

***Ranger II Storm Series<sup>®</sup>***  
***Wheelchairs***  
***MWD/FWD***

***Ranger II<sub>BASIC</sub>***  
***Ranger II<sub>STANDARD</sub>***  
***Ranger II<sub>JR</sub>***  
***Ranger II<sub>250 SERIES</sub>***

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.



**Yes, you can.™**

WARNING

### WARNING

THE PROCEDURES IN THIS MANUAL SHOULD ONLY BE PERFORMED BY A QUALIFIED TECHNICIAN.

DO NOT SERVICE OR OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING THIS MANUAL AND THE OWNER'S MANUAL SUPPLIED WITH THE WHEELCHAIR. 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.

SPECIAL NOTES

### SPECIAL NOTES

WARNING/CAUTION notices as used in this manual apply to hazards or unsafe practices which could result in personal injury or 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.

#### WHEELCHAIR TIE-DOWN RESTRAINTS AND SEAT POSITIONING STRAPS

Invacare recommends that wheelchair users NOT be transported in vehicles of any kind while in wheelchairs. 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.

AS REGARDS RESTRAINTS - SEAT POSITIONING STRAPS - IT IS THE OBLIGATION OF THE DME DEALER, THERAPISTS AND OTHER HEALTHCARE PROFESSIONALS TO DETERMINE IF A SEATING POSITIONING STRAP IS REQUIRED TO ENSURE THE SAFE OPERATION OF THIS EQUIPMENT BY THE USER. SERIOUS INJURY MAY OCCUR IN THE EVENT OF A FALL FROM A WHEELCHAIR.

SAVE THESE INSTRUCTIONS

# TABLE OF CONTENTS

The procedures in this manual refer to the following models:

RANGER II MWD models: RANGER II BASIC RANGER II STANDARD RANGER II 250<sup>SERIES\*</sup>  
 RANGER II FWD models: RANGER II<sub>BASIC</sub> RANGER II<sub>STANDARD</sub> RANGER II<sub>250 Series</sub> and RANGER II with  
 Weight Shift Basic Tilt.

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**SPECIFICATIONS**

**SPECIFICATIONS**

NOTE: All specifications are approximate.

**SPECIFICATIONS**

	<b>RANGER II MWD - R2</b>		
	<b>R2<sub>BASIC</sub></b>	<b>R2<sub>STANDARD</sub></b>	<b>R2<sub>250 SERIES</sub></b>
	<b>INTEGRATED SLING SEAT</b>		<b>CAPTAIN'S SEAT</b>
			<b>BACKTYPE</b>
			<b>LOW SOLID SEAT (LOBSS)</b>
			<b>HIGH<sup>1</sup> (HIB)</b>
<b>Seat Width Range:</b>	16, 18 or 20-inches		19-in.
<b>Seat Depth Range:</b>	16, 17 or 18-in. - in 1-inch increments (17 and 18-in. by extension)		17-in.
<b>Back Height Range Std.:</b>	16, 17, 18, 19 or 20-in. - In 1-in increments	16-in.	18-in.
<b>Opt. Headrest:</b>	N/A	N/A	22-in.
<b>Opt. Backrest Ext.:</b>	N/A	23-in.	N/A
<b>Back Angle Range:</b>	90° to 105° - in 5° increments	(55° - 114°) <sup>2</sup>	(96°) <sup>2</sup>
<b>Seat-to-Floor:</b>	18-1/4-inches	22-in.	19-1/2-in.
<b>Overall Width (No joystick):</b>			22-in.
<b>Overall Height:</b>	24-7/8-inches	24-3/4-in.	24-3/4-in.
	34-3/8-in. - 18-in. Back Height	35-in.	35-in.
<b>Weight<sup>3,6</sup> W/O Batteries:</b>	<b>R2<sub>BASIC</sub> / R2<sub>250 series</sub></b> 110 to 114 lbs.	<b>R2<sub>STANDARD</sub></b> 112 to 116 lbs.	<b>R2<sub>BASIC</sub> / R2<sub>250 series</sub></b> 131 to 135 lbs.
<b>W/Batteries (Gel Cell):</b>	178 to 182 lbs.	190 to 194 lbs.	<b>R2<sub>STANDARD</sub></b> 138 to 142 lbs.
<b>Shipping:</b>	134 to 153 lbs.	146 to 155 lbs.	206 to 210 lbs.
<b>Armrests:</b>	Removable, Flip Back, Fixed or Adjustable Height - Desk and Full Length		213 to 217 lbs.
<b>Upholstery:</b>	Black Nylon		168 to 172 lbs.
			Flip Back - Adjustable Height - Full Length (Std.)
			Vinyl or Cloth with Vinyl (R2 <sub>250 SERIES</sub> - Gray fabric trimmed w/ gray Vinyl)

	<b>INTEGRATED SLING SEAT AND CAPTAIN'S SEAT</b>	
<b>Overall Length</b> (Drive wheel in Front Position - Refer to <b>PERCENTAGE OF WEIGHT DISTRIBUTION</b> in <b>PROCEDURE 1</b> of this manual.)	43-1/2-inches <b>(With 8-in. rear casters and 93 front riggings)</b>	35-1/2-inches <b>(With 8-in. rear casters and no front riggings)</b>
<b>Front Stabilizers</b>	7-inch Urethane	
<b>Drive Wheels/Tires:</b>	12-1/2 x 2-1/4-in. (Std.); 14-in. x 3-in. (Opt.) (Flat Free or Pneumatic)	
<b>Casters w/Precision Sealed Bearings:</b>	8 x 1-3/4-in. Semi Pneumatic (Std.), 8 x 2-in. Pneumatic (Opt.) 6 x 2-in. Semi Pneumatic (Opt.)	
<b>Footrest/Legrest:</b>	Swingaway, Removable Adjustable Flip Up Removable Footboard	
<b>Battery/Size (Not Supplied):</b>	R2 <sub>BASIC</sub> / R2 <sub>STANDARD</sub> - 22NF Gel Cell (Two (2) Required); R2 <sub>250-SERIES</sub> uses - U1 GEL CELL)	

<b>PERFORMANCE</b>	<b>R2<sub>BASIC</sub></b>	<b>R2<sub>250 series</sub></b>	<b>R2<sub>STANDARD</sub></b>
<b>Speed (M.P.H.):</b>	0 to 3.8	0 to 3.6	0 to 5.8
<b>Turning Radius:</b>	≥ 23-inches	≥ 23-inches	≥ 23-inches
<b>Range (variable)<sup>4</sup>:</b>	18-22 miles	12-14 miles	18-22 miles
<b>❖ Weight Limitation<sup>5</sup>:</b>	250 lbs.	250 lbs.	300 lbs.

❖ NOTE: Refer to **PERCENTAGE OF WEIGHT DISTRIBUTION** in **PROCEDURE 1** of this manual.

**Footnotes:**

- High Back not available on model R2<sub>250 SERIES</sub>.
- Low and High Back Types have an Infinite adjustment. Low Backs with Solid Seat have no adjustment.
- 18-in. wide x 16-in. deep wheelchair with MKIV RII electronics.
- Range will vary with battery conditions, surface, terrain and operators weight.
- Includes seating systems and accessories.
- Weight varies between motors. R2<sub>BASIC</sub> AND R2<sub>250 SERIES</sub> have clutches. The R2<sub>STANDARD</sub> has motor locks.

**SPECIFICATIONS**

NOTE: All specifications are approximate.

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	<b>RANGER II FWD -R2</b>	<b>R2</b>	<b>R2</b>
	<small>BASIC</small>	<small>STANDARD</small>	<small>250 SERIES</small>
	<b>INTEGRATED SLING SEAT</b>	<b>CAPTAIN'S SEAT</b>	
		<b>BACK TYPE</b>	
		<b>LOW (LOB)</b>	<b>LOW SOLID SEAT (LOBSS) HIGH (HIB)</b>
<b>Seat Width Range:</b>	16, 18 or 20-inches	19-in.	19-in. 19-in.
<b>Seat Depth Range:</b>	16, 17 or 18-in. - In 1-in. increments (17 and 18-in. by extension)	17-in.	17-in. 17-in.
<b>Back Height Range Std.:</b>	16, 17, 18, 19 or 20-in. - In 1-in. increments	16-in.	18-in. 22-in.
<b>Opt. Headrest:</b>	N/A	N/A	N/A 28-in.
<b>Opt. Backrest Ext.:</b>	N/A	23-in.	N/A N/A
<b>Back Angle Range:</b>	90° to 105° - in 5° increments	(55° - 114°) <sup>1</sup>	(98°) <sup>1</sup> (35° - 170°) <sup>1</sup>
<b>Seat-to-Floor:</b>	18-1/2-in.	22-in.	19-1/2-in. 22-in.
<b>Overall Width (No joystick):</b>	24-5/8-in.	24-3/4-in.	24-3/4-in. 24-3/4-in.
<b>Overall Height:</b>	34-3/8-in. - 16-in. Back Height	35-in.	35-in. 39-in.
<b>Weight<sup>2,5</sup></b>			
<b>W/O Batteries:</b>	<b>R2</b> <sub>BASIC</sub> / <b>R2</b> <sub>250 series</sub> 90 to 100 lbs.	<b>R2</b> <sub>STANDARD</sub> 105 to 115 lbs.	<b>R2</b> <sub>BASIC</sub> / <b>R2</b> <sub>250 series</sub> 122 to 127 lbs.
<b>W/Batteries (Gel Cell):</b>	170 to 180 lbs.	185 to 195 lbs.	<b>R2</b> <sub>STANDARD</sub> 138 to 142 lbs.
<b>Shipping:</b>	105 to 115 lbs.	120 to 130 lbs.	203 to 207 lbs. 218 to 222 lbs. 168 to 172 lbs.
<b>Armrests:</b>	Removable, Flip Back, Fixed or Adjustable Height - Desk and Full Length	Flip Back - Adjustable Height - Full Length (Std.)	
<b>Upholstery:</b>	Black Nylon	Vinyl or Cloth with Vinyl (R2 <sub>250 SERIES</sub> - Gray fabric trimmed w/ gray Vinyl)	

<b>INTEGRATED SLING SEAT AND CAPTAIN'S SEAT</b>			
	<b>REAR POSITION</b>	<b>❖ DRIVE WHEEL POSITION</b>	
		<b>MIDDLE POSITION</b>	<b>FORWARD POSITION</b>
<b>Overall Length</b>			
<b>With 8-in. rear casters and 93 front riggings:</b>	47-1/4-inches	48-1/4-inches	49-1/4-inches
<b>With 8-in. rear casters and no front riggings:</b>	40-1/2-inches	40-1/2-inches	N/A
	<b>❖ NOTE: Refer to PERCENTAGE OF WEIGHT DISTRIBUTION in PROCEDURE 1 of this manual.</b>		
<b>Drive Wheels/Tires:</b>	12-1/2 x 2-1/4-in. (Std.); 14-in.x 3-in. (Opt.) (Flat Free or Pneumatic)		
<b>Casters w/Precision Sealed Bearings:</b>	8 x 1-3/4-in. Semi Pneumatic (Std.), 8 x 2-in. Pneumatic (Opt.) 6 x 2-in. Semi Pneumatic (Opt.)		
<b>Footrest/Legrest:</b>	Swingaway, Removable Adjustable Flip Up Removable Footboard		
<b>Battery/Size (Not Supplied):</b>	22NF Gel Cell (Two (2) Required); R2 <sub>250-SERIES</sub> uses- U1 GEL CELL		

<b>PERFORMANCE</b>	<b>R2</b> <sub>BASIC</sub>	<b>R2</b> <sub>250 SERIES</sub>	<b>R2</b> <sub>STANDARD</sub>
<b>Speed (M.P.H.):</b>	0 to 3.8	0 to 3.6	0 to 4.0
<b>Turning Radius:</b>	≥ 25.8-inches	≥ 25.8-inches	≥ 25.8-inches
<b>Range (variable)<sup>3</sup>:</b>	17-22 miles	12-14 miles	12-16 miles
<b>❖ Weight Limitation<sup>4</sup>:</b>	250 lbs.	250 lbs.	300 lbs.

❖ NOTE: Refer to PERCENTAGE OF WEIGHT DISTRIBUTION in PROCEDURE 1 of this manual.

- Footnotes:**
1. Low and High Back Types have an Infinite adjustment. Low Backs with Solid Seat have no adjustment.
  2. 18-in. wide x 16-in. deep wheelchair with MKIV RII electronics.
  3. Range will vary with battery conditions, surface, terrain and operators weight.
  4. Includes seating systems and accessories.
  5. Weight varies between motors. R2<sub>BASIC</sub> AND R2<sub>250 SERIES</sub> have clutches. The R2<sub>STANDARD</sub> has motor locks.

**SPECIFICATIONS**

*NOTE: All specifications are approximate.*

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**RANGER II FWD - R2<sub>JR</sub>**

	<b>INTEGRATED SLING SEAT</b>
<b>Seat Width Range:</b>	14-inches
<b>Seat Depth Range:</b>	16 to 18-inches - In 1-inch increments (17 and 18-inch by extension)
<b>Back Height Range:</b>	16 to 20-inches - In 1-inch increments
<b>Back Angle Range:</b>	90° to 105° - in 5° increments
<b>Seat-to-Floor:</b>	18-1/2-inches
<b>Overall Width (No joystick):</b>	20-5/8-inches
<b>Overall Height:</b>	34-3/8-inches - 16-inch Back Height
<b>Overall Length</b>	❖ REAR DRIVE POSITION
<b>With 8-inch rear casters and 93 front riggings:</b>	43-1/2-inches
<b>With 8-inch rear casters and no front riggings:</b>	32-1/2-inches ❖ <i>NOTE: Refer to PERCENTAGE OF WEIGHT DISTRIBUTION in PROCEDURE 1 of this manual.</i>
<b>Drive Wheels/Tires</b>	12-1/2 X 2-1/4-inch (Pneumatic-Standard, Flat Free - Optional)
<b>Caster w/Precision Sealed Bearings:</b>	8 x 1-3/4-inch Semi Pneumatic (Std.), 8 x 2-inch Pneumatic (Opt.) 6 x 2-inch Semi Pneumatic (Opt.)
<b>Footrests/Legrests:</b>	Swingaway, Removable
<b>Weight<sup>1</sup></b>	
<b>W/O Batteries:</b>	83 lbs.
<b>W/Batteries (Gel Cell):</b>	153 lbs.
<b>Shipping:</b>	98 lbs.
<b>Armrests:</b>	Removable, Flip Back, Fixed or Adjustable Height - Desk and Full Length
<b>Upholstery:</b>	Black Nylon
<b>Batteries:</b>	U1 Gel Cell

**PERFORMANCE**

<b>Speed (M.P.H.):</b>	0 to 3.6
<b>Turning Radius:</b>	24-inches
<b>Range (variable)<sup>2</sup>:</b>	14 miles
<b>❖ Weight Limitation<sup>3</sup>:</b>	200 lbs.

❖ *NOTE: Refer to PERCENTAGE OF WEIGHT DISTRIBUTION in PROCEDURE 1 of this manual.*

**Footnotes:**

1. 14-in. wide x 16-in. deep wheelchair with MKIV RII electronics.
2. Range will vary with battery conditions, surface, terrain and operators weight.
3. Includes seating systems and accessories.

<i>This Procedure Includes the Following:</i>	
<i>Repair or Service Information</i>	<i>Operating Information</i>

**WARNING**

**CONTROLLER SETTINGS FOR R2<sub>JR</sub>**

Set-up of the Electronic Control Unit is to be performed **ONLY** by qualified technicians. Factory setting of the controller **MUST** be used for daily activities. Reprogramming the controller to reflect aggressive settings (i.e. increased acceleration, turning, braking etc..) could cause the wheelchair to tip over resulting in serious injury to the user and/or damage to the surrounding property.

**REPAIR OR SERVICE INFORMATION**

Set-up of the Electronic Control Unit is to be performed **ONLY** by qualified technicians. The final tuning adjustments of the controller may affect other activities of the wheelchair. Damage to the equipment could occur under these circumstances. If any individual other than a qualified technician performs any work on these units, the warranty is void.

**OPERATING INFORMATION**

**GENERAL WARNINGS**

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 chair 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 procedure until the wheelchair performs to specifications.

**DO NOT** use parts, accessories, or adapters other than those authorized by Invacare.

**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 suggestions may cause the tire to explode and cause bodily harm. The recommended tire pressure is listed on the side wall of the tire.

**BATTERIES** - The warranty and performance specifications contained in this manual are based on the use of deep cycle gel cell or sealed lead acid batteries. Invacare strongly recommends their use as the power source for this unit.

The use of rubber gloves and safety glasses is recommended when working with batteries. Carefully read battery/battery charger information prior to installing, servicing or operating your wheelchair.

**ELECTRICAL**

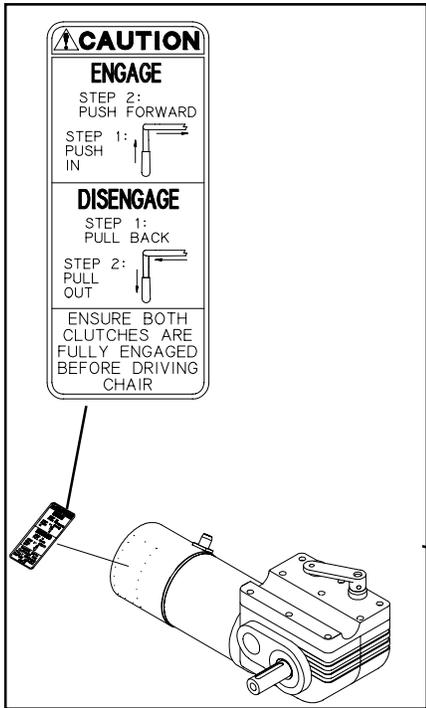
**Grounding Instructions:**

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

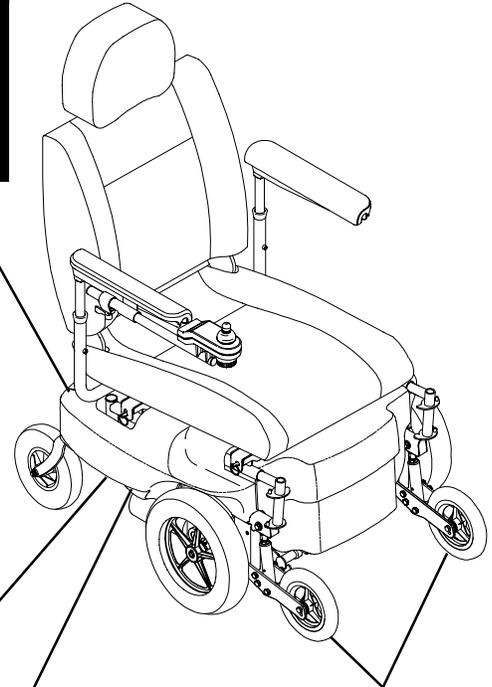
# WARNING/CAUTION LABEL LOCATION - MWD MODELS

(R2<sub>BASIC</sub> / R2<sub>STANDARD</sub> / R2<sub>250 SERIES</sub>)

GENERAL GUIDELINES



**CAUTION**  
 HIGH BACK CAPTAIN'S SEATS ONLY - Disconnect limit switch BEFORE removing seat - damage to seat can occur.

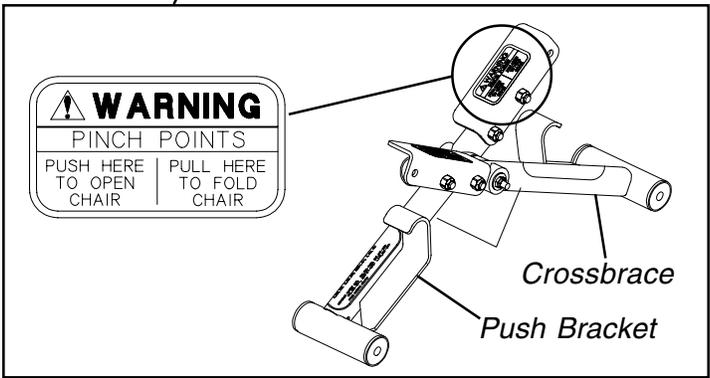


Stabilizers may vary depending on manufacturing date of the wheelchair

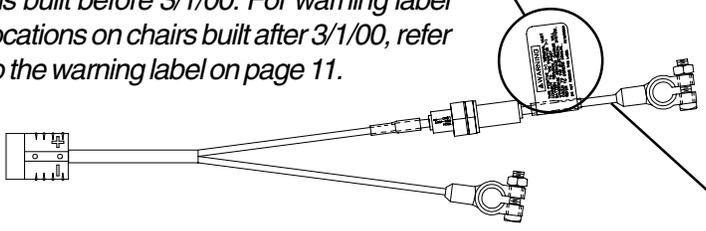
**WARNING**

THIS POSITIVE (+) TERMINAL MUST CONNECT TO THE POSITIVE (+) BATTERY TERMINAL/POST OTHERWISE SERIOUS DAMAGE WILL OCCUR TO THE ELECTRICAL SYSTEM. REFER TO OWNERS MANUAL.

DO NOT REMOVE THIS LABEL 60106X088



**NOTE:** This warning label is found on models built before 3/1/00. For warning label locations on chairs built after 3/1/00, refer to the warning label on page 11.



Wiring Harness for Battery Box Lid

# WARNING/CAUTION LABEL LOCATION - FWD MODELS

## (R2<sub>BASIC</sub>/R2<sub>STANDARD</sub>/R2<sub>250</sub> SERIES)

GENERAL GUIDELINES

**WARNING**  
Replacement controller **MUST** be SAME part number.

Controller (Back View)

Side Frame

**CAUTION**  
HIGH BACK CAPTAIN'S SEATS ONLY - Disconnect limit switch BEFORE removing seat - damage to seat can occur.

NOTE: Caution Label is located on side shroud.

Motor Assembly

**WARNING**  
PINCH POINTS  
PUSH HERE TO OPEN CHAIR | PULL HERE TO FOLD CHAIR

Crossbrace  
Push Bracket

**CAUTION**  
Repositioning the motors WILL affect the stability and/or performance of the wheelchair. Refer to PERCENTAGE OF WEIGHT DISTRIBUTION in the Owner's Manual BEFORE repositioning motors. 1080267

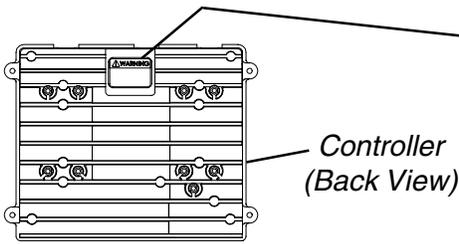
Wiring Harness for Battery Box Lid

**WARNING**  
THIS POSITIVE (+) TERMINAL MUST CONNECT TO THE POSITIVE (+) BATTERY TERMINAL/POST OTHERWISE SERIOUS DAMAGE WILL OCCUR TO THE ELECTRICAL SYSTEM. REFER TO OWNERS MANUAL.  
DO NOT REMOVE THIS LABEL 60106X088

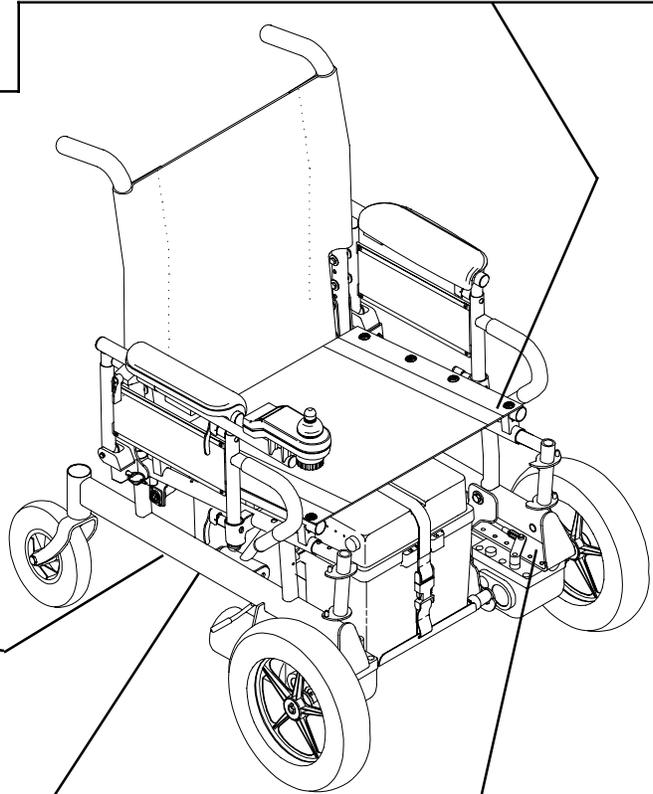
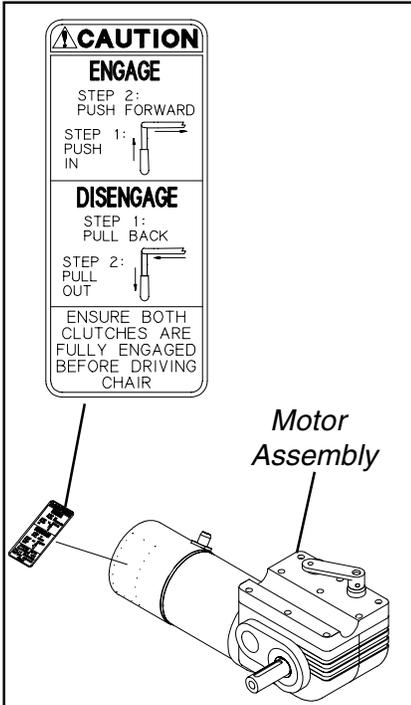
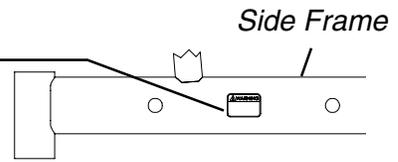
NOTE: This warning label is found on models built before 3/1/00. For warning label locations on chairs built after 3/1/00, refer to the warning label on page 11.

# WARNING/CAUTION LABEL LOCATION - FWD MODELS (R2<sub>JR</sub>)

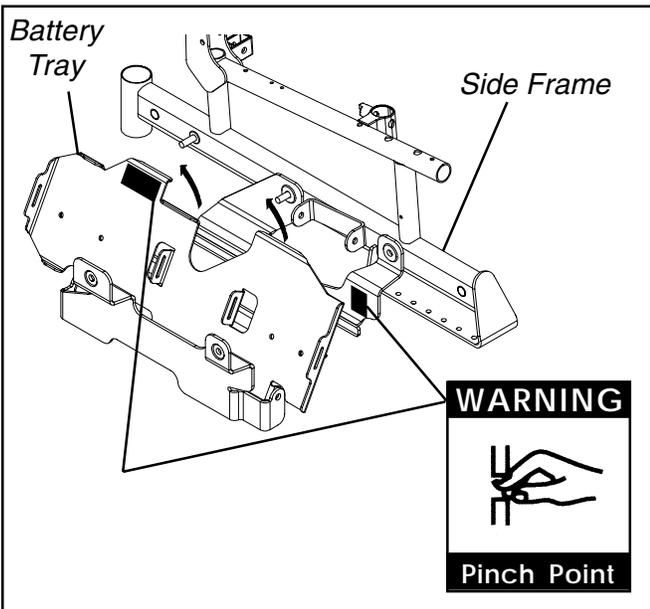
GENERAL GUIDELINES



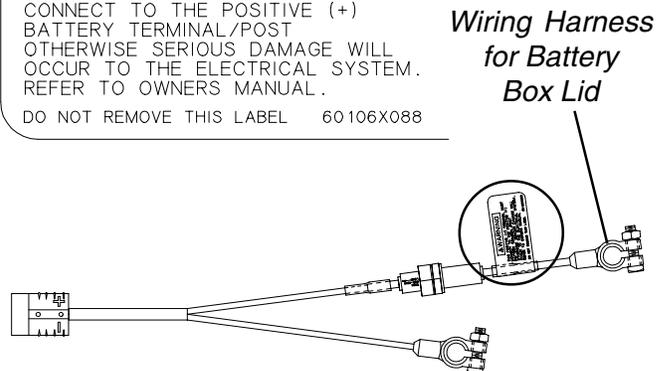
**WARNING**  
 Replacement controller **MUST** be SAME part number.



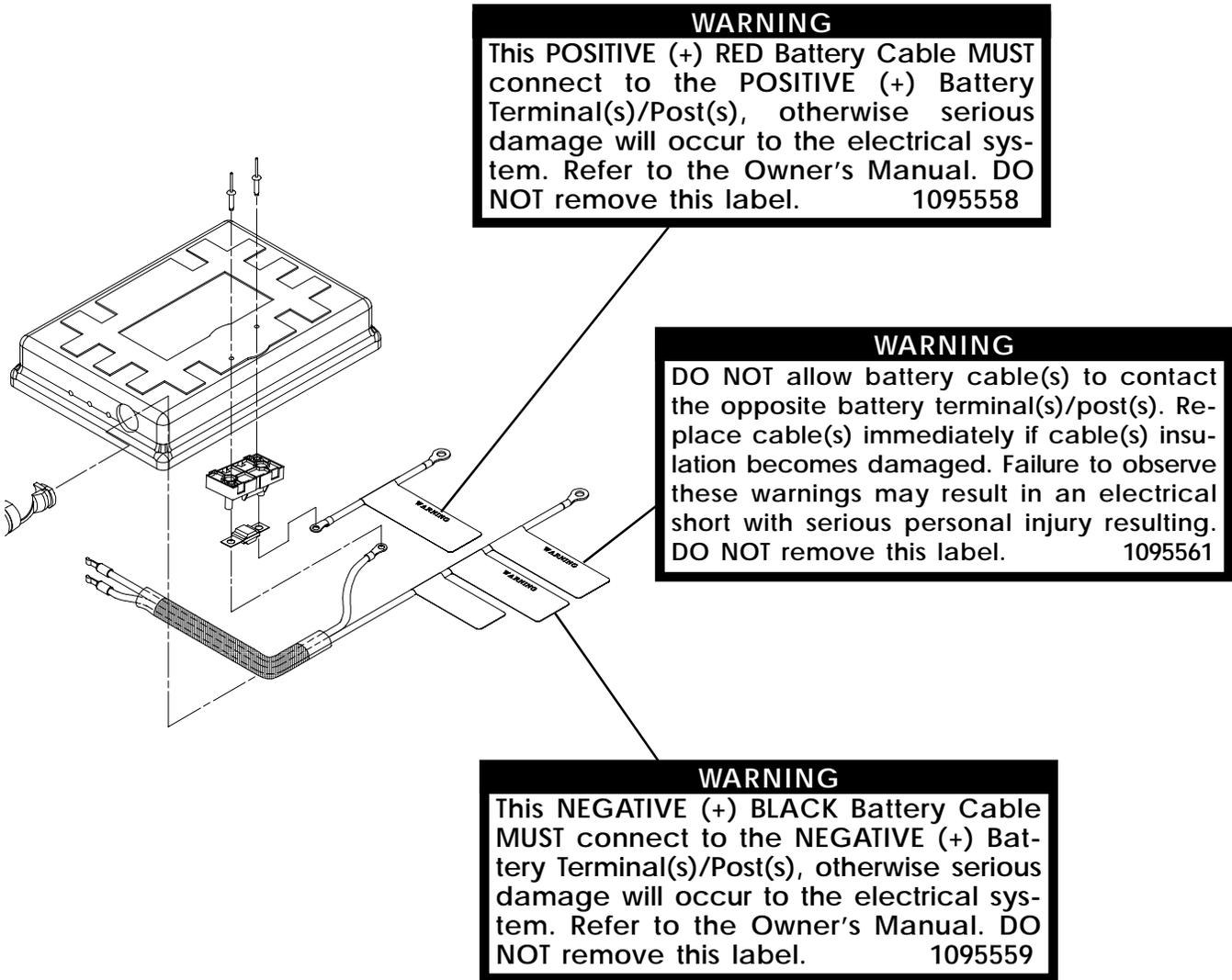
**CAUTION**  
 Repositioning the motors **WILL** affect the stability and/or performance of the wheelchair. Refer to **PERCENTAGE OF WEIGHT DISTRIBUTION** in the Owner's Manual **BEFORE** repositioning motors. 1080267



**WARNING**  
 THIS POSITIVE (+) TERMINAL MUST CONNECT TO THE POSITIVE (+) BATTERY TERMINAL/POST OTHERWISE SERIOUS DAMAGE WILL OCCUR TO THE ELECTRICAL SYSTEM. REFER TO OWNERS MANUAL.  
 DO NOT REMOVE THIS LABEL 60106X088



# BATTERY WARNING LABEL LOCATION



*NOTE: Only U1 battery box top is show for clarity. Warning Labels are located on the group 22 battery box top in the same manner.*

*NOTE: These warning labels are found on models built after 3/1/00. For warning label locations on chairs built before 3/1/00, refer to specific drive system for the wheelchair.*

***This Procedure Includes the Following:***

***Field Load Test***

***Using Hydrometer To Check Battery Cells (Lead Acid)***

***Motor Testing***

***Motor Brush Inspection***

***Electro-Mechanical Parking Brake Testing***

**FIELD LOAD TEST (FIGURE 1)**

*NOTE: The following test can also be performed through the controller of the wheelchair along with a remote programmer. Refer to the individual CONTROLLER MANUAL supplied with each wheelchair.*

Old batteries lose their ability to store and release power, due to increased internal resistance. This means that as you try to take power from the battery, some of that power is used up in the process of passing through the battery, resulting in less voltage at the posts. The more power drawn, the lower the voltage available. When this lost voltage drops the output 1.0 volts under load (2.0 for a pair), replace the batteries.

Testing under load is the only way to spot this problem. While special battery load testing equipment is available, it is costly and difficult to transport.

Use a digital voltmeter to check battery charge level at the charger connector. It is located on the base of the wheelchair frame.

*NOTE: READ the instructions CAREFULLY before using the digital voltmeter.*

*NOTE: Invacare recommends that ONLY qualified service personnel perform this test.*

1. Ensure that power is OFF.
2. Make sure battery is fully charged. An extremely discharged battery will exhibit the same symptoms as a bad one.
3. Place a one (1) piece of wood taller than the axle of the drive wheels between the wheelchair and a wall, workbench or other stationary object.
4. Remove the footrests from the wheelchair and place the stabilizer wheels or the front of the wheelchair against the piece of wood.
5. Place the voltmeter leads into the charger plug on the wheelchair. Most digital voltmeters are not affected by polarity, however, analog meters (meters with swinging needles) can be and should be used carefully. A good meter reading should be 25.5 to 26 VDC.
6. Have two (2) individuals (one [1] on each arm) apply as much downward pressure as possible on the arms of the wheelchair.

7. Turn the wheelchair ON and push the joystick forward, trying to drive the wheelchair through the stationary object. This puts a heavy load on the batteries as they try to push through the stationary object. Read the meter while the motors are straining to determine the voltage under load.

*NOTE: If the voltage drops to less than 23.5 volts from a pair of fully charged batteries while under load, they should be replaced regardless of the unloaded voltages.*

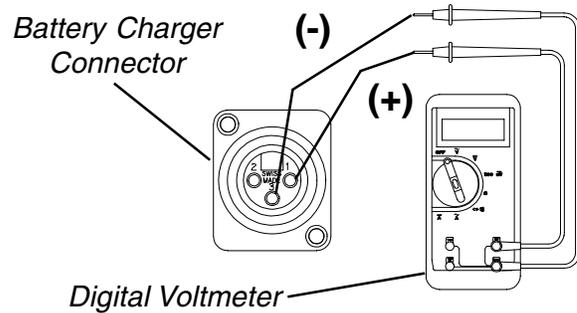


FIGURE 1 - FIELD LOAD TEST

**USING HYDROMETER TO CHECK BATTERY CELLS (LEAD ACID) (FIGURE 2)**

*NOTE: Perform this procedure when a digital voltmeter is not available.*

**WARNING**

**NEVER** smoke or strike a match near the batteries. If the caps of the battery cells are removed, **NEVER** look directly into them when charging the battery.

The use of rubber gloves and safety glasses is recommended when testing the battery cells.

When reading a hydrometer, **DO NOT** allow any liquid to come in contact with your eyes or skin. It is a form of acid and can cause serious burns, and in some cases, blindness. If you do get battery acid on you, flush the exposed areas with cool water **IMMEDIATELY**. If the acid comes into contact with eyes or causes serious burns, get medical help **IMMEDIATELY**.

The battery acid can damage your wheelchair, clothing, and household items. Therefore, take readings cautiously and only in designated areas.

**WARNING**

ONLY use distilled water when topping off the battery cells.

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

1. Remove the battery box(es). Refer to one (1) of the following:

FWD WHEELCHAIRS - INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 13 of this manual.

MWD WHEELCHAIRS - INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 14 of this manual.

2. Remove the battery caps from the battery.
3. Squeeze the air from the hydrometer.
4. Place the hydrometer into a battery cell.

*NOTE: DO NOT fill hydrometer more than 3/4 full.*

5. Draw up sufficient acid to cover float balls.
6. Tap lightly to remove air bubbles.
7. Number of floating balls indicates charge.

**Number of Floating Balls**

0	Discharged
1	25% Charged
2	50% Charged
3	75% Charged
4	100% Charged
* 5	Overcharged

\* Check charging system.

8. Flush the liquid back into the same cell after reading the float. Repeat this step until all cells have been properly read. A shorted or dead cell can be detected when it is the only cell that does not charge.

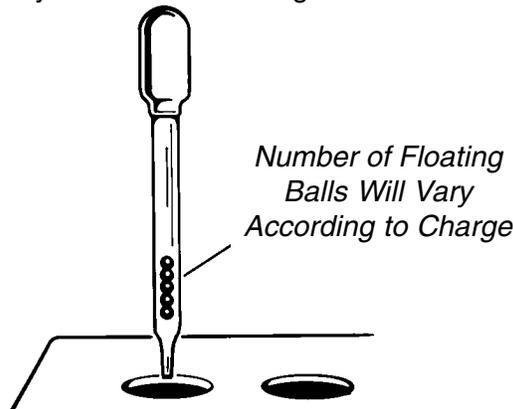


FIGURE 2 - USING A HYDROMETER TO CHECK BATTERY CELLS (LEAD ACID)

9. Flush hydrometer in cold running water by allowing the water to rise into hydrometer as far as possible. Do this several times to guard against burn damage.
10. Replace the battery caps.
11. Reinstall battery boxes. Refer to one (1) of the following:

FWD WHEELCHAIRS - INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 13 of this manual.

MWD WHEELCHAIRS - INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 14 of this manual.

**MOTOR TESTING (FIGURE 3)**

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

*NOTE: A normal reading is between 1 and 5 ohms ( $\Omega$ ). A reading of 0 ohms ( $\Omega$ ) or in excess of 15 ohms ( $\Omega$ ) indicates a problem. High readings are generally caused by bad connections and/or damaged brushes. Contact authorized dealer or Invacare.*

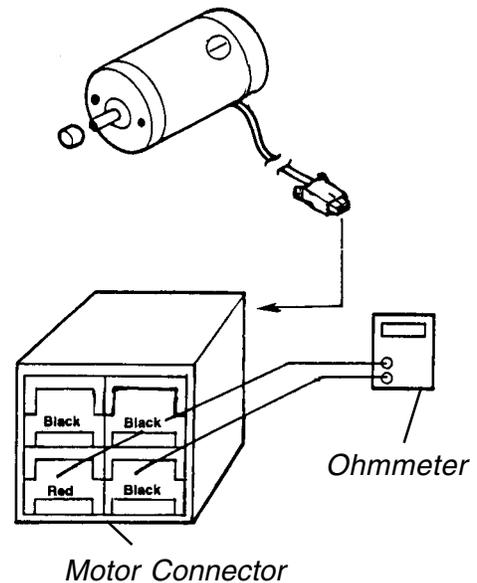


FIGURE 3 - MOTOR TESTING

**MOTOR BRUSH INSPECTION (FIGURE 4)**

There are two (2) contact brushes on the motors located under the brush caps on the motor housing. If these caps are hard to remove they are either overtightened or the motor has become very hot. Let motors cool. If caps still cannot be removed, it is recommended that the motor be sent to Invacare Technical Services for inspection/repair.

*NOTE: It is very important to note which way the brush comes out of the motor. The brush **MUST** be placed into the motor exactly the same way to ensure good contact with the commutator.*

1. Once the motor brush caps have been removed, pull the brushes out of the motor. The end of the brushes should be smooth and shiny and the spring should not be damaged or discolored. If one or both of the brushes are damaged, only the damaged or worn brushes need be replaced. It is very important that any time a brush is replaced, it must be "burned in". This is accomplished by running the motor for one hour in each direction with a half hour break in-between. This should also be done with little or no load on the motor, i.e., put the wheelchair up on blocks so the drive (large) wheels do not contact the ground and run the wheelchair. A motor with only one brush replaced will only carry a small percentage of its rated load capacity until the NEW brush is burned in.

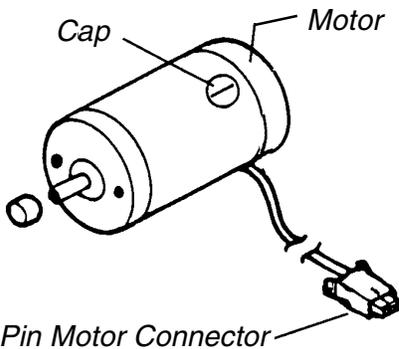


FIGURE 4 - MOTOR BRUSH INSPECTION

**ELECTRO-MECHANICAL PARKING BRAKE TESTING (FIGURE 5)**

1. On the four-pin motor connector, locate the side by side connectors in the black housings.
2. Set the digital multimeter to read ohms ( $\Omega$ ).
3. Measure the resistance between the two (2) brake contacts. A normal reading is 100 ohms ( $\Omega$ ). A reading of 0 ohms ( $\Omega$ ) or a very high reading; i.e., MEG ohms or O.L. (out of limit) indicates a shorted brake or an open connection respectively. If either condition exists, send the motor to Invacare Technical Service for inspection/repair.

**CAUTION**

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

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

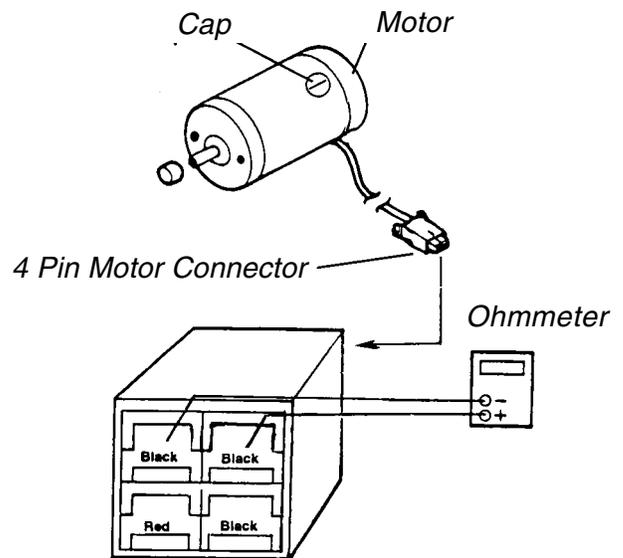


FIGURE 5 - ELECTRO-MECHANICAL PARKING BRAKE TESTING

TROUBLESHOOTING

**This Procedure Includes the Following:**  
**Adjusting Flip-Up Removable Footboard**  
**Adjusting the Removable Footboard**

**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 FLIP-UP REMOVABLE FOOTBOARD**

*NOTE: This footboard assembly is located on models built BEFORE 3/1/00. Refer to ADJUSTING THE REMOVABLE FOOTBOARD for the footboard assembly on models built AFTER 3/1/00 in this procedure of the manual.*

*NOTE: The following procedures are for both FWD and MWD wheelchairs, unless otherwise noted.*

**Angle (FIGURE 1)**

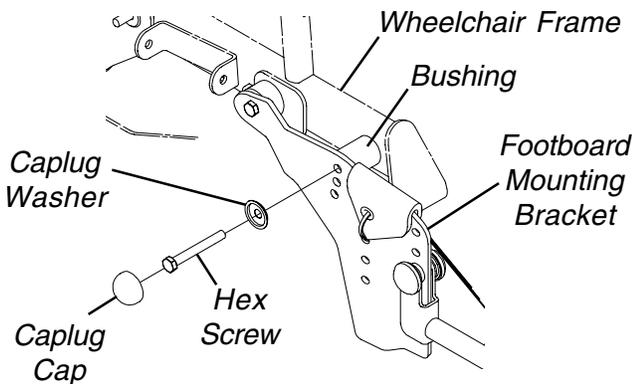
*NOTE: This procedure is for FWD wheelchair only.*

*NOTE: Angle availability is limited when the motors are in the forward-most position.*

1. Remove the caplug caps.
2. Remove the front hex screw and caplug washer that secure the footboard mounting bracket and bushing to the wheelchair.
3. Repeat STEPS 1-2 for the opposite front hex screw and caplug washer.
4. Move the footboard mounting brackets to one (1) of three (3) positions.

*NOTE: To ensure the existing hex screws tighten securely, apply Loctite 242® onto the threads.*

5. Reinstall the two (2) hex screws and caplug washers through the two (2) footboard mounting brackets and bushings and into the wheelchair.

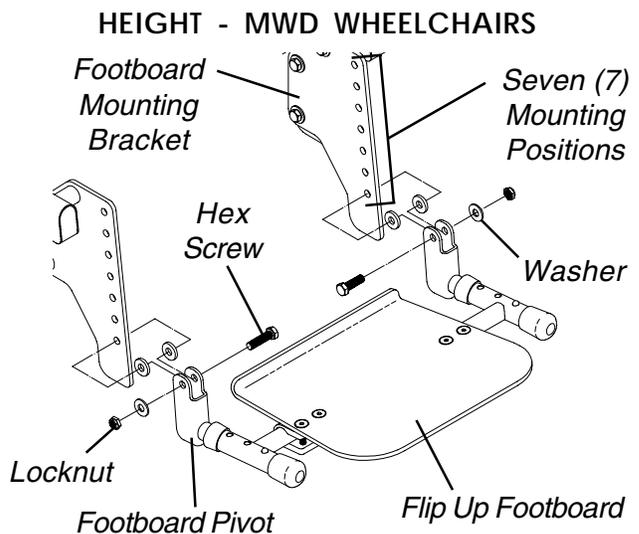
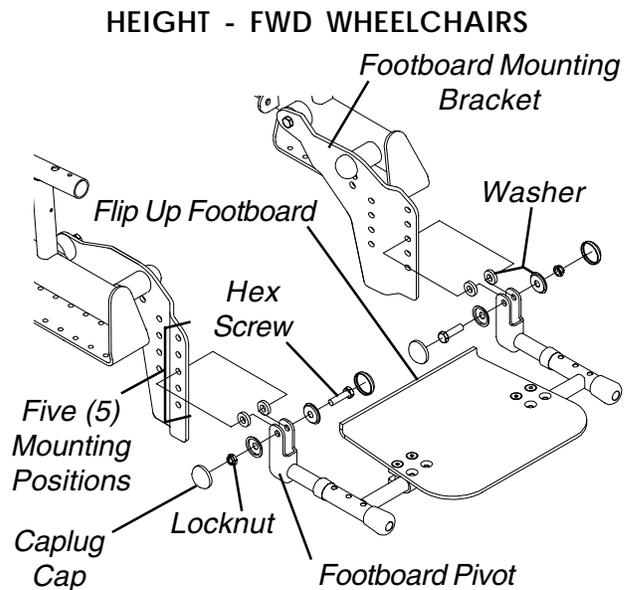


**FIGURE 1 - ADJUSTING FLIP-UP REMOVABLE FOOTBOARD (ANGLE)**

6. Torque the two (2) hex screws to 156-in/lbs.
7. Reinstall the two (2) caplug caps.

**Height (FIGURE 2)**

1. If necessary, remove the four (4) caplug caps.
2. Remove the hex screw, two (2) spacers, washers and locknut that secure one (1) of the footboard pivots to the footboard mounting bracket.
3. Repeat STEP 2 for opposite side of the wheelchair.
4. Move the footboard pivots to one (1) of the following:  
 MWD WHEELCHAIRS: one (1) of seven (7) positions.  
 FWD WHEELCHAIRS: one (1) of five (5) positions.



**FIGURE 2 - ADJUSTING FLIP-UP REMOVABLE FOOTBOARD (HEIGHT)**

**Loctite - Registered Trademark of Loctite Corporation.**

5. Resecure the two (2) footboard pivots to the footboard mounting brackets with the hex screws, spacers, washers and locknuts. Refer to FIGURE 2 for the correct hardware orientation.
6. Torque the two (2) hex screws to 156in/lbs. and back off the hex screws 1/8-1/4 of a revolution.
7. If necessary, reinstall the four (4) caplug caps.

**ADJUSTING THE REMOVABLE FOOTBOARD**

*NOTE: This footboard assembly is available on models built AFTER 3/1/00. Refer to ADJUSTING THE FLIP-UP REMOVABLE FOOTBOARD for the footboard assembly on models built BEFORE 3/1/00 in this procedure of the manual.*

*NOTE: The following procedures are for both FWD and MWD wheelchairs, unless otherwise noted.*

**Depth (FIGURE 3)**

*NOTE: There is no footboard depth adjustment for 16-inch wide MWD wheelchairs.*

1. Remove the four (4) flat head screws and barrel nuts that secure the removable footboard to the two (2) footplate clamps.
2. Move the removable footboard to one (1) of the four (4) positions.

*NOTE: Before reinstalling the four (4) flat head screws, make sure the footplate clamps are in the proper position as shown in DETAIL "A".*

3. Reinstall the four (4) flat head screws and barrel nuts that secure the removable footboard to the two (2) footplate clamps. Tighten securely.

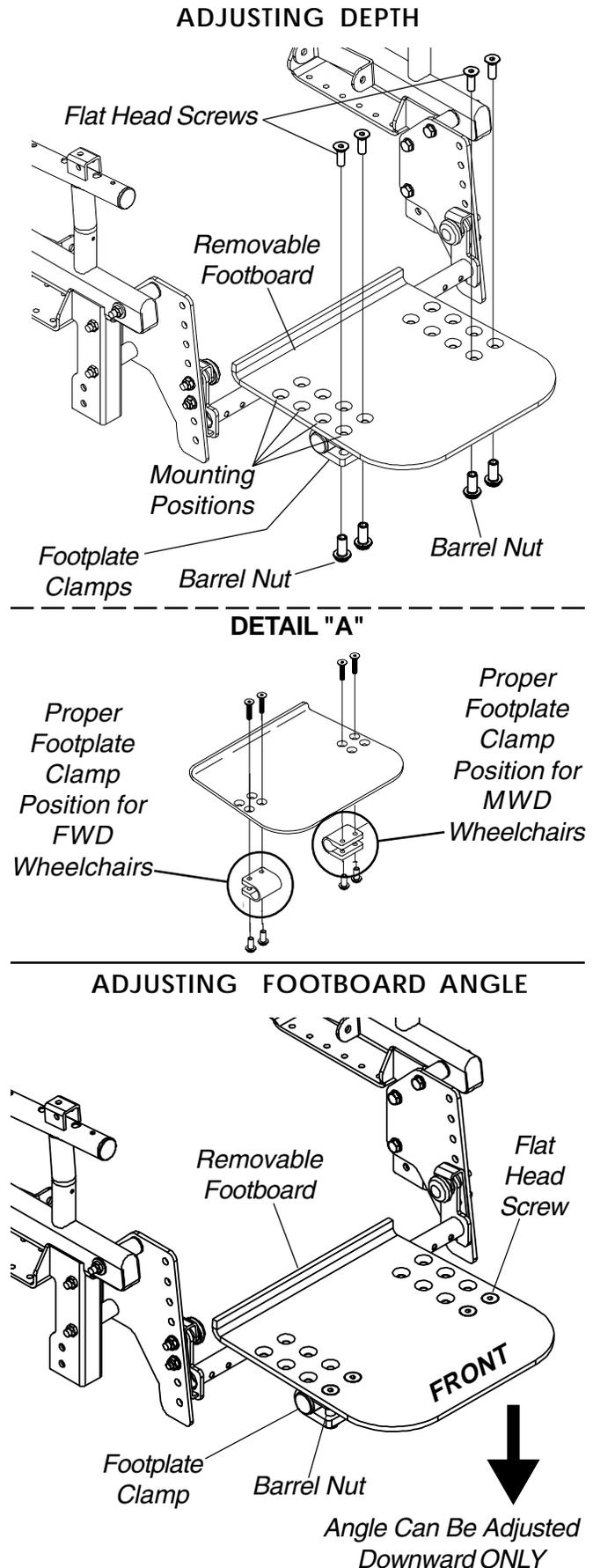
**Angle**

**ADJUSTING FOOTBOARD ANGLE (FIGURE 3).**

1. Loosen, but do not remove, the four (4) flat head screws and barrel nuts that secure the removable footboard to the two (2) footplate clamps.

*NOTE: Because of the two (2) support tubes, the angle of the removable footboard can be adjusted downward ONLY.*

2. Grasp the front of the removable footboard and rotate it DOWNWARD until the desired angle is reached.
3. While holding the removable footboard in place, tighten the four (4) flat head screws and barrel nuts securely.



**FIGURE 3 - ADJUSTING FLIP-UP REMOVABLE FOOTBOARD**

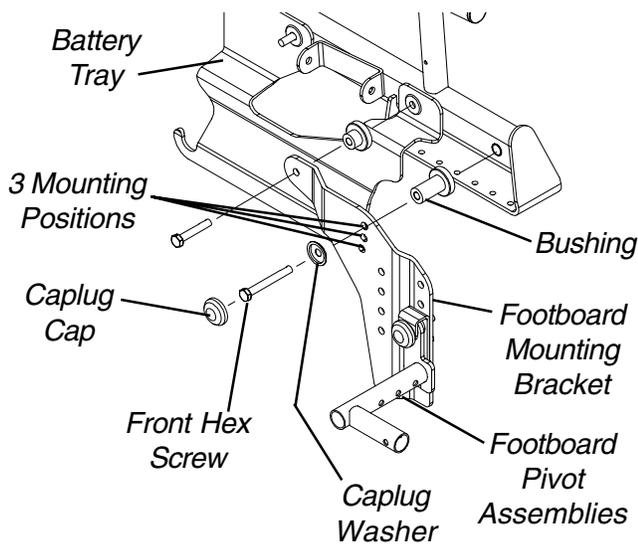
**ADJUSTING FOOTBOARD MOUNTING BRACKET ANGLE - FWD MODELS ONLY (FIGURE 4).**

*NOTE: Angle availability is limited when the motors are in the forward-most position.*

1. Remove the caplug cap.
2. Remove the front hex screw and caplug washer that secure the footboard mounting bracket and bushing to the wheelchair.
3. Repeat STEPS 1-2 for the opposite footboard mounting bracket.
4. Move the footboard mounting brackets to one (1) of three (3) positions.

*NOTE: To ensure the existing hex screws tighten securely, apply Loctite 242 onto the threads.*

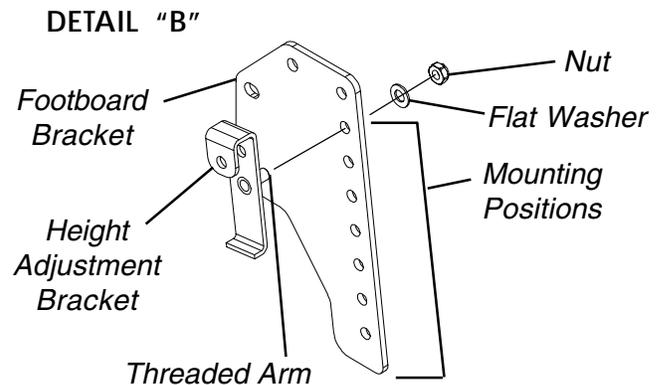
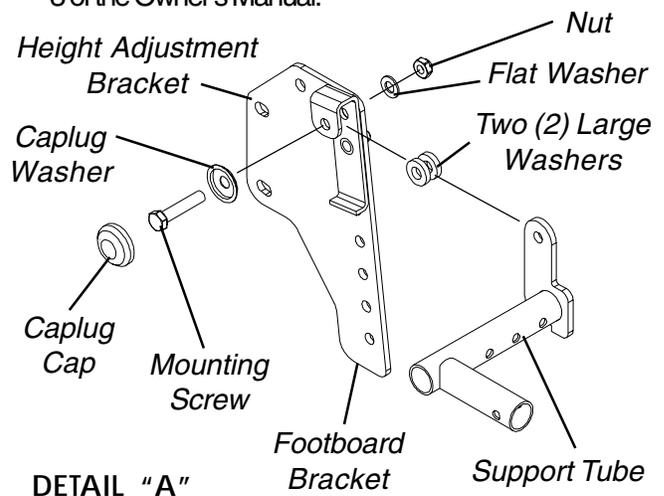
5. Reinstall the two (2) hex screws and caplug washers through the two (2) footboard mounting brackets and bushings and into the wheelchair.
6. Torque the two (2) hex screws to 13-ft/lbs.
7. Reinstall the two (2) caplug caps.



**FIGURE 4 - ADJUSTING REMOVABLE FOOTBOARD - ADJUSTING FOOTBOARD MOUNTING BRACKET ANGLE Height (FIGURE 5)**

1. Remove the removable footboard plate. Refer to PREPARING REMOVABLE FOOTBOARD FOR WHEELCHAIR TRANSPORTATION in PROCEDURE 3 of the Owner's Manual.
2. Remove the caplug cap.
3. Remove the mounting screw, caplug washer, flat washer and nut that secures the two (2) large washers and support tube to the height adjustment bracket and footboard bracket. Refer to DETAIL "A".

4. Remove the nut, flat washer and that secure the threaded arm on the height adjustment bracket to the footboard bracket. Refer to DETAIL "B".
5. Perform one (1) of the following:
  - A. **MWD WHEELCHAIRS** - Move the height adjustment bracket to one (1) of seven (7) height positions.
  - B. **FWD WHEELCHAIRS** - Move the height adjustment bracket to one (1) of five (5) height positions.
6. Reinstall the flat washer and nut that secures the threaded arm on the height adjustment bracket to the footboard bracket. Refer to DETAIL "B".
7. Reinstall mounting screw, caplug washer, flat washer and nut that secures the two (2) large washers and support tube to the height adjustment bracket and footboard bracket. Refer to DETAIL "A".
8. Reinstall the caplug caps.
9. Repeat STEPS 2-8 for the opposite footboard bracket.
10. Reinstall the removable footboard plate. Refer to REMOVING/INSTALLING THE REMOVABLE FOOTBOARD ONTO/FROM THE WHEELCHAIR in PROCEDURE 3 of the Owner's Manual.



*NOTE: MWD footboard bracket shown for clarity. Footboard bracket on FWD models adjusts in the same manner.*

**FIGURE 5 - ADJUSTING FLIP-UP REMOVABLE FOOTBOARD - HEIGHT**

**This Procedure Includes the Following:**  
**Replacing Armrest Pads**  
**Replacing Armrest Plate**

*NOTE: The following procedures are for Captain's seats only.*

**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.

**REPLACING ARMREST PADS (FIGURE 1)**

1. Remove the mounting screws that secures the front of the armrest pad to the armrest plate.
2. Remove the mounting screw that secures the rear of the armrest pad and armrest insert to the armrest plate.
3. Remove the existing armrest pad and position the new armrest pad on the armrest plate.
4. Line up the mounting holes in the armrest insert, armrest plate and new armrest pad.
5. Reinstall the rear mounting screw through the armrest insert, armrest plate and armrest pad and tighten securely.
6. Reinstall the front mounting screw into the armrest plate and new armrest pad and tighten securely.

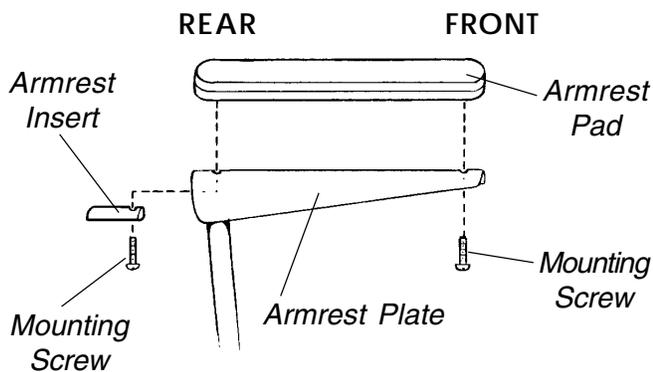


FIGURE 1 - REPLACING ARMREST PADS

**REPLACING ARMREST PLATE (FIGURE 2)**

1. If necessary, remove the three (3) hex bolts, spacers and locknuts that secure the joystick mounting bracket to the armrest plate.
2. Remove armrest pad. Refer to REPLACING ARMREST PADS in this procedure of the manual.
3. Remove the lug bolt, washers and locknut that secure the existing armrest plate to the seat frame assembly.
4. Position the new armrest plate on the seat frame assembly and secure with the lug bolt, washers and locknut. Refer to FIGURE 2 for correct hardware orientation.
5. Reinstall armrest pad. Refer to REPLACING ARMREST PADS in this procedure of the manual.
6. If necessary, reinstall the three (3) hex bolts, spacers and locknuts that secure the joystick mounting bracket to the armrest plate.
7. Repeat STEPS 1-6 for the opposite armrest plate, if necessary.

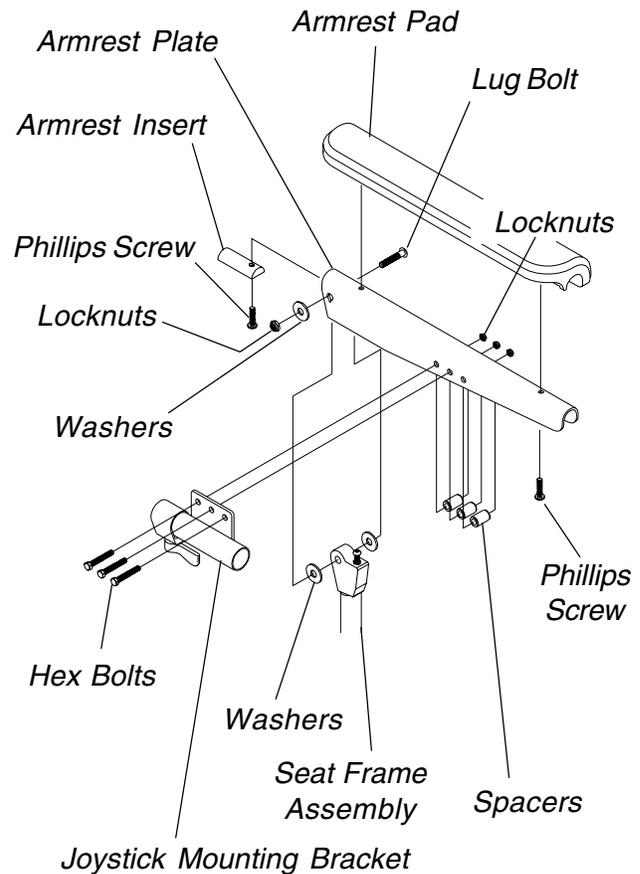


FIGURE 2 - REPLACING ARMREST PLATE

***This Procedure Includes the Following:******Replacing Seat Positioning Strap******Replacing Back Upholstery******Replacing Captain's 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.

## REPLACING SEAT POSITIONING STRAP

### Captain's Seats (FIGURE 1)

1. Remove the Captain's seat from the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.
2. Remove the two (2) hex bolts, washers and locknuts that secure the seat positioning strap to the seat frame assembly.
3. Remove the two (2) halves of the seat positioning strap from the seat frame assembly.
4. Position the two (2) new seat positioning strap halves on the inside of the seat frame assembly as shown in FIGURE 1.
5. Position the mounting holes in the two (2) new seat positioning strap halves with the mounting holes in the seat frame assembly.
6. Reinstall the two (2) hex bolts, washers and locknuts that secure the seat positioning strap to the seat frame assembly and tighten securely.

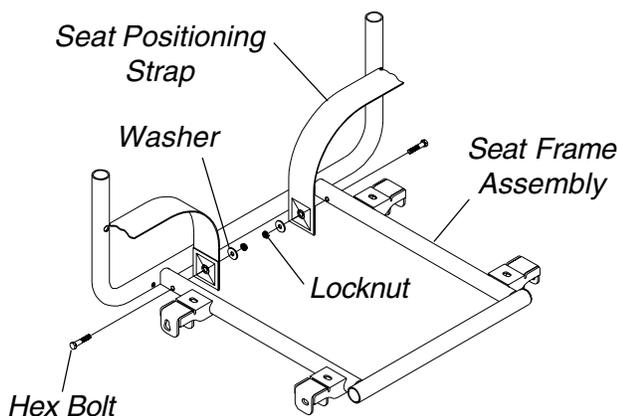


FIGURE 1 - REPLACING SEAT POSITIONING STRAP - CAPTAIN'S SEATS

7. Reinstall the Captain's seat onto the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.

## REPLACING BACK UPHOLSTERY (FIGURE 2)

*NOTE: The following procedure is for Integrated sling seat wheelchairs only.*

1. Flip the armrests up and out of the way. Refer to USING/ADJUSTING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, part number 1080722.
2. Cut the tie-wraps that secure the bottom of the existing back upholstery to the wheelchair frame.
3. Remove the two (2) phillips screws and washers that secure the existing back upholstery to the back canes.
4. Remove the two (2) hex bolts, washers and locknuts that secure one (1) back cane to the wheelchair frame.

*NOTE: It is necessary to remove only one (1) back cane to replace the back upholstery.*

5. Pull the loose back cane out of the existing back upholstery.
6. Pull the existing back upholstery up and over the mounted back cane.
7. Install new back upholstery over mounted back cane.

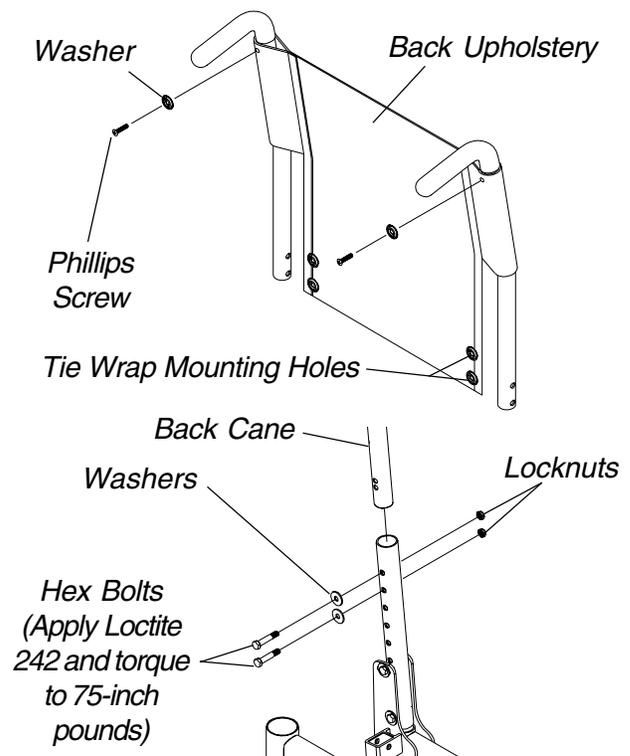


FIGURE 2 - REPLACING BACK UPHOLSTERY

8. Slide the loose top half of the back cane through the new back upholstery.
9. Using the mounted back cane as a guide, reinstall the two (2) hex bolts that secure the top half of the back cane to the bottom half of the back cane.

*NOTE: Make sure the back canes are mounted to the same height.*

**WARNING**

The top and bottom half of the back canes **MUST** be tightened securely together **BEFORE** using the wheelchair, otherwise injury or damage may occur. Use Loctite 242 on the hex bolts and torque to 75-inch pounds.

10. Use Loctite 242 on the hex bolts and torque into the back canes to 75-inch pounds.
11. While holding the hex bolt, reinstall the locknut and torque to 75-inch pounds.
12. Repeat STEP 11 for the other hex bolt and locknut.
13. Securely tighten the new back upholstery to the back canes with the two (2) phillips screws and washers.
14. Secure the bottom of the new back upholstery to the wheelchair frame with tie-wraps.

*NOTE: Clean upholstery with warm DAMP cloth and mild detergent to remove superficial soil.*

**WARNING**

Laundering or moisture will reduce flame retardation of the upholstery.

### REPLACING CAPTAIN'S SEAT (FIGURE 3)

1. Remove the Captain's seat from the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual part number 1080722.
2. Remove the four (4) hex screws and washers that secure the existing captain's seat to the seat frame assembly.
3. Line up mounting holes in the new captain's seat with mounting holes in the seat frame assembly.
4. Apply Loctite 242 to the hex screws.
5. Install the four (4) hex screws and washers through the seat frame assembly and into the new captain's seat. Tighten securely.
6. Install the new captain's seat onto the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.

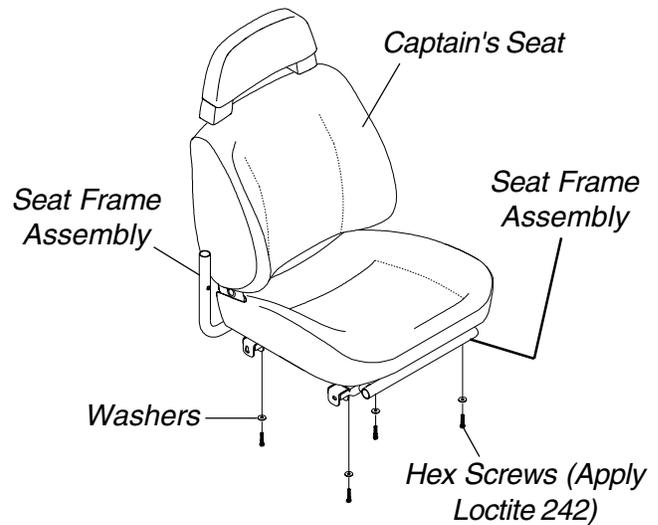


FIGURE 3 - REPLACING CAPTAIN'S SEAT

**This Procedure Includes the Following:**  
 Adjusting Seat Depth  
 Adjusting Back Height  
 Changing Back Angle  
 Replacing Back Canes

*NOTE: The instructions in this procedure are for INTEGRATED SLING SEAT wheelchairs ONLY.*

**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 SEAT DEPTH (FIGURE 1)**

1. Remove the existing seat upholstery from the wheelchair. Refer to REPLACING SEAT UPHOLSTERY in PROCEDURE 5 of the owner's manual, part number 1080722.

*NOTE: If adjusting seat depth of the wheelchair, the seat upholstery MUST be changed as well.*

2. Remove the two (2) plug buttons from the ends of the crossbraces that are towards front of wheelchair.

*NOTE: The two (2) plug buttons will be used in the ends of the seat extensions.*

3. Install the two (2) seat extension tubes into the ends on the crossbraces. Line up the **second** mounting hole from the **rear** of the seat extension tube with the front mounting hole in the crossbrace.
4. Install the new seat upholstery onto the wheelchair. Refer to REPLACING SEAT UPHOLSTERY in PROCEDURE 5 of the owner's manual, part number 1080722.

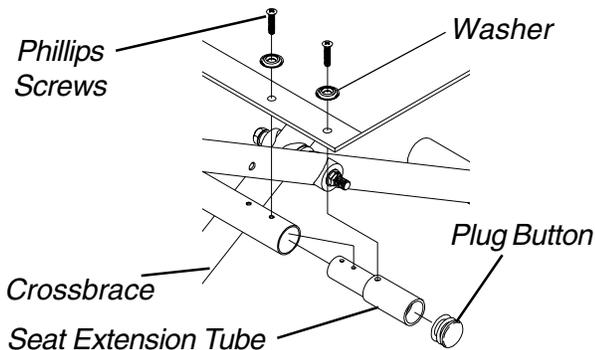


FIGURE 1 - ADJUSTING SEAT DEPTH

*NOTE: Make sure to line up the mounting holes in the seat extension tubes with the new seat upholstery.*

5. Install plug buttons into ends of the seat extension tubes.

**ADJUSTING BACK HEIGHT (FIGURE 2)**

1. Remove the two (2) hex bolts, washers and locknuts that secure the top half of the back cane to the bottom half of the back cane.
2. Reposition the back cane to one (1) of five (5) pairs of height adjustment holes:

⊕ HOLE PAIR #	1	2	3	4	5
Back Height (in inches)	16	17	18	19	20

⊕ Holes numbered from bottom to top for reference only. (There are no numbers on the back canes.)

3. Reinstall the two (2) hex bolts that secure the top half of the back cane to the bottom half of the back cane.

**WARNING**

The top and bottom half of the back canes MUST be tightened securely together BEFORE using the wheelchair, otherwise injury or damage may occur. Use Loctite 242 on the hex bolts and torque to 75-inch pounds.

4. Use Loctite 242 on the hex bolts and torque into the back canes to 75-inch pounds.
5. While holding the hex bolt, reinstall the locknut and torque to 75-inch pounds.
6. Repeat STEP 5 for the other hex bolt and locknut.
7. Repeat STEPS 1-6 for the opposite back cane.

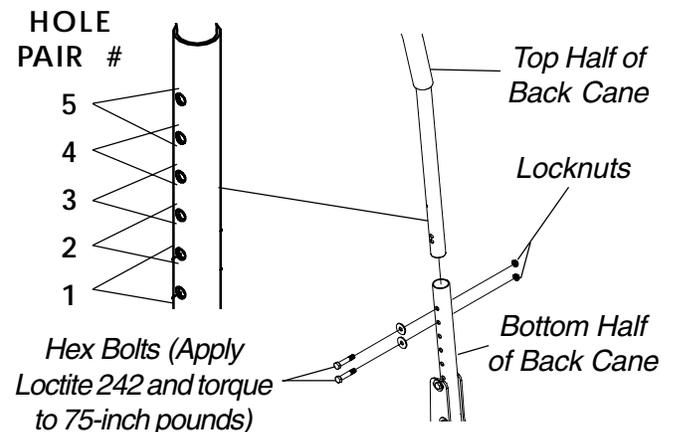


FIGURE 2 - ADJUSTING BACK HEIGHT

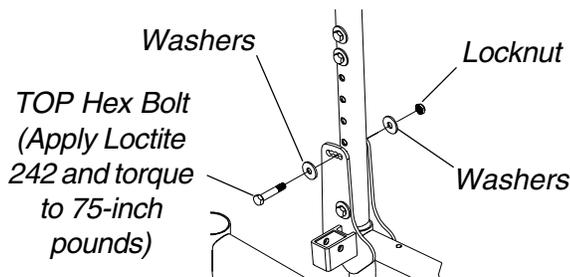
### CHANGING BACK ANGLE (FIGURE 3)

1. Flip the armrests up and out of the way. Refer to USING/ADJUSTING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, part number 1080722.
2. Remove the TOP hex bolt, two (2) washers and locknut that secure the back cane to the mounting plate on the wheelchair frame.
3. Refer to DETAIL "B" in FIGURE 3 to determine the mounting plate hole for the desired back angle.
4. Reposition the back cane to the position determined in STEP 3.
5. Reinstall TOP hex bolt, two (2) washers and locknut. Refer to FIGURE 3 for correct hardware orientation.

#### WARNING

The back canes **MUST** be tightened securely to the wheelchair frame **BEFORE** using the wheelchair, otherwise injury or damage may occur. Use Loctite 242 on the hex bolt and torque to 75-inch pounds.

6. Use Loctite 242 on the hex bolt and torque the hex bolt to 75-inch pounds.
7. Repeat STEPS 2-6 for opposite side of wheelchair.



#### DETAIL "B"

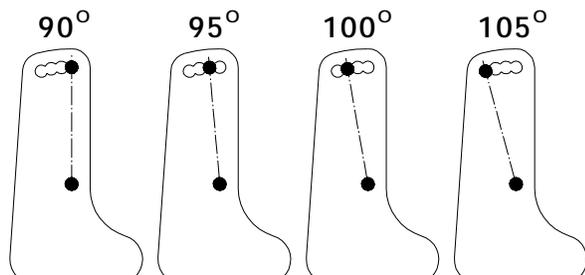


FIGURE 3 - CHANGING BACK ANGLE

### REPLACING BACK CANES (FIGURE 4)

#### Top Half of Back Canes

1. Flip the armrests up and out of the way. Refer to USING/ADJUSTING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, part number 1080722.

*NOTE: If the back height of the wheelchair is staying the same, note the position of the existing top half of the back cane(s) before removing from the wheelchair.*

2. Remove the phillips screw and washer that secure the back upholstery to the existing top half of the back cane.
3. Slide the back upholstery up to expose the two (2) hex bolts, washers and locknuts.
4. Remove the two (2) hex bolts, washers and locknuts that secure the existing top half of the back cane to the bottom half of the back cane.
5. Remove the existing top half of the back cane from the bottom half of the back cane.
6. Perform one (1) of the following:
  - A. Install the new top half of the back cane through the back upholstery and into the bottom half of the back cane at the existing position noted.
  - B. Install the new top half of the back cane through the back upholstery and into the bottom half of the back cane to one (1) of the following new positions:

⊕ HOLE PAIR #	1	2	3	4	5
Back Height (in inches)	16	17	18	19	20

⊕ Holes numbered from bottom to top for reference only. (There are no numbers on the back canes.)

7. Reinstall the two (2) hex bolts that secure the new top half of the back cane to the bottom half of the back cane.

#### WARNING

The top and bottom half of the back canes **MUST** be tightened securely together **BEFORE** using the wheelchair, otherwise injury or damage may occur. Use Loctite 242 on the hex bolts and torque to 75-inch pounds.

8. Use Loctite 242 on the hex bolts and torque into the back canes to 75-inch pounds.
9. While holding the hex bolt, reinstall the locknut and torque to 75-inch pounds.
10. Repeat STEP 9 for the other hex bolt and locknut.

11. Securely tighten back upholstery to the new top half of the back cane with the phillips screw and washer.
12. Repeat STEPS 2-11 for the opposite side of the wheelchair, if necessary.

### Bottom Half of Back Canes

1. Flip the armrests up and out of the way. Refer to USING/ADJUSTING FLIP BACK ARMRESTS in PROCEDURE 4 of the owner's manual, part number 1080722.
2. Remove phillips screw and washer that secure back upholstery to the existing top half of the back cane.
3. Slide the back upholstery up to expose the two (2) hex bolts, washers and locknuts.
4. Remove the two (2) hex bolts, washers and locknuts that secure the top half of the back cane to the existing bottom half of the back cane.
5. Remove the top half of the back cane from the existing bottom half of the back cane.

*NOTE: If the back angle of the wheelchair is staying the same, note the position of the existing bottom half of the back cane(s) before removing from the wheelchair.*

6. Remove the two (2) hex bolts, four (4) washers and two (2) locknuts that secure the bottom half of the back cane to the wheelchair.
7. Remove the existing bottom half of the back cane from the wheelchair.

*NOTE: The existing insert will be reused.*

8. Remove the insert from the existing bottom half of the back cane.
9. Install the insert into the new bottom half of the back cane and line up the mounting holes.
10. Install the new bottom half of the back cane onto the wheelchair at the position noted.

*NOTE: If the back angle needs to be changed, refer to CHANGING BACK ANGLE in this procedure of the manual.*

11. Reinstall the two (2) hex bolts, four (4) washers and two (2) locknuts that secure the new bottom half of the back cane to the wheelchair.

12. Use Loctite 242 on the hex bolts and torque the hex bolts to 75-inch pounds.
13. Securely tighten back upholstery to the top half of the back cane with the phillips screw and washer.
14. Repeat STEPS 2-13 for the opposite side of the wheelchair, if necessary.

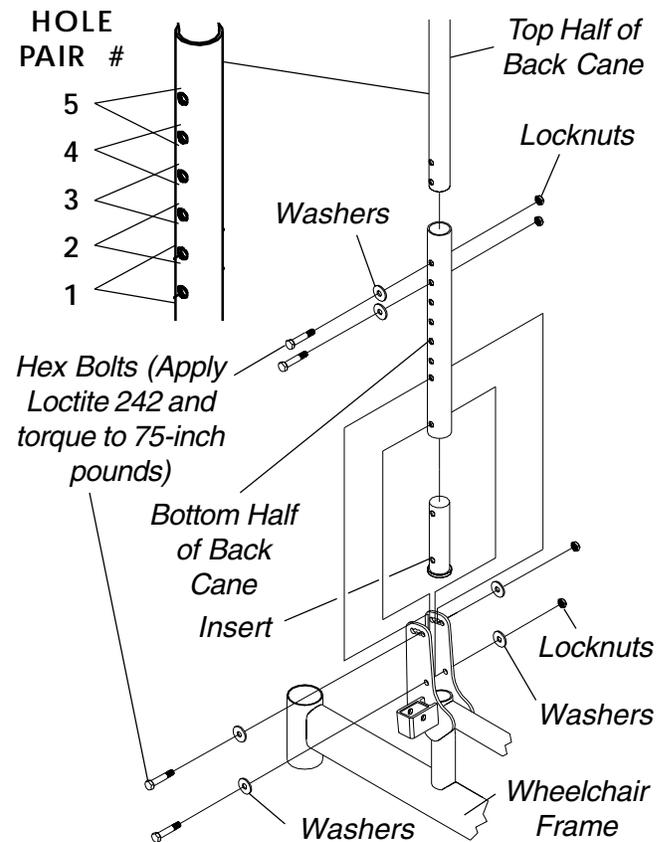


FIGURE 4 - REPLACING BACK CANES

### WARNING

The back canes **MUST** be tightened securely to the wheelchair frame **BEFORE** using the wheelchair, otherwise injury or damage may occur. Use Loctite 242 on the hex bolts and torque to 75-inch pounds.

***This Procedure Includes the Following:***

***Repositioning MKIV Joystick***

***Removing/Installing MKIV Controller***

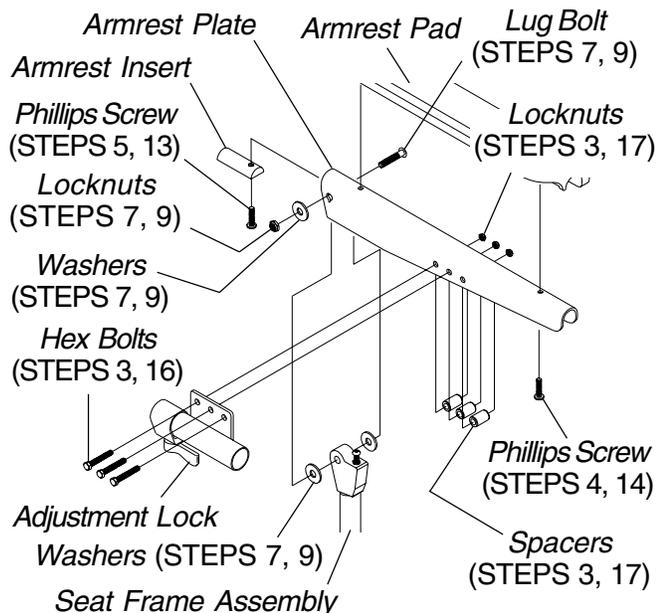
**WARNING**

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

**REPOSITIONING MKIV JOYSTICK**

**Captain's Seats (FIGURE 1)**

1. Turn the lever on the adjustment lock to release the adjustment lock from joystick mounting tube.
2. Remove the joystick from the wheelchair.
3. Remove the three (3) hex bolts, spacers and locknuts that secure joystick mounting bracket to armrest plate.
4. Remove the phillips screw that secures the front of the armrest pad to the armrest plate.
5. Remove the phillips screw that secures the rear of the armrest pad and armrest insert to the armrest plate.
6. Remove the armrest pad from the armrest plate.
7. Remove the lug bolt, washers and locknut that secure the existing armrest plate to the seat frame assembly.
8. Repeat STEPS 4-7 for opposite side of wheelchair.
9. Position armrest plate with joystick mounting holes on desired side of seat frame assembly and secure with lug bolt, washers and locknut. Refer to FIGURE 1.
10. Position armrest plate without joystick mounting holes on opposite side of seat frame assembly and secure with lug bolt, washers and locknut. Refer to FIGURE 1.



**FIGURE 1 - REPOSITIONING MKIV JOYSTICK - CAPTAIN'S SEATS**

11. Position the armrest pad on the armrest plate.
12. Line up the mounting holes in the armrest insert, armrest plate and armrest pad.
13. Reinstall rear phillips screw through the armrest insert, armrest plate and armrest pad and tighten securely.
14. Reinstall the front phillips screw into the armrest plate and armrest pad and tighten securely.
15. Repeat STEPS 11-14 for opposite side of wheelchair.
16. Install Loctite 242 onto the three (3) hex bolts.
17. Install the three (3) hex bolts, spacers and locknuts that secure joystick mounting bracket to armrest plate.
18. Slide the joystick mounting tube through the joystick mounting bracket to the desired position.
19. Secure adjustment lock to joystick mounting tube by turning lever on adjustment lock.

**REMOVING/INSTALLING MKIV CONTROLLER**

**WARNING**

Replacement controller **MUST** be same part number as factory installed controller - Otherwise, injury or damage may result.

**16, 18, or 20-inch Wide Models (FIGURE 2)**

**REMOVING.**

1. If necessary, remove the rear shroud and rear compartment (if equipped). Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES for one (1) of the following:

**FWD WHEELCHAIRS** - in PROCEDURE 13 of this manual.

**MWD WHEELCHAIRS** - in PROCEDURE 14 of this manual.

3. Disconnect the following connections:
  - A. The right hand motor and controller connection.
  - B. The left hand motor and controller connection.
  - C. Battery wiring harness and controller connection.
4. Remove the two (2) locknuts that secure the existing MKIV controller and washer(s) to the wheelchair.
5. Remove existing MKIV controller from the wheelchair.

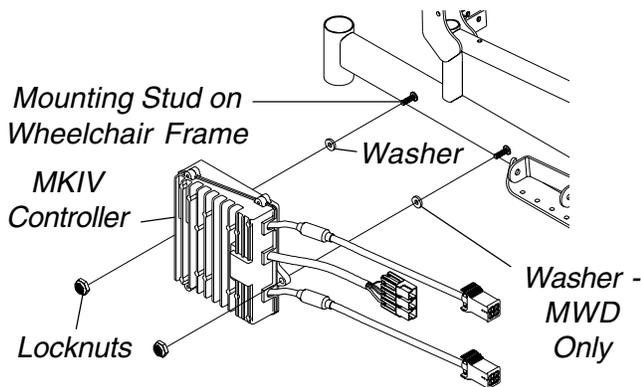
**INSTALLING.**

1. Install washer(s) onto rear mounting stud.
2. Install new/existing MKIV controller onto wheelchair frame.

3. Secure the new/existing MKIV controller to the wheelchair with NEW locknuts. Torque to 156-in/lbs.
4. Connect the following connections:
  - A. The right hand motor and controller connection.
  - B. The left hand motor and controller connection.
  - C. Battery wiring harness and controller connection.
5. Install the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES for one (1) of the following:
 

**FWD WHEELCHAIRS** - in PROCEDURE 13 of this manual.

**MWD WHEELCHAIRS** - in PROCEDURE 14 of this manual.
6. If necessary, install the rear shroud and rear compartment (if equipped). Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.



**FIGURE 2 - REMOVING/INSTALLING MKIV CONTROLLER - 16,18, 20-INCH WIDE MODELS**

### 14-inch Wide Models (FIGURE 3)

#### REMOVING.

1. Remove the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in PROCEDURE 12 of this manual.
3. Cut the tie wrap that secure the following connections to the wire connector support:
  - A. The right hand motor and controller connection.
  - B. The left hand motor and controller connection.
  - C. Battery wiring harness and controller connection. (BLUE)

4. Disconnect the following connections:
  - A. The right hand motor and controller connection.
  - B. The left hand motor and controller connection.
  - C. Battery wiring harness and controller connection.
5. Cut the tie-wrap that secure the the left hand motor cable and controller cable together.
6. Remove the two (2) locknuts that secure the existing MKIV controller and washer(s) to the wheelchair.
7. Remove existing MKIV controller from the wheelchair.

#### INSTALLING.

1. On models without shrouds, install washer onto rear mounting stud.
2. Install new/existing MKIV controller onto wheelchair frame.
3. Secure the new/existing MKIV controller to the wheelchair with NEW locknuts. Torque to 156-in/lbs.
4. Connect the following connections:
  - A. The right hand motor and controller connection.
  - B. The left hand motor and controller connection.
  - C. Battery wiring harness and controller connection.

*NOTE: See FIGURE 3 for proper positioning of the connections noted in STEP 4 on the wire connector support.*

5. Secure the connections noted in STEP 4 to the wire connector support with a tie-wrap

*NOTE: Make sure to thread tie-wrap around crossbrace and through slot in wire connector support.*

6. Secure the left hand motor cable and the controller cable to the crossbrace with a tie-wrap .
7. Install the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in PROCEDURE 12 of this manual.
8. Install the front and rear shroud. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

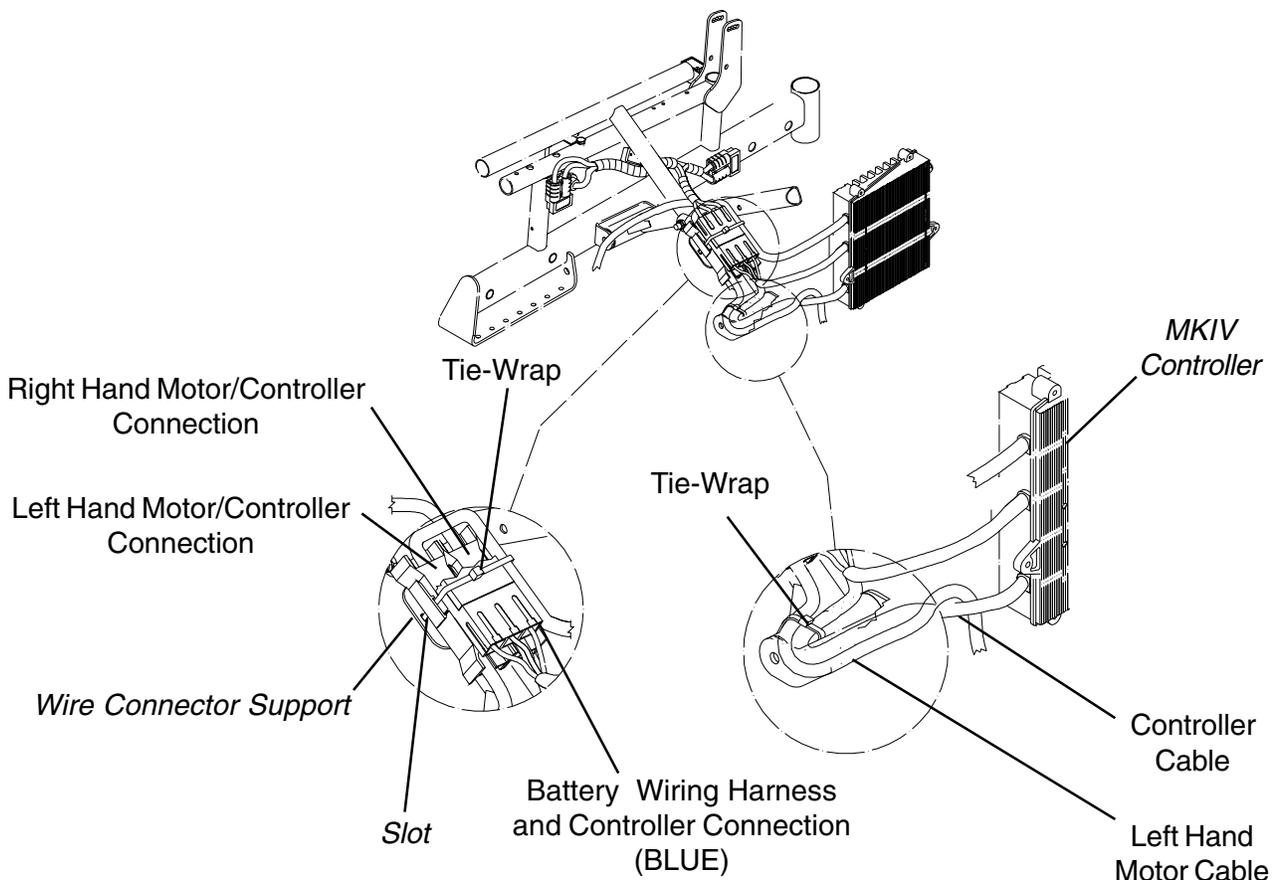
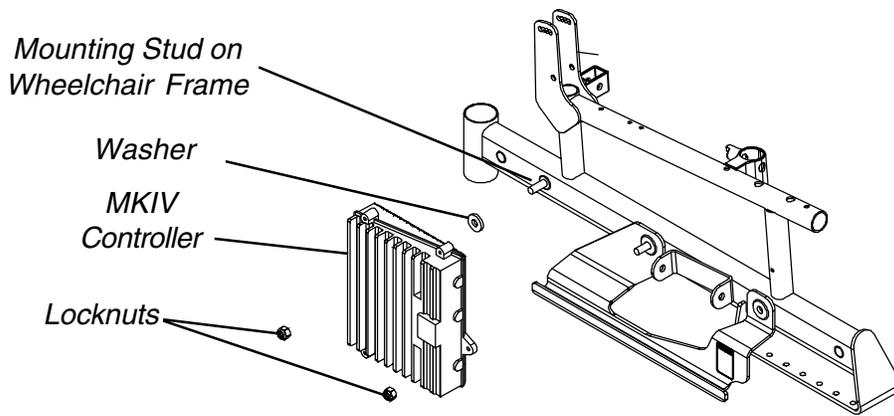


FIGURE 3 - REMOVING/INSTALLING MKIV CONTROLLER - 14-INCH WIDE MODELS

*This Procedure Includes the Following:*  
**Disconnecting/Connecting Limit Switch**  
**Adjusting Limit Switch**

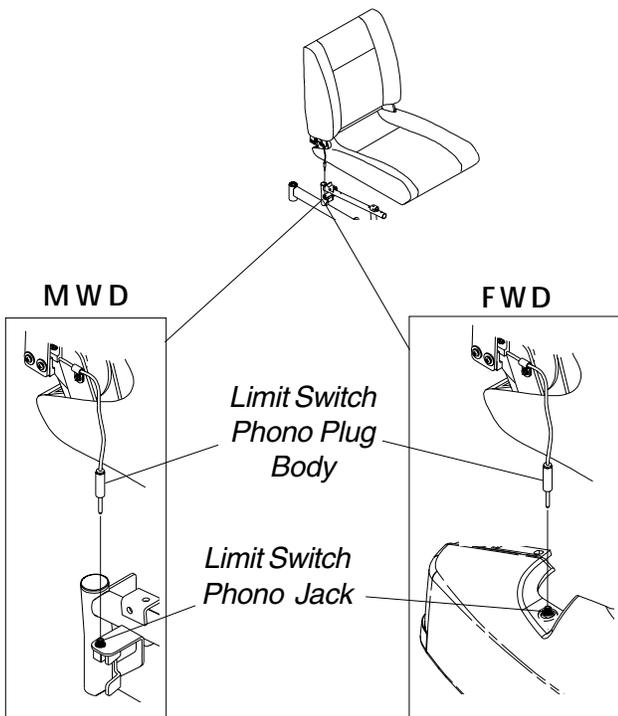
**WARNING**  
 After ANY adjustments, repair or service and BEFORE use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

**DISCONNECTING/CONNECTING LIMIT SWITCH (FIGURE 1)**

*NOTE: The following procedure is for High Back Captain's seat model wheelchairs only.*

**CAUTION**  
 Disconnect limit switch BEFORE removing seat or damage to switch may occur.

- Perform one (1) of the following:
  - DISCONNECTING -** While holding the body of the limit switch phono plug, lift up gently.
  - NOTE: When the limit switch is unplugged the wheelchair will NOT operate.*
  - CONNECTING -** Plug limit switch plug into the limit switch phono jack.



**FIGURE 1 - DISCONNECTING/CONNECTING LIMIT SWITCH**

**ADJUSTING LIMIT SWITCH (FIGURE 2)**

*NOTE: The following procedure is for High Back Captain's seat model wheelchairs only.*

**WARNING**  
 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. Adjust the limit switch or have the wheelchair serviced by a dealer or qualified technician, otherwise injury or damage may occur.

- Place the wheelchair on a level surface.
- Recline the captain's seat back to a 24° to achieve the 114° angle relative to the seat frame. Refer to ADJUSTING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.

*NOTE: The captain's seat frame is at a 5° angle relative to the ground. When the back angle is adjusted to 114° relative to the seat, it will measure 61° relative to the ground.*

*NOTE: To determine 114° back angle relative to the seat frame, place a magnetic protractor (available at any hardware store) on the back as shown in FIGURE 3 and adjust the back until the magnetic protractor reads 61°.*

- Turn the wheelchair power switch on the joystick to the ON position.

*NOTE: The wheelchair should not operate.*

- IF** wheelchair operates, proceed to the following steps to adjust the actuator on the upper limit switch bracket:
  - Fully recline the back. Refer to ADJUSTING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.

*NOTE: This will make access to the limit switch easier.*

- Loosen, but do not remove, the two (2) phillips screws, washers and locknuts that secure the actuator to the upper limit switch bracket.
- Slide the actuator UP (towards the top of the wheelchair).

**CAUTION**  
 DO NOT over tighten the phillips screws that secure the actuator to the upper limit switch bracket. Damage to the actuator may occur.

- D. Only tighten the two (2) phillips screws, washers and locknuts that secure the actuator to the upper limit switch bracket until the actuator does not move.
- E. Repeat STEPS 1-3 until the wheelchair does not operate when the captain's seat back is at a 24° angle.

LIMIT SWITCH

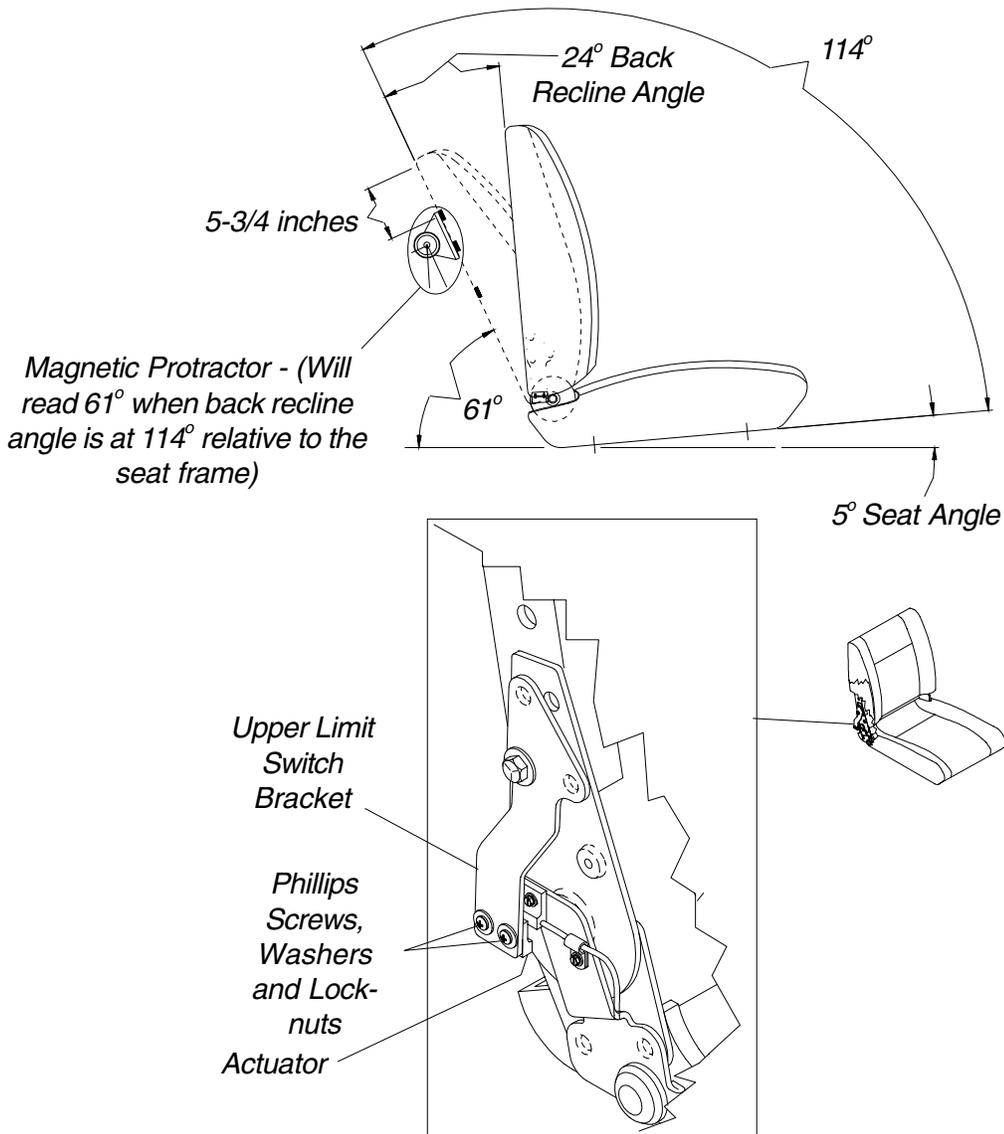


FIGURE 2 - ADJUSTING LIMIT SWITCH

**This Procedure Includes the Following:**  
**Replacing Pneumatic Tires/Tubes - Drive Wheels/Casters**  
**Removing/Installing Drive Wheels**  
**Removing/Installing Drive Wheel Hub**  
**Replacing Casters**  
**Replacing Forks**

**WARNING**

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

**CAUTION**

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

**REPLACING PNEUMATIC TIRES/TUBES - DRIVE WHEELS/CASTERS**

**WARNING**

DO NOT use your wheelchair unless it has the proper tire pressure (p.s.i.). DO NOT over-inflate the tires. Failure to follow these suggestions may cause the tire to explode and cause bodily harm.

If tires are pneumatic, replacement of tire or tube MUST be performed by a qualified technician.

*NOTE: If drive wheels or casters are pneumatic, under-inflation causes excessive wear which results in poor performance of the tires.*

**REMOVING/INSTALLING DRIVE WHEELS**

**WARNING**

NEVER use a locking tab washer more than once. ALWAYS use a NEW locking tab washer when installing the drive wheels.

**12-inch Drive Wheel (FIGURE 1)**

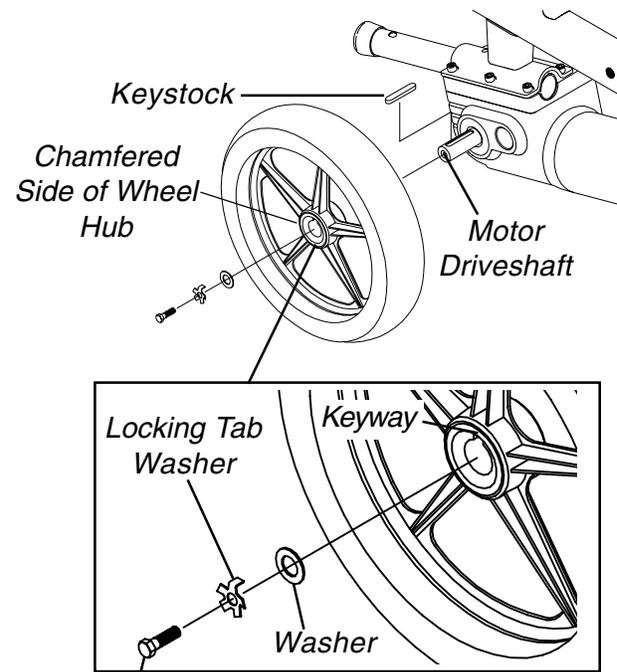
**REMOVING.**

1. The tab of the locking washer that is bent 90° up against the head of the mounting screw MUST be flattened before the mounting screw can be removed.
2. Remove the hex screw, locking tab washer and washer that secure the existing front wheel to the wheel hub.
3. Use a wheel puller to remove the existing front wheel from the motor drive shaft.

**INSTALLING.**

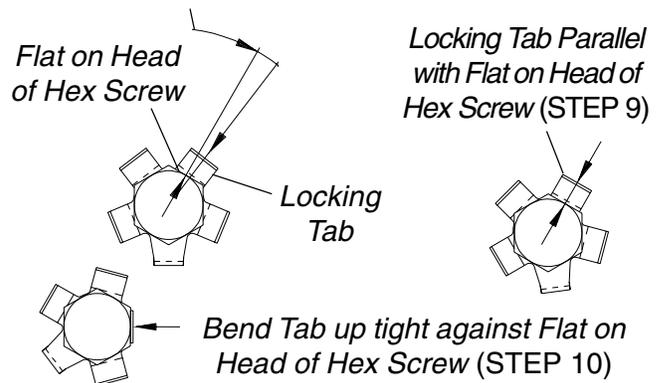
*NOTE: The keystone in the wheel hub MUST lineup with the cutout in the gearbox drive shaft.*

1. Install new/existing front wheel onto the motor drive shaft. Make sure the chamfered (angled in) side of the wheel hub is pointing away from the wheelchair.
2. Install washer onto motor drive shaft.
3. Install the **NEW** locking tab washer onto the motor drive shaft. Make sure the locking tab is in line with the keyway of the front wheel.
4. Apply Loctite 242 to the hex screw.
5. Install the hex screw. Use a torque wrench only and torque to 90-inch pounds.



Hex Screw (Apply Loctite 242 and use a Torque Wrench only to Torque to 90-inch pounds)

TIGHTEN Hex Screw if Locking Tab is not Parallel with Flat on Head (STEP 9)



**FIGURE 1 - REMOVING/INSTALLING 12-INCH DRIVE WHEELS**

6. Examine the head of the hex screw and the locking tab washer. Make sure one (1) of the tabs on the locking tab washer is parallel with one (1) of the flats on the head of the hex screw.
7. If one (1) of the tabs on the locking tab washer is NOT parallel with one (1) of the flats on the head of the hex screw (FIGURE 1), **TIGHTEN** the hex screw until the closest flat and locking tab are parallel.

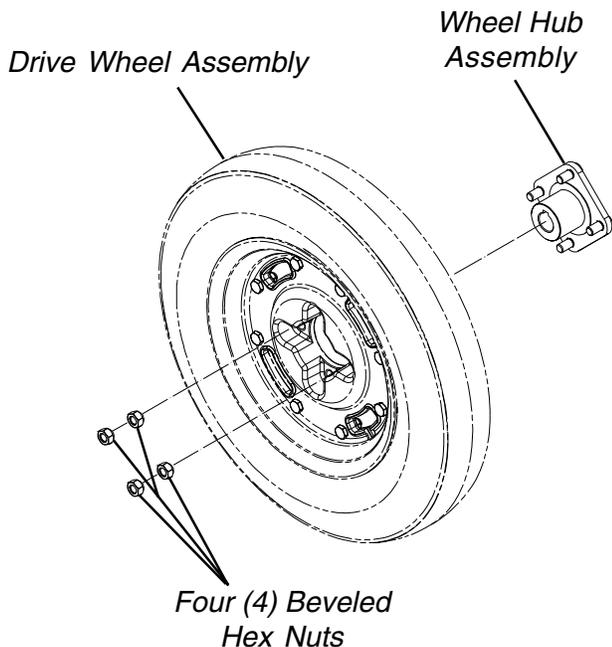
*NOTE: Tighten hex screw only. DO NOT loosen hex screw to make one of the tabs on the locking washer parallel.*

8. Bend the parallel tab of locking tab washer up tight against flat of the hex screw (FIGURE 1).

**14-inch Drive Wheel (FIGURE 2)**

**REMOVING.**

1. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES for one (1) of the following:  
**FWD WHEELCHAIRS** - in PROCEDURE 13 of this manual.  
**MWD WHEELCHAIRS** - in PROCEDURE 14 of this manual.
2. Remove the four (4) beveled locknuts that secure the drive wheel to the wheel hub.
3. Remove the existing drive wheel from the wheel hub.



**FIGURE 2 - REMOVING/INSTALLING 14-INCH DRIVE WHEELS**

**INSTALLING.**

1. Install drive wheel onto wheel hub
2. Secure the drive wheel onto the drive wheel hub with the existing four (4) beveled locknuts. Torque locknuts to 160-inch pounds.
3. Repeat STEPS 1-2 for opposite side if necessary.
4. Install the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES for one (1) of the following:

**FWD WHEELCHAIRS** - in PROCEDURE 13 of this manual.

**MWD WHEELCHAIRS** - in PROCEDURE 14 of this manual.

**REMOVING/INSTALLING DRIVE WHEEL HUB (FIGURE 3)**

*NOTE: Drive wheel hubs are only on 14-inch drive wheels.*

**WARNING**

**NEVER** use a locking tab washer more than once. **ALWAYS** use a **NEW** locking tab washer when installing the drive wheels.

**Removing**

1. Remove the drive wheels. Refer to REMOVING/INSTALLING THE DRIVE WHEELS in this procedure of the manual.

*NOTE: The tab of the locking washer that is bent 90° up against the head of the mounting screw **MUST** be flattened before the mounting screw can be removed.*

2. Flatten the tab of the locking washer that is bent 90° up against the head of the mounting screw.
3. Remove the mounting screw, locking tab washer and washer that secure the existing drive wheel to the wheel hub.
4. Remove the wheel hub and keystick from drive shaft.

**Installing**

1. Position the keystick on the drive shaft

**CAUTION**

**DO NOT** apply more than a one (1)-inch (in length) thin film of anti-seize compound to the drive shaft. Applying more than one (1)-inch (in length) can cause the anti-seize compound to leak resulting in damage to flooring (carpet, tile, etc.).

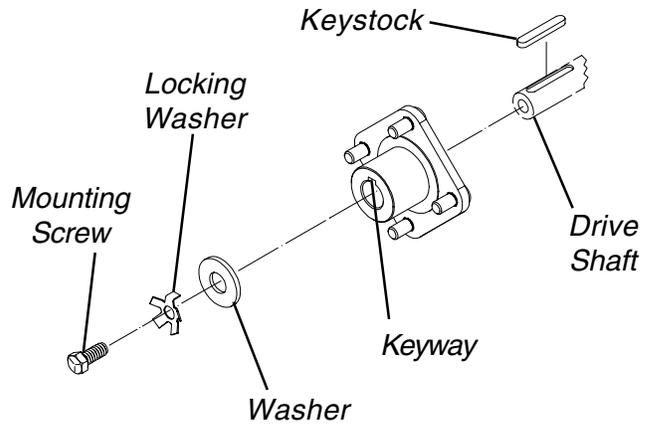
2. Apply a thin film of anti-seize compound one (1) inch in length to the end of the drive shaft.
3. Reinstall drive wheel hub onto the gearbox drive shaft.

*NOTE: While installing the drive wheel hub onto the drive shaft, spin the drive wheel hub to evenly distribute the anti-seize compound over the entire drive shaft.*

4. Install the washer and **NEW** locking tab washer onto the wheel hub. Make sure the locking tab is in line with the keyway of the wheel hub.
5. Apply Loctite 242 to the mounting screw.
6. Install the mounting screw. Use a torque wrench only and torque to 90-inch pounds.
7. Examine the head of the hex screw and the locking tab washer. Make sure one (1) of the tabs on the locking tab washer is parallel with one (1) of the flats on the head of the hex screw.
8. If one (1) of the tabs on the locking tab washer is NOT parallel with one (1) of the flats on the head of the hex screw (FIGURE 1), **TIGHTEN** the hex screw until the closest flat and locking tab are parallel.

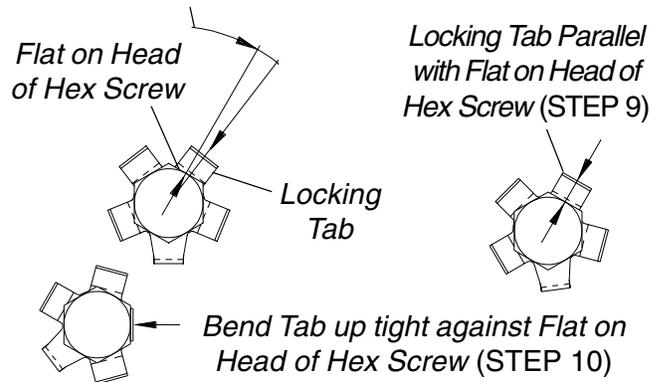
*NOTE: Tighten hex screw only. DO NOT loosen hex screw to make one of the tabs on the locking washer parallel.*

9. Bend the parallel tab of locking tab washer up tight against flat of the hex screw (FIGURE 1).
10. Reinstall the drive wheel onto the wheel hub. Refer to REMOVING/INSTALLING DRIVE WHEELS in this procedure of the manual.
11. Repeat procedure for the opposite side of the wheel-chair, if necessary.



*Mounting Screw (Apply Loctite 242 and use a Torque Wrench only to Torque to 90-inch pounds)*

**TIGHTEN** Hex Screw if Locking Tab is not Parallel with Flat on Head (STEP 9)



**FIGURE 3 - REMOVING/INSTALLING DRIVE WHEEL HUB**

**REPLACING CASTERS (FIGURE 4)**

1. Remove the hex screw, washers and locknut that secure the caster to the fork.
2. Remove the caster from the fork.
3. Install Loctite 242 onto the hex screw.
4. Replace caster and reverse STEPS 1-3.
5. Torque the locknut to 120-inch pounds.
6. Loosen the locknut 1/8 of a turn.
7. Move the caster side to side.

*NOTE: If the caster moves side to side, tighten the locknut slightly. Repeat STEP 7 until there is no side to side movement of the caster.*

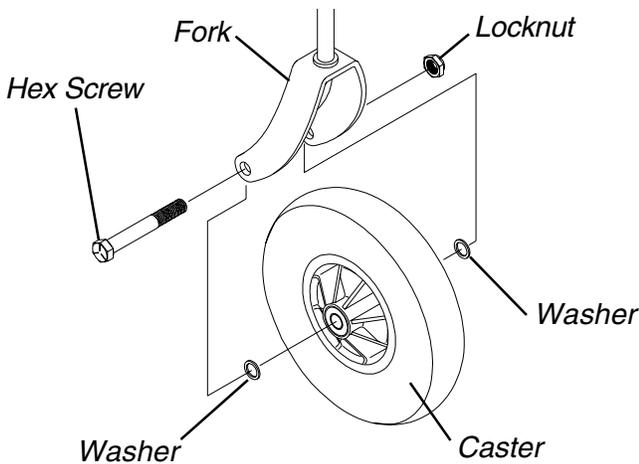


FIGURE 4 - REPLACING CASTERS

**REPLACING FORKS (FIGURE 5)**

1. Remove the hex screw, washers and locknut that secure the caster to the existing fork.
2. Remove the caster from the existing fork.
3. Remove the dust cover.
4. Remove the locknut and nylon washer.
5. Drop the existing fork out of the caster head tube.
6. Slide the new fork into the caster head tube.

*NOTE: Check bearing assemblies and replace if necessary.*

7. Ensure that new fork slides completely into the caster head tube.
8. Install nylon washer and secure with locknut.

**WARNING**  
**Improper positioning of the washer will prohibit the free movement of the forks.**

9. Install Loctite 242 onto the hex screw.
10. Position the caster into the new fork.
11. Reinstall the hex screw, washers and locknut that secure the caster to the new fork.
12. Torque the locknut to 120-inch pounds.
13. Loosen the locknut 1/8 of a turn.
14. Move the caster side to side.

*NOTE: If the caster moves side to side, tighten the locknut slightly. Repeat STEP 14 until there is no side to side movement of the caster.*

15. Adjust the fork. Refer to **ADJUSTING FORKS** in PROCEDURE 8 of the owner's manual, part number 1080737.

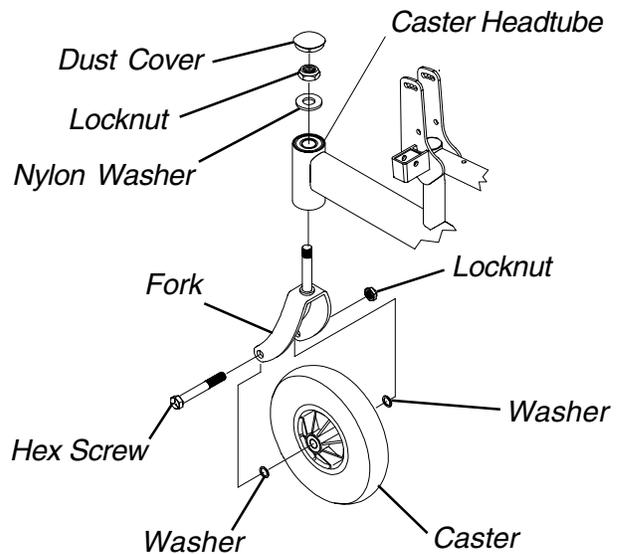


FIGURE 5 - REPLACING FORKS

***This Procedure Includes the Following:***

***Removing/Installing Shrouds***

**WARNING**

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

## REMOVING/INSTALLING SHROUDS

### MWD Wheelchairs (FIGURE 1)

#### REMOVING FRONT SHROUD.

1. Turn the two (2) 1/4-turn bolts that secure front shroud to the two (2) side shrouds COUNTERCLOCKWISE.
2. Remove the front shroud from the wheelchair.

#### INSTALLING FRONT SHROUD.

1. Position the two (2) 1/4-turn bolts with the two (2) mounting holes in the side shrouds.
2. Install the front shroud onto the two (2) side shrouds.
3. Turn the two (2) 1/4-turn bolts that secure the front shroud to the two (2) side shrouds CLOCKWISE.

#### REMOVING REAR SHROUD AND REAR STORAGE COMPARTMENT.

*NOTE: The rear storage compartment is available on wheelchairs NOT equipped with weight shift basic tilt only.*

1. Lift up on rear shroud and remove from wheelchair.
2. Turn the two (2) 1/4-turn bolts that secure the rear storage compartment to the wheelchair frame COUNTERCLOCKWISE.
3. Remove rear storage compartment from wheelchair.

#### INSTALLING REAR SHROUD AND REAR STORAGE COMPARTMENT.

1. Position the two (2) 1/4-turn bolts with the two (2) mounting holes in the wheelchair frame.
2. Install rear storage compartment onto chair frame.
3. Turn two (2) 1/4-turn bolts that secure the rear storage compartment to the wheelchair frame CLOCKWISE.
4. Position rear shroud on the two (2) side shrouds and slide towards the front of the wheelchair until it stops.
5. Press down on the rear shroud until the two (2) clips secure the rear shroud to the two (2) side shrouds.

#### REMOVING SIDE SHROUDS.

1. Remove the front shroud from the wheelchair. Refer to REMOVING/INSTALLING FRONT SHROUD in this procedure of the manual.

2. Remove rear shroud and rear storage compartment (if equipped) from the wheelchair. Refer to REMOVING/INSTALLING REAR SHROUD AND REAR STORAGE COMPARTMENT in this procedure of the manual.
3. Perform one (1) of the following:
  - A. INTEGRATED SLING SEAT MODELS - Fold the wheelchair. Refer to TRANSPORTING RANGER II MWD - INTEGRATED SLING SEATS in PROCEDURE 12 of this manual.
  - B. CAPTAIN'S SEAT MODELS - Remove the Captain's Seat from the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of this manual.
  - C. WEIGHT SHIFT BASIC TILT MODELS - Proceed to STEP 4.
4. Remove the phillips screws and washers that secure side shroud to wheelchair frame. Refer to FIGURE 1 for phillips screw and washer locations.
5. Remove the phillips bolt and locknut that secure the side shroud to the wheelchair frame. Refer to FIGURE 1 for phillips bolt and locknut location.
6. Repeat STEPS 4-5 for the opposite side of the wheelchair, if necessary.

#### INSTALLING SIDE SHROUDS.

1. Position the side shroud on the wheelchair frame.
2. Line up the mounting holes in the side shroud with the mounting holes in the wheelchair frame.

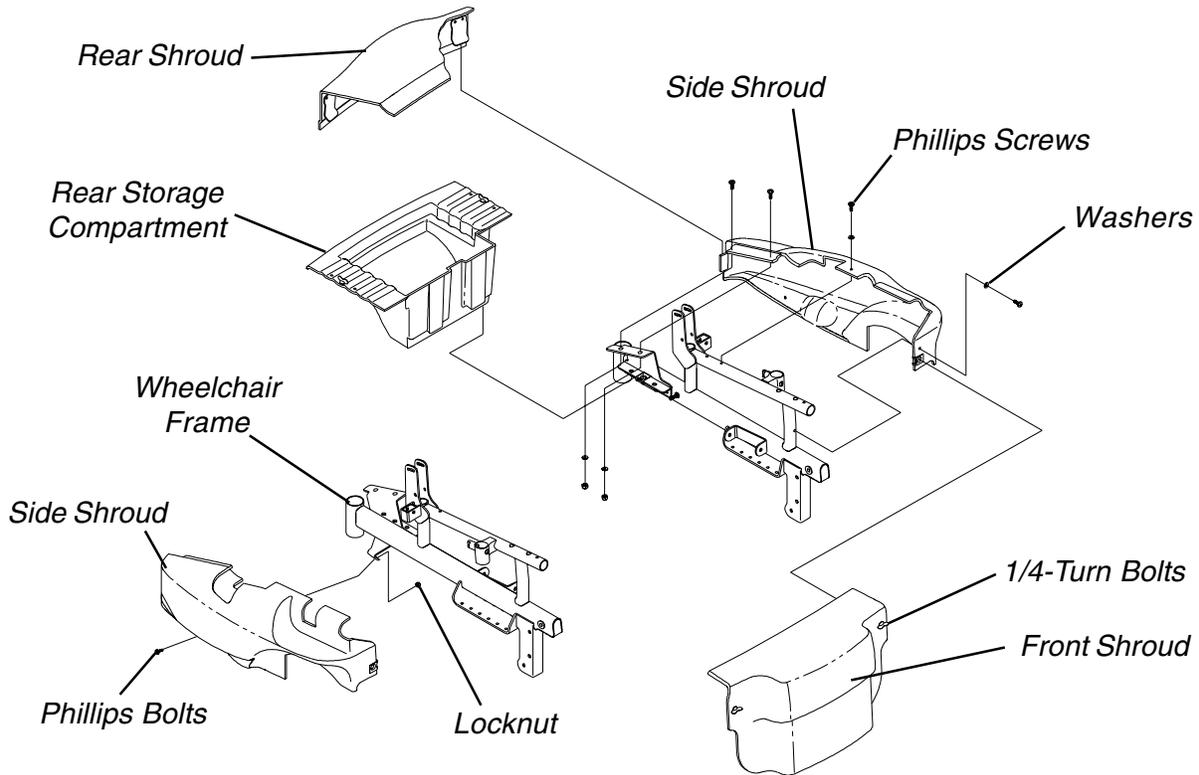
**CAUTION**

**DO NOT overtighten the phillips screws and phillips bolt that secure the side shroud to the wheelchair frame - otherwise damage to the side shroud can occur.**

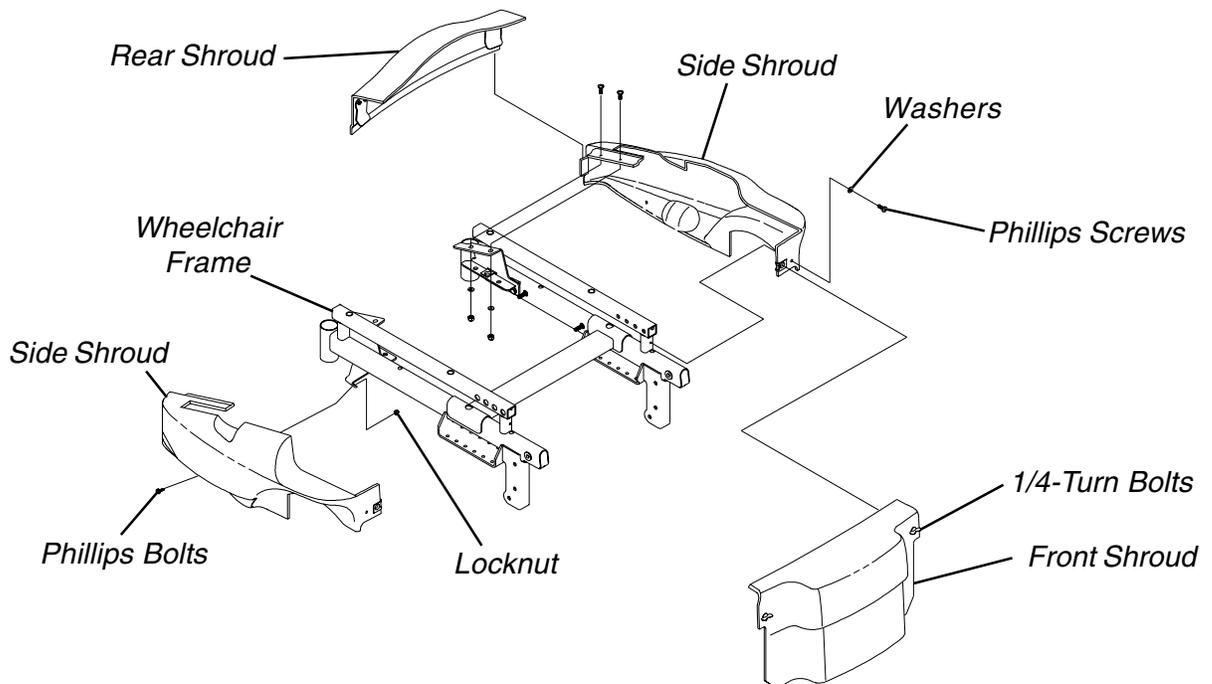
3. Install the phillips bolt and locknut that secure the side shroud to the wheelchair frame and tighten securely. DO NOT OVERTIGHTEN. Refer to FIGURE 1 for phillips bolt and locknut location.
4. Install the phillips screws and washers that secure the side shroud to the wheelchair frame and tighten securely. DO NOT OVERTIGHTEN. Refer to FIGURE 1 for phillips screw and washer locations.
5. Repeat STEPS 1-4 for the opposite side of the wheelchair, if necessary.
6. Perform one (1) of the following:
  - A. INTEGRATED SLING SEAT MODELS - Unfold the wheelchair. Refer to TRANSPORTING RANGER II MWD - INTEGRATED SLING SEATS in PROCEDURE 12 of this manual.
  - B. CAPTAIN'S SEAT MODELS - Reinstall the Captain's Seat onto the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of this manual.

- C. WEIGHT SHIFT TILT MODELS - Proceed to STEP 7.
7. Reinstall the rear shroud and rear storage compartment (if equipped) onto the wheelchair. Refer to REMOVING/INSTALLING REAR SHROUD AND REAR STORAGE COMPARTMENT in this procedure of the manual.
  8. Reinstall the front shroud onto the wheelchair. Refer to REMOVING/INSTALLING FRONT SHROUD in this procedure of the manual.

**WHEELCHAIRS NOT EQUIPPED WITH WEIGHT SHIFT BASIC TILT**



**WHEELCHAIRS EQUIPPED WITH WEIGHT SHIFT BASIC TILT**



**FIGURE 1 - REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS**

**FWD Wheelchairs (FIGURE 2)****REMOVING FRONT SHROUD.**

1. Unclip the retaining strap securing the front shroud and battery box to the wheelchair.
2. Feed the retaining strap through the front shroud.
3. Remove the front shroud from the wheelchair.

**INSTALLING FRONT SHROUD.**

1. Feed the retaining strap through the front shroud as shown in FIGURE 2.
2. Position the bottom of the front shroud between the battery box and the battery tray.
3. Clip the retaining strap together.
4. Pull end of retaining strap to secure front battery box and front shroud in place.

**REMOVING REAR SHROUD.**

1. Perform one (1) of the following:
  - A. For 16, 18, and 20-inch wide chairs:
    - Unclip the retaining strap securing the rear shroud and battery box to the wheelchair.
    - Feed the retaining strap through the rear shroud.
    - Remove the rear shroud from the wheelchair.
  - B. For 14-inch wide chairs:
    - Lift up on rear shroud and remove from wheelchair.

**INSTALLING REAR SHROUD.**

1. Perform one (1) of the following:
  - A. For 16, 18, and 20-inch wide chairs:
    - Feed the retaining strap through the rear shroud as shown in FIGURE 2.
    - Clip the retaining strap together.
    - Press down on the rear shroud until the two (2) clips secure the rear shroud to the two (2) side shrouds.
    - Pull end of retaining strap to secure rear battery box and shroud in place.
  - B. For 14-inch wide chairs:
    - Align clips of rear shroud with tabs on side shrouds.
    - Press down on rear shroud until the two clips and dual lock fastener secure the rear shroud in place.

**REMOVING SIDE SHROUDS AND FILLERS.**

1. Remove the front shroud from the wheelchair. Refer to REMOVING/INSTALLING FRONT SHROUD in this procedure of the manual.
2. Remove the rear shroud from the wheelchair. Refer to REMOVING/INSTALLING REAR SHROUD in this procedure of the manual.
3. Perform one (1) of the following:
  - A. INTEGRATED SLING SEAT MODELS - Fold the wheelchair. Refer to TRANSPORTING RANGER II FWD in PROCEDURE 12 of this manual.
  - B. CAPTAIN'S SEAT MODELS - Remove the Captain's Seat from the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.
4. HIGH BACK CAPTAIN'S SEAT MODEL WHEELCHAIRS ONLY (DETAIL "A") - Remove the phono jack nut that secures the phono jack to the side shroud.
5. Remove the phillips screws, bolts, washers and locknuts that secure side shroud and filler to the wheelchair frame. Refer to FIGURE 2 for phillips screw and washer locations.
6. Remove side shroud and filler from the wheelchair.
7. Repeat STEPS 5-6 for the opposite side of the wheelchair, if necessary.

**INSTALLING SIDE SHROUDS AND FILLERS.**

1. Position side shroud and filler on the wheelchair frame.
2. Line up the mounting holes in the side shroud and filler with the mounting holes in the wheelchair frame.

**CAUTION**

**DO NOT** overtighten the phillips screws and phillips bolt that secure the side shroud to the wheelchair frame - otherwise damage to the side shroud can occur.

3. Install the phillips screws, bolts, washers and locknuts that secure the side shroud and filler to the wheelchair frame and tighten securely. **DO NOT OVERTIGHTEN.** Refer to FIGURE 2 for phillips screw, bolt, washer and locknut locations.
4. Repeat STEPS 1-3 for the opposite side of the wheelchair, if necessary.
5. HIGH BACK CAPTAIN'S SEAT MODEL WHEELCHAIRS ONLY - If necessary, perform the following:
  - A. Position the phono jack on the side shroud.
  - B. Reinstall the phono jack nut onto the phono jack and tighten securely.

SHROUDS

6. Perform one (1) of the following:
  - A. INTEGRATED SLING SEAT MODELS - Unfold the wheelchair. Refer to TRANSPORTING RANGER II FWD in PROCEDURE 12 of this manual.
  - B. CAPTAIN'S SEAT MODELS - Reinstall the Captain's Seat onto the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.
7. Reinstall the rear shroud onto the wheelchair. Refer to REMOVING/INSTALLING REAR SHROUD in this procedure of the manual.
8. Reinstall the front shroud onto the wheelchair. Refer to REMOVING/INSTALLING FRONT SHROUD in this procedure of the manual.

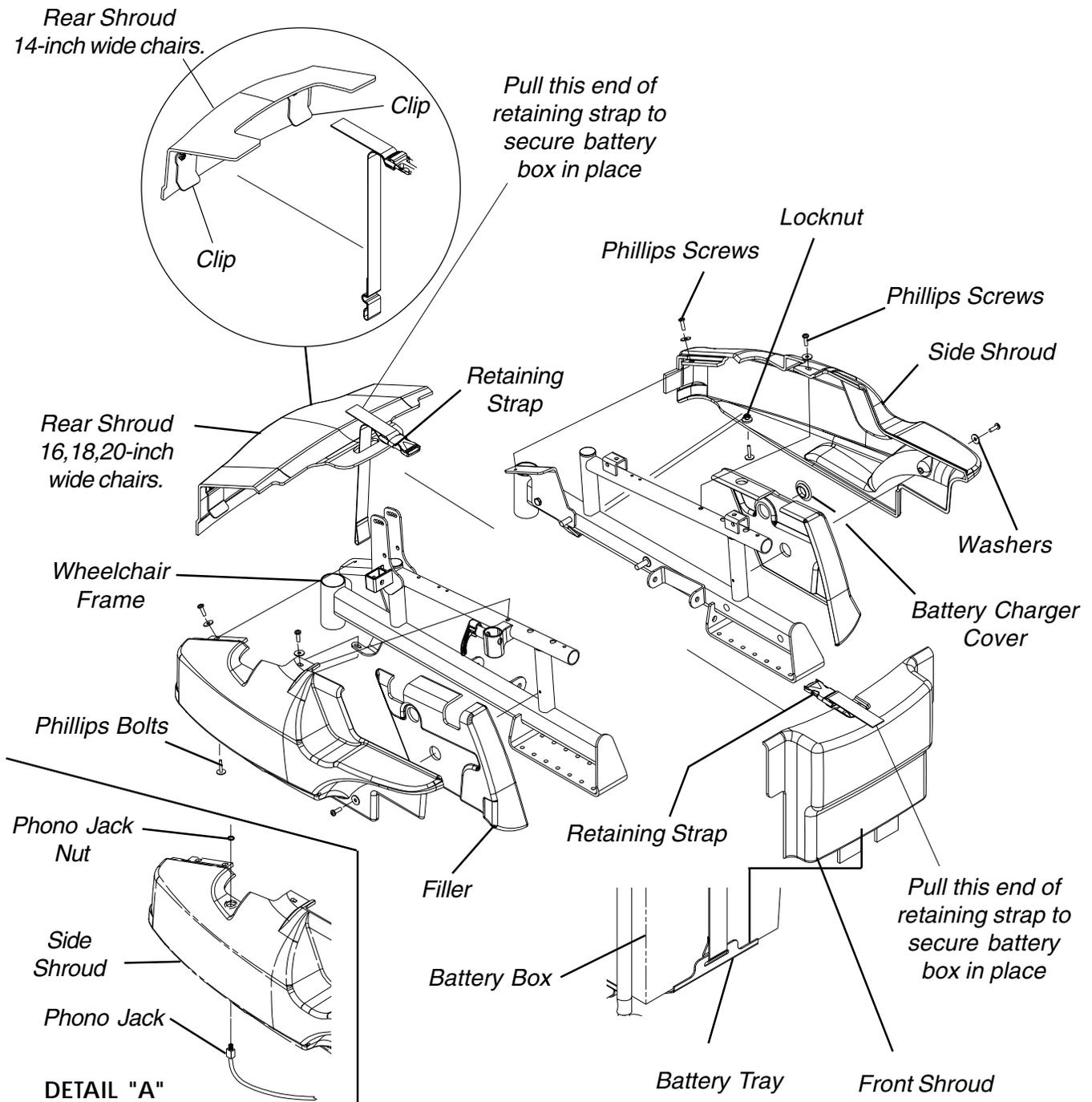


FIGURE 2 - REMOVING/INSTALLING SHROUDS - FWD WHEELCHAIRS

***This Procedure Includes the Following:***  
***Adjusting Seat Width - Integrated Sling Seats***  
***Replacing Crossbraces - Captain's Seats***

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

**ADJUSTING SEAT WIDTH - INTEGRATED SLING SEATS (FIGURE 1)**

1. If necessary remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Perform one (1) of the following:
  - FWD WHEELCHAIRS -
    - A. Remove the battery boxes from the wheelchair. INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 13 of this manual.
    - B. Fold the battery tray. Refer to FOLDING BATTERY TRAY FOR TRANSPORT in PROCEDURE 13 of this manual.
  - MWD WHEELCHAIRS -
    - A. Remove the battery boxes from the wheelchair. INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 14 of this manual.
    - B. Remove the battery tray from the wheelchair. Refer to INSTALLING/REMOVING BATTERY TRAY in PROCEDURE 14 of this manual.
3. Remove the existing back and seat upholstery from the wheelchair. Refer to REPLACING BACK UPHOLSTERY in PROCEDURE 5 of this manual and REPLACING SEAT UPHOLSTERY in PROCEDURE 5 of the owner's manual, part number 1080722.

*NOTE: If adjusting the seat width of the wheelchair, the back and seat upholstery MUST be changed as well.*

4. Remove the hex bolts and locknuts that secure the two (2) pivot links to the wheelchair frame and crossbraces. Refer to the following chart to determine if new pivot links will be needed:

<b>PIVOT LINK SEAT WIDTH RANGE (in inches)</b>
<b>16-18 or 20</b>

5. Remove the dust covers from the bottom of the crossbraces.

*NOTE: Note position of the tie wraps that secure the wiring harness to the crossbraces.*

6. Cut the tie wraps that secure the wiring harness to the crossbrace.
  7. Remove the hex bolts, washers and locknuts that secure the bottom of the two (2) crossbraces to the wheelchair frame.
  8. Remove the hex bolt, coved spacers, washers and locknut that secure the two (2) existing crossbraces together.
- NOTE: Note coved spacer, washer and locknut order for reinstallation.*
9. Remove the four (4) pivot tube plug pins from the bottom of the two (2) existing crossbraces.
  10. Install the four (4) pivot tube plug pins into the bottom of the two (2) new crossbraces.
  11. Assemble the two (2) new crossbraces together. Refer to DETAIL "A" in FIGURE 1 for hardware orientation.

*NOTE: FWD wheelchairs only - There are right and left crossbraces. Refer to DETAIL "B" in FIGURE 1.*

12. Reinstall the hex bolts, washers and locknuts that secure the bottom of the two (2) new crossbraces to the wheelchair frame and tighten securely.
13. Reinstall the hex bolts and locknuts that secure the new/existing pivot links to the wheelchair frame and crossbraces and tighten.

*NOTE: Seat widths are stamped on the pivot links.*

14. Secure wiring harness to the new crossbraces with new tie wraps.
15. Reinstall the black dust covers onto the bottom of the crossbraces.
16. Install the new back and seat upholstery onto the wheelchair. Refer to REPLACING BACK UPHOLSTERY in PROCEDURE 5 of this manual and REPLACING SEAT UPHOLSTERY in PROCEDURE 5 of the owner's manual, part number 1080722.

17. Change the width of the battery tray. Refer to one (1) of the following:

FWD WHEELCHAIRS - CHANGING WIDTH OF BATTERY TRAY in PROCEDURE 13 of this manual.

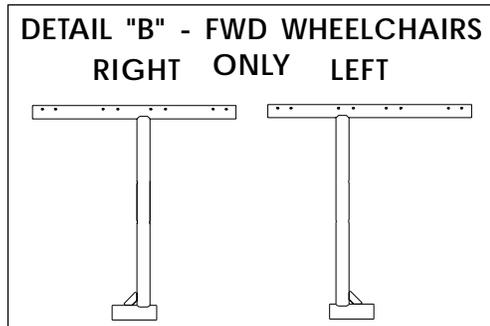
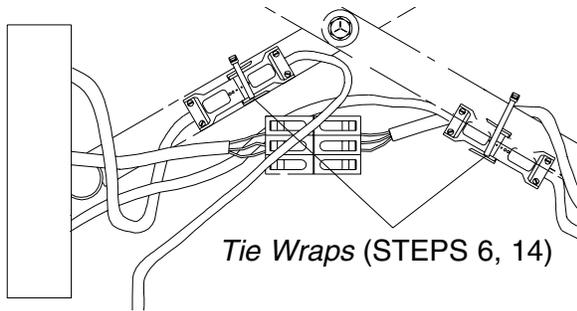
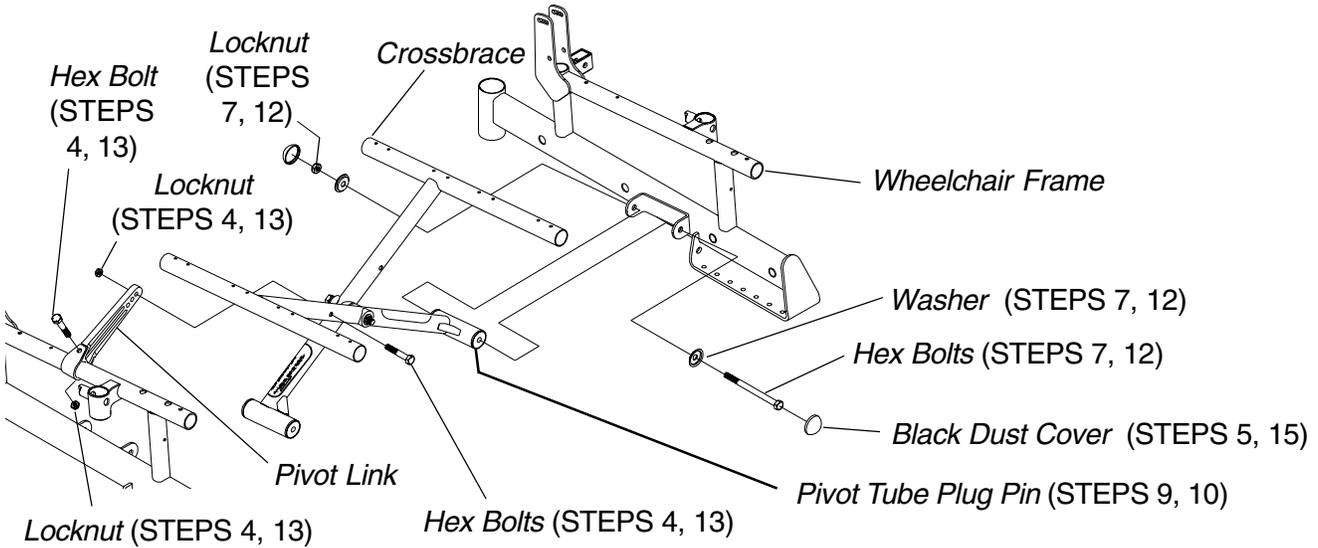
MWD WHEELCHAIRS - CHANGING WIDTH OF BATTERY TRAY in PROCEDURE 14 of this manual.

18. Perform one (1) of the following:
  - FWD WHEELCHAIRS -
    - A. Unfold the battery tray. Refer to FOLDING BATTERY TRAY FOR USE in PROCEDURE 13 of this manual.
    - B. Reinstall the battery boxes onto the wheelchair. INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 13 of this manual.

MWD WHEELCHAIRS -

- A. Reinstall the battery tray onto the wheelchair. Refer to INSTALLING/REMOVING BATTERY TRAY in PROCEDURE 14 of this manual.
- B. Reinstall the battery boxes onto the wheelchair. INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 14 of this manual.

19. If necessary, reinstall the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.



NOTE: Right and left is determined by sitting in the wheelchair.

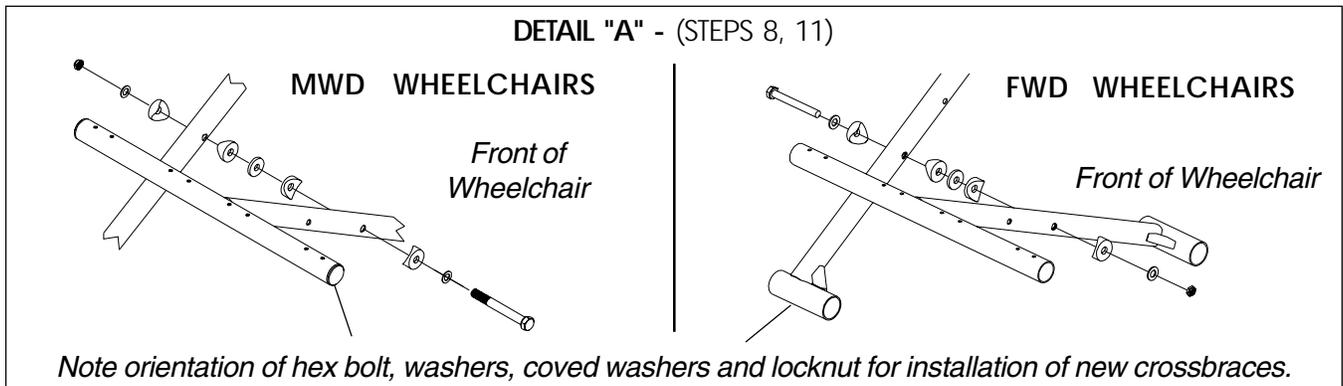


FIGURE 1 - ADJUSTING SEAT WIDTH - INTEGRATED SLING SEAT S

## REPLACING CROSSBRACES - CAPTAIN'S SEATS (FIGURE 2)

1. Remove the captain's seat from the wheelchair. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.
2. Remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
3. Perform one (1) of the following:
  - FWD WHEELCHAIRS -
    - A. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 13 of this manual.
    - B. Fold the battery tray. Refer to FOLDING BATTERY TRAY FOR TRANSPORT in PROCEDURE 13 of this manual.
  - MWD WHEELCHAIRS -
    - A. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 14 of this manual.
    - B. Remove the battery tray from the wheelchair. Refer to INSTALLING/REMOVING BATTERY TRAY in PROCEDURE 14 of this manual.
4. Remove the hex bolts and locknuts that secure the two (2) pivot links to the existing crossbraces.
5. Remove the hex bolts, spacers, washers and locknuts that secure the two (2) push brackets to the existing crossbraces.
6. Remove the dust covers from the bottom of the existing crossbraces.

*NOTE: Note position of the tie wraps that secure the wiring harness to the existing crossbraces.*

7. Cut the tie wraps that secure the wiring harness to the existing crossbrace.
8. Remove the hex bolts, washers and locknuts that secure the bottom of the two (2) existing crossbraces to the wheelchair frame.
9. Remove the hex bolt, covered spacers, washers and locknut that secure the two (2) existing crossbraces together.

*NOTE: Note covered spacer, washer and locknut order for reinstallation.*

10. Remove the four (4) pivot tube plug pins from the bottom of the two (2) existing crossbraces.

11. Install the four (4) pivot tube plug pins into the bottom of the two (2) new crossbraces.
12. Assemble the two (2) new crossbraces together. Refer to DETAIL "C" in FIGURE 2 for hardware orientation.
13. Reinstall the hex bolts, washers and locknuts that secure the bottom of the two (2) new crossbraces to the wheelchair frame and tighten.
14. Secure the wiring harness to the new crossbraces with new tie wraps.
15. Reinstall the dust covers onto the bottom of the new crossbraces.
16. Reinstall the hex bolts, spacers, washers and locknuts that secure the (2) push brackets to the new crossbraces and tighten securely.
17. Reinstall the hex bolts, washers and locknuts that secure the pivot links to the crossbraces and tighten securely.
18. Perform one (1) of the following:
  - FWD WHEELCHAIRS -
    - A. Unfold the battery tray. Refer to FOLDING BATTERY TRAY FOR USE in PROCEDURE 13 of this manual.
    - B. Reinstall the battery boxes onto the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 13 of this manual.
  - MWD WHEELCHAIRS -
    - A. Reinstall the battery tray onto the wheelchair. Refer to INSTALLING/REMOVING BATTERY TRAY in PROCEDURE 14 of this manual.
    - B. Reinstall the battery boxes onto the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 14 of this manual.
19. Reinstall shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
20. Reinstall the Captain's seat. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.

CROSSBRACES

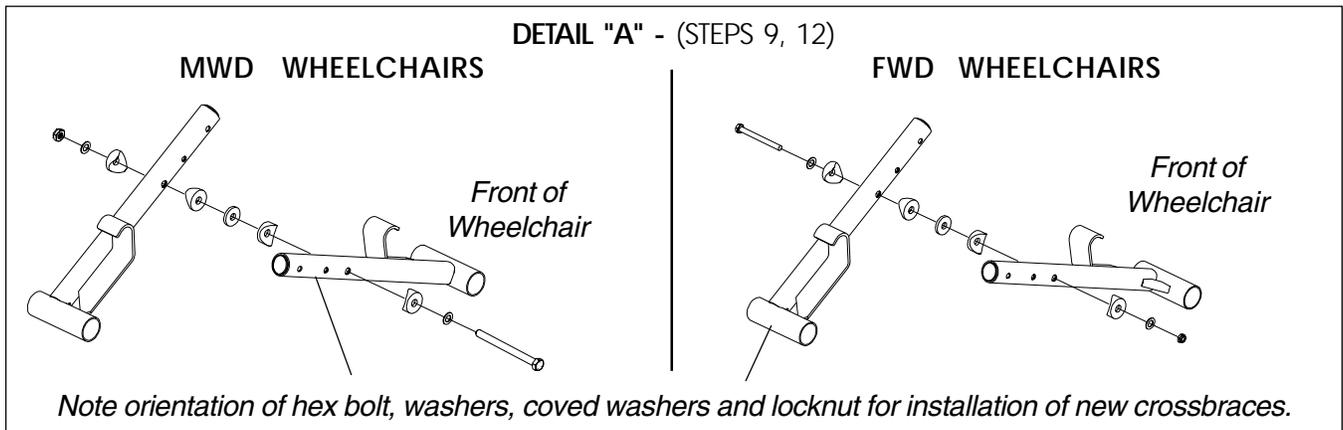
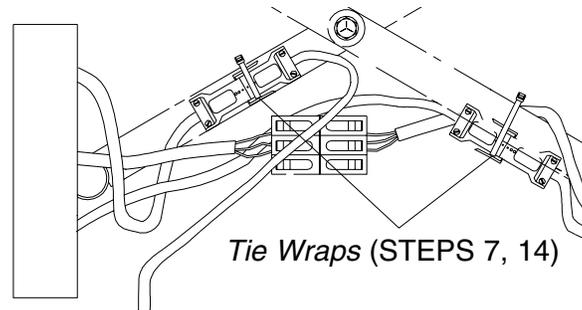
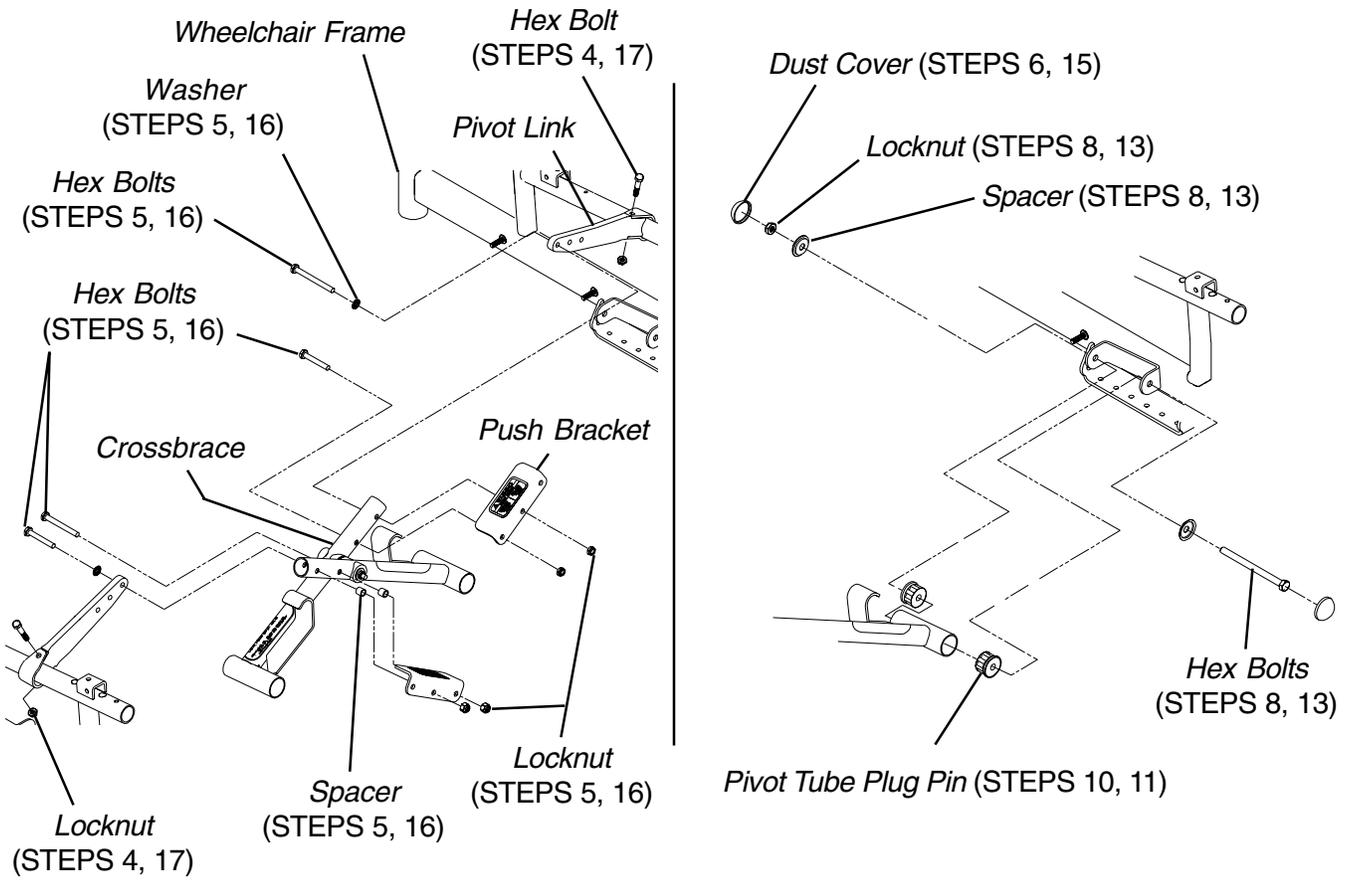


FIGURE 2 - REPLACING CROSSBRACES - CAPTAIN'S SEATS

**This Procedure includes the following:**  
**Installing/Removing Batteries into/From Battery Boxes**  
**Connecting Battery Cables**

**WARNING**

Make sure power to the wheelchair is OFF before performing this procedure.

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

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

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

*NOTE: For changing or removing/installing the battery boxes, refer to PROCEDURE 13 - FWD wheelchairs or PROCEDURE 14 - MWD wheelchairs.*

**INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOXES (FIGURE 1)**

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

*NOTE: Have the following tools available:*

TOOL	QTY	COMMENTS
Battery Lifting Strap	1	See Note
1/2-inch (6 pt) Box Wrench	1	Not Supplied
7/16-inch (6pt) Box Wrench	1	Not Supplied
3/8-inch (6pt) Box Wrench	1	Not Supplied
Diagonal Cutters	1	Not Supplied

*\*NOTE: The Battery Lifting strap supplied is for Group 22 Batteries ONLY. Refer to the battery manufacturer for the proper lifting strap and/or battery tools for U1 battery removal/installation.*

**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.

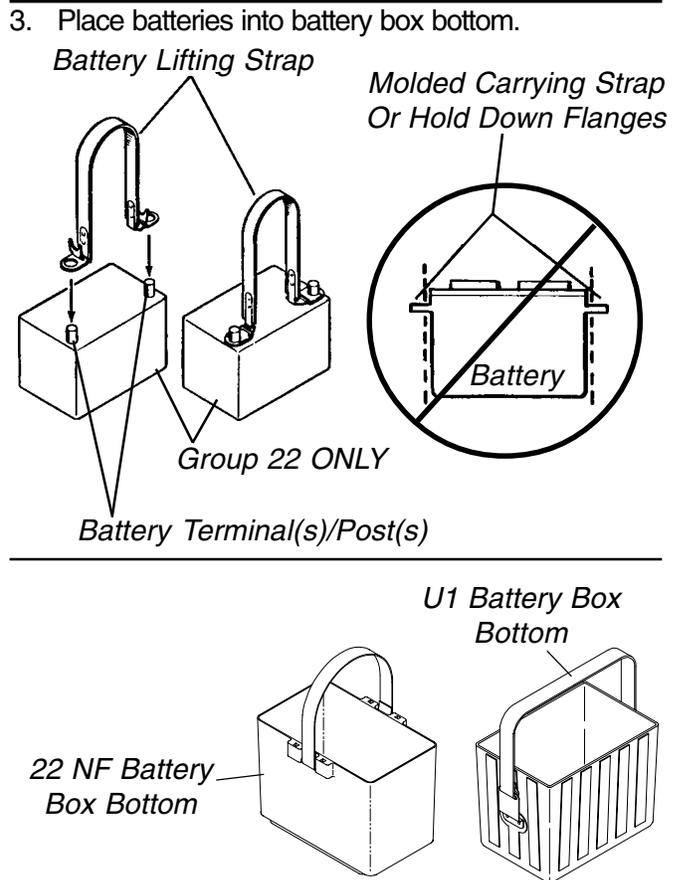
*NOTE: If there is battery acid in the bottom or on the sides of the battery box(es) or battery(ies), apply baking soda to these areas to neutralize the battery acid. Before reinstalling the NEW or existing battery(ies), clean the baking soda from the battery box(es) or battery(ies).*

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

1. If necessary, remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 13 - FWD or PROCEDURE 14 - MWD of this manual.
2. Secure the battery lifting strap to battery terminal(s)/post(s) (FIGURE 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.



**FIGURE 1 - INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOXES**

**CONNECTING BATTERY CABLES**

BATTERIES

**WARNING**

NEVER allow any of your tools and/or battery cable(s) to contact BOTH battery terminal(s)/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.

**Dual U1 or Dual Group 22 Battery Boxes**

Perform one (1) of the following methods for connecting the battery cable(s):

- A. **FOR DUAL U1 BATTERIES** - Use direct mount method. Refer to FIGURES 2, and 3.
- B. **FOR DUAL GROUP 22 NF BATTERIES THAT HAVE MOUNTING HOLES IN THE BATTERY TERMINAL(S)/POST(S)** - Use direct mount method. Refer to FIGURES 2, 3 AND 4.
- C. **FOR DUAL GROUP 22 NF BATTERIES THAT DO NOT HAVE MOUNTING HOLES IN THE BATTERY TERMINAL(S)/POST(S)** - Use battery clamp method. Refer to FIGURES 4, 5 AND 6.

**DIRECT MOUNT METHOD (FIGURE 2 AND 3).**

1. Install battery terminal cap(s) onto battery cable(s) as follows (FIGURE 2):

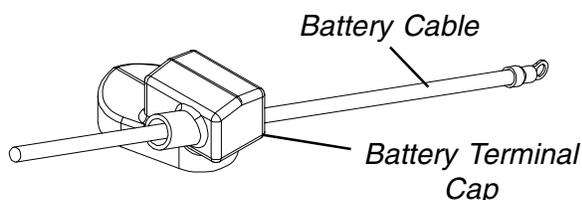
**DUAL U1 BATTERIES:**

- A. ORANGE battery terminal cap onto RED battery cable.
- B. GRAY battery terminal cap onto BLACK battery cable.

**DUAL GROUP 22 NF BATTERIES:**

- A. RED battery terminal cap onto RED battery cable.
- B. BLACK battery terminal cap onto BLACK battery cable.

**INSTALLING BATTERY TERMINAL CAPS**



*NOTE: Only one (1) battery cable and terminal cap shown for clarity. Both caps install in the same manner.*

**FIGURE 2 - CONNECTING BATTERY CABLES - DIRECT MOUNT METHOD**

**CAUTION**

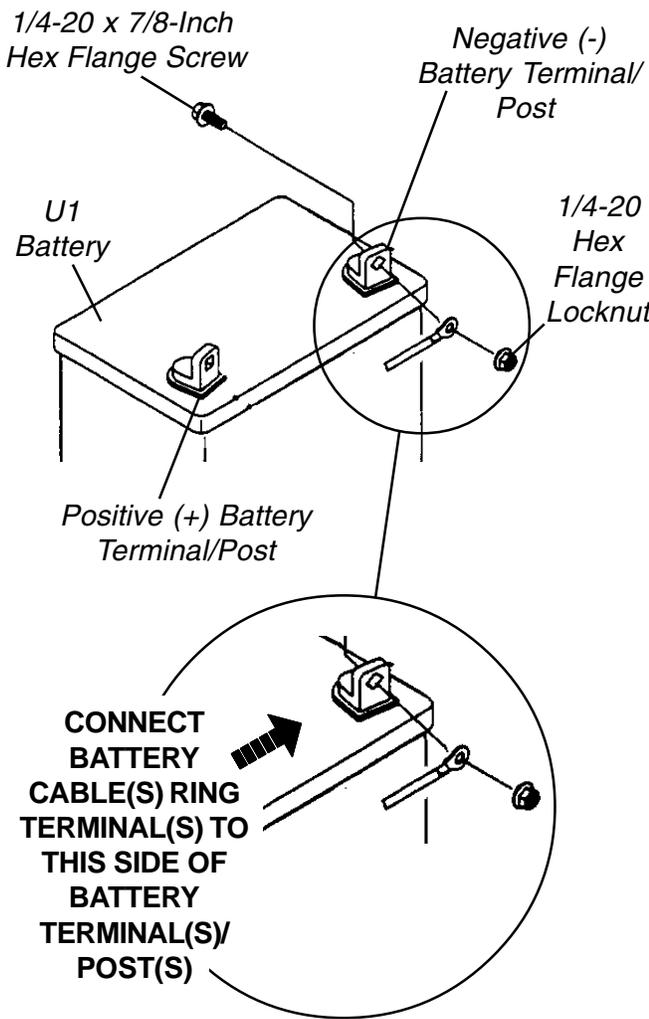
When connecting the battery cables to the battery(ies), the battery cable(s) MUST be connected to the battery terminal(s)/post(s) as shown in DETAIL "A" or DETAIL "B" of FIGURE 3 (depending on battery type), otherwise damage to the battery cable may result when installing battery terminal caps.

2. Connect battery cable(s) to battery(ies) terminal(s)/post(s) as follows (DETAIL "A" or DETAIL "B" of FIGURE 3, depending on battery type):
  - A. NEGATIVE (-) BLACK battery cable to NEGATIVE (-) battery terminal/post.
  - B. POSITIVE (+) RED battery cable to POSITIVE (+) battery terminal/post.
3. Secure the battery cable(s)/ring terminal(s) to the battery terminal(s)/post(s), BLACK to NEGATIVE (-) and RED to POSITIVE (+), with the provided 1/4-20 x 7/8-inch hex flange screw and hex flange locknut. Securely tighten. (DETAIL "A" or DETAIL "B" of FIGURE 3, depending on battery type).
4. Verify all battery cable(s)/ring terminal(s) are correctly installed and securely tightened.
5. Slide terminal cap(s) down battery cable(s) and onto battery clamps (FIGURE 3).
6. Secure each terminal cap in place with a tie-wrap (Use tie-wraps 11-1/2-inches long) (FIGURE 3).
 

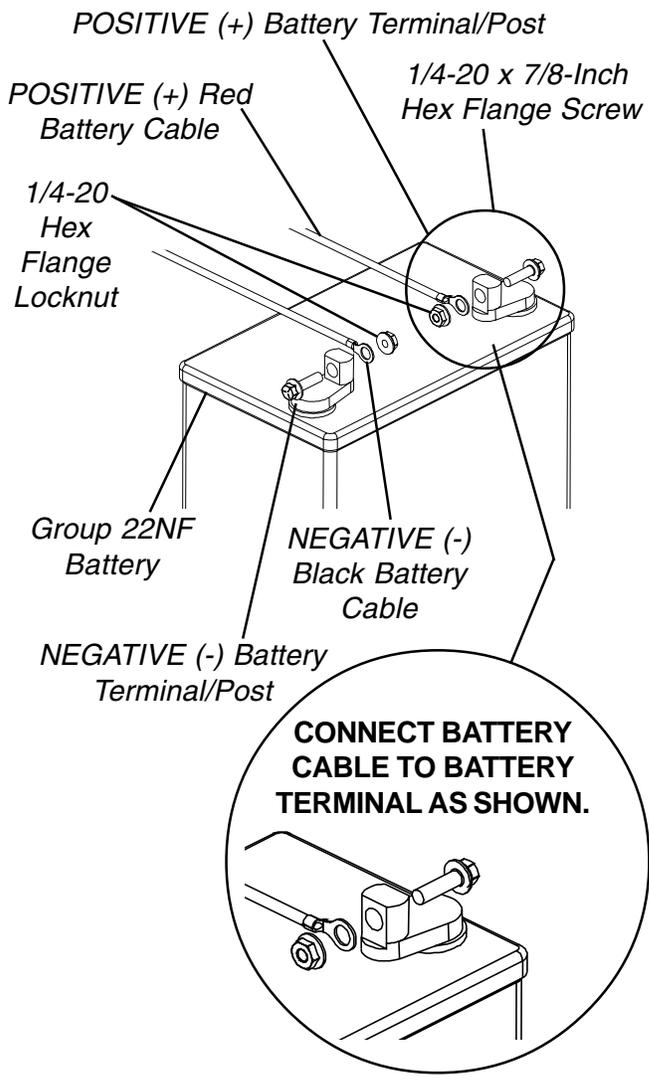
*NOTE: It will be necessary to trim excess tie-wrap in order to install the battery box top(s).*
7. Install the battery box top(s).
8. Install the battery box(es) into the wheelchair. Refer to **INSTALLING/REMOVING BATTERY BOX(ES)** in the PROCEDURE 13 - FWD MODELS or PROCEDURE 14 - MWD MODELS of this manual.
 

*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** in the PROCEDURE 13 - FWD MODELS or PROCEDURE 14 - MWD MODELS of this manual.

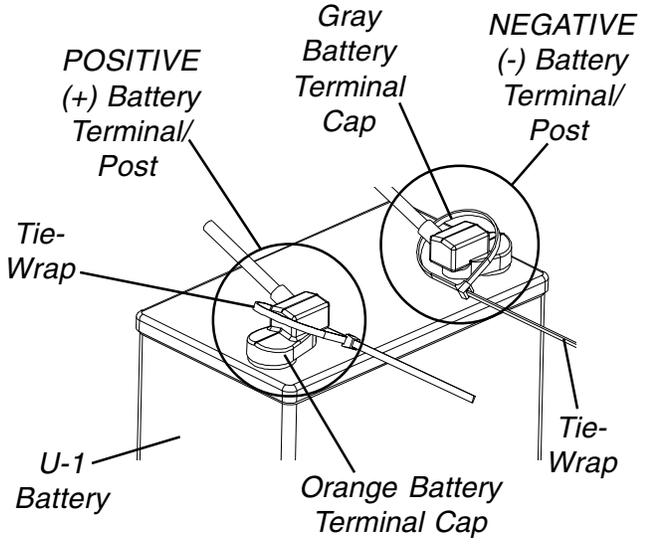
DETAIL "A"  
DUAL U1 BATTERIES



DETAIL "B"  
DUAL GROUP 22 NF BATTERIES



DUAL U1 BATTERIES



DUAL GROUP 22 NF BATTERIES

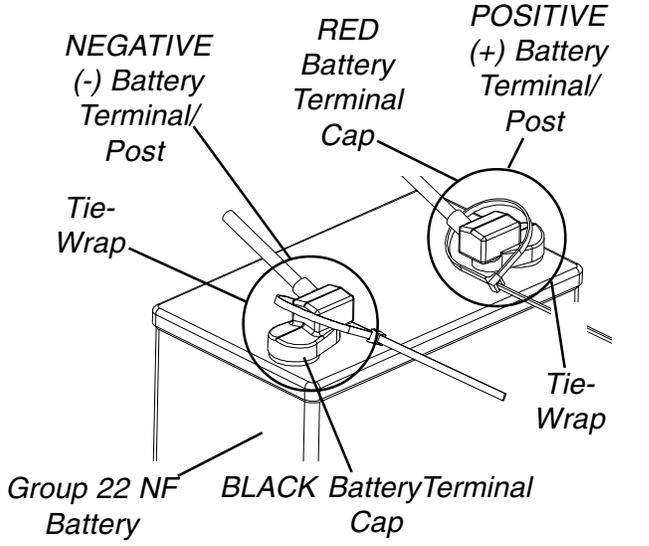


FIGURE 3 - CONNECTING BATTERY CABLES - DIRECT MOUNT METHOD

**BATTERY CLAMP METHOD (FIGURES 4, 5 AND 6).**

**WARNING**

The battery clamp of the POSITIVE (+) battery terminal/post MUST be mounted in the position shown in FIGURE 5, otherwise the battery box top cannot be installed properly.

1. Perform one (1) of the following:
  - A. If the battery clamp of the POSITIVE (+) battery terminal/post is **NOT** mounted in the orientation shown in FIGURE 5, perform the following:
    - Loosen the hex nut that secures the battery clamp to the POSITIVE (+) battery terminal/post.
  - B. If the battery clamp on the POSITIVE (+) battery terminal/post is positioned as shown in FIGURE 4, proceed to STEP 2.

**CAUTION**

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.

- Remove the battery clamp from the POSITIVE (+) battery terminal/post.
- Reposition the battery clamp on the POSITIVE (+) battery terminal/post as shown in FIGURE 4.
- Securely tighten the hex nut that secures the battery clamp to the positive (+) battery terminal/post.

**CORRECT ORIENTATION OF THE POSITIVE (+) BATTERY TERMINAL/POST BATTERY CLAMP**

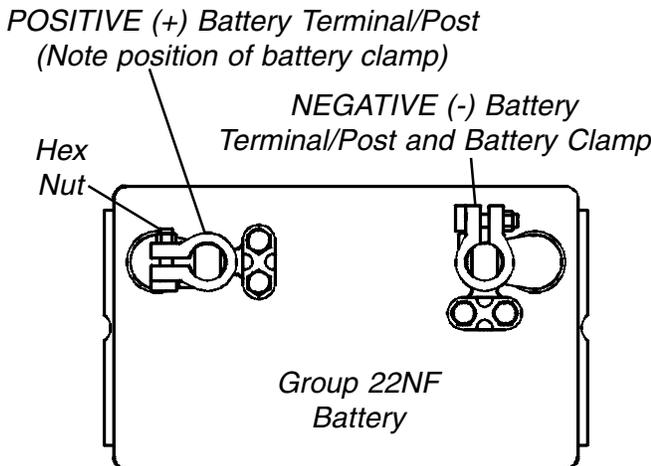


FIGURE 4 - CONNECTING BATTERY CABLES - BATTERY CLAMP METHOD

2. Install battery clamp covers onto battery cables as follows (FIGURE 5):
  - A. RED battery clamp cover onto RED battery cable.
  - B. BLACK battery clamp cover onto BLACK battery cable.

*NOTE: Only one (1) battery cable and battery clamp cover are shown for clarity. Both battery clamp covers install in the same manner.*

**INSTALLING BATTERY CLAMP COVERS**

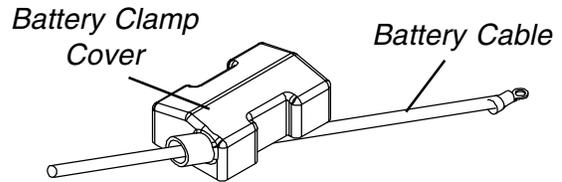


FIGURE 5 - CONNECTING BATTERY CABLES - BATTERY CLAMP METHOD

**CAUTION**

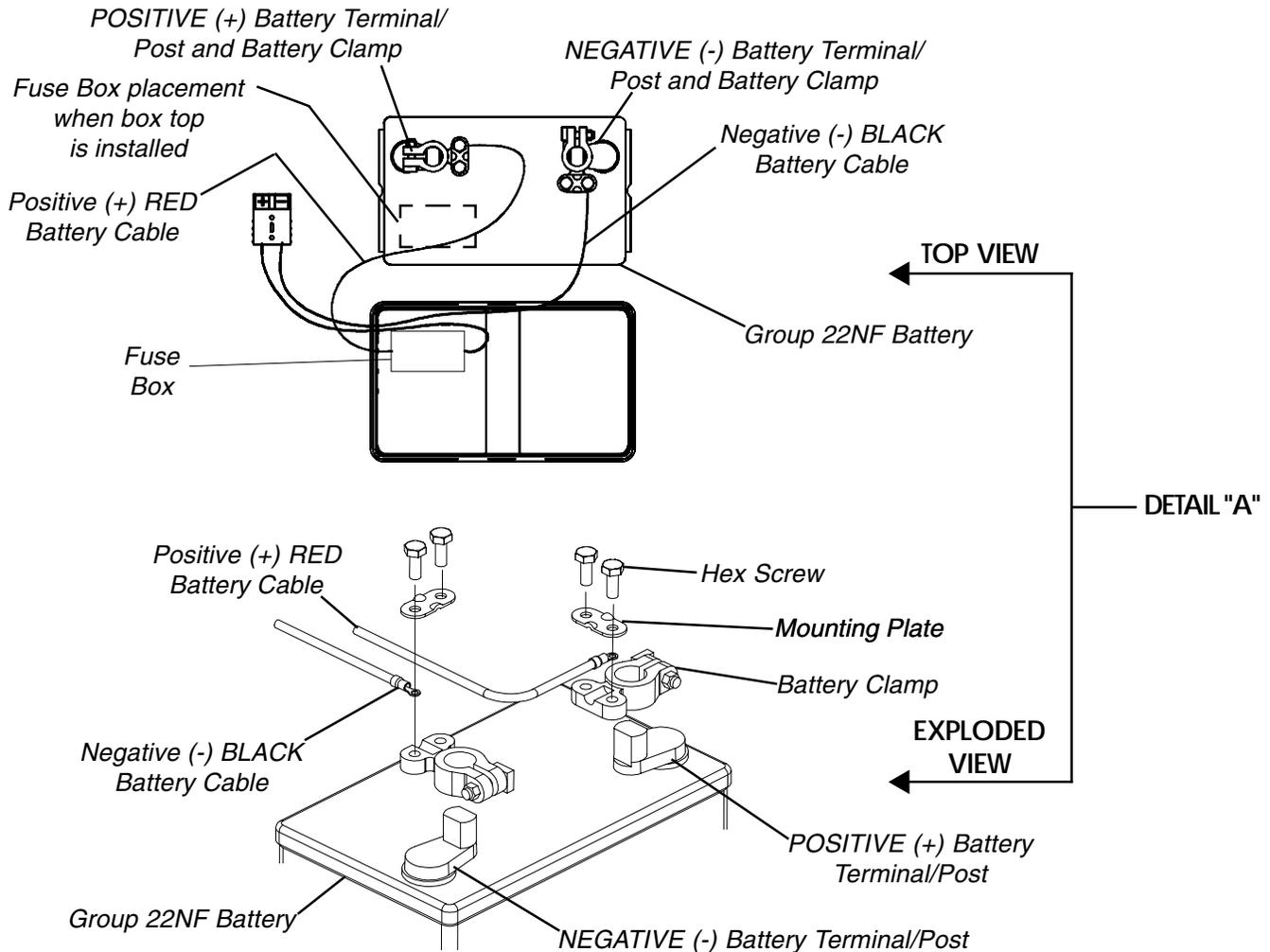
When connecting the battery cable/ring terminal(s) to the battery(ies) clamp(s), the battery cable(s) MUST be connected in the position shown in DETAIL "A", otherwise damage may occur to the battery cable and/or battery clamp covers.

3. Connect battery cable(s) to battery(ies) terminal(s)/post(s) as follows (DETAIL "A"):
    - A. NEGATIVE (-) BLACK battery cable/ring terminal between the mounting plate and battery clamp of NEGATIVE (-) battery terminal/post.
    - B. POSITIVE (+) RED battery cable/ring terminal between the mounting plate and battery clamp battery clamp of POSITIVE (+) battery terminal/post.
  4. Secure the battery cable(s)/ring terminal(s) to the battery clamp(s), BLACK to NEGATIVE (-) and RED to POSITIVE (+), with existing hex screws. Securely Tighten. (DETAIL "A")
  5. Verify battery cable ring terminal(s) are correctly installed and securely tightened.
  6. Slide battery clamp covers down battery cables and onto battery terminals. (DETAIL "B")
  7. Secure each terminal cap in place with a tie-wrap (Use tie-wraps 11-1/2-inches long). (DETAIL "B")
- NOTE: It will be necessary to trim excess tie-wrap in order to install the battery box top(s).*
8. Install the battery box top(s).

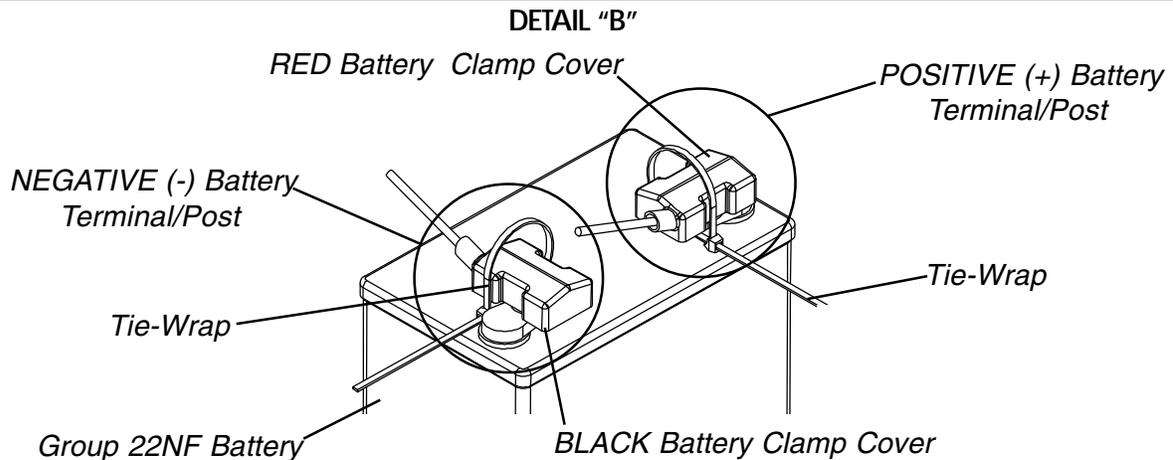
9. Install the battery box(es) into the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOX(ES) in the PROCEDURE 13 - FWD MODELS or PROCEDURE 14 - MWD MODELS of this manual.
10. If necessary, charge the battery(ies). Refer to CHARGING BATTERIES in the PROCEDURE 13 - FWD MODELS or PROCEDURE 14 - MWD MODELS of this manual.

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

**CONNECTING BATTERY CABLE(S) TO BATTERY(IES) TERMINAL(S)/POST(S)**



*NOTE: Battery clamps exploded away for clarification purposes only.*



**FIGURE 6 - CONNECTING BATTERY CABLES - BATTERY CLAMP METHOD**

***This Procedure Includes the Following:***

- Assembling Ranger II FWD***
- When to Charge Batteries***
- Charging Batteries***
- Replacing Batteries***
- Installing/Removing Battery Boxes***
- Battery Tray***
- Replacing Wiring Harness***
- Repositioning Motors***
- Replacing Clutch Handles - R2<sub>BASIC</sub>***
- Replacing Motor/Gearbox - R2<sub>BASIC</sub>***
- Replacing Motor/Gearbox - R2<sub>STANDARD</sub>***

**WARNING**

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

**ASSEMBLING RANGER II FWD-**

**Integrated Sling Seats (FIGURE 1)**

**WARNING**

The weight of the wheelchair without the user and batteries is still between 83 and 100 lbs. Use proper lifting techniques (lift with your legs) to avoid injury. Extreme caution is advised when it is necessary to move an UNOCCUPIED power wheelchair. Invacare recommends using two (2) assistants and making thorough preparations. Make sure to use ONLY secure, non-detachable parts for hand-hold supports.

Keep hands and fingers clear of moving parts to avoid injury.

The overall performance of the wheelchair WILL be affected by the front wheel mounting position. Refer to REPOSITIONING MOTORS - FWD WHEELCHAIRS in this procedure of the manual BEFORE operating the wheelchair.

**UNFOLDING THE WHEELCHAIR.**

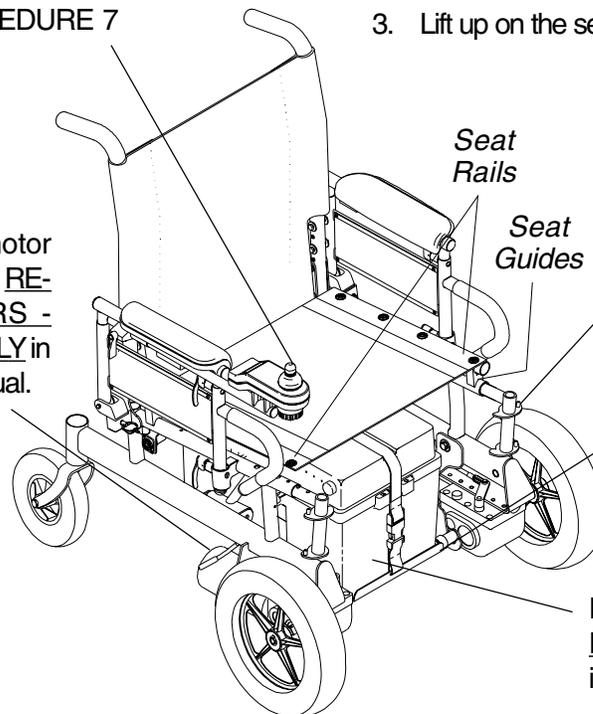
1. Push down on the seat rails until the seat rails are positioned in the seat guides.
2. Assemble the wheelchair. Refer to FIGURE 1.

**FOLDING THE WHEELCHAIR.**

1. Remove the batteries and footrests/legrests from the wheelchair. Refer to FIGURE 1.
2. Lift the battery tray UP and out of the way. Refer to FIGURE 1.
3. Lift up on the seat rails of the wheelchair.

Install the electronics. Refer to PREPARING MKIV JOYSTICK FOR USE in PROCEDURE 7 of this manual.

Determine the proper motor mounting position. Refer to REPOSITIONING MOTORS - FWD WHEELCHAIRS ONLY in this procedure of the manual.



Install the footrests/legrests. Refer to INSTALLING/REMOVING FOOTRESTS or INSTALLING ELEVATING LEGRESTS in PROCEDURE 3 of the owner's manual, part number 1080722.

Position the battery tray for use. Refer to BATTERY TRAY in this procedure of the manual.

Install the batteries. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

**FIGURE 1 - ASSEMBLING RANGER II FWD- INTEGRATED SLING SEATS**

**Unfolding/Folding - Captain's Seat (FIGURE 2)**

**UNFOLDING.**

1. Push down on the push brackets until they are flush with the pivot links on the crossbraces.
2. Assemble the wheelchair. Refer to FIGURE 2.
3. Install the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 9 of this manual.
4. Install the Captain's Seat. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of this manual.
5. HIGH BACK CAPTAIN'S SEATS ONLY - Connect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in PROCEDURE 6 of this manual.

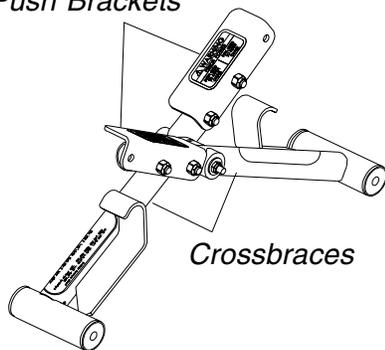
**FOLDING.**

1. HIGH BACK CAPTAIN'S SEATS ONLY - Disconnect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in PROCEDURE 6 of this manual.
2. Remove the Captain's Seat. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of this manual.
3. Remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 9 of this manual.
4. Remove the batteries, battery tray and footrests/leg-rests from the wheelchair. Refer to FIGURE 2.
5. Lift up on push brackets located on the crossbraces.

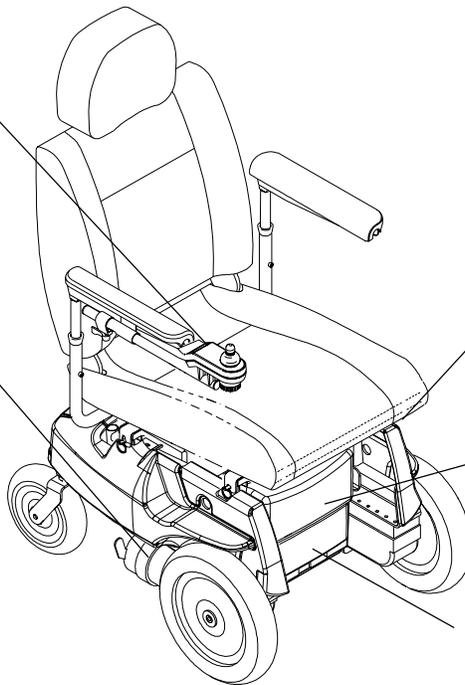
Install the electronics. Refer to PREPARING MKIV JOYSTICK FOR USE in PROCEDURE 7 of this manual.

Determine the proper motor mounting position. Refer to REPOSITIONING MOTORS - in this procedure of the manual.

*Push Brackets*



*Crossbraces*



Install the footrests/legrests. Refer to INSTALLING/REMOVING FOOTRESTS or INSTALLING ELEVATING LEGRESTS in PROCEDURE 3 of the owner's manual, part number 1080722.

Position the battery tray for use. Refer to BATTERY TRAY in this procedure of the manual.

Install the batteries. Refer to INSTALLING/REMOVING BATTERY BOXES in PROCEDURE 10 of this manual.

FIGURE 2 - TRANSPORTING RANGER II FWD - CAPTAIN'S SEATS

**WHEN TO CHARGE BATTERIES (FIGURE 5)**

*NOTE: As a general rule, batteries should be recharged daily to assure longest possible life and minimize required charging time. In fact, a battery's life is extended if the charge level is maintained well above a low condition. Plan to recharge batteries when it is anticipated wheelchair will not be used for a long period of time.*

**MCC-MKIV X, A or A+ Joystick**

**BATTERY GAUGE DISPLAY (BGD)** is the bar graph display located on the MKIV X, A or A+ 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 (2) 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 (2) bars (LEFT) are illuminated. At this level the last two (2) bars (LEFT) will start to Flash ON and OFF to indicate that the end user should charge the batteries as soon as possible.

**MKIV RII Joystick**

**BATTERY DISCHARGE INDICATOR (BDI)** is located at the rear of the joystick housing and provides information on the remaining charge in the batteries. At FULL charge the BDI will be GREEN. As the battery becomes discharged, the BDI indicator will turn AMBER (YELLOW), then RED and finally FLASHING RED. If the BDI is FLASHING RED, the user should charge the batteries as soon as possible.

*NOTE: Accurate readings are displayed when in neutral.*

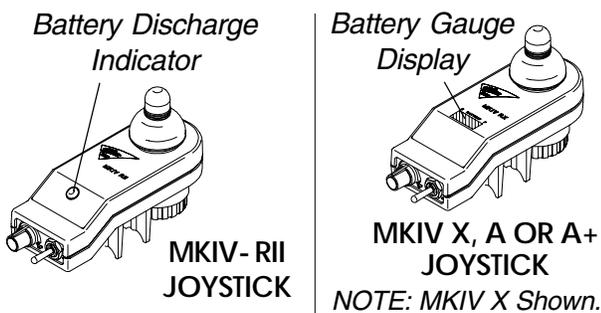


FIGURE 5 - WHEN TO CHARGE BATTERIES

**CHARGING BATTERIES (FIGURE 6)**

**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, unsealed batteries will vent hydrogen gas which is explosive in the right concentration with air.

**CAUTION**

Always charge new batteries fully BEFORE initial use or battery life will be reduced.

*NOTE: As a general rule, batteries should be recharged daily to assure longest possible life and minimize required charging time. In fact, a battery's life is extended if the charge level is maintained well above a low condition. Plan to recharge batteries when it is anticipated 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 shut-off when full charge is obtained.

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

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

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

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

**Required Items:**

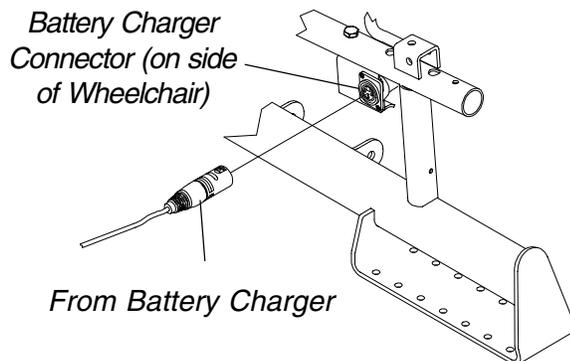
TOOL	QUANTITY	COMMENTS
Battery Charger	1	Supplied
⊕ Extension Cord	1	Not Supplied

⊕ 3-prong plug, 15 ampere current rating; industrial type

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

*NOTE: Allow eight (8) hours for normal charging. Larger batteries (greater than 55 ampere-hours) or severely discharged batteries may require up to sixteen (16) hours to be properly charged and equalized. If the charger operates for sixteen (16) hours and is unable to fully charge the batteries, an internal timer turns the charger off and begins to fast blink the green light.*

*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 authorized dealer for service.*



*NOTE: Position of Battery Charger Connector may vary depending on wheelchair options.*

FIGURE 6 - CHARGING BATTERIES

**REPLACING BATTERIES**

**WARNING**

Most batteries are not sold with instructions. However, warnings are frequently noted on the cell caps. Read them carefully, otherwise injury or damage can occur.

*NOTE: Invacare recommends that both batteries be replaced if one (1) battery is defective.*

**Recommended Battery Types**

**WARNING**

Only deep cycle, sealed case construction batteries should be used in this device.

**CAUTION**

Failure to use the correct battery size and/or voltage may cause damage to your wheelchair and give you unsatisfactory performance.

CHAIR SEAT WIDTH	QTY	VOLTS	BATTERY SIZE	REMARKS
14-inch	2	12	U1	Deep Cycle
16,18, 20-inches	2	12	22NF	Deep Cycle

1. Remove the battery boxes from the wheelchair. Refer to REMOVING/INSTALLING BATTERY BOXES in this procedure of the manual.
2. Remove existing batteries from the battery boxes. Refer to INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOXES in this procedure of the manual.
3. Clean the new battery terminals.
4. Install the new batteries into the battery boxes. Refer to INSTALLING/REMOVING BATTERIES INTO/FROM BATTERY BOXES in this procedure of the manual.

**Cleaning Battery Terminals**

**WARNING**

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.

The use of safety glasses is recommended when cleaning the battery terminals.

NEVER smoke or strike a match near batteries. If the caps of the battery cells are removed, NEVER look directly into them while charging batteries.

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

*NOTE: When done, these areas should be shiny, not dull.*

## INSTALLING/REMOVING BATTERY BOXES

### WARNING

NEVER unplug the battery cables by pulling on the wires. Unplug the battery cables by pulling on the connector ONLY. Otherwise, injury or damage may occur.

*NOTE: To remove the battery boxes, reverse the following procedure.*

*NOTE: Motors should be in the engaged position when removing/installing batteries. Refer to ENGAGING/DISENGAGING MOTORS in PROCEDURE 8 of this manual.*

### Installing

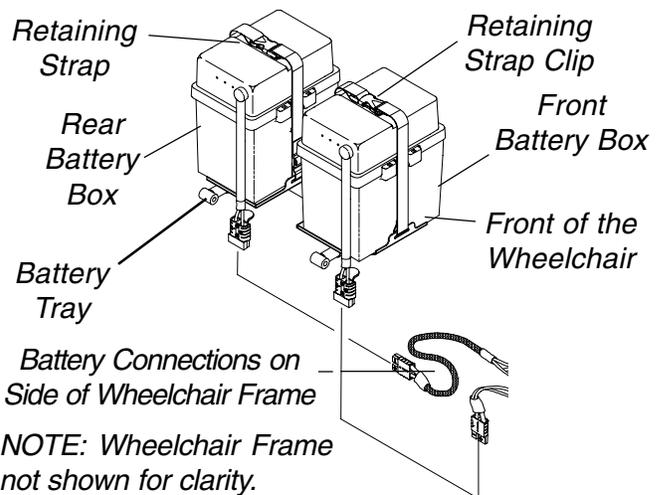
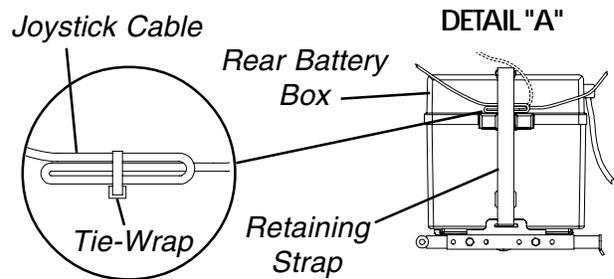
#### R2<sup>BASIC</sup> AND R2<sup>STANDARD</sup> (FIGURE 7).

1. Verify that the ON/OFF switch on the joystick is in the OFF position.
2. If necessary, remove the captain's seat. Refer to REMOVING/INSTALLING THE CAPTAIN'S SEAT in PROCEDURE 5 of this manual.
3. If necessary, remove the front and rear shrouds. Refer to REMOVING/INSTALLING THE SHROUDS in PROCEDURE 9 of this manual.
4. Position the battery boxes onto the battery tray.

*NOTE: Make sure the battery cable on the battery boxes are on the same side as the battery connectors on the wheelchair frame.*

5. Feed the retaining strap through the slot located on the top of the front shroud.
6. Position the bottom of the front shroud in-between the battery box and the battery tray.
7. Clip the retaining strap together and pull strap tight to secure the front shroud and battery box in place.
8. Feed the retaining strap through the slot located on the top of the rear shroud.
9. Bundle excess joystick cable and tie wrap together. See **DETAIL "A"**.
10. Position bundled joystick cable between retaining strap and rear battery box. See **DETAIL "A"**.
11. Clip the retaining strap together to secure the rear shroud and battery box in place.
12. Press down on the rear shroud until the two (2) clips secure the rear shroud to the two side shrouds.
13. Connect the battery cables from the battery boxes to the battery connectors on the wheelchair frame.

14. If necessary, install the Captain's Seat. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of this manual.



*NOTE: Wheelchair Frame not shown for clarity.*

FIGURE 7 - INSTALLING/REMOVING BATTERY BOXES ALL MODELS EXCEPT R2<sub>JR</sub>

#### R2<sub>JR</sub> (FIGURE 8).

1. Verify that the ON/OFF switch on the joystick is in the OFF position.
2. If necessary, remove the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 9 of this manual.

*NOTE: Make sure the battery cables on the battery boxes are on the same side as the battery connectors on the wheelchair frame.*

*NOTE: The battery cables of the front battery box must be connected to the battery connectors on the wheelchair before placing battery on battery tray.*

3. Connect the battery cables from the front battery box to the battery connectors on the wheelchair frame.
4. Position the front battery box onto the battery tray as shown in FIGURE 8.
5. Feed the front retaining strap through the slot located on the top of the front shroud.
6. Position the bottom of the front shroud in-between the front battery box and edge of battery tray.
7. Clip the front retaining strap together.

8. Pull end of retaining strap to secure front battery box and front shroud in place.
9. Position the rear battery box onto the battery tray as shown in FIGURE 8.
10. Connect the battery cable from the rear battery box to the rear battery connectors on the wheelchair frame.
11. Bundle excess joystick cable and tie wrap together. See DETAIL "A".
12. Position excess joystick cable between retaining strap and rear battery box. See DETAIL "A".
13. Clip the rear retaining strap together.
14. Pull end of retaining strap to secure battery box and joystick in place.
15. Install the rear shroud. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 9 of this manual.

**BATTERY TRAY**

**WARNING**  
Pinch point exists between battery tray and battery bracket.

**Folding Battery Tray for Transport (FIGURE 9)**

1. If necessary, remove the front and rear shroud. Refer to REMOVING/INSTALLING SHROUDS - FWD WHEELCHAIRS in PROCEDURE 9 of this manual.
2. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
3. Perform one (1) of the following:
  - A. **FOR R2<sub>BASIC</sub> and R2<sub>STANDARD</sub>** - Lift up on the pin side of the battery tray and rotate UP towards the battery tray pivot.
  - B. **FOR R2<sub>JR</sub>** - Lift up on the notched side of the battery tray and rotate UP towards the battery tray pivot.
4. Fold the wheelchair. Refer to TRANSPORTING RANGER II FWD in this procedure of the manual.

**Unfolding Battery Tray for Use (FIGURE 10)**

1. Unfold the wheelchair. Refer to TRANSPORTING RANGER II FWD in this procedure of the manual.
2. Perform one (1) of the following:
  - A. **FOR R2<sub>BASIC</sub> and R2<sub>STANDARD</sub>** -

**WARNING**  
Make sure pins of battery tray are secure in the mounting slots of the hanger bracket, otherwise injury or damage may result.

Rotate the pin side of the battery tray DOWN against the mounting slots on the hanger bracket.

- B. **FOR R2<sub>JR</sub>** - Rotate the notched side of the battery tray and DOWN against the battery tray stop.
3. Install the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
4. If necessary install the front shroud. Refer to REMOVING/INSTALLING SHROUDS - FWD WHEELCHAIRS in PROCEDURE 9 of this manual.

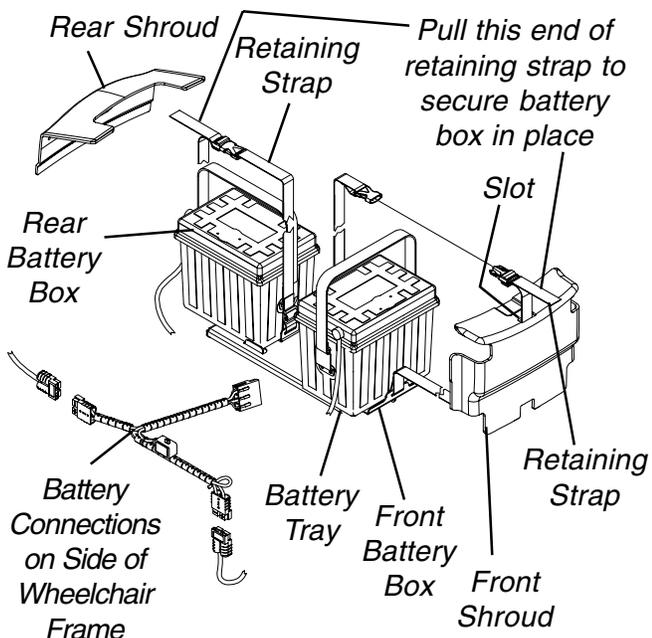
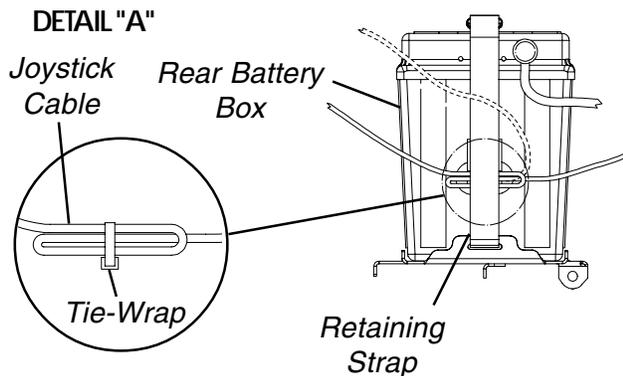


FIGURE 8 - INSTALLING/REMOVING BATTERY BOXES  
R2<sub>JR</sub>

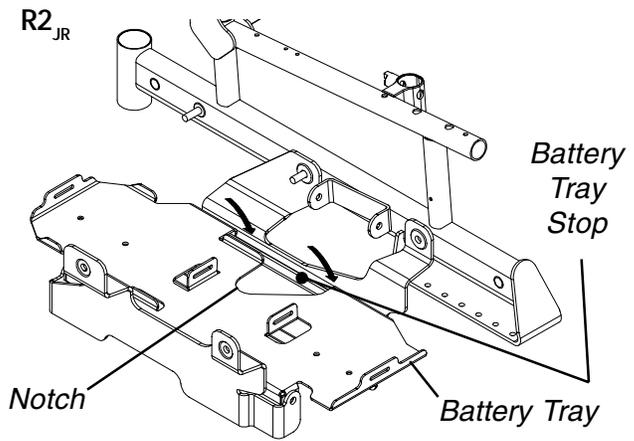
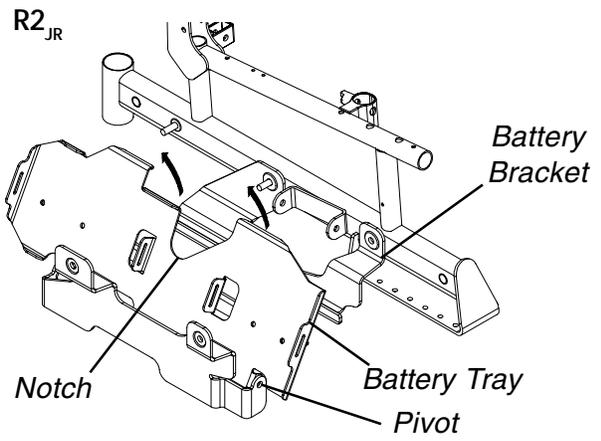
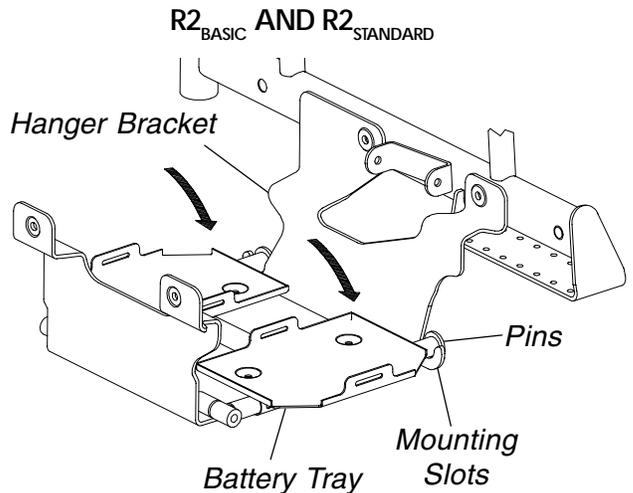
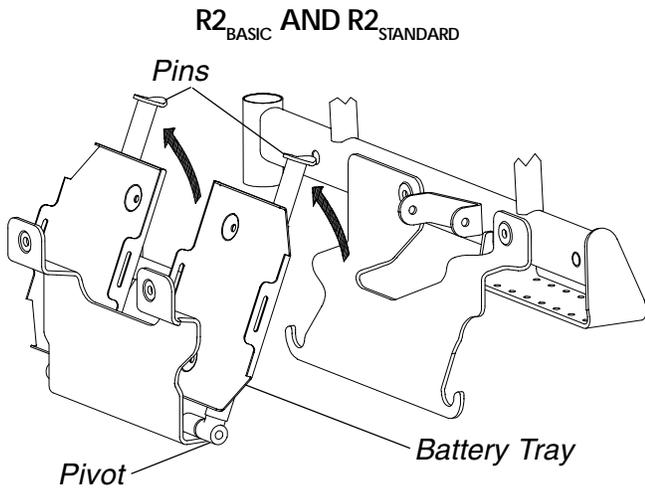


FIGURE 9 - BATTERY TRAY - FOLDING BATTERY TRAY FOR TRANSPORT

FIGURE 10 - BATTERY TRAY - UNFOLDING BATTERY TRAY FOR USE

**Changing Width of Battery Tray (FIGURE 11)**

*NOTE: This procedure applies to R2<sub>BASIC</sub> AND R2<sub>STANDARD</sub> only.*

*NOTE: This procedure is only necessary when changing the width of the wheelchair.*

1. Fold the battery tray. Refer to FOLDING BATTERY TRAY FOR TRANSPORT in this procedure of the manual.
2. Remove the hex bolt and locknut that secure one (1) of the battery tray pins to the battery tray.
3. Refer to FIGURE 11 to determine mounting hole in the battery tray that corresponds to width of the wheelchair.
4. Reposition the battery tray pin to the mounting hole determined in STEP 3.
5. Secure the battery tray pin to the battery tray with the hex bolt and locknut.
6. Repeat STEPS 2-5 for remaining battery tray pin and two battery tray pivots.

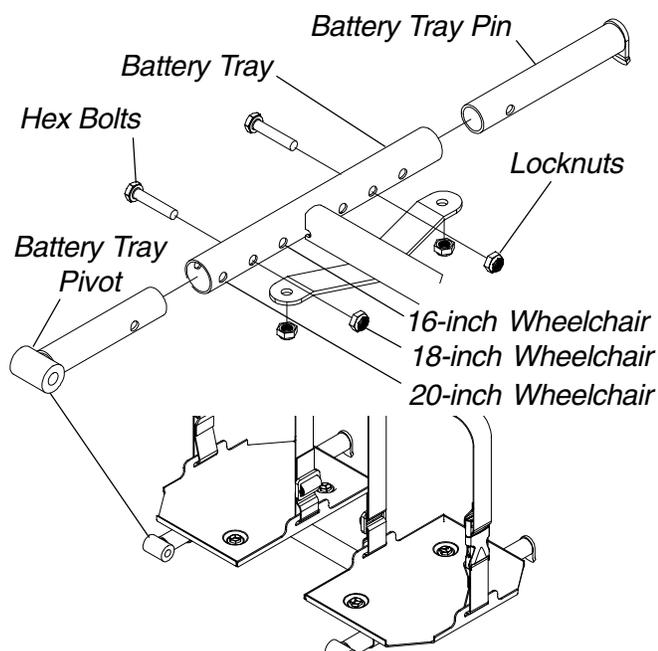


FIGURE 11 - BATTERY TRAY - CHANGING WIDTH OF BATTERY TRAY

**Removing/Installing Battery Tray for R2<sub>BASIC</sub> and R2<sub>STANDARD</sub>**

**REMOVING (FIGURE 12).**

1. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Remove the two (2) hex bolts, four (4) washers and two (2) locknuts that secure the existing battery tray and washers to the battery tray hanger bracket.
3. Remove the existing battery tray from the wheelchair.

**INSTALLING (FIGURE 12).**

1. Line up mounting holes in the new/existing battery tray with the mounting holes in the battery tray hanger bracket.
2. Position one (1) of the washers between the battery hanger bracket and the new/existing battery tray.
3. Reinstall one (1) of the hex bolts and washers through the new/existing battery tray, washer and battery tray hanger bracket and loosely tighten with a locknut.
4. Repeat STEPS 2-3 for the remaining washers, hex bolt, and locknut.
5. Tighten the two (2) hex bolts and locknuts.

*NOTE: Tighten the Two (2) hex bolts and locknuts until the tray stays up by itself. Over tightening the hex bolts and locknuts will make the battery tray difficult to flip up.*

6. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

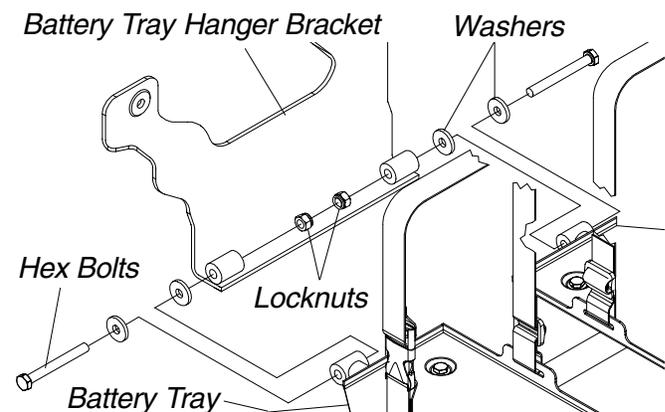


FIGURE 12 - REMOVING/INSTALLING BATTERY TRAY FOR R2<sub>BASIC</sub> AND R2<sub>STANDARD</sub>

**Removing/Installing Battery Tray R2<sub>JR</sub> (FIGURE 13)**

**REMOVING.**

1. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Remove the two (2) mounting screws, four (4) washers, and two (2) locknuts that secure the battery tray to the battery tray bracket.
3. Remove the battery tray from the wheelchair.

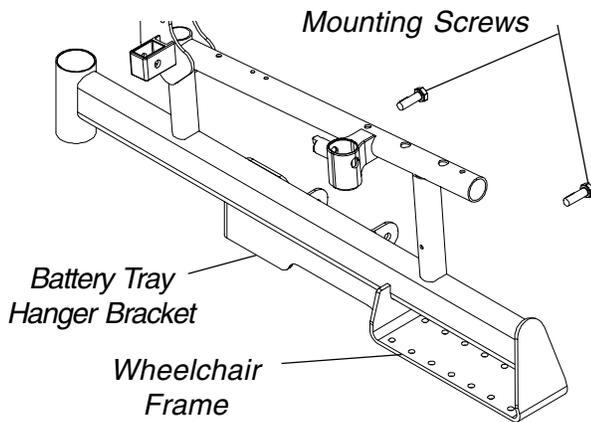
**INSTALLING.**

1. Position battery tray inside tab of battery tray bracket.
2. Secure battery tray to battery bracket with the existing two (2) mounting screws, four (4) washers, and two (2) locknuts. Torque mounting screws to 72-inch pounds. See Figure 12 for hardware orientation.

**FOR MODEL R2<sub>JR</sub> (FIGURE 15).**

*NOTE: Right and left is determined by sitting in wheelchair.*

1. Remove the footrests. Refer to INSTALLING /REMOVING FOOTRESTS in PROCEDURE 3 of the Owner's Manual, part number 1080722.
2. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
3. Remove the battery tray. Refer to REMOVING BATTERY TRAY in this procedure of the manual.
4. Remove the two (2) mounting screws that secures the existing right battery tray hanger bracket to wheelchair frame.
5. Secure NEW battery tray hanger bracket to wheelchair frame with the existing two (2) mounting screws. Securely tighten.
6. Reinstall battery tray, battery boxes, and footrests by reversing STEPS 1-3.



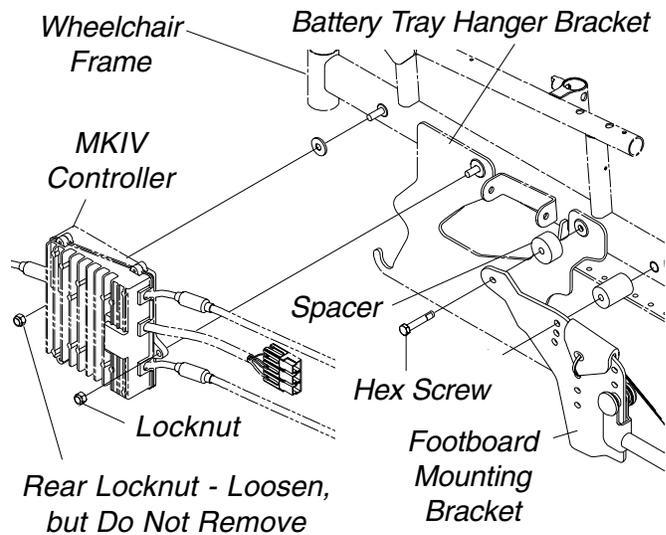
**FIGURE 15 - REPLACING RIGHT BATTERY TRAY HANGER BRACKET FOR MODEL R2<sub>JR</sub>**

**Replacing Left Battery Tray Hanger Bracket FOR MODELS R2<sub>BASIC</sub> AND R2<sub>STANDARD</sub> (FIGURE 16).**

*NOTE: Right and left is determined by sitting in wheelchair.*

1. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Loosen, but do not remove the rear locknut that secures MKIV controller to the wheelchair.
3. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Remove the hex screw and spacer that secures the existing left battery tray hanger bracket and footboard mounting bracket to the wheelchair frame.

4. Remove the locknut that secures existing left battery tray hanger bracket and MKIV controller from the wheelchair.
5. Remove the existing left battery tray hanger bracket from the wheelchair.
6. Line up the mounting holes in the new battery tray hanger bracket with the front mounting hole and rear stud on the wheelchair frame.
7. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the hex screw and spacer that secures the new left battery tray hanger bracket and footboard mounting bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
  - B. WHEELCHAIR NOT EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the front hex screw that secures the new left battery tray hanger bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
8. Reinstall locknut. Use Loctite 242 and torque to 156-in/lbs.
9. Torque the rear locknut that secures MKIV controller to the wheelchair to 156-in/lbs.

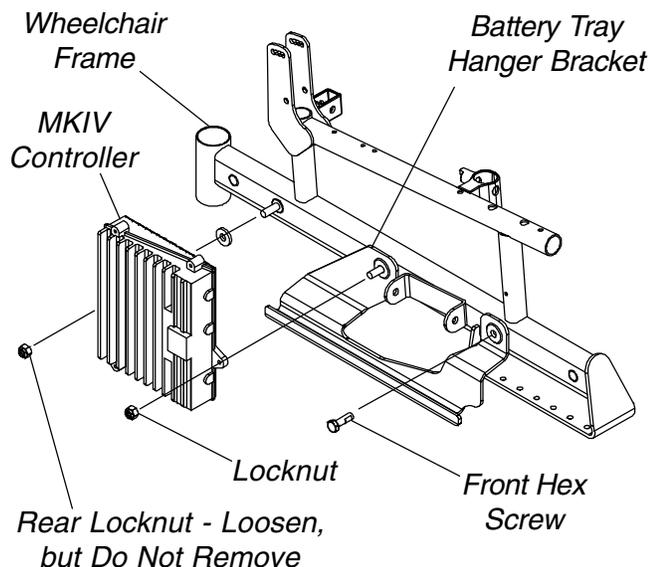


**FIGURE 16 - REPLACING LEFT BATTERY TRAY HANGER BRACKET FOR MODELS R2<sub>BASIC</sub> AND R2<sub>STANDARD</sub>**

**FOR MODEL R2<sub>JR</sub> (FIGURE 17).**

*NOTE: Right and left is determined by sitting in wheelchair.*

1. Remove the footrests. Refer to INSTALLING /REMOVING FOOTRESTS in PROCEDURE 3 of the Owner's Manual, part number 1080722.
2. Remove the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 in this manual.
3. Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
4. Fold battery tray. Refer to FOLDING/UNFOLDING BATTERY TRAY in this procedure of the manual.
5. Loosen, but do not remove the rear locknut that secures MKIV controller to the wheelchair.
6. Remove the front hex screw that secures the existing left battery tray bracket to the wheelchair frame.
7. Remove the locknut that secures existing left battery tray hanger bracket and MKIV controller from the wheelchair.
8. Remove the existing left battery tray hanger bracket from the wheelchair.
9. Line up the mounting holes in the new battery tray hanger bracket with the front mounting hole and rear stud on the wheelchair frame.
10. Reinstall the front hex screw that secures the new left battery tray hanger bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.



**FIGURE 17 - REPLACING LEFT BATTERY TRAY HANGER BRACKET FOR MODEL R2<sub>JR</sub>**

11. Reinstall locknut that secures the front of the MKIV controller and rear of the left battery tray hanger bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
12. Tighten the rear locknut that secures MKIV controller to the wheelchair and torque to 156-in/lbs.

**REPLACING WIRING HARNESS (FIGURE 18)**

**16, 18, and 20-inch Wide Models**

1. If necessary, remove the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
3. HIGH BACK CAPTAIN'S SEAT MODEL WHEELCHAIRS ONLY (DETAIL "A") - Perform the following:
  - A. Disconnect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in PROCEDURE 8 of this manual.
  - B. Remove the phono jack nut that secures the phono jack to the side shroud.
4. Disconnect the wiring harness (BLUE) from the controller connector (BLUE).
5. Remove the two (2) phillips screws and spacers that secure the rear battery connector to the wheelchair frame.
6. Remove the two (2) phillips bolts and locknuts that secure the front battery connector to wheelchair frame.
7. Remove the two (2) phillips screws that secure the wiring harness to the charger cable mounting bracket.
8. Note the position of the tie wraps that secure the existing wiring harness and motor cables to the crossbraces.
9. Cut the tie wraps that secure the existing wiring harness and motor cables to the crossbraces.
10. Remove the existing wiring harness from wheelchair.
11. Position the rear battery connector of the new wiring harness on the wheelchair frame as shown in FIGURE 18 and secure with the two (2) phillips screws and spacers.
12. Position the front battery connector on the wheelchair frame as shown in FIGURE 18 and secure with the two (2) phillips bolts and locknuts.
13. Secure the wiring harness to existing charger cable mounting bracket on the seat frame with the two (2) phillips screws.

14. Resecure the wiring harness and motor cables to the crossbraces with new tie wraps at the positions noted in STEP 8.
15. Connect the wiring harness (BLUE) to the controller connector (BLUE).
16. HIGH BACK CAPTAIN'S SEAT MODEL WHEELCHAIRS ONLY - Perform the following:
  - A. Position the new phono jack on the side shroud.
  - B. Reinstall the phono jack nut onto the new phono jack and tighten securely.
- C. Connect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in this PROCEDURE 8 of this manual.
17. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
18. If necessary, install the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

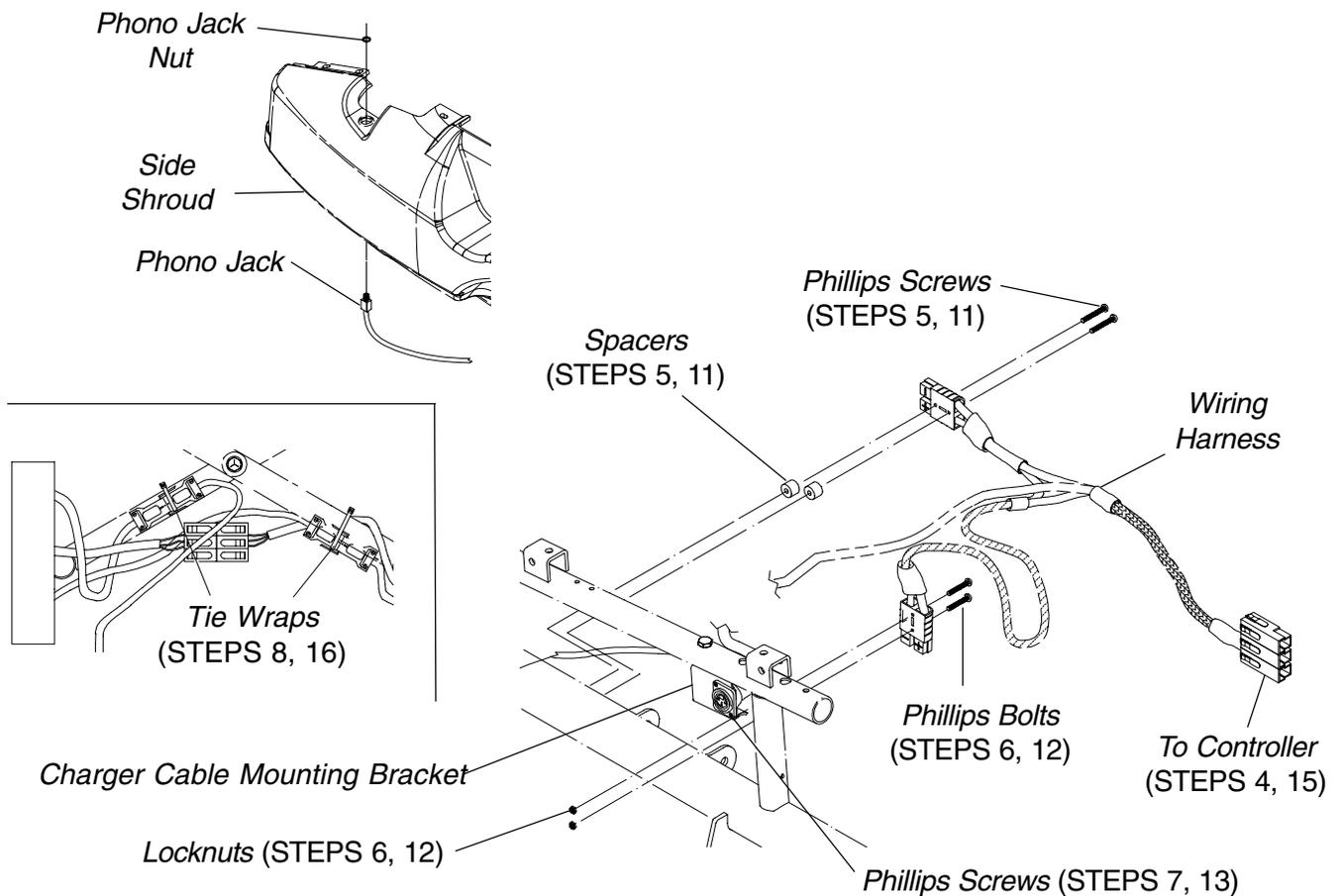


FIGURE 18 - REPLACING WIRING HARNESS - 16, 18, AND 20-INCH WIDE MODELS

**14-inch Wide Models (FIGURE 19)**

1. Remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in PROCEDURE 12 of this manual.
3. Cut the tie wrap that secure the following connections to the wire connector support:
  - A. The right hand motor and controller connection.
  - B. The left hand motor and controller connection.
  - C. Battery wiring harness and controller connection. (BLUE)
4. Disconnect the battery wiring harness (BLUE) and controller connector (BLUE).
5. Remove the two (2) phillips screws and spacers that secure the rear battery connector to the wheelchair frame.
6. Remove the two (2) phillips bolts and locknuts that secure the front battery connector to wheelchair frame.
7. Remove the two (2) phillips screws that secure the wiring harness to the charger cable mounting bracket.
8. Remove the existing wiring harness from wheelchair.
9. Position the rear battery connector of the new wiring harness on the wheelchair frame as shown in FIGURE 19 and secure with the two (2) phillips screws and spacers.
10. Position the front battery connector on the wheelchair frame as shown in FIGURE 19 and secure with the two (2) phillips bolts and locknuts.
11. Secure the wiring harness to existing charger cable mounting bracket on the seat frame with the two (2) phillips screws.
12. Connect the wiring harness (BLUE) to the controller connector (BLUE).

*NOTE: See FIGURE 19 for proper positioning of connections on wire connector support.*

13. Position the right hand motor/controller connection and the left hand motor/controller connection side by side on the wire connector support.
14. Position the battery wiring harness/controller connection on top of the right/left hand motor/controller connections.

*NOTE: When securing the above connections to wire connector support, make sure to wrap tie-wrap around crossbrace and thread through slot in wire connector support.*

15. Secure the connections stated in STEPS 13 and 14 to the wire connector support with a tie-wrap.
16. Install the battery boxes. Refer to REMOVING/INSTALLING THE BATTERY BOXES in PROCEDURE 12 of this manual.
17. Install the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

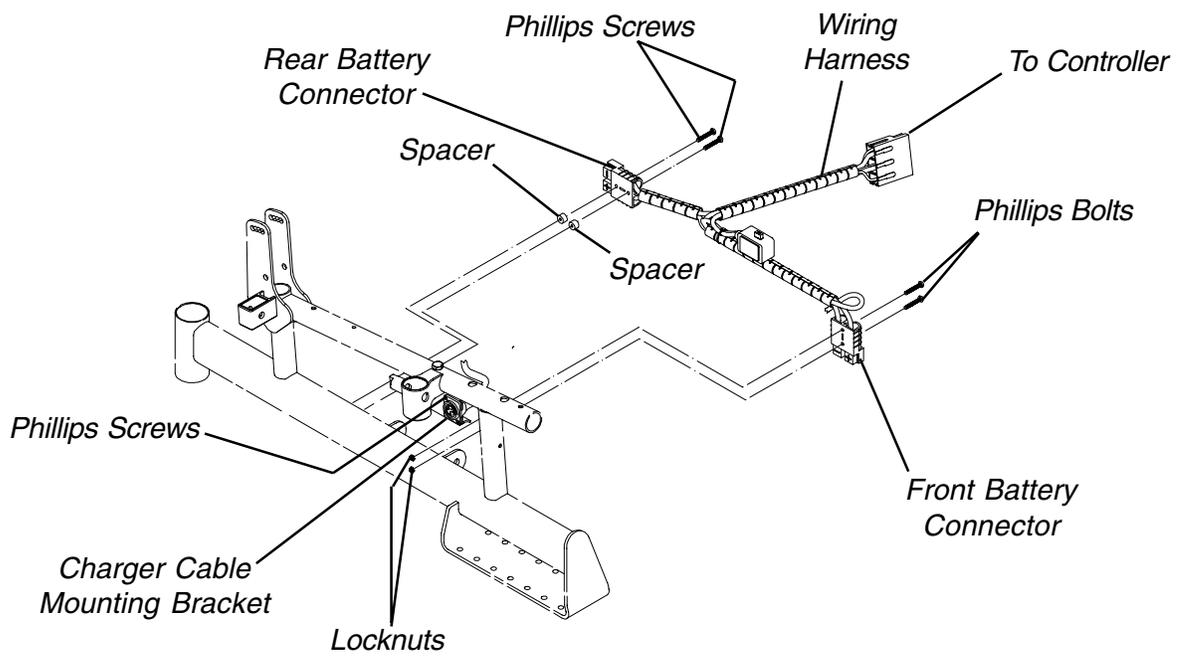
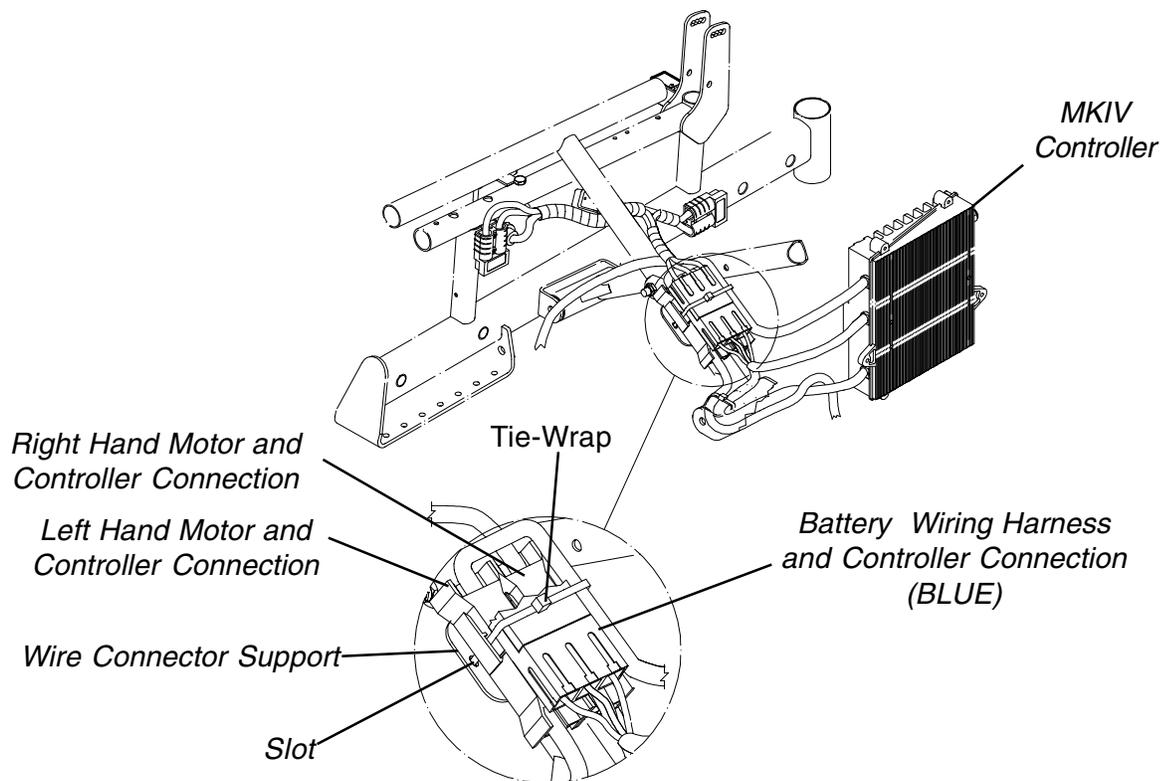


FIGURE 19 - REPLACING WIRING HARNESS - 14-INCH WIDE MODELS

**REPOSITIONING MOTORS (FIGURE 20)**

**WARNING**

The overall performance of the wheelchair WILL be affected by the front wheel mounting position. The following charts show the mounting position of the motors for each seat width and depth depending on the factory setting or user's weight.

If the mounting position that corresponds to the user's weight is different than the factory setting, the motors **MUST BE** repositioned to maintain proper stability and controllability **BEFORE** using the wheelchair. Otherwise injury or damage can occur.

Periodically review the following charts to make sure the motor mounting position still corresponds to the user's weight to maintain the proper stability and controllability.

**R2<sub>JR</sub> ONLY - NEVER** reposition the motors. Repositioning the motors forward **WILL** reduce the controllability of the wheelchair. This procedure **MUST** be performed by an Invacare Dealer.

*NOTE: If motors are repositioned, the front riggings may need to be repositioned. Refer to ADJUSTING/REPLACING TELESCOPING FRONT RIGGING SUPPORT in PROCEDURE 9 of the owner's manual, 1080722.*

**FACTORY SETTINGS - MOTOR MOUNTING POSITIONS (R2<sub>STANDARD</sub>)**

SEAT WIDTH	SEAT DEPTH		
	16	17	18
*14	N/A	N/A	N/A
16	FRONT	FRONT	FRONT
18	FRONT	FRONT	FRONT
20	FRONT	FRONT	FRONT

**FACTORY SETTINGS - MOTOR MOUNTING POSITIONS (R2<sub>BASIC</sub> AND R2<sub>JR</sub>)**

SEAT WIDTH	SEAT DEPTH		
	16	17	18
*14	REAR	REAR	REAR
16	MIDDLE	MIDDLE	MIDDLE
18	MIDDLE	MIDDLE	MIDDLE
20	MIDDLE	MIDDLE	MIDDLE

**USERS' WEIGHT 200 LBS AND UNDER - MOTOR MOUNTING POSITIONS**

SEAT WIDTH	SEAT DEPTH		
	16	17	18
*14	REAR	REAR	REAR
16	REAR	REAR	REAR
18	REAR	REAR	REAR
20	REAR	REAR	REAR

**USERS' WEIGHT 201 TO 250 LBS - MOTOR MOUNTING POSITIONS**

SEAT WIDTH	SEAT DEPTH		
	16	17	18
*14	N/A	N/A	N/A
16	MIDDLE	MIDDLE	MIDDLE
18	MIDDLE	MIDDLE	MIDDLE
20	MIDDLE	MIDDLE	MIDDLE

**USERS' WEIGHT 251 TO 300 LBS (FWD MOTORS WITH MOTOR LOCKS ONLY)- MOTOR MOUNTING POSITIONS**

SEAT WIDTH	SEAT DEPTH		
	16	17	18
*14	N/A	N/A	N/A
16	FRONT	FRONT	FRONT
18	FRONT	FRONT	FRONT
20	FRONT	FRONT	FRONT

\*NOTE: 14 wide is only for R2<sub>JR</sub>.

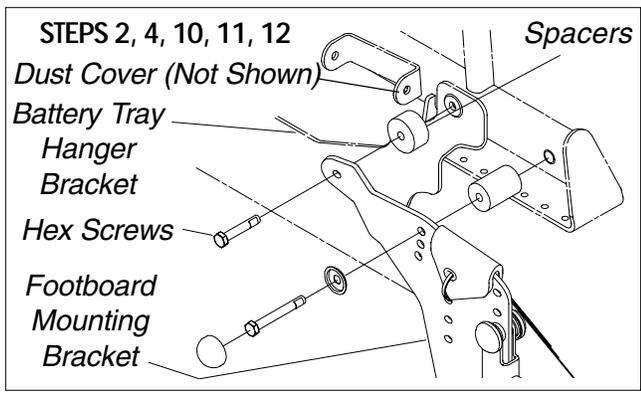
1. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Remove the hex screws and spacers that secure the battery tray hanger bracket and footboard mounting bracket to the wheelchair frame.
  - B. WHEELCHAIR NOT EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Remove the front hex screw that secures the battery tray hanger bracket to the wheelchair frame.
3. Rotate battery tray hanger bracket up.
4. Left side of wheelchair only - Remove the front dust cover from the end of the crossbrace.

*NOTE: Left is determined by sitting in the wheelchair.*

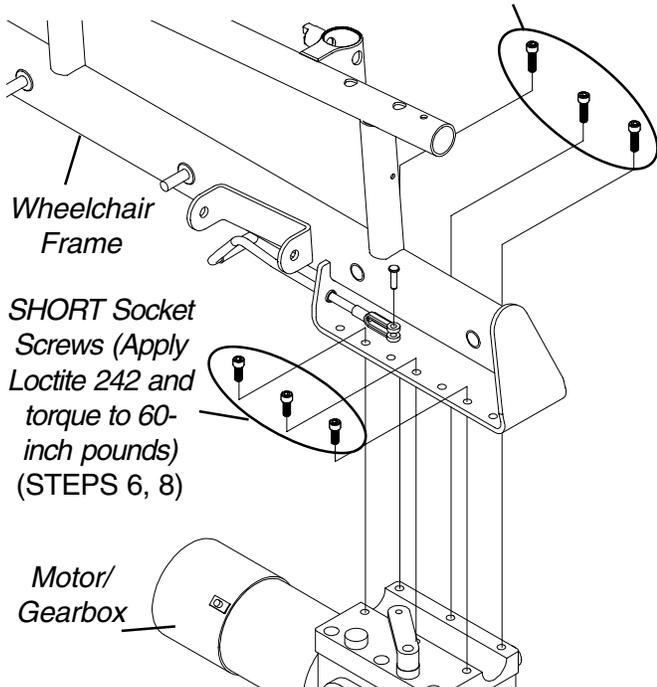
5. Refer to the charts in this procedure to determine proper mounting position that corresponds to the user's weight.
6. Remove the six (6) socket screws that secure the motor to the wheelchair frame.
7. Position the motor on the wheelchair frame at the position noted in STEP 5 as shown in FIGURE 20.

**CAUTION**

The longer socket screws must be positioned in the mounting holes on the **OUTSIDE** of the wheelchair frame and the short socket screws must be in the mounting holes on the **INSIDE** of the wheelchair frame. Otherwise damage to the gearbox may result.

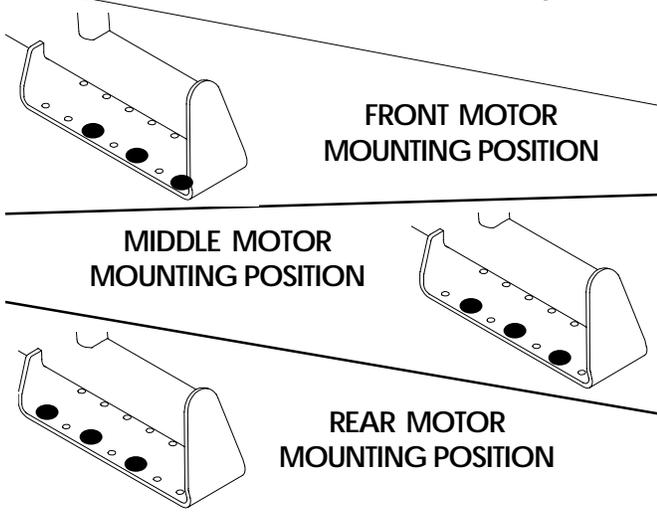


**LONG Socket Screws (Apply Loctite 242 and torque to 60-inch pounds) (STEPS 6, 8)**



**NOTE:** Basic motor/gearbox shown only for clarity. Standard motor/gearbox reposition the same way.

**NOTE:** Basic motor/gearbox - It is not necessary to disconnect clutch handle from the motor/gearbox.



**FIGURE 20 - REPOSITIONING MOTORS**

8. Use Loctite 242 and tighten the motor to the wheelchair frame securely with the six (6) socket screws. Torque to 60-inch pounds.
9. Repeat STEPS 2-8 for the opposite side of the wheelchair, if necessary.
10. Line up the mounting hole in the battery tray hanger bracket with the mounting hole in the wheelchair frame.
11. Left side of wheelchair only - Reinstall the front dust cover onto the end of the crossbrace.
12. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the hex screws and spacers that secure the battery tray hanger bracket and footboard mounting bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
  - B. WHEELCHAIR NOT EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the front hex screw that secures the battery tray hanger bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
13. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

**REPLACING CLUTCH HANDLES - R2<sub>BASIC</sub> AND R2<sub>JR</sub> (FIGURE 21)**

1. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Remove the tip from the existing clutch handle.
3. Remove the pin that secures the existing clutch handle to the motor/gearbox.
4. Disconnect the existing clutch handle from the motor/gearbox.
5. Feed existing clutch handle through wheelchair frame.
6. Remove the rubber tip from the new clutch handle.
7. Install the new clutch handle onto the wheelchair.
8. Install the rubber tip onto the new clutch handle.
9. Connect the clutch handle to the motor/gearbox and line up the mounting holes in the clutch handle and motor/gearbox.
10. Insert the pin through the clutch handle and motor/gearbox as shown in DETAIL "A" in FIGURE 21.

**NOTE:** Make sure the detent ball on the pin is fully visible.

11. Repeat STEPS 2-10 for the opposite side of the wheelchair, if necessary.
12. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

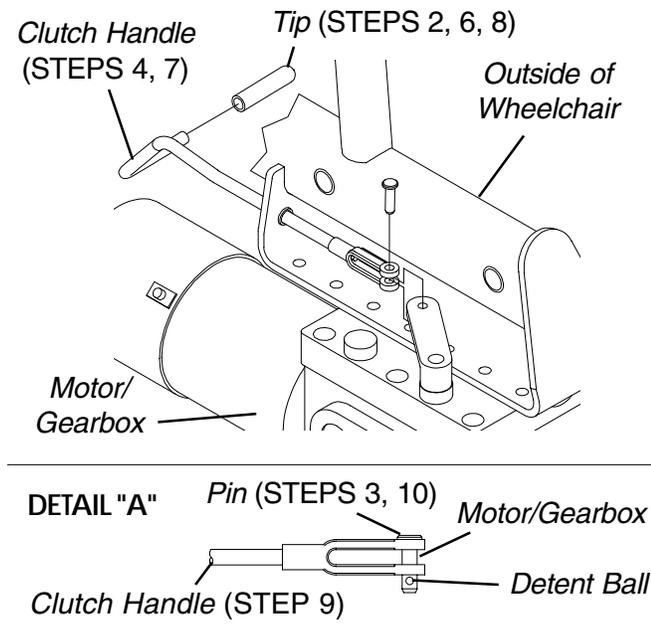


FIGURE 21 - REPLACING CLUTCH HANDLES - RANGER II FWD BASIC

**REPLACING MOTOR/GEARBOX - R2<sub>BASIC</sub> AND R2<sub>JR</sub> (FIGURE 22)**

1. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Perform one (1) of the following:
  - A. For R2<sub>BASIC</sub> - Proceed to STEP 3
  - B. FOR R2<sub>JR</sub>

Cut the tie wrap that secures the following connections to the wire connector support:

    - The right hand motor and controller connection.
    - The left hand motor and controller connection.
    - Battery wiring harness (BLUE) and controller connector (BLUE).
3. Disconnect the right and left motor connector from the controller.
4. Remove the drive wheels from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 9 of this manual.

5. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Remove the hex screws and spacers that secure the battery tray hanger bracket and footboard mounting bracket to the wheelchair frame.
  - B. WHEELCHAIR NOT EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Remove the front hex screw that secures the battery tray hanger bracket to the wheelchair frame.
5. Rotate battery tray hanger bracket up.
6. **Left side of wheelchair only** - Remove the front dust cover from the end of the crossbrace.
 

*NOTE: Left is determined by sitting in the wheelchair.*
7. Remove the pin that secures the clutch handle to the existing motor/gearbox.
8. Disconnect clutch handle from existing motor/gearbox.
9. Note mounting position of motor/gearbox on the wheelchair frame for installation of the new motor/gearbox.
10. Remove the six (6) socket screws that secure the existing motor/gearbox to the wheelchair frame.
11. Position the new motor/gearbox on the wheelchair frame at the position noted in STEP 9 as shown in FIGURE 22.

**CAUTION**

The longer socket screws must be positioned in the mounting holes on the **OUTSIDE** of the wheelchair frame and the short socket screws must be in the mounting holes on the **INSIDE** of the wheelchair frame. Otherwise damage to the gearbox may result.

12. Use Loctite 242 and tighten the motor/gearbox to the wheelchair frame securely with the six (6) socket screws. Torque to 60-inch pounds.
13. Connect the clutch handle to the new motor/gearbox and line up the mounting holes.
14. Insert the pin through clutch handle and new motor/gearbox as shown in DETAIL "B" in FIGURE 22.
 

*NOTE: Make sure the detent ball on the pin is fully visible.*
15. Repeat STEPS 6-13 for the opposite side of the wheelchair, if necessary.
16. Reinstall the drive wheels onto the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 9 of this manual.
17. **Left side of wheelchair only** - Reinstall the front dust cover onto the end of the crossbrace.
18. Line up the mounting hole in the battery tray hanger bracket with the mounting hole in the wheelchair frame.

19. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the hex screws and spacers that secure the battery tray hanger bracket and footboard mounting bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
  - B. WHEELCHAIR NOT EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the front hex screw that secures the battery tray hanger bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
20. Reconnect the right and left motor connector to the controller.
21. **FOR R2<sub>JR</sub> ONLY** -
  - A. Position the right hand motor/controller connection and the left hand motor/controller connection side by side on the wire connector support.
  - B. Position the battery wiring harness/controller connection on top of the right/left hand motor/controller connections.

*NOTE: When securing the above connections to wire connector support, make sure to wrap tie-wrap around crossbrace and thread through slot in wire connector support.*

  - C. Secure the above connections to the wire connector support with a tie-wrap.
22. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

**REPLACING MOTOR/GEARBOX - R2<sub>STANDARD</sub> (FIGURE 23)**

1. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
2. Disconnect the right and/or left motor connector from the controller.
3. Remove the drive wheels from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in **PROCEDURE 9** of this manual.
4. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Remove the hex screw and washer that secure the battery tray hanger bracket to the wheelchair frame.
  - B. WHEELCHAIR NOT EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Proceed to STEP 6.

5. Rotate battery tray hanger bracket up.
  6. Left side of wheelchair only - Remove the front dust cover from the end of the crossbrace.
- NOTE: left is determined by sitting in the wheelchair.*
7. Note the mounting position of the motor/gearbox on the wheelchair frame for installation of new motor/gearbox.
  8. Remove the six (6) socket screws that secure the existing motor/gearbox to the wheelchair frame.
  9. Position the new motor/gearbox on the wheelchair frame at the position noted in STEP 6 as shown in FIGURE 23.

**CAUTION**

The longer socket screws must be positioned in the mounting holes on the OUTSIDE of the wheelchair frame and the short socket screws must be in the mounting holes on the INSIDE of the wheelchair frame. Otherwise damage to the gearbox casting can result.

10. Use Loctite 242 and tighten battery tray mounting bracket and motor/gearbox to the wheelchair frame securely with the six (6) socket screws. Torque to 60-inch pounds.
11. Repeat STEPS 2-10 for the opposite side of the wheelchair, if necessary.
12. Reinstall the drive wheels onto the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 9 of this manual.
13. Line up the mounting hole in the battery tray hanger bracket with the mounting hole in the wheelchair frame.
14. Left side of wheelchair only - Reinstall the front dust cover onto the end of the crossbrace.
15. Perform one (1) of the following:
  - A. WHEELCHAIR EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the hex screws and spacers that secure the battery tray hanger bracket and footboard mounting bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
  - B. WHEELCHAIR NOT EQUIPPED WITH FLIP-UP REMOVABLE FOOTBOARD - Reinstall the front hex screw that secures the battery tray hanger bracket to the wheelchair frame. Use Loctite 242 and torque to 156-in/lbs.
16. Reconnect the right and/or left motor connector to the controller.
17. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

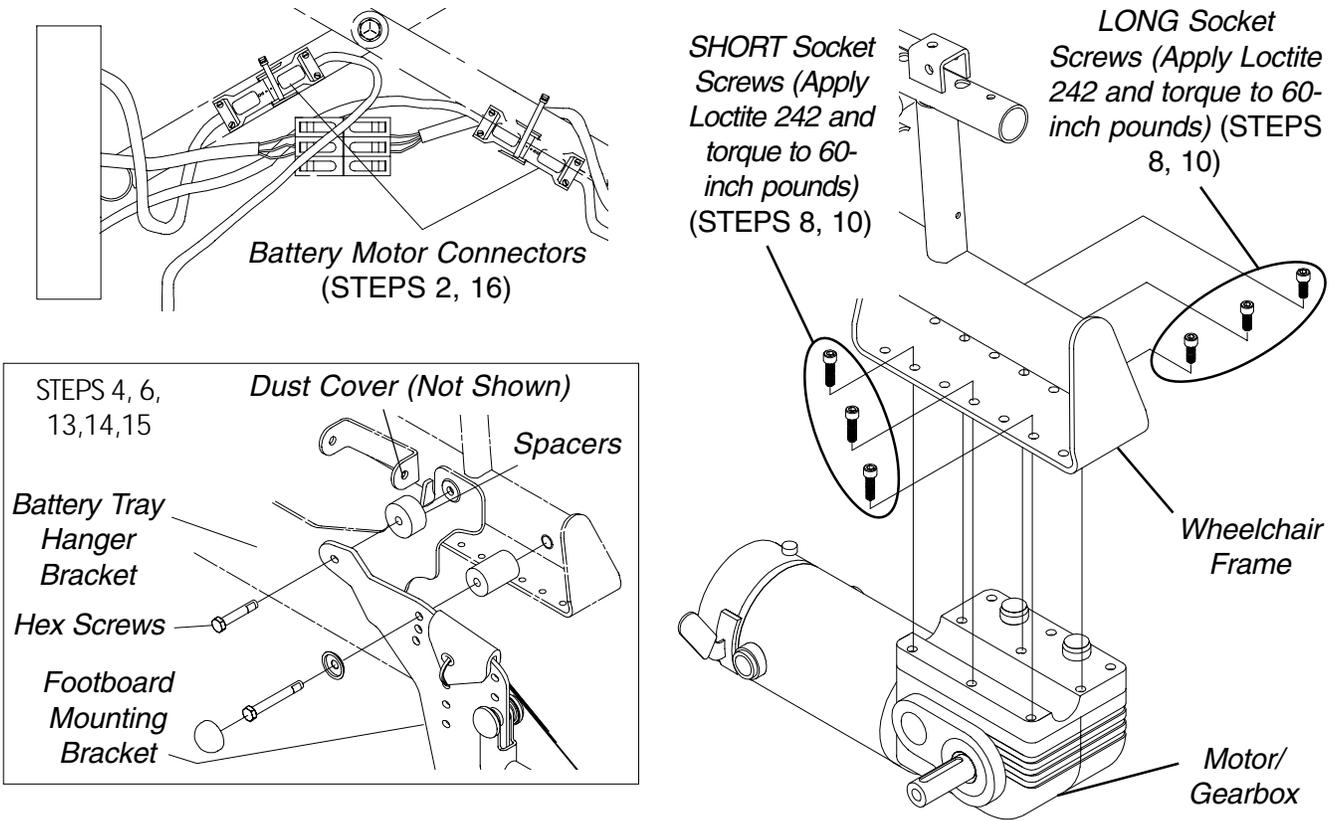


FIGURE 23 - REPLACING MOTOR/GEARBOX - RANGER II FWD - STANDARD

*This Procedure Includes the Following:*

- Assembling Ranger II MWD**
- When to Charge Batteries**
- Charging Batteries**
- Replacing Batteries**
- Installing/Removing Battery Boxes**
- Battery Tray**
- Replacing Wiring Harness**
- Stabilizer Identification**
- Adjusting Stabilizer Springs**
- Adjusting Stabilizer for User Preference**
- Replacing Stabilizer Cylinders**
- Replacing Stabilizer Wheels**
- Replacing Stabilizer Cylinder Springs**
- Repositioning Motors**
- Replacing Clutch Handles - R2<sub>BASIC</sub> AND R2<sub>250 SERIES</sub>**
- Replacing Motor/Gearbox - R2<sub>BASIC</sub> AND R2<sub>250 SERIES</sub>**
- Replacing Motor/Gearbox - R2<sub>STANDARD</sub>**

**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.

**ASSEMBLING RANGER II MWD**

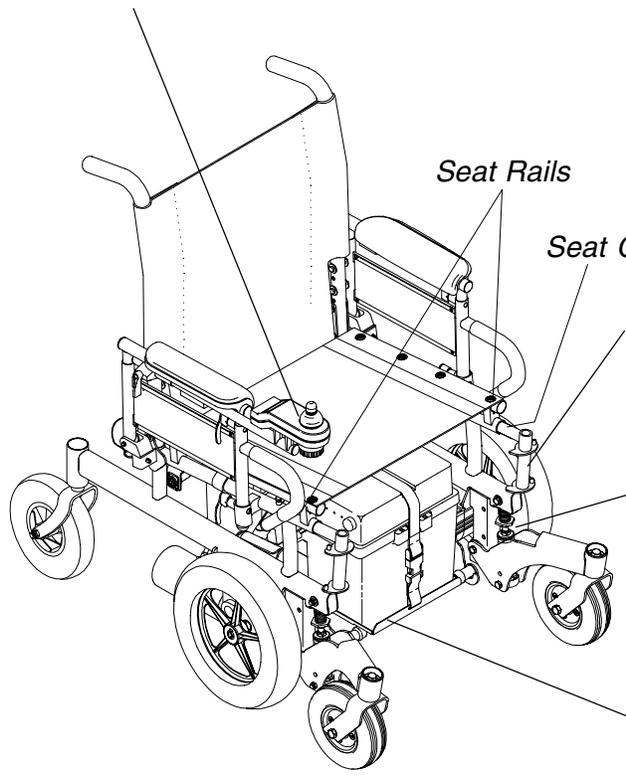
**WARNING**  
 The weight of the wheelchair without the user and batteries is still between 100 and 116 lbs. Use proper lifting techniques (lift with your legs) to avoid injury. Extreme caution is advised when it is necessary to move an UNOCCUPIED power wheelchair. Invacare recommends using two (2) assistants and making thorough preparations. Make sure to use ONLY secure, non-detachable parts for hand-hold supports.  
 Keep hands and fingers clear of moving parts to avoid injury.

Install the electronics. Refer to REPOSITIONING MKIV JOYSTICK in PROCEDURE 7 of this manual.

**Unfolding/Folding Integrated Sling Seats (FIGURE 1)**

**UNFOLDING.**

1. Push down on the seat rails until the seat rails are positioned in the seat guides.
2. Assemble the wheelchair. Refer to FIGURE 1.
3. If necessary, install the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.



Install the footrests/legrests. Refer to INSTALLING/REMOVING FOOTRESTS or INSTALLING ELEVATING LEGRESTS in PROCEDURE 3 of the owner's manual, part number 1080722.

Adjust the stabilizers. Refer to ADJUSTING STABILIZERS in this procedure of the manual.

Install the battery tray and batteries. Refer to INSTALLING/REMOVING BATTERY TRAY and INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.

**FIGURE 1 - ASSEMBLING RANGER II MWD - INTEGRATED SLING SEATS**

**FOLDING.**

1. If necessary, remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the batteries, battery tray and footrests/legrests from the wheelchair. Refer to FIGURE 1.
3. Lift up on the seat rails of the wheelchair.

**Unfolding/Folding Captain's Seats (FIGURE 2)**

**UNFOLDING.**

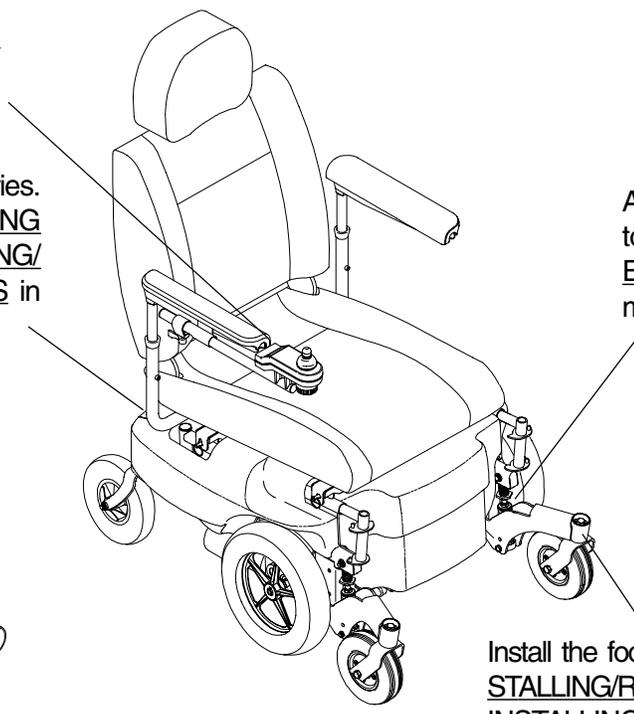
1. Push down on the push brackets until they are flush with the pivot links on the crossbraces.
2. Assemble the wheelchair. Refer to FIGURE 2.
3. Install the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
4. Install the captain's seat. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.
5. HIGH BACK CAPTAIN'S SEATS ONLY - Connect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in PROCEDURE 8 of this manual.

**FOLDING.**

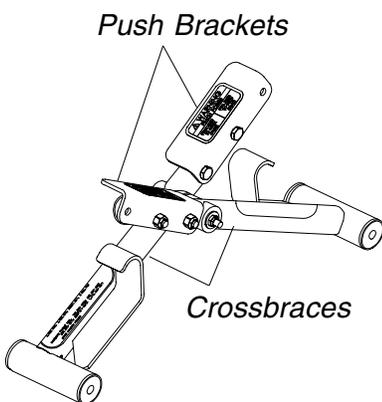
1. **HIGH BACK CAPTAIN'S SEATS ONLY** - Disconnect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in PROCEDURE 8 of this manual.
2. Remove captain's seat. Refer to REMOVING/INSTALLING CAPTAIN'S SEAT in PROCEDURE 5 of the owner's manual, part number 1080722.
3. Remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
4. Remove the batteries, battery tray and footrests/legrests from the wheelchair. Refer to **FIGURE 2**.
5. Lift up on push brackets located on the crossbraces.

Install the electronics. Refer to REPOSITIONING MKIV JOYSTICK in PROCEDURE 7 of this manual.

Install the battery tray and batteries. Refer to INSTALLING/REMOVING BATTERY TRAY and INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.



Adjust the stabilizers. Refer to ADJUSTING STABILIZERS in this procedure of the manual.



Install the footrests/legrests. Refer to INSTALLING/REMOVING FOOTRESTS or INSTALLING/REMOVING ELEVATING LEGRESTS in PROCEDURE 3 of the owner's manual, part number 1080722.

FIGURE 2 - ASSEMBLING RANGER II MWD - CAPTAIN'S SEATS

**WHEN TO CHARGE BATTERIES (FIGURE 5)**

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

**MKIV RII Joystick**

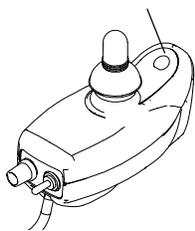
**BATTERY DISCHARGE INDICATOR (BDI)** is located at the rear of the joystick housing and provides information on the remaining charge in the batteries. At FULL charge the BDI will be GREEN. As the battery becomes discharged, the BDI indicator will turn AMBER (YELLOW), then RED and finally FLASHING RED. If the BDI is FLASHING RED, the user should charge the batteries as soon as possible.

*NOTE: Accurate readings are displayed when in neutral.*

**MCC-MKIV X, A or A+ Joystick**

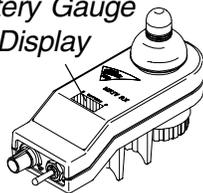
**BATTERY GAUGE DISPLAY (BGD)** is the bar graph display located on the MKIV X, A or A+ joystick. It will keep you informed as to power availability. A visual warning is given before the power becomes too low to operate the wheelchair. At full charge the two (2) LEFT segments and the farthest RIGHT segment 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 (2) bars (LEFT) are illuminated. At this level the last two (2) bars (LEFT) will start to Flash ON and OFF to indicate that the end user should charge the batteries as soon as possible.

Battery Discharge Indicator (BDI)



MKIV-RII JOYSTICK

Battery Gauge Display



MKIV X, A OR A+ JOYSTICK

*NOTE: MKIV X Shown.*

FIGURE 5 - WHEN TO CHARGE BATTERIES

**CHARGING BATTERIES (FIGURE 6)**

**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/rear of the wheelchair frame.

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

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

**CAUTION**

Always charge new batteries fully 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.

**SHUTOFF PROCEDURE.**

- A. **For Models R2<sub>BASIC</sub> and R2<sub>STANDARD</sub>** -If left unattended, the charger should automatically shut-off when full charge is obtained.
- B. **For R2<sub>250 SERIES</sub>** -The Charger output and green light will stay ON until the power switch on the battery charger is moved to the OFF position.

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

The amount of electrical current drawn within a given time to charge a battery is called "charge rate". If, due to usage, the charge stored in the battery is low, the charge rate is high. **(FOR MODELS R2<sub>BASIC</sub> and R2<sub>STANDARD</sub>** - this is 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 following will occur:

- A. **For Models R2<sub>BASIC</sub> and R2<sub>STANDARD</sub>** -the green light will stay illuminated for a longer period of time followed by a shorter off time.
- B. **For Model R2<sub>250 SERIES</sub>** - the battery charger rate decreases to a "trickle charge".

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

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

**Required Items:**

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

⊕ 3-prong plug, 15 ampere current rating; industrial type

**Wheelchairs Equipped With MCC-Mark IV Joystick (Detail "A" of FIGURE 6)**

1. If necessary, remove the rear shroud. Refer to REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS in PROCEDURE 9 of this manual.
2. Attach the battery charger connector to the charger cable/battery harness.
3. Plug the charger's AC power cord, or extension, into the grounded 120 VAC wall outlet.
4. Wait until charging is complete.
5. If necessary, install the rear shroud. Refer to REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS in PROCEDURE 9 of this manual.

**Wheelchairs Equipped With Mark IV RII Joystick (Detail "B" of FIGURE 6)**

1. 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: Allow eight (8) hours for normal charging. Larger batteries (greater than 55 ampere-hours) or severely discharged batteries may require up to sixteen (16) hours to be properly charged and equalized.*

*NOTE: R2<sub>BASIC</sub> and R2<sub>STANDARD</sub> ONLY - If the charger operates for sixteen (16) hours and is unable to fully charge the batteries, an internal timer turns the charger off and begins to fast blink the green light.*

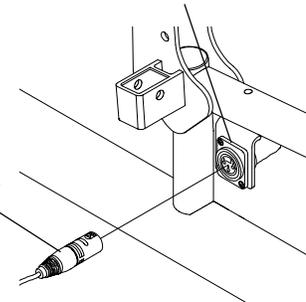
*NOTE: If the batteries need to be charged more often or take longer to charge than normal, they may need to be replaced. Contact an Invacare dealer for service.*

**DETAIL "A"**

Battery Charger Connector (on Side of Wheelchair)

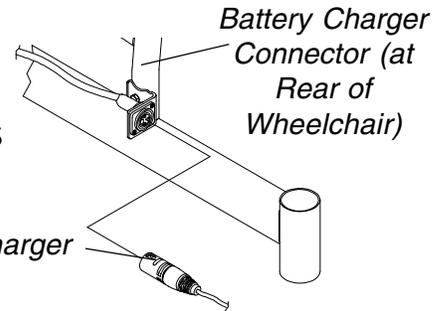
WHEELCHAIRS WITHOUT SHROUDS

From Battery Charger



WHEELCHAIRS WITH SHROUDS

From Battery Charger

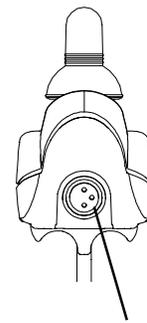


**DETAIL "B"**

Battery Charger Three (3) Pronged Plug

Front View of Joystick

From Battery Charger



Charger Port

Charger Port

Joystick

Battery Boxes

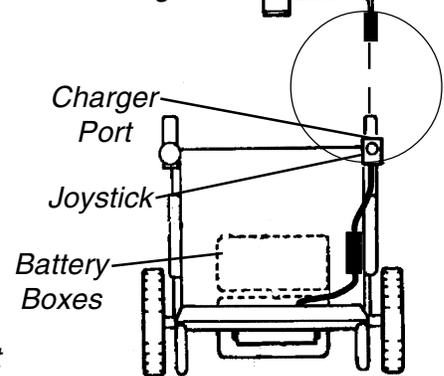


FIGURE 6 - CHARGING BATTERIES

**REPLACING BATTERIES**

**WARNING**

The following procedure should be performed only by a qualified technician.

Most batteries are not sold with instructions. However, warnings are frequently noted on the cell caps. Read them carefully, otherwise injury or damage can occur.

*NOTE: Invacare recommends that both batteries be replaced if one (1) battery is defective.*

**Recommended Battery Types**

**CAUTION**

Failure to use the correct battery size and/or voltage may cause damage to your wheelchair and give you unsatisfactory performance.

CHAIR MODEL	QTY	VOLTS	BATTERY SIZE	REMARKS
R2 <sub>BASIC</sub>	2	12	22NF	Deep Cycle
R2 <sub>STANDARD</sub>	2	12	22NF	Deep Cycle
R2 <sub>250 SERIES</sub>	2	12	U1	Deep Cycle

1. Remove the battery boxes from the wheelchair. Refer to REMOVING/INSTALLING BATTERY BOXES in this procedure of the manual.
2. Remove existing batteries from the battery boxes. Refer to INSTALLING/REMOVING BATTERIES TO/FROM BATTERY BOXES in this procedure of the manual.
3. Clean the new battery terminals.
4. Install the new batteries into the battery boxes. Refer to INSTALLING/REMOVING BATTERIES TO/FROM BATTERY BOXES in this procedure of the manual.

**Cleaning Battery Terminals**

**WARNING**

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.

NEVER smoke or strike a match near batteries. If the caps of the battery cells are removed, NEVER look directly into them while charging batteries.

1. If applicable, verify that the plastic caps are in place over the battery cell holes.
2. Cut the tie wraps around the terminal caps/covers.
3. Slide the terminal cap/cover up the wire to expose the battery terminal.
4. Examine battery clamps and terminals for corrosion.
5. Clean terminals and inside the battery clamps by using a battery cleaning tool, wire brush, or medium grade sand paper.

*NOTE: When done, these areas should be shiny, not dull.*

6. Carefully dust off all metal particles.
7. Slide the terminal cap/cover back down the wire to cover the battery terminal.
8. Secure the terminal cap/cover using NEW tie wraps.

**INSTALLING/REMOVING BATTERY BOXES (FIGURE 7)**

**Installing**

*NOTE: To remove the battery boxes from the wheelchair, reverse the following procedure.*

**WARNING**

If the wheelchair is equipped with the removable footboard AND it is installed in the highest position, it is necessary to remove the footboard plate BEFORE removing the battery boxes. Otherwise, injury can occur.

*To remove the removable footboard, refer to REMOVING THE REMOVABLE FOOTBOARD ASSEMBLY FROM THE WHEELCHAIR in PROCEDURE 3 of this Owner's Manual, part number 1080722.*

*NOTE: Motors should be in the engaged position when removing/installing batteries. Refer to ENGAGING/DISENGAGING MOTORS in PROCEDURE 8 of this manual.*

1. Verify that the ON/OFF switch on the joystick is in the OFF position.
2. If necessary, remove the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 9 of this manual.

**WARNING**

Battery boxes MUST be installed/removed in the order stated below or the battery tray could rotate causing the rear battery box to fall possibly causing injury or damage.

Use extreme care when installing/removing the battery boxes.

NEVER unplug the battery cables by pulling on the wires. Unplug the battery cables by pulling on the connector ONLY. Otherwise injury or damage may result.

When removing the battery boxes from the wheelchair, remove the rear battery box first.

3. Position the battery boxes onto the battery tray in the following order:
  - A. FRONT Battery Box.
  - B. REAR Battery Box.
4. Position retaining straps around each battery box as shown in DETAIL "A" of FIGURE 7 and clip retaining strap together.

*NOTE: Make sure battery box leads are on the same side as battery connectors on wheelchair frame.*

5. Connect the battery box leads to the battery connectors on the wheelchair frame.

- If necessary, reinstall the removeable footboard. Refer to REMOVING THE REMOVABLE FOOTBOARD ASSEMBLY FROM THE WHEELCHAIR in PROCEDURE 3 of this Owner's Manual, part number 1080722.

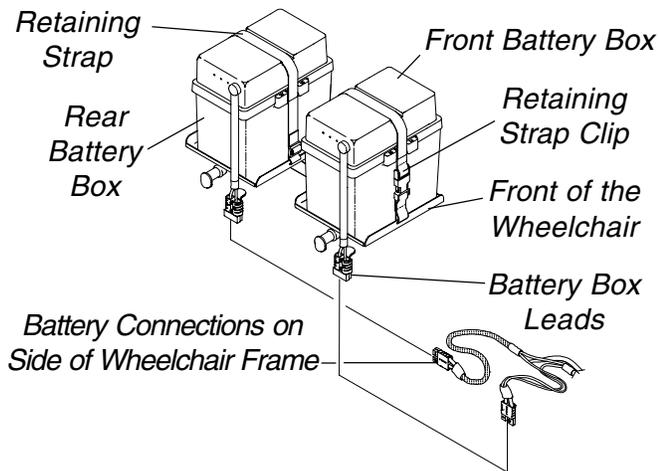


FIGURE 7 - INSTALLING/REMOVING BATTERY BOXES

## BATTERY TRAY (FIGURE 8)

### Installing Battery Tray onto Wheelchair NOT Equipped Weight Shift Basic Tilt

- If necessary, remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS in PROCEDURE 10 of this manual.
- Turn the battery tray slightly to one (1) side.

*NOTE: Make sure the end of the battery tray labeled "FRONT" is towards the front of the wheelchair.*

- Position the battery tray pins over the mounting slots on the hanger brackets.

#### WARNING

Make sure pins of battery tray are secure in the mounting slots of the hanger bracket, otherwise injury or damage may result.

- Push down on the battery tray to secure in place.
- Install the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
- If necessary, install the shrouds. Refer to REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS in PROCEDURE 10 of this manual.

### Installing Battery Tray onto Wheelchair Equipped Weight Shift Basic Tilt

- If necessary, remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS in PROCEDURE 10 of this manual.

- Turn the battery tray slightly to one (1) side.
- Position the battery tray pins over the mounting slots on the hanger brackets.

#### WARNING

Make sure pins of battery tray are secure in the mounting slots of the hanger bracket, otherwise injury or damage may result.

- Push down on the battery tray to secure in place.
- Install the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
- If necessary, install the shrouds. Refer to REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS in PROCEDURE 10 of this manual.

### Removing

- If necessary, remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS - MWD WHEELCHAIRS in PROCEDURE 10 of this manual.
- Remove the battery boxes from the wheelchair. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
- Lift up on the battery tray to release the battery tray pins from the mounting slots on the hanger brackets.
- Turn the battery tray slightly to one (1) side.
- Remove the battery tray from the wheelchair.

MWD WHEELCHAIRS

BATTERY TRAY FOR WHEELCHAIRS NOT EQUIPPED WITH WEIGHT SHIFT BASIC TILT

Hanger Bracket

Mounting Slots

Battery Tray

"FRONT" Label

Battery Tray Pins

BATTERY TRAY FOR WHEELCHAIRS EQUIPPED WITH WEIGHT SHIFT BASIC TILT

Hanger Bracket

Mounting Slots

Battery Tray

Battery Tray Pins

FIGURE 8 - BATTERY TRAY

### Changing Width of Battery Tray (FIGURE 9)

*NOTE: This procedure is only necessary when changing the width of the wheelchair.*

1. Remove the battery tray from the wheelchair. Refer to INSTALLING/REMOVING BATTERY TRAY in this procedure of the manual.
2. Remove the hex bolt and locknut that secure one (1) of the battery tray pins to the battery tray.
3. Refer to FIGURE 9 to determine the mounting hole in the battery tray that corresponds to the width of the wheelchair.
4. Reposition the battery tray pin to the mounting hole determined in STEP 3.
5. Secure the battery tray pin to the battery tray with the hex bolt and locknut.
6. Repeat STEPS 2-5 for the other three (3) battery tray pins.
7. Reinstall the battery tray onto the wheelchair. Refer to INSTALLING/REMOVING BATTERY TRAY in this procedure of the manual.

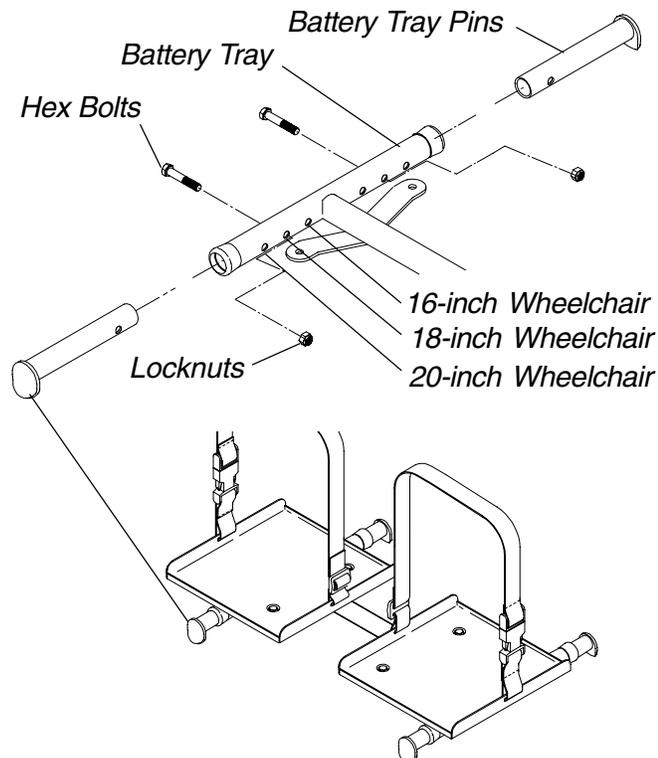


FIGURE 9 - BATTERY TRAY - CHANGING WIDTH OF BATTERY TRAY

### REPLACING WIRING HARNESS (FIGURE 10)

1. If necessary, remove the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of manual.
3. Disconnect the wiring harness (BLUE) from the controller connector (BLUE).
4. Remove the two (2) phillips screws and spacers that secure the rear battery connector to the wheelchair frame.
5. Remove the two (2) phillips bolts and locknuts that secure the front battery connector to wheelchair frame.
6. Remove the two (2) phillips bolts and locknuts that secure the wiring harness to the charger cable mounting bracket.
7. HIGH BACK CAPTAIN'S SEAT MODEL WHEELCHAIRS ONLY (DETAIL "A") - Perform the following:
  - A. Disconnect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in this procedure of the manual.
  - B. Remove the phono jack nut that secures the phono jack to the limit switch bracket.
8. Note the position of the tie wraps that secure the existing wiring harness and motor cables to the cross-braces.
9. Cut the tie wraps that secure the existing wiring harness and motor cables to the crossbraces.
10. Remove the existing wiring harness from wheelchair.
11. Position the rear battery connector of the new wiring harness on the wheelchair frame as shown in FIGURE 10 and secure with the two (2) phillips screws and spacers.
12. Position the front battery connector on the wheelchair frame as shown in FIGURE 10 and secure with the two (2) phillips bolts and locknuts.
13. Secure the wiring harness to existing charger cable mounting bracket on the seat frame with the two (2) phillips bolts and locknuts.
14. HIGH BACK CAPTAIN'S SEAT MODEL WHEELCHAIRS ONLY - Perform the following:
  - A. Position the new phono jack on the limit switch bracket.
  - B. Reinstall the phono jack nut onto the new phono jack and tighten securely.
  - C. Connect the limit switch. Refer to DISCONNECTING/CONNECTING LIMIT SWITCH in this procedure of the manual.

- 15. Connect the wiring harness (BLUE) to the controller connector (BLUE).
- 16. Resecure the wiring harness and motor cables to the crossbraces with new tie wraps at the positions noted in STEP 8.
- 17. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of manual.
- 18. If necessary, install the front and rear shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

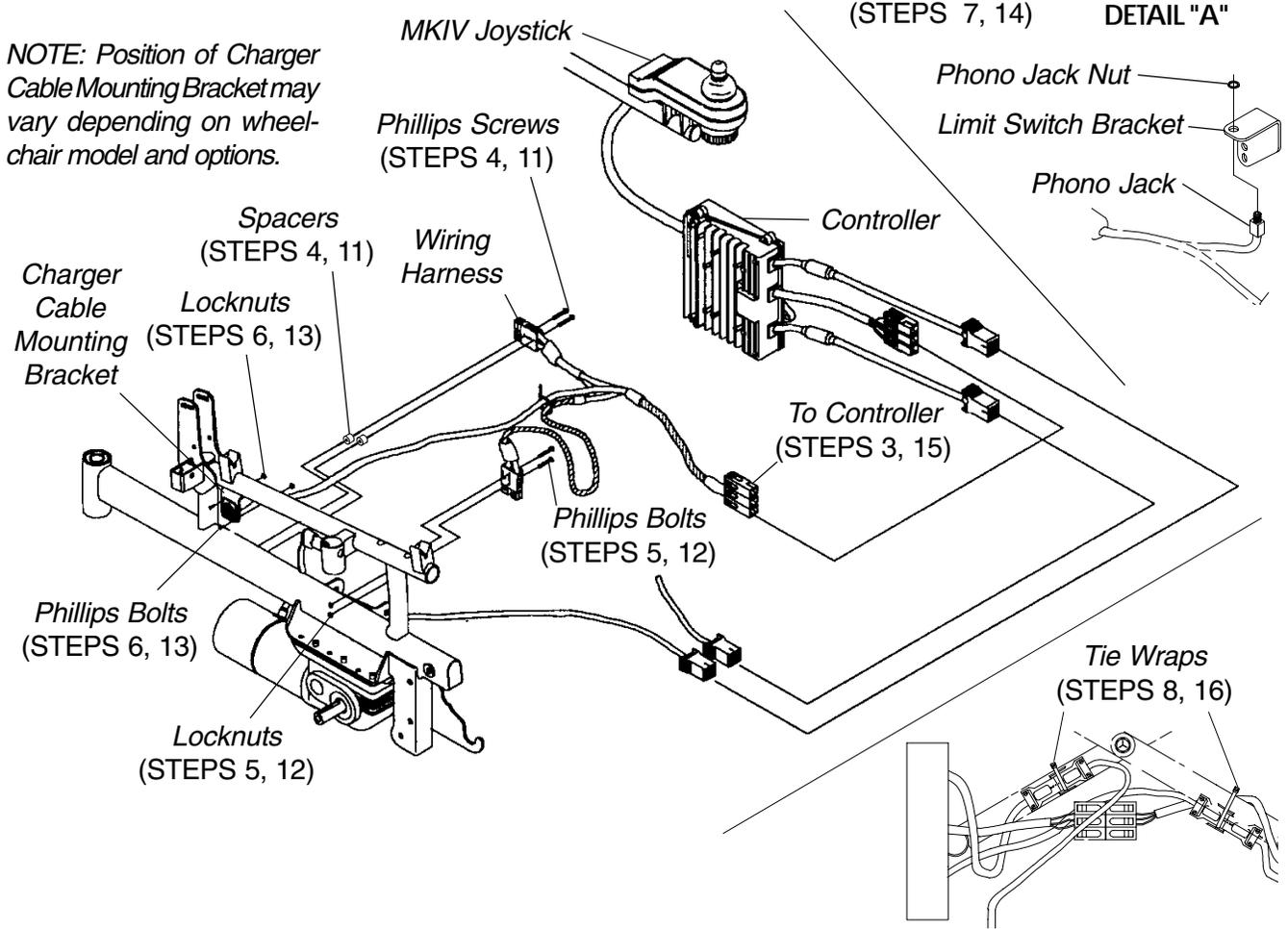


FIGURE 10 - REPLACING WIRING HARNESS

# STABILIZERS

## STABILIZER IDENTIFICATION (FIGURE 11)

NOTE: Depending on the date of manufacture, the wheelchair will have one (1) of the following types of stabilizer assemblies. Refer to the chart below to determine the correct stabilizer assembly.

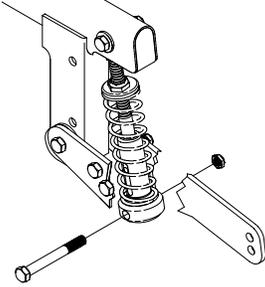
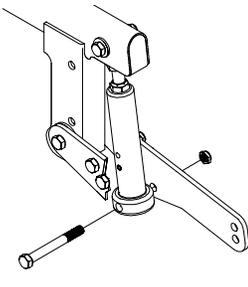
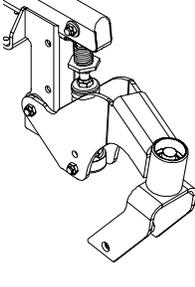
<b>TYPE A</b> Wheelchairs built before 7/1/1999	<b>TYPE B</b> Wheelchairs built between 7/1/1999 and 3/1/2000	<b>TYPE C</b> Wheelchairs built after 3/1/2000
		

FIGURE 11 -STABILIZER IDENTIFICATION

## ADJUSTING SPRINGS FOR TYPE A STABILIZER ASSEMBLY (FIGURE 12)

NOTE: Refer to STABILIZER IDENTIFICATION above to determine correct stabilizer assembly.

**WARNING**

Injury or damage can occur if the height of the stabilizer springs does not correspond to the approximate weight of the user. If the height of the stabilizer springs does not correspond to the approximate weight of the user, the wheelchair will feel less stable and possibly cause the footrests/legrests to drag the ground.

If adjusting a new cylinder spring, it **MUST** be compressed to the 3-1/2-inch height (FIGURE 12) **BEFORE** adjusting the stabilizer spring to correspond to the approximate weight of the user. Otherwise the stabilizer will not work properly.

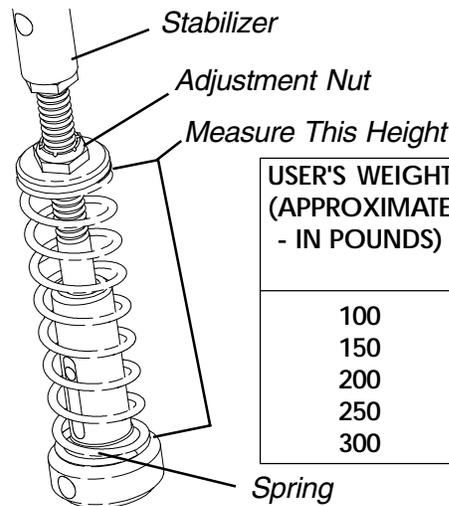
NOTE: If the height of the stabilizer springs is less than the height that corresponds to the approximate weight of the user, the wheelchair will not be able to clear 2-inch obstacles.

NOTE: The stabilizer springs are factory set for a user weighing approximately 300-pounds. Use FIGURE 12 as a starting point when adjusting the stabilizer spring.

NOTE: The following adjustment should be made with an unoccupied wheelchair.

1. Determine the approximate weight of the user.

2. **NEW STABILIZER SPRINGS ONLY** - Rotate adjustment nut DOWN until the 3-1/2-inch height is obtained.
3. Refer to FIGURE 12 to determine the height of the stabilizer spring.
4. Rotate the adjustment nut UP or DOWN to adjust the stabilizer spring to the height determined in **STEP 2**.
5. Adjust the for user preference. Refer to ADJUSTING TYPE A STABILIZER ASSEMBLY FOR USER PREFERENCE in this procedure of the manual.



USER'S WEIGHT (APPROXIMATE - IN POUNDS)	HEIGHT MEASURED (APPROXIMATE - IN INCHES)
100	4-3/16
150	4
200	3-7/8
250	3-11/16
300	3-1/2

NOTE: If the user's approximate weight is not listed above, use the **HIGHEST** listed approximate weight closest to user's weight as a starting point to adjust the stabilizer spring.

FIGURE 12 - ADJUSTING STABILIZERS - SPRINGS

## ADJUSTING STABILIZER FOR USER PREFERENCE

### Adjusting Type A Stabilizer Assembly for User Preference (FIGURE 13)

*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

1. While the user is in the wheelchair, measure the distance between the bottom of the stabilizer wheel and the ground/floor.

*NOTE: Measurement MUST be between 7/8 and 1-inch.*

2. If the measurement taken in STEP 1 IS NOT between 7/8 and 1-inch, perform the following procedure:

- A. Loosen the jam nut on the stabilizer cylinder rod and back the jamnut down until it is touching the adjustment nut.
- B. Remove bottom bolt and locknut that secure bottom of the stabilizer cylinder to the stabilizer plates.
- C. Perform one (1) of the following:  
**MEASUREMENT GREATER THAN 1-INCH -** Turn the bottom of the stabilizer cylinder COUNTERCLOCKWISE.

**MEASUREMENT LESS THAN 7/8-INCH -** Turn the bottom of the stabilizer cylinder CLOCKWISE.

- D. Line up mounting holes in stabilizer cylinder and the stabilizer plates and reinstall the bottom bolt.
- E. Perform one (1) of the following:  
**DISTANCE IS BETWEEN 7/8 AND 1-INCH -** Reinstall the locknut tighten securely.

**DISTANCE IS NOT BETWEEN 7/8 AND 1-INCH -** Repeat STEPS B-E until the measurement is between 7/8 and 1-inch.

- F. Tighten the jamnut on the stabilizer cylinder.

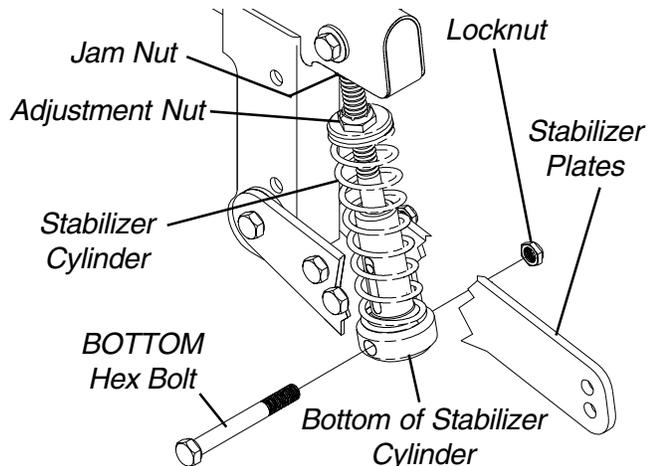


FIGURE 13 - ADJUSTING TYPE A STABILIZER ASSEMBLY FOR USER PREFERENCE

### Adjusting Type B Stabilizer Assembly for User Preference (FIGURE 14)

*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

1. While the user is in the wheelchair, measure the distance between the bottom of the stabilizer wheel and the ground/floor.

*NOTE: The distance between the bottom of the stabilizer wheel and the ground/floor is factory set at one (1) inch.*

2. To increase obstacle climbing ability or stability perform the following:

- A. Loosen the jam nut on the stabilizer cylinder rod and back the jamnut down until it is touching the adjustment nut.

- B. Remove bottom hex bolt and locknut that secure bottom of the stabilizer cylinder to the stabilizer plates.

- C. Perform one (1) of the following:  
**Increase obstacle climbing ability -** Turn the bottom of the stabilizer cylinder COUNTERCLOCKWISE.

**Increase stability -** Turn the bottom of the stabilizer cylinder CLOCKWISE.

- D. Line up mounting holes in stabilizer cylinder and the stabilizer plates and reinstall the bottom hex bolt.

- E. Check performance of the wheelchair. Repeat STEPS A-D if necessary.

- F. Tighten the jamnut on the stabilizer cylinder.

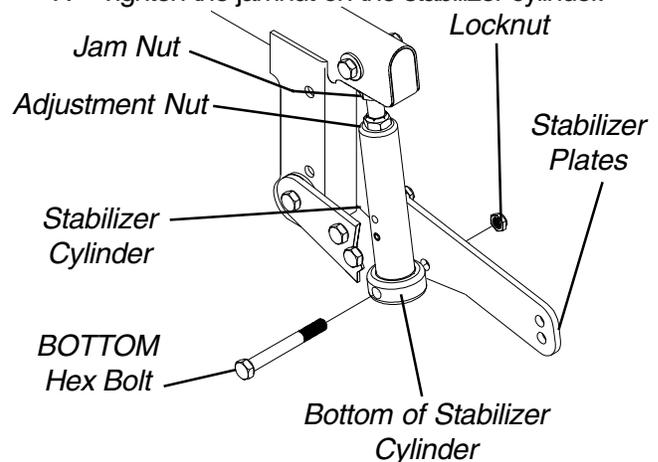


FIGURE 14 - ADJUSTING TYPE B STABILIZER ASSEMBLY FOR USER PREFERENCE

**Adjusting Type C Stabilizer Assembly for User Preference (FIGURE 15)**

*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

1. Rotating the locknut that is located on top of the lower spring provides one (1) of the following:
  - A. **Rotating the locknut CLOCKWISE** - provides more resistance of the stabilizer when stopping and increases stability.
  - B. **Rotating the locknut COUNTER-CLOCKWISE** - provides less resistance of the stabilizer when stopping and improves obstacle climbing ability.

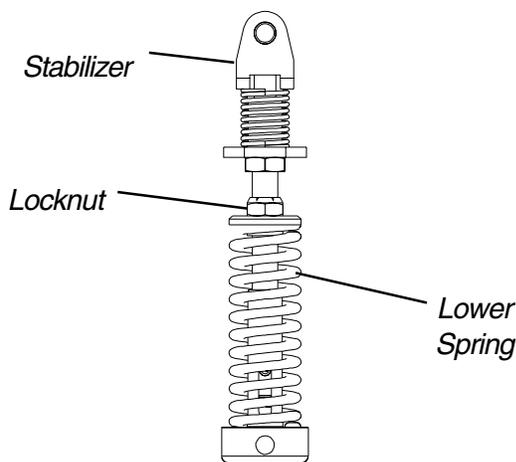


FIGURE 15 - ADJUSTING TYPE C STABILIZER ASSEMBLY FOR USER PREFERENCE

**REPLACING STABILIZER CYLINDERS**

**Replacing Stabilizer Cylinders for Type A and Type B Stabilizer Assemblies (FIGURE 16)**

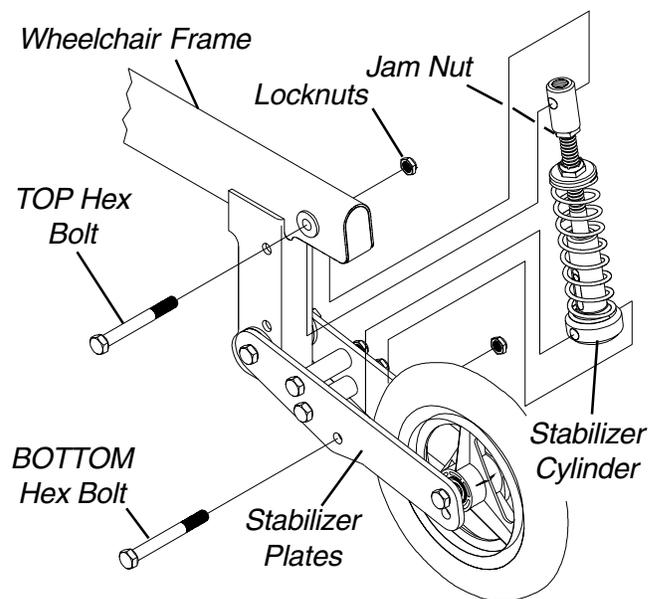
*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

1. If necessary, remove the front shroud. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the top hex bolt and locknut that secure the existing stabilizer cylinder to the wheelchair frame.
3. Remove the bottom bolt and locknut that secure the bottom of the existing stabilizer cylinder to the stabilizer plates.
4. Remove existing stabilizer cylinder from the wheelchair.

5. Position the new stabilizer cylinder on the wheelchair as shown in FIGURE 16.
6. Secure the top of the new stabilizer cylinder to the wheelchair frame with the hex bolt and locknut.

**WARNING**  
**DO NOT overtighten. Stabilizer cylinder will not operate properly.**

7. Secure the bottom of the new stabilizer cylinder to the stabilizer plates with the hex bolt and locknut.
8. Repeat STEPS 2-7 for the opposite side of the wheelchair, if necessary.
9. Tighten the jam nut on the stabilizer cylinder.
10. Adjust the front stabilizer(s). Refer to ADJUSTING STABILIZERS in this procedure of the manual.
11. If necessary, install the front shroud. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.



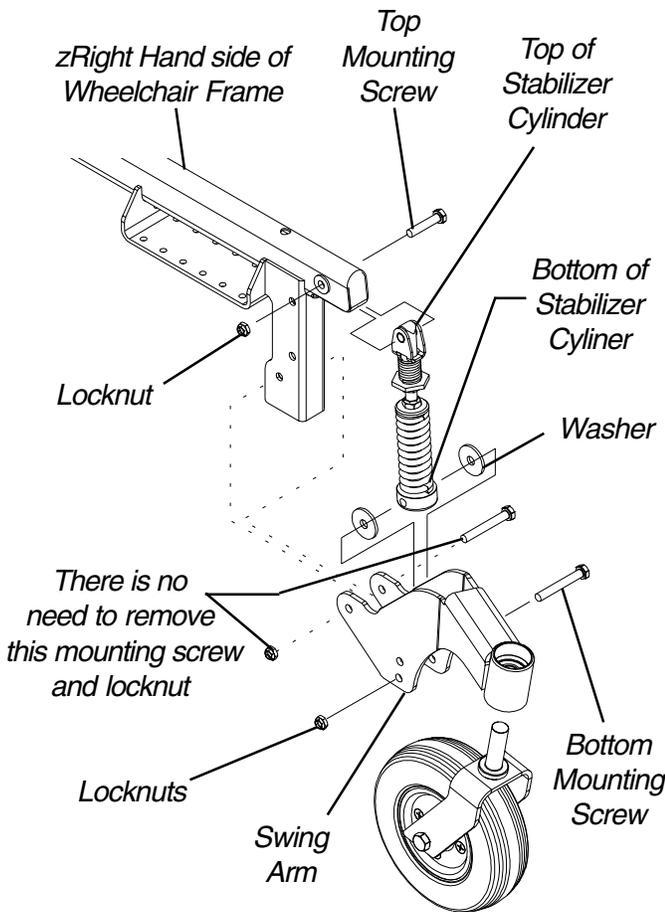
*NOTE: Only stabilizer cylinder for Type A stabilizer assembly shown. Stabilizer cylinder for Type B stabilizer assembly removes/installs in the same manner.*

FIGURE 16 - REPLACING STABILIZER CYLINDERS FOR TYPE A AND TYPE B STABILIZER ASSEMBLIES

**Replacing Stabilizer Cylinders for Type C Stabilizer Assemblies (FIGURE 17)**

*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

1. Place a 1/2-inch block underneath drive wheel.
2. Remove the top mounting screw and locknut that secures the top of the stabilizer cylinder to the wheelchair frame.
2. Note the mounting position of the existing stabilizer cylinder for proper installation of the new stabilizer cylinder.
3. Remove the bottom mounting screw, washers and locknut that secures the bottom of the stabilizer cylinder to the swing arm.
4. Remove the existing stabilizer cylinder.



*NOTE: Stabilizer assembly exploded away for clarity. It is not necessary to remove the stabilizer assembly from the wheelchair frame.*

**FIGURE 17 - REPLACING STABILIZER CYLINDERS FOR TYPE C STABILIZER ASSEMBLIES**

5. Secure the bottom of the NEW stabilizer cylinder to the mounting hole on the swing arm noted in STEP 2 with the mounting screw, washers, and locknut. Loosely tighten.
6. Secure the top of the stabilizer cylinder to the wheelchair frame with the top mounting screw and locknut. Loosely tighten.
7. Torque both mounting screws to 13 ft/lbs and then back off 1/8 to 1/4 turn.

*NOTE: The length of the new stabilizer cylinder must be adjusted to match the length of the stabilizer cylinder just removed.*

8. Measure the distance between the top mounting hole and the bottom mounting hole on the existing stabilizer cylinder. Note this distance as distance "A". Refer to DETAIL "A"
9. Place the wheelchair on a flat surface so that the stabilizer wheels can hang freely.
10. Loosen the jam nut, located underneath the hex nut adjuster, by turning CLOCKWISE as viewed from the top.
11. Rotate the hex nut adjuster in one (1) of the following directions:
  - A. Rotating the hex nut adjuster CLOCKWISE, as viewed from the top, will move the stabilizer wheel up.
  - B. Rotating the hex nut adjuster COUNTER-CLOCKWISE, as viewed from the top, will move the stabilizer wheel down.
12. When distance "A" is achieved, noted from STEP 8, retighten the jam nut by rotating COUNTER-CLOCKWISE to lock the hex nut adjuster in position.
13. Place the wheelchair on a flat surface with all six wheels in contact with the surface.

**REPLACING STABILIZER WHEEL**

**Replacing Stabilizer Wheel for Type A and Type B Stabilizer Assemblies (FIGURE 18)**

*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

*NOTE: Note the position of the stabilizer wheel for installation of the new stabilizer wheel.*

1. Remove the hex bolt and locknut that secure the existing stabilizer wheel and spacers to the stabilizer plates.

2. Remove existing stabilizer wheel from the wheelchair.
3. Position the new stabilizer wheel and spacers between the stabilizer plates.
4. Reinstall the hex bolt through the stabilizer plates, spacers and new stabilizer wheel and tighten securely.
5. Repeat STEPS 1-4 for opposite side of wheelchair.

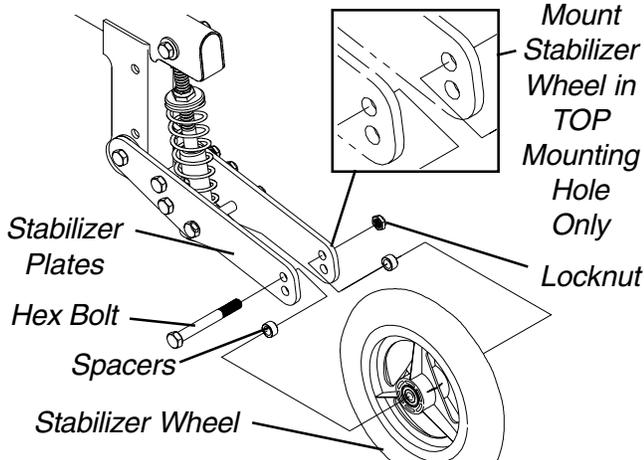


FIGURE 18 - REPLACING STABILIZER WHEEL FOR TYPE A AND TYPE B STABILIZER ASSEMBLIES

**Replacing Stabilizer Wheel for Type C Stabilizer Assemblies (FIGURE 19)**

*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

1. Secure the fork to the caster with one (1) 7/16-20 x 3-1/4-inch hex screw, washer, and locknut.
2. Torque the locknut to 120-in/lbs.
3. Loosen the locknut 1/8 of a turn by turning the locknut COUNTER-CLOCKWISE.
4. Move the caster side to side.

*NOTE: If the caster moves side to side, tighten the locknut slightly. Repeat STEP 3 until there is no side to side movement.*

5. Repeat STEP 1 for other caster and fork.

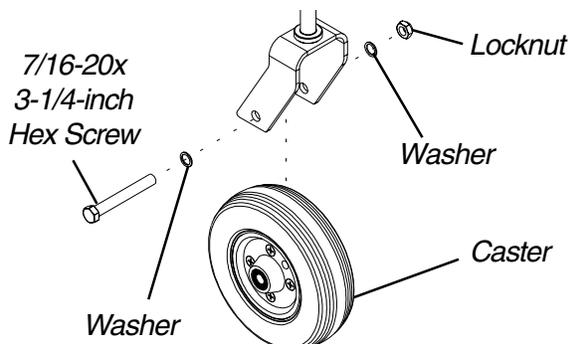


FIGURE 19 - REPLACING STABILIZER WHEEL FOR TYPE A AND TYPE B STABILIZER ASSEMBLIES

**REPLACING STABILIZER CYLINDER SPRINGS (FIGURE 16)**

**Replacing Stabilizer Cylinder Springs for Type A Stabilizer Assemblies (FIGURE 14)**

*NOTE: Refer to STABILIZER IDENTIFICATION in the beginning of this section to determine correct stabilizer assembly.*

1. If necessary, remove the front shroud. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Loosen the jam nut on the stabilizer cylinder.
3. Remove the top hex bolt and locknut that secure the stabilizer cylinder to the wheelchair frame.
4. Remove the bottom bolt and locknut that secure the bottom of the stabilizer cylinder to the stabilizer plates.
5. Remove the stabilizer cylinder from the wheelchair.
6. Unscrew the stabilizer cylinder pivot and jam nut from the stabilizer cylinder.

**WARNING**

The stabilizer cylinder spring is under compression. SLOWLY remove the adjustment nut while checking to make sure the cylinder spring is becoming uncompressed. If the spring is not becoming uncompressed, DO NOT remove the adjustment nut, otherwise injury or damage can occur. Contact Invacare Technical Service, 1-800-832-4707.

7. SLOWLY remove adjustment nut and plate from stabilizer cylinder while checking to make sure existing stabilizer cylinder spring is becoming uncompressed.
8. Remove the existing stabilizer cylinder spring from the stabilizer cylinder.

*NOTE: Examine the stabilizer cylinder and replace if worn.*

9. Install the new stabilizer cylinder spring onto the stabilizer cylinder.
10. Reinstall the plate and adjustment nut onto the stabilizer cylinder as shown in FIGURE 16.
11. Screw the jamnut and stabilizer cylinder pivot onto the stabilizer cylinder.
12. Position the new stabilizer cylinder on the wheelchair as shown in FIGURE 16.
13. Secure the top of the new stabilizer cylinder to the wheelchair frame with the hex bolt and locknut.

**WARNING**

DO NOT overtighten. Stabilizer cylinder will not operate properly.

14. Secure the bottom of the new stabilizer cylinder to the stabilizer plates with the hex bolt and locknut.

- Repeat STEPS 2-14 for the opposite side of the wheelchair, if necessary.
- Tighten the jamnut on the stabilizer cylinder.

**WARNING**  
 Stabilizers **MUST** be adjusted **BEFORE** use, otherwise they will **NOT** operate properly.

- Adjust the front stabilizer(s). Refer to ADJUSTING STABILIZERS in this procedure of the manual.
- If necessary, install the front shroud. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

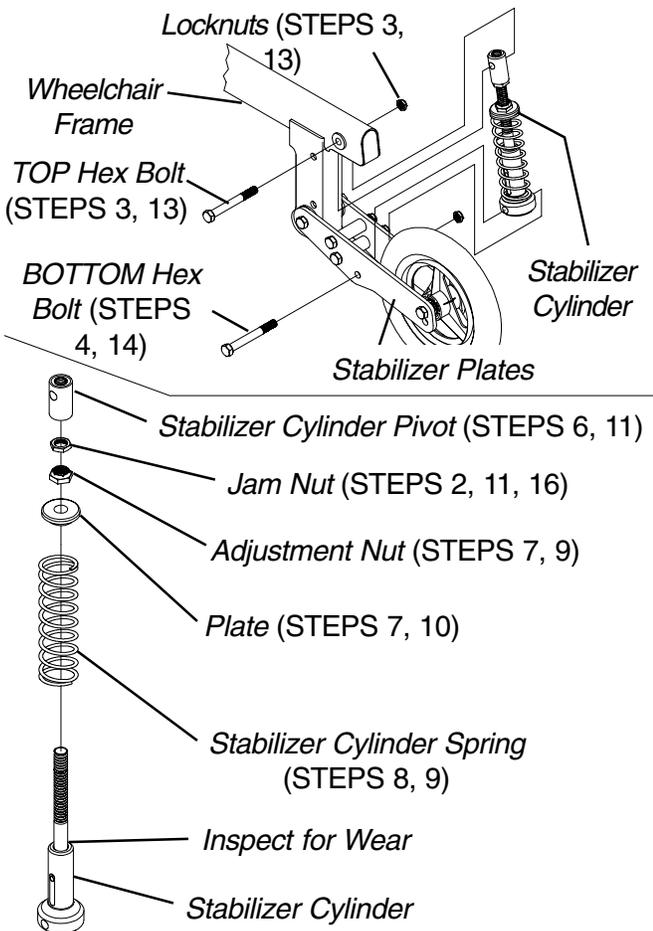


FIGURE 16 - REPLACING STABILIZER CYLINDER SPRINGS

**REPOSITIONING MOTORS**

**WARNING**  
 Repositioning the motors **MUST** be performed by an authorized Invacare dealer or qualified technician.

**REPLACING CLUTCH HANDLES - R2<sub>BASIC</sub> AND R2<sub>250 SERIES</sub> (FIGURE 21)**

- If necessary, remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

- Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
- Remove the tip from the existing clutch handle.
- Remove the pin that secures the existing clutch handle to the motor/gearbox.
- Disconnect the existing clutch handle from the motor/gearbox.
- Feed the existing clutch handle through the wheelchair frame.
- Remove the rubber tip from the new clutch handle.
- Install the new clutch handle onto the wheelchair.

*NOTE: Make sure the new clutch handle is pointing towards the outside of the wheelchair.*

- Install the rubber tip onto the new clutch handle.
- Connect the clutch handle to the motor/gearbox and line up the mounting holes in the clutch handle and motor/gearbox.
- Insert the pin through the clutch handle and motor/gearbox as shown in DETAIL "A" in FIGURE 21.

*NOTE: Make sure the detent ball on the pin is fully visible.*

- Repeat STEPS 3-11 for the opposite side of the wheelchair, if necessary.
- Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
- If necessary, install the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

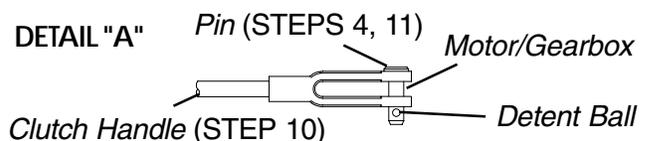
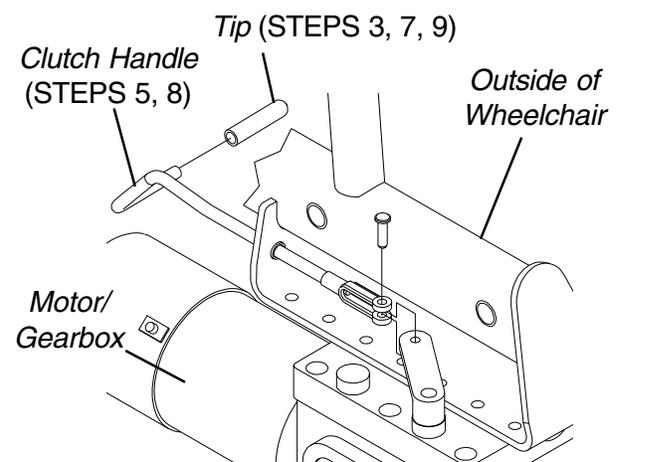


FIGURE 21 - REPLACING CLUTCH HANDLES - RANGER II MWD BASIC

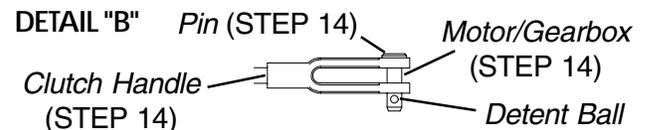
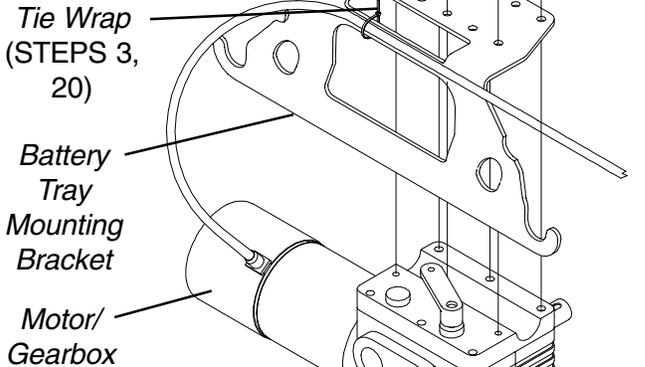
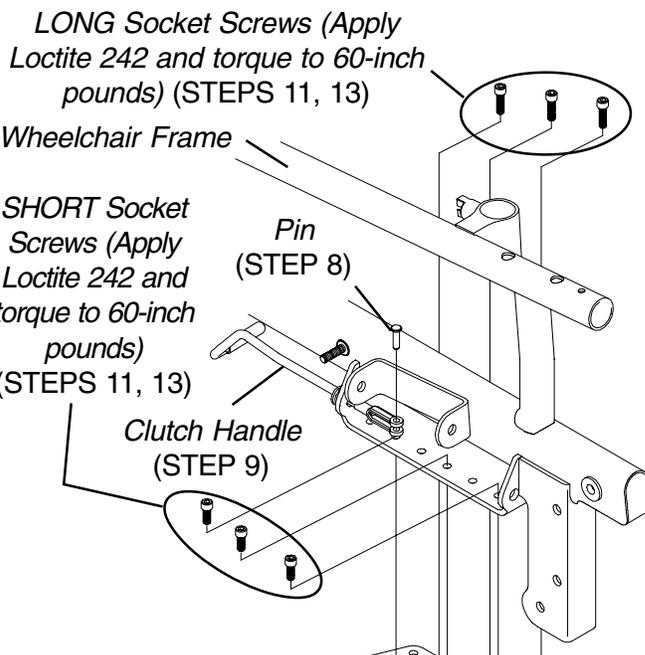
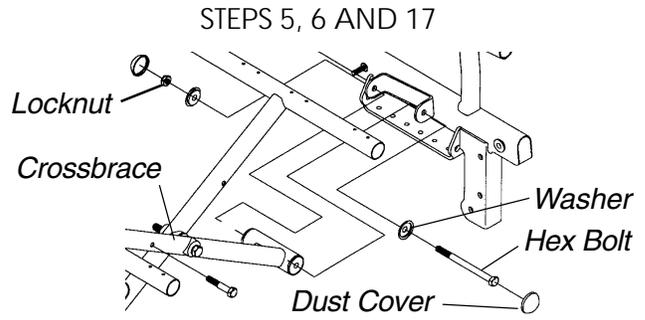
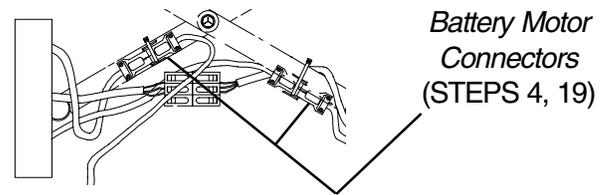
**REPLACING MOTOR/GEARBOX -  
R2<sub>BASIC</sub> AND R2<sub>250 SERIES</sub> (FIGURE 22)**

1. If necessary, remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
3. Cut the tie wrap that secures the motor wire to the battery tray mounting bracket.
4. Disconnect the right and/or left motor connector from the controller.
5. Remove the drive wheels from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 9 of this manual.
6. Remove the dust covers, hex bolt, washers and locknut that secure the bottom of the crossbrace to the wheelchair frame
7. Remove the bottom of the crossbrace from the mounting bracket on the wheelchair frame.
8. Remove the pin that secures the clutch handle to the existing motor/gearbox.
9. Disconnect clutch handle from existing motor/gearbox.
10. Note mounting position of motor/gearbox on the wheelchair frame for installation of the new motor/gearbox.
11. Remove the six (6) socket screws that secure the existing motor/gearbox and battery tray mounting bracket to the wheelchair frame.
12. Position the new motor/gearbox and existing battery tray mounting bracket on the wheelchair frame at the position noted in STEP 10 as shown in FIGURE 22.

**CAUTION**

The longer socket screws must be positioned in the mounting holes on the **OUTSIDE** of the wheelchair frame and the short socket screws must be in the mounting holes on the **INSIDE** of the wheelchair frame. Otherwise damage to the gearbox may result.

13. Use Loctite 242 and tighten the battery tray mounting bracket and motor/gearbox to the wheelchair frame securely with the six (6) socket screws. Torque to 60-inch pounds.
14. Connect the clutch handle to the new motor/gearbox and line up the mounting holes.
15. Insert the pin through clutch handle and new motor/gearbox as shown in DETAIL "B" in FIGURE 22.



**FIGURE 22 - REPLACING MOTOR/GEARBOX - RANGER II MWD BASIC**

**MWD WHEELCHAIRS**

*NOTE: Make sure the detent ball on the pin is fully visible.*

16. Repeat STEPS 3-15 for the opposite side of the wheelchair, if necessary.
17. Reinstall the drive wheels onto the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 9 of this manual.
18. Reinstall the hex bolt, washers, locknuts and covers that secure the bottom of the crossbrace to the wheelchair frame.
19. Reconnect the right and/or left motor connector to the controller.
20. Secure motor wire to the battery tray mounting bracket with a new tie wrap.
21. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
22. If necessary, install the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.

**REPLACING MOTOR/GEARBOX -  
R2 STANDARD (FIGURE 23)**

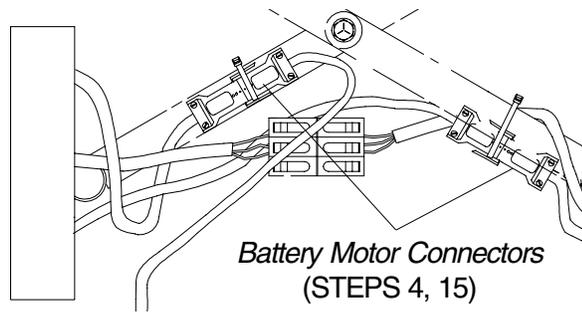
1. If necessary, remove the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.
2. Remove the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
3. Cut the tie wrap that secures the motor wire to the battery tray mounting bracket.
4. Disconnect the right and/or left motor connector from the controller.
5. Remove the dust covers, hex bolt, washers and locknut that secure the bottom of the crossbrace to the wheelchair frame
6. Remove the bottom of the crossbrace from the mounting bracket on the wheelchair frame.
7. Remove the drive wheels from the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 9 of this manual.
8. Note the mounting position of motor/gearbox on wheelchair frame for installation of new motor/gearbox.
9. Remove the six (6) socket screws that secure the existing motor/gearbox and battery tray mounting bracket to the wheelchair frame.

10. Position the new motor/gearbox and existing battery tray mounting bracket on the wheelchair frame at the position noted in STEP 8 as shown in FIGURE 19.

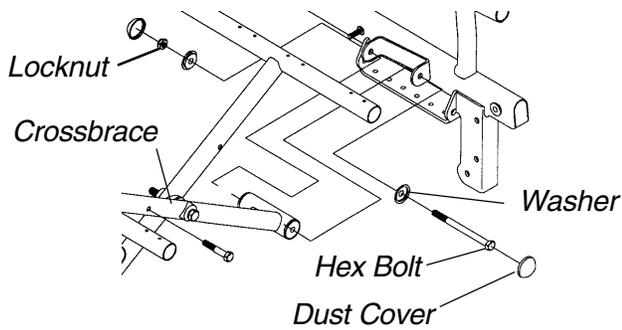
**CAUTION**

The longer socket screws must be positioned in the mounting holes on the **OUTSIDE** of the wheelchair frame and the short socket screws must be in the mounting holes on the **INSIDE** of the wheelchair frame. Otherwise damage to the gearbox casting may result.

11. Use Loctite 242 and tighten battery tray mounting bracket and motor/gearbox to the wheelchair frame securely with the six (6) socket screws. Torque to 60-inch pounds.
12. Repeat STEPS 3-11 for the opposite side of the wheelchair, if necessary.
13. Reinstall the drive wheels onto the wheelchair. Refer to REMOVING/INSTALLING DRIVE WHEELS in PROCEDURE 9 of this manual.
14. Reinstall the hex bolt, washers, locknuts and dust covers that secure the bottom of the crossbrace to the wheelchair frame.
15. Reconnect the right and/or left motor connector to the controller.
16. Secure the motor wire to the battery tray mounting bracket with a new tie wrap.
17. Reinstall the battery boxes. Refer to INSTALLING/REMOVING BATTERY BOXES in this procedure of the manual.
18. If necessary, install the shrouds. Refer to REMOVING/INSTALLING SHROUDS in PROCEDURE 10 of this manual.



STEPS 5, 6 AND 14



LONG Socket Screws  
(Apply Loctite 242 and  
torque to 60-inch pounds)  
(STEPS 9, 11)

SHORT Socket Screws  
(Apply Loctite 242 and  
torque to 60-inch  
pounds) (STEPS 9, 11)

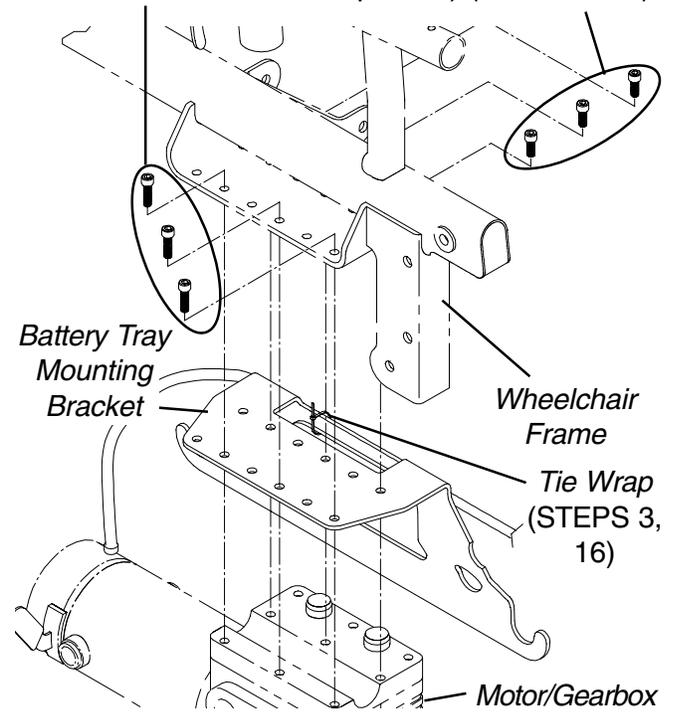


FIGURE 23 - REPLACING MOTOR/GEARBOX - RANGER II MWD STANDARD



## 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.

With regards to the original purchaser/user only, Invacare warrants the side frames and crossbraces to be free from defects in materials and workmanship for a period of five (5) years from date of purchase; electronics for a period of one (1) year from the date of purchase; motors and gearboxes for a period of eighteen (18) months for Ranger II models with motors that have motor locks and a period of twelve (12) months for Ranger II models with motors that have clutches from the date of purchase; all remaining components (including gas cylinders for recliners) for one (1) year from the date of purchase except upholstered materials, padded materials and tires/wheels. If within such warranty period any 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 on 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 SUBJECT 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. A CHANGE IN OPERATING NOISE, PARTICULARLY RELATIVE TO MOTORS AND GEARBOXES DOES NOT CONSTITUTE A FAILURE. ALL SUCH DEVICES WILL EXHIBIT A CHANGE IN OPERATING NOISE DUE TO AGING.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES. IMPLIED WARRANTIES, IF ANY, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL NOT EXTEND BEYOND THE DURATION OF THE EXPRESSED WARRANTY PROVIDED HEREIN AND THE REMEDY FOR VIOLATIONS OF ANY IMPLIED WARRANTY SHALL BE LIMITED TO REPAIR OR REPLACEMENT OF THE DEFECTIVE PRODUCT PURSUANT TO THE TERMS CONTAINED 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.



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