

**3G Storm Series<sup>®</sup>**  
**Wheelchairs**  
**Arrow<sup>®</sup> RWD**  
**Torque<sup>™</sup> SP RWD**  
**Ranger X<sup>™</sup> RWD**  
**including**  
**Power Tilt Only**  
**Elevating Seat Only**  
**Power Tilt and Elevating Seat**  
**2G Tarsys<sup>®</sup>**  
**(2GT<sup>™</sup> - Tilt, 2GR<sup>™</sup> - Recline,**  
**2GTR<sup>™</sup> - Tilt/Recline)**

**DEALER:** This manual MUST be given to the user of the wheelchair.

**USER:** BEFORE using this wheelchair, read this manual and save for future reference.

For more information regarding  
Invacare products, parts, and services,  
please visit [www.invacare.com](http://www.invacare.com)



**Yes, you can.**

**⚠ WARNING**

**A QUALIFIED TECHNICIAN MUST PERFORM THE INITIAL SET UP OF THIS WHEELCHAIR. ALSO, A QUALIFIED TECHNICIAN MUST PERFORM ALL PROCEDURES IN THE SERVICE MANUAL.**

**WHEELCHAIR USERS: DO NOT SERVICE OR OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING (1) THE OWNER’S OPERATOR AND MAINTENANCE MANUAL AND (2) THE SEATING SYSTEM’S MANUAL (IF APPLICABLE). IF YOU ARE UNABLE TO UNDERSTAND THE WARNINGS, CAUTIONS, AND INSTRUCTIONS, CONTACT INVACARE TECHNICAL SUPPORT BEFORE ATTEMPTING TO SERVICE OR OPERATE THIS EQUIPMENT - OTHERWISE INJURY OR DAMAGE MAY RESULT.**

**DEALERS AND QUALIFIED TECHNICIANS: DO NOT SERVICE OR OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING (1) THE OWNER’S OPERATOR AND MAINTENANCE MANUAL, (2) THE SERVICE MANUAL (IF APPLICABLE) AND (3) THE SEATING SYSTEM’S MANUAL (IF APPLICABLE). IF YOU ARE UNABLE TO UNDERSTAND THE WARNINGS, CAUTIONS AND INSTRUCTIONS, CONTACT INVACARE TECHNICAL SUPPORT BEFORE ATTEMPTING TO SERVICE OR OPERATE THIS EQUIPMENT - OTHERWISE, INJURY OR DAMAGE MAY RESULT.**

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**REFERENCE DOCUMENTS**

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

MANUAL	PART NUMBER
MKIV™ Electronics Manual	1043576
MKIV RII Electronics Manual	1095272
3G Storm Base Service Manual	1104849
2G Tarsys Service Manual	1090208

*NOTE: Updated versions of this manual are available on [www.invacare.com](http://www.invacare.com).*

# 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. Refer to the table 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.

## NOTICE

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

### WHEELCHAIR USER

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 certified rehab technology supplier and/or a member of NRRTS or RESNA.

### WHEELCHAIR TIE-DOWN RESTRAINTS AND SEAT RESTRAINTS (TRRO OR TRBKTS)

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 I 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.

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.

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.

Refer to Transport Ready Package on page 123 for more information about transporting the wheelchair.

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## **⚠ TRRO AND TRBKTS WARNINGS**

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

Battery support brackets **MUST** be installed at all times. Otherwise, the wheelchair will not be WC/19 compliant. Refer to Installing/Removing Batteries Into/From Battery Boxes on page 91.

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## **⚠ WARNING**

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.

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, belt **MUST** be replaced immediately.

Wheelchairs should be examined during maintenance for signs of corrosion (water exposure, incontinence, etc.). Electrical components damaged by corrosion should be replaced **IMMEDIATELY**.

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

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## **⚠ POWERED SEATING SYSTEM WARNING**

This seating system has been custom designed and will be assembled to the wheelchair base before delivery to the user. The information contained in this manual is for maintaining and adjusting the seating system. There are very few adjustments that can safely be made by the user. If there is a procedure or adjustment that needs to be performed on the seating system that is not in this manual, **DO NOT** perform that procedure. Have the seating system serviced by a qualified technician.

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## **⚠ RECLINER WARNINGS**

**TO HEALTHCARE PROFESSIONALS/ASSISTANTS:**

Make sure the occupant of the wheelchair is properly positioned.

When returning the occupant of the wheelchair to the full upright position, more body strength will be required for approximately the last twenty degrees of incline (reverse recline). Make sure to use proper body mechanics (use your legs) or seek assistance if necessary to avoid injury.

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## REGISTER YOUR PRODUCT

The benefits of registering:

1. Safeguard your investment.
2. Ensure long term maintenance and servicing of your purchase.
3. Receive updates with product information, maintenance tips, and industry news.
4. Invacare can contact you or your provider, if servicing is needed on your product.
5. It will enable Invacare to improve product designs based on your input and needs.

**Register ONLINE at [www.invacare.com](http://www.invacare.com)**

**- or -**

**Complete and mail the form on the next page**

Any registration information you submit will be used by Invacare Corporation only, and protected as required by applicable laws and regulations.



# PRODUCT REGISTRATION FORM

Register **ONLINE** at [www.invacare.com](http://www.invacare.com) - or -  
Complete and mail this form

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_

Zip/Postal Code \_\_\_\_\_

Email \_\_\_\_\_ Phone No. \_\_\_\_\_

Fold  
here

Invacare Model No. \_\_\_\_\_ Serial No. \_\_\_\_\_

Purchased From \_\_\_\_\_ Date of Purchase: \_\_\_\_\_

1. Method of purchase: (check all that apply)

Medicare  Insurance  Medicaid  Other \_\_\_\_\_

2. This product was purchased for use by: (check one)

Self  Parent  Spouse  Other

3. Product was purchased for use at:

Home  Facility  Other

4. I purchased an Invacare product because:

Price  Features (list features) \_\_\_\_\_

5. Who referred you to Invacare products? (check all that apply)

Doctor  Therapist  Friend  Relative  Dealer/Provider  Other \_\_\_\_\_

Advertisement (circle one): TV, Radio, Magazine, Newspaper  No Referral \_\_\_\_\_

6. What additional features, if any, would you like to see on this product?

\_\_\_\_\_

Fold  
here

7. Would you like information sent to you about Invacare products that may be available for a particular medical condition?  Yes  No

If yes, please list any condition(s) here and we will send you information by email and/or mail about any available Invacare products that may help treat, care for or manage such condition(s):

\_\_\_\_\_

8. Would you like to receive updated information via email or regular mail about the Invacare home medical products sold by Invacare's dealers?  Yes  No

9. What would you like to see on the Invacare website?

\_\_\_\_\_

10. Would you like to be part of future online surveys for Invacare products?  Yes  No

11. User's Year of birth: \_\_\_\_\_

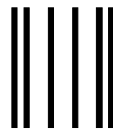
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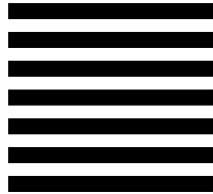


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Invacare Product Registration Form

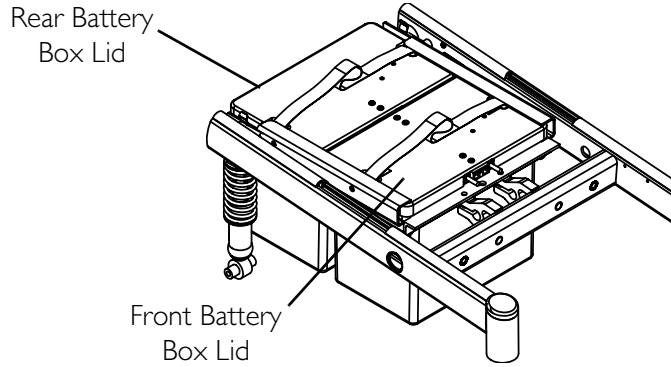
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# LABEL LOCATIONS

## All Wheelchairs

*NOTE: The battery labels shown on this page and the next are found on the inside of the battery box lids.*



### Group 24 Batteries Only

**⚠ WARNING**

This wheelchair is to use **ONLY** Group 24 batteries, otherwise, injury to the user and/or assistant or damage to the wheelchair may result.

Rev A (1)-201 1104924

### 22NF Batteries Only

**⚠ WARNING**

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)**. **DO NOT** allow Battery Cable(s) to contact the opposite Battery Terminal(s)/Post(s). Replace cable(s) immediately if cable(s) insulation becomes damaged. Failure to observe these warnings may result in an electrical short with serious personal injury and/or damage to the electrical system. See Owner's Manual.

**WIRING DIAGRAM for Single 22NF Batteries**

**DO NOT remove this label.** 1098359

### Gearless Brushless GB™ Motors with Group 24 Batteries Only

**⚠ WARNING**

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)**. **DO NOT** allow Battery Cable(s) to contact the opposite Battery Terminal(s)/ Post(s). Install protective caps on **POSITIVE (+) and NEGATIVE (-) battery terminals**. Replace cable(s) immediately if cable(s) insulation becomes damaged. Failure to observe these warnings may result in an electrical short with serious personal injury and/or damage to the electrical system. See Owner's Manual.

**WIRING DIAGRAM for Dual GP24 Batteries**

**DO NOT remove this label.** 1123795

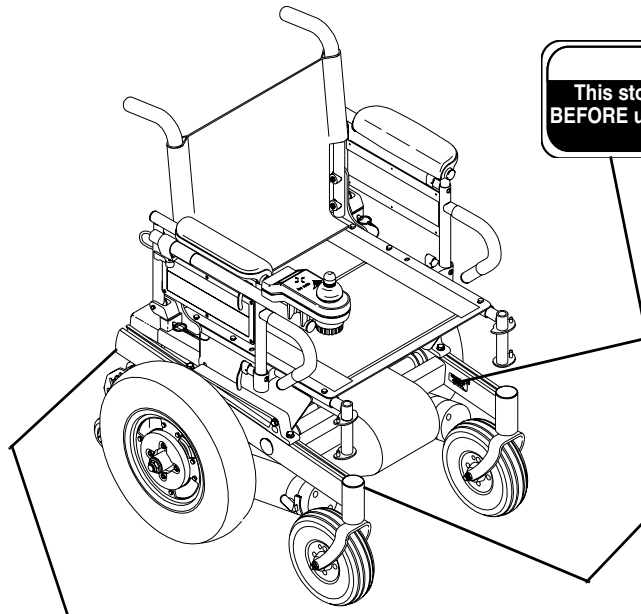
### 4 Pole Motors with Group 24 Batteries Only

**⚠ WARNING**

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)**. **DO NOT** allow Battery Cable(s) to contact the opposite Battery Terminal(s)/Post(s). Replace cable(s) immediately if cable(s) insulation becomes damaged. Failure to observe these warnings may result in an electrical short with serious personal injury and/or damage to the electrical system. See Owner's Manual.

**WIRING DIAGRAM for Dual GP24 Batteries**

**DO NOT remove this label.** 1098361



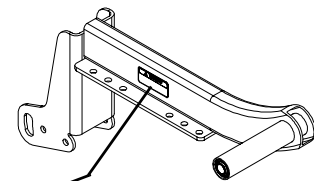
Serial number label is located on the inside of the front or rear frame.

**WARNING**  
 This stop **MUST** be in place **BEFORE** using. **DO NOT** remove.  
 1070497

*NOTE: Warning label also found on side frame near the rear of the wheelchair.*

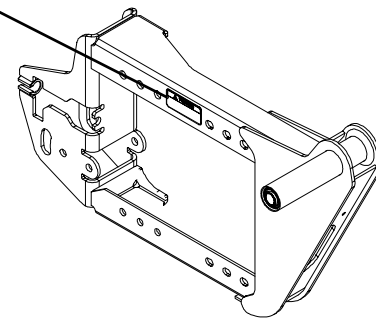
NO WHEELCHAIR HAS BEEN APPROVED FOR USE AS A SEATING SURFACE WITHIN A MOTOR VEHICLE. THIS LABEL IS FOR INFORMATIONAL PURPOSES ONLY. LIABILITY ISSUES WERE NOT CONSIDERED IN THE ATTACHMENT OF THIS LABEL.  
 AUCUN FAUTEUIL ROULANT N'A ÉTÉ APPROUVÉ POUR ÊTRE UTILISÉ COMME SIÈGE À L'INTÉRIEUR D'UN VÉHICULE MOTORISÉ. CETTE ÉTIQUETTE NE PEUT ÊTRE UTILISÉE QU'À TITRE D'INFORMATION ET N'A PAS ÉTÉ AFFICHÉE ICI POUR DES RAISONS DE RESPONSABILITÉ LÉGALE

**Suspension Arm Used with Conventional Motor/ Gearbox Assembly**



**! WARNING**  
 When using a recliner/high back van seat, the motor/gearbox or motor **MUST** use most **REARWARD** mounting holes on the suspension arm assembly.  
 1053056

**Suspension Arm Used with Standard GB Motor**

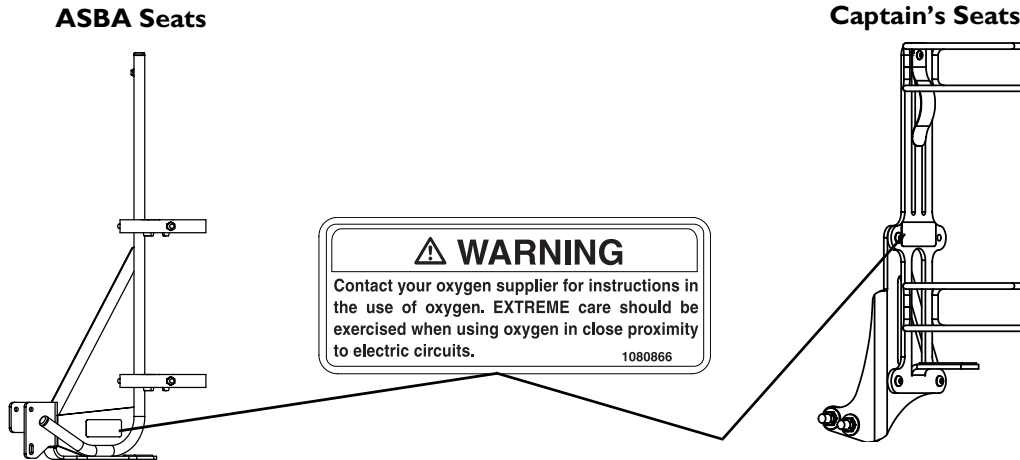


**Suspension Arm Used with GB Motor Shown**

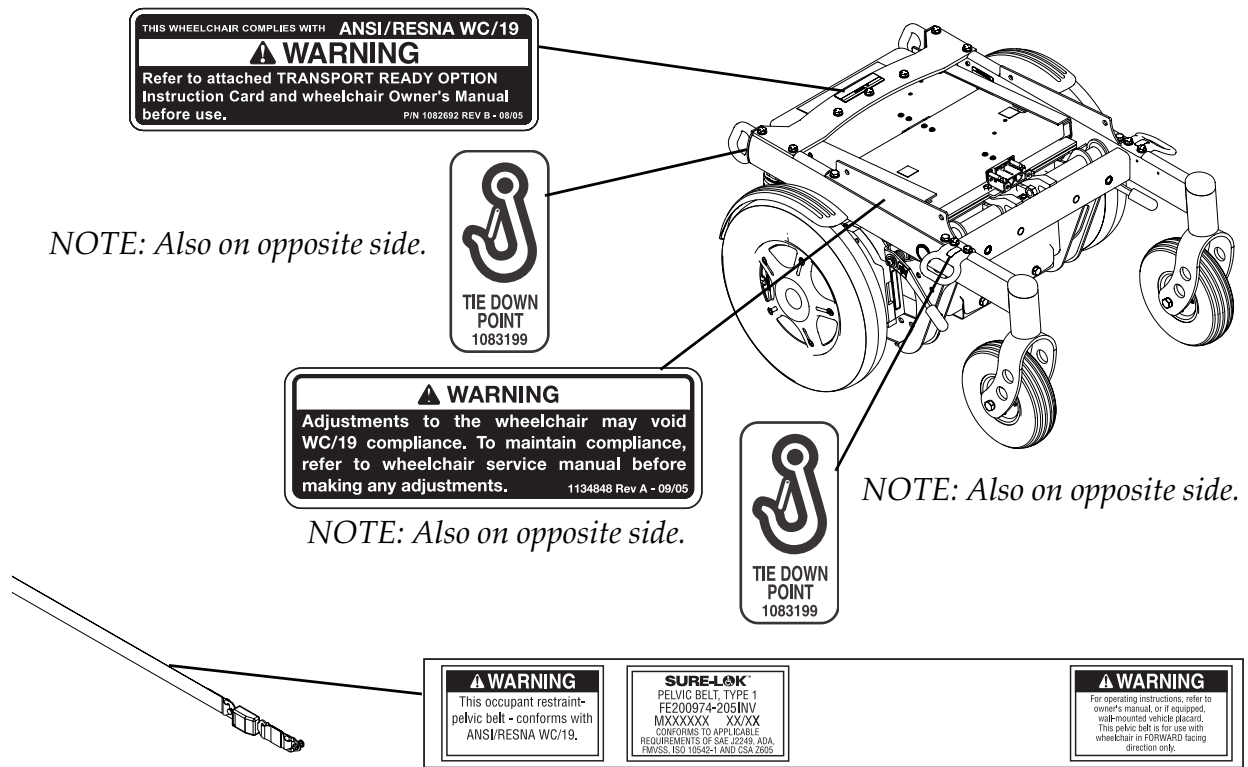
**! WARNING**  
 If wheelchair is equipped with pneumatic tires, deflate tire **BEFORE** removing rim - otherwise serious personal injury and damage will result.  
 P/N 1114824 Rev A - 12/02

**DRIVE PUSH**  
 P/N 1114835

# Wheelchairs with O<sub>2</sub> Holders

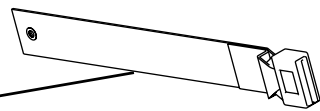


# Wheelchairs with TRRO



# Wheelchairs without TRRO

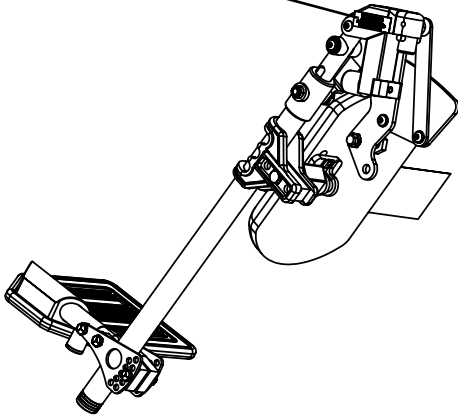
*NOTE: Auto style seat positioning strap shown. This label is also on the airline style seat positioning strap.*



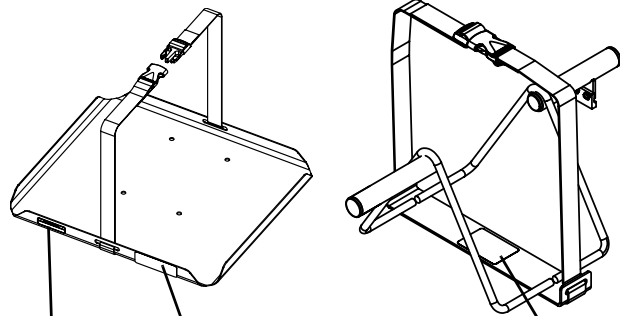
# Wheelchairs with 2G Tarsys

## Systems with Genius/Mechanical Legrests Only

**WARNING**  
DO NOT ATTACH TIE-DOWNS  
TO TILTING SEAT FRAME



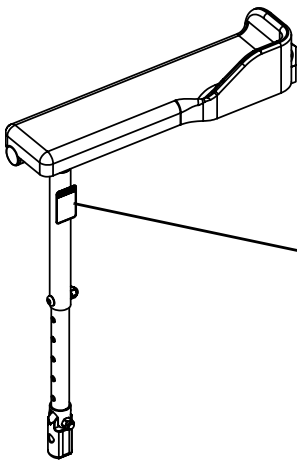
## Systems with Vent Trays Only



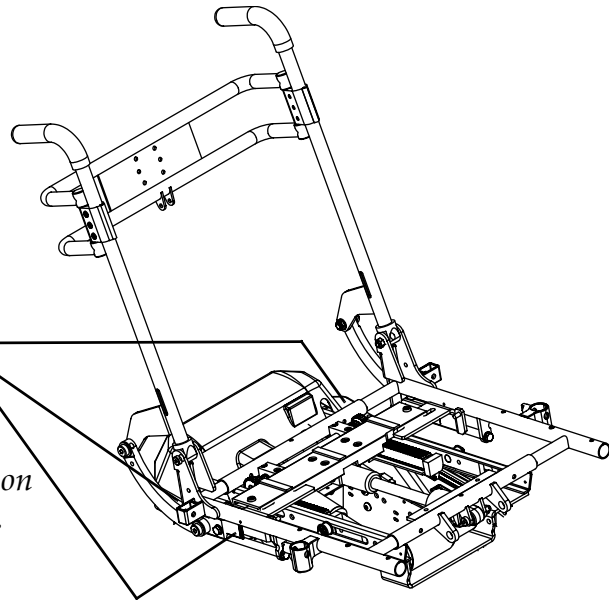
**WARNING**  
Maximum weight capacity of vent tray is 40 lbs.  
Otherwise, injury may result.  
1098164 Rev A(1) - 03/00

**WARNING**  
The weight of the vent tray battery acts as a counterweight for this wheelchair. DO NOT operate wheelchair without vent tray battery installed, otherwise wheelchair will tip over resulting in serious injury.  
1098335 Rev A(1) - 04/00

**WARNING**  
Chairs equipped with vent tray option: Reduced Tilt/Recline limits apply. See MKIV Operating Instructions, part number 1043576.  
Rev B (1) - 4/01 1081365



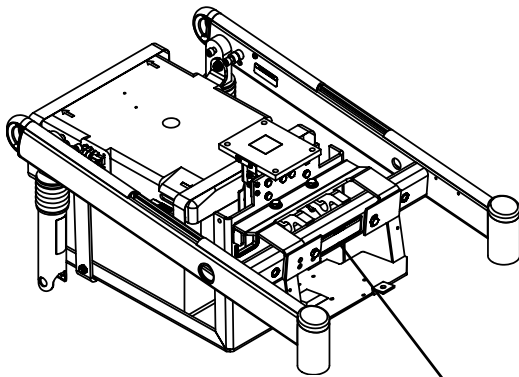
**WARNING**  
  
**Pinch Point**  
1079203



*NOTE: These labels are present on both sides of the seating system.*



## Wheelchairs with Elevating Seats



**⚠ WARNING**

The elevating seat controller installed on this chair is not compatible with MKIV Controllers manufactured before August 2000. If you are uncertain about the date of manufacture, contact an authorized Invacare Dealer. **DO NOT REMOVE THIS LABEL.**

Rev A - 10/01 1106662

# TYPICAL PRODUCT PARAMETERS

## Arrow

	ARROW	
<b>SEAT WIDTH:</b>	Standard 12 to 24 inches	Recliner 16 to 24 inches
<b>SEAT DEPTH:</b>	Standard 12 to 22 inches	Recliner 16 to 22 inches
<b>BACK HEIGHT:</b>	Standard 12 to 24 inches	Recliner 18 to 26 inches
<b>BACK ANGLE RANGE:</b>	Standard 85° to 105°	Recliner 90° to 170°
<b>SEAT-TO-FLOOR:</b>	Standard 17½-inches	Optional 19¾ or 21 inches
<b>OVERALL WIDTH OF BASE:</b>	25 inches (without joystick)	
<b>OVERALL HEIGHT</b> STANDARD: MINIMUM: MAXIMUM:	34¼ inches 34¼ inches 44¼ inches	
<b>RECLINER</b> LOW SEAT FRAME: MEDIUM SEAT FRAME: HIGH SEAT FRAME:	51½ inches 53¾ inches 55½ inches	
<b>OVERALL LENGTH</b> STANDARD: LONG FRAME:	Without front riggings 29½ inches 32½ inches	
<b>WEIGHT</b> WITHOUT GP24 BATTERIES: WITH GP24 BATTERIES: SHIPPING (APPROX.):	174 lbs 278 lbs 214 lbs.	
<b>DRIVE AXLE:</b>	Adjustable (Non-Recliners ONLY)	
<b>DRIVE WHEELS/TIRES:</b>	14 x 3 inch (Foam filled or pneumatic)	
<b>CASTERS W/ PRECISION SEALED BEARINGS</b> SEMI-PNEUMATIC: PNEUMATIC OR FOAM FILLED:	8 x 2¼ inches (Std), 6 x 2 inches with shock fork (Opt) 8 x 2 inches (Std), 9 x 2¾ inches (Opt)	
<b>ANTI-TIPPER:</b>	3-inch wheels	
<b>CASTER FORKS:</b>	Standard, Shock Fork (Opt)	
<b>FOOTRESTS:</b>	Telescoping Front Rigging Supports (Std), Swing-Away (Std), Heavy Duty (Opt), 2-in. and 4-in. longer Pivot Slide Tube (Opt)	
<b>ARMRESTS:</b>	Flip Back, Fixed or Adjustable Height (Desk and Full Length)	
<b>SEAT ANGLE ADJUSTMENT:</b>	Adjustable (0° to 10°)	
<b>SEAT CUSHION:</b>	Cushion (Optional)	
<b>WHEELCHAIR UPHOLSTERY OPTIONS:</b>	Vinyl and Nylon	
<b>BATTERY REQUIREMENTS:</b>	Group 24	
<b>*WEIGHT LIMITATION:</b>	Up to 400 lbs.	
<b>PERFORMANCE</b> ***GB MOTOR Rating: Speed: **Range:	***Force to operate motor lock lever exceeds ANSI/ RESNA WC/VOL2-1998 requirements for section 14.7 paragraph 7.2d.  400 lbs. Up to 7 mph +/- 10% mph Up to 33 miles	

\*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: Values for range are calculated for maximum chair weight rating using largest batteries applicable (GP24), per test procedures described in ANSI/RESNA WC/VOL2-1998 Section 4 and meet federal reimbursement requirements for this product. While considered typical, they are derived based on certain ideal conditions. Variances in battery condition, user weight, usage pattern or overall terrain conditions will result in actual values for range that differ from these stated values. Users should become accustomed to how their unique conditions impact their individual results. Users should become familiar with the battery discharge indicator on the joystick to determine the range of their wheelchair. Refer to When to Charge Batteries on page 98 for more information about the battery discharge indicator.

## Torque SP

	TORQUE SP	
<b>SEAT WIDTH:</b>	Standard 12 to 24 inches	Recliner 16 to 24 inches
<b>SEAT DEPTH:</b>	Standard 12 to 22 inches	Recliner 16 to 22 inches
<b>BACK HEIGHT:</b>	Standard 12 to 24 inches	Recliner 18 to 26 inches
<b>BACK ANGLE RANGE:</b>	Standard 85° to 105°	Recliner 90° to 170°
<b>SEAT-TO-FLOOR:</b>	Standard 17½-inches	Optional 19¾ or 21 inches
<b>OVERALL WIDTH OF BASE: (W/O JOYSTICK)</b>	25 inches	
<b>OVERALL HEIGHT</b>	34¼ inches	
STANDARD:	34¼ inches	
MINIMUM:	44¼ inches	
MAXIMUM:		
<b>RECLINER</b>	51½ inches	
LOW SEAT FRAME:	53¾ inches	
MEDIUM SEAT FRAME:	55½ inches	
HIGH SEAT FRAME:		
<b>OVERALL LENGTH</b>	Without front riggings	
STANDARD:	29½ inches	
LONG FRAME:	32½ inches	
<b>WEIGHT</b>		
MODEL 251 - 300 TQ (4 POLE MOTOR)		
Without 22NF Batteries:	154 lbs.	
With 22NF batteries:	228 lbs.	
Shipping (approx.):	194 lbs.	
MODEL 301 - 400 TQHD (4 POLE MOTOR)		
Without Group 24 Batteries:	154 lbs.	
With Group 24 Batteries:	258 lbs.	
Shipping (approx.):	194 lbs.	
MODEL TRUTK		
Without Group 24 Batteries:	166 lbs.	
With Group 24 Batteries:	270 lbs.	
Shipping (approx.):	206 lbs.	
<b>DRIVE AXLE:</b>	Adjustable (Non-Recliners ONLY)	

TYPICAL PRODUCT PARAMETERS

	TORQUE SP
<b>DRIVE WHEELS/TIRES:</b>	Foam filled or pneumatic 14 x 3 inches (Std), 14 x 4 inches - Not available with GB motors (Opt)
<b>CASTERS W/ PRECISION SEALED BEARINGS</b> SEMI-PNEUMATIC: PNEUMATIC OR FOAM FILLED:	8 x 1¼ inches (Std), 6 x 2 inches with shock fork (Opt) 8 x 2 inches (Std), 9 x 2¾ inches (Opt)
<b>ANTI-TIPPER:</b>	3-inch wheels (Std)
<b>CASTER FORKS:</b>	Standard, Shock Fork (Opt)
<b>FOOTRESTS:</b>	Telescoping Front Rigging Supports (Std), Swing-Away (Std), Heavy Duty (Opt), 2-in. and 4-in. longer Pivot Slide Tube (Opt)
<b>ARMRESTS:</b>	Flip Back, Fixed or Adjustable Height (Desk and Full Length)
<b>SEAT ANGLE ADJUSTMENT:</b>	Adjustable (0° to 10°)
<b>SEAT CUSHION:</b>	Cushion (Optional)
<b>WHEELCHAIR UPHOLSTERY OPTIONS:</b>	Vinyl and Nylon
<b>BATTERY REQUIREMENTS</b> 251-300 LBS - 4 POLE MOTOR: 301-400 LBS - 4 POLE MOTOR: UP TO 400 LBS - GB MOTOR:	22NF - Two batteries inside one battery box Group 24 Group 24
<b>*WEIGHT LIMITATION:</b> MODEL 251 - 300TQ - TORQUE SP WITH 4 POLE MOTOR MODEL 301 - 400TQ - TORQUE SP WITH 4 POLE MOTOR MODEL TRUTK - TORQUE SP WITH GB MOTOR	251 lbs. to 300 lbs. 301 lbs. to 400 lbs. Up to 400 lbs.
<b>PERFORMANCE</b> MODEL 251 - 300TQ Rating: Speed: *Range: MODEL 301 - 400TQ Rating: Speed: *Range: MODEL TRUTK Rating: Speed: **Range:	251 - 300 lbs. with 24:1 ratio 4 pole motor 251 - 300 lbs. with 18:1 ratio 4 pole motor Up to 4½ mph Up to 6½ mph Up to 19 Up to 19 301 - 400 lbs. with 24:1 ratio 4 pole motor Up to 4½ mph Up to 19 400 lbs. with GB motor Up to 7 mph Up to 33 miles

*\*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:** Values for range are calculated for maximum chair weight rating using largest batteries applicable (GP24), per test procedures described in ANSI/RESNA WC/VOL2-1998 Section 4 and meet federal reimbursement requirements for this product. While considered typical, they are derived based on certain ideal conditions. Variances in battery condition, user weight, usage pattern or overall terrain conditions will result in actual values for range that differ from these stated values. Users should become accustomed to how their unique conditions impact their individual results. Users should become familiar with the battery discharge indicator on the joystick to determine the range of their wheelchair. Refer to When to Charge Batteries on page 98 for more information about the battery discharge indicator.

## Ranger X

	RANGER X	
<b>SEAT WIDTH:</b>	Standard 12 to 22 inches	Recliner 16 to 22 inches
<b>SEAT DEPTH:</b>	Standard 12 to 22 inches	Recliner 16 to 22 inches
<b>BACK HEIGHT:</b>	Standard 12 to 24 inches	Recliner 18 to 26 inches
<b>BACK ANGLE RANGE:</b>	Standard 85° to 105°	Recliner 90° to 170°
<b>SEAT-TO-FLOOR:</b>	Standard 17½-inches	Optional 19¾ or 21 inches
<b>OVERALL WIDTH OF BASE: (W/O JOYSTICK)</b>	25 inches	
<b>OVERALL HEIGHT</b>	34¼ inches	
STANDARD:	34¼ inches	
MINIMUM:	44¼ inches	
MAXIMUM:		
<b>RECLINER</b>	51½ inches	
LOW SEAT FRAME:	53¾ inches	
MEDIUM SEAT FRAME:	55½ inches	
HIGH SEAT FRAME:		
<b>OVERALL LENGTH</b>	Without front riggings	
STANDARD:	29½ inches	
LONG FRAME:	32½ inches	
<b>WEIGHT</b>		
<b>GB MOTOR</b>		
Without GP24 Batteries:	174 lbs	
With GP24 Batteries:	278 lbs	
Shipping (approx.):	214 lbs.	
<b>4 POLE MOTOR</b>		
Without GP24 Batteries:	162 lbs.	
With GP24 Batteries:	266 lbs.	
Shipping (approx.):	202 lbs.	
<b>DRIVE AXLE:</b>	Adjustable (Non-Recliners only)	
<b>DRIVE WHEELS/TIRES:</b>	Foam filled or pneumatic 14 x 3 inches (Std), 14 x 4 inches - not available with GB motors (Opt)	
<b>CASTERS W/ PRECISION SEALED BEARINGS</b>		
SEMI-PNEUMATIC:	8 x 2¼ inches (Std), 6 x 2 inches with shock fork (Opt)	
PNEUMATIC OR FOAM FILLED:	8 x 2 inches (Std), 9 x 2¾ inches (Opt)	
<b>ANTI-TIPPER (3-INCH WHEELS):</b>	Standard	

TYPICAL PRODUCT PARAMETERS

	RANGER X
<b>CASTER FORKS:</b>	Standard, Shock Fork (Optional)
<b>FOOTRESTS:</b>	Telescoping Front Rigging Supports (Std), Swing-Away (Std), Heavy Duty (Opt), 2-in. and 4-in. longer Pivot Slide Tube (Opt)
<b>ARMRESTS:</b>	Flip Back, Fixed or Adjustable Height (Desk and Full Length)
<b>SEAT ANGLE ADJUSTMENT:</b>	Adjustable (0° to 10°)
<b>SEAT CUSHION:</b>	Cushion (Opt)
<b>WHEELCHAIR UPHOLSTERY OPTIONS:</b>	Vinyl and Nylon
<b>BATTERY REQUIREMENTS:</b>	Group 24
<b>*WEIGHT LIMITATION:</b>	300 lbs.
<b>PERFORMANCE</b>	
GEARLESS/BRUSHLESS MOTOR	
Rating:	300 lbs.
Speed:	Up to 7 mph
**Range:	Up to 33 miles
STANDARD 4 POLE MOTOR	
Rating:	300 lbs.
Speed:	Up to 6½ mph
**Range:	Up to 19 miles

*\*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: Values for range are calculated for maximum chair weight rating using largest batteries applicable (GP24), per test procedures described in ANSI/RESNA WC/VOL2-1998 Section 4 and meet federal reimbursement requirements for this product. While considered typical, they are derived based on certain ideal conditions. Variances in battery condition, user weight, usage pattern or overall terrain conditions will result in actual values for range that differ from these stated values. Users should become accustomed to how their unique conditions impact their individual results. Users should become familiar with the battery discharge indicator on the joystick to determine the range of their wheelchair. Refer to When to Charge Batteries on page 98 for more information about the battery discharge indicator.*

## 2G Tarsys

2G TARSYS SEATING SYSTEM	
<b>SEAT WIDTH RANGE:</b>	16 - 22 inches in 1-inch increments
<b>SEAT DEPTH RANGE:</b>	16 - 22 inches in 1-inch increments
<b>BACK HEIGHT RANGE</b> TILT/RECLINE: RECLINE: TILT:	20 - 26 inches in 1-inch increments 20 - 26 inches in 1-inch increments 20 - 25 inches in 1-inch increments
<b>BACK ANGLE RANGE</b> TILT:	90° - 115° in 5° increments
<b>TILT RANGE</b> TILT AND TILT/RECLINE 0° Seat Angle: 5° Seat Angle:	0° - 45° ± 3° 5° - 50° ± 3°
<b>RECLINE RANGE (MEASURED RELATIVE TO THE GROUND)</b> RECLINE 0° Seat Angle: 5° Seat Angle: TILT/RECLINE 0° Seat Angle: 5° Seat Angle:	90° - 175° ± 3° 95° - 175° ± 3° 90° - 175° ± 3° 95° - 175° ± 3°
<b>SEAT-TO-FLOOR</b> 0° SEAT ANGLE: 5° SEAT ANGLE:	18.25 inches ± .25 inches 19.75 inches ± .25 inches
<b>*OVERALL WIDTH:</b>	25 to 27 inches
<b>*OVERALL HEIGHT:</b>	53 inches
<b>*OVERALL LENGTH:</b>	48 inches in upright position
<b>ARMRESTS</b> TILT:  RECLINE AND TILT/RECLINE:	Flip Back, Adjustable Height (9 - 13 inches) - Desk or Full Length Adjustable Height (11 - 16 inches) - Desk or Full Length
<b>LEGRESTS:</b>	Mechanical Elevating, Genius Legrests, or Power Elevating Legrests
<b>HEADRESTS:</b>	Curved, Contoured, Small or Large
<b>WEIGHT OF SEATING SYSTEM:</b>	105 lbs
<b>**WEIGHT LIMITATION:</b> ALL SEATING SYSTEMS WITHOUT HEAVY DUTY OPTION: TILT ONLY, RECLINE ONLY OR TILT/RECLINE SYSTEMS WITH HEAVY DUTY OPTION: ALL SEATING SYSTEMS WITH VENT TRAY:	250 lbs 350 lbs Subtract 50 lbs from the seating system weight limitations (200 and 300 lbs respectively)

\*NOTE: Tilt/recline seating system, 18 inch deep x 18 inch wide, 24-inch high back, on short frame base with AT5544 front riggings in minimum position, 5° seat angle and headrest.

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

NOTE: All parameters apply to Tilt only, Recline only and Tilt/Recline systems except where specified. All parameters are approximate.

## TYPICAL PRODUCT PARAMETERS

**\*\*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.

### **⚠ WARNING**

**If the seating system is mounted onto a power wheelchair that has a weight limitation greater than 350 lbs, the weight limitation of the wheelchair is 350 lbs. Example: If a seating system with a weight limitation of 300 lbs is mounted onto a power wheelchair with a weight limitation of 350 lbs, then the power wheelchair is restricted to a 300 lb weight limitation.**

## Elevating Seat/Power Tilt Only

	ELEVATING SEAT/POWER TILT ONLY
<b>SEAT WIDTH RANGE</b> ANY SYSTEM WITH CURVED BACK: TILT ONLY WITH BACK POST ONLY: ELEVATE ONLY:	16 - 22 inches in 1-inch increments 12 - 22 inches in 1-inch increments 16 - 22 inches in 1-inch increments
<b>SEAT DEPTH RANGE</b> ANY SYSTEM WITH CURVED BACK: TILT ONLY WITH BACK POST ONLY: ELEVATE ONLY:	16 - 22 inches in 1-inch increments 12 - 22 inches in 1-inch increments 16 - 22 inches in 1-inch increments
<b>BACK HEIGHT RANGE:</b>	12 - 24 inches in 1-inch increments
<b>BACK ANGLE RANGE (ASBA):</b>	85° - 105° in 5° increments
<b>TILT RANGE</b> TILT AND TILT/ELEVATE 0° Seat Angle: 5° Seat Angle:	0° - 45° ± 3° 5° - 50° ± 3°
<b>SEAT-TO-FLOOR</b> ELEVATE ONLY 0° Seat Angle: 5° Seat Angle: TILT ONLY 0° Seat Angle: 5° Seat Angle: TILT/ELEVATE 0° Seat Angle: 5° Seat Angle:	17.5 inches ± .25 inches 18.25 inches ± .25 inches 18.25 inches ± .25 inches 19.25 inches ± .25 inches 18.5 inches ± .25 inches 19.5 inches ± .25 inches
<b>OVERALL WIDTH</b> WITHOUT JOYSTICK: WITH JOYSTICK:	22.25 - 26.25 inches 22.5 - 26.2 inches
<b>OVERALL HEIGHT</b> ELEVATE ONLY: TILT ONLY: TILT/ELEVATE:	37.5 inches 38.75 inches 39.25 inches
<b>OVERALL LENGTH (WITH FRONT RIGGINGS):</b>	41 inches (16-inch deep frame with AT5544 legrests)
<b>ARMRESTS:</b>	Adjustable Height (10.5 - 14.5 inches) - Desk or Full Length



ELEVATING SEAT/POWER TILT ONLY	
<b>WEIGHT OF POWER TILT ONLY:</b>	65 lbs
<b>WEIGHT OF ELEVATING SEAT:</b>	26 lbs
<b>WEIGHT LIMITATION</b>	
ELEVATE ONLY:	300 lbs
TILT ONLY MOUNTED ON TORQUE SP WITH RANGER II ELECTRONICS:	200 lbs
ALL OTHER TILT ONLY SYSTEMS:	250 lbs

*\*NOTE: 20 inch deep x 20 inch wide with 24-inch high back.*

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

*NOTE: All parameters apply to Tilt only, Recline only and Tilt/Recline systems except where specified. All parameters are approximate.*

*\*\*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.*

**⚠ WARNING**

**If the seating system is mounted onto a power wheelchair that has a weight limitation greater than 350 lbs, the weight limitation of the wheelchair is 350 lbs. Example: If a seating system with a weight limitation of 300 lbs is mounted onto a power wheelchair with a weight limitation of 350 lbs, then the power wheelchair is restricted to a 300 lb weight limitation.**

# SECTION I—GENERAL GUIDELINES

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## **⚠ WARNING**

**SECTION I - GENERAL GUIDELINES** contains important information for the safe operation and use of this product. **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 **Owner's Manuals, Service Manuals or Instruction Sheets** supplied with this product or optional equipment. If you are unable to understand the **Warnings, Cautions or Instructions**, contact a healthcare professional, dealer or technical personnel before attempting to use this equipment - otherwise, injury or damage may occur.

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## **Repair or Service Information**

Set-up of the Electronics Control Unit is to be performed only by a qualified technician. The final adjustments of the controller may affect other activities of the wheelchair. Damage to the equipment could occur if improperly set-up or adjusted.

Except for programming, **DO NOT** service or adjust the wheelchair while occupied, unless otherwise noted.

**POWERED SEATING SYSTEMS ONLY** - Pinch point may occur when lowering the elevating seat and/or returning the tilted seat to the full upright position. Make sure the hands and body of the occupant, attendants and bystanders are clear of all pinch points before lowering seat or returning the tilted seat to the full upright position.

Before adjusting, repairing or servicing the wheelchair, **ALWAYS** turn the wheelchair power **OFF**, otherwise, injury or damage may occur.

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.

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

Battery support brackets **MUST** be installed at all times. Otherwise, the wheelchair will not be WC/19 compliant. Refer to Installing/Removing Batteries Into/From Battery Boxes on page 91.

Wheelchairs should be examined during maintenance for signs of corrosion (water exposure, incontinence, etc.). Electrical components damaged by corrosion should be replaced **IMMEDIATELY**.

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

## Operation Information

Performance adjustments should only be made by professionals of the healthcare field or persons fully conversant with this process and the driver's capabilities. Incorrect settings could cause injury to the driver, bystanders, damage to the wheelchair and to surrounding property.

After the wheelchair has been set-up, 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. Repeat this section until the wheelchair performs to specifications.

DO NOT leave the power button ON when entering or exiting your wheelchair.

DO NOT operate on roads, streets or highways.

DO NOT climb, go up or down ramps or traverse slopes greater than 9°.

DO NOT attempt to move up or down an incline with water, ice or oil film.

DO NOT stand on the frame of the wheelchair.

DO NOT attempt to drive over curbs or obstacles. Doing so may cause your wheelchair to turn over and cause bodily harm or damage to the wheelchair.

DO determine and establish your particular safety limits by practicing bending, reaching and transferring activities in the presence of a qualified healthcare professional BEFORE attempting active use of the wheelchair.

DO NOT attempt to reach objects if you have to move forward in your seat.

DO NOT attempt to reach objects if you have pick them up from the floor by reaching between your knees.

DO NOT lean over the top of the back upholstery to reach objects behind you, as this may cause the wheelchair to tip over.

ALWAYS shift your weight in the direction you are turning. DO NOT shift your weight in the opposite direction of the turn. Shifting your weight in the opposite direction of the turn may cause the inside drive wheel to lose traction and the wheelchair to tip over.

DO NOT shift your weight or sitting position toward the direction you are reaching as the wheelchair and/or seating system (if any) may tip over.

DO NOT use an escalator to move a wheelchair between floors. Serious bodily injury may occur.

DO NOT use the footplates as a platform. When getting in or out of the wheelchair, make sure that the footplates are in the upward position or swing footrests towards the outside of the wheelchair.

NEVER leave an unoccupied wheelchair unattended on an incline.

DO NOT attempt to stop a moving wheelchair with the wheel locks. Wheel locks are not brakes.

Inasmuch as wheel locks are an option on this wheelchair, (You may order with or without wheel locks.) transfer to and from the wheelchair in the presence of a qualified healthcare professional to determine individual safety limits. Invacare strongly recommends ordering the wheel locks as an additional safeguard for the wheelchair user.

DO NOT attempt to lift the wheelchair by any removable (detachable) parts. Lifting by means of any removable (detachable) parts of a wheelchair may result in injury to the user or damage to the wheelchair.

DO NOT overtighten hardware attaching to the frame. This could cause damage to the frame tubing.

ALWAYS keep hands and fingers clear of moving parts to avoid injury.

ALWAYS wear your seat positioning strap. 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, belt MUST be replaced immediately.

ALWAYS turn the wheelchair power OFF and engage the motor locks/clutches to prevent the wheels from moving BEFORE attempting to transfer in or out of the wheelchair. Also make sure every precaution is taken to reduce the gap distance. Align both casters parallel with the object you are transferring onto.

DO NOT use with a broken or missing joystick knob.

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.

ALWAYS check foam grips for looseness before using the wheelchair. If loose, contact a qualified technician for instructions.

ALWAYS engage both wheel locks AND reduce the gap distance BEFORE transferring to and from the wheelchair. Turn all casters parallel to the object you are transferring onto.

Anti-Tippers must be used at all times. When outdoors on wet, soft ground or on gravel surfaces, anti-tippers may not provide the same level of protection against tip over. Extra caution must be observed when traversing such surfaces.

Avoid storing or using the wheelchair near open flame or combustible products. Serious injury or damage to property may result.

DO NOT engage or disengage the motor locks until the power is in the OFF position.

### **Wheelchairs with TRRO or TRBKTS Only**

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

### **Wheelchairs with Powered Seating Systems Only**

DO NOT operate the seating system while on an incline.

DO NOT operate the seating system while the wheelchair is moving.

NEVER operate the wheelchair or elevate/lower the seat while in any tilted/reclined/back angle position over 20° relative to the vertical position. If the drive lock-out does not stop the wheelchair from operating or the seat from elevating/lowering in a tilt position over 20° relative to vertical, DO NOT operate the wheelchair or elevate/lower the seat. DO NOT attempt to adjust the drive lock-out. Have the wheelchair serviced by a qualified technician.

Use only TSS, TRSS, TRCM, and SAC actuator controls to activate the tilt/recline/elevate functions\*. DO NOT USE any other actuator controls. Such devices may result in excess heating and cause damage to the actuator and associated wiring and could cause a fire, death, physical injury or property damage. If such devices are used, Invacare shall not be liable and the limited warranty is void.

*\*NOTE: Specific actuator controls are noted for each function or combination throughout this manual.*

DO NOT operate tilt seat around children.

ALWAYS keep hands and feet out from underneath tilt seat - otherwise serious injury may result.

DO NOT tip the seating system/wheelchair without assistance.

DO NOT store items under seat.

Cables must be routed and secured properly to ensure that cables DO NOT become entangled and damaged during normal operation of seating system.

2G Tarsys Equipped with Vent Tray Only - Reduced tilt/recline limits apply. See the electronics manual listed in [Reference Documents](#) on page 2.

2G Tarsys Equipped with Power Legrests Only - NEVER allow items to become trapped between the legrest assemblies, otherwise damage to the power legrest may occur.

### **Wheelchairs with Manual Recliners Only**

NEVER operate the wheelchair while in any recline position over 105° relative to the seat frame. If the limit switch does not stop the wheelchair from operating in a recline position greater than 105° relative to the seat frame, DO NOT operate the wheelchair. Have the limit switch adjusted by a qualified technician.

Both gas cylinders MUST be operational and adjusted properly before using the recliner. DO NOT operate the recliner option if only one of the gas cylinders is operational or adjusted properly.

When using the recliner option, the motor/gearbox or motor MUST be mounted to the most rearward mounting holes on the suspension arm assembly.

### **To Healthcare Professionals/Assistants**

Make sure the occupant of the wheelchair is properly positioned.

When returning the occupant of the wheelchair to the full upright position, more body strength will be required for approximately the last twenty degrees of incline (reverse recline). Make sure to use proper body mechanics (use your legs) or seek assistance if necessary to avoid injury.

## Tire Pressure

DO NOT use your wheelchair unless it has the proper tire pressure (P.S.I.). DO NOT overinflate the tires. Failure to follow these recommendations may cause the tire to explode and cause bodily harm. The recommended tire pressure is listed on the side wall of the tire.

## Electrical

### Grounding Instructions:

DO NOT, under any circumstances, cut or remove the round grounding prong from any plug used with or for Invacare products. Some devices 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 receptacle 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. In addition, Invacare has placed RED/ORANGE Warning Tags on some equipment. DO NOT remove these tags.

## Batteries

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.

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

### Charging Batteries

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#### **DANGER**

**When using an extension cord, use only a 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. Use of improper extension cord could result in risk of fire and electric shock. Three prong to two prong adapters should not be used. Use of three prong adapters can result in improper grounding and present a shock hazard to the user.**

---

NEVER attempt to recharge the batteries by attaching cables directly to the battery terminals.

DO NOT attempt to recharge the batteries and operate the wheelchair at the same time.  
DO NOT operate wheelchair with extension cord attached to the AC cable.

DO NOT attempt to recharge the batteries when the wheelchair has been exposed to any type of moisture.

DO NOT attempt to recharge the batteries when the wheelchair is outside.

DO NOT sit in the wheelchair while charging the batteries.

READ and CAREFULLY follow the manufacturer's instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures.

Ensure the pins of the extension cord plug are the same number, size, and shape as those on the charger.

DO NOT under any circumstances cut or remove the round grounding plug from the charger AC cable plug or the extension cord plug.

## **Rain Test**

Invacare has tested its power wheelchairs in accordance with ISO 7176 "Rain Test". This provides the end user or his/her attendant sufficient time to remove his/her power wheelchair from a rain storm and retain wheelchair operation.

DO NOT leave power wheelchair in a rain storm of any kind.

DO NOT use power wheelchair in a shower.

DO NOT leave power wheelchair in a damp area for any length of time.

Direct exposure to rain or dampness will cause the wheelchair to malfunction electrically and mechanically; may cause the wheelchair to prematurely rust.

Check to ensure that the battery covers are secured in place, joystick boot is NOT torn or cracked where water can enter and that all electrical connections are secure at all times.

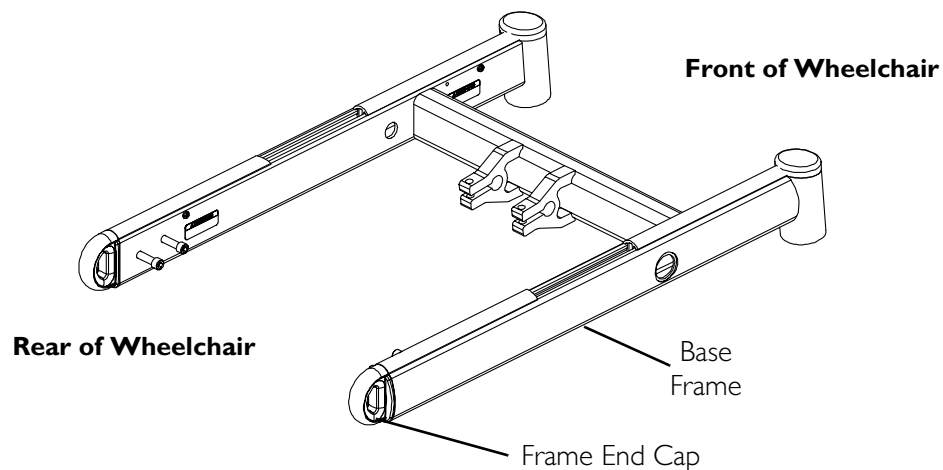
DO NOT use the joystick if the boot is torn or cracked. If the joystick boot becomes torn or cracked, replace Immediately.

## **Weight Training**

Invacare DOES NOT recommend the use of its wheelchairs as a weight training apparatus. Invacare wheelchairs have NOT been designed or tested as a seat for any kind of weight training. If occupant uses said wheelchair as a weight training apparatus, INVACARE SHALL NOT BE LIABLE FOR BODILY INJURY AND THE WARRANTY IS VOID.

## **Shipping Securement Points**

Frame end caps are only intended for manufacturer's initial shipping securement points. They are not intended for any other use.



## Weight Limitation

### 3G Storm Wheelchairs without Powered Seating Systems

Refer to Typical Product Parameters for Arrow on page 18, Torque SP on page 19 or Ranger X on page 21 to determine the weight limit (total combined weight of user and any attachments) of your wheelchair model. DO NOT exceed the limit - otherwise, injury or damage may result.

### 3G Storm Wheelchairs with Powered Seating Systems

Refer to Typical Product Parameters to determine the weight limit (total combined weight of user and any attachments) of your wheelchair and seating system. The weight limitation indicated overrides the weight limitation of the wheelchair by itself. DO NOT exceed the limit - otherwise injury or damage may result. Typical Product Parameters can be found for:

- 2G Tarsys on page 23.
- Elevating Seat/Power Tilt Only on page 24.



# SECTION 2—SAFETY/HANDLING OF WHEELCHAIRS

“Safety and Handling” of the wheelchair requires the close attention of the wheelchair user as well as the assistant. This manual points out the most common procedures and techniques involved in the safe operation and maintenance of the wheelchair. It is important to practice and master these safe techniques until you are comfortable in maneuvering around the frequently encountered architectural barriers.

Use this information only as a “basic” guide. The techniques that are discussed on the following pages have been used successfully by many.

Individual wheelchair users often develop skills to deal with daily living activities that may differ from those described in this manual. Invacare recognizes and encourages each individual to try what works best for him/her in overcoming architectural obstacles that they may encounter, however all warnings and cautions given in this manual **MUST** be followed. Techniques in this manual are a starting point for the new wheelchair user and assistant with “safety” as the most important consideration for all.

## Stability and Balance

---

### **⚠ WARNING**

**ALWAYS** wear your seat positioning strap. 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, belt **MUST** be replaced immediately.

**DO NOT** climb, go **UP** or **DOWN** ramps or traverse slopes greater than 9°.

Invacare strongly recommends proceeding down ramps or slopes slowly to avoid hard braking or sudden stops.

**DO NOT** leave elevating legrests in the fully extended position when proceeding down ramps or slopes.

Be aware that carrying heavy objects on your lap while occupying the wheelchair may adversely affect the stability of the wheelchair, resulting in serious bodily injury to the user, damage to the wheelchair and surrounding property.

This wheelchair has been designed to accommodate one individual. If more than one individual occupies the wheelchair this may adversely affect the stability of the wheelchair, resulting in serious bodily injury to the user and passenger and damage to the wheelchair and surrounding property.

---

To assure stability and proper operation of your wheelchair, you must at all times maintain proper balance. Your wheelchair has been designed to remain upright and stable during normal daily activities as long as you **DO NOT** move beyond the center of gravity. **DO NOT** lean forward out of the wheelchair any further than the length of the armrests. Make sure the casters are pointing in the forward position whenever you lean forward. This can be achieved by advancing the wheelchair and then reversing it in a straight line.

### **Coping with Everyday Obstacles**

Coping with the irritation of everyday obstacles can be somewhat alleviated by learning how to manage your wheelchair. Keep in mind your center of gravity to maintain stability and balance.

### **A Note to Wheelchair Assistants**

When assistance to the wheelchair user is required, remember to use good body mechanics. Keep your back straight and bend your knees whenever tilting wheelchair or traversing curbs or other impediments.

Also, be aware of detachable parts such as arms or legrests. These must **NEVER** be used to move the wheelchair or as lifting supports, as they may be inadvertently released, resulting in possible injury to the user and/or assistant(s).

When learning a new assistance technique, have an experienced assistant help you before attempting it alone.

### **Percentage of Weight Distribution**

---

#### **⚠ WARNING**

**DO NOT** attempt to reach objects if you have to move forward in the seat or pick them up from the floor by reaching down between your knees.

**Many activities require the wheelchair user to reach, bend and transfer in and out of the wheelchair. These movements will cause a change to the normal balance, center of gravity, and weight distribution of the wheelchair. To determine and establish your particular safety limits, practice bending, reaching and transferring activities in several combinations in the presence of a qualified healthcare professional BEFORE attempting active use of the wheelchair.**

**Proper positioning is essential for your safety. When reaching, leaning, bending or bending forward, it is important to use the casters as a tool to maintain stability and balance.**

**When using the recliner/high back van seat, the motor/gearbox or motor MUST use most REARWARD mounting holes on the suspension arm assembly.**

---

*NOTE: For this procedure, refer to FIGURE 2.1.*

Changing the position of where the motors are positioned affects the weight distribution over the rear wheels. The following contains information about changing the position of the motors.

**Rear Position** - Lengthens the wheelbase and gives the wheelchair the most stability and standard maneuverability.

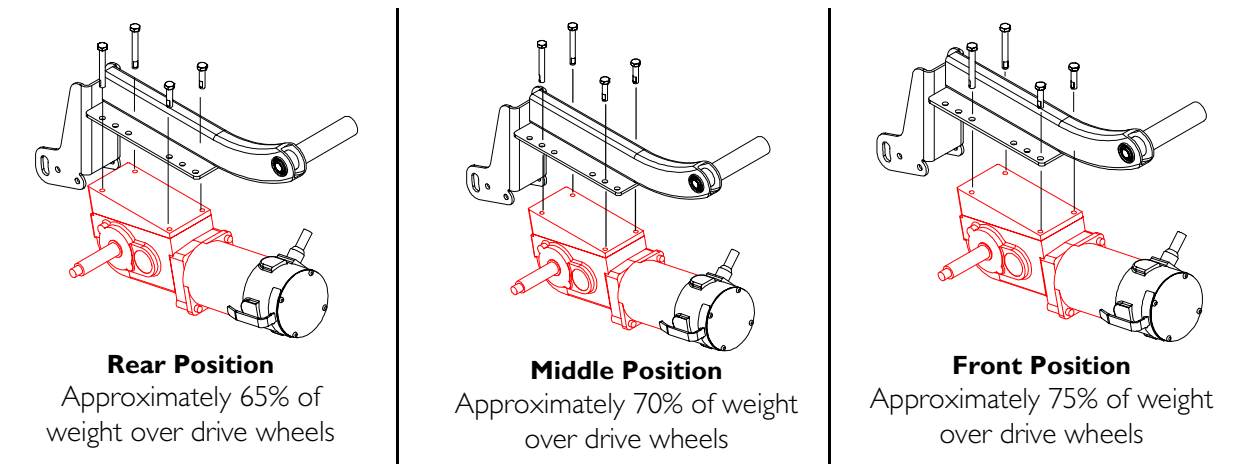
**Middle Position** - Centers the wheelbase and gives the wheelchair standard stability and maneuverability.

**Forward Position** - Shortens the wheelbase and increases maneuverability and distributes additional weight on rear wheels.

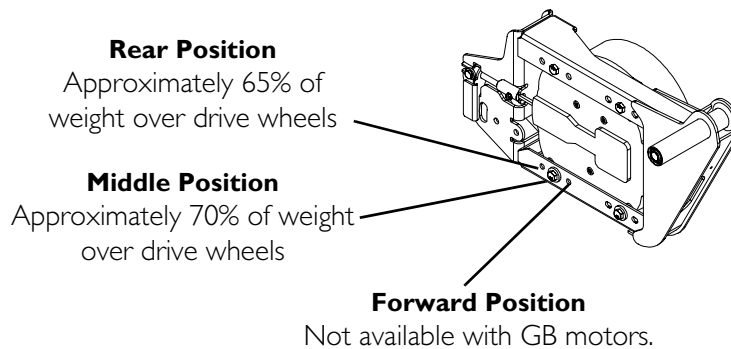
*\*NOTE: The forward mounting position is not available on Arrow wheelchairs equipped with GB motors.*

The following shows the positions of the screws into the gearbox:

**DETAIL “A” - MOTOR/GEARBOX WHEELCHAIRS**



**DETAIL “B” - \*GB WHEELCHAIRS**



**FIGURE 2.1** Percentage of Weight Distribution

## Reaching, Leaning and Bending - Forward

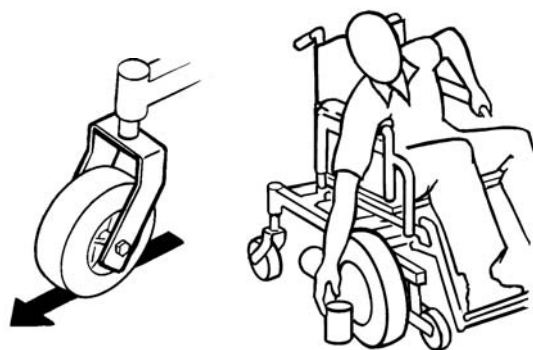
### **⚠ WARNING**

**DO NOT** attempt to reach objects if you have to move forward in the seat or pick them up from the floor by reaching down between your knees.

Inasmuch as wheel locks are an option on this wheelchair, (You may order with or without wheel locks.) transfer to and from the wheelchair in the presence of a qualified healthcare professional to determine individual safety limits. Invacare strongly recommends ordering the wheel locks as an additional safeguard for the wheelchair user.

*NOTE: For this procedure, refer to FIGURE 2.2.*

Position the casters so that they are extended away from the drive wheels and engage wheel locks/motor locks/clutches.



**FIGURE 2.2** Reaching, Leaning and Bending  
- Forward

## Reaching, Leaning and Bending - Backward

### **⚠ WARNING**

**DO NOT** lean over the top of the back upholstery. This will change your center of gravity and may cause you to tip over.

*NOTE: For this procedure, refer to FIGURE 2.3.*

Position wheelchair as close as possible to the desired object. Position the casters so that they are extended away from the drive wheels to create the longest possible wheelbase. Reach back only as far as your arm will extend without changing your sitting position.



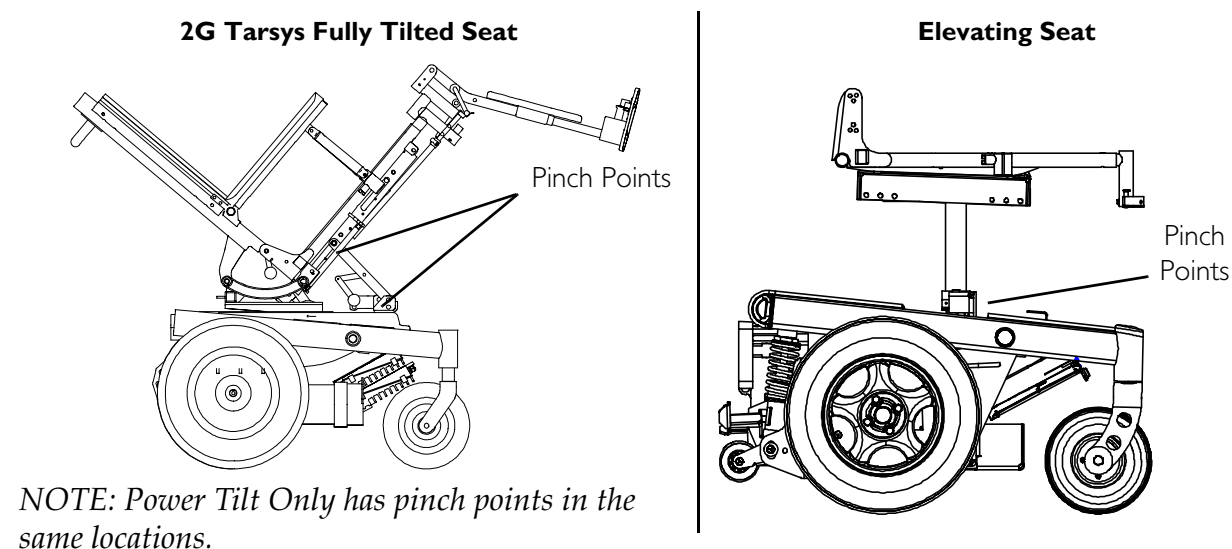
**FIGURE 2.3** Reaching, Leaning and Bending  
- Backward

## Pinch Points

### ⚠ WARNING

**POWERED SEATING SYSTEMS ONLY** - Pinch point may occur when lowering the elevating seat and/or returning the tilted seat to the full upright position. Make sure the hands and body of the occupant, attendants and bystanders are clear of all pinch points before lowering seat or returning the tilted seat to the full upright position.

*NOTE: For this procedure, refer to FIGURE 2.4.*



**FIGURE 2.4** Pinch Points

## Stairways

### ⚠ WARNING

**DO NOT** attempt to move an occupied power wheelchair between floors using a stairway. Use an elevator to move an occupied power wheelchair between floors. If moving a power wheelchair between floors by means of a stairway, the occupant **MUST** be removed and transported independently of the power wheelchair.

Extreme caution is advised when it is necessary to move an unoccupied power wheelchair up or down the stairs. Invacare recommends using two assistants and making thorough preparations. Make sure to use **ONLY** secure, non-detachable parts for hand-hold supports.

**DO NOT** attempt to lift the wheelchair by any removable (detachable) parts. Lifting by means of any removable (detachable) parts of a wheelchair may result in injury to the user or damage to the wheelchair.

The weight of the wheelchair without the user and without batteries is between 154 and 278 lbs. Use proper lifting techniques (lift with your legs) to avoid injury.

Follow this procedure for moving the wheelchair between floors when an elevator is NOT available:

*NOTE: When using a stairway to move the wheelchair and any accessories, move all wheelchair components away from the stairway prior to reassembly.*

1. Remove the occupant from the wheelchair.
2. Remove battery box(es) from wheelchair. Refer to Batteries on page 89.
3. Bend your knees and keep your back straight.
4. Using non-removable (non-detachable) parts of the wheelchair, lift the wheelchair off of the ground and transfer the wheelchair up or down the stairs.
5. The wheelchair should not be lowered until the last stair has been negotiated and the wheelchair has been carried away from the stairway.

---

**⚠ WARNING: ESCALATORS**

**DO NOT** use an escalator to move a wheelchair between floors. Serious bodily injury may occur.

---

## Transferring To and From Other Seats

---

**⚠ WARNING**

**ALWAYS** turn the wheelchair power **OFF** and engage the motor locks/clutches to prevent the wheels from moving **BEFORE** attempting to transfer in or out of the wheelchair. Also make sure every precaution is taken to reduce the gap distance. **Align both casters parallel with the object you are transferring onto.**

Inasmuch as wheel locks are an option on this wheelchair, (You may order with or without wheel locks.) transfer to and from the wheelchair in the presence of a qualified healthcare professional to determine individual safety limits. Invacare strongly recommends ordering the wheel locks as an additional safeguard for the wheelchair user.

---

**CAUTION**

**When transferring, position yourself as far back as possible in the seat. This will prevent broken screws, damaged upholstery and the possibility of the wheelchair tipping forward.**

---

*NOTE: For this procedure, refer to FIGURE 2.5.*

*NOTE: Adequate mobility and upper body strength is required to perform this activity independently.*

1. Position the wheelchair as close as possible along side the seat to which you are transferring, with the casters aligned parallel with the object.
2. Engage motor locks and wheel locks. Refer to Disengaging/Engaging Motor Lock Levers on page 110.

3. Shift body weight into seat with transfer.

*NOTE: During independent transfer, little or no seat platform will be beneath you. Use a transfer board if at all possible.*



**FIGURE 2.5** Transferring To and From Other Seats

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# SECTION 3—EMI INFORMATION

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## **⚠ 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 meter (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.

**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 meter (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) The immunity level of this product is unknown.

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

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# SECTION 4—SAFETY INSPECTION/ TROUBLESHOOTING

*NOTE: Every six months take your wheelchair to a qualified technician for a thorough inspection and servicing. Regular cleaning will reveal loose or worn parts and enhance the smooth operation of your wheelchair. To operate properly and safely, your wheelchair must be cared for just like any other vehicle. Routine maintenance will extend the life and efficiency of your wheelchair.*

## Safety Inspection Checklists

Initial adjustments should be made to suit your personal body structure needs and preference. Thereafter follow these maintenance procedures:

### All Wheelchairs

#### Inspect/Adjust Initially

---

#### **CAUTION**

**As with any vehicle, the wheels and tires should be checked periodically for cracks and wear, and should be replaced.**

---

- Make sure wheelchair rolls straight (no excessive drag or pull to one side).
- Inspect all fasteners.
- Make sure clothing guards are secure.
- Make sure arms are secure but easy to release and adjustment levers engage properly.
- Make sure adjustable height arms operate and lock securely.
- Make sure upholstery has no rips.
- Make sure armrest pad sits flush against arm tube.
- Make sure axle nut and wheel mounting nuts are secure on drive wheels.
- Make sure there is no excessive side movement or binding when drive wheels are lifted and spun when disengaged (free-wheeling).
- Inspect wheel/fork assembly for proper tension by spinning caster; caster should come to a gradual stop.
- Loosen/tighten caster locknut if wheel wobbles noticeably or binds to a stop.
- Make sure all caster/wheel/fork/headtube fasteners are secure and not damaged/missing.
- Make sure wheel locks DO NOT interfere with tires when rolling.
- Make sure wheel lock pivot point are free of wear and looseness.
- Make sure wheel locks are easy to engage.

- Inspect tires for flat spots and wear.
- Check pneumatic tires for proper inflation.
- Check power 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/Adjust Weekly**

---

**CAUTION**

**As with any vehicle, the wheels and tires should be checked periodically for cracks and wear, and should be replaced.**

---

- Inspect wheel/fork assembly for proper tension by spinning caster; caster should come to a gradual stop.
- Make sure all caster/wheel/fork/headtube fasteners are secure and not damaged/missing.
- Inspect tires for flat spots and wear.
- Check pneumatic tires for proper inflation.

**Inspect/Adjust Monthly**

- Make sure axle nut and wheel mounting nuts are secure on drive wheels.
- Loosen/tighten caster locknut if wheel wobbles noticeably or binds to a stop.
- Make sure wheel locks DO NOT interfere with tires when rolling.
- Make sure wheel lock pivot point are free of wear and looseness.
- 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/Adjust Periodically**

- Make sure wheelchair rolls straight (no excessive drag or pull to one side).
- Inspect all fasteners.
- Make sure clothing guards are secure.
- Make sure arms are secure but easy to release and adjustment levers engage properly.
- Make sure adjustable height arms operate and lock securely.
- Make sure upholstery has no rips.
- Make sure armrest pad sits flush against arm tube.
- Inspect wheel/fork assembly for proper tension by spinning caster; caster should come to a gradual stop.
- Make sure wheel locks are easy to engage.

- Check power 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 electrical components for signs of corrosion. Replace if corroded or damaged.

### **Inspect/Adjust Every 18 Months**

- Replace motor brushes and gearbox coupling (4 pole).

### **Additional Requirements for Wheelchairs with Powered Seating Systems**

#### **Inspect/Adjust Initially**

- Make sure all electrical connections are secure.
- Check that cables are routed and secured properly to ensure that cables DO NOT become entangled and damaged during normal operation of seating system.
- Check limit switch position.
- Make sure drive lock-out operates properly.
- Make sure tilt operates smoothly and properly.
- Make sure tilt mechanism and tilt tracks are clean.
- Make sure recline operates smoothly and properly (2G Tarsys Only).
- Make sure elevate operates smoothly and properly (Elevating Seat Only).
- Make sure elevate systems drive with reduced speed when seat is in elevated position (Elevating Seat Only).
- Check that spreader bar mounting fasteners are tight (2G Tarsys Only).
- Check that back cane mounting fasteners and back mounting fasteners are tight (2G Tarsys Only).

#### **Inspect/Adjust Weekly**

- Make sure all electrical connections are secure.
- Check that cables are routed and secured properly to ensure that cables DO NOT become entangled and damaged during normal operation of seating system.

#### **Inspect/Adjust Monthly**

- Make sure drive lock-out operates properly.
- Make sure tilt operates smoothly and properly.
- Make sure recline operates smoothly and properly (2G Tarsys Only).
- Make sure elevate operates smoothly and properly (Elevating Seat Only).
- Make sure elevate systems drive with reduced speed when seat is in elevated position (Elevating Seat Only).

- Check that spreader bar mounting fasteners are tight (2G Tarsys Only).
- Check that back cane mounting fasteners and back mounting fasteners are tight (2G Tarsys Only).

**Inspect/Adjust Periodically**

- Check that spreader bar mounting fasteners are tight (2G Tarsys Only).
- Make sure tilt mechanism and tilt tracks are clean.
- Check limit switch position.
- Check that back cane mounting fasteners and back mounting fasteners are tight (2G Tarsys Only).

## Troubleshooting - Mechanical

WHEELCHAIR VEERS LEFT/RIGHT	SLUGGISH TURN/PERFORMANCE	CASTERS FLUTTER	SQUEAKS AND RATTLES	LOOSENESS IN WHEELCHAIR	WHEELCHAIR 3 WHEELS	SOLUTIONS
X	X	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.

## Troubleshooting - Electrical

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

### All Wheelchairs

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Batteries draw excessive current when charging.	Battery failure.	Check batteries for shorted cell. Replace if necessary (Refer to <a href="#">Replacing Batteries</a> on page 102).
	Electrical malfunction.	Contact Dealer/Invacare for Service.
Battery indicator flashes the charge level is low— immediately after recharge.	Battery failure.	Check batteries for shorted cell. Replace if necessary (Refer to <a href="#">Replacing Batteries</a> on page 102).
	Malfunctioning battery charger.	Contact Dealer/Invacare for Service.
	Electrical malfunction.	Poor connections between charger/ wheelchair. Contact Dealer/Invacare.
Battery indicator flashes the charge level is low—too soon after being recharged.	Batteries not charged.	Have charger checked.
	Weak batteries.	Replace batteries if necessary. Contact Dealer/Invacare for Service.
Motor “chatters” or runs irregular.	Electrical malfunction.	Contact Dealer/Invacare for Service.
Only one drive wheel turns.	Electrical malfunction.	Contact Dealer/Invacare for Service.
	One motor lock is disengaged.	Engage motor lock (Refer to <a href="#">Disengaging/Engaging Motor Lock Levers</a> on page 110).

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Joystick erratic or does not respond as desired.	Damaged motor coupling.	Contact Dealer/Invacare for Service.
	Electrical malfunction.	Contact Dealer/Invacare for Service.
	Controller programmed improperly.	Reprogram controller. (Refer to electronics manual supplied with wheelchair).
Wheelchair does not respond to commands.	Poor battery terminal connection.	Clean terminals (Refer to <u>Cleaning Battery Terminals</u> on page 103).
Power indicator OFF—even after recharging.	Electrical malfunction.	Contact Dealer/Invacare for Service.

## Wheelchairs with Powered Seating Systems

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Wheelchair Power ON but does not drive	System tilted, reclined or elevated beyond drive lock-out angle (20°).	<b>Return to neutral position (upright and completely lowered). Refer to <u>Operating Powered Seating Systems</u> on page 52.</b> Contact Invacare/Dealer for service if this does not solve the problem.
Seating system not functioning or working intermittently.	Low batteries. Faulty electrical connection. Blown fuse. Seat has been driven under a heavy load for an extended period of time.	Charge batteries. Check all connections. Have wiring harness replaced by a qualified technician. Allow time for the electronics to cool down (Light Duty Use).
Programmer does not work or gives “communication error”	System tilted, reclined or elevated beyond drive lock-out angle (20°).	<b>Return to neutral position (upright and completely lowered). Refer to <u>Operating Powered Seating Systems</u> on page 52.</b> Contact Invacare/Dealer for service if this does not solve the problem.
Wheelchair drives at reduced speed.	Seating system is elevated.	Return joystick to neutral position and completely lower the seat.

## Checking Battery Charge Level

The following “Do’s” and “Don’ts” are provided for your convenience and safety.

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



# SECTION 5—WHEELCHAIR OPERATION

## ⚠ WARNING

After **ANY** adjustments, repair or service and **BEFORE** use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

Set-up of the Electronic Control Unit is to be performed only by a qualified technician. The final adjustments of the controller may affect other activities of the wheelchair. Damage to the equipment could occur under these circumstances.

## Operating the Wheelchair

*NOTE: For this procedure, refer to FIGURE 5.1.*

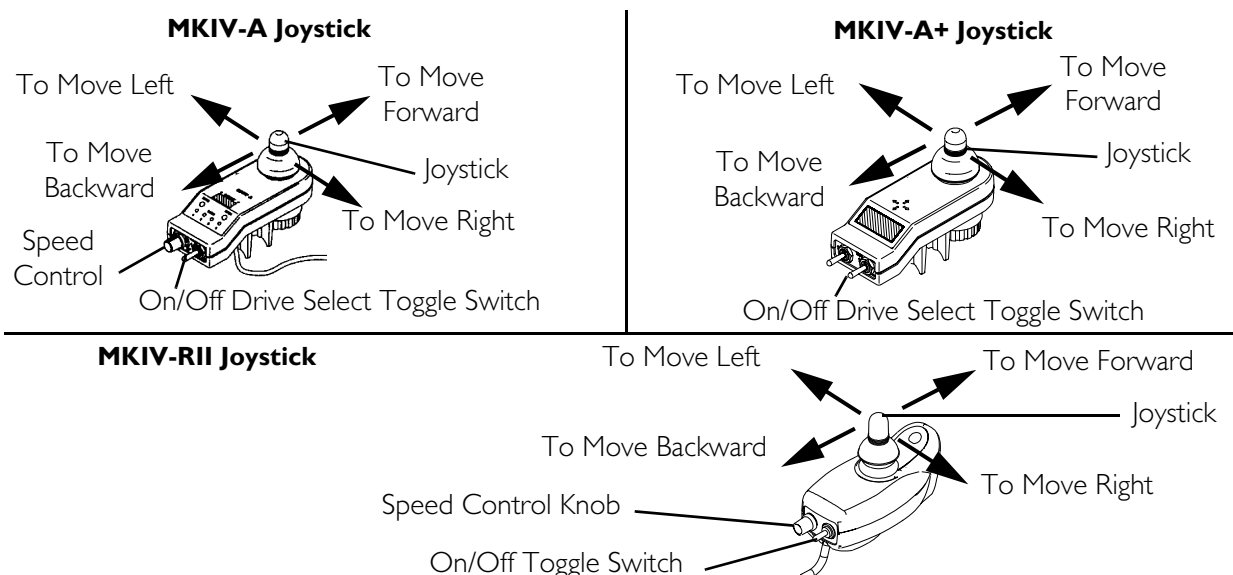
### Turning the Power On/Off

1. To turn the power on, move the on/off toggle switch up to the On position.

*NOTE: After turning power on, all indicators will light briefly and the display gauge will indicate one of the following:*

- *The Current Battery Charge - Information gauge shows all LED's lit or partial LED's lit. Refer to table on previous page.*
- *Out of Neutral at Power Up - Information Gauge shows all LED's flashing slowly. This occurs when the power is turned on when the joystick is out of neutral. This feature prevents sudden and unexpected movements of the power wheelchair.*

2. To turn the power OFF, move the on/off toggle switch down to the OFF position.



**FIGURE 5.1** Operating the Wheelchair

## Using the Joystick to Drive the Wheelchair

The joystick is located at the front of the joystick housing and provides smooth control of speed and direction. It is equipped with 360 degrees of mobility for ease of operation. The joystick is spring-loaded, and automatically returns to the upright (neutral) position when released. Pushing the joystick in a given direction causes the wheelchair to move in that direction.

The joystick has proportional drive control, meaning that the further it is pushed from the upright (neutral) position, the faster the wheelchair moves. The maximum speed, however, is limited by the setting of the speed-control knob.

To slow the wheelchair to a stop, simply release the joystick. The wheelchair has automatic speed and direction compensation to minimize corrections.

When first learning to drive, select a slow speed and try to drive the wheelchair as slowly as possible by pushing the joystick slightly forward. This exercise will help you learn to utilize the full potential of the proportional control and allow you to start and stop smoothly.

To drive the wheelchair, perform the following steps:

1. Perform one of the following:
  - MKIV-A and MKIV-RII Joysticks - Adjust speed control knob to the appropriate setting.
  - MKIV-A+ Joysticks - Select the desired drive program.
2. Turn the power on. Refer to [Turning the Power On/Off](#) on page 49.
3. Maneuver the joystick in the following manner:

MOVEMENT	ACTION
Forward	Push forward on the joystick.
Reverse	Pull back on the joystick.
Turn Left	Move the joystick right.
Turn Right	Move the joystick left.
Stop	Release the joystick and the wheelchair will quickly slow down.

*NOTE: For specific information about the joystick installed on the wheelchair, refer to one of these procedures:*

- [MKIV-A Joystick Switches and Indicators](#) on page 58.
- [MKIV-A+ Joystick Switches and Indicators](#) on page 61.
- [MKIV-RII Joystick Switches and Indicators](#) on page 63.

---

## A Note About Drive Lock-Out

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### **WARNING**

**NEVER** operate the wheelchair or elevate/lower the seat while the back is in any tilted/reclined/back angle position over 20° relative to the vertical position. If the drive lock-out does not stop the wheelchair from operating or the seat from elevating/lowering in a tilt/recline/back angle position over 20° relative to the vertical position, **DO NOT** operate the wheelchair or elevate/lower the seat. **DO NOT** attempt to adjust the drive lock-out. Have the wheelchair serviced by a qualified technician.

The wheelchair user **MUST** have a clear line of sight to drive safely. On initial wheelchair delivery and after adjusting the back angle, drive lock-out switch, tilt system or recline system, tilt and recline the seat back to the farthest driving position immediately before drive lock-out engages and ensure there is a clear line of sight present in which to drive the wheelchair. If a clear line of sight is not present, have the back angle repositioned or readjust the lockout angle such that safe driving with a clear line of sight is achieved. **Otherwise injury or damage may occur.**

---

The LED on the single function toggle switch will light when the drive lock-out feature has been activated. Drive lock-out is a feature designed to prevent the wheelchair from being driven after the seating system has been tilted or reclined beyond 20°\* relative to the vertical position. The back can be positioned at a 10° relative offset to the seat base, thereby resulting in a back angle potential of 30° before which the drive lock-out is activated. This may affect the wheelchair user's line of sight while driving. Make sure the wheelchair user can see properly to ensure safe driving.

*\*NOTE: 20° back angle can be any combination of recline, tilt, back angle and/or surface angle.*

*NOTE: Refer to Typical Product Parameters for 2G Tarsys on page 23 or Elevating Seat/Power Tilt Only on page 24 for tilt and/or recline angle ranges.*

## Operating Powered Seating Systems

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### **⚠ GENERAL WARNINGS**

Refer to **A Note About Drive Lock-Out** on page 51 **BEFORE** performing this procedure.

Pinch points may occur when returning the seat from any tilted position to the full upright position or when lowering the elevating seat. Make sure the hands and body of both the occupant and attendants/bystanders are clear of all pinch points before returning the seat to the full upright position or lowering the elevating seat.

**NEVER** operate the wheelchair or elevate/lower the seat while the back is in any tilted/reclined/back angle position over 20° relative to the vertical position. If the drive lock-out does not stop the wheelchair from operating or the seat from elevating/lowering in a tilt/recline/back angle position over 20° relative to the vertical position, **DO NOT** operate the wheelchair or elevate/lower the seat. **DO NOT** attempt to adjust the drive lock-out. Have the wheelchair serviced by a qualified technician.

**DO NOT** operate the seating system while on an incline.

**DO NOT** operate seating system while the wheelchair is moving.

**DO NOT** operate the tilt or elevate function near or under a fixed object such as a table or desk.

---

### **⚠ ELEVATING SEAT WARNING**

The elevating seat option is equipped with a speed reduction safety mechanism. While the seat is in an elevated position, the safety feature slows the speed of the wheelchair to 20% of its maximum speed (not to exceed the programmed speed). If the wheelchair operates at maximum speed while in an elevated position, **DO NOT** operate the wheelchair. Have the wheelchair serviced immediately by a qualified technician.

---

### **2G TARSYS CAUTION**

**DO NOT** operate the recline function of the seating system if one or both of the mechanical elevating legrest push rods is bent. Damage to the seating system can occur.

---

### ⚠ ACTUATOR CONTROL WARNING

Use only the actuator controls listed in the following chart to activate the tilt/recline/elevate functions. **DO NOT USE** any other actuator controls. Such devices may result in excess heating and cause damage to the actuator and associated wiring and could cause a fire, death, physical injury or property damage. If such devices are used, Invacare shall not be liable and the limited warranty is void.

SEATING SYSTEM	ACTUATOR CONTROL				
	TRSS	TRCM	TAC	SAC	ESC
<b>2G TARSYS - TILT ONLY</b>	Y	Y	Y	N	N
<b>2G TARSYS - TILT ONLY WITH POWER LEGS</b>	N	Y	N	N	N
<b>2G TARSYS - RECLINE ONLY</b>	N	Y	Y	N	N
<b>2G TARSYS - RECLINE ONLY WITH POWER LEGS</b>	N	Y	N	N	N
<b>2G TARSYS - TILT/RECLINE</b>	N	Y	N	N	N
<b>POWER TILT ONLY</b>	Y	Y	Y	N	N
<b>ELEVATING SEAT ONLY</b>	N	N	Y	N	Y
<b>POWER TILT/ELEVATING SEAT</b>	N	N	Y	N	N

*NOTE: This procedure applies to wheelchairs with 2G Tarsys, Elevating Seat and/or Power Tilt seating systems ONLY.*

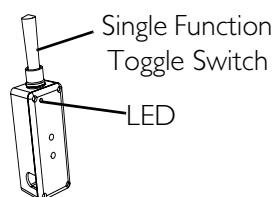
### Single Function Toggle Switch

*NOTE: For this procedure, refer to FIGURE 5.2.*

1. Make sure the wheelchair is on a level surface.
2. Refer to the chart for the operation of the seating system using a single function toggle switch mounted on the right side of the wheelchair.
3. Release single function toggle switch to neutral position.

SEATING SYSTEM	SINGLE FUNCTION TOGGLE SWITCH	
	FORWARD	BACK
<b>2G TARSYS - TILT ONLY</b>	Decrease Tilt Angle	Increase Tilt Angle
<b>ELEVATING SEAT ONLY**</b>	Raise the Seat	Lower the Seat
<b>POWER TILT ONLY</b>	Decrease Tilt Angle	Increase Tilt Angle

*\*\*NOTE: The seat MUST be tilted/reclined so the back angle is less than 20° relative to the vertical position before elevating/lowering the seat.*



**FIGURE 5.2** Single Function Toggle Switch

### Optional Four-Way Toggle Switch

*NOTE: For this procedure, refer to FIGURE 5.3.*

*NOTE: This procedure applies to wheelchairs with Elevating Seat, Power Tilt and 2G Tarsys systems only.*

1. Make sure the wheelchair is on a level surface.
2. Refer to the charts for the operation of the seating system using a four-way toggle switch:

*NOTE: The charts show the factory programmed settings only. Switch assignments can be reprogrammed.*

#### Seating Systems with the TAC Actuator Control

SEATING SYSTEM	FOUR-WAY TOGGLE SWITCH			
	FORWARD	REAR	LEFT	RIGHT
2G Tarsys - Tilt Only	Increase Tilt Angle	Decrease the Tilt Angle	N/A	N/A
2G Tarsys - Recline Only	Increase the Recline Angle/ Back Height (VSR) Up	Decrease the Recline Angle/ Back Height (VSR) Down	N/A	N/A
Elevate Only**	Raise the Seat	Lower the Seat	N/A	N/A
Power Tilt Only	Increase Tilt Angle	Decrease the Tilt Angle	N/A	N/A
Tilt/Elevate**	Increase/ Decrease the Tilt Angle*	Raise/Lower the Seat*	N/A	N/A

*NOTE: If the wheelchair is equipped with switch options, scan to the correct ECU or Auxiliary Mode and activate the control device in the corresponding "forward" direction to operate the tilt function. Refer to the Electronics Service Manuals listed in Reference Documents on page 2 for complete switch option operating instructions.*

*\*NOTE: The four-way toggle switch will alternate functions (increase tilt angle, decrease tilt angle) after it has been released to the neutral position for a minimum of five seconds. Refer to the Electronics Service Manual listed in Reference Documents on page 2 for complete four-way toggle switch operating instructions.*

*\*\*NOTE: The seat MUST be tilted/reclined so the back angle is less than 20° relative to the vertical position before elevating/lowering the seat.*

**Seating Systems with the TAC Actuator Control**

SEATING SYSTEM	FOUR-WAY TOGGLE SWITCH			
	FORWARD	REAR	LEFT	RIGHT
Power Legrests Only	Raise/Lower Power Legrests*	N/A	N/A	N/A

*NOTE: If the wheelchair is equipped with switch options, scan to the correct ECU or Auxiliary Mode and activate the control device in the corresponding "forward" direction to operate the tilt function. Refer to the Electronics Service Manuals listed in Reference Documents on page 2 for complete switch option operating instructions.*

*\*NOTE: The four-way toggle switch will alternate functions (increase tilt angle, decrease tilt angle) after it has been released to the neutral position for a minimum of five seconds. Refer to the Electronics Service Manual listed in Reference Documents on page 2 for complete four-way toggle switch operating instructions.*

*\*\*NOTE: The seat MUST be tilted/reclined so the back angle is less than 20° relative to the vertical position before elevating/lowering the seat.*

**Seating Systems with the TRCM Actuator Control**

SEATING SYSTEM	FOUR-WAY TOGGLE SWITCH			
	FORWARD	REAR	LEFT	RIGHT
2G Tarsys - Tilt Only	Increase/Decrease the Tilt Angle*	N/A	N/A	Raise/Lower Power Legrests*
2G Tarsys - Recline Only	N/A	Increase/Decrease the Recline Angle*	Increase/Decrease the Back Height (VSR)*	Raise/Lower Power Legrests*
2G Tarsys - Tilt/Recline	Increase/Decrease the Tilt Angle*	Increase/Decrease the Recline Angle*	Increase/Decrease the Back Height (VSR)*	Raise/Lower Power Legrests*
Elevate Only**	N/A	Elevate/Lower the Seat*	N/A	Raise/Lower Power Legrests*
Power Tilt Only	Increase/Decrease the Tilt Angle*	N/A	N/A	Raise/Lower Power Legrests*

*NOTE: If the wheelchair is equipped with switch options, scan to the correct ECU or Auxiliary Mode and activate the control device in the corresponding "forward" direction to operate the tilt function. Refer to the Electronics Service Manuals listed in Reference Documents on page 2 for complete switch option operating instructions.*

*\*NOTE: The four-way toggle switch will alternate functions (increase tilt angle, decrease tilt angle) after it has been released to the neutral position for a minimum of five seconds. Refer to the Electronics Service Manual listed in Reference Documents on page 2 for complete four-way toggle switch operating instructions.*

*\*\*NOTE: The seat MUST be tilted/reclined so the back angle is less than 20° relative to the vertical position before elevating/lowering the seat.*

## Seating Systems with the TRCM Actuator Control

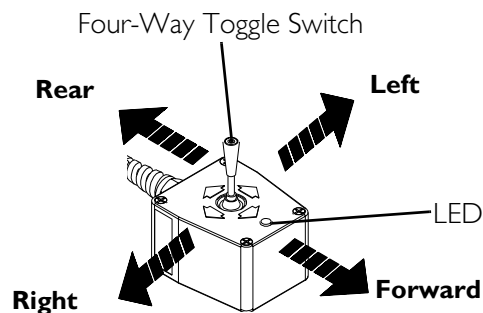
SEATING SYSTEM	FOUR-WAY TOGGLE SWITCH			
	FORWARD	REAR	LEFT	RIGHT
Tilt/Elevate**	Increase/ Decrease the Tilt Angle*	Elevate/Lower the Seat*	N/A	Raise/Lower Power Legrests*

*NOTE: If the wheelchair is equipped with switch options, scan to the correct ECU or Auxiliary Mode and activate the control device in the corresponding "forward" direction to operate the tilt function. Refer to the Electronics Service Manuals listed in [Reference Documents](#) on page 2 for complete switch option operating instructions.*

*\*NOTE: The four-way toggle switch will alternate functions (increase tilt angle, decrease tilt angle) after it has been released to the neutral position for a minimum of five seconds. Refer to the Electronics Service Manual listed in [Reference Documents](#) on page 2 for complete four-way toggle switch operating instructions.*

*\*\*NOTE: The seat MUST be tilted/reclined so the back angle is less than 20° relative to the vertical position before elevating/lowering the seat.*

3. Release four-way toggle switch to neutral position.



**FIGURE 5.3** Optional Four-Way Toggle Switch

### Vernier Shear Reduction (2G Tarsys Systems Only)

*NOTE: For this procedure, refer to FIGURE 5.3.*

#### About Vernier Shear Reduction

### **⚠ WARNING**

The relationship between Vernier Shear Reduction (VSR) and the recline function of the seating system is dependent on the needs of the user and **MUST** be set and adjusted by a trained qualified technician.

Have the relationship between Vernier Shear Reduction (VSR) and the recline function of the seating system periodically inspected to maintain proper setting for the user. Otherwise injury to the user may result.



Vernier Shear Reduction (VSR) moves the back of the seating system along with the recline function. VSR reduces shear between the user and the seating system as the seating system reclines.

*NOTE: VSR is electronically linked to the recline function of the seating system and operating the recline function automatically activates VSR.*

VSR function can also be used independently from the recline function to allow for a change in seating position or access to additional seating system options. Refer to [Using Vernier Shear Reduction \(VSR\) Independently of Recline Function](#) on page 57.

### **Using Vernier Shear Reduction (VSR) Independently of Recline Function**

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#### **WARNING**

**The back of the seating system MUST be returned to original position before the degree of recline is changed (increased or decreased). Otherwise, the relationship between VSR and the recline function of the seating system will change, possibly resulting in injury to the user.**

---

1. Make sure the wheelchair is on a level surface.
2. Note the current position of the back.
3. Push four-way toggle switch toward the left of the wheelchair until the desired VSR is achieved.

*NOTE: Left and right are determined by standing behind the wheelchair.*

*NOTE: The four-way toggle switch will alternate functions (move VSR actuator up, move VSR actuator down) after it has been released to the neutral position for a minimum of one second.*

*NOTE: If the wheelchair is equipped with switch options, scan to the correct ECU or Auxiliary Mode and activate the control device in the corresponding "left" direction to operate the tilt function. Refer to the Electronics Service Manual listed in [Reference Documents](#) on page 2 for complete switch option operating instructions.*

4. Return the back to the position noted in STEP 2 before changing the degree of recline.

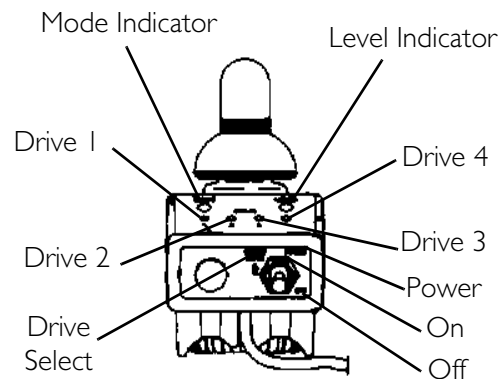
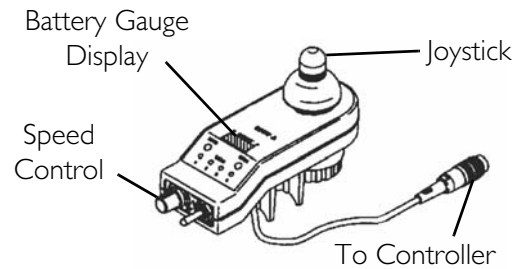
## MKIV-A Joystick Switches and Indicators

*NOTE: For this procedure, refer to FIGURE 5.4.*

### Drive Select/On/Off Switch

A three position toggle switch is located at the back of the joystick housing. The Drive Select position is momentary.

This switch allows the operator to select the type of operation or performance which best suits a particular control need or situation. The Drive 1 program uses performance values which are independent of those used for the Drive 2 or 3 or 4 program. As an example, an operator may have a control need for spasticity in the morning and a very different need in the afternoon. Drive 1 can be programmed for higher speeds and quicker response while Drive 2 can be programmed for slower speeds and less responsiveness or vice versa. The other two drive programs could be indoor and outdoor versions of Drive 1 and Drive 2.



**FIGURE 5.4** MKIV-A Joystick Switches and Indicators

### Selecting the Drive Mode

1. To select Drive 1 mode, move the toggle Up and release. Drive 1 indicator becomes lighted.
2. To select Drive 2 mode, move the toggle Up and release again. Drive 2 indicator becomes lighted.
3. To select Drive 3 mode, move the toggle Up and release again. Drive 3 indicator becomes lighted.
4. To select Drive 4 mode, move the toggle Up and release again. Drive 4 indicator becomes lighted.
5. Move the toggle Up and release one more time to select Drive 1.

### Speed Control

Rotary knob is located at the back of the joystick housing. Turning the knob clockwise increases the maximum speed of the wheelchair.

### Joystick

Proportional drive control located at the front of the control provides smooth control of speed and direction.

## Battery Gauge Display (BGD)

Located at the rear of the control provides information on the remaining charge in the batteries. At full charge, the two left segments and the farthest right segment of the bar graph are lit. As the battery becomes discharged, the farthest right segment will progressively move to the left until only the last two bars are lit; at this level the last two bars will start to flash on and off to indicate the user should charge the batteries as soon as possible.

The BGD also serves as a system diagnostic device when a fault is detected by the control module. A specific number of bars (up to eight bars) will start to flash on and off to indicate the type of fault detected. A chart of the diagnostic indications is given in the Diagnostic Code Section of the electronics manual, part number 1043576.

## Mode and Level Indicators

Two LED indicators are located on either side of the battery bar graph display.

The Mode light is On (operational) with no options attached and level indicators are only operational when the optional ECU/Recliner Control or optional joysticks are utilized or the Reset switch is activated. These indicators provide information of the status of the control system and the environmental controls. The GREEN Mode indicator shows one of five control states.

<u>MODE (GREEN LED)</u>	<u>INDICATION</u>
Drive	Continuously on
Attendant	Flashing (twice/second)
E.C.U. or Recliner Control	Off
Stand-by	Flashing rapidly (four/second)
Remote Drive Selection	Slow Flashing (once/second)

The RED Level indicator provides information on the control level within each mode. Its operation changes with each mode:

MODE	LEVEL INDICATOR	MEANING
Latched	Off	N/A
Proportional	Off	N/A
Attendant	Off	N/A
Momentary	Off	Slowest speed has been selected.
	Flashing	Medium speed has been selected.
	Rapid Flashing	Fastest speed has been selected.
ECU	Off	ECU 1 and/or ECU 3 are active.
	On	ECU 2 and/or ECU 4 are active.
	Flashing	Recliner control
RIM	Off	Wheelchair moves forward when forward command is given.
	On	Wheelchair moves in reverse when forward command is given.

## Emergency Stop Reset Switch

*NOTE: For this procedure, refer to FIGURE 5.5.*

The emergency stop switch is used to stop the wheelchair and to select the operating mode for the wheelchair. The switch reset input connector is located on the control module next to the joystick input connector. An emergency stop switch is needed whenever any of the following operating modes are programmed.

Environmental Controls (E.C.U.) including:

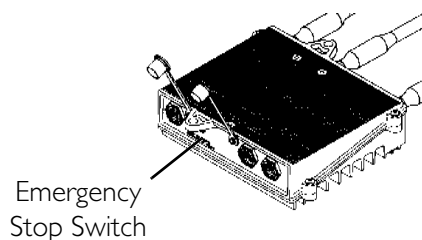
- Recliner Controls
- 3 Speed Mode in Momentary
- Latched Modes
- Pneumatic Control
- Stand-by Mode
- RIM Control
- Remote Drive Selection Mode

If any of the above modes are selected, the control will require activation of the switch immediately after the power switch is turned on in order to enter the drive mode. The GREEN mode indicator will be flashing rapidly. A second after the switch is released, the GREEN LED will light continuously to indicate the drive mode is active.

## Emergency Stop Reset Input Connector

The input connector accepts a 1/8-inch diameter Phono plug. The Emergency Stop switch must be an open contact for normal driving and a closed contact to activate the Emergency Stop function.

<b>PIN</b>	<b>DESIGNATION</b>
TIP	RESET (EMERGENCY STOP)
RING	COMMON (B-)



**FIGURE 5.5** Emergency Stop Reset Switch

## MKIV-A+ Joystick Switches and Indicators

*NOTE: For this procedure, refer to FIGURE 5.6 and FIGURE 5.7.*

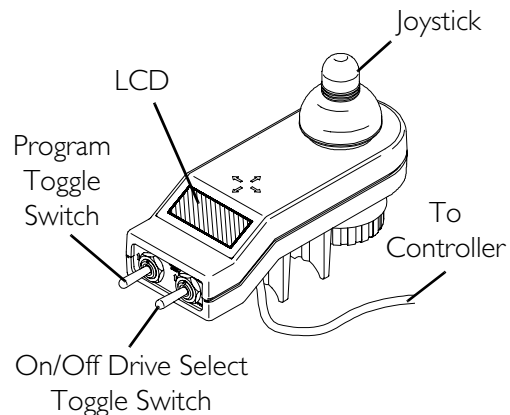
### Drive Select/On/Off Switch

A three position toggle switch is located at the back of the joystick housing. The Drive Select position is momentary.

This switch allows the operator to select the type of operation or performance which best suits a particular control need or situation. The Drive 1 program uses performance values which are independent of those used for the Drive 2 or 3 or 4 program. As an example, an operator may have a control need for spasticity in the morning and a very different need in the afternoon. Drive 1 can be programmed for higher speeds and quicker response while Drive 2 can be programmed for slower speeds and less responsiveness or vice versa. The other two drive programs could be indoor and outdoor versions of DRIVE 1 and Drive 2.

### Selecting the Drive Mode

1. Move the toggle Up and release. Drive 1 will appear on the LCD.
2. Move the toggle Up and release again. Drive 2 will appear on the LCD.
3. Move the toggle Up and release again. Drive 3 will appear on the LCD.
4. Move the toggle Up and release again. Drive 4 will appear on the LCD.
5. Move the toggle Up and release one more time to select Drive 1.



**FIGURE 5.6** MKIV-A+ Joystick Switches and Indicators - Drive Select/On/Off Switch

### Program Toggle Switch

The program toggle switch is located on the left side at the rear of the joystick housing. This switch is used to program the wheelchair. Refer to the electronics manual, part number 1043576, for more information about programming the wheelchair.

### Joystick

Proportional drive control knob located at the front of the joystick housing provides smooth control of speed and direction.

### LCD Display

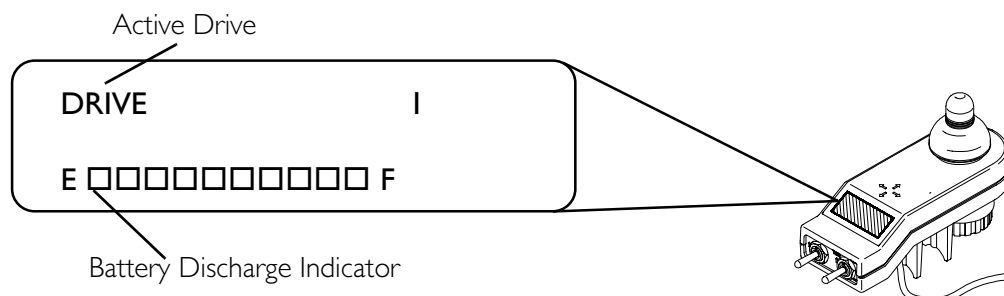
Located in front of the joystick, it provides information on the status of the wheelchair through a two line by twelve character length back lighted display. The LCD display is easily readable in both bright sunlight and complete darkness.

During normal operation the active drive is displayed on the left half of the first line. The left half of the second line is the Battery Discharge Indicator (BDI). It provides information on the remaining charge in the batteries. At full charge, solid blocks fill in all ten segments between E (Empty) and F (Full). As the battery becomes discharged, the farthest right segments will progressively disappear a half bar at a time until no segments appear between E and F. At this level the word RECHARGE will appear on the second line to indicate that the user should charge the batteries as soon as possible.

The right half of the display is the Information Center. The Information Center displays current data on the wheelchair. FIGURE 5.7 shows the factory default display.

Speedometer	Current Wheelchair Speed - MPH/KMH
Trip Odometer	Distance traveled since the wheelchair was last powered ON - MI/KM
Odometer	Total Distance Traveled (Factory Default) - MI/KM
Trip Amp-Hour Meter	Battery Capacity consumed since the wheelchair was last powered ON - AH
Battery Volts	Current Battery Voltage - VOLT
Battery Current	Battery Current being used - AMP
Load Test Results	Current battery condition based on a load test - BATT

If a fault is detected, the cause of the fault will scroll across the second line of the display.



**FIGURE 5.7** MKIV-A+ Joystick Switches and Indicators - Emergency Stop Reset Input Connector

## Emergency Stop Reset Switch

The emergency stop switch is used to stop the wheelchair and to select the operating mode for the wheelchair. The switch input connector is located on the control module next to the joystick input connector. An emergency stop switch is needed whenever any of the following operating modes are programmed:

- Environmental Controls (E.C.U.) including actuator controls
- 3 Speed Mode in Momentary
- Latched Modes
- Pneumatic Control
- Stand-by Mode
- RIM Control
- Remote Drive Selection Mode

- Information Center Display Selection (does not require Reset activation at power up)

If any of the above modes are selected, the control will require activation of the switch immediately after the power switch is turned on in order to enter the drive mode. The second line of the LCD will display - press Reset.

### Emergency Stop Reset Input Connector

The input connector accepts a 1/8-inch diameter Phono plug. The Emergency Stop switch must be an open contact for normal driving and a closed contact to activate the Emergency Stop function.

PIN	DESIGNATION
TIP	RESET (EMERGENCY STOP)
RING	COMMON (B-)

## MKIV-RII Joystick Switches and Indicators

*NOTE: For this procedure, refer to FIGURE 5.8.*

### On/Off Switch

Two position toggle is located at the back of the joystick housing.

### Speed Control

Rotary knob is located at the back of the joystick housing. Turning the knob clockwise increases the maximum speed of the wheelchair.

### Joystick

Proportional drive control located at the front of the joystick housing provides smooth control of speed and direction.

### Battery Discharge Indicator (BDI)

Located at the front of the joystick housing provides information on the remaining charge in the batteries. At full charge, the BDI will be GREEN. As the battery becomes discharged, the BDI will become YELLOW (Amber), then RED and finally the BDI will flash On and Off Red. At this level, the user should charge the batteries as soon as possible.

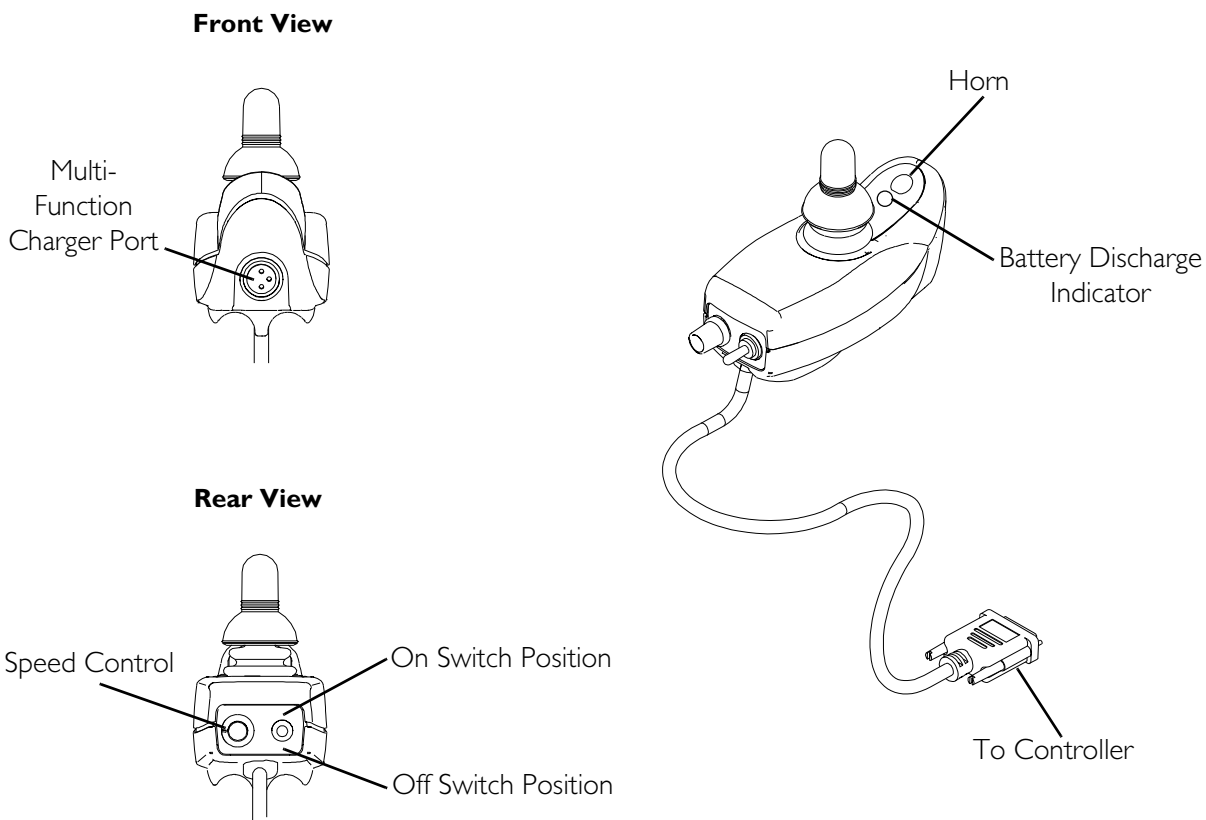
The BDI will flash On and Off YELLOW to indicate a reduced speed or power output.

The BDI also serves as a system diagnostic device when a fault is detected by the control module. A specific number of Green flashes will indicate the type of fault detected. A chart of the diagnostic indications is given in the Diagnostic Code Section of the Electronics manual, part number 1095272.

*NOTE: When reading the Battery Discharge Indicator (BDI), the joystick MUST be in the Neutral position for an accurate reading.*

## Multi Function Charger Port

Located at the front of the joystick housing provides easy access for charging the wheelchair batteries. This port also serves as the Remote Programmer/AVS Communication connection.



**FIGURE 5.8** MKIV-R11 Joystick Switches and Indicators



# SECTION 6—FRONT RIGGINGS

## ⚠ WARNING

After **ANY** adjustments, repair or service and **BEFORE** use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

For the following procedures, make sure the **ON/OFF** switch on the joystick is in the **OFF** position.

## Installing/Removing Footrests

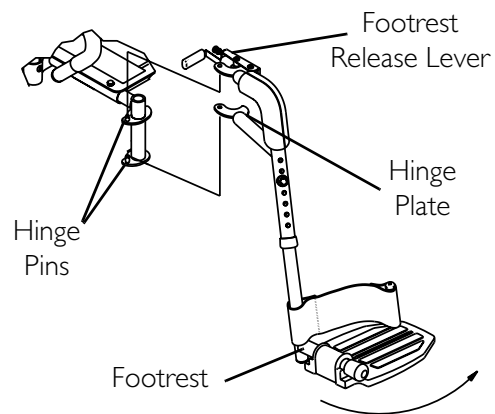
### 70°/Taper Pin Style

*NOTE: For this procedure, refer to FIGURE 6.1.*

1. Turn the footrest to the side (open footplate is perpendicular to wheelchair).
2. Install the hinge plates on the footrest onto the hinge pins on the wheelchair frame.
3. Push the footrest towards the inside of the wheelchair until it locks into place.

*NOTE: The footplate will be on the inside of the wheelchair when locked in place.*

4. Repeat STEPS 1-3 for other footrest assembly.
5. To remove the footrest, push the footrest release lever inward, rotate footrest outward.
6. Adjust footrest height if desired. Refer to Footrest Height Adjustment on page 66.



**FIGURE 6.1** Installing/Removing Footrests - 70°/Taper Pin Style

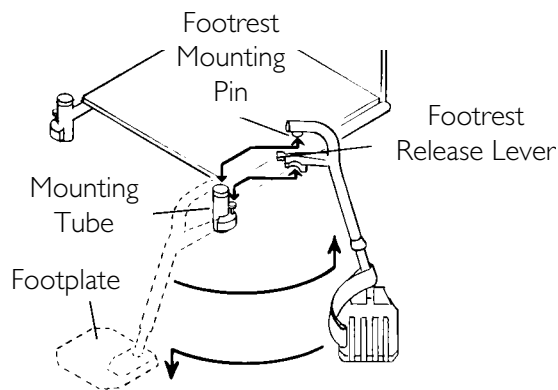
### 60°, 70°, MFX, Taper and 90°

*NOTE: For this procedure, refer to FIGURE 6.2.*

1. Turn the footrest to the side (open footplate is perpendicular to wheelchair itself).
2. Insert footrest mounting pin into mounting tube.
3. Push the footrest towards the inside of the wheelchair until it locks into place.

*NOTE: The footplate will be on the inside of the wheelchair when locked in place.*

4. Repeat STEPS 1- 3 for the other footrest assembly.
5. To remove the footrest, push the footrest release lever inward, rotate footrest outward.
6. Adjust footrest height if desired. Refer to Footrest Height Adjustment on page 66.



**FIGURE 6.2** 60°, 70°, MFX, Taper and 90°

## Footrest Height Adjustment

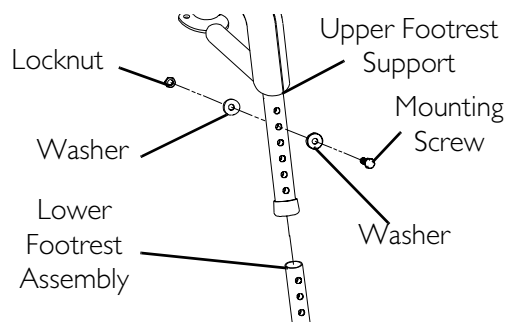
### 60°, 70°, 70° MFX, 90°, PW93, PW93E, PW93ST

*NOTE: For this procedure, refer to FIGURE 6.3.*

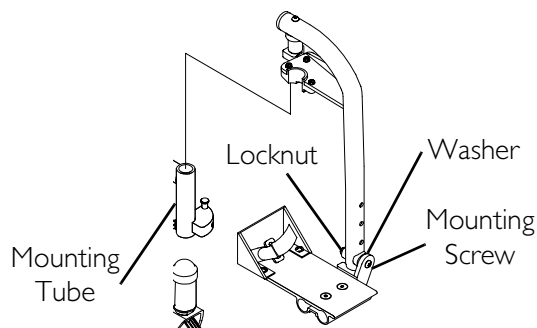
1. Remove any accessories from the footrest(s).
2. Remove the footrest from the wheelchair. Refer to [Installing/Removing Footrests](#) on page 65.

*NOTE: Lay the footrest on a flat surface to simplify this section.*

3. Remove the mounting screw, washers and locknut that secure the lower footrest to the footrest support.
4. Reposition the lower footrest to the desired height.
5. Reinstall the mounting, washers and locknut that secure the lower footrest to the footrest support and tighten securely.
6. Repeat STEPS 1-5 for the opposite side of the wheelchair footrest, if necessary.
7. Reinstall the footrest(s) onto the wheelchair. Refer to [Installing/Removing Footrests](#) on page 65.
8. Reinstall any accessories onto the footrest(s).



**90° Footrest**



**FIGURE 6.3** Footrest Height Adjustment - 60°, 70°, 70° MFX, 90°, PW93, PW93E, PW93ST

**60° MFX, 70° Taper**

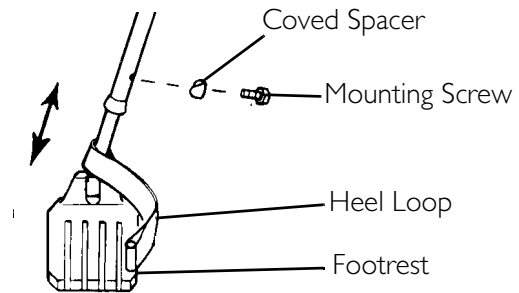
*NOTE: For this procedure, refer to FIGURE 6.4.*

1. Remove any accessories from the footrest(s).
2. Remove the footrest from the wheelchair. Refer to [Footrest Height Adjustment](#) on page 66.

*NOTE: Lay the assembly on a flat surface to simplify this section.*

*NOTE: Note the position of the spacers before disassembly.*

3. Remove the mounting screw and covered spacer that secures the lower footrest assembly.
4. Position the footrest assembly to the desired height.
5. Secure lower footrest assembly with existing mounting screw and covered spacer. Securely tighten.



**FIGURE 6.4** Footrest Height Adjustment - 60° MFX, 70° Taper

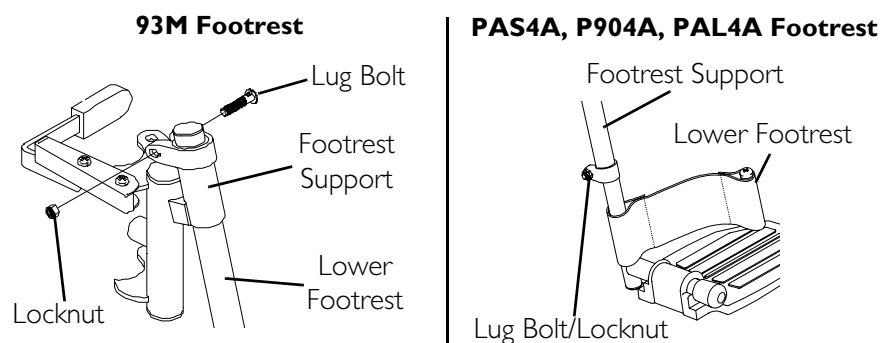
*NOTE: Make sure spacers are positioned properly when reassembling so as not to damage the frame mounting tubes.*

6. Reinstall the footrest(s) onto the wheelchair. Refer to [Installing/Removing Footrests](#) on page 65.
7. Reinstall any accessory onto the footrest(s).

**PAS4A, 93M, P904A, and PAL4A**

*NOTE: For this procedure, refer to FIGURE 6.5.*

1. Loosen, but DO NOT remove the lug bolt and locknut that secure the lower footrest to the footrest support.
2. Reposition the lower footrest to the desired height.
3. Securely tighten the lug bolt and locknut that secure the lower footrest to the footrest support.
4. Repeat STEPS 1-3 for the opposite side of the wheelchair footrest, if necessary.



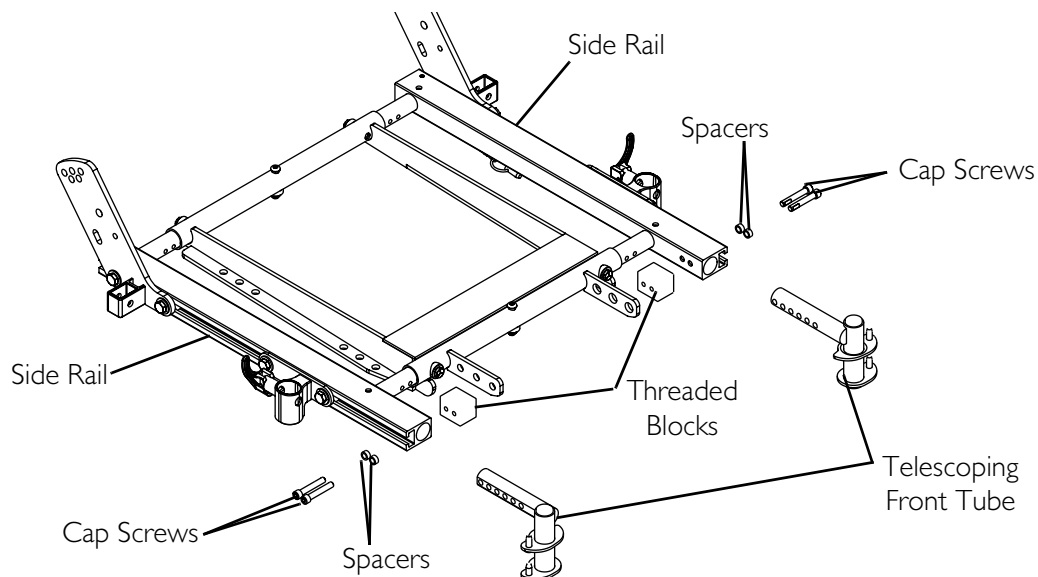
**FIGURE 6.5** Footrest Height Adjustment - PAS4A, 93M, P904A, and PAL4A

## Adjusting/Replacing Telescoping Front Rigging Support

### Wheelchairs without 2G Tarsys Systems

*NOTE: For this procedure, refer to FIGURE 6.6.*

1. Remove the two cap screws, spacers and threaded blocks securing the telescoping front tube to the side rail.
2. Perform one of the following:
  - Slide existing telescoping front rigging support to one of six depth positions.
  - Remove existing telescoping front rigging.
3. Secure the telescoping front tube to the side rail at the desired depth with the existing two cap screws, spacers and threaded blocks.
4. Repeat STEPS 1 to 3 on the opposite side, if desired.

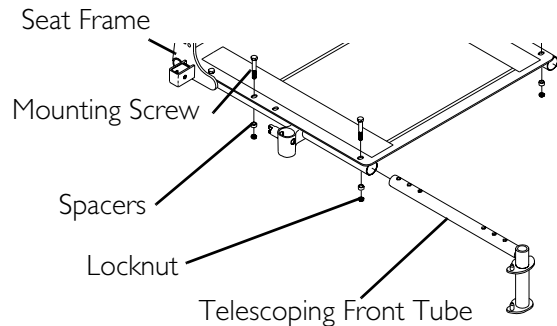


**FIGURE 6.6** Adjusting/Replacing Telescoping Front Rigging Support - Wheelchairs without 2G Tarsys Systems

## Wheelchairs with 2G Tarsys Seating Systems

*NOTE: For this procedure, refer to FIGURE 6.7.*

1. Remove the two mounting screws, spacers and locknuts that secure the telescoping front rigging support to the seat frame.
2. Perform one of the following:
  - Slide existing telescoping front rigging support to one of three depth positions.
  - Remove existing telescoping front rigging.
3. Secure telescoping front rigging at desired depth with existing two mounting screws, spacers, and locknuts. Securely tighten.



**FIGURE 6.7** Adjusting/Replacing Telescoping Front Rigging Support

*NOTE: The two telescoping front rigging supports can be positioned at different depths depending on the need of the user.*

## Installing Adjustable Angle Flip-up Footplate Hinge

*NOTE: For this procedure, refer to FIGURE 6.8.*

1. Position footplate hinge on the footrest support tube at the desired height.
2. Position mounting screw, washers, spacer, and locknut on the footrest support as shown in FIGURE 6.8.
3. Flip the footplate hinge to the Up position.

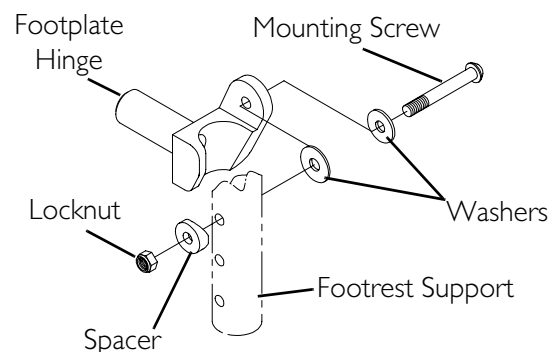
*NOTE: The footplate hinge will fall to the Down position.*

4. Tighten the mounting screw, washer, and locknut that secure the footplate hinge to the footrest support until the footplate hinge remains in the Up position.
5. Check the up and down motion of the footplate hinge to make sure the user of the wheelchair can operate the footplates easily.

*NOTE: If footplate's motion is too tight, loosen the mounting screw and locknut approximately 1/4-turn counter clockwise.*

*NOTE: If the footplate's motion is too loose, tighten mounting screw and locknut approximately 1/4-turn clockwise.*

6. Adjust footplate. Refer to [Installing Adjustable Angle Flip-up Footplate Hinge](#) on page 69.



**FIGURE 6.8** Installing Adjustable Angle Flip-up Footplate Hinge

## Installing/Adjusting Adjustable Angle Flip-Up Footplates

### Installing Adjustable Angle Flip-up Footplates

*NOTE: For this procedure, refer to FIGURE 6.9.*

1. Slide the half clamp over the footplate hinge.
2. Loosely tighten the two flat screws that secure the footplate to the half clamp.
3. Adjust the footplates to the necessary angle and depth for the user. Refer to [Installing/Adjusting Adjustable Angle Flip-Up Footplates](#) on page 70.

### Adjusting Adjustable Angle Flip-up Footplates

#### Depth

*NOTE: For this procedure, refer to FIGURE 6.9.*

1. Remove the two flat screws, washers and locknuts that secure articulating footplate to the half clamp.

*NOTE: Observe the angle of the articulating footplate for reinstallation.*

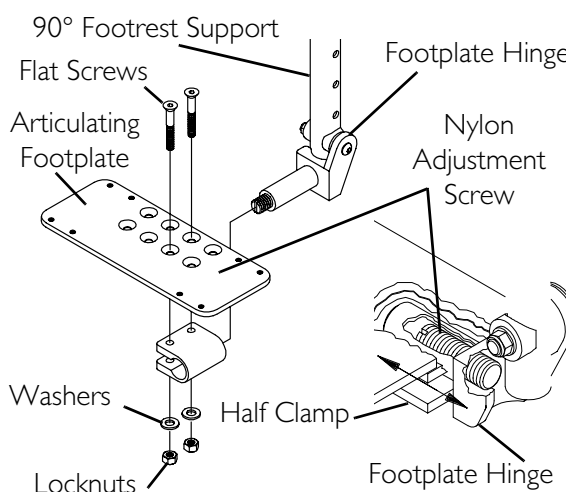
2. Move articulating footplate to one of four mounting positions.

*NOTE: If desired depth is still not obtained, rotate the half clamp on the footplate hinge 180°.*

3. Retighten the two flat screws, washers and locknuts.

*NOTE: The settings for positioning the articulating footplates on the half-clamps may vary for each footplate.*

4. Refer to [Angle](#) on page 71 or [Perpendicular and/or Inversion/Eversion Adjustment](#) on page 71.

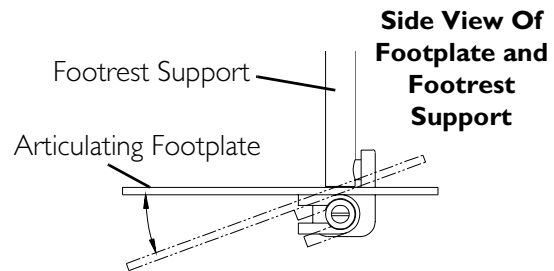


**FIGURE 6.9** Adjusting Adjustable Angle Flip-up Footplates - Depth

**Angle**

*NOTE: For this procedure, refer to FIGURE 6.10.*

1. Loosen, but DO NOT remove the two flat screws, washer and locknuts that secure the footplate to the footplate hinge.
2. Position the articulating footplate to the necessary angle to accommodate the user.
3. Retighten the two flat screws, washers and locknuts.



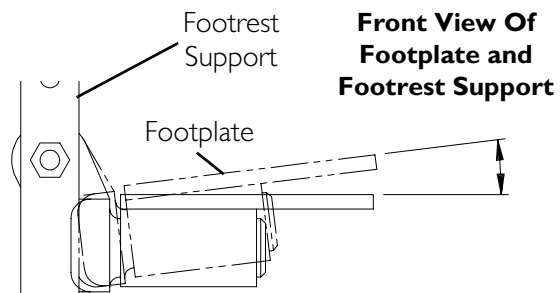
**FIGURE 6.10** Adjusting Adjustable Angle Flip-up Footplates - Angle

**Perpendicular and/or Inversion/Eversion Adjustment**

*NOTE: For this procedure, refer to FIGURE 6.11.*

*NOTE: It is not necessary to remove the footplate to perform this adjustment.*

1. Insert a flathead screwdriver through the half clamp on the articulating footplate.
2. Slowly turn nylon adjustment screw in or out until articulating footplate is perpendicular to the footrest assembly or the desired inversion or eversion is obtained.



**FIGURE 6.11** Adjusting Adjustable Angle Flip-up Footplates - Perpendicular and/or Inversion/Eversion Adjustment

**Replacing Composite/Articulating Footplate Heel Loop**

*NOTE: For this procedure, refer to FIGURE 6.12.*

**Disassembly****Composite**

1. Remove the mounting screw and spacer that secures the lower half of the footrest to the swingaway footrest assembly.
2. Remove the lower footrest assembly.
3. Remove the mounting screw and locknut that secure the heel loop to the footrest.
4. Slide heel strap over cane of footrest assembly.

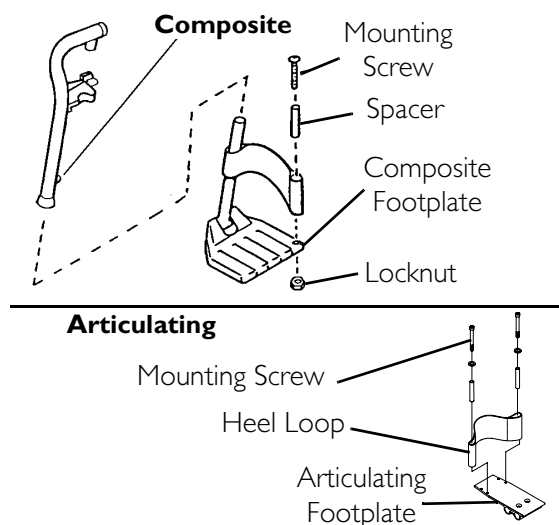
**Articulating**

1. Remove the two mounting screws that secure the heel loop to the articulating footplate.

**Reassembly**

1. Replace heel strap/loop.
2. Reverse preceding steps to reassemble.

*NOTE: When securing heel loop to the footrest assembly, tighten mounting screw until the spacer is secure.*



**FIGURE 6.12** Replacing Composite/Articulating Footplate Heel Loop

**Installing/Removing Elevating Legrests**

*NOTE: For this procedure, refer to FIGURE 6.13.*

**Installing**

1. Turn legrest to side (open footplate is perpendicular to wheelchair) and position mounting holes in the legrest hinge plates with hinge pins on the wheelchair frame.
2. Install the legrest hinge plates onto the hinge pins on the wheelchair frame.
3. Rotate legrest toward the inside of the wheelchair until it locks in place.

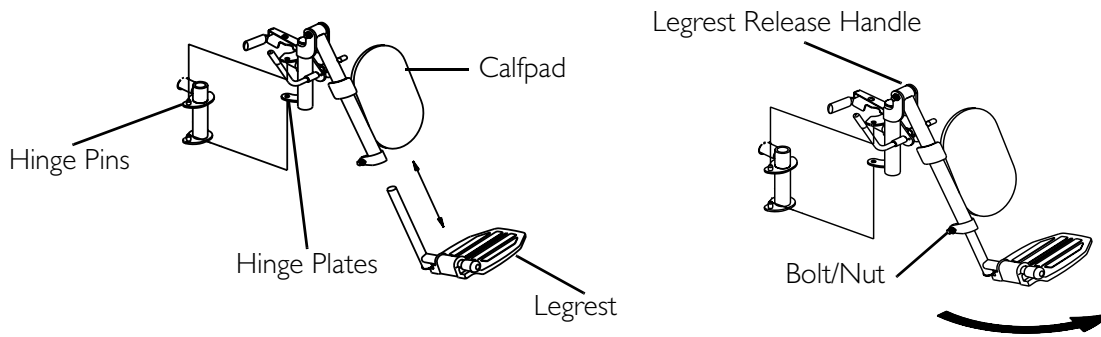
*NOTE: The footplate will be on the inside of the wheelchair when locked in place.*

4. Repeat STEPS 1-3 for the opposite legrest.
5. After seated in wheelchair, adjust footplate to correct height by loosening nut and sliding the lower footrest assembly up or down until desired height is achieved.

**Removing**

1. Push the legrest release handle toward the inside of the wheelchair (facing the front of the wheelchair) and swing the legrest to the outside of the wheelchair.
2. Lift up on the legrest and remove from the wheelchair.
3. Repeat STEPS 1- 2 for opposite side of wheelchair.





**FIGURE 6.13** Installing/Removing Elevating Legrests

## Raising/Lowering Elevating Legrests and/or Adjusting Calfpads

*NOTE: For this procedure, refer to FIGURE 6.14.*

### Raising/Lowering Elevating Legrests

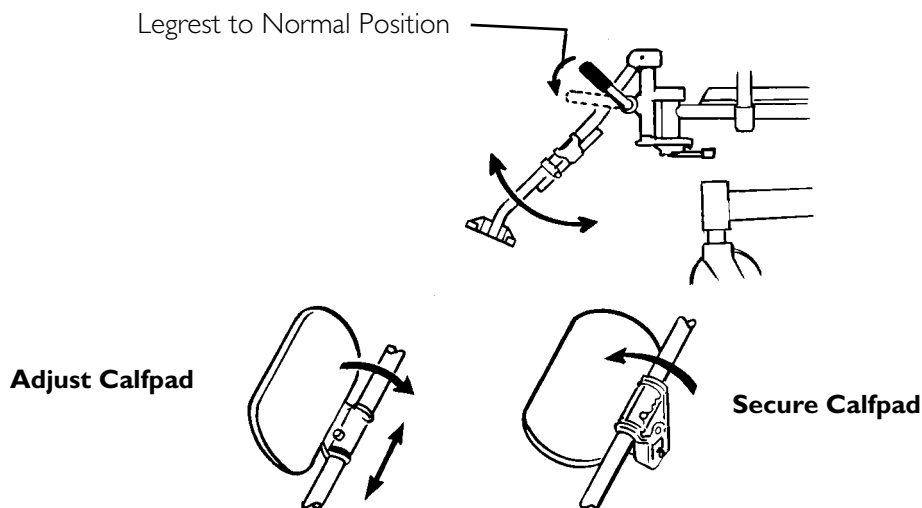
1. Perform one of the following:
  - Raising - Pull back on the release lever until the leg is at the desired height.
  - Lowering - Support leg with one hand and push release lever downward with other hand.

### Adjusting Calfpads

1. Turn the calfpad towards the outside of the wheelchair.
2. Slide the calfpad up or down until the desired position is obtained.

*NOTE: If one of the top two calfpad adjustment positions is being used, the legrest will need to be raised to avoid interference with the front stabilizers while going over obstacles or going up and down ramps. Refer to Raising/Lowering Elevating Legrests and/or Adjusting Calfpads on page 73.*

3. Turn the calfpad towards the inside of the wheelchair.



**FIGURE 6.14** Raising/Lowering Elevating Legrests and/or Adjusting Calfpads

## Installing/Removing/Adjusting the Power Elevating Legrests

### **⚠ WARNING**

To prevent personal injury, always verify proper positioning of legs and feet prior to use. Individual user weight may impact the rate of travel for each legrest assembly. If simultaneous operation is desired, select a speed which allows for the most uniform travel.

**DO NOT** insert fingers between legrest components, otherwise personal injury may occur.

### **CAUTION**

**NEVER** allow items to become trapped between the legrest assemblies, otherwise damage to the power legrests may occur.

**Ensure** that all parts of both power legrests are clear of any obstructions before raising and lowering, otherwise damage to the power legrests may occur.

*NOTE: These procedures apply to wheelchairs with 2G Tarsys seating systems only.*

*NOTE: Power legrests are linked to the recline function of the powered seating system. Operating the recline function automatically operates power legs. Power legrests can also be operated independently of the recline function.*

## Installing the Power Elevating Legrests

*NOTE: For this procedure, refer to FIGURE 6.15.*

1. Turn power legrest to side (open footplate is perpendicular to wheelchair). Refer to Detail "A" of FIGURE 6.15.
2. Insert the mounting pin of power legrest into the mounting hole of the seat frame (Detail "A" of FIGURE 6.15).

*NOTE: Make sure the legrest sits flush on the seat frame.*

3. Rotate the power legs toward the INSIDE of the wheelchair until it locks in place.

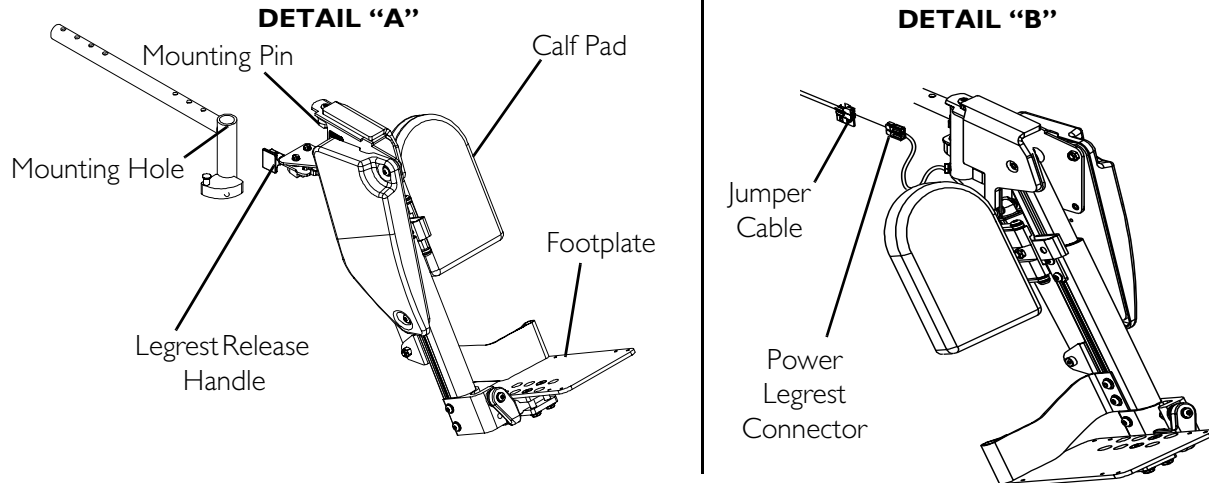
*NOTE: The footplate will be on the INSIDE of the wheelchair when locked in place.*

4. Repeat STEPS 1-3 for the opposite legrest.
5. Connect power legrest connector to jumper cable (Detail "B" of FIGURE 6.15).

## Removing the Power Elevating Legrests

*NOTE: For this procedure, refer to FIGURE 6.15.*

1. Disconnect power legrest connector from jumper cable.
2. Push legrest release handle and swing legrest to the outside of the wheelchair.
3. Lift up on powered legrest and remove from wheelchair.
4. Repeat STEPS 1-3 for opposite power legrest.



**FIGURE 6.15** Installing/Removing/Adjusting the Power Elevating Legrests

## Adjusting the Power Elevating Legrests

The speed of the power legrests must be adjusted to the following specifications, otherwise the legrests will not work properly. For assistance in speed adjustment, contact an Invacare Dealer or qualified technician.

CONTROLLER	LEG UP SPEED	LEG DOWN SPEED
TRCM version 2.2 or earlier	70% or higher	50% or higher
TAC version 1.1 or earlier		
TRCM version 2.3 or higher	40% or higher	35% or higher
TAC version 1.11 or higher		

## Using Mechanical Elevating/Genius Legrests

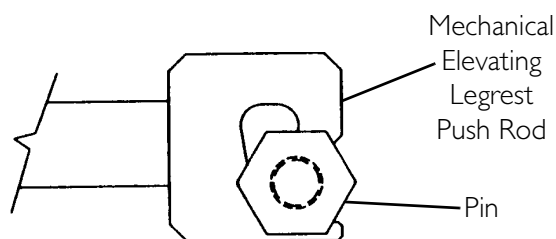
### CAUTION

**DO NOT** operate the recline function of the seating system if one or both of the mechanical elevating legrest push rods is bent. Damage to the seating system can occur.

*NOTE: For this procedure, refer to FIGURE 6.16.*

*NOTE: These procedures apply to wheelchairs with 2G Tarsys seating systems only.*

Mechanical elevating legrests are linked to the recline function of the seating system. Operating the recline function automatically operates elevating legrests.



**FIGURE 6.16** Using Mechanical Elevating/Genius Legrests

## Installing/Removing Mechanical Elevating/Genius Legrests

*NOTE: For this procedure, refer to FIGURE 6.17.*

*NOTE: These procedures apply to wheelchairs with 2G Tarsys seating systems only.*

### Installing

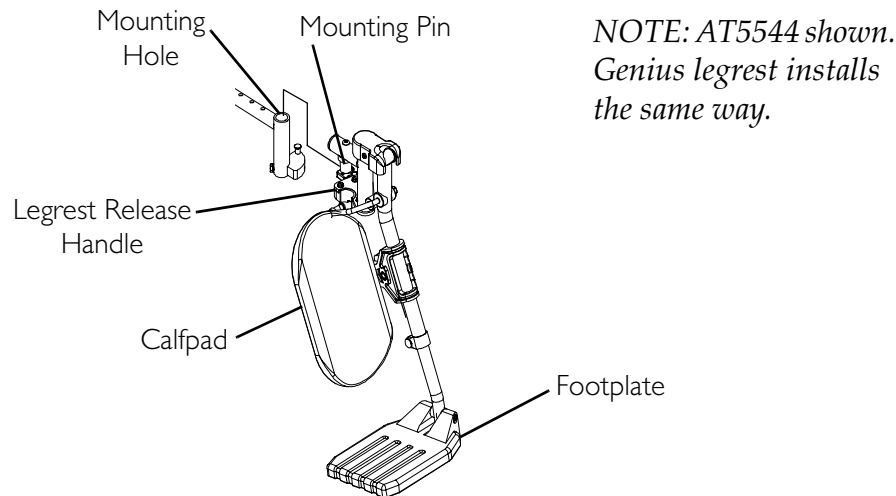
1. Turn elevating legrest to side (open footplate is perpendicular to wheelchair) and position the mounting pin on the legrest mounting holes on the seat frame.
2. Insert the mounting pin into the mounting hole.

*NOTE: Make sure the legrest sits flush on the seat frame.*

3. Rotate the elevating legrest toward the inside of the wheelchair until it locks in place.

*NOTE: The footplate will be on the inside of the wheelchair when locked in place.*

4. Lift the elevating legrest up and position the mechanical elevating legrest push rod around the pin on the legrest as shown in FIGURE 6.17.
5. Press down on mechanical elevating legrest push rod until there is an audible “click”.
6. Repeat STEPS 1-5 for the opposite elevating legrest.
7. If necessary, adjust elevating legrests. Refer to one of the following:
  - [Adjusting Mechanical Elevating Legrests](#) on page 77.
  - [Adjusting Genius Legrests](#) on page 79.



**FIGURE 6.17** Installing/Removing Mechanical Elevating/Genius Legrests

## Removing

1. Lift up on the mechanical elevating legrest push rod and remove from the pin on the legrest as shown in FIGURE 6.17.
2. Push elevating legrest release handle toward the opposite side of the wheelchair and swing legrest to the outside of the wheelchair.
3. Lift up on elevating legrest and remove from wheelchair.
4. Repeat STEPS 1-3 for opposite side of wheelchair.

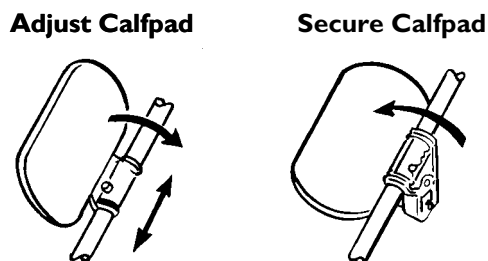
## Adjusting Mechanical Elevating Legrests

*NOTE: These procedures apply to wheelchairs with 2G Tarsys seating systems only.*

### Calfpads

*NOTE: For this procedure, refer to FIGURE 6.18.*

1. Turn the calfpad toward the outside of the wheelchair.
2. Slide calfpad up or down until desired position is obtained.
3. Turn the calfpad toward the inside of the wheelchair.



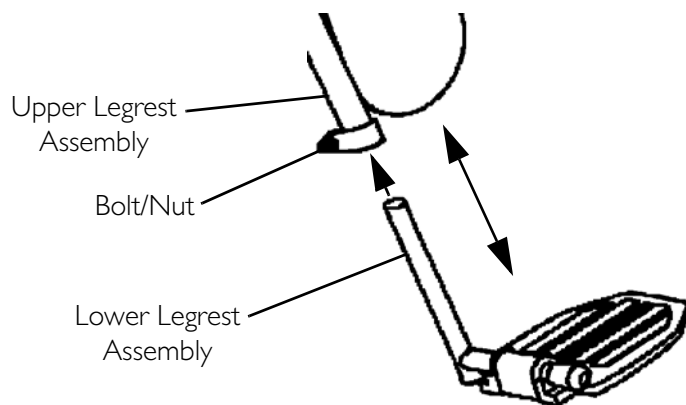
**FIGURE 6.18** Adjusting Mechanical Elevating Legrests - Calfpads

### Footplate Height

*NOTE: For this procedure, refer to FIGURE 6.19.*

*NOTE: The following procedure should be performed with the user in the wheelchair.*

1. Loosen, but DO NOT remove, the bolt and locknut that secure the lower legrest assembly to the upper legrest assembly.
2. Move the lower legrest assembly to the desired position for the user.
3. While holding the lower legrest in position, tighten the bolt and locknut securely.
4. Repeat STEPS 1-4 for opposite legrest if necessary.



**FIGURE 6.19** Adjusting Mechanical Elevating Legrests - Footplate Height

### Speed/Height

*NOTE: Mechanical Elevating Legrest speed and height cannot be adjusted independently of the recline function of the wheelchair. If the mechanical elevating legrests are not operating as desired, have the wheelchair serviced by an Invacare dealer or technician.*

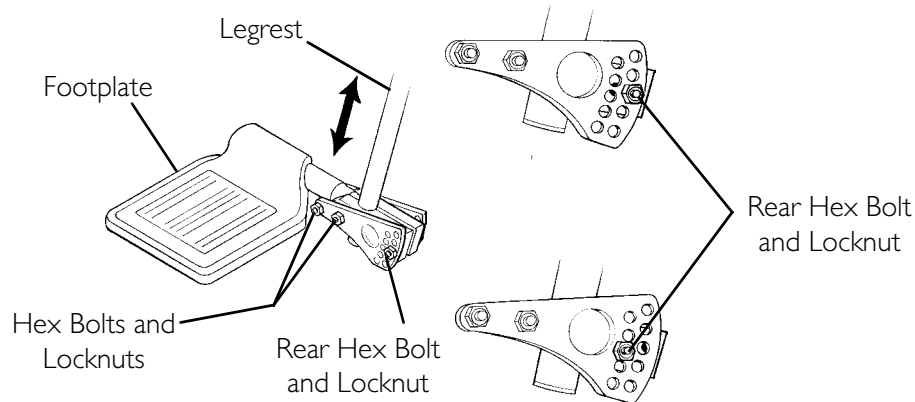
## Adjusting Genius Legrests

*NOTE: These procedures apply to wheelchairs with 2G Tarsys seating systems only.*

### Footplate Height

*NOTE: For this procedure, refer to FIGURE 6.20.*

1. Note the angle of the footplate in relation to the legrest as shown in FIGURE 6.20.
2. Loosen, but DO NOT remove, the three hex bolts and locknuts that secure the footplate to the legrest.
3. Adjust the footplate to the desired height.
4. Line up the footplate to the angle noted in STEP 1.
5. While holding the footplate, tighten the three hex bolts and locknuts securely.



**FIGURE 6.20** Adjusting Genius Legrests - Footplate Height/Footplate Angle

### Footplate Angle

*NOTE: For this procedure, refer to FIGURE 6.20.*

1. Note the angle of the footplate in relation to the legrest as shown in FIGURE 6.20.
2. Remove the rear hex bolt and locknut that secure the footplate to the legrest.
3. Move the footplate to the desired angle.
4. Install the hex bolt through the mounting holes that correspond to the desired footplate angle.
5. Install the locknut onto the hex bolt.
6. Line up the footplate to the angle noted in STEP 1.
7. While holding the footplate, tighten the hex bolt and locknut securely.

## Calfpad Height

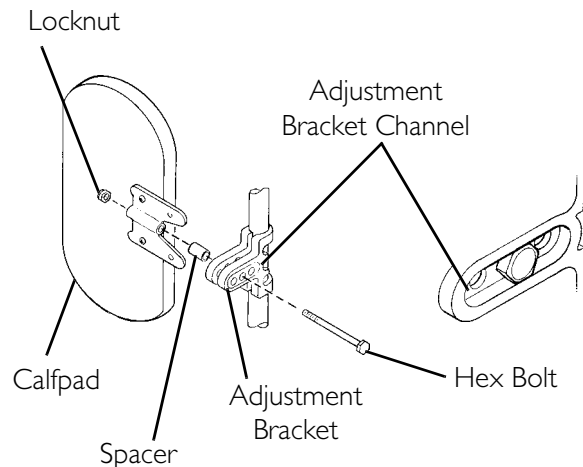
*NOTE: For this procedure, refer to FIGURE 6.21.*

1. Turn the calfpad towards the outside of the wheelchair.
2. Slide calfpad up or down until desired position is obtained.
3. Turn the calfpad towards the inside of the wheelchair.

## Calfpad Depth

*NOTE: For this procedure, refer to FIGURE 6.21.*

1. Remove the hex bolt and locknut that secure the calfpad and spacer to the adjustment bracket.
2. Move the legrest to one of three positions.
3. Reinstall the hex bolt through the spacer and calfpad.



**FIGURE 6.21** Adjusting Genius Legrests - Calfpad Height/Calfpad Depth

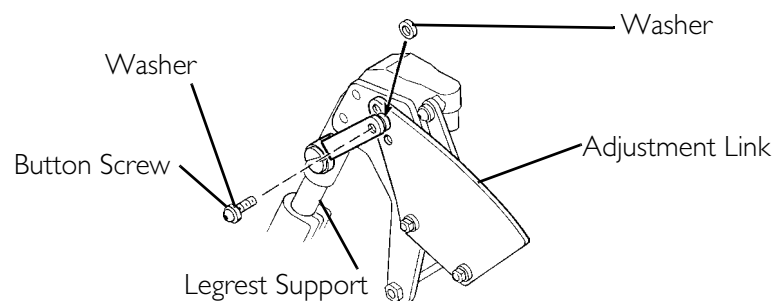
*NOTE: Make sure hex bolt sits flush adjustment bracket channel.*

4. Reinstall locknut onto the hex bolt and tighten securely.

## Legrest Height

*NOTE: For this procedure, refer to FIGURE 6.22.*

1. Remove the button screw that secures the adjustment link and two washers to the legrest support.
2. Move adjustment link to one of three positions.
3. Line up the two washers and adjustment link with the mounting hole in the legrest support.
4. Install the button screw and tighten securely.



**FIGURE 6.22** Adjusting Genius Legrests - Legrest Height



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# SECTION 7—ARMS

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## **⚠ WARNING**

**After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.**

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## Installing/Removing Flip Back Armrests

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### **⚠ WARNING**

**Make sure the flip back armrest release and height adjustment levers are in the locked position before using the wheelchair.**

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*NOTE: For this procedure, refer to FIGURE 7.1.*

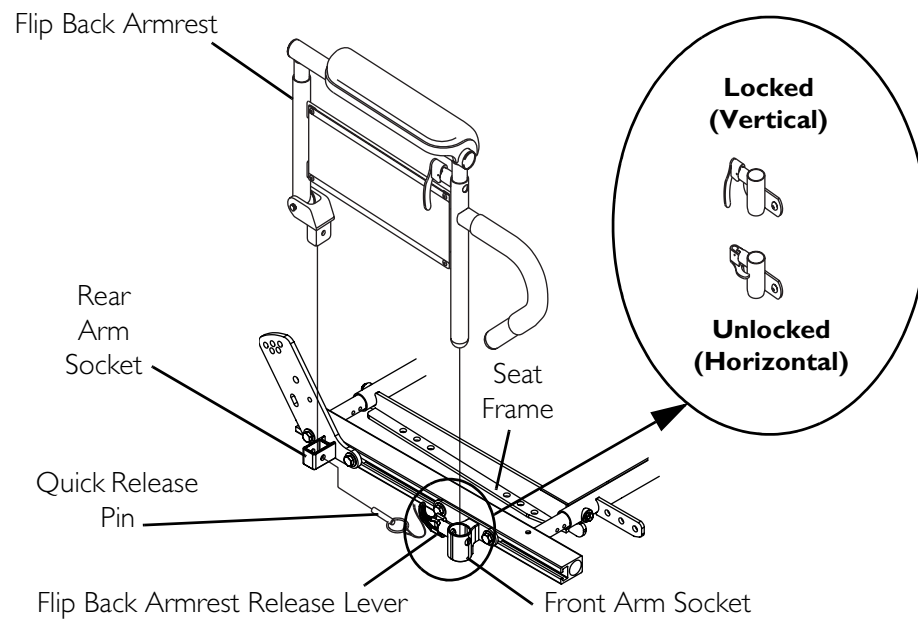
*NOTE: Flip back armrest release lever must be in the unlocked (horizontal) position when placing the armrest into the arm sockets.*

### **Installing**

1. Visually inspect to ensure flip back armrest release lever is in the unlocked (horizontal) position.
2. Slide the flip back armrest into the arm sockets on the seat frame.
3. Install the quick release pin through the rear arm socket and flip back armrest.
4. Lock the flip back armrest by pressing the flip back armrest release lever into the locked (vertical) position.
5. Repeat STEPS 1-4 for the opposite flip back armrest.

### **Removing**

1. Unlock the flip back armrest by positioning the flip back armrest release lever into the unlocked (horizontal) position.
2. Remove the quick release pin that secures the flip back armrest to the rear arm socket.
3. Pull up on the flip back armrest and remove the armrest from the arm sockets.
4. Repeat STEPS 1-3 for the opposite flip back armrest, if necessary.



**FIGURE 7.1** Installing/Removing Flip Back Armrests

## Adjusting Flip Back Armrests

### **⚠ WARNING**

**Make sure the flip back armrest release and height adjustment levers are in the locked position before using the wheelchair.**

*NOTE: For this procedure, refer to FIGURE 7.2.*

### **Positioning Flip Back Armrests for User Transfer**

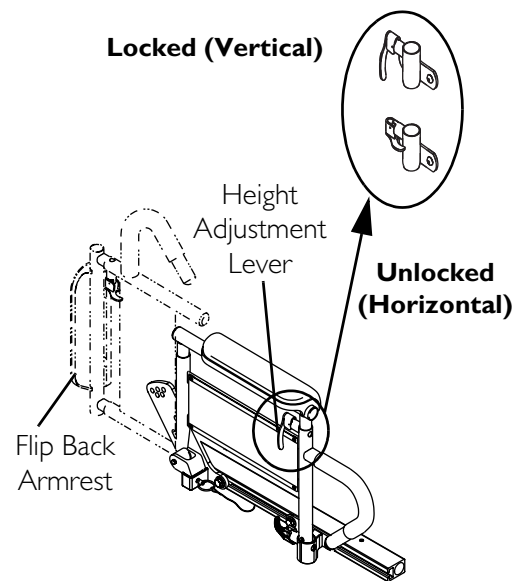
1. Unlock the flip back armrest by pulling the armrest release lever into the up (horizontal) position.
2. Pull up on the flip back armrest and remove the armrest from the front arm socket.
3. Continue to pull up on the flip back armrest until the armrest is out of the way.
4. Repeat STEPS 1-3 for opposite flip back armrest, if necessary.

### **Positioning Flip Back Armrests for Use**

1. Make sure the flip back armrest release lever is in the up (horizontal) position.
2. Install the flip back armrest into the front arm socket.
3. Lock flip back armrest by pressing flip back armrest release lever into the down (vertical) position.
4. Lift up on flip back armrest to make sure the armrest is locked in place.
5. Repeat STEPS 1-4 for opposite flip back armrest, if necessary.

## Adjusting

1. Unlock top of flip back armrest by pulling height adjustment lever into the up (horizontal) position.
2. Adjust top of the flip back armrest to the desired height.
3. Lock top of flip back armrest by pushing height adjustment lever into the down (vertical) position.



**FIGURE 7.2** Adjusting Flip Back Armrests

## Adjusting Captain's Van Seat Armrests

### Angle

*NOTE: For this procedure, refer to FIGURE 7.3.*

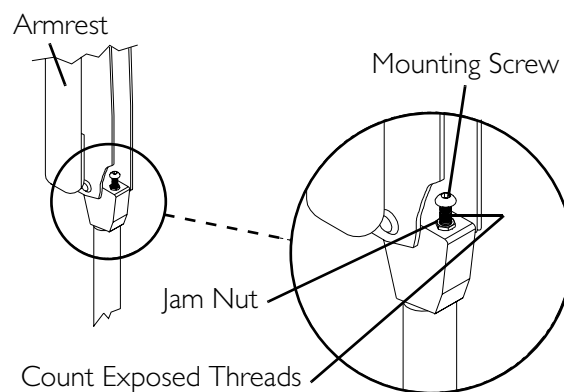
1. Lift-up the armrest and loosen the jam nut.

*NOTE: Adjust the mounting screw up or down to the desired arm angle position.*

*NOTE: Tighten the jam nut.*

*NOTE: Repeat STEPS 1-3 for opposite armrest.*

*NOTE: To determine the same angle for the opposite armrest, count the exposed threads after the jam nut has been tightened.*

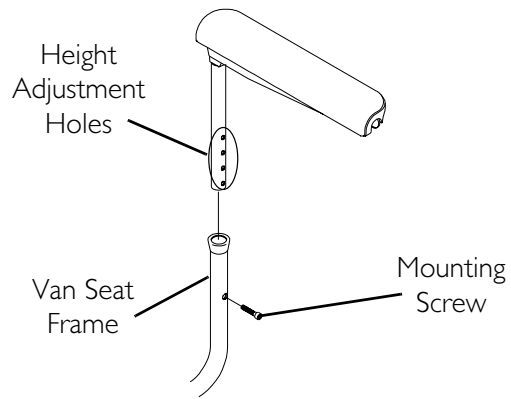


**FIGURE 7.3** Adjusting Captain's Van Seat Armrests - Angle

## Height

*NOTE: For this procedure, refer to FIGURE 7.4.*

1. Remove the mounting screw that secures the armrest to the van seat frame.
2. Adjust the armrest to one of four positions.
3. Reinstall the mounting screw that secures the armrest to the van seat frame and tighten securely.



**FIGURE 7.4** Adjusting Captain's Van Seat Armrests - Height

## Removing/Installing Reclining Armrests

*NOTE: For this procedure, refer to FIGURE 7.5.*

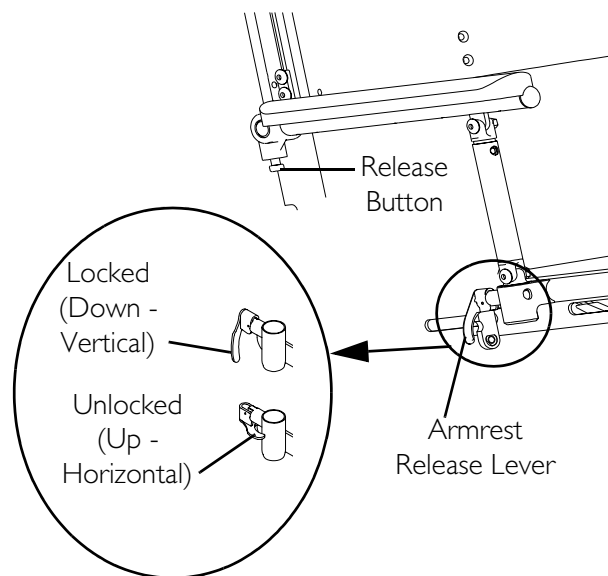
*NOTE: This procedure applies to 2G Tarsys seating systems only.*

### Removing Armrests

1. Lift the armrest release lever at the front of the wheelchair to the unlocked (horizontal) position.
2. Lift up on the armrest and remove from the front arm socket.
3. Press the release button at the rear of the armrest in.
4. While holding the release button in, remove the armrest from the seat frame.

### Installing Armrests

1. Position the armrest on the seat frame as shown in FIGURE 7.5.
2. Press the release button at the rear of the armrest in.
3. While holding the release button in, slide the armrest onto the seat frame.
4. Make sure the armrest release lever is in the unlocked (horizontal) position.
5. Install the armrest into the front socket.
6. Push the armrest release lever down into the locked (vertical) position.



**FIGURE 7.5** Removing/Installing Reclining Armrests

## Adjusting Reclining Armrest Height

*NOTE: For this procedure, refer to FIGURE 7.6.*

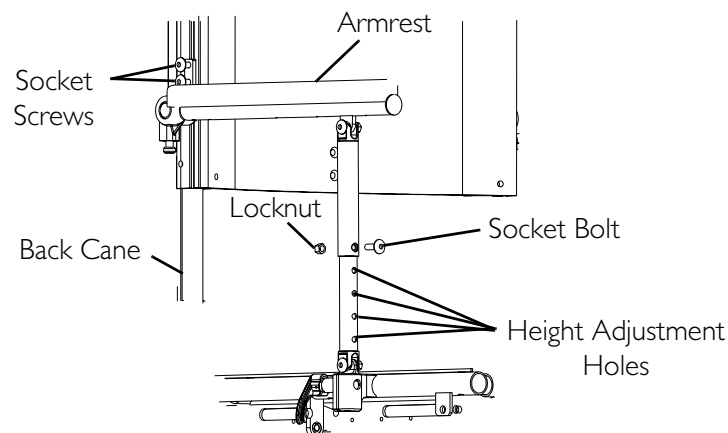
*NOTE: This procedure applies to 2G Tarsys seating systems only.*

1. Make sure the seating system is in the full upright position. Refer to Operating Powered Seating Systems on page 52.
2. Remove the socket bolt and locknut that secure the front of the upper armrest to the lower armrest.
3. Loosen, but DO NOT remove, the two socket screws that secure the rear of the armrest of the back cane.
4. Adjust the armrest to the desired height for the user.

*NOTE: The armrests can be at different heights to accommodate the user.*

*NOTE: The armrest adjusts from 11 to 16 inches in 1-inch increments.*

5. Reinstall the socket bolt through the mounting hole determined in STEP 4.
6. Reinstall the locknut and tighten securely.
7. While holding the armrest level, tighten the two socket screws that secure the rear of the armrest to the back cane.
8. Repeat STEPS 2-7 for the opposite side if necessary.



**FIGURE 7.6** Adjusting Reclining Armrest Height

# SECTION 8—POSITIONING STRAP

---

## **⚠ WARNING**

**After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.**

**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, belt **MUST** be replaced immediately.**

---

## **Replacing Seat Positioning Strap**

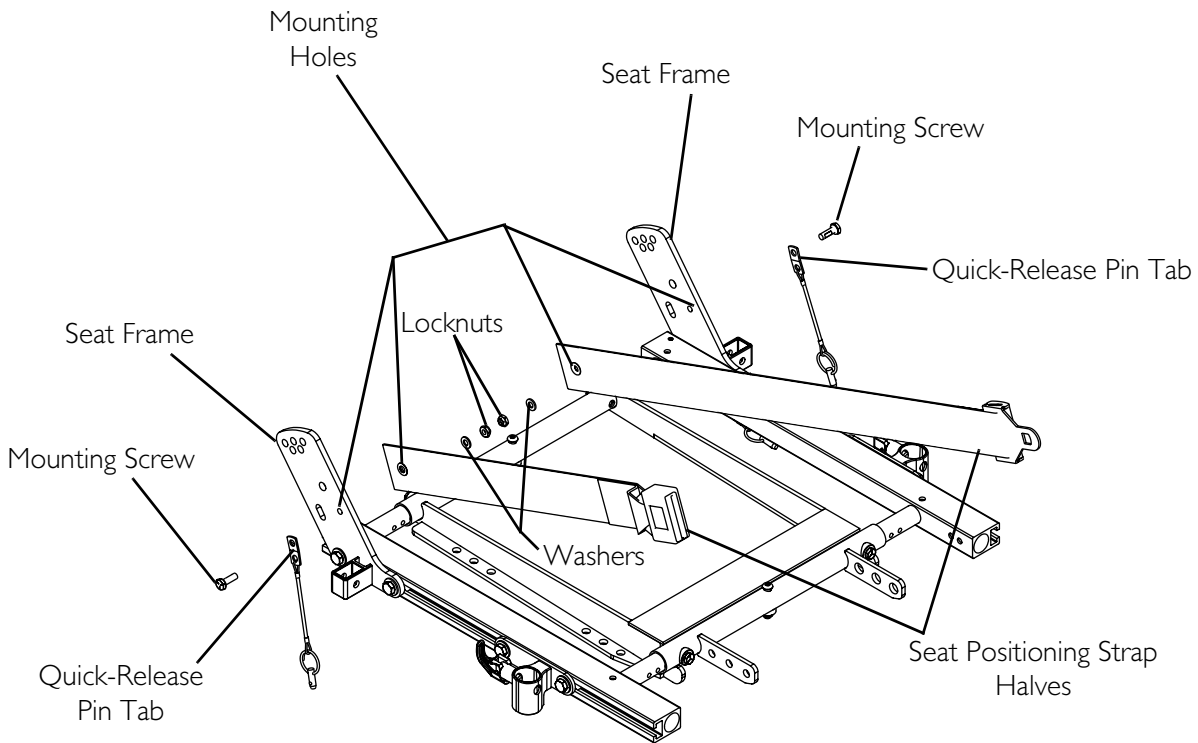
### **Wheelchairs with TRRO Option**

To replace the seat positioning strap, refer to [Wheelchair-Anchored Belts](#) on page 127.

### **Wheelchairs without 2G Tarsys Seating Systems or TRRO Option**

*NOTE: For this procedure, refer to FIGURE 8.1.*

1. Remove the seat cushion from the seat pan.
2. Move the flip back armrests out of the way. Refer to [Adjusting Flip Back Armrests](#) on page 82.
3. Remove the two mounting screws, locknuts, washers and quick-release pin tabs that secure the seat positioning straps to the seat frame.
4. Remove the two halves of the seat positioning strap from the rear seat frame.
5. Reposition the two new seat positioning strap inside of the seat frame as shown.
6. Reinstall the two mounting screws and quick-release pin tabs that secure the seat positioning straps to the seat frame and torque to 75 in-lbs.
7. Reinstall the seat cushion onto the seat pan.

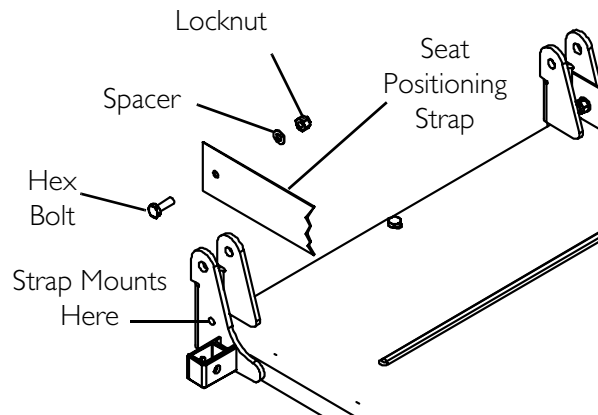


**FIGURE 8.1** Replacing Seat Positioning Strap - Wheelchairs without 2G Tarsys Seating Systems or TRRO Option

## Wheelchairs with 2G Tarsys Seating Systems

*NOTE: For this procedure, refer to FIGURE 8.2.*

1. Remove the two hex bolts, washers and locknuts that secure the two halves of the seat positioning strap to the seat frame.
2. Remove the existing seat positioning strap from the seat frame.
3. Position the new seat positioning strap on the seat frame as shown.
4. Reinstall the hex bolt, washer and locknut as shown. Tighten securely.



**FIGURE 8.2** Replacing Seat Positioning Strap - Wheelchairs with 2G Tarsys Seating Systems

# SECTION 9—VAN SEAT

## ⚠ WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

## Adjusting Captain's Van Seat

NOTE: For this procedure, refer to FIGURE 9.1.

### Low Back Captain's Van Seats

1. Lift up on the release handle and move the back to the desired position

### High Back Captain's Van Seats

#### Angle

## ⚠ WARNING

### HIGH BACK CAPTAIN'S VAN SEATS ONLY

**NEVER** operate the wheelchair while in any recline position over 114° relative to the seat frame. If the limit switch does not stop the wheelchair from operating in a recline position greater than 114° relative to the seat frame, **DO NOT** operate the wheelchair. Have the limit switch adjusted by an authorized Invacare dealer or qualified technician.

When using high back Captain's van seat, the motor/gearbox or motor **MUST** use the **MOST** rearward mounting holes on the suspension arm assembly.

1. Lift up on the release handle and move the back to the desired position.
2. Check the angle of the back relative to the seat frame.
3. If necessary, have the limit switch adjusted by an authorized dealer or qualified technician.

#### Lumbar

1. Rotate the knob on the side of the high back Captain's Van seat counterclockwise until the desired support is obtained.

NOTE: The knob only rotates counterclockwise.

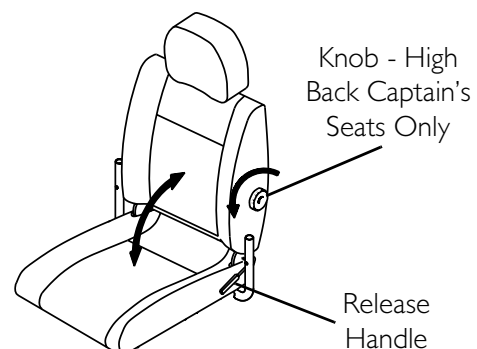


FIGURE 9.1 Adjusting Captain's Van Seat



# SECTION 10—BATTERIES

## Warnings for Handling and Replacing Batteries

### **WARNING**

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may occur.

Make sure power to the wheelchair is **OFF** before performing these procedures.

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

Invacare strongly recommends that battery installation and battery replacement **ALWAYS** be done by a qualified technician.

**22NF** batteries weigh 37 pounds each. Use proper lifting techniques (lift with your legs) to avoid injury.

**GP24** batteries weigh 51 pounds each. Use proper lifting techniques (lift with your legs) to avoid injury.

Use **22NF** or **GP24** batteries only. Failure to use the correct battery size and/or voltage may cause damage to your wheelchair and give you unsatisfactory performance.

**ALWAYS** use a battery lifting strap when lifting a battery. It is the most convenient method and assures that the battery acid will not spill. It also helps to prolong the life of the battery.

**DO NOT** tip the batteries. Keep the batteries in an upright position.

**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 personal injury or damage may occur.

When tightening the clamps, always use a box wrench. Pliers will “round off” the nuts. **NEVER** wiggle the battery terminal(s)/post(s) when tightening. The battery may become damaged.

The **POSITIVE (+) RED** battery cable must connect to the **POSITIVE (+)** battery terminal(s), otherwise serious damage will occur to the electrical system.

Install protective caps on **POSITIVE (+)** and **NEGATIVE (-)** battery terminals.

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

---

*NOTE: If there is battery acid in the bottom of the battery tray or on the sides of the battery(ies), apply baking soda to these areas to neutralize the battery acid. Before reinstalling the existing or new battery(ies), clean the baking soda from the battery tray or battery(ies) being sure to avoid contact with skin and eyes. Determine source of contamination. NEVER install/reinstall a battery with a cracked or otherwise damaged case.*

## Using the Proper Batteries

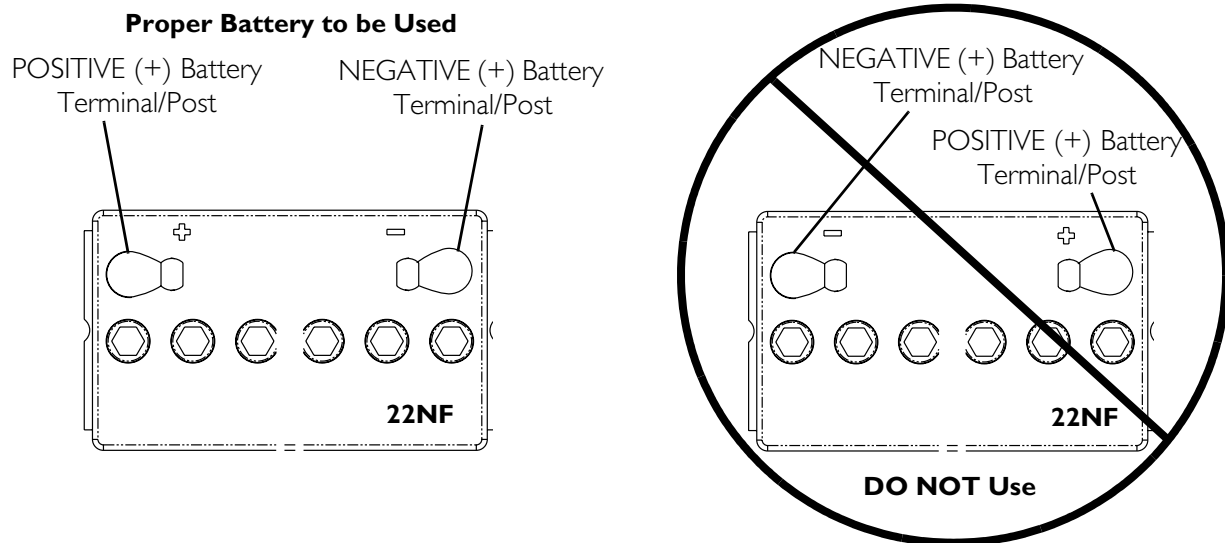
1. Place battery on ground/flat surface.
2. Visually inspect the battery to ensure the correct position of the POSITIVE and NEGATIVE terminals:

### **⚠ WARNING**

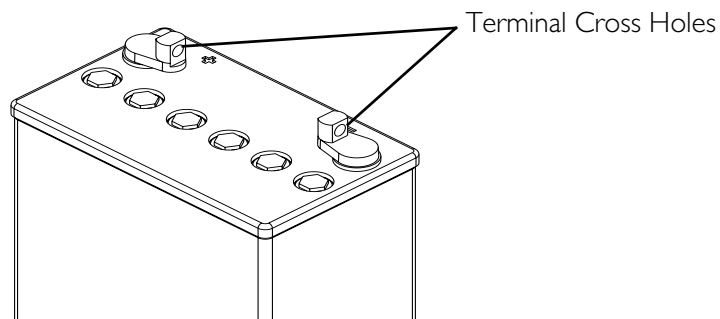
#### **FOR WHEELCHAIRS WITH 22NF BATTERIES**

**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 in Detail “A” below.**



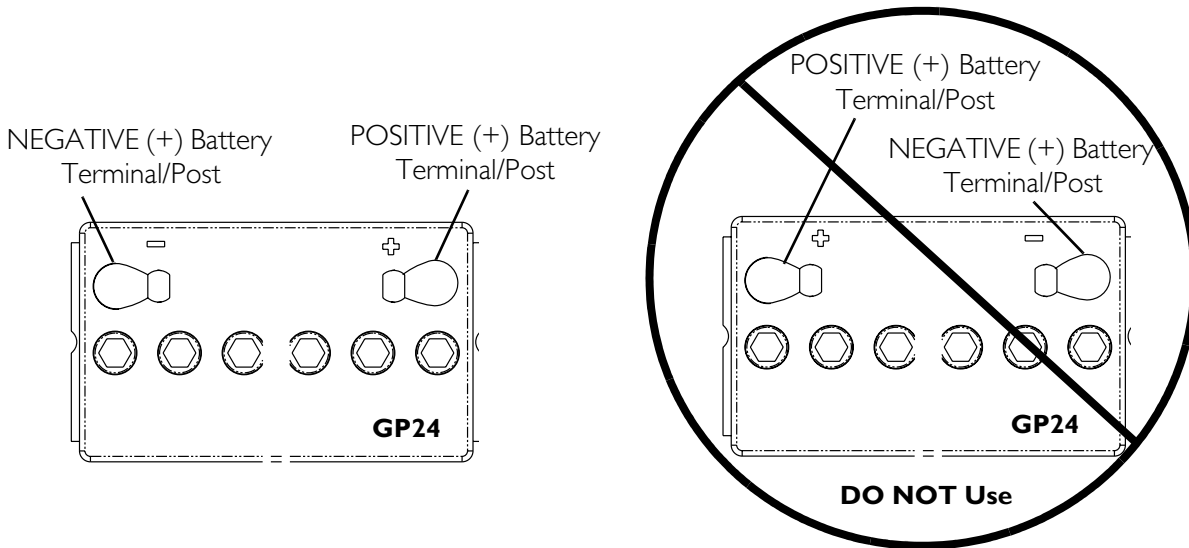
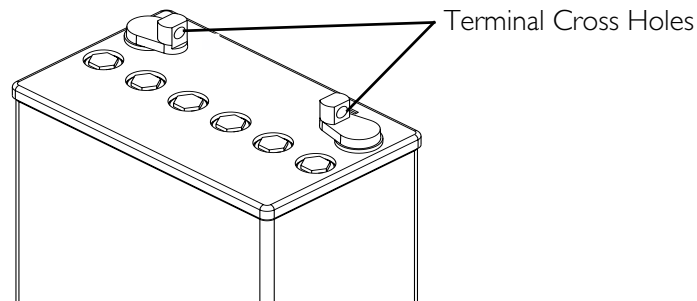
#### **DETAIL “A” - TERMINAL CROSS HOLES**



**⚠ WARNING****FOR WHEELCHAIRS THAT 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 in Detail “A” below.

**DETAIL “A” - TERMINAL CROSS HOLES****Installing/Removing Batteries Into/From Battery Boxes**

*NOTE: For this procedure, refer to FIGURE 10.1.*

*NOTE: To remove the battery(ies) from the battery box(es), reverse the following steps.*

*NOTE: Have the following tools available:*

- Battery Lifting Strap
- 1/2-inch (6 pt) Box Wrench

**⚠ WARNING**

**ALWAYS** use a battery lifting strap when lifting a battery. It is the most convenient method and assures that the battery acid will not spill. It also helps to prolong the life of the battery.

**DO NOT** tip the batteries. Keep the batteries in an upright position.

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.

**CAUTION**

Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.

*NOTE: If there is battery acid in the bottom or on the sides of the battery boxes or batteries, apply baking soda to these areas to neutralize the battery acid. Before reinstalling the new or existing batteries, clean the baking soda from the battery boxes or batteries.*

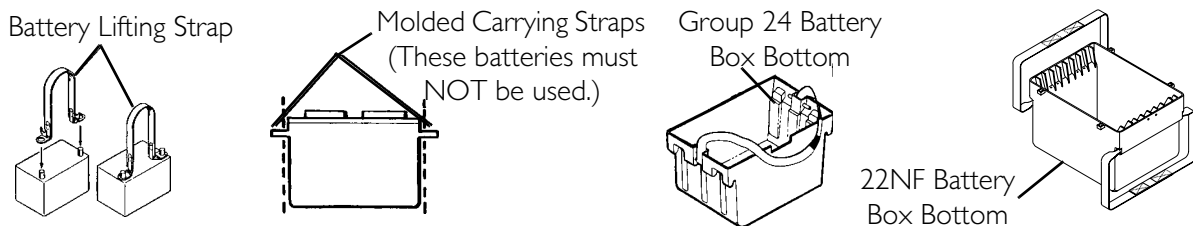
*NOTE: When securing battery lifting strap to battery, observe polarity markings located on the ends of the battery lifting strap, (+) side to POSITIVE (+) battery post and (-) side to NEGATIVE (-) battery post.*

1. If necessary, remove the battery box(es) from the wheelchair. Refer to one of the following procedures:
  - Removing/Installing Group 24 Battery Boxes on page 103.
  - Removing/Installing the 22NF Battery Box on page 108.
2. Disconnect battery cables. Refer to Disconnecting/Connecting Battery Cables on page 93 for either Group 24 batteries or 22NF batteries in a single battery box.
3. Secure battery lifting strap to battery terminal(s)/post(s) (FIGURE 10.1).

**CAUTION**

Some battery manufacturers mold a carrying strap and/or hold down flanges directly into the battery case. Batteries which interfere with the battery box cannot be used for these applications. Attempting to “wedge” a battery into a battery box may damage the box and/or the battery.

4. Remove batteries from battery box(es).



**FIGURE 10.1** Installing/Removing Batteries Into/From Battery Boxes

## Disconnecting/Connecting Battery Cables

### **⚠ WARNING**

**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 personal injury or damage may occur.

The use of rubber gloves and safety glasses is recommended when working with batteries.

When tightening the clamps, always use a box wrench. Pliers will “round off” the nuts. **NEVER** wiggle the battery terminal(s)/post(s) when tightening. The battery may become damaged.

The **POSITIVE (+) RED** battery cable **MUST** connect to the **POSITIVE (+)** battery terminal(s)/post(s), otherwise serious damage will occur to the electrical system.

### **Group 24 Batteries**

*NOTE: For this procedure, refer to FIGURE 10.2.*

#### **Disconnecting**

*NOTE: Perform this section on one battery and battery box at a time. Repeat section for other battery box.*

1. Lift up on battery box lid to expose underlying cables.
2. Peel back battery terminal caps to expose battery cable ends as follows:
  - A. RED battery terminal cap from RED battery cable.
  - B. BLACK battery terminal cap from BLACK battery cable.
3. Remove the locknut and mounting screw to disconnect BLACK battery cable from the NEGATIVE(-) battery terminal/post (Detail “A” of FIGURE 10.2)
4. Remove the locknut and fuse mounting screw to disconnect RED battery cable from the POSITIVE (+) battery post (Detail “A” of FIGURE 10.2).

#### **Connecting**

*NOTE: Perform this section on one battery and battery box at a time. Repeat section for other battery box.*

1. Position battery box top above battery as shown in FIGURE 10.2.
2. Peel back battery terminal caps to expose battery cable ends as follows:
  - A. RED battery terminal cap from RED battery cable.
  - B. BLACK battery terminal cap from BLACK battery cable.
3. Install the locknut and mounting screw to connect the BLACK battery cable to the NEGATIVE(-) battery terminal/post (Detail “A” of FIGURE 10.2).

4. Install the locknut and fuse mounting screw to connect the RED battery cable to the POSITIVE (+) battery post (Detail "A" of FIGURE 10.2).
5. Verify battery cables are correctly installed and securely tightened.

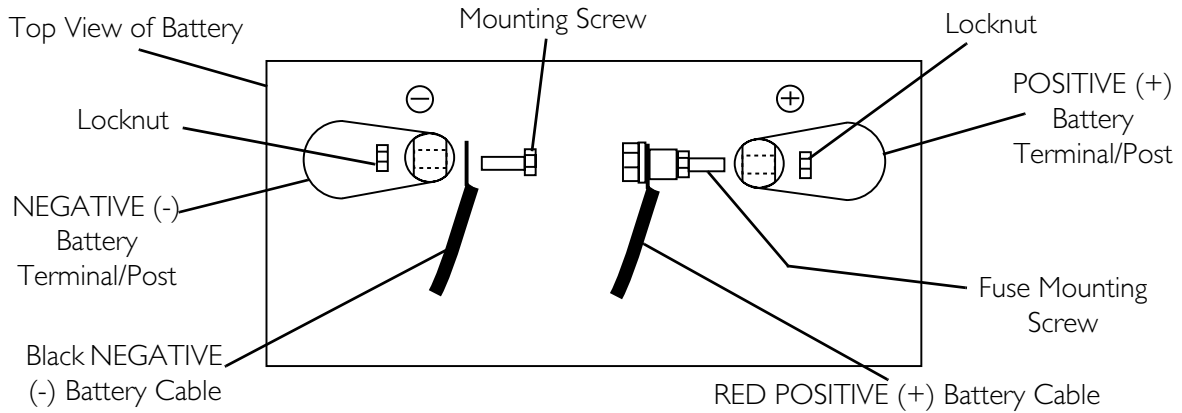
*NOTE: Cables will be crossed on one connector battery box top.*

6. Reposition terminal caps over battery post(s).
7. Install the battery box top(s).
8. Install the battery box(es) into the wheelchair. Refer to Removing/Installing Group 24 Battery Boxes on page 103.

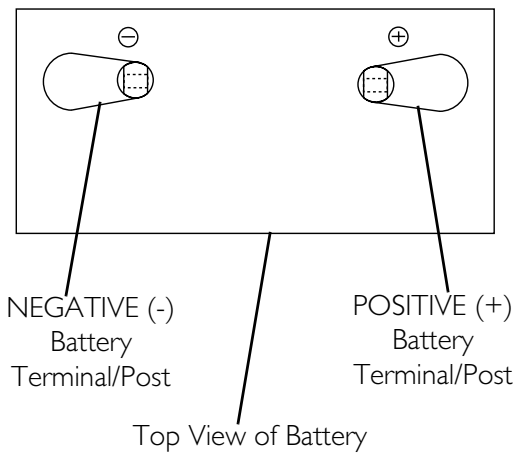
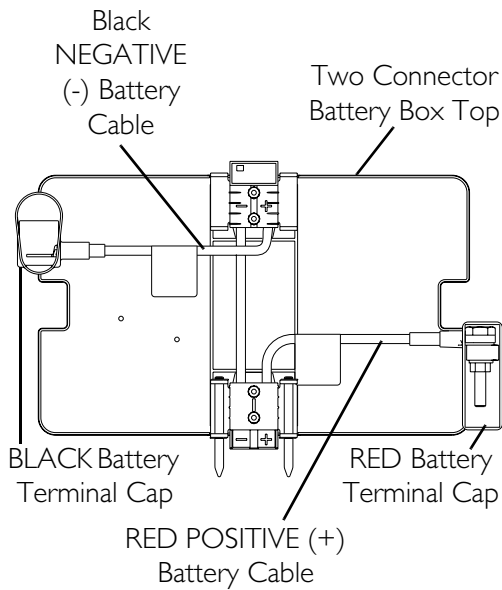
*NOTE: New Battery(ies) MUST be fully charged before using, otherwise the life of the battery(ies) will be reduced.*

9. If necessary, charge the battery(ies). Refer to Charging Batteries on page 98.

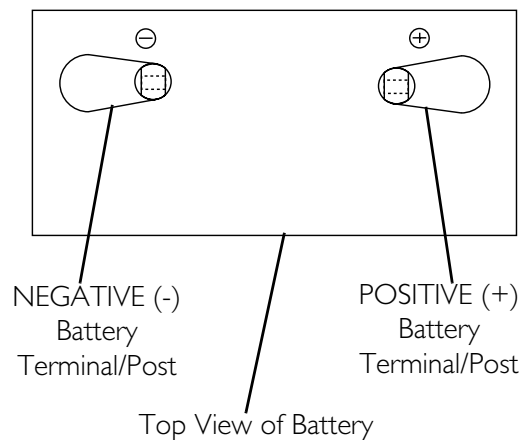
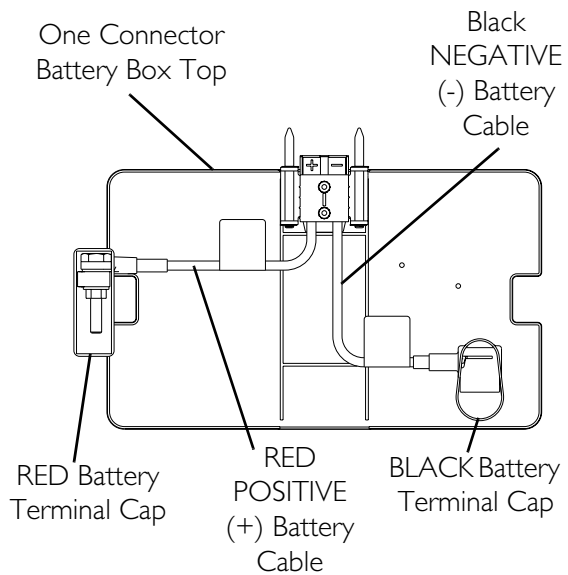
**DETAIL "A" - CONNECTING CABLES TO TERMINALS**



**Two Connector Battery Box**



**One Connector Battery Box**



**FIGURE 10.2** Disconnecting/Connecting Battery Cables - Group 24 Batteries

## **22NF Batteries in Single Battery Box**

*NOTE: For this procedure, refer to FIGURE 10.3.*

*NOTE: Note polarity of white battery cable (jumper) battery terminal ends.*

### **Disconnecting**

1. Remove battery terminal cap(s) from battery terminal(s) ends. Refer to Detail A" in FIGURE 10.3.
2. Disconnect WHITE battery cable (jumper) NEGATIVE (-) terminal end from NEGATIVE (-) battery terminal/post of front battery and disconnect POSITIVE (+) terminal end from POSITIVE (+) battery terminal/post of rear battery.
3. Disconnect NEGATIVE (-) BLACK battery cable of the battery box top from NEGATIVE (-) battery terminal/post of rear battery.
4. Disconnect POSITIVE (+) RED battery cable on battery box top from POSITIVE (+) battery terminal/post of front battery.

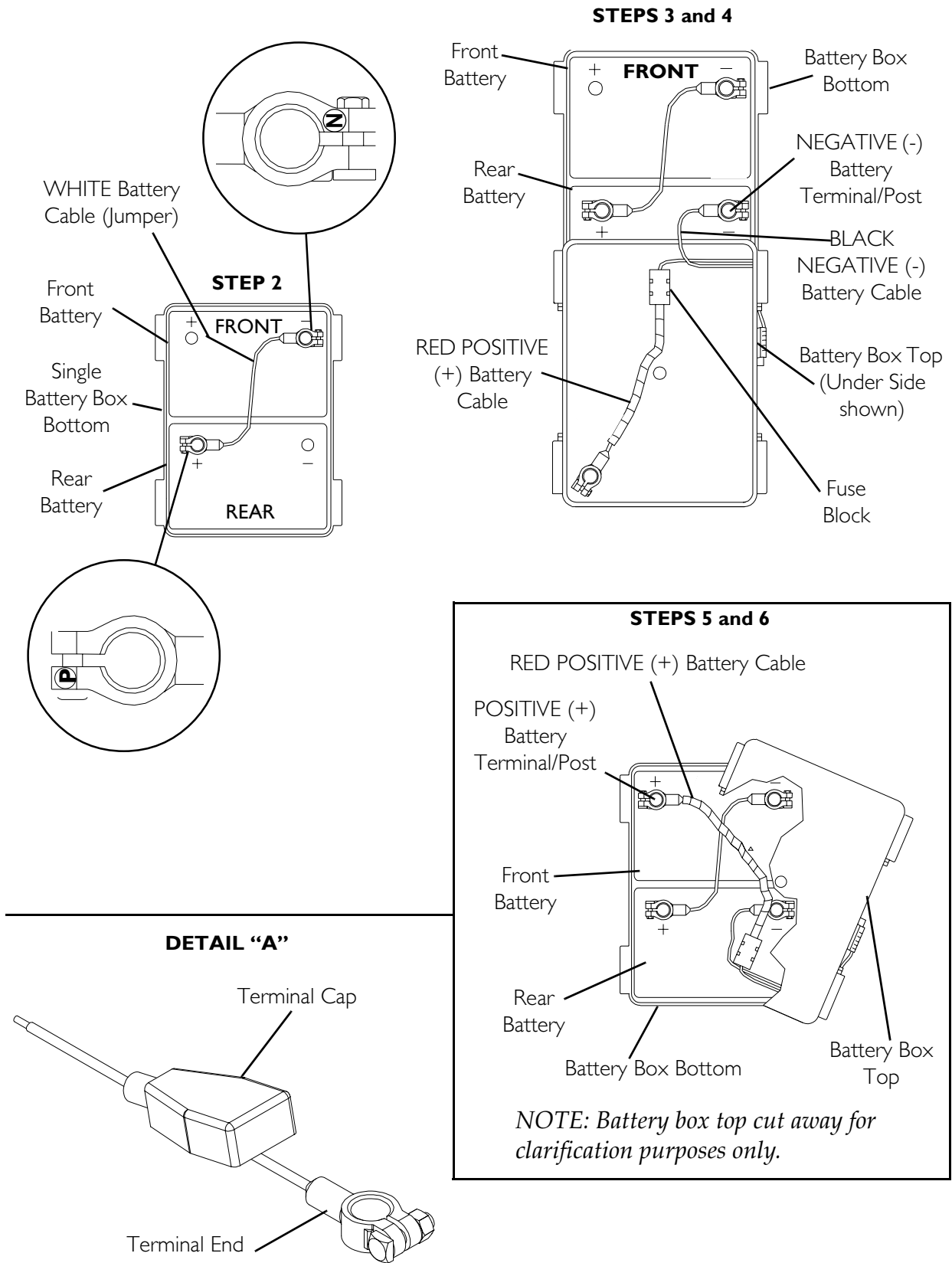
### **Connecting**

1. Remove battery terminal cap(s) from battery terminal(s) ends. Refer to Detail "A" in FIGURE 10.3.
2. Connect WHITE battery cable (jumper) NEGATIVE (-) terminal end to NEGATIVE (-) battery terminal/post of front battery and connect POSITIVE (+) terminal end to POSITIVE (+) battery terminal/post of rear battery.
3. Place battery top upside down on top of rear battery.
4. Connect NEGATIVE (-) BLACK battery cable of the battery box top to NEGATIVE (-) battery terminal/post of rear battery.
5. Position battery box top right side up and rotate outward toward right to expose POSITIVE (+) battery terminal/post of front battery.
6. Connect POSITIVE (+) RED battery cable on battery box top to POSITIVE (+) battery terminal/post of front battery.
7. Replace battery terminal cap(s) onto battery cable terminal end(s).
8. Rotate top toward left into position. Secure in place.
9. Install the battery box into the wheelchair. Refer to Removing/Installing the 22NF Battery Box on page 108.

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

10. If necessary, charge the battery(ies). Refer to Charging Batteries on page 98.





**FIGURE 10.3** Disconnecting/Connecting Battery Cables - 22NF Batteries in Single Battery Box

## When to Charge Batteries

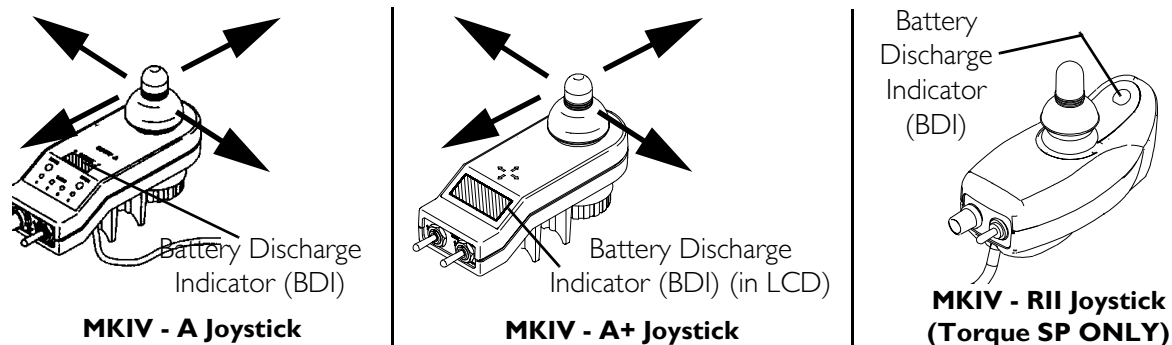
*NOTE: For this procedure, refer to FIGURE 10.4.*

### MKIV-A and MKIV-RII Joysticks

The Battery Discharge Indicator (BDI) is a bar graph display located on the MKIV joystick. It will keep you informed as to power availability. A visual warning is given before the power becomes too low to operate the wheelchair. At full charge the two Left segments and the farthest Right segment of the bar graph will be illuminated. As the battery becomes discharged, the farthest Right segment will progressively move to the Left until only the last two bars (Left) are illuminated. At this level the last two bars (Left) will start to Flash On and Off to indicate that the end user should charge the batteries as soon as possible.

### MKIV-A+ Joysticks

The left half of the second line on the LCD is the Battery Discharge Indicator (BDI). It provides information on the remaining charge in the batteries. At full charge solid blocks fill in all ten segments between E (Empty) and F (Full). As the battery becomes discharged, the farthest right segments will progressively disappear a half bar at a time until no segments appear between E and F. At this level the word RECHARGE will appear on the second line to indicate that the user should charge the batteries as soon as possible.



**FIGURE 10.4** When to Charge Batteries

## Charging Batteries

*NOTE: For this procedure, refer to FIGURE 10.5.*

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

### **⚠ WARNING**

**NEVER** attempt to recharge the batteries by attaching cables directly to the battery terminals or clamps. Always use the recharging plug located on the side of the wheelchair frame.

**DO NOT** attempt to recharge the batteries and operate the power wheelchair at the same time.

During use and charging, batteries may vent hydrogen gas, which is explosive in the right concentration with air.

---

**⚠ WARNING**

**DO NOT sit in wheelchair while charging batteries.**

---

**CAUTION**

**Always charge new batteries before initial use or battery life will be reduced.**

---

*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 5 to 9 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 stop charging 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.

---

**⚠ WARNING**

**NEVER leave the charger unattended when the charger circuit breaker is tripping on and off. A condition between the battery charger and batteries exists. Contact an Invacare dealer.**

---

*NOTE: If performing the charging sections 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 instructions.*

*NOTE: Have the following tools available:*

- Battery Charger
- Extension Cord\*

*\*NOTE: 3-prong plug, 15 ampere current rating; industrial type.*

1. Perform one of the following:

- Wheelchairs Equipped with MCC-MARK IV Joystick - Attach the battery charger connector to the charger cable/battery harness.

*NOTE: The battery charger connector is factory installed on the right side of the wheelchair. It can be positioned on either side of the wheelchair for user convenience.*

*NOTE: For Recliners Only - If the wheelchair is a recliner, the battery charger connector as well as the limit switch, are factory set on the right side of the wheelchair. However, they can be positioned on either side for user convenience. The limit switch MUST be positioned on the same side as the battery charger connector.*

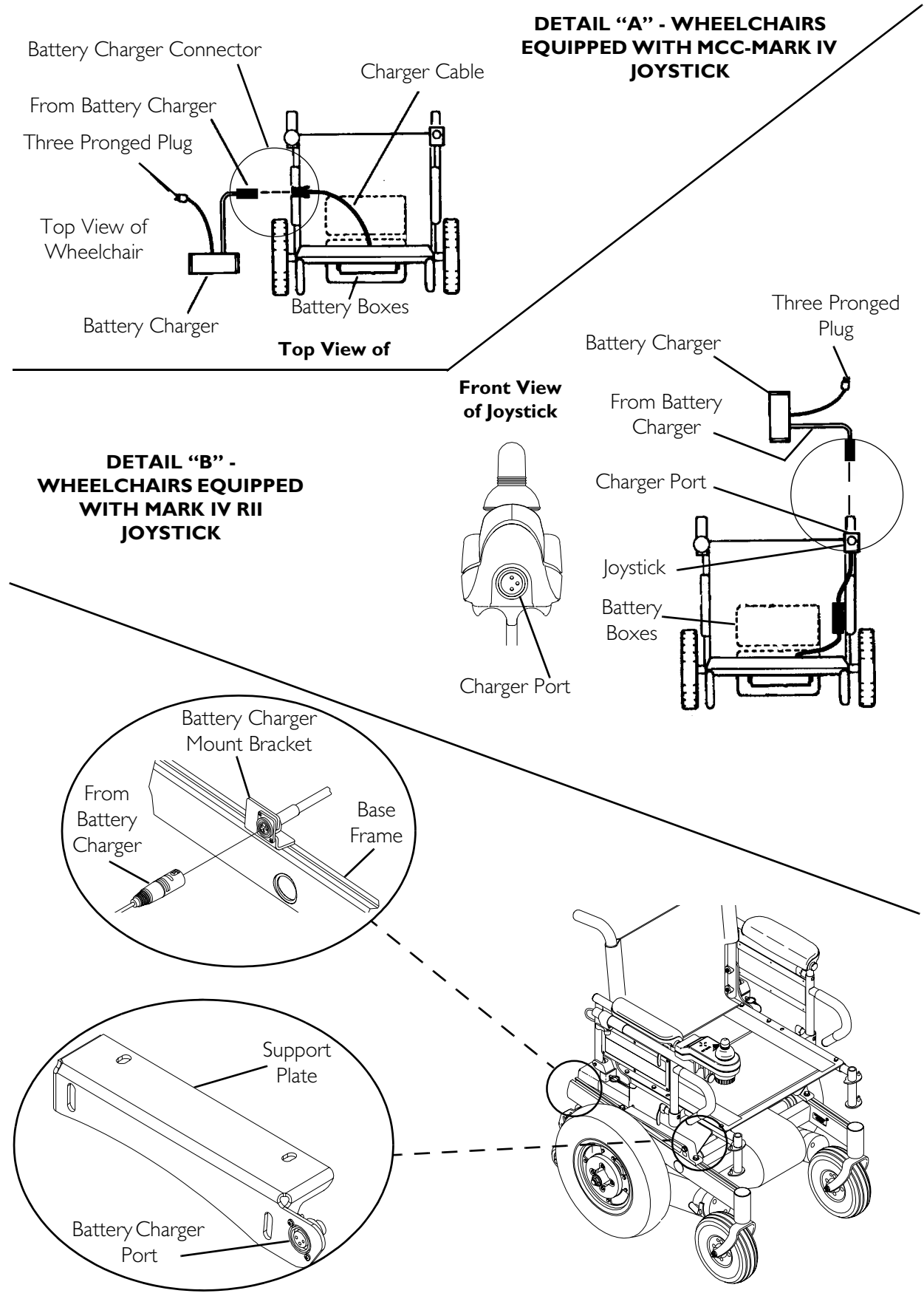
- Torque SP Equipped with MARK IV RII Joystick- Attach the battery charger connector to the charger port on the Front of the joystick.

2. Plug the charger's AC power cord, or extension, into the grounded 120 VAC wall outlet.

3. Wait until charging is complete.

*NOTE: 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 10.5** Charging Batteries

## Replacing Batteries

*NOTE: Invacare recommends that both batteries be replaced if one battery is defective.*

### Recommended Battery Types

#### **⚠ WARNING**

**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: Both battery sizes are deep cycle batteries.*

*NOTE: Charge batteries daily. It is critical not to let them run low at any time.*

1. Remove the battery box(es) from the wheelchair. Refer to one of the following procedures:
  - Removing/Installing Group 24 Battery Boxes on page 103.
  - Removing/Installing the 22NF Battery Box on page 108.
2. Remove existing batteries from the battery box(es). Refer to Installing/Removing Batteries Into/From Battery Boxes on page 91.
3. Clean the new battery terminals. Refer to Cleaning Battery Terminals on page 103.
4. Install the new batteries into the battery box(es). Refer to Installing/Removing Batteries Into/From Battery Boxes on page 91.

#### **Battery Requirements and Weight Limitations**

MODEL	WEIGHT LIMITATION	MOTOR	BATTERY
<b>ARROW</b>	Up to 400 lbs	GB	Group 24
<b>TORQUE SP</b>	251-300 lbs	4 Pole Motor	*22NF
	301-400 lbs	4 Pole Motor	Group 24
	Up to 400 lbs	GB	Group 24
<b>RANGER</b>	Up to 300 lbs	4 Pole Motor	Group 24
	Up to 300 lbs	GB	Group 24

*\*NOTE: Two batteries inside one battery box.*

*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.*

---

## Cleaning Battery Terminals

---

### **⚠ WARNING**

Most batteries are not sold with instructions. However, warnings are frequently noted on the cell caps. Read them carefully.

**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.

---

1. Examine battery clamps and terminals for corrosion.
2. Verify the plastic caps are in place over battery cell holes.
3. Clean terminals and inside battery clamps by using a battery cleaning tool, wire brush, or medium grade sand paper.

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

4. Carefully dust off all metal particles.

## Removing/Installing Group 24 Battery Boxes

### Wheelchairs without Vent Tray

---

### **⚠ WARNING**

Each battery weighs 51 pounds. Use proper lifting techniques (lift with your legs) to avoid injury.

---

### **CAUTION**

Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.

---

*NOTE: For this procedure, refer to FIGURE 10.6.*

### Removing

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. Wheelchairs with TRRO or TRBKTS Only - Perform the following steps:
  - A. Remove the three bolts and washers that secure the front battery retainer bracket (Detail “A”).
  - B. Remove the three short hex screws that secure the top battery retainer bracket to the lower battery retainer bracket.
  - C. Remove the four long hex screws and washers that secure the top battery retainer bracket to the rear of the wheelchair frame (Detail “B”).
  - D. Remove the top battery retainer bracket.
  - E. Remove the lower battery retainer bracket.
4. Rotate the levers of the battery retainer assembly to the unlocked position.
5. Lift battery retainer assembly up off the mounting screws that secure the shocks to the base frame.

*NOTE: For GB motors, ensure that the motor lock levers are in the engaged (drive) position. Refer to Motor Locks/Wheel Locks/Forks on page 110.*

6. Slide one connector battery box along the sub-frame and remove from the wheelchair.
7. Slide the two connector battery box along the sub-frame and remove from the wheelchair.

### **Installing**

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. Secure the battery box carrying strap to the lid of the two connector battery box.
4. Place two connector battery box onto the battery sub-frame assembly with guide pins facing the inside of the wheelchair.
5. Slide the two connector battery box along the sub-frame until its guide pins are engaged in the sub-frame connector.

*NOTE: Visually inspect to ensure the connection is properly made. Connectors MUST be fully engaged.*

*NOTE: Make certain that the battery box carrying strap is positioned on top of the battery box and will not interfere with the one battery box guide pins when engaging the connector on the one battery box lid.*

6. Secure the battery box carrying strap to the lid of the one connector battery box.
7. Place one connector battery box onto battery sub-frame.
8. Slide one connector battery box along the sub-frame until its guide pins are engaged in the connector of the two connector battery box.

*NOTE: Visually inspect to ensure the connection is properly made. Connectors MUST be fully engaged.*



9. Place the battery retainer assembly on head portion of the mounting screws that secure the shocks to the base frame.

---

**⚠ WARNING**

**Wheelchairs with TRRO or TRBKTS Only - Battery support brackets MUST be installed at all times. Otherwise, the wheelchair will not be WC/19 compliant.**

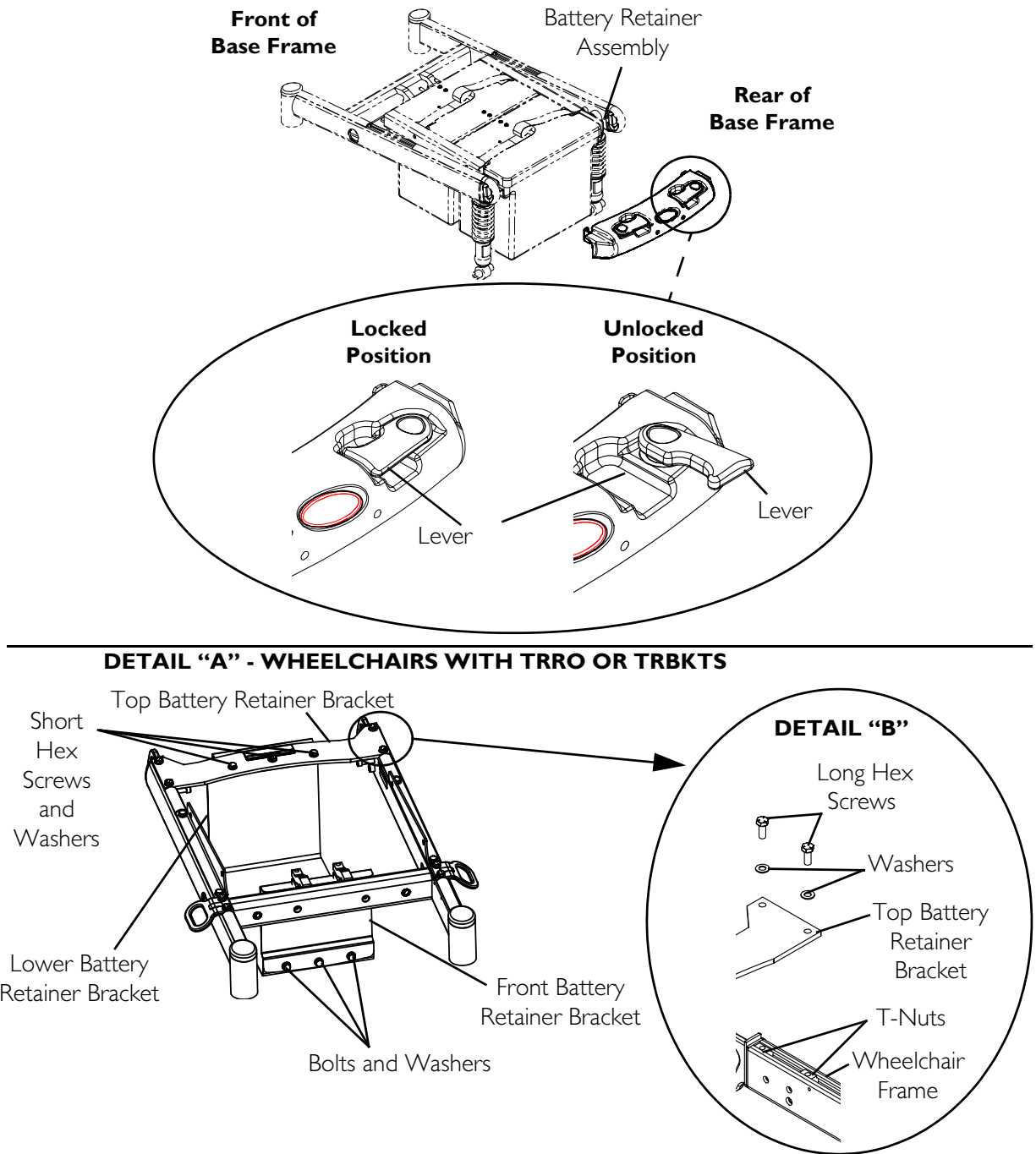
---

**CAUTION**

**The battery retainer assembly MUST be locked securely to hold the battery boxes firmly in place or battery box connectors may be damaged causing erratic wheelchair operation.**

---

10. Rotate the levers of the battery retainer assembly to the locked position.
11. Wheelchairs with TRRO or TRBKTS Only - Perform the following steps:
  - A. Position the lower battery retainer bracket as shown in Detail "A" of FIGURE 10.6.
  - B. Install the top battery retainer bracket onto the wheelchair frame using four long hex screws and washers. Torque to 13 ft-lbs.
  - C. Secure the top battery retainer bracket to the lower battery retainer bracket using three short hex screws and washers. Torque to 13 ft-lbs.
  - D. Install the front battery retainer bracket using three bolts and washers. Torque to 13 ft-lbs.



**FIGURE 10.6** Removing/Installing Group 24 Battery Boxes - Wheelchairs without Vent Tray

## Wheelchairs with Vent Tray

### ⚠ WARNING

Each battery weighs 51 pounds. Use proper lifting techniques (lift with your legs) to avoid injury.

### CAUTION

Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.

*NOTE: For this procedure, refer to FIGURE 10.7.*

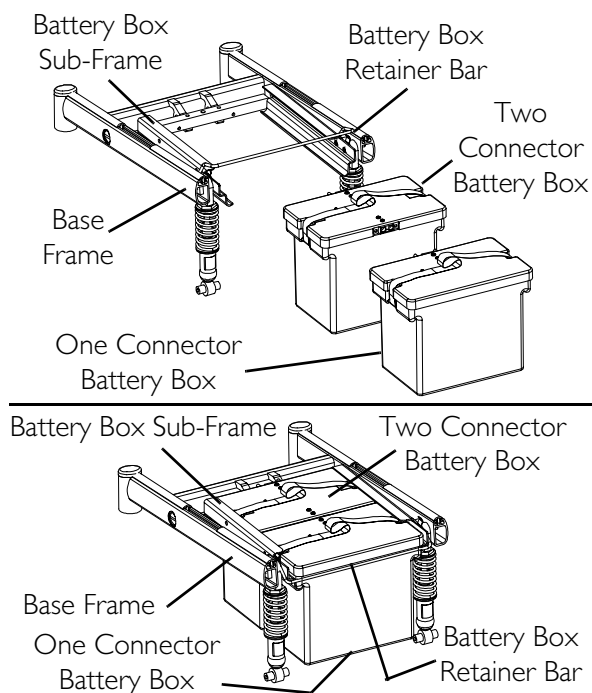
### Removing

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. Pull the battery box retainer Up over the end of the one connector battery box.
4. Slide one connector battery box along the sub-frame and remove from the wheelchair.
5. Slide the two connector battery box along the sub-frame and remove from the wheelchair.

### Installing

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. Secure the battery box carrying strap to the lid of the two connector battery box.
4. Place two connector battery box onto the battery sub-frame assembly with guide pins facing the inside of the wheelchair.
5. Slide the two connector battery box along the sub-frame until its guide pins are engaged in the sub-frame connector.

*NOTE: Visually inspect to ensure the connection is properly made. Connectors MUST be fully engaged.*



**FIGURE 10.7** Wheelchairs with Vent Tray

*NOTE: Make certain that the battery box carrying strap is positioned on top of the battery box and will not interfere with the one battery box guide pins when engaging the connector on the one battery box lid.*

6. Secure the battery box carrying strap to the lid of the one connector battery box.
7. Place one connector battery box onto battery sub-frame.
8. Slide one connector battery box along the sub-frame until its guide pins are engaged in the connector of the two connector battery box.

*NOTE: Visually inspect to ensure the connection is properly made. Connectors **MUST** be fully engaged.*

### **CAUTION**

**The battery box retainer **MUST** be locked securely to hold the battery boxes firmly in place or battery box connectors may be damaged causing erratic wheelchair operation.**

9. Pull the battery box retainer down over the end of the one connector battery box until it is securely clipped (locked) into place.

## Removing/Installing the 22NF Battery Box

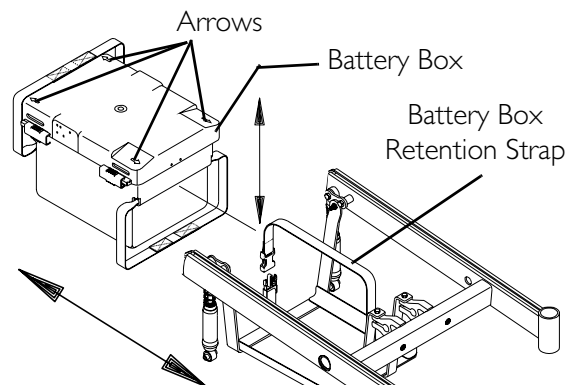
*NOTE: For this procedure, refer to FIGURE 10.8.*

*NOTE: To install the battery box onto the wheelchair, reverse the following steps.*

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. Disconnect the battery cable from the outside of the battery box.
4. Disconnect the battery box retention strap.
5. Remove the battery box.
6. Slide the four clips that secure the battery box cover to the battery box to the Open position.

*NOTE: Arrows on the battery box cover point to the open position.*

7. Remove battery box cover from the battery box.



**FIGURE 10.8** Removing/Installing the 22NF Battery Box

# SECTION 11—RETAINING STRAP

## ⚠ WARNING

After ANY adjustments, repair or service and BEFORE use, make sure all attaching hardware is tightened securely - otherwise injury or damage may occur.

## Replacing Battery Box Retaining Strap - 22NF Battery Base Frames

NOTE: For this procedure, refer to FIGURE 11.1.

1. Remove the battery box. Refer to [Removing/Installing the 22NF Battery Box](#) on page 108.

## ⚠ WARNING

The retaining strap **MUST** be fed through the adjustable end of the battery box retaining strap clip as shown in FIGURE 11.1.

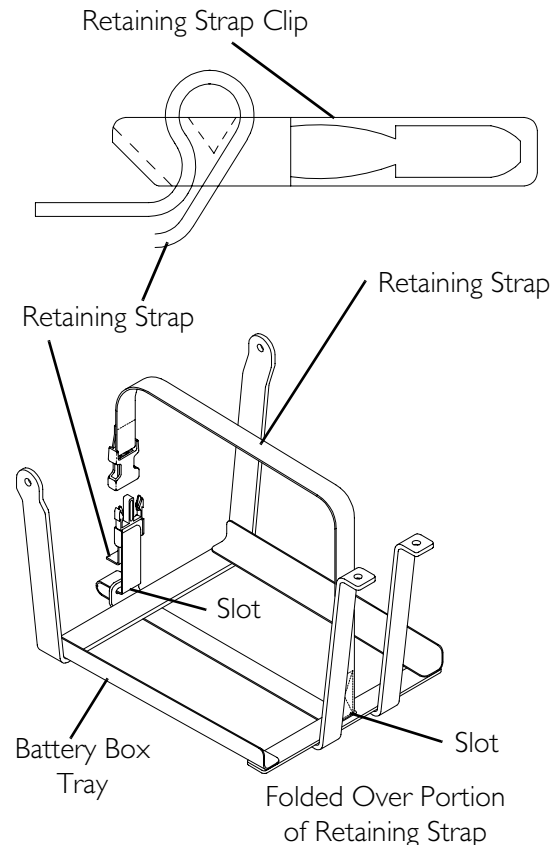
2. Feed the battery box retaining strap through the adjustable end of the battery box retaining strap clip.
3. Feed the battery box retaining strap through the slots in the battery box tray.

NOTE: The folded over portion of the retaining strap stops at the slot. DO NOT try to force the folded over section through the slot.

4. Install the new battery box retaining strap by reversing STEPS 2 and 3.
5. Reinstall the battery box. Refer to [Removing/Installing the 22NF Battery Box](#) on page 108.

## ⚠ WARNING

The Battery Box Retaining Strap **MUST** be fastened securely in place before using the wheelchair.



NOTE: Tray shown by itself for clarity. There is no need to remove the tray from the wheelchair if the strap is being replaced.

**FIGURE 11.1** Replacing Battery Box Retaining Strap - 22NF Battery Base Frames

# SECTION 12—MOTOR LOCKS/ WHEEL LOCKS/FORKS

---

## **⚠ WARNING**

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may occur.

---

## **CAUTION**

As with any vehicle, the wheels and tires should be checked periodically for cracks and wear, and should be replaced.

---

## Disengaging/Engaging Motor Lock Levers

---

### **⚠ WARNING**

**DO NOT** engage or disengage motor locks until the power is in the **OFF** position.

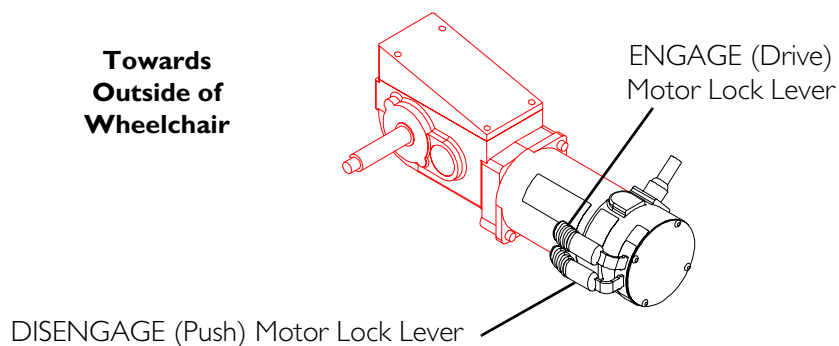
---

*NOTE: For this procedure, refer to FIGURE 12.1.*

*NOTE: Motor lock disengagement/engagement allows free wheeling or joystick controlled operation. Free wheeling allows an assistant to maneuver the wheelchair without power.*

### **4 Pole Motors**

1. Perform one of the following:
  - Disengage (Push) - Push motor lock levers downward.
  - Engage (Drive) - Pull motor lock levers upward.



**FIGURE 12.1** Disengaging/Engaging Motor Lock Levers

## GB Motors

NOTE: For this procedure, refer to FIGURE 12.2.

1. Perform one of the following (Detail "B"):
  - Engage (Drive) - Pull motor lock lever into Up position.
  - Disengage (Push) - Push motor lock lever into Down position.

NOTE: Effort to engage/disengage motor lock levers is 25 to 30 pounds\*.

\*NOTE: Force to operate motor lock lever exceeds ANSI/RESNA WC/VOL2-1998 requirements for section 14.7 paragraph 7.2d.

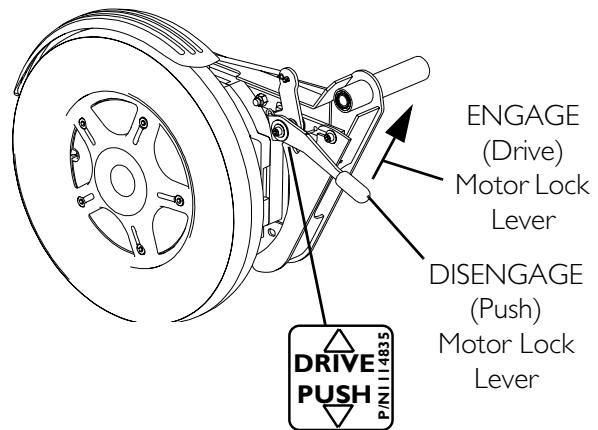


FIGURE 12.2 GB Motors

## Using Optional Wheel Hubs

NOTE: For this procedure, refer to FIGURE 12.3.

NOTE: Wheel hubs are not available on Heavy Duty GB motors.

1. Perform one of the following:
  - Disengage (Free Wheel) - Pull OUT on engagement knob and rotate engagement knob approximately 1/6-turn until the pins on the engagement knob fall into the free wheel detents on the wheel hub (Detail "A").

NOTE: If the pins on the engagement knob are not in the free wheel detents, the engagement knobs can engage the motors unexpectedly while the wheelchair is being pushed.

  - Engage (Drive) - Pull OUT on engagement knob and rotate engagement knob approximately 1/6-turn until the pins on the engagement knob fall into the holes in the wheel hub and axle sleeve. Gently rock the wheelchair until the engagement knob snaps into place (Detail "B").

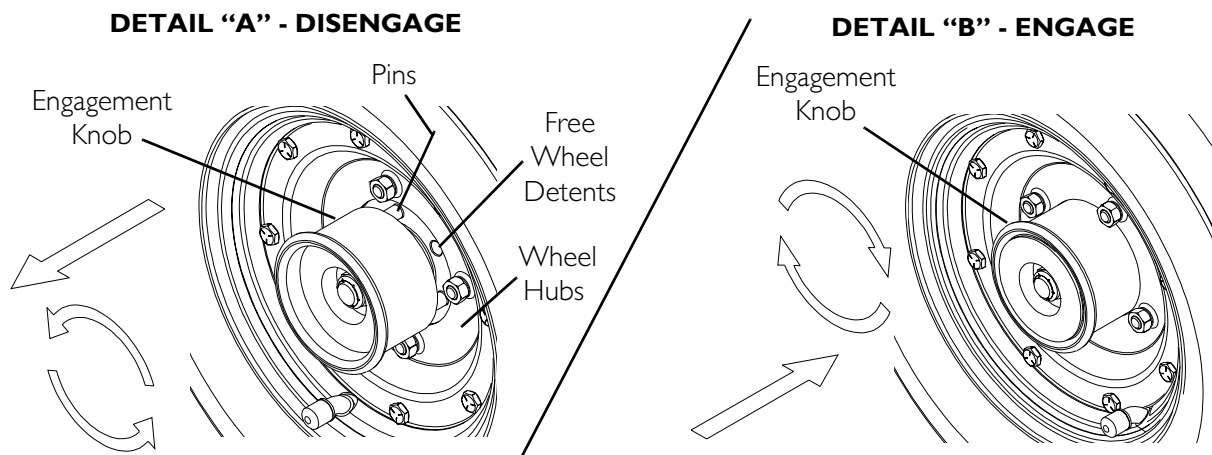


FIGURE 12.3 Using Optional Wheel Hubs

## Installing Wheel Locks

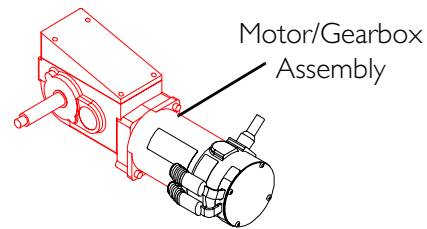
### ⚠ WARNING

Inasmuch as **Wheel Locks** are an option on this wheelchair - (You may order with or without the wheel locks.) - transfer to and from the wheelchair in the presence of a qualified healthcare professional to determine individual safety limits. Invacare strongly recommends ordering the wheel locks as an additional safeguard for the wheelchair user.

### Wheel Lock Installation Identification

NOTE: For this procedure, refer to FIGURE 12.4.

- Examine the motor and perform one of the following:
  - Motor assembly Resembles FIGURE 12.4 - Refer to [Installing Wheel Locks for Motor/Gearbox Assemblies](#) on page 112.
  - Motor Assembly Does Not Resemble FIGURE 12.4 - Refer to [Installing Wheel Locks for GB Motors](#) on page 113.



**FIGURE 12.4** Wheel Lock Installation Identification

### Installing Wheel Locks for Motor/Gearbox Assemblies

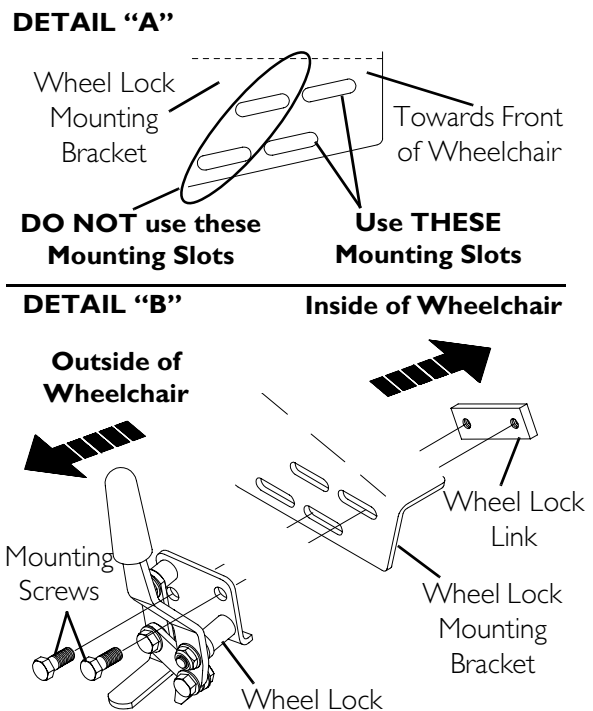
NOTE: For this procedure, refer to FIGURE 12.5.

NOTE: Refer to Detail "B" in FIGURE 12.5 for proper positioning of wheel locks.

- Position the wheel lock on the outside of the wheel lock mounting bracket and the wheel lock link on the inside of the wheel lock bracket.
- Loosely assemble the wheel lock and wheel lock link to the wheel lock mounting bracket with the two mounting screws provided.

NOTE: The two mounting screws will screw into the wheel lock link.

- Repeat STEPS 1-2 for the opposite wheel lock.
- Adjust the wheel locks. Refer to [Adjusting Wheel Locks](#) on page 113.



**FIGURE 12.5** Installing Wheel Locks for Motor/Gearbox Assemblies



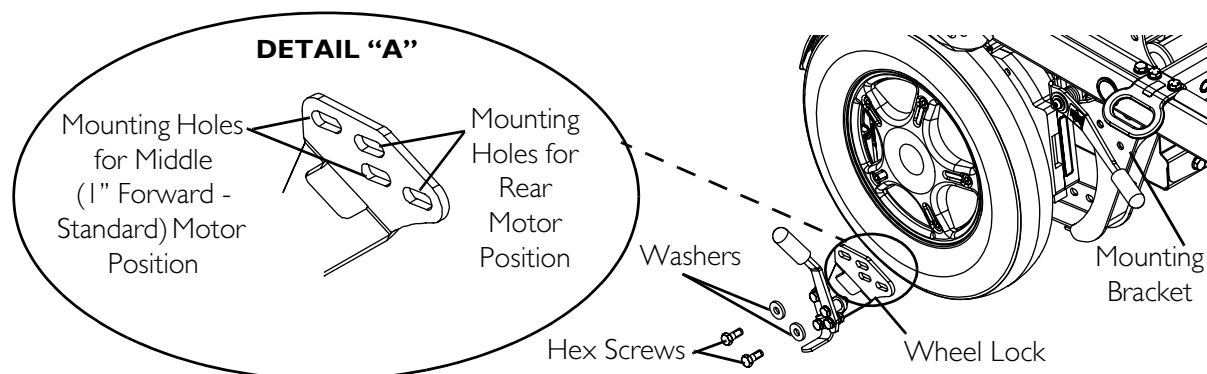
## Installing Wheel Locks for GB Motors

*NOTE: For this procedure, refer to FIGURE 12.6.*

1. See Detail "A" to determine the correct mounting position for the wheel lock based on the motor mounting position.

*NOTE: Refer to Percentage of Weight Distribution on page 34 for a description of the motor mounting positions.*

2. Loosely install the wheel lock onto the mounting bracket using the mounting holes determined in STEP 1 and two hex screws and two washers.
3. Repeat STEP 2 for the opposite wheel lock.
4. Adjust the wheel locks. Refer to Adjusting Wheel Locks on page 113.

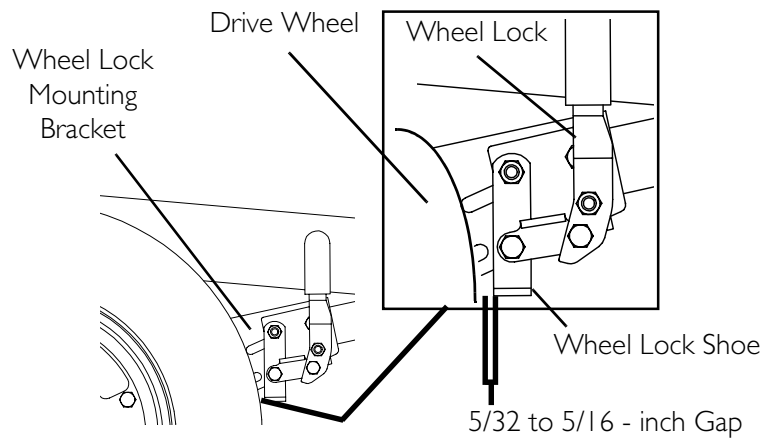


**FIGURE 12.6** Installing Wheel Locks for GB Motors

## Adjusting Wheel Locks

*NOTE: For this procedure, refer to FIGURE 12.7.*

1. Make sure wheel lock is disengaged from drive wheel.
2. Measure distance between the Wheel Lock Shoe and the Drive Wheel.
3. Loosen the two hex screws securing the wheel lock to the mounting bracket.
4. Slide the wheel lock along the slots until the measurement is between 5/32 and 5/16-inches. Securely tighten mounting screws.
5. Repeat STEPS 1-3 for the opposite wheel lock.
6. Disengage motor locks. Refer to Disengaging/Engaging Motor Lock Levers on page 110.
7. Engage the wheel locks and push against the wheelchair to determine if the wheel locks engage the drive wheels enough to hold the wheelchair.
8. Repeat STEPS 2-7 until the wheel locks engage the drive wheels enough to hold the wheelchair.
9. Engage motor locks. Refer to Disengaging/Engaging Motor Lock Levers on page 110.



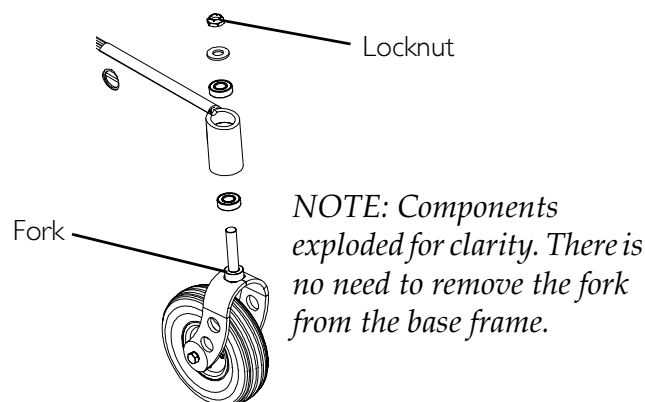
*NOTE: Illustration depicts wheel lock for motor/gearbox assembly.*

**FIGURE 12.7** Adjusting Wheel Locks

## Adjusting Forks

*NOTE: For this procedure, refer to FIGURE 12.8.*

1. Remove the dust cover (not shown) from the caster headtube.
2. To properly tighten caster journal system and guard against flutter, perform the following check:
  - A. Tip back the wheelchair to floor.
  - B. Pivot both forks and casters to top of their arc simultaneously.
  - C. Let casters drop to bottom of arc (wheels should swing once to one-side, then immediately rest in a straight downward position).
  - D. Adjust locknuts according to freedom of caster swing.
3. Test wheelchair for maneuverability.
4. Readjust locknuts if necessary, and repeat STEPS 1-3 until correct.
5. Snap dust cover into the caster headtube.



**FIGURE 12.8** Adjusting Forks

# SECTION 13—ELECTRONICS

## ⚠ WARNING

After ANY adjustments, repair or service and BEFORE use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

## Preparing MKIV Joystick for Use

NOTE: For this procedure, refer to FIGURE 13.1.

NOTE: The MKIV joystick is factory installed on the right side of the wheelchair. To reposition the MKIV joystick onto the left side of the wheelchair, refer to [Repositioning MKIV Joystick](#) on page 115.

1. Turn the adjustment lock lever to release the adjustment lock from joystick mounting tube.
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.

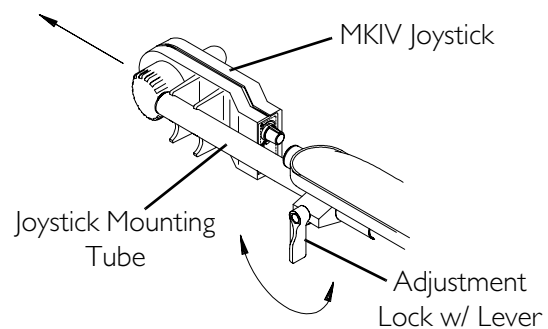


FIGURE 13.1 Preparing MKIV Joystick for Use

## Repositioning MKIV Joystick

NOTE: For this procedure, refer to FIGURE 13.2.

1. Turn the adjustment lock lever to release the joystick mounting tube from the mounting bracket.
2. Remove the joystick from the wheelchair.
3. Remove the three hex screws that secure the both halves of the mounting bracket to the arm tube.
4. Reposition mounting bracket on opposite arm tube ensuring the threaded plate of the mounting bracket is on the inside of the arm tube as shown in FIGURE 13.2.
5. Using the three hex mounting screws and washers, secure both halves of the mounting bracket to the arm tube.
6. Slide the 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.

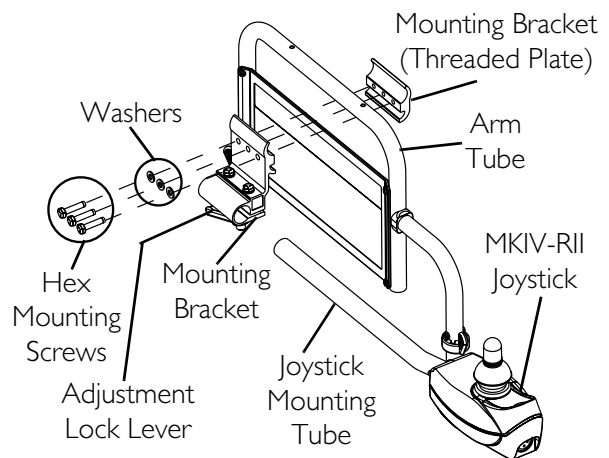


FIGURE 13.2 Repositioning MKIV Joystick

# SECTION 14—RECLINER

## ⚠ WARNING

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

**NEVER** operate the wheelchair while in any recline position over 105° relative to the seat frame. If the limit switch does not stop the wheelchair from operating in a recline position greater than 105° relative to the seat frame, **DO NOT** operate the wheelchair. Have the limit switch adjusted by a qualified technician.

Both gas cylinders **MUST** be operational and adjusted properly **BEFORE** using the recliner. **DO NOT** operate the recliner option if only one of the gas cylinders is operational or adjusted properly.

When using the recliner option, the motor/gearbox or motor **MUST** be mounted to the **MOST** rearward mounting holes on the suspension arm assembly.

### TO HEALTHCARE PROFESSIONALS/ASSISTANTS:

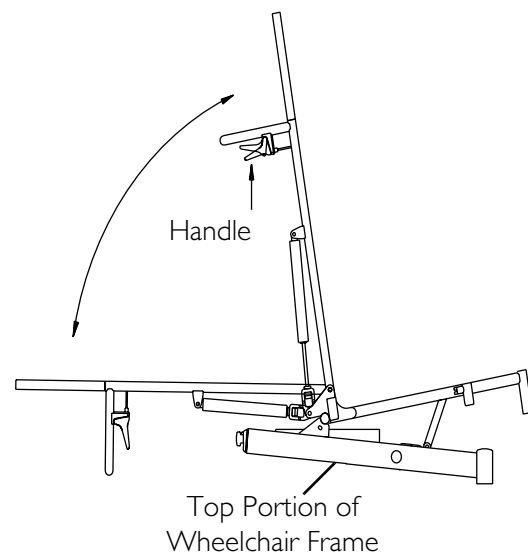
Make sure the occupant of the wheelchair is properly positioned.

When returning the occupant of the wheelchair to the full upright position, more body strength will be required for approximately the last twenty degrees of incline (reverse recline). Make sure to use proper body mechanics (use your legs) or seek assistance if necessary to avoid injury.

## Recliner Operation

*NOTE: For this procedure, refer to FIGURE 14.1.*

1. Make sure the wheelchair is on a level surface.
2. Inform the occupant of the wheelchair that the wheelchair is about to be reclined.
3. Stand behind the wheelchair and grasp both back canes firmly.
4. Pull up on the handles of the recliner cable assemblies to release the gas cylinders.
5. Slowly, push down on the back canes while squeezing the handles of the recliner cable assemblies in a continuous motion.
6. When the back reaches the desired angle, slowly let go of the handles of the recliner cable assemblies.
7. To return the back to the full upright position, reverse the above steps keeping in mind proper body mechanics.



**FIGURE 14.1** Recliner Operation

## Replacing Back or Headrest Upholstery

*NOTE: For this procedure, refer to FIGURE 14.2.*

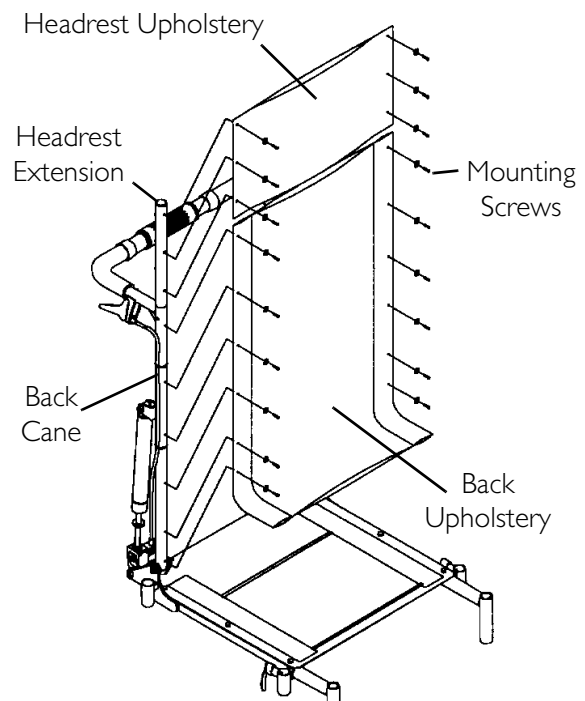
### Replacing Back Upholstery

1. Remove the ten or twelve mounting screws (depending on back height) that secure the back upholstery to the back canes.
2. Remove existing back upholstery from back canes.
3. Install the new back upholstery onto the back canes.
4. Install the ten or twelve mounting screws (depending on back height) that secure the back upholstery to the recliner back canes.
5. Adjust the back upholstery to the desired tautness. Refer to [Adjusting Back or Headrest Upholstery](#) on page 118.

*NOTE: Changing the back upholstery height must be performed by an authorized dealer or qualified technician.*

### Replacing Headrest Upholstery

1. Remove the six mounting screws that secure the headrest upholstery to the headrest extensions.
2. Remove the existing headrest upholstery from the headrest extensions.
3. Install the new headrest upholstery onto the headrest extensions.
4. Install the six mounting screws that secure the headrest upholstery to the headrest extensions.
5. Adjust the headrest upholstery to the desired tautness. Refer to [Adjusting Back or Headrest Upholstery](#) on page 118.

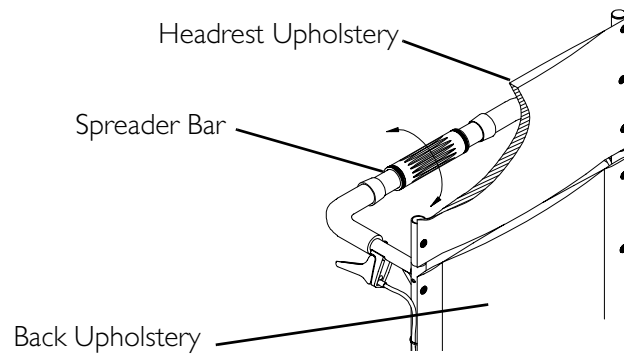


**FIGURE 14.2** Replacing Headrest Upholstery

## Adjusting Back or Headrest Upholstery

*NOTE: For this procedure, refer to FIGURE 14.3.*

1. Rotate the spreader bar either:
  - Counterclockwise (away from back upholstery) to loosen back/headrest upholstery.
  - Clockwise (towards back upholstery) to tighten back/headrest upholstery.



**FIGURE 14.3** Adjusting Back or Headrest Upholstery

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# SECTION 15—VENTILATOR TRAY

---

## **⚠ WARNING**

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may occur.

Before adjusting, repairing or servicing the seating system, **ALWAYS** turn the wheelchair power **OFF**, otherwise, injury or damage may result.

Pinch points exist between seat and base frames. Use caution, otherwise injury may occur.

---

## Using the Optional Ventilator Tray

---

### **⚠ WARNING**

Maximum weight capacity for the vent tray is 40 lbs ± 20%. **DO NOT** exceed weight capacity for vent tray - otherwise, injury or damage may occur.

Reduced tilt/recline limits apply. See the electronics manual listed in Reference Documents on page 2 of this manual.

---

### **CAUTION**

This ventilator tray was designed to hold a ventilator that is approximately 13 inches long, 14½ inches wide, and 14 inches high. Use of ventilators larger than the above specifications may result in damage to the ventilator or stability issues.

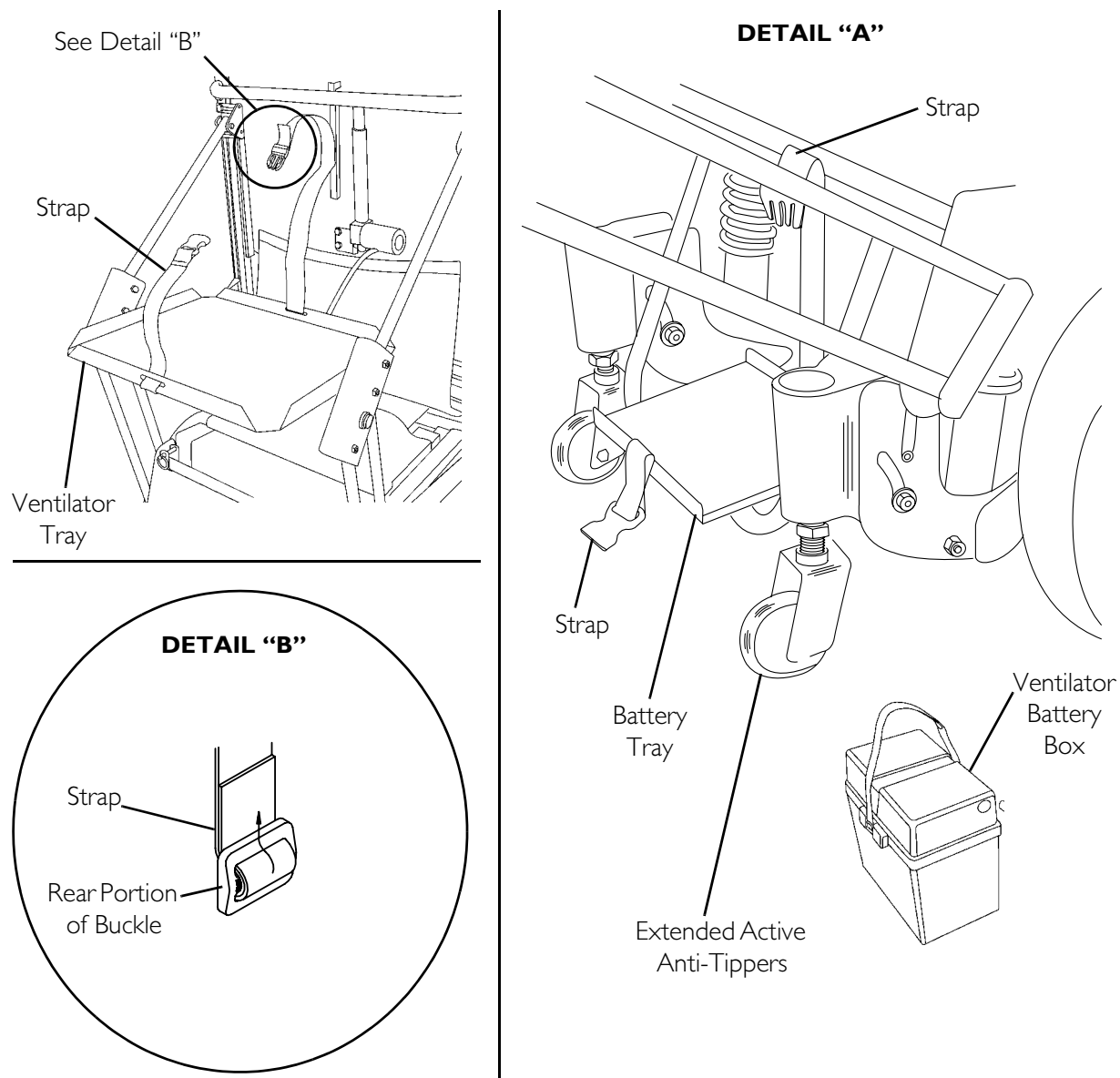
Verify that the headrest support does not interfere with ventilator at all recline angles.

---

*NOTE: For this procedure, refer to FIGURE 15.1.*

*NOTE: This procedure applies to 2G Tarsys seating systems only.*

1. Position straps to the outside of the ventilator tray.
2. Position the ventilator (not shown) on the ventilator tray.
3. Secure strap around the ventilator and clip together.
4. Position the ventilator battery box in the battery tray (Detail “A”).
5. Secure strap around the battery box and clip together.
6. Securely tighten the straps around the ventilator by pulling the ends of the strap through the rear portion of each buckle (Detail “B”).



**FIGURE 15.1** Using the Optional Ventilator Tray



# SECTION 16—ANTI-TIPPERS

## ⚠ WARNING

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may occur.

Before adjusting, repairing or servicing the seating system, **ALWAYS** turn the wheelchair power **OFF**, otherwise, injury or damage may result.

Pinch points exist between seat and base frames. Use caution, otherwise injury may occur.

Anti-Tippers must be used at all times. When outdoors on wet, soft ground or on gravel surfaces, anti-tippers may not provide the same level of protection against tip over. Extra caution must be observed when traversing such surfaces.

## Adjusting the Extended Active Anti-Tippers

### ⚠ WARNING

Wheelchairs equipped with ventilator tray **MUST** have extended active anti-tippers installed, otherwise, injury or damage may occur.

Wheelchairs that are **NOT** equipped with optional ventilator tray **MUST** have either the standard anti-tippers or the optional extended active anti-tippers installed, otherwise, injury or damage may occur. Refer to Detail “A” and Detail “B” in **FIGURE 16.1**.

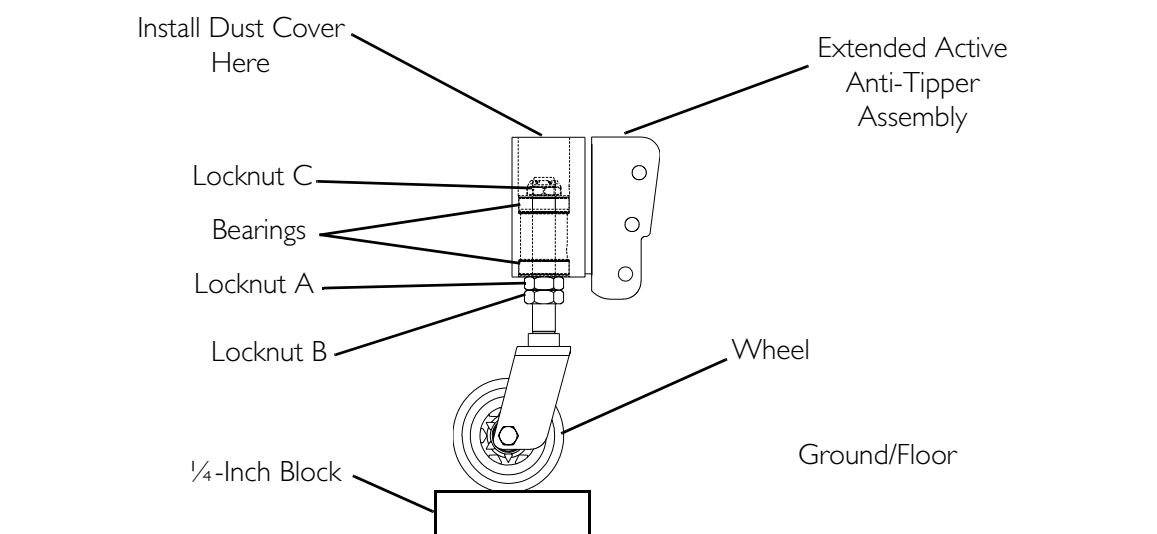
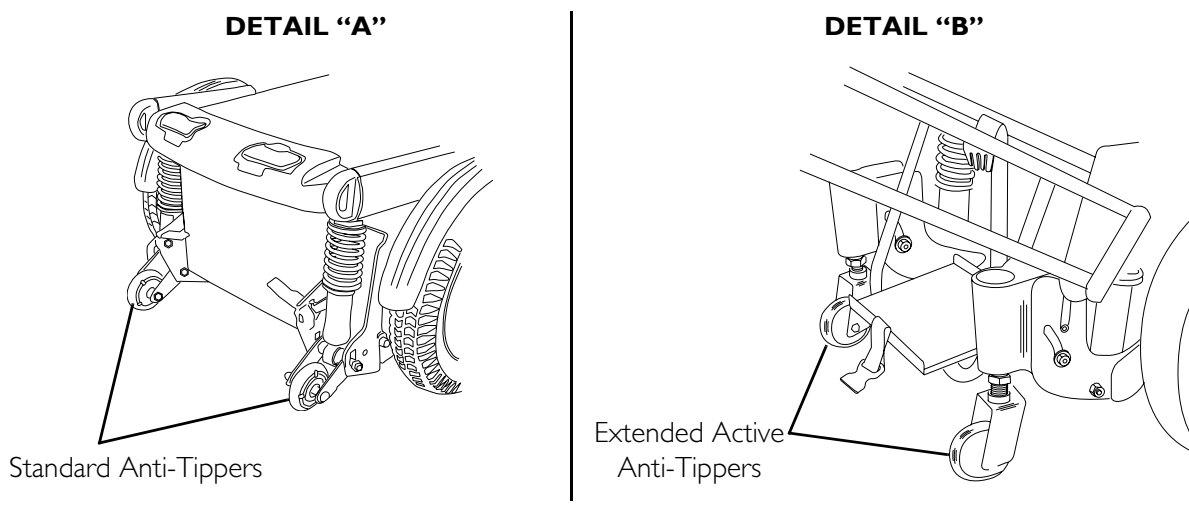
*NOTE: For this procedure, refer to FIGURE 16.1.*

*NOTE: This procedure applies to 2G Tarsys seating systems only.*

*NOTE: The extended active anti-tippers are standard when the wheelchair is equipped with a ventilatory tray.*

*NOTE: The recommended height requirement for the anti-tippers, which is factory preset, is ¼-inch off the ground/floor.*

1. Loosen locknuts A, B and C.
2. Lift anti-tipper and place ¼-inch block underneath the wheel.
3. Tighten locknut A upward against the bearing.
4. Tighten locknut B upward against locknut A.
5. Tighten locknut C downward against bearing inside anti-tip assembly.
6. Remove ¼-inch block.
7. Repeat STEPS 1-6 for the remaining anti-tip assembly.
8. Install the dust cover onto each anti-tip assembly.



**FIGURE 16.1** Adjusting the Extended Active Anti-Tippers

# SECTION 17—TRANSPORT READY PACKAGE

*NOTE: The information in this section is for wheelchairs ordered with the transport ready package ONLY.*

---

## **⚠ WARNING**

Contact Invacare Corporation (800-333-6900) with any questions about using this wheelchair for seating in a motor vehicle.

When feasible, wheelchair occupants should transfer into the vehicle seat and use the OEM (Original Equipment Manufacturer) vehicle-installed restraint system.

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 and chest impacts with vehicle components.

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.

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

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

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.

**IT IS STRONGLY RECOMMENDED THAT BOTH PELVIC AND UPPER-TORSO BELT(S) BE USED TO REDUCE THE RISK OF INJURY.**

To reduce the potential of injury to vehicle occupants, wheelchair-mounted accessories, including but not limited to IV poles, trays, respiratory equipment, backpacks, and other personal items should be removed and secured separately.

Postural supports, positioning devices, and/or strap(s) should not be relied on for occupant restraint. These items may be used **IN ADDITION TO** the wheelchair-anchored or vehicle-anchored belts.

Wheelchairs with adjustable seat angles **MUST** be set to 10°.

**DO NOT** alter or substitute wheelchair frame parts, components, or seating systems.

A sudden stop and/or collision may structurally damage your wheelchair.

Wheelchairs involved in such incidents should be replaced.

Spill proof batteries, such as “gel cells”, should be installed on wheelchairs to be used during travel in a motor vehicle.

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

## **⚠ WARNING**

**Only use the transport brackets included with TRRO and TRBKTS for the purposes described in this manual.**

**Battery support brackets MUST be installed at all times. Otherwise, the wheelchair will not be WC/19 compliant. Refer to Installing/Removing Batteries Into/From Battery Boxes on page 91.**

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## **About Transport Ready Packages**

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.

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.

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.

## **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
Arrow	GB	Up to 400 lbs	Up to 150 lbs
Torque SP	GB	Up to 400 lbs	Up to 150 lbs
Torque SP	4 Pole HD	Up to 400 lbs	Up to 150 lbs
Torque SP	4 Pole	Up to 300 lbs	Up to 150 lbs
Ranger X	GB	Up to 300 lbs	Up to 150 lbs
Ranger X	4 Pole	Up to 300 lbs	Up to 150 lbs

## Securing the Wheelchair to the Vehicle

### Positioning the Wheelchair in the Vehicle

#### **⚠ WARNING**

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.

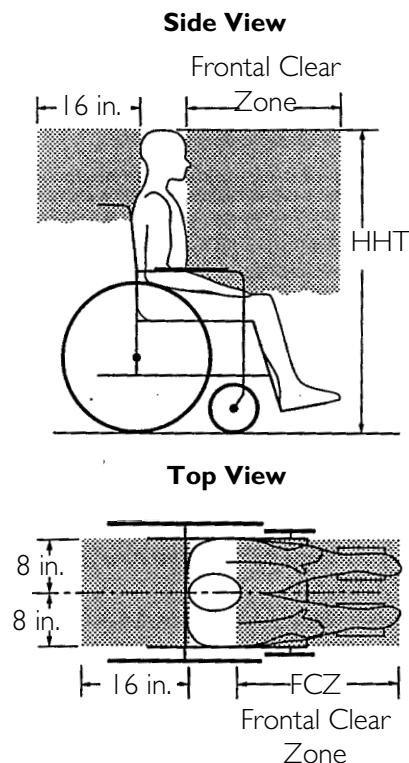
**Frontal Clear Zones (FCZ)** need to be **LARGER** when upper-torso belt(s) are **NOT** used.

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

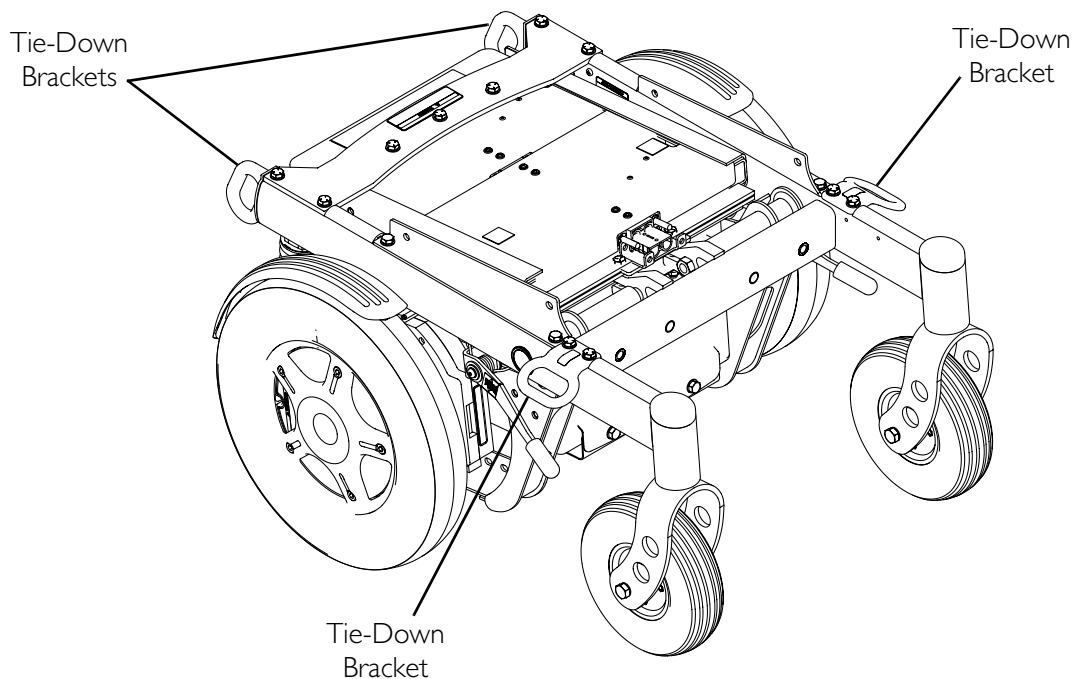
The frontal clear zone is measured from the frontmost point on an occupant's head and is 26-inches with pelvic and upper-torso belt(s) and 37-inches with **ONLY** a pelvic belt.

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.



## Securement Points



**FIGURE 17.1** 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.

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# Securing the Occupant

## Wheelchair-Anchored Belts

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### **⚠ WARNING**

**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.**

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*NOTE: For this procedure, refer to FIGURE 17.2.*

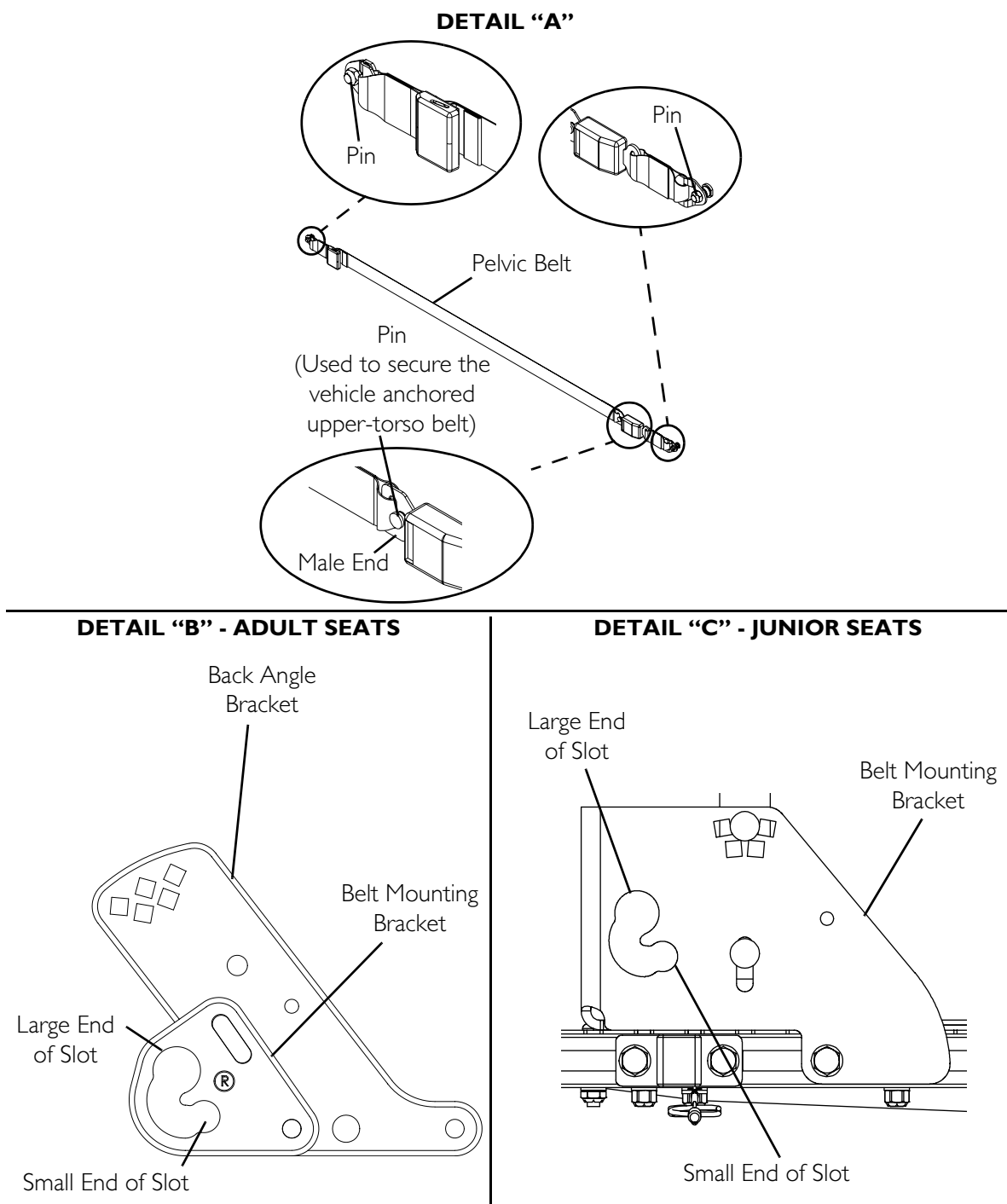
The wheelchair has been provided with a pelvic belt which meets the requirements of ANSI/RESNA W/C 19.

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 17.2) into the large end of the slot in the belt mounting bracket. Rotate downward and forward until it snaps into place into the small end of the slot (Detail "B" or Detail "C").

*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 17.2) 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 17.2** Wheelchair-Anchored Belts



## Vehicle-Anchored Belts

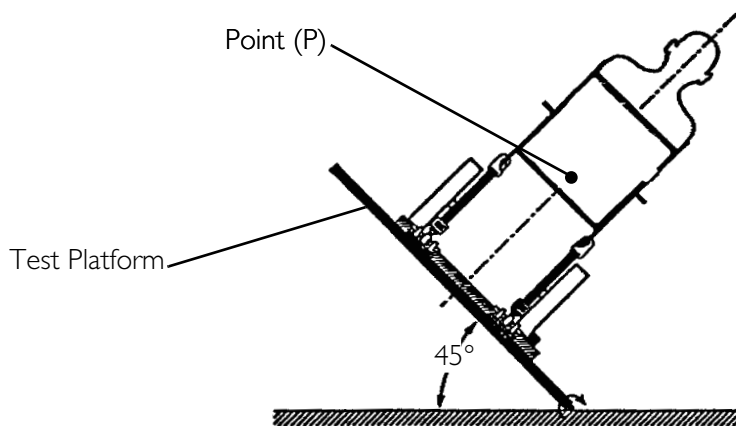
*NOTE: For this procedure, refer to FIGURE 17.3.*

This wheelchair has an overall rating of “A” with regard to accommodating the use and fit of vehicle-anchored belts. This rating is scored as follows:

RATING	DESCRIPTION
<b>A</b>	Excellent
<b>B</b>	Good
<b>C</b>	Fair
<b>D</b>	Poor

The test for Lateral Stability Displacement for Point (P) is shown in FIGURE 17.3. The average test result for point (P) is:

- Adult - 0.48 inches (12.3 mm)
- Junior - 0.54 inches (13.7 mm)



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

**FIGURE 17.3** - Vehicle-Anchored Belts

## Seating System

### **⚠ WARNING**

**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 owner's manual.

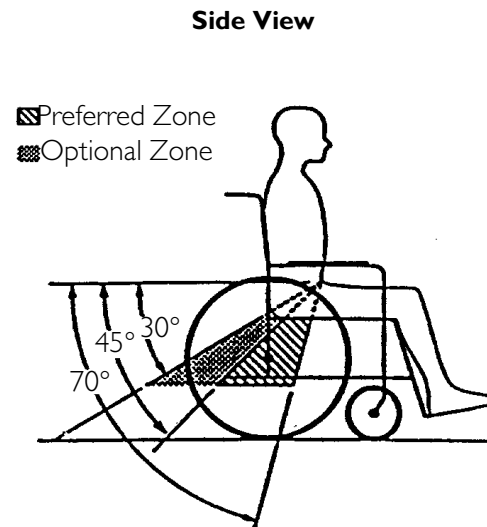
## Positioning Belts

### ⚠ WARNING

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.

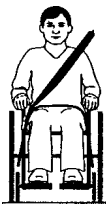
Steeper belt angles also reduce the tendency for upper-torso belts to pull the pelvic belt onto the abdomen during frontal impact loading.



*NOTE: For this procedure, refer to FIGURE 17.4.*

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 17.4 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 17.4** Positioning Belts

# LIMITED WARRANTY

**PLEASE NOTE: THE WARRANTY BELOW HAS BEEN DRAFTED TO COMPLY WITH FEDERAL LAW APPLICABLE TO PRODUCTS MANUFACTURED AFTER JULY 4, 1975.**

This warranty is extended only to the original purchaser/user of our products.

This warranty gives you specific legal rights and you may also have other legal rights which vary from state to state.

Invacare warrants the product to be free from defects in materials and workmanship for the periods of time from date of purchase listed below:

One Year	Electrical components and powered seating actuators
One Year	All remaining components (including gas cylinders and motor lock pads) except for upholstered materials, padded materials and tires/wheels
Eighteen Months	Gearbox/Motors (4 Pole)
Three Years	Seat frame
Three Years	Tilt mechanism (Power Tilt Only Seating System)
Five Years	GB motors
Life of Product	Base frame

If within such warranty period any such product shall be proven to be defective, such product shall be repaired or replaced, at Invacare's option. This warranty does not include any labor or shipping charges incurred in replacement part installation or repair of any such product. Invacare's sole obligation and your exclusive remedy under this warranty shall be limited to such repair and/or replacement.

For warranty service, please contact the dealer from whom you purchased your Invacare product. In the event you **DO NOT** receive satisfactory warranty service, please write directly to Invacare at the address at the bottom of the back cover. Provide dealer's name, address, date of purchase, indicate nature of the defect and, if the product is serialized, indicate the serial number. Do not return products to our factory without our prior consent.

**LIMITATIONS AND EXCLUSIONS: THE FOREGOING WARRANTY SHALL NOT APPLY TO SERIAL NUMBERED PRODUCTS IF THE SERIAL NUMBER HAS BEEN REMOVED OR DEFACED, PRODUCTS SUBJECTED TO NEGLIGENCE, ACCIDENT, IMPROPER OPERATION, MAINTENANCE OR STORAGE, COMMERCIAL OR INSTITUTIONAL USE, PRODUCTS MODIFIED WITHOUT INVACARE'S EXPRESS WRITTEN CONSENT INCLUDING, BUT NOT LIMITED TO, MODIFICATION THROUGH THE USE OF UNAUTHORIZED PARTS OR ATTACHMENTS; PRODUCTS DAMAGED BY REASON OF REPAIRS MADE TO ANY COMPONENT WITHOUT THE SPECIFIC CONSENT OF INVACARE, OR TO A PRODUCT DAMAGED BY CIRCUMSTANCES BEYOND INVACARE'S CONTROL, AND SUCH EVALUATION WILL BE SOLELY DETERMINED BY INVACARE. THE WARRANTY SHALL NOT APPLY TO PROBLEMS ARISING FROM NORMAL WEAR OR FAILURE TO ADHERE TO THESE INSTRUCTIONS.**

**THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY OTHER WARRANTIES WHATSOEVER, WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND THE SOLE REMEDY FOR VIOLATIONS OF ANY WARRANTY WHATSOEVER, SHALL BE LIMITED TO REPAIR OR REPLACEMENT OF THE DEFECTIVE PRODUCT PURSUANT TO THE TERMS CONTAINED HEREIN. THE APPLICATION OF ANY IMPLIED WARRANTY WHATSOEVER SHALL NOT EXTEND BEYOND THE DURATION OF THE EXPRESS WARRANTY PROVIDED HEREIN. INVACARE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES WHATSOEVER.**

**THIS WARRANTY SHALL BE EXTENDED TO COMPLY WITH STATE/PROVINCIAL LAWS AND REQUIREMENTS.**



**Yes, you can.®**

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Rev B - 11/07/05