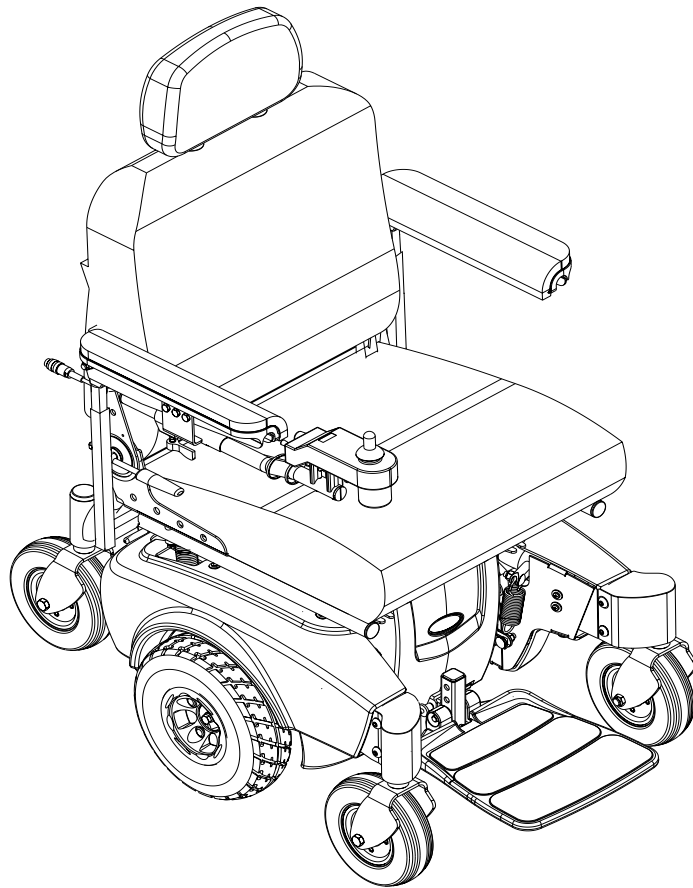


Pronto[®] M71[™] with SureStep[™]



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



Yes, you can.[®]

⚠ WARNING

DO NOT OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING THIS MANUAL. IF YOU ARE UNABLE TO UNDERSTAND THE WARNINGS, CAUTIONS, AND INSTRUCTIONS, CONTACT A HEALTHCARE PROFESSIONAL, DEALER OR A QUALIFIED TECHNICIAN BEFORE ATTEMPTING TO USE THIS EQUIPMENT - OTHERWISE INJURY OR DAMAGE MAY RESULT.

PROCEDURES OTHER THAN THOSE DESCRIBED IN THIS MANUAL MUST BE PERFORMED BY A QUALIFIED TECHNICIAN.

IF WHEELCHAIR IS EQUIPPED WITH POWER TILT ONLY OR THE FORMULA PTO PLUS SEATING SYSTEM, REFER TO POWER TILT ONLY FOR PRONTO M7I AND M9I OWNER'S MANUAL, PART NUMBER 1118362 OR TO FORMULA PTO PLUS POWERED SEATING SERVICE MANUAL, PART NUMBER 1125031 TO PERFORM THE FOLLOWING PROCEDURES:

- **TILTING THE SEAT ASSEMBLY (REPLACES REMOVING/ INSTALLING THE SEAT ASSEMBLY IN THIS MANUAL)**
- **ADJUSTING SEAT HEIGHT**
- **ADJUSTING SEAT POSITION**
- **CHARGING THE BATTERIES**

REFERENCE DOCUMENTS

DOCUMENT	PART NUMBER
M7I with MK ₅ ™ Owners Manual BEFORE 1/24/06	1106631
M7I with MK ₅ Owners Manual AFTER 1/23/06	1141449
MK ₅ EX™ Electronics Owners Manual	1114808
MK ₅ NX™ Electronics Owners Manual	1110532
MK6i™ Field Reference Guide	1141471
MK6i Service Manual	1143203
MKIV™ RII Electronics Owners Manual	1095272
M7I Base with MK6i Owners Manual	1143240

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

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SPECIAL NOTES

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

SIGNAL WORD	MEANING
DANGER	Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Caution indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

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

WHEELCHAIR USER

As a manufacturer of wheelchairs, Invacare endeavors to supply a wide variety of wheelchairs to meet many needs of the end user. However, final selection of the type of wheelchair to be used by an individual rests solely with the user and his/her healthcare professional capable of making such a selection.

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.

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

TRRO includes four factory-installed transport brackets and a wheelchair anchored pelvic belt. TRRO has been crash-tested in accordance with ANSI/RESNA WC Vol I Section 19 Frontal Impact Test requirements for wheelchairs with a 168 lb crash dummy, which corresponds to a person with a weight of 114 to 209 lbs.

TRBKTS includes four factory-installed wheelchair transport brackets. TRBKTS has not been crash-tested in accordance with WC 19. Use these transport brackets only to secure an unoccupied wheelchair during transport.

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

Refer to Transport Ready Package on page 109 for more information about transporting the wheelchair.

SEAT POSITIONING STRAP

It is the obligation of the Dealers, Therapists and other Healthcare Professionals to determine if a seat positioning strap is required to ensure the safe operation of this equipment by the user. Serious injury can occur in the event of a fall from a powered wheelchair.

⚠ TRRO AND TRBKTS WARNINGS

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

Battery support brackets **MUST** be installed at all times. Otherwise, the wheelchair will not be WC/19 compliant. Refer to Removing/Installing Batteries From/Into Battery Tray on page 88.

⚠ WARNING

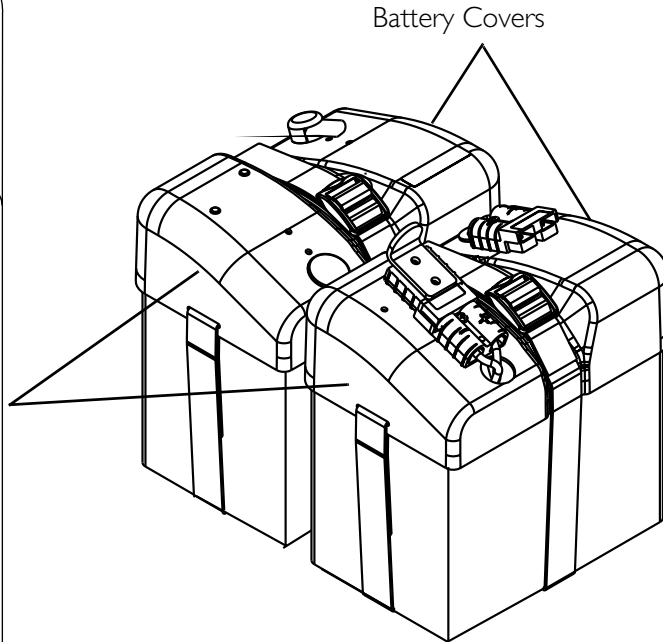
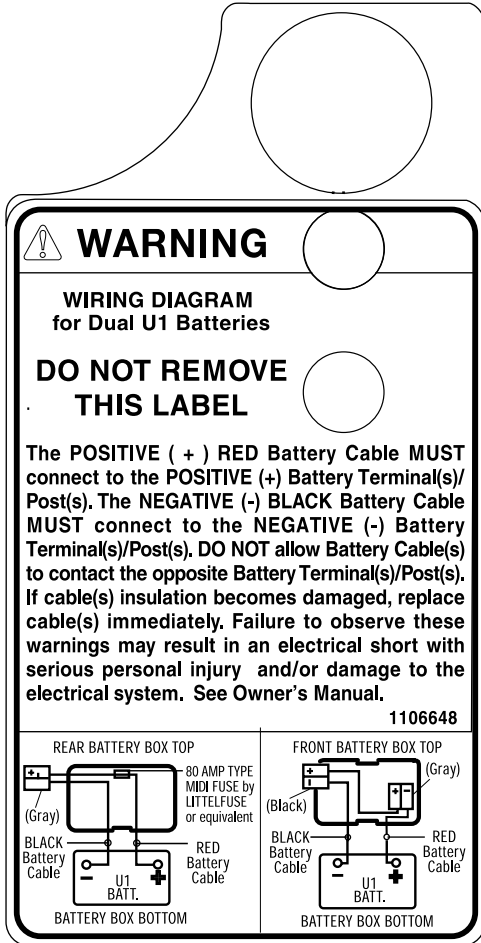
Invacare products are specifically designed and manufactured for use in conjunction with Invacare accessories. Accessories designed by other manufacturers have not been tested by Invacare and are not recommended for use with Invacare products.

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

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

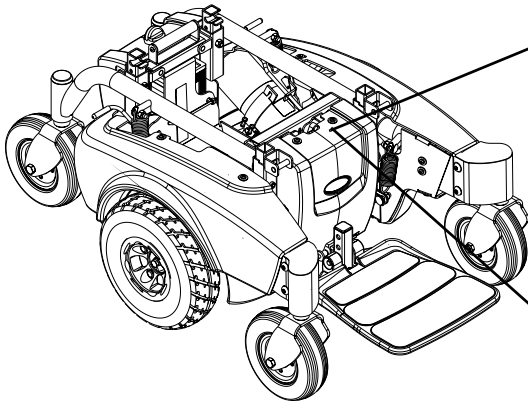
LABEL LOCATIONS

Wiring Label on M7I Standard with Battery Covers



NOTE: Label under battery cover.

Serial Number is located underneath seat in rear, should not have to remove seat.



One of these battery wiring labels is in this location.

⚠ WARNING The POSITIVE (+) RED Battery Cable MUST connect to the POSITIVE (+) Battery Terminal(s)/ Post(s). The NEGATIVE (-) BLACK Battery Cable MUST connect to the NEGATIVE (-) Battery Terminal(s)/Post(s). DO NOT allow Battery Cable(s) to contact the opposite Battery Terminal(s)/Post(s). Install protective caps on POSITIVE (+) and NEGATIVE (-) battery terminals. Replace cable(s) immediately if cable(s) insulation becomes damaged. Failure to observe these warnings may result in an electrical short with serious personal injury and/or damage to the electrical system. See Owner's Manual. DO NOT remove fuse or mounting hardware from POSITIVE (+) RED battery cable mounting screw. **DO NOT REMOVE THIS LABEL.**

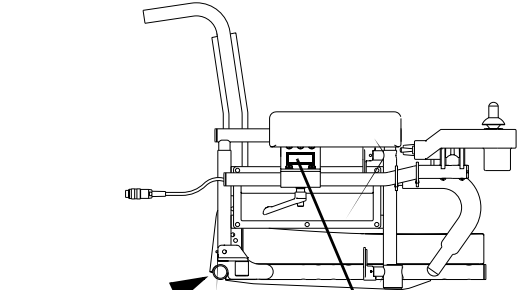
P/N 1118381

⚠ WARNING The POSITIVE (+) RED Battery Cable MUST connect to the POSITIVE (+) Battery Terminal(s)/ Post(s). The NEGATIVE (-) BLACK Battery Cable MUST connect to the NEGATIVE (-) Battery Terminal(s)/Post(s). DO NOT allow Battery Cable(s) to contact the opposite Battery Terminal(s)/Post(s). Install protective caps on POSITIVE (+) and NEGATIVE (-) battery terminals. Replace cable(s) immediately if cable(s) insulation becomes damaged. Failure to observe these warnings may result in an electrical short with serious personal injury and/or damage to the electrical system. See Owner's Manual. DO NOT remove fuse or mounting hardware from POSITIVE (+) RED battery cable mounting screw. **DO NOT REMOVE THIS LABEL.**

P/N 1122143

M7I with PTO+ Labels

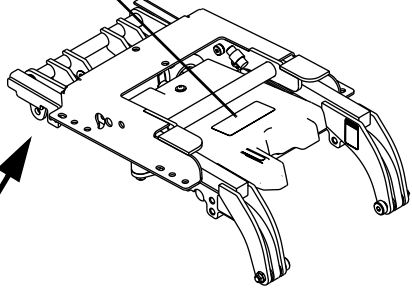
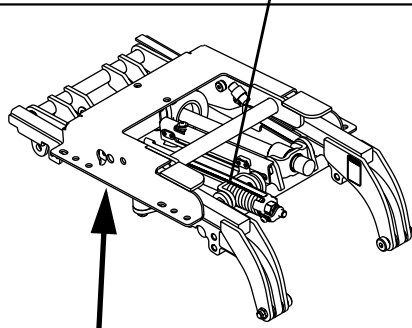
⚠ WARNING ALWAYS reinstall the spring safety bracket AND tether when servicing the PTO Plus seating system is complete. These safety devices must be in place at all times, otherwise, injury or damage may occur. P/N 1125062



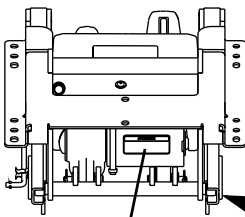
Serial Number Located HERE

WEIGHT CAPACITY
275 LBS. (125 kgs.)
 REFER TO OWNER'S MANUAL
 P/N 1111014

⚠ WARNING
 If tilt function is not operating and is in the down (seated) position, PRIOR to servicing the device, contact Invacare Technical Services for instructions on how to safely service the tilt system, actuator or spring assist module. Call 800-832-4707.
 P/N 1125066



rear view of actuator




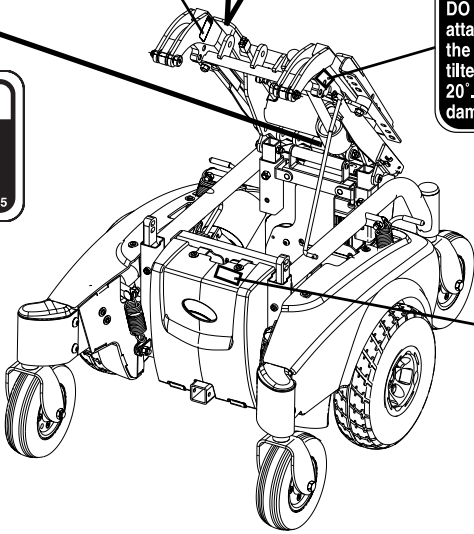
⚠ WARNING

 Pinch Point.
 1079203

WARNING
 DO NOT remove the screws attaching the tilt mechanism to the base unless it has been tilted to an angle greater than 20°. Otherwise, injury or damage may occur. 1125052 Rev A

⚠ WARNING
 DO NOT remove the hardware attaching the actuator or spring assist to the wheelchair frame, unless the seat has been tilted to an angle greater than 20°. Otherwise, injury or damage may occur. Refer to the seating system service manual for complete instructions.
 1122538 Rev B - 02/05

NOTICE
 Ensure prop rod properly engages the support bracket before allowing prop rod to support weight of seat assembly.

 1118368 Rev. A 04/03



TYPICAL PRODUCT PARAMETERS

	18 INCH VAN	20 INCH VAN	ASBA	ADJUSTABLE ASBA
SEAT WIDTH:	18 inches	20 inches	16 to 20 inches	
SEAT DEPTH:	16 to 18 inches	18 to 20 inches	16 to 20 inches	
BACK HEIGHT:	18 inches	18 inches	16 to 20 inches	
BACK ANGLE RANGE:	N/A	N/A	80° to 100°	85° to 105°
UPHOLSTERY:	Grey Cloth, Grey Vinyl, Tan Vinyl		Black Nylon Back with Seat Pan	
SEAT-TO-FLOOR:	21 to 23 inches (cushion not compressed)		18 to 20 inches (to seat pan)	
OVERALL WIDTH OF BASE (W/O JOYSTICK):	24 inches			
OVERALL HEIGHT:	48 inches			
OVERALL LENGTH FOOTBOARD FOLDED:	35 inches			
FOOTBOARD EXTENDED:	39½ inches			
WEIGHT¹ WITHOUT BATTERIES:	150 pounds			
WITH BATTERIES:	203 pounds			
SHIPPING (WITHOUT BATTERIES):	200 pounds			
DRIVE WHEELS/TIRES (PNEUMATIC)	10 x 3½ inches			
CASTERS W/PRECISION SEALED BEARINGS:	6 x 2 inches			
FOOTRESTS/LEGRESTS:	Flip Up, Depth and Height Adjustable, Footboard, Swingaway Front Rigging, Elevating Legrest			
ARMRESTS:	Adjustable Width, Angle and Height			
BATTERY REQUIREMENTS:	Use only U1 batteries (Quantity - 2)			
WEIGHT LIMITATION:	up to 300 pounds			
INCLINE CAPABILITY:	9°			
PERFORMANCE SPEED:	up to 4 MPH			
TURNING RADIUS:	19½ inches with footboard			
*RANGE (VARIABLE):	up to 12 miles			
OVERALL WIDTH OF BASE (W/O JOYSTICK):	300 pounds			

1. Includes seating systems and accessories.

*NOTE: Values for range are calculated for maximum chair weight rating using largest batteries applicable (U1), per test procedures described in ANSI/RESNA WC/VOL2-1998 Section 4 and meet federal reimbursement requirements for this product. While considered typical, they are derived based on certain ideal conditions. Variances in battery condition, user weight, usage pattern or overall terrain conditions will result in actual values for range that differ from these stated values. Users should become accustomed to how their unique conditions impact their individual results. Users should become familiar with the battery discharge indicator on the joystick to determine the range of their wheelchair. Refer to Connecting/Disconnecting Battery Cables on page 91 for more information about the battery discharge indicator.

SECTION I—GENERAL GUIDELINES

⚠ WARNING

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

Repair or Service Information

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

DO NOT service or adjust your wheelchair while occupied, unless otherwise noted.

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

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

Operation Information

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

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

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

Avoid storage or use near external flame or combustible product.

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.

Batteries

DANGER

When using an extension cord, use only a three wire extension cord having at least 16 AWG (American Wire Gauge) wire and the same or higher electrical rating as the device being connected. Use of improper extension cord could result in risk of fire and electric shock. Three prong to two prong adapters should not be used. Use of three prong adapters can result in improper grounding and present a shock hazard to the user.

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

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

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

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

⚠ WARNING**Powered Wheelchair Electromagnetic Interference (EMI)**

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

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

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

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

Important Information

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

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

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 seat positioning strap for any signs of wear. Ensure buckle latches. Verify hardware that attaches strap to frame is secure and undamaged. Replace if necessary.
- Inspect motor brushes and gearbox coupling.
- Inspect electrical components for signs of corrosion. Replace if corroded or damaged.
- Check that all labels are present and legible. Replace if necessary.
- Ensure the casters are free of debris.

Troubleshooting

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







Troubleshooting - Electrical

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

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

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

Information Gauge Display Diagnostics

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





Service Indicator Light Diagnostics


NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
1	E 01	User Fault	00	Stall Timeout or user error.	Release joystick to neutral and try again.
2	E02	Battery Fault	00	Recharge batteries or replace.	Check the batteries and cable. Try charging the batteries. Batteries may require replacing.
3	E03	Left Motor Fault	00	Left Motor Short Circuit	Check the left motor, connections and motor cable.
			01	Left Motor Open Circuit	
			02	Left Motor Connection Fault B-	
			03	Motor Terminal Connected to B+	
			04	Left Motor Voltage Fault	
			05	Left Motor Bridge Fault	
			06	Too Many Hardware Current Limit Events	
			07	Current Offset Out of Range	
			08	Hardware Current Limit Fault	
4	E04	Right Motor Fault	00	Right Motor Short Circuit	Check the right motor, connections and motor cable.
			01	Right Motor Open Circuit	
			02	Right Motor Connection Fault B-	
			03	Motor Terminal Connected to B+	
			04	Right Motor Voltage Fault	
			05	Right Motor Bridge Fault	
			06	Too Many Hardware Current Limit Events	
			07	Current Offset Out of Range	
			08	Hardware Current Limit Fault	

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
5	E05	Left Park Brake Fault	00	Left Park Brake Drive-Time Test Failed	Check the left park brake connections and cable.
			01	Left Park Brake Output Enabled When Wheelchair Idle	
			02	Left Park Brake Output Did not Enable When Entering Drive Mode	
			03	Left Park Brake fault during power-up testing	
			04	Left park brake feedback low during drive (park brake short)	
6	E06	Right Park Brake Fault	00	Right Park Brake Drive-Time Test Failed	Check the right park brake connections and cable.
			01	Right Park Brake Output Enabled When Wheelchair Idle	
			02	Right Park Brake Output Did not Enable When Entering Drive Mode	
			03	Right Park Brake fault during power-up testing	
			04	Right park brake feedback low during drive (park brake short)	
7	E07	Remote Fault	00	Local SR Fault (CPU, EEPROM, etc.)	Check the communications bus, connections and wiring. Replace the remote.
			01	Joystick fault at the remote	
			02	Speed pot fault at the remote	

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
8	E08	Controller Fault	00	Controller fault	Check connections and wiring. Replace power module.
			01	RAM fault	
			02	ROM fault	
			03	CPU fault	
			04	EEPROM fault	
			05	Watchdog fault	
			06	Stack fault	
			07	Software fault	
			08	Power-up testing fault	
			09	Relay fault or precharge fault	
			10	Bridge fault or disable all fault	
			11	Electronics fault: Thermistor	
			12	Calibration setting fault	
9	E09	Communications Fault	00	Remote connection lost	Check connections and wiring. Replace Bus cable.
			01	Low communication mode	
10	E10	General Fault	00	General fault	Check all connections and wiring. Contact Invacare Technical Service.
11	E11	Incompatible/incorrect Remote	00	Incompatible/incorrect Remote	Wrong type of remote connected. Ensure the branding of the joystick matches that of controller unit.

MPJ+, PSR+, PSF+ Joysticks or Displays

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
 SPM L Park Brake Fault or  SPM R Park Brake Fault displays and wheelchair does not drive.	Motor lock levers disengaged (Error code E9 or E10).	Engage motor lock levers.
CHARGER PLUGGED IN displays.	Battery charger connected (Error code E28).	Unplug battery charger from the wheelchair.
 SPM Battery Fault displays and the wheelchair does not drive.	Batteries need to be charged (Error code E14).	Charge batteries. If batteries fail to charge properly, check battery charger or replace batteries. Refer to Replacing the On-Board Battery Charger on page 95.
 JOYSTICK TIMEOUT displays and the wheelchair does not drive.	Joystick or input device is disconnected (Error code 32).	Turn Off power, reconnect the joystick of input device and turn power On.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
<p>⊘ JS REV TOO LARGE</p> <p>⊘ JS FWD TOO LARGE</p> <p>⊘ JS LFT TOO LARGE or</p> <p>⊘ JS RGT TOO LARGE</p> <p>displays and the wheelchair does not drive.</p>	The joystick or input device is sending a value outside of the reverse, forward, left or right limits (Error codes E01, E02, E03 or E04).	Replace joystick or input device.
NEUTRAL TESTING displays.	The joystick neutral test has failed (Error code E18).	Release the joystick and try to get the joystick back into the center-most position.
<p>⊘ BAD JOYSTICK CAL VALUES</p> <p>displays and the wheelchair does not drive.</p>	The joystick calibration values are outside of the expected range (Error code E19).	Recalibrate the joystick (joystick throw procedure).
⚠ SPM NOT CONNECTED	The MPJ or Display module is not communicating with the control module (Error code E200).	Check the connections between the joystick or display and the controller. Turn the power Off and then back On. Replace the controller if necessary.
⚠ SPM Communications Fault displays and the wheelchair drives slowly.	The controller has determined a fault during a previous turn-off process (Error code E41).	Turn the wheelchair Off and back On.
ATTENDANT ACTIVE and 	The Proportional or Digital Attendant control is active and can be used to drive the chair (Error code W05).	This is normal behavior.
Batteries draw excessive current when charging.	Battery failure.	Have batteries checked for shorted cell. Replace if necessary.
	Electrical malfunction.	Contact Dealer/Invacare for service.
Battery indicator flashes the charge level is low - immediately after recharge.	Battery failure.	Check batteries for shorted cell. Replace if necessary.
	Malfunctioning battery charger.	Contact Dealer/Invacare for Service.
	Electrical malfunction.	Contact Dealer/Invacare for Service.
Battery indicator flashes the charge level is low - too soon after being recharged.	Batteries not charged.	Have charger checked.
	Weak batteries.	Replace batteries if necessary. Contact Dealer/Invacare for Service.
Motor “chatters” or runs irregular.	Electrical malfunction.	Contact Dealer/Invacare for Service.
Joystick erratic or does not respond as desired.	Damaged motor coupling.	Contact Dealer/Invacare for Service.
	Electrical malfunction.	Contact Dealer/Invacare for Service.
	Controller programmed improperly.	Contact Dealer/Invacare to have controller reprogrammed.
Wheelchair does not respond to commands.	Poor battery terminal connection.	Have terminals cleaned.
Power indicator Off - even after recharging.	Electrical malfunction.	Contact Dealer/Invacare for Service.

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.

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 or replace motor. 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 0-5 Ohms.
Grinding noise or motor is locking up.	Bad gearbox. Bad coupler between motor and gearbox or bad bearings. Bad Gears.	Replace gearbox or motor. Replace coupler mor motor. If bearings are bad, replace motor.
Motors stall and starts 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.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Motor chatters or runs erratically, or only one motor turns.	Damaged connector or worn brushes. Bad motor or gearbox	Ohm out motors. Check brushes and replace brushes if necessary. Replace motor or gearbox 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	If seal is bad, replace motor or gearbox. Remove motor brushes and inspect for grease contamination. Replace motor or gearbox if contamination is found.
	Loose hardware.	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 motor or gearbox.
Motor Stutters.	Poor connection or worn brushes.	Check motor connectors. Check brushes and replace if necessary.
Motor Fails to start after initial installation.	Battery voltage is too low. Bad Connection Brake Disengaged	Check batteries and recharge if necessary. Check connector Engage brake
Motor is running then fails to restart when stopped.	Heavy load on the motors forcing controller into the current rollback mode.	Leave power ON and allow controller to count down, and recharge the wheelchair overnight with power ON.
	Blown fuse in battery wiring harness.	Replace battery wiring harness.
	Damaged Motor	Replace brushes if necessary, or replace motor or gearbox 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.
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.	Check all connections and housings for damage. If you have blown fuse a new battery wiring harness must be purchased.
	Batteries are dead.	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.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
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 MK ₅ electronics manual, part number 1114808.
	Check programming settings.	Torque setting and power level setting may be too high. Refer to MK ₅ 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 on page 29.

NOTE: The following test can also be performed through the controller of the wheelchair along with a remote programmer. Refer to the electronics manual, part number 1114808 supplied with each wheelchair.

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

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

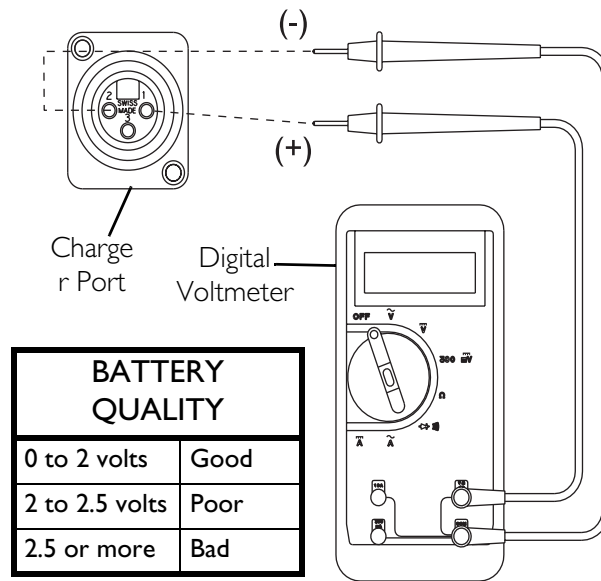
When performing STEPS 5 and 6 ensure feet are clear from casters and wall otherwise injury may result

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 individuals (one on each arm) apply as much downward pressure as possible on the arms of the wheelchair.

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

NOTE: If the voltage drops more than 2 volts from a pair of fully charged batteries while under load, they should be replaced regardless of the unloaded voltages.

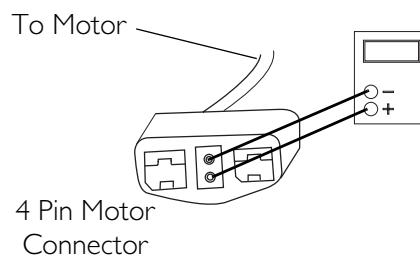
**FIGURE 3.1** Field Load Test

Motor Testing

NOTE: For this procedure, refer to FIGURE 3.2.

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

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

**FIGURE 3.2** Motor Testing

SECTION 4—SEAT ASSEMBLY

⚠ 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 Seat Assembly

⚠ WARNING

For wheelchairs with **POWER TILT ONLY** or **PTO PLUS**, it is unnecessary to remove the seat. Refer to the owner's manual for information on tilting the seat.

NOTE: For this procedure, refer to FIGURE 4.1 on page 31.

NOTE: This procedure applies to ASBA and van seat assemblies.

Removing Seat

1. Disconnect the joystick cable at rear of seat. Refer to Disconnecting/Connecting the Joystick on page 97.
2. Push down on the latch bar underneath front of seat (Detail "A" of FIGURE 4.1).
3. Rotate seat assembly backward (Detail "B" of FIGURE 4.1).
4. Slide the seat assembly forward to disengage seat from the pivot brackets located in the rear of the wheelchair.

Installing Seat

1. Position the seat in the rear pivot brackets (Detail "B" of FIGURE 4.1).
 2. Rotate seat assembly forward.
 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 - otherwise injury or damage may result.

4. Pull up on latch bar to verify that seat brackets are engaged with seat clevis pins.

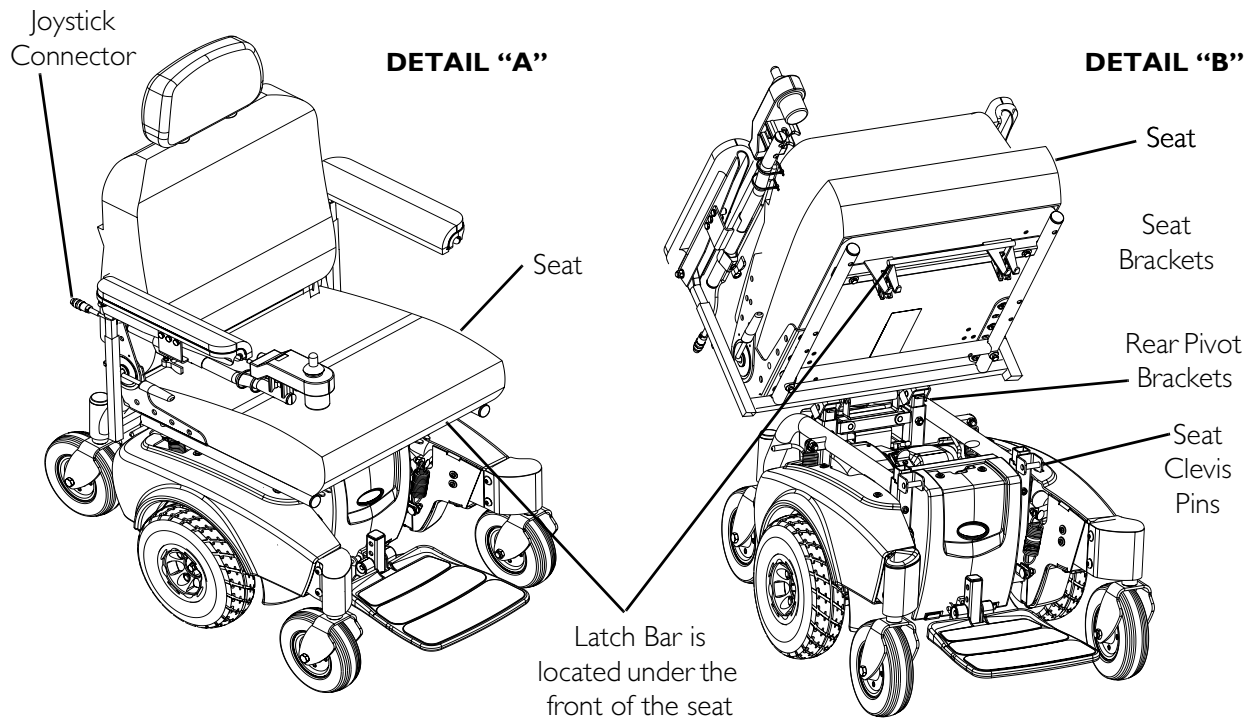


FIGURE 4.1 Removing/Installing the Seat Assembly

Adjusting the Seat Height

⚠ WARNING

For wheelchairs with **POWER TILT ONLY**, refer to **ADJUSTING SEAT HEIGHT** in **SECTION 4** of the **Power Tilt Only for Pronto M71 and M91 owner's manual, Part Number 1118362**.

PTO PLUS ONLY - DO NOT adjust the seat height. Adjusting the seat height from the factory setting will make the wheelchair unstable and injury or damage may occur. The M71 wheelchair seat should only be mounted in mounting hole **B** (**FIGURE 4.2**).

For users over 250 lbs: The seat MUST be mounted in the furthest rearward position and the front seat posts **MUST** be in the 1-inch raised position or lower mounting holes **A** or **B**. Refer to **Table: Available Mounting Holes** on page 32 for available mounting positions.

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

NOTE: For this procedure, refer to FIGURE 4.2 on page 32.

NOTE: The seat can be adjusted to five height positions in 1/2-inch increments.

1. Remove the seat assembly. Refer to Removing/Installing the Seat Assembly 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 Table: Available Mounting Holes on page 32 for available mounting positions.
4. Reinstall mounting screw and locknut. Securely tighten.
5. Repeat STEPS 2-4 for the three remaining adjustable height tubes.
6. Reinstall the seat assembly. Refer to Removing/Installing the Seat Assembly on page 30.

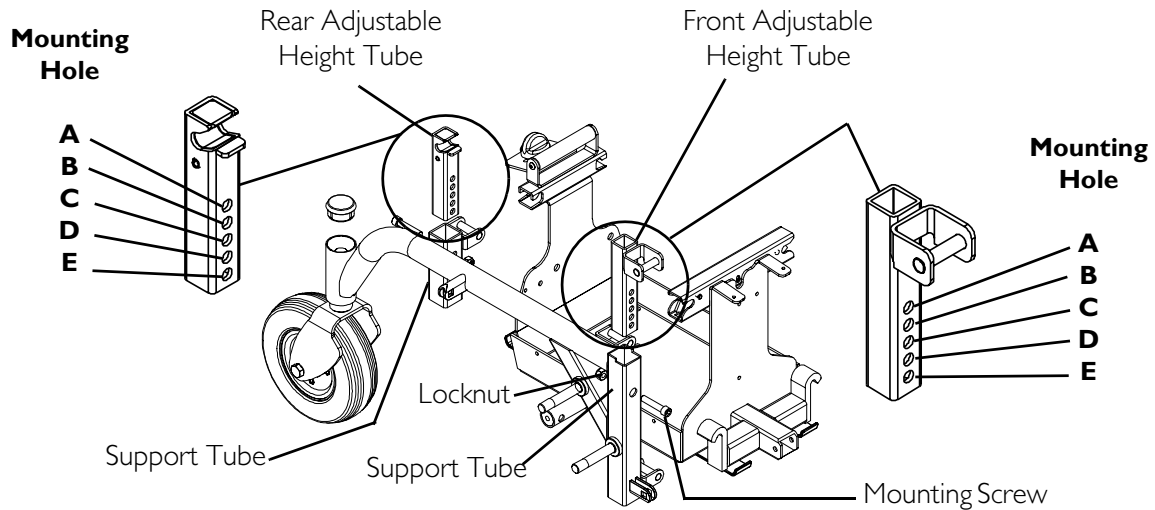


FIGURE 4.2 Adjusting the Seat Height

AVAILABLE MOUNTING HOLES

WHEELCHAIR EQUIPPED WITH:	AVAILABLE MOUNTING HOLES FOR FRONT ADJUSTABLE HEIGHT TUBE				
	A	B	C	D	E
VAN SEAT WITH NON-HEMI FRONT RIGGING					
Rear Adjustable Height Tube					
Mounted in hole A	N/A**	N/A**	N/A**	N/A**	N/A**
Mounted in hole B	N/A**	N/A**	N/A**	N/A**	N/A**
Mounted in hole C	N/A**	N/A**	N/A**	N/A**	✓
Mounted in hole D	N/A**	N/A**	N/A**	N/A**	✓
Mounted in hole E	N/A**	N/A**	N/A**	N/A**	✓
VAN SEAT WITH HEMI FRONT RIGGING OR FOOTBOARD					
Rear Adjustable Height Tube					
Mounted in hole A	✓	✓	✓	✓	✓
Mounted in hole B	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*	✓

WHEELCHAIR EQUIPPED WITH:	AVAILABLE MOUNTING HOLES FOR FRONT ADJUSTABLE HEIGHT TUBE				
ASBA SEAT WITH FOOTBOARD OR FRONT RIGGINGS (NON-HEMI OR HEMI)	A	B	C	D	E
Rear Adjustable Height Tube					
Mounted in hole A	N/A**	N/A**	N/A**	N/A**	N/A**
Mounted in hole B	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 (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 will cause interference between the front riggings and/or the ASBA seat frame and wheelchair base. DO NOT use this mounting hole combination.

Removing/Installing the Adjustable Height Tubes

NOTE: For this procedure, refer to FIGURE 4.3.

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

1. Remove the seat assembly. Refer to [Removing/Installing the Seat Assembly](#) on page 30.
2. Remove the desired side shroud from the wheelchair. Refer to [Removing/Installing the Shrouds](#) on page 74.
3. Remove the mounting screw and locknut securing the front adjustable height tube to the front support tube.
4. Remove the front adjustable height tube from the front support tube.
5. Remove the mounting screw and locknut securing the rear adjustable height tube to the rear support tube.

6. Remove the rear adjustable height tube from the rear support tube.

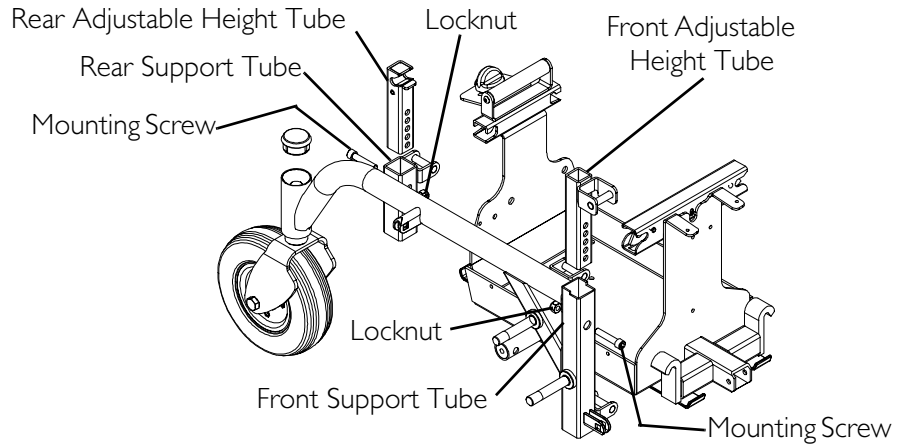


FIGURE 4.3 Removing/Installing the Adjustable Height Tubes

Adjustable ASBA Seat Service Procedures

Removing/Installing the Seat Pan

NOTE: For this procedure, refer to FIGURE 4.4.

Removing

1. Remove the seat cushion.
2. Remove the two socket screws securing the seat pan to the seat frame.
3. Remove the seat pan from the seat frame.

Installing

1. Position the new seat pan onto the seat frame as shown.
2. Secure the new seat pan to the seat frame using the two socket screws.
3. Install the seat cushion.

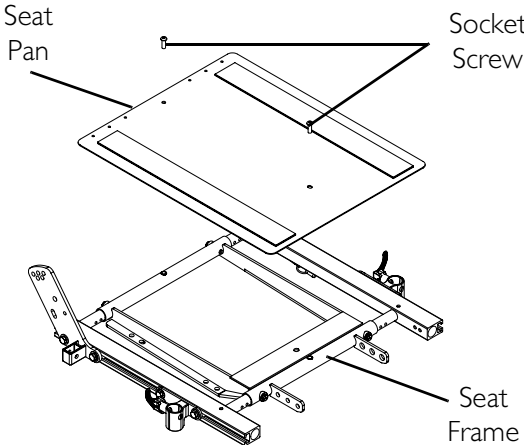


FIGURE 4.4 Removing/Installing the Seat Pan

Adjusting the Seat Width

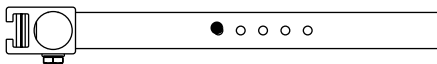
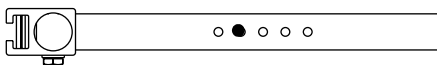
NOTE: For this procedure, refer to FIGURE 4.5 on page 36.

NOTE: The seat width can be adjusted from 16 to 20 inches.

NOTE: The spreader bar must be replaced for seating systems ordered with the BPO (Back Post Only) option.

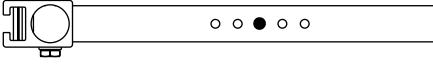
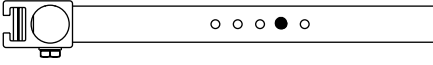
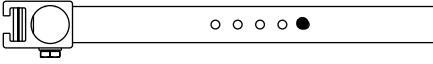
1. If necessary, remove the spreader bar. Refer to Removing/Installing the Spreader Bar on page 43.
2. Remove the hex screw and coved washers securing each crossbar to the seat frame.
3. Pull/push the side rails to the desired width shown in the following table.

Seat Width Mounting Holes

SEAT WIDTH	SIDE RAIL MOUNTING HOLES*
16-INCH	
17-INCH	

*NOTE: Only right side rail shown. Use the same mounting hole for opposite side rail.

Seat Width Mounting Holes

SEAT WIDTH	SIDE RAIL MOUNTING HOLES*
18-INCH	
19-INCH	
20-INCH	

*NOTE: Only right side rail shown. Use the same mounting hole for opposite side rail.

- Align the crossbar mounting holes with the seat frame mounting holes.
- Secure each crossbar to the seat frame with a hex screw and covered washer. Torque the hex screw to 75 in-lbs.
- If necessary, install the new spreader bar. Refer to [Removing/Installing the Spreader Bar](#) on page 43.

NOTE: Seat pan, back and arms removed for clarity.

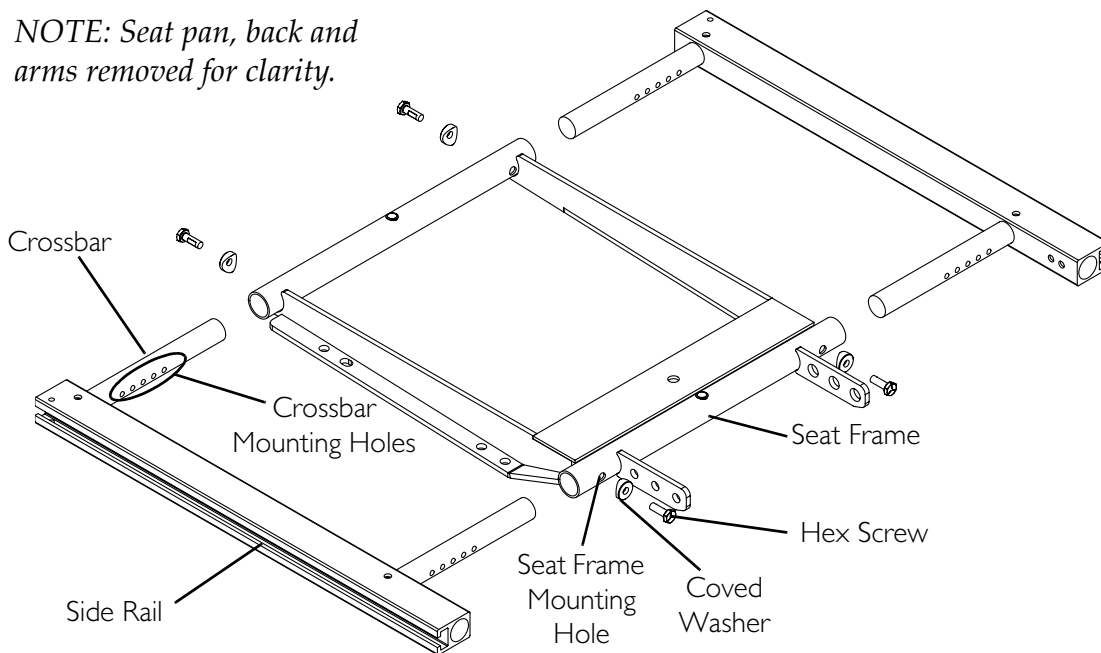


FIGURE 4.5 Adjusting the Seat Width

Adjusting the Seat Depth

NOTE: For this procedure, refer to [FIGURE 4.6](#) on page 38.

- Examine the following chart to determine if the desired seat depth adjustment is within or beyond the range of the existing seat frame.

FRAME SIZE	SEAT DEPTH RANGE
SMALL	16 - 19 inches in 1-inch increments

FRAME SIZE	SEAT DEPTH RANGE
LARGE	19 - 20 inches in 1-inch increments

2. Perform one of the following:
 - Seat Depth Adjustment is WITHIN the Range of Existing Seat Frame - Proceed to STEP 3.
 - Seat Depth Adjustment is BEYOND the Range of Existing Seat Frame - Replace the side rails. Refer to Removing/Installing Side Rails on page 38.
3. Loosen, but DO NOT remove, the four hex screws and washers securing the bottom of the cane brackets to the side rails.
4. Loosen, but DO NOT remove, the four hex screws securing the front arm sockets to the side rails.
5. Use the following Seat Depth Adjustment Table to determine the distance required to obtain the desired seat depth.

Seat Depth Adjustment Table

SEAT DEPTH	DISTANCE* (IN INCHES)
16-INCH	5.50
17-INCH	4.50
18-INCH	3.50
19-INCH	2.50 (Small Frame) 5.50 (Large Frame)
20-INCH	4.50

*NOTE: Distance is between the rear of the rear arm socket and the rear of the side rail (Detail "A").

6. Measure the distance determined in STEP 5 from the end of the side rail.
7. Slide the cane brackets along the side rails to align the rear of the rear arm socket with the distance measured in STEP 6.
8. Secure the cane brackets to the side rails with the four hex screws and washers. Torque the hex screws to 13 ft-lbs.
9. Secure the front arm sockets to the side rails with the four hex screws. Torque the hex screws to 13 ft-lbs.

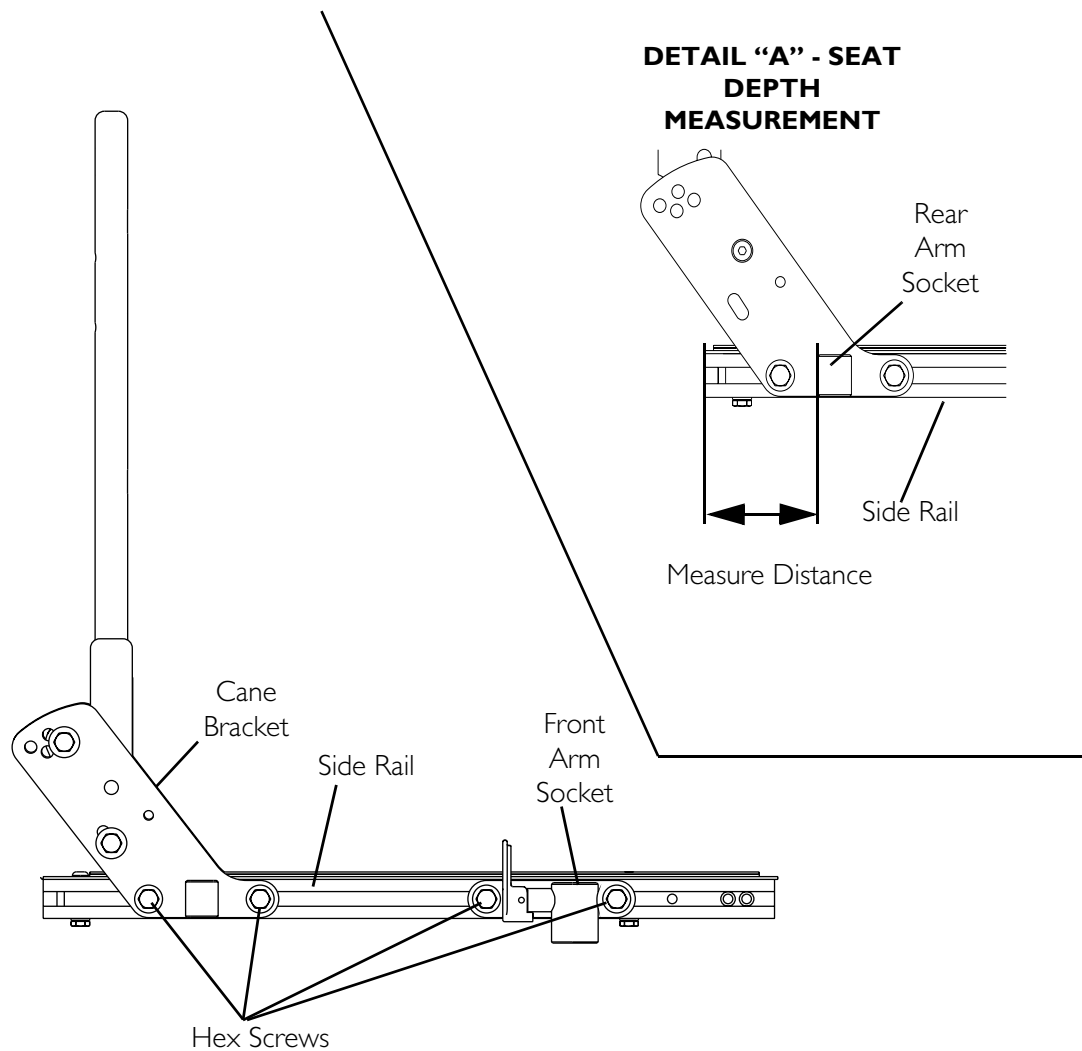


FIGURE 4.6 Adjusting the Seat Depth

Removing/Installing Side Rails

NOTE: For this procedure, refer to FIGURE 4.7 on page 39.

Removing Side Rails

1. Remove both armrests.
2. Remove the two hex screws, washer and lanyard securing the crossbars to the side rail.
3. Loosen, but DO NOT remove, the four hex screws securing the cane brackets to the side rails.
4. Loosen, but DO NOT remove, the four hex screws securing the front arm sockets to the side rails.
5. Use a screwdriver to gently tap the two roll pins out of the side rails.
6. Slide both cane brackets (with T-nuts and back canes) out of the slots in the side rails.
7. Slide both front arm sockets (with T-nuts) out of the slots in the side rails.

- Pull both side rails off the crossbars.

Installing Side Rails

- Install new side rails onto crossbars.

NOTE: Ensure long end of side rail is towards the front of the wheelchair.

- Secure the side rails to the crossbars with the hex screws, washer and lanyard. Torque to 75 in-lbs.
- Slide cane brackets (with T-nuts and back assembly) into the slots in the side rails.
- Slide front arm sockets (with T-nuts) into the slots in the side rails.
- Use a rubber mallet to tap the two roll pins into the side rails.
- Tighten the four hex screws to secure the cane brackets to the side rails. Torque to 13 ft-lbs.
- Install the armrests.

NOTE: It may be necessary to slide the front arm sockets to the proper position to install the armrests.

- Tighten the four hex screws to secure the front arm sockets to the side rails. Torque to 13 ft-lbs.

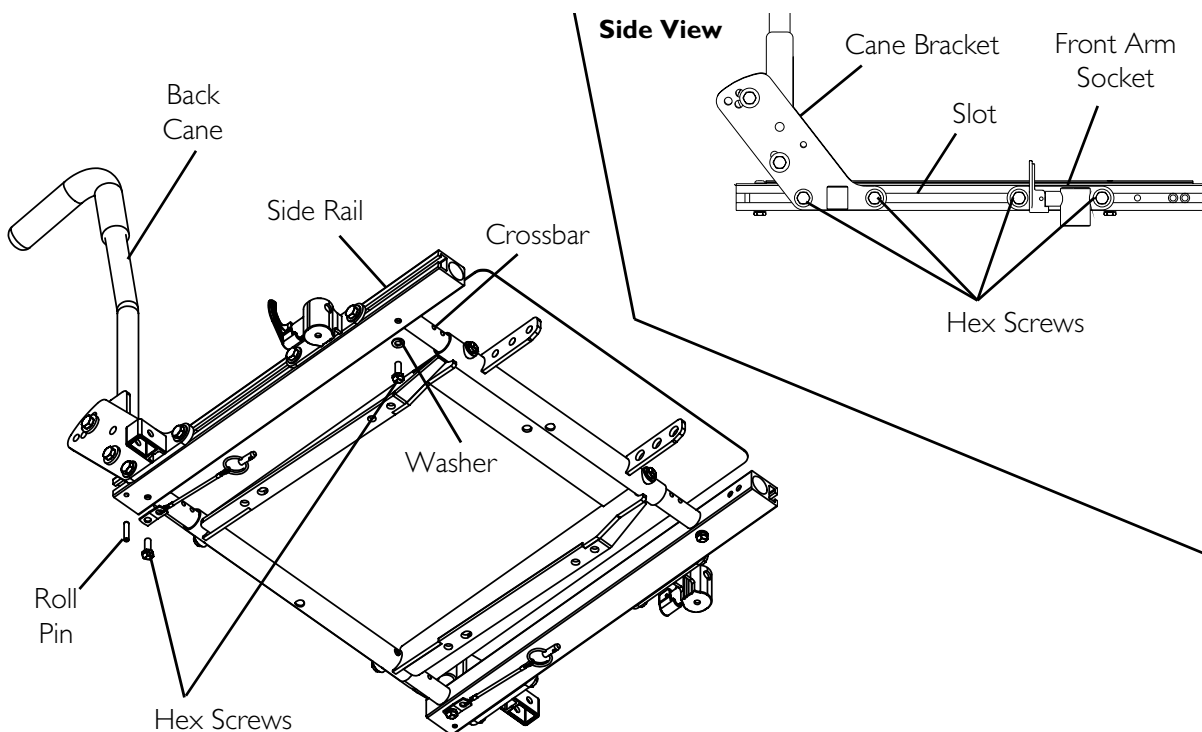


FIGURE 4.7 Removing/Installing Side Rails

Replacing the Seat Frame

NOTE: For this procedure, refer to FIGURE 4.13.

1. Remove the front riggings from the seat frame. Refer to Installing/Removing Front Riggings on page 66.
2. Remove the seat from the wheelchair. Refer to Removing/Installing the Seat Assembly on page 30.
3. Remove the seat pan. Refer to Removing/Installing the Seat Pan on page 35.
4. Remove the four 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 mounting holes of the new seat frame with the correct mounting position on the seat frame adapter (DETAIL "A" of FIGURE 4.13).
8. Using four existing mounting screws and four 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 35.
10. Install the seat onto the wheelchair. Refer to Removing/Installing the Seat Assembly on page 30.

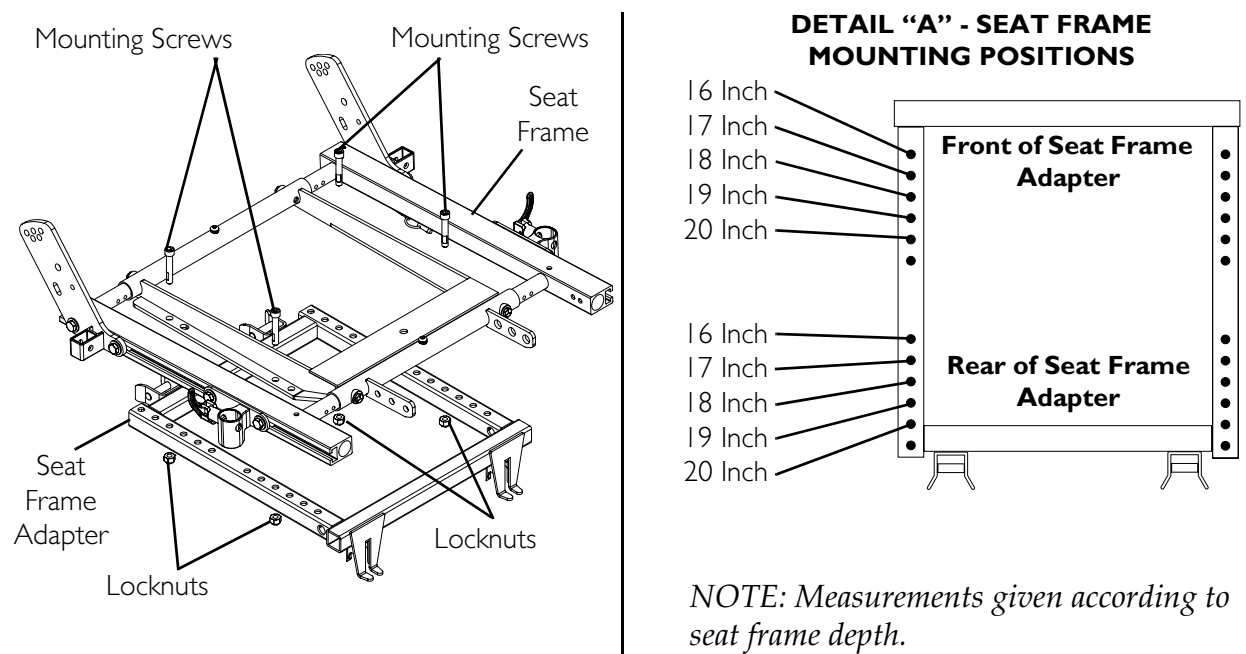


FIGURE 4.8 Replacing the Seat Frame

Removing/Installing the Back Canes

NOTE: For this procedure, refer to FIGURE 4.9 on page 42.

NOTE: Existing hardware will be reused.

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

Removing

1. Remove armrest from the wheelchair. Refer to the wheelchair owner's manual.

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

2. For proper installation, note the mounting position of the upper hex screw securing the cane bracket to the back cane.
3. Remove the upper hex screw, washer and locknut securing the cane bracket to the back cane.
4. Remove the lower hex screw, washer and locknut securing the cane bracket to the back cane.
5. Remove the back cane from the wheelchair.
6. Repeat STEPS 1 - 6 for the opposite back cane.

Installing

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

1. Install the lower hex screw, washer and locknut through the slot in the cane bracket to secure the cane bracket to the back cane.

NOTE: The cane bracket should be positioned as shown in FIGURE 4.9.

2. Install the upper hex screw, washer and locknut through one of the following:
 - Using the Same Back Angle - the mounting hole noted in STEP 3 of Removing on page 41.
 - Changing the Back Angle - the mounting hole determined in Adjusting the Back Angle on page 43.
3. Torque both locknuts to 13 ft-lbs.
4. Repeat STEPS 1 - 3 for the opposite back cane.
5. Reinstall the flip back armrest onto the wheelchair. Refer to the wheelchair owner's manual.

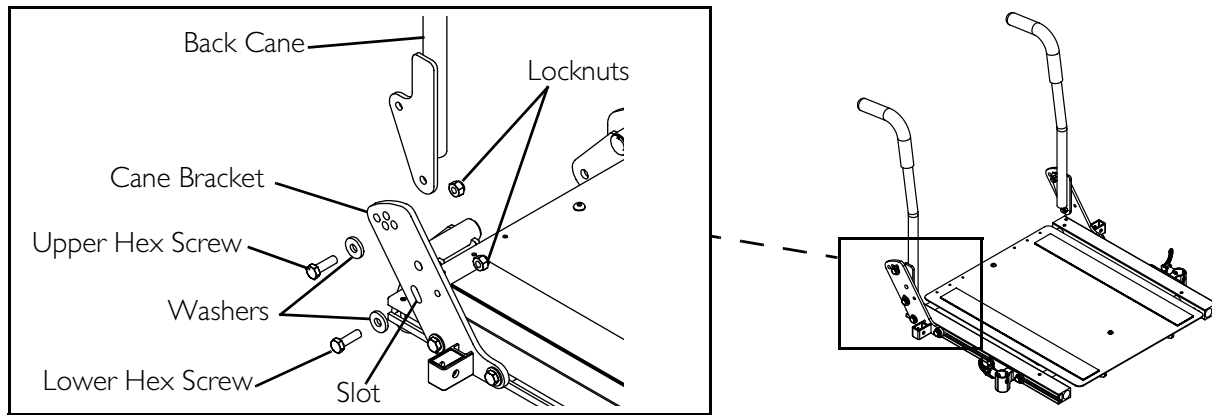


FIGURE 4.9 Removing/Installing the Back Canes

Replacing Seat Positioning Strap

NOTE: For this procedure, refer to FIGURE 4.10.

1. Remove the seat cushion from the seat pan.
2. Move the flip back armrests out of the way. Refer to [Adjusting Flip Back Armrests](#) on page 60.
3. Remove the two mounting screws, locknuts, washers and quick-release pin tabs that secure the seat positioning straps to the seat frame.
4. Remove the two halves of the seat positioning strap from the rear seat frame.
5. Reposition the two new seat positioning strap inside of the seat frame as shown.
6. Reinstall the two mounting screws and quick-release pin tabs that secure the seat positioning straps to the seat frame and torque to 75 in-lbs.
7. Reinstall the seat cushion onto the seat pan.

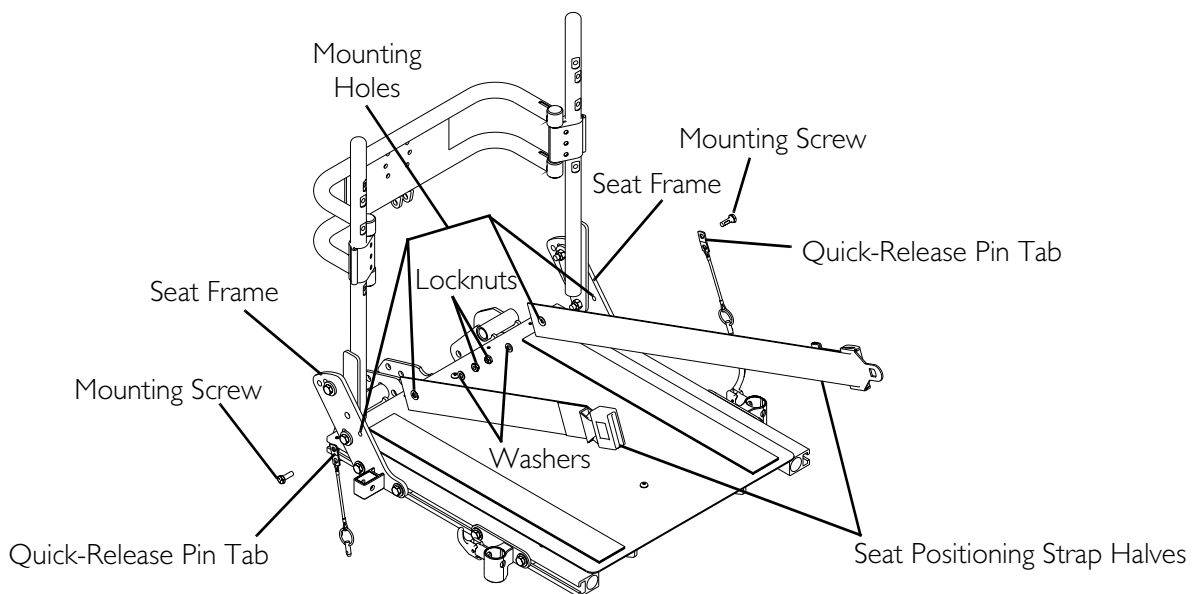


FIGURE 4.10 Replacing Seat Positioning Strap

Adjusting the Back Angle

⚠ WARNING

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

NOTE: For this procedure, refer to FIGURE 4.11.

1. Loosen, but DO NOT remove, the two lower hex screws securing the cane brackets to the back canes.
2. Remove the two upper hex screws, washers and locknuts securing the cane brackets to the back canes.
3. Align the upper mounting holes in the back canes with the desired mounting holes in the cane brackets (Detail "A").
4. Install the two upper hex screws, washers and locknuts to secure the cane brackets to the back canes.
5. Torque the locknuts to 13 ft-lbs.

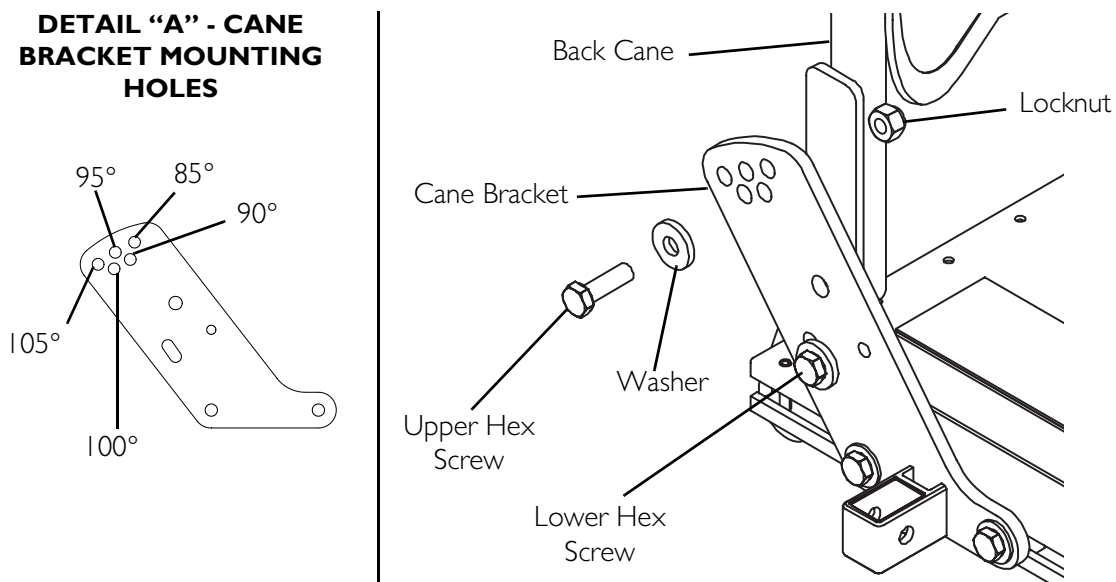


FIGURE 4.11 Adjusting the Back Angle

ASBA Seat Service Procedures

Removing/Installing the Seat Pan

NOTE: For this procedure, refer to FIGURE 4.12.

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

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

1. Perform one of the following:
 - A. Remove seating system. Refer to manufacturers seating system installation instructions.
 - B. Remove cushion by pulling up to release hook and loop strips. Remove cushion from seat pan.
2. Remove the two 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 front mounting screws, spacers and locknuts also secure the front rigging support tubes to the seat frame.

3. Remove the four mounting screws, locknuts and four spacers securing the seat pan to the seat frame (FIGURE 4.12).
4. Remove the seat pan from the seat frame.

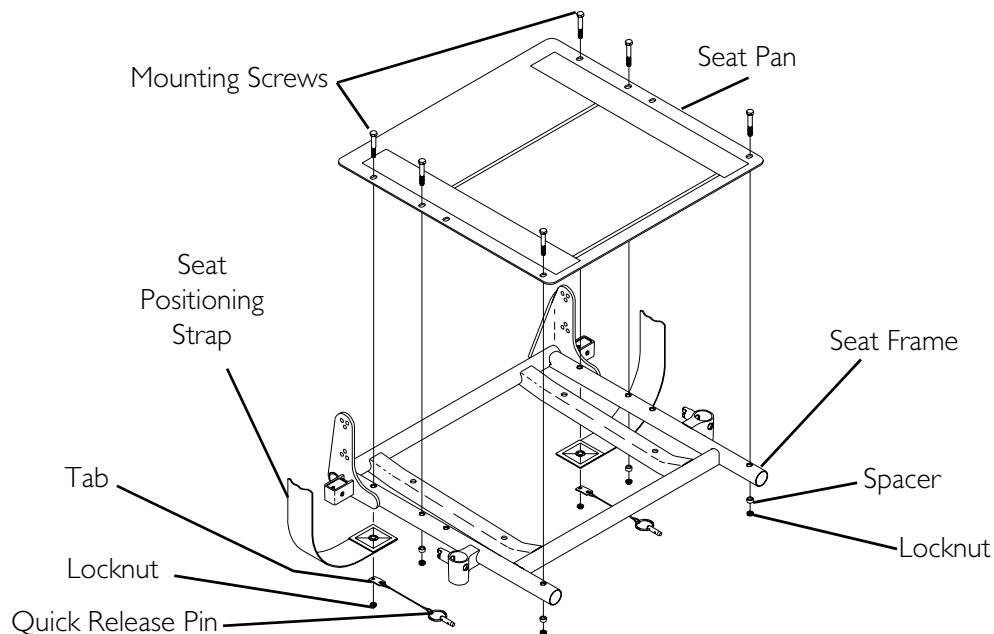


FIGURE 4.12 Removing/Installing the Seat Pan

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 45.

Replacing the Seat Frame

NOTE: For this procedure, refer to FIGURE 4.13.

1. Remove the front riggings from the seat frame. Refer to Installing/Removing Front Riggings on page 66.
2. Remove the seat from the wheelchair. Refer to Removing/Installing the Seat Assembly on page 30.
3. Remove the seat pan. Refer to Removing/Installing the Seat Pan on page 44.
4. Remove the four 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 mounting holes of the new seat frame with the correct mounting position on the seat frame adapter (DETAIL "A" of FIGURE 4.13).
8. Using four existing mounting screws and four 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 44.
10. Install the seat onto the wheelchair. Refer to Removing/Installing the Seat Assembly on page 30.

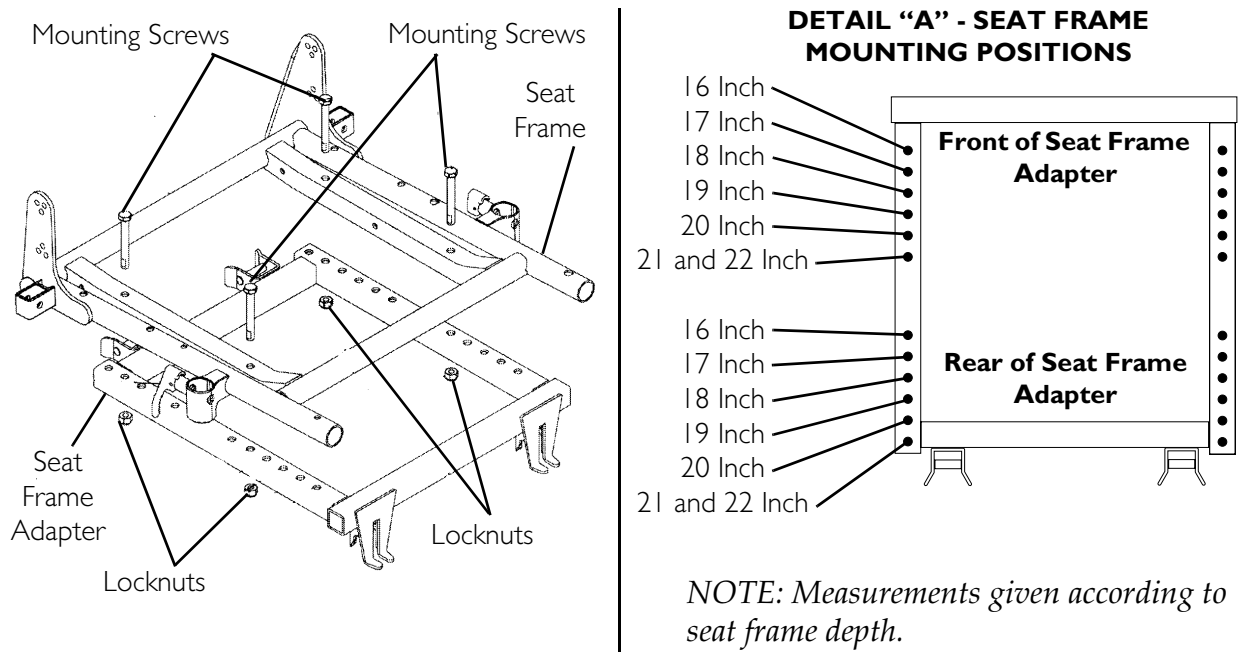


FIGURE 4.13 Replacing the Seat Frame

Replacing the Seat Positioning Strap

NOTE: For this procedure, refer to FIGURE 4.14.

1. Remove the seat cushion from the seat pan.
2. Remove the flip back armrests. Refer to [Removing/Installing Flip Back Armrest](#) on page 58.
3. Remove the two 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 halves of the seat positioning strap from the rear seat frame.
5. Reposition the two new seat positioning strap halves underneath seat rails.
6. Reinstall the two 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.

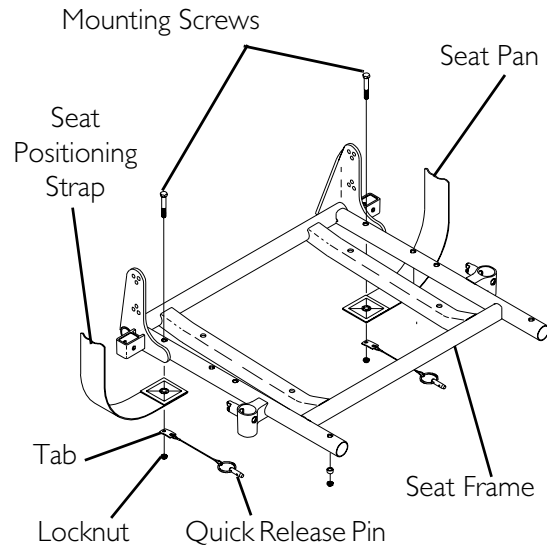


FIGURE 4.14 Replacing the Seat Positioning Strap

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 46.

Removing/Installing/Changing the Back Cane Height

NOTE: For this procedure, refer to FIGURE 4.15 on page 49.

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
	21 to 22 inches

NOTE: Existing hardware and inserts will be reused.

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

Removing

1. Remove flip back armrest from the wheelchair. Refer to Arm Service Procedures for ASBA or Adjustable ASBA Seat on page 58.

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

2. On the side of wheelchair with armrest removed, remove one of the mounting screws, washer, coved washer and locknut that secures 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 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 mounting screws used to keep inserts in the back canes in STEP 3. Set mounting screws and inserts aside.
10. Loosen, but DO NOT remove, the two 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 4.15 for proper spreader bar location on back canes.

1. Slide one 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.

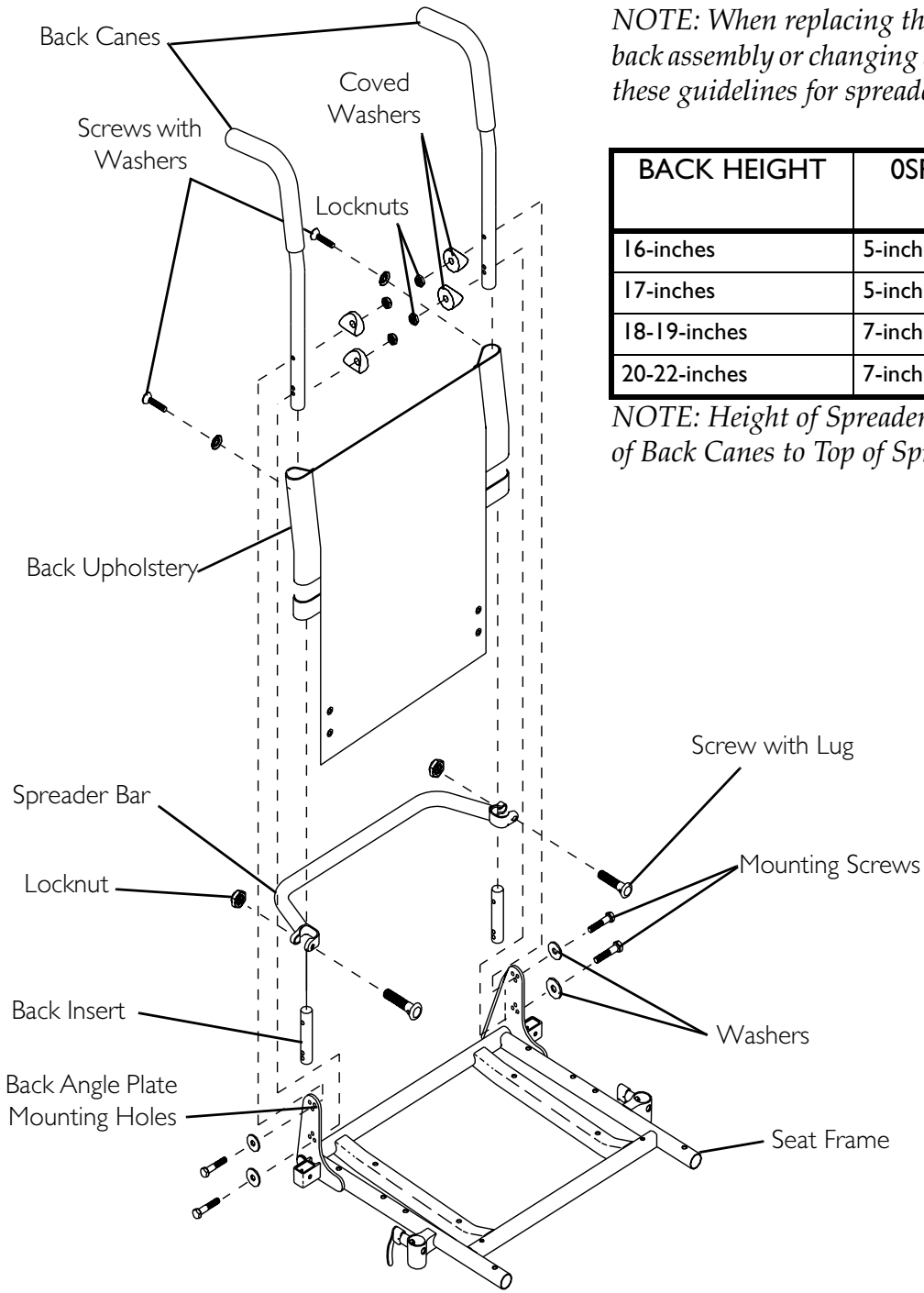
NOTE: If changing the back angle, refer to Adjusting the Back Angle on page 50 to determine the proper mounting holes for the desired back angle.

5. Position back assembly between the back angle plates (FIGURE 4.15).
6. On one side of wheelchair, align back cane mounting holes with the desired mounting holes of the back angle plate.
7. Remove the two 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 mounting screws, washers, coved washers and locknuts (FIGURE 4.15). 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 existing mounting screws.
11. Using two 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 4.15).
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 58.



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
20-22-inches	7-inches

NOTE: Height of Spreader Bar from Bottom of Back Canes to Top of Spreader Bar Clamp.

FIGURE 4.15 Removing/Installing the Back Upholstery

Adjusting the Back Angle

NOTE: For this procedure, refer to FIGURE 4.16.

1. Remove the flip back armrests from the wheelchair. Refer to [Removing/Installing Flip Back Armrest](#) on page 58.
2. Remove the mounting screw, washer, coved washer and locknut from the top mounting hole of back angle plate and back cane (FIGURE 4.16).

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 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 58.

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

FIGURE 4.16 Adjusting the Back Angle

Van Seat Service Procedures

Adjusting the Back Angle

NOTE: For this procedure, refer to FIGURE 4.17.

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.

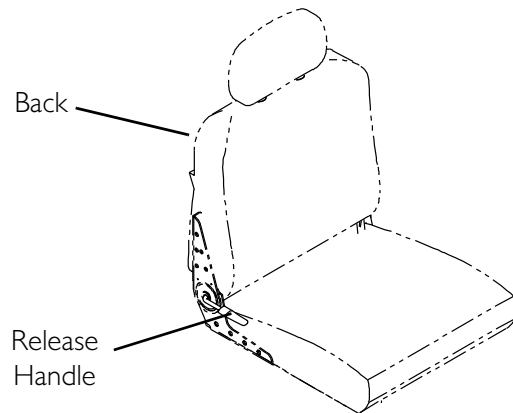


FIGURE 4.17 Adjusting the Back Angle

Adjusting the Seat Position on Van Seat Frame

⚠ WARNING

For users over 250 lbs: The seat MUST be mounted in the furthest rearward position and the front seat posts MUST be in the 1-inch raised position or lower mounting holes A or B. Refer to Table: Available Mounting Holes on page 32 for available mounting positions

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

NOTE: For this procedure, refer to FIGURE 4.18 on page 52.

1. Remove the seat assembly. Refer to Removing/Installing the Seat Assembly on page 30.
2. Remove the four bolts, four coved washers and two spacers securing the van seat to the seat frame.
3. Separate van seat from seat frame.
4. Refer to FIGURE 4.18 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 bolts, four coved washers and two spacers. Securely tighten.
7. Reinstall the seat assembly. Refer to Removing/Installing the Seat Assembly on page 30.

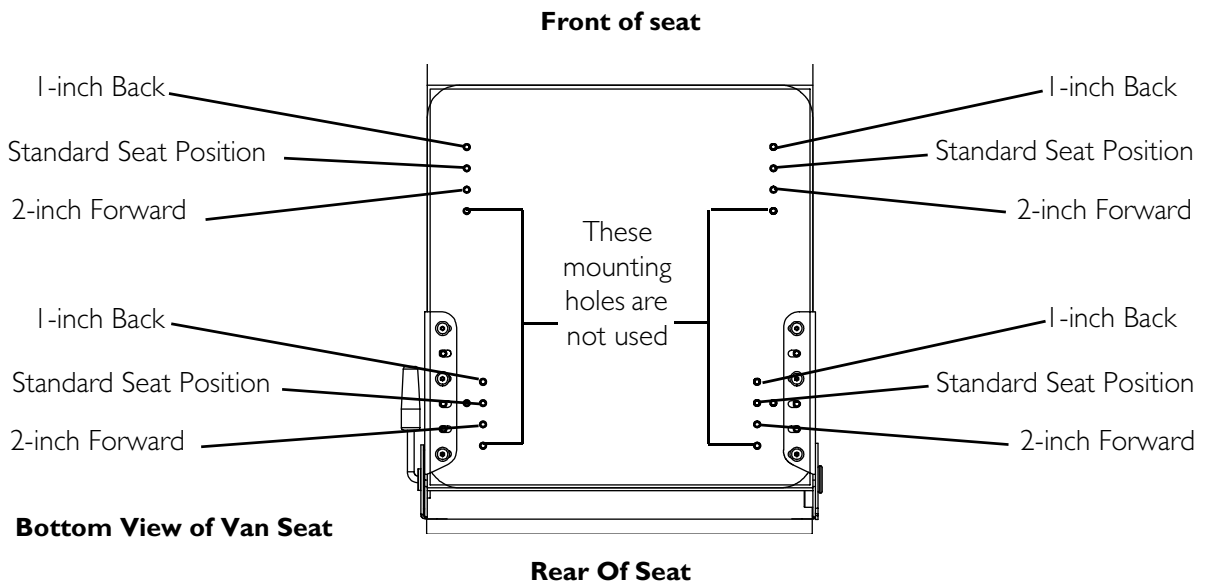
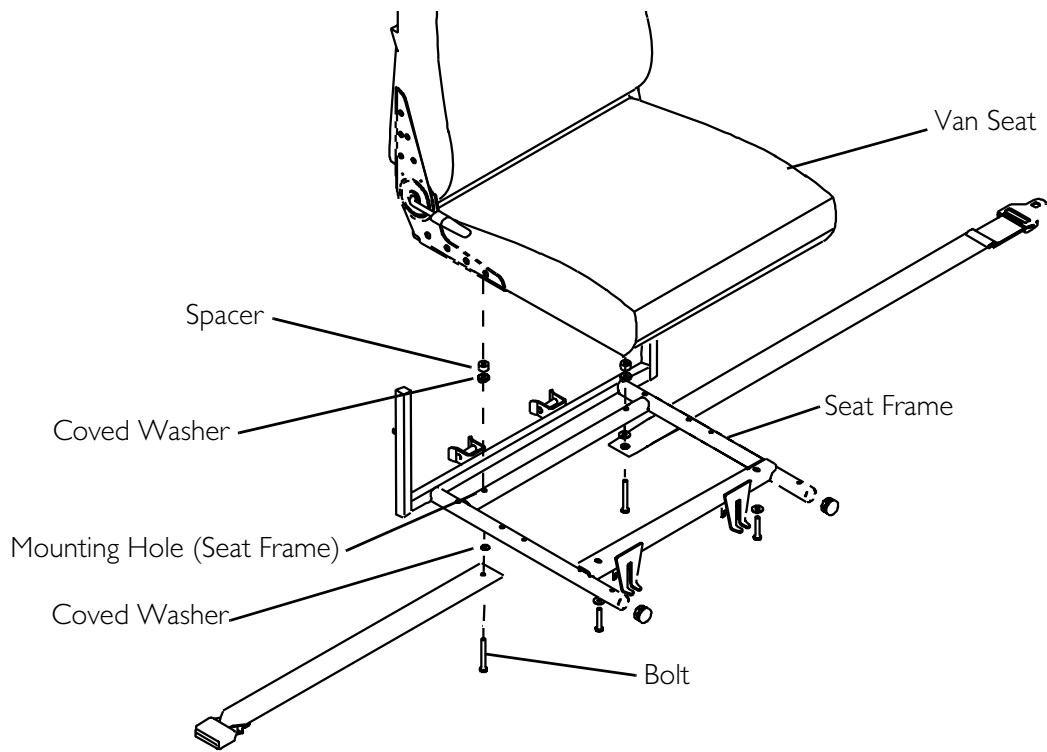


FIGURE 4.18 Adjusting the Seat Position on Van Seat Frame

Adjusting the Van Seat Back Depth

NOTE: For this procedure, refer to FIGURE 4.19.

1. Remove the seat assembly. Refer to Removing/Installing 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 51.
3. Remove the six 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 4.19).
5. Using the six 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 51.
7. Reinstall the seat assembly. Refer to Removing/Installing the Seat Assembly on page 30.

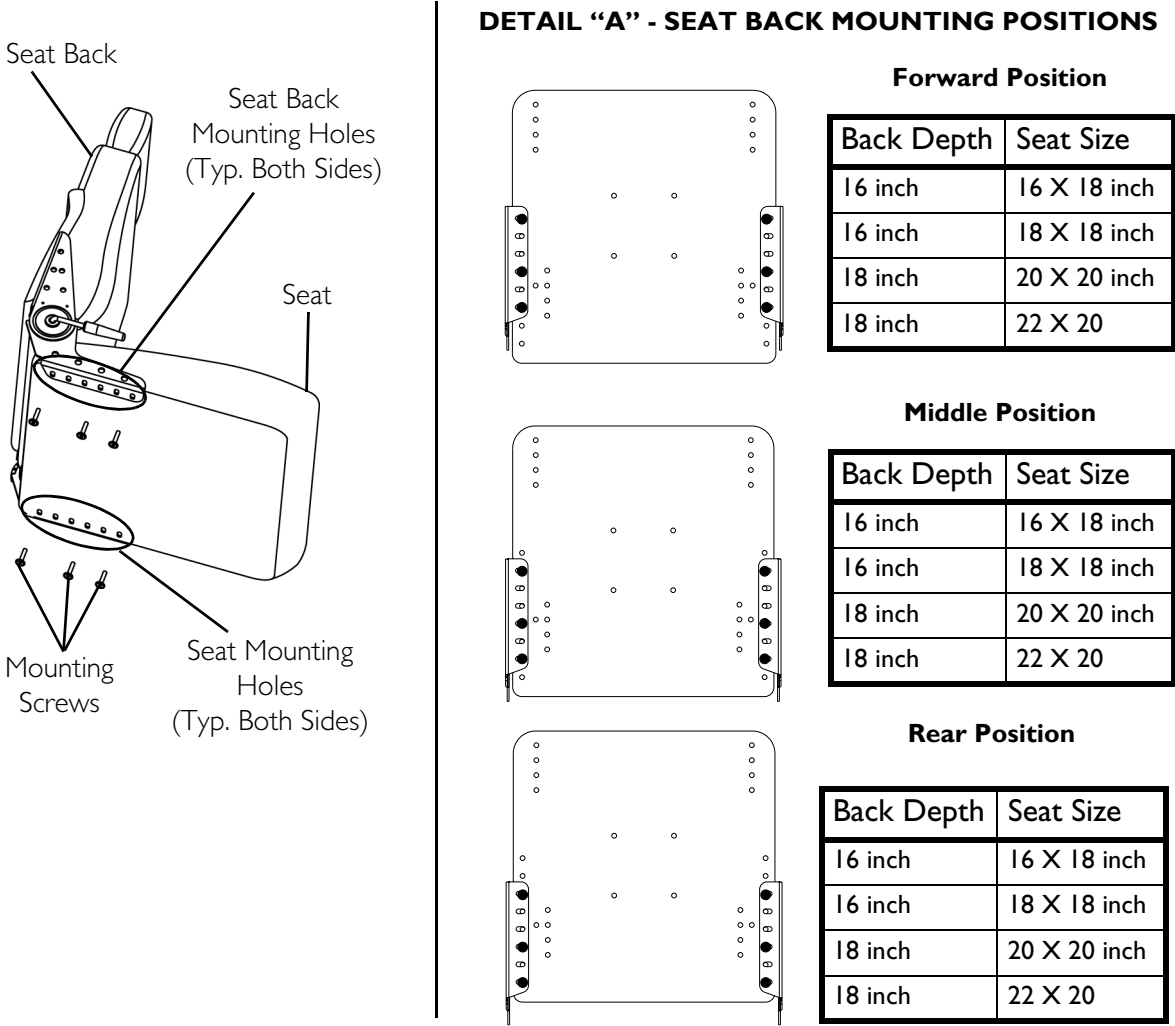


FIGURE 4.19 Adjusting the Van Seat Back Depth

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 97.
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 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 lock knobs that secure the adjustable width arms to the arm support tube.

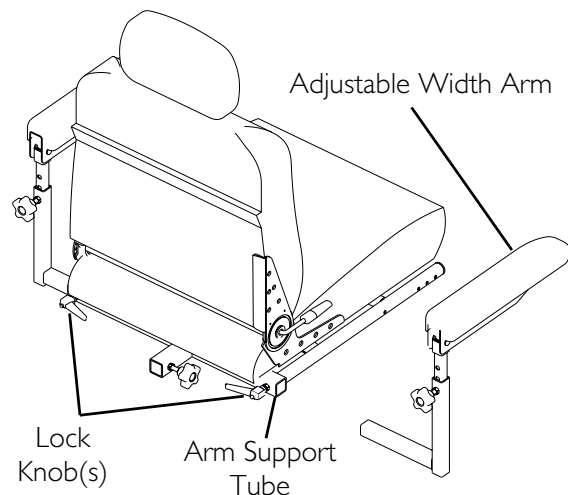


FIGURE 5.1 Removing/Installing Van Seat Arm and Adjusting Van Seat Arm Width

Adjusting Van Seat Arm Angle

NOTE: For this procedure, refer to FIGURE 5.2.

⚠ WARNING

Pinch point may occur when adjusting the arm angle position.

1. Lift-up the armrest.
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

NOTE: For this procedure, refer to FIGURE 5.2.

NOTE: This procedure is for adjustable height arms only.

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

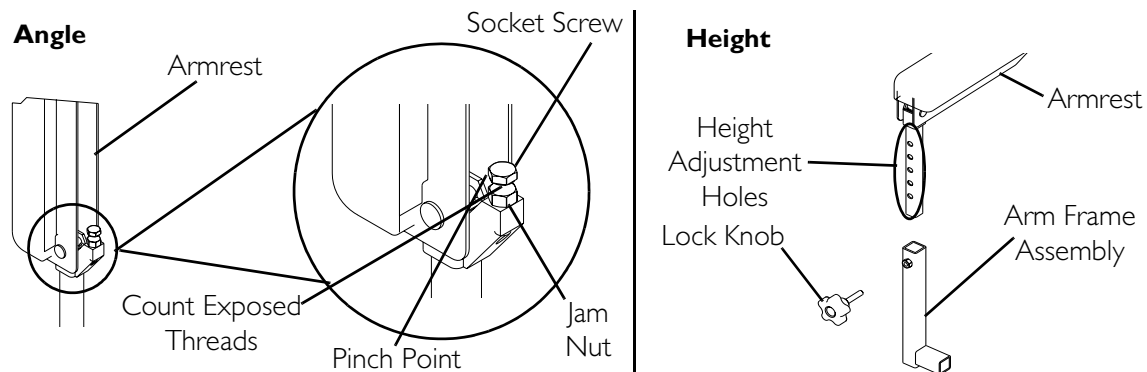


FIGURE 5.2 Adjusting Van Seat Arm Angle - Adjusting Van Seat Arm Height

Replacing Van Seat Armrest Pads (Wheelchairs Built before October 2003)

NOTE: For this procedure, refer to FIGURE 5.3.

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

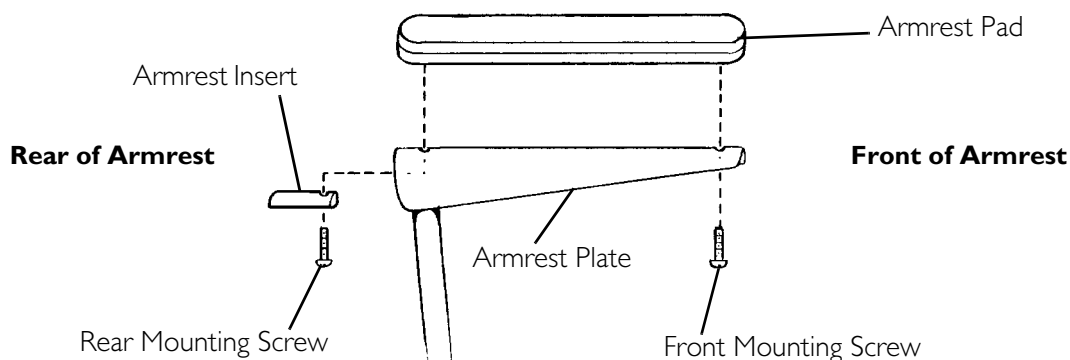


FIGURE 5.3 Replacing Van Seat Armrest Pads (Wheelchairs Built before October 2003)

Replacing Van Seat Armrest Plate (Wheelchairs Built before October 2003)

NOTE: For this procedure, refer to FIGURE 5.4 on page 57.

1. If necessary, remove the joystick. Refer to Removing/Installing the Joystick, Van Seat Models on page 98.
2. Remove armrest pad. Refer to Replacing Van Seat Armrest Pads (Wheelchairs Built before October 2003) on page 56.
3. Remove the mounting screw, washers and locknut that secure the existing armrest plate to the arm post.
4. Position the new armrest plate on the armrest post and secure with the mounting screw, washers, and locknut. Refer to FIGURE 5.4 for correct hardware orientation.

5. Reinstall van style armrest pad. Refer to [Replacing Van Seat Armrest Pads \(Wheelchairs Built before October 2003\)](#) on page 56.
6. If necessary, install the joystick. Refer to [Removing/Installing the Joystick, Van Seat Models](#) on page 98.
7. Repeat STEPS 1-6 for the opposite armrest plate, if necessary.

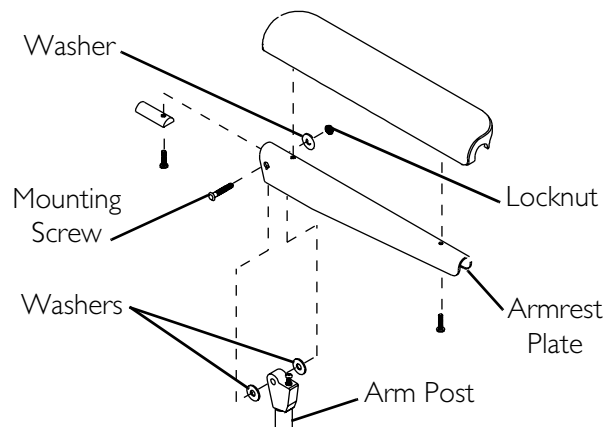


FIGURE 5.4 Replacing Van Seat Armrest Plate (Wheelchairs Built before October 2003)

Replacing Van Seat Armrest Pad Assembly (Wheelchairs Built After October 2003)

NOTE: For this procedure, refer to FIGURE 5.5.

1. If necessary, remove the joystick. Refer to [Removing/Installing the Joystick, Van Seat Models](#) on page 98.
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 5.4 for correct hardware orientation.
4. If necessary, install the joystick. Refer to [Removing/Installing the Joystick, Van Seat Models](#) on page 98.
5. Repeat STEPS 1-4 for the opposite armrest plate, if necessary.

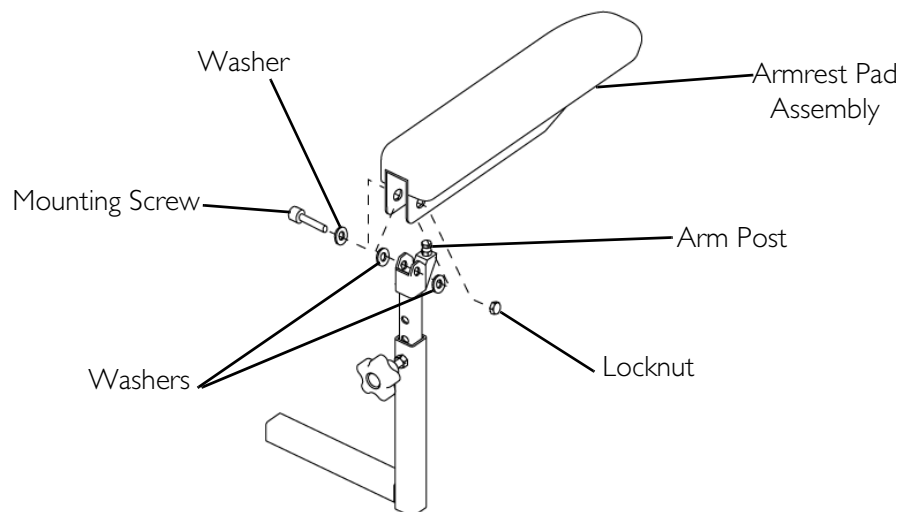


FIGURE 5.5 Replacing Van Seat Armrest Pad Assembly (Wheelchairs Built After October 2003)

Arm Service Procedures for ASBA or Adjustable 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 5.6.

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 97.
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 1-4 for the opposite flip back armrest, if necessary.

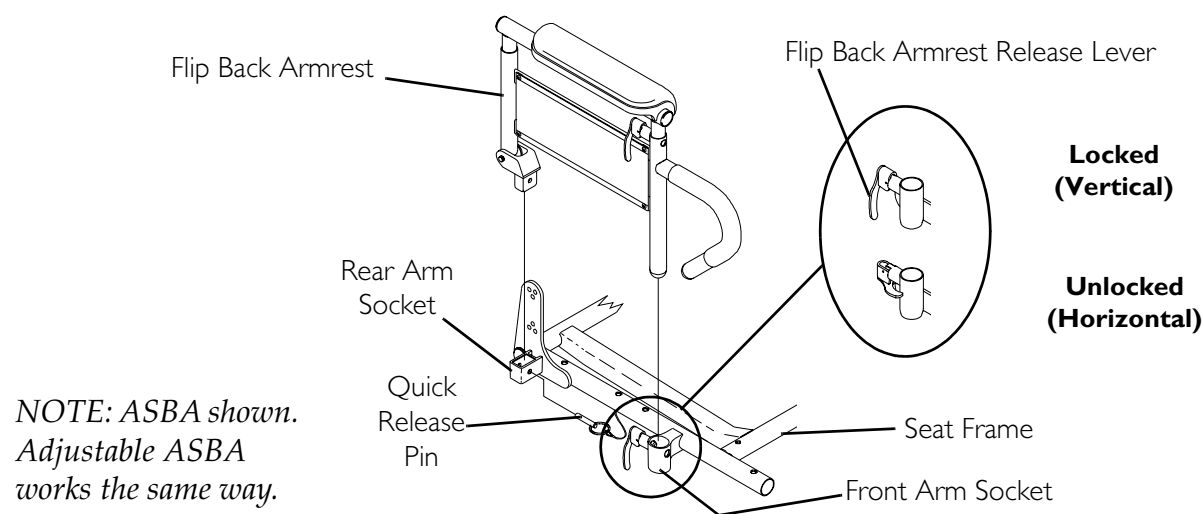


FIGURE 5.6 Removing/Installing Flip Back Armrest

Adjusting the Flip Back Armrest

NOTE: For this procedure, refer to FIGURE 5.7 on page 59.

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.

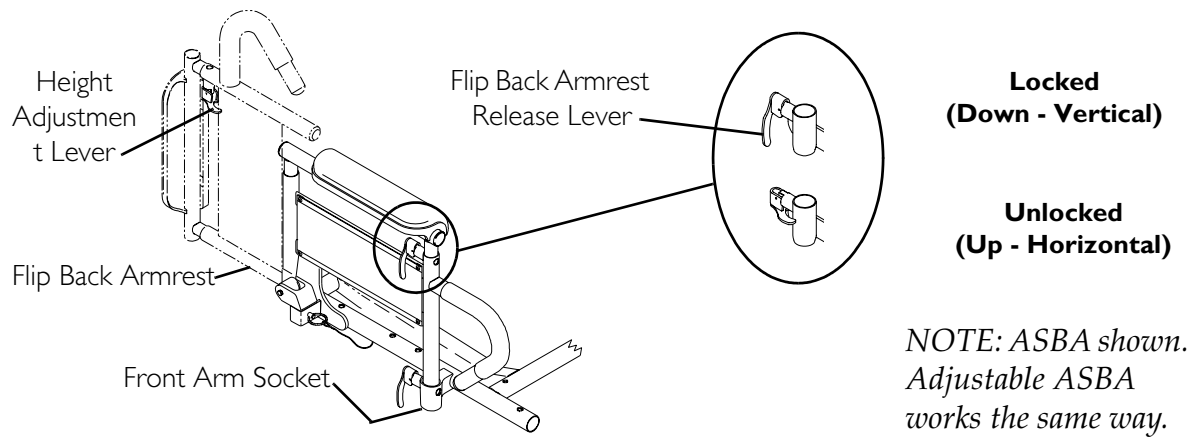


FIGURE 5.7 Adjusting the Flip Back Armrest

SECTION 6—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 6.1.

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

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

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

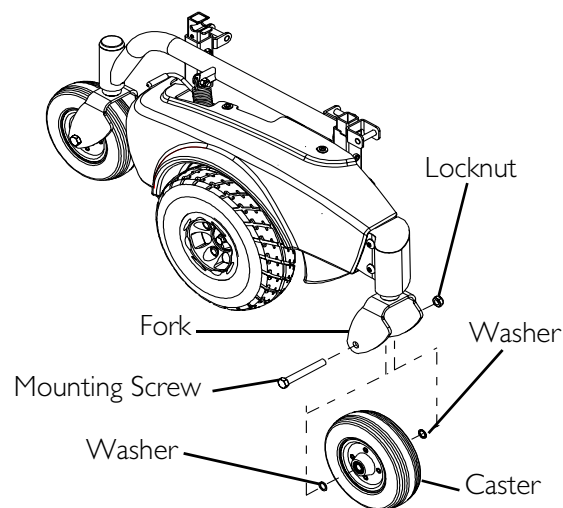


FIGURE 6.1 Replacing the Front/Rear Casters

Adjusting Caster Assembly

NOTE: For this procedure, refer to FIGURE 6.2.

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

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

- A. Tip back the wheelchair.
 - B. Pivot both caster assemblies to top of their arc simultaneously.
 - C. Let casters drop to bottom of arc (casters should swing once to one-side, then immediately rest in a straight downward position).
 - D. Adjust locknuts according to freedom of caster swing.
3. Test wheelchair for maneuverability.
 4. Readjust locknuts if necessary, and repeat STEPS 1-3 until correct.
 5. Snap dust cover into the caster headtube ensuring that the tabs are under the plastic side shrouds.

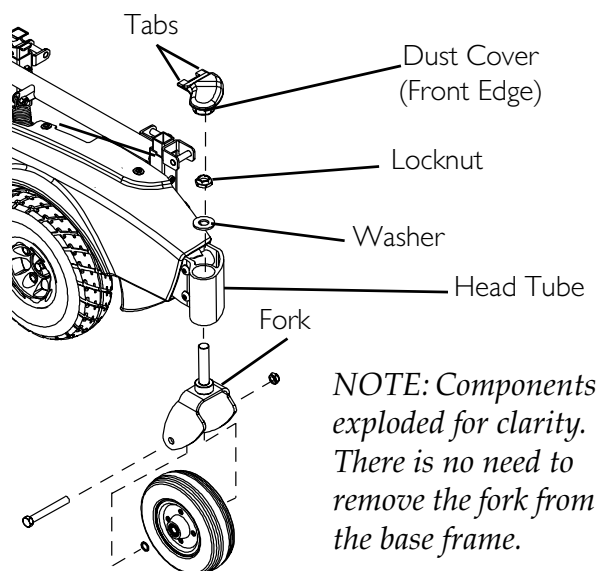


FIGURE 6.2 Adjusting Caster Assembly

Removing/Installing the Front/Rear Caster Assemblies

NOTE: For this procedure, refer to FIGURE 6.3.

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

Removing

1. Remove the dust cover.
2. Remove locknut and washer securing caster assembly to the headtube.

Installing

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

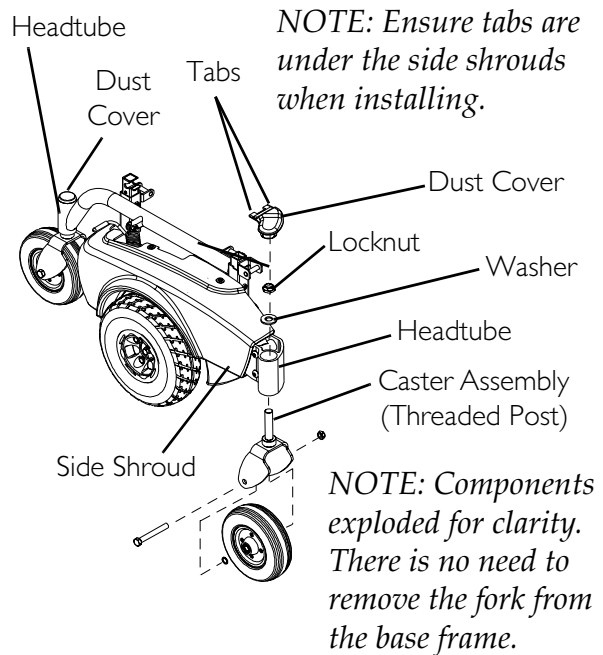


FIGURE 6.3 Removing/Installing the Front/Rear Caster Assemblies

Removing/Installing the Front Headtube Assembly

NOTE: For this procedure, refer to FIGURE 6.4.

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 top mounting screws and bushing that secure the headtube to the walking beam.
3. Remove the two bottom mounting screws and bushing that secure the head tube to the pivot tube.
4. Remove the headtube from the walking beam and pivot tube.

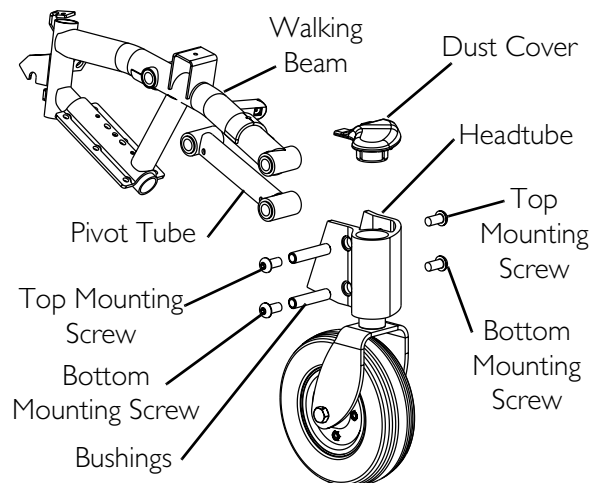


FIGURE 6.4 Removing/Installing the Front Headtube Assembly

Removing/Installing the Drive Wheel

NOTE: For this procedure, refer to FIGURE 6.5 on page 64.

Removing the Drive Wheel

1. Fold down tab of existing locking tab washer (Detail “A” of FIGURE 6.5).
2. Remove mounting bolt and locking tab washer (Detail “B” of FIGURE 6.5). Discard existing locking tab washer.
3. Remove the wheel from the drive shaft. If necessary, use wheel puller to remove the drive wheel from the drive shaft.

Installing the Drive Wheel

NOTE: Ensure keystone is in the cutout on the drive shaft (Detail “B” of FIGURE 6.5). The keystone MUST line up with the wheel hub cutout.

CAUTION

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

-
1. Apply an anti-seize compound to drive shaft and keystone.
 2. Align the keystone in the drive shaft with the cutout in the wheel hub and position the wheel on to the drive shaft (Detail “B” of FIGURE 6.5).

⚠ 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.

NOTE: The locking tab of the locking tab washer MUST be inserted into the cutout in the rim and hub (Detail “B” of FIGURE 6.5).

3. Using the mounting bolt, washer and new locking tab washer, secure the wheel to the drive shaft (Detail “B” of FIGURE 6.5).
4. Fold one tab of the locking tab washer UP so that the tab rests against one side of the mounting bolt (Detail “A” of FIGURE 6.5)

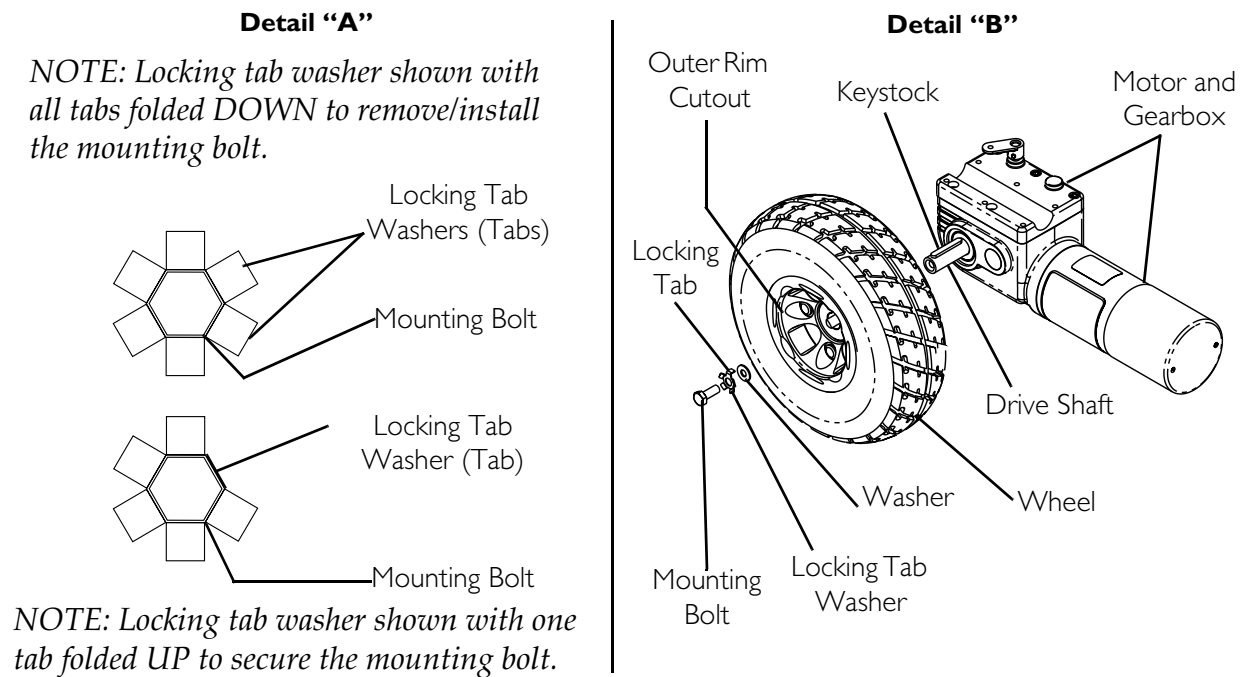


FIGURE 6.5 Removing/Installing the Drive Wheel

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

NOTE: For this procedure, refer to FIGURE 6.6 on page 65.

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 63 to remove the existing 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. Deflate existing pneumatic tire.
2. Remove the four existing mounting screws, locknuts and washers that secure the existing outer rim and inner rim.
3. Separate the two 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.

4. Insert the outer rim and inner rim into the new/existing tire.

5. Insert the hub into the inner rim and align the four mounting holes of the hub, inner rim and outer rim.
6. Using the four mounting screws, lock washers and hex nuts, secure the outer rim to the inner rim and hub. Torque hex nuts to 160 - 200-inch-lbs.
7. If pneumatic, fill tire to correct air pressure as noted on tire side wall.

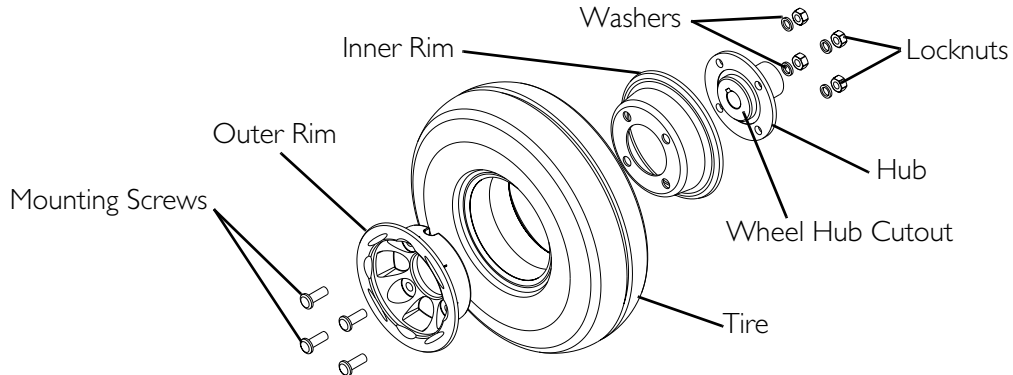


FIGURE 6.6 Replacing the 2-Piece Wheel Rim and/or the Foam Filled or Pneumatic Tires

SECTION 7—FRONT RIGGINGS/ FOOTBOARD

⚠ 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.

Installing/Removing Front Riggings

CAUTION

If non-hemi front riggings are used, then the seat **MUST** be adjusted to the highest mounting position - otherwise damage may occur.

NOTE: For this procedure, refer to FIGURE 7.1.

Installing

1. If necessary, remove the footboard. Refer to [Removing/Installing the Footboard Assembly](#) on page 71.
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.
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 1-4 for opposite side of wheelchair.

Removing

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

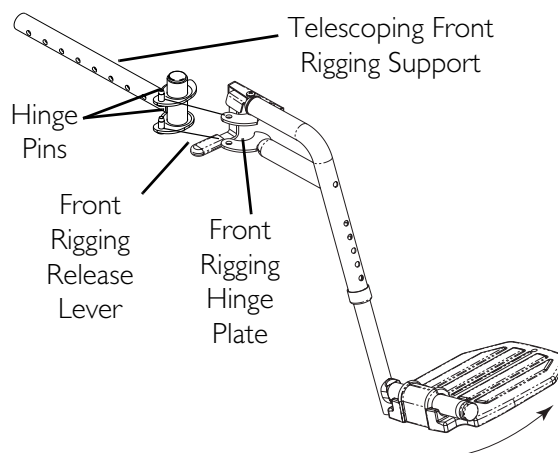


FIGURE 7.1 Installing/Removing Front Riggings

Adjusting Footrest Height

Model PHWH93 Front Riggings

NOTE: For this procedure, refer to FIGURE 7.2.

1. Remove any accessory from the front rigging(s).
2. Remove the front rigging from the wheelchair. Refer to [Installing/Removing Front Riggings](#) on page 66.

NOTE: Lay front rigging on a flat surface to simplify 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.
6. Repeat STEPS 1-5 for the opposite side of the wheelchair footrest, if necessary.
7. Reinstall the footrest(s) onto the wheelchair. Refer to [Installing/Removing Front Riggings](#) on page 66.

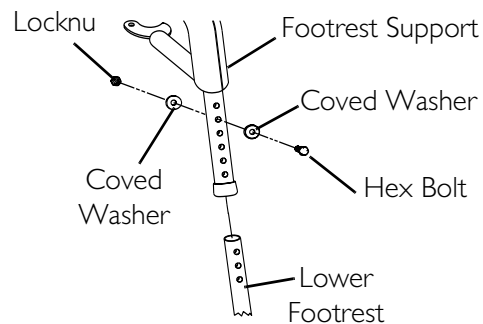
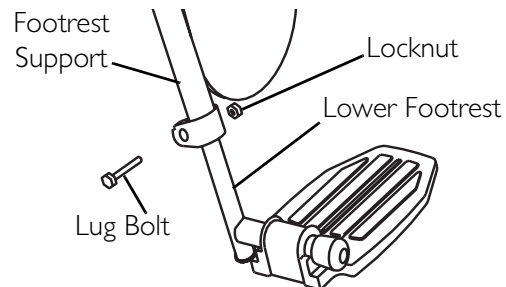


FIGURE 7.2 Model PHWH93 Front Riggings

Model PH904A and PHAL4A Front Riggings

NOTE: For this procedure, refer to FIGURE 7.3.

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



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

FIGURE 7.3 Model PH904A and PHAL4A Front Riggings

Replacing Heel Loops

NOTE: For this procedure, refer to FIGURE 7.4.

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 mounting screw, 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.

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

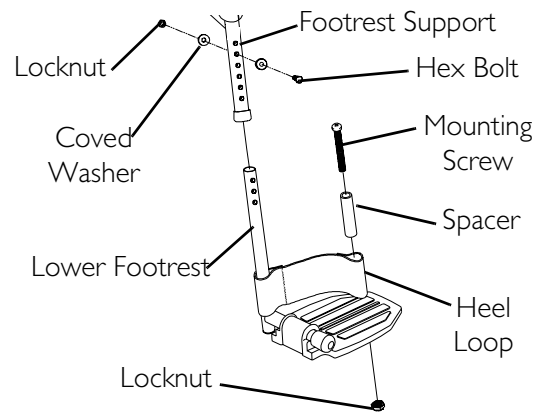


FIGURE 7.4 Replacing Heel Loops

Raising/Lowering Elevating Front Riggings

NOTE: For this procedure, refer to FIGURE 7.5.

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

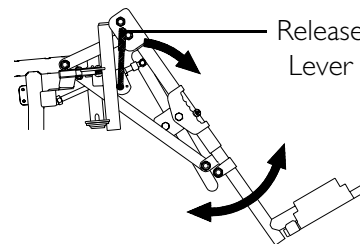


FIGURE 7.5 Raising/Lowering Elevating Front Riggings

Adjusting/Replacing Telescoping Front Rigging Supports

Van Seat

NOTE: For this procedure, refer to FIGURE 7.6 on page 69.

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

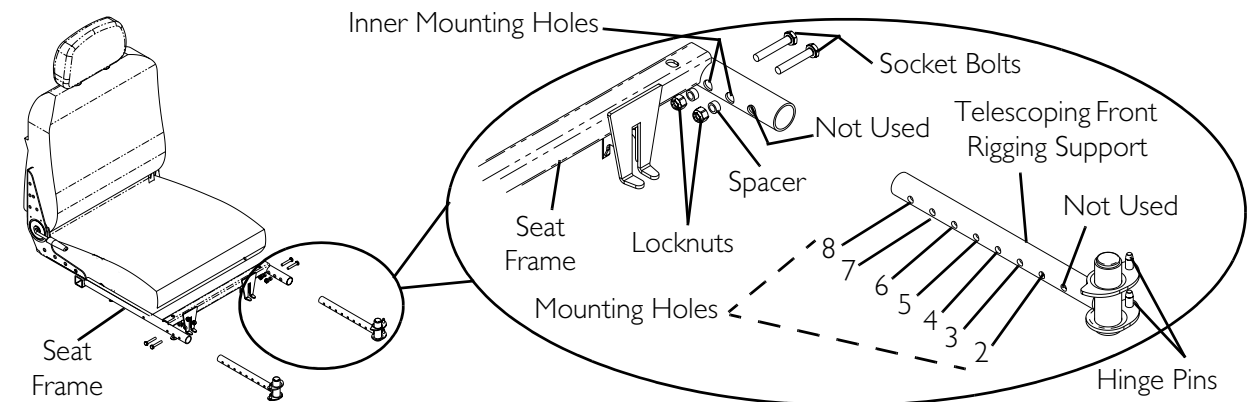
NOTE: Telescoping front rigging supports may be extended up to 2-inches from the wheelchair frame in 1-inch increments. This adjustment does not affect seat depth.

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

1. Remove the seat assembly. Refer to Removing/Installing the Seat Assembly on page 30.
2. Remove the two socket bolts, spacers and locknuts that secure telescoping front rigging support to the seat frame.
3. Perform one of the following:
 - A. Adjusting - Align the appropriate mounting hole of the telescoping front rigging support with the front mounting hole in the seat frame tubes to achieve the desired depth (FIGURE 7.6).
 - B. Replacing - Perform the following:
 - 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 front mounting hole in the seat frame tubes to achieve the desired depth (FIGURE 7.6).

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

4. Using the two socket bolts, spacers 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 assembly. Refer to Removing/Installing the Seat Assembly on page 30.



STANDARD POSITION		1-INCH OUT		2-INCHES OUT	
18-inch Wide	20-inch Wide	18-inch Wide	20-inch Wide	18-inch Wide	20-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 7.6 - Adjusting/Replacing Telescoping Front Rigging Supports - Van Seat

ASBA Seat

NOTE: For this procedure, refer to FIGURE 7.7.

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

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

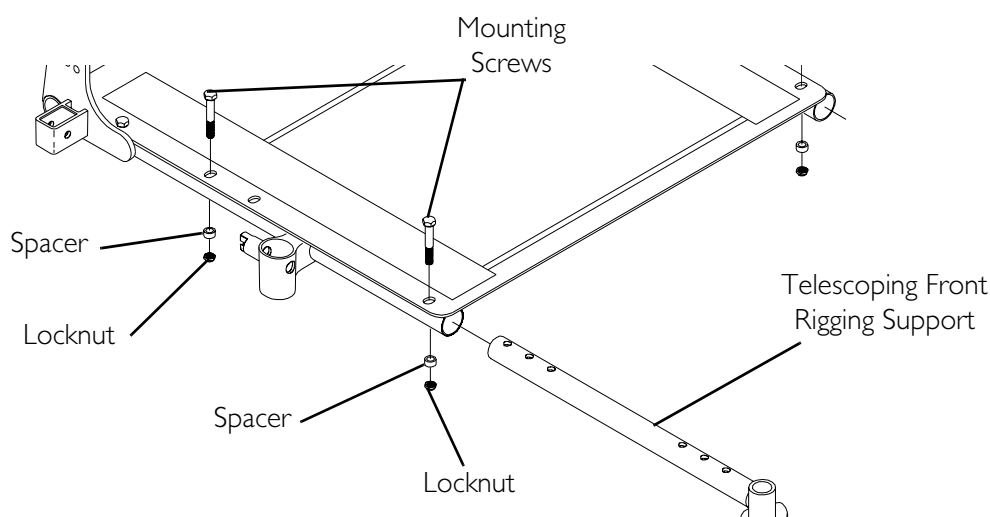


FIGURE 7.7 Adjusting/Replacing Telescoping Front Rigging Supports - ASBA Seat

Adjustable ASBA Seat

⚠ WARNING

If the telescoping tubes need to be extended greater than two inches, then the seat **MUST be repositioned rearward to ensure stability - otherwise personal injury and/or damage to the wheelchair and surrounding property may result.**

NOTE: For this procedure, refer to FIGURE 7.8 on page 71.

1. Remove the two cap screws, spacers and threaded blocks securing the telescoping front tube to the side rail.
2. Perform one of the following:
 - Slide existing telescoping front rigging support to one of six depth positions.
 - Remove existing telescoping front rigging.

3. Secure the telescoping front tube to the side rail at the desired depth with the existing two cap screws, spacers and threaded blocks.
4. Repeat STEPS 1 to 3 on the opposite side if desired.

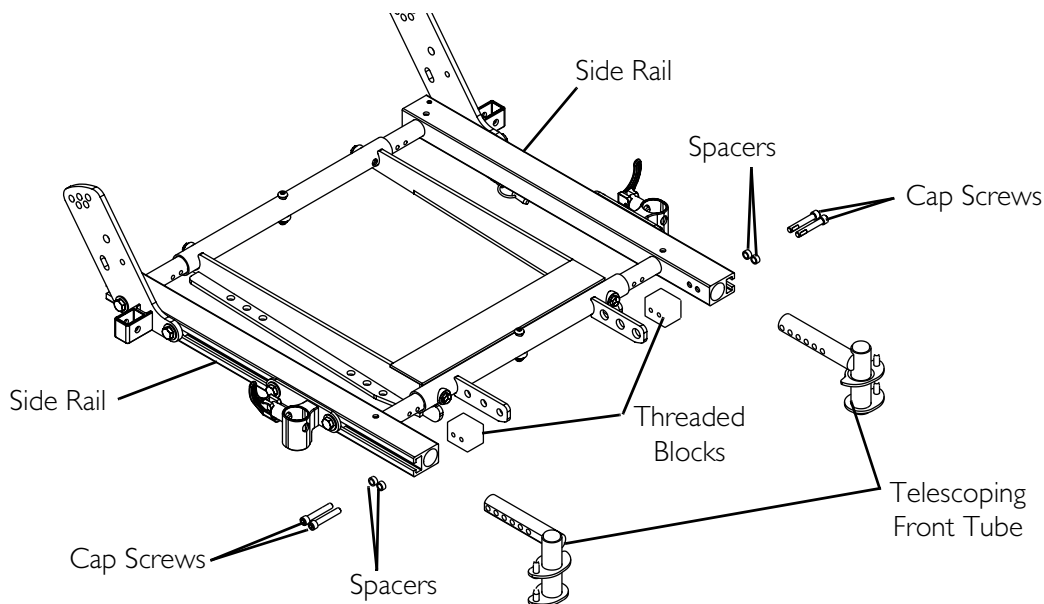


FIGURE 7.8 Adjusting/Replacing Telescoping Front Rigging Supports - Adjustable ASBA Seat

Removing/Installing the Footboard Assembly

NOTE: For this procedure, refer to FIGURE 7.9 on page 72.

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 holes in the wheelchair frame align with the desired mounting holes 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.

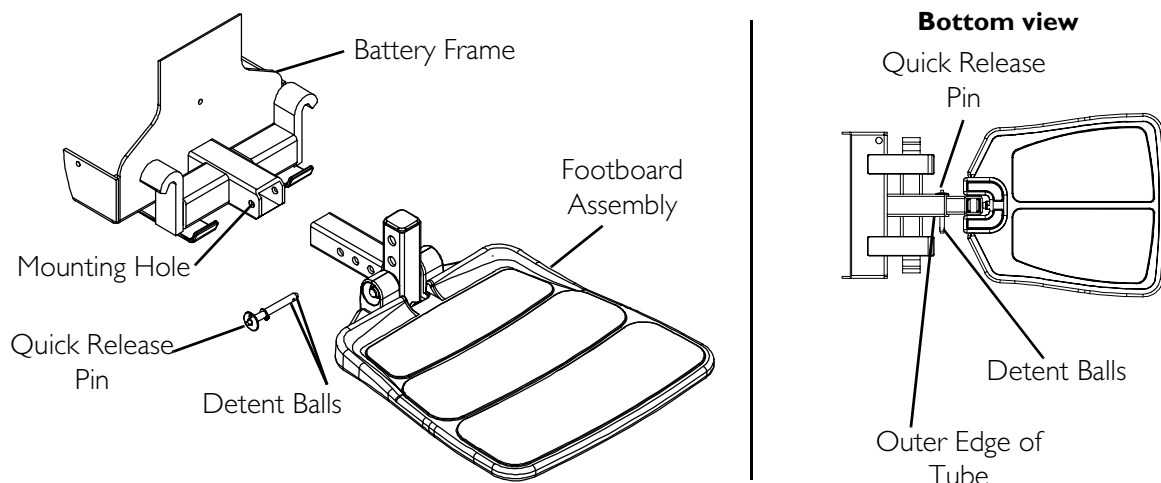


FIGURE 7.9 Removing/Installing the Footboard Assembly

Angle/Depth/Height Adjustment of the Footboard Assembly

⚠ WARNING

Pinch point may occur when rotating the footboard assembly.

Angle Adjustment

NOTE: For this procedure, refer to FIGURE 7.10.

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

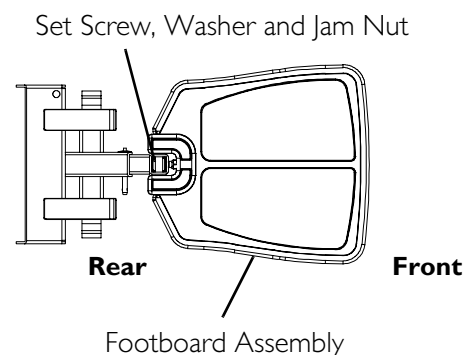


FIGURE 7.10 Angle Adjustment

Depth Adjustment

NOTE: For this procedure, refer to FIGURE 7.11 on page 73.

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 of three mounting positions.
3. Install the quick release pin. Make sure the detent balls are engaged with the outer edge of the tube.

Height Adjustment

NOTE: For this procedure, refer to FIGURE 7.11.

1. Remove the quick release pin that secures the footboard assembly to the wheelchair frame.
2. Remove mounting screw, washer, bushing, locknut and two nylon washers that secure the footboard to the footboard support.
3. Align footboard mounting holes with one of three height adjustment mounting holes.
4. Using the mounting screw, washer, bushing, locknut and two nylon washers, secure the footboard to the footboard support.
5. Insert footboard support, with footboard attached, into the wheelchair frame and align wheelchair frame mounting holes with the desired depth adjustment mounting holes in the footboard assembly.

⚠ WARNING

Make sure the detent balls of the quick-release pin are fully released beyond the outer edge of the tube before operating the wheelchair. Otherwise, injury and/or damage may result.

Keep detent balls clean.

6. Using the quick release pin, secure the footboard assembly to the wheelchair frame. Make sure the detent balls are engaged with the outer edge of the tube.

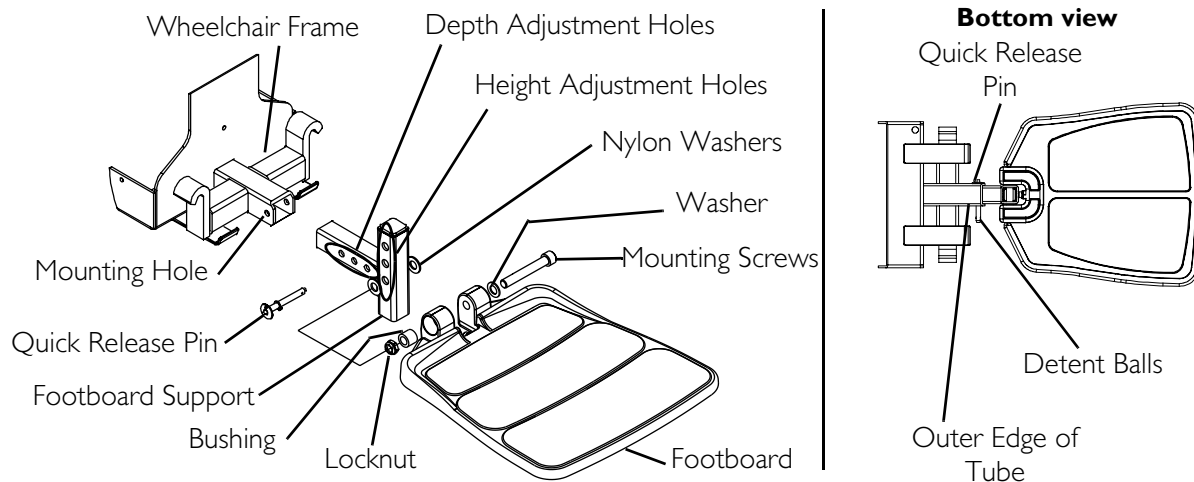


FIGURE 7.11 Depth Adjustment/Height Adjustment

SECTION 8—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 8.1 on page 75.

⚠ 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 97.
2. Remove the seat assembly. Refer to Removing/Installing the Seat Assembly on page 30.
3. Perform one of the following:
 - A. Right and Left Side Shroud - Remove the five mounting screws that secure the shroud to the side frame assembly.

NOTE: Shorter mounting screws are used to secure the top rear of side shrouds (Detail "A" of FIGURE 8.1).

- B. Shroud Plate - Remove the two mounting screws and washers securing the shroud plate to the side frame assembly (Detail "A" of FIGURE 8.1).
- C. Front Shroud - Remove the two mounting screws that secure the front shroud to the base frame (Detail "B" of FIGURE 8.1).
- D. Rear Shroud - Perform one of the following:
 - i. BEFORE 7/14/03 - Rotate knob 90° and remove rear shroud from base frame (Detail "B" of FIGURE 8.1).
 - ii. AFTER 7/14/03 - Remove the two mounting screws securing the rear shroud to the base frame and remove rear shroud from base frame (Detail "C" of FIGURE 8.1).

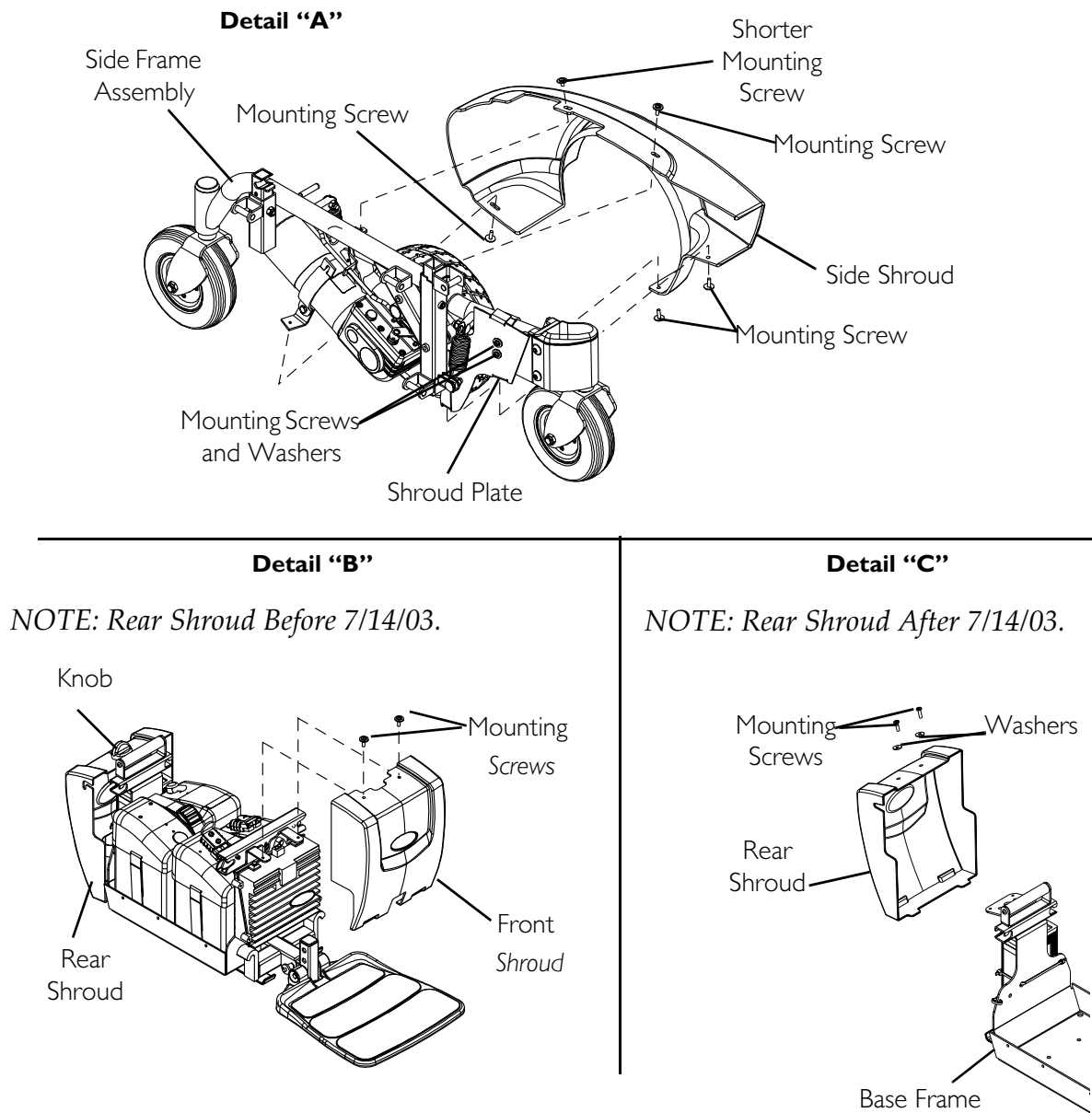


FIGURE 8.1 Removing/Installing the Shrouds

Disassembling/Reassembling the Side Frame Assembly

NOTE: For this procedure, refer to FIGURE 8.2 on page 77.

NOTE: Reverse this procedure to reassemble the side frame.

1. Remove desired side frame assembly from the wheelchair. Refer to Disassembling/Assembling the Wheelchair on page 103.
2. Remove the side shroud and shroud plate. Refer to Removing/Installing the Shrouds on page 74.
3. Remove the front head tube assembly. Refer to Removing/Installing the Front Headtube Assembly on page 62.
4. Remove the two locknuts and bolt securing the reinforcement plate to the side frame and the two washers and nylon spacer under the reinforcement plate on the upper mounting pin (FIGURE 8.2).

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

5. Remove the pivot tube from the lower mounting pin.
6. Remove the motor release lever. Refer to Removing/Installing the Motor Release Lever on page 81.
7. Remove the motor. Refer to Removing/Installing the Motor on page 80.
8. Remove the front and rear springs. Refer to Removing/Installing the SureStep Springs on page 78.
9. Remove the walking beam, nylon spacer and two washers from the upper mounting pin (FIGURE 8.2).
10. Remove the rear caster assembly. Refer to Removing/Installing the Front/Rear Caster Assemblies on page 62.
11. Remove the height adjustment tubes. Refer to Removing/Installing the Adjustable Height Tubes on page 33.
12. If replacing side frame, discard existing side frame.

Removing/Installing the Pivot Tube

NOTE: To remove the pivot tube, follow steps 1-5 of Disassembling/Reassembling the Side Frame Assembly on page 76.

NOTE: To install the pivot tube, reverse steps 1-5 of Disassembling/Reassembling the Side Frame Assembly on page 76.

Removing/Installing the Walking Beam

NOTE: To remove the walking beam, follow steps 1-9 of Disassembling/Reassembling the Side Frame Assembly on page 76.

NOTE: To install the walking beam, reverse steps 1-9 of Disassembling/Reassembling the Side Frame Assembly on page 76.

Replacing the Side Frame

NOTE: To disassemble the side frame assembly and replace the side frame, follow steps 1-12 of Disassembling/Reassembling the Side Frame Assembly on page 76.

NOTE: To install a new side frame and reassemble the side frame assembly, reverse steps 1-12 of Disassembling/Reassembling the Side Frame Assembly on page 76.

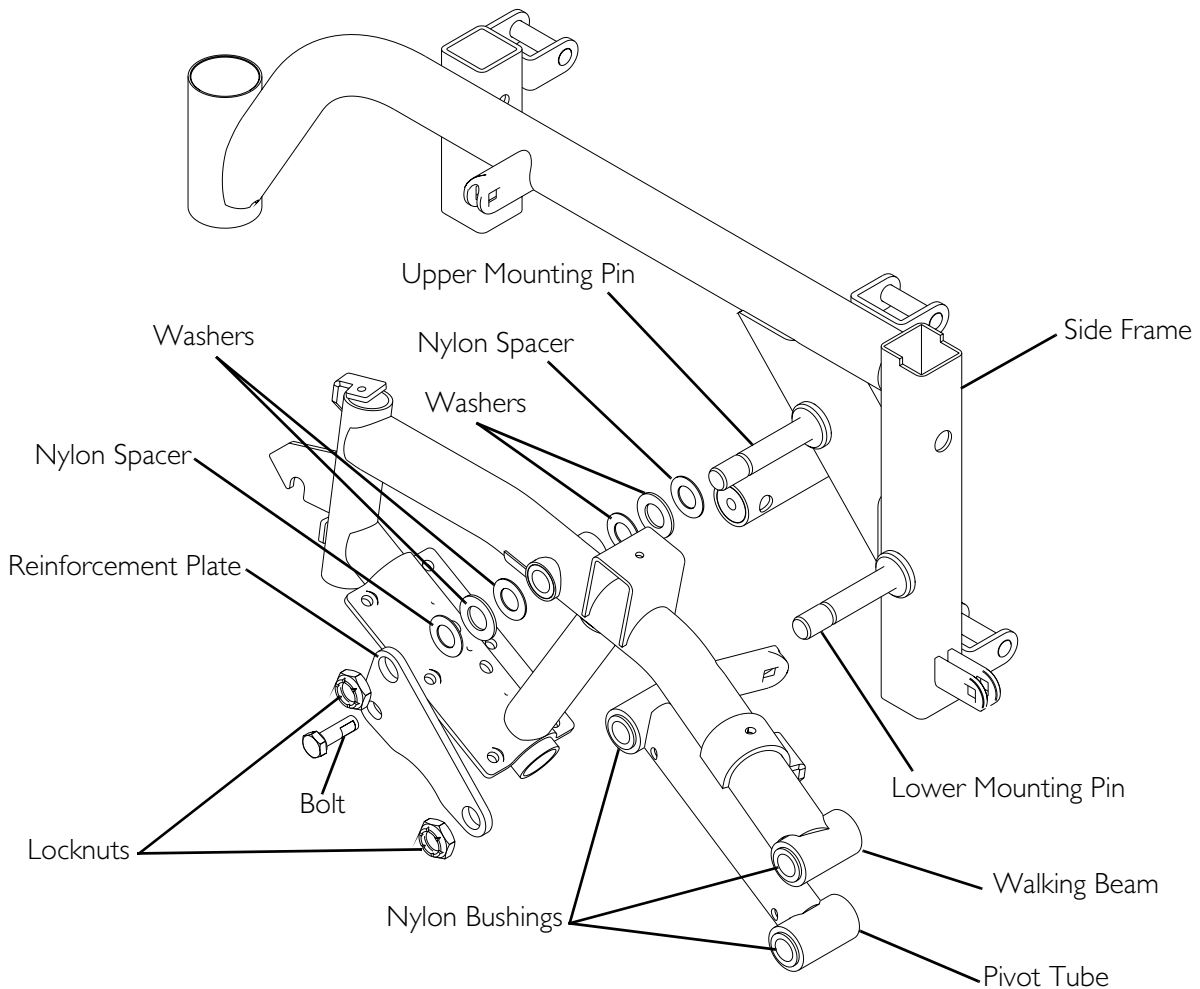


FIGURE 8.2 Disassembling/Reassembling the Side Frame Assembly

Removing/Installing the SureStep Springs

NOTE: For this procedure, refer to FIGURE 8.3 on page 79.

NOTE: To ensure proper operation of the SureStep feature, it is recommended that all four springs be replaced at one time.

NOTE: If necessary, stretch the spring slightly to remove or install mounting hardware.

NOTE: If replacing springs, use new springs when performing STEPS 4 and 6.

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

1. Remove the seat. Refer to Removing/Installing the Seat Assembly on page 30.
2. Remove side shroud. Refer to Removing/Installing the Shrouds on page 74.
3. Perform the following to remove the front spring:
 - A. Loosen and remove the bolt and locknut securing the upper spring loop to the upper mounting bracket.
 - B. Loosen and remove the bolt and locknut securing the lower spring loop to the lower mounting bracket.
4. Perform the following to install the front spring:
 - A. Install the lower spring loop into the lower mounting bracket and secure with bolt and locknut.
 - B. Install the upper spring loop into the upper mounting bracket and secure with bolt and locknut.
5. Perform the following to remove the rear spring:
 - A. Loosen and remove the bolt and locknut securing the upper spring loop to the mounting bracket.
 - B. Remove the lower spring loop from the hook bracket.
6. Perform the following to install the rear spring:
 - A. Place the lower spring loop in the hook bracket.
 - B. Install the upper spring loop into the upper mounting bracket and secure with bolt and locknut.
7. Securely tighten all hardware.
8. Reinstall side shroud. Refer to Removing/Installing the Shrouds on page 74.
9. If necessary, repeat STEPS 1-8 to replace springs on remaining side frame assembly.
10. Install the seat. Refer to Removing/Installing the Seat Assembly on page 30.

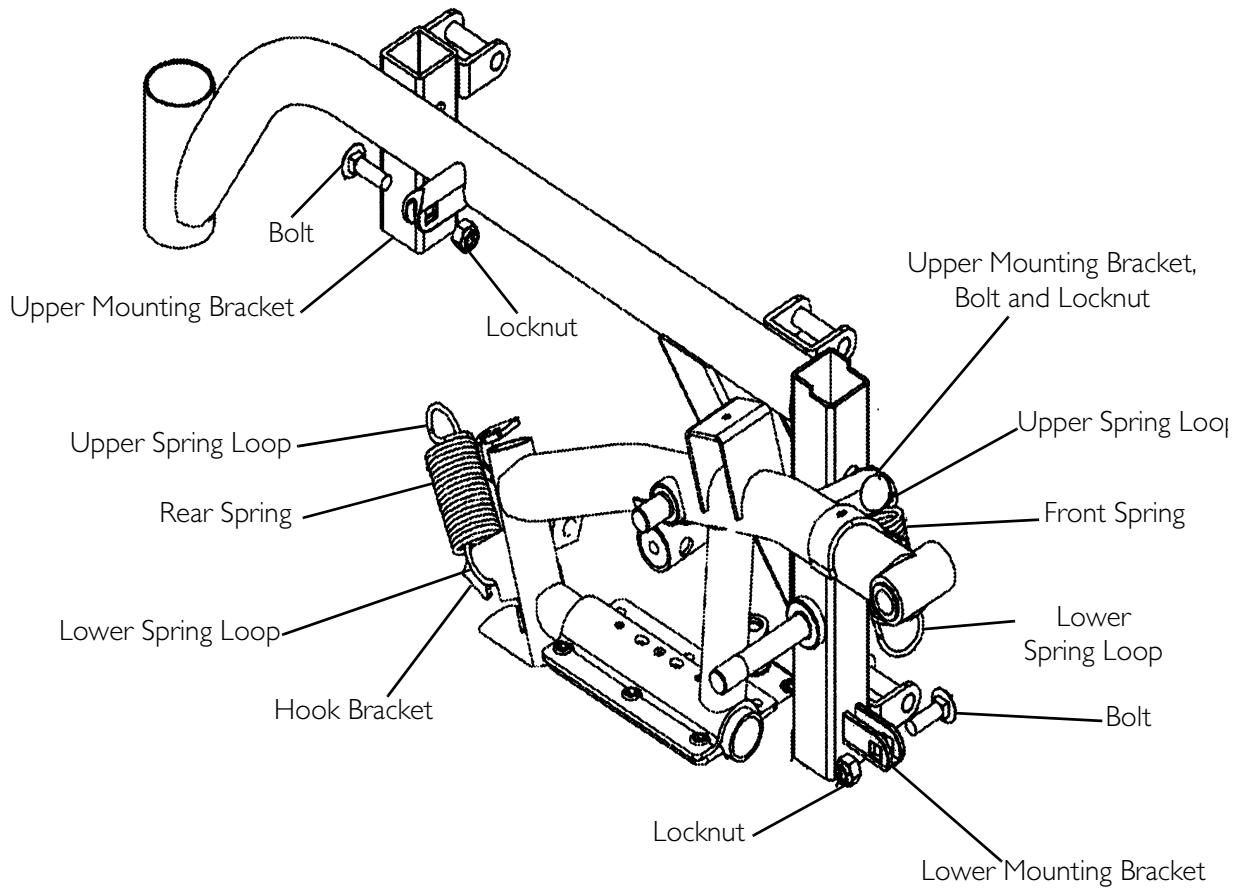


FIGURE 8.3 Removing/Installing the SureStep Springs

SECTION 9—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.

Removing/Installing the Motor

NOTE: For this procedure, refer to FIGURE 9.1 on page 80.

NOTE: Reverse this procedure to install the motor.

NOTE: Removing side frame assembly from wheelchair, while not necessary, may improve access to the motor. Refer to Disassembling/Assembling the Wheelchair on page 103.

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 63.

1. Remove the seat. Refer to Removing/Installing the Seat Assembly on page 30.
2. Remove the side shroud. Refer to Removing/Installing the Shrouds on page 74.
3. If side frame has not been removed from wheelchair, disconnect the motor lead.
4. If replacing the motor, remove drive wheel from drive shaft. Refer to Removing/Installing the Drive Wheel on page 63.
5. Remove the cotter pin to disconnect the motor release lever. Refer to Removing/Installing the Motor Release Lever on page 81.

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

6. Remove the three long mounting screws and three short mounting screws securing the motor to the walking beam (FIGURE 9.1).
7. If necessary, repeat STEPS 2-6 for the motor on the other side.

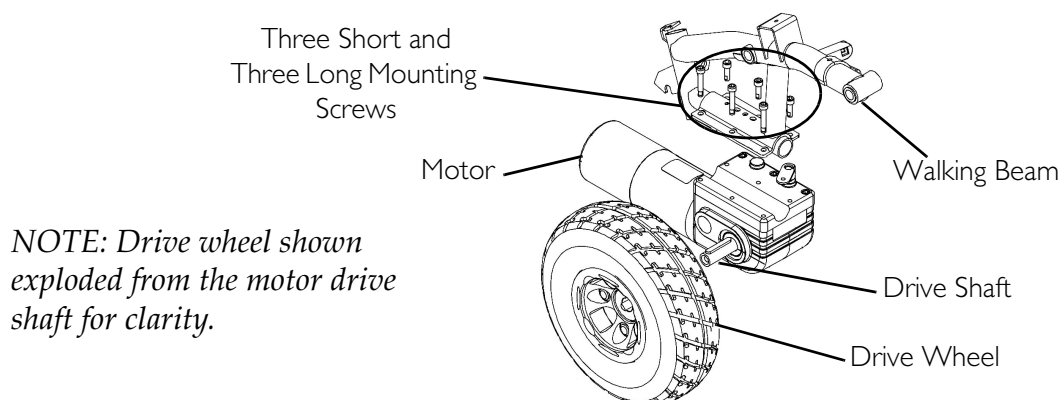


FIGURE 9.1 Removing Motor and Drive wheel

Removing/Installing the Motor Release Lever

NOTE: For this procedure, refer to FIGURE 9.2.

NOTE: Reverse this procedure to install the motor release lever.

1. If necessary, remove the side shroud. Refer to [Removing/Installing the Shrouds](#) on page 74.
2. Remove the cap from the motor release lever.
3. Remove the cotter pin, washer and mounting pin securing the motor lock to the motor release lever. Set cotter pin and mounting pin aside.
4. Grasp the motor release lever by the end that attaches to the motor lock.
5. Pull the motor release lever through the lever support on the inside of the walking beam.

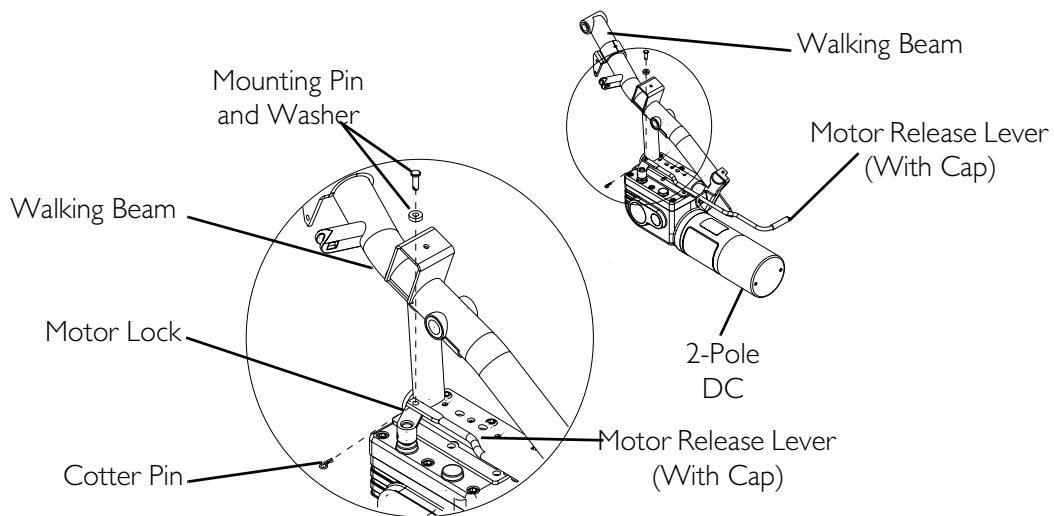


FIGURE 9.2 Removing/Installing the Motor Release Lever

Replacing Internal Motor Brushes

NOTE: For this procedure, refer to FIGURE 9.3 on page 83.

1. Turn power off.
2. Disengage motors.
3. Remove the two end cap screws on the end cap. Refer to Detail "A."
4. Remove the end cap and locate the brush assembly on each side of the motor. Refer to Detail "B".

CAUTION

Use caution when removing the screw and washer that attaches the shunt wire to the motor. DO NOT discard the screw and washer. The screw and washer are not available as service parts.

-
5. Remove the mounting screw and washer that mounts the shunt wire to the motor assembly. DO NOT discard the mounting screw and washer. Refer to Detail "C" .

CAUTION

When removing the existing brushes, ensure that the spring retainer is not removed and/or discarded. The spring retainer is not available as a service part.

-
6. Release the tension on the brush spring retainer with a small screwdriver and position the screwdriver in place to hold the spring retainer. Refer to Detail "D".
 7. 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 any discoloration in the shunt wire and perform one of the following:
 - i. If motor brush is in good condition, (i.e., the end of the brushes are smooth and shiny and shunt wire is not discolored), reinstall existing brush back into brush holder.
 - ii. If motor brush is in bad condition, brush is worn or damaged, discard immediately and install new brush into brush holder.
 8. Remove the screwdriver to release spring retainer so as to hold brush in place.
 9. Attach the shunt wire to the motor housing using the mounting screw and washer (removed in STEP 5). Securely tighten.
 10. Replace the motor end cap and secure using the two end cap screws.
 11. If new motor brush was installed, perform the following process:

NOTE: Repeat STEPS 1-12 for the opposite motor.

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.

⚠ 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 hour.

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

D. Run the motors in reverse for one hour.

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

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

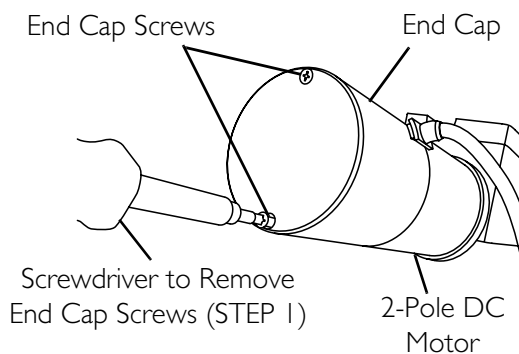
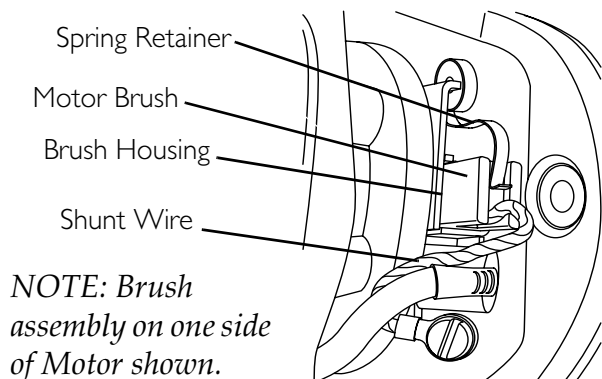
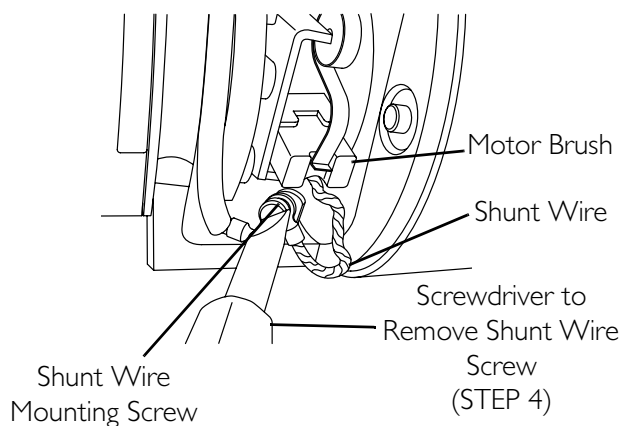
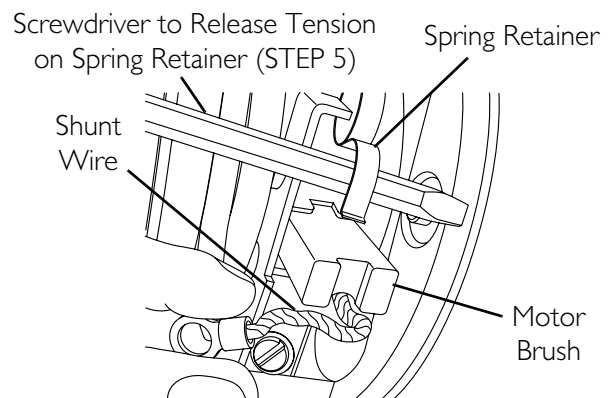
DETAIL "A" - REMOVE END CAP**DETAIL "B" - LOCATE MOTOR BRUSH****DETAIL "C" - REMOVE SHUNT WIRE****DETAIL "D" - REMOVE LARGE BRUSH**

FIGURE 9.3 Replacing Internal Motor Brushes

Inspecting/Replacing External Motor Brushes

NOTE: For this procedure, refer to FIGURE 9.3 on page 83.

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 80.

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

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 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 motor brushes have been inspected/replaced.
7. Reinstall the motor. Refer to Removing/Installing the Motor on page 80.

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 hour.
- C. Turn motors off and allow 30 minutes for motors to cool off.
- D. Run the motors in reverse for one 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.

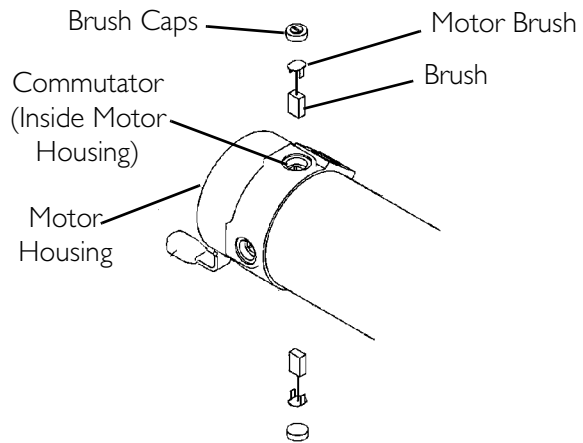


FIGURE 9.4 Replacing Internal Motor Brushes

Electro-Mechanical Parking Brake Testing

NOTE: For this procedure, refer to FIGURE 9.5.

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

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

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

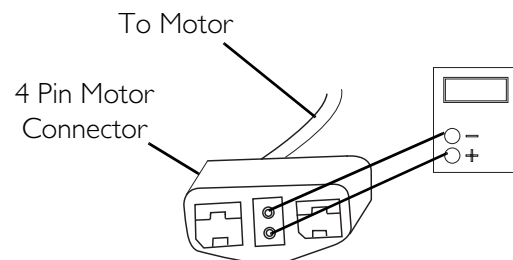


FIGURE 9.5 Electro-Mechanical Parking Brake Testing

SECTION 10—BATTERIES/CHARGER

Warnings For Handling and Replacing Batteries

⚠ 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.

Make sure power to the wheelchair is Off before performing this section.

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

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

UI batteries weight 18 pounds each. Use proper lifting techniques (lift with your legs) to avoid injury.

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

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

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

NEVER allow any of your tools and/or battery cables to contact BOTH battery posts at the same time. An electrical short may occur and serious personal injury or damage may occur.

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

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

Using the Proper Batteries

NOTE: For this procedure, refer to FIGURE 10.1.

1. Place battery on ground/flat surface.
2. Visually draw a horizontal and vertical centerline through the middle of battery (FIGURE 10.1).
3. Position the battery so that the terminals are above the horizontal centerline.
4. Visually inspect the battery to ensure the correct position of the POSITIVE and NEGATIVE terminals (FIGURE 10.1).

⚠ WARNING

Batteries with terminal configuration as shown below *MUST* be used. Batteries that have the reverse terminal configuration *MUST NOT* be used - otherwise injury and damage may occur.

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

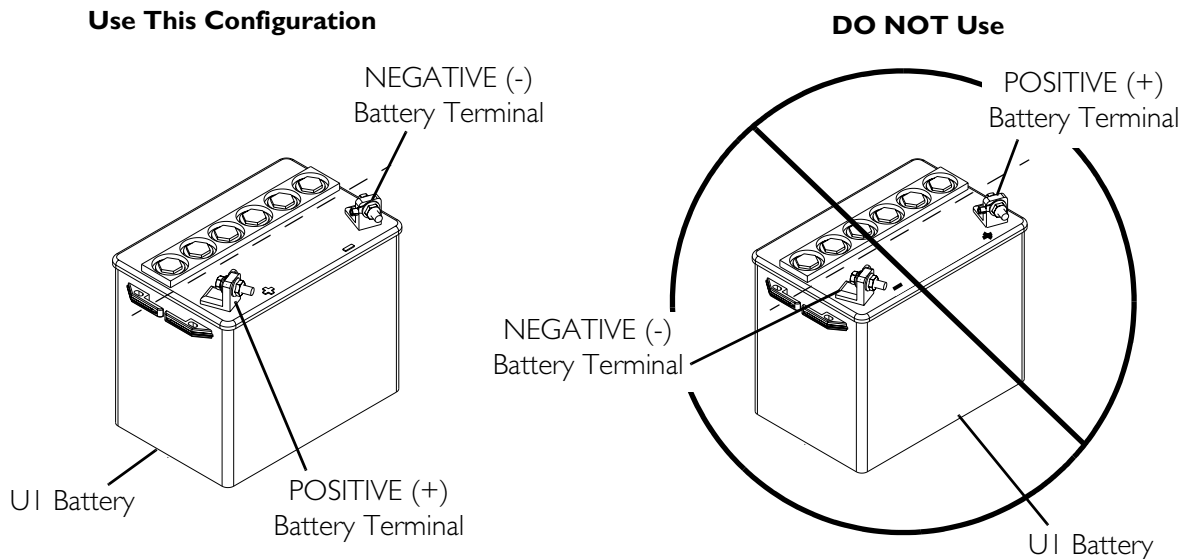


FIGURE 10.1 Using the Proper Batteries

Removing/Installing Batteries From/Into Battery Tray

⚠ WARNING

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

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

CAUTION

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

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

NOTE: For this procedure, refer to FIGURE 10.2 on page 90.

NOTE: Have the following tools available:

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

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.

NOTE: Never install/reinstall a battery with a cracked or otherwise damaged case.

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

NOTE: Battery covers are used on wheelchairs manufactured BEFORE 7/14/03.

NOTE: Wheelchairs manufactured AFTER 7/14/03 DO NOT use battery covers.

Removing Batteries

1. Verify the joystick ON/OFF switch is in the OFF position and disconnect joystick cable. Refer to [Disconnecting/Connecting the Joystick](#) on page 97.
2. Remove seat from base. Refer to [Removing/Installing the Seat Assembly](#) on page 30.
3. Disconnect the front battery from the controller (BLACK connector on the standard M71 or RED connector on the M71 PTO).
4. Disconnect the rear battery from the front battery (GREY connector).
5. Lift the rear battery OUT of the battery tray using the battery handle.
6. Slide front battery back and lift OUT of battery tray using the battery handle.

Installing Batteries

1. Position front battery in rear of battery tray as shown in FIGURE 10.2 and slide forward (FIGURE 10.2).

NOTE: For wheelchairs with battery covers, the arrows on the battery decal point forward. See FIGURE 10.2 for location of battery decal.

2. Position rear battery in rear of battery tray (FIGURE 10.2).
3. Connect the rear battery to the front battery (GREY connector).
4. Connect the front battery to the controller (BLACK connector on the standard M71 or RED connector on M71 PTO).
5. Reinstall seat assembly. Refer to [Removing/Installing the Seat Assembly](#) on page 30.
6. Connect joystick cable (not shown). Refer to [Disconnecting/Connecting the Joystick](#) on page 97.

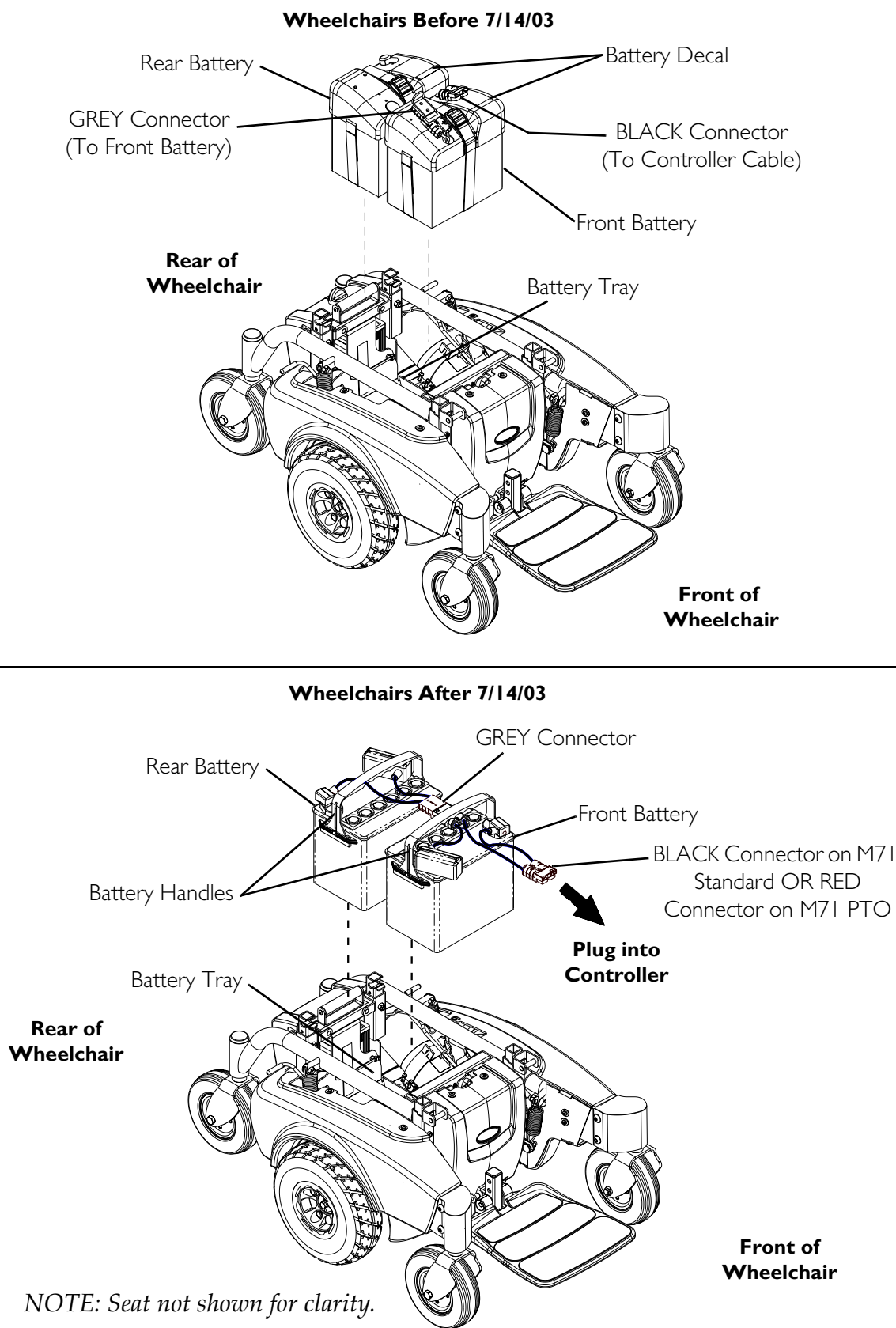


FIGURE I0.2 Removing/Installing Batteries From/Into Battery Tray

Connecting/Disconnecting Battery Cables

⚠ WARNING

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

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

Connecting Battery Cables

NOTE: For wheelchairs manufactured BEFORE 7/14/03, refer to FIGURE 10.3 and FIGURE 10.4 on page 92.

NOTE: For wheelchairs manufactured AFTER 7/14/03, refer to FIGURE 10.3 and FIGURE 10.5 on page 93.

1. Install battery terminal cap(s) onto battery cable(s) as follows (FIGURE 10.3):
 - A. ORANGE or RED battery terminal cap onto RED battery cable.
 - B. GREY or BLACK battery terminal cap onto BLACK battery cable.

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 “A” of FIGURE 10.5, (depending on battery type), otherwise damage to the battery cable may result when installing battery terminal caps.

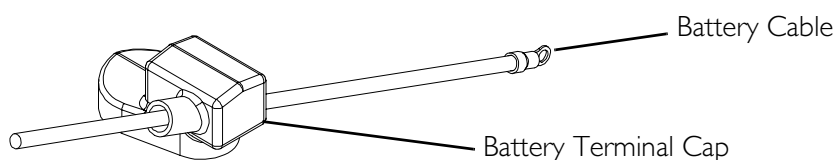


FIGURE 10.3 Connecting Battery Cables

2. Connect battery cable(s) to battery(ies) terminal(s)/post(s) (“A”DETAILDETAILDETAIL of FIGURE 10.4 or FIGURE 10.5).
 - A. NEGATIVE (-) BLACK battery cable to NEGATIVE (-) battery terminal/post.
 - B. POSITIVE (+) RED battery cable to POSITIVE (+) battery terminal/post.
3. Secure the battery cable(s)/ring terminal(s) to the battery terminal(s)/post(s), BLACK to NEGATIVE (-) and RED to POSITIVE (+), with the provided 1/4-20 x 7/8-inch hex flange screw and hex flange locknut. Securely tighten.
4. Verify all battery cable(s)/ring terminal(s) are correctly installed and securely tightened.
5. Slide terminal cap(s) down battery cable(s) and onto battery clamps (DETAIL “B” of FIGURE 10.4 or FIGURE 10.5).

- Secure each terminal cap in place with a tie-wrap (use tie-wraps 11-1/2-inches long) (DETAIL "B" of FIGURE 10.4 or FIGURE 10.5).

NOTE: It will be necessary to trim excess tie-wrap in order to install the battery box top(s).

- If necessary, install the battery box top(s) using the nylon webbing straps and snug the adjuster against the box top (Detail "C" of FIGURE 10.4).

- Position the battery(ies) into the wheelchair. Refer to Installing Batteries on page 89.

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

- If necessary, charge the battery(ies). Refer to Charging Batteries in owner's manual shipped with wheelchair.

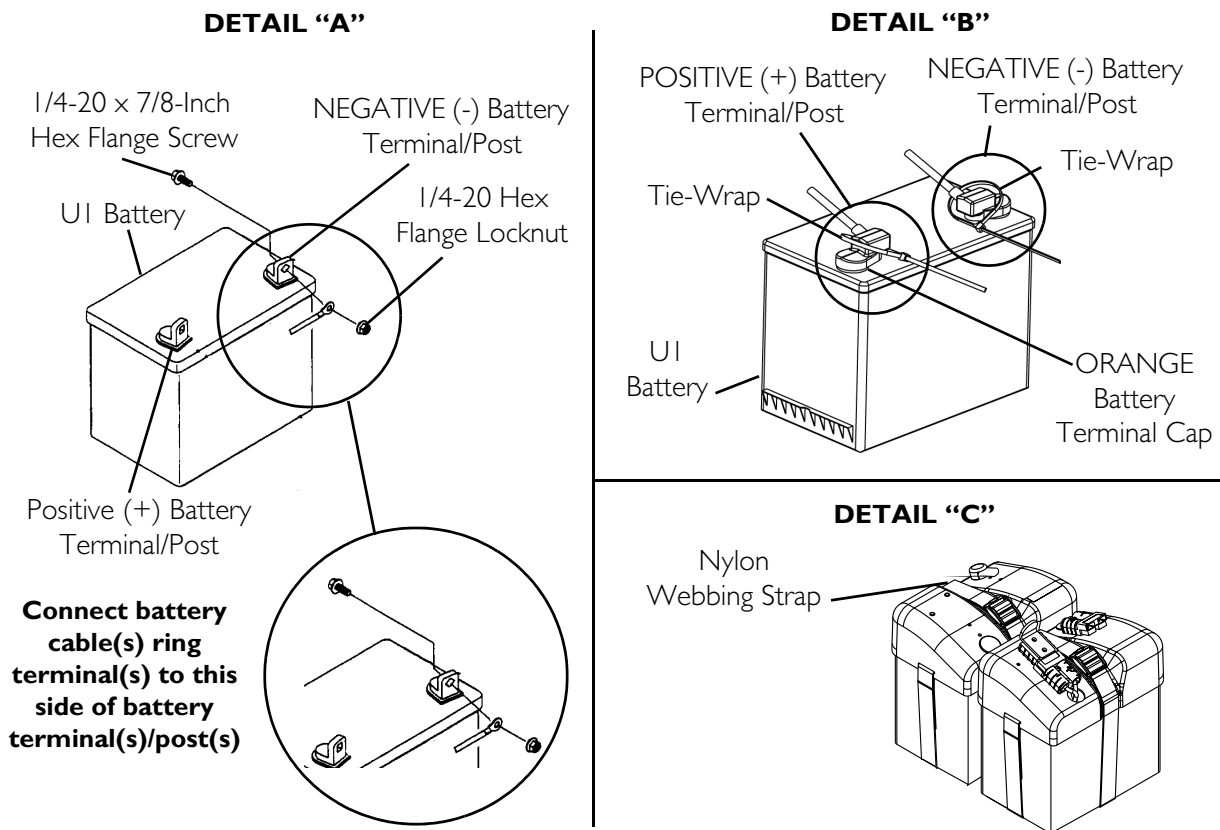


FIGURE 10.4 Connecting/Disconnecting Battery Cables - Wheelchairs Manufactured Before 7/14/03

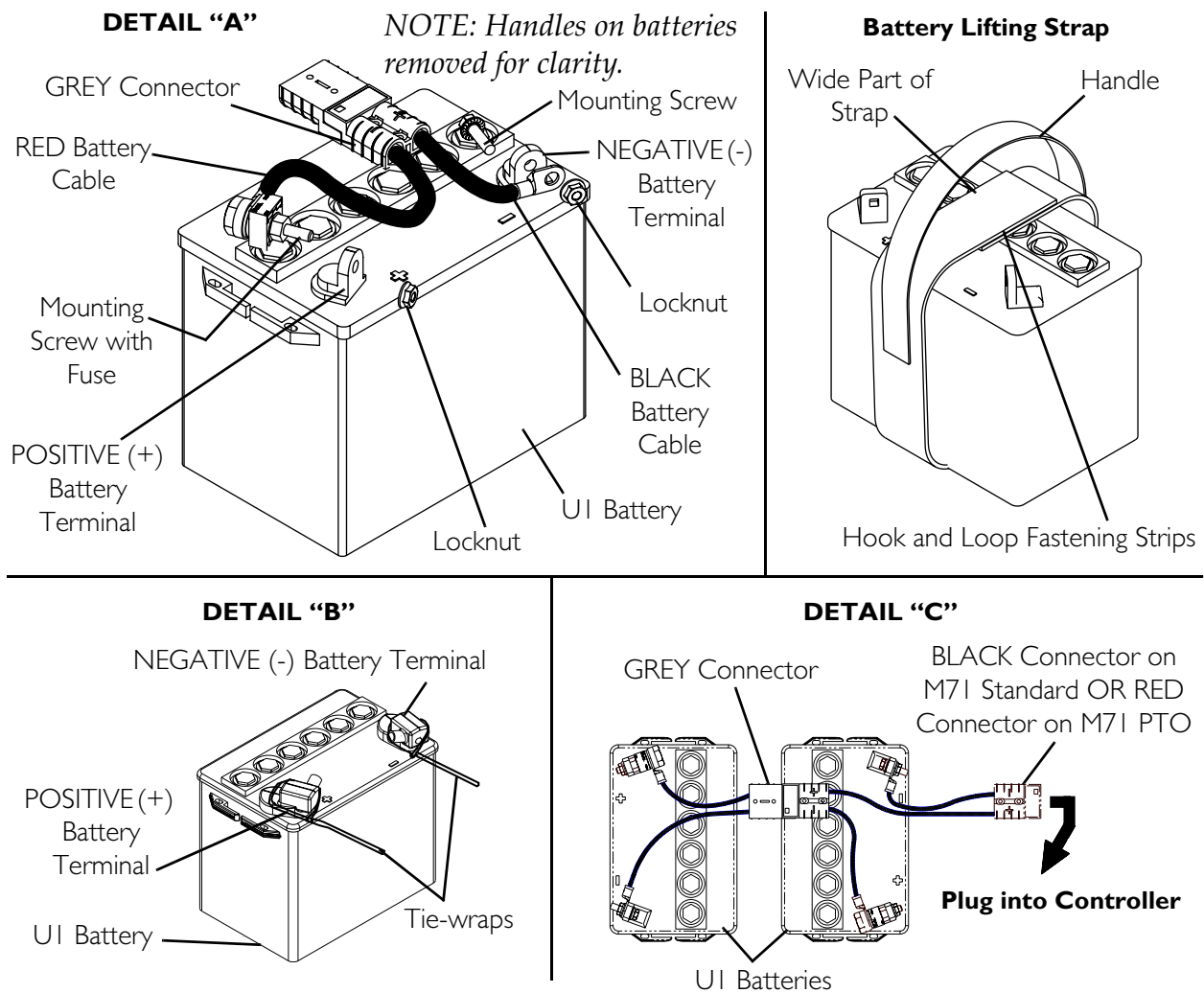


FIGURE 10.5 Connecting/Disconnecting Battery Cables - Wheelchairs Manufactured After 7/14/03

Disconnecting Battery Cables

NOTE: For wheelchairs manufactured BEFORE 7/14/03, refer to FIGURE 10.4 on page 92 for this procedure.

NOTE: For wheelchairs manufactured AFTER 7/14/03, refer to FIGURE 10.5 for this procedure.

1. Remove the batteries from the wheelchair. Refer to [Removing Batteries](#) on page 89.
2. If necessary, disconnect the nylon webbing strap (DETAIL "C" of FIGURE 10.4).
3. Cut the tie-wrap that secures the battery terminal cap in place (DETAIL "B" of FIGURE 10.4 or FIGURE 10.5).
4. Slide terminal cap(s) up on the battery cable(s) (DETAIL "B" of FIGURE 10.4 or FIGURE 10.5).

5. Disconnect battery cable(s) from battery(ies) terminal(s)/post(s) (DETAIL “A” of FIGURE 10.4 or FIGURE 10.5).
 - A. NEGATIVE (-) BLACK battery cable from NEGATIVE (-) battery terminal/post.
 - B. POSITIVE (+) RED battery cable from POSITIVE (+) battery terminal/post.

Replacing the On-Board Battery Charger Fuse

⚠ 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 fuse with power applied to the wheelchair. Otherwise, equipment damage and/or personnel injury may occur.

NOTE: For this procedure, refer to FIGURE 10.6.

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. If it has been determined the charger should be replaced. Refer to Replacing the On-Board Battery Charger on page 95.

1. Turn off power and disconnect joystick. Refer to Disconnecting/Connecting the Joystick on page 97.
2. Remove rear shroud. Refer to Removing/Installing the Shrouds on page 74.
3. Remove threaded fuse holder from top of charger next to battery charger cable and perform one of the following:
 - A. If fuse is bad, replace with new 250V, 6.3 amp fuse.
 - B. If fuse is good, replace charger. Refer to Replacing the On-Board Battery Charger on page 95.
4. Connect joystick and turn power on. Refer to Disconnecting/Connecting the Joystick on page 97.
5. Perform one of the following:
 - A. If wheelchair functions, install rear shroud. Refer to Removing/Installing the Shrouds on page 74.
 - B. If wheelchair does not function, replace charger. Refer to Replacing the On-Board Battery Charger on page 95.

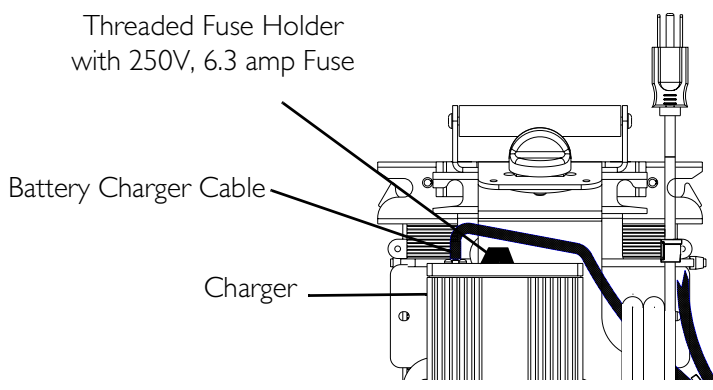


FIGURE 10.6 Replacing the On-Board Battery Charger Fuse

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 personnel injury may occur.

NOTE: For this procedure, refer to FIGURE 10.7 on page 96.

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 wheelchair. This fuse should be checked first before replacing the battery charger for improper operation. Refer to Replacing the On-Board Battery Charger Fuse on page 94.

1. Remove the batteries from the wheelchair. Refer to Removing Batteries on page 89.
2. If necessary, remove the rear shroud. Refer to Removing/Installing the Shrouds on page 74.
3. Disconnect the battery charger cable from the controller charger cable.

NOTE: The battery charger is secured to the frame with two tie-wraps and hook and loop strips.

4. Remove the four tie-wraps securing the existing charger and charger cable to the wheelchair frame.
5. Pull existing charger away from wheelchair frame to release the hook and loop strips and remove the existing charger from the wheelchair frame.
6. Place the new battery charger against the wheelchair frame, ensuring that the hook and loop strips properly engage.
7. Using four tie-wraps, secure the charger to the wheelchair frame.

8. Route the battery charger cable to the right side (from the rear of the wheelchair) of the battery charger body.
9. Connect the battery charge cable to the controller charger cable.
10. Using hook and loop strap provided, wrap the AC cord and secure to back of wheelchair.
11. Install the rear shroud. Refer to Removing/Installing the Shrouds on page 74.
12. Install the batteries. Refer to Installing Batteries on page 89.

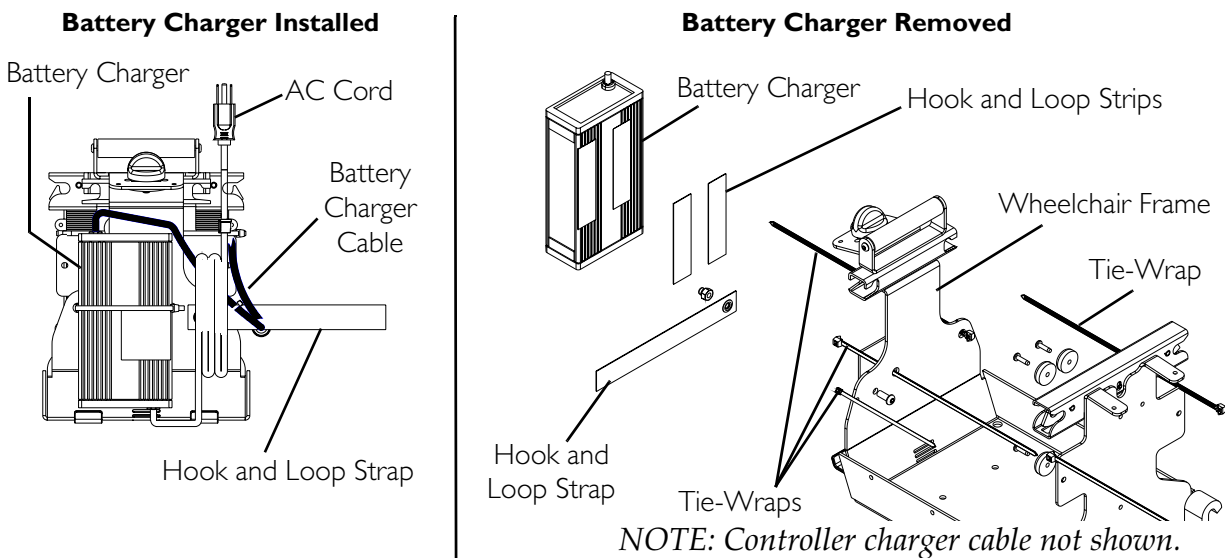


FIGURE 10.7 Replacing the On-Board Battery Charger

SECTION 11—CONTROLLER AND JOYSTICK

⚠ 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 11.1 on page 98.

Disconnecting

1. Perform one of the following:
 - On Wheelchairs with SPJ™ and SPJ+ Joystick ONLY - Hold the light GREY collar portion of the joystick connector with one hand and the controller connector on the wheelchair in the other and disconnect them by pulling them apart (Detail “A” of FIGURE 11.1).
 - On Wheelchair with SPJ™ -80,MPJ or DPJ™ Joystick - Loosen the thumb screws on the joystick connector and disconnect the joystick connector from the controller connector (Detail “C” of FIGURE 11.1).
 - On Wheelchairs with MPJ+ - Pull the latch away from the joystick connector and Disconnect the joystick connector from the remaining connectors (Detail “B” of FIGURE 11.1).

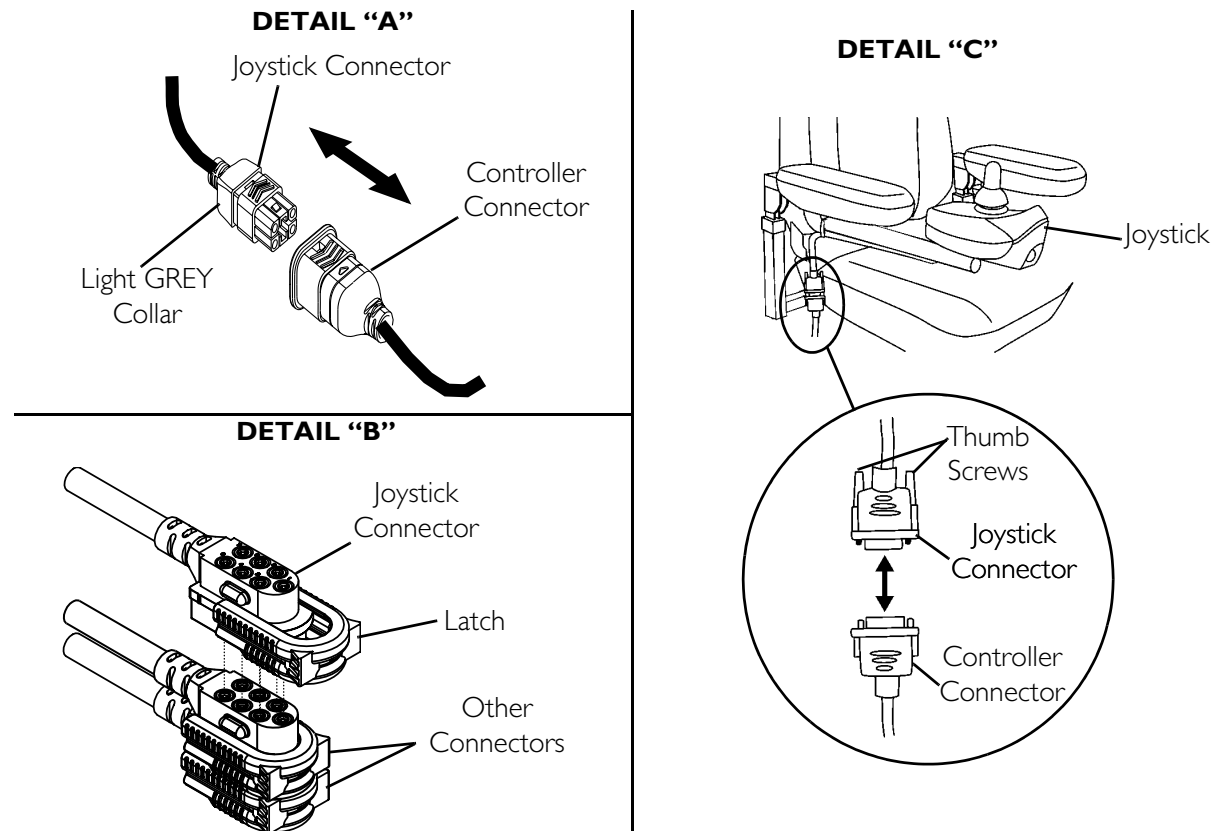
Connecting

⚠ WARNING

The joystick connector and controller connector fit together in one way only; DO NOT force them together.

1. Perform one of the following:
 - On Wheelchair with SPJ and SPJ+ Joystick ONLY - Hold the light GREY collar portion of the joystick connector with one hand and the controller connector on the wheelchair in the other and align them; then lightly push to engage the joystick connector and the controller connector (Detail “A” of FIGURE 11.1).

- On Wheelchair with SPJ-80,MPJ or DPJ Joystick - Align the joystick connector with the controller connector and secure using the thumb screws on the joystick connector (Detail "C" of FIGURE 11.1).
- On Wheelchairs with MPJ+ - Ensure the latch is pulled away from the joystick connector; connect the joystick connector to the other connectors, then push the latch in to secure the joystick connector to the other connectors (Detail "B" of FIGURE 11.1).



NOTE: Only Van seat shown. Above procedure applies to all seats.

FIGURE 11.1 Disconnecting/Connecting the Joystick

Removing/Installing the Joystick

NOTE: If necessary, the joystick can be repositioned to the opposite armrest after being removed.

Van Seat Models

NOTE: For this procedure, refer to FIGURE 11.2 on page 99.

Removing

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

1. Cut two tie-wraps securing the joystick cable to the joystick mounting tube.

2. Turn the adjustment lock lever to release the joystick mounting tube from the mounting bracket.
3. Remove the joystick from the wheelchair.
4. Remove the three hex mounting screws, bushings and locknuts that secure the mounting bracket to the three mounting holes on the armrest plate.

Installing

NOTE: The mounting bracket is mounted to the inside of the armrest plate.

1. If necessary, reposition the mounting bracket on the opposite armrest plate.
2. Using the three hex mounting screws, bushings and locknuts, secure the mounting bracket to the three mounting holes of the armrest plate.
3. 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.
4. Slide joystick mounting tube through the mounting bracket to the desired position and secure adjustment lock to tube by turning lever on adjustment lock.
5. Using two tie-wraps, secure the joystick cable to the joystick mounting tube.

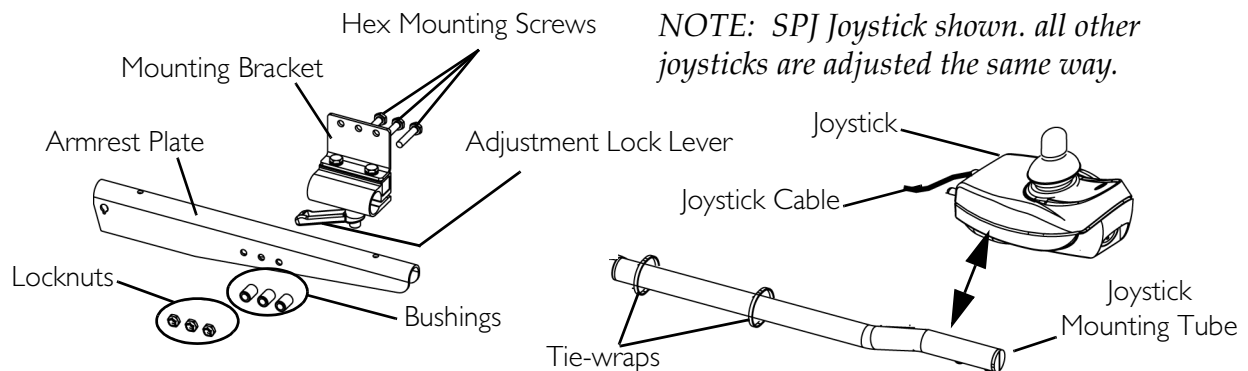


FIGURE 11.2 Removing/Installing the Joystick - Van Seat Models

ASBA and Adjustable ASBA Models

NOTE: For this procedure, refer to FIGURE 11.3 on page 100.

Removing

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 hex screws that secure joystick mounting bracket, the threaded hole half clamp and the opened hole half clamp to the arm tube.

Installing

1. If necessary, reposition the mounting bracket on the opposite armrest plate.
2. Position the threaded hole half clamp and opened hole half clamp on the arm tube. Make sure threaded hole half clamp is on the inside of arm tube.
3. While holding the two half clamps, install the front hex screw into the two half clamps. Securely tighten.
4. Align the mounting holes of the joystick mounting bracket with the mounting holes in the two half clamps.
5. Secure the joystick mounting bracket to the two half clamps with the remaining two hex screws.
6. Slide tube through the bracket to the desired position.
7. 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: SPJ Joystick shown. SPJ-80, DPJ and MPJ joysticks are adjusted the same way.

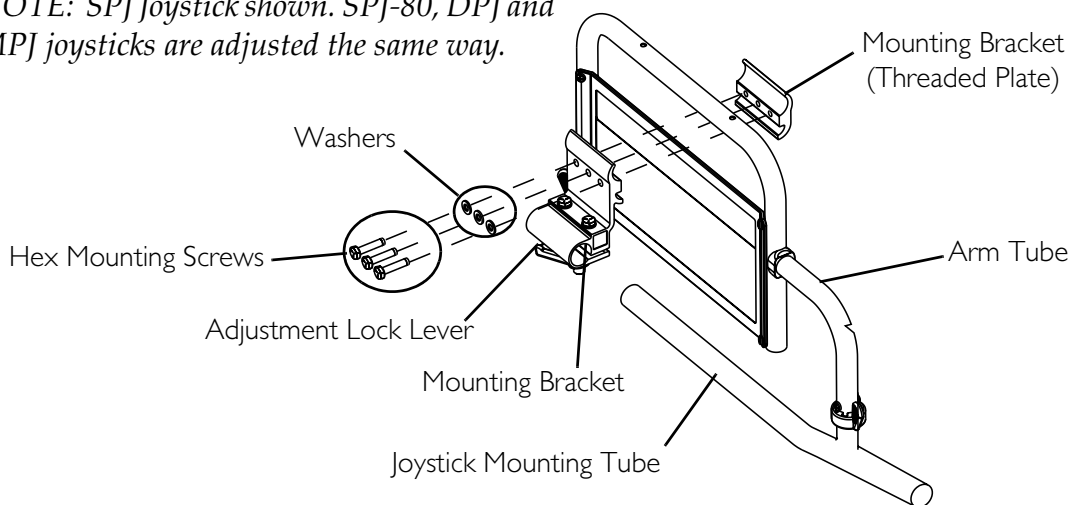


FIGURE 11.3 Removing/Installing the Joystick - ASBA and Adjustable ASBA Models

Replacing the MKIV RII 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 MKIV RII controller module. Otherwise, equipment damage and/or personnel injury may occur.

NOTE: For this procedure, refer to FIGURE 11.4 on page 101.

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 a connection for the on-board battery charger.

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 the Seat Assembly on page 30.
2. Remove the batteries from the wheelchair. Refer to Removing Batteries on page 89.
3. Remove the front shroud. Refer to Removing/Installing the Shrouds on page 74.
4. Disconnect the right and left motor leads (Detail “A” of FIGURE 11.4) .

NOTE: Tie-wraps are joined together to reach around the controller, controller charger cable and wheelchair frame.

5. Remove the two tie-wraps securing the controller charger cable and controller to the wheelchair frame (Detail “A” of FIGURE 11.4).
6. Disconnect the controller charger cable from the charger cable (Detail “A” of FIGURE 11.4).
7. From inside the wheelchair frame, remove the three mounting screws and rubber washers that secure the existing controller to the wheelchair frame (Detail “B” of FIGURE 11.4).
8. Remove the existing controller from wheelchair frame.
9. Reverse STEPS 1-8 to install new controller.

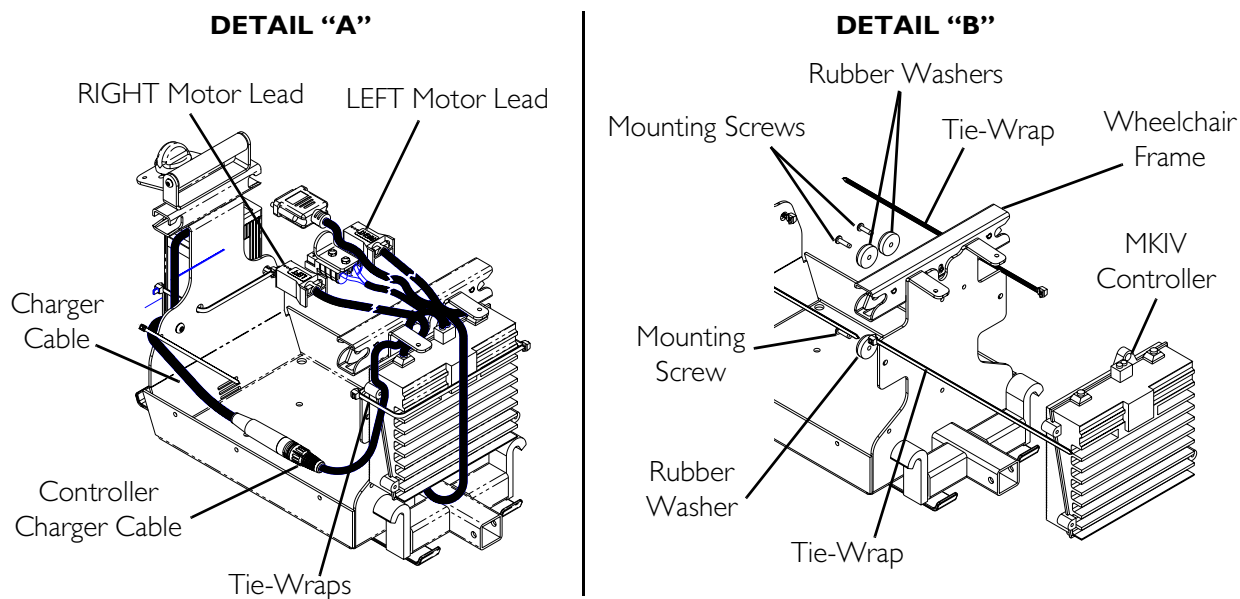


FIGURE 11.4 Replacing the MKIV RII Controller

Replacing the MK₅-NX or MK660 ACC 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-NX controller module. Otherwise, equipment damage and/or personnel injury may occur.

NOTE: For this procedure, refer to FIGURE 11.5 on page 102.

NOTE: There are five cables connected to the MK₅-NX or MK660 ACC 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 the Seat Assembly on page 30.
2. Remove the batteries from the wheelchair. Refer to Removing Batteries on page 89.
3. Remove the front shroud. Refer to Removing/Installing the Shrouds on page 74.
4. Disconnect the cables (joystick, motors, battery, charger, actuator) from the controller (Detail “A” or “B” of FIGURE 11.4).
5. From inside the wheelchair frame, remove the two mounting screws and rubber washers that secure the existing controller to the wheelchair frame (Detail “C” of FIGURE 11.4).
6. Remove the existing controller from wheelchair frame.
7. Reverse STEPS 1-6 to install new controller.

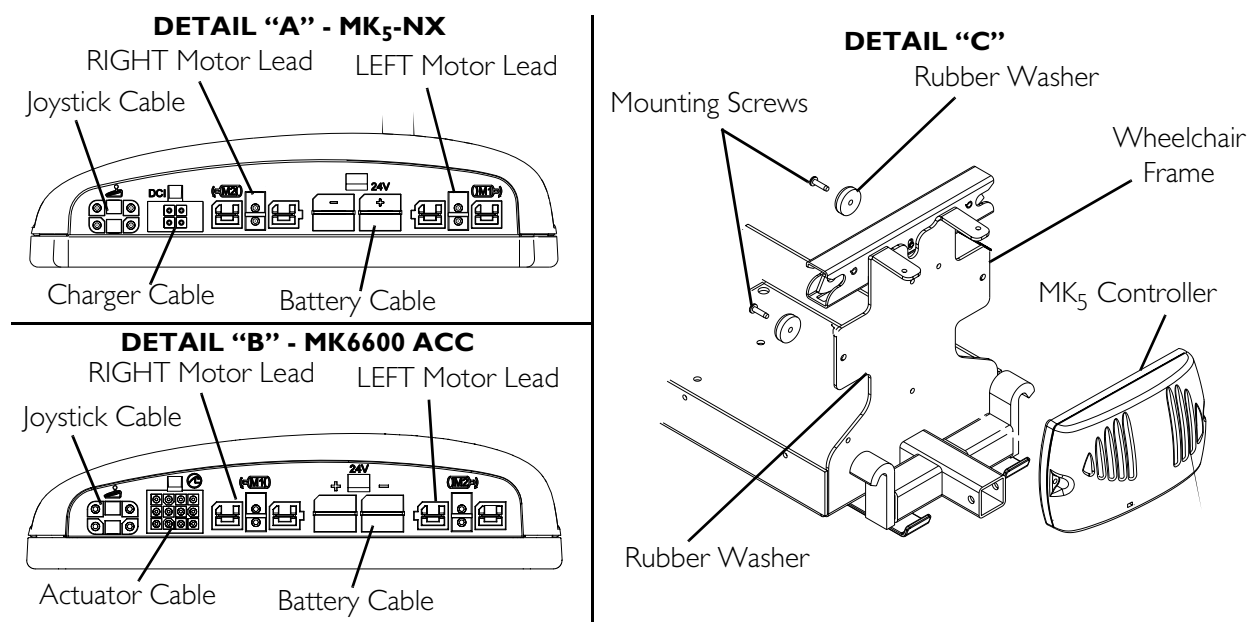


FIGURE 11.5 Replacing the MK₅-NX or MK660 ACC Controller

SECTION 12—DISASSEMBLING/ ASSEMBLING THE M71

⚠ WARNING

DO NOT attempt to disassemble wheelchair or remove the seat if equipped with Power Tilt Only system - 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.

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

CAUTION

All cables are securely tie-wrapped in place before being shipped. If any changes are made to the locations of the tie-wrapped cables, the owner must verify that they are clear from being pinched in any of the latching points of the “take-apart” side-frames.

Cables **MUST** be routed and secured properly to ensure that they do **NOT** become entangled or damaged during normal operation of seating system.

Disassembling/Assembling the Wheelchair

Disassembling the Wheelchair

⚠ WARNING

The joystick **MUST** be turned off and disconnected before attempting to remove the seat - otherwise personal injury, damage to the wheelchair and/or surrounding property may result. See Note below.

The weight of the van seat is 47 lbs and weight of each of the side frames is 39 lbs. It is recommended that two people pick up these components together - otherwise injury may result.

NOTE: For this procedure, refer to FIGURE 12.1 on page 105.

NOTE: To remove the seat, the seat is flipped up and the arm is rotated backwards which results in the joystick facing the ground. The wheelchair could be inadvertently activated by the joystick coming in contact with the ground.

1. Turn the joystick **OFF** and disconnect. Refer to Disconnecting/Connecting the Joystick on page 97.

CAUTION

When flipping back the seat, be sure to maintain a grip on the seat so it does not flip over the back of the base frame - otherwise damage to the wheelchair may result.

2. Van Seat ONLY: Pull the recline lever up and bring the seat back all the way forward.
3. Remove the seat. Refer to [Removing/Installing the Seat Assembly](#) on page 30.
4. While standing at the REAR of the wheelchair base, disconnect the LEFT motor connector from the controller and insert the motor connector into the opening in the side shroud behind the left motor release lever.
5. Disconnect the right motor connector from the controller and insert the motor connector into the opening in the side shroud behind the right motor release lever.

Removing the Batteries

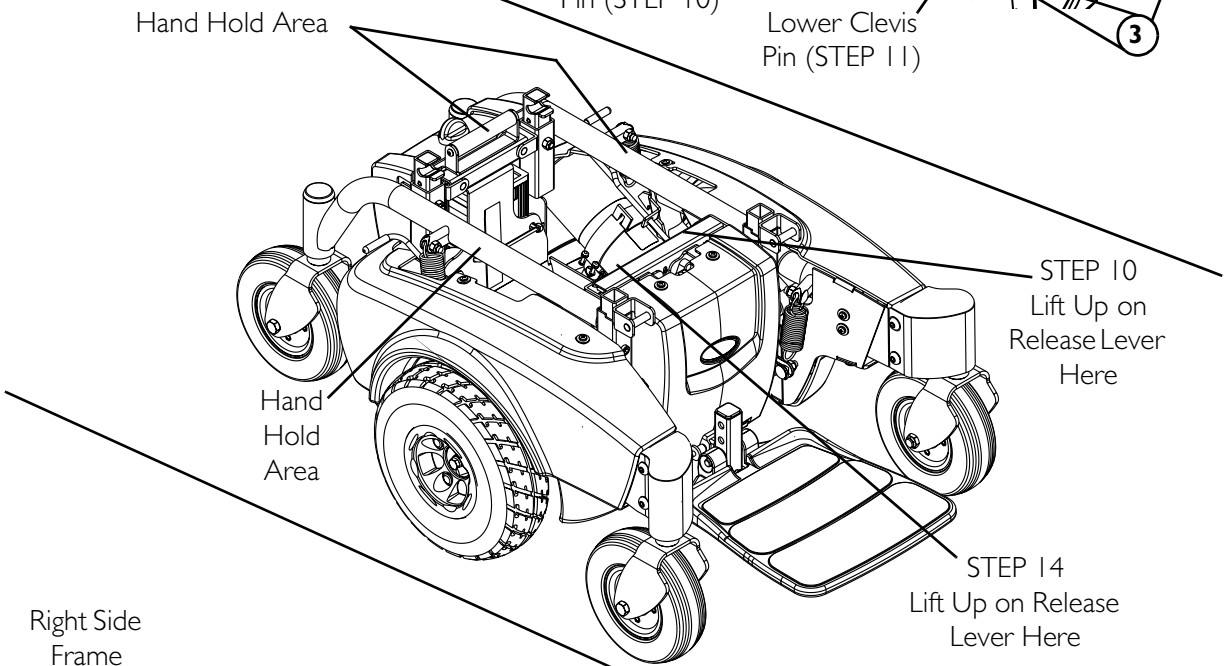
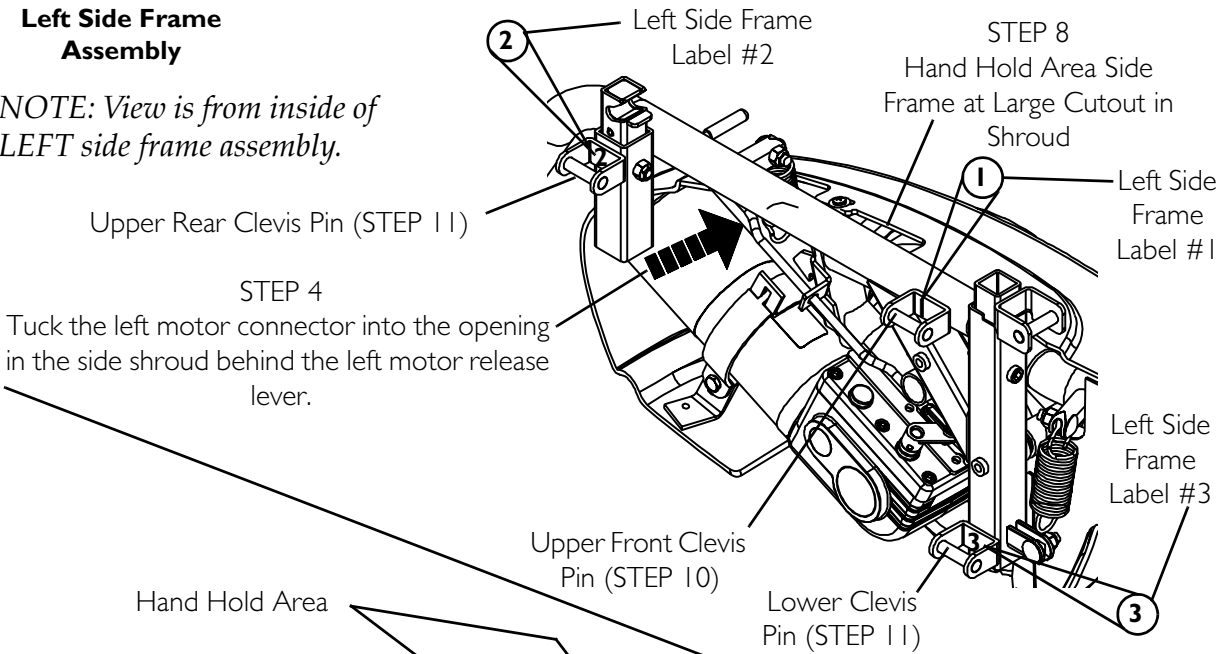
6. Disconnect the rear battery from the front battery (GREY connector).
7. Disconnect the front battery from the controller (BLACK connector on the standard M71).
8. Remove the rear battery and place on the ground away from the wheelchair base.
9. Slide the front battery rearward then remove and place on the ground away from the wheelchair base.

Removing the Left Side Frame Assembly

10. Using your left hand, grip the left side frame at the large cutout in the side shroud.
11. Using your right hand, lift up on the frame release lever at the front of the battery section on the left side (Left Side Frame Label #1).
12. While the frame release lever is activated, separate the upper front clevis pin (Left Side Frame Label #1) and upper rear clevis pin (Left Side Frame Label #2) away from the battery section while simultaneously lifting the frame release lever and battery section.
13. Continue lifting the battery section with the right hand until the battery section lifts completely away from the lower clevis of the left side frame (Left Side Frame Label #3).
14. Slide the left side frame away from the battery section and lay down on its side or leave in an upright position by turning both the front and rear caster inward.
15. Repeat STEPS 9-13 to remove the right side frame assembly.
16. Store the seat assembly, left and right side frames, battery section and batteries safely and securely as required in your vehicle. Side frames should be stored on their side to prevent them from tipping over.

Left Side Frame Assembly

NOTE: View is from inside of LEFT side frame assembly.



Right Side Frame Assembly

NOTE: View is from inside of RIGHT side frame assembly.

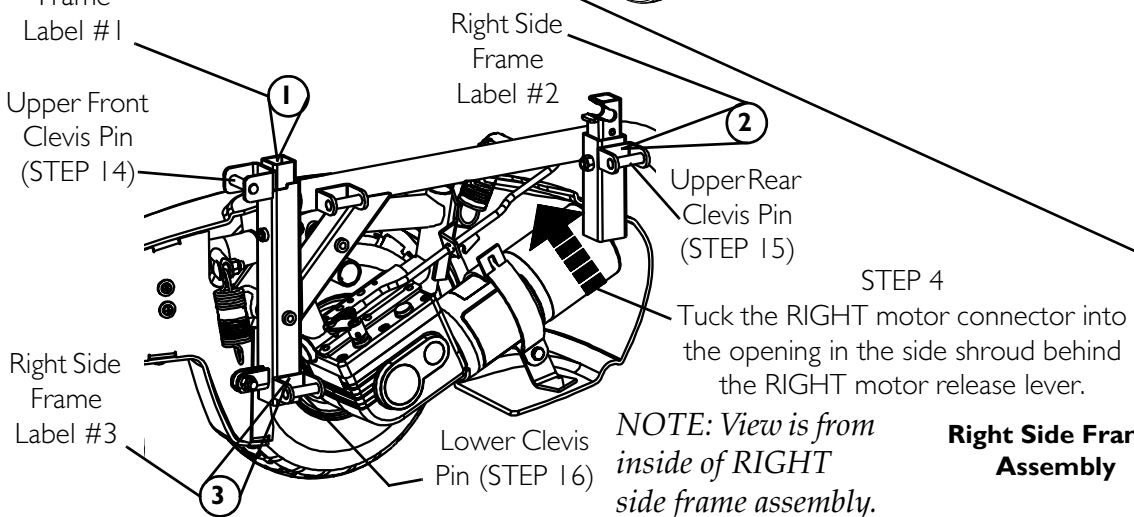


FIGURE 12.1 Disassembling the Wheelchair

Assembling the Wheelchair

CAUTION

When reassembling the base frame be sure that the motor, battery and joystick leads are positioned away from any of the three side frame attachment points (FIGURE 12.2) and the four seat frame attachment points (FIGURE 12.2) - otherwise pinched cables could result. It is recommended that the cables from the controller are draped over the front of the shroud (FIGURE 12.1) and tuck the motor leads (from each side frame) behind the rear spring in the side shroud (FIGURE 12.1).

NOTE: For this procedure, refer to FIGURE 12.2 on page 107 and FIGURE 12.3 on page 108.

Installing the Right Side Frame onto the Battery Tray

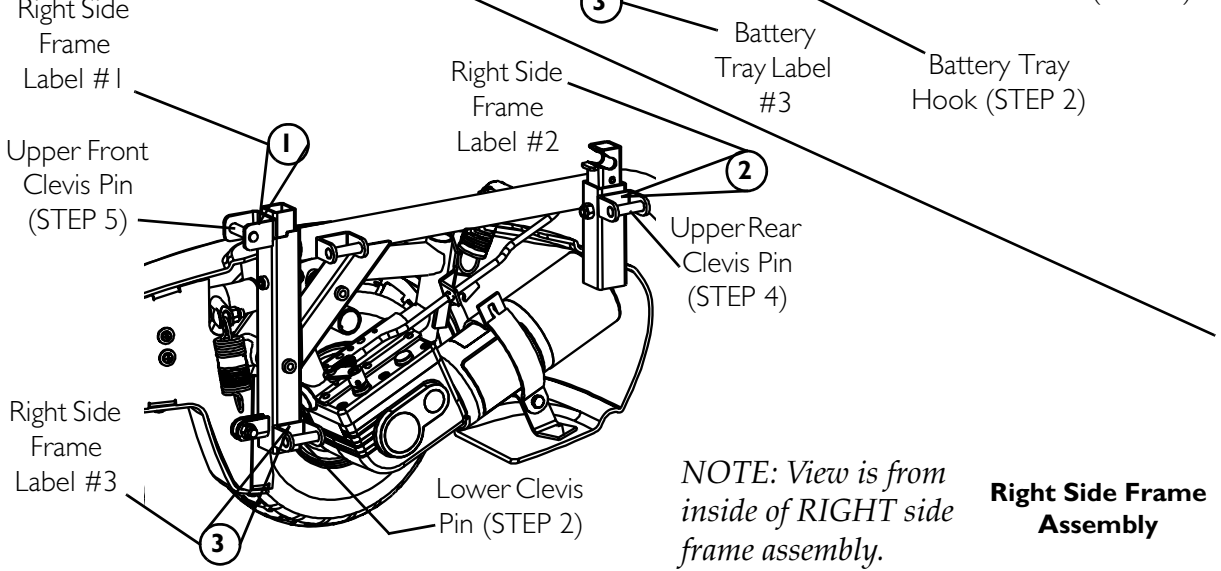
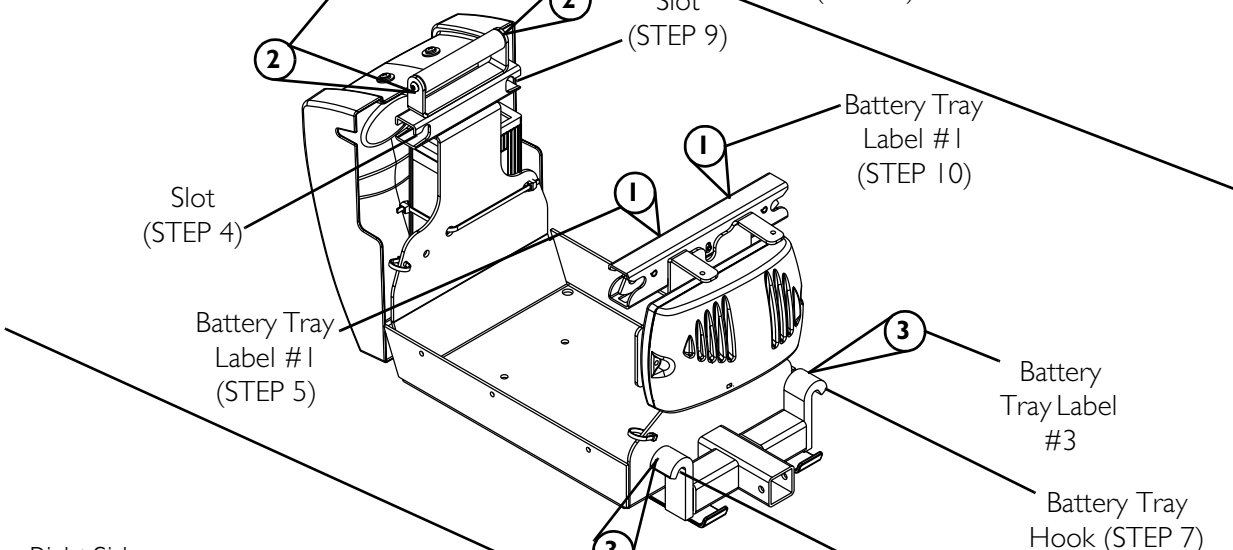
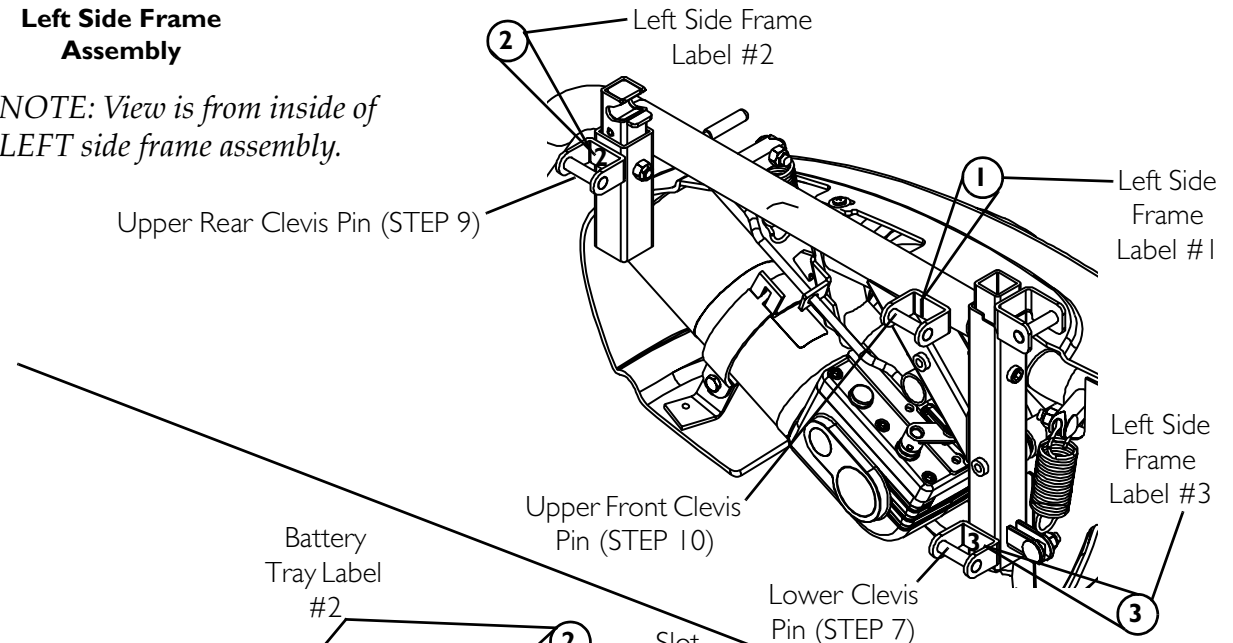
1. Using your right hand, grip the right side frame at the hand hold area (FIGURE 12.2) and slide close to the battery section.
2. Using your left hand, grip the handle on the battery section and rotate the battery section to align the battery tray hook (Battery Tray Label #3) with the lower clevis pin (Right Side Frame Label #3).
3. Continue sliding the right side frame towards the battery section and guide the hook onto the front lower clevis pin.
4. Continue lifting the handle on the battery section and guide the rear upper clevis pin (Right Side Frame Label #2) into the slot on the rear of the battery tray (Battery Tray Label #2).
5. Push right side frame towards the battery section until an audible click is heard to confirm that the front upper clevis pin (Right Side frame Label #1) is locked in place (Battery Tray Label #1).
6. Repeat STEPS 1-5 to install the left side frame assembly.

Installing the Batteries

7. Insert front battery first with battery terminals towards the front of the wheelchair and ensure front battery is sitting firmly in the bottom of the battery tray. Slide front battery forward into position.
8. Insert rear battery with battery terminals towards the front of the wheelchair and ensure battery is sitting in the bottom of the battery tray.
9. Connect the rear battery to the front battery (GREY connector).
10. Connect the front battery to the controller (BLACK connector on the standard M71).

Left Side Frame Assembly

NOTE: View is from inside of LEFT side frame assembly.



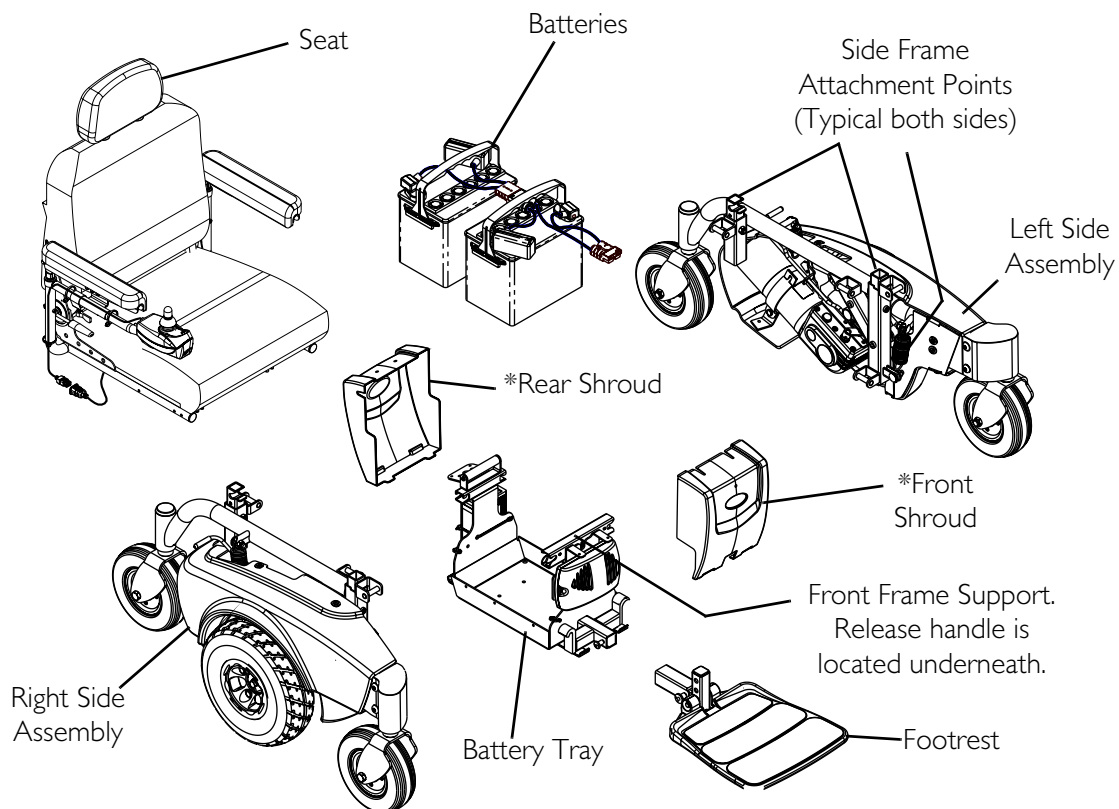
NOTE: View is from inside of RIGHT side frame assembly.

Right Side Frame Assembly

FIGURE 12.2 Assembling the Wheelchair

Final Assembly

11. Connect the right motor lead to the right motor connector. Align the RED connectors on both the lead and connector.
12. Connect the left motor lead to the left motor connector. Align the RED connectors on both the lead and connector.
13. Replace the seat by sliding the rear clevis into the rear uprights and allow the front seat latches to pivot into the front seat posts. Lift up on seat release lever to ensure seat is securely locked in place.
14. Connect the joystick cable. Refer to Disconnecting/Connecting the Joystick on page 97.



**NOTE: Front and rear shrouds are removable but removing the shrouds is not required for transporting.*

NOTE: Wheelchair after 7/14/03 shown.

FIGURE 12.3 Final Assembly

SECTION 13—TRANSPORT READY PACKAGE

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

⚠ WARNING

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

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

This wheelchair has been dynamically tested in a forward-facing mode with the specified crash test dummy restrained by BOTH pelvic and upper-torso belt(s) (shoulder belts), and that BOTH pelvic and upper-torso belt(s) should be used to reduce the possibility of head and chest impacts with vehicle components.

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

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

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

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

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

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

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

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

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

A sudden stop and/or collision may structurally damage your wheelchair. Wheelchairs involved in such incidents should be replaced.

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

TRANSPORT READY PACKAGES ARE NOT RETROFITTABLE TO EXISTING MODELS AND ARE NOT FIELD SERVICEABLE.

⚠ WARNING

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

About Transport Ready Packages

TRRO includes four factory-installed transport brackets and a wheelchair anchored pelvic belt. TRRO has been crash-tested in accordance with ANSI/RESNA WC Vol 1 Section 19 Frontal Impact Test requirements for wheelchairs with a 168 lb crash dummy, which corresponds to a person with a weight of 114 to 209 lbs.

TRBKTS includes four factory-installed wheelchair transport brackets. TRBKTS has not been crash-tested in accordance with WC 19. Use these transport brackets only to secure an unoccupied wheelchair during transport.

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

Compliance Information

This wheelchair conforms with the requirements of the ANSI/RESNA WC/Vol. 1 - Section 19.

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

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

Specifications

MODEL	WHEELCHAIR WEIGHT LIMIT
M71	Up to 300 lbs

Securing the Wheelchair to the Vehicle

Positioning the Wheelchair in the Vehicle

⚠ WARNING

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

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

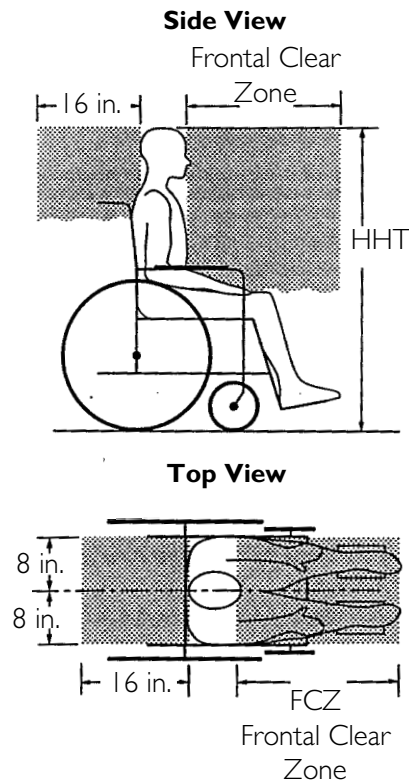
Frontal Clear Zones (FCZ) need to be **LARGER** when upper-torso belt(s) are **NOT** used.

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

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

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

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



Securement Points

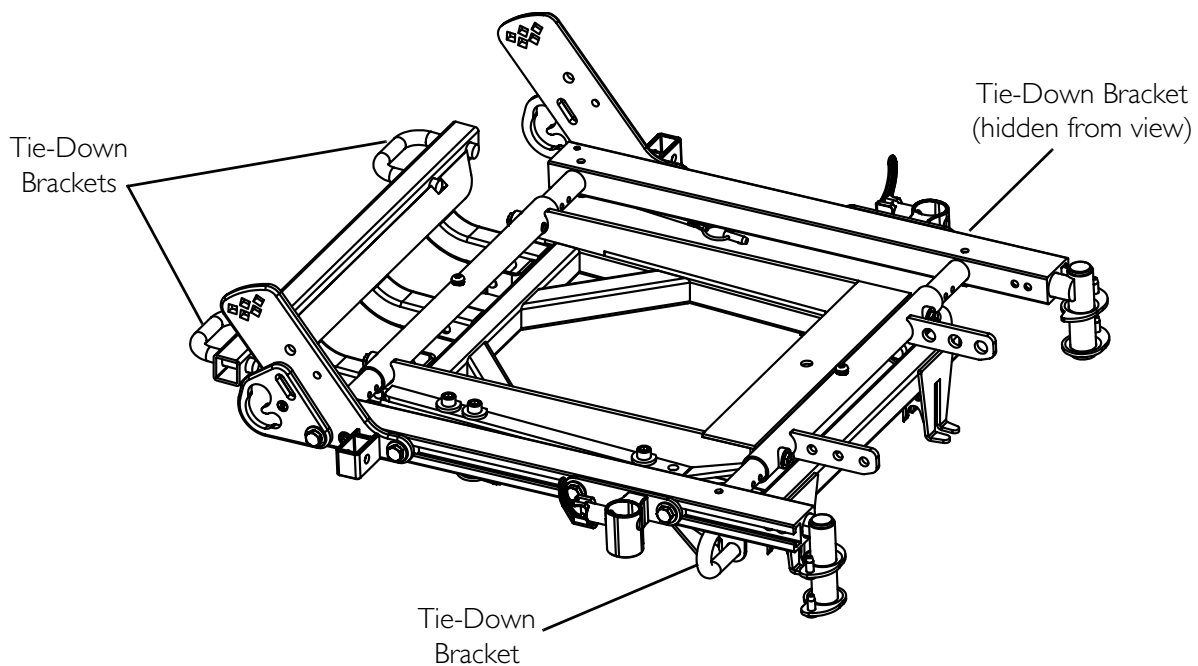


FIGURE 13.1 Securement Points

Securing the Wheelchair

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

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

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

Securing the Occupant

Wheelchair-Anchored Belts

⚠ WARNING

The pelvic belt that is provided by Invacare has been tested for use in a motor vehicle on this wheelchair **ONLY**. **DO NOT** replace the pelvic belt with a different style pelvic belt.

NOTE: For this procedure, refer to FIGURE 13.2.

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

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

1. Install the pelvic belt pin (DETAIL "A" of FIGURE 2) into the large end of the slot in the belt mounting bracket. Rotate downward and forward until it snaps into place into the small end of the slot.

NOTE: Note the position of the male end of the belt when installing the pelvic belt onto the belt mounting brackets. The male end of the pelvic belt (DETAIL "A" of FIGURE 2) has a pin which is used to secure the vehicle-anchored upper torso belt.

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

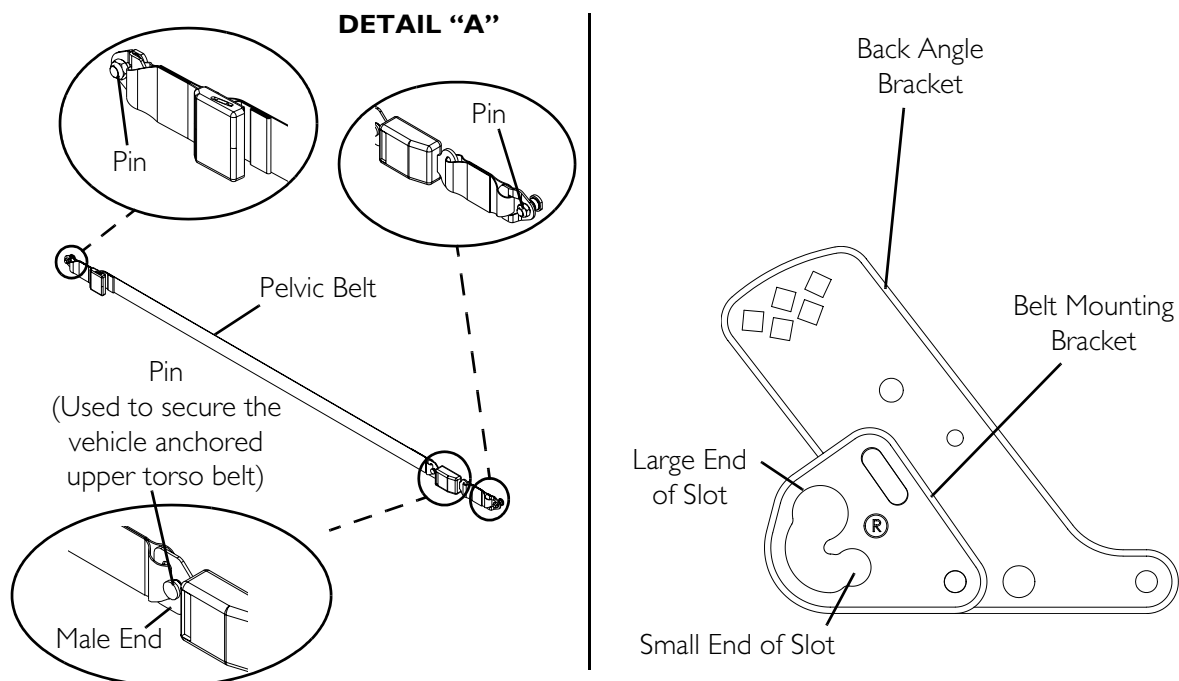


FIGURE 13.2 Wheelchair-Anchored Belts

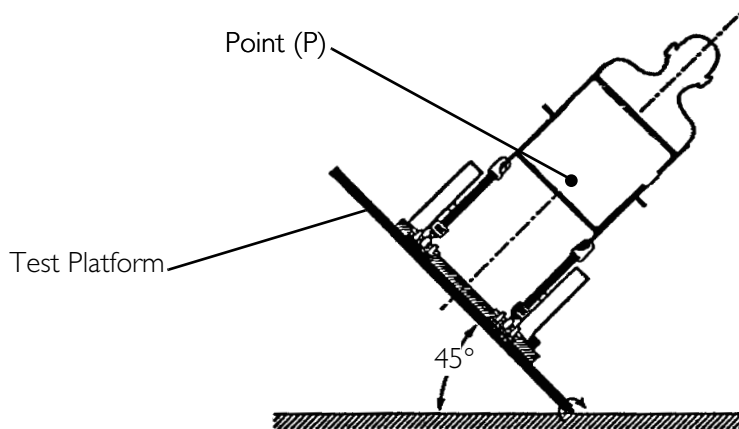
Vehicle-Anchored Belts

NOTE: For this procedure, refer to FIGURE 13.3.

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

RATING	DESCRIPTION
A	Excellent
B	Good
C	Fair
D	Poor

The test for Lateral Stability Displacement for Point (P) is shown in FIGURE 13.3. The average test result for point (P) is 0.33-inches (8.4 mm).



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

FIGURE 13.3 Vehicle-Anchored Belts

Seating System

⚠ WARNING

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

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

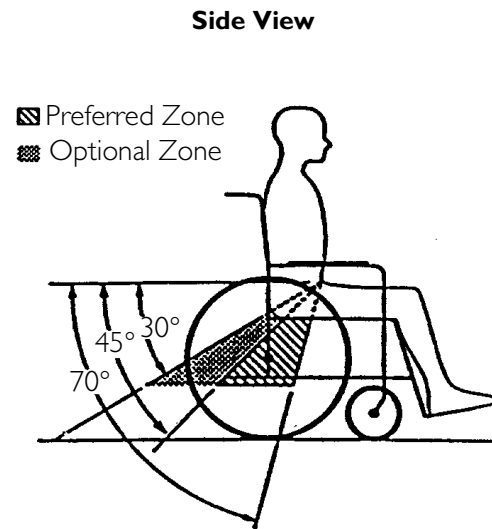
Positioning Belts

⚠ WARNING

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

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

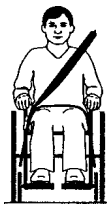
Steeper belt angles also reduce the tendency for upper-torso belts to pull the pelvic belt onto the abdomen during frontal impact loading.



NOTE: For this procedure, refer to FIGURE 13.4.

1. The pelvic belt should be worn low across the front of the pelvis.
2. Position the upper torso belt(s) over the shoulders.
3. The belt(s) should not be held away from the body by wheelchair components or parts, including but not limited to wheelchair armrests or wheels. Refer to FIGURE 13.4 for proper and improper positioning of the belts.
4. Ensure the belt(s) are not twisted.
5. Adjust belts as firmly as possible, being mindful of user comfort.

**DO POSITION BELT INSIDE OF
ARMRESTS, WHEELS, ETC.**



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



FIGURE 13.4 Positioning Belts

LIMITED WARRANTY

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



Yes, you can.

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