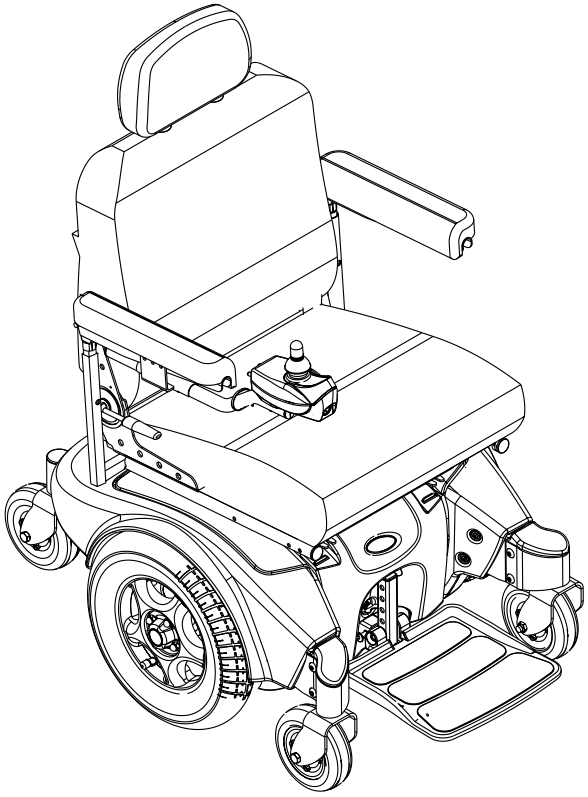
Service Manual

Pronto® M91™ and M94™ with SureStep™



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

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

INVACARE®

Yes, you can.™

⚠ WARNING

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

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

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

IF WHEELCHAIR IS EQUIPPED WITH POWER TILT ONLY OR THE FORMULA PTO PLUS SEATING SYSTEM, REFER TO POWER TILT ONLY FOR PRONTO M71 AND M91 OWNER'S MANUAL, PART NUMBER 1118362 OR TO FORMULA PTO PLUS POWERED SEATING SERVICE MANUAL, PART NUMBER 1125031 PERFORM THE FOLLOWING PROCEDURES:

- **ADJUSTING SEAT HEIGHT**
- **ADJUSTING SEAT POSITION**
- **CHARGING THE BATTERIES**

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

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

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 RESTRAINTS

Wheelchair users should 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.

⚠ WARNING

The drive behavior initially experienced by the user may be different from other chairs previously used. This Power Wheelchair has Invacare's SureStep technology, a feature that provides the chair with optimum traction and stability when driving forward over transitions and thresholds of up to 3-inches. The following warnings apply specifically to the SureStep Feature.

- **Do not use on inclines greater than 9°.**
- **Do not use on inclines with wet, slippery, icy or oily surfaces. This may include certain painted or otherwise treated wood surfaces.**
- **Do not traverse down ramps at high speed. Doing so will reduce traction and increase stopping distance.**
- **The end user's weight can materially affect traction on sloped surfaces. Great care should be taken when traversing such slopes.**

To determine and establish your particular safety limits, practice use of this product on various sloping surfaces in the presence of a qualified healthcare provider BEFORE attempting active use of this wheelchair. Other general warnings listed within this document also apply.

⚠ WARNING

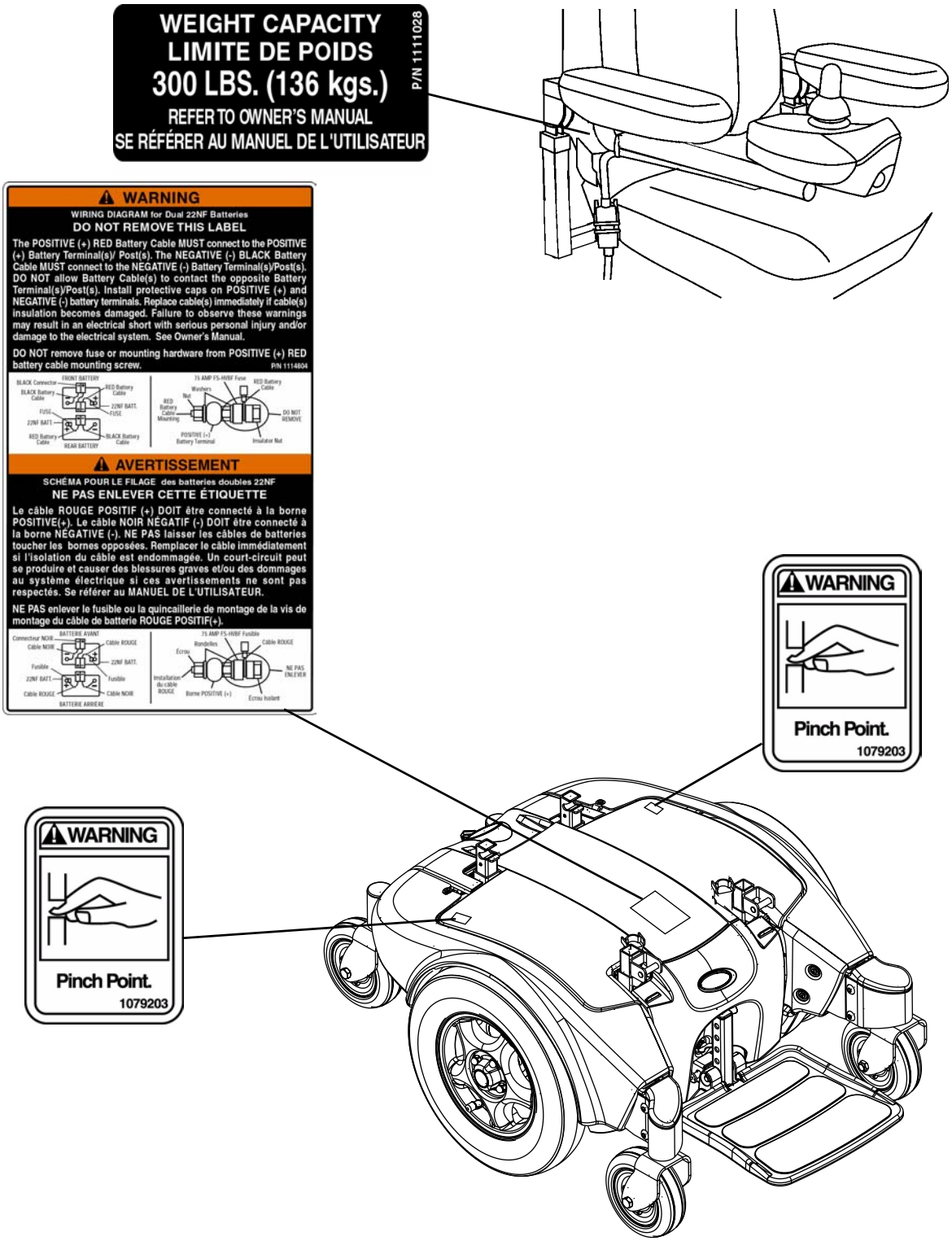
The seat positioning strap is a positioning belt ONLY. It is not designed for use as a safety device withstanding high stress loads such as auto or aircraft safety belts. If signs of wear appear, belt MUST be replaced immediately.

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

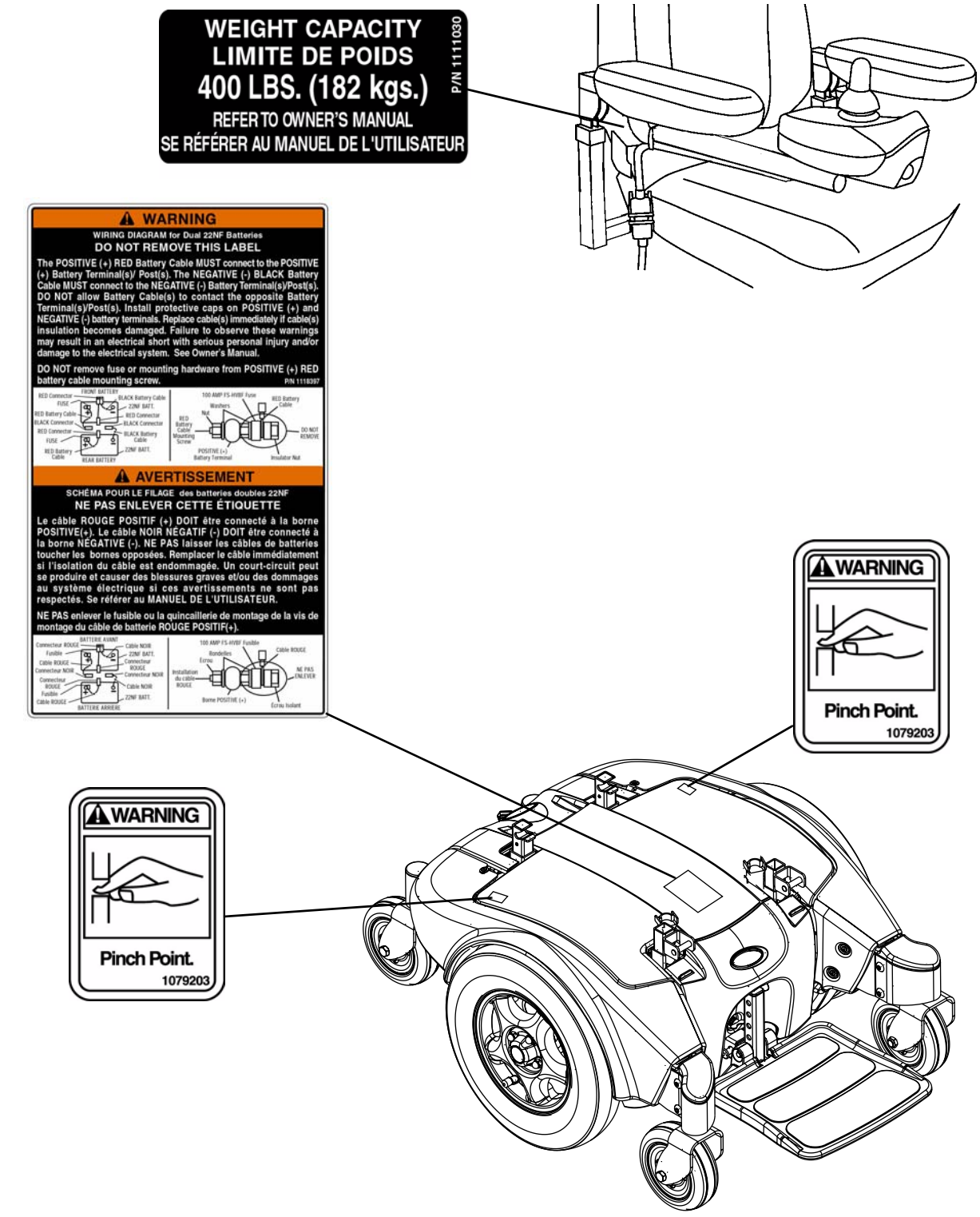
POWERED SEATING SYSTEMS ONLY - This seating system has been custom designed and will be assembled to the wheelchair base before delivery to the user. The information contained in this manual is for maintaining and adjusting the seating system. There are very few adjustments that can safely be made by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

LABEL LOCATIONS

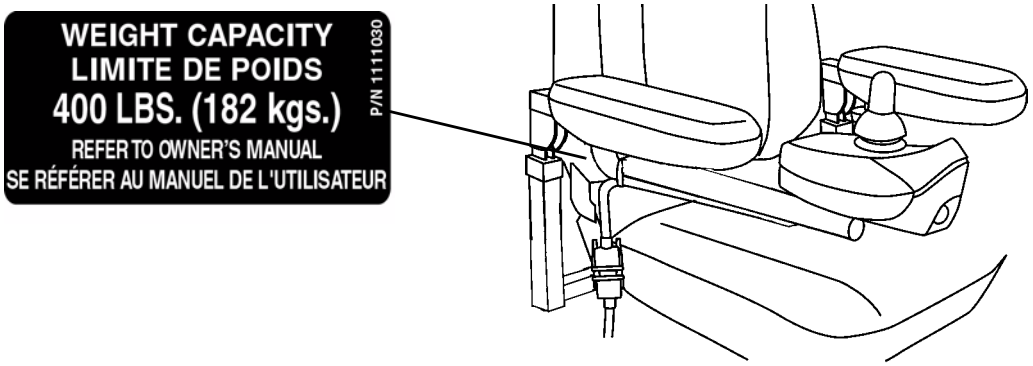
M91 Standard

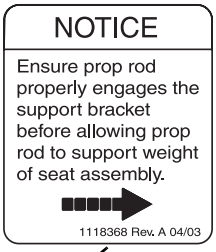


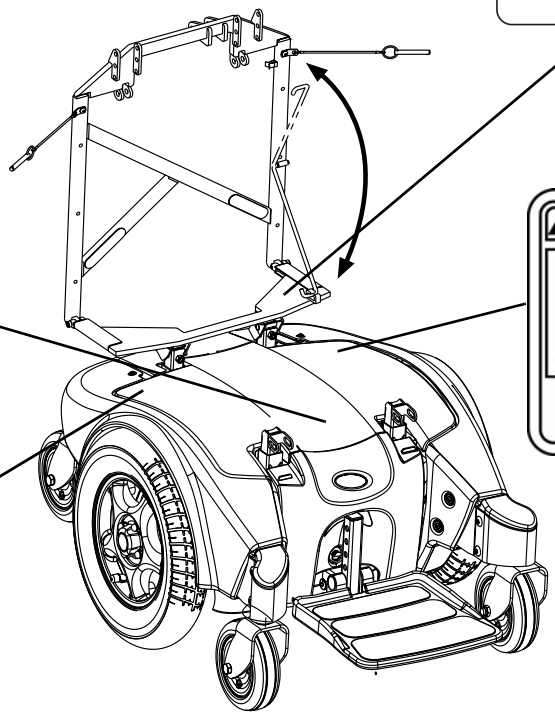
M91 Heavy Duty



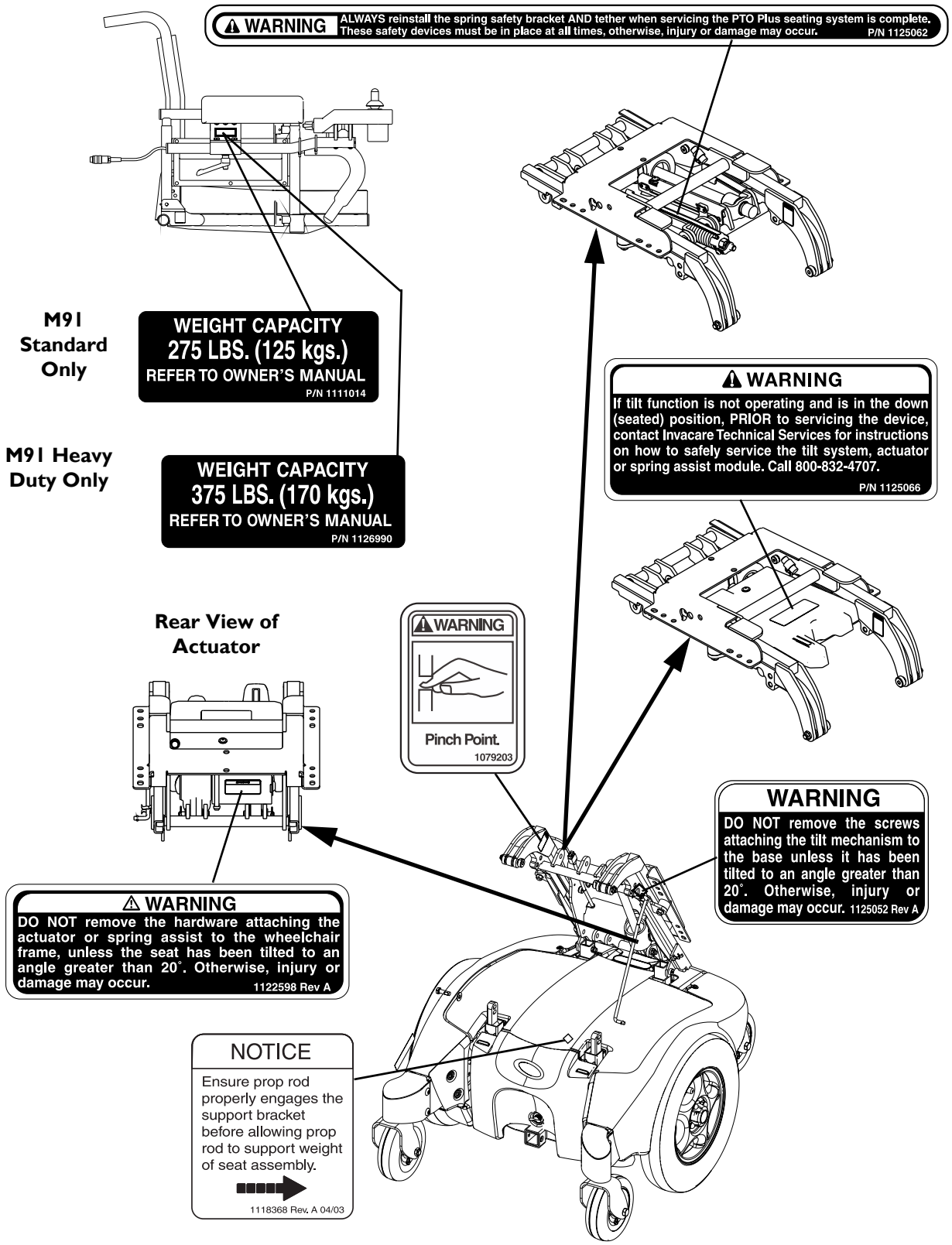
M91 with Power Tilt Only



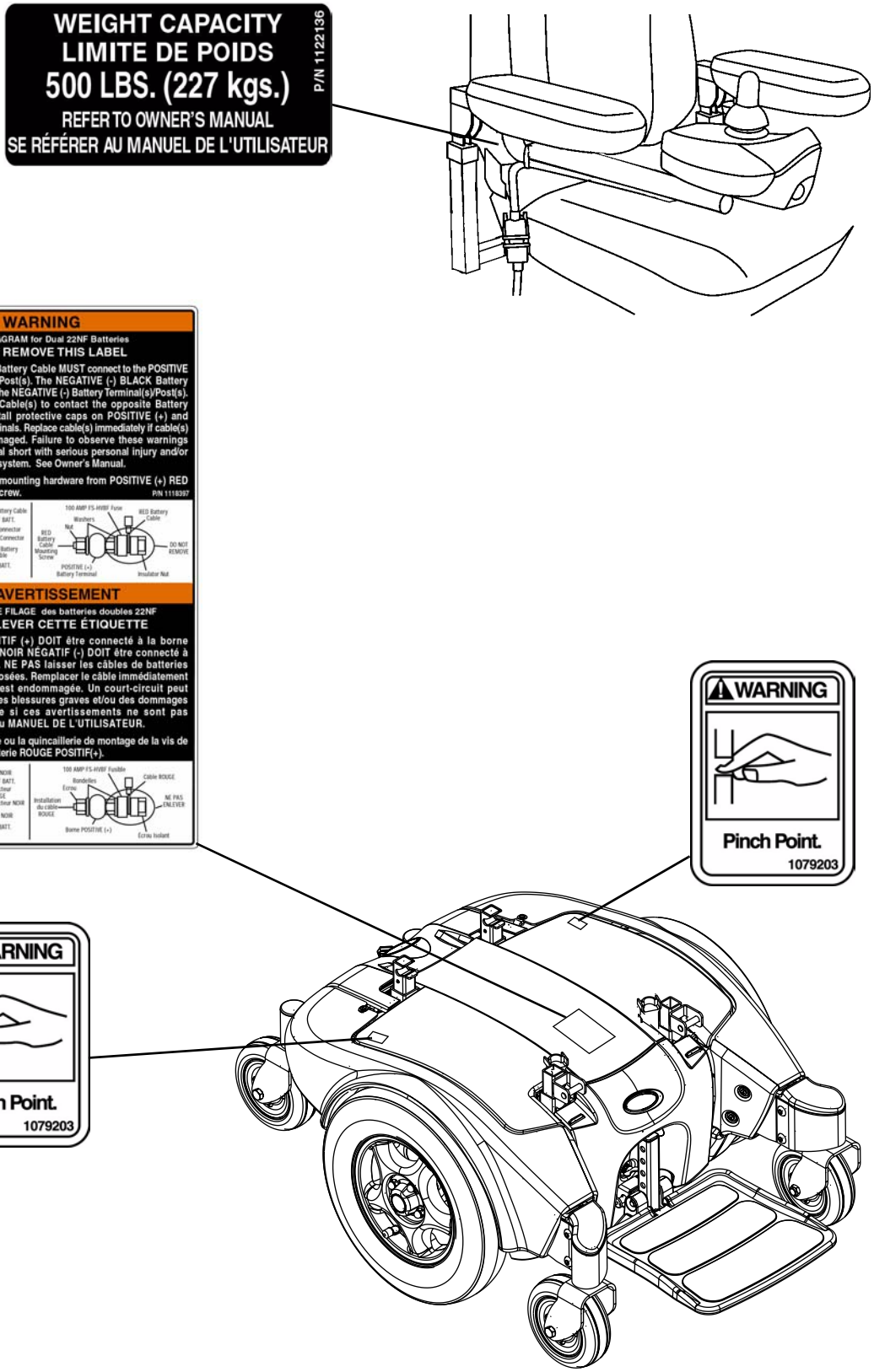




M91 with Formula™ PTO Plus Seating System



M94 Standard



TYPICAL PRODUCT PARAMETERS

Pronto M91

	18-INCH VAN SEAT	20-INCH VAN SEAT	22-INCH VAN SEAT	ASBA SEAT
SEAT WIDTH RANGE:	18 inches	20 inches	22 inches	16-24 inches
SEAT DEPTH:	16 -18 inches	18-20 inches	20-22 inches	16-20 inches
BACK HEIGHT W/O HEADREST SEMI RECLINE:	18 inches	18 inches	18 inches	16-20 inches
BACK ANGLE RANGE SEMI RECLINE:	35° to 115°	35° to 115°	35° to 115°	Standard - 80° to 100°
UPHOLSTERY:	Grey Vinyl, Grey Cloth, Tan Vinyl			Black Nylon Back
SEAT-TO-FLOOR:	22½ to 23½ inches (Cushion Not Compressed)			20-22 inches (To Seat Pan)
OVERALL WIDTH (NO JOYSTICK):	25-7/8 inches			
OVERALL HEIGHT:	36-49¼ inches (Semi Recline Back) 39-52¼ inches (Full Recline Back)			
OVERALL LENGTH:	39 inches (With Footboard Folded) 40¾ inches (With Footboard Extended)			
DRIVE WHEELS/TIRES:	14 x 3-inch (Pneumatic; Flat Free tires ONLY on wheelchairs with Heavy Duty option)			
CASTERS:	6 x 2-inch Front/Rear with Precision Sealed Bearings			
FOOTRESTS/LEGRESTS:	Flip Up, Depth and Height Adjustable, Footboard, Swingaway Front Rigging, Elevating Legrest			
WEIGHT W/SEATING SYSTEM AND ACCESSORIES W/O BATTERIES: W/BATTERIES:	 199 lbs 273 lbs			
SHIPPING:	260 lbs (w/o Batteries), 310 lbs (w/Batteries)			
ARMRESTS:	Adjustable Angle, Depth and Width			
BATTERIES:	22NF - Quantity 2			
INCLINE CAPABILITY:	9°			
PERFORMANCE SPEED Standard: Heavy Duty: TURNING RADIUS: *RANGE (VARIABLE) Standard: Heavy Duty: WEIGHT LIMITATION Standard: Heavy Duty:	 0 to 6.4 mph 0 to 4.25 mph 19½ inches (Front with Footboard); 21½ inches (Rear) 22 miles 12-16 miles 300 lbs 400 lbs			

NOTE: Based on 18-inch deep Van seat.

**NOTE: Range varies with battery conditions, surface terrain and operator's weight.*

TYPICAL PRODUCT PARAMETERS

Pronto M91 with Power Tilt Only

SEAT WIDTH RANGE:	16 - 22 inches
SEAT DEPTH RANGE (1-INCH INCREMENTS):	16 - 22 inches
BACK HEIGHT RANGE:	16 - 24 inches
BACK ANGLE RANGE (ASBA):	90° to 120° in 6¼° increments
***SEAT-TO-FLOOR HEIGHT (ADJUSTABLE):**	20 - 21 inches ± ½ inch increments
OVERALL WIDTH WITHOUT JOYSTICK: WITH JOYSTICK AND TRSS:	 26 inches 27 inches
OVERALL HEIGHT:	37 - 45 inches
OVERALL LENGTH WITH FRONT RIGGINGS:	44 inches
TILT RANGE 0° SEAT PAN ANGLE: 5° SEAT PAN ANGLE:	 0 - 45° 5 - 50°
TURNING RADIUS WITH FRONT RIGGINGS:	27½ inches
SEAT CUSHION:	Cushion (Optional)
WEIGHT OF FORMULA PTO PLUS:	25 lbs
ARMRESTS:	Adjustable Angle, Height and Depth
WEIGHT LIMITATION OF M91 WITH FORMULA PTO PLUS M91 STANDARD:	 Up to 250 lbs

**NOTE: The seat-to-floor heights are based on 18-inch deep seat with 0° (±1°) seat pan angle and pneumatic tires or flat free inserts. Seat-to-floor height measured from the front edge of seat to floor. All heights are measured with properly inflated new tires. These heights can vary ±¼-inch due to tire wear.*

⚠ WARNING

If the seating system is mounted onto a power wheelchair that has a weight limitation greater than that of the seating system, the weight limitation is maintained at the seating system's weight limitation. (Example: The M91 Standard wheelchair has a 300 lb weight limitation, so the seating system still has a weight limitation of 275 lbs).

TYPICAL PRODUCT PARAMETERS

Formula PTO Plus

SEAT WIDTH RANGE:	16 - 22 inches
SEAT DEPTH RANGE (1-INCH INCREMENTS):	16 - 22 inches
BACK HEIGHT RANGE:	16 - 24 inches
BACK ANGLE RANGE (ASBA):	80° to 100° in 5° increments
***SEAT-TO-FLOOR HEIGHT (ADJUSTABLE):**	18 - 20 inches ± ½ inch increments
OVERALL WIDTH WITHOUT JOYSTICK: WITH JOYSTICK AND TRSS:	 26 inches 27 inches
OVERALL HEIGHT:	37 - 45 inches
OVERALL LENGTH WITH FRONT RIGGINGS:	44 inches
TILT RANGE 0° SEAT PAN ANGLE: 5° SEAT PAN ANGLE:	 0 - 55° 5 - 60°
TURNING RADIUS WITH FRONT RIGGINGS:	27½ inches
SEAT CUSHION:	Cushion (Optional)
WEIGHT OF FORMULA PTO PLUS:	25 lbs
ARMRESTS:	Adjustable Angle, Height and Depth
WEIGHT LIMITATION OF M91 WITH FORMULA PTO PLUS M91 STANDARD: M91 HEAVY DUTY OPTION:	 Up to 275 lbs Up to 375 lbs

**NOTE: The seat-to-floor heights are based on 18-inch deep seat with 0° (±1°) seat pan angle and pneumatic tires or flat free inserts. Seat-to-floor height measured from the front edge of seat to floor. All heights are measured with properly inflated new tires. These heights can vary ±¼-inch due to tire wear.*

⚠ WARNING

If the seating system is mounted onto a power wheelchair that has a weight limitation greater than that of the seating system, the weight limitation is maintained at the seating system's weight limitation. (Example: The M91 Standard wheelchair has a 300 lb weight limitation, so the seating system still has a weight limitation of 275 lbs).

TYPICAL PRODUCT PARAMETERS

Pronto M94

	18-INCH VAN SEAT	20-INCH VAN SEAT	22-INCH VAN SEAT	24-INCH VAN SEAT	ASBA SEAT
SEAT WIDTH RANGE:	18 inches	20 inches	22 inches	24 inches	18-24 inches
SEAT DEPTH:	16 -18 inches	18-20 inches	20-22 inches	20-22 inches	16-22 inches
BACK HEIGHT W/O HEADREST: SEMI RECLINE:	18 inches	18 inches	18 inches	18 inches	16-20 inches
BACK ANGLE RANGE: SEMI RECLINE:	35° to 115°	35° to 115°	35° to 115°	35° to 115°	Standard - 80° to 100°
UPHOLSTERY: WITH SEAT PAN:	Grey Vinyl				Black Nylon Back
SEAT-TO-FLOOR:	21-24 inches (Cushion Not Compressed)				19-22 inches (To Seat Pan)
OVERALL WIDTH (NO JOYSTICK):	27-29 inches				
OVERALL HEIGHT:	31 inches (Folded) 54 inches (Upright)				
OVERALL LENGTH:	35 inches (With Footboard Folded) 43 inches (With Footboard Extended)				
DRIVE WHEELS/TIRES:	14 x 3-inch (Flat Free)				
CASTER W/PRECISION SEALED BEARINGS:	6 x 2-inch Front/Rear				
FOOTRESTS/ LEGRESTS:	Flip Up, Depth and Height Adjustable, Footboard, Swingaway Front Rigging, Elevating Legrest				
WEIGHT W/ SEATING SYSTEN AND ACCESSORIES: W/O BATTERIES: W/BATTERIES:	216 lbs 290 lbs				
SHIPPING:	260 lbs (w/o Batteries), 310 lbs (w/Batteries)				
ARMRESTS:	Adjustable Angle, Height and Width, Desk and Full Length				
BATTERIES:	22NF - Quantity 2				
PERFORMANCE: SPEED: TURNING RADIUS: RANGE (VARIABLE)*: WEIGHT LIMITATION:	0 to 4.5 MPH 19½ inches 10-15 miles 500 lbs				

NOTE: Based on 24-inch wide Van seat.

**NOTE: Range varies with battery conditions, surface terrain and operator's weight.*

SECTION 1—GENERAL GUIDELINES

⚠ WARNING

SECTION 1 - GENERAL GUIDELINES contains important information for the safe operation and use of this product. DO NOT use this product or any available optional equipment without first completely reading and understanding these instructions and any additional instructional material such as Owner's Manuals, Service Manuals or Instruction Sheets supplied with this product or optional equipment. If you are unable to understand the Warnings, Cautions or Instructions, contact a healthcare professional, dealer or technical personnel before attempting to use this equipment - otherwise, injury or damage may occur.

Repair or Service Information

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

Operation Information

Ensure that driving surfaces, ramps, lifts, elevators, ect. are capable of supporting combined weight of user and wheelchair (for 500lbs user, the combined weight could be up to 800 lbs).

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

After the wheelchair has been set-up, check to make sure that the wheelchair performs to the specifications entered during the set-up procedure. If the wheelchair does NOT perform to specifications, turn the wheelchair OFF immediately and reenter set-up specifications. Repeat this section until the wheelchair performs to specifications.

DO NOT adjust the rear seat posts higher than the front seat posts.

Avoid storage or use near external flame or combustible product.

The arms on the M94 wheelchair are designed as armrests ONLY. The arms are not designed to support the full weight of the wheelchair user.

Tire Pressure

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

Electrical

Grounding Instructions

DO NOT, under any circumstances, cut or remove the round grounding prong from any plug used with or for Invacare products. Some devices are equipped with three-prong (grounding) plugs for protection against possible shock hazards and fire. 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.

Three (3) prong to two (2) prong adapters should not be used. Use of three (3) prong adapters can result in improper grounding and present a shock hazard to the user.

Batteries

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

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

SECTION 2—EMI INFORMATION

⚠ WARNING

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

Electromagnetic Interference (EMI) From Radio Wave Sources

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

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

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

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

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

2) **Medium-range mobile transceivers, such as those used in police cars, fire trucks, ambulances and taxis. These usually have the antenna mounted on the outside of the vehicle; and**

3) **Long-range transmitters and transceivers, such as commercial broadcast transmitters (radio and TV broadcast antenna towers) and amateur (HAM) radios.**

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

⚠ WARNING

Powered Wheelchair Electromagnetic Interference (EMI)

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

Electromagnetic interference (EMI) from sources such as radio and TV stations, amateur radio (HAM) transmitters, two-way radios, and cellular phones can affect powered wheelchairs and motorized scooters.

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

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

Important Information

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

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

SECTION 3—SAFETY INSPECTION/ TROUBLESHOOTING

Safety Inspection Checklists

These adjustments should be made whenever this product is serviced, especially as part of the initial unit setup. Follow these procedures:

Inspect/Adjust

△ CAUTION

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

- ❑ Ensure wheelchair rolls straight (no excessive drag or pull to one side).
- ❑ Ensure all fasteners on clothing guards are secure.
- ❑ Ensure arms are secure but easy to release and adjustment levers engage properly.
- ❑ Ensure adjustable height arms operate and lock securely.
- ❑ Ensure armrest pad sits flush against arm tube.
- ❑ Ensure seat and/or back upholstery have no rips.
- ❑ Inspect seat positioning strap for any signs of wear. Ensure buckle latches. Verify hardware that attaches strap to frame is secure and undamaged. Replace if necessary.
- ❑ Ensure axle nut and wheel mounting nuts are secure on drive wheels.
- ❑ Inspect wheel/fork assembly has proper tension when caster is spun. Caster should come to a gradual stop.
- ❑ Loosen/tighten caster locknut if wheel wobbles noticeably or binds to a stop.
- ❑ Ensure all caster/wheel/fork/headtube fasteners are secure.
- ❑ Inspect tires for flat spots and wear.
- ❑ Check pneumatic tires for proper inflation.
- ❑ Clean upholstery and armrests.
- ❑ Inspect motor brushes and gearbox coupling.

Troubleshooting

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

Wheels

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

Troubleshooting - Common

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
E28 Error code.	Charger still plugged in when user tries to drive the wheelchair.	Unplug charger to drive wheelchair.
	Manual recliner, Power tilt and/or recline is in reclined position and drive lockout is engaged	To disengage drive lockout, return seat to upright position.
No LED's on DPJ™ /SPJ™ Joystick	Batteries discharged. Fuse Open Loose Battery Terminal	Plug connections back together, and check for damaged wiring.

Troubleshooting - Motor/Gearbox/Brake

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Motor makes a clicking noise.	Bad coupler between motor and gearbox or bad bearings.	Replace coupler. If bearings are bad, replace motor.
	Raised commutator plate inside of motor.	Ohm out motor and replace motor if high reading is present. Normal reading is 0.2-5 Ohms.
Grinding noise or motor is locking up.	Bad gearbox. Bad coupler between motor and gearbox or bad bearings. Bad gears.	Replace gearbox. Replace coupler. If bearings are bad, replace motor.
Motors stall and start up again.	Current rollback.	Stop driving and let electronics cool.
Wheelchair will not drive with power on (E09 or E10).	Check motor locks.	Engage motor locks to drive wheelchair.
Motor chatters or runs erratically, or only one motor turns.	Damaged connector or worn brushes. Bad motor or gear box.	Ohm out motors. Check brushes and replace brushes if necessary. Replace motor if high reading is present. Normal reading is 0-5 Ohms.
	Controller malfunction.	Check for error codes with programmer. Refer to electronics manual, part number 1114808.
Wheelchair veers to the left or right when driving on level surface.	Uneven tire pressure. Motors out of balance.	Inflate tires. Replace tires if worn. Use programmer to balance motors.
E09/E10 error code will not go away.	Bad motor connection. Bad brake coil.	Check all connections. Ohm out each brake coil. Normal reading is 45-50 Ohms.
Gearbox is leaking fluid.	Bad seal around drive shaft. Loose hardware.	If seal is bad, replace gearbox. Remove motor brushes and inspect for grease contamination. Replace motor if contamination is found. If loose hardware is found retighten hardware.
Excessive clicking coming from motor/gearbox.	Bad bearing in motor or gearbox.	Replace motor or gearbox.
	Loose wheel hardware.	Tighten hardware, (use removable Loctite™ on hardware). Follow torque settings in this manual.
Gearbox shaft movement or bent shaft.	Rough driving.	Replace gearbox.
Motor stutters.	Poor connection or worn brushes.	Check Anderson connectors. Check brushes and replace if necessary.
Motor fails to start after initial installation.	Battery voltage is too low. Bad connection. Brake disengaged.	Check batteries and recharge if necessary. Check connector Engage brake

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Motor is running then fails to restart when stopped.	Heavy load on the motors forcing controller into the current rollback mode.	Leave power ON and allow controller to count down, and recharge the wheelchair overnight with power ON.
	Blown fuse in battery wiring harness.	Replace battery wiring harness.
	Damaged Motor	Replace brushes if necessary, or replace motor if internal damage is determined.
		Ohm out motor to check for possible internal damage (worn out brushes may be possible).
	Controller power stage board or relays may be damaged.	Replace controller or send to Invacare for repair.
Motor runs but loses power.	Controller senses heavy load and has entered the current rollback mode.	Stop driving and let electronics cool. Leave power ON and allow controller to count down, and recharge the wheelchair overnight with power ON.
Wheelchair loses all power while driving.	Bad connection on wheelchair.	Turn power "OFF", wait 10 seconds and turn power back "ON". Check joystick connection. Check battery connection and fuses.

Troubleshooting - Battery

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

Troubleshooting - Battery Charger

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
No LED's on Charger	Charger not plugged into outlet, or disconnected from wiring harness on wheelchair.	Make sure the charger is plugged into the outlet and check the wiring on the wheelchair.
	No AC power at outlet.	Check for AC power with digital volt meter.
	Damaged power cord.	Check for damage on the power cord, replace if damaged or send in for repair.
	Charger LED's burnt out.	Send charger to Invacare for repair.
	Charger may have internal fuse that is blown.	Remove charger cover and check for fuses. if fuses are present Ohm out fuses and replace if necessary.
Batteries won't charge.	Blown battery fuse in wiring harness, or charger.	Check battery wiring harness fuse on the wheelchair Check fuse in the charger.
	Charger not plugged into outlet.	Make sure charger is plugged into the outlet.
	No AC power at the outlet.	Check for AC power with a digital volt meter.
	Charger power cord may be damaged, or the connector may be damaged.	Check for damage and replace if necessary, or send in for repair.
	Charger may have internal damage.	Charge batteries with known good charger.
	Battery voltage too low for charger to start charging cycle.	Replace batteries.
Batteries have short driving range during a single charge. Battery Gauge falls off faster than normal.	Consumer not charging batteries long enough.	Instruct consumer to charge for 8-10 hours minimum.
	Batteries may be weak.	Perform load test or check "Battery Quality Menu" with the programmer. Refer to MK5 electronics manual, part number 1114808.
	Check programming settings.	Torque setting and power level setting may be too high. Refer to MK5 electronics manual, part number 1114808.
	Heavy load on motors.	Chairs weight distribution may be offset (wheelchair may be front loaded).
E28 Error code.	Charger still plugged in when user tries to drive the wheelchair.	Unplug charger to drive wheelchair.

Checking Battery Charge Level

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

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

Field Load Test

NOTE: For this procedure, refer to FIGURE 3.1

NOTE: The following test can also be performed through the controller of the wheelchair along with a remote programmer. Refer to the electronics 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 (2.5 for a pair), replace the batteries.

To spot this problem, test batteries under load.

Use a digital voltmeter to check battery charge level at the charger connector. It is located on the joystick.

NOTE: READ these instructions CAREFULLY and the manufacturer's instructions on the digital voltmeter before using the digital voltmeter.

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

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

⚠ WARNING

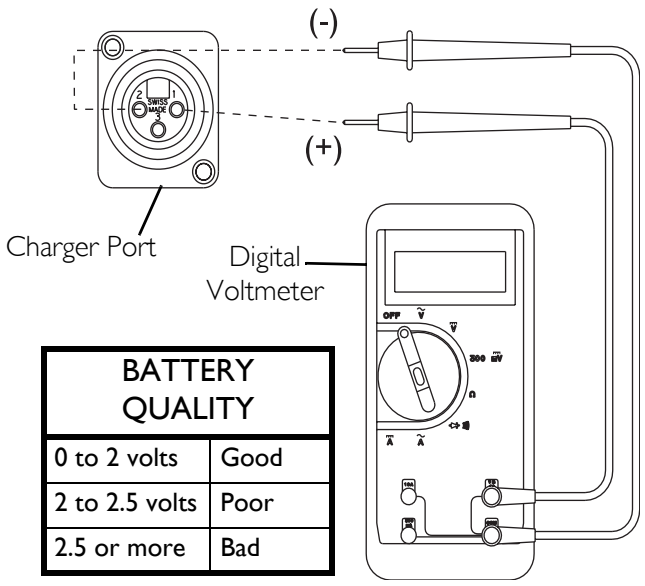
When performing STEPS 5 and 6 ensure feet are clear from casters and wall otherwise injury may result

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

NOTE: This puts a heavy load on the batteries as they try to push through the stationary object. If the wheels spin, have two (2) individuals (one [1] on each arm) apply as much downward pressure as possible on the arms of the wheelchair.

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

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



BATTERY QUALITY	
0 to 2 volts	Good
2 to 2.5 volts	Poor
2.5 or more	Bad

FIGURE 3.1 Field Load Test

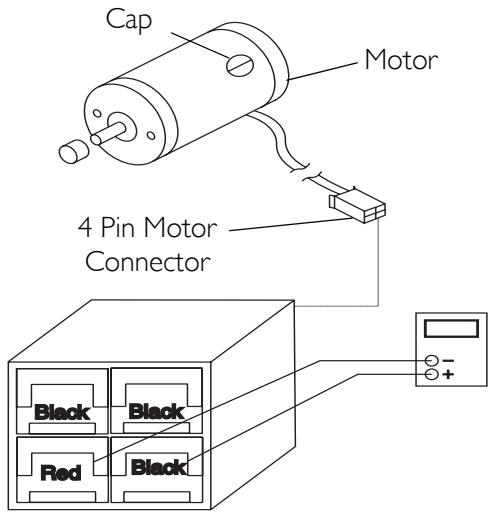
Motor Testing

NOTE: For this procedure, refer to FIGURE 3.2.

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

NOTE: A normal reading is between 0.2 and 5 ohms. A reading of 0 ohms or in excess of 15 ohms indicates a problem. High readings are generally caused by bad connections and/or damaged brushes. Contact Invacare.

MKIV For-pin Motor Commector



MK5 For-pin Motor Commector

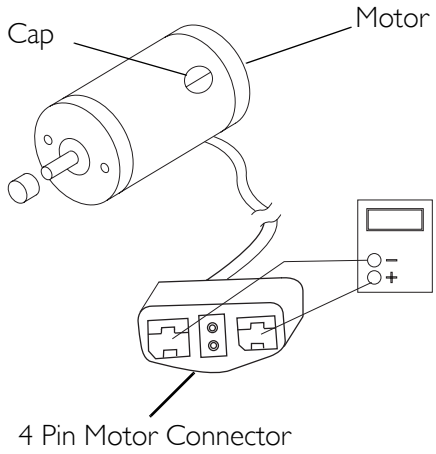


FIGURE 3.2 Motor Testing

SECTION 4—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.

Before performing any maintenance, adjustment or service verify that ON/OFF switch on the joystick is in the OFF position.

Removing/Installing or Tilting the Seat Assembly

Removing/Installing the Seat Assembly without Powered Seating Systems

NOTE: For this procedure, refer to FIGURE 4.1.

Removing

1. Disconnect the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
2. M91 with Full Recline Back and Drive Lockout Switch ONLY - Perform the following to disconnect the drive lock out switch:
   A. Open rear shroud by turning knob 90° until detent is felt, slide rear shroud towards rear casters and tilt top edge away from wheelchair.
   B. Disconnect the drive lockout switch cable located next to the charger (Detail "A" of FIGURE 4.1).
   C. Close the rear shroud by tilting the top edge towards the wheelchair, sliding the rear shroud towards the knob, and turning knob 90° until detent is felt.
3. Push down on the latch bar underneath front of seat.
4. Tilt front edge of seat up.
5. Slide the seat assembly forward to disengage seat from the pivot brackets located in the rear.

Installing

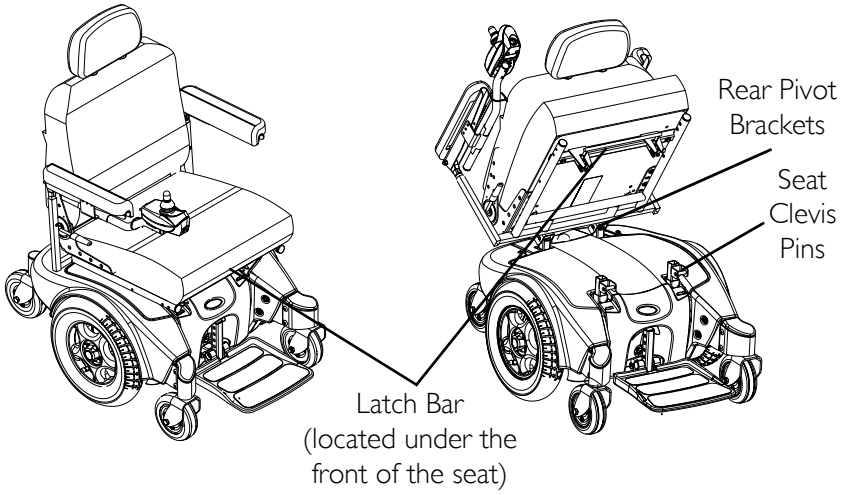
1. Position the seat in the rear pivot brackets as shown in FIGURE 4.1.
2. Tilt front edge of seat down.
3. When seat is lowered, engage seat brackets into seat clevis pins.

⚠ WARNING

When reinstalling the seat verify that the seat brackets are engaged with the seat clevis pins by pulling up on the latch bar.

4. Pull up on latch bar to verify that brackets are engaged with seat clevis pins.
5. M91 with Full Recline Back and Drive Lockout Switch ONLY - Perform the following to connect the drive lockout switch:
   A. Open rear shroud by turning knob 90° until detent is felt, slide rear shroud towards rear casters and tilt top edge away from wheelchair.
   B. Connect the drive lockout switch cable located next to the charger (Detail "A" of FIGURE 4.1).
   C. Close the rear shroud by tilting the top edge towards the wheelchair, sliding the rear shroud towards the knob, and turning knob 90° until detent is felt.
6. Connect the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.

NOTE: Van Seat model shown. ASBA seat removes/installs in the same way.



DETAIL "A"

NOTE: Rear shroud not shown for clarity.

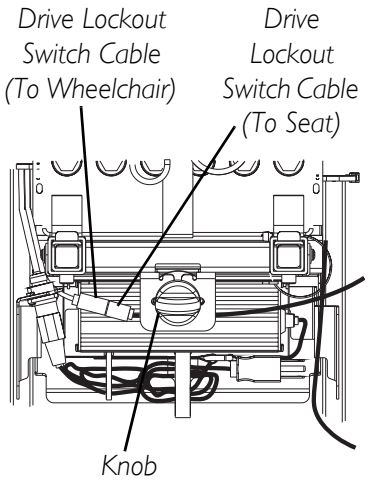


FIGURE 4.1 Removing/Installing or Tilting the Seat Assembly

Tilting the Seat Assembly - Power Tilt Only Seating System

⚠ WARNING

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

NEVER leave the seat assembly in the UP/OPEN position unless necessary to perform a procedure on the wheelchair - otherwise injury or damage may result.

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 this procedure, refer to FIGURE 4.2.

NOTE: Removing the seat is not necessary to access the battery compartment on wheelchairs equipped with a power tilt only seating system. The seat assembly with power tilt only tilts back and is propped in place to provide access to the batteries and underside of the seat.

Tilting the Seat Assembly Back

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position and disconnect joystick cable.
3. Remove front rigging. Refer to owner's manual shipped with wheelchair.
4. Remove the two (2) detent pins securing the power tilt only frame to the front seat posts (FIGURE 4.2).
5. Firmly grasp the front edge of the seat assembly, slowly tilt the seat assembly BACK into the up/open position.
6. Remove prop rod from the clip located on the power tilt only frame and engage the prop rod end in to the support bracket (FIGURE 4.2).
7. Gently allow weight of seat assembly to be supported by the prop rod.

NOTE: Leave the seat assembly in the up/open position only while performing any necessary procedures. Always lower the seat assembly to the down/closed position when not servicing the wheelchair.

Tilting the Seat Assembly Forward

1. Using one hand, firmly grasp the front edge of the seat assembly and lift until seat assembly is no longer supported by the prop rod.
2. Disengage prop rod from the support bracket and secure into clip (FIGURE 4.2).
3. Using both hands, slowly tilt the seat assembly forward into the down/closed position.

⚠ WARNING

Ensure the two (2) detent pins are fully engaged and the power tilt only frame is securely locked in place before use - otherwise injury or damage may result.

4. Insert the two (2) detent pins through both the power tilt only frame and the two (2) front seat posts (FIGURE 4.2).

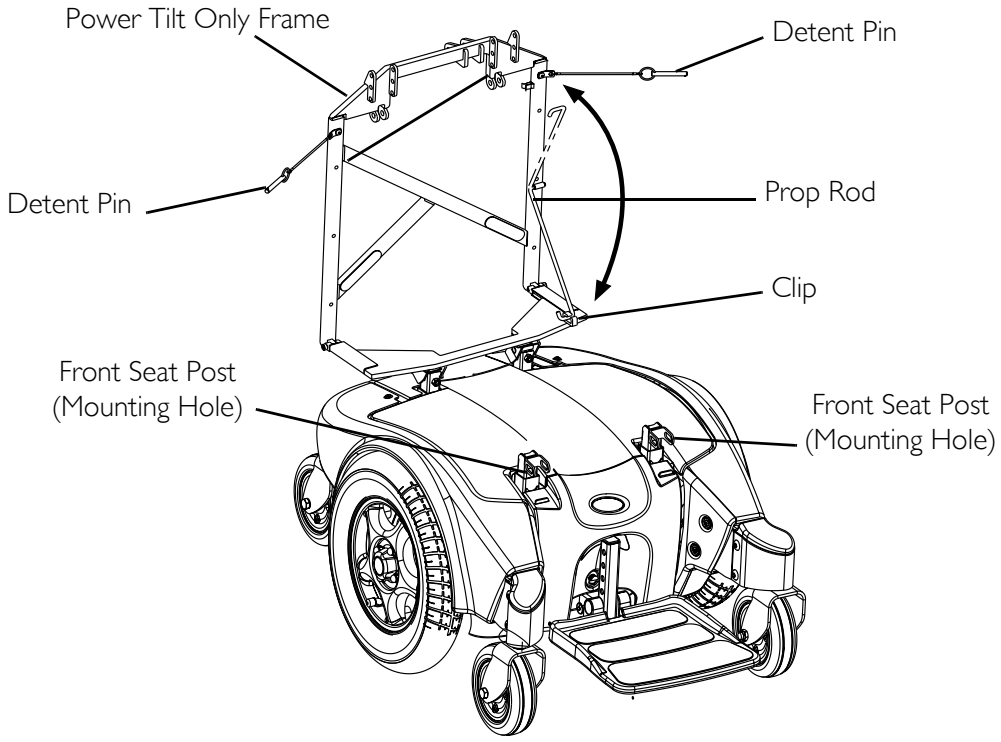


FIGURE 4.2 Tilting the Seat Assembly - Power Tilt Only Seating System

Tilting the Seat Assembly - Formula PTO Plus Seating System Only

⚠ WARNING

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

Never leave the seat assembly in the UP/OPEN position unless necessary to perform a procedure on the wheelchair - otherwise injury or damage may result.

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 this procedure, refer to FIGURE 4.3.

NOTE: This procedure is for M91 wheelchairs with the Formula PTO Plus Seating System ONLY.

NOTE: Removing the seat is not necessary to access the battery compartment on wheelchairs equipped with a Formula PTO Plus seating system. The seat assembly with the Formula PTO Plus seating system tilts back and props into place to provide access to the batteries and the underside of the seat.

Tilting the Seat Assembly Back

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Tilt seat back 20° to 25°. Refer to owner's manual shipped with wheelchair.

3. Verify the joystick ON/OFF switch is in the OFF position and disconnect joystick cable.
4. Engage the motor release levers. Refer to Engaging/Disengaging Motor Release Lever on page 77.
5. Remove front rigging. Refer to Installing/Removing Front Riggings on page 55.
6. Remove the two (2) screws and washers securing the Formula PTO Plus frame to the front seat posts.
7. Firmly grasp the front edge of the seat assembly, slowly tilt the seat assembly back into the UP/OPEN position.
8. Remove prop rod from the clip located on the Formula PTO Plus frame and engage the prop rod end into the front seat post as shown in FIGURE 4.3.
9. Gently allow weight of seat assembly to be supported by the prop rod.

NOTE: Leave the seat assembly in the up/open position only while performing any necessary procedures. Always lower the seat assembly to the down/closed position when not servicing the wheelchair and ensure it is in the locked position before using.

Tilting the Seat Assembly Forward

1. Using one hand, firmly grasp the front edge of the seat assembly and lift until seat assembly is no longer supported by the prop rod.
2. Disengage the prop rod from the front seat post and secure into clip.
3. Using both hands, slowly tilt the seat assembly forward into the down/closed position.

⚠ WARNING

Ensure the two (2) screws are fully engaged and the Formula PTO Plus frame is securely locked in place before use - otherwise injury or damage may result.

4. Insert the two (2) screws through the washers, the Formula PTO Plus frame and the two (2) front seat posts.

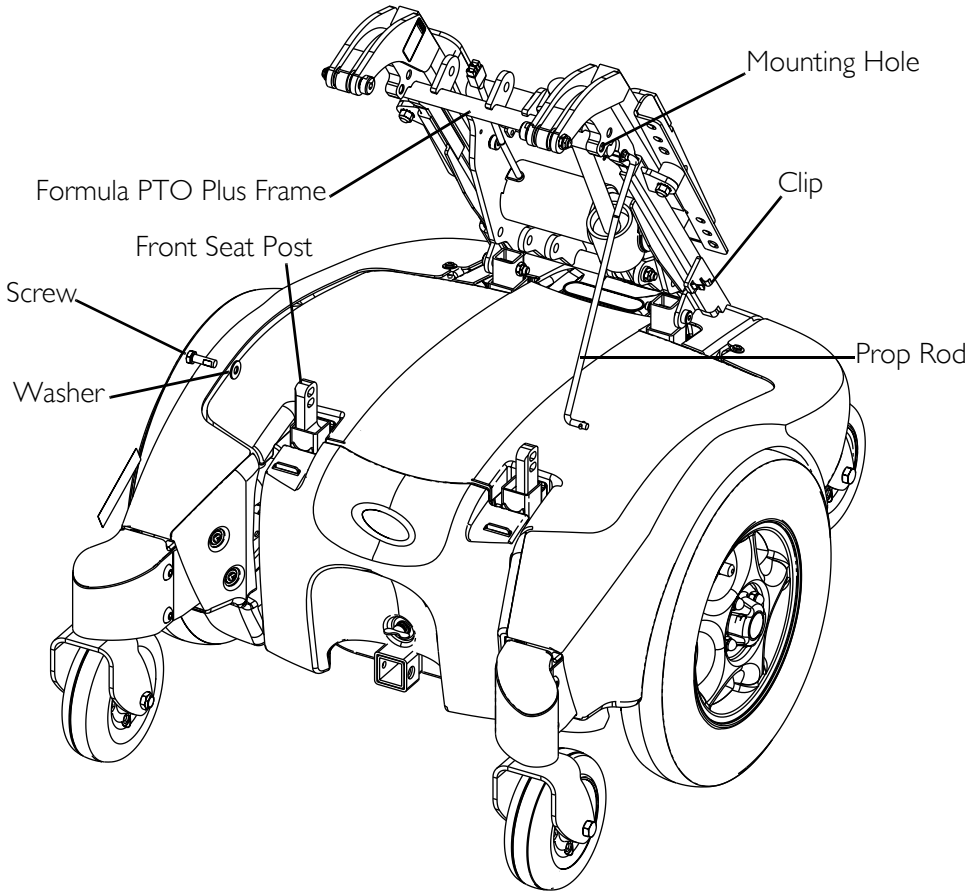


FIGURE 4.3 Tilting the Seat Assembly - Formula PTO Plus Seating System Only

Adjusting the Seat Height

⚠ WARNING

If wheelchair is equipped with power tilt only or the Formula PTO Plus seating system, refer to Power Tilt only for Pronto M71 and M91 Owner's Manual, Part Number 1118362 or to Formula PTO Plus Powered Seating Service manual, part number 1125031 to perform this procedure.

NOTE: For this procedure, refer to FIGURE 4.4.

NOTE: The seat can be adjusted to five (5) height positions in ½-inch increments.

1. Remove the seat. Refer to Removing/Installing the Seat Assembly without Powered Seating Systems on page 30.
2. Remove the mounting screw and locknut that secure the adjustable height tube to the support tube.
3. Adjust tube to desired mounting position. Refer to the table in FIGURE 4.4 for available mounting positions.
4. Reinstall mounting screw and locknut (FIGURE 4.4). Securely tighten.

5. Repeat STEPS 2-4 for the three (3) remaining adjustable height tubes.

⚠ WARNING

When reinstalling the seat verify that the seat brackets are engaged with the seat clevis pins by pulling UP on the latch bar.

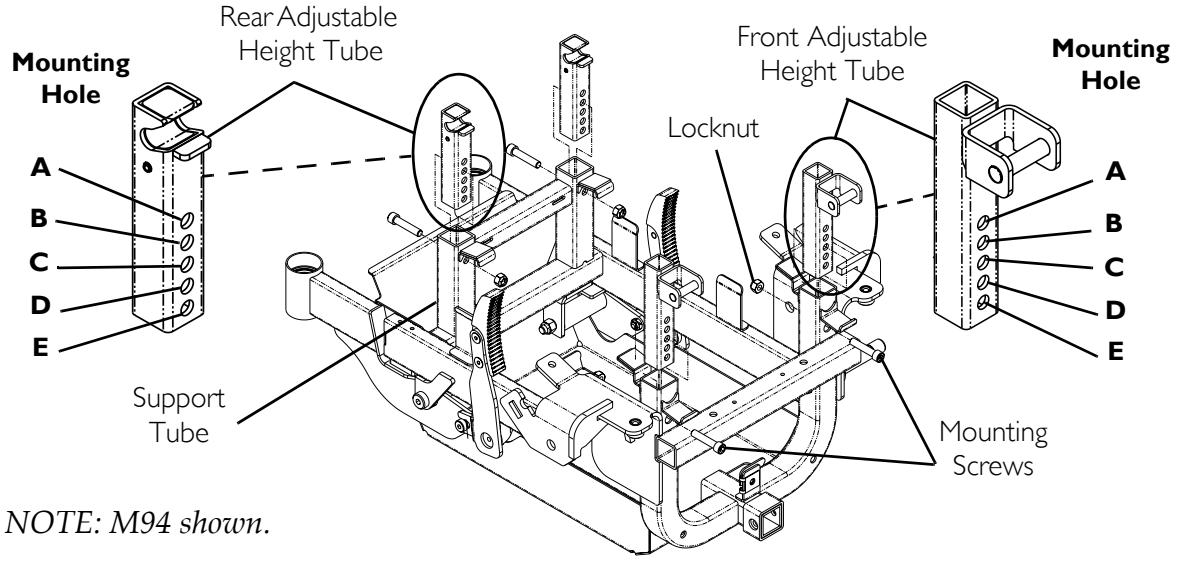
6. Reinstall the seat. Refer to Removing/Installing the Seat Assembly without Powered Seating Systems on page 30.

ADJUSTING THE SEAT HEIGHT

	AVAILABLE MOUNTING HOLES FOR FRONT ADJUSTABLE HEIGHT TUBE				
CHAIR IS EQUIPPED WITH	**A**	**B**	**C**	**D**	**E**
VAN SEAT WITH FOOTBOARD					
REAR ADJUSTABLE HEIGHT TUBE					
Mounted in hole A	N/A**	✓	✓	✓	✓
Mounted in hole B	N/A*	N/A*	✓	✓	✓
Mounted in hole C	N/A*	N/A*	✓	✓	✓
Mounted in hole D	N/A*	N/A*	N/A*	✓	✓
Mounted in hole E	N/A*	N/A*	N/A*	N/A*	✓

**NOTE: This mounting hole combination would result in a forward seat dump. Forward seat dump is where the rear of the seat is higher than the front of the seat. The seat should never be adjusted to a position that results in a forward seat dump.*

***NOTE: This mounting hole combination cannot be used because it would cause the front riggings of the wheelchair to interfere with other components of the chair.*



NOTE: M94 shown.

FIGURE 4.4 Adjusting the Seat Height

Removing/Installing the Adjustable Height Tubes

NOTE: For this procedure, refer to FIGURE 4.5.

NOTE: Reverse this procedure to install the adjustable height tubes.

1. Remove the top shroud from the wheelchair. Refer to Removing/Installing the Shrouds on page 71.
2. Remove the mounting screw and locknut securing the front adjustable height tube to the front support tube.
3. Remove the front adjustable height tube from the front support tube.
4. Remove the mounting screw and locknut securing the rear adjustable height tube to the rear support tube.
5. Remove the rear adjustable height tube from the rear support tube.

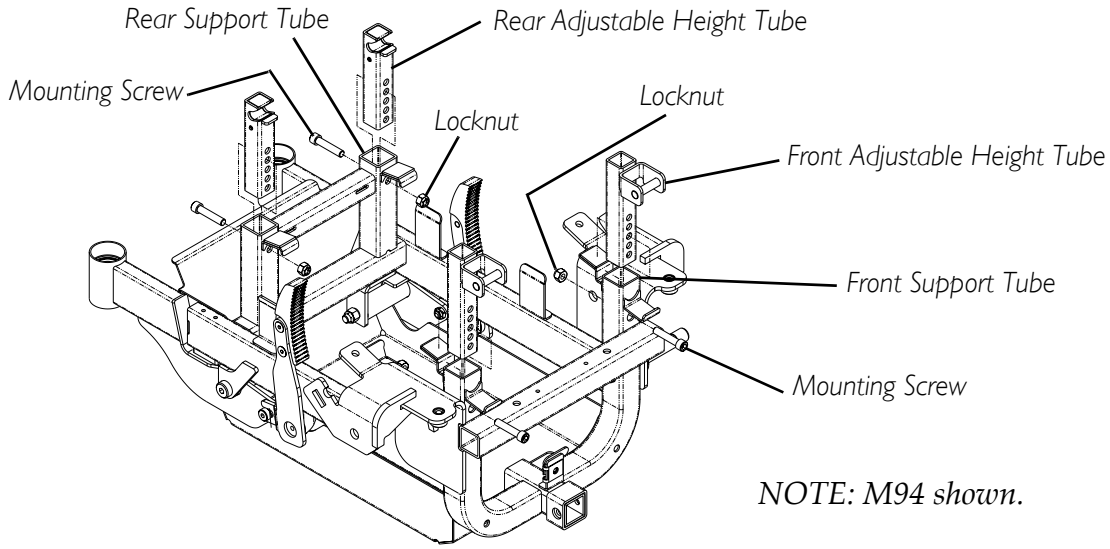


FIGURE 4.5 Removing/Installing the Adjustable Height Tubes

ASBA Seat Service Procedures

Removing/Installing the Seat Pan

NOTE: For this procedure, refer to FIGURE 4.6.

NOTE: Take note of the position and orientation of the mounting hardware, seat positioning straps and quick release pin tabs for installation of the seat pan.

NOTE: Reverse this procedure to install the seat pan. Torque locknuts to 75-inch-lbs.

1. Perform one (1) of the following:
   - Remove seating system. Refer to manufacturer's seating system installation instructions.
   - Remove cushion by pulling UP to release hook and loop strips. Remove cushion from seat pan.
2. Remove the two (2) rear mounting screws, quick release pin tabs, spacers and locknuts that secure the seat pan and seat positioning straps to the seat frame.

NOTE: The two (2) front mounting screws, spacers and locknuts also secure the front rigging support tubes to the seat frame.

3. Remove the four (4) mounting screws, locknuts and four (4) spacers securing the seat pan to the seat frame (FIGURE 4.6).
4. Remove the seat pan from the seat frame.

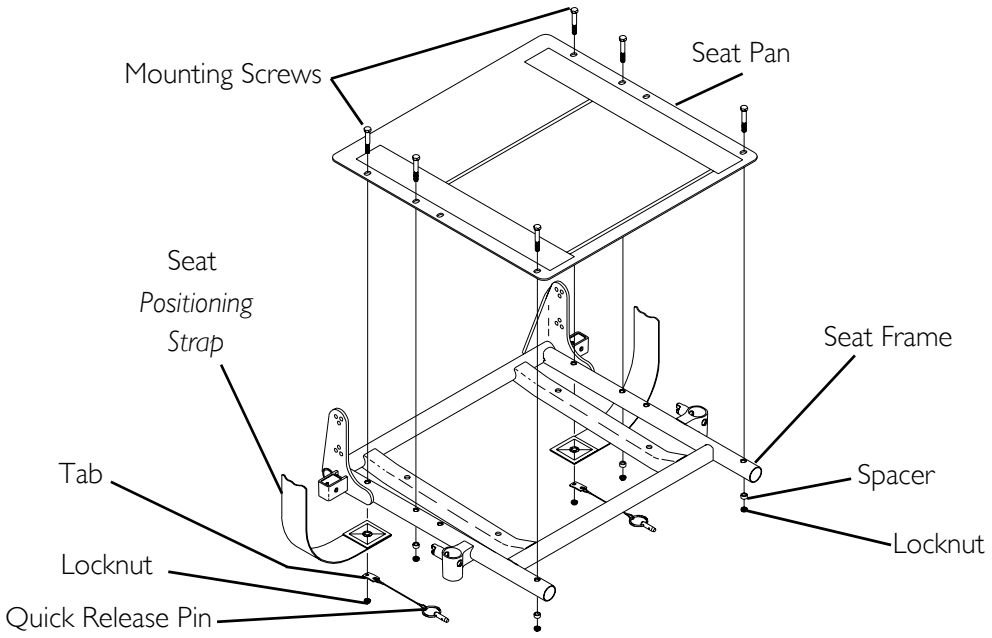


FIGURE 4.6 Removing/Installing the Seat Pan

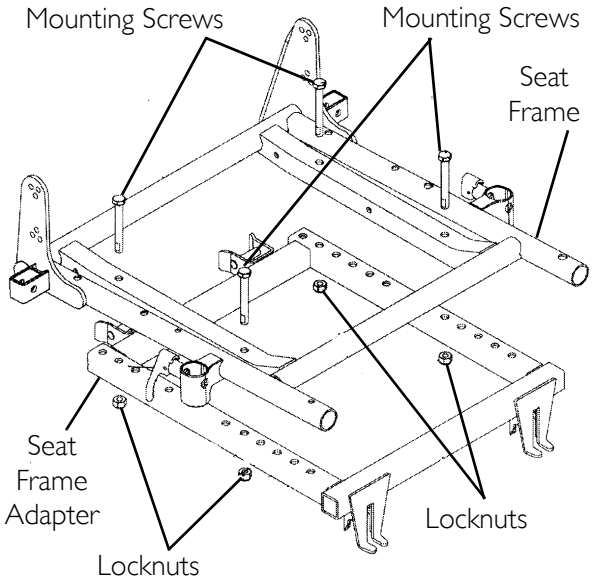
Changing the Seat Width/Depth

NOTE: The seat frame width and depth are not adjustable. A new seat frame must be ordered to change seat depth and/or width. Refer to Replacing the Seat Frame on page 39.

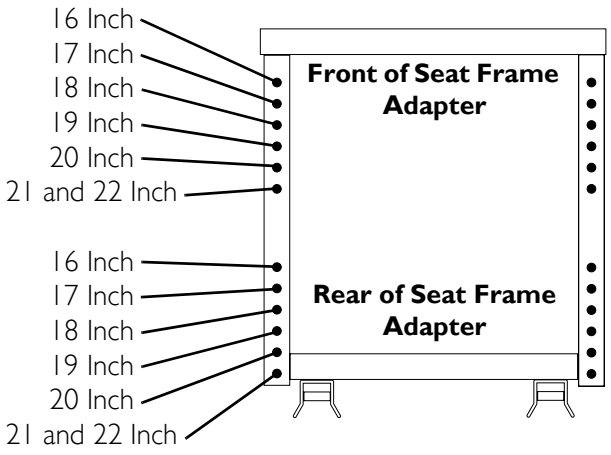
Replacing the Seat Frame

NOTE: For this procedure, refer to FIGURE 4.7.

1. Remove the front riggings from the seat frame. Refer to Installing/Removing Front Riggings on page 55.
2. Remove the seat from the wheelchair. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
3. Remove the seat pan. Refer to Removing/Installing the Seat Pan on page 38.
4. Remove the four (4) mounting screws and locknuts securing the seat frame to the seat frame adapter.
5. Remove the seat frame from the seat frame adapter.
6. Discard the existing seat frame.
7. Align the four (4) mounting holes of the new seat frame with the correct mounting position on the seat frame adapter (Detail "A" of FIGURE 4.7).
8. Using four (4) existing mounting screws and four (4) new locknuts, secure the seat frame to the seat frame adapter.
9. Install the seat pan. Refer to Removing/Installing the Seat Pan on page 38.
10. Install the seat onto the wheelchair. Refer to Removing/Installing the Seat Assembly without Powered Seating Systems on page 30.



Detail "A" - Seat Frame Mounting Positions



NOTE: Measurements given according to seat frame depth.

FIGURE 4.7 Replacing the Seat Frame

Replacing the Seat Positioning Strap

NOTE: For this procedure, refer to FIGURE 4.8.

1. Remove the seat cushion from the seat pan.
2. Remove the flip back armrests. Refer to Removing/Installing Flip Back Armrest on page 53.
3. Remove the two (2) mounting screws, quick release pin tabs, spacers and locknuts that secure the seat pan and seat positioning straps to the seat frame.
4. Remove the two (2) halves of the seat positioning strap from the rear seat frame.
5. Reposition the two (2) new seat positioning strap halves underneath seat rails.
6. Reinstall the two (2) mounting screws, quick release pin tabs, spacers and locknuts that secure the seat pan and seat positioning straps to the seat frame and torque to 75 inch-lbs.
7. Reinstall the seat cushion onto the seat pan.

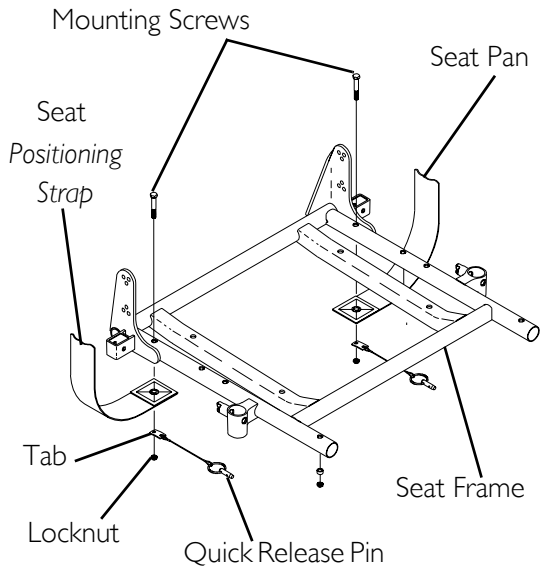


FIGURE 4.8 Replacing the Seat Positioning Strap

Removing/Installing the Back Upholstery

NOTE: The back canes must be removed when removing/installing the back upholstery. Refer to Removing/Installing/Changing the Back Cane Height on page 40.

Removing/Installing/Changing the Back Cane Height

NOTE: For this procedure, refer to FIGURE 4.9.

NOTE: If changing the back height, new back upholstery may be needed as well. Refer to the following chart to determine if new back upholstery is needed:

NOTE	BACK UPHOLSTERY HEIGHT
If back height required is within the range of the original back upholstery height, only new back canes will be needed.	16 to 17 inches
	18 to 19 Inches
If the back height required is NOT within the range of the original back upholstery height, new back upholstery, and back canes will be required	20 inches

NOTE: Existing hardware and inserts will be reused.

NOTE: Take note of position and orientation of mounting hardware for reinstallation.

Removing

1. Remove (1) flip back armrest from the wheelchair. Refer to Arm Service Procedures for ASBA Seat on page 53.

NOTE: Note the back angle before disassembly for proper reinstallation.

2. On the side of wheelchair with armrest removed, remove one (1) of the mounting screws, washer, coved washer and locknut that secure the back cane to the seat frame.
3. Cut the tie-wraps that secure the bottom of the existing back upholstery to the seat frame.
4. Thread the mounting screw removed in STEP 2 through the back cane from the inside of the wheelchair to hold the insert in place.
5. Remove the remaining mounting screw, washer, coved washer and locknut that secures the back cane to the seat frame.
6. Repeat STEPS 1-4 for the opposite side of the wheelchair and remove back assembly from wheelchair.
7. Remove the two (2) mounting screws and washers that secure the existing back upholstery to the back canes.
8. If present, release hook and loop strap securing the back upholstery to the back canes.
9. Remove the two (2) mounting screws used to keep inserts in the back canes in STEP 4. Set mounting screws and inserts aside.
10. Loosen, but DO NOT remove, the two (2) mounting screws and locknuts securing the spreader bar to the back canes.
11. Grasp the hand grip and slide the back cane out of the spreader bar (if applicable) and the back upholstery.

Installing

NOTE: If replacing back upholstery, discard existing back upholstery and perform this procedure using new back upholstery.

NOTE: If replacing back canes, discard existing back canes and perform this procedure using new back canes.

NOTE: Spreader bar is required on ALL back heights between 20-24-inches. Spreader bar is required on back heights 16, 17, 18, or 19 ONLY if the width or depth of the chair exceeds 19 inches. Refer to FIGURE 4.9 for proper spreader bar location on back canes.

1. Slide one (1) back cane into back upholstery and through spreader bar (if applicable).
2. Position insert into bottom of back cane.
3. From inside of wheelchair, thread a mounting screw through the back cane to hold the insert in position when installing the back assembly.
4. Repeat STEPS 1-3 for remaining back cane.

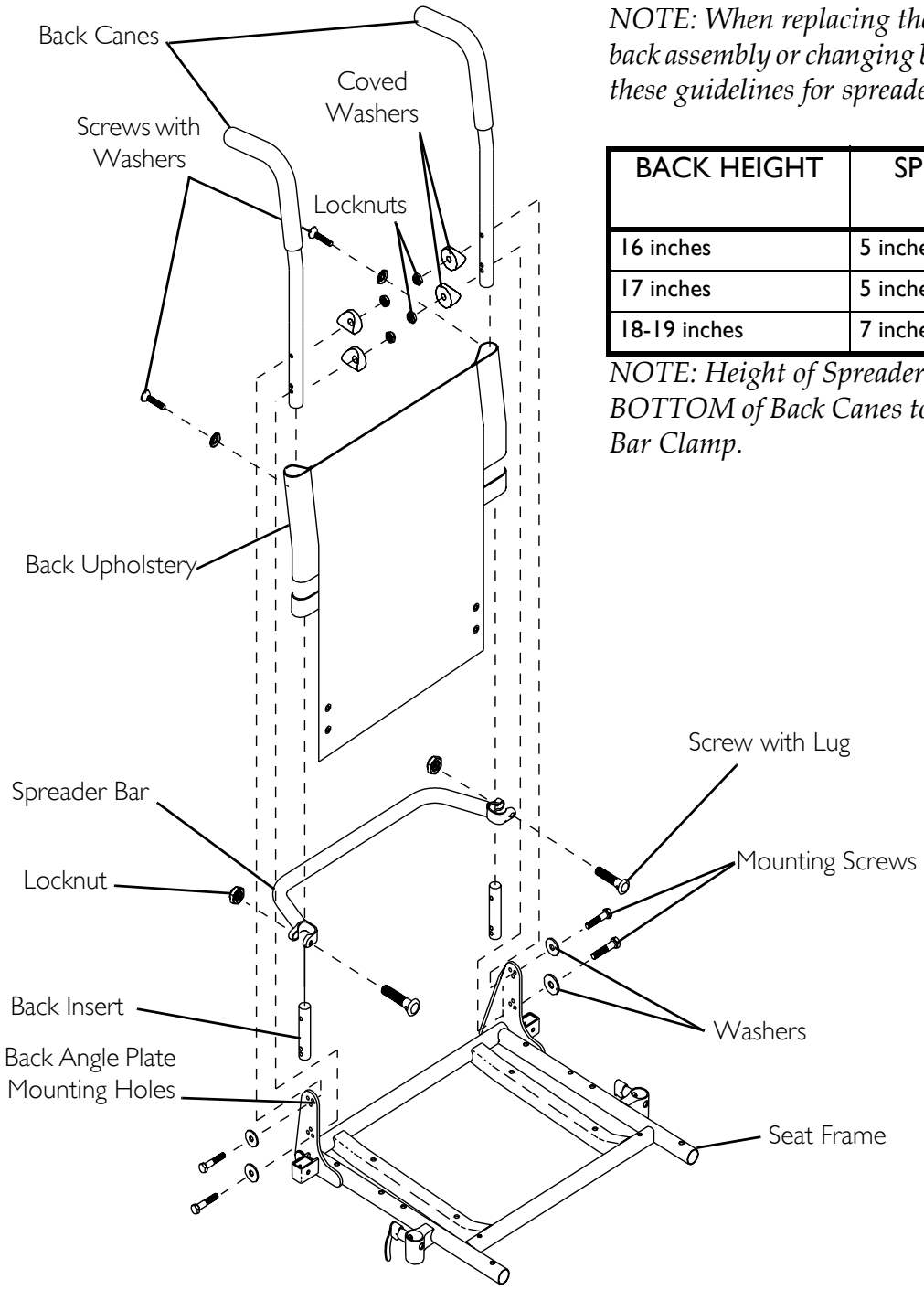
NOTE: If changing the back angle, refer to Adjusting the Back Angle on page 43 to determine the proper mounting holes for the desired back angle.

5. Position back assembly between the back angle plates (FIGURE 4.9).
6. On one (1) side of wheelchair, align back cane mounting holes with the desired mounting holes of the back angle plate.
7. Remove the two (2) mounting screws used to keep inserts in the back canes in STEP 3. Set mounting screws and inserts aside.

⚠ WARNING

The back canes MUST be fastened securely to the seat frame BEFORE using the wheelchair. Torque to 75-inch-lbs.

8. From outside of wheelchair, secure the back cane to the back angle plate using two (2) mounting screws, washers, coved washers and locknuts (FIGURE 4.9). Use Loctite 242 and torque to 75-inch-lbs.
9. Repeat STEPS 6-8 on opposite side of wheelchair.
10. Secure the top of the back upholstery to the back canes with the two (2) existing mounting screws.
11. Using two (2) new tie-wraps, secure bottom of back upholstery to the seat frame.
12. If necessary, reposition the spreader bar at the correct height for the corresponding back height and torque the mounting hardware to 60-inch-lbs (FIGURE 4.9).
13. If present, secure back upholstery hook and loop straps around back canes.
14. Reinstall the flip back armrest onto the wheelchair. Refer to Removing/Installing Flip Back Armrest on page 53.



NOTE: When replacing the back upholstery, back assembly or changing back height, follow these guidelines for spreader bar height:

BACK HEIGHT	SPREADER BAR HEIGHT
16 inches	5 inches
17 inches	5 inches
18-19 inches	7 inches

NOTE: Height of Spreader Bar from BOTTOM of Back Canes to TOP of Spreader Bar Clamp.

FIGURE 4.9 Removing/Installing/Changing the Back Cane Height

Adjusting the Back Angle

NOTE: For this procedure, refer to FIGURE 4.10.

1. Remove the flip back armrests from the wheelchair. Refer to Removing/Installing Flip Back Armrest on page 53.

2. Remove the mounting screw, washer, coved washer and locknut from the top mounting hole of back angle plate and back cane (FIGURE 4.10).

NOTE: To avoid losing the insert in each back cane, thread the mounting screw through the cane from the inside of wheelchair to hold the insert in place.

3. Remove the mounting screw, washer, coved washer and locknut from the bottom mounting hole of the back angle plate and back cane.
4. Reposition the back canes into the correct mounting holes of the back angle plate to obtain a back angle between 80° and 100° in 5° increments.
5. Starting with the bottom mounting hole, use the two (2) mounting screws, washers, coved washers and locknuts to secure the back cane with insert to the back angle plate.
6. Torque mounting screws to 75-inch-lbs.
7. Reinstall the flip back armrests onto the wheelchair. Refer to Removing/Installing Flip Back Armrest on page 53.

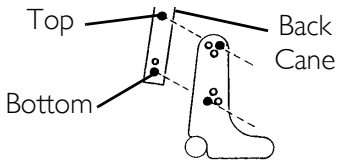
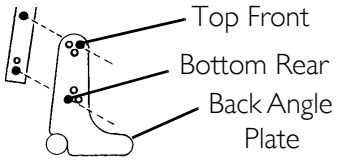
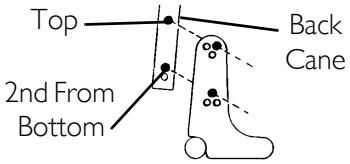
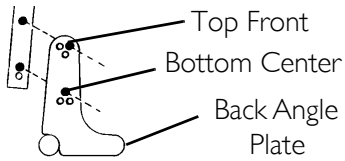
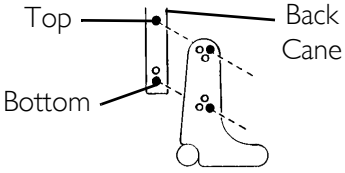
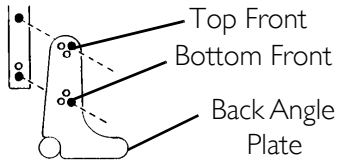
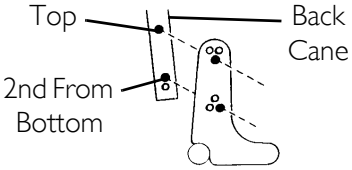
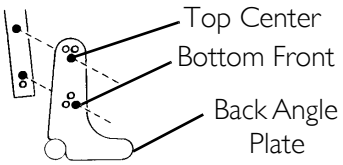
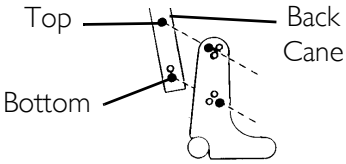
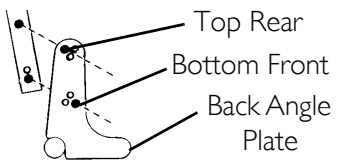
ANGLE	BACK CANE MOUNTING HOLE	BACK ANGLE PLATE HOLE
80°		
85°		
90°		
95°		
100°		

FIGURE 4.10 Adjusting the Back Angle

Van Seat Service Procedures

Adjusting the Back Angle

NOTE: For this procedure, refer to FIGURE 4.11.

1. Lift up on the release handle and adjust back to desired angle.
2. Let go of the release handle to lock the back in position.

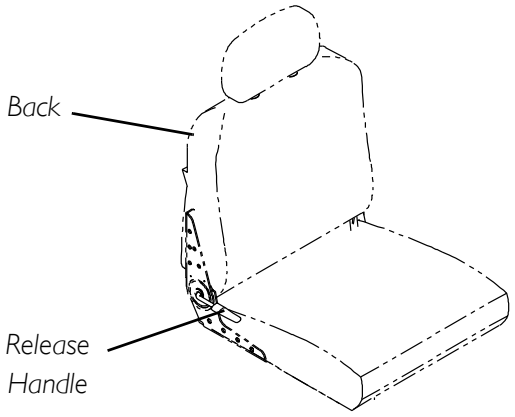


FIGURE 4.11 Adjusting the Back Angle

Adjusting the Seat Position on Van Seat Frame

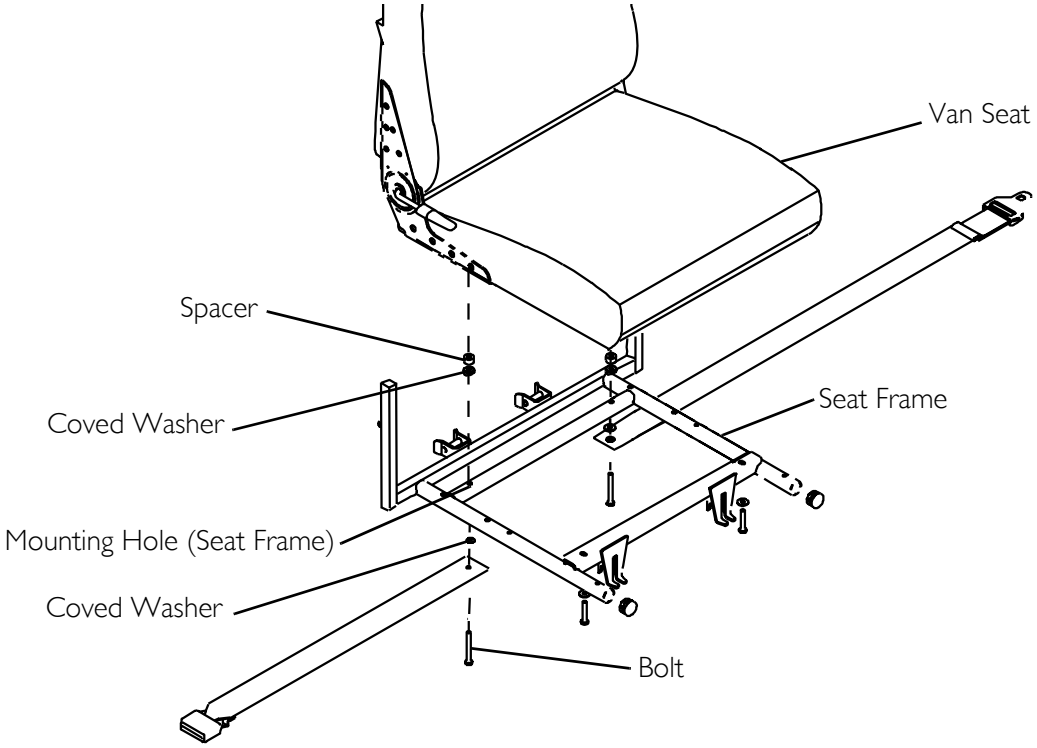
⚠ WARNING

DO NOT adjust the rear seat posts higher than the front seat posts.

If wheelchair is equipped with power tilt only or the Formula PTO Plus seating system, refer to Power Tilt only for Pronto M71 and M91 Owner's Manual, Part Number 1118362 or to Formula PTO Plus Powered Seating Service manual, part number 1125031 perform this procedure.

NOTE: For this procedure, refer to FIGURE 4.12.

1. Remove the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
2. Remove the four (4) bolts, four (4) coved washers and two (2) spacers securing the van seat to the seat frame.
3. Separate van seat from seat frame.
4. Refer to Detail "A" of FIGURE 4.12 to determine the correct mounting holes to achieve the desired seat position on the seat frame.
5. Align the van seat mounting holes determined in STEP 4 with the seat frame mounting holes.
6. Secure the van seat to the seat frame using the four (4) bolts, four (4) coved washers and two (2) spacers. Securely tighten.
7. Reinstall the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.



DETAIL "A"

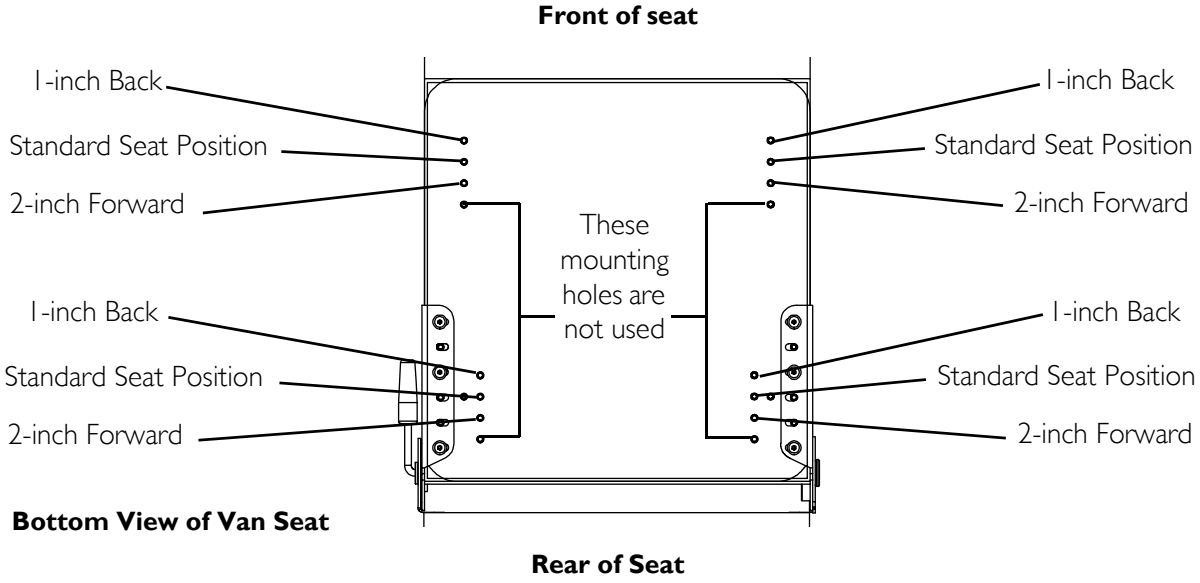
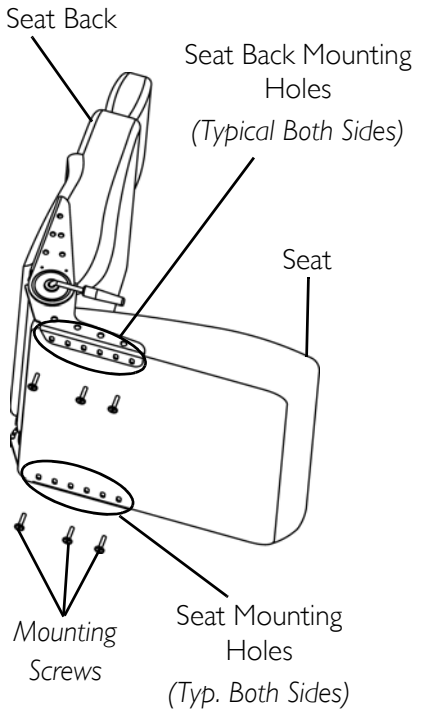


FIGURE 4.12 Adjusting the Seat Position on Van Seat Frame

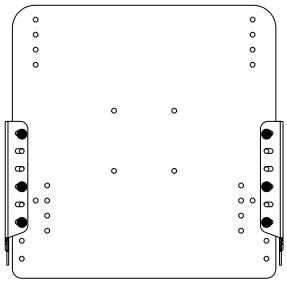
Adjusting the Van Seat Back Depth

NOTE: For this procedure, refer to FIGURE 4.13.

1. Remove the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
2. Remove the van seat from the seat frame. Refer to Adjusting the Seat Position on Van Seat Frame on page 45.
3. Remove the six (6) mounting screws that secure the seat back to the seat.
4. Align the seat mounting holes with the seat back mounting holes in the desired mounting position (Detail "A" of FIGURE 4.13).
5. Using the six (6) mounting screws, secure the seat back to the seat. Securely tighten.
6. Reinstall the van seat onto the seat frame. Refer to Adjusting the Seat Position on Van Seat Frame on page 45.
7. Reinstall the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.

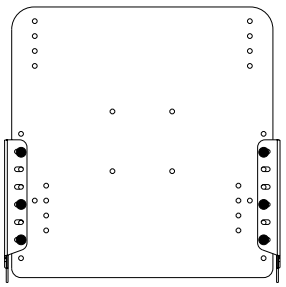


DETAIL "A" - Seat Back Mounting Positions



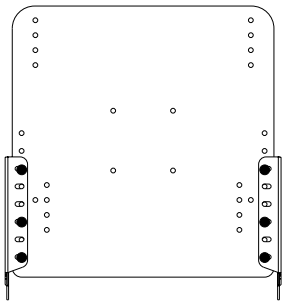
Forward Position

Back Depth	Seat Size
16 inch	16 X 18 inches
16 inch	18 X 18 inches
18 inch	20 X 20 inches
18 inch	22 X 20 inches



Middle Position

Back Depth	Seat Size
16 inch	16 X 18 inches
16 inch	18 X 18 inches
18 inch	20 X 20 inches
18 inch	22 X 20 inches



Rear Position

Back Depth	Seat Size
16 inch	16 X 18 inches
16 inch	18 X 18 inches
18 inch	20 X 20 inches
18 inch	22 X 20 inches

FIGURE 4.13 Adjusting the Van Seat Back Depth

Removing/Installing Drive Lockout Switch Mounting Hardware and Cable (Full Recline Van Seat Only)

NOTE: For this procedure, refer to FIGURE 4.14.

NOTE: Reverse this procedure to install the drive lockout switch mounting hardware.

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position and disconnect joystick cable.
3. Lift up on the release handle and recline seat back to 170°.
4. Remove the two (2) mounting screws and washers securing the drive lockout switch cable to the seat.
5. Lift up on the release handle and return the seat to the upright position.
6. Remove the seat. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
7. Remove the batteries. Refer to Installing/Removing the Batteries on page 83.

NOTE: By this step the rear and top shrouds should be open and the drive lockout switch cable should be disconnected (connector is located next to charger).

NOTE: Tie-wraps that secure the auxiliary power connectors and drive lockout cable are also used to secure the charger cable lead to the wheelchair frame.

8. Cut the three (3) ties-wrap that secure the auxiliary power connectors and drive lockout cable to the wheelchair frame (Detail "A" of FIGURE 4.14).

NOTE: After disconnecting the drive lockout cable, ensure the charger cable is securely connected to the auxiliary power connectors.

9. Disconnect the drive lockout cable from the auxiliary power connectors.
10. Remove drive lockout cable from the wheelchair frame.

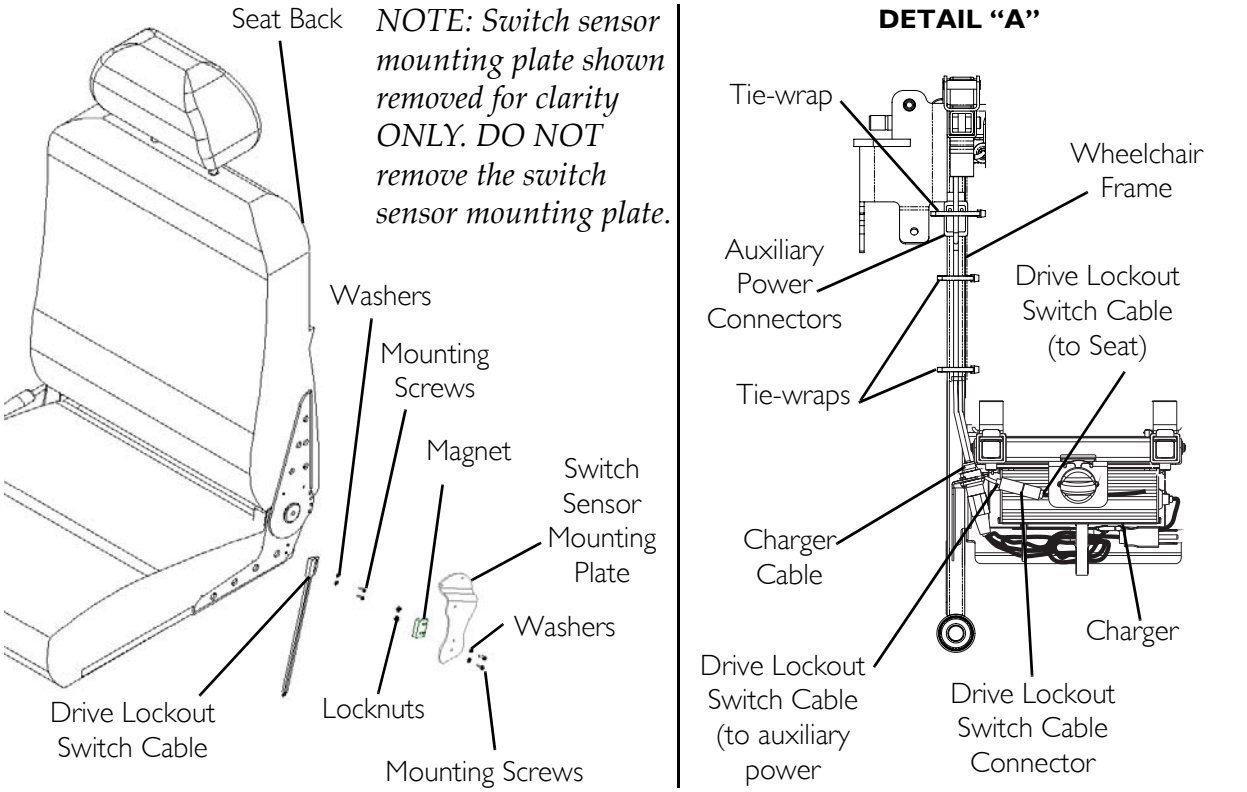


FIGURE 4.14 Removing/Installing Drive Lockout Switch Mounting Hardware and Cable (Full Recline Van Seat Only)

SECTION 5—ARMS

⚠ WARNING

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

Before performing any maintenance, adjustment or service verify that ON/OFF switch on the joystick is in the OFF position.

Arm Service Procedures for Van Seat

Removing/Installing Van Seat Arm

NOTE: For this procedure, refer to FIGURE 5.1.

NOTE: Reverse this procedure to install the adjustable width arms.

1. If necessary, disconnect the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
2. Loosen lock knob that secures the adjustable width arm to the arm support tube.
3. Remove the adjustable width arm from the arm support tube.
4. If necessary, repeat STEPS 1-3 to remove the remaining adjustable width arm.

Adjusting Van Seat Arm Width

NOTE: For this procedure, refer to FIGURE 5.1.

1. Loosen the two (2) lock knobs that secure the adjustable width arms to the arm support tube.

NOTE: Both adjustable width arms should be adjusted to the same distance away from the arm support tube.

NOTE: Changing the width of the adjustable width arms may also effect the overall width of the wheelchair.

2. Reposition adjustable width arms until desired width is achieved.
3. Securely tighten the two (2) lock knobs that secure the adjustable width arms to the arm support tube.

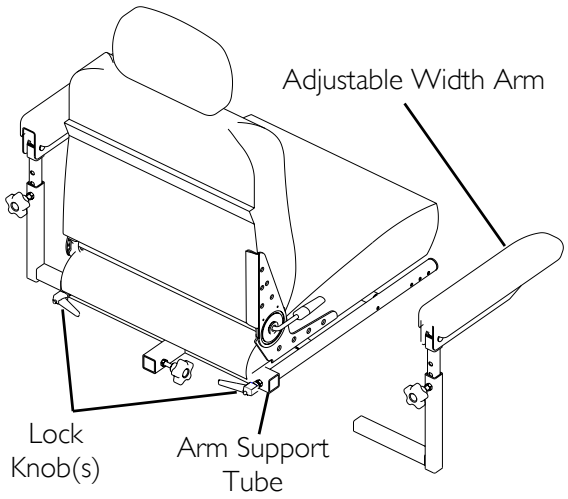


FIGURE 5.1 Removing/Installing Van Seat Arm and Adjusting Van Seat Arm Width

Adjusting Van Seat Arm Angle

NOTE: For this procedure, refer to FIGURE 5.2.

1. Lift armrest up.
2. Loosen the jam nut.
3. Adjust the socket screw up or down to the desired arm angle position.
4. Tighten the jam nut.
5. To determine the same angle for the opposite armrest, count the exposed threads after the jam nut has been tightened.
6. Repeat STEPS 1-5 for opposite armrest, if necessary.

Adjusting Van Seat Arm Height (Adjustable Height Arms Only)

NOTE: For this procedure, refer to FIGURE 5.2.

1. Remove the lock knob that secures the armrest to the arm frame assembly.
2. Adjust the armrest to one (1) of five (5) positions in 1-inch increments.
3. Reinstall the lock knob that secures the armrest to the arm frame assembly and tighten securely.

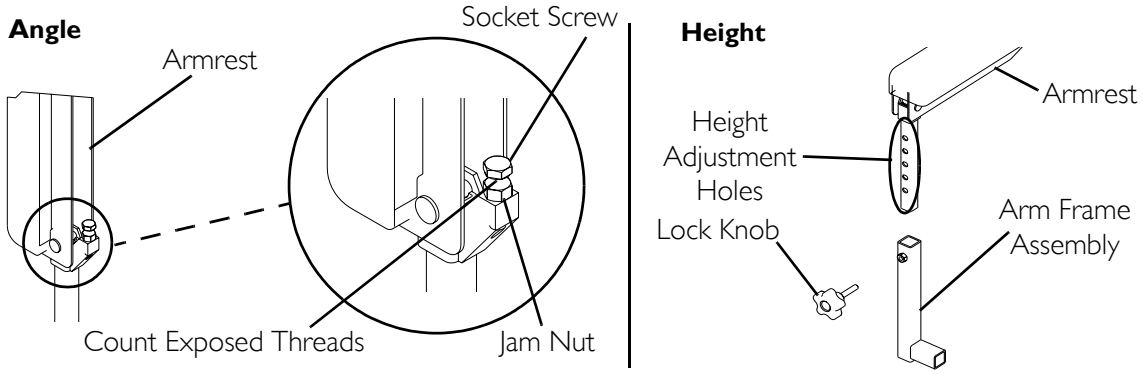


FIGURE 5.2 Adjusting Van Seat Arm Height (Adjustable Height Arms Only)

Replacing Van Seat Armrest Pad Assembly

NOTE: For this procedure, refer to FIGURE 5.3.

1. If necessary, remove the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
2. Remove the mounting screw, washers and locknut that secure the existing armrest pad assembly to the arm post.
3. Position the new armrest pad assembly on the armrest post and secure with the mounting screw, washers, and locknut. Refer to FIGURE 5.3 for correct hardware orientation.
4. If necessary, install the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
5. Repeat STEPS 2-4 for the opposite armrest plate, if necessary.

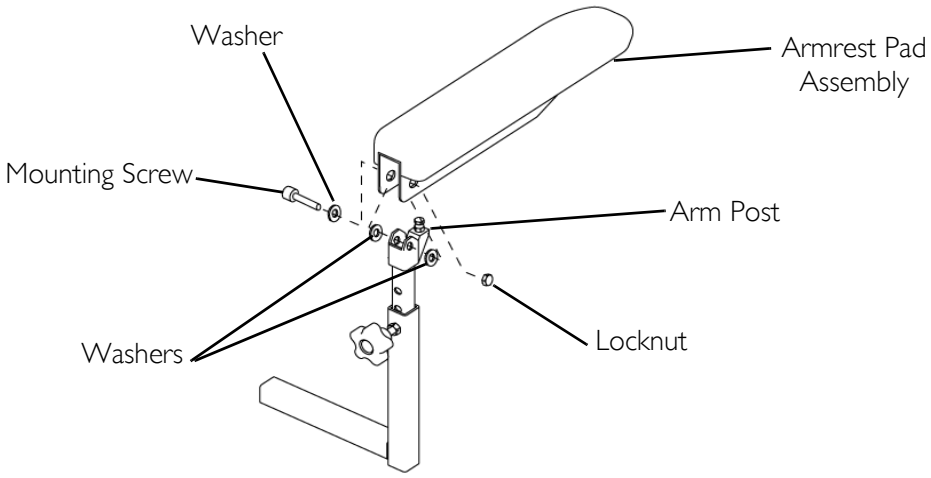


FIGURE 5.3 Replacing Van Seat Armrest Pad Assembly

Arm Service Procedures for ASBA Seat

⚠ WARNING

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

Removing/Installing Flip Back Armrest

NOTE: For this procedure, refer to FIGURE 5.4.

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

NOTE: Reverse this procedure to install the flip back armrest.

1. If necessary, disconnect the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
2. Unlock flip back armrest by pulling flip back armrest release lever into the unlocked (horizontal) position.
3. Remove quick release pin securing the flip back armrest to the wheelchair frame.
4. Pull UP on the flip back armrest and remove the armrest from the arm sockets.
5. Repeat STEPS 2-4 for the opposite flip back armrest, if necessary.

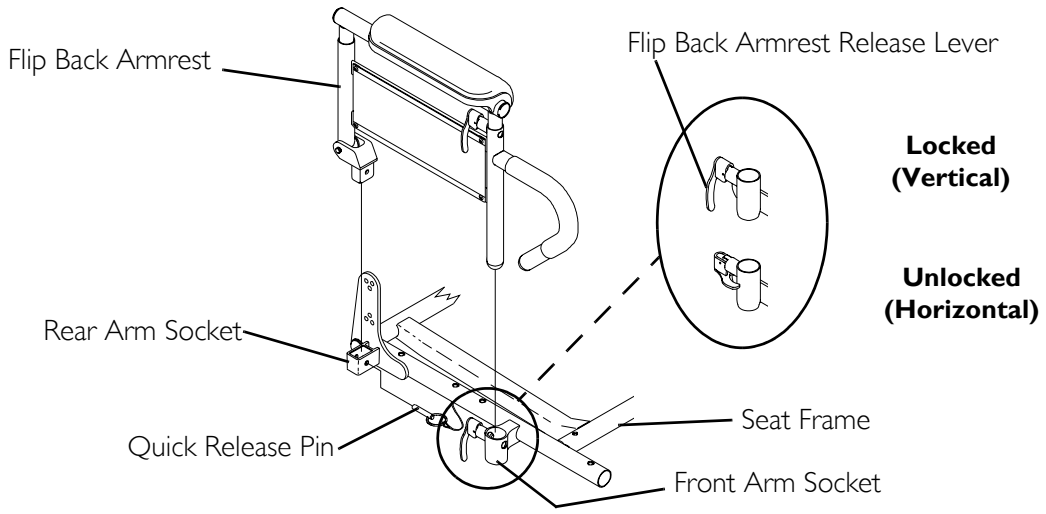


FIGURE 5.4 Removing/Installing Flip Back Armrest

Adjusting the Flip Back Armrest

NOTE: For this procedure, refer to FIGURE 5.5.

1. Unlock top of flip back armrest by pulling height adjustment lever into the up (horizontal) position.
2. Adjust top of the flip back armrest to the desired height.
3. Lock top of flip back armrest by pushing height adjustment lever into the down (vertical) position.
4. Lift up on flip back armrest to make sure the armrest is locked in place.
5. Repeat STEPS 1-4 for opposite flip back armrest, if necessary.

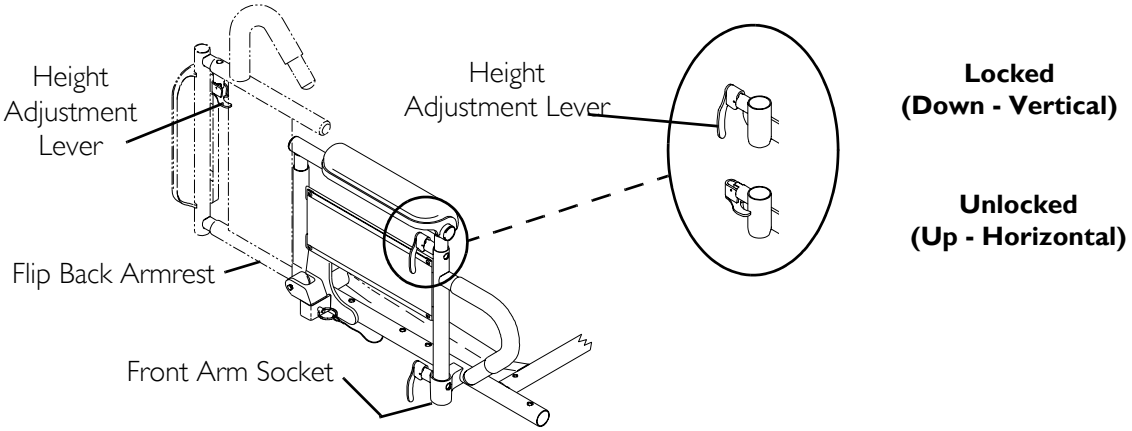


FIGURE 5.5 Adjusting the Flip Back Armrest

SECTION 6—FRONT RIGGINGS

⚠ WARNING

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

DO NOT stand on the front riggings, otherwise damage may occur. When getting in or out of the wheelchair, make sure that the footplates on the front riggings are in the upward position or moved out of the way.

Before performing any maintenance, adjustment or service verify that On/Off switch on the joystick is in the OFF position.

Installing/Removing Front Riggings

NOTE: For this procedure, refer to FIGURE 6.1.

Installing

1. If necessary, remove the footboard. Refer to Removing/Installing the Footboard Assembly on page 61.
2. Turn front rigging to the side (open footplate is perpendicular to wheelchair) and position mounting holes in the front rigging hinge plates with hinge pins on the wheelchair frame.
3. Install the front rigging hinge plates onto the hinge pins on the wheelchair frame.

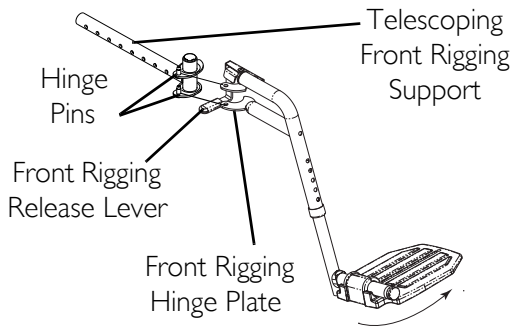


FIGURE 6.1 Installing/Removing Front Riggings

4. Push the front rigging towards the inside of the wheelchair until it locks into place.

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

5. Repeat STEPS 2-4 for opposite side of wheelchair.

Removing

1. Push the front rigging release lever inward and rotate the footrest out.
2. Lift up on front rigging and remove from the wheelchair.
3. Repeat STEPS 1-2 for opposite side of wheelchair.

Adjusting Footrest Height

Model PHWH93

NOTE: For this procedure, refer to FIGURE 6.2.

1. Remove any accessories from the footrest(s).
2. Remove the footrest from the wheelchair. Refer to Installing/ Removing Front Riggings on page 55.

NOTE: Lay footrest on a flat surface to simplify performing procedure.

3. Remove the hex bolt, coved washers and locknut that secure the lower footrest to the footrest support.
4. Reposition the lower footrest to the desired height.
5. Reinstall hex bolt, coved washers and locknut that secure lower footrest to footrest support. Tighten securely.

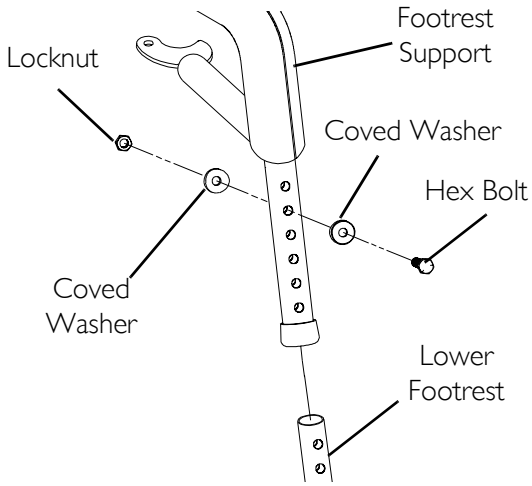


FIGURE 6.2 Adjusting Footrest Height - Model PHWH93

6. Repeat STEPS 1-5 for the opposite footrest, if necessary.
7. Reinstall the footrest(s) onto the wheelchair. Refer to Installing/Removing Front Riggings on page 55.
8. Reinstall any accessories onto the footrest(s).

Model PH904A and PHAL4A

NOTE: For this procedure, refer to FIGURE 6.3.

NOTE: PH904A style front rigging shown. PHAL4A front rigging adjusts the same way.

1. Loosen, but do not remove the lug bolt and locknut that secure the lower footrest to the footrest support.
2. Reposition the lower footrest to the desired height.

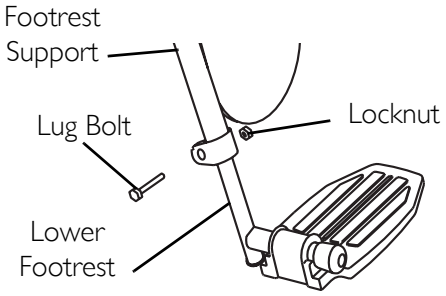


FIGURE 6.3 Adjusting Footrest Height - Model PH904A and PHAL4A

3. Securely tighten the lug bolt and locknut that secure the lower footrest to the footrest support.
4. Repeat STEPS 1-3 for the opposite footrest, if necessary.

Replacing Heel Loops

NOTE: For this procedure, refer to FIGURE 6.4.

1. Note the position of hex bolt, coved washers and locknut for reinstallation.
2. Remove the hex bolt, coved washers and locknut that secure the lower footrest to the footrest support.
3. Remove the lower footrest.
4. Remove the phillips bolt, spacer and locknut that secure the existing heel loop to the lower footrest.
5. Slide the existing heel loop off the lower footrest.
6. Replace heel loop.
7. Reverse STEPS 1-6 to reassemble.

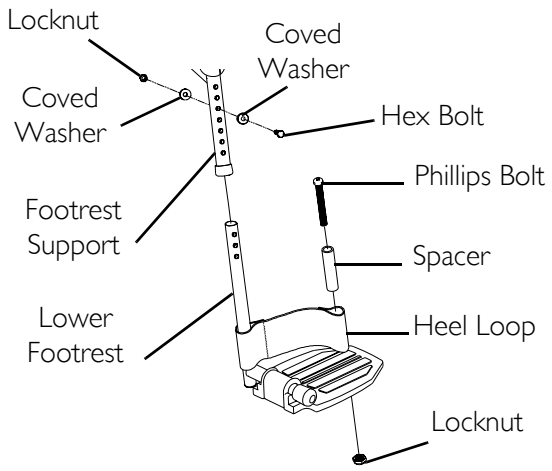


FIGURE 6.4 Replacing Heel Loops

NOTE: When securing heel loop to lower footrest, tighten the phillips screw and locknut until the spacer is secure.

Raising/Lowering Elevating Front Riggings

NOTE: For this procedure, refer to FIGURE 6.5.

1. Perform one (1) of the following:
   - Raising - Pull back on the release lever and raise front rigging to the desired height.
   - Lowering - Support front rigging with one (1) hand away from the release lever. Push release lever downward with other hand.

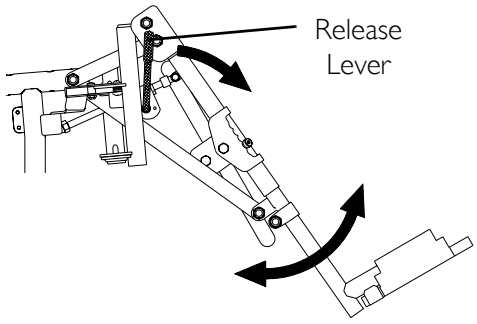


FIGURE 6.5 Raising/Lowering Elevating Front Riggings

Adjusting/Replacing Telescoping Front Rigging Supports - Van Style Seats

NOTE: For this procedure, refer to FIGURE 6.6.

NOTE: When adjusting the telescoping front rigging support depth, ensure the footplate does not interfere with the caster wheel rotation.

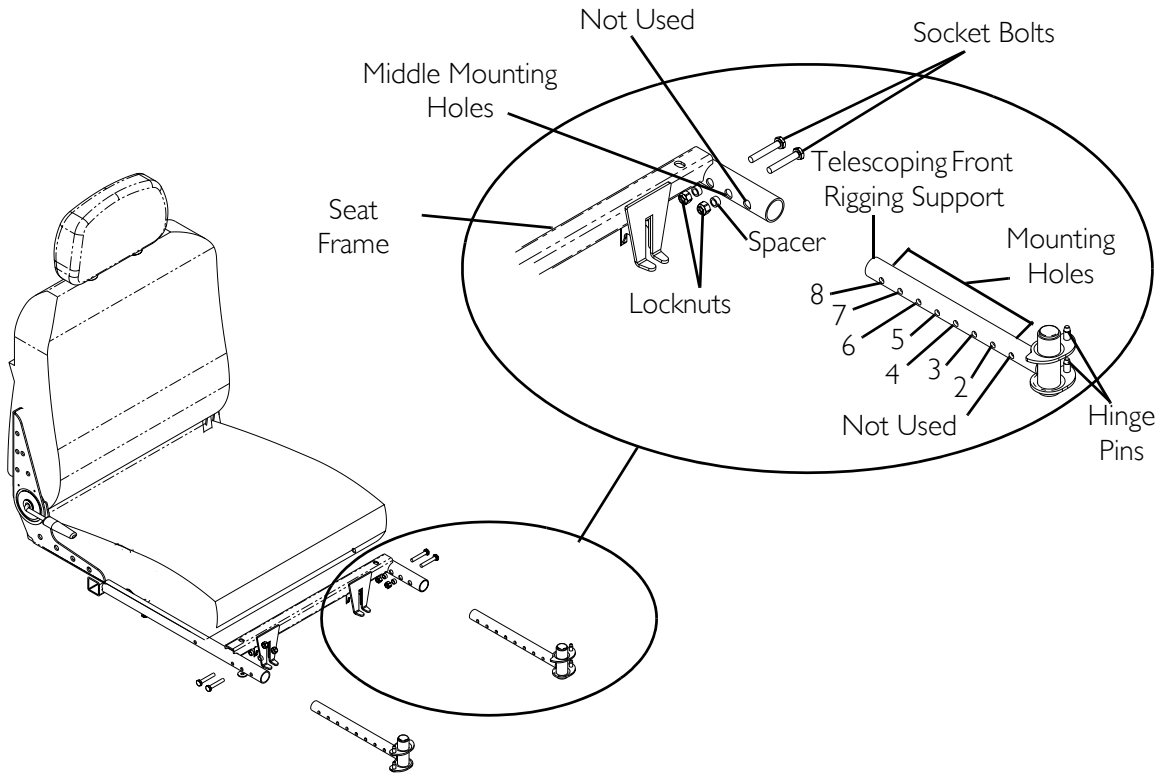
NOTE: Telescoping front rigging supports can be extended up to 2-inches from the wheelchair frame in 1-inch increments. This adjustment does not affect seat depth.

NOTE: When installing the front riggings support tubes, ensure that the hinge pins are on the outside of the chair facing away from the seat frame.

1. Remove the seat. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
2. Remove the two (2) socket bolts, spacers and locknuts that secure telescoping front rigging support to the seat frame.
3. Perform one (1) of the following:
   - Adjusting -
     i. Align the appropriate mounting hole of the telescoping front rigging support with the middle mounting hole in the seat frame tubes to achieve the desired depth. Refer to Front Rigging Support Mounting Positions in FIGURE 6.6.
   - Replacing -
     i. Remove the existing telescoping front rigging support from the wheelchair frame.
     ii. Insert the new telescoping front rigging support into the seat frame.
     iii. Align the appropriate mounting hole of the telescoping front rigging support with the middle mounting hole in the seat frame tubes to achieve the desired depth. Refer to Front Rigging Support Mounting Positions in FIGURE 6.6.

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

4. Using the two (2) socket bolts and locknuts, secure the telescoping front rigging support to the seat frame.
5. If necessary, repeat STEPS 2-4 on remaining telescoping front rigging support.
6. Reinstall the seat. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.



FRONT RIGGING SUPPORT MOUNTING POSITIONS

STANDARD POSITION		1-INCH OUT		2-INCHES OUT	
18 & 20-Inch Wide	22 & 24-Inch Wide	18 & 20-Inch Wide	22 & 24-Inch Wide	18 & 20-Inch Wide	22 & 24-Inch Wide
Holes 2 and 3	Holes 4 and 5	Holes 3 and 4	Holes 5 and 6	Holes 4 and 5	Holes 6 and 7

FIGURE 6.6 Adjusting/Replacing Telescoping Front Rigging Supports - Van Style Seats

Adjusting/Replacing Telescoping Front Rigging Supports - ASBA

NOTE: For this procedure, refer to FIGURE 6.7.

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

NOTE: The two (2) telescoping front rigging supports can be positioned at different depths depending on the need of the user.

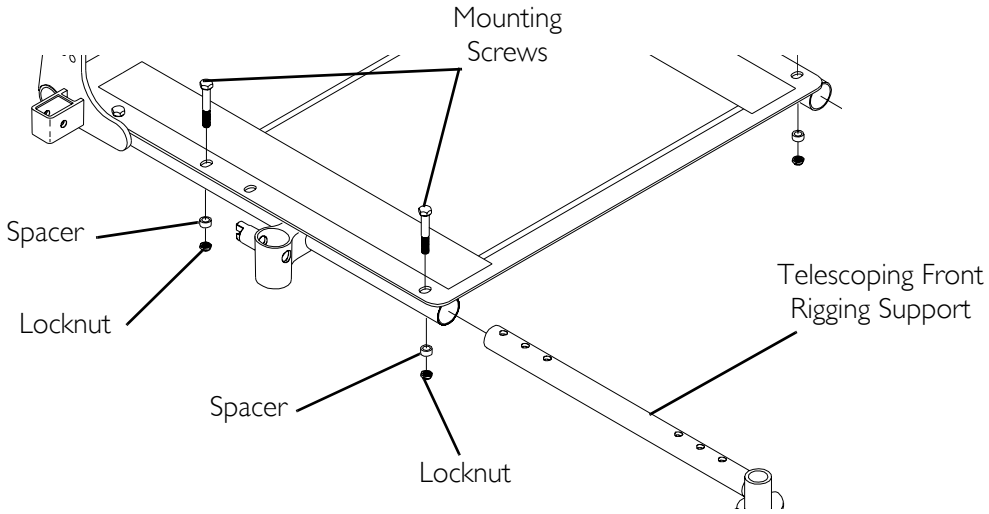


FIGURE 6.7 Adjusting/Replacing Telescoping Front Rigging Supports - ASBA

SECTION 7—FOOTBOARD ASSEMBLY

⚠ 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.

Before performing any maintenance, adjustment or service verify that ON/OFF switch on the joystick is in the OFF position.

DO NOT stand on the flip-up footboard. When getting in or out of the wheelchair, make sure that the flip-up footboard is in the upward position.

LIMITED CLEARANCE BETWEEN FOOTBOARD AND CASTER - The user's feet MUST remain on the footboard while operating the chair. If the user's feet are allowed to rest off the side of the footboard they may come in contact with the caster possibly resulting in injury.

Before performing any maintenance, adjustment or service verify that On/Off switch on the joystick is in the OFF position.

Removing/Installing the Footboard Assembly

NOTE: For this procedure, refer to FIGURE 7.1.

Removing

1. Remove the quick release pin that secures the footboard assembly to the wheelchair frame by depressing the button while sliding the pin out.
2. Remove the footboard assembly from the wheelchair frame.

Installing

⚠ WARNING

Make sure the detent balls are engaged with the outer edge of the tube - otherwise, injury and/or damage may result.

1. Position the footboard assembly onto the wheelchair frame so that the mounting hole in the wheelchair frame aligns with the desired mounting hole in the footboard assembly.
2. Install the quick release pin by depressing the button while sliding the pin in. Make sure the detent balls are engaged with the outer edge of the tube (Detail "A" of FIGURE 7.1).

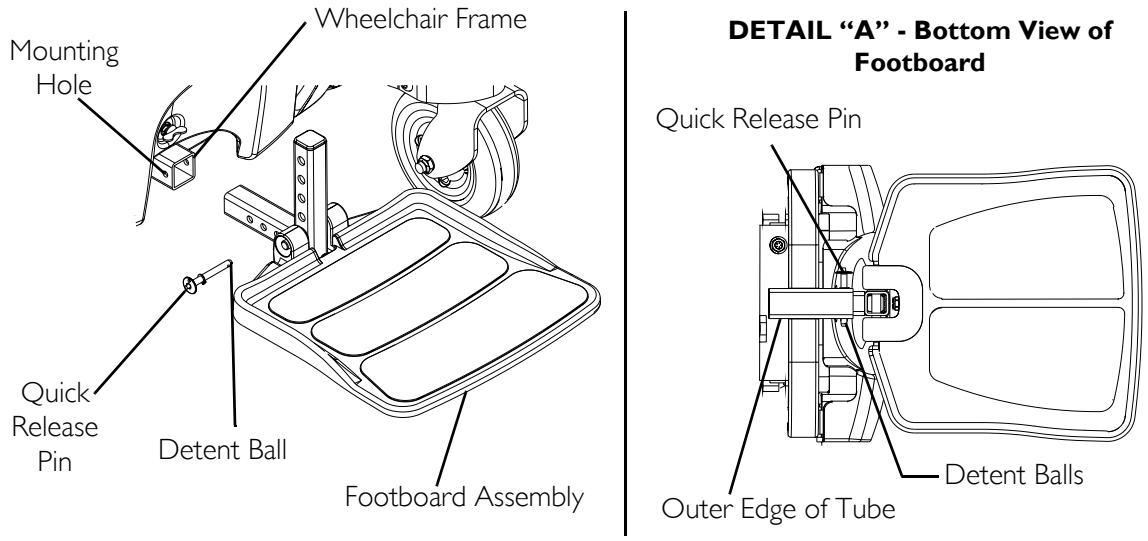


FIGURE 7.1 Removing/Installing the Footboard Assembly

Adjusting the Footboard Assembly

Angle

NOTE: For this procedure, refer to FIGURE 7.2.

1. Loosen the jam nut and set screw located underneath the rear of the footplate.
2. Adjust the set screw in or out to obtain the desired footboard assembly angle.
3. Thread the jam nut and washer inward until flush with the footboard bracket.
4. Securely tighten the jam nut and washer to secure the mounting screw in place.

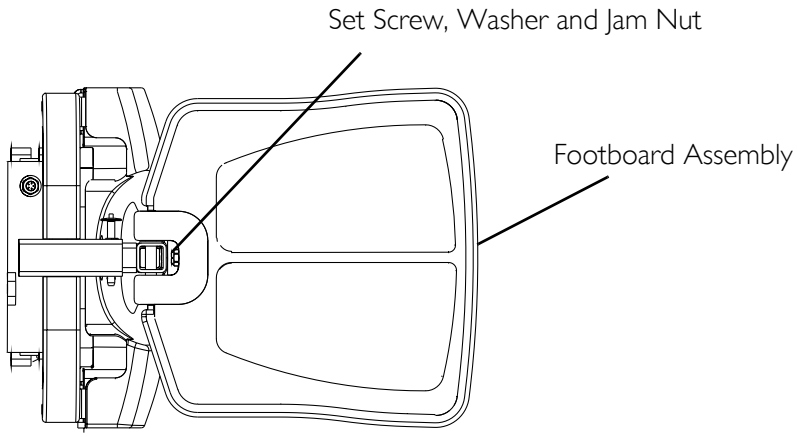


FIGURE 7.2 Adjusting the Footboard Assembly - Angle

Depth

NOTE: For this procedure, refer to FIGURE 7.3.

1. Remove the quick release pin that secures the footboard assembly to the wheelchair frame.

⚠ WARNING

Make sure the detent balls are engaged with the outer edge of the tube - otherwise, injury and/or damage may result.

2. Adjust footboard to one (1) of three (3) mounting positions.
3. Install the quick release pin. Make sure the detent balls are engaged with the outer edge of the tube (Detail "A" of FIGURE 7.3).

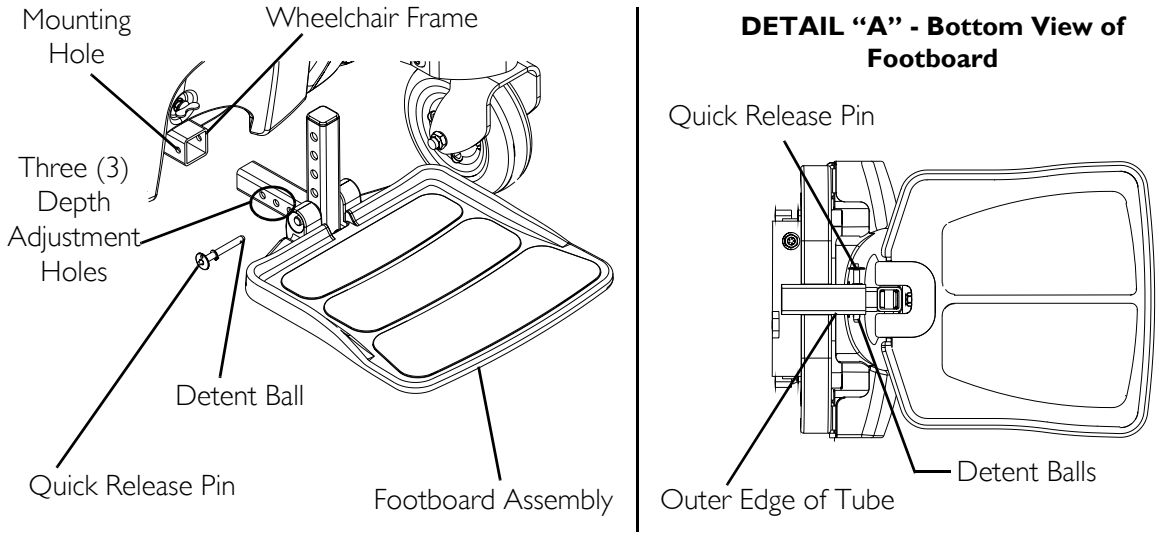


FIGURE 7.3 Adjusting the Footboard Assembly - Depth

SECTION 8—WHEELS

⚠ WARNING

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

Before performing any maintenance, adjustment or service verify that ON/OFF switch on the joystick is in the OFF position.

Replacing the Front/Rear Casters

NOTE: For this procedure, refer to FIGURE 8.1.

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

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

1. Remove the mounting screw, two (2) washers and locknut that secure the caster to the fork.
2. Remove the caster and discard.
3. Secure new caster to fork with existing mounting screw, two (2) washers and locknut. Securely tighten.

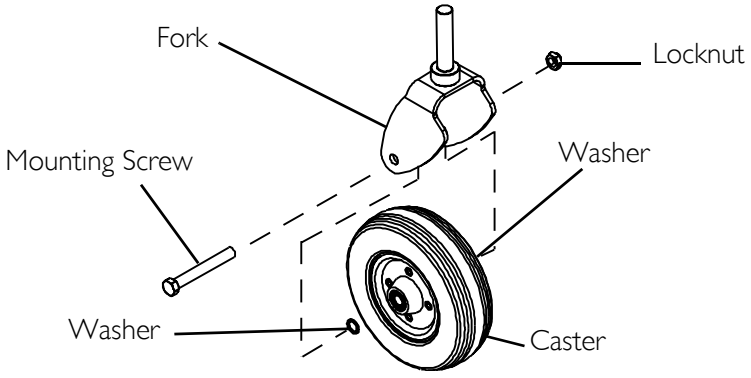


FIGURE 8.1 Replacing the Front/Rear Casters

Adjusting Caster Assembly

NOTE: For this procedure, refer to FIGURE 8.2.

1. Lift front edge of the dust cover up and remove from head tube.
2. To properly tighten caster assembly and guard against flutter, perform the following check:

NOTE: Two (2) people are recommended to perform this STEP - one (1) to tip wheelchair back and one (1) to inspect/adjust the caster assembly.

   A. Tip back the wheelchair.

   B. Pivot both caster assemblies to top of their arc simultaneously.

   C. Let casters drop to bottom of arc (casters should swing once to on -side, then immediately rest in a straight downward position).

   D. Adjust locknuts according to freedom of caster swing.

3. Test wheelchair for maneuverability.
4. Readjust locknuts if necessary, and repeat STEPS 2-3 until correct.
5. Snap dust cover into the caster headtube, ensuring that the tabs are under the plastic side shrouds.

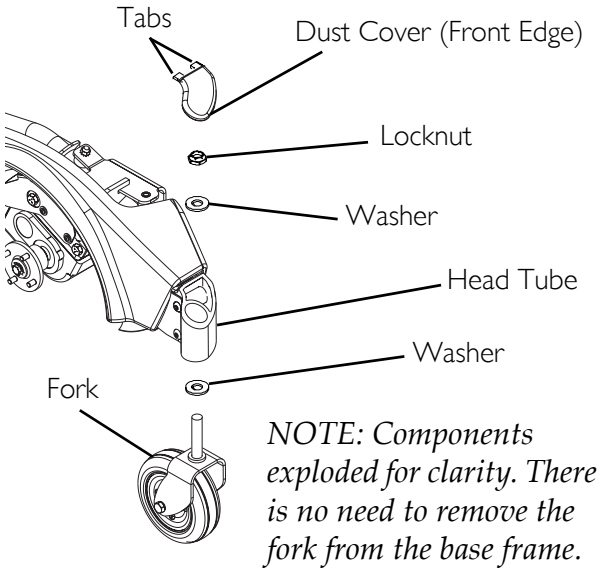


FIGURE 8.2 Adjusting Caster Assembly

Removing/Installing the Front/Rear Caster Assemblies

NOTE: For this procedure, refer to FIGURE 8.3.

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

Removing

1. Remove the dust cover.
2. Remove locknut and two (2) washers securing caster assembly to the headtube.

Installing

1. Insert threaded post of caster assembly into headtube.
2. Using locknut and two (2) washers, secure caster assembly to head tube.
3. Snap dust cover into the headtube.

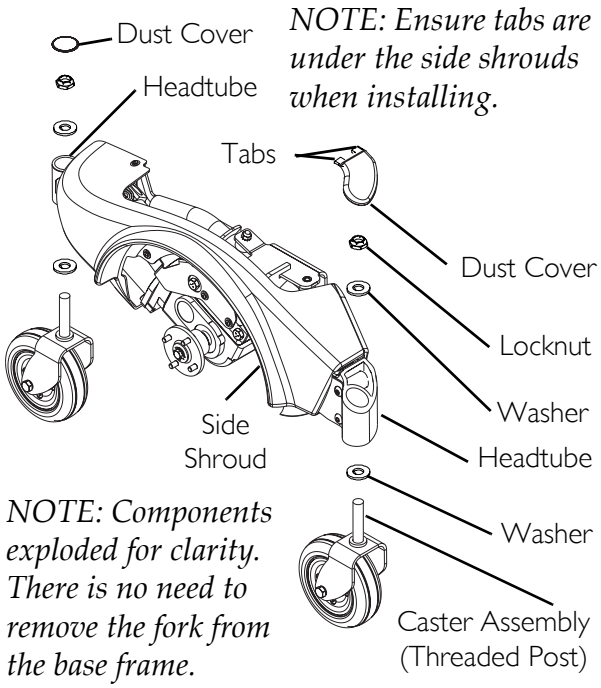


FIGURE 8.3 Removing/Installing the Front/Rear Caster Assemblies

Removing/Installing the Front Headtube Assembly

NOTE: For this procedure, refer to FIGURE 8.4.

NOTE: Take note of position and orientation of headtube and mounting hardware for installation.

NOTE: Reverse this procedure to install the front headtube assembly.

1. Remove the dust cover.
2. Remove the two (2) top mounting screws and bushings that secure the headtube to the walking beam.
3. Remove the two (2) bottom mounting screws and bushings that secure the head tube to the pivot tube.
4. Remove the headtube from the walking beam and pivot tube.

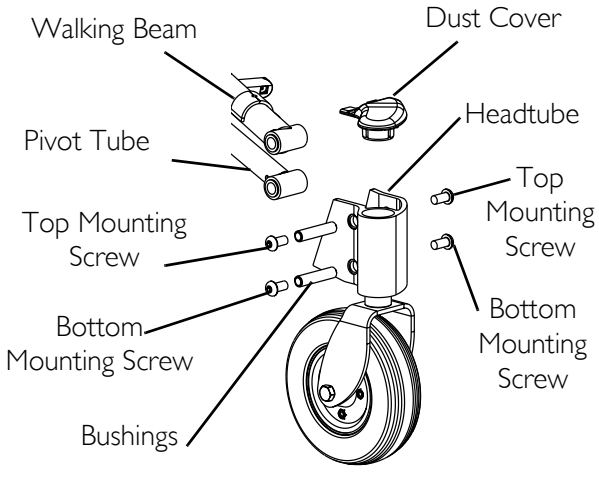


FIGURE 8.4 Removing/Installing the Front Headtube Assembly

Removing/Installing the Drive Wheel

NOTE: For this procedure, refer to FIGURE 8.5.

⚠ WARNING

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.

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.

△ CAUTION

Perform the following procedure in a designated work area to prevent damage to flooring (carpeting, tile, etc.).

Removing

1. Remove the four (4) beveled hex nuts that secures the drive wheel assembly to the wheel hub.
2. Remove existing drive wheel assembly from wheel hub.

Installing

1. Reinstall new/existing drive wheel assembly onto the wheel hub and torque the four (4) beveled hex nuts to 160-inch pounds.
2. Repeat procedure for opposite side of wheelchair, if necessary.

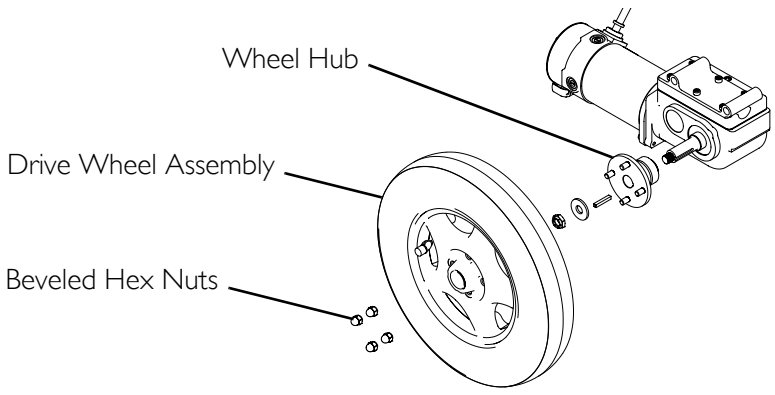


FIGURE 8.5 Removing/Installing the Drive Wheel

Removing/Installing the Drive Wheel Hub

NOTE: For this procedure, refer to FIGURE 8.6.

Removing

1. Remove the drive wheel from the wheelchair. Refer to Removing/Installing the Drive Wheel on page 67.
2. Remove hub and mounting hardware. Perform one (1) of the following:
   - All M91 300 lbs Limit Wheelchairs and 400 lbs Wheelchairs Built Before 12/19/03:
     i. Fold down tab of existing locking tab washer (Detail "A" of FIGURE 8.6).
     ii. Remove mounting bolt and locking tab washer (Detail "B" of FIGURE 8.6). Discard existing locking tab washer.
     iii. Remove the existing wheel hub and keystock from the drive shaft.
   - All M94 Wheelchairs and 400 lbs M91 Wheelchairs built after 12/19/03 - Remove locknut, washer, keystock and existing drive wheel hub from the drive shaft.

Installing

△ CAUTION

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

1. Apply a thin film of anti-seize compound 1-inch in length to the end of the drive shaft.
2. Reinstall drive wheel hub onto the drive shaft and spin the drive wheel hub to evenly distribute the anti-seize compound over the entire drive shaft.
3. Remove drive wheel hub from drive shaft.
4. Position the keystock on the drive shaft of the motor/gearbox assembly.
5. Reinstall drive wheel hub onto the drive shaft of the motor/gearbox assembly.
6. To secure the wheel hub to the drive shaft, perform one (1) of the following:
   - All M91 300 lbs Wheelchairs and 400 lbs Wheelchairs Built Before 12/19/03:

⚠ WARNING

Failure to properly install locking tab washer can result in wheel separation and potential user injury or property damage. When replacing wheels always use a new locking tab washer. DO NOT reuse locking tab washers.

     i. The locking tab of the locking tab washer MUST be inserted into the hub cutout (Detail "B" of FIGURE 8.6).

ii. Using the mounting bolt, washer and new locking tab washer, secure the wheel to the drive shaft (Detail "B" of FIGURE 8.6).

iii. Fold one (1) tab of the locking tab washer UP so that the tab rests against one side of the mounting bolt (Detail "A" of FIGURE 8.6)

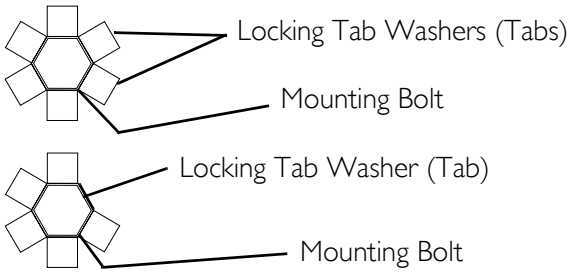
- All M94 Wheelchairs and 400 lbs M91 Wheelchairs built after 12/19/03 - Reinstall the washer and locknut and torque locknut to 45 ft-lbs (540 in-lbs).

7. Reinstall the drive wheel assembly to the wheelchair. Refer to Removing/Installing the Drive Wheel on page 67.
8. Repeat procedure for the opposite side of the wheelchair, if necessary.

M91 Wheel Hub Hardware for all 300 lbs Limit Wheelchairs and 400 lbs Wheelchairs Built Before 12/19/03

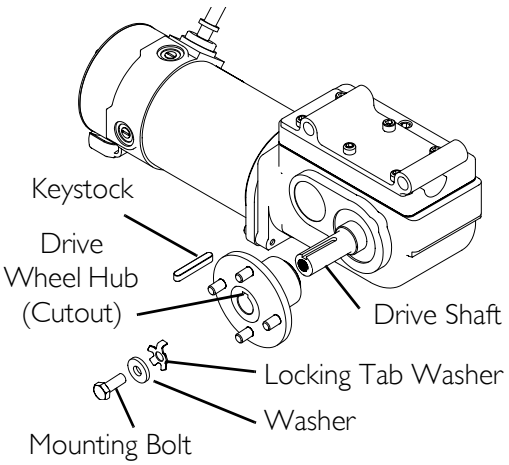
DETAIL "A"

NOTE: Locking tab washer shown with all tabs folded DOWN to remove/install the mounting bolt.



NOTE: Locking tab washer shown with one (1) tab folded UP to secure the mounting bolt.

DETAIL "B"



All M94 Wheelchairs and 400 lbs Limit M91 Wheelchairs built after 12/19/03

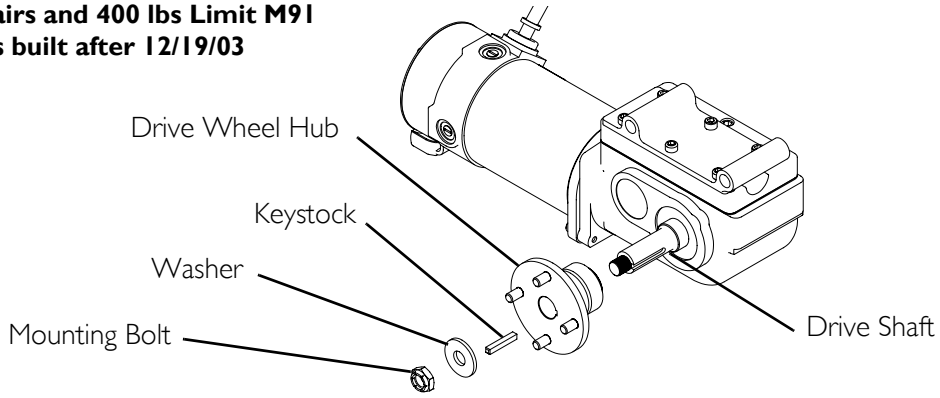


FIGURE 8.6 Removing/Installing the Drive Wheel

Replacing the 2-Piece Wheel Rim and/or the Foam Filled or Pneumatic Tires

NOTE: For this procedure, refer to FIGURE 8.7.

NOTE: When replacing the 2-piece wheel rim, DO NOT remove tire. Replacement 2-piece wheel rims are shipped assembled with a new tire. Refer to Removing/Installing the Drive Wheel on page 67 to remove the existing drive wheel and install the new 2-piece wheel rim and tire.

⚠ WARNING

When replacing the hub of a pneumatic tire, ALWAYS deflate tire before removing/installing hub - otherwise, injury or damage may occur. Failure to observe this warning can result in sudden, violent rim separation and possible injury.

1. Remove drive wheel from wheelchair. Refer to Removing/Installing the Drive Wheel on page 67.
2. Deflate existing pneumatic tire.
3. Remove the five (5) existing mounting screws that secure the existing outer rim and inner rim.
4. Separate the two (2) halves of the rim and remove the existing tire. Discard existing tire.

NOTE: When installing the NEW pneumatic tire, if necessary, place the inner tube into the tire.

NOTE: When installing the outer rim into a pneumatic tire, ensure the valve stem of the inner tube protrudes through the stem opening in the outer rim.

5. Insert the outer rim and inner rim into the new/existing tire.
6. Using the five (5) existing mounting screws secure the outer rim to the inner rim and hub. Torque mounting screws to 160-200 in-lbs.
7. If pneumatic, fill tire to correct air pressure as noted on tire side wall.
8. Reinstall the drive wheel onto the wheelchair. Refer to Removing/ Installing the Drive Wheel on page 67.

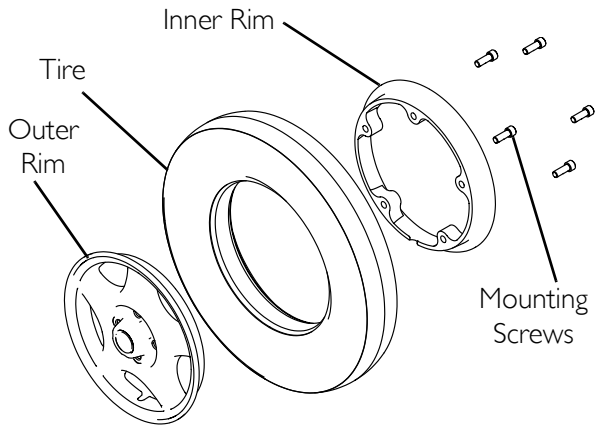


FIGURE 8.7 Replacing the 2-Piece Wheel Rim and/or the Foam Filled or Pneumatic Tires

SECTION 9—SHROUDS/FRAME

⚠ WARNING

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

Before performing any maintenance, adjustment or service verify that ON/OFF switch on the joystick is in the OFF position.

Removing/Installing the Shrouds

NOTE: For this procedure, refer to FIGURE 9.1.

⚠ WARNING

To prevent cracking the plastic shroud material, DO NOT overtighten the mounting screws.

NOTE: Reverse this procedure to install the shrouds.

1. Disconnect the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
2. Remove or tilt the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
3. Perform one (1) of the following:
   - Top Shroud - Lift up on rear edge of top shroud to release the four (4) hook and loop strips that secure the top shroud to the base frame.
   - Right and Left Side Shroud -
     i. Remove the drive wheel. Refer to Removing/Installing the Drive Wheel on page 67.
     ii. Remove the five (5) mounting screws that secure the shroud to the side frame assembly and remove side shroud from side frame.

NOTE: Shorter mounting screws are used to secure the top rear of side shrouds (Detail "A" of FIGURE 9.1).

- Shroud Plate - Remove the two (2) mounting screws and washers securing the shroud plate to the side frame assembly (Detail "A" of FIGURE 9.1) and remove shroud plate from side frame.
- Front Shroud - Remove the two (2) mounting screws that secure the front shroud to the base frame (Detail "B" of FIGURE 9.1) and remove front shroud from the base frame.

- Rear Shroud - M91 Before 7/14/03 - Perform the following:

NOTE: The rear shroud on the M91 built before 7/14/03 can be opened and closed with out being removed from the wheelchair. The rear shroud should be removed only if being replaced. To open the rear shroud refer to STEP ii below.

i. Open rear shroud by turning the knob 90° until detent catch is felt, then slide rear shroud toward the rear casters and lift top edge away from the rear of the wheelchair frame (Detail "C" of FIGURE 9.1).

ii. Grasp the bottom edges of the rear shroud sides.

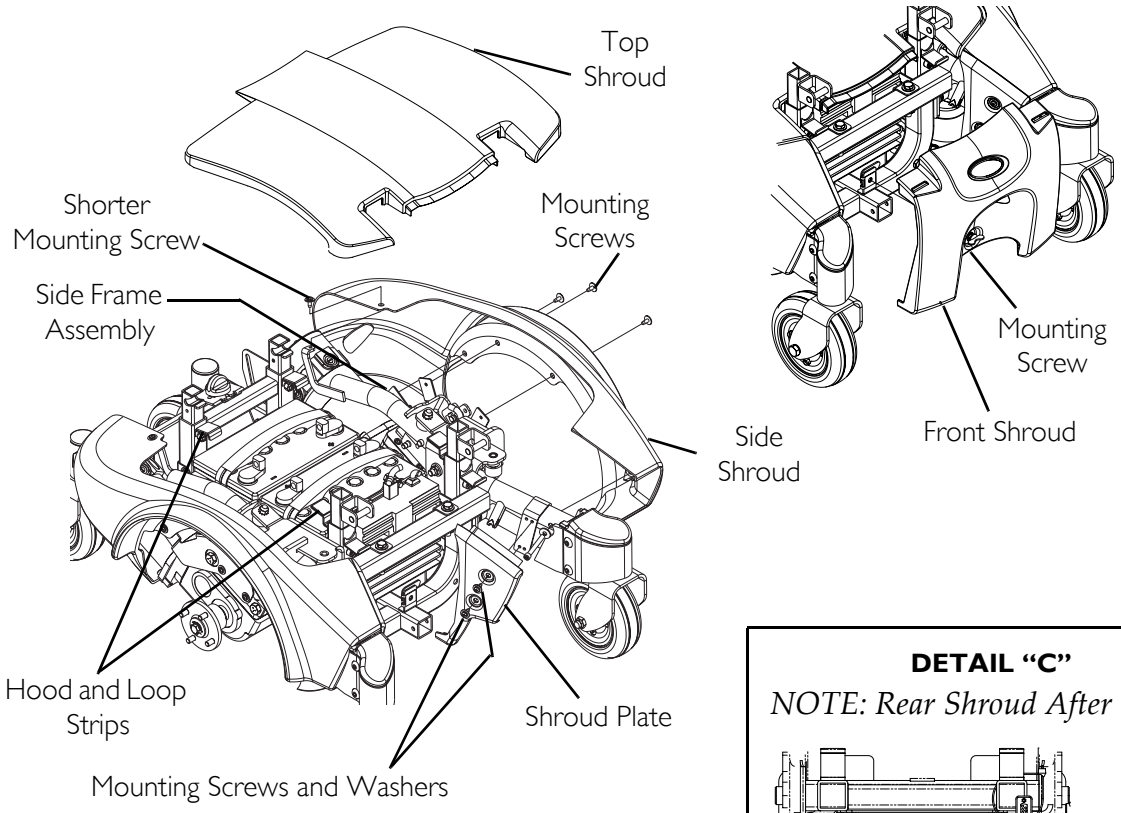
iii. Gently pull the rear shroud sides away from the channels in the rear frame until the rear shroud mounting pins are clear of the wheelchair frame and remove the rear shroud from the wheelchair frame.

- Rear Shroud - M91 After 12/18/03 and M94 Wheelchairs - Perform the following:

i. Remove the two (2) mounting screws and locknuts securing the charger port to the rear shroud.

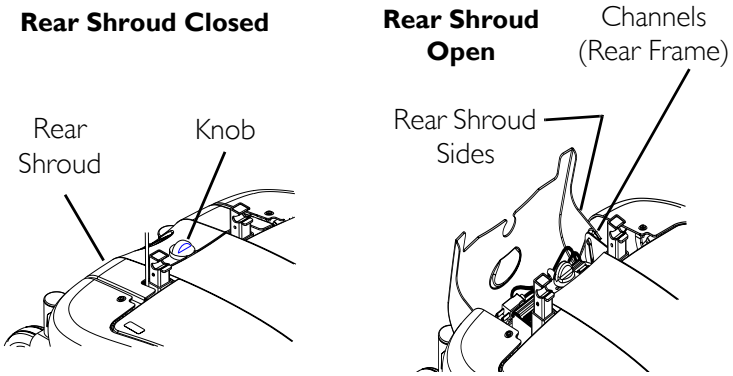
ii. Remove the mounting bolt and washer securing the rear shroud to the base frame and remove rear shroud from base frame (Detail "C" of FIGURE 9.1).

DETAIL "A" - Top Shroud, Side Shrouds, Shrouds Plates and Front Shroud



DETAIL "B"

NOTE: Rear Shroud Before 7/14/03.



DETAIL "C"

NOTE: Rear Shroud After 7/14/03.

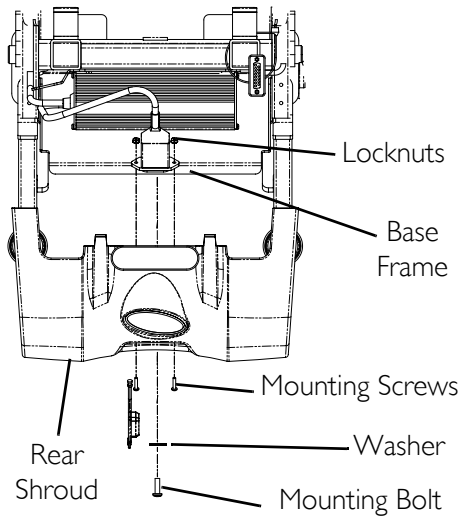


FIGURE 9.1 Removing/Installing the Shrouds

Removing/Installing the Pivot Tube

NOTE: For this procedure, refer to FIGURE 9.2.

NOTE: Reverse this procedure to reassemble the side frame.

1. Remove the side shroud and shroud plate. Refer to Removing/Installing the Shrouds on page 71.
2. Remove the front head tube assembly. Refer to Removing/Installing the Front Headtube Assembly on page 48.
3. Remove the locknut and spacer securing the pivot tube to the mounting pin.

NOTE: Two nylon bushings are located in each end of the pivot tube.

4. Remove the pivot tube from the lower mounting pin.

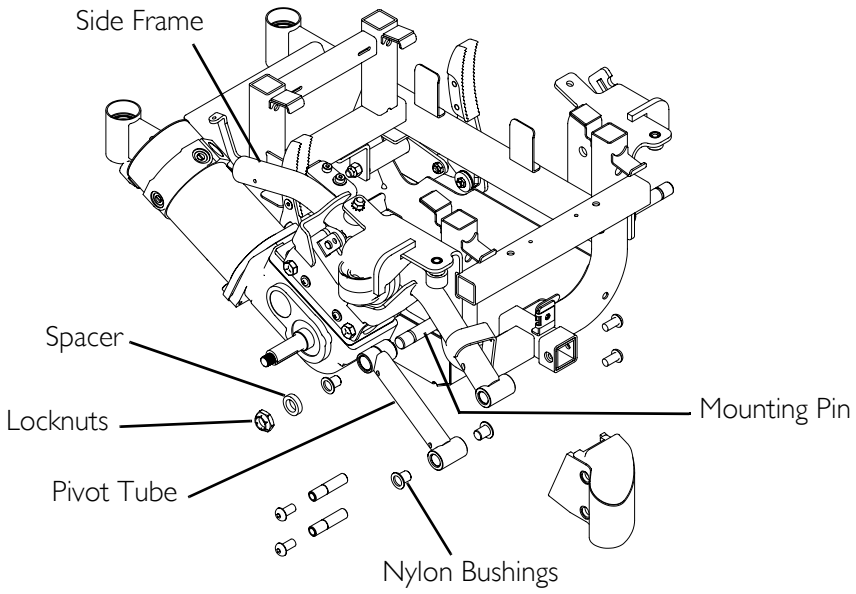


FIGURE 9.2 Removing/Installing the Pivot Tube

Removing/Installing the Walking Beam and/or SureStep Springs

⚠ WARNING

Replacement of the walking beam and or the SureStep spring MUST be performed by Invacare service personnel ONLY - otherwise injury or damage may result.

Removing/Installing the Stability Lock Assembly and/or Swing Arm

NOTE: For this procedure, refer to FIGURE 9.3.

NOTE: Take note of position and orientation of the stability lock, swing arm and mounting hardware before removal.

Removing

1. Remove the batteries. Refer to Installing/Removing the Batteries on page 83.
2. Remove the side shroud. Refer to Removing/Installing the Shrouds on page 71.
3. Remove the motor. Refer to Removing/Installing the Motor on page 78.
4. Remove the two (2) mounting screws securing the pivot rack to the pivot link.
5. Remove the pivot rack from the pivot link.
6. Remove the front mounting screw, two (2) nylon washers, O-ring, cupped washer, locknut securing the pivot link to the wheelchair frame mounting hole.
7. Remove the shoulder screw and locknut securing the pivot link to the swing arm mounting hole.
8. Perform one (1) of the following:
   - Removing the Stability Lock Assembly Hardware ONLY -
     i. Remove the two (2) shoulder screws and one (1) washer securing the motor rack to the walking beam.
     ii. Remove the motor rack from the walking beam.
   - Removing the Swing Arm -
     i. Remove the long shoulder screw and locknut securing the swing arm to the wheelchair frame.
     ii. Remove the swing arm from the wheelchair frame.
9. Repeat STEPS 2-7 on opposite side of wheelchair.

Installing

1. Perform one (1) of the following:
   - Installing the Stability Lock Assembly ONLY -
     i. Ensure compression spring is positioned in the middle hole of the motor rack.
     ii. Align the motor rack under the walking beam (Detail “A”).
     iii. Using two (2) shoulder screws and one (1) washer, secure the motor rack to the walking beam.

- Installing the Swing Arm -
  i. Align swing arm with wheelchair frame.
  ii. Insert long shoulder screw through swing arm and wheelchair frame and secure using a locknut. Securely tighten.

2. Align pivot link front mounting hole with wheelchair frame mounting hole.
3. Using the front mounting screw, two (2) nylon washers, O-ring, cupped washer and locknut, secure the pivot link to the wheelchair frame.
4. Using the shoulder screw and locknut, secure the pivot link to the swing arm mounting hole.
5. Align the pivot rack from the pivot link.
6. Using two (2) mounting screws secure the pivot rack to the pivot link.
7. Install the motor. Refer to Removing/Installing the Motor on page 78.
8. Install the side shroud. Refer to Removing/Installing the Shrouds on page 71.
9. Repeat STEPS 1-8 on opposite side of wheelchair.
10. Install the batteries. Refer to Installing/Removing the Batteries on page 83.

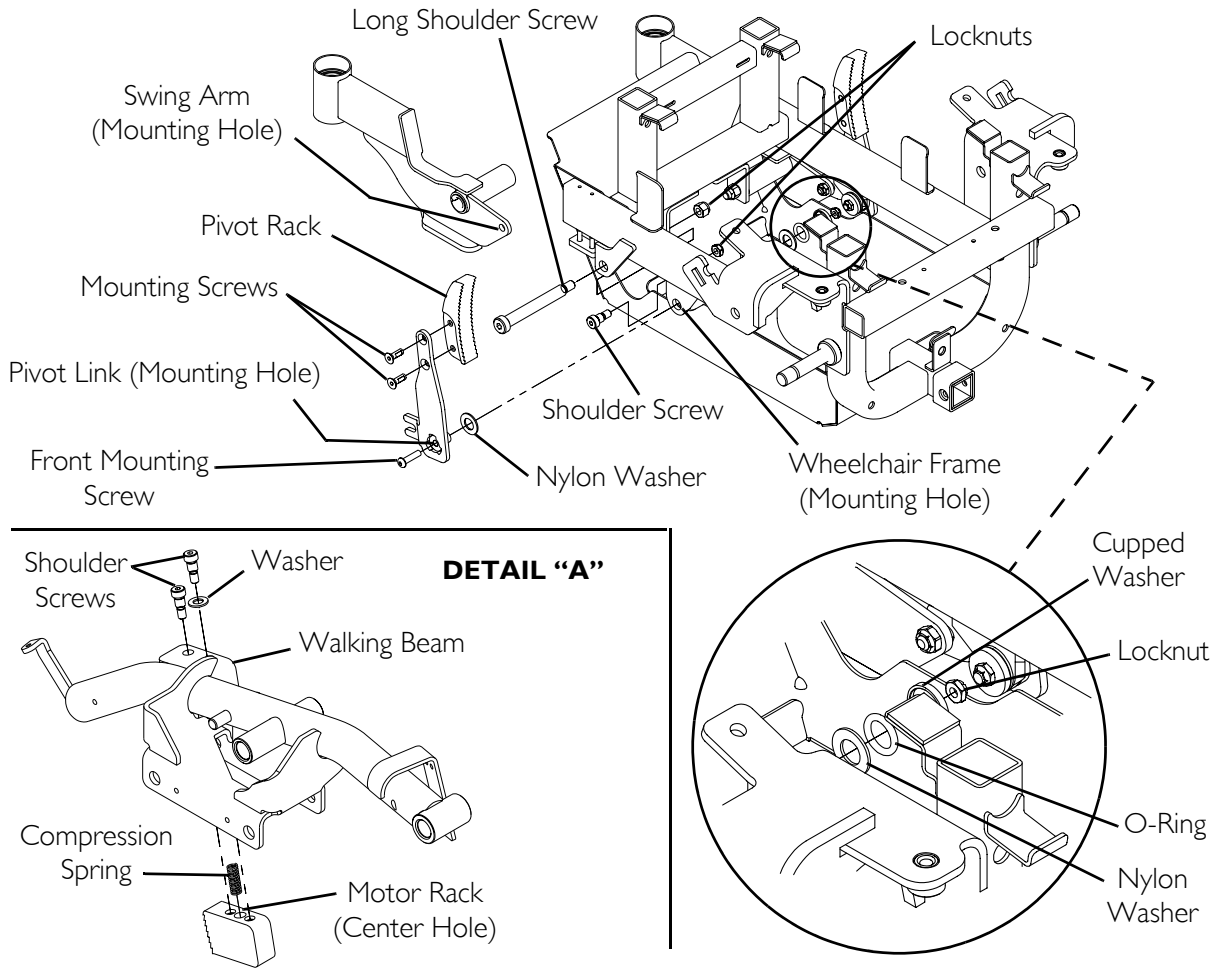


FIGURE 9.3 Removing/Installing the Stability Lock Assembly and/or Swing Arm

SECTION 10—MOTORS

⚠ WARNING

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

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

Engaging/Disengaging Motor Release Lever

⚠ WARNING

DO NOT engage or disengage the motor release lever until the On/Off switch on the joystick is in the OFF position.

△ CAUTION

Ensure both motor release levers are fully engaged BEFORE driving the wheelchair

NOTE: For this procedure, refer to FIGURE 10.1.

NOTE: The motor release lever disengagement/engagement allows freewheeling or joystick controlled operation. Freewheeling allows an attendant to maneuver the wheelchair without power.

1. Locate the motor release levers on the motors protruding through the shrouds by the rear springs.
2. Perform one (1) of the following:
   - To disengage the motor release levers -

     NOTE: This allows the chair to freewheel for pushing if necessary

     i. Slide the motor release lever towards the outside of the wheelchair (free wheel position) (Detail "A" of FIGURE 10.1).
   - To engage the motor release levers -

     NOTE: This allows the motors to drive the wheels.

     i. Slide the motor release lever towards the center of the wheelchair (drive position) (Detail "A" of FIGURE 10.1).

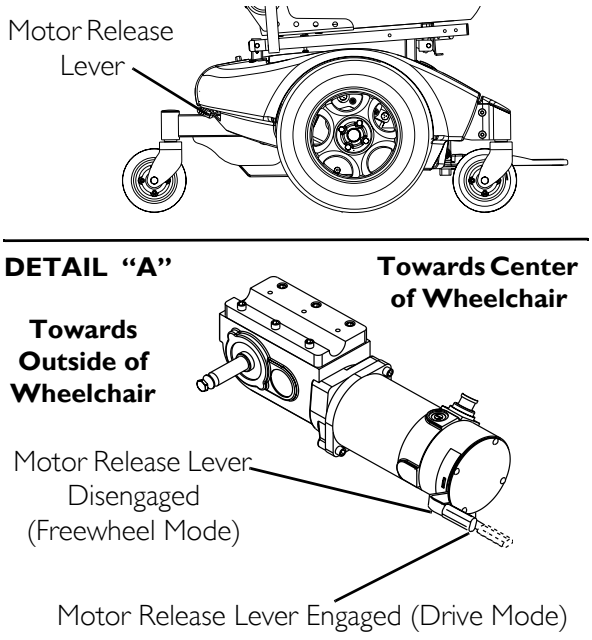


FIGURE 10.1 Engaging/Disengaging Motor Release Lever

Removing/Installing the Motor

NOTE: For this procedure, refer to FIGURE 10.2.

NOTE: Reverse this procedure to install the motor.

NOTE: Removing the drive wheel, while not necessary (unless replacing the motor), may improve access to the motor. Refer to Removing/Installing the Drive Wheel on page 67.

1. Remove the seat. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
2. Remove the side shroud. Refer to Removing/Installing the Shrouds on page 59.
3. Disconnect the motor lead (not shown).

NOTE: Long mounting screws are used on the same side of the motor as the drive shaft.

4. Remove the two (2) motor release pins securing the motor plate to the walking beam and remove the motor assembly from the walking beam.
5. Remove the three (3) long mounting screws and three (3) short mounting screws securing the motor to the motor plate (FIGURE 10.2).
6. If necessary, repeat STEPS 2-5 for the motor on the other side.

NOTE: Drive wheel not shown.

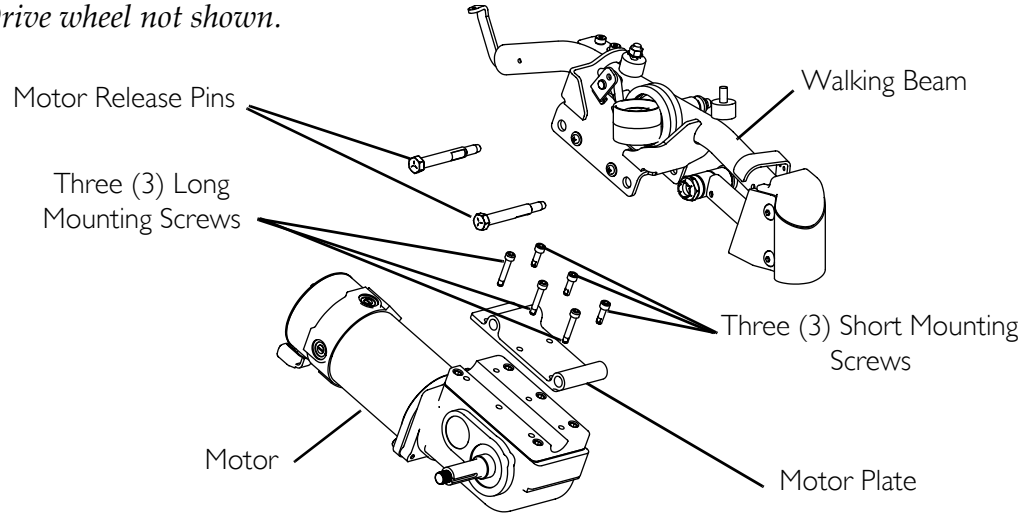


FIGURE 10.2 Removing/Installing the Motor

Inspecting/Replacing Motor Brushes

NOTE: For this procedure, refer to FIGURE 10.3.

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. Turn power off.
2. Remove the motor. Refer to Removing/Installing the Motor on page 78.

NOTE: There are four (4) motor brushes on M91/M94 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.

3. Remove the brush cap securing the motor brush into the motor housing.
4. Remove the motor brush and perform the following:
   A. Inspect the commutator (not shown) for damage.
   B. Inspect the motor brush thoroughly for excessive wear or chips in the brush and perform one (1) of the following:
      - If motor brush is in good condition, (i.e., the end of the brushes are smooth and shiny), reinstall existing brush.
      - If motor brush is in bad condition, brush is worn or damaged, discard immediately and install new brush.
5. Reinstall motor brush and brush cap into the motor housing.
6. Repeat STEPS 3-5 until all four (4) motor brushes have been inspected/replaced.
7. Reinstall the motor. Refer to Removing/Installing the Motor on page 78.

   NOTE: Repeat STEPS 2-7 for the opposite motor.

8. If new motor brush was installed, perform the following process:

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

   NOTE: 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.

⚠ WARNING

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

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

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

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

B. Run the motors forward for one (1) hour.

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

D. Run the motors in reverse for one (1) hour.

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

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

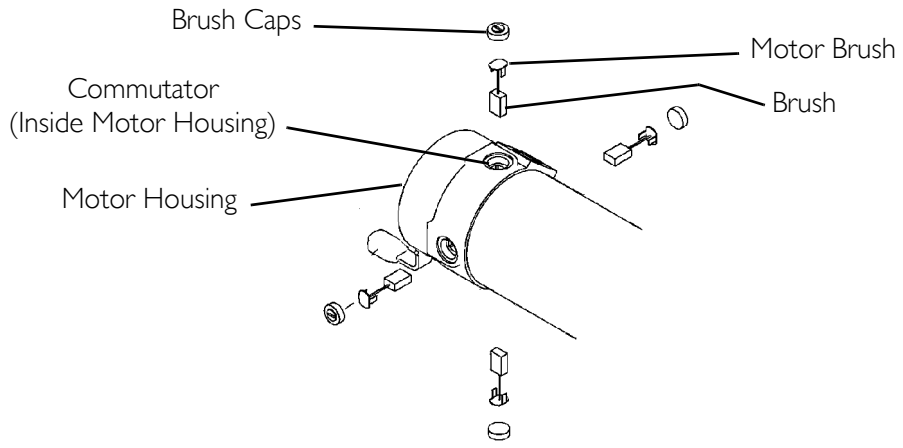


FIGURE 10.3 Inspecting/Replacing Motor Brushes

Electro-Mechanical Parking Brake Testing

NOTE: For this procedure, refer to FIGURE 10.4.

1. On the four-pin motor connector, locate the side-by-side connectors in the black housings (FIGURE 10.4).
2. Set the digital multimeter to read ohms (Ω).
3. Measure the resistance between the two (2) brake contacts. A normal reading is between 45-100 ohms depending on the motor. A reading of 0 ohms (Ω) 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.

⚠ WARNING

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

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

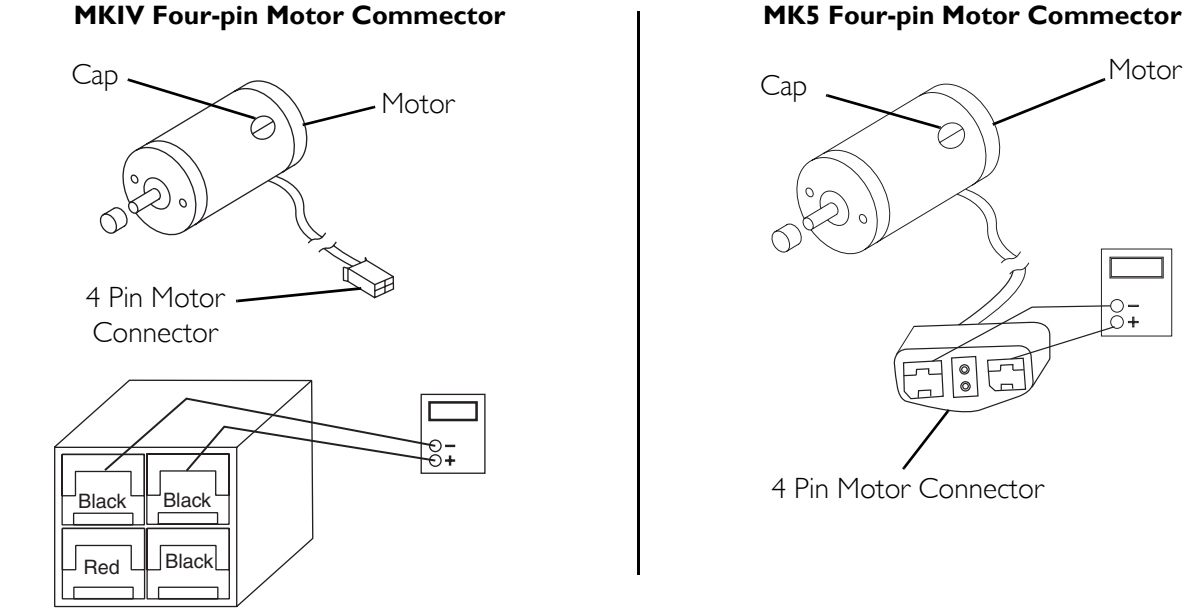


FIGURE 10.4 Electro-Mechanical Parking Brake Testing

SECTION 11—BATTERIES

⚠ WARNING

Before performing any maintenance, adjustment or service verify that On/Off switch on the joystick is in the OFF position.

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 chemical goggles and face shield is recommended when working with batteries.

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.

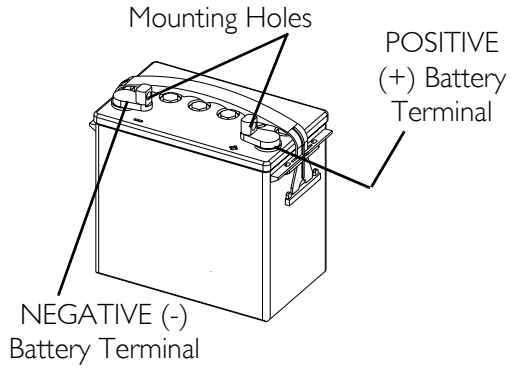
Invacare strongly recommends that battery installation and battery replacement always be done by a qualified technician.

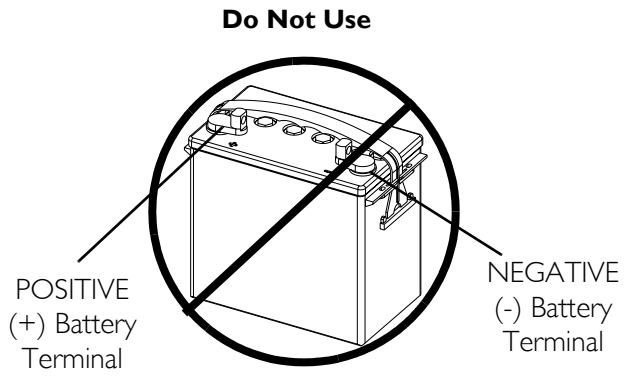
After ANY adjustments, repair or service and BEFORE use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Battery terminal configuration shown below MUST be used. Batteries that have the reversed terminal configuration MUST NOT be used - otherwise serious injury or damage may occur.

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

All battery terminal covers (two [2] on the front battery and two [2] on the rear battery) MUST be installed prior to use.





⚠ 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 FIGURE 11.3 - otherwise damage to the battery may result.

For proper battery connection, batteries MUST use post style terminals with mounting holes through the terminal.

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

Installing/Removing the Batteries

NOTE: For this procedure, refer to FIGURE 11.1 and FIGURE 11.2.

NOTE: Have the following tools available:

TOOL	QTY	COMMENTS
Battery Lifting Strap	1	Supplied
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: Wheelchairs with MKIV Electronics: Wiring harness used with the front battery has two (2) connectors, one (1) to the rear battery wiring harness and one (1) to the Controller cable.

NOTE: Wheelchairs with MKIV Electronics: Wiring harness used with the rear battery has one (1) connector to the front battery wiring harness.

NOTE: Wheelchairs with MK5™ Electronics: The front battery has three (3) connectors - two (2) to the rear battery wiring harness (RED and BLACK) and one (1) to the controller cable (RED), and the rear battery has two (2) connectors (RED and BLACK) to the front battery wiring harness.

Installing Batteries

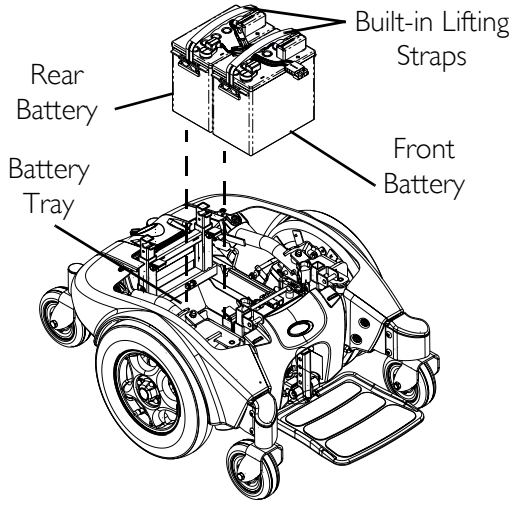
1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick On/Off switch is in the OFF position and disconnect joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
3. Remove or tilt back the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
4. Remove the top shroud. Refer to Removing/Installing the Shrouds on page 71.

5. If necessary, disconnect right and left motor leads to allow access to the front of the battery tray.
6. Move aside the motor leads and controller cable to allow unobstructed access to the front of the battery tray.

NOTE: Perform this section on one (1) battery at a time starting with the rear battery. Repeat STEP 6 to position the remaining battery into the battery tray.

7. Perform one (1) of the following to position the battery into the battery tray:
   - Batteries With Built In Lifting Strap - Use built in lifting strap to position battery into the battery tray (Detail "A" of FIGURE 11.1).
   - Batteries Without Built In Lifting Strap - Use the battery lifting strap to position battery into the battery tray. When battery is in proper position, remove lifting strap (Detail "B" of FIGURE 11.1).
8. Using the battery retaining strap, secure the two (2) batteries into the battery tray.
9. If necessary, connect the wiring harness to the two (2) batteries. Refer to Connecting/Disconnecting the Battery Wiring Harness on page 86.
10. Reconnect right and left motor leads to allow access to the FRONT of the battery tray, if disconnected in STEP 5.

DETAIL "A" - Batteries with built-in lifting straps



DETAIL "B" - Batteries without built-in lifting straps

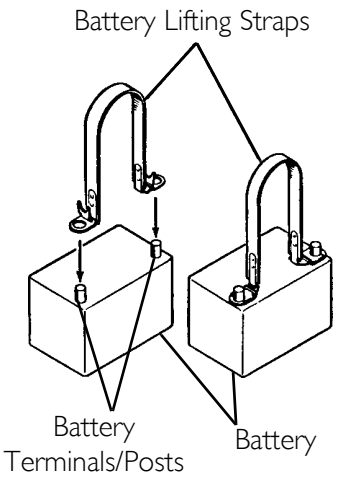
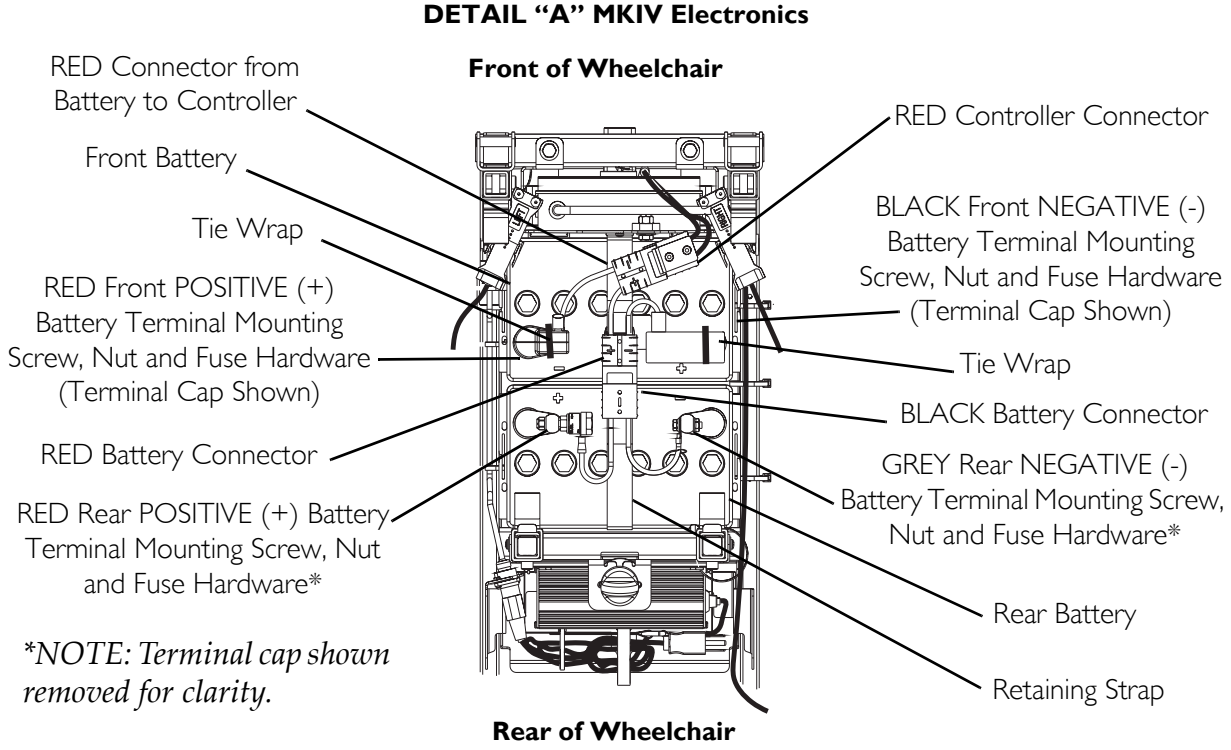


FIGURE 11.1 Batteries with/without Lifting Straps

11. Connect the front battery to the controller (RED connector). Refer to FIGURE 11.2.
12. Connect the rear battery to the front battery (RED and BLACK connectors). Refer to FIGURE 11.2.
13. Reinstall the top shroud. Refer to Removing/Installing the Shrouds on page 71.
14. Install or tilt forward the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
15. Connect the joystick. Refer to Disconnecting/Connecting the Joystick on page 92.

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

16. If necessary, charge the battery(ies). Refer to owner's manual shipped with wheelchair.



*NOTE: Terminal cap shown removed for clarity.

FIGURE 11.2 Installing/Removing the Batteries

Removing Batteries

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick ON/OFF switch is in the OFF position and disconnect joystick. Refer to Disconnecting/Connecting the Joystick on page 92.
3. Remove or tilt back the seat assembly. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
4. Remove the top shroud. Refer to Removing/Installing the Shrouds on page 71.
5. If necessary, disconnect right and left motor leads to allow access to the front of the battery tray.
6. Disconnect the front battery from controller (RED connector). Refer to FIGURE 11.2.
7. Move aside the motor leads and controller cable to allow unobstructed access to the front of the battery tray.
8. Disconnect the rear battery from the front battery (RED and BLACK connectors). Refer to FIGURE 11.2.
9. If necessary, disconnect the wiring harness from batteries. Refer to Connecting/Disconnecting the Battery Wiring Harness on page 86.
10. Unfasten the retaining strap that secures the two (2) batteries in the battery tray.

NOTE: Perform this section on one (1) battery at a time starting with the FRONT battery. Repeat STEP 10 to remove remaining battery from battery tray.

11. Perform one (1) of the following to remove the battery from the battery tray:
    - Batteries With Built-in Lifting Strap- Use built in lifting strap to remove the battery from the battery tray (Detail "A" of FIGURE 11.1).
    - Batteries Without Built-in Lifting Strap- Use the battery lifting strap to remove the battery from the battery tray (Detail "B" of FIGURE 11.1).

Connecting/Disconnecting the Battery Wiring Harness

NOTE: For this procedure, refer to FIGURE 11.3.

NOTE: Perform this section on one (1) battery at a time starting with the front battery.

NOTE: Wheelchairs with MKIV™ Electronics: Wiring harness used with the front battery has two (2) connectors; one (1) to the rear battery wiring harness and one (1) to the Controller cable.

NOTE: Wheelchairs with MKIV™ Electronics: Wiring harness used with the rear battery has one (1) connector to the front battery wiring harness.

NOTE: Wheelchairs with MK5 Electronics: The front battery has three (3) connectors - two (2) to the rear battery wiring harness (RED and BLACK) and one (1) to the controller cable (RED), and the rear battery has two (2) connectors (RED and BLACK) to the front battery wiring harness.

NOTE: Both the front and rear wiring harnesses are shipped with the POSITIVE (+) RED battery cable and mounting screw connected. Use the exposed, threaded portion of the mounting screw to secure the POSITIVE (+) RED cable to the POSITIVE (+) terminal.

⚠ WARNING

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

All battery terminal covers (two [2] on the front battery and two [2] on the rear battery) MUST be installed prior to use.

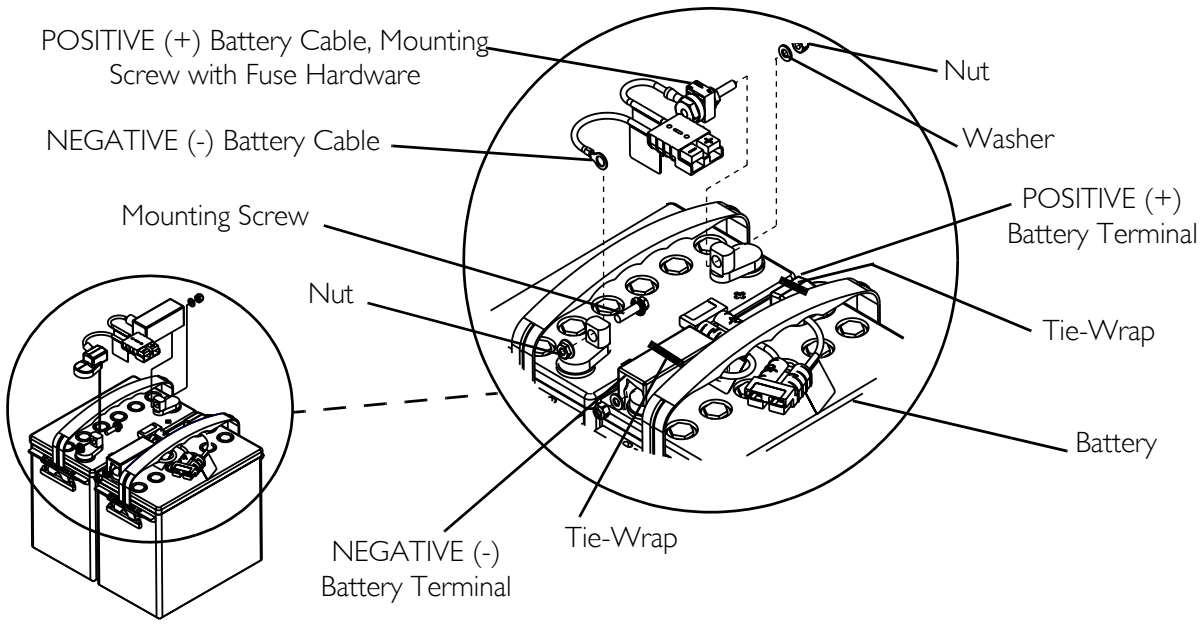
Connecting

1. Peel back RED battery terminal cover to expose RED battery cable connection to battery terminal.
2. Peel back BLACK battery terminal cover from BLACK battery cable on front battery or GREY battery terminal cover from BLACK battery cable on rear battery.
3. Using the mounting screw and nut, secure the NEGATIVE (-) BLACK battery cable to NEGATIVE (-) battery terminal/post as shown in FIGURE 11.3.
4. Using the mounting screw washer and nut, secure the POSITIVE (+) RED battery cable to POSITIVE (+) battery terminal/post.
5. Verify wiring harness is correctly installed and securely tightened.
6. Verify proper battery orientation.
7. Reposition battery terminal covers over battery post(s).
8. Using new tie-wraps, secure the terminal covers to the battery terminals.
9. Repeat STEPS 1-8 to install and connect the rear battery to the rear battery harness.

Disconnecting

1. Remove the existing tie-wraps that secure the battery terminal covers to the battery terminals.
2. Peel back RED battery terminal cover to expose POSITIVE (+) battery cable connection to battery terminal.
3. Peel back BLACK battery terminal cover from NEGATIVE (-) BLACK battery cable on front battery or GREY battery terminal cover from NEGATIVE (-) battery cable on rear battery.
4. Remove the mounting screw, washer and nut that secure the POSITIVE (+) RED battery cable to the POSITIVE (+) battery terminal/post.
5. Remove the mounting screw and nut that secure the NEGATIVE (-) BLACK battery cable to the NEGATIVE (-) battery terminal/post.
6. Repeat STEPS 1-6 to disconnect the rear battery from the rear battery harness.

MKIV Electronics



MK5 Electronics

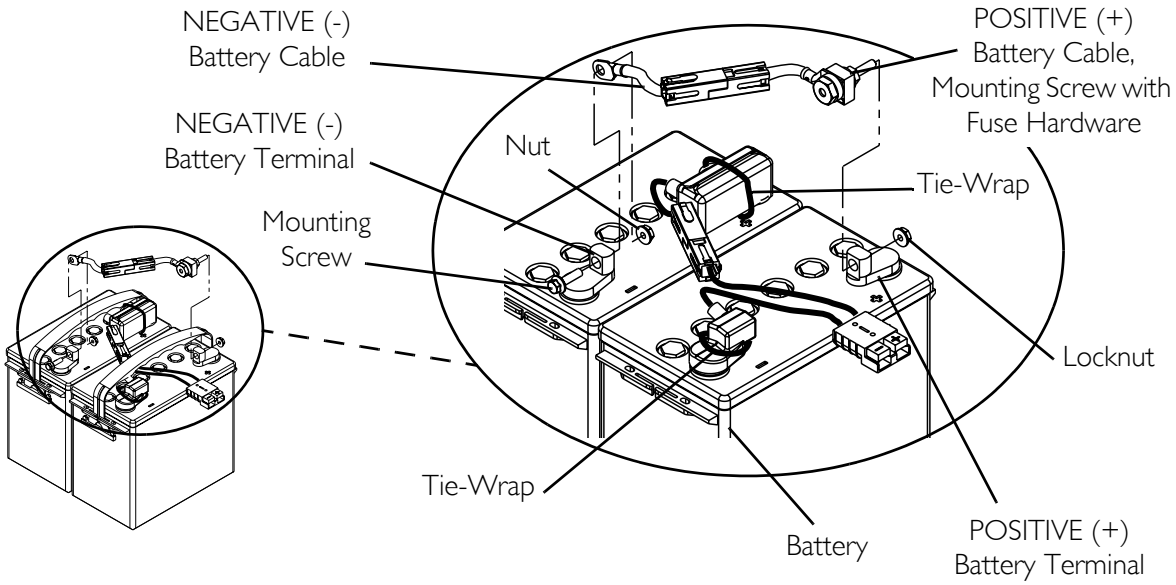


FIGURE 11.3 Connecting/Disconnecting the Battery Wiring Harness

Replacing the On-Board Battery Charger

⚠ WARNING

DO NOT replace the battery charger fuse with anything other than a 250V 6.3 Amp fuse. Otherwise, equipment damage and/or personnel injury may occur.

DO NOT attempt to remove the battery charger with power applied to the wheelchair. Otherwise, equipment damage and/or personal injury may occur.

NOTE: For this procedure, refer to FIGURE 11.4.

NOTE: On-board charger not used on wheelchairs equipped with a powered seating system.

NOTE: Take note of position and orientation of battery charger wires and tie-wraps for reinstallation.

NOTE: The output of the battery charger is fused with a 250V, 6.3 amp fuse. The fuse holder is located at the top of the charger as it is mounted to the wheel chair. This fuse should be checked first before replacing the battery charger for improper operation. Refer to Replacing the On-Board Battery Charger on page 89.

NOTE: Reverse this procedure to install the on-board battery charger.

1. Remove the batteries from the wheelchair. Refer to Installing/Removing the Batteries on page 83.
2. Remove the rear shroud. Refer to Removing/Installing the Shrouds on page 71.
3. Perform one (1) of the following:
   - M91 Before 12/19/03 (Detail "A" of FIGURE 11.4) -
     i. Open rear shroud by turning the knob 90° until detent catch is felt, then slide rear shroud toward the rear casters and lift top edge away from the rear of the wheelchair frame.
     ii. Disconnect the battery charger cable from the controller charger cable.
     iii. Release hook and loop strap securing charger to the wheelchair frame
   - M91 Built between 12/18/03 to 4/1/04 (Detail "A" of FIGURE 11.4) -
     i. Remove the rear shroud. Refer to Removing/Installing the Shrouds on page 71.
     ii. Disconnect the battery charger cable from the controller charger cable.
     iii. Release hook and loop strap securing charger to the wheelchair frame.

- M91 After 3/31/04 and M94 wheelchairs (Detail "B" of FIGURE 11.4) -
  i. Remove the front shroud. Refer to Removing/Installing the Shrouds on page 71
  ii. Remove the three (3) tie-wraps securing the charger cable to the wheelchair frame.
  iii. Disconnect the charger cable from the AUX port of the controller.
  iv. Remove the two (2) mounting screws securing the charger to the wheelchair frame.

4. Remove charger from wheelchair frame.
5. Place the new battery charger against the wheelchair frame.
6. Perform one (1) of the following:
   - M91 Before 12/19/03 (Detail "A" of FIGURE 11.4) -
     i. Using the hook and loop strap, secure the charger to the wheelchair frame.
     ii. Route the battery charger cable to the right side (from the rear of the wheelchair) of the battery charger body.
     iii. Connect the battery charger cable from the controller charger cable.
     iv. Close the rear shroud by tilting the rear shroud towards the wheelchair and push forward. Turn the knob 90° until detent is felt to lock rear shroud.
   - M91 Built between 12/18/03 to 4/1/04 (Detail "A" of FIGURE 11.4) -
     i. Using the hook and loop strap, secure the charger to the wheelchair frame.
     ii. Route the battery charger cable to the right side (from the rear of the wheelchair) of the battery charger body.
     iii. Connect the battery charger cable from the controller charger cable.
   - M91 After 1/31/04 and M94 wheelchairs (Detail "B" of FIGURE 11.4) -
     i. Using the two (2) mounting screws, secure the charger tot he wheelchair frame.
     ii. Connect the charger cable from the AUX port of the controller.
     iii. Route the battery charger cable to the left side wheelchair frame (from the rear of the wheelchair).
     iv. Using the three (3) new tie-wraps, secure the charger cable to the wheelchair frame.
     v. Connect the charger cable from the AUX port of the controller.
7. Using hook and loop strap provided, wrap the AC cord and secure to back of wheelchair.
8. If necessary, install the rear shroud. Refer to Removing/Installing the Shrouds on page 71.
9. Install the batteries. Refer to Installing/Removing the Batteries on page 83.

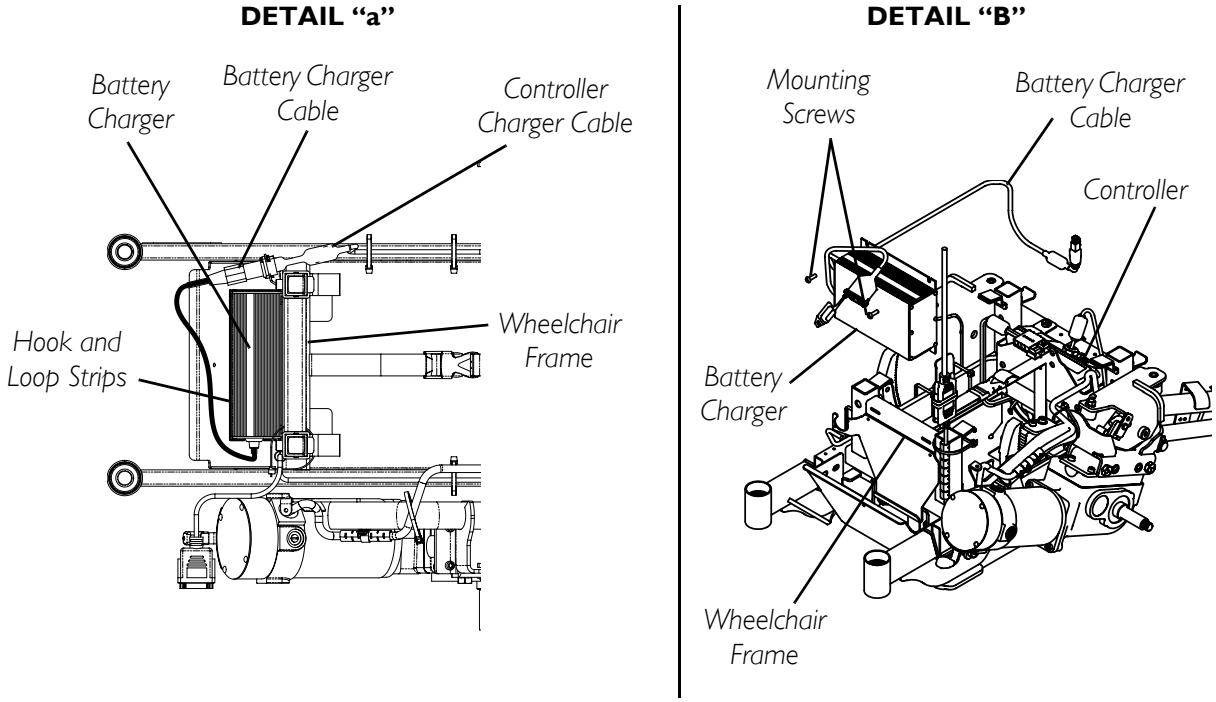


FIGURE 11.4 Replacing the On-Board Battery Charger

SECTION 12—ELECTRONICS

⚠ WARNING

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

Before performing any maintenance, adjustment or service verify that On/Off switch on the joystick is in the OFF position.

Disconnecting/Connecting the Joystick

NOTE: For this procedure, refer to FIGURE 12.1.

Disconnecting

MKIV RII/MK5 Joysticks

1. Loosen the thumb screws on the joystick connector.
2. Disconnect the joystick connector from the controller connector.

MKIV "A" Joystick

1. Loosen the threaded collar on the joystick connector.
2. Disconnect the joystick connector from the controller connecter.

Connecting

MKIV RII/MK5 Joysticks

1. Align the joystick connector with the controller connecter.
2. Secure the joystick connector to the controller connector using the thumb screws on the controller connector.

MKIV "A" Joystick

1. Align the joystick connector with the controller connecter.
2. Secure the joystick connector to the controller connector using the threaded collar on the controller connector.

⚠ WARNING

The excess joystick cable must be coiled, and tie-wrapped to the rear of the seat frame to ensure that cable does NOT become entangled or damaged during normal operation of seating system - otherwise injury or damage may result.

3. If necessary, coil and tie wrap excess joystick cable to rear of seat frame.

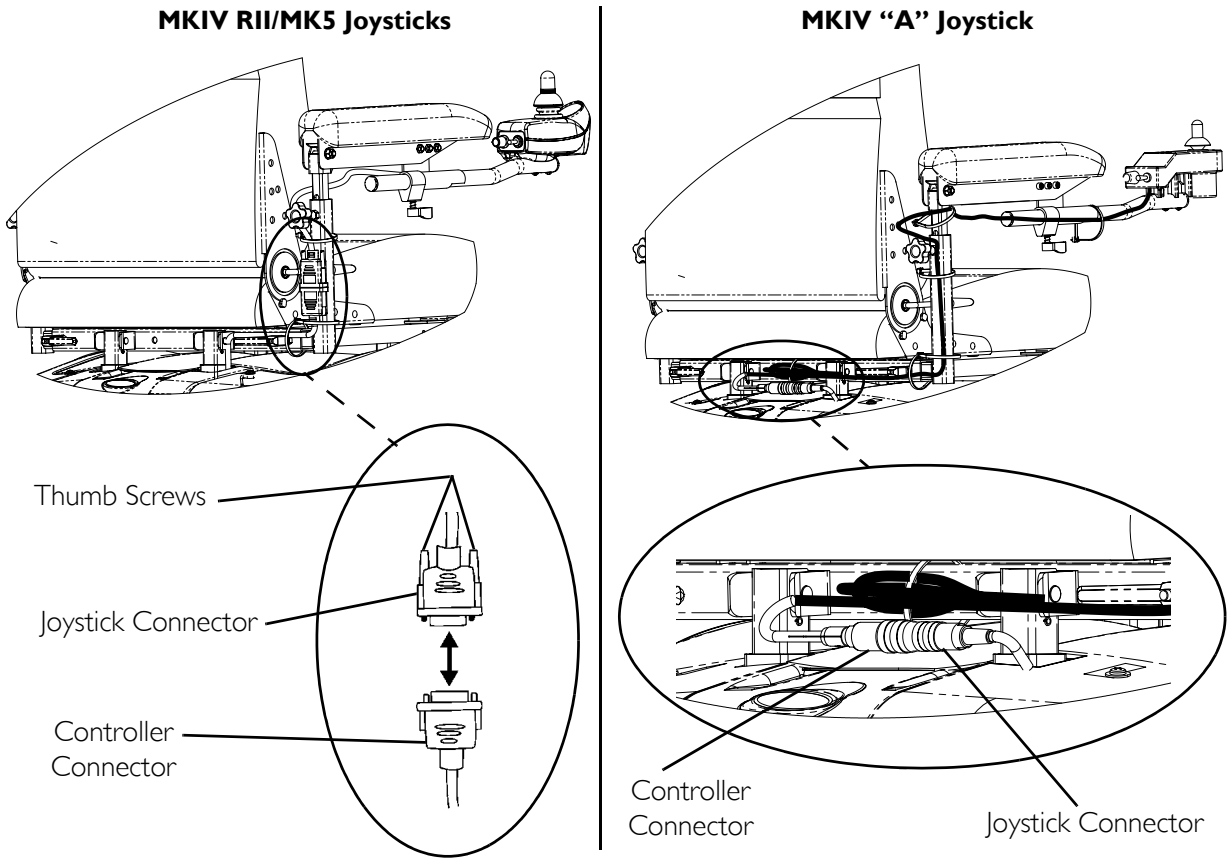


FIGURE 12.1 Disconnecting/Connecting the Joystick

Repositioning the Joystick

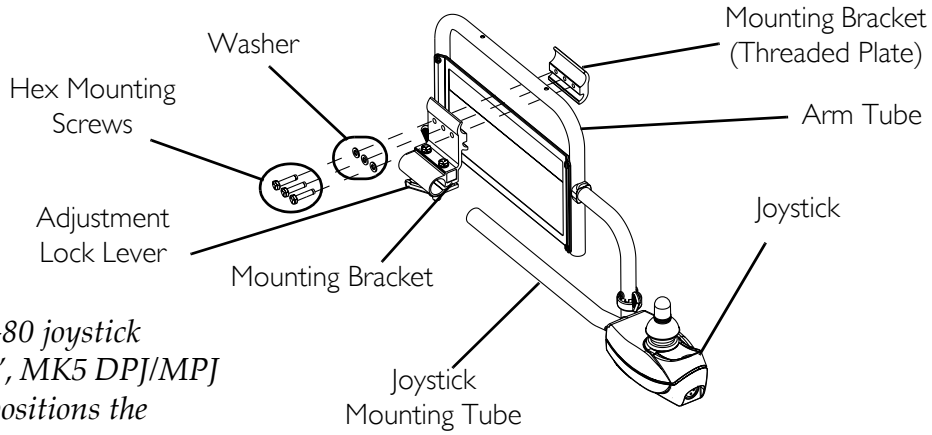
Adjustable Seat Back Angle (ASBA) Model

NOTE: For this procedure, refer to FIGURE 12.2.

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 screws that secure joystick mounting bracket, the threaded hole half clamp and the opened hole half clamp to the arm tube.
4. Reposition the threaded hole half clamp and opened hole half clamp on the opposite arm tube. Make sure threaded hole half clamp is on the inside of arm tube.
5. While holding the two (2) half clamps, install the front hex screw into the two (2) half clamps. Securely tighten.
6. Line up mounting holes of the joystick mounting bracket with the mounting holes in the two (2) half clamps.

7. Secure the joystick mounting bracket to the two (2) half clamps with the remaining two (2) hex screws.
8. Slide tube through the bracket to the desired position.
9. Slide adjustment lock over end of tube and secure adjustment lock to tube by turning lever on adjustment lock.

NOTE: If adjustment lock does not fit over tube, rotate 180°.



NOTE: MK5 SPJ-80 joystick shown. MKIV "A", MK5 DPJ/MPJ and MKIV RII repositions the

FIGURE 12.2 Repositioning the Joystick - Adjustable Seat Back Angle (ASBA) Model

Van Seat Model

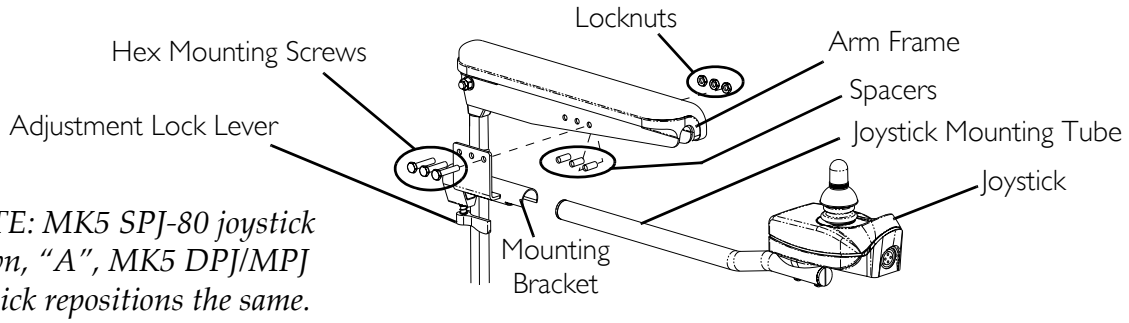
NOTE: For this procedure, refer to FIGURE 12.3.

NOTE: Take note of position and orientation of mounting hardware for reinstalling the joystick assembly.

1. Turn the adjustment lock lever to release the joystick mounting tube from the mounting bracket.
2. Remove the joystick from the wheelchair.
3. Remove the three (3) hex mounting screws, spacers and locknuts that secure the mounting bracket to the three (3) mounting holes on the arm frame.

NOTE: The mounting bracket is mounted to the inside of the arm frame.

4. Reposition the mounting bracket on the opposite arm frame.
5. Using the three (3) hex mounting screws, spacers and locknuts, secure the mounting bracket to the three (3) mounting holes of the arm frame.
6. If necessary, perform the following to reposition the adjustment lock:
   A. Slide the adjustment lock from the mounting bracket.
   B. Rotate adjustment lock 180° and slide adjustment lock over the opposite end of the mounting bracket.
7. Slide joystick mounting tube through the mounting bracket to the desired position and secure adjustment lock to tube by turning lever on adjustment lock.



NOTE: MK5 SPJ-80 joystick shown, "A", MK5 DPJ/MPJ joystick repositions the same.

FIGURE 12.3 Repositioning the Joystick - Van Seat Model

Replacing the MKIV RII™ 80 AMP Controller

⚠ WARNING

DO NOT attempt to perform this procedure with any power supplied to the wheel chair. The joystick and batteries MUST be disconnected prior to removing the MKIV RII controller module. Otherwise, equipment damage and/or personnel injury may occur.

NOTE: For this procedure, refer to FIGURE 12.4.

NOTE: The MKIV RII Controller Module has five cables, with connectors. These cables are for control of the Left and Right drive motors (cables are labeled), MKIV RII Joystick control, power connection for the batteries and (if equipped) a power take off lead.

NOTE: Take note of position and orientation of the controller, cables, connectors, and mounting hardware for reinstallation of controller.

NOTE: Take note of position and orientation of wiring and tie-wraps for installation.

1. Remove the seat. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
2. Remove the batteries from the wheelchair. Refer to Removing Batteries on page 86.
3. Disconnect the right and left motor leads (Detail "A" of FIGURE 12.4).
4. Disconnect the controller charger cable from the charger cable (Detail "A" of FIGURE 12.4).
5. Remove the two (2) mounting screws and nuts securing the controller charger cable to the charger cable bracket.
6. Remove the three (3) tie-wraps securing the controller charger cable to the wheelchair frame.
7. Remove the four (4) tie-wraps securing the joystick cable to the wheelchair frame.
8. Remove the two mounting bolts securing the controller bracket to the wheelchair frame. (Detail "B" of FIGURE 12.4).
9. Remove the controller and controller bracket from the wheelchair frame.

10. Remove the mounting bolt, washer, locknut and mounting screw that secure the controller to the controller bracket.
11. Remove the existing controller from the controller bracket.
12. Using new tie-wraps, reverse STEPS 1-11 to install new controller.

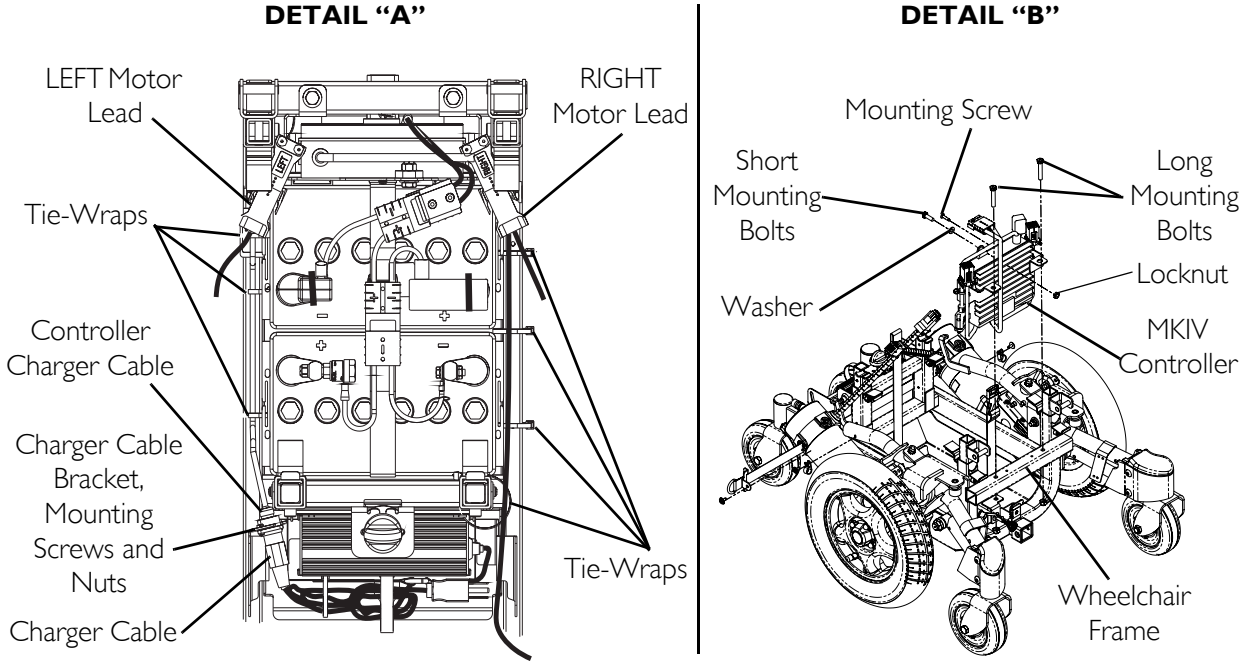


FIGURE 12.4 Replacing the MKIV RII™ 80 AMP Controller

Replacing the NX-80 or MK5-EX Controller

⚠ WARNING

DO NOT attempt to perform this procedure with any power supplied to the wheel chair. The joystick and batteries MUST be disconnected prior to beginning to remove the MK5-EX controller module. Otherwise, equipment damage and/or personnel injury may occur.

NOTE: For this procedure, refer to FIGURE 12.5.

NOTE: There are four (4) cables connected to the MK5-NX Controller Module. These cables must be disconnected before the controller can be removed.

NOTE: Take note of position and orientation of the controller, cables, connectors and mounting hardware for reinstallation of controller.

1. Remove the seat. Refer to Removing/Installing or Tilting the Seat Assembly on page 30.
2. Remove the batteries from the wheelchair. Refer to Installing/Removing the Batteries on page 83.
3. Remove the front shroud. Refer to Removing/Installing the Shrouds on page 71.

4. Remove the tie-wraps securing the joystick cable to the wheelchair frame.
5. Remove the two mounting bolts securing the controller bracket to the wheelchair frame. (Detail "B" of FIGURE 12.4).
6. Lay the controller and controller bracket down in the battery tray and disconnect the following:
   A. The right and left motor leads.
   B. Controller charger cable.
   C. Controller battery cable.
7. From inside the wheelchair frame, remove the two (2) mounting screws secure the existing controller to the wheelchair frame (Detail "B" of FIGURE 12.4).
8. Remove the existing controller from wheelchair frame.
9. Reverse STEPS 1-8 to install new controller.

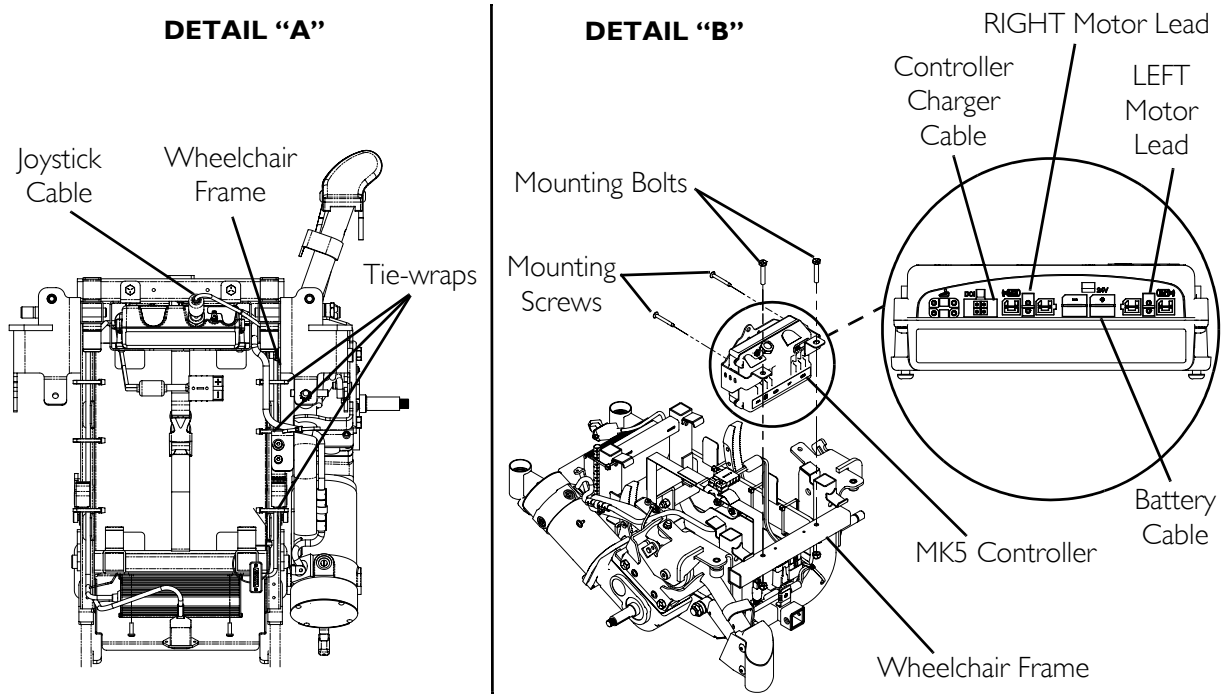


FIGURE 12.5 Replacing the NX-80 or MK5-EX Controller

SECTION 13—WIRE ROUTING

⚠ 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.

Before performing any maintenance, adjustment or service verify that On/Off switch on the joystick is in the OFF position.

MKIV Wire Routing

NOTE: For this procedure, refer to FIGURE 13.1.

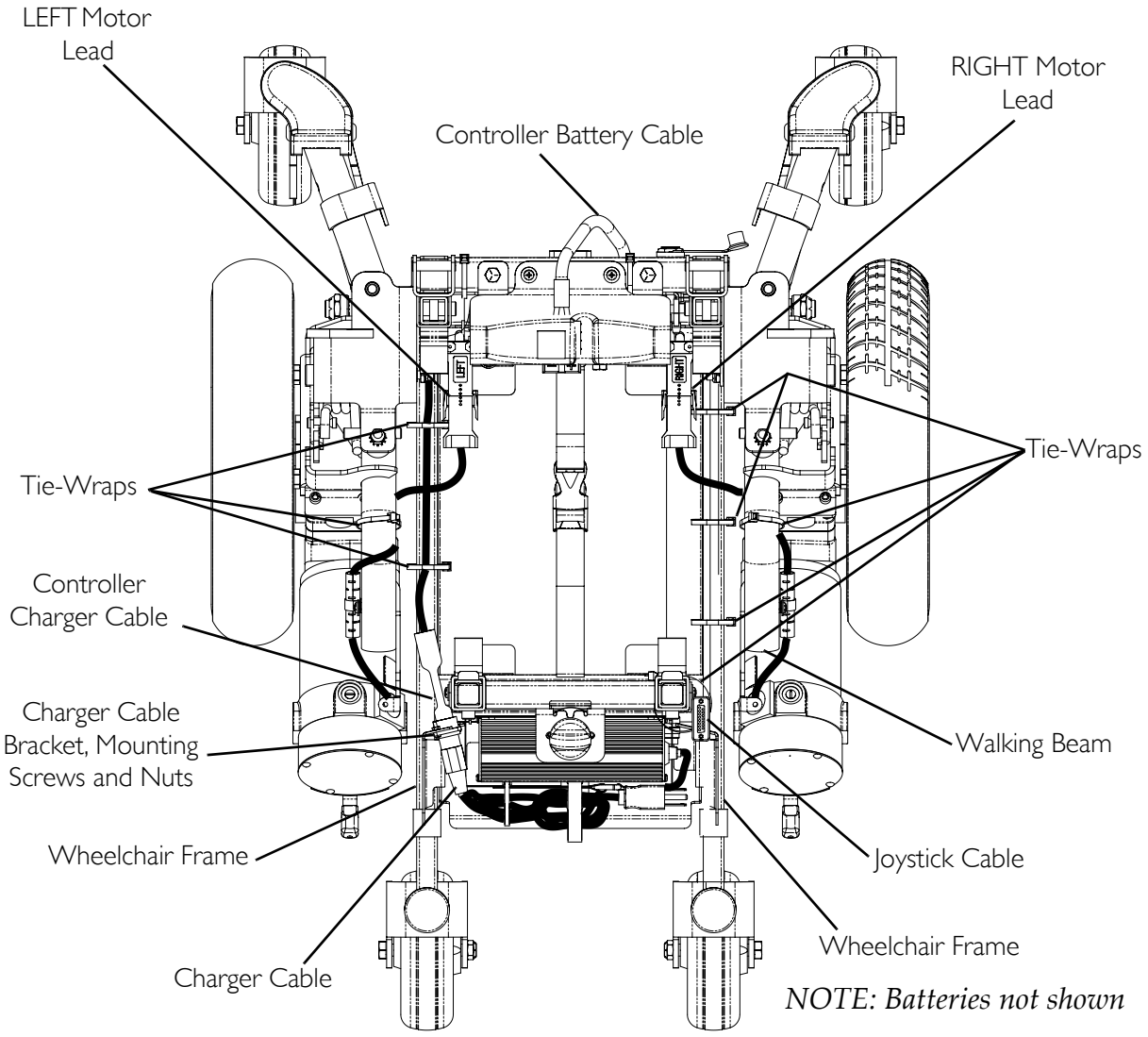


FIGURE 13.1 MKIV Wire Routing

MK5 Wire Routing

NOTE: For this procedure, refer to FIGURE 13.2.

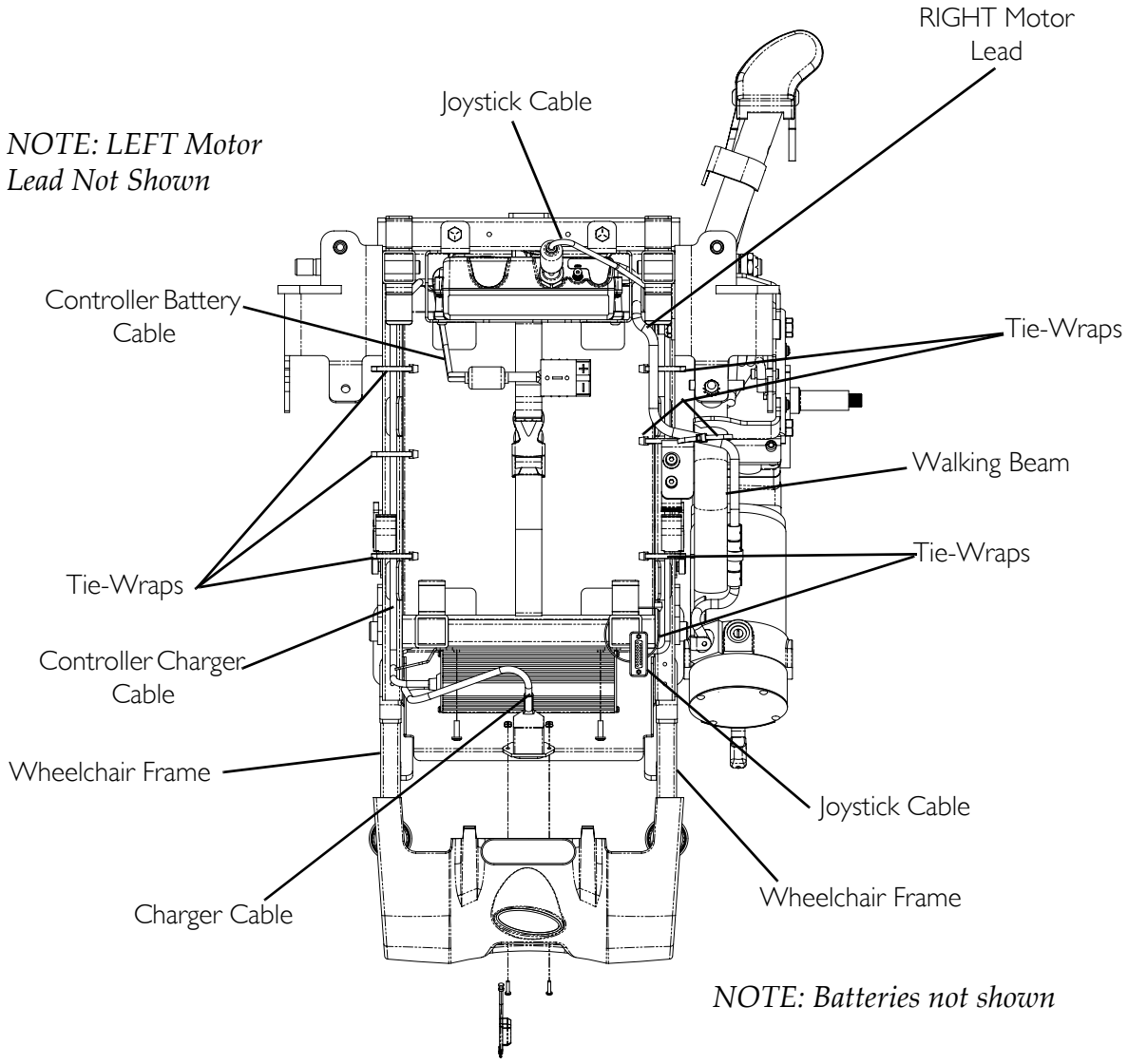


FIGURE 13.2 MK5 Wire Routing

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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 front and rear frames to be free from defects in materials and workmanship for a period of five (5) years from date of purchase; seat frame for a period of five (5) years from the date of purchase; electronics, motors and gearboxes for a period of one (1) year from the date of purchase; all remaining components 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 bottom of the back cover. Provide dealer's name address, date of purchase, indicate nature of the defect and, if the product is serialized, indicate the serial number. Do not return products to our factory without our prior consent.

LIMITATIONS AND EXCLUSIONS: THE FOREGOING WARRANTY SHALL NOT APPLY TO SERIAL NUMBERED PRODUCTS IF THE SERIAL NUMBER HAS BEEN REMOVED OR DEFACED, PRODUCTS 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 EXPRESS WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY OTHER WARRANTIES WHATSOEVER, WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND THE SOLE REMEDY FOR VIOLATIONS OF ANY WARRANTY WHATSOEVER, SHALL BE LIMITED TO REPAIR OR REPLACEMENT OF THE DEFECTIVE PRODUCT PURSUANT TO THE TERMS CONTAINED HEREIN, THE APPLICATION OF ANY IMPLIED WARRANTY WHATSOEVER SHALL NOT EXTEND BEYOND THE DURATION OF THE EXPRESS WARRANTY PROVIDED HEREIN. INVACARE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES WHATSOEVER.

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

Invacare Corporation www.invacare.com

USA
One Invacare Way
Elyria, Ohio USA
44036-2125
800-333-6900

Canada
570 Matheson Blvd E Unit 8
Mississauga Ontario
L4Z 4G4 Canada
800-668-5324

Part No. 1125038

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