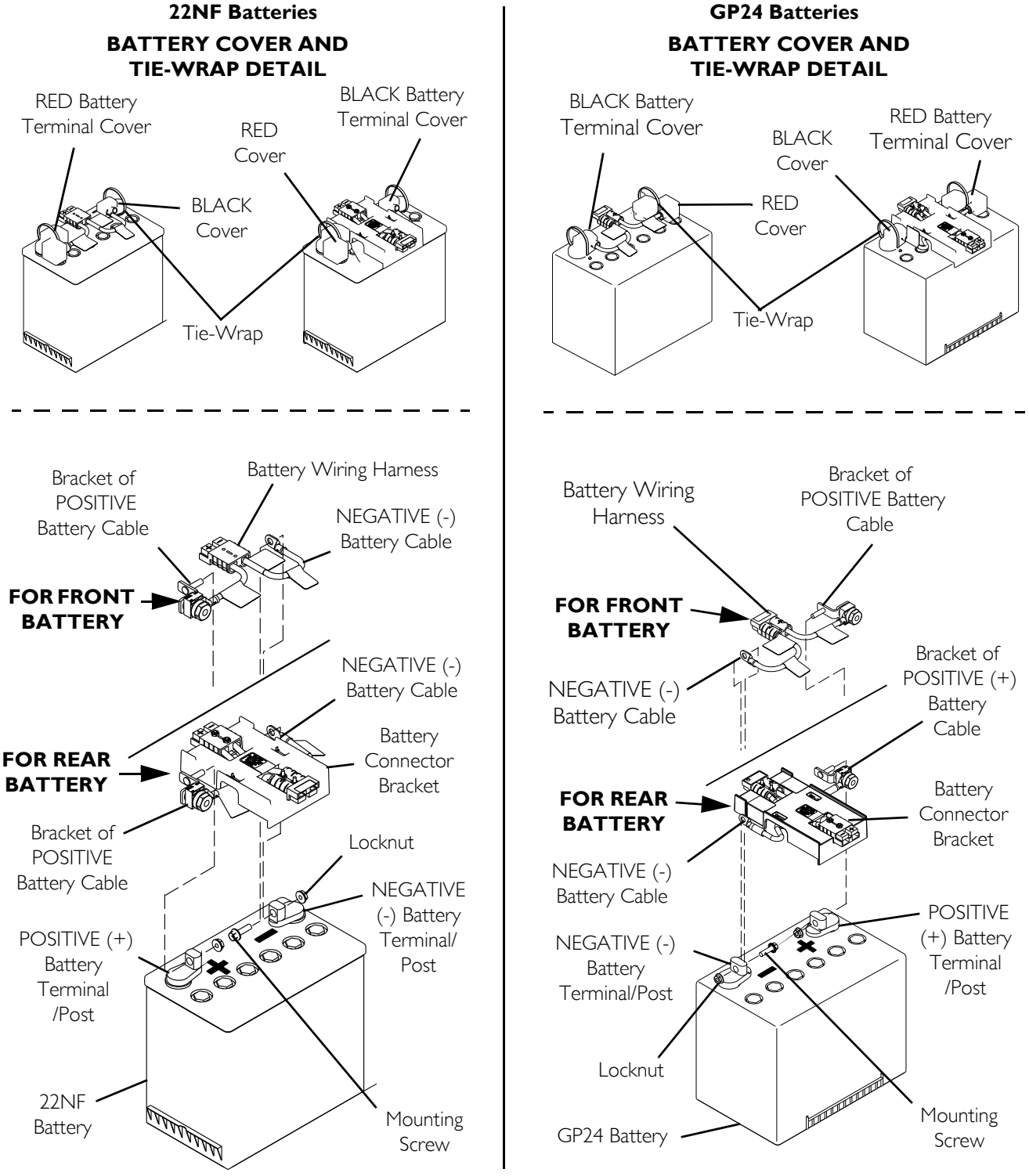


FIGURE 9.1 Replacing Batteries

Cleaning Battery Terminals

⚠ WARNING!

Risk of Injury

Exposure to battery acid may result in injury.

– The use of rubber gloves is recommended when working with batteries.

– DO NOT allow the liquid in the battery to come in contact with skin, clothes or other possessions. It is a form of acid and harmful or damaging burns may result. Should the liquid touch your skin, wash the area IMMEDIATELY and thoroughly with cool water. In serious cases or if eye contact is made, seek medical attention IMMEDIATELY.

– DO NOT install/reinstall a battery with a cracked or otherwise damaged case.

14. Examine battery terminals for corrosion.
15. Verify the plastic caps are in place over battery cell holes.
16. Clean terminals by using a battery cleaning tool, wire brush, or medium grade sand paper.

NOTE: Upon completion, areas should be shiny, not dull.

17. Carefully dust off all metal particles.

Removing/Installing the Batteries From/Into the Wheelchair

Removing the Front Shroud/Battery Retention Bracket and Rear Shroud

CAUTION

Risk of Damage

Cleaning or maintenance may cause damage to carpeting or flooring.

– Place the wheelchair in a well ventilated area where cleaning or maintenance can be performed without risk of damage to carpeting or flooring.

NOTE: For this procedure, refer to FIGURE 9.2 on page 68.

1. Verify the joystick On/Off switch is in the Off position.
2. Remove the three 10-32 X 1/2-inch pan head screws, thumb screw or lock knob securing the rear shroud to the base frame.
3. Remove the rear shroud from the wheelchair.

NOTE: The front shroud and battery retention bracket are removed from and installed onto the wheelchair frame as a single unit.

4. Remove the two mounting screws securing the front shroud/battery retention bracket to the wheelchair.
5. Wheelchairs with Footboards Only: Remove the mounting screw and washer securing the footboard support to the wheelchair frame.
6. Lift up to unhook the battery retention bracket from the wheelchair frame and remove the front shroud/battery retention bracket from the wheelchair.
7. Disconnect the controller from the batteries at the rear of the wheelchair.
8. Remove the batteries. Removing the Batteries from Wheelchair on page 69.

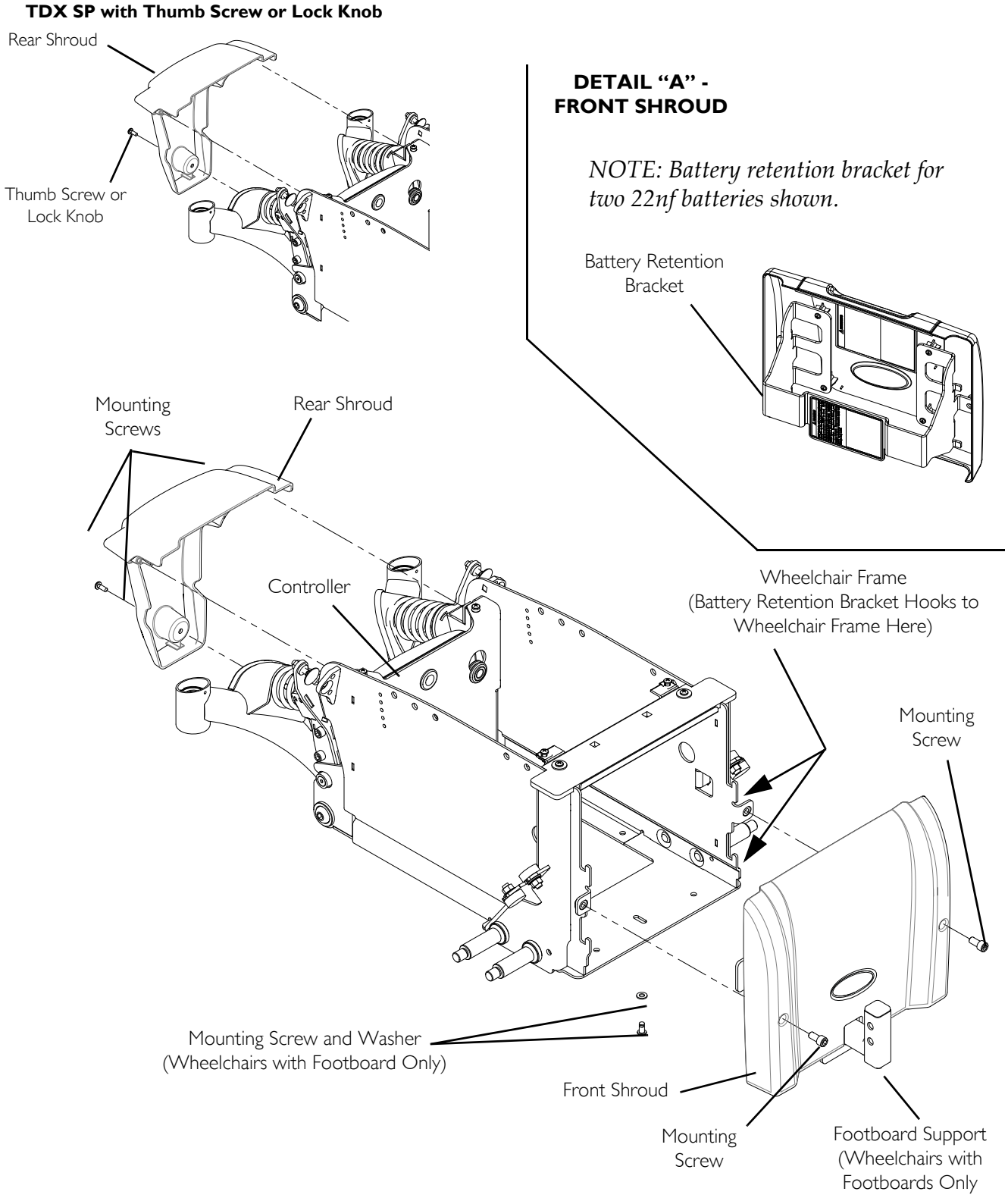


FIGURE 9.2 Removing the Front Shroud/Battery Retention Bracket and Rear Shroud - Installing the Front Shroud/Battery Retention Bracket and Rear Shroud

Removing the Batteries from Wheelchair

⚠ WARNING

Risk of Serious Injury
Improperly installed battery tray can cause instability resulting in serious injury.
- Ensure batteries and battery tray are installed properly to maintain stability.

NOTE: For this procedure, refer to FIGURE 9.3.

1. Slide battery tray with batteries out.
2. Disconnect the battery straps.
3. Unplug front battery from rear battery.
4. Remove the front battery.
5. Slide the rear battery forward and remove it from the tray.

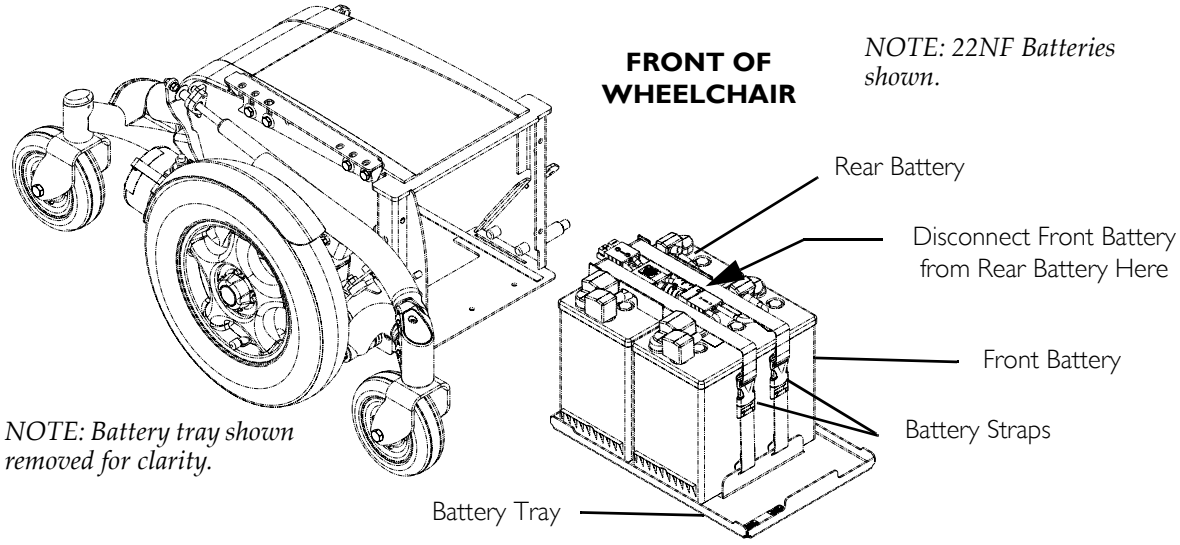


FIGURE 9.3 Removing the Batteries from Wheelchair

Installing Batteries into Wheelchair

NOTE: For this procedure, refer to FIGURE 9.3 and FIGURE 9.4 on page 70.

NOTE: Positioning of the batteries into the battery tray is completed with battery tray positioned in wheelchair and partially pulled out. Refer to FIGURE 9.3 for full view of wheelchair base. Illustrations in FIGURE 9.4 on page 70 are shown without the wheelchair for clarification purposes only.

1. Position the battery with battery connector bracket in the rear of the battery tray in the orientation as shown. See Detail "A" of FIGURE 9.4 on page 70.

NOTE: Front of battery tray is designated by the battery stop. Rear of the battery tray is the opposite end.

NOTE: Orientation of the battery is critical otherwise batteries will not connect to the controller or each other.

2. Position the remaining battery in the front of the battery tray in the orientation shown so that the wiring harnesses can be connected together. See Detail "B" of FIGURE 9.4 on page 70.
3. Connect front battery to rear battery. See Detail "B" of FIGURE 9.4 on page 70.
4. Connect battery straps. See Detail "C" of FIGURE 9.4 on page 70.
5. Slide the battery tray into the wheelchair (FIGURE 9.3).
6. Install the battery door and rear shroud. Refer to Installing the Front Shroud/Battery Retention Bracket and Rear Shroud on page 70.

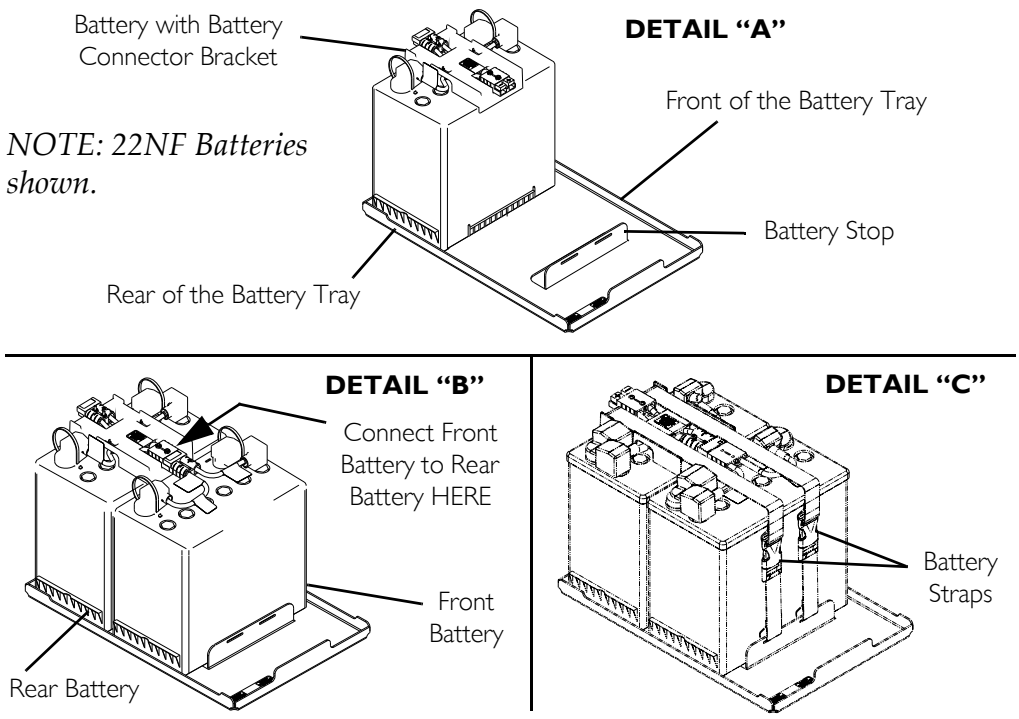


FIGURE 9.4 Installing Batteries into Wheelchair

Installing the Front Shroud/Battery Retention Bracket and Rear Shroud

NOTE: Wheelchairs with TRRO or TRBKTS Only - Battery retention brackets MUST be installed at all times. Otherwise, the wheelchair will not be WC/19 compliant. After installing front shroud, ensure that the mounting screws on the front shroud/battery retention bracket are fully engaged into the battery box.

NOTE: For this procedure, refer to FIGURE 9.2 on page 68.

1. Reinstall the front shroud/battery retention bracket onto front of wheelchair frame.
2. Install two mounting screws on the sides of the front shroud/battery retention bracket.

⚠ WARNING

When installing batteries, ensure battery connector is securely engaged to the controller connector - otherwise serious personal injury may result.

3. Wheelchairs with Footboards Only: Using the mounting screw and washer, secure the footboard support to the wheelchair frame.
4. Connect the controller to the batteries at the rear of the wheelchair.
5. Reinstall the rear shroud and secure in place with the three 10-32 X 1/2-inch pan head screws, thumb screw or lock knob.

NOTE: New Batteries MUST be fully charged before using, otherwise the life of the battery(ies) will be reduced.

6. If necessary, charge the batteries. Refer to Charging Batteries on page 72.

Removing/Installing the Battery Tray

NOTE: For this procedure, refer to FIGURE 9.5.

Removing

1. Remove the batteries. Refer to Removing/Installing the Batteries From/Into the Wheelchair on page 67.
2. Slide the battery tray back into the battery box.

3. Remove the two #10-32 X .50-inch riv nuts, .200/.193 X .334 X .062-inch lock washers and #10-32 X .75-inch socket head screws.
4. Slide battery tray out of battery box.

Installing

1. Slide battery tray into battery box.
2. Install the two #10-32 X .50-inch riv nuts, .200/.193 X .334 X .062-inch lock washers and #10-32 X .75-inch socket head screws, one in each side of the battery box. Torque to 25 in-lbs ± 20%.
3. Install the batteries. Refer to Removing/Installing the Batteries From/Into the Wheelchair on page 67.

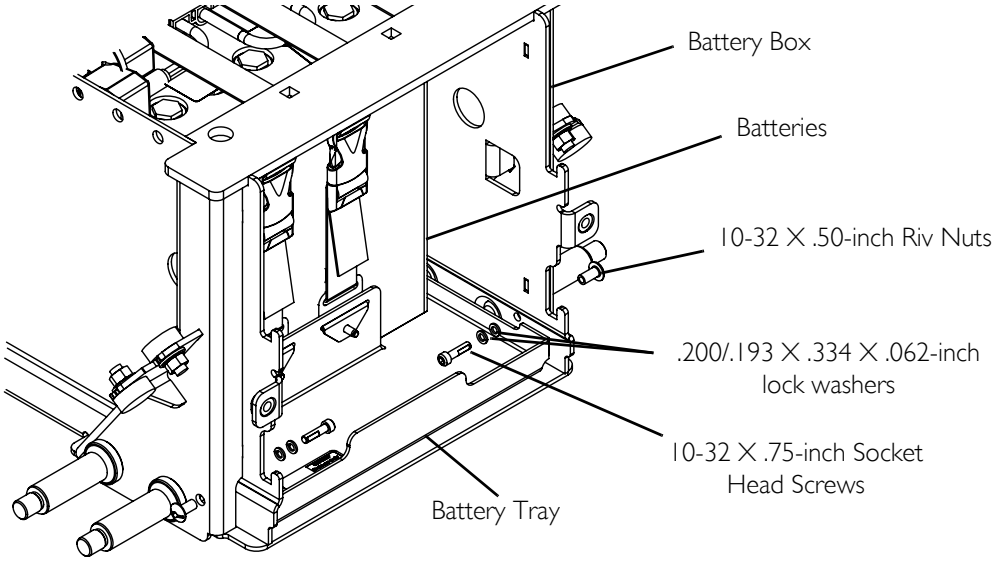


FIGURE 9.5 Removing/Installing the Battery Tray

When to Charge Batteries

NOTE: Avoid draining battery to low or empty levels.

Fully charge battery before use if the battery becomes fully drained.

If battery charge becomes so low that no battery indicators are lit, allow the batteries to charge overnight.

New batteries MUST be fully charged prior to initial use to avoid reduced battery life.

Recharge daily and frequently to extend battery life and reduce charge time.

Charge battery when product will not be used for an extended period of time.

SPJ Joysticks

NOTE: For this procedure, refer to FIGURE 9.6.

The Information Gauge Display located on the front of the joystick housing, it provides the state-of-battery charge, including notification of when the battery requires charging. It also provides the following information to the user on the status of the wheelchair:

A. GREEN LEDs are lit, indicating well charged batteries.
B. AMBER LEDs are lit, indicating batteries are moderately charged. Recharge batteries before taking a long trip.
C. RED LEDs are lit, indicating batteries are running out of charge. Recharge batteries as soon as possible.

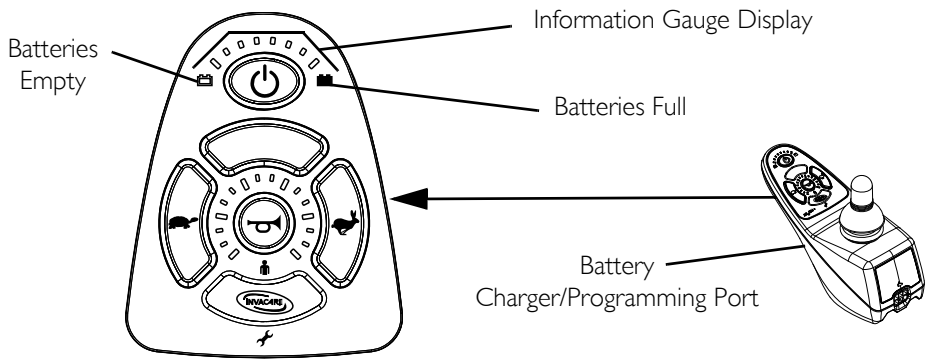


FIGURE 9.6 SPJ Joysticks

MPJ Joystick

NOTE: For this procedure, refer to FIGURE 9.7 on page 73.

The far right side of the screen is the Battery Gauge Display (BGD). It provides information on the remaining charge in the batteries. All battery indicators will be lit at full charge. The battery discharges as power is used. Indicators will turn off as the battery discharges.

Charging Batteries

⚠ WARNING

Risk of Injury, Damage or Death

Improper charging may cause injury or damage

– Charge battery in a cool, dry and well-ventilated area.

– DO NOT attempt to charge the battery by attaching cables directly to the battery terminals.

– DO NOT attempt to charge the battery and operate the wheelchair at the same time.

– DO NOT attempt to charge the battery when the wheelchair has been exposed to any type of moisture.

– DO NOT sit in the wheelchair while charging the battery.

– DO NOT leave the charger unattended when the breaker has tripped. Unplug and discontinue use immediately. Contact a qualified service technician or Invacare for service.

NOTE: For this procedure, refer to FIGURE 9.7 on page 73.

NOTE: New batteries MUST be fully charged prior to initial use of the wheelchair.

NOTE: As a general rule, batteries should be recharged daily to assure the longest possible life and minimize the required charging time. Plan to recharge the batteries when it is anticipated the wheelchair will not be used for a long period of time.

The range per battery charge using recommended batteries should be approximately five to nine hours of typical operation. Extensive use on inclines may substantially reduce per charge mileage.

Description and Use of Battery Chargers

The charger automatically reduces the charge from an initially high rate to a zero reading at a fully charged condition. If left unattended, the charger should automatically shut-off when full charge is obtained.

There are some basic concepts which will help you understand this automatic process. They are:

The amount of electrical current drawn within a given time to charge a battery is called the "charge rate". If, due to usage, the charge stored in the battery is low, the charge rate is high, as indicated by the GREEN light on the charger. Initially, the GREEN light will stay illuminated for a short period of time followed by a longer period of off time. As a charge builds up, the charge rate is reduced, and the GREEN light will stay illuminated for a longer period of time followed by a shorter off time.

NOTE: If performing the charging procedures independently, READ and CAREFULLY follow the individual instructions for each charger (supplied or purchased).

NOTE: If charging instructions are not supplied, consult a qualified service technician for proper procedures.

Required Items:

TOOL	QUANTITY	COMMENTS
Battery Charger	1	Supplied
Extension Cord	1	Not Supplied

1. Attach the battery charger connector to the charger port on the joystick.
2. Plug the charger's AC power cord, or extension, into the grounded 120 VAC wall outlet.
3. Wait until charging is complete.

NOTE: Allow eight hours for normal charging. Larger batteries (greater than 55 ampere-hours) or severely discharged batteries may require up to sixteen hours to be properly charged and equalized.

NOTE: It is advantageous to recharge frequently rather than only when necessary. In fact, a battery's life is extended if the charge level is maintained well above a low condition.

NOTE: If the batteries need to be charged more often or take longer to charge than normal, they may need to be replaced. Contact an Invacare dealer for service.

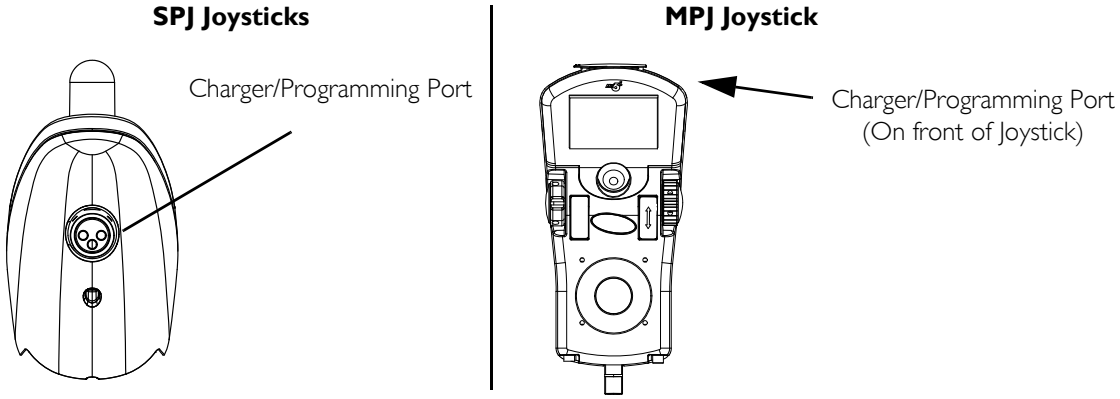


FIGURE 9.7 Charging Batteries

SECTION 10—ELECTRONICS

Controller Calibration

NOTE: For this procedure, refer to FIGURE 10.1.

1. Connect the programer to the charger/programming port.
2. Refer to MK6 electronics programing guide part number 1141471 for controller calibration information.

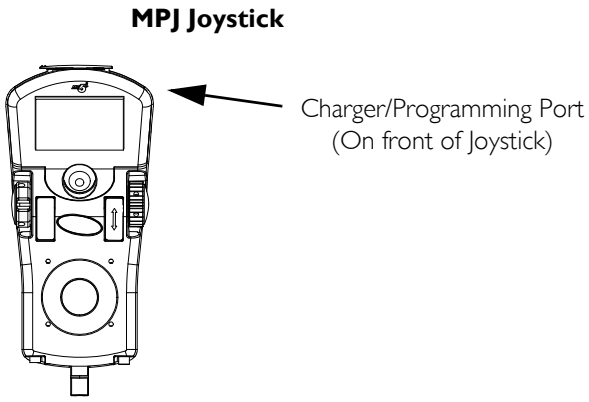


FIGURE 10.1 Controller Calibration

Removing/Installing the Controller

NOTE: For this procedure, refer to FIGURE 10.2 on page 75.

Removing

1. Wheelchairs with TRRO, TRBKTS, or powered Seating System Installed ONLY: Remove the four 5/16-18 X 5/8 socket head cap screws and secure the pivot cross-member to the two rear swingarms (Detail "A").
2. Remove the rear shroud. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.
3. Disconnect the right and left motors form the controller.
4. Disconnect the joystick cable from the controller.
5. Disconnect the battery cable from the controller.
6. Lift the controller up until the two 9/16 ID X 1-1/16 OD X 3/8-inch washers release from the base frame.
7. Pull the controller away to remove the controller from the wheelchair frame.
8. If necessary to replace the controller mounting hardware, perform the following:
   A. Remove the two 8-32 X 1.00-inch pan head screws and 8-32 locknuts that secure the controller mounting washers and 9/16 ID X 1-1/16 OD X 3/8-inch washers to the controller.
   B. Remove the two controller mounting washers from the two 9/16 ID X 1-1/16 OD X 3/8 inch washers.

Installing

1. If necessary to install the controller mounting hardware, perform the following:
   A. Insert the two controller mounting washers into two 9/16 ID X 1-1/16 OD X 3/8-inch washers.
   B. using the two 8-32 X 1.00-inch pan head screws and 8-32 locknuts, secure the controller mounting washers and 9/16 ID X 1-1/16 OD X 3/8 inch washers to the controller.
2. Align the two 9/16 ID X 1-1/16 OD X 3/8-inch washers of the controller with the two large openings of the base frame.
3. Insert the two 9/16 ID X 1-1/16 OD X 3/8-inch washers into the two large openings of the base frame and push down until the controller is securely locked into position.
4. Connect the battery cable from the controller.

5. Connect the joystick cable from the controller.
6. Connect the right and left motors form the controller.
7. Install the rear shroud. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.
8. Wheelchairs with TRRO, TRBKTS, or powered Seating System Installed ONLY: Using the four 5/16-18 X 5/8 socket head cap screws, secure the pivot cross-member to the two rear swingarms (Detail "A").

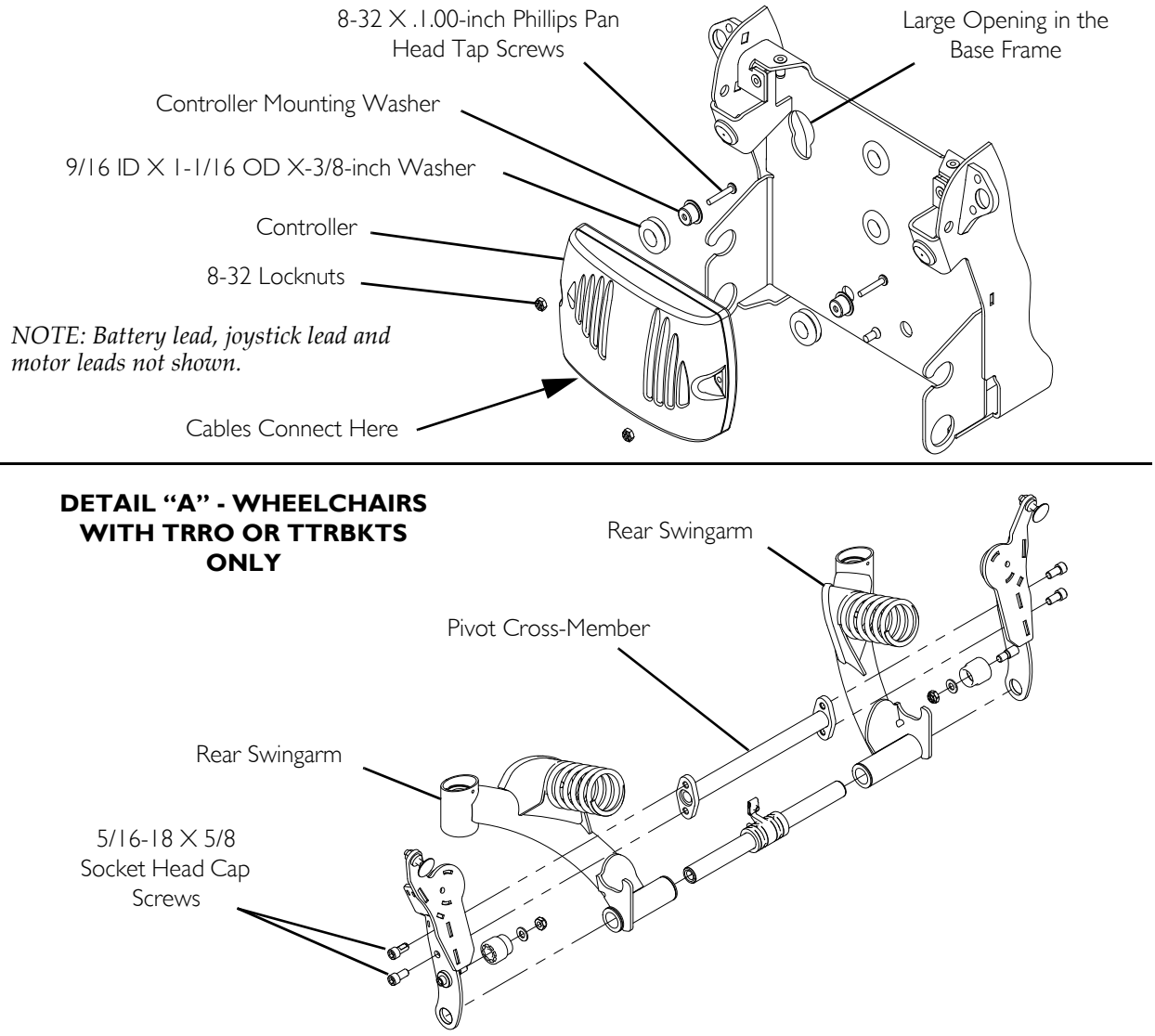


FIGURE 10.2 Removing/Installing the Controller

Preparing MK6i Joystick For Use

NOTE: For this procedure, refer to FIGURE 10.3.

1. Turn the adjustment lock lever to release the adjustment lock from joystick mounting tube (FIGURE 10.3).
2. Slide joystick mounting tube to the desired position.
3. Turn the adjustment lock lever to secure the adjustment lock to the joystick mounting tube.

NOTE: Joystick not shown

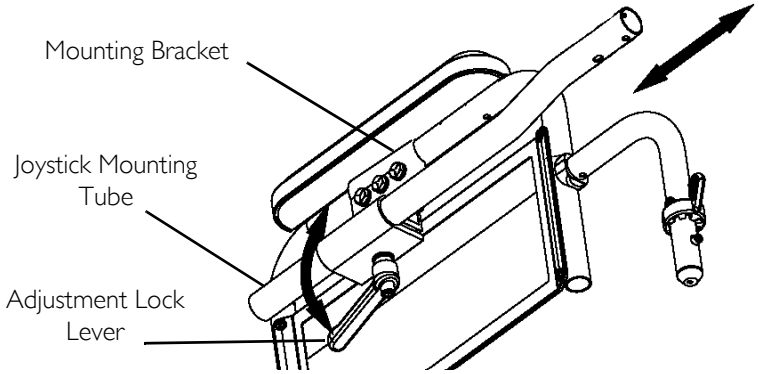


FIGURE 10.3 Preparing MK6i Joystick For Use

Removing/Installing/Repositioning MK6i Joystick

NOTE: For this procedure, refer to FIGURE 10.4 on page 76.

1. Turn the adjustment lock lever to release the joystick mounting tube from the mounting bracket.
2. Disconnect the joystick connector from the controller connector.
3. Cut the tie wraps that secure the joystick cable in place.
4. Remove the joystick from wheelchair.
5. If repositioning joystick, perform the following:
   A. Remove the three hex screws and washers that secure both halves of the mounting bracket to the arm tube.
   B. Reposition the mounting bracket on the opposite arm tube, ensuring the threaded plate of the mounting bracket is on the inside of the arm tube as shown.
   C. Using the three hex mounting screws and washers, secure both halves of the mounting bracket to the arm tube.

NOTE: If replacing the exact same joystick then proceed to STEP 6. If installing a different joystick, call Technical Services for assistance.

6. Slide the new or existing joystick mounting tube through the mounting bracket to the desired position.
7. Turn the adjustment lock lever to secure the joystick mounting tube into the mounting bracket.
8. Connect the joystick connector to the controller connector.
9. Secure joystick cable in place with new tie wraps.

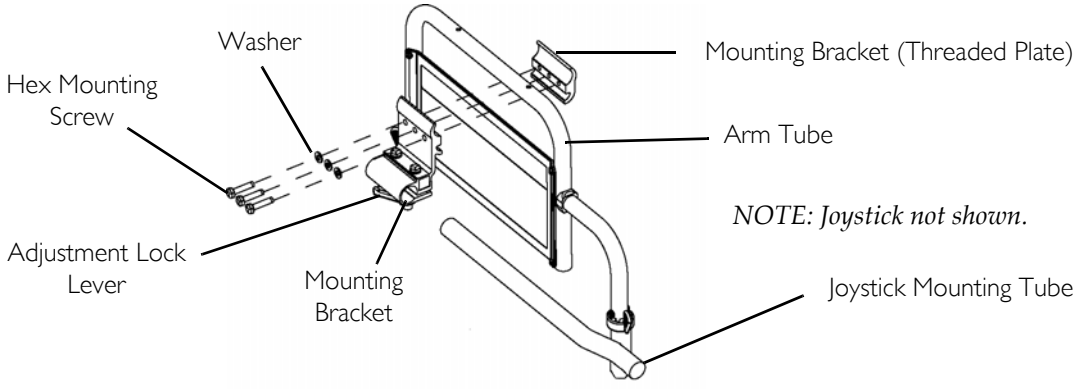


FIGURE 10.4 Removing/Installing/Repositioning MK6i Joystick

Wire Routing

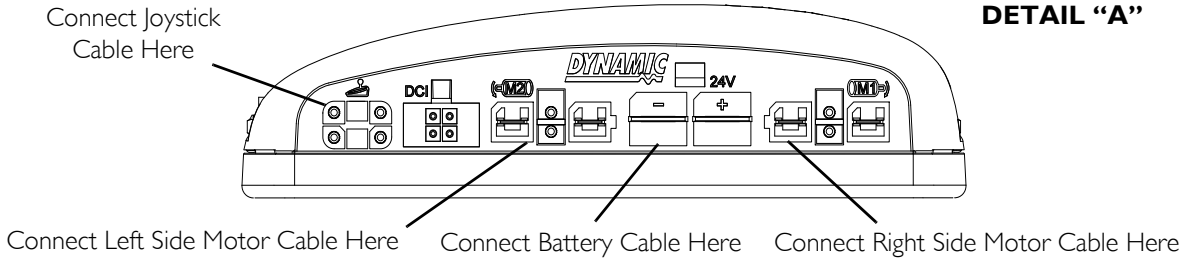
NOTE: For this procedure, refer to FIGURE 10.5 on page 77.

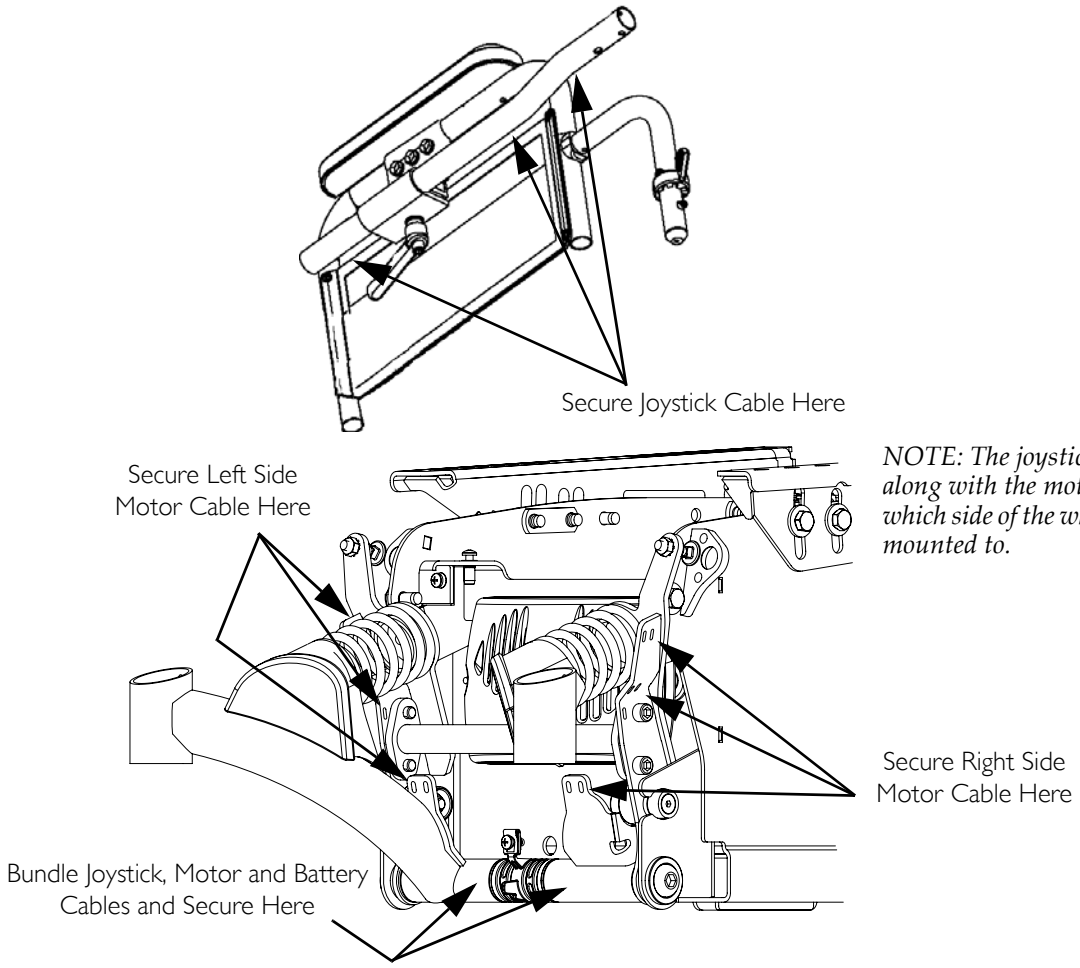
Removing Wiring

1. Remove the rear shroud. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.
2. If necessary, cut the existing tie-wraps securing wiring to the wheelchair.
3. Disconnect necessary cables from the controller (Detail "A").

Securing Wiring

1. Connect the necessary cables to the controller (Detail "A").
2. Using new tie-wraps, secure the wiring to the wheelchair according to FIGURE 10.5.
3. Install the rear shroud. Refer to Adjusting the Formula CG Seating System Mounting Position on page 58.





NOTE: The joystick cable will be secured along with the motor cable according to which side of the wheelchair the joystick is mounted to.

FIGURE 10.5 Wire Routing

SECTION 11—TRANSPORT IN VEHICLES

About Transport Ready Packages

⚠ WARNING!

Risk of Injury, Damage or Death

Failure to observe and follow transport warnings and instructions may result in injury, damage or death.

– Wheelchair occupants should transfer into the vehicle seat and use the OEM (Original Equipment Manufacturer) vehicle-installed restraint system.

– Ensure wheelchair is secured using proper restraint systems. Use ONLY Wheelchair Tie-down and Occupant Restraint Systems (WTORS) which meet the requirements of the SAE (Society of Automotive Engineers) J2249 Recommended Practice during travel in a motor vehicle.

– Wheelchair-mounted accessories, including but not limited to IV poles, trays, respiratory equipment, backpacks, and other personal items should be removed and secured separately.

– Spill proof batteries, such as "gel cells", should be installed on wheelchair to be used during travel in a motor vehicle.

– Contact Invacare Corporation with any questions about using this wheelchair for seating in a motor vehicle.

⚠ WARNING!

Risk of Injury, Damage or Death

Improper installation or service may result in injury, damage or death.

– Transport ready packages are not retrofittable to existing models and are not field serviceable.

– DO NOT overtighten hardware.

⚠ WARNING!

Risk of Injury, Damage or Death

Alteration or substitution may result in injury, damage or death.

– DO NOT alter or substitute product parts, components or systems.

⚠ WARNING!

Risk of Injury, Damage or Death

Damaged parts due to collision or impact may result in injury, damage or death.

– Seek immediate attention and service if wheelchair is involved in a collision or impact event. This includes, but is not limited to, vehicle accidents, mishandling and impact events where the wheelchair strikes something or is struck by something that may cause damage.

– Ensure your wheelchair is working properly and is inspected by a qualified Invacare technician if the wheelchair is involved in a collision or impact event.

NOTE: ANSI = American National Standards Institute, RESNA= Rehabilitation Engineering and Assistive Technology Society of North America.

Wheelchair Transport Brackets (TRBKTS)

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 Invacare's position that users of wheelchairs should be transferred into appropriate seating in vehicles for transportation and use be made of the restraints made available by the auto industry. Invacare cannot and does not recommend any wheelchair transportation systems.

TRBKTS includes four factory-installed wheelchair transport brackets.

⚠ WARNING!

Risk of Injury, Damage or Death

Improper use of wheelchair transport brackets (TRBKTS) may result in injury, damage or death.

– Use these transport brackets only to secure an unoccupied wheelchair during transport.

– Ensure wheelchair is secured using proper restraint systems. Wheelchair transport brackets have not been crash-tested in accordance with ANSI/RESNA WC Vol I Section 19 Frontal Impact Test requirements for wheelchairs.

– Only use the transport brackets for the purposes described in this manual.

NOTE: ANSI = American National Standards Institute, RESNA= Rehabilitation Engineering and Assistive Technology Society of North America.

Transport Ready Option (TRRO)

NOTE: As of January 1, 2017, Transport Ready Option (TRRO) has been discontinued on this product. Please contact your dealer or Invacare for legacy information or to answer questions regarding TRRO.

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 Invacare's position that users of wheelchairs should be transferred into appropriate seating in vehicles for transportation and use be made of the restraints made available by the auto industry. Invacare cannot and does not recommend any wheelchair transportation system.

⚠ WARNING!

Risk of Injury, Damage or Death

Failure to observe and follow transport warnings and instructions may result in injury, damage or death.

– Use ONLY Wheelchair Tie-down and Occupant Restraint Systems (WTORS) which meet the requirements of the SAE (Society of Automotive Engineers) J2249 Recommended Practice during travel in a motor vehicle.

– The wheelchair MUST be in a forward facing position during travel in a motor vehicle.

– Only use the transport brackets included with TRRO for the purposes described in this manual.

– This wheelchair is equipped, and has been dynamically tested to rely on WHEELCHAIR-ANCHORED pelvic belts. If desired, VEHICLE-ANCHORED pelvic belts may be used.

– Use both pelvic and upper-torso belts.

⚠ WARNING!

Risk of Injury, Damage or Death

Lack or improper use of wheelchair transport systems may result in injury, damage or death.

– Use both pelvic and upper torso belts.

– The pelvic belt that is provided by Invacare has been tested for use in a motor vehicle on this wheelchair only. Do not replace the pelvic belt with a different style pelvic belt.

NOTE: ANSI = American National Standards Institute, RESNA=Rehabilitation Engineering and Assistive Technology Society of North America.

TRRO includes four factory-installed transport brackets and a wheelchair anchored pelvic belt.

- The wheelchair has been tested for seating in a motor vehicle with the factory installed seating system only.
- This wheelchair has been dynamically tested in a forward-facing mode with the specified crash test dummy restrained by BOTH pelvic and upper-torso belt(s) (shoulder belts), and that BOTH pelvic and upper torso belt(s) should be used to reduce the possibility of head an chest impacts with vehicle components.
- TRRO has been crash-tested in accordance with ANSI/RESNA WC Vol 1 Section 19 Frontal Impact Test requirements for
- wheelchairs with a 130 lb (59 kg) crash test dummy, which corresponds to a person with a weight of 125 lb (57 kg) to 165
- lb (75 kg) for Junior seat sizes or a 168 lb (76 kg) crash dummy, which corresponds to a person with a weight of 165 lb (75 kg) to 300 lbs (136 kg) for Adult seat sizes.

Compliance Information

This wheelchair conforms with the requirements of the ANSI/RESNA WC/Vol. 1 - Section 19.
NOTE: ANSI = American National Standards Institute, RESNA= Rehabilitation Engineering and Assistive Technology Society of North America.

This wheelchair has been dynamically tested in a forward-facing mode with the specified crash test dummy, which corresponds to a person with a weight of 114-209 pounds, restrained by BOTH pelvic and upper-torso belts in accordance with ANSI/RESNA WC Vol 1 Section 19. BOTH pelvic and upper-torso belts should be used to reduce the possibility of head and chest impacts with vehicle components.

Specifications

MODEL	MOTOR	WHEELCHAIR WEIGHT LIMIT	
		ADULT	JUNIOR
TDX SP HD	4 Pole HD	Up to 400 pounds	Up to 150 pounds
TDX SP	4 Pole	Up to 300 pounds	Up to 150 pounds

Securing the Wheelchair to the Vehicle

Positioning the Wheelchair in the Vehicle

This wheelchair must be in a forward facing position during travel in a motor vehicle.

The recommended clear zones for wheelchair seated occupants restrained by BOTH pelvic and upper-torso belt(s) and ONLY by a pelvic belt are shown in the diagrams and described below.

Frontal Clear Zones (FCZ) need to be LARGER when upper-torso belt(s) are NOT used.

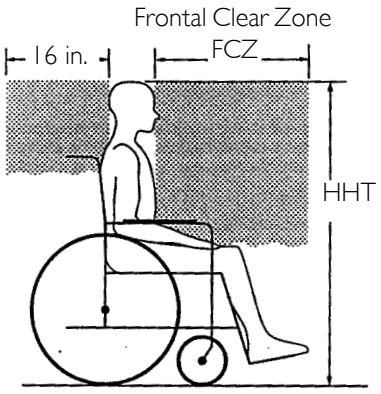
The rear clear zone of 16-inches is measured from the rearmost point on an occupant's head.

The frontal clear zone is measured from the frontmost point on an occupant's head and is 26-inches with pelvic and upper-torso belt(s) and 37-inches with ONLY a pelvic belt.

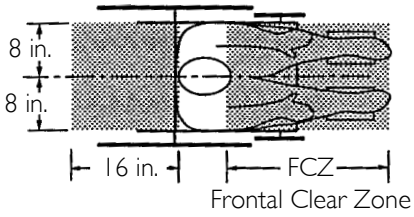
The frontal clear zone may not be achievable for wheelchair-seated drivers.

The estimated seated height (HHT) from the ground or floor to the top of the wheelchair-seated occupant's head ranges from approximately 47-inches for a small adult female to about 61-inches for a tall adult male.

Side View



Top View



Securement Points

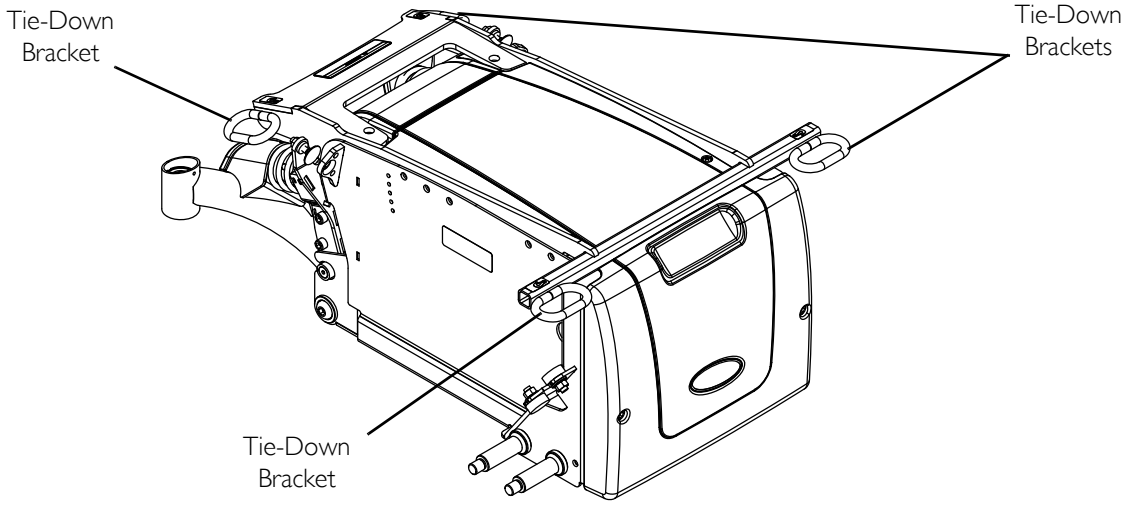


FIGURE 11.1 Securement Points

Securing the Wheelchair

This wheelchair is to be used only with Wheelchair Tie-down and Occupant Restraint Systems (WTORS) that have been installed in accordance with the manufacturer's instructions and SAE J2249.

NOTE: A copy of SAE J2249 Wheelchair Tie-down and Occupant Restraint Systems (WTORS) for use in Motor Vehicles can be obtained from: SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, (877) 606-7232 or (724) 776-4970.

Attach WTORS to the tie-down brackets in accordance with the manufacturer's instructions and SAE J2249.

Securing the Occupant

Wheelchair-Anchored Belts

⚠ WARNING

Risk of Injury, Damage or Death

Lack or improper use of wheelchair transport systems may result in injury, damage or death.

– Use both pelvic and upper torso belts.

– The pelvic belt that is provided by Invacare has been tested for use in a motor vehicle on this wheelchair only. Do not replace the pelvic belt with a different style pelvic belt.

NOTE: For this procedure, refer to FIGURE 11.2 on page 83.

The wheelchair has been provided with a pelvic belt which meets the requirements of ANSI/RESNA W/C 19.

The pelvic belt, provided by Invacare, has been designed to accommodate use on either side of the vehicle. If necessary, follow the instructions below to reverse the orientation of the pelvic belt to accommodate the vehicle-anchored upper-torso belt.

1. Install the pelvic belt pin (Detail "A" of FIGURE 11.2) into the large end of the slot in the belt mounting bracket (Detail "B" or Detail "C"). Rotate downward and forward until it snaps into place into the small end of the slot.

NOTE: Note the position of the male end of the belt when installing the pelvic belt onto the belt mounting brackets. The male end of the pelvic belt (Detail "A" of FIGURE 11.2) has a pin which is used to secure the vehicle-anchored upper-torso belt.

2. Repeat STEP 1 for the opposite belt mounting bracket.
3. Install the vehicle-anchored upper-torso belt onto the pin on the male end of the pelvic belt.

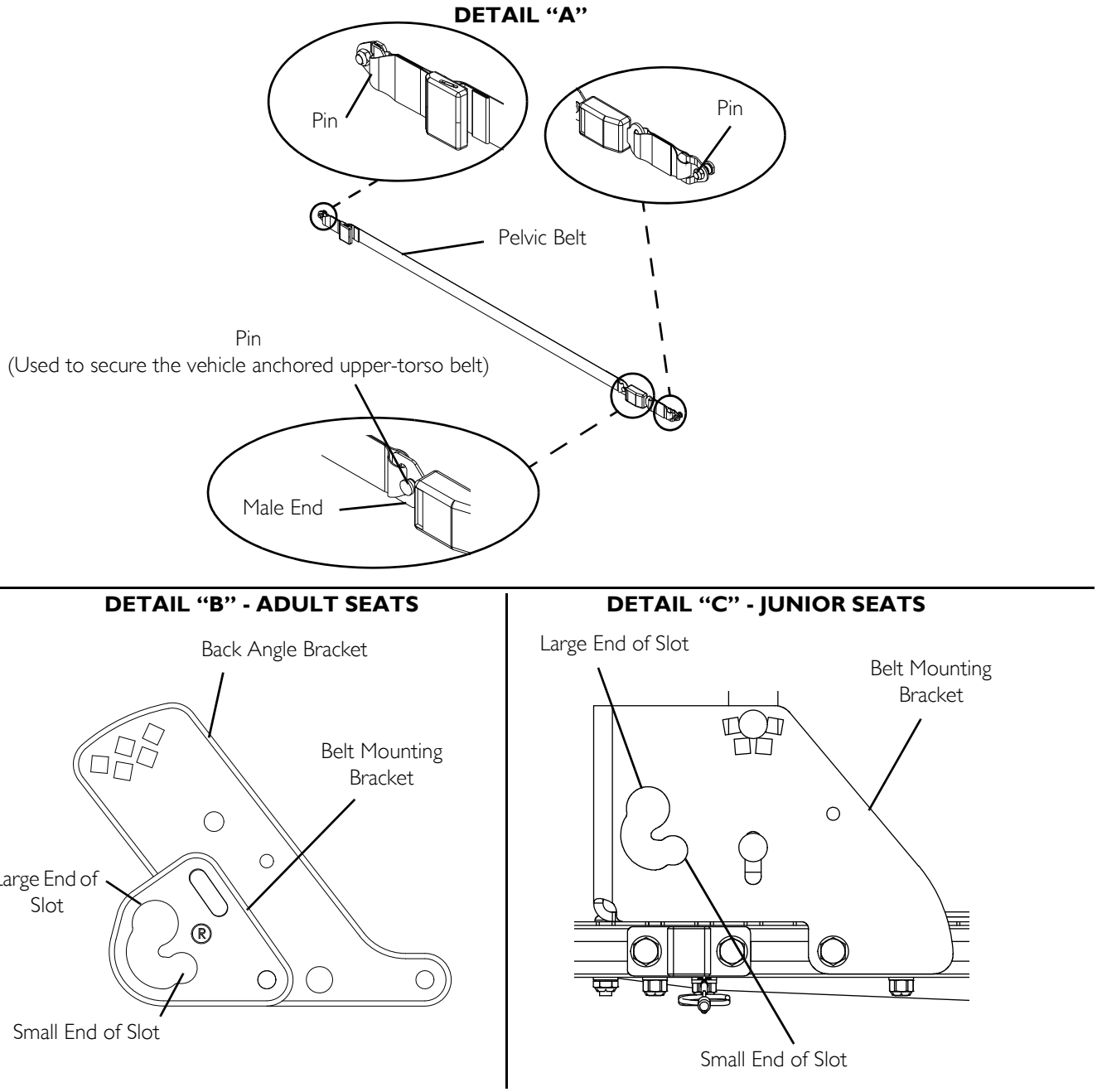


FIGURE 11.2 Wheelchair-Anchored Belts

Vehicle-Anchored Belts

NOTE: For this procedure, refer to FIGURE 11.3.

With regard to accommodating the use and fit of vehicle-anchored belts, this wheelchair has an overall rating of:

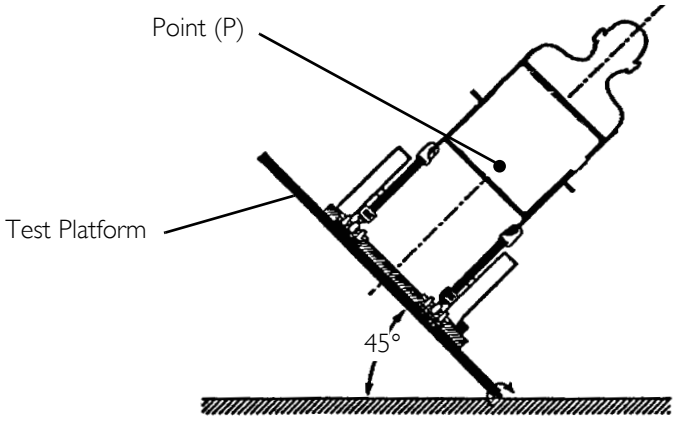
- TDX SP Adult - A
- TDX SP Junior - B

This rating is scored as follows:

RATING	DESCRIPTION
A	Excellent
B	Good
C	Fair
D	Poor

The test for Lateral Stability Displacement for Point (P) is shown in FIGURE 11.3. The average test result for point (P) is:

- TDX SP Adult - 0.53-inches (13.4 mm)
- TDX SP Junior - 0.57 inches (14.4 mm)



NOTE: Rear view of the wheelchair and human surrogate secured on test platform and tilted to 45°.

FIGURE 11.3 Vehicle-Anchored Belts

Seating System

This wheelchair has been tested for seating in a motor vehicle with the factory installed seating system ONLY.

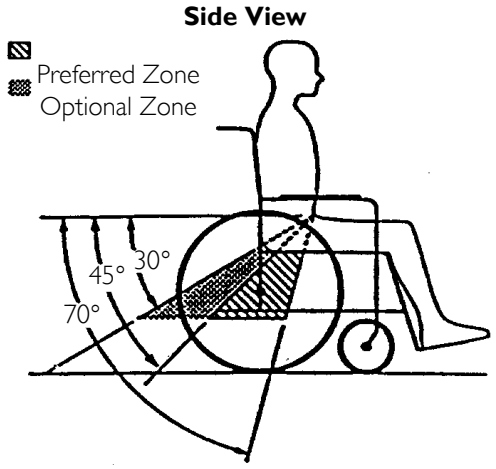
Ensure that the factory installed seating system is secured to the wheelchair frame before operation. Refer to the seating system user manual.

Positioning Belts

The angle of the pelvic belt should be within the preferred zone of 45 to 75 degrees to the horizontal OR within the optional zone of 30 to 45 degrees to the horizontal.

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.

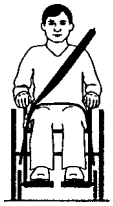
Steeper belt angles also reduce the tendency for upper-torso belts to pull the pelvic belt onto the abdomen during frontal impact loading.



NOTE: For this procedure, refer to FIGURE 11.4.

1. The pelvic belt should be worn low across the front of the pelvis.
2. Position the upper-torso belt(s) over the shoulders.
3. The belt(s) should not be held away from the body by wheelchair components or parts, including but not limited to wheelchair armrests or wheels. Refer to FIGURE 11.4 for proper and improper positioning of the belts.
4. Ensure the belt(s) are not twisted.
5. Adjust belts as firmly as possible, being mindful of user comfort.

DO POSITION BELT INSIDE OF ARMRESTS, WHEELS, ETC.



DO NOT POSITION BELT OUTSIDE OF ARMRESTS, WHEELS, ETC.

FIGURE 11.4 Positioning Belts

NOTES

NOTES

LIMITED WARRANTY

For warranty information, please refer to the original user manual which came with this product, or contact Invacare for more information.

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